KODIAK NATIONAL WILDLIFE REFUGE

Kodiak, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1987

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

REVIEW AND APPROVALS

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Kodiak, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1987

Jay R. Dillinger 2/29/88
Refuge Manager Date

Paul R. Schmidt 3/11/88
Refuge Supervisor Review Date

John P. Rogers 4/11/88
Regional Office Approval Date

INTRODUCTION

The Kodiak National Wildlife Refuge was established by Executive Order Number 8657 on August 19, 1941 "for the purpose of protecting the natural feeding and breeding range of the brown bears and other wildlife on Uganik and Kodiak Islands, Alaska" (Figure 1). A one mile wide shoreline strip was made part of the refuge but remained open to the public land laws, resulting in numerous small coastal inholdings. In 1958 the one mile shoreline strip was closed to the public land laws and two large peninsulas were removed from the Refuge by Public Land Order Number 1634. These peninsulas were to be removed from the refuge so that they might be opened to livestock grazing. No leases have ever been let on these areas and in 1982 as part of mitigation for the Terror Lake Hydroelectric Project one of these peninsulas (Shearwater) was permanently closed to livestock entry.

The Alaska National Interest Lands Conservation Act of 1980 added approximately 50,000 acres of land on Afognak and Ban Islands to the Refuge, bringing the total acreage to approximately 1.865 million acres, of which approximately 310,000 acres are Native owned but subject to Refuge regulations per Alaska Native Claims Settlement Act Section 22(g) (Figure 2).

The refuge encompasses roughly the southwestern two thirds of Kodiak Island, all of Uganik Island (which lies off the northwest shore of Kodiak Island), the Red Peaks area on the northwest side of Afognak Island, and all of Ban Island, which is adjacent to the Red Peaks area. Habitats include salt water estuaries, riparian zones, wet tundra, extensive brushlands, alpine areas, bare rock, permanent snow and, on the Afognak addition, Sitka spruce forest.

The Refuge is host to five species of Pacific salmon whose spawning grounds are the relatively short, swift streams characteristic of the Island. Approximately 200 breeding pairs of bald eagles nest on the refuge annually and a year round population of several hundred eagles gives Kodiak one of the highest numbers of bald eagle use days of any refuge in the system.

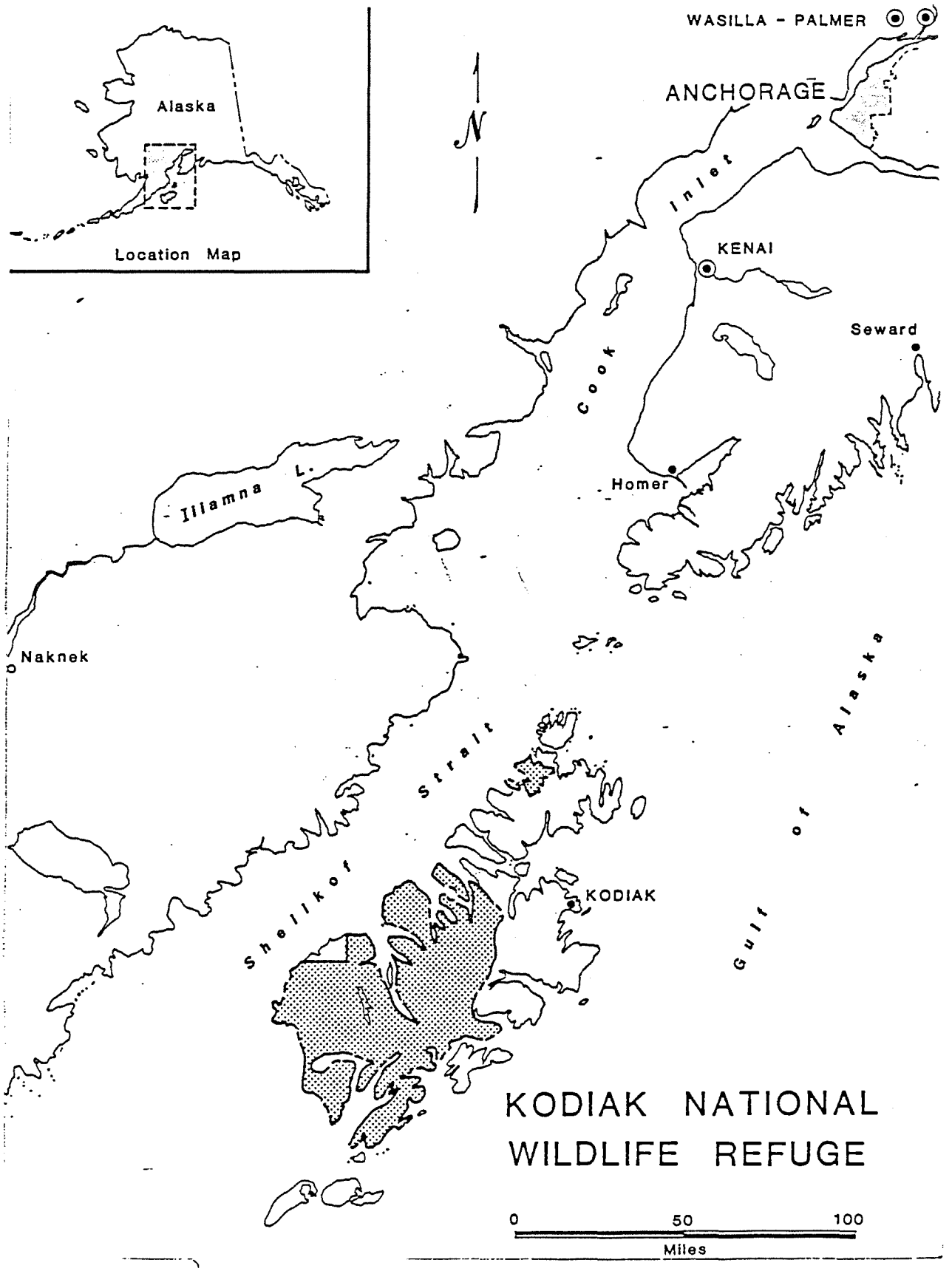
The combination of huge numbers of salmon, the tremendous berry crops found on the island and productive alpine sedge fields provide a virtually endless food supply for brown bears. Kodiak supports one of the highest densities of brown bears known.

Although the salmon, eagles, and bears are the most widely known inhabitants of Kodiak, other species are abundant as well, including Sitka black-tail deer, red fox, beaver, river otter, tundra swan, many species of sea birds and, in offshore waters many species of marine mammals.

Several major problems exist. One is that in recent years over 300,000 acres of the Refuge's best wildlife habitat have been conveyed to Native Corporations under the provisions of the Alaska Native Claims Settlement Act. Although these lands remain subject to the rules that govern use and development of the Refuge [Section 22 (g) Alaska Native Claims Settlement Act], no one knows for sure what this means. The bottom line is that much of the best bear, eagle, and fisheries habitat on the Refuge is now privately owned.

Over 60 commercial fishermen use refuge lands for shore bases to support fishing operations. Over fifty of these have cabins on refuge land and there is pressure to allow more cabins on refuge lands and major expansions of existing sites. Brown bears are a wilderness type animal which will not survive substantial human intrusion into their habitats. Further expansion of cabins and human occupancy into refuge habitats, particularly interior areas, will certainly cause irreparable damage to bear populations.

Refuge staffing is shown elsewhere in this report. The staff occupies a headquarters complex five miles from municipal Kodiak. The complex is approximately 25 air miles from the refuge boundary and two Service aircraft and a 48 foot motor vessel provide the only transportation to and throughout the Refuge. A field headquarters is maintained at Camp Island on Karluk Lake. This camp provides a more centralized base for field operations.


WASILLA - PALMER
ANCHORAGE
Alaska
Location Map
N
Cook Inlet
KENAI
Seward
Homer
Iliamna L.
Naknek
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KODIAK
Gulf of Alaska
KODIAK NATIONAL
WILDLIFE REFUGE
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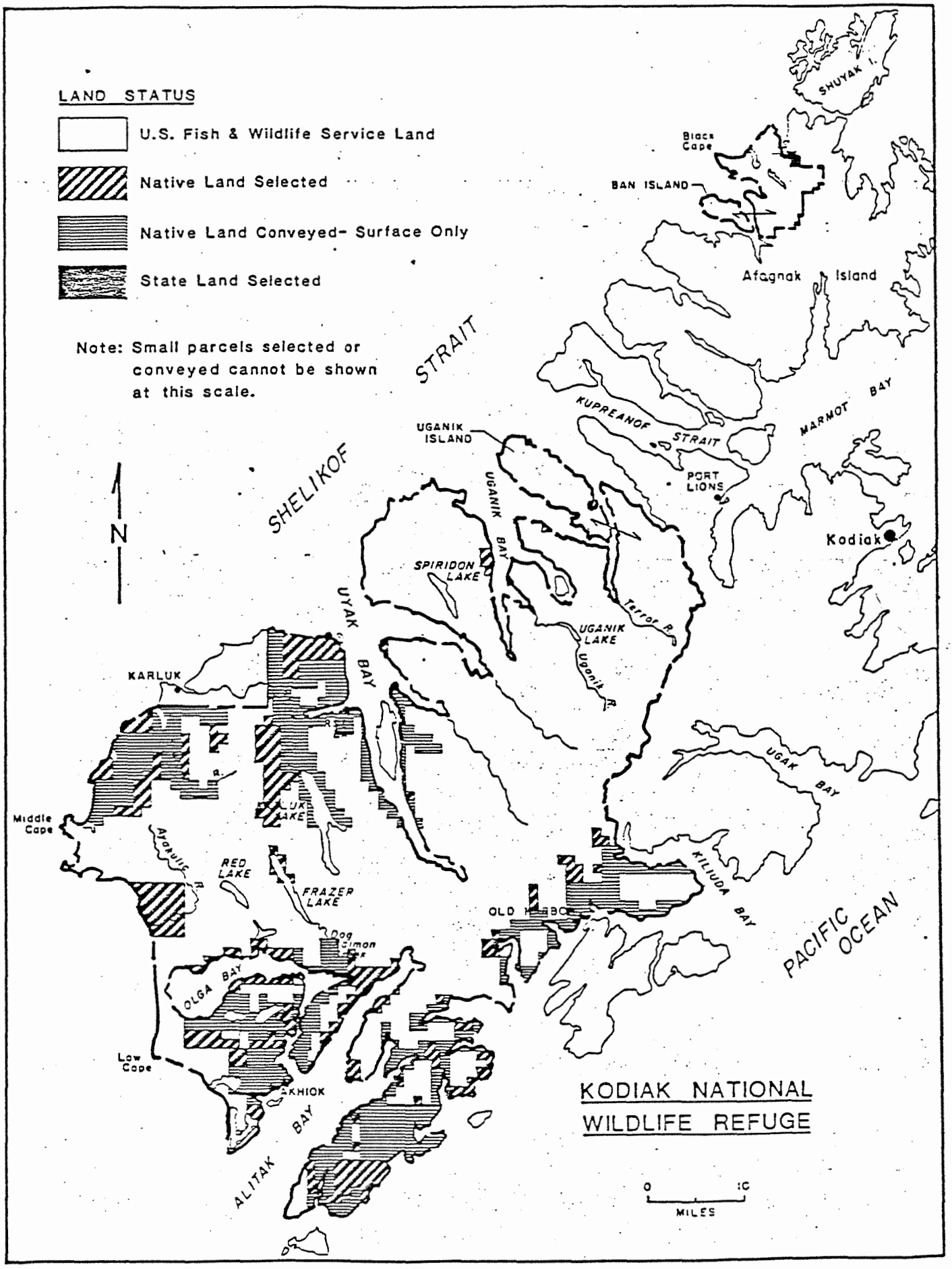
Figure 1


LAND STATUS
U.S. Fish & Wildlife Service Land
Native Land Selected
Native Land Conveyed- Surface Only
State Land Selected
Note: Small parcels selected or conveyed cannot be shown at this scale.
N
SHUYAK I.
Black Cape
BAN ISLAND
Afognak Island
STRAIT
KUPREANOF STRAIT
MARMOT BAY
UGANIK ISLAND
SHELIKOF
UGANIK BAY
PORT LIONS
Kodiak
SPIRIDON LAKE
UYAK BAY
Terror R.
UGANIK LAKE
Uganik R.
KARLUK
UGAK BAY
Middle Cape
RED LAKE
FRAZER LAKE
KILIUDA BAY
OLD HARBOR
PACIFIC OCEAN
OLGA BAY
Low Cape
ALITAK BAY
KODIAK NATIONAL WILDLIFE REFUGE
0
10
MILES

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INTRODUCTION

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I. EQUIPMENT AND FACILITIES

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A. HIGHLIGHTS

- The refuge was visited by numerous VIP's including Congressional members and Congressional staff looking at Native-conveyed lands proposed for trade back to the Service. Sec. C-3.

- A Record of Decision on the Kodiak National Wildlife Refuge Comprehensive Conservation Plan was signed by Regional Director Stieglitz on December 2, 1987. The plan included a 1.17 million acre wilderness proposal and a provision for no new commercial fishing sites. Sec. D-1.

- Management plans for commercial fishing activities, fire, and signs were submitted and approved. Sec. D-2.

- A brown bear density study was conducted. Sec. D-5.

- The controversial Thumb River sockeye salmon hatchery/eggplant project terminated. Sec. F-6.

- A record number of active bald eagle nests (299) was found on spring survey. Sec. G-6.

- Sea otters suffered a mysterious die off. Sec. G-9.

- The Ayakulik River had a record run of chinook salmon while Frazer Lake sockeye salmon experienced another extremely low return. Sec. G-11.

- The Visitor Center was upgraded with mounted brown bear and bird specimens. Sec. H-6.

- Meat caches were constructed at eight public use cabins. Sec. H-12.

Brown bear of Kodiak National Wildlife Refuge.
(15-113-86) DM

B. CLIMATIC CONDITIONS (Ryan)

Table 1 presents a summary of weather conditions for Kodiak for 1987 (data from the National Weather Service). The only weather recording station on Kodiak Island is the National Weather Service office at Kodiak State Airport, near the northeast tip of the island. Weather conditions vary greatly over the island because of exposure, aspect, and terrain. In general, easterly exposures (such as Kodiak State Airport) are wetter and warmer than north or west slopes.

The first quarter of the year was warmer and wetter than normal as shown in Table 1. Only 19.8 inches of snow fell as compared to 46.9 inches in 1986. February was the third warmest on record and ranked second for least amount of snowfall.

Spring continued to be wet. June's precipitation was 13.46 inches above normal. The average spring temperature was just slightly cooler than normal but not enough to freeze the blossoms on the various berry plants.

Summer was dry and warm. August was the driest month ever recorded in Kodiak. Temperatures in August surpassed record readings twice during the month of August. The berry crops continued to look good but low water levels in the streams, particularly salmon spawning grounds on the north to middle-east side of the refuge may have been adversely affected.

Table 1
1987 Weather data summary - National Weather Service, Kodiak, Alaska.

Month	Snowfall inches	Precip. inches	Precip. dept. from normal inches	Temperatures Max °F	Min	Temperatures dept. from Norm.
January	8.3	10.21	+1.92	42	6	+2.1
February	2.0	4.73	-1.56	45	18	+6.8
March	9.5	6.31	+2.25	49	19	+2.7
April	4.3	4.93	+0.09	49	18	+0.1
May	T	3.67	-4.06	66	32	+1.6
June	---	16.88	+13.46	60	35	-2.0
July	---	1.25	-2.66	81	44	+2.1
August	---	0.65	-4.56	73	40	+1.6
September	---	7.83	+0.23	67	32	-1.5
October	---	8.08	-1.91	56	21	+0.7
November	5.8	4.98	-1.69	48	18	-1.4
December	6.9	2.49	-4.19	45	6	-1.6
Total	36.80	72.01				

The fall season was drier than normal, although the salmonberry crop was the best observed in the last three years. Bears keyed to the good berry

crops and were frequently seen foraging in mid-slope brushfields in late summer and early fall.

The year ended with precipitation levels and temperatures below normal. October through December precipitation levels were 15.5 inches compared to 27.8 inches for the same time period in 1986.

C. LAND ACQUISITION

3. Other (Bellinger)

The refuge staff was again involved in the trade of Native-conveyed lands on Kodiak for oil and gas rights on the Arctic National Wildlife Refuge (approximately 285,000 acres of Native lands on Kodiak are presently being offered). Our primary involvement this year was providing resource data on specific locations to Fish and Wildlife Service Realty and to consultants working for the Native Corporations. Service work on the project is now complete. However, Congressional opening of the Arctic to oil and gas is required before it can take place.

The refuge manager and staff spent a considerable amount of time, during the summer, guiding VIP trips reviewing the land trade. Trips were completed as follows:

July 4 to 6 - Deputy Director Steve Robinson and Region 6 Assistant Regional Director for Administration Marv Duncan.

Aug. 7 - O.M.B. Fish and Wildlife Service Examiner Bruce Beard, 1002 Land Exchange Examiner Norm Hartness, and Fish and Wildlife Service Assistant Director for Administration Joe Dodridge.

Aug. 12 to 14 - Regional Director Stieglitz, Congressman Lindsey Thomas (Georgia), Counsels for the Merchant Marines and Fisheries Committee Don Berry and Ed Welch.

Aug. 18 to 20 - Refuge manager accompanied Native-hosted tour of exchange lands with several key Congressmen and Congressional staffers.

Aug. 27 - Interior Department Congressional Liaison Steve Britt, Secretary of Interior's Office staffers Pat Clarey and Kathy Wolf.

Sept. 1 - Regional Director Stieglitz, Deputy Regional Director Olsen and Congressman Conte (Massachusetts).

The biological aspects of a proposed trade in Uganik Bay (Uganik Trading Company site for patented site number 204209) have been reviewed by Realty. We are presently waiting for Realty to complete an appraisal on the two sites.

D. PLANNING

1. Master Plan (Bellinger and Menke)

The refuge staff extensively reviewed and commented upon an internal review draft of the Kodiak Final Comprehensive Conservation Plan in January and February. Due to the fact that the final plan was approximately 400 pages in length, the refuge suggested printing a summary document to be distributed to the public at large. The final comprehensive conservation plan was received on April 28, with 350 plans or plan summaries being mailed out to Kodiak residents on April 30.

The refuge staff was again involved in many meetings generated by this planning process during the year. These meetings are listed in chronological order as follows:

Jan. 17 and 26 - Public workshops with transporter/outfitters, sport fish guides and big game guides.

Feb. - Briefing for local Fish and Game Advisory Board.

Mar. - Briefings held for local staff of Alaska State Divisions of Sport fish, Game, Commercial Fish, and Fisheries Rehabilitation and Enhancement.

Apr. 24 - Refuge manager assisted Refuge Supervisor (South) on briefing for Congressional delegation staffers.

May 13 - Refuge manager, outdoor recreation planner, and Bill Knauer from the Regional Office conducted a public hearing in Kodiak regarding commercial fishing activities on the refuge. A total of 40 people attended this "lively" session.

Aug. 21 - Refuge manager attended briefing for Regional Director Stieglitz in preparation for meetings with the State and Citizen's Advisory Commission on Federal Areas. This meeting also served as a briefing for the Record of Decision.

Sept.29 and 30 - Refuge manager attended meeting in Anchorage with Regional Director Stieglitz and the Alaska Land Use Council.

Although a significant amount of staff time and station funds were expended on this effort over the last four years, the approved plan established some direction that should benefit the refuge in the future. The primary accomplishments in the plan are as follows: no new base camps for commercial fishing, 73% of refuge is proposed wilderness, oil and gas exploration and development are not compatible

with refuge purposes and upper limits were established for sport fish guides and hunting outfitters.

2. Management Plan (Bellinger)

A. Commercial Fishing Activities

A management plan for commercial fishing activities was completed and approved in 1987. The primary refuge involvement in regard to this activity is oversight and control of the commercial fishing base camps located on Fish and Wildlife Service lands.

In the original executive order that established Kodiak National Wildlife Refuge (August 14, 1941) a one mile-wide strip along the entire coastline boundary was left open to entry under the public land laws. In 1958, the boundary was revised by Public Land Order to include the coastal strip under refuge jurisdiction. However, many private land parcels were claimed and trespass structures constructed during the 1941 to 1958 period. The Service began to locate and bring trespass structures under Special Use Permit in the late 1960's. Trespass structures (primarily commercial fishing camps) continued to proliferate, however, and the refuge made a concentrated effort to locate, cite, and bring them under permit in 1976.

Due to the fact that commercial fishermen continued to construct facilities without prior approval, a refuge policy was initiated in 1979. This policy mandated that no new permanent structures would be constructed (applicants for new camps were permitted to use temporary structures).

A maximum size for living and storage structures was also established at this time.

On December 2, 1980, the Alaska National Interest Lands Conservation Act redesignated Kodiak National Wildlife Refuge. This act mandated that the refuge would complete a comprehensive conservation plan by December 2, 1987. During the public involvement phase of this process, the commercial fishing special interest group stated their case that the existing policy did not adequately meet the needs of the fishery (400 sq. ft. for living space and 400 sq. ft. for storage building).

In response to the group's concern, the Fish and Wildlife Service agreed to investigate the matter to determine: 1) if the current size restriction met the basic needs of the fishery, and 2) if the current permitted size is not sufficient, what size and type of structures should be permitted to meet the basic needs of the fishery.

The number of people needed per salmon gill-net permit was utilized to determine the size and type of facilities that should be allowed.

The approved plan allows one primary cabin of 600 sq. ft. and one utility structure (400 sq. ft. for one through three salmon permits, 500 sq. ft. for four permits and 600 sq. ft. for an operation with 5 permits). The season of use is May 15 through September 15 annually.

B. Sign Plan (Menke)

Minor revisions were made to the Sign Plan draft and the plan was submitted in April, 1987. The plan was approved in October. Several new highway information signs and cabin signs were ordered in accordance with the sign plan schedule.

C. Public Use Cabin Management Plan (Menke)

In September, Outdoor Recreation Planner Dave Menke submitted a final draft of the Public Use Cabin Management Plan to the Regional Office for review.

D. Fire Management Plan (Becker)

During 1987 the refuge staff completed a Fire Management Plan. The document tiers to the Alaska Interagency Fire Management Plan (Kodiak/Alaska Peninsula Planning Area) and allows fires to burn except where human safety or designated physical developments dictate otherwise. An annual evaluation of suppression categories will be conducted by August 1 of each year. Due to Kodiak's moist maritime climate, fire is not a frequently occurring event on the refuge. The approved plan will allow fire to play a more natural role on the refuge, while at the same time reducing suppression costs.

E. Fishery Management Plan (Chatto)

In October, 1987, after numerous drafts, the refuge completed what it hoped was the final draft of the refuge Fishery Management Plan. The plan is basically a extension of the refuge comprehensive conservation plan and provides the direction and strategies the Service will take to manage the fishery resources of the refuge.

In the plan, a description of refuge fishery resources is presented along with human use and management history. Major issues and concerns relative to the fishery resource are identified along with goals, objectives, and tasks which are designed to span a 5-year period. Some of the major concerns identified are: a lack of comprehensive data on habitat and escapement data for some species which could hinder proper land and resources management decisions, the Service's role in trying to grapple with proposed fishery restoration and enhancement activities on the Refuge and the potential or possible impact these activities would have on wildlife habitat or populations, the maintenance of salmon escapement as a food source for wildlife and, the lack of comprehensive data on sport fishing effort in the

refuge to gauge potential or actual impacts on the fish populations.

The objectives and tasks were developed to address the concerns and Service management direction. These objectives and tasks ranged from conducting necessary administrative functions, regulation of commercial harvest of refuge fish populations, escapement and sport harvest monitoring, and the development of an aquatic habitat data base to support proper land and resource management decisions.

Finally, the plan prioritizes work for both the Service and the Alaska Department of Fish and Game for the years 1988 to 1992.

3. Public Participation (Menke)

Two meetings were held to discuss transporter/outfitter and sport fish guiding operations on the refuge on February 17 and 26, respectively. Both meetings were well attended. Those invited to participate in the meetings included big game guides, sport fish guides, air taxi operators, marine transporters, transporter/outfitters, local fish and game advisory committee members and local Alaska Department of Fish and Game employees.

As a result of comment received at the meetings, a questionnaire was sent out for people attending, to receive their reaction on various ideas and proposals which were addressed at the sessions. Most guides and outfitters felt that some limits on either the public or commercial users should be enforced to maintain the quality of the experience and reduce potential conflicts between users and wildlife resources.

4. Compliance with Environmental and Cultural Resource Mandates (Becker)

In May, 1987, the Kodiak National Wildlife Refuge was informed that the village of Larsen Bay had formally proposed to construct a small hydroelectric project in the Fall of 1987 on 22 (g) lands in the Humpy Creek drainage. The proposal resulted from the findings in the "Hydropower Feasibility Study for Larsen Bay, Alaska" completed by Polar Consult Alaska, Inc. in 1986. Refuge staff and representatives from the Alaska Department of Fish and Game and Alaska Power Authority visited the site on May 12 and relayed primary concerns surrounding access into high density brown bear habitat to the Service's Fish and Wildlife Enhancement Division, Anchorage.

Because the project was thought to require a Section 404 permit from the U.S. Corps of Engineers, a meeting was held in Anchorage on June 30, 1987 with that agency and Fish and Wildlife Service to iron out agency responsibilities. At that time, it was agreed that the Corps of Engineers would be the lead agency for completing the necessary Environmental Assessment with Fish and Wildlife Service dovetailing a required compatibility determination with the Corps Environmental Assessment. It was also decided that the Fish and Wildlife Service would meet with the applicant (Larsen Bay) to discuss mitigation measures that could be incorporated into the Section 404 permit.

On July 22, 1987 Refuge Manager Bellinger and Wildlife Biologist/Pilot Becker met with Charles Christensen, Mayor of Larsen Bay, to discuss mitigation measures. It was agreed at the meeting that two locked gates, one with chain link leads placed on the entrance road near the power house, and the other located at a strategic location higher up on the slope, would be constructed to prevent unauthorized vehicular traffic. The village agreed to keep the gates locked at all times except for authorized vehicle access for inspection and maintenance of the facility.

It was also decided that no camps would be allowed on the construction site, that no disposal would be allowed, and that any transmission lines erected would be of raptor proof design.

Prior to the planned October start update the refuge received word that the Corps had decided a Section 404 permit would not be required for the project after all. This necessitated a change in plans; and the Fish and Wildlife Service would now be the sole Federal agency overseeing the project. Therefore, we would be responsible for both the Environmental Assessment and the compatibility determination. At this time, an informal opinion by the solicitor has deleted the Environmental Assessment requirement and a compatibility determination is all that will be needed before the project can be approved.

5. Research and Investigations

Kodiak NR 87 - "Karluk Lake Sockeye Salmon Studies" Fish and Wildlife Service 81410-02 (Alaska Department of Fish and Game) (Chatto)

This project was initiated by the Alaska Department of Fish and Game in 1978 through a special use permit issued by the refuge. In 1982, the Service and the Department entered into a Memorandum of Understanding for cooperative studies on Karluk sockeye restoration. The overall project involved escapement monitoring and harvest regulation, an eyed egg plant in the Upper Thumb River (a sub-component of the Karluk system), fertilizing Karluk Lake to increase zooplankter levels as an increased food source for sockeye juveniles, monitoring the outmigrant sockeye smolts and conducting competitor/predator prey relationships which could affect juvenile sockeye survival in the lake rearing environment. The latter two of these studies were being carried out by the Service's Alaska Fish and Wildlife Research Center.

The overall project results for 1987 are summarized below:

A. Karluk Sockeye Escapement and Harvest:

In 1987 an adult sockeye escapement of approximately 766 thousand fish were enumerated through the Karluk Lagoon by the Department's weir personnel. By July 15, 96% of the desired early run escapement of 350 thousand fish had been met and by the end of September 78% of the desired late run of 550 thousand fish had been met. Overall the minimum escapement goal of 560 thousand fish and 85% of the desired 900 thousand spawners were realized. This is the third best escapement since 1960 into the Karluk system.

In 1987, approximately 354 thousand fish of Karluk origin were calculated, by the Department, to have been harvested in the Karluk district and along the west side of Kodiak Island. Thus, the total return of Karluk sockeye in 1987 was approximately 1.12 million fish. This is comparable to the 1.14 and 1.65 million fish returns observed in 1985 and 1986.

B. Upper Thumb River Eyed Egg Plant and Fry Population Estimate:

During the spring of 1987 the Department conducted pre-emergent sampling in those areas in Upper Thumb where approximately 19.8 million eyed sockeye eggs were planted in the fall of 1986. These eyed eggs were the result of the approximately 23.4 million green eggs taken from wild Thumb River stocks as a means of rehabilitating the Upper Thumb River sockeye. Pre-emergent sampling indicated that approximately 7.8 million sockeye fry were produced from the 1986 egg plant. In 1987 the Department ceased taking eggs and removed the incubating facility in Upper Thumb (Sec. F-6).

C. Lake Fertilization 1987

As in 1986, a program which is being carried out by the Department in an attempt to increase the available nutrient level and thus the zooplankter abundance for rearing juvenile sockeye in Karluk Lake was again carried out in 1987. Between May 14 and July 6, 1987, approximately 96 tons of a liquid fertilizer composed of inorganic phosphorus and inorganic nitrogen was applied by a Cessna 188 ag-truck aircraft.

Prior to fertilization in 1987 the refuge and the Department placed marker buoys to delineate the target area for fertilization. In addition, the refuge conducted an overflight of the area with the contract pilot. Department plans are to continue fertilization until at least 1989.

D. Karluk Sockeye Coded Wire Tag Recovery:

In 1987, outmigrating Karluk River smolt and potential four-year-old returning jacks (age 2:1 fish) in the Upper Thumb River were examined for tags. A total of 117 and 141 thousand sockeye fry were released with half-length coded wire tags in 1984 and 1985, respectively. A total of 36,290 smolt were examined in 1987 for tags. One tagged smolt from the 1984 group was detected. No tagged jacks were observed in the Upper Thumb River.

E. Karluk Sockeye Early Run Escapement Distribution Evaluation:

In 1987 early run sockeye salmon were tagged at the Karluk Lagoon fish weir by the Department. The objective was to determine if Thumb River sockeye could be segregated from other subcomponents of the Karluk stock by time of entry, which would allow a directed harvest on projected excess returns to the Upper Thumb River system.

Between June 8 and July 14 a total of 5,000 adult sockeye were tagged. Color codes on the tags were changed each week to separate fish on the spawning grounds.

Spawning ground surveys were conducted on a weekly basis from July 5 to August 13; a total of 23 tributaries to Karluk Lake were surveyed. A total of approximately 375,670 fish were observed on the spawning grounds, of which 1,699 were tagged. The largest numbers of tagged fish were found in Canyon Creek (35.4%) and the Upper Thumb River (22.2%). Although analysis of the data is incomplete, it appears that the Upper Thumb River component of the early escapement is not adequately distinct in timing or spatially as it moves into the lagoon to allow a directed harvest without negatively impacting other components of the early run at Karluk (especially the Canyon Creek stock).

F. Lake Limnology - Karluk and Other Lakes, 1987:

The Department sampled Karluk, Frazer, and Akalura Lakes in 1987. The Karluk work was done in conjunction with the evaluation of fertilization. Frazer and Akalura are being analyzed as to their rearing potential or limits for juvenile sockeye. A total of 88 station visits were made to the three lakes between May and October, 1987. The lakes were sampled for zooplankton, water temperature, transparency, dissolved oxygen, and other water chemistry parameters. Data are not yet available for 1987 because the samples have not been processed by the Department's limnology lab in Soldotna, Alaska.

G. Karluk Sockeye Competitor/Predator and Smolt Investigations:

During 1987, the Service's Research Division field station at Camp Island continued their fifth and possibly final year of littoral and limnetic sampling at Karluk Lake. Samples of sockeye, stickleback, and coho are being processed to compile data for a final report on the predation/competition potential as a limiting mechanism on sockeye production in Karluk Lake. A low-head dam on the O'Malley River which blocks migrating stickleback from entering O'Malley Lake for spawning was again installed in 1987. Final data analysis for this component of the study is now being completed.

During 1987, the Service continued to monitor the Karluk sockeye smolt outmigration at the lake's outlet. A total of 2,135 smolt were sampled for age, weight, and length information. Preliminary data indicate that 2, 83, and 15% of the sample were age one, two, and three fish, respectively. The condition factor of the age two smolt in 1987 (which usually makes up 60-85% of the migration) was the lowest observed in the past nine years. Possible explanations are that even with lake fertilization the escapement of approximately 900 thousand fish in 1985 and 1986 may have resulted in a temporary increase in competition for food which was reflected in the condition factor of the two-year-old smolt in 1987.

In early 1987 the Service's National Fishery Research Center in Seattle produced a draft report entitled "Depensatory Predation Mortality of Karluk River Sockeye Salmon". This report is an initial draft production on the results of data collected on the possible role coho salmon play in the predation of juvenile sockeye salmon in Karluk Lake. Comments and additional data on coho escapements were provided for the manuscript by the refuge.

