ANNUAL NARRATIVE REPORT

Calendar Year 1990

IZEMBEK NATIONAL WILDLIFE REFUGE

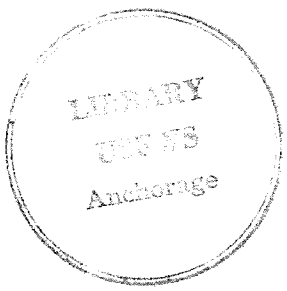
Including Izembek, Unimak and Pavlof Units

IZEMBEK NATIONAL WILDLIFE REFUGE
P.O. Box 127
Cold Bay, Alaska 99571

Including:
Izembek, Unimak and Pavlof Units

ANNUAL NARRATIVE REPORT
CALENDAR YEAR 1990

DEPARTMENT OF THE INTERIOR
UNITED STATES FISH AND WILDLIFE SERVICE
NATIONAL WILDLIFE REFUGE SYSTEM



REVIEW AND APPROVALS

IZEMBEK NATIONAL WILDLIFE REFUGE

COLD BAY, ALASKA

ANNUAL NARRATIVE REPORT
CALENDAR YEAR 1990

Mark A. Shasa — 3/6/91
Refuge Manager ACTING — Date

[signature] — 9/30/91
Associate Manager — Date

Paul R. Schmidt
Regional Office Approval — Date

INTRODUCTION

The Izembek National Wildlife Refuge is located near the western terminus of the Alaska Peninsula. The refuge is administered from its headquarters in Cold Bay. Refuge staff is additionally responsible for the Unimak Island and Pavlof administrative units of the Alaska Maritime and Alaska Peninsula National Wildlife Refuges, respectively (Figure 1). This narrative report incorporates information from all three units.

In December 1980, the Alaska National Interest Lands Conservation Act (ANILCA P.L. 96-487) was enacted creating sweeping changes in the National Wildlife Refuge System in Alaska. The Act, among other things, created new refuges, enlarged and/or redesignated existing refuges, defined and redefined the purposes for all Alaska refuges, and designated wilderness areas. Additionally, several mandates were given to the Department of Interior and the Fish and Wildlife Service which affect the day-to-day operation of Alaska's National Wildlife Refuges. With the passage of ANILCA, nearly 54 million acres were added to the National Wildlife Refuge System bringing the total to 77 million acres within 16 refuges in Alaska. Roughly 18.5 million of these acres, among 13 of the 16 refuges were designated as wilderness as a result of the Act.

The Izembek National Wildlife Refuge was originally established as the Izembek National Wildlife Range on December 6, 1960, by Public Land Order 2216. The Range contained 415,300 acres encompassing the Izembek Lagoon and its entire watershed. Under the Tide and Submerged Lands Act, roughly 95,300 acres of the area are owned and managed by the State of Alaska. In 1972, the State of Alaska designated the 95,300 acres of lagoon as the Izembek State Game Refuge (Figure 2). With the passage of ANILCA, Izembek was redesignated as a National Wildlife Refuge. With its 320,000 acres surrounding the lagoon, it is the smallest of Alaska's refuges. Also with the enactment of ANILCA, the purposes of the refuge were redefined and 300,000 acres were designated wilderness.

In spite of Izembek's rather paltry size (by Alaska standards), the Izembek Lagoon and associated watershed is critically important to wildlife. So much so, that in 1986, the Izembek NWR and State Game Refuge was designated as a Wetland of International Importance by the Convention on Wetlands of International Importance Especially as Waterfowl Habitat. Though the designation in itself does not affect management or afford additional protection, it does document the United States' and world's recognition that this is a special habitat that we are committed to preserving. Details of the designation are found in Section F.2; Wetlands.

The habitat of the Izembek Unit is mainly ericaceous tundra with lake, pond and stream interspersion. Dominant plants are crowberry (Empetrum nigrum), mountain cranberry (Vaccinium vitis-idaea), bluejoint grass (Calamagrostis canadensis), white cotton grass (Eriphorum scheuchzeri), reindeer moss (Cladonia spp.) sitka alder (Alnus crispa) and arctic willow (Salix spp.). Eelgrass (Zostera marina) dominates the lagoon habitats and is critical to staging waterfowl. Elevations range from sea level to 6,600 feet at the summit of Frosty Peak.

Cold Bay is a small (156 people in 1990 census) town inhabited largely by transient state and federal government employees. It is rather unique among villages of the lower peninsula in that it lacks the fishing industry presence. Cold Bay was first settled in recent times by the U.S. Military who had more than 20,000 troops stationed in Cold Bay (then Ft. Randall) during World War II.

The Aleutian Islands National Wildlife Range was established in 1913 by Executive Order 1733. With the passage of ANILCA came the creation of the Alaska Maritime National Wildlife Refuge of which the Aleutian Islands became an administrative unit. Unimak, the first and largest island in the chain is managed by Izembek staff for both administrative and biological reasons. The passage of ANILCA designated 910,000 acres of the 989,000 acre island as wilderness.

The administrative division at Unimak Pass conforms to the "biological" barrier at this point. Unimak, separated from the mainland by about a half a mile, supports flora and fauna similar to the mainland. It is not until one goes west of Unimak Pass that the unique flora and fauna of the Aleutians becomes apparent.

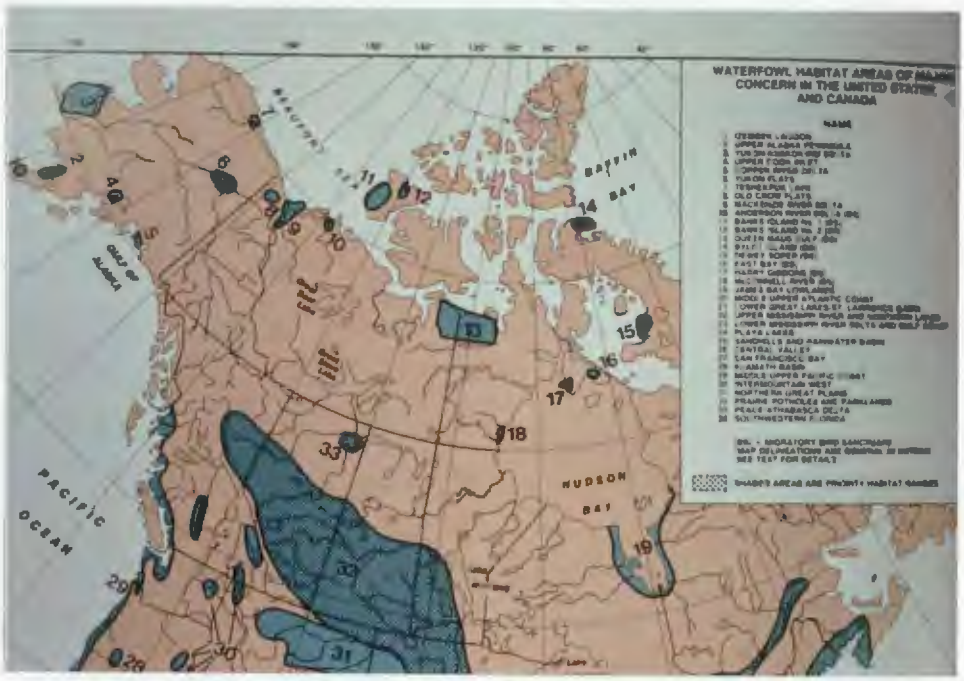
The habitat and physiography of Unimak is similar to the lower peninsula though somewhat impoverished. Volcanos, both active and dormant, dominate the landscape. Elevations range from sea level to 9,372 feet at the summit of Shishaldin Volcano. Extensive, and fairly recent (geologic time), lava flows dominate the eastern portion of the island. Shishaldin itself is a designated National Historic Landmark as its easily recognized, near-perfect, cone has guided seamen since the days of the Russian explorers and undoubtedly the Aleuts before that.

False Pass, a fishing village of roughly 50 people, is the only settlement on the island. Two small military settlements on the island's west end were abandoned prior to 1980.

The Alaska Peninsula National Wildlife Refuge was created by ANILCA. The exterior boundary of the Pavlof Unit encompasses roughly 1.5 million acres on the south side of the Alaska

Peninsula from Port Moller to Unimak Island. The terrain is dominated by mountains of volcanic origin that form the "backbone" of the Alaska Peninsula. The Pavlof Unit has been extensively impacted by regional and village native corporation land selections under the Alaska Native Claims Settlement Act of 1971 (ANCSA). Well over half the area has been conveyed to, or selected by, entitled native corporations and the State of Alaska. King Cove is the primary settlement within the Pavlof Unit. This is the largest town in the area with a population of around 650. The village economy is based on the salmon and crab fisheries. Responsibility for the Pavlof Unit was given to the Izembek staff in 1982 for logistical reasons.

Under the Draft Alaska Omnibus Act, it is proposed that the Unimak and Pavlof Units be officially incorporated into the Izembek NWR. This would involve a name change only and should not affect current refuge programs or operations.



WE'RE NUMBER ONE! RLW

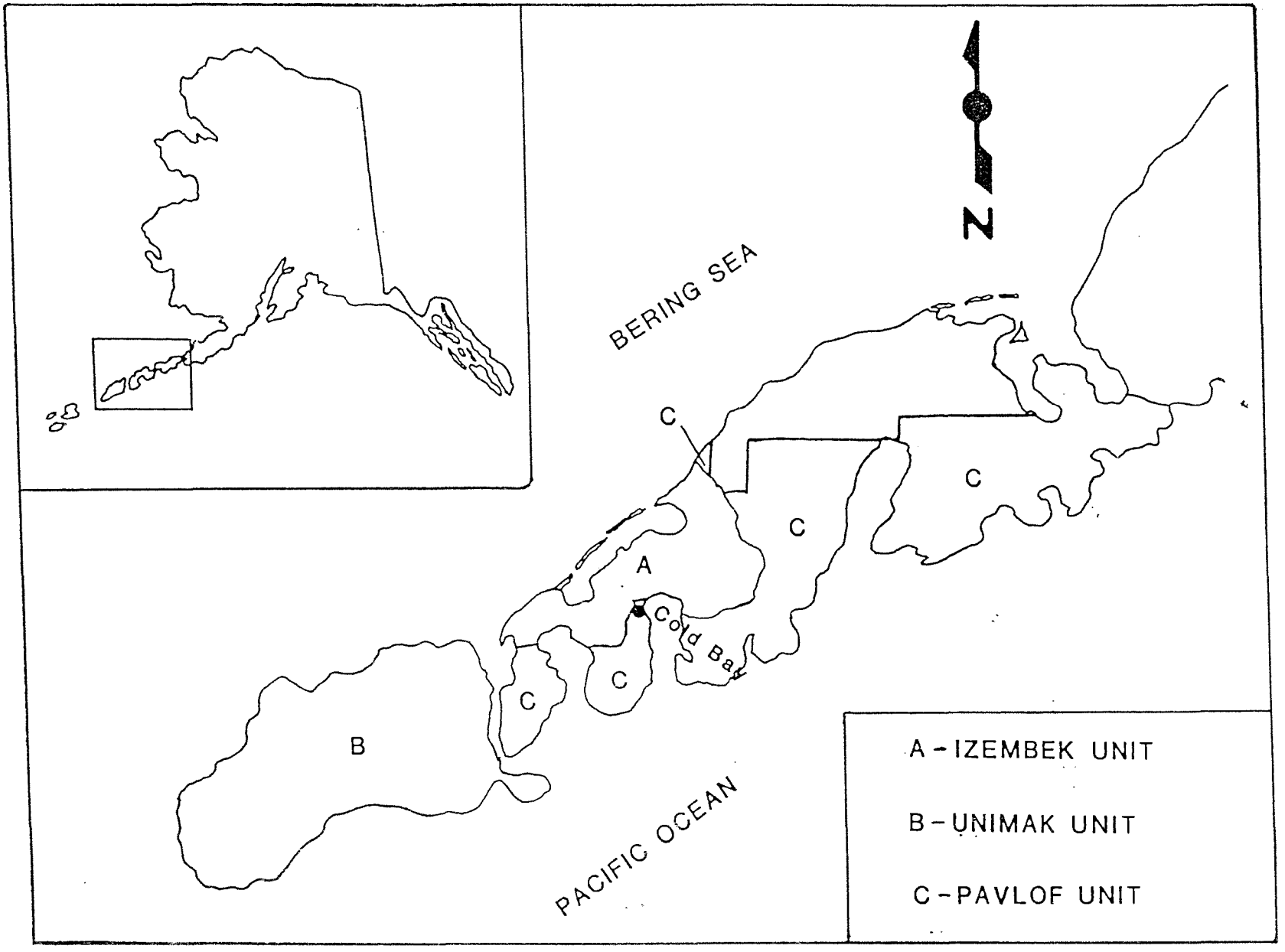


Figure 1. National Wildlife Refuge Units of the lower peninsula.

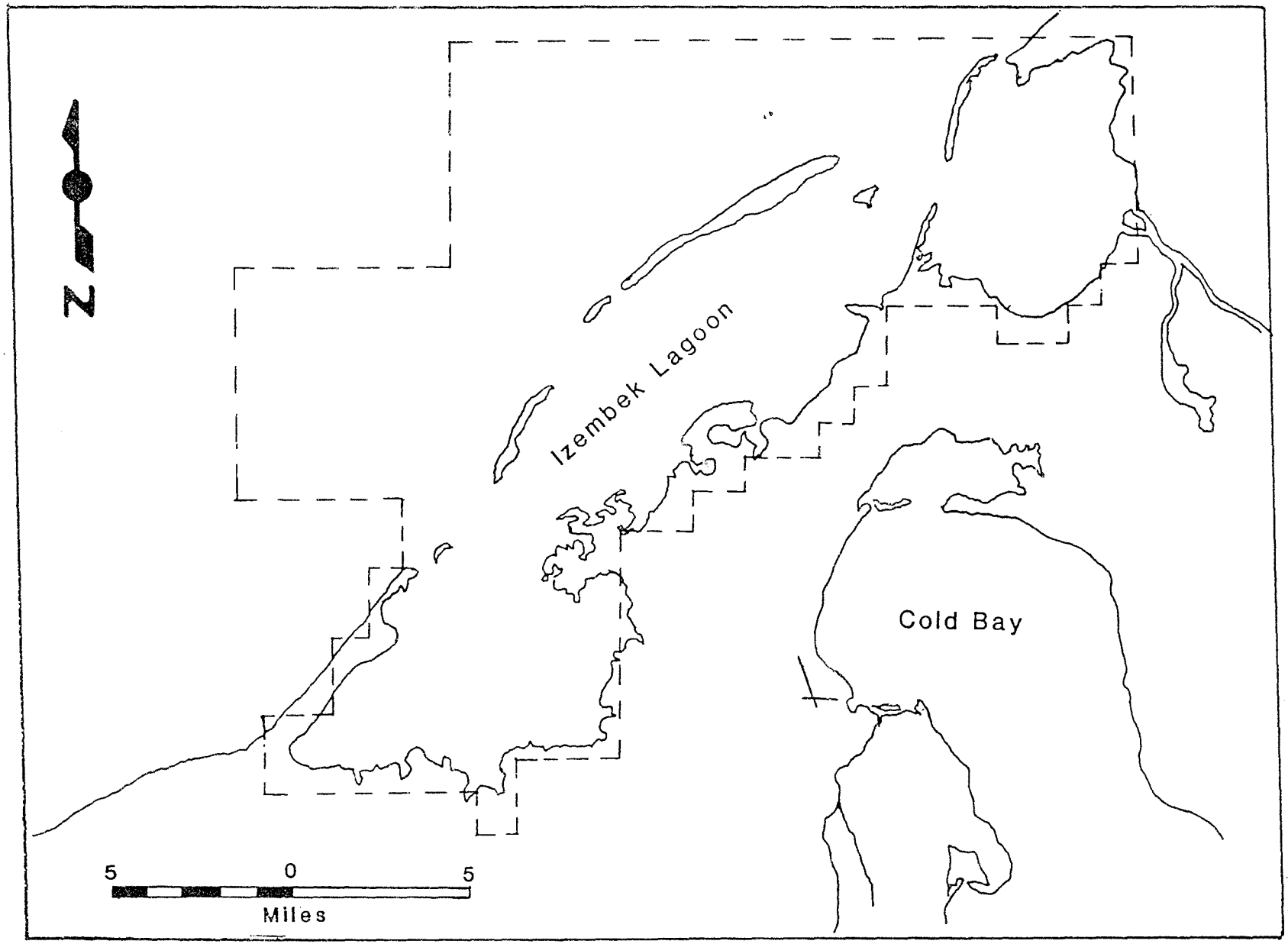


Figure 2. Izembek State Game Refuge

INTRODUCTION Page

TABLE OF CONTENTS i

G. WILDLIFE

Page

H. PUBLIC USE

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

- Details, Details, Details! The federal government takes over subsistence management on federal lands in accordance with Title VIII of ANILCA. (J.3)

- Izembek continued to participate in the US/USSR Cooperative Brant Research when Refuge Manager West travelled to Wrangel Island, USSR. (G.3 and J.1)

- The Refuge, Alaska Department Fish & Game, and the University of Alaska Cooperative Wildlife Research Unit intensified efforts to understand the decline of the Southern Alaska Peninsula Caribou Herd. (G.8 Caribou and D.5)

- Black brant and emperor goose productivity counts were conducted for the 28th and 24th consectutive years, respectively. (G.3)

- Wildlife Biologist/Pilot Chris Dau participated in his 10th consecutive year of the Spring Emperor Goose Survey and 2nd year of the Statewide Breeding Pairs Survey. (G.3 Emperor geese)

- Three residences received new windows and arctic entries. (I.2)

The Aghileen Pinnacles in the Izembek Wilderness. Donna Dewhurst (APNWR)

B. CLIMATIC CONDITIONS

Cold Bay weather is characterized by wind, precipitation, wind, clouds and wind. The average wind speed is 16.9 mph and monthly blows with sustained winds of 50 mph are more the rule than the exception. Eighty to 100% cloud cover is also the rule for a typical Cold Bay day. Daily averages of percent cloud cover are recorded by the National Weather Service in Cold Bay. Days of 0 - 30% cloud cover are classified as clear, 40 - 70% are partly cloudy and >80% are cloudy. In 1990, 320 days were cloudy, 35 partly cloudy and 10 were clear days.

Precipitation averages 35.01" annually and occurs throughout the year. A small peak in precipitation occurs in late fall and a small low in the spring. Measurable precipitation ($\geq$.01") occurred on 251 days in 1990 and amounted to 37.58". Although it rains or snows often, it seldom dumps large amounts at any one time.

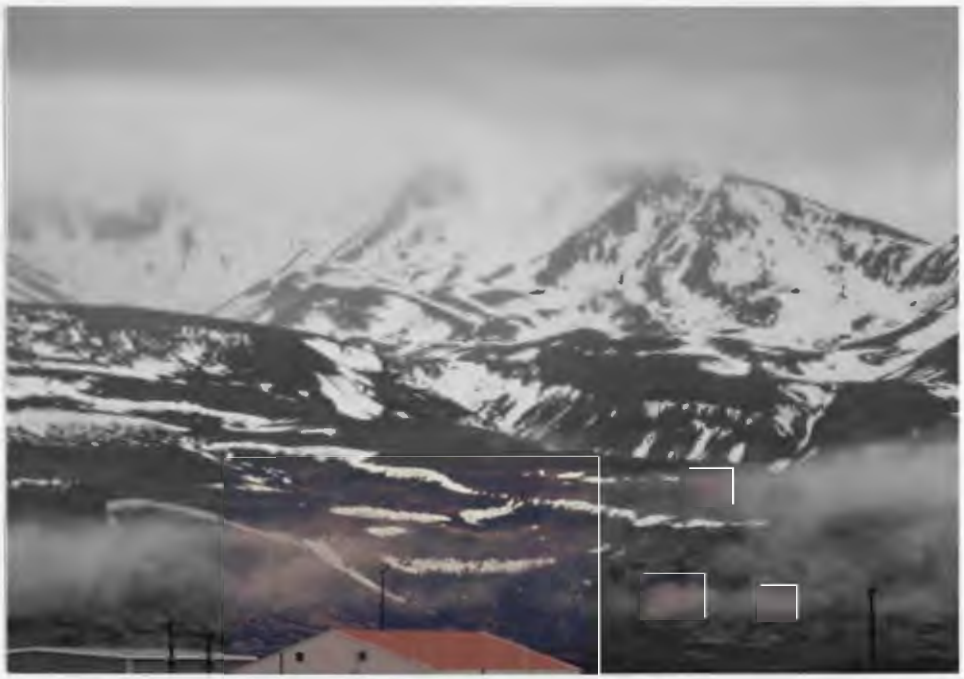
By Alaskan standards, Cold Bay temperatures are mild in both summer and winter. All-time extremes are recorded at +78^{o} F and -13^{o} F. For 1990, the high temperature was recorded at 68^{o}F in August and the low at 8^{o}F in February. The average February temperature is 27.5^{o} F and the August average is 51.2^{o} F. The average annual temperature is 37.9^{o} F, hence the name.

Nineteen-ninety was a wet, mild year overall. The annual temperature averaged 39.5^{o} F, slightly warmer than 1989. The number of cloudy days and days with measureable precipitation also increased from 1989. Accordingly, the amount of precipitation totaled 2.57 inches more in 1990. Temperature and precipitation may vary slightly but the wind remains the same.

December, 1990 stood apart as the third warmest December on record. The high temperature of 54^{o} F tied the December record for Cold Bay and several record high overnight lows were recorded. In fact, from 18 December to the end of the month, the mercury dipped below freezing only two times. So much for a white Christmas. Weather data for 1990 is summarized in Table 1.

The high and gusty winds typical of this area are generated each fall and winter as a continuous series of cyclonic low pressure systems sent to us by our Japanese and Soviet neighbors. The sequence of events in such systems are as follows: southerly winds and driving rains pelt the area, then calm as the "eye" of the storm passes, then northerly winds and blowing snow prevail as the "backside" of the low passes. There are the occasional nice days between systems, events which we "Aleuts by choice" enjoy so much.

Birds and mammals, which call the lower Alaska Peninsula home for all or a part of the year, thrive at varying levels of abundance. Adaptations have provided them the characteristics and behaviors necessary to prosper in conditions modern man views as inhospitable. Pacific brant and Taverner's Canada geese, our two primary fall migrants, make important survival-related use of the cyclonic lows we hide from. From 23 October to 10 November, these species picked storms of suitable intensity to give them supportive tail-winds along portions of their flight to Mexico and Oregon, respectively. Other species exhibit similar, albeit less dramatic, behavioral adaptations with respect to migration (or annual leave) all of which is largely dictated by climate.



Warm south winds and rain drove the snow line high up Frosty Peak in December. This phota was taken on December 29, 1990. Typically at this time, snow cover would be continous right down the mountain to the elevation behind the peak of the orange roof. MAC

Table 1. Weather Summary, Cold Bay, Alaska, 1990

	TEMPERATURE (F°)			PRECIPITATION (INCHES)		WINDS (MPH)		
Month	High	Low	Average (Deviation)	Amount (Deviation)	#Days (≥.01)	Average	1-Minute*	Gust
January	42	14	30.4 (+2.1)	3.99 (+1.29)	25	16.7	46	58
February	40	8	26.2 (-1.3)	2.18 (-0.09)	21	16.1	40	52
March	44	15	32.1 (+3.5)	1.84 (-0.47)	21	16.3	40	55
April	49	26	36.4 (+3.4)	1.16 (-0.79)	15	14.3	35	47
May	57	29	41.4 (+1.9)	3.23 (+0.76)	25	19.7	40	52
June	60	39	46.9 (+1.5)	1.38 (-0.78)	15	13.8	37	49
July	59	41	50.1 (-0.2)	2.13 (-0.37)	17	16.4	36	45
August	68	43	52.2 (+1.0)	2.89 (-0.81)	18	16.2	41	54
September	63	31	47.6 (+0.1)	6.55 (+2.78)	23	16.4	40	54
October	57	27	40.3 (+0.8)	4.21 (-0.08)	27	17.3	46	60
November	56	13	34.6 (+0.3)	2.06 (-1.98)	20	18.7	51	71
December	54	14	36.4 (+6.9)	5.96 (+3.11)	24	20.5	52	69
				37.58 (+2.57)	251	16.9		

* Greatest sustained wind for a 1 minute period.

C. LAND ACQUISITION

1. Fee Title

Native conveyed lands within the Izembek National Wildlife Refuge (Section 22g-Alaska Native Claims Settlement Act) and conveyed and selected lands adjacent to the Pavlof Unit of the Alaska Peninsula National Wildlife Refuge vary in resource value. The village corporations of King Cove, False Pass (Isanotski Corporation) and Pauloff Harbor have suggested they are interested in land exchanges. As a result, the Realty Division prepared Land Exchange Ascertainment Reports for lands belonging to each of these three Native Corporations. These reports were distributed in December of 1986 allowing further negotiations to proceed. Preliminary responses by the Native Corporations to appraised land values presented in the Realty Division ascertainment reports were not encouraging. Their trade lands, largely marsh, exposed coastline and areas adjacent to shallow estuaries, were evaluated at a quite low dollar/acre figure. Proposed United States Fish and Wildlife Service trade lands adjacent to the Cold Bay road system were, on the other hand, valued quite high due to their economic development potential. It will be necessary to negotiate a reasonable compromise if any land exchanges are to be consummated.

One meeting, resulting in little progress, was held with members of the Isanotski Corporation on March 14, 1990. Potential land exchanges between the Corporation and the Service were discussed.

In August 1989, the Nelson Lagoon Corporation contacted our Regional Office, Realty Division, with a proposal for a land exchange in the Nelson Lagoon area. The corporation wishes to acquire 195 acres from within the Pavlof Unit of Alaska Peninsula NWR (N1/2 Section 3; T52S; R74W - US Survey 1022 excluded) in exchange for the roughly 195 acres in the Kudobin Islands east of Nelson Lagoon (Sections 16, 17, 19, 20, 21, 29, 30; T48S; R75W.). Realty began work on the Environmental Assessment but notified us in February 1990, that this project has been "back-burnered" due to other priorities.

Bureau of Land Management realty specialists travelled to Cold Bay in July 1990 to inspect two parcels of land that the Federal Aviation Administration is relinquishing back to the Service. The two parcels, totalling approximately 1300 acres, are excess to the FAA needs and will be transferred to the refuge. One parcel is located north of Cold Bay around the VORTAC site and occupies 1270.40 acres. The second parcel is south of Cold Bay near the incinerator and covers 25.83 acres.

The final Alaska Submerged Lands Act Report was received in 1990. The report is a result of a provision of the Alaska Submerged Lands Act of 1988 which directed the Secretary of

Interior to prepare a report on the effects of the Act on Conservation System Units within Alaska. The report identifies, and estimates acreage, of all lands selected by, and conveyed to, Natives, Native Corporations and the State of Alaska within the boundaries of Conservation System Units. Additionally, priorities for acquisition of these lands are established and recommendations for reducing adverse impacts on Conservation System Units as a result of this Act are included. From the report, it appears that the Nelson Lagoon and Pauloff Harbor Corporations will be underselected by 3,728 and 1,815 acres, respectively. Additional selections by these corporations could come from refuge lands.

D. PLANNING

1. Master Plan

The Izembek National Wildlife Refuge Comprehensive Conservation Plan, mandated by the Alaska National Interest Lands Conservation Act in 1980, was finalized in 1985. We are currently operating under that plan.

In general, this plan restated the Fish and Wildlife Service's desire to continue management of Izembek Refuge as has been done since it was established in 1960. The Service selected a management alternative that will continue to manage 300,000 acres (95% of the refuge) as wilderness. The remaining 15,000 acres (5% of the refuge) consists of refuge land adjoining the City of Cold Bay and the associated road system. This land was not designated as wilderness in 1980, due to the extensive system of roads and disturbance from military habitation during World War II. Under the Service's preferred management alternative, this land will not be recommended for wilderness designation, but is designated as a Minimal Management Area in which development and vehicular access would be kept at current levels.

