

ANNUAL NARRATIVE REPORT

Calender Year 1988



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1988

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



REVIEW AND APPROVALS

ALASKA MARITIME NATIONAL WILDLIFE REFUGE

Homer, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1988

Michael J. Blum
Refuge Manager

10/5/90
Date

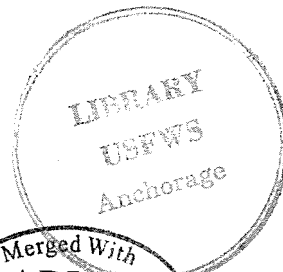
Carol M. [Signature]
Associate Manager,
Refuges & Wildlife

Date

Acting

Paul R. Schmidt
Regional Office Approval

Date



US FISH & WILDLIFE SERVICE--ALASKA



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HOMER OFFICE
ALASKA MARITIME NATIONAL WILDLIFE REFUGE
Homer, Alaska

ANNUAL NARRATIVE REPORT
Calendar Year 1988

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

INTRODUCTION

Homer Headquarters Office

Alaska Maritime National Wildlife Refuge

The 3,500,000 acre Alaska Maritime National Wildlife Refuge (Maritime Refuge) was established in 1980 by the Alaska National Interest Lands Conservation Act (Lands Act). This act added 460,000 acres of additional lands to eleven existing refuges combining practically all coastal refuge areas under one office. There are about 3,000 headlands, islands, islets, and pinnacle rocks within the refuge. These areas are used annually by about 75 million nesting seabirds representing about 80 percent of Alaska's seabird population.

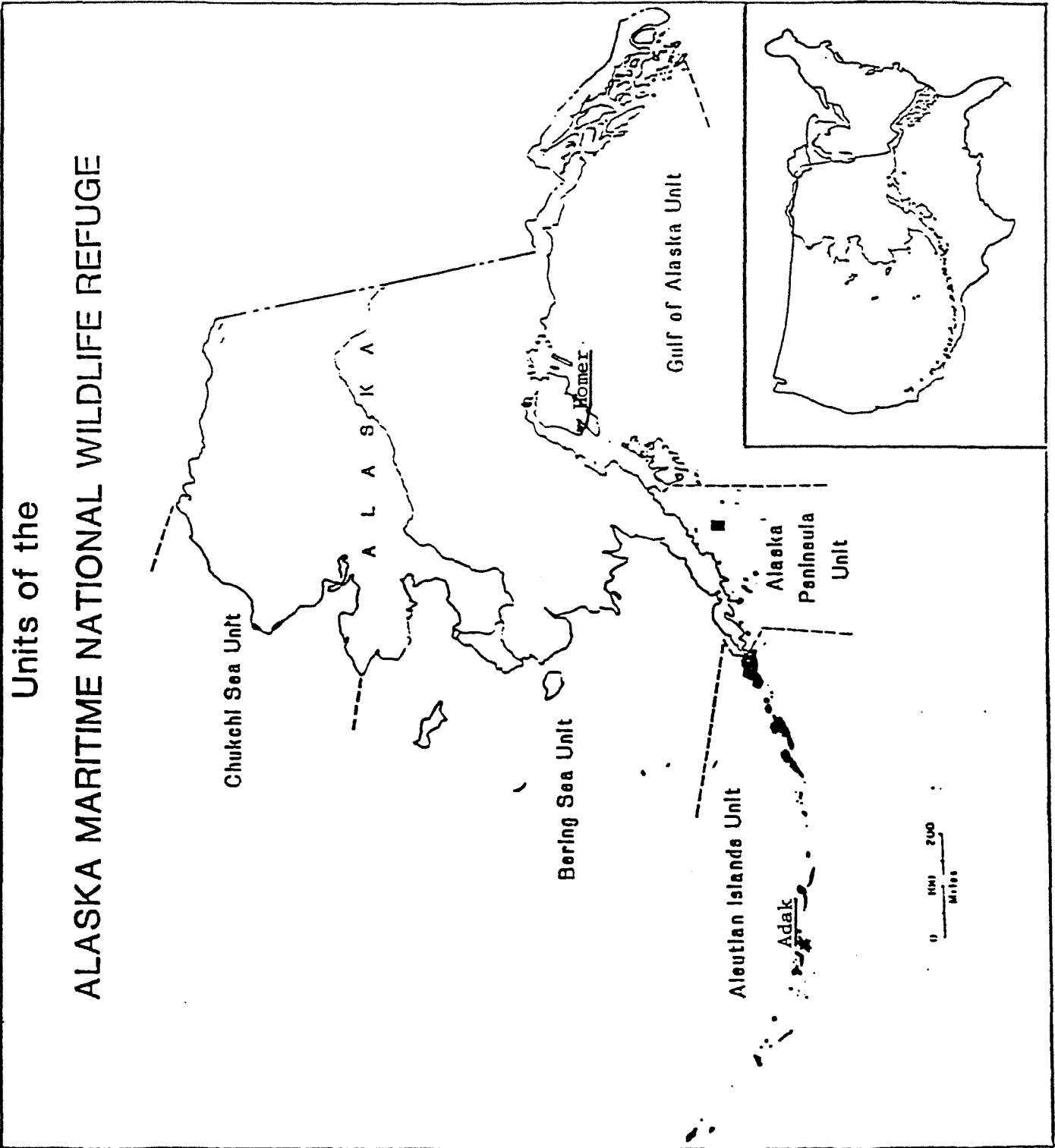
Each of the eleven refuges included in the Maritime Refuge had their own establishing authority and purposes, but the Lands Act added to these stating management shall: 1) conserve fish and wildlife populations and habitats in their natural diversity; 2) fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats; 3) provide the opportunity for continued subsistence uses by local residents; 4) provide a program of national and international scientific research on marine resources; and 5) ensure, to the maximum extent practicable, water quality and necessary water quantity within the refuge. The Lands Act also established five distinct geographic refuge units: the Chukchi Sea Unit, the Bering Sea Unit, the Aleutian Islands Unit, the Alaska Peninsula Unit, and the Gulf of Alaska Unit (Figure 1).

The five units which comprise the Maritime Refuge have headquarters located in Homer, Alaska. Homer is situated on the south end of the Kenai Peninsula about 220 miles by road from Anchorage. There is a sub-headquarters at Adak which administers the Aleutian Islands Unit.

The sea is common to all refuge areas, but each unit has its own unique features. Lush rain forests dominate much of the precipitous small islands in the Gulf of Alaska Unit; there are mountains rising directly from the sea to over 9,000 feet on the volcanic and treeless Aleutian Islands Unit; and areas of permafrost and high coastal escarpments are found in the Chukchi Sea Unit.

Overall remoteness, bad weather and accompanying rough seas, swift currents, rocky shorelines, poor anchorages, and high cost of transportation make administration of the refuge difficult. Recent interests in the oil-rich areas off Alaska's coast, increased demand for fishery stocks, increased population, and increases in efficient and more comfortable tourist transportation to remote areas are adding to management responsibilities of the refuge.

Figure 1. Location of the units of the Alaska Maritime National Wildlife Refuge



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B. CLIMATIC CONDITIONS

D. PLANNING

1. Master Plan

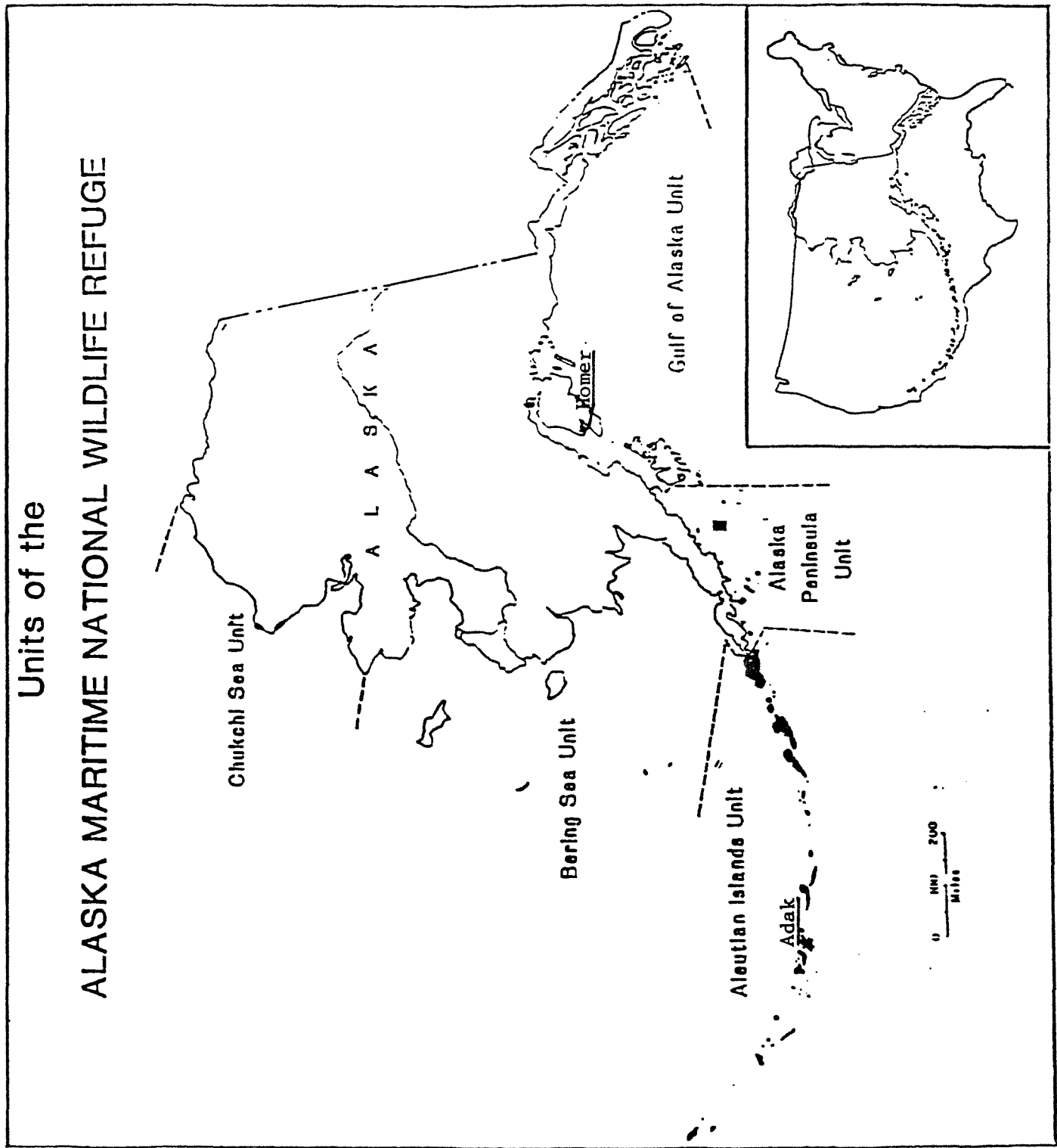
The Alaska National Interest Lands Conservation Act requires all Alaskan refuges to prepare a Comprehensive Conservation Plan/Environmental Statement/Wilderness Review which will serve as the station master plan. A special planning team was put together in the regional office in 1985 to begin work on the plan. Refuge biologists as well as Refuge Manager Martin and Assistant Refuge Manager Early were involved in development of the draft plan which was completed in December of 1987.

The draft plan returned from the printers and went out for public comment on February 19. The Service received 51 letters commenting on the plan and 145 people participated in 20 public meetings and one teleconference held in March and April throughout the refuge. Refuge Manager Martin and Assistant Refuge Manager for the Aleutians, Boylan, conducted the meetings with planning staff from the regional office. The issues of greatest concern to plan commenters were wilderness designation and management of the marine waters within the refuge. The 90 day comment period closed May 19 and work on revising the draft began.

All staff were involved in commenting on the draft plan and the in-house final plan. Refuge Manager Martin briefed the Regional Director on the final plan on May 20. All staff met with the regional office planning team in Homer on May 25 to coordinate the plan revision. The final plan was published on August 26 and the record of decision was signed in October.

Principle decisions coming out of the plan were the recommendation for wilderness designation of an additional 109,648 acres of refuge land and the intensive use designation of 342,000 acres of marine waters surrounding Afognak Island and in Womens Bay on Kodiak Island. This designation leaves open the possibility of mariculture in most of the marine waters of the refuge. The plan also called for construction of a refuge headquarters and large visitor center in Homer and a 70 percent increase in staff size. Most of the increase would be for intermittent biological technicians and an intermittent relief crew for the Tiglax.

Figure 1. Location of the units of the Alaska Maritime National Wildlife Refuge



2. Management Plan

In cooperation with the Kenai Fisheries Assistance Office, the Refuge Fisheries Management Plan was started. The Fisheries Office started gathering data from around the state on coastal fisheries, subsistence, and sport and commercial fishing.

3. Public Participation

Most public involvement this year was a result of the planning process. Meetings on the draft plan were held in 20 different communities affording refuge staff an opportunity to touch bases with local people on a number of issues. In addition, several meetings were held with local officials and officers of Native corporations in conjunction with the planning hearings.

E. ADMINISTRATION

1. Personnel



From left to right: Carol Hagglund, Dave Nysewander, Trina Fellows, Tom Early, Ed Bailey, Art Sowls, and John Martin. SS



From left to right: Al Bayer, Anne Furman, Kevin Bell, Robert Angell, Tom Callahan, and Robert Archibald. TJE



Pribilof Island crew 1988. Left to right: Don Dragoo, Belinda Bain, Art Sowls, and Rosalind Chaundy. 7/88-9C2 RC

Personnel

PERMANENT:

1. John L. Martin, Refuge Manager, GM-13, entered on duty December 21, 1981, permanent full-time.
2. Tom J. Early, Assistant Refuge Manager, GS-11, entered on duty July 23, 1981, permanent full-time, transferred Kanuti National Wildlife Refuge, October 22, 1988
3. David R. Nysewander, Supervisory Wildlife Biologist, GS-12, entered on duty September 28, 1986, permanent full-time.
4. Edgar P. Bailey, Wildlife Biologist, GS-11 entered on duty October 1, 1981, permanent full-time.
5. Michael L. Nishimoto, Wildlife Biologist, GS-11, entered on duty April 15, 1984, permanent full-time.
6. Arthur L. Sowls, Wildlife Biologist, GS-11, entered on duty September 28, 1986, permanent full-time.
7. Carol M. Hagglund, Budget Assistant, GS-7, entered on duty August 21, 1983, permanent full-time.
8. Trina B. Fellows, Refuge Clerk, GS-4, entered on duty November 28, 1983, permanent full-time.
9. Kimberlee D. Honsowetz, Clerk-Typist, GS-3, entered on duty July 5, 1988, permanent full-time.
10. Laurie (Poppy) A. Benson, Outdoor Recreation Planner, GS-9, entered on duty July 17, 1988, permanent full-time.
11. Robert E. Archibald, Engineer, WG-10, entered on duty March 23, 1987, permanent full-time.
12. Alvin D. Bayer, Ship Operator, WG-12, entered on duty October 6, 1986, permanent full-time.
13. Kevin D. Bell, Ship Operator 1st Mate, WG-11, entered on duty July 8, 1987, permanent full-time.
14. Marcia J Macone, Cook/Deckhand, WG-8, entered on duty August 8, 1988, permanent intermittent.
15. G. Vernon Byrd, Wildlife Biologist, GS-11, entered on duty April 29, 1984, permanent intermittent, transferred to Aleutian Islands Unit, Adak, May 22, 1988.
16. Tom J. Callahan, Ship Operator First Mate, WG-11, entered on duty June 8, 1987, permanent intermittent, resigned February 24, 1988.

TEMPORARY:

17. Ira S. Bailey, Relief Ship Operator, entered on duty July 23, 1988, temporary, terminated August 27, 1988.
18. Forney H. Ingram, Cook/Deckhand, entered on duty June 24, 1988, temporary, terminated July 24, 1988.
19. Don E. Dragoo, Biological Technician, GS-5, entered on duty May 27, 1987.
20. David E. Swift, Ship Operator, entered on duty January 25, 1988, temporary, terminated February 12, 1988.

VOLUNTEERS:

21. Nancy Norvell, Refuge volunteer, January 1, 1988-April 18, 1988.
22. Lisa Leftwich, Refuge volunteer, January 1, 1988-February 29, 1988.
23. Charley T. Unkefer, Student Conservation Association volunteer, January 1, 1988-March 15, 1988.
24. Jeff W. Snedgen, Volunteer Deckhand, October 11, 1988-October 14, 1988.
25. John W. Valikonis, Volunteer Deckhand, July 7, 1988-September 30, 1988.
26. Raquel J. Caster, Volunteer Deckhand, July 22, 1988-October 30, 1988.
27. Sharon L. Hockenson, Volunteer Deckhand, May 13, 1988-May 21, 1988 and July 21, 1988-October 24, 1988.
28. James Noland, Deckhand, Student Conservation Association volunteer, June 1, 1988-July 26, 1988.
29. Jimmy R. Crow, Volunteer Deckhand, May 8, 1988-May 20, 1988.
30. Wells M. Stephensen, Refuge volunteer, April 1, 1988-June 30, 1988.
31. Mathew E. Smith, Volunteer Deckhand, October 1, 1988-October 30, 1988.
32. Rosalind Chaundy, Student Conservation Association volunteer, June 12, 1988-September 15, 1988.
33. James H. Schaver, Refuge volunteer June 1, 1988-August 30, 1988.
34. Kathleen M. O'Reilly, Student Conservation Association volunteer, June 18, 1988-August 27, 1988.
35. Charles H. Bennett, Refuge volunteer, July 25, 1988-August 13, 1988.
36. Kurt Schmidt, Student Conservation Association volunteer, May 26, 1988-August 1, 1988.
37. Kirsten Brennan, Student Conservation Association volunteer, May 15, 1988-August 15, 1988.
38. Ian Jones, Refuge volunteer, May 6, 1988-June 21, 1988.
39. Dean S. Kildew, Refuge volunteer, May 24, 1988-August 30, 1988.
40. Martha Madsen, Refuge volunteer, July 1, 1988-July 30, 1988.
41. Bernie R. Tershy, Volunteer Cook/Deckhand, September 6, 1988-October 5, 1988.
42. Simon Gawn, Refuge volunteer, May 6, 1988-June 21, 1988.
43. Kathy Kuletz, Refuge volunteer, May 10, 1988-December 31, 1988.
44. Tim Dingman, Refuge Volunteer,
45. Ralph Louis Murray, Student Conservation Association volunteer, May 29, 1988-August 16, 1988.
46. Terry R. Spraker, Refuge Volunteer, July 8, 1988-August 11, 1988.
47. Robert C. Angell, Volunteer Deckhand,

Four of the five units of the refuge are supported by personnel located in the Homer office. Personnel for the Aleutian Islands Unit are presented in that section. The staffing pattern for the Homer office is presented in Table 1.

Table 1. Staffing Pattern, 1984 to 1988

	<u>Full-Time</u>	<u>Permanent</u> <u>Part-Time</u> <u>or intermittent</u>	<u>Temporary</u>	<u>Total</u> <u>FTE</u>
FY88	13	3	4	15.20
FY87	10	0	0	10.00
FY86	7	0	0	7.00
FY85	7	0	2	6.30
FY84	6	1	0	6.30

4. Volunteer Program

The volunteer program is actually the backbone of the summer field program. We have had tremendous success with this program by utilizing Student Conservation Association volunteers and other non-Association/refuge volunteers. We pay \$88 per week per student through the Student Conservation Association or \$20 per day for a refuge volunteer. Transportation costs are provided for all volunteers recruited from outside the local area.

5. Funding

Alaska Maritime Refuge funding by programs for the last five fiscal years is presented in Table 2. Funding for the entire refuge is through the Homer headquarters office. Funds internally distributed to the Aleutian Islands Unit are discussed in that unit's section.

Table 2. Alaska Maritime Refuge Funding, FY 1984 to FY 1988

	<u>1260</u>	<u>1400/ 1480/1113</u>	<u>1520</u>	<u>8610</u>	<u>1975</u>	<u>Totals **</u>
FY88	1,395,600	340,000	-	17,700	69,498	1,823,023
FY87	1,154,000	346,000	-	19,000	68,201	1,587,201
FY86	882,000	476,000	1,975	26,781	-	1,389,136
FY85	1,100,000	239,000	3,010	24,500	-	1,368,010
FY84	858,560	245,000	1,875	7,000	-	1,112,435

**Includes 6850 funds of \$2,380 for 1986; \$1,500 for 1985; and 225 for 1988.

The Alaska Maritime National Wildlife Refuge is headquartered in the Ross Duncan building located on Pioneer Avenue in downtown Homer. A total of \$59,400 (which includes utilities, snow and refuse removal) is paid for approximately 4,032 square feet of leased office/storage space. An additional 1,400 square feet of storage space was leased, beginning in mid-December.

6. Safety

First aid and CPR training were given to field people before leaving for field camps. In addition, all employees receive survival suit training and must complete the U.S. Coast Guard Water Survival Series of video tape training. All permanent employees who operate boats must complete the U.S. Coast Guard Axillary Small Boat Safety and Seamanship course.

The Tiglax had a new foam fire fighting system installed. A new pump for the water fire fighting system was also installed. With this new pump water can reach any location on the Tiglax. All the fire extinguishers and the automatic engine room fire fighting system were checked and certified. The two 25-man life rafts were checked and certified.

All the remote camps have a SAFETY plan which is kept in the Homer office radio room. The plan indicates emergency contacts, radio schedule frequencies and times, camp members, etc. This works in most areas. However, we do have some places, like the Barren Islands, that appears to be a "black

hole" which swallows all radio transmission. We still have not figured out a satisfactory communication system for this area.

H. PUBLIC USE

1. General

The first outdoor recreation planner for the Homer office was hired in March. Poppy Benson transferred down from the regional office planning staff where she had been editor for the refuge plan. Outdoor Recreation Planner Benson split her summer between Homer and completing the final plan in Anchorage. In mid October she left for nine weeks of basic police training at the Federal Law Enforcement Center in Glynco, Georgia.

The refuge does not have adequate space for a visitor center in its rented quarters. One small room has been used as a visitor contact facility for the past few years. A large hallway to the bathroom is used as an audiovisual room. Fortunately, this is not the only bathroom access. Student Conservation Association volunteer Ralph Murray was hired to run the contact station for the summer season. Visitation is still very low with 1,450 visitors, up 50 percent from 1987.

The Comprehensive Conservation Plan, the refuge's master plan, which was approved in October, called for development of a major visitor center for the refuge in Homer.

2. Outdoor Classrooms

Outdoor Recreation Planner Benson gave a program on seabirds to eight different groups, a total of 250 students, at Paul Banks Elementary during SeaWeek. She also gave a program on public lands in October to a fifth grade class at McNeil Canyon School. Student Conservation Association volunteer Murray gave a talk to 4-Hers on a camp-out at Anchor River.

Outdoor Recreation Planner Benson and Biologist Nysewander and Biological Technician Norvell took 44 senior scholars from the Elderhostel program on a birdwatching trip to the Homer Spit in September. Great weather and lots of binoculars assisted the seniors in spotting marine birds. Benson hosted the group at refuge headquarters where she gave a talk on the refuge and showed the refuge movie, "Chain of Life".

6. Interpretive Exhibits/Demonstrations

The small room used as the refuge contact station was much improved by the addition of portable interpretive panels

designed by Biologist Sowls. Also, some new specimens of freeze dried marine birds were put on exhibit.

7. Other Interpretive Programs

The M/V Tiglax made several village stops in the Bering Sea Unit during the month of August. Several people were given tours of the vessel.

Refuge Manager Martin also gave a Homer area Boy Scout troop a tour of the Tiglax.

11. Wildlife Observation

Marine wildlife sightseeing on refuge lands increased dramatically, particularly in the Seward area. Over 13,000 visitors toured the Chiswell Islands bird rookery on chartered tour boats in 1988, up from 630 at the inception of the industry in 1982. Cruise ships, the state ferry, and private boats also visit this part of the refuge bringing total visitation up to an estimated 24,000 visits. Outdoor Recreation Planner Benson attended one of the charter tours incognito. Interpretive information presented by the tour operator was sketchy. There is definitely a need and an opportunity for the refuge to provide more information to these visitors.

St. Lazaria Island in southeast Alaska is the second most visited refuge island with an estimated 3,000 visitors primarily from charter boats serving the cruise ship industry. St. Paul and St. George in the Pribilof Islands receive about 1,000 visitors per year.

The Society Explorer, a natural history oriented cruise ship, received a permit to tour all units of the refuge.

17. Law Enforcement

Outdoor Recreation Planner Benson graduated, tied for first in her class from basic police training at the Federal Law Enforcement Training Center in December. She also received a sharpshooter award for marksmanship. Prior to this only Assistant Refuge Manager Early had law enforcement authority in the Homer office.

Early visited Chisik Island in April and again in June to check compliance of commercial set net fishermen who camp on the island. One citation was issued.

18. Cooperating Associations

The refuge's outlet of the Alaska Natural History Association was closed in 1985 due to low sales and lack of an outdoor recreation planner to manage the operation. With the arrival of Outdoor Recreation Planner Benson plans were initiated to reactivate the outlet. Benson attended an Alaska Natural History Association board meeting in September to explain the refuge's plans for the outlet. At their December meeting the board approved reopening of the outlet.

I. EQUIPMENT AND FACILITIES

4. Equipment Utilization and Replacement

This was the second year of operation for the Service vessel M/V Tiglax. The Tiglax left Homer on February 1st to go to Bellingham, Washington for warranty work, repair, and modification.

One hundred fifteen modifications were made (20 were warranty items). Some of the major modifications were controls changed from hydraulic to pneumatic, wheels repitched, crane hydraulics hard piped, main engines and shafts realigned, shaft brakes repaired, potable water tanks relined, water lines through fuel tank rehung, loading cat down on helo deck, new hinges on helo deck fence, new foam fire fighting system installed, bottom pressure-washed, zincs replaced, paint locker constructed, outboard gas can locker constructed, antiroll tank converted to fuel tank, boiler replaced, and security cages constructed in the hold. The total cost for all the modifications was \$408,489.00.

The Tiglax left Bellingham on May 13. She arrived at Homer May 19, and immediately started getting ready for the field season.

The Tiglax left Homer on May 31, and returned on September 24. During October a short trip was made to Chisik Island to dismantle some trespass cabins in the Tuxedni Wilderness.

The Tiglax sailed over 15,490 nautical miles to support over 2,995 staff-days of Service work on shore and on board the vessel. Work included support of archaeological work, fox elimination, Aleutian goose nesting surveys, contaminant sampling, fish surveys, water quality, gill-net mortality of sea lions, plastics pollution, trap and transplant Aleutian Canada geese, walrus surveys (remote camera), on-shore and off-shore research of seabird feeding regimes, and SCUBA surveys of otter habitat. The vessel track went from Homer to

Attu with a trip to Cape Thompson and back to Homer. A map in Figure 2 shows the actual point to point travel.

All work on the schedule was accomplished. No major breakdowns occurred. However, the vessel still had an overheating problem on one engine and the hull paint needs to be replaced. The Tiglax will have the wheels lightened and repitched in hope of solving the overheating problem. While in the yard, the bottom will also be repainted. This yard work will be accomplished in Bellingham. After a few more seasons all the bugs should be worked out of her.

The extreme cold this winter (-24° F set a new record low for Homer) also took its toll on the Tiglax. The city's present shore power has proved unreliable. After power cut out, the pipes in the Tiglax froze and burst, putting over 1,000 gallons of potable water down ducting, into the engine room and berthing areas. Until we get reliable shore power, the Tiglax will have to be drained and completely winterized. We have been reluctant to do this because it requires longer start up time to move the boat in case of a harbor fire or tsunami. At present we are now operating the vessel with auxiliary generators rather than shore power.

The ironic part of this is we have contracted with the city to put in 200 AMP shore power. The purchase order, for \$18,000.00 was let by CGS during the spring. We still had not received the improved shore power by the end of the reporting period.



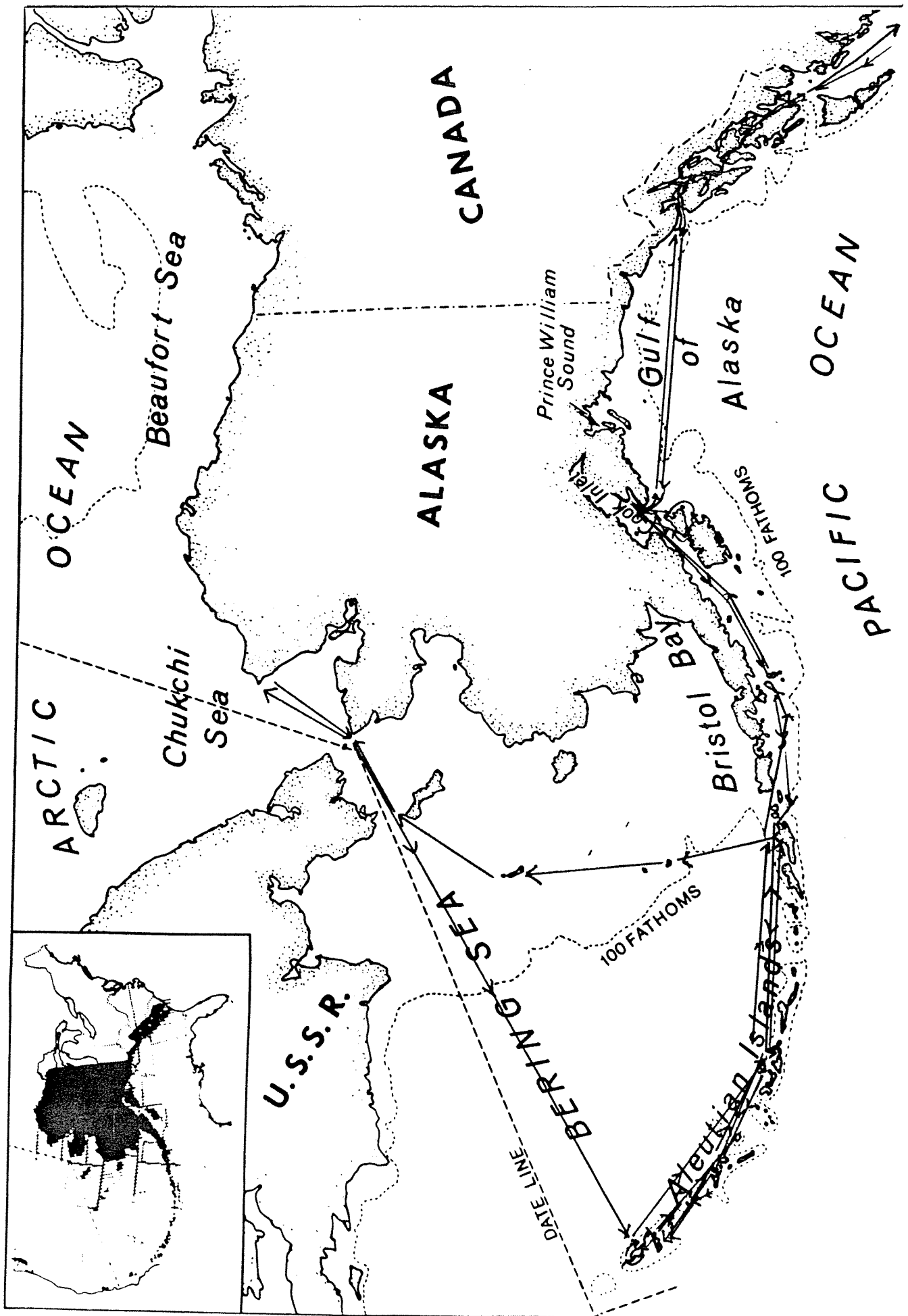
M/V Tiglax refueling at Homer Ferry Dock. Three tanker trucks from Anchorage brought fuel in. 5-28-88 TE

Table 3. Schedule of the M/V Tiglax, 1988

<u>Date</u>	<u>Location</u>	<u>Activity</u>
May 16-31	Homer	Field preparations
Jun 2	Shumagins	Check for fox, pick up Sand Point gear, collect sparrows
Jun 3	Nikolski	Pick up local hire
Jun 3	Carlisle	Off-load crew
Jun 5	Adak	Load crew and gear
Jun 8-9	Kiska	Off-load gear and crew for 1080 study
Jun 10	Agattu	Set up Aga Cove camp
Jun 11-15	Near Islands	Support goose survey, support seabird work, pick up crew
Jun 16	Buldir	Off-load two refuge people
Jun 17-21	Kiska	Resupply, personnel and camp support
Jun 23-27	Adak	Resupply, load field gear
Jun 28-30	Tanaga	Contaminant sampling, fish surveys, water quality work
Jul 1-3	Kiska	Contaminant sampling, fish surveys, water quality, pick up gear and crews
Jul 4-5	Buldir	Gather seabird/gill net data
Jul 6	Agattu	Move camps
Jul 7	Shemya	Program review, plant work
Jul 7-8	Agattu	Review program
Jul 8-11	Attu	Contaminant sampling, fish surveys, water quality, program review

July 11	Shemya	Drop off and pick up crews
July 11-14	Attu	Contaminant sampling, fish surveys, water quality work
Jul 15-16	Agattu	Pick up refuge people
Jul 17	Buldir	Drop off refuge people
Jul 18-20	Semisopochnoi	Contaminant sampling, fish surveys, water quality work
Jul 21-25	Adak	Unload gear, personnel, load trapping gear
Jul 28	Buldir	Drop off trapping gear
Jul 29-30	Agattu	Pick up personnel
Aug 1-11	Buldir	Support goose trapping/trans-plant
Aug 13-14	Adak	En route Dutch Harbor
Aug 16	Dutch Harbor	Refuel, resupply
Aug 17	Pribilofs	Pick up personnel
Aug 18-19	St. Matthew	Pick up cameras
Aug 20-Sep 3	Cape Thompson	Support seabird work
Sep 5	Adak	En route Attu
Sep 7	Attu	Pick up gear
Sep 7	Agattu	Pick up personnel and gear
Sep 8	Buldir	Pick up personnel and gear
Sep 10	Adak	Off-load/pick up personnel and gear
Sep 11	Carlisle	Pick up camp
Sep 12	Dutch Harbor	Pick up personnel
Sep 13-18	Shumagins	Support fox, sea otter, and seabird work
Sep 20	Barrens	Pick up crew
Sep 20-Oct 10	Homer	En route Kodiak
Oct 11-23	Kodiak	Support refuge and research
Oct 24	Homer	Off-load

Figure 2. Path of the M/V Tiglax in 1988.





Trespass cabin at Chisik Island. 10-88 DJ



Burning trespass cabin at Chisik Island. 10-88 DJ

J. OTHER ITEMS

3. Items of Interest

Martin is a member of the Kachemak Bay Rotary Club, the Homer Yacht Club, the Kachemak Bay Conservation Society, the Coast Guard Auxiliary, Rescue 21, the Kachemak Gun Club, the Alaska Natural History Association, on the Board of Directors for the Kachemak Bay Ski Club, and a member of the Homer Society of Natural History. Early is a member and on the Board of the Kachemak Bay Rotary Club, a member of the Kachemak Bay Conservation Society and a member of Homer Society of Natural History. Nysewander, Bailey, Nishimoto, Sowls, Hagglund and Fellows are members of the Kachemak Bay Conservation Society and Homer Society of Natural History. Bailey is a Board Member of the Kachemak Bay Conservation Society and serves on the city's Hazardous Wastes Task Force. Fellows is on the Board of Directors for the Kachemak Bay Lioness Club, and a school boarding mother for village children.

4. Credits

The Homer office section was written and edited by Early, Hagglund, Blenden, Martin, and Benson and typed by Honsowetz, Fellows, and Andrew-Miller.

ALASKA PENINSULA UNIT
ALASKA MARITIME NATIONAL WILDLIFE REFUGE
Homer, Alaska

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NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

Alaska Peninsula Unit

Alaska Maritime National Wildlife Refuge

The Alaska Maritime National Wildlife Refuge was created by the Alaska National Interest Lands Conservation Act in 1980. It was established to conserve fish and wildlife populations and habitats in their natural diversity, fulfill international fish and wildlife treaty obligations, provide opportunities for continued subsistence uses by local residents, provide a program of national and international scientific research on marine resources, and ensure water quality and necessary water quantity within the refuge. This Act consolidated management of eleven existing refuges with 460,000 additional acres resulting in a 3,500,000 acre refuge. Although relatively small in land mass, its lands are scattered through most of coastal Alaska and extends from Forrester Island in southeast Alaska along the Gulf of Alaska to the Aleutian Islands and northward until near Barrow in northwest Alaska. There are over 2,500 islands, islets, and pinnacle rocks within the refuge which are used annually by millions of seabirds of at least 30 species. The Maritime Refuge has five units with all former refuges designated subunits.

