Kodiak National Wildlife Refuge

Annual Narrative Report
1993

KODIAK NATIONAL WILDLIFE REFUGE

KODIAK, ALASKA

ANNUAL NARRATIVE REPORT

Calendar Year 1993

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

REVIEW AND APPROVALS

KODIAK NATIONAL WILDLIFE REFUGE

Kodiak, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1993

11/21/94 — Refuge Manager — Date

11/28/94 — Associate Manager — Date

9/19/94 — Regional Office Approval — Date

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- The Final Public Use Management Plan was released during October (Section C. 2).

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- Mild winter results in good survival of Sitka black-tailed deer (Section G. 8.6).

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- Total harvest of Kodiak area commercial salmon fishery was 27.2 million salmon (Section G. 11).

- Partnership in Education agreement signed with Kodiak Island Borough School District (Section H. 2).

- National Fishing Week activities include Pink Salmon Derby booth (Section H. 2).

- Environmental Education program includes presentation in villages (Section H. 2).

- Ayakulik River enforcement camp results in ticketing a major illegal fishing operation (Section H. 17).

- New Public Use Cabin constructed at Little River (Section I. 1).

Fireweed in full bloom against green hillsides of the Karluk Lake Area. (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 1993 as collected by the National Weather Service at Kodiak State Airport.

Table 1. 1993 Weather Data Summary

Month	Snowfall (Inches)	Precip. (Inches)	Precip. Departure from Normal	Temp. Maximum (°F)	Temp. Minimum (°F)	Average	Temp. Departure From Normal
January	6.9	2.97	-4.41	43	2	27.3	-2.6
February	4.2	7.11	+1.83	45	-1	30.9	+0.4
March	3.8	8.17	+3.54	47	18	35.3	+2.4
April	1.0	8.74	+4.54	54	2	40.3	+2.8
May	Trace	5.18	-0.34	76	33	47.1	+3.6
June	0	3.51	-1.27	67	38	50.9	+1.3
July	0	2.33	-1.37	81	42	57.1	+2.7
August	0	8.41	+3.26	79	41	57.1	+1.9
September	0	5.44	-1.55	67	31	50.7	+0.7
October	0.2	9.80	+2.62	60	25	42.4	+1.7
November	0.5	5.56	-0.40	53	20	37.5	+3.1
December	6.4	11.68	+4.87	45	19	35.0	+4.2
Totals	23.0	78.90	+11.32	59.7 (Ave.)	24.7 (Ave.)		+1.85 (Ave.)
Normal (1961-1990)		67.58		46.8		40.8	

Total rainfall during 1993 was 78.90 inches, or 11.32 inches above average. Total snowfall was 23 inches, or 51.5 inches below average. Average high and low temperatures were 59.7 °F and 24.7 °F, respectively (normal high and low are 46.3 and 35.1).

These figures reflect the relatively mild weather conditions experienced during 1993. Winter of 92-93 was considered very moderate. Summer was characterized by unusually sunny conditions for extended periods. This mild weather pattern continued into the first half of the 93-94 winter.

Fall colors on Camp Island in the Karluk Lake area. Administrative cabins for refuge field work are located on Camp Island. The cabin in the lower right hand side of the photo is on Koniag Corporation land and is being rented as a recreational cabin. (V. Barnes)

Rosy hue of fireweed blossoms compliment the reds of sunrise on a peak at the south end of Karluk Lake. (V. Barnes)

C. Land Acquisition: (Bellinger)

1. Fee Title:

No inholdings were acquired this year, however, native corporation lobbyists, private environmental groups and the media continued a "full court press" in this endeavor. The new administration is very supportive and interested in acquisition. As a result of this interest, the refuge hosted visits by Secretary Babbitt, Asst. Secretary Frampton, Director Beatty and various staff during the year.

Secretary of Interior Bruce Babbitt discusses archaeology of Kodiak Island with Kodiak Area Native Association Archaeologist Rick Knecht during a visit to Old Harbor.

Five Kodiak inholdings have ranked in the high priority category for Exxon/Valdez restoration funding. The Fish and Wildlife Service has been directed to begin negotiations to acquire the following areas: North Olga Bay, Aliulik Peninsula, Karluk Lake/River, Brown's Lagoon and Uyak Bay.

The Service received 3 million dollars in Land and Water Conservation Funds and 2.5 million dollars in Exxon/Valdez criminal settlement funds for acquisition during the year, however, no acquisitions have been completed to date.

The Refuge's high country provides a scenic backdrop to the head of Uyak Bay. A private parcel located at the mouth of Uyak River was appraised and the landowners offered a price. Unfortunately, the initial offer was turned down. (D. Munoz)

Secretary of Interior Bruce Babbitt and Akhiok-Kaguyak, Inc., president Ralph Eluska meet with Old Harbor residents during a trip to Kodiak NWR.

Regional Director Walt Steiglitz (far left), Akhiok-Kaguyak, Inc. president Ralph Eluska (center) and Refuge Manager Jay Bellinger were among the members of a group accompanying Secretary Babbitt.

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

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

D. **Planning:** (Taylor)

1. **Master Plan:** Nothing to report.

2. **Management Plan:**

a. **Public Use Management Plan:** (Taylor)

Culminating a long and tortuous trip, the final Public Use Management Plan (PUMP) was printed in October of 1993. Additional snags and substantial internal adjustment added a half year to the date projected in the '92 narrative. This final product represents over 5 years of work which extends all the way back to a 1988 beginning. Regional Director signature on a Decision Notice is yet needed to complete the process.

Significant change occurred late in the process in the areas of upland aircraft landings and snow machine use. Guidance from the Regional Office resulted in a more restrictive position than existed in the draft edition. Upland landings are prohibited. Snow machine use is restricted to a traditional use corridor, mostly paralleling the Terror River, but extending from Kizhuyak Bay to a point near Mt. Glottoff.

Restrictions proposed in the PUMP, which must be implemented through the rulemaking process, include:

CAMPING LIMIT *** 15 DAYS *** REFUGE-WIDE **EXCEPT:**

UNLIMITED CAMPING

Refuge-Wide	Jan 1 - Apr 30

7 DAY CAMPING LIMIT

Main Stem Ayakulik River	Jun 1 - Jul 15
Dog Salmon Creek	Jun 15 - Aug 15
Karluk Lake Lakeshore	Sep 1 - Oct 24

CAMPING CLOSURE

Upper Sturgeon River	Jun 15 - Aug 15
Red Lake River (and Adjacent Red Lake Lakeshore)	Jul 1 - Aug 31
Upper Thumb River	Jul 1 - Aug 31
Southeast Creek	Jul 15 - Aug 31
Little River (and Adjacent Little River Lake Lakeshore)	Jul 15 - Aug 31
Lower Zachar River	Aug 1 - Sep 30
Spiridon River	Aug 1 - Nov 30
East Uyak Creek	Aug 15 - Sep 30
Deadman Bay Creek	Aug 15 - Sep 30
Lower Terror River	Aug 15 - Sep 30

CLOSURE TO ALL PUBLIC ACCESS

O'Malley River and Adjacent Karluk Lake Lakeshore	Jun 25 - Sep 30
Connecticut Creek	Jul 15 - Aug 31
Upper Pinnell Creek	Jul 15 - Aug 31
South Uyak Creek	Aug 15 - Sep 30

JET BOAT CLOSURE

Upper Sturgeon River	Jun 15 - Aug 15
Red Lake River	Jul 1 - Aug 31
East Fork Ayakulik River	Jul 1 - Sep 30
Upper Uganik River	Jul 15 - Nov 30
Spiridon River	Aug 1 - Nov 30
Zachar River	Aug 1 - Nov 30
Deadman Bay Creek	Aug 15 - Sep 30
Lower Terror River	Aug 15 - Sep 30

UPLAND AIRCRAFT LANDING CLOSURE

Refuge-wide (except ocean beaches)	Year-Round

SNOW MACHINE CLOSURE

All lands not identified as part of the Snow Machine Use Area (PUMP Figure 4, page 127)	Year-Round

b. River Management Plan: (R. Squibb)

The objective of this planning process is to determine desired future conditions and an upper limit of visitor use that will not adversely affect the resource for all of the Refuge's major rivers, by season and river section. These decisions will be based primarily on Refuge purposes (ANILCA Sec. 303(5)(B)), and secondarily on quality of visitor experience. The plan will be the basis for allocating commercial guiding opportunities on the Refuge's rivers.

In 1993 progress was made on summarizing existing data, collecting additional information, determining a long term schedule for the planning process, and obtaining funding for 1994 work. The staff collected new information through field work at the Ayakulik River, aerial surveys of visitor use, and interviews of visitors leaving the Refuge.

Squibb began the task of summarizing the information present in the Refuge's files that would be applicable to river management. Much of the information lends itself best to presentation on maps. However, the process of learning and applying the Refuge's geographic information system has been very time consuming, therefore this part of the process will almost certainly take more time than planned.

At the Ayakulik River, Squibb was the third person along with a law enforcement officer and creel survey technician in the six-week field camp (28 May to 10 July). From two vistas on ridge top, he collected data on

distribution and timing of visitor and wildlife use, and on bear-human interactions. Everyone contributed to logs of aircraft landings, visitor days, and overnight camps. John Baker and John Crye, creel survey technicians at Bare Creek and the mouth, respectively, asked departing visitors six questions regarding the quality of their experience on the river.

Preliminary results from the Ayakulik studies indicated that visitor use there in 1993 was comparable to that of the previous year. There were 977 visitor days (excluding use by FWS and Alaska Fish & Wildlife Protection) originating from the Bare Creek area recorded during the 1993 chinook salmon sport fishery. The most comparable estimate from 1992 is 994 visitor days (excluding FWS use) originating at Bare Creek. The 1992 estimate was based on a shorter sampling period than that of 1993; so actual use in 1993 may have been considerably lower than in 1992. Overnight stays on Refuge lands were 9% lower in 1993: 568 were recorded in 1993 compared to 624 in 1992, excluding the FWS camp. The larger and longer FWS camp in 1993 contributed an additional 125 user days to the total on the river, compared to 62 user days in 1992.

Subsistence fishing occurred on the Ayakulik at Bare Creek in 1993, the first recorded there. Three Kodiak area residents flew in to the river on a few days to fish mostly with hook and line, and on one day with a net.

The occurrence of bear incidents near Bare Creek in 1993 was similar to previous years. A total of 33 written reports of bear-human incidents was accumulated on the Ayakulik River between 29 May and 6 July 1993: 20 occurred in the Bare Creek area, 10 at the mouth off Refuge lands, and 3 elsewhere on the river on Refuge lands (see Table 2 below). There were no reports of charges, injuries, or DLP's in 1993.

In 1992, 11 incidents were recorded on the river within Refuge lands; the increase in recorded incidents in 1993 probably does not represent any real change in bear-human relations on the river. In 1992, there were 3 incidents at Bare Creek in which a bear got human food, garbage, or fish (excluding offal) from people; in 1993, there were 4. One party that experienced problems with bears getting into their food or garbage over the previous few years used a locking-ring steel barrel for secure storage in 1993, and they reported having no problems with bears around their camp.

Public use information was also collected using aerial surveys and exit interviews. There were five aerial surveys flown with the primary mission of mapping visitors, camps, boats, and planes on the Refuge. In addition, Fishery Biologist Chatto recorded information on public use during seven salmon stream surveys. Subsistence Biologist Stovall contacted 43 parties as they exited air taxis returning from the Refuge; he interviewed them on the location and duration of their visits, their fish and game take, and the quality of their experience.

Table 2. Summary of bear incident reports from the Ayakulik River in 1993 by whole river and area of the river.

Category	Count -or- Mean (n)			
	Ayakulik River	Areas of the River		
		Bare Ck	Mouth[1]	Other
Tot. Incidents	33	20	10	3
People Present	4.1 (31)	5.0 (20)	1.8 (8)	4.0 (3)
Min. Dist. (m)	32 (24)	34 (15)	24 (6)	45 (3)
Weapon Dischg.	0.6 (31)	0.6 (20)	0.6 (8)	0.3 (3)
Type of Incident				
Displacement	6	4	0	2
Bear in Camp	13	10	3	0
Food Involved	14	6	7	1
Consequence (most serious of incident)				
Habituation	6	6	0	0
Bear Displaced	17	9	5	3
Prop. Damage	1	0	1	0
Fish Stolen	4	3	1	0
Food/Garb. Taken	4	1	3	0
None	1	1	0	0

[1]Totals at the mouth are underestimates. The creel survey technician said that one bear was raiding the lodge's freezers on an almost daily basis and getting some food on about half its attempts; his conservative estimate was about 16 such incidents -- only the 3 written reports received are included in this table.

On 2 September, Regional and Refuge staff met in Kodiak to discuss several issues central to the river management planning process: a workplan schedule, determining limits of visitor use, the prospectus system for commercial guides, unguided use, resource impacts, and the 1994 study plan priorities. Present were Associate Manager George Constantino, Chief of Planning Leslie Kerr, and Planners Mike Haase and Bob Stevens from the Regional Office, and Jay Bellinger, Dick Munoz, Paul Taylor, and Ron Squibb from Kodiak. The group decided on the following workplan schedule, although all agreed that it was an ambitious schedule that would be hard to meet.

Year 1998, Summer - Guides using new permits

Jan. '97 - June '97 - Work through appeals

Dec. '96 - Award permits

July '96 - Mail prospectus

Mar. '96 - Final Plan & Record of Decision signed

Dec. '95 - Final Plan released to public

Summer '95 - Evaluate comments, rewrite draft to final

Mar. '95 - Public Meetings

Jan. '95 - Draft plan released

Nov. '94 - Draft plan to printer

Mar. '94 - Scoping et al.

Nov. '93 - Start writing draft plan & public involvement process

3. **Public Participation**: (Stovall, Taylor)

On the afternoon of January 26, staff from the Subsistence Office held an interagency staff meeting at the Kodiak Refuge Conference room. A Coast Guard representative and staff members from Izembek and Kodiak Refuges attended. This meeting was followed a public meeting held that evening in the Kodiak High School Choral Pod. Seventeen members of the public attended. Discussion included the Federal Regional Advisory Council system status, a designated hunter/community harvest proposal and changes in the Federal Subsistence Regulations.

Village public meetings were held by Refuge staff in Karluk (March 9), Old Harbor (March 23), Larsen Bay (March 24), and Akhiok (March 31). A village

meeting was held in Port Lions during April and at Ouzinkie during May. Discussions included the Federal Subsistence Regional Advisory Council, community harvest/designated hunter for black-tailed deer, problem bears, bear viewing program, land acquisition program and other subsistence species including brown bear, sea otter, elk and waterfowl/sea ducks.

On September 22 and 23, the first Federal Subsistence Regional Advisory Council training and public meeting was held in Kodiak. This was the first gathering of the seven council members representing Kodiak/Aleutian Islands (Region 3). The members are Mark Olsen (Chairman) from Kodiak, Thomas Everitt also from Kodiak, David K. Eluska (Secretary) from Akhiok, Herman Squartsoff from Ouzinkie, Randy Christensen from Larsen Bay, Vincent M. Tutiakoff Sr. (Vice-Chairman) from Unalaska, and Gilda Shellikoff from False Pass. The Regional Advisory Council Coordinator for Region 3 is Helga Eakon, who works out of the Subsistence Management Office in Anchorage.

In August of 1993, the draft O'Malley Bear Viewing Prospectus was released for written public comment. Thirteen comments were received, resulting in a number of modifications to the final prospectus. RR Taylor summarized the comments and included the summary in the mailing of the final prospectus to potential bidders.

The first meeting of the Federal Subsistence Regional Advisory Council was held in Kodiak on September 22 and 23. Council members, from left to right, are Vincent Tutiakoff, Gilda Shellikoff, Mark Olsen, Helga Eakon (Subsistence Coordinator), Thomas Everitt, David Eluska and Herman Squartsoff. Not pictured is Randy Christiansen.

4. Compliance with Environmental and Cultural Resource Mandates:

a. Little River Cabin: (Taylor)

An environmental assessment was written for relocation of the Little River public use cabin. In connection with that assessment, Archeologist Diters examined the relocation site and declared it free of significant archeological or cultural resources.

b. 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 assessment outlined the biological and physical parameters the project must comply with to ensure compatibility with refuge purposes. Spiridon Lake is the third largest lake on the refuge but was barren of anadromous fish due to a series of impassable falls that 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 1993 the ADF&G stocked 4.25 million sockeye fry into Spiridon Lake. The fry were transported from the town of Kodiak to the lake via float plane and released. The Department also monitored the sockeye smolt migration from the lake during late April to the first week in June 1993. Preliminary results from ADF&G indicate that a total of approximately 330 thousand smolt migrated to the ocean in 1993. These smolt are from fry planted in 1992 and 1991.

Preliminary limnological data collected by the Department in 1993 indicate a slight reduction in the size of some zooplankton species but the average size is still over the threshold level of 0.5mm. The data indicate no major shifts in the zooplankton community within the lake. Sampling for Dolly Varden in the lake in 1993 indicated a slight increase in catch/unit effort over 1992, particularly for the younger age classes. This was expected, as sockeye fry were at an optimal size for predation by young Dolly Varden.

Eight aerial salmon index surveys on Spiridon River were conducted by the ADF&G and the refuge in 1993. Peak index escapement counts for the river were 34,000 pinks, 5,000 chum, 2,250 coho and 4 sockeye. Escapement for pinks was above the minimum target goal of 15,000 fish, but the chum and coho escapement was only 33 and 56%, respectively, of the minimum goals. Reduced chum and coho escapements have also been observed in other systems on the island during 1993. The observation of only four sockeye is the lowest count in the last two years and it is unknown if this variation is normal or not. The ADF&G projects a return of 100 and 150 thousand sockeye to the area in 1994.

Kodiak refuge staff continued to monitor bald eagle nesting and productivity within the Spiridon Lake project area during 1993. Bald eagle nesting

activity within the project area has been monitored by the refuge since project initiation in 1991. A minimum of 35 bald eagle territories could potentially be impacted by the project. The cost of monitoring this project's potential impacts to nesting bald eagles is supported by refuge wildlife inventory funds.

c. Hidden Lake Sockeye Enhancement Project: (Chatto)

This project was initiated in 1992 by the ADF&G under the auspices of another 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. The goal of this project is to enhance the common property fishery in the Kodiak area.

In 1993, a monitoring plan and cooperative agreement between the refuge, ADF&G, and the Kodiak Regional Aquaculture Association (KRAA) was completed for this project. Funding for the work is provided by the KRAA. As a result, the ADF&G stocked 594 thousand sockeye fry into Hidden Lake. The fry were transported to the lake via float plane from the town of Kodiak and released. Smolt monitoring in 1993 consisted of sampling in the lake by tow-netting to collect condition data on the smolt. There was no estimate on the number of smolt that left the lake in 1993.

Preliminary data obtained through limnological sampling indicate that the zooplankton biomass in the lake has decreased in 1993, but the magnitude of the decrease has not yet been quantified. The Department is still working on the data collected in 1993.

In 1993 sampling for Dolly Varden in the lake was continued by the Department and no significant shifts in the catch/unit effort were detected. In addition, sampling in the creek draining the lake detected both Dolly Varden and rainbow trout, but no coho salmon. This sampling will continue in 1994.

One stream survey was completed in 1993 by ADF&G. Totals of 6,000 pink and 500 coho salmon were recorded. This is the first year of the project and documenting escapement is part of the evaluation process. The 1993 pink count is within the midpoint range of the minimum and desired escapement goal of 3,000-9,000 fish. There is no escapement goal for coho salmon in the system since these fish are remnants from an earlier enhancement project the ADF&G terminated in 1992.

Monitoring of bald eagle nesting and productivity within the Hidden Lake fisheries enhancement area was initiated during 1993. A minimum of 28 bald eagle nesting territories has been identified as having potential for impacts from activities associated with the enhancement project. Costs of conducting annual bald eagle nest monitoring surveys for the Hidden Lake Enhancement Project are paid for by the Kodiak Regional Aquaculture Association.

d. Ayakulik River Sockeye Restoration Project: (Chatto)

Forecasted sockeye salmon returns to the Ayakulik River by ADF&G in 1993 indicated that the minimum escapement level of 200 thousand fish might be difficult to achieve. Subsequently, the ADF&G proposed that if escapement levels were not achieved, a rehabilitation program be initiated in 1993. The main emphasis of this program was to take sockeye eggs, incubate them at the KRAA hatchery in the town of Kodiak and plant the fry back into the lake for rearing. The objective was to increase survival of a portion of the run to make up for the decrease in escapement. This project was to be funded through the oil spill restoration funds. In 1992 the refuge indicated that an environmental assessment was needed to determine compatibility of the project with refuge purposes. In March 1993 the refuge received an assessment that had been prepared by the ADF&G for the National Marine Fisheries Service (NMFS) which was the lead agency for the oil spill project. After careful review by the Service, it was determined that there was insufficient documentation included in the assessment to make a compatibility determination. This information was conveyed to the NMFS along with the indication that the Service would make a diligent effort to process a revised assessment. In July 1993 the Service was notified that the project was being terminated because minimum escapement levels of sockeye into the Ayakulik were being met and there was no further justification to pursue the project.

e. Terror Lake Hydroelectric Release Water Project: (Chatto)

In 1993, the Kodiak Electric Association (KEA) proposed to initiate studies for a Release Water Project associated with the parent Terror Lake Hydroelectric facility that was constructed in 1984 within the refuge boundary. This new thrust involves the use of release water from the Terror river outflow that would be shunted via a 9,000 foot penstock to a powerhouse/generator downstream. The water would then be dumped back into the river to maintain fishery values. In the fall of 1993, the KEA requested a Special Use Permit from the refuge to conduct the studies. At the same time, they petitioned the Service to modify the classification of the area from proposed wilderness to one that would be more friendly to the project. The Service informed KEA that a Right-of-Way permit needed to be obtained and that an environmental assessment on the project would be necessary to determine compatibility. Then, if the project is found compatible, the Service will determine if the proposed wilderness classification should be amended.