This low-head dam on the O'Malley River blocking stickleback from entering O'Malley Lake to spawn, is part of the Karluk sockeye competitor/ predator investigations. (87-01) TC

Kodiak NR 87 - "Seasonal Migration and Movements of Kodiak Island Bald Eagles" (74530-82-01) (Zwiefelhofer)

The 1987 marking effort was conducted during the period July 14 to 31 from Terror Bay to Uyak Bay on the west side of Kodiak Island and from Sitkalidak Island to Cape Alitak on the east side of Kodiak Island. Thirty-seven fledglings from 24 nests were marked with colored patagial flags. Sixteen of the 37 young eagles were also fitted with radio transmitters. The summer of 1987 was the last field season of active marking in the study. During 1988, study efforts will focus on the monitoring of the radio transmitters placed in 1987 and the collection of color patagial marker observations from juveniles marked during the previous six field seasons. A final study report will be prepared during FY 90.

As outlined in the study proposal, a survey of coastal wintering bald eagles was completed during February (27, 28) and March (3, 11, and 12)

The pre-marking swim this eaglet took didn't improve its disposition. 7/87 (87-02) DZ

Some are not fond of participating in research studies. 7/87 (87-03) DZ

Eaglets fitted with radio transmitters are also color marked. 7/87 (87-04) DZ

Eaglets this size are considered barely old enough to retain patagial flags. 7/87 (87-05) DZ

on Kodiak, Uganik, Sitkalidak, Harvester, Two-headed, and Sally Islands. In addition, all other named and unnamed small islands and islets within 1/2 mile of the Kodiak coastline were surveyed with the exception of Spruce Island, the Geese Islands, and Trinity Islands group. A portion of the Kodiak coastline representing approximately 5% of the total coastline from Spruce Cape to Inner Point (the entrance of Whale Pass) was not surveyed. The total number of bald eagles tallied in this survey should be considered a minimum number. A substantial number of bald eagles remained in the interior freshwater habitats due to the mild winter weather conditions experienced in 1987. No effort was made to enumerate bald eagles occurring on interior or estuarine habitats. Some duplication may have occurred due to eagles moving from one survey section to another, but this was thought to be minimal. The ratio of subadult to adult eagles varied considerably with the highest percent of subadults occurring in survey sector 2 (Table 2), which also had the most radioed subadults (4).

The total of subadult bald eagles was felt to have been substantially under represented due primarily to the difference in observability and behavior from the adults. In an attempt to quantify the number of subadults missed in the survey, the radio frequencies of radio marked subadults were monitored during the first 3 survey sections resulting in visual observations of only 3 (37.5%) of the 8 radioed subadults heard. All eight of these subadults have colored patagial flags (yellow/right, green/left) in addition to radio transmitters to further facilitate visual observation. Despite this, over half were not seen supporting the assumption that the numbers of subadults counted were much lower than the actual population. If the ratio of observed to unobserved radioed subadults is applied, the actual numbers of subadult bald eagles on Kodiak Island during the survey was approximately 361 or 62.5% more than the observed number of 222. This would increase the total number of wintering bald eagles on Kodiak to 1324, well over the previous estimate of 500 to 800 bald eagles made from results of a 1980 winter coastal survey.

Table 2
Kodiak Island bald eagle coastal winter population survey results.

Survey section	Date	Time (hours)	Subadults	Adults	Total
1. Whale Pass-Larsen Bay	2/27	6.7	57(13%)	385(87%)	442
2. Pasagshak-Cape Kiavak	2/28	5.0	89(26%)	256(74%)	345
3. Pasagshak-Spruce Cape	3/03	1.5	33(25%)	98(75%)	131
4. Larsen Bay-Portage Bay	3/11	6.7	36(19%)	152(81%)	188
5. Cape Kiavak-Portage Bay	3/12	1.3	7(9%)	72(91%)	79
Totals			222(19%)*	963(82%)	1185

* Includes 5 radioed subadults radio located, but not visually observed.

Movements of Kodiak Island subadult bald eagles have been primarily within the Kodiak Archipelago. However, movements to and from the Kenai Peninsula and across Shelikof Strait have been documented. Some differences in movement have been seen in juveniles marked on different sides of Kodiak Island. Data to date suggest that the majority of bald eagles on Kodiak Island are part of a resident population.

The social and foraging movements described for wintering bald eagles in other areas also occurs on the Kodiak Archipelago.

Mortality of radioed juvenile bald eagles on Kodiak Island is notably less than reported in other studies of subadult bald eagles. Wintering bald eagle population numbers indicate an increasing resident population supporting the above average survival rate hypothesis for bald eagles hatched on Kodiak Island.

Kodiak NR 87 - "Impacts of Construction and Post-construction Operation of the Terror Lake Hydroelectric Project on Brown Bears (Ursus arctos)" (74530-82-03) (Barnes)

This study is being conducted by the Alaska Department of Fish and Game under contract to the Alaska Power Authority. The field work phase of this study was completed in 1986; intensive data analysis and drafting of the final report are in progress. Submission of the final report is expected in March, 1988 and will be summarized in the 1988 narrative report.

Kodiak NR 87 - "Alaska Department of Fish and Game Monitoring Program to Assess Project Effects During Construction and Operation of the Terror Lake Project on Salmon Egg and Fry Survival, and Trends in Salmon Escapement, Magnitude, and Distribution" (Alaska Department of Fish and Game) (74530-82-05) (Chatto)

A progress report on work done in 1986 was completed in 1987. Progress on work done in 1987 is not available as of this writing. Pre-emergent sampling for pink salmon in the Terror River in the spring of 1986 indicated that the even-year pink salmon fry densities of 0.22 live fry/m^2 for the Terror River is one of the lowest on record. It is suspected that the heavy October 1985 rainfall caused severe flooding in several major westside island streams including the Terror River.

Escapement into the Terror River in 1986 was strong. An index escapement of 196,500 adult pinks, 10,000 chums, and 220 coho salmon were observed during aerial survey flights. Distribution of spawning fish was observed to be similar to previous years.

Numerous problems plagued the data acquisition for water temperature analysis during 1986. The use of a data pod temperature recorder may not be feasible because of continual flood related and bear damage, plus equipment failure suffered by the data pods. Plans are being made to try to alleviate some of the problems associated with this aspect of the study. In 1987 an agreement was reached between the Alaska Power Authority and the Kodiak Electric Association wherein the Association's on-site personnel would be responsible for maintaining the data pods.

The 1987 "Integravel and Surface Water Temperature Annual Report" issued by the Alaska Power Authority indicates that, although some problems still plagued the use of the data pods, an active maintenance schedule by Association personnel has helped alleviate some of the problems.

Kodiak NR 87 - "Investigation of Habitat Use and Evaluation of Aerial Surveys of Brown Bear in Southwest Kodiak Island" (74530-83-02) (Barnes)

Study accomplishments in 1987 included the accumulation of over 500 relocations of radio-collared bears, the recapture of 8 adult females for collar replacement, instrumenting and intensively tracking 2 females with satellite radio-collars, and collection of stream use data from a ground camp along Connecticut Creek.

Forty-five radio-collared bears were tracked for various time intervals during the year. By late December, 9 bears had shed collars, 4 were dead (1 hunter kill, 3 natural deaths), 26 had been located in winter dens, and the status of 6 bears was unknown.

The first bears to emerge from winter dens in 1987 were an adult male (early March) and 2 females with 3-year-old offspring (late March). Sixteen (67%) of 24 animals were out of their dens by May 12 and just one bear remained in its den past May 30.

Only 3 of 9 potential breeding females emerged from winter dens with new-born cubs in 1987. One of the females with cubs subsequently died and another lost her single cub. The remaining female emerged from her den with 2 cubs and adopted another cub during the summer. Five females weaned a total of 10 juveniles during spring of 1987; 3 of the litters were 3-years-old and the remaining 2 litters were 2-years-old.

Eighteen (58%) of 31 radio-collared bears that fished at salmon streams in the aerial survey study area were sighted at least once during a survey. Sightability averaged 0.27 for individual survey flights. A minimum of 49 different bears were identified from the ridge-top camp above Connecticut Creek during August 8 to 12. Seven radio-collared bears were observed and monitored along the stream during that time.

Overall, bear use of salmon streams was about average in 1987. For individual streams, use was below-average on Sturgeon River and Pinnell Creek, average on Connecticut Creek, and above-average on the East Fork of the Ayakulik River. The 1987 berry crop was good and late-summer use of mid-slope areas was greater than in the past 2 years when berry crops were poor.

Six (23%) bears entered winter dens during the first 3 weeks of November, an additional 18 (69%) were in dens by December 12, and the remaining 2 were denned by December 30.

(009-009-001) DM

Kodiak brown bears showing differences in pelage color.

(15-189-87) DM

Kodiak NR 87 - "Steelhead Trout Movements and Habitat Use in the Ayakulik/Red River System Southwest Kodiak Island" (74530-84-01) (Chatto)

This study which was initiated in the fall of 1984 to map and characterize overwintering and spawning habitat for steelhead on the Ayakulik River (Figure 3) continued in 1985 and the fall of 1986. Adult steelhead marked with radio implants in the fall of 1986 were located into the spring of 1987. General movements of overwintering fish in 1987 were similar to the spring of 1986 with a majority of the fish overwintering in the mainstem river. Problems were encountered in the spring of 1987, with some transmitter failures suspected. Data is being analyzed for all years of the study and a final report may be completed in 1988.

Kodiak NR 87 - "Chinook Salmon Movements and Habitat Use in the Ayakulik/Red River System Southwest Kodiak Island" (74530-85-02) (Chatto)

This study was conducted in 1986 and 1987 to map and characterize critical spawning habitat of Ayakulik chinook salmon, and to determine timing of these fish through the sport fishery on the river. Movement and distribution of these fish was determined by radio-telemetry.

Tagging of chinook was done by personnel of the Department's Commercial Fish Division at a fish counting weir located immediately above the intertidal zone in the Ayakulik River Lagoon. Those adults trapped at the weir were marked with radio tags. Age, weight, and length data were taken for all fish and each fish was marked with a external (floy) tag prior to release.

Twenty-five chinook were marked at the weir in 1986 and 31 were marked in 1987. Marked fish were tracked by aircraft in one to two week intervals until late August 1986 and early September 1987. Escapement of chinook spawners through the weir was 6,371 and 15,636 in 1986 and 1987, respectively.

Preliminary data analysis for both years of the study reveal several tentative conclusions. These were: (1) few fish moved upstream into the upper reaches of the Ayakulik drainage until a majority of the sport fishery on the lower river was over; (2) a major spawning area on the East Fork of the Ayakulik and the lower mainstem was confirmed, and (3) those early run chinook appear to be a vital and integral food source for a segment of the brown bear utilizing the area during the month of July.

A final report on the study is expected to be completed in 1988.

Kodiak NR 87 - "Movement, Dispersal, and Life History of Sea Otters Near Kodiak Island, Alaska, and Relationships to Shell Fisheries (87200-210-02 and 03) (DeGange)

This study, conducted by the Service's Alaska Fish and Wildlife Research Center, does not take place on Kodiak Refuge lands but rather

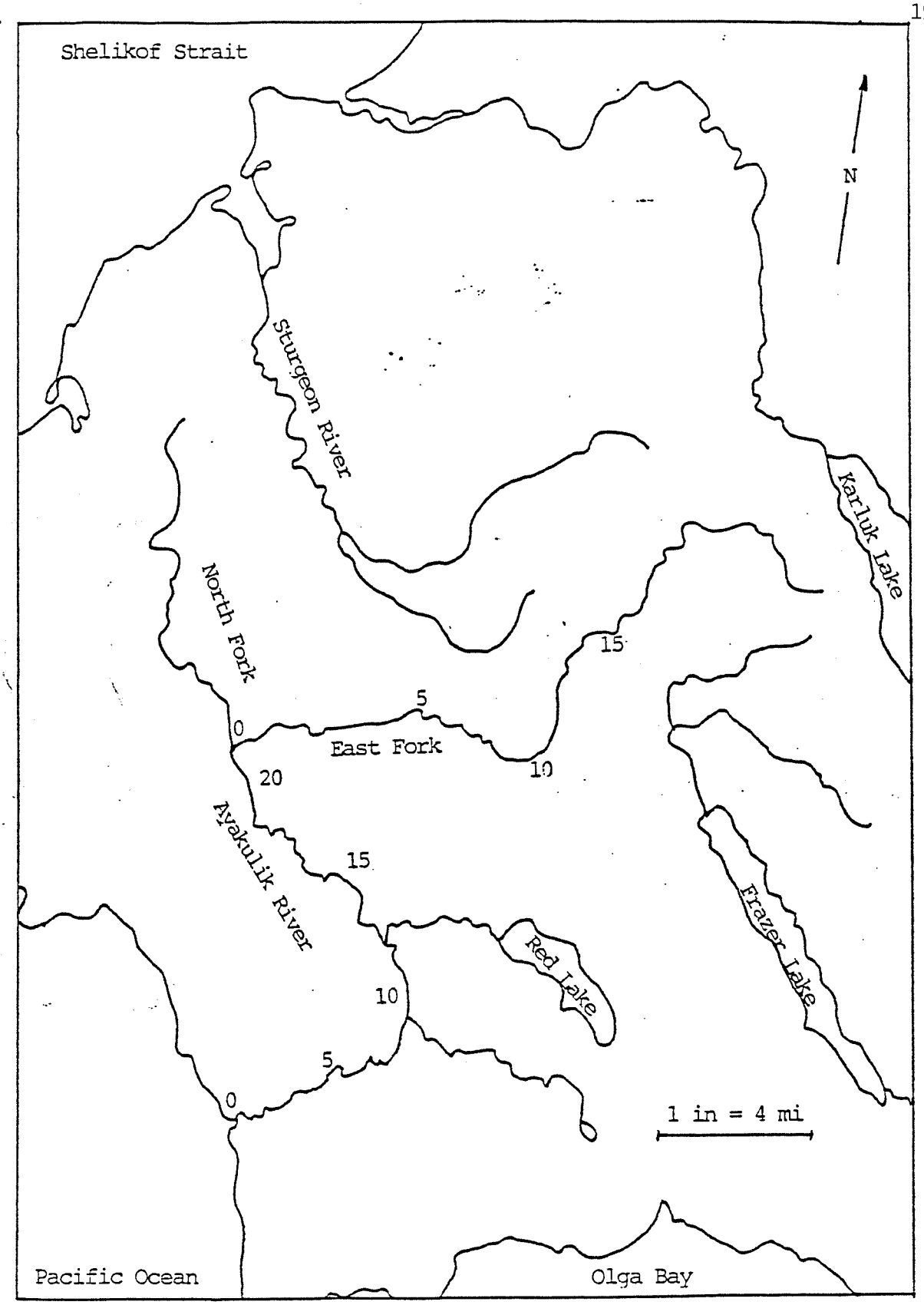


Figure 3. Ayakulik River drainage, south end Kodiak Island.

on those areas immediately adjacent to the refuge. It is included here because sea otters were identified in the Alaska National Interest Lands Conservation Act as one of the species that the refuge would be managed for.

Research at Kodiak Island continues to emphasize the movements of radio-marked sea otters, their feeding habits and the effects of their foraging on subtidal benthic communities. The sample size of marked sea otters was increased from 20 to 45. Preliminary analysis of movement data indicates a general movement of males into a protected bay in fall 1986 and an exodus from that bay in late winter 1987. Males tend to form large persistent groups in the Kodiak region. These large groups were found in different parts of the study area during summer 1986 and summer 1987. Females, in comparison to males, were relatively sedentary.

More than 2,000 foraging dives were observed during spring, summer, and fall, 1987. As in 1986, clams were overwhelmingly the most important prey type in terms of biomass and frequency of occurrence in diets. Commercial shellfish were of negligible importance in diets of sea otters in northern Kodiak Island; however, we were unable to collect foraging data from southern Kodiak Island where a population of sea otters inhabits rich crab and sea urchin fishing grounds. Center biologists observed a distinct contrast in the size of clams taken by sea otters at northern Kodiak Island compared to northern Afognak Island. Clams taken by sea otters at northern Afognak Island were distinctly smaller than those taken at northern Kodiak which presumably relates to the length of time sea otters have been present in each area exerting predation pressure. Divers using SCUBA confirmed the contrast in the sizes of clams between the two areas as well as a similar contrast in clam densities between the two areas.

Divers established permanent study areas at several sites near Kodiak Island that are still unoccupied or only recently occupied by sea otters. The permanently marked sites will give biologists an opportunity to track changes in prey abundance and size as predation pressure by sea otters increases. Divers continue to focus effort on the interactions of sea otter foraging on prey populations and other members of the benthic community.

Kodiak NR 87 - "Frazer Lake Sockeye Smolt Evaluation" (Alaska Department of Fish and Game) (Chatto)

Sockeye salmon have experienced drastic, reduced returns to the Frazer Lake system in the last five years. In conjunction with operation of the Frazer Lake Fish Pass (see Sec. J-1), the Alaska Department of Fish and Game, Commercial Fish Division, sampled sockeye smolt at the facility to document smolt timing, quality, and relative abundance as indicators and measurements of lake productivity. The data obtained will be used to reevaluate the productivity of the lake and reassess escapement goals into the system.

In 1987, the Frazer Lake fish pass station was operational on May 15 with installation of an inclined plane trap, the lower fish pass weir,

and the downstream gate on the permanent downstream migrant fish trap by a Department technician, and a U.S. Fish and Wildlife Service volunteer. Based on trap catches at the Frazer Lake fish pass station, the smolt migration essentially began on May 21 and ended on June 11. The peak migration occurred from May 27 through 29. The total catch in the two traps amounted to 55,807 sockeye salmon. The number of smolt exiting Frazer Lake in 1987 was 25% of the 1986 level based on between-year differences in the inclined plane trap catches.

As part of the Frazer Lake investigation the littoral areas of the lake were sampled for young-of-the-year sockeye. Sampling established that sockeye fry were utilizing the littoral area from mid-May through mid-August. In addition to the lake work, spawning ground surveys began on July 29 and ended on September 29. In contrast to previous years, nearly all (80%) of the 1987 sockeye escapement in Frazer utilized the lake shore for spawning. In addition during 1987, a hydroacoustic survey of the lake was done to ascertain key rearing areas within the lake and to try to estimate abundance of sockeye fry.

Frazer Lake fish pass. This facility is located below the outlet of Frazer Lake. (87-06) TC

Kodiak NR 87 - "Estimation of Brown Bear Density on Kodiak Island" (74530-87-01) (Barnes)

This study was conducted under a cooperative agreement between the Fish and Wildlife Service, the Kodiak Brown Bear Research and Habitat Maintenance Trust, and the Alaska Department of Fish and Game.

The investigation utilized on-going studies (74530-82-02 and 74530-83-02) as a foundation for obtaining density estimates in the 2 areas. In

mid-May a capture/marking operation was conducted to supplement the existing sample of radio-collared bears on those areas. Collars were placed on 28 bears, most of which were either subadults or adult males. These animals raised the sample to 28 bears on the southwest Kodiak study area (244 mi^2) and 33 bears on the Terror Lake study area (137 mi^2). Between May 27 and June 15, intensive aerial searches (fixed-wing) of the 2 areas were flown and sightings of marked and unmarked bears were recorded. Three and 4 replicate surveys were flown on the Terror Lake and southwest areas, respectively.

Population estimates were derived from a mark/recapture design that used locations of radio-collared bears to correct for geographic closure of the population and to assess sightability bias among sex and age classes. The estimated population of independent bears (excludes juveniles) was 134 for the southwest area (1 bear/1.82 mi^2) and 78 for the Terror Lake area (1 bear/1.75 mi^2). The data indicated that single bears and maternal females comprised about 53% and 17%, respectively, of each population.

Typical coastal Kodiak bald eagle ground nest. (08-157-87) DM

E. ADMINISTRATION

1. Personnel (Ryan, Castonguay)

Left to right; back row: 1, 5, 7, 4, 3, 10
front row: 12, 9, 6 , 2 (87-07) DM

Personnel

1. Jay R. Bellinger, Refuge Manger, GS-12, PFT
2. Kevin Ryan, Assistant Refuge Manager, GS-11, PFT
3. Kurt G. Becker, Wildlife Biologist/Pilot, GS-12, PFT
4. Donald A. Chatto, Fisheries Biologist/Pilot, GS-12, PFT
5. David W. Menke, Outdoor Recreation Planner, GS-9, PFT
6. Dennis C. Zwiefelhofer, Wildlife Biologist/Boat Operator, GS-9, PFT
7. Geraldine M. Castonguay, Refuge Clerk, GS-5, PFT
8. Jeffrey S. Selinger, Biological Technician, EOD 8/10/87, Termination of Appointment 10/30/87, GS-5, Temporary
9. Becky A. Brewer, Clerk Typist, LWOP/Resignation 12/4/87, LWOP Approved NTE 3/6/88, GS-3, PFT
10. Ronny D. Bowers, Maintenance Mechanic, WG-9, PFT
11. Leroy M. McDonald, Carpenter Helper, WG-5, EOD 8/10/87, Termination of Appointment 10/9/87, WG-5, Temporary
12. Rasmus G. Anderson, Laborer, WG-2, PPT

Alaska Fish and Wildlife Research Center

13. Victor G. Barnes, Jr., Wildlife Biologist (Research), GS-12, PFT

Volunteers

14. Jeffrey S. Selinger, Volunteer, EOD 5/7/87, Separated 9/9/87
15. Roslyn Rodeheaver, Volunteer, EOD 5/13/87, Separated 8/14/87
16. Raymond F. Hander, Volunteer (Research), EOD 5/24/87, Separated 8/18/87
17. Betty Dean, Volunteer, EOD 5/27/87, Separated 7/1/87
18. Jack Dean, Volunteer, EOD 5/27/87, Separated 7/1/87

Becky Brewer resigned in December when her U.S. Coast Guard husband transferred to Florida. We're sure that Becky and John will find a "wee bit" more sunshine there than here at Kodiak.

Leroy (Mac) McDonald was hired as a Carpenter Helper under emergency hire provisions to assist with construction at headquarters. Mac worked well until expiration of his appointment.

Jeff Selinger was hired under the local hire provisions of the Alaska National Interest Lands Conservation Act as a biological technician after his volunteer appointment ended. Jeff began formatting and entering brown bear harvest data into computer files.

Table 3 shows on board strength for the last five years.

Table 3
Staffing 1983 to 1987

	(Number of employees) permanent full time	part time	temporary	Total FTE
FY 1987	9	1	2	9.7*
FY 1986	9	1	1	9.7
FY 1985	9	1	0	9.5
FY 1984	9	1	0	9.5
FY 1983	9	1	0	9.5

* Local hire appointments do not count toward FTE.

4. Volunteer Program (Menke)

In 1987 volunteers donated a total of 3,371 hours of Service to the refuge. A total of 27 individuals did a wide variety of volunteer tasks over the course of the year as is shown in the following list of jobs performed by volunteers.

a. Acting as visitor center receptionists on weekends.
b. Bald eagle banding and survey work.
c. Bear tagging and tracking.
d. Winter seabird surveys.

Volunteer Jeff Selinger returned for his second summer working on a variety of biological and public use projects. 6/87 (87-08) VB

Volunteer Jack Dean weighs a "Ripe" chinook salmon during the Karluk River sport fishing survey. 6/87 (87-09) B. Dean

e. Taxidermy work.
f. Rehabilitation of visitor center exhibits.
g. Cabin maintenance and repair.
h. Creel census camp work.
i. Collecting fisheries data.
j. Construction of meat caches at recreation cabins.

Thirteen volunteers kept the refuge visitor center open on weekend afternoons. Volunteers Betty and Jack Dean did a public use creel census on the Karluk River during the June chinook salmon fishery. Jeff Selinger and Ray Hander did excellent work volunteering for a creel census on the Ayakulik River as well as working on the meat cache construction projects and helping with various summer research efforts. Roslyn Rodeheaver spent the summer assisting with fisheries work at the Frazer fish pass in a cooperative effort with the Alaska Department of Fish and Game employee there (Sec. J-1). Roz also drafted a short slide/tape program on Kodiak bears which we hope to make into a video tape in the near future.

The number of hours volunteers donated in various project categories are as follows:

a.	Public Use Inventory	1408 hours
b.	Fish and Wildlife Censusing	772 hours
c.	Construction	524 hours
d.	Information/Visitor Center Receptionist	470 hours
e.	General Maintenance	96 hours
f.	Audio Visual Productions	48 hours
g.	Exhibit Design or Preparation	45 hours
h.	Report Writing	8 hours
	Total	3371 hours

Kodiak National Wildlife Refuge accomplishes a great deal of work and many tasks would otherwise go undone without the volunteer program. We look forward to expanding our use of volunteers in future years.

5. Funding (Bellinger)

Table 4 depicts Kodiak National Wildlife Refuge funding in thousands of dollars by programs for the last five fiscal years.

Table 4
Kodiak National Wildlife Refuge funding levels

Program	Fiscal year 1984	1985	1986	1987	1988
WR-1260 (O&M)	488.3	582.2	536.0	620.0*	690.0**
WR-1260 (Large ARMM)	86.7	152.8	125.9	170.0	
FR-1300	100.0	105.0	104.0	100.0	100.0
EFS-1510		1.4		2.0	
YCC-1520	4.9	2.8	3.4		
Contaminants				1.0	25.0
Totals	679.9	844.2	769.3	893.0	815.0

* A total of 98K were monies for one-time add-ons, therefore, did not become part of base funding. Actual base funding (520.3K) represented a 3% decrease from 1986 and was down 10.6% from 1985.

** A total of 152K are monies for one-time add-ons. Therefore actual base funding is 538K.

A total of 529K of the 1988 planning budget will be needed to cover fixed cost (65%). After other airplane costs (47K), contaminants lab analysis (20K), research project support (62K), triplex rehabilitation (70K) and necessary travel cost (8K) are deducted, approximately 79K of our budget remains for operations. This amount does not allow any flexibility for equipment replacement or purchase of equipment.

6. Safety (Becker)

One lost time accident occurred during 1987. On November 5, Maintenance Mechanic Ron Bowers slipped while stepping off of the "Bob Cat" front end loader and twisted his left ankle. Subsequent medical examination revealed a torn ligament. After two days of rest, he was able to return to work but he had to wear an ankle brace for three weeks thereafter.

Monthly safety meetings were held during the year, utilizing films and videos from the Regional Office Safety Library. The subject material ranged form Aircraft Safety to Winter Driving Tactics, and helped to elevate the importance of working safely.

Two tsunami alerts were issued for Kodiak during 1987, following strong earthquakes in the Gulf of Alaska. The first earthquake, measuring 6.9 on the Richter scale, occurred on November 16 at 11:47 p.m. (AST). Due to the time and inclement weather, protective measures were not taken to safeguard the refuge aircraft or vessel. The second and stronger quake (7.6) occurred at 10:23 a.m. (AST) on November 30 and sufficient

time was available before the forecast tsunami to taxi both aircraft to the highest point on the aircraft ramp where they were tied securely. The mooring lines on the refuge vessel were checked but, due to its slow speed, attempts were not made to ferry the Ursa Major to safer water. Fortunately, no tsunamis materialized from either earthquake but predictions include an even larger earthquake in the Gulf within the next twenty years.

7. Technical Assistance (Chatto)

Information on the migratory behavior and run size of Karluk River steelhead was provided to the Alaska Department of Fish and Game in late September 1987, when a proposed coho salmon fishery in the Karluk Lagoon was being evaluated by the Commercial Fisheries Division. Since steelhead enter the Karluk River coincidental to coho salmon, there was concern that a fishery in the lagoon would be detrimental to the steelhead stocks. A general consensus was that if a coho fishery in the lagoon was limited to one day openings spaced at least five to seven days apart, the effect on migrating steelhead would be minimal. As a result the Department held a 30 hour commercial opening in the lagoon on September 24 to 25 where a total of nine units of gear (beach and purse seine) harvested 5,207 coho, 948 sockeye, and 200 chum salmon. Very few steelhead (< 20) were caught and most were released unharmed. Another 9 hour opening on October 3 resulted in only one unit of gear, beach seine fishing, where a total of 7 coho, 35 sockeye, and 3 chum were harvested. No steelhead were caught during this fishery. Two other 9 hour fisheries were allowed on October 6 and 9 but there was no gear being fished and no harvest recorded.

F. HABITAT MANAGEMENT

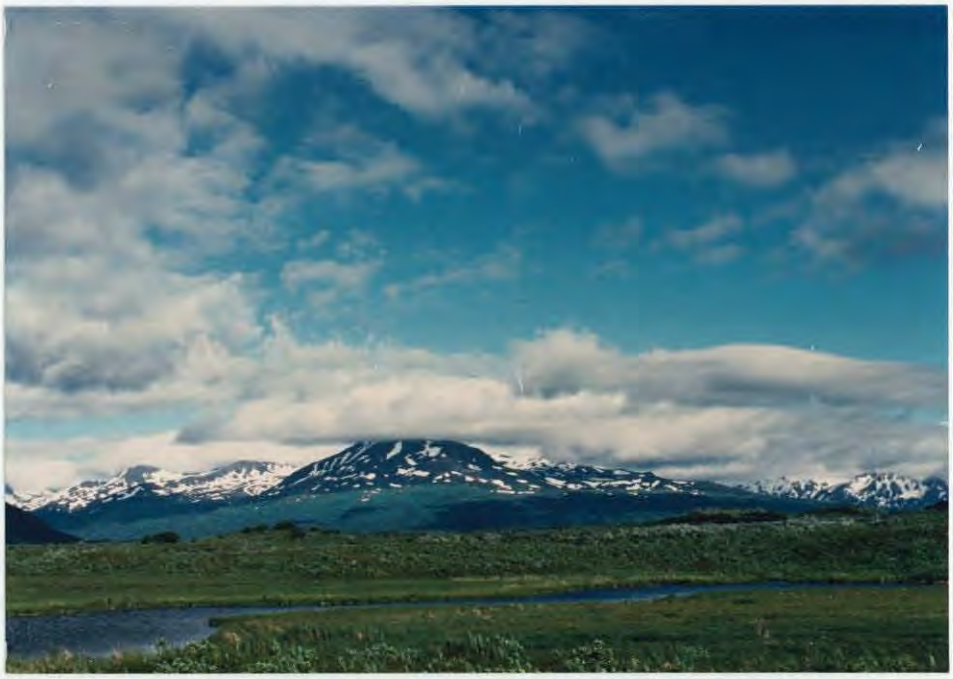
1. General (Ryan)

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 1,886,000 acres of Federal and Native lands, 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 essentially as de facto wilderness (73% of the refuge has been recommended for wilderness designation in the preferred alternative of the comprehensive conservation plan). Most of the habitats on Kodiak remain in a relatively undisturbed state, the major

exception being the coastline, where considerable human development has occurred.



Akalura pass from south Frazer Lake.
(25-108-87) DM

6. Other Habitats - Aquatic (Chatto)

a. Upper Thumb River Rehabilitation Facilities

In 1987 a significant improvement in the streamside habitat occurred in the Upper Thumb River, a subcomponent of the Karluk River Drainage, on the refuge. Between 1978 and 1986 the Alaska Department of Fish and Game, Fisheries Rehabilitation, Enhancement, and Development Division, had steadily built up temporary fish rehabilitation support facilities within the Upper Thumb River as a integral component of the Karluk sockeye rehabilitation effort. Support structures included a temporary weatherport structure which housed equipment capable of incubating up to 40 million sockeye eggs, two 3 to 4 man weatherport housing structures, a weir and a fry trap plus an instream pipeline which extended approximately one quarter mile upstream and served as a water supply system for incubation. In addition, an egg-taking area and other equipment was located on the mouth of the Upper Thumb River at Thumb Lake. Associated with this project during the summer months was a support group of up to 20 people. This project had been a source of constant disagreement between the refuge and the Department since it was located in what was considered high quality brown bear habitat.

In 1987, after recommendations were solicited by the Division from other participants in the Karluk sockeye project, including the

Commercial Fish Division and the refuge, a decision was made to terminate the egg planting operations on the Upper Thumb River. The refuge then requested all temporary structures and related equipment be removed from the drainage in order to rehabilitate that habitat for brown bear and other wildlife. Removal operations began in May and by the end of August 1987 the Upper Thumb drainage was once again devoid of structures and personnel and belonged to the wildlife and the occasional hunter, fishermen, or photographer.

The previous site of a temporary egg incubation facility on Upper Thumb River, a drainage of Karluk Lake, shows very little evidence of use after removal. (87-10) TC

b. Karluk Lake Fertilization

Manipulation of the rearing habitat for juvenile sockeye salmon in Karluk Lake through fertilization was continued in 1987. The project objective is to increase the amount of available nutrients in the lake and enhance juvenile sockeye growth (Sec. D-5).

9. Fire Management (Becker)

No fires were reported on refuge lands in 1987. With the completion of the refuge Fire Management Plan in 1987 (Sec. D-2), the majority of future fires will be allowed to burn unless they pose hazards to human safety or physical developments.

Sulua Bay, an example of esturine habitat, lies at southern end of the refuge. 7/85 (87-11) G. DeBella

Spiridon Bay, on the west side of the refuge, is typical of the deep fjord bays surrounding the refuge. 7/85 (87-12) DM

Typical alpine habitat on the refuge.
(001-039) V. Berns

Cirque lake in northern part of the refuge.
(001-039) D. Boone

These mountains, located in the northeastern part of the refuge, are some of the highest on the refuge. (001-029) G. Atwell

The Ayakulik River, one of two rivers on the refuge that has all five species of Pacific salmon plus steelhead trout, lies in the southwest part of the refuge. (001-024) DM

One off-refuge fire was spotted and reported by Fisheries Biologist/ Pilot Chatto and Wildlife Biologist/Boat Operator Zwiefelhofer while flying back to Kodiak in the refuge supercub. The fire was subsequently suppressed.