The Alaska Peninsula Unit is the second largest unit of the Alaska Maritime National Wildlife Refuge. Over 800 islands, totaling 600,000 acres comprise this unit, which incorporated two refuges established before designation of the Maritime Refuge. The Semidi Islands, designated a refuge in 1932, and Simeonof Island, a refuge since 1958, also are the only areas in the Alaska Peninsula Unit which extend beyond mean high tide.

Except for the Aleutians, the greatest diversity of breeding seabirds is found along the south side of the Alaska Peninsula. Over 6,000,000 seabirds comprised of at least 25 species nest in this region.

Surprisingly, few of the islands remain truly pristine due to past introductions of foxes, rodents, and ungulates. Foxes destroyed fossorial and surface-nesting seabird colonies on numerous islands and left only remnant populations on others. More damaging than foxes on some islands, are the ground squirrels and voles which were released with them as an added food source.

Few people visit refuge islands except in the vicinity of villages, primarily Sand Point, Squaw Harbor, and King Cove; six other villages are located in the region. Egging and

hunting of seabirds is generally negligible in this region where most residents derive their livelihoods from commercial fishing. The first contact between Russians and Alaska Natives occurred in 1741 in the Shumagin Islands. The islands have been little affected by off-shore oil exploration and development, but exploration has begun in Shelikof Strait to the north and is planned elsewhere off the Peninsula. Human competition for fish relied upon by marine birds and mammals probably poses the greatest potential threat.

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Red fox eradicated from Poperechnoi Island in the Pavlof Islands. (Section G.15)

Bird and Big Koniuji islands in the Shumagins rechecked and no fox sign detected. (Section G.5)

Major archeological investigations continued on Chernabura Island, the second oldest site in the Shumagin Islands. (Section D.5)

Reconnaissance of additional islands in the Pavlof Island and Fox Island groups completed. (Section G.5)

B. CLIMATIC CONDITIONS

Cold Bay provides the only long-term weather records available for the south side of the Alaska Peninsula. Intermittent records are available from Sand Point in the Shumagin Islands and from Chignik, which lies 100 miles to the northeast. Sand Point's annual mean temperature is 37.9 ° F, and it averages 60.3 inches (four-year record) of precipitation. Chignik, one of the wettest stations in the state, averages 127 inches of precipitation and has an annual mean temperature 38.5 ° F, based on eight years of data.

Table 1.

Climatological data for Cold Bay, Alaska 1988

Month	<u>Temperature</u> (°F)				<u>Precipitation</u> (in)				<u>Wind Velocity</u>	
	Ave. Max.	Extreme	Ave. Min.	Extreme	Monthly mean	Departure from mean (40 yrs.)	Water equivalent	Snow	Departure from mean	Mean (mph)
Jan	35.8	42	26.6	09	31.2	+2.9	3.70	11.0	+1.00	15.6
Feb	34.5	42	25.8	05	26.2	0	2.91	5.9	+0.64	17.1
Mar	31.7	44	20.4	10	26.1	-2.5	0.89	7.5	-1.42	15.8
Apr	35.8	46	26.3	12	31.1	-1.9	1.81	11.6	-0.14	18.4
May	45.4	51	35.4	28	40.4	+0.9	2.70	0.1	+0.23	16.3
Jun	50.9	62	41.0	34	46.0	+0.6	1.69	0	-0.47	16.1
Jul	55.3	62	46.6	43	51.0	+0.7	1.12	0	-1.38	14.4
Aug	55.9	63	46.2	39	51.1	+0.1	3.03	0	-0.67	15.1
Sep	51.8	58	41.9	30	46.8	-0.7	3.90	0	+0.13	16.9
Oct	45.5	53	35.5	28	40.5	0	3.28	0.3	-1.01	15.8
Nov	37.4	47	27.5	10	32.5	-1.8	3.98	15.2	-0.06	18.5
Dec	35.2	45	26.5	12	30.9	+1.4	6.37	22.1	+3.52	22.4
Total	42.9	62	33.3	05	37.8	-0.2	35.38	73.7	-0.21	16.9

D. PLANNING

1. Master Plan

See Homer office section.

2. Management Plan

See Homer office section.

5. Research and Investigations

AMNWR NR 88 - People in a Tectonically Unstable Environment-Vassar College, New York.

Dr. Lucy Johnson provided the following edited summary of findings in 1988:

Excavation of the largest and most eroded site on Chernabura Island, located on the south end of the Chernabura Spit, was begun during the summers of 1986 and 1988. This site was chosen because of its size and its imminent danger of disappearing into the sea. The periwinkle mound was chosen for excavation because it wasn't eroded past the floor level of barabaras as shown by whale bone uprights sticking up from the mound which outline a barabara. On the east, sand dunes underlie the periwinkles, on the west cultural deposits extend below the current ground surface. A trench from east to west was established in 1986 and extended in 1988. In 1988, three 2x2 meter squares were dug from east to west on the top of the mound, continuing on from the 1986 excavation, and two from west to east from the bottom. Four squares remain undug in the middle of the trench. This trench was positioned to run along the outside of the whalebone house and thus provide a wall from which to excavate the house.

Although there has not been time for a detailed analysis of the materials collected in 1988, the field study of two bone collections has raised intriguing possibilities. A set of faunal remains from the western, lower end of the trench was composed of many periwinkles, minor amounts of chitin, limpet and mussel, many codfish bones, and a limited number of sea mammal bones. On the other hand, a level from the top eastern end of the trench contained few periwinkles compared to chitin, limpet and mussel, a considerable presence of sea urchin spines, moderate numbers of fish bones and many sea mammal bones, ranging from sea otter to whale. Perhaps the lower area is earlier than the upper, and diet changed from fish to sea mammal through time, or it may be that Shumagin eating habits and living areas varied with class, and the upper class lived high off the sea mammals; or we may have located different processing areas within the site. Deciding between these and

other possible hypotheses will require further dating and excavation of the site.

In the summer of 1988, excavation was also begun at two other sites on the Chernabura Spit. The excavation of a small house depression was designed initially to provide information about the underground appearance of an intact barabara in order to aid in the interpretation of the remains from the highly decayed periwinkle mound. Six 1x1 meter pits were placed around the apparent edges of a house pit and intact house walls encountered at a depth of approximately one meter. The lithic inventory included obsidian, slate, jasper, chalcedony and other charts and large cobble flakes as well as the ubiquitous andesitic basalt with plagioclase inclusions of which most Shumagin tools are made. This rich body of foreign lithics indicates some special role either for this house or for this site which will be investigated through further excavation during the 1989 field season.

Much of the remainder of Chernabura was surveyed by foot and inflatables. Two additional sites were found. On the west side of the island, in the first bay south of the spit a "closed" lagoon was investigated. It has recent fish drying platforms standing and prehistoric deposits along the cliff edge facing Bird Island. The absence of barabara circles suggests that the site was a summer camp, probably for fishing and collecting the salmon berries which grow rampant on the south side of the valley.

On the east side of the island, a site was found above a rocky bay.

We also found a World War II radio station in a cirque near the top of the island which was reached by a corduroy road.

Two trips were made to Simeonof Island. Two sites on either side of Simeonof Harbor were checked. These turned out to be very large, very late sites which may well have been inhabited at the time of Russian contact. They are later than any sites on Chernabura and may represent a relocation of the major Shumagin population from Chernabura to Simeonof.

Bird Island was revisited on the east side to map and collect a carbon sample.

Chernabura and Simeonof are adjacent to major resources which are less likely to be disrupted by seismic activity than resources of the inner islands. These resources include migrating sea mammals, particularly whales, and cod fish. While people on Simeonof and Chernabura will feel the immediate effects of large earthquakes as severely as will other people on the islands, they will not suffer as much disruption in

their food base. Uplift and subsidence can seriously affect near shore contours, thus disrupting mollusks, inshore fish, and the mammals which feed upon them. On the other hand, the codfish and the migrating whales are more dependent on the resources brought up by the upwelling waters of the Shumagin trench, which are not as severely affected by earthquakes and tsunamis.

If the hypothesis is correct, the huge sites on Chernabura and Simeonof should have more large mammal bones in them than the smaller Koniuji sites as well as having a larger proportion of large sea mammal hunting implements. In particular, the excavations on Chernabura, which are the major thrust of this proposal, should reveal a heavy dependence on cod and whale and a large number of whale and cod related artifacts.

AMNWR NW-88. Use of red fox as a biological control against introduced arctic fox.

On September 13, Student Conservation Association volunteer Hector Douglas and three other volunteers spent roughly two hours on Uliaga Island to determine if any fox remained. They found at least one set of tracks and collected several fox scats. At least two red foxes were found on this island a year earlier when five days were spent on the island. It is believed that the tracks and scats were that of a red fox, but until all fox sign disappears, it is impossible to be certain that all arctic fox are gone. In 1987, it appeared that one red fox still survived on this small island. Thorough examination of both Uliaga and Adugak is planned in 1989.

E. ADMINISTRATION

1. Personnel

See Homer office section.

4. Volunteer Program

See Homer office section.

5. Funding

See Homer office section.

6. Safety

See Homer office section.

G. WILDLIFE

2. Endangered and/or Threatened Species

No refuge or research personnel visited the Semidi Islands to ascertain the status of the relict population of Aleutian Canada geese on tiny Kiliktagik Island.

3. Waterfowl

Spring waterfowl surveys along the south side of the Alaska Peninsula have been conducted for eight years by migratory bird management personnel to monitor the status of declining populations of emperor geese. A total of 2,601 emperor geese was counted on the south side of the Peninsula between Kodiak Island and Unimak Island. This compares to 3,549 in this region in 1987 and 2,072 five years ago. The overall statewide population of emperors reportedly increased slightly to roughly 60,000.

No nesting waterfowl were noted on any of the Pavlof islands during fox eradication operations in July. Harlequin ducks occasionally were present along the shore of Poperechnoi.

5. Shorebirds, Gulls, Terns, and Allied Species

The only seabird-related activities in the Alaska Peninsula Unit were associated with fox eradication in the Pavlof islands. Two islands in the Shumagins also were rechecked for the presence of fox, but unfortunately the visit occurred in September after breeding seabirds had dispersed.

Seabird observations were documented while eradicating fox on Poperechnoi Island in July. Also, a reconnaissance of Outer Illiasik and other nearby islands was conducted to locate seabird colonies. These two islands were again briefly visited in September to check for fox sign.

Very few seabirds nest on Poperechnoi, and no colonies have previously been documented. An estimated 125 pairs of horned puffins nested on the island in 1988. Because of irregular colony attendance horned puffins are extremely difficult to census, particularly when they nest in ill-defined small colonies or as scattered pairs as they do on Poperechnoi. The most discrete colony, consisting of about 25 pairs, is on a point on the west side roughly one kilometer south of the northern tip of the island. The remainder of the puffins occurred along headlands and cliffs in four general areas on the southern end. A few tufted puffins also nest along the south side. The only other known nesting seabirds on Poperechnoi are scattered pigeon guillemots, probably numbering

less than 50. Nearly all of the south side of the island appears to have excellent habitat for burrowing birds.

This stretch of verdant headlands faces open ocean unobstructed by other islands. Similar habitat in the fox-free Sandman Reefs lying to the southeast teem with fossorial seabirds. Nearly all puffin habitat, however, is accessible to fox. No cormorants were noted nesting along the massive volcanic cliffs on the east side of Poperechnoi. These cliffs seem unstable and suitable ledges appear scarce.

American black oystercatchers and semipalmated plovers were the only shorebirds found nesting in the Pavlof islands. Rock sandpipers and wandering tattlers also were observed. The two small stacks off the northeast end of Dolgoi were landed on, and we found approximately 150 active tufted puffin burrows on the furthest west sea-stack. This colony is not cataloged. Surprisingly, there also were voles. No burrows existed on the eastern islet.

Islets at Dolgoi Harbor on the south side of Dolgoi were surveyed. Curiously, no seabirds were observed on Olga Island where 6,350 nesting birds, mainly tufted puffins, were reported in 1973. We counted 30 glaucous-winged gull nests on Entrance Island. Most young hatched much earlier, as 25 large chicks with primary feathers were wandering about. About 50 doubled-crested cormorants, mainly fledglings, also were roosting on Entrance Island, but no nests were seen. Oystercatchers also nest on this tiny island. In 1973 about 200 gulls nested here. We estimated 20 pairs of glaucous-winged gulls nesting on the unnamed islets southeast of the entrance of Dolgoi Harbor; a surprisingly large number of 600 gulls reportedly nested there 15 years ago.

When we surveyed Outer Iliasik Island, no nesting seabirds were found, and we were surprised to find no sign of fox.

A new colony of approximately 65 pairs of glaucous-winged gulls and 20 pairs of horned puffins were discovered on an inaccessible pinnacle on the east side of Inner Iliasik. A few guillemots also nested here. No colonies previously were recorded on this island. Fox tracks existed on the isthmus south of the pinnacle.

Albeit Fox Island, lying north of Deer Island, also is Native-owned. We briefly visited it enroute to Cold Bay. Birds used practically all of the island, and breeding pairs numbered at least 1,200 glaucous-winged gulls, 150 horned puffins, 50 tufted puffins, and 15 oystercatchers. No previous estimates are listed in the colony catalog (Sowls et. al. 1978) for this former fox farm.



Base Camp on Poperechnoi Island. This steep cobblestone beach on the west side is the only site where landings are nearly always possible and water is available. 1988 KS



Poperechnoi is surmounted by a 1,500 foot extinct volcano. 1988 KS

When Big Koniuji was checked in September, no crested auklets were present at the large colony at Yukon Harbor.

6. Raptors

Two active and one abandoned bald eagle nests were located on Poperechnoi. An active eagle nest with one eaglet was found on a sea-stack below the pinnacle on Inner Iliasik. Another eyrie probably was on Outer Iliasik, but we were unable to spot it, despite the presence of an agitated pair of adults. An eagle nest with two large chicks existed on one of the unnamed islets southeast of Dolgoi Harbor.

Two pairs of red-tailed hawks repeatedly were encountered about the cliffs on the east side of Poperechnoi Island; eyries were highly likely, judging from the aggressive behavior of these pairs. An abandoned peregrine falcon eyrie was found on the north end of Poperechnoi, and an active nest ledge apparently is present on the southeast end.

7. Other Migratory Birds

In spite of the presence of fox, rock ptarmigan still survive on Poperechnoi. Fifteen birds were recorded during our stay on this island. Ptarmigan also are present on Outer Iliasik, but none were seen on Inner Iliasik.

No unusual passerine birds were recorded on any islands visited. The few resident or breeding species on Poperechnoi included common raven, black-billed magpie, dipper, hermit thrush, yellow warbler, Wilson's warbler, song sparrow, savannah sparrow, Lapland longspur, snow bunting, common redpoll, and rosy finch.

9. Marine Mammals

Sea otters inhabit the area, but we counted only 20 individuals while circumnavigating Poperechnoi. Harbor seals also were scarce in 1988; the largest pod of seals, 30 individuals, was encountered at an unnamed islet north of Dolgoi. Since the Pavlofs are frequented by fishing boats from King Cove, local seals are probably shot regularly. Though a few have been sighted in past years, no Steller's sea lions were spotted at Poperechnoi or on other islands we visited in 1988. Sea lions are declining throughout most of the state.

Tony DeGange from the Anchorage Research staff spent a few days in September diving off islands in the Pavlof and Shumagin groups to determine the impacts of sea otters on benthic organisms.



The east side of Poperechnoi mostly consists of cliffs; offshore shoals and rocks also complicated working on this side of the island. 1988 EB



Looking north from atop this volcano on Poperechnoi, Dolgoi Island, upper left. 1988 EB

10. Other Resident Wildlife

Unlike many of the larger islands in the nearby Shumagins, ground squirrels are not found on the Pavlof Islands. Voles, however, are prevalent even on most islets. Mink occur on Poperechnoi Island. River otters are common on Poperechnoi, and as previously mentioned, brown bears occasionally visit Poperechnoi and presumably the other islands in the Pavlofs, which all are closer to the Alaska Peninsula. They probably wander onto some islands in search of food early in summer before concentrating at mainland salmon streams.

15. Animal Control

Student Conservation Association volunteer Kurt Schmidt and I arrived on Poperechnoi on July 8 from Cold Bay in a 17-foot inflatable. We circumnavigated the island and deployed number 1 3/4 coil-spring leg-hold traps around Poperechnoi; a .223 rifle was carried to shoot foxes sighted. We continued to deploy traps on trails and beaches until July 17 when 60 traps had been set. Thereafter, we repeatedly checked all traps on the island every two or three days. Most traps were left set in case any fox remained after our return to Cold Bay on July 25.

Poperechnoi was revisited briefly on September 17 aboard the Tiglax and 13 traps on the west side of the island were checked.

After 17 days of trapping on Poperechnoi Island, we killed 11 red foxes, two of which were pups at the only den site discovered. All were trapped except one fox, which was shot. Oddly, all but one of the nine adult foxes killed were males. The one female taken was believed associated with the den where two approximately 8-week old pups were found. A female pup was caught at one of the six den entrances, and a male pup was trapped about 0.5 kilometer away from the den. Seven of the 11 foxes killed on the island were on beaches or on trails adjacent to a beach. All four of the foxes captured in the interior of this island were within about one kilometer from the den site located near the southeast end. All but one of the foxes were killed within eight days after our arrival, and the last one was trapped on July 22.

One fox escaped from a trap by pulling out the trap stake. This animal was never recaptured, and there is no way of knowing whether it survived. A few other traps were sprung during our stay, but river otters were believed the cause. Fortunately, no ground squirrels exist on Poperechnoi because they severely interfere with trapping operations by repeatedly springing traps. Voles are common on the island, but they are too small to frequently trip traps. No non-target species were captured before leaving the island. However, a mink was found



Northern tip of Poperechnoi with Ukolnoi and Pavlof Volcano, Alaska Peninsula, in background. 1988 KS



The south slopes of Poperechnoi have ample habitat for fossorial seabirds. A red fox den was located near this site. 1988 KS

in a trap during a brief visit in September. This was the first mink ever trapped on an island where fox were being removed. An otter or fox escaped from a trap checked in September.

The preponderance of male foxes on Poperechnoi is a unique anomaly; nothing like this has been found on any of the 13 other islands in the refuge from which fox have been eliminated. In fact, on Amukta, Bird, Big Koniuji, and Rat islands, where traps were also primarily employed, more females than males were taken. On Bird and Big Koniuji islands 58 percent of the fox trapped were females; on Rat Island females constituted 57 percent of the arctic fox removed, and sex ratios on Kasatochi and Amukta were 62 percent and 54 percent females, respectively. Also, of 132 poisoned foxes sexed on Kiska in 1986, 57 percent were females. Since studies elsewhere have shown that males tend to disperse further than females and that sometimes several vixens are at a den with a single male (Novak et al. 1987), the excess of females found on other islands would be expected. It appears that normally males sustain higher mortality. Why were 82 percent of the foxes trapped on Poperechnoi males? Probably no more than two or three foxes remained on this island. Since red foxes are normally monogamous and only one adult female was trapped, it appears likely that the den we found was the only one on the island. Certainly the genetic variability and adaptability, already limited by so small an isolated population, would be negligible with evidently only one breeding female on the island at the time of our visit.

With 57 traps left set on Poperechnoi and no ground squirrels to spring them, survival of any foxes that eluded us in July is unlikely. In 1989 this island should be revisited to confirm the anticipated absence of fox and the start of recovery of bird populations.

H. PUBLIC USE

Very little recreational use takes place in the remote unit. Sea kayaking occurs in only rare instances because of the costly and difficult logistics and frequent foul weather.

1. General

See Homer office section.

2. Outdoor Classrooms

See Homer office section.



The only lakes on Poperechnoi are at higher elevations in the interior. Brown bear tracks were noted around this small lake. 1988 KS



Spotted sandpiper chicks on Poperechnoi. With such superb cryptic coloration, some are overlooked by foxes. 1988 KS

6. Interpretive Exhibits/Demonstrations

See Homer office section.

7. Other Interpretive Programs

See Homer office section.

11. Wildlife Observation

See Homer office section.

17. Law Enforcement

See Homer office section.

I. EQUIPMENT AND FACILITIES

A 17-foot Avon inflatable boat was used to reach the Pavlof Islands, and the M/V Tiglax took personnel to the Shumagins in September. We appreciated the assistance of the Izembek National Wildlife Refuge staff for use of their bunkhouse before and after our venture in the Pavlof Islands.

4. Equipment Utilization and Replacement

See Homer office section.

J. OTHER ITEMS

3. Items of Interest

See Homer office section.

4. Credits

Most of the Alaska Peninsula section of this report was compiled by Edgar Bailey.

ALEUTIAN ISLANDS UNIT
ALASKA MARITIME NATIONAL WILDLIFE REFUGE

Adak, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1988

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

INTRODUCTION

Aleutian Islands Unit

Alaska Maritime National Wildlife Refuge

The Alaska National Interest Lands Conservation Act (ANILCA) combined a majority of Alaska's seabird habitat into one refuge by adding 1.9 million acres of land to 11 existing refuges to create Alaska Maritime National Wildlife Refuge.

The Aleutian Islands Unit (AIU) comprises about 3.9 million acres in southwestern Alaska and extends over 1,100 miles from Unimak Island west to Attu Island. The Aleutians are actually tips of an arc of 57 submerged volcanoes, 27 of which are active and rise 2,000 to over 9,000 feet above sea level along the north side of the islands. Izembek National Wildlife Refuge borders the east end of the unit.

Bounded by the Pacific Ocean to the south and the Bering Sea to the north, the unit includes over 200 treeless islands, islets and rocks. These surrounding oceans affect the climate and weather, and provide habitat and migrational pathways for fish, birds, and mammals.

The AIU is divided into seven island groups; The Near Islands, Rat Islands, Delarof Islands, Andreanof Islands, Islands of the Four Mountains, Fox Islands, and Krenitzen Islands. Unimak Island is also presently part of the unit but is not considered part of the Aleutian chain.

Approximately 68 percent or 2.3 million acres of the AIU is congressionally designated wilderness; this includes Unimak Island which has 910,000 acres of wilderness. Unimak is proposed for transfer to Izembek National Wildlife Refuge.

The Aleutians have a maritime climate characterized by overcast skies, frequent, violent storms, high winds, fog and precipitation. Year-round temperatures are cold but not normally severe, with a mean annual temperature of 40 degrees F. Strong winds, sometimes approaching 100 m.p.h., can induce very cold chill factors.

The AIU provides unique nesting habitat for several million seabirds, the endangered Aleutian Canada goose, and other waterfowl. It is also an important migration and staging area for a wide variety of waterfowl, shorebirds and passerines and provides wintering habitat for the emperor goose and other waterfowl. The refuge is one of the few places in North America where Asiatic birds can be observed in the spring and fall. Fully 35 percent of all bird species observed in the Aleutians breed only in Asia; most are seen at the western end of the chain. Some 260 bird species have been recorded in the AIU.

The AIU has the largest nesting population of seabirds (approximately 10 million) in North America. It is one of the few refuges in the United States managed primarily for seabirds. A major problem affecting seabirds in the AIU is the widespread introduction of foxes. The Aleutians' 10 million seabirds is probably a fraction of what it was prior to fox introduction. Of over 100 named islands, islets and rocks in the Aleutian Islands Unit, only 44 units or 6% of the total acreage are fox-free.

Land mammals found in the AIU (other than Unimak Island) are generally non-native. Reindeer were introduced to Atka for food and for antlers to be sold as an aphrodisiac. The commercial venture failed and over 2,000 feral reindeer are left on the island. Caribou from mainland Alaska were released on Adak in 1958 for emergency food and recreational hunting. The herd is managed for a post-season population of 250 animals.

The Norway rat was accidentally introduced by the early Russians and again during World War II and is now found on 20 islands throughout the chain. Introduced rodents act as predators of ground nesting birds; voles and ground squirrels cause erosion by overgrazing the vegetation.

Arctic and red fox were originally found on a few of the eastern Aleutians but were introduced to over 80 other islands between 1836 and 1930. The damage to native birds on these islands is significant. Plans call for the eradication of introduced fox to allow native bird species to recover.

The Aleutian Islands were originally established as a refuge in 1913 to protect the sea otter. Since that time, the sea otter has made a dramatic recovery. Their population in the Aleutians is estimated to be 55,000-75,000.

An estimated 85,000 harbor seals are found throughout the Aleutians and can be seen hauled-out on offshore reefs, rocks, ledges, and beaches along the main islands. The northern or Steller sea lion is also found throughout the Aleutian Chain. The world population of northern sea lions has decreased by more than 50 percent in a decade and National Marine Fisheries Service is considering a "depleted" status for them. On certain rookeries in the eastern Aleutian Islands, the sea lion population is estimated to be 20 percent or less of its original numbers. In the western Aleutians, populations may have declined by over 60%.

Fourteen species of cetaceans have been observed in the waters of the Aleutian Chain: killer whales, Dall porpoises and Minke whales are the three species most commonly observed.

The Aleutian Canada goose, short-tailed albatross, Chinese egret, and the Aleutian shield fern are the four endangered species that have been observed in the Aleutians.

The Aleutian Canada goose historically nested throughout the Aleutians. Since the introduction of arctic foxes, these birds occur naturally on only two islands (Chagulak and Buldir) in the AIU. Neither island had foxes introduced. A reintroduced population is developing at Agattu Island following fox removal.

To aid in the recovery, fox are being eradicated on selected islands and geese transplanted from Buldir to fox free islands where the birds historically nested. The Aleutian Canada goose population is estimated to be about 5,000 birds up from its 1975 population of 700 geese.

The Aleutian shield fern, historically found only on Adak and Atka islands, was listed as endangered in 1988. Field work continues in an effort to prepare a recovery plan for this species, recently found only on Adak.

The Aleutians were originally occupied by the Aleuts, related to the Eskimos. Subsistence was entirely maritime, with extensive exploitation of local whales, sea mammals, fish, invertebrates, seabirds, eggs and plants.

The Russian fur trade and Russian Orthodox Church dominated Aleut life from the 1850's until the American purchase of Alaska. The early years, before the founding of the Russian-American Company, saw considerable loss of population from epidemic and other causes. Today's Aleut population numbers some 2,000 in only four villages but up to 20,000 once called these islands home.

The later history of the Aleutians was marked by a continuation of fur trapping, the introduction of fox farming, and the development of commercial fishing. The 20th century was dominated by World War II including the first occupation of America soil since the war of 1812.

During World War II, the Japanese seized Kiska and Attu islands after bombing the military bases on Dutch Harbor. The U.S. constructed large bases in the Aleutians with thousands of structures erected on Adak, Amchitka, Shemya, and other refuge islands. An assault on Attu Island resulted in a hard-won victory for the United States, followed by the Japanese evacuation of Kiska Island. Prior to the invasion of Kiska, there were 100,000 American and Canadian soldiers in the Aleutians. The recapture of Attu was the only battle of the war fought on U.S. soil; also the only battle fought in a National Wildlife Refuge.

Several sites in the Aleutians are National Historic Landmarks due to their significance in World War II. Attu, Shemya, Amchitka, and Adak are military bases. The Coast Guard maintains a base on Attu Island and Shemya is an Air Force Base while the Navy is on Amchitka and Adak islands, the latter AIU

headquarters. With over 5,000 people, Adak is the sixth largest community in Alaska.

The Department of Defense continues its Defense Environmental Restoration Program (DERP) to rehabilitate World War II military sites including chemical sampling and analysis for contaminants. Sites on Alaid, Agattu, Buldir, Amchitka, Tanaga, Atka, Great Sitkin, and Unimak islands in the AIU are targeted for cleanup.

Olaus Murie called the Aleutians "a melting pot" for species from two continents while Michael Frome described them as a "great oceanic crossroads". Ironically, the Aleutians' remoteness has not guaranteed their preservation and may have hastened their demise. Would Amchitka Island have been thrice-choked by nuclear blasts were it near Anchorage? Was it not the isolation that allowed a "forgotten war" of three years to leave a legacy of debris and toxic wastes that we are unable to clean up after half-a-century? And was it not this isolation that allowed foreign foxes to wipe out native birds as native Aleuts were being exterminated by foreign entrepreneurs and armies?

Geologically, the Aleutians are the youngest part of Alaska. But in 100 years, humankind has inflicted considerable damage by manipulating these islands, trying to make them something other than the Aleutians. Aldo Leopold said the first rule of intelligent tinkering is to "save all the pieces". Only time will tell if we have done so in the Aleutians. If we have not, time will not matter...



Regrettably, 1988 will be remembered as the first and last time our friends Jim Baker (shown above at Attu's Peace Memorial) Regional Chief of Migratory Birds and Gerry Gray of the Kenai Fisheries Assistance Office visited the Aleutian Islands. We will miss them.

INTRODUCTION

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A. HIGHLIGHTS

The Aleutian Islands Unit underwent a major staff overhaul in 1988 as personnel changes occurred in the refuge manager, outdoor recreation planner, biologist, biological technician, laborer and two clerk-typist positions (Section E.1).

After four years, the Alaska Maritime Comprehensive Conservation Plan (CCP) was completed in 1988 with public meetings on the final draft held at communities throughout the Aleutians (Section D.1).

In February, the Navy's construction contractor for the \$250 million Amchitka Relocatable-Over-The-Horizon Radar (ROTHR) system spilled oil containing PCB's and it took the remainder of the year to get the contaminated soil off the island (Section J.3).

Construction of the refuge's \$400,000 bunkhouse began May 6 and occupancy of the structure began in October (Section I.1).

After being closed since January for repairs, modifications and installation of interpretive exhibits, the visitor center had its "grand re-opening" July 23 to a record crowd and a number of VIPs (Section H.6).

A major management initiative began successfully this winter as staff made regular trips to nearby islands to eradicate introduced arctic fox (Section G.15).

The refuge residence area underwent a major rehabilitation this summer as staff painted all their homes in colors complimentary to adjacent military housing, the new bunkhouse was completed and Quarters 6, an abandoned mobil home and long suffering eyesore was removed (Section I.3).

In 1988 the refuge began a weekly page in the military newspaper the Eagle's Call, while the island's first privately-owned newspaper began publication in October as the bi-weekly Ptarmigan Times afforded the refuge a column called "The Nature of Things" (Section H.1).

The first Adak caribou survey in three years was accomplished over two days in August with the assistance of a visiting Coast Guard helicopter crew (Section G.8).

Despite operating at less than full strength due to the closure of the visitor center for remodeling, Adak's cooperating association sales reached \$35,000 for fiscal year 1988 to once again surpass all refuges in Alaska (Section H.18).

Refuge biologists aboard the Tiglax documented evidence of a significant decline in the sea lion population of the western

Aleutians (Section G.9).

In July, the remains of a World War II American soldier were found by biologists working on Buldir Island and returned to Adak where they were transferred to the military for identification and subsequent burial (Section J.3).

Regional Office personnel spent a week aboard the vessel Tiglax conducting the refuge programmatic review and learning first-hand about the logistical problems caused by the scope of the refuge (Section E.5).

Following enactment of the Aleut Restitution Act by Congress, the refuge staff accompanied personnel from other agencies to study the historical Aleut village of Attu on Attu Island prior to conveying it along with a cash settlement to the Aleut people (Section E.7).

The Navy's Relocatable-Over-The-Horizon-Radar (ROTHR) system on Amchitka Island completed its construction phase in December, six months ahead of schedule (Section J.3).

Winter storms plagued shipping in the Aleutians and threatened wildlife as oil spills became a frequent occurrence (Section J.3).

The Aleutian Islands Unit twice received national publicity in 1988 with the discovery of the World War II soldier's remains on Buldir while the November/December issue of Defenders magazine did a feature story on plastic pollution on the refuge (Section J.3).

B. CLIMATIC CONDITIONS

The complex, highly irregular Aleutian weather is a frequent subject of discussion in and away from the islands. Conditions vary greatly from year to year, month to month, day to day, hour to hour and even minute to minute. Individual islands have their unique micro-climates based upon storm tracks and topography. Weather data for 1988 was available from Attu, Shemya and Adak.

Attu received almost 50% more rainfall in 1988 than in 1987, but considerably less snow (Table 1). Late summer (July-August) was warmer than 1987 and the winter-spring period (February-June) was consistently colder. The mean monthly temperatures for the first 6 months were higher than in 1987 with the rest of the year recording lower averages.

Due to the lack of nearby mountains to snag passing clouds, Shemya receives considerable less precipitation than other Aleutian weather stations. In 1988, they received 21.9 inches of rain compared to 68.5 inches at Attu (30 miles west) and 42.3

Table 1. 1988 Attu, Alaska, weather summary with comparisons to 1987 data.

	<u>Inches of precipitation</u>		<u>Inches of snow</u>		<u>Days of measureable precipitation</u>		<u>Degrees fahrenheit</u>				
	<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	<u>Maximum</u>		<u>Minimum</u>		<u>Norm</u>
							<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	
JAN	N.C.	6.95	N.C.	54.0	N.C.	19	N.C	39	N.C.	9	N.C.
FEB	5.66	2.50	19.5	25.0	17	13	38	37	7	12	26.5
MAR	5.04	NVD	15.7	NVD	17	21	41	38	11	25	28.4
APR	5.41	NVD	2.5	NVD	12	4	42	45	12	20	31.4
MAY	2.78	2.14	5.9	T	16	5	47	47	15	27	36.6
JUN	3.01	2.55	0.0	0.0	12	7	59	62	31	35	42.3
JUL	1.97	4.10	0.0	0.0	16	9	62	58	39	41	47.6
AUG	7.08	3.12	0.0	0.0	17	4	66	57	40	37	50.9
SEP	7.91	3.99*	0.0	0.0	21	10	57	56	39	39	48.5
OCT	11.54	10.71	0.0	0.1	21	23	51	50	31	30	41.0
NOV	15.95	N.C.	N.C.	N.C.	18	N.C.	48	N.C.	26	N.C.	37.0
DEC	2.10	N.C.	N.C.	N.C.	12	N.C.	40	N.C.	21	N.C.	30.5
Totals:	68.45	36.06	43.6	79.1*	179	115*					

Extremes:

Dates:

* INCOMPLETE DATA

NVD NO VALID DATA AVAILABLE

N.C. NOT CERTIFIED, NO WEATHER DATA ACCUMULATED

66 62 7 9
7/23 6/21 2/17 1/15

inches at Adak (Table 2). Even though the island received rain approximately 63% more often than in 1987, total amount received was 58% less. Average monthly temperature and snowfall were about equal for both years.

Total precipitation on Adak was about equal to 1987's however, both years were approximately 68% below normal (Table 3). Snowfall in 1988 was 4.6 feet above normal, with a record set for January (50.5 inches) and above average amounts in March and December. Our last spring snow (1.3 inches) occurred on May 13, a Friday! Overall, maximum/minimum temperatures were about equal.

Storm Condition One (winds in excess of 48 knots) seemed to be the norm during the last half of December. When Reeves Aleutian Airways cancels three flights in one week due to high winds, you know conditions are bad.

The winds, combined with warm temperatures and rain, melted all our snow. This excess water created a foot deep lake around our new bunk house as well as a pond in the crawl space under one of our duplexes.

Adak and surrounding islands observed a lot of geologic disturbances this past year. Eight earthquakes ranging from 3.5 to 6.0 were recorded at Adak. The most active period was on November 26-27 when four quakes in the 3.5 to 4.8 range were recorded followed with nine aftershocks. The Gareloi volcano and the Anvil Peak volcano on Semisopochnoi Island were observed with smoking vents during August.

D. PLANNING

1. Master Plan

Numerous public meetings were held in towns and Native villages throughout the AMNWR in March and April to involve residents in the planning of the Comprehensive Conservation Plan (CCP) for the refuge. RM Boylan, ARM Klett and RO Planner Poppy Benson attended meetings in Atka, Adak, Sand Point, Unalaska, Anchorage, Seward and Soldotna. At each meeting, refuge objectives and programs were explained and the management alternatives described. Residents were asked how they would like to see the refuge managed; which objectives should be emphasized and what problems in the local area should be considered.

