KODIAK NATIONAL WILDLIFE REFUGE

Kodiak, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1991

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

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REVIEW AND APPROVALS

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Refuge Manager — Date 6/29/92. Associate Manager — Date 12/11/92

Regional Office Approval — Date 3/23/93

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B. CLIMACTIC CONDITIONS

The climate of the Kodiak Region is dominated by a strong marine influence. Typically, this results in cloudy skies, moderately heavy precipitation, and cool temperatures. During winter, the waters of the North Pacific Ocean provide the moisture that makes clouds and rain the norm. The relatively warm marine waters also provide a relatively mild climate year-round. Weather conditions vary greatly over the island because of exposure, aspect, and terrain. 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 depicts a summary of weather conditions for 1991 as collected by the National Weather Service Office at Kodiak State Airport.

Table 1

1991 Precipitation Summary

MONTH	Snowfall in Inches	Precip. in Inches	Precip. departure from normal	Average Maximum Temp.	Average Minimum Temp.	Average	Temp. departure from normal
January	20.1	10.7	2.4	35.8	24.8	30.3	-1.6
February	13.2	10.8	-3.4	32.6	22.3	27.5	-1.9
March	5.0	0.7	4.5	41.4	25.8	33.6	0.9
April	11.0	8.0	3.2	43.3	34.7	39.0	1.0
May	-	9.7	2.0	49.7	40.0	44.9	1.7
June	-	8.6	5.3	59.2	48.3	53.8	0.1
July	-	2.3	-1.6	54.8	44.6	49.7	0.0
August	-	4.8	-0.5	60.3	48.3	54.3	-0.5
September	-	10.2	1.6	55.6	45.0	50.3	0.4
October	-	11.5	1.5	48.4	35.0	41.7	0.5
November	24.8	13.0	6.4	41.8	33.2	37.5	2.8
December	24.0	5.8	-0.5	36.5	23.9	30.2	0.6
TOTAL	98.1	96.1	-	-	-	-	-

The 1991 total of 96.1 inches of precipitation broke the old record set in 1943 of 91.09 inches. This included 7.44 inches of rain that fell on Halloween. There were 234 days in 1991 during which measurable precipitation fell, breaking a record of 223 days set in 1976.

Springtime wandering in the Kodiak alpine. (Photo V. Barnes)

C. LAND ACQUISITION

1. Fee Title

A 160 acre inholding was acquired this year on the east shore of Uganik Passage which is located in the northwest portion of the refuge. This tract was owned by Clara Helgason and had been used as a fishing and hunting guide camp for over 30 years. The tract represented the only private land in Terror Bay, and would have been a prime candidate for subdivision and cabin development due to its proximity to Kodiak.

Acquisition of the Only Parcel of Private Land in the Terror Bay Area Highlighted Land Protection Activities During 1991.

Realty Specialist Bob Rice officially adds the Helgason Tract to Kodiak NWR by presenting Clara Helgason a check for $470,000. Looking on are Refuge Manager Jay Bellinger (far Left) and ARM Munoz. (Photo H. Johnson)

The inholding problem continued to attract media attention. In fact, 1991 will probably be recorded as one of the busiest years ever for VIP trips and media events. Several major magazines, newspapers and wire services sent reporters or recorded telephone interviews. Television news crews from CBS, ABC and Globo TV (Brazilian) made trips to the refuge to cover this issue. However, as of this writing, we still have not seen significant progress in acquiring the 300,000 plus acres of inholdings.

2. **Easements**

The final locations for public 17(b) easements trails were negotiated with Akhiok-Kaguyak Inc. in the Horse-Marine Lake area. We also negotiated the placement of a public 17 (b) easement trail across a cemetery and historic site with Koniag Inc. at the mouth of O'Malley Creek on Karluk Lake.

D. PLANNING

1. Master Plan

Nothing to report.

2. Management Plan

a. Public Use Management Plan

The final Public Use Management Plan was submitted to the Regional Office during December. These issues were modified somewhat in 1992. The final draft should be approved in 1992 and the differences will be noted in next year's annual report. A summary of regulations proposed by the plan is as follows:

1. All Terrain Vehicles - The use of all terrain vehicles including but not limited to off-road wheeled vehicles, airboats, and hovercraft is prohibited on Kodiak National Wildlife Refuge.

2. Snow Machines - The use of snow machines on Kodiak National Wildlife Refuge is permitted in all areas except for important deer wintering and bear denning habitat as depicted on the maps available at refuge headquarters. The use of snowmachines is restricted to periods when there is adequate snow cover to protect underlying vegetation.

3. Domestic Animals - The use of pack animals may be permitted on Kodiak National Wildlife Refuge subject to an approved operations plan and the owner obtaining a refuge special use permit. All domestic animals must remain under the immediate supervision of the owner while on refuge lands.

The landing of aircraft in alpine areas, such as the three super cubs pictured above the South Arm of Uganik Bay, would be prohibited if the Public Use Management Plan is approved. Undisturbed alpine areas are critical to brown bear management. (Photo V. Barnes)

4. Aircraft - The landing of fixed-wing aircraft on Kodiak National Wildlife Refuge is permitted only on adjacent saltwater beaches, water bodies, and frozen waters.

5. Motorboats - The use of motorboats is authorized on all waters of Kodiak National Wildlife Refuge with the exception of jet drive motorboats, which are permitted only in moderate management areas as outlined in the refuge comprehensive conservation plan and delineated on maps available at refuge headquarters.

6. Public Entry - Public entry is permitted in all areas of Kodiak National Wildlife Refuge except for those areas, time periods, and activity restrictions listed below and shown on the maps available from Kodiak National Wildlife Refuge.

a. Areas closed to entry and time periods of closure are:

Connecticut Creek (Red Lake) - 5/15 through 8/31
South Uyak Creek - 8/15 through 9/30
Upper Pinnell Creek (Frazer Lake) - 5/15 through 8/31
O'Malley Creek and adjacent lakeshore - 5/1 through 9/30

b. Area closed to overnight tent camps and time periods of closure are:

Red Lake River and adjacent lakeshore - 5/2 through 8/31
Southeast Creek (Red Lake) - 5/15 through 8/31
Deadman Bay Creek - 8/15 through 9/30
Lower Terror River - 8/15 through 9/30
Lower Zachar River - 8/1 through 9/1
Southeast Uyak Creek - 8/15 through 9/30
Upper Thumb River - 5/1 through 9/30
Upper Sturgeon River - 5/15 through 8/31

7. Tent Platforms - New tent platforms are permitted only to replace existing tent platforms or cabins subject to an environmental assessment and a permit issued by the refuge manager.

8. Overnight Camping - Camping is permitted on all areas of Kodiak National Wildlife Refuge except as specified in 6 (a) and 6 (b) above. Time limits for users to set up overnight tent camps in a single location are:

- 7 day Camping Limit - Areas within 1/4 mile of the following anadromous streams and lakeshores for the specified time periods.

1. Uganik River and Lake - 8/1 through 9/30
2. Spiridon River - 8/15 through 9/30
3. Zachar River - 8/15 through 9/30
4. Ayakulik River - 6/1 through 9/30
5. Dog Salmon Creek - 8/15 through 9/30
6. Karluk Lakeshore - 6/1 through 10/15

- No Camping Time Limit - January 1 through May 1 - All refuge locations.

- 15 day Camping Limit - All refuge locations and time periods not listed above or otherwise posted.

Note: Tent camps must be moved a minimum of 1 mile upon expiration of the time periods specified above.

9. Public Use Cabins - Occupancy of refuge public use cabins requires a reservation confirmation which must be obtained prior to use. During a calendar year, no individual may occupy a refuge public use cabin longer than any one of the time periods specified below:

   A. January 1 through March 31 - Thirty days
   B. April 1 through May 15 - Fifteen Days
   C. May 16 through December 31 - Seven days

10. Commercial and Administrative Structures - Occupancy of these buildings on refuge lands is not allowed unless permitted in writing by the refuge manager.

b. **Land Protection Plan**

The Land Protection Plan process was initiated during March when Gary Muehlenhardt and Danielle Jerry (Realty) coordinated public meetings at Old Harbor, Akhiok, Larsen Bay, Karluk and Kodiak.

Land Protection Plans are designed to prioritize privately owned land within refuge boundaries that the Service would like to see protected for fish and wildlife. Material covered at the public meetings summarized the five options available to private inholding owners; that is, sell to the government, exchange for other federal land, establish a conservation easement, establish a cooperative agreement/Land Bank, and retain in private ownership. A form was developed for willing participants to formally express their preference. The other major focus of this process is to prioritize inholdings in regards to their relative importance for refuge management. Finalization of the plan is scheduled for May 1992. Once the plan is approved by the Director of the Service, then the refuge can start competing for funds through the Service's inholding acquisition fund.

c. **Public Participation**

Besides the public meetings mentioned above that were conducted for the Land Protection process, public meetings were also conducted in five of seven towns on Kodiak Island (Kodiak, Old Harbor, Larsen Bay, Karluk, and Ouzinkie) to gather comments on the draft environmental impact statement regarding federal management of subsistence fishing and hunting on federal lands. Representatives from the Subsistence Office conducted meetings at Kodiak, Old Harbor and Larsen Bay. Refuge staff conducted follow-up meetings at the remainder of the towns that we could access before the December 9 comment deadline. Weather forced cancellation of the Akhiok and Port Lions meetings. A summary of comments was provided to the Federal Subsistence Board. Concerns brought forward included the need to legalize the taking of fish and game for others, maintaining the availability of deer for subsistence harvest adjacent to villages, increasing opportunities for subsistence hunters to harvest deer when the season is normally closed, initiating regulations to reflect that brown bears are a subsistence animal, increasing opportunities to reflect traditional sea duck harvest (i. e. running the season through Mid-March), and designating elk as a subsistence species.

d. **Compliance with Environmental and Cultural Resource Mandates** (Chatto)

In late 1990, the Alaska Department of Fish and Game (ADF&G) and the Kodiak Regional Aquaculture Association (KRAA) submitted a proposal to the refuge to stock sockeye salmon fry into Spiridon Lake on the refuge. Spiridon Lake is a non-anadromous system and has been investigated by ADF&G over the course of several years as a candidate for stocking. Spiridon is the third largest lake on Kodiak Island and does not support anadromous fish because of an impassable series of falls located below the lake outlet, precluding fish access from the ocean. The project was proposed in order to enhance the commercial harvest of sockeye in the Kodiak area. The objective of the project is to use Spiridon Lake as a rearing area for sockeye fry which will migrate from the lake, via the Telrod River, to the ocean. A 0.5 mile pipeline will allow downstream migrating sockeye smolt to by-pass the falls on the river. Since returning adults will not be able to ascend the falls for spawning and subsequent rearing of progeny, all returning adults will be harvested by the commercial fishery. It is expected, with maximum annual stocking level of 11 million sockeye fry, that approximately 440 thousand sockeye adults will be available for harvest.

As part of the Spiridon Lake Project, this is one of a series of falls around which migrating sockeye smolt will be routed via a 0.5 mile pipeline on their way to the ocean. (Photo T. Chatto)

In 1991 the refuge prepared an Environmental Assessment (EA) on the project which examined the proposal and no-action alternative in relation to physical, biological, cultural, economic and subsistence 810(a) impacts on the refuge purposes. Based on the results of the EA and direction provided by the Kodiak Comprehensive Conservation Plan and Fishery Management Plan, the project was found to be compatible with refuge purposes and a Finding Of No Significant Impact (FONSI) was declared for the project. Several specific guidelines were required by the EA for the project to proceed. These include:

1. Stocking levels proceed incrementally with full evaluation on biological and chemical response prior to any increase in stocking level.

2. Evaluation of population trends of resident fish in the lake be completed by ADF&G concurrent with stocking.

3. Funding, by the KRAA, of a brown bear study to evaluate bear response to the project.

4. Funding and completion of wildlife surveys in the proposed terminal harvest area of Spiridon Bay prior to and after adult sockeye returns to evaluate management options and commercial fleet activity.

5. Increased effort by ADF&G to monitor natural stocks of salmon in adjacent river systems.

In mid-1991 the ADF&G completed initial construction of the smolt by-pass system and approximately 5.0 million sockeye fry were planted in the lake.

E. RESEARCH AND INVESTIGATIONS

1. Kodiak NWR 91 "Karluk Lake Sockeye Salmon Studies" Fish and Wildlife Service 81410-02 ADF&G (Chatto)

Management of the Karluk Lake sockeye run has been one of the major focus points for ADF&G and the refuge for the past 10^{+} years. A major rehabilitation effort involving life history studies, egg plants, fertilization and restrictive harvest measures has resulted in total annual escapements which approximate the 560-900 thousand spawners desired by management. Unfortunately the Karluk sockeye run is composed of distinct early and late-run fish with management escapement goals of 250-350 and 310-550 thousand spawners respectively. The initial results of fertilization, which was begun in 1986 and completed in 1990, should have been apparent in those four and five year old adult fish returning in 1991. The total Karluk return for 1991 is estimated by ADF&G at approximately 1.13 million fish. This includes a commercial harvest of approximately 500 thousand fish from the late-run. The late-run escapement was approximately 894 thousand spawners, or 63 percent above the maximum goal of 500 thousand fish. In contrast, the early-run escapement was 96 percent (239,600) of the minimum escapement goal of 250 thousand fish. Preliminary estimates by ADF&G of the early-run harvest indicate 31,700 fish were caught. Those early-run fish returning in 1991 would have been progeny from escapements in 1985-87, where the average early-run escapement was approximately 335 thousand fish. These returns indicate a low return-per-spawner for the early-run. Fishery managers are currently re-evaluating the data on Karluk early-run fish to determine if a revision in the escapement goal may be necessary to increase the return-per-spawner for these fish.

2. Kodiak NR 91 - "Frazer Lake Sockeye Salmon Studies" ADF&G (Chatto)

This project was continued in 1991 by the ADF&G. Previous excessive sockeye escapement into this system had taxed the juvenile rearing base for sockeye. As a result the escapement goal was readjusted and a five year lake fertilization program was begun in 1988. The fertilization program was under the auspices of an EA prepared by the refuge. ADF&G preliminary data indicate a total of 1.27 million sockeye returned in 1991. Approximately 980 thousand of these fish were commercially harvested, while the remaining 288 thousand passed through the Dog Salmon fish counting weir in the lower river. A fish pass facility located on the upper river enables these spawners to circumvent a large impassable falls

and access the spawning and rearing areas of Frazer Lake. The desired maximum escapement into the lake is 200 thousand sockeye, set in 1988. Escapements in 1988, 89 and 90 were 23, 80 and 13 percent, respectively, above this goal. Since the emphasis of fertilization was to restore a sockeye rearing base which had been depleted, these overescapements appeared to be counter-productive to the objectives of fertilization. By July 11, 1991, cumulative sockeye escapement through the Lower Dog Salmon weir had surpassed 230 thousand fish and the decision was made by management to close down the fishpass facility when 190-200 thousand sockeye had been counted through the fishpass. On July 14, 1991, the fishpass was closed with a final count of 190,358 sockeye. The final count on the lower river weir site was 288 thousand sockeye. This left approximately 98 thousand fish in the lower river. This action created some controversy but was fully supported by the refuge, ADF&G Commercial Fish Division and most of the commercial fishermen who are concerned with the long term conservation and productivity of this run.

1992 is expected to be the final year for fertilization of Frazer Lake and as long as escapement is maintained at $\leq$200 thousand spawners, the rearing base for sockeye should remain productive.

Sockeye salmon escapement into the Dog Salmon River through early July still exceeded 230 thousand fish despite concentrated efforts of commercial set gill net fishermen at the stream terminus. (Photo V. Barnes)

3. Kodiak NR 91 - "Sockeye Salmon Overescapement Studies" Alaska Department of Fish and Game (Chatto)

Work by ADF&G evaluating the effects of the 1989 sockeye overescapement on the Ayakulik and Akalura systems on the refuge continued through 1991. Sockeye escapement into the Ayakulik and Akalura was, respectively, 156 and 93% above the maximum desired level in 1989, and may have impacted the survival and production of subsequent returns. Data gathered by ADF&G in 1990 and 1991, indicate that the number of sockeye smolt migrating from Red Lake (on the Ayakulik system) in particular are at a significantly lower level than expected, indicating returns in 1993, 1994 and 1995, could be exceedingly low compared to previous years. Even with a restrictive commercial harvest scenario, the minimum escapement needs may not be met. Projected adult returns in 1992 are not expected to be impacted because rearing conditions for these fish, which migrated to the ocean prior to 1989, were considered good.

As part of the evaluation process for the Ayakulik, ADF&G operates a sockeye smolt counting trap below the outlet of Red Lake, conducts hydroacoustic analysis of rearing fish in the lake and collects limnological data on the lake environment. In addition, a secondary adult fish counting weir is located at the outlet of Red Lake. In 1992, ADF&G will be installing a total sockeye smolt counting weir below the outlet of the lake to calibrate their index trap and verify estimates of low numbers of smolt leaving the system.

The 1991 sockeye run on the Ayakulik is calculated at 1.32 million fish, of which 935 thousand were harvested in the commercial fishery. The escapement of 385 thousand sockeye into the system was 28 percent above the maximum desired goal of 300 thousand fish. Approximately 316 thousand (82%) of these fish entered into the Red Lake environment.

Preliminary data by ADF&G for Akalura indicate that an estimated 74 thousand sockeye returned in 1991. A total of 44 thousand sockeye made up the escapement into Akalura with the early run escapement only 26 percent of the minimum desired goal, while the late run component was 18 percent above the desired goal of 35 thousand fish. Evaluation of both Ayakulik and Akalura by ADF&G will continue through 1995.

4. Kodiak NR 91 - "Uganik River Salmon Escapement Investigation" - Kodiak NWR (Chatto)

This project, which was initiated in 1990, was continued again in 1991. This is a cooperative project with ADF&G, using a high-tech floating weir to determine escapement and timing of

sockeye, pink, chum and coho salmon on the Uganik River. Daily escapement counts for salmon were provided to the ADF&G for use as an in-season commercial fish management tool. The weir was fish tight by May 19 and operated by Kenai Fishery Assistance (FWS) personnel until October 8. As in 1990, the operation of the weir was successful and, except for brief periods of extreme high water, personnel were able to accurately count fish the entire season.

1991 escapement into the Uganik is calculated at 89,305 sockeye (79,305 weir count plus estimate of 10,000 fish which passed during a major high water event), 11,704 coho, 11,823 chum, 1 chinook and 69,564 Dolly Varden. In addition, it is estimated that approximately 249,000 pinks (185,414 weir count plus 63,590 fish which may have spawned below weir) entered the Uganik in 1991.

Preliminary estimates from the Inner Uganik ADF&G statistical harvest area indicate approximately 46,470 sockeye, 2,480 coho, 92,740 pink, 18,500 chum and 70 chinook salmon of Uganik River origin were caught in the 1991 commercial fishery.

5. Kodiak NR 91 - "Terror Lake Hydroelectric Project - Fisheries Studies" (74530-82-05 (Chatto)

During 1991 the final segments of the Terror Lake Hydroelectric fisheries studies were completed. These studies are being conducted by ADF&G and a private contractor. The goal of the studies is to evaluate the post-project pink and chum salmon production from the Terror River drainage and determine how this production relates to the guideline minimum flow requirements (Figure 1) stipulated by the Federal Energy Regulatory Commission's (FERC) license. The license was granted to the Alaska Power Authority for the project. Progress on the various salmon and flow studies during the six year post-project period, 1985-90, was reviewed and coordinated by the "Fishery Monitoring Group" of which the refuge was an active member. Review of final reports for the various studies is expected to be accomplished in 1992 and a final recommendation made to the FERC on a minimum flow regime to conserve the fishery. Figure 2 depicts the salmon escapement into the Terror River from 1982-1991.

Figure 1.

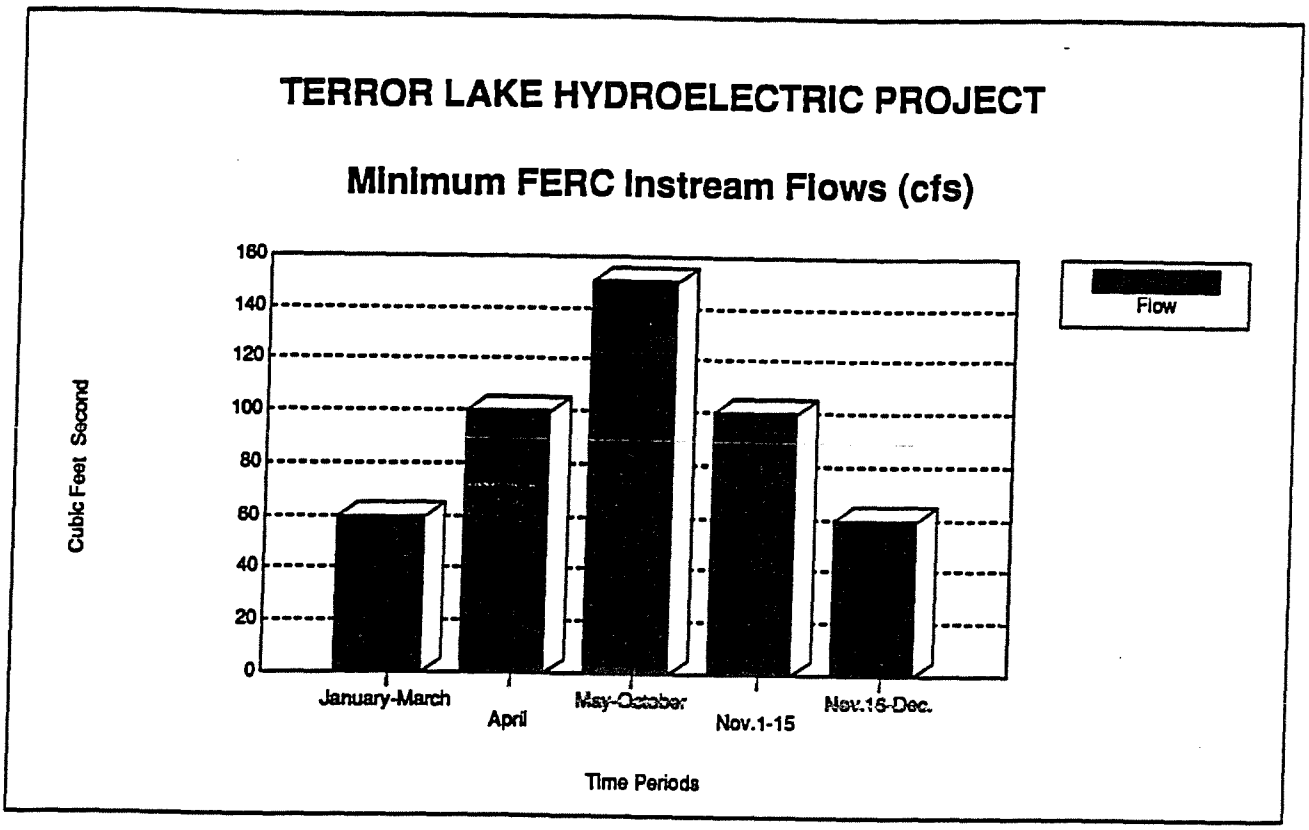
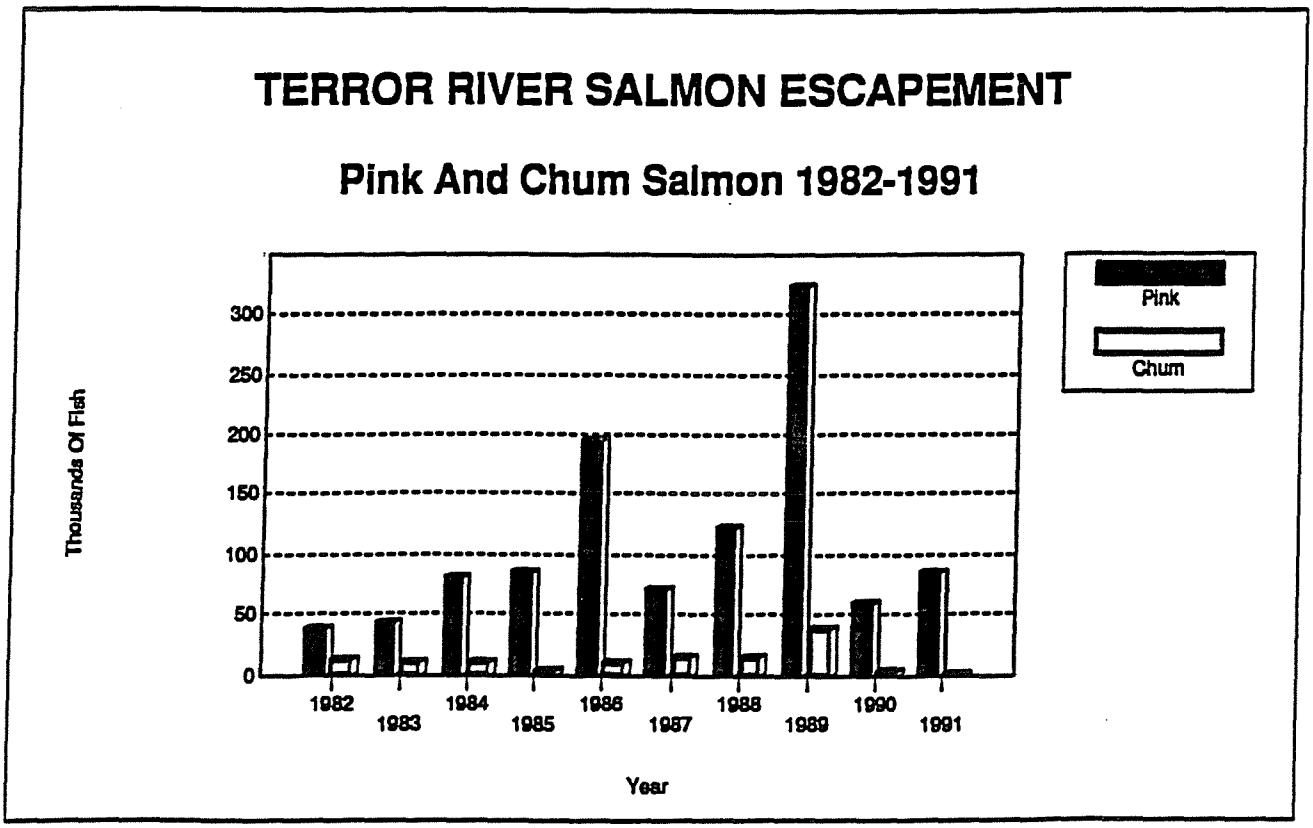


Figure 2.



6. Kodiak NR 91 - "Coho Salmon Investigations Karluk and Ayakulik Rivers" (Chatto)

Work was initiated in 1991 to classify coho salmon juvenile rearing areas on these river systems and determine distribution and movement of coho spawners. During the summer of 1991, field measurements of six major rearing areas for juvenile coho were completed in both the Karluk and Ayakulik drainages. The data will be used to determine total available rearing areas (Euphotic Volume) for coho on these systems. In addition, sampling for juvenile coho was completed in order to determine the relative density and life history stage of these fish in these areas. This information will be used to generate a minimum rearing capacity for the Karluk and Ayakulik, as well as to estimate the adult spawning escapement required.

In September 1991, a total of 60 coho salmon adults were radio-tagged in the Karluk and Ayakulik Rivers. These fish were closely monitored by aerial tracking to record their movement and distribution during spawning. An additional 60 fish will be tagged in 1992 to replicate the data. Results will allow the identification of spawning areas for measurement and aerial indexing. In addition, the data will allow a more precise calculation of average stream life for spawning coho salmon adults. This is a very critical component of the current area-under-the-curve model used by the refuge to generate escapement numbers using aerial index surveys.

Volunteer Julie Erickson and BT Hander radio-tag an adult coho salmon for the purposes of identifying major spawning grounds and estimating stream life on the Ayakulik River. (Photo T. Chatto)

Bruce McIntosh(ADF&G) and BT Hander prepare for coho radio-tagging at the Karluk River ADF&G weir. Study purpose is to identify major spawning grounds and estimate stream life. (Photo E. Samson, ADF&G)

Volunteer Steve Mosher and BT Hander sort juvenile coho salmon for a coho rearing habitat study on Red Lake. (Photo R. Hander)

Volunteer Steve Mosher overlooking a small pothole lake and tributary on the Upper reaches of the Ayakulik River Drainage which was sampled for juvenile coho salmon. (Photo R. Hander)

7. Kodiak NR 91 - "Survival and Productivity of Female Brown Bears and Survivorship of Cubs on Kodiak Island, Alaska" (Kodiak Brown Bear Trust) (Barnes)

This is a long-term project supported by the Kodiak Brown Bear Research and Habitat Maintenance Trust, the FWS, and the ADF&G. Activity in 1991 consisted of radio-tracking flights in spring and fall to document production and fate of new cub litters, survival of older (>1 year-old) cubs, and survival of adult females. Fixed-wing aircraft and helicopters were used to recover shed collars and investigate mortalities. The sample of adult females declined from 53 in fall, 1990 to 43 in fall, 1991. One female was confirmed as a natural mortality during that period and the remainder were lost from the sample due to shed collars, lost signals, or unconfirmed status (shed collar or mortality).

This sow demonstrates proper eating technique to her yearling on O'Malley Creek. (Photo G. Wilker)

Ten of 15 potentially pregnant females produced new cub litters in 1991, with an average litter size of 2.5. Cub survival to fall was 64%. Fifteen yearling litters, with an average 2.1 cubs per litter, were present in the sample in spring and yearling survival to fall was unusually low (65%).

Seven (58%) of 12 2-year-old litters were weaned by females in spring and early summer. Mean litter size of 2-year-old litters was 1.6. Four (67%) of 6 3-year-old litters, and a total of 10 3-year-old cubs, were also weaned in 1991. The other 2 3-year-old family groups remained intact all season and entered winter dens as family units. This is the first time we have observed families remaining together through 4 seasons.

The annual salmon potluck on lower Dog Salmon Falls. (Photo V. Barnes)

8. Kodiak NR 91 - "Brown Bear/Human Interactions Associated with Deer Hunting on Kodiak Island" (74530-88-01) (Barnes)

The principal objectives of this study were to assess effects of deer hunting activity on range and movements of brown bears, evaluate real or potential interactions between deer hunters and bears, and to quantify observations and attitudes of deer hunters. Results of the study were presented at the Ninth International Bear Conference held during late February 1992, in Missoula, Montana. The following is the abstract of the draft manuscript for the conference proceedings:

Abstract: Distribution and range of brown bears was compared with temporal and spatial distribution of Sitka black-tailed deer hunting activity on westside Kodiak Island, Alaska, to examine impacts of deer hunting on bears. Mean number of bears that annually ranged < 5 km from the coast ≥ 5 km inland from the coast, or in both areas was 10, 8, and 11, respectively. Bears that exclusively or seasonally occupied the coast zone were usually classed as having moderate or high potential to interact with hunters because most hunter access and effort (> 95%) was via the coast. Bears that ranged exclusively inland were considered unlikely to encounter hunters. Animals that ranged in both zones often (39%) moved inland during fall (Oct-Dec) and most bears (71%) denned in the inland zone. Females that denned near the coast entered

dens later (x = 22 Nov) than females that denned inland (x = 12 Nov). Two radio-collared bears were known to raid deer hunting camps and 9 other marked bears were observed by hunters or were located < 200 m from hunting camps. Deer hunter surveys revealed that over two-thirds of the deer harvest occurred during October-November. About half of the hunters observed at least 1 bear during their hunt. Seven to 21% of the respondents annually reported having a threatening encounter with a bear and 5-26% reported losing deer meat to bears. Human-induced mortality to radio-collared bears occurred more often near the coast (5) than inland (3); 7 bears were harvested by sport hunters and 1 was killed (non-sport) in a Native village. Deer hunters killed 2 unmarked females in defense of life or property situations in the study area. High bear densities and concentrated deer hunting activity combine to make conflicts unavoidable. Adverse impacts to bears can be minimized by maintaining low levels of human activity in inland areas and improving hunter awareness of bear ecology and behavior.

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

Objectives of this project are to evaluate effects of a structured bear viewing program on bear use patterns and interactions between humans and bears. The three-year study was initiated in 1991 with documentation of bear use and bear/human interactions under conditions of comparatively unrestricted public use. Collection of these data will continue in 1992 and 1993 when public use of the O'Malley River will be limited to participants of the bear viewing program.

The study camp, located at 1600 feet elevation on a ridge overlooking the O'Malley River flats, was established on June 21 and was in operation until September 20. During that period study members recorded 662 scan samples to document distribution and activities of bears, logged over 250 hours of intensive monitoring of individual bears, and spent countless additional hours observing bears to record physical and behavioral characteristics necessary to distinguish individual animals. During the conduct of this work, observers quantified 66 interactions between humans and bears and 43 cases of bear response to low-flying aircraft.

A minimum of 50 independent bears and 110 total bears (including dependent cubs) were identified on the study area in 1991. Bear use of the study area increased sharply after July 1, peaked in late July, declined in August, and then increased again in September. Bear use of the study area appeared to generally reflect the chronology and distribution

of early and late runs of sockeye salmon in the O'Malley sub-basin. Data on bear/human interactions and bear response to aircraft were utilized in the Karluk Lake compatibility determination and in preparation of an Environmental Assessment for the O'Malley bear viewing program.

The O'Malley study camp (lower right) is an ideal site for studying bear use and bear/human interactions at the O'Malley bear viewing site (upper center). (Photo V. Barnes)

10. Kodiak NR 91 - "Seasonal Migration and Movements of Kodiak Island Bald Eagles" (74530-82-01) (Zwiefelhofer)

Study efforts in 1991 continued to focus upon cataloguing color-marker observations and preparing preliminary data analyses. Only 2 color-marked bald eagle observations were recorded during 1991, indicating that the four year lifespan of the markers reported by other researchers may be similar for this study. The observed birds had all attained their adult plumage. All observations occurred on the Kodiak Archipelago. A brief presentation of the study's preliminary findings was given at the 1991 Alaska Bird Conference. The study's final report is scheduled for completion during 1992.

11. Kodiak NR 91 - "Habitat Utilization and Seasonal Distribution of Sitka Black-tailed Deer on the Spiridon Peninsula, Kodiak Island, Alaska (74530-89-01) (Zwiefelhofer)

Radio telemetry data from collared deer continued to be collected from the study area until August 1991. Graduate student Selinger broke down his Chief Cove field camp in September and returned to the University of Alaska in Fairbanks to complete his course work. All 21 of the radio-collared deer survived through the winter. Nineteen of the 21 returned to the same summer range utilized in 1990.

Overall winter mortality in the study area during 1991 was minimal in comparison to the previous two winters. A 1991 mortality survey in a portion of the study area located 13 fawn carcasses. Coverage of the same area during 1989 and 1990 located 161 and 116 carcasses, respectively, from all age cohorts. Fecal and rumen samples were collected and sent to Washington State University for analysis. Graduate Student Selinger's thesis is scheduled for completion by June, 1992.

12. Other (Chatto)

A meeting of the Kodiak Regional Salmon Planning Team was held in March 1991. The team consists of members of the ADF&G and Kodiak Regional Aquaculture Association. Fishery Biologist/Pilot Chatto is an ex-officio member of the team. Work in 1991 by the team focused on completing the final public review draft for the Kodiak Regional Comprehensive Salmon Plan-2002. The final draft plan will be reviewed by the team sometime in early 1992.

During the year the team also reviewed a preliminary proposal by the Old Harbor Native Corporation for a non-profit hatchery in Three Saints Bay on the East side of Kodiak Island. No specific action was taken on this proposal

Fishery Biologist/Pilot Chatto attended the annual American Fisheries Society Western Divisional meeting in Bozeman, Montana and the Alaska Chapter meeting in Ketchikan, Alaska during 1991.

The refuge provided technical assistance to the ADF&G-Sport Fish Division during the pre-planning of a Karluk River steelhead study which will be implemented in 1992 by the Department.

F. ADMINISTRATION

1. Personnel

1. Jay R. Bellinger, Refuge Manager, GS-12, PFT, EOD 1/8/84

2. John R. Munoz, Asst. 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. David W. Menke, Park Ranger, GS-11, PFT, Transferred to Klamath Basin NWR, 9/3/91

6. Dennis C. Zwiefelhofer, Wildlife Biologist/Boat Operator, GS-11, PFT, EOD 5/78

7. Geraldine M. Castonguay, Refuge Clerk, GS-5, PFT, EOD 2/7/83, LWOP 10/3/91

8. Julie C. Revalee, Refuge Clerk, GS-5, PFT, EOD 9/17/91

9. Rene Hunter, Clerk Typist, GS-3, TFT, EOD 6/27/90, Resigned 6/1/91

10. Ronnie D. Bowers, Maintenance Mechanic, WG-9, PFT, EOD 4/3/83

11. Rasmus Anderson, Jr., Laborer, WG-2, PPT, EOD 6/11/83

12. Raymond F. Hander, Biological Technician, GS-5, TFT (Local Hire) EOD 7/3/88

13. Scott Shelton, Biological Technician, GS-6, Temporary (Local Hire) EOD 5/15/91, Terminated 10/15/91

14. Diana Brooks, Assistant Park Ranger, GS-9, PFT, EOD 9/1/91

15. Robert Stovall, Wildlife Biologist/Subsistence, GS-9, PFT EOD 12/23/91

16. Gary Johnson, Biological Technician/Subsistence, GS-6, PFT (Local Hire), EOD 11/1/91

17. Jacke Barnes, Office Automation Clerk, GS-3, PFT (Local Hire), EOD 1/23/92

18. Heather Johnson, Coop Student, GS-5, EOD 6/91, Returned to school 10/91

19. Greg Wilker, Seasonal Biological Technician, GS-5

20. Sally Wilker, Seasonal Biological Technician, GS-5

21. Tim Walker, Seasonal Biological Technician, GS-5

ALASKA FISH AND WILDLIFE RESEARCH CENTER

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

STAFF PHOTOS

Refuge Manager Jay Bellinger

Refuge Clerk Gerri Castonguay (left) and Clerk Typist Rene Hunter.

From left to right, Rasmus Anderson, Scott Shelton, Paul Taylor, Ron Bowers, Diana Brooks, Keith Globis, Julie Revalee, Butch Patterson and Jacke Barnes

From left to right, Dick Munoz, Tony Chatto, Vic Barnes and Ray Hander

Graduate Student Jeff Selinger and Assistant

Coop Student Heather Johnson

Refuge clerical positions underwent several personnel changes throughout 1991. Clerk Typist Rene Hunter resigned June 1, 1991. This position remained vacant until it was filled by Jacke Barnes in November, a local hire appointee. Refuge Clerk Gerri Castonguay went on LWOP in October, as her husband was transferred to Florida. Julie Revalee started the process of learning administrative duties of a refuge clerk during September. This allowed for two weeks of overlap with Gerri that helped smooth the transition.

Diana Brooks was hired as the new Assistant Park Ranger during September.

The new subsistence wildlife biologist position was filled by Robert Stovall near the end of December. Robert transferred from Ninigret NWR in Rhode Island.

Gus Johnson was hired in November to fill the subsistence biological technician/boat deckhand position.

Park Ranger Dave Menke transferred to Klamath Basins NWR during September after seven years of work at Kodiak.

Attempts to fill Dave's job were unsuccessful at first. We knew filling Dave's shoes would be a difficult task but weren't ready for the seven months it eventually took. At a time when the public use management plan was being finalized, Dave's absence was especially apparent. Paul Taylor from Back Bay NWR was selected during December to fill the Park Ranger slot.

Table 2 depicts personnel totals for the past five years.

Table 2

Staffing 1988 to 1991

Fiscal Year	Permanent Full Time Employees	Permanent Part Time Employees	Temporary Employees	Total Full Time Equivalents
1991	10	1	5**	
1990	9	1	4	9.5*
1989	9	1	4	9.5*
1988	9	1	3	9.5*
1987	9	1	2	9.7

*Local hire appointments do not count toward full time equivalents.
**Includes one Cooperative Education Student.

Coop student Heather Johnson was assigned to Kodiak NWR from June to September and assisted with several projects including cabin maintenance, seabird surveys, set net cabin inspections, waterfowl production surveys and the Ayakulik River creel census.

During December, employees in government housing were notified that utilities will no longer be a part of the rent computation process. New quarters agreements were received and signed. Shortly thereafter, another notice was received that voided the above mentioned notice and replaced it with another rent computation that not only eliminates the utilities factor, but also rescinds the isolation factor. This will more than double the rates of housing in Kodiak. For the houses (1324 square feet, 3 bedroom), this means that rates will jump to $880/month. Average utility costs will add $275-$350/month to this figure. The basis for this increase is OMB Circular A-45 which states that when the nearest established community exceeds 5,000 in population, the isolation factor is no longer valid. The assumption is that communities of this size are likely to support a mixture of

services, stores, Government facilities and cultural resources that are adequate for the needs of housing occupants. We submitted comments to OMB requesting a re-evaluation of this issue from the perspective that Kodiak is an island community, without access to the resources available to communities linked to a road system. We also sent a request to the Regional Office to examine the possibility of administrative action to maintain the isolation factor.

2. **Funding**

Table 3 depicts Kodiak Refuge funding in thousands of dollars by program for the last five fiscal years. Base operations and maintenance funding for 1260 increased by 10 percent in FY92. This increase will be totally utilized, however, by a 60K increase in personnel costs, (several positions were filled for the entire year, higher percentage of personnel costs under FERS retirement, cost-of-living increase and moving costs).

We received a 20 percent decrease in fisheries funding (1330) this year. All of these funds were tied up in ongoing surveys and studies. Therefore, 1260 funds will be utilized to make up for this shortfall.

In summary, if the MMS projects are not included, our overall budget was reduced by 10K in 1992. Due to the 60K increase in personnel costs, however, the funds available for field projects were reduced by 16 percent from 1991.

Table 3

Kodiak National Wildlife Refuge Funding Levels

Program	FY 1988	FY 1989	FY 1990	FY 1991	FY 1992
WR-1260 (Base O&M)	538.0	520.0	536.0	555.1	616.0
WR-1260 (Projects)	152.0	139.0	119.0	283.4	201.0
WR-1260 (MMS)	--	7.0	18.0	38.0	67.0
WR-1221 (Subsistence)	--	--	--	72.5	103.0
FR-1330 (Base O&M)	90.0	90.0	79.0	75.0	66.5
FR 1330 (Projects)	--	--	--	24.0	13.5
Contaminants	25.0	--	--	--	--
TOTALS	815.0	756.0	734.0	1048.0	1067.0

3. Safety

Butch Patterson served as safety officer for 1991.

Regional Safety Officer Ginny Hyatt conducted an inspection of refuge facilities and equipment on January 22 and 23.

Bear safety training was conducted for seasonal, refuge staff and volunteers as the need arose.

Aviation safety training was attended by all staff members as required by Regional policy.

No official lost time accidents were processed during 1991.

Refuge volunteers were given a firearms familiarization session prior to working on the refuge as mandated by the Service's Bear Safety Policy. (Photo H. Johnson)

4. Technical Assistance (Zwiefelhofer)

On May 29, 1991, WB Zwiefelhofer assisted the Region 7 Oil Spill Administrative Office in evaluating a fuel spill originating from the sinking of the F/V Almighty on May 28,

1991, near the Round Island Walrus Sanctuary in Bristol Bay. Although Bristol Bay is not part of the Kodiak refuge, the Kodiak Coast Guard Air Station is the point of origin for oil spill evaluation flights over most of western Alaska. The logistics and short response time of getting Fish and Wildlife Service Personnel from the Anchorage Regional Office aboard these flights often require Kodiak refuge personnel to fulfill the Service's responsibility to evaluate wildlife resource impacts.

On November 25, 1991, WB Zwiefelhofer again provided wildlife and avian population estimates for the Women's Bay area of Kodiak Island, after a derelict hull anchored in the bay sank and began leaking No. 2 diesel fuel. In addition to the resource data, WB Zwiefelhofer also informed the Oil Spill Administrative Office of another recently sunken boat in the same vicinity which had been sporadically leaking fuel.

Bald eagle nest locations for off-refuge lands on Afognak Island were provided to the Afognak Native Corporation for their logging contractor. Hopefully, this information will lead to increased nest buffers in the future. The contractor has been less than generous in the past. In one recently logged bay, the maximum distance measured from a nest site to logging activity was 265 feet, and the minimum was 12 feet.

G. HABITAT MANAGEMENT

1. General

Kodiak Refuge encompasses about two-thirds of Kodiak Island, all of Uganik and Ban Islands, and part of Afognak Island. The islands, part of the Kodiak Archipelago, lie at the western border of the Gulf of Alaska in the Pacific Ocean.

Although the Refuge is larger than the State of Delaware, with about 1.6 million acres of Federal land, no place in the refuge is more than 15 miles from the sea. The refuge contains a variety of landscapes including glacial valleys, tundra uplands, lakes, wetlands, sand and gravel beaches, salt flats, meadows, and rugged mountains. All but the highest peaks and ridges are covered by lush, dense vegetation in summer. Vegetation varies from tundra type plants on the south end of Kodiak Island to a dense Sitka spruce forest on Afognak Island.

The refuge is managed as de facto wilderness (73% of the refuge has been recommended for wilderness designation in the comprehensive conservation plan). Most of the habitats on

Kodiak remain in an undisturbed state, the major exception being the coastline, where in some sections considerable development has occurred.

2. **Other Habitats**

In 1988 the ADF&G initiated a coho salmon stocking program in Hidden Lake on the Afognak Unit of the refuge. This program is under the auspices of an environmental assessment prepared by the refuge in 1988, and stocking is to take place each year. Hidden Lake is inaccessible to salmon due to a large falls below the lake outlet. No stocking occurred in 1990, but approximately 125,300 coho fry were planted in 1991. ADF&G estimates that approximately 3,700 and 3,000 adult project fish were caught in the commercial fishery in 1990 and 1991, respectively. It is expected that in 1992 the refuge will receive a proposal by ADF&G to stock sockeye salmon fry into the system.

3. **Wilderness and Special Areas**

There is currently no designated wilderness on Kodiak Refuge. The comprehensive conservation plan includes a 1.17 million acre wilderness proposal (73% of the refuge). The proposal is currently going through the Department of Interior. The refuge also contains an 88,000 acre research natural area and four rivers designated for special river management according to the refuge comprehensive conservation plan.

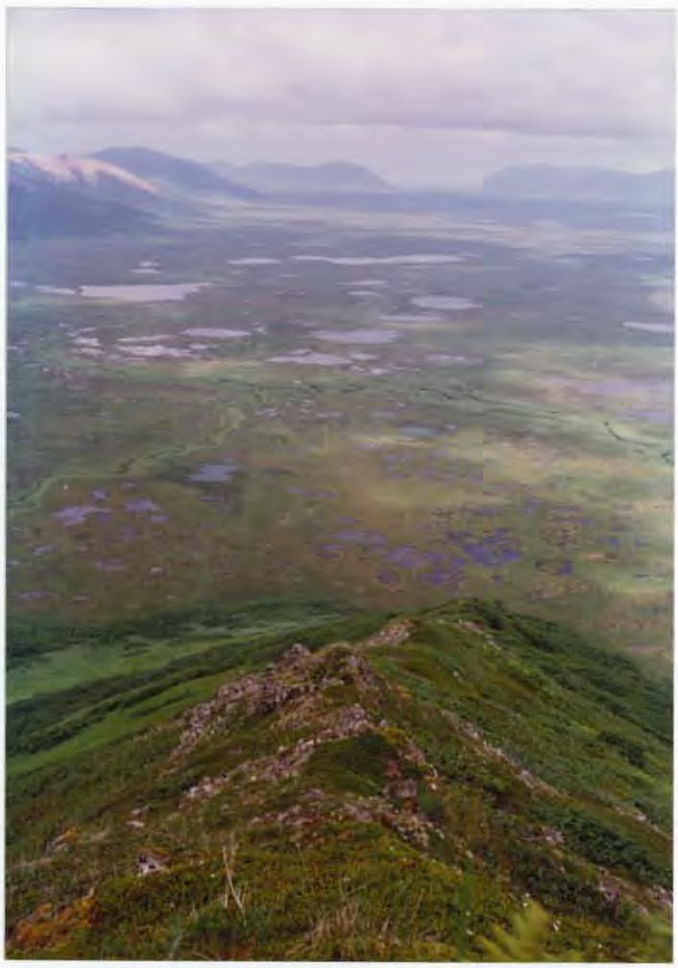
H. WILDLIFE

1. **Waterfowl** (Zwiefelhofer)

Unlike most other Alaskan refuges, the Kodiak National Wildlife Refuge has not conducted annual waterfowl production surveys in the past. Kodiak's non-participation was based on the assumption that the limited wetlands found on the refuge would not produce enough waterfowl data to be significant in terms of management of the Pacific Flyway. However, since Region 7 adopted a standard operating procedure for waterfowl production surveys, comparison of Kodiak's waterfowl production to other Alaskan refuge waterfowl production areas is now possible. However, this was not funded in 1991. Helicopter surveys replaced ground surveys in many other Alaska production areas.

To initiate waterfowl production surveys on the Kodiak refuge, the Ayakulik River area was selected for sample collection. This area is considered prime waterfowl habitat based on a

high density of nesting tundra swans. Tundra swans have been used by refuge staff as an indicator of the quality of waterfowl habitat during various land evaluation and planning processes. Surveying this area would offer an opportunity to validate the refuge's use of tundra swans as an indicator species. Two strata (low and other) were designated, using historic tundra swan nesting data. Plots with no past tundra swan observations were placed in the low strata category. From the two strata, we selected random sample plots along the main stem of the Ayakulik River.



Ayakulik River area was selected as the location to initiate waterfowl production surveys on Kodiak Refuge. (Photo D. Zwiefelhofer)

Kodiak's waterfowl production surveys were conducted July 10-20, 1991 by WB Zwiefelhofer and Cooperative Education Student, Heather Johnson. The two-person survey crew was dropped off via helicopter at a point approximately 3 miles downstream

from the Ayakulik main stem's source lakes. Low water conditions precluded the original plan of a fixed-wing drop off on one of the 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. Four low strata plots and seven "other" strata plots were surveyed during the period.

Table 4 presents the number of observed broods and brooding hens, by species, found in the random plots during the survey. With the exception of tundra swans, waterfowl species seen during the survey are year-round residents of the Kodiak archipelago. Although overwintering by tundra swans on the Kodiak refuge has been documented, this activity does not seem to occur every year.

Survey timing appears to have been somewhat late for the early nesters such as mallards, red-breasted mergansers, and northern pintails. Broods of these species were either nearly flight capable class III's, or single young class I broods which were likely the result of renesting efforts. Several broods of green-winged teal were seen that were also nearly flight capable. No broods of greater scaup were found in the plots but several class II's were observed along the Ayakulik River during transit. These were the only broods of diving ducks seen during the survey period.

Table 5 presents the expanded waterfowl production and population estimates for the 57 square miles of Ayakulik main stem drainage, sampled using the Alaska Duck Production Survey Data Analysis Software provided by Migratory Bird Management - Juneau.

Table 4

Waterfowl Production Summary - Observed Broods

Production Area: South Central
Selected Data: ALL STRATA
Number of Plots: 11
Expanded Area: 57

Year: 1991

SPECIES	Class I	Class II	Class III	Broody Hens	Total
Mallard	0	2	0	0	2
Gadwall	0	1	0	1	2
American Wigeon	2	2	1	2	7
Green-winged Teal	0	1	8	3	12
Blue-winged Teal	0	0	0	0	0
Northern Shoveler	0	0	0	0	0
Northern Pintail	0	2	1	1	4
DABBLER SUBTOTAL	2	8	10	7	27
DIVER SUBTOTAL	0	0	0	0	0
Red-breasted Merganser	2	0	5	0	7
MISC DUCK SUBTOTAL		20	5	0	7
Unidentified Duck	0	1	0	0	1
TOTAL DUCKS OBSERVED	4	9	15	7	35
GOOSE TOTAL	0	0	0	0	0
GREBE TOTAL	0	0	0	0	0
Red-throated Loon	0	1	0	0	1
LOON TOTAL	0	1	0	0	1

Table 5

Waterfowl Production Summary - Expanded Estimates

Production Area: South Central Year: 1991
Selected Data: ALL STRATA
Number of Plots: 11
Expanded Area: 57

Species	Broods Expanded	Broods C. V.	Adults Expanded	Adults C. V.	Young Expanded	Young C. V.
Mallard	9	1.00	61	0.39	17	1.00
Gadwall	9	0.65	13	0.47	24	0.81
American Wigeon	30	0.69	34	0.59	93	0.70
Green-winged Teal	53	0.53	48	0.38	211	0.55
Northern Pintail	17	0.52	13	0.47	57	0.47
DABBLER SUBTOTAL	117	0.32	168	0.25	402	0.33
Red-breasted Merganser	35	0.56	22	0.66	72	0.54
MISC DUCK SUBTOTAL	35	0.56	22	0.66	72	0.54
Unidentified Duck	4	1.00	0	-	4	1.00
TOTAL	156	0.27	191	0.23	478	0.28
Tundra Swan	0	-	30	0.49	0	-
Red-throated Loon	4	1.00	21	0.79	4	1.00
LOON TOTAL	4	1.00	21	0.79	4	1.00

No tundra swan broods were found in the random survey plots. However, 1991 aerial tundra swan survey data for the same Ayakulik area found 24 adult swans and 2 broods with a total of 8 cygnets. The random plots appear to under-represent production by waterfowl (such as Kodiak tundra swans) which nest in low densities or widely scattered areas. If the production aspect is not considered, the total number of 32 tundra swans counted in the area closely matches the expanded adult population estimate of 30 birds.

Water levels along the survey route were 1 to 2 feet below normal. The East Fork of the Ayakulik was the only water body

in the survey area that had a water level only slightly below normal.

A positive correlation appears to exist between beaver activity on a water body and use by waterfowl. Given the low water conditions encountered during the survey, the stability of water levels provided by the presence of beaver on a water body is likely the main attraction for the waterfowl. Tundra ponds without recent or current beaver activity had little or no use by waterfowl. However, these water bodies were utilized by the following shorebirds in order of abundance: red-necked phalaropes, short-billed dowitchers, greater yellowlegs, and common snipe. Other shorebirds observed included numerous least sandpipers along the main stem and East Fork of the Ayakulik River and a single whimbrel observed in survey plot number 11.

Plans for 1992 waterfowl surveys include repeating the surveys of the 1991 plots and conducting additional surveys in at least one other Kodiak refuge wetland area. Possible future survey areas include Spiridon River and Olga Bay Flats.

The annual refuge aerial tundra swan nesting surveys were completed on 10 June. A total of 89 adult tundra swans were counted during the survey. Kodiak's spring phenology and much of the refuge waterfowl nesting activity appeared to be normal but water levels were below normal. Sixteen swan nests and 6 broods (22 nest sites) containing a total of 25 cygnets were also tallied. The total of 22 nest sites found in 1991 was comparable to the 9-year mean, and the 1991 total spring swan count of 114 was up from the 9-year mean of 103 spring swans present on the breeding grounds.

The tundra swan production survey was conducted on 29 August. Of the 25 cygnets found in the 6 early broods during the spring survey, 19 of the cygnets were relocated during the productivity survey. The 1991 cygnet survival rate of 76% for early hatching broods is considerably higher than the rate of cygnet survival for the remaining 16 tundra swan nest sites located on the refuge in 1991. Only a total of 26 cygnets (including the 19 from early broods previously mentioned) from 10 broods were counted during the productivity survey. Only 4 broods hatched from the 16 late nest sites. The average brood size of 2.6 cygnets recorded for the 1991 nesting season, is a slight decrease over the 8-year mean of 2.7.

The 1991 Kodiak refuge tundra swan survey data were utilized in preparing an estimate for the western Alaska tundra swan nesting population. Figure 3 and Table 6 depict survey area and results from a preliminary report prepared by the Juneau Branch of Migratory Bird Management and is included to illustrate Kodiak's place in the overall view of Alaska's tundra swan nesting population.

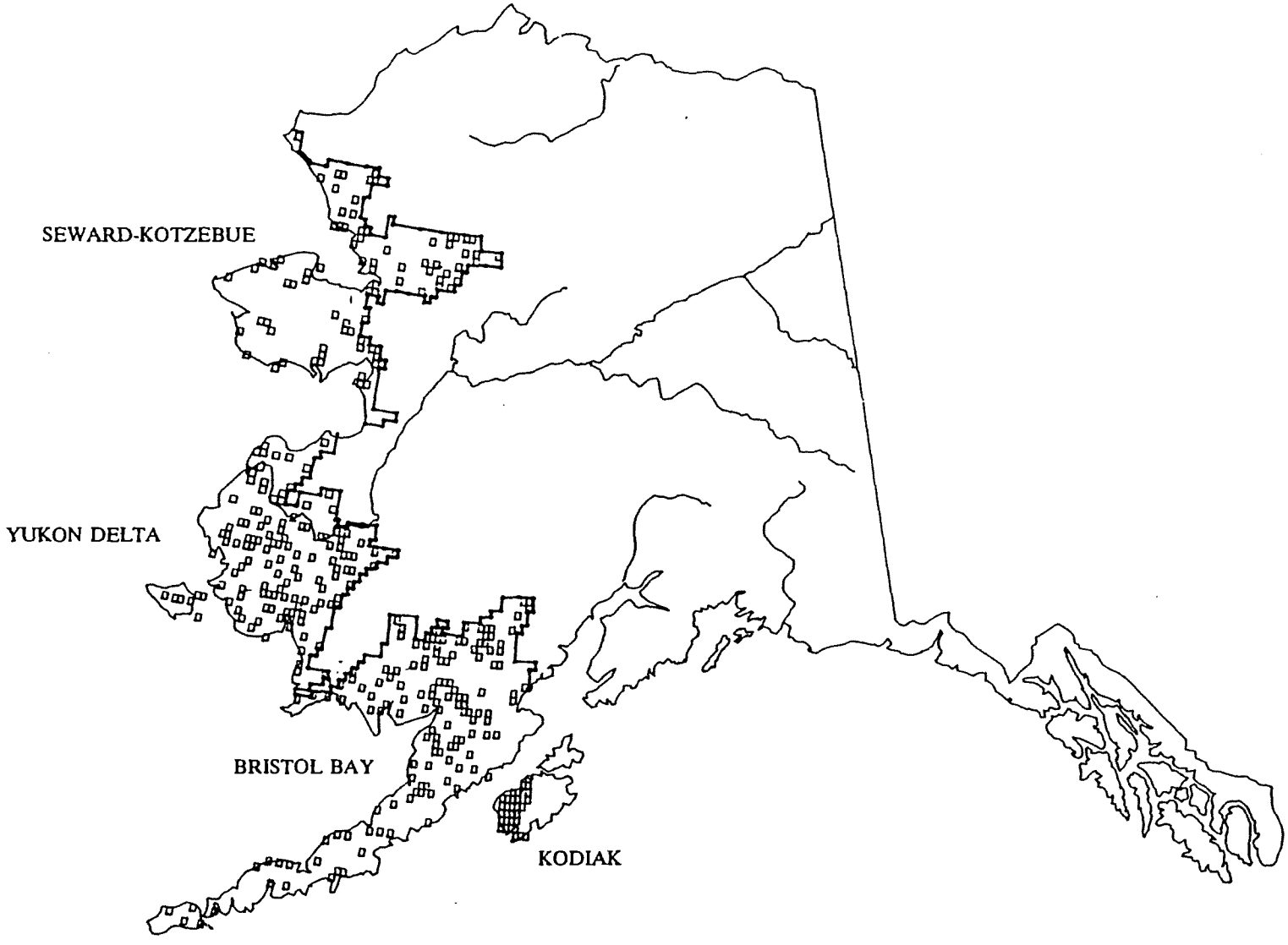


Figure 3. Locations of 376 quarter USGS 1:63,360 scale maps surveyed for Tundra Swans in 1991.

Table 1. Western Alaska tundra swan sample estimates from 376 quarter USGS 1:63360 scale maps.

	Adults and Subadults										
	in Pairs	as Singles	Singles + Pairs	in Flocks	Subtotal	Cygnets	Total Swans	Number of Broods	Average Brood Size	Percent Juvenile	Broods per Pair
BRISTOL BAY N = 701 n = 139											
Total Population	7071	751	7822	2037	9859	2370	12230	817	2.9	19	0.23
95% Confidence Limit (+/-)	1312	167	1323	896	1987	531	2517	179			
Percent Error	19	22	17	44	20	22	21	22			
YUKON DELTA N = 631 n = 126											
Total Population	27233	4452	31685	9856	41541	15124	56665	5153	2.9	27	0.38
95% Confidence Limit (+/-)	3946	785	4023	3630	7513	3465	10977	1032			
Percent Error	14	18	13	37	18	23	19	20			
SEWARD-KOTZEBUE N = 403 n = 81											
Total Population	5801	552	6353	4319	10672	2418	13090	876	2.8	18	0.30
95% Confidence Limit (+/-)	1221	149	1230	1833	2779	801	3580	275			
Percent Error	21	27	19	42	26	33	27	31			
KODIAK N = 30 n = 30											
Total Population	60	3	63	27	90	26	116	10	2.6	22	0.33
GRAND TOTAL N =1765 n = 376											
Total Population	40165	5759	45924	16239	62162	19938	82101	6856	2.9	24	0.34
95% Confidence Limit (+/-)	4334	816	4410	4164	8253	3596	11848	1083			
Percent Error	11	14	10	26	13	18	14	16			

2. **Marsh and Water Birds** (Zwiefelhofer)

Winter observations of Great Blue Herons continue to be recorded in the Kodiak and Chiniak Bay areas. A local Chiniak resident reported what he believes to be a Great Blue Heron nest on a lake near Chiniak. This is the first report of a nest for this species on Kodiak. On June 7, 1991, 2 adult and 1 subadult sandhill cranes were observed by BT Hander near the junction of the Red and Ayakulik Rivers. Sandhill cranes are not known to nest on Kodiak Island, indicating these 3 cranes were probably late migrants.

3. **Shorebirds, Gulls, Terns and Allied Species** (Zwiefelhofer)

The annual wintering pelagic seabird and waterfowl survey was conducted from February 11 to 17 in Kodiak west side bays and from February 26 to March 2 in the east side bays. Plans to complete eastern bay surveys were abandoned in 1990 due to the presence of skim ice in the area. Skim ice conditions were encountered in survey areas on both sides of Kodiak during 1991 as well, but the refuge's new fiberglass survey vessel, Ursa Major II, can safely complete survey operations that were not possible with the previous wooden-hulled boat. Results of the surveys are presented in Table 7.

Observations made on February 17, during survey area transition, included a mass southern movement of murres (est. 10-12,000) in the Shelikof Straits, 2-5 miles off Spiridon Peninsula. A similar mass murre movement involving 50-60,000 murres was recorded in the same area during 1984 surveys, but was in the northerly direction. This indicates that the murres are most likely responding to a food abundance or tidal change. An unusual feeding concentration of hundreds of red-breasted and common mergansers was encountered in the middle of Terror Bay. It is not known what species of fish the mergansers were foraging on, but juvenile herring are prevalent in Terror Bay.

Comparison analysis of recent years' data will be reported after the Exxon Valdez oil spill impact litigation is resolved.

The Kodiak refuge staff is still awaiting action by Regional Office personnel, promised last year, to convert and download the large pelagic marine bird and mammal data base resulting from past refuge survey efforts. Lack of access to the data severely hampered the refuge's ability to monitor population changes of Kodiak's wintering sea birds and sea ducks.

4. **Raptors** (Zwiefelhofer)

Kodiak bald eagles made news headlines during 1991. The wave of "killer eagle" hysteria started early in March when a Monashka Bay resident reported that a subadult bald eagle chased his chained 70 lb. dog around the yard and into his dog house. The next incident occurred in April. A local resident, fishing along the Buskin River, reported that he was returning to his car with his catch when an adult bald eagle allegedly snatched an 18 inch Dolly Varden trout from his hand. The third news-making incident happened on June 16, when a man was supposedly attacked without provocation by a pair of adult bald eagles. The article was fairly sensationalized and generated fears in the community for the safety of children and pets. After further investigation, however, it seems that the man supposedly was not aware of the active bald eagle nest in the area where he was photographing and the attack was not as life-threatening or unprovoked as earlier reported. Hopefully, this trend is not going to continue in 1992.

The Kodiak National Wildlife Refuge was surveyed for bald eagle nesting activity on May 16, 17, and 19, 1991. During 1991, 45 random plots consisting of five degree longitude-latitude blocks were chosen to survey bald eagle nesting habitat on the refuge. Random number sets for the three strata were generated using 28 low density plots, 11 medium density plots, and 6 high density plots selected to be surveyed at the 95% CL.

Availability of winter killed black-tailed deer to bald eagles diminished during 1991. Bald eagles that had become accustomed over the past several years to abundant deer carrion suffered considerable mortality during the winter and spring. The limited winter food resources resulted in poor overall body condition of nesting adults. This seems to have resulted in lower numbers of nesting attempts and production than historic averages for all three of the refuge's nesting strata. Nesting success (number of nests producing young), however, remained within the historic range.

Winter storms destroyed a minimum of 6 nest platforms. An additional 31 historic nest platforms were not located during the survey effort. It could not be established whether these nests had been destroyed or were only difficult to locate. Seventeen new nest platforms were discovered during the 1991 survey effort.

Aerial surveys of the 45 plots were conducted to determine bald eagle nesting population. A total of 29 occupied (13 tree and 16 ground) nests and 43 unoccupied (17 tree; 26 ground) nests were located in the low density stratum plots (mean of 1.04 occupied nests/plot). Twenty eight occupied (17 tree; 11 ground) nests and 61 unoccupied (42 tree; 19 ground) nests were located in the medium density stratum plots (mean of 2.5 occupied nests/plot). Twenty occupied (17 tree; 3 ground) nests and 45 unoccupied (42 tree; 3 ground) nests (mean of 3.3 occupied nests/plot) were located in the high density stratum plots (See Table 8).

Table 7

Kodiak NWR Bald Eagle Nesting Survey Random Plot Data Summary, May, 1991.

tratum	Total Plots	Plots Sampled	No. Occupied Nests/Strata	Mean Occupied Nests/Plot	Nests Est. in Strata
High	22	6 (27%)	20	3.3	73 + 2.06
Medium	42	11 (26%)	28	2.5	105 + 0.52
Low	107	28 (26%)	29	1.0	111 + 0.78
Totals	171	45 (26%)	77	2.5	289 + 3.36

Table 8

Kodiak NWR Bald Eagle Productivity Random Plot Data Summary, August, 1991.

Stratum	Nests Sampled	Successful Nests	No. Young Fledged	No. Young/ Occ. Nest	Est.Production Mean YG/Plot
High	20	11 (55%)	16	.8	2.6 + 1.22
Medium	22	16 (73%)	25	1.14	2.9 + 0.39
Low	26	16 (62%)	23	.88	.9 + 0.37
Totals	68	43 (63%)	64	.94	2.13 + 0.66

An estimated 364 $\pm$ 113 young bald eagles were fledged in the 171 plots on Kodiak refuge during 1991.

On July 26, twenty-six of the 29 spring-occupied nests in the low density strata, 22 of the 28 occupied nests in the medium density strata, and all 20 occupied nests in the high density plots were checked for production of young eagles.

Sixteen (62%) of the 26 nests in the low density strata produced 23 fledglings (0.9 yg/spring occupied nest; 1.4 yg/successful nest). Sixteen (73%) of 22 nests in the medium density strata produced a total of 25 fledglings (1.1 yg/occupied nest; 1.6 yg/successful nest) and 11 (55%) of 20 nests in the high density stratum produced 16 fledglings (.8 yg/occupied nest; 1.5 yg/successful nest).

During the production survey, a total of 4 nests were found to contain unhatched eggs. One nest on Noisy Island contained a dead eaglet, approximately 3 weeks younger (by plumage) than the other two live and nearly fledged eaglets in the nest.

Table 9 presents historic bald eagle data from past Kodiak refuge survey efforts. It has been noted that random plot surveys may under-estimate bald eagle production. The 1992 survey effort will encompass the refuge lands and the data will be used to restratify and update the refuge's bald eagle nest survey sampling scheme. Data from future random surveys will be examined for a similar trend.

Table 9

Summary of Kodiak Bald Eagle Nest Data

Survey Year	Empty Nests	Active-Not Rechecked	Active W/O YG	Active W/1 Yg	Active W/2 Yg	Active W/3 Yg	Yg/Nesting Attempt	Total Young
1991[c]	145	36	28	22	22	0	0.9	66
1990[b]	380	5	149	108	160	6	1.1	446
1989[b]	308	3	94	94	134	13	1.2	401
1988[c]	119	4	35	57	52	4	1.2	173
1987[a]	318	94	81	66	63	0	0.9	192
1986[c]	92	8	39	47	21	1	0.9	92
1985	25	1	17	23	18	1	1.1	62
1982[a]	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[a]	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[a]	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[a]	91	109	17	11	26	0	1.2	63
1966[a]	85	81	15	10	14	0	1.0	38
1965[a]	91	86	16	12	7	0	0.7	26
1964[a]	55	48	23	8	13	1	0.8	37
1963[a]	95	72	27	20	26	3	1.1	81

[a] Complete KNWR survey coverage

[b] Includes Afognak, Shuyak, Whale, Raspberry, Ban, Amook, Uganik, and Spruce Islands plus the north and west sides of Kodiak Island

[c] Random plot data only

5. Raptor Mortality

The number of dead and injured bald eagles reported to the Kodiak refuge continues to increase each year. A total of 31 carcasses (or parts of carcasses) were reported or collected during 1991, compared to 16 during 1990. This increased mortality could be indicative of a saturated population, low food supplies, or possibly an increase in human-induced impacts.

Avian pox was identified among bald eagle mortalities recovered during 1991. (Photo D. Zwiefelhofer)

The local Kodiak Borough Landfill has continued to be a source of mortality for Kodiak bald eagles. Eight dead eagles were found in the landfill area and 1 immobilized bald eagle was found immediately adjacent to the landfill. Three of the 8 carcasses tested positive for barbiturates, indicating that these casualties were due to the improper handling of euthanized animals from the local pound. It is possible that more than these three casualties were the result of barbiturate ingestion, however the condition of the remaining carcasses precluded accurate analysis. During the winter of 1990 as many as 5 bald eagle mortalities occurred after landfill personnel uncovered remains of euthanized animals when moving fill to cover bales of trash. The uncovered carcasses (particularly the liver and organs) were capable of causing secondary euthanization in the bald eagles feeding on them. Consumption of small amounts would anesthetize and

incapacitate the eagle for approximately 24 to 36 hours. This same scenario occurred again in 1991, hopefully for the last time.

The 8 dead bald eagles and the 1 immobilized eagle were found at or near the landfill facility between March 13 and April 19, 1991. Having been alerted to this situation the previous year, we quickly began to investigate the handling technique for euthanized animals once they reached the landfill. We were assured the euthanized animals were being properly disposed of, even though we suspected this was not the case. After positive identification of the euthanizing agent used by the local pound was made from one of the bald eagle carcasses, the Kodiak Island Borough (responsible for landfill operations) was informed that they could be liable for prosecution if additional mortalities occurred. Meetings with Borough and City representatives and local veterinarians resulted in development of a protocol for handling euthanized animals. This includes disposal of carcasses in locking, 55 gallon hazardous waste drums and marking disposal sites of drums for future reference. We will continue to monitor the landfill for bald eagle mortality during 1992.

Thirty-one bald eagles were recovered from various locations around Kodiak Island. Causes of increased mortalities included barbiturate ingestion. Disposal of euthanized animals by the City of Kodiak at the Kodiak Island Borough landfill exposed bald eagles to the drug when birds scavenged carcasses. (Photo D. Zwiefelhofer)

6. Injured Raptors

A total of 10 bald eagle injuries were reported during 1991. Eight of the eagles were recovered. Three of the injured bald eagles required extensive surgery and long term rehabilitation, and therefore were transferred to the Arctic Animal Hospital in Anchorage. The bald eagles were either transferred to captive breeding programs or are currently being rehabilitated for release at a future date. The remaining 5 injured bald eagles were rehabilitated locally by refuge personnel or by volunteers Pam and Steve Honnald, who have the appropriate permits to hold and care for raptors. Of the 2 injured bald eagles not recovered, the first was observed by a local Kodiak resident who reported a subadult eagle partially electrocuted on a powerline near his house. The bird spent several minutes on the ground after being stunned and, after several attempts, flew away but left a large part of its left leg behind. The second was observed until out of sight floating on an ice floe with the outgoing tide of Anton Larsen Bay. The disposition of these 2 birds is not known but it is suspected that each succumbed.

A short-eared owl found at the St. Herman's boat harbor with extensive wing damage was sent to Anchorage for treatment. Unfortunately, the owl had to be euthanized due to massive infection and gangrene.

Assessment activities associated with the Exxon Valdez oil spill included capturing, taking blood samples and then banding bald eagles in the impact areas. An adult captured in the East Arm of Uganik Bay on July 27, 1989 was found on a beach near West Pt. in Uganik Bay by a local resident during a January 1991 wood gathering expedition. Because of the advanced carcass decomposition, no cause of death could be ascertained.

7. Other Migratory Birds

Resident populations of small passerines, decimated by record low temperatures during the winter of 1989, continue to show signs of recovery. Several good nesting seasons will be needed for these reduced populations to return to their previous abundance. Noteworthy sightings included a hummingbird at a local bird feeder in October and 8 bramblings seen during the Audubon Christmas Bird Count.

8. Game Mammals

a. **Brown Bear** (Barnes)

General

Primary activities associated with brown bears included spring and fall sport harvest seasons, aerial stream surveys, evaluation and ranking of habitat as part of acquisition strategies, incorporating brown bear considerations into the draft Public Use Management Plan, conduct of the bear viewing program at Dog Salmon Creek (see Public Use), planning for the bear viewing program at O'Malley River, and the conduct of research projects (see Research and Investigations). Other tasks included input into the contracted analysis of the Brown Bear Trust and preparation of a compatibility determination for development on Native-owned land in the Karluk Lake watershed.

Surveys

Nine aerial surveys of bears concentrated along salmon streams were flown during the period of July 17 to August 21. Individual counts ranged from 64 (August 20) to 201 (August 2) and averaged 114. Peak counts for the most important streams were: Sturgeon River - 53 on July 23, East Sturgeon River - 37 on August 2, Connecticut Creek - 56 on August 2, and Pinnell Creek - 44 on August 8.

Composition of 1024 observations accumulated over the entire survey period was: single bears - 52%, maternal females - 15%, old (1-2 yr) cubs - 21%, and first-year cubs - 13%. These figures compare with 44%, 17%, 26% and 12% composition for the same categories, respectively, in 1990 surveys.

Survey results indicate continued high use of these important salmon streams on southwest Kodiak Island; peak counts and composition, when compared with data from recent years, suggest a relatively stable population.

Mortality

Sport harvest of brown bears on the refuge was 115 in 1991, compared to 116 in 1990 (Table 10). A relatively large harvest (85) during the spring season was offset by a reduced kill (30) during the fall season. A number of guides commented that the 1991 fall season was one of the worst in recent years. Unseasonably warm and wet weather was blamed for poor hunting success. The harvest of bears on refuge land represented 82% of the kill for all of Game Management Unit 8 (Kodiak Archipelago).

FB/P Chatto inspects a brown bear carcass on Ayakulik River near Bare Creek. It had apparently pulled itself out on the bank and died sometime during the fall or winter. (Photo R. Hander)

Table 10
Reported brown bear mortality on
Kodiak National Wildlife Refuge, 1982 to 1991

Year	Source		Other**	Total
	Sport	DLP*		
1982	108	7	3	118
1983	112	2	5	119
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
Average	120	6	5	132

* Defense of Life or Property.

** Includes accidental study deaths and mortality from natural or unknown causes.

Composition of the 1991 harvest was 64% male, 35% female, and 1% unknown. For the entire GMU 8, 13 males had skull measurements that exceeded 28 inches (trophy class) and 12 of those were taken on refuge land. All but one of the trophy animals was taken in the spring season.

Six non-sport mortalities were documented on the refuge in 1991 and four of those bears were killed in Defense of Life or Property (DLP) incidents. Three of the DLP kills were maternal females accompanied by a total of six cubs. All those females were shot by deer hunters. One male was shot as a DLP kill in Karluk Village and two bears of unknown sex died of unknown causes.

b. **Mountain Goats**

Mountain goat aerial composition survey results, as reported to the refuge by Roger Smith of the ADF&G, totalled 269 goats (211 adults and 58 kids). It is estimated that 30% of the known goat range was covered. Last year 494 goats were counted on a survey of about 75% of the goat range. The kid/100 adult ratio was 27:100.

Smith also reported that a total of 32 goats were harvested (17 male and 15 females). Total permits issued was 125. This harvest total is three higher than last year when 100 permits were issued. Two new ares were hunted during 1991 in the Uyak Bay and Deadman Bay areas.

c. **Sitka Black-Tailed Deer**

An accurate method of censusing black-tailed deer on Kodiak Island has been sought since the species was transplanted to the island in 1924. Two different survey methods were tested during 1991 with limited success. On March 11, 8 different areas near local villages were surveyed via helicopter for winter black-tailed deer. Winter survival is the key factor for deer on Kodiak Island. The 1990-91 winter was relatively mild and it appears winter mortalities were down from the previous two years.

d. **Roosevelt Elk**

Elk are found on the Ban Island and Afognak portions of the refuge. The herd represents the offspring of a transplant that occurred in 1929. Roger Smith of the ADF&G reported that 100 elk were harvested during 1991 (36 males and 64 females) on Afognak Island. Of this total, 36 were harvested by 167 hunters in the northwest Afognak registration area, which includes the Afognak unit of the refuge.

e. **Marine Mammals**

Marine mammal tagging program assistant Dean Crammer visited Akhiok, Larsen Bay and Karluk to meet with village taggers and answer questions from villagers. Interest in subsistence harvest of sea otters has increased following the Holland ruling that native Alaskans can legally sell handicraft items made from sea otter pelts to non-natives. The Service filed an intent to appeal but the judgement will stand in the interim.

f. Other Resident Wildlife

Due to budget and personnel constraints, the reindeer survey was not conducted during 1991. Reports from hunters and sightings by Refuge staff during other surveys indicate the population hasn't changed dramatically from the last survey figure of about 250 animals. The herd originated from an unsuccessful husbandry operation that was attempted by the village of Akhiok. Since these animals are non-native and feral, state regulations allow the harvest of reindeer on the refuge year round. Logistics and cost of accessing the southwest end of the island limit the amount of hunting pressure on this herd.

I. FISHERY RESOURCES (Chatto)

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

The goal of the refuge for fishery resources is to conserve water resources and 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 various divisions of ADF&G in conducting studies and routine annual management surveys.

In 1991 the total indexed salmon returns to the refuge (including native conveyed (22g) lands) for all species was observed to be well within or, as in the case of sockeye and pink salmon, has exceeded the management objectives for these species (Figure 4). These objectives were established in the refuge Fishery Management Plan which was completed in August of 1990.

1. Salmon Escapement

In 1991 a total of six fish counting weirs (5 ADF&G, 1 FWS) and repeated aerial index surveys on an additional 52 streams were used by ADF&G and the refuge to monitor salmon and steelhead escapement. Preliminary refuge wide escapement indexes by species for 1991 are illustrated in Figure 5. The data in Figure 5 do not reflect any variation for individual streams on the refuge but present a general overview of

escapement. The escapement index of 2.29 million sockeye in 1991 is approximately 47 percent above the 1982-90 average and is probably a reflection of good brood stock escapements during 1985-87 and environmental conditions for rearing juveniles from 1986-89.

Coho and chum salmon indexes for 1991 are 169 and 35 percent above the 1982-90 average of 82,940 and 299,180 fish, respectively. Although, this appears to be a significant change, it may be a reflection of increased emphasis on aerial escapement surveys the refuge has initiated in recent years.

The 1991 escapement index of 27,430 chinook (Figure 5) is 38 percent above the 1982-90 average of 19,880 fish indicating good to excellent survival from brood year escapements in 1985-87. Downstream migrant adult steelhead (Kelt) counts through fish weirs in May and June are used as an index of the previous fall-winter escapements for these species. Steelhead indexes in 1991 (Figure 6) for the Karluk and Ayakulik Rivers were approximately $\pm$ six percent of the 1983-90 average of 1430 and 970 fish, respectively. Although the steelhead count on the Dog Salmon River in 1991 was only 50 percent of the 1983-90 average of 250 fish, the 1991 count is still within observed ranges in previous years.

2. The Commercial Fishery

The commercial fishery in Kodiak is regulated by the ADF&G and in 1991 the total harvest in the Kodiak area was approximately 23.7 million salmon (Figure 7) worth an exvessel value of approximately 31.5 million dollars. The refuge based salmon contribution (including native conveyed 22(g) lands) is estimated at 16.6 million fish (Figure 8) worth approximately 24.8 million dollars. These fish are harvested in the various bays and nearshore areas surrounding the refuge by commercial fishermen using purse seine, set net and beach seine gear. Overall the 1991 total commercial harvest was approximately 26.7 percent above the record 1988 catch of 18.7 million fish, but the 1991 exvessel value of these fish was only 33.5 percent of the 94.0 million dollars observed in 1988. In 1991 there was a severe drop in the price paid per pound to fishermen, particularly for pink and sockeye salmon. As in previous years, the catch of pink and sockeye salmon dominated the harvest of fish in both refuge (Figures 7 and 8) and non-refuge based stocks.

Figure 4.

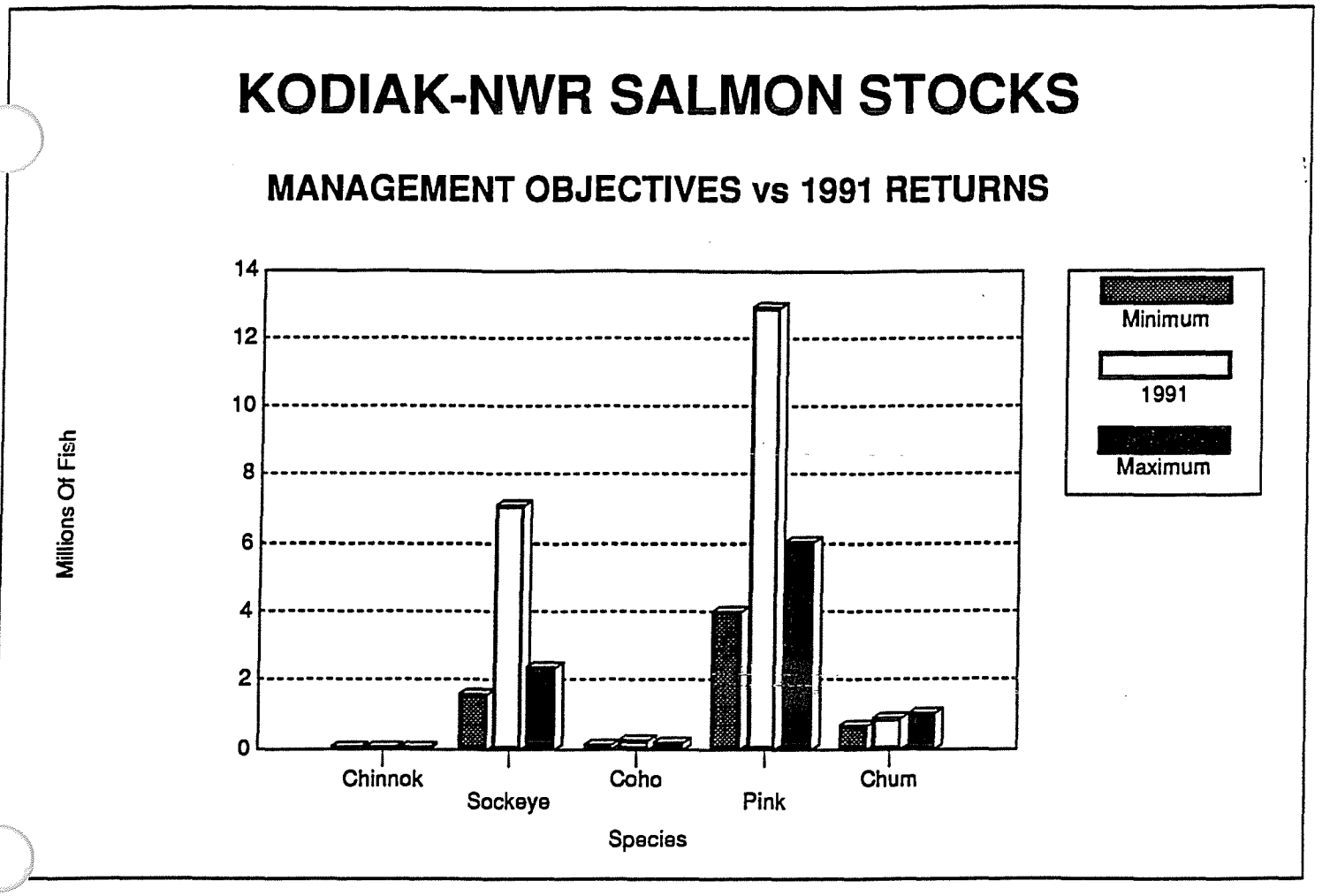


Figure 5.

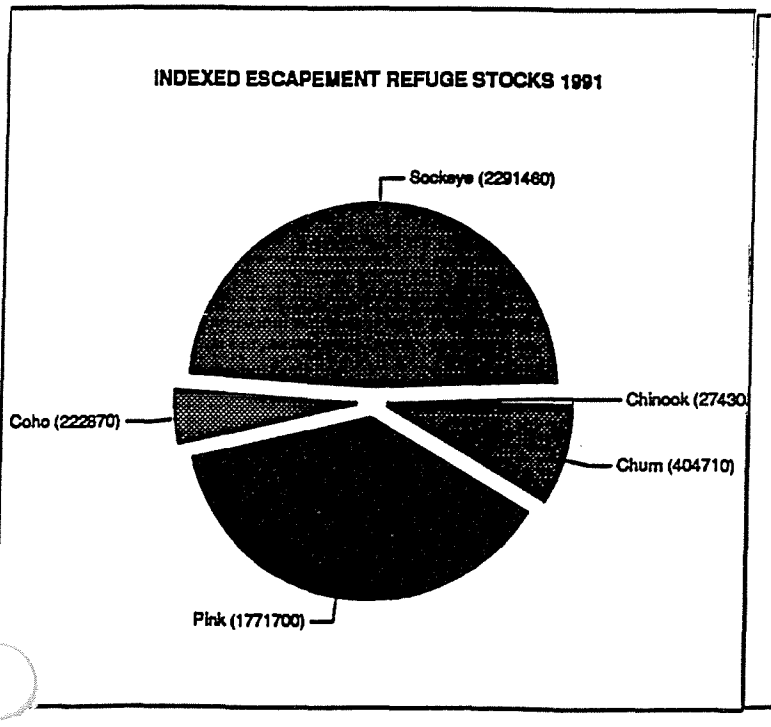


Figure 6.

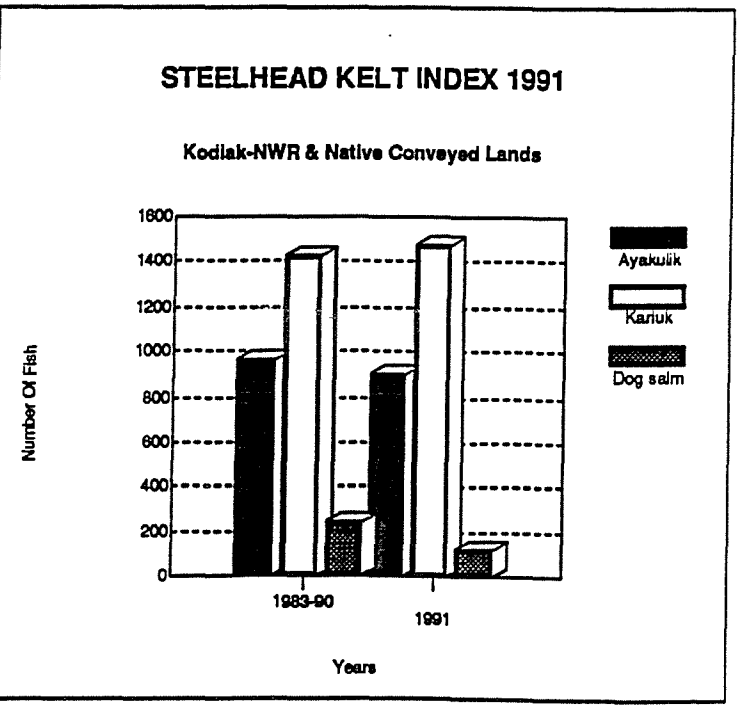


Figure 7.

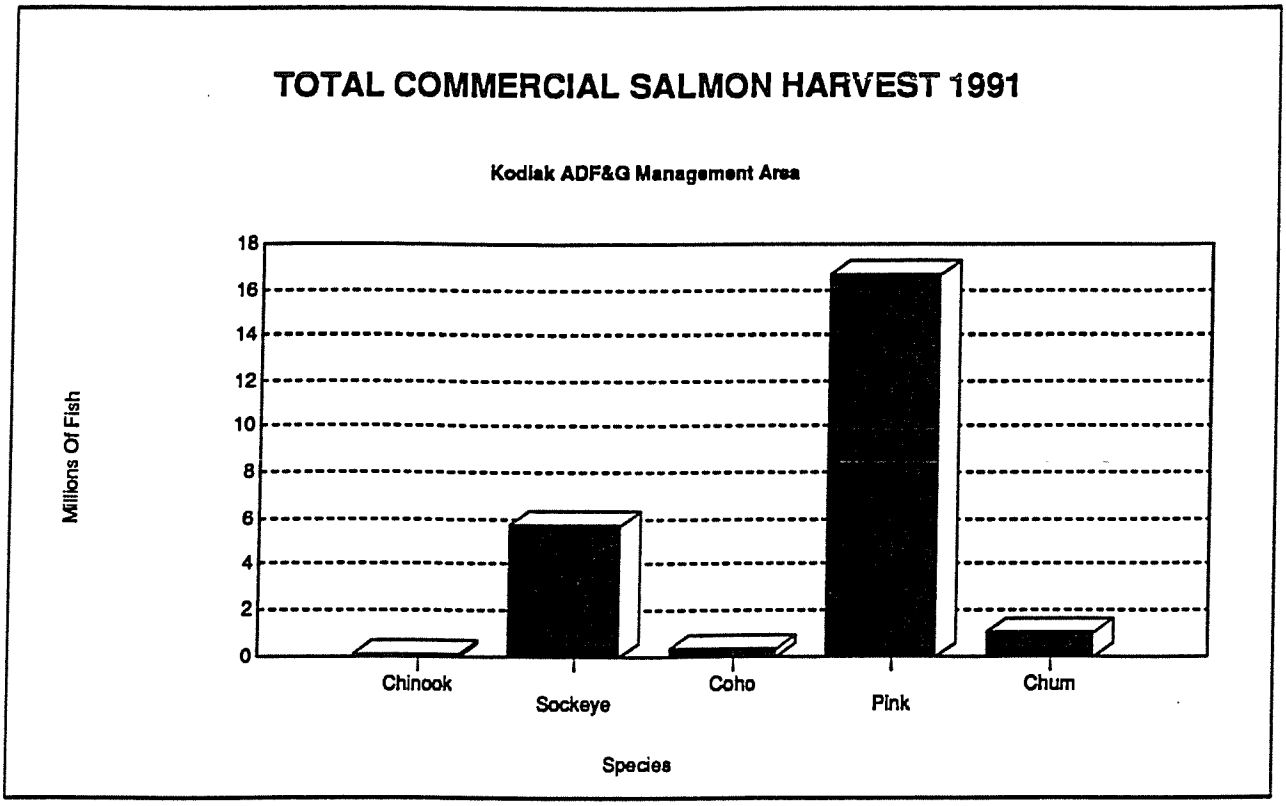
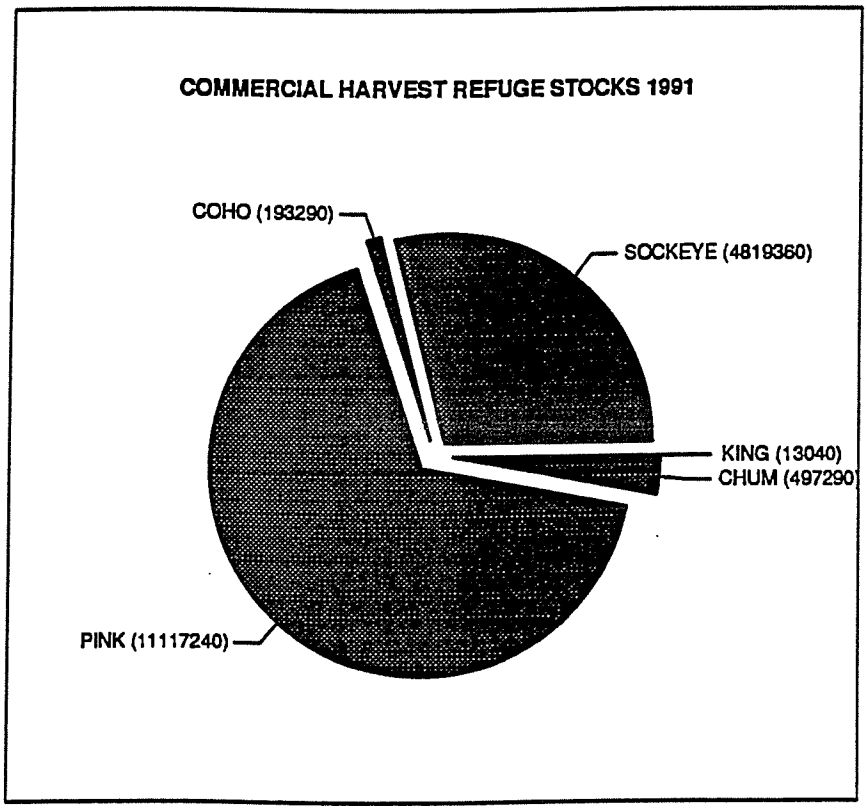


Figure 8.



3. The Sport Fishery

There are approximately 14 streams on the refuge where a majority (>90 percent) of the sport fishing on the refuge currently takes place. Sport fishing 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 fish guides through the special use permit process. Sport fishing occurs from late May through early November with peak effort in June for chinook salmon and then again in August and September for coho salmon. Steelhead are sought after by anglers in September, October and early November. Although coho salmon are found in numerous streams around the refuge, populations of chinook and steelhead are located mainly on the southwest end of the refuge.

Some sport fishing guides permitted to operate on the refuge also operate on conveyed lands under permit from the natives and report their catch to the refuge. In 1991, 17 (77%) of the 22 permitted sport fish guides responded to the deadline for report activity. These guides operated on a combination of both refuge and native conveyed [22(g)] lands. The primary areas used by guides in 1991 were the Uganik, Ayakulik, Karluk and Dog Salmon drainages. Overall with the exception of chinook and sockeye salmon, the guided catch in 1991 (Figure 9) was less than or equal to the 1988-90 average. Figure 11 indicates that a majority (>60%) of the chinook, coho, chum and steelhead caught by guided anglers under permit were on refuge lands only. Average catch for all species per angler day in all areas was 10.1 with 9.1 fish per angler day reported for refuge lands only. A subsample of guided catch indicated the percentage of fish kept ranged from 0 for rainbow trout to 14 percent for coho salmon. Guided sport fishing effort in 1991 accounted for a total of 1301 angler days of which 56.5 percent occurred on refuge lands only (Figure 11).

In 1991 a sport fishing creel census was conducted by the refuge on the Ayakulik River from June 10 to July 1, during the chinook salmon run. The census was done to determine the non-guided effort and catch for this popular fishery. Angler catch and effort was calculated from a 56 percent voluntary return of creel census data sheets provided to fishermen on the river. A total of approximately 357 non-guided angler days are projected for the season. Angler catch is depicted in Figure 12. Retention (kill) of chinook salmon is calculated at 10.0 percent.

Figure 9.

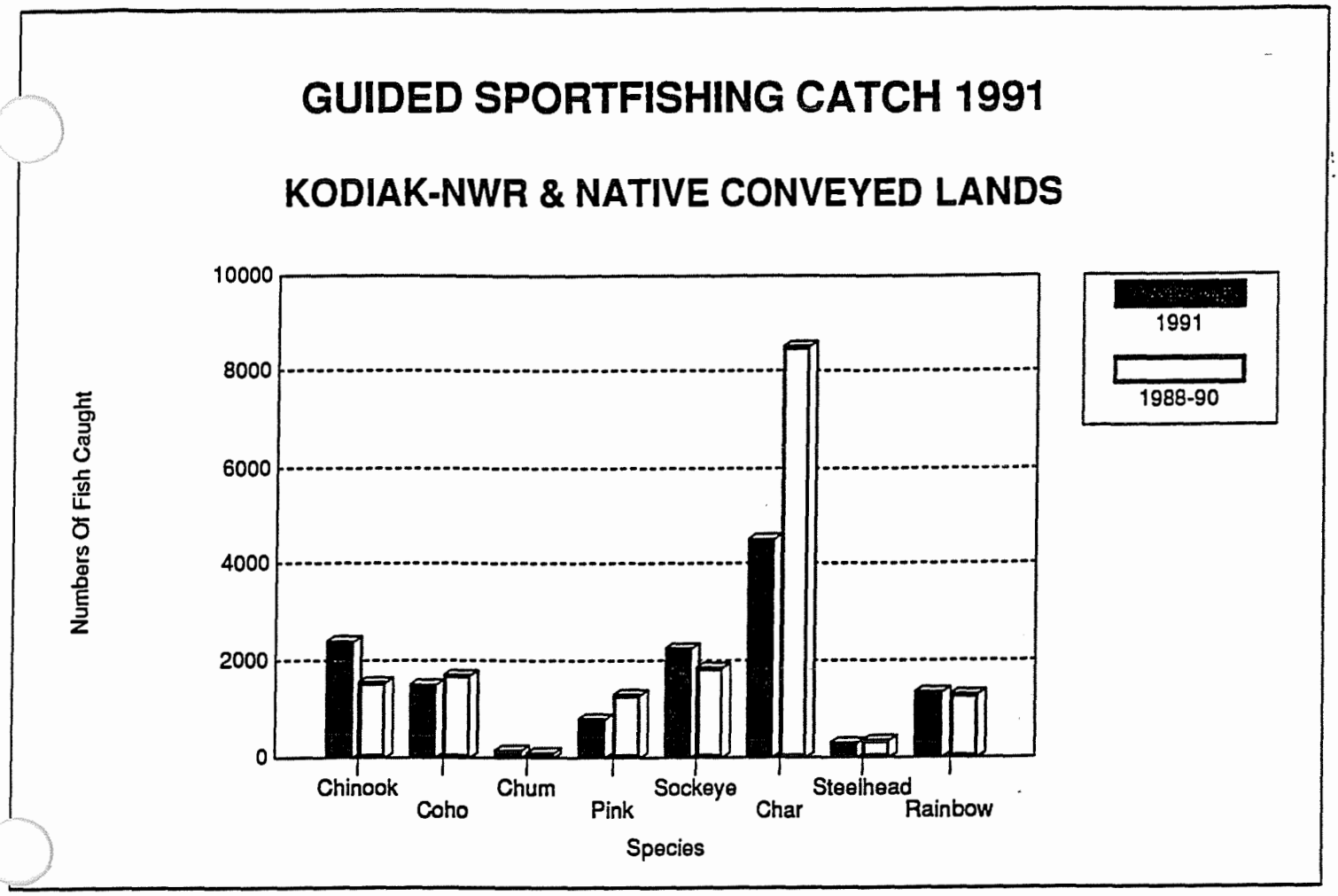


Figure 10.

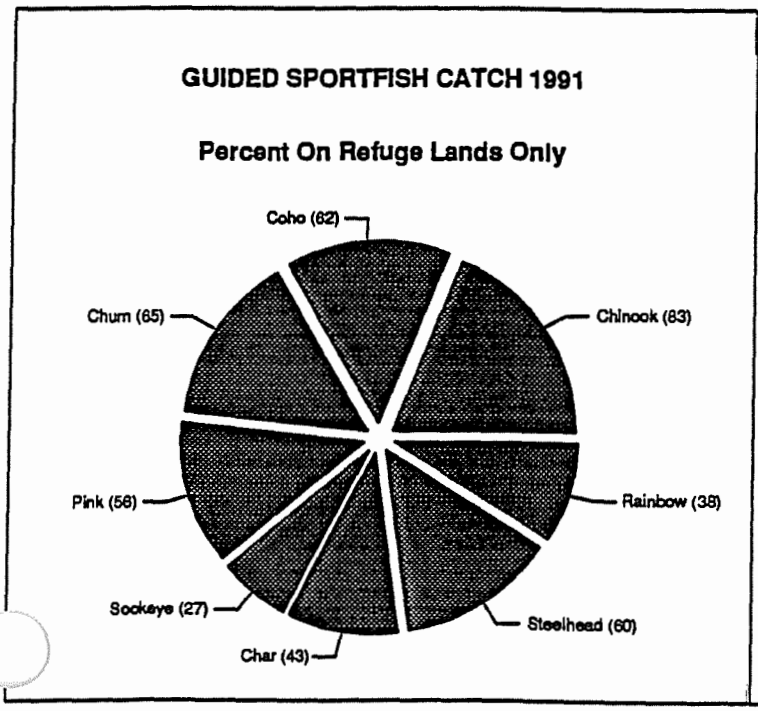


Figure 11.

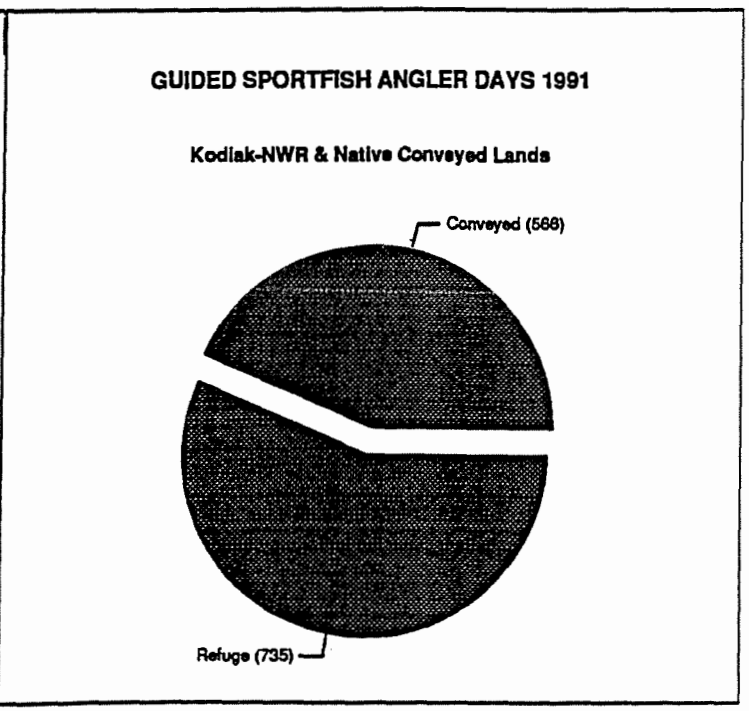
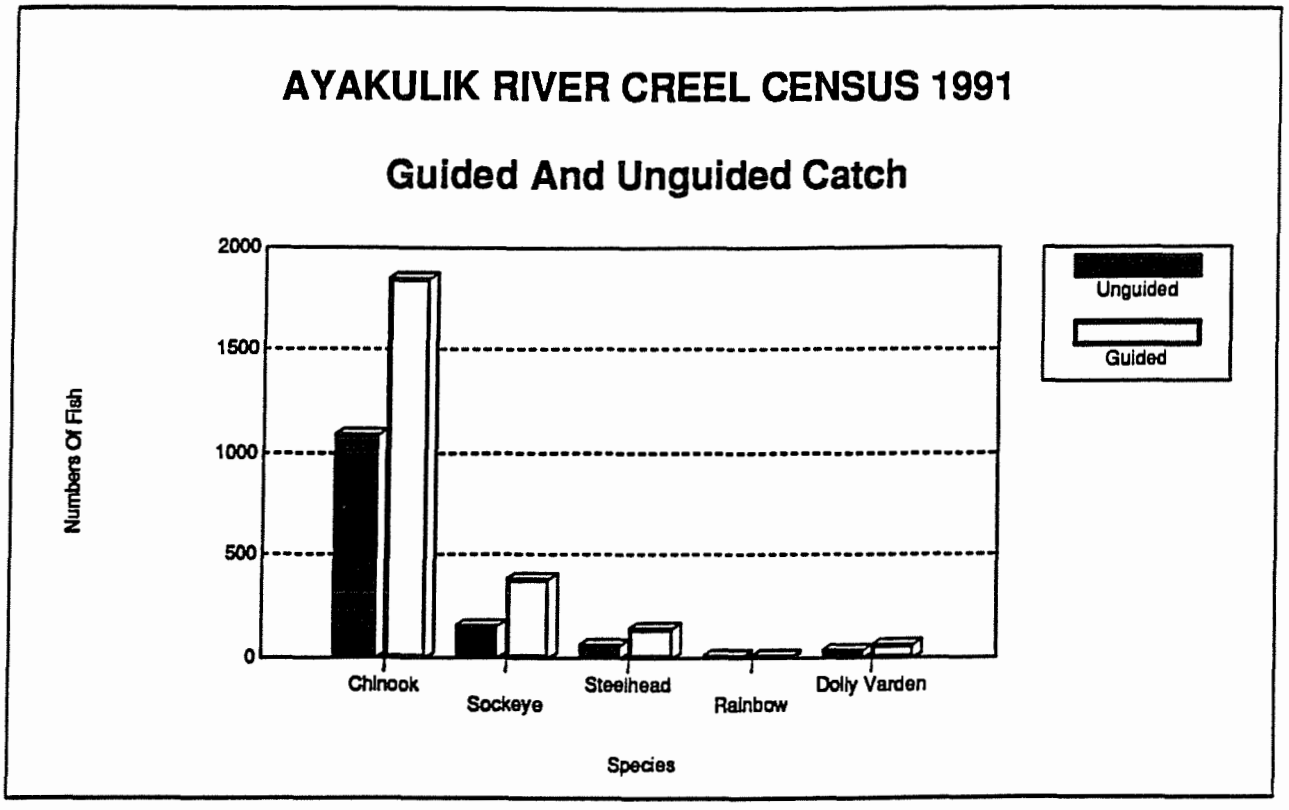


Figure 12.



In comparison, the catch by guided anglers on the Ayakulik for the same time period was higher, with angler effort estimated at 341 days. Guided catch of chinook salmon was 1855 fish with a retention (kill) of approximately 13.8 percent.

Overall on the Ayakulik in 1991 guided and non-guided anglers expended approximately 698 angler days and caught 2952 chinook of which 368 (12.5%) were retained and taken home.

The sport harvest (kill) of chinook on the Ayakulik River has increased from $\leq$1.4 percent in 1986 to $\leq$2.8 percent of the escapement in 1991. In general the current sport harvest (kill) by both guided and non-guided anglers is well below the calculated surplus over escapement needed to conserve chinook production on the Ayakulik River.

J. INTERPRETIVE PROGRAMS

1. General

The nearest point of refuge land is located about 20 miles from the headquarters and visitor center which is 4 miles from the town of Kodiak. Visitors to the refuge and headquarters from off-island, arrive by plane or ferry. Public use on the refuge was 18,760 visits, down from 21,300 visits in 1990. The 1991 drop in visitor numbers may have been influenced by the fact that the Alaska State Ferry did not run during the summer months.

More than 100 businesses and individuals currently have permits or have expressed an interest in obtaining permits for the following categories of public use: big game guiding and outfitting, sport fish guiding, recreation guiding and air taxi operations. This refuge now has many more requests for sport fish guiding and big game guiding/outfitting permits than the numbers specified in the refuge's comprehensive conservation plan (24 sport fish guides and 18 big game guide/outfitters). Refuge Manager Jay Bellinger participated in the process of developing a prospectus for allocation of big game permits in a fair manner. It appears the Service will implement the new big game guide selection process during 1992.

Two types of public use are recorded for the refuge. People stopping at the refuge visitor center spend an average of 1/2 hour viewing films and exhibits, obtaining leaflets, and asking questions about the refuge. Visits to the refuge proper involve chartering a small aircraft or boat to access an activity site. Most of these visitors spend 4 to 7 days on the refuge during hunting, fishing or photography trips. Seven days is the limit for use of refuge public use cabins.

The refuge has more than 40 wildlife films, videos and slide/tape programs which are available for schools and service clubs to borrow. Also available to teachers are a variety of environmental curriculum materials.

2. Outdoor Classrooms-Students

In 1991 the number of student visits decreased slightly to a total of 598, down from 650 last year.

Several mailings went out to all private and public schools in the Kodiak area. A mailing in March included National Wildlife Week packets and a list of films available from the refuge library. In the fall, an updated and reorganized film list, a list of curriculum materials, and a list of other environmental education resources available was sent. The

schools were also notified of the scheduled visitor center activities that might be of interest. School counselors were also contacted about opportunities for students in the Resource Apprenticeship Program and volunteering at the refuge.

3. Outdoor Classroom- Teachers

Contacts with school teachers and program offerings were limited by the transfer of Park Ranger Dave Menke in August, and the vacancy in the assistant park ranger position which was filled by Diana Brooks in late September. In October Diana presented environmental education activities and curriculum at the Kodiak Island Borough School District's Teacher In-Service. Teachers attended 2 different sessions. Diana also participated in the judging of a district Science Fair.

The Buskin River Nature Trail offers visitor center guests an opportunity to experience the Sitka spruce habitat. (Photo D. Menke)

4. Interpretive Foot Trails

The Buskin River Trail, a short loop nature trail located adjacent to the visitor center, was completed with the aid of boy scouts and refuge volunteers who cleared, leveled, and graveled the area. The trail leaflet is available at the foot of the trail and at the visitor center.

5. Interpretive Programs

During 1991, the refuge continued with another season of bear viewing opportunities on the Dog Salmon River. The program was conducted from July 1 through August 13. A total of 54 participants were selected by a lottery drawing. Forty five viewers were actually able to participate this season. A maximum of six people at a time were scheduled into nine, four-day viewing periods. Since this was the second year of the program, we had many word-of-mouth referrals and more opportunity for advanced publicity. The requests outnumbered spaces available by 4 to 1. The fee of $100.00, instituted for the first time, did not seem to be a deterrent to potential bear viewers.

Scott Shelton was the refuge field representative again this season for the bear viewing program (BVP). The field representative provided an orientation to all viewers upon arrival. The representative supervised bear observation activities and carried a weapon for the viewers' protection when in bear viewing locations.

The site was improved this season prior to July 1. Old structures associated with the fish pass were removed by refuge staff. A temporary bear observation blind, constructed from weathered lumber, provided a popular location for viewing and photography. The elevated viewing blind provided excellent opportunities for the viewers to observe bear behavior near Dog Salmon River and Falls. Viewing was confined to the blind and to a 6 x 10 platform on the upper bench near the Fish and Game cabin. These restrictions helped control movement and disturbance in the upper areas when bear activity near the fishway was present.

Every 5th day was set aside this year for non-viewing activities. This allowed for maintenance of the fishway and biological fish sampling procedures conducted by fish and game employees at the site.

The facilities for viewers included one extra weatherport sleeping structure. The cooking area had no changes. An

incinerator located on site controlled daily combustible waste. Non-burnables were transported back to town with each departing group of viewers.

A total of 18 individual bears were observed 214 different times over the 47 days of the program. Of the 18, 3 were females accompanied by cubs. Bear activity increased by late June with the arrival of higher concentrations of sockeye salmon to the Dog Salmon River system. Bear concentrations were the most intensive from July 1st-July 27. During these dates up to 15 bears could be viewed daily. Six bears identified during the 1990 BVP returned to the viewing area during the 1991 program.

The majority of the viewers utilized the observation areas 6 or more hours a day. Forty percent averaged 4-6 hours daily. Bear viewing opportunities tapered off greatly from July 28 to August 14 due to lowered numbers of sockeye salmon in the river system. Viewers during the final 2 weeks of the program made observations from a distance of 500 meters or more. Two sub-adult bears continued to frequent the falls area near the blind on a rather sporadic schedule, allowing viewers a chance for photography and behavior observations. Bear activity by mid-August dropped off even more. Only occasional observations were noted in the lower stream areas, however despite the low numbers of bear observations during the final weeks of the program, the viewers enjoyed many of the other activities that a wilderness area has to offer. Hiking, sport fishing and wildlife observations within the Frazer Valley still made the trip worthwhile.

On two different occasions viewers encountered bear 06-91 outside the designated viewing area. Both encounters occurred along the trail between the cook shack and Frazer Lake. Bear 06 showed no aggressive behavior and continued on in a circle of the facility to end up fishing at the fish pass. In both cases, the viewers handled the encounter very calmly. Their encounters were brought to the refuge representative's attention immediately.

Bear/human interaction in the blind area occurred when sub-adult 3 year olds investigated the blind from the back side. Interactions resulted in the bears fleeing a short distance and then resuming fishing activities.

Aircraft circling the fishway resulted in several bears fleeing the area this year. The refuge field representative was able to meet with most of the air taxi pilots associated with the BVP and aircraft disturbance was greatly reduced by Mid-July. However, flightseeing aircraft did pose some problems on several subsequent occasions. The closure of the lower Dog Salmon River to commercial operators facilitated undisturbed viewing opportunities.

Overall, the final season for the BVP at the Frazer fishway operated very well. Weather-associated problems were the major disturbance for the program. The viewers expressed a positive attitude toward a continued viewing program within the refuge. For many, it was a first-time experience observing brown bears in the wild.

An analysis of the bear viewing program was made by the refuge staff and ADF&G Biologist, Roger Smith during October. A decision was made to move the program to the O'Malley River area during 1992. A 1991 study of bear/human interaction at O'Malley River indicated that it will be easier to control negative impacts on bears if use is structured and access is strictly controlled. An environmental assessment of the impact of conducting the bear viewing program at O'Malley River and the promulgation of a regulation to close the O'Malley area to public access were submitted to the Regional Office for approval.

6. Interpretive Exhibits/Demonstrations

Use of the refuge visitor center decreased slightly to 595 from 635 in 1990. As mentioned before, the ferry Tustamena, usually a major means of transportation to the island, was under repair. There were also no tour ships this summer. Two local tour operators utilize the Visitor Center as one stop on their tour.

The diminished refuge public use staff was not able to offer much more than basic services and regularly scheduled films. In November, local high school students' botanical specimens and research work were displayed.

The contract to replace the topographic map in the visitor center was finalized this summer. The new model was delivered and installed. The contractor had to be prodded on several occasions in order to maintain the quality of the final product. A trip to Seattle by Dave Menke to inspect the map was a critical part of keeping this project on track. Dave had to recover the vegetation color scheme after the contractor failed to make a record of color prior to making his template from the old map.

A variety of free literature from the refuge, ADF&G and Chamber of Commerce are provided to visitors. The refuge reprinted the Wildlife Viewing Guide to Kodiak's Road System with funds from the Alaska Natural History System and a state grant. Approximately 60 sales items are available in the sales area (See Sec. H-18).

7. Other Interpretive Programs

A 15-minute video on Kodiak's wildlife is shown to visitors on request. Regularly scheduled weekend wildlife films have proven a popular feature, attracting over 250 visitors during 1991. Each month, the selections feature a topical theme. The refuge's collection of 40 films is supplemented with videos borrowed from other sources for variety and to avoid excessive repeats.

A cooperative effort involving Alaska State Parks, Alaska Department of Fish and Game and the refuge resulted in this display at Buskin River State Park that highlights the ecology of salmon on Kodiak Island. (D. Menke)

Visitation at Buskin River State Park is high during the summer and interpretive value of this display should reach a wide audience. (Photo D. Menke)

In response to public concerns about a bear that was shot after entering a home in a Coast Guard housing area, bear safety films were shown and a children's bear safety coloring book was distributed. Biologist Vic Barnes addressed a meeting of Coast Guard housing residents on the subject of bear safety.

8. Other Wildlife Oriented Recreation

Use of the refuge recreation cabins for photography, sightseeing and wildlife observation has been increasing each year. However, these recreational uses do not require licenses, tags or permits and often occur in conjunction with hunting or fishing trips, the exact extent of wildlife observation and photography is difficult to document.

The refuge has nine public use cabins which are available to recreational users for a maximum stay of seven days per cabin per year. Use of most cabins is highest during the peak deer hunting and fishing periods. The South Frazer, Red Lake, and O'Malley cabins were heavily used by wildlife photographers from early July through the end of August.

Red Lake and South Frazer cabins' wood stoves were replaced with oil stoves by refuge staff. Coop student H. Johnson,

Biotech. S. Shelton and volunteers built a ramp to make the Uganik Lake cabin handicapped accessible and re-roofed the South Frazer cabin. The staff commitment to the cabin program includes maintenance, answering inquiries, handling reservations, and law enforcement.

9. **Cooperating Association**

The Kodiak branch of the Alaska Natural History Association (ANHA) had a successful year in 1991, generating a gross income of $11,104.00 (down from $13,150.00 in 1990). Over 60 educational items including books, slide sets, post cards, note cards and posters are sold in the visitor center. New items for sale this year included videos, calendars, and newly published books. "Bear Country, A Wildlife Viewing Guide to Kodiak's Road System" was reprinted with association funds in combination with a matching grant from the State of Alaska. This publication is distributed free at the visitor center and to those inquiring about the refuge by mail. It is also made available to the public through the Kodiak Island Convention and Visitors Bureau. Other projects made possible by association funds included purchase of references for the refuge library and funding of ANHA branch manager attendance at an annual meeting.

10. **Fishing**

Sport fishing activities are detailed in Section G 11.

11. **Trapping**

Ten trapping permits were issued for the 1990-91 trapping season on the refuge. Total reported harvest was 1 beaver, 7 land otter, and 3 foxes.

K. LAW ENFORCEMENT

During 1991, four refuge employees had law enforcement authority: Refuge Manager Bellinger, Assistant Manager Munoz, Park Ranger Menke and Pilot Patterson.

During May and early June several members of the staff traveled to Yukon Delta NWR to assist in enforcement of the Y. K. Delta goose management plan. Most of the effort involved conducting public meetings in areas where citations and contacts had already been made, and conducting aerial surveillance.

A new law enforcement initiative this year was establishment of the Ayakulik River Ranger Camp for monitoring the king salmon sport fishing activity. A field camp was set up near the aircraft landing site on the Ayakulik river from June 10 through July 1. Three two-person crews conducted the study, shifting the crews every 4-10 days. The two person crews were: Dick Munoz and John Munoz; Jay Bellinger and Gordon Abar; Dave Menke and Heather Johnson. All groups were contacted upon arrival, and daily contacts were made throughout the study area. The first contact was used to check fishing licenses, and get information on party size, time of arrival, date of departure, and activities planned for the duration of their trip. Further contacts were make to answer any questions, collect fishing data, observe and record any wildlife observations or activities. Public use data was recorded and comparisons were made with previous years' data. As time allowed, day hikes were undertaken to observe wildlife and human activities in the area. The operation of the camp resulted in several citations being issued. Citations included possession of steelhead during a closed season, air taxi special use violations, and commercial operations without the proper permits.

King salmon fishing at Bare Creek in Ayakulik was the subject of a new law enforcement initiative with the establishment of the Ayakulik River Ranger camp. (Photo V. Barnes)

The staff, assisted by agents from Anchorage (Stan Pruzinski, Jill Schweiger and Roger Parker), conducted the annual set net site and deer hunter camp checks from the "Ursa Major II."

Law enforcement activities during the year resulted in the following violation notices and citations:

1. Two bear hunters cited for not cleaning up their trash before leaving their campsite.

2. Two bear hunters cited for using the Hook Point setnet cabin for hunting.

3. Unauthorized use of a setnet cabin.

4. Warnings issued to three Air taxi operators for unnecessary low flying and wildlife harassment.

5. Two tickets to the same individual, on two different beaches at two different times for the illegal beach seining.

6. One ticket issued to a deer hunter for hunting without a license.

7. One deer hunter cited for not validating his harvest ticket.

8. An air taxi operator cited for operating on the refuge without a permit.

9. An air taxi operator cited for sport fish guiding without a permit.

10. Four tickets issued to a Koniag Native Corporation for ANSCA 22(g) violations involving development on conveyed land that is incompatible with refuge purposes (i.e. construction of a cabin in a key brown bear feeding area).

L. EQUIPMENT AND FACILITIES

1. Rehabilitation

Rehabilitation of the Camp Island panabode that began during 1991 was completed. This work was assisted in part by a crew from Engineering.

As of 1990, the public use cabins at Frazer and Red Lake both still used wood stoves for heat. To upgrade these facilities and improve their general condition, we installed oil heaters and refurbished the roofs.

Kodiak National Wildlife Refuge is working at increasing the variety of options for people to enjoy wilderness and wildlife on the Refuge. One priority project was to complete a handicap access at the Uganik Lake public use cabin, to allow the handicapped the opportunity to spend time in the wilderness. This cabin was chosen due to its close proximity to Kodiak, the ease of access to the cabin, the quality of the scenic view and the opportunity to view wildlife.

A four person crew was flown out to build the handicapped access ramp from September 12 through September 17, 1991.

The September 1991 trip was scheduled to complete a 30 foot stretch of decking to the lake and a 24 foot stretch to the outhouse. A platform was placed in the center of the two access ramps for a turn-around area. The outhouse was moved to allow easier access. Two benches were built for the kitchen table to allow more room in the cabin for a wheel chair. Also, two benches were built for the deck. A hand rail was built down the length of the ramp as a support rail for the disabled. A ramp was put on the threshold for easy wheelchair access into the cabin.

Charlie Elliott volunteered his carpentry skills for the project. He assisted in planning the project, purchasing lumber and materials, prefabricating the lumber, and constructing the access ramp. Charlie has been a volunteer in the visitor center for two years, is a member of the Audubon Society, and has assisted on other building projects at the refuge public use cabins. His carpentry expertise and enthusiasm are what pulled the project together. The other three people were employees of Kodiak National Wildlife Refuge, two of which also had carpentry experience.

Refuge volunteers and staff cooperated on public use cabin rehabilitation projects at South Frazer, Uganik Lake and Uganik Island. (H.Johnson)

M. EQUIPMENT UTILIZATION AND REPLACEMENT

1. Marine Vessel (Zwiefelhofer)

Safe operation of a marine vessel in Kodiak waters requires at least annual dry docking for hull cleaning and inspection. This process includes replacement of sacrificial anodes, and the renewal of the anti-fouling bottom coating.

The annual maintenance dry docking of the refuge marine research/patrol vessel, M/V Ursa Major II occurred from September 9 to 19 at the local boat yard. Additional safety equipment for added sound reduction, stability, and operator visibility were installed while in dry dock. A spare propeller to carry on board the vessel was purchased in December.

2. Airplanes

The refuge 206 operated on amphibious floats all year round. Other than continually breaking exhaust pipe hangers and persistent gear problems, the airplane performed well throughout the year.

In mid-November when Lily Lake froze, the floats were taken off the Super Cub and it operated the remainder of the year on wheels. Taking advantage of a break in the weather, we delivered the Cub to OAS in Anchorage just after Christmas for a thorough inspection. Also, OAS plans to remove unnecessary equipment and wiring to reduce the airplanes' empty weight.

N. COMMUNICATION SYSTEMS

In June, a radio telephone system was installed in the Camp Island administrative cabin and panabode. This involved situating a repeater on a mountain north of Larsen Bay. The contractor used a cargo plane and a helicopter to deliver the repeater to this remote spot. The village of Larsen Bay agreed to let the refuge situate the radio telephone patching unit in a storage closet in the post office building.

A radio telephone repeater was airlifted to a peak north of Larsen Bay as part of establishment of a new communication link with the Camp Island administrative site. (Photo D. Munoz)

Completed repeater installation on an unnamed peak overlooking the Karluk River area. (Photo V. Barnes)

O. COMPUTER SYSTEMS

Implementation of the Office Automation Plan was initiated at the beginning of FY 1992. Two Maintenance Management System projects totalling $23,000 funded orders for five computers and associated software and furniture.

P. OTHER ITEMS

1. Cooperative Programs

A special use permit was issued to the ADF&G Fisheries Rehabilitation Enhancement and Development (FRED) Division in 1991 to construct and operate the support facilities for the Spiridon Lake Sockeye salmon stocking project. The permit is under the auspices of the 1991 refuge environmental assessment

for this project and will be renewed every five years.

A permit was issued to the ADF&G FRED Division for the fourth year of fertilization on Frazer Lake. This action is also under the auspices of an environmental assessment prepared by the refuge in 1988.

A permit was issued to ADF&G FRED Division for the operation of a helicopter and the taking of pink salmon eggs from the Terror River as part of the dewatering study evaluating the Terror Lake Hydroelectric Project.

A permit was issued to ADF&G Commercial Fisheries Division for use of a helicopter to access index streams on the refuge and conduct annual pre-emergent pink salmon sampling.

CREDITS

Staff members who wrote or contributed to sections are identified by name in parenthesis following the section title. Typing and organization were done by Julie Revalee and Jacke Barnes. Photographs were contributed by Dave Menke, Tony Chatto, Vic Barnes, Heather Johnson, Greg Wilker, Denny Zwiefelhofer and Scott Shelton.