11. Water Rights (Chatto)

In 1987, the Service was removed (at our request) as a co-applicant with the Alaska Department of Fish and Game concerning the reservation of water for the Terror River on the refuge. Initially both the Service and the Department had indicated it was going to apply for water reserves on the lower 4.5 miles of the river only. Since current flows will be re-negotiated in 1991 the Service contends that flow releases should, or may be needed, which will not only encompass the lower 4.5 miles of the river for fish habitat, but would also include the entire watershed for a broader array of purposes.

12. Wilderness and Special Areas (Menke)

There is currently no designated wilderness on Kodiak National Wildlife Refuge. The refuge Comprehensive conservation plan was finalized this year with a Record of Decision signed by Regional Director Stieglitz in December. The preferred alternative was selected and includes a 1.17 million acre (73% of the refuge lands) wilderness proposal. The formal wilderness record will be drafted in 1988.

G. WILDLIFE

3. Waterfowl (Zwiefelhofer)

Approximately 15 tundra swans wintered along the Ayakulik River during 1987, marking the fifth year a portion of the refuge's tundra swan population has overwintered on Kodiak.

The first spring tundra swan migrants consisted of a flock of ten swans which were observed flying over refuge headquarters on March 23.

An early spring phenology during 1987 was evidenced by the sighting of a pair of newly hatched tundra swan cygnets on May 26, which is the earliest refuge hatching record for this species. A pair of adult bald eagles were observed harassing the swan family group. A check of the area several days later revealed the adult swans were no longer accompanied by cygnets.

The annual refuge tundra swan nesting survey was conducted on June 8 and 9. A record high of 141 (129 adults, 12 cygnets) tundra swans, including 15 nest sites and 5 broods was recorded during the survey. While the number of tundra swans nesting on the refuge remains relatively constant at approximately 20 to 25 pairs, the total number of adult swans has more than doubled since surveys were initiated in 1980. This increase may be related to the non-migratory behavior exhibited by a portion of the population due to a series of unusually

mild winters which began in the early 1980's. Good population productivity and higher survival of that production is normally evidenced by an upward trend in total population numbers.

The follow-up productivity survey conducted on August 10 and 11 located a total of 11 broods. Two record size broods of six cygnets each helped to generate a record for total annual production, (35 cygnets in 1987). One of the pairs of swans with 6 cygnets in 1987 fledged 5 cygnets in 1986. A summary of tundra swan surveys is presented in Table 5.

Table 5
Kodiak National Wildlife Refuge tundra swan

Spring survey summary

			Adults and Subadults					
Year	No. maps	No. obs.	In pairs	As singles	In flocks	Subtotal	Cygnets	Total Swans
1980	10	31	38	8	15	61	0	61
1981	10	45	62	10	13	85	0	85
1983	12	51	86	8	0	94	23	117
1984	11	53	62	21	4	87	8	95
1985	10	50	76	8	13	97	20	117
1986	12	58	80	17	7	104	1	105
1987	11	64	98	11	20	129	12	141

Fall survey summary

			Adults and Subadults						
Year	No. maps	No. obs	In pairs	As singles	In flocks	Sub-totals	Cygnets	Percent juveniles	Total Swans
1980	8	28	46	5	0	51	32	39	83
1981	7	36	56	5	18	79	33	29	112
1984	5	24	32	4	16	52	28	35	80
1985	8	33	60	0	21	81	31	28	112
1986	9	33	52	2	17	71	17	19	88
1987	10	54	80	12	16	108	35	24	143

1980-86 mean brood size = 2.7

1987 mean brood size = 3.2

Emperor geese do not nest on the refuge but a small number are known to winter on the Kodiak Archipelago. Historically, emperor goose observations were collected incidental to other duties and no direct effort to determine wintering numbers was made. During the 1950's the refuge staff utilized aircraft from the Kodiak Naval Station to carry out coastal wintering bird surveys. The numbers of emperors counted during these surveys ranged from 48 in 1954 to 1,555 in 1957. The 1957 survey was the only year in which Tugidak and Sitkinak Islands were known to have been covered. Although coverage of these early surveys is not well documented, it appears these islands were not normally included in the survey route. Neither of the islands are part of the refuge and are currently controlled by the State of Alaska. Tugidak has the distinction of never having fox released on it as other Alaskan islands have. Tugidak contains the largest eelgrass bed (an important waterfowl food) found on the Kodiak Archipelago.

The steep decline of emperor geese over the past few years prompted the refuge to begin monitoring Kodiak's wintering population during 1987. Surveys of Tugidak Island were conducted in January, October, and November of 1987. Initiation of these surveys proved to be timely as several applications for placer gold mining permits in the lagoon areas of Tugidak and Sitkinak were made during the summer of 1987. Although vigorously opposed by local and state environmental organizations plus State and Federal wildlife agencies, initial approval of the permits was given by the development-oriented local borough government. The borough felt the State and Federal regulatory agencies would "police" the mining operations sufficiently to prevent any environmental degradation. Should approval by the State and Federal regulatory agencies occur, mining operations could begin as early as the summer of 1988. Monitoring surveys for wintering emperor geese will continue to be conducted from October through May.

Over the past two winters, four emperor geese, neck-collared on the Yukon Delta during July of 1984, have been observed in Womens Bay along the Kodiak road system. The same four geese were again present in the Womens Bay area during the winter of 1987. They were observed in a flock of approximately 80 emperors on March 1 and 25. The collared geese have associated with a flock of the same approximate size all three winters.

4. Marsh and Water Birds (Zwiefelhofer)

Another species was added to the Kodiak bird list when a great egret was observed along the road system on May 20. The lone adult was in breeding plumage and spent approximately 6 weeks in the vicinity. Kodiak is far north of this specie's normal breeding range.

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

On June 18, Wildlife Biologist Zwiefelhofer and volunteer Doug Vandergest (Regional Office, Realty) assisted Alaska Maritime National Wildlife Refuge in conducting seabird breeding colony surveys in Chiniak Bay. Only eleven of the twelve inner colonies and none of the outer Chiniak Bay seabird colonies were covered because of time and weather constraints.

A total of 1,511 black-legged kittiwake nests, 372 pelagic cormorant nests, and 69 red-faced cormorant nests were counted in 1987. This compares to 2,330, 438, and 154 nests, respectively, for each of these species on the same colonies in 1986. The 1987 nesting season marks the first year a decline in black-legged kittiwake nesting effort has occurred since the surveys began in 1975. It is not known what factor or factors are responsible for this decline.

The follow-up productivity survey of the same colonies was conducted on August 26. No black-legged kittiwake production was found during 1987. Several of the colonies were no longer being attended by the adult kittiwakes at the time the survey was done. A similar lack of production was observed at approximately 20 other Kodiak black-legged kittiwake colonies visited but not surveyed during the course of other summer field work.

Cormorant species did only slightly better than the kittiwakes in production of young during 1987. The largest cormorant colony had young red-faced and pelagic cormorants that had already left the nests when the productivity survey was done. Young cormorants tend to congregate in groups around the nests after fledging. The remaining colonies surveyed had either no production or a handful of nests with young cormorants less than 2 weeks of age. None of the latter young would be expected to fledge, as cormorants take 45 to 60 days to reach flight capability. Predation by bald eagles in the early summer may have played at least some part in the difference in ages and productivity of the cormorant colonies in 1987. The largest successful colony is adjacent to the Kodiak SeaLand shipping terminal. Bald eagle disturbance at this colony would not be as high as other remote colonies near bald eagle nesting habitat.

The annual wintering pelagic seabird and waterfowl survey was conducted on February 9 to 19. The results of the 1987 are presented in Table 6.

6. Raptors (Zwiefelhofer)

The Kodiak National Wildlife Refuge Migratory Bird Management Plan calls for the entire refuge to be surveyed for nesting bald eagles every five years. The last survey of the entire refuge occurred in 1982. The 1987 survey was conducted on May 7, 8, 14, 18, 19, and 22. The refuge's bald eagle nesting population has remained relatively stable since 1975 at approximately 200 pairs. However, the results of the 1987 survey indicate bald eagle nesting on the Kodiak National Wildlife Refuge increased nearly 50% since the 1982 survey. A total of 184 (61%) active tree nests and 115 (39%) active ground nests were located during the initial 1987 spring survey. The total includes 7 nests which contained at least one egg but no adult eagles were present. A coastal ground nest in the Shelikof Strait near Karluk contained 2 downy young on May 22, marking a refuge record for the earliest documented bald eagle hatching date. In addition, a total of 771 adult bald eagles (including incubating adults) and 123 immature bald eagles were counted during the 1987 survey. Total active nests found in past refuge wide surveys is presented in Figure 4.

Table 6
Densities (mean birds/km^2) of the most frequently occurring species or species groups observed in five bays of Kodiak Island, 1980 to 1987.

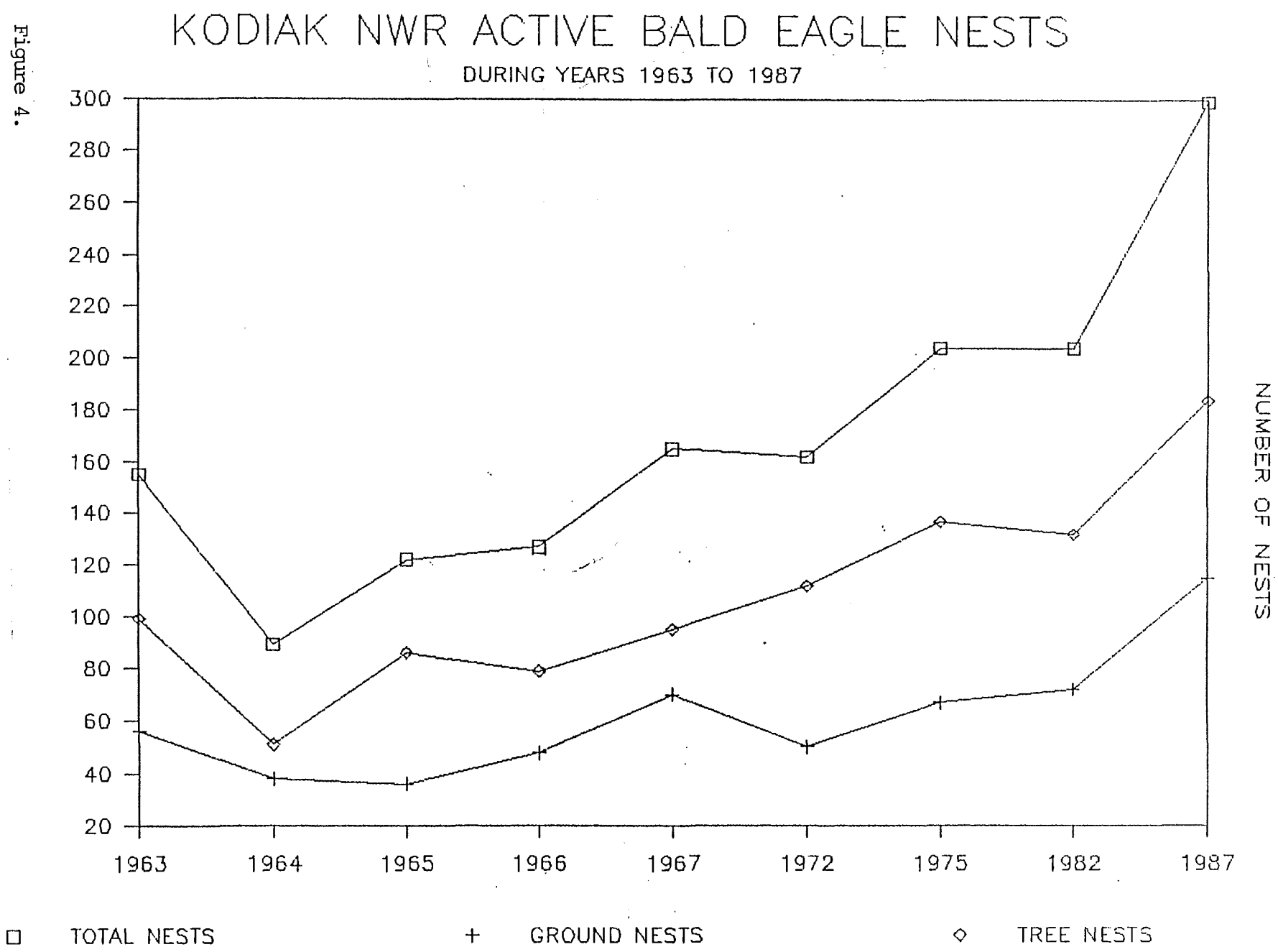
Species	Winter 1980	1981	1982	1983	198[4] [a]	1985[a]	1986[a]	1987[a]
Loons	0.47	0.87	0.76	0.85	0.56	0.54	0.97	*
Grebes	0.79	0.63	0.92	1.58	1.45	0.97	0.80	*
Cormorants	5.20	7.13	7.05	6.08	5.12	4.55	5.25	*
Goldeneyes	2.00	2.54	1.97	1.18	3.25	2.82	3.07	*
Oldsquaw	25.37	19.67	12.82	11.51	10.68	5.42	9.37	*
Harlequin Duck	3.24	3.25	3.35	3.01	3.81	3.14	3.77	*
Eiders	3.74	2.87	3.43	5.80	0.49	0.10	0.78	*
Black Scoter	10.54	12.18	10.58	12.59	7.55	8.31	7.13	*
White-winged Scoter	7.51	6.56	4.33	6.53	4.57	4.43	1.94	*
Surf Scoter	1.19	1.04	1.18	1.08	1.75	0.73	1.24	*
Unidentified Scoter	2.90	0.00	0.00	0.00	0.58	0.00	0.09	*
Total Scoters	22.14	19.78	16.09	20.20	14.45	13.47	10.40	*
Mergansers	0.84	0.53	0.40	0.45	0.96	0.82	1.62	*
Glaucous-winged Gull	1.94	1.95	1.16	3.71	8.75	1.80	4.73	*
Mew Gull	2.61	4.20	4.49	3.23	4.07	2.26	5.32	*
Black-legged Kittiwake	0.14	0.12	11.72	0.46	3.40	0.13	0.36	*
Murres	106.57	49.23	71.95	38.26	31.28	14.35	39.85	*
Pigeon Guillemot	2.51	3.08	2.40	2.26	3.18	1.50	1.73	*
Brachyramphus Murrelet	7.93	4.90	10.29	4.30	9.82	1.70	5.82	*
Crested Auklet	6.99	0.44	0.40	13.82	0.07	4.26	18.62	*
Total Birds[b]	194.63	122.17	149.84	117.93	102.13	59.84	115.50	*

[a] - Data includes only Uyak Bay, Uganik Bay, and Kupreanof Strait.

[b] - Includes all species observed, not limited to species in above table.

* - Data not available at time of writing due to Regional Office data base retrieval problems.

Figure 4.


KODIAK NWR ACTIVE BALD EAGLE NESTS
DURING YEARS 1963 TO 1987
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
1963
1964
1965
1966
1967
1972
1975
1982
1987
NUMBER OF NESTS
TOTAL NESTS
GROUND NESTS
TREE NESTS

Black turnstone. (10-110-86) DM

Wandering tattler. (10-112-86) DM

Dunlin. (10-096-86) DM

Short-billed dowitcher. (10-111-86) DM

On August 5, 10, 11 and 14, the follow-up productivity survey of 203 of the 299 active nests was conducted. A total of 125 (61%) of the 203 nests checked were successful, producing a total of 186 young bald eagles (1.5 young/successful nest).

The dramatic increase in bald eagle nesting is probably due to one or more of the following reasons. (1) Improved observer efficiency in locating nests in typical and non-typical bald eagle nest habitat because of familiarity with the Kodiak bald eagle population. (2) Since 1975, Kodiak has experienced milder than average winters resulting inincreased survival rates. (3) Areas of Kodiak Island with a suitable food source but lacking in typical bald eagle nesting habitat receiving increased utilization by nesting bald eagles. A minimum of 20 bald eagle nests located in 1987 were in areas having no history of bald eagle nesting or could be construed as being typical bald eagle nesting habitat. This indicates an expanding, or at the very least, a pioneering segment of the nesting population. The 1987 data will be used to further stratify and refine the random sampling scheme utilized for surveying the refuge bald eagle nesting population. Table 7 summarizes refuge bald eagle productivity for the years in which the entire refuge was surveyed for nesting. Unfortunately, 1987 is the only year that more than half the active nests were checked for productivity.

Table 7
Kodiak National Wildlife Refuge bald eagle nest productivity surveys summary 1963 to 1987.

Year	Number of nests checked	Number of nests successful (percent)	Total young	Number young/ occupied nest[1]	Number of young/ successful
1963	80	53 (66)	88	1.1	1.7
1964	45	22 (49)	37	0.8	1.7
1965	35	19 (54)	26	0.7	1.4
1966	39	24 (62)	38	1.0	1.6
1967	54	37 (69)	63	1.2	1.7
1972	24	16 (67)	24	1.0	1.5
1975	51	34 (67)	46	0.9	1.4
1982	33	23 (69)	37	1.1	1.6
1987	203	125 (61)	186	0.9	1.5

Mean Young/Occupied Nest[1] = 0.96

Mean Young/Successful Nest = 1.56

[1] - Occupied (active) during initial spring nest survey.

A total of five bald eagles, plus a single immature golden eagle, were brought into the refuge headquarters during 1987 because they were unable to fly. Only one of the bald eagles required extensive rehabilitation for a broken wing and had to be shipped to the Raptor Rescue Center at Sitka, Alaska. Unfortunately, the wing injury proved to be a permanent disability and the eagle was placed in one of the several captive breeding program operated in the "lower 48". The remaining eagles required only rest and an adequate food supply before they regained their flight capabilities and were released.

In addition, 13 dead bald eagles were brought into refuge headquarters. Causes for these mortalities could not be determined in all the cases, but starvation seemed the most logical explanation for the majority of the dead eagles except in the following two instances. One flightless immature bald eagle was found alive; however, it had small pox lesions (2 to 3 mm. in diameter) around the beak and eyes and was quite emaciated. The young eagle responded well to rest and plenty of food. The lesions did not appear to be increasing in size during the time the eagle was held captive. After about 10 days the eagle was released. Approximately one month later a dead immature bald eagle was found floating in the Kodiak harbor with pox lesions in the exact locations as the eagle that had been released. However, the lesions on the dead eagle were at least three times larger than those observed on the rehabilitated bald eagle released a month earlier. The carcass was shipped to the National Wildlife Health Lab in Madison, Wisconsin in hopes the pox could be cultured and positively identified. Unfortunately, the Health Lab has been unable to culture the pox virus from bald eagles and cultures from this sample proved no more successful than previous attempts. The lack of unfrozen fresh samples of the pox lesions contributes to the difficulty in culturing of the virus according to laboratory personnel.

The cause of death in four of the bald eagles was a result of improper disposal of an euthanized horse carcass. The horse carcass had been fed on by various species throughout the winter with no ill effects to the scavengers. Since the barbiturates used to euthanize the horse concentrate in the internal organs (particularly the heart and liver), a problem did not develop until the carcass began to thaw and the body cavity was opened by the scavengers. The refuge staff first became involved with the problem when a comatose subadult bald eagle was brought to headquarters. The eagle had a very slow, labored respiration rate and showed no signs of external or internal injuries. The bird remained immobile and appeared close to death for two days. The general body condition of the comatose eagle looked excellent. On the morning of the third day (coincidentally Easter Sunday), the eagle was found to be very much alive and fighting to leave the confines of the holding cage. When the miraculous recovery of the comatose eagle was combined with a delivery the following day of a dead bald eagle with no obvious injuries from the same area, an extensive search of the locality was launched. Three additional bald eagles, a northwestern crow, and a black-billed magpie were found dead in the vicinity of a partially devoured horse carcass. The history of the horse carcass was determined through questioning of the local veterinarian. A backhoe was utilized to bury "the remains" deep enough to avoid any reoccurrence of the problem.

This immature golden eagle was reluctant to leave our hospitable facilities after two weeks of free food. (87-13) DM

Bald eagles are particularly susceptible to capture by trappers using exposed bait. (87-14) DM

Juvenile bald eagle with pox lesions on the mucous membranes of the eyes, beak, and inner throat. (87-15) DZ

An adult bald eagle released after an adult recovering from a trap injury. (87-16) GC

Hawk Owl (09-078-85) DM

8. Game Mammals

A. Brown Bear (Barnes)

General

Management of brown bears on the Kodiak National Wildlife Refuge is a responsibility shared by the Alaska Department of Fish and Game and the Fish and Wildlife Service. The Alaska Department of Fish and Game regulates sport harvest of bear through a highly controlled permit system. Twenty-one permit areas are on the refuge and another 4 permit areas straddle the refuge's northern boundary. Resident and non-resident permits are allocated by permit area on 60:40 ratio basis. Alaska residents obtain permits in a drawing, while non-residents acquire permits by registering in person or through a representative (guide). All non-residents are required to hunt with a registered big game guide. The spring bear season extends from April 1 to May 15 and the fall season occurs from October 25 to November 30. Bear hunters are required to check in and out of the Alaska Department of Fish and Game office in Kodiak and successful hunters must present their bear hide and skull for sealing. The skull is measured, a premolar tooth is extracted for age determination, and the hide is examined to determine sex. Total kill, plus the above sex and age data, are the main parameters used to monitor the harvest.

The Fish and Wildlife Service has primary responsibility for managing brown bear habitat on the refuge. This is accomplished by identifying important and critical habitat components and by allocating special use permits to various users with the objective

of minimizing adverse human impacts on bear. Special use permits are issued for activities such as big game guiding, transporter/ outfitting, sport fish guiding, and land-based commercial fishing. The refuge also conducts aerial stream and alpine surveys to monitor population trend and assess use of critical feeding sites. An important effort this year was construction of meat caches at public use cabins as a means of reducing conflict between deer hunters and bear.

The Alaska Department of Fish and Game and Fish and Wildlife Service maintain active lines of communication to advise and consult with each other on bear habitat and population issues. Probably the most important issue faced by both agencies is accelerating human use of Refuge lands. Examples of cooperative efforts to improve bear management include agency input into the refuge comprehensive conservation plan and the State bear management plan, research summarized in Sec. D-5 of this narrative report, and joint preparation of public information pamphlets on bear/man interactions.

Surveys

Aerial stream surveys were flown during the period of July 23 to August 11. For the 5 standard routes, the number of replicate surveys per stream ranged from 8 for Sturgeon River and Connecticut Creek to 2 for Dog Salmon Creek. Supplemental flights also were made along Red Lake River, East Fork Ayakulik River, and East Fork Sturgeon River. Peak counts on individual streams were as follows:

Stream	Date	No. Bears
Sturgeon River	July 24	24
Connecticut Creek	August 7	34
Pinnell Creek	August 7	8
Southeast Creek	August 11	16
Dog Salmon Creek	July 23	10

Overall, bear use of the 5 traditional survey streams was below average. Reduced use of Sturgeon River and Pinnell Creek, in particular, probably reflects poor salmon runs in each system. Another factor could have been the above-average abundance of chinook salmon in the East Fork of Ayakulik River that attracted bears from streams with low salmon runs. Movements of radio-collared bears suggested that East Fork chinook were an important food source this year.

Composition of bears observed during stream surveys (Table 8) was comparable to that recorded in recent years. It is interesting to note that composition determined from the stream surveys was similar to that obtained in the density estimate study (Sec. D-5) conducted in spring of 1987.

Alpine surveys were not conducted for the fourth consecutive year. Again, poor weather during the July and early August survey period was the limiting factor.

Table 8
Comparison of aerial stream counts
of brown bear, 1978 to 1987

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	Average
Number surveys											
complete	3	3	3	7	7	-	6	6	3	2	
partial	0	0	1	2	3	-	1	4	6	6	
Single bear											
number	63	38	134	169	430	-	186	434	445	205	
percent	44	54	65	55	48	-	51	54	55	54	53
Maternal female											
number	26	12	23	41	150	-	56	110	115	58	
percent	18	17	11	13	17	-	15	14	14	15	15
Yearling (1-2 year)											
number	33	12	41	79	207	-	69	189	191	92	
percent	23	17	20	25	23	-	19	24	24	23	22
Cub											
number	22	9	7	21	107	-	56	67	54	31	
percent	15	13	3	7	12	-	15	8	7	8	10
Total number	144	71	205	310	894	-	367	800	805	397	

Mortality

The 1987 sport kill of brown bears on Kodiak National Wildlife Refuge totalled 120 animals (Table 9), including 78 taken during spring season and 42 harvested in fall. The refuge harvest accounted for 79% of the total harvest for Game Management Unit 8 (Kodiak Archipelago). Males comprised 65% of the sport harvest on Refuge land. The seasonal distribution and sex composition of the 1987 harvest was similar to that of 1986.

Sixteen non-sport mortalities were recorded in 1987, including 7 defense of life and property kills. Additional non-sport mortalities included 6 carcasses that were found (unknown cause of

mortality) and 3 radio-collared bears that succumbed to natural causes. Sources of defense of life and property kills included deer hunters (3) and a bear hunter (female plus 2 yearlings killed). Continuing the trend of recent years, deer hunters accounted for about one-half of the defense of life and property kills in Game Management Unit 8.

Table 9
Sources of brown bear mortality on
Kodiak National Wildlife Refuge, 1976 to 1987

Year	Source			Total
	Sport	DLP*	Other**	
1976	88	--	2	90
1977	98	3	--	101
1978	106	2	--	108
1979	105	3	--	108
1980	101	5	1	107
1981	112	3	2	117
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
Average	111	5	3	119

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

Although bears were numerous along Connecticut Creek, there were few clear days such as this to observe them. 8/87 (87-17) J. Selinger

Checking on tooth wear in Kodiak brown bear. 6/87 (87-18) J. Selinger

B. Mountain Goats (Becker)

The mountain goat hunt ran from September 1 to October 31, 1987 with 100 permits being issued. It is estimated that one third of the 22 goats harvested were taken within the refuge (Table 10). Billies comprised 59% of the harvest. Compared with 1986, the 1987 harvest was down 45%. Inclement weather was primarily responsible for this decline. Only 48 of the permit holders even ventured into the field and many hunters spent their entire trip "grounded" by rain and fog.

Aerial trend counts conducted by Alaska Department of Fish and Game indicate that the mountain goat population on the northern portion of Kodiak is stable, while the population on the southern portion (which includes the refuge) is increasing slowly. A mountain goat composition survey conducted by Alaska Department of Fish and Game on August 8, 12, and 19, 1987 revealed 210 adults and 44 kids for a kid/100 adult ratio of 21:100.

Table 10
Kodiak Island Mountain Goat Harvest, 1987.

Hunt Area	Mountain Goat Harvested			# Hunters Afield	# Days Hunted	Avg Days Hunted
	Male	Female	Total			
871[1]	1	2	3	7	18	2.6
872[1]	0	4	4	7	22	3.1
873[2]	4	1	5	9	18	2.0
874[3]	3	1	4	11	51	4.6
876[2]	5	1	6	14	57	4.1
Totals	13	9	22	48	166	3.5

[1] Does not include Kodiak National Wildlife Refuge.

[2] Includes a portion of Kodiak National Wildlife Refuge.

[3] Exclusively on Kodiak National Wildlife Refuge.

C. Sitka Black-tailed Deer (Becker)

In 1987, the deer hunting season on Kodiak National Wildlife Refuge portions of Unit 8 opened on August 1 and ran until January 7, 1988. The limit was five deer with antlered deer restrictions until September 15. Numbers of hunters and numbers of deer harvested on the refuge in 1987 were down considerably from 1986, due primarily to the depressed Alaskan economy.

A survey of 117 hunters conducted by refuge staff (Sec. H-8) revealed an average of 1.9 deer harvested per hunter with 72% of

the harvest composed of bucks. The Alaska Department of Fish and Game hunter questionnaire survey results will most likely corroborate this data but won't be available until May, 1988.

The 1986-87 winter was relatively mild which helped to minimize overwinter losses and resulted in good fawn production. Deer numbers continue to be high, particularly on the southern portion of the refuge.

Sitka black-tailed deer are abundant on Kodiak Refuge. (15-194-87)

D. Roosevelt Elk (Becker)

Elk are present on Ban Island and the associated Afognak Island portion of the Kodiak National Wildlife Refuge but total numbers are unknown. It is estimated that 10% of the 49 elk harvested in Unit 757 were on refuge lands. Therefore, approximately 5 elk were harvested on the refuge in 1987 in the registration hunt that ran from September 1 to November 15.

Each year, reports surface of elk sightings in the Uyak and Uganik Bay portions of Kodiak Island but thus far these sightings have not been documented. In 1987, the entire refuge was open to elk hunting by registration permit. However, no elk were known to have been harvested on Kodiak Island proper.

9. Marine Mammals (Ryan)

An unusual die-off of sea otters was documented by Alaska Fish and Wildlife Research Center biologists at Kodiak Island during the summer of 1987. A minimum of 100 and a maximum of 200 sea otters were

estimated by Center biologists to have died. The cause of the die-off is unknown although paralytic shellfish poisoning has been hypothesized.

10. Other Resident Wildlife (Becker)

Reindeer

Although no surveys were conducted this year to specifically count reindeer, they were counted during the course of other aerial work. The highest number of reindeer counted in 1987 was 161 during a brown bear density estimator survey on May 31. Because this count occurred while conducting an intensive low level flight in the core area where reindeer most often frequent, it is possible that this count represents a near total population count.

Although no formal survey was conducted in 1987, 161 reindeer were counted in May incidental to the bear density estimator survey. 5/87 (87-19) KB

Sea lion haul out on Two Headed Island adjacent to Kodiak Refuge. 5/87 (87-20) KB

11. Fishery Resources (Chatto)

The refuge provides freshwater habitat for all five species of Pacific salmon, steelhead, rainbow trout, arctic char, and Dolly Varden. These refuge-based fishery populations support a viable and active commercial, sport and subsistence (personal use) fishery which is regulated by the Alaska Department of Fish and Game. The harvest, escapement, distribution, and public use of these populations is monitored by the refuge fishery program utilizing information collected by both the Alaska Department of Fish and Game and the refuge.

A. The Commercial Fishery

Preliminary catch statistics for the commercial salmon catch in the Kodiak management area indicate approximately 7.74 million fish worth an estimated ex-vessel value of approximately 28.11 million dollars were harvested in 1987. The estimated contribution of refuge based salmon to the area's harvest was calculated at 4.52 million fish worth an approximate value of 16.70 million dollars (Table 11). Harvest of refuge-based salmon stocks was within $\pm$ 20% of the 1981 to 1986 average with the exception of pink and chum salmon (Table 12). Total harvest of pink and chum salmon was 44% and 31% below the 1981 to 1986 average of 5.39 million and 506,830 fish, respectively.

Table 11
Estimated numbers, species composition and dollar value of commercially caught salmon by all gear types during 1987 calculated to be of Kodiak National Wildlife Refuge origin[1].

Geographical Harvest Districts	Chinook	Sockeye	Coho	Pink	Chum	Total
Afognak	3	5,157	566	9,269	1,082	16,077
Uganik	141	170,993	12,433	522,664	84,319	790,550
Uyak	165	65,703	12,063	309,156	67,591	454,678
Karluk	678	144,103	14,426	241,112	49,909	450,228
Sturgeon	285	105,451	15,921	160,578	7,542	289,777
Red	827	67,635	15,594	43,050	2,257	129,363
Alitak	105	515,484	17,960	916,883	59,727	1,510,159
General	216	14,462	8,304	775,671	77,688	876,341
Total	2,420	1,088,988	97,267	2,978,383	350,115	4,517,173
Ex-vessel value	38,720	11,320,030	817,118	3,431,097	1,092,359	16,699,324

[1] Data compiled from Alaska Department of Fish and Game preliminary 1987 catch statistics for the Kodiak Management Area. Ex-vessel values are preliminary projections of actual value.

Table 12
Estimated average annual harvest and escapement values for Kodiak National Wildlife Refuge based salmon stocks 1981 to 1986 compared to 1987 values[1].

	Chinook	Sockeye	Coho	Pink even year	Pink odd year	Chum
Harvest						
1981-1986	1,840	1,073,800	100,820	8,670,540	5,391,310	506,830
1987	2,420	1,088,990	97,270	---	2,978,380	350,120
Indexed Escapement						
1981-1986	15,040	1,497,250	63,180	6,509,210	1,069,500	327,340
1987	23,670	1,340,730	109,980	---	1,596,290	204,960
Total Returns						
1981-1986	17,570	2,707,310	164,000	12,131,350	4,762,270	834,160
1987	26,090	2,429,720	207,250	---	4,574,670	555,070

[1] Data compiled from 1987 preliminary Alaska Department of Fish and Game catch statistics and index salmon escapement counts for the Kodiak area.

B. The Sport Fishery

Sport fishing on refuge streams occurs in late May through July for chinook salmon, rainbow trout, and char, then again in September through November for coho salmon, steelhead trout, and char. Although coho salmon and char are present in all major, and some minor, systems on the refuge, chinook salmon and steelhead are only known to be abundant in the Karluk and Ayakulik/Red River systems. Smaller but more accessible chinook and steelhead populations also occur on the Dog Salmon River which drains Frazer Lake. Table 13 depicts the known and peak escapement index counts on refuge streams which supported species of major interest to sport fishermen during 1986. The actual numbers of coho salmon and steelhead trout which continue to enter the systems throughout the fall months is unknown.