2. Management Plan

In March of 1989, permission was granted from the Regional Office to initiate work on a Wildlife Inventory Plan rather than a step-down Big Game Management Plan. The Wildlife Inventory Plan was to be a cooperative effort between refuge staff and Alaska Department of Fish and Game (ADF&G) personnel addressing agency responsibilities for the work done on Izembek's big game populations. A draft was completed in October 1989 and sent to ADF&G for comment. In January 1990, Refuge Manager West traveled to Anchorage and King Salmon to meet with ADF&G and Regional Office staffs to discuss the plan. Following the meetings it was determined that perhaps a cooperative agreement would better suit everyone's needs.

Work continued on the Izembek Fisheries Management Plan through 1990. The Kenai Fisheries Assistance Office is drafting the plan which is promised to be out in January 1991.

5. Research and Investigations

Izembek NR90 - "Range Ecology and Population Limitation of the Southern Alaska Peninsula Caribou Herd" (74520-1)

A cooperative investigation between the Refuge, Alaska Cooperative Wildlife Research Unit and the Alaska Department of Fish & Game was initiated to investigate the continuing decline of the Southern Alaska Peninsula Caribou Herd. Eric Post is the principal investigator under the direction of Dr. David Klein. The objective of the study is to determine the relationship between qualitative and quantitative characteristics of range vegetation and body size, reproductive success, adult cow and calf survival, and parturition dates in the Southern Alaska Peninsula Caribou Herd. Field work is scheduled to begin in 1991, continue through 1992 and culminate with analysis and a final write-up in 1993.

Personnel from the Alaska Fish & Wildlife Research Center continued their fall work on brant at Izembek in 1990. This year's work involved extensive radio tracking to determine arrival dates, departure dates and diurnal movements within the lagoon. Production counts for both black brant and emperor geese continued as did data collection on resightings of marked birds of both species. Details of the work are contained in Section G.3 Waterfowl.

Eelgrass seed, collected from hunter killed waterfowl, was again sent to Dr. Frederick Short at the University of New Hampshire. Over the years, Dr. Short has been conducting numerous eelgrass propagation studies.

Wildlife Biologist Dau drafted a manuscript for submission to Wildfowl magazine dealing with brant migration in relation to weather conditions at the time of departure. The abstract follows.

The Fall Migration of Pacific Flyway Brant in Relation to Climatic Conditions

ABSTRACT

The entire Pacific Flyway population, averaging approximately 140,000 brant, spends the fall staging period in the Izembek Lagoon area. The first brant arrive in mid-August and latest departures are in mid-November. The staging population peaks in mid-September with an average departure date of 4 November. The migratory phenology, behavior and population dynamics of brant have been studied by the Izembek NWR staff since 1957. This paper correlates these data with climatic conditions.

Brant depart Izembek Lagoon en masse normally at night with strong northwesterly tailwinds generated by anticyclonic weather systems. Average altitude of departing brant flocks, determined by radar observations, was 1149m. Thirty flocks were tracked by radar for an average distance of 75.4 km from the observation point on Izembek Lagoon. The trans-oceanic flight to Pacific coast wintering areas, primarily in Mexico, is probably nonstop. Estimated routes of flight were determined using surface and 850mb (approx. 1400m) weather charts on which wind speeds and direction are indicated. Average distance en route was 5301 km. Estimated time en route was 54.8 hours.

The short duration fall migration of brant from Izembek Lagoon is energetically costly as indicated by losses in body weight of over 30 percent in adult males and females.

Ken Pitcher (ADF&G), Chris Dau (FWS), David Johnson (ADF&G), Dick Sellars (ADF&G) and Robin West (FWS) prepared a publication detailing the history and current research of the Southern Alaska Peninsula Caribou Herd. The text is a publication of the Alaska Department of Fish and Game and is entitled "Causes of Low Calf Recruitment in the Southern Alaska Peninsula Caribou Herd and Recent Herd History".

Emphasis on understanding the decline of the Southern Alaska Peninsula Caribou Herd increased in 1990. CPD

E. ADMINISTRATION

1. Personnel

RM Robin West at Ushakovskiy, USSR — David Ward (AFWRC)

ARM Mark Chase with old 64 — Ken Pitcher (ADF&G)

Secretary Donna Christensen and Wildlife Biologist Christian Dau with tundra swans SZ and VH. MAC

Refuge Operations Specialist Julie Chase on the Christmas Bird Count MAC

Maintenance Worker Thomas Morey RLW

PERSONNEL

1.	Robin L. West	Refuge Manager GS-0485-12, PFT	9/12/88-Present
2.	Mark A. Chase	Assistant Refuge Manager GS-0485-11, PFT	5/07/89-Present
3.	Christian P. Dau	Wildlife Biologist/Pilot GS-0486-12, PFT	1/30/81-Present
4.	Julie E. Chase	Refuge Operations Specialist GS-0485-07, Permanent Intermittent	10/07/90-Present
5.	Thomas R. Morey	Maintenance Worker WG-4749-8, PFT	1/29/89-Present
6.	Donna Christensen	Secretary (Typing) GS-0318-5, PFT	7/01/90-Present
7.	Shirley Simpson	Secretary (Typing) GS-0318-5, PFT	12/18/88-5/5/90

Refuge Secretary Shirley Simpson resigned from the Service May 5, 1990, to move to Nome where her husband took a job with the Federal Aviation Administration. Her vacancy was filled by Donna Christensen on July 1, 1990. Donna came to Cold Bay from Soldotna when her husband took over as Flight Service Manager in Cold Bay.

Refuge Operations Specialist Julie Chase entered on duty October 7, 1990. Julie was laterally reassigned to Izembek from Attwater Prairie Chicken National Wildlife Refuge in Region 2. This is an intermittent appointment with funding for 1/2 of FY91.

Assistant Refuge Manager Mark Chase was promoted from GS-9 to GS-11 on May 20, 1990.

Refuge Manager West was detailed to the Regional Office to serve as Acting Migratory Bird Coordinator on December 3, 1990, and remained in that capacity through year's end.

Refuge Manager West also served on numerous short subsistence details in 1990.

A five year summary of the Izembek staffing pattern is included in Table 2.

Table 2. Five Year Staffing Pattern, Izembek NWR.

	Permanent			
	Full Time	Part Time	Temporary	Total FTE's
FY 86	5	-	2 (YCC)	5
FY 87	5	-	2 (YCC)	5
FY 88	5	-	2 (YCC)	5
FY 89	5	-	2 (YCC)	5
FY 90	5	-	-	5

2. Youth Programs

The refuge did not participate in the Youth Conservation Corps Program in 1990. After planning and advertising, only one application was received and this was from someone who had no housing in Cold Bay and would not be available for 2 to 3 weeks of the program. As a result, the program for 1990 was cancelled.

4. Volunteer Program

One volunteer was signed up for 1990. Julie Chase volunteered for work from the time of her arrival in mid-August until the end of the fiscal year. Julie put in roughly 80 hours assisting the Alaska Fish & Wildlife Research Center personnel working on the brant project. Details of the project are included in Section G.3 Black Brant.

5. Funding

Fiscal year 1990 funding was reduced to its lowest level since 1986. However, with the absence of a secretary for 2 months and a Government Printing Office contract not costing as much as expected, no programs suffered. A five year funding summary is provided in Table 3.

Table 3. Five Year Funding Summary, Izembek NWR (000's)

	1260	1360	1210	8610	Total*
FY 86	385				385
FY 87	432		3		435
FY 88	442				442
FY 89	478			28	478
FY 90	428[1]			47	428

* - 8610 Funds are excluded.
1 - includes 4K in earmarked MMS Funds.

6. Safety

No lost-time accidents involving refuge staff or cooperators occurred in 1990. There were however, three fatalities occurring on or adjacent to the refuge in 1990.

On February 17, 1990, a Peninsula Airways Navajo crashed on King Cove Corporation land near Lenard Harbor taking the life of the pilot. The plane had just departed the King Cove airstrip after dropping off a load of passengers; the pilot was the only one on board. A number of snow squalls passed through the area that day and may have contributed to the crash.

A second plane crash fatality occurred on December 21, 1990 when a MarkAir Caravan (Cessna 208) went down en route on a mail/freight run from Cold Bay to False Pass; the pilot was the only one aboard. The crash site was located near Hot Springs Bay near the terminus of the Alaska Peninsula within the Pavlof Unit on a parcel of land selected by both the State of Alaska and the Aleut Corporation (Sec. 31; T60S; R92W). High, gusting winds are suspected of contributing to the crash.

Another fatality occurred in the Pavlof Unit area in June due to Paralytic Shellfish Poisoning (PSP). A Sand Point resident died after eating clams dug from the Volcano Bay area on the Pacific side of the Peninsula. In addition to the single fatality, at least 12 other cases of PSP were reported from area villages in June. It seems all the contaminated clams came primarily from the Volcano Bay area. The clams were taken from State of Alaska owned tidelands; the surrounding uplands are native conveyed lands from the Pavlof Unit. State of Alaska health officials took the lead in notifying area residents of the health threat.

Staff safety meetings were held more-or-less monthly throughout the year as staff was available. Topics in 1990 included bear safety, diet, health and exercise, hypothermia, boating safety, military ordnance, earthquake/tsunami safety, fire safety, and safety around the new backhoe/loader.

The "Bomb Craters Camping Area" remained closed through 1990. The area is a favorite camping spot for waterfowl hunters as the craters offer protection from the infamous area winds. The area (±3 acres) was closed to the public when Refuge Manager West discovered an unexploded 20 mm round in October of 1989. Fort Richardson Explosive Ordnance Disposal personnel came out to inspect the site in November of 1989 but snow cover precluded any work. Fort Richardson personnel returned in June 1990, to inspect and clean up the site. During a three day inspection, 77 pieces of ordnance including 20 mm shells, 37 mm anti-aircraft shells, part of a 23# fragmentation bomb, and a number of various fuses were discovered and disposed of. An operating plan for the area was drafted and submitted to the Regional Office for approval in June 1990.

8. Other Items

Special Regulations

With the passage of ANILCA in 1980, existing Special Regulations for the Izembek and Unimak Units were abolished. Resubmissions of the Special Regulations for Izembek and Unimak and submissions for the Pavlof Unit have been made in 1982, 1985, 1986, 1987, and 1989. Late in 1990 work began to resubmit the Special Regulations packet again. We are hopeful that this effort will meet with success.

Special Use Permitting

Seventeen Special Use Permits were issued for 6 different activities in 1990. Permitted activities include:

Big Game Guiding.....8	Tent Frame Maintenance..2
Gravel Removal.....4	Radio Navigation Tower..1
Geological Surface Investigation.....1	Seismic Station.....1

One request for a Big Game Guiding permit was formally denied in 1990, keeping with the Service's "moratorium" policy on this activity.

Relative to the Special Use Permitting program, Refuge Manager West met with Regional Office staff to discuss the compatibility issue in February 1990. The meeting was in response to the Government Accounting Office's report dealing with compatibility issues on National Wildlife Refuges.

Staff Training in 1990

Refuge Manager West		
EEO for Mangers & Supervisors	Anchorage	February
Law Enforcement Annual Refresher	Marana, AZ	March
Drug-Free Work Place	Anchorage	April
NPI Small Purchases Seminar (Warrant Authority)	Anchorage	May
Assistant Refuge Manager M. Chase		
Arctic Survival	Eielson AFB	January
Introduction to Supervision (OPM)	Anchorage	February
Law Enforcement Annual Refresher	Marana, AZ	March
Drug-Free Work Place	Anchorage	April
Wildlife Biologist/Pilot Dau		
Technical Writing	Anchorage	January
OAS Annual Ground School	Anchorage	December
DBase III+ (self study video)	Cold Bay	December
Refuge Operations Specialist J. Chase		
DBase III+ (self study video)	Cold Bay	December
Maintenance Worker Morey		
Retirement Seminar	Anchorage	March
"Investing in Excellence"	Cold Bay	March
Secretary Christensen		
DBase III+ (self study video)	Cold Bay	December
Secretary Simpson		
"Investing in Excellence"	Cold Bay	March

Ordnance discovered during inspection of the "Bomb Craters" area. Left to right: .30 caliber shell, mine fuse, .50 caliber tracer (red tip), 20mm shell, some kind of fuse, 37mm anti-aircraft round and two other parts of some kind of fuses. MAC

Ft. Richardson E.O.D. personnel sandwich ordnance between layers of high explosive for disposal. - BOOM! MAC

F. HABITAT MANAGEMENT

1. General

Protection and preservation of habitat integrity has long been the management goal of Izembek staff. The area administered from the Cold Bay office is chiefly wilderness in the adjective sense and a large portion is wilderness in the legal sense. For this reason, active management in conventional terms (i.e., water level manipulations, farming etc.) is not necessary, nor is it feasible, to meet refuge goals. Instead, habitat integrity is maintained, rather than restored, primarily through the management of the activities which persist in the area. Thus far, demands in the area have been largely upon fisheries and wildlife resources rather than on habitat resources (i.e., mining, oil/gas development).

Serious challenges to the habitat integrity have not come about though some seem to continuously loom in the wind. Though Izembek and much of the lower peninsula were evaluated as having zero to low hydrocarbon development potential, it seems the threat of offshore oil and gas development in the Bering Sea just will not go away. Should it ever come to pass, Cold Bay will surely be a hub for maintenance and transportation to offshore rigs. Increased air traffic over the lagoon could prove disastrous to staging waterfowl. Perhaps the greatest potential consequence as of result of offshore oil development would occur with an "EXXON VALDEZ" repeat in the Bering Sea. A single incident of this type near Izembek Lagoon during the staging period could nearly extirpate the Pacific black brant and gravely impact the Steller's eider and emperor goose populations.

Additional management challenges have come about by the confounding land status of the lower peninsula brought about by ANCSA & ANILCA. Native and state selections and conveyances have hit the Pavlof Unit particularly hard. Though specific land development plans of the villages are unknown at present, they will surely center on an economic return for the shareholders. Roads, harbors, canneries, gravel mining and hydro-electric development have all been mentioned as potentials. Increased development around the refuge will surely place additional demands on the refuge proper.

2. Wetlands

In 1986, the United States joined the Convention on Wetlands of International Importance Especially as Waterfowl Habitat. The Convention, commonly known as the RAMSAR Convention by its meeting in Ramsar, Iran in 1975, is dedicated to curbing world-wide wetland losses and has 53 member nations. Upon joining the Convention, a nation must designate at least one wetland

whose importance goes well beyond the political boundaries of the country; it must be a wetland of international importance.

Upon joining The Convention, the U.S. designated four wetlands of International Importance, all within the National Wildlife Refuge System. Izembek NWR and State Game Refuge, Ash Meadows NWR, Edwin B. Forsythe NWR and Okefenokee NWR were all ratified on 18 December 1986 as Wetlands of International Importance. Since that time, three more wetlands, Everglades National Park, Chesapeake Bay Wetlands System and Cheyenne Bottoms Wildlife Area have been added by the United States.

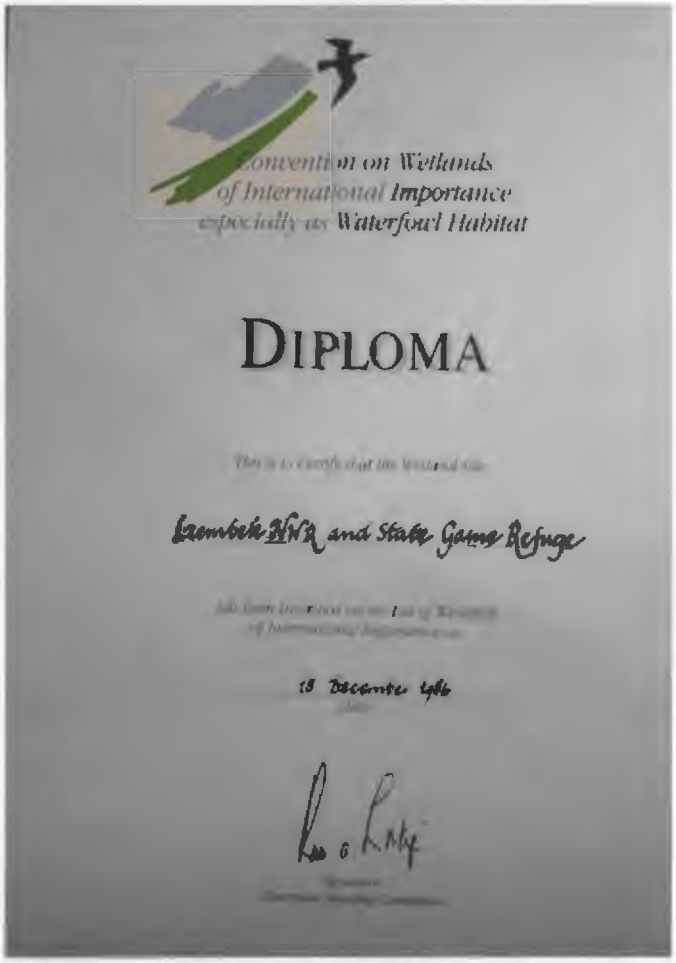
Criteria for listing of a wetland is specified in the Federal Register; Volume 54, No. 68; Tuesday, April 11, 1989. The rational for the listing of Izembek NWR and State Game Refuge is obvious to anyone who has visited Izembek during the fall waterfowl staging period. Nearly the entire Pacific black brant population is present to fatten up on eelgrass prior to their migration south to Mexico. Additionally, the lagoon supports significant numbers of Taverner's Canada geese, emperor geese, Steller's eiders and a multitude of other ducks. The waterfowl all come to Izembek to exploit the abundant food resources for putting on fat reserves for the upcoming winter or migration south.

The eelgrass beds within the lagoon are probably the largest of their kind anywhere in the world. It is estimated that the eelgrass of Izembek Lagoon produces and exports, in the form of detached plants, 166,000 metric tons of carbon, 7,400 metric tons of nitrogen and 1,660 metric tons of phosphorous to the Bering Sea on an annual basis.

With the support of the waterfowl, who know no political boundaries, and the contribution to the Bering Sea food web, and ultimately the international commercial fishery, it is easy to see Izembek truly is a wetland of international importance. In 1989, the headquarters received a diploma from The Convention recognizing Izembek as a designated Wetland of International Importance.

Although the Izembek Lagoon and other lagoon systems are the wetlands of primary concern, the variety of other wetland types are important as well. Excluding the lagoon, Izembek is nearly 87% wetlands. Of the total area, approximately 61% is low ericaceous tundra, 19% is ponds, lakes and river systems and 7% is grass/sedge marsh. These other wetlands are critical to the well being of the lagoon in contributing to the water quality of the flow into the lagoon. The Pavlof and Unimak Units contain substantially smaller proportions of wetlands since the terrains there are dominated by mountains. Important wetlands in these areas are the riverine systems with their associated grass/sedge meadows. In all cases, "management" is through preservation.

In October 1990, the refuge received a copy of the State of Alaska Department of Natural Resources' guidelines for state owned shorelands adjacent to land not in state ownership. In the report are guidelines that the state will apply to management decisions on these areas. This has particular application to the refuge in that the Izembek Lagoon, below the ordinary high water mark, is State of Alaska owned.



Izembek Lagoon is a Wetland of International Importance RLW

6. Other Habitats

Tundra

In 1989, the United States Corps of Engineers developed a plan to conduct a preliminary sampling investigation of former Department of Defense installations located at Scotch Cap and Cape Sarichef on Unimak Island. In January 1990, the refuge received a copy of the Hazardous and Toxic Waste Report for Cape Sarichef and Scotch Cap. Shortly after that in February 1990, the refuge received the draft Pre-Design Report which is the first of a three-phase process to identify and remove contaminants from the Department of Defense sites. Comments were made on the draft Pre-Design Report and submitted to the Corps of Engineers. In May 1990, a final Pre-Design Report was received incorporating the refuge's comments. The refuge expressed the desire for the clean-up to be complete as opposed to a piece-meal approach of cleaning up isolated contaminant sites first and then possibly dealing with structures and less hazardous contaminants in the future. No clean up work has been initiated thus far.

12. Wilderness and Special Areas

Large portions of the Izembek and Unimak Units are designated wilderness. As mentioned earlier, the entire area is basically wilderness but 300,000 acres of Izembek and 910,000 acres of Unimak enjoy the formal designation. Currently, all the areas are "managed" as wilderness and there have not been any serious threats to lands designated wilderness or otherwise. It's only a matter of time however, before a serious issue threatens the habitat of the lower peninsula. Hopefully, official designation will afford some additional habitat protection. There are several areas within the Pavlof Unit which meet wilderness criteria. Designation procedures should be initiated as soon as land ownerships are clear and the dust has settled from the ANCSA conveyances.

Frosty Peak in the Izembek Wilderness MAC

G. WILDLIFE

1. Wildlife Diversity

Approximately 142 species of birds and 23 species of mammals have been reported as residents and/or migrants on Izembek NWR. At least 25 species of fish have been documented with most all of these being marine for some period of their lives. Primary resident and anadromous species include chum, pink, red, and silver salmon, dolly varden, arctic char, sticklebacks and, in much smaller numbers, steelhead and king salmon. The marine species are reported from Izembek Lagoon and from Cold Bay.

2. Endangered and/or Threatened Species

The presence of the Aleutian Canada Goose (B.c. leucopareia) on the Izembek Refuge was documented in 1987 when a tarsal banded individual of the subspecies was observed. Canada geese are monitored closely by observers making composition counts and hunter bag checks in the Izembek Lagoon area. The single encounter of this subspecies, considering all that have been marked, suggests they are rare stragglers to the lower peninsula.

Due to population increases and successful transplant efforts, the Aleutian Canada goose may soon be considered for downlisting to threatened status.

Arctic and American races of the peregrine falcon (F.p. tundrius and F.p. anatum, respectively) may occur in the area during migration but their presence has never been documented. The non-endangered Peales' (F.p. pealei) race is a fairly common resident of the area.

Evaluations of the population and taxonomic status of the Amak song sparrow (Melospiza melodia amaka) and the Amak tundra vole (Microtus oeconomus amakensis), both of which only occur on Amak Island, are underway and their designation as threatened or endangered is under review. Amak is an isolated island of volcanic origin lying approximately 10 miles offshore in the Bering Sea northwest of Izembek Lagoon. Some limited field work was undertaken in 1987 however, the data obtained proved inconclusive. Additional field work and research is necessary in order to document the population size and taxonomic status of the subspecies.

A petition to list both the Steller's (Polysticta stelleri) and spectacled eider (Somataria fischeri) under the provisions of the Endangered Species Act was received by the Fish and Wildlife Service in December. Since a majority of Steller's eiders winter at Izembek, refuge staff were busy preparing information on this species. A petition finding will be completed by Fish and Wildlife Enhancement staff in early 1991.

3. Waterfowl

Izembek supports an abundance of waterfowl both in total numbers and in species diversity. Most all of the "typical" North American species visit Izembek as well as a few vagrants from the Old World. Eurasian wigeon (Anas penelope) and common teal (A.c. crecca) are regular visitors seen each year. Tufted ducks (Aythya fuligula) and possibly common pochards (A. ferina) have been observed. An unconfirmed spectacled eider sighting was received in 1989, the third such report since work began in the area in the 1960's. The other eiders, Steller's, common, and king, are regular migrants at Izembek.

Steller's are the most abundant from fall through spring followed by a few commons and even fewer king eiders. King eiders are present each year but typically in small numbers in both Izembek Lagoon and Cold Bay. A very few white-fronted geese spend the fall at Izembek amidst the flocks of emperor and Canada geese. One sighting was made in 1990 however, no snow geese were reported when in most years one or two are seen.

Tundra Swan

Tundra swan nest throughout lowland habitats of the Izembek, Pavlof and Unimak Units of the refuge. Historical information is scant and subjective however, indications are that summering swans have always been numerous. Winter observations are even more sparse but suggest that prior to 1970 few swans overwintered. This trend changed during the 1970's and 1980's when 500 to 600 tundra swans wintered near spring-fed lagoons on Unimak Island. Based on neck collaring information, this wintering population may have amounted to essentially all of the swans using the Unimak and Izembek Units of the refuge. Conversely, the swans of the Pavlof Unit have been found to be strictly migratory.

Evaluations of habitat utilization, population size and productivity of tundra swans was begun in 1977 and has proven useful in managing and protecting ecological units of the refuge. Tundra swans require remote, undisturbed habitats such as that characterizing much of the Izembek Refuge. Knowledge of this key indicator species continues to be valuable in determining the health and stability of refuge habitats.

One of our refuge mandates is to conserve populations and habitats in their natural diversity. The annual surveys conducted on tundra swans by the refuge staff are important in fulfilling this essential purpose of the refuge. Surveys include aerial assessments of the spring population size, distribution, habitat use and production. To facilitate and augment these evaluations, numerous swans have been captured and neck collared for individual identification. Visibly marked swans have not only aided our evaluations during the nesting and brood rearing seasons, but also identified migratory and non-migratory trends in birds from various areas of the refuge. The importance of collecting these data on an annual basis became apparent in the late 1980's when the Izembek Unit swans began to decline in numbers and to alter their migratory behavior.

Beginning with the winter season of 1987/88, dramatic departures from the non-migratory characteristics of the Izembek and Unimak populations began. During nine winters prior to 1987/88, only 16 neck collared birds from this population (eight in one family) had been seen in the Pacific northwest as far south as California. The normal winter haunt

for the 500-600 swans in the Izembek population was the Peterson Lagoon area of the Unimak Unit. Beginning with the winter of 1987/88 a departure from the historic wintering pattern began with 24 different marked individuals observed from Calgary, Alberta, Canada to Ensenada, Baja California, Mexico. Eight additional marked birds were seen during the 1988/89 winter period, one as far south as central California. Three swans were observed singly during spring migration in 1989 in Idaho, Montana, Saskatchewan and Alberta. A total of 22 other marked swans were observed during the winter of 1989/90 from southern British Columbia to northern California.

From the winter of 1989/90 and throughout 1990, a total of 31 resightings of 15 individual neck collared tundra swans captured at Izembek were reported. The temporal and spatial distribution of winter resightings was similar to that pattern observed during the previous two winters (Figure 3). A sizable network of observers exists throughout the Pacific northwest and their efforts indicate that the lower Columbia River area, especially locations on or near the Ridgefield NWR, are important to Izembek tundra swans.

Spring resightings in 1990 included our first reports of Izembek tundra swans in other breeding areas in Alaska or at staging areas utilized by other breeding populations. These resightings were all of known-aged swans that were potential breeders in 1990. Tundra swan Z4 was captured as a second-year female in 1987. It was in its fifth year when resighted in May 1990, near King Salmon, Alaska along with hundreds of other swans. Tundra swans in this important staging area are viewed each spring and Z4 is our first reported sighting from that location. In November 1990, Z4 was seen with 28 other tundra swans near Hillsboro, Washington and was reported the previous winter near the Ridgefield NWR. Swan 5X was a second-year male captured in 1988 and reported in January 1990, in the Sacramento Valley of California. In late April, 5X was on the Susitna Flats, west of Anchorage, an area especially important to tundra swans migrating to western Alaska.

The 14 May sighting of swan ZZ along the coastal fringe of the Yukon-Kuskokwim Delta is the most significant report of 1990. Swan ZZ was a second-year female when captured in 1987. It was observed in California from December 1987 to February 1988 and not seen again until the spring of 1990. It was a five year old female in 1990 and a potential breeder however, ZZ was seen only on 14 May with eight other swans. Another bird, X2 was a four year old female when shot in 1989 along the lower Kuskokwim River. Reports of ZZ and X2 suggest that some portion of the Izembek Unit population of 500 to 600 swans may have been absorbed into the Yukon-Kuskokwim Delta population that may include up to 70,000 swans. Such a distributional shift will be difficult to document even though a moderate number of Izembek swans are marked.

