

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

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# KOYUKUK/NOWITNA REFUGE COMPLEX

Galena, Alaska

# ANNUAL NARRATIVE REPORT

Calendar Year 1995

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## ANNUAL NARRATIVE REPORT

1995

### **KOYUKUK NWR**

# NORTHERN UNIT, INNOKO NWR

# KOYUKUK/NOWITNA NATIONAL WILDLIFE REFUGE COMPLEX

Galena, Alaska

**REVIEW AND APPROVALS** 

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<u>5-2-97</u> Date

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<u>08/30/2</u>004 Date

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## **INTRODUCTION**

This Annual Narrative Report is for the Koyukuk, Northern Unit of Innoko and Nowitna Refuges. These three refuges are administered collectively as the Koyukuk/Nowitna Refuge Complex. Narrative items common to all three units are discussed in the Koyukuk and Northern Unit of Innoko report. Any additional events are reported in respective sections.

The **Koyukuk National Wildlife Refuge** (NWR) 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. This refuge lies within the roughly circular floodplain basin of the Koyukuk River. The extensive forested floodplain is surrounded by hills 1500' - 4000' to the north, east, and west, and the Yukon River to the south.

The Koyukuk NWR was established December 2, 1980 with passage of the Alaska National Interest Lands Conservation Act (ANILCA). The refuge was established and is managed for the following purposes:

- 1. To conserve 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 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.

The refuge contains a 400,000 acre wilderness surrounding the 16,000 acre Nogahabara Sand Dunes, one of only two active dune fields in Alaska. Access to the refuge is by boat, aircraft, or snowmobile.

The Northern Unit of the Innoko NWR (known locally as the Kaiyuh Flats) encompasses 750,800 acres. Located south of the Yukon River, its northeastern boundary is directly across the river from the town of Galena. The Innoko Refuge was also established by ANILCA and is characterized by a wide, lowland interlaced by sloughs, creeks, and lakes. The gently rolling foothills of the Kaiyuh Mountains along the southeastern border rise to 2,000 feet. Only the first purpose for the Northern Innoko Refuge differs from the Koyukuk Refuge. This purpose is: 1. To conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, waterfowl, peregrine falcons, other migratory birds, black bear, moose, furbearers, and other mammals and salmon.

Vegetation types of the Koyukuk and Northern Innoko units are typical of the boreal forest or taiga of interior Alaska. The lowland boreal forest of spruce, birch, and aspen gradually merges with tundra vegetation near 3,000 feet. Black spruce bogs with poorly drained permafrost soils are a dominant feature of the area. Large pure stands of white spruce can be found along rivers where soils are better drained. Dense willow and alder are common along the rivers and sloughs. Winter ice scours sand bars which promotes a lush regrowth of vegetation each year. Numerous fires have set back vast areas to earlier seral stages consisting of aspen, birch, and willow. The most prominent characteristic of these refuges is the extensive mosaic of the vegetation types.

One of the greatest wildlife values of the Koyukuk and Kaiyuh is its productive breeding habitat used by waterfowl from the four migratory flyways. Thousands of waterfowl, primarily wigeon, pintail, scaup, white-fronted geese and Canada geese are joined by both tundra and trumpeter swans on the lush breeding grounds each spring. Refuge streams and lakes also sustain large fish populations that support subsistence, commercial and sport fisheries. King, silver, and chum salmon migrate up the waters of the Yukon River and its tributaries, including the Koyukuk River. These three fish species are important in the region's subsistence and financial economies.

Major programs of the Complex include resource inventory, management related research, subsistence management, wildfire management, and information/education programs. Field investigations collect baseline data and quantify fish, bird, mammal, and habitat resources. An information and education program that stresses communications with the eight villages in or near the Complex is vital to the management of these natural resources.

The Complex staff currently has: 9 permanent, 3-7 temporary (varies seasonally), 2 term appointments, and 1 TAPER position. Facilities include a leased office and cold storage facility, three administrative cabins, nine government residences, and several smaller cold storage buildings.

The Koyukuk/Nowitna Refuge Complex headquarters is in Galena, a village located on the Yukon River. Galena was established about 1919 as a supply point for the mining of galena (lead sulphite ore) south of the Yukon River. Galena serves as a transportation hub for nearby villages. More like a town than a village, Galena has the advantages of direct air service to Fairbanks, modern communications, river access, two general stores, a K-12 school, health clinic, and a retail outlet for boats, motors, snowmachines and generators. The population of Galena is approximately 500 and includes approximately equal numbers of Alaska Natives and non-Natives. Many Galena residents depend on a subsistence lifestyle of fishing and hunting. The U.S. Air Force, commercial airlines and general aviation jointly use the Galena Airport. The U.S. Air Force Base formerly supported two F-15 Eagle interceptor aircraft, but the entire base was put in a"warm shutdown" status as of October 1, 1993.