Table 13
Known and peak index escapement counts on refuge streams which supported species of major interest to sport fishermen during 1987.

River system	Chinook salmon	Coho salmon	Steelhead trout	Char
Little[3]	unk	340	unk	unk
Browns Lagoon[3]	unk	1,500	unk	unk
East Uganik[3]	unk	800	unk	3,000
Karluk[4]	7,935	50,000	228[1] 687[2]	29,336[1] unk[2]
Sturgeon	0	7,000	unk	unk
Ayakulik/Red[4]	15,636	16,242	190[1] 729[2]	25,0551 unk[2]
Upper Station[4]	1	2,505	5[2]	5,747[1]
Dog Salmon/Frazer[4]	103	5,223	16[1] 385[2]	8,322[1]
Horse Marine[3]	0	200	unk	unk
Midway3	0	6,300	unk	unk
Akalura[4]	0	980	31[2]	5,402[1]

1 Immigrant adults passing upstream through weir.
2 Outmigrant adults passing down through weir.
3 Peak aerial surveys only.
4 Fish weir count.

Figure 5 depicts those refuge streams of high interest for sport fishing. Actual total catch by sport fishermen is unknown since it is difficult to census all streams on the refuge. In 1987, creel census information was gathered on the Karluk and Ayakulik Rivers during the chinook salmon sport fishery. From May 27 until June 26, 1987 a camp was manned by refuge volunteers at the Portage area (river mile 15.0) on the Karluk River. Information was collected on angler use of the area and the number of fish caught and retained by each angler or party interviewed. For those anglers that were floating downstream to the Karluk Lagoon a mail-in form was provided to record use and catch data. Although this camp was projected to continue until at least July 4, potential problems with a brown bear sow and her cubs necessitated an early closure of the camp on June 26.

A total of 182 angler days were recorded with 823 angler hours spent on efforts to catch chinook (Table 14). Peak activity occurred between the two week period of June 10 to 23. A total of 199 chinook were recorded being caught with 25% (51) of the fish

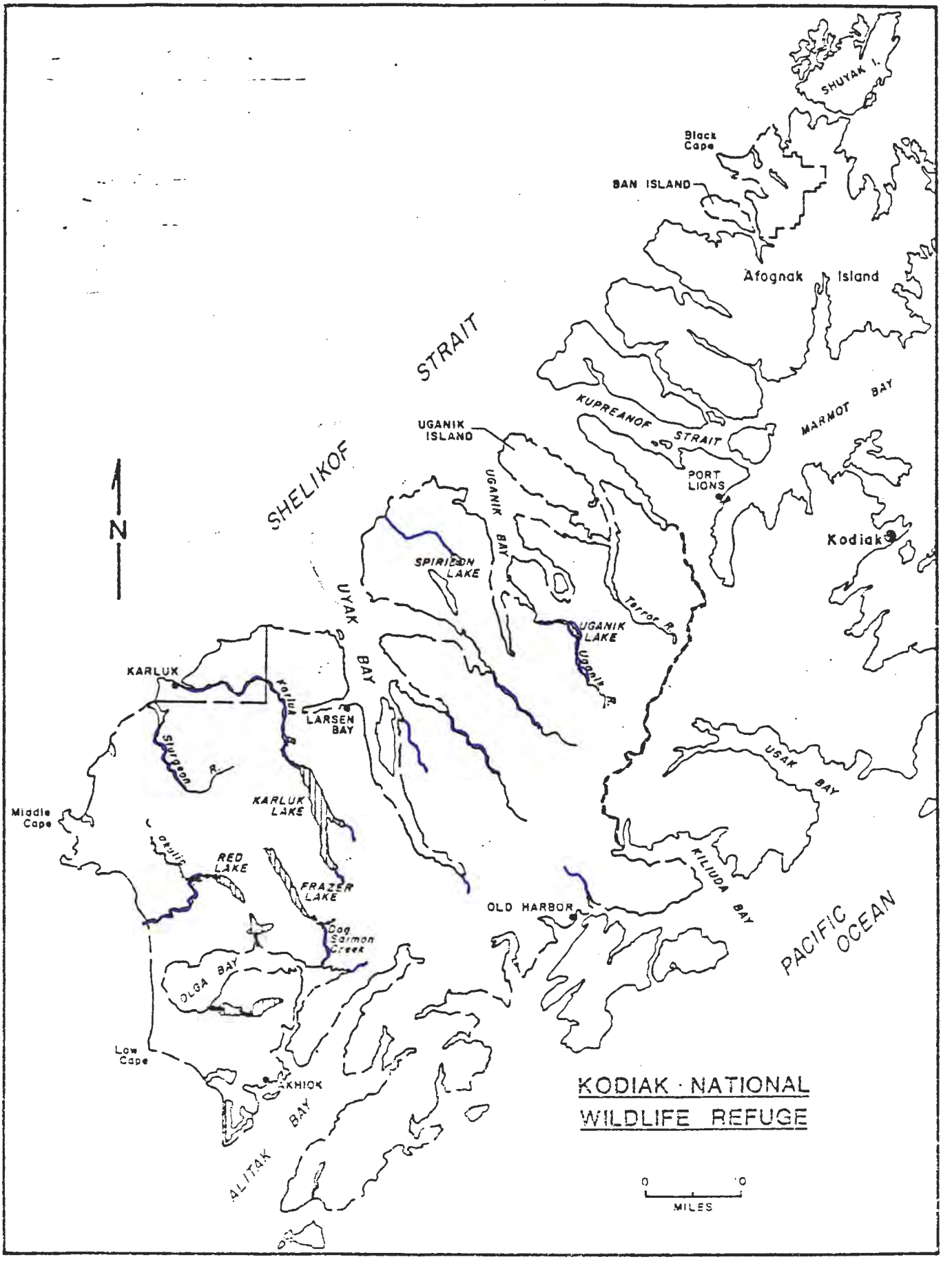


Figure 5. Important sport fishing areas on Kodiak Refuge.

being retained. An overall catch per angler hour of 0.2 was recorded for chinook. Other species caught incidental to the chinook fishery in order of importance were sockeye salmon, Dolly Varden, and steelhead/rainbow trout.

Table 14
Streamside creel census Karluk River Portage May 27 to June 26, 1987.

	May 27 to June 2	June 3-9	June 10-16	June 17-23	June 24-26	Total	Catch/ Angler hour[1]
Number Angler Days[2]	1	10	46	115	10	182	
Total Hours Fished	1	48	209	537	28	823	
Species			Number Caught (Retained)				
Chinook	---	---	28(7)	115(29)	5(15)	148(51)	0.2
Sockeye	---	1(20)	24(3)	58(6)	---(2)	83(31)	0.1
Steelhead	---	10	32	3(1)	---	45(1)	0.1
Rainbow	---	---	4(1)	2	---	6(1)	---
Dolly Varden	---	2	---	55(10)	---	57(10)	0.1
Total	---	13(20)	88(11)	233(46)	33(15)	367(92)	0.6

[1] Rounded to nearest tenth of hour.
[2] One angler day = one fisherman.

Overall the total sport catch of chinook at the Portage in 1987 was the lowest recorded since 1972 but a catch per-angler-hour of 0.2, indicates angler success was similar to past years.

Current catch information for the entire river, Portage and Karluk Lagoon, is lacking and a complete census in 1988 is planned to more accurately define any trends on harvest or use.

A creel census camp was operated on the Ayakulik River from May 27 through July 7. The camp was located at river mile 10.0 which is the aircraft access point on the river. A total of 456 angler days were recorded with 3,646 hours spent on efforts to catch chinook salmon (Table 15). Peak activity was observed from June 10 to 23. A total of 1,433 chinook were caught with only 11% (157) of the fish being retained.

Total angler hours increased by 86% in 1987 compared to 1986 with approximately 50% of that increase attributed to the first 2 weeks of the study. Catch per angler hour for chinook in 1987 was 0.5 compared to 0.2 over the same time period in 1986 with escapement

up from 6,370 in 1986 to 15,630 in 1987. This year sport fishermen caught 9.2% of the total escapement of chinook, but as mentioned previously, only harvested 157 fish (1% of escapement).

Incidental catch of other species was also extremely low compared to the resource available. Of the 274 steelhead caught, only 3 were retained (1.1%). The percentage of all other species retained was insignificant. A weekly breakdown of the 1987 and a total of the 1986 fishing efforts are given in Table 15.

Table 15
Streamside creel census Ayakulik River May 27 to July 7, 1987.

	May 27-June 2	June 3-9	June 10-16	June 17-23	June 24-30	July 1-7	Total	Catch/ Angler hour[1]
Number Angler Days[2]	17	74	166	112	48	39	456	
Total Hours Fished	138	593	1,325	893	387	309	3,646	
Species				Number Caught (Retained)				
Chinook	36	74	530	593	166	34	1,433(157)	0.4
Sockeye	1	14	23	50	54	19	161(40)	---
Steelhead	55	53	142	20	3	1	274(3)	0.1
Rainbow	1	---	9	9	---	1	20(0)	---
Dolly Varden	6	19	40	30	14	1	110(6)	---
Total	99	163	744	713	238	56	2,013(206)	0.6

[1] Rounded to nearest tenth of hour (less than 0.5 = 0).
[2] One angler day = one fisherman.

In addition to the creel census presented above, the refuge also summarizes catch information from 24 sport fish guides under permit to operate on the refuge. This information is being used to initiate a data base on the catch and monitor any overall trends which develop that may effect the resource. Of the 24 commercial guides, 16 (67%) responded to the January 15, 1988 deadline for report submission for 1987 activities. Overall, the guides utilized eight river systems: Ayakulik, Karluk, Browns Lagoon, Upper Station, Dog Salmon, Uganik, Akalura, and Sturgeon for their activities. In addition, the beach areas in three bays: Olga-Moser, East Uganik, and Zachar were also utilized by guides in 1987.

In 1987 a preliminary total of 748 angler days were utilized by guided sport fishermen from May 15 to October 30. Although fishermen caught all five species of Pacific salmon, trout, and Dolly Varden, the highest total number of any one species caught was Dolly Varden (Table 16).

Table 16
Summary of guided sport fish harvest on the Kodiak National Wildlife Refuge May 1 to October 30, 1987[1].

	May 1-31	June 1-30	July 1-31	August 1-31	September 1-30	October 1-31	Sub-total	Total
Number Angler Days[2]	2	274	153	187	123	9	784	784
Species				Number Released (Retained)				
Chinook	---	505(56)	112(14)	18(6)	---	---	635(76)	711
Sockeye	---	54(16)	18(2)	27(11)	---	---	99(29)	128
Pink	---	15(0)	10(15)	89(18)	255(20)	---	369(53)	422
Coho	---	---	3(0)	27(28)	100(116)	100(0)	230(144)	374
Chum	---	---	---	10(0)	10(0)	---	20(0)	20
Steelhead	---	196(0)	158(0)	---	10(0)	25(0)	389(0)	389
Rainbow	---	6(0)	5(0)	18(0)	67(0)	100(0)	196(0)	196
Dolly Varden	---	184(45)	1,561(49)	1,438(44)	540(18)	100(0)	3,823(156)	3,979

[1] Data compiled from 16 of 24 sport fish guide reports for activities on the Kodiak National Wildlife Refuge. Data must be considered preliminary until all guide reports are submitted.

[2] Angler days calculated by equating one angler visit as one angler day. No hour limit applied.

A total of 3,979 Dolly Varden were reported caught in 1987 with a retention or kill of 4%. Catch of other species in descending order was 711 chinook, 422 pinks, 389 steelhead, 374 coho, 196 rainbow trout, 128 sockeye, and 20 chum salmon. The highest retention or kill was associated with coho salmon (39%) while sockeye and chinook were retained at a rate of 23 and 11%, respectively. No kill was reported on chum salmon, steelhead rainbow trout.

For the second consecutive year, volunteers headquartered in a weatherport surveyed sport fishing use and catch data on the Ayakulik River. 6/87 (87-21) J. Selinger

Volunteer Jack Dean interviews chinook salmon fishermen along the Karluk River. 6/87 (87-22) B. Dean

C. Salmon Escapement

Adult salmon and steelhead escapements to the river systems on the refuge were monitored through Alaska Department of Fish and Game fish weir counts and aerial index surveys conducted by both the Alaska Department of Fish and Game and the refuge. Preliminary composite escapement index numbers for 1987 are presented in Table 17. Overall, the 1987 salmon index escapements with the exception of sockeye and chum salmon, were greater than 20% above the 1981 to 1986 average. Sockeye were within ± 20% of the 1981 to 1986 average but the chum salmon index escapement was approximately 37% below the 1981-86 average. Escapement of sockeye into the Frazer Lake system, a major producer of sockeye, in 1987 was only 48,956 fish, which is well below the minimum and desired escapement goals of 200 and 275 thousand fish, respectively (Sec. J-1). All other major sockeye systems met or exceeded the minimum or desired goals for sockeye (Table 17).

Escapement indexes for those rivers important to sport fishing (Table 13) were similar to previous years with the exception of the Karluk River where the 1987 kelt count of 687 fish represented those fish which actually passed through the weir. A total of 1,132 steelhead were observed at the weir but 448 of these were mortalities which washed up on the upstream side of the fish weir. It is unknown at this time why such a large percentage of the migrating steelhead kelts died in 1987.

Table 17
Sockeye salmon escapement to major and minor sockeye systems on the Kodiak National Wildlife Refuge 1985 to 1987.

River system	Escapement goals	Actual (index) counts		
		1985	1986	1987
East Uganik[1]	unk	40,000	21,000	7,700
Little[1]	unk	15,000	9,000	unk
Karluk[2]	560,000-900,000	995,948	887,171	766,251
Ayakulik/Red	200,000-300,000	388,759	318,135	261,913
Akalura[1]	unk	3,000	9,485	6,116
Upper Station[2]	150,000-300,000	435,817	466,385	232,195
Horse Marine[1]	unk	9,000	5,500	11,600
Dog Salmon/Frazer[2]	200,000-275,000	506,336	136,533	48,956

[1] Peak aerial surveys only.

[2] Fish weir count.

Coho or silver salmon on the spawning grounds.
(008-003) DM

D. Rehabilitation - Enhancement Activities

In 1987 the refuge received a proposal from the Alaska Department of Fish and Game to stock one (1) gram coho salmon fry into Hidden Lake on the Afognak unit of Kodiak National Wildlife Refuge at a rate of approximately 500 fish per acre starting in June of 1988. Stocking would be via aircraft and no shore-based operations would be required. The coho fingerlings are expected to reside in the lake for approximately one year and migrate out as two-year-old smolt. Stocking is projected to continue on an annual basis (outplanting) since there is no access to the lake area for returning adults and subsequent rearing by their progeny. Evaluation of project success will be through examination of increased contribution to the areas coho harvest and some escapement into the lower river.

Coho fingerlings for the project will come from the Alaska Department of Fish and Game Kitoi Bay Hatchery on Afognak Island. These fish will have been certified as disease free and a Fish Transport Permit has been approved by Alaska Department of Fish and Game for this work.

It was determined that stocking Hidden Lake with coho salmon fry via aircraft on an annual basis was compatible with refuge purposes if the following stipulations were followed to ensure compatibility:

1. The project was limited to outplanting of coho salmon fry only.

2. Any proposed changes or modifications to the project which may involve additional activity or changes to the instream or

lake would negate the compatibility statement and require a new assessment of the project.

Although enhancement projects such as Hidden Lake are not a goal of the Service it is not a project which would require any changes to the instream habitat of the lake or lower river. In addition, there is expected to be negligible impact on natural populations in the system or a change in the natural diversity. Also, human activity in the area would be limited to a few brief landings with aircraft to stock coho fry.

12. Wildlife Propagation and Stocking (Zwiefelhofer)

In July of 1986, an attempt was made to introduce Vancouver Canada geese on the Kodiak National Wildlife Refuge. The transplant of 110 geese from southeast Alaska to Spiridon Bay on Kodiak Island was a cooperative effort between Alaska Department of Fish and Game, Fish and Wildlife Service, and the Kodiak Game Bird Association. Approximately 50% of the geese remained in the vicinity of the Spiridon release site through early March. However, hopes of observing Canada goose broods on the refuge disappeared as quickly as the transplanted geese. Two of the three geese in the flock which were radio equipped to assist in following the flock's movements lost their transmitters. The remains of the third radio equipped goose were found in Saposa Bay on Afognak Island during early May. No goose observations were made until late August when several flocks, ranging in size from 30 to 90, were seen in various locations in the Kodiak Archipelago. The number of observations dwindled quickly in September with the sighting of only two groups of less than 10 geese each in December.

Plans for a second Vancouver Canada Goose transplant on the Kodiak Refuge scheduled for July 1987 were abandoned when insufficient numbers of molting geese were located to make the transplant viable. The lack of any reproductive activity or summer observations of the geese from the 1986 transplant was also a contributing factor in the decision. It is not known at this time if another transplant attempt will be made in 1988.

16. Marking and Banding (Ryan)

In conjunction with the refuge bald eagle migration and movements study (74530-82-01), 37 fledgling bald eagles were color-marked with patagial flags (green on left wing and yellow on right). In addition to the patagial flags, a blue acrylic leg band and a standard Fish and Wildlife Service metal leg band were placed on these birds. Sixteen of the 37 were also fitted with radio transmitters.

Thirty-nine brown bears were captured and fitted with radio-collars as part of studies (74530-82-01 and 74530-87-01). Thirty-one of these animals were new captures (11 subadults and 20 adults) and 8 were recaptures (all adults). Two of the collars placed on adult sows had satellite transmitters. All new captures were tattooed on the upper left and right lips and the right groin, including 3 subadults that were not fitted with radio-collars.

H. Public Use

1. General (Menke)

Public use on the refuge increased to 24,200 visits and 181,400 activity hours in 1987 from 23,600 and 148,000 in 1986, respectively. The previous figures include both use on the refuge proper and at the visitor center which is located about 20 miles from the refuge boundary. Table 18 summarizes public use levels for some of the major recreational activities for the last four years.

Table 18
Refuge public use for selected activities from 1984 to 1987.

Category	1984	1985	1986	1987
Interpretive Center				
Visits	2,217	6,707	7,719	9,784
Activity hours	1,329	3,353	3,865	4,851
Environmental Education				
Visits	307	826	1,029	591
Activity hours	179	1,209	1,313	517
Deer Hunting				
Visits	1,386	1,513	1,620	1,800
Activity hours	36,728	41,435	52,879	82,089
Sport Fishing				
Visits	1,445	1,675	2,430	2,740
Activity hours	13,940	22,800	30,060	34,480

During the year, both the number of sport fish guides and hunting transporter/outfitters reached the upper levels allowable according to the refuge comprehensive conservation plan (24 and 18 permittees, respectively).

More than 70 businesses and individuals currently have refuge permits or have applied for permits for the following categories of use: big game guiding, sport fish guiding, air transporting, marine transporting, hunting transporting/outfitting, and recreation guiding. Use levels for fishing guides and outfitters are documented in the following sections of this report. Both deer hunting and sport fishing use increased in the refuge during the past year.

Two types of public use are recorded for the refuge. People stopping at the visitor center headquarters building, located about four miles from the town of Kodiak, spend an average of one-half hour viewing

films and exhibits, obtaining leaflets, and asking questions about the refuge. The second type are the actual visits to the refuge proper which involves chartering a small aircraft or boat to get to an activity site. Most visitors spend three to seven days on the refuge during hunting, fishing, and photography trips.

The refuge has 30 wildlife films, videos, and slide/tape programs which are available to local school teachers and service clubs. Regular orientations are presented at the Coast Guard Base by refuge staff to provide base personnel with a preview of refuge programs and outdoor recreation opportunities on Kodiak. Several new films and videos were added to the refuge "film library" this year.

With the completion of the refuge sign plan and a public use cabin management plan being finalized this year, new signs were ordered and some cabin improvements were completed (sec. I-1).

Twenty-five thousand copies of the refuge leaflet were ordered and received during the year.

2. Outdoor Classrooms - Students (Menke)

In 1987 the number of school students involved in educational activities at the visitor center decreased from about 1,000 visits in 1986 to about 580 visits. Many teachers told us that they would not be able to use the visitor center as in the past because of school budget cuts for field trips. Letters were sent to all Kodiak Island school teachers at the beginning of the school year letting them know about opportunities and materials available from the refuge including films, visitor center activities, and special programs. The refuge also sent out Wildlife Week packets to all teachers on the island. One temporary display in the visitor center featured posters of many different bird species prepared by local high school students.

Outdoor Recreation Planner Menke gave presentations to several high school classes on Kodiak bird life. Many cub scout groups were provided information for badge requirements and a member of the refuge staff acted as field advisor for one scout group during an outing. All groups using the visitor center are encouraged to use educational worksheets to enhance their understanding of refuge wildlife and issues. During the year several new worksheets were prepared for use by different age school groups.

6. Interpretive Exhibits/Demonstrations (Menke)

Use of the refuge visitor center in 1987 increased about 26% compared to 1986. Once again in 1987 we were able to keep the visitor center open on weekend afternoons using volunteers. Use of the center during the summer months by off island tourists accounted for much of the increased use. Although there were no tour ships this summer, tourists arriving via the airlines increased compared to last year. Two local tour operators use the visitor center as one stop on their scheduled rounds. Improvements added to the center this year include: (1) a display of a mounted Kodiak bear and two cubs-of-the-year;

(2) installation of a railing designed by the refuge staff and fabricated by a local carpenter to enclose the exhibit; and (3) fabrication and installation of an exhibit case for mounted bird specimens. A temporary exhibit of a mounted brown bear hide and several skulls with descriptive information was put up in the center prior to the placement of the bear mounts. Other temporary exhibits used in the center this year included 1986 top duck stamp entries, posters of birds by high school students and a display of bird photographs.

The most popular exhibit in the visitor center is a large topographic relief map which identifies the unique characteristics of Kodiak Island. Other displays feature information on natural and cultural history, weather, geology, marine life, salmon spawning, native and introduced mammals, birds, and refuge management and recreation opportunities. A fifteen minute video on Kodiak's wildlife is shown to visitors upon request. A variety of Service, Alaska Department of Fish and Game, and Chamber of Commerce leaflets are distributed in the center. Approximately 60 sales items are provided in the small sales area.

An exhibit and leaflet entitled "Kodiak Bear Facts" was produced in cooperation with the local Alaska Department of Fish and Game office. The exhibit plaque was installed near a standing bear mount in the Kodiak Airport lobby.

A new exhibit in the Visitor Center shows typical poses of a female Kodiak brown bear and her two nine-month-old cubs. The exhibit was designed by refuge staff; taxidermy was done in California and the railing was fabricated by a local carpenter. (87-23) DM

7. Other Interpretive Programs (Menke)

Regularly scheduled weekend wildlife films have proven a popular feature, attracting nearly 2,300 visitors during 1987. The films are shown at 1:00, 2:00, and 3:00 p.m. both Saturdays and Sundays. The refuge owns 30 films and videos which are shown to requesting groups and mailed out to schools.

8. Hunting (Menke)

The entire refuge is open to hunting. Species hunted include brown bear, mountain goat, Sitka black-tailed deer, reindeer, Roosevelt elk, fox, ptarmigan, snowshoe hare, and waterfowl. Hunting seasons and regulations are set by Alaska Department of Fish and Game.

Approximately 250 hunters used the refuge during the spring and fall bear hunts in 1987. Bear hunting on the refuge accounted for nearly 19,000 hours of public use. Fifteen big game guides have permits for hunting areas on the refuge.

Deer hunting use, both on and off-refuge, has increased dramatically in the past several years. Liberal bag limits (5 deer per hunter) and a five month-long hunting season, combined with Kodiak's high population of Sitka black-tailed deer, attract many hunters to the island. About 1,800 deer hunters spent 82,000 activity hours hunting on the refuge in 1987.

From mid-October through late November the refuge staff assisted by Regional law enforcement personnel and Alaska Department of Fish and Game personnel conducted a law enforcement check and survey of deer hunters on the refuge. The enforcement patrol was conducted along the west coast of Kodiak from Viekoda Bay to Uyak Bay using the refuge vessel Ursa Major. Objectives were to: (1) Check all deer, bear, and waterfowl hunters for compliance with State laws and refuge regulations; (2) To develop a profile of refuge deer hunting by administering a survey to all hunters contacted in the field; and (3) To check recreation and set-net cabins on refuge lands for general condition and illegal use.

During the survey a total of 117 hunters in 36 parties were contacted. Resident information was obtained indicating that 9% of the hunters were from Kodiak, 77% were from other locations in Alaska and 14% were from the "lower 48" states. Six percent of the interviewed hunters were guided, 9% were with outfitters and 85% were neither guided or outfitted. Of the deer hunters contacted, 20% were based on boats and 80% had camps or used refuge cabins.

This is the second year that fall deer hunter checks have been conducted along the west coast of the refuge. A review of Table 19 shows that the hunting use statistics from both year's surveys are quite similar.

Table 19
Comparison of data obtained during 1986 and 1987 deer hunter surveys.

	1986 Deer Hunters		1987 Deer Hunters	
	Number	Percent	Number	Percent
Residence				
Kodiak	8	9	9	9
Other Alaska	78	88	90	77
Lower 48 States	2	2	16	14
Foreign Country	1	1	--	--
Type of Hunt				
Guided	3	3	7	6
Outfitted	12	13	10	9
Unguided/Outfitted	74	83	100	85
Base Camp				
Boat	15	17	23	20
Land	74	83	94	80
Deer Harvested				
Males	90	64	118	72
Females	41	29	43	26
Fawns	9	6	4	2
Averages				
Deer Harvested/Hunter		2.1		1.9
Days Afield/Deer Harvested		2.0		2.5
Days Afield/Trip		5.3		5.9
Deer Observed/Hunter		40		34

The refuge plans to repeat this survey and deer hunter check in 1988. Law enforcement violations and citations issued during the operation are noted in Sec. H-17.

Requests for outfitter permits have increased dramatically in the last three years. In 1985 only four transporter/outfitters applied for refuge permits. By 1986 thirteen land-based transporter/outfitters, four marine transporters, and three Natives operating on Native-conveyed 22 (g) lands were issued permits for deer hunting operations. This year eighteen transporter/outfitter permits were issued for deer hunting operations on refuge lands. According to the refuge comprehensive conservation plan a maximum of eighteen outfitters will

be permitted to operate on refuge lands. Seventeen additional requests have been received for outfitting on refuge lands.

Transporters/outfitters are required to report use and harvest information as a condition of their permit. In 1987 transporter/ outfitters reported 1,711 days of use on the refuge by 368 clients and a total of 1,086 deer harvested. The majority of use on the refuge by transporter/outfitters was focused on the Uyak, Uganik, and Zachar Bay areas, with 71% of the use and 75% of the harvest reported in those areas.

Less than 40 mountain goat hunters used the refuge during the past year. Most of the other hunting activity on the refuge including small game, upland game (i.e. ptarmigan), and duck hunting occurs while on deer or bear hunting trips. At least two outfitters have conducted hunts for waterfowlers who want to hunt the varied sea and diving ducks wintering in the bays around Kodiak.

9. Fishing (Menke)

Sport fishing is the most popular activity taking place on the refuge. This year, 2,740 fishermen participated in over 34,500 activity hours of freshwater fishing on the refuge. The most popular fishing locations on the refuge include the Ayakulik and Karluk drainages and Uganik Lake. The Karluk and Ayakulik systems support Kodiak's largest chinook salmon and steelhead runs. These three areas have well over half of the sport fishing pressure occurring on the refuge and Native-conveyed 22 (g) lands.

Creel census camps were set up on the Ayakulik and Karluk Rivers during the chinook salmon runs during 1987 (Sec. G-11B). Use of the Ayakulik River was similar to last year with 113 anglers accounting for 557 angler days and 4,391 activity hours. Both non-Alaskan (41% other states, 14% foreign) and Alaskan fishermen (47%) used the Ayakulik River.

A total of 182 angler days and 823 activity hours were documented on the Karluk River. Harvest for both the Ayakulik and Karluk is reported in Sec. G-11B.

Interest in sport fish guiding has increased rapidly since 1983 when the refuge received its first permit requests. That year six sport fish guiding permits were issued; in 1984 nine permits were issued; in 1985 fourteen; and in 1986 twenty-two. In 1987 the refuge reached the limit of 24 guides identified in the refuge comprehensive conservation plan. An additional 9 requests have been received for refuge sport fish guiding permits.

As a condition of the special use permit, guides are required to submit a report of their use and the number of fish caught and released by their clients. The 1987 guided sport fishing use on the refuge totalled 597 visits and 9500 activity hours. Most of the guided sport fishermen on the refuge are day users.

Wildlife photography continues to grow in popularity on the Refuge. (014-004) DM

During 1987, 2,740 fishermen participated in over 34,500 activity hours of freshwater fishing on the refuge. 6/87 (014-001) B. Dean

10. Trapping (Ryan)

Four trapping permits were issued for the 1986-87 trapping season on the refuge. This should be considered a minimum number as undoubtedly a number of people trap without getting permits. Individuals with permits reported harvesting 18 red fox, 31 beaver, and 17 river otter.

12. Other Wildlife Oriented Recreation (Menke)

Use of refuge recreation cabins for photography, sightseeing, and wildlife observation has been on the increase for several years. Because these recreational uses frequently occur in conjunction with hunting or fishing trips, the extent of photography and wildlife observation 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 are beginning to receive heavy use by wildlife photographers from mid-June through the end of August. During the year, about 800 recreationists stayed in the cabins.

The refuge cabin program is estimated to require about 1/2 staff year of time to administer. The staff commitment to the cabin program includes maintenance, answering inquiries, handling reservations, and law enforcement related to public use cabins. This year refuge volunteers made spring maintenance and cleanup visits to several cabins. Meat caches were constructed at eight different public use cabins. About three-quarters of the construction time spent on the meat cache projects was donated by refuge volunteers. The primary purpose for constructing meat caches was to prevent potential conflicts between deer hunters using the cabins and bears. The reaction of cabin users to the availability of the new storage facilities was extremely positive.

Cabin users are required to pay $10.00 per night for cabin reservations. Unfortunately, the $7,720.00 collected for use of cabins in 1987 does not return to the refuge to administer this program. Despite several requests by the refuge there is currently no mechanism for returning monies collected for cabins to the refuge to help defray maintenance and administration costs.

17. Law Enforcement (Menke)

Four refuge employees currently have law enforcement authority: Refuge Manager, Bellinger; Assistant Refuge Manager, Ryan; Wildlife Biologist/Pilot, Becker; and Outdoor Recreation Planner, Menke. Thirteen violation notices were issued during the year including:

- 5 littering cases;
- 5 cases for unlawful occupancy of a cabin outside the permitted season of use;
- 1 case for possession of a protected migratory bird (common murre);
- 2 cases for failure to validate deer harvest tickets as required by state law.

Several additional warnings were also issued to hunters for failing to validate deer harvest tickets at the time of the kill.

18. Cooperating Associations (Menke)

This was the third year for operation of the Alaska Natural History Association sales outlet at the visitor center. Sales this year totalled $10,775.00 compared to $9,180.00 last year (an 18% increase). About 60 different items including books, posters, notecards, pins, postcards, and slide sets are offered for sale through the Alaska Natural History Association outlet.

The cooperating association provides the dual benefits of allowing the refuge to distribute high quality publications and interpretive material as well as accomplishing much needed interpretive support projects to benefit refuge programs. During the last year Alaska Natural History Association projects included printing a refuge poster, a refuge pin, and a set of five Kodiak bird slides. The Alaska Natural History Association also paid for a custom exhibit case which was designed to display a small collection of mounted bird specimens. The exhibit case was installed in the visitor center in July. Books on natural history topics were purchased by the Association and donated to the Kodiak City and refuge library.

I. EQUIPMENT AND FACILITIES

1. New Construction (Ryan)

The meat storage caches were constructed by force account and volunteer labor at eight of the refuge's public use cabins. These eight foot by eight foot structures are designed to be bear proof and will hopefully reduce human-bear conflicts associated with deer hunting at these sites (Sec. H-12).

Work began on four new 12 foot by 16 foot storage sheds, one at each residence at the refuge headquarters late in 1987. By year's end concrete pads and footers, framing, and roofing were completed for all units and two had windows and siding installed. All work is being done through force account.

A contract was let and work completed by Brechan Enterprises, Inc. of Kodiak for fabrication and installation of a handrail from the visitor's center parking lot to the visitor center entrance. The design of the handrail was not what we had in mind from an aesthetic perspective but is functionally adequate .

The framework goes up on one of eight meat caches built at refuge public use cabins. 8/87 (87-24) C. Provost

Volunteers, Chris Provost and Ray Hander, proudly show off the handiwork of a completed meat cache at the Chief Cove public use cabin. 8/87 (87-25) C. Provost

2. Rehabilitation (Ryan)

Renovation of Unit 1 of the refuge triplex was completed and beneficial occupancy granted on May 13, 1987. The occupants were not allowed to occupy the premises, however, until mid-June because of a contract dispute. Work was done by Titan Construction, Inc. of Anchorage for a total cost of $153,280 (Contract No. 14-16-0007-86-6645).

A contract to renovate Unit 2 of the triplex was awarded to Brechan Enterprises, Inc. of Kodiak on September 21, 1987 for $105,600 (Contract No. 14-16-0007-87-6731). Scope of work will be similar to that for Unit 1 and will include tearing out all walls, installing new wiring and some new plumbing, a new kitchen and bathroom, a new heating system, rearranging utility rooms, and new walkways in front and back. Work is scheduled for completion in March, 1988.