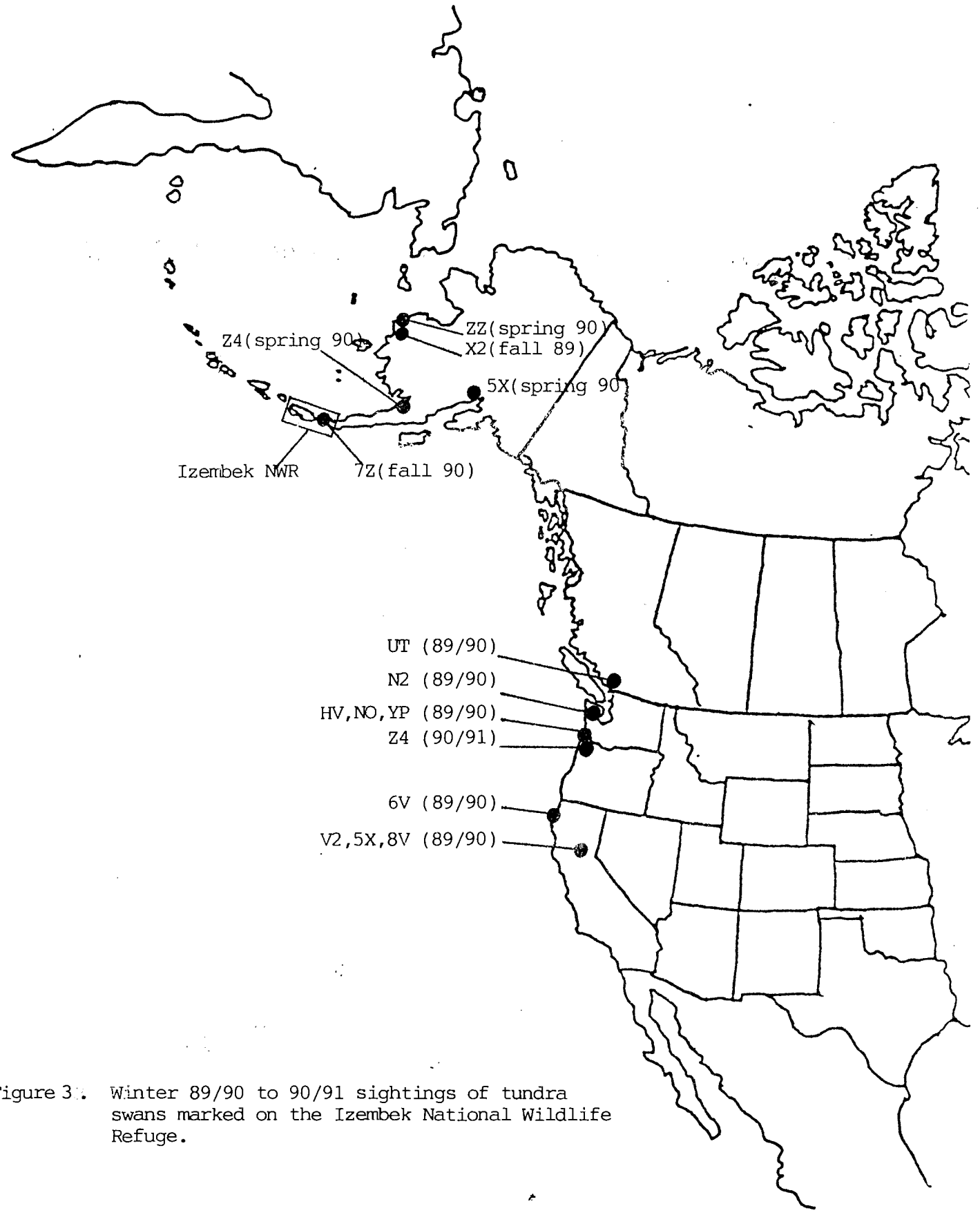


Figure 3. Winter 89/90 to 90/91 sightings of tundra swans marked on the Izembek National Wildlife Refuge.

The causative factors involved in such a drastic shift in winter and potentially spring distribution are speculative. Fall and early winter climatic conditions at Cold Bay show typical levels of variation and a long-term trend toward milder winters. Wintering habitat conditions at Peterson Lagoon on Unimak Island, the primary historical winter use area, have not appeared to differ significantly in recent years. However, unknowns such as winter food availability, behavioral responses to crowding or disturbance factors may be involved. Another theory, as mentioned, is that Izembek swans may have been absorbed into larger breeding populations. Whatever the cause, the resulting change in winter distribution is remarkable.

Spring nesting surveys of the Izembek Unit have been no less remarkable. Total birds and nesting pairs observed in 1988 were down 48 and 53 percent, respectively from the previous nine year average. In 1989, surveys indicated a 14 percent increase in population size over the 1988 level which was attributable to an increase in flocked birds as nesting pairs declined another 36 percent. In 1990, the number of nesting pairs (up 156%) and total birds (up 9%) in the spring population increased, however, these groupings were 11 percent below the long-term average (Tables 4 and 5). The number of flocked swans (subadults and non or failed breeding adults) increased 43 percent in 1990 over the 1989 level and was 29 percent above the long term average. Numbers and production of tundra swans using the Izembek Unit have been erratic over the past three years and aerial surveys will be continued to monitor future trends.

The fates of tundra swan nests located on or near the Izembek Unit suggest nesting success remains at a low level although the 57 percent success rate observed in 1990 (Table 6) is above the 11 year average of 51 percent. In 1990, 69 percent of successful nests had cygnets reach flightstage versus the 11 year average of 55 percent. Extremely poor fledgling success of 27 percent occurred in 1988. Increasing numbers of nesting birds along with higher rates of nest success and brood survival in 1990 may help the Izembek Unit population rebound from declines in 1988 and 1989.

The winter of 1990 was extremely mild both in terms of temperature and precipitation. In early November waterbodies, including some saltwater areas, froze but thawed by mid-month. December temperatures were 6.9 degrees above normal with average highs and lows of 40.7 and 32.1 degrees, respectively. All ponds were ice-free throughout the month and into the second week of January with no snow cover below 1000 feet of elevation.

Reconnaissance of the Izembek and Pavlof Units in December 1990 and January 1991 suggested a minimum of 52 swans wintered from Moffet Bay south to Bechevin Bay while only two were seen from the Izembek boundary north to Herendeen Bay. A similar pattern

Table 4. Spring nesting surveys of tundra swans on the Izembek Unit and the western portion of the Pavlof Unit NWR, 1978-1990.

	No. of Swans Observed (% of Total)							
	Singles	Swans (nesting pairs)	Swans (other pairs)	In Groups	Total	Area Cov. (sq. mi.)	Density (sq. mi.)	No. of Collared Swans Seen
5/8/78[1]	6(8)	18(23)	26(33)	28(36)	78	315.5	.25	n/a
4/25,28/79[2]	10(5)	24(12)	96(47)	75(36)	205	413.9	.50	12
5/14-15/80	9(4)	60(26)	84(36)	80(34)	233	413.9	.56	1
5/13,15/81	16(8)	58(29)	94(48)	29(15)	197	413.9	.48	21
6/2,6/82[3]	11(5)	68(30)	92(41)	55(24)	226	413.9	.55	23
5/31-6/1/83[3]	8(4)	48(21)	94(41)	77(34)	227	413.9	.55	37
6/7-8/84[3]	5(2)	78(35)	54(25)	85(38)	222	413.9	.54	42
5/28,30,6/1/85	20(7)	54(20)	52(20)	140(53)	266	413.9	.64	32
5/20/86	11(5)	70(29)	66(28)	90(38)	237	413.9	.57	24
5/19/87	7(3)	76(36)	50(23)	81(38)	214	413.9	.52	30
5/18-19/88	7(6)	28(24)	42(36)	41(35)	118	413.9	.29	7
5/30-31/89[3]	3(2)	18(11)	~~40(24)~~ 80(47)	69(41)	170	413.9	.41	6
5/21-22/90	9(5)	46(25)	32(17)	99(53)	186	413.9	.45	3
Avg. 1979-1990	10(5)	52(25)	~~69(33)~~ 70(34)	77(37)	208	413.9	.51	20

[1] Cathedral lakes, lakes south of Mortensen's Lagoon and west side of Morzhovoi Bay areas not covered. Other areas not covered thoroughly.

[2] Survey done too early to include peak of nesting.

[3] Survey late for peak of nesting.

Table 5. Numbers of swans using the Izembek refuge in relation to winter distributional shift.[1]

Date	Number of Swans Observed (%)					Area Cov. (Sq. Mi.)	Density (Sq. Mi.)
	Singles	Nesting Pairs	Non-nesting Pairs	In Groups	Total		
Average[2] 1979-87	10.8±4.6	59.6±16.7	75.8±20.0	79.1±29.5	225.2±20.0	413.9	.55±.05
(range)	(5-20)	(24-78)	(50-96)	(29-140)	(197-266)		(48-64)
Average 1988-90	6.3±3.1	30.7±14.2	38.0±5.3	69.7±29.0	158.0±35.6	413.9	.38±.08
(range)	(3-9)	(18-46)	(32-42)	(41-99)	(118-186)		(.29-.45)
% change[3]	-42	-49	-50	-12	-30		-31

1 Survey area: Izembek Unit, Pavlof Unit south of Cold Bay and Izembek Unit north to Cathedral River.

2 Period prior to shift in winter distribution and decline in summering swans.

3 From 1979-87 average.

Table 6. Summary of 1990 tundra swan nests, Izembek NWR.

Nest No.(Survey No.)	Collar[1] Status	Est. Clutch Size	Status	Brood Size	
				Class I	Class II/III
1(2)	UCP	6	Destroyed	-	-
2(4)	UCP	UNK	Hatch 2	2	2
3(5)	UCP	5	Hatch 5	5	5
4(8)	UCP	5	Hatch 4	4	4
5(9)	UCP	3	Destroyed	-	-
6(14)	UCP	UNK	Destroyed	-	-
7(16)	DCP	3	Destroyed	-	-
8(19)	UCP	UNK	Hatch	-	-
9(20)	UCP	4	Hatch	2	2
10(31)	SCP	4	Hatch 4	-	-
11(32)	UCP	6	Hatch 5	5	5
12(33)	UCP	UNK	Destroyed	-	-
13(34)	UCP	3	Destroyed	-	-
14(38)	UCP	5	Destroyed	-	-
15(40)	UCP	6	Hatch 5	5	4
16(45)	UCP	UNK	Destroyed	-	-
17(46)	UCP	5	Hatch 3	3	3
18(50)	UCP	UNK	Hatch	2	2
19(51)	UCP	UNK	Hatch	2	2
20(56)	UCP	5	Destroyed	-	-
21(57)	UCP	5	Hatch	-	-
22(58)	UCP	UNK	Hatch	-	-
23(59)	UCP	UNK	Destroyed	-	-
Average		4.6	Nesting Success 56.5%	3.3	3.3

1-UCP = uncollared pair, DCP = double collared pair, SCP = single collared pair.

Table 7. Summary of tundra swan nesting surveys on the Pavlof Unit, Izembek NWR.

Date	Survey Coverage (Maps)	Single	Single w/nest	Pair w/nest	Pair w/brood	Pair w/o nest or brood	Swans in flocks	Total Swans	Area Surveyed (mi^2)	Density (swan/mi^2)
6/12/84	D-5,6	11	5	16	10	39	25	171	281.6	.61
6/6-10/85	C-5,6 D-5,6	35	5	16	0	124	166	486	502.8	.97
5/16-21/86	C-5,6 D-4,5,6	46	18	38	0	92	182	506	678.6	.75
5/27-28/87	C-5,6 D-3,4,5,6	48	14	40	0	91	196	520	707.6	.73
5/19-23/88	C-5,6 D-4,5,6	66	17	35	0	97	287	634	678.6	.93
5/31-6/1/89	C-5,6 D-3,4,5,6	46	12	40	1	147	245	679	707.6	.96
Average 1986-1989 (± 1SD)		52 (10)	15 (3)	38 (2)	0	107 (27)	228 (48)	585 (85)	690 (14)	.85 (.13)
% Change in 1989		-12	-20	+5	0	+37	+8	+16		+15

Table 8. Proportions and densities of single and paired swans in relation to flocked swans on the Pavlof Unit, Izembek NWR.

Year	Swans observed			
	Singles & Pairs (% of total)	Density ($birds/mi^2$)	Flock of birds (% of total)	Density ($birds/mi^2$)
1984	146 (85)	.52	25 (15)	.09
1985	320 (66)	.64	166 (34)	.33
1986	324 (64)	.48	182 (36)	.27
1987	324 (62)	.46	196 (38)	.28
1988	347 (55)	.51	287 (45)	.42
1989	434 (64)	.61	245 (36)	.35
Averages (SD)	66 ± 10	.54 ± .07	34 ± 10	.29 ± .11

was observed during the winter of 1989/90 however, a flock of 10 birds remained on the Caribou River flats. No estimate of wintering swans on Unimak Island was obtained last winter (1989/90) nor thus far this winter.

Tundra swans nesting from the Black Hills north to Herendeen Bay, on and adjacent to the Pavlof Unit, were surveyed annually from 1984 to 1989. Data obtained help identify the distributional breeding range of the semi-migratory swans of the Izembek Unit and identified Pavlof Unit birds as being migratory. The number of swans on the Pavlof Unit were analyzed on the basis of aerial surveys on up to six 1:63,360 scale maps covering most of the available nesting habitat (Table 7).

Total numbers in 1988 and 1989 were over 100 swans higher than the 1987 level while Izembek Unit swans declined by a comparable number. Because we have marked numerous swans in both areas without finding evidence of interchange, we believe these population changes may be independent of each other. Flocked swans, either immature or non or failed breeding adults, amounted for 68 and 31 percent of the 1988 and 1989 increases, respectively. Single and paired swans, on the other hand, are indicative of the number of breeding birds in the population. The density of birds seen as singles and pairs has remained relatively constant over the six years ($x = .54$ birds/mi^2, range .46 to .61) suggesting that observed population increases may be most influenced by annual rates of production (Table 8).

In 1988, nesting success was 88 percent on one map segment of the Pavlof Unit. Productivity surveys have not been performed annually however, it is possible that the higher rate of nest success and survival observed in 1988 are representative of this population and could be responsible for increasing numbers of birds in flocks and for most of the total population increase observed in 1988 and 1989. Our swan survey funding was restored for FY91 to help fund statewide trumpeter swan surveys. We hope to be back on track with this important project in 1991.

Black Brant

Essentially the entire Pacific Flyway brant population, an average of approximately 140,000 birds, uses the Izembek Refuge for up to three weeks each spring and eight weeks each fall. These birds breed in Alaska, Canada and the Soviet Union (Figure 4). The short duration spring staging period is characterized by a gradual transition through the Izembek Lagoon area beginning normally in late April. By mid-May, most brant have departed the area for northerly breeding areas. In fall, the pattern is altered and the population builds to a peak in mid-September and remains at peak levels until they depart for wintering areas in late October or early November.

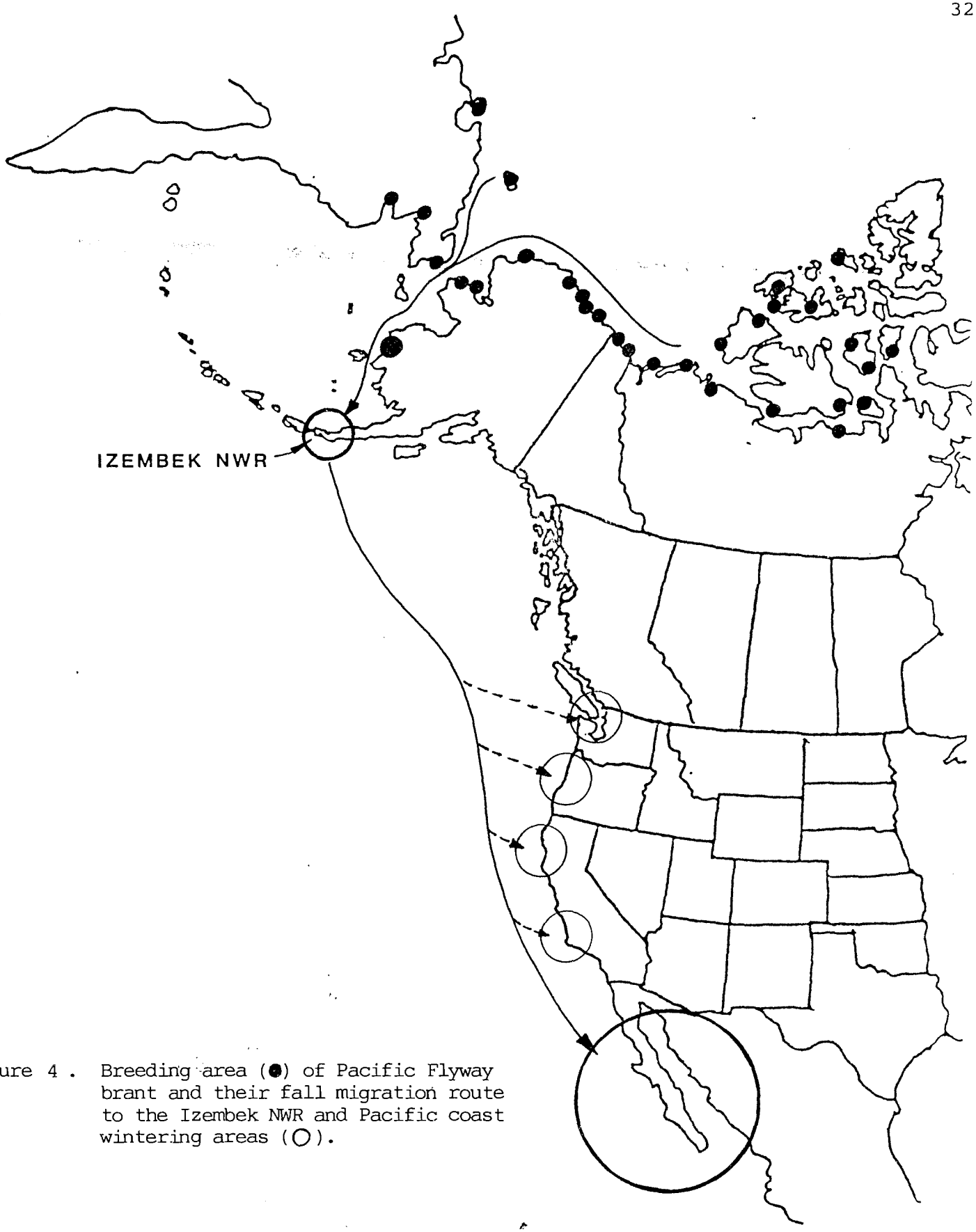


Figure 4 . Breeding area (●) of Pacific Flyway brant and their fall migration route to the Izembek NWR and Pacific coast wintering areas (○).

The fall migration from Izembek Lagoon is largely en masse and after a 55 hour and 3,300 mile flight, they arrive in coastal Baja California. The phenology of this fall flight in relation to climatic conditions is the subject of a paper submitted for publication by the refuge (D.5 Research and Investigations). Brant investigations performed on an annual basis are directed toward the collections of fall data on productivity and population size. These data are collected by a variety of ground and aerial survey efforts performed by not only the Izembek refuge staff but also by personnel with the Alaska Fish and Wildlife Research Center and the Migratory Bird Management Division.

The Izembek refuge staff continued to provide assistance to Migratory Birds - Waterfowl Investigations personnel in Juneau by monitoring the numbers of black brant over-wintering in Izembek and adjacent lagoons. These data are important in assessing the distribution and abundance of brant, flyway wide, as determined from the annual mid-winter surveys conducted in January. An aerial survey conducted on 30 November resulted in a count of 4,950. Another count was made on 9 January 1991 while the mid-winter survey was underway and 4,350 brant were observed in areas from Izembek Lagoon south to Unimak Island. In the past 10 years an average of 5097 brant (range 2,075-9,860) have over-wintered at the Izembek Refuge. This is in contrast to subjective reports from the 1950's to 1970's when brant apparently overwintered in the hundreds. Milder winters in recent years may be an important factor allowing more brant to winter in Alaska. Other potential causative factors such as nutrition or disturbance could be preventing brant from assimilating the body reserves necessary to perform the strenuous fall migration.

The first spring arrivals of brant at Izembek were on 10 April, peaking on about 19 April. Normally, arrival occurs over about a 10 to 15 day period and flocks of a few hundred up to a thousand are observed during daylight hours flying northwest over Cold Bay. As these birds near the head of Cold Bay, they rise to altitudes up to 1,500 feet AGL to cross the Alaska Peninsula before descending into Izembek Lagoon. Some of the spring influx occurs during nocturnal hours and may not be detected at Cold Bay. A total of 76,528 brant were counted in the Izembek/Kinzarof Lagoon areas on 2 May. From 28 April to 4 May, the refuge coordinated with Migratory Bird Management - North in performing a coastal waterfowl survey of southwestern Alaska with brant numbers totaling 94,049. Spring migration of brant from wintering areas to Izembek Lagoon is characterized by short, daily movements over roughly a two month period. Nevertheless, brant have arrived at Izembek over a month long period or less in recent years.

The types and magnitudes of disturbance factors and their overall effects on fall staging brant was the primary topic of an investigation by the Research Division (AFWRC) from 1985 to

1988. The emphasis of the Research Division work at Izembek has now shifted to concentrated efforts to track and observe both radio and color marked brant from various breeding locations and to analyze their distributional use of the Izembek Lagoon system.

Brant productivity and family group counts conducted at Izembek in 1990 marked the 28th consecutive year such appraisals have been made. Brant were first seen arriving on the lagoon on 25 August in 1990. The average arrival date for first migrants at Izembek for 19 years for which we have data is 18 August. Production counts were obtained from 29 August to 22 October with a total of 29,965 individual brant classified to age. Juveniles comprised 5,750 (19.2%) of this total in comparison to the long-term average of 23.1% (Tables 9, 10 and 11). Estimated composition of the 1990 population based on the observed percentages and aerial survey counts is presented in Table 12. Productivity of the Pacific Flyway brant population, based on observations from the Izembek area, has been below average in seven of the past ten years, however, overall population size, determined from mid-winter surveys, is relatively stable. Average or better production has occurred only four times in the past 13 years possibly resulting from the dwindling sub-arctic Yukon Delta population and the growing but less productive, arctic populations in Canada and possibly the Soviet Union.

Family group size data were collected concurrently with productivity counts. A total of 349 individual families were observed giving an average of 2.6 juveniles/family (Table 13).

Based on our family group counts, survival of young may have been below average (down 0.13 juveniles/family in comparison to the 25 year average). Research being conducted on the Yukon-Kuskokwim Delta suggests that a considerable amount of brood mingling occurs among brant even before fall migration begins. As yet, data are insufficient to identify the extent or duration of this phenomenon or its implications on family group size data from Izembek. Other goose species maintain family bonds through fall and winter and even into the following spring.

Nesting success for brant at one area on the Yukon-Kuskokwim Delta was 64 percent versus the 82 percent recorded in 1989. Likewise, the mean clutch size during incubation was 3.1 eggs/nest this summer, down from 3.9 in 1989 based on data from the Kokechik Bay area.

The fall staging population of brant at Izembek Lagoon includes birds from Alaska, the western and central Canadian Arctic and the Soviet Arctic. These birds are thought to mix throughout the lagoon and hence our counts are representative of the entire Pacific Flyway population. Recent efforts using radio telemetry and color marking at selected breeding locations will

Table 9. Annual black brant production counts, Izembek Refuge, 1970-1990.

Year	Adults	Juveniles	Total	% Juveniles
1970	12,104	6,256	18,360	34.1
1971	4,820	1,953	6,773	28.8
1972	6,599	3,698	10,297	35.9
1973	12,025	4,999	17,024	29.4
1974	13,118	632	13,750	4.6
1975	9,396	5,452	14,848	36.7
1976	7,962	4,340	12,302	35.3
1977	8,856	4,092	12,948	31.6
1978	10,696	1,842	12,538	14.7
1979	13,674	2,349	16,023	14.7
1980	9,618	3,341	12,959	25.8
1981	4,109	936	5,045	18.6
1982	11,509	1,213	12,722	9.5
1983	6,149	1,947	8,096	24.1
1984	9,451	1,499	10,950	13.7
1985	12,032	1,915	13,947	13.7
1986	15,621	2,823	18,444	15.3
1987	17,411	7,882	25,293	31.2
1988	16,138	3,847	19,985	19.3
1989	13,654	4,281	17,935	23.9
1990	24,215	5,750	29,965	19.2
28 Year Average	11,812	3,530	15,342	23.0

Table 10. Brant production counts by month and location, Izembek NWR, 1990.

Month	Location	Number of brant classified to age		
		Adult	Juvenile (%)	Total
September	Banding Island	282	84 (23.0)	366
	Operl Island	8132	1278 (13.6)	9410
	Lucky Cove	849	556 (39.6)	1405
	Grant Point	675	133 (16.5)	808
Sub-total		9938	2051 (17.1)	11989
October	Operl Island	4334	1546 (26.3)	5880
	Lucky Cove	245	94 (27.7)	339
	Tern Island	14	9 (39.1)	23
	Applegate Cove	2539	377 (12.9)	2916
	Norma Bay	1942	463 (19.3)	2405
	Neumann Island	1461	617 (29.7)	2078
	Outer Marker	3742	593 (13.7)	4335
Sub Total		14277	3699 (20.6)	17976
Total		24215	5750 (19.2)	29965

Table 11. Brant production counts by geographic areas of Izembek Lagoon, 1990.

Location	No. Adults	No. Juveniles	% Juveniles	Total Birds
Norma Bay	1942	463	19.3	2405
Applegate Cove	2539	377	12.9	2916
Banding Island	282	84	23.0	366
Operl Island	12466	2824	18.5	15,290
Grant Point	675	133	16.5	808
Lucky Cove	1094	650	37.3	1744
Tern Island	14	9	39.1	23
Outer Marker	3742	593	13.7	4335
Neumann Island	1461	617	29.7	2078
Totals	24,215	5750	19.2	29,965

Table 12. Brant population composition, Izembek Refuge, 1990.

Parameters	Est. number of birds	% Change from 1989
Total Count[1]	123,182	-17.3
Est. No. of Juveniles (19.2% of total)	23,651	-33.6
Est. No. of Families (total juveniles 2.6 juv./fam.)	9,097	-23.4
Est. No. of Breeding Adults (No. of families x 2)	18,194	-23.4
Est. No. of Sub-adult and Non and Failed Breeding Adults (total count minus juveniles and breeding adults)	81,337	- 9.3

[1] Average of 19 September to 25 October peak counts.

Table 13. Black brant family group counts at Izembek Refuge, 1980-1990.

Year	Frequency by Family Group Size								No. Families	No. Juveniles	$\bar{X}$ Juv/Family
	1	2	3	4	5	6	7	8			
1980	26	47	57	39	7	0	1	0	177	489	2.76
1981	34	38	36	27	10	8	1	0	154	431	2.80
1982	18	22	25	20	4	0	0	0	89	237	2.66
1983	25	40	55	26	21	6	0	0	173	515	2.98
1984	19	49	70	39	10	4	1	0	192	564	2.94
1985	125	223	173	73	24	6	0	0	624	1538	2.46
1986	23	46	43	19	4	2	0	0	137	352	2.57
1987	168	263	267	171	66	13	0	0	948	2587	2.73
1988	62	91	65	35	6	4	0	0	263	633	2.41
1989	42	80	72	65	28	16	0	0	303	914	3.00
1990	70	104	106	54	8	7	0	0	349	894	2.56
25 Yr MEAN	44	77	72	42	14	4	<1	<1	254	682	2.69

help qualify the extent of mixing of these population components, their seasonal movements and fidelity for specific areas.

Radio marking of brant from various breeding areas from 1987 to 1990 addresses questions about fall distribution in the Izembek Lagoon area among other data gaps. A total of 40 brant were radio marked in 1990 from the Yukon-Kuskokwim Delta (n = 10), Colville River area (n = 10), Wrangel Island (USSR)(n = 10), Anderson River (Canada)(n = 5), and Kent Peninsula (Canada) (n = 5). Only 24 (60%) of these birds were detected during the fall staging period at Izembek. Data on specific arrival and departure dates and duration of stay were obtained on only 15 birds (Table 14).

Black brant receiving a radio transmitter backpack on Wrangel Island, USSR. The yellow rump is from picric acid marking used to identify Wrangel Island birds during the staging period at Izembek. RLW

The radio tracking effort at Izembek Lagoon involved several techniques including aerial tracking, the use of directional antenna systems at fixed locations and the use of mobile antennas. Aerial tracking of radio equipped brant was used initially to determine dates and locations of arriving brant. After a majority of the radio equipped brant had arrived, aerial tracking was concentrated on those birds that were absent or infrequently detected by ground tracking systems. Many times aerial tracking was done in conjunction with population surveys.