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## A. <u>HIGHLIGHTS</u>

-Our study of declining White-fronted Geese continues to document decreased abundance in spite of good production. Two of three nests found in 1995 indicated that these birds can nest above the flood plain, and that perhaps production may not be as greatly affected by flooding as once believed. The study is being coordinated with Selawik and Kanuti NWRs, Division of Migratory Birds and the Canadian Wildlife Service.

-FMO Bob Rebarchik reported for duty in late September from the Wichita Mountains Wildlife Refuge in Oklahoma.

-The mildest wildfire season since 1978 brought three wildfires to the Koyukuk and one fire to the Northern Unit of the Innoko Wildlife Refuges for a total of 3,570.2 acres burned.

-Three teacher workshops were presented this year on the <u>Wetlands and Wildlife</u> and the <u>Role of Fire in Alaska</u> curricula.

-An open house at the Gisasa River salmon weir was hosted by the refuge and Fairbanks Fisheries Assistance Office. Twenty-seven people from seven villages traveled by boat to attend the event. The refuge hosted another open house at the Galena headquarters in October, which attracted over 200 people from the community. The highlight was the unveiling of the a 8' x 24' mural of a moose cow and calf in the marsh with geese flying over head.

-Our two part refuge video <u>Lands and Rivers of the Koyukon Region</u> and <u>Natural</u> <u>Resources of the Koyukon Region</u> was finally completed this year. Copies of the video will be sold through the Alaska Natural History Association book outlet. T-shirts and coffee mugs with the refuge logo have been produced and will also be sold through the outlet.

-WB Johnson co-chairs 8th Northern Furbearer Conference in Anchorage.

-Results of Wildland Fire/Furbearer studies presented at Northern Furbearer Conference (3 papers) and International *Martes* Conference in Edmonton, Alberta (2 posters).

-A bird banding station was established in Galena in association with the Monitoring Avian Productivity and Survivorship (MAPS) program.



The Galena community waits in anticipation of the unveiling of the 8' x 24' cow moose and calf silhouette mural during the refuge open house. (HJ 95)



The 8' x 24' mural is an attractive addition to the refuge office. This design has been adopted as our refuge logo. (RC 10/95)

#### **B.** <u>CLIMATIC CONDITIONS</u>

The climate of western interior Alaska is subarctic/continental with warm pleasant summer weather during June, July and August and generally cold, but calm weather from October to early April. The winters in the Galena area tend to fluctuate between periods of extreme cold (-70°F), caused by clear skies and no wind, to milder temperatures (-20°F to +20°F) with clouds, snow, and light to moderate winds. In interior Alaska the moderating effect from Bering Sea and Pacific storm fronts increases the farther west one proceeds. By late winter, the snowpack in the valley bottoms averages 2-3 feet. The months of April and May are transitional, with the arrival of most waterfowl in late April and breakup of the Yukon River ice in early to mid-May. Green-up of the trees and shrubs begins in late May. Summer daytime temperatures in the western Interior generally range from 50-70°F; however, extreme highs have exceeded 90°F. Compared to Fairbanks, summers in the Galena area are generally cooler, with more overcast skies and precipitation. Perhaps the most pleasant time of the year is late August to early October when cool nights, warm days, and dying vegetation spell the end of the bug season and the start of hunting season. Temperature and precipitation data are presented in Table B.2. Much of the data are estimates because of reduced recording by the official observer in Galena.

The movement (or non-movement) of ice on the Yukon River is always a significant climatological event in Galena. Summer made its splash this year when the Yukon River ice moved at Galena on the 2nd of May and finally went out on the 5th. This year's onset of breakup occurred earlier than the previous twelve-year record (Table B1). No significant flooding occurred on the Koyukuk and Nowitna drainages; however, water level in the Yukon increased enough to recharge Alexander Lake during breakup -Galena's float plane base. Although the total precipitation for 1995 was 3.96 inches above normal, most of the year was relatively dry except for March and May when precipitations totaled 5.13 and 2.24 inches respectively. Lower than normal precipitation and snowfall accumulations for October and November made for very dry conditions. The Yukon River and its tributaries remained open throughout October but freezing conditions were imminent by the last week of the month. The Yukon River ice stopped flowing at Galena on the 30th of October. The combination of early winter, colder than normal temperatures and the lack of snow, left the frozen landscape and the river ice without insulation during October, November, and the first half of December resulting in unusually thick ice formation. October had a snowfall accumulation of 3.72 inches that soon melted leaving the frozen landscape and the rivers without insulation from the cold. What effects this thick ice will have upon the resource remains to be seen. Late fall and early winter snowfall accumulations were lower than most years. The first snowfall of the season (trace) occurred on the 28th of September; however, the first significant snowfall did not occur until the night of December 14th with an accumulation of 10 inches. December completed the year with a total of 17.1 inches of snowfall.

