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NATIONAL WILDLIFE REFUGE SYSTEM





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KOYUKUK NATIONAL WILDLIFE REFUGE Anchorage, Alaska 99503

Galena, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1986

*Michael J. Funn*  
Refuge Manager

5/8/87  
Date

*John Kutz*  
Refuge Supervisor Review

10/16/87  
Date

*Robert M. Wagoner*  
Regional Office Approval

10/17/87  
Date



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3. 5. 4. 2. 1.

Personnel

1. Michael L. Nunn, Refuge Manager, PET, GS-12/03, EOD 5/26/84.
2. Daryle R. Lons, Assistant Refuge Manager, PFT, GS-11/04, EOD 8/14/84.
3. Gregory R. Rost, Wildlife Biologist/Pilot, Term NTE 4 years, GS-12/02, EOD 9/28/86.
4. Michael D. Motschenbacher, Wildlife Biologist/FMO, PFT, GS-9/04, EOD 6/24/84.
5. Dianna R. White, Refuge Secretary, PFT, GS-5/01, EOD 2/7/86.

## INTRODUCTION

Koyukuk National Wildlife Refuge was established December 2, 1980 with passage of the Alaska National Interest Lands Conservation Act. Purposes for which the refuge was established are:

1. To conserve the fish and wildlife populations and habitats in their natural diversity including, but not limited to, waterfowl and other migratory birds, moose, caribou, furbearers and salmon;
2. To fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitat;
3. To provide the opportunity for continued subsistence uses by local residents; and
4. To ensure water quality and necessary water quantity within the refuge.

Koyukuk National Wildlife Refuge is located in west central Alaska, about 270 air miles west of Fairbanks and 330 air miles northwest of Anchorage. The exterior boundaries encompass 4.6 million acres, an area slightly smaller than the state of New Jersey. After the conveyance of native allotments, village and native regional corporation (Doyon, Inc.) lands, the refuge will contain 3.69 million acres.

The refuge is situated in a roughly circular floodplain basin of the Koyukuk River just north of its confluences with the Yukon River. The extensive forested flood plain is surrounded by the Nulato Hills, elevation 1500' - 3000' on the west; the Purcell Mountains and Zane Hills, elevation 3100' - 4000' on the north; the Galena Mountains, elevation 1500' - 3000' on the east and the Yukon River on the south.

Koyukuk has also been delegated responsibility for managing the upper unit of the Innoko NWR (Kaiyuh Flat). This unit consists of 350,800 acres located south of the Yukon River with its eastern upper boundary starting directly across the river from Galena. This unit was also established by ANILCA. The majority of the flatland is dominated by a maze of sloughs, creeks, and lakes. The foothills of the Kaiyuh Mountains run along the southeastern border of the unit.

Vegetation types are typical of the boreal forest or taiga of interior Alaska. White spruce occurs in large pure stands along rivers where soils are better drained. Numerous fires have set vast areas back to earlier seral stages consisting of aspen, birch and willow. Black spruce muskegs or bogs are a dominate feature and develop on the poorly drained soils. Dense willow

and alder stands are common along the rivers and sloughs. The most conspicuous characteristic of the vegetation is the complex interspersed of types.

This unique combination of wetlands and diverse terrestrial habitats supports dense moose population (up to six per square mile). This area also supports black bears, wolves, wolverine, lynx, marten, red fox, land otter and beaver; all of vital importance to local subsistence users.

The refuge achieves national and international significance through its contribution to waterfowl populations using all four flyways. Thousands of waterfowl, primarily wigeon, pintail, scaup, white-fronted geese and Canada geese are joined by both tundra and trumpeter swans on the Koyukuk's lush breeding grounds each spring.

Fish abound in refuge streams and lakes supporting subsistence, commercial and sport fisheries.

Refuge headquarters is located in Galena, on the Yukon River approximately 6 miles south of the southernmost portion of the refuge and 110 miles south of the northernmost point. Galena, Alaska was established about 1919 as a supply point for the galena (lead sulphite ore) deposits south of the Yukon River.

Galena's population of approximately 900 is bolstered by the approximately 325 military personnel stationed at the Galena Air Base where two F-15 Eagle intercept aircraft are kept on 24 hour alert.

Galena is not a typical Alaskan village. It has advantages of regular air service, modern communications, river access, and such amenities as two general stores, a lumber yard/hardware store, cafe, hotel, health clinic, and a retail outlet for boats, motors, snowmachines and generators.

Management of the refuge for the next several years will consist primarily of field investigations to quantify significant bird and mammal resources by habitat type on a seasonal basis. The goal of this effort will be to learn as much as possible in order to maintain refuge habitats in their present pristine condition in the face of development of lands within adjacent to the refuge.



#### A. HIGHLIGHTS

1. Staff size increases with addition of a Secretary and Wildlife Biologist/Pilot position.
2. Wolf study initiated.
3. Alaska's first Land Bank Agreement signed.
4. Three new residences constructed.
5. CCP draft printed.
6. Waterfowl production makes rebound from previous year.
7. Water quality sampling program is initiated.

#### B. CLIMATIC CONDITIONS

The climate of the Koyukuk basin is similar to Fairbanks. The summer sun provides almost continuous radiation and heats valleys which are protected from coastal winds and clouds by surrounding hills. During the winter the sun stays above the horizon for less than four hours. The valleys become cold sinks and temperatures are among the coldest on the continent. Galena, located approximately 125 miles south of the Arctic Circle, has a mean of 60.1 degrees Fahrenheit and a January mean of -9 degrees Fahrenheit. The frost-free period is normally about 100 days. Temperature extremes range from near 70 below to the high 90's. Ice is present in the lakes from early October to late May. Precipitation averages 14.6 inches, the bulk being in the form of rain in June, July, August and September.

The year started out with January and early February being very mild. The last half of February was a different story with much colder temperatures. There was approximately two feet of snow cover during the late winter of 85-86. March through May were normal for that period of the year. Blue skies prevailed with moderate daytime temperatures and chilly evening temperatures. The Yukon broke up at Galena on May 20. June and the first half of July were absolutely beautiful with mostly hot and blue sky days. Late July and August were cool and wet. September remained wet with temperatures becoming much cooler and the first snow flurries occurring on the 24th and 25th. Winter arrived in October. Snow fell during twelve days of the month and the Yukon froze up on the 28th. November was normal and December closed the year out being unusually mild.

TABLE 1. 1986 WEATHER SUMMARY

<u>Month</u>	<u>Mean</u>	<u>Precipitation</u>		<u>Temperature (F)</u>	
		<u>1986</u>	<u>Snow</u>	<u>Maximum</u>	<u>Minimum</u>
January	.82	.80	13.2	17	-38
February	.81	.41	5.6	38	-43
March	.63	.05	.5	26	-34
April	.52	.28	3.8	44	-30
May	.59	.38	1.9	74	23
June	1.24	.79	----	83	42
July	2.22	2.31	----	84	45
August	2.76	3.09	----	74	31
September	1.76	2.54	.2	59	18
October	.81	1.30	10.8	40	-5
November	.90	.78	7.9	34	-37
December	.76	.98	17	34	-39
Totals/ Extremes	13.80				

C. LAND ACQUISITION3. Other

Alaska National Interest Lands Conservation Act (ANILCA) increased National Wildlife Refuge System lands in Alaska by 300 percent. These refuges are not large solid blocks of lands; but, instead are a complex pattern of native, state, private and federal lands. Of the approximately 5,246,900 included in the exterior boundaries of the Koyukuk NWR and northern unit of Innoko, current "official" Fish and Wildlife Service acreage is about 4,086,500. Current land status is shown in Tables 3 and 4. The acreage estimates will change when the land is surveyed and various inholding claims are adjudicated.

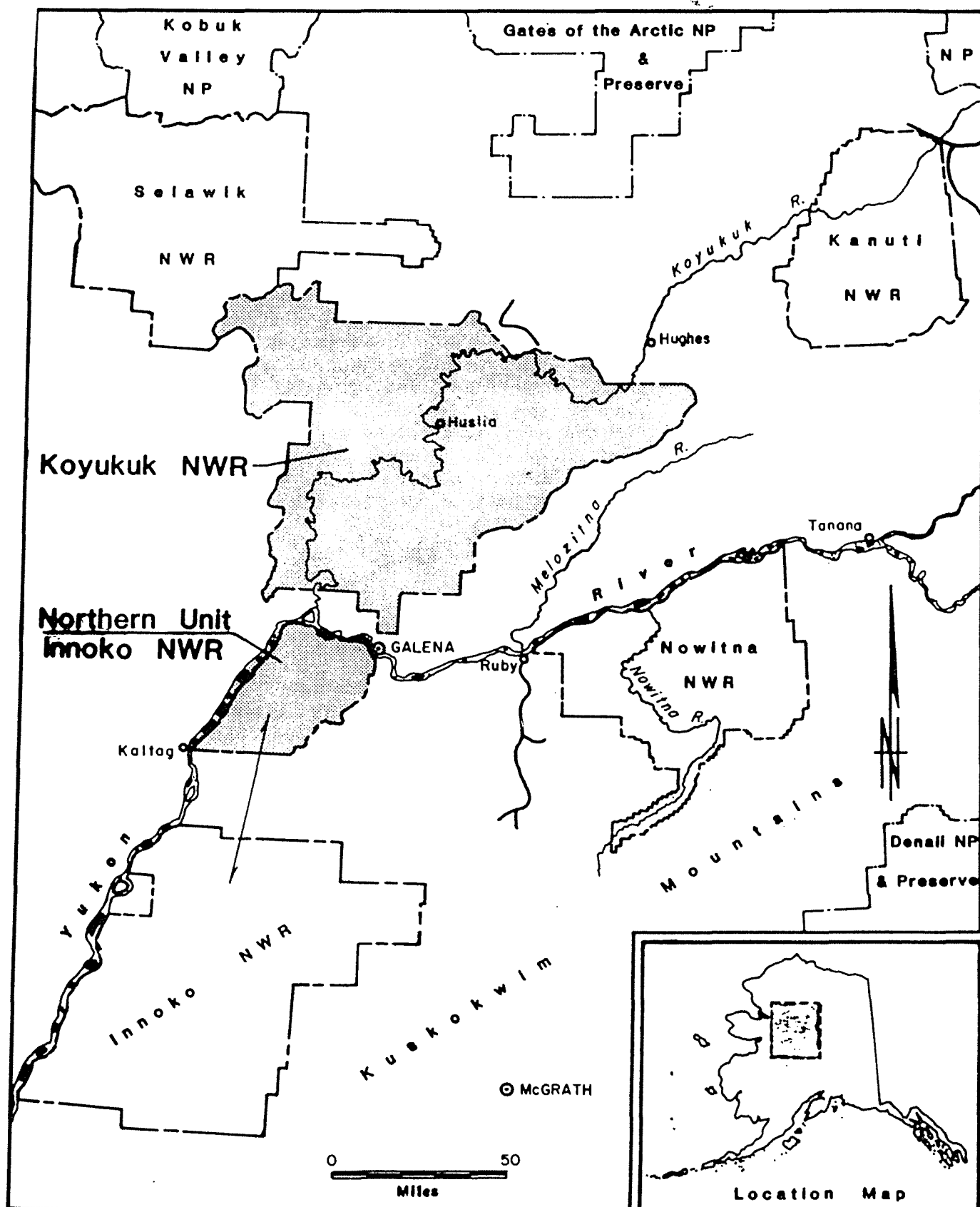
ANILCA also provided native corporations with the right to enter into land bank agreements with USFWS. In 1983, Gana-A' Yoo Limited Corporation, an Alaskan Native Village Corporation organized under ANCSA, expressed an interest in entering into a land bank agreement with the Koyukuk NWR. The object of the program is "to enhance the quantity and quality of Alaska's renewable resources and facilitate the coordinated management and protection of Federal, State, and Native and other private lands." Under this agreement, Gana-A' Yoo Ltd. agrees to manage the subject lands in a manner compatible with the management plan for the adjacent refuge, to permit reasonable access by federal agency personnel, not to alienate, transfer, assign, mortgage, or pledge the subject lands, and to develop or improve subject lands only in agreement with specific provisions of the agreement. The benefits to Gana-A' Yoo Ltd. include immunity from: adverse

possession; real property taxes; and judgments to recover debts incurred by the owner. In accordance with the agreement, the Service will provide technical and other assistance to Gana-A' Yoo Ltd. with respect to management of those lands. Appendix L provides details of the agreement. Lands subject to land bank agreements do not become refuge lands. Ownership and management responsibility remain with Gana-A' Yoo Ltd.

After much discussion and work in 1984 and 1985, the agreement was signed in Galena on May 27, 1986. Regional Director and Assistant Regional Director Rogers attended the ceremony. This is the first such agreement to be enacted under ANILCA. Approximately 496,800 acres are included in the agreement.

Regional Director Gilmore, presented Refuge Manager Nunn, with an Excellence in Performance Award at the Regional 7 Project Leader's meeting for his efforts in getting the Land Bank Agreement signed.

Figure 1. Location of Koyukuk Refuge and the northern unit of Innoko Refuge.



# NATIONAL WILDLIFE REFUGES IN ALASKA

- 1 Alaska Maritime
- 2 Alaska Peninsula
- 3 Arctic
- 4 Becharof
- 5 Innoko
- 6 Izembek
- 7 Kanuti
- 8 Kenai
- 9 Kodiak
- 10 Koyukuk
- 11 Nowitna
- 12 Selawik
- 13 Tetlin
- 14 Togiak
- 15 Yukon Delta
- 16 Yukon Flats

Koyukuk NWR and  
Northern Unit of Innoko NWR

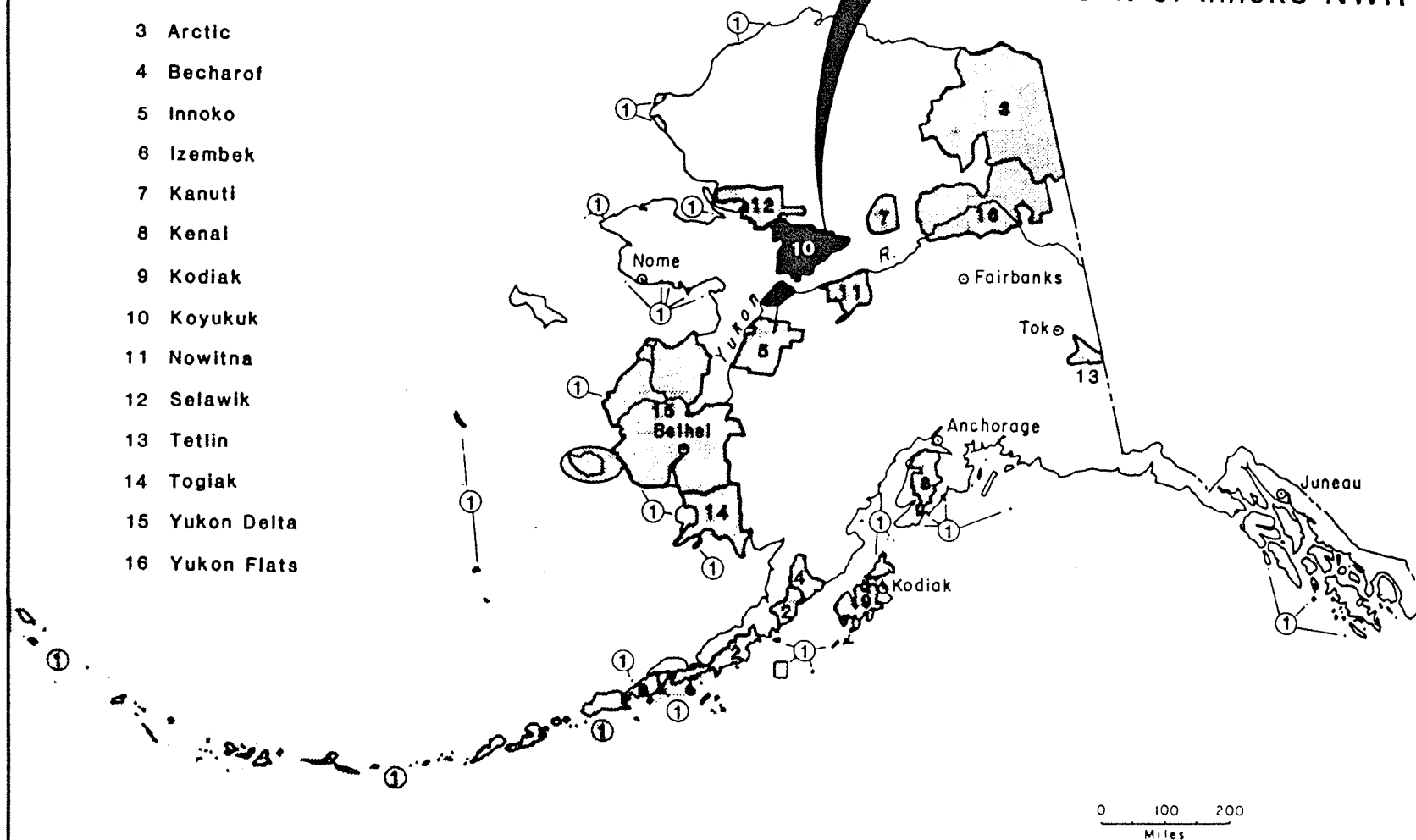


Figure 2. National wildlife refuges in Alaska.