Table 14. Arrival and departure dates of radio-tagged brant marked on Yukon-Kuskokwim Delta (YKD), North Slope (NS) of Alaska near Teshekpuk Lake, Wrangel Island (WI), USSR, and Canadian Arctic (AC) at Izembek Lagoon in fall of 1990.

Breeding location	YKD	NS	WI	CA
Date of arrival				
Mean	8 Sep	20 Sep	11 Sep	26 Oct
SD	± 9	± 5	± 5	± 4
n	8	4	5	3
First	27 Sep	13 Sep	5 Sep	22 Sep
Last	10 Nov	23 Sep	19 Sep	29 Sep
Date of Departure				
Mean	7 Nov	6 Nov	7 Nov	10 Nov
SD	± 2	± 4	± 3	
n	6	3	4	1
First	5 Nov	2 Nov	2 Nov	
Last	7 Nov	10 Nov	10 Nov	
Duration of Stay				
Mean	59	47	57	49
SD	± 9	7	±6	
n	6	3	4	1
Range in Days	47-71	40-54	48-61	

Four primary stations have been used for radio tracking brant in the Izembek Lagoon complex. These were Baldy Mountain, Grant Point, Cape Glazenap, and Frosty Road as shown in Figure 5. The Baldy Mountain station was unique due to it's 1000' elevation, proximity (two miles) to Izembek Lagoon and superior transmitter reception at longer ranges (approximately 10 miles).

AFWRC personnel John Pierce (left) and MAC David Ward (right) transport an observation blind across the Operl Island tidal flats. The blind is mounted on the barrels and secured by guy wires.

Each radio tracking station was equipped with either four element or five element stacked, dual Yagi antenna arrays with a null detection system. The quality of reception of a radio signal at a particular station depended on the individual transmitter, distance between the source and receiver, obstructions between source and receiver, elevation, and weather conditions (e.g. rain reduced reception of the signal). Attempts to locate radio equipped birds from the tracking blinds occurred intermittently, from one to five days per week for up to 12 hours a day. Time and occupancy varied for each blind site depending on weather, use of the area by geese and timing of experimental overflights. During a tracking session, the start time, end time, and frequencies searched during each scan were recorded as well as the time, azimuth, null width, and signal strength for each frequency located. Handheld "H" antennas were used for mobile radio tracking in areas not covered adequately by fixed stations. This device had a very limited range of approximately three miles, line of sight when used at sea level.

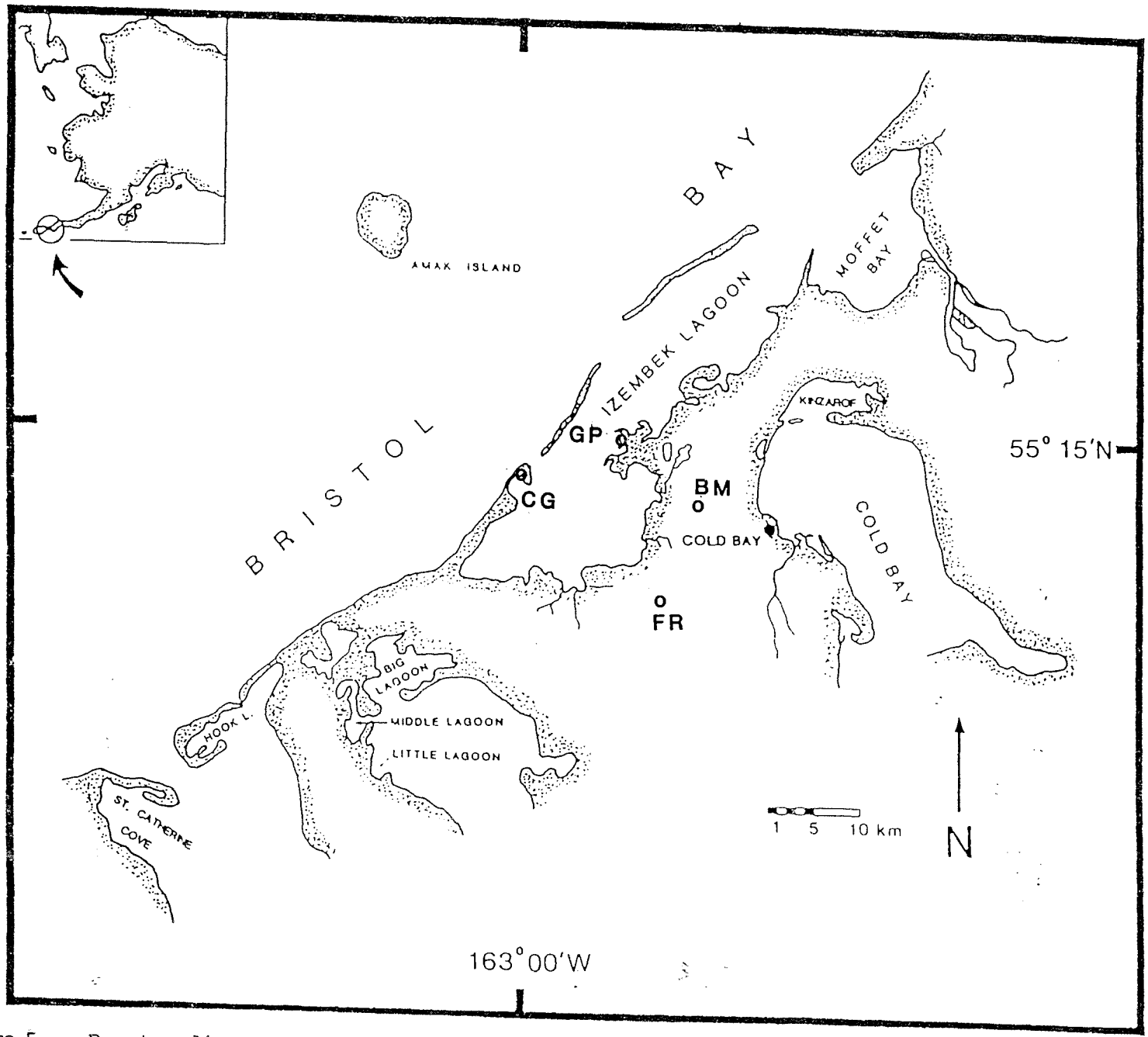


Figure 5 . Brant radio tracking/observation points on or adjacent to Izembek Lagoon. (FR, Frosty Road; BM, Baldy Mtn.; GP, Grant Point; CG, Cape Glaznap).

Radio telemetry data suggest that breeding populations from Arctic nesting areas arrive at Izembek later than those from closer areas such as the Yukon-Kuskokwim Delta. It appears that some migrants may continue to arrive into October as suggested by radio relocation information on Table 14 and aerial survey data (Table 15). Ultimately, it is hoped to determine the timing of arrivals and departures for each primary breeding location over a series of years. The possible preference of Arctic breeding populations for the Moffet Bay area requires further research. It does however, appear that Moffet Bay is important for these and other population components when first arriving in the fall.

Light-bellied brant predominate in northern and central Canadian Arctic populations. There is an east to west transition in Arctic Canada of light to dark-bellied plumage morphs with light-bellied brant seldom seen at breeding locations in Alaska or the USSR. The variation in plumage color observed in Canadian Arctic brant is broad and interchange of varying degrees occurs annually at specific nesting locations. Hence, belly color is not always a positive indicator of breeding location. Also, the size of the various "light" bellied population components is not regularly assessed. These factors complicate attempts to differentiate birds at Izembek however, in nearly 30 years of bag checking during the hunting season, refuge personnel have not documented the presence of light-bellied forms. Likewise, our incidental observations of birds in flight at Moffet Bay have been negative for light-bellied birds. Radio telemetry data showed that most of the light-bellied and intermediate color phase brant marked in the Canadian Arctic have preferred the Moffet Bay area. This provided us with insight into why they have not appeared in hunters' bags in that Moffet Bay is a remote, virtually unhunted area at the north end of Izembek Lagoon.

In 1989 and 1990, increased efforts were made to determine the ratio of dark to light-bellied brant throughout the Izembek Lagoon complex. No light-bellied birds were observed from a sample of approximately 150 brant at Moffet Bay. One light-bellied brant was seen in a sample of 500 birds from Applegate Cove while 20 were seen in a similar sample from Grant Point. In 1990, observations were made on Operl and Neumann Islands, narrow barrier islands where brant come ashore and gather for sanding or roosting. Another roosting location east of Grant Point (Lucky Cove), provided a similar opportunity to view belly plumage and tarsus bands. Only at Neumann Island (near the mouth of Moffet Bay) were light-bellied brant observed, making up 61 percent of a sample of 1100 birds. These observations further suggest that population segregation may be occurring in the Izembek Lagoon complex.

Biological investigations of Pacific Flyway brant throughout their range in Alaska continued to be a high priority of the Alaska Fish and Wildlife Research Center in 1990.

Table 15. Aerial surveys of goose populations on Izembek and adjacent lagoons, 1990.

Date	Number of Birds			Observers
	Brant	Canada Goose	Emperor Goose	
10 Jan.	5,595	-	4,536	C. Dau/S. Simpson
29 Mar.	4,630	-	5,741	C. Dau/R. West
12 Apr.[1]	2,525	-	12,744	C. Dau/M. Chase
2 May.	76,528	-	1,973	R. King/C. Dau
31 Aug.	28,325	6,000	317	C. Dau/M. Chase
10 Sept.	84,239	8,131	2,072	C. Dau/J. Pearce
19 Sept.	121,422	12,710	4,616	C. Dau/M. Chase
28 Sept.	107,386	41,948	4,258	C. Dau/D. Ward
15 Oct.	120,691	49,323	2,786	C. Dau/R. West
18 Oct.	169,934	72,445	9,421	R. King/A. Brackney
22 Oct.	109,178	45,964	3,445	C. Dau/M. Chase
25 Oct.	110,482	33,348	4,143	C. Dau/M. Chase
4 Nov.	63,138	31,480	3,615	C. Dau/J. Pearce
30 Nov.	4,950	-	2,386	C. Dau/J. Chase

[1] Izembek Lagoon only.

Table 16. Black brant mid-winter survey data, Pacific flyway.

Year	Washington	Oregon	California	Mexico (West Coast)	Total	3 Year Running Average
1974/75	6,163	1,507	480	115,340	123,490	126,382
1975/76	7,540	1,769	680	112,056	122,045	125,395
1976/77	14,111	2,100	0	130,756	146,967	130,834
1977/78	18,100	1,110	560	143,117	162,887	143,966
1978/79	8,078	1,255	10	120,070	129,413	146,422
1979/80	7,665	1,015	135	137,550	146,365	146,222
1980/81	10,107	1,790	540	181,760	194,197	156,658
1981/82	6,451	706	485	113,402	121,044	153,869
1982/83	3,113	718	565	104,918	109,314	141,518
1983/84	7,097	930	700	124,703	133,430	121,262
1984/85	11,675	641	801	131,568	144,685	129,143
1985/86	12,026	1,113	706	114,725	128,570	135,562
1986/87	14,371	1,133	736	86,913	103,152	125,469
1987/88	19,831	1,104	947	116,696	138,578	133,317
1988/89	18,538	871	1,033	107,721	128,163	123,298
1989/90	13,756	1,399	992	129,865	146,012	137,584
1990/91	16,221	1,262	1,340	108,555	127,378	138,851

Calendar year prior to January mid-winter survey (i.e., 1990 data represents survey done in January 1991).

Additionally, they continued to actively pursue cooperative work on Wrangel Island in the USSR in coordination with the Izembek refuge staff and are continuing wintering ground investigations at Bahia de San Quintin, Mexico.

Fall investigations by the staff of the AFWRC at Izembek this year were directed primarily to relocating color marked or radioed brant from various breeding locations and to collecting observations on diurnal movements, habitat use and migration timing. These data will supplement previous investigations of the behavioral, temporal and spatial responses to various forms of disturbance. In combination, the information being collected will greatly enhance our abilities to manage the Izembek Lagoon ecosystem.

A total of 127,378 Pacific brant were reported during the mid-winter inventory (Jan. 1991) with 108,555 of these in Mexico (Table 16). The average of six counts during the peak of the fall staging period at Izembek was 123,182 brant. The Izembek refuge coordinated with personnel performing the mid-winter survey by performing an aerial count of brant in the Izembek area. A total of 4,350 brant were counted during this 9 January 1991 survey at Izembek and adjacent lagoons. The total mid-winter survey count of 127,378 brant plus the additional 4,350 observed at Izembek gave a total 131,728 which is comparable to the average of peak counts at Izembek this fall (Table 15).

Pacific brant are managed in accordance with the Pacific Flyway Management Plan which calls for a minimum population of 120,000 brant determined from a three year moving average. The current three-year average is 138,851 birds. If the average falls below this threshold, a closure of the entire flyway to brant hunting would be instituted.

Emperor Goose

Based on comprehensive spring and fall aerial surveys, the population of emperor geese showed gradual increases in 1987 and 1988. This trend was welcomed after abrupt declines from 1981 to 1986 when an already slumping population dropped from approximately 100,000 to 40,000 birds. Surveys in 1989 suggested further declines in both spring and fall numbers. In 1990 the population again responded with 48 and 55 percent increases in emperor geese seen during the comprehensive spring and fall surveys, respectively (Table 17). Given favorable nesting conditions, the emperor goose population has shown the potential for growth necessary to return to historic levels. The spring population size of 67,581 in 1990 is 51.4 percent below the historic, mid-1960's, level of 139,000 geese.

The Izembek refuge staff and Migratory Bird Management - North cooperated to perform the annual aerial survey of emperor geese in coastal areas from the Yukon-Kuskokwim Delta to Unimak

Table 17. Population size and productivity trends in Emperor geese.

Year	Spring Population Size (% change prev. year)	Production[1] (% young in fall)	Family Group Size	Fall Population Size (% change prev. year)
1980	No Survey	24.8	2.3	65,971
1981	91,267	31.7	3.2	63,156 (-4.3)
1982	100,643 (+10.3)	7.8	2.7	80,608 (+27.6)
1983	79,155 (-21.4)	27.1	3.2	72,551 (-10.0)
1984	71,217 (-10.0)	22.3	2.8	82,842 (+14.2)
1985	58,833 (-17.3)	17.4	2.8	59,792 (-27.8)
1986	42,228 (-28.2)	26.1	2.6	68,051 (+13.8)
1987	51,655 (+22.3)	33.6	3.1	65,663 (-3.5)
1988	53,784 (+4.1)	24.2	3.1	76,165 (+16.0)
1989	45,712 (-15.0)	23.0	3.1	70,729 (-7.1)
1990	67,581 (+47.8)	25.2	3.2	109,451 (+55.1)

[1] Data from Izembek National Wildlife Refuge, (1980-1984) and from Izembek Refuge and other Alaska Peninsula areas (1985-1990).

Island including the north and south sides of the Alaska Peninsula. The 1990 spring survey from 28 April to 4 May, as with previous efforts, was initiated when essentially the entire population was believed to be staging in bays and lagoons within the survey area. A total of 67,581 emperor geese were observed in the survey area (Table 18 and Figure 6). Climatological charts prepared by the National Weather Service and aerial reconnaissance by refuge personnel from the Yukon Delta, Togiak and Alaska Peninsula/Becharof Refuges again provided essential indications used to determine when to initiate the survey.

The 1990 survey total of 67,581 geese increased the 3-year average to 55,712 (Figure 7). Limited hunting of emperor geese may be allowed again when the spring population reaches 80,000 geese based on a 3-year moving average (Figure 7). An action plan and a draft Pacific Flyway Management Plan for emperor geese identify a population goal of 150,000 birds which is comparable to historic levels. The difficulty in reaching and maintaining a population of 150,000 emperor geese is greatly increased by allowing hunting when only 80,000 individuals are present. A more biologically sound approach would be that hunting be prohibited if the populations falls to 25% below the identified goal (i.e. when fewer than 110,000-115,000 geese are present).

Emperor geese began their fall influx into the Izembek Refuge on 26 August when a small group was seen at Stapp Creek near Cold Bay. Peak numbers were present beginning in October as determined from six aerial surveys (Table 15). The aerial survey conducted by Rod King and Alan Brackney, Migratory Bird Management - North was part of the annual fall survey of emperor geese in southwestern Alaska. The total of 109,451 geese counted from 17-19 October 1990 was used to estimate the composition of the fall population (Table 19).

Emperor goose productivity counts in 1990 were performed by the Izembek staff and personnel from the Research and Migratory Bird Management Divisions. Observations were made from 5 September to 22 October. Emperor goose productivity, as determined from Izembek counts, was based on aerial photographic surveys and by conventional ground counts using spotting scopes. Aerial surveys by the Izembek staff resulted in a sample of 728 emperor geese from the Nelson Lagoon area. This sample gave an estimate of 27.9 percent juveniles in the population. Combined aerial and ground productivity counts through October resulted in 5,070 emperor geese classified to age with 1,068 (21.1%) of these being juveniles (Table 20).

Izembek information was combined with similar counts made at other bays and estuaries along the north side of the Alaska Peninsula from 28 September to 2 October (Tables 21 and 22). The proportion of young in the population based on all sampling (13,541 geese) in 1990 was 25.2 percent.

Figure 6 . Percentage distribution of emperor geese by survey area, 28 April to 4 May, 1990.

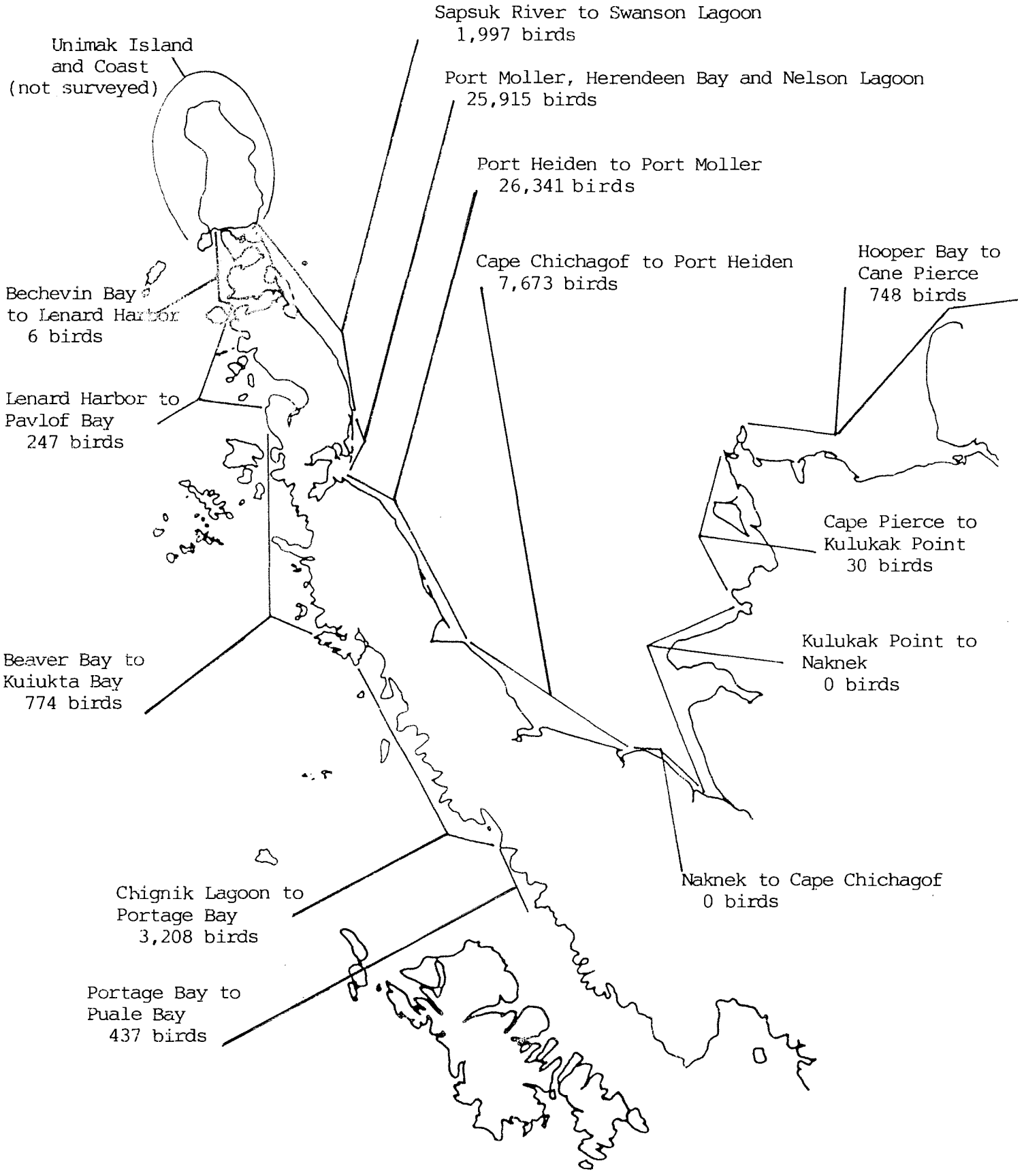


Table 18. Emperor goose numbers observed by segment.

28 April 1990 Wind 10kts. Southwest; clear; 29 degrees F; time 110 to 1500 hours.

	Hooper Bay to Kuskokwim River mouth.	0

29 April, 1990 Overcast; wind 13kts. Northeast; 32 degrees F; time 1115 to 1715 hours.

1.	Bethel to Quinhagak	0
2.	Quinhagak to Jacksmith Bay	0
3.	Jacksmith Bay to Carter Spit	30
4.	Carter Spit to Goodnews Bay	50
5.	Goodnews Bay to Chagvan Bay	0
6.	Chagvan Bay to Nanvak Bay	30
7.	Nanvak Bay to Cape Pierce	668
7A.	Cape Pierce to Hagemeister Island	30
7B.	Hagemeister Island to Tongue Point	0
7C.	Tongue Point to Summit Island Point	0
7D.	Summit Island Point to Kulukak Point	0
7E.	Kulukak Point to Dillingham	0
7F.	Dillingham to Kvichak	0
7G.	Kvichak to Naknek	0

30 April, 1990 Overcast; wind 10kts. Northeast; 40 degrees F; time 1110 to 1830 hours.

8.	Naknek to Egegik Bay	0
9.	Egegik Bay to 6 km South of Goose Point	1,185
10.	6 km South of Goose Point to Smokey Point	0
11.	Smokey Point to Cape Menshikof (Includes Ugashik Bay)	1,618
12.	Cap Menshikof to Cinder River lagoon	0
13.	Cinder River Lagoon	4,828

30 April, 1990 (Table 18. Continued)

14.	Cinder River Lagoon to Port Heiden	42
15.	Port Heiden to 24 km South of Strogonof Point	18,922
16.	South of Strogonof Point to Seal Island	0
17.	Seal Islands to Ilnik Lake	7,419
18.	Ilnik Lake to Port Moller	0
19.	Port Moller to Herendeen	1,840
20.	Herendeen to Cape Rozhnof (Including Mud Bay)	815
21.	Cape Rozhnof to Lagoon Point (Including Kudobin Islands)	23,260
22.	Lagoon Point to Kinzarof Lagoon	15

2 May, 1990 Overcast; wind 20kts. Northwest; 32 degrees F; time 1410 to 1650 hours.

23.	Kinzarof Lagoon	6
24.	Moffet Lagoon	1,908
25.	Izembek Lagoon	29
26.	Applegate Cove to Big Lagoon	25
27.	Big Lagoon/Hook Bay	5
28.	Morzhovoi Bay	0
29.	Bechevin Bay	15
30.	Swanson Lagoon	-
31.	Urilia Bay	-
32.	Southside Unimak Island (Cape Luke to Cape Aksit)	-
33.	Otter Cove	-
34.	Ikatan Bay to Kenmore Head	-
35.	Kenmore Head to Thin Point	-
36.	Thin Point to Cold Bay	175

4 May, 1990 Overcast; wind 10kts. West; 40 degrees F; time 0930 to 1550 hours.

37.	Cold Bay to King Cove	0
38.	King Cove to Pavlof Bay	0
39.	Pavlof Bay	247
40A.	Canoe Bay to Seal Cape	0
40B.	Seal Cape to Balboa Bay	(not surveyed)
41.	Balboa Bay to Dorenoi Bay	0
42.	Dorenoi Bay to American Bay	0
43.	American Bay to Ramsey Bay	60
44.	Ramsey Bay to Ivanof Bay	14
45.	Ivanof Bay to Chignik Lagoon	700
46.	Chignik Lagoon to Chignik Bay	0
47.	Chignik Bay to Kujulik Bay	223
48.	Kujulik Bay to Aniakchak Bay	0
49.	Aniakchak Bay	0
50.	Amber Bay to Cape Kunmik	850
51.	Cape Kunmik to Cape Providence	260
52.	Cape Providence to Agripina Bay	123
53.	Argipina Bay to Wide Bay	273
54.	Wide Bay to Portage Bay	1,469
55.	Portage Bay to Puale Bay	124
56.	Puale Bay	313
	TOTAL EMPERORS	67,581

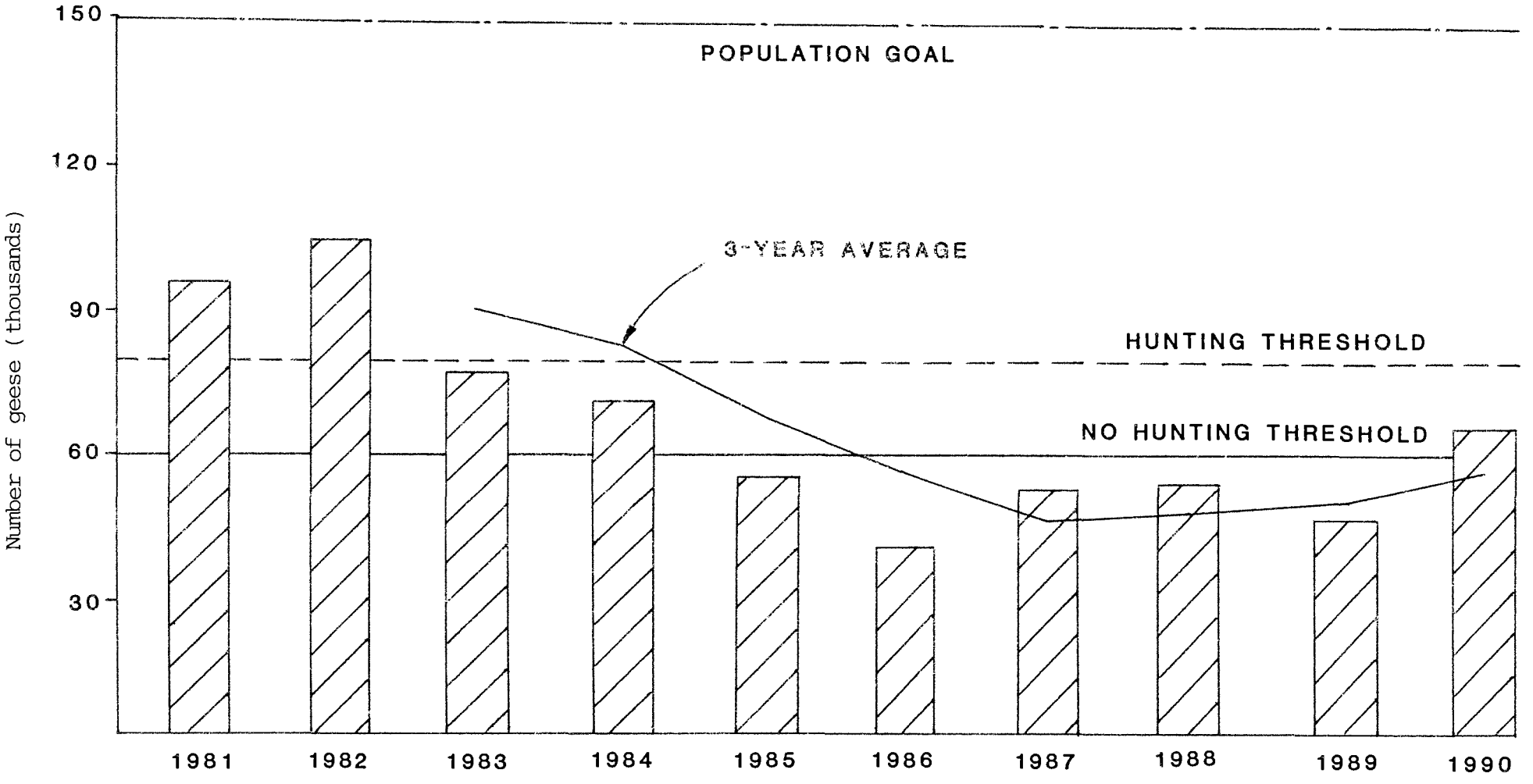


Figure 7 . Emperor goose spring population size in relation to management thresholds.

Table 19. Composition of the emperor goose population based on fall surveys in southwestern Alaska.

	Number of Birds					
	1985	1986	1987	1988	1989	1990
Fall Count	59,792	68,051	65,663	76,165	70,729	109,451
Est. number of juvenile birds (percent young x total)	10,404	17,761	22,063	18,432	16,268	27,582
Est. number of families (number HY : Avg. family group size)	3,716	8,881	7,117	5,946	5,248	8,619
Est. maximum number of breeding adults with young (number of families x 2)	7,432	17,762	14,234	11,892	10,496	17,238
Est. total number of sub-adults non and/or failed breeding adults (total count minus juveniles and breeding adults)	41,956 (70.2%)	32,528 (47.8%)	29,366 (44.7%)	45,841 (60.2%)	43,965 (62.2%)	64,631 (59.1%)

Table 20. Emperor goose productivity counts, Izembek National Wildlife Refuge, 1970-1990.

Year	Adults	Juveniles	Total	% Juveniles	No. of Families	Family Group Size
1970	9,722	4,933	14,655	33.7	383	2.9
1971	8,142	3,458	11,600	29.8	480	2.7
1972	4,680	2,270	6,950	32.7	210	3.1
1973	-	-	-	-	-	-
1974	2,025	377	2,402	15.7	50	2.6
1975	744	405	1,149	35.2	51	2.9
1976	1,023	324	2,247	14.4	207	2.7
1977	996	683	1,679	40.7	108	2.8
1978	1,395	495	1,890	26.2	62	3.0
1979	841	113	954	11.8	53	3.3
1980	1,777	586	2,363	24.8	40	2.3
1981	1,067	495	1,562	31.7	181	3.2
1982	1,653	140	1,793	7.8	32	2.7
1983	1,058	393	1,451	27.1	192	3.2
1984	2,753	795	3,548	22.4	79	2.8
1985	2,245	503	2,748	18.3	125	2.8
1986	3,283	1,381	4,664	29.6	266	2.6
1987	2,989	1,523	4,512	33.8	186	3.1
1988	3,884	1,242	5,126	24.2	200	3.1
1989	3,811	1,136	4,947	23.0	145	3.1
1990	4,002	1,068	5,070	21.1	97	3.2
24_Yr. X	2,990	1,153	4,156	27.7	148	2.9

Table 21. Annual emperor goose productivity estimates from photographs taken on the northside of the Alaska Peninsula, 1985-1990.

Year	Adults	Juveniles	Total	Percent Juveniles
1985	2,657	536	3,193	16.8
1986	4,721	1,659	6,380	26.0
1987	7,760	2,417	10,178	23.7
1988	8,407	2,773	11,180	24.8
1989	10,044	2,686	12,730	21.1
1990	10,123	3,418	13,541	25.2
Average	7,285	2,248	9,534	22.9

Data compiled by Bill Butler, Office of Migratory Bird Management, Anchorage including observations collected by the Izembek staff.

Table 22. Estimates of percent juvenile emperor geese from aerial photographs on the Alaska Peninsula, fall 1990.

Date	Location						
	Egegik	Ugashik	Cinder River	Port Heiden	Seal Islands	Nelson Lagoon	Izembek Lagoon
28 Sept.	-	23.0(261)	30.8(447)	24.5(371)	22.2(442)	27.3(1735)	9.3(279)
29 Sept.	15.6(180)	14.8(256)	39.9(1620)	20.1(612)	25.1(1222)	23.1(831)	14.2(226)
30 Sept.	-	-	24.8(606)	29.9(395)	19.5(446)	23.0(894)	20.2(94)
2 Oct.	-	11.3(168)	29.8(678)	17.2(464)	22.4(254)	21.7(568)	21.1(492)
Average	15.6(180)	16.4(685)	31.3(3351)	22.9(1842)	22.3(2364)	23.8(4028)	16.2(1091)

The number of emperor geese classified from photographs at each location are in parentheses.

Comprehensive surveys using aerial photography provide the most accurate assessment of productivity in the emperor goose population. Temporal variation in the percentage of juveniles using various lagoons along the Alaska Peninsula suggests that family groups follow non and failed breeders in the migration. Data also suggest that some individuals or components may show a high degree of fidelity for certain estuaries and that there is a possibility that geographic breeding populations may also segregate during migration.

Family group sizes of emperor geese observed in the Izembek area averaged 3.2 young per family (n = 97 families) over the period 5 September to 23 October (Table 20). Average Class I and II brood sizes for emperor geese at one study site on the Yukon-Kuskokwim Delta were 3.6 and 3.0, respectively (Craig Ely, Research, Anchorage). These data suggest a minimum attrition rate of 40% for young emperor geese from hatch into the fall migration period. This rate of mortality, as evidenced by size of family groups, is two percentage points less than the average for the historical period 1969-1980, suggesting average survival of young in 1990 (Table 23).

Neck collaring of emperor geese at research study sites on the Yukon-Kuskokwim Delta continued in 1990. A total of 1,256 birds were fitted with yellow neck collars with black number/letter combinations. In addition, two emperor geese were fitted with collars with attached solar powered radio packages. Thirty and five additional birds carried solar powered radios deployed in 1989 and 1988, respectively.

In 1990, the Alaska Fish and Wildlife Research Center placed camps at Nelson Lagoon, Seal Islands/Port Heiden and Cinder River Lagoon, from which observations on emperor goose migration, productivity and habitat use were made. Intensive efforts were also made to locate and read codes on neck collared geese.

Data continue to suggest that some individuals show a high degree of fidelity for certain staging areas. Tracking of radio marked and observations of neck collared geese confirmed these data. Radio relocation data suggest that some birds use preferred lagoon systems for prolonged periods in fall and that the shift to Aleutian wintering areas may be direct and rapid.

No radioed emperor geese were located in the Izembek Lagoon area in 1990 however, 58 neck collar observations were made of 31 separate birds (19 adults and 12 juveniles). Most of these sightings were made by AFWRC personnel while conducting their brant investigations. These data will supplement the extensive emperor goose monitoring efforts conducted at Nelson Lagoon and at Seal Islands/Port Heiden this fall. Two radioed birds were located by Bill Butler (MBM) and Margaret Peterson (AFWRC) during fall surveys, one in the Seal Islands/Port Heiden area and one at Mud Bay near Nelson Lagoon.

Table 23. Juvenile mortality of emperor geese during summer and fall, estimated from historical (1969-1980) and current data.[1]

	Date	$\bar{X}$ Clutch Size (n)	$\bar{X}$ Class I/II Brood Size (n)	$\bar{X}$ Class III/F Brood Size (n)	$\bar{X}$ Fall Family Group Size (n)
	1969-80	5.0 (806)	4.1 (517)	3.5 (497)	2.9 (1,805)
	1990	5.0 (354)	3.2 (202)	-	3.2 (97)
Estimated mortality from preceeding age classification	1969-80		18%	15%	17%
	1990		36%	-	0%[2]
Estimated mortality in relation to fall family group size	1968-80	42%	29%	17%	
	1990	36%	0%	-	

[1] Summer data from Yukon-Kuskokwim Delta study areas (Ely, C.R. pers.comm); Fall data from Izembek NWR.

[2] Compared to class I/II brood size data

Canada Goose

Taverner's Canada geese are an important component in the fall waterfowl concentration at Izembek. The first fall arrivals were on 23 August. The influx of birds continued slowly through September. Largest numbers are present in October each year and aerial survey efforts in the fall of 1990 placed the peak population at 72,445 birds on 18 October (Table 15). The average of six surveys during the peak fall staging period for Canada geese was 45,715 birds. Canadas disperse over the tundra feeding on the crowberry crop as well as throughout nearshore areas of Izembek and adjacent lagoons where they feed on eelgrass. The fall surveys concentrate on the waterbodies and geese on the tundra are difficult to sight and enumerate thus survey totals for Canada geese reflect minimums.

The Canada goose is the primary species in the hunter's bag at Izembek. Canada geese are of increasing importance due to the harvest restrictions or closures on other species. Canada geese made up 85.3% of the estimated goose harvest and 62.1% of the total estimated waterfowl take at Izembek in 1990 (Table 38). Adults predominated slightly over juveniles in the hunter harvest based on our bag check data (Table 24).

The fall departure of Canada geese from the Izembek area began on 23 October and was continuous during daylight hours through 24 October. Later, smaller departures occurred up to 6 November. Canada geese initiate their migration with weather conditions similar to those used by brant, but leave during daylight hours. All Canada geese have usually departed the area by late November. Canada geese declined in number throughout November based on aerial surveys by the refuge staff. By 4 November, numbers of Canadas had declined to 31,480. No Canadas were seen on a 30 November survey. No reports or observations of banded cackling Canada geese are available from our bag checking efforts.

Very small numbers of cackling Canada geese occur among the masses seen at Izembek each fall. Of the numerous cacklers banded on the Yukon-Kuskokwim Delta in recent years, none have been recovered by hunters here. Three neck collared cacklers were seen at Moffet Bay in the Fall of 1988. Approximately 1,100 Canada geese were scanned for the presence of collars at Moffet Bay in October 1989. Neither collars, nor noticeably small birds were observed. In 1990, 800 Canada geese from a flock of 3,000 in Moffet Bay were viewed. A total of three (0.4%) cackling Canada geese were seen however, other vocalizations were heard suggesting approximately ten birds may have been present. Considering the relatively large number of cacklers that have been either standard banded or neck collared, the few sightings at Izembek seem to confirm the "uncommon" status of this subspecies on the Southern Alaska Peninsula. No reports or observations of banded cackling Canada geese were seen during 1990 bag checking efforts.

Table 24. Age ratio of Canada geese in hunter's bags, Izembek NWR, 1976-1990.

Year	Canada Geese Harvested		Total	Adult: Immature Ratio in Harvest
	Adults(%)	Immatures(%)		
1976	78(38.6)	124(61.4)	202	1.00:1.60
1977	32(43.2)	42(56.8)	74	1.00:1.30
1978	29(37.7)	48(62.3)	77	1.00:1.70
1979	98(53.3)	86(46.7)	184	1.00:0.91
1980	30(43.5)	39(56.5)	69	1.00:1.30
1981	113(57.1)	85(42.9)	198	1.00:0.77
1982	74(50.7)	72(49.3)	146	1.00:0.97
1983	51(49.1)	53(50.9)	104	1.00:1.04
1984	37(41.6)	52(58.4)	89	1.00:1.40
1985	23(67.6)	11(32.4)	34	1.00:0.48
1986	11(50.0)	11(50.0)	22	1.00:1.00
1987	17(51.5)	16(48.5)	33	1.00:0.94
1988	50(48.5)	53(51.5)	103	1.00:1.06
1989	94(56.0)	74(44.0)	168	1.00:0.79
1990	40(46.0)	47(54.0)	87	1.00:1.18
Total	777	813	1,590	1.00:1.05

Steller's Eider

The Steller's eider has been a continual subject of research and investigation by the Izembek refuge staff. This species molts in large numbers throughout Izembek and adjacent lagoons. From 1961 to 1984 a total of 6980 birds were captured for banding and of these 405 (5.8%) were recaptured in the same area in subsequent years. Through December of 1990 a total of 154 (2.2%) banded Steller's eiders were recovered (shot or otherwise found dead) and of these, 94 were reported during the breeding season (Figure 8). These data have helped identify the breeding distribution of the Steller's eider which includes both Alaska and the Soviet Union. Ninety-one (97%) of breeding ground recoveries of Steller's eiders captured at Izembek are from the Soviet Union.

In Alaska the Steller's eider is now a rare breeding species and totally absent from some of its historical range such as the Yukon-Kuskokwim Delta. This situation has caused considerable concern even though the Steller's eider continues to be common in spring and fall staging and in wintering areas. The concern was heightened in December when the Service was petitioned to consider the species for endangered status (Section G.2 Endangered Species).

Aerial survey data has been collected by the Izembek Refuge staff and personnel of the Migratory Bird Management Division since 1975 and these data suggest that Steller's eiders are declining in number at Izembek during fall, winter, and spring (Figure 9). The Izembek Lagoon area is only one of several important use areas. Thus declines could be indicative of an overall population decline or a distributional shift. Downward population trends in Steller's eider numbers have been observed in comprehensive spring and fall surveys of southwestern Alaska (Figure 10). Although more intensive survey efforts are needed from fall through spring, the available data seem to indicate that the Steller's eider population is in trouble.

Other Ducks

In 1990, an effort was begun state-wide to obtain duck brood information necessary to relate productivity data to spring breeding pair survey strata within Alaska. The Izembek Refuge is in the Bristol Bay strata segment which also includes the Togiak and Alaska Peninsula/Becharof Refuges. Plots were randomly selected throughout the strata and three of the 20 samples were on or near the Izembek Refuge.

The brood survey in the Bristol Bay strata was done by helicopter with WB Donna Dewhurst of the Alaska Peninsula/Becharof Refuge as the observer. A total of 376 waterbodies on the 20 sample plots were surveyed and 100 broods were seen only seven of which were on plots near, or on, the Izembek Refuge (Table 25).

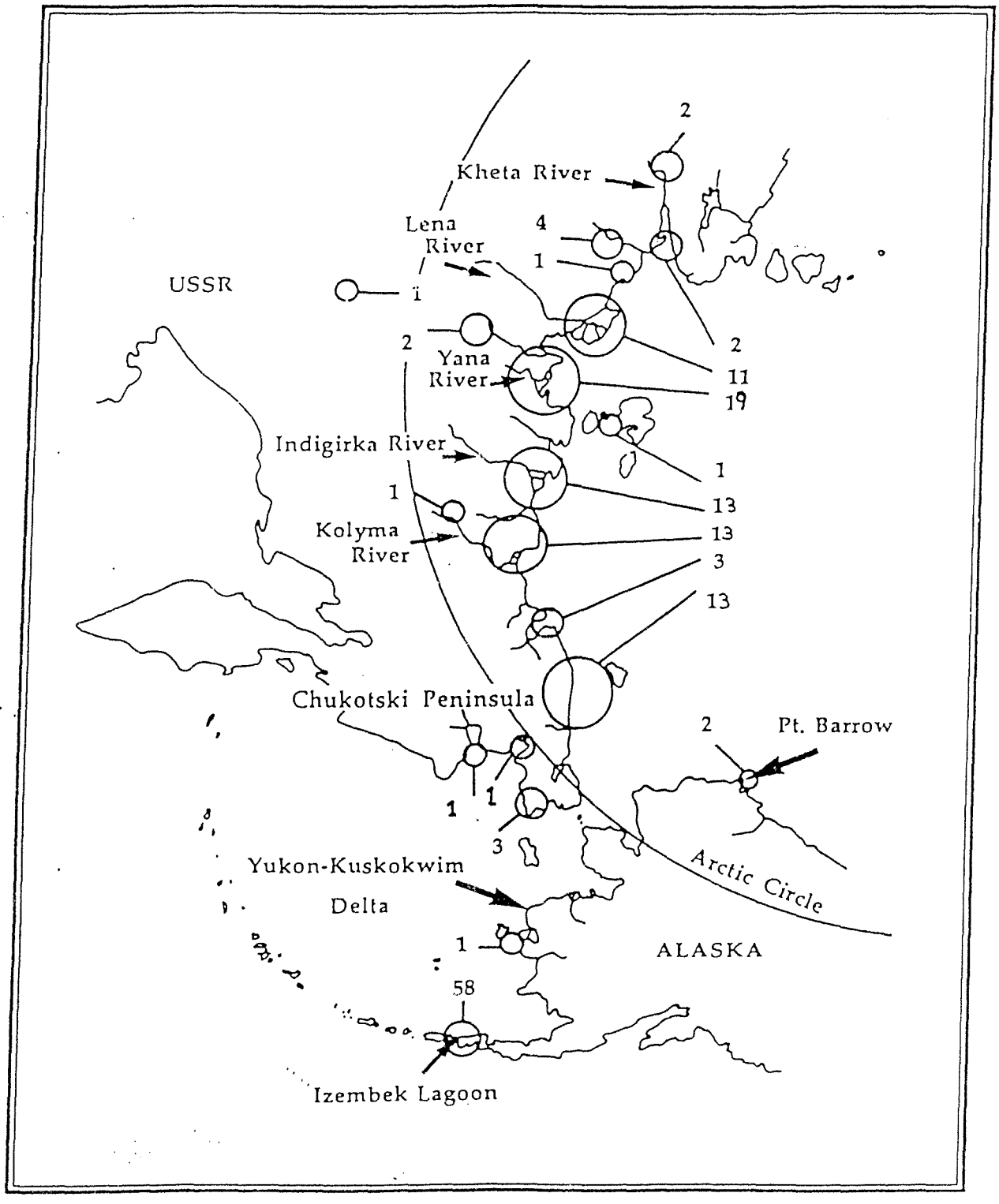


Figure 8 . Distribution of 152 direct and indirect recoveries of Steller's Eiders banded in Izembek Lagoon (USSR - 91, Alaska - 61)

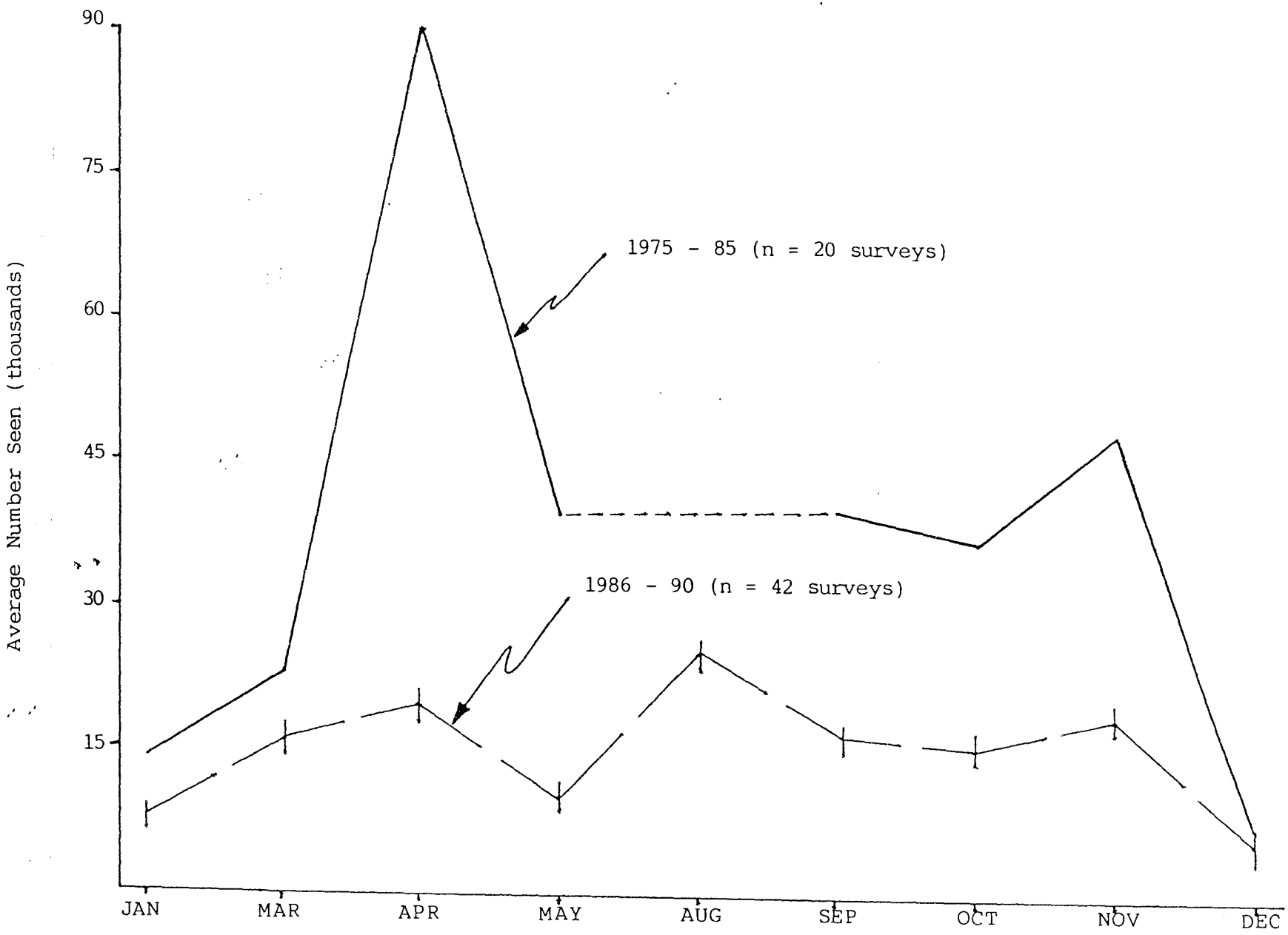


Figure. 9 . Monthly aerial surveys of Steller's eiders in Izembek Lagoon

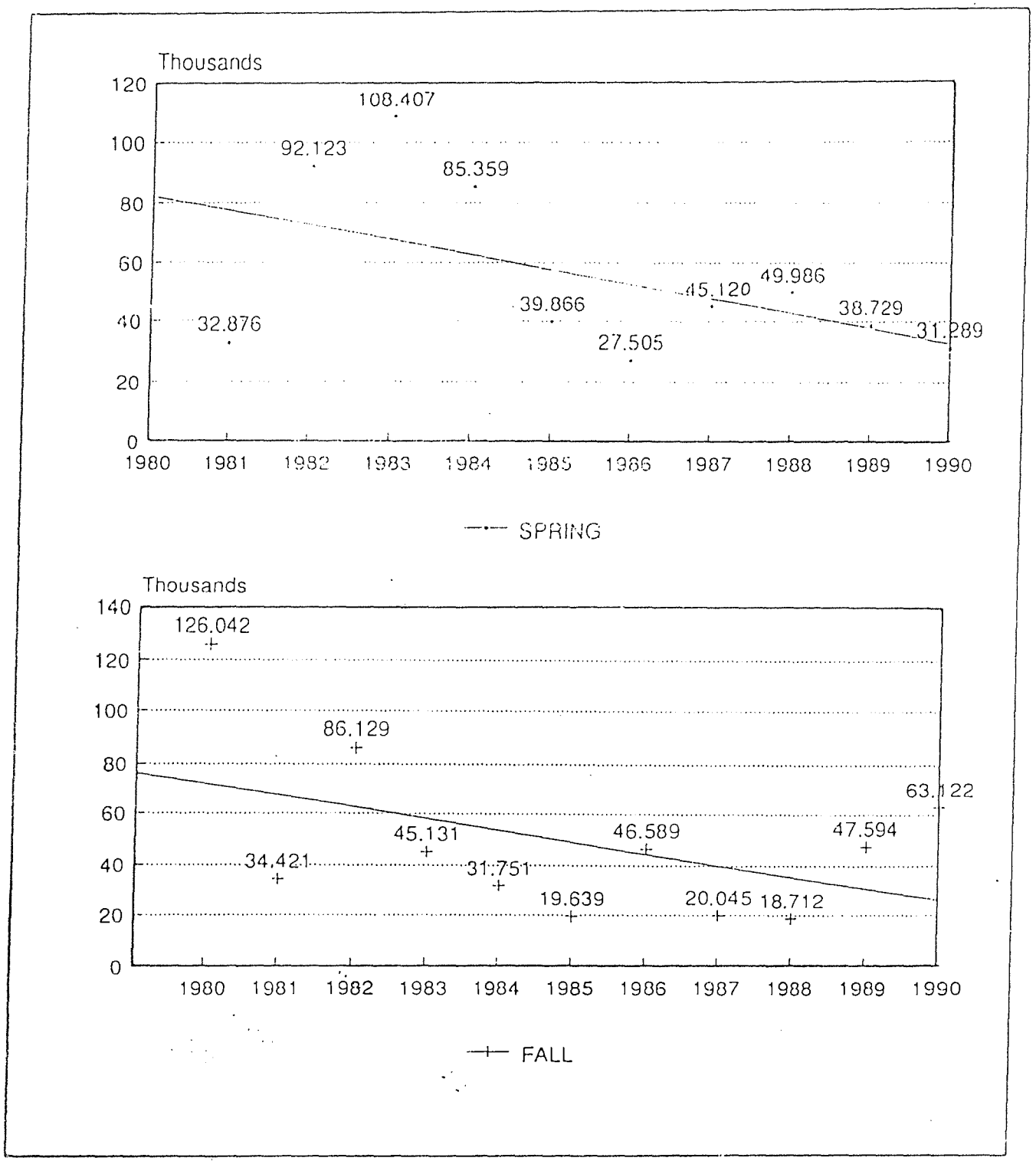


Figure 10. Steller's eider population trends based on comprehensive coastal surveys in southwestern Alaska (Data supplied by R. King, Migratory Bird Management - North).

Banding of Steller's eiders on Izembek occurred from 1961 to 1984 and may resume in 1991 due to increased concern over the species well-being. Refuge Files

Table 25. Results of helicopter brood surveys on or near the Izembek Refuge, 1990.

Area	Plot No.	Date	No. Waterbodies	Brood Observed [1]
Nelson Lagoon (near Pavlof Unit)	18	19 July	52	MALL(2,5,6) BLSC(2,6,BH) COME(BH) NOPI(BH) UNDU (BH)
Cold Bay (Izembek Unit)	19	22 July	11	none
Cold Bay (Izembek Unit)	20	22 July	19	NOPI(2,9) MALL(BH)

[1] MALL = Mallard, BLSC = Black Scoter, COME = Common Merganser, NOPI = Northern Pintail, UNDU = Unknown Duck. Numbers are sizes of individual broods. BH = broody hen.

The refuge staff did not attempt to ground truth the three random plots selected in the area. We did however, see the need to monitor duck production for trend data on road system lakes known to be important to ducks. Three lakes, Lamprey, VOR, and Bluebill Lakes were chosen for the annual refuge survey however, only one was checked in 1990. The periphery of Bluebill Lake was walked by one person with a Labrador retriever on 23 July. A total of 166 ducks were seen including six broods and five additional broody hens (Table 26). Trend data from known high density areas are not directly applicable to attempts to estimate brood densities and annual productivity for a large geographic area. However, the three lakes (waterbodies) selected in the Cold Bay road system will provide useful data and due to their accessibility and size they are cost effective to check on an annual basis.

Table 26 . Results of brood survey, Cold Bay road system, 1990.

Lake	Date	Brood Observed [1]
Bluebill	23 July	MALL(2,6,9,BH, BH, BH, BH) GRSC(8) GWTE (2,10,BH)

[1] MALL = Mallard, GRSC = Greater Scaup, GWTE = Green-winged Teal. Numbers are sizes of individual broods. BH = broody hen.

4. Marsh and Water Birds

Annual breeding bird surveys conducted since 1982 and incidental observations of occurrence, migratory phenology and nesting provide indices of population trends, production and habitat use by the numerous unstudied bird species on the refuge.

In the "marsh and water bird" category, only red-necked grebes, common and red-throated loons and lesser sandhill cranes occur regularly on the refuge as breeding species. During the 1990 breeding bird survey, only the common loon was encountered (Table 27) however, occurrence and probable breeding of all four species was observed later.

5. Shorebirds, Gulls, Terns and Allied Species

Rock sandpipers and semipalmated plovers are two of the most common shorebird species occurring on the refuge. Shorebird populations peak in the area during the fall migration. The

extensive intertidal flats with the detached and decaying eelgrass provides ideal shorebird habitat.