Table 2. 1988 Shemya, Alaska, weather summary with comparisons to 1987 data.

	<u>Inches of precipitation</u>		<u>Inches of snow</u>		<u>Days of measureable precipitation</u>		<u>Degrees fahrenheit</u>				
	<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	<u>Maximum</u>		<u>Minimum</u>		<u>Norm 1988</u>
							<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	
JAN	1.22	5.63	10.7	57.0	24	15	36	38	20	21	28.6
FEB	1.28	2.66	12.3	25.3	23	7	36	36	19	21	28.6
MAR	1.61	2.42	14.5	17.4	23	8	37	43	22	25	29.9
APR	0.70	1.50	5.8	11.3	12	7	39	42	20	27	33.0
MAY	0.75	0.87	3.3	0.1	12	2	45	46	32	33	38.2
JUN	2.50	2.54	0.0	T	18	5	53	50	36	36	42.4
JUL	1.79	3.75	0.0	0.0	13	17	52	50	42	41	46.7
AUG	2.29	6.34	0.0	0.0	14	19	58	53	45	43	49.6
SEP	2.01	1.71	0.0	0.0	16	15	56	53	44	38	50.5
OCT	3.37	2.32	T	2.5	19	21	52	52	35	34	44.1
NOV	3.39	2.20	10.1	7.1	25	24	45	43	29	27	37.0
DEC	1.00	5.55	6.1	39.8	24	NVD	39	40	25	20	32.0
Totals:	21.91	37.49	62.7	60.5	223	140*					
Extremes:							58	53	19	20	
Dates:							8/15	8/4	2/26	12/?	
* INCOMPLETE DATA											
NVD NO VALID DATA AVAILABLE											

Table 3. 1988 Adak, Alaska, weather summary with comparisons to 1987 and normal data.

	<u>Inches of precipitation</u>			<u>Inches of snow</u>			<u>Days of measurable precipitation</u>		<u>Degrees fahrenheit</u>				
	<u>1988</u>	<u>1987</u>	<u>NORM</u>	<u>1988</u>	<u>1987</u>	<u>NORM</u>	<u>1988</u>	<u>1987</u>	<u>Maximum</u>	<u>Minimum</u>			
									<u>1988</u>	<u>1987</u>	<u>1988</u>	<u>1987</u>	<u>NORM</u>
JAN	1.99	4.10	6.11	51.5	21.7	17.5	29	28	46	43	16	17	33
FEB	0.74	1.15	4.75	20.4	28.3	19.2	28	23	44	42	20	17	33
MAR	1.48	5.11	5.85	31.3	13.6	20.1	26	27	47	43	14	22	35
APR	1.27	2.38	4.50	10.8	16.5	9.9	27	24	44	56	25	28	37
MAY	4.17	1.79	4.10	2.6	1.1	2.1	29	19	50	51	33	31	41
JUN	2.49	4.88	3.17	0.0	0.0	T	16	11	57	55	36	39	44
JUL	3.57	4.69	2.98	0.0	0.0	0.0	16	21	66	57	42	39	49
AUG	2.31	3.31	4.15	0.0	0.0	T	18	19	65	67	36	39	51
SEP	8.16	3.81	5.36	0.0	0.0	0.1	23	22	57	57	35	34	48
OCT	6.64	7.37	6.61	0.4	0.05	1.9	26	29	53	60	32	28	43
NOV	4.08	3.40	8.17	14.4	11.8	12.4	25	26	49	47	21	23	37
DEC	5.42	1.47	7.33	27.5	32.9	20.1	26	29	44	46	18	13	34
Totals:	42.32	43.46	63.08	158.9	125.95	103.3	289	278					
Extremes:									66	67	14	13	
Dates:									7/15	8/22	3/27	12/?	



RO Planner Poppy Benson describes CCP alternatives to participants at the Adak meeting on the draft final plan. EVK.

Copies of the final plan, including environmental impact statement and wilderness review, were received in September and distributed to all military commands on Adak, Amchitka, Shemya and Attu as well as the four native villages in the unit.

4. Compliance with Environmental Mandates

The 'refuge has been tasked by an AWP advice to identify and document refuge special values (cultural, scenic, ecological, wilderness, geologic, etc.)...

During the period June 18 - July 4, ARM Klett was involved in conducting population and productivity plots of cliff nesters (murres, black-legged kittiwakes and cormorants) on Agattu. Their base camp was established in a cove adjacent to an Aleut village site recorded in 1985. Returning from checking seabird plots, ARM Klett discovered 11 projectile points and 2 scrapers (made from local basalt rock) that had washed from the village site into the stream near the head of the cove. Since they were in danger of eventually washing out to sea and lost, they were collected for eventual display at our visitor center. Further investigation found a small barabara (4'x8') with roof supports of whale ribs and a jaw bone. The roof was partially collapsed and had covered the floor up to ground level.



Aleut artifacts collected from Agattu by ARM Klett were returned to the Visitor Center for interpretive purposes. EVK.

5. Research and Investigation

Geological Mapping of Sequam Island.

Dr. James Myers, Associate Professor of Geology, University of Wyoming, continued a study to learn the source and evolution of Aleutian arc magma. Study objectives were to geologically map the island and collect rock samples for analytical and paleomagnetic study. The study may be concluded in 1989.

U.S. Environmental Protection Agency (EPA) Experimental Compound 1080 use permit G704-EUP-28, USFWS, AIU-AMNWR.

The Aleutian Canada goose (ACG) Compound 1080 program was completed in 1988. Final work consisted of collecting bait weathering stations, confirming the fox-free status of the island, and monitoring response of other animals to fox eradication. Detailed discussions are contained in Section G.15.

Plastic Beach Surveys in the Western Aleutians.

Albert M. Manville, Defenders of Wildlife Senior Staff Wildlife Biologist conducted surveys on Attu, Agattu, Buldir, and Shemya islands for derelict fishing gear and other plastic debris. This material washes ashore after being lost or dumped in the open ocean and its effect on wildlife and the environment are becoming

of national interest. A detailed article of Dr. Manville's findings appeared in the November/December 1988 issue of Defenders magazine, pp 10-15. (Appendix 1)



Biologist Dr. Albert Manville of Defenders of Wildlife conducted beach surveys in the Aleutians and found discarded plastic as well as an occasional dead seabird such as this one wrapped in monofilament line. GVB.

Maintenance of Seismic Telemetry Stations.

U.S. Geological Survey, Adak Seismological Observatory. Personnel from the observatory (U.S. Navy and U.S. Geological Survey) visited Great Sitkin, Bobrof, Kanaga, Tanaga, Umnak, Unalaska, and Adak islands to maintain and upgrade seismic telemetry stations in support of continuing earthquake prediction studies. ..

Song Sparrow Study in the Central Aleutians.

Matthew P. Hare, University of Alaska Fairbanks, conducted a study of song sparrow (Melospiza melodia maxima) on Adak Island for comparisons with other subspecies. This is part of a program to evaluate, by mitochondrial DNA variation, the status of endangered M. melodia amakensis on Amak island.

Aleutian Shield Fern Study.

Dr. David K. Smith and Paul G. Davison, University of Tennessee, Robert Lipkin, Environmental Protection Agency, Karen L. Kincheloe, U.S. Fish and Wildlife Service, Anchorage, and Stephen

and Sandra Talbot, U.S. Fish and Wildlife Service conducted searches for the endangered fern (Polystichum aleuticum), on Adak, Atka, Attu, Kagalaska, and Unalaska islands. At least 111 plants were found on Mt. Reed, Adak, including a colony of 13 plants, which were originally discovered in 1987 by Dr. Smith and a new group of at least 98 plants in 1988 by Mr. Lipkin. No plants were found on the other islands, but additional surveys are planned for 1989.

Seabird Food Habit Study.

Dr. John Piatt, Alaska Fish and Wildlife Research Center, Anchorage, conducted ocean profile studies of seabird prey distribution in the Bering Sea and collected seabirds for food habits analysis in summer 1988.

Environmental Contaminants Sampling at Defense Environmental Restoration Program (DERP) Cleanup Sites.

Nancy Norvell, U.S. Fish and Wildlife Service conducted pre-cleanup sampling of fish and water at Agattu, Kiska, and Attu islands, to determine what contaminants may have entered the environment from abandoned military installations. DERP is a Department of Defense program administered by the Army Corps of Engineers to identify and cleanup hazardous waste sites on abandoned military bases, and restore the areas to near-original state.



At first glance, Nancy Norvell seems the typical biologist collecting field samples in a pristine Alaskan wildlife refuge... MFB.



...except that the Aleutian Islands harbor numerous DERP sites, a legacy of WWII. MFB.

6. Other

Refuge Biologist Byrd was selected to fill the position as leader of the Aleutian Canada Goose Recovery Team. A team meeting is scheduled in early 1989 to discuss the downgrading of the goose to threatened status. Further discussions will center on the islands to receive future transplants of geese from Buldir Island.

E. ADMINISTRATION

1. Personnel

1. Michael F. Boylan, Refuge Manager, GS-12, PFT (EOD 1/3/88)
2. Evan V. Klett, Assistant Refuge Manager, GS-11, PFT
3. Vernon Byrd, Wildlife Biologist, GS-11, PFT (EOD 5/22/88)
4. Donna A. Dewhurst, Assistant Refuge Manager, Amchitka Island, GS-9, PFT
5. Tom Edgerton, Outdoor Recreation Planner, GS-9, PFT (transferred 11/6/88)
6. Sonja Boss, Clerk-Typist, GS-4, PFT (reassigned 2/12/88)
- 6a. Linda Sweeting, Clerk-Typist, GS-4, PFT (EOD 3/28/88)
7. Greg McClellan, Clerk-Typist, GS-3, PFT (EOD 2/1/88, transferred 11/18/88)
8. Bob Schulmeister, Maintenance Worker, WG-8, PFT

9. Marc Straub, Laborer, WG-2, TFT (appointment expired 9/30/88)
10. Greg McClellan, Biological Technician, GS-5, TFT, Local Hire (reassigned 1/31/88 to Clerk-Typist position)
- 10a. Jim Fuller, Biological Technician, GS-5, TFT, Local Hire (EOD 4/22/88. SCA Biological Aid/Volunteer, 5/21/87-4/21/88)
11. Lisa Climo, Seasonal Biological technician, GS-5, (5/2-12/30/88)
12. Robert Zetzer, SCA Naturalist Aid, (1/7-4/29/88)
13. Linda Weatherford, SCA Naturalist Aid, (5/26-8/19/88)
14. David Backstrom, SCA Biological Aid, (5/26-9/17/88)
15. Colleen Baggot, SCA Biological Aid, (5/26-9/17/88)
16. Virginia Collins, SCA Biological Aid, (5/26-9/17/88)
17. Kurt Hellman, SCA Biological Aid, (5/12-9/2/88)
18. Bruce Seppi, SCA Biological Aid, (5/25-8/8/88)
19. Cary Tamborski, SCA Biological Aid, (5/26-9/17/88)
20. Hector Douglas, SCA Biological Aid, (6/2-9/17/88)



Staff personnel: 2, 6A, 10A, 1, 3, 8. Not pictured: Edgerton, Boss, Dewhurst, McClellan, Straub. EVK.

Volunteers:

- | | |
|--------------------|---------------------|
| 21. Alan Blanchard | 28. Greta Johnson |
| 22. Bob Bruff | 29. Liz Lang |
| 23. Rita Childress | 30. Mark Pfof |
| 24. Carron Davila | 31. Polly Sanderson |
| 25. John Fink | 32. Randy Shepard |
| 26. Dawn Fuller | 33. Nancy Williams |
| 27. Brenda Hoskyns | |



Summer Seasonals and Volunteers: 16, 18, 15,
11, 14, 3, 20, 19, 10A. MFB.



Buldir Field Crew: (front) 19, 10, 14, (Rear)
11, 30, 31, 20, 32, 18, 17, 29. GVB.

Table 4. AIU Staffing, FY-1984 to FY-1988.

<u>Year</u>	<u>Permanent</u>		<u>Temporary</u> <u>all</u> <u>categories</u>	<u>Total</u> <u>FTE's</u>	<u>Volunteers</u>	
	<u>full</u> <u>time</u>	<u>part</u> <u>time</u>			<u>SCA</u>	<u>Other****</u>
FY-88	8	0	4***	8.3	9	12
FY-87	8	0	2*	8.6	10	5
FY-86	7	0	2*	7.1	4	3
FY-85	7	0	5**	10.8	4	3
FY-84	7	0	7**	10.5	3	5

* 1 local hire, 1 intermittent

** 1 local hire, 1 intermittent, 3-5 seasonal bio-techs

*** 2 local hire, 1 full time, 1 seasonal bio-tech

**** long term, multiple hours

It was like a game of musical chairs in 1988, what with personnel leaving, new people arriving and other staff personnel swapping positions.

Vernon Byrd arrived in May to fill our vacant Wildlife Biologist position. Vern had previously worked in the Aleutians back in the early 1970's.

Tom Edgerton, Outdoor Recreation Planner, elected to transfer to the Chincoteague NWR in Virginia. From the land of seabirds and military bases to ponies and PEOPLE.

Sonja Boss resigned as our number one Clerk-Typist to accept a GS-5 Personnel Specialist position for the NAS Civilian Personnel Office on Adak. Sonja had handled our refuge bookkeeping, accounting and clerical duties since 1985. Linda Sweeting was selected to fill this vacant position.

Greg McClellan started his career with us in April, 1988, as an SCA Biological Aid and continued working as a volunteer until December, 1985 when he was selected as our GS-5 local hire Biological Technician, TFT. He held this position until January 1988, when he was selected to fill our vacant PFT, GS-3 Clerk-Typist position. During the summer Greg did double duty behind the desk and in the field and was presented with a special achievement award for taking over as field leader and completing the Aleutian Canada Goose Translocation project from Buldir Island when the team leader stepped on a nail and was medivaced to Adak. Greg accepted a PFT, Biologist position in the Regional Realty Division in November. His dedication and enthusiasm for his work was super!

Jim Fuller moved up from the volunteer ranks to fill the local

hire Biological Technician slot.

Lisa Climo arrived in May to assist with our field studies as a seasonal biological technician. She was invaluable to this year's field season and did a great job compiling data from the summer field reports. She is missed - Good Luck in Thailand with the Peace Corps.

4. Volunteer Programs

During 1988, we again selected volunteer workers from outside Adak through the Student Conservation Association (SCA). SCA provided AIU with biologists and two interpretive naturalists. The dedicated efforts of these people contributed many hours to the Kiska field study, goose transplant and seabird population/productivity surveys, contaminant sampling, a variety of environmental education and interpretive programs, Fish and Wildlife Center operation, and other refuge programs.

A renewed effort was made to recruit and train refuge volunteers from the Adak community. By the time we were ready for the grand opening of the renovated visitor center, we had six volunteers trained and ready to assist the public. By year's end, this cadre of local volunteers had increased to nine. Their interest has allowed us to keep the visitor center open weekends and offer expanded programs. Other volunteers helped with winter Emperor goose surveys on Attu, Aleutian Canada goose nest surveys, Aleutian Canada goose translocation and winter fox eradication on Igitkin and Umak islands.

5. Funding

Funding for the AIU is included in the AMNWR budget. AIU funding was received from wildlife resources (1260), endangered species (1113), and Accelerated Refuge Maintenance Management (ARMM) in 1987 (Table 5). Funding in 1987 was adequate due to the expeditious use of volunteers and SCA resource assistants.

Table 5. AIU funding, FY-1984 to FY-1988 (in thousands of dollars)

Year	Discretnry MB (1260+)	Discretnry SE (1113)	Discre. ARMM	Discre. total	Contr. ARMN	Grand total
FY-88	261.2	317	0	578.2	0	578.2
FY-87	326.5	275	0	601.5	95	696.5
FY-86	177.4	219	0	396.4	205	601.4
FY-85	435.0	105	95	635.0	54	689.0
FY-84	326.5	105	200	631.5	176	807.5

6. Safety

Refuge Biological Technician Fuller served as station safety officer January 1 through September 30, ARM Klett assumed safety officer duties on October 1, 1988.

Safety meetings were held monthly with 7 movies shown. Topics included lifting, first aid, water safety, CPR certification, drug free work place, firearms safety, alcohol/drug abuse, winter hazards and flotation jacket/suits.

A variety of safety training was received by refuge personnel during the year. Fourteen permanent, seasonal and volunteer employees were certified for CPR. A week long spring training session for field personnel included viewing of U.S. Coast Guard cold weather/cold water training films, use of personal flotation devices and survival suits, the care and use of outboard motors and inflatable boats, radio operation and communication procedures, and the operation and maintenance of the Kittiwake, a 26 foot Boston Whaler used around Adak. All field personnel had a safety tour of the new refuge vessel Tiglax, shown the location of all safety and survival equipment and its use discussed or demonstrated. All personnel practiced a fire drill and an abandoned ship drill.

Safety-related purchases included new batteries for ELT's, new batteries for E.P.I.R.B.'s, and numerous pocket survival kits containing flares, a dye marker, a fire starter kit and a signaling mirror.

Two radios were taken to each AIU field camp in 1988. One served as the primary communication unit and the other served as a backup in the event of failure by the primary unit. Multi-frequency whip antenna (5907.5, 3215.0, 4125.0 and 2182.4) also were used in all field camps.

All field crews continued to be briefed regularly on the safety aspects of their duties relating to weather, getting lost and necessity for maintaining equipment in good working order.

Minimum of twice-daily radio contact was maintained from Adak to all field camps as well as the Tiglax.

RB Byrd stepped on a nail while repairing the Buldir cabin roof. He was taken via the Tiglax to Shemya where he received emergency treatment prior to being flown to Adak via the U.S. Coast Guard where he was examined and given a tetanus booster.

On May 15-16, Assistant Refuge Manager Dewhurst held a CPR class for construction workers on Amchitka as part of a first aid class.

Maintenance personnel Schulmeister and Straub passed a battery of respiratory tests at the Naval medical clinic.

RM Boylan and ARM Klett met with Navy personnel regarding a request to install a CB/VHF radio antenna on the Three Arm Bay cabin. Everyone agreed this was a good idea for the personnel using the cabin.

Radon levels were checked in the refuge office shop and residences in December. Results showed levels below the minimum unsafe level.

8. Others

Alaska Maritime's field station review took a different tack this year as part of the analysis was conducted at sea. Paul Schmidt (Supervisor, Refuges-South), Jim Baker (Migratory Birds) and Art Wemmerus (Refuges-South) conducted part of the review aboard the m/v Tiglax as it visited Buldir, Agattu, Attu and Shemya islands. In addition to providing the review team a unique opportunity to see the scope of the refuge, this format gave team members valuable insight into the demanding nature of Tiglax operations and scheduling. Refuge staff, including the crew of the Tiglax, greatly appreciated the efforts RO personnel made to conduct this review.



Attu native Innokenty Golodoff, 71, shows representatives of FWS and BIA the location of village structures as he remembered them prior to being taken POW by the Japanese in 1942. MFB.

RM Boylan spent September 9-16 with representatives from Bureau of Indian Affairs, U.S. Geological Survey, the Aleut Corporation

and Dee Butler of Fish and Wildlife Service's Division of Realty on a survey of the historic Aleut village of Attu on Attu Island. Accompanying the group was Attu native Innokenty Golodoff, 71, who was born and raised on Attu until taken as a POW by the Japanese. After the war Innokenty and other Attu residents were relocated on Atka where he still lives. Returning to the long-abandoned home he forcibly left 46 years ago was an emotional time for this gentle man. The group was weathered-in several days on Shemya. Title to the village site is scheduled to be conveyed to the Aleut Corp. as part of the "Aleut/Pribilof Restitution Act" recently passed by Congress.

RM Boylan met with Navy and Coast Guard personnel aboard the cutter Rush and promulgated a written policy that the Coast Guard will not land shots on Great Sitkin Island during target practice on the hulk of an abandoned vessel that went aground years ago. The Coast Guard also will provide advance notice well before such firing attempts and use non-explosive shells filled with sand.

F. HABITAT MANAGEMENT

1. General

The AIU contains at least 200 named islands totalling 3.9 million acres. These islands stretch over 1,100 mi from the tip of the Alaska Peninsula to within 500 mi of the Soviet Union's Kamchatka Peninsula. Commonly referred to as "The Chain", all but portions of the seven larger eastern Aleutian islands are included in the refuge unit. Due to their close proximity to the Alaska Peninsula, Unimak (1.0 million ac.) and Amak islands are administered by the Izembek National Wildlife Refuge, headquartered at Cold Bay, Alaska. The AMNWR CCP recommended that these islands be formally transferred to Izembek NWR. The Sanak Islands south of the Alaska Peninsula are managed from AMNWR headquarters at Homer, Alaska. Except for the Aleut village at Atka, the Navy bases at Adak and Amchitka, the U.S. Air Force base at Shemya, and the U.S. Coast Guard LORAN Station at Attu, the only recent signs of human activity on the AIU are the unhealed scars and debris remaining from World War II.

2. Wetlands

Many of the islands have numerous freshwater "potholes", some superficially resembling the prairie pothole country of the Midwest. A few areas at lower elevations produce aquatic growth and support modest waterfowl populations, especially Amchitka, Kanaga and Agattu islands. Current management efforts include orienting military development away from lowland wetlands and lagoons. The AIU staff monitors construction projects on military installations at Adak, Amchitka, and Shemya and provides recommendations on proposed activities by Native corporations on the refuge as well. The military, especially at Adak, was cooperative and sensitive to our suggestions throughout the year.

Assistance continued on Amchitka Island where the U.S. Navy started construction of a Relocatable-Over-The-Horizon-Radar last year. Specific discussions centered around the location of a sanitary landfill, several oil spills, location of support facilities, a PCB spill and location of a fiber-optic cable.

Other technical assistance this office provided the military on Adak included the inspection of a replacement waterline and the required flushing with a highly-chlorinated water solution (NAS). A proposal to relocate the trap/skeet range from the seawall to Mitt Lake raised questions regarding the potential for lead poisoning of migratory birds (NAS) and was declined. A plan to construct 12 new cabins in the Adak Wilderness (NAS), was also abandoned. Refuge management continued to work with the Navy and its contractor, the Soil Conservation Service, to complete a long overdue NAS Natural Resources Management Plan by 1990. Refuge management also met with personnel from the environmental consulting firm of Woodward-Clyde (Oakland, CA) on potential environmental impacts of planned Navy housing expansion and clean up of unsightly World War II dumps (some containing possible contaminants).



WWII debris throughout the Aleutians is eventually to be cleaned-up; Adak's debris shown here is systematically being removed. EVK.

As a result of the military's local efforts to clean-up the island, RM Boylan in September nominated NAS Adak for the Regional Director's Commendation Award as well as a "Take Pride in America" award. Nas Adak, under the direction of CO R.P. Monro, has removed over 100 WWII quonset huts and other debris. In addition the CO had initiated an "Adopt-A-Trail" program whereby various departments assume responsibility for maintaining trails and other popular natural areas. In December, we learned NAS won a "Take Pride" award and "Honorable Mention" for the Regional Director's award.

7. Grazing

All three grazing operations continue under Special Use Permits. The policy of charging a \$100.00 administrative fee is working well for everyone. The permittees felt they could afford this fee and the Service resolved the problem of obtaining payment.

12. Wilderness and Special Areas

The Alaska National Interest Lands Conservation Act (ANILCA) designated approximately 1.3 million ac. of the Aleutian Islands Unit as Wilderness. Notable areas of the refuge unit excluded from the designation include 127,870 ac. on Shemya, Attu, Adak, Amchitka and Ugamak islands for military and lighthouse purposes or World War II debris and approximately 200,000 ac. selected by Native corporations under the Alaska Native Claims Settlement Act (ANCSA).

Other special designations which occur on the AIU are as follows:

<u>AREA</u>	<u>DESIGNATION</u>
Aleutian Islands Unit	Biosphere Reserve
Agattu Island	Research Natural Area
Buldir Island	Research Natural Area
Naval Air Station, Adak	National Register of Historic Landmarks
Kiska Island Occupation Site	National Register of Historic Landmarks
Attu Island Battlefield	National Register of Historic Landmarks
P-38 G Lightning Aircraft, Attu Island	National Register of Historic Landmarks
B-24 D Liberator Bomber Aircraft, Atka Island	National Register of Historic Places

G. WILDLIFE

1. Wildlife Diversity

Due to their geographic location, separating the North Pacific Ocean from the Bering Sea and bridging North America to Asia, the Aleutian Islands offer refuge to an international variety of birds. Migrants converge from all points of the compass. Nearly 100 Asiatic species have been observed in the Aleutians, primarily from Adak to Attu. Several have been reported nowhere else in North America, and observations of new species occur almost annually. In 1988, 49 species of rare or less frequent occurrence were seen on the refuge (Table 6). In contrast, the breeding fauna is relatively depauperate due to low breeding habitat diversity. Nevertheless, isolation has produced several unique resident Aleutian forms (e.g., rock ptarmigan, Sec. G.10).

2. Endangered and/or Threatened Species

a. Aleutian Canada Goose Translocation. (excerpts taken from Byrd, G.V., G.T. McClellan, and J.P. Fuller. 1988 Translocation of Aleutian Canada geese in 1988 from Buldir Island to Little Kiska and Nizki islands, refuge reports).

An important part of the recovery program for endangered Aleutian Canada geese is translocations of birds from Buldir Island, the major remaining nesting site, to former nesting islands where introduced arctic foxes have been removed. Predation by introduced foxes is the primary reason goose populations were reduced to endangered levels.

Since 1971 over 2,000 Aleutian Canada geese (both captive-reared and wild) have been released on Amchitka, Agattu, and Nizki islands. Breeding populations have become reestablished on Agattu and Nizki but not on Amchitka, probably due to predation by bald eagles. Eagles do not occur at the former sites.

Recovery of goose populations has progressed most rapidly at Agattu Island where the management approach has been characterized by periodic releases over a decade with emphasis on translocated wild birds rather than release of captive-reared individuals. Female goslings are more likely to return to the release site than are other age and sex classes, therefore, including a substantial percentage of this group in translocations is important.

The recovery program provides for annual translocations until self-sustaining populations of geese (defined as 50 breeding pairs) becomes reestablished at three scattered locations in the Aleutians. The most recent site where a fox-removal project has occurred is Kiska Island. Most foxes were removed in 1986, but at least one remained as late as 1988. Agattu's reestablished population of geese provides hope for recovery of this endangered species in the Near Islands, so in 1988 the primary release site

Table 6. Sightings of rare to accidental species in the central and western Aleutians in 1988.

Species	Island
Yellow-billed Loon	Adak
Cattle Egret	Agattu
Tundra Swan	Amchitka
Whooper Swan	Adak, Amchitka
Greater White-fronted Goose	Shemya
Eurasian Wigeon	Adak, Amchitka
Common Pochard	Amchitka
Tufted Duck	Adak, Amchitka, Kiska
Steller's Eider	Adak, Amchitka
Surf Scoter	Amchitka
Barrow's Goldeneye	Amchitka
Smew	Adak
White-tailed Eagle	Attu
Northern Harrier	Adak
Merlin	Adak
Sandhill Crane	Amchitka
Mongolian Plover	Buldir
Semipalmated Plover	Buldir
Common Greenshank	Amchitka
Wood Sandpiper	Buldir
Gray-tailed Tattler	Adak, Agattu, Buldir
Common Sandpiper	Attu, Buldir
Terek Sandpiper	Agattu
Far-eastern Curlew	Adak, Buldir
Bar-tailed Godwit	Adak
Red Knot	Buldir
Little Stint	Buldir
Temminck's Stint	Buldir
Long-toed Stint	Buldir
Baird's Sandpiper	Buldir
Sharp-tailed Sandpiper	Adak, Attu, Buldir
Buff-breasted Sandpiper	Buldir
Ruff	Buldir
Common Snipe	Buldir
Slaty-backed Gull	Adak, Agattu, Amchitka, Buldir
Common Tern	Agattu
Common Cuckoo	Adak, Agattu, Attu, Buldir, Kiska, Tanaga
Eurasian Skylark	Attu, Shemya
Siberian Rubythroat	Agattu, Buldir, Nizki
Northern Wheatear	Adak, Amchitka
Red-flanked Bluetail	Attu
American Robin	Adak
Pechora Pipit	Attu
Water Pipit	Adak, Shemya
Bohemian Waxwing	Adak
Northern Shrike	Adak
Yellow-breasted Bunting*	Attu, Buldir
Brambling	Adak, Amchitka
Hoary Redpoll	Adak,

* North American record

was selected in the Rat Islands. Although Amchitka Island is free of foxes and has been used for reintroductions previously, Kiska was chosen as the primary release site in 1988 because past experiences at Amchitka indicated poor survival of birds released there. We thought eagle depredation might be less severe at Kiska due to lower populations there compared to Amchitka and the relatively large number of spawning salmon at Kiska which provide alternate prey.

Due to uncertainty about whether the last fox had been removed from Kiska, the small fox-free island Little Kiska adjacent to the main island was picked as the release site. Geese released there could be expected to eventually populate the main island of Kiska.

Besides the primary release at Little Kiska, we moved a few geese to Nizki Island to supplement the small reestablished breeding population there. Only two nests were found on Nizki during a survey in June 1988.

Past research has shown that relatively young goslings do not survive translocation well, so we planned to move only birds which were at least 35 days old. The dates chosen for the translocation had to be selected months ahead to secure use of the M/V Tiglax. Unfortunately, geese exhibited delayed phenology in 1988, so goslings were younger than expected during the period allotted to the project. Due to other vessel commitments, it was not possible to delay the effort until goslings reached the desired age. Instead of cancelling the translocation, the decision was made to move younger birds. We usually did not transport goslings younger than 28 days old. Also non-breeding adults were not translocated since they are very unlikely to return in future years to the release site.

One hundred twenty eight geese were translocated from Buldir Island to Little Kiska and Nizki islands in August 1988. The sex and age ratios of birds taken to each location were as follows:

Little Kiska	Nizki
Aug. 1 - 55 geese	Aug. 7 - 6 geese
Aug. 6 - 61 geese	Aug. 10 - 6 geese
Total - 116 geese	Total - 12 geese
7 adult males	2 adult males
13 adult females	2 adult females
3 adult unknown sex	2 gosling males
54 gosling males	6 gosling females
39 gosling female	

The only goose that died during the translocation process was an adult female found dead in the large holding pen at Buldir the morning after it was released there. The specimen has been sent to the National Wildlife Health Research Center for necropsy.

Capture paralysis has occurred in over 10% of the geese handled in some prior years. In 1988 two adults and two goslings (3%) showed signs of this disorder (e.g. one leg partially paralyzed) as they were released at Little Kiska.

Five to eight geese were killed by bald eagles at Little Kiska from August 1 to August 6, the dates of translocations. Five bands were recovered, all from released goslings.

The difference between survival rates of goslings released at eagle free Nizki and Little Kiska is illustrated by resightings on wintering areas. By the end of December 1988, only about 25% of the goslings released at Little Kiska had been seen whereas 88% of the goslings released at Nizki reached the wintering area.

b. Aleutian Canada Goose Nest Surveys (excerpts taken from the following U.S. Fish and Wildlife Service reports: Amaral, M. 1988. Aleutian Canada geese and other birds observed on Nizki and Alaid islands, Alaska; and Byrd, G.V., S.E. Cantor, and K. Hellman. 1988. The status of Aleutian Canada geese at Agattu Island, Alaska in 1988).

In June 1988 surveys were conducted for nesting pairs of Aleutian Canada geese at Nizki and Agattu islands, the two locations where this endangered goose has begun to nest again after being extirpated by introduced arctic foxes. The first nest was discovered at Nizki in 1987, but birds have been nesting again on Agattu since at least 1984 following releases of captive reared birds and translocation of wild birds from Buldir Island, the only site where large populations of wild birds remain.

Surveys at Nizki were conducted June 4-10. Observers found 2 goose nests and suspected that one additional nest might be present. Nests were at the edge of lakes. It was estimated that 13-15 geese were present on Nizki and adjacent Alaid islands.

At Agattu, 22 nests were found in the same areas containing 11 nests in 1985, and 3 additional nests were discovered in other locations during surveys June 8-24, 1988. At least 114 geese were accounted for in the study area on the southeastern portion of Agattu.

Over 80% of the nests found in 1988 were in the Elymus-umbel community, similar (Chisquare = 0.62, $p > 0.1$) to the situation in 1985. Admittedly, our survey covered this community more thoroughly than the upland tundra areas, so importance of the latter habitat may be slightly underestimated. As in 1985 most nests (about 90%) were found within 250 m of the coast on gentle slopes (mean about 10 degrees, both years).

The onset of laying was relatively late in 1988. From float tests and observations, we estimated that nearly 90% of the pairs initiated clutches after May 30; mean initiation date June 4. For the modal clutch (6 eggs) and an average incubation period

(28 days), the mean hatch date in 1988 was July 7. This phenology is up to a week later than that recorded in most past years at Buldir but similar to Buldir in 1988.

The mean clutch found in 1988 was 5.68 eggs, nearly identical to the mean of 5.73 in 1985 (Student's $T = 0.05$, $p > 0.1$). The mode was 6 eggs in both years. Reproductive success was not measured in 1985, but in 1988 we estimated that 88.2% (90% B = 7.9%) of the nests had at least one egg hatch. Nesting success was not significantly different (Chisquare = 0.78, $p > 0.1$) than that recorded for the population at Buldir. Nearly 70% (69.1%) of the eggs we found in nests ultimately hatched, similar (Chisquare = 1.38, $p > 0.1$) to the success at Buldir in past years.

Interestingly, 9 of 16 (56%) nests had at least one unhatched egg left after geese left the nest site at Agattu in 1988. This is considerably higher than at Buldir. In a different comparison, approximately 20% of the known-fate eggs at Agattu were left in nests compared to only 10% at Buldir (Chisquare = 5.15, $p < 0.03$). About half the eggs examined at Agattu showed signs of embryo development, the remaining half looked fresh as if they had never been fertilized. We would expect the age structure of the population at Agattu to be skewed toward younger birds since it is largely composed of geese translocated as goslings, most probably less than 6 years old in 1988. This may account for the unusually large percentage of infertile and addled eggs.

A total of 13 eggs disappeared from nests. At least two were in a nest taken over by common eiders, and five eggs in one clutch disappeared completely. There was an opportunity for membranes to blow out of nests or be displaced by scavenging gulls, and this would have resulted in recording the status of a hatched egg as "disappeared". Therefore, the estimates of hatching success are conservative.

No evidence of egg predation by gulls was observed, although glaucous-winged gulls have increased at Agattu since foxes were removed. Nevertheless, gulls may have taken some of the eggs recorded as having disappeared.

It seems apparent that Aleutian Canada geese are increasing at Agattu. The doubling of nests within the study area between 1985 and 1988 is encouraging, but we still lack evidence that the recovery plan definition of "self-sustaining population" (i.e. 50 breeding pairs) has been met at Agattu. The rate of increase has been about 33% per year between 1985 and 1988. If a similar rate of increase occurs in the future, the objective of 50 nesting pairs would be obtained in 1991. Nevertheless, unknown age structure, potentially variable reproductive success in various years, and variable mortality rates make such a projection highly speculative.

Characteristics of the nesting population in the study area at Agattu seem normal compared to Buldir. As indicated above, the

only indication of reduced productivity was a significantly high rate of unhatched eggs at Agattu. Nevertheless, the overall reproductive success was normal in 1988.

Perhaps geese are nesting elsewhere on Agattu besides the area we searched 1985 and 1988. If this is true we may be much closer to the goal than suspected.

c. Other Observations of Aleutian Canada Geese. -- Spring migration, from California wintering grounds to breeding grounds in the western Aleutian Islands occurs from late April to late May. Most breeders are involved in incubation during June, but non-breeders apparently wander during this period. Fall migration occurs generally in September. In 1988, Aleutian Canada geese were observed at several locations on the refuge other than breeding sites.

The earliest migrants were observed at Adak May 2, but most observations were during the last 2 weeks of May (Table 7). Small numbers of geese were seen at Amchitka in mid to late June, and substantial numbers, probably non-breeders, were noted periodically at Kiska throughout the month.

The only fall records were for Amchitka and Adak. All were during a short period, September 21-23.

d. Short-tailed Albatross. -- Three observations of this endangered seabird were recorded in the Aleutians in 1988. Lone subadults were seen August 8 near Agattu Island, August 15 near Unalaska, and September 13 near Seguam; all from the M/V Tiglax.

e. Aleutian Shield-Fern. -- Three different groups of investigators (Steve and Sandy Talbot, David Smith, and Karen Kincheloe and Rob Lipkin) searched for the endangered Aleutian Shield-fern on Adak's Mt. Reed during July. Two separate groups of plants were located totaling over 100 individuals. This comprises the known world's population. Dr. Smith also searched for ferns at Atka Island and found none. He suggested reindeer grazing may have been detrimental to ferns on the latter island, the only location other than Adak where the species has been observed in the past.

3. Waterfowl

Emperor Goose. -- A refuge inventory plan for emperor geese was initiated in September 1988. This species has declined drastically in the past 15 years, and most winter on the Aleutian Islands Unit. A number of geese have been marked with plastic neck collars near breeding areas on the Yukon Delta NWR, and one of the objectives of our survey was to resight marked birds. Furthermore, we wanted to determine whether collar icing was a problem. Other data recorded included juvenile ratios, general habitat utilization, and fluctuations in numbers of birds along set survey routes.

Table 7. Observations of migrating and vagrant non-breeding Aleutian Canada geese in the Aleutian Islands in 1988.

Season	Location	Flock Size(s)	Date(s)
Spring	Adak	11	May 2
	Adak	41, 21	May 12
	Adak	11	May 28
	Amchitka	63	May 18
	Amchitka	14	May 20-30
	Amchitka	24	May 22-28
Summer	Amchitka	4	June 10
	Amchitka	1+	June 11-30
	Kiska	32	June 7
	Kiska	4	June 13
	Kiska	50	June 17
	Kiska	17, 34	June 22
	Kiska	14, 18, 36	June 26
Fall	Adak	32	Sept 21
	Adak	12	Sept 23
	Amchitka	7	Sept 23

The refuge staff and volunteers made observations at four locations in the refuge; Attu, Shemya, Amchitka, and Adak islands. By the middle of October dozens of geese had arrived in the extreme western Aleutians, probably from Siberian nesting areas. By early November birds were arriving in the central Aleutians, and by the end of November, and throughout December, several hundreds of geese were under observation at all four study sites.

Since the survey will continue throughout the winter, data have not yet been analyzed, but preliminary results indicate approximately 25% of the geese observed in the western Aleutians were young in early winter, but only about 15% were young at central Aleutian sites. At least four different collared geese were observed at Adak, and one marked bird was observed at Shemya. None of the collars showed signs of icing.

Other Waterfowl. -- The primary nesting species include the "Aleutian" green-winged teal, mallard, northern pintail, and common eider. Greater scaup and red-breasted mergansers also nest on some of the refuge islands. No breeding pair surveys are currently conducted for any of these species, but incidental observations confirmed that common eiders and other species of duck are increasing at Agattu and Nizki since introduced foxes were removed.

Indices to relative abundance and seasonal occurrence of wintering waterfowl are provided by periodic surveys at Shemya, Amchitka, and Adak islands. Generally wintering ducks arrive in October or early November and remain into April. Common eiders and harlequin ducks were the most abundant species at Shemya this winter (Table 8), whereas common goldeneyes, oldsquaws, and buffleheads joined harlequins as particularly common species at Amchitka and Adak (Tables 9 & 10).

4. Marsh and Waterbirds

The primary marsh and waterbirds found on the refuge are loons and grebes. Red-throated loons are particularly common breeders at Amchitka, May-August (Table 11) and common loons and grebes winter nearshore in the Aleutians (e.g., Table 12).

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

Ledge-nesting Seabird Monitoring -- (Excerpted from Byrd, G.V. and L.A. Climo 1988. The status of ledge-nesting seabirds in the western Aleutian Islands, Alaska in summer 1988). From June to September 1988 a long-term monitoring program was established at Agattu and Buldir islands, western Aleutian Islands, and additional observations were made at nearby Hammerhead and Kiska islands. Objectives included establishing indices to trends in populations and productivity of cormorants, kittiwakes, and murre in this region to provide comparisons with similar data currently being gathered elsewhere in Alaska.

Table 8. Waterfowl observed along the coast at Shemya in winter 1988.

Species	November 10	November 11	Total
Emperor Goose	24	21	45
Brant	1	1	2
Green-winged Teal	16	0	16
Mallard	28	17	45
Northern Pintail	19	16	35
Common Eider	545	368	913
Harlequin	570	492	1062
Oldsquaw	100	4	104
Black Scooter	2	2	4
White-winged Scooter	5	0	5

Table 9. Waterfowl observed during weekly vehicle surveys at Amchitka, 1988.

Species	JAN	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
Whooper Swan	12	12	0	0	0	0	0	0	0	0	0	24
Emperor Goose	74	442	88	0	0	0	0	0	82	116	42	844
Aleutian Canada Goose	0	0	0	63	0	0	0	0	0	1	0	64
Green-winged Teal	1	237	267	148	74	20	123	466	229	218	0	1783
Mallard	14	103	136	95	35	148	128	276	504	619	16	2074
Northern Pintail	0	0	81	76	9	39	48	664	605	636	0	2158
Northern Shoveler	0	0	0	0	0	0	0	0	2	2	0	4
Eurasian Wigeon	0	0	14	29	0	0	0	48	79	138	0	308
Common Pochard	0	0	0	0	0	0	0	0	1	2	0	3
Canvasback	0	0	0	0	0	0	0	0	1	3	0	4
Tufted Duck	0	0	2	16	1	7	8	12	11	0	0	60
Greater Scaup	11	15	101	121	65	233	110	101	155	95	12	1019
Common Eider	0	0	0	233	169	129	180	115	193	0	0	1019
Steller's Eider	0	0	0	0	0	0	0	0	0	8	4	12
Harlequin Duck	10	78	705	322	10	0	0	49	573	684	26	2447
Oldsquaw	0	0	42	5	0	0	0	0	11	19	0	77
Black Scoter	0	0	44	19	7	0	0	0	11	21	0	101
Surf Scoter	0	0	1	0	0	0	0	0	0	0	0	1
White-winged Scoter	0	0	82	56	29	1	4	0	0	7	1	180
Common Goldeneye	22	4	110	39	29	9	10	10	28	80	13	394
Barrow's Goldeneye	0	0	0	0	0	0	0	0	0	1	0	1
Bufflehead	14	54	112	54	11	11	15	15	22	138	15	464
Common Merganser	0	0	2	8	4	0	0	0	0	0	0	14
Red-breasted Merganser	0	9	28	27	4	17	46	59	3	8	1	202

Table 10. Waterfowl observed during surveys at Adak in 1988.

Species	JAN	FEB	MAR	APR	MAY	JUN-AUG	SEP	OCT	NOV	DEC	TOTAL
	a										
Whooper Swan	-	-	-	-	-		-	-	2	4	4
Emperor Goose	396	151	340	164	-		-	-	69	274	1367
Brant	-	-	-	-	-		-	1	-	-	1
Green-winged Teal (NA)	-	-	-	-	2		-	-	-	-	2
Green-winged Teal (EUR)	154	44	93	272	50		-	83	93	21	810
Northern Pintail	6	22	162	189	25		-	6	32	78	520
Eurasian Wigeon	6	-	-	-	-		-	8	1	3	18
Canvasback	2	2	6	-	-		-	-	-	-	10
Tufted Duck	14	5	4	12	1		-	1	2	-	39
Greater Scaup	202	203	323	268	83		15	6	33	118	1251
Common Eider	-	-	-	-	-		-	2	-	-	2
Steller's Eider	-	-	-	-	-		-	-	2	-	2
Harlequin Duck	482	286	312	383	187		65	435	741	192	3083
Oldsquaw	171	35	76	29	-		-	-	66	77	454
Black Scoter	8	21	32	20	5		-	-	30	11	127
White-winged Scoter	-	6	-	-	-		-	-	-	-	6
Common Goldeneye	253	92	222	203	36		-	15	164	205	1190
Bufflehead	70	17	38	70	7		-	3	56	53	314
Red-breasted Merganser	39	13	66	41	38		-	86	106	61	450
Number of Surveys	(2)	(1)	(2)	(2)	(1)	(0)	(1)	(2)	(2)	(1)	

a

dashes indicate no birds seen.

Table 11. Marsh and waterbirds observed during weekly vehicle surveys at Amchitka, 1988.

Species	JAN	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR TOTAL
Red-throated Loon	0	0	0	14	10	10	12	0	0	0	0	46
Common Loon	0	0	0	0	0	1	0	0	0	0	0	1
Western Grebe	0	0	0	1	0	0	0	0	0	0	0	1

Table 12. Waterbirds observed at Shemya on November vehicle survey.

Species	November 10	November 11	Total
Common Loon	2	1	3
Horned Grebe	2	0	2
Red-necked Grebe	1	0	1

Agattu and Buldir were chosen for primary monitoring sites because they represent a sand lance based seabird food web versus one more pelagic in character where ledge-nesting seabirds depend on a relatively high diversity of prey.

Limited comparisons with prior data in the western Aleutian Islands suggested that since the mid-1970's populations of black-legged and red-legged kittiwakes may have increased at Buldir, but no evidence of similar increases was seen for the former species at Kiska or Agattu. A few more common murres were present on plots at Agattu in 1988 than had been there in 1978, and at Buldir thick-billed murre counts were also higher in 1988 than in the mid-1970's.



Seabird plots like this for Black-legged kittiwakes on Agattu are used to monitor population trends.
EVK.

In 1988 red-faced cormorants apparently had relatively high productivity in the western Aleutians, but kittiwakes produced only average or below numbers of young. Thick-billed murres experienced relatively high rates of productivity at Buldir, and common murres chicks survived well at Agattu in 1988.

Monitoring Puffins. -- (Excerpted from Byrd, G.V., L.A. Climo, and J. Fuller. 1988. Results of monitoring studies for puffins in the western Aleutian Islands, Alaska, in summer 1988. USFWS Report, Adak).

Due to the death of thousands of puffins in Japanese gill nets

near the western Aleutian Islands, we began a study in 1988 of the breeding populations most likely affected. This survey was designed to gather baseline data against which future trends could be determined. We set up plots for monitoring changes in numbers of breeding birds at Agattu, Hammerhead, Buldir, and Adak islands, the latter as a control since Adak is outside the area influenced by the commercial fishery. To understand the influence of environmental factors on changes in populations we gathered data on nesting phenology, reproductive success, chick growth, and food habits.



SCA Volunteer Cary Tamborski monitors burrow nesting puffins. GVB.

The few prior comparable counts of tufted puffin nest sites suggest fewer puffins nested on plots on Agattu, Hammerhead and Buldir islands in 1988 than in the mid-1970's and early 1980's. Strong conclusions should not be drawn about population change however, because prior data are so limited. Substantial samples obtained in 1988 will allow more confident comparisons in the future for tufted puffins, but monitoring methods for tracking horned puffin populations remain to be developed.

Agattu apparently provided more suitable nesting conditions for tufted puffins in 1988 than did Buldir. At Agattu the nesting was slightly earlier, reproductive success was higher (due largely to better chick survival), chick growth rates were higher, and large sand lance was the major prey fed to chicks at

Agattu (compared to small sand lance and other prey at Buldir). Horned puffins had higher reproductive success at Buldir than tufted puffins. Sand lance was also the major food item of horned puffins at Buldir, but like tufted puffins other fish were also fed to chicks. At Buldir, horned and tufted puffins had similar growth rates.



Tufted puffin colonies are the subject of long-range studies at numerous Aleutian sites, such as Agattu Island. EVK.

Gulls and Others -- Glaucous-winged gulls and cormorants were the most abundant species observed in this category at Shemya, Amchitka and Adak islands (Tables 13,14, & 15). Gull numbers peaked in October and November and decreased in January and February. Tufted and horned puffins were seen in large numbers only on Amchitka Island surveys, arriving in May and leaving in September.

6. Raptors

A survey of known eagle nest sites was conducted on Amchitka Island from May 8 to July 21, 1988. (D. Dewhurst. 1989. 1988 Raptor Survey; the breeding bald eagle population Amchitka Island, Alaska. Refuge report. Adak, AK.) No significant differences were found in the number of nests, distribution of sites, or habitat types preferred from prior years.

A total of 22 bald eagles carcasses were retrieved on Adak in 1988. Sixteen of these were electrocuted, three were killed by

Table 13. Shorebirds, Terns, Gulls and allied species observed at Shemya on November vehicle survey in 1988.

Species	November 10	November 11	Total
Pelagic Cormorant	400	202	602
Red-faced Cormorant	142	126	268
Unidentified Cormorant	252	205	457
Rock Sandpiper	40	14	54
Glaucous-winged Gull	253	98	351
Black-legged Kittiwake	30	6	36
Common Murre	60	4	64
Pigeon Guillemot	1	0	1

Table 14. Shorebirds, gulls, and allied species observed during weekly vehicle surveys at Amchitka, 1988.

Species	JAN	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Pelagic Cormorant	38	58	203	38	20	124	152	160	310	573	64	1730
Red-faced Cormorant	0	0	2	0	0	0	0	0	0	0	0	2
Lesser Golden Plover	0	0	0	0	0	0	0	18	22	2	0	42
Black Oystercatcher	0	0	11	12	8	17	9	2	7	1	0	67
Wandering Tattler	0	0	0	0	0	0	0	1	0	0	0	1
Ruddy Turnstone	0	0	0	0	0	0	4	3	4	0	0	11
Rock Sandpiper	0	1	83	8	8	33	21	19	22	22	0	217
Red-necked Phalarope	0	0	0	0	0	9	0	0	0	0	0	9
Pomarine Jaeger	0	0	0	1	0	0	0	0	0	0	0	1
Parasitic Jaeger	0	0	3	14	9	4	5	0	0	0	0	35
Slaty-backed Gull	0	0	0	0	0	1	0	0	0	0	0	1
Glaucous-winged Gull	28	62	364	656	368	816	748	626	446	755	20	4889
Arctic Tern	0	0	0	1	8	52	8	0	0	0	0	69
Pigeon Guillemot	0	0	186	115	59	169	103	0	0	0	0	632
Kittlitz's Murrelet	0	0	0	0	0	0	0	0	2	1	0	3
Ancient Murrelet	0	0	18	0	3	10	1	0	0	0	0	32
Crested Auklet	0	0	1	0	0	0	0	0	0	0	0	1
Parakeet Auklet	0	0	0	0	0	0	1	0	0	0	0	1
Tufted Puffin	0	0	0	70	133	220	354	26	0	0	0	803
Horned Puffin	0	0	0	12	52	204	212	12	0	0	0	492

Table 15. Shorebirds, gulls, terns and allied species observed during Adak surveys, 1988.

Species	JAN	FEB	MAR	APR	MAY	JUN-AUG	SEP	OCT	NOV	DEC	TOTAL
	a										
Pelagic Cormorant	-	-	2	17	50		-	1	19	15	104
Cormorant species	131	33	64	44	28		22	87	198	48	655
Black Oystercatcher	4	-	3	1	2		-	-	-	1	11
Sanderling	6	-	30	14	-		-	-	-	18	68
Rock Sandpiper	149	6	113	34	2		3	-	34	3	344
Phalarope species	-	-	-	-	-		50	-	-	-	50
Parasitic Jaeger	-	-	-	-	3		-	-	-	-	3
Mew Gull	-	-	-	-	-		-	-	-	3	3
Herring Gull	-	-	-	-	-		-	-	-	1	1
Glaucous-winged Gull	70	30	118	158	120		601	906	277	68	2348
Black-legged Kittiwake	-	-	-	-	-		45	12	1	-	58
Arctic Tern	-	-	-	-	31		-	-	-	-	31
Aleutian Tern	-	-	-	-	30		-	-	-	-	30
Tern species	-	-	-	-	40		-	-	-	-	40
Murre species	1	-	-	-	-		-	-	-	-	1
Pigeon Guillemot	43	9	39	76	30		15	3	43	10	268
Ancient Murrelet	-	1	84	-	1		-	-	-	-	86
Murrelet species	-	-	11	5	4		1	-	-	-	21
Least Auklet	-	-	-	-	-		-	-	-	2	2
Tufted Puffin	-	-	-	-	13		-	-	-	-	13
Number of Surveys	(2)	(1)	(2)	(2)	(1)	(0)	(1)	(2)	(2)	(1)	

a

dashes indicate no birds seen.

airplane collisions, and three died from unknown causes. The majority of the electrocutions occurred on power poles not equipped with artificial perches, however electrocutions occasionally occurred on poles with perches. Within seven days the Navy erected perches on all poles where eagles have been electrocuted. Electrocutions have decreased over the past decade (Fig. 1), reflecting the installation of perches.



Navy electrical workers retrieve a bald eagle from a pole with an artificial perch. Eagles occasionally get electrocuted on poles with perches but not nearly as often as on poles without perches. JPF.

One immature bald eagle and two adults were rehabilitated and released either at the Adak office or at the Arctic Animal Hospital in Anchorage. ..

On Adak Island, bald eagles were the most common raptor found on surveys. Their numbers declined May-September, as they dispersed to nesting territories and peaked in November (Table 16). At Amchitka, numbers peaked in April (Table 17).

7. Other Migratory Birds

The 21st annual Adak Christmas Bird Count was conducted on December 31, 1988. This year's count established several records: 1) total number of participants (40), 2) most species observed (41), and 3) most individual birds (5,254). Three species never recorded on an Adak count were found: merlin, northern harrier, and horned puffin.

Electrocuted Eagles at Adak

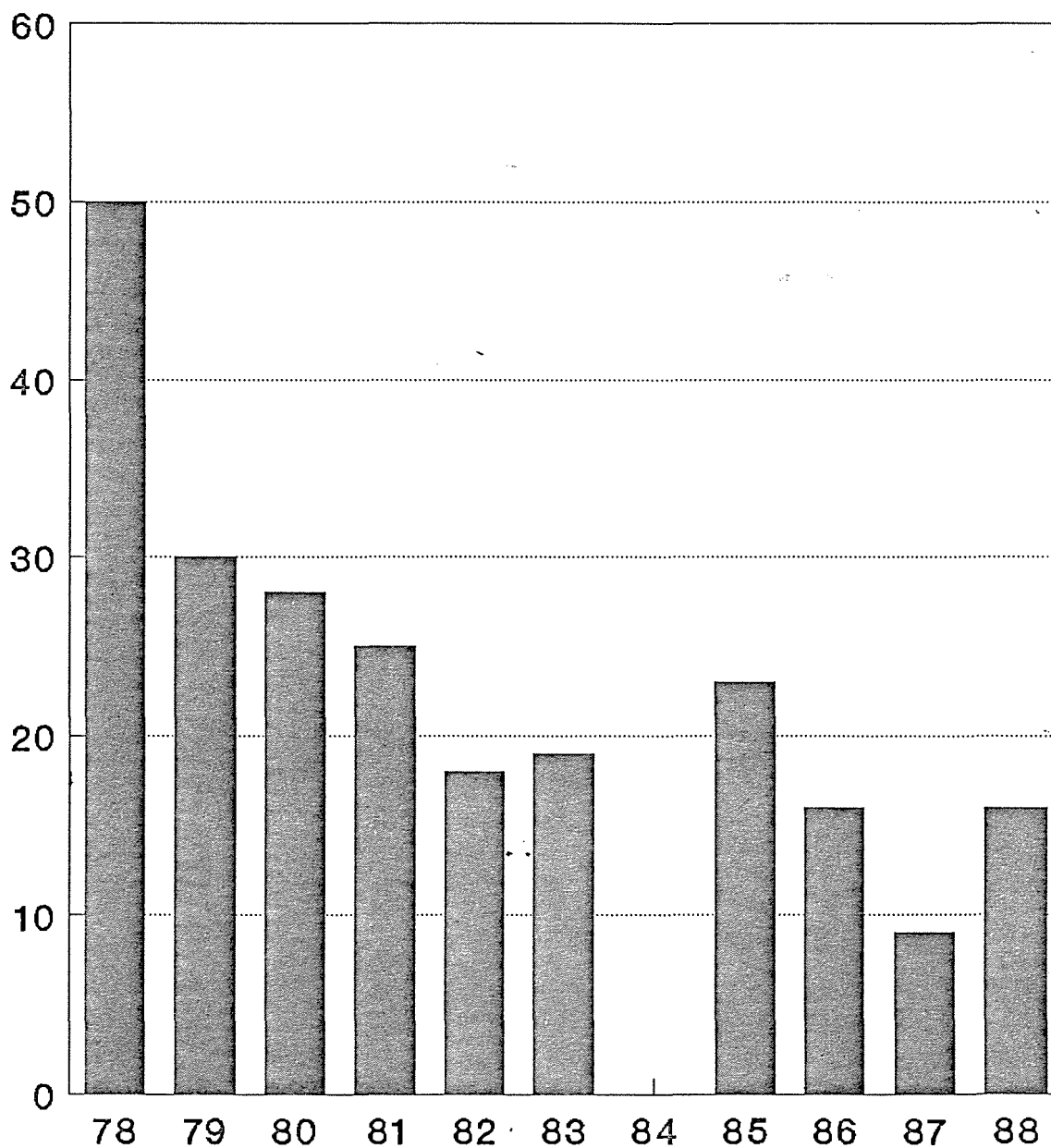


Figure 1. Numbers of bald eagles electrocuted on power poles at Adak annually 1978-88 (Note: complete records were not available for 1984).

Table 16. Raptors observed during vehicle survey at Adak in 1988.

	JAN	FEB	MAR	APR	MAY	JUN-AUG	SEP	OCT	NOV	DEC	TOTAL
Bald Eagle (Adult)	12	7	11	14	1		2	14	17	15	93
Bald Eagle (Imm.)	14	13	11	8	1		1	11	7	17	83
Peregrine Falcon	^a -	-	-	-	-		2	-	-	1	3
Number of Surveys	(2)	(1)	(2)	(2)	(1)	(0)	(1)	(2)	(2)	(1)	

^a

Dashes indicate no birds seen.

Table 17. Raptors observed during weekly vehicle surveys at Amchitka, 1988.

	JAN	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Bald Eagle	3	2	52	50	21	22	14	24	23	33	2	246
Merlin	0	0	1	0	0	0	0	0	0	0	0	1
Gyr Falcon	0	0	0	0	0	0	0	0	0	1	0	1
Peregrine Falcon	1	1	1	0	0	0	1	0	0	1	2	7

8. Game Animals

Caribou were introduced to Adak in 1958 and 1959 . The herd grew quickly and within ten years many islanders were hunting caribou. A record bull (over 700 pounds) was taken at Adak in 1968. Since no natural predators or disease exist on the island, population control is accomplished through sport hunting. U.S. Navy boat transportation for military hunters is necessary to maintain adequate harvests.

For the first time in three years, the "annual" pre-harvest aerial caribou survey was conducted thanks to support from a U.S. Coast Guard helicopter. A total of 335 caribou were observed during a two-day survey. It is impossible to know how many animals were missed during the survey because the caribou were dispersed in 28 small herds ranging from 2 to 40 animals (average 12), but a minimum estimate of 350 animals seems reasonable.

Alaska Department of Fish and Game has set the pre-calving population objective for the Adak herd at 150 animals. Ninety-six caribou were reported harvested from September 1 to December 31, 1988. This compares to 78 in 1987, 121 in 1986, 116 in 1985, and 119 in 1984. Generally over 60% of the total harvest occurs by the end of December. With the conservative estimate of 350 caribou on Adak in August, it appears the post-season population will exceed the management objective again this year. Due to the non-stressful environment in which the Adak caribou live, the number of deaths from natural mortality is extremely low.

9. Marine Mammals

A harbor porpoise (Phocoena phocoena) stranded itself and died on January 27 after repeated attempts failed to free the 92 pound, 1.3 m long female. No obvious external injuries were observed on the animal, though bald eagles began feeding on the living porpoise soon after it came ashore.

Two Stejneger's beaked whales (Mesoplodon stejnegeri) washed ashore December 11 on Adak's Kuluk Beach. The 4.9 m long adult female, and 3.2 m long juvenile male had no visible external injuries. The stomachs contained remains of squid and the female's stomach had a six inch long piece of polypropylene rope, and some mono-filament fishing line. The stomach and other internal organs also contained hundreds of roundworms. Large quantities of internal parasites may cause death in whales. After taking measurements and tissue samples from both animals, the skulls were removed to be cleaned and shipped to the Smithsonian Institution in Washington D.C. We provide the Smithsonian with almost all its information on beaked whales through the somewhat frequent occurrence of whale strandings at Adak.



WB Byrd measures one of two Stejneger's beaked whales washed ashore on Adak in December. JPF.

Whales were seen frequently in the western Aleutians during the summer of 1988. The highlight was a pod of nine sperm whales observed off Kiska Island. They swam just in front of the refuge vessel "Tiglax" for about 15 minutes to the amazement of everyone aboard. Several pods of killer whales, and large numbers of Dall's porpoises were also observed near the ship.

An extensive western Aleutian sea lion survey was conducted by refuge personnel in June and July of 1988. Counts were made at five locations in the Delarof, Rat, and Near island groups. The objective was to compare these counts with results of surveys made in the 1970's to determine whether the sea lions in this area had maintained stable populations in spite of the major declines in the eastern Aleutians. Incidence of net entanglement, or other debris, was also recorded.

A comparison of the total number of sea lions counted at all five sites in the mid 1970's with 1988 indicates a large reduction, on the order of 65%. The 1988 surveys probably accounted for a higher proportion of animals present than counts made in the mid 1970's, because the more recent counts were mostly from land compared to boat work earlier. The latter method usually results in underestimates. Only three animals had net fragments or entanglement scars on them. It is probable that the observers failed to see some entangled animals, but no more than a tiny

fraction of animals could have been entangled.



Surveys in the western Aleutians indicate sea lion populations may be reduced as much as 65%. EVK.

10. Other Resident Wildlife

Eight subspecies of ptarmigan occur in the Aleutian Islands. Due to predation by introduced arctic foxes, at least three of the forms now have very restricted ranges (probably only one or two islands each). Population levels, reproduction, and limiting factors other than foxes are not known for any of the populations. Foxes remain on most islands, so unnaturally high mortality continues.

There may be reason for concern about the long term conservation of the more restricted populations of ptarmigan in the Aleutians. Researchers speculated in 1983 that islands with high mountains and relatively rugged topography provide the necessary ecosystem complexity to keep foxes from extirpating ptarmigan. Nevertheless, ptarmigan apparently have been wiped out on Semisopochnoi, a large high island, so the reasons for extinction are not completely understood.

It might be argued that since ptarmigan have persisted this long after fox introductions they are not likely now to be extirpated. This may be true, but it seems unprofessional to rely on such an argument, particularly with a species like ptarmigan which is known to experience large population fluctuations naturally.

Ideally, the uniqueness of various gene pools of ptarmigan in the Aleutian Islands, and perhaps other Alaskan Islands, could be assessed with modern techniques. Further, foxes should continue to be removed from selected islands to benefit ptarmigan as well as other native species. Finally, population trends should be monitored in selected populations to understand whether there is reason for concern. We are planning to begin some of this work as budgets allow.

11. Fisheries Resources

Pink salmon are the most numerous and heavily harvested of the four anadromous fish species utilizing Adak streams, though the Dolly Varden and small kokanee salmon are also harvested. Abundant red and silver salmon runs occur at Adak and surrounding islands, and even years prove more abundant than odd years.

For the first time in three years a Spawning Salmon Count (Wildlife Inventory Procedure #1, Aleutian Islands Unit, Alaska Maritime NWR) was conducted of the Finger Bay Stream on August 25, September 7 and 20, and October 20. Estimates of the numbers of fish were conservative especially for the high density areas. At the peak of the run we conservatively estimated over 40,000 fish were in the stream (Table 18). This is similar to peak estimates in previous "high" years.

14. Scientific Collection

No species were collected by the Aleutian Islands Unit staff in 1988. However, several species of birds and mammals were salvaged after being found dead (Table 19).

15. Animal Control

a. Introduced Predators: the problem. -- The single biggest threat to native wildlife on this unit is the continued presence of introduced arctic foxes on many islands. Stocked on nearly every Aleutian Island by 1930 for fur farming purposes, this predator has decimated many species of native birds.

The area was designated a wildlife refuge in 1913, but fox leases were issued until just prior to WWII. The procedure was to introduce foxes to "bird islands" so the fur bearers could use this natural food. Then in winter the foxes were trapped. Either enough animals were left for replenishing stocks or more animals were introduced the next spring. Some of the lease holders went so far as to introduce fox food after bird populations declined (e.g. ground squirrels were introduced on Kavalga I.).

Government officials became concerned about the devastation of the birds, and in 1936 and 1937 Olaus Murie came to the Aleutians

Table 18. Spawning salmon count, Finger Bay Stream, 1988.

Segment	AUG 25	SEP 7	SEP 20	OCT 20
A	200	850	400	1
B	3000	12300	3500	0
C	2000	1200	1200	1
D	8000	13250	4500	2
E	1200	1300	750	1
F	1100	1200	800	0
G	1000	1450	950	0
H	3000	6000	300	0
I	1800	1450	1100	0
J	1300	550	400	0
K	1100	650	450	0
L	1500	625	40	0
Total Live	25200	40825	14390	5
Total Dead	57	867	2794	-

a

Several piles of dead fish remained on the stream bottom but most had been washed out of the stream or cleaned up by scavengers.

Table 19. Scientific specimens salvaged, 1988.

Species	Location	# Salvaged
Cattle Egret	Agattu	1
Aleutian Canada Goose	Buldir	1
Bald Eagle	Adak	22
Pectoral Sandpiper	Adak	1
Red-necked Phalarope	Adak	1
Marbled Murrelet	Adak	1
Crested Auklet	Adak	2
Common Raven	Adak	4
Sea Otter	Adak	5
Stejneger's Beaked Whale	Adak	2

to determine which islands had enough native birds left to be taken out of fox production and reserved for birds. What Murie found in most areas were fox dens full of bird remains and only remnant populations of native species. He repeatedly heard from natives that there used to be large colonies of seabirds on various islands before foxes were put there. Although Murie recommended a number of islands revert from "fox islands" to "bird islands", the only action taken was to revoke leases. Apparently he expected foxes to die if lessees quit managing stocks, but this seldom happened. Arctic foxes proved adept at survival although islands probably support lower populations of foxes. After accessible birds were extirpated, the foxes remain and keep bird populations from becoming reestablished.

Obviously, not all species of birds were extirpated after fox introductions. The larger, more conspicuous species that nest on the surface of the ground (e.g., geese, ducks, gulls) or in burrows (e.g., storm petrels, ancient murrelet, Cassin's auklet, puffins) were most severely impacted.

There is no way to know the magnitude of the damage done to native birds by introduced foxes, but a comparison of avifaunas on the few islands where foxes were never introduced with those containing foxes provides some insight. Furthermore, the response of bird populations to removal of foxes on islands where that has been accomplished is instructive.

Although increases can not be quantified, former refuge manager Robert Jones reported an amazing increase in nesting ducks and ptarmigan at Amchitka following fox removal. Rock sandpipers are also noticeably more abundant on Amchitka than on islands with foxes. Amchitka has by far the largest nesting colonies of Aleutian and arctic terns in the Aleutians, and these species have apparently reoccupied the island after foxes were removed. On Nizki/Alaid Island researchers found that ground nesting species increased an average of 1500% within 5 years after foxes were removed.

The most recent example of response of native species to removal of introduced foxes is Kiska Island. Most foxes were removed in late winter 1986. By summer 1988 increases were recorded in ancient murrelets, tufted and horned puffins, and rock ptarmigan.

The idea that introduced arctic foxes have caused problems in the Aleutian Islands has been relatively well publicized in connection with the endangered Aleutian Canada goose, but this is only the tip of the iceberg. It is clear that a number of other species have also been severely depleted by the foxes, and it is equally clear that if foxes are removed at least some of the species become reestablished or increase quickly from low population levels.

In fall 1988 we began removing foxes on Igitkin Island (30 miles east of Adak). The island formerly had substantial storm-petrel

and puffin breeding populations, but these have been extirpated. Aided by refuge volunteers Bob Bruff and John Fink who camped on the island December 27- January 1, we were able to remove 16 foxes by January 1. Probably less than five animals remain, and we hope to catch them before spring.

b. Fox removal from Kiska. -- A three year study to determine the effectiveness and environmental hazards of Compound 1080 to remove introduced arctic foxes on Kiska Island was completed this year. The abstract from the final report follows: (Byrd, G.V., G.T. McClellan, and J.P. Fuller. 1988. To Determine the Efficacy and Environmental Hazards of Compound 1080 (Sodium Fluoroacetate) as a control agent for arctic fox (Alopex lagopus) on Kiska Island, Aleutian Islands Unit-Alaska Maritime National Wildlife Refuge. Report to Environmental Protection Agency.)

From 1985 to 1988 a study was conducted to determine the efficacy and environmental hazard involved with using Compound 1080 to remove introduced arctic foxes from Kiska Island, Alaska. Feeding trails indicated 4 mg of 1080 in beef tallow and bees wax pellets was an adequate lethal dose for arctic foxes. Nearly 50,000 single-dose baits were distributed in coastal areas at Kiska in March and June 1986. Most foxes on Kiska were killed in March 1986, but at least one remained in June 1988. There was no evidence of mortality to non-target species like bald eagles or common ravens, but at least a few glaucous-winged gulls were killed, probably by directly ingesting baits. Several species of native birds were already showing signs of population increase by 1988 as a result of fox eradication. It appears the use of Compound 1080 to remove introduced arctic foxes and thus restore the natural ecosystem at Kiska has been successful.

16. Marking and Banding

The major AIU banding effort resulted in the marking of 163 Aleutian Canada geese (ACG) with metal leg bands, and 123 ACG with yellow and blue leg bands, on Buldir Island. Red and black-legged kittiwakes were also banded on Buldir Island in 1988. Twenty-six red-legged kittiwakes were marked with metal leg bands and 16 with green plastic leg bands. Ten black-legged kittiwakes were marked with metal bands and nine with yellow leg bands. Twenty-two tufted puffins were marked on Kohl Island, Agattu, 22 with metal bands and 18 with plastic bands.

H. PUBLIC USE

1. General

1988 was a year of transition for the Aleutian Islands Unit public use effort in many respects. Among the biggest changes were:

- 1) Installation of professional exhibits and remodeling of the

Adak Fish & Wildlife Center to convert it to a first-class visitor facility after several years of planning and design; 2) Transfer of Tom Edgerton, Aleutian Islands Unit first Outdoor Recreation Planner who established the public use program; 3) An expanded information/education effort by Amchitka Island's resident Assistant Refuge Manager Donna Dewhurst; 4) Expanded hours and programs at the renovated Fish & Wildlife Center to accommodate increased use of the new facility; 5) An expanded public information education effort via newspaper columns in the island's two newspapers, the military's Eagle's Call and the privately owned Ptarmigan Times; 6) New initiatives in programs including hosting bi-weekly island orientations for all newly arrived military personnel, participation in bi-weekly Navy "Blue Card" (outdoor safety) lectures; 7) Planning for new 1989 initiatives including hosting University of Alaska wildlife courses and Alaska-certified hunter safety courses.

Despite operating on a limited basis for much of the year due to the visitor center's exhibit area being closed for seven months for remodeling, over 10,000 people visited the facility in 1988, which equates to two visits per island resident. Adak once more topped cooperating association outlets on Alaska refuges with Alaska Natural History Association sales of \$34,978, an increase over last year's \$29,704 including a record 136 memberships in ANHA.

In April, the refuge initiated a weekly column "From the Wildside" in the Eagle's Call, the military newspaper in Adak. This weekly page, written by ORP Edgerton or RM Boylan, proved popular with local readers and continued each week all year. In September, Adak's first non-military newspaper began publication as the bi-weekly tabloid "Ptarmigan Ptimes" made its debut carrying the refuges newest column "The Nature of Things" by RM Boylan. After several years where we found it difficult to even get news releases in print, having two local newspapers carry our information is a welcome, if demanding change.

2. Outdoor classrooms

The inhospitable weather of the Aleutians makes outdoor activities for students difficult to schedule and even more difficult to accomplish. The Outdoor Recreation Planner's time for most of the year was dedicated to planning visitor center remodeling. With the Fish and Wildlife Center under construction through July, we had no adequate indoor staging area and lacked personnel to do anything labor intensive.