It should be noted that the difference in cost for renovation of Unit 1 versus Unit 2 is due in large part to removal of asbestos siding from the entire triplex unit that was accomplished with the renovation of Unit 1. This material had to be shipped off island for disposal.

4. Equipment Utilization and Replacement (Ryan and Zwiefelhofer)

The refuge Research/Patrol Vessel, Ursa Major, had its annual dry docking, hull inspection, cleaning, and painting on June 14, 1987. A new four-bladed prop was also installed at that time. The flying bridge and midship bulwarks were replaced in September by Ken's Boat Repair of Kodiak. A solar panel was installed on the new flying bridge to help maintain sufficient battery power required to operate the various electronic equipment on board.

Major equipment purchased in 1987 is summarized in Table 20.

5. Communications Systems (Ryan)

The telephone system at the headquarters building was upgraded with the acquisition and installation of a COMDIAL 616 system with 12 regular 8 line telephone units. This systems replaces one that we could no longer repair because spare parts were unavailable. The system was acquired from and installed by Telephone Utilities of the Northland for a cost of $3,486.00.

Mid-ship bulwarks were removed and replaced to the deck on the MV Ursa Major because of rot. 9/87 (87-26) DZ

The wood in the flying bridge was also "soft" and replaced. 9/87 (87-27) DZ

Table 20
Major equipment purchased in 1987.

Item	Quantity	Cost
Liferaft, two man (Eastern Aeromarine)	1	$1,065.00
Emergency Position Indicating Radio Beacon	2	650.00
Radio, HF, Portable with Antenna (Spilsbury SBY-11A)	2	4,787.00
Motor, Outboard, 55 Horse Power Commercial Grade (Johnson)	1	2,365.00
Computer (Compaq) International Business Machine Compatible	1	4,751.00
Printer, Laser (Data General Model 6454-X)	1	2,236.00
Shotgun, 12 gauge, stainless steel (Winchester)	2	676.00
Rifle, 458 Magnum (Winchester, Model 70)	1	604.00
Compressor, 1 1/2 horse power (Emglo Model K15-8P)	1	638.00
Freezer, 9 cubic feet, (Sears)	1	395.00

6. Computer Systems (Zwiefelhofer)

To facilitate the archiving of massive accumulations of data generated by various on-going refuge projects, a International Business Machine compatible computer system capable of running "user friendly" database and spreadsheet software was ordered in May. Due to the wonders of government procurement, the software, printer, and monitor for the new system arrived in early fall but the central processing unit had not been delivered by year's end.

The Central Electronic Office word processing software on the refuge Data General 10 SP computer system was replaced by the less cumbersome and complicated Word Perfect software. The added hard disk space gained by the change allowed the installation of Map Overlay and Statistical System and Geographic Information System software on the Data General 10 SP. Much of the digitized habitat and status information in the refuge's comprehensive conservation plan is archived in this database format. Numerous small problems kept the system inoperable until early December when the source of the majority of the trouble was identified as a faulty input cable. The failure of the tape drive unit and several "hard boards" in the central processing unit during 1987, gave the system manager more experience in computer "troubleshooting" than he ever wanted.

The one bright spot in our current Data General computer system during 1987 was the addition of a laser printer. After unsuccessfully attempting to procure a single page sheet feeder for a letter quality printer since the system was purchased by the Regional Office in 1984, the addition of the laser printer allows the clerical staff to fully utilize the computer's word processing capabilities. Large mailings of letters to commercial special use permit holders and other similar administrative tasks take much less time and effort to accomplish with this printer. Too bad it took so long to get the right compatible equipment.

8. Other (Ryan)

The refuge Accelerated Refuge Maintenance Management budget was $170,000 ($122,000 large projects and $48,000 small projects). Small project funding was used to beef up our operations and maintenance budget and was expended in five areas. Table 21 shows large and small Accelerated Refuge Maintenance Management projects and expenditures.

Table 21
Fiscal year 1987 accelerated refuge maintenance management projects.

	Project	Cost
KD-1*	Handrail at Visitor Center	15,000.00
KD-2*	Storage (meat) Caches at Public Use Cabins	18,000.00
KD-3*	Rehabilitation Triplex Residence	89,000.00
KS-1	Buildings	4,145.00
KS-2	Utilities Systems	11,022.00
KS-6	Habitat	8,538.00
KS-7	Transportation Equipment	10,295.00
KS-8	Other Equipment	14,000.00

* Large Accelerated Refuge Maintenance Management.

J. OTHER ITEMS

1. Cooperative Programs (Chatto and Ryan)

The refuge "houses and hosts" Vic Barnes, a Research Biologist with the Alaska Fish and Wildlife Research Center. Research (Sec. D-5) is directed toward the ecology and status of the refuge's brown bear population to improve management actions.

The refuge provided $6,000.00 in funds to the Alaska Department of Fish and Game for a cooperative deer hunter survey. The Department will

utilize existing Game Division personnel to collect and interpret data on deer harvest during the 1987 to 1988 deer hunting season on the refuge and adjacent lands in Game Management Unit 8. The survey has three primary objectives:

a. To determine the distribution and numbers of deer harvested and distribution and number of recreational days used by deer hunters during 1987 to 1988 hunting season.

b. To collect other data on characteristics of deer hunting activities including: transportation mode, sex of deer killed, and commercial facilities - operators use.

c. To estimate frequency of encounters between deer hunters and brown bears.

The results of the survey will be used to evaluate the current deer hunting regulations and current refuge programs with regard to public and commercial use. Baseline data on frequency of brown bear encounters with deer hunters will also be collected.

During 1987 the refuge cooperated with the Alaska Department of Fish and Game, Commercial Fish Division in operation of the Frazer Lake fish pass. A refuge volunteer assisted Department personnel between May 15 and July 15, 1987 to monitor sockeye salmon smolt migration and the first half of the adult sockeye immigration to Frazer Lake.

Frazer Lake is located on the south end of the refuge and covers approximately 4,200 surface acres. The sockeye salmon run in Frazer was established in 1951 and in 1962 a steep pass was constructed over a natural 30 foot barrier falls on the Dog Salmon Creek which drains the lake. Although a fish counting weir is located at the mouth of Dog Salmon Creek in lower Olga Bay, the escapement is recounted at the fish pass as a back up in the event that the Dog Salmon weir washes out during the sockeye migration and for a more accurate measure of the spawning escapement which is used in measuring the response of the Frazer Lake system to different escapement levels. The escapement is sampled at the fish pass for length, sex, and age composition. Personnel at the fish pass also document the spawning grounds distribution of the escapement and sockeye fry densities in selected lake littoral areas.

Adult sockeye salmon began migrating through the fish pass on June 19, but it was not until July 2 when any substantial numbers of fish were recorded. The migration was basically over by July 27. A total of 48,956 adult sockeye entered through the weir on the Dog Salmon Flats and 40,544 of these fish passed through the fish pass.

A commercial catch of approximately 8,700 fish is estimated in the harvest district which brings the total Frazer Lake return of sockeye to approximately 57,700 fish. This same system had a total return of approximately 517,370 fish in 1985. The lowered production level is suspected to be a direct result of overtaxing the rearing area within the lake and the escapement goal is being adjusted downward by the Department from approximately 400 thousand fish to between 200 and 275 thousand spawners.

A special use permit was issued to the Kodiak Island Borough to fertilize Karluk Lake in 1987. The Borough was issued the permit in 1987 since the financing and actual fertilization of Karluk Lake in 1987 was to be carried out by the Kodiak Aquaculture Association through the Kodiak Island Borough. This is a different approach than in 1986 when the permit was issued to the Alaska Department of Fish and Game, Fisheries Rehabilitation Enhancement Department Division. A similar scenario for the 1988 fertilization effort at Karluk is in progress.

During September, 1987 Professor Fumio Yamazaki and an assistant from the Facilities of Fisheries of the Hokhido University in Japan spent approximately four days at Karluk Lake. Their purpose was to collect Dolly Varden and coho salmon samples as part of an international and statewide electrophoresis study on these species. Approximately 30 juvenile fish of each species were collected and processed for shipment during their stay.

4. Credits

As usual, the writing of the annual narrative report for Kodiak National Wildlife Refuge is a team effort. Staff members who wrote or contributed to a section are identified by name in parenthesis following the section title. Barnes, Bellinger, Chatto, and Ryan edited the report, Menke provided the information packet, and the thoroughly undesirable job of typing and compiling was accomplished by Castonguay.

The Cousteau Societie's "Alcyone" with it's distinctive wind sails at Kodiak harbor. (87-28) DZ

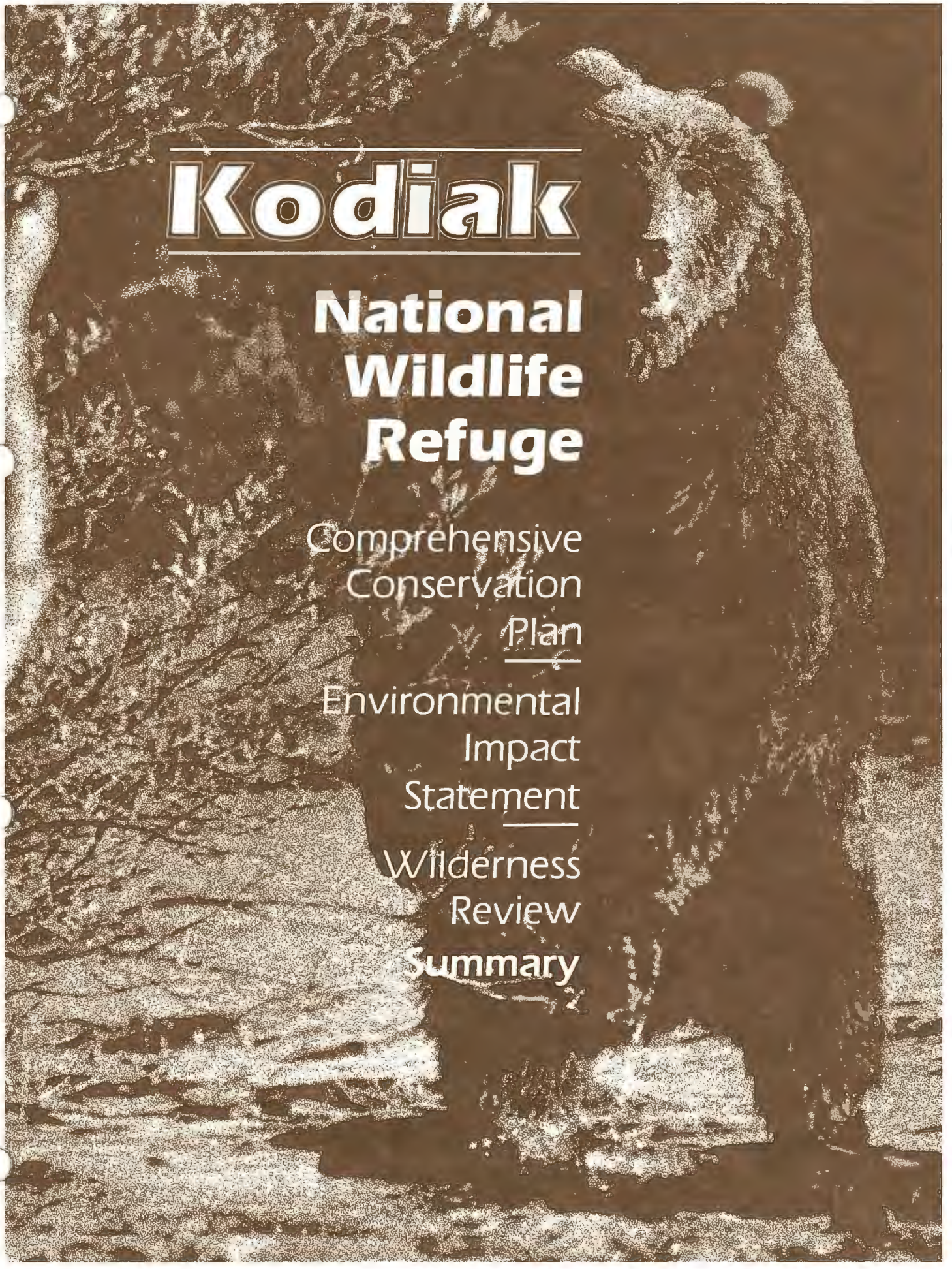
K. FEEDBACK (Bellinger)

Refuge Comprehensive Conservation Plan

The Kodiak Plan was approved during the year. The refuge staff was involved in formulation of this plan for four frustrating years and thought they could finally concentrate on refuge business. However, the celebration was premature as the first step in implementing the direction established in the comprehensive plan is a whole new planning effort. This effort is called step-down management planning.

This next phase in the process will require public participation (meetings, meetings, and more meetings), compatibility determinations, and a rule making process. Eventually we will get through this planning phase and be able to concentrate on resource/people management.

I realize that all of this planning is required and hopefully will help achieve the purposes for which the refuge was established, however, it does get frustrating. At times we think resource needs are apparent, but the process required to meet those needs is very cumbersome. Hopefully, we don't spend so much time planning how to keep the fox out of the hen house that we lose all of the chickens in the interim.



Kodiak

National Wildlife Refuge

Comprehensive Conservation Plan

Environmental Impact Statement

Wilderness Review

Summary

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

IN REPLY REFER TO:
PSS-PL/0669S

MAR 9 1987

Dear Reader:

Enclosed for your review is a Summary of the Final Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS), Wilderness Review for the Kodiak National Wildlife Refuge, Alaska. This CCP/EIS has been prepared pursuant to Sections 304(g), and 1317 of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA), Section 3(d) of the Wilderness Act of 1964, and Section 102(2)(C) of the National Environmental Policy Act of 1969.

The final CCP/EIS describes four alternative strategies for long-term management of the Kodiak National Wildlife Refuge, and identifies the Fish and Wildlife Service's preferred alternative. The document also reviews all of the lands under federal jurisdiction within the refuge boundary (1.6 million acres) to determine their suitability for possible addition to the National Wilderness Preservation System (NWPS).

Pursuant to Section 304(d) of ANILCA and 50 CFR 36.32, the Service will hold a public hearing in the Kodiak Refuge area on commercial fishing support facilities on refuge lands. The Service's recommendations for these facilities are included in an appendix to this summary; the rationale for the recommendations is described in detail in the full plan. The public hearing will be held during the 45-day protest period; notice of the hearing date will be published in the Federal Register and local newspapers. After considering the public's comments and the compatibility analysis, the Service will include a final compatibility determination in the record of decision.

Comments provided on the draft CCP/EIS have been taken into account in preparation of this final comprehensive conservation plan. Any further remarks you may have on the final CCP/EIS will be considered during a 45-day protest period following the publication of the document. A record of decision then will be published, and the Service will begin implementing the management directions in the preferred alternative. Comments or requests for further information should be directed to the Regional Director, Attention: Bill Knauer, (907) 786-3399.

Sincerely,

James C. Pitman

Acting Regional Director

Enclosure

KODIAK NATIONAL WILDLIFE REFUGE
SUMMARY
FINAL COMPREHENSIVE CONSERVATION PLAN,
WILDERNESS REVIEW
AND
ENVIRONMENTAL IMPACT STATEMENT

April, 1987

U.S. FISH AND WILDLIFE SERVICE
REGION 7, 1011 E. TUDOR RD.
ANCHORAGE, AK 99503

Kodiak National Wildlife Refuge is located on the western boundary of the Gulf of Alaska in southwestern Alaska. This summary describes four alternatives for managing Kodiak National Wildlife Refuge, and the effects of implementing each alternative. The alternatives vary in emphasis from Alternative A, the "no action" alternative [which would maintain the current range of uses and management directions] to Alternative D [which would provide the greatest level of protection to the refuge's fish and wildlife resources]. The U.S. Fish and Wildlife Service's preferred alternative is identified and the criteria used in its selection are described. The plan also includes a wilderness review, which evaluates the suitability of lands for wilderness designation under each management alternative.

The full Kodiak Refuge Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) provides additional information on the refuge's resources and uses, significant issues, the wilderness review, the management alternatives, and environmental consequences. In particular, the full plan addresses in more detail the effects of the wilderness proposal. The full plan also includes a consistency determination for the Kodiak Island coastal zone management policies, an analysis of the effects of commercial fishing and related facilities on the refuge's brown bear, a compatibility determination on oil and gas leasing, and copies of public comment letters on the draft plan.

Copies of the full CCP/EIS may be found at Alaska state depository libraries and Fish and Wildlife Service regional offices. For further information contact William W. Knauer (907) 786-3399.

THE KODIAK NATIONAL WILDLIFE REFUGE

Kodiak Refuge encompasses about 1.87 million acres on Kodiak, Uganik, Afognak and Ban islands in southwestern Alaska. The islands, part of the Kodiak Archipelago, lie at the western border of the Gulf of Alaska. The city of Kodiak is about 250 air miles from Anchorage and about 21 miles northeast of the refuge boundary.

Kodiak Refuge is larger than the state of Delaware, but no place on Kodiak Island 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. The refuge's lakes and rivers are major spawning grounds for five species of salmon. Steelhead, rainbow trout and Dolly Varden are also found in the refuge waters. Besides brown bear there are only five other native land mammals in Kodiak Refuge: red fox, river otter, short-tailed weasel, little brown bat, and tundra vole. Several other species, including Sitka black-tailed deer, elk, snowshoe hare, and beaver, have been introduced into the refuge. Over 215 species of birds have been seen on the Kodiak Archipelago. Whales, porpoises, sea otters, and sea lions are found in the bays adjacent to the refuge.

President Franklin D. Roosevelt established Kodiak National Wildlife Refuge by Executive Order 8857 on August 14, 1941, to preserve the natural feeding and breeding ground of the brown bear and other wildlife. The refuge thus became a part of the National Wildlife Refuge System, managed by the U.S. Fish and Wildlife Service. The refuge system includes over 430 units in 49 states, with 16 refuges in Alaska (Figure 1).

The refuge's boundary has changed several times since it was first established. In 1958, the refuge boundary was adjusted to resolve a bear/livestock problem. In 1971, Congress enacted the Alaska Native Claims Settlement Act (ANCSA). As part of the settlement, about 310,000 acres of Kodiak Refuge lands were to be conveyed to Native village corporations and Native groups.

THE ALASKA NATIONAL INTEREST LANDS CONSERVATION ACT (ANILCA)

Congress redesignated Kodiak Refuge in 1980 when it enacted the Alaska National Interest Lands Conservation Act (ANILCA). The ANILCA defined the purposes of the refuge, established administrative and planning requirements, and authorized studies and programs relating to wildlife and wildland resources, commodity resources, and recreational and economic uses. The Act also added 50,000 acres on Afognak and Ban islands to the refuge.

The purposes of Kodiak Refuge, as specified in ANILCA, are:

> (i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, Kodiak brown bears, salmonoids, sea otters, sea lions, and other marine mammals and migratory birds;

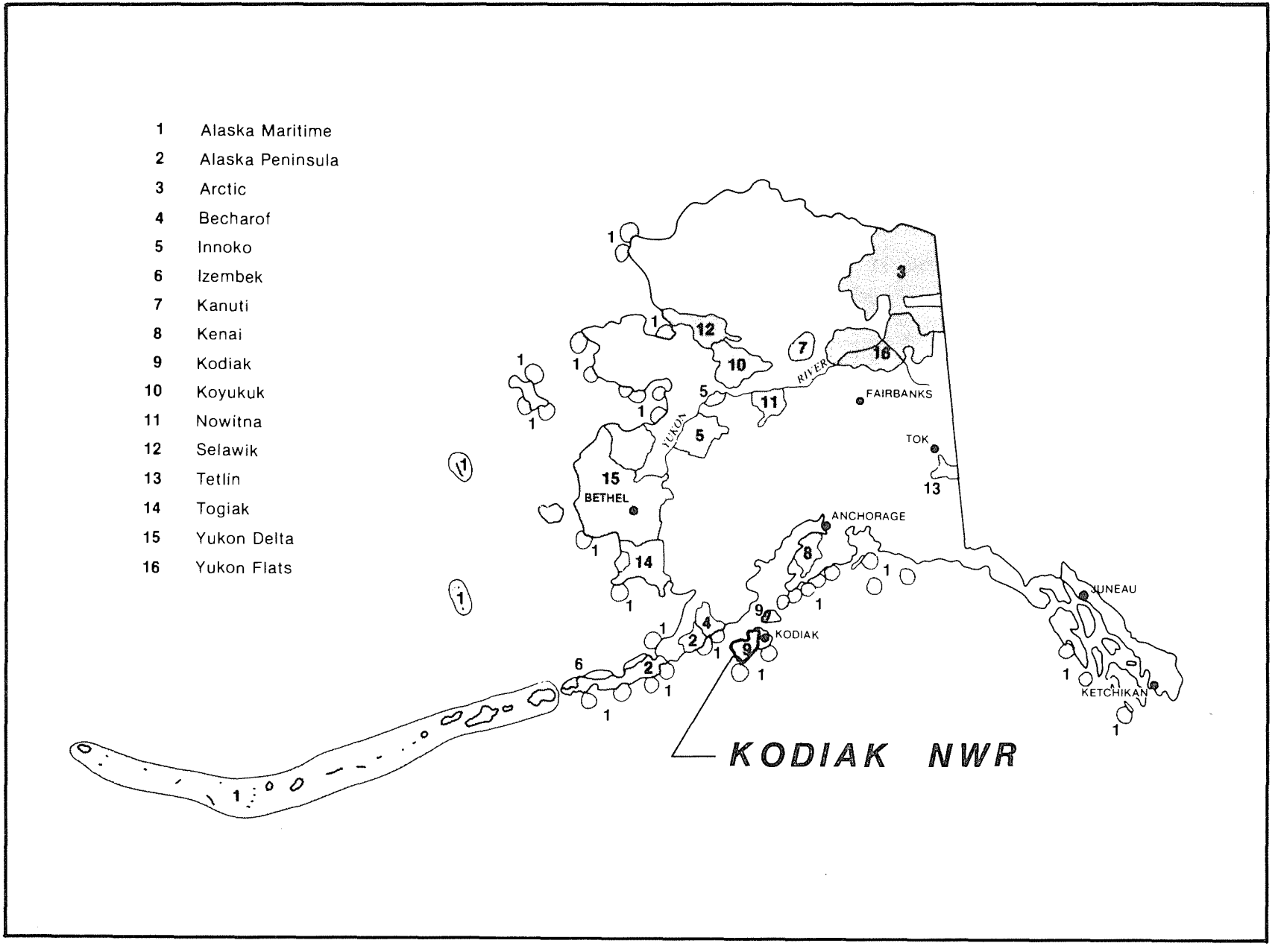
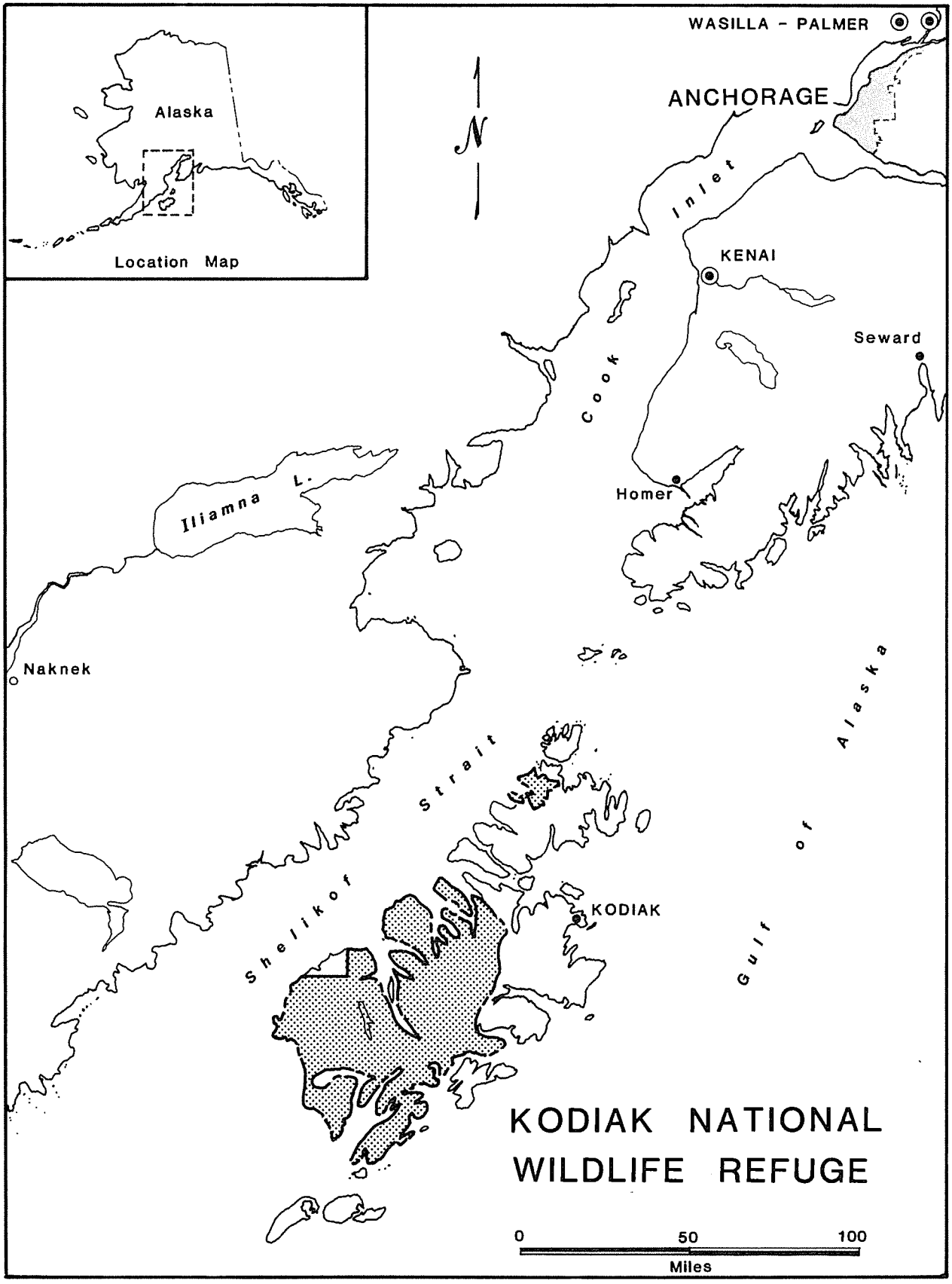


Figure 1. National wildlife refuges in Alaska.

Figure 2. Location of Kodiak Refuge.



(ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;

(iii) to provide, in a manner consistent with purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and

(iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in subparagraph (i), water quality and necessary water quantity within the refuge.

THE PLANNING PROCESS

Figure 3 shows the major steps of the planning process for the Kodiak Refuge Comprehensive Conservation Plan. The first step in developing the plan was to collect information. Natural resource and public use information was gathered from field inventories, remote sensing, refuge files, other resource agencies, and literature searches. The Service held public meetings and workshops throughout Kodiak Island, as well as in Anchorage, to identify refuge issues and concerns.

Old Harbor is one of five local communities where the Fish and Wildlife Service held public meetings on the Kodiak Refuge Comprehensive Conservation Plan/EIS.

Figure 3. The refuge comprehensive conservation planning process.

Step 1 - PREPLANNING

- o Identify laws, regulations, policies and direction
- o Develop analysis methods and capabilities
- o Prepare public involvement plan
- o Hold region-wide public scoping meetings
- o Identify management issues and concerns
- o Prepare physical, biological, economic and social environment description

Step 2 - INVENTORY

- o Assemble data base or inventory, of resources
- o Identify habitat and population models
- o Identify resource management units

Step 3 - FORMULATE MANAGEMENT ALTERNATIVES

- o Develop alternative strategies for management
- o Identify different combinations of uses for resources
- o Determine management directions for each alternative

Step 4 - ANALYZE MANAGEMENT ALTERNATIVES

- o Identify sensitivity of fish and wildlife resources to land uses
- o Describe changes in the impacts of each alternative
- o Identify changes from base line in the physical, biological, social, and economic environment

Step 5 - EVALUATION OF ALTERNATIVES

- o Evaluate biological and socioeconomic effects of each alternative, and the extent to which issues and concerns raised by the public are met

Step 6 - PLAN SELECTION

- o Recommend a proposed alternative

Step 7 - PUBLISH DRAFT CCP/EIS

- o Prepare and distribute a draft plan that describes the alternatives and their expected consequences when implemented

Step 8 - PUBLIC COMMENT

- o Provide opportunities for public comments and analyze the feedback

Step 9 - PUBLISH FINAL CCP/EIS

- o Prepare and distribute a final plan that is responsive to comments received on the draft document
- o Provide 45-day period for public comments and protest

Step 10 - ISSUE RECORD OF DECISION

- o Implement the Comprehensive Conservation Plan

All available information was then analyzed with the help of resource specialists from several agencies and the private sector to identify special values, significant problems and issues as required by ANILCA.

LAND STATUS

- Of the 1.87 million acres of land within the refuge boundary, 1.59 million acres (85%) is presently under federal jurisdiction.

- As of July, 1985, 274,000 acres (15%) of land within the refuge had either been patented, interim conveyed or legislatively approved for conveyance to five Native village corporations (Akhiok, Kaguyak, Karluk, Larsen Bay and Old Harbor), individual Natives and private parties.

- About 183,000 acres of land within the refuge have been selected by Native village corporations and groups, Koniag Inc. (the Native regional corporation), and the State of Alaska; these lands may or may not be conveyed.

- There are 110 Native allotment applications for about 200 separate parcels in the refuge, totaling about 15,000 acres; to date, the Bureau of Land Management has conveyed about 1,000 acres to Natives.

- There are about 1,300 acres of private patented inholdings within the refuge boundary, including 73 homestead sites, 2 homesites, 3 trade and manufacturing sites, 3 mission sites, and 2 headquarter sites.

LANDSCAPE CHARACTERISTICS

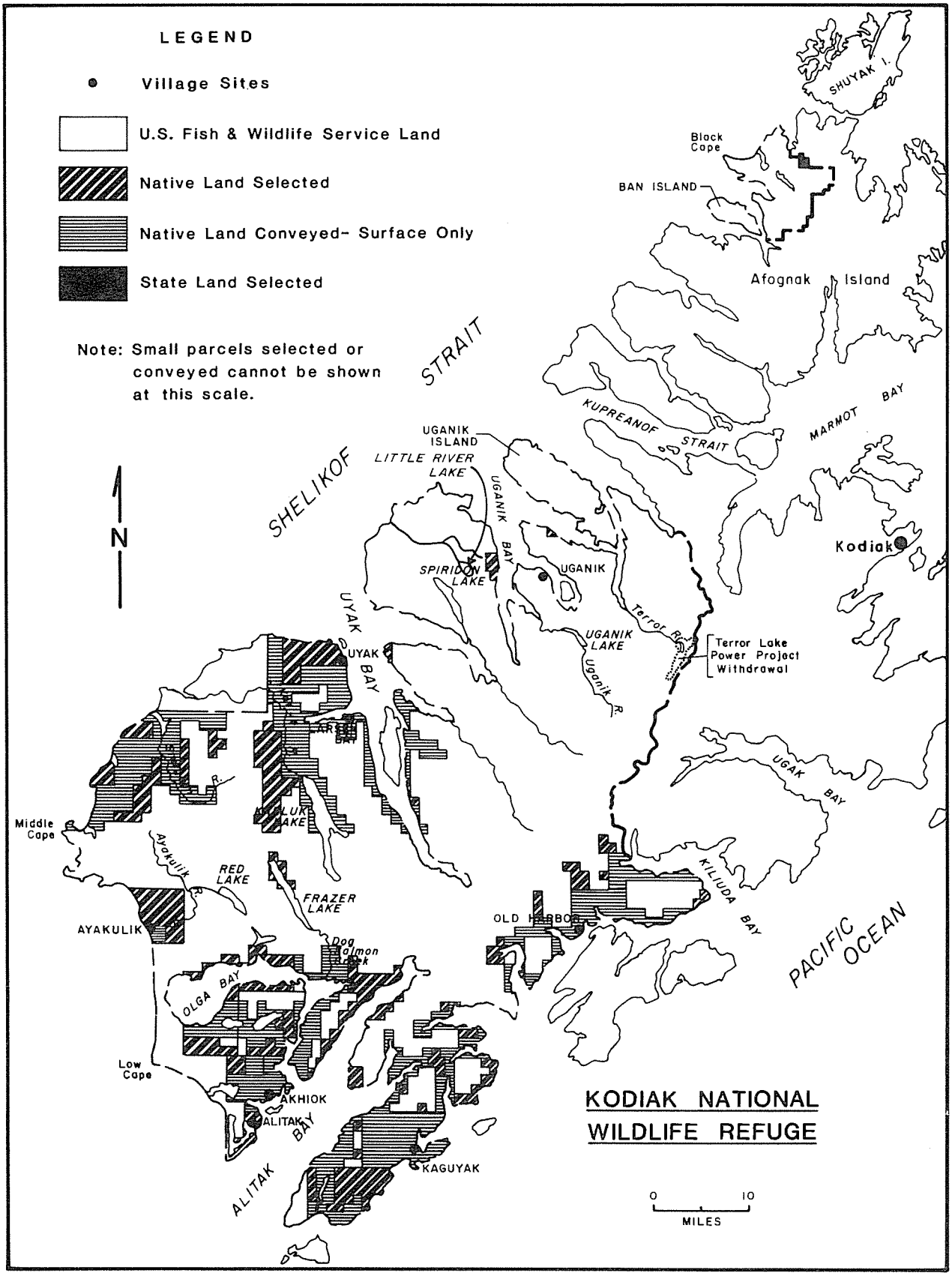
- Kodiak Refuge has a rugged 800-mile coastline. The island's coastline is indented to such an extent that no place on the island is more than 15 miles from the sea.