Noteworthy observations for 1990 include:

Species	No.	Date	Remarks
Sharp-tailed sandpiper	1	11 Sept.	Juvenile, E. of Grant Point
Sharp-tailed sandpiper	1	19 Sept.	Juvenile, E. of Grant Point
Sharp-tailed sandpiper	5	4 Oct.	Juveniles, E. of Grant Point
Sharp-tailed sandpiper	18	13 Oct.	Five flocks near S. Applegate Cove
Hudsonian godwit	1	13 Sept.	Juvenile seen with 6 red phalaropes
Whimbrel	1	9 Sept.	Flying south over Trout Creek
Whimbrel	1	10 Sept.	Juvenile on Operl Island
Slaty-backed gull	1	16,26 Sept.	Adult near Stapp Creek
Glaucous-winged gull		10 Apr.	First migrants. 10-15 April a few migrants seen. 17 April - 7 May many migrants seen.

Semipalmated plover feigning near nest site. These are common nesters along refuge roads. MAC

6. Raptors

A third occurrence of an osprey for the Izembek Refuge was documented in 1990 when a single adult was seen on 28 September in Cold Bay. The previous two sightings were in the springs of 1983 and 1984.

Merlins were observed four times during the fall of 1990 (19,21,27 September and 7 October). Two birds were observed chasing a gyrfalcon on 27 September near Lamprey Lake while the other three sightings were of single birds. We have seven previous sightings for the refuge dating back to 1965.

Two new bald eagle nest sites were established in 1990 bringing the total number of documented sites on or near the Izembek Unit to five. Three sites were active in 1990 and a single eaglet was seen at each in late June.

A commonly used rough-legged hawk eyrie on Mt. Simeon (Baldy Mtn.) was inactive in 1990. Another site that has been used each year by gyrfalcons was taken over by rough-legged hawks in 1990 and three chicks were present in this nest on 12 July.

Rough-legged hawk young at nest site near Black Hills. This has been a traditional gyrfalcon nest site over the past years. CPD

7. Other Migratory Birds

Refuge Manager West and ARM Chase performed the annual Breeding Bird Survey along a 15 mile segment of the Cold Bay road system on 1 June. This survey is part of a nationwide effort organized by the Migratory Bird Management Office with

Table 27. Results of Spring breeding bird survey conducted on the Izembek Refuge, 1990.

Species	1990 No. Birds	1990 Stops	Range 1982-1990 /2 No. Birds	Range 1982-1990 /2 Stops	Total Yrs Observed
C. Loon	5	4	0-5	0-4	7
Tundra Swan	23	2	2-23	1-8	8
Black Brant	350	1	0-350	0-1	2
Mallard	6	4	0-9	0-4	6
N. Pintail	5	2	0-5	0-2	6
G-w. Teal	2	1	0-5	0-2	2
A. Wigeon	2	1	0-2	0-1	1
G. Scaup	21	8	2-32	1-9	8
B. Scoter	10	3	5-25	3-6	8
W. Ptarmigan	36	21	3-67	3-27	8
Bald Eagle	1	1	0-3	0-1	3
N. Harrier	1	1	0-1	0-1	1
Semipalmated Plover	7	6	1-7	1-6	8
Least Sandpiper	8	6	0-10	0-6	7
Rock Sandpiper	91	29	52-93	23-30	8
Dunlin	3	2	0-3	0-2	4
C. Snipe	11	10	1-20	1-10	8
Mew Gull	11	5	4-21	3-13	8
G-w. Gull	95	17	1-204	1-19	8
Arctic Tern	5	2	0-5	0-2	1
Aleutian Tern	1	1	0-1	0-1	1
Tree Swallow	7	4	0-7	0-4	3
Bank Swallow	5	1	0-5	0-1	1
C. Raven	13	7	0-13	0-7	5
B-b. Magpie	2	2	0-5	0-2	3
N. Shrike	1	1	0-1	0-1	1
Water Pipit	27	17	7-27	6-17	8
Sav. Sparrow	25	14	3-41	2-20	8
G-c. Sparrow	19	12	3-19	3-12	8
L. Longspur	82	30	40-92	22-30	8
C. Redpoll	6	2	0-8	0-6	6
Total Species	31		18-31		

/1 This is an automobile survey with thirty (30) three minute stops at half mile intervals. No. Birds is the total heard or seen for the survey; Stops: is the number of stops on which the species was encountered.

/2 No survey in 1986.

Table 28. Results of Christmas Bird Count, Cold Bay, Alaska 29 December 1990.

Species[1]	1990	Average Number[2] (No. years seen)	% Change from average
Horned Grebe	1	12 (14)	-92
Pelagic Cormorant	20	13 (23)	+54
Black Brant	4	1429 (17)	-99
Emperor Goose	1930	1200 (25)	+61
Mallard	14	39 (17)	-64
Green-winged Teal	4	6 (9)	-33
Greater Scaup	33	31 (7)	+6
C. Goldeneye	30	108 (24)	-72
Bufflehead	2	10 (17)	-80
Oldsquaw	9	215 (25)	-96
Harlequin Duck	23	33 (24)	-30
Steller's Eider	4	1033 (25)	-99
White-winged Scoter	11	18 (21)	-39
B. Scoter	7	145 (22)	-95
C. Merganser	20	13 (13)	+54
R-b. Merganser	1	110 (23)	-99
Bald Eagle	14(8a:6j)	11 (25)	+27
Gyrfalcon	1	1 (13)	0
Willow Ptarmigan	13	7 (16)	+86
G-w. Gull	106	153 (25)	-31
P. Guillemot	13	6 (16)	+117
B-b. Magpie	7	3 (17)	+133
C. Raven	83	86 (25)	-3
N. Shrike	2	1 (17)	+100
G-c. Rosy finch	1	54 (25)	-98
C. Redpoll	12	13 (9)	-8
Snow Bunting	3	38 (25)	-92

Total number of species 21
Total number of individuals 2472

Number of observers: 2 (Mark and Julie Chase)
Observation time: 7:50
Distance covered: ± 42 miles

[1] A total of 58 species have been observed in the 25 years of counts.

[2] Average for year during which the species was observed.

participation by the Izembek refuge beginning in 1982. In 1990, the refuge staff heard or observed 881 individual birds of 31 species (Table 27).

The Audubon Christmas Bird Count was conducted by ARM Chase and ROS Chase in the Izembek/Cold Bay area on 29 December. A total of 2,472 individuals birds of 27 species were observed (Table 28). This is the 25th year the CBC has been conducted at Cold Bay by the Izembek staff.

Noteworthy observations of "other migratory birds" in 1990 include:

Species	No.	Date	Remarks
Robin	1	23 March	Single bird at Cold Bay
Robin	1	24 October	Single bird on Outpost Road
Pine grosbeak	1	1 October	Single bird at Cold Bay. Second record for refuge.
Hermit thrush	2	16 September	Two seen in alders on Frosty Road. Third record for the refuge.
Tree sparrow	1	16 September	Adult seen in alders on Frosty Road. Third record for the refuge.
Yellow-rumped warbler	1	29 September	Near Grant Point. First record for the refuge.

8. Game Mammals

Big game species found on all units of the Izembek Refuge include brown bear, caribou, moose, wolf and wolverine. Of these, moose are least abundant while wolverine are the most seldom observed. Moose are regularly seen in low numbers in the eastern portion of the Pavlof Unit where willow (Salix spp.) is common. The taller species of willow preferred by moose are rare on the remainder of the Pavlof Unit and on both the Izembek and Unimak Units. Hence moose do not prefer this area. A single animal seen near King Cove in August of 1989, a pair of young bulls observed in Lefthand Valley during the spring bear hunt and a single medium bull seen on Unimak Island in September of 1990 comprise our most recent sightings.

Fur animals which can be hunted on the refuge include coyote, red fox, and arctic ground squirrel. The coyote appears to be slowly pioneering into the area with an unconfirmed report in 1949 and first documented reports of single animals in 1984 and 1985. The species was not reported again until fall of 1989, when a specimen was taken at Pavlof Bay. The red fox is a commonly hunted species on the refuge with most taken by people

who are also engaged in trapping activities. There is essentially no harvest of ground squirrels on the refuge in that Aleut people have not traditionally used the species for clothing.

The interest in game mammals on the refuge by both consumptive and non-consumptive users centers primarily on brown bear and caribou populations. Both species are hunted with nonresident hunters accounting for most of the bear harvest while local residents are the primary users of caribou. Declining herd size, due to low recruitment and poor survival in the Southern Alaska Peninsula Caribou Herd, has brought about management decisions that limit the harvest and that also provide preferential use to local residents.

Brown Bear

Management activities associated with the lower Alaska Peninsula brown bear population in 1990 consisted of aerial surveys of study areas on the Izembek and Unimak Units and continued monitoring of the sport harvest. The sport harvest of brown bears is allowed both spring and fall during alternate regulatory years. In 1990, the spring season was open. The next open season will be in the fall of 1991. The Izembek staff monitors hunter activity on the refuge which is primarily in the form of commercial guiding of nonresident hunters. The Izembek office is a designated sealing location for species such as brown bear for which both hide and skull must be sealed.

Aerial surveys performed by the refuge staff provide an index of population size and productivity on both the Izembek and Unimak Units (Table 29). These surveys are flown during crepuscular periods (morning or evening) as bears are most active then and throughout nocturnal hours. Available survey data suggest that brown bear populations in these remote areas are stable if not increasing due to better than average productivity and survival. These data in addition to the magnitude, age, and sex of the harvest help guide refuge and state management strategies for brown bear.

Caribou

The Southern Alaska Peninsula Caribou Herd (SAPCH) has been in steady decline since 1983. The herd winters in the Cold Bay area and migrates up the peninsula to calving and summer ranges. Since the peak of roughly 10,200 animals in 1983, the herd has suffered a drastic decline due to poor recruitment and high adult mortality. Cooperative work by ADF&G and refuge staff intensified in 1990 in order to determine the cause, or causes, of the herd's recent decline.

Table 29. Fall aerial brown bear survey results, Izembek and Unimak Units, Izembek NWR, 1990.

Area	Date	Single Bears			Females with[1]			Total Females with Family Groups	Total Bears
		Small	Med.	Large	COY	Yrl.	2.5		
Izembek Unit									
N.E. Izembek	6 Sept.	8	21	0	10w/17	5w/7	6w/10	21	84
Average									
1976-90		12	19	3	8w/17	7w/15	1w/2	16	88
Unimak Unit									
N.E. Unimak	10 Sept.	12	24	6	2w/3	1w/1	3w/7	6	59
S.E. Unimak	13 Sept.	6	8	0	1w/1	1w/3	1w/2	3	23
Average									
N.E. Unimak (1978-1990)		8	21	3	4w/8	4w/7	<1	8	55
S.E. Unimak (1976-1990)		2	4	<1	1w/3	1w/3	<1	3	15

[1] Total females with young in each age class.

Ken Pitcher of ADF&G takes electrical impedance measurements from an adult cow in mid-October. Capture is by a skid-mounted net gun on the helicopter in the background. MAC

In 1990, the refuge and ADF&G agreed on financial and field support for a graduate student from the University of Alaska, Fairbanks. The doctoral student, Eric Post, visited the refuge and participated in aerial radio tracking flights in December. The calving areas in the Black Hills/Trader Mountain area and wintering habitats south and west of Cold Bay to the end of the peninsula were flown to give Eric an overview of these important habitats. He also spent a considerable amount of time during his five-day visit viewing caribou and observing food and feeding conditions in the Cold Bay road system. Eric's primary advisor is Dr. David R. Klein, leader of the Cooperative Wildlife Research Unit at UAF. Dr. Klein visited the refuge from 9 to 12 July to obtain an overview of the potential study areas and available facilities. Assistant Manager Chase accompanied Dr. Klein on a tour of habitats extensively used by wintering caribou. An aerial survey of calving and post-calving areas in the Black Hills/Trader Mountain area and habitats in the Caribou and David River areas was performed on 9 and 12 July. Dr. Klein also participated in radio tracking activities on these flights and helped with a post-calving production count near the Black Hills where the bulk of the Southern Alaska Peninsula herd was found in a single group of nearly 3000 animals.

In April, ARM Chase and ADF&G Biologists Ken Pitcher and Dave Johnson worked with Chris Soloy of Soloy Helicopters to capture 19 cows of the SAPCH. Twelve cows were outfitted with radio and visual identifier collars. Blood samples, fecal samples, weights and measurements, condition indices, and electrical impedance measures were taken on all animals. Efforts are aimed at understanding this herd's poor production performance since about 1983. There were two capture related mortalities due to broken necks. Live weights of mature cows ranged from 177-230 lbs. Nine of the 12 radioed animals were recaptured in October to make comparative measurements. The animals in October appeared quite healthy and most had put on 20-30 lbs. over the summer.

Post-calving aggregation near Black Hills. CPD
This group contained an estimated 80% of
the SAPCH members.

Productivity surveys are typically conducted by ADF&G in mid-June as an indicator of early calf recruitment. Refuge staff then conducts a pre-hunt survey, usually in September or October, to determine herd composition, recruitment, and summer survival (Table 30). A total count is made by refuge staff on the wintering grounds with variable timing from year-to-year. Typically, the count is conducted after the bulk of the herd is in the Cold Bay area, the snow cover is near 100% (for best visibility), and the weather is suitable for flying; not an easy combination to achieve working within the available time frame.

Post-calving surveys were conducted by the ADF&G from 12 to 16 June from the Black Hills/Trader Mountain area north to Nelson

Lagoon. One primary goal of this effort was to determine the reproductive status of 33 female caribou with active radio collars. Three of these animals were found dead and three others not heard were probably outside the search area or their radios had failed. Of the remaining 27, reproductive status was determined on 25. Five of 19 cows (26%) in the Black Hills/ Trader Mountain area were observed with calves versus five of six (83%) with calves in the Caribou River area.

This trend in differential recruitment between the two primary use areas was supported by ocular and photographic appraisals of production conducted during these mid-June tracking flights. Calves comprised 28 percent of a sample of 943 caribou in the Caribou River versus 6 percent (n = 2,432) in the Black Hills/Trader Mountain area. The total of 3,375 (12 percent calves) sampled comprised the bulk of the Southern Alaska Peninsula Caribou Herd, subjectively estimated by the surveyors at approximately 4,000 animals.

Productivity was not estimated again until 9 and 12 July when most of the herd (approximately 3,000 animals) was viewed in the Black Hills area. Approximately 200 calves (7%) were observed in this group while an aerial estimate based on a small sample (n = 63) from the Caribou River suggested calves comprised 24 percent of this more northerly segment of the herd. June and July production counts suggest good survival during this mid-summer period and that the low recruitment, indicated by six to seven percent calves in the bulk of the herd, is continuing due to poor survival of calves early in the post-calving periods.

Two productivity counts were counted in October. From 13 to 14 October a helicopter survey was conducted by ADF&G personnel throughout the SAPCH range. The percentage of calves changed little in the Black Hills/Trader Mountain based on a sample of 790 animals (6.7% calves) however, percent calves dropped markedly from July (24%) to October (15%) near the Caribou River. The bulk of the herd, including most animals that calve near the Black Hills, spend the winter in the Cold Bay area. A sample of these animals was viewed by the refuge staff on 26 October as they neared the Cold Bay road system. A total of 2,361 caribou were counted from the ground and 640 of these were near enough to be classified with only 37 (5.8%) of these being calves.

There are few large bulls in the SAPCH however, pregnancy and birth rates, comparable to other Alaskan herds, are high so the bull component is apparently adequate to allow for good production. The low rate of recruitment observed appears to be due to poor nutrition in both pregnant cows and their calves. The proportion of bulls in the population was estimated during both October productivity efforts. Bulls, medium and large combined, comprised 12.9 and 19.9 percent of the Black Hill/Trader Mountain and Caribou River segments, respectively,

Table 30. Population and productivity survey data for the Southern Alaska Peninsula Caribou Herd, 1990.

Date	Number and percentage of calves		No. Animals Sampled	Est. Total Animals
	Black Hills/Trader Mtns	Caribou River		
12-16 June	141 (6.0)	264 (28.0)	3375	3375
12 July	200 (6.7)	15 (24.0)	3000	3000
13-14 October	53 (6.7)	40 (15.3)	1051	-
26 October	37 (5.8)	-	640	2361

in mid-October. A much lower rate of 4.5 percent bulls was found on 26 October near Cold Bay, however, this difference may be due to small sample size or variations in migratory phenology of different population components.

Survey conditions in late winter were not conducive for the completion of a total population count throughout the herd's range. Such counts are best done using aerial photography during periods of complete snow cover. Warm conditions throughout most of late November and December resulted in little or no snow cover in lowland areas favored by wintering caribou. A radio tracking and population survey was flown on 4 January (1991) with no snow cover below 1000 feet (ASL). Due to their light pelage, caribou were highly visible and we feel that few animals were missed. The Caribou/David River segment of the herd which is comparatively sedentary was numbered at 858 animals down from the 943 caribou estimated for that area in June. Our best estimate of numbers for the Cold Bay wintering segment was the 2,361 observed as the animals neared the Cold Bay area. This suggests that a minimum of approximately 3300 animals were present in the total winter population. Alaska Department of Fish & Game biologists estimated the post-calving population in June at 4,000 animals. Considering the effects of natural mortality and harvest, our subjective estimate may be quite close (Table 31).

Table 31. Annual recruitment and population size of the SAPCH 1983-1990

Year	Fall Calf Composition(%)	Winter Total Count
1983	15 %	10,203
1984	15 %	NA
1985	9 %	NA
1986	13 %	NA
1987	16 %	6401 /1
1988	12 %	3407 /1
1989	3 %	3957
1990	6 %	3300 /2

/1 Post-calving census.
/2 Estimated total based on December and January efforts.

The age structure of the hunter harvested animals is also indicative of the sustained poor recruitment to the SAPCH. Since 1986, Refuge staff has been collecting lower jaws from hunter killed animals and ADF&G personnel have been aging these jaws. Over the past four seasons, 83% of the reported caribou harvest has been at least five years old. Results of the jaw aging are contained in Table 32.

Table 32. Summary of hunter-harvested caribou as determined by tooth wear and replacement, SAPCH, 1986-1990.

		Total (%)			Aged to 5+ Years (%)			
Season	n	M	F	U	M	F	U	All
86/87	40	16(40)	14(35)	10(25)	10(63)	12(86)	9(90)	31(78)
87/88	51	28(55)	22(43)	1(2)	24(86)	19(86)	1	44(86)
88/89	40	20(50)	19(48)	1(2)	18(90)	16(84)	0	34(85)
89/90	20	13(65)	7(35)	0	11(85)	5(71)	0	16(80)
Total	151	77(51)	62(41)	12(8)	63(82)	52(84)	10(83)	125(83)

Though there is some selection for the larger, thus typically older bulls, the age of harvested cows should approximate their availability as cows are taken for meat without a great deal of selection.

Intuitively, it is felt that under nutrition may be the key factor in the poor calf survival. This would follow naturally from the population buildup through the 1970's, the increased demand on the forage resources, and the subsequent inability of the range vegetation to keep pace with demand. Range surveys and food habits analyses were undertaken to examine this possibility. Fecal pellets have been collected on the winter range for the previous 2 years and on the calving range since 1989. Results of the analysis is summarized in Table 33. The high percentage of mosses in the winter diet may be an indication that this herd is nutritionally stressed. Field sampling to determine availability of vegetative species was initiated in 1988 and these data, along with more intensive evaluations to be undertaken as part of the graduate research project, will help quantitatively address herd nutrition.

The large number of caribou killed around the Cold Bay road system gives the Refuge staff opportunities for large amounts of data collection with little effort. Refuge staff initiated a serological investigation into potential disease problems with the SAPCH in 1989. Sampling kits were distributed to local hunters and they were encouraged to take a blood sample from harvested caribou. The samples (n=17) were then centrifuged and the serum frozen. The samples were sent to Randy Zarnke with the ADF&G in Fairbanks for analysis. The serum samples were analyzed for the presence of nine different disease titers indicating exposure at some time. Collecting

samples by hunters led to generally poor quality samples and a small sample size as most folks forgot to take blood. High quality samples are preferred but not imperative in this type of investigation. Analysis of 27 samples from individual animals suggests there is not a major disease problem in the herd (Table 34). Of the nine diseases tested for, only Q-fever was found in some of the samples. Wildlife disease specialists with the ADF&G suggest that "Q-fever pops up sporadically in a variety of wildlife species" and that the current results are not cause for alarm. Q-fever is caused by the rickettsium Coxiella burnetti, which usually localizes in the respiratory tract. Rarely does death occur however, it has caused abortions in sheep and goats.

Blood samples from captured animals during the April and October collaring efforts were also analyzed to determine packed cell volumes which is a general indicator of overall health and vigor. Results yielded "normal" (compared to other herds in Alaska) values between 45% and 53%.

A scarce commodity on the range of the Southern Alaska Peninsula Caribou Herd. MAC

Table 33. Percent composition of various forage types found in fecal pellets of caribou, SAPCH, 1988-90.

Species/Group	Cold Bay Road System Dec.88	Dec.88	Mar.90	Black Hills/Trader Mtns. Jun.89	Apr.90	Caribou/David River Apr.90
Moss (Type 1)	21.77	14.10	.05	7.50		3.60
Moss (Type 2)	31.32	20.90	35.90	3.40	14.90	14.30
Other(4 minor types)	4.73	17.70	24.10	2.10	11.00	3.90
Club Moss				.30		
TOTAL MOSS	57.82	52.70	60.05	13.30	25.90	21.80
Lichen (Alectoria)	9.41	8.00	.30	2.90	1.10	1.00
Lichen (Fructicose)	4.61	6.50	5.90	1.80	14.10	14.70
Lichen (Foliose)	1.56	4.70	2.40	1.50	5.20	1.60
TOTAL LICHEN	15.58	19.20	8.60	6.20	20.40	17.30
Sedge spp.	.76	.30	.90	12.20	2.50	8.60
Poa			3.60		.80	
Festuca				5.80		
Calamagrostis				12.30		
Unk. Grasses	4.35	5.10	3.10	1.90	1.90	4.80
TOTAL GRASSES	4.35	5.10	6.70	20.00	2.70	4.80
Shrub stem	1.31					
Shrub other[1]	15.12	17.40	19.60	34.30	35.20	32.50
TOTAL SHRUB	16.43	17.40	19.60	34.30	35.20	32.50
Forb[2]	.62	5.00	3.70	9.80	13.30	15.0
Unk. leaf	4.44					
Hair		.30		4.20		
Sample Size (No. Pellet groups/ No. Pellets)	125/250	84/168	5/10	56/112	6/12	14/28

1 - Winter samples primarily Empetrum, Arctostaphylos, Vaccinium and small amounts of Salix and Cornus. Spring sample 18.6% Salix, 4.40% Empetrum and remaining 11.30% Arctostaphylos, Vaccinium, Rubus, Equisetum and Unk.

2 - Winter samples of Solidago, Trientalis, Angelica and Unk. Spring sample mostly Angelica also with Artemisia, Epilobium, Solidago, Trientalis, and Unk.

Table 34. Results of blood sample analysis, SAPCH, 1988-90.

Disease Type	Results/Year (No. animals sampled) 1988 (10)	1989/90 (17)
Epizootic hemorrhagic disease	Negative	Negative
Blue tongue	Negative	Negative
Contagious ecthyma	Negative	Negative
Brucellosis	Negative	Negative
Q-fever	Positive in 4 of 7	Positive in 2 of 17
Infectious bovine rhinotracheitis virus	Negative	Negative
Bovine viral diarrhea virus	Negative	Negative
Parainfluenza 3 virus	Negative	Negative
Respiratory syncytal virus	Negative	Negative

9. Marine Mammals

Gray whales are common spring and fall migrants in nearshore waters along both the Bering and Pacific sides of the Alaska Peninsula. They prefer shallow water during migrations and are occasionally seen in estuaries such as Izembek Lagoon. Because of this behavior, gray whales commonly become stranded on beaches or barrier islands. A larger than normal stranding occurred in the spring of 1990, when eight animals, six of which appeared to be adults, were seen between Cape Krenitzin and Cathedral River and another single adult was found in Cold Bay all between 1 and 15 June. It is not uncommon to see half this number of animals stranded in a more typical year.

The first sighting of a gray whale during spring migration was on 13 April. First spring reports for Cape Sarichef on the west end of Unimak Island occur in the last week of March and for the Izembek area early reports can occur in the first week of April. Spring migration normally ends by mid-June. Fall migrants are less commonly reported and this movement may extend well into October or November.

Killer whales are rarely seen in the Izembek area but are likely more common in offshore areas. Two animals were observed from the Cold Bay dock and three others from a small skiff in Cold Bay in August.

Sea otter and harbor seal populations were reduced in the northern Gulf of Alaska and along the south side of the Alaska Peninsula due to the EXXON VALDEZ oil spill in March of 1989. Even though oil was not reported as far south as Cold Bay, local populations of these mobile animals may have been impacted. A coastal survey of Cold Bay and Morzhovoi Bay in March of 1990 indicated 50 percent lower numbers of sea otter in comparison to a pre-spill survey (March 1983). Harbor seals increased from three to 10 over the same period along the 80 miles of coastline surveyed. Other surveys indicate that nearshore aerial counts of sea otter and harbor seal may not adequately assess population trends. These species are counted during emperor goose surveys both spring and fall along the Alaska Peninsula. More sea otters were observed along the south side of the Alaska Peninsula in 1989 and 1990 than in pre-spill springs from 1986 to 1988. Weather and sea conditions are important factors affecting visibility of these species. Such conditions are highly variable along the Alaska Peninsula so these biases likely affect the determination of population trends from nearshore surveys.

10. Other Resident Wildlife

Ptarmigan, primarily willow, are abundant on the lower Alaska Peninsula and on Unimak Island. Rock ptarmigan are uncommon, occurring only in higher elevations. Ptarmigan are not

intensively studied by the Refuge staff nor is their harvest level monitored however, an index to their general abundance is obtained from our annual breeding bird survey (Table 27) and from ADF&G collection of subjective impressions of small game abundance from a randomly selected sample of hunters in various geographic areas of the Alaska.

The results of our breeding bird surveys are based on the numbers of birds seen and heard at 30 stations positioned at one-half mile intervals along the Cold Bay road system. Willow ptarmigan have been encountered each of the eight years in which the survey has been done. From 1982 to 1990 an average of 33 ptarmigan were encountered at an average of 17 stations. The 1990 survey results of 36 (+9%) ptarmigan at 21 (+25%) stations indicates we may expect a better than average production year. A sizable rabies outbreak in 1990 could also benefit the ptarmigan population due to a greatly reduced red fox population.

The hunting season for ptarmigan opens on August 10 and locals pursue them prior to the opening of waterfowl season in September. After the Canada geese and brant depart the area, interest in ptarmigan hunting picks up again until the season ends on April 30. The bag limit is 20 per day.

11. Fisheries Resources

Although the anadromous fisheries resources are not directly "managed" by the Refuge staff, they are of particular interest in that they are an extremely important part of the food chain, especially to bears and bald eagles. The King Salmon Fisheries Assistance Office began field work in 1986 on the Izembek Refuge to provide baseline data for the Fisheries Management Plan. After several field seasons and completion of the data, a draft plan was prepared and supplied to the refuge for review (January '91).

The Alaska Department Fish and Game - Commercial Fish Division monitors the commercial catch and escapement for the major streams in the Izembek and Pavlof Units. Data on catch and escapement is contained in the 5-part Table 35 (one part for each species) and in Table 36. The ADF&G - Fisheries Rehabilitation and Enhancement Division (FRED) staffs the Russell Creek Hatchery which works with chum, pink and silver salmon.

Jim Larson (FAO - King Salmon) visited Izembek 4-6 September to do some char fisheries sampling. Approximately 150 char were collected from 3 locations in the area. Frosty Creek, Russell Creek, and the quonset pond were sampled to provide specimens for genetic comparison studies of three distinct char populations.