In May, SCA volunteer Robert Zetzer presented seven half-hour programs on marine mammals to several hundred Adak Elementary School students as part of their two week "Sea Week" celebration that included walks to see sea otters and other wildlife.

In July, the refuge joined with the Navy's Family Services Center (FSC) to organize a "Family Olympics" with medals awarded for



SCA volunteer Robert Zetzer presented marine mammal programs during "Sea Week" to elementary students. EVK.



ARM Klett interprets the salmon lifecycle at Adak's Finger Bay to local elementary students during this year's run of 40,000 pinks. MFB.

completion of a variety of activities including a bird walk and a weekend wildlife film.

In August, the refuge hosted six environmental education classes for the local day-care students including activities related to the exhibits and wildlife films.

In September, quiz sheets designed for teachers to use with the new exhibits in the Visitor Center were developed and "field tested" by two fourth grades classes bringing 55 students to the center.

Also in September refuge staff alternated duty at Finger Bay interpreting this year's record spawning run of 40,000 pink salmon to local students. At designated stations, staff collected eggs and milt, discussed salmon life cycles and addressed other concepts relating to salmon as 350 students and teachers participated in the week-long event.

In October, Refuge Manager Boylan visited the Aleut village of Atka where he met with Head Teacher Peggy Baker and donated a variety of educational materials from the Alaska Natural History Association.



Virtually all (22) local elementary teachers attended orientation sessions to become familiar with the new exhibits at the Fish & Wildlife Visitor Center. EVK.

Boylan also conducted three orientation sessions for 22 local teachers to the Fish and Wildlife Center in November providing quiz sheets to accompany exhibits, an introductory film and review of activities for elementary grades. Since virtually every elementary school teacher attended, 1988 ended on a positive note with expectations that the new educational materials would induce more teachers to take their students out of the classroom to see what Adak has to offer.

6. Interpretive Exhibits/Demonstrations

From January through July the refuges interpretive program was on hold awaiting remodeling of the Visitor Center and installation of \$100,000 of professionally crafted exhibits. During this time, we continued to show wildlife films on Sundays only until June when showings were held every Saturday and Sunday. In May, Laborer Marc Straub installed a \$6,000 big screen video projection system purchased by the Alaska Natural History Association. This facilitated weekend wildlife film showings by allowing us to use 1/2" and 3/4" video tapes in addition to 16mm film. The ease of using the new VCR allowed greater involvement of local volunteers in visitor center operations since the chronic malfunctioning of the movie projector is no longer an obstacle.

Visitor center exhibits were installed in mid-July and the "Grand Reopening" held Saturday, July 23. While Adak's 5,000 residents had enjoyed the homemade exhibits and artwork of the Fish & Wildlife Center for the past three years, they were favorably impressed with the professional exhibits.

New exhibits addressed topics including endangered species (Aleutian Canada Goose), Russian occupation of the Aleutians, the Aleut people, American occupation, World War II, fox farming, geology and volcanos, weather, Adak wildlife, recreational opportunities, America's National Wildlife Refuge System, Adak wildlife, seabirds, and Aleutian weather.

The technology used to convey these topics included a large plexiglass-covered seabird diorama (artwork and taxidermy by former staffers Sue Steinacker and Chris Ambroz, respectively). An Apple IIGS computer features environmental games and activities ranging from waterfowl ID to animal adaptations and sportsmen's ethics. A working seismograph that depicts Adak's daily earthquake activity proved extremely popular as local residents drop by daily to see what the latest "big one" looked like.

A map of the National Wildlife Refuge System including Alaska and Hawaii entitled "Where Do We Go From Here?" identifies refuge locations when respective state's buttons are pressed. This exhibit was designed for Adak's unique, highly mobile military population.

GRAND REOPENING OF THE FISH & WILDLIFE CENTER



Some of the 500 who attended opening day festivities at the renovated Fish & Wildlife Center. GIM.



Region 7 ARD Dr. John Rogers addresses the opening day crowd as (from left) NAS CO R.P. Munro, NSGA CO Charles Authement, NAS Chaplain Ralph Gibson, RM John Martin and AIU-RM Boylan listen. GIM.



An Apple IIGS computer with environmental quizzes is a popular feature of the remodeled Adak Fish & Wildlife Center. EVK.

By years end, Adak's Fish & Wildlife Center had earned it's reputation as one of the island's finest facilities, prompting one visitor to remark "It's like finding the Smithsonian in a small town". Well, not quite, but it's not bad.

The rationale for the center is easy enough to explain when one remembers Adak's 5,000+ population makes it Alaska's 6th largest community. Annual visitation by military and civilian personnel from other locations swells it by another 20%.

For this predominantly military constituency which includes some high-level decision makers with large budgets, it is an unsurpassed opportunity to present the Service's message. For the majority of Adak residents, refuge programs, classes, bookstore and technical assistance are a welcome relief from military duties and provide insight into an unusual area of a unique state. Being stationed in the Aleutians without appreciating the wildlife is like being locked in the New York Public Library and not knowing how to read. This year, the Service made big strides toward increasing Adak's environmental literacy.

8. Hunting

The entire Aleutian chain is open to hunting; however, the Air

Force command on Shemya and the Navy command on Amchitka do not allow any hunting and the USCG command allows only waterfowl hunting on Attu. Table 20 provides a breakdown of consumptive use on Adak. The waterfowl season opened on October 8. Adak waterfowl hunters took relatively high numbers of pintails and mallards early in the season. These and the resident "Aleutian" green-winged teal made up the bulk of the take. At least three Eurasian wigeon were also harvested. Most dabblers scattered to inaccessible areas or continued their migration and by month's end the few hunters still pursuing ducks were getting mostly harlequins and mergansers. As the only upland game bird on Adak, ptarmigan receive pressure throughout the season. Caribou hunting ended on March 31 with a total 1987-88 harvest of 121 animals (65 males, and 56 females). Previous years yielded a harvest of 134 and 152 animals in the 1986-87 and 1985-86 seasons, respectively. The season began on September 1 and 335 hunters had received registration hunt permits from the refuge office by the end of the year. Naval Air Station Adak provides tug service to the public use cabins on the south half of Adak for active duty military personnel during the caribou hunting season except for December and January. The NSGA Recreation Division charter vessel Kuluk Clipper also provides logistical support to hunters. Without this assistance, we could not effectively manage Adak's caribou herd. Caribou hunting is considered to be quite good on Adak and is extremely popular.

Table 20. Adak consumptive use

	<u>Visits</u>		<u>Activity hours</u>	
	1988	1987	1988	1987
Hunting				
Caribou	848	891	10,685	11,336
Ptarmigan	920	918	3,174	3,244
Waterfowl	<u>280</u>	<u>295</u>	<u>924</u>	<u>969</u>
Total	2,048	2,104	14,783	15,549
Fishing	<u>6,880</u>	<u>4,515</u>	<u>16,963</u>	<u>8,331</u>
Total	8,928	6,619	31,746	23,880

9. Fishing

Fishing is the most popular consumptive activity on the refuge (Table 20.). Saltwater enthusiasts angle for halibut and set crab pots in nearby waters. Stream and lake fishermen concentrate on pink, red and silver salmon, and Dolly Varden. The 1988 pink salmon run was exceptional. With an estimated run of 40,000+ salmon, the largest since 1982, Adak's Finger Bay was a round-the-clock fishery for three weeks. Weekend patrols by refuge officers with occasional evening work plus omnipresent Conservation Team personnel kept violations to a minimum. Finger Bay Stream has been designated "fly fishing only" by Naval Air Station directive to control fishing pressure in that popular

spot. High quality wilderness fishing is also available for those interested in hiking. NSGA's Kuluk Clipper ran daily halibut fishing trips for up to six fishermen, one of whom must win a reservation through the lottery system. Demand for the trips is always high and many people put in for the monthly drawing.

All NSGA land, including Clam Lagoon (the island's clamming "hotspot"), remained closed to clamming this year due to the uncertainty of the existence of red tide and the possibility of Paralytic Shellfish Poisoning (PSP).

RM Boylan met with National Marine Fisheries Service (NMFS) agent Guy Hollstein visiting Adak aboard the Coast Guard Cutter Rush to discuss commercial fishing violations. They agreed an annual program to update fishermen on regulations was in order and tentatively scheduled a class for the Fish and Wildlife Center next spring.

10. Trapping

Trapping for arctic fox is allowed year round on Adak. Free refuge permits were issued to 27 trappers during the year. Much of the trapping is at sites near personal or organizational cabins on the north (Navy) portion of the island.

17. Law Enforcement

RM Boylan, ARM Klett and ORP Edgerton attended the 40 hour Refuge Law Enforcement Officer refresher training session in Anchorage in February. Their "practical" exercise once again turned into the real thing as refuge officers assisted in seizure of several aircraft used in connection with federal wildlife violations. Once again, this year's training earned local television coverage and was part of a nationwide probe in 12 states (including Alaska) that was covered by the major networks.

At present, most refuge enforcement work occurs on Adak Island. The lack of logistical support makes enforcement on other islands virtually impossible. By agreement with the Navy, resource-related infractions (hunting, fishing, ORV's) cited under the Service's authority while other violations (litter, vandalism, etc.) will receive review by the Commanding Officer for possible military sanctions which may include loss of pay, demotion and extra duty.

This year, the Naval "Conservation Team" of the NAS and NSGA Security Departments was very active. The Conservation Team provides qualified volunteers to check sportsmen on the Naval Reservation for compliance with state and federal fishing and hunting regulations. Conservation Team volunteers have authority to issue citations for game law violations, since all state and federal laws are covered under Navy regulations.

A slide program was developed for NAS and NSGA Security personnel and Conservation Team volunteers to help them help us with wildlife law enforcement efforts on Adak. RM Boylan presented this program on fishing regulations to three groups of Navy Conservation Team volunteers and the security (police) forces of Naval Air Station and Naval Security Group Activity. The Navy's volunteer "wardens" did an excellent job monitoring fishing activity at problem areas on the military reservation. In the past, persons reported fishing violations (i.e. snagging salmon in fresh water, keeping too many fish, or taking fish with illegal gear) to us. We often responded but usually found no evidence of a violation or could not locate the alleged violator. Several undercover investigations were conducted with negative results. Table 21 presents a rundown of citations issued this year.

Table 21. 1988 Law enforcement summary

<u>Violation</u>	<u>Number of Violations</u>	<u>Cost</u>
Off road vehicle	4	\$400
Fishing w/o license	3	300
Over limit salmon	1	150
Over limit ducks	1	100
Unplugged shotgun	1	100
Over limit caribou*	1	375

*Meat from 4 caribou was seized. Donated to Native villagers at Atka and needy families on Adak (through the local church).

In September, Refuge Officers Klett, Dewhurst, Edgerton and Boylan qualified with Service revolvers at the Naval Air Station's outdoor range, shooting the FLETC practical pistol course under the watchful eye of the military's range officer.

During October and November, refuge officers checked licenses and permits of hunters returning on the Navy tugboat each Tuesday evening from the south end of the island.

A report of Aleut artifacts being removed from Shemya Island was investigated by refuge officers and RO-LE. Special Agent Steve Tuttle retrieved a quantity of artifacts taken by a civilian in violation of the Archaeological Resources Protection Act. No citations were issued as the individual was extremely cooperative in returning the artifacts, which were turned over to RO Archaeologist Chuck Deters for disposition. A letter reiterating federal law pertaining to artifacts was sent to Shemya's commanding officer for preventive enforcement.

18. Cooperating Associations

Adak has hosted a cooperating association sales outlet of the Alaska Natural History Association since 1984 and annually seen

its income rise to the point it has been the highest selling refuge in Alaska for the past three years.

In FY1988, ANHA sales exceeded last years \$29,704 by 18%, an increase to \$34,978. What is even more remarkable is that this increase occurred despite the fact the Fish & Wildlife center was virtually closed January-July for remodeling with no exhibit area and a reduced sales area temporarily arranged in the library.

ANHA sales from January-March were \$5,085, a major increase over 1987. A one-week visit to Amchitka by ORP Edgerton in April where he presented programs and sold ANHA items gained some \$1,500 and helped set a one month sales record of \$3,197.

After the visitor center's "Grand Reopening" in late July, sales soared. The first weekend topped \$1,000 and by the end of the quarter (June-August) sales reached \$13,108!



Cooperating Associations sales through the Alaska National History Association reached \$35,000 in 1988 as Adak again surpassed other refuge outlets in Alaska. EVK.

Cooperating association proceeds, (85% of which return to this station for inventory, interpretive or educational materials) from 1987 were used to purchase a ceiling-mounted, \$6,000 big screen video projection unit and 1/2" VCR to accompany the 3/4" VCR we've had and provide a wider range of weekend films. Additional ANHA proceeds purchased bookshelves, new films and

videotapes, library books, subscriptions to National Wildlife and Ranger Rick for the library and pay for expenses associated with teacher training as well as the 40 participants' fees for the 1988 Christmas Bird Count held December 31.

There is little doubt that with increased inventory, expanded hours of operation and opportunities for educational programs as well as outreach efforts throughout the Chain, ANHA sales will exceed \$50,000 annually.

New inventory items for 1988 were few and timing was such they didn't all have a major impact on this year's sales. One of our most popular (and profitable) items was the paperback The Thousand Mile War (\$3.95) detailing the war in the Aleutians. Out of print since 1982, it is a consistent best seller among residents and guests alike. Likewise, a 1/2" videotape of the 1943 John Houston film classic "Report From the Aleutians" went on sale in December and the inventory quickly disappeared at \$34.95 each.

ANHA donated a \$50 gift certificate to the Adak Chapter of Ducks Unlimited which helped DU raise \$23,000 at their second annual banquet October 1.

Over \$100 in cash was taken from the ANHA outlet between 9:00 p.m. November 2 and 8:00 a.m. November 3. Naval Investigative Service (NIS) fingerprinted and interviewed all persons with access to the building but to no avail. As a result of the theft, security procedures were revamped.

I. EQUIPMENT AND FACILITIES

1. New Construction

Wolverine Supply of Anchorage Alaska was awarded the contract for construction of a new eight person bunkhouse at Adak. Construction began on May 6th with an original estimated completion date in late July. This project was a first for the contractor out here on Adak and they learned quickly how long it takes to order needed supplies with a three week barge schedule. Regional Office inspection of the completed building took place on August 22-23. A total of 54 discrepancies were found, all of which the contractor had to correct before the Service could accept the building. Final work was completed by October 5, and the building became part of the refuge housing complex.



Bunkhouse construction began in May and finished in October. EVK.

2. Rehabilitation

Construction work for the remodeling of the Adak Fish & Wildlife Center, as its called, began in October of 1987 with a concrete pad for the new entry-way being poured. The entry-way itself along with the complete change of the visitor center and projection room plus partial changes in the conference room were completed between January 26, and July 23, 1988. The contractor, Dar Con Corporation of Anchorage planned to complete the construction phase of the remodel project by March and Condit

Exhibits of Denver was expecting to have the exhibits here and installed by late May. Neither of these dates were met due to the logistics of shipping supplies to Adak. The project was completed in mid-July and the "Grand Re-Opening" of the Adak Fish & Wildlife Center was held on July 23, 1988 with some 500 people attending opening weekend festivities. Assistant Regional Director for Refuges & Wildlife, Dr. John Rogers was keynote speaker joined by local VIPs.



Dr. John Rogers receives congratulations from NAS CO Capt. R.P. Munro and NSGA CO Capt. Charles Authement on the dedication of the renovated Adak Fish & Wildlife Center. GIM.

After many years of dark brown, all seven refuge residences were painted a light tundra tan and with either light brown or "California Rustic" trim. This spruce up of the housing area was done by residents with paint purchased by the station. Due to the unpredictability of Adak weather, painting their own homes was the most efficient and practical way to finish the job this year. Construction of modern new Navy housing around refuge residences made our quarters look like a ghetto until the new paint jobs. Both housing storage sheds were painted to match the housing. A dilapidated residence area storage building received a major remodeling. The building was insulated, wired for lights and electrical outlets, sheet rocked, a new metal roof added and finished off with a coat of paint to match the houses.



BEFORE: Dirty brown residences detracted from housing area. MFB.



AFTER: Lighter, contrasting colors complement new Navy housing. MFB.



Navy Seabees remove Quarters 6 from the residence area. EVK.

In addition to re-painting the residences, a major aesthetic improvement came with the removal by the Navy of Quarters 6, an old mobile home unfit for habitation. It was excised and given to the military fire department as a "training aid" which gives you an indication of its condition.

Due to the bunk house construction, landscaping around the building area was needed. In addition the existing rockwall fence had to be moved to encompass the area around the bunkhouse. Through the rainy fall and winter it was discovered that after the contractor finished landscaping the berm around the bunkhouse the surrounding area was left lower than the rest of the housing complex. Now after every rain a large lake forms and holds water for days and sometimes weeks. This large undrained area helps to flood the crawl space under the duplex housing units 4A-4B. Hopefully the refuge can afford to purchase fill and gravel to slope the ground so water runs off to the existing storm sewer system.

The visitor entrance sign was rehabilitated and framed in the weathered WWII wood that is found on Adak. Mounting posts had to be put in six foot holes with concrete to support the 10'x12' sign in the strong Aleutian winds. Larger-than-life size sheet iron silhouettes fabricated by Kenai refuge maintenance staff were installed on the front of the building. A bald eagle, caribou, common loon and a far-eastern curlew help draw attention to the building. The area around the visitor center and the refuge entrance sign were also landscaped, mulched, fertilized and seeded. A lush green lawn was the result.



Earthwork associated with bunkhouse construction created a seasonal wetland in the residence area. EVK.



Renovation completed, the Fish & Wildlife Center features wildlife silhouettes on the exterior as well as a new entrance sign framed in Adak wood. MFB.

On the interior of the visitor center, shelves were built into the new audio-visual room to mount projectors and store films and videos. An electric fireplace featuring handsome tongue and groove woodwork over the mantle and a wooden FWS seal completed the auditorium remodeling.

3. Major Maintenance

Repairs and regular maintenance of furnaces are a constant work load due to year-round use of the heating system. Two air compressor motors were replaced on the pneumatic temperature control system of the headquarters heating unit. Two circulating pump motors on the headquarters heating unit and one circulating pump and motor on the bunkhouse had to be replaced. Two pneumatic valve actuators controlling hot water flow in the headquarters heating unit had to be replaced.

The transmission had to be rebuilt in one of the 1979 Chevy Suburbans while the clutch was replaced in the other 1979 Chevy Suburban in January and again in December. The standard shift Suburban has an 8-foot snow plow so the clutch system gets a rigorous winter workout. The first clutch was obtained through Navy Supply and the quality turned out to be less than standard Chevy replacement parts. The second clutch system was from a Chevy dealer and works much better.

The brown Chevrolet Suburban and the Chevrolet S-10 Blazer both received paint jobs during the year. The Suburban also required many hours of body repairs. The Blazer spent a few months at the Amchitka field station. Due to the gravel road system the paint had chipped and rust spots were developing. Preparatory work on the second Suburban for a paint job was initiated in December.

A variety of exhaust replacements, electrical starter and alternator replacements and brake system replacements were made on other vehicles.

A sticking shuttle reverser valve on the shuttle transmission of the JCB Loader backhoe caused the pressure in the hydraulic system to build and blow out seals in the filter system. A new valve solved the problem.

In addition to Adak maintenance, both the laborer and maintenance worker spent time at the Amchitka field station making repairs on heating, electrical and water supply systems.

Maintenance worker Schulmeister spent 9 weeks working at the AMNWR Headquarters in Homer, Alaska. Work consisted of repair, tune-up and preventive maintenance on outboard motors and small boats. The projects included automotive and building maintenance plus the installation of a spiral staircase in the headquarters building. Schulmeister also spent a week learning the vessel engineer's job on the refuge vessel Tiglax and then spent three

weeks doing that job while the engineer went on annual leave.

4. Equipment Utilization and Replacement

A new Dodge Caravan ordered in October of 1986 was finally due to arrive at the end of the year but only the paperwork made it. Supposedly it has been shipped and should arrive early in 1989.

J. OTHER ITEMS

1. Cooperative Programs

On February 16, while demolishing the old Atomic Energy Commission (AEC) barracks on Amchitka as part of the Navy's \$250 million Relocatable-Over-The-Horizon-Radar (ROTHR) system, the contractor spilled oil containing PCB's from two transformers. The damaged transformers were buried in the landfill. After becoming aware the oil contained PCB's in excess of 50 ppm, the contractor removed the transformers from the landfill and promptly secured both sites. A sampling program and Remediation Work Plan was quickly developed in cooperation with FWS and the EPA. The contaminated soil was excavated and stored in 12 Conex containers for shipment to Arlington, Oregon for incineration.



12 Conex boxes containing PCB's were stored on Amchitka for 10 months before the Navy shipped them off. DAD.

In December, as the Navy transferred from the construction phase to the operational phase of their ROTHF system, they were considering leaving the containers of PCB-contaminated soil on the island. The cost of insurance to ship the hazardous waste to the incinerator in Oregon had the Navy and its contractor (Taywood/Berg/Riedel) looking at options including burying the containers in the landfill. Cleanup of the contaminated soil left 150 cu. yds. of hazardous waste in storage while the Navy and the contractor faced an unexpected \$200,000 insurance bill to the \$250 million project. The last barge was scheduled to leave Amchitka mid-December and with it the last chance to remove the hazardous waste until next summer. Despite assurances that the PCB's would be removed, correspondence revealed the Navy was considering alternatives. Letters from the Regional Director and the Refuge Manager to all parties including officials at Pearl Harbor, Hawaii, emphasized the 12 containers must be removed. The EPA was notified of the potential violation.

After numerous discussions with the Service, the Navy finally removed the containers of PCB-laden soil on the mid-December barge; however, the barge went aground on the Shumagin Islands a week later. Attempts were underway at year's end to re-float the barge, which contains equipment and supplies as well as hazardous materials.

On April 12, 1988, a truck belonging to the Amchitka contractor dropped a D-9 cat in Bridge Creek with a gallon of motor oil and 30 gallons of diesel fuel leaking into the creek. Cleanup operations were initiated immediately. Habitat damage was minimal.

While on Shemya on December 8 for an Emperor goose survey, BT Fuller met with Air Force and NOAA personnel regarding a fishing boat that ran aground. The ship was leaking diesel fuel and there was concern about environmental damage. Plans called for pumping the fuel from the damaged ship as soon as conditions allowed. No wildlife was known to be affected by the fuel leak. At month's end the fuel had been removed and the ship hauled ashore for salvage.

December winter storms took their toll of shipping in the Aleutians. Besides the grounding of the fishing boat, mentioned above, a 280 ft. Japanese freighter went aground on Akun Island, Fox Island group. It carried 68,000 gallons of crude oil and a large quantity of diesel. As the year ended, plans called for the diesel fuel to be mixed with the crude oil and setting the whole ship afire. It was anticipated that the diesel would act as an igniter and set the crude oil afire.



This 65" fishing boat aground off Shemya was one of several shipwrecks caused by Aleutian weather. JPF.

3. Items of Interest

On July 12, while setting-up a spike camp on the east side of Buldir Island, SCA volunteer Colleen Baggot discovered the remains of a WWII soldier concealed among the rocks. On July 17, FWS personnel John Martin, Mike Boylan, Vernon Byrd, Gerald Gray and Nancy Norvell hiked to the remote site and carefully brought the human remains and military artifacts back to the Tiglax which delivered them to the military on Adak on Thursday, July 21. In addition to all of the human remains, a military pocket watch, a wristwatch, a 1940's quarter, a comb, empty ammunition clips, an M-1 rifle, a sheath knife, a pocket knife and a wallet in remarkably good condition were recovered. From Adak, the remains were sent to Elmendorf AFB where they were received by an honor guard and subsequently transferred to the Army's Central Identification Laboratory in Hawaii for analysis and identification. The discovery gained national publicity in newspapers, radio, (Paul Harvey) and television including "Good Morning America". (Appendix 2)



Vernon Byrd holds an M-1 rifle, one of several artifacts removed from Buldir Island along with the remains of an WWII soldier. MFB.

Refuge staff continued to work with PAO on the story of the remains of the WWII soldier discovered on Buldir in mid-July. On August 22, Anchorage UPI reporter Jeff Berliner's story identified the remains as those of Corporal Carl E. Houston of Manitowoc, Wisconsin as collaborated by the survivors of Houston's detachment.

The Central Identification Lab made positive identification in December of Cpl Carl Houston. The remains were shipped to his sister in Wisconsin, where they received proper burial.

Laborer Marc Straub, Clerk-Typist Greg McClellan and Outdoor Recreation Planner Tom Edgerton earned performance awards in 1988 of \$300, \$500, and \$1,000, respectively.

Straub was recognized for superior performance in overcoming multiple mechanical problems to keep all facilities operating during the absence of Maintenance Worker Schulmeister. McClellan's effort coordinating the Aleutian Canada goose translocation when WB Byrd was injured earned him special recognition. OPR Edgerton's extra effort in completing the planning and design of visitor center exhibits when the contractor defaulted saved the Service a great deal of money and salvaged the project.

4. Credits

The 1988 Narrative Report was authored by the following:

- Introduction - Mike Boylan
- A. Highlights - Mike Boylan
- B. Climatic Conditions - Van Klett
- C. Land Acquisition - Van Klett
- D. Planning - 1. Van Klett, 5. Jim Fuller, 6. Van Klett,
- E. Administration - Van Klett
- F. Habitat Management - Van Klett
- G. Wildlife - Vernon Byrd, Jim Fuller
- H. Public Use - 1. Mike Boylan, 17. Van Klett, 18. Mike Boylan
- I. Equipment & Facilities - Bob Schulmeister
- J. Other Items - Van Klett
- K. Feedback - Mike Boylan

Word processing, computer entry, photo placement and collection was accomplished by Dorothy Wheeler. Final editing was provided by Mike Boylan.

K. FEEDBACK

From our distant perspective there were some positive steps in the Service's operations this year but, alas, some of the same problems continue to make refuge management unnecessarily difficult.

Improvements in the personnel management came in the overdue promotion of selected stations to GM-14's, and improved management training opportunities such as the rotational Upper Level Management Program. The issuance of a mobility policy is also seen as a positive personnel management issue. This year also saw the implementation of an "Alaska Administrative Return Policy" so new employees are guaranteed placement in their home region should they wish to leave the Last Frontier. This is a major policy achievement that's had lots of discussion but little action until this year and should provide increased numbers of qualified applicants for Alaska jobs.

Region 7 had a bright moment this year that left us all feeling better about ourselves and the jobs we do. PAO Bruce Batten deserves the 1988 "Breath of Fresh Air Award" for showing what public affairs is all about. His outstanding cooperation on stories such as the remains of the World War II soldier and the Aleutian Canada goose translocation earned this station much favorable publicity and we know others enjoyed their time in the spotlight.

That's the good news. The bad news is we continue to be plagued by a system that causes interminable delays in filling vacancies which results in chronic staff shortages, poor morale and inferior service to the public. If Director Dunkle was known as the man who put 'fish' back in Fish & Wildlife, his successor should put the 'Service' back in our name by streamlining the filling of vacancies. Why should it take an average of seven months to fill three vacancies that were all established positions?

Despite the efforts of the RO's Personnel Management staff, cumbersome personnel procedures coupled with micro-management of every position resulted in unnecessary delays in filling vacancies this year.

Our wildlife management efforts center around an arctic fox eradication program. Arctic fox were introduced in the Aleutians for a century and decimated bird populations, including the endangered Aleutian Canada Goose. Despite a successful experiment using 1080 baits to clear 70,000 acre Kiska Island of foxes we are not allowed to use 1080 so 50,000 pellets sit in storage. We can't use M-44's because they're only legal for red foxes. Lacking proper tools, we use improper ones. One day a week if the weather cooperates we take a small boat across some of the world's worst ocean to trap fox on islands we can reach.

It is slow, labor intensive and potentially dangerous but it is all we can do. If you haven't got the tools to do the job, do your job with the tools you've got.

In a time of high technology and with proven toxicants available, we must be allowed to use more efficient, acceptable methods to remove these introduced predators. It took fox farmers 100 years to wreak environmental havoc with these islands but it shouldn't take us that long to undo the damage.

Finally, as of March we once again find ourselves midway through the fiscal year without a budget and unable to plan what we'll do or who we'll do it with. While we rely on Student Conservation Association (SCA) volunteers for field camps, the annual budget debacle makes it difficult to assure these young people that they'll have jobs.

TRACKING PLASTIC IN THE PACIFIC

A visit to the westernmost Aleutians proves that a growing scourge is reaching our remotest beaches

Article and photographs by Albert M. Manville II

AS THE PUBLIC is beginning to realize, discarded plastic trash is increasingly causing suffering, disfigurement and death among marine animals around the world. One of the chief causes of plastic-related wildlife deaths is entanglement—the trapping, and often slow starvation or strangulation, of seabirds, marine mammals and sea turtles by lost or discarded fishing nets and other plastic debris.

Unknown numbers of seabirds, mammals and fish also die after eating plastic particles, either from broken-down finished plastic products or from raw materials used in plastics manufacturing. Still another threat to wildlife is posed by the ingestion of floating plastic bags by hungry sea turtles, which often mis-

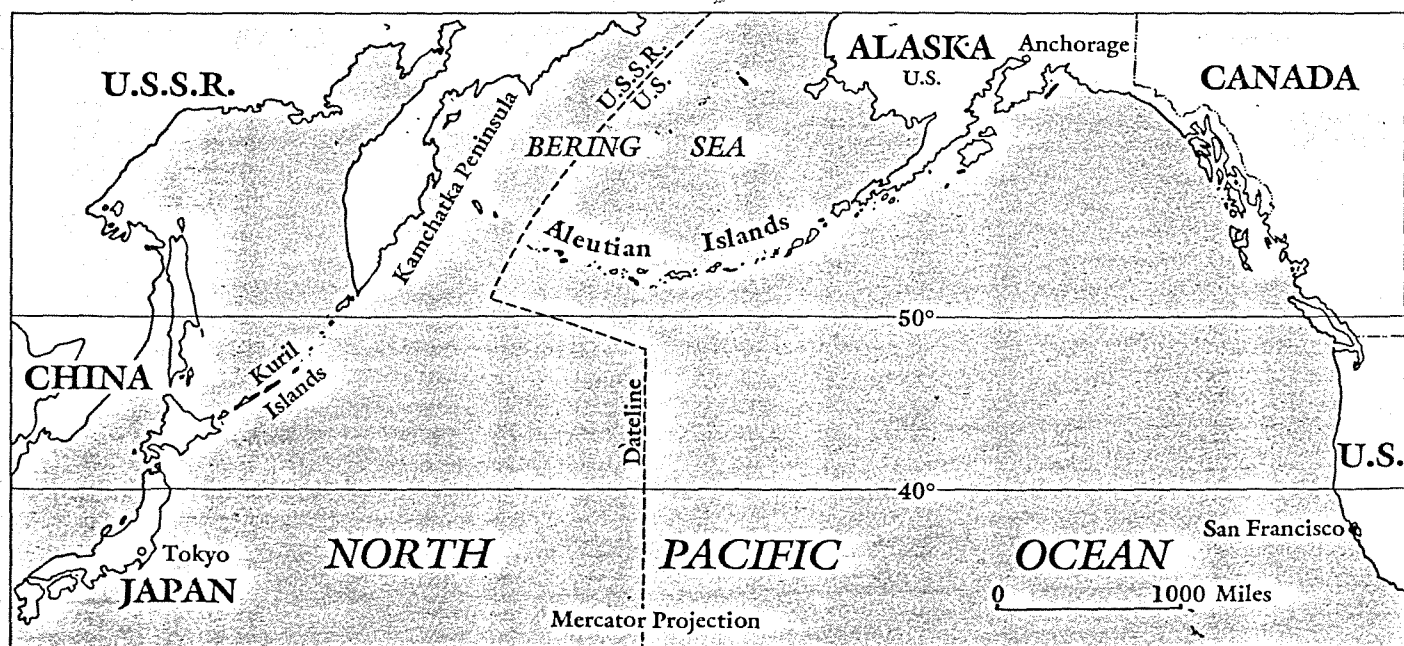
take them for jellyfish. Once swallowed, the bags often lodge in the turtles' stomachs, where they block the digestive tract and produce ulcers and starvation.

The exact extent of wildlife mortality caused by plastics pollution is hard to gauge, since most marine animal deaths occur out of sight of human beings. However, a slightly different but related problem, the incidental taking of non-targeted animals in active salmon driftnets, is easier to measure. This kills an estimated 750,000 seabirds each year in the North Pacific alone. Researchers believe that in addition, 125,000 North Pacific marine mammals die in active driftnets annually. And it is believed that as many as a million seabirds and 100,000 marine mammals may be dying

in this region each year after eating plastic or becoming entangled in it.

The United States, with six percent of the world's population, is the source of perhaps a third of the plastic waste found in the oceans of the Northern Hemisphere. In 1985 alone we used some 48 billion pounds of plastics, of which we discarded 1.4 billion pounds into the oceans. In 1987 our national plastics use grew to 53 billion pounds, and a recent report by the Society of the Plastics Industry projects that it will reach 76 billion pounds by the year 2000. Plastics use by other nations also is growing. What will this mean for marine wildlife?

As chair of the Washington, D.C.-based Entanglement Network Coalition, I recently traveled to Alaska to see what discarded plastics may be



doing to the waters surrounding the Aleutian Islands, a region rich in marine life. At the invitation of the U.S. Fish and Wildlife Service, I joined Captain Alvin Bayer and the crew of the new research vessel *Tiglax* on a tour of the westernmost islands in the Aleutian chain, in order to look for plastic trash on 25 of North America's most remote beaches.

Plastic entanglement, especially in trawl net fragments and packing bands, has been well documented as a leading cause of deaths of northern fur seals in the North Pacific, where the seals are declining by four to eight percent annually. Entanglement is blamed for killing perhaps 30,000 to 50,000 a year.

Just outside our 200-mile limit, in this isolated area far from where most Americans live, fishing boats from a number of nations create a special entanglement threat by setting out tens of thousands of miles of driftnet every night during the five-month fishing season. Driftnets get their name from the fact that commercial fishermen do not anchor them but let them

drift in the ocean catching fish automatically. This practice virtually guarantees regular losses of plastic netting to the ocean, as well as the deaths of seabirds and marine mammals. Some 700 boats from Japan, Taiwan and South Korea put out an estimated 20,500 miles of driftnet each night in international waters in the North Pacific. The National Marine Fisheries Service estimates that the Japanese alone lose about 12 miles of net per night, or about 639 miles every season. In addition, plastic debris is dumped into the North Pacific by naval and fishing vessels from the bordering nations.

The Aleutians, totaling some 3.9 million acres, extend more than 1,100 miles from Unimak Island west to Attu Island. Of more than 200 named islands, islets and rocks in the chain, most of them treeless, I visited seven of the westernmost, three of them situated in the Near Island group named for its proximity to the Soviet Union. These islands were unlike anything I'd ever imagined. Volcanic in origin, they boast mountains over

4,000 feet in altitude, shorelines that are frequently indented with fjords, and several-thousand-foot cliffs that drop abruptly to the ocean.

Because these islands are a barrier between the Pacific Ocean and the Bering Sea, the waters around them are roiled by ocean upwellings, tidal surges and ever-present tidal rips—places where two currents come together, rich nutrients are brought up and plankton are concentrated, in turn attracting fish and seabirds. Unfortunately, such areas also tend to collect plastic trash that has been discarded elsewhere and carried along by the currents.

Even in July, most of the outer Aleutians were still covered with a patchwork of snowfields, especially in their upper elevations. Frequent fogs and low-lying clouds provided nearly continuous dampening of the lush vegetation, which consists of tall, herbaceous meadows as well as li-

Some of 28 rope coils and pieces, 13 trawl net sections and other plastic debris at Etienne Cove, Attu Island.





The Tiglax waits off Little Kiska Island. On North Bight Beach on Buldir Island, expedition members Nancy Norvell, Mike Boylan and Vern Byrd inspect a dead glaucous-winged gull on a piece of trawl net.



chens, mosses and low alpine plants. This rich environment provides nesting habitats for several million seabirds of 25 different species. It also supports the endangered Aleutian Canada goose, three common raptors and other waterfowl. Arctic foxes and Norway rats were introduced here, the former for fur, the latter by mistake. The foxes especially have had a significant impact on native birds.