- The refuge is entirely mountainous from its interior to shoreline, the only exceptions being flat bottoms of glacial valleys, lowland shores, capes and peninsulas, and the refugium in the southwest part of the refuge. The highest peaks in the refuge are Koniag Peak and Mount Glottof, both over 4,000 feet.

- The refuge contains 95 watersheds, 14 large lakes (greater than 250 acres in size), and over 70 smaller lakes; except for the Ayakulik/Red and Karluk rivers, which drain large glacial lakes, the refuge's rivers are small, short and steep.

- The interior of the Kodiak Island portion of the refuge is covered with lush, dense shrub or grass-like vegetation at the lower elevations, and alpine tundra at the higher elevations; the southwestern portion of the refuge is covered with hummocks (knolls) of grass, while the Afognak/Ban Island portion of the refuge is covered with spruce forests.

Figure 4. Land status of Kodiak Refuge, 1985.



FISH AND WILDLIFE

Over 250 species of fishes, birds, and mammals have been recorded on Kodiak Refuge and adjacent areas:

- All five Pacific salmon species (sockeye, chinook, pink, coho and chum) spawn in the refuge. Sockeye, pink and chum are the three most important commercial salmon species: from 1981 to 1984 commercial fishermen harvested annually an average of 607,000 refuge sockeye, 4.7 million pinks, and 534,000 chum salmon.

- Other fish found in the refuge's streams and lakes include Arctic char/ Dolly Varden, rainbow trout, and steelhead; two streams support abundant steelhead and chinook salmon populations, an unusual occurrence in an Alaska national wildlife refuge.

- Bald eagles reside year-round on the refuge in such numbers as to be considered very common; about 200 pairs of bald eagles nest on the refuge annually.

- An estimated 1.5 million seabirds and at least 150,000 ducks and geese winter on the bays, inlets and shores adjacent to the refuge. Over 140 seabird colonies are found along Kodiak's coastline.

- Most of Kodiak Refuge is considered to be optimum brown bear habitat. The refuge's brown bear population is estimated at 2,000 to 2,500 animals.

- Sitka black-tailed deer, first introduced on Kodiak Island in 1934, have spread throughout the refuge and now occupy virtually all habitats and vegetative zones, from sea level to alpine areas.

- Roosevelt elk were transplanted on Afognak Island in 1929; about 300 animals use the Afognak portion of the refuge, the only national wildlife refuge in Alaska where this species occurs.

- Mountain goats have also been introduced onto the refuge; the island's total population is estimated at 400 plus animals.

- Fourteen marine mammal species have been recorded in the waters adjacent to the refuge, including eight whale species, harbor seals, Steller's sea lions, and sea otters; Foul Bay, adjacent to the refuge's Afognak Unit, is thought to be an important "nursery" area for female sea otters with young.

PUBLIC USES

People come to Kodiak Refuge primarily to hunt and fish, although other nonconsumptive recreational uses such as hiking and wildlife observation have been increasing. A substantial number of people come from outside of the island and out-of-state to hunt and fish:

- In 1984, the five most popular uses of the refuge based on activity hours were: 1) deer hunting (35%); 2) fishing (26%); 3) bear hunting (10%); 4) trapping (5%); and 5) berry picking and other consumptive use (4%).

- Kodiak Refuge provides high quality opportunities for hunting and observing brown bear. In 1984, hunters harvested 131 brown bear on the refuge during the spring and fall seasons.

- Liberal bag limits and a six month long hunting season, combined with Kodiak's high population of Sitka black-tailed deer, attracts many hunters to the island. In 1984, nearly 1,400 hunters visited the refuge; an estimated 3,220 deer were harvested on the Kodiak Island portion of the refuge.

- Many nonlocal sport fishermen come to Kodiak because of its reputation as an angler's paradise. Sport fishermen come to catch the five species of Pacific salmon, steelhead, rainbow trout, and Dolly Varden.

Brown bears concentrate in streams and lakes in the summer when fish can be caught easily.

- Fifteen big game guides, as well as sport fishing guides, nonconsumptive guides, outfitters and marine transporters, provide services to Kodiak Refuge hunters and fishermen. Commercial sport fish guiding in the refuge has recently accelerated, with 22 guides having permits to use the refuge in 1986. The annual revenues realized from these services is conservatively estimated at over $2 million.

- People camp, hike, observe wildlife, and take photographs in the refuge usually in conjunction with hunting and fishing. If recent trends continue, photography and wildlife observation will grow more rapidly in the future, although these uses are expected to remain a relatively small proportion of the refuge's overall public use.

- Residents of the six communities on Kodiak Island harvest a variety of fresh and saltwater fish, game, marine invertebrates, and plant species, primarily outside of the refuge boundary. Salmon and deer are probably the most important resources harvested on the refuge by local residents.

SPECIAL VALUES

During the planning process the following special values of Kodiak Refuge were identified:

- Kodiak Refuge was originally designated to conserve the Kodiak brown bear--the largest brown bear in the world. The refuge supports the highest known density of brown bear in the world.

- The diversity of resources and uses of the refuge, including landforms, habitats, fish and wildlife, and subsistence and recreational uses, is noteworthy in Alaska. The refuge supports large populations of brown bear, bald eagles and salmon, species of special interest to many Americans, as well as black-tailed deer, mountain goat, elk, waterfowl, upland game birds and small game.

- The Kodiak Refugium and associated glacial lakes in the southwestern portion of the refuge have special scientific, educational, and recreational values. The refugium and adjacent glacial lakes supports the highest recorded density of brown bears in North America, the highest density of nesting waterfowl species on Kodiak Island, and the highest summer feeding concentration of bald eagles. Four drainages in the refugium support high concentrations of fish and wildlife, and have high recreation and economic values (see below).

- The Ayakulik/Red River provides spawning or rearing habitat for all five Pacific salmon species, rainbow trout, steelhead, and Dolly Varden. Average annual escapements (1979 to 1984) of all five salmon species have reached or exceeded 1.14 million fish during even years. About 40 to 200 bald eagles uses the drainage in July and August, while an estimated 200 to 300 brown bear use the drainage annually.

- Although the Karluk River is entirely on Native lands within the refuge boundary, the river is of special value. The Karluk River, like the Ayakulik/Red River, supports abundant steelhead and chinook salmon populations. The average annual escapement (1979 to 1984) of all five Pacific salmon species has reached or exceeded 2.5 million fish during even years. About 20 to 150 bald eagles feed along the river year-round, while an estimated 150 to 200 brown bears use the upper river and Karluk Lake tributaries from June through December.

- The Sturgeon River is used by pink, chum and coho salmon, steelhead, and Dolly Varden for spawning or rearing. An estimated 100 to 250 bald eagles feed along the river in July, while 80 to 100 brown bear feed on the upper 6 to 10 miles of the river from early July through August.

- The Dog Salmon Creek provides rearing or spawning habitat for all five species of Pacific salmon, rainbow trout, steelhead, and Dolly Varden. An estimated 20 to 50 bald eagles use the upper 2 miles of the drainage from late May through July, while more than 50 brown bear feed along the creek from June through early August.

- Uganik Lake is a scenic mountain lake that provides spawning habitat for salmon and key habitat for bears and eagles. The lake also has high recreational values for deer and bear hunting, sport fishing, and sightseeing.

- Three Saints Bay is of historical significance. This bay was used by Russian fur traders and was the first caucasian settlement in Alaska.

- The Mount Glottof Research Natural Area was designated in 1975 to protect alpine feeding habitat for brown bears and to provide an area for future research on this brown bear summer habitat. The area also contains key habitat for mountain goats, and high scenic and recreational values.

WILDERNESS REVIEW

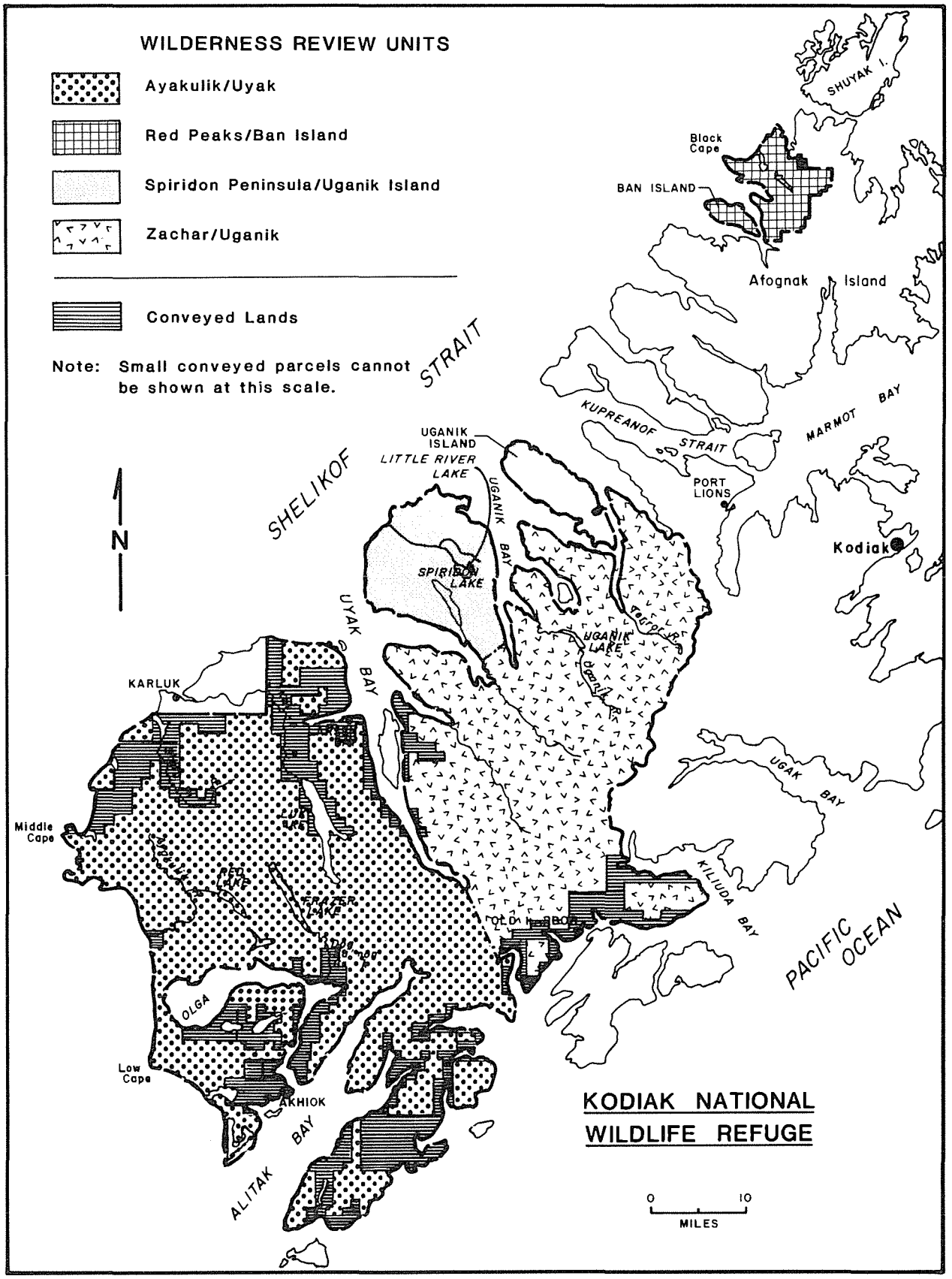
The ANILCA directed the Service to study all of the non-wilderness lands in the Alaska refuges and recommend areas suitable for wilderness designation. None of the lands within the boundary of Kodiak Refuge were designated as wilderness by the ANILCA. The Service used seven criteria, based on the Wilderness Act, to evaluate the wilderness qualities of the refuge: size; land ownership; natural integrity of the area; apparent naturalness; outstanding opportunities for solitude; outstanding opportunities for primitive recreation; and the presence of special or unique features.

To analyze the wilderness suitability of Kodiak Refuge, the refuge was divided into four geographically distinct wilderness review units. Figure 5 shows the locations of these units.

Ayakulik/Uyak Unit (768,000 acres)

This unit consists of all the refuge lands east and south of Uyak Bay. It encompasses the Kodiak Refugium and associated glacial lakes. The unit has a distinctive flora and rolling landscape that contrasts with the rest of the

Figure 5. Wilderness review units.



refuge. Four large lakes (Karluk, Frazer, Red and Akalura lakes), the Ayakulik/Red River, and the headwaters of the Karluk River are in this unit. The unit is renowned for its aggregation of species occurring in densities that are not found elsewhere. It contains some of the best brown bear habitat on earth, as well as key bald eagle feeding and nesting habitat.

Most of the Ayakulik/Uyak Unit meets the Wilderness Act criteria for size, ownership, natural integrity, apparent naturalness, solitude, and primitive recreation opportunities. It also has outstanding special values. Scattered areas along the coastline where development is concentrated, particularly in the Olga Bay area, may not meet the criteria of ownership, apparent naturalness, and outstanding opportunities for solitude.

Spiridon Peninsula/Uganik Island Unit (160,000 acres)

The Spiridon Peninsula and Uganik Island both extend into the Shelikof Strait. Both areas share many of the same qualities with the previously described units. The terrain consists of rolling hills and less rugged mountains. One major salmon stream (Little River) flows through the Spiridon Peninsula. Large numbers of black-tailed deer winter on the outer capes of the two areas. The unit also provides key habitat for brown bear.

Karluk Lake scenery.

The Spiridon Peninsula/Uganik Island Unit meets the Wilderness Act criteria for size, land ownership, natural integrity, apparent naturalness, solitude, and primitive recreation opportunities. Small developments along the coastline do not detract from the wilderness character of the area.

Zachar/Uganik Unit (614,000 acres)

This unit encompasses all of the refuge north of Uyak Bay, with the exception of the Spiridon and Uganik peninsulas and the Afognak Island Unit. The unit contains much of the most rugged and scenic mountainous terrain on Kodiak Island. Numerous streams provide extensive spawning areas for large runs of pink and coho salmon. The area provides prime denning and feeding habitat for brown bear. Most of the refuge's mountain goat population is found here.

Except for the 3,000-acre Terror Lake Hydroelectric Project Withdrawal Area, the Zachar/Uganik Unit meets the Wilderness Act criteria for size, ownership, natural integrity, apparent naturalness, solitude, and primitive recreation opportunities. It also has outstanding special features.

The west arm of the Terror Lake valley.

Red Peaks/Ban Island Unit (50,000 acres)

This area is located on the northwest side of Afognak Island facing Shelikof Strait. The terrain is extremely rugged. Except for the highest elevations, the area is completely covered with a stand of Sitka spruce. Brown bear, Roosevelt elk, bald eagle, deer, and other wildlife use the area extensively. The Forest Service recommended this unit for wilderness designation when it was part of the Chugach National Forest.

The Red Peaks/Ban Island Unit meets the Wilderness Act criteria for size, ownership, natural integrity, apparent naturalness, solitude, and primitive recreation. It also contains special features.

SIGNIFICANT POTENTIAL PROBLEMS

The ANILCA requires that significant problems that may adversely affect refuge fish and wildlife populations and habitats be described in the comprehensive conservation plan. Eleven potential problems have been identified for Kodiak Refuge:

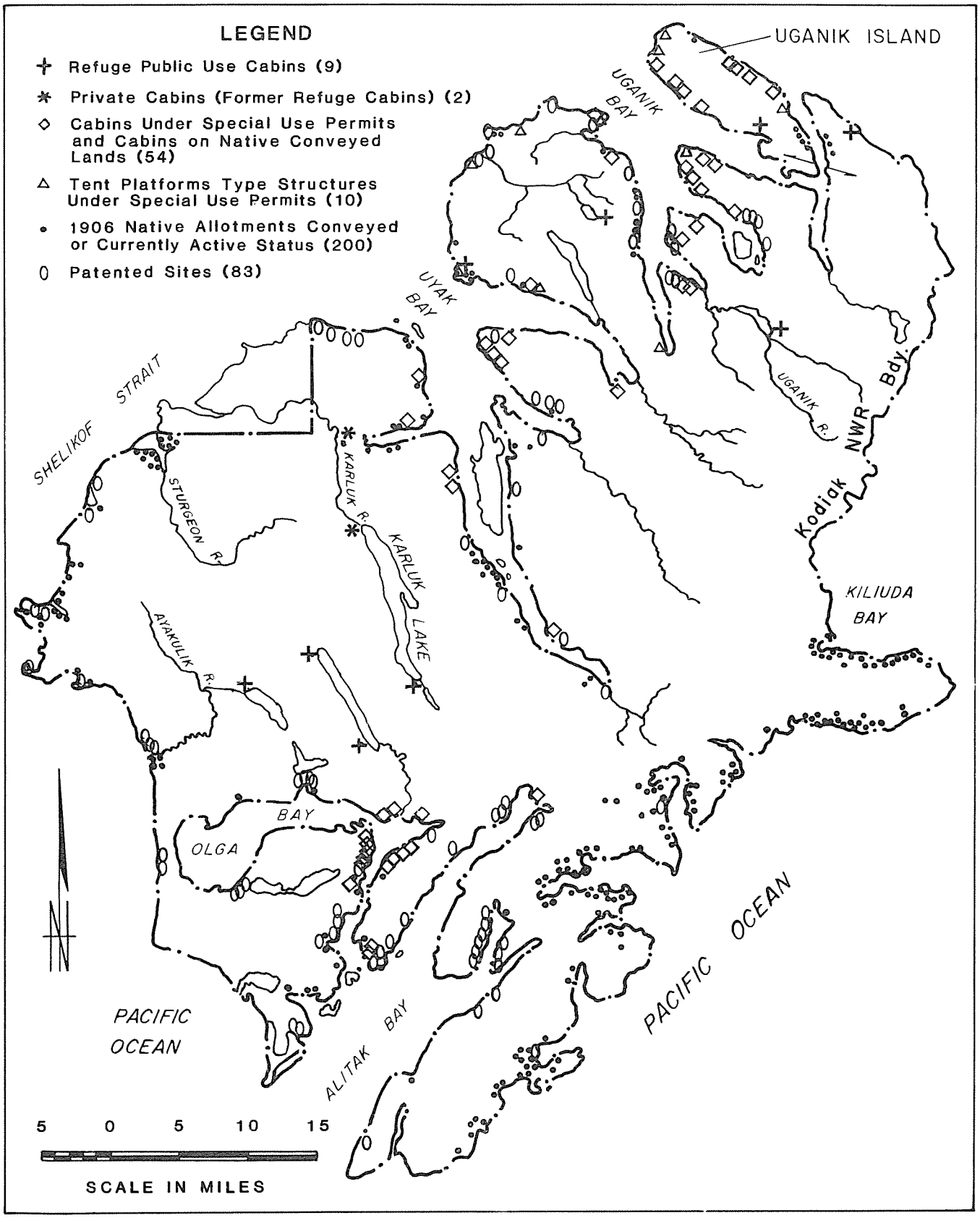
- **Development and use of existing commercial and public use facilities within the refuge boundary.** In 1985, there were at least 62 commercial fishing sites on refuge and Native lands within the refuge boundary, ten permitted commercial guide camps, nine public use cabins, and the Terror Lake hydroelectric project. In the future new proposals probably will be made to expand existing facilities or construct new facilities on refuge lands. These facilities have the potential to adversely affect, both directly and indirectly, fish and wildlife resources and user groups. Figure 6 shows the locations of areas where development has occurred, or could occur, within Kodiak Refuge.

- **Development and use of private inholdings and adjacent lands.** Development and use of Native village corporation lands, Native allotments, village sites, and private patented parcels within the refuge boundary, as well as private lands adjacent to the refuge, could impact bears and other fish and wildlife populations and habitats on the refuge.

- **Impacts due to increasing public use.** Fish and wildlife populations and habitats in environments such as those of Kodiak Refuge are sensitive to human disturbance. Brown bear, tundra swan, and nesting bald eagles are especially susceptible to disturbance. Public use of Kodiak Refuge is increasing, particularly on the refuge's major river systems and lakes. As public use increases, the potential for disturbance will increase. Increasing public use also is probably responsible for increased kills of brown bears in defense of life and property (DLPs).

- **Loss of wilderness values.** With more people using the refuge to hunt and fish, and development of commercial facilities on the refuge, the refuge's wilderness values are being eroded. If use continues to increase, the potential for overcrowding, litter, noise and water pollution will increase, while opportunities for solitude and primitive recreation will disappear along the coastline and major drainages.

Figure 6. Approximate locations of areas where development has occurred, or could occur, within Kodiak Refuge.



- **Subsistence, commercial and sport harvests of salmon.** Although carefully regulated to ensure maintenance of adequate breeding stocks, if salmon escapements decrease, for whatever reason, refuge resources and users could be adversely affected.

- **Fishery management activities.** Although most fishery management activities are compatible and necessary to ensure continuance of refuge fishery resources, some development projects could cause conflicts in the future. Fishery development projects that necessitate long-term human habitation in key wildlife habitats may result in direct adverse impacts to wildlife populations.

- **Conflicts between users.** As public use increases on the refuge, competition increases within user groups and between different user groups for limited resources such as salmon, cabins, or solitude. Although competition is currently at relatively low levels in most instances, the potential exists for competition to intensify. Competition is already perceived to be a problem by some local fishermen, who complain that nonlocal fishermen are taking too many fish.

Trash left by a group at a campsite on Spiridon Lake.

- **Grazing of domestic livestock.** Grazing of cattle or reindeer within or adjacent to the refuge boundary in the future would result in major problems. The grazing of these animals in prime bear habitat would inevitably result in additional bears being killed in defense of life and property.

- **Development of new hydroelectric facilities.** Interest has been expressed in expanding the capacity of the existing Terror Lake Hydroelectric Project, part of which lies within the refuge boundary. The construction and maintenance of new hydroelectric facilities could directly and indirectly impact fish and wildlife populations in the refuge.

- **Development of oil and gas staging facilities.** An oil or gas staging facility could be proposed in the refuge area if commercial deposits are discovered offshore. Although the facility probably would not be built on refuge lands, the impacts of building and operating the facility could spill over and adversely affect refuge resources and users.

- **Need for additional resource data.** Additional information on refuge resources, the uses people make of these resources, and the effects of people on the resources is needed for effective management of the refuge in the future. Additional research and monitoring are needed to record baseline conditions, determine management needs, assess potential impacts, and identify what actions are needed to minimize or avoid potential impacts.

SIGNIFICANT ISSUES

Many issues and subjects of concern were identified by the public during the early stages of planning. Nine issues were identified by the Service as being significant for the comprehensive conservation Plan:

- How does the Service plan to conserve fish and wildlife resources?
- What effect would fishery development projects have on the refuge's fish and wildlife resources?
- What procedures will the Service follow in applying refuge rules and regulations to Native lands subject to the provisions of Section 22(g) of the Alaska Native Claims Settlement Act (ANCSA)?
- What effect will the Service have on the level of recreational use?
- How will the Service manage guiding and outfitting activities and facilities?
- How will the Service manage the activities and onshore facilities of commercial fishermen?
- Should the Service permit oil and gas activities on the refuge?
- Should the Service permit additional hydroelectric development on the refuge?
- How will the Service protect the refuge's wilderness values?

PUBLIC COMMENTS ON THE DRAFT KODIAK REFUGE CCP/EIS

The draft Kodiak Refuge Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) was made available for public review and comment on November 25, 1985. A 90-day comment period was provided for the public to review the plan. The Service held five public meetings and one formal public hearing to receive comments on the draft CCP/EIS. During the comment period the Service received over 300 written responses from local, state and federal agencies, industry, conservation groups, Native and local groups, and concerned individuals. Copies of the letters and Service responses to selected comments can be found in the complete Kodiak Refuge CCP/EIS. Table 1 provides an overview of written comments the Service received.

In response to comments on the draft CCP/EIS, the Service revised the draft document. The major changes that were made in the draft document include the following:

- The description of issues in Chapter III, "Public Involvement," was completely rewritten. Significant issues are identified for both the comprehensive conservation plan and for wilderness designation.

Guided sport fishing party on the lower Thumb River, by Karluk Lake.

- The wilderness suitability review of refuge lands in Chapter V, "The Affected Environment," was expanded in the final plan.
- A new wilderness management category was added to Chapter VI, "The Management Alternatives."
- The discussion of wilderness management actions under each wilderness proposal in the alternatives was rewritten. The management actions now focus on the significant wilderness issues identified in Chapter III.
- Chapter VII, "The Environmental Consequences," was reorganized and expanded. New scenarios were added to assess the effects of wilderness designation.
- The discussion of management of Native lands subject to Section 22(g) in Chapter VI was completely rewritten.
- The common management direction on commercial fishing support facilities was revised.
- A new appendix was added to the plan which documents the expansion of commercial fishing activities on Kodiak Refuge, describes the problem facing the Service in maintaining the bear population, and provides the rationale for many of the management directions in the plan.
- The Service's position on fishery development projects in the draft plan was revised to reflect the Service's current fishery policies.
- The fishery management directions under each alternative were revised to accommodate where possible the concerns of ADF&G.
- A general discussion of the Service's policies on wildlife introductions on the refuge, and general management goals for deer and sea otter were added to the "Management Alternatives" chapter.
- The "Economic Uses" common management direction in Chapter VI was revised to address proposals to expand the Terror Lake Hydroelectric Project.
- A common management direction on oil and gas support facilities was added to Chapter VI in the final plan.
- A formal compatibility determination on oil and gas leasing, including exploration and development, was included as an appendix to the plan.
- A new chapter has been added to the final plan on implementation and revision of the refuge comprehensive conservation plan.

THE MANAGEMENT ALTERNATIVES

The ANILCA requires the Service in the Kodiak Refuge Comprehensive Conservation Plan to: 1) designate areas within the refuge according to their respective resources and values; 2) specify management programs to conserve fish and wildlife resources in each area; and 3) specify what uses may be compatible within these areas. To do these things, and to examine alternative ways in which conflicting demands for refuge resources could be resolved, the Service developed "management categories."

MANAGEMENT CATEGORIES

The Service identified four different management categories that could be applied to Kodiak Refuge. Each management category provides general direction for managing a given area in light of its resources and existing and potential uses. These management categories, and the uses permitted in them, are the primary "building blocks" from which the alternatives for managing Kodiak Refuge were developed. Table 2 shows what management activities and uses would be permitted in each management category.

Table 1. Analysis of written comments on the draft Kodiak Refuge CCP/EIS.

	State of Alaska	Citizens Advisory Commission on Federal Areas	Kodiak Is. Borough & Fish and Game Advisory Committee	Regional Corps. & Native Groups (9)	Commercial Fishing Interests (13)	Guides, Outfitters & Related Business (9)	Other Industry (KEA, Oil Companies, etc.) (5)	Conservation Groups (19)	Kodiak Residents (34)	Alaska Residents (Outside of Kodiak) (95)	Lower 48 Residents (245)	TOTALS (433)	Pro / Con
Alternative A (Current situation)		1	1			2	1		2	1		8	
					1		1		1	1	8	12	
Alternative B							2					2	
			1	1	2		2	1	1		8	16	
Alternative C (Preferred Alternative					1				2		1	4	
			1	2			2	2	2	3	15	27	
Alternative D				1		4		16	17	74	231	343	
			1				2		3	2		8	
FISHERIES													
Allow new permanent fishery development facilities in refuge	1		2	4	7		1	1	4			20	
								2	3	1	14	20	
Allow fishery development activities (e.g. fertilization)	1		2	2	7		1		1	1		15	
								1	1		11	13	
Do separate EIS on state's Karluk Lake Project								2	1		35	38	
Impacts of setnetters are overstated		1			8							9	
CABINS													
Remove all cabins											9	9	
Maintain cabins (commercial and public) at existing levels					1			7	12	51	96	167	
			1	2					1			4	
Provide for expansion of existing setnetter cabins	1	1	1		8							11	
Allow setnetters in tents to build permanent cabins	1	1	1		8				3			14	
WILDERNESS													
Designate a portion of the refuge as wilderness					3	6		18	23	73	217	340	
	1	1	1	2	1	1	1		2	4		14	
Add additional wilderness (over Alternative C)				1		4		17	16	48	178	264	
	1	1	1	3	1	1	2		3	3		16	
Provide coastal areas with same level of protection as interior						2		11	10	60	117	200	

Table 1. Analysis of written comments on the draft Kodiak Refuge CCP/EIS (continued).

	State of Alaska	Citizens Advisory Commission on Federal Areas	Kodiak Is. Borough & Fish and Game Advisory Committee	Regional Corps. & Native Groups (9)	Commercial Fishing Interests (13)	Guides, Outfitters & Related Business (9)	Other Industry (KEA, Oil Companies, etc.) (5)	Conservation Groups (19)	Kodiak Residents (34)	Alaska Residents (Outside of Kodiak) (95)	Lower 48 Residents (245)	TOTAL (433)	Pro / Con
22(g)													
Acquire or trade for high priority 22(g) lands				2		2		9	10	56	111	190	
Ensure that 22(g) lands are under same regs. as refuge lands				2					2	25	2	29	2
Increase level of protection for 22(g) lands				3				2		3	35	40	3
PUBLIC USE													
Maintain public use at existing levels								1		7	14	22	
Regulate unguided use				1				1	2		2	4	2
Maintain guides and outfitters at existing levels					1	3		10	6	48	97	164	2
WILDLIFE													
Protect brown bears and their habitats						3		8	5	14	40	70	
Provide for a brown bear sanctuary (closed to hunting)								2	1	3	54	60	
Introduction of exotic species					1			4	2	1	12	19	1
OTHER ISSUES													
Prohibit livestock grazing and use of pack animals								4	2	3	16	25	
Prohibit helicopters, ORV's and other non-motorized access						1		3	5	4	21	34	
Provide for oil and gas activities							2	2		1	18	2 / 21	
Provide for expansion of the Terror Lake hydroelectric project	1				1		1					2	1
CCP is inconsistent with the local coastal zone plan	1		1									2	

Table 2. Summary of permitted activities and uses on Kodiak Refuge.

LAND MANAGEMENT CATEGORY / MANAGEMENT ACTIVITIES	I MODERATE MANAGEMENT	II MINIMAL MANAGEMENT	III WILDERNESS MANAGEMENT	IV SPECIAL RIVER MANAGEMENT
HABITAT/POPULATION MANAGEMENT ACTIVITIES				
• Research and management studies	■	■	■	■
• Ecological monitoring	■	■	■	■
• Fish and wildlife inventories	■	■	■	■
• Marking and banding	■	■	■	■
• Habitat manipulation	◧	◧	◧	◧
• Native wildlife species introduction	◧	◧	◧	◧
• Exotic wildlife species introduction	□	□	□	□
• Wildlife stocking	◧	◧	◧	◧
• Predator control	◧	◧	◧	◧
• Pest control	◧	◧	◧	◧
• Disease prevention and control	◧	◧	◧	◧
• Fire management	■	■	■	■
• Water quality and quantity	■	■	■	■
FISHERIES DEVELOPMENT				
• Fish passes [a/]	◧	◧	◧	◧

a/ The existing Frazer fish pass would continue to be permitted.

■ Activity or use is permitted

◧ Activity or use may be permitted based on a site-specific environmental assessment; a compatibility determination must be made for this activity or use

□ Activity or use is not permitted, or will not be administratively undertaken

Table 2. Summary of permitted activities and uses on Kodiak Refuge (continued).

LAND MANAGEMENT CATEGORY / MANAGEMENT ACTIVITIES	I MODERATE MANAGEMENT	II MINIMAL MANAGEMENT	III WILDERNESS MANAGEMENT	IV SPECIAL RIVER MANAGEMENT
HABITAT/POPULATION MANAGEMENT ACTIVITIES				
• Fish weirs	◧	◧	◧	◧
• Spawning channels	◧	◧	◧	◧
• Fish hatcheries [a/]	◧	◧	◧	◧
• Fish egg taking sites	◧	◧	◧	◧
• Physical habitat modifications	◧	◧	◧	◧
• Chemical habitat modifications	◧	◧	◧	◧
• Supplemental fish production	◧	◧	◧	◧
• Predator/competitor control	◧	◧	◧	◧
• Native fish reintroductions	◧	◧	◧	◧
• Native fish introductions	◧	◧	◧	◧
• Exotic fish introductions	◫	◫	◫	◫
SUBSISTENCE				
• Fishing, hunting, trapping, berry picking	■	■	■	■
• Access	■	■	■	■

a/ The existing Thumb River egg-taking and incubation facility would continue to be permitted.

■ Activity or use is permitted

◧ Activity or use may be permitted based on a site-specific environmental assessment; a compatibility determination must be made for this activity or use

◫ Activity or use is not permitted, or will not be administratively undertaken

Table 2. Summary of permitted activities and uses on Kodiak Refuge (continued).

MANAGEMENT ACTIVITIES / LAND MANAGEMENT CATEGORY	I MODERATE MANAGEMENT	II MINIMAL MANAGEMENT	III WILDERNESS MANAGEMENT	IV SPECIAL RIVER MANAGEMENT
PUBLIC USES				
• Hunting, fishing and trapping	■	■	■	■
• Wildlife observation	■	■	■	■
• Interpretation and environmental education	■	■	■	■
PUBLIC ACCESS METHODS*				
• Non-motorized (foot travel, boats without motors)	■	■	■	■
• Pack animals	☐	☐	☐	☐
• Motorboats	■	■	■	◧
• Float planes	■	■	■	◧
• Land planes	◧	◧	◧	◧
• Helicopters	☐	☐	☐	☐
• Snowmobiles	◧	◧	◧	◧
• Other motorized vehicles	☐	☐	☐	☐

*Restrictions subject to Sections 811 and 1110 of ANILCA.

■ Activity or use is permitted

◧ Activity or use may be permitted based on a site-specific environmental assessment; a compatibility determination must be made for this activity or use

☐ Activity or use is not permitted, or will not be administratively undertaken

Table 2. Summary of permitted activities and uses on Kodiak Refuge (continued).

LAND MANAGEMENT CATEGORY / MANAGEMENT ACTIVITIES	I MODERATE MANAGEMENT	II MINIMAL MANAGEMENT	III WILDERNESS MANAGEMENT	IV SPECIAL RIVER MANAGEMENT
PUBLIC FACILITIES				
• Primitive camping	■	■	■	◧
• Improved campsites	◧	◫	◫	◫
• Other temporary facilities (new)*	◧	◫	◫	◫
• Public use cabins (new)	◧	◫	◫	◫
• Visitor contact facilities	◧	◫	◫	◫
• Foot trails	◧	◧	◧	◧
• Remote navigation aids/communication stations/weather stations	◧	◧	◧	◧
ECONOMIC USES**				
• Surface geology studies	◧	◧	◧	◧
• Core sampling	◧	◧	◧	◧
• Seismic (geophysical) studies	◧	◧	◧	◧
• Other geophysical studies	◧	◧	◧	◧
• Oil and gas leasing	◫	◫	◫	◫
• Oil and gas support facility	◫	◫	◫	◫

* Restrictions are subject to the provisions of Section 1316 of ANILCA.

** Geothermal development, coal leasing, and hard rock mining are prohibited by law.

■ Activity or use is permitted

◧ Activity or use may be permitted based on a site-specific environmental assessment; a compatibility determination must be made for this activity or use

◫ Activity or use is not permitted

Table 2. Summary of permitted activities and uses on Kodiak Refuge (continued).

LAND MANAGEMENT CATEGORY / MANAGEMENT ACTIVITIES	I MODERATE MANAGEMENT	II MINIMAL MANAGEMENT	III WILDERNESS MANAGEMENT	IV SPECIAL RIVER MANAGEMENT
ECONOMIC USES				
• Sand and gravel removal	☐	☐	☐	☐
• Hydroelectric power development	◧*	☐*	☐	☐
• Transmission lines/pipelines	◧	☐	☐	☐
• Guiding/outfitting/transporting	■	■	■	■
• Commercial fishing support facilities (new sites)	☐	☐	☐	☐
• Seafood processing (new)	☐	☐	☐	☐
• Private aquaculture support facilities	☐	☐	☐	☐
• Grazing	☐	☐	☐	☐

* The Hidden Basin diversion may be permitted to expand the Terror Lake Hydroelectric Project if determined to be compatible with refuge purposes.

■ Activity or use is permitted

◧ Activity or use may be permitted based on a site-specific environmental assessment; a compatibility determination must be made for this activity or use

☐ Activity or use is not permitted

- **Moderate management areas (I)** are intended to provide opportunities for public use and limited commercial development, while protecting fish and wildlife populations and habitats. Access by floatplanes, motorboats and snowmachines for recreational purposes would be permitted with reasonable regulations. Increased opportunities or recreational uses could be provided in these areas. Guiding and transporter/outfitting services and related temporary support facilities would be permitted, with reasonable regulations. Existing onshore commercial fishing facilities on refuge lands would continue to be permitted.

- **Minimal management areas (II)** are intended to maintain existing fish and wildlife resources and other resources values in their present state. These lands generally would not be subjected to habitat alterations. Thus, minimal management areas are suitable for wilderness designation, although the Service's wilderness proposals do not necessarily include all lands in this category. Opportunities for public use and access would be available for subsistence purposes and for traditional recreational activities. Guiding and outfitting would be permitted. Existing commercial fishing support facilities would continue to be permitted, but other economic developments generally would not be permitted. Fisheries development facilities may be built in these areas if they are compatible with refuge purposes. New management facilities would be built by the Service only as needed to properly administer the refuge.

- **Designated wilderness (III)** does not presently exist on Kodiak Refuge. This category would only apply after Congress formally designates a wilderness area in the refuge. In accordance with the Wilderness Act, the Service would manage the area to maintain wilderness resources and values, preserve the wilderness character of the biological and physical features, and provide opportunities for research, subsistence, and recreation. Opportunities for public use and access would be available for subsistence purposes and for traditional recreational activities. Guiding and outfitting would be permitted. Existing commercial fishing support facilities would continue to be permitted, but other economic developments generally would not be permitted. New permanent structures would be permitted only for administrative, public safety or subsistence purposes. Chain saws may be used for subsistence purposes, but other motorized equipment, such as generators and water pumps, would not be permitted unless it is a minimum tool for administrative purposes.

- **Special river management areas (IV)** are established in recognition of important resource values of the refuge's drainages and adjacent lands, their interest to the public, and the special management concerns they pose to the Service. The Service would protect and maintain the biological qualities of the drainages and adjacent refuge lands. Public use would be managed to maintain the drainages' resource values and recreational values. River management plans would be completed for all of the drainages in this category. These plans would form the foundation for future use and access regulations that may be required.

MANAGEMENT OF NATIVE CONVEYED LANDS

Native lands within Kodiak Refuge are subject to the provisions of Section 22(g) of the Alaska Native Claims Settlement Act (ANCSA). The Service is concerned with protecting the important resource values of these private lands, while also enabling the Native landowners to derive economic benefits from their land. To ensure that resource values are protected, the Service will promulgate regulations that specify what uses and developments are in compliance with refuge rules and regulations, and what stipulations or mitigation measures may be necessary. These regulations "...shall permit such uses that will not materially impair the values for which the refuge was established " (43 CFR 2650.4-6(b)). The Service will work together with the Native corporations in developing these regulations so that Native and federal interests on Native lands are balanced.

COMMON MANAGEMENT DIRECTIONS

Management of Kodiak Refuge under any alternative is governed by federal laws, Service policies, and principles of sound resource management--all of which restrict the range of potential activities. Accordingly, certain management directions must be implemented in all of the management alternatives for Kodiak Refuge. These common management directions include:

- managing the Mount Glottof Research Natural Area as a minimal management area or as a wilderness area, if designated by Congress, to protect the natural resource and research values of this area;
- coordinating management with other resource management agencies, and cooperating with owners of refuge inholdings and adjacent lands;
- working with the State of Alaska to ensure that all Service actions taken under this plan are consistent with the state approved coastal zone management plan;
- collecting data on fish and wildlife species, public use, and other topics that are of high management concern;
- ensuring that fish and wildlife populations and ecological relationships necessary to conserve natural diversity are maintained;
- permitting existing Alaska Department of Fish & Game (ADF&G) fish management structures (e.g., the Frazer Falls fish pass, weirs, and egg-take and incubation facilities on the upper Thumb River) to continue operations;
- working with ADF&G to maintain the refuge's fish and wildlife populations;
- ensuring the Service is in compliance with state water quality standards for refuge waters;
- ensuring that subsistence opportunities are maintained by assessing potential impacts of proposed uses or activities, conducting research, enforcing regulations, and monitoring fish and wildlife populations and uses;
- maintaining opportunities for hunting, fishing, trapping, and other wildlife-oriented activities on the refuge;
- providing reasonable access onto the refuge so visitors can participate in wildlife-oriented activities;

- o permitting the use of motorboats, airplanes, and non-motorized surface transportation methods for traditional activities on refuge lands, and for travel to and from villages and homesites, subject to reasonable regulations;
- o requiring special use permits for all commercial users on the refuge, including air taxi operators and marine boat transporters taking people into the refuge;
- o permitting guides and outfitters to use the refuge, subject to stipulations to reduce the potential for resource impacts; tents would be permitted, but no new permanent structures;
- o limiting, if necessary, on a seasonal or area-specific basis how long groups in tents can stay at at one location;
- o permitting oil and gas studies, including seismic surveys, throughout the refuge on a case-by-case basis, subject to a determination of compatibility with refuge purposes and consistency with management objectives;
- o prohibiting oil and gas exploration and development on refuge lands;

The Service's brown bear management goal is to maintain a viable population with a diversity of all sex and age classes for the benefit of both consumptive and nonconsumptive users.

- o permitting an oil and gas support facility on refuge lands only if the facility is determined to be compatible with refuge purposes and the refuge comprehensive conservation plan is revised;
- o permitting the Hidden Basin diversion to expand the Terror Lake Hydroelectric Project if it is determined to be compatible with refuge purposes; and
- o allowing commercial fishing support facilities on sites under permit in 1985 to continue operating on the refuge, subject to reasonable regulations; the conversion of some temporary facilities into permanent facilities will be permitted; the expansion of existing facilities may be permitted; no new facilities on new sites will be permitted.

DESCRIPTION OF THE ALTERNATIVES AND ENVIRONMENTAL CONSEQUENCES

Based on the purposes, resources, issues, and opportunities unique to Kodiak Refuge, four management alternatives were developed to guide management of the refuge. The alternatives are general in nature and provide broad strategies for management of refuge resources and uses for the next 10-15 years. Each of the alternatives designates areas within the refuge using the management categories described previously. Although the alternatives share common strategies, each alternative has a distinct overall management emphasis.

Each alternative includes a map showing the location and size of the management categories. The maps are intended to only generally portray the alternatives and do not show all of the patented lands and Native allotments within the refuge boundary.

To evaluate the effects of each alternative the Service developed scenarios that describe events likely to occur on the refuge. These scenarios, and the definitions of the magnitudes of the impacts, are described in the complete Kodiak Refuge Comprehensive Conservation Plan/Environmental Impact Statement.

ALTERNATIVE A (THE CURRENT SITUATION)

Alternative A, the "no action" alternative, would maintain the status quo on Kodiak Refuge. In this alternative the Service would maintain the refuge's fish and wildlife values and natural diversity. Opportunities for hunting, fishing and other wildlife-oriented uses and subsistence uses would be maintained. Additional guides and outfitters would be permitted to use the refuge. New temporary commercial support facilities may be permitted in the moderate management areas on the coast. No areas would be proposed for wilderness designation.

ALTERNATIVE A

COMPREHENSIVE CONSERVATION PLAN/EIS
KODIAK NATIONAL WILDLIFE REFUGE

N

Minimal Management

Moderate Management

Native Lands
(Subject to Section 22(g))

SHELIKOF STRAIT

Ban Island

Afognak Island

Raspberry Island

Kupreanof Strait

Whale Island

Marmot Bay

Uganik Island

Viekoda Bay

Uganik Bay

Port Lions

Spiridon Bay

Uyak Bay

Karluk

Larsen Bay

Terror Lake Power Project Withdrawal

MT. GLOTTOF RESEARCH NATURAL AREA

Ugak Bay

Kiliuda Bay

Old Harbor

Sitkalidak Island

Olga Bay

Kaiugnak Bay

Deadman Bay

Akhiok

Alitak Bay

5 0 5 10
Miles

ALASKA

Bering Sea

Anchorage

KODIAK NWR

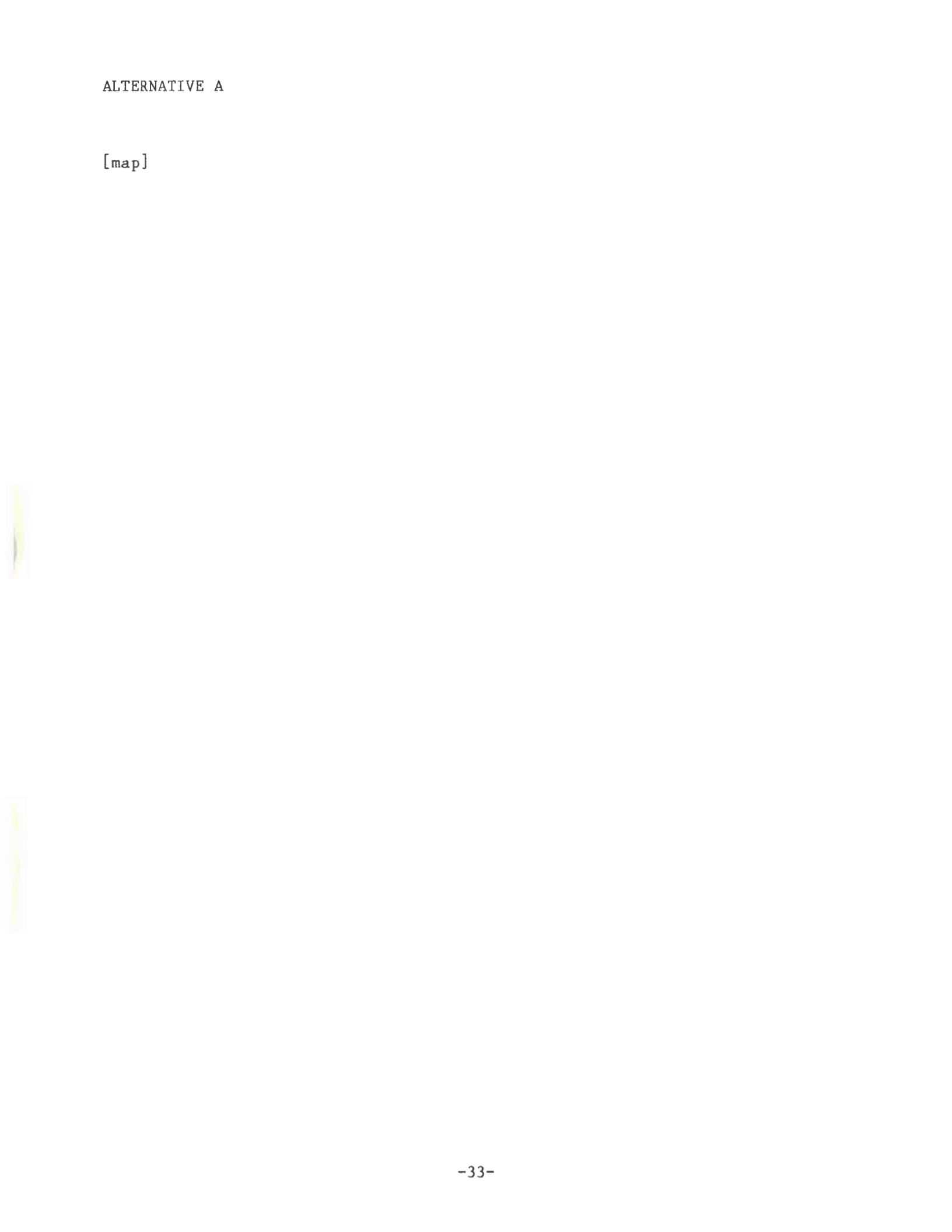
Gulf of Alaska

Kodiak Island

LOCATION OF KODIAK REFUGE

Figure 36. Alternative A

ALTERNATIVE A



Management Directions

Alternative A would:

- maintain the refuge in an undeveloped state;
- emphasize the maintenance of the refuge's natural diversity and key fish and wildlife populations and habitats;
- provide for continued subsistence use of refuge resources;
- maintain traditional access opportunities;
- maintain opportunities for hunting, fishing, trapping, and other wildlife-oriented activities in the refuge;
- permit guides and outfitters to operate in the refuge, with temporary support facilities in designated areas;
- permit commercial fishermen to continue using support facilities on the refuge's coastline, with opportunities to convert some existing temporary structures to permanent structures on sites under permit in 1985; and
- propose no areas for wilderness designation.

Environmental Consequences of Alternative A

Fish and Wildlife
- Negligible effects on sockeye, chinook, chum and pink salmon, waterfowl, shorebirds, raptors, marine birds.
- Negligible effects overall on brown bear, with possible minor to moderate impacts in localized areas.
- Minor adverse impacts to marine mammals.
- Possible moderate adverse impacts to coho salmon and rainbow trout, and minor adverse impacts to steelhead.

Water Quality and Quantity
- Increased erosion in localized areas, but no significant changes in water quality or quantity.

Population and Economy
- Seasonal increase in the population of the city of Kodiak.
- Minor benefits to the city of Kodiak's economy, primarily to recreation-related businesses.

Subsistence
- No significant effect on important resources or the harvest of these resources.

Recreation
- Increased competition and perceived overcrowding in popular fishing and hunting areas.
- Negligible effect on nonconsumptive users and no effect on bear hunters.

Cultural Resources
- Moderate adverse impacts from increased public use, with severe localized impacts possible.

Wilderness Values
- Potential for loss of wilderness values from increased public use and new developments in the refuge.

ALTERNATIVE B

Under Alternative B the Service would continue to protect fish and wildlife populations and habitats, while providing opportunities for additional public use and limited commercial uses. Opportunities for hunting, fishing and other wildlife-oriented uses would be increased by providing new public use cabins or developed campsites, increasing the number of permits for guides and outfitters that wish to operate on the refuge, and providing additional opportunities for guides and outfitters to use temporary facilities on designated areas in the refuge. Seventy-three percent of the refuge would be proposed for wilderness designation.

Management Directions

Alternative B shares the following management directions with Alternative A (the Current Situation). Alternative B would:

- maintain the refuge in a relatively undeveloped state;
- emphasize the maintenance of the refuge's natural diversity and key fish and wildlife populations and habitats;
- maintain opportunities for hunting, fishing, trapping, and other wildlife-oriented activities in the refuge;
- maintain traditional access opportunities;
- provide for continued subsistence use of refuge resources; and
- permit commercial fishermen to continue using support facilities on the refuge's coastline, with the opportunity to convert some existing temporary facilities to permanent facilities.

The following management directions indicate the major differences in Alternative B from Alternative A. Alternative B would:

- provide significantly more opportunities for sport fish guide and outfitters on the refuge;
- provide additional opportunities for guides and outfitters to use temporary support facilities in designated parts of the refuge;
- provide additional cabins or campsites for the public to use; and
- propose most of the Kodiak Refuge interior for wilderness designation.

Environmental Consequences of Alternative B

Fish and Wildlife

- Negligible effects on sockeye, chinook, coho, chum and pink salmon, shorebirds, and marine birds.
- Minor adverse impacts on the marine mammals, waterfowl and raptors, with moderate adverse impacts possible to waterfowl and raptors in localized areas.
- Possible minor to moderate adverse impacts on brown bear in localized areas due to increased public use.
- Possible moderate adverse impacts to rainbow trout and steelhead.

Water Quality and Quantity

- Increased erosion in localized areas, but no significant changes in water quality or quantity.

ALTERNATIVE B.

[map]

ALTERNATIVE B

COMPREHENSIVE CONSERVATION PLAN/EIS
KODIAK NATIONAL WILDLIFE REFUGE

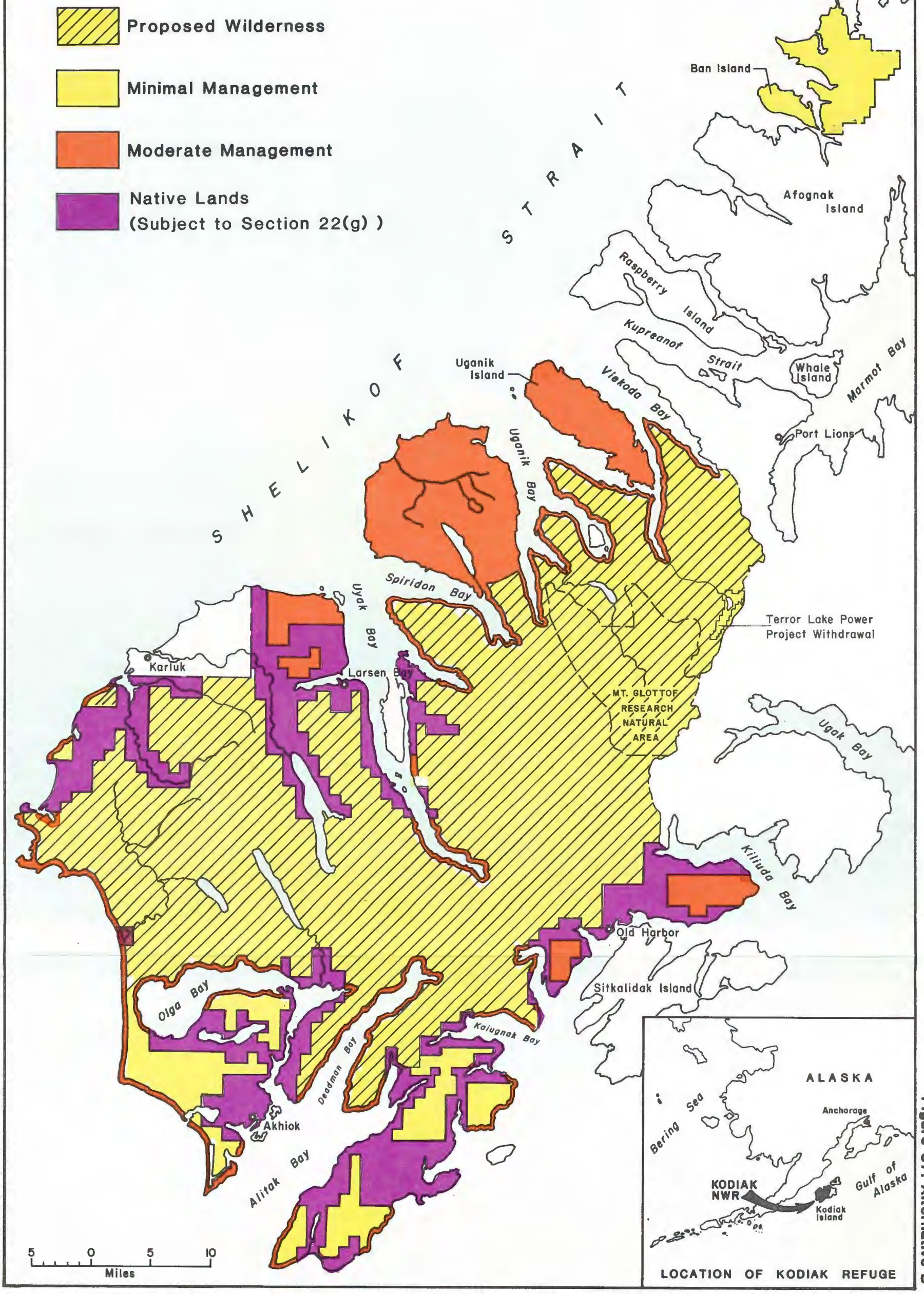


Figure 37. Alternative B

Population and Economy
- o Greatest seasonal increase in the population of the city of Kodiak of the four alternatives.
- o Minor benefits to the city of Kodiak's economy, primarily to recreation-related businesses.

Subsistence
- o No significant effect on important resources or the harvest of these resources.

Recreation
- o Increased numbers of sport hunters and fishermen would use the refuge compared to Alternative A.
- o Substantial increases in competition and perceived overcrowding for all user groups.

Cultural Resources
- o Moderate adverse impacts from increased public use, with severe localized impacts possible.

Environmental Consequences of the Wilderness Proposal (73% of the refuge proposed for wilderness designation)

Wilderness Values
- o The proposal would help maintain wilderness values on 1,155,000 acres;
- o There would be the potential for loss of wilderness values in the non-wilderness area from increased public use and new developments.[a/]

Fish and Wildlife
- o The wilderness proposal would help maintain fish and wildlife resources in the refuge interior.

Fishery Development Facilities
- o Two potential fishery development facilities to enhance salmon populations would be precluded in the wilderness area, foregoing opportunities to increase the refuge's fisheries and to realize potential benefits to the local economy.

[a/] The term "non-wilderness" in this document refers to areas not proposed to Congress for wilderness designation. It does not refer to the area's wilderness suitability--an area may be de facto wilderness and still be labeled "non-wilderness."
In the future proposals may be made to develop an oil and gas support facility in the non-wilderness area. It is important to note, however, that this potential project could only be permitted if the Service determined it is compatible with refuge resources and the refuge comprehensive conservation plan is revised.

Alternative C (The Preferred Alternative)

Alternative C describes the way in which the Service proposes to manage Kodiak Refuge. Alternative C emphasizes protection of fish and wildlife populations and habitats, while providing for some limited increases in public use. Special attention would be devoted to protecting the resource values in the Sturgeon, Karluk, Ayakulik/Red and Dog Salmon drainages. Opportunities for hunting, fishing and other wildlife-oriented uses would be maintained. Additional opportunities would be provided for commercial guides and outfitters to use temporary support facilities and for other commercial uses along the coast. Seventy-three percent of the refuge lands would be proposed for wilderness.

Alternative C shares the following management directions in common with Alternative A (the Current Situation). Alternative C would:

- maintain the refuge in an undeveloped state;
- emphasize the maintenance of the refuge's natural diversity and key fish and wildlife populations and habitats;
- maintain opportunities for hunting, fishing, trapping, and other wildlife-oriented activities in the refuge;
- maintain traditional access opportunities;
- provide for continued subsistence use of refuge resources;
- permit commercial fishermen to use support facilities on the refuge's coastline, with opportunities to convert some existing temporary facilities to permanent facilities; and
- permit guides and outfitters opportunities to use temporary facilities in designated portions of the refuge.

The following management directions indicate the major differences in Alternative C from Alternative A. Alternative C would:

- provide additional opportunities for guided sport fishing in the refuge;
- provide increased protection of fish and wildlife resources on coastal areas;
- manage use on the Ayakulik/Red, Sturgeon, Karluk and Dog Salmon drainages to protect sensitive fish and wildlife resources and provide a primitive recreational experience; and
- propose most of the suitable areas in the refuge interior and the heads of key bays for wilderness designation.

Environmental Consequences of Alternative C

Fish and Wildlife

- Negligible effects on sockeye, chinook, coho, chum and pink salmon, waterfowl, shorebirds, raptors, and marine birds.
- Negligible to minor effects overall on brown bear.
- Minor adverse impacts to marine mammals and steelhead.
- Moderate adverse long-term impacts to rainbow trout.

Water Quality and Quantity

- Increased erosion in localized areas, but no significant changes in water quality or quantity.

ALTERNATIVE C

COMPREHENSIVE CONSERVATION PLAN/EIS
KODIAK NATIONAL WILDLIFE REFUGE

Proposed Wilderness

Minimal Management

Moderate Management

Native Lands
(Subject to Section 22(g))

Special River Management

N

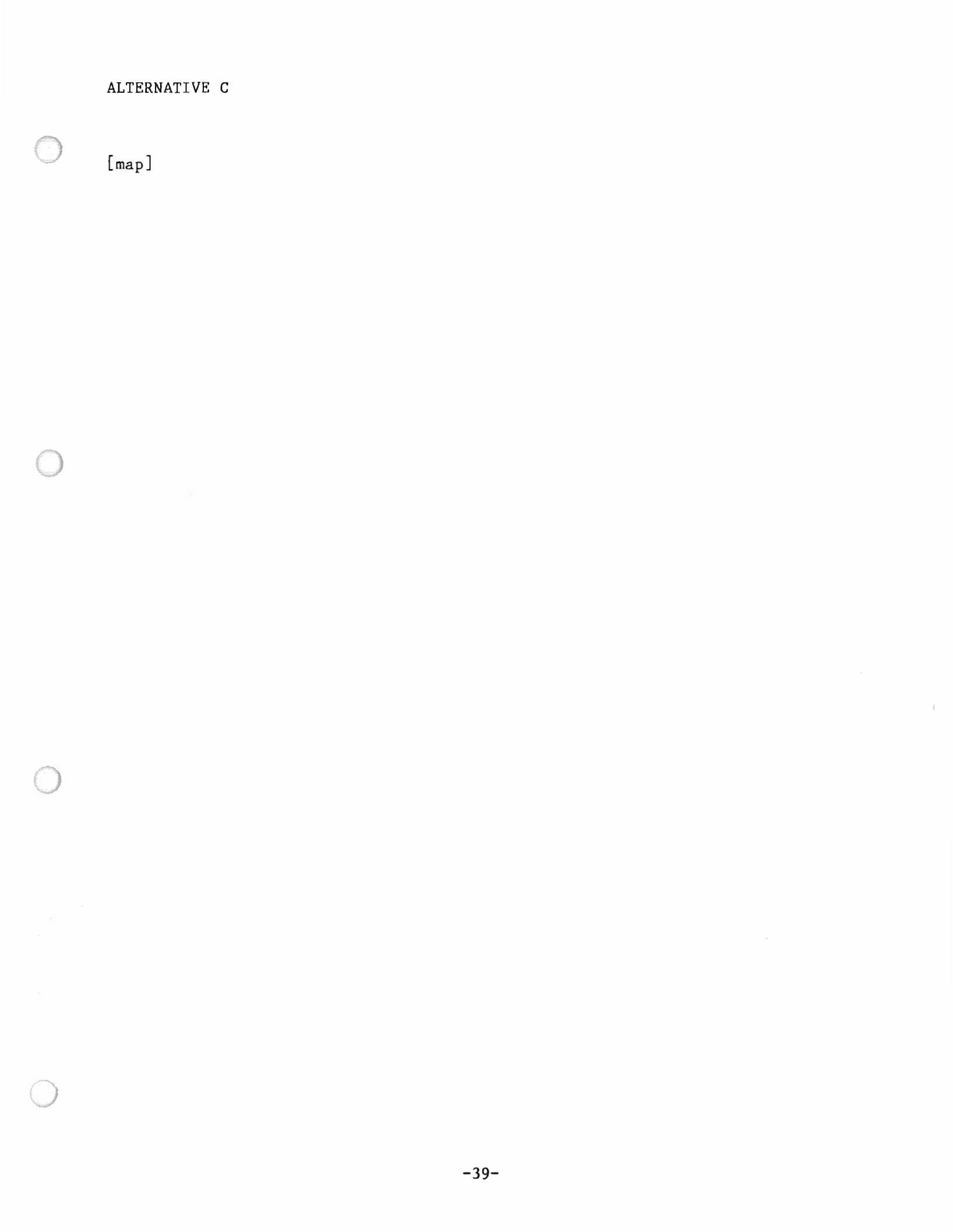
Ban Island
Afognak Island
Raspberry Island
Kupreanof Strait
Whale Island
Marmot Bay
Viekoda Bay
Uganik Island
Uganik Bay
Port Lions
Spiridon Bay
Uyak Bay
Karluk
Larsen Bay
Terror Lake Power Project Withdrawal
MT. GLOTTOF RESEARCH NATURAL AREA
Ugak Bay
Kiliuda Bay
Old Harbor
Sitkalidak Island
Olga Bay
Kaiugnak Bay
Deadman Bay
Akhiok
Alitak Bay
SHELIKOF STRAIT

5 0 5 10
Miles

ALASKA
Bering Sea
Anchorage
KODIAK NWR
Gulf of Alaska
Kodiak Island
LOCATION OF KODIAK REFUGE

Figure 38. Alternative C

ALTERNATIVE C



Population and Economy
- o Slight seasonal increase in the population of the city of Kodiak.
- o Minor benefits to the city of Kodiak's economy, primarily to recreation-related businesses.

Subsistence
- o No significant effect on important resources or the harvest of these resources.

Recreation
- o Reduced competition and perceived overcrowding in popular fishing and hunting areas relative to Alternatives A and B.
- o Negligible effect on nonconsumptive users and bear hunters.

Cultural Resources
- o Moderate adverse impacts from increased public use, with severe localized impacts possible.

Environmental Consequences of the Wilderness Proposal (73% of the refuge proposed for wilderness designation)

Wilderness Values
- o The proposal would help maintain wilderness values on 1,170,000 acres;
- o There would be the potential for loss of wilderness values in the non-wilderness area from increased public use and new developments.[a/]

Fish and Wildlife
- o The wilderness proposal would help maintain fish and wildlife resources in the refuge interior and at the heads of key bays.

Fishery Development Facilities
- o Two potential fishery development facilities to enhance salmon populations would be precluded in the wilderness area, foregoing opportunities to increase the refuge's fisheries and to realize potential benefits to the local economy.

[a/] In the future proposals may be made to develop an oil and gas support facility in the non-wilderness area. It is important to note, however, that this potential project could only be permitted if the Service determined it is compatible with refuge resources and the refuge comprehensive conservation plan is revised.

ALTERNATIVE D

Of all the alternatives considered, Alternative D would provide the maximum protection to fish and wildlife values. The Service would restore important habitat on the coastline by removing existing commercial support structures when operations cease or are abandoned. Special attention would be devoted to protecting the resource values in the Sturgeon, Karluk, Ayakulik/Red and Dog Salmon drainages. Opportunities for hunting, fishing and other wildlife-oriented uses would continue to be provided in the refuge, although the growth in both guided/outfitted and unguided use, and access may be limited in parts of the refuge to minimize potential resource impacts. Commercial uses would be limited to existing commercial fishing support facilities and guiding and outfitting. Existing permanent and temporary commercial support structures would continue to be allowed, but the Service would work with the users to move structures where there are resource concerns. New commercial operators would be based out of tents that would be removed--no new permanent or temporary support facilities would be permitted in the refuge. In this alternative all of the refuge lands, except the Terror Lake Hydroelectric Project Withdrawal Area, would be proposed for wilderness designation.