Figure 3. Land status, Koyukuk Refuge and the northern unit of Innoko Refuge,

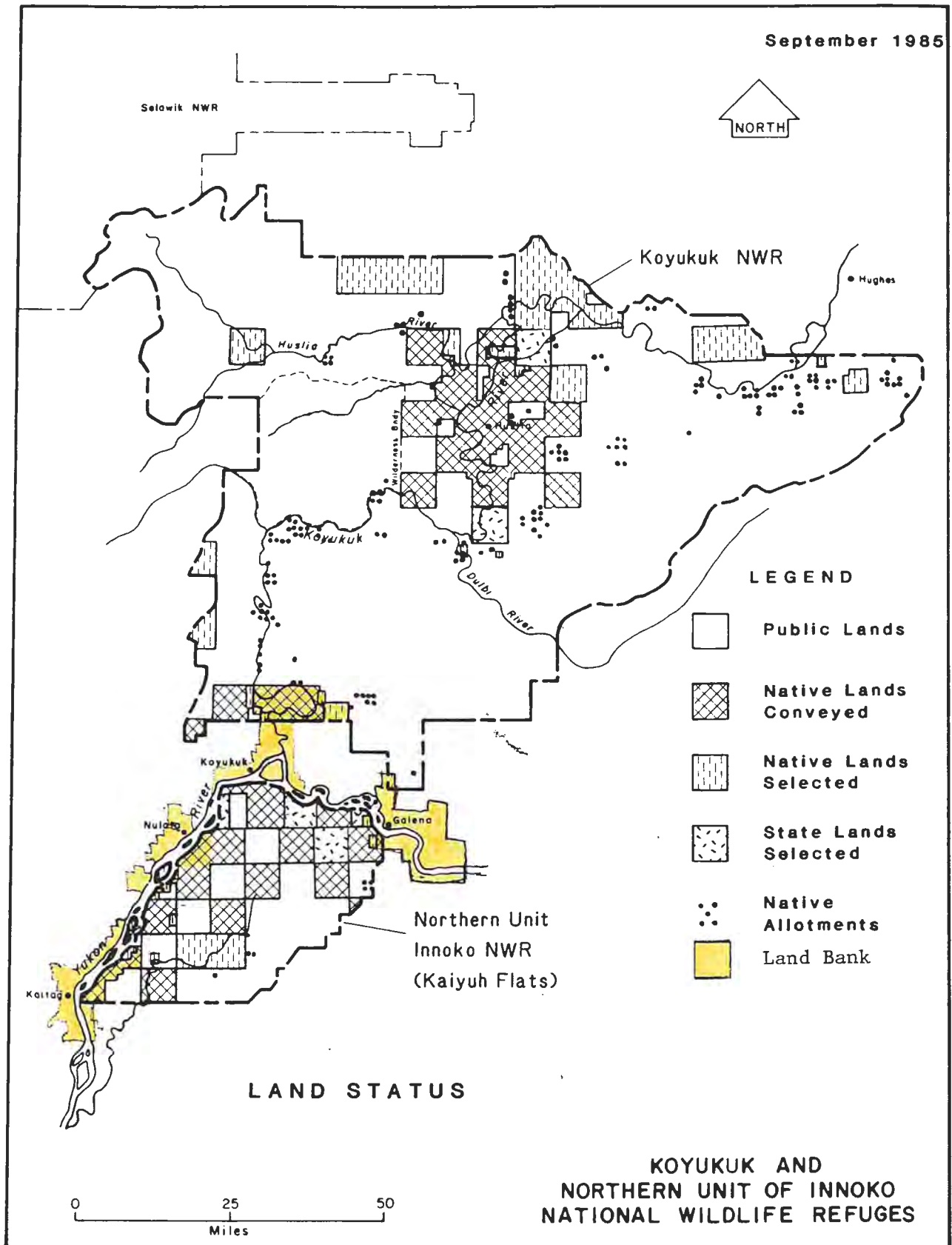




Table 2.

LAND STATUS OF KOYUKUK REFUGE AS OF SEPTEMBER 1985

<u>OWNERSHIP</u>	<u>ACRES</u>		<u>% OF REFUGE</u>
FEDERAL	3,735,700		83
NATIVE CORPORATIONS			
- Selections (b)	258,600		6
- Conveyances (c)	373,900		8
REGIONAL NATIVE CORPORATION			
- 14(h) (1) Selections (d)	66,300	Greater than	1
- 14(h) (1) Conveyances	0		0
NATIVE ALLOTMENTS			
- Applications (157)	16,000	Less than	1
- Conveyances (0)	0		
PRIVATE PARTIES (e)			
- Applications (0)	0		0
- Conveyances (2)	(12)	Less than	1
STATE			
- Selections	44,600		1
STATE-NATIVE			
- Selection Conflicting	1,000	Less than	1
<u>TOTAL WITHIN BOUNDARY</u>	<u>4,496,100</u>		<u>100</u>

- (a) Acreages are approximate due to rounding, inaccuracies in information available, and changes in the land status (e.g., relinquishments, invalidations and conveyances of selected land).
- (b) The native corporations have over selected on Koyukuk Refuge. Consequently, some of these selections may be invalidated.
- (c) Conveyances include interim conveyances and patented lands.
- (d) Section 14(h) (1) selection are historic/cemetery sites that have been identified by the regional corporation, Doyon, Ltd. in this case.
- (e) Private inholdings include homestead sites, trade and manufacturing sites, mission sites, native townsites, and headquarter sites.

Table 3.

## LAND STATUS NORTH UNIT OF INNOKO REFUGE AS OF SEPTEMBER 1985

<u>OWNERSHIP</u>	<u>ACRES</u>		<u>% OF REFUGE UNIT</u>
FEDERAL	350,800		47
NATIVE CORPORATIONS			
- Selections (b)	16,700		2
- Conveyances (c)	291,200		39
REGIONAL NATIVE CORPORATION			
- 14(h) (1) Selections (d)	46,300		6
- 14(h) (1) Conveyances	0		0
NATIVE ALLOTMENTS			
- Applications (50)	5,600	Less than	1
- Conveyances (2)	300	Less than	1
PRIVATE PARTIES (e)			
- Applications (0)	0		0
- Conveyances (2)	(4)	Less than	1
STATE			
- Selections	39,200		5
STATE-NATIVE			
- Selections Conflicting	700	Less than	1
<u>TOTAL WITHIN BOUNDARY</u>	<u>750,800</u>		<u>100</u>

- (a) Acreages are approximate due to rounding, inaccuracies in information available, and changes in the land status (e.g., relinquishments, invalidations and conveyances of selected land).
- (b) The native corporations have over selected on Innoko Refuge. Consequently, some of these selections may be invalidated.
- (c) Conveyances include interim conveyances and patented lands.
- (d) Section 14(h) (1) selections are historic/cemetery sites that have been identified by the regional corporation, Doyon, Ltd. in this case.
- (e) Private inholdings include homestead sites, trade and manufacturing sites, mission sites, native townsites, and headquarter sites.

## D. Planning

### 1. Master Planning

Koyukuk's draft comprehensive conservation plan (CCP) was printed in late 1986. Section 304(g) of ANILCA requires the preparation of a CCP for each unit of the National Wildlife Refuge System established or enlarged by ANILCA. These CCPs will serve as Alaskan refuges' Master Plans. These plans are to designate areas within the refuge according to their respective resources and values, specify the programs for conserving fish and wildlife resource values and specify the uses within each area which may be compatible with the major purposes of the refuge. The plan will also set forth those opportunities which will be provided within the refuge for fish and wildlife oriented recreation, ecological research, environmental education and interpretation of refuge resources and values, and economic use.

Public meetings were held in Kaltag, Koyukuk, Nulato, and with Gana-A' Yoo during January 28-31 and in Hughes and Huslia on February 3 and 4 to discuss CCP management alternatives, prior to writing the draft plan. Planning Team Leader Norm Olson presented a program outlining the alternative, while team member Maggie Arend helped Norm answer questions.

Planning Team Biologist Danielle Jerry visited us and Game Biologist Osborne on March 18-19 to discuss wildlife population figures for the CCP.

Norm Olson, Maggie Arend, and Danielle Jerry visited on May 7-8 to go over the CCP with us prior to printing the internal draft on April 21. The plan looked good to us and only a few changes were made.

Printing of the plan was held up for a couple of months awaiting clearance from the Office of Environmental Project Review. Clearance was finally received and the plan was printed in October. The public comment period was open until January 30, 1987.

Refuge Manager Nunn, Planning Team Chief Norm Olsen, and Hearing Officer Bill Knauer conducted public meetings in Hughes on 1 December, and Huslia on 2 December to receive comments on the draft CCP. Meetings in Kaltag, Nulato, and Koyukuk were postponed until January 12-15, due to weather. The meeting in Galena was conducted on 6 December with all in attendance choosing alternative A. (See later discussion in this section). Residents of all villages preferred Alternative A., the minimal management alternative.

The draft CCP designates areas within the refuge according to their resources and values, outlines programs for conserving fish

and wildlife resource values, and specifies uses within each area that may be compatible with major purposes of the refuge. In addition, the plan discusses opportunities that will be made available for fish and wildlife oriented recreation, ecological research, environmental education and interpretation and economic use of refuge lands. Comments received on the range of management alternatives and permitted activities presented in the plan will be taken into account during the development of a final plan.

In addition to presenting the Service's long-range management strategies for Koyukuk Refuge and the northern unit of Innoko Refuge, the plan evaluates the effect of the proposed management alternatives on subsistence uses and needs, as required by section 810 of ANILCA. The law required the Service to give adequate notice and hold public hearings before implementing any part of the plan determined to have an effect on subsistence. These requirements are met by: (1) public hearings held in conjunction with the development of this plan; (2) the section 810 evaluation found as part of the text; and (3) the consideration of comments received.

Section 1008(a) of ANILCA directs the Secretary of the Interior to establish an oil and gas leasing program on federal lands in Alaska except where prohibited by law, or on those units of the NWRS where oil and gas development would be incompatible with refuge purposes. Through the planning process with its opportunity for public review, the Service is trying to determine to what extent oil and gas development should be permitted. The Secretary also must consult with the Secretary of Energy to determine the national interest in developing oil and gas on refuge lands. His finding could influence the establishment of an oil and gas program. In addition, consultation must be held with the Governor, local governments, native and regional corporations, the Alaska Land Use Council, representatives of the oil and gas industry, conservation groups and other interested individuals to determine the public interest in, or opposition to oil and gas exploration and leasing activities.

During the process of developing CCP's, the public has an opportunity to suggest what additional lands, if any, should be placed in the National Wilderness Preservation System (NWPS). Section 1317 of ANILCA requires the Service to review all lands in the Alaskan NWR's not congressionally designated as wilderness to determine their suitability, or nonsuitability as wilderness and to subsequently recommend areas for inclusion in the NWPS. Section 4(a) of the Wilderness Act states that the designation of wilderness within a national wildlife refuge must be within and supplemental to the purpose for which the refuge was established.

Although large tracts of land on Alaska refuges may be found to be suitable as wilderness, not all suitable land will be proposed for wilderness designation because of management strategies that

will be used to meet refuge purposes. As a result, the range of wilderness alternatives is evaluated subsequent to the Service's selection of its preferred management alternative. One wilderness proposal is examined in the draft plan for the Koyukuk Refuge and the northern unit of Innoko Refuge. The preferred alternative identified in the draft plan does not include a wilderness proposal.

Congress established over 19 million acres of wilderness on Alaska refuges during the passage of ANILCA. Therefore, the criteria used to determine what land the Service additionally proposes for wilderness designation include (1) the need for wilderness unit boundary adjustment and (2) the addition of selected areas with outstanding resource values that may have been inadvertently over looked during the original wilderness review and subsequent designations undertaken by Congress. A summary of public comments on the Service's recommended wilderness proposal will be included in the final plan which is part of the wilderness package sent to Congress.

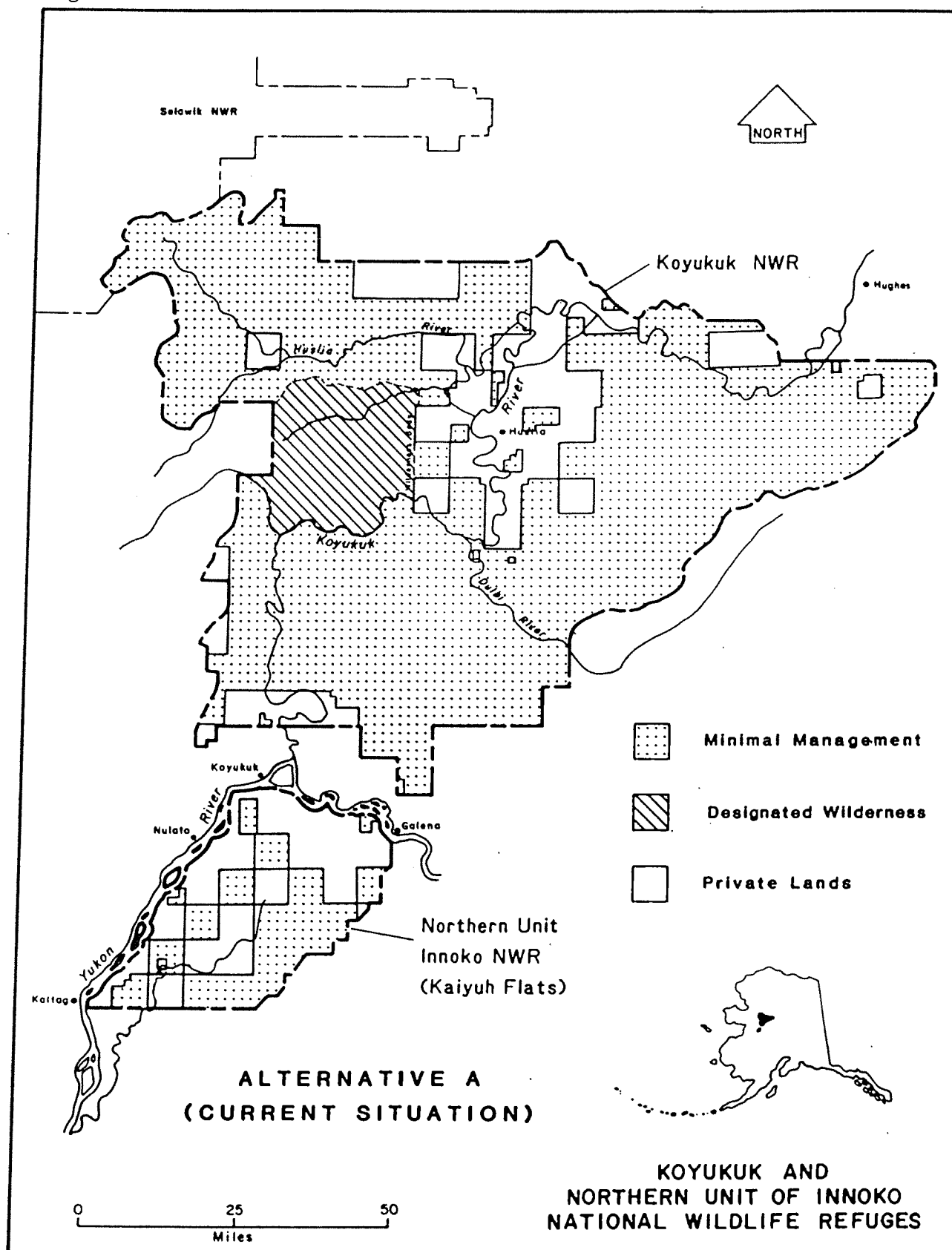
After careful consideration of the refuge purposes, resources, issues, and opportunities unique to Koyukuk Refuge and the northern unit of Innoko Refuge, two alternatives were formulated to guide the refuge's management.

Alternative A., the current situation or "no action" alternative, would maintain the existing range and intensity of management, recreational and economic uses on Koyukuk Refuge and the northern unit of Innoko Refuge. This is the Service's preferred alternative in the draft plan. It is assumed that existing laws, executive orders, regulations, and policies governing Service administration and operation of the National Wildlife Refuge System would remain in effect.

Under this alternative, all refuge lands would be placed in minimal management category as depicted in Figure 4 and Table 4. This category would protect the natural diversity of fish and wildlife populations and habitats on the refuge. Disturbance of fish and wildlife habitats and populations would be minimized. A variety of fish and wildlife management activities would be allowed. Subsistence and recreational uses of the refuge would continue to be allowed using existing access methods.

Some economic uses of the refuge would be permitted under this alternative. Guiding, outfitting, and transporting would be permitted, subject to reasonable regulation. Land based facilities in support of commercial fishing would also be allowed, subject to reasonable regulation. Certain oil and gas studies would be permitted, including surface geological studies, subsurface core sampling, and seismic geophysical studies, although no oil and gas leasing would be permitted on refuge lands.

Figure 4. Alternative A





The pristine conditions and fish and wildlife values found on the refuge would be maintained, but no additional refuge lands would be protected by potential designation as wilderness. Under this alternative, changes in management category could be accomplished through administrative action, thus flexibility in future management of refuge lands would be maintained. Proposed changes in management categories would be made only after appropriate public involvement.

Table 4. Acreage distribution by management category - Alternative A.

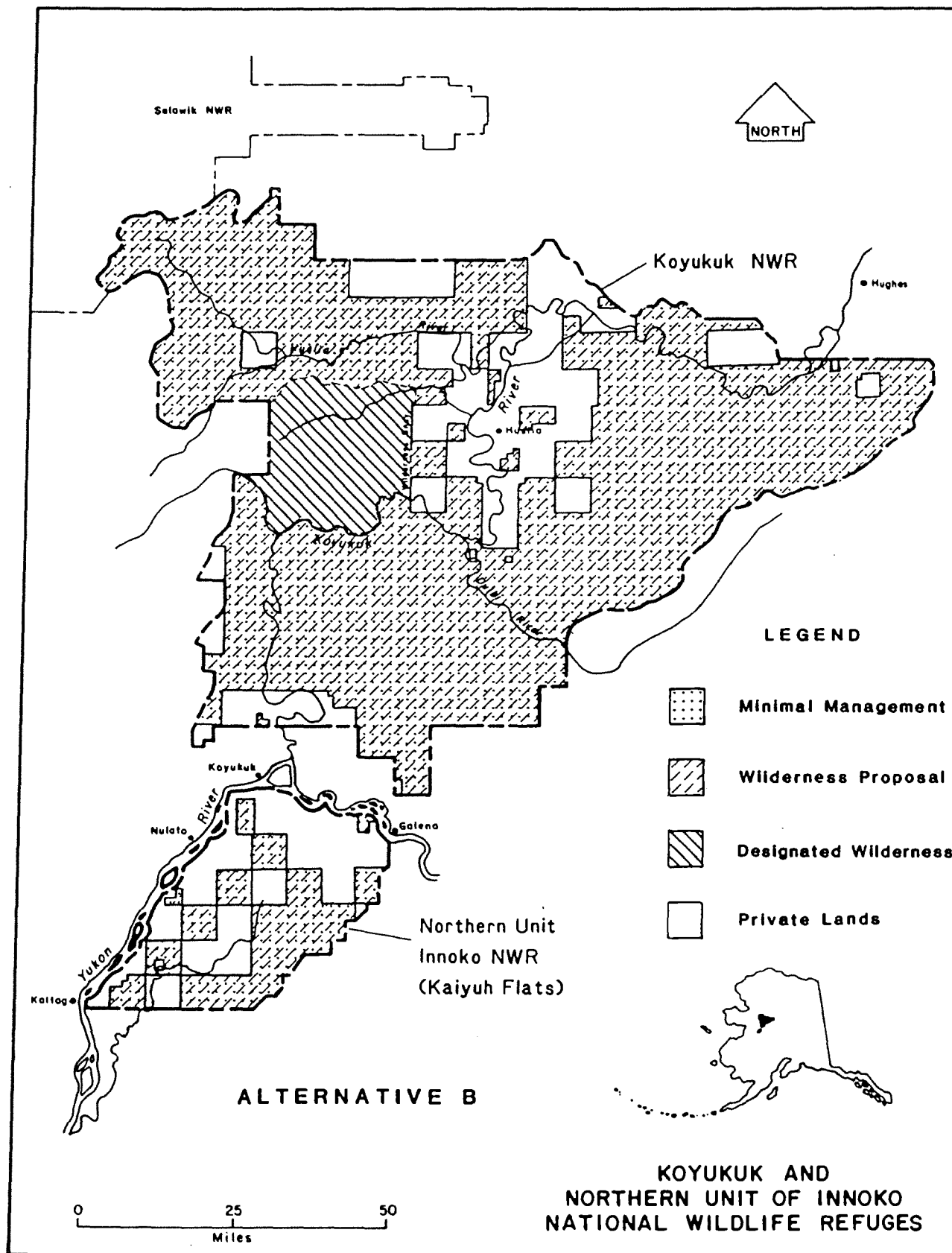
Mgt. Cat.	KOYUKUK NWR		NORTHERN UNIT INNOKO NWR	
	Acreage	% of Refuge	Acreage	% of Refuge
Inten. Mgt.	0	0	0	0
Moderate Mgt.	0	0	0	0
Minimal Mgt.	3,340,000	89%	350,800	100%
Designated Wild.	400,000	11%	0	0
Recommended for Wild. Designation	0	0	0	0

Alternative B would maintain the existing range and intensity of management and recreational uses on Koyukuk Refuge and the northern unit of Innoko Refuge. As in Alternative A, it is assumed that existing laws, executive orders, regulations, and policies governing Service administration and operation of the National Wildlife Refuge System would remain in effect.

Under this alternative, all refuge lands (with the exception of the Koyukuk Wilderness) would be placed in the minimal management category as depicted in Figure 5 and Table 5. The minimal management category provides the basis for the Service's recommendation for future designation as wilderness. Under Alternative B, all refuge lands outside of the existing Koyukuk Wilderness would be recommended for wilderness designation and could receive the added protection of management under the Wilderness Act. Management under the wilderness category would begin when a formal proposal is before Congress and would continue if Congress voted to include the area in the wilderness system. If Congressional designation is not afforded, management would revert to the Minimal Management category.

This alternative would provide for maximum protection of the natural diversity of fish and wildlife populations and habitats that occur on the refuge. Disturbance of fish and wildlife habitats and populations would be minimized. The pristine conditions and fish and wildlife values found on the refuge would be maintained. Most public and economic uses of the refuge allowed in minimal management would continue to be allowed using existing methods of access. Opportunities for hunting, fishing,

Figure 5. Alternative B



trapping, and other recreational activities, for subsistence harvest, and for scientific research would be maintained. No oil and gas leasing or exploration activities would be permitted on refuge lands. Surface geological and geophysical studies which do not disturb the surface may be allowed where site-specific stipulations ensure compatibility with refuge purposes and consistency with management objectives.

Table 5. Acreage distribution by management category -  
Alternative B.

Mgt. Cat.	KOYUKUK NWR		INNOKO NWR	
	Acreage	% of Refuge	Acreage	% of Refuge
Inten. Mgt.	0	0	0	0
Moderate Mgt.	0	0	0	0
Minimal Mgt.	3,340,000	89%	350,800	100%
Designated Wild.	400,000	11%	0	0
Recommended for Wild. Designation	3,340,000	89%	350,800	100%

#### 5. Research and Investigation

A moose study, in cooperation with ADF&G, started in October 1984, was continued in 1985. (Section G-8)

A wolf study, again in cooperation with ADF&G, was initiated in April of this year. (Section G-8)

E. ADMINISTRATION1. Personnel

Koyukuk gained two positions during 1986 and its original three permanent positions remained filled during the year. Dianna White was hired for the new permanent secretary position and started work on 2 February. Dianna has done a great job during her first year. While waiting for the biologist/pilot position to be advertized and filled, we opted for an OAS pilot to get us through the field season. Carl Downing arrived on June 24 and worked for us until September 11. Carl was an excellent pilot and did a very good job filling in for us this summer. The biologist/pilot position was finally advertized and filled; although, it is a temporary 4 year position. Greg Rost was hired and came aboard September 28. Greg has also done a terrific job for us and just loves to fly.

Table 6. Five Year Summary of Manpower

	Permanent Full Time	Permanent Part Time	Shared Permanent Full Time	Temporary	FTE
FY 82	2	0	0	0	2
FY 83	2	1	0	0	3
FY 84	3	0	2	1-Local-H	3
FY 85	3	0	2	1-Local-H	5
FY 86	5	0	0	1-NTE 4 yrs.	6

5. Funding

Station funding for the last five fiscal years is shown in Table 7.

Table 7. Koyukuk National Wildlife Refuge Funding

Programs	FY83	FY84	FY85	FY86	FY87
1210	\$80,000	-0-	-0-	-0-	1500
1220	\$60,000	-0-	-0-	-0-	-0-
1260	-0-	\$290,000	\$315,000	\$360,000	\$464,500
1994	\$12,000	-0-	-0-	-0-	-0-
Totals	\$152,000	\$290,000	\$315,000	\$360,000	\$466,000

6. Safety

Informal safety meetings were conducted throughout the year. All safety material received from the Regional Office Safety Office was reviewed by all employees.

We had a fire drill exercise on March 31. We thought Nowitna's Suburban was on fire, but it was just a broken heater hose. The official response time was a mere 7 seconds.

ARM Lons practiced giving I.V.'s on Galena Health Clinic's "I.V. Annie" prior to the staff working with the immobilization drugs associated with the wolf, moose and caribou collaring projects in April.

The new King hand held FM radio added a great deal of safety, as well as, increased efficiency in our field work this past year. However, we are still in need of a radio system with long range capability so that we can contact our office or other outside help when we are out on the refuge.

Fire ladders for the residences, Nomex flight suits, and ELT's to be carried by all field personnel were ordered in November.

#### 7. Technical Assistance

Biological data pertinent to resident and migratory game was routinely supplied to the Alaska Department of Fish and Game biologist on Galena. It should be noted here that this is a two-way street and the local area biologist is freely providing his data to us.

#### 8. Other Items

A refuge program evaluation was conducted February 17-20 by Refuge Supervisor Kurtz, John Rogers, Jim Baker, and Lynn Fisher. No significant problems in our operations were identified. However, we identified a few problems with the R.O. operations!

A public meeting concerning proposed changes in Title 50 of the CFR was held in Galena on the evening of July 11. Bill Knauer was planning on coming out to conduct the meeting, but was unable to make it; therefore, Refuge Manager Nunn and Fisher conducted the meeting. Comments were recorded and sent to the R.O. Refuge Manager Nunn also explained the proposed changes to Gana-A' Yoo personnel on the following Monday.

Other "official" visitors to the refuge during 1986 and not elsewhere mentioned in this report were:

- Ruth Johnson, April 15-17, to go over correct administrative procedures with Refuge Secretary White.

- Jessie Lockhart and Mary Guerrero, April 21-22, to review our position descriptions and to discuss personnel related problems.

- Innoko ARM Mike Smith, July 28, to pick up our 18' alumaweld boat.

- Bruce Conant and Steve Kane, August 22-23, conducting swan surveys.

- OAS check pilot Tom Belleau, November 5, to check out Pilot Rost on skis in both the C-185 and the cub.

Refuge staff members received the following training and attended the following workshops during 1986.

Michael Nunn: LE Refresher Course, February 24-28.  
Advanced Refuge Managers Academy, March 1-April 7.  
Service annual firearms qualification, August 27.  
Project Leaders Meetings, December 10-12.

Daryle Lons: Arctic Survival, February 3-7.  
Regional Waterfowl Workshop, April 15-16.  
Service annual firearms qualification, August 27.  
Project Leaders Meeting, December 10-12.

Michael

Motschenbacher: Fire Training, February 3-7.  
Fire Training, May 19-23.

Gregory Rost: Annual OAS Ground School, December 2-5.

Dianna White: Federal Financial Tracking System Course,  
September 24-26.



## F. HABITAT MANAGEMENT

### 1. General

Located 270 miles northwest of Fairbanks in west central Alaska, the Koyukuk N.W.R. lies within a roughly circular basin and connects the floodplain of the Koyukuk River just north of its confluence with the Yukon River. The extensive floodplain is a forested basin surrounded by high hills and characterized by many lakes. The terrestrial vegetation is typical of the boreal forest or taiga of interior Alaska and northwestern Canada.



The Koyukuk River floodplain is characterized by many lakes and many meandering sloughs and streams. This photo shows a portion of the Dulbi Flats area of the refuge.

DRL



Habitat reflecting meander scars of the Koyukuk River in the Three Day Slough area. DRL

The most conspicuous characteristic of vegetation on the refuge is the complex interspersion of types. Differences in vegetation cover are caused by soil types, erosion by streams and rivers, permafrost exposure, flooding and fire. There are four broad vegetation types on the refuge.

Closed spruce-hardwood forests are found mainly along the major water courses and on warm, dry south-facing hillsides where drainage is good and permafrost absent. This type consists of tall to moderately tall stands of white and black spruce, paper birch, aspen and balsam poplar.





Understory forest species include labrador tea, prickly rose, dwarf and bog blueberry and various cranberry species such as low bush cranberry as shown here.

low  
DRL





Blue Lupine

HPL

Open, low growing spruce forests are found in the northwestern quarter of the refuge and scattered throughout the central portion. This type is composed primarily of black spruce but is often associated with tamarack, paper birch and willows and locally interspersed with treeless bog. They are found on north facing slopes and poorly drained lowlands usually underlain by permafrost.

Treeless bogs make up the bulk of the vegetation type in the center of the refuge. The vegetation of these bogs consists of various species of grasses, sedges and moss, especially sphagnum. On drier ridges, willows, alders, resin birches, black spruce and tamarack are found.





Alpine tundra is found at the highest elevations on the refuge.  
Plants such as dwarf willow and . . . . .

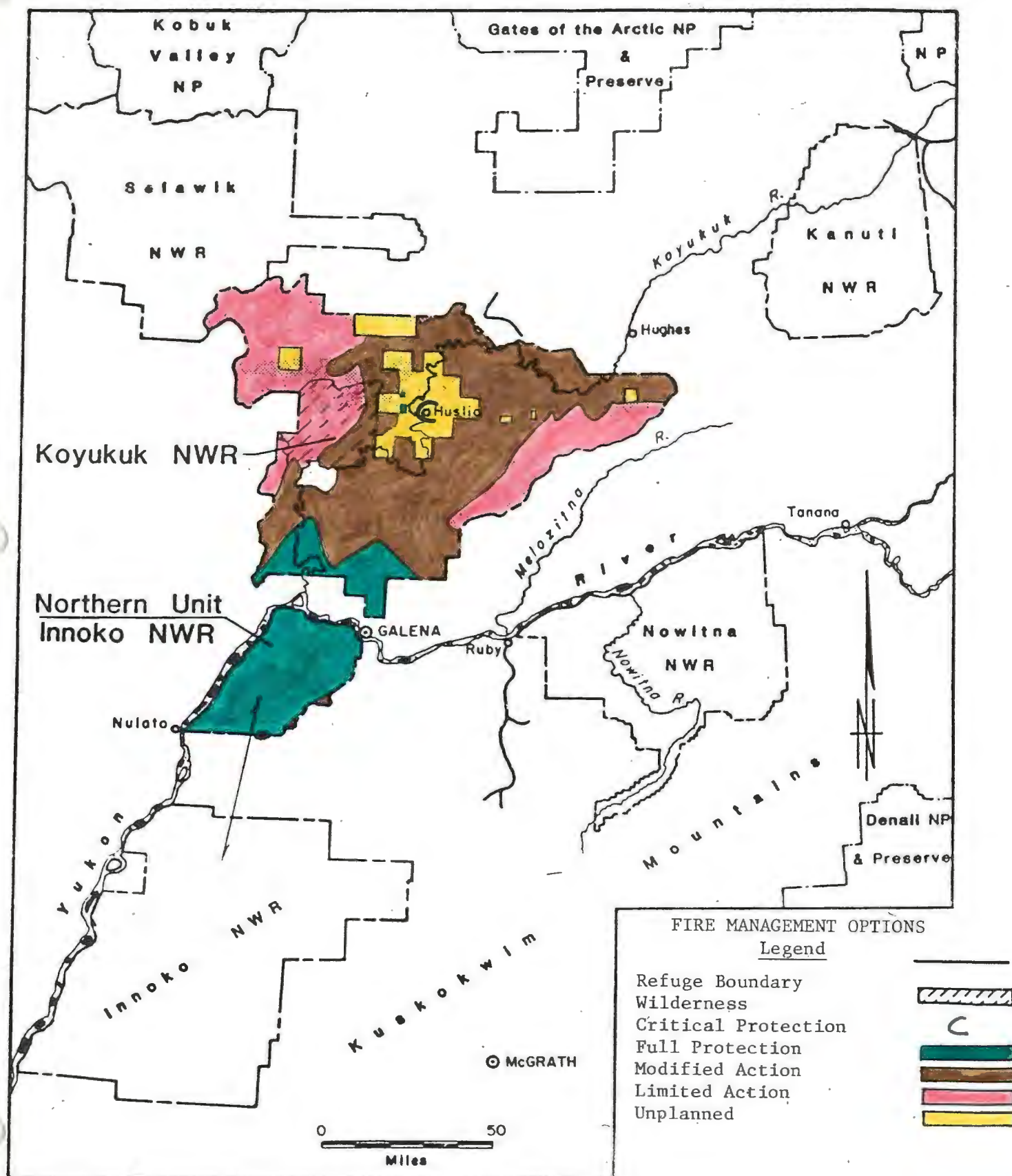
HPL



lapland rosebay are found in this alpine habitat.

DRL

Figure 6. Fire Management Options on the Koyukuk NWR and the Northern Unit of the Innoko NWR.





LANDSAT maps of the refuge were developed in conjunction with the refuge comprehensive planning process. It was felt that high altitude satellite photo-imagery providing computerized digital data was the most efficient and least costly means of mapping vegetation on the refuge while meeting deadlines imposed by ANILCA.

However, the LANDSAT vegetation mapping for the refuge is generalized. More refined habitat mapping recognizing smaller habitat units may be done later as needed, using traditional aerial photo interpretation. Until then the refuge has been mapped on a 1:250,000 scale using the LANDSAT multispectral high altitude imagery.

Fourteen land and three water cover types were used to describe the vegetation on the refuge. Acreage by cover types for all lands in the refuge, both federal and private, is shown in Table 8.

Table 8. Acreage summary of land classes on Koyukuk Refuge (from U.S.G.S. satellite imagery - LANDSAT).

Land Cover Class	Federal (acres)	Private (acres)	Percentage Total Refuge
Open needleleaf forest	212,380	141,170	6.7
Needle woodland	1,105,050	246,510	25.7
Mix needleleaf- deciduous forest	203,500	106,820	5.9
Deciduous forest	110,860	26,830	2.6
Alluvial & lowland- tall scrub	111,790	31,210	2.7
Alpine & subalpine- tall scrub	131,530	22,300	2.9
Dwarf scrub:graminoid,- tussock, peatland	1,119,030	300,140	27.0
Prostrate shrub & - lichen tundra	39,860	13,710	1.0
Wet herbaceous:graminoid- bog, marsh	78,200	24,380	1.9
Moist herbaceous:gram.- tussock, shrub	589,640	128,070	13.7
Dry herbaceous:gram.- meadow, lichen, moss	40,530	11,010	1.0
Fire regeneration:- graminoid dominated	131,030	24,200	3.0
Aquatic vegetation	28,290	10,260	0.7
Scarce vegetated:- floodplain, sand, scree	24,550	7,760	0.6
Clear water	135,510	53,240	3.6
Sedimented or shallow water	7,790	11,010	0.4
Heavily sedimented water	3,620	7,280	0.2
Total	4,073,170	1,175,910	99.6

## 2. Wetlands

The rivers in the refuge lowlands are characterized by a low gradient, tortuously meandering course and heavy spring flooding. Flooding during spring is typical and subsidence of the waters frequently continues through much of the summer.

The rivers, in particular the Koyukuk, carry a heavy silt load at flood stage. An active placer mine on the Hogatza River upstream from the refuge has caused some turbidity in the Koyukuk River below the confluence of the two rivers.



The Koyukuk River at the refuge's administrative cabin site. DRL

Creeks are typically shallow, slow and meandering with steep banks. Narrow bands of white spruce line the higher banks, while willow and alder thickets predominate in the lower areas.





The Gisasa River flows into the southwest portion of the refuge.  
DRL

Lake and pond types include upland basin, ice-formed lakes on the flats, river flooded lowlands, oxbows and bog lakes. Spring runoff, rain and river flooding charge the lakes resulting in variable water depth and shorelines from year to year. Depths seldom exceed 15 feet and are usually much shallower.

Water temperatures in shallow lakes reach 70 and above in midsummer, creating ideal conditions for heavy growth of aquatic plants and invertebrates. Among the aquatic plants, duck weeds are common. Water milfoil, coontail, and smartweed are abundant in some lakes and one more of 12 species of pondweed occur in almost all lakes. Bog lakes usually contain water lilies.

Shoreline vegetation varies with stability of water levels. Lakes which fluctuate with rivers and streams usually are surrounded by dense stands of horsetail. Several species of sedge, bluejoint grass, foxtail and fleabane provide cover on receding shorelines and dry basins. After flooding, sedges and occasionally bluejoint grass survive as emergent vegetation to water depths exceeding four feet. Shorelines of bog lakes vary in character but nearly always contain buckbean, wild calla and various species of sedge. Cattails and bur-reeds are found in only a few lakes.

Waterfowl use is related to both type and density of aquatic and shoreline vegetation. Preference is given to lakes with abundant submerged pondweeds, water milfoil and coontail and having shoreline vegetation that is moderately dense and interspersed with openings. These are either closed basin type lakes maintained by infrequent flooding and long periods of gradually receding water levels, or lakes connected to river systems that are more frequently flooded but also experience gradually receding water levels.

### 3. Forests

A general description of forest types is given in Section F-1.

No commercial harvest of timber has taken place in the area since the gold rush days at the turn of the century. However, forest products are extremely important to subsistence users for house logs, firewood, fish wheels and fish drying racks. The regulation requiring a permit to cut trees greater than three inches in diameter has caused much consternation among locals. This regulation for northern Alaska refuges was changed this year so that a permit would not be needed unless more than 20 trees of size 3"-6" were cut in one area. This change has not really clarified or solved the problem.



## 9. Fire Management

During the 1986 fire season, the Koyukuk NWR had 12 fires burning a total of 6768.72 acres (Table 9). The size of the fires ranged from 0.02 acre to 6200 acres.

Fire has been a natural force on the Koyukuk NWR for thousands of years. It is a key environmental factor in this cold dominated system. The fire cycle ranges from 108 years in the lowlands to 197 years in the surrounding hills. Fire removes organic matter, resulting in the warming of the soil, lowering of the permafrost layer and an increase in organic matter decomposition rates.



Fire is common on the Koyukuk NWR, the cycle is as low as 108 years in lowland areas.

DRL

Fire suppression on the Koyukuk NWR is provided by B.L.M.'s Alaska Fire Service. Initial attack is achieved with smoke jumpers and retardant bombers such as C-119's, DC-6's, and 7's, Catalina PBY's and a Navy version of the B-24, the PB4Y. Helicopters are used to pick up smoke jumpers and to ferry in Emergency Fire Fighter crews as needed.

Fire suppression activities on the Koyukuk NWR are guided by the Alaska Interagency Fire Management Plan. Under this plan, refuge land is put into one of four management options; critical protection, full protection, modified action and limited action.

Figure 6. shows the fire protection status of land within the refuge boundary. Unplanned land is treated as "modified action" areas that are continually in a critical burning period, which in effect places them in "full protection."

The critical protection option is for those areas where fire presents a real and immediate threat to human safety and physical developments. These areas or sites are occupied areas such as villages and fish camps. The highest priority in the allocation of suppression forces is given to sites in this option.

The full protection option is for those areas designated to receive aggressive initial attack and suppression efforts until the fire is declared out. This option is designed for the protection of cultural and historic sites, high resource value areas which require fire protection, but do not involve the protection of human life and habitation. Only fires in the critical protection area receive a higher priority for suppression resources.

The modified action option is designed for those areas that require a relatively high level of protection during critical burning periods, but a lower level of protection during the non-critical burning periods when the risk of large, damaging fires is diminished. During the critical burning periods, fires in "modified action" areas receive aggressive initial attack. If a fire escapes initial attack and requires more than modest commitment to contain it, an Escape Fire Analysis is conducted to determine the level of suppression needed in relation to the values at risk. Lands in this category are suited to indirect attack, the intent being to balance the acres burned with suppression costs. During the non-critical burning period, "modified action" areas do not receive initial attack or suppression; the intent being to reduce suppression cost and achieve resource management objectives through limited fire activity.





After a fire, it takes a black spruce forest 100 years to reach the climax stage. MDM

The limited action option recognizes those areas where a natural fire program is desirable, or the values at risk do not warrant the expenditures of funds. Suppression actions are only to the extent necessary to keep a fire within the management unit or to protect higher classified sites within the area. The careful monitoring of fire behavior and fire weather conditions is essential on all fires in limited action areas.

The interagency fire plan is reviewed for revision yearly by a committee of land managers/owners. Managers may change the management option on any part of agency land at any time between September 30 and April 1, but not during the fire season.

Table 9. Fires on the Koyukuk NWR and northern unit of the Innoko NWR during the 1986 fire season.

		Date	Date		
Fire Name/Fire #/Discovered/Dec. Out/#		Acres Burn./Fire Mgt Opt.			
HUS 06547	A034	5/31	5/31	0.1	Limited Action
632092	A265	7/06	7/10	30	Modified Act.
GAL NE 46	A266	7/06	7/07	0.1	Modified Act.
GAL NE 87	A270	7/06	7/29	6200	Modified Act.
GAL SW 35	A276	7/06	7/08	30	Full Protect.
GAL N 19	A279	7/06	7/07	0.5	Full Protect.
GAL W 9	A291	7/07	7/08	0.02	Full Protect.
632093	A296	7/07	7/08	1.0	Modified Act.
GAL N 42	A301	7/07	7/08	5.0	Limited Action
HUS SW 18	A306	7/08	7/10	100	Modified Act.
GAL NE 64	A323	7/08	7/11	2.0	Limited Action
HSL W 17	A350	7/13	7/21	400	Limited Action
Total				6768.72	

## 12. Wilderness and Special Areas

The 400,000 acre Koyukuk Wilderness was established by Public Law 96-487 (ANILCA) on December 2, 1980 in accordance with subsection 3(c) of the Wilderness Act (78 Sect. 892). The Koyukuk Wilderness surrounds the geologically unique Nogahabra Sand Dunes and also includes the Three Day Slough area. Since the Koyukuk area is unglaciated it is theorized that the dunes are wind-blown deposits of sand that originated in glaciated areas to the northeast.

In addition to the dunes, the wilderness area encompasses some of the best habitat on the refuge, with moose densities of up to 6 per square mile recorded in the fall.



## G. Wildlife

### 1. Wildlife Diversity

Baseline data continues to be collected to determine which of the numerous species listed as common and casual to interior Alaska are present on the Koyukuk NWR. Over 145 bird and 30 mammal species are thought to occur, as well as, three salmon species and numerous fresh water species.

Sixty nine bird species were recorded during our work this year (Table 9), including eight species recorded for the first time by refuge staff. First time sightings were recorded for snow goose, common merganser, sharp-shinned hawk, golden eagle, osprey, lesser golden plover, Swainson's thrush, and pine grosbeak. These sightings brought the number of bird species documented by refuge staff to 101.

### 2. Endangered and/or Threatened Species

It is likely that the peregrine falcon is nesting on the refuge; however, this has not been confirmed. There are birds nesting off the southwestern boundary of the refuge near the confluence of the Koyukuk and Yukon River, and further up the Yukon across from the mouth of the Yuki River.

Table 10. Avian species observed within the boundaries of the Koyukuk NWR and Kaiyuh Flats unit of the Innoko NWR during 1986.

common loon a	sandhill crane a
Arctic loon	lesser golden plover
red-throated loon a	semipalmated plover
red-necked grebe a	Hudsonian godwit b
horned grebe a	lesser yellowlegs
tundra swan a	yellowlegs spp. a
trumpeter swan a	spotted sandpiper
Canada goose a	long-billed dowitcher
greater white-fronted goose a	rednecked phalarope b
snow goose a	common snipe
mallard a	pectoral sandpiper
northern pintail a	long-tailed jaeger
American wigeon a	glaucous-winged gull
northern shoveler a	mew gull a
green-winged teal a	Bonaparte's gull a
redhead a	Arctic tern a
canvasback a	belted kingfisher
greater scaup	alder flycatcher
lesser scaup	tree swallow
scaup spp. a	bank swallow a
goldeneye spp. a	common raven
bufflehead a	American robin
old squaw b	Swainson's thrush
black scoter a	Bohemian waxwing
white-winged scoter a	yellow warbler
surf scoter a	yellow-rumped warbler
red-breasted merganser	northern waterthrush
common merganser	rusty blackbird
sharp-shinned hawk	pine grosbeak
northern harrier	redpoll spp.
rough-legged hawk	white-crowned sparrow
red-tailed hawk	fox sparrow
golden eagle a	song sparrow
bald eagle a	great-horned owl
osprey	short-eared owl
	great-gray owl

---

a young seen

b broody adults

### 3. Waterfowl

A duck pair count was conducted on five trend areas. The trend areas of approximately one square mile in size were arbitrarily chosen because in the past they have supported high waterfowl production. The five trend areas were surveyed by a pilot and an observer in a Piper Super Cub, flying 80 to 100 mph at an above ground elevation between 150 and 200 ft. The species, number of individuals, and number of pairs of ducks observed were recorded.

Eight species of ducks, for a total of 112 ducks, were observed (Table 11). Of these birds, 40 were observed in pairs. In a ground survey of duck broods on the trend area during 15-22 July, 82 broods were seen.

Table 11. Number of ducks observed on five trend areas on 30 May 1986.

Species	Total Birds	# Pair Observed	# Broods a
lesser scaup	37	1	0
American wigeon	28	7	24
pintail	10	5	15
northern shoveler	10	0	15
white-winged scoter	10	0	0
mallard	9	4	10
canvasback	6	3	0
bufflehead	2	0	0
green-winged teal	0	0	18
Total	112	20	82

a Observed during 15-22 July 1986.

Several differences between the pair count and brood count were observed. Of the 55 diving ducks observed during the breeding pair count, none was later observed with broods. In contrast, though no green-winged teal were observed during the pair count, 18 broods were observed.



Pintails and other early migrants start arriving in the last half of April. MDM

This year's duck brood survey was conducted by surveying 46 one-square mile plots and five trend area plots of approximately one square mile each. The 46 one square mile plots were delineated by section lines on USGS topographical maps. According to USGS maps, these plots contained potential waterfowl habitat. Waterfowl habitat was defined as any section with more than 15 acres of water in lakes, sloughs with water flowing less than three miles per hour, or streams meandering through marsh habitat.

Forty five one square mile plots were optimally allocated using stratified random sampling. The plots were allocated 6 to poor, 7 to moderate, and 32 to key habitat. Poor habitat was any section with more than 15 acres but less than 60 acres of water. Moderate habitat was any section in non-bog areas with at least 60 acres, but no more than 100 acres of water. In bog areas, moderate habitat was defined as any section including at least 60 acres, but no more than 120 acres of water from a lake over 200 acres in size. Key habitat was any section in non-bog areas with over 100 acres of water. In bog areas, key habitat was defined as any section including over 120 acres of water from a lake over 200 acres in size.

An additional square mile plot was nonrandomly selected in the Kaiyuh Flats. The trend area plots were areas that were initially sampled in either 1984 or 1985.

Individual plots were censused with the aid of binoculars by walking, from a canoe or helicopter.

The species, size, and age class of observed duck broods were recorded. Broody hens with no observable brood were counted as being a brood. Broods outside of the study plots observed prior to and during this survey were also recorded to aid in obtaining brood species, size, and age class data. Due to the difficulty in distinguishing between female lesser and greater scaup and between common and Barrow's goldeneye, broods from these species were classified as scaup species or goldeneye species.

The young from 544 duck broods were observed (Table 12). Broods from 14 species were identified. This included the first refuge record of breeding canvasbacks.

An average of 5.67 broods sq. mi. were observed on the refuge (Table 13). The species with the most broods was green-winged teal with 5,155 broods, followed by American wigeon with 4,549 broods and pintail with 2,365 broods.

Brood densities were 3.6 times higher in key than in poor habitat (Tables 14-16); however, because the amount of poor habitat exceeded that of the key, the total broods produced in poor habitat exceeded that of key. On the poor habitat 6,526 broods were produced, and in the key habitat 4,668 broods were produced.

The estimate, at the 95% confidence level, of duck young produced on the refuge was  $95,892 \pm 24,682$ . Table 13. gives the production estimates for the species observed on the refuge. Green-winged teal produced the most young with 28,354 young, followed by American wigeon at 23,654. These two species produced 54% of the ducks produced this year on the study area.

To aid in detecting duck production changes from year to year, five trend areas were established. These trend areas experienced a 62% increase in production over 1985 (Table 17). Northern shovelers, pintails, and green-winged teal showed the most increase. The overall increase in production is also indicated by the data from the random plots. The population estimate was 28% higher than last year's estimate.





Trend area counts indicate that pintail production this year was up 300% over 1985. MLN

The mean hatching dates and mean onset of flying date for each species were determined from the midpoint of the observed brood's current age class (Tables 18-19).

Pintail broods had the earliest hatching date of 16 June and white-winged scoters and redhead broods had the latest at 14 July. Pintail broods were the first to fly at 7 August and redhead broods were the latest at 14 September.

A helicopter was used for the first time in duck brood surveys this year. A comparison of ground and helicopter surveys was conducted to determine the effectiveness of using helicopters

Table 12. Size of duck broods observed in the Koyukuk area during 5 July to 5 August 1986.

Species	$\bar{x}$	s	n	Range
green-winged teal	5.5	2.32	102	1-12
American wigeon	5.2	2.03	158	1-12
pintail	4.6	2.40	111	1-15
scaup spp. (a)	6.5	2.32	52	1-12
mallard	5.0	2.59	43	1-10
surf scoter	7.1	3.07	13	4-13
bufflehead	5.1	2.62	09	1-08
common scoter	6.8	3.27	05	4-12
northern shoveler	4.6	2.46	31	1-09
old squaw (c)	-	-	-	-
goldeneye spp (b)	4.5	3.32	04	1-09
white-winged scoter	7.0	1.0	03	6-07
canvasback	4.0	3.00	03	1-07
redhead	2.0	0.00	01	-
unidentified spp.	7.7	7.42	09	2-21

(a) Greater and lesser scaup broods could not be distinguished from each other.

(b) Common and Barrow's goldeneye broods could not be distinguished from each other.

(c) Only one broody hen observed.

Table 13. Estimate of the number of duck young produced within the boundaries of the Koyukuk NWR during 11 July to 5 August 1986.

Species	Broods/sq.mi.		Total	Total
	$\bar{x}$	SE	Broods (a)	Young
green-winged teal	1.64	0.401	5155	28,354
American wigeon	1.45	0.496	4549	23,654
pintail	0.75	0.189	2365	10,880
scaup spp (b)	0.60	0.178	1897	12,330
mallard	0.45	0.170	1407	7,034
surf scoter	0.16	0.093	497	3,529
bufflehead	0.21	0.117	658	3,357
black scoter	0.07	0.061	232	1,577
northern shovler	0.11	0.040	331	1,523
old squaw	0.03	0.031	94	705 (c)
goldeneye spp (d)	0.04	0.035	119	534
white-winged scoter	0.01	0.008	36	253
canvasback	0.01	0.008	36	144
redhead	0.004	0.004	12	24
unidentified spp.	0.08	0.038	259	1,994
Total	5.67	0.730	17,785	95,892

(a) 3,135 square miles of brood habitat.

(b) Greater and lesser scaup broods could not be distinguished from each other.

(c) Total young for old squaw estimated using brood size data from old squaw broods observed on the Koyukuk NWR in 1984 and 1985.

(d) Common and Barrow's goldeneye broods could not be distinguished from each other.



Table 14. Estimate of the number of broods in poor habitat within the boundaries of the Koyukuk NWR during 11 July to 5 August 1986.

Species	Broods/sq.mi.		Range	Total Brood (c)
	$\bar{x}$	SE		
green-winged teal	1.17	0.477	0-3	2,409
American wigeon	1.00	0.632	0-3	2,059
pintail	0.33	0.211	0-1	679
scaup spp (a)	0.33	0.211	0-3	679
mallard	0.17	0.167	0-1	350
surf scoter	0.00	0.000	-	0
bufflehead	0.17	0.167	0-1	350
black scoter	0.00	0.000	-	0
northern shoveler	0.00	0.000	-	0
old squaw	0.00	0.000	-	0
goldeneye spp (b)	0.00	0.000	-	0
white-winged s.	0.00	0.000	-	0
canvasback	0.00	0.000	-	0
redhead	0.00	0.000	-	0
unidentified spp	0.00	0.000	-	0
Total	3.17	0.654		6,526

(a) Greater and lesser scaup broods could not be distinguished from each other.

(b) Common and Barrow's goldeneye broods could not be distinguished from each other.

(c) 2,059 square miles of brood habitat.

Table 15. Estimate of the number of broods in moderate habitat within the boundaries of the Koyukuk NWR during 11 July to 5 Aug. 1986

Species	Brood/sq.mi.			Tot. Broods (c)
	$\bar{x}$	SE	Range	
green-winged teal	3.14	1.143	0-9	2,120
American wigeon	2.00	1.215	0-8	1,350
pintail	1.57	0.571	0-4	1,060
scaup spp (a)	0.71	0.421	0-1	479
mallard	0.71	0.565	0-4	479
sur.scot.	0.57	0.429	0-3	385
bufflehd.	0.29	0.184	0-1	196
black.sc.	0.29	0.286	0-2	196
north.sh.	0.14	0.143	0-1	94
old squaw	0.14	0.143	0-1	94
gold.spp	0.14	0.143	0-1	94
white-winged s.	0.00	0.000	-	0
canvasback	0.00	0.000	-	0
redhead	0.00	0.000	-	0
unidentified spp.	0.14	0.143	0-1	94
Total	9.86	2.521		6,547

(a) Greater and lesser scaup broods could not be distinguished from each other.

(b) Common and Barrow's goldeneye broods could not be distinguished from each other.

(c) 675 square miles of moderate brood habitat.

Table /b. Estimate of the number of broods in key habitat.

Species	Broods/sq.mi			Tot. Brood(c)
	$\bar{x}$	SE	Range	
green-winged teal	1.56	0.472	0-10	626
American wigeon	2.84	0.641	0-14	1,139
pintail	1.50	0.308	0-06	602
scaup spp (a)	1.84	0.539	0-12	738
mallard	1.44	0.378	0-09	577
surf scoter	0.28	0.136	0-04	112
bufflehead	0.28	0.103	0-02	112
black scoter	0.09	0.052	0-01	36
north. shoveler	0.59	0.205	0-05	237
old squaw	0.00	0.000	-	0
gold. spp (b)	0.60	0.43	0-01	241
white-winged s.	0.09	0.069	0-02	36
canvasback	0.09	0.069	0-02	36
redhead	0.03	0.031	0-01	12
unidentified spp.	0.41	0.190	0-05	164
Total	11.47	1.952	0-40	4,668

(a) Greater and lesser scaup broods could not be distinguished from each other.

(b) Common and Barrow's goldeneye broods could not be distinguished from each other.

(c) 401 square miles of key brood habitat.

Table 17. Estimate of the number of duck broods on four trend area plots on the Koyukuk NWR in 1986.

Species	No. of Broods/1986	% change/1984-86	% change/1985-86
American wigeon	24	-21	33
green-wing. teal	18	-44	180
pintail	15	30	333
north. shoveler	15	-09	1400
mallard	10	500	-27
scaup spp. (a)	0	-100	-100
old squaw	0	-100	-100
common scoter	0	0	-100
bufflehead	0	-100	0
Total	82	-26	62

(a) Greater and lesser scaup broods could not be distinguished from each other.

Table 18. Estimated hatching dates of duck broods observed within the boundaries of the Koyukuk NWR in 1986.

Species	Hatching			
	$\bar{x}$	s	n	Range
pintail	16 June	10	151	15 May - 20 July
northern shoveler	21 June	10	31	10 June- 12 July
mallard	23 June	12	43	09 June- 19 July
goldeneye spp. (a)	29 June	09	4	17 June- 07 July
American wigeon	29 June	10	151	27 May - 24 July
green-winged teal	30 June	09	96	13 June- 19 July
bufflehead	01 July	10	8	16 June- 14 July
surf scoter	04 July	03	6	01 July- 08 July
canvasback	05 July	05	3	29 June- 08 July
scaup spp (b)	11 July	07	49	20 June- 26 July
white-wing. sco.	14 July	00	2	-- -----
black scoter	-- ----	--	---	-- -----
redhead	14 July	--	1	-- -----

(a) Common and Barrow's goldeneye broods could not be distinguished from each other.

(b) Greater and lesser scaup broods could not be distinguished from each other.

Table 19. Projected mean dates for initial flying of duck broods observed within the boundaries of the Koyukuk NWR.

species	Onset of flying		
	$\bar{x}$ 1984	$\bar{x}$ 1985	$\bar{x}$ 1986
pintail	23 August	21 August	07 August
northern shov.	20 August	10 September	10 August
mallard	22 August	02 September	18 August
goldeneye spp (a)	03 September	30 August	21 August
American wigeon	31 August	04 September	21 August
green-winged teal	05 August	17 August	09 August
bufflehead	23 August	26 August	23 August
surf scoter	-- -----	-- -----	26 August
canvasback	-- -----	-- -----	05 Sept.
scaup spp (b)	26 August	30 August	27 August
white-wing. scot.	15 Sept.	19 September	05 Sept.
black scoter	12 Sept.	11 September	-- -----
redhead	-- -----	-- -----	14 Sept.

(a) Common and Barrow's goldeneye broods could not be distinguished from each other.

(b) Greater and lesser scaup broods could not be distinguished from each other.

in brood surveys. Of the 51 plots surveyed during the duck brood survey, 32 were done from the ground and 24 from the helicopter. Five plots surveyed both from the ground and the helicopter indicate that the total number of duck broods observed by each method are comparable (Table 19). Seventy four duck broods were observed from the ground and 75 from the helicopter. The number of broods observed in each species was different. Except for mallards and goldeneyes, more surface feeding and less diving duck broods were observed from the helicopter than from the ground. The helicopter survey of the plots was done 10-13 days after the ground surveys, and part of the increase in surface feeding ducks may have been due to new broods hatching. This did not; however, seem to have been a large factor. Of the broods that could be classified from the helicopter, only one brood in class I was identified, a class IC American wigeon brood with an estimated age of 13 to 18 days.

Of the geese and grebes observed from the ground, none were observed from the helicopter. All but one brood, a red-necked grebe brood, was observed in one plot. That plot contained a lake that was only 40% inside the plot. Since the helicopter survey of this plot was not conducted until 12 days after the ground survey, there is a possibility that the geese and grebes had moved outside of the plot.

The costs of the two survey methods are given in Table 21. The cost comparison between the two methods show that helicopter surveys cost 25% more per plot than ground surveys. The comparison; however, is biased in favor of ground surveying. The methodology used for each plot was assigned arbitrarily with the more difficult, less accessible plots being done by helicopter.

Several advantages and disadvantages were noted when using each method. The ground method was slower (0.9 plots/observer/day vs. 4.0 plots/observer/day) but age classification of the young was better (of the plots surveyed using both methods, all young were classified from the ground, and only 51% of the young could be classified from the helicopter). Observability of surface feeding ducks in areas of dense emergent vegetation was better from the helicopter while the identification of diving ducks was easier from the ground. There were occasions where diving duck broods were frightened by the helicopter and could not be identified. The helicopter would cause the ducks to dive underwater and surface only long enough to replenish their air supply.

Table 20. Comparison of the number of broods observed using ground and helicopter surveys on five plots on the Koyukuk NWR in 1986.

Ducks	Ground Survey	Helicopter Survey	% Change from Ground to Helicopter Surveys
American wigeon	20	25	25
green-winged teal	18	24	33
mallard	16	02	-88
pintail	10	14	40
northern shoveler	04	06	50
bufflehead	03	01	-67
scaup spp. a	02	01	-50
goldeneye spp. b	01	02	100
Total	74	75	1
<u>Others</u>			
white-fronted goose	51 c	0	-100
Canada goose	40 c	0	-100
red-necked grebe	03	0	-100
horned grebe	03	0	-100

- a Greater and lesser scaup broods could not be distinguished from each other.
- b Common and Barrow's goldeneye broods could not be distinguished from each other.
- c The number given is for the number of individual young observed.

Table 21. The cost of ground and helicopter surveys on the Koyukuk NWR in 1986.

Attributes	Ground Survey	Helicopter Survey
<u>Expenses</u>		
Salary	\$ 5,397.68	\$ 544.00
Air Support	\$ 6,130.19	\$ 1061.04
Meals	\$ 350.00	\$ 0.00
Total	\$11,877.87	\$11,154.04
Number of plots	32	24
Cost/Plot	\$371.18	\$464.75

Several surveys of white-fronted and Canada geese were completed on the refuge. Censuses of 56.8 miles of Dulbi River and 69.0 miles of Dulbi Slough were conducted from 5 to 8 July. Geese on lakes adjacent to Dulbi River were censused from a Piper Super Cub on 9 July. A survey to obtain total population estimates on the refuge was also conducted in conjunction with the duck brood survey.

The Dulbi River was surveyed using a 15 ft. Grumman canoe and a 4 h.p. outboard motor. Overall, goose numbers and broods increased in 1986 by 84% and 289%, respectively, compared to 1985. In 1986, 794 adult and 483 young white-fronts and 184 adults and 164 young Canada geese were recorded on the Dulbi River. In addition, 600 adult and 304 young white-fronted and 16 adult and 10 young Canada geese were observed on lakes in the Dulbi River drainage (Table 22). This represents a 151% increase in white-fronted geese counts from 1985 and an 85% increase from 1984 counts. Canada geese estimates increased by 84% from 1985 and 79% from 1984. Due to the mixing of broods, only four Class Ib and one Class II white-fronted broods and eleven Class I Canada goose broods could be used to obtain mean brood size (Table 23). Average brood size for white-fronts was  $2.8 \pm 2.64$  and  $5.7 \pm 3.16$  for Canada geese (Less than 3% of the total white-fronts and 38% of the total Canada geese young are included in these average brood numbers). Table 24 depicts age classes of the young geese observed. Most of the young white-fronts found in mixed broods were classified as Ic.

As in previous years, waterfowl were considerably more abundant closer to the mouth of the Dulbi River. Nearly 83% of all geese and 93% of all ducks were observed on the last day of the survey. Canada geese appeared further upstream than the white-fronts. Whereas, 95% (754) of the adult and 88% (426) of the young white-fronts were observed on the last day, only 48% (88) of the adult and 46% (76) of the young Canada geese were seen that day.



Table 22. Dulbi River Populations

Species	1986 (7/5-8)			1985 (7/10-12)			1984 (7/4-6)		
	Adult	Young	Tot.	Adult	Young	Tot.	Adult	Young	Tot.
White-Front Geese	794	483	1,277	428	80	508	454	234	688
Canada-Geese	184	164	348	103	86	189	87	107	194
Total Geese	978	647	1,625	531	166	697	541	341	882

Lake Survey 1986 (7/9)

Species	1986 (7/9)		
	Adult	Young	Tot.
White-Front Geese	600	304	904
Canada-Geese	16	10	26
Total Geese	616	314	930

Table 23. Waterfowl brood size on the Dulbi River (5-8 July/86)

Species	Water Brood Size (1986)			
	X	S	N	Range
White-Front Goose	2.8	2.64	5	1-8
Canada Goose	5.7	3.16	11	2-10
American Wigeon	7.6	4.00	9	2-12
Pintail	6.1	4.37	8	3-7
Mallard	7.4	1.62	5	5-10
Goldeneye	-	-	1	9

a

Used only broods accompanied by one or two adults.

Table 24. Number and Age Class of Waterfowl Young on the Dulbi River (5-8 July 1986).

Species	Age Class					1986 Total #
	Ia	Ib	Ic	IIa	IIb	
White-Front-Geese		20	126	95	-	483
Canada Geese	22	62	51	29	-	164
American Wigeon		54	6			68
Pintail		8		18	23	49
Mallard		5		22	10	37
Goldeneye		9				9

a

242 young were not classified (Ib, Ic, and IIa mixed).

The Dulbi Slough was surveyed using an Avon inflatable raft and a 6 h.p. Evinrude outboard motor. This was the first year that Dulbi Slough has been surveyed in early summer. Seven hundred and eighty seven adult and 287 young white-fronted geese, 22 adult Canada geese, one adult and two young snow goose, (or snow goose white-fronted goose hybrids) and 14 unidentified adult geese were observed. The young creme colored geese identified as snow geese young were observed in a group of 35 white-fronted goose young. The parents of the young are not known, but at least one was assumed to be the adult snow goose that was observed near by.

Most of the geese were observed in the upper parts of the slough. The upper 55% of the slough contained 93% of the adult and 90% of the young white-fronted geese and all of the Canada and snow geese observed.

The average brood size of white-fronted geese was 5.5 (Table 25). One hundred and twenty four of the white-fronted young were classified into age classes (Table 26). Most of the young, 78%, were in class IIA.

Table 25. Waterfowl brood size on the Dulbi Slough during 7-8 July 1986.

Species	x	s	n	Range
white-front. goose	5.5	3.82	8	2-13
snow goose	2	-	1	-
mallard	9.0	0.00	2	-
northern pintail	4.8	2.50	46	2-14
American wigeon	6.1	1.86	35	2-10
northern shoveler	7.0	2.83	2	5-9
green-winged teal	7.2	2.59	26	2-12

Table 26. Number and Age Class of Waterfowl young classified on the Dulbi Slough during 7-8 July 1986.

Species	IA	IB	IC	IIA	IIB	IIC	III
white-front. goose	0	4	5	97	18	0	0
mallard	0	0	0	18	0	0	0
northern pintail	10	21	0	67	48	54	8
American wigeon	68	86	27	28	0	0	0
northern shoveler	0	5	9	0	0	0	0
green-winged teal	86	15	0	53	15	0	0

The survey to determine total geese populations on the refuge was conducted using a combination of censusing river corridors and stratified random sampling of lacustrine habitat. Riverine habitat was censused on 18 and 22 August in a Piper Super Cub flying at 500 feet over river and slough corridors, oxbow lakes, and Boat Lake. Lacustrine habitat was sampled using 33 square mile plots optimally allocated into three strata. Plots were censused with the aid of binoculars by walking, from a canoe, or by helicopter.

The estimate of the number of geese within the boundaries of the Koyukuk NWR in 1986 was 5352 for white-fronted geese and 1049 for Canada geese (Table 27). The increase in Canada geese observed in 1986 over 1985 came primarily from an increase in the number of Canada geese observed in the square mile plots in the non-riverine area (Table 28). The estimate of the number of Canada geese in the non-riverine area in 1985 was zero and in 1986 it was  $781 \pm 725$  (SE).

The distribution of geese in the riverine area in 1986 was different from 1985. In 1985, Dulbi River, Huntington Slough, Three Day Slough, Boat Lake, and Kateel River contained 73% of the observed white-fronted geese and 100% of the observed Canada geese. The 58 miles of the Koyukuk River above the refuge administrative cabin that was not surveyed in 1985 was surveyed in 1986. Not including the 58 miles, only 13% of the white-fronted and 30% of the Canada geese were observed in those areas in 1986. The main concentration of geese observed in 1986 was on the Koyukuk River. Sixty eight percent of the white-fronted geese and 50% of the Canada geese were observed there, compared with 14% and 0% respectively in 1985.

The change in distribution was probably a function of the date of the survey. The 1986 survey occurred eleven days later than in 1985, and the geese were probably staging on the Koyukuk River prior to migration south.

Table 27. Estimate of the number of geese within the boundaries of the Koyukuk NWR in 1985 and 1986.

Species	1985		1986	
	N	SE	N	SE
White-fronted geese	6573	3189	5352	2081
Canada geese	170	-	1049	725

Table 28. Estimate of the number of geese per square mile in riverine and non-riverine habitat on the Koyukuk NWR.

Species	Riverine a		Non-riverine b			
	1985	1986	1985	1986	1985	1986
	x	x	x	SE	x	SE
White-fronted geese	3.64	3.437	1.46	1.090	1.19	0.785
Canada geese	0.27	0.421	0.0	0.00	0.29	0.273

a Estimates obtained from aerial census

b Estimates obtained from random sampling

Both tundra and trumpeter swans occur on the refuge. Previously it was thought that only trumpeters nested in the area; however, in 1984 a tundra swan nest with 5 eggs was found on the refuge. It now seems that tundra swans are more numerous on the Koyukuk NWR than trumpeter swans.

To aid in determining the proportion of each species on the refuge, all known or suspected swan habitat on four 1:63,360 USGS topographic maps was surveyed from a Piper Super Cub during 10 to 20 June. Sixty adult swans and 15 nests were observed. During 1 to 3 July, attempts were made to identify the nests from the ground. Of nine nests that could be identified, eight were tundra and one was a trumpeter swan nest.

#### 4. Marsh and Water Birds

Common, Arctic and red-throated loons; red-necked and horned grebes; and sandhill cranes were observed on the refuge in 1986. No population estimates were made for these species. Reproduction by red-throated loons was observed for the first time by refuge staff. Two pair of broody adults and one adult with one young were observed.

#### 5. Shorebirds, Gulls, Terns and Allied Species.

Numerous shorebirds inhabit the Koyukuk NWR. Those species observed in 1986 included lesser golden plover, semipalmated plover, Hudsonian godwit, lesser yellowlegs, spotted sandpiper, long-billed dowitcher, red-necked phalarope, and pectoral sandpiper. Common snipe were abundant and were observed on 18 of 45 one-square mile waterfowl survey plots. Mew gulls were numerous on the refuge, with Bonaparte's, glaucous-winged, and glaucous gulls present in lesser numbers. Long-tailed jaegers and arctic terns were also common on the refuge.



Shorebirds, such as this Hudsonian godwit, are not always found along shores.

MDM





Refuge staff observations of red-necked phalaropes were up this year. MDM

#### 6. Raptors

The refuge has nesting populations of harrier hawks, merlins, rough-legged hawks, sharp-shinned hawks, northern harriers, red-tailed hawks, goshawks, great horned owls, great gray owls, boreal owls, and hawk owls.



Great-horned owls are common on the Koyukuk NWR. MDM



Two active bald eagle nests were observed near lakes adjacent to the Koyukuk River. Two eaglets were observed in each nest.



A second active bald eagle's nest was discovered on the Koyukuk NWR this year. MDM

#### 7. Other Migratory Birds

Numbers and species composition of passerine birds fluctuate with the seasons. Redpoll, common raven, blacked-capped and boreal chickadees, and pine grosbeaks are common winter residents. Species seen in the spring and summer include alder flycatcher, olive-sided flycatcher, tree swallow, gray jay, robin, gray-cheeked thrush, Bohemian waxwing, yellow warbler, rusty blackbird, savannah sparrow, dark-eyed junco, tree sparrow, white-crowned sparrow, fox sparrow, Lincoln sparrow, and song sparrow.

#### 8. Game Mammals

Moose are presently the most important game and subsistence mammal on the Koyukuk NWR. They are found in almost all refuge habitats, but are most numerous in the riparian habitat along the Koyukuk River and its major tributaries. Historically, moose arrived in the area where the refuge now exists in the early 1940's and following Federal wolf control efforts, have been abundant during the past 30 years. Average moose densities are estimated to be .5-1.0 moose/sq. mi. for the entire refuge with



known densities of up to 6 moose/sq. mi. occurring in optimum riparian habitat. (See Figure 7).



The moose twinning rate was up in 1986.

MLN

Three major projects pertaining to refuge moose populations were conducted during the year. A hunter check station was set up on the lower Koyukuk River during the September hunting season. The telemetry study initiated in 1984 was continued and aerial moose surveys were conducted in November.

ADF&G Area Game Biologist Osborne has conducted a hunter check station on the Koyukuk River just south of the refuge boundary for the past five years. A total of 111 moose were checked. This compares to a total of 70 moose in 1985.

Information collected at the check station in past years indicates bull moose in the Koyukuk drainage of Subunit 21D have larger antler spreads and attain large spreads at an earlier age than most interior Alaska moose. Age and antler spread data from 72 moose killed in the Koyukuk drainage in 1982 indicated that Koyukuk moose attain the 50-inch average at 4.5 years, 1.25 years earlier than moose in the Nowitna drainage and 1.5 years earlier than moose harvested from Units 12 and 20. The 60-inch average is attained at nine years of age along the Koyukuk. The Koyukuk moose are similar to Seward Peninsula moose with respect to their antler spread and early attainment of the 50-inch average size. This similarity is expected since moose are



thought to have emigrated from the Koyukuk area to the Seward Peninsula during the last 30 years.

A three year moose telemetry study was initiated in the Three Day Slough area of the refuge in 1984 to investigate: (1) moose movement patterns and distribution on and between ranges. (2) mortality rates and causes and (3) seasonal habitat use and preferences. The study is a cooperative effort with ADF&G.

Prior to the initiation of the moose study, it was believed that a substantial portion of the moose were only seasonally utilizing the study area. High concentrations of moose were believed to be in the area from May to December. The first two years of the study has shown this not to be the case. Several of the collared moose leave the Three Day Slough area during the summer months, but return in the fall. Only one collared moose, a bull, doesn't remain in the Three Day area for the majority of the year. One mortality occurred during the year. Bull # 18 was shot during the fall hunting season. Four moose were collared in April with recovered collars from the four 1985 mortalities. Of the twelve collared cows, seven were observed with calves when located in mid June. All seven of these calves survived through the end of the year.

Since 1981, ADF&G Biologist Osborne and refuge staff have been aerially surveying moose on the refuge using a trend area method developed by the state. Trend areas are 40-60 square miles in size and are comprised of several 12-15 square mile sample units. One-quarter mile wide transects are flown over sample units at 60-80 mph and at elevations of 300-500- feet. When animals are observed, they are circled at low elevations in order to be accurately classified. Classifications include yearlings, medium and large bulls, calves, and cows.

Only two trend areas were surveyed in 1986. We helped out the Nowitna NWR during their moose stratification census work from November 17-22 and then bad weather precluded us from getting any more trend areas surveyed. The two trend areas we did get surveyed were Batza Slough and Three Day Slough. Pilot Rost/ARM Lons surveyed Batza Slough trend area on November 12-13 and State Biologist Osborne, surveyed Three Day Slough on the same days. (See tables 28 and 29).

Figure 7. Moose Distribution and Densities Per Square Mile.

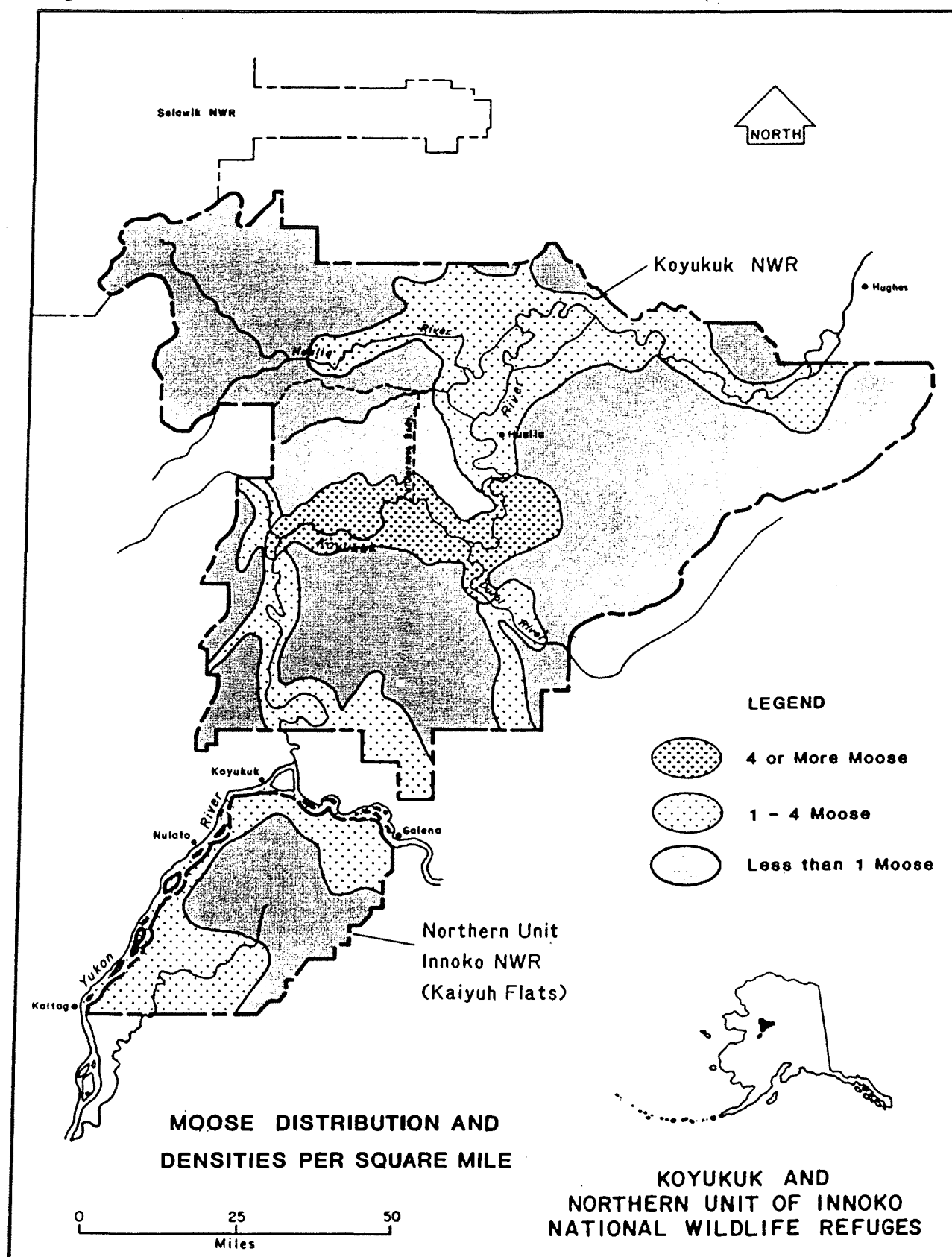


Table 29: SUMMARY OF MOOSE SURVEYS IN KOYUKUK NATIONAL WILDLIFE REFUGE IN 1986 (Sex and Age Rates)

Trend Area	SU#	Date	Total Moose	Moose Seen	Search Effort	Total Bulls	Yrlg Bulls	Yrlg Bulls	Calves	Calves	Twins	Calf
				per Sq Mi	(min./ Sq Mi)	per 100 F	per 100 F	% in Herd	per 100 F	per 100 F =2 yrs	per 100 F w/Calf	% in Herd
Three Day Slough	1	11/12/86	113	8.43	4.85	41	18	9	61	74	11	30
Three Day Slough	2	11/12/86	98	9.70	7.13	37	0	0	35	35	6	20
Three Day Slough	3	11/12/86	82	5.90	4.32	55	10	5	40	45	15	21
Three Day Slough	4	11/12/86	86	5.45	5.25	18	7	5	36	38	21	23
Three Day Slough	5	11/12/86	114	5.71	5.71	50	5	3	47	49	29	24
Three Day Slough	6	11/12/86	157	10.19	6.17	38	4	3	38	40	15	22
Batza Slough	1	11/13/86	15	.80	3.97	8	0	0	15	15	0	13
Batza Slough	2	11/12/86	18	1.16	5.10	42	8	6	6	9	0	6
Batza Slough	3	11/12/86	33	1.78	5.89	55	0	0	6	6	0	6

Table 30. SUMMARY OF MOOSE SURVEYS IN KOYUKUK NATIONAL WILDLIFE REFUGE IN 1986 (Herd Composition Data)

Trend Area	SU#	Date	Sm Bull	Med Bull	Lg Bull	Total Bull	Cows w/0 Calf	Cows w/1 Calf	Cows w/2 Cal.	Cows w/3 Cal.	Total Cows	Total Adult	Lone Cal.	Total Cal.	Unid	Total Moose	Area in SqMi	Time in Min
Three Day Slough	1	11/12	10	8	5	23	25	28	3	0	56	79	0	34	0	113	13.4	65
Three Day Slough	2	11/12	0	20	1	21	38	18	1	0	57	78	0	20	0	98	6.1	72
Three Day Slough	3	11/12	4	9	10	23	27	13	2	0	42	65	0	17	0	82	13.9	60
Three Day Slough	4	11/12	4	4	2	10	39	14	3	0	56	66	0	20	0	86	15.8	83
Three Day Slough	5	11/12	3	14	12	29	36	17	5	0	58	87	0	27	0	114	14.7	84
Three Day Slough	6	11/12	4	14	16	34	50	34	5	0	89	123	0	34	0	157	15.4	95
Batza Slough	1	11/13	0	1	0	1	10	2	0	0	12	13	0	2	0	15	18.9	75
Batza Slough	2	11/12	1	2	2	5	11	1	0	0	12	17	0	1	0	18	15.5	79
Batza Slough	3	11/12	0	5	6	11	18	2	0	0	20	31	0	2	0	33	18.5	109
Totals for selected sample units:			26	77	54	157	254	129	19	0	402	559	0	157	0	716		

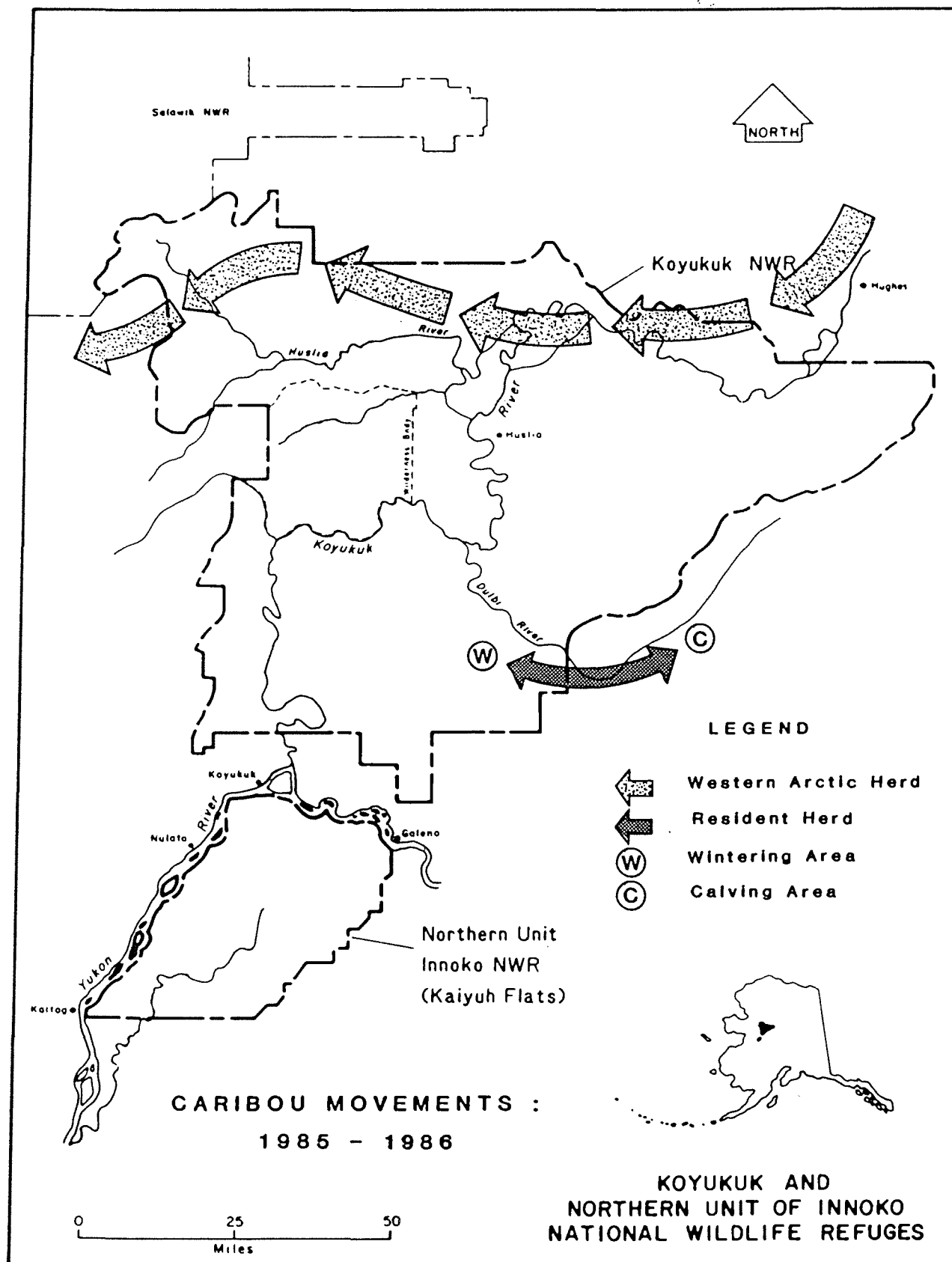
The ranges of two herds of caribou include portions of the Koyukuk Refuge. The southern edge of the range of the western Arctic herd, the largest caribou herd in Alaska, is in the refuge. Current distribution patterns may change if herd size increases. In winter of 1985-86, an estimated 1,000 caribou from the Western Arctic herd migrated through the refuge north of Huslia, some of which wintered on the refuge. This is the first time caribou have come so far south in several decades. The Western Arctic herd had been growing steadily since its crash in the 70's. Figure 17 displays caribou distribution on the refuge.

In addition, a smaller caribou herd (200-300) winters on the refuge in the Hozatka Lake area. This herd summers on BLM lands in the mountains and hills east of the refuge. On April 9, refuge staff and State Biologist Osborn assisted BLM Biologist Scott Robinson in radio collaring five caribou from this herd. The station's super cub was used to locate and help keep track of the caribou while the helicopter crew was darting. Three bulls and two cows were collared. Unfortunately, one of the cows suffered a capture related death. She was found dead during the first relocation flight on May 5 very close to where she had been collared.



The ranges of two herds of caribou include portions of the refuge. DRL

Figure 8. Caribou Movements: 1985-1986.







This wolf observed on the bank of the Dulbi River appears to live up to the old "hungry as a wolf" expression. MLN

Wolves range throughout Koyukuk refuge and the northern unit of Innoko refuge. Though wolves prey on a variety of species, they are primarily dependent on large ungulates. Their numbers tend to respond to population fluctuations of the large ungulates on which they prey. In addition to prey numbers, harvest intensity of wolves is another factor determining the wolf population of an area. Koyukuk NWR and the northern unit of Innoko NWR currently have both healthy moose populations and healthy wolf populations.

A refuge wolf study was initiated in April. Although there have been numerous studies done on wolf prey relationships in Alaska, Canada, and the lower 48 states such as Minnesota and Michigan, it is apparent that the relationship varies greatly from one area to another. No prior wolf/prey studies have been done in this part of interior Alaska. To date, the refuge has not been involved with the controversial wolf control issue. However, with time we will certainly be faced with important management decisions regarding wolf control. The objectives of the study are: 1) determine pack sizes, location, home ranges, and general age classes of three wolf packs on the refuge 2) determine seasonal habitat use and preferences, including denning areas and 3) develop estimate of wolf/prey relationships.

To collar the wolves we chartered a Bell Jet Ranger helicopter from Trans Alaska Helicopter, Inc. from Anchorage. We had a "Cap Chur" dart gun and were using M99 (etorphine hydrochloride) with ace promazine as an immobilizing drug. M50-50 was used as the antagonist drug.

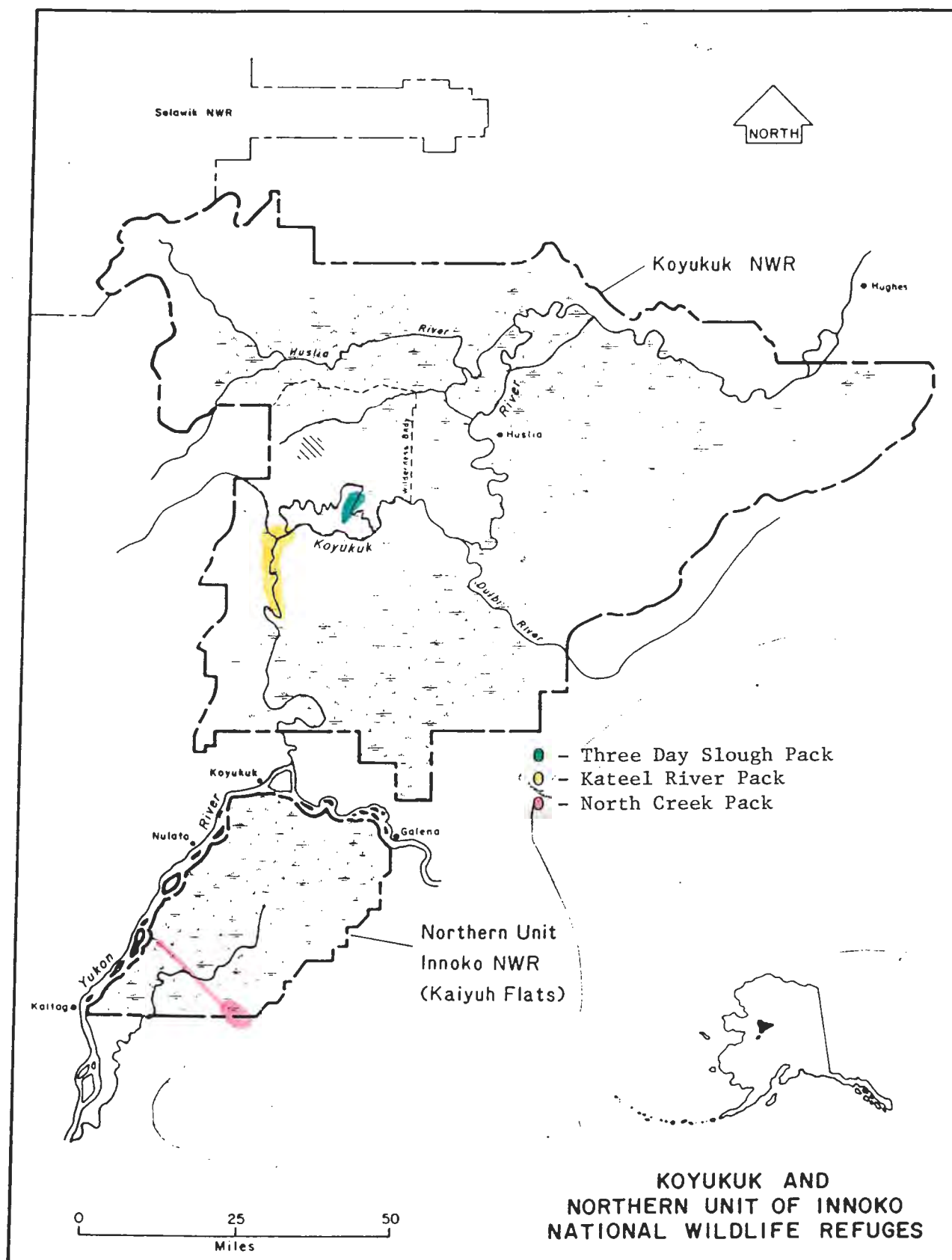
Our plan was to collar the wolves after helping BLM collar five caribou and after we rehung four moose collars. On April 10, while rehanging the moose collars in the Three Day Slough, our supper cub pilot, Brownie, spotted a lone wolf.

The wolf was a young female and gave us a long chase before being darted. Within a few seconds after being darted, she was down and convulsing. Chest compressions and "mouth to muzzle" respirations were needed to keep her alive for the first few minutes. Three cc of M-99 (plus .5cc of ace promazine) proved to be an overdose probably due to her small size and exhausted condition after the long chase. We dropped back to 2 & 1/2 cc of M-99, and didn't have any more trouble. We collared the last two moose that same day and then started seriously looking for wolves. We searched the next two days with no luck. Then Saturday night we received .1" of fresh snow. Although not ideal tracking snow, it was enough to give us the edge. We were able to get another wolf collared during the first hour of flying Sunday morning. This was an adult male up at Kateel River. Another wolf was originally with the one we got, but it managed to disappear while we were working on the first one. We got the third wolf in the Kaiyuh Flats later that same day. It was another male which was travelling alone. Apparently most of the packs had already broken up before we started the project.

We did not observe the Three Day wolf (W-1) with other wolves until October 30. The first time we saw the Kaiyuh Flats wolf (W-3) in a pack was on December 12 and the Kateel River wolf (W-2) was still, apparently travelling alone at year's end. All three wolves observed ranges were a lot smaller than we had anticipated (See figure 9).



Figure 9. Radio-collared wolf pack territories.





Canine tooth measurement as well as . . . . .DRL



other physical data such as contour body length, tail length, girth, shoulder height, estimated weight and color was recorded while the wolves were immobilized.

T00



State Game Biologist Osborne administering the antagonist drug,  
M50-50. DRL

Black bears are common throughout most of the refuge. The population was seeming to decline for the past several years until last year when many more observations were made during our field work. Rod King, a Service biologist who regularly conducts statewide aerial waterfowl surveys believes that the Koyukuk Refuge may have the highest black bear population in the state.





Sometimes black bears belie their common name.

MDM



Grizzly bears are not common on the refuge. They are most commonly observed at higher elevations on the refuge: however, they can be found just about anywhere.

DRL

Important furbearers on the refuge include marten, beaver, lynx, wolverine, red fox, mink, river otter and some coyotes. Little is known about the distribution and populations status of these species. A beaver cache survey on several refuge streams was conducted in early November.

#### 10. Other Resident Wildlife

Willow and rock ptarmigan occur on the refuge. Willow ptarmigan numbers increased tremendously during the past year. Rock ptarmigan occur at the higher elevations of the refuge. Spruce and ruffed grouse are also common inhabitants of the refuge. Porcupine, short-tailed weasel, muskrat, snowshoe hare, red squirrel and other small mammals may also be found. Little is known about population levels or geographic distribution.

The only known amphibian present is the boreal frog. This species appears numerous in shallow refuge ponds in the southern end of the refuge and may be found throughout the refuge as baseline data is gathered.

#### 11. Fishery Resources

Anadromous species found in the Koyukuk River include chum, chinook, coho, sockeye and pink salmon. Chum salmon, summer and fall runs, and chinook salmon are the primary subsistence fish of the refuge. Coho and sockeye are occasionally found and pink is a rare occurrence.

Freshwater species found on the refuge include sheefish and burbot, both of which are important subsistence species. Other species which occur are broad whitefish, humpback whitefish, Alaska blackfish, least cisco, Arctic grayling, longnose sucker, northern pike, and ninespine stickleback.

A total of 22 lakes were surveyed on Koyukuk NWR during 1985, by Fishery Resources personnel from Fairbanks. This was in conjunction with an ongoing study for characterizing lake fisheries habitat on Interior Alaska National Wildlife Refuges. A progress report of the survey was completed in 1986. It stated that the presence of fish populations in Interior Alaska lakes is primarily dependent on the presence of river connections, as fish were found in all lakes with river connections. Fish were also collected from all oxbow lakes. In oxbow lakes not connected to rivers, the presence of fish may be related to their close proximity to large river channels, and initial colonization pathways through prior connection to rivers along with adequate depth to provide for overwintering.

Northern pike was the most frequently occurring species collected. Other species commonly collected included broad whitefish, humpback whitefish, and least cisco. Species found in lowland and oxbow lakes were generally similar.

Significant difference in total fish catch per-unit-effort (CPUE) was found where the data was grouped by lake type and flood probability. Results of a Newman-Keuls Test indicated two groupings with lowest values including a group formed by lowland-low flood probability lakes, oxbow lakes and foothill lakes and with highest values in a group formed by lowland-high flood probability lakes, oxbow and foothill lakes.

CPUE appears to be related to the proximity of lakes to large river channels and where fish can gain access to these waters from the rivers. This is apparent by the high mean total CPUE value for lowland-high flood probability lakes. Oxbow lakes also meet these requirements; however, the much lower mean CPUE value might suggest a difference in productivity levels between these lakes and lowland-high flood lakes.

#### H. PUBLIC USE

##### 1. General

The major public use is subsistence in nature and conducted by people living near or within the exterior boundaries of the refuge. This includes residents of Galena, Huslia, Koyukuk, Kaltag and Nulato. In addition to hunting, fishing and trapping, other subsistence activities include berry picking and wood cutting. Sport hunters and fishermen from Anchorage and Fairbanks use the refuge to a lesser degree.

No new cabin permits were issued during 1986.





There is limited use of dog sled teams to run traplines on the refuge, but most teams are used for racing and are purely recreational.

#### 8. Hunting

Moose and black bear are the major sport and subsistence species hunted on the refuge. However, ducks, geese, snowshoe hare, grouse, ptarmigan, sandhill cranes, caribou and grizzly bears are also taken. While total take for most species is unknown, subsistence studies in Huslia, Hughes, and Koyukuk during the last several years has given us a good feel for the subsistence harvest.

Most of the refuge is also covered by the Koyukuk Controlled Use Area established by the Game Board which closes the area "during all open moose hunting seasons to the use of aircraft in any manner for hunting moose, including transportation of moose hunters into or within this area, and the transportation of moose parts to or from this area."

#### 9. Fishing

Fisheries resources provide a very important source of protein for local residents. The subsistence studies done in Huslia, Hughes, and Koyukuk in the past several years show an annual harvest from 14,000 to 22,000 salmon. The summer chum salmon run accounts for the bulk of fish harvested for subsistence. Most are preserved by drying or smoking. King salmon and fall chums are also important but runs are smaller. Sheefish, whitefish, grayling and pike are also harvested by local subsistence users. There is no commercial fishing on the refuge.

Most fish harvested for subsistence are taken in set nets. Fish wheels are not used on the Koyukuk River. Blackfish are taken in funnel traps and burbot are taken with nets or trot-lines set under the ice in the winter.

In addition to being eaten by people, summer chums are also commonly fed to dogs and used as trapping bait.

Sport fishing is usually done in conjunction with hunting trips by non-local residents, however, there is some sport fishing by residents of Galena. Northern pike, grayling and sheefish are the primary species caught.

#### 10. Trapping

Trapping provides an important source of cash for residents of the villages of Hughes, Huslia, Koyukuk, Nulato, Kaltag and Galena. 805 beaver, 93 lynx, 21 wolves, 13 otter and 16 wolverine were reported taken last year on the refuge. The total number of marten trapped on the refuge is not known, but marten are the most important fur animal in terms of numbers harvested. Most of the fur is sold, however, some is used for the making of hats, mittens, boots, parkas and ruffs on parkas. Beaver are also important as food items.

Traplines are not registered but are generally passed down from generation to generation within a family. Thus, claim for a certain area for trapping is recognized and respected by other local residents and disputes are not common, however, they can be very heated when they do occur.

Beaver trapping is treated slightly different from other trapping in that beaver areas are often shared by several people, perhaps because of their importance as a food item.

Snowmobiles are the primary means of transportation for trapping with a few individuals traveling up to 200 miles round trip on the trapline. Dog teams are used by a few trappers and some simply walk their traplines. Marten are taken using pole sets and cubby sets. Beaver are taken with snares through the ice and more wolves are shot than actually trapped.

Under State law, wolves can be taken on a trapping license with the use of an airplane. The airplane must land and the "trapper" must get out of the plane prior to shooting. This is commonly referred to as "land and shoot wolf hunting" as opposed to aerial hunting. Each year in late winter, several land and shoot wolf hunters come to Galena from Anchorage and Fairbanks, much to the consternation of some locals. In addition to wolves, they also take wolverine, fox and lynx. The problem arises in that they do not know where active subsistence traplines are located and conflicts occur. There is also the temptation to shoot while airborne or herd animals into large lakes or openings suitable for landing. The magnitude of harvest by this method is not known.

## 12. Other Subsistence Activities

Berry-picking and woodcutting are important subsistence activities in addition to hunting, trapping, and fishing. Cranberries, both low and high bush, and blueberries provide the bulk of the berries used. The cutting of dead trees for firewood is permitted. Special Use Permits are required for cutting of house logs. No permits were issued for house logs in 1986.

## 17. Law Enforcement

Law enforcement patrols by boat and aircraft were conducted during the fall moose season. Air patrol was limited due a lack of a pilot for most of the season. RM Nunn flew a highly visible air patrol on the first day of the season to maintain the integrity of the Koyukuk Controlled Use Area. ARM Lons patrolled the lower Koyukuk River and assisted at the ADF&G moose check station during September 16-18.

ARM Lons, while bird hunting on September 1 near Galena, found where a yearling bull moose had been poached. The information was given to Wildlife Protection Officer Foster.

On September 15, ARM Lons took Officer Foster up to Bishop Creek in the refuge riverboat to inspect the site of a wanton waste moose case involving Galena AFB personnel.

An illegally built cabin was found by refuge staff on the northern unit of Innoko NWR in late September of 1985. The cabin was on Cook Island and was built by Robert Attla, a Galena resident. Mr. Attla was notified that he would have to remove the cabin and his belongings not later than 60 days from the date the Yukon froze on December 31, 1985, whichever came later. We checked the site in January 1986 and he had moved the cabin off the refuge.



## I. EQUIPMENT AND FACILITIES

### 1. New Construction

Three new residences were constructed in Galena for refuge staff. Straub Construction from Anchorage was awarded the contract in April for the residences at a cost of approximately \$200,000 apiece. Mr. Straub and Engineer Rhodehamel met with refuge staff on April 28 and 29. By the end of April the contractor had cleared the lots and had subcontracted to have the pilings put in. Construction went fairly smoothly and the houses were nearly completed by early September. Completion and the acceptance inspection occurred in October with the residences being occupied on October 26.



One of the newly constructed refuge staff residences just prior to being finished. DRL

These residences are quite luxurious by Galena standards and are a real pleasure to live in. Built in garages and a large storage/workshop area are great deterrents to getting cabin fever during the long cold winters of this area.

The fuel oil/hot water boiler heating systems have been giving us some trouble and is really the only serious problem to date with these houses. The furnaces sometimes shut off for unknown reasons, pressures in the system are hard to maintain and the circulating pumps jamb or fail due to "crud" in the system. Hopefully, we can get the bugs worked out before next winter.

Also the wood stoves in the living room were installed incorrectly and we are waiting for them to be reinstalled so that we can use them.

### 3. Major Maintenance

Speaking of heating system problems.....the duplex furnace's fuel pump was a victim of a "brown out" and failed on November 26. Several water pipes froze on November and burst. The full extent of the damage hasn't been determined, but it is going to be in the thousands of dollars. Galena Plumbing installed a small "Monitor" furnace to keep the duplex above freezing for the remainder of the winter. The repair work will be completed next spring.



#### 4. Equipment Utilization and Replacement



Koyukuk and Nowitna share the use of Nowitna's Cessna and.....MDM



Koyukuk's Super Cub. These planes are the key to accomplishing our field work.

GRR

### 5. Communication Systems

Another year has gone by and we still do not have a good communications system. This field season was an improvement since we at least had five King VHF 5-watt portable hand held radios. They were a great help for short range air to ground communication, but we still need a good long range system. Our FY-87 budget has \$55,000 for a new system. Hopefully, it will work!

### J. OTHER ITEMS

#### 3. Credits

ARM Lons wrote the introduction and sections A, B, C, D, E, F1-3, G8 and 10, H, I, and J. FMO Motschenbacher wrote sections F9, 12, G1-7 and 11. RM Nunn wrote section K and edited the report. Refuge Secretary White typed the entire report.



## K. FEEDBACK

### In the aftermath of the CCP

My first experience with the Comprehensive Conservation Plan process (CCP) was at Izembek. At first I was skeptical that a lot of effort and money would be spent writing a plan that would sit on the shelf and gather dust. Various people in the R.O. assured me that this was not the case and that this would be the "Plan to end all Plans." In theory the plan would provide direction for refuges for 20 years with only minor fine tuning every 5 years or so.

It has taken several years for the CCP process to evolve and at every opportunity it seems that it was water-downed or made more non-committal to the point that the latest plans are 99% boiler-plate and are so insignificant that they have not been sent out for review by other refuges and I seriously doubt that they have been reviewed by supervisors in the R.O.

By last December at the project leaders meeting, the concept of "step down" plans was the sacred cow, occupying the position recently vacated by the CCP. The "step down" management plans would do what the CCP was originally designed to do, but didn't. In a year or two I suspect there will be another "plan" to accomplish what the "step down" failed to accomplish.

My point is that millions have been spent on a planning exercise that was in many cases ineffective and at the very least did not receive adequate guidance and review from decision makers in the R.O. As a result most of these plans will remain on the shelf - collecting dust.

We should learn from our mistakes and not repeat them. We were mandated to do the CCP's, and we're meeting that mandate; although, at extreme expense in terms of dollars and time. We have no mandate to do step down plans. We should do only those that are absolutely necessary, and keep them as simple and as inexpensive as possible.

If management plans were looked at and culled as closely as study proposals are, we would probably ensure that the "Plan to end all Plans" does not become the "Mother of all Plans" and the population explosion of planning exercises spawned by the CCP mandate can be held in check.