Along with sperm, minke, killer and Steineger's beaked whales, the world's largest sea lions are found in the Aleutians. Adult bull Steller's sea lions can weigh nearly a ton. I also saw sea otters, harbor seals, northern fur seals and Dall's porpoises.

My plan for surveying beaches for plastic was simple. First I selected sample sites 100 yards long. Then I counted plastic items found at these sites from the water's edge up through high storm-tide level. I also photographed all the beaches and collected representative plastic samples.

As I soon discovered, there were good reasons why surveys had probably never been done before on many of these beaches. Not only are they remote, but the seas around them are unpredictable and storms come up quickly. Access was mostly by inflatable Zodiac, and the swell of the waves was a formidable hazard. Massive kelp beds around the islands also

made Zodiac landings difficult. Then there was the fog: we were in the clear one moment, enshrouded the next. Because of the danger of capsizing in the icy water, we all wore bulky Mustang survival suits and carried two-way radios and other survival equipment as we rode the Zodiacs in to the beaches.

Shielded by their protective harbors from storms and strong currents, the first few beaches I visited on Shemya and Attu islands had only small amounts of plastic. But even the most protected beaches had some debris; at least 15 items were deposited on the cleanest of them.

Then, as the *Tiglax* rounded Wrangell Point on Attu, site of the westernmost beach in North America (it is so far west it is located in the Eastern Hemisphere), I saw in the distance a myriad of colored dots on the shore. They turned out to be plastic floats for trawl nets and crab pots, and the beach was littered with them. After dropping anchor and fighting the usual battle to get the Zodiac through the kelp, we carefully approached the beach without disturbing 13 sleeping bull Steller's sea lions. One had his head on a plastic buoy. Another lay on a plastic trawl net. The sea lions soon awoke and lumbered toward the water, all the while bellowing, growling and barking at us.

My survey of this beach recorded the following array of plastic items: 34 bottles, seven bottle caps and lids, nine fish-sorting baskets, a beer crate, three plates, two hard hats and two beverage coolers. In addition, I found nine strapping bands, nine pieces of

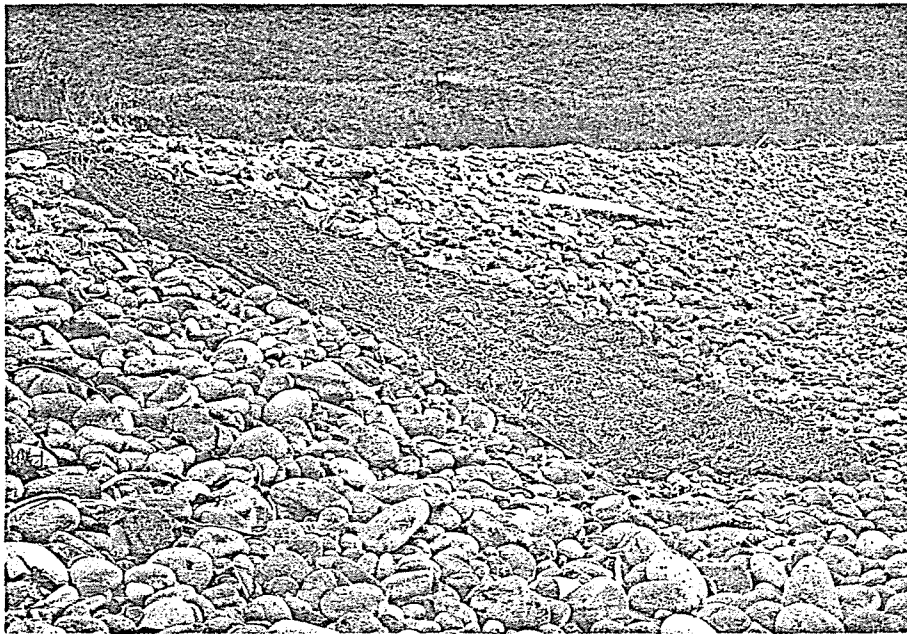
polystyrene foam, 47 hard plastic buoys and 80 foam plastic buoys. On the same beach were 110 nets, most of them trawl nets, but also including a few gillnets; and 179 pieces or complete coils of plastic rope. There were even three orange drift cards from a National Marine Fisheries Service study of the forces causing oil to move along the ocean surface. On this one beach I counted 511 items representing 27 varieties of plastic.

As four of us from the *Tiglax* surveyed the beaches on northern Attu for sea lions, another disturbing trend became evident. An FWS count of sea lions here in 1979 turned up 5,705 animals; we sighted only 811. Could plastic trash be one reason for the decline? I found no dead sea lions entangled in plastic, but for unknown reasons the Steller's sea lion population worldwide has dropped 50 percent in the last decade. In the eastern Aleutians, a 50-percent fall-off in the Steller's sea lion population has been observed since 1957. More research is definitely needed to determine whether this decline is linked to plastic entanglement. On Buldir Island I did photograph a bull sea lion with a massive entanglement scar on its neck. It looked as if the plastic were still imbedded in the bull's flesh, but I couldn't get close enough to be sure. I received reports of other sea lions with entanglement scars on Kiska Island.

On the 2.3 miles of beach on seven islands that I covered during the trip, I tallied 3,159 plastic items in 67 different product categories. On the average, each beach yielded 126 different pieces of plastic. But this total



Top, trawl net, monofilament drift net and other plastic on Buldir Island. Left, Tiglax first mate Kevin Bell holds a plastic naval ordnance container on Kiska. On Buldir, a Steller's sea lion's neck bears a massive entanglement scar.



accounts only for what was visible not for what doubtless lay hidden under debris, sand and rocks. Since Alaska boasts some 36,000 miles of coastline, my survey results undoubtedly represent only a tiny fraction of the state's beach debris problem. The next storm could easily wash this plastic back into the ocean to continue its lethal journey through the marine environment. Or a storm could just as easily reveal additional plastic that has floated in on the water, or plastic nets that have temporarily disappeared beneath the water's surface.

This section of trawl net on Buldir Island probably came from a Soviet or Japanese fishing boat. The pink inflatable plastic buoy in the Buldir Steller's sea lion rookery below is from the Alaskan king crab fishery.



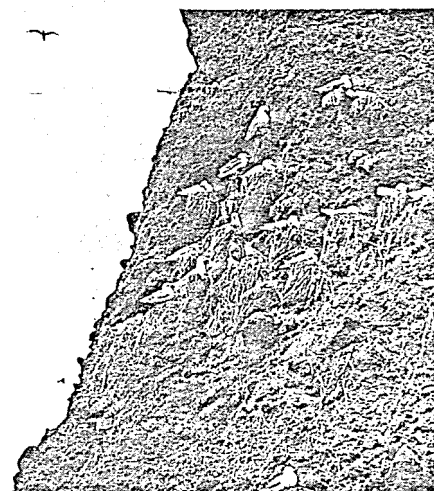
because of entangled debris and dead wildlife.

The most prevalent of the 67 different kinds of items I found was plastic rope. Pieces of it, and sometimes complete coils, accounted for 706 of the 3,159 plastic articles I tallied. The next most common type of debris consisted of 535 foam plastic buoys from gillnets. The discarded plastic appeared to come from ships, oil-drilling platforms or land sources and included products from Japan, South Korea, China, Taiwan, the Soviet Union, Norway and the United States.

Most of the plastic lacked convenient identification markings. Previous reports indicated that most beach litter found on Amchitka Island was from Japanese and Soviet fishing vessels. My findings in the outer Aleutians are consistent with earlier researchers' discoveries of enormous quantities of trawl web nets on Amchitka. Trawl nets, large webs dragged along the ocean bottom, are used to harvest salmon, walleye pollock, cod and other fish in this region.

The outer Aleutians appear to be a paradise for birds. Troubling, though, is the possibility that plastics may be taking a heavy toll on their populations. I found hundreds of dead seabirds on the beaches, some wrapped in plastic. Given the decomposition of the carcasses, it usually was impossible to determine the cause of their deaths. But my initial analysis suggests that more research on seabird mortality definitely needs to be conducted in the outer Aleutians. The birds that seem most abundant here are least auklets, estimated to number 1.3 million on Buldir and Kiska islands. In flight, least auklets and crested auklets resembled a large cloud of smoke as we sighted them from a distance while steaming toward their Buldir rookery. Among the common birds in the islands are tufted and horned puffins, thick-billed and common murres, black-legged kittiwakes, red-faced and pelagic cormorants, forked-tailed and Leach's storm petrels and glaucous winged gulls.

What is astounding about many of these birds is their diving prowess. Murres, for example, have been found diving to depths of more than 600 feet, and crested auklets to depths below 120 feet. The tufted puffin can dive at least 450 feet below the ocean's surface in search of fish, squid or



Potential victims of the Pacific's spreading burden of plastic are this mother Pacific harbor seal guarding a concealed pup and the black-legged kittiwakes thronging an oceanside cliff, in both cases on Buldir Island.

other prey. It's worth asking whether this increases the birds' chances of drowning in plastic "ghost nets" and other debris lurking below the surface.

What does the future hold for these birds? What entanglement threats may lie ahead of the huge bull Steller's sea lion that I accidentally surprised on one island while changing my film behind a boulder where he was sleeping? Fortunately, 35 nations have now ratified Annex V of the MARPOL (International Marine Pollution) Treaty which bans the disposal of plastic wastes from commercial and other private vessels. The United States ratified the MARPOL Protocol late last year after an extensive public-education campaign by environmentalists, and last December President Reagan signed legislation implementing the treaty and prohibiting plastic dump-

ing by any vessel within our 200-mile Exclusive Economic Zone. The U.S. Navy last June accepted and began implementing recommendations to phase out its plastics dumping over the next five years.

The campaign to make our increasingly plastics-dependent world safe for marine wildlife, however, still has much to accomplish. As we disembarked from the *Tiglay* at the end of our ten-day research voyage, I observed that our trash had been carefully stored on board for proper disposal later. The plastic debris floating in the harbor at Adak Naval Air Station, however, had not been handled so carefully. Perhaps it had been pitched overboard by deckhands on some non-naval vessel still out at sea.

To reduce the plastics threat, conservationists need to work for strict enforcement of the 1987 Marine Plastic Pollution Research and Control Act after it takes effect this December. We must also ensure that the federal government carries out its mandate under the Driftnet Impact Monitoring, Assessment and Control Act to negotiate with foreign nations over reducing and ultimately eliminating the killing of marine life by driftnets and related equipment.

Congress should require use of degradable nets and marking and registration of driftnets, trawl nets and purse seines, as proposed in testimony supported by a majority of the Entanglement Network Coalition in 1987. Finally, it seems clear that significantly larger appropriations are needed to support research on seabird and marine mammal deaths in the outer Aleutians and elsewhere. What we found last July on those 2.3 miles of beaches is surely only a hint of a much larger problem. Many questions remain about entanglement, other impacts of plastic on marine organisms and the decline of wildlife populations in the region. But with the federal government facing a deficit problem and a host of competing claims on its financial resources, conservationists may have to expend some effort to make sure that those questions are answered. □

Albert M. Manville, Defenders' senior staff wildlife biologist, is a member of the Navy's Ad Hoc Advisory Committee on Plastics and has testified about plastic pollution problems before several congressional committees.

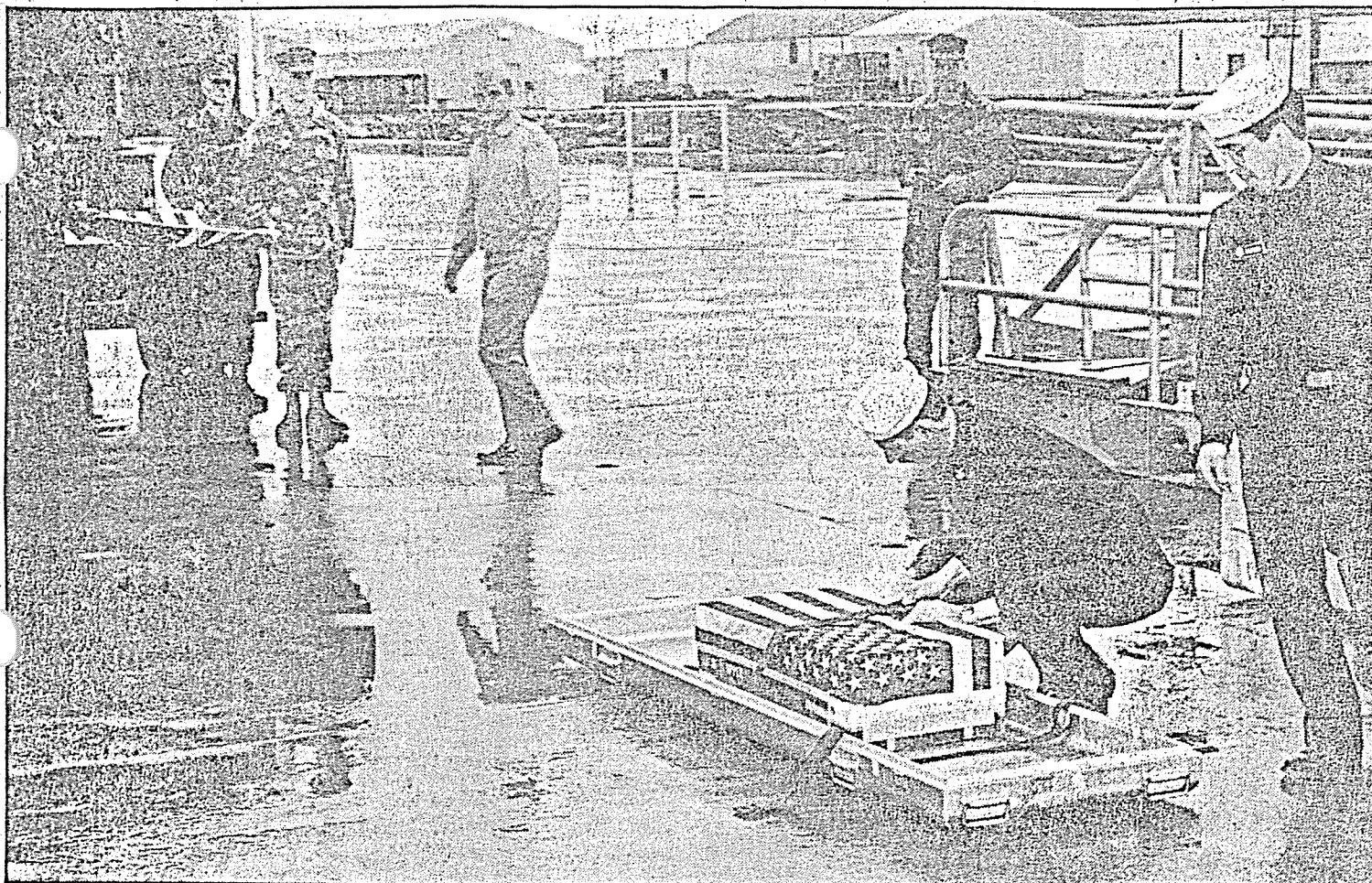


Photo by C.F. Scott

The remains of Cpl. Carl "Bud" Houston, who had been missing in the Aleutian Islands for 44 years, are loaded into a military transport in Adak last July for the start of the trip to Wisconsin.

Family lays long-lost soldier to rest

By MARYANN MROWCA

The Associated Press

WAUSAU, Wis. — Nearly 44 years after he disappeared on a remote island in Alaska's Aleutian chain, the remains of Cpl. Carl "Bud" Houston were returned Friday to a final resting place in Wisconsin.

About two dozen relatives and friends attended a brief, private funeral service for Houston, whose remains were found last summer by biologists studying geese on the island.

"Uncle Bud is finally home and I look forward to meeting him some day in the hereafter," said Jay Gitchel, who was 4 months old when his 21-year-old uncle disappeared.

Although he never met his uncle, Gitchel said older relatives in the family spoke so fondly of Houston that Gitchel named his son after him.

Houston, who grew up in Manitowoc in eastern Wisconsin, disappeared March 3, 1945, while hiking on Buldir Island, where he was one of five volunteers assigned to operate a weather station.

For years, Army officials and the family believed Houston was caught in a landslide on the coast of the snowy, rugged island. His body was never found, despite ground and aerial searches by his four fellow team members.

Jacqueline Gitchel, Houston's sister and closest surviving family member, said relatives never thought his body would be found because it was assumed to be buried.

But she was surprised to learn last summer that a U.S. Fish and Wildlife team found a WWII vintage M-1 rifle and skeletal remains further inland on the 4,250-acre island.

The remains were found by a woman looking for a stone to pound tent pegs.

After an investigation by the Army, military officials confirmed the remains were Houston's, Gitchel said.

Gitchel said she hoped Friday's service at a mausoleum at the Restlawn Memorial Park in north-central Wisconsin was the final chapter in her brother's story.

Gitchel, 69, remembered her younger brother as a young man who liked to hunt and fish. He had worked at a number of jobs, taken classes at a University of Wisconsin extension and worked at a Manitowoc shipyard before enlisting in 1942.

In the Army, he received arctic survival training and was assigned in 1944 to a weather observation squadron in the Aleutian islands. Once he volunteered for duty on the remote island, the family heard little from him because mail was picked up only about twice a year, Gitchel said.

Gitchel said she believes her mother once thought Houston may have been captured by the Japanese.

"I think she was sorry she didn't have a grave to take care of," Gitchel said.

Before he died in 1980, Houston's father talked about going to see the island where his son died and wrote to shipping companies asking about passage without luck, Gitchel said.

"The father made a real strong effort to get to Buldir. I don't think he realized how remote it is," he said.

BERING SEA UNIT
ALASKA MARITIME NATIONAL WILDLIFE REFUGE
Homer, Alaska

ANNUAL NARRATIVE REPORT
Calendar Year 1988

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

INTRODUCTION

Bering Sea Unit

Alaska Maritime National Wildlife Refuge

The Alaska Maritime National Wildlife Refuge (Maritime Refuge) was created by the Alaska National Interest Lands Conservation Act in 1980. It was established to conserve fish and wildlife populations and habitats in their natural diversity, fulfill international fish and wildlife treaty obligations, provide opportunities for continued subsistence uses by local residents, provide a program of national and international scientific research on marine resources and ensure water quality and necessary water quantity within the refuge. This Act consolidated management of eleven existing refuges with 460,000 additional acres resulting in a 3,500,000 acre refuge. Although relatively small in land mass, its lands are scattered through most of coastal Alaska and extend from Forrester Island in southeast Alaska along the Gulf of Alaska to the Aleutian Islands and northward until near Barrow in northwest Alaska. There are over 3,000 islands, islets, and pinnacle rocks within the refuge which are used annually by millions of seabirds of at least 30 species. The Maritime Refuge has five units with all former refuges in designated subunits.

The Bering Sea Unit includes far-flung islands and headlands between the Aleutian Islands and the Bering Strait. Although the topography varies from small sandy islands, like the Sand Islands off the Yukon Delta, to large volcanic islands, like St. Matthew. These areas all provide habitat for nesting seabirds. Marine mammals also occupy many of the sites.

Some of the most serious potential threats to the seabirds and marine mammals are related to oil development in the outer continental shelf. Not only can oil spills cause decimation of the birds and their food chain, but increased activities from airplanes, boats, and people in these relatively undisturbed areas may adversely affect marine animals.

Long-term refuge objectives include establishing a seabird monitoring scheme which is of sufficient intensity to detect population changes of 20 percent or greater with 90 percent confidence, and to measure annual changes in reproductive success. In addition, we should be able to identify the major causes of change. This will require a cooperative effort with other divisions in the Service, other federal, state and local government agencies, and private organizations. In 1988 monitoring was conducted at three

sites: St. Paul and St. George islands in the Pribilof islands (refuge personnel), and Bluff (University of Alaska personnel under contract to the refuge).

There are significant opportunities for interpretive programs in the unit, particularly in the Pribilof Islands where several thousand natural history-oriented tourists visit each summer. Also, environmental education opportunities exist at schools in the Pribilof Islands, and at some of the villages in Norton Sound which occur near refuge seabird colonies.

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A. HIGHLIGHTS

Kittiwakes had the first good reproductive success in the Pribilof Islands in several years. (Section G.5)

Counts in the Pribilof Islands continue to suggest kittiwake and murre populations may be declining (except common murre at St. George which show no clear trend). (Section G.5)

Reindeer censuses at Hagemeister Island indicates reindeer numbers are continuing to increase. (Section F.7)

B. CLIMATIC CONDITIONS

Except for March and April, spring and summer were warmer at St. Paul than normal. At Nome, spring and summer were considerably warmer than normal. Weather conditions probably are one of the main factors which influence the breeding chronology of seabirds. At the Pribilofs, the timing of breeding was similar to most years, except it was more asynchronous than usual. At the colony at Bluff (near Nome), it was an exceptionally early year.

Table 1. January to December 1988 temperatures at St. Paul Island

Month	Average Temp. (°F)	Departure from Average (°F)
<hr/>		
Jan	27.3	1.0
Feb	24.2	2.3
Mar	17.8	-5.5
Apr	25.8	-1.9
May	32.6	0.3
Jun	42.2	1.3
Jul	47.7	2.0
Aug	48.7	1.2
Sep	44.9	0.4
Oct	39.2	1.6
Nov	29.5	-3.8
Dec	27.5	-0.6

Table 2. January to December 1988 temperatures at Nome.

Month	Average Temp. (°F)	Departure from average (°F)
Jan	13.6	7.8
Feb	7.6	4.3
Mar	6.5	-0.1
Apr	23.0	5.1
May	43.2	7.5
Jun	47.9	2.5
Jul	53.0	2.5
Aug	51.4	1.5
Sep	41.4	-0.9
Oct	25.6	-2.4
Nov	7.9	-8.3
Dec	8.4	4.0

D. PLANNING

1. Master Plan

See Homer Office section.

2. Management Plan

See Homer Office section.

5. Research and Investigations

AMNWR-NR88. Monitoring disturbance to seabirds from harbor construction and other activities at St. Paul Island.

Shawn Stevensen, City of St. Paul, St. Paul Island, Alaska.

Ref: Stevensen, Shawn 1988. A survey of cliff-nesting and shorebirds on Saint Paul Island, Alaska. Draft report, City of St. Paul.

This study was the fifth consecutive year of observations of seabirds near the City of St. Paul designed to determine if harbor construction or other man-caused activities were causing damage to seabird populations. Since the report is still in draft form, it would be improper to summarize the conclusions here. We were allowed to use data from city plots to supplement the refuge's monitoring effort in the Pribilofs. The fact that the city continues to monitor seabirds near the harbor site is an impressive example of local concern for wildlife resources.

AMNWR-NR88. Seabird monitoring at Bluff

Ed Murphy, Institute of Arctic Biology, University of Alaska, Fairbanks

Ref: Schauer, Jay H. 1988. Preliminary report for seabird studies at Bluff, Alaska - 1988.

Monitoring of seabird populations continued at Bluff in 1988. Kittiwakes and murres were censused on the same plots as has been done in previous years. Numbers of black-legged kittiwakes were down slightly on the plots since last year, but the number of nests was higher. Murre counts on plots were very similar to 1987. Productivity information was also gathered on kittiwakes, murres, and cormorants and will be discussed further in the final report.

AMNWR-NR88 Differences in breeding success of common murres based on nesting density.

Jay H. Schauer, University of Alaska, Fairbanks

Ref: Schauer, Jay H. 1988. Preliminary report for seabird studies at Bluff, Alaska - 1988.

This was the second year of a Master's thesis and data analysis is still proceeding. Reproductive success among common murres may be influenced by a number of factors, including location of nest site and number of breeding neighbors. Data was collected for nest sites including dates of egg-laying, hatching, fledging, egg or chick loss, and similar data for relaid eggs. In addition, the number of breeding neighbors and the "security" of the nest site was recorded. It is these three variables - number of breeding neighbors, nest site description, and plot - that are being examined for influence on reproductive success.

AMNWR-NR88. Energetics of kittiwakes and murres: density dependent factors.(74500-BSU-49208)

George Hunt, University of California, Irvine

Hunt had a crew on St. Paul Island, headed by Beth Flint and a crew on St. George Island, headed by Margrate Rubega. Hunt also had observers on the Institute of Marine Science's Vessel Alpha Helix on the waters off the Pribilofs collecting data on distribution of birds and food supplies. On land they were studying the reproductive ecology of thick-billed murres and kittiwakes, with emphasis on energetics. The good reproductive success of kittiwakes in 1988 allowed them to do much that they were unable to accomplish in 1987 when kittiwakes failed.

They measured chick growth, food intake using tritiated water, feeding frequency, and brooding duration during behavioral watches of color-marked birds. They measured field metabolic rate of adult birds that were feeding chicks using the doubly-labeled water technique and collected concurrent behavioral information about their time-activity budgets. Food value, type, and nutritional quality were sampled in adults and chicks by collecting regurgitations from kittiwakes, collecting adult murres, and collecting fish dropped by murres on ledges.

The pelagic work consisted of a series of radial transects in which bioacoustics were used to estimate food supplies and the transects were used to estimate seabird numbers at sea. Analysis of data is currently being done and further pelagic field work will continue in 1989.



Measurements and blood samples are taken to study energetics of the birds. 7/88-9C1 ALS



Dr. Hunt, University of California, Irvine had crews on St. Paul and St. George Islands in 1988. Here they are capturing murre with a noose. 7/88-9B2 ALS



Some of the Refuge seabird population plots are cliffs counted by walking the beaches below the cliffs. This is Tolstoi Cliffs, St. George Island. 7/88-18B ALS



Refuge plots are done primarily by observations from the tops of the cliffs. 7/88-9C1 ALS

E. ADMINISTRATION

1. Personnel

See Homer Office Section

4. Volunteer Program

See Homer Office Section

5. Funding

See Homer Office Section

6. Safety

See Homer Office Section

7. Technical Assistance

Sowls worked closely with Shawn Stevensen, the bird monitor for the City of St. Paul harbor construction to insure comparability of data, Bob Browker and Randy Tweeten of Ecological Services, branch of the Fish and Wildlife Service, who were involved with permits for harbor and airport construction projects at the Pribilof Islands, and Beth Flint and Margrate Rubaga, ornithological researchers from University of California at Irvine.

8. Other

Special Use Permits were issued to George Hunt for seabird research on the Pribilofs and to Exploration Holiday Tours to conduct tours on the Pribilof Islands. Also, a permit was issued to Jack Gosak to graze reindeer on Hagemeister Island.

F. HABITAT MANAGEMENT

7. Grazing

On March 30, Sowls was accompanied by Don Tomlin of the Bureau of Indian Affairs and Zeak Brink of the Bristol Bay Natives Association to the Village of Togiak for a meeting about the Hagemeister Island reindeer herd. They meet with the Togiak Village Council, a village elder, and Dave and Sam Gosak. Jack Gosak, who has the grazing lease with the refuge for Hagemeister Island, was not there. His brother Dave and son Sam represented him.

Sowls explained that studies done on the island showed range degradation and that the refuge wanted the numbers of

reindeer reduced from the current level of about a 1,000 animals down to about 100.

Everyone seemed to agree that there were a lot of reindeer on Hagemeister and there was no apparent disagreement that numbers should be reduced. Various ways to reduce the herd were discussed. During the previous year Jack did not harvest any animals, but had plans to do so in the spring.

Reindeer on Hagemeister Island were censused on April 7. Sows conducted the survey with Hotchkiss and Bavilla from the Togiak National Wildlife Refuge. A total of 1,061 animals were seen. This confirmed our fears that the herd was continuing to grow beyond the carrying capacity of the island.

G. WILDLIFE

The information summarized in this section comes from reports mentioned in the Planning Section (e.g. Stevensen 1988, Schauer 1988) and a summary report for the refuge monitoring program in the Pribilof Islands (Dragoo et. al. 1989. The status of cliff nesting seabirds in the Pribilof Islands, Alaska, 1976-1988: A summary); refuge shrew study report (Byrd and Norvell, 1988. Distribution and habitat use of the Pribilof Shrew in the summer.), and personnel communications from Ian Jones, graduate student at Queens University, Toronto, Canada and refuge volunteer.

2. Endangered and or Threatened Species

In 1985 Fay and Sease reviewed the status of small mammals inhabiting Alaska's coastal islands for the endangered species office, United States Fish and Wildlife Service, Anchorage. The report indicated that the Pribilof shrew (Sorex pribilofensis) might be threatened, but that more information was needed to be learned about the animal before any action could be taken.

Field work on shrews at St. Paul, conducted by the refuge in 1987, was written up (Byrd and Norvell, 1988). They concluded that shrews apparently occur throughout the tall-plant association on St. Paul. It extends around most of the periphery of the island and is relatively continuous. There is no indication of heavy depredation of shrews currently on St. Paul Island and preferred habitats do not seem to be declining significantly.

4. Marsh and Water Birds

Northern fulmar Information was gathered on this species only in the Pribilofs. Counts were slightly lower on

monitoring plots at St. Paul and slightly higher at St. George Island than in 1987. There has been a great deal of variation in counts on these plots since 1976 when surveys began.

Cormorants For St. Paul, red-faced cormorants had an average clutch size of 2.75 eggs per clutch and an overall productivity of 1.15. This is the second lowest recorded productivity in the eight years for which there are data.

5. Shorebirds, Gull, Terns, and Allied Species

Black-legged kittiwake While the mean clutch size (2.75) was lower on St. Paul Island in 1988 than in 1987, the clutch size on St. George Island (1.40) was somewhat larger than last year. Productivity was the highest reported since 1979 for both St. Paul and St. George Islands. This increase was especially dramatic on St. George Island where it increased from zero in 1987 and to almost half of the nests fledging young in 1988.

Population counts of plots showed black-legged kittiwake numbers increased modestly on St. Paul Island in 1988, but these levels were not as high as those reported from 1984 through 1986, and were considerably lower than 1976 levels. The 1988 counts for St. George Island also increased slightly over those of 1987, and were the highest recorded since 1982, but were much lower than in 1976.

At Bluff, numbers of black-legged kittiwake nests were up on plots in 1988 from 668 to 775. Reproductive success was 0.64 chicks fledged per nest in 1988 and represented another good year. In 1987 reproductive success was only slightly higher at 0.67 chicks fledged per nest. It appeared that success would have been higher in 1988 if it were not for a heavy storm that lasted three days in early August. Laying began June 11, five days earlier than 1987. Mean clutch size was 1.29 and only a few nests fledged two chicks.

Red-legged kittiwake Since red-legged kittiwakes normally lay only one egg, the clutch size is therefore always one. The productivity of this species on St. Paul in 1988 was the highest reported since 1977. Nearly half of the red-legged kittiwake nests fledged a young in 1988 compared to zero in 1987. Red-legged kittiwakes on St. George Island produced the greater number of fledged chicks per nest start in 1988 than in all but one of the thirteen years for which data are available.

While there are not many red-legged kittiwakes on our plots on St. Paul Island there were a few more than in 1987. The counts for St. George Island were somewhat lower this year

than 1987. Red-legged kittiwake numbers have been relatively stable on both islands since 1984 after declining appreciably between 1976 and 1984.

While 1988 showed good production of red-legged kittiwakes, we are still concerned that its population may be in a long-term decline. The previous several years did not supply many young to the population and the age structure is likely getting quite old.

No red-legged kittiwakes nest at Bluff.



In 1988 red-legged kittiwakes produced many young. This was the first good production year in many years. 7/88-1013 ALS



Common murres appear to be continuing to decline at St. Paul Island.
7/88-1P1 ALS

Murres Common murres had the second highest reproductive success ever reported on both St. Paul (0.67) and St. George Island (0.71). While this species has not been monitored every year, what data that are available indicate reproductive levels that are very consistent from year to year at the Pribilof Islands.

Population counts of common murres on St. Paul study plots declined again this year to the lowest level ever recorded. From the first counts done in 1976, population levels appear to have declined. Counts of common murres on St. George Island were slightly lower than previous years, but appear to be stable.

Information gathered on common murres at Bluff show that numbers were almost identical to 1987. Laying began June 6 in 1988, five days earlier than 1987. Both years were exceptionally early. In 1988, hatching success was 55.3, and fledging success 94.2 for eggs that hatched. Data was also gathered on second eggs that were laid if the first egg was lost. The percentage of lost eggs that were replaced was 50.6, and 63.0 percent of these hatched. The overall success of common murres at Bluff was 64.1.

Thick-billed murres exhibited reproductive success in 1988 and was approximately equal to that of 1987 on both St. Paul Island (0.50) and St. George Island (0.65). In general reproductive success of this species varies more year to year than it does for common murres.

Population counts for thick-billed murres have remained relatively steady on both St. Paul and St. George Island since 1984, after declining between 1976 and 1984.

Auklets Ian Jones, volunteer with the refuge, and his assistant, Simon Gawn, continued their research on St. Paul Island into the behavior of least auklets. During 1988 fewer birds attended study plots and fewer of those breed than in 1987. Field work will continue into 1989 and data will be written up as Ian's thesis for his Ph.D. dissertation. We feel this research will help in devising methods to monitor auklets.

14. Scientific Collections

Hunt collected 14 thick-billed murres, five common murres and three black-legged kittiwakes. These samples were studied for food mass, type, quality, and to help evaluate bioacoustics surveys done during radial transect by ship around the Pribilof Islands.

Ian Jones collected 24 least auklets in connection with his studies of the behavior of this species.

The refuge collected a freshly killed northern fulmar chick that had fallen from a nest for Dr. Bernice Wenzel of the University of California. She is studying the neuroanatomy of the olfactory mucosa and bulb development of the northern fulmar.

H. PUBLIC USE

1. General

British Broadcasting Company visited St. George Island to film northern fur seals. They worked in cooperation with Roger Gentry of the National Marine Fisheries Service.

Native subsistence eggging at the Pribilof Islands seems to be at a similar level as in 1987. At Bluff there appeared to be less eggging than the previous year. Natives were observed shooting birds off the cliffs at Bluff both in 1987 and 1988. This subsistence hunting is causing murres to lose eggs during panic flights from the cliffs. The number of birds taken by hunters is quite small compared to the loss of murres that could be produced in the absence of the hunting disturbance.

12. Wildlife Observation

From June through August 1988, Exploration Holidays Tour Company had about 1,000 people visit the refuge at St. Paul for two to three days. The visitation was spread out approximately evenly through the summer. The company was sold in the fall of 1988 and has no plans to continue tours to the Pribilof Islands.

The Tanadgusix Corporation started its own tours on St. Paul Island in 1988. They offer a three-day, two-night package. No information was available on the number of clients they had in 1988.

At St. George, the Village Corporation, Tanaq, runs four-day nature tours. They had about 30 people participate in 1988.



Construction of a harbor and adjacent airport on St. George Island will increase human activity at one of the largest seabird colonies in the North Pacific. 7/88-18G ALS



The village of St. George on a rare clear day in July. In the background is High Bluffs, one of the most important seabird nesting areas. 7/88-11A ALS

I. EQUIPMENT AND FACILITIES

1. New Construction

The Pribilof "Terms and Conditions", an agreement signed by the Native Corporation and the Secretary of Interior, indicates corporations are to provide buildings for the refuge on one-acre leased administrative sites on each island. While discussions between the Tanadgusix Corporation and the Fish and Wildlife Service are continuing, no resolution to this problem has yet occurred.

More information on new construction is also available in the Homer Office section.

4. Equipment Utilization and Replacement

See Homer Office Section.

6. Computer Systems

The portable Corona computers which we have used in the Pribilofs for data storage and analysis for several years worked well again in 1988, but one was damaged in shipping back to Homer. We upgraded to dBase III and started using Lotus 123 software in 1988. We hope to replace the computers with lap top models for 1989.

J. OTHER ITEMS

3. Items of Interest

See Homer Office Section

4. Credits

The report was written and typed by Sowls, and edited by Hagglund and Andrew-Miller.

CHUKCHI SEA UNIT
ALASKA MARITIME NATIONAL WILDLIFE REFUGE
Homer, Alaska

ANNUAL NARRATIVE REPORT
Calendar Year 1988

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

INTRODUCTION

Chukchi Sea Unit

Alaska Maritime National Wildlife Refuge

The Alaska Maritime National Wildlife Refuge (Maritime Refuge) was created by the Alaska National Interest Lands Conservation Act in 1980. It was established to conserve fish and wildlife populations and habitats in their natural diversity, fulfill international fish and wildlife treaty obligations, provide opportunities for continued subsistence uses by local residents, provide a program of national and international scientific research on marine resources and ensure water quality and necessary water quantity within the refuge. This Act consolidated management of eleven existing refuges with 460,000 additional acres resulting in a 3,500,000 acre refuge. Although relatively small in land mass, its lands are scattered through most of coastal Alaska and extend from Forrester Island in southeast Alaska along the Gulf of Alaska to the Aleutian Islands and northward until near Barrow in northwest Alaska. There are over 3,000 islands, islets, and pinnacle rocks within the refuge which are used annually by millions of seabirds of at least 30 species. The Maritime Refuge has five units with all former refuges in designated subunits.

Lying primarily north of the Arctic Circle, the Chukchi Sea Unit includes scattered areas extending from just west of Point Barrow to just north of the Bering Strait. Unlike other units of the Alaska Maritime Refuge, this unit includes mainland areas. Habitats range from low, sandy barrier islands in the Arctic Ocean to high, rocky spires in the western Brooks Range.

Nearly half a million kittiwakes and murrelets breed on cliffs at Cape Lisburne and Cape Thompson; these are the most spectacular concentrations of seabirds on the unit. Chamisso and Puffin islands in Kotzebue Sound are the largest island colonies in the unit. An extra-limital population of black guillemots, a species which normally is found in the north Atlantic, extends as far south as Cape Thompson and may be increasing. The most common species of bird nesting on the low barrier islands between Cape Lisburne and Point Barrow is the common eider. One of the refuge islands, Solivik Island, has the largest eider colony in the Chukchi Sea (>500 birds).

Up to several hundred walrus haul out annually at Cape Lisburne when the sea ice recedes well offshore. In winter, polar bears occur at Cape Lisburne. Terrestrial mammals include grizzly bear, musk ox, wolverine, moose, Dall sheep and caribou. Thousands of caribou from the Western Arctic Caribou Herd congregate near Cape Lisburne in a summer post-calving aggregation.

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2. Easements.....	Nothing to report
3. Other.....	Nothing to report

D. PLANNING

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2. Management Plan.....	1
3. Public Participation.....	Nothing to report
4. Compliance with Environmental and Cultural Resource Mandates.....	1
5. Research and Investigations.....	Nothing to report
6. Other.....	Nothing to report

E. ADMINISTRATION

1. Personnel.....	2
2. Youth Programs.....	Nothing to report
3. Other Manpower Programs.....	Nothing to report
4. Volunteer Program.....	2
5. Funding.....	2
6. Safety.....	2
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F. HABITAT MANAGEMENT

1. General.....	Nothing to report
2. Wetlands.....	Nothing to report
3. Forests.....	Nothing to report
4. Croplands.....	Nothing to report
5. Grasslands.....	Nothing to report
6. Other Habitats.....	Nothing to report
7. Grazing.....	Nothing to report
8. Haying.....	Nothing to report
9. Fire Management.....	Nothing to report

F. HABITAT MANAGEMENT (cont.)

- 10. Pest Control.....Nothing to report
- 11. Water Rights.....Nothing to report
- 12. Wilderness and Special Areas.....Nothing to report
- 13. WPA Easement Monitoring.....Nothing to report

G. WILDLIFE

- 1. Wildlife Diversity.....Nothing to report
- 2. Endangered and/or Threatened
Species.....Nothing to report
- 3. Waterfowl.....Nothing to report
- 4. Marsh and Water Birds.....Nothing to report
- 5. Shorebirds, Gulls, Terns and Allied
Species.....3
- 6. Raptors.....Nothing to report
- 7. Other Migratory Birds.....Nothing to report
- 8. Game Mammals.....Nothing to report
- 9. Marine Mammals.....Nothing to report
- 10. Other Resident Wildlife.....Nothing to report
- 11. Fisheries Resources.....Nothing to report
- 12. Wildlife Propagation and Stocking.....Nothing to report
- 13. Surplus Animal Disposal.....Nothing to report
- 14. Scientific Collections.....Nothing to report
- 15. Animal Control.....Nothing to report
- 16. Marking and Banding.....Nothing to report
- 17. Disease Prevention and Control.....Nothing to report

H. PUBLIC USE

- 1. General.....Nothing to report
- 2. Outdoor Classrooms-Students.....Nothing to report
- 3. Outdoor Classrooms-Teachers.....Nothing to report
- 4. Interpretive Foot Trails.....Nothing to report
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- 6. Interpretive Exhibits/
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- 9. Fishing.....Nothing to report
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- 11. Wildlife Observation.....Nothing to report
- 12. Other Wildlife Oriented Recreation.....Nothing to report
- 13. Camping.....Nothing to report
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- 17. Law Enforcement.....3
- 18. Cooperating Associations.....Nothing to report
- 19. Concessions.....Nothing to report

I. EQUIPMENT AND FACILITIES

- 1. New Construction.....Nothing to report
- 2. Rehabilitation.....Nothing to report
- 3. Major Maintenance.....Nothing to report
- 4. Equipment Utilization and Replacement.....3
- 5. Communications Systems.....Nothing to report
- 6. Computer Systems.....Nothing to report
- 7. Energy Conservation.....Nothing to report
- 8. Other.....Nothing to report

J. OTHER ITEMS

- 1. Cooperative Programs.....Nothing to report
- 2. Other Economic Uses.....Nothing to report
- 3. Items of Interest.....4
- 4. Credits.....4

K. FEEDBACK

A. HIGHLIGHTS

Cape Thompson seabird colony was studied by Alaska Fish and Wildlife Research Center. (Section G.5)

B. CLIMATIC CONDITIONS

Kotzebue weather data, from the National Weather Service, probably best represents weather conditions for the Chukchi Sea Unit. The year was warmer than average with eight months having departures above normal (Table 1). This year seemed to support the theory that the Chukchi Sea is undergoing a warming trend.

Table 1. Temperatures at Kotzebue in 1988.

Month	Average Temp. (°F)	Departure from Average (°F)
Jan	7.5	10.5
Feb	1.4	7.5
Mar	-2.3	-1.7
Apr	17.7	5.4
May	34.4	2.8
Jun	44.7	.9
Jul	52.2	-.9
Aug	52.0	.1
Sep	42.9	1.3
Oct	18.1	-4.7
Nov	1.5	-6.6
Dec	3.9	8.1

D. PLANNING

1. Master Plan

See Homer office section.

2. Management Plan

See Homer office section.

4. Compliance with Cultural Resource Mandates

Archaeological Services, a cultural resources contracting firm from Pennsylvania, investigated the Pingasagruk archaeological site at Point Franklin, Chukchi Sea Unit, in 1986 (Contract No. 14-16-0007-86-6612). A final report on this project has not yet been received by the refuge.

E. ADMINISTRATION1. Personnel

See Homer office section

4. Volunteer Program

See Homer office section

5. Funding

See Homer office section

6. Safety

See Homer office section

7. Technical Assistance

The refuge reviewed Corp of Engineer plans for cleaning up the "Project Chariot" site at Cape Thompson. The Corp of Engineers, using super-fund toxic cleanup monies, is preparing specifications for the cleanup which should start in 1989 if the final funding is approved. Cape Thompson has large seabird colonies, nesting raptors (including peregrine falcons in some years), grizzly bears, musk ox, and moose. The cleanup must occur without causing harm to the wildlife, habitat, or aesthetics of the area. The refuge is hopeful that the cleanup will occur soon.

8. Other

Table 2. Special use permits issued, 1988.

<u>Permittee</u>	<u>Location</u>	<u>Purpose</u>
U.S. Army, Corps of Engineers	Cape Thompson	Toxic Waste Cleanup
Midnight Sun Adventures	Cape Thompson and Lisburne	Tours and Big Game Guide
U.S. Army, Corps of Engineers	Cape Lisburne	Rock for Riprap
Phil Driver	Cape Lisburne and Thompson	Hunting Guide

G. WILDLIFE

5. Shorebirds, Gulls, Terns and Allied Species

Wildlife monitoring in the Chukchi Unit of the Maritime was only done at Cape Thompson. Seabird populations were monitored by the Fish and Wildlife Service's Alaska Fish and Wildlife Research Center, through a contract with the Minerals Management Service. Additional funding was provided by the Maritime Refuge. Land-based research was performed between July 1 and August 31, and shipboard observations were done August 27-31 from the M/V Tiglax.

The refuge had planned to continue seabird monitoring at Cape Lisburne and Chamisso Island, but unexpected expenses caused the cancellation of these projects in 1988.

H. PUBLIC USE

8. Hunting

In 1988 a permit was again issued to Phil Driver, a registered hunting guide, for the Cape Thompson and Cape Lisburne refuge lands. He did not take any game on refuge lands, but did use the area for sightseeing and photography. Phil did not observe any meaningful fall migration of caribou in the area for the second year in a row. The Western Arctic herd will enter these areas in large numbers in some years.

17. Law Enforcement

See Homer office section.

I. EQUIPMENT AND FACILITIES

4. Equipment Utilization and Replacement

See Homer office section.

J. OTHER ITEMS

3. Items of Interest

See Homer office section.

4. Credits

The report was written and typed by Sowls and edited by Hagglund and Blenden.

GULF OF ALASKA UNIT
ALASKA MARITIME NATIONAL WILDLIFE REFUGE
Homer, Alaska

ANNUAL NARRATIVE REPORT
Calendar Year 1988

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

INTRODUCTION

Gulf of Alaska Unit

Alaska Maritime National Wildlife Refuge

The Alaska Maritime National Wildlife Refuge (Maritime Refuge) was created by the Alaska National Interest Lands Conservation Act in 1980. It was established to conserve fish and wildlife populations and habitats in their natural diversity, fulfill international fish and wildlife treaty obligations, provide opportunities for continued subsistence uses by local residents, provide a program of national and international scientific research on marine resources and ensure water quality and necessary water quantity within the refuge. This Act consolidated management of eleven existing refuges with 460,000 additional acres resulting in a 3,500,000 acre refuge. Although relatively small in land mass, its lands are scattered through most of coastal Alaska and extends from Forrester Island in southeast Alaska along the Gulf of Alaska to the Aleutian Islands and northward until near Barrow in northwest Alaska. There are about 3,000 islands, islets, and pinnacle rocks within the refuge which are used annually by millions of seabirds of at least 30 species. The Maritime Refuge has five units with all former refuges designated subunits.

The Gulf of Alaska Unit extends from Alaska's southcentral coast near Kodiak Island then eastward to southeast Alaska and includes four former refuges; Tuxedni, St. Lazaria, Hazy and Forrester islands. Major seabird colonies occur on the following islands or island groups within the unit: Chisik, Barren, Gull, Pye, Chiswell, Middleton, St. Lazaria, Hazy and Forrester.

This unit has the only forest habitat on the Maritime Refuge. Spruce-hemlock forests are the dominant plant community on nearly all islands until Cook Inlet. The transition zone occurs in the Barren Islands where there is only a small forested area on Ushagat Island with alpine tundra the dominant vegetation type. Like much of the refuge, topography in the unit is often precipitous with seabirds using cliffs, talus slopes, burrows, boulder rubble and rock crevices to breed and nest. Besides terrestrial habitat, submerged lands also occur around Afognak and some waters around Kodiak Island.

Seabird colonies in this unit are probably the most visited in Alaska. Unlike most units, two colonies are readily accessible by charter boat or pleasure craft: St. Lazaria Island is 15 miles from Sitka and the Chiswell Islands are 35 miles from Seward.

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5. Funding.....7
6. Safety.....7
7. Technical Assistance.....7
8. OtherNothing to report

F. HABITAT MANAGEMENT

1. General.....Nothing to report
2. Wetlands.....Nothing to report
3. Forests.....8
4. Croplands.....Nothing to report
5. Grasslands.....Nothing to report
6. Other Habitats.....9
7. Grazing.....Nothing to report

F. HABITAT MANAGEMENT (cont.)

8. Haying.....	Nothing to report
9. Fire Management.....	Nothing to report
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10. Other Resident Wildlife.....	Nothing to report
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12. Wildlife Propagation and Stocking.....	Nothing to report
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17. Disease Prevention and Control.....	Nothing to report

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1. General.....	19
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7. Other Interpretive Programs.....	Nothing to report
8. Hunting.....	Nothing to report
9. Fishing.....	Nothing to report
10. Trapping.....	Nothing to report
11. Wildlife Observation.....	Nothing to report
12. Other Wildlife Oriented Recreation.....	Nothing to report
13. Camping.....	Nothing to report
14. Picnicking.....	Nothing to report

H. PUBLIC USE (cont.)

- 15. Off-Road Vehicling.....Nothing to report
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- 5. Communications Systems.....19
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- 7. Energy Conservation.....Nothing to report
- 8. Other.....Nothing to report

J. OTHER ITEMS

- 1. Cooperative Programs.....Nothing to report
- 2. Other Economic Uses.....Nothing to report
- 3. Items of Interest.....19
- 4. Credits.....19

K. FEEDBACK

A. HIGHLIGHTS

Afognak Native Corporation constructs a low gradient log transfer slide at Kazakof Bay. (Section F.3)

A proposal for a second log transfer facility at Kazakof Bay proposed by Koncor Inc. (Section F.3)

Storm-petrels and kittiwakes recover after suffering reproductive failure in 1987. (Section G.4, G.5)

Refuge begins developing techniques for monitoring marbled murrelets in Kachemak Bay. (Section G.5)

B. CLIMATIC CONDITIONS

Although it does not extend as far south as the Aleutians, the Gulf of Alaska has the most moderate climate among units of the Alaska Maritime National Wildlife Refuge. Winter temperatures normally remain above 0°F except for lands adjacent to the Kenai Peninsula. The temperate climate in Southeast Alaska is often overcast, but seldom experiences the wind and summer fog of the other units.

The year began with 4.71 inches of total precipitation in January. This was 3.06 inches above normal and mainly in the form of rain. Our trend of relatively warm winters continued through the first three months of 1988 with temperatures of at least 6.0 °F above normal. However, the big news this winter was the snow storms that blanketed the upper elevations surrounding Homer with 2-3 times the normal accumulation of snow. Snow disappeared in the lower elevations by April. The summer was quite dry, resulting in one of our best summers in over 10 years. We received our first snowfall in November with 11.4 inches falling. By the end of December, we had 3-5 feet of snow on some local ridges and total accumulation was above normal for this time of year.

Table 1. Meteorological Data - Homer 1988

<u>Month</u>	<u>Temperatures (°F)</u>			<u>Precipitation (inches)</u>		
	<u>Max.</u>	<u>Min.</u>	<u>Avg.</u>	<u>Dep.</u>	<u>Norm.</u>	<u>Total</u>
Jan	44	5	27.8	7.0		4.7
Feb	44	3	30.3	6.0		4.5
Mar	43	24	33.5	6.6		4.3
Apr	49	24	35.4	0.3		4.1
May	59	30	45.0	2.8		0.9
Jun	69	35	51.2	2.4		0.9
Jul	67	40	55.3	2.5		0.8
Aug	67	41	53.9	1.1		3.2
Sep	60	28	46.0	-1.3		1.3
Oct	55	20	37.5	0.2		2.4
Nov	45	2	26.4	-2.5		1.9
Dec	Not available					11.4

D. PLANNING1. Master Plan

See Homer office section.

2. Management Plan

Final revisions of the wildlife inventory plans are awaiting completion of the seabird management plan and seabird censusing techniques manual. This manual is being written by the Research staff in Anchorage with much input by Wildlife Biologist Byrd of our staff.

3. Public Participation

See Homer office section.

4. Compliance with Environmental and Cultural Resources Mandates

See Homer office section.

5. Research and InvestigationsAMNWR NR88 "Adult survival of black-legged kittiwakes on Middleton Island, Alaska"

Personnel of the Alaska Fish and Wildlife Research Center conducted studies of seabirds on Middleton Island from May 2 to August 24 in 1988. The field party initially consisted of Scott Hatch (Project Leader), Lisa Haggblom (Biological

Technician), Holly Hogan, Mark Simpson, and Jon Syder (volunteers). Activities during May included resighting of previously banded black-legged kittiwakes for the estimation of over-winter survival and installation of electronic balances under nests of kittiwakes to monitor body weight dynamics of adults and young. Hatch and Syder left the island on May 11, while Haggblom, Hogan, and Simpson remained to conduct further observations on return rates and monitor the electronic weighing devices. Ray Roberts (Wildlife Biologist) joined the research team at Middleton on June 6 and supervised the field work to its completion in August.

Band resighting indicated an annual adult survival (1987-88) of about 94 percent for birds breeding on the most intensively studied plot. That value considerably exceeds the estimates from earlier years (ca. 80-85 percent annual survival from 1985-87), but it is not yet clear whether the higher apparent survival was due more to improved methodology or natural variability. It is planned to observe the sample of nearly 400 banded birds for several more years to improve our estimate of mean survival and make reasonably accurate life-table projections.

The performance of solar-powered weighing platforms was excellent in 1988, as it was also the preceding year. Eight platforms were deployed that functioned nearly flawlessly for most of the summer. Enhancements to the system included improved software and a time-sampling scheme that should allow frequent measurement of adult weights exclusive of the nest without having to disturb the attending birds in any manner.

Other field activities in 1988 included island-wide censuses of kittiwakes, pelagic cormorants, murres (with assistance from Alaska Maritime National Wildlife Refuge volunteers Kathy Kuletz and Katie O'Reilly, June 15-22) and productivity studies for kittiwakes and cormorants. The census indicated a somewhat larger population of adults on the island in 1988 than in 1987, whereas productivity was poor for the fourth consecutive year (<10 percent of nests fledged young over the whole island).

Four cooperators from the Wildlife Health Research Laboratory (Madison, Wisconsin) and the University of Wisconsin School of Veterinary Medicine visited Middleton Island from July 22-25 1988. Joint efforts resulted in the live-capture and sampling of some 500 adult kittiwakes and chicks for the presence of avian influenza virus (a hypothetical contributor to recent reproductive failures). Preliminary analyses to this material has proved negative for influenza virus, but further analyses to detect other possible pathogens are planned.



One of the old Federal Aviation Administration houses on Middleton Island was used by the Alaska Fish and Wildlife Center's field crew. (6/88 KO)



Student Conservation Association volunteer Katie O'Reilly helped count seabirds at Middleton Island. (6/88 KK)



The seabird colony at Middleton Island has large numbers of viewable cliff sections making it a good monitor site. (6/88 KO)

AMNWR NR88 - "Foods and Feeding of Sea Otters in the Kodiak Archipelago" (87200-210-2)

The mammal section, Alaska Fish and Wildlife Research Center, conducted research on sea otters at Kodiak Island focusing on movements, home range size, foraging behavior and food habitats, and their relationship to commercial shell fisheries. Approximately 23 radios were still on the air as of November 1 1988, including two radios originally implanted into sea otters in September 1986. Notable movements of radio-marked sea otters include repeated excursions by one male from Hog Island in Afognak Bay to Woody Island in Chiniak Bay, a distance of more than 30 kilometers, and two males who have moved from Raspberry Strait to Uganik East Side Passage and Uganik Bay, respectively. In addition, several females marked near old Afognak village have made repeated excursions into Kazakof Bay.

As a follow-up to the documented mortality of sea otters at Kodiak Island in summer 1987, feeding trials were conducted to examine the responses of sea otters to high concentrations of Paralytic Shellfish Toxins. All five sea otters involved in the experiment, when fed sequentially low-toxicity and high-toxicity clams, either significantly reduced their rates of consumption of the highly toxic clams or increased the quantity of siphons and kidneys they discarded, i.e., those tissues which contain the highest concentrations of Paralytic Shellfish Toxins. Sea otters fed highly toxic clams also significantly reduced the amount of time they were engaged in foraging behavior, and significantly reduced the number of dives made per hour during which they secured prey. Sea otters exposed to Paralytic Shellfish Toxins probably are not at mortal risk from paralytic shellfish poisoning provided sufficient prey of low toxicity is available.

AMNWR NR88 - "Botanical Reconnaissance of Chisik Island, Alaska Maritime National Wildlife Refuge, Alaska", (AMI)

In late August and early September 1988, Stephen Talbot and Sandra Looman Talbot continued a botanical reconnaissance initiated in 1987 of Chisik Island for air quality purposes. The main objectives of the study are to: 1) establish a list of vascular plants, mosses and lichens; 2) determine which species occurring on Chisik Island are known to be sensitive to air pollution based on a literature survey; and 3) collect plant samples for elemental analysis.

Two hundred eighty-five vascular plant species and 159 lichen species have now been determined. One lichen, Xanthoria alaskana, is being described as new to science. Additional collections of 460 lichens and 722 moss specimens are being determined.

Plant community descriptions were recorded from 75 stands ranging from coastal to upper elevation lichen heath in 1988. These descriptions combined with those of 1987 total 123. The stands will be classified into plant community types using computerized classification programs.

To establish current levels of pollutants in plant tissues, 50 plant and soil samples were collected for elemental analysis of heavy metals and total sulfur. The following species will be analyzed by the U.S. Geological Survey in Denver: Cladina rangiferina, Parmelia sulcata, Picea sitchensis, Alnus crispa, and Hylocomium splendens. Results are anticipated in July.

E. ADMINISTRATION

1. Personnel

See Homer office section.

4. Volunteer Program

Student Conservation Association volunteer Kirsten Brennen and Katie O'Reilly assisted in monitoring of seabird colonies at Gull Island, Sixty-Foot Rock, Chiniak Bay and East Amatuli Island. Refuge volunteer Kathy Kuletz monitored at sea distributions of marbled and Kittlitz's murrelets in Kachemak Bay. She also presented her findings at a marbled murrelet workshop in Portland, Oregon. In September, refuge volunteer Tim Dingman assisted in monitoring seabirds at East Amatuli Island.

5. Funding

See Homer office section.

6. Safety

See Homer office section.

7. Technical Assistance

Several dead sea otters found along the beaches around Homer were sent to the National Wildlife Health Center at the request of the Marine Mammal Section, Alaska Fish and Wildlife Research Center.

In the spring, we worked with the Homer city planners, Alaska Department of Fish and Game biologists, and U.S. Army Corps of Engineers in assessing wetlands around Homer. The information would be used in developing a general permit for filling wetlands.

Information on the biological resources of Tugidak Island was provided for Fish and Wildlife Enhancement, Anchorage, relating to a proposal to mine the island.

We continued to work with Kenai Fjords National Park in preparing a report on the Kenai Peninsula survey conducted in 1986.

F. HABITAT MANAGEMENT

3. Forests

Forested islands exist only in the Gulf of Alaska Unit, with Ragged Island (5,400 acres) in the Pye Islands being the largest island totally covered by spruce. Except for Forrester and St. Lazaria in southeast Alaska, all forested islands including Discoverer and Delphin islands near Afognak Island were incorporated into the refuge by the Alaska Lands Act. Though better timber exists on other Federal, State and Native lands, Alaska National Interest Lands Act provides the Afognak Joint Venture use of timber on both Discoverer and Delphin islands. Both islands are heavily used by Sitka black-tailed deer and brown bear. Delphin also has a small seabird colony and nesting eagles. Delphin Island is particularly important to wildlife and has magnificent trees up to five feet in diameter.

Studies by the Alaska Department of Fish and Game suggest that old growth forests provide important winter range for black-tailed deer by retaining snow on the forest canopy and reducing ground snow depth and hence access to winter feed. Due to slow growth rates, Alaskan old growth forests have been recognized as a non-renewable resource.

In the past, former U.S. Forest Service lands on Afognak Island have been logged and the timber transferred through a barge loading facility at Perenos Bay. Under the Alaska National Interest Lands Act, these lands were transferred to Native corporations. In 1986, several Native corporations working through Koncor, Inc., resumed logging on the north side of the island.

In 1988, the Afognak Native Corporation received a right-of-way permit to construct a low gradient log transfer slide at Kazakof Bay. The transfer facility was constructed in August. In the same bay, Koncor, Inc., also applied for a right-of-way permit for a barge type log transfer facility about three miles

south of the Afognak native facility. The permit is currently being processed.

6. Other Habitats

Nearshore marine habitat on the refuge exists at Womens Bay, and Karluk along the Kodiak Island coast, and the former Afognak Forest and Fish Culture Reserve surrounding Afognak Island. Both Womens Bay and Afognak are threatened by development activities. A Coast Guard base, freight transfer facility, and seafood reduction plant have been constructed at Womens Bay. Numerous fuel spills and leaks have been associated with the Coast Guard facility. In addition, military landfills (abandoned and active), military barrel storage areas (abandoned), and an extant golf course produce leachates that could potentially enter the Buskin River, which discharges immediately north of Womens Bay.

Within two miles of the Kodiak town site, is a seafood reduction plant that has created air and water pollution problems in the past. The plant has been taken over by the City of Kodiak and renovated. The city has applied for a special use permit, but delayed signing it.

The bay supports a herring fishery which resulted in landings of 95.9 tons in 1984. Dungeness crab, commercial and subsistence, fisheries also occur in the bay. The bay provides habitat for large numbers of king and tanner crab as well as shrimp and several species of salmon. It is used as a staging area by waterfowl and as a wintering area by seaducks. Several seabird colonies occur on islands within Womens Bay and have been monitored by various fish and wildlife offices.

12. Wilderness and Special Areas

Only Forrester, Hazy, St. Lazaria and Chisik (Tuxedni subunit) islands are designated wilderness areas in the unit.

Below is a breakdown of those areas:

<u>Island</u>	<u>Acres</u>	<u>Designation Date</u>
Forrester	2,832	10/23/70
Hazy	32	10/23/70
St. Lazaria	64	10/23/70
Tuxedni	5,547	10/23/70

G. WILDLIFE

1. Wildlife Diversity

This is the only unit on the refuge which supports a population of forest birds. No other unit has forest habitat.

2. Endangered and/or Threatened Species

Occasional individuals of the endangered or threatened subspecies of the peregrine falcon may visit the area during migration.

3. Waterfowl

Migrating and wintering waterfowl are abundant around the Pye Islands, Afognak Island, Womens Bay at Kodiak Island and in the Barrens. Canada and white-fronted geese as well as brant visit the Barrens in migration. Populations of common eiders and white-winged scoters can be found in waters around Duck and Chisik islands.

4. Marsh and Water Birds

Little breeding habitat for loons and grebes exists, except for Ushagat Island in the Barrens. Many such birds winter around the Pyes, Chiswells, Barrens, and off Kodiak.

Cormorants This year we found 130 pairs of pelagic cormorants and eight pairs of red-faced cormorants at Gull Island. The pelagics produced an average of 0.79 pre-fledging chicks per nest. At inner Chiniak Bay, the 1988 census of cormorant nesting attempts and productivity essentially showed that both pelagic and red-faced cormorants have not decreased from the higher numbers seen 1984-86. The 209 nest attempts of red-faced cormorant and the 606 nest attempts of the pelagic cormorant are the highest totals ever recorded in the inner port of Chiniak Bay in either 1975-78 or 1984-88. The cormorants were able to produce more chicks this year than any other year since 1975-78. The sealand colony and its nearby neighboring colony at Gibson Cove produced 95 percent of the pelagic chicks and 98 percent of the red-faced chicks that fledged in 1988. The productivity of 0.86 chicks (pelagic) and 0.59 chicks (red-faced) per nest attempt at the sealand cliffs raised the overall productivity of the inner Chiniak Bay to 0.73 for pelagic and 0.39 for red-faced cormorants.

The geographic configuration of Chiniak Bay and the numerous smaller colonies has allowed monitoring to continue effectively from boats unlike many of the more exposed larger colonies of the Aleutians and the Bering/Chukchi Seas. In 1988 photographs of cliffs and plots were taken so as to give the refuge options

for monitoring in the future, in case we wish to implement the replicate sampling schemes used recently in the Pribilof Islands and Aleutians. The advantages and disadvantages of such a change along with a summary of 1984-88 surveys will be discussed in an upcoming refuge report.

Storm-petrels East Amatuli Island was visited June 29 to July 10 to determine nesting attempts and continue banding studies of fork-tailed storm-petrels. To monitor active burrows, 661 marked burrows from eight subcolonies were searched. During this period, petrels were just beginning to hatch. We found 54.9 percent active burrows in the index subcolonies. This figure represents a slightly better than average year and is 18.7 percent higher than last year's 36.2 percent active burrows. This island was revisited on August 30 to September 5 to check reproductive success. We searched 662 burrows. At our index subcolonies, we found 0.55 chicks per active burrows. This compares with 0.26 and 0.44 chicks per active burrow reported in 1987 and 1985 respectively. Most of the chicks were near fledgling size, about 40-45 days old or older.



The campsite at East Amatuli Island. (9/88 MN)



Fork-tailed storm-petrel chicks were generally over 40 days old when we checked fledging success in September. (9/88 MN)



Experimental fork-tailed storm-petrel nestboxes used at subcolony "F" at East Amatuli Island. (7/88 MN)



Fork-tailed storm-petrel chicks were banded at East Amatuli Island. (9/88 MN)

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

Many species of shorebirds utilize the islands, especially Ushagat, during migration. Oystercatchers nest on nearly all of the islands.

Glaucous-winged gulls On Gull Island, Kachemak Bay, 527 nests were located on June 10. This was much more than the 296 and 286 nests found in 1986 and 1987 respectively. The difference in counts in 1988 compared to previous years may be due, in part, to variations in counting methods. We counted by transects in 1988, but did not divide the colony in previous years. At Sixty-Foot Rock, we counted 96 gulls from the water since it is difficult to land on the rock. The colony on East Amatuli Island failed to reproduce this year.



High vegetation made searches of gull nests difficult at Gull Island, Kachemak Bay. (6/88 MN)

Black-legged kittiwakes At Gull Island, black-legged kittiwakes produced 0.63 chicks per nest. Production was near the average for 1984-86. In 1987 the colony failed. In September, we recovered several carcasses of fledglings near the colony and along the north side of Kachemak Bay. Five

birds were sent to the National Wildlife Health Center. Their analyses indicated that the birds died of starvation. At Sixty-Foot Rock, kittiwakes produce 0.58 chicks per nest. The 1988 census of populations and nesting attempts of black-legged kittiwakes at Chiniak Bay confirmed that the dramatic increase seen between 1975-78 and 1984-1986 was still present and nesting efforts had returned to the 1986 level despite a severe drop in nesting attempts in 1987 when a total breeding failure occurred. In fact, there had essentially been no kittiwake reproduction for three years in Chiniak Bay (1985-87) and the decrease in nest attempts observed in 1987 made us wonder if the population and nesting effort was beginning to decline. Even though the number of nesting attempts returned in 1988 to a high level (2,366 nests on 13 colonies), the reproductive success differed dramatically between large colonies (over 700 nests) and small colonies (less than 100 nests). Eight small colonies produced 0.67 chicks per nest attempt while two of the three large colonies produced 0.19 chick per nest attempt. The four smallest colonies that had the highest reproductive success (0.41, 0.63, 0.97, and 0.99 chicks per nest attempt) were not used for nesting by kittiwakes in the past. The intensive predation and disturbance of kittiwake colonies by eagles, corvids, and gulls seen in 1984-87 was not seen by the time we arrived in 1988, but there was much evidence of this type of loss on the large colonies. This loss occurred early in the egg laying stage and did not occur later and the smaller new colonies appeared to escape it.



Disturbance plots were used to determine kittiwake clutch size at Kulichkof Island, Chiniak Bay. (6/88 MN)

Murres The sub-colony on Murre Rock (part of the Gull Island colony) was photographed as in past years as a way of monitoring gross changes in this colony. The common murres are located at the top of this rock and most of the sub-colony can only be viewed by climbing on another island. In 1988 murres were accidentally flushed off the colony when we estimated a population of 5,500 birds.

Puffins We continued to monitor tufted puffins on East Amatuli Island by searching burrows along four transects. Total burrow counts ranged from 0.07 burrows per meter to 0.33 burrows per meter. Although we attempted to estimate the percent of occupied burrows by signs of use, it was often difficult to make determination on burrow status.

Marbled murrelets The forest habitat is continuing to climb throughout most of the marbled murrelet range. This concern led the Pacific Seabird Group to pass a resolution recommending that wildlife management agencies fund studies to investigate the habitat requirements of marbled murrelets in 1982. In 1986, they recommended that government agencies establish and interagency working group to address research and management need for the marbled murrelets. In 1987, this group organized a special workshop addressing this species. In Alaska, large populations still remain, but are also threatened by logging activities.



Kittlitz's and marbled murrelets were monitored at Kachemak Bay. (7/88 MN)

Although there is tremendous interest on the decline of this species, little is known about its biology since it is a solitary nester. Due to this lack of information, we began a study in Kachemak Bay to develop at-sea monitoring techniques that could be used elsewhere. At-sea surveys were conducted twice weekly from mid-May to early August between 0600-0930 hours Alaska daylight time. Marbled murrelet densities were higher in May ($x=19.7$ birds per kilometer, $SD=10.7$) and July ($x=26.2$ birds per kilometer, $SD=15.7$), but less variable in June ($x=17.1$ per kilometer, $SD=3.3$). Densities increased after mid-July, with a peak of 52.5 birds per kilometer on July 29. Based on plumage changes, feeding observations and appearance of fledglings, marbled murrelet egg laying peaked around mid-May, hatching mid- to late June and fledgling late July.

6. Raptors

Bald eagles nest on many of the islands. Peregrine falcon eyries have been found in the Pyes, Chiswells, Barrens, and Forrester Island.

7. Passerines

Common ravens, four species of sparrow (golden-crowned, fox, song, and savannah), and two species of swallow (violet-green and bank) are commonly seen on most of the islands.

8. Game Mammals

Black bears wander onto the Pye Islands, while brown bears periodically visit Delphin and Discoverer islands, Latax Rocks and other islands near Afognak and Kodiak. Sitka deer inhabit Delphin and Discoverer islands.

9. Marine Mammals

Sea otters and harbor seals are common around the Barren Islands. Sugarloaf Island in the Barrens, Outer Island in the Pye Islands, and Forrester Island contain major sea lion rookeries. Minor haulouts are found on the Latax Rocks, Sea Otter Island, and on other islands.

15. Animal Control

A three person field team stayed on Ushagat Island, one of the Barren Islands, from June 13 to 29 to eradicate arctic foxes by trapping. According to Bureau of Land Management files, 21 foxes were released on Ushagat in 1928.

Although it was obvious that the density of foxes was low since none were seen on earlier visits to the island, it appeared that more than 50 years of predation by introduced fox had exacted a heavy toll on breeding waterfowl, shorebirds, ptarmigan and probably some species of seabirds and passerines.



Ushagat Island is the only forested island in the Barren Islands. (6/88 MN)



Two nests of Harlan's hawks were found on Ushagat Island. (6/88 MN)

Despite excellent waterfowl habitat in several areas, no breeding ducks have been noted. Likewise, excellent beaches were devoid of black oystercatchers, semipalmated plovers, and other breeding shorebirds.

In June, 70 number 1-3/4 leghold traps were set around most of the island.

No fox were trapped, nor were any tracks or fresh scats noted anywhere on the island.

H. PUBLIC USE

1. General

See Homer office section.

17. Law Enforcement

See Homer office section.

I. EQUIPMENT AND FACILITIES

5. Communications Systems

To improve communications between refuge headquarters and East Amatuli Island, we used an ICOM single side band radio and a large ground screen. This is the only system we found that could consistently communicate with Homer. Previously, a variety of radios and antennas were used with very limited success.

J. OTHER ITEMS

3. Items of Interest

See Homer office section.

4. Credits

The Gulf of Alaska Unit section was written by Nishimoto and edited by Hagglund and Andrew-Miller. Photos were taken by Nishimoto, O'Reilly and Kuletz.



THE ALEUTIAN SOUND

ALEUTIAN ISLANDS UNIT – ALASKA MARITIME NATIONAL WILDLIFE REFUGE 1987

ISLAND CARETAKERS

Conversations about the Aleutian Islands almost always focus on their adverse weather, isolation, treelessness or volcanic nature. Rarely, if ever, do people refer to the fact that the Chain harbors one of our country's greatest concentrations of wildlife. Yet the Aleutians were set aside as a wildlife preserve more than 70 years ago, primarily to protect and re-establish the once-endangered sea otter. Today they comprise part of the world's longest national wildlife refuge (NWR), a multipurpose area that provides sanctuary for millions of nesting seabirds and hundreds of thousands of marine mammals. Its caretaker is the U.S. Fish and Wildlife Service (USFWS) whose mission is to manage these vast wildlife resources for the continuing benefit of all of us.