5. Research and Investigations:

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

The objective of this study is to evaluate effects of a structured bear viewing program on brown bear use patterns and bear/human interactions. The

study was originally designed as a three year project. During the first year (1991) data were collected under conditions of comparatively unrestricted public use, and in the second year (1992) identical study methods were employed when public use was very structured and limited to participants of the FWS-run bear viewing program. The intent of the third year (1993) was to evaluate effects of public use similar to that of 1992 except that the program was to be conducted by a private operator. Administrative problems precluded that scenario and public use in 1993 reverted back to conditions that existed in 1991. A private operator will conduct the program in 1994, and data collection will be extended into a portion of the 1994 season. This should strengthen the data set and provide the basis for long-term monitoring of bear use in the O'Malley River area.

In 1993 data were collected from 1 July to 19 September, resulting in 63 days of sampling. Observers completed 640 scan samples during that period, compared to 652 and 617 in 1991 and 1992, respectively.

A minimum of 59 different bear groups (129 bears including cubs) were identified in the O'Malley study area in 1993. Similar numbers of bear groups were noted in 1991 (50 groups) and 1992 (63 groups).

Human use in the study area, based on mean number of human groups observed per scan, was 58% higher in 1993 than in 1992 (Figure 1). This rise in use probably can be attributed to the general trend of increasing public use on the Refuge, compounded by the specific attention that has been focused on the O'Malley River area over the past three years. The rise in human use occurred during the mid-to late July period when bear use of the area is highest.

Overall bear use in the O'Malley area in 1993 during 1 July through 19 September was 16% less than during the same time span in 1992 and 14% greater than in 1991 (Figure 2). During the 1-14 July period bear use was higher in 1993 than in the previous two years. However, from 15 July to 11 August bear use was highest in 1992. Comparable levels of use were evident across all three years after 11 August. For all three years a general pattern was apparent - high use during mid-July through early August, decreased use during the remainder of August, and growing use during September.

Nearly all human use (93-100% annually) has occurred in four of the 12 zones of the study area that are designed to examine spatial distribution of bears and humans (Figure 3). Zones A and D encompass O'Malley River, and Zones B and C include the Karluk Lake shore and adjacent habitat that lies between the O'Malley public use cabin and O'Malley River. The bear viewing platform site is located in Zone D, the O'Malley cabin is located in Zone C, and most people access the river from Zones B and C.

A comparison of bear and human use in Zones A-D indicates that most use by both entities has been in or adjacent to O'Malley River (Zones A and D). Although fewer bears have been observed in zones B and C, it appears that limited use of that area by people in 1992, while the bear viewing program was in progress, contributed to a higher level of bear use of that area.

The relatively high level of unstructured human use on the O'Malley River area

in 1993 appeared to cause some nuisance bear problems. However, no injuries were known to have been incurred by bears or people as a result of their interactions. At least one subadult became a nuisance problem to users of the O'Malley cabin and a bear reportedly damaged some equipment of a person tent camping near the cabin.

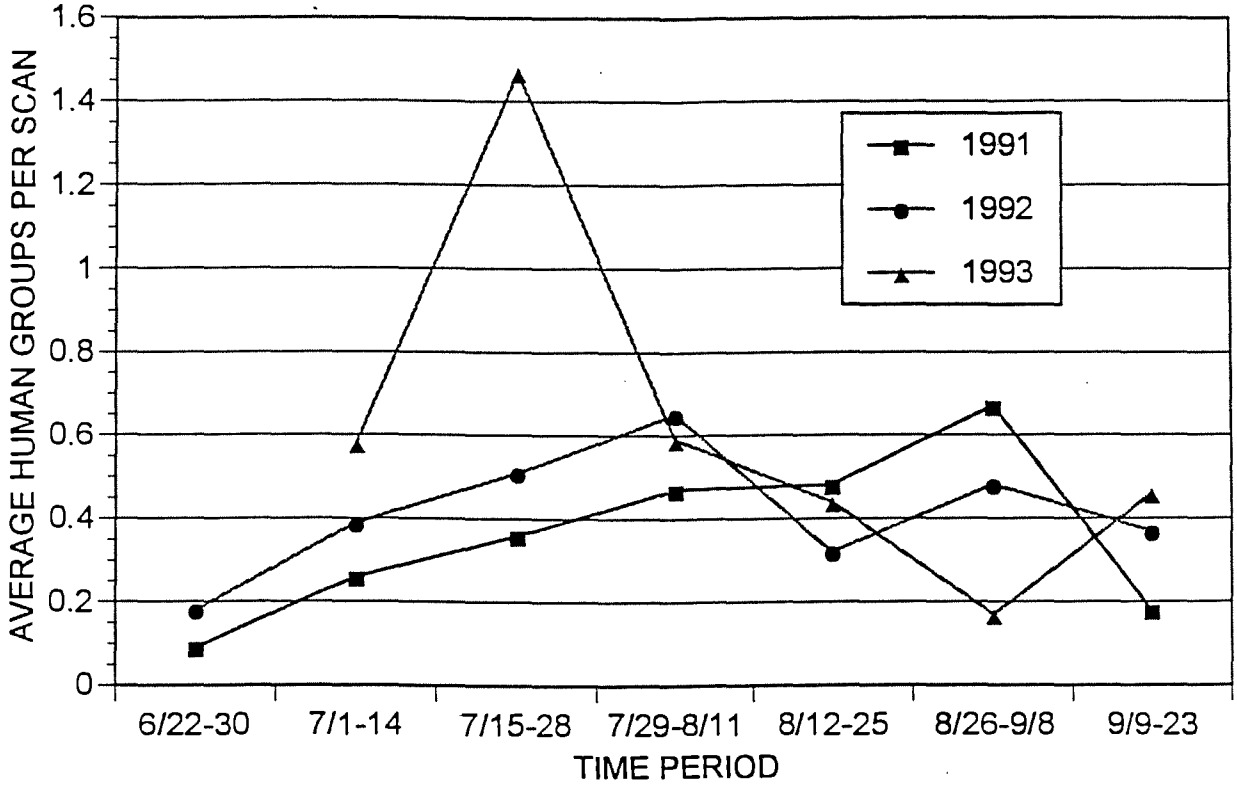


Figure 1. Patterns of human use (average number of human groups observed by scan) on the O'Malley River study area, 1991-1993.

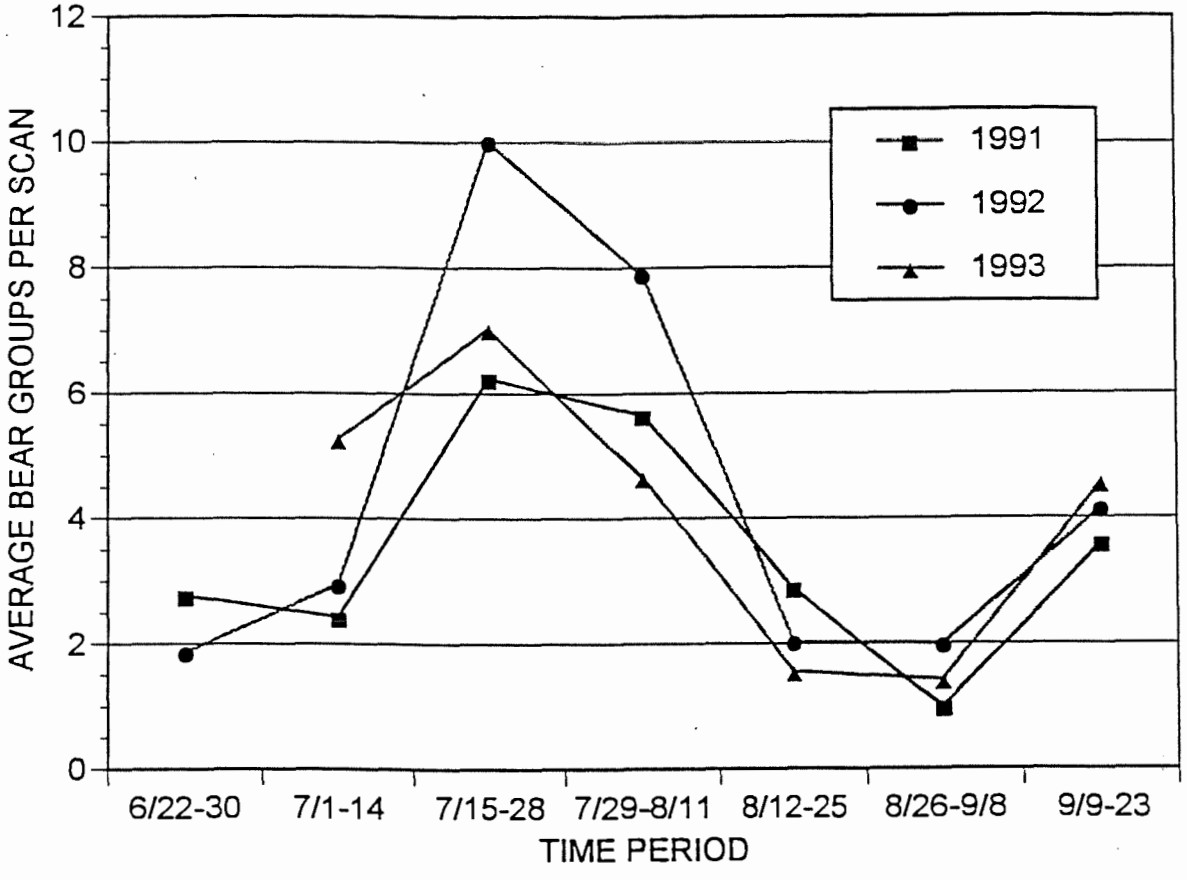


Figure 2. Patterns of brown bear use (average number of bear groups observed per scan) on the O'Malley River study area, 1991-1993.

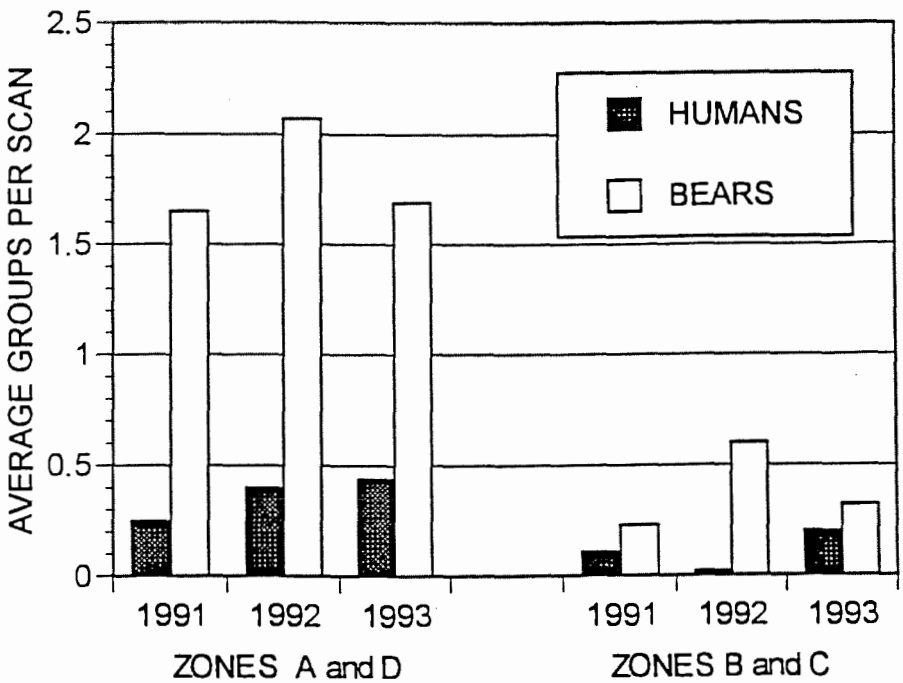


Figure 3. Brown bear and human use (average number of groups observed per scan) on the O'Malley River (Zones A and D) and Karluk Lake shore/O'Malley cabin (Zones B and C) areas of the O'Malley River study area, 1991-1993.

b. Kodiak NR 93 - "Applications of Aerial Survey Methods to Estimate Density and Composition of Brown Bears on Kodiak Island, Alaska" (FWS, ADF&G and Kodiak Bear Trust) (Barnes)

This two-year study was designed to obtain an estimate of brown bear density for the Aliulik Peninsula, utilize aerial survey procedures to estimate relative bear densities on key resource areas on southwest Kodiak Island, and revise population estimates for various geographic areas of the Kodiak Archipelago.

Nineteen brown bears were captured and radio-collared on Aliulik Peninsula in 1993 to supplement a sample of 14 animals radio-collared in 1992. During 27-30 May the radio-collared sample was utilized to obtain a capture-mark-resight (Lincoln-Peterson procedure) estimate of density and composition. Five replicate surveys of the study area provided an estimate of 73.8 (95% CI = 61.4-86.3) independent bears and 103.1 (95% CI = 87.3-118.8) total bears, including cubs. Corresponding densities were 1.83 mi^2/bear and 1.31 mi^2/bear for independent and total bears, respectively. Additional analyses indicated that the population of independent bears may have been slightly underestimated (<4%) because females with newborn cubs were not represented in the marked sample. Composition of single animals, maternal females, and cubs was estimated at 53-54%, 14-15% and 31-33%, respectively.

Extrapolated population estimates for the Kodiak Archipelago were based on mark-resight density estimates obtained for two study areas in 1987 and the one obtained this year (1993). Density estimates were assigned to various geographic units by comparing those units to the specific study areas, using factors such as vegetation, topography, food availability, and results of past studies. Density estimates for independent bears ranged from 1.33 mi^2/bear at Karluk Lake to 16.13 mi^2/bear on three small islands. Population estimates for independent and total bears for the entire Archipelago were 2017 and 2842, respectively.

Aerial survey data in the form of search effort (min) per bear observed and area (mi^2) searched per observed were collected for each of three areas in late May 1993. These data, referred to as intensive area survey data, are being collected as a means of population trend monitoring. Observation rates (mi^2/independent bear) for the Aliulik peninsula, Sturgeon River, and Olga Lakes study areas were 3.7, 5.2, and 11.5 respectively. These data indicated that the Aliulik and Sturgeon areas supported similar densities and that the Olga Lakes area had fewer bears than either of the other two sites. Search effort data provided similar comparisons. A final report on this study is in draft form and will be completed in early 1994.

The Aliulik Peninsula, Portage Bay area, is the focus of the brown bear density estimate work. (V. Barnes)

East side habitat is characterized by precipitous country interspersed with relatively short river courses. (V. Barnes)

Craig Lofstedt of Kenai Air, provided aerial support for bear capture work accomplished on the Aliulik Peninsula. This boar was one of 19 brown bears tranquilized and radio-collared during 1993. (V. Barnes)

c. **"Winter Food Habits of Sitka Black-Tailed Deer in a Non-Coniferous Habitat of Kodiak Island"** - Jeff Selinger, Fairbanks

Samples of Sitka black-tailed deer pellet groups were collected from 20 October 1990 to 12 April 1991 on the Spiridon Peninsula of Kodiak Island. The samples were combined over 2 week intervals and ranged from 10-50 samples per interval. The "composite" samples were analyzed for plant fragment occurrence, grouped into 4 general categories and their relative abundance compared. Shrubs increased from mid October to mid February, then gradually declined. Forbs generally remained constant throughout the entire period. Ferns had high representation from mid October to November, then decreased drastically until late March. Miscellaneous genera (grass, moss, lichen, kelp) increased gradually from October through January then gradually decreased through April.

d. Kodiak NWR 93 "Karluk Lake Sockeye Salmon Studies" Fish and Wildlife Service, ADF&G (Chatto)

Alaska Department of Fish and Game data indicate that the 1993 total sockeye return to Karluk was approximately 1.2 million fish. Escapement in 1993 was approximately 261 thousand early-run and 396 thousand late-run fish. The early desired escapement goal of 200 thousand fish was exceeded by approximately 4% and the minimum late run goal of 400 thousand was basically met (>99%). Overall, both the early and late run sockeye returns in 1993 were within the ranges forecasted by ADF&G.

The ADF&G preliminary forecast for the 1994 Karluk sockeye return is approximately 1.25 million total fish, with roughly a 50/50 split between the early and late runs.

In 1993, ADF&G continued work on the evaluation of the 1986-1990 fertilization project. Overall results are expected to be summarized in 1994.

e. Kodiak NR 93 - "Frazer Lake Sockeye Salmon Studies" ADF&G (Chatto)

This project was completed in 1992 by the ADF&G. The project was begun in 1988 to restore the rearing base for juvenile sockeye in the system by a reduction in the escapement goal and a lake fertilization program under the auspices of an EA prepared by the refuge. Overall results of the project are being compiled by ADF&G.

In 1993, a total of approximately 750 thousand Frazer Lake sockeye returned to the Kodiak area. Approximately 198 thousand of these returning fish escaped into the Frazer Lake system to spawn while the remainder were caught in the commercial fishery. The sockeye escapement in 1993 is commensurate with an escapement goal of 140-200 thousand fish. The ADF&G forecast for 1994 projects a return similar or slightly above (5%) that observed in 1993.

f. Kodiak NR 93 - "Sockeye Salmon Overescapement Studies" ADF&G (Chatto)

The ADF&G continued work on this study in 1993 as part of the 1989 Exxon Valdez oil spill assessment. This work was initiated in 1990 and is directed at assessment of sockeye salmon over-escapement into the Ayakulik and Akalura systems on the refuge and how it may effect future sockeye production. To assess the affects of over-escapement, the ADF&G initiated a sockeye smolt monitoring program in 1990. Results of the work to date indicate that below average returns of adult fish in 1994 and possibly 1995 will require minimal commercial fishing time in some nearby offshore areas to ensure that the escapement goal of 200-300 thousand fish is met. There are indications that the rearing environment for sockeye in Red Lake (Ayakulik) has recovered, however Akalura lake has not recovered. Management options under consideration range from a reduction in the escapement goal to fertilization. Work on this study will continue in 1994.

g. Kodiak NR 93 - "Terror Lake Hydroelectric Project - Fisheries Studies" (Chatto)

No action on these studies was taken in 1993. Since the Federal Energy Regulatory Commission (FERC) has not yet reviewed the studies to determine if the conditions of the license for the project have been met, there has been no action or proposed changes to the mandate flow regimes. In the interim, the Kodiak Electric Association (KEA) has proposed an add-on to the project that will utilize the mandated release flows from the dam to generate additional power (see Sec. D.4.D).

h. Kodiak NR 93 - "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 determine 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 a graduate student at the University of Alaska Fairbanks.

In July and August 1993, field work entailed gathering substrate information on 81 sections of the river. Data obtained in 1993 will be used to develop preliminary variance estimates and allow the required number of randomly selected subsections to be more intensively sampled during field work in 1994.

Overview of the East Fork of the Ayakulik River showing a portion of the study area for the coho salmon investigation. (R. Hander)

Volunteer Heather Bolte assisted graduate student Ray Hander along the East Fork of the Ayakulik River mapping stream substrate. (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, Refuge Clerk, 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, Biological Technician, GS-5, TFT (Local Hire), EOD 7/3/88

15. Jeffrey S. Selinger, Seasonal Biological Technician, GS-6

16. Keith P. Globis, Seasonal Biological Technician, GS-4

17. Rasmus G. Anderson, Jr., Laborer, WG-2, PPT, Terminated 3/18/93

Alaska Fish and Wildlife Research Center:

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

Laborer Rasmus Anderson's employment terminated on 3/18/93 following approval of his disability retirement request by the Office of Personnel Management. This position was not filled. Future janitorial service will be provided on a contract basis.

The Office Automation Clerk position was upgraded to GS-4.

Table 3. Staffing at Kodiak NWR from 1989-1993

Fiscal Year	Permanent Full Time Employees	Permanent Part Time Employees	Temporary Employees	Total Full Time Equivalents*
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)

2. **Youth Programs:** Nothing to report.

3. **Other Manpower Programs:** Nothing to report.

4. **Volunteer Program:** (Brooks)

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. During the spring and summer months, the addition of SCA Daniel Herzberg and full-time volunteer Sibley Driscoll, with help from volunteers Kathryn Beeks, Jeremy Fernandez and Sandra Calvalcanti as weekday VC staff, meant that the Visitor Center was available every day for a period of 22 weeks solely through the dedicated efforts of volunteers.

Volunteers also supported and participated in a number of environmental education projects, with Charlie Elliot's ingenious portable puppet stage leading the way. Many thanks to those who did less glamorous-sounding but essential things such as photocopying or organizing the EE library.

Major projects completed in 1993 were:

Fishing Week events - D. Herzberg and S. Driscoll

Cabin Maintenance - J. Fernandez, Millie Duncan, C. Elliot, Don Gates, C. J. Lanahan, Fred Roberts, Janet Taylor

Buskin View Trail Refurbishment - C. Elliot, D. Herzberg, F. Roberts and a host of assistants.

ANHA Storage/VC Rehab - F. Roberts and J. Taylor with assistance from Rich MacIntosh.

Film Translation- German: Hans Tschersich; Spanish (in progress): Elinor Poll Ramos, Keyla Gammarano.

The number of "lifetime hours" accumulate slowly for public use volunteers, since their usual shifts are only 5 hours. Still, several people got awards for 1993. Three new volunteers who put in substantial effort were Jeremy Fernandez, Kathryn Beeks, and Millie Duncan. Second-year volunteers who contributed outstanding amounts of time included Elinor Poll Ramos and Cyndie Wyman. Veteran volunteers Charlie Elliot and Chris Provost, who have both been past "Volunteer(s) of the Year" also contributed substantial time. For the third consecutive year Charlie received "Volunteer of the Year" for highest number of hours contributed. He also tied with Fred Roberts for "Outstanding Special Project" for works listed above. They each received a signed original print by a local artist.

Volunteers were also utilized in fisheries research, bear research, bird research, deer research and data entry, and include the following people: Barb Knapton, Vicki Vanek, Bobbie Johnson, Heather Bolte, Sandra Calvalcanti, Tim Revalee, Urs Roth, and Mirjam Weurth.

5. **Funding:** (Bellinger)

Table 4 depicts Kodiak Refuge funding in thousands of dollars by program for the last five fiscal years. The 1260 budget increased by five percent from FY93. However, the percentage available for operations remained essentially the same due to increased fixed costs (see Table 5).

Our subsistence budget received a substantial reduction from last year (18% cut). We will still be able to continue our field projects (31 percent of budget available for projects) as one of our subsistence positions was switched to the base budget.

We continued to receive a "bare-bones" fisheries budget. Only 8 percent of the allocated funds were available for operations.

Table 4. Kodiak National Wildlife Refuge Funding Levels

Program	FY90	FY91	FY92	FY93	FY94
1260 Fixed Costs/Overhead	536	555	616	668	700
1260 Projects	119	283	201	126	136
1260 Subsistence	-------	73	103	95	78
1260 MMS	18	38	67	48	34
1230 Projects	-------	-------	3	4	------
1331 Fixed Costs/Overhead	79	75	67	77	74
1331 Projects	12	24	13	5	6
Totals	734	1048	1070	1023	1028

Table 5. Change in Funds Available for Field Projects

Fund	FY90	FY91	FY92	FY93	FY94
1260 Budget	655	838	817	794	836
1260 % for Operations	18%	33%	24%	15%	16%
1260 (Subsistence) Budget	----	73	103	95	78
1260 (Subsistence) % for Operations	----	96%	32%	37%	31%
1331 Budget	91	99	90	82	80
1331 % for Operations	13%	24%	14%	6%	8%

6. **Safety**: (Stovall)

Robert Stovall served as Safety Officer for 1993. Topics of monthly safety meeting and training were as follows:

January - FB/P Chatto and Pilot Patterson completed the aircraft Emergency Maneuver Training and Basic Aerobatics at Santa Paula, California, during the latter part of January. While in the area, FB/P Chatto completed an

additional two-day mountain flying course for off-airport operations given by Redlands Aviation. A report on the course was prepared and sent to the RAM for distribution to any other interested pilots. Maintenance Worker Lanahan gave the refuge compound a thorough safety inspection. The following safety improvements were accomplished in January: 1) All paper items, boxes, files, and trash were removed from the area adjacent to the shop furnace. Items were sorted and stored in appropriate shelving units at the opposite end of the shop and free from any immediate heat source. 2) Two first aid cabinets were purchased and installed in the shop equipment area and woodworking shop. 3) A wooden box cover was manufactured and installed over the electrical floor outlet in the refuge office clerk area in order to avoid the possibility of accidental electrical shock.

February - All fire alarm and smoke detector systems on the refuge compound were tested. All fire extinguishers were inspected. Safety road markers were installed on all culverts on the refuge compound. Safety warning stickers were installed on all cutting and grinding equipment as well as in all areas where combustibles are stored. A smoke detector and fire extinguisher were installed in the temporary subsistence office building. Warning stripes were painted on the floor in all appropriate areas of the shop. The safety meeting topic this month was Airport security. A tape was viewed at the State Highway Department Office and new security badges were processed.

March - Wildlife Biologist Stovall completed the office of Safety and Health Administration Training for collateral duty Safety Officers. This month's safety meeting topic was the Tsunami Warning System in Kodiak. Refuge emergency preparedness for disasters was also discussed.

April - Maintenance Worker Lanahan manufactured a moving bear target for use in annual bear safety firearms training. The target was tested and found to be an effective training tool. First aid kits for field camps were ordered and additional cracker shells for bear safety were ordered for the field camp season. On April 27, Refuge staff completed annual CPR training. Also during the month, all field personnel underwent bear safety firearm qualification.

June - The last three refuge staff members were certified for firearms safety on the stationary and charging bear targets.

August - The safety meeting topic was a review of near misses and unsafe situations observed or experienced throughout the field season.

October - Refuge Staff viewed a video on "Your Healthy Back" that discussed various exercises and fitness techniques for maintaining back health.

December - Refuge Staff discussed safe driving tips for the atypical Kodiak winter weather.

Boat deckhand Gus Johnson and Refuge Manager Jay Bellinger participating in annual firearm qualification for bear safety. Maintenance worker Bill Lanahan and Johnson designed and fabricated the pulley system that simulates a charge. (V. Barnes)

7. **Technical Assistance:** (Zwiefelhofer)

WB Zwiefelhofer provided bald eagle nest tree locations to logging contractors and Kodiak Electric Association for several off-refuge areas of Afognak and Kodiak Islands during 1993. Information regarding waterfowl use and abundance in the Red Lake area was provided to the Alaska Department of Fish and Game Fisheries Rehabilitation and Enhancement Division in February, and to the Women's Bay Habitat Division during December.

From September 20-22 WB Zwiefelhofer participated in the evaluation of 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. As a result of the impacted species data provided to the habitat working group, nine Kodiak Archipelago parcels comprised the majority of the Trustee's seventeen high ranking parcels, half (twelve) of the twenty-four moderate ranking parcels, and less than a quarter (six) of the forty low ranking parcels under consideration for purchase. The overall ranking of the parcels on Kodiak supports high wildlife values given to native conveyed lands and reflects the importance of reacquiring these areas to the preservation of biodiversity within the Kodiak National Wildlife Refuge.

Marine mammal data collected since 1978 during pelagic surveys and anecdotal observations in the Shelikof Straits and adjacent bays were provided to Mineral Management Services. The data will be used to evaluate numbers of various marine mammal species and potential impacts of offshore oil lease sales in the Shelikof and Cook Inlet areas. Federal Oil Lease Sale 149 proposed for 1995, removed the Shelikof Straits from the sale area but still includes the lower Cook Inlet. Due to the prevailing southern flow of the ocean currents, the sale area is still "upstream" of coastal areas of the Kodiak refuge bordering the Shelikof Straits.

Marine mammal observations and survey data were also provided to local University of Alaska marine mammal biologist, Kate Wynne. Her position at the Kodiak Fisheries Technology Center is basically a liaison between marine mammal researchers and local fishermen.

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 period August 9 to 13. The trip covered the Katmai coast from Kashvik to Kukak Bays, with stops at various archeological sites and other points of interest to the Park Service personnel.

The URSA MAJOR II and crew also provided transportation and logistical support for a regional U. S. Fish and Wildlife Service archeological team during the period August 17 to August 21. Various sites on Afognak and Kodiak Islands were visited and mapped by the 3-person team.

8. **Other:** (Chatto)

A meeting of the Kodiak Regional Salmon Planning Team was held in Kodiak on November 1993. The Refuge is an ex-officio member of this team that meets on an annual basis to discuss and plan fishery rehabilitation, enhancement and direction in the Kodiak area. In 1993, the team reviewed numerous projects in the Kodiak area and their applicability to the Kodiak Regional Comprehensive Salmon Plan. The refuge provided input at the meeting and gave a brief overview to the members on the Services' position on the proposed Terror Lake Release-Water Project.

Fishery Biologist\Pilot Chatto attended the annual Alaska Chapter meeting of the American Fisheries Society in Fairbanks Alaska in 1993. A summary report of the meeting was prepared and sent to the regional office for distribution. In addition, he attended a fisheries habitat symposium in Cordova, Alaska, this year. The theme of the symposium was evaluation of fishery habitat enhancement projects.

Fishery Biologist/Pilot Chatto attended the Alaska Board of Fish meeting held in Kodiak on January 5 and 6. Some of the proposals before the Board involved regulations directed at harvesting sockeye from the Spiridon Lake enhancement project (see section D. 4. b.)

In May 1993 a Special Use Permit was issued to the ADF&G to use a helicopter on the refuge. The purpose of the work was to collect chum salmon genetic samples on the refuge as part of a State-wide chum genetic study. The ADF&G Commercial Fish Division conducted their annual pre-emergent pink salmon sampling on refuge streams in March and April of 1993. The refuge issues a SUP to the Department for the use of a helicopter to access refuge streams each spring.

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)

Efforts to quantify wildlife resources in popular recreational areas of the Kodiak National Wildlife Refuge continued during 1993. Waterfowl production surveys were again conducted over the upper portion of Ayakulik river drainage. The nine plots surveyed in 1992 were again covered in 1993. Spring phenology in 1993 was approximately 3 weeks earlier than normal. Above average temperatures, combined with average precipitation levels for April and May, provided as near-to-optimum waterfowl nesting conditions as Kodiak can expect. However, minimal rainfall and unusually warm temperatures in June resulted in below-normal water levels in the survey area during the July survey period. The lack of water during this period of the 1993 breeding season seems to have had a limited impact on waterfowl production over the survey area. The 1993 waterfowl production surveys were conducted July 16 to 22 by BT Johnson and Volunteer K. Berglund. The two-person survey crew was dropped off via fixed-wing aircraft, at a point approximately 3 miles downstream from the Ayakulik main stem's source lakes. Transportation of equipment and personnel between survey plots was accomplished by use of a 10-foot rubber raft. Water bodies in the plots were surveyed on foot, with the exception of those plots which contained portions of the main stem of the Ayakulik river. These river segments were surveyed while in transit with the rubber raft. Two low strata plots and seven "other" strata plots were surveyed during the period. Table 6 presents the number of observed broods and brooding hens, by species, found in the random plots during the 1993 survey. Table 7 compares 1991, 1992, and 1993 expanded waterfowl production and population estimates (by species) for the 56 square miles of Ayakulik drainage sampled. Waterfowl species occurring on the production survey plots are present throughout the year on the Kodiak archipelago. Monitoring of the local waterfowl populations' availability for resident subsistence users could be accomplished with the addition of survey coverage in other Kodiak waterfowl

production areas. Figures 4 and 5 present the total waterfowl broods observed and expanded (projected) waterfowl broods for the primary dabbling duck species encountered during the 1991, 1992, and 1993 productions surveys, respectively.

Waterfowl production in the Ayakulik River area was the focus of survey work accomplished during July 1993. (V. Barnes)

Figure 4.

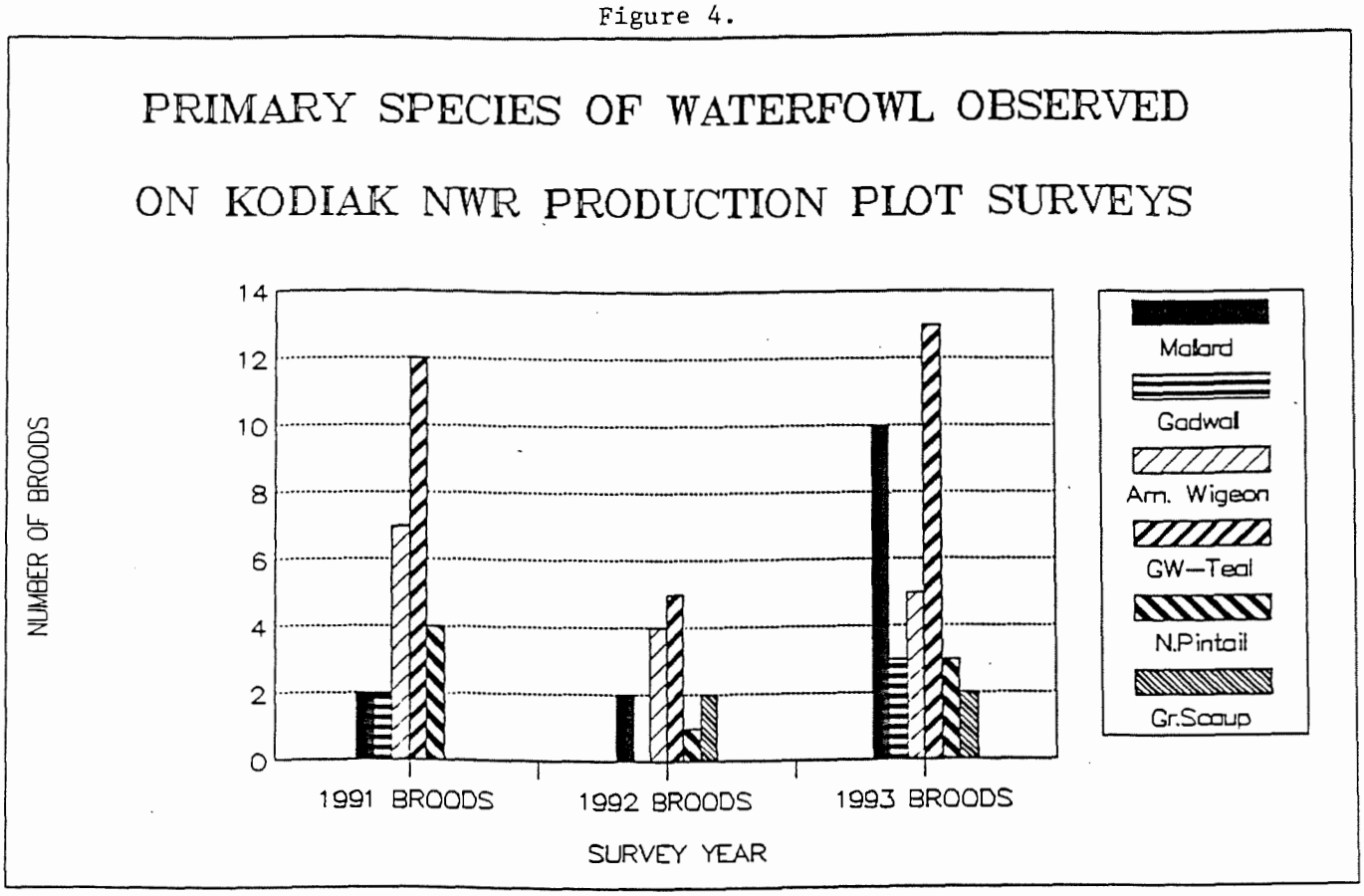


Figure 5.

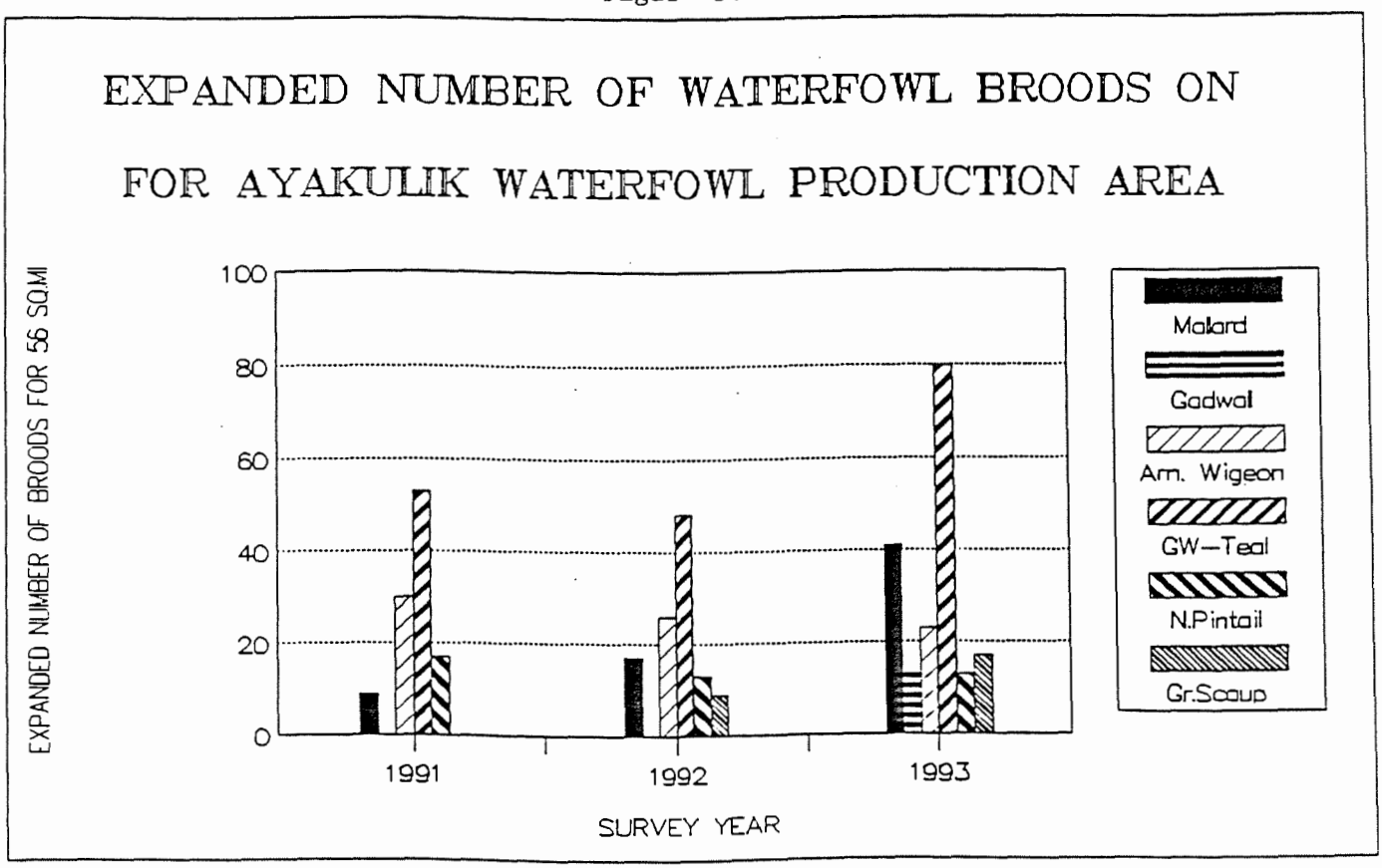


Table 6. Waterfowl Production Summary - Observed Broods

Production Area: South Central Year: 1993
Selected Data: ALL STRATA
Number of Plots: 9
Expanded Area: 56

Species Observed	Class I	Class II	Class III	Brooding Hens	Total
Mallard	1	4	0	5	10
Gadwall	1	1	0	1	3
American Widgeon	5	0	0	0	5
Green-winged Teal	2	6	0	5	13
Northern Pintail	1	0	0	2	3
DABBLER SUBTOTAL	10	11	0	13	34
Greater Scaup	1	1	0	0	2
DIVER SUBTOTAL	1	1	0	0	2
Red-breasted Merganser	1	2	0	1	4
MISC. DUCK SUBTOTAL	1	2	0	1	4
Unidentified Duck	0	2	0	0	2
TOTAL DUCKS	12	15	0	14	42
Tundra Swan	0	2	0	0	2
Common Loon	0	1	0	0	1
Red-throated Loon	0	0	0	0	0
TOTAL	12	18	0	14	45

Table 7. KODIAK NWR WATERFOWL PRODUCTION SUMMARY
- EXPANDED ESTIMATES -

Production Area: South Coastal
Selected Data: ALL STRATA
Number of Plots: 1993 N=9 1992 N=9 1991 N=11
Expanded Area: 56

SPECIES	Broods Expanded			Adults Expanded			Young Expanded		
	1991	1992	1993	1991	1992	1992	1991	1992	1993
Mallard	9	17	41	61	151	129	17	97	183
Gadwall	0	0	13	13	0	26	24	0	52
American Wigeon	30	26	23	34	56	69	93	96	109
Green-Winged Teal	53	48	80	48	125	168	211	99	367
Northern Pintail	17	13	13	13	22	13	57	78	46
DABBLER SUBTOTAL	109	0104	170	168	354	403	402	370	756
Greater Scaup	0	9	17	0	9	17	0	52	69
Red-breasted Merganser	35	22	35	22	220	99	72	160	207
Unidentified Duck	4	0	0	0	0	0	4	0	46
TOTAL	156	135	230	191	582	520	478	582	1079
Tundra Swan	0	0	9	30	26	73	0	0	26
Red-throated Loon	4	0	4	21	13	26	4	0	4

The annual refuge aerial tundra swan nesting survey was conducted on 6 June. A total of 87 adult tundra swans was recorded during the survey. Twelve swan nests and 5 broods (5 nest sites) containing a total of 13 cygnets, were also tallied. While no tundra swan broods were found during the waterfowl production plot surveys in 1991 or 1992, two broods of 3 cygnets each were observed in 1993. They were also seen during the aerial tundra swan surveys and are included in the results.

The tundra swan production survey was conducted on 18 August, covering all of the traditional survey area. Of the 13 cygnets found in the 5 early broods during the spring survey, 7 (2 broods) of the cygnets were found during the productivity survey. A total of 32 cygnets from 10 broods was recorded during the productivity survey. The average brood size of 3.2 cygnets for the 1993 nesting season is an increase over the 10-year mean of 2.7. The results of both 1993 surveys are included in the summary of refuge's historic tundra swan nesting data found in Table 8a and 8b.

Table 8a. Kodiak National Wildlife Refuge Tundra Swan Surveys

1993 Spring Survey Summary

Adults and Subadults								
Year	No. Maps	No. Obs.	In Pairs	As Singles	In Flocks	Sub-Total	Cygnets	Total Swans
1980	10	31	38	8	15	61	0	61
1981	10	45	62	10	13	85	0	85
1983	12	51	86	8	0	94	23	117
1984	11	53	62	21	4	87	8	95
1985	10	50	76	8	13	97	20	117
1986	12	58	80	17	7	104	1	105
1987	11	64	98	11	20	129	12	141
1988	11	55	74	17	9	100	0	100
1990	11	49	82	7	16	105	12	117
1991	11	45	84	2	3	89	25	114
1992	7	34	58	3	5	66	13	79
1993	12	51	54	16	3	73	22	95

Table 8b. 1993 Fall Survey Summary

Adults and Subadults									
Year	No. Maps	No. Obs.	In Pairs	As Singles	In Flocks	Sub-Total	Cygnets	Percent Juveniles	Total Swans
1980	8	28	46	5	0	51	32	39%	61
1981	7	36	56	5	18	79	33	29%	112
1984	5	24	32	4	16	52	28	35%	80
1985	8	33	60	0	21	81	31	28%	112
1986	9	33	52	2	17	71	17	19%	88
1987	10	54	80	12	16	108	35	24%	143
1988	11	59	90	8	37	135	60	30%	195
1990	11	34	64	1	27	92	33	26%	125
1991	11	34	60	3	27	90	26	22%	116
1992	11	38	60	4	34	98	33	25%	131
1993	12	27	44	1	55	100	32	24%	132

Kodiak provides wintering habitat for a small stable population of emperor geese from September until May. Emperor geese that were neck-collared on the Yukon Delta continued to be sighted in Women's Bay in 1993. BT Johnson observed 151 emperors at the head of Women's Bay on February 21 and WB Zwiefelhofer counted 154 birds in that area on March 13. Two collared geese were with the flock observed on March 13 but the individual code numbers couldn't be deciphered. A much larger segment of the Kodiak wintering population is found on the southern end of Kodiak archipelago. A flock of 1000 emperor geese were counted in Sukhoi Lagoon on March 7, along with 3000 mallards and other dabbling ducks. Efforts to improve our knowledge of the emperor use and numbers on the southern portion of the refuge have been hampered by lack of funding and logistical support facilities. Increased commercial, recreational, and subsistence demand in this area has seen a similar rise in conflicting use methods and patterns.

Coastal aerial surveys initiated in 1992 to enumerate steller's eiders wintering along the east side of Kodiak Island were again conducted. Surveys were conducted on March 15, 17, and 18 utilizing the refuge Cessna 206 (N9623R) piloted by B. Patterson, with D. Zwiefelhofer as observer. Use of the same observer during all survey segments and improved coverage in two portions of the survey area resulted in detection of greater numbers of steller's eiders. Unfortunately the Chiniak Bay area, which contained the largest concentration of steller's eiders in 1992, was not surveyed during 1993. Aircraft availability due to Office of Aircraft Services maintenance problems and inclement weather were again factors in limiting survey coverage.

The most notable differences between the 1992 and 1993 surveys were the 1600% increase of steller's eiders in the southern portion of Kodiak area while king eiders were nearly absent. The number of king eiders in the Kodiak area appears to correspond to winter ice conditions in the Bering Sea. The further south the sea ice edge advances, the greater number of king eiders migrate into Kodiak waters. Bering Sea ice coverage was minimal during the winter of 1993. It is not known if these same winter weather conditions influence the number of steller's eiders observed in the Kodiak waters. It is more likely that better survey coverage plus an observer with greater aerial survey experience were the main reason higher numbers of most species were tallied. Results of the 1993 survey are presented and compared to the 1992 survey in Tables 9a and 9b.

Table 9a. Comparison of 1992 and 1993 Kodiak Coastal Aerial Survey Results

Species	1992 Totals	1993 Totals
Tundra Swan	24	3
Black Brant	1	0
Emperor Goose	1657	1093
White-Fronted Goose	19	0
Mallard	1737	4180
Gadwall	86	54
Northern Pintail	490	19
Green-winged Teal	111	296
American Wigeon	152	483
Greater Scaup	1168	1020
Goldeneye sp.	371	1043
Bufflehead	256	190
Oldsquaw	1609	1198
Harlequin Duck	911	1270
Steller's Eider	2892	4032
Common Eider	135	45
King Eider	1350	257
White-winged Scoter	546	544
Surf Scoter	393	739
Black Scoter	5624	4751
Common Merganser	172	125
Red-breasted Merganser	750	1236
Unidentified Duck sp.	279	0
Unidentified Loon sp.	0	12
Unidentified Shorebird sp.	1055	286
TOTALS	21788	22876

Table 9b. Marine Mammals observed during annual winter surveys for 1992 and 1993.

MARINE MAMMALS	1992 Totals	1993 Totals
Steller's Sea Lion	118	50
Harbor Seal	132	145
Sea Otter	4	72
Harbor Porpoise	4	0
Fin Whale	0	3
Unidentified Whale	1	0
TOTALS	259	270

The Chiniak Bay segment of the 1992 survey was not covered in 1993. Steller's eider numbers in this area were estimated to be comparable to the 1992 count of 2100 birds. Reports from local sea duck hunting guides operating in Chiniak Bay, estimate the population of steller's eiders in this area at 2500 to 3000. It appears the minimum 1993 population of steller's eiders wintering in the Kodiak area was approximately 6000 birds.

4. **Marsh and Water Birds:** (Zwiefelhofer)

Observations of Great Blue Herons around the Kodiak area continue to be made. A juvenile heron was observed September 27 in the Trident Basin area adjacent to the Kodiak's St. Herman's Harbor.

A pair of red-throated loons accompanied by 1 young and several unaccompanied (by young) pairs were observed during the surveys of waterfowl production plots done in July.

Pacific and arctic loons are normal winter residents of Kodiak's marine waters but are rarely found here during the summer breeding season. A visiting bird

enthusiast reported observing a pair of Pacific loons feeding in the ocean waters off Mill Bay beach on June 29.

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

The annual wintering pelagic seabird, sea duck, and marine mammal survey was conducted from February 18 to 24 in Kodiak east side bays and from February 28 to March 4 in the west side bays. Tables 10 and 11 compare the total numbers of species counted during surveys from 1991 to 1993. Sea water temperatures during the 1993 survey averaged 1 to 1.5 degrees (centigrade) warmer than the last several years. Warm water temperatures and their effect on the availability of forage fish may be responsible for significant increase in the numbers of species such as common murres and oldsquaw as compared to survey results of the past few years. The large die-off of common murres that occurred in the eastern Gulf of Alaska during the winter of 1993 appears to have been of minimal consequence on the Kodiak Archipelago. Five dead common murres were found and collected for analysis during the 1993 survey. A report that several dozen dead common murres (along with some red-necked grebes) had been sighted on Sitkalidak Island was received shortly after the survey was completed. However, the area where the carcasses were found is open to the Gulf of Alaska, so it is possible that the birds died elsewhere and drifted in from offshore waters. It is also highly probable that the factors responsible for murre deaths in the Gulf of Alaska influenced their distribution and increased their abundance Kodiak waters.

Table 10. Results of annual winter survey for pelagic seabirds and sea ducks from 1991 to 1993.

Species Common Name	1991 Numbers	1992 Numbers	1993 Numbers
American Wigeon	3	0	6
Bald Eagle	94	120	316
Barrow's Goldeneye	710	720	691
Black-legged Kittiwake	3	2	32
Black Oystercatcher	30	106	68
Black Scoter	1998	1980	2134
Bufflehead Duck	66	40	68
Common Loon	1	0	0
Common Merganser	165	11	65
Common Murre	3909	5065	9998
Emperor Goose	12	0	0
Greater Scaup	24	42	6
Glaucous-winged Gull	935	612	1627
Green-winged Teal	10	0	0
Harlequin Duck	1020	1298	1091
Horned Grebe	359	297	212
King Eider	252	640	6
Mallard Duck	47	91	95
Marbled Murrelet	985	1060	761
Mew Gull	764	290	367
Oldsquaw	1814	2158	4567
Pigeon Guillemot	305	237	221
Red-breasted Merganser	897	484	422
Red-necked Grebe	288	285	180
Rock Sandpiper	89	0	76
Steller's Eider	15	280	228
Surf Scoter	293	296	242
Cormorant Sp.	1222	1147	1254
Loon Sp.	243	317	192
White-winged Scoter	981	1180	1103

Marine mammal observations made during the surveys since 1991 are presented in Table 11.

Table 11. Marine Mammals observed during the 1991-1993 annual winter surveys.

Species Common Name	1991 Numbers	1992 Numbers	1993 Numbers
Dall Porpoise	4	2	20
Harbor Porpoise	3	11	10
Harbor Seal	35	13	4
Sea Otter	382	118	278
Stellar's Sea Lion	39	25	37
Fin Whale	0	0	7
Unidentified Whale	1	0	0

A short-tailed albatross and a South polar skua, both species rarely seen in this area, were observed during October on the east side of Kodiak, indicative of the warmer-than-normal sea temperatures' influence on seabird distribution. A more common black-footed albatross was observed by WB Zwiefelhofer on August 19 in Marmot Bay.

6. Raptors: (Zwiefelhofer)

According to the Kodiak National Wildlife Refuge's Migratory Bird Management Plan, 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 historic survey data detailing the number of active nest sites from 1963 to 1982. However, the number of bald eagle nests sites on Kodiak refuge lands has doubled since 1982. The last refuge-wide survey (1992) for bald eagle nesting activity counted 443 occupied nests, 304 occupied nest sites were located during the 1987 survey, and 223 occupied sites were found during 1982. Because of the notable increase in bald eagle nesting effort 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 modify this discrepancy, an additional Very High density strata designation was added in 1993 to the 3 previously existing categories (High, Medium, and Low). Active nest densities for the plot strata in 1993 were:

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
plots with 4 or more active nest sites = Very High

Since the definitions for 2 lower strata remained unchanged and the upper stratum was split, comparisons using the new strata and historic plot strata will be possible by combining the "High" and "Very High" strata. The numbers of plots in the various strata during 1993 were as follows: Low strata - 61 plots; Medium strata - 68 plots; High strata - 47 plots; and Very High strata - 16 plots. A grand total of 192 bald eagle nest survey plots was surveyed on the Kodiak National Wildlife Refuge. The sub-sample sizes for each stratum randomly selected for the 1993 survey were as follows: 8 plots each for the Low and Medium strata, 7 plots for the High strata, and 4 plots in the Very High strata for a total sample of 27 plots.

The initial occupancy survey flights to determine nest location and status were completed on May 14, 17, and 18. A total of 14 hours of flight was expended during the survey. The follow-up productivity survey to determine the status of nests observed to be occupied during the May survey was completed on July 16, 26-28. A total of 11 hours of flight time was required to finish the nest productivity survey.

Surveys were accomplished utilizing the refuge's PA-18 Piper supercub. The initial nest occupancy survey effort was flown by Fisheries Biologist/Pilot T. Chatto, with WB D. Zwiefelhofer as the observer. The productivity survey flight was piloted by J. Patterson with WB D. Zwiefelhofer again acting as the observer.

A total of 174 bald eagle nests, including 78 occupied and 96 empty bald eagle nests, was recorded on the 27 plots surveyed for occupancy during May. Tree nests comprised 51%(n=40) of the occupied nests. Ground, shrub, or cliff nests comprised the remaining 49%(n=38) of occupied nests from all strata. The results (by strata) of the May occupancy survey and the expanded numbers of nests occupied are presented in Tables 12 and 13, respectively.

Table 12. Results of Kodiak NWR bald eagle stratified random plot nest survey conducted during May 1993.

NEST STRATA	TOTAL NO. OF PLOTS	NO. PLOTS SURVEYED	OCC./ACT. NESTS	EMPTY NESTS	TOTAL NESTS
Low	61	8	10	9	19
Medium	68	8	19	15	34
High	47	7	28	32	60
Very High	16	4	21	40	61
TOTAL	192	27	78	96	174

Table 13. Expanded Estimate of Occupied/Active Bald Eagle Nests on the Kodiak National Wildlife Refuge during May 1993.

NEST STRATA	TOTAL NUMBER PLOTS	ESTIMATED NUMBER OF NESTS (90% C.I.)
Low	61	76 (46 to 105)
Medium	68	162 (137 to 187)
High	47	188 (172 to 204)
Very High	16	84 (77 to 91)
TOTAL	192	510 (433 to 587)

All 78 occupied nests located in May were rechecked in July to ascertain the number of young produced. The 69% overall nesting success (54 successful nests) during 1993, was above historic refuge averages (1.1 young per occupied nest and 1.55 young per successful nest). Table 14 presents 1993 overall production results along with historic refuge production data. Tables 15 and 16 summarize the 1993 productivity survey results by strata and displays expanded (90% C.I.) production estimates for the entire refuge, based on the sample plots.

Table 14. Summary of Kodiak Bald Eagle Nest Data.

Year	Empty Nests	Active Not Rechckd	Active W/O Yg	Active W/1 Yg	Active W/2 Yg	Active W/3 Yg	Yg/OccNest	Total Young
1993'''	96	78	24	26	26	2	1.1	84
1992'	436	33	170	112	120	7	0.9	373
1991'''	145	36	28	22	22	0	0.9	66
1990''	380	5	149	108	160	6	1.1	446
1989''	308	3	94	94	134	13	1.2	401
1988'''	119	4	35	57	52	4	1.2	173
1987'	318	94	81	66	63	0	0.9	192
1986'''	92	8	39	47	21	1	0.9	92
1985	25	1	17	23	18	1	1.1	62
1982'	155	197	2	9	14	1	1.5	40
1980	75	11	20	15	10	0	0.8	35
1978	67	9	29	19	4	0	0.5	27
1977	106	17	10	13	20	0	1.2	53
1976	79	17	10	24	7	1	1.0	41
1975'	136	151	18	23	14	0	0.9	51
1974	85	48	14	15	17	0	1.1	49
1973	117	54	21	13	8	0	0.7	29
1972'	135	135	8	8	8	0	1.0	24
1971	9	4	14	13	7	0	0.8	27
1970	31	40	6	14	8	0	1.1	30
1968	68	57	11	8	14	2	1.2	42
1967'	91	109	17	11	26	0	1.2	63
1966'	85	81	15	10	14	0	1.0	38
1965'	91	86	16	12	7	0	0.7	26
1964'	55	48	23	8	13	1	0.8	37
1963'	95	72	27	20	26	3	1.1	81

' = Complete KNWR survey coverage.

'' = Includes Afognak, Shuyak, Whale, Raspberry, Ban, Amook, Uganik, and Spruce Islands plus the north and west sides of Kodiak Island.

''' = Random plot data only.

Note: Occupied and active nest statuses are combined and reported as "active".

Table 15. Results of Kodiak NWR bald eagle stratified random plot productivity survey completed July 1993.

Nest Strata	Nests W/0 Yg	Nests W/1 Yg	Nests W/2 Yg	Nests W/3 Yg	Total Young
Low	3	5	2	0	9
Medium	8	6	5	0	16
High	6	9	12	1	36
Very High	7	6	7	1	23
TOTAL	24	26	26	2	84

Table 16. Expanded Estimates of Number of Young Bald Eagles Produced on Kodiak NWR during 1993 Nesting Season.

NEST STRATA	ESTIMATED NUMBER OF YOUNG PRODUCED (90% C.I.)
LOW	69 (46 TO 92)
MEDIUM	136 (92 TO 180)
HIGH	242 (225 TO 259)
VERY HIGH	92 (83 TO 101)
TOTAL	539 (446 TO 632)

Raptor Mortality: (Zwiefelhofer)

The numbers of dead or injured bald eagles received by or reported to the Kodiak refuge increased in 1993 from 1992. A total of 22 carcasses (or parts of carcasses) was reported or collected during 1993. Although this is a substantial increase from the 8 found in 1992, it is closer to the normal number of annual mortalities reported. The 1992 bald eagle mortality was comparable to the 1989 total and may be closely related to the severity of winter weather. The winter of 1993 was relatively mild with limited snow cover. The mild weather resulted in little or no winter kill of black-tailed deer. The lack of carrion as a food supply may result in larger numbers of bald eagles dying of starvation or other causes. Table 17 summarizes the 1993 mortality results.

Table 17. Summary of 1993 Kodiak bald eagle mortalities.

AGES	CAUSE OF DEATH	LOCATIONS FOUND
	15 - Unknown	10 - Local Area
15 Adults	2 - Electrocuted	5 - Village Areas
7 Subadults	1 - Powerline Strike	2 - Remote Refuge areas
	1 - Entangled in fishing net	5 - Remote Off-refuge areas
	1 - Starvation	
	1 - Gunshot	
	1 - Severe injury; Euthanized	

One report of an injured subadult bald eagle along the road near Kodiak turned out to be something entirely different. When refuge staff arrived at the reported location, a large brown bird was observed walking (rather strangely for a bald eagle) along the side of the road. The "injured eagle" turned out to be a game farm turkey that a local resident had released, foraging along the roadside for gravel.

7. **Other Migratory Birds**: (Zwiefelhofer)

An indication of the early spring phenology during 1993 was evident from a report by a local big game guide. The guide observed a nest of 5 newly hatched northern shrikes May 4. By May 13, all but 2 of the shrikes had fledged. The remaining 2 birds were fully feathered and sitting in the nest tree.

8. **Game Mammals**:

a. **Brown bears**: (Barnes)

General:

Habitat conditions for brown bear on the Refuge were good in 1993. Despite ever-expanding recreational use, much of the refuge is de facto wilderness and represents optimum brown bear habitat. In general, spawning runs of salmon were strong and the berry crop was probably the best in the last 10 years. Important issues affecting brown bears during the year were the bear viewing program, the public use management plan, compatibility, and land acquisition.

Aerial Surveys:

Counts of bears congregated along salmon-spawning streams were conducted from 18 July through 9 August. Six complete surveys of the standard streams yielded counts that ranged from 118 (18 July) to 38 (8 August). Overall, peak counts were below normal and timing of peak concentrations was atypical. An important influence on stream surveys this year was extremely low escapement of chum salmon into Sturgeon and East Sturgeon Rivers. Peak counts on both rivers (15 bears) were one-third to one-half of normal. Concurrently, abnormally high and early bear concentrations were noted on Red Lake streams. Counts on Connecticut Creek on 18 and 19 July (64 and 67 bears, respectively) were the highest recorded in 33 years. Also, peak counts on Connecticut Creek usually are recorded around the first of August. Results of past radio-tracking studies indicate that poor escapement of chum salmon in the Sturgeon Rivers caused bears to move to the Red Lake system. High abundance of berries probably contributed to below-average bear counts in August.

Composition of bears observed during surveys (n=519) was as follows: single bear - 47%, Maternal female - 17%, new (<1yr) cubs- 13%, old (>1yr) cubs - 23%. These values are within the normal range for all classes.

Stream surveys were also initiated on Aliulik Peninsula (eastside Kodiak) in 1993. This work was done to complement population studies conducted in the area (see research). Stream surveys have potential for cost-effective population monitoring on Aliulik Peninsula because the open habitat is conducive to good sightability and also because streams in the area are noted for strong and consistent runs of pink salmon. Five surveys of 3 streams were conducted from 30 July to 8 August, and results were encouraging. Counts were consistent, ranging from 27 to 33 bears, and composition of single bears (47%), maternal females (16%), and cubs (37%) was comparable to that recorded on standard surveys conducted on southwest Kodiak Island.

Mortality:

Total reported mortality from within Refuge boundaries was 131 in 1993 (Table 18) and included 126 animals harvested during spring and fall sport seasons, 2 animals killed in defense of life or property (DLP), and 3 animals that died from natural or unknown causes. The 2 DLP's, one by a deer hunter and one by a bear guide, represented the lowest number in that category since 1983. The 1993 sport harvest continued the relatively stable harvest pattern that has prevailed since 1984. (Figure 6).

Table 18. Reported Brown Bear Mortality
on Kodiak National Wildlife Refuge, 1984-1993

Source				
Year	Sport	DLP*	Other**	Total
1984	131	4	3	138
1985	125	11	8	144
1986	121	12	8	141
1987	120	7	9	136
1988	128	3	6	137
1989	125	4	8	137
1990	116	6	2	124
1991	115	4	2	121
1992	124	6	2	132
1993	126	2	3	131

*Defense of Life or Property
**Includes mortality from natural or unknown causes and accidental study deaths.

The harvest on Refuge land comprised 75% of the harvest for GMU 8 (Kodiak Archipelago). Seventy percent of the harvest on Refuge land occurred during the spring season and, for both seasons combined, female composition was 36%. The number of trophy class males (≥ 28 inch skull measurement) taken during spring and fall seasons was 10 and 5, respectively.

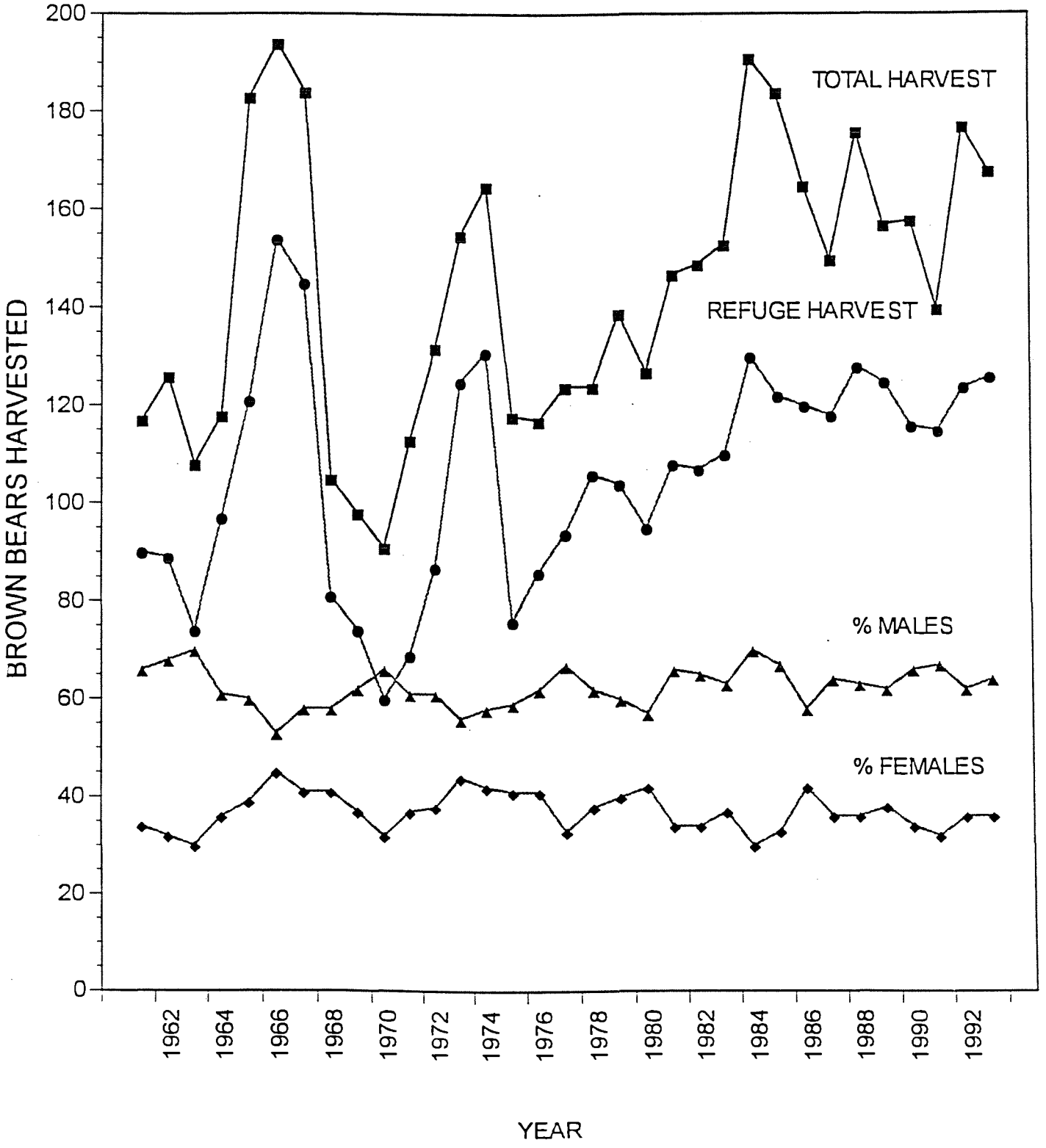


Figure 6. Brown bear harvest on Kodiak Island from 1962-1993.

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 1980's, the black-tailed deer on Kodiak Island experienced high growth and expansion rates, peaking by mid-decade. From 1985 to 1991, a series of severe winters produced high winter mortality among the various deer herds. This, along with increased hunting pressure, eventually led to decreased bag limits for deer harvest in non-refuge areas.

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 type of information has never been quantified or qualified with accurate and comprehensive refuge data.

The deer survey work begun in 1992 was the initial effort toward gathering this data for the Kodiak NWR. Black-tailed deer ground counts and mortality surveys were continued on Refuge lands in 1993, and were expanded to include mortality surveys through the winter months. The reason for conducting mortality surveys through the winter months was to document any mortalities that may have been missed during spring-only mortality surveys. Black-tailed deer ground counts and mortality surveys were accomplished in 1993 using the Refuge's 48 foot M/V URSA MAJOR II, and 206 amphibious float plane. The following report summarizes information collected during the 1993 field season, describes the refinements in the field techniques used, and provides suggestions and management recommendations.

Survey Area Habitats:

Habitat types for the ground count/mortality survey areas were similar to the 1992 areas and included a vegetative canopy cover of alders, birch or willows less than 9 meters in height. An overstory of cottonwood trees greater than 9 meters, in addition to the aforementioned brush/shrub species was found in East Arm of Uganik Bay, and north Sitkalidak Strait areas. All areas are interspersed with tall grass and low shrub habitats.

Olga Bay and Kempff Bay are characterized as Bristol Bay/Tundra type habitats, and include low growing alder, willow, and dwarf birch shrubs less than 2 meters in height. Bearberry, moss, lichens, other matted forbs, muskeg and tundra-type grasses are set in a topography with many wet shallow potholes or depressions and low-lying hills.

Ground Counts:

Deer ground counts were completed in seven different locations during 1993. On the west side of Kodiak Island, Chief Cove north (CCN), Chief Cove south

(CCS), Uganik Island northwest side (UGI), East Arm Uganik Bay tidal flats north side (EAU); and on the east side, North Sitkalidak Strait (NSS) were all counted both in 1992 and 1993. On the south end of Kodiak Island, Olga Bay (OGB), and Kempff Bay (KEB) had ground counts completed in 1993 where only mortality surveys were conducted in 1992.

Count methods were similar to those used in last year's surveys. Teams of two scan-counted areas from a fixed observation point using 20X to 60X spotting scopes. The total number of deer per scan was recorded and general locations of deer sightings were plotted on maps. Scans took between 45 and 90 minutes to complete. Scan coverage was from the edge of the salt water to 500 meters elevation. Other information recorded during the counts included weather conditions, visibility, snow cover, general habitat types, and general deer behavior.

The observation points were reached by foot and ranged from sea level to 450 meters in elevation. The observation point at East Arm Uganik was moved from Packer Spit to the southwest shoreline side of the tidal flat to allow for maximum coverage of this area. The Olga Bay observations were made from the northwest corner of Olga Bay on a southwest-facing slope approximately 150 meters in elevation. Kempff Bay observations were made from a northwest-facing slope on the north side of the bay at 15 meters elevation. All other observation points were similar to 1992 locations.

The primary observers for this field season were Wildlife Biologist Stovall, and Biological Technician Johnson. They were assisted by staff Wildlife Biologist Zwiefelhofer, Maintenance Worker Lanahan, and Volunteers Stan Ness, Mirjam Wuerth, and Urs Roth. Some of the less experienced observers had difficulty spotting animals in areas that did not have snow cover. Although the problem diminished with practice, it may have affected the quality of data gathered during January and February in the Chief Cove North and North Sitkalidak areas.

Results from all the ground counts have been summarized in Table 19. The mean number of deer reported in the table is the result of the total number of deer counted during all completed scans in the designated count area, divided by the total number of completed scans. The total square kilometer area of the ground count sites shown in this table is a gross estimate of the amount of area observed and does not account for portions that were not visible, such as ravines and thick clumps of brush.

Replicate counts were completed January 9 and February 22 at CCN and CCS; January 12 and February 19 at EAU and UGI; and February 8 and 28 at NSS. Single counts were completed at OGB on March 2, and KEB on March 6. On March 14, CCN was counted for a third time.

Table 19. Results of winter ground counts for Sitka black-tailed deer during 1993.

COUNT SITE	AREA (SQ. KM.)	#SCANS	HIGH COUNT/AREA	MEAN # DEER/AREA	DEER /SQ. KM.
*CCN	6.19	8	160	35.0	5.65
CCS	4.58	10	30	7.6	1.66
UGI	2.43	12	68	23.2	9.55
EAU	5.13	9	40	15.0	2.92
*NSS	4.05	9	62	15.8	3.90
OGB	9.00	2	80	61.0	6.78
KEB	4.40	2	38	34.0	7.73
TOTAL	35.78	49	478	191.6	**5.35

CCN = CHIEF COVE NORTH
CCS = CHIEF COVE SOUTH
UGI = NORTHWEST UGANIK ISLAND
EAU = EAST ARM UGANIK BAY
NSS = NORTH SIDE OF EAST SITKALIDAK STRAIT
OGB = OLGA BAY WEST END
KEB = KEMPFF BAY
* = Four scans from these areas not used in data analysis.
** = Result of total mean deer counted divided by total square kilometers of the ground count areas.

The 1993 field season data were heavily influenced by the mild winter weather. Ground counts were difficult due to lack of snow cover in deer wintering areas. The mild winter weather also enabled the deer to spread up into the higher elevations, making them hard to spot and resulting in lower counts than in 1992.

Mortality Surveys:

Deer mortality surveys were conducted in the same seven areas where the ground counts occurred. To avoid disturbance of deer during the ground counts, mortality surveys were conducted on the following day. A total of 16

mortality surveys was completed along 28.5 kilometers of survey routes. Seven survey routes with 55 waypoints were established using hand held GPS units. These routes and associated waypoints were walked by teams of two. The first team member navigated the predetermined route between waypoints using the GPS unit. The second team member walked a zigzag pattern 30-60 meters wide, and on either side of the navigator (depending on the terrain) searching for carcasses and recording all carcass data. Surveys were conducted from coastline to approximately 200 meters up slope and were unidirectional.

Mortality surveys were completed on January 10, 13, February 20 and 23 at CCN, CCS, UGI, and EAU; February 9 and March 1 at NSS; March 3 at Olga Bay, and March 7 at KEB. In the core Chief Cove area the annual cooperative mortality survey was completed with ADF&G Biologist R. Smith on April 12 and 13. Uganik Island and East Arm Uganik were also surveyed on May 5, similar to the time these surveys were completed in 1992. All personnel involved with the ground counts also did the mortality surveys.

Information collected included: approximate GPS carcass coordinates, distance from beach, carcass condition, sex and age when possible, and bone marrow appearance. Any remains with enough bones, fur and skin to positively identify the carcass as black-tailed deer were designated as "found" carcasses. "Old" carcasses were those characterized by green moss growth, bleached bones and/or were covered with leaf litter. All other carcasses found were considered to be "new" carcasses, or this year's winter mortalities.

Only four new carcasses were found during surveys this year. Only one of the mortalities could be attributed to winter starvation (North Chief Cove core area). The other three carcasses were suspected to be hunter killed, as they were found in Kempff Bay (close to the village of Akhiok) and the bone marrow for all three was white and firm indicating a healthy animal at death. The starvation death at Chief Cove was found in April. No new carcasses were found during the January, February or March surveys.

The number of new carcasses per kilometer for all areas was 0.14 in 1993, compared to last year's 9.3 new carcasses per kilometer. A total of 122 old carcasses was recorded during mortality surveys this year.

Table 20. COMPARATIVE RESULTS OF DEER MORTALITY SURVEYS FOR 1992 and 1993

SURVEY AREA	# OF NEW CARCASSES 1992	# OF NEW CARCASSES 1993	TOTAL LINEAR KM	CARCASS/KM 1993
CCNa	64	1	5.60	0.17
CCNb	0	0	2.30	0.00
CCSa	45	0	4.00	0.00
CCSb	0	0	2.75	0.00
UGI	13	0	2.40	0.00
EAU	69	0	2.75	0.00
NSS	11	0	3.15	0.00
OGB	5	0	3.44	0.00
KEB	11	3	2.11	1.42
TOTAL	218	4	28.50	0.14

a = Area surveyed in 1992 and 1993 with ADF&G
b = Area only surveyed in 1993

The one winter starvation carcass was found south of Humpy Creek in the core Chief Cove area, and was a fawn of unknown sex. It was located near a large beaver pond 15 meters from the coastline. This carcass had been partially consumed by unknown scavengers and only a few bones, fur, skin, and the lower jawbone were found. The bone marrow was red in coloration and gelatinous.

Of the three new carcasses found at Kempff Bay, one was on the beach at the head of the bay and the other two were found 90 meters inland. The bone marrow coloration was whitish, firm and fresh. The skulls were missing from all carcasses so sex could not be determined. However, the overall size of the carcasses and the jawbones indicated that they were fawns.

During the mortality surveys, elderberry clumps were examined for browse utilization by black-tailed deer. Clumps of debarked elderberry stems were categorized as: low (<30%), medium (30-75%), or severe (75-100% of the stems completely debarked per clump). Other browse vegetation within the areas walked during mortality surveys was subjectively characterized by general browse amount (or use) as low, medium or high. The results are as follows:

CCN - Medium to severely browsed elderberry, high utilization of other browse species.

CCS - Severely browsed elderberry, and high utilization of other browse species.

UGI - Medium browsed elderberry, and medium to high browse of other species.

EAU - Medium to severely browsed elderberry, and medium browsing of other species.

NSS - Low to medium debarked elderberry, and medium browsing of other species.

Deer browse observed within the mortality surveyed areas of Olga and Kempff Bay was moderate to heavy. Deer activity within these areas was centered within the low growing shrub areas. These habitats provided sufficient escape, hiding and feeding cover, protection from wind and weather and are ideal bedding areas. During the mortality survey in Olga Bay, over 60 deer were flushed out of this habitat as surveyors walked by or through these habitats.

Summary and Recommendations:

The mild winter weather in 1993 contrasted with the moderate to severe winter of 1992 and is apparent in the mortality survey results from the two years (Table 21). In Figure 7, the comparison of the ground counts does not show the true population status of the deer. The mild winter weather of 1993 will probably allow deer numbers to increase. The 1992-1993 ground count results contrast deer behavior during mild and severe winter weather. In mild winters deer tend to spread out over the higher elevations, and severe winters tend to concentrate them in the lower elevations.

The lack of long periods with deep snow cover contributed to very little deer winter mortality due to starvation. The deer herds apparently overwintered in good condition. A two-week early spring green up provided additional sources of forage, and further decreased deer winter mortality.

The data from two years of field work indicate that winter weather directly effects deer distribution, and does influence their population status and levels. Winter weather may have an indirect effect on wintering deer habitats and ultimately on the carrying capacity of these lands for deer.

In an effort to better understand deer population fluctuations and their relationship with critical wintering habitats, additional quantifiable browse surveys will need to be done in wintering areas. Other habitat use data recommended for collection includes the construction and monitoring of exclosures within selected deer winter range areas. These will assist in determining any long term habitat vegetation changes that may be caused by deer. Seasonal deer fecal pellet collections will also be made in these critical habitat areas to analyze plant utilization by deer. It is recommended that remote weather stations be placed in key deer wintering habitat areas to monitor winter weather severity or lack of it. This information, when used in conjunction with winter mortality information, could be useful in predicting pre-hunting season deer population levels.

Figure 7.

COMPARSION OF WINTERING AREAS ON KODIAK NWR FOR 1992 AND 1993

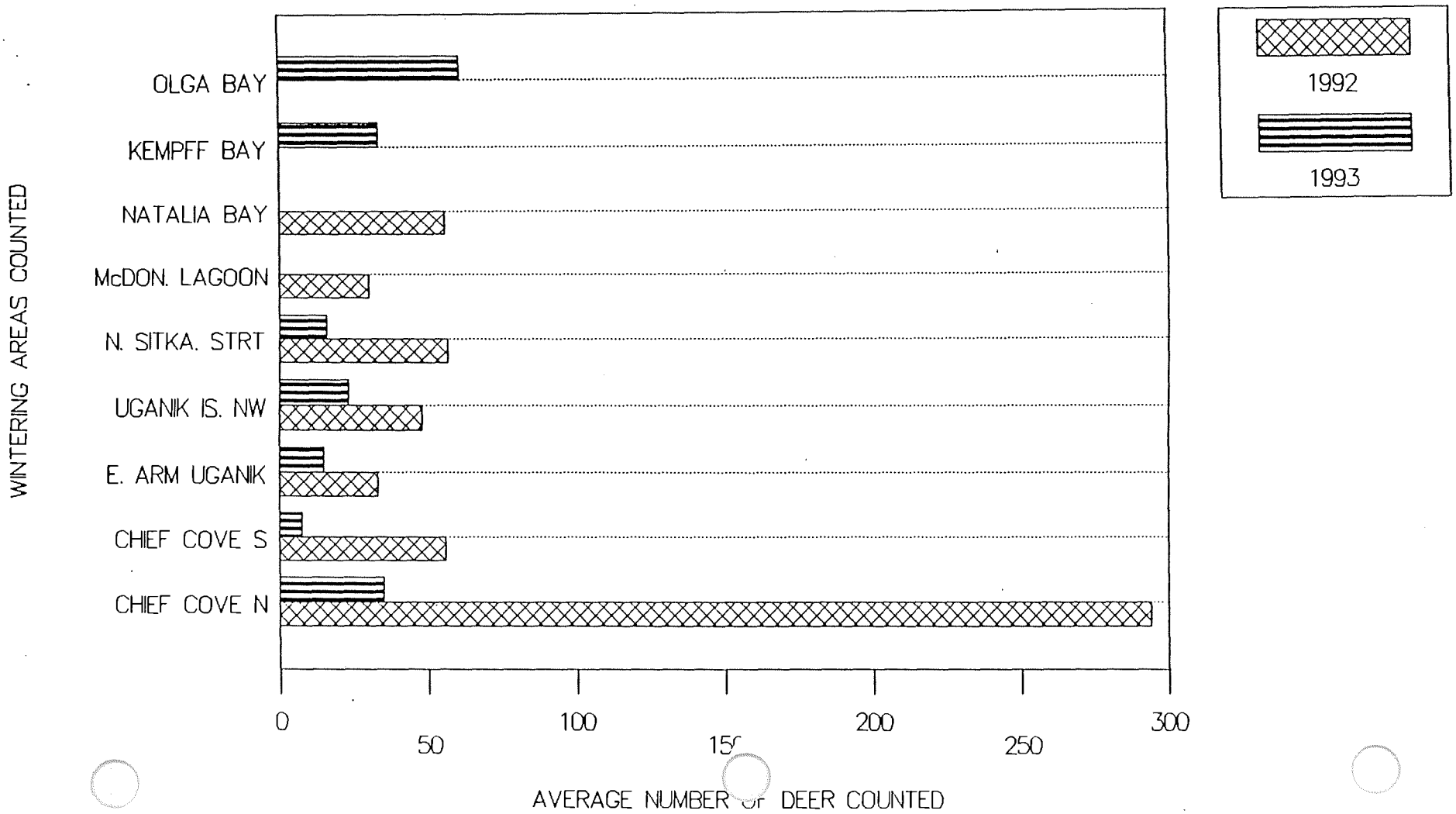


Table 22. Annual sex and age composition of deer winter mortalities for Chief Cove, 1988-93, as prepared by ADF&G big game biologist Roger Smith.

Survey Year	Number of Adults	%	Number of Yearlings	%	Number Fawns	%	# Age Unknown	Total
1988*	8 (5M,1F)	21%	4 (3M)	11%	30 (6M,6F)	79%	10	52
1989	16 (13M)	10%	6 (2M, 4F)	4%	98 (41M, 29F)	58%	41	161
1990	34 (8M, 12F)	31%	0	0%	77 (8M, 7F)	69%	1	112
1991	-----	---	-----	---	-----	---	8	8
1992	14 (6M, 5F)	16%	17 (16M, 1F)	19%	59 (25M, 20F)	66%	19	109
1993	-----	---	-----	---	1 (UNK)	---	---	1
Total	72 (32M, 18F)	20%	27 (21M, 5F)	7%	265 (8M, 62F)	73%	79	443

On April 7, 8 and 9, WB Stovall, BT Johnson, and graduate student Jeff Selinger attended the ADF&G sponsored Sitka black-tailed deer workshop held at the Buskin River Inn in Kodiak. Various papers and reports were presented, including Selinger's talk on winter food habits of deer on Kodiak Island. This was the first gathering of deer and elk biologists in the state since 1978.

c. Subsistence: (Stovall)

The Federal Subsistence Regional Advisory Councils become operational this year with the acceptance of their charters in January, and the selection of the Regional Advisory Council members in April. On July 11, the Secretary of the Interior announced the appointees to the Federal Subsistence Regional Advisory Councils. These councils will provide a regional forum for gathering information from rural Alaskans and making recommendations on subsistence uses of fish and wildlife to the Federal Subsistence Board.

The first public meetings and training for the Kodiak/Aleutian Islands Regional Advisory Councils were held in September at Kodiak. In attendance were: Regional Advisory Council Coordinator Helga Eakon (Federal Subsistence Management Office), Jim Kurth (DARD Subsistence), John Borbridge (BIA Staff Committee), Moses Kirk (Subsistence Publication), Ron Thuma (Social Scientist), and Robert Willis (Biologist). ADF&G staff present at the meeting included Roger Smith, Allen Quimby, Larry Allen, and Lisa Scarborough. WB Stovall and ARM Munoz attended for Kodiak Refuge and Robert Schulmeister for Izembek Refuge. During the two days of meetings, Regional Advisory Council officers were elected, proposals for changing Federal Subsistence Regulations were discussed, council members were trained on the Federal Subsistence Management Program and the first public meetings were held.

From March 30 through April 1, WB Stovall assisted State of Alaska Subsistence office personnel with the Akhiok Village Harvest Survey. This survey (similar to last year's Kodiak Road System Harvest Survey) gathered information by interviewing members of 20 Akhiok Village households and included mapping out areas where villagers hunted deer during 1992. The survey included all subsistence-harvested resources during 1992, with a State emphasis (special form) on sea lions and seals. The State subsistence office will provide the completed report.

On November 23, WB Stovall attended a training session for sea lion and seal harvest surveyors on Kodiak Island. Surveyors are employed by the ADF&G Subsistence division and are part of a 2-year program to gather harvest and use data for these two species groups. A technical paper outlining the 1992 sea lion and seal harvest results was given to the Refuge at this training session.

The 1993-1994 Subsistence Management Regulations contained a major change for federal lands, proposed by the Refuge. According to the Federal Subsistence Regulations, "Unless restricted in the regulations in this booklet or unless restricted under the terms of a subsistence fishing permit, fish may be taken

at any time." This provision allows subsistence fishing on federal lands during all hours of the day as opposed to the State's 6am to 9pm limitation. Proposals submitted by rural residents regarding proxy harvest of fish and shellfish were addressed by ADF&G in a letter included in the subsistence fishing permit mailing. The letter states that, provided they record the extra take on their permits, subsistence permittees will be allowed to harvest fish and shellfish for other subsistence users. The State also enacted a proxy hunting law that allowed resident hunters to harvest deer, caribou and moose for other resident hunters. The process of customary and traditional use determinations for subsistence hunting of Kodiak Brown bear and elk is ongoing at the Federal Subsistence Management Office level.

In a similar action to the State's proxy hunting law, the Refuge submitted a proposal to allow a designated hunter provision in the Federal Subsistence Regulations. This proposal was adopted by the newly organized Kodiak/Aleutian Islands Regional Advisory Council and was resubmitted by them to the Federal Subsistence Board for consideration in the 1994-1995 regulations.

A letter from the Subsistence Management Office signed by the Regional Director was sent to the Coast Guard explaining the reasons why the Kodiak Coast Guard base was not included in the federal subsistence fishing regulations. This was sent in response to a letter from the Commander of the Coast Guard Base Kodiak requesting clarification on this subsistence fishing matter.

9. **Marine Mammals:** Nothing to report.

10. **Other Resident Wildlife:** (Stovall)

a. <u>Mountain Goats</u>:

ADF&G big game biologist Roger Smith reported that preliminary harvest surveys for 1992 were as follows:

UNIT	TOTAL HARVEST
471 (Off Refuge)	9
472 (Off Refuge)	5
473 (Part Refuge)	4
474 (Part Refuge)	7
475 (Refuge)	7
476 (Refuge)	8
477 (Refuge)	7
TOTAL	47 (29 males, 18 females)

This total is nine higher than the 1992 harvest, when 22 males and 16 females were reported by hunters to ADF&G. Results of composition counts conducted in August of 1993 were 238 adults and 54 kids, for a total of 292 animals. Areas surveyed were off the Refuge.

b. Roosevelt Elk:

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 125-140. Radio-collared elk in this herd (one collared in 1989 and two in 1992) were tracked this year. A count of 119 elk was recorded in 1993 surveys conducted by Smith. Total composition estimate for all of Afognak Island was 746 animals.

Estimates and actual counts for the Waterfowl Lake herd since 1989 are as follows:

YEAR	TOTAL ELK OBSERVED	MAXIMUM ESTIMATED POPULATION
1989	413	500
1990	231	475
1991	167	285
1992	128	150
1993	119	140

The refuge portion of Afognak Island will remain a registration hunt. The season opened on October 10. Total harvest for Afognak and Raspberry Islands was 85 animals, 13 of which were killed on the Refuge portion of Afognak Island.

c. Reindeer:

Funding was not available for censusing the refuge's remnant reindeer herd in FY93. These reindeer, originally introduced to Kodiak Island as a domestic herd, are now regulated as feral caribou by the state of Alaska and year-round 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. On July 20, BT Johnson counted a herd of reindeer during waterfowl production surveys in the upper Ayakulik River drainage. A high count of 324 animals, including approximately 50 calves, was recorded.

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. These 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 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 1993 the estimated total indexed salmon returns to the refuge (including conveyed 22g lands) for chinook, sockeye, coho, pink and steelhead were at or above refuge management objectives for these species (Figure 8). The estimated total indexed return for chum salmon was only 60 percent of the minimum desired level. This phenomenon was observed in numerous other chum salmon production areas in the State, particularly the Yukon River in 1993. The cause of the poor returns is unknown at this time.

a. Salmon Escapement:

Total numbers recorded at five ADF&G fish counting weirs as well as data from repeated aerial index surveys on an additional 46 streams were used to monitor salmon escapement on the refuge in 1993. The escapement index for sockeye, coho, pink and steelhead in 1993 is at or above the 1981-85 baseline goal outlined in the refuge Fishery Management Plan (Figure 9). Indexed escapement of chum salmon in 1993 was only 26% of the 1981-85 average. The information in Figure 9 does not represent any variation for individual streams on the refuge, but does present an overview of escapement. The escapement index of coho in some areas, such as the Ayakulik and the Sturgeon Rivers, was below that observed in previous years. Fall survey conditions in these areas during 1993 was not good due to inclement weather and high water.

The 1993 index of downstream migrant adult steelhead (kelt) through fish weirs in May and June is used as an index of the previous fall-winter escapement. Figure 10 shows the estimated return of steelhead for related in 1993. The 1992\93 total steelhead return is estimated at approximately 8850 fish, which is within management guidelines. This estimate is predicated on an overwinter survival rate of approximately 50-67 percent, based on studies conducted by the refuge and ADF&G.

Figure 8.

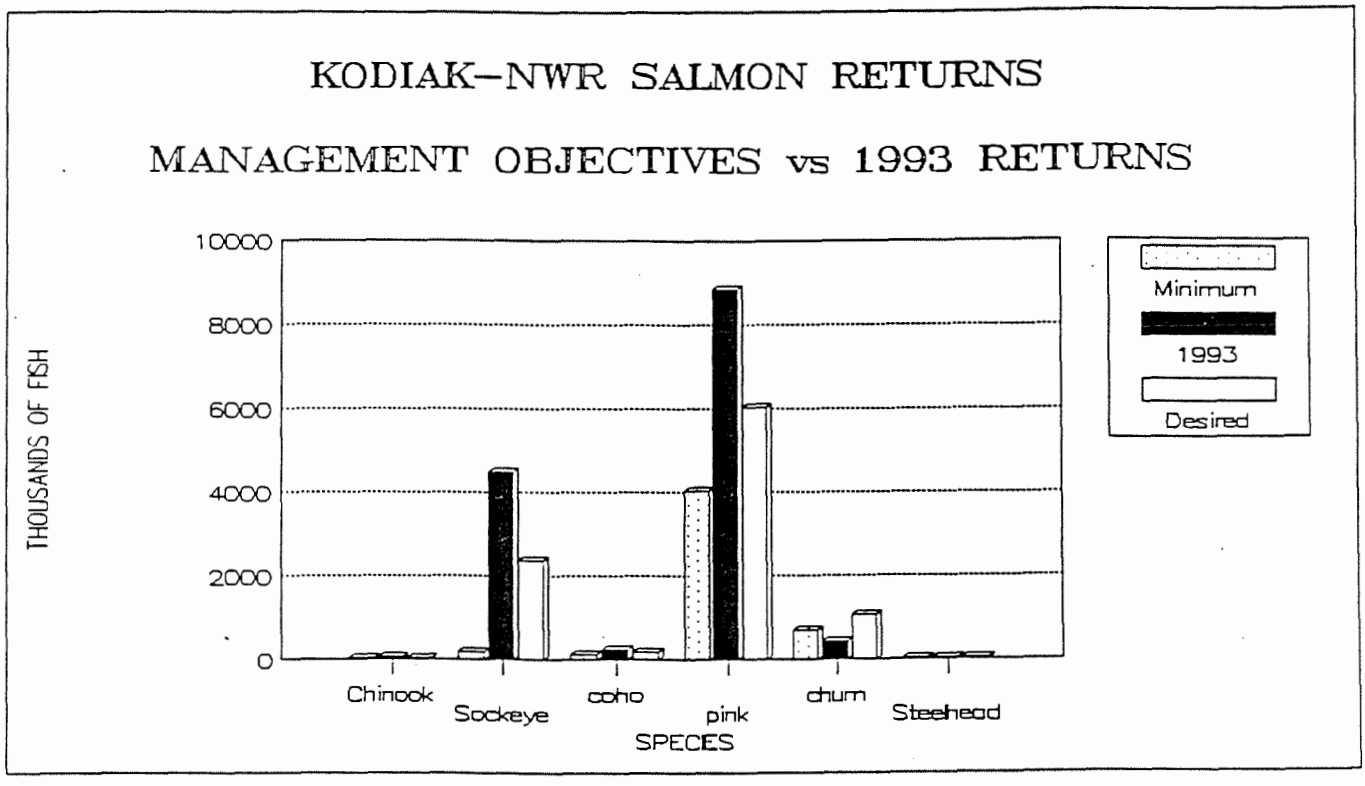


Figure 9.

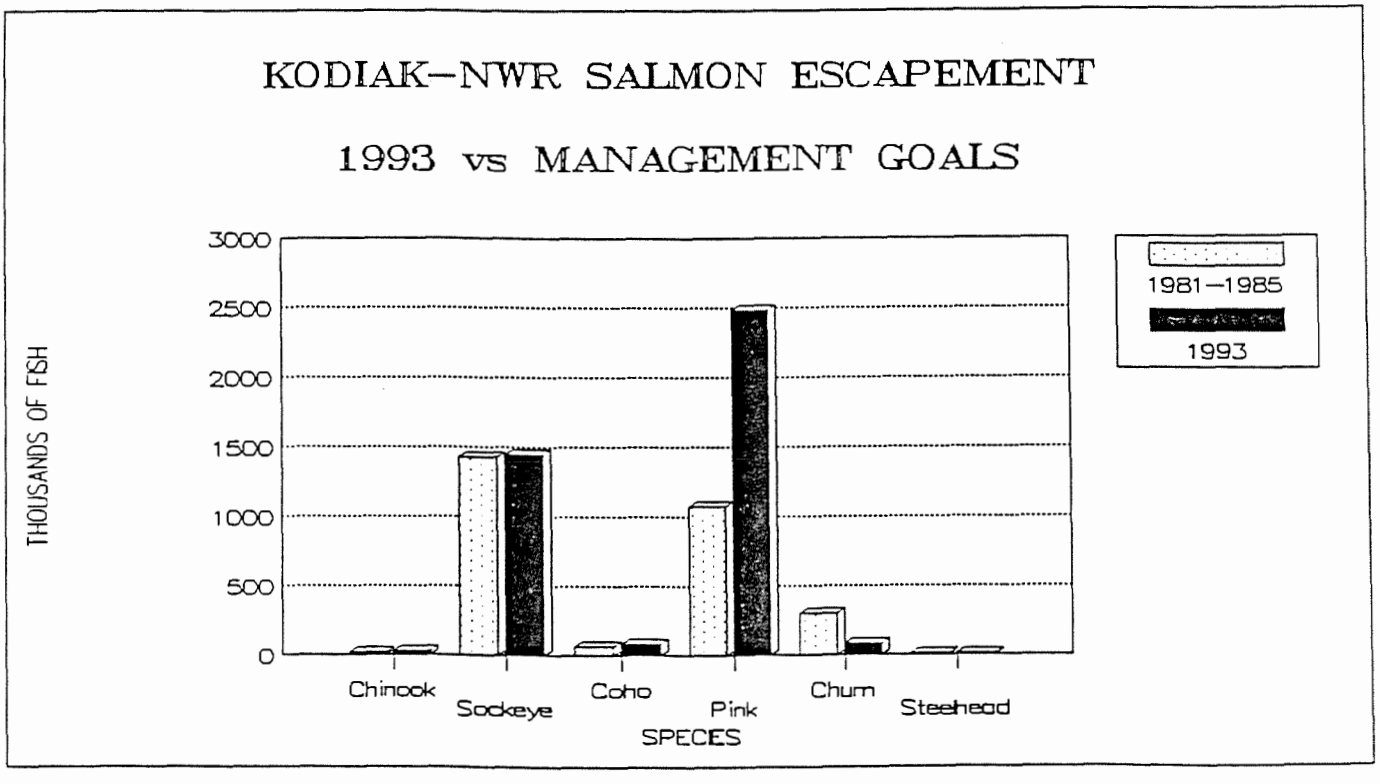


Figure 10.

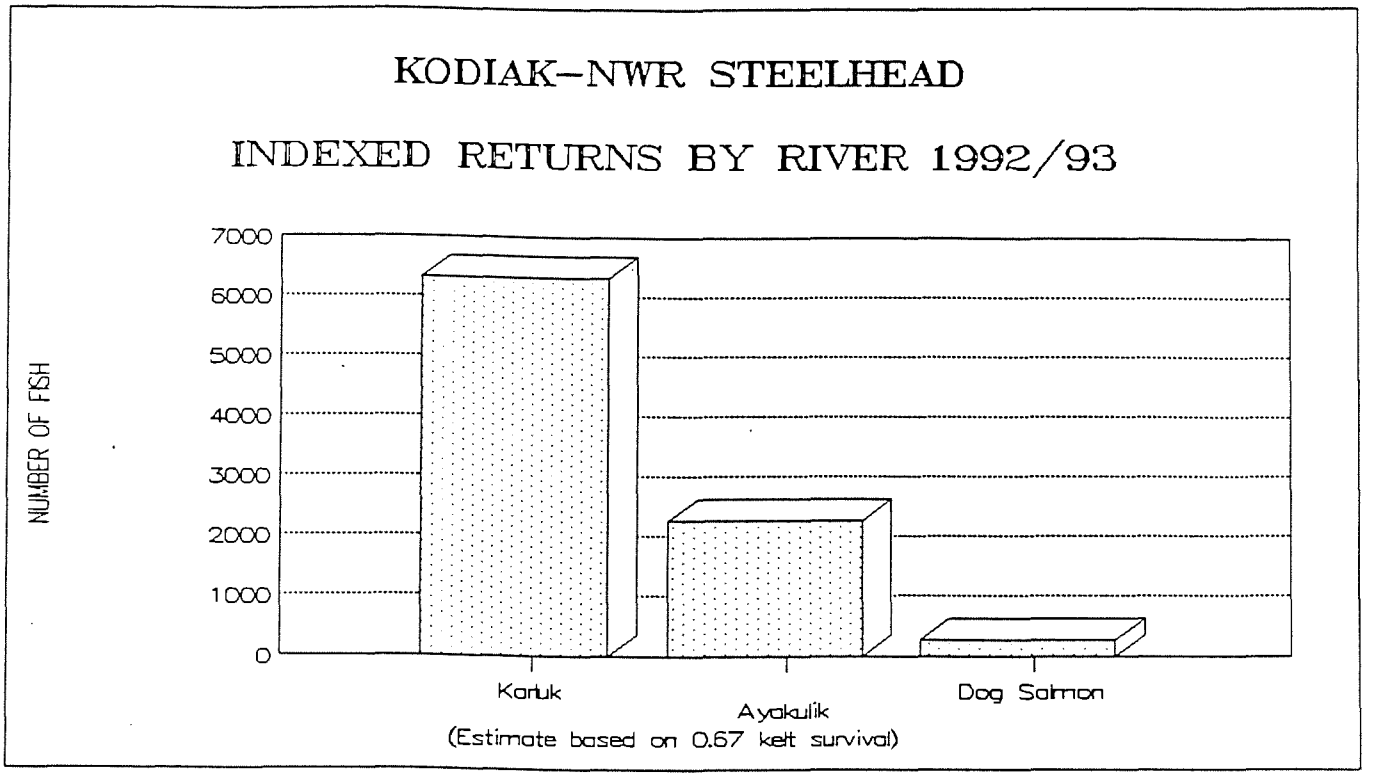
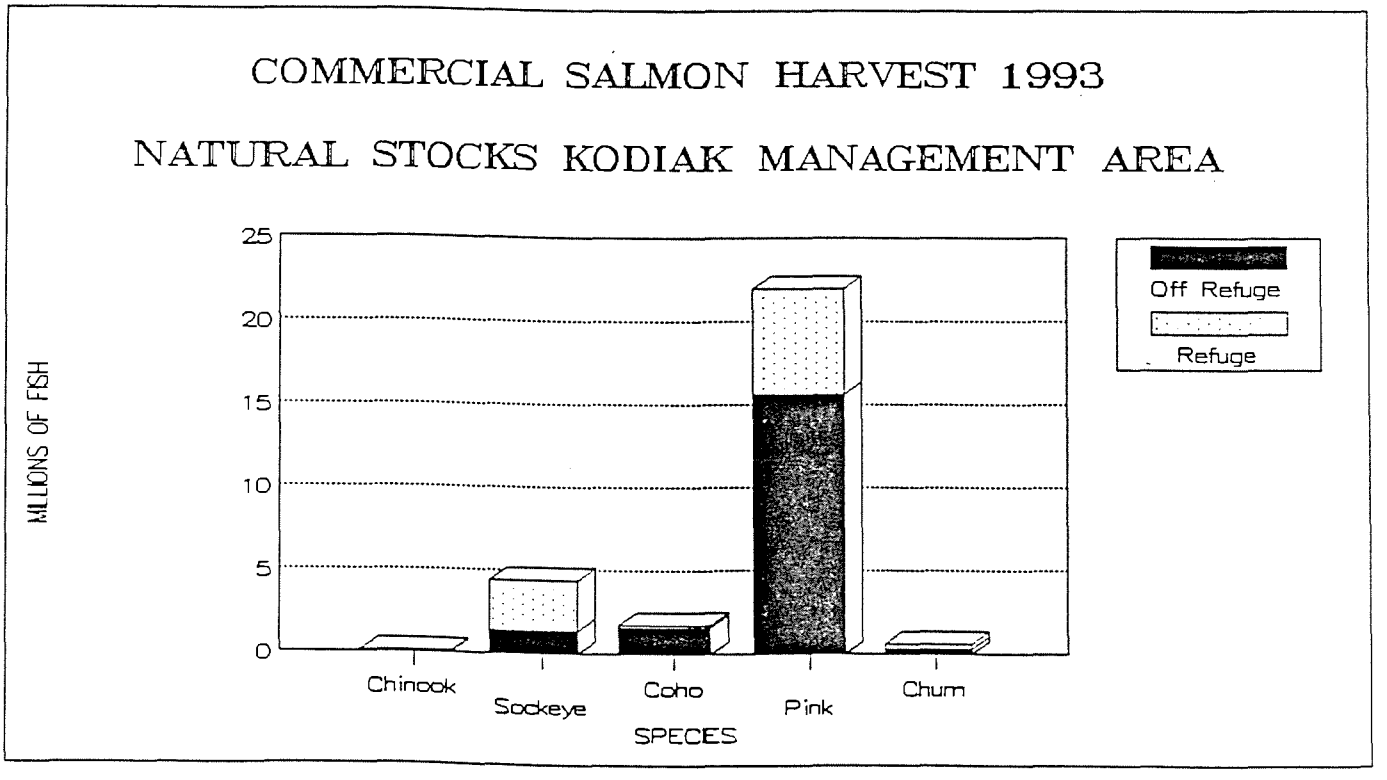


Figure 11.



b. The Commercial Fishery:

The commercial fishery in Kodiak is regulated by the ADF&G. In 1993, the total harvest in the Kodiak area was approximately 27.2 million salmon worth an ex-vessel value to fisherman of approximately 28.4 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 9.9 million fish (Figure 11) worth approximately 19.2 million dollars ex-vessel value. These fish are harvested in bays and nearshore areas surrounding the refuge by commercial fishermen using purse seine, set net and beach seine gear.

The commercial harvest of refuge based stocks in 1993 was approximately 110 % greater than the 4.76 million fish observed in 1992, but the ex-vessel value paid to commercial fishermen in 1993 particularly for pink salmon was less than half of the 1992 price. As in past years, the catch of sockeye and pink salmon dominated the harvest of refuge-based fish.

c. 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 managed 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 1993 a total of 19 sportfishing guides operated under permit on the refuge and their clients expended 1005 angler days fishing. The majority of the total angler use in 1993 occurred in the Dog Salmon (14%), Uganik (16%) and the Ayakulik (68%) River drainages (Figure 12). Fishing occurred between June and November with peak effort (430 angler days) in June through mid-July for king salmon on the Ayakulik River drainage. With the exception of the Ayakulik River, guided use in 1993 was similar to previous years (Figure 12).

Figure 12.

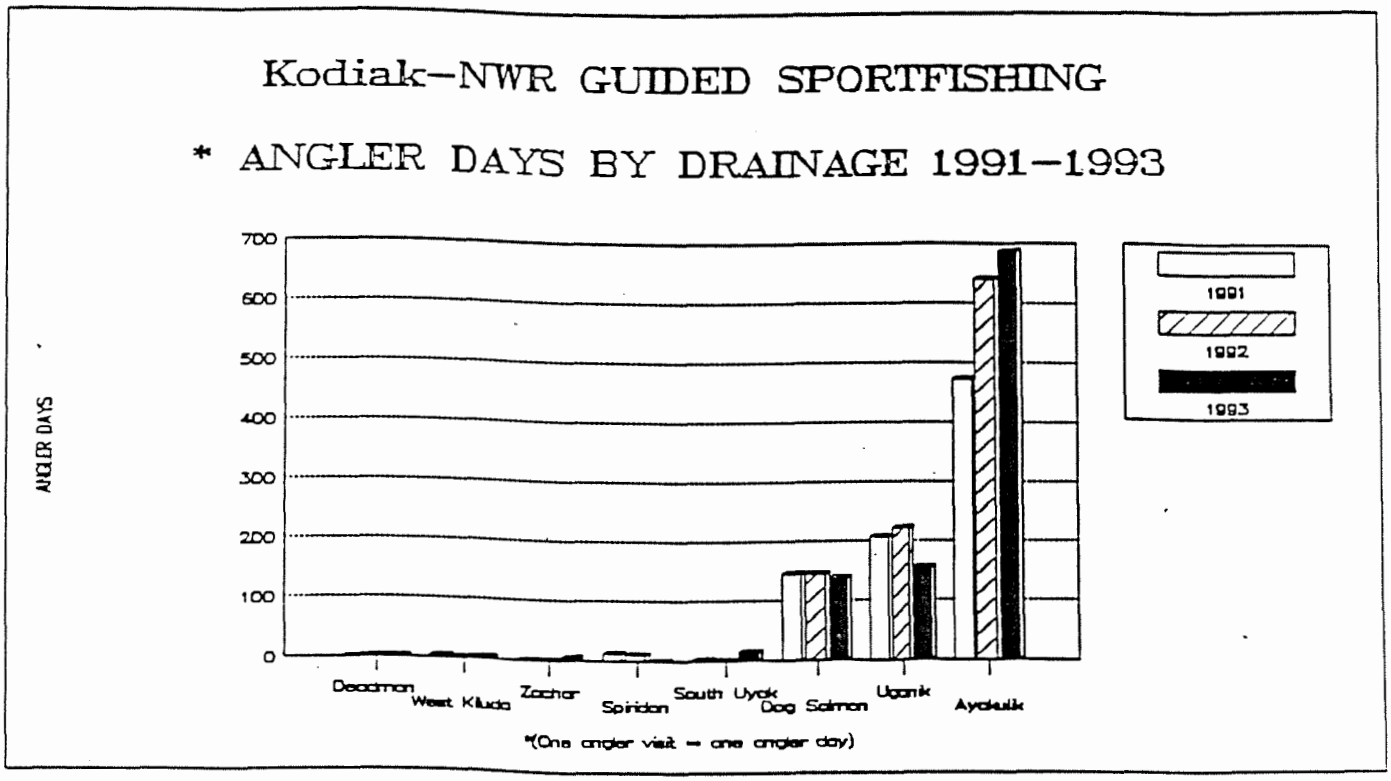
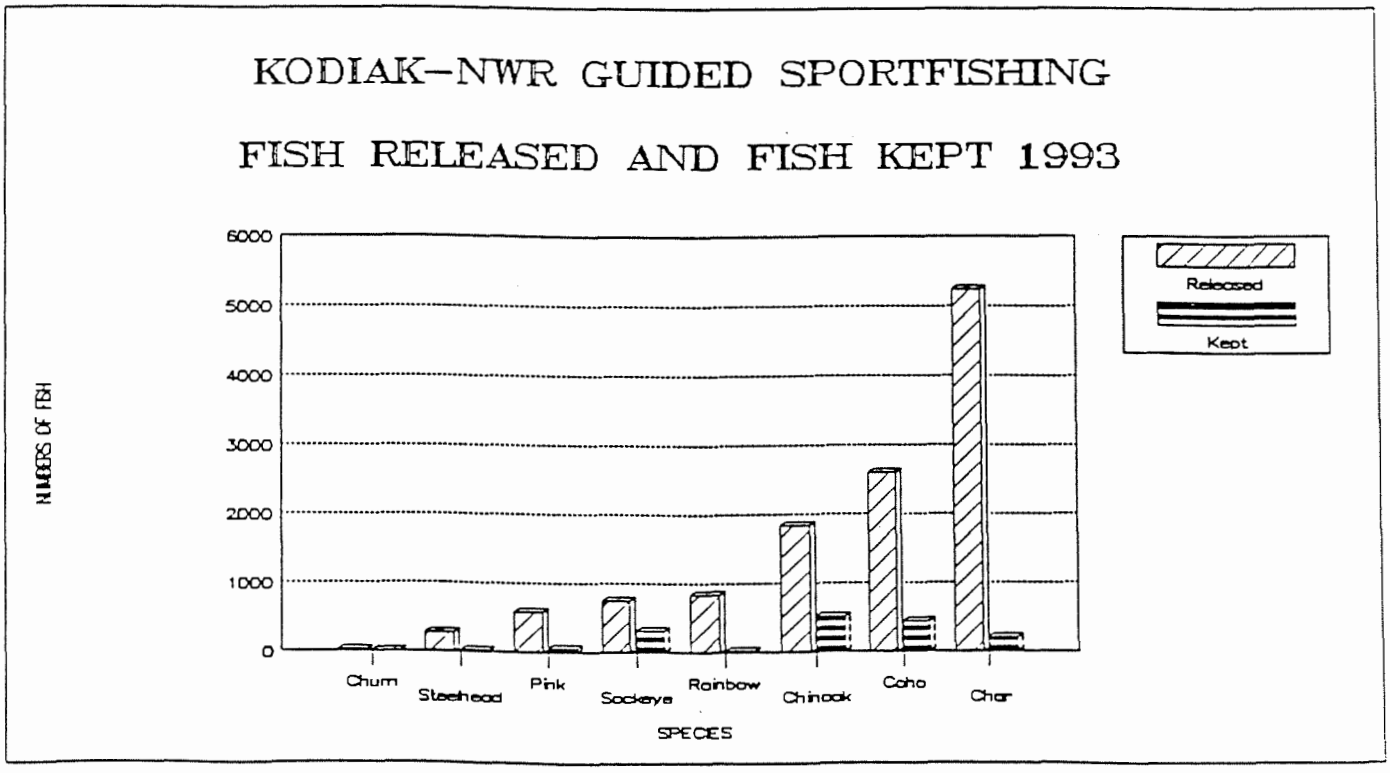


Figure 13.



Total guided angler catch for 1993 is depicted in Figure 13, the highest number of fish caught were char (5420) followed by coho (3026), and chinook (2331) salmon. Sockeye, pink and chum salmon catch were 1036, 644 and two fish, respectively. Totals of 839 rainbow trout and 269 steelhead were also caught in 1993 by guided anglers. Total fish kept ranged from 507 chinook (22%) to 15 each for steelhead and rainbow trout (5.3% and 1.8%, respectively). No chum salmon were kept by anglers in 1993.

Uganik River drainage yielded the highest percentage (71) of the total char caught on the refuge by guided anglers. The Ayakulik River drainage accounted for >99 percent of the chinook caught and 78 percent of the coho salmon. Approximately 40 percent of the steelhead caught were from the Dog Salmon and 60 percent from the Ayakulik River drainage. The majority (96%) of the rainbow were caught by guided anglers on the Dog Salmon River.

In 1993 a sport fishing creel census was conducted by the Service during the popular chinook salmon run on the Ayakulik River. From May 28 through July 10 a total of 1098 angler days (guided and unguided) was documented on the river. Anglers caught totals of 3667 chinook, 951 sockeye, 278 steelhead, 162 Dolly Varden, 42 rainbow trout and 6 pink salmon. The totals of fish kept were 800 chinook and 337 sockeye. In addition, very small numbers (<10) of Dolly Varden, rainbow trout and steelhead were kept by anglers.

Escapement of chinook into the Ayakulik River in 1993 was 7,819 fish. The escapement goal ranges from a minimum of 6,500 to a desired 10,000 chinook. In previous years, the return of chinook to the Ayakulik has been more than adequate to provide for both the incidental catch of chinook during the commercial sockeye fishery and the in-river sport harvest. In 1993 the escapement after both fisheries approached the minimum goal for the first time. To monitor this fishery, the refuge will continue the creel census again in 1994.

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: (Taylor)

In 1993, there were changes in responsibility for certain public use functions. As a collateral duty, pilot Patterson now manages the SUP program. His intimate knowledge of air taxis and guide operations makes him the logical choice. Additionally, Maintenance Worker Lanahan now plans and executes maintenance of Refuge public use cabins, including management of funds from the Buildings and Grounds budget.

Estimation of visitation has historically been a cut above a guess. That is changing. Confidence in the accuracy of reported use is now much higher.

Until 1993, the commercial operator reporting system did not differentiate use on Refuge-owned lands from use on privately-owned lands. Reports generally included all use occurring within the Refuge boundary. In 1993, all commercial operators were required to pay for (and hence report) only use occurring on Refuge-owned property. As a result, the picture of commercial use on Refuge-owned lands is clearer and more reliable. We are now able to describe pretty well the "who, what, when and where" of Refuge lands use originating through these operators. That's the good news.

The bad news is two-fold. Because operators now reliably report only use on Refuge-owned lands, use data from previous reports is less relevant. For the same reason, this year's numbers are slightly lower despite a perceived increase in use. This may produce confusion during a time when significant increased use is being recorded in areas being studied. It should be noted that having removed use occurring on private lands (such as the Karluk River) from the report, the 18,123 visits recorded in 1993 probably represents a more significant increase over 1992's 18,092 visits than meets the eye.

Second, no reliable method yet exists for estimating use originating from villages, private aircraft, mail planes, private boats, and commercial marine transporters. Use from these sources is no doubt substantial, but we can only make informed assumptions based on anecdotal observations, staff experience, and the observations of weir personnel, State of Alaska biologists, and Refuge users.

Visitor Center use is also difficult to get an accurate handle on. The building's electric eye was relocated early in the year, but continues to be unreliable. It only takes one person lingering in the entry foyer to dramatically skew a day's count. It's count cannot be used for any reliable estimation. RR Brooks must piece together staff and volunteer records of weekday and weekend use. Reported VC use for 1993 was 6,748 visits and 3,377 use days. Weekday VC use which occurs when RR Brooks is out of the building does not get recorded. This missed activity is estimated to be 25% of the reported total, or 1,687 visits and 844 use days. Total VC use is therefor estimated at 8,435 visits and 4,221 use days.

Table 24. MONTHLY VISITOR CENTER USE (Reported) during 1993.

MONTH	VISITS	ACTIVITY HOURS
January	142	72
February	186	93
March	292	146
April	516	258
May	391	195
June	955	478
July	1272	636
August	1391	696
September	857	429
October	289	145
November	301	151
December	156	78

2. **Outdoor Classrooms - Students:** (Brooks)

Two events related to National Fishing Week were presented. Since there are no sportfishing opportunities suitable for children during National Fishing Week, refuge staff Taylor and Brooks, assisted by volunteers Driscoll and Herzberg presented aquatic habitats awareness activities at a refuge booth at Kodiak Island's Crab Festival (dates coincide with Fishing Week). In August, Kodiak Refuge and the refuge's cooperating association, Alaska Natural History Association, co-sponsored the Children's Pink Salmon Derby along with ADF&G and Kiwanis. 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.

Volunteer Sibley Driscoll provided environmental education material to one of the hopeful Pink Salmon Derby participants. (D. Brooks)

Refuge Ranger Paul Taylor captivated two of hundreds of visitors that were contacted at the annual Crab Festival. (D. Brooks)

Kodiak National Wildlife Refuge and the Kodiak Island Borough School District signed a **"Partnership In Education" Agreement**. This facilitated the implementation of the newly approved Environmental Education Plan written by Rangers Taylor and Brooks in 1992-93. Lessons for students have always been a part of the refuge environmental education program. The new plan formalized this component. In 1993 lessons were presented to scout groups, home school students, senior citizens and school groups from pre-school through 12th grade. A total of 392 children attended presentations in the Visitor Center and 801 children were taught off site. A grand total of 1193 children was served by the EE Program in 1993. This is an increase of 244 (about 20%) over numbers of students served in 1992 and a huge increase over the number of students in prior years. The major factor contributing to the increase over 1992 was the segment of the EE Plan calling for the expansion of staff visits to the nine remote village schools. Environmental Education lessons were presented during 1993 at schools in Chiniak, Karluk, Larsen Bay, Old Harbor, Ouzinke, and Port Lions. Substantial accomplishments in the preparation of refuge-specific environmental education materials were a highlight of the program for 1993 as detailed below and in the segment on Outdoor Classrooms - Teachers.

The Partnership in Education Agreement signed with Kodiak Island Borough School District resulted in teacher workshops such as pictured above. (D. Brooks)

One segment of the KNWR environmental education plan called for a more structured program for Visitor Center presentations. Ten subjects (listed below) were targeted as both refuge concerns and components of the local science curricula. Packets including refuge lesson plans, previsit and postvisit materials were prepared for teachers to present to their classes. A sample teacher's packet is included in the materials at the back of the annual narrative. Ranger Brooks has informally aligned the salmon presentation with a visit to a nearby state weir where Pat Holmes of ADF&G presents life cycle information. Since the Visitor Center is 25 miles from refuge lands, this partnership allows kids to see "the real thing" as well as learn about refuge programs.

List of Visitor Center Environmental Education Programs

All Grades:	Visitor Center and Refuge Familiarization
Kindergarten:	Animals and Winter
First Grade:	Animals and Homes; Animals and Movement
Second Grade:	Plant Parts
Third Grade:	Food Webs
Fourth Grade:	Refuge Salmon Research; Special Features of Fish
Fifth Grade:	Food Webs; Special Features of Birds
Sixth Grade:	Refuge Bear Research

3. Outdoor Classrooms - Teachers: (Brooks)

The EE Plan also included goals to increase local educators' expertise in environmental education. Ranger Brooks prepared materials to present an accredited course in Environmental Education at Kodiak College during the 92/93 school year. The course featured four different curricula (habitat, salmon, wetlands, and refuge management pertaining to bears) focused on issues of interest to the refuge and USFWS. Materials were targeted to coincide with portions of required study for third through sixth grade students in the Kodiak Island Borough School District. Since this was the first use of the prepared materials, teacher assignments were aimed at evaluating effectiveness of the lessons for expansion of the teacher training in the next school year. A special effort was made to reach village teachers by offering travel scholarships to the sessions. Five teachers originally made arrangements to come from villages, but weather and health problems prevented two from actually attending. In the Fall of 1993, (the 1993/94 school year) two of the four curricula were offered again, this time as teacher workshops. (The other two are scheduled to take place in 1994 - the same school year, but next year's annual narrative). Travel scholarships were offered again, but not disbursed. A special effort was made to reach home school families and private school teachers, since none had attended the accredited course. Refuge cooperator Alaska Natural History Association sponsored pay for substitute teachers to fill in for the private school educators when it was discovered that this was the primary obstacle preventing their attendance. We will continue to try to serve as many educators as possible and to seek innovative solutions to any problems that may prevent their participation. Statistics are: 15 curricula/training recipients for the 92/93 year and 30

curricula/training recipients for the 93/94 year. In town, we have reached nearly every fourth grade teacher in the six elementary schools. Our future goals are "perfect attendance" from the other grades' teachers and teachers in the nine village locations, and to expand the number of youth group leaders and home school parents attending.

4. **Interpretive Foot Trails:** (Brooks)

Student Conservation Association Volunteer Daniel Herzberg organized Audubon Society members and other refuge volunteers to rehabilitate the Buskin View Trail. The volunteer crew cut brush, replaced missing signs, and blocked off a trail that had been cut into the BV trail by people at the State campground. This accessory trail had confused a large number of our trail users. Later in the summer Jeremy Fernandez hauled gravel to muddy spots and cut back the brush again. Volunteers Charlie Elliot and Mirjam Weurth rewrote 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. However, this brochure project is not complete.

5. **Interpretive Tour Routes:** Nothing to report.

6. **Interpretive Exhibits/Demonstrations:** (Brooks)

Reflections of Nature, a photographic exhibit about refuges by John and Karen Hollingsworth which has been touring the country, was hung in the KNWR Visitor Center from May 28th through September 10. The "July" photograph in the Reflections of Nature Calendar featured a Kodiak bear. The Hollingsworths donated a portion of the profits from this calendar of refuge images to the non-profit National Wildlife Refuge Association.

Sibley Driscoll and Heather Bolte, volunteers, used our portable display and brochures to present information about the refuge at the annual "Coast Guard Day" picnic.

7. **Other Interpretive Programs:** (Brooks)

Staff members asked to participate in both onsite and offsite information exchanges were not able to accommodate as many requests in 1993 as has been the case in the past. Research Biologist Barnes was the most active individual. Outstanding examples include:

Mar. 8: Biologist Barnes was co-presenter of a slideshow/talk on bears presented to 25 persons at a Kodiak Sportsman's Association membership function.

Mar.-Apr. RR Brooks and RR Taylor served as judges at a number of public and private school science fairs.

On several occasions, RR Brooks conducted programs for senior citizens, on and off-Refuge, for members of local senior centers.

May 28-30: RR Brooks, RR Taylor and Volunteers Herzberg and Driscoll staffed the Refuge's Crab Festival booth. Visitor contact was extensive; "Kodiak Jeopardy" and the Refuge's "Goose on a Stick" kept kids coming throughout the 3 day event.

May 30: RM Bellinger hosted an aerial tour for a small group which included the vice president of the Sierra Club. Acquisition and development were the topics of keenest interest.

Jun. 19: Biologist Barnes did a bear program at Fort Abercrombie State Park for 25 enthusiastic visitors. The following week, Vol. Herzberg also cooperated at the park, conducting a tidepool walk.

July: RR Taylor provided a video introduction to the biological review held at the Refuge's Camp Island facility.

RR Taylor wrote an article for the annual hunting issue in the Kodiak Daily Mirror.

August: Vol Driscoll staffed a Refuge booth at the Coast Guard open house on the USCG base.

Sep. 14: RR Taylor was guest speaker at the September meeting of the Kodiak chapter of the Audubon Society.

Volunteer Hans Tschersich, a local physician and native of Austria, narrated the USFWS video Orientation to Kodiak National Wildlife Refuge in German; the dubbing was supervised by Steve Kreber of the local college television station. This has been quite useful since a substantial proportion of foreign visitors speak German.

April: Rangers Brooks and Taylor served as judges at various science fairs.

July: Ranger Paul Taylor provided an introduction and orientation to participants at the Biological Review and wrote an article for the Kodiak Daily Mirror's annual hunting issue.

Ranger Paul Taylor provided the local chapter of the Audubon Society with an update on the status of the Bear Viewing Program on Sept 14.

8. **Hunting:** (Taylor)

Deer populations on Kodiak Island, including portions of the Refuge, are rebounding from recent severe winters. Winter '92-93 broke the trend and was relatively mild. Populations on the southern half of the island appeared to be more vigorous, with more trophy animals, than the northern half. Local hunters report that the hunting seemed improved, but that small bucks were

predominant in north island habitat. In 1993, guides reported 25 visits, averaging 6 days of hunting, for 150 use days. Air transporters reported 543 visits, averaging 6 days of hunting, for 3,250 use days. Total reported use was 568 visits and 3,395 use days.

As in the past, 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 1,136 total visits and 6,790 total use days.

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 actual use by bear hunters is mainly based on available State information.

In 1992 RR Taylor and Bio Barnes determined that 183 resident bear permits and 113 non-resident bear permits (total 296) were issued 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). According to State Bio Smith, the number of bear permits in these areas did not change in 1993.

Permit Report Summary Data indicate:

	Areas 231-259	Areas 201-229	Combined Approx.
Permits Actually Issued	69%	74%	72%
Hunters Afield	98%	97%	98%
Mean Days Hunted	7.7	7.3	7.5

Assumption: 72% of 296 available were issued = 213 permits issued
Assumption: 98% of 213 actually hunted = 209 visits
Assumption: 209 hunters averaged 7.5 days = 1,568 use days

Goat hunting use is considered in the same manner as bear hunting use. According to the 1993 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	57%
Mean Days Hunted	3.6

Assumption: 57% of 76 actually hunted = 43 visits

Assumption: 43 hunters averaged 3.6 days = 155 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. Guides reporting waterfowl or small game hunting as a primary use reported 4 visits and 54 use days. Air transporters reported 10 visits and 112 use days. Total reported use was 14 visits and 166 use days. Assuming unreported use to be roughly equal to reported use, doubling these totals results in 28 visits and 332 use days.

9. **Fishing:** (Taylor)

The manner in which guides reported use does not clearly differentiate one party from another. This makes it impossible to accurately determine the number of days a party spent afield. We do know that the overwhelming majority of guided sportfishing was day use. For these reasons, all use will be treated as day use and the number of visits will equal the number of use days. Guides reported 1,005 visits and 1,005 use days. Air transporters reported 609 visits, averaging 4.89 days, and 2,978 use days. Total reported use was 1,614 visits and 3,983 use days.

In the 1992 narrative, unreported use was estimated at just 5% of reported use. Upon further examination, that figure is considered low. Use of private aircraft may be higher than thought. Additionally, access by mail plane, private boats at river mouths, and visitors originating from Native villages could be significant. For these reasons, the 1993 estimate of unreported use has been increased from 5% to 25% of reported use; unreported use would then be estimated at 404 visits and 996 use days. The resulting total estimate for all 1993 sportfishing effort is 2,018 visits and 4,979 use days.

For additional information regarding guided sportfishing, see Section G. 11.

10. **Trapping:** (Taylor)

The State trapping season does not follow the calendar year. The seasons for Kodiak species (primarily red fox, 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 1992 through spring of 1993. During that period, 3 permits to trap on Refuge lands were issued. No report of use is available at this time, but 180 visits and 180 use days is a reasonable estimate.

Red fox are one of six mammals native to Kodiak Island and the target of a minimal recreational trapping effort. (V. Barnes)

11. **Wildlife Observation:** (Taylor)

Following the 1992 field season, the agency decision was made to move the Refuge Bear Viewing Program to private operation under special use permit. A draft prospectus was prepared for distribution and notice of its release was made public in January of 1993. Due to difficulties connected with necessary rule development, the offering was pulled back and the program postponed for 1993.

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 third season. The study team collected data under conditions similar to those of the 1991 season --- unregulated public use including use of the O'Malley cabin. For further information on this study see Section D. 5 (Research and Investigations).

The move to privatize bear viewing at the O'Malley site was re-engaged in fall of 1993. A draft prospectus was released for public comment; Mike Munsey of Amook Pass was selected.

Other non-consumptive public use continues to grow at a rapid rate. Photography/Sightseeing use reported by guides was 521 visits and 949 use days. Air transporters reported 126 visits, averaging 4.2 days, for 529 use

days. It is estimated that unreported use (mainly marine transporters, private boats and aircraft, mail planes, Native villages) was an additional 25% (162 visits, 370 use days) of this reported use. The resulting total estimate for all 1993 Photography/Sightseeing is 809 visits and 1,848 use days.

12. **Other Wildlife-Oriented Recreation:** (Taylor)

Due to Clerk Barnes ability to effectively track and manipulate use data, public use cabin system reporting is greatly improved. The following tables pretty much tell the story:

Lottery	Applications Accepted	Applications Selected	% Success	Paid
October 1992	0	N/A	N/A	N/A
January 1993	11	9	82	4
April 1993	93	61	66	40
July 1993	58	41	71	29
TOTAL	162	111	69%	73

SYSTEM USE

Month	Parties	People	Nights	Use Days	ActHrs	Fees
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	7	17	60	165	3552	600
May	5	12	27	79	1608	270
June	15	31	67	197	3984	770
July	35	105	146	551	10704	1540
August	29	91	133	520	10296	1370
September	4	11	101	63	1248	180
October	35	118	214	831	17112	2140
November	22	66	132	474	9792	1320
December	12	34	56	197	3912	560
TOTALS	164	485	936	3,077	62,208	8,750

INDIVIDUAL CABIN USE

Cabin	Parties	People	Nights	Use Days	ActHrs	Fees
Viekoda Bay	15	43	75	278	5640	790
Uganik Island	16	43	99	314	6504	990
Chief Cove	15	46	94	337	6984	940
Uganik Lake	30	89	142	505	9984	1480
Little River	17	43	82	272	5496	860
O'Malley	30	91	144	531	10560	1440
North Frazer	12	32	74	221	4536	740
South Frazer	24	73	116	460	9288	1240
Red Lake	21	63	110	397	8016	1100
TOTALS	180	523	936	3,315	67,008	9,580

13. **Camping:** (Taylor)

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:** Nothing to Report

15. **Off-Road Vehicling:** Nothing to Report

16. **Other Non-Wildlife-Oriented Recreation:** (Taylor)

A late change in proposed regulations in the final PUMP will result in somewhat reduce potential for Refuge snow machine use ... but not until regulations are promulgated. At that time, use will be restricted to a corridor mainly paralleling the Terror River, but extending from Kizhuyak Bay to a point near Mt. Glottof. During 1993, use was unlimited.

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: (Patterson)

Five employees on staff had law enforcement authority at the beginning of 1993. However, as part of the general reduction of Refuge Officers in Region 7, enforcement authority for Wildlife Biologist Stovall was withdrawn. This left Refuge Manager Bellinger, Assistant Manager Munoz, Refuge Ranger Taylor and Pilot Patterson as the KNWR law enforcement staff.

As in past years, the Ursa Major II and crew got underway to check bear hunters in the spring, set net sites in the summer and deer and bear hunters in the fall. This is a very efficient way to conduct field interviews with users of the refuge, particularly hunters. This year the boat checks resulted in seven citations and fifteen warnings for failure to validate harvest tickets.

For the third year, the Ayakulik River camp was used to monitor king salmon sport fishing activity. One case this summer involved five fishermen with a total of forty salmon over the catch limit. The total fine amounted to $1,500. With the data collected at the river, we were able to identify an Air Taxi operator who was operating on the refuge without a permit.

Red salmon confiscated from sport fisherman on the Ayakulik River during a significant overharvest situation. (J. Bellinger)

Ayakulik River law enforcement and creel census camp was established again in 1993. Refuge Manager Jay Bellinger and volunteer John Baker are pictured above. (R. Squibb)

The refuge's Cessna 206 aircraft was used to check hunters and fishermen that were camping inland on fresh water. Although our 206 was grounded for two months for maintenance, we conducted field interviews though mid November. This effort produced one violation for wanton waste and one for failure to validating a harvest ticket.

With tourism on the increase and every visitor wanting to see a bear, flight seeing is on the rise. Most viewers want an up-close and personal look at wildlife. Air Taxi Operators, wanting to oblige their clients, fly low and close to any visible wildlife. By midsummer, incidents of low flying had increased to such a level that we sent warning letters to all permitted Air Transporters. Following up a big game guide's complaint of wildlife harassment by aircraft, the responsible Air Taxi Operator fined the low flying

pilot $300. Most of the operators under permit are very cooperative and anxious to work out problems with the refuge staff.

Other related law enforcement activity included:

-Assisting state agents during the spring waterfowl hunt in the Bethel area

-Responding to complaints on the road system

-Assisting Special Agents with information and logistics during undercover operations

-Issuance of caution letters to four cabin users that either didn't know better, or were trying to extend their visit beyond the seven-day limit.

18. **Cooperating Associations:** (Brooks)

Revenues for FY93 totaled $13,150 - an increase of 2% over the previous year. 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. Funds were also used to support teacher attendance at refuge-sponsored environmental education training. Donations of some of our educational materials were sent with our Refuge Manager to the education staffs at Russian refuges. The Kodiak ANHA branch also 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 paid for some puppets and materials for the puppet stage for EE programs. ANHA also financed some of the costs associated with our Pink Salmon Derby project. In addition, tokens of appreciation and volunteer uniforms were furnished from ANHA resources.

19. **Concessions:** (Taylor)

1993 was the first year that commercial operators providing more than one permittable service were required to obtain separate permits for each service. It was also the first year for implementation of a new commercial use fee schedule.

FEE SCHEDULE

- A non-refundable $100 administrative fee (one-time fee for multiple year permits)
- A $100 fee for use of reserved land sites

- Client Use Day Fee

Guiding/Outfitting

A. Brown Bear = $15/client use day ($100 minimum)

B. All Other Species = $5/client use day

C. Sport Fishing = $2/client use day

D. Photography/Birding/Other = $2/client use day

All Transporters = $2/client use day

In this phase-in year, commercial operators were only required to pay one half of the client use fee. Full implementation of the new fee schedule will occur in 1994.

With just 20 sportfish guides under permit in 1992, use still increased substantially that year. The number of permits in 1993 was 19. It has been determined, however, that the 24 guide limit established in the CCP must be maintained, and a lottery in early 1994 will be held to re-fill open slots.

Guides selected through prospectus in late 1992 and early 1993 began operation in the fall of 1993. One set of big game guide SUP's was issued to cover the spring bear hunt. A second set was cut for the fall bear, deer and goat hunts.

Portions of the 1992 guide selection process splashed into 1993. A successful Mileur appeal won KOD 22 from Hendricks. The Munsey and Rohrer appeals were unsuccessful. A second prospectus process resulted in award of KOD 6 to Bailey.

Due to a conflict with State regulations, Harms recorded no use in KOD 4, which could result in loss of that area in 1994. Apparently, he will have until June 30, 1994 to obtain a State exemption, or face cancellation (for non-use) of his Refuge permit.

The State permit process continued to be a problem. Conflict between Refuge-permitted guides and guides wishing to work private lands makes the process dicey. Modification of the process is expected in 1994.

Until 1993, photography/sightseeing guiding was mostly incidental to hunting and fishing guided service. Guided viewing/photography as a primary activity was more evident in 1993. The opportunity to offer guided service in this area is especially attractive to commercial operators (primarily air taxi operators) who are unable to gain a foothold in the restricted hunting/sportfishing guiding business. Presently, there is no limit on the number of permits of this kind which can be issued for Refuge use. In 1993, 11 photography/sightseeing permits were issued.

SUP's for commercial set net cabins and hunting cabins were issued without significant incident.

SUMMARY OF PUBLIC USE FOR THE CALENDAR YEAR 1993

	$$$$$$	######	VISITS	USE DYS	ACT HRS
1. GENERAL					
Visitor Center			8435	8435	4221
Volunteers		25			1074
News Releases		21			
Radio/TV Spots		11			
2. OUTDOOR CLASSROOM - STUDENTS					
--- STAFF CONDUCTED					
Offsite EE Students		7	801	801	819
Onsite EE Students		15	392	392	354
--- NONSTAFF CONDUCTED					
Offsite EE Students		0	0	0	0
Onsite Students		0	0	0	0
3. OUTDOOR CLASSROOM - TEACHERS					
Teachers, OC		4	20	20	64
Teacher Wrkshp		11	103	121	479
EE Material Loans		61			
4. INTERPRETIVE FOOT TRAILS					
Buskin View Trail			577	577	289
5. INTERPRETIVE TOUR ROUTES					
No activity in this section					
6. INTERPRETIVE EXHIBITS/DEMONSTRATIONS					
Exhibits/Demonstrations		3	2600	2600	89

	$$$$$$	######	VISITS	USE DYS	ACT HRS

7. OTHER INTERPRETIVE PROGRAMS

Staff Talks (on-site)	3	35	35	35
Staff Talks (off-site)	4	73	73	89

8. HUNTING

Deer	1136	6790
Bear	209	1568
Goat	43	155
Other	28	332

9. FISHING

Sportfishing	2018	4979

10. TRAPPING

Trapping	3	180	180

11. WILDLIFE OBSERVATION

N/A	809	1848

12. OTHER WILDLIFE ORIENTED RECREATION

Cabin Use	$ 9580.00	180	523	3315	67008

13. Camping

No activity in this section

14. Picnicking

No activity in this section

15. Off-Road Vehicling

No activity in this section

	$$$$$$	######	VISITS	USE DYS	ACT HRS

16. OTHER NON-WILDLIFE ORIENTED RECREATION

	VISITS	USE DYS
Snowmobiling	24	48

17. LAW ENFORCEMENT

Citations	11

18. COOPERATING ASSOCIATIONS

ANHA	$13150.00

19. CONCESSIONS --- Special Use Permits

Big Game Guiding (Spring)	16
Big Game Guiding (Fall)	25
Big Game Guide Base Camp	5
Sportfish Guiding	19
Sportfish Guide Base Camp	2
Air Taxi	12
W/P/S	8
Commercial Fishing	
Set Net	27
Beach Seine	2
Other	
Subsistence Base Camp	1
Homesite	1
Radio Repeater Site	1
Agency Helicopter(BLM, BIA, ADF&G)	4
O&M Terror Lake Hydro Project	1
Commercial Photography	2
Storage Cache Site	2
Military Ground Training	1
Surface Geology	1
Scientific Collecting	1
Archeology Study	1
Fisheries Enhancement (salmon)	3
Fisheries Restoration	1
TOTAL PERMITS ISSUED FOR 1993 SEASON	136

Prior to 1993, each multiple use operator was issued a single permit covering all permitted uses. In 1993, multiple use operators were issued multiple permits and required to pay multiple fees. A separate permit was written for each authorized use.

TOTALS	VISITS	USE DYS
	18004	32209

I. Equipment and Facilities:

1. New Construction: (Lanahan)

The public use cabin at Little River was relocated to the outlet of Little River Lake by maintenance worker Bill Lanahan and volunteer C. J. Lanahan. The purpose for this action was detailed in an environmental assessment. The main justification for the change of location was the fact that brown bear use is significantly higher around the old location. This relocation will redress incompatible public use in a important bear feeding area. Funding for this project came from the Maintenance Management System allocation for 1993.

2. Rehabilitation: (Lanahan)

A total of 935 maintenance hours was dedicated to the public use cabin maintenance program during 1993. About 433 of these hours were that of volunteer labor. One volunteer, C. J. Lanahan, was responsible for 393 of these hours. C. J. assisted with the construction of the Little River cabin as highlighted above.

3. Major Maintenance: (Lanahan)

Two of the major vehicle maintenance projects performed during the year were the body repairs and painting of the full-sized Dodge van, and the conversion of the plow/sander truck for use as a portable welding/generator unit. The latter unit was modified to allow for a quick and easy changeover between plow/sander, and welding/generator unit.

4. Equipment Utilization and Replacement: (Lanahan)

The mission of the maintenance program at Kodiak NWR is to provide a quality maintenance program that is beneficial to both the Refuge and the Service. The goals are 1) to provide quality repairs and maintenance procedures in a timely fashion in order to eliminate mechanical down-time and lessen the chance of unforeseen mechanical repairs, and 2) to maintain a working environment within the refuge that contributes to the harmonious operations of the entire staff.

To accomplish these goals, maintenance hours were allocated to projects as outlined in Figure 14. This chart represents the total hours for FY 1993. The new vehicle maintenance program began the second quarter of the fiscal year. A major concentration of effort was dedicated to this program in order to establish a workable history on each refuge vehicle. Under the new program, scheduled maintenance is performed on a monthly basis, along with monitoring of fuel, repairs and maintenance costs. All vehicle information is now computerized and will be automatically updated each month for each vehicle.

Figure 15 illustrates allocation of funds to the refuge fleet of vehicles. Amounts do not include the first quarter of the fiscal year as the new vehicle maintenance program was not in effect at that time. The total cost of vehicle parts for 1993 was $1724.18. A total of 114.75 hours at a refuge cost of $20/hour was spent on vehicle maintenance during this period. The greater amounts of time and dollars spent on the large van were due to the body work and paint job completed during the spring. Work on the plow truck includes the conversion of this unit from a plow/sand unit to a workable welding truck during the summer.

Grounds maintenance included brush removal around the refuge complex and re-landscaping the back sidewalk area to allow water to drain away from the refuge office entrance. The latter project was initiated to alleviate annual flooding that results from winter storms.

Airplanes:

A new Continental IO-550 engine was installed in the refuge's Cessna 206 aircraft (N9623R) during April of 1993. The engine is rated at a continuous 300hp. Although this is no more horsepower than the old IO-520, it is a longer-stroke, slower-turning engine, which turns a shorter, broader propeller. The result is that the airplane is faster and can take off in a shorter distance. The new engine made it possible to use the refuge 206 aircraft to provide aircraft support to the Ayakulik River camp. The river is narrow and the take-off area is too short for an amphibious 206 with an IO-520 engine. In previous years it was necessary to charter a straight-float 206 or Beaver to do this work.

The Office of Aircraft Services crew modified the refuge N720 Piper Super Cub to reduce its empty weight by removing several unnecessary instruments. The navigation system was also upgraded by adding a GPS unit. Included with all the adding and subtracting of equipment was installation of a new "state of the art" instrument panel.

A fleet of float planes was assembled to conduct the bear density estimation work detailed earlier in this report. Mike Reardon and Dan Doshier from Selawik and Kenai Refuges, respectively, generously agreed to loan two of the super cubs pictured above. Success of this project hinged on avalability of aircraft and cooperation from these refuge managers is greatly appreciated.

5. **Communications Systems:** Nothing to report.

6. **Computer Systems:** Nothing to report.

7. **Energy Conservation:** Nothing to report.

8. **Other:** Nothing to report.

J. Other:

1. **Cooperative Programs:**

Refuge Manager Jay Bellinger participated in an exchange of management information with counterparts in Russia during a September trip to various locations in Russia.

Refuge Managers Jay Bellinger and Fred Zeillemaker, Sergei Alekseyev, Special Agent Al Crane and Evgeniy Labkov participated in an exchange of information between Russia and the United States.

As part of the U. S. - Russia Environmental Agreement, and exchange of wildlife biologists and refuge managers was conducted during 1993. Participants that visited Kodiak Refuge included, from left to right, Natalya Danilina, International Affairs Specialist Steve Kohl, Natalya Dobrovolskaya and Refuge Manager Jay Bellinger. (V. Barnes)

2. **Other Economic Uses:** Nothing to report.

3. **Items of Interest:** Nothing to report.

4. **Credits:** As noted in text.

K. <u>Feedback</u>: Nothing to report.