

KODIAK NATIONAL WILDLIFE REFUGE

KODIAK, ALASKA

ANNUAL NARRATIVE REPORT

Calendar Year 1994

United States Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

ARLIS
Alaska Resources Library & Information Services
Library Building, Suite 111
3211 Providence Drive
Anchorage, AK 99508-4614

SPEC
COLL
NARR
KONWR
1994

REVIEW AND APPROVALS
KODIAK NATIONAL WILDLIFE REFUGE
Kodiak, Alaska

ANNUAL NARRATIVE REPORT
Calendar Year 1994

Jay R. Bellini 3/4/96
Refuge Manager Date

G. M. G. 3/9/96
Associate Manager Date

[Signature] 3/9/96
Regional Office Approval Date

ARLIS
Alaska Resources Library & Information Services
Library Building, Suite 111
3211 Providence Drive
Anchorage, AK 99508-4614

3 3755 001 00381 3

Table of Contents

A. Highlights	1
B. Climate	3
C. Land Acquisition	4
1. Fee Title.....	4
2. Easements.....	Nothing to Report
3. Other.....	Nothing to Report
D. Planning	5
1. Master Plan.....	Nothing to Report
2. Management Plan.....	5
3. Public Participation.....	18
4. Compliance with Environmental and Cultural Resource Mandates.....	18
5. Research and Investigations.....	22
6. Other.....	Nothing to Report
E. Administration	31
1. Personnel.....	31
2. Youth Programs.....	See Outdoor Classrooms-Students
3. Other Manpower Programs.....	35
4. Volunteer Program.....	36
5. Funding.....	37
6. Safety.....	38
7. Technical Assistance.....	38
8. Other.....	39
F. Habitat Management	Nothing to Report
G. Wildlife	40
1. Wildlife Diversity.....	Nothing to Report
2. Endangered and/or Threatened Species..	Nothing to Report
3. Waterfowl.....	40
4. Marsh and Water Birds.....	51
5. Shorebirds, Gulls, Terns, and Allied Species.....	51
6. Raptors.....	53
7. Other Migratory Birds.....	57
8. Game Mammals:	
a. Brown bears.....	57
b. Sitka black-tailed deer.....	60
c. Subsistence.....	65
9. Marine Mammals.....	66
10. Other Resident Wildlife.....	66
11. Fisheries Resources.....	68

12.	Wildlife Propagation and Stocking.....	Nothing to Report
13.	Surplus Animal Disposal.....	Nothing to Report
14.	Scientific Collections.....	Nothing to Report
15.	Animal Control.....	Nothing to Report
16.	Marking and Banding.....	Nothing to Report
17.	Disease Prevention and Control.....	Nothing to Report
H.	Public Use.....	74
1.	General.....	74
2.	Outdoor Classrooms-Students.....	75
3.	Outdoor Classrooms-Teachers.....	75
4.	Interpretive Foot Trails.....	76
5.	Interpretive Tour Routes.....	Nothing to Report
6.	Interpretive Exhibits/Demonstrations.....	76
7.	Other Interpretive Programs.....	77
8.	Hunting.....	77
9.	Fishing.....	78
10.	Trapping.....	78
11.	Wildlife Observation.....	78
12.	Other Wildlife Oriented Recreation.....	80
13.	Camping.....	81
14.	Picnicking.....	Nothing to Report
15.	Off-Road Vehicling.....	Nothing to Report
16.	Other Non-Wildlife Oriented Recreation.....	82
17.	Law Enforcement.....	82
18.	Cooperating Associations.....	83
19.	Concessions.....	83
J.	Equipment and Facilities.....	86
1.	New Construction.....	86
2.	Rehabilitation.....	Nothing Reported
3.	Major Maintenance.....	Nothing Reported
4.	Equipment Utilization and Replacement.....	86
5.	Communications Systems.....	87
6.	Computer Systems.....	87
7.	Energy Conservation.....	Nothing to Report
8.	Other.....	87
K.	Other.....	Nothing to Report
1.	Cooperative Programs.....	87
2.	Other Economic Uses.....	Nothing to Report
3.	Items of Interest.....	Nothing to Report
4.	Credits.....	As Noted in Text
L.	Feedback.....	Nothing to Report

A. Highlights:

- ☛ Relocation of O'Malley cabin to Bluefox Bay includes disabled accessible design. (Section D.4)
- ☛ O'Malley bear viewing program shifted to operation by a private operator selected via the bid prospectus technique. (Section H.11)
- ☛ Final year of a four year brown bear study at O'Malley River examines affect of structured bear viewing in a critical feeding area. (Section D.5)
- ☛ Waterfowl production surveys expanded to include the Spiridon River drainage. (Section G.3)
- ☛ Exxon Valdez Oil Spill Trustee Council approves land acquisition of Native Corporation inholdings. (Section C.1)
- ☛ Second year of harlequin duck production surveys target key areas along west side of Kodiak Island and along Afognak Island. (Section G.3)
- ☛ Bald eagle nesting and production estimates derived from 1994 sample plots indicate an increasing population. (Section G.6)
- ☛ Brown bear stream survey trends were a little below average but remain within the range of counts recorded in past years. (Section G.8)
- ☛ Reported bear mortality within Refuge boundaries was 9 percent higher than in 1993. (Section G.8)
- ☛ Another mild winter resulted in good Sitka Black-tailed deer survival. (Section G.8)
- ☛ Designated hunter proposal submitted by Kodiak-Aleutians Subsistence Regional Advisory Council. (Section G.8.c)

- Survey along the entire Kodiak Archipelago results in documentation of 1067 sea otters. (Section G.9)
- "Science Fun Days" and "Families Understanding Nature" highlight an active environmental education program. (Section H.6)
- River Management Planning data collection expands to Karluk, Dog Salmon and Uganik Rivers. (Section D.2)



Koniag Peak, at 4,470 feet is the highest point on Kodiak Island. (V. Barnes)

B. Climate: (Munoz)

The climate of the Kodiak region is dominated by a strong marine influence. It is characterized by cloudy skies, moderately heavy precipitation, and cool temperatures. In winter, the waters of the North Pacific Ocean provide moisture for cloudiness and precipitation. The marine waters also provide heat that maintains a mild year-round climate.

Temperature patterns are characterized by cool summers and, compared to the rest of Alaska, warm winters. The range between mean annual maximum and mean annual minimum temperatures is small throughout the region. Extreme temperatures last only a few days at a time. The average summer maximum temperatures occur in July and August (in the high 50's and low 60's). Coldest average winter minimum temperatures drop to the low 20's in December.

Precipitation is probably the most variable parameter measured. By way of example, annual amounts of precipitation range from 23 inches at Larsen Bay to 98 inches at Shearwater Bay. Differences are due primarily to variations in terrain and exposure. Snowfall averages more than 6 feet per year in some areas, but this also varies considerably with location, as does the length of time the snow remains on the ground and the amount that accumulates.

The air that travels ahead of storms generally flows out of the southeast with a long fetch over water. It is heavily laden with moisture and can deposit large volumes of precipitation. Weather conditions vary greatly over the island because of exposure, aspect and terrain. Precipitation on ridges and on the windward side of mountain ranges will probably reach as high as 200 inches in isolated locations. (The above description was taken from Kadyak, A Background for Living). In general, easterly exposures (such as Kodiak State Airport where we get our weather records) are wetter and warmer than north or west slopes.

Table 1. summarizes weather conditions for 1994 as collected by the National Weather Service at Kodiak State Airport. Total rainfall was 82.3 inches, 14.72 inches above average. Total snowfall was 79.4 inches, which is 4.9 inches above average. Average high and low temperatures were 56.5°F and 22.1°F, respectively (normal high and low are 46.3 and 35.1).

Snow depth was close to normal this winter which was a change from 1993 when only 23 inches were recorded. Most snowfall occurred in December. Overall, the winter was relatively mild.

Table 1. 1994 Weather Data Summary

Month	Snowfall (Inches)	Precip. (Inches)	Precip. Departure from Normal	Temp. Maximum (°F)	Temp. Minimum (°F)	Average	Temp. Departure From Normal
January	3.8	11.81	+4.43	43	12	34.5	+4.56
February	14.5	4.15	-1.13	45	14	30.1	-0.4
March	14.3	10.14	+5.51	48	1	30.4	-2.5
April	Trace	7.27	+3.07	48	20	38.7	+1.2
May	Trace	9.10	+3.58	66	32	44.2	+0.7
June	0	3.36	-1.42	73	36	51.7	-2.1
July	0	7.29	+3.59	67	42	53.0	-1.4
August	0	0.65	-4.50	77	36	57.1	+1.9
September	0	6.57	-0.42	66	30	49.3	-0.7
October	2.9	11.35	+4.17	55	21	39.4	-1.3
November	6.3	1.90	-4.06	48	12	31.5	-2.9
December	37.6	8.71	-1.90	42	9	28.5	-2.3
Totals	79.4	82.3	+14.72	56.5 (Ave.)	22.1 (Ave.)		-1.0 (Ave.)
Normal (1961- 1990)	74.5	67.58		46.8		40.8	

C. Land Acquisition: (Bellinger)

1. Fee Title:

Land acquisition again was a major focus for activity involving Refuge and Refuge and Regional Office personnel. Negotiations with Old Harbor, Akhiok-Kaguyak and Koniag Native Corporations gained momentum as the year progressed. This culminated in a major success during November and December when the Exxon Valdez Oil Spill Trustee Council passed a resolution that outlined the intent to reach a purchase agreement with the Native Corporations. Support for this acquisition effort continues to be strong from a wide variety of individuals and organizations. Old Harbor and Akhiok-Kaguyak Corporation deals looked very positive by year's end. Potentially, 106,000 acres could be added back outright to the Refuge if deals are finalized. In addition, 46,000 acres would be permanently protected by conservation easements.

Small parcel acquisitions activity included purchase of three parcels in Olga Bay and Deadman Bay.

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

D. Planning: (Taylor)

1. **Master Plan:** Nothing to report.
2. **Management Plan:**
 - a. River Management Plan: (Squibb)

Proposals have been made to change the system for allocating permits to commercial guides operating in Kodiak National Wildlife Refuge. The process toward allocating guided use in terms of visitor days will require (1) prior determinations of the desired future conditions of natural resources in the areas where use is being permitted and (2) estimates of the upper limits of use beyond which the impacts to resources, including brown bears (*Ursus arctos middendorffi*) and bald eagles (*Haliaeetus leucocephalus*), would be unacceptable. An initial step in this process is gaining a better understanding of current visitor and wildlife use and current impacts to natural resources within river systems on Kodiak National Wildlife Refuge.

The specific field objectives of 1994 field work stated in the FY 1994 Study Plan (Squibb and Taylor 1993) were:

1. Improve estimates of the current level of visitor use on Refuge river systems.
2. Estimate the current level of visitor use during peak periods and determine its spatial and temporal distribution on selected Refuge rivers.
3. Estimate bear, eagle, and waterfowl use, and determine its spatial and temporal distribution.
4. Evaluate the proportion of time that bears spend responding to people at observed levels of visitor use on selected Refuge rivers.
5. Determine the causes of bear-human incidents on selected Refuge rivers.
6. Describe the relationship of eagle and human use using spatial and

temporal correlations.

7. Describe the relationship of waterfowl and human use using spatial and temporal correlations.
8. Evaluate the impacts of visitor use to soils and vegetation by estimating vegetative cover on trails and campsites.
9. Collect baseline information on visitor experience on the Refuge.

This summary includes data gathered from several sources during the summer of 1994. Observations of human and wildlife use of rivers were taken from study camps (1) on the Karluk River during the early part of the chinook salmon (Oncorhynchus tshawytscha) run and sport fishery, (2) on the Ayakulik and Red Lake Rivers during the later part of the chinook and sockeye salmon (O. nerka) runs after the peak of the chinook sport fishery, (3) on the Dog Salmon River during the sockeye run through the Frazer Fish Pass, (4) on the Uganik River during the early part of the coho salmon (O. kisutch) run and sport fishery, and (5) on the upper part of Karluk River during the coho and late sockeye salmon runs (Fig. 1).

In addition to data gathered from study camps, data on visitor use and quality of experience were obtained from four other sources in 1994. Aerial surveys to count the number of people using Refuge rivers were flown on several occasions, both as the sole purpose of the flight and in combination with salmon stream surveys. Parties of visitors returning from the Refuge were interviewed as they exited air taxis in Kodiak, regarding their trip, quality of experience, and success at fishing and/or hunting. Kenai Fisheries Resource Office (FRO) creel survey technicians asked the same questions regarding quality of experience of visitors on their departure days from the Ayakulik River during the chinook sport fishery. The Alaska Department of Fish and Game (ADF&G), Sport Fish Division provided records of bear incidents that they recorded during their creel survey of the chinook sport fishery on the Karluk River.

STUDY AREAS AND PERSONNEL

From 7 to 23 June, a field camp was located on Refuge lands on the west side of Barnaby Ridge; N. R. Planner Ron Squibb and Biological Technician Greg Wilker viewed the upper reaches of Karluk River and a small section below Portage from a ridge top observation point on Refuge lands.

From 23 June to 19 July, Public Involvement Specialist Bob Stevens and Biological Technician Brian Loly worked out of the Ayakulik creel survey camp to take observations from two vistas atop the ridge west of Bare Creek. In addition to their primary creel survey duties, Kenai Fisheries Resource Office (FRO) Biological Technicians Brad Benter and John Crye asked anglers several questions regarding their experience, e.g. perceptions of crowding and occurrence of bear incidents, as part of their exit interviews from 27 May to

11 July. The study area included the lower half of the Red Lake River and the Ayakulik River from the Red Lake River confluence to near the private lands at the mouth.

From 5 July to 11 August, Squibb worked out of the ADF&G Frazer Fish Pass facility and used vistas on the ridge northeast of the Fish Pass to view the south end of Frazer Lake and the Dog Salmon River above the lower falls. N. R. Planner Mike Haase assisted from 17 to 29 July; National Biological Survey Biological Technician Tammy Olson assisted from 29 July to 11 August.

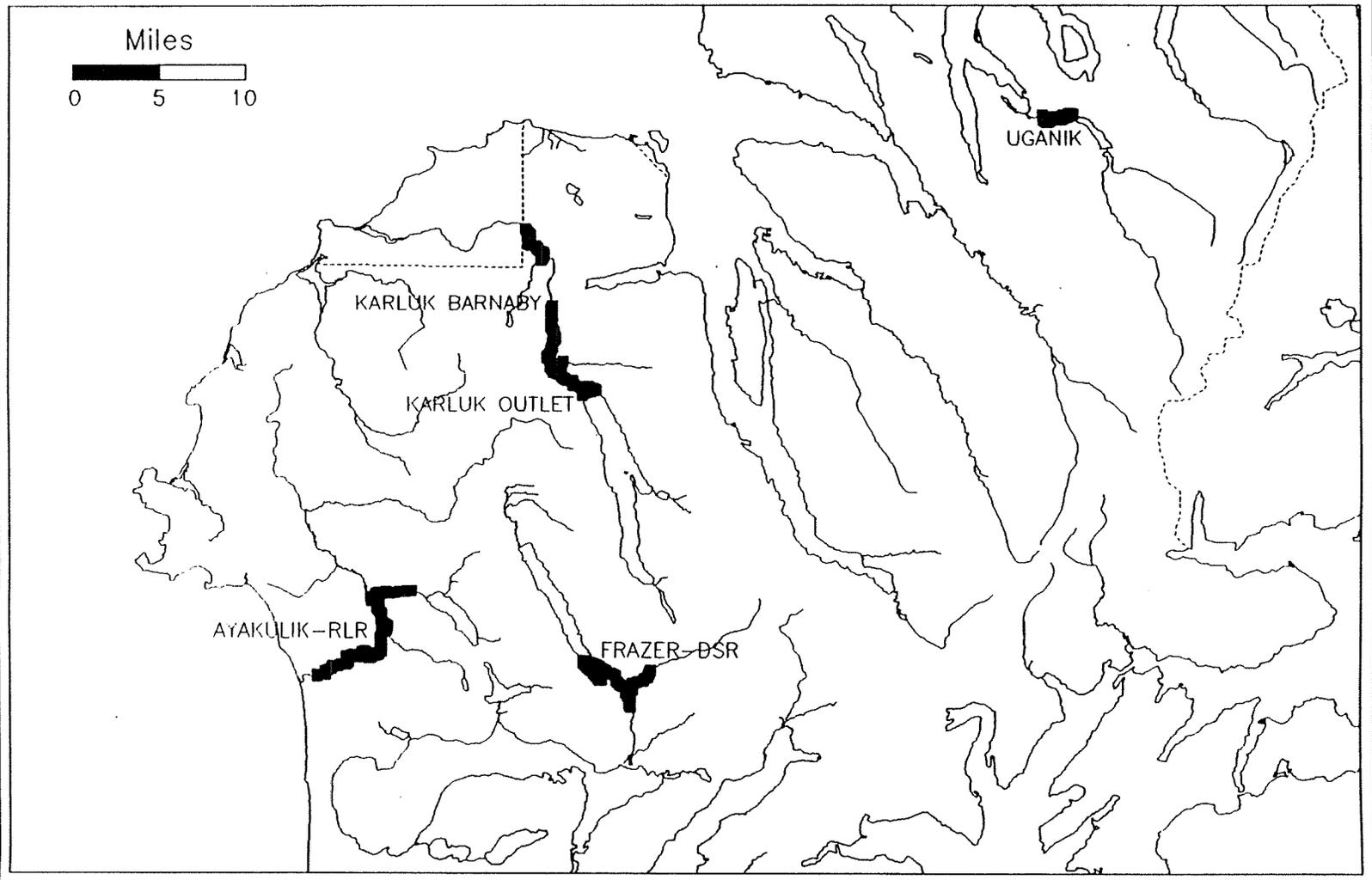


Planner Ron Squibb in the field.

Figure 1. River Management Planning study areas for 1994

RIVERS

- BOUNDARY
- RIVERS
- STUDY_AREAS



From 1 to 15 September, Squibb and Wilker worked out of a camp at the outlet of Uganik Lake to take observations of the lake outlet and upper reaches of the lower Uganik River from points along the river course.

From 21 to 29 September, Squibb and Wilker used a camp site and nearby ridge top vista on Refuge lands to view the outlet of Karluk Lake and the upper reaches of Karluk River past Silver Salmon Creek.

Aerial surveys of visitor use were flown over rivers in the Kodiak Island unit of the Refuge. Pilot Butch Patterson with NBS Research Biologist Vic Barnes flew the surveys in June. Kodiak Air Service pilot Willie Hall with Barnes flew a survey in August. In conjunction with his coho salmon surveys, Fishery Biologist/Pilot Tony Chatto flew visitor surveys during August through September with Biological Technicians Ray Hander and Gus Johnson, and Subsistence Biologist Robert Stovall as observers. No surveys were flown in the Ban Island unit during 1994.

Loly interviewed passengers returning from the Refuge as they exited air taxis in Kodiak from 1 June to 17 September 1994 except during his field work on the Ayakulik. During his absence, Data Transcriber Shirley Monty did interviews 23 and 24 June, and Volunteer Alice Iliff did interviews from 15 to 20 July.

METHODS

From observation points, observers used 20-45x spotting scopes and 10x binoculars to do scan and focal samples (Altmann 1974). Observers recorded people, bears, eagles, and waterfowl along the river during scans, and recorded time budget data on bears during focals taken between the scan samples. Observers also kept logs of visitation, aircraft activity, and bear-human incidents in the study areas.

Scan samples were taken every hour at 30 min. past the hour, from 0630 to 2130 except during September when decreasing daylight reduced the hours to 0830 to 1930. When only one observer was available, it took more than one day to complete all scans within those hours; and weather frequently delayed completion of these sample blocks.

Aerial surveys of human use (people, camps, planes, and boats) on rivers in the Kodiak Island unit of the Refuge were flown periodically during June through September. Survey effort was concentrated during the chinook salmon sport fishery of June and July and during the coho salmon sport fishery of September.

Visitors to the Refuge and surrounding lands were interviewed at three locations to learn their fishing success and their perceptions of crowding in the areas that they visited. Visitors were asked a series of paired questions regarding a few measures of the level of human activity that they had encountered. The first question asked what they had experienced, and the second question asked what level of use they would have accepted. Creel

survey technicians from Kenai Fisheries Resource Office interviewed anglers departing the Ayakulik River during the chinook fishery; similarly, Refuge personnel interviewed visitors at the Uganik River during September. Refuge personnel also interviewed visitors as they departed air taxis on their return to Kodiak town.

SUMMARY OF 1994 RESULTS

Visitor Use of the Ayakulik and Dog Salmon Rivers

Ayakulik River. Visitor use of the Ayakulik River during May, June, and July is primarily for sport fishing of chinook and sockeye salmon. Visitors who are brought by floatplane to the Bare Creek area either camp in that area and walk to fishing holes, or float the river, usually camping at more than one site, and depart from the mouth. A substantial number of visitors also enter the refuge from the mouth. Anglers, mostly guided lodge clients, regularly walk upriver from the mouth. These anglers frequently encounter anglers rafting from Bare Creek, but almost never encounter those walking from camps near Bare Creek (Squibb 1992, 1994).

The Kenai FRO creel survey estimated a total of 1251 angler days originating at Bare Creek from 27 May to 11 July 1994 (Booth 1995). In addition, there were 182 user days by FWS personnel working on projects. Angler days by raft-campers doubled from 305 in 1993 to 644 in 1994, and angler days by campers and day users at Bare Creek increased 21%, from 501 (1993) to 607 (1994) (Booth 1995). No subsistence use was observed in 1994.

The air traffic necessary to support this level of use was considerable. There were 246 landings above Bare Creek between 27 May and 11 July. There were an additional 77 overflights of Bare Creek during this period, mostly by floatplanes flying to and from the river mouth. Aircraft events (landings, take offs, and flyovers) at Bare Creek averaged 12.4 per day.

Dog Salmon River -- Frazer Fish Pass. Visitors to the river came for sport fishing or for bear viewing. Most visitors came to the river directly by floatplane from outside the area; visitors from the South Frazer Cabin used inflatable boats to reach the fish pass trailhead at the lake outlet. Anglers typically fished the entrance of the river or the flats downriver of the fish pass. Bear viewers watched bears fishing the river below the weir and at the entrance to the fish pass. Guided bear viewers were required by FWS to remain on a viewing pad on a low bench about 50 - 70 m northeast of the fish pass entrance. Non-guided bear viewers were not restricted, but typically used the guide's viewing pad or the picnic table in the ADF&G compound.

During the period 5 July to 11 August 1994, we recorded 204 visits to the Dog Salmon River near the Fish Pass; these included day visits from visitors staying at South and North Frazer Cabins. ADF&G and FWS personnel accounted for 11 of the visits.

These visits resulted in a total of 364 user days, including 145 use days by ADF&G and FWS personnel at the fish pass and 219 visitor days by anglers and

bear viewers. Of these use days, 170 were overnight stays, 136 by ADF&G and FWS personnel and 34 by campers. The remaining 194 use days were day use, 9 by ADF&G and FWS personnel and the remaining 185 by guided and private parties. The maximum number of people in the area on one day was 26.

We recorded 308 aircraft events (landings, take offs, and flyovers) in the area. Flyovers (n=133) were most common on a route between the valley of the East Fork and the Dog Salmon Flats on Olga Bay. The peak was 36 events on 18 June, but there were typically less than 10 per day ($\bar{x}=8.1$).

Comparison of Use by Wildlife and Visitors on Different Streams

The observed level of visitor use was highest on the Karluk River at the beginning of the chinook sport fishery at 0.47 people per kilometer of river scanned, even excluding the Portage area, which was not visible from our observation point, where most visitor use concentrated. Use was next highest at the Frazer-Dog Salmon study area at 0.38 people/km-scanned. All other areas were half or less that observed at Frazer, including the Ayakulik during the tail of the chinook sport fishery (Table 1). (During the 1993 chinook sport fishery on the Ayakulik when we collected data through the peak period of visitor use, visitor use averaged 0.92 people/km-scanned. Had we monitored the peak during 1994, we would have observed similar levels of use.)

Bear use was greatest at Karluk Outlet in late September at 1.12 bears/km-scanned, followed closely by Red Lake River in June-July at 0.91 bears/km-scanned. Overall bear use at Frazer-Dog Salmon averaged 0.38 bears/km-scanned, but bears concentrated at the Fish Pass at 1.60 bears/km-scanned where they encountered an average of 2.22 people/km-scanned.

Most eagle use occurred on the Red Lake River during June-July and at Frazer-Dog Salmon during July-August at 1.49 and 1.29 eagles/km-scanned, respectively. Karluk Outlet followed at about half that level of use.

Waterfowl were by far most common on the Karluk River. Waterfowl use averaged 6.59 per km-scanned during June and 5.15 during September. Other study areas had less than a third as much use (Table 2).

Visitor Impacts

Food-Conditioning of Bears. The Ayakulik and Karluk Rivers had the most serious problems of bears getting food from people of the areas that we observed. During the chinook salmon sport fisheries, many parties camping along these rivers stored food, garbage, and caught fish in an insecure fashion, and discarded salmon carcasses near their camps. These conditions resulted in bears obtaining food from people on several occasions.

A major factor in the prevention of bear incidents is the proper management of human food and garbage (Herrero 1985). The manner in which visitors stored food on the Ayakulik appeared to be similar to that of previous years (Squibb 1994). Bear resistant food containers were rare outside the FWS base camp, sport caught fish were kept in the river in front of camps, the remains of cleaned fish were often deposited in the river in front of camps, and food was

typically stored in plastic coolers in the vicinity of camps.

There were 12 bear incidents recorded on the Ayakulik from 27 May until 19 July. As the method of data collection was opportunistic, this sample was certainly not a complete count; but, hopefully, it was representative of the types of incidents occurring on the Ayakulik.

FWS personnel were involved in 4 of the 12 incidents, displacing bears from camps or the vicinity of visitors. Of the 8 other incidents involving only visitors, 6 (75%) involved bears taking food or sport caught fish from visitors' camps. Incidents included (1) a bear taking 3 chinook salmon stored in the river in front of a camp, (2) a bear taking a cooler containing human food from a camp and consuming the contents, and (3) a bear entering a camp on three different occasions to take a total of 90 lb. of sport caught fish and human food. This last incident was the worst recorded on the Ayakulik during the three years of this project.

There were records of 13 bear-human incidents for the Karluk River during the chinook sport fishery between 7 June to 3 July (ADF&G personnel recorded 11 incidents during their creel survey). Bears obtained human food and/or caught fish in 7 (58%) of the incidents. Bears gained control of coolers or food boxes in 6 incidents. Records indicated that bears ate the entire contents of coolers on at least 2 occasions. And bears stole fish from anglers actively landing them in 2 incidents. We are aware of no records of bears taking fish off of anglers' lines from the Ayakulik in 1992 - 1994; such fish stealing has been common in some recent years at Brooks River and Big River in Katmai National Park. As on the Ayakulik, secure storage of food and caught fish appeared to be a major factor in these incidents.

At the Dog Salmon River and Frazer Fish Pass, observers recorded 5 incidents from 5 July to 11 August. Most (4) of the incidents were ADF&G personnel displacing bears from their facilities with deterrent rounds; the fifth incident involved bears displacing two visitors from their gear. Most visitor use to Frazer was day use and food storage of the few campers in the ADF&G compound was secure. There were no records of bears obtaining food from people. Even though several of these bears were sufficiently habituated to people to fish at the weir when several people were watching nearby, they showed no behavior indicative of being food-conditioned. The situation at Frazer demonstrated that, with proper food management, serious bear incidents can be avoided.

Displacement of Wildlife. The process of displacement from a river corridor is simple. As people move down the river, wildlife are flushed. Whenever the interval between groups of people is less than the time that it takes for wildlife to return to the river, wildlife use on the river will be reduced to zero. Some wildlife will adapt to this impact by habituating to people. Habituation is common on Kodiak Refuge by subadult bears and to a lesser degree by bear family groups. Squibb has seen a few eagles on the Refuge that appeared habituated to some degree. Unfortunately, there can be undesirable consequences to habituation, especially among bears, and not all individuals will habituate.

As visitor use increased during our observations of the upper Karluk River in June, a substantial displacement of ducks was clearly demonstrated by our data. We believe that such displacement was probably occurring with both waterfowl and eagles in other areas of moderate to high visitor use, such as the Bare Creek area of the Ayakulik, although our data were not sufficient to clearly demonstrate it.

There appeared to be great potential for the displacement of bears from the Karluk River near Silver Salmon Creek during the September and October coho sport fishery and deer seasons if the number of rafting parties increased to more than an occasional party every several days. In the Ayakulik drainage during the chinook sport fishery, the confluence of the Red Lake River and the Ayakulik was the only place at present levels of use where substantial levels of visitor use overlap an important bear feeding area (see also Squibb 1994). The level of displacement of bears from the Frazer Fish Pass appeared low because a habituated cohort of bears had developed there and human use occurred at low levels and in predictable patterns. At the present moderate levels of human use at Frazer, the shier bears which were more susceptible to displacement appeared to still have sufficient opportunities to access the weir for fishing.

Aerial Visitor Surveys

Aerial visitor surveys from both 1993 and 1994 were included because the 1993 data had not yet been reported. There were 5 aerial surveys flown during 1993 with the primary mission of counting visitors on Refuge streams. Observers on 8 aerial salmon stream surveys in 1993 also counted visitors as a secondary purpose. During 1994, 4 aerial surveys were flown with the primary mission of counting visitors on Refuge streams. Additional counts of visitors were taken as the secondary purpose of 5 aerial salmon stream surveys in 1994. In both years, the streams surveyed included most major streams within the Kodiak Refuge boundaries on Kodiak Island. Streams on the east side of Kodiak Island were flown only during the coho salmon runs.

Visitor counts throughout the summer seasons of both 1993 and 1994 were greatest on the Karluk (1993 $\bar{x} = 25$, $n = 6$; 1994 $\bar{x} = 54$, $n = 4$); the next highest counts observed were on the Ayakulik (1993 and 1994 $\bar{x} = 15.8$, $n = 6$ and 5). People were also observed, though at much lower numbers, on the Dog Salmon, the Uganik, Uyak South, Zachar, Little R., Horse Marine, Akalura, and Upper Station. The aerial surveys detected no people at other streams (Fig. 2). The only notable difference between years was a much higher maximum count at Karluk in 1994 (145 people) than in 1993 (55 people). Nevertheless, the average counts on the Karluk did not differ significantly between the years (2-tailed $t = -1.07$, $df = 8$, $P = 0.31$) presumably because of high variability and small sample sizes. However, if that change in maximum counts did indeed reflect real changes in peak visitor use to Koniag, Inc. lands on the Karluk River, then it may presage future increases in demand for chinook fishing opportunities on the Ayakulik River on Refuge lands.

Exit Interviews -- Angler Success

Interviewers contacted passengers departing air taxis in Kodiak town on flights that dispatchers told them were returning from the Refuge or vicinity. Data were recorded according to Refuge Public Use Areas. Interviewers contacted no visitors returning from Afognak Island; all data were from visitors returning from Kodiak Island. Results are presented according to whether visitors used Refuge lands or non-Refuge lands. If visitors used Public Use Areas that included a substantial proportion of native conveyed lands or if they visited the private lands in the Karluk reservation, those data were classified as from non-Refuge lands.

Interviewers surveyed 63 parties, totalling 241 people, between 1 June and 17 September; 25 of the parties were commercially guided during their visits. Of these visitors, 191 were sport anglers in 59 parties who fished for a total of 876 angler days.

The overall rate of 5.4 fish landed per angler day on Refuge lands was about twice that reported off Refuge lands (2.8). Yet anglers both on and off Refuge lands kept fish at about the same rate, 0.3 per day. To accomplish this rate, anglers off Refuge lands kept 10% of their catch, versus 5% for anglers on Refuge lands. Anglers off Refuge reported keeping 28% of their chinook catch, compared to 20% by anglers on Refuge. In contrast, anglers on Refuge kept 35% of their coho salmon catch, compared to only 6% off Refuge.

The higher overall success rate on Refuge lands resulted from much higher reported success catching dolly varden/arctic char (2.3 fish/angler-day vs. 0.7 off) and pink salmon (1.3 fish/day vs. 0.2 off) there. Off Refuge lands, the reported success catching coho salmon (0.8 fish/day vs. 0.2 on) was much greater. Success catching chinook salmon was the same in both areas (0.4 fish/day). Anglers also had better luck catching rainbow trout (O. mykiss) on Refuge lands (0.25 fish/day vs. 0.02 off).

Visitor Experience

Ayakulik River. Creel survey technicians from Kenai FRO interviewed 48 parties departing the Ayakulik River regarding their experience there during the chinook sport fishery.

Day users and campers in the Bare Creek area would have accepted substantial increases in the numbers of parties that they encountered. Anglers who rafted downriver to fish would not have accepted increases in use, finding present levels of use to be their acceptable upper limit.

Campers in the Bare Creek area would have accepted only slight increases in the number of camps within sight or sound of them. Raft-campers downriver found the present density of camps to be slightly above their acceptable upper limit.

Day users in the Bare Creek area would have accepted triple the number of

aircraft operating in the area. In contrast, visitors staying overnight at Bare Creek and downriver found current levels of air traffic to be substantially greater (1.3 to 1.6 times greater) than their acceptable upper limits.

A large majority (>68%) of visitors to the Ayakulik River were not opposed to limits on the level of visitor use in the area.

These 1994 results indicated less acceptance of increases in visitor use than did the 1993 survey. The percentage of parties supporting limits of use was about the same in both years. This change resulted largely from raft-campers apparently reaching their acceptable upper limit of crowding with the doubling of their numbers from 1993 (66 anglers, 305 angler days) to 1994 (130 anglers, 644 angler days; Booth 1995).

Uganik. There were only 8 parties in our survey of visitor experience on the Uganik drainage during September. Overall these parties found current levels of human use and of air traffic slightly below their acceptable upper limits. All 5 parties of day users said that they might support limits on visitor use; all three parties of campers responded that they would support limits.

Exit Interviews. Interviewers meeting arriving air taxis in Kodiak town contacted 46 parties, totalling 135 visitors, who responded that they were returning from Refuge lands and 17 parties, totalling 106 visitors, from non-Refuge lands. Guided parties accounted for 33% (15) of the Refuge parties and 59% (10) of the non-Refuge parties. Refuge and non-Refuge lands were defined according to Public Use Areas and Karluk reservation lands, as above.

In general, visitors both on and off Refuge lands found current levels of visitor use, air traffic, and power boat traffic to be below their acceptable upper limits. Visitors off Refuge lands would have accepted substantially greater increases in visitor use and air traffic than would have visitors on Refuge lands, even though the two groups reported that they had experienced about the same levels of use.

Responses regarding power boat use differed substantially between the areas. Visitors off Refuge lands reported 9 times the power boat traffic reported on Refuge lands; visitors off Refuge lands also had a 4 times higher acceptable upper limit for power boats. These differences in power boat use probably resulted from the fact that popular areas in conveyed lands included much more water near established communities and lodges where power boats were more readily available.

Solitude and recreating in a pristine natural area were goals of a substantially larger proportion of visitors to Refuge lands, but these experiences were found by almost all parties seeking them in both areas. The majority of parties using both areas were unopposed to limits on visitor use (>89% on Refuge lands vs. >70% off Refuge lands). Visitors to Refuge lands reported seeing many more bears but had fewer undesirable bear encounters than did visitors off Refuge lands.

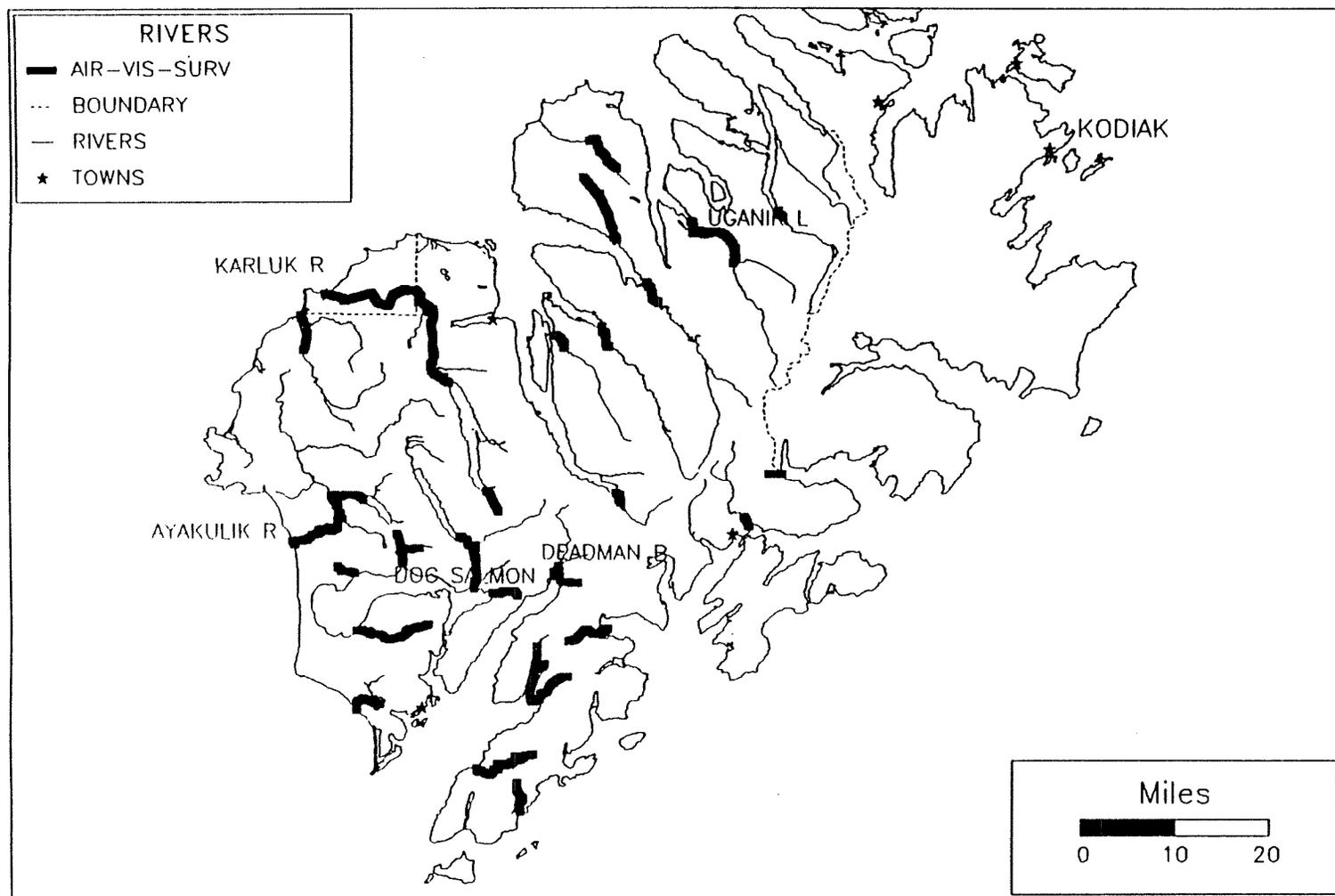


Figure 2. Approximate stream sections flown during aerial visitor surveys. For several rivers, only the river immediately above the mouth and the adjacent shoreline on the bay were surveyed, as drawn. Rivers on the east side of the island were flown only during the coho salmon runs.

Table 1. Comparison of visitor and wildlife use in study areas during 1994 by use per visible length of river scanned.

	<u>Ayakulik</u>	<u>Red L. R.</u>	<u>Frazer-DS</u>	<u>Ugank L/R</u>	<u>Karluk-Bn</u>	<u>Karluk-Out</u>
Dates of Scans	6/23-7/19	6/23-7/17	7/6-8/7	9/4-9/14	6/9-6/20	9/22-9/29
Visible River (km)	14.5 ¹	8.7 ²	12.4	3.8	14.5 ³	11.9 ⁴
Total km scanned	799.8	526.4	2076.8	283.8	2173.1	756.6
People/km-scanned	0.19	0.05	0.38 ⁵	0.07	0.47	0.15
Bears/km-scanned	0.03	0.91	0.23 ⁵	0.01	0.01	1.12
Eagles/km-scanned	0.32	1.49	1.29	0.06	0.12	0.73
Waterfowl/km-scanned	0.74	0.28	1.49	1.66	6.59 ⁶	5.15 ⁷

¹ length in zones A - G; sightability was poor in G.

² length in zones A, X, Y, and Z.

³ sightability was poor in zones A and D; did not record waterfowl there.

⁴ did not record ducks in zones B1 and B2 because of poor sightability for ducks.

⁵ Note that overall summaries belie local concentrations in study areas such as Frazer-Dog Salmon where local concentrations in zone B, the Fish Pass, averaged 2.22 people and 1.60 bears per kilometer of river scanned.

⁶ statistic for waterfowl excluded zones A and D; denominator was 1031.2 km-scanned.

⁷ statistic for waterfowl excluded zones B1, B2, & S; denominator = 464.4 km-scanned.

REFERENCES

- Altmann, J. 1974. Observational study of behavior: sampling methods. Behavior 49:227-267.
- Booth, J. 1995. Ayakulik River chinook salmon creel survey, Kodiak NWR, Alaska, 1993 and 1994. USFWS, Kenai Fishery Resource Office, Final Report 95-____, Kenai, Alaska. 41 + app.
- Herrero, S. 1985. Bear attacks, their causes and avoidance. Lyons and Burford, New York. 287 pp.
- Squibb, R. 1992. Visitor use and wildlife use of the Ayakulik River, Kodiak National Wildlife Refuge, 1992. USFWS, Kodiak NWR, Kodiak, Alaska. 18 pp. + 13 fig. + 3 app.
- Squibb, R. 1994. Visitor use and wildlife use of the Ayakulik River, Kodiak National Wildlife Refuge, 1993. USFWS, Kodiak NWR, Kodiak, Alaska. 29 pp. + 17 fig.
- Squibb, R., and P. Taylor. 1993. Human use and human-wildlife interactions on rivers in Kodiak National Wildlife Refuge, Alaska (River Management Planning), Study Plan for FY 1994. USFWS, Kodiak NWR, Kodiak, Alaska. 17 pp. + fig. + app.

3. Public Participation:

DRM Munoz conducted a public meeting at the local High School on April 20, 1994 to gain public comment on the temporary O'Malley closure, as well as the proposed permanent (seasonal) closure. The meeting was lightly attended. As a result of this meeting and the call for comment contained in the proposed regulation, about 2 dozen written comments were subsequently received. Copies were shipped to the RO. As of the turn of the year, no further action had been taken on a final regulation.

4. Compliance with Environmental and Cultural Resource Mandates:

O'Malley Public Use Cabin-(Taylor)

An environmental assessment was written for relocation of the O'Malley public use cabin. Alternative actions identified in the document included (1) No action (2) Seasonal closure (3) Replacement at an alternate site within the Karluk drainage (4) Relocation to Bluefox Bay on Afognak Island. Preferred Alternative 4 was selected.

Spiridon Lake Sockeye Enhancement Project-(Chatto)

This project was initiated by ADF&G in 1991 under the auspices of an environmental assessment prepared by the refuge. The refuge and ADF&G meet on an annual basis to track the progress of the project and ensure that the biological and physical characteristics of the lake are in concert with stipulations in the environmental assessment. Spiridon Lake is the third largest lake on the refuge but was barren of anadromous fish due to an series of impassable falls which prevented fish access from the ocean. The ADF&G stocks sockeye salmon fry into the lake annually. These fish migrate to the ocean and return as adults to be harvested in the common property fishery within the Kodiak area.

In the spring of 1994 approximately 5.68 million sockeye fry were stocked into Spiridon Lake. Additionally, the ADF&G recorded approximately 850,000 sockeye smolt which migrated from the lake to the ocean in late spring of 1994. These fish were from fry planted in 1991, 1992 and 1993.

Data collected by the Department in 1994 indicate that there continue to be no changes in either the water quality or limnological characteristics of the lake. The physical and biological parameters stipulated in the environmental assessment continue to be within acceptable limits. Sampling for Dolly Varden in the lake in 1994 indicates a slight decrease in catch/unit effort over 1993, but the catch is still above that observed in 1991.

A total of nine aerial index surveys for salmon on Spiridon River were conducted by the ADF&G and the refuge in 1994. The Spiridon River drains into the bay adjacent to the Spiridon Lake project and monitoring of escapement is mandated by the environmental assessment. The peak index escapement count for pinks and chum was 85 and 69 percent respectively of the minimum escapement goals. Indexed escapement of coho was 20 percent above the minimum goal of 4,000 fish. Sockeye escapement into the river was indexed at 375 fish. Although there is no established escapement goal for sockeye into the Spiridon River, this small population is being monitored to determine the effects if any from the enhancement project on Spiridon Lake.

In 1994 an estimated 263,750 project sockeye were caught by commercial fishermen along the west side of Kodiak. Approximately 44 percent of these fish were harvested in the Spiridon Bay special harvest area that was established by ADF&G to harvest returning sockeye that escaped the more traditional fishing areas along the west side of the island. The commercial harvest activity was monitored by ADF&G and the Refuge. As a result of observations in 1994 it was decided to install an experimental barrier seine in 1995 within the Telrod Cove area where the stream that drains Spiridon Lake empties into the bay. This action was recommended to avoid potential wildlife resource problems within the inner cove by numerous boats trying to fish and since there is no escapement goal for these returning sockeye it will also allow for a more complete harvest. In 1995 the ADF&G estimates that approximately 160,000 sockeye will return and be available for harvest by commercial fishermen.



Spiridon Lake-(Zwiefelhofer)

Monitoring of bald eagle nesting and productivity within the Spiridon Lake project area by the Kodiak refuge staff continued during 1994. Bald eagle nesting activity within the project area has been monitored by the refuge since project initiation in 1991. A minimum of 42 occupied bald eagle territories with potential to be impacted by the project were identified during 1994. The cost of monitoring this enhancement project's potential impacts to nesting bald eagles is supported by refuge wildlife inventory funds.

Hidden Lake Sockeye Enhancement Project-(Chatto)

This project was initiated in 1992 by the ADF&G and is also under the auspices of an environmental assessment. This project is similar to the Spiridon Lake project except on a smaller scale and is located on the Ban Island/Afognak Unit of the refuge.

In 1994 the ADF&G stocked 250 thousand sockeye fry into Hidden Lake. Smolt monitoring in 1994 consisted of sampling the out-migration using a fyke net in the lake outlet to collect data on the smolts. As in previous years there is no total estimate on the number of smolts which left the lake in 1994. Data collected indicate that approximately 98 percent of the smolts which left the lake in 1994 were from the fry stocking in 1993.

Data obtained through limnological sampling in 1993 indicated that the lake zooplankton biomass had decreased significantly and as a consequence, stocking in the lake was drastically reduced to approximately 200 thousand fry. Sampling in 1994 indicated that water quality and other limnological parameters were either at desired levels or still recovering. Consequently, the decision was made to continue the low density stocking of fry again in 1994.

In 1994 sampling for Dolly Varden in the lake was continued by the Department and catch/unit effort was at or above that observed in 1993. This sampling will continue in 1995.

A total of five stream surveys were conducted by the ADF&G on Hidden Lake creek in 1994. Pink salmon escapement was 23 percent above the desired goal and approximately 750 coho salmon were observed. There is no escapement goal for coho salmon in the system since these fish are remnants from an earlier enhancement project the ADF&G had terminated in 1992. In 1995 the ADF&G estimates that approximately 21,000 sockeye will return and be available for harvest by commercial fishermen.

Hidden Lake-(Zwiefelhofer)

Monitoring of bald eagle nesting and productivity within the Hidden Lake fisheries enhancement project area was initiated during 1993. A minimum of 37 occupied bald eagle nesting territories were identified during 1994 as having potential for impacts from activities associated with the enhancement project. Cost of conducting annual bald eagle nest monitoring surveys for the Hidden Lake Enhancement Project are paid for by the Kodiak Regional Aquaculture Association.