Alternative D has the following similarities with Alternative A (the Current Situation). Alternative D would:

- maintain the refuge in an undeveloped state;
- emphasize the maintenance of the refuge's natural diversity and key fish and wildlife populations and habitats;
- maintain traditional access opportunities;
- provide for continued subsistence use of refuge resources;
- permit guides and outfitters to operate in the refuge, with limited support facilities in designated areas; and
- permit commercial fishermen to continue using existing support facilities on the refuge's coastline, with opportunities to convert some existing temporary facilities to permanent facilities.

The following management directions indicate the major differences in Alternative D from Alternative A. Alternative D would:

- restore fish and wildlife habitat along coastal areas by removing commercial support facilities when operations cease;
- manage use on the Ayakulik/Red, Sturgeon, Karluk and Dog Salmon drainages to protect sensitive fish and wildlife resources and to provide a primitive recreational experience;
- reduce the number of public use cabins in the refuge;
- reduce the number of permitted sport fish guides and outfitters;
- require guides and outfitters operating in the refuge to use tents;
- regulate the number of unguided users in the refuge if necessary; and
- propose all of the refuge's suitable lands for wilderness designation.

ALTERNATIVE D

[map]

ALTERNATIVE D

COMPREHENSIVE CONSERVATION PLAN/EIS
KODIAK NATIONAL WILDLIFE REFUGE

N

Proposed Wilderness

Minimal Management

Native Lands
(Subject to Section 22(g))

Special River Management

SHELIKOF STRAIT

Ban Island

Afognak Island

Raspberry Island

Kupreanof Strait

Whale Island

Marmot Bay

Uganik Island

Viekoda Bay

Uganik Bay

Port Lions

Spiridon Bay

Uyak Bay

Karluk

Larsen Bay

Terror Lake Power Project Withdrawal

MT. GLOTTOF RESEARCH NATURAL AREA

Ugak Bay

Kiliuda Bay

Old Harbor

Sitkalidak Island

Olga Bay

Kaiugnak Bay

Deadman Bay

Akhiok

Alitak Bay

5 0 5 10
Miles

ALASKA

Bering Sea

Anchorage

KODIAK NWR

Gulf of Alaska

Kodiak Island

LOCATION OF KODIAK REFUGE

Figure 39. Alternative D

Environmental Consequences of Alternative D

Fish and Wildlife
- Negligible effects on sockeye, chinook, coho, chum and pink salmon, waterfowl, shorebirds, raptors, and marine birds.
- Negligible effect on brown bear, with minor adverse impacts in localized areas.
- Minor adverse impacts to marine mammals.
- Minor to moderate adverse impacts to the refuge's rainbow trout and steelhead fishery.

Water Quality and Quantity
- Increased erosion in localized areas, but no significant changes in water quality or quantity.

Population and Economy
- Smallest seasonal increase in the population of the city of Kodiak of the four alternatives.
- Minor benefits to the city of Kodiak's economy, primarily to recreation-related businesses.

Subsistence
- No significant effect on important resources or the harvest of these resources.

Recreation
- Reduced competition and perceived overcrowding in popular fishing and hunting areas relative to Alternative A.
- Negligible effect on nonconsumptive users and bear hunters.

Cultural Resources
- Moderate adverse impacts from increased public use, with severe localized impacts possible.

Environmental Consequences of the Wilderness Proposal (over 99% of the refuge proposed for wilderness designation)

Wilderness Values
- The proposal would help maintain wilderness values on 1,589,000 acres.
- Potential developments that could adversely affect wilderness values would be precluded.[a/]

Fish and Wildlife
- The proposal would help maintain fish and wildlife resources throughout the refuge.

Fishery Development Facilities
- Three potential fishery development facilities to enhance salmon populations would be precluded, foregoing opportunities to increase the refuge's fisheries and to realize potential benefits to the local economy.

[a/] The wilderness proposal would preclude such projects as developing an oil and gas support facility, and/or expanding the Terror Lake Hydroelectric Project on refuge lands.

SECTION 810(a) EVALUATION

The Service has determined in its Section 810(a) evaluation that neither the management recommendations nor the preferred alternative would significantly restrict subsistence uses in Kodiak Refuge, although concerns over increased recreational use may be expressed. The harvest of marine resources, the most important resources used by local residents for subsistence purposes, occurs primarily in salt water outside of the refuge and would not be affected by actions described in Alternative C. Increased numbers of sport hunters and fishermen in this alternative would take more deer and salmon in the refuge than in 1984, but sufficient deer and salmon should be available for local residents to satisfy their needs. The Service would work with the Native villages and corporations, ADF&G and the state Boards of Fisheries and Game to ensure that subsistence activities are not adversely affected by actions taken in this alternative.

Salmon are one of the most important resources harvested on the refuge for subsistence purposes.

COMPARISON OF THE MANAGEMENT ALTERNATIVES

The tables that follow summarize the major differences in management directions of the four alternatives. Table 3 shows the size of three of the four management categories under each alternative. This table, together with Table 2, can be used to determine where various uses and access opportunities would be permitted in each alternative. Table 4 compares the management directions of the four alternatives in written form.

Table 3. Size of management categories under the four alternatives.[a/]

	Moderate Management (I)		Minimal Management (II)		Wilderness Management (III)[b/]	
	Acres	(%)	Acres	(%)	Acres	(%)
Alternative A	82,000	5	1,510,000	95	0	0
Alternative B	288,000	18	149,000	9	1,155,000	73
Alternative C	97,000	6	324,000	21	1,170,000	73
Alternative D	0	0	3,000	<1	1,589,000	>99

a/ Alternative A reflects how the Service currently manages Kodiak Refuge. The special river management category (IV) is not included in this table. Also not included in the table are 272,000 acres of Native lands within the refuge boundary that are subject to Section 22(g) of the Alaska Native Claims Settlement Act (ANCSA)--the Service has some residual controls over the use of these lands. All acreage figures in the table are approximate due to rounding, uncertain boundaries, and inaccuracies in information available.

b/ This assumes Congress designates wilderness in Kodiak Refuge. All areas under wilderness management would be managed as minimal management areas until the areas are designated by Congress.

Table 4. Summary of the management alternatives.

Management	Alternative A (Current Situation)	Alternative B	Alternative C	Alternative D
Fish & Wildlife	High level of protection provided to populations and habitats	Fish and wildlife populations and habitats protected	High level of protection provided to populations and habitats	High level of protection provided to populations and habitats
Access	Existing access opportunities maintained	Existing access opportunities maintained	Access opportunities may be limited in the special river management areas	Access opportunities may be limited in the special river management areas
Subsistence	Continued opportunities for harvests assured	Continued opportunities for harvests assured	Continued opportunities for harvests assured	Continued opportunities for harvests assured
Public Use Facilities	All public use cabins maintained	Additional cabins and campsites provided	Additional cabins and campsites may be provided	Some public use cabins may be removed
Guided and Outfitted Use	Increased numbers of sport fish guides and outfitters permitted; all big game guides permitted	Additional opportunities provided for sport fish guides and outfitters; all big game guides permitted	Some increases in sport fish guides and outfitters permitted; all big game guides permitted	Sport fish guides limited to 1984 levels; limited increases in outfitters; all big game guides permitted
New Commercial Support Facilities	New temporary guide or outfitter support facilities may be permitted along the coastline; no new commercial fishing facilities permitted on new refuge sites	New temporary guide or outfitter support facilities may be permitted along the coastline, and on Uganik Island, Spiridon Peninsula, and other moderate management areas; no new commercial fishing facilities permitted on new refuge sites	New temporary guide or outfitter support facilities may be permitted along the coastline, except for bays with high wildlife values; no new commercial fishing facilities permitted on new refuge sites	No new guide or outfitter support facilities permitted; no new commercial fishing facilities permitted on new refuge sites
Wilderness Proposal	No areas proposed for designation	73% of the refuge lands proposed for wilderness designation; excludes Uganik Island, Spiridon Peninsula, Red Peaks/Ban Island, Terror Lake, and other areas surrounded by conveyed/selected lands	73% of the refuge lands proposed for wilderness designation; excludes Uganik Island, Spiridon Peninsula, Red Peaks/Ban Island, Terror Lake, and other areas surrounded by conveyed/selected lands	All suitable refuge lands proposed for wilderness designation; excludes the Terror Lake Hydroelectric Project area
Management Costs	About a 27% increase in costs over the present	About a 75% increase in cost over the present	About a 44% increase in cost over the present	About a 35% increase in cost over the present

EVALUATION OF THE ALTERNATIVES

Selection of a preferred alternative was based primarily on two criteria:

1) To what extent does the alternative satisfy the purposes of the refuge and other provisions of ANILCA?

2) To what extent does the alternative satisfy the issues and concerns of the public?

Refuge Purposes

Each alternative represents a different approach to achieving the purposes for which the refuge was established. Each alternative would provide a unique combination of uses and access opportunities. None of the alternatives, as currently written, would result in major impacts to the refuge's fish and wildlife resources, and water quality/quantity, or would prevent the United States from fulfilling its international treaty obligations. None of the alternatives would significantly affect the availability of important subsistence fish and wildlife populations or restrict harvest opportunities. All of the alternatives, however, would have some adverse effects on refuge resources and users due to the expected increase in public use. Most of these impacts would be negligible to minor.

Of all the alternatives considered, Alternative D would best fulfill ANILCA purposes relating to conservation of fish and wildlife populations and habitats in their natural diversity.

Public Issues and Concerns

The second criterion used to evaluate the alternatives is the degree to which each alternative responds to or satisfies the issues and concerns raised by local residents, the State of Alaska, industry, conservation groups, and other interested parties. The Service must work closely with all of these groups, minimizing conflicts, if it is to effectively manage the refuge and its resources.

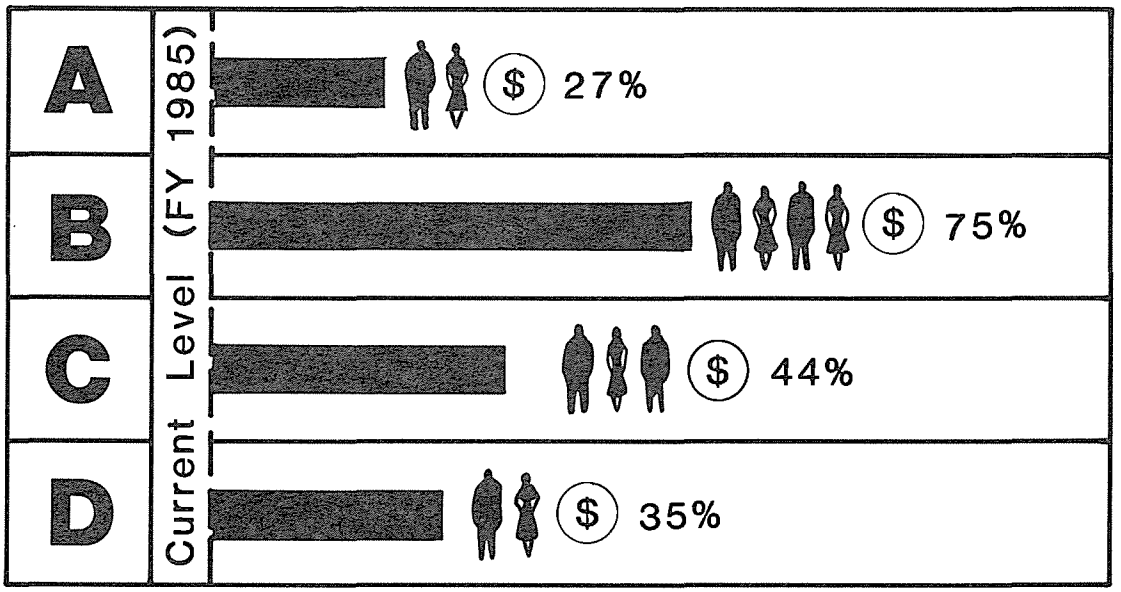
The major refuge issues and concerns identified early in the planning process provided one of the bases for the development of the management alternatives. Many groups have an interest in and would be affected by how the Service manages Kodiak Refuge. Because of the number of different issues and the diversity of groups affected by management of the refuge, no single alternative probably would satisfy everyone. For example, Alternative D would satisfy the desire of conservation groups to maximize environmental protection, but the alternative may not satisfy commercial guides and outfitters who want to provide services for their clients in the refuge.

The Service believes that Alternative C would satisfy most of the major concerns of local residents, refuge users, adjacent landowners and other affected groups.

Management Costs

Staffing needs and management costs are another factor to consider in evaluating the alternatives. Table 5 compares the annual operations and maintenance costs of the alternatives in graphic form. Alternative A would be the least costly of the four alternatives, both in terms of staff and funding; Alternative B would be the most expensive. Alternative C would require five more staff than the current staff and about a 44% increase in funding over the current operations and maintenance budget to manage the expected increase in public use.

Table 5. Management costs under the four alternatives.



SELECTION OF THE PREFERRED ALTERNATIVE

The Service has selected Alternative C as its preferred alternative for managing Kodiak Refuge on the basis that it would both satisfy the purposes of the refuge, and ensure that the opportunities for high quality recreational uses are maintained for the widest range of users. The alternative would continue most existing refuge policies, which are well accepted by most users, and would provide opportunities for additional use. With increased public use, some adverse impacts would be expected to refuge resources and users, but these would tend to be concentrated in a few areas. Under this alternative the Service would lay the groundwork for future regulation of refuge users, if that becomes necessary, in the special river management areas (i.e., the Karluk, Dog Salmon, Sturgeon, and Ayakulik/Red rivers). The Service would also carefully monitor and regulate all uses and activities both within and adjacent to the refuge to ensure that adverse impacts to refuge resources and users are minimized.

The Service will not begin to implement the management directions in the preferred alternative until a 45-day protest period following the publication of the final CCP/EIS has elapsed, and a Record of Decision (ROD) has been published.

IMPLEMENTATION AND REVISION OF THE COMPREHENSIVE CONSERVATION PLAN

Implementation of the proposed actions in this plan will depend upon the availability of funds and personnel, and upon the coordination of many governmental activities. These factors will determine the extent of development, management and maintenance the refuge receives in any given year.

Following adoption of the plan, the Service will, as necessary, undertake detailed "management planning" to guide implementation of the plan and operation of the refuge. In accordance with Service policy, detailed management plans will be prepared to address specific resource and public use management activities such as fisheries, wilderness, habitat, and recreation management. The Service will work closely with appropriate publics, government agencies, and corporations in developing individual management plans.

The Kodiak Refuge Comprehensive Conservation Plan/Environmental Impact Statement provides broad policy guidance for managing Kodiak Refuge over the next 10 to 15 years. It should be viewed as a dynamic document that will need to be reviewed and updated periodically. Every three to five years the Service will review public comments, local and state government recommendations, staff recommendations, and research studies, among other sources, to determine if revisions to the plan are necessary. If major changes are proposed, public meetings may be held, or new environmental assessments/environmental impact statements may be necessary. Full review and updating of the plan will occur every 10 to 15 years, more often if necessary.

There are several management actions in this plan that indicate the Service will regulate uses and facilities on refuge lands. Specifically, the CCP states restrictions will be needed on refuge lands for:

- o the use of temporary facilities by guides and outfitters (subject to the provisions of Section 1316 of ANILCA);
- o the use of tent platforms related to the taking of fish and wildlife (subject to the provisions of Section 1316 of ANILCA);
- o the use of pack animals (subject to the provisions of Section 1110(a) of ANILCA);
- o the use of jet boats (subject to the provisions of Section 1110(a) of ANILCA);
- o landing of airplanes (subject to the provisions of Section 1110(a) of ANILCA);
- o the use of snowmachines in key bear denning habitat (subject to the provisions of Section 1110(a) of ANILCA); and
- o the use of Native lands subject to Section 22(g) of the Alaska Native Claims Settlement Act (ANCSA).

Although the refuge comprehensive conservation plan indicates these uses will be restricted, the plan will not by itself restrict these uses or facilities. The Service will follow the procedures outlined in ANILCA and the Code of Federal Regulations in implementing the proposed restrictions.

View from Uganik Island.

APPENDIX A. Summary of an Analysis of the Effect of Commercial Fishing Support Facilities and Related Activities on Brown Bear, Kodiak National Wildlife Refuge, and Proposed Recommendations.

Based on the number of sites and facilities, the Service believes that the level of commercial fishing activity on refuge lands may have significantly expanded past the 1979 level of activity, and that further expansion may be inconsistent with refuge purposes. In identifying this concern the Service considered the purposes of the refuge and the incremental increases in human activity that have occurred, and will continue to occur, on Kodiak Refuge. Documentation has shown that the cumulative effects of increasing human activity in brown bear habitat ultimately leads to significant reductions in the brown bear population.

Congress set four primary purposes for Kodiak Refuge, among which is the conservation of brown bear and other fish and wildlife in their natural diversity. All uses and developments must be consistent with refuge purposes. Kodiak Refuge is one of the few places left in the world with prime brown bear habitat and a healthy bear population. However, Kodiak Refuge's bear population is not immune from the adverse impacts of human activity.

Development and public use, particularly deer hunting and sport fishing, have been increasing within the Kodiak Refuge boundary, and likely will continue to increase. In addition to commercial fishing sites, there are commercial guide camps, public use cabins, and the Terror Lake Hydroelectric Project within the refuge boundary. In the future developments probably will occur on Native allotments, private patented lands and Native village corporation lands within the refuge boundary. Other developments, such as new commercial guiding facilities, hydroelectric facilities, oil and gas support facilities, and administrative facilities, may be proposed. All of these developments and uses will affect the refuge's brown bear population. Of particular concern is the potential for loss of adult female bears from areas adjacent to permanent facilities occupied on a year-round basis.

Private land outside of the refuge boundary, such as on Kizhuyak Bay and the Kupreanof Peninsula, which is part of the bears' habitat, also eventually will be developed. Many of the bears that live on Kodiak Refuge use these areas--the Terror Lake Hydroelectric Project studies showed that many of the bears impacted by the project live on refuge lands at least part-time.

Considering all of these developments and uses collectively, the Service believes there may be a potential for significant cumulative impacts to the refuge's bear population. "Cumulative impact" can be defined as "the incremental impacts on the environment due to collectively significant, but perhaps individually minor, actions" (Williamson, et al., 1986). Current knowledge provides conclusive evidence that increased levels of human activity are not compatible with the activity of the brown/grizzly bear. When all of the developments and uses of Kodiak Refuge and adjacent areas are considered as a whole, it is safe to say that Kodiak Refuge's bear habitat and population will decrease as human use and development increase. This trend would conflict with the Service's legal mandates and management objectives.

To prevent cumulative impacts to the refuge's bear population, there is a need to take a cautious view on future expansion of all activities on the refuge, including those activities on commercial fishing sites. It is imperative that land in Kodiak Refuge be maintained without additional permanent development and human occupancy, if the Kodiak brown bear population is to continue at or near its present level in the future. Refuge management must emphasize a high level of protection for bears unless sound biological data indicate otherwise. Primary management objectives should be to minimize permanent and long-term human occupation, maintain present levels of seasonally occupied facilities, and provide for reasonable regulation of access, distribution and intensity of public use.

As noted above, the Service believes that the level of commercial fishing activity has significantly increased past the 1979 level. The following recommendations are intended to both provide for commercial fishing activity and maintain the brown bear population in the refuge.

Recommendations:

A. Existing Permanent Facilities on Commercial Fishing Sites

Recommendation 1: Existing permanent commercial fishing sites with permanent facilities will continue to be permitted on refuge lands.

Rationale: The Service has permitted these sites for many years. Although the Service is concerned about the effect of some sites on brown bear, the Service does not have specific data concerning the impact of these sites on bear. Any displacement of bears as a result of existing sites has probably already impacted the bears. Under Section 304(d) of ANILCA these facilities shall be permitted.

Recommendation 2: The Service will increase its monitoring of the sites.

Rationale: To ensure that adverse impacts are minimized, the Service needs to carefully monitor what is occurring on the sites.

B. Conversion of Existing Temporary Living Facilities to Permanent Facilities on Existing Commercial Fishing Sites

Recommendation: The Service will allow conversion of permittees with temporary living facilities (i.e. tent platforms) to permanent facilities.

Rationale: The Service has already granted permits to these individuals for onshore facilities to support their fisheries activities. This is in compliance with Section 304(d) of ANILCA. Converting the temporary facilities to permanent facilities will not affect their level of fishing activity, and will provide the fishermen with the same level of safety and comfort as has been granted to other permittees.

C. Permitting New Commercial Fishing Sites on Refuge Lands

Recommendation: No new commercial fishing sites (onshore facilities) will be permitted on Kodiak Refuge.

Rationale: The number of commercial fishing sites on refuge lands has significantly expanded beyond the 1979 level of activity. Permitting additional sites, when combined with other potential developments and public use on the refuge, would increase long-term human presence on the refuge, which would not be consistent with refuge purposes.

D. Expansion of Facilities on Existing Commercial Fishing Sites

Recommendation: The Service will study the minimum size and type of support facilities required to conduct the fishery, and then develop guidelines for the size and type of facilities that will be permitted on existing sites.

Rationale: Permitting the conversion of existing temporary facilities to permanent facilities does not constitute a significant expansion under Section 304(d) of ANILCA. The Service also recognizes that some expansion of facilities may be necessary to meeting industry requirements. These additional needs will be evaluated based on compatibility with refuge purposes.

K. FEEDBACK (Bellinger)

Refuge Comprehensive Conservation Plan

The Kodiak Plan was approved during the year. The refuge staff was involved in formulation of this plan for four frustrating years and thought they could finally concentrate on refuge business. However, the celebration was premature as the first step in implementing the direction established in the comprehensive plan is a whole new planning effort. This effort is called step-down management planning.

This next phase in the process will require public participation (meetings, meetings, and more meetings), compatibility determinations, and a rule making process. Eventually we will get through this planning phase and be able to concentrate on resource/people management.

I realize that all of this planning is required and hopefully will help achieve the purposes for which the refuge was established, however, it does get frustrating. At times we think resource needs are apparent, but the process required to meet those needs is very cumbersome. Hopefully, we don't spend so much time planning how to keep the fox out of the hen house that we lose all of the chickens in the interim.

KODIAK AREA SPORT FISHING
TIMING GUIDE

May	(Entire month)	- Dolly Varden fishing in Buskin River.
	(Mid-month)	- Dolly Varden, rainbow, steelhead at Saltery River.
	(Peak of high tides near end of month)	- Capelin (grunion-type fish) spawning at night on Silver (Roslyn) Beach.
June	(Entire month)	- Rainbows in all major rivers on Afognak Island.
	(1st 2 weeks)	- Sockeye salmon in Afognak River, a few in Buskin.
	(Last 2 weeks)	- Sockeye in Buskin and Saltery Rivers.
		- Halibut fishing in Chiniak Bay.
		- King salmon at Karluk Portage area.
July	(1st 2 weeks)	- Pink salmon in Women's Bay and off Roslyn Creek.
	(Last 2 weeks)	- Pink salmon in Buskin River, off all stream mouths in Chiniak Bay.
August	(Entire month)	- Rainbow fishing good in all stocked lakes on road system.
	(Mid-month)	- Dolly Varden in middle pools of American River.
September	(Entire month)	- Silver salmon in Buskin, Pasagshak, other rivers.
	(Last 2 weeks)	- Silver salmon & Dolly Varden in Saltery and American Rivers.
October	(1st 2 weeks)	- Steelhead fishing at Karluk Portage and outlet Red Lake.

Winter Ice Fishing:

Abercrombie Lake
Pony Lake
Southern Lake
Barry Lagoon
Mayflower

ALASKA EXPERIENCE INC.
1091 Pine Crescent Loop
Kodiak, AK 99615
(907) 486-3929
(907) 486-3376

ISLAND MARINE CHARTERS
P.O. Box 814
Kodiak, Ak 99615
(907) 486-3672

KODIAK ISLAND CHARTERS
Star Route 10914
Kodiak, AK 99615
(907) 486-5380

KODIAK SEA CHARTERS
P.O. Box 2156
Kodiak, AK 99615
(907) 487-2683
(907) 486-4658

OCEAN RIVER CHARTERS
P.O. Box 2676
Kodiak, AK 99615
(907) 486-5397

PORT LIONS CHARTERS
Box 251
Port Lion, AK 99550
(907) 454-2264

SEA SURGEON
P.O. Box 95
Kodiak, AK 99615
(907) 486-4183

SZABO MARINE SERVICES
P.O. Box 1633
Kodiak, AK 99615
(907) 486-3853

TOUR GUIDE SERVICES

GRAY LINE TOURS
547 W. Fourth
Anchorage, AK 99510
(907) 486-8379
(907) 277-5581

ISLAND TERRIFIC TOURS
Roger Page/Lola Harvey
P.O. Box 3001
Kodiak, AK 99615
(907) 486-6591

PENINSULA AIRWAYS/ATS
P.O. Box 890
Kodiak, AK 99615
(907) 487-4014

ISLAND AIR SERVICE
P.O. Box 125
Kodiak, AK 99615
(907) 486-6196

SEA HAWK, INC.
P.O. Box 500 USCG
Kodiak, AK 99619
(907) 487-2477
(907) 486-5936

UYAK AIR SERVICE
P.O. Box 4188
Kodiak, AK 99615
(907) 487-4443
(907) 847-2210

SPORTING GOODS/CAMPING GEAR

CY'S SPORTING GOODS
P.O. Box 332
Kodiak, AK 99615
(907) 486-3900

G&S SPORTING GOODS
P.O. Box 2729
Kodiak, AK 99615
(907) 486-5972

KODIAK CAMP SUPPLY
1314 Mill Bay Road
Kodiak, AK 99615
(907) 486-3771

MACK'S SPORT SHOP
P.O. Box 1155
Kodiak, AK 99615
(907) 486-4276

SUTLIFF'S TRUE VALUE
P.O. Box 1157
Kodiak, AK 99615
(907) 486-5797

THE CHANDLERY
P.O. Box 95
104 Center Avenue
Kodiak, AK 99615
(907) 486-6158

OUTDOOR EQUIPMENT RENTAL

KODIAK OUTFITTERS
321 Maple
Kodiak, AK 99615
(907) 486-5373

BED AND BREAKFAST
Mary Monroe
308 Cape Street
Kodiak, AK 99615
(907) 487-5367

KODIAK BUSKIN RIVER INN
1395 Airport Way
Kodiak, AK 99615
(907) 487-2700

SHEFFIELD HOUSE
P.O. Box 1547
Kodiak, AK 99615
(907) 486-5712

SHELIKOF LODGE
P.O. Box 774
Kodiak, AK 99615
(907) 486-4141

STAR MOTEL
P.O. Box 553
Kodiak, AK 99615
(907) 486-5657

LODGE FACILITIES

AFOGNAK WILDERNESS LODGE
Roy Randall
Seal Bay, AK 99697
(907) 486-6442

IRA SHEPARD
P.O. Box 247
Port Lions, AK 99550

KARLUK LODGE
Rob Sikes
Karluk, AK 99608
(907) 241-2229

LIONS DEN LODGE
P.O. Box 266
Port Lions, AK 99550
(907) 454-2301

MIKE MULLAN
P.O. Box 237
Port Lions, AK 99550

PLEASANT HARBOR LODGE
P.O. Box 94
Ouzinkie, AK 99644
(907) 486-6526

LIST OF GAME MANAGEMENT UNIT 8 BIG GAME GUIDES
WITH EXCLUSIVE AREA ASSIGNMENTS

Darrell Farmen	(208)	1200 E. 76th Ave., Suite 1228	Anch., AK	99518
Leon Francisco	(216,219)	P.O. Box 483	Kodiak, AK	99615
Lee Hancock	(205)	Nebesna Road	Slana, AK	99586
Dennis Harms	(223, 219)	P.O. Box 71	Chugiak, AK	99567
Leonard Helgason	(225,226)	P.O. Box 546	Kodiak, AK	99615
Joe Hendricks	(221)	P.O. Box 10-2104	Anch., AK	99510
Tom Kirstein	(208)	1200 E. 76th Ave., Suite 1228	Anch., AK	99518
Frenchy Lamoureux	(206)	P.O. Box 90-444	Anch., AK	99509
Larry Matfay	(205,209,210)	P.O. Box 2	Old Harbor, AK	99643
Rocky Morgan	(204)	Box 870649	Wasilla, AK	99687
Mike Munsey	(217,218,220)	Amook Pass	Kodiak, AK	99615
Bill Pinnell Morris Talifson	(209,210,211, 212,213)	Olga Bay	Kodiak, AK	99615
Dick Rohrer	(222,224)	P.O. Box 2219	Kodiak, AK	99615
Andy Runyan	(207)	SRC Box 8860	Palmer, AK	99645
Joe Want	(214,215)	P.O. Box 10044	Fairbanks, AK	99701

(N) Indicates which of Kodiak brown bear hunt numbers the individual is authorized to guide in. (Refer to Permit Hunt Brochure)

SPORT FISHING GUIDES

Alan Austerman - Zachar Bay Camp, 401 N. Boulevard, Kodiak, AK 99615
Paul Chervenak (907) 486-3008, (907) 486-5930

Bill Berestoff - 1210 Purtov #9, Kodiak, AK 99615
(907) 486-4520

Dan Campbell - Wilderness Outfitters, Inc., P.O. Box 2301, Kodiak, AK 99615
(907) 486-4607

Mike Cusack - 3300 Providence Drive, Suite 309, Anchorage, AK 99508
(907) 246-3452

Harry Dodge - Dodge Outfitters, Olga Bay, Kodiak, AK 99615

Dave Duncan - Dave Duncan & Sons, Ltd., High Valley Ranch, Rt. 1, Box 740
Ellensburg, WA 98926 (509) 962-1060

Ron Eads - Ron and Don's Fishing Service, P.O. Box 1304, Kodiak, AK 99615
Don Keyer (907) 486-4471, (907) 486-5568

Chuck Evans - 1521 Baranof, Kodiak, AK 99615
(907) 486-5190, (907) 486-3035

Guy Geffroy - 12, Rue Vignon, 75009 Paris, France
47.42.10.60

Dennis Harms - Alaska Trophy Safaris, Inc., P.O. Box 71, Chugiak, AK 99567
(907) 688-2484

J. L. Holt - P.O. Box 763, Kodiak, AK 99615
(907) 486-8232

David Jones - Kodiak Outfitters, 321 Maple, Kodiak, AK 99615
(907) 486-5373

Jack Lechner - L & L Outfitters, P.O. Box 1616, Kodiak, AK 99615
(907) 486-5851

Ray Loesche - Rainbow King Lodge, Inc., P.O. Box 106, Iliamna, AK 99606
(907) 571-1277

Terry Manthey - The King Connection, Inc., 119 140th Street SE, Everett, WA 98204
(206) 745-0262

Rob Missal - Kodiak Sea Charters, Box 2156, Kodiak, AK 99615
Jim Baglien (907) 487-2683, (907) 486-4658

Rocky Morgan - Kodiak Island Adventures, Box 870649, Wasilla, AK 99687

Mike Munsey - Munsey's Bear Camp, Amook Pass, Kodiak, AK 99615
(907) 487-2203, (907) 487-2103

Ken Owsichek - Fishing Unlimited, P.O. Box 6301, Anchorage, AK 99502
(907) 243-5899

Bill Pinnell - Master Guides, Olga Bay, Kodiak, AK 99615
Morris Talifson

Jay Rasmussen - P.O. Box 2146, Kodiak, AK 99615
(907) 486-4301

Dick Rohrer - Rohrer's Bear Camp, P.O. Box 2219, Kodiak, AK 99615
(907) 486-5835

Greg Samson - P.O. Box 4323, Kodiak, AK 99615
(907) 486-6510, (907) 486-6064

Rob Sikes - Karluk Lodge, Karluk, AK 99608
(907) 241-2203

Chuck Weir - Safaris of Alaska, 3653 W. 100th, Anchorage, AK 99502

Kodiak National Wildlife Refuge Photography Guides

Mike Munsey
Amook Pass
Kodiak, AK 99615

Harry Dodge
Olga Bay
Kodiak, AK 99615

Jack Lechner
P.O. Box 1616
Kodiak, AK 99615

Weekend Wildlife Films at the Kodiak Wildlife Refuge Visitor Center

These Free Films will be shown Saturdays and Sundays
at 1:00 p.m., 2:00 p.m. and 3:00 p.m.

February 6 & 7 - The Sea Lion - Biologists are shown studying the life history of a sea lion rookery in Alaska. (30 min.)

February 13 & 14 - Large Animals of the Arctic - Some animals such as muskox, wolves, caribou, and wolverines have evolved unique adaptations which allow them to thrive in the harsh arctic environment. (22 min.)

February 20 & 21 - Bird Brain: The Mystery of Bird Migration - Learn how scientists are just now beginning to conduct research in an attempt to unravel the mystery and marvels of bird migration. (26 min.)

February 23 & 24 - The Forest Primeval - Forests in the tropics and North America provide a unique environment which has influenced the evolution of plants and animals living there. (25 min.)

March 5 & 6 - Monarch of the Arctic: Polar Bears - Scientists are studying the life history of polar bears in an effort to determine how the effects of Arctic development may affect this large mammal of the ice pack and arctic seas. (30 min.)

The Kodiak National Wildlife Refuge Visitor Center is open from 8:00 a.m. to 4:30 p.m. on weekdays and noon to 4:30 p.m. on weekend days. This schedule is subject to change. If you have any questions call 487-2600.