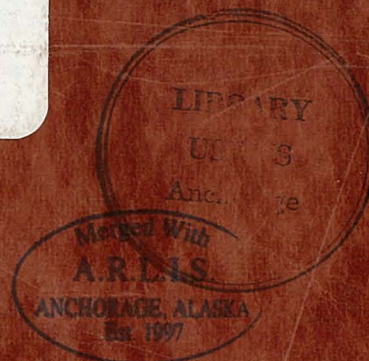


KENAI NATIONAL WILDLIFE REFUGE

Soldotna, Alaska



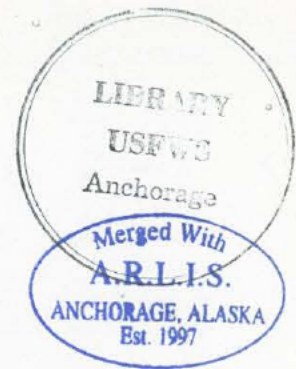
ANNUAL NARRATIVE REPORT

Calendar Year 1985

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



KENAI NATIONAL WILDLIFE REFUGE
Soldotna, Alaska



ANNUAL NARRATIVE REPORT
Calendar Year 1985



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

REVIEW AND APPROVALS

KENAI NATIONAL WILDLIFE REFUGE

Soldotna, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1985

Mike Hedrick 4/1/86
Acting Refuge Manager Date

[Signature] 4/24/86
Refuge Supervisor Review Date

[Signature]
Regional Office Approval

7/1/86
Date



INTRODUCTION

The Kenai National Wildlife Refuge is situated on the Kenai Peninsula in southcentral Alaska. The northern portion of the refuge is only 20 air miles from the State's largest population center, the City of Anchorage. Although a scenic 112 mile drive through the Kenai Mountains is necessary to reach the wildlife refuge via road, commercial commuter aircraft fly into Kenai and Soldotna daily from Alaska's largest city, 60 air miles north.

Located within the center of the Kenai Peninsula and extending 115 miles from Turnagain Arm on the north to nearly the Gulf of Alaska on the south, this refuge encompasses about one-third of the Peninsula. The western portions of the Kenai Mountains generally form the eastern refuge boundary, a common boundary shared with our Chugach National Forest and Kenai Fjords National Park neighbors.

Since the establishment of the refuge on December 16, 1941, under E.O. 8979, these lands have undergone at least two boundary changes and a name change. The original refuge included 2,058,000 acres and, among other mandates, authorized settlement, location, and other disposition under public land laws applicable to Alaska. At that time, the refuge was bounded on the northwest, from Point Possession to the Kasilof River, by the waters of Cook Inlet. A six mile wide strip of land from Boulder Point to the Kasilof River and a six mile strip of land, including portions of the Kenai River, were open for development. Homesteads, grazing areas, road systems, and other developments occurred in these areas which were eventually excluded from the refuge during a 1964 boundary adjustment. Also excluded, were Cook Inlet coastal lands one to three miles inland and considerable portions of the Harding Ice Field, reducing the refuge area to 1.73 million acres.

Passage of the Alaska National Interest Lands Conservation Act (ANILCA) December 2, 1980, not only changed the Kenai National Moose Range to Kenai National Wildlife Refuge but further increased the refuge acreage to 1.97 million, with the addition of mostly mountainous regions, an area of approximately 150,000 acres on the extreme south and about 90,000 acres of formerly adjacent Forest Service lands to the extreme northeast near the Chickaloon Flats. At the same time, the passage of ANILCA, commonly known as "The Alaska Lands Act," withdrew from the refuge 16,535 acres to satisfy the claims of the Salamatof Native Association under the Alaska Native Claims Settlement Act (ANCSA). The now-1.953 million acre refuge has been reestablished and is managed to: 1) conserve fish and wildlife populations and habitats in their natural diversity, 2) fulfill international treaty obligations with respect to fish and wildlife, 3) insure water quality and quantity, 4) provide opportunities for scientific research, interpretation, and environmental education, and 5) to provide opportunities for fish and wildlife-oriented recreation. In addition to establishing new boundaries, new purposes, and a new name, 1.35 million acres of the refuge were formally designated as wilderness.

The refuge is divided into two generalized physiographic types, a mountainous region and a forested lowland. Elevations on the refuge range from 150 feet in the lowlands to over 6000 feet in the Kenai Mountains. Treeline is at 1800 feet and among the peaks lie the Harding Ice Field which thrusts numerous glacial fingers out from the mountains. The glaciers, mountains, lakes, alpine tundra and receding foothills are extremely scenic.

The vegetation of the refuge may be subdivided into three major classes: 1) humid coastal forests dominated by Sitka spruce (Picea sitchensis); 2) interior forests of white and black spruce (Picea glauca, P. mariana) with a mixture of birch (Betula papyrifera); and 3) mountain tundra, including glaciers and snowfields.

Forests cover 39% of the refuge. Swampy forests of black spruce alternate with peatbogs and grassy mires while white spruce forests are distributed in the drier areas and in the foothills and mountains. They are often intermixed with or include, deciduous trees such as white birch, especially in old burns and cut-over areas. Aspen (Populus tremuloides) is also found with white spruce and birch. Lowland shrub (alder and willow) covers 9% of the refuge.

Mountain tundra covers about 11% of the refuge. Of this class, about 87% is dwarf shrub and lichen tundra and 13% is tall shrub (alder and willow) thickets usually associated with tundra.

Water and associated wetlands cover 13% and snow, ice and glaciers cover the remainder of the refuge.

The Kenai River, the largest river system on the peninsula drains about 2,148 square miles (5,563 km²). About 54% of the watershed is on the refuge, 37% in the Chugach National Forest, and the remainder on private lands. Ten major tributaries feed the Kenai River System: Beaver Creek, Slikok River, Soldotna Creek, Funny River, Moose River, Killey River, Skilak River, Russian River, Cooper Creek, and Juneau Creek.

Other refuge river and stream systems flowing westward into the Cook Inlet include Kasilof River (which drains Tustumena Lake), Deep Creek, and the Swanson, Fox, Ninilchik, and Chickaloon rivers.

There are thousands of lakes on the Kenai Peninsula. Nearly all of them are on the refuge. The largest are two glacial lakes, Tustumena Lake (72,000 acres or 30,000 ha), and Skilak Lake (25,000 acres or 10,000 ha). More than 4,500 smaller lakes dot the refuge mostly in the Moose, Swanson, and Chickaloon River drainages.

At least 199 species of amphibians, birds, and mammals use the wildlife habitats on the refuge. None of these species are known to be threatened or endangered. Significant populations of brown and black bear, sheep, goat, wolves, bald eagles, trumpeter swans, caribou, moose, loons, four species of salmon and a wide variety of furbearers occur on the refuge.

INTRODUCTION	Page
TABLE OF CONTENTS	
A. <u>HIGHLIGHTS</u>	1
B. <u>CLIMATIC CONDITIONS</u>	2
C. <u>LAND ACQUISITION</u>	
1. Fee Title	3
2. Easements	6
3. Other	7
D. <u>PLANNING</u>	
1. Master Plan	8
2. Management Plan	8
3. Public Participation	9
4. Compliance with Environmental and Cultural Resource Mandates	
Nothing to Report	
5. Research and Investigations	11
6. Other	Nothing to Report
E. <u>ADMINISTRATION</u>	
1. Personnel	31
2. Youth Programs	34
3. Other Manpower Programs	Nothing to Report
4. Volunteer Services	36
5. Funding	38
6. Safety	39
7. Technical Assistance	Nothing to Report
8. Other Items	Nothing to Report
F. <u>HABITAT MANAGEMENT</u>	
1. General	Nothing to Report
2. Wetlands	41
3. Forests	41
4. Croplands	Nothing to Report
5. Grassland	Nothing to Report
6. Other Habitats	Nothing to Report
7. Grazing	Nothing to Report
8. Haying	Nothing to Report
9. Fire Management	42
10. Pest Control	43
11. Water Rights	Nothing to Report
12. Wilderness and Special Areas	43
13. WPA Easement Monitoring	Nothing to Report

G. <u>WILDLIFE</u>		Page
1.	Wildlife Diversity	45
2.	Endangered and/or Threatened Species	45
3.	Waterfowl	45
4.	Marsh and Water Birds Nothing to Report	
5.	Shorebirds, Gulls, Terns, and Allied Species	46
6.	Raptors	46
7.	Other Migratory Birds	48
8.	Game Mammals	51
9.	Marine Mammals Nothing to Report	
10.	Other Resident Wildlife	55
11.	Fisheries Resources	55
12.	Wildlife Propagation and Stocking	55
13.	Surplus Animal Disposal Nothing to Report	
14.	Scientific Collections Nothing to Report	
15.	Animal Control Nothing to Report	
16.	Marking and Banding	55
17.	Disease Prevention Nothing to Report	
18.	Injured Wildlife	57

H. <u>PUBLIC USE</u>		
1.	General	57
2.	Outdoor Classrooms - Students	58
3.	Outdoor Classrooms - Teachers	60
4.	Interpretive Foot Trails Nothing to Report	
5.	Interpretive Tour Trails Nothing to Report	
6.	Interpretive Exhibits/Demonstrations	61
7.	Other Interpretive Programs	61
8.	Hunting	62
9.	Fishing	64
10.	Trapping	70
11.	Wildlife Observation	72
12.	Other Wildlife Oriented Recreation	75
13.	Camping	77
14.	Picnicking Nothing to Report	
15.	Off-Road Vehicles	79
16.	Other Non-Wildlife Oriented Recreation Nothing to Report	
17.	Law Enforcement	79
18.	Cooperating Associations	86
19.	Concessions	88

I. <u>EQUIPMENT AND FACILITIES</u>		
1.	New Construction	92
2.	Rehabilitation	93
3.	Major Maintenance	94
4.	Equipment Utilization and Replacement	95
5.	Communications Systems	98
6.	Computer Systems	98
7.	Energy Conservation	99
8.	Other Nothing to Report	

J. OTHER ITEMS

Page

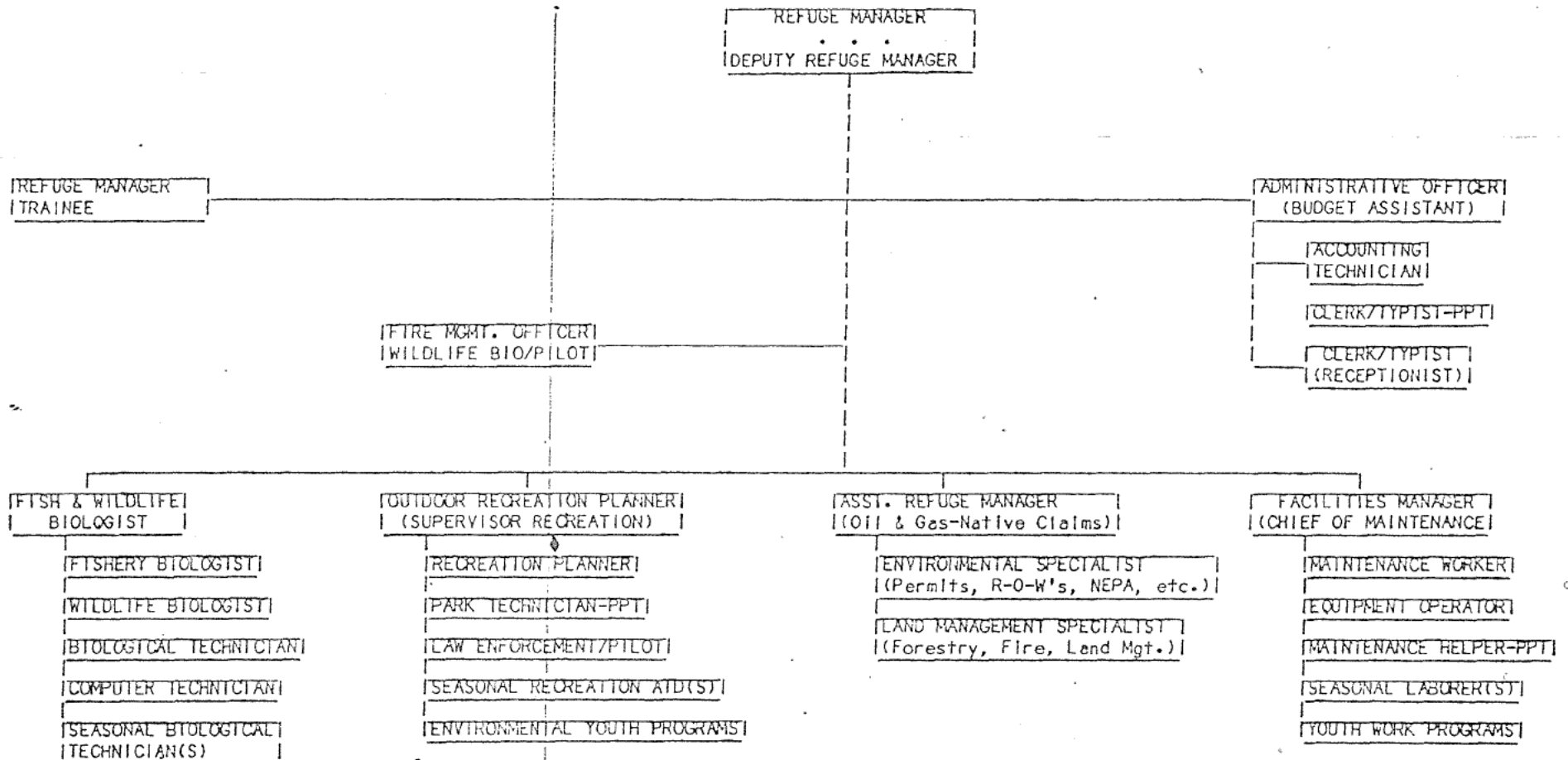
1.	Cooperative Programs	Nothing to Report
2.	Other Economic Uses	100
3.	Items of Interest	106
4.	Credits	107

K.	<u>FEEDBACK</u>	107
----	-----------------	-----

L.	<u>APPENDIX</u>	
----	-----------------	--

May 10, 1984

KENAI NATIONAL WILDLIFE REFUGE
ORGANIZATION CHART



APPROVED BY:

Robert L. Delong

5/10/84

Refuge Manager Date

Asst. Regional Director (AWR) Date

Jerry R. Colvert

1/5/85

Refuge Supervisor South (RF) Date

Regional Director

1/5/85

Date

A. HIGHLIGHTS

The coldest spring in years (after a relatively mild winter) delayed ice-out on the lowland lakes until just before Memorial Day weekend. This weekend is the first of the "big" recreational weekends and water based recreation, such as featured in the two wilderness canoe systems, is very popular. The first canoeists into many areas had to break ice to get to open water.

Chevron, U.S.A., Inc. agreed to a clean-up schedule of the PCB contamination discovered in the Swanson River Oil Field in 1984. This will be a very expensive clean-up effort funded by Chevron.

The volunteer effort on Kenai in 1985 consisted of 43 persons who contributed a total of over 15,000 hours of quality work.

The FWS appealed a BLM conveyance of 4,481 acres of refuge lands to Point Possession, Inc. (a native group) to the Office of Hearings and Appeals. The ruling went in our favor and the conveyance invalidated.

The third exploratory well drilled on Cook Inlet Region, Inc.-owned subsurface beneath refuge lands was completed by ARCO and partially reclaimed. All three wells drilled under this program were dry.

The native allotment case concerning Sarah F. Lindgren was settled in the refuge's favor. This case returned 111 acres of prime wildlife habitat along the Kenai River to the refuge.

In June 1985, Regional Director Gilmore signed the Record of Decision for the Kenai Comprehensive Conservation Plan. This completes more than four long years of planning and will direct refuge management and development for the next ten to fifteen years.

Regrettably, eleven persons lost their lives on the refuge in 1985. Nine were lost in one aircraft accident and two boaters drowned in Skilak Lake.

An agreement was reached with the Alaska Department of Fish and Game to limit wolf harvest in the northern portion of the refuge to a predetermined level. This should stop the decrease in the wolf population.

Twenty eight caribou were released on the refuge by FWS and ADF&G. Hopefully, this will be the nucleus of a herd that will establish in the central portion of the refuge. This caribou habitat has been unoccupied for over 90 years.

The late Russian River Sockeye salmon run broke all previous records. The escapement into the system was 136,669, and an additional 58,412 were caught by fishermen. The previous harvest record was 33,390.

Our new 40' x 50' heated storage building was given the final approval by Engineering. This gives us some badly needed work room in the winter.

B. CLIMATIC CONDITIONS

The weather profile for 1985 proved to be a marathon of records and near records causing even veteran weather prognosticators, such as NBC's Willard Scott, to admit that Alaska was indeed "out of sync" -- a real "meteorological mess," as he described it during a broadcast of NBC's "Today" Show in January.

Whether or not 1985 will go down in the refuge's record books as a "meteorological mess" remains to be seen, but nevertheless, Mother Nature's fickle ways kept life interesting on the Kenai Peninsula. January began the pattern of climatic inconsistencies by being the second mildest since record keeping began in 1944. With the daily average temperature exceeding 17 degrees above normal, pussy willows were in full bloom by the end of the month. Eleven months later, the year ended about where it started, with December being the third warmest on record. Temperatures over much of southcentral Alaska exceeded those of northern Florida. Between January and December, however, it was a different story.

While basking in relative warmth during January and December we experienced the coldest April on record -- with the low hitting a -15 degrees. The month of June tried to make up for an obnoxious April by coming within one degree of breaking the previous high of 77 degrees set ten years earlier. The only thing approaching normal was the first frost which came in on cue about mid-September. October brought yet another surprise -- producing the coldest average temperature ever recorded for that month.

This roller coaster-like weather pattern resulted in an abrupt transition from winter to summer. Spring, if in fact it ever arrived, was certainly never readily noticeable. March produced one of the heaviest snowfalls in recent years (17"), and by the end of May trees were still "leafless," although most of the lowland lakes were "iceless." By late October, most all lakes except Hidden, Skilak, and Tustumena, were ice covered, and by the first week in November open water anywhere on the Kenai Peninsula was a rarity.

The following monthly excerpts characterize our 1985 "springless" climatic conditions.

- January - second warmest on record
- March - heaviest snowfall in 20 years
- April - coldest on record
- June - one degree short of all time record high
- October - coldest on record
- December - third warmest on record

Despite the extreme fluctuations in temperature, we were still 55 percent below the 38-year average total precipitation level. Snowfall was over 60 percent less than the same 38-year average despite a near record breaking accumulation in March (see Table 1). Perhaps Willard Scott was right. Maybe 1985 was a "meteorological mess."

Table 1. Monthly temperatures and precipitation data*.

Month	Temperature		Precipitation	
	High	Low	Total	Snow
January	40°	15°	1.48"	7.2"
February	36°	-20°	.9 "	2.5"
March	34°	0°	1.60"	17.3"
April	46°	-15°	.15"	3.6"
May	65°	25°	.10"	2.0"
June	77°	29°	1.68"	0.0
July	76°	39°	2.35"	0.0
August	68°	32°	3.23"	0.0
September	62°	24°	1.57"	0.0
October	50°	12°	.95"	1.5"
November	37°	-21°	.17"	2.0"
December	44°	- 3°	.42"	5.3"
Total for 1985			12.79"	41.4"
38-Year Average Total			19.91"	68.7"

*Reported by FAA at Kenai Airport

C. LAND ACQUISITION

1. Fee Title

a. Alaska Native Claims Settlement Act (ANCSA)

1) Kenai Native Association, Inc (KNA) - Under ANCSA, the Kenai Native Association was conveyed 18,083 acres of refuge lands. These lands were conveyed with the Section 22(g) ANCSA covenant requiring such lands remain subject to the regulations of the refuge. Other than a one mile gravel road to the 1982 Southwest Fork 23-29 wildcat dry well, no development has occurred on these lands.

During November, Division of Realty gathered information on land sales adjacent KNA property to assist in appraising these conveyed lands both with and without the impacts of Section 22(g). In a memorandum dated November 21, 1985, various zones within KNA lands were identified by Realty as providing differing levels or types of use which may be allowed or prohibited under developing regional policy.

2) Salamatof Native Association, Inc. (SNA) - With the passage of ANCSA, this native group received approximately 16,535 acres of refuge lands free from Section 22(g) provisions. The result was the development by SNA of the Moose Range Meadows Subdivisions adjacent to the Kenai River.

Development in this subdivision included construction of a 60 foot road north of the Kenai River to a new boat ramp. Overburden was replaced with gravel from a new gravel pit. Huge drainage ditches along this road and adjacent wetlands channel surface and ground water into the River while lowering the water table by as much as 6 feet to provide additional development area. As much as twelve feet of peat was encountered during this ditch development.

The Corps of Engineers (COE), following unauthorized placement of overburden on the floodplain adjacent the first of four new boat ramps ordered the material be removed by March 31. Ice prevented SNA from a timely removal and they received a 30 day extension from the COE. Other violations including placement of overburden on wetlands and improper construction of drainage ditches and catch basins required several visits from the COE.

SNA, during subdivision development, mined substantial amounts of gravel from open pits and along the road rights-of-way. No payments for this gravel have been received. However, a proposal to exchange land with SNA for a Kenai River non-development easement in exchange for gravel was developed. Under this proposal, FWS would acquire a non-development easement along three miles of the Kenai River. In exchange, SNA would be authorized FWS gravel for development of their lands in that area contiguous to the Kenai River. This proposed exchange would resolve the issue of unauthorized use of gravel by SNA and would provide perpetual protection for important recreational and fish and wildlife resources of the Kenai River. This non-development agreement was signed by SNA March 11, but the refuge is still waiting Washington Office approval.

During July, SNA began clearing along section lines of conveyed lands north of the Kenai Airport adjacent to Kenai Native Association's north boundary. In August some of these cleared lines were posted "Salamatof Native Property, entry permit required."

3) Toyonek Native Corporation - Nothing to Report.

4) Point Possession, Inc. (PPI) - On April 29, the Bureau of Land Management approved the Point Possession, Inc. Native Group surface estate conveyance for 4,481.32 acres located at the northern tip of Kenai National Wildlife Refuge.

The U.S. Fish & Wildlife Service (FWS), as well as the Sierra Club and Air Taxi Operator Hank Rust, appealed this decision in separate briefs filed prior to the conveyance. PPI sought refuge acreage previously as

an Alaska Native Village but negotiated for an off-coast land settlement. The FWS appeal is based on technical considerations, while the Sierra Club/Hank Rust brief attacks the validity of the entire organization. A reading of the Sierra Club brief raises issues of possible fraud in several.

The conclusion of the Office of Hearings and Appeals stated, "The lands described in BLM's April 29, 1985 decision are not available for conveyance to PPI for several reasons. First, such refuge lands were not formally withdrawn by the Secretary for selection and conveyance to PPI as a native group at the time the Secretary had the authority to do and, therefore, such refuge lands are not now subject to the operation of ANCSA and do not satisfy the requirement of § 14(h) of ANCSA that they be "unreserved public lands". Second, PPI has no vested or valid existing rights in the lands covered by its group selection application and the Secretary's discretionary authority under §§ 14(h)(2) and (7) to convey refuge lands to native groups has been rescinded by legislation adopted after the passage of ANCSA. Third, the conveyance to PPI is barred by BLM's selection regulations.

PPI may argue that equity requires the Board to overlook the administrative errors committed in the implementation of ANCSA that now prevent PPI from obtaining title to the lands covered by its group selection application. But, in this case, a ruling favorable to FWS will not cause hardship to the group because it is located on the native allotment granted to Feodoria Pennington, one of its members, in 1963. A ruling for FWS in this case will be consistent with applicable law and the intent of § 14(h) of ANCSA to avoid hardship to natives otherwise ineligible for the act's settlement benefits. See, Neechootaalichaagat Corp., 79 IBLA 301, 304, 307, (March 20, 1984)."

5) Cook Inlet Region, Inc. (CIRI) - RM Bob Delaney and ARM Bob Richey attended a meeting on July 23, at the RO to discuss with ADF&G, State Parks, WAES, and RO, the Restricted Zone covenant along the Kasilof River associated with refuge lands selected by CIRI years ago. The purpose of the restriction is to maintain the integrity of this natural area adjacent to Kenai Wilderness. Staff also met with CIRI representatives on September 19, to negotiate the extent of the restriction zone and again on November 8, Delaney, DRM Mike Hedrick, and Richey, accompanied by DARD Joe Mazzoni, met with CIRI Land Department personnel Don Marx, Steve Planchon, and Russ Johnson to discuss options available for possible land exchange for their Tustumena area land selection.

Following three months of drilling operations at the Wolf Lake Well No. 2, ARCO/CIRI experienced another dry hole. This is the third in a series to be drilled by CIRI within their sub-surface inholdings on the KNWR. The first two, Wolf Lake No. 1 and Funny River No. 1, produced no commercial resource and were both abandoned. The Wolf Lake Well No. 2 was plugged and abandoned in February. However, ARCO was stymied in their efforts to reclaim the Wolf Lake No. 2 drill site for lack of a

current State-approved waste disposal site accepting drilling fluids. ARCO began in June agitating reserve pit fluids in preparation for their draw-down and disposal at the Sterling Waste Site. The ADEC, however, has told the site operator it would not authorize further mud disposal at the site until certain steps under the current ADEC site permit were accomplished. ARCO suspended operations at the drill pad and ADEC requested the site remain status quo until an approved disposal site is identified. In the interim, this site was prepared for winter and partial reclamation of the Wolf Lake No. 2 pad to stop erosion was completed in late July.

Early August ARCO, conducted reclamation work of the Wolf Lake No. 2 pad. The flare pit was reclaimed, and the surrounding dike reconstructed. Pad slopes were rebuilt and gradient reduced, seeded and fertilized to stabilize the facility for another winter.

Not until September was ARCO able to draw-down reserve pit fluids with authorization of ADEC, BLM, and agreement with Chevron, USA, Swanson River Field Operator. ARCO completed the draw-down of Wolf Lake No. 2 in October. ADEC approved the disposal of cuttings and solids at the site October 21. Crews folded the fabric liner over the disposables and covered it with overburden removed from the pit. Contouring of the area will be conducted next summer after reclamation of the pad and access road.

6) Representatives from BIA visited the office June 25 and 26 for the location of refuge lands conveyed to Native groups and the offices of the Kenai and Salamatof Native Associations. They were preparing to survey native forest allotments in the North Kenai area and adjacent the refuge. BIA planned to contract an aerial survey (presumably over refuge native inholdings), which will spill over to adjacent lands outside the refuge, thereby providing additional information to the Kenai and Salamatof Associations.

BIA representatives obtained SUP 61-85 to conduct an archaeological study/inventory of the 14(h)(1) site in Section 22 which includes the Tustumena Campground. The BIA team, headed by Walt Dotter, was unable to complete their investigations before being sent to Lake Clark to continue similar studies. It is our understanding this study will not be resumed before spring 1986.

2. Easements

The Division of Realty personnel held their first negotiating meeting on October 22, with City of Kenai officials concerning Kenai River Flats/old Kenai Headquarters land exchange.

FWS initiated a land exchange with the City of Kenai that could bring as much as 2,300 acres of prime wildlife habitat on the flats of the Kenai River into the refuge. In trade for the old 5-acre "Moose Range"

administrative site with in the business district, the refuge would acquire a prime viewing site for snow geese which stage there each spring on their way to the Wrangell Islands in Russia. The flats also provide excellent opportunities to view caribou.

During January, under FWS Permit E-170-KE, Homer Electric Association continued construction of the buried 25kV power transmission lines adjacent the refuge boundary near Ski Hill Road. A shallow water table, combined with unfrozen ground, slowed construction. H.E.A. equipment driving on the refuge outside the 30 foot right-of-way has been a problem, and HEA representatives were contacted.

Gilbert/Commonwealth representatives Paul Stempin, Steve Ott, John Bridges, Dave Mooberry, and Jim Bartel visited the refuge June 6, to discuss with RM Delaney and ARM Richey the refuge's stipulations for the proposed 115kV powerline from Fritz Creek to Soldotna which crosses the headquarters complex. Both Gilbert/Commonwealth, engaged by Homer Electric Association (HEA) to develop and construct this facility, and HEA have agreed to the conditions of under these special stipulations. These special regulations were finalized in July with Gilbert/Commonwealth and HEA representatives. Centerline clearing was also completed the entire length of the project. Additional clearing within the right-of-way is planned for early fall 1985 with facility construction to follow.

Homer Electric Association (HEA) consultants from Gilbert/Commonwealth Associates, Inc., of Jackson, Michigan, conducted aerial surveys in August for a 60-mile 115kV transmission line from the Fritz Creek substation near Homer to the Soldotna substation. This route will cross four miles of the refuge west and north of the headquarters to parallel the existing right-of-way, with the possible exception of a future southerly displacement within the Soldotna Airport Easement Area. An archaeological survey of this proposed route was conducted during September and centerline posting completed early October.

3. Other

a. Native Allotments:

An eight page decision was received from Administrative Law Judge Harvey C. Sweitzer in late November. The decision was favorable to Kenai National Wildlife Refuge and involved Sarah F. Lindgren's Native Allotment Claim (AA8228) involving 111 acres of Kenai Riverfront land. The decision to reject Ms. Lindgren's claim was based on a December 4, 1984 government contest hearing held in Kenai. The judge rejected the liberal application of the Native Allotment Act which BLM used to originally convey the land to her. Judge Sweitzer rejected the claim for several reasons including non-substantial use and possession of the land, intermittent use, claimant's use was not exclusive, and claimant did not use the land as an independent adult.

The decision is significant in that the issues are similar for hundreds of other native allotment claims that have been approved by BLM through other refuges in Alaska. FWS must insist that the requirement of the Native Allotment Act be adhered to during the adjudication of each claim. The Lindgren case should send notice that approval of native allotment claims not supported by facts, believable claims, or credible witnesses will not be tolerated. The rejection of a particularly liberal application of the Native Allotment Act may indicate that many other previously approved claims would not stand the test of a contest hearing.

ORP Rick Johnston deserved sole credit for this decision. His persistence, in spite of many other priorities, paid off. Few of us can say we saved 111 acres of key habitat.

D. PLANNING

1. Master Planning

The Kenai National Wildlife Refuge Comprehensive Conservation Plan, Environmental Impact Statement, and Wilderness Review was signed by the Regional Director on June 27, 1985. This planning effort began shortly after ANILCA passed in December 2, 1980. The final protest period drew over 100 comments most favoring more resource protection than the Service's preferred Alternative C. This alternative recommended 79% of the refuge be managed as Wilderness, motorized access more restricted in Wilderness, and a reduced area open to oil and gas leasing. In addition to establishing wildlife viewing and non-motorized boating areas, the plan recommended reintroducing caribou and marten to historical ranges, controlling human disturbance near trumpeter swan, bald eagle, and brown bear feeding areas, and modifying harvest programs so wildlife populations would reflect natural sex and age ratios, social structure, and behavior. Recommendations of the plan will be implemented through cooperative agreements with the State of Alaska, the State and Federal regulatory procedures, direct management actions, and interpretation and education programs. Regulations to implement the preferred alternative should be available for public review in the spring of 1986 and implemented prior to the 1986 field season.

It is hoped the direction set forth by the preferred management alternative will benefit wildlife by correcting many current problems while preventing future ones.

2. Management Plans

With the Master Plan behind us, work began on a seemingly endless list of management plans.

Forest, fire, wilderness, big game, fish, furbearer management, waterfowl, marine bird, raptor, public use, oil and gas, interpretation, sign, river management, law enforcement, search and rescue, equipment

utilization and replacement, maintenance and rehabilitation, and Skilak Loop Special Management Area plans are all scheduled to be completed in the near future. Like death and taxes, planning seems to be inescapable.

3. Public Participation

As a major public use refuge in Alaska, Kenai is constantly under scrutiny. Lately, even the moose have started looking over our shoulder... MBF

In June 27, Regional Director Robert Gilmore signed the record-of-decision giving final approval to the Kenai comprehensive Conservation Plan (KCCP), the first CCP completed for the 16 Alaskan national wildlife refuges as mandated by the landmark 1980 Alaska National Interest Lands Conservation Act (ANILCA).

After more than four years and countless opportunities for public input at myriad scoping meetings, hearings, informational meetings, open houses, etc. the final plan was released in early April with a 60 day comment period. As the planning process was nearing the finish line, once again public comments from individuals as well as agencies continued to surface. Main areas of concern during the final 60-day comment period centered around the two most controversial provisions of the KCCP namely,

the closure to most hunting and trapping within the Skilak Loop Special Management Area, a 42,000 acre area destined to promote wildlife observation and interpretation. The other controversial aspect, which has been dormant until some discerning party apparently actually read the document, call for a prohibition on stocking or other enhancement techniques in wilderness for purposes other than to restore depressed population(s) to historic levels. Since the Alaska Department of Fish & Game's Fisheries Rehabilitation Enhancement Division (FRED) was in the fifth year of a salmon stocking resource program on Tustumena Lake's wilderness, this provision spelled curtailment of this project as well as potential for reduced commercial salmon harvest. However, it appears likely the lake can produce as many salmon naturally as it can under enhancement.