History has shown us time and again that whenever man has access to a place, there is a good chance it will be at least partially changed or destroyed. The Aleutian Islands are no exception. They bear the ugly scars of a "forgotten" war. They witnessed the brutal exploitation and overharvest of marine mammals they had sheltered for ages. They heard the cries of thousands of native birds being eaten by marauding foxes, brought here by enterprising fox trappers. They even felt the rumblings of nuclear bombs set off beneath Amchitka Island. Yet despite these invasions of their pristine sanctity, the Aleutians are still an important national treasure. They contain over a million acres of land with high scenic, historic, biological and scientific value.

The main job of the USFWS is to preserve these values and restore those which have been lost through past misuse.

The former Aleutian Islands NWR became a unit of the Alaska Maritime NWR when the "Alaska Lands Bill" was passed in 1980. Today, as in the past, refuge personnel face a number of diverse tasks that involve many difficult decisions and tough compromises. Ironically, much of this work is directed toward reversing the damage done to wildlife as a result of refuge objectives in the early years. The Executive order that created the refuge in 1913 mandated, among other things, the promotion of fox farming and reindeer husbandry. These and other activities created havoc with this unique island ecosystem. Lands were overgrazed, seabird populations were reduced and the Aleutian Canada goose became an endangered species.

For over 35 years the USFWS has been striving to eliminate introduced fox from the Aleutians and rebuild the goose population to a healthy level. This work has produced results. Since 1965 the Aleutian Canada goose population has increased from an estimated 300-500 birds to roughly 5000 and eight former nesting islands are now once again fox-free.

Continuing success with this program means that USFWS personnel will, in the future, be able to spend more time and money on other important refuge work such as: studying seabird populations and the impact of man's activities on them; inventorying wildlife populations



USFWS photo

to provide better baseline data on the health of the Aleutian environment; and monitoring increased commercial, recreational and military activity to ensure minimal disturbance to the land and the wildlife. This is priority work, but does not include what is perhaps the greatest challenge facing the USFWS—increasing public awareness and appreciation of the refuge.

The Aleutian Islands could be considered the "last frontier" of Alaska. They are still relatively untouched and sparsely populated due to their remoteness and harsh climate, conditions which may

inhibit rapid change in the future. This is important because the Aleutian ecosystem is too delicate to endure such change. Conveying that message to all who are interested in the islands is not an easy task, especially with a small refuge staff, limited budget and the fact that the only refuge visitor center is located on Adak Island. That is why THE ALEUTIAN SOUND has been produced. It offers information that should answer many questions and help make your Aleutian experience more rewarding and memorable. Enjoy!

THE GREAT ALEUTIAN ILLUSION

You're going where? The sun never shines and the wind blows all the time! You'll be cold, wet and miserable with nothing to do! There are no trees! Those islands are nothing but barren, lifeless rocks!

Sound familiar? These are but a few of the unfortunate images of the Aleutian Islands tenaciously held by a vast number of people. Yet these impressions are really only illusions in people's minds, crafted from the incomplete bits and

pieces of information filtered to them over time. To those who truly know and appreciate the Aleutians, the unpredictable weather is actually a regular source of fascination. They recognize that the conditions which concern and frustrate so many help create and sustain those amenities which make the islands so magnificent—lush, colorful vegetation; scenic beauty; open space; pure, sparkling water and truly unique wildlife. These people are thankful for the rare

opportunity to have experienced the changing Aleutians.

Webster defines the word illusion as the "perception of something objectively existing in such a way as to cause misinterpretation of its actual nature." Those who hold such illusions about the Aleutians will have them vanish when they see carpets of wildflowers unveiled from rugged hilltops or witness an Aleutian sun melt into an ocean of fire at day's end. Hillside vistas of steaming volcanoes will feed the hungry minds of those who seek unmatched beauty but did not expect to find it here. And the visitor who wades through waist-high grass to be startled by a burst of rock ptarmigan in hurried flight will experience that which is vanishing elsewhere.

Loren Eisely once said, "Sometimes the rare, the beautiful, can only emerge or survive in isolation." Nowhere is this more true than in the Aleutians. Huge colonies of unique seabirds are found on many islands scattered throughout the Chain. Brightly-colored puffins, penguin-like murres and auklets with their ghostly-looking eyes and strange calls—these and other species delight many a birder each summer. Scores of Asiatic wanderers found nowhere else in North America may also be seen here. All it takes is an awareness, a keen eye and a little time.

A relaxing stroll along an Aleutian shoreline brings other surprises. Curling ocean waves tease numerous shorebirds, licking at the feet of rock sandpipers and sanderlings who explore the water's edge

for its delicacies. Closer examination of that "barren" nearshore rock may reveal the brightly painted face of a resting harlequin duck or a black oystercatcher intent on prying open a stubborn mussel. Many are impressed by the twisting-turning flight of the green-winged teal as it whizzes by. Perhaps you'll be lucky enough to witness a bald eagle snatching a salmon from an icy stream—not an uncommon sight since these magnificent raptors are numerous in the Aleutians.

The same islands that can bring strong winds, fog, rain, snow and earthquakes all in a matter of hours can also fill a hungry belly with hand-picked blueberries, provide the wilderness fishing experience of a lifetime or offer a very close encounter with an energetic sea otter. A photographer can embrace with his lens wildflowers of unbelievable vibrance and splendor. Orchids, hard to find elsewhere, are so thick in places that a hiker must be careful to avoid stepping on them.

While the weather may not be Miami beach, it is not quite as poor as it is made out to be. The sun does make appearances and has been known to reddens arms and noses. Yet weather, good or bad, should not be the focus of an Aleutian experience because the islands have so much more to offer. Visions of the Aleutians as nothing more than wretched chunks of isolated, boring rock were created by those who did not really know the islands. They are illusions perpetuated by those who do not care to know more.



Photo by Fred Zeilemaker

SURVIVAL OF THE ALEUTS

The sea was their lifeblood. They lived in harmony with nature, the result of a give-and-take arrangement born nearly 10,000 years ago. They were the Aleuts, a gentle and resourceful people who, for many ages, found peace, happiness and a rich livelihood throughout the harsh Aleutian archipelago.

The "Unangan" or "people," as they referred to themselves, numbered some 20,000 individuals less than 250 years ago. Today, fewer than 1,000 Aleuts remain in the Aleutians, an area that once supported the densest Native American population in North America. Where have they all gone? Why do Aleuts no longer live on Adak, Attu and a host of other islands? Like much of history, there is no simple answer and the story is a sad one.

Historians tell us that these natives once crossed the Bering Land Bridge from Asia in a quest that would eventually lead them to the sea on a series of "stepping stones" reaching 1,100 miles to the west—the Aleutian Islands. In this windswept, treeless region where few others could have survived, the hardy Aleuts flourished! The cold, turbulent but nutrient-rich Bering and North Pacific waters teemed with sea otters, seals, sea lions, whales and many varieties of fish that provided the natives with food and materials for clothing. Puffins, cormorants and other seabirds yielded skins that made beautiful, warm parkas. Tidepools and nearshore ocean rocks offered tasty urchins, mollusks and other delicacies for the Aleut dinner table. Sea lion skins, carefully stretched over driftwood frames, provided the Aleut hunters with a swift, lightweight craft called a bidarka, their most valued and prized tool. A man's worth was often measured by his skill at sea and the quality of his bidarka.

The Aleuts wasted nothing taken in the hunt. Tools, waterproof bags, boots and even translucent windows for their subterranean homes were crafted with materials from the animals they harvested. Plants like the chocolate lily and cotton grass supplemented the varied Aleut diet, while others were gathered for medicinal purposes. The beautiful monkshood produced a poison that was applied to the stone-tipped spears used to hunt whales.

Life was good for the Aleuts until 1741 when Vitus Bering discovered the Aleutians. The rich ocean resources were no longer a treasure for the natives alone. Bering's men returned to Russia with nearly 1,000 luxurious otter pelts, an event that brought a rush of greedy outsiders to the islands. Violence and disease raged in the years that followed. The lives of the Aleuts were changed forever.

Ruthless fur barons, or "promyshlenniki" as they were called, enslaved the islanders, forcing them to use their bidarkas to kill otters and other marine animals by the thousands. Those who fought enslavement were killed. Their crime: protecting the only life they had ever known. Occasionally an entire village was wiped out. When the smoke of the Russian wrath cleared some 40 years after it began, only 10,000 or so Aleuts remained.

If an Aleut survived the harsh treatment, he or she still ran the risk of death from smallpox, venereal disease or other introduced sicknesses. Other natives perished as they were forced to hunt in deeper, more treacherous waters for the increasingly scarce otters. Fewer marine animals also meant starvation for these gentle people. Famine decimated the village at Adak, which was abandoned in 1831. The broken and beaten natives finally succumbed; by 1834, less than



Photo by Tom Edgerton

2,300 Aleuts populated the islands.

The depletion of Aleutian wildlife continued after Alaska was purchased from Russia in 1867. Not until 1911 did the U.S. government finally put an end to the slaughter. Legislation was passed to protect the otter, whose population had dwindled to around 2,000 animals. Two years later the Chain became a national wildlife refuge, a designation which brought protection and eventual recovery for many wildlife species but not for the Aleuts. Their suffering was not over.

War came to their homeland bringing more death and destruction. In June 1942, Japanese forces invaded Attu. They captured the 43 villagers and imprisoned them in Japan. Natives on other islands were relocated by the American military to southeast Alaska "for their own protection," an injustice which caused additional hardship and stress. For roughly three years the Aleuts lived in damp, cold, abandoned canneries. The

wretched conditions, a strange diet, boredom and loneliness took more lives. When they returned after the war, many Aleuts found their homes ransacked or destroyed. Others were not allowed to go home. The 25 Attu natives who returned from Japan were taken to Atka, again "for their own protection."

Somehow the Aleuts survived through it all. The Russian Orthodox religion is one reason. It became well established during the early years of Russian rule and is an important sustaining force for the natives to this day. In addition, the Aleuts are inherently a strong, proud people, a fact that has helped them to live through great adversity in this remote part of the world. Even so, the villages of Atka, Nikolski, Unalaska, Akutan and False Pass are all that remain in the Aleutian Islands. Many traditions have been lost. Those which still exist are passed on from one generation to the next in the hope that the Aleut heritage and lifestyle will endure.

THE PREPOSTEROUS PUFFIN

The opportunity to observe a puffin creates a special feeling of excitement for anyone coming to the Aleutians for the first time. Why? With its absurd, multi-colored beak, clown-like behavior and comical appearance, the puffin seems almost fictitious. Sometimes called the "sea parrot" or "fruit-loop bird," it is probably the most sought-after and photographed seabird in Alaska.

Puffins spend summers in the Aleutian Islands raising their young. They dress up for the job, bringing splashes of color to the fog-shrouded islands and dark gray coastal waters. Two of the world's three puffin species can be seen here; both are named for their conspicuous head ornaments—the Tufted for its golden tassels and the Horned for the fleshy projection above each eye. Sociable, but somewhat insecure by nature, these birds find comfort and safety in numbers. Puffins gather in groups that sometimes reach tens of thousands of birds. Within these colonies, the birds reduce competition by selecting different nesting sites. Tufted puffins use their strong beak and feet like a pick and shovel to dig burrows up to six feet long. Horned puffins are less industrious, preferring to settle in rock crevices on inaccessible cliffs. These sites provide the stage for some rather unique behavior; pairs of puffins bow to one another in elaborate courtship rituals in which they may also nibble at each other's bill or present a mouthful of beautiful wildflowers. One or more of these activities usually has its intended effect—a single



Tufted Puffin

white egg is laid. Both adults then spend the next three months on the tiring task of parenting.

It is easy to marvel at a puffin in flight because it looks like a bird that shouldn't be able to fly. Indeed, it resembles an airborne torpedo anxiously trying to stay aloft with its short, stubby wings. The puffin has trouble sustaining long flights, hence its ability to hold up to 20 small fish at one time—an important adaptation that limits the number of flights taken from the nest to the rich offshore feeding grounds. Torpedoes, however, belong underwater and that is where these birds come into their own. Their wings become powerful paddles which propel them in hot pursuit of fish, squid and zooplankton. Puffins can "fly" underwater to depths of more than 100 feet, an ability they share with other unique seabirds that are so numerous in the Aleutians.

Puffins are most easily observed from May through August when they venture near shore to nest. During this time they are also easy to recognize with their traditional black and white body suits and those amazing beaks. Seeing a puffin in the winter, you would hardly recognize it as the same bird—a drab, dark gray color without head decorations or the bright bill plates that distinguish the species in the summer. From September to April, puffins and most of their seabird cousins are at sea, often hundreds of miles from the Aleutian Islands. There they pass the time finding food, surviving storms and avoiding fishing nets until once again the time comes to dress up and return to their summer homes.

Horned Puffins



Illustrations courtesy of Alaska Department of Fish and Game.



Photo by Fred Deines

All Nature's wildness tells the same story: the shocks and outbursts of earthquakes, volcanoes, geysers, roaring, thundering waves and floods, the silent uprush of sapling plants, storms of every sort, each and all, are the orderly, beauty-making love-beats of Nature's heart.

John Muir

GOOD ETHICS BENEFIT WILDLIFE

The Aleutian Islands are set aside as part of a national wildlife refuge primarily for the benefit and enhancement of their varied marine and terrestrial wildlife species. Viewing or photographing unique or special Aleutian wildlife, especially at close range, can bring out feelings of excitement, happiness and satisfaction in all of us. Although wildlife watchers and photographers do not intend to harm wildlife, it is important to remember that these activities, if not done properly, can cause increased stress and even death to wild animals. For that reason, the following guidelines have been established to help protect the valuable wildlife resources found all along the Aleutian Chain.

1. Wild animals need space in order to raise their young, find food and just plain survive. Please allow them that space. Avoid approaching nesting birds too closely. If a bird deserts its nest, calls or exhibits other signs of disturbance, it is probably a signal that you are too close and need to back off. Harassment at nests can result in an attack by one or both parents trying to defend their young.

2. Intentional feeding of wildlife is prohibited except at bird feeders. Feeding wild animals can cause a change in their natural feeding habits and make them more dependent on man. At Adak this is a problem that has resulted in many bald eagles dying by electrocution from powerlines located around the Navy base. It can also make eagles bold enough to attempt to snatch small dogs or cats from residential areas.

3. Photograph wildlife as naturally as possible. Do not attract animals with scents, food or other man-made items. Use a telephoto lens. This will enable you to take pictures from a distance that will be safe for you, eliminate the possibility of unnecessary stress for the animal and prevent you from chasing the animal away. Be patient and take plenty of time to approach your subject. Wear camouflage clothing and move in a way that will help you to blend in with the environment. Do not damage or alter tundra vegetation around photographic subjects.

4. The use of temporary, portable blinds at sites frequented by wildlife is permitted as long as the blinds do not disturb the animal's habitat, nesting, rearing or feeding activities. Your high-way vehicle, however, is often your best

concealment when approaching wild animals seen next to roads. Remember to pick a safe pullout for parking and stay in your car.

5. Summer is the time when Aleutian residents often find baby animals, especially fuzzy ducklings, that appear to be abandoned. Usually, however, they are not. In most cases the mother is nearby and will soon return to her babies if they are left alone. A baby animal should only be "rescued" if its mother is lying dead nearby and then only by trained wildlife managers.

6. A number of small perching birds (rosy finches, snow buntings, etc.) do not migrate from the Aleutians in the winter. Food is harder for them to find during this time. If you set up a bird feeder at your home to help them out, please be sure that once you begin feeding, you continue to do so throughout the winter because the birds will come to depend on it.

By following these guidelines, you can help ensure the protection of Aleutian wildlife and allow others to enjoy this magnificent resource, both now and in the future.



Illustration by Rodney A. Weems

NATURE'S CARPET

Massive herds of caribou need it to survive. Engineers built an 800-mile long pipeline through the heart of it. It occurs in a cold, windy environment and enables you to see for miles. It's called tundra, a puzzling combination of soil, water and plantlife that defies adequate description to those who have not seen it or, better yet, walked on it.

Tundra is normally found in extreme northern latitudes in areas underlain by permafrost, a permanently frozen layer that prevents water drainage. Yet tundra is also found in the Aleutian Islands, an area too warm for permafrost. Here it is called "maritime tundra," an ecosystem somewhat different from "arctic tundra." The far north receives little precipitation, but permafrost keeps the moisture available for thirsty plants. Aleutian tundra, on the other hand, thrives because regular, heavy moisture keeps the vegetation wet and healthy.

Trees are noticeably absent from tundra, but the land is rich with a myriad of elegant wildflowers and other plants superbly adapted to their seemingly inhospitable environment. These plants are midgets; many do not grow higher than the toe of a hiker's boot. But in the Aleutian Islands, there are also a few giants: knee-high chocolate lilies, bush-like lupines that can grow two to three feet tall, and thick "forests" of ryegrass, cow-parsnip and monkshood. These and other surprising plants combine to decorate the so-called "barren" Aleutians and make them one of the world's most intriguing, lush and beautiful places.

THE AWAKENING

Residents of Adak and Shemya often refer to their island homes as "the rock." Their view is an ancient one. It refers to the appearance of the Aleutian Islands when they first broke the surface of the ocean eons ago—lifeless, unvegetated mounds of sedimentary and volcanic rock. Obviously these uplifted plateaus, volcanic mountains and basaltic lava

flows have undergone dramatic change. Driving winds, rain and ice pounded the slopes, slowly disintegrating rocks and washing bits of sediment into the valleys. Soil-building lichens and mosses provided extra muscle to complete this long, arduous process.

Finally a thin soil layer developed. A classic story of plant succession was then written in which each of the actors played their part: ferns, grasses, forbs, mushrooms and trees. But hold on a minute—the Aleutians, as we know them, are treeless! Enter another actor into this unfolding drama.

Glaciers moved in and covered the islands until roughly 10-12,000 years ago. They scraped the hillsides bare and carved basins and valleys, forming today's freshwater lakes and streams. Pioneering lichens and the Aleutian climate began, all over again, the rock-breaking work of creating soil.

A RIOT OF COLOR

Aleutian tundra today is generally a varied crowberry-moss-lichen-sedge-grass meadow laced with an assortment of abundant, colorful wildflowers. The specific mix of vegetation depends on such factors as elevation, exposure to wind, underlying moisture and location in the Chain. Plantlife came from both mainland Alaska and Russia. Thus, the western islands are more like the Kamchatka Peninsula while the eastern Aleutians closely resemble the Alaska Peninsula. Tundra vegetation forms a living, intertwining mat that lies upon a layer of dead plants which decay at a snail's pace in the cold Aleutian climate. Persistent rainfall and high humidity soak this covering, making the Chain a sort of "giant sponge." Wind, cold and a high incidence of cloud cover limit plant growth, especially above 1,000 feet. Winds also cause willow trees, which are native to the Aleutians, to spread their branches as vines which hug the ground. They are easy to overlook, especially by those seeking the "real thing." Except for

some willow bushes at both ends of the Chain and a few introduced spruce here and there, upright trees are not to be found on these islands. Seeds have been dispersed but isolation, a short growing season, lack of bare soil and the same factors which limit plant growth have combined to prevent natural reforestation.

Although some Aleutian plants bloom as early as March, the lushest growth appears in late June and stays until mid-September. A walk on the tundra during this time can offer an experience almost surrealistic in nature. The soft carpet of heath and lichen produces a springy, invigorating gait. A detour to the base of a steep, sheltered bank dominated by velvet-green mosses may reveal a "quaking bog" where it is possible to bounce and roll as though on a water bed. Pass by a slightly drier meadow and you may find tufts of blonde cotton grass waving in the wind. Farther on you'll be greeted by fields of orchids, geraniums, buttercups, rhododendrons and perhaps even irises. Together they provide an inspiring, colorful, ever-changing pageant of majesty. Berries are there also, free for the taking; it is a nice way to end a hike.

A FOUNDATION FOR LIFE

It is easy to daydream on these island slopes, especially since there are no significant bug populations that are such a nemesis in the arctic. The Aleutian tundra does not support the huge concentrations of waterfowl found farther north and, except for certain eastern islands, you won't find any natural land mammals. Yet it is still an important wildlife habitat providing nesting material, sustenance and ground cover for seabirds, sandpipers, terns, ptarmigan, ducks and other species. Cormorants and kittiwakes remove patches of vegetation to create their cliff-side nests. Lapland longspurs set up and defend territories abundant with dried, hard-shelled seeds—their main diet. One sometimes wonders if the croaking call of the ptarmigan is

caused by a crop choked too full of crowberries. Huge bumblebees somehow stay aloft to visit flowers for their rich nectar and pollen. And an endless variety of spiders find refuge among the tundra plants, bringing life to an environment that, at first glance, might not seem as rich as it is.

The tundra is perhaps the most fragile environment on earth. A lichen, for example, may take 30-100 years to regrow after being grazed by caribou. Battle scars remain on the Aleutian landscape more than 40 years after World War II. Even so, open space and undisturbed wilderness, two features becoming increasingly scarce in our world, are still the rule in the Aleutians. They can bring forgotten feelings of freedom and peace back to life in an almost overpowering fashion. It is important for all of us to preserve these amenities and make sure they are never taken for granted. The Aleutian tundra is just too special.



Cotton Grass

USFWS photo by Duane Lawson

COMMUNITY PROFILES

The Aleutian Islands extend from Unimak, located immediately southwest of the Alaska Peninsula, westward for 1,100 miles to Attu. Approximately 8,000 people reside along the Chain in eight different communities—five Aleut native villages and three military bases. Over three-fourths of the population lives on the military bases. The following is a brief description of each of these communities introducing the people of the Aleutian Islands.

FALSE PASS. This Aleut village has 75 residents and is located on the eastern side of Unimak, largest of the Aleutian Islands. The village has a seafood cannery that provides the foundation for its fishing-based economy.

AKUTAN. An incorporated city of 71 people (60 natives and 11 non-natives), Akutan is located on an island of the same name. Its first church and school were built in 1878. Akutan was a whaling village until about 1939, just three years before the residents were temporarily relocated to southeast Alaska because of the war. The present day economy is based on commercial crabbing, salmon fishing and fish processing. There are no roads, but young and old alike can be seen biking or rollerskating on the town's boardwalk.

UNALASKA/DUTCH HARBOR. Unalaska village is located on Unalaska Island; Dutch Harbor is located on Amaknak Island. The two are connected by a 100-yard long bridge. Once two separate villages, they merged into one community in 1967. Because the local economy centers on fishing and fish processing, the normal population of 1500 jumps to over 3,000 during the busy summer fishing season. Regular airline service and the only commercial lodging in the Aleutians are two amenities provided by the community.

NIKOLSKI. Located on the southwest side of Unimak Island, Nikolski is the site of the earliest documented human habitation in the Aleutian Islands, dating back 8,500 years. Nikolski's residents were also evacuated by the military in 1942, but most returned in 1945. The 30 natives and one non-native work at local



Naval Air Station, Adak

Photo by Lon E. Lauber

businesses or are retired.

ATKA. This native village, centrally located in the Chain, was established in the 1800's. Atka's 92 residents still rely heavily on subsistence hunting and fishing, but they also operate a commercial halibut fishery. During the time the residents were interned in southeast Alaska during World War II, all but two of their houses were burned by the U.S. military to prevent the Japanese from using the buildings if they invaded the island.

ADAK. Occupied by the U.S. military

since August 1942, the island population now averages around 5,500 people. The northern half of Adak was designated a naval base in 1959. Employees of the U.S. Fish and Wildlife Service, Adak Region School District and various construction contractors comprise the small non-defense contingent of the community.

SHEMYA. Only one by three miles in size, Shemya is home to nearly 1,000 U.S. Air Force personnel. The U.S. Army Corps of Engineers established a base there in September 1943 which was

utilized until 1945. From then until the Air Force took over in 1958, the island was used mainly as a refueling stop for commercial airline flights.

ATTU. Attu was the site of the only land battle fought on North American soil during World War II. The battle in 1943 claimed more than 3,000 American and Japanese lives. Some 2,300 Americans were also injured. Today the battlefield is designated a National Historic Landmark and Attu is the site of a 25-person U.S. Coast Guard LORAN station.



Photo by Fred Deines

WET, WILD AND... WONDERFUL?

Aleutian weather, renowned for its unpredictability, results from the collision of two air masses—one from the warm Japanese current flowing into the North Pacific, the other from the frigid waters of the Bering Sea. The meeting of these fronts spawns fog, rain and strong winds. In the winter, persistent storm systems move through the Chain from the open ocean to the southwest. It is a little known fact that calm days and,

occasionally, phenomenally clear skies are sandwiched between these storms. Centrally located in the Chain, Adak's weather, shown in the accompanying chart, is somewhat typical of the islands. Temperatures and precipitation may vary slightly west to Attu and east to Unimak because of differences in terrain, latitude and distance from mainland Alaska.

ALASKA NATURAL HISTORY ASSOCIATION

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ADAK'S WEATHER							
TEMPERATURE			PRECIPITATION		WINDS		
	Average Monthly	Record High	Record Low	Average Rain (Inches)	Average Snow (Inches)	Average Speed (MPH)	Peak Gust (MPH)
January	33	50	03	6.11	17.50	12.7	94.3
February	33	54	03	4.75	19.20	13.8	120.8
March	35	57	13	5.85	20.01	15.0	125.4
April	37	56	21	4.50	9.90	13.8	103.5
May	41	65	20	4.10	2.10	12.7	92.0
June	45	67	29	3.10	Trace	11.5	69.0
July	49	72	33	2.98	0.00	10.4	73.6
August	51	75	33	4.15	Trace	11.5	77.1
September	48	66	28	5.36	.10	11.5	112.7
October	43	61	22	6.61	1.90	12.7	109.3
November	37	57	12	8.17	12.40	15.0	116.2
December	34	55	08	7.33	20.10	15.0	89.7



Pigeon Guillemot

J F M A M J J A S O N D

AUKS & PUFFINS

Common Murre	on	..	..	..	..	..	..	..	..	..	..
Thick-billed Murre	on	..	..	..	..	..	..	..	..	..	..
• Pigeon Guillemot	n	..	..	..	..	..	..	..	..	..	..
• Marbled Murrelet	on	..	..	..	..	..	..	..	..	..	..
• Kittlitz's Murrelet	on	..	..	..	..	..	..	..	..	..	..
Ancient Murrelet	on	..	..	..	..	..	..	..	..	..	..
Cassin's Auklet	on	..	..	..	..	..	..	..	..	..	..
Parakeet Auklet	on	..	..	..	..	..	..	..	..	..	..
Least Auklet	on	..	..	..	..	..	..	..	..	..	..
Whiskered Auklet	on	..	..	..	..	..	..	..	..	..	..
Crested Auklet	on	..	..	..	..	..	..	..	..	..	..
• Tufted Puffin	on	..	..	..	..	..	..	..	..	..	..
• Horned Puffin	on	..	..	..	..	..	..	..	..	..	..

CUCKOOS & OWLS

X Common Cuckoo	t	..	..	..	..	..	..	..	..	..	..
Snowy Owl	ta	..	..	..	..	..	..	..	..	..	..
Short-eared Owl	t	..	..	..	..	..	..	..	..	..	..

SWALLOWS

Tree Swallow	w	..	..	..	..	..	..	..	..	..	..
Bank Swallow	w	..	..	..	..	..	..	..	..	..	..

RAVENS & WRENS

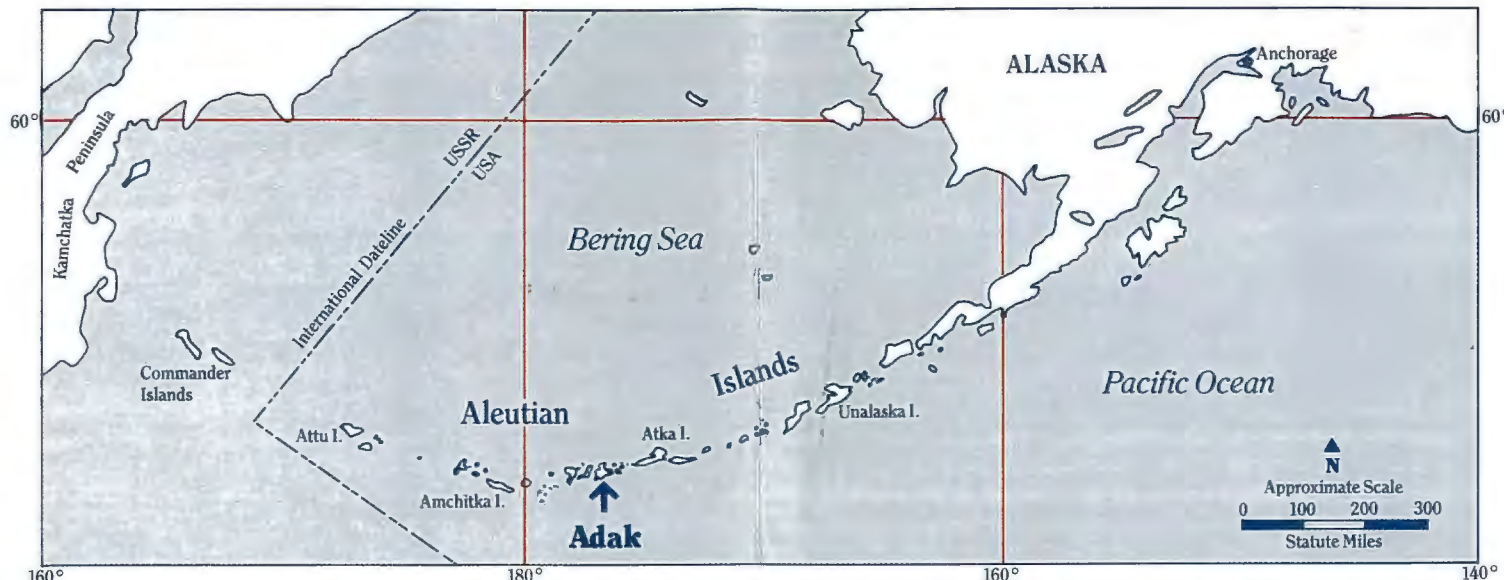
• Common Raven	nwsta	..	..	..	..	..	..	..	..	..	..
• Winter Wren	s	..	..	..	..	..	..	..	..	..	..

THRUSHES

Northern Wheatear	ta	..	..	..	..	..	..	..	..	..	..
X Dusky Thrush	t	..	..	..	..	..	..	..	..	..	..

WAGTAILS & PIPITS

X Black-backed Wagtail	s	..	..	..	..	..	..	..	..	..	..
Water Pipit	t	..	..	..	..	..	..	..	..	..	..



WAXWINGS & SHRIKES

Bohemian Waxwing	t	..	..	..	..	..	..	..	..	..	..
Northern Shrike	t	..	..	..	..	..	..	..	..	..	..

SPARROWS

Savannah Sparrow	t	..	..	..	..	..	..	..	..	..	..
• Song Sparrow	st	..	..	..	..	..	..	..	..	..	..
• Lapland Longspur	t	..	..	..	..	..	..	..	..	..	..
X Rustic Bunting	t	..	..	..	..	..	..	..	..	..	..
• Snow Bunting	bsta	..	..	..	..	..	..	..	..	..	..

FINCHES

X Brambling	t	..	..	..	..	..	..	..	..	..	..
• Rosy Finch	sta	..	..	..	..	..	..	..	..	..	..
X Common Rosefinch	t	..	..	..	..	..	..	..	..	..	..
White-winged Crossbill	t
Common Redpoll	t
Hoary Redpoll	t
X Hawfinch	t



Rosy Finch

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April 1987

Birds of Adak Island

Aleutian Islands Unit

Alaska Maritime National Wildlife Refuge



Bald Eagle

Adak Island is part of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge. It is one of some 200 islands in the Chain important to migratory birds. Adak's nearness to Siberia and Asia presents opportunities to observe birdlife not found elsewhere in North America.

A variety of habitats from barren mudflats to high alpine tundra attract birds to Adak. Birdwatching is best at low tide and during early morning and late evening. Species abundance also varies with the season and weather conditions. Clam Lagoon, especially the southwest portion, is considered the best birding area although Kuluk Bay, Sweeper Cove, Lake Andrew and other areas are also productive.

Birding in the Aleutians is fun and challenging because there is always a chance to see a unique species. Thirty-four of the 155 birds on this checklist are "Asiatic" in origin. In addition, this list is provisional and almost any observer can help fill in missing pieces with data on species range, migration dates and bird behavior.

Good birding!

■ — Common.
 ■ — Uncommon.
 — — Rare. May not be seen every year.
 - - - - - Casual. Not present every year but records too numerous to show individually.
 • — Accidental record.

- o** — open ocean
- n** — near shore ocean waters, bays and estuaries
- w** — lowland lakes, ponds and streams
- b** — beaches and mudflats
- s** — rocky shorelines
- t** — lowland tundra (includes town areas)
- a** — alpine tundra and rocky areas

Red-throated Loon n.

Pacific Loon n.

• Common Loon nw

Yellow-billed Loon n

_____	Horned Grebe	n	.....		.	.
_____	Red-necked Grebe	n	....		.	.
_____	Western Grebe	n	.....		.	.

Species	Mean Relative Abundance (approx.)	95% CI (approx.)
Black-footed Albatross	10	5 - 15
Laysan Albatross	15	10 - 20
Northern Fulmar	25	20 - 30
Cook's Petrel	30	25 - 35
Sooty Shearwater	35	30 - 40
Short-tailed Shearwater	40	35 - 45
Fork-tailed Storm-petrel	45	40 - 50
Leach's Storm-petrel	50	45 - 55

— Double-crested
Cormorant n *

— • Pelagic Cormorant ons ..

— • Red-faced Cormorant ons

Species	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019
Tundra Swan nw					
X Whooper Swan nw					
X Bean Goose n					
Greater White-fronted Goose n					
Emperor Goose ons					
Brant n					
Canada Goose (Aleutian) nw					

Species	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	2020-2029
• Green-winged Teal (Aleutian) nw						
X Falcated Teal nw						
• Mallard nw						
X Spot-billed Duck nw						
• Northern Pintail nw						
X Garganey n						
Blue-winged Teal n						
Northern Shoveler n						
Gadwall nw						
X Eurasian Wigeon nw						
American Wigeon nw						
X Common Pochard nw						
Canvasback nw						
Ring-necked Duck w						
X Tufted Duck nw						
• Greater Scaup nw						
Lesser Scaup w						
• Common Eider n						
King Eider n						
Steller's Eider n						
Harlequin Duck ns						



	J	F	M	A	M	J	J	A	S	O	N	D
Oldsquaw n.....							.	.	.			
Black Scoter n.....							.	.	.			
Surf Scoter n.....							.	.	.			
White-winged Scoter n.							.	.	.			
Common Goldeneye n.							.	.	.			

[illegible][illegible]

Species	Black-bellied Plover	Lesser Golden-Plover	Mongolian Plover	Common Ringed Plover	Semipalmated Plover
Black-bellied Plover	b . .				
Lesser Golden-Plover	bt				
Mongolian Plover	b . .				
Common Ringed Plover	b				
Semipalmated Plover	w				

_____	• Black Oystercatcher	s . .
_____	Greater Yellowlegs	b . .
_____	Lesser Yellowlegs	b . . .
_____	X Spotted Redshank	b . .
_____	X Wood Sandpiper	b . . .
_____	Wandering Tattler	nbs .

_____ Pomarine Jaeger **on** ...
 _____ • Parasitic Jaeger **onbt** ...
 _____ Long-tailed Jaeger **on** ...

	X Common Black-headed Gull	n b	.	.	.	.	.
	Mew Gull	n bs	.	.	.	.	.
	Herring Gull	n b	.	.	.	.	.
	Glaucous-winged Gull	onw bst	.	.	.	.	.
	Glaucous Gull	on b	.	.	.	.	.
	Black-legged Kittiwake	n w	.	.	.	.	.
	Red-legged Kittiwake	o n	.	.	.	.	.
	Sabine's Gull	o	.	.	.	.	.
	X Common Tern	w	.	.	.	.	.
	Arctic Tern	nwb t	.	.	.	.	.
	Aleutian Tern	nwb t	.	.	.	.	.