Terror Lake Hydroelectric Release-Water Project-(Chatto)

In 1993 the Kodiak Electric Association (KEA) proposed to initiate studies for the Release-Water-Project associated with the parent Terror Lake Hydroelectric facility which was constructed in 1984 within the refuge boundary. This proposal involved the use of release water from the Terror river outflow which would be shunted via a 9,000 foot long penstock to a powerhouse/generator downstream. The water would then be dumped back into the river to maintain fishery values. During 1994 the KEA initiated the first stage consultation process for the project and numerous joint agency/public meetings were held. In addition, the Service provided input to the design of biological studies to obtain data for preparation of an environmental assessment on the project.

The KEA was also encouraged to begin the process of applying for a Right-Of-Way permit from the Service for the project. In October 1994 the Refuge was notified by KEA that due to a reassessment of the available water and potential energy production associated with the proposed project it was deemed to not be economically feasible to continue their development efforts and the project had been canceled.

In late 1994 the Alaska Energy Authority (AEA) in conjunction with the KEA initiated discussions with concerned agencies in evaluating the possibility of requesting an amendment to the Terror Lake projects Federal Energy Regulatory Commission (FERC) license to modify the current minimum in-stream flow requirement in the Terror River. At this time no decision has been made by AEA/KEA to pursue a license amendment for the proposal.

The Federal Regulatory Commission has not yet reviewed the completed fishery studies to determine if the conditions of the license for the project have been met in regards to the minimum flow regime.

5. Research and Investigations:

Kodiak NR 94 - "Population Ecology of Brown Bears on Aliulik Peninsula, Kodiak Alaska" (National Fish and Wildlife Foundation Challenge Grant) (Barnes)

The National Fish and Wildlife Foundation awarded the Kodiak NWR a 2 year challenge grant to continue brown bear investigations of Aliulik Peninsula. Initial work on this area was directed at density estimation and aerial survey methodology. The challenge grant study is a complement to the initial work and will focus on (1) seasonal habitat use patterns and (2) mortality by sex and age class. The study is a cooperative effort involving the Refuge, NBS, and ADF&G. Challenge grant contributors include Wildlife Forever, Brown Bear Trust, and Safari Club International.

The study began in October 1994 and to date has consisted of periodic radio-tracking to document aspects of winter den ecology. Additional animals will be marked in 1995 and aerial tracking of radio-collared animals will continue.



Most of the Aliulik Peninsula study area is a low benchland intersected by numerous draws and stream drainages; Aiaktalik and Sitkanik Islands are in the background. (V. Barnes)

Kodiak NR 93 - "Brown Bear Activity, Behavior, and Distribution Related to a Bear Viewing Program at O'Malley River, Kodiak Island, Alaska" (74530-91-01) (Barnes)

The objective of this study was to evaluate effects of a structured bear viewing program on brown bear. In 1991 and 1993 data were collected under conditions of comparatively unrestricted public use, and in 1992 identical study procedures were used when public use was limited to bear-viewing participants and use was strictly regulated. The study was extended to 1994 to include a second year of data under conditions of structured bear viewing. An additional objective in 1994 was to correlate ground and aerial counts of

bear on the O'Malley area to provide a procedure for long-term monitoring of bear use on that area.

In 1994 data were collected from 1 July to 20 August, resulting in 371 scan samples and 116 focal samples. The sampling period in 1994 was shorter than in the previous 3 years and was designed to cover the period of greatest bear use (Mid-July to mid-August).

Although sampling occurred over a shorter time span in 1994, the number of bears identified on the study area was comparable to past years. This was an expected result because the sampling occurred during the period of highest bear use. A minimum of 101 different bears were identified, including 20 subadults, 10 adult males, 32 adult females, and 30 offspring. The number of bears identified in past years ranges from 110-133.

Human use of the O'Malley study area, measured as average number of human groups observed per scan, declined 54% from 1993 to 1994. (Figure 3). This difference can be attributed primarily to the different forms of public use permitted in 1993 (non-structured) and 1994 (structured bear viewing). Human use in 1994 was about 24% less than during the other year (1992) of bear viewing. Lower use in 1994 compared to 1992, reflects partial use of available bear-viewing slots and can be attributed to the fact that 1994 was the first year of bear viewing conducted by a private operator. In 1992 bear viewing was operated by the Refuge.

Bear use of the O'Malley study area in 1994, also measured as average bear groups observed per scan, was 48% higher in 1994 than in 1993 (Figure 4) and 19% higher than in the other year (1992) of bear viewing. For the 1 July - 25 August period that sampling occurred in all 4 years, bear groups were observed more frequently during years with bear viewing programs (6.3 bear groups/scan) than during years with no bear viewing (4.5 groups/scan).

Over 90% of all public use on the O'Malley area occurs along O'Malley River (study zones A and D) and along the southwest shore of Karluk Lake (Zones B and C). Bear use in those zones provides insight into bear response to different forms of public use. Bear use in zones A and D was high in all years, but was highest during the 2 years (1992, 1994) when public use was in the form of a bear viewing program (Figure 5). In zones B and C human use associated with bear viewing programs was about one-fourth (23%) of that during non-bear viewing years, and bear use in that area during bear viewing years 44% greater. These data suggest that, at least during daylight hours, bears spent more time along O'Malley River and the southwest shore of Karluk Lake under conditions of structured bear viewing. The effect on bears was most apparent on the Karluk Lake shore, as that is the area typically used as a staging area for parties using boats and float planes.



*The O'Malley observation camp.
(V. Barnes)*



*This crossroads of bear trails in the
Karluk Lake area attests to many years of
heavy bear use. (V. Barnes)*

The study to correlate ground and aerial counts was completed with 4 sets of paired counts. Each set of 3 or 4 replicated counts was completed over a 2-3 day period. Overall, 14 paired counts were conducted. The ground/aerial counts were initiated between 0700-0810 or 1800-1930 hours. Companion counts were started within 9 minutes of each other with 1 exception (24 minutes).

Mean number of bears counted during each period (Figure 6) indicated very close agreement between ground and aerial counts. Additionally, the paired counts compared favorably with average number of bears observed per scan from the ground over the 5-day survey period that included the 2-3 day sampling period. This data set provides the foundation for long-term monitoring of bear use on the O'Malley area.

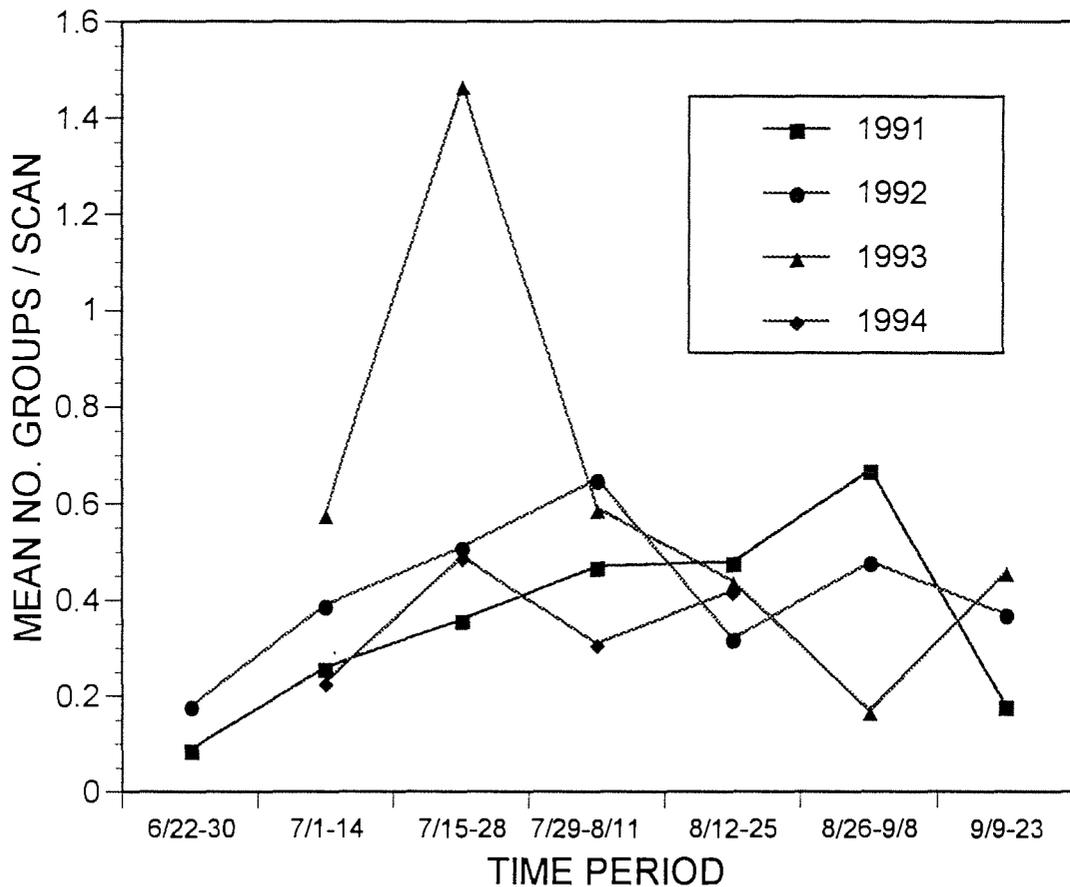


Figure 3. Temporal patterns of human use (mean number of human groups observed per scan) on the O'Malley River study area, 1991 - 1994.

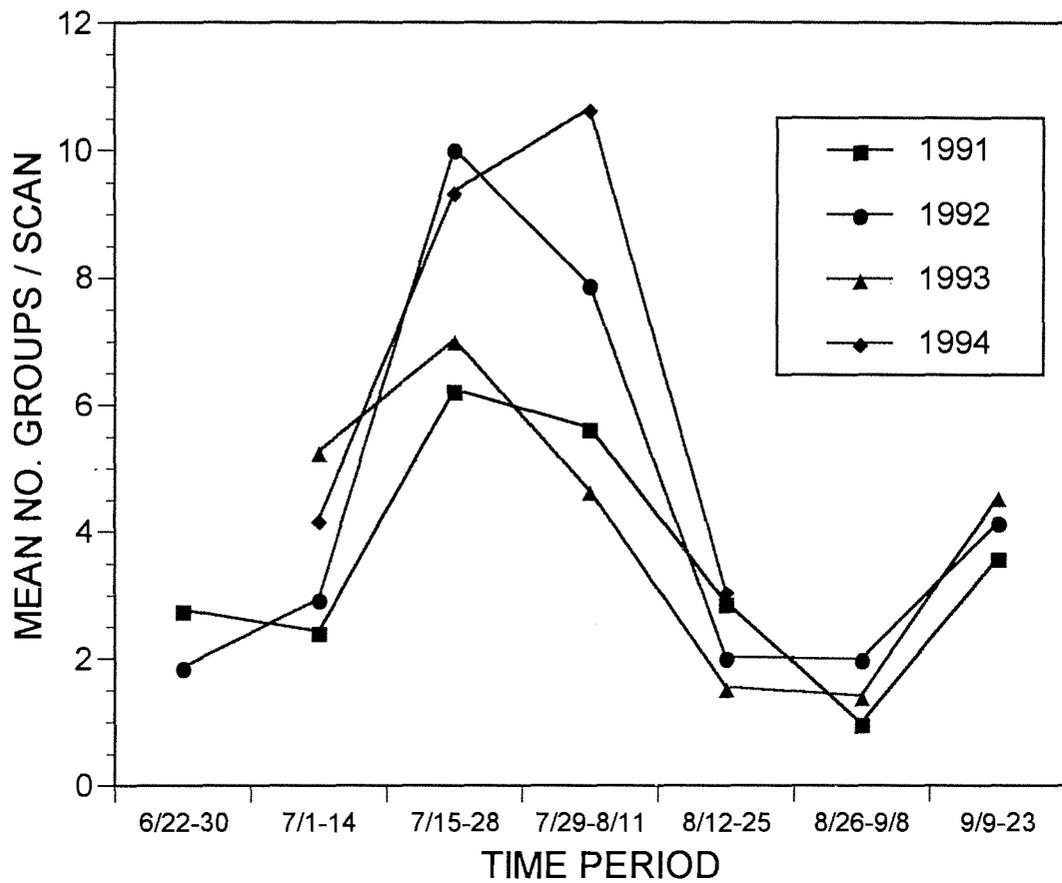


Figure 4. Temporal patterns of brown bear use (Mean number of bear groups observed per scan) on the O'Malley River study area, 1991-1994.

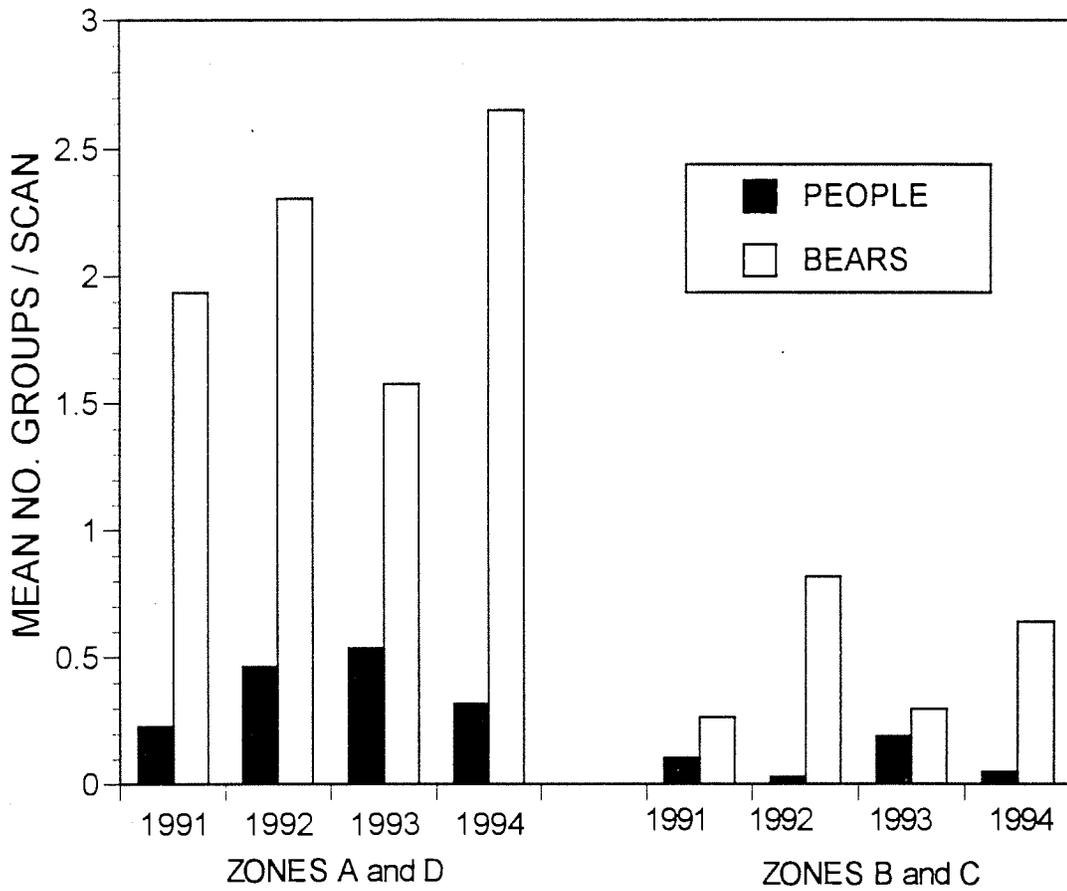


Figure 5. Brown bear and human use (mean number of groups observed per scan) on O'Malley River (Zones B and C) during years when public use was restricted to structured bear viewing programs (1992, 1994) and years when public access was comparatively unregulated (1991, 1993).

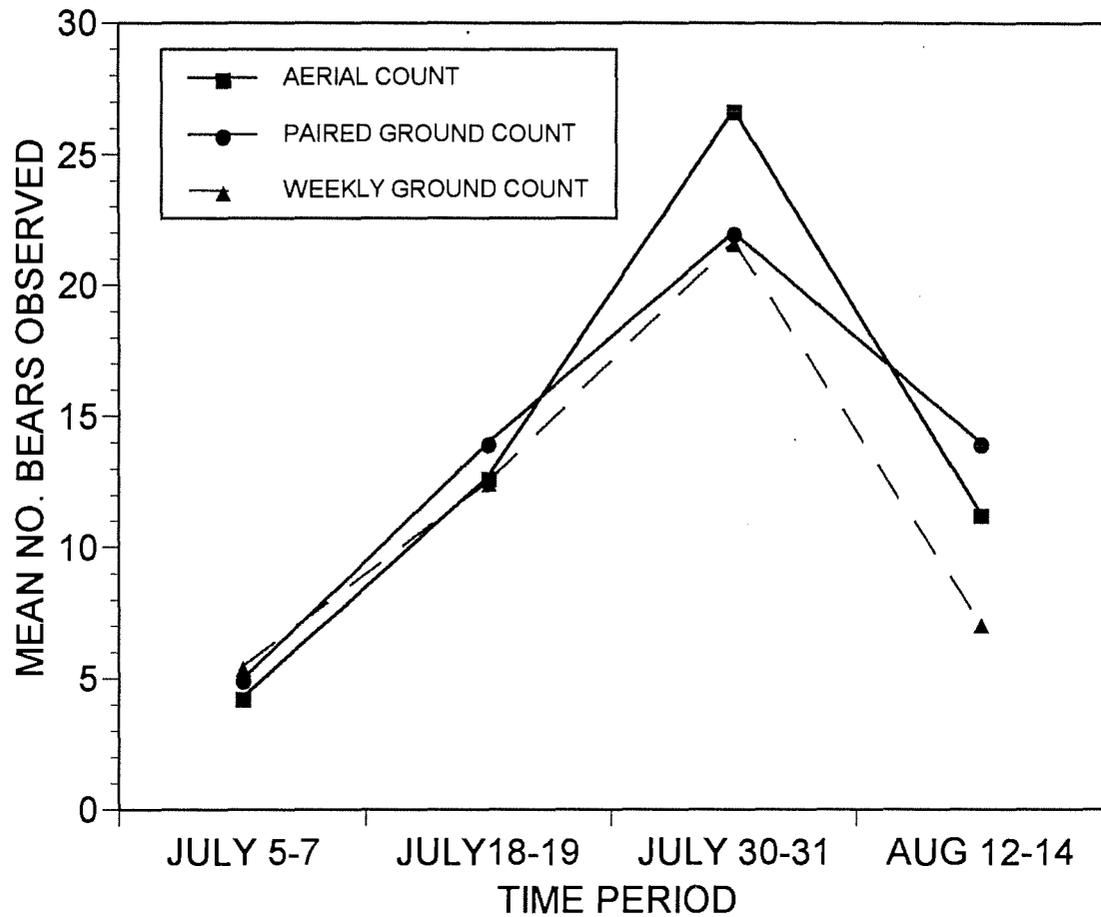


Figure 6. Mean number of bears observed during simultaneous counts (3-4 replicates/period, 14 total) made by observers on the ground and in fixed-wing aircraft, and mean counts per scan (46-50 scans per week) by ground observers during 5-day periods that encompassed the 2-3 day time span of simultaneous counts, O'Malley River study area, 1994.

Kodiak NR 94 - "Coho Salmon Investigations Ayakulik River" (Chatto)

In 1993 a study was initiated on the Ayakulik River to evaluate coho salmon spawning habitat through assessment of stream substrate and how this composition directly affects the suitability of potential spawning habitat. The goal of the study is to calculate optimum coho escapement based on available stream substrate. This project is being conducted by Ray Hander, a graduate student at the University of Alaska Fairbanks.

In July and August 1994 field work was continued and statistically random sections of the river, identified from work conducted in 1993, were intensively sampled in both the East Fork and the main stem of the Ayakulik. In addition, a coho spawner survey was conducted in late-October early-November in the sampled sections. Spawning adults in each of the sections were counted by foot surveys. Data analysis and the final thesis composition is expected to be complete in 1996.

Kodiak NR 94 - "Ayakulik River Chinook Salmon Creel Census" (Chatto)

A chinook salmon creel census was conducted on the Ayakulik River to document the level of public use and fish caught and harvested. This information is necessary to ensure the in-river sport fishery harvest does not adversely impact the minimum biological escapement goal of 6,500 chinook. This project is scheduled to be carried out every three years to periodically monitor the fishery and detect any major trends. Although this project was carried out in 1993 it was continued in 1994 because the escapement of chinook, after both the commercial intercept fishery and the sport fishery, approached the minimum goal of 6,500 fish. In 1994 the fishery was monitored as a cooperative effort by the Refuge and the FWS Kenai Fishery Resources Office.

From May 28 through July 13, 1994 a total of 1,533 angler days (guided and unguided) were documented on the river. Anglers caught a total of 3,472 chinook, 1762 sockeye, 381 steelhead, 118 Dolly Varden, 22 rainbow trout and 3 pink salmon, of which 739 chinook and 558 sockeye, were kept. In addition, as in 1993, very small numbers (<10) of Dolly Varden, rainbow trout and steelhead were kept by anglers.

The 1994 chinook escapement into the river was 9,138 fish. Allowing for the sportfish harvest it is estimated that approximately 8,399 chinook (29% above the minimum goal) were available to meet biological escapement needs.



Graduate student Ray Hander and Volunteer Chris Weland spent the greater part of the summer identifying coho salmon spawning habitat in the Ayakulik River. (R. Hander)

6. Other: Nothing to report.

E. Administration: (Munoz)

1. Personnel:

1. Jay R. Bellinger, Refuge Manager, GM-13, PFT, EOD 1/8/84
2. John R. Munoz, Assistant Refuge Manager, GS-11, PFT, EOD 1/28/90
3. Donald A. Chatto, Fishery Biologist/Pilot, GS-12, PFT, EOD 3/21/81

4. James A. Patterson, Airplane Pilot, GS-12, PFT (Local Hire), EOD 6/7/89
5. Paul B. Taylor, Park Ranger, GS-11, PFT, EOD 4/15/92
6. Dennis C. Zwiefelhofer, Wildlife Biologist/Boat Operator, GS-11, PFT, EOD 5/78
7. Julie C. Revalee, Administrative Technician, GS-6, PFT, EOD 9/17/91
8. William J. Lanahan, Maintenance Worker, WG-8, PFT, EOD 12/16/92
9. Diana L. Brooks, Assistant Park Ranger, GS-9, PFT, EOD 9/1/91
10. Robert A. Stovall, Wildlife Biologist/Subsistence, GS-9, PFT, EOD 12/23/91
11. Gary A. Johnson, Biological Technician/Subsistence, GS-6, PFT (Local Hire), EOD 11/1/91
12. Jacquelyn D. Barnes, Office Automation Clerk, GS-3, PFT (Local Hire), EOD 1/23/92
13. Ronald C. Squibb, Resource Planner, GS-11, Temporary Appointment Detailed to Kodiak from Regional Office
14. Raymond F. Hander, Seasonal Biological Technician, GS-6
15. Brian D. Loly, Seasonal Biological Technician, GS-5
16. Gregory A. Wilker, Seasonal Biological Technician, GS-5
17. Carol A. Nelson, Seasonal Park Ranger, GS-5
18. Shirley Monte, Intermittent Data Transcriber, GS-4
19. Sarah Lukin, Resource Apprentice Program Participant

Alaska Fish and Wildlife Research Center:

20. Victor G. Barnes, Jr., Wildlife Biologist, GS-12, PFT, EOD 6/19/82

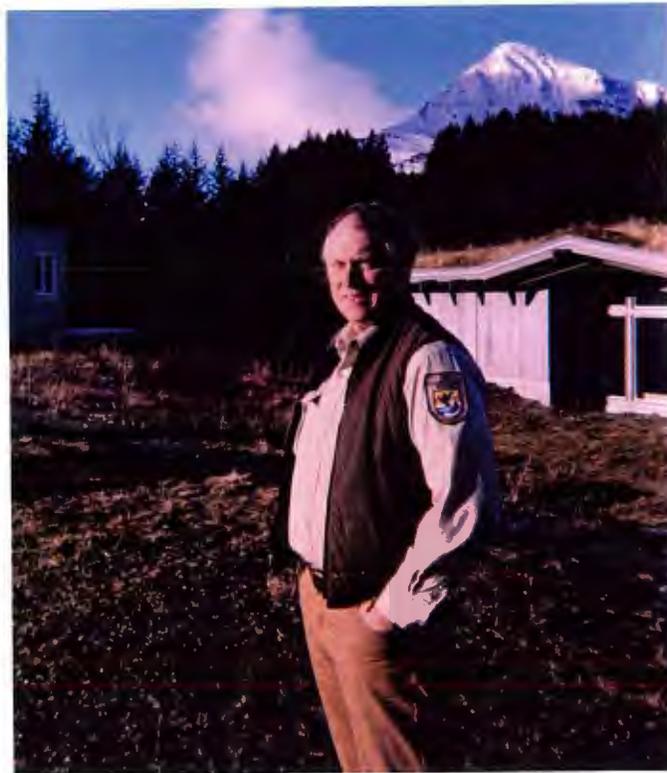
Table 2. Staffing at Kodiak NWR from 1989-1994

Fiscal Year	Permanent Full Time Employees	Permanent Part Time Employees	Temporary Employees	Total Full Time Equivalents*
1994	9	0	6**	9.0
1993	9	1	3	9.5
1992	9	1	6	9.5
1991	9	1	5	9.5
1990	9	1	4	9.5
1989	9	1	4	9.5
1988	9	1	3	9.5
1987	9	1	2	9.5

*Local hire appointments do not count toward full time equivalents (3 local hires were on staff during 1993)

**Includes RAPS student

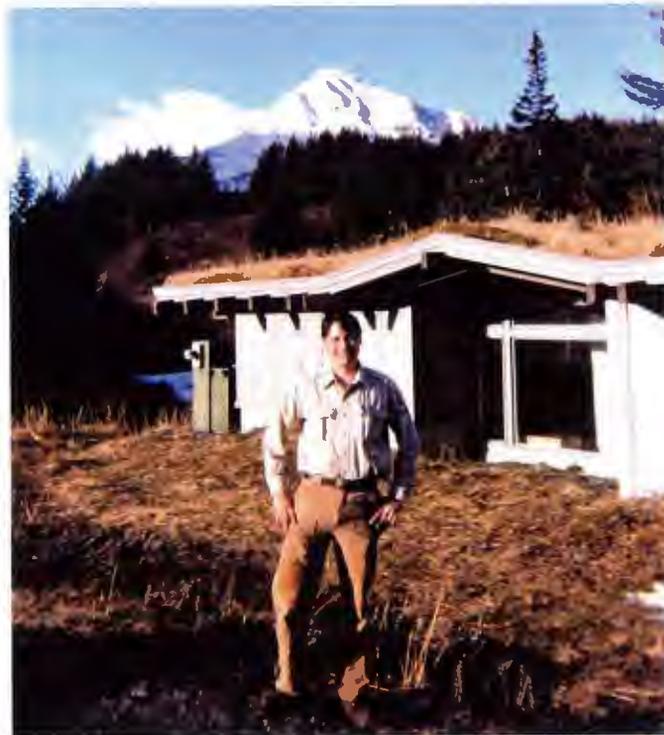
Staff Photos



Refuge Manager Jay Bellinger



From left to right in the front row are Julie Revalee, Jacke Barnes, and Dick Munoz. Second row has Vic Barnes, Robert Stovall, Greg Wilker, Tony Chatto, Butch Patterson and Ron Squibb.



Maintenance Worker, Bill Lanahan



Refuge Ranger, Diana Brooks

2. Youth Programs:

3. Other Manpower Programs:

A Resource Apprentice Program (RAP) participant, Sarah Lukin, was funded by the BIA and worked under the supervision of the volunteer coordinator. The Resource Apprenticeship Program is an attempt to increase the number of Native American students pursuing careers in natural resources. This will aid both the management of Native and Tribal lands, and the attempts by Department of Interior agencies to diversify the work force. Sarah is a student at Port Lions school and an Alutiiq native. She worked on a variety of projects, primarily public use, over a 10 week period. She had the opportunity to travel to village schools and refuge lands. Sarah's final summary of her experience reported that the summer had been enjoyable, the experience had strengthened her resolve to attend college, and said that one of most unexpected things she learned was that she needed to "learn more math!" to pursue a biology degree. Sarah is expected to return and expand her knowledge of refuge operations in 1995.

4. Volunteer Program:

The overall number of volunteers in the Public Use Division remained between 22 and 25, although individuals came and went throughout the year. Public Use volunteers continued to staff the Visitor Center on Saturdays and Sundays, keeping it open as much as possible year round. However, the level of participation has begun to drop, primarily because the former public use program of cabin maintenance is now operated by the maintenance program. Apparently, the idea of potential field work kept many volunteers' interest up, even if they did not actually participate. As it became more and more difficult to fill vacancies in the schedule, and the same few dedicated volunteers were being called on repeatedly, the public use staff has begun to consider the possibility in the future of relying primarily on paid staff to open VC and reducing the number of open hours or days.

The most significant change in the volunteer program was a shift towards supporting the refuge environmental education plan. Experienced volunteers JoAnn Alvarez, Meldonna Cody, and Carol Nelson all prepared and presented various lessons. Ranger Brooks also formed a partnership with a Kodiak high school group, the Future Teachers of America, at the suggestion of volunteer Emily Calloway, a high school senior. The teens desired a service project that would give them actual classroom experience. Ranger Brooks presented a Project WILD workshop and provided the teens with lesson plans and materials related to refuge E.E. goals. Nine of the most interested FTA's declared themselves the Teen Nature Teachers (with the slogan "T.N.T.'s - we're dynamite!") and set out with a goal to reach every elementary school classroom in the town of Kodiak during Wildlife Week. With the dedication of volunteer Nelson, who coordinated scheduling, and the teens' parents providing a significant amount of the transportation, the goal was met - although it was more like Wildlife Month than Wildlife Week. The nine teens, with either volunteer Nelson or Ranger Brooks accompanying, had reached over 1000 students - twice last year's Wildlife Week numbers. The story of the Teen Nature Teachers in the local media made its way to statewide circulation and additional federal funds were provided to enable the TNT's to travel to Kodiak Island Borough School District's six village schools and two logging camp schools. It seemed that the TNT's learned almost as much as the village children on these trips - several teens commented later that they had reevaluated their college and career plans. The experiences also positively impacted the teens' self esteem, and two of the participants had the opportunity to independently run a small summer school program at the recommendation of a teacher whose classroom they had visited.

Volunteers used in other areas included Vicki Vanek - winter seabird survey, harlequin duck survey, Bluefox Bay supply haul (100 hrs), Tammy Olsen - River Use Management Plan (100 hrs), Alice Iliff - River Use Management Plan (100 hrs), Chris Weland - coho spawning survey (684 hrs), Janet Taylor - interpretive materials development, house painting (104 hrs), Greg and Sally Wilker - bear research (760 hrs), C.J. Lanahan - facilities construction (667 hrs), Randy Lanahan - facilities construction and maintenance (402 hrs), Russ Lanahan - facilities construction and maintenance (286 hrs), Cris Russell - facilities maintenance (135 hrs), Jo Tate - facilities maintenance (66 hrs),

Bobbie Johnson - facilities maintenance (60 hrs), Tim Revalee - facilities maintenance (55 hrs), and Ann Munoz - facilities maintenance (36 hrs).

5. Funding:

Table 4 depicts Kodiak Refuge funding in thousands of dollars by program for the last five fiscal years. The 1260 and 1330 budgets remained essentially the same as in FY 93. However, subsistence management funding dropped another \$5,000.00.

Table 3. Kodiak National Wildlife Refuge Funding Levels

Program	FY91	FY92	FY93	FY94	FY95
1260 Fixed Costs/Overhead	555	616	668	700	696
1260 Projects	283	201	126	136	152
1260 Subsistence	73	103	95	78	73
1260 MMS	38	67	48	34	68
1230 Projects	--	3	4	--	--
1331 Fixed Costs/Overhead	75	67	77	74	80
1331 Projects	24	13	5	6	0
Totals	1048	1070	1023	1028	1069

Table 4. Change in Funds Available for Field Projects

Fund	FY91	FY92	FY93	FY94	FY95
1260 Budget	838	817	794	836	848
1260 % for Operations	33%	24%	15%	16%	16%

6. Safety: (Stovall)

Robert Stovall served as Safety Officer for 1994. Topics of monthly safety meeting and training were as follows:

January - A video on defensive driving "When You Least Expect", was viewed by refuge staff and discussed.

April - Eight staff members completed the Red Cross CPR and First Aid training.

May and June - During these months Refuge staff, temporary staff, and volunteers completed bear safety training/firearms qualification, and watercraft refresher training in time for the field season.

September - Bio Tech/Deck hand Johnson successfully completed the Department of Interior's "Motorboat Operator Instructor Certification Course". This allows him to qualify refuge staff on safe watercraft operation and operator instruction.

October - Stress Management was discussed by refuge staff, after viewing the video "Managing Stress".

No lost time accidents were recorded in 1994.

7. Technical Assistance:

(Zwiefelhofer) WB Zwiefelhofer provided resource data to native corporation lobbyists for native owned lands within the Kodiak National Wildlife Refuge under consideration for purchase as mitigation for habitat loss resulting from the Exxon Valdez oil spill. By year's end, a tentative deal to acquire the high priority native owned lands had been approved by the Exxon Trustee Council and needed to be accepted by corporation shareholders. The overall ranking of the parcels on Kodiak supports past high wildlife values given to native conveyed lands and shows why reacquiring these areas is so important to the biodiversity of the Kodiak National Wildlife Refuge.

(Zwiefelhofer) Data on Tugidak Island raptors and Kodiak Island loons were provided to Habitat and Nongame divisions of the Alaska Department of Fish and Game by WB Zwiefelhofer. The Tugidak Island (off refuge) information will be used to develop a critical habitat protection plan for the area. The loon observations will be used in expanding the state-wide database documenting range and habitat use.

(Zwiefelhofer) WB Zwiefelhofer provided comments to Endangered Species and Western Alaska Ecological Services on a proposed commercial satellite launch facility at Narrow Cape (off refuge) on Kodiak Island. Data from seabird and sea duck surveys in the area were also provided to federal agencies and a private contractor preparing various environmental documents for the proposed development.

(Zwiefelhofer) Kodiak refuge's marine vessel, URSA MAJOR II, and her crew (WB Zwiefelhofer and BT Johnson) provided technical expertise, transportation, and logistical support to personnel of Katmai National Park during the month of June. The trip covered the Katmai coast from Katmai Bay to Shaw Island. Surveying the seabird colonies and marine mammal haul-outs along the coast was the primary focus of the Park Service personnel. Beach debris surveys to categorize flotsam and jetsam were also conducted on selected drift beaches.

(Chatto) Fishery Biologist/Pilot Chatto and ADF&G-Sportfish Area Management Biologist Len Schwarz traveled to the Karluk River in January to collect liver and heart tissue samples from coho salmon spawners. The tissues were sent to the University of Alaska Fairbanks as part of a regional Alaska genetics study.

(Chatto) Assistance was provided to the ADF&G-Sport Fish Division during April in tagging adult steelhead spawners on the Karluk River. This effort is part of a multi-year study to assess the status of one of the most important populations of steelhead in the Kodiak Archipelago.

8. Other: (Chatto)

Fishery Biologist/Pilot Chatto participated in the ADF&G-Sport Fish Divisions annual project review and staff meeting in Anchorage during January. During the meeting there was several issues relating to sport fisheries on the Refuge that were discussed.

Fishery Biologist/Pilot Chatto attended the annual Alaska Fishery Resources project leaders meeting in Anchorage in January and then again in October to discuss the current Regional Service Fishery Restoration and Enhancement Policy. A draft issue paper was prepared on the policy and presented for review by both Refuges and Fisheries personnel.

Remote field camps operated by the ADF&G on the Refuge in the spring to monitor sockeye salmon smolt migrations were visited to monitor ongoing activity and offer any needed assistance to keep camp activities compatible with Refuge purposes.

Fishery Biologist\Pilot Chatto attended the annual Alaska Chapter meeting of the American Fisheries Society in Sitka, Alaska in 1994.

The ADF&G-Commercial Fish Division conducted their annual pre-emergent pink salmon sampling on refuge streams in March and April of 1994. The refuge issues a SUP to the Department for the use of a helicopter to access refuge streams each spring.

A draft Right-of-Way permit for ADF&G fish weir sites located on native conveyed lands was prepared by the Refuge in August and submitted to the Regional Office in late-August. The purpose of this draft permit was to identify those fish weir sites on conveyed lands that may be acquired by the Service and set up a long term agreement with the Department for their continued use.

In December of 1994 a Cooperative Agreement between the ADF&G and the refuge was prepared for the shared use of the refuge's field camp facilities at Camp Island on Karluk Lake. This agreement is on a space and equipment availability basis.

During the year numerous informational requests on the status of the fishery populations and habitat the refuge and on Native Conveyed lands were processed. This information was provided as part of the ongoing effort to brief the Exxon Trustees on the value of the aquatic habitat located on conveyed lands which were being considered for purchase.

F. Habitat Management: Nothing to report.

G. Wildlife:

1. Wildlife Diversity: Nothing to report.
2. Endangered and/or Threatened Species: Nothing to report
3. Waterfowl (Zwiefelhofer):

Waterfowl production surveys were conducted during 1994 in a continuing effort to quantify wildlife resources in popular recreational areas of the Kodiak National Wildlife Refuge. The 1994 production surveys were carried out in the Spiridon river drainage. The nine one mile square plots (5 low strata, 4 other strata) were surveyed in 1994. One low strata plot will be dropped during future surveys due to lack of suitable wetland habitat. Spring phenology in 1994 was about normal. Near average temperatures combined with above average precipitation levels for April and May should have set the stage for good waterfowl nesting conditions. However, lack of rainfall and unusually warm temperatures in June resulted in below normal water levels prior to the survey. July precipitation was over twice the normal, resulting in extremely high water levels and flood conditions, particularly during the survey period. July temperatures were also below the long-term average. The lack of water during June and flood conditions during July probably had a very negative effect on waterfowl production over the survey area. Unfortunately, since this was the first year surveys were conducted in the Spiridon drainage, the effect of these adverse weather conditions is hard to quantify.

The 1994 waterfowl production surveys were conducted July 18 to 26 by BT G. Johnson and Ranger P. Taylor. The two person survey crew was dropped off via fixed-wing aircraft, at small lake which drains into the Spiridon river known locally as Munsey's lake. Transportation of equipment and personnel between survey plots was accomplished by use of two 11.5-foot inflatable kayaks. Water bodies in the plots were surveyed on foot, with exception of those plots which contained portions of the main stem of the Spiridon river. The river

segments were surveyed while in transit with the inflatable kayaks. Surveys were conducted using U.S. Fish and Wildlife Service Region 7 Standard Operating Procedures established for ground waterfowl production surveys in Alaska.

The high water conditions and steeper gradient of the Spiridon river (comparing to Ayakulik river) made the transit between the survey plots very treacherous. Fortunately, Ranger Taylor is an experienced whitewater kayaker and was able to keep the survey crew from getting into dangerous situations which can easily develop when traveling a river during flood conditions.

Table 5 represents the number of observed broods and brooding hens, by species, found in the random plots during the 1994 survey. Table 6 represents the 1994 expanded waterfowl production by species for the 22 square miles of Spiridon drainage sampled. Waterfowl species occurring on the production survey plots continue to be found at approximately the same composition and relative abundance that they occur during the winter months on the Kodiak archipelago. Hopefully, monitoring these primarily resident waterfowl populations and their availability for resident subsistence users will be possible with the addition of survey coverage in other Kodiak waterfowl production areas.

Table 5. 1994 Waterfowl Production Summary - Observed Broods

Production Area: South Central
 Selected Data: ALL STRATA
 Number of Plots: 8
 Expanded Area: 22
 Year: 1994

Species Observed	Class I	Class II	Class III	Broody Hens	Total
Mallard	0	1	0	2	3
Gadwall	0	0	0	0	0
American Widgeon	6	2	0	0	8
Green-winged Teal	1	2	0	0	3
Northern Pintail	0	0	0	0	0
DABBLER SUBTOTAL	7	5	0	2	14
Greater Scaup	0	0	0	0	0
Barrow's Goldeneye	1	5	0	0	6
DIVER SUBTOTAL	1	5	0	0	6
Common Merganser	0	2	0	0	2
Red-breasted Merganser	0	0	0	0	0
MISC. DUCK SUBTOTAL	0	2	0	0	2
Unidentified Duck	0	0	0	0	0
TOTAL DUCKS	8	12	0	2	22
Tundra Swan	0	1	0	0	1
Common Loon	0	0	0	0	0
Red-throated Loon	0	0	0	0	0
TOTAL	8	13	0	2	23

Ponds or lakes without recent or current beaver activity again had little or no use by waterfowl in 1994. Shorebird activity in the survey area was mostly limited to the main stem of the Spiridon river. Shorebird species observed were least and western sandpipers, and greater yellowlegs. The relatively low numbers of shorebirds observed are indicative of the differences in wetland habitat between the tundra areas along the Ayakulik and the mostly wooded areas along the Spiridon river. Results were provided to the Anchorage Regional Office Waterfowl Production Survey Coordinator to increase the baseline information for the South Coastal waterfowl production area. Kodiak is the sole representative of this stratum to date. The south coastal waterfowl production area maybe of much greater importance to the health and size of resident (wintering waterfowl) populations than to the overall flyway waterfowl populations. Subsistence use of these apparently resident populations, as well as the migrating component of the waterfowl populations locally available, cannot be separated. The resident portion of Kodiak and other south coastal waterfowl populations may be much more important in providing subsistence opportunities for rural residents than has been previously thought.



Waterfowl production surveys designed to monitor trends on Kodiak Refuge, including Barrow's Goldeneye pictured above, were expanded to include the Spiridon River area. (V. Barnes)

Table 6. 1994 Waterfowl Production Summary - Expanded Broods

Production Area: South Central Year: 1994
 Selected Data: ALL STRATA
 Number of Plots: 8
 Expanded Area: 22

Species Observed	Expanded Broods	Co. of Var.	Stand. Error	90% C.L. Lower	90% C.L. Upper
Mallard	10	0.33	3	4	15
Gadwall	0	0	0	0	0
American Widgeon	26	0.71	18	-4	56
Green-winged Teal	10	0.64	6	-1	20
Northern Pintail	0	0	0	0	0
DABBLER SUBTOTAL	46	0.53	0	6	85
Greater Scaup	0	0	0	0	0
Barrow's Goldeneye	20	0.33	7	9	31
DIVER SUBTOTAL	20	0.33	7	9	31
Common Merganser	5	0.75	4	-1	12
Red-breasted Merganser	0	0	0	0	0
MISC. DUCK SUBTOTAL	5	0.75	4	-1	12
Unidentified Duck	0	0	0	0	0
TOTAL DUCKS	71	0.42	30	21	121
Tundra Swan	3	1.00	3	-2	9
Common Loon	0	0	0	0	0
Red-throated Loon	0	0	0	0	0
TOTAL	3	1.00	3	-2	9

Harlequin ducks (*Histrionicus histrionicus*) have come to be recognized as an excellent indicator of high quality freshwater and marine habitats. While this species has declined over much of its range, the numbers of wintering harlequin ducks on the Kodiak National Wildlife Refuge since 1980 (Kodiak refuge) appear to have remained relatively stable. However, a significant ($p=0.031$) decline in wintering harlequin numbers was detected following the Exxon Valdez Oil Spill (EVOS). In July 1993, initiation of baseline data collection to monitor Kodiak refuge's resident harlequin duck breeding population was proposed and approved for funding as a part of the Kodiak refuge's overall wildlife inventory program.

The Kodiak refuge has been in existence for over 50 years, yet accurate baseline data for many species including harlequin ducks is sparse. The majority of current knowledge about less common species found on the Kodiak refuge has by necessity, been gathered in sporadic and anecdotal fashion. Over the last decade, recreational and commercial users have placed increased demands on critical coastal and interior harlequin duck habitats of the Kodiak refuge. The peak of human activity normally occurs during the sensitive spring and summer reproductive season.

The initial efforts were directed at areas felt to have greatest potential for impacts from past, current, and future human activities. Coastal survey efforts encompassed the majority of refuge land impacted by the Exxon Valdez Oil Spill. Interior freshwater observations were collected from watersheds receiving the greatest amount of visitor use during the critical breeding season.

Marine survey efforts covered nearly 950 kilometers of the Kodiak refuge's western coastline from Uyak Bay on Kodiak Island to Bluefox Bay on Afognak Island (Figure 7). Coastal surveys were conducted from a small boat equipped with a Global Positioning System (GPS) and a waterproof notebook computer loaded with GpsTrak.

The coastal spring breeding population surveys were conducted from May 10 to 19 on Kodiak refuge lands. The Bluefox Bay/Foul Bay refuge unit was surveyed May 26 and 27. The presence of breeding pairs of harlequins near estuarine or stream mouth habitats were considered indicative of breeding activity on those streams. A late summer survey of nearly the same shoreline areas to attempt identification of harlequin duck broods and brood rearing habitat was conducted on August 16 to 28. Broods located in areas classified as breeding habitat added evidence to the validity of the initial classification.

Harlequin duck observations were collected from the interior freshwater habitats by staff personnel and volunteers during the period May 5 to September 6. Observations of harlequin duck breeding and foraging activity were collected on watersheds receiving the greatest amount of public use such as the Ayakulik, Karluk, Dog Salmon, Uganik, and Zachar Rivers. Observation data consisted of date, number of individuals, location (on map or GPS), and behavior. Time of observation, sex and age of an individual were also determined and noted whenever possible.

The 949 kilometers of Kodiak National Wildlife Refuge shoreline surveyed in May tallied 4369 harlequins for a density of 4.6 ducks/km of coast. Table 7 presents the harlequin duck results from the 3 bay areas surveyed. Males comprised 56% of the total identified population. Subadult males were 8% of the total population. The coastal linear density of breeding pairs was computed to be 1.54 prs/km. Potentially, a small number of subadult females would be accompanied by adult males. The amount which these nonbreeding pairs inflate the reported breeding pair density is unknown. Figure 8 depicts the observed breeding pair distribution and density of harlequin ducks found in the Kodiak survey area during May.

Table 7. Results of May 1994 harlequin duck surveys along the western coast of Kodiak National Wildlife Refuge.

	<u>UYAK</u>	<u>UGANIK</u>	<u>BLUEFOX/FOUL</u>	<u>TOTAL</u>
Total km shoreline	468	307	252	1027
Total km surveyed	451	290	208	949
Total Harlequins Obs.	2088	1828	453	4369
Density (ducks/km)	4.6	6.3	2.2	4.6
# Males Adults	972	751	232	1955
% Males Adults	50%	51%	51%	50%
# Males Subadults	120	151	39	310
% Males Subadults	6%	10%	9%	8%
# Total Males	1092	902	271	2265
% Total Males	56%	61%	60%	58%
# Females	851	579	182	1612
% Females	44%	39%	40%	42%
# Unknown Sex	145	347	0	492
% Unknown Sex	7	19	0	11
# Breeding Pairs	763	535	165	1464
% Pop. Br. Prs.	79%	72%	73%	72%
Dens. of Br. Prs. Harlequins (Prs/km)	1.69	1.84	0.79	1.54

Figure 7. Survey area along the west coast of Kodiak National Wildlife Refuge during May and August, 1994.

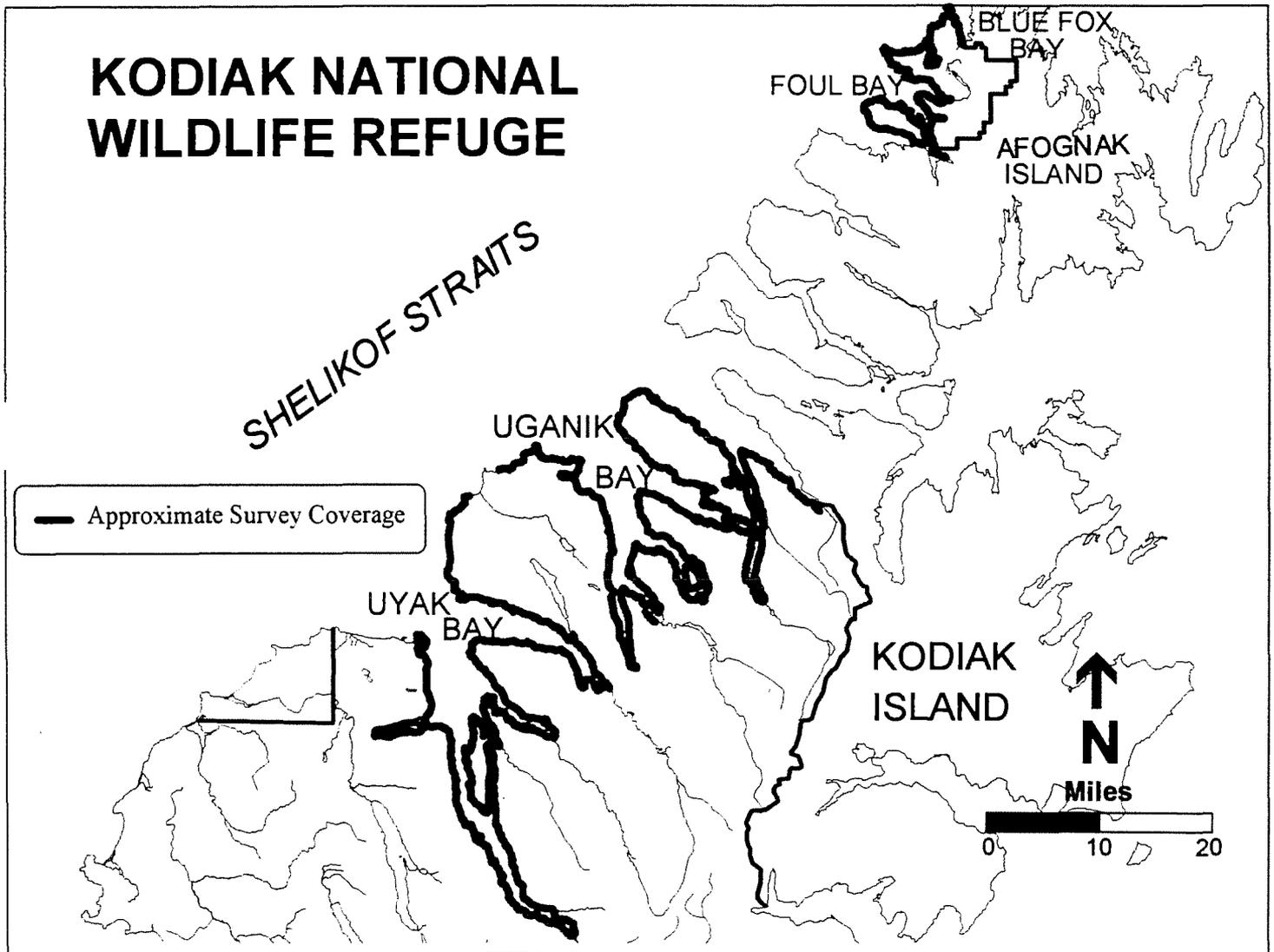
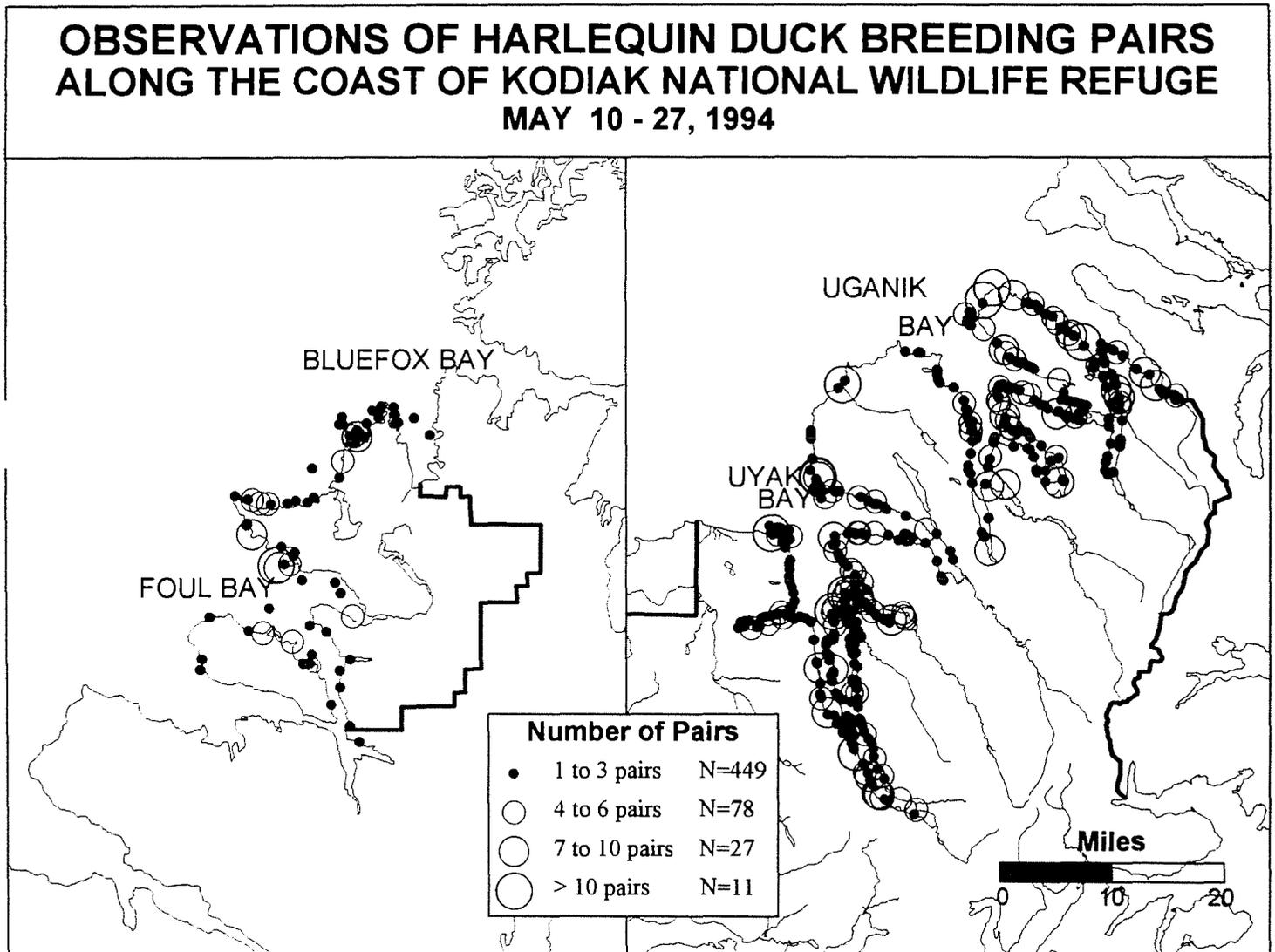


Figure 8. Locations and density of breeding pairs of harlequin ducks observed along the west coast of Kodiak National Wildlife Refuge during May 1994.



In August, 974 kilometers of coast including much the same shoreline area covered in May, tallied a total of 3684 harlequins (Table 8). The primary change in the August survey route influencing the number of observed harlequins was the addition of 31 kilometers of shoreline in Bluefox Bay. The area was not surveyed in May and includes the eastern shoreline and inner islands of Bluefox Bay. While not part of the Kodiak refuge, this area contains a large part of the habitat available to the Bluefox Bay's harlequin ducks. Numbers and linear densities of harlequin ducks decreased over most of the survey area with the exception of the Afognak area. Increasing the Afognak survey area by 17% nearly doubled (47%) the number of harlequin ducks counted. This strongly supports the importance these added habitats have in the overall success of Bluefox Bay harlequin ducks.

A total of 48 broods were identified during the August survey. Using the survey data to compute the standard reproductive variable of brood size (4.1 yg/brood) however, is of little value. The relatively small number of young identified (n=196) during the survey is a minimum number due to sex and aging difficulties discussed in the methods section of this report. By necessity, separation of larger "gang" broods was sometimes arbitrary and consequently a source of brood size error. Due to the lateness of the survey timing, still flightless freshwater broods may have moved from nearby estuarine areas to the offshore island habitats used by flight capable broods additionally inflating brood sizes. Kodiak harlequin duck broods were located most frequently on offshore rocks and island areas. Use of similar atypical breeding habitat by harlequins has been identified in coastal breeding populations from British Columbia, Siberia, and Greenland. This habitat type has also been described as "alternate" harlequin duck nesting habitat in Prince William Sound. Approximately 83% of the observed broods occurred in "offshore" islet and island habitat. However, the unknown number of unidentified broods included in the unaged harlequin duck totals limits the accuracy of expanding these data when locating or ranking brood rearing habitats. The observed brood size of 4.1 yg/brood was likely influenced by all these limitations and will not be used in describing 1994 harlequin reproductive results.

Table 8. Results of August 1994 harlequin duck surveys along the western coast of Kodiak National Wildlife Refuge.

	<u>UYAK</u>	<u>UGANIK</u>	<u>BLUEFOX/FOUL</u>	<u>TOTAL</u>
Total km shore	468	307	252	1027
Total km surveyed	434	288	252	974
Total Harlequins	1349	1471	864	3684
Density (ducks/km)	3.1	5.1	3.4	3.8
# Total Males	279	48	29	356
% Total Males	21%	3%	3%	10%
# Females	67	25	9	101
% Females	5%	2%	1%	3%
# Unk Sex or Age	925	1353	753	3031
% Unk Sex or Age	69%	92%	87%	82%
# Young	78	45	73	196
# Broods	12	16	20	48
Shoreline Dens of Harlequins(Yg/km)	0.18	0.16	0.29	0.20

A minimum of 53 interior freshwater harlequin duck observations of breeding and foraging activity were made in 5 different watersheds. The Dog Salmon River observations of a primary foraging area comprise 55% of all the observations and consist of peak daily counts. Observations made in Uganik River drainage were also peak daily counts. A total of 3 brood observations were made in 2 different watersheds during 1994. One of the broods seen (Uganik) was likely observed twice. Decreasing observer effort in suitable freshwater breeding habitats during the later brood rearing period limited the amount of brood data collected.

A total of 29,150 individual birds representing 40 different species were found during the May effort. The August survey tallied 54,773 birds from 43 species. Larus gulls were the most abundant specie group observed during both May and August surveys. They totaled 51% and 63% of all observations respectively with glaucous-winged gulls dominating the Laridae totals. Harlequin ducks were the second most abundant species found during

the May survey with 15% of the total birds observed. However, in August, harlequin ducks were only 7% of the total birds observed influenced by a 51% increase of other species and a 16% decrease in harlequin numbers.

Coastal aerial surveys initiated in 1992 to enumerate steller's eiders wintering along the east side of Kodiak Island were again conducted in 1994. However, responsibility and funding for the surveys was retained by Eider Recovery Team (ERT). Project Coordinator (ERT) William Larned acted as the pilot and primary observer for the surveys conducted in March. The refuge Cessna 206 (N9623R) was utilized with WB Zwiefelhofer as the secondary observer. Data analysis and reporting was to be handled by the ERT.

A female steller's eider banded on September 8, 1993 at Cold Bay (Izembek NWR) struck the F/V Hickory Wind's high intensity (crab) deck lights February 9, 1994 in the Geese Channel on the south end of Kodiak Island. This is the first time a steller's eider banded at Cold Bay is known to have been collected on Kodiak.

A Vancouver's Canada Goose, banded and released as part of a 1986 transplant effort on Shuyak Island was found dead on June 3, 1994 approximately a mile from the 1986 release site. Several canada goose broods have been observed in the area since the transplant but the population has not expanded to other areas as had been hoped.

A local waterfowl hunter documented the first known occurrence of a wood duck on Kodiak Island when he shot an adult drake at Kalsin Bay during the early October waterfowl hunting season.

4. Marsh and Water Birds (Zwiefelhofer):

Observations of Great Blue Herons around the Kodiak area continue to be made. An adult heron was observed by AO Revalee roosting in the spruce trees at refuge headquarters on February 22.

5. Shorebirds, Gulls, Terns, and Allied Species (Zwiefelhofer):

The annual wintering pelagic seabird, sea duck, and marine mammal survey was conducted from February 10 to 18 in Kodiak east side bays and February 23 to March 1 in the west side bays. Table 9 compares the total number of species counted during surveys from 1992 to 1994.

Marine mammal observations made during the surveys since 1992 are presented in Table 10. Sea water temperatures were down from 1993 but were closer to the normal average. Numbers of common murrees tallied during the 1994 survey were down from 1993 as well as black scoter, oldsquaw, and harlequin ducks.

Table 9. Comparison of total birds observed during winter surveys 1992 to 1994.

Species Common Name	1992 Numbers	1993 Numbers	1994 Numbers
American Wigeon	0	6	0
Bald Eagle	120	316	216
Barrow's Goldeneye	720	691	623
Black-legged Kittiwake	2	32	5
Black Oystercatcher	106	68	180
Black Scoter	1980	2134	1250
Bufflehead Duck	40	68	4
Common Merganser	11	65	206
Common Murre	5065	9998	4515
Emperor Goose	0	0	41
Greater Scaup	42	6	81
Glaucous-winged Gull	612	1627	1534
Harlequin Duck	1298	1091	842
Horned Grebe	297	212	366
King Eider	640	6	8
Mallard Duck	91	95	109
Marbled Murrelet	1060	761	763
Mew Gull	290	367	560
Oldsquaw	2158	4567	1773
Pigeon Guillemot	237	221	267
Red-breasted Merganser	484	422	568
Red-necked Grebe	285	180	180
Rock Sandpiper	0	76	130
Steller's Eider	280	228	130
Surf Scoter	296	242	263
Cormorant Sp.	1147	1254	1200
Loon Sp.	317	192	258
White-winged Scoter	1180	1103	1168

Table 10. Marine Mammals

Species Common Name	1992 Numbers	1993 Numbers	1994 Numbers
Dall Porpoise	2	20	0
Harbor Porpoise	11	10	8
Harbor Seal	13	4	35
Sea Otter	118	278	248
Stellar's Sea Lion	25	37	15
Fin Whale	0	7	1
Killer Whale	0	0	1

A black-footed albatross was sent into the refuge September 22, 1994 from the village of Old Harbor. It was determined the bird had probably been blown on to the shore by a strong fall storm and was unable get airborne again. WB Zwiefelhofer released the bird at Chiniak Bay and after a short preening period and a long takeoff run the albatross was back riding the winds.

6. Raptors (Zwiefelhofer):

The Kodiak National Wildlife Refuge's Migratory Bird Management Plan, outlines all refuge lands are to be surveyed for bald eagle nesting activity at five year intervals. During the intervening years, stratified random plots consisting of 5 degree longitude-latitude blocks are utilized to monitor bald eagle nesting and productivity. Stratification of the plots was based on the number of active nest sites from 1963 to 1982 historic survey data. However, since 1982 the number of bald eagle nests sites on Kodiak refuge lands has more than doubled.

The last refuge-wide survey for bald eagle nesting activity in 1992 counted 443 occupied nests while 304 occupied nest sites were located during the 1987 survey and 223 occupied sites found during 1982. Due to the notable increase in bald eagle nesting effort on the Kodiak NWR from historic levels, the strata developed from past mean active nest density data do not accurately represent current bald eagle nesting densities. In an attempt to resolve this discrepancy, an additional Very High density strata was added to the 3 previously existing (High, Medium, and Low) nest survey strata in 1993. Active nest densities for the plot strata used during 1993 was a mean less than 1 - Low; a mean of 1 but less than 2 active nests - Medium; a mean of 2 but less than 4 active nest sites - High; and plots with 4 or more active nest sites - Very High. Since the definitions for 2 lower strata remained unchanged and the upper strata was split, comparisons using the new and historic plot strata will be possible by combining the High and Very High stratums.

The number of plots in the various strata during 1994 were as follows: Low strata - 62 plots; Medium strata - 69 plots; High strata - 47 plots; and

Very High strata - 16 plots; for a grand total of 194 bald eagle nest survey plots on the Kodiak National Wildlife Refuge. The sub-sample sizes for each of the stratum randomly selected for the 1994 survey were as follows: 8 plots each for the Low and Medium stratums, 8 plots for the High strata, and 3 plots in the Very High strata for a total sample of 27 plots.

Surveys are normally accomplished utilizing the refuge's PA-18 Piper supercub. However, during 1994 due to the Office of Aircraft Service's failure in issuing a waiver to operate PA-18's on floats (relative to weight and balance) in time for the start of the refuge field season, the initial nest survey was conducted over several weeks instead of the normal 2-3 day time period. The effect of this piecemeal approach on the accuracy and quality of data should be considered when comparing to past refuge surveys. Parts of the initial nest occupancy surveys were flown by both Fisheries biologist/pilot T. Chatto and Pilot J. Patterson. Observers included WB D. Zwiefelhofer, RB V. Barnes, and Alaska Dept. of Fish and Game biologist R. Smith. The productivity survey flights were again piloted by both T. Chatto and J. Patterson with WB D. Zwiefelhofer and RB V. Barnes acting as observers.

The initial occupancy survey flights to determine nest location and status were completed on May 9, 21, 28, 30, June 2 and 4. The follow-up productivity survey to determine the status of nests determined to be occupied during the May survey was completed on July 27, 28 and August 6.

A total of 173 bald eagle nests including 82 active, 4 occupied and 87 empty bald eagle nests was found (May-June) in the 27 plots surveyed for a nest occupancy rate of 50%. Tree nests comprised 77% (n=66) of the active/occupied nests with ground, shrub, or cliff nests comprising the remaining 23% (n=20) of active/occupied nests from all stratums. The results of the nest occupancy survey can be found in Table 11. The expanded estimates for the number of spring occupied bald eagle nests refuge-wide are presented in Table 12.

Table 11. Results of Kodiak NWR bald eagle stratified random plot nest survey conducted during May and June 1994.

NEST STRATA	TOTAL NO. OF PLOTS	NO. PLOTS SURVEYED	OCC./ACT. NESTS	EMPTY NESTS	TOTAL NESTS
Low	62	8	10	8	18
Medium	69	8	15	19	34
High	47	8	32	24	56
Very High	16	4	29	35	64
TOTAL	194	28	86	87	173

Table 12. Expanded Estimate of Occupied/Active Bald Eagle Nests on the Kodiak NWR during May and June 1994.

NEST STRATA	MEAN ACTIVE NESTS	TOTAL NUMBER PLOTS	ESTIMATED NUMBER OF NESTS (90% C.I.)
Low	1.25	62	78 (22 to 134)
Medium	1.88	69	130 (100 to 160)
High	4.0	47	188 (179 to 197)
Very High	7.25	16	112 (105 to 119)
TOTAL	3.07	194	595 (545 to 645)

All 86 active or occupied nests located in May and June were re-checked in July and August to ascertain the number of young produced. A total of 92 young were counted during the survey effort. A total of 58 nests were successful in producing young for an overall nesting success of 67%, 1.07 young per occupied nest (spring) or 1.6 young per successful nest. These results are above historic refuge averages of 65% nesting success, 1.01 young per occupied nest (spring), or 1.55 young per successful nest. Table 13 summarizes the 1994 productivity survey results by strata. Table 14 displays the expanded (90% C.I.) 1994 bald eagle nesting production estimates for the entire Kodiak refuge.

Table 13. Results of Kodiak NWR bald eagle stratified random plot productivity survey completed July and August 1994.

Nest Strata	Nests W/0 Yg	Nests W/1 Yg	Nests W/2 Yg	Nests W/3 Yg	Total Young
Low	2	4	4	0	12
Medium	10	5	0	0	5
High	9	9	14	0	37
Very High	7	6	16	0	38
TOTAL	28	24	34	0	93

Table 14. Expanded Estimates of the Number of Young Bald Eagles Produced on Kodiak NWR during 1994 Nesting Season.

NEST STRATA	TOTAL NUMBER OF PLOTS	MEAN NUMBER OF YOUNG PER SAMPLE PLOT	ESTIMATED NO. OF YOUNG IN ALL PLOTS
Low	62	1.63	100 (42 - 158)
Medium	69	0.63	43 (0 - 98)
High	47	4.63	218 (210-226)
Very High	16	9.5	152 (140-164)
TOTAL	194	4.1	795 (668-922)

The bald eagle nesting and production estimates derived from the 1994 sample plots appears to indicate that the Kodiak National Wildlife Refuge's bald eagle population is still increasing. This trend is supported by the number of new nest territories observed both in and outside the 1994 survey plots. Mild weather during late March and April may have contributed to an increased effort by nesting bald eagles. Several anomalies occurred within the various sample strata resulting in a large amount of variance in the number of active/occupied nests observed and consequently the number of young produced. For example, one of the low strata sample plots which has had only one nesting territory since 1963 contained 5 active nest sites producing a total of 7 young during 1994. Contrast this with a very high strata sample plot in the Karluk Lake area which had 4 active nests producing a total of only 2 young in 1994 and the reason for the large confidence intervals on the expanded estimates becomes apparent.

The large number of paired adult bald eagles within the Kodiak population not associated with known nesting territories may respond to late winter or spring food abundances by establishing nests in marginal nesting habitats. The validity of this explanation is debatable but whatever the cause, the expansion of the Kodiak nesting bald eagle population appears to be

continuing. Extensive statistical modeling and analysis will obviously be necessary to improve the sampling accuracy and estimates given the continued changes seen throughout the Kodiak bald eagle nesting strata. Overall, 1994 appears to have been a very good year for Kodiak's bald eagles.

Raptor Mortality

The number of dead and injured bald eagles received and reported to the Kodiak refuge decreased in 1994 from 1993. A total of 12 carcasses or parts of carcasses were reported or collected during 1994. Table 15 summarizes the 1994 mortality results.

Table 15. Summary of 1994 Kodiak bald eagle mortalities.

AGES	CAUSE OF DEATH	LOCATIONS FOUND
	5 - Unknown	8 - Local Area
5 Adults	3 - Electrocuted	2 - Village Areas
7 Subadults	2 - Powerline Strike	2 - Remote Refuge areas
	1 - Hypothermia	
	1 - Starvation	

In addition to the mortalities, six injured bald eagles were handled during 1994 by the refuge staff. All six eagles were transferred to the Arctic Animal Hospital in Anchorage for long term care. Three of the birds were found to be permanently incapacitated and were placed in breeding programs in the "lower 48". The final prognosis on the remaining three birds is not certain but it appears that at least one will be releasable. Four other injured bald eagles were reported but not found or turned in.

7. Other Migratory Birds (Zwiefelhofer):

The first observation of a yellow-bellied sapsucker on Kodiak Island occurred in Monashka Bay on October 20.

8. Game Mammals:

a. Brown bears (Barnes):

General:

Management of brown bears on the Refuge is directed at maintaining population density, composition and distribution at or near current levels. Implicit in that objective is protection of high quality habitat on the Refuge and monitoring of human-caused bear mortality. Additionally, substantial effort is devoted to investigations and inventories to improve our understanding of

bear ecology and population status. Important bear management and research activities in 1994 included the O'Malley bear viewing program, spring and fall sport harvests, work on regulations affecting public use in critical bear habitats, aerial population surveys, continuation of the Spiridon bear evaluation (fisheries enhancement project), and the start of a new challenge grant study (National Fish and Wildlife Foundation).

Aerial Stream Surveys:

Stream surveys on the southwest Kodiak Island area spanned the period of 6 July to 12 August. Total bears observed in 5 complete surveys of the standard routes were as follows: 101 (7/18 PM), 103 (7/19 PM), 106 (7/30 PM), 42 (8/12 PM). The high counts were a little below average, but within the range of counts recorded in past years. As in 1993, low chum salmon escapement into Sturgeon and East Sturgeon Rivers in 1994 probably account for below average bear counts on those streams. Low bear counts on the Red Lake tributaries were a more surprising result because sockeye escapements into that system appeared normal. Reasons for low bear use of Red Lake streams were not apparent.

Composition of bears observed on the above surveys (n=502) was as follows: single bear - 47%, maternal female - 17%, new (<1yr) cubs - 13%, old (\geq 1yr) offspring - 22%. This composition is nearly identical to that recorded in 1993.

Stream surveys were also conducted on the Aliulik Peninsula to complement investigations in progress in that area. Three surveys completed during 13 and 14 August produced a mean count of 33.3 bears. Surveys conducted in 1993 produced a similar average (29.6). Single bears, females with offspring, and offspring comprised 60%, 12%, and 28% of the sightings in 1994.

Intensive Area Survey

This year (1994) marked the first time the IAS procedure was implemented as part of the Refuge inventory plan. The method is an extension of density estimation studies conducted in past years. Objective of the procedure is to improve population estimates for representative areas and to provide a base for monitoring population change.

The 1994 IAS was conducted in the Karluk Lake watershed; 4 replicate surveys of the 103 mi² area were completed during 21-31 May. Survey effort averaged 5.3 min/mi². Mean observation rates were 46.7/100mi² \pm 3.0 (SE) for independent bears (excludes offspring) and 77.0/100mi² \pm 6.2 for all bears. We also calculated observation rates per unit of time; average rates were 5.4/hr \pm 0.6 for independent bears and 8.6/hr \pm 1.1 for all bears. Observation rates for the Karluk Lake area are the highest that have been recorded to date on the Refuge. Using independent bears/100mi² as the basis for comparison, observation rates were 8.6 for Olga Lakes (1992 and 1993), 19.4 for Terror Lake (1987), 19.8 for Sturgeon River (1992 and 1993), 29.5 for Aliulik Peninsula (1993), and 46.7 for Karluk Lake (1994). Using sightability values obtained with radio-collared bears in mark-resight density studies elsewhere on the Refuge, we derived population estimates of 105 independent bears and 167 total bears for the Karluk Survey area.



Brown bear production on Kodiak Refuge is monitored extensively through radio telemetry. Sows such as the one pictured above are tracked throughout the year from the Refuge supercub by NBS Kodiak Field Station Project Leader Vic Barnes. This year an unusually high number of sows produced triplets. (V. Barnes)



Sow nursing cubs. (V. Barnes)

Mortality

Reported brown bear mortality from within Refuge boundaries was 143 in 1994 and 9% higher than in 1993. Although the sport harvest in 1994 was relatively low (116), non-sport mortality was exceptionally high. An all-time high of 18 defense of life or property (DLP) kills was recorded, including 8 (44%) due to hunting activity (primarily deer hunting) and 7 (39%) in Villages. An additional 4 DLP's occurred on the Kodiak Archipelago but outside Refuge boundaries.

The 1994 sport harvest on Refuge land included 71 taken in the spring season and 45 taken during fall. This harvest represented 70% of the total harvest for GMU 8 (Kodiak Archipelago). Sixteen trophy males (≥ 28 inch skull measurement) were harvested this year.

b. Sitka black-tailed deer (Stovall):

General:

Sitka black-tailed deer have been identified as the primary big game species for subsistence use on the Kodiak NWR. During the early 1980's, the black-tailed deer population on Kodiak Island experienced high growth and expansion rates, peaking by mid-decade. From 1985-1992 a series of severe winters produced high winter mortality. This, along with increased hunter pressure, eventually led to decreased bag limits for deer harvest on non-refuge areas. Refuge bag limits remained the same.

The severity of winter weather is considered to be the primary factor influencing the Sitka black-tailed deer population on Kodiak Archipelago. The number of black-tailed deer surviving the winters has a direct correlation to the number of deer available for subsistence and sport harvest. This relationship has never been confirmed. The deer survey work begun in 1992 was the initial effort toward gathering this type of data for the Kodiak NWR. Black-tailed deer ground counts were discontinued this year, however, mortality surveys were continued in the same areas completed in 1992 and 1993. Black-tailed deer mortality survey areas were accessed by the Refuge's 48 foot M/V URSA MAJOR II, and CESSNA 206 amphibious floatplane.

The following report summarizes the mortality data collected during the 1994 field season, and describes the pilot studies initiated this year to gather baseline deer population trend data and habitat information in wintering areas. This included pellet group count transects, browse surveys, and aerial deer surveys using Forward Looking Thermal Infrared (FLIR) technology, in cooperation with the U.S. Coast Guard.

Survey Area Habitats:

Habitat types for the mortality survey areas are the same as in 1992 and 1993. The habitats of South Central Uganik Island (UGI) and East Arm Uganik Bay (EAU) included tall shrubs, (open and closed canopy) composed of alders, birch, or willows species less than 9 meters in height. A broadleaf overstory of cottonwood trees greater than 9 meters, and interspersed with the aforementioned brush/shrub species, is also found in these areas. The Chief Cove areas (CCN, CCS) are similar to (UGI) and (EAU) but have more tall shrubs and less overstory cottonwood riverine areas. All areas have mixed moist to wet, tall grass/forbs complexes, and low shrub vegetation sites. Rolling

hills, to steep slope and cliffs, as well as scattered ponds, lakes, and narrow deep-cut brushy streamsides, account for most of the topography features.

Olga Bay (OGB) and Kempff Bay (KEB) habitats are characterized as Bristol Bay/Tundra types, and include low growing alder, willow, and dwarf birch shrubs less than 3 meters in height. Bearberry, moss, lichens, other matted forbs and tundra-type grasses are set in a topography with many wet shallow potholes or depressions and low-lying hills.

Mortality Surveys:

In 1994, deer mortality surveys were conducted in five areas, which included Olga Bay (OGB), North and South Chief Cove (CCN, CCS), East Arm Uganik Bay (EAU), and Uganik Island (UGI). Mortality surveys were not conducted in two areas this year, Kempff Bay (KEB) and North Sitkalidak Strait (NSS); both areas are presently not on lands administered by the Refuge. The Uganik Island mortality survey was conducted in the south central lowlands this year. This area better represents deer wintering habitats than previous years mortality surveys, which were located in very steep terrain on the western side of Uganik Island.

Mortality survey routes were walked by two-person teams using a hand held Garmin GPS 100 unit. The first team member navigated the predetermined route between waypoints using the GPS unit, searching for deer carcasses and recording carcass locations in the GPS unit. The second team member walked a parallel zigzag pattern, 30-60 meters apart, and on either side of the navigator, (depending on the terrain) searching for carcasses and recording all carcass data. The survey transect areas were from coastlines to approximately 200 meters up slope, and along the coastline for a predetermined distance.

Information collected included: GPS carcass coordinates, carcass distance from beach, general carcass appearance, sex and age when possible, and bone marrow coloration. A determination of a "found" carcass was made after finding remains which had enough bones, fur and skin to identify the carcass as a black-tailed deer. Old carcass determinations (carcasses which are greater than one year old) were made when carcasses had signs of green moss growth, bleached bones, and/or were covered with fallen leaf litter.

A total of five surveys were completed along 20.9 kilometers of GPS survey routes. Mortality surveys were completed on March 30 at Olga Bay, April 4, 5 at Chief Cove North and South, in cooperation with ADF&G Wildlife Technician J. Dinnocenzo, and April 8 at East Arm Uganik Bay and Uganik Island.

A total of 17 "new" carcasses were found during all surveys. Only one carcass, (at Olga Bay) could not be attributed to winter starvation, and is believed to be a hunter kill. All winter starvation carcasses had red gelatinous bone marrow when checked. Twelve of the 17 total carcasses were found during the Chief Cove surveys.

The number of carcasses per kilometer for all areas was 0.81 in 1994, slightly higher than last year's 0.18, which is still much lower than 1992, which had 6.4 carcasses per kilometer.

Table 16. COMPARATIVE RESULTS OF DEER MORTALITY SURVEYS: 1992-1994

SURVEY AREAS	CARCASS/KM 1992	CARCASS/KM 1993	CARCASS/KM 1994
CCNa	11.3	0.17	1.60
CCNb	NS	0.00	0.00
CCSa	11.4	0.00	0.75
CCSb	NS	0.00	NS
UGI	5.4	0.00	0.71
EAU	7.8	0.00	0.73
NSS	1.2	0.00	NS
OGB	0.52	0.00	0.30
KEB	6.9	1.42	NS
AVERAGE CARCASS/KM	6.36	0.18	0.81
TOTAL CARCASSES	218	4	17

CCN, CSS = CHIEF COVE NORTH AND SOUTH; UGI = UGANIK ISLAND
 EAU = EAST ARM UGANIK BAY; NSS = NORTH SIDE OF EAST SITKALIDAK STRAIT
 OGB = OLGA BAY WEST END; KEB = KEMPF BAY
 a = Area surveyed in 1992, 1993, and 1994 with ADF&G

Table 17. DEER CARCASS AGE AND SEX CHARACTERISTICS 1994:

<u>AGE/SEX/UNKNOWN</u>	<u>TOTAL CARCASSES</u>	<u>% OF TOTAL</u>
Adult/Male	5	29%
Yearling/Male	3	18%
Fawn/Male	1	6%
Fawn/Female	1	6%
Fawn/Unidentified Sex	7	41%
Unidentified Sex and Age	0	



The second mild winter in a row resulted in good survival of Sitka black-tailed deer. Mortality surveys were continued this year as recommended in the biological review conducted in 1992. (V. Barnes)

All deer observed during mortality surveys in March and April appeared in good health with no signs of usual winter stress.

The mild winter weather in 1994 influenced deer distribution similar to 1993. During surveys, deer were observed mostly at higher elevations, presumably due to the lack of snow on the ground and warmer overall temperatures for most of the winter. Most of the snowfall and colder temperatures occurred in February and March in 1994. This may have led to the slightly higher numbers of deer mortality found this year over last year (1993), which had higher temperatures and less snow during those months. (Heavy snows in December 1994, will probably affect the 1995 mortality surveys.)

Deer Pellet Group Count Transects

Following the Olga Bay Mortality Surveys, two deer Pellet Group Count Transects were established. Methods used to complete these pellet group transects were similar to those developed by ADF&G Biologists and used for population trend data on Sitka black-tailed deer in Southeast Alaska.

GPS coordinates were recorded and a metal red top painted stake was placed at the beginning and end of each transect. A transect location form was filled out for each transect. For each transect a compass bearing was determined and followed. At the beginning of each 1X20 meter plot on the transect line, the compass bearing was rechecked.

Plots were run consecutively by a two person team. The lead team member would pull the 20+ meter line to 20 meters and stop; the second team member with meter stick would walk the line and count the number of pellet groups found within a half meter on either side of the line and report to the first team member. Every five plots the duties were reversed to provide a basis for estimating variability between team members in counting. Seventeen random plots were spot checked by both team members as a review of observer accuracy.

The information gathered at each plot included the number of pellet groups, the habitat type, and plant species abundance within the plots. All pellet groups were counted regardless of age. Transects were located in the Northwest corner of Olga Bay, on the Southwestern portion of the Refuge.

PELLET GROUP COUNT ANALYSIS:

TRANSECT # 1 - 3/31/95, BEARING 310° NW; NW CORNER OF POND:
110 Plots Completed = 2.2 KM
Total Pellet Groups Counted = 347
MEAN = 3.24 Pellet Groups/Plot
Range of Pellet Groups/Plot = 0-11

TRANSECT # 2 - 4/1/95, BEARING 250° WSW; SW CORNER OF POND:
90 Plots Completed = 1.8 KM
Total Pellet Groups Counted = 243
MEAN = 2.7 Pellet Groups/Plot
Range of Pellet Groups/Plot = 0-26

The transects established this year will be run in subsequent years, developing deer population trend data for this area. Other wintering habitat areas should have pellet group count transects established in subsequent years.

Browse Surveys:

At Olga Bay, during the Mortality Surveys, 21 deer browse survey plots were completed along the seven waypoint mortality survey route, using the Aldous Deer Browse ocular estimation method. Three browse survey plots were established at each GPS waypoint. The center plot, located at the waypoint GPS coordinates was staked. The second and third plots were located upslope and downslope from center, and was separated by 7.5 meters. Plots were a 3.5 meter radius circle.

Within the plots, all available browse was identified to genus. Browse plant density was determined by counting stems and/or by visually estimating percent of ground cover. The degree of browsing of each plant by deer within the plot was visually estimated and recorded by percent.

A total of 13 browse plants were identified in all plots. Seven were browsed by deer. Three species of willow, black birch, bearberry, ferns, and grasses accounted for all browse eaten and 75% of the browse available. All Refuge major habitat types should have wintering deer browse surveys completed, to monitor changes in vegetation, and habitat quality.

Evaluation Of Forward Looking Thermal Infrared (FLIR) For Aerial Deer Surveys

An ongoing analysis of forward looking infrared (FLIR) technology for doing more precise deer surveys continued this year with the cooperation of the U.S. Coast Guard, and their flight personnel. Four survey transects were flown by a U.S. Coast Guard H-60 helicopter, with FLIR camera/controls, video display, VCR equipment; and GPS tracking system for navigating to transects, and for flying between the transect start and stop waypoints. Areas surveyed were on the Spiridon Peninsula: Chief Cove North and Campbell Lagoon areas.

The FLIR camera was set straight ahead and 30 degrees down, so that the altitude above ground level is equal to twice the survey strip width of coverage, while over transects. Strip width averaged 932 feet, at an average AGL of 466 feet. A ≥ 90 knot air speed was best for low levels of FLIR camera vibration.

Deer counts were done while monitoring the FLIR video display during flight and from interpretation of video tape after flight. A total of four replicates were flown for each transect.

The total high count from all transects, interpreted from the FLIR videotape, during and after the flight was 17. Approximately 17 other deer were observed, between transects, along the ridgetops on Southeast and Southwest

facing slopes. Deer were not concentrated in the lowland areas where strip transects were flown. A total of 1.5 square miles were flown for an average of 6 deer/sq mi for all strip transects flown.

The flight completed on February 3, 1994 had inconclusive results due to the prevailing weather conditions. Sunny and bright, weather with no snow in the lower elevations made identification of the spectral images of the deer difficult or impossible. Additional flights with better weather conditions; for example overcast or cloudy days, with little wind, and a snow cover, would aid in identifying deer thermal images. Additional flights were planned with the Coast Guard for early 1995.

c. Subsistence: (Stovall)

The Kodiak/Aleutians Subsistence Regional Advisory Council (Council) convened two public meetings as required by their charter in 1994. The first meeting occurred on February 8 and 9, at the Regal Alaskan in Anchorage. Agenda items included amending the Councils designated hunter proposal. This proposal would allow a qualified rural resident of GMU 8 to hunt black-tailed deer for another qualified rural resident of GMU 8. The Council also commented upon various other proposals that had state-wide implications or effected GMU 9D in the Aleutian Islands.

Other business conducted at this meeting included recruitment to fill the seats of Council Members whose terms expire this year. One third of the Council members' terms expire each year. Mark Olsen's and Randy Christensen's terms expired during 1994. Both members did reapply and were reappointed. The Council requested that two additional seats be added to the council to increase representation from the Aleutian Islands. WB Stovall attended this meeting.

On March 30, the consolidated subsistence litigation cases of Katie John vs. the United States and the State of Alaska vs. Babbitt, Secretary of Interior, was ruled upon by U.S. District Court Judge Holland, with the following results:

- Katie John vs. United States (The Where Question) - "For the purposes of Title VIII, public land includes all navigable waterways in Alaska." This order was granted a stay pending appeal by the State of Alaska to the Ninth Circuit Court of Appeals. This ruling could have major ramifications for fisheries management in waters surrounding the State of Alaska
- State of Alaska vs. Bruce Babbitt, Secretary of Interior (The Who Question)
- "The court concludes that the Secretary, not the State of Alaska, is entitled to manage Fish and Wildlife on public lands in Alaska for purposes of Title VIII of ANILCA (Alaska National Interest Lands Conservation Act)."

On April 13, The Federal Subsistence Board (the Board) rejected the designated hunter proposal from the Kodiak/Aleutians Regional Advisory Council, during its annual meeting. The Board meets annually to review changes to the federal subsistence regulations for the 1994-1995 season. The Board also rejected similar designated hunter proposals from the Southeast Regional Advisory Councils. The Board requested the Federal Subsistence Management Staff, in coordination with the other Regional Advisory Councils, and ADF&G; to convene a Task Force which will develop statewide regulations, which allows for the customary and traditional practice of individuals providing for the needs of others in the community. This Federal Subsistence Board meeting was attended by Kodiak/Aleutians Regional Council Chairman Olsen, Vice Chair Tutiakoff, Council Member Everitt, and WB Stovall.

On July 12, 13 and August 25, 26, the Designated Hunter Task Force met and developed a report, which was given to the Federal Regional Advisory Councils during their fall meetings for review. The report focuses on four options: Local Management, Tribal Management, Community Harvest, and Designated Hunters. WB Stovall attended July 12,13 and Regional Council Chair Olsen attended the August 25,26 meeting.

On October 4 and 5, the Kodiak/Aleutians Federal Subsistence Regional Advisory Council fall public meeting took place at the Regal Alaskan in Anchorage.

RM Bellinger and WB Stovall attended and gave a presentation on Kodiak NWR management. RM Boone gave a presentation on Alaska Maritime NWR and information on the disposition of the Adak Island Caribou herd. The Council adopted the Designated Hunter option from the Designated Hunter Task Force Report and re-submitted a proposal for GMU 8.

Mark Olsen and Vincent Tutiakoff were re-elected as the Chair and Vice Chair, respectively, for the Kodiak/Aleutians Regional Advisory Council. Gilda Shellikoff was elected the Council's Secretary.

Other discussions included a ADF&G proposal to limit the size of King Crab taken by subsistence user to a 7" carapace. At present Federal regulations have no size limitation. The Council voted to oppose this proposal.

On November 14, the Federal Subsistence Board voted to close federal waters around the Kodiak area to non-subsistence harvest of king crab. This action was taken in response to the proposal from ADF&G to restrict the size of King Crab taken by subsistence users. The Board rejected this proposal but recognized a need to enact conservation measures to protect the king crab population after hearing testimony from ADF&G, Regional Council members, Federal staff, and the public. The Board also requested their subsistence management staff to submit a gear size restriction proposal. After consultation with Regional Council Chair Olsen, a gear restriction proposal was drafted and submitted to the Board for the 1995-1996 regulatory year.

9. Marine Mammals:

a. Sea Otters: (Stovall)

During 1994, the FWS Marine Mammals Management Office completed a survey of sea otters along the entire Kodiak Archipelago, from the Barren Islands to Chirikof Island. This was accomplished using a Aerial Strip Transect design with Intensive Search Units flown to determine the proportion of otters not seen by the observer within the strip. This aerial survey technique was developed and tested in the Prince William Sound by NBS biologist. This was the first time the survey was applied outside of the Sound. Very few problems arose, and with the exception of the "Kodiak Weather", the surveys were a success.

WB Stovall was trained in this aerial survey technique during May, and was the primary aerial observer for surveys completed around the Kodiak Archipelago. A total of 1067 sea otters were actually counted along 991 stratified transects; for an estimated total of 6100 sea otters. In October a total of 5 sea otters were captured and exported to Sea World Aquarium in Seoul, Korea for public display. The International Animal Exchange under permit from the Marine Mammals Management Office, trapped sea otters from the west side of Whale Island, held them for five days, then transported them from Kodiak to Anchorage, then on to Seoul, Korea.

10. Other Resident Wildlife

a. Mountain Goats: (Stovall)

ADF&G big game biologist Roger Smith completed mountain goat summer composition surveys this year. A total of 719 goats were aerielly counted in August. This total included 579 adults (81%) and 140 kids (21%), for a kids:100 adults equal to 24:100.

Table 18. Summary of 1994 Mountain Goat Composition Surveys from areas on part and all of the Refuge.

UNIT #	# ADULTS	# KIDS	KIDS:100 ADULTS	TOTAL
473	93	33	36:100	126
474	55	18	33:100	73
475	106	13	13:100	119
476	33	2	6:100	35
477	80	13	16:100	93
TOTAL ALL AREAS	367	79	AVE. = 21:100	438

ADF&G preliminary harvest for mountain goats on Kodiak Island are as follows:

UNIT	TOTAL HARVEST
471 (Off Refuge)	9
472 (Off Refuge)	4
473 (Part Refuge)	8
474 (Part Refuge)	10
475 (Refuge)	5
476 (Refuge)	3
477 (Refuge)	3
Total	42 (22 males, 20 females)

b. Roosevelt Elk: (Stovall)

Alaska Department of Fish and Game big game biologist, Roger Smith reported that the Waterfowl Lake elk herd inhabiting refuge lands on Afognak Island is estimated to number 120-140. Three radio collared elk were tracked this year. A count of 105 elk was recorded in the 1994 surveys. A total composition estimate for all of Afognak and Raspberry Island numbered over 1000 animals. Total harvest for Afognak and Raspberry Islands was 85 animals, 6 of which were killed on the Refuge portion of Afognak Island.

c. Reindeer/Feral Caribou:

Reindeer, originally introduced to Kodiak Island as a domestic herd, are now regulated as feral caribou by the state of Alaska and year around hunting of them is allowed. Local residents still utilize the species for subsistence when the herd moves near the coast. Historically, as many as 1500 animals have been reported in the Ayakulik River drainage. (Stovall)

During the 1993 review of the Kodiak refuge's biological programs it was determined the censusing the refuge's remnant reindeer herd was not necessary. The herd has remained rather stable at approximately 300 animals. If any changes in the population's stability is detected, monitoring of population numbers would be reinstated. (Zwiefelhofer)



Ptarmigan in summer plumage.

11. Fisheries Resources (Chatto):

There are 114 streams and numerous lakes located within the refuge boundary and on native conveyed (22g) lands adjacent to the refuge. These systems support one or more species of Pacific salmon, rainbow trout, Dolly Varden and arctic char whose populations contribute to a multi-million dollar commercial fishery, a subsistence fishery and sport fisheries within the Kodiak Archipelago. In addition, these species of fish, particularly salmon, provide a critical seasonal food source for dense populations of brown bear and bald eagles on the refuge and native lands.

The goal of the refuge for fishery resources is to conserve fish populations and habitat in their natural diversity for the benefit of both human and wildlife use. To accomplish this goal the refuge manages human use and works cooperatively with the Sport, Commercial and Habitat Divisions of ADF&G in conducting fishery studies and annual salmon escapement surveys in refuge streams. In addition, the refuge monitors the annual harvest of refuge based salmon returns through harvest statistics compiled by ADF&G.

In 1994 the estimated total indexed salmon returns to the refuge (including conveyed 22g lands) for chinook, sockeye, coho, chum and steelhead were at or above refuge management objectives for these species (figure 9, 11). The estimated total indexed return for pink salmon was only 53 percent of the minimum desired level. Alaska Department of Fish and Game data indicate that there was poor production of pinks from both the Karluk and Ayakulik Rivers from the 1992 brood year. This phenomenon was not as evident in other pink systems on the refuge.

1. Salmon Escapement

In 1994 a total of five ADF&G fish counting weirs and data from repeated aerial index surveys, conducted by the ADF&G and the Refuge, on an additional 46 index streams were used to monitor salmon escapement on the refuge. The

escapement index for sockeye, coho, pink and chum in 1994 is at or above the 1981-85 baseline goal outlined in the refuge Fishery Management Plan (figure 10). Indexed escapement of chinook was 63 percent above the desired goal of 21,600 fish. Escapement of steelhead was at the midpoint of the minimum and desired range (9,378 fish) (figure 11). The steelhead estimate is predicated on an overwinter survival of approximately 50-67 percent from studies conducted by the refuge and ADF&G. The information in figures 10 and 11 does not represent any variation for individual streams on the refuge, but does present a composite overview of escapement.

2. The Commercial Fishery

The commercial fishery in Kodiak is regulated by the ADF&G. In 1994 the total harvest in the Kodiak area was approximately 10.0 million salmon worth an ex-vessel value to fisherman of approximately 23.8 million dollars. These figures are for natural stocks only and do not include the harvest of pink salmon from the ADF&G Kitoi Bay hatchery on Afognak Island. The refuge based salmon contribution (including conveyed 22g lands) is estimated at 6.4 million fish (Figure 12) worth approximately 17.3 million dollars ex-vessel value. These fish are harvested in bays and near shore areas surrounding the refuge by commercial fishermen using either purse seine, set net and beach seine gear.

Overall in 1994 refuge based salmon stocks contributed approximately 64 percent of the total ADF&G Kodiak Management Area harvest and 73 percent of the exvessel value paid to commercial fishermen. Coincidentally the sockeye harvest made up approximately 73 percent of the dollar value of refuge stocks harvested in 1994.

3. The Sport Fishery

A majority of the sportfishing effort on the refuge takes place from late May through early November. Anglers target chinook and sockeye salmon in June and early July. Fishing for pink and chum salmon occurs from mid-July through late August. Starting in mid-to-late August anglers target coho salmon and steelhead. Fishing for coho usually ends by the first week of October while anglers continue to target steelhead into late November. Anglers catch both Dolly Varden, Arctic char, and resident rainbow trout throughout the season.

There are approximately eight streams on the refuge currently used by sport fishermen. Sport fishing catch on the refuge is regulated through the Alaska Sport Fishery Regulations as promulgated by the Alaska Board of Fisheries. In addition, the refuge manages commercial sport fishing guides through the special use permit process.

With the exception of the Ayakulik River, the sport fishing catch and effort for unguided anglers on the refuge is unknown. Sport fish effort is monitored through analysis of the use reports for those sport fish guides that are permitted to operate on the refuge.

In 1994 a total of 19 sportfishing guides operated under permit on the refuge and their clients expended 916 angler days fishing (figure 13). A majority of the total angler use in 1994 occurred in the Dog Salmon (17%), Uganik (22%) and the Ayakulik (54%) River drainages. Fishing occurred between June and November with peak effort (355 angler days) in June through mid-July for king salmon on the Ayakulik River drainage.

Total Guided angler catch for 1994 is depicted in figure 14, the highest number of fish caught were char (5217) followed by coho (1952), and chinook (1799) salmon. Sockeye, pink and chum salmon catch was 866, 1158, and 48 fish respectively. A total of 681 rainbow trout and 261 steelhead were also caught in 1994 by guided anglers. Total fish kept ranged from 354 chinook to 15 rainbow trout and one steelhead.

Figure 9. Kodiak NWR Total 1994 Salmon Returns vs. Management Objectives.

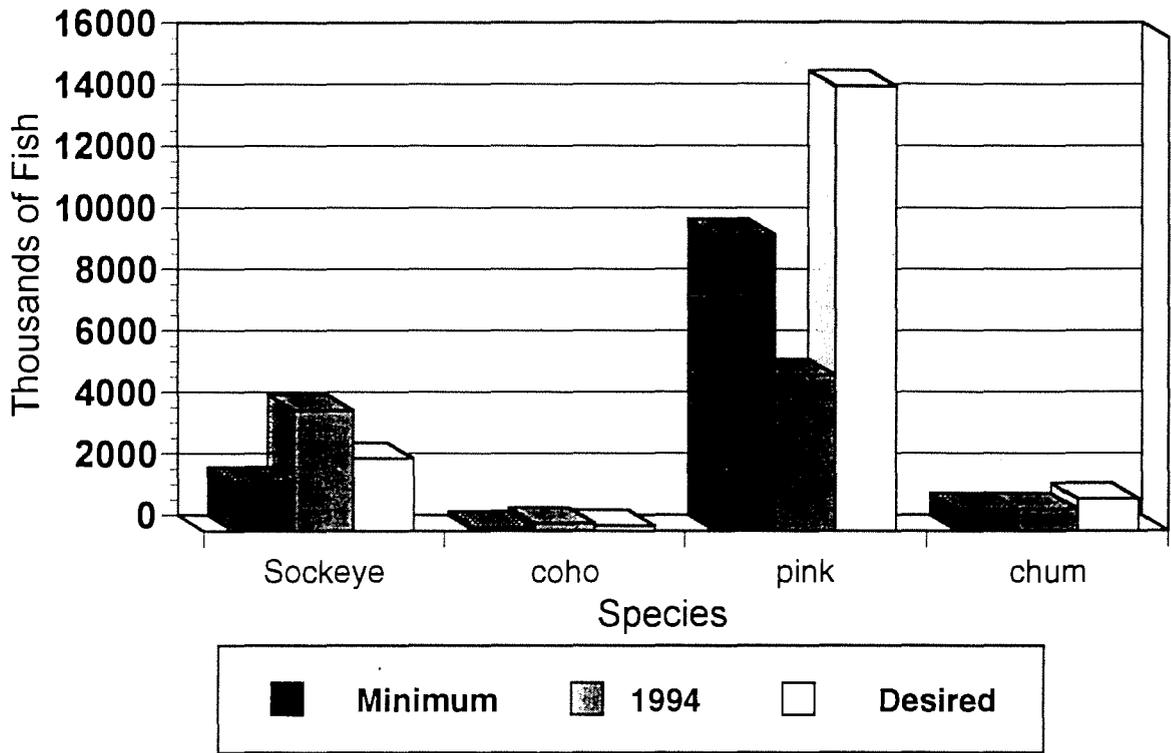


Figure 10. Kodiak NWR Indexed Salmon Escapement 1994 vs. Management Objectives.

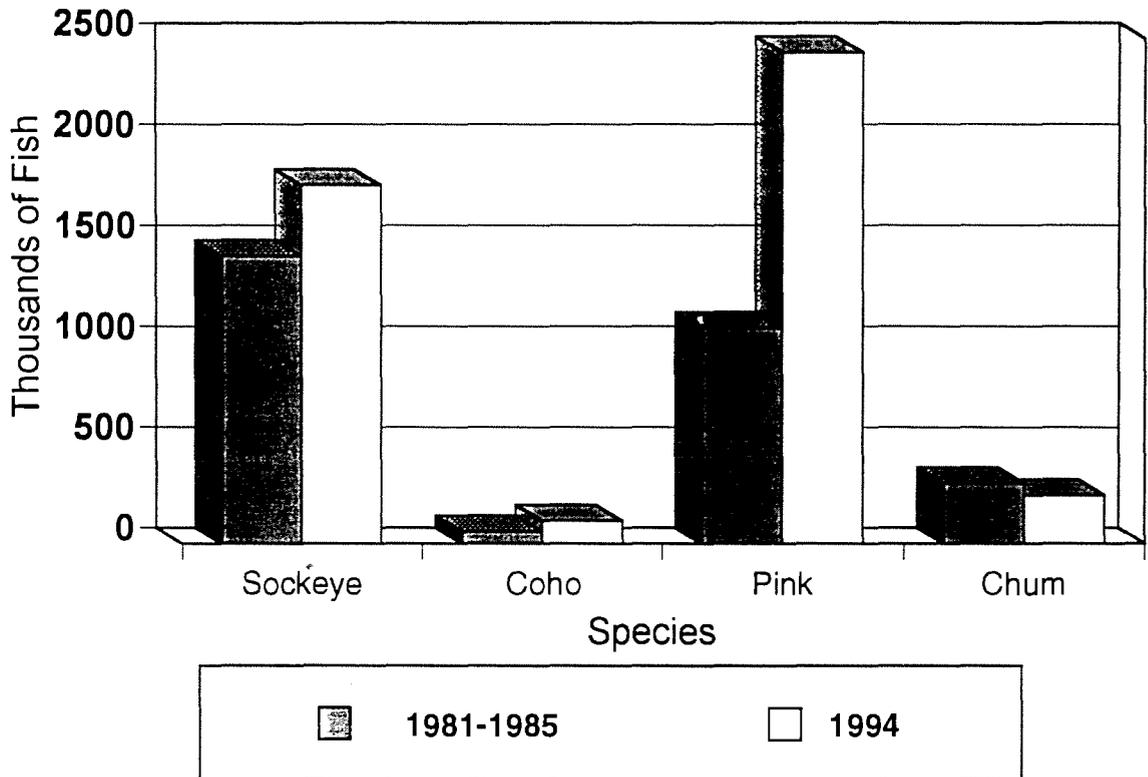


Figure 11. Kodiak NWR Steelhead and Chinook Returns vs. Management Objectives.

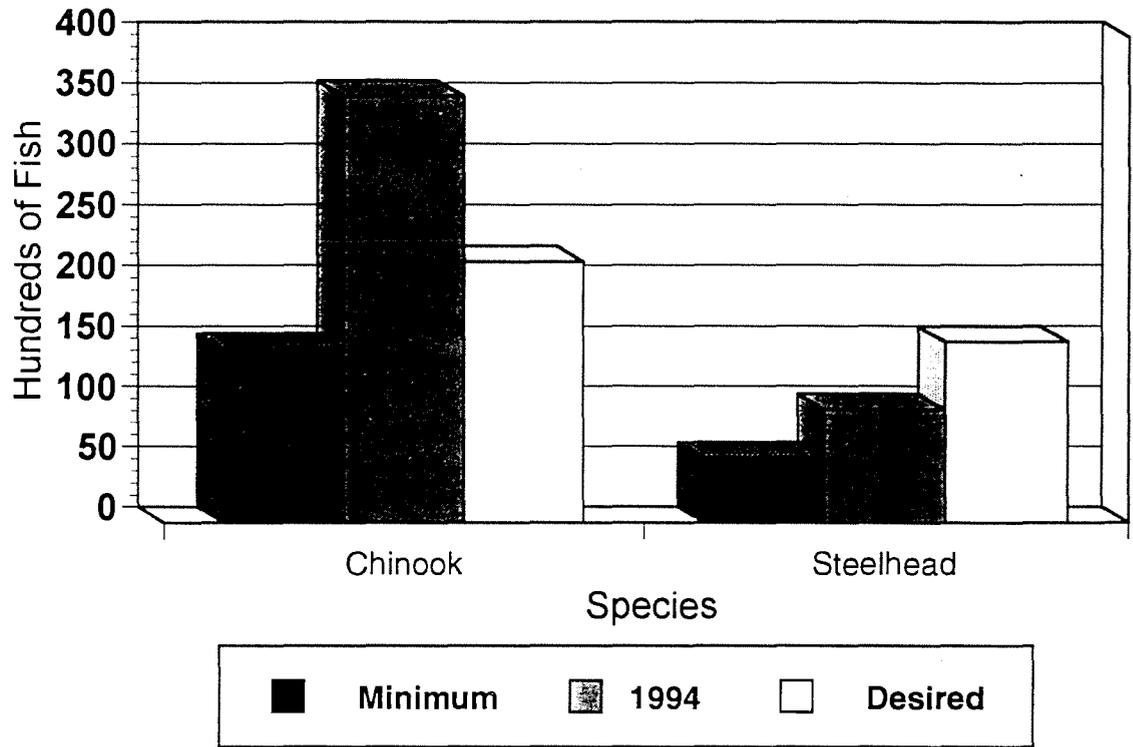


Figure 12. Kodiak Salmon Harvest 1994 (Natural Stocks Only).

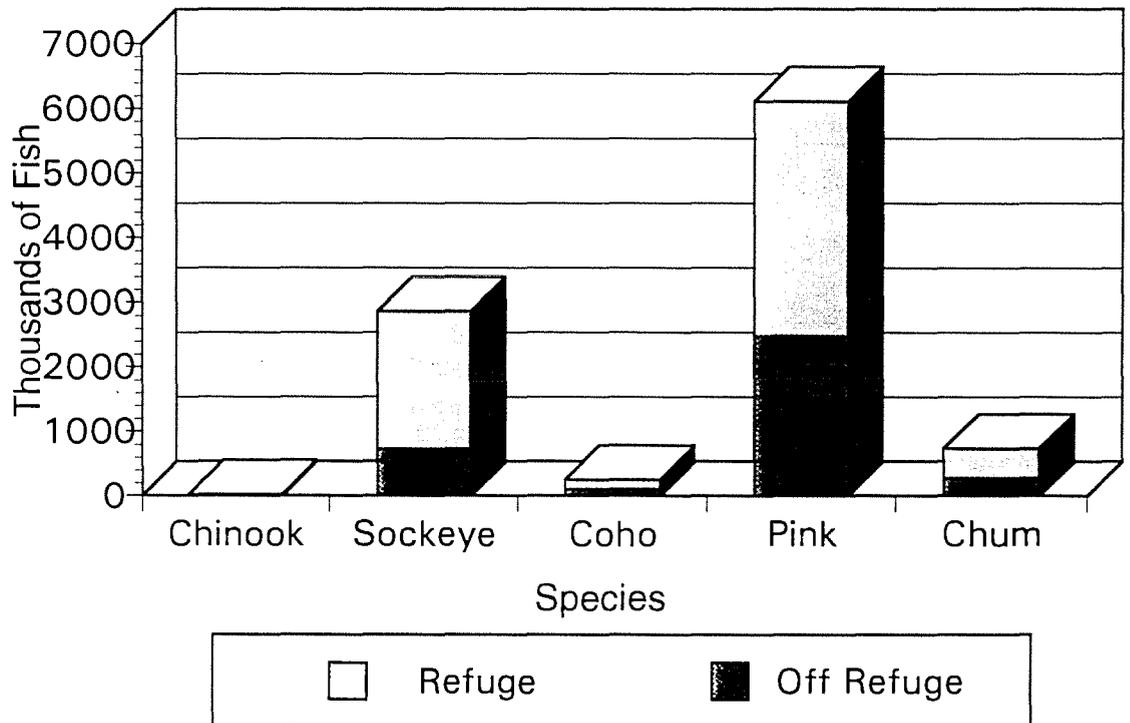


Figure 13. Total Guided Sportfishing Angler Use Days on the Kodiak NWR from 1990 to 1994.

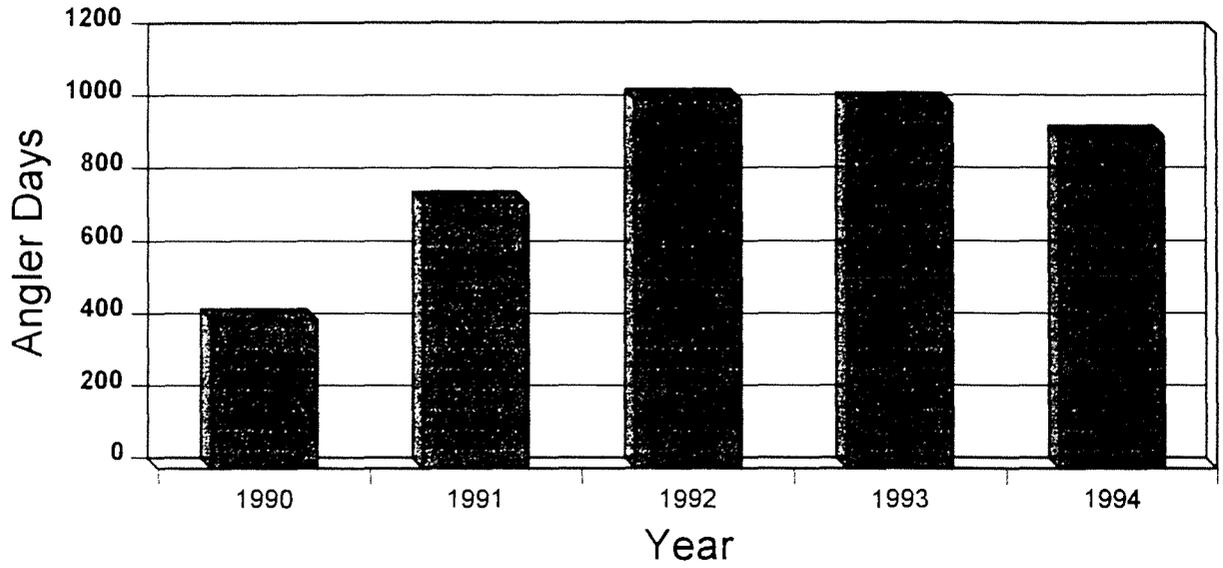
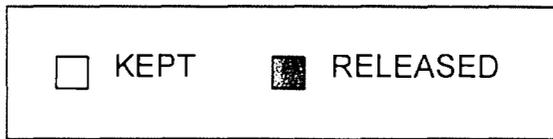
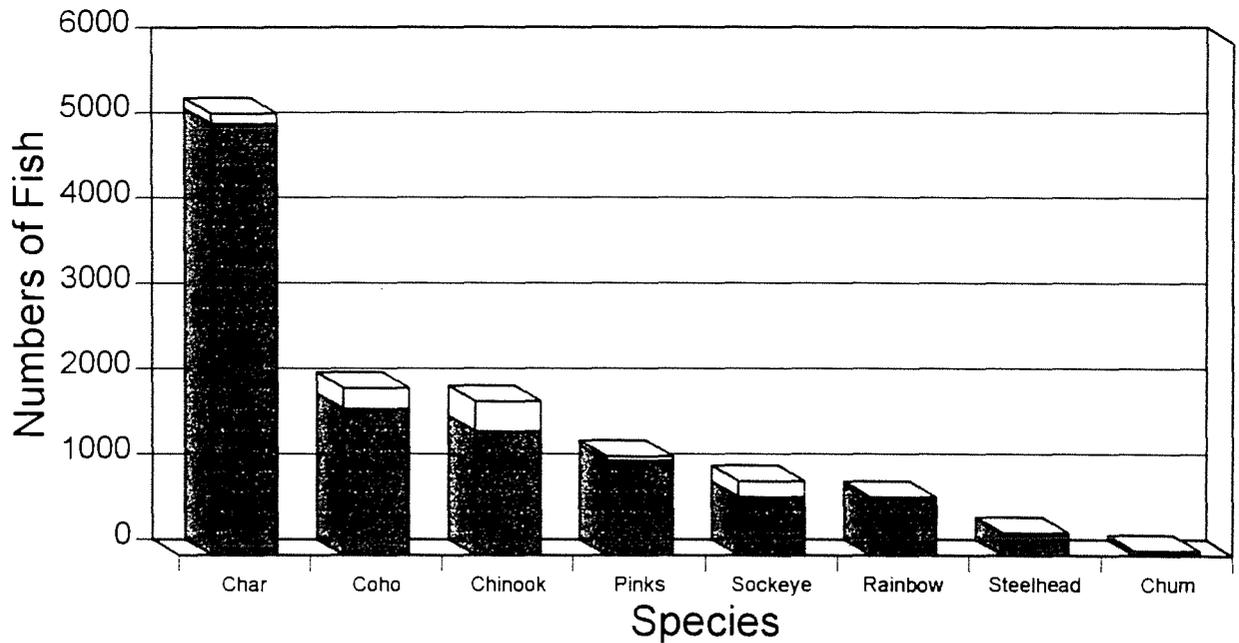


Figure 14. Total Guided Sportfishing Catch on the Kodiak NWR in 1994.





*The Bare Creek confluence at the Ayakulik River is a popular spot among fishermen during the chinook salmon sport fishery.
(V. Barnes*

Uganik River drainage yielded the highest percent (63) of the total char caught on the refuge by guided anglers. The Ayakulik River drainage accounted for >99 percent of the chinook caught and 63 percent of the coho salmon. Approximately 48 and 52 percent of the total steelhead caught were from the Dog Salmon and the Ayakulik River drainages respectively. A majority (94%) of the rainbows were caught by guided anglers on the Dog Salmon River.

In 1994 a sport fishing creel census was conducted by the Service during the popular chinook salmon run on the Ayakulik River (see section D.5.1.).

12. Wildlife Propagation and Stocking: Nothing to report.
13. Surplus Animal Disposal: Nothing to report.
14. Scientific Collections: Nothing to report.
15. Animal Control: Nothing to report.
16. Marking and Banding: Nothing to report.
17. Disease Prevention and Control: Nothing to report.

H. Public Use: (Taylor/Brooks)

1. General:

Pilot Patterson and Clerk Barnes have continued to refine the methods used for collecting and tracking Refuge public use. Although there remains a level of unreported use which can only be estimated, the majority of public use is now tracked through guide and air taxi operator reports. Patterson is now using the Paradox data management software to store entries, and is able to manipulate outputs in a number of convenient ways. Our ability to explain the origin of reported use and defend the numbers we generate has improved. We are, however, still largely at the mercy of commercial operators. We report what they report; their inaccuracies become our inaccuracies. There is some suspicion that underreporting may be substantial.

There is a down side to this evolution of data collection and management. In the past, public use on non-Refuge lands was generally lumped in with Refuge public use. We simply did not have the means to differentiate use occurring on non-Refuge lands from that occurring on Refuge-owned property. Now that we are developing the capability, even though all signs indicate that Refuge use is steadily increasing, refined numbers are smaller. As we continue to root out non-Refuge use, the numbers we must report may be smaller; this despite pragmatic indications of increased use in most Refuge public use activities.

This is probably a good time and place to establish definitions of terms commonly used in public use data collection for the narrative and for the annual RMIS report:

VISIT - This is a measure of the number of people who come to the refuge. One person arriving on refuge property counts as one visit, regardless of length of stay or changes in location.

USE DAY - This is a measure of participation in a given activity. One person who spends three days (or any part(s) of three days) deer hunting, fishing and wildlife viewing counts as one use day of deer hunting, one use day of fishing and one use day of wildlife viewing. Change in location during the stay is not a factor.

ANGLER DAY - This is also a measure of participation (in sportfishing). The difference between it and a USE DAY is that change in location is a factor. A fisherman who fishes 6 drainages in three days will count 6 ANGLER DAYS (one for any part of a day at a different drainage). To date, this unit of measure has been restricted to tracking of guided sportfishing.

ACTIVITY HOUR - This is a measure of participation which is more finely calibrated than the USE DAY. It is reserved for activities in which close monitoring is possible (interp & EE).

Table 19. MONTHLY VISITOR CENTER USE

<u>Month</u>	<u>Visits</u>		<u>Activity Hours</u>	
	Reported	Unreported	Reported	Unreported
January	145	36	73	18
February	190	48	95	24
March	295	74	148	37
April	520	130	260	65
May	395	99	198	50
June	960	240	480	120
July	1275	319	638	160
August	1395	349	698	175
September	860	215	430	108
October	290	73	145	36
November	305	76	153	38
December	160	40	80	20
TOTALS	8489		4249	

2. Outdoor Classrooms - Students:

Since there are no sportfishing opportunities suitable for children during National Fishing Week, ranger Brooks and seasonal ranger Nelson, assisted by volunteers Elinor Ramos, Meldonna Cody, and JoAnne Alvarez and TNT's Kim Saunders and Tim Kreta presented educational activities and puppet shows on salmon life cycle (written by volunteer Nancy Maia) at the annual August Children's Pink Salmon Derby. In addition, "shy" Tim actually consented to dress in a salmon costume and answer questions about salmon biology. This annual contest for kids up to age 15 had primarily been a sporting event in the past. Our participation added an educational component to the activities.

Kodiak National Wildlife Refuge and the Kodiak Island Borough School District again collaborated in a "**Partnership In Education**" Agreement which had been negotiated with the previous superintendent.

In 1994 lessons were presented to scout groups, home school students, senior citizens and Borough school groups from pre-school through 12th grade. A total of 392 children attended presentations in the Visitor Center and 2108 children were taught off site. A grand total of 2,500 children was served by the E.E. Program in 1994. This is an increase of more than 100% over numbers of students served in 1993 and a huge increase over the number of students in prior years. Highlights of the program for 1994 are detailed in the volunteer program and below in the segment on Outdoor Classrooms - Teachers.

3. Outdoor Classrooms - Teachers:

KNWR's E.E. Plan includes goals to increase local educators' expertise in environmental education. Although an accredited college course had been presented the prior year, feedback from elementary school teachers indicated that they were most interested in attending in-service for 93/4. Since the materials were targeted to coincide with portions of required study for specific grades, the most efficient way to do this was to gather all the teachers from one grade -not always possible during the district-wide inservice, but allowed by a special program called teacher-to-teacher which provided substitutes for workshops on school days in the Kodiak Island Borough School District. We repeated our effort to reach village teachers by offering travel scholarships to the sessions. Refuge cooperator Alaska Natural History Association sponsored pay for substitute teachers for the private school educators when it was discovered that this was the primary obstacle preventing their attendance. In town, we reached nearly every fourth grade teacher in the six elementary schools.

93/94 school year - 4 Kodiak Workshops, 28 teachers
 94/95 school year - 1 Kodiak Workshop in 94 calendar year, 25 attendees.
 Pilot Station - 8 teachers in-service; 3 in credit course
 RIT training - 6 RIT's
 NAME Meeting - 7 NAME members in 2 hour presentation.

Reg 7 meeting - 30 people in 1 hour presentation.
Coast Guard Day Care Providers - 1 hour edible and poisonous plants program.
Project WILD Training for Future Educators - 15 attendees.

4. Interpretive Foot Trails:

Buskin View Trail: Volunteers Charlie Elliot and Mirjam Weurth and seasonal ranger Nelson contributed to a rewrite of the trail's interpretive brochure on our current computer, since it could no longer be printed from a previous file created on a now-obsolete program. Volunteer Elliot and Fred Roberts replaced some missing trail markers, and use of the trail is estimated to have continued at the same rate as previously, except that judicious (natural) debris dumping and overgrowth seems to have finally discouraged the use of a cut-off from the state park campground.

5. Interpretive Tour Routes:

No activity

6. Interpretive Exhibits/Demonstrations:

We repeated our successful Crab Festival Booth staffed by Public Use with help from volunteers Janet Eldridge, Justin Mathis, Christina Mathis, Carrie Mathis, Steven Mathis, Mary Forbes, Gail Smith, Meldonna Cody, Cyndie Wyman, Marcia Oswalt, Keyla Gammarano, Kim Saunders, Emily Calloway, and Robert Anderson. Booth painting including a beautiful USFWS symbol by RAP student Sarah Lukin and volunteers Marie Barni and Walter Parker.

Seasonal ranger Nelson and volunteers Laurel and Larry Nelson, used a weatherport, our portable display and brochures to present information about the refuge at the annual "Coast Guard Day" picnic.

Rangers Taylor, Brooks and Nelson each judged one science fair in May for the Kodiak Island Borough School District.

In November, "Science Fun Days" a hands-on event for third to seventh grades offered a challenge: how to interpret something meaningful to large quantities of children in a short time. Ranger Brooks developed a series of worksheets on endangered species of the United States. Students had their faces painted to resemble the species they chose, then received a worksheet to keep and use as a reference when people asked them about the animals they portrayed. Ranger Brooks painted approximately 600 children over two days, in likenesses of everything from Black-footed Ferrets to Valley Elderberry Longhorn Beetles. She reported that it was an excellent way to provide information one-on-one, because, while being painted the children were "a captive audience". The only drawback was that for weeks afterwards, everywhere she went, children would say "I remember you from Science Fun Days!" and she would feel compelled to say she remembered them, which, after 600 children, was not necessarily true. However, the children also remembered some of the information about "their" species, which fulfilled the purpose of the activity. An article about this technique written by Ranger Brooks will be published in 1995 in the National Association of Interpretation's professional journal, Legacy.

In December, ranger Brooks piloted a trial program that she hopes to develop into a year round activity, called "Families Understanding Nature" (F.U.N.) Parents or other adult family members and children ages 3 to 11 attended interpretive talks, and participated in related activities which were self-guided but structured so that they encouraged the family to explore together, such as hands-on exhibits and crafts. This interpretive program was scheduled during the school holiday break, when families might be seeking activities to engage in together. However, we had an unprecedented amount of snow during this period, which probably stifled attendance. It also seemed to negatively affect promptness. Evaluations from the participants were very positive, and we will incorporate their comments and our observations into the 1995 version of this program as it develops.

7. Other Interpretive Programs:

Now that Monthly Activity Reports have been discontinued, staff activities previously summarized in this section are difficult to track. Suffice it to say that all members of the biological, public use, and administrative staff conducted several programs each, onsite and offsite. Groups reached included most local service organizations, the Senior Center, and cooperative State Park visitor groups.

8. Hunting:

The winter of 1993-94 was the second mild winter in a row. That, of course, means more and bigger deer throughout the archipelago. Although trophy animals are still more available in the south, hunters reported better trophy opportunities in the north as well. In 1994, guides reported 41 primary use visits, averaging 7.85 days of hunting, for 322 use days. Guides reported an additional 207 use days of deer hunting as a secondary activity (mostly by guided bear hunters). Air transporters reported 363 visits, averaging 6.45 days of hunting, for 2342 primary use days. Air transporters reported an additional 311 use days of deer hunting as a secondary activity. Total reported use was 404 visits and 3223 use days.

Once again, Refuge law enforcement field checks indicate that at least 50% of surveyed deer hunters reached Refuge lands by means other than Refuge-permitted guides and air transporters. This would include private aircraft, private boats, marine transporters, mail planes and use originating from villages. Doubling the reported use results in an estimate of 808 total visits and 6446 total use days. This represents a substantial reduction in reported use from 1993. Either reporting was inaccurate or the terrible weather experienced in late fall seriously cut back on the number of hunters able to make it into the field.

Since all bear hunting on Refuge lands is by permit only, bear hunting effort is mainly controlled by bag and season limits imposed by the State of Alaska. The State's Permit Report Summary data will be far more accurate than the information pieced together from guide and air transporter records. As a result, determination of use by bear hunters is based on available State information.

In 1992 RR Taylor and Research Biologist Barnes determined that 183 resident bear permits and 113 non-resident bear permits (total 296) were available for hunt areas which incorporate the Refuge (201, 60% of 204, 205-225, 40% of 226, 231, 60% of 234, 235-255, 40% of 256).

Permit Report Summary Data indicate:

	<u>Areas 231-259</u>	<u>Areas 201-229</u>	<u>Combined Approx.</u>
Permits Actually Issued	70%	74%	72%
Hunters Afield	96%	97%	97%
Mean Days Hunted	7.9	7.2	7.6

Assumption: 72% of 296 available were issued = 213 permits issued
 Assumption: 97% of 213 actually hunted = 207 visits
 Assumption: 207 hunters averaged 7.6 days = 1,573 use days

Goat hunting use is considered in the same manner as bear hunting use. According to the 1994 Harvest Summary (resident and non-resident), 76 goat permits were actually issued for hunt areas which incorporate the Refuge (33% of 473, 474, 475, 50% of 476, 477).

Permit Report Summary Data indicate:

Areas 471-477

Hunters Afield 61%
Mean Days Hunted 3.6

Assumption: 61% of 76 actually hunted = 46 visits
Assumption: 46 hunters averaged 3.6 days = 166 use days

Hunting of other species (fox, squirrel, hare, ptarmigan, reindeer, waterfowl) does occur, but normally incidental to some other primary activity, and not in significant measure. No waterfowl or small game hunting use was reported by Guides or air taxis. Total unreported use is estimated at 30 visits and 350 use days.

9. Fishing:

Reported sportfishing use is probably hardest hit by changes in data collection methods. Improved ability to weed out non-Refuge use lowers use data at a time when sportfishing pressure is clearly increasing. Eliminating inappropriate non-Refuge use from reported data makes for more realistic data. For instance, Karluk River use, which is extensive, occurs on non-Refuge property. At one time, it was lumped right in with Refuge use data, which inflated reported use. Perhaps one day the Karluk will rejoin the Refuge, and its use will again be countable. For now, it is private property.

Guides reported 997 visits, averaging 1.28 days, and resulting in 1225 use days. Air transporters reported 440 visits, averaging 4.37 days, and 1924 primary use days. Air transporters reported an additional 187 use days of sport fishing as a secondary activity. Total reported sportfishing use on Refuge lands was 1437 visits and 3336 use days.

For reasons identified in the 1993 Narrative, unreported use is estimated at 25% of reported use; unreported use would then be estimated at 359 visits and 834 use days. The resulting total estimate for all 1994 Refuge sportfishing effort is 1796 visits and 4170 use days.

10. Trapping:

The State trapping season does not follow the calendar year. The seasons for Kodiak species (primarily red fox, pine marten, river otter, beaver) begin in early November and end by late April. As a result, it is not practical to record calendar year use. Trapping reported in this narrative is that which occurred from fall of 1993 through spring of 1994. During that period, 6 permits to trap on Refuge lands were issued. No report of use is available at this time, but 360 visits and 360 use days is a reasonable estimate.

11. Wildlife Observation:

Permittee Mike Munsey opened Munsey's O'Malley Camp the first week of July, 1994. Guided by conditions outlined in his prospectus, plus the program SOP, Mike set up a tent camp at the Stony Point location. Due to the late selection (January 94), Mike was only just over 50% booked, hosting a total of 51 guests, 12 of whom were Kodiak residents at Mike's special local rate of \$600 (normal rate was \$1400 for the standard 4 night stay). His first group arrived July 6 and his last group departed September 20.

This commercially operated program was essentially a mirror of the pilot program run by Refuge employees in 1992. Structures were of canvas wall tent construction instead of the Weatherports used in 1992. The 750 square feet of tent space allotted consisted of a wall tent kitchen, three wall tent sleeping quarters, and one screen porch. The camp was finished out with two pit outhouses and an incinerator.



The O'Malley bear viewing program again resulted in opportunities for the public to experience scenes such as captured in this photo. Private operator Mike Munsey conducted the program this year after his selection via the bid prospectus technique. (V Barnes)



The O'Malley Bear Viewing Program was conducted by Mike Munsey, a private operator selected via the bid prospectus system, out of this camp located along the Karluk Lake shoreline. (V. Barnes)

Similar to 1992, guests were guided daily to the platform site ½ mile up the O'Malley River. To better accommodate camera tripods, the platform in 1994 was set on wooden piers and expanded to approximately 6x20 feet. A half barrel was used for a nearby latrine.

Evaluation of the program, plus feedback from guests, indicated that the program was well run. Areas which were identified as requiring improvement included interpretation, bear deterrence in camp, and food management. None of these problems were considered serious, and their resolution was considered part of the honing process. Overall, Refuge staff were well satisfied with the first year effort. Unfortunately, due to problems connected with an appeal of operator selection, the Regional Director has determined that the O'Malley Viewing Program will not continue in 1995. The operator's permit has been cancelled and will not be renewed. Due to the importance of the O'Malley area to bears and the proven negative impacts of unregulated human use, a permanent seasonal closure of this area will continue to be pursued.

Study 74530-91-01, Brown Bear Activity, Behavior and Distribution Related to a Bear Viewing Program at O'Malley River, Kodiak, Alaska was continued for a fourth season. The study team collected data under conditions similar to those of the 1992 season --- area closed to all public use other than the bear viewing program. For further information, see the Section on Study 74530-91-01.

Other non-consumptive public use continues to grow. Wildlife observation use reported by guides was 250 visits and 658 use days. Air transporters reported 131 visits, averaging 3.76 days, for 492 primary use days. Air transporters reported an additional 74 use days of wildlife viewing as a secondary activity. Total reported use was 381 visits and 1224 use days. It is estimated that unreported use (mainly marine transporters, private boats and aircraft, mail planes, Native villages) was an additional 25% (95 visits, 306 use days) of this reported use. Adding BVP visitation of 51 visits and 205 use days results in a wildlife observation total of 527 visits and 1735 use days.

12. Other Wildlife Oriented Recreation:

Because of significant people/bear incompatibilities, O'Malley and Red Lake cabins were removed from service in 1994. O'Malley was used April, May, June and then relocated to Bluefox Bay on Afognak Island. Red Lake was boarded up and no reservations were taken.

Although O'Malley was historically the most popular of Refuge cabins, the new Bluefox Bay structure looks like a real winner. Relocation to Bluefox Bay reduces wildlife impacts, avoids conflict with pre-existing uses, maintains sportfishing opportunity, improves public safety, and provides a broad range of wildlife-oriented recreational opportunities in a high quality marine and monotypic spruce environment. It is a cheap ride from town, can be used throughout most of the year, is disabled accessible, and will appeal to hikers, kayakers, hunters (including elk), fishermen, wildlife viewers, and photographers.

Table 20. Summary of public use cabin use during 1994.

<u>LOTTERY USE</u>				
LOTTERY	APPLCTNS ACCEPTED	APPLCTNS SELECTED	% SUCCESS	% PAID
October 1993	0	0	0	0
January 1994	18	12	67%	83%
April 1994	74	50	68%	72%
July 1994	<u>60</u>	<u>44</u>	<u>73%</u>	<u>52%</u>
TOTAL	152	106	70%	65%

<u>SYSTEM USE</u>						
MONTH	PARTIES	PEOPLE	NIGHTS	USE DAYS	ACTHRS	FEES
January	1	2	6	14	288	120
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	8	18	79	198	4320	1580
May	6	13	40	109	2304	800
June	12	41	57	237	4704	1140
July	25	65	122	385	7680	2440
August	24	69	98	344	6600	1960
September	24	81	102	438	8568	2040
October	27	88	154	591	12072	3080
November	21	70	134	530	10992	2680
December	<u>12</u>	<u>35</u>	<u>61</u>	<u>215</u>	<u>4320</u>	<u>1220</u>
TOTALS	160	484	843	3061	61848	17060

There was a dip in system totals from 1993 to 1994. This, of course, was due to removal from service of the heavily used O'Malley and Red Lake cabins. Of the remaining cabins, only Chief Cove, however, failed to show a substantial increase over 1993 use. As Bluefox Bay gains steam, and assuming a replacement site is found for the Red Lake cabin in 1995, there is little doubt that system totals will soon see new highs.

<u>INDIVIDUAL CABIN USE</u>						
CABIN	PARTIES	PEOPLE	NIGHTS	USE DAYS	ACTHRS	FEES
Viekoda Bay	19	60	90	359	7176	1800
Uganik Island	19	54	116	409	8520	2520
Chief Cove	13	41	78	290	5976	1560
Uganik Lake	31	90	153	535	10680	3060
Little River	19	56	97	356	7200	1940
O'Malley	3	6	30	66	1440	600
Bluefox Bay	10	38	47	211	4152	940
North Frazer	19	52	88	286	5616	1760
South Frazer	27	87	144	549	11088	2880
Red Lake	0	0	0	0	0	0
TOTALS	160	484	843	3061	61848	17060

13. Camping:

A significant portion of the use occurring on the Refuge is overnight use. Most camping, however, is incidental to the primary objectives of sightseeing/photography, fishing and hunting. To preclude confusing double counting, no use will be assigned to this category.

14. Picnicking:

No Activity

15. Off-Road Vehicling:

No (legal) Activity

16. Other Non-Wildlife Oriented Recreation:

It remains difficult to assess the actual level of snowmobile use on Refuge lands. In all probability, the use from Kodiak is sporadic and does not constitute a significant number of use days. The numbers supplied are a "best guess" only. Use emanating from villages is unknown.

17. Law Enforcement: (Taylor/Patterson)

One commercial operator case was closed with no charges filed. There were 2 instances of forcible entry at the Refuge's Terror Bay facility for which no suspects have been identified.

The following cases were successfully completed by Refuge Officers in 1994:

<u>OFFICER</u>	<u>CITATION</u>	<u>HEADING</u>
Taylor	36.32 (c) (2) (i)	State Law - Steelhead out of season
Taylor	26.22 (a)	Closed Area violation (O'Malley)
Taylor	36.32 (c) (1) (i)	State Law - Harvest ticket
Patterson	27.97	Commercial activity without SUP (involving aircraft)
Patterson	27.97	Commercial activity without SUP (involving aircraft)
Patterson	27.97	Commercial activity without SUP
Munoz	27.94	Disposal of waste on NWR
Munoz	26.22 (b)	SUP violation - unapproved Operations Plan modification
Munoz	27.97	Commercial activity without SUP
Munoz	36.32 (c) (2) (i)	State law - Wanton waste of edible meat
Munoz	36.32 (c) (2) (i)	State law - Wanton waste of edible meat

The "Service Incident" category on the Annual Law Enforcement Program Report (DC Office) is described as "assistance to other law enforcement officers, or assistance to the general public by way of help with disabled vehicles, giving directions, etc.". It is estimated that of all field contacts made by Refuge Officers, 40 (each Officer) resulted in service of a type which would fit this description (total = 120).

According to AST Tom Schwantes, 5 DLP cases on Refuge property were investigated by Alaska State Troopers and dismissed. Two commercial operator cases were also closed without filed charges. The following successful Refuge cases were completed by Troopers during 1994:

- 3 Failure to validate harvest ticket
- 1 Failure to release sportfish
- 1 Fishing with more than 1 line
- 1 Unlicensed marine transporter

There were no violent crimes or incidents reported on Refuge property in 1994.

18. Cooperating Associations:

Revenues for 1994 totaled 11,874. Because the fiscal year for ANHA does not match the calendar year, the figures in ANHA reports are slightly, but not significantly, different. Even more important than the dollars are the ways that ANHA fulfills its mission "to enhance public understanding of Alaska's natural, cultural and historical resources". The Kodiak branch of the Alaska Natural History Association reprinted the refuge newspaper, Bear Country and the refuge brochure. Funds were also used to support teacher attendance at refuge-sponsored environmental education training. The Kodiak ANHA branch again donated a number of items to the Alaska Maritime NWR "library" of natural history information on the Tustamena. The Alaska Maritime staff on the ferry also continued to distribute Bear Country to passengers. Books and videos were purchased to support our outreach education and biological programs. ANHA also financed some of the costs associated with our Pink Salmon Derby project. In 1994 several attempts were made to reach customers outside the visitor center, including selling items at a Crab Festival Booth, attending Christmas Bazaars, and joining community cultural events. The Christmas Bazaars were the most successful of these ventures and should be repeated if possible.

19. Concessions:

--- Special Use Permits

Big Game Guiding	25	
Big Game Guide Base Camp	5	
Sportfish Guiding	20	
Sportfish Guide Base Camp	2	
Trapping	6	
Air Taxi	10	
W/P/S	13	
Commercial Fishing		
Set Net	26	
Beach Seine	1	Dumm
Other		
Subsistence Base Camp	1	Anderson
Homesite	1	Schuckman
Radio Repeater Site	1	Cook Inlet
Agency Helicopter (BLM, BIA, ADF&G)	2	ADF&G, BLM
O&M Terror Lake Hydro Project	1	KEA
Commercial Photography	1	O'Brian
Storage Cache Site	0	
Military Ground Training	0	
Surface Geology	0	
Scientific Collecting	2	Peteet, Tannambaum
Archeology Study	1	Fitzhugh
Fisheries Enhancement (salmon)	1	
Fisheries Restoration	1	Hidden lake
TOTAL PERMITS ISSUED IN CALENDAR YEAR 1994	120	

SUMMARY OF PUBLIC USE FOR THE CALENDAR YEAR 1994

	<u>\$\$\$\$\$\$</u>	<u># OF:</u>	<u>VISITS</u>	<u>USE DYS</u>	<u>ACT HRS</u>
<u>1. GENERAL</u>					
Visitor Center			8489	8489	4249
Volunteers		47			4697
News Releases		23			
Radio/TV Spots		15			
<u>2. OUTDOOR CLASSROOM - STUDENTS</u>					
--- STAFF CONDUCTED					
Offsite EE Students		41	1851	1851	1316
Onsite EE Students		15	173	173	173
--- NONSTAFF CONDUCTED					
Offsite EE Students		10	257	257	257
Onsite Students		0	0	0	0
<u>3. OUTDOOR CLASSROOM - TEACHERS</u>					
Teachers, OC		54	56	56	56
Teacher Wrkshp		11	67	67	546
EE Material Loans		60			
<u>4. INTERPRETIVE FOOT TRAILS</u>					
Buskin View Trail			580	580	290
<u>5. INTERPRETIVE TOUR ROUTES</u>					
No activity in this section					
<u>6. INTERPRETIVE EXHIBITS/DEMONSTRATIONS</u>					
Exhibits/Demonstrations		3	2600	2600	200
<u>7. OTHER INTERPRETIVE PROGRAMS</u>					
Staff Talks (on-site)		19	168	168	168
Staff Talks (off-site)		15	158	158	158

\$\$\$\$\$\$

#####

VISITS

USE DYS

ACT HRS

8. HUNTING

Deer		808	6446
Bear		207	1573
Goat		46	166
Other		30	350

9. FISHING

Sportfishing		1796	4170
--------------	--	------	------

10. TRAPPING

Trapping	6	360	360
----------	---	-----	-----

11. WILDLIFE OBSERVATION

	N/A	527	1735
--	-----	-----	------

12. OTHER WILDLIFE ORIENTED RECREATION

Cabin Use	\$17060.00	160	484	3061	61848
-----------	------------	-----	-----	------	-------

13. Camping

No activity in this section

14. Picnicking

No activity in this section

15. Off-Road Vehicling

No activity in this section

16. OTHER NON-WILDLIFE ORIENTED RECREATION

Snowmobiling		24	48
--------------	--	----	----

17. LAW ENFORCEMENT

Citations	11
-----------	----

18. COOPERATING ASSOCIATIONS

ANHA	\$11874.00
------	------------

TOTALS

<u>VISITS</u>	<u>USE DYS</u>
18681	29741

J. Equipment and Facilities: (Patterson)

1. New Construction:

A public use cabin was constructed at Bluefox Bay on Afognak Island to replace the cabin at O'Malley River. The construction was funded with MMS dollars. Construction was accomplished utilizing volunteer labor under the supervision of Maintenance Worker Bill Lanahan. This facility is disabled accessible.

2. Rehabilitation:

3. Major Maintenance:

4. Equipment Utilization and Replacement:

Marine Vessel (Zwiefelhofer)

Safe marine vessel operations in Kodiak waters, dictate dry docking for hull cleaning and inspection, replacement of sacrificial anodes, and the renewal of the anti-fouling bottom coating.

The dry docking of the refuge marine research/patrol vessel, M/V Ursa Major II at the local boat yard occurred twice during 1994. The first haul-out occurred from February 19 to 21 to check on a unusual vibration from the rudder assembly. Inspection revealed a cracked weld on the rudder strut which was repaired. The entire rudder assembly was reinforced in an attempt to eliminate this reoccurring problem. The second haul-out during September 6 to 9 was to check on the status of the rudder strut repairs and to accomplish other hull and equipment maintenance procedures. The rudder struts were not in need of additional welding, the struts will continue to be monitored.

The skiff at the Camp Island administrative field facility was replaced this year with MMS funding. The skiff was built by BT Gus Johnson. The U. S. Coast Guard lent their support to this project by slinging the vessel into Karluk lake via helicopter during July.



The new skiff for Camp Island on Karluk Lake was delivered by the U. S. Coast Guard in good order. (V. Barnes)

5. Communications Systems: (Revalee)

A radio communications package was funded through the regional office with end-of-year monies. The package included a base radio for the Camp Island field facility, replacement of one portable field radio, two hand-held units for communication with the Camp Island skiff and replacement batteries for the radio-phone repeater site in the Karluk area. These improvements should improve communications and safety in the field seasons to come.

6. Computer Systems: (Zwiefelhofer)

The refuge replaced one laptop computer and acquired 2 new waterproof notebook computers during FY94. The refuge's first (286) Zenith laptop purchased in 1988 died and had to be replaced in August. The waterproof notebooks are being utilized in interfacing with Global Positioning Systems to collect "real time" wildlife observations and inventory survey data. A color inkjet printer was also acquired during the 1994 fiscal year to provide greater flexibility in producing Geographic Information System (GIS) maps.

7. Energy Conservation: Nothing to report.

8. Other: Nothing to report.

K. Other:

1. Cooperative Programs:

As part of the U. S. - Russia Environmental Agreement an exchange of wildlife biologists and refuge managers was again conducted during 1994. The visit by the Russian delegation occurred during June. One group joined Denny Zwiefelhofer and Gus Johnson on the Ursa Major II for a survey of seabirds along the west side of Kodiak. The other group was based out of Camp Island and took side trips to O'Malley River, Frazer Fish Pass, Ayakulik River and aerial bear tracking trips. Leslie Kerr, from the Regional Office coordinated the trip.



2. Other Economic Uses: Nothing to report.
3. Items of Interest: Nothing to report.
4. Credits: As noted in text.

L. **Feedback:** Nothing to report.



*A showy lupine patch in the alpine
above Karluk Lake. (V. Barnes)*