Table 35. Commercial salmon catch and escapement, vicinity of Izembek Refuge, 1969 - 1990.[1]

	Pink (Humpy) salmon (in thousands)			
	Cold Bay Area & Morzhovoi*		Izembek & Moffet	
Year	Catch	Escape	Catch	Escape
1969	0.2	20.3	0	2.3
1970	1.5	43.9	0	0
1971	3.6	4.5	0	0.1
1972	0	5.7	0	0
1973	0	4.6	0	0
1974	0	9.9	0	0
1975	0	8.3	0	0.1
1976	0.8	55.8	0.1	0
1977	0	21.7	0	0.2
1978	6.0	157.7	2.2	0
1979	0.03	19.2	0.01	0
1980	126.1	127.1	0	0
1981	8.5	17.5	0	0
1982[2]	136.9	319.7	0	0.2
1983	13.8	31.2	0	0
1984	139.7	236.7	0.1	0
1985	5.3	15.6	0	0
1986	48.2	84.4	0	0
1987	0.1	17.4	0	0
1988	90.6	111.1	1.2	1.8
1989	6.9	132.7	0	0
1990	14.8	90.6	0.1	0.4

* Much of the Cold Bay/Morzhovoi runs occur off refuge.

1 Data supplied by Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak.

2 Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Morzhovoi Bay.

Table 35. continued.

	Chum (Dog) salmon (in thousands)			
	Cold Bay Area & Morzhovoi*		Izembek & Moffet	
Year	Catch	Escape	Catch	Escape
1969	0	24.6	4.5	94.4
1970	1.8	43.5	10.0	53.4
1971	0.5	54.3	36.3	54.8
1972	0	51.0	57.9	72.7
1973	0.7	30.4	96.6	70.3
1974	0	30.9	11.2	70.6
1975	0	17.7	3.4	77.6
1976	2.9	38.7	40.8	123.3
1977	0	139.1	20.3	368.3
1978	5.9	102.2	81.4	119.0
1979	4.6	27.4	17.8	178.0
1980	43.3	64.4	282.6	365.2
1981	27.0	48.5	296.4	235.0
1982[2]	102.6	103.6	57.5	166.4
1983	58.9	62.5	154.8	173.3
1984	145.5	123.4	102.7	427.5
1985	87.4	94.4	126.6	194.7
1986	134.5	157.9	69.1	142.4
1987	2.9	163.8	148.6	286.0
1988	186.4	129.5	112.2	304.4
1989	5.2	74.9	14.5	90.6
1990	5.6	60.5	24.0	92.5

* Much of the Cold Bay/Morzhovoi runs occur off refuge.

1 Data supplied by Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak.

2 Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Morzhovoi Bay.

Table 35. continued.

	Coho (Silver) salmon (in thousands)**	
	Cold Bay Area & Morzhovoi*	Izembek & Moffet
Year	Catch	Catch
1969	0	0
1970	0	0
1971	0	0
1972	0	0
1973	0	0.2
1974	0	0
1975	0	0
1976	0	0
1977	0	0
1978	1.3	0
1979	7.0	0
1980	16.4	0
1981	13.1	0
1982[1]	1.4	0
1983	0.7	0
1984	0.6	0
1985	1.9	0
1986	2.5	0
1987	6.7	2.9
1988	11.4	3.0
1989	5.3	0.1
1990	13.1	0

* Much of the Cold Bay-Morzhovoi runs occur off refuge.

** Coho escapement data is incomplete. Some surveys are done, but they are rarely peak counts. Fishing effort is usually very light on Alaska Peninsula coho (Arnold R. Shaul, Alaska Department of Fish and Game, Commercial Fish Division, Kodiak).

1 Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Thin Point Cove from 1982 on.

Table 35. continued.

	Red (Sockeye) salmon (in thousands)			
	Cold Bay Area & Morzhovoi*		Izembek & Moffet	
Year	Catch	Escape	Catch	Escape
1969	2.2	7.5	6.1	14.0
1970	1.0	3.3	3.1	7.5
1971	1.1	2.3	6.9	3.5
1972	0	2.5	0.8	4.8
1973	0.2	3.3	1.2	2.0
1974	0	27.3	4.7	3.7
1975	0.5	15.6	1.5	13.6
1976	1.4	27.3	20.4	15.3
1977	12.5	28.7	3.1	26.1
1978	1.0	24.7	15.5	23.0
1979	0	8.5	10.8	8.4
1980	15.6	6.1	34.2	11.2
1981	8.9	7.0	30.9	12.0
1982[2]	19.8	17.0	24.5	21.2
1983	13.8	18.2	15.2	18.5
1984	59.3	14.1	4.7	19.1
1985	30.8	7.1	6.2	17.2
1986	42.5	19.7	19.1	15.7
1987	1.5	23.5	6.5	13.6
1988	6.6	40.4	11.5	17.3
1989	7.8	41.7	8.6	22.5
1990	12.0	62.5	39.4	33.7

* Much of the Cold Bay/Morzhovoi runs occur off refuge.

[1] Data supplied by Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak.

[2] Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Morzhovoi Bay.

Table 35. continued.

	King (Chinook) salmon (in thousands)			
	Cold Bay Area & Morzhovoi*		Izembek & Moffet	
Year	Catch	Escape	Catch	Escape
1969	0	0	0	6.9
1970	0	0	0	2.1
1971	0	0	0	0.2
1972	0	0	0	0.2
1973	0	0	0	0.7
1974	0	0	0	0
1975	0	0	0	0
1976	0	0	0	0
1977	0	0	0	0
1978	0	0	0	0
1979	0.002	0	0	0
1980	0	0	0	0
1981	0	0	0	0
1982[2]	0	0	0	0
1983	0	0	0	0
1984	0	0	0	0
1985	0	0	0	0
1986	0	0	0	0
1987	0	0	0.1	0
1988	0	0	0	0.1
1989	0	0	0	0
1990	0	0	0	0.03

* Much of the Cold Bay/Morzhovoi runs occur off refuge.

1 Data supplied by Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak.

2 Includes inner Cold Bay, Lenard Harbor, Sandy Cove-Mortensen's Lagoon, Morzhovoi Bay.

Jim Larson (left - King Salmon FAO) & ARM Chase collected char from quonset pond for genetic comparison studies. RLW

Two Char both collected from Frosty Creek. RLW

Table 36. Catch and escapement data for salmon in the Hoodoo (Sapsuk) Lake/Caribou River Drainage. (Data supplied by Arnold Shaul, Commercial Fisheries Division, Alaska Department of Fish and Game, Kodiak, Alaska).

Year		Species					
		Red	Silver	Chum	King	Pink	Total
1983	Catch	192,900	64,000	14,000	12,100	0	283,000
	Escapement	128,800	13,000[1]	14,000	12,500	0	168,300
1984	Catch	118,800	113,300	78,400	7,800	100	318,400
	Escapement	251,000	41,000[1]	49,000	6,300	-	338,300
1985	Catch	706,300	88,200	6,600	10,900	0	812,000
	Escapement	318,500	18,100[1]	13,000	3,200	0	352,800
1986	Catch	178,400	99,300	3,600	4,800	100	286,200
	Escapement	117,900	23,000[1]	1,800	1,800	0	144,500
1987	Catch	128,500	83,700	6,700	5,800	0	224,700
	Escapement	155.700	27.500[1]	5.200	4.100	0	192.500
1988	Catch	185,800	95,400	13,400	6,500	100	301,200
	Escapement	142,500	17,000	11,000	3,300	0	173,800
1989	Catch	325,000	119,300	5,000	3,800	0	453,100
	Escapement	206,800	32,000	800	3,100	0	242,700
1990	Catch	410,200	79,200	2,100	3,600	0	495,100
	Escapement	269,200	30,000	-	2,300	-	301,500

[1] Sapsuk River only.

16. Marking and Banding

Snow buntings and rosy finches were banded with standard leg bands at the refuge headquarters in 1990. This banding is an excellent environmental awareness activity for visiting school children and also is providing data on migration and longevity for these two species.

Three tundra swans were captured and neck collared in 1990 during an abbreviated banding effort due to personal travel.

The refuge staff cooperated with the ADF&G in the helicopter capture of 17 caribou in April and 9 of these same animals in October. (G.8 Caribou).

ARM Chase and Cold Bay students band snow buntings and rosy finches at refuge headquarters. RLW

Biologist Dau processes 3, 2-year-old swans MAC at Rescue Lake while Secretary Christensen records the data.

17. Disease Prevention and Control

A rabies outbreak swept through the area's red fox population in the spring of 1990. One fox head, from a peculiar acting fox, was submitted to the state health lab in April and confirmed rabid. Three more suspect foxes were killed by local residents and the heads sent in; all three were rabid. By June, a marked decline in the area's fox population was evident and by late summer, fox were downright scarce. Fewer wolves have been observed around the Cold Bay area during the winter of 1990/91 than in the past. Though this could well be a result of a distributional shift due to the location of the caribou herd, if the wolf numbers have truly declined rabies may be a causative factor.

No other incidence of rabies was documented in any other species during the year.

The red fox suffered a setback due to rabies in 1990. Conversely, incidental observations of ptarmigan, voles, and shrews indicate increases in these populations. MAC

H. PUBLIC USE

1. General

The majority of refuge public use comes from the residents of Cold Bay and, to a lesser degree, residents of King Cove, False Pass, Sand Point and Nelson Lagoon. Consequently, a great deal of our public use and interpretive programs is geared to this audience. The presence of the refuge in this area greatly influences these people's lives. In turn, these people have the potential to greatly influence refuge resources. It is imperative then, that we reach these people through effective interpretation and environmental education programs.

As an ongoing effort to keep the user public informed, several outreach activities are routine to Izembek staff. Open houses, periodic letters to all boxholders and visits to the local communities are all informal public relations activities. Special interpretive programs or exhibits are discussed in other relevant parts of Section H.

An open house/public meeting was hosted by the refuge in early September to discuss the upcoming hunting seasons and applicable regulations. Twenty people attended the meeting which was held at the refuge headquarters in Cold Bay. The changes to the caribou regulations, waterfowl season and subsistence in general were the primary topics of discussion. The Federal Subsistence Program is detailed in Section J.3 Items of Interest.

In 1990, two letters were sent to all Cold Bay boxholders. The first, in April, dealt with bears, bear hunting, the rabies outbreak and the Grant Point Wildlife Observation Facility. The second letter, in August, addressed the upcoming hunting seasons with reminders on bag limits, required tags and some of the more common violations.

Refuge staff visited area schools to talk to the students about refuges, the Service in general and area wildlife. In January, ARM Chase and WB Dau visited False Pass School in conjunction with "False Pass Week". Sixteen students and three teachers were contacted. In March, RM West and WB Dau visited Nelson Lagoon School contacting 13 students and two teachers. King Cove School was visited in April. A total of 120 students attended three assemblies during the day; 14 teachers were contacted as well. This visit also included a short meeting with the 14 teachers to discuss Alaska/National Wildlife week materials and the Region's Teach About Geese program. Teach About Geese packets were distributed to all teachers.

Several school classes visited the refuge headquarters periodically during the year as well. The Cold Bay high school class, consisting of 5 students and 1 teacher, visited the refuge in January to participate in snow bunting and rosy finch banding. The 1st - 3rd grades class also visited the refuge in January to learn about bird banding; eight students and one teacher attended. Fifteen students and two teachers from Sand Point visited the refuge in April on their way through Cold Bay.

Wildlife Biologist Dau conducted a field trip for Cold Bay students grades 6 - 12; seven students and two teachers attended. The trip was to the Grant Point Wildlife Observation Facility and discussions centered around the wildlife and ecology of Izembek Lagoon.

In addition to the regular school visits Refuge staff participated in other school activities. In February, RM West and WB Dau participated in "Cold Bay Mini Week" during which time students can take a number of "short courses" taught by local folks. Manager West taught a chess course while Biologist Dau taught the "finer points" of porcupine needle jewelry craft.

Manager West and Biologist Dau also instructed a Hunter's Safety Course in Cold Bay. Six local youths completed the course.

Alaska Wildlife Week and National Wildlife Week coincided in 1990. Information packets were distributed to all area teachers. Assistant Manager Chase met with Cold Bay teachers to further discuss the material and ways to incorporate environmental education into everyday lessons.

Three news articles prepared by Refuge staff were published in the Aleutians East Borough Advocate in 1990. Articles for the local paper discuss refuge related issues of concern primarily at the local level. Responses to the articles have been very positive from local residents.

5. Interpretive Tour Routes

Although Izembek has no tour route per se, the road system does provide recreational access for visitors and thus provides us another "avenue" for interpretive information dissemination. Eight, covered billboard/bulletin board-type signs were ordered from the L.C. Haney Company and received via barge in October 1989. The signs will be installed in 1991 at strategic places around the road system to display interpretive and regulatory information.

6. Interpretive Exhibits/Demonstrations

The interpretive display for the Reeve terminal was finally received in September 1990. This project first began in April of 1987 with the idea of placing an interpretive exhibit in the Reeve terminal and Cold Bay Post Office. Over three years later, after contractor defaults, obligated funds going unused and hundreds of man-hours and phone calls, a display was installed in the Reeve terminal; the Post Office display was given up on in frustration long ago. The Reeve terminal display consists of four large plexiglass panels that piece together to form a map of the lower peninsula. Smaller panels, interpreting wildlife or habitats, are attached, by velcro, to the main panels. An additional panel showing the Cold Bay Road System was also received and is displayed next to the map panels. Unused small panels were arranged around a Service shield emblem at the new MarkAir terminal to serve as a small interpretive display for that location. Patti Gallagher (EIR) travelled to Cold Bay to assist in the installation of the display.

Interpretive display at the Reeve terminal in Cold Bay. RLW

The Grant Point Wildlife Observation Facility received a new set of bird identification panels and a pair of deck binoculars for wildlife observation in April, 1990. The bird identification panels supplement the original interpretive panels which deal with the area's physiography, history and ecosystems. The deck binoculars are mounted on a locking pedestal and swivel to provide 360° viewing through the picture windows.

8. Hunting

Hunting on Izembek is responsible for a large percentage of the public use. On the Unimak and Pavlof Units, nearly all of the public use can be attributed to hunting. On Izembek, waterfowl, caribou, brown bear and ptarmigan are the primary targets of interest. This is true for the Unimak and Pavlof Units as well, with the exception of the waterfowl. The Cold Bay road system provides ready access to excellent hunting for all species and consequently, with the exception of brown bear, most of the hunting is done within the road system. Brown bear hunting is limited within the road system to a 2-bear harvest quota per season. The hunt is by registration permit with no limit on the number of permits. Though the harvest is limited, the system does provide many locals, and a few non-locals, the

opportunity to hunt brown bear locally. The majority of the bear hunting occurs outside the road system and much of this is by nonresident hunters utilizing a guide's services. With the exception of brown bear, most hunting pressure comes from local residents. In the past, large numbers of non-local hunters flocked to Izembek to experience fantastic hunting and liberal bag limits on both waterfowl and caribou. Since the closure of the emperor goose season in 1986 and the reduction in bag limits for other species as well as caribou (from 4 to 1 for non-locals in 1986), hunting pressure has decreased dramatically from the non-local public. Due to the subsistence lifestyle, local pressure is rather constant over time.

Waterfowl

Although brown bear is the "big money" species and caribou the primary dietary staple, Izembek is known primarily for waterfowl. This is waterfowl country; a retriever's paradise! Since the closure of the emperor goose season in 1986, non-local use has declined dramatically. The days of the "Goose Charters" from Anchorage are past but several non-local groups still visit Izembek each fall primarily to hunt the Taverner's Canada geese. No commercial waterfowl guides operated on the refuge in 1990.

Waterfowl hunter effort is contained in Table 37. Harvest data and statistics are contained in Figure 11 and Tables 38 and 39.

Caribou

Caribou harvest is largely local subsistence take with a few non-local hunters taking animals on combination brown bear/caribou hunts. As the caribou arrive on their wintering grounds around Cold Bay, hunting activity is heavy for a short period as many hunters are trying to take large bulls before the bulls shed their antlers. For the 1989-90 season, nearly a third of the caribou were harvested during a two week period beginning 5 November; the caribou arrived in the road system in numbers on 4 November. Hunter and harvest data for the 1989/90 hunting are summarized in Table 40. Intuitively, it is felt that the documented harvest is about 40-50% of the actual harvest.

Brown Bear

Eight registered guides were issued special use permits for big game guiding in 1990. Among the eight guides 59 clients were booked for the Spring 1990 hunt and one client for the fall hunt on Unimak Island. Hunting pressure for the Unit 9D spring hunt seemed somewhat high this year. The number of guided hunters remains fairly constant from year to year however, their seemed to be more than the usual number of unguided hunters trying to take a bear in 1990. Forty-eight camps were

Table 37. Waterfowl hunter statistics, Izembek NWR, 1990.

Est. Total Hunters (Sept. 90)	226	
No. of Hunter Contacts (Sept. 90)	30 (13%)	
Est. Total Hunters (Oct. 90)	497	
No. of Hunter Contacts (Oct. 90)	160 (32%)	
Est. Total Hunters (Nov. 90)	59	
No. of Hunter Contacts (Nov. 90)	3 (5%)	
Est. Total Hunters (Dec. 90)	14	
No. of Hunter Contacts (Dec. 90)	2 (14%)	
Est. Total Hunters (1990 Season)	796	
No. of Hunter Contacts (1990)	195 (25%)	
Av. No. Hours Afield/Hunter/Day Hunted (From 195 bag checks)	4.9 Hours	
Est. Total Hunter-Hours 1990 Season (4.9 Hours Av. x 796 Est. Total Hunters)	3,900 Hunter Hours	
Av. No. of Ducks Taken/Hunter/Day Hunted (From 195 bag checks)		0.65
Av. No. of Brant Taken/Hunter/Day Hunted (From 195 bag checks)		0.26
Av. No. of Canada Geese Taken/Hunter/Day Hunted (From 195 bag checks)		1.5

Table 38. Summary of waterfowl bag check data, Izembek NWR, 1990.

Species	(Harvest by age/sex) Adult M	Adult F	Adult U	Immature M	Immature F	Immature U	Unknown M	Unknown F	Unknown U	Lost	Total	% of Harvest
Black Brant	6	9	0	8	6	1	0	0	18	2	50	14.7
Canada Goose	27	13	0	25	20	2	4	3	187	9	290	85.3
Goose Total	33	24	3	33	26	3	4	3	205	11	340	
Pintail	3	3	0	5	11	0	0	0	19	2	43	34.1
Mallard	16	6	0	2	2	0	0	0	4	2	32	25.4
Gadwall	2	0	0	0	2	0	0	0	0	0	4	3.2
G-W Teal	3	1	0	4	2	0	1	0	5	0	16	11.9
A. Wigeon	0	1	0	1	1	0	0	0	2	1	6	4.8
Shoveler	0	0	0	0	1	0	0	0	0	0	1	0.8
Other Puddle Ducks	0	0	0	0	0	0	0	0	4	1	5	3.9
G. Scaup	1	0	0	0	0	0	0	0	5	0	6	4.8
C. Goldeneye	0	1	0	0	1	0	0	0	0	0	2	1.6
Steller's Eider	0	1	0	1	0	0	0	0	0	0	2	1.6
Black Scoter	0	0	0	0	0	0	0	0	1	0	1	0.8
Harlequin	2	0	0	0	0	0	0	0	1	1	4	3.2
Other Sea Ducks	0	0	0	0	0	0	0	0	0	5	5	3.9
Duck Total	26	13	0	13	20	0	1	0	41	12	127	

Table 39. Estimates of total waterfowl harvest at Izembek NWR, 1990.

	Species	Estimated Total Harvest[1]	
Geese			
	Brant	224	
	Canada Geese	1,302	
			subtotal: 1,526
Puddle Ducks			
	Pintail	194	
	Mallard	144	
	Gadwall	18	
	Green-winged Teal	68	
	American Wigeon	27	
	Shoveler	5	
	Unidentified Puddle Ducks	22	
			subtotal: 478
Diving Ducks			
	Greater Scaup	27	
	Common Goldeneye	9	
			subtotal: 36
Sea Ducks			
	Steller's Eider	9	
	Black Scoter	5	
	Harlequin	18	
	Unidentified Sea Ducks	22	
			subtotal: 54
			TOTAL 2,094

[1] Estimated total harvest is based on hunter success during separate months of the waterfowl season as determined by 195 bag checks out of an estimated 796 hunts total. An estimated 10% crippling loss was then factored in to provide an estimated total harvest.

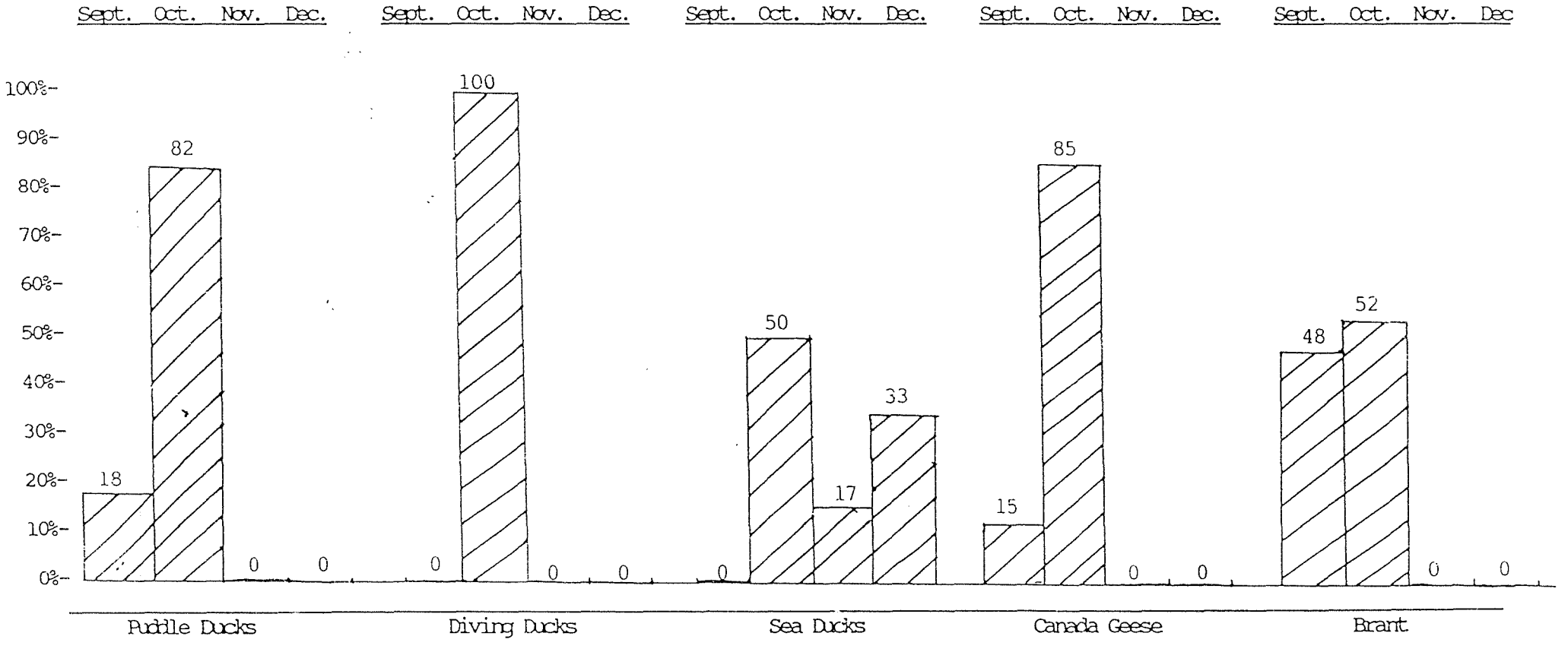


Figure 11 . Bag check waterfowl harvest by month during the open hunting season, Izembek NWR, 1990.

Table 40. Southern Alaska Peninsula Caribou Herd
Harvest Information
1989-90 Hunting Season

Documented Harvest

Males	Females	Unknown Sex	Total
27	17	41	85

Cold Bay Hunters	King Cove Hunters	Other Local Hunters	Non-Local Hunters	Total
44	25	10	6	85

Estimated Total Harvest

Cold Bay Hunters	45-50
King Cove Hunters	40-70
Nelson Lagoon Hunters	25-45
False Pass Hunters	15-25
Sand Point Hunters	30-50
Non-local Hunters	10-20

Total Estimated Harvest: 165-260 caribou

Samples Collected

Jaws	Blood Samples	Urine Samples
24	16	1

located on the southern Alaska Peninsula with an additional three on Unimak Island during the spring hunt. Sixty-five bears (49 male, 16 females) were taken in Unit 9D which is slightly higher than usual. It is believed the harvest would have been higher yet if not for the especially bad weather during the spring hunt.

The Unimak Island hunt is open each spring and fall by drawing permit. Seven permits are issued each spring and eight permits each fall. During the 1990 spring hunt, four permit holders showed up and one harvested a bear. Spring hunters talked of deep winter snowpack, lousier than usual weather and few bears. Six of the eight permit holders showed up for the fall season and harvested five bears.

The Cold Bay Road System hunt opened on May 10th along with the regular spring bear season. Twelve locals put in 59 halfdays of hunting before the two bear quota was reached. The season was closed by Emergency Order No. 02-03-90 at 11:59 pm on 21 May. Few bears were reported being seen and little effort was put in by many of the hunters due to the weather. Two hunters accounted for 60% of the halfdays of effort.

A fall Cold Bay Road System hunt for 1990 and a spring Cold Bay Road System hunt for 1991 were mistakenly published as open seasons for the 90/91 regulatory year. After some discussions with the state, the seasons were closed by Emergency Order No. 02-07-90 before they ever opened. The structure of the Cold Bay Road System hunt provides for open seasons only concurrent with the regular brown bear season in Unit 9D. The next road system hunt will be in the fall of 1991.

Forty-two of the total bears taken in Units 9D and 10 - Unimak Island, in 1990 were sealed out of the Cold Bay office. Of these, four possessed the minimum skull measurement (length plus width) of 28 inches to tentatively make the Boone & Crockett record book.

9. Fishing

Sport fishing within the refuge proper is somewhat limited due to access and basically confined to Frosty Creek, upper Russell Creek, and a few lakes. The majority of sport fishing in the area is concentrated on lower Russell Creek and to a lesser extent, Trout Creek. Both of these streams flow out of refuge lands but the actual fishing occurs off refuge.

Sport fishing high-use seasons are basically the months of June through October. Non-local use is typically greatest in September when fisherman can combine their trip with some goose hunting. Silver, or Coho salmon, is the "bread-n-butter" species of the area and generates the greatest fishing effort.

Abuse of the silver salmon resource runs rampant in September among chiefly non-local users. Parties come out for a limited time with only one concern: taking home as much fish as possible. Snagging and "double-dippin'" are commonplace. Since the fishing is off refuge, staff LE officers are in that "gray area" of jurisdiction. Attempts to have State Fish and Wildlife Protection Officers, who are in Cold Bay for the commercial fishing season, stay on until mid-September were initiated in 1989. The FWP officers typically leave Cold Bay around 1 September and we feel the extra two weeks would be well worth their while. Refuge LE staff (two officers) devote their time to the waterfowl hunters during this period.

A 42 pound male king salmon was caught at the whirlpool in Russell Creek on 8 July. Though hatchery workers do report a few kings (less than six) each year at the weir, it is very unusual for someone to catch one. This was the first in at least 10 years.

10. Trapping

Izembek NWR and the Unimak Unit (Aleutian Islands Unit of Alaska Maritime NWR) require trapping permits as per 50 CFR Part 36. Two permits were issued for Unimak and seven for Izembek for the 1990-91 trapping season. The special conditions for the trapping permits were updated in 1989. All special conditions and changes were discussed and explained in detail at the November 1989 public meeting. All trapping is basically "recreational" though some trappers are more serious than others.

The Izembek office is a designated sealing location to seal furbearers in accordance with state law. In 1990, four wolves and six otters were sealed for hunters and trappers at the Izembek office. Trapping results are contained in Table 41. The wolves taken during the season do not appear in the table as these wolves were taken under big game hunting licenses and not trapped.

11. Wildlife Observation

Wildlife observation is a common pastime for residents of Cold Bay. With the road system access, many residents drive the area year-round to view and photograph wildlife. Bears and caribou are the primary species of interest for this activity since many of the residents come from outside of Alaska and have never seen a bear or caribou. With the construction of the Grant Point Wildlife Observation Facility we hope to increase the non-consumptive, recreational use of the spectacular waterfowl concentrations in the area.

Table 41. Results of permit trapping program, Izembek National Wildlife Refuge.

	1982/83 (21)	1983/84 (17)	1984/85 (16)	1985/86 (11)	1986/87 (7)	1987/88 (11)	1988/89 (4)	1989/90 (7)
Red Fox	74	82	51	29	16	29	36	30
Land Otter	18	25	3	5	7	5	21	13
Mink	6	32	34	15	12	5	26	0
Wolverine	1	1	0	0	0	0	0	0
Wolf	0	0	0	3	1	1	3	0

Number of trappers in parentheses.

12. Other Wildlife Oriented Recreation

A few groups of out-of-town waterfowl hunters brave the elements and camp out during their visits to the area. The "Bomb Craters National Camping Area" was a popular place for camping as the craters afforded protection from the infamous Cold Bay winds. The "Bomb Craters" area remained closed through 1990. Details are contained in Section E.6 Safety.

A husband and wife backpacking team from Taos, New Mexico visited Izembek intending to backpack on Unimak Island for 10 days. The couple did a great deal of research and talked to Refuge staff several times about their plans. They were concerned about bears and took all the precautions so as not to attract any bears to their camp. Lo and behold, the second night out, roughly five miles from False Pass, a bear entered their camp after dark and began snuffling around their gear. Not having any experience with bears or a firearm, the couple slipped out of camp leaving it to the bear. At the time of their retreat, the couple was separated from their boots and decided not to go get them as the bear was near. They walked, in the dark, back to False Pass in bare feet and waited until morning. A False Pass resident returned with the husband to the camp the next day. All of their food was gone and one backpack was shredded. The tent and sleeping bags were untouched. The camp was cleaned up and the couple decided to head somewhere else in Alaska where there were fewer bears. Through it all, the couple maintained good spirits and realized from the beginning that they were the visitors in the bears' country. It is somewhat ironic that for a month prior, at least 48 tent camps of bear hunters were in the field with no unwanted encounters occurring.

In January we received a letter from Bob Stone in Davenport, Iowa. Bob's grandfather was the captain of the "Courtney Ford" which went aground between Glen and Operl Islands, Izembek Lagoon, in fall of 1902. The decaying remnants of this 146 foot brig can still be seen from Grant Point. Bob is a shop instructor for the Davenport School District and is also an accomplished folk singer and builder of stringed instruments. He is exhaustively searching the maritime records and other sources to describe the life of the "Courtney Ford" and the role his grandfather played in her voyages. He composed a ballad about the ship's last voyage and before the death of his grandmother promised her that he would visit the ship and sing this ballad in honor of his grandfather. After several months of correspondence and planning, Bob's sentimental journey became a reality. He arrived in Cold Bay on 6 July and remained at the wreck until 9 July when he returned to Cold Bay. On the evening of 10 July Bob put on a community concert during which he played a guitar and two types of dulcimers of his own construction. He sang a variety of Irish, Scottish,

and U.S. folk ballads in addition to the ballad he had written in honor of his grandfather. The evening was enjoyed by all and he was off for home on 11 July.

15. Off-Road Vehicling

All-terrain vehicles are a common mode of transportation in Cold Bay and area villages so the potential for off-roading problems is high. Actual problems are typically isolated instances of people driving off-road to retrieve a caribou or people off-roading in an ATV for a short distance to gain access to the beach. The latter is most common at the end of the Pintail Lake Loop where it is less than 100 yards to the beach. Most of this off-roading occurs during waterfowl season by hunters who are too lazy to walk.

Vehicle travel is limited to the designated Cold Bay road system by 50 CFR and is also included in the preferred alternative of the Izembek Comprehensive Conservation Plan. Under the preferred alternative of the CCP, it also provides for maintenance of the existing road system but without any new road construction on the refuge. The current road system was so designated in a public meeting in the 1970's. At the public meeting, basically the drivable portions of the roads that persisted from the military occupation in the 1930's and 1940's were left open and designated as the road system. At that time, vehicular traffic in Cold Bay was mainly passenger four-wheel drives, and ATV's were unheard of. As a result, if a road was impassable to a passenger 4x4 it was closed at that point. With the surge in popularity of the ATV, a few challenges have arisen as to why a given road is closed. As the road system stands now, access is excellent for all refuge activities. Opposition to points where a road has been closed is typically from a small group who want to be able to drive somewhere else to hunt or trap.

16. Other Non-Wildlife Oriented Recreation

Beachcombing is a popular pastime among local residents. The beaches of the Pacific Ocean and Bering Sea in the area are littered with "treasures" and junk from nature and civilization, past and present. Much of the beachcombing is done during the summer when temperatures are warm and in the fall in conjunction with a waterfowl hunt. These beachcombers are usually content to find a small glass ball fishing float and call it a day. There are also a few very serious beachcombers who concentrate their efforts on the outer beaches in the late spring. The primary trophies of interest are walrus tusks and large (16") glass fishing floats. The idea with them is to get out to the outer beaches in the spring as soon as the weather permits, thereby having first crack at the bounty brought ashore by the winter storms.

Much of the animal parts collected on the beaches must be registered pursuant to the Marine Mammal Protection Act of 1972. The Izembek office issued 13 titles for marine mammal part registrations in 1990. Registration titles included eight for walrus parts, (mainly tusks) two for whale parts, and three for sea otter skulls.

In 1990, a visitor came to Cold Bay wanting to search for fossilized (pre-MMPA) walrus ivory in offshore areas around Izembek Lagoon and Amak Island. Sometime in August, our man set out solo with two Zodiac inflatables to Amak Island to dive and search for ivory. By late September, many townspeople were getting concerned that he had not returned so WB/P Dau and David Ward (AFWRC) flew out to check on him during a radio tracking flight. By this time, our man was no longer an explorer, he was a survivor. Marooned on Amak when high winds beat one of his inflatables and his motor against the rocks, he abandoned his search for ivory and awaited rescue. The U.S. Coast Guard was notified immediately but informed us that they had already been contacted and a fishing boat on its way to Dutch Harbor would stop and pick up the castaway on Amak. A few days later we received word that our man had arrived safety in Dutch Harbor.

Water skiing was attempted on Blinn Lake this fall by a few hardy locals, in drysuits of course. To our knowledge, this is the first attempt at this use on refuge lakes. Though it is not expected to catch on, refuge staff will closely monitor water skiing activity on Blinn Lake.

17. Law Enforcement

Refuge officers' law enforcement activities are primarily geared toward the waterfowl, caribou, and brown bear seasons in the local area. In 1990, two special enforcement efforts were participated in by Izembek refuge officers. The Regional policy on enforcement of waterfowl hunting during the closed season and the spring bear season both received special attention in 1990.

During the spring brown bear season, there was a peninsula-wide cooperative effort between the State Fish & Wildlife Protection, the Service's Division of Law Enforcement, Refuges, and the National Parks Service to make our presence known in the field to deter and identify violations during the hunting season. Refuge Officers John Sarvis (RAM) and Cheryl Cline (AMNWR) were detailed to Cold Bay to assist Refuge Officer Mark Chase in the enforcement activities in the area. Refuge Officer Robin West was on detail to the Subsistence Office and unavailable at that time. In addition to the Service's personnel, Rollin Young from the State Fish & Wildlife Protection Division was also working out of Cold Bay. Officer's Sarvis and Cline, in the refuge's supercub, and

Trooper Young, also in a supercub, made numerous field checks and hunter contacts from Port Moller to Unimak Island. Hunters were checked for compliance with State and Federal laws, and guides were checked for the same plus for compliance with Special Use Permits. A number of bears were also field sealed to cut down on the sealing burden in Cold Bay. Refuge Officer Chase remained in Cold Bay administering the Cold Bay Road System hunt, sealing bear hides, and monitoring aircraft. No violation notices were issued here however, State Troopers did make a case in Anchorage on a hunter who took a bear in this area claiming to be an Alaska resident and apparently was not.

The Regional policy on enforcement of migratory bird hunting during the closed season (spring waterfowl harvest) received special attention in 1990. Refuge Officers Chase and West along with assistance from Regional Aircraft Manager Sarvis devoted a total of about 12 days to attempt to quantify spring harvest in this area. No waterfowl hunting activity was observed during any of the springtime flights including efforts during the bear season, swan surveys and caribou tracking flights. It is unlikely that spring waterfowl harvest in this area occurs other than incidentally. During the time when the birds are moving back through to nesting grounds, commercial fishing activities are gearing up for the salmon opener and has most area residents occupied with that concern.

Only two violation notices were issued by refuge officers in 1990. The first was issued to a local trapper for violating the conditions of this trapping permit for Izembek which requires that all trapping gear be removed by the close of the trapping season. Traps were discovered in the field 43 days after the season closure. The second NOV issued in 1990 was for the taking of three emperor geese. The hunter claimed he thought they were blue geese. Three NOV's originally issued in 1989, all to the same defendant, were reissued in 1990. The defendant promptly paid the second time around.

A Unimak Island brown bear permit holder for the fall 1990 season brought a bear in for sealing but did not have the State of Alaska locking metal tag. This is an all to common occurrence with Unimak permit holders who receive their permit by mail and do not realize that they still must purchase the $25 brown bear tag. Refuge Officer West explained the situation to the hunter and directed him to purchase a tag and send him evidence of such a purchase within the next 7 days.

In an effort to prevent future occurrences of this situation, the refuge is now sending a general information letter on Unimak Island bear hunting, including a reminder to purchase a tag, to all Unimak permit holders.

Refuge Office Chase tagging emperor geese. RLW
The season has been closed on emperors since 1986 but these were taken because the hunter "thought they were blue geese".

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

In 1990, the refuge received a great deal of assistance from the Regional maintenance team which was put together to assist field stations with large maintenance projects. The three-man crew of Walt Szelag (Engineering) and seasonal workers Harold Shipley and Ray Gauthier arrived in Cold Bay on 3 July 1990 to install Alaska windows and arctic entries on residences 1, 2, and 3. The crew worked without delay and completed the replacement of eight windows in each home and the new construction of three arctic entries in just nine days. The Alaska windows replaced the originals that were built into the homes in 1963. Though the originals were stout and solid, they had become somewhat leaky over time allowing cold air and dirt free-will ingress to the homes. The new windows have reduced this problem substantially, but we have noticed that

fine volcanic grit and dust driven by 60 mile-per-hour winds will not be denied access. At any rate, the new PVC, triple-pane windows are a vast improvement for the refuge homes. The arctic entries were installed on the back doors (main entrances) of homes to offer the occupants greater ease in entering and exiting the homes during the frequent periods of high winds. Prior to their installation the simple task of letting the dog out was often a major ordeal when battling the high winds. This was also particularly hard on door hinges and jams, a problem which is now alleviated.

Harold Shipley (left) and Ray Gauthier (right) worked with Walt Szelag (RO-Eng) to install Alaska windows in residences 1, 2, & 3.

Walt Szelag (RO-Eng)

The Regional maintenance team efficiently completed this work providing substantial benefits to the refuge. Done under contract, these same projects would have undoubtedly cost considerably more to bring a crew to Cold Bay. Done solely by Refuge staff, they probably would not be finished yet. In addition to saving money (the refuge paid material costs, salaries, and travel and per diem for the three-man crew), the help of the crew also allowed Refuge staff to complete other priority maintenance projects during the opportune period of nice weather.

New windows and arctic entries are welcome additions to refuge quarters — Walt Szelag (RO-Eng)

3. Major Maintenance

The first two weeks of July 1990, was one of those rare time periods when the Cold Bay weather allows real progress on outdoor maintenance projects. To make July 1990 even more unique, this period of nice weather coincided with our plans for outdoor maintenance! It was during this time period that the Regional maintenance team was in Cold Bay and during this time period that we accomplished 90% of our outdoor maintenance work. While Walt and crew installed windows and constructed arctic entries, Maintenance Worker Morey sealed asphalt and Assistant Manager Chase painted roofs.

After years of exposure to the salt air, ice and frequent natural "sand blasting", the metal roofs on many refuge buildings are in need of new paint. In 1989, paint and primer of the type used on offshore oil platforms was received but weather and other priorities precluded any work. In 1990, good weather and extra help allowed the roof painting project to begin. The refuge bunkhouse roof was primed on 8 July 1990 and painted on the 13th. The residence #4 roof was primed on 13 July but weather halted the painting until one fine day in September. Finally, on 6 September, a suitable combination of

dry and calm allowed the painting to be completed before the winter weather set in. The office roof and all four residence garages still need paint and will be targeted in 1991.

The same environmental factors acting to prematurely age the metal roofs also do a number on metal doors. In 1990, the small doors on the garages of residences 1, 2, and 3 were replaced. Replacement doors were purchased for many others around the compound and will be installed as time allows.

The asphalt that paves the headquarters compound was sealed in 1990. The sealant, which resembles viscous tar, is intended to limit moisture penetration and thus reduce cracking and chipping. This was another project that would have been considered routine in most areas but being dependant on the area's weather gives "routine" a whole new meaning in Cold Bay. The asphalt sealing began in June but could not be completed until 13 July when the weather permitted us to do so.

Maintenance Worker Morey seals the asphalt on a sunny day in July. RLW

Maintenance Worker Morey gave the Jeep Wagoneer a major facelift to go with the new engine installed in 1989. The body was sanded, filled, primed and painted to stop rusting and prevent premature aging. With the new paint job and engine we should be able to depend on the Wagoneer for several more years into the future.

While filling the residence heating oil tanks at the end of May, it was discovered that the tank at residence #2 had an apparent leak. Typical May usage runs around 70 gallons but the underground storage tank (UST) at residence #2 took 370 gallons to top off the 500 gallon tank. Expecting a leak, the tank was promptly pumped dry and excavated. To our surprise, no evidence of any leakage could be detected. Since the tank was scheduled for replacement with an above ground tank in 1991 anyway, we replaced the tank with a 300 gallon above ground tank. Though the reason for the indication that 370 gallons were pumped could not be determined, we suspect the totalizer on the main tank temporarily malfunctioned. The UST's at residences 1, 3, and 4 will be raised above ground in 1991 in accordance with Service policy.

New 300-gallon fuel oil tank installed at residence #2. MAC

4. Equipment Utilization & Replacement

A Case 480F backhoe/front end loader was finally received in 1990. The backhoe/loader had been one of the station's highest RNIS priorities for several years and finally became a reality in October. The backhoe/loader will be used extensively for road and bridge work as well as for snow removal during the winter months.

New Case 480F backhoe/loader is a welcome addition for snow removal and road work tasks. MAC

The refuge supercub, N745, received a new VHF FM radio in May 1990, after chronic problems with the old unit. By year's end this FM too was having problems as it would transmit but would not receive. Scheduled or routine maintenance for N745 in 1990 included the Annual Inspection in May and 100 hour inspections in July and November. The plane was changed from tundra tires to floats on July 20 and back to tundra tires on November 2.

5. Communications Systems

In July of 1989, the refuge was informed that our VHF radio frequency would need to be changed in order to comply with existing policy. Delaying the change until after the field season, the radios were sent to the contracted company in January to change the frequency from 168.350 mhz to 172.450 mhz. This was done with a promised 2 week turnaround for the radios. In April, the radios were returned and soon we discovered that our base station now had an effective range of approximately 1 mile - line of sight only. The base station was returned to the contractor and promptly fixed and returned.

The FM antenna at the refuge office was replaced in 1990. A fiberglass antenna was installed after the metal antenna blew over in high winds.

7. Energy Conservation

Triple-pane Alaska windows were installed in residences 1, 2, and 3. See Section I.2 Rehabilitation.

8. Other

An update of the station's Refuge Needs Information System (RNIS) was completed in December 1990. Following the update, the construction of a shop building at the headquarters has become the station's new #1 priority RNIS project. A new shop building would allow for vehicle maintenance to be performed without having to move the current shop's contents outside and provide a storage bay for the new backhoe/loader. The backhoe/loader is currently being stored off-site at the U.S. Air Force storage building which is facing an uncertain future.

In May 1990, we received word from the State of Alaska Department of Transportation that they wish for us to move the Air Force storage building before issuing us a lease for the land on which the building sits. The building is sitting on an old gravel apron and according to D.O.T., is too close to the runway. In addition to the Air Force storage building, an entire row of Federal Aviation Administration homes also sit on the same line the same distance from the runway. The problem with the storage building is that the equipment is not available in Cold Bay to move the building without destroying it. The uncertain future of this critical storage building makes our shop construction project all the more important.

J. OTHER ITEMS

1. Cooperative Programs

Continuation of U.S./U.S.S.R. Brant Research

Robin West, Izembek National Wildlife Refuge and David Ward, Alaska Fish and Wildlife Research Center, travelled to Wrangel Island, USSR July 1-30, 1990 to continue a cooperative research project of black brant on Wrangel Island, USSR. This was the second year of the project initiated in the summer of 1989. Specific objectives were to: 1) survey Wrangel Island from the air to determine total number of brant, 2) take aerial photographs of areas used by brant for habitat utilization studies, 3) describe habitat used by molting brant by photographing and collecting vegetation and documenting habitat types and abundance, 4) capture molting brant to search for previously marked birds, 5) band molting brant with metal and alpha-numeric red plastic leg bands as part of a cooperative marking program in progress with the Canadian Wildlife Service

and USFWS, 6) mark ten brant with radio transmitters for use in ecology studies at Izembek Lagoon, Alaska, and 7) foster a cooperative working relationship with the Soviet Academy of Sciences and Wrangel Island Reserve staff.

David Ward (AFWRC) and Refuge Manager Robin West at Wrangel Island, USSR. Irina Kharitonov (USSR)

The first ever aerial survey for black brant on Wrangel Island was completed 19 - 21 July and 27 July using a Soviet MI-8 helicopter. A total of 5,470 brant were counted during the 4 days of the survey. Most of these birds were seen on the southwest coast and north central coast of the island where they were molting in the coastal lagoons and small freshwater lakes. No nesting birds or young of the year were observed during the surveys or during capture work. Eight hundred and forty-two brant were captured using a drive trap. Of these, 78 were captured at Red Flag Camp on the north side of the island. The remainder were captured at Jack London Lake on the south side of the island (the site of last year's capture efforts). All of the 78 birds from Red Flag were banded with metal bands and plastic red tarsus bands with white lettering. Eight of these birds were also fitted with radio transmitters. We banded 311 of the 764 brant caught at Jack London Lake and fitted two birds with radio transmitters. We recaptured a total of 29 previously marked birds: two near the Red Flag River Camp and 27 at Jack London Lake. Twenty-two of these had been banded on the Yukon-Kuskokwim Delta, Alaska, two others

were banded on the North Slope of Alaska, and the remaining five were recaptures from the banding effort on Wrangel Island in 1989.

Soviet Biologists work on brant banding on Wrangel Island, USSR. RLW

Video imagery was taken to improve the visual accuracy of the aerial counts in areas of major brant concentrations and to assess habitat characteristics used by molting brant. At Jack London Lake, we intensified our efforts to understand habitat availability and use by brant. Aerial 35mm photographs were taken along line transects to map plant communities used by brant. Additional video imagery and 35mm photography were made along 4 line-transects and from selected ground locations adjacent to the lake. Extensive field notes were taken and samples of vegetation were collected and preserved to describe the major habitat types. Dried plant specimens were transported to Alaska for identification and mounting.

Discussions were held on several occasions with the staff of the Wrangel Island Reserve, Dr. Sergei Kharitonov (Bird Ringing Centre) of the Academy of Sciences in Moscow, and ourselves about the brant research and other projects of mutual interest. All discussions were very productive and an excellent cooperative spirit was evident. We were all in agreement that the research of brant on Wrangel Island should be extended for at least one more year.

Copies of the 1989 progress report expressing the results of the first field season of research on black brant on Wrangel Island and at Izembek Lagoon, Alaska were provided to Dr. Alexander Sukhov and his staff. They greatly appreciated the information and the fact that the abstract of the report was translated into Russian.

This cooperative research project with the Soviet Union has not only provided increased opportunities for biologists to work in different geographic areas important to Pacific Flyway brant but also has greatly enhanced channels for the exchange of biological information on brant and numerous other species of mutual concern. Reciprocal travel for Soviet biologists to participate in the fall research work at Izembek in 1990 could not be negotiated in time so this aspect of the work will be pursued again in 1991.

3. Items of Interest

Under Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA - 16 U.S.C. 3111-3126), the State of Alaska is required to implement a program to ensure preference to rural Alaskans for subsistence uses of fish and wildlife on federal public lands. This requirement was included in order to preserve the culture and subsistence lifestyle of Alaskan natives. The responsibility of providing a subsistence program falls to the Secretaries of Agriculture and the Interior if the State's program proves to be inconsistent with ANILCA requirements.

The State of Alaska had a program that the Department of the Interior found consistent with ANILCA until December, 1989. Then, in the case of McDowell v. State of Alaska, the Alaska Supreme Court ruled that the rural limitation in the State subsistence program, which is required by ANILCA, violated the Alaska Constitution. The Court ruled the State's program illegal but stayed the effect of the decision until 1 July 1990.

As a result of the decision, the Departments of Agriculture and Interior were required to take over implementation of Title VIII of ANILCA on federal public lands on 1 July 1990. Temporary regulations, based on existing state regulations, were developed to initiate the Federal Subsistence Program until final regulations could be developed. Public comments relating to a number of issues on subsistence management on public lands were collected at public meetings and by phone or mail from 25 September through 31 December 1990. These comments are being used to prepare an environmental impact statement (EIS) and final Federal Subsistence Regulations due out in late 1991. The EIS will evaluate alternative approaches in the federal subsistence management program.

The Fish and Wildlife Service is designated the lead agency for preparation of the EIS. The National Park Service, Forest Service, Bureau of Land Management, and Bureau of Indian Affairs are participating as cooperating agencies. The Regional Directors of these five agencies make up the Federal Subsistence Board, the managing entity of this program.

Although the transition from state to federal control did not take place until 1 July subsistence was the talk of the refuge early in the year. Refuge Manager West spent 12-26 May in Fairbanks and Anchorage working on temporary Federal Subsistence Regulations. He also met with Regional Office and Alaska Department of Fish and Game staffs 6-8 June to discuss these regulations and on 14-15 June in Alyeska with other federal land managers to discuss the impending federal subsistence take over.

The temporary regulations were completed in time for the "changing of the guard" 1 July. By the end of July, the federal subsistence regulations had been distributed throughout the local area.

October brought to Izembek the first test of federal control over subsistence. While looking through the temporary subsistence regulations, it was discovered that no subsistence preference was provided for in State Game Management Units 9(D) and 10(Unimak Island only) for caribou. In past years, the caribou sport season took place 1 September through 31 October and the subsistence season was 1 September through 31 March. According to temporary regulations the sport season for 1990 was 1 September through 31 March 1991. Refuge Manager West brought this discrepancy to the attention of the Federal Subsistence Board and the State Game Board. Discussion ensued and an emergency closure of Units 9(D) and 10(Unimak Island) to all but qualified subsistence users was the result. The closure went into effect 5 November. The emergency closure was posted and there was relatively little uproar by the public.

During October and November, federal subsistence panels held over 60 public meetings throughout the State. The meeting in Cold Bay was held 15 November. Prior to the meeting, notices were sent to local post offices, city leaders were contacted, and a video describing the federal subsistence program was made available to the public. Despite the early notice, only three people attended the meeting conducted by the four member subsistence panel. Good discussion was generated and many valid concerns and comments were recorded. It was a productive meeting, but due to the low turnout and the fact that Cold Bay is not a typical Alaskan bush town, it was decided to conduct another meeting in December in King Cove. Refuge Operations Specialist Chase attended the Cold Bay meeting and Assistant Refuge Manage Chase attended the meeting in King Cove. About 20 people attended the King Cove meeting,

including 10 school children. Concern mainly revolved around the reduced hunting opportunity for caribou and the status of the caribou herd. The subsistence panel provided all comments to the writing team for later review by the subsistence board. A newspaper article about the Cold Bay meeting was published in the Aleutian East Borough Advocate.

Also in December, Refuge Manager West met with Alaska Department Fish and Game and Fish and Wildlife Service representatives to iron out a proposal for the State Board of Game dealing with the 1991-92 caribou season. Recommendations from the meeting were forwarded to the Subsistence Office.

Military Exercises

Following the successful PACEX-89 military training operations in Cold Bay in 1989, the U.S. military was considering incorporating Cold Bay into more-or-less annual "War Games" training exercises. In the spring of 1990, U.S. Navy officers met with Cold Bay representatives (ARM Chase represented the refuge) to discuss this potential. Later, an Environmental Assessment was prepared and exercises planned for the late fall. As it turns out, no exercises were conducted in Cold Bay due to the scaled down nature of the training because of the priority commitments to Operation Desert Shield in the Middle East.

Grant Point USAF Site

Following the relocation of the minimally attended radar site (MARS) from the 91 acre withdrawal at Grant Point, the old facilities were removed and the area cleaned up in compliance with a Special Use Permit to locate the new site on refuge lands. The Corps of Engineers dismantled all the Grant Point site facilities, removed some and buried the remainder. It was the intention to relinquish the 91 acres to the Izembek NWR following site rehabilitation. As yet the transfer has not occurred and the site remains in military ownership. In October 1990, Refuge Manager West and Biologist/Pilot Dau discovered an apparent fuel seep at the Grant Point site. A call was made to Ecological Services and the Corps of Engineers to discuss clean-up of the site. In addition to the apparent fuel seep, remedial clean-up of buried items appears necessary as soil settling has exposed metal and rebar in several pits. The Corps of Engineers are planning to visit the site in the spring of 1991 to initiate remedial clean-up. The site will have to be satisfactorily restored prior to any land ownership actions.

Refuge Operations Specialist Julie Chase looks over apparent seep of petroleum product at Grant Point site. RLW

4. Credits

RM Robin West reviewed the report and wrote Section J.1.

ARM Mark Chase wrote the report excluding Sections B, G, and J.1 and J.3 Subsistence.

Wildlife Biologist Christian Dau wrote Section G.

Refuge Operations Specialist Julie Chase wrote Sections B and J.3 Subsistence.

Secretary Donna Christensen typed the report.

K. FEEDBACK

Resource Problems: The plight of the Steller's and spectacled eiders.

In December 1990, the Service was petitioned to add both of these species to the endangered species list. Was this a shock or did we see it coming? The answer is yes to both questions. The situation is a shock in that we must now act administratively to address what some would perceive as a new problem. The data, on the other hand, indicated ten or more years ago that these species may be declining.

In Alaska, both species were common nesters along the coastal fringe of the Yukon-Kuskokwim Delta (YKD). By the early 1970's, biologists rarely observed a Steller's eider on the YKD and the last nest was reported in 1975. Spectacled eiders began to decline precipitously on YKD study areas by 1980. Spring breeding pair surveys, conducted annually since 1955, supplement these nesting studies and are also indicative of drastic declines in eider populations on the YKD and elsewhere in western Alaska. Combined, these data help quantify the population declines in these species which began a decade or more ago. So, yes we did see it coming. Long-term YKD researchers, Cal Lensink for one, provided supportive, although subjective, impressions based on revisits to the area that he managed from 1964 to 1975, which indicated spectacled eiders were in real trouble by the mid-1980's.

Could it be that management is too often focusing on trees and losing sight of the more important forest? Thankfully, amidst the constant flurry of brushfires, large and small, that adversely impact foresight and long-term vision, there is a continuum of data collection and thought being directed to approaching resource problems. This tendency needs to be promoted. Response to an immediate brushfire nearly always results in positive recognition while insight that visualizes and addresses a problem before it materializes is often ignored. Additional foresight, direction and continuity would likely serve the resource better by "keeping the forest in sight". This could also allow for a welcome change from the Services' usual predicament by dealing with problems before they reach the critical stage.

Foresight provided by a very few individuals has resulted in our current knowledge about Steller's and spectacled eiders. Both species will get a well deserved increase in attention that hopefully will reverse adverse trends rather than just describe their disappearance. The Service will always have to

deal with unpredictable or unforseen problems however, this must not cripple our ability to generate long-term insight or to build expertise necessary to see and address the foreseeable.