When the comment period ended June 7, over 116 letters were received on the final plan. Surprisingly, comments generally favored support for more protective management including less motorized access, more wilderness designation and less emphasis on moose production. The only support for continuing FRED's salmon enhancement in wilderness was from organizations receiving a financial subsidy. No individual letter supported the salmon enhancement while several opposed the project. When the record of decision signed, the light at the end of the tunnel could be seen, however dimly. The next few years will result in a potpourri of "step-down" plans designed to implement the KCCP's general direction. By all counts, something like 20 sub-plans will be developed addressing everything from Archaeology through Zooplankton including Search & Rescue, Fire, Law Enforcement, Public Use, etc. etc.

But if the KPCC planning process seemed interminable, it was a prelude to another opportunity for public participation which came on its heels. In 1984, Governor Bill Sheffield responded to cries for increased protection for Alaska's world-famous Kenai River by creating the Kenai River Special Management Area as a unit of the Alaska State Park System. To chart the future course of the river, the Governor appointed a 19-member Kenai River Advisory Board comprised of local citizens, agency representatives and business leaders. Beneath the Advisory Board were seven subcommittees including Lands, Habitat, Guides, Fisheries, Permits, Agency, Biology/Upland Habitats and Social/Recreation. Refuge staff participated to various degrees on these committees, as did FWS representatives from the Region Office.

At times, Alaskans' overriding fear & loathing of suspected restrictions on personal freedoms and government intervention results in such extensive opportunities for public participation that the "means" appears to become the "end". In the effort to insure participation from all segments, attempts to reach management by consensus sometimes resembles democracy run amok. The interminable meetings, hearings, of the Kenai River Advisory Board and its numerous committees represented this management strategy taken to the extreme.

By year's end, order was beginning to emerge from chaos as proposed regulations governing horsepower limitations, permits for guides, closures to motors and non-development buffer zones all promised that public hearings fitting the health of the river versus economic self-interest would continue. Thankfully, since the Kenai River Special Management Area is under the jurisdiction of Alaska State Parks, public attention was focused on that agency rather than the refuge. Wisely, the advisory board and its numerous committees were comprised not only of agency experts in their respective fields but respected local citizens whose personal integrity endowed this complex planning process with a high degree of credibility from the start.

With the Kenai CCP completed and the Kenai River Advisory Board wrapping-up its duties, 1985 brought a new era of responsibility and concern to resource management on the Kenai Peninsula. The heretofore unchallenge short-term gain of the individuals in the free enterprise system were now weighed against the long-term economic health of the community as reflected in its biological base. "The times, they are a changin" Dylan said. And most seemed to agree, it is for the better.

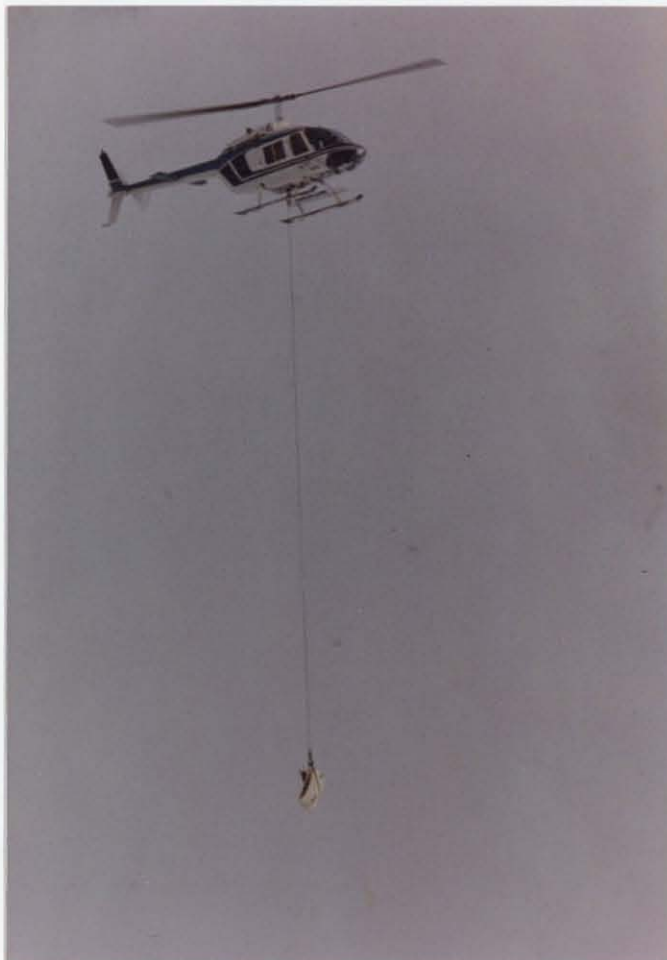
5. Research and Investigations

a. Reintroduction, Monitoring, and Management of Caribou (*Rangifer tarandus*) in the Central and Southern Regions of the Kenai National Wildlife Refuge. Investigators: U.S. Fish & Wildlife Service (T.W. Bailey, E.E. Bangs, W.W. Larned). Cooperators: Alaska Department of Fish & Game (T.H. Spraker).

Caribou were successfully captured in the Nelchina Basin, transported to the Kenai Peninsula, and released on the Tustumena Glacier Flats on the refuge on April 14, 1985. Forty-seven caribou, captured on April 11 and 12 near Lake Louise west of Glenallen, were transported by helicopter slings to a holding pen. Forty-four of these were then loaded into a stock trailer on April 13, and trucked to refuge headquarters. Of these, 28 survived transport and the additional immobilization, needed to transport them in a Bell 205 helicopter to the release site. Since high winds and a snowstorm prevented release at the preferred alpine release site east of Lake Emma, the caribou were released on the Tustumena Glacier Flats about 0.5 miles east of Tustumena Lake. Of the 28 released caribou (6M, 22F), 20 (4M, 16F) were radio-collared and their post-release movements and productivity monitored. All released caribou were additionally identified by numbered ear tags and a visual collar.

By December 31, 1985, 4 radio-collared caribou, all females, were dead. One died from suspected capture-related or transportation injuries, one from a vehicle collision, and two were shot by hunters after they associated with the Kenai Mountains caribou herd which is legally hunted. Two females have joined the Lowland caribou herd, and at least one male and a female are with the Kenai Mountains herd. Two groups of reintroduced caribou wintered in the release region; a herd of 13-14

adults and calves which wintered at about 3,000 feet elevation in the upper Funny River-Indian Creek region, and three adults (1M, 2F) and two calves at the 3,000 foot elevation south of Tustumena Glacier near Truuli Creek. Movements of the caribou between the release period and the overwintering period were complex with the caribou essentially exploring most of the available habitat between Skilak and Tustumena Lakes. As summarized in a progress report (Appendix), the most significant obstacle to the establishment of a viable caribou herd in the Tustumena Benchland appears to be the presence of other herds of caribou. Once the introduced caribou discover a herd, they join them instead of occupying new habitat. Based on observations of 12 radio-collared caribou, the population south of the Kenai River increased 33% by December 31. An additional 30-50 caribou will be captured in the Nelchina Basin during April 1986 and released on the refuge south of Skilak Lake to supplement the initial reintroduction.



Helicopter bringing in an immobilized
caribou to be processed at the Lake
Louise capture site. TNB



Transferring immobilized caribou from truck to helicopter at refuge headquarters. MFB



Caribou recovering from last trip to the release site at Tustumena Glacier Flats, 4/14/85. TNB

b. Feasibility of Studying Lynx on the Kenai National Wildlife Refuge.
Investigators: U.S. Fish & Wildlife Service (I.N. Bailey and E.E. Bangs)

A total of 11 lynx (7M, 4F) were captured and fitted with radio collars during 1985. Six were captured in the Mystery Creek Hills area, three in the Tustumena Benchlands, and two in the lowlands. Of these, one later died from trap-related injuries, one was taken by a trapper, and another was struck and killed by a vehicle on the Sterling Highway. Productivity of radio-collared lynx suggested that females produced fewer surviving young during 1985, compared to 1983 and 1984. Lynx movements indicated a shift in habitat use from higher to lower elevations in upland areas, and dispersal of resident lynx during the fall and winter. These patterns, relative to patterns observed between 1982-85, strongly suggest a response of lynx to declining snowshoe hare populations, particularly in upland areas. Concurrent snowshoe hare investigations suggested lower snowshoe hare numbers throughout the refuge with the lowest levels in upland habitats.

During 1985, the title and emphasis of the investigation of lynx on the refuge was changed and a new project proposal submitted and approved. The project in the future will focus on lynx in the lowland area north of the Kenai River where trapping pressure has been the greatest and incidental catch of lynx is expected to continue despite a closed season. The project is also scheduled to be taken over by a student working on a Master of Science degree in Wildlife Science. A manuscript on lynx investigations on the refuge from 1982-84 was submitted to, and accepted by, the Journal of Wildlife Management. It is to appear in the April (Vol. 2) 1986 issue. A project report summarizing telemetry data on lynx from September 1984 through October 1985 appears in Appendix .



Biological volunteer Mike Kesterson with radio-collared lynx. Study was converted to a graduate project for 1986 with Mike as a graduate student at the University of Alaska. MFP

c. Wolf-Lice and Wolf Population Investigations on the Kenai National Wildlife Refuge. Investigators: U.S. Fish & Wildlife Service (T.N. Bailey, E.E. Bangs, W.W. Larned). Cooperator: Alaska Department of Fish & Game (T.H. Spraker).

A total of 47 wolves taken from the Kenai Peninsula were sealed by ADF&G during the 1984-85 season. Of these, at least 35 were taken from the refuge, and of these, at least 10 showed evidence of lice. Baits treated with Ivermectin to kill lice were dropped from aircraft around a kill within the area formerly used by the Point Possession pack and four wolves were live-captured by refuge personnel during July 1985 in the Skilak Lake pack area and treated with Ivermectin (Table 2). One wolf was later euthanized after it failed to recover from immobilization. Poor nutritional state was diagnosed as an "open" but probable contributing factor by the National Wildlife Health Laboratory because no physical injuries, disease, or parasite could be attributed to the poor condition of the wolf. None of 12 wolves taken by hunters and trappers to date on the refuge during the 1985-86 season exhibited signs of lice. One to four wolves observed on the southern refuge in the Fox River Valley appeared to have lice, as observed from the air at the end of the year. Wolf numbers on the northern region (GMU15A) of the refuge appeared to be significantly lower than in previous years (see Section G. Wildlife).

Table 2. Wolves captured and/or fitted with radio-collars and treated with Ivermectin during 1985.

Sex	Age	Date of Capture	Location	Status (12/31/85)
F	A	21 July 85	South Pipeline Rd	Unknown
F	A	"	" " "	Euthanized/Poor Cond.
M	A	"	" " "	Shot 9/1/85 by moose hunter
F	A	30 July 85	Mystery Creek Road	Alive



Biological Technician Mary Portner (l.) and Biological volunteers Randy Phelps, Cindy Levy, and Dan Taylor (r.) surround Tom Schumacher and an immobilized wolf captured and fitted with a radio collar for census purposes. (Note: wolf is in center - the only one not smiling.) TNB

d. Breeding Populations and Productivity of Cormorants and Gulls at Lake Louise and Skilak Lake, Alaska. Investigators: U.S. Fish & Wildlife Service Marine Bird Management Project (J.L. Trapp, A.L. Sows, D.R. Nysewander, and M.F. Portner).

Skilak Lake marine bird colonies were visited on June 6, July 29-31, and October 2, 1985. Number of double-crested cormorants was 26, at least 13 nests were available, eight of which contained eggs and 19 chicks were fledged. This was the highest productivity of cormorants observed on Skilak Lake since 1982 (Table 3).

Table 3. Summary of trends in populations and productivity of double-crested cormorants at Skilak Lake, Alaska, 1982-85.

Variable	1982	1983	1984	1985	1982-85		
					Mean	SD	CV
Adults at Colony	29	25	20	26	25.0	3.7	14.8
Number of Nests Available	8+	8	11+	13	10.0	2.4	24.0
Number of Nests With Eggs	7	5	6	8	6.5	1.3	20.0
Nests with Eggs/ Nests Avail.	0.88	0.63	0.54	0.62	0.67	0.15	22.4
Total Eggs Laid	23	15	21	21	20.0	3.5	17.5
Eggs/Nest with Eggs	3.29	3.00	3.50	3.00	3.20	0.24	7.5
Clutch Size Distribution (%)							
1 egg	28.6	0.0	0.0	28.6	15.4	-	-
2 eggs	0.0	40.0	16.7	28.6	19.2	-	-
3 eggs	14.3	40.0	33.3	28.6	26.9	-	-
4 eggs	28.6	0.0	33.3	14.3	19.2	-	-
5 eggs	28.6	20.0	16.7	14.3	19.2	-	-
6 eggs	0.0	0.0	0.0	0.0	0.0	-	-
Total Chicks Fledged	9	11	11	19	12.5	4.43	35.4
Chicks Fledged/ Nest with eggs	1.29	2.20	1.83	2.38	1.92	0.48	25.0

The numbers of herring x glaucous-winged gull hybrids observed on Skilak Lake and the numbers of nests were down compared to previous years (Table 4), but the proportion of nests containing eggs was similar. A close examination of iris and wingtip color of 100 gulls indicated all were hybrids. No phenotypically pure herring or glaucous-winged gulls were observed in the sample. Two hundred and eighty gull chicks were banded in 1985 and previously-banded Skilak Lake gulls were observed in California, Oregon, southeast Alaska, Kodiak, and throughout southcentral Alaska.



The herring x glaucous-winged gull colony at the upper rocks on Skilak Lake being surveyed by biologist Art Sowls from Anchorage Regional Office and refuge biological technician Mary Portner.

TNB

Table 4. Summary of trends in populations and productivity of herring x glaucous-winged gull hybrids at Skilak Lake, Alaska, 1982-1985.

Variable	1982	1983	1984	1985			1982-85		
				Upper	Camp	Total	Mean	SD	CV
Adults at Colony	967	895	948	745	116	861	917.8	48.6	5.3
Number of Nests									
Available	492	542	518	435	59	494	511.5	23.5	4.6
Number of Nests with Eggs	472	507	514	416	59	475	492.0	21.6	4.4
Nests with Eggs/ Nests Avail.	0.96	0.94	0.99	0.96	1.00	0.96	0.96	0.02	2.0
Total Eggs Laid Eggs/Nest	1219	1262	1371	1105	163	1268	1280.0	64.5	5.0
with Eggs	2.58	2.49	2.67	2.66	2.76	2.67	2.60	0.09	3.5
Clutch Size									
Distrib. (%)									
1 egg	8.9	14.8	4.3	7.9	3.4	7.4	8.8	-	-
2 eggs	25.4	22.7	25.5	19.5	16.9	19.2	23.2	-	-
3 eggs	64.2	61.3	69.5	71.6	79.7	72.6	66.9	-	-
4 eggs	1.5	1.2	0.8	1.0	0.0	0.8	1.1	-	-
5 eggs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
Total Chicks									
Fledged	765 (229)	745 (222)	843 (92)	670 (119)	95 (95)	765 (214)	779.5	43.4	5.6
Chicks Fledged/ Nest with Eggs	1.62 (141)	1.47 (151)	1.64 (56)	1.61 (74)	1.61 (59)	1.61 (133)	1.58	0.08	5.1
Chicks Banded	115	295	197	212	60	280	219.8	81.4	37.0

Figures in parentheses indicate the number of chicks and nests in the sample used to determine productivity.

e. Use of the Kenai National Wildlife Refuge's Upper Kenai River by Overwintering Bald Eagles. Investigators: U.S. Fish & Wildlife Service (T.N. Bailey, E.E. Bangs, W.W. Larned, M.F. Portner)

Fourteen bald eagles (6A, 8Juv) were captured, equipped with radio transmitter harnesses, and released along the Kenai River during 1985 (Table 5). Movements of tagged eagles indicate they are moving from the Kenai River to other areas on the Kenai Peninsula, including Kachemak Bay, Deep Creek, Anchor River, Stariski Creek, and areas off the Kenai Peninsula such as Big River and Beluga Lake on the west side of Cook Inlet and Prince William Sound as far south as the Bering Glacier north of Yakataga. Some apparently range even farther as they move away from the Kenai River during the summer so they cannot be detected during our radio-monitoring surveys but return to the Kenai River the following winter.

Table 5. Bald eagles captured and released with radio transmitters in 1985.

Date	Age	Sex	Method of Capture	Location Captured	Leg Band #
01-30-85	Imm	U	Net	Swiftwater (Rehab.)	629-16091
02-02-85	Ad	U	Padded Foothold	Lower Kenai R.	629-16093
02-03-85	Ad	U	" "	" " "	629-16094
02-03-85	Imm	U	" "	" " "	629-16100
02-12-85	Imm	U	" "	Jim's Landing	629-16099
02-13-85	Imm	U	" "	" "	629-16098
02-28-85	Imm	U	" "	Lower Kenai R.	629-16096
02-28-85	Ad	U	" "	" " "	629-16097
03-06-85	Ad	U	" "	" " "	629-18628
03-06-85	Ad	U	" "	" " "	629-18629
05-24-85	Imm	U	Found by Arc L.	Arc Lake (Rehab)	629-18627
12-04-85	Ad	F	Padded Foothold	Jim's Landing	629-16095
12-06-85	Imm	M	" "	" "	629-18648

Eagle surveys by boat and aircraft along the Kenai River during 1985 indicate similar trends to previous years with numbers reaching a peak in January (Tables 6 and 7). Mild winter conditions during 1985-86 kept the Kenai River ice free through December 31, 1985. Locations of eagles radio-equipped the previous winter (1984-85) suggested some individuals remained on unfrozen streams on the west side of Cook Inlet well into the winter (December).

Table 6. Bald eagles observed along ice-free portions of the Kenai River during aerial surveys in 1985.

Date	Adults	Juveniles	Total
01-18-85	180	72	252
02-13-85	84	45	129
03-15-85	107	29	136
04-18-85	22	3	35
10-25-85	23	8	31
11-21-85	55	19	74
12-30-85	163	53	216



A bald eagle on a Kenai River gravel bar is recorded during a bald eagle survey.

CEP

Table 7. Ages of bald eagles observed during boat surveys along the Upper Kenai River during winter-spring and fall-winter months, 1985.

Dates	River Route Number				Total		
	1		2		Ad	Juv	Combined
	Ad	Juv	Ad	Juv			
01/21&23/85	70	32	198	120	268	152	420
02/14&15/85	75	54	103	54	178	108	286
03/14&15/85	50	34	91	46	141	80	221
04/18&22/85	5	3	12	18	17	21	38
10/17&18/85	12	1	8	9	20	10	30
11/12&13/85	16	3	17	11	33	14	47
12/12&13/85	25	8	41	22	66	30	96

1. Kenai Lake Outlet to Jim's Landing.
2. Lower Skilak Lake Campground to Bing's Landing.



Biological volunteers Liz Sharpe and Carlos Paez ready canoe to census bald eagles on the Kenai River below Skilak Lake.

TNB



Development along the Kenai River outside the refuge boundary threatens to decrease the value of the Kenai River to wintering bald eagles. TNB

f. Movements and Fates of Young Trumpeter Swans on the Kenai National Wildlife Refuge, Alaska. Investigators: USFWS, Kenai NWR (T.N. Bailey, E.E. Bangs, W.W. Larned, M.F. Portner).

Trumpeter swan investigations continued through 1985. A total of 13 adult and subadult trumpeter swans from eight bachelor groups were captured. Twelve of these were banded and fitted with radio transmitters. One of the 13 captured represented a recapture of a 1984 bird (see 55UR, Table 8). Though the leg bands and neck collar were intact, the radio transmitter was replaced. In addition, an adult female trumpeter, captured on a small lake west of Tundra Lake, had apparently been originally captured and banded on the refuge in 1977. Though both plastic bands were gone she still wore an aluminum FWS band. She was fitted with a plastic leg band, a neck collar (69UR), a radio transmitter, and released. All swans captured this year were associated with bachelor groups, not family groups due to low productivity, probably influenced by severe spring weather.



Trumpeter swans were banded and fitted with radio harnesses during the final year of a movement study. Refuge Biologist Ted Bailey holds swan before its release.
WES



Many trumpeter swans spent late March and April on the Kenai River at the outlet of Skilak Lake. This area was closed to motor boats during this period (3/1-5/15) to minimize disturbance.
TNB

Table 8. Trumpeter swans banded on the Kenai National Wildlife Refuge, Alaska, July 1985.

Banding Location on KNWR	Date	Age	Sex	Neck & Tarus Band #	USFWS Band #
N. Curlew Lk.	07-10-85	Ad	F	55UR	619-00555 (84 Recapture)
Gooseneck Lk.	07-23-85	Ad	M	58UR	619-00558
Meadow Lk.	07-08-85	Ad	F	63UR	619-00563
Meadow Lk.	07-08-85	Ad	F	64UR	619-00564
Meadow Lk.	07-08-85	Ad	F	65UR	619-00565
Rabbitfoot Lk.	07-09-85	SubAd	M	66UR (no neck collar)	619-00566
Rabbitfoot Lk.	07-09-85	SubAd	F	67UR (no neck collar)	619-00567
NNW Curlew Lk.	07-09-85	Ad	F	68UR	619-00568
W. Tundra Lk.	07-10-85	Ad	F	69UR	619-00814 (Originally Banded in 77)
Grouse Lk.	07-16-85	SubAd	Unk	70UR	619-00570
Grouse Lk.	07-16-85	SubAd	Unk	71UR	619-00571
Flat Lk.	07-17-85	Ad	M	72UR	619-00572
Flat Lk.	07-17-85	Ad	F	73UR	619-00573

Most of the swans remained at or near their capture sites until moving into staging areas and beginning their flight south in October. By the end of October radioed swans had been located on Lower Russian Lake, north of Portage, and several on the Copper River Delta.

Of the adult trumpeter swans captured in 1984, two are known dead, seven never returned to the Kenai Peninsula to our knowledge (definitely not to their nesting lakes), though several had been observed alive during the winter on Prince of Wales Island and near Yakutat. Two adult females returned to or near their former nest sites, and two returned to the Kenai Peninsula but did not nest (Table 9).

Table 9. The fate of Trumpeter swans banded on the Kenai National Wildlife Refuge, Alaska in 1984.

Banding Location on KNWR	Date	Age	Sex	Visual Band #	Fate
Beaver Lk.	07-06-84	Ad	F	49UR	Dead
Donkey Lk.	07-11-84	Ad	F	50UR	Never returned
Doroshin Lk.	07-12-84	Ad	F	51UR	Assumed dead at Icy Bay
Decoy(Quill)Lk.	07-12-84	Ad	F	52UR	Nested at Quill Lk.
Moose Lk.	07-13-84	Ad	F	53UR	Nested at Moose Lk.
Grey Cliff Lk.	07-18-84	Ad	F	54UR	Never returned
Lk. NW Hook Lk.	07-18-84	SubAd	F	55UR	Returned to bachelor male group
Curlew Lk.	07-18-84	Ad	F	56UR	Never returned
Nest Lk.	07-19-84	Ad	F	57UR	Last observed Alsek River
N. Pepper Lk.	07-20-84	Ad	F	59UR	Last observed Dangerous R
N. Pepper Lk.	07-20-84	Ad	M	60UR	Last observed Icy Bay
Kenaitze Lk.	07-20-84	Ad	F	61UR	Probably returned
Fox Lk.	07-23-84	Ad	F	62UR	Last observed alive on Prince Wales Island

g. Fox River Fishery Investigation. Investigators: U.S. Fish & Wildlife Service, Kenai Fisheries Resources Station (J.L. Dean).

At least seven species of fish, including all five species of salmon, utilized the Fox River during 1985. In order of relative abundance they were: 1) anadromous Dolly Varden, 2) coho salmon, 3) pink salmon, 4) sockeye salmon, 5) chum salmon, 6) chinook salmon, and unknown numbers of 7) eulachon. The only lake (Windy Lake) surveyed in the system held landlocked coho. Two clear-water streams enter in glacial Fox River; Clearwater Slough, which is used by all five species of salmon and another, named "Clay" Creek, into which Windy Lake Creek empties. Despite its turbidity, Dolly Varden and sculpins appear to be rearing in the Fox River and later in the fall (November) coho were observed, perhaps spawning, in the main channel. Over 1,000 fish were estimated taken by sport anglers on the Fox River but only about 300 actually kept. According to locals, the Fox River supports the largest coho fisheries (sport, commercial, and subsistence) in the Kachemak Bay area.

h. Chickaloon River Fishery Investigations. Investigators: U.S. Fish & Wildlife Service, Kenai Fisheries Resources Station (J.L. Dean).

This study was in its second year and included reconnaissance surveys, a weir on the lower river, and two lake surveys. The most abundant species of salmon were sockeye, chinook, and/or coho in order of decreasing abundance. Most sockeye were 3-year-old fish and most chinook 4-year-old fish. The majority (5,600) of sockeye spawn on the refuge and 1,000-3,000 additional sockeye spawn in Swan Lake in the Chugach National

Forest at the headwaters of the Chickaloon River. A reconnaissance survey of North (Upper) Fuller Lake revealed populations of Dolly Varden and sculpin. Flow measurements were also taken on the river throughout different regions of the watershed in attempt to describe observed productivity.

i. Moose River Fishery Investigations. Investigators: U.S. Fish & Wildlife Service, Kenai Fisheries Resources Station (J.L. Dean).

A weir and inclined plane juvenile trap were established in the lower Moose River and five lakes within the Moose River system were examined during 1985. Four species of salmon were recorded including about 700 early-run, 3-year-old and 2,800 late-run, 2-year-old sockeye salmon; 1,900 coho, 13 pinks, and 2 chinook salmon. Also documented were spawning rainbow trout and round whitefish, believed to have come up from the Kenai River, plus spawning runs of Pacific and Arctic lamprey. The juvenile trap revealed the following composition in order of decreasing abundance: coho salmon, Arctic lamprey, 3-spine stickleback, and sockeye salmon. The four lakes sampled included Muskrat, Bear, Clam, Grebe, and Camp Island Lakes.

j. Evaluation of Sampling Gears for Fish Population Assessment in Alaskan Streams and Rivers. Investigators: Alaska Cooperative Fishery Research Unit (M.Sc. Student Thesis: William R. Lorenz).

Some of the field work in the above study was conducted on Jean Lake and Hidden Creek within the refuge and on the Moose River and Kenai Rivers outside the refuge boundaries. An abstract of the thesis, a copy of which is in refuge files, follows:

During summers, 1982 and 1983, a variety of habitats were sampled on the Tanana and Kenai River drainages to evaluate sampling gears used for fish population assessment in Alaskan streams and rivers. Experiments were conducted to investigate sampling efficiency, length and species selectivity, and injuries to fish by three active (backpack electroshocker, electrofishing boat, seine), and two passive (minnow trap, fyke net) gear types. Gears were compared using a common set of attributes: accuracy, portability, scope or species detection, labor required, fishing power, fish savings (low mortality), and initial cost. Electrofishing systems were best for species detection and fishing power, while passive gears had higher catch per hour of labor. Large fyke nets and seines were effective under limited environmental conditions. A linear model was developed to assist in selecting an optimum fishing gear, or array of gears, for any level of fisheries population assessment, considering all applicable sampling constraints.

k. Hidden Lake Sockeye Enhancement Project. Investigators: Alaska Department of Fish & Game, Fisheries Rehabilitation and Enhancement Division (F.R.E.D.) (D.S. Litchfield).

Hidden Lake was selected by the Alaska Department of Fish & Game as an enhancement site in 1976. Sockeye production in the lake is believed to be limited by spawning area. Eggs were taken from returning spawners since 1976, hatched in fish hatcheries, and returned as fingerlings to Hidden Lake in 1977, 1978, 1979, 1983, 1984, and 1985. The egg take goal in 1985 was 6.0 million which should result in about 4.5 - 5.0 million fingerlings for stocking in 1986. Although the project has resulted in increased sockeye production from Hidden Lake, a number of questions raised by the U.S. Fish & Wildlife Service, Kenai National Wildlife Refuge, have yet to be recognized, addressed, and satisfactorily answered. Some of these include: 1) effects of sockeye enhancement on other species in Hidden Lake, particularly lake trout; 2) effects of hatchery-reared sockeye on natural genetic diversity of Hidden Lake and other sockeye populations within the Kenai River system; 3) effects on Hidden Lake ecosystem particularly water quality and zooplankton population composition and dynamics; and 4) how to manage for artificially high number of returning adults to Hidden Creek.

l. Tustumena Lake Sockeye Enhancement Project. Investigators: Alaska Department of Fish & Game, F.R.E.D. Cooperator: U.S. Fish & Wildlife Service - Kenai Fisheries Resources Station (J.L. Dean).

Results of the hydro-acoustics survey on Tustumena Lake during 1985 were unavailable at the time of this report. A very general, unofficial estimate obtained during the September surveys suggested levels perhaps only 80% of those observed in 1984. During 1985 the Kasilof-Tustumena systems contributed about 1,000,000 sockeye to the Cook Inlet commercial catch or 26% of the total Inlet commercial harvest. This now ranks the Kasilof River system as the second-most important contributor to the Cook Inlet commercial catch. The Kenai River system is most important and the Susitna River system the third. In the past, the Kasilof River system was third. Total sockeye escapement into Tustumena Lake was estimated at 500,000 during 1985. The impacts of stocking millions of hatchery reared sockeye fingerlings on other fish populations, on the genetics of natural sockeye populations, and on the productivity of the Tustumena Lake system remains unaddressed and therefore unanswered.

m. Moose Habitat Capacity Model. Investigators: Alaska Department of Fish & Game (Moose Research Center).

Investigations on the energy requirements of moose continued through 1985 with various measurements on the nutrition levels of different diets. A graduate student from the University of Alaska, John Bevins, began working on a M.Sc. project to define seasonal activity patterns of moose using movement-activated radio transmitters attached to the legs of moose. Mike Hubbard, a Ph.D. candidate, also through the University of Alaska, continued his work on the carrying capacity model.

n. Ecology of Black Bears. Investigators: Alaska Department of Fish & Game (C. Swartz).

This study of black bears in the 1947 and 1969 burned areas continued through 1985. Some concern was raised when a high proportion of radio-collared bears were taken by bear hunters this past year. Most of the harvested, radio-collared bears were taken at bait stations, but it is unclear if this year's harvest was a result of increased hunting pressure, increased number of bait stations, lack of foods primarily berries of bears during 1985, or a combination of the above.

o. Kenai Peninsula Brown Bear Study. Investigators: USFWS (E. Bangs), ADF&G (C. Schwartz), USFS (K. Nelson).

The study team efforts in 1985 concentrated on completing the salmon stream surveys and attempting to capture bears. The results of the 1984 work were summarized and published in a progress report. Two brown bear, trapped in 1984, were not located in 1985. One shed his collar and radio failure is suspect on the other.



A part of a cooperative study on brown bears, ADF&G biologist Chuch Schwartz (l.) and refuge biologist Ed Bangs (r.) ear tag a brown bear on the refuge. CRL

Eleven aerial searches for brown bear (37 hours) resulted in a maximum of 66 bears being seen. Thirteen attempts were made to dart bears during June and July. Four bears were radio-collared, two were only ear tagged, and one bear died during these efforts. Six other bears were darted and either did not become immobilized or were lost in thick brush or timber. Helicopter capture appeared most successful in the spring before the alder leaves are out. Snaring or culvert trapping will be investigated in 1986.

Ground surveys were conducted on eight suspected high use brown bear areas over a period of 39 days. These surveys completed the survey of salmon spawning areas started in 1984. Efforts in 1986 will concentrate on determining the habitat use and food habits of radio-collared bears.

The use of trail counters, trail questionnaires, and interviews with knowledgeable locals, to expand knowledge of visitor use patterns and bear sightings, continued.

E. ADMINISTRATION

1. Personnel



Back row: Hare (18), Fenc1 (16), Ward (17), Portner (19), O'Guinn (15), Kivi (14), Hedrick (2), Blaylock (10), Boylan (5), Bailey (6). Front row: Frates (8), Bangs (13), Larned (4), Nelson*. Missing: Delaney (1), Richey (3), Johnston (9). (2/86 JEF)

*Deanne Nelson new Clerk/Typist hired 1/06/86

1985 PERSONNEL
Permanent

1.	Robert L. Delaney	Refuge Manager	GM-13	PFT
2.	Michael B. Hedrick	Deputy Refuge Manager	GS-12	PFT
3.	Robert A. Richey	Asst RM Oil & Gas (Pilot)	GS-12	PFT
4.	William W. Larned	Fire Mgmt. Officer (Pilot)	GS-12	PFT
5.	Michael F. Boylan	Supv. Recreation Planner	GS-11	PFT
6.	Theodore N. Bailey	Fish & Wildlife Biologist	GS-11	PFT
7.	Benjamin R. Chio	Facility Manager	GS-11	PFT
8.	James E. Frates	Facility Manager	GS-11	PFT
9.	Richard K. Johnston	Recreation Planner	GS-09	PFT
10.	Leslie G. Blaylock	Budget Assistant	GS-07	PFT
11.	Anne M. Toppa	Accounting Technician	GS-05	PFT
12.	Jacqueline Goodwin	Accounting Technician	GS-05	PFT
13.	Edward E. Bangs	Wildlife Biologist	GS-09	PFT
14.	Richard D. Kivi	Equipment Operator	WG-10	PFT
15.	Elvin "Al" O'Guinn	Maintenance Mechanic	WG-08	PFT
16.	Patricia A. FencI	Clerk/Typist	GS-03	PPT
17.	Candace D. Ward	Park Technician	GS-06	PPT
18.	Jeri Lee Hare	Clerk/Typist	GS-03	PFT
		Accounting Technician	GS-4/5	PFT

Temporaries

19.	Mary F. Portner	Biological Tech.	GS-05
20.	William P. Eickhoff	Park Technician	GS-05
21.	Karen P. Farrar	Park Technician	GS-05
22.	Ronald A. Levy	Park Technician	GS-05
23.	William Prestridge	Laborer	WG-03
24.	Albert "Bud" Marrs	Laborer	WG-03
25.	James Farrar	Laborer	WG-03
26.	Douglas Emery	YCC Camp Director	GS-07
27.	Sam Evanoff	YCC Group Leader	GS-05
28.	Susan McFarland	YCC Group Leader	GS-05

Permanent Personnel

Facility Manager Ben Chio transferred to Washington, DC on September 28. He was selected for a position in the Office of Maintenance Management and we wish him the best of luck.

James E. Frates transferred to us from the Regional Office on December 9, to fill the facility manager position. This refuge is not new to Jim as he was our past Refuge Manager. It will certainly make driving to work much easier for him. Jim had not moved his family to Anchorage while working in the Regional Office. He was commuting to and from Kenai on the weekends (170 miles one-way).

The permanent part-time position of Maintenance Helper had not been refilled in 1985 due to budget constraints.

Budget Assistant Leslie Blaylock has spent a lot of time this past year recruiting for positions that became vacant in the administrative section of the refuge:

(b) (6)

Temporary Personnel

Our summer seasonal staff decreased by four positions this past year due to budget reductions (Table 10). We reduced seasonal positions in all areas except our YCC staff. Last year we needed 4 YCC staff members for the 20 enrollee camp, this year we kept the same number of staff members but reduced the enrollees from 20 to 15.

Table 10.

Temporary Positions

	1981	1982	1983	1984	1985
Biological Aid & Techs.	0	2	4	3	1
Laborers	0	2	6	4	3
Park Technicians	3	3	3	4	3
YACC/YCC Staff	1	3	3	3	3
Clerk/Typist	0	1	0	0	0

During the past three year period, a larger and larger role of expanding refuge administrative functions from office duties to biological studies have been met through an aggressive volunteer program. This becomes obvious by a review of staffing in Table 11. We are, however, at the point that additional permanent or temporary staff will be necessary to adequately plan and supervise any additional volunteers.

Table 11. Staff Breakdown from FY 1981 to FY 1985.

	Permanent		Vacant as of 12/31	Temporary	Volunteers
	Full-Time	Part-Time			
FY81	13*	1	2	3	1
FY82	12	1	1	5	12
FY83	12	2	2	16	26
FY84	13	3	1	14	25
FY85	13	2	2	10	43

*Includes career seasonal positions.

2. Youth Programs

In 1985, Kenai hosted a YCC camp consisting of 15 enrollees and three staff. Enrollees were selected by random drawing from some 50 applicants with seven females and eight males comprising the final crew. Staff persons including GS-7 Camp Director Doug Emery and GS-5 Group Leaders Susan McFarland and Sam Evanoff. Salaries for 15 enrollees totalled \$19,377, staff salaries (1 GS-7, 2 GS-5's) were \$12,273, and miscellaneous food, equipment, etc., was \$4,815, bringing total cost of this year's camp to some \$36,465. One enrollee was terminated early in the session for disciplinary reasons while three others found the wilderness living/working conditions not to their liking and resigned. While we were not accustomed to such an exodus, the morale and productivity improved with a leaner, if not meaner, crew.

YCC Enrollees

ATT Entered on Duty 06/10/85 - Remaining Terminated 8/02/85

1. J. Allen Agibinik
2. Julie Bunch
3. Alicia Chapman
4. Trenna Connick
5. Shanna Dominguez
6. Dirk Dykstra
7. Manuel Figueiredo
8. Sonya Gillespie

(b) (6)

9. Rachel Gray
10. James Knodel
11. Perry Miller
12. Alfred Orth*
13. Bruce Rosga
14. Jonathan Smith
15. Amber Spearin*

(b) (6)

*Youth Leaders

Kenai's large size and wilderness characteristics require a residential camp, yet lack of centrally-located living facilities make a purely residential setting impractical. As a result, enrollees worked "spikes" of 10 days on and four days off. This adaptation to Kenai's logistical

problems enables the completion of long-term projects in remote areas while providing enrollees the opportunity for extended camping/group living experiences.

Due to the potential hazards involved in safeguarding 15 teenagers for two months in the Alaskan wilderness, the first week of camp is dedicated to enrollee orientation. YCC'ers are instructed and tested in first aid/CPR, physical fitness, swimming, canoe safety, tool use, personal protective gear, bear safety, and related topics. The value of this training becomes evident when incidents occur, such as the two enrollees that capsized a canoe in 40' water but successfully paddled it to shore in their life jackets. Incidents like this and the fact that in recent years Kenai has never had a serious injury to a YCC enrollee or staffer suggests the week-long orientation is invaluable. Teachable moments also occur, such as the YCC'ers confrontation with a sow black bear and two cubs the afternoon following a morning presentation on "Bear Safety" by Biologist Ed Bangs. Spellbound enrollees watched as the bears ran, leaving a lasting impression.

Work projects in 1985 concentrated on trail maintenance, since Kenai has 140 miles of canoe trails and another 60 miles of hiking trails. Twelve days were spent re-routing, filling, and corduroying the popular Hidden Creek Trail. A major project that concluded the summer was the cutting and brushing of a six-mile loop of cross-country ski trail leading from the visitor center.

As always, the highlight of the summer was the 10-day spike through the 60-mile Swan Lake Canoe Route, one of the refuge's National Recreation Trails (the 80-mile Swanson River Canoe Route being the other). Despite their wilderness designation, these canoe lakes receive 8,000 visitors annually with most using the Swan Lake Route. As a result, annual maintenance by YCC is required to repair the numerous portages and pickup the abundant trash (minimum impact camping hasn't made it to the Kenai yet):

As always, environmental education was an important part of Kenai's YCC and our three staffer's extensive wilderness skills and knowledge were supplemented by refuge personnel's expertise as well as three field trips to unique areas. Alaska Department of Fish & Game led enrollees through the Moose Research Center on the refuge where the population dynamics and nutritional requirements of moose are under study (and YCC'ers got good close ups of bulls, cows, and young calves). At the State's busiest fishing hole, the Russian River, an ADF&G biologist explained the life cycle of the red salmon as YCC'ers watched them jump the falls to spawn.

Since the Kenai River was the hottest news story on the Peninsula in 1985, a half-day trip down Alaska's most famous river, led by naturalist-guides from Alaska Wilderness Adventures, gave the enrollees a feel for the importance of the Kenai's blue-green waters.

These special events were supplemented by a program detailing refuge research projects on wolves, brown bears, lynx, eagles, and trumpeter swans by Biological Technician Mary Portner. Park Technician Candace Ward also led enrollees and staff through an evening of environmental education games and activities in the field.

At summer's end, YCC had accomplished some needed trail work, continued to attract favorable publicity in local communities, and succeeded in making a few more teenagers and their parents aware of the work and costs associated with maintaining public lands. The season was capped, as always, with an evening pot luck and awards ceremony at the refuge.

4. Volunteers

Kenai's volunteer program offers persons interested in working on the refuge two options. Local volunteers are the backbone of our program; these persons are required to contribute at least 16 hours a month. In return for their services, they receive 1) an honorary membership in the Alaska Natural History Association and a 15% discount on all books, cards, posters, etc. sold at cooperating association outlets throughout Alaska; 2) free or reduced admission to adult education courses offered at the refuge; 3) uniform provided by the refuge; 4) complimentary Kenai NWR T-shirt, poster, and wildlife books; and 5) periodic "volunteer appreciation nights" with awards, pizza, soft drinks, and certificates.

Our other category of volunteers consists of "seasonal" volunteers who are required to contribute 40 hours a week for at least three months. We are able to provide these volunteers with free housing in a four-bedroom, two bath home adjacent to the headquarters/visitor center as well as \$15 a day travel allowance since these persons are from outside the local area. Since Alaska is a mecca for budding natural resources professionals, Kenai is able to attract highly-qualified persons with a variety of educational backgrounds and experiences.

In addition to our "seasonal" and community volunteer programs, Kenai contracted with the Student Conservation Association (SCA) as a source of five volunteers for 1985. While we have been extremely fortunate in acquiring ample volunteers for field biology, we are short of persons trained in interpretation-recreation skills. The SCA alliance provided a source of trained personnel for these areas while giving these young people a chance to participate in one of the country's most beautiful, albeit challenging resource management areas.

Student Conservation Volunteers

	Position	Arrived	Departed
Randy Conway	Recreation Aid	05/20/85	08/11/85
Cecilia Dennis	Recreation Aid	05/20/85	08/11/85
Cindy Levy	Biological Aid	05/20/85	10/07/85
Florence Munro	Recreation Aid	05/20/85	08/11/85
Orinda Newton	Recreation Aid	05/20/85	08/11/85

SCA volunteers received housing and \$15 per day subsistence allowance from FWS as do our "seasonal" volunteers. Total cost to the refuge for five SCA volunteers was \$12,590, or roughly \$30/day including transportation and administration. Kenai highly recommends the SCA as a source of high quality, enthusiastic volunteers. Due to the remoteness of much of Kenai, the irascible nature of many refuge visitors, and the diversity of recreationists using the refuge, Kenai's SCA'ers were required to have a maturity, self-assurance, and outdoors experience beyond most college age students. Cecilia Dennis of California, Florence Munro from Arizona, Randy Conway from Wisconsin, and Orinda Newton from Vermont all had these qualities and were a credit to the FWS uniform. They alternated all summer from visitor information duties at the refuge contact station to patrolling hiking trails to back-country canoe patrols to routine labor and maintenance. They lived and worked well together and made refuge staff fervent supporters of SCA.



1985 SCA'ers (l. to r.) Cecilia Dennis (CA), Florence Munro (AZ), Randy Conway (WI), & Orinda Newton (VT). KPF

During 1985, Kenai had 43 volunteers on duty. Of these, 14 were "seasonal" and SCA volunteers who contributed 40 hours a week while 29 local volunteers contributed at least 16 hours each month. By year's end, these people had totalled over 15,000 hours or the equivalent of almost eight years of work on the refuge in duties such as visitor information, hiking and ski trail maintenance, youth programs, wildlife rehabilitation, biological research, interpretive programs, and vehicle maintenance.

5. Funding

Table 12. Kenai National Wildlife Refuge funds and position patterns - FY 1981 through 1985.

FISCAL YEAR	1981	1982	1983	1984	1985
<u>PERSONNEL</u>					
FTE's Person years	N/A	17.3	18.5	21.5	21.5
PFT Positions filled	9	12*	12	13	13
Vacant PFT 12/31	5	10	10	8	8
P-Career Seasonal	4	0	0	0	0
PPT Positions Filled	1	1	2	3	2
Vacant PPT 12/31	0	3	2	1	2
Temporary	3	5	13	12	10
Temp. Intermittent	0	0	0	1	0
YCC Staff Positions	0	3	3	3	3
Vacant YCC Staff		1	1	1	0
YCC Enrollees	0	13	18	20	15
YACC Camp	5-22	0	0	0	0
Volunteers	1	12	26	25	43
<u>OPERATING & MAINTENANCE FUNDS</u>					
Wildlife Funds	579,000	669,000	970,000	928,000	863,000
Fisheries	0	0	0	10,000	30,000
Exp. for Sales	49,000	55,000	54,000	62,000	62,000
Subtotals O&M	628,000	724,000	1,024,000	1,000,000	955,000
Small ARMMs	0	0	0	0	130,000
Totals	<u>628,000</u>	<u>724,000</u>	<u>1,024,000</u>	<u>1,000,000</u>	<u>1,085,000</u>
<u>SPECIFIC PROJECT FUNDS</u>					
YCC Funds	0	0	0	34,693	26,600
I&R-Fee Area	7,300	7,300	0	0	0
BLHP-New HQ	1,494,000	0	0	0	0
Fee Area Rehab	0	52,700	0	0	0
Large ARMM	0	0	40,000	264,000	225,000
RRP-Water Quality	0	0	0	0	150,000
RRP-Oil & Toxic Chem.	0	0	0	0	40,000

*Conversion of 2 career Seasonals to PFT.
 Bicentennial Land Heritage Program (BLHP)
 Accelerated Refuge Maintenance Management (ARMM)
 Refuge Resource Problems (RRP)

Large ARMM funding decreased some from last year. The projects completed with these funds were Caribou reintroduction to the Kenai Peninsula and tracking of these animals; a contract for recreation facilities design of the Skilak Loop Special Management Area; and purchase of signs for the Skilak Loop. The Cultural Resources Site Evaluation contract was not issued because there were no bids received. After approval from Washington, DC, these funds were used to purchase replacement vehicles for the Kenai NWR and Innoko NWR.

Small ARMM funds were added into the base budget and used for maintenance and small projects that did not exceed \$5,000.

RRP funds were transferred to Habitat Resources in the Regional Office to complete the Water Quality and Effect of Oil & Toxic Chemical projects.

Funds were decreased in the YCC program from last year. We reduced the number of enrollees to 15 to make the group size more manageable for the Group Leaders. Only 3 staff members were hired rather than the 4 we would have hired for a 20 enrollee camp.

6. Safety

Eleven private citizens lost their lives on the refuge this year. Nine men lost their lives in the North Pacific aircraft accident on February 4, 1985, while the commuter airplane was making an approach for a landing at the Soldotna airport. The airplane crashed due to poor visibility and icing just a couple of miles from the refuge headquarters on refuge lands. Two men died in a drowning accident on the Skilak Lake September 29, two others suffered from hypothermia and exposure. Copies of newspaper clippings can be seen in Appendix.

Personnel accidents increased this year from 5 in 1984 to 8 in 1985. All accidents reported were minor injuries (Table 13).

Table 13. Personnel Accidents.

Types	Number	Doctor Cost	Days Lost
Back injury while unloading map cabinet	1	\$242.20	3
Knee injury from kneeling on burning slag while welding	1	201.00	3
Eye injury while metal grinding	1	55.00	0
Raven bite to forearm	1	83.00	0
Injury to right wrist by talon on Great Horned Owl	1	69.56	0
Stomach discomfort after drinking lake water	2	68.00	0
Cut to right ankle with Pulaski	1	66.00	2
Totals	8	\$784.76	8

The ankle injury with a pulaski was to a YCC enrollee. The enrollee was wearing heavy leather boots and shin guards while clearing trail. The severity of the accident was decreased because of the safety precautions.

Safety meetings were held monthly with each staff member presenting a topic of their choice (Table 14). Accidents still happen even after increased safety awareness.

Table 14. Safety Meetings from January through December 1985

<u>Date</u>	<u>Chairperson</u>	<u>Topic</u>
01/28/85	Robert Richey	Play Safe with Snowmobiles
02/25/85	Ted Bailey	Bend your Knees (Film)
03/18/85	Mike Boylan	One Minute Manager (Film)
04/29/85	Ed Bangs	Human Exposure to Immobilizing Agents & Helicopter Safety
05/20/85	Rick Johnston	The Uncalculated Risk (Swiftwater Safety)
06/85	Various	New employee orientation, CPR, First Aid, Defensive Driving, boating, bear safety, etc.
07/15/85	Ben Chio	Room to Live I & II, (Seatbelts)
08/19/85	Bill Larned	Aircraft Survival Kit
10/21/85	Dick Kivi	Shake Hands with Danger (repair of heavy equipment)
11/25/85	Leslie Blaylock	Discussion of Marking, Disposing and Handling of Hazardous Material
12/16/85	Candace Ward	Hazards of Sitting (exercises that can be done in the office)

September's safety meeting was cancelled due to scheduling conflicts and due to the close of the Fiscal Year.

In 1985 we had one minor motor vehicle accident due to rain and extreme ice on the Ski Hill Road. A refuge vehicle that was completely stopped slid down an incline into a State Park vehicle denting it in front of the driver's door.

In May 1985, after a request by Facility Manager Ben Chio, the City of Kenai Fire Department inspected the refuge aircraft hanger and old headquarters in Kenai. The deficiencies noted were that the fire extinguishers throughout needed to be serviced and sealed. This was completed and a copy of the invoice was sent to the Fire Department.

F. HABITAT MANAGEMENT

2. Wetlands

Wetlands contiguous to the Kenai River and its tributaries continue to generate controversy about needed habitat protection along the Kenai River. This controversy relates to recommendations of the Kenai River Special Management Area advisory board to protect valuable fish and wildlife habitats along the river. The wetlands have been documented to be especially valuable to rearing coho salmon in the Kenai River system.

3. Forests

No commercial timber sales were made during 1985. Commercial timber permits may be issued in the future in certain intensive and moderate management zones but will be de-emphasized in favor of prescribed fire, personal use firewood and houselog harvest.

Three commercial Christmas tree permits were issued in 1985 at 80¢ per tree. About 175 trees were cut along the Mystery Creek Access Road. Most local residents cut their own trees, for which no permit is required.

Public firewood areas serve the dual functions of low-cost habitat enhancement and providing a source of fuel for local people. Personal use firewood permits were handled as in 1984, with two distinct seasons split by spring breakup and moose hunting season. Five hundred fifty-five free permits were issued in 1985, compared to 536 in 1984.

Two firewood areas were open again this year, one on Finger Lakes Road and one on Funny River Road. The wood supply at Finger Lakes is becoming exhausted and this will likely be the last year for that unit. A decision will be made this spring whether or not to open another area in the Swanson River Road portion of the refuge, serving Sterling residents. The Funny River Road area was extremely popular this fall and winter, with the opening of a new 120-acre section of accessible birch and spruce. The new section was rapidly depleted but should continue to produce wood through this winter and possibly the winter of 1986-87. Another 300 acres of wood is available for future years in this area.

The second year of a cooperative ADF&G/USFWS forest habitat enhancement program resulted in approximately 700 acres in Skilak Loop treated by the State's 3 LaTourneau tree crushers. FMO/Pilot Bill Larned coordinated this effort, endeavoring to end up with a natural-looking mosaic which lent itself well to prescribed burning for fuels cleanup. Funds from ADF&G ran out this year before the project was completed, so they are planning to return to the area during late winter of 1985-86 to finish the job.

9. Fire Management

This was the third year that the Alaska Division of Forestry provided fire protection for the refuge and surrounding lands. Detection and suppression of fires on the refuge were accomplished quickly and efficiently through the use of patrol planes and an experienced helitack crew.

The 1985 fire season was a wet one on the Peninsula, and only three wildfires were responded to on the refuge. These all occurred in June, and totalled less than one acre. All three were along the Sterling Highway, were all man-caused, and two resulted from fireworks. All three were in full or critical suppression areas under the Interagency Fire Planning, and were immediately and completely extinguished.

FMO Larned was chosen leader of the planning team for the Kodiak/Alaska Peninsula Interagency Fire Management Plan. The team worked through the year on the project and the plan will be signed and implemented by the start of the 1986 fire season.

Larned also worked on the Kenai Refuge Fire Plan, which will also be implemented during the 1986 fire season. The deadline for this plan was delayed one year in order to insure compatibility with the refuge CCP which was not completed until summer of 1985.

A basic firefighter course was given at the refuge in late May by Larned and George Walter, training specialist from BLM's Alaska Fire Service. This session with a subsequent step test qualified five additional refuge personnel as "Red-carded Basic Firefighters," bringing the total number of certified fire personnel on the refuge to eight.

Larned was also utilized as an instructor for the newly-developed fire management training program for refuge personnel throughout the country. This will be an annual responsibility for him and other FMO's in the Service.

Bill underwent additional fire training this year, including Incident Command System (ICS), Air Operations Branch Director Transition training, and Introduction to RAWS (Remote Automatic Weather STation), and acted as role player during ICS fire simulations at the Alaska Fire Service in Fairbanks.

But 1985 was not a good year for prescribed burning on the Kenai, in spite of optimism resulting from successes enjoyed in 1984. An unusually wet, cool spring and summer, combined with unavailability of necessary contingency resources due to commitments in the "Lower 48", postponed the operation until late August. Finally on August 27, it appeared we would have conditions meeting the burn prescription long enough to burn a significant portion of the 1,500-acre area crushed the preceding winter.

With the help of Glenn Anderson (FMO from Bureau of Indian Affairs) as burning boss, we mobilized on August 28, igniting a test fire with a terra-torch on loan from the Alaska Division of Forestry. By early afternoon, however, the weather deteriorated into a cold drizzle, and our fire went out. Subsequent rain and shortening days made us abandon further attempts in 1985.

Observations made in the three areas burned in 1984 showed a prolific, though spotty, suckering response from willow, birch, and aspen stumps and root systems. Our initial impression, however, gained by inspection of units burned in different months, is that response is faster and mortality much lower for these plants if they are burned in May or early June, rather than July or August. Our expectation, based on information obtained from the Institute of Northern Forestry, was that burn timing would have little effect on plant mortality in this area due to high year-round soil moistures. We now feel, however, that the issue may be fairly complex and that, in the absence of adequate data from the Kenai or similar areas, our best bet is to try to burn in the spring whenever possible. This is a fertile area for future studies.

10. Pest Control

Spruce bark beetles continue to attack large slow growing white spruce trees especially on the northern part of the refuge. These periodic outbreaks are viewed as a natural process and no attempts are made to control insects on the refuge. Where insect-killed trees occur in campgrounds, they are removed for safety reasons.

12. Wilderness and Special Areas

Several issues involving the management of Kenai Wilderness surfaced during 1985, primarily through the final approval process of the Kenai NWR Final CCP/EIS/Wilderness Review document. A large portion of the access issues discussed and resolved in the new master plan set the future stage for wilderness management on the refuge.

Salmon enhancement in wilderness was a major area of comment and discussion during the final public comment on the master plan. The refuge plan initially did not allow fisheries enhancement in wilderness. The final plan ended with Region 7 leadership again compromising wilderness resource values, over the objection of refuge staff.

The final CCP/EIS/Wilderness Review recommended several additions to the Kenai Wilderness, including the 97,500 acre Two Indian area, and the Chickaloon and Tustumena areas totalling 98,000 acres. Apparently all new wilderness recommendations for Alaskan refuges are being held for a comprehensive statewide refuge wilderness proposal.

The "Alaska Mountain Wilderness Classic", AKA the "Hope-To-Homer" footrace, AKA the "Iditafoot" was discontinued on Kenai in 1985 after Senator Stevens intervened to have it allowed through designated wilderness in 1984 over the much-publicized objections of refuge staff. As a result of the adverse publicity for the controversial event, its promoters moved it northeast to the Alaska Range for 1985 where the NPS must now deal with it. Although Kenai lost the battle over the footrace in 1984, it appears we've won the war...

ORP Rick Johnston conducted a training and familiarization trip on the Swan Lake Canoe Route for Student Conservation Association (SCA) volunteers who would be doing wilderness patrol during the 1985 season. All portage signs and portages were in good condition reflecting two previous seasons of a full-time park technician assigned primarily to backcountry duties.

A new leaflet was developed for the Swan Lake and Swanson River portions of the Kenai Wilderness (see packet). The new leaflet contains information on travel, ethics, wildlife, and wilderness values within the canoe routes, as well as a reduced scale map which makes navigation even more exciting.

New wilderness boundary signs were installed by SCA volunteers where the Kenai Wilderness parallels the Sterling Highway and Swan Lake Road.

Volunteers, SCA, and refuge staff worked on several wilderness cabins during 1985. Cabin rehabilitation concentrated on popular cabins and on basic maintenance and safety construction for those cabins.

A cabin repair and clean up was completed on Tustumena Lake's public use cabins during July. Several of the cabins were badly abused and littered during the previous winter.

Four Anchorage North Star Kiwanis Club members on refuge volunteer agreements installed a new roof, stained 6 sleeping bunks, felled and cut-up 6 dead trees, and made other repairs to the Vogel Lake public recreation cabin. Refuge aircraft supported their work.

A new stove pipe was installed in the Emma Lake cabin because the existing one had become unsafe.

An illegally constructed road was discovered during July inside the common refuge and Kenai Wilderness boundary near Brown's Lake. A subsequent investigation revealed that the road had been built by an unknown Cat operator under contract by [REDACTED] of Soldotna who lived on private property adjacent the refuge.

After a three week investigation ORP Johnston met on August 7, with [REDACTED] regarding the unauthorized road constructed into the Kenai Wilderness near Brown's Lake. After an additional investigation, [REDACTED]

admitted constructing the road around a boundary lake in order to access his property adjacent to the refuge. A formal agreement was made to forego criminal prosecution upon complete restoration of the unauthorized road. At year's end the restoration was 70% complete with hand-work and seeding yet to be done in the spring of 1986.

A draft refuge manual chapter for wilderness management, 6 RM 8, was received from Washington, via the Regional Office during early October. Comments on the new draft chapter were prepared and forwarded to the Regional Office. From this field station's perspective, the draft failed to follow the intent of the Wilderness Act, sought to liberalize activities in wilderness areas, and failed to recognize the values of wilderness on Alaskan refuges to wildlife populations and traditional human use. Refuge comments urged a rewrite of the proposed draft and suggested utilizing the proposed changes recommended by the Alaska Wilderness Task Force Group as well as incorporating portions of the Kenai Wilderness Administration Guide.

Johnston accompanied Fisheries Biologists on a survey of the Fox River on August 21-24. The trip reinforced the fact that the upper Fox River is a primitive portion of the refuge with few signs of public use. Refuge sub-entrance signs and wilderness boundary signs downstream from Clearwater Slough were in good condition. The refuge portions of the Fox River is entirely within Kenai Wilderness and has no drop-off places for public rafting.

G. WILDLIFE

1. Wildlife Diversity

In order to maintain natural wildlife diversity on the refuge, as mandated by ANILCA, efforts continue to be focused on wildlife species that are endangered or rare elsewhere (bald eagles, trumpeter swans, brown bears, wolves, wolverine, lynx, marten), or have been extirpated from the refuge (caribou). History has demonstrated that these species are the first to decline in the face of development and increased human access and exploitation. In the long run, how well wildlife was managed on the Kenai NWR will be assessed by the status and health of populations of the above species.

2. Endangered and/or Threatened Species

No new information was obtained on the presence of any of the officially-recognized endangered species of plants or animals on the refuge during 1985.

3. Waterfowl

Snow geese arrived on the Kenai River Flats on, or about, April 16, 1985, when approximately 60 birds were observed. Peak numbers were observed

between April 18-22, when approximately 1,000-1,200 snow geese were observed on the Flats. At this time 70-90% of the flats was still snow covered. All the geese observed during this period were in the snow free areas. Other waterfowl using the area included Canada geese and by May 8, pintails, wigeons, shovelers, and about 240 sandhill cranes were also observed. Compared to 1984, the snow geese arrived 2 weeks later (April 4, 1984).

5. Shorebirds, Gulls, Terns, and Allied Species

On July 29-31, 1985, Bio Tech Mary Portner, FWB Ted Bailey and Volunteer Dan Taylor assisted Wildlife Assistance, Regional Office, with banding glaucous winged herring gull hybrid chicks at the Skilak Lake nesting colonies. Two hundred seventy two of the chicks were captured, using 1-2 zodiacs and a long handled net. The chicks were fitted with yellow and black visual bands (i.e., L91) on the right leg and standardized metal USFWS bands on the left leg.

6. Raptors

Fifty two nests of bald eagles were located in 1985 (Table 15). Thirty three of these were active (63%). This compares to 47 nests located in 1984, 79% of which were active. In 1983, 41 nests were located, 80% of which were active.

Table 15. Location of eagle nests and number of eaglets/nest on the Kenai Peninsula, Alaska, 1985.

Area	Inactive	Active Nests 6/5-7/85	Eaglets 7/25-26/85	No Search	Search/No Location
Afonasi Lk		x	2		
Bear Cr		x	1		
Beaver Lk		x	3	New site	
Bedlam Cr	x			x	
Big Indian Cr		x	0		
Birch Hill Coastal	x		0		
Bishop Cr Outlet		x	1		
Bradley R Outlet		x	1	New site 1 mi NW of old nest	
Camp Island	x		0		
Campfire Lk		x	0		
Camper's Lk		x	2		
Daniel's Lk		x	?	x Found nest in spruce	
Upper Fox R	a.x	b.x	1	nest lower on river	
Gavia Lk		x	2		
Otter Cr		x	2		
Gene Lk	x		0		
Kenai R (FR Pwrline)	a.x	b.x	1		
Kenai R (College Is)	x		0		
Kenai R (Jim's Lndg)		x	1		
Kenai R (Near RR)		x	2		
Killey R (Lower)	x		0		
Killey R (Upper)		x+1 empty	?	Couldn't locate	
Loon/Clam Lks	x		0		
Mink Cr		x	2		
Moose Lk		x	0		
Moosehorn Lk	x		0		
Moose R (lowest)	x		?	Not located	
Moose R (lower R)		x	1	S of E Fork	
Moose R (Spruce tree)			-	x	Blown dn
Moose R (W. Fork)		x	1		
Pincher Cr Outlet	x		-	x	
Russian R	x		-	x	
Sheep Cr	x		?	Couldn't locate	
Skilak Inlet	a.x	b.x	3		
Sucker Lk		x	1		
Suneva Lk	a.x b.x		0		
Swan Lk		x	2	new nest	
Torpedo Lk		x	0		
Coyote Lk		x	1		
Juneau Cr		x	1		
Bear Lk	x (ad near)		0		
Kenai R (E of Bridge)	x			x	
Beaver Cr Outlet		x	2		
1st Lk N of Trapper					
Joe off pipeline on					
Cr 200 yds					
Trapper Joe		x	2		
S. Oilfield Rd				x	Blown dn
Clearwater Slough		x	2		x No nests seen despite extensive search
L. Deep Creek		x	?		No location
L. Fox R		x?	?		No location
Nikolai Cr		x	2		
Kasilof R		x	1		
Killey R/Harvey Lk		?	(2 near nest)	x	

Surveys flown June 5, 6, and 7, 1985, and July 25 and 26, 1985.

Of the active nests located in both the nesting and productivity survey, 25 of 29, or 86%, successfully produced eaglets.

A productivity survey on July 25 and 26, 1985, revealed 40 eaglets in 25 nests (1.6 eaglets/successful nest or 1.38 eaglets/active nest). Active nests discovered in new locations include Trapper Joe Lake, Kasilof River, Beaver (Kenai Outlet), lower Deep Creek and 2 nests in slightly different locations, Bradley River Outlet, 1 miles northwest of the old nest, and Upper Fox River nest lower on the river. Additional inactive nests, which were located in 1985, and may or may not have been checked prior to 1985, include Kenai River - east of Kenai River Bridge.

7. Other Migratory Birds

The Alaska Breeding Bird Survey was conducted along two routes in 1985. The Swan Lake route was surveyed by Bio Tech Mary Portner on June 17. Results of the survey, as shown in Table 16, indicate the most commonly observed birds were the Swainson's thrush (81), Alder flycatcher (63), and the dark-eyed junco (58). A total of 429 birds of 30 species were recorded. The Alaska Breeding Bird Survey of the Skilak Loop route was completed on June 20, (Table 17) despite numerous weather delays. The most commonly encountered birds included the Swainson's thrush (52), yellow rumped warbler (34), and the dark-eyed junco (34). A total of 366 birds of 31 species were observed along the Skilak route.

Table 16. Birds recorded on the Swan Lake Route, Alaska Breeding Bird Survey, 1985.

Species	#	Species	#	Species	#
Common loon	11	Tree sparrow	2	Yellow warbler	1
Arctic loon	1	Gray jay	10	Orange-crowned warbler	18
Sandhill crane	1	Common raven	3	Blackpoll warbler	18
Greater yellowlegs	2	Blackcapped chickadee	2	Northern waterthrush	11
Common snipe	4	Boreal chickadee	4	Yellow rumped warbler	42
unid. shorebird	4	American robin	3	Common redpoll	13
unid. woodpecker	2	Varied thrush	7	Savannah sparrow	6
Alder flycatcher	63	Swainson's thrush	81	Dark-eyed junco	58
Olive sided flycatcher	9	Gray-cheeked thrush	8	White-crowned sparrow	14
Violet green swallow	1	Ruby-crowned kinglet	26	Song sparrow	4

Table 17. Birds recorded on the Skilak Loop Route, Alaska Breeding Bird Survey, 1985.

Species	#	Species	#	Species	#
Common loon	4	Gray jay	4	Townsend's warbler	1
Northern goshawk	1	Black billed magpie	1	Ruby-crowned kinglet	23
Greater yellowlegs	1	Common raven	3	Orange crowned warbler	5
Common snipe	1	Black capped chickadee	1	Blackpoll warbler	2
Spotted sandpiper	1	Boreal chickadee	3	Northern water thrush	7
unid shorebird	1	American robin	16	Yellow-rumped warbler	34
Arctic tern	1	Varied thrush	14	Common redpoll	18
Alder flycatcher	23	ermit thrush	1	Savannah sparrow	11
Olive sided flycatcher	5	Swainson's thrush	52	Darkeyed junco	34
Violet-green swallow	1	Gray-cheeked thrush	24	White-crowned sparrow	32
Tree swallow	21			Song sparrow	1

Eighteen pairs of trumpeter swans successfully produced broods from at least 26 nests (69%) during 1985 (Table 18). Sixty two cygnets in 18 broods averaged 3.44 cygnets/brood. The early brood survey in July revealed 44 cygnets in 13 broods for an average of 3.38 cygnets/brood. Thirty five cygnets in 10 broods averaged 3.5 cygnets/brood during the late brood survey on September 12, 17, and 21.

Table 18. Locations of trumpeter swan nests and numbers of cygnets observed on the Kenai Peninsula, 1985.

Nest Location	Cygnets	Nest Location	Cygnets
<u>N. Kenai River</u>		<u>S. Kenai River</u>	
Moose Lake	5	Gaswell area	3
Camp Island Lake	3	S. Bay Lake	0
Grebe Lake	4	Clam Gulch	0
Bishop Creek	0	Fox River	2
Beaver Lake	4	Ice Lake	6
1 mi. W. Doroshin	0	Otter Creek	4
2 mi. SW Timberlost	0		
1 mi. S. Daniel's Lake	2		
1 mi. E. Trigger	3		
SW Warbler	3		
Two Island Lake	0		
2 mi. NW Lonesome	0		
Lonesome Lake	4		
1-1/2 mi. N. Scenic Lake	5		
N. Trapper Joe	3		
Angler Lake	4		
Phalarope Lake	1		
1 mi. W. Hook Lake	4		
Quill Lake	0		
1-1/2 mi. E. Suneva Lake	2		

Comparison 1985 to 1984 and overall is indicated in Table 19.

Table 19. Comparison of trumpeter swan production 1985 to 1984 and overall.

Year	# Broods	# Nests	# Cygnets	Ave. Cygnets/Brood
1985	18	26	62	3.44
1984	32	46	108	3.38
	Down	Down	Down	
	44%	43%	43%	
Overall (Summarized last 25 years)				
1957-1981	21	25	85	

Note: Late spring probably had significant effect on numbers of pairs able to successfully nest this year.

8. Game Animals

a. Moose - A winter density count was not done in 1985 because of low snowfall and poor counting conditions.

Only a limited fall moose composition count was conducted in 1985 because of low snowfall and poor counting conditions (Table 20). The 1969 burn was surveyed in cooperation with ADF&G. Results indicated a rebound in the number of bulls, although still abnormally low (1984 - 6 bulls/100 cows and 1985 - 12 bulls/100 cows). Cow/calf ratios remain good with over 40 calves/100 cows. A comprehensive density count and composition count are needed to determine if the trends seen in the 1969 burn (the best moose habitat on the Kenai Peninsula) are representative of other areas. Some winter kill was suspected to have occurred during the spring of 1985 because of a prolonged cold spell with heavy snow in late March and April.

Table 20. Moose composition counts in the 1969 burn, Kenai NWR, 1985.

Area	Date	Count	Total	50"+	30-50"	-30"	Cows	Cow/1	Cow/2
		Time		Bulls	Bulls	Bulls		Calf	Calves
15A-2	11/14-15/85	4.3 hrs	460	3	12	18	205	98	8
15A-5	11/15/85	3.2 hrs	118	1	5	8	48	23	3

Total - 12 bulls/100 cows, 43 calves/100 cows out of 578 moose.

b. Caribou - The lowland caribou herd was surveyed by ADF&G on June 13, 1985 (Table 21). The herd is still around 60-80 animals but appears to slowly growing the past few years. Poaching has removed some of the large antlered bulls in the lowland herd.

Table 21. ADF&G survey data on Kenai Peninsula caribou, 1985.

Herd	Date	Sample	Calves/ 100 cows	Bulls/ 100 cows	Cows w/ Utters	Cows w/o Utters
Lowland	06/13/85	69	32.5	40	29	11
Lowland	10/29/85	61	26	49	--	--
Upland	02/19/85	343	----	--	--	--
Upland	10/29/85	401	25	44	--	--

The upland caribou herd continues to expand its use of the Kenai Mountains. Caribou were in several widely scattered bands during the winter of 1984-85, probably because of relatively low snow depths in the mountains. The number of hunting permits has been slowly increased with the herd's growth and provides an outstanding recreational opportunity.

c. Dall's Sheep and Mountain Goat - Dall's sheep and mountain goats were not surveyed north of Tustumena Glacier again this year due to poor flying conditions. Sheep were surveyed in the most southern and marginal habitat on the refuge by ADF&G biologists (Table 22). Status of sheep and goat populations is not documented but both are believed to be expanding slowly. The number of full curl (mature) rams remains abnormally low.

Table 22. Sheep and goat surveys on the Kenai NWR in 1985.

Count Area	Date	Legal		Sublegal		Ewes	Lambs	Total	Total Goats
		Rams	Rams	Rams	Rams				
857 Fox R	8/05/85	5	18			65	12	100	68
858 Sheep Cr	7/26/85	5	15			2	2	28 ^a	--

^a four unclassified

d. Brown Bear - Brown bear were investigated during the summer but population estimates are not available. Radio tracking of four bears, tagged in 1985, indicates that bears move from considerable distances to utilize spawning salmon. Most tagged bears utilized off-refuge lands despite being captured in the largest block of wilderness available on the Kenai Peninsula. The 1985 harvest of brown bear was relatively high--15 sport, two defense of life and property, and one capture-related mortality.

e. Black Bear - Black bear remain abundant on the refuge but concern is being raised about the potential impact of the record harvest of 378 bears in 1985. A Devil's Club berry failure and good blueberry crop resulted in many bears feeding in open areas rather than in forests. The high harvest was in part a result of increased bear visibility. Black bear baiting which is permitted in only one portion of the refuge, where the State biologist also has a bear study area, resulted in a localized excessive harvest. If that trend continues, the State will likely recommend restricting harvests by eliminating baiting or reducing the bag limit.

f. Wolf - Wolf numbers in the northern region of the refuge appeared to be particularly low prior to the 1985-86 hunting and trapping seasons. Preliminary population estimates for this region of the refuge totaled only 38-44 wolves (Skilak Lake 4, Bear Lake 5, Elephant Lake 5, Swanson River 8, Point Possession 6, and Big Indian 10-16). No lice were detected in any captured or observed wolves or wolves taken by hunters and trappers on the refuge after September 1 (see Investigations).

Because of last season's (1984-85) high harvest of wolves on the refuge including 32 in the northern refuge, an agreement was made to have the ADF&G emergency close the wolf season if numbers observed in packs reached 35 and to limit harvest to 40% of the pre-season wolf population based on observed numbers of wolves in packs plus harvest up to that time. This is expected to reduce the excessive rate of harvest on the refuge and preserve a minimum viable population with a natural appearing social structure averaging 6 wolves/pack. Because of the apparent low number of wolves in the northern part of the refuge, it is anticipated that the season on wolves will have to be closed by an emergency order during the 1985-86 season.

g. Lynx - Lynx numbers still appear to be low relative to their potential levels in the northern region of the refuge where lynx trapping was closed prior to the 1984-85 season. The season remains closed, survival of radio-collared adult lynx was significantly increased after the trapping closure and production continued but at reduced levels.

Reduced recruitment throughout the refuge was suggested during 1985 because young-of-the-year females appeared to produce fewer or no young and adult females appeared to produce fewer surviving offspring (2-3) this year compared to previous years (4-5). Declining snowshoe hare populations throughout the refuge, especially in upland areas are believed responsible for the reduced recruitment.

Because of lowered productivity within the lynx populations and problems associated with incidental catch, a closure of the lynx season throughout the remainder of the refuge for the next 3-5 years may be appropriate beginning with the 1986-87 season.

h. Beaver - An aerial beaver colony survey was flown over the Swan Lake Canoe System area on October 11, 1985. Twenty-one active colonies were documented, an increase of 12 over last year's survey and 9 over the 1983 survey. The greatest increase was seen in lakes inaccessible to small aircraft and the least in roadside lakes. Whether this sample is representative of the entire refuge is unknown but is encouraging because the refuge beaver population is believed to be below potential for the amount of available habitat. The Skilak Loop area was closed to beaver trapping as were all areas within one mile of refuge roads and two miles of campgrounds or trailheads. At least four active colonies were known in the Skilak Loop Area prior to the 1985-86 season.

i. Other Furbearers - Little is currently known about other furbearer populations on the refuge. Marten and red fox continue to be extremely rare, wolverine are uncommon, and otter numbers are unknown. Tracks and visual observations suggest coyote are still relatively common, especially in the 1969 burn area. Nothing is known about mink, muskrat, and weasel populations on the refuge.

10. Other Resident Wildlife

a. Small Mammals - Small mammal trapping occurred in the uncrushed mature forest and crushed mature forest plots at Willow Lake, October 7-10, 1985 (Table 23). Capture rates were similar to previous years. Red-backed voles and masked shrews dominate the small mammal community. Vagrant shrews were the only other species captured.

Table 23. Small mammal captures in uncrushed mature forest and crushed mature forest, Willow Lake, Kenai NWR, October 7-10, 1985.

Area	<u>Red-backed vole</u>		<u>Masked shrew</u>		<u>Vagrant shrew</u>		Total Catch/ 100 Trap Night
	<u>Adult</u>	<u>Immature</u>	<u>Adult</u>	<u>Immature</u>	<u>Adult</u>	<u>Immature</u>	
Mature Crushed	4	20	0	17	0	2	11.9
Mature Uncrushed	5	31	0	29	0	0	18.0

b. Others - Snowshoe hares appear to be declining on the refuge but the results of our 1985 hare population census is not yet available. Numbers appear most stable in the 1969 and 1947 burns, although some live-trapping grids suggest lower hare densities in the 1947 burn compared to previous years (1982-84). Numbers appear particularly low in upland areas and in mature forest/alder zone ecotones relative to the past three years. Hunters and trappers generally report significantly fewer hares in 1985 compared to 1984. Spruce grouse populations appear to be low relative to previous years and no areas are known where ptarmigan are abundant on the refuge.

11. Fisheries Resources

See Research and Investigations for fisheries-related information and Fishing for harvest data.

12. Wildlife Propagation and Stocking

Caribou were reintroduced into the central region of the refuge during 1985 and sockeye salmon fingerlings continued to be released into Hidden and Tustumena Lakes by ADF&G. See Sections D.5 for details.

16. Marking and Banding

Reference summary of wildlife tagged - See Table 24.



18. Injured Wildlife

In 1985, the numbers of injured wildlife turned into the refuge for rehabilitation increased to 41 individuals of 19 species, compared to a 1984 total of 27 individuals of 15 species (increase of 66%). Of these 41 individuals, 17 were successfully release (41%) 6 were turned over to breeding, educational, or zoo facilities (15%), and 18 (44%) sustained injuries so serious they were euthanized. In addition to these 41 individuals, the refuge received numerous additional calls during June and July regarding "abandoned" baby birds, despite extensive publicity warning against disturbing these fledglings. Most of these people were convinced to return the fledglings to the capture sites.



This boreal owl was only one of many injured wildlife cared for by biological technician Mary Portner during 1985. Owl was eventually released in good condition after a wing injury. TNB

H. PUBLIC USE

1. General

Public use at Kenai NWR continued to expand in diversity if not numbers during 1985. Fishing conditions were not as outstanding as in previous years, so tourism for the Kenai Peninsula on a whole was down an estimated 10%. (Visitors to the Kenai Peninsula have to drive through the refuge to reach other destinations even if they don't engage in recreation on the refuge, although many do.)

Despite a slight downturn in visitation, however, 1985 will be remembered as the year that public use, i.e., recreation, visitation, tourism on the Kenai Peninsula took on a new dimension. Controversial regulations and policies that were initiated two years earlier when Governor Sheffield designated the State's most famous fishing stream as the Kenai River Special Management Area were released to the public this year. Likewise, FWS Regional Director Robert Gilmore signed the "Record of Decision" thereby agreeing to the implementation of the policies, regulations, and management direction of the Kenai Comprehensive Conservation Plan. Increased cooperation between agencies became the rule rather than the exception. Whereas the refuge previously had dealt mainly with the Alaska Department of Fish and Game, a new cooperative agreement was signed with a growing force on the Kenai Peninsula -- the Alaska State Parks. With new areas under their jurisdiction (including the highly visible and controversial Kenai River Special Management Area), an increased budget, larger staff, and growing responsibilities, Alaska State Parks became a dominant force in the recreation outlook of the Kenai Peninsula.

The Kenai Peninsula Borough's Resource Development Council commissioned a study by the McDowell Group of Juneau to attempt to understand the changing public use picture on the Peninsula. The Impact of Tourism on the Kenai Peninsula revealed that the Peninsula's tourism-related economy is one-dimensional, i.e. fishing, and as a result the Peninsula attracts a much smaller scale of the tourist market than it should if it had a more diversified tourism picture. Not surprisingly, the consultants report validated the direction the refuge proposed to take in its KCCP by identifying the lack of wildlife viewing opportunities as the limiting factor to tourism on the Peninsula. The report unintentionally gives support to the most controversial aspect of the KCCP -- the Skilak Loop Special Management Area -- the 50,000 acre intensive public use section of the refuge that is to be closed to hunting and trapping in favor of increased wildlife observation.

As 1985 ended -- there were indications -- the McDowell Group's report, a new Chamber of Commerce publication featuring wildlife rather than fishing -- that the heretofore strictly consumptive view of wildlife, i.e. hunting, fishing and trapping -- was being re-directed to focus on non-consumptive uses such as wildlife observation, photography, interpretation, and education. For the overharvested populations of certain species on the Kenai National Wildlife Refuge, 1985 signalled a turn for the better.

3. Outdoor Classrooms - Students

Approximately 2,500 students participated in the refuge's environmental education program in 1985. This stabilization in attendance is the result of late winter snow conditions causing the majority of teachers to book their classes in a one month period from late April to late May. This booking bottleneck deprived some classes from attending, but hopefully

the 1986 weather pattern will be more "normal" and allow more spring days for field trips. An encouraging "indicator species" for the response to the EE program was the fact that school groups began making visits as early as late September within two weeks after classes began.

We are working to develop a more year-round program to encourage teachers to bring their classes in fall and winter. Teachers are required to attend one of our monthly orientations, scheduled September through May, before bringing their class for a visit. Orientation sessions last for two hours and teachers participate in the same activities their students pursue during their visit.

A typical school visit lasts from 9:00 A.M. until 2:00 P.M. Students see an introductory film "Denali Wilderness" which, although set in Denali National Park, matches refuge wildlife exhibits dealing with concepts of adaptation, interdependence, communities, succession, etc. After the film, students search the exhibit area with clipboards and quizzes, to answer questions on the various exhibits.

There are three levels of quizzes for grades K-2, 3-6, and 7 and above. After a lunch break at Headquarters Lake, students return to their clipboards, pencils, and trail leaflets, and set out on the "Keen Eye Trail" where they answer questions at various stops along the way. The addition of the trail and accompanying leaflet enables classes to spend a full day at the refuge, and in 1985 a good number of local teachers did. In 1985, a special leaflet for pre-school and kindergarten was created by local teacher Carolyn Canava and PT Ron Levy for the "Keen Eye" trail.

Wildlife Biologist Ed Bangs remained active in education teaching hunter safety courses, leading seasonal and volunteer orientation sessions on refuge wildlife, and acting as a naturalist for the China Poot Bay/Pratt Museum annual field trip with 150 in attendance. In addition, Bangs and volunteer Laurie Fenner served as judges at several school science fairs.

Many long hours were devoted to YCC environmental education training by group leaders Sue McFarland and Sam Evanoff, Camp Director Doug Emery, Biologist Ed Bangs, and PT Candace Ward. Topics ranged from refuge wildlife to ways enrollees could change their lifestyles to benefit wildlife and wilderness.



Some 2,500 students use the Visitor Center annually where quizzes accompany each exhibit. MFB

3. Outdoor Classrooms - Teachers

Kenai continued to offer monthly teacher orientations for most of 1985. Teachers were required to attend one of these two-hour sessions prior to bringing their class for a visit. Since many local elementary teachers attended an orientation in 1983 and 1984, the number of new teachers attending sessions numbered 62 in 1985.

Class visits remained at the same level as the previous year with returning teachers supplemented by a crop of new teachers. Among these new teachers and group leaders were those from private schools, pre-schools, and scouts as well as classes from as far away as Homer (75 miles) and Seldovia (85 miles).

In March, PT Candace Ward and Volunteer Becky Bowen conducted a C.L.A.S.S. Project workshop for 12 teachers and resource agency educators. The four hour course presented a variety of environment education materials and activities for science and social studies designed by the National Wildlife Federation. In April, PT Candace Ward and State Park Ranger Peter Stortz led a 4 hour interpretation workshop for State Park rangers. In May, PT Candace Ward presented marine mammal training for educators at the Northwest Association of Marine Educators Conference in Seward, and in conjunction attended a facilitators training session that will aid her in conducting environmental education training workshops. In August, SORP Mike Boylan gave a "Resource Management in Alaska" program for 30 teachers from Alaska Pacific University, who used the Refuge Environmental Education Camp and Visitor Center for their environmental education course.

In October, SORP Mike Boylan, RO Environmental Education Specialist Janet Ady, and PU Assistant Sheri della Silva conducted a Project WILD workshop during the Kenai Peninsula Borough's annual in-service. Despite competition from less demanding workshops, "how-to" courses, and more entertaining sessions, the 8-hour course had excellent attendance with 20 teachers participating. This turnout was a testimony to: 1) the motivation and professionalism of local teachers, and, 2) the refuge's reputation for offering worthwhile teaching materials.

6. Interpretive Exhibits/Demonstrations

In January, PT Candace Ward created the exhibit "Using Your Five Senses." This tactile and interactive exhibit was designed for pre-school and kindergarten children who have trouble reaching and seeing the majority of our exhibits, which have an average height of 3 feet.

Volunteer John Andrews, a local teacher who also owns and operates an audio-visual production firm, and SORP Mike Boylan created an outstanding 15-minute Refuge slide program entitled "Wild Refuge: Fortune and Future of the Kenai." This program utilized 2 lapse-dissolve slide projectors and a synchronized tape with narration and seven cuts of music. The program is valued at \$4,000 by professional media consultants. The program dynamically presents refuge history, wildlife, public use, and resource management issues. The new program is a fixture in the refuge's visitor center and serves as our standard orientation program. For his outstanding effort at producing "Wild Refuge," John Andrews was awarded an honorarium (b) (6) and a plaque from the Alaska Natural History Association.

7. Other Interpretive Programs

The refuge's most popular interpretive program continued to be the weekend wildlife films shown year round. While the films introduced many local people to the refuge when the showings began in 1983, by 1985 the weekend movies were a local institution, attracting over 5,250 visitors, an increase of 5% over 1984.

With the addition of the park technician Candace Ward and volunteer Amelie Harris, evening interpretive programs were reinstituted this summer. In addition, a Saturday morning "Children's Hour" was added. Approximately 300 people attended programs on a variety of wildlife topics.

In September, SORP Boylan presented the new refuge slide show, "Wild Refuge: Fortune and Future of the Kenai," in separate showings to the Kenai and Soldotna Chambers of Commerce. The groups were favorably impressed by the program and surprised by the strong interest in wildlife viewing demonstrated by Kenai Peninsula visitors.

After two years of discussion and preparation, the refuge and Kenai Peninsula Community College launched a series of workshops entitled, "Earth and Spirit, Man and his Relationship to the Environment." The format of the series was a Friday evening lecture at the Community College and a Saturday morning workshop at the refuge Visitor's Center.

This series began in October, with author/educator Paul Sheppard and followed with author and director of the Alaska Humanities Forum Gary Holthaus in December. The public response has been very positive and at year's end FWS Wolf Biologist Dr. David Mech had agreed to conduct the February program while the April program would feature Barry Lopez author of Wolves And Men, whose newest book Arctic Dreams has just been published.

8. Hunting

Hunting is a popular activity on the refuge and has resulted in noticeable changes in the composition of some wildlife populations, most noticeably moose (Table 25). Currently, increased hunting pressure has resulted in implementation of permit hunts for mountain goat, upland caribou, and moose in GMU 15B east. The refuge goal of 35 bull moose/100 cows and increasing hunter pressure will probably also result in modification of moose hunting on the refuge in the near future. Sheep and goat harvests were slightly lower than in past years, due to bad weather and the number of subsistence permit drawing hunts. A subsistence court ruling meant that all permit hunts on the refuge were allocated on personal subsistence need including mountain goat, caribou, and even the trophy bull moose hunt. The trophy bull moose hunt was not open during the normal September 1-20 early season, but only from September 26-October 10. The guidelines for awarding trophy bull moose

permit resulted in a high proportions of local hunters getting permits. The deviation from standard trophy moose hunt permit awarding procedures due to the "subsistence court ruling" is expected to be temporary. The permit antlerless moose hunt was cancelled due to the logistics of setting it up in time and getting an interpretation of the subsistence ruling.

Table 25. Big game harvest data on the Kenai Peninsula, 1985.

	15A	15B	15C	7	Total Mortality
Brown Bear	2	2	7(1)	4(2)	18 ^a
Black Bear	95(1)	26	122	133(1)	378 ^b
Caribou (Upland Herd)	21 male	12 female			33
Dall's Sheep		17		3	21 ^c
Moose	220	E18 ^d W49	161	49	502 ^e
Mountain Goat	0	Most off refuge			112

^a includes 2 defense of life & property, plus 1 study related mortality.

^b includes 2 defense of life & property.

^c 1 unknown which GMU. 162 sheep hunters (13% successful).

^d 50 permits, 29 permittees hunted, avg. antler spread-54-3/4".

^e includes all known harvest including unknown subunit, 2,362 hunters 21% success.

Black bear harvest, particularly in GMU15A, was at a record high. Both refuge and State biologists have expressed concern about the affect of record harvest and the health of the over-all bear populations in certain areas. (Refer to Wildlife Section under Black Bear for further explanation.)

Twenty-five permits were issued for black bear baiting in 1985. The baiting season on the refuge ran from April 15 through July 1. Baiting was only allowed in the 1969 burn area since no campgrounds are in that area and there was a relatively high bear population. Numerous complaints were received from bear baiters about other hunters crowding them. The staff found that litter, barrels, and stands were left in the field despite a permit condition to remove all material by July 1. Next year's program will try to correct these problems.

Small game hunting remained a popular activity along road accessible portions of the refuge; however, apparently declining snowshoe hare populations in certain areas resulted in both less hunter effort and success.

Waterfowl hunting was generally poor on both Chickaloon Flats and the Kenai River outlet. Waterfowl populations, as had been predicted, appeared to be down and hunting success mirrored the population situations.

Moose hunter check stations were operated for the seventh year by refuge staff and volunteers. Check station personnel provided general information as well as received information from hunters which aided in several game violation cases. Three stations were staffed a total of 500 manhours. Swanson River Check Station was open eight days and contacted 2,000 hunters. Forty-four moose and several black bear were checked through the Station. Mystery Creek was operated for six days, and 500 hunters were contacted. Six moose and one wolf were checked through the station. Marathon Check Station operated three days and 400 hunters were contacted with eight moose being checked through the station. Hunter effort was up and the harvest was down with numerous complaints about the lack of bull moose.

9. Fishing

Sport fishing remained a dominant and popular activity within all portions of the Kenai NWR during 1985. Sport fishing opportunities ranged from world class anadromous salmon fishing opportunities to remote fly-in ice fishing during the winter months. A total of 21 sport fishing guides were under refuge special use permit to outfit and guide refuge visitors. The capture of a world-record 97+ pound King salmon in the summer on the Kenai River spread the fame of the already famous river and enticed more anglers to try its turquoise waters.



During the peak of the salmon run, Lower Skilak Campground becomes a busy staging area for Kenai River fishing. RKJ

The late season Russian River Sockeye Salmon run broke all previous historical records for both harvest and escapement. The harvest for the late run was 58,412 and the escapement was 136,669. The previous record harvest was in 1980 with 33,390 sockeyes harvested. The strength of run provided excellent fishing until the August 20 season closure. Angler effort during the later portion of the season was only average despite excellent fishing opportunity, and overall angler effort was lower than would be expected with such a record run of salmon. A total of 34,633 man days were documented (Table 26).

Table 26. Estimated sockeye salmon harvest, effort and success rates on Russian River, 1963-1985.

Year	Harvest			Total Effort (Man-Days)	Catch/ Hour	Census Period
	Early Run	Late Run	Total			
1963	3,670	1,390	5,060	7,880	0.190	6/08-8/15
1964	3,550	2,450	6,000	5,330	0.321	6/08-8/16
1965	10,030	2,160	12,190	9,720	0.265	6/15-8/15
1966	14,950	7,290	22,240	18,280	0.242	6/15-8/15
1967	7,240	5,720	12,960	16,960	0.141	6/10-8/15
1968	6,920	5,820	12,740	17,280	0.134	6/10-8/15
1969	5,870	1,150	7,020	14,930	0.094	6/07-8/15
1970	5,750	600	6,350	10,700	0.124	6/11-8/15*
1971	2,810	10,730	13,540	15,120	0.192	6/17-8/30*
1972	5,040	16,050	21,090	25,700	0.195	6/17-8/21
1973	6,740	8,930	15,670	30,690	0.102	6/08-8/19*
1974	6,440	8,500	14,940	21,120	0.131	6/08-7/30*
1975	1,400	8,390	9,790	16,510	0.140	6/14-8/13*
1976	3,380	13,700	17,080	26,310	0.163	6/12-8/23*
1977	20,400	27,440	17,840	69,510	0.168	6/18-8/17
1978	37,720	24,530	62,250	69,860	0.203	6/07-8/09
1979	8,400	26,830	35,230	55,000	0.136	6/09-8/20*
1980	27,220	33,490	60,710	56,330	0.245	6/13-8/20
1981	10,770	23,720	34,440	51,030	0.156	6/09-8/20
1982	34,500	10,300	44,820	51,480	0.261	6/11-8/04**
1983	8,360	16,000	24,360	31,890	0.117	6/08-8/09**
1984	35,880	21,970	57,850	49,550	0.238	6/04-8/19**
1985	12,300	58,410	77,710	50,770	0.286	6/13-8/16**
1963-85 Mean	12,136	12,599	24,735	30,508	0.177	

* Census period was not continuous during these years due to emergency closures required to increase escapement levels.

** Census period was not continuous during these years do to negligible fishing effort after completion of the early run and prior to arrival of late run.



"Combat fishing" is a term coined at the Russian River
when the reds are running. MFB

It has been a refuge goal, regarding the Russian River fishing, to somehow control the overall number of persons utilizing the fishing. To be sure, the Russian River fishing remains a very high density social situation; however, the all-time high annual use figures achieved during 1978 and 1979 have been stabilized partially due to access management controls to insure a quality fishery. In the years since 1980, angler effort has lowered and stabilized near the 50,000 man-day mark for the season (Table 27).

Table 26. Differences between weekday and weekend day fishing pressure, and rates of success at Russian River, 1964-1985.

Year	Mean Angler Counts		Catch/Hour		Mean Hours Fished	
	Week-days	Weekend Days	Week-days	Weekend Days	Week-days	Weekend Days
1964	29.6	70.6	0.444	0.209	3.3	3.9
1965	31.7	78.1	0.305	0.223	4.5	5.4
1966	53.2	143.1	0.297	0.183	4.8	5.5
1967	68.9	110.5	0.171	0.100	5.3	5.4
1968	71.5	124.9	0.153	0.107	5.3	5.8
1969	64.5	111.7	0.110	0.074	4.9	5.1
1970	83.5	127.8	0.140	0.100	4.8	4.7
1971	87.9	157.2	0.194	0.189	4.8	5.3
1972	73.3	138.5	0.203	0.187	4.0	4.4
1973	147.1	195.0	0.113	0.088	4.8	5.5
1974	123.8	144.4	0.164	0.085	4.7	5.7
1975	65.0	149.6	0.145	0.136	4.5	5.1
1976	72.5	134.4	0.165	0.161	3.5	4.5
1977	201.7	438.6	0.172	0.164	3.9	4.3
1978	264.1	425.7	0.205	0.191	3.9	4.2
1979	190.6	276.8	0.158	0.117	3.8	3.9
1980	299.1	317.8	0.270	0.210	4.2	4.7
1981	195.6	238.5	0.167	0.141	4.1	4.1
1982	256.0	423.4	0.210	0.144	4.3	4.5
1983	205.1	307.6	0.208	0.151	4.6	4.6
1984	217.1	342.3	0.261	0.211	4.8	4.7
1985	226.9	291.1	0.311	0.267	4.4	4.6
1964-1985						
Mean	133.4	212.2	0.203	0.153	4.4	4.8

It is still relatively early to report on the overall success of recent protective changes along the Russian and upper Kenai Rivers (including methods and means of fishing, seasons, and bag limits) regarding resident rainbow trout; however, the public seems to have accepted most changes. A single-hook-only fishery for Russian River and no bait for the upper Kenai River are just a few of the recent changes. Rainbow trout received additional protection within Skilak Lake during the 1985 spring fishery. Most anglers contacted were familiar with the new provisions of State fishing regulations expanding spring protection of rainbows to Skilak Lake.

Snagging of sockeye salmon during the peak of the July salmon run remains a problem both above and below Skilak Lake. Problem areas are the powerline hole, Jean Creek, Hidden Creek Slough, Thompson's Hole, and several other holding-water locations along the Kenai River. The number of Kenai River sport fishing violation notices that can be written during the peak red salmon runs is limited only by officer

effort. Perhaps methods and means proposals similar to the single hook fly fishing regulation instituted at Russian River and Isaak Walton State Recreation Area would solve the problem.

Sockeye salmon enhancement within the Hidden Creek System produced a large return during 1985. Due to the inherent shallow character of Hidden Creek, existing regulations, and the inaccessibility of Hidden Creek Slough, a major sport fishing area has not developed despite the large number of returning sockeyes. There is a significant potential for a lake sockeye salmon fishery to develop similar to the sockeye salmon fishery within Lake Washington near Seattle.

Early season fishing effort centers on the Kenai River Inlet to Skilak Lake and accessed by the Hidden Creek Trail. The first open water, combined with mixed-bag of lake trout (catch-release), rainbows, and Dolly Varden seem to be the drawing card.

Boat fishing at the Kenai River below Skilak Lake has continued to grow in popularity and extends well into November for late season silvers, rainbows, and Dolly Varden. Including king salmon fishing, an estimated 40,976 man-days of fishing occurred in this stretch of the Kenai River for sport fishing in 1985 with many camping along the shoreline (Table 28). Of the 40,976 fishing days, 1,209 were guided. Of this overall total, approximately 15% occurred in refuge waters.

Table 28. Kenai Peninsula Freshwater Sport Fisheries, 1984.

	<u>Days fished</u>	<u>Est. % occurring on KNWR</u>
Kenai River - (Soldotna Bridge to Moose River)	42,644	7%
Kenai River - (Moose River to Skilak Outlet)	40,976	15%
Kenai River - (Skilak Inlet to Kenai Lake)	(non) (guided) 33,661 2,317	70%
Russian River	55,861	70%
Kasilof River	25,697	5%
Swanson River	5,671	90%
Other Rivers	5,662	20%
Hidden Lake	4,835	100%
Canoe Lake System	7,014	100%
Other Lakes	11,860	50%
TOTAL	233,841	

The above statistics represent survey data for 1983, and were published in 1985.

Skilak Lake, a glacial lake, experienced reduced glacial melt runoff again during 1985 and visibility was higher than normal until August.

10. Trapping

Trapping continues to be a relatively popular winter pasttime on the refuge. One hundred four permits were issued for the 1984-85 season. Despite the refuge being closed to snowmobiling until March 6, due to insufficient snow cover, harvest was high (Table 29). Coyote and mink harvest was the highest ever and beaver harvest the highest since 1963-64. Wolf harvest was also high particularly in GMU 15A. Lynx season was closed in GMU 15A after excessive harvest depressed the population. The lynx season on the remainder of the Kenai Peninsula was reduced from November 10-March 15, to December 15-January 31. A major problem has resulted from liberal trapping seasons on the refuge and the current absence of motorized access regulations. Wolverine are at extremely low levels and harvest is apparently also depressing lynx, wolf, and beaver populations (Table 30). Other problems include changes in furbearer distribution (none in accessible areas); abandoned traps and snares that later caught bear, coyotes, wolves, eagles, dogs, and people; a relatively high incidental raptor catch near exposed baits; and complaints from other refuge users as well as other trappers. Major changes in the trapping program are scheduled to be implemented for the 1985-86 season to start correcting the situation.



Beaver lodge and food cache being trapped in the Skilak Loop area during a 1984-85 furbearer season. This area was closed to trapping to support wildlife viewing during the 1985-86 season.

TNB

Table 29. Total reported land furbearer harvest and average per permit holder on the Kenai National Wildlife Refuge (Moose Range), 1960-1985.

Season	Total permits	Land furbearer reported harvest									
		Lynx		Coyote		Wolverine		Weasel		Wolf	
		Total	Mean per permit holder	Total	Mean per permit holder	Total	Mean per permit holder	Total	Mean per permit holder	Total	Mean per permit holder
1960-61	16	13	0.6	15	0.9	1	0.1	1	0.1	--	---
1961-62	24	23	1.6	30	1.2	4	0.2	13	0.5	--	---
1962-63	28	28	1.0	27	1.0	2	0.1	0	0	--	---
1963-64	33	28	0.8	39	1.2	1	0.1	6	0.2	--	---
1964-65	17	24	1.4	11	0.6	6	0.3	10	0.6	--	---
1965-66	16	17	1.1	16	1.0	4	0.2	2	0.1	--	---
1966-67	25	7	0.3	5	0.2	4	0.2	35	1.4	--	---
1967-68	---	---	---	---	---	---	---	---	---	--	---
1968-69	22	18	0.8	44	2.0	1	0.1	81	3.7	--	---
1969-70	53	62	1.2	23	0.4	3	0.1	35	0.7	--	---
1970-71	59	67	1.1	30	0.5	10	0.2	79	1.3	--	---
1971-72	61	181	3.0	13	0.2	14	0.2	35	0.6	--	---
1972-73	65	146	2.2	51	0.8	8	0.1	4	0.1	1	0.1
1973-74	81	245	3.0	58	0.7	7	0.1	149	1.8	0	0
1974-75	52	162	3.1	24	0.5	10	0.2	68	1.3	0	0
1975-76	70	113	1.6	32	0.5	6	0.1	16	0.2	1	0.1
1976-77	86	53	0.6	25	0.3	6	0.1	10	0.1	2	0.1
1977-78	86	43	0.5	34	0.4	4	0.1	14	0.2	8	0.1
1978-79	96	36	0.4	44	0.5	3	0.1	7	0.1	32	0.3
1979-80	104	12	0.1	64	0.6	3	0.1	58	0.6	19	0.2
1980-81	102	2	0.1	38	0.4	0	0	14	0.14	16	0.16
1981-82	104	17	0.2	66	0.6	4	0.1	70	0.7	44	0.4
1982-83	122	* 47	0.4	80	0.6	2	0.1	43	0.3	39	0.3
1983-84	114	** 38	0.3	87	0.8	2	0.1	29	0.2	30	0.3
1984-85	107	*** 31	0.3	107	1.0	2	0.1	17	0.2	38	0.3

*Includes 9 lynx, radiocollared and released for study.

***Includes 7 lynx, radiocollared and released.

**Includes 1 lynx, radiocollared and released for study.

Table 30. Total reported aquatic furbearer harvest and average per permit holder on the Kenai National Wildlife Refuge (Moose Range), 1960-85.

Season	Total permits	Aquatic furbearer reported harvest							
		Beaver		Otter		Muskrat		Mink	
		Total	Mean per permit holder	Total	Mean per permit holder	Total	Mean per permit holder	Total	Mean per permit holder
1960-61	16	145	9.1	16	1.0	2	0.1	42	2.6
1961-62	24	79	3.3	19	0.8	0	0	69	2.9
1962-63	28	109	3.9	19	0.7	2	0.1	66	2.4
1963-64	33	150	4.5	26	0.8	0	0	83	2.5
1964-65	17	6	0.3	3	0.2	0	0	15	0.9
1965-66	16	17	1.1	4	0.2	0	0	13	0.8
1966-67	25	22	0.9	9	0.4	0	0	45	1.8
1967-68	---	---	---	---	---	---	---	---	---
1968-69	22	14	0.6	10	0.4	207	9.4	64	2.9
1969-70	53	33	0.6	32	0.6	75	1.4	82	1.5
1970-71	59	25	0.4	9	0.1	29	0.5	60	1.0
1971-72	61	23	0.4	8	0.1	18	0.3	9	0.1
1972-73	65	76	1.2	24	0.4	111	1.7	48	0.7
1973-74	81	40	0.5	26	0.3	334	4.1	160	2.0
1974-75	52	6	0.1	8	0.1	21	0.4	33	0.6
1975-76	70	34	0.5	13	0.2	82	1.2	25	0.4
1976-77	86	24	0.3	7	0.1	8	0.1	39	0.4
1977-78	86	19	0.2	9	0.1	140	1.6	33	0.4
1978-79	96	22	0.2	6	0.1	73	0.8	25	0.3
1979-80	104	83	0.8	17	0.1	127	1.1	57	0.5
1980-81	102	82	0.8	30	0.3	191	1.9	111	1.1
1981-82	104	61	0.6	26	0.2	183	1.8	119	1.1
1982-83	122	93	0.8	18	0.1	227	1.8	202	1.6
1983-84	114	43	0.4	18	0.2	39	0.4	268	2.3
1984-85	107	103	1.0	20	0.2	121	1.1	392	3.7

11. Wildlife Observation

Kenai has a variety of landscapes and wildlife/wildland observation opportunities throughout the refuge. Scenic driving occurs in several areas and traffic volume has increased slightly during 1985 on most roads. Thousands of wildlife/wildlands observations occur along refuge water routes and backcountry hiking trails. Primary access to the refuge is by state and refuge roads so annual traffic volume reports are used as one measure to determine wildlife/wildland observation numbers. The most recent (1984) annual traffic volume statistics for refuge roads are indicated in Table 31. These figures represent a 2-5% increase in average daily traffic.

Table 31. Annual Traffic Volumes and Daily Averages, 1984

<u>Annual Traffic Volumes (1984)</u>	<u>Average Daily Traffic</u>	<u>Annual</u>
Sterling Highway (Approx. Watson Lk)	1,900	693,500
Sterling Highway (2 Mi. west of Russian River)	2,300	839,500
Skilak Rd-Sterling H.-L. Skilak Cpg.	110	51,100
L. Skilak-Upper Skilak	110	40,150
U. Skilak-Hidden Lk Road	115	40,150
Hidden Lk Rd-Junc. /Skilak L. Rd..	120	41,975
Hidden Lake Road	80	29,200
Lower Skilak Campground Road	65	23,725
Upper Skilak Campground Road	65	23,725
Swanson River (Refuge Boundary)	195	71,179
Ski Hill Road	50	13,775
Tustumena Campground Road	60	21,900

Note: The above includes vehicles traveling both directions.

From the wildlife observation standpoint, 1985 was probably the most significant year in Kenai's recent history. The completion of the Kenai Comprehensive Conservation Plan (KCCP) showed a definite change in management strategy at Kenai with such policies as the establishment of the Skilak Loop Special Management Area, a 42,000-acre area closed to most hunting and trapping and dedicated to wildlife viewing and interpretation. Likewise several thousand acres surrounding the Headquarters/Visitor Center in Soldotna was closed to hunting and trapping in keeping with the environmental education and interpretive emphasis of this popular area which receives over 30,000 visitors annually.



Wildlife viewing opportunities like this beaver lodge along a refuge road should be increased in the future due to new regulations designed to improve wildlife viewing opportunities.

RKJ

While the new emphasis on non-consumptive wildlife recreation was not unanimously applauded in a State as pro-hunting and trapping as Alaska, there was sufficient support to justify the closures. The Kenai Peninsula's population has surged by 400% from 10,000 in 1964 to 40,000 in 1984. Instead of a handful of homesteaders and sourdoughs relying on wild game, the average tenure on the Kenai is four years and with a high disposable income, more people eat at McDonalds, Wendy's, Godfather's Pizza, or Dairy Queen than rely on moosemeat. To this changing clientele, as well as visitors, the opportunity to see a bull moose can be more important than the chance to eat one. Likewise, if public comments are any indication, more people living or visiting the Kenai would rather hear a wolf than wear one. Since new residents have generally moved from states where major mammals like moose, wolves, and brown bear are non-existent, they are extremely interested in the welfare of these species. As evidenced by our most frequently asked question, "where can I see a bull moose?", local visitors and tourists alike want an opportunity to see the animal that made Kenai famous and is visible on our entrance sign (but rarely elsewhere, according to the Audubon Society).

Enhanced wildlife viewing opportunities at Kenai got another boost when the refuge contracted for a \$71,000 design plan for the Skilak Loop with an Anchorage landscape architecture firm, Land Design North. By October 1, 1986, the firm will provide a comprehensive design scheme for the Skilak Loop's campgrounds, roads, and trails, that will facilitate traffic flow, reduce congestion, and enhance the quality of this popular area. SORP Boylan is administering this contract for the refuge.

The Kenai Comprehensive Conservation Plan and the Skilak Loop design contract showed sufficient commitment by the FWS that as 1985 closed the refuge learned it had received a special \$1.2 million appropriation courtesy of Senator Ted Stevens for improved facilities in Skilak Loop. With over \$800,000 for facilities and another \$300,000 for personnel and "visitor services," Kenai has seed money to make the first substantial changes in its major public use area. While most refuges don't have campgrounds -- and are better off for it -- at Kenai, like Wichita Mountains Crab Orchard and a few others, we've found it's better to recognize your problems for what they are and correct them rather than wishing they would go away. As they say, the best defense is a good offense...



A \$71,000 contract to an Architecture Engineering Firm from Anchorage will re-design Skilak Loop Campgrounds and reduce crowding and congestion. MFB

12. Other Wildlife Oriented Recreation

Canoeing continued to be a very popular outdoor recreational activity on Kenai NWR with visitor use reaching an estimated 16,000 visits during 1985. During 1985, a Fisheries study, conducted on the Moose River, counted canoeists utilizing that area. A backcountry park technician was not hired during 1985, although canoe patrols were conducted by SCA volunteers and other refuge Park Technicians on a rotating basis.

Efforts to reduce wildlife displacement along various canoe routes continued to be a priority. For the fourth year in a row, eagles successfully nested on Gavia Lake. Conflicts increased dramatically between canoeists and illegal aircraft landings on several lakes within the canoe system due to the refuge's inability to enforce illegal aircraft landings.

Unlike the previous year, which saw some 3,000 cross-country skiers use the refuge's cross-country ski trails located at the Visitor Center, 1985 was a dismal snow year for the Kenai Peninsula. We didn't receive enough snow to ski until March 1. From then through the entire month, skiing conditions were good and an estimated 1,000 skiers used our groomed trails, which were maintained by a dedicated cadre of x/c ski enthusiasts headed by Dr. Alan Boraas of Kenai Peninsula Community College. KPCC also contributed a track-setter to groom the ski trails periodically, pulled by a refuge snowmobile. Despite the dismal snow conditions, the 84-85 season ended upbeat with skiers using the groomed trails to ski, view wildlife, and as a prelude to an apres ski wildlife film each weekend at the Visitor Center. An important side-effect was that the presence of so many x/c skiers greatly reduced the illegal snowmobile activity around the Visitor Center complex.

By late 1985, it looked like the winter of 85-86 would be equally poor for x-c skiers. At year's end, the only positive note was the formation of the Kenai Peninsula Nordic Ski Club. The extreme interest in x/c skiing and the large number of volunteers interested in monitoring refuge ski trails during periods of good snow unduly strained the carrying capacity of our volunteer program. At the refuge's urging, the Nordic Ski Club was formed and closed-out 1985 with some field trips, a newsletter, and monthly meetings held at the Visitor Center. Most important, the Kenai Peninsula Nordic Ski Club, like the area's other newest group, the Kenai Peninsula Audubon Society, provides a much-needed voice for the non-consumptive and non-motorized wildlife interests of this area. At a time when refuge access regulations have been unenforceable for 3 years and once-inaccessible areas are vulnerable to overharvest by airborne hunters and trappers, the non-motorized public looking for wildlife, solitude, and other wilderness values of the Kenai are feeling like an oppressed minority. Through the Nordic Ski Club they found their voice and should prove a valuable ally to the refuge in years to come.

Refuge float-boating and white water canoeing continued in popularity throughout 1985, with the upper and lower Kenai River receiving ever increasing numbers of river runners. It is expected as non-motorized boating regulations are implemented for the upper river, river floating, kayaking, and canoeing popularity will only increase. Commercial raft guides took over 1,400 clients down the upper river during June, July, and August.



A group of white water boaters challenge the Kenai River Canyon during an Upper Kenai River float trip.

RKJ

13. Camping

An estimated 70,000 overnight visits occurred within the refuge campgrounds during 1985. Basic maintenance of facilities, outhouse upkeep, safe drinking water, garbage removal, public safety patrols, and information dispersal continue to be offered at a minimal level due to lack of staff.

Because of outdated inadequate campground designs, limiting overflow campers to designated sites is impossible and remains the biggest campground problem. When 30 campers use 20 sites, associated problems occur, including vegetation damage, unauthorized construction of fire rings, off-road driving and parking, excessive removal of fire wood, congestion, and over use of existing waste disposal and toilet facilities. Congestion, which reduces the overall quality of experience occurs at Jim's Landing, Hidden Lake, and Upper and Lower Skilak campgrounds virtually every weekend. Russian River Campground also receives a great deal of use and congestion, but management controls and supervision have fostered vegetation rehabilitation, nuisance behavior reduction, adequate waste disposal, adequate toilet conditions, and reasonable traffic flow when compared to previous years. While Russian River received record salmon runs during 1985, overall use remained relatively constant and within previously established capacity.



Three young refuge visitors participate in the daily Russian River litter program where they help refuge staff clean up the parking area in exchange for conservation-related prizes. RKJ

Entrance road counters recorded 10,200 vehicles entering the Russian River facility with an average of 2.8 persons per vehicle, or 28,560 individuals. As in previous years, many Russian River visitors come to fish while others come to watch other people fish and enjoy the excitement of a salmon run in full swing. Recreational use fees collected were \$9,108, as compared to \$12,590 during 1984, and \$7,319 during 1983.

New regulations to be implemented for 1986 recommended two changes regarding camping visitation on Kenai NWR. The overall 14 consecutive day limit was changed to allow only 14 days in 30 within the refuge in order to prevent long term camping for 14 days, leaving for a single day then returning. The second change reduced the camping stay allowed at Russian River from three to two days.

15. Off-Road Vehicles

Due to very low snowfall, 1985 was a very poor season for snowmobile users with the 1984-85 season open only shortly in late winter and the 1985-86 not being opened at all through December.

Perhaps because of the lack of snow and inability to utilize snowmobiles, unauthorized 3-wheeled ATV's have become increasingly popular. Dozens of warnings and numerous citations were issued for unauthorized ATV use at several refuge locations. Unauthorized 3-wheelers have caused long term damage in several locations.

Kenai NWR snowmobile regulations were again in limbo during 1985 as proposed access regulations worked their way through a labyrinth of political obstacles. The fact that very little snow existed throughout 1985 kept new conflicts associated with the non-enforcement policy from developing.

17. Law Enforcement

Kenai NWR ended the year with five uniformed officers who logged approximately 3,000 patrol hours during 1985. While refuge patrols and officer/visitor contacts increased, cases again decreased slightly during 1985. A decrease in actual cases can be attributed to two reasons. First, the lack of enforceable access regulations prevented citations from being issued for most aircraft, snowmobile, and motorboat infractions. Warnings were given for most parking violations at Russian River rather than Notices of Violation. Since no mechanism exists to leave parking violations with the vehicle, all citations must be issued through the mail. This became logistically difficult at certain times with out-of-state vehicles and with the exception of parking matters involving public safety, issuing Violation Notices was seldom worth the administrative case load for routine parking infractions (Table 32).



Parking tickets at Russian River is one of the daily events at Alaska's busiest fishing holes. MFB

Table 33. Incidents, occurring on Kenai National Wildlife Refuge, responded to by refuge staff where no Notice of Violation was issued, 1985.

<u>Incident/Violation</u>	<u># of Incidents</u>
Low flying aircraft	8
Violation of a refuge SUP	8
Vandalism	10
Altercation/disturbance	2
Theft	4
Drunk and disorderly	1
Unattended or abandoned property	6
Coyote chasing cars	4
Unauthorized taking of wildlife/injured wildlife	4
Violation of trapping permit	5
Violation of wood cut permit	8
Assist to public involving injury	3
Unauthorized use of motor vehicle	16
Coast Guard violation/boating	30
Animal trespass (grazing)	2
Unauthorized cutting green trees or timber removal	9
Unauthorized fireworks	4
Unauthorized parking/blocking refuge road or facility	40
Target shooting/unauthorized use of firearms	6
Search and rescue	3
Drowning	2
Miscellaneous fishing violations	9
Unattended fire/wildfire	3
Disposal of waste/littering	8
Other refuge regulations	1
Assist to AK State Troopers/traffic accidents	8
Assist to AK Fish & Wildlife Protection Officers	15
	<u>220</u>

Uniformed seasonal employees and volunteers contributed significantly to the overall preventive law enforcement program by logging thousands of hours of patrol time during the busy seasons. Seasonals are expected to contribute even more to the enforcement program during future years as they may now be commissioned officers provided they've completed the basic 240 hour LE course. This new development by the FWS follows a long-established NPS policy and is long overdue. While we are often quick to blame WO for deficiencies and shortcomings, in this seasonal LE capability the FWS WO staff has provided refuges like Kenai a sorely-needed management tool. Keep up the good work...

Refuge staff recorded 250 hours of patrols during the 20 day moose season and several citations were issued. Violations were noticeably less than previous years. Three unsolved poaching incidents also occurred.

A second, fully equipped law enforcement vehicle, with emergency lights, sirens, and public address system, was added to the refuge vehicle fleet during 1985. The new vehicles have contributed to a higher profile for refuge patrols and made vehicle stops and emergency response significantly more professional and safe.



A second, fully equipped patrol vehicle was added to the vehicle fleet during 1985, enhancing refuge officer safety and roadside safety, when responding to accidents.

RKJ

RM Delaney, a member of the Kenai River Social and Recreation Committee, spent a large amount of time during 1985 assisting the Committee in formulating draft regulations covering motorboat horsepower, use of firearms, and other items for presentation before the Kenai River Advisory Board.

Alaska State Park rangers patrolled portions of the Kenai River within the Kenai NWR which are also within the Kenai River Special Management Area. Former refuge employees Dave Kenagy and John Wilber, now Alaska State Park rangers, patrolled the Kenai River portions of Kenai NWR three days each week. These new park rangers, hired in conjunction with the Alaska Division of Park's Kenai River Special Management Area, have enhanced public safety efforts along the upper Kenai River by logging hundreds of river patrol hours.

After installing new radios capable of accessing the AST radio system in our law enforcement vehicles, the refuge had to re-submit a request to Alaska State Troopers to use their repeater frequency since the simplex (non-repeater) frequency they originally approved was not adequate. With the new frequency, refuge officers would be able to use trooper dispatch as well as reach AST and Fish & Wildlife Protection.

Alaska State Troopers denied the refuge's request to have access to their radio frequency for law enforcement emergencies. AST allowed the refuge to use the ineffective "Simplex" frequency which has a radius of about 10 miles. As a result, refuge officers are still without the service of a dispatcher to relay information, check license plates, wants and warrants, etc. By year's end, no approval had been received although efforts continued to secure permission to utilize the full capabilities of the State's dispatcher and communication system.

Public confidence in refuge regulations and the ability to respond to complaints was again severely eroded during 1985 by the lack of access regulations which the U.S. Attorney claimed were unenforceable.

Refuge hunters and trappers took maximum advantage of the "window" of regulatory opportunity and flew, boated, and snowmobiled into locations which had not been opened to motorized access since the mid-1960's. Use of aircraft and snowmobiles in particular within formerly closed areas caused significant conflicts and resource damage. Aircraft were used to support many hunters in formerly non-motorized portions of GMU15B during the trophy bull moose hunt, causing a significant erosion in the quality of this unique hunt.

As problems with uncontrolled use accelerated, refuge staff continued to press to publish special regulations which would meet the public notice requirements of ANILCA, Sec. 1110. A biological and resource justification document as well as an Environmental Assessment were developed in support of the new regulations. By year's end tentative approval for republication of access regulations had been received but publication and public hearings had not yet occurred.



An example of some of the aircraft which impact refuge resources parked at the Soldotna Airport only several hundred yards from the refuge boundary. Proposed access regulations are designed to minimize aircraft impacts on refuge wildlife.

TNB

Although the 1985-86 trapping season is not generally discussed until the following year's narrative, new 1985-86 trapping permit stipulations created both the opportunity and need for trapping permit compliance/enforcement work in late 1985. Prior to year's end, S.A. Soroka and ORP Johnston had confiscated dozens of illegally set traps and had issued several Notices of Violation, warnings, and in some cases suspended trapping permits. A requirement that traps be individually marked helped significantly with permit compliance efforts. Major permit infractions included trapping with unmarked traps, trapping within a closed area, illegal length of snares, unauthorized site baits for lynx, improperly marked traps, unauthorized snare sets, and illegal methods of access to check traplines.

The positive studies in Kenai's LE effort parallels the improvements being made in refuge's law enforcement program nationally. This year FWS has standardized leather gear and supplies, created an LE patch for outerwear, and made use of the GS-1802 Refuge Law Enforcement Officer series as well as allowing seasonal employees to hold commissions. All of these improvements are welcomed at Kenai where the LE program is so important yet has not had the tools to do the job.

In 1985, Park Technician Candace Ward completed the 9-week LE training at FLETC, Glynco, Georgia. The good news is that with her commission, Kenai now has five LE officers on staff. The bad news is that three of the five officers are GS-11 and above and spend 90% of their time handling administrative duties (office work).

The cost effectiveness of Kenai's LE personnel was openly criticized by the Regional Directorate this year in light of annual costs for LE refresher training. What such criticism fails to take into account are two significant factors, namely:

1. Of four commissioned officers on staff for most of 1985, two are GS-12's, one a GS-11, and one GS-9. The GS-9 regularly worked weekend LE patrols. Of the 3 remaining officers, paperwork and administrative duties prevented 2 of them from ever leaving their desks while the third had piloting responsibilities for the Biology program as well.
2. Since most of Kenai is not accessible by road, a limiting factor is the lack of aircraft support to conduct adequate LE patrols. While the majority of LE problems will continue to correlate with the road system, regular aircraft support is a necessity for adequate coverage.

In summary, Kenai's LE program's shortcomings are shared by other refuges, namely, it is not that too many people have LE authority, as was suggested, but rather that the wrong ones have commissions. The answer is not to strip the commissions from office-bound personnel who occasionally get out on the refuge. Rather, we should consider using the FWS's two newest mechanisms for effective LE, specifically the addition of a full-time refuge LE Officer(s) (GS-1802) and the use of seasonal employees with LE commissions. Then our PFT staff with "incidental" LE duties would have supplementary rather than primary LE roles as they have now.

Despite the shortcomings, Kenai's LE program made progress in 1985. By year's end, recently-commissioned Park Ranger Candace Ward (GS-7) had joined the refuge's main LE officer ORP Rick Johnston (GS-9) so that two marked vehicles were on daily weekend patrols. Unfortunately, the refuge lacked a regular dispatch service since Alaska State Troopers denied our request to use their radio dispatch. At year's end the refuge LE program had come quite a ways in terms of vehicles and qualified personnel but, like law enforcement on refuges nationwide, we still have a way to go.

18. Cooperating Associations

The refuge's Alaska Natural History Association (ANHA) sales outlets continued a healthy growth pattern increasing sales from \$11,500 in FY 1984 to \$13,350 in FY 1985 (an increase of 16% over last year's sales). This occurred despite highway construction and lack of signing on the state-owned entrance road to our Visitor's Center. Kenai's cooperating Association ranked 8th out of 28 FWS sales outlets in sales volume for FY 1985.

Visitation decreased from 16,500 (1984) to 15,000 at the Visitor Center, due to entrance road construction and remained at a constant 6,000 at the Sterling Highway Visitor Contact Station. The success of the Visitor Contact Station and Visitor Center operation was due to the dedicated efforts of SCA and seasonal volunteers without whom these important public contacts would not be possible.

The refuge carries some 36 sales items with the our 6-color T-shirt the most popular. Other new items include: National Geographic's Birds of North America, The Chilkat River Valley, Guide to Alaska's Kenai Fjords, Wildlands for Wildlife, Wolves of the Kenai, Path of the Paddle, Wolves Zooobook, Bears Zooobook, and Eagles Zooobook.

Our most exciting new sales item is the wildlife poster "The First Alaskans." The artwork for this poster was done by volunteer Laurie Fenner. The black and white charcoal poster with contrasting burgundy border depicts all the mammals and many of the bird species of the refuge. The poster earned a first-place award at the Northwest Region of the Association of Interpretive Naturalists (AIN) annual meeting in Seattle in May. Credit for its success goes to SORP Mike Boylan, Laurie Fenner, and Alaska Natural History Association Business Manager, Catherine Rezabek. Laurie Fenner was given a \$250 honorarium and a plaque from ANHA in recognition of her effort.



"The First Alaskans" Poster sketched by
Laurie Fenner. JEF

In March, PT Candace Ward had an opportunity to attend the first annual Alaska Natural History Association Branch Manager's Workshop. The training from the workshop proved invaluable in gaining new sales and marketing ideas and in streamlining paperwork.

Proceeds from cooperating association sales were used to: add resource books to the refuge library, provide honorariums for outstanding contributions from volunteers, and to give awards to volunteers based on hours of service. In addition, the Kenai Branch donated \$500 in the form of a lifetime membership to the National Wildlife Refuge Association.

19. Concessions/Special Use Permits

Several longtime outfitter/guides relinquished their permits during 1985, while at the same time several new SUP applications were received for

various guiding activities. The instability of the insurance industry within Alaska may have contributed to several outfitter/guide's being unable to exist as a profit making business. Outfitters utilizing horses seem to be the hardest hit with few horsepackers renewing permits during 1985.

All permits issued during 1985 were redesigned so that the special condition format and text were in compliance with the new Region 7 outfitter/guide policy. All guides were required to pay \$100.00 permit fee pursuant to the new policy.

During 1985, five new outfitter/guide permits were issued. Twenty-seven permits were renewed and 10 were discontinued for a total of 32 outfitter/guide 1985 SUP's. Special Use Permits issued for 1984 were: five permits for 17 fly-in tent camps, 14 permits for guiding on the Kenai and Kasilof Rivers and other boating operations, one permit for the operation of the Russian River Ferry, six permits for big game guiding and/or outfitting, and six permits for Swan Lake/Swanson River Canoe Routes. No SUP's were issued for special events during 1985. The State sled dog race was not conducted due to lack of snow and the infamous "Alaska Mountain Wilderness Classic" was not held on the refuge this year following its much publicized running in 1984 over the objections of refuge staff. It moved to NPS lands in 1985.

ORP Johnston and FMO Bill Larned conducted commercial tent camp inspections on June 13. Seventeen camps were inspected with only minor deviations in the SUP stipulations noted. For the most part tent camp appearances and compliance with SUP provisions has improved dramatically from previous years. A standard form, to be filled out for each camp inspected, was developed for the 1985 inspections and will be utilized in the same format during future inspections.

Pursuant to the 1980 Tent Camp Policy and guidelines of the Kenai CCP, use of two tent camps on Two Island Lake was suspended for part of the 1985 season, due to the lake's use by nesting trumpeter swans. The tent camps have been operated by Big Red's Flying Service and efforts may have to be undertaken to relocate the camps for the 1986 season. Permanent relocation may be necessary depending on future swan nest locations.

Sport Fish Lake camp was also relinquished by Alaska Bush Carriers due to lack of fish within the lake. Fisheries studies during 1984 confirmed a general lack of productivity.

The only portion of the refuge that remained limited to overall numbers of guides was the increasingly popular Upper Kenai River. Twelve hopeful drift boat fishing guides were placed on a waiting list in hopes of obtaining a SUP to operate on the upper Kenai. Overall number of permits on the upper Kenai was frozen by RM Delaney in 1984, pending an evaluation of a general user carrying capacity and appropriate ratio of guided visitor days to general public visitor days.



A group of clients are treated to a float trip down the upper Kenai River by one of several guides authorized to provide visitor services on the Kenai River.

RKJ

A commercial services visitor directory was developed during 1985 which offers an easy guide to those businesses under SUP on Kenai NWR, and categorizes them according to the services they provide (Table 34).

Table 34. Commercial Visitor Directory, Kenai National Wildlife Refuge.

<u>AIR TAXI/</u>	<u>BACK PACKING/BACK COUNTRY</u>
<u>DESTINATION TENT CAMPS</u>	<u>CANOE GUIDE SERVICE</u>
Alaska Air Guides	AK Fishing & Wilderness Adv.
Alaska Bush Carriers	AK Outdoor Services
Big Red's Flying Svc.	AK Pioneer Canoeing Assn.
Ketchum Air Service	Frontier River Safaris
Rust's Flying Service	GreatAlaska Fish Camp
	Hugh Glass Back Packing
<u>EQUIPMENT RENTAL</u>	Kenai Guide Svc.
AK Outdoor Svcs.	Saint Theresa's Camp
AK Pioneer Canoe Assn.	Solid Rock Bible Camp
GreatAlaska Fish Camp	
<u>HORSE PACKING GUIDE SVC.</u>	<u>GAME MEAT TRANSPORTING</u>
Blood&Guts Packing Svc.	AK Outdoor Svcs.
Hope Trading Post	Blood & Guts Packing Svc.
Jones Guide/Outfitting Svc.	Hope Trading Post
Running W Outfitters	Jones Guide & Outfitting Svc.
Willard Moose Camp	Northwest Outfitters
	Running W Outfitters
<u>SCHEDULED BOAT SVC.</u>	Willard Moose Lodge
Sportsmans Lodge, Inc.	
<u>KAYAK INST. & GUIDE SVC.</u>	<u>RIVER FLOAT TRIPS</u>
AK Rivers Co.	AK Fishing & Wilderness Adv.
	AK Outdoor Svcs.
<u>SCUBA INSTRUCTION</u>	AK Pioneer Canoeing Assn.
Don's Dive Shop	AK River & Ski Tours, Inc.
	AK River's Co.
<u>LAKE/OCEAN TOURING</u>	Freebird Charters & Fish Camp
AK Fishing & Wilderness Adv.	GreatAlaska Fish Camp
AK Outdoor Svcs.	Northwest Outfitters
AK Pioneer Canoeing Assn.	Pacific Coast Charters
GreatAlaska Fish Camp	RW's Guide Svc.
Hugh Glass Backpacking	Saint Theresa's Camp
Kenai Guide Svc.	Solid Rock Bible Camp
Pacific Coast Charters	Sportsman's Lodge, Inc.
St. Theresa's Camp	
Solid Rock Bible Camp	<u>HUNTING GUIDE SERVICE</u>
	<u>Air Cushion Guides</u>
<u>SPORT FISHING GUIDE SVC.</u>	AK Outdoor Svcs.
AK Air Guides	Hope Trading Post
AK Bush Carriers	Jones Guide&Outfitting Svc.
AK Drift Boaters	Kenai Guide Svc.
AK Fishing & Wilderness Adv.	Northwest Outfitters
AK North Flying Svc.	Dennis Owen Guide Svc.
AK Outdoor Svc.	Running W Outfitters
AK River & Ski Tours	Willard Moose Lodge
B&B Guide Svc.	
Big Red's Flying Svc.	<u>PHOTOGRAPHY GUIDE SVC.</u>
Freebird Charters & Fish Camp	AK Fishing & Wilderness Adv.
Johnnie's Guide Svc.	AK Outdoor Svcs.
Kenai River Charters	AK River & Ski Tours
Ketchum's Air Svc.	Hope Trading Post
Bruce Nelson Float Fish. Svc.	Hugh Glass Backpacking Co.
Northwest Outfitters	Kenai Guide Svc.
Pacific Coast Charters	Northwest Outfitters
Randa's Guide Svc.	
Rust's Flying Svc.	<u>SIGHTSEEING TOURS</u>
RW's Guide Svcs.	AT YORK/AK WITdiffe Tours
Silver Salmon Charters	
Sportsman Lodge, Inc.	<u>WINTER BACKCOUNTRY GUIDE SVC.</u>
	AK Outdoor Svcs.
	AK River & Ski Tours
	Kenai Guide Svc.

I. EQUIPMENT AND FACILITIES

1. New Construction

The new 40' x 50' warm storage facility, completed late in 1984, was given final approval from Engineering early in 1985. This facility not only proved to be a real asset toward meeting our warm storage needs, but provided badly needed winter work space for completing a backlog of sign repair and new construction needs. As the refuge phases into predominately wooden routed signs, this facility will be increasingly important to our overall sign maintenance-management program.



The 40' x 50' warm storage/carpentry shop, completed late in 1984, was put to good use during 1985. JEF

Two 5' x 10' entrance signs were constructed and placed at both ends of Ski Hill Road. Permanent anchoring and stone facing work will be completed in 1986.

Steel storage bins and spare tire racks were constructed and mounted on all low-boy trailers. The bins will be used for proper storage of tire chains and binders.

New fire pits were installed at Tustumena Lake Campground.

New storage bins were constructed for holding the vast variety of refuge signs. While perhaps not as sophisticated as the Dewey Decimal System, it does allow some sense of order to the old "stack-em-in-the corner" method.



New storage bins brought some semblance of order to the many types of signs used on the Kenai. JEF, 1986.

2. Rehabilitation

Thirty-five picnic tables and numerous shot up wooden routed signs were brought into the shop from various campgrounds for repair and repainting.

The two 4 x 4 sub-entrance signs along Funny River Road fell victim to a not so funny phantom sign collector who used a chain saw on one to cut the 6" x 6" support beams. The other sign was simply removed with the benevolent perpetrator(s) at least leaving us the upright supports. Both signs were replaced.

With our increased capacity to repair and construct wooden signs, we plan to phase into a predominately routed sign program. Removing signs from all campgrounds in the fall has reduced our replacement costs and permits a more orderly sign maintenance-management program.

3. Major Maintenance

Equipment Operator Dick Kivi and our new Caterpillar 130 Road Grader were kept busy with extensive road maintenance throughout the summer with targeted areas being the Skilak Loop and associated campgrounds, Tustumena Lake, and Swan Lake Roads. As part of our cooperative agreement with ADF&G to provide all-weather access into the Moose Research Center, the Swan Lake/Moose Pens road were plowed twice in March following extended periods of heavy snowfall.

The boat ramp at Upper Skilak Lake Campground was revamped by pulling out the old aircraft landing mat, grading, shaping, and replacement of matting.

Vehicle maintenance on the 28-vehicle refuge fleet continued to occupy a significant portion of our maintenance efforts. Maintenance Mechanic Al O'Guinn has established and executed an efficient maintenance schedule, and both our vehicle fleet and equipment are maintained in excellent operating condition. With our cumulative fleet mileage approaching 170,000 miles annually, we are planning to establish a full-time maintenance helper position in 1986 in an attempt to keep abreast of increasing maintenance responsibilities/needs.

Other maintenance activities included complete rewiring and installation of new lights on all trailers in addition to installing new brakes and wheel bearings. Another new S-10 Chevy 4 x 4 pickup was equipped for law enforcement duties with a light bar, siren, external speaker, and a radio capable of using State frequencies bringing to two the number of LE vehicles. The folding aircraft hangar doors were refitted with new cables, and pulleys reversed to counter uneven wear.

Our perennial nemesis - poor water at the refuge headquarters complex - continued to plague our pallets, stain our toilets and shower stalls, and produces a catastrophic cup of coffee. Despite the use of over 12 ton of salt per year through our dual-stage softening system, we are still borderline in meeting EPA and A.D.E.C. standards for a public facility. Should funds become available and the City of Soldotna relent to our tapping into their water main, we may eventually solve this aggravating situation by running a 3/4 mile line from headquarters to the bottom of Ski Hill Road.

The make-up air unit, installed in the Shop Building in 1984, was used only intermittently during 1985 due to excessive gas emissions. We suspect the problem was over pressurization without sufficient air exchange and ventilation to the outside. Three large external exhaust

fans, formerly working off timer switches, were rewired to run simultaneously with the make-up unit. Testing for carbon monoxide by the Gas Company proved negative, and the internal shop environment has been greatly improved.

Efforts continued this past year to convert the headquarters complex to three-phase power. At the time the facilities were completed in late 1979, access to a three-phase feeder line made the cost prohibitive although internal wiring systems were designed for this level of power. This necessitated the use of a "temporary" roto-phase unit to convert single to three-phase power. This "temporary" roto-phase has become a more or less permanent occupant of the Headquarters/Visitor Center building, and, while located directly under the refuge auditorium, continues to emit highly irritating and distracting audible inflections not unlike a chorus of unhappy hummers. Maintenance problems with this unit are imminent, as we have already detected bearing problems during shut-down periods.

A three-phase line is now available less than a mile away, and we will continue to pursue funding efforts to upgrade this system. Should we lose the roto-phase, we have no internal fire control system, and our 6,000 gallon emergency water tank would be only a useless "hot tub".

4. Equipment Utilization and Replacement

Replacement equipment this year consisted of four S-10 Chevy 4 x 4 extended cab pickups. This brings our total S-10 fleet to seven vehicles, and has considerably reduced the maintenance costs of keeping "old veterans" on the front lines. Several of the "old vet's" will be surplusd in 1986.



The addition of 4 more S-10 Chevy 4 x 4 pickups
helped greatly to reduce maintenance costs in 1985.
JEF

New equipment purchased in 1985 included a Play-Mor camper trailer for use at remote field camps, a 4,000 watt portable generator for use at the Guard Station on Skilak Loop, and three outboard motors, 10, 25, and 40 hp. A jig saw and South Bend machine lathe, both in excellent condition, were picked up as excess property from Elmendorf AFB.



The new Play-Mor camper trailer will be warmly welcomed by those assigned to field camp/check station duties.
JEF

The old carpentry shop was moved from the shop building to the new 40x50 warm storage building. A new router and two hand planers and sanders were added to our equipment inventory.

The old carpentry shop was converted to a machine shop with lathe, drill presses, band saw, and additional storage facilities.

The last of nearly 45 years of accumulated refuge "heirlooms" at the old Kenai Headquarters were finally reunited with their companions of long standing at our Soldotna Shop complex. While our "new" boneyard doesn't look a whole lot different than the "old" boneyard, a number of older residents were dispatched to the local landfill during the move. So far we haven't missed the rear bumper from a WWII military jeep and a fender from a 1950 Ford pickup.

The old No. 12 Caterpillar road grader, which served us well for the past 20 years, will be finishing out its remaining years in the private sector. This machine was replaced by our new 130 Caterpillar grader and sold to a Seward man for \$6,000.

5. Communication Systems

Telecommunications capability on the Data General microcomputer was activated. All input into the Regional Office Financial Tracking System is now done through the Data General. We still must enter one keystroke at a time over long distance toll lines which is very costly.

This past year mobile radios were purchased for our two law enforcement vehicles. Permission was obtained from the Alaska State Troopers to install a crystal to reach their direct line frequency in case of emergency. This has been tested from our high public use fee area at Russian River with negative results. The Alaska State Troopers would not give permission for use of their repeater frequency unless it was absolutely necessary. Permission was again requested to use the repeater frequency after being unable to reach them from Russian River. The State Troopers again refused to approve the request. Time will tell as to what the consequences will be. In the Russian River Fee Area numerous emergencies have occurred ranging from major traffic accidents on the highway to accidental injuries to the visiting public.

6. Computer Systems

Our new Data General 10SP microcomputer was received during December 1984, and this past year we obtained several software packages to run on it. The major problem we have encountered is lack of training. Another problem is there is little software available to run directly under the AOS operating system, compared to what is available under MS/DOS or CP/M operating systems. MS/DOS and CP/M operating systems can be installed under the AOS operating system, but we must be very careful to make sure the MS/DOS and CP/M software will work on the Data General. When operating under the MS/DOS the computer can only be used by one individual compared to three users under AOS. F&W Biologist Ted Bailey is currently learning to operate the database software, dBase II, which runs under MS/DOS, to set up databases for swan, moose, wolf, and caribou data. All users must schedule their operations so there are no conflicts.

In October, 1985 Budget Assistant Leslie Blaylock attended a meeting in the Regional Office to assist with the format of a financial tracking system for the field stations. IRM is currently working on developing the software. One of the best features that the software should have is the ability to enter all our information at the field level then be able to telecommunicate the entire package of information into the MV8000 computer in Anchorage to update the Regional Office Financial Tracking System.

The last week of October BA Leslie Blaylock attended a week long training course in Anchorage on the Data General. This course was to assist system managers in field stations. There was so much information given, and so little time to practice what was being taught, that nearly everyone left the course as confused as when they arrived. Leslie is currently working to complete two self study courses to be able to assist other employees with problems on the Data General.

A Wang Personal Computer was purchased in 1985 to be used as another OIS word processing work station. We now have three work stations and this has helped relieve the congestion.

7. Energy Conservation

Table 35 shows a comparison of energy consumption between calendar years 1984 and 1985. The notable increase in electricity in 1985 (45% over 1984) is attributed primarily to full operation of the 40' x 50' warm storage/carpentry shop. This facility was used on a near continual basis for both new sign construction and repair of damaged ones. Increasing use of the Visitor Center on weekends and evenings was also a contributing factor as well as maintaining the remote field camp at Schooner Bend.

Table 35. Energy Use Comparisons

Product	Unit of Measure	Consumption		Comparison % Change With 1984
		1984	1985	
Electricity	KWH	166,843	241,770	+45%
Natural Gas	100 Cu.Ft.	21,317	18,876	-11%
Vehicle Gas	Gallon	9,132	9,565	+ 5%
Aviation Gas	Gallon	7,884	9,413	+19%
Propane	Gallon	524	354	-32%
Diesel Fuel	Gallon	1,024	1,798	+75%

The drop in natural gas consumption reflects the NPS occupancy of the old Refuge Office in downtown Kenai. The NPS began utilizing this facility in late fall of 1984, and assumed responsibility for all utilities in December of that year.

While vehicle gasoline showed only a slight (5%) increase, the total fuel efficiency has increased significantly with the addition of seven S-10 Chevy 4 x 4 pickups. Total miles driven was nearly 165,000 miles, with a total fleet mileage rate of 17.25 MPG.

The increase in aviation gas (19%) reflects added responsibilities in monitoring/tracking radio collared eagles, wolves, lynx, swans, and also caribou which were transplanted to the refuge in the spring of 1985.

The decrease in propane consumption (-32%) is deceptive in that the tanks for the three trailers at Schooner Bend were filled in late 1984 with sufficient reserve to carry us through most of the field season in 1985. The use in 1985 was probably similar to 1984 levels.

The increase in diesel (75%) reflects extensive use of our 130 Caterpillar road grader for road maintenance and the addition of the 930 Caterpillar front-end loader.

J. OTHER ITEMS2. Other Economic Uses

a. Oil and Gas

1. Beaver Creek Field - For the third consecutive year, no drilling operations were conducted. In October, Marathon Oil Company, completed a \$200,000 30'x100' office/shop building complex communications and monitoring instruments, quarters for the daily shift operators, and general shop activities.

Marathon, looking ahead to the usual problems of spring breakup, installed a dozen new road culverts and transported substantial gravel to their access road. Some public gravel/sand was used from Kenai Native Association lands.

Cumulative production through August 31, 1985 was:

3,134,480 barrels of oil
1,271,748 MCF of solution gas
25,139,110 MCF of gas well gas

Production for the period from September 1, 1984, through August 31, 1985, was:

154,171 barrels of oil
103,151 MCF of solution gas
9,568,963 MCF of gas well gas

Production for the month of August 1985 was:

13,383 barrels of oil
6,502 MCF of solution gas
634,772 MCF of gas well gas

2) Swanson River Oil Field (SRF) - No new wells were drilled during 1985.

Soil samples taken from the Swanson River Oilfield by FWS personnel in 1984 revealed the presence of PCB's and DDT. Further tests, conducted by Chevron and the EPA, verified the extent and concentration of these highly toxic environmental contaminants. The contaminated soil is believed to be the result of an industrial accident 14 years ago, which contaminated the snow and was later mixed with soil. This soil, not known to contain contaminants, was later used on certain roads as a means of dust control. Only in later years was the contaminant found to contain a suspected carcinogen PCB. The believed contaminate, a liquid recommended and utilized at the time of the accident in support of production operations at the Field, was found to contain, some years later, a suspected carcinogen (PCB).

The Order By Consent, Mitigation Plan - Swanson River Oil Field, Kenai National Refuge, was signed August 6, 1985 by Chevron U.S.A., Inc., specifying the time to comply with the clean-up schedule. Chevron provided security at the SCU 14-3 site; as well as a description of operations within the Field; identified spills of hazardous substances; including an inventory of any item that contains PCB fluids or materials; and listed petroleum compounds and hazardous substances other than PCBs used at this facility. Chevron contracted Ecology and Environment, Inc. of San Francisco, CA., to develop the required Interim Mitigation Plan which was completed September 5. This plan's primary objectives include containing areas known to have PCBs and prevent contaminants from migrating into the soil or underground. An initial Sampling Plan identified areas for remedial action and assessed impacts of contaminants on fish and wildlife. An Analytical Plan to provide data from samples collected from the Swanson River Field was submitted. The data generated from the sampling and analysis program will be used for risk assessment and to delineate areas requiring eventual mitigation. The Mitigation Plan and Sampling Plan were approved while the Analytical Plan provides for soil samples to begin October 15. According to the Mitigation Plan, the SCU 14-3 stockpile was covered.

Under Phase I of the Sampling Plan, Ecology and Environment, Inc., Chevron's contractor for the PCB clean-up, began collecting more than 2,000 soil samples from selected areas within the field in October. Biological and water samples were also collected and four monitoring wells drilled. Approximately 2,000 samples were collected, but the limited spiked samples received permitted only 150 soil samples to be shipped to the lab for analysis.

An additional 220 soil samples were shipped in December to Analytical Technologies for PCB and heavy metal analysis.



Soils were collected from varying depths throughout the Field under Chrvron's Order by Consent. RAR



Contracting crew collecting soil sample and checking for aromatics along a Swanson River Oil Field Road. RAR



Over 1000 soil samples were collected in the Swanson River Oil Field under Chevron's Order by Consent. RAR



Crews checking for aromatics from soil sample collected at one of five monitoring well sites drilled within the Swanson River Field. RAR



Each soil sample collected from the Swanson River Field required special handling for shipment for lab analysis. RAR



The Swanson River Field 14-3 site was covered to contain and secure contents and prevent wildlife contact. RAR

Defenders of Wildlife requested and received pictures of PCB soil collection at Swanson River Oil Field and we took the liberty to clarify some misinformation printed in a recent Defenders news bulletin.

Chevron provided additional gravel as they upgraded Swanson River Road and a bad curve just south of Dolly Varden Campground was realigned and vegetation brushed back substantially.

Pressure surveys were conducted in the field in the SCU fault block in July 1985 and in the remainder of the field in October 1985. The results are listed below:

	<u>Average Pressure</u>
SCU Fault Block	4916 psi
Center Fault Block	3600 psi
34-10 Fault Block	4400 psi

The following is the production/injection data for the Swanson River Field for the period January 1985 through December 1985:

		<u>Dec 1985</u>	<u>Jan - Dec 1985</u>	<u>Cumulative thru Dec. 1985</u>
Oil Production	BBLS	175,133	2,161,007	203,216,759
	B/D	5,649	5,920	
Gas Production	MCF	7,691,732	89,786,317	1,534,951,972
	MCF/D	248,120	245,989	
Gas Injection	MCF	8,789,030	101,850,385	1,765,586,784
	MCF/D	283,517	279,042	
Water Production	BBLS	204,175	2,276,754	63,689,459
	B/D	6,603	6,237	
Water Injection	BBLS	0	0	8,471,561
	B/D	0	0	

All water production was injected into disposal wells completed in shallow salt water sands approved by the State and the E.P.A. for injection.

Work began on bringing the shut-in wells into mechanical integrity compliance and a list of shut-in well status was submitted in October.

A truck-trailer accident December 5, 1984, near Jean Lake, about Mile 61 Sterling Highway, spilled 5,900 gallons of unleaded gasoline, some of which reached Jean Creek. Absorbent booms and pads were used to trap the fluid in addition to some burnoff. The creek site was checked in June including trenches/absorbent booms and any evidence of hydrocarbons. Traces of fuel were found in upland depressions and the Creek boom catching only normal drainage foam. Unused absorbent material was removed along with the booms when the trench was filled in by the contractor.

Realty assisted in cancellation of several grants issued in 1965 by BLM to provide gravel to the Department of Highways for construction of the Sterling Highway. Only one site still provides some gravel, the others mined-out and reclaimed. Two sites, one under SUP to the State DOT, now provide all anticipated needs.

Two SUP's were requested in August by Dr. Doug Reger, State Archaeologist, for excavation surveys within 1/2 mile of the Kenai River and Skilak Lake, as well as continuing last season's project KEN-094 located near the east refuge boundary just north of the Sterling Highway at Mile 55.2. The SUP will be issued upon receipt of a Federal Permit from R.O. Archaeologist Chuck Diters.

3. Items of Interest

The following VIP's visited the Kenai National Wildlife Refuge during 1985:

Dr. Al Manville of Defenders of Wildlife visited the refuge the weekend of March 20-21.

R.D. Gilmore and DRD Olson visited the Swanson River Oilfield April 19, to review the PCB problem.

Dick Hensel and Dave Spencer of the National Wildlife Refuge Association visited Kenai April 24, to discuss NWRA's comments of the KCCP.

Wildlife artist Guy Coheleach visited the refuge May 15, on his way to Homer. Coheleach was visiting Alaska as the 1985 judge of the Anchorage Audubon Art show.

Jack Fairell of the Washington D.C. EIS office visited June 1.

WO personnel Suzanne Mayer, Don Minnick, and Jim Gillette visited Kenai for the Wildlife Resource Programatic the weekend of August 23-24, accompanied by ARD's John Rodgers and Bob Jacobson.

Larry Smith, southwest representative of the National Wildlife Refuge Association, visited Kenai in early September.

Irene Magyai of WO-Planning toured the refuge and met with staff to discuss access regulations.

Author/ecologist Dr. Paul Shepard visited Kenai September 20-21, in conjunction with his appearance in the "Earth and Spirit" lecture/workshop series, sponsored by the refuge and Kenai Peninsula Community College.

NBC news reported Frank Burgholzer and crew toured the refuge the weekend of October 12-13 for a television news segment.

4. Credits

All refuge staff participated in the writing and photography of the narrative. It was edited by Mike Boylan, coordinated by Mike Hedrick, and typed in its entirety by Pat Fencil and Deanne Nelson.

K. FEEDBACK

The continued pressures on the public use program at Kenai become more acute each year. The "Public Use Requirements" (PUR) published by the W.O. in 1985, while generally well-done and much needed, are deficient in a couple of areas if Kenai's program is an example.

The PUR for refuges establish standards or areas of concern but we feel they should be expanded to include at least two others, namely, trapping and refuge law enforcement.

While the PUR calls for refuges to "Maintain Quality Hunting Program" (#7) and "Maintain Quality Fishing Program" (#8), nary a word is said re: trapping. Many refuges maintain trapping programs which, although they are established as management tools (as hunts often are), they are also recreation programs (according to Refuge Manual and FWS Policy). Yet the lack of "quality" or standards is conspicuous by its absence in this refuge program. Likewise, refuge law enforcement would seem to be an important public use program yet it is not mentioned in the PUR. Recent welcome developments in the refuge LE program including commissions for seasonal employees, new credential cases, the refuge officer outerwear patch, and standardized leather gear, show a greater awareness and concern for a quality LE program on refuges. Since refuge enforcement either affects or is affected by other aspects of public use such as signs (or their absence), quality hunting and fishing, etc., it only makes sense that standards for a quality refuge LE program be developed and included within the Public Use Requirements.

With the accelerated public use of Kenai, the emphasis on consumptive uses, i.e., hunting, fishing, trapping, and the great distances covered, the refuge covers the spectrum of public use requirements. In failing to include trapping and LE as public use programs, no forum is available to establish standards of quality. If quality on refuges is our goal (and

it should be) then standards to insure such quality should be developed. And these standards should include, not ignore, two of the most important and sometimes controversial programs conducted on refuges, namely, trapping and law enforcement.

L. APPENDIX

1. Publications

Recent publications of the Kenai National Wildlife Refuge.

- Bailey, T.N., E.E. Bangs, M.F. Portner, J.C. Malloy, and R.J. McAvinchey. 1986. An apparent overexploited lynx population on the Kenai Peninsula, Alaska. *J. Wildl. Manage.* 50:In Press.
- Bailey T.N. and A.W. Franzmann. 1983. Mortality of resident versus introduced moose in a confined population. *J. Wildl. Manage.* 47(2):520-523.
- Bailey, T.N., A.W. Franzmann, P.D. Arneson, and J.L. Davis. 1983. An evaluation of visual location data from neck-collared moose. *J. Wildl. Manage.* 47(1):25-30.
- Bailey, T.N. and E.E. Bangs. 1983. The significance of natural sanctuaries in maintaining lynx population levels on the Kenai National Wildlife Refuge, Alaska. Abstracts. 3rd Northern Furbearer Conf. March 22-23, Fairbanks, Alaska.
- Bangs, E.E., T.N. Bailey, N. Olson, R.L. Delaney, M.B. Hedrick, R.K. Johnston, and J. Freidersdorff. 1986. Land management planning on the Kenai National Wildlife Refuge, Alaska. *Trans. N. Am. Wildl. and Nat. Res. Conf.* 51:In Press.
- Bangs, E.E. 1985. Lynx:boom or bust. *The Alaska Trapper Magazine.* Summer Issue.
- Bangs, E.E. 1985. Occurrence of the nematode *Protospirura muris* in Alaskan Northern Red-backed voles, *Clethrionomys rutilus*. *Canadian Field-Naturalist.* 99(3):386-388.
- Bangs, E.E., S.A. Duff, and T.N. Bailey. 1985. Habitat differences and moose use of two large burns on the Kenai Peninsula, Alaska. *ALCES* 21:In Press.
- Bangs, E.E. 1984. Summer food habits of voles, *Clethrionomys rutilus* and *Microtus pennsylvanicus*, on the Kenai Peninsula, Alaska. *Canadian Field-Naturalist.* 98(4):489-492.
- Bangs, E.E., T.N. Bailey, and M.F. Portner. 1984. Bull moose behavior and movements in relation to harvest on the Kenai National Wildlife Refuge. *ALCES* 20:187-207.
- Bangs, E.E. and T.N. Bailey. 1983. Recreational trapping on the Kenai National Wildlife Refuge. Abstracts. 3rd Northern Furbearer Conf. March 22-23, Fairbanks, Alaska.

- Bevins, J.S., C.C. Schwartz, E.E. Bangs, and K.J. Nelson. 1985. Kenai Peninsula Brown Bear Studies: Report of Interagency Brown Bear Study Team 1984. Unpubl: Progress Report 103pp mimeograph.
- Oldemeyer, J.L. and W.L. Regelin. 1984. Forest succession, habitat management, and moose on the Kenai National Wildlife Refuge. Viltrey: In Press.
- Peterson, R.O. and J.D. Woolington. 1982. The apparent extirpation and rerappearance of wolves on the Kenai Peninsula, Alaska. Pages 334-344 in F.H. Harrington and P.C. Paquet, eds. Wolf of the World. Noyes Publ., Park Ridge, N.J.
- Peterson, R.O., J.M. Scheidler, and P.W. Stephens. 1982. Selected skeletal morphology and pathology of moose from the Kenai Peninsula, Alaska and Isle Royale, Michigan. Can. J. Zool. 60:2812-2817.
- Peterson, R.O., T.N. Bailey, and J.D. Woolington. 1983. Wolf management and harvest patterns on the Kenai National Wildlife Refuge, Alaska. Canadian Wildlife Service Report Series Number 45:96-99.
- Schwartz, C.C., R. Stephenson, and N. Wilson. 1983. Trichodectes canis on the gray wolf and coyote on Kenai Peninsula, Alaska. J. Wildl. Dis. 19(4):372-373.
- Smith, P.A. 1984. Kenai black bears and cranberries: bear food, habitats, and densities. M.S. Thesis. Univ. of Alaska. 143pp.
- Talbot, S.S., M.B. Shasby, and T.N. Bailey. 1985. Landsat-facilitated vegetation classification of the Kenai National Wildlife Refuge and adjacent areas, Alaska. Precor 10:333-345.
- Trapp, J.L., A.L. Sows, D.R. Nysewander, and M.F. Portner. 1986. Breeding populations and productivity of cormorants and gulls at Lake Louise and Skilak Lake, Alaska, 1985. Unpubl. Admin. Report, U.S. Fish & Wildlife Service, Anchorage, Alaska. 29pp.

U.S. FISH AND WILDLIFE SERVICE

KENAI NATIONAL WILDLIFE REFUGE

P.O. BOX 3129

SOLDOTNA, ALASKA 99669

PROGRESS REPORT NO. 1

PROJECT 74525-84-01

REINTRODUCTION, MONITORING AND MANAGEMENT
OF CARIBOU (RANGIFER TARANDUS)
IN THE CENTRAL AND SOUTHERN REGIONS OF THE
KENAI NATIONAL WILDLIFE REFUGE

by
Theodore N. Bailey
and
Edward E. Bangs

NOVEMBER 1985

PROGRESS REPORT NO. 1
KENAI NATIONAL WILDLIFE REFUGE
P.O. Box 2139, Soldotna, Alaska, 99669

Cooperator: ALASKA DEPARTMENT OF FISH AND GAME

PERIOD: 14 FEBRUARY THROUGH 31 OCTOBER 1985

1. Title: Reintroduction, monitoring, and management of caribou (Rangifer tarandus) in the central and southern regions of the Kenai National Wildlife Refuge.
2. Project Number: 74525-84-01
3. Objectives: The goal of this project is to re-establish viable caribou populations throughout suitable and/or historic, but unoccupied, caribou habitat within the central and southern regions of the Kenai National Wildlife Refuge. Specific objectives include:
 1. Release 40-60 caribou to establish nuclei for viable populations in each of two release areas: Skilak-Tustumena Benchlands (1st priority); and if sufficient numbers of caribou are available, the Caribou Hills area (2nd priority).
 2. Assess the success of the reintroduction by monitoring the movements, seasonal habitat use patterns, reproductive success, and mortality rates of reintroduced caribou from 1985 through 1987.
 3. Establish the following management guidelines for the reintroduced caribou population(s):
 - A. Hunting may occur after the population(s): 1) reach a sufficient size which enables them to maintain themselves or increase, with natural predation from wolves and bears and hunting; 2) investigate or seasonally use the majority of suitable caribou habitat in the region; and 3) can maintain a minimum bull:cow ratio of 40:100 after hunting. The harvest rate will be dependent upon the sexes of caribou harvested and the desired herd size.
 - B. Uses on portions of the refuge may be restricted to prevent or reduce public use impacts, if such use is conflicting with caribou habitat use patterns.
4. Background:

The purpose of the Kenai National Wildlife Refuge is to conserve fish and wildlife populations and habitats in their natural diversity. Since it is the Service's responsibility to manage for naturally occurring

wildlife communities, or to restore natural populations that have been eliminated by man on Alaskan refuges, it is appropriate to reintroduce caribou into the former habitats and the Kenai NWR. Caribou were apparently once widespread on the Kenai Peninsula (Porter 1893; Seton-Karr 1887; and Schiefner 1874 cited in Lutz 1960; Palmer 1938). However, by the early 1900's caribou were essentially exterminated by man over most of the Peninsula. The last reported caribou was seen in 1912 (Palmer 1938). Although caribou were probably never really numerous, old caribou antlers have been found in the Kenai Mountains and in the Caribou Hills (D. Holdermann, W. Soroka, personal communication). Davis and Franzmann (1979) concluded that caribou on the Kenai Peninsula were probably exterminated by overhunting and further stated: "Although fires may have decreased the theoretical carrying capacity of caribou ranges on the Kenai, we are confident that sufficient habitat was always available for remnant populations."

The Refuge's first attempts to address the "loss of caribou" problem can be traced to at least 1951 when a reintroduction was seriously considered. In 1961, Refuge personnel concluded that there were five potential habitats that might support caribou on the Kenai Peninsula. The four sites on the Refuge included the Western Kenai Peninsula, the Mystery Creek-Chickaloon River Mountains, the Tustumena Benchlands, and the Caribou Hills. Eventually, the Alaska Department of Fish and Game released 44 caribou on the Refuge in 1965 and 1966. Two herds resulted from the transplant: an upland Kenai Mountains herd of approximately 300 individuals which utilize and overwinter on the Refuge in the Big Indian Creek basin, and a lowland Kenai caribou herd of about 60-80 individuals which seasonally migrate between the Moose River Flats and the Kenai area. This transplant confirmed that caribou habitat was available in the northern part of the Refuge and led to the occupancy of 2 of the 4 caribou habitats recognized on the refuge. However, despite the success of the introductions in the northern Refuge, two available caribou habitats remain unoccupied in the central and southern parts of the refuge - the Skilak-Tustumena Benchlands area and the Caribou Hills.

5. Procedures:

Caribou from the Nelchina Herd, in Game Management Unit 13, were selected as the donor population for the reintroduction because caribou previously reestablished on the Kenai Peninsula originated from this herd (Burris and McKnight 1973). Furthermore, a segment of the herd wintered near the Glen Highway near Lake Louise, thus reducing capture and transportation costs. All capture operations were based at the Point of View Lodge, Lake Louise.

Holding pen materials were transported to Lake Louise on April 8, and by April 10, a circular holding pen was assembled on the lake ice approximately 100 m from the lodge. The pen, approximately 30 m in diameter, was constructed of interlocking sections of metal corral to which were added wooden extensions to reach a height of approximately 2.5 m (8 ft). The entire inside of the pen was covered with burlap and fishing seine netting to provide a visual barrier in order to reduce injuries to the caribou. A gate and chute connected to a fenced-in work

area completed the holding pen (Fig. 1). Snow was pushed up to a height of about 1.2 m (4 ft) around the entire outside perimeter of the pen to provide stability.

Two Bell 206 helicopters, each with two capture crews, were used to capture caribou and transport them back to the holding pen area. Immobilized caribou had all four legs hobbled together and were then fitted inside a holding-transport bag. A cloth "blinder" was placed over the face of each transported caribou and their necks were encircled with 7-10 cm (3-4 in) thick foam to keep the head upright during transport. A 15 m (50 ft) cable was used to sling the captured caribou to the holding pen area. Caribou were lowered to the ground about 300 m (990 ft) from the holding pen to reduce noise and disturbance to caribou already in the pen. Once the caribou were lowered to the ground, they were removed from the bag, placed on a field-hospital stretcher, loaded on the back of a pick-up truck, and driven to the holding pen. At the holding pen they were de-antlered, ear-tagged, and fitted with a visual collar and radio collar. Three 10cc blood samples were collected from the jugular vein of each captured caribou; each was injected, intermuscularly, with 2cc of ivermectin, MDS (Eqvalan) 5-10cc of penicillin; given an appropriate injection of the antidote disphenorphine (M50-50); and released into the holding pen. One of the helicopters was fitted with an on-board weighing device to weigh caribou as they were transported by sling to the holding pen.

Caribou were captured on two days. On April 11, each captured caribou was immobilized with 5.75cc of etorphine (M-99) combined with 1.25cc of acepromazine (PromAce). The following day (April 12) captured caribou were immobilized with 6.25cc of M-99, combined with 0.75cc of Acepromazine.

Captured caribou in the holding pen were herded on a stock truck between 10:00 A.M. and 5:00 P.M., April 13, were in route 8-9 hours, and arrived at Kenai National Wildlife Refuge headquarters 10:00 A.M. on April 14. They were then immobilized again with ketamine hydrochloride (Ketaset) and promazine hydrochloride (Sparine), 7-9 at a time, and transported by a Bell 205 helicopter to the release site where they were unloaded and allowed to recover. All caribou were released by 5:30 P.M.

6. Findings and Discussion:

Forty-seven captured caribou were transported to the holding pen. Of these, 45 survived the capture operation; 1 died on transport to the pen, and one died after it failed to recover from the immobilizing drug. Twenty-two of the surviving caribou (1 M, 21 F) were captured on April 11 (Table 1), and 23 (6 M, 17 F) on April 12 (Table 2). Nine females which were weighed averaged 104.5 kg (230 lbs) and the only male weighed 120.4 kg (265 lbs).

The average time from darting to immobilization on April 11 was 17.3 min (n = 18) and 15 min (n = 23) on April 12. Once recovered inside the pen, only 1-2 individuals, both females, periodically attempted to escape from the holding pen by running and attempting to jump over the top. The majority remained calm and several were observed feeding on hay provided in the pen.

The only serious problem experienced during the capture operation was temporary damage to the cornea of the eye of caribou as they were transported in a sling to the holding pen. Although protected over their face by a cloth "blinder," the cold temperatures (-10° to $+10^{\circ}$ F), and chill factor associated with transport, apparently froze the cornea to the cloth. Once this was discovered, additional insulation (foam, handkerchiefs) was inserted between the eye and the cloth "blindings."

Only forty-four of the caribou (7 M, 37 F) were loaded on the truck because one (1 F) was released at Lake Louise on April 12. Loading the penned caribou on to the truck was a problem because it was difficult to keep individuals inside the truck while others were being herded on to the truck. Caribou kept running into each other while going in opposite directions. Caribou were successfully loaded by herding 8-10 individuals in the back of the trailer. Two people then raised a tarp and slowly forced the caribou to the front of the trailer. Another 8-10 caribou were then loaded into the trailer and the door closed. The tarp was lowered, moved to the back of the trailer and the procedure repeated. When all the penned caribou were finally loaded, many were already stressed and at least two were down inside the trailer.

Mortality was high during transport in the stock truck. Nine females and one male captured on April 12 died in route as well as three females captured on April 11. In addition, one female was dead when the helicopter landed at the release site and two other females were euthanized at the release site after they failed to recover from the second immobilization. Both appeared near the point of death, were unable to get up on their feet, and displayed uncoordinated eye movements.

Twenty-eight (6M, 22F) of the 44 caribou loaded on the truck survived the transport and release phase of the operation (Tables 1 and 2). Of these 20 (4M, 16F) were fitted with radio collars. Three radio-collared caribou were dead as of 1 November: one female died near the release site shortly (April 24) after release from suspected capture- or transport-related causes (no evidence of predation); another female was struck and killed by a vehicle on the Sterling Highway, near Echo Lake Road, on May 21; and another was shot by a caribou hunter on October 24 as it associated with the upland Kenai Mountains caribou herd. At least eight calves were observed with surviving females after the 1985 calving period.

Movements and Post-Release Behavior - Movements exhibited by the introduced caribou will be presented in detail in a later report. To date, the caribou have explored a vast area south to the Caribou Hills, east to the eastern edge of the Kenai Mountains, north to the Moose River Flats, and west to the Sterling Highway. At least one female had joined the lowland caribou herd and at least two had joined the upland caribou herd. The largest aggregation observed to date, at least 14, occurred in the benchlands during the rutting period.

The most significant problem regarding colonization appears to be the splitting up of caribou into small groups or individuals which are often widely spaced. Another is joining existing herds of caribou. Once an introduced caribou discovered another herd, it did not return to the release region nor rejoin introduced caribou it previously associated with. Because of their wide ranging movement patterns, the greatest problem perhaps precluding establishment of a new herd may be the

presence of existing herds of caribou which incorporate the new individuals. To date, predation was not documented as a mortality factor, at least among radio-collared adults, although a black bear was observed chasing (unsuccessfully) a caribou calf on the Tustumena Glacier Flats.

7. Recommendations:

The remainder of 1984-85 caribou introduction funds transferred to the Alaska Department of Fish and Game is available and should be used to capture and move additional caribou to the refuge during 1986. Additional caribou should be released in attempt to replace individuals lost during transport and/or after the release. Based on the results and observations of the first reintroduction the following are recommended:

1. Capture and release a minimum of 20 additional caribou from the Nelchina Herd on to the refuge during March-April 1986.

2. Use the same capture techniques and holding arrangements. The last capture effort was efficient and effective. Most of the mortality was associated with trampling during transport.

3. Use thicker or insulated natural "blindings" to minimize damage to cornea of eyes of caribou while they are being transported to the holding pen.

4. Hold caribou in holding pens at least one day beyond the last date of capture before moving them to the release site. Mortality of caribou held over 24 hrs. was only 14% compared to 57% for those held less than 24 hrs.

5. Transport caribou in smaller groups (6-12) either in horse trailers, smaller trucks, or in a large trailer with separate compartments.

6. Radio-collar 10-12 of the released caribou and monitor their movements and mortality patterns. All released caribou should be ear-tagged and fitted with a numbered visual collar.

7. Release caribou again on Tustumena Glacier Flats. The steep mountains surrounding the flats prevented immediate dispersal of caribou, the Flats provided a low-snow cover area suitable for feeding, and there was no documented loss to predators on the Flats. Later, caribou were able to explore all neighboring alpine and lowland habitats. There is also a probability that the recently reintroduced caribou may join caribou from the April 14, 1985 release, especially if the 1985 caribou calve on or near the Tustumena Glacier Flats as many did in 1985.

8. Caribou from each day's capture effort should be held in separate pens if possible. This would reduce the stress on all captive caribou during the loading and would allow easy separation of caribou for transport if more than one load is necessary.

9. Transport immobilized caribou from refuge headquarters to Tustumena Glacier Flats in same manner as April 1985, but build temporary ramp to off-load caribou from Bell 205 helicopter or sling crate with non-immobilized caribou inside if feasible and weather permits.

8. Acknowledgments:

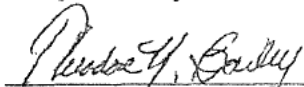
Primary funding for this project was provided by the U.S. Fish and Wildlife Service with additional funding from the Alaska Department of Fish and Game. T.H. Spraker, Alaska Department of Fish and Game, did an excellent job of coordinating the capture phase of the project (obtaining accommodations, immobilizing drugs, constructing hobbles, transport bags, blinders, etc.). We are also grateful to D.A. Holdermann, C.C. Schwartz, J.L. Davis, R.L. Zarnke, K.W. Pitcher, R.W. Tobey, K.P. Taylor, of the Alaska Department of Fish and Game for their skilled expertise during the capture operation. T.R. Spraker, pathologist, Diagnostic Laboratory, Colorado State University, provided excellent veterinary support during the entire operation, and V.L. and C.R. Lofstedt, Kenai Air Alaska, provided their usual excellent helicopter support.

Kenai National Wildlife Refuge Manager R. L. Delaney and Deputy Refuge Manager M. B. Hedrick coordinated the project with the Alaska Dep. of Fish and Game. Refuge Wildlife Biologist W. W. Larned provided excellent flying support throughout the monitoring period. Biological Technician M. F. Portner flew on many of the monitoring flights; Facility Manager B. R. Chio and Heavy Equipment Operator R. D. Kivi constructed and transported materials to and from the capture site; and R. D. Kivi and Biological Volunteers C. Piaz and M. B. Kesterson provided needed assistance during the capture and release phases of the project.

9. Literature Cited:

- Burris, O.E. and D.E. McKnight. 1973. Game transplants in Alaska. Alaska Dep. of Fish and Game. Game Tech. Bull. No. 4. Juneau. 57pp.
- Davis, J.L. and A.W. Franzmann. 1979. Fire-moose-caribou interrelationships: A review and assessment. Proc. N. Amer. Moose Conf. and Workshop. 15:80-118.
- Holdermann, D.A. 1983a. Caribou. Survey-Inventory Progress Report. Game Mgmt. Unit 7. Kenai Peninsula Mountain. Pages 1-2 In Barnett, J.A. (ed.), Ann. Rpt. of Survey-Inventory Activities. Part II. Caribou. Vol. XIII. Proj. W-22-1, Alaska Dept. Fish and Game, Juneau. 55pp.
- 1983b. Caribou. Survey-Inventory Progress Report. Game Mgmt. Unit 15. Kenai Peninsula Lowlands. Pages 22-23 In Barnett, J.A. (ed.), Ann. Rpt. of Survey-Inventory Activities. Part II. Caribou. Vol. XIII. Proj. W-22-1, Alaska Dept. Fish and Game, Juneau. 55pp.
- Palmer, L.J. 1938. Management of moose herd on Kenai Peninsula. Res. Proj. Rept. March, April, and May 1938. Unpublished manuscript. Kenai National Wildlife Refuge Files, Soldotna. 40pp.
- Porter, R.P. 1893. Report on populations and resources of Alaska at the Eleventh Census: 1890. U.S. Dept. of Interior, Census Office. 282pp.
- Schiefner, A. 1874. Leopold Radloff's Worterbuch der Kinai-Sprache. Memories de L'Academie imperiale des sciences de St. Petersburg. Vol. VIIe Series. Tome XXI, No. 8 (Cited by Lutz, H.J. 1966 Early occurrence of moose on the Kenai Peninsula and in other sections of Alaska. U.S. Dept. of Agr., Alaska Forest Res. Center, Miscel. Publ. 1, Juneau, 25pp).
- Seton-Karr, H.W. 1887. Shores and alps of Alaska. A.C. McClurg and Co., Chicago. 248pp.

Prepared by:



Theodore N. Bailey
Fish and Wildlife Biologist

Table 1. Caribou captured at Lake Louise on April 11, 1985 and released on the Tustumena Glacier Flats on April 14, 1985.

Date of capture	Sex	Age (years)	Visual collar number	Ear tags L / R	Radio-collared	Status	1985 calf
4-11-85	F	2-5	1	365/366	no	released on Tustumena Flats	?
4-11-85	F	2-5	2	388/387	yes	released on Tustumena Flats	?
4-11-85	F	2-5	3	394/393	no	released on Tustumena Flats	yes
4-11-85	F	2-5	4	-	-	died in transport	-
4-11-85	F	2-5	5	318/317	no	released on Tustumena Flats	?
4-11-85	F	2-5	6	377/378	yes	released on Tustumena Flats	?
4-11-85	F	2-5	7	342/341	yes	released on Tustumena Flats	no
4-11-85	F	2-5	8	348/347	yes	released on Tustumena Flats	no
4-11-85	F	2-5	9	310/309	yes	shot 10/24/85 near Hope, AK	no
4-11-85	F	5-6	10	-	-	died in transport	-
4-11-85	F	?	11	362/361	no	released on Tustumena Flats	yes
4-11-85	F	?	12	334/333	yes	found dead 4/24/85	-
4-11-85	F	?	13	350/349	yes	released on Tustumena Flats	yes
4-11-85	F	2-5	14	400/399	yes	released on Tustumena Flats	?
4-11-85	F	6-9	15	? / ?	yes	released on Tustumena Flats	no
4-11-85	F	1-2	16	364/363	yes	released on Tustumena Flats	yes
4-11-85	F	2-5	17	390/389	yes	released on Tustumena Flats	yes
4-11-85	F	2-5	18	-	-	died in transport	-
4-11-85	F	2-5	32	356/355	yes	released on Tustumena Flats	yes
4-11-85	F	?	20	370/369	yes	released on Tustumena Flats	no
4-11-85	F	2-5	21	338/337	yes	released on Tustumena Flats	yes
4-11-85	M	2-5	70	342/341	yes	released on Tustumena Flats	-

Table 2. Caribou captured at Lake Louise on April 12, 1985 and released on the Tustumena Glacier Flats on April 14, 1985.

Date of capture	Sex	Age (years)	Visual collar number	Ear tags L / R	Radio-collared	Status	1985 Calf
4-12-85	F	2-5	22	212/211	yes	released on Tustumena Flats	no
4-12-85	F	2-5	23	-	-	died in transport	-
4-12-85	F	6-9	24	-	-	died during release	-
4-12-85	F	10+	25	-	-	euthanized at release site	-
4-12-85	F	6-9	26	-	-	euthanized at release site	-
4-12-85	F	2-5	27	392/391	yes	road killed 5/21/85	fetus
4-12-85	F	2-5	28	-	-	died in transport	-
4-12-85	F	2-5	29	386/385	no	released on Tustumena Flats	?
4-12-85	F	2-5	30	-	-	died in transport	-
4-12-85	F	6-9	31	-	-	died in transport	-
4-12-85	F	6-9	32	-	-	died in transport	-
4-12-85	F	5-6	33	-	-	released at Lake Louise	-
4-12-85	F	2-5	34	-	-	died in transport	-
4-12-85	F	2-5	35	-	-	died in transport	-
4-12-85	F	2-5	36	-	-	died in transport	-
4-12-85	F	?	37	-	-	died in transport	-
4-12-85	F	6-9	38	326/325	no	released on Tustumena Flats	yes
4-12-85	M	6-9	66	314/313	yes	released on Tustumena Flats	-
4-12-85	M	2-5	68	308/309	yes	released on Tustumena Flats	-
4-12-85	M	?	69	372/371	yes	released on Tustumena Flats	-
4-12-85	M	6-9	-	-	-	died in transport	-
4-12-85	M	2-5	71	332/331	no	released on Tustumena Flats	-
4-12-85	M	2-5	72	441/443	no	released on Tustumena Flats	-

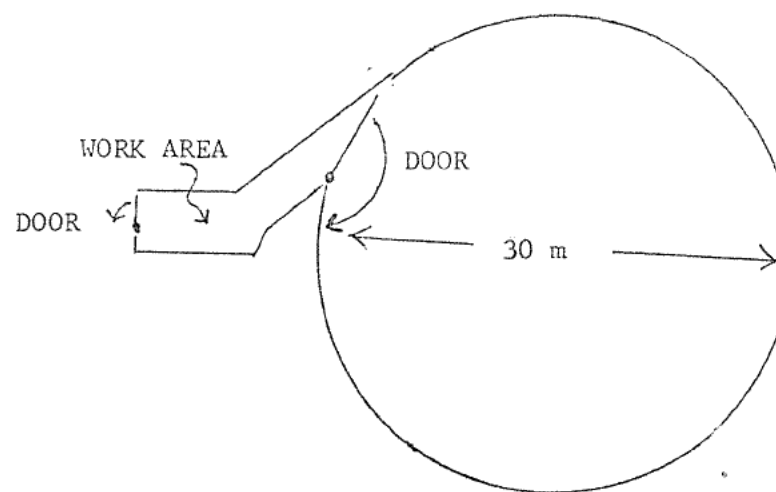
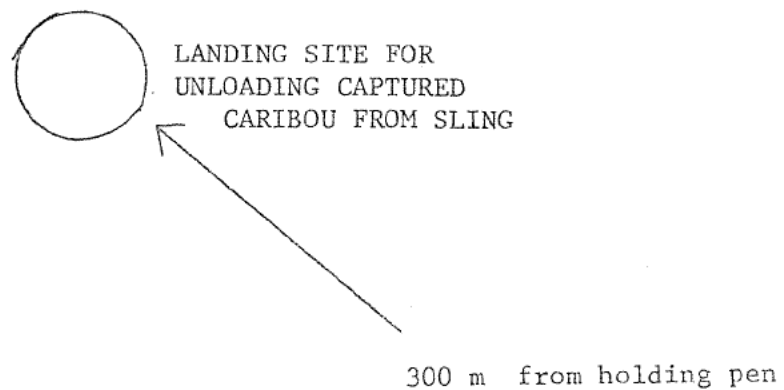


Figure 1. Configuration and location of caribou holding pen in relation to area where caribou were unloaded from capture helicopters.

U.S. FISH AND WILDLIFE SERVICE
KENAI NATIONAL WILDLIFE REFUGE
P.O. BOX 2139
SOLDOTNA, ALASKA 99669

PROGRESS REPORT NO. 2

PROJECT 74525-82-01

CAPTURE SUCCESS, MOVEMENTS AND SPATIAL ORGANIZATION
OF LYNX (Lynx canadensis)
ON THE
KENAI NATIONAL WILDLIFE REFUGE, ALASKA

by
Michael B. Kesterson
Theodore N. Bailey
Edward E. Bangs
and
Mary F. Portner

JANUARY 1986

CAPTURE SUCCESS, MOVEMENTS AND SPATIAL ORGANIZATION OF LYNX (Lynx canadensis)
ON THE KENAI NATIONAL WILDLIFE REFUGE, ALASKA.

By

Michael B. Kesterson

Theodore N. Bailey

Edward E. Bangs

and

Mary F. Portner

As part of a continuing study of lynx population dynamics on the Kenai National Wildlife Refuge, lynx were captured, radio-collared, and their movements and activities monitored during a 426-day period from 1 September 1984 to 31 October 1985. Although some work has been done involving the use of radio telemetry to determine movements and home range size of lynx (Berrie 1973, Mech 1980, Parker et al. 1983, Carbyn and Patriquin 1983, Bailey et al. 1984) relatively little is known about their spatial organization, seasonal home range use, and movement patterns. By monitoring lynx activity in three major habitats with different harvest intensities we were able to compare differences or similarities in distribution, home range size, and spatial organization as it related to exploitation.

The Kenai NWR is located on the Kenai Peninsula in southcentral Alaska and is composed of two Alaska Department of Fish and Game management units: GMU 15 and GMU 7. Unit 15 is further subdivided into 15A, 15B, and 15C - the northern, central, and southern portions of the refuge, respectively.

As a result of data collected earlier on the refuge which indicated that lynx were being intensively exploited in the northern portion of the refuge and to a lesser extent in the central portion (Bailey et al. 1984) the lynx trapping season was closed in 15A and shortened to 47 days in 15B and 15C prior to the 1984-1985 trapping season.

STUDY AREAS

The three major habitats investigated during this study and their degree of exploitation were the northern lowlands (heavy exploitation), the northeastern mountains or uplands (minimal exploitation), and the central benchlands (moderate exploitation)(Fig. 1). The northern lowlands average 122 m in elevation and are comprised largely of early and mid-successional stage spruce (Picea glauca), birch (Betula papyrifera), and aspen (Populus tremuloides) interspersed with remnant stands of mature forest. This was the result of two refuge wildfires - one in 1947 which burned 900 km² and the other in 1969 which burned 300 km². The uplands range up to 1,600 m and are comprised of transitional zone alder mixed with hemlock and spruce. The central benchlands average 550 m and are largely mature stands of spruce, aspen, and alder (Alnus crispa).

MATERIALS AND METHODS

Trapping Techniques

Lynx trapping in the northern lowlands and uplands was accomplished by refuge personnel because of the trapping closure. Areas trapped had either produced lynx in the past or supported lynx as evident by tracks. Several

different capture techniques were employed in an attempt to find a method that would enable us to capture lynx consistently during all seasons without inflicting injury to the animal in the form of frozen feet or broken bones. These included leg-hold traps with (No. 1-1/2 and 3) and without (No. 2 and 3) padded jaws, and Tomahawk single-door box traps (51 x 66 x 152 cm). Lynx in the benchlands were captured by cooperating local trappers who used No.3 and No.4 steel-jawed coil and double-long spring leghold traps. They were compensated at current market value for released lynx. Traps set by refuge personnel were checked either daily (No. 1-1/2 and 3) during cold weather or every 48 hours (box traps) if temperatures were above freezing. Cooperating trappers checked their sets every 1-7 days. The various capture techniques were employed at selected periods throughout the monitoring period in each of the three major habitats (see Table 1).

Leghold sets were baited with either whole or pieces of snowshoe hares (Lepus americanus) and/or lynx scats. Box traps were baited with whole hares. All sets were flagged with attractants such as hare feet, aluminum pie tins, grouse wings, or pieces of styrofoam except for trail sets and several cubbies. Commercial lynx lure was used as a scent attractant on all sets except for trail sets.

Immobilization, Handling, and Radio-collaring

Live-captured lynx were immobilized with ketamine hydrochloride (Ketaset) and Acepromazine administered in the hindquarters via a jabstick. Dosages varied from 0.5-1.5 cc. of ketamine hydrochloride and 0.3-0.5 cc of Acepromazine per individual. All animals were examined for trap-related injuries and general condition, weighed, sexed, and standard measurements were taken. Captured lynx were ear-tagged, radio-collared, and released.

Radio Tracking

Radio-collared lynx were located from an aircraft 1-12 times a month depending on weather and pilot/biologist availability. Locations were plotted on 1:63,360 topographical maps and home range size was determined by connecting outermost location points. Daily cruising distances were determined by measuring the plotted straight-line distance between consecutive daily locations and adding 1 km to account for unmeasured travel distance (Parker et al. 1983). Information from two additional lynx captured earlier but monitored throughout the period was also included.

RESULTS AND DISCUSSION

Capture Success

During the 14 month period, 17 lynx were captured, 16 of which were radio-collared (Table 2). Total trapping effort during this monitoring period was 5,993 trap nights. Lynx capture/trapping success averaged one capture/374 trap nights. Trapping in the benchlands averaged one capture/157 trap nights and trapping in the lowlands and uplands averaged one capture/653 trap nights. If trap nights with box traps and No.1-1/2 rubber-jawed foothold traps were excluded, the lowlands and uplands averaged one capture/307 trap nights. This is comparable to the one individual captured/347 trap nights by Berrie (1973) in interior Alaska.

The box traps were investigated by lynx and entered several times but no lynx were captured. It was not certain if freezing of the treadle mechanism and debris lodged under it prevented lynx from triggering the door or if they merely avoided stepping on the treadle. The location of the treadle near the rear of the trap was inconvenient as a lynx would have to step to the very

back of the trap to trigger the mechanism. However, placement of the treadle closer to the entrance might result in the door falling on the animal's back or hindquarters thus preventing it from closing entirely.

In period 5, 500 trap nights using No.1-1/2 rubber-jawed foothold traps produced no lynx. However, in three instances during a 6-day period, lynx were caught and then pulled out of the traps. The No. 1-1/2's were then replaced with No.3 rubber-jawed foothold traps which produced five captures in 874 trap nights (Table 2).

During the 47-day trapping season in the benchlands, 1,416 trap nights by a cooperating trapper resulted in the capture of nine lynx 14 times. Eight of the nine individuals were radio-collared. Another benchlands trapper who trapped for an unknown number of trap nights captured another individual which was also radio-collared.

Of the seven lynx captured by refuge personnel, only one sustained an injury in a No.3 rubber-jawed leghold trap. Three toe bones were broken as a result of the animal twisting its foot. The lynx was taken to a veterinarian where the bones were reset and a cast was put on the foot. It was then held in captivity for three weeks to allow the bones to knit properly before it was released near its capture location.

Lynx in the benchlands sustained injuries probably commonly associated with steel-jawed traps. The only captured lynx not fitted with a radio collar (an adult male) sustained a severely broken leg and was sacrificed. Other injuries included broken toe bones, frozen feet, and lacerations (Table 2).

HOME RANGE SIZE AND SPATIAL ORGANIZATION

Lowland Lynx

Lynx No. 18, a juvenile female, was located 57 times during the monitoring period and occupied a total home range of 120 km^2 . Her first 40 locations were primarily in the northern part of her range with an occasional location south of Swan Lake Road (see Fig. 1). In April 1985, however, she moved south of the road remaining there except for single April and May locations in her old area. Excluding the single May location north of the road she utilized a summer range of 23 km^2 .

On 17 February 1985 adult female No. 29 was captured incidentally by the hindquarters in a trapper's snare (Table 3). She was apparently uninjured and, after she was released, occupied a home range of 50 km^2 directly adjacent and overlapping that of female No. 18. They shared approximately 13 km^2 of that area for an overlap of 12-27%. The summer range of female No. 29 was 24 km^2 of which 2.5 km^2 or 11% was shared with female 18.

Adult male No. 30 was captured north of Swan Lake Rd. on 24 March 1985. Two days later he was located with female No. 18 and was located with or near female No. 29 periodically throughout the spring and summer. He occupied a total home range of 586 km^2 that completely overlapped those of the two females and possibly several unmarked females.

Upland Lynx

Female No. 16, captured in November 1983, dispersed off the refuge the following spring and settled in another upland area. She was located 18 times during the monitoring period and occupied a home range of 27 km^2 .

Juvenile female No. 31, captured on 8 May 1985 was located 17 times and utilized a home range of 12.5 km^2 and a summer range of 5 km^2 . She dispersed from her established area in October 1985 moving off the refuge further into the mountains.

Another juvenile female, No. 33, captured on 20 May 1985 and located 16 times, had a home range of 12 km^2 and a summer range of 6 km^2 which was adjacent to that of No. 31. Excluding the capture location of female No. 33, their summer ranges were mutually exclusive.

Adult male No. 35, captured on 28 May 1985 and located 15 times had a home range of 48 km^2 that encompassed the ranges of both female No. 31 and female No. 33. Part of the range of lowland male No. 30 extended into the foothills adjoining but not overlapping that of upland male No. 35.

Juvenile male No. 32, captured on 16 May 1985, dispersed out of the foothills and into the lowlands. He was located eight times and occupied a home range of 127 km^2 before being killed by a vehicle on the Sterling Highway on 27 July 1985.

Rehabilitated juvenile male No. 34, captured on 28 April 1985 and released on 21 May 1985, also dispersed into the lowlands. He was located ten times and occupied a total home range of 80 km^2 . Excluding three of these locations which were during dispersal, male No. 34 occupied a home range of 30 km^2 .

Benchlands Lynx

Female kitten No. 20, captured on 21 December 1984 and located once, was found dead in a trail snare on 27 December 1984. Male kitten No. 21, captured on 22 December 1984, was also located once before being recaptured on 27 December 1984. He sustained a badly dislocated hind leg during that recapture

and was sacrificed. Adult female No. 22 was captured on 27 December 1984 near the capture location of the previous two kittens. Female kitten No. 23 was also captured on 27 December 1984 and in the same set as the other two kittens. She sustained two broken toe bones but was collared and released. Another female kitten No. 24 was captured near the triple capture site on 28 December 1984. The two surviving kittens No. 23 and No. 24 were located with female No. 22 twenty two times throughout the winter. The family group utilized a winter range of 23 km^2 . Female No. 23 was recaptured on 23 January 1985 and an examination indicated that her broken toe bones had formed a callous and were knitting.

A fifth kitten, male No. 27 was captured on 11 January 1985 and the family group was located with him. He sustained a laceration and a broken toe bone but was collared and released. Unlike the female kittens, however, he was not located with the adult female again. He was recaptured on 18 January 1985. His foot had become infected and his weight had dropped by 1 kilogram. He was re-released and located ten times in a 4 km^2 area before being sacrificed after a final recapture on 31 January 1985 revealed extensive infection to the capture foot and extreme emaciation.

A similar incident occurred elsewhere in the benchlands when male kitten No. 28, captured by a trapper on 23 January 1985, sustained an injury to the foot. He was located six times in a 6.5 km^2 area during a three week period before succumbing to starvation and extensive infection of the capture foot.

The two female kittens separated from the female in early March. They did not disperse to new areas but occupied ranges overlapping and approximating that of the adult female. Female No. 23 was located 31 times for a home range of 76 km^2 . Female No. 24 was located 30 times and utilized a 51 km^2 area. Female No. 22, located 30 times, occupied a home range of

41 km². Summer home ranges of females Nos. 22 and 23 were 25 and 15 km² and were 92-95% exclusive. Female No. 24, however, utilized a larger area of 42 km² that overlapped those of Nos. 22 and 23 by 80 and 95%, respectively. This behavior would seem to suggest that of the three females, No. 24 was probably not successful in rearing young.

Adult male No. 25, captured on 28 December 1984, was located 50 times during the monitoring period and occupied a home range of 128 km². Adult male No. 26, captured on 4 January, was also located 50 times and utilized a home range of 178 km². The two males shared 38 km² of that area for an overlap of 21-30%.

The home range of male No. 25 overlapped those of the three females by more than 75%. During the period 25 March to 26 April 1985 he was located with each of the three females. During this same period, No. 26 was located most frequently in the part of his range that did not overlap with the other marked lynx. It is possible that he was in association with one or more unmarked females.

In Nova Scotia, Saunders (1963) determined from snowtracking that a female with kittens had a home range of 15 km² and two males averaged 19 km² in area. Nellis et al. (1972) in Alberta, found that lynx home ranges averaged 31.5 km². In Alaska, Berrie (1974) determined from radio-tracking that an adult female and male had home ranges of 13 and 25 km², respectively. In Minnesota, Mech (1980) determined from radio-tracking that females and males had average home ranges of 51-122 km² and 145-243 km², respectively. According to Parker et al. (1983), an adult female and male on Cape Breton Island had home ranges of 32.3 and 25.6 km², respectively. Carbyn and Patriquin (1983) found that two females in Riding Mountain National Park, Manitoba had average home ranges of 156 km² and one male utilized 221 km².

Home ranges of lynx on the refuge averaged 49 km^2 for eight females and 191 km^2 for six males. These figures were as high or higher than those reported for lynx in the other studies. The lowland lynx had the largest home range size with the females averaging 85 km^2 and the one male utilizing 586 km^2 . This is very similar to the 89 and 783 km^2 noted by Bailey et al. (1984) for a lowland female and male, respectively. These home range sizes also approximate those of the low-lynx density areas in Manitoba and Minnesota.

Home ranges of female lynx in the benchlands averaged 56 km^2 , very similar to a previously marked female in the benchlands that utilized a 51 km^2 area. The home ranges of the two males in the benchlands averaged 153 km^2 in area. These home ranges were considerably smaller than those in the lowlands but still approximated those of the Minnesota study (Mech, 1980). The ranges of the non-dispersing upland lynx, however, with an average of 12 km^2 for females and 48 km^2 for a male were more comparable in size to those in the higher lynx density study areas in Alberta (Nellis et al. 1972), Cape Breton Island (Parker et al. 1983), and interior Alaska (Berrie 1974).

DAILY CRUISING DISTANCE

Forty three consecutive daily locations were used to determine daily cruising distance and averaged 5.7 km . Thirty one consecutive daily locations were obtained from lynx in the benchlands and averaged 5.4 km . Twelve consecutive daily locations in the lowlands averaged 6.5 km . Distances between consecutive daily locations ranged from 1.3 to 16.5 km and averaged 7 km for males ($n=17$) and 4.9 km for females ($n=26$).

These averages are considerably smaller than the 8 km determined by Saunders (1963) in Newfoundland and the 8.8 km by Nellis and Keith (1968) in Alberta. Parker (1983) found that lynx on Cape Breton Island also had an average daily cruising distance of 7-8 km.

CONCLUSION

Results from the trapping effort during this study indicated that #3 rubber-jawed foothold traps most effectively captured lynx while still minimizing trap-related injuries. However, their effect on the captured feet of lynx during subzero temperatures has yet to be documented. Ideally, if the box traps could be utilized more effectively, they might provide a safer all-season means of live-capturing lynx.

A concern of several previous researchers (Parker 1980; Carbyn and Patriquin 1983) was that kittens orphaned in early winter might not be able to survive. The extent to which kittens are dependent on the female is uncertain but our data suggests that they may depend on the female as late as January or February. The two male kittens that were separated from their family groups in mid-January were unable to obtain sufficient prey to sustain themselves and succumbed to starvation and trap-related injuries. The two female kittens, one of which also sustained a trap-related injury, were successful in rejoining the adult female and stayed with her well into March before they dispersed or separated.

The home range sizes of marked lynx in each of the three habitats appeared related to the relative degree of exploitation. Although Nellis and Keith (1979) postulated that lynx densities had no effect on home range size

our data suggest that lynx in apparent low density areas have larger home ranges than those in apparent high density areas.

The spatial organization patterns of lynx on the refuge were such that the home ranges of the males overlapped slightly and encompassed or overlapped those of two or more females. The home ranges of females tended to overlap to some extent except during denning when summer ranges were 94% exclusive. No data was available to determine overlap for adjacent female ranges in the winter.

Berrie (1973) found that female lynx were less tolerant of each other than the males. In Minnesota, Mech (1980) suggested that the spatial organization of lynx was similar to that of mountain lions (Seidensticker et al. 1973) but different from that of bobcats (Bailey 1974). He proposed that ranges of females tended to overlap more than those of males; male ranges did not overlap; and the ranges of males overlapped with those of female lynx very little. Carbyn and Patriquin (1983) reported similar tendencies but with inconclusive data for their study area in Manitoba. However, according to Seidensticker, the ranges of individual male lions did overlap with those of one or more females. This is consistent with our data which strongly suggest that lynx social organization is very similar to that of mountain lions.

Lynx social organization on the refuge was also similar to that of bobcats in Idaho (Bailey 1974). The ranges of female bobcats, however, did not overlap while those of female lynx overlapped consistently except during the summer.

Daily cruising distances were considerably larger for males than females which is to be expected in relation to the larger areas occupied by the males. It is not certain why our daily cruising distances were shorter than

our data suggest that lynx in apparent low density areas have larger home ranges than those in apparent high density areas.

The spatial organization patterns of lynx on the refuge were such that the home ranges of the males overlapped slightly and encompassed or overlapped those of two or more females. The home ranges of females tended to overlap to some extent except during denning when summer ranges were 94% exclusive. No data was available to determine overlap for adjacent female ranges in the winter.

Berrie (1973) found that female lynx were less tolerant of each other than the males. In Minnesota, Mech (1980) suggested that the spatial organization of lynx was similar to that of mountain lions (Seidensticker et al. 1973) but different from that of bobcats (Bailey 1974). He proposed that ranges of females tended to overlap more than those of males; male ranges did not overlap; and the ranges of males overlapped with those of female lynx very little. Carbyn and Patriquin (1983) reported similar tendencies but with inconclusive data for their study area in Manitoba. However, according to Seidensticker, the ranges of individual male lions did overlap with those of one or more females. This is consistent with our data which strongly suggest that lynx social organization is very similar to that of mountain lions.

Lynx social organization on the refuge was also similar to that of bobcats in Idaho (Bailey 1974). The ranges of female bobcats, however, did not overlap while those of female lynx overlapped consistently except during the summer.

Daily cruising distances were considerably larger for males than females which is to be expected in relation to the larger areas occupied by the males. It is not certain why our daily cruising distances were shorter than

those reported for other studies but it was interesting to note that the average daily distance travelled was influenced by a movement pattern characterized by lynx often frequenting an area for several days before leaving and travelling to a new area.

LITERATURE CITED

- Bailey, T.N. 1974. Social organization in a bobcat population. *J. Wildl. Manage.* 38:435-446.
- Bailey, T.N., E.E. Bangs, M.F. Portner, J.C. Malloy, and R.J. McAvinchey. 1985. An apparent overexploited lynx population on the Kenai Peninsula, Alaska. *J. Wildl. Manage.* In press.
- Berrie, P.M. 1973. Ecology and status of the lynx in interior Alaska. In *the Worlds cats*. Edited by R.L. Eaton. World Wildlife Safari, Winston, Oregon. 1:349 pp.
- Carbyn, L.N., and D. Patriquin. 1983. Observations on home range sizes, movements and social organization of lynx, *Lynx canadensis*, in Riding Mountain National Park, Manitoba. *Canadian Field-Nat.* 97(3):262-267
- Mech, L.D. 1980. Age, sex, reproduction, and spatial organization of lynxes colonizing Northeastern Minnesota. *J. Mammal.* 61:261-267.
- Nellis, C.H., S.P. Wetmore, and L.B. Keith. 1972. Lynx-prey interactions in Central Alberta. *J. Wildl. Manage.* 36:320-329.
- Parker, G.R. 1981. Winter habitat use and hunting activities of lynx (*Lynx canadensis*) on Cape Breton Island, Nova Scotia. Pages 221-248 in J.A. Chapman and D. Pursley, eds. *Proc. 1980 Worldwide Furbearer Conf.*, Frostburg, Maryland.
- _____, J.W. Maxwell, L.D. Morton, and G.E.J. Smith. 1983. The ecology of the lynx on Cape Breton Island. *Can. J. Zool.* 61:770-786.
- Saunders, J.K., Jr. 1963. Movements and activities of the lynx in Newfoundland. *J. Wildl. Manage.* 27:390-400.
- Seidensticker, J.C., M.G. Hornocker, M.V. Wiles, and J.P. Messick. 1973. Mountain lion social organization in the Idaho Primitive area. *Wildlife Monograph* 35. 60 pp.

Table 1. Capture techniques and trap nights on the Kenai National Wildlife Refuge, Alaska, 1984-1985.

No.	Period	Location	Traps used			Trap nights
			Box	Steel jaws	Rubber jaws	
1A.	07/10/84-08/12/84	Lowlands		X		617
1B.	07/10/84-08/12/84	Lowlands	X			30
2.	09/17/84-09/29/84	Lowlands		X		120
3.	10/01/84-04/28/85	Uplands	X			1894
4.	12/15/84-01/31/85	Benchlands		X		1416
5.	02/27/85-05/28/85	Uplands			X	1374
6.	03/20/85-04/17/85	Lowlands			X	404
7.	03/26/85-04/16/85	Lowlands			X	138

Table 2. Capture success on the Kenai National Wildlife Refuge, Alaska, 1984-1985.

Trapping period	Captures						Total	Trap nights/ capture
	male			female				
	kitten	juvenile	adult	kitten	juvenile	adult		
1.					1		1	617
2.							0	---
3.							0	---
4.	3		3	3		1	10 ¹	157
5.		2	1		2		5 ²	274
6.			1				1	404
7.							0	---

¹ Trap-related injuries included two broken legs, two broken feet, one frozen foot, and two lacerations.

² Trap-related injuries included one broken foot.

Table 3. Lynx radio-collared on the Kenai National Wildlife Refuge, 1984-1985.

No.	Sex	Capture		Major habitat	Days ² radio-collared	Number of locations	Fate
		Age ¹	Date				
16	F	J	11-19-83	Upland	426	18	Alive
18	F	J	7-16-84	Lowland	426	57	Alive
20	F	K	12-21-84	Benchland	6	1	Trapped
21	M	K	12-22-84	Benchland	5	1	Trapped
22	F	A	12-27-84	Benchland	308	53	Alive
23	F	K	12-27-84	Benchland	308	31	Alive
24	F	K	12-28-84	Benchland	307	30	Alive
25	M	A	12-28-84	Benchland	307	50	Alive
26	M	A	1-04-85	Benchland	300	50	Alive
27	M	K	1-11-85	Benchland	20	10	Trapped
28	M	K	1-24-85	Benchland	12	6	Died
29	F	A	2-17-85	Lowland	256	34	Alive
30	M	A	3-24-85	Lowland	218	20	Alive
31	F	J	5-08-85	Upland	175	17	Alive
32	M	J	5-16-85	Upland	72	8	Died
33	F	J	5-20-85	Upland	163	16	Alive
34	M	J	5-21-85	Upland	162	10	Alive
35	M	A	5-28-85	Upland	155	12	Alive

¹ K=kitten (10 months), J=juvenile (10-22 months), A=adult.

² As of 10-31-85

Tuesday

The Anchorage Times

52 pages

TUESDAY EVENING, FEBRUARY 5, 1985

25¢

Fiery crash claims lives of 9 Alaskans

Associated Press and Times Staff

Soldotna — Nine Alaskans died Monday night when a commuter aircraft making an instrument approach in poor weather slammed into a wooded knoll a mile southeast of the airport here.

The fiery crash occurred as the pilot made his second attempt at landing in the murky conditions, according to federal and state officials investigating the accident.

North Pacific Airlines' twin-engine Beechcraft Queen Air went down about 40 minutes after departing Anchorage International Airport on a scheduled commuter flight to the Kenai Peninsula town.

"The aircraft was destroyed. All aboard suffered fatal injuries," said James Michelangelo, Alaska director of the National Transportation Safety Board (NTSB).

Michelangelo said the aircraft came down in a heavily forested

Anchorage man among victims of plane crash

Times Staff

Soldotna — One Anchorage man was among nine persons killed Monday night when a North Pacific Airlines commuter aircraft slammed into a knoll during a failed landing attempt about a mile east of Soldotna Airport.

The twin-engine Beechcraft was en route from Anchorage to Soldotna and was in its final landing approach when the crash occurred, according to Alaska State Troopers spokesman Paul Edscorn.

He said the conditions were foggy with freezing rain. The pilot, Edscorn said, had already made one unsuccessful approach.

Listed as dead were Doug Horton, 36, who had piloted the

Beechcraft Queen Air. Horton apparently had addresses both in Anchorage and Soldotna.

The following were from Soldotna: Co-pilot Brent Davis, no age listed; Frank Lazer, 39; Duane "Willie" Breitenfeld, 44, and Jim Hodgins, 49.

Frank Ault, 30, was listed as a Sterling resident and Jim Rider, 47, lived in Ninilchik.

Troopers said Mike Hodgins, 28, was from Bethel and Rick Stroud, 24, was a Petersburg resident.

The first rescue crews, traveling by snowmobile and foot, reached the wreckage about 20 minutes after the plane went down.

See Landing, page A-8

area in a "shallow, high-speed descent. This is one of the worst air disasters in several years (in Alaska).

"This is like that Korean Airlines crash (at Anchorage International Airport in December 1983)," he said, referring to a crash between a jumbo jet and a commuter plane. No one died in that incident, however.

NTSB officials from Alaska and Oregon, and a seven-member team from Washington, D.C., were scheduled to begin investigating the cause of the crash this afternoon, Michelangelo said. A complete report will not be issued for eight or nine months.

Officials at the scene said the plane disintegrated as it tore through two 60-foot spruce trees

and came to rest in a thick grove of spruce and alder about 60 miles southwest of Anchorage on federal lands near the Kenai River.

Small fires from the ensuing blaze still were flaring up intermittently this morning, he said.

The federal officials as well as Alaska State Troopers and many volunteers were still at the scene

this morning, removing the bodies and taking pictures, troopers spokesman Paul Edscorn said.

When the plane went down, there were flight advisories in effect warning of 300-foot ceilings, freezing rain and light snow, Michelangelo said. "Very poor weather," he said.

The Federal Aviation Administration had issued an AIRMET,

a airman's meteorological information notice, advising pilots of freezing rain, snow and icy conditions in the Cook Inlet and Susitna Valley area at about 3:15 p.m., said spokesman Paul Steucke.

Those conditions continued beyond 8 p.m., he said.

The pilot also had received a weather briefing and had filed a flight plan from Anchorage Flight Information Center, Steucke said.

Mike Wiley, a 15-year Moose Pass resident, said he had been in the Soldotna area shopping shortly before the time of the accident. "I can see why it crashed. It (the weather) was horrible. I could hardly see across the street.

"It was thick ice fog. You get that down by the river," he said. "It was the foggiest place (by the airport). I was amazed they even tried to land."

The plane was owned and
See Beechcraft, page A-8

Beechcraft crash

Continued from page A-1

operated by North Pacific Airlines of Anchorage. "We have no idea what happened," said owner Roy Musgrove. "The pilot indicated when he made his approach that there were no problems."

Flight 1802 was en route from Anchorage to Soldotna on a flight that normally takes 30 minutes. Musgrove said the aircraft was de-iced before leaving Anchorage.

"They were approaching Soldotna; they made an approach and apparently missed," Steucke said. "They were coming around again for another attempt and just dropped off the radar."

Commuter air lines recorded six fatal accidents resulting in 60

deaths during 1984. Three of those crashes were in Alaska, according to the NTSB. They included an aerial collision in August of a Wings West aircraft and a private plane near San Luis Obispo, Calif., that killed 17 people; the crash of a Viques Air Link plane in Puerto Rico, also in August, that killed nine people; and the crash of a Provincetown-Boston Airline plane that killed 13 people in December near Jacksonville, Fla.

Commuter carriers had 20 accidents in 1984, a rate of 0.74 for every 100,000 scheduled departures, about the same rate as 1983, the board said. The six fatal accidents reflected a sharp increase from 1983, a rate of 0.22 per 100,000 departures, compared with 0.09 in 1983, the board said.

Landing fails

Continued from page A-1

Edscorn said.

Rescuers found eight bodies about 10 p.m. and then found the ninth one, badly burned, an hour later after an extensive search of the wreckage, according to James Michelangelo, Alaska director of National Transportation Safety Board.

A doctor at the scene pronounced all dead at the scene of the accident.

The plane disintegrated as it tore through two 60-foot spruce trees and came to rest in a thick grove of spruce and alder.

Anchorage Daily News

VOL. XL, NO. 36, 60 PAGES

ANCHORAGE, ALASKA, TUESDAY, FEBRUARY 5, 1985

PRICE 25 CENTS

At least 8 killed in Soldotna plane crash

By **RONNIE CHAPPELL**
and **DON HUNTER**
Daily News reporters

At least eight persons died Monday night when a commuter airliner crashed in freezing drizzle about a mile from the Soldotna airport, according to airline and federal aviation officials.

By midnight, eight bodies had been found and rescue workers were continuing to search through darkness and a heavy fog for more, authorities said.

Late Monday North Pacific Airlines released a flight manifest listing seven passengers and two crew members.

They were identified as Carlton Horton and Brent Davis, pilots; Frank Lazer; W. Breitenfeld; R. Stroud; F. Ault; J. Ryder; M. Hodgins; and J. Hodgins, passengers.

The twin-engine Beechcraft, Flight 1802, left Anchorage International Airport for the half-hour flight to Soldot-

na about 6:40 p.m., after a 40-minute delay because of poor weather.

Roy Musgrove, director of operations for North Pacific Airlines, said the cause of the crash was unknown. "We have no idea what happened," he said.

Paul Steucke, a spokesman

for the FAA in Anchorage, said the eight-passenger Beechcraft Queen Air disappeared after an abortive attempt at landing.

"They were approaching Soldotna, they made an approach and apparently missed," Steucke said. "They were coming around again for

another attempt and just dropped off the radar at about 8:20 p.m."

Two later Pacific Airlines flights from Anchorage were canceled because of freezing drizzle, misting and heavy fog. At least one other airline

See Back Page, COMMUTER

Commuter plane crashes in fog near airport in Soldotna; at least eight persons killed

Continued from Page A-1

that flies to the Kenai Peninsula scrubbed flights as well, airline officials in Soldotna said.

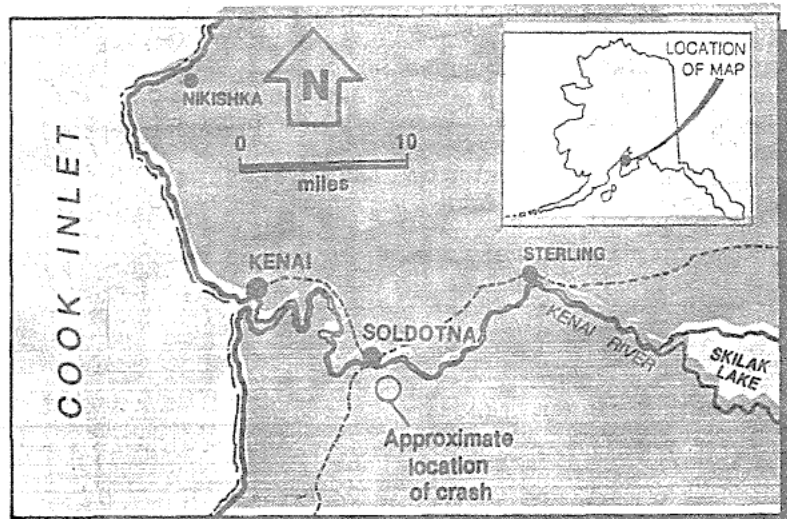
However, "the pilot indicated when he made his approach that there were no problems," Musgrove said.

He said the aircraft was deiced before leaving Anchorage.

Within minutes after the aircraft was reported missing, Soldotna volunteer firefighters, police and other searchers mounted snowmachines and began criss-crossing the woods near Funny River Road, which runs parallel to the airport.

The wreckage was found about 10 p.m., according to Udland, the Soldotna police chief. Clay Norman, a pilot for a missionary service that operates out of Soldotna, was the first to reach it, Steucke said.

Rescue workers were at first hopeful when they found the plane that they would find survivors. When the first people at the scene radioed



Anchorage Daily News/Peter Dunlap-Shohl

Map shows location of plane crash Monday night.

back that they found only bodies, depression settled on the workers at a staging area near the east end of the runway.

Late into the night, workers were ferrying equipment to the scene, using a big all-terrain vehicle and sleds hooked to snowmobiles to carry lights and stretchers.

A federal transportation in-

vestigation team from Washington, D.C., was on its way to Alaska, and a local team from the Anchorage office of the NTSB planned to drive to Soldotna early this morning, Steucke said.

He said tapes of the pilot's conversation with Anchorage FAA indicate he first attempted a landing by non-directional beacon, did not

complete it and said he would try a more precise instrument landing. That was when the plane disappeared.

Local pilots say the Soldotna airport has minimal navigational aids for landing. Dr. Alex Russell, a pilot and member of the civil air patrol, described it as a "non-precision approach."

Pilots flying into Soldotna make their approach by using a VOR (very high frequency optimum range) navigational device, then take an instrument heading off the VOR and fly a straight line to the Soldotna airport, Russell said. Because of a large hill that borders the entire length of the runway, the Soldotna strip is closed any time visibility drops below 680 feet, he said.

The city of Soldotna purchased and installed a non-directional beacon about four miles east of the airstrip and it was turned on about a month ago, Russell said. The beacon makes it possible to fly to that point east of the runway and, using a distance measuring beacon, figure the

“They were approaching Soldotna, they made an approach and apparently missed. They were coming around again for another attempt and just dropped off the radar at about 8:20 p.m.”

— Paul Steucke, FAA

glide path to the airport.

However, the beacon does not provide altitude information, he said.

In Anchorage, Musgrove and a half-dozen employees had waited through the evening for some word on the flight.

The vigil was punctuated about 9:45 by a brief crescendo of joy when they received a telex from Soldotna that the

plane had been found and all aboard were safe. The erroneous report came from another small airline monitoring rescue efforts, said David Walsh, North Pacific's attorney.

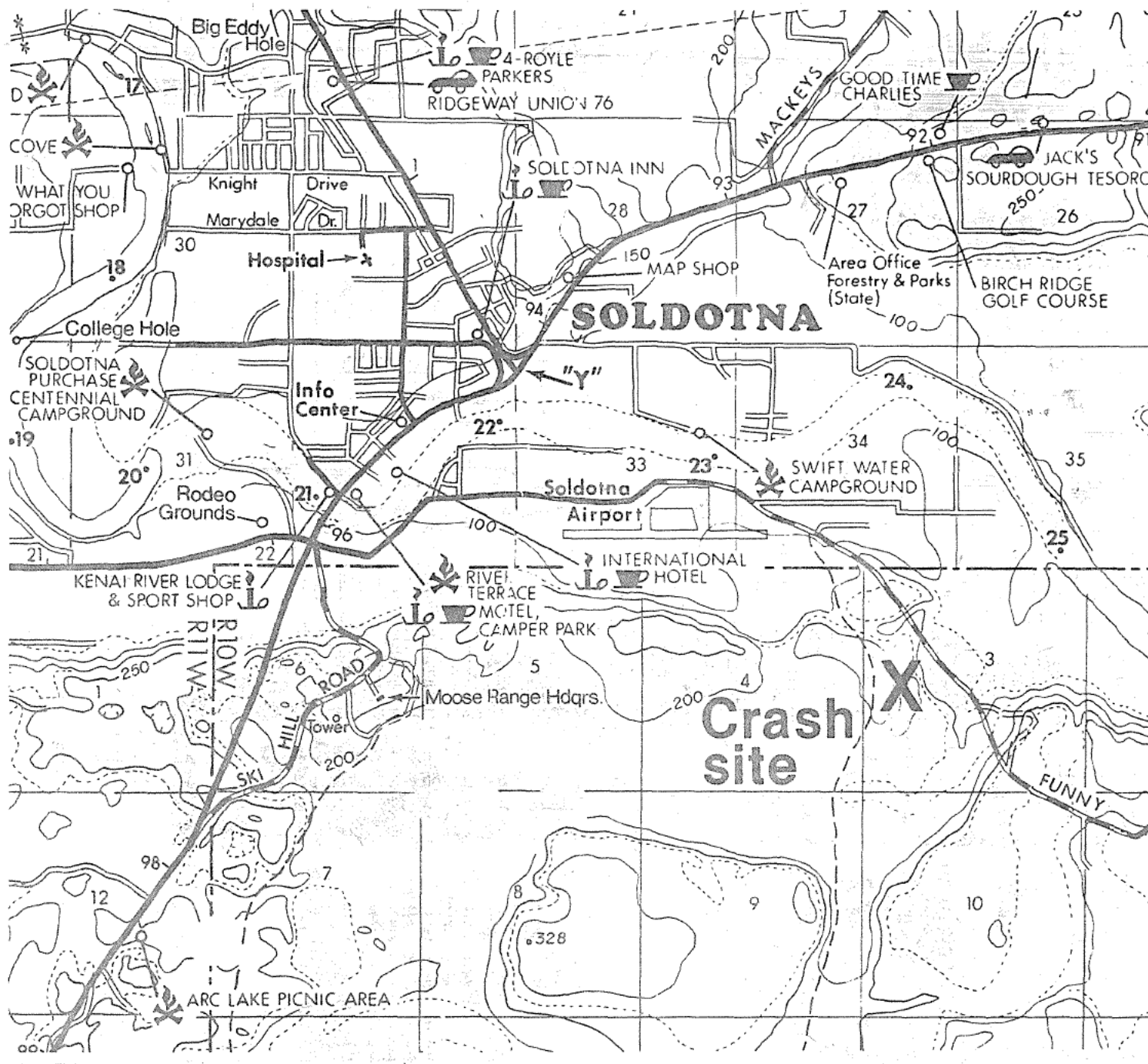
In less than an hour, confirmation of the crash came. Musgrove gathered the employees into a small office to break the news.

The young ticket agent who booked the passengers on the flight and had remained at the counter until she heard what happened was escorted from the terminal in tears.

The North Pacific crash is the second fatal airplane accident this year, according to Steucke. About a week ago a pilot was killed when his small plane crashed south of Wasilla.

In 1984, airplane crashes claimed 39 lives in Alaska, according to FAA records. The fatalities came in 229 reported accidents.

□ Daily News reporters Sheila Toomey and David Postman contributed to this report.



Fatal crash probably area's worst

The central Kenai Peninsula has had several airplane crashes in the past five years, but none as serious as Monday night's crash near Soldotna.

None of the other recent fatal accidents involved commuter airliners.

On July 15, 1981, a DC-4 flying to Bristol Bay crashed near Kalifornsky Beach Road and the Kenai River bridge. An engine had caught on fire near Kasilof. Three men were killed.

On Sept. 6, 1983, a single-engine private plane crashed off the north end of Coho Loop. A man and two children died in the crash.

The most recent fatal aircraft accident was last month when a helicopter headed for the Granite Point oil platform crashed in the ocean off Nikiski. One man died and three were injured.

Two recent major accidents involved commuter aircraft. On Dec. 23, 1983, a Southcentral Air Navajo was run over on the ground at Anchorage International Airport by a Korean Airlines 747. No one was killed, but several people were injured. On Jan. 22, 1980, an Alaska Aeronautical Industries Twin Otter landed on a lake four miles short of the Kenai Airport. There were no fatalities.

No peninsula air traffic crash records were readily available for the years before 1980. John Arsenault, a long-time FAA official on the peninsula, and Jettie Petersen, 90, long-time Kenai resident and historian, said they could not recall any earlier major crashes.

...Soldotna crash's cause questioned

Continued from Page 1

Reporters and photographers were allowed to view the charred bits of wreckage remaining from behind red perimeter tape used to cordon off the site. Michelangelo refused to announce any findings until he had a chance to confer with Washington team leader George Seidlein. He added that it may be nine months before anyone knows why the plane crashed.

Seidlein arrived in Soldotna late Tuesday afternoon and went immediately to the crash site. He said his team would begin examining the wreckage early this morning.

"Right now I only know what I read in the newspaper," Seidlein said. "I know as much as you do, probably less."

Seidlein's team includes specialists in structures, survival factors, meteorology, operations, air traffic and systems.

Monday night's crash stymied at least one FAA official who said he doesn't know why the pilot didn't decide to land at the Kenai Municipal Airport instead. Paul Steucke, an FAA spokesman, said most pilots by-pass the Soldotna Airport for Kenai during bad weather. Steucke said seven flights landed Monday night in Kenai and none in Soldotna.

When the plane went down, there were flight advisories in effect warning of 300-foot ceilings, freezing rain and light snow, Michelangelo said. "Very poor weather," he said.

Two later NPA flights from Anchorage were canceled because of heavy fog and freezing drizzle, but airline owner Roy Musgrove said, "the pilot indicated when he made his approach that there were no problems."

"As far as we know there is no reason why," this happened," said Bill Rodgers, an airline executive.

The plane had been de-iced before leaving Anchorage and made contact with the Soldotna Airport moments before slipping

off radar about 8 p.m., Michelangelo said. The FAA told Michelangelo's office about the missing plane at 8:18 p.m., he said.

Tapes of Horton's conversation with Anchorage FAA indicate he had attempted a landing using the airport's month-old non-directional beacon but was unable to complete it. Horton then decided to try a precise instrument landing from a different angle.

On its return approach, however, the plane did not clear the 311-foot, spruce-studded ridge. "The aircraft came down in a heavily wooded area in a shallow, high-speed descent," Michelangelo said.

The plane exploded as it tore through two 60-foot spruce trees, scattering debris in a thick grove of spruce and alders. Only a portion of the right wing and part of the tail could be easily identified from behind State Trooper barricades. Small fires burned intermittently hours after the crash and late Tuesday morning smoke was seen rising from the remnants.

Authorities launched a search moments after the plane disappeared. According to Soldotna firefighter Michael Huckabay, five search teams consisting of state troopers, Soldotna police officers and maintenance employees, and volunteers searched for the plane on foot and on snow machines.

Volunteers Clay Norman and Dick Page, pilots with MARC Flight Center in Soldotna, were among the first to reach the crash. Both men have worked on rescue operations before and were carrying portable aircraft receivers designed to hone in on the plane's emergency locator transmitter. They said they had hopes of finding survivors.

"We felt that it was going to be tough to find the plane in the dark with the fog," said Page. "We double-timed it hoping that time might be of the essence for somebody -- we hoped to find survivors, but it didn't work out that way."

Page said searchers had an idea about

where to look because Soldotna resident Charlie Parker had called saying a plane might have crashed near the airport. Parker visited the crash site Tuesday morning and told reporters the plane had flown low over his house moments before the crash.

Parker, who has a pilot's license, said a plane should have rerouted to Kenai. "I'm getting tired of these cowboys coming in here landing their planes in marginal weather," he said.

Once they found the crash scene, rescuers began searching the wreckage for survivors. What they found were nine bodies burned beyond recognition, Page said. Page, Huckabay and Norman said some of the remains were still burning.

"We checked to see if anyone had survived, skirted the area and went back and had to extinguish the burning bodies," Page said. "It was difficult. When you're in the circumstance you just do what has to be done."

Norman said he would not forget the experience. "The four of us didn't get home until 2:30 a.m. and I don't think anyone slept more than two or three hours last night. It's just something you won't forget," Norman said.

Page said that unless a mechanical error is found he thought it was unlikely authorities will ever know what happened. "They make the run all the time," he said. "No one will ever know why they did what they did. It makes you realize that none of us are immortal."

See related story back page

Staff members John Quinley, Janet Hevly and Clark Fair contributed to this report or others on this page relating to Monday's crash and the investigation.

Plane badly iced, flight tape shows

□ By JOHN MARRS, Editor, and JAN MIRELES, Staff writer

The in-flight tape recording from the fatal crash of North Pacific Airline Flight 1802 confirms suspicions that the commuter airliner's wings were heavily iced when it crashed Monday night on a ridge near the Soldotna Airport.

That report was given Thursday night by Paul Stuecke, Federal Aviation Administra-

tion public information officer in Anchorage, from notes he took during a review of the in-flight recording.

His account was confirmed by George Seidlein, who is heading the National Transportation and Safety Board investigation team in Soldotna.

Full transcripts of the recording were not due for release until noon today under arrangements made by the FAA and the investigators from the National Transportation and Safety Board.

Stuecke, however, took notes at what seemed a critical part of the tape when the pilot was talking with air route control in Anchorage. He said he noted the following exchange:

Controller: "Roger radar. Contact... when you reach 2,000 feet...(pause) Climb and maintain 5,000 feet."

Pilot: "Unable, 5,000; carrying heavy load of ice."

Stuecke said this conversation tells conclusively that the flight was having trouble

with icing, which he said not only added weight to the plane but also impaired the plane's lifting ability because of the effect on wing configuration.

The part of the conversation Stuecke quoted occurred after the pilot had aborted his first attempt to land. He then talked with route control about switching from Soldotna airport's non-directional beam approach system to the more precise

See PLANE, Page

Continued from Page 1

higher VOR system (very high frequency omni-directional range system).

Stuecke said that picking up the VOR beacon took the plane over Island Lake over the North Kenai area. From there, the instrument approach would lead the pilot on an angle southeast over the Soldotna runway to loop around from the south to approach the landing from the east.

Earlier this week Stuecke had questioned why the pilot, Carleton "Doug" Horton and co-pilot, Brent Davis, had not switched to the Kenai Municipal Airport to land. Stuecke said most pilots prefer to land at Kenai during poor weather.

As Stuecke described the likely approach from his tape review notes, the plane began the VOR run at about 573 ft. of altitude. As the plane crossed over the runway to bank left for the landing approach, Stuecke indicated the pilot's leeway would have been only 300 to 315 feet — the difference between the minimum level required for the approach and the height of the ridge south of the airport.

At the same time, one effect of the icing, according to Seidlein, would be that the pilot

would have to keep using more speed to maintain altitude.

"Ice disrupts the air foil and increases the stall speed of the plane which means the airplane has to go faster to keep the plane in the air," Seidlein said.

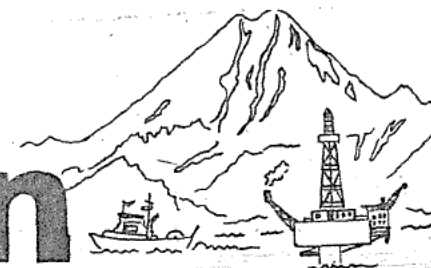
Seidlein said the pilot was supposed to have leveled off at 680 feet until he could spot the airport complex. After his last contact with the Anchorage controller, the pilot checked with his company for a weather report and then decided to try a second attempt at the Soldotna field, Seidlein said.

Stuecke said, "I cannot say what the cause of the accident is," but he said the description of the pilot's approach left room for a number of possibilities ending in the plane's crash on the ridge southeast of the airport about 315 ft. up the ridge, and little more than 200 ft. above the east end of the runway which is at 106 ft. above sea level.

The plane's passengers were Frank Au of Sterling, Willy Breitenfeld of Soldotna; Frank G. Lazer of Soldotna, Mike and Jim Hodgins of Soldotna, Rick Stroud of Soldotna and Jim Rider of Ninilchik.

Venusula name
8 February 1985

Peninsula Clarion



TUESDAY October 1, 1985 Vol. 16, Issue 4 © The Peninsula Clarion/U.S.P.S. 438-410 Kenai, Alaska 25 cents

2 drown in boating accident on Skilak Lake

By TIM ELLIS
Staff Writer

A weekend bear-hunting outing turned into a nightmare for six men from Elemendorf Air Force Base, when two of their group drowned Saturday after hours of floating around Skilak Lake holding on to a capsized boat.

The identities of the drowning victims were not released by Alaska State Troopers, pending notification of next of

kin.

Two of the survivors, Airman Corey R. Koward, 20, and Airman Brian E. Westoff, 24, told trooper Cpl. Mike Marrs that they decided to ferry some of their gear from the Forest Service cabin on the east side of Skilak Lake. They began to ferry the gear to the campground on the other side, near the Skilak Guard Station, when bad weather set in Saturday afternoon.

Marrs said Koward and Westoff told him that the four left two others, Airman Christopher M. Kosher, 22, and Airman Douglas L. DeField, 19, back at the cabin. All were stationed at Elemendorf.

Wind gusts kicked up high waves. The boat, equipped with a small outboard motor, capsized en route on the stormy, northern end of the lake.

See SKILAK, back page

16.1.85

...Skilak Lake claims pair; 4 survive bear-hunting trip

Continued from Page 1

"The wind comes right off the glacier," Marrs said, and is funneled into the area where the boat capsized near Doroskin Bay.

The men told Marrs they stuck with the capsized boat, waiting for a chance to swim to shore. After hours of drifting, the boat came within a couple hundred yards of shore and the four men attempted to swim to shore. They became exhausted and swam back to the boat, but one of them did not make it and drowned.

Marrs said that later that afternoon, the boat again drifted within a couple hundred yards of shore and the three remaining survivors again tried to swim to shore. Once again they became exhausted and swam back to the boat. Only Koward and Westoff made it back and the lake claimed its second victim.

Finally, late Saturday, the boat drifted near enough for Koward and Westoff to make it to shore. They made a fire, and spent the night drying out and trying to warm up.

On Sunday morning, the bodies of their two buddies washed ashore.

Koward and Westoff shot their rifles attempting to summon help. The first boater who heard the shots was unable to help, because his boat motor had broken down.

Later Saturday, Kenai Police Department officer Jeff Kohler, who was fishing on Skilak Lake, heard the gunfire. Kohler picked up Koward and Westoff and took them back to the campground. From there, he summoned a float plane to retrieve the two airmen.

Marrs said Kohler's assistance was extremely important during the rescue. He helped in the rescue on Saturday and Sunday.

Meanwhile, Kosher and DeField had decided they might get stranded by the bad weather. They began to hike from the cabin to find help.

The two were found Monday afternoon, both suffering from hypothermia. A float plane summoned to rescue found them in an isolated spot near Motion Bay, which is located near the lake's inlet to the Kenai River.

"It could have been very disastrous," an exhausted Marrs said Monday night after returning to the Soldotna Trooper Station. "We could have had four lives lost."

As of Monday night, the 18-foot john boat was floating upside down about a mile from the inlet of the Kenai River and about 200 yards from shore. Troopers requested the state Division of Forestry to remove the boat sometime today to eliminate the potential hazard.

In another boating accident Sunday, two men survived when their boat capsized on Tustumena Lake, though neither was wearing a life jacket.

According to state troopers, Brett Duncan and Jim Handsaker were returning from Bear Creek in a 14-foot Boston Whaler inflatable boat when it capsized in choppy water.

They told troopers they climbed on top of the boat, rowed to shore, and hiked out to their car parked at the Kasilof River.

Neither man was injured.