	Breakup	Freeze up
	(first ice movement)	(ice stoppage)
1983	May 10	
1984	May 18	
1985	May 22	
1986	May 19	
1987	May 17	
1988	May 7	October 14
1989	May 7	October 25
1990	May 7	October 25/26
1991	May 7	November 1
1992	May 25	October 20
1993	May 12	November 3
1994	May 7	November 4
1995	May 2	October 30

Table B.1. Breakup and freeze up dates for the Yukon River at Galena, Alaska.

Table B.2. Precipitation amounts and temperatures at Galena, Alaska, 1995\*.

Month	Prec	ipitation	Temp	erature (F)
	<u>Rain</u>	Snow	Max	Min
JAN	0.42	10.5	23	-50
FEB	0.12	4.4	39	-38
MAR	5.13	0.7	42	-45
APR	0.08	0.2	51	3
MAY	2.24	0	80	27
JUN	1.67	0	78	29
JUL	1.76	0	80	36
AUG	1.76	0	74	31
SEP	1.12	0	72	26
OCT	0.59	3.7	45	-6
NOV	0.10	1.0	32	-25
DEC	1.71	17.1	16	-35
Total	16 7	37.6		

\*Weather observation for Galena does not include weekends. Weekend temperature readings are not incorporated into this table. Weekend precipitation figures are estimates based on a Monday morning reading.

The October 1993 closure of the Galena Air Force Base reduced local weather observation from full time, manual climatological monitoring to inconsistent, part time, manned monitoring and an Automated Weather Observation System (AWOS). The current system lacks manned weekend temperature readings. The AWOS had a provision to retrieve recorded temperatures during the weekend; however, it stopped functioning within a year of its installation. We, therefore, were not able to incorporate weekend temperature observations in Figure B2. Precipitation records also do not include weekend readings; however, an estimate of weekend precipitation is achieved by a single reading on the following Monday morning between 7:00 and 8:00 a.m. Maintaining a complete database of climatological records for Galena is essential to our operation but the current system at best produces only partial records often of estimated values. The inconsistency of the new system has forced us to research various options and we have "specked-out" an arctic grade, self-contained weather station with data logger and modem for future purchase. The lack of consistent and complete climatological records continues to be a problem. The nearest stations with complete records are McGrath and Tanana, both over 100 miles from Galena.

### C. LAND ACQUISITION

#### 3. Other

The Service has a Land Bank Agreement per Section 907 of ANILCA with one of the major refuge inholders - Gana 'A Yoo, Ltd., the local native corporation for the villages of Galena, Koyukuk, Nulato and Kaltag. A total of 437,000 acres of corporation land are included in this agreement. Although minor land withdrawals have been made in the past for activities such as airport expansion at the villages, no withdrawals were made in 1995. Major components of the agreement provide for management of included lands in a manner compatible with the management plan for the Koyukuk NWR and for providing of technical and other assistance to the land owner. The agreement is scheduled for renewal in 1996. Activities related to technical assistance through challenge grant funding are described in Section J.1.

The Bureau of Land Management was issued a special use permit to conduct allotment surveys on the refuge. Approximately 60 of the allotments to be surveyed are located on refuge land along the Koyukuk River. This segment of the survey was to locate a point of beginning (POB) and a full survey of the tract will be done by contract in 1996. Most of the work was done in August.

# D. PLANNING

# 4. Compliance with Environmental And Cultural Resource Mandates

Little attention has been focused on cultural resource mandates on the Koyukuk NWR due to other priorities, mandates, budgets, and human resources. The Complex's staff is particularly concerned with identifying important cultural resource sites and effecting appropriate protection. During 1995, a Cultural Resource Management Guide was developed with the aid of Archaeologist Debra Corbett and Planner Margaret "Maggi" Arend. This guide will help direct the Complex in protection and education related to these valuable resources.

Elders in Huslia, Kaltag, Galena and Nulato have been contacted concerning important areas and locations. The Batza Téna obsidian source, near the confluence of the Indian and Koyukuk Rivers, is considered by archaeologists as a world-class cultural site, deserving of special protection. The Batza Téna obsidian source has been used for at least the last 12,000 years with obsidian from this area being found in archaeological sites on the North Slope and in the Tanana Valley. The Batza Téna source is one of only three known obsidian sources in Alaska. Archaeologists from the Canadian Museum of Civilization have conducted extensive field studies of the obsidian source and their results have been summarized in the following publication:

Clark, D.W. and A.M Clark. 1993. *Batza Téna: Trail to Obsidian - Archaeology at an Alaskan Obsidian Source.* Canadian Museum of Civilization. Archaeological Survey of Canada, Mercury Series Paper 147.

Currently, archaeologists from the U.S. Bureau of Land Management are continuing studies of the site and are operating under a special-use permit from this Complex.

# 5. Research and Investigations

The following approved refuge wildlife studies were active during 1995. Progress reports are available from the Complex office or the Regional Office Library. A brief report from each study is included in the appropriate sections of the Koyukuk and Nowitna narratives.

Seasonal movements and home range of three wolf packs on the Koyukuk National Wildlife Refuge.

This project was initiated in the spring of 1990. Primary objectives of the study were to determine pack sizes, location, and home range size, seasonal habitat use, and to develop an estimate of wolf/prey ratios in an area of known prey density. The study





BLM Archaeologist Mike Kunz holds obisidian samples at a study site near the Little Indian River in the NE corner of the refuge. (94 PL)



also included three radio-collared packs on the Nowitna NWR. A progress report was completed in 1992. Additional collars were deployed in February 1994 to monitor trends in the wolf population. Recent progress is reported in Section G.10.

Nesting ecology and habitat requirements of white-fronted geese (Anser albifrons).

This study was originally proposed and approved for the Nowitna in 1987. One season of field work occurred in 1987 and a progress report was completed in 1988. The study was then moved to the Koyukuk in 1991 because of historically low numbers of the species on the Nowitna, and the indication of a decline from former abundance on the Koyukuk. Progress reports were written in 1992, 1993, 1994 and 1995. Results of the 1995 work are reported in Section G.3.

# E. ADMINISTRATION

## 1. <u>Personnel</u>

## a. Permanent

- 1. Thomas J. Eley, Jr., Refuge Manager, GS-485-13, EOD 5/2/94, PFT
- 2. Michael A. Spindler, Refuge Operations Specialist/Airplane Pilot, GS-485-12, EOD 2/11/90, PFT
- 3. Paul A. Liedberg, Refuge Operations Specialist/Airplane Pilot, GS-485-12, EOD 2/11/90, PFT
- 4. Peter G. DeMatteo, Refuge Operations Specialist, GS-485-9, EOD 12/01/91, PFT
- 5. Walter (Buddy) N. Johnson, Wildlife Biologist, GS-486-11, EOD 5/21/89, PFT
- 6. Robert A. Rebarchik, Fire Management Officer, GS-401-11, EOD 9/3/95, PFT, transfer from Witchita Mountains NWR
- 7. Colin B. Brown, Airplane Pilot, GS-2181-12, EOD 4/20/84, PFT, Local Hire
- 8. Orville H. Huntington, Wildlife Biologist, GS-486-5, EOD 11/12/95, PFT, transfer from Arctic NWR
- 9. Heather N. Johnson, Park Ranger, GS-025-7, EOD 7/8/91, Converted to PFT effective 3/5/95
- 10. Maudrey M. Honea, Administrative Technician, GS-318-6, EOD 10/7/85, PFT, Local Hire
- 11. Theresa Burley, Refuge Clerk, GS-303-4, EOD 2/10/91, PFT, Local Hire, Resigned 7/7/95
- 12. Rosie M. Cassou, Refuge Clerk, GS-303-4, EOD 6/12/95, TFT, Local Hire, Converted to PFT effective 9/17/95
- 13. Bernard Attla, Maintenance Worker, WG-4749-8, EOD 9/23/91, TAPER, FT-Seasonal



Back Row L-R: FMO-Rebarchik; RM-Eley; ROS-DeMatteo; Pilot-Brown; BT-Lowe; MW-Attla. Front Row L-R: WB-Johnson, PR-Johnson; WB-Saperstein, WB-Huntington; RC-Cassou; AT-Honea; ROS/Pilot-Liedberg. (Missing WB/Pilot-Spindler) (JM 5/96)

### b. Term

- 1. Thomas F. Paragi, Wildlife Biologist, GS-486-9, EOD 6/17/90, LWD 2/23/95, FT
- 2. Lisa B. Saperstein, Wildlife Biologist, GS-486-9, EOD 5/30/93, FT
- 3. Marlene R. Settle, Biological Technician, GS-404-5, EOD 7/15/93, FT, Converted to term position 3/5/95

### c. Temporary

- 1. Jenny M. Lowe, Biological Technician, GS-404-5, EOD 6/17/90, LWD 12/23/95 Local Hire, TFT
- 2. Donald D. Katnik, Biological Technician, GS-404-5, EOD 5/2/93, LWD 3/17/95, TFT
- 3 Gayle W. Moore, Biological Technician, GS-404-5, EOD 5/15/95, LWD 9/22/95, TFT.
- 4. George C. Yaska Sr., Maintenance Worker, WG-4749-5, EOD 7/20/95, LWD 8/19/95, TFT
- 5. Winthrop R. Staples, Biological Technician, GS-404-5, EOD 5/30/95, TFT
- 6. Maurene DeZeeuw, Biological Technician, GS-0404-5, EOD 3/6/95, Resigned 5/26/95, Intermittent

### d. Volunteer

Jack Moermond	Phillip Pilot
Tom Paragi	Maryanne Dickey
Adam Eley	Frank Prosak
Judy Redmond	Anne-Marie Barber
Karen Lehmkuhl	Catherine Attla
William Pilot	Gunnar Carnwath

Two permanent employees were added to the staff this year and two were hired to fill vacant positions. Heather Johnson, who had served in various education and outreach temporary positions for the past four years, was appointed to a new permanent Park Ranger position on March 5. Fire Management Officer Bob Rebarchik reported for duty on September 3 to fill the position that had been vacant for over a year. Bob had worked at the Witchita Mountains NWR for several years. On September 17, Rosie Cassou was converted from a temporary to a permanent position to fill the vacant Refuge Clerk position left by Theresa Burley. Finally, on November 12, Orville Huntington transferred from the Arctic NWR in Fairbanks to occupy a new Wildlife Biologist position on the staff. Orville, who grew up in Huslia and Galena, is a recent graduate of the University of Alaska, Fairbanks.

### 2. Youth Programs

This summer the refuge was again fortunate to have RAPS (Resource Apprenticeship Program for Students) student Ed Sommer on the staff. During his assignment from June 1 to August 19, he assisted in several field projects including the goose production survey, waterfowl banding at Willow Lake, and Gisasa salmon weir project. Ed has set a good example for future RAPS students to follow.

### 4. Volunteer Program

Twelve volunteers contributed 1,608 hours to the refuge in 1995, more than double the 1994 figures. Two volunteers contributed the majority of those hours.

Jack Moermond, a retired patent lawyer from Michigan, spent most of the summer in Galena. His love of waterfowl (hunting, mounting, and eating) enticed him here to work on the white-fronted goose project. He was involved with radio-tracking, banding, and data entry. He also spent considerable time summarizing results of a swan study which would not have been completed without his help. He continued to work on the report even after returning home.

Another volunteer who contributed a significant amount of time was Gunnar Carnwath, a 17-year-old from Alabama who wanted to gain some experience in the field before beginning college. He arrived in late September and stayed until mid-December. Gunnar worked on a variety of projects during his term, most of which took place in the office.

Other volunteers assisted with observer duties in an airplane or on float trips during the goose survey. Tom Paragi continued to volunteer his time after his term appointment expired to assist with writing up the final report and manuscripts from the wildfire/furbearer project. Ann-Marie Barber traveled out from Fairbanks to assist with the neotropical bird banding project when we were short on help. William and Phillip Pilot assisted with maintenance work being done by their father, Barney Attla at the Hog River administrative cabin. The volunteer program continues to provide valuable assistance to the station.

## 5. Funding

A summary of funding for the past five years follows:

<u>Program</u>	<u>FY91</u>	<u>FY92</u>	<u>FY93</u>	<u>FY94</u>	<u>FY95</u>
1230	6,000	6,000	1,500	8,000	
1261	652,000	646,000	648,200	632,500	658,500
1262	295,000	301,000	320,000	313,000	336,000
1411			10,000		
8610	40,000	29,300	28,100	25,000	25,300
9110	61,000	125,000	78,000	55,000	104,000
9120	81,700	145,000	190,000	198,000	48,000
Total	1,135,700	1,252,300	1,275,800	1,231,500	1,171,800

Table E.1. Koyukuk/Nowitna Refuge Complex Funding, 1990-1994.

Within the total funding this year, \$58,000 was designated as subsistence funding. This funded the position for ROS Pete DeMatteo (50,000) and completion of the Galena Mountain Caribou Herd study (8,000). The challenge grant project with Gana-A' Yoo continued this year and was funded with 62K in 1261 funds. Three MMS projects were funded as follows: repair duplex residence exterior - 15K; replace office copier - \$5,000; replace worn/obsolete computers - \$5,000. Six thousand dollars in Migratory Bird funds were provided in 1261 to conduct duck banding. This was the first year that ecosystem funding was provided to the ecoregions who ranked projects and then divided it between stations. Fifty thousand dollars was divided by the northern ecoregion. This station received \$9,000 to fund a neotropical bird banding project.

#### 6. <u>Safety</u>

Probably the single most important action the Service can do to improve safety in remote locations such as Galena, is to hold extensive safety training. ROS DeMatteo received training on the Resource Conservation Recovery Act (RCRA) in February. As the station safety officer, he in turn conducted training for the staff on the HAZMAT and HAZCOM requirements of RCRA.

The Complex held its annual safety/orientation training for the entire staff on June 2, 5-9, and 12. A total of 15 staff members from this station were involved in this year's training. The safety training "week" was expanded to seven days to allow for the addition of HAZMAT, HAZCOM, Wildland Fire Safety, and Blood-Borne Pathogens

training to the agenda. All regional safety training mandates were met with the help of our staff, WB/P Mike Vivion of the Yukon Flats NWR, SO Linda Worcester of the RO, Bob Quillin of the BLM Galena Zone, and Training Specialist Marge Attla of the Tanana Chiefs Conference. Safety training was also conducted in the areas of first aid, CPR, aviation safety, firearms/bear safety, watercraft safety, hypothermia, survival gear, refuge radio system, fuel handling safety, and proper lifting training. A combination of multi-media, hands-on demonstrations through field practicum, and an array of instructional presentations were made by 11 speakers during the seven-day training. Also, during several weekly staff meetings, safety hazards in and out of the office were discussed and remedied.

Regional SO Linda Worcester conducted a RCRA/OSHA safety inspection of our facilities on June 3. Included in the inspection were the office, workshop, cold storage, wareyard, and the float plane base. Worcester enlightened us to the improvements that should be made to bring this station into compliance. RM Eley and ROS DeMatteo have compiled and prioritized the list of improvements that can be accomplished with existing resources. Our co-occupied leased maintenance and storage facilities remain out of RCRA/OSHA compliance; however, a request for space acquisition on the U.S. Air Force base in Galena is underway.

Pilots Brown, Spindler, and Liedberg attended the annual OAS ground school in Anchorage the first week of December. Spindler and Brown attended flight school in Florida where they received Certified Flight Instructor (CFI) ratings in preparation for Mentor Pilot status.

## 8. Other

AM George Constantino conducted a station visit on July 28 and 29. As part of his visit he joined many of the staff on a trip to the Gisasa River weir for an open house on the 29th.

GARD Dick Pospahala and Northern Ecoregion Refuge Coordinator Jerry Stroebele conducted a station visit on October 12. Stroebele remained in Galena through the 13th when the station hosted an open house for the community.

CGS Chief Winston Jacobson conducted a property and procurement review on October 12.

For the second year, several flights were made through the summer to support the Fairbanks FRO project on the Selawik River. Traveling through Galena to the Selawik has proven to be efficient and economical.

Tribal Compacting rose to the front as an issue to deal with this year. Lofty expectations on both sides led, through the year, to a more reasonable approach. Tanana Chiefs Conference was supplied with information on our budgets and projects. A list of possible compacting projects was submitted to the Regional Office for consideraton.

### F. HABITAT MANAGEMENT

#### 1. General

The rivers in the refuge lowlands are characterized by low gradients, meandering courses, and heavy spring flooding. Flooding during spring is common, and it is often mid-summer before most of the flood waters subside. The rivers, particularly the Yukon and Koyukuk, carry a heavy silt load at flood stage. Meandering creeks with steep banks are typically slow and shallow. Narrow bands of white spruce line higher banks, while willow and alder thickets are found in lower areas.

Lake and pond wetlands include upland basins, ice-formed lakes on the flats, river flooded lowlands, oxbows, and bog lakes. Spring runoff, rain, and river flooding recharge lakes. Water depths and shorelines can vary from year to year. Lake depths seldom exceed 15 feet and usually are much shallower. Water temperatures in shallow lakes reach 70°F or more in mid-summer, creating ideal conditions for growth of aquatic plants and invertebrates. Among the aquatic plants, duckweed (*Lemma*), horsetail (*Equisetum*), water milfoil (*Myriophyllum*), mare's tail (*Hippuris*), and smartweed (*Polygonum*) are abundant. One or more of 12 species of pondweed (*Potamogeton*) occur in almost all lakes, and bog lakes usually contain water lilies (*Nuphar*). Several species of graminoids including sedge (*Carex*), bluejoint grass (*Calamagrostis*), and foxtail (*Hordeum*) provide cover on exposed shorelines. A variety of forbs grow on recently exposed soils along shorelines.

Shallow seasonally flooded basins (locally called "grass lakes") are common along the Koyukuk River. They are usually wetlands during spring breakup and flooding, but otherwise are dry meadows with many showing the beginnings of shrub and forest succession. During flooding, sedges, and occasionally bluejoint grass will survive as emergent vegetation in water depths exceeding four feet. Shorelines of bog lakes vary in character, but nearly always contain buckbean, wild calla, and various sedge species; cattails are rare.

## 3. Forest

Three broad forest vegetation types occur on the refuge.

<u>Closed spruce-hardwood forests</u> are found mainly along the major water courses and on warm, dry, south-facing hillsides where drainage is good and permafrost is absent. This type consists of moderately tall (50 feet) to tall (80 feet) stands of white and black spruce, paper birch, aspen and balsam poplar.

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

<u>Treeless bogs</u> are the predominant vegetation type in the center of the refuge. The vegetation of these bogs consists of various species of grasses, sedges and mosses, especially sphagnum moss. On drier ridges, willow, alders, resin birches, black spruce and tamarack are found.

### 9. Fire Management

Fire management goals and procedures for the Complex are contained within two regional interagency fire management plans. The Complex is within the Seward/Koyukuk (1984) and the Kuskokwim/Iliamna Fire Management Planning Units

(1983) of the Alaska Interagency Fire Management Plan which designated levels of suppression throughout the planning area.

Although prescribed burning is an approved activity per the comprehensive conservation plans for all three refuges, the majority of the fire management program activity is related to managing wildland fires. The Complex lies within a zone of extremely high lightning strike activity which is the source of most wildfire starts. On an average day during June and July, over 500 lightning strikes can be recorded in the immediate area and over 5,000 in the Galena Zone of Alaska Fire Service. With favorable drying conditions, we can expect numerous wildfires from early June until mid-September.

Selection for the vacant Fire Management Officer position was done in June and Bob Rebarchik's transfer was effective September 3. Bob transferred from the Wichita Mountains NWR in southwestern Oklahoma where he was the FMO.

Environmental education and public outreach programs about fire are a big part of the fire program. This year three teacher workshops were conducted in Nulato, Kaltag, and Huslia including information about The Role of Fire and related topics. A station video was completed during the year that contained a segment about the wildfire program on the refuge. The video has a target audience of the 2,500 village residents in the area.

Wildfires burned about 44,000 acres in Alaska in 1995, the least amount recorded by fire observers since 1978. There were only three wildfires on the Koyukuk Refuge and one on the Northern Unit of the Innoko Refuge during the year. The largest fire (7521) totaled 2,780 acres and occurred in the northeast portion of the Koyukuk Refuge, north of Bear Mountain and south of the Hog River administrative cabin. Details for 1995 individual wildfires are shown in Table H.1.

Table H.1. Wildfire Occurrence on the Koyukuk and Upper Innoko NWRs, 1995.

Fire Number	Acres Burned	Cause	Option of Protection	Discovery Date	Declared Out
7500	770.0	Lightning	Limited	05/12/95	05/15/95
7506	* 20.0	Human	Modified	05/17/95	05/19/95
7521	2780.0	Lightning	Limited	07/29/95	08/14/95
7522	.2	Campfire	Limited	09/21/95	10/13/95

\* This fire was 60.0 acres in size, 20.0 acres on Refuge lands, 40.0 acres on BLM lands.

A 15-month process of public involvement ended in March when approximately 500,000 acres of multiple agency and private ownership holdings were changed to a reduced suppression level. Although formal meetings were held in 1994, the outreach and EE with local residents and private landowners continued into 1995. Approximately 250 residents were contacted. This project was a coordinated effort with FWS, Gana-A' Yoo Village Corporation, Doyon Regional Corporation, Tanana Chiefs Conference representing allotment holders, the State of Alaska, and the Bureau of Land Management. Our process drew wide attention because it was the largest cooperative effort of it's size in the state.

# 11. Water Rights

The formal collection of data and application for water rights has not begun on this Complex. Hydrologist Maggie Wilson has started collecting data on the navigability of the Khotol River and Kaiyuh Slough on the Kaiyuh Flats. Complex staff have conducted



Every year for about 3 weeks Wildlife Biologist/Pilot Mike Spindler sequesters himself in the studio at KIYU-AM to produce <u>Raven's Story</u>, a collection of Athabascan elders' knowledge and experiences about subsistence use of wildlife and fish on and near the Refuge. Stories from Galena, Huslia, Hughes, and Ruby have been assembled to date. (SC 10/96)



A total of 492 Trumpter swans was estimated for the Nowitna NWR portion of the statewide survey conducted by Migratory Birds and Refuges in 1995. The estimated annual growth rate for adults was 12% since the last census in 1990.

goose surveys on the Khotol River and Kaiyuh Slough since 1993 and this data was provided to Hydrologist Wilson. Ms. Wilson hopes to accompany Complex staff during a future goose (float trip) survey and collect additional data.

### 12. Wilderness and Special Areas

One needs only to step to the top of a 50-foot high dune within the 400,000 acre Koyukuk Wilderness to recognize the uniqueness of the Nogahabara Sand Dunes. This active dune area contains about 16,000 acres and is only a small part of a Pleistocene dune field that is now mostly inactive. The individual dunes have been recorded to be 50 to 200 feet high and 300 feet or more in length. The dunes are wind-blown deposits of sand that originated in glaciated areas to the northwest and were deposited in the periglacial Koyukuk area.

In addition to the sand dunes, the Koyukuk Wilderness includes the Three Day Slough area of the Koyukuk River. Three Day Slough contains several large meanders of an old Koyukuk River Channel which represent the Complex's best moose habitat with the densest concentration of moose. Increasing numbers of moose hunters enter this area by boat each fall. In 1995, 444 hunters passed through the Koyukuk River check station and the bulk of these hunters were headed for the Three Day Slough portion of the Wilderness Area.

The Koyukuk Wilderness was established by Public Law 96-487 (Alaska National Interest Lands Conservation Act) on December 2, 1980, in accordance with subsection 3(c) of the Wilderness Act (78 Section 892).

# G. WILDLIFE

### 1. Wildlife Diversity

The Koyukuk National Wildlife Refuge has a high diversity of habitat types resulting from riverine erosion, deposition, and flooding, the actions of wildfire, and topographical variation. Baseline data continues to be collected to determine the status and distribution of bird, fish, and mammal species. Over 140 bird species, 30 mammal species, and 14 fish species occur on refuge lands. A refuge bird list was published in 1992 following a decade of active field surveys and local observations of staff living in Galena. Fish, mammal, and plant lists, published in the Comprehensive Conservation Plan in 1987, need to be updated and revised.

Included among the biodiversity monitoring efforts on the Complex in 1995 were surveys of spring bird migration phenology (collection of arrival dates and North American

Migration Count), breeding birds (Standard BBS), wintering birds (Christmas Bird Count) (see Section G.7), and small mammals (see Nowitna Section G.10).

### 2. Endangered and/or Threatened Species

The American peregrine falcon (*Falco peregrinus anatum*) is listed as endangered and regularly nests along the Yukon and Koyukuk Rivers. Delisting has been proposed for the American peregrine. Region 1 is responsible for acting upon the proposal and is currently gathering information. The status of the arctic peregrine falcon (*Falco peregrinus tundrius*), which nests in the arctic but migrates across the refuge, was changed from endangered to threatened in 1994. Alaska Department of Fish & Game (ADF&G) has recommended that the American and arctic peregrine falcons be removed from the state's endangered species list but should be considered "species of special concern." A description of the raptor survey is included in Section G.6. It is unknown if any threatened or endangered plant species occur on the refuge. Disjunct species occur on the Nogahabara Sand Dunes, and some species found there may represent range extensions. Also, inaccessible alpine and subalpine habitats on the refuge have received little botanical survey work to date.

### 3. Waterfowl

Wetlands within the Koyukuk River floodplain and Northern Unit of the Innoko NWR (Kaiyuh Flats) support large waterfowl populations. Principle duck species breeding on the Koyukuk NWR include American wigeon, northern pintail, mallard, green-winged teal, northern shoveler, surf scoter, white-winged scoter, common and Barrow's goldeneye, bufflehead, and lesser scaup. Less abundant breeding ducks include red-breasted merganser, greater scaup, canvasback, ring-necked duck, redhead, black scoter, and oldsquaw. Arctic, red-throated, and common loons also nest on the refuge, as do horned and red-necked grebes. Canada geese, white-fronted geese, trumpeter swans, and tundra swans are found on the refuge in moderate to high numbers. The greatest concentrations of waterfowl occur during spring and fall migrations on large, shallow floodplain waterbodies.

#### Weather Conditions and Waterfowl Migration Chronology

The arrival of pintails in Galena was four days earlier (April 21) than the long term-mean (April 25), and the arrival of mallards was eight days earlier (April 18) than the long-term mean (April 26). Arrival of Canada geese was 2 days later (April 29) than the long-term mean (April 27) for the species. A radio-collared greater-white-fronted goose was observed within her nesting area on the Koyukuk NWR on April 28th. Swans arrived at Galena April 29th, which was three days later than average arrival. Spring conditions in the lower 48 states and Canada in 1995 were less than favorable and may have contributed to a late arrival or low abundance of waterfowl on the refuge. Snow cover



Forty-two white-fronted geese that were likely to have nested on Koyukuk NWR were banded and radio-collared in July 1994 and 1995. Wildlife Biologist/Pilot Mike Spindler received assistance from Division of Migratory Bird Management, Selawik, Innoko, Kanuti, and Yukon Flats NWR's, as well as our refuge staff to conduct the banding and radiotracking. (LBS 94)



Three nests were found during the first year of the white-fronted goose radio telemetry study. This was one of two nest in open black spruce-dwarf birch above the Koyukuk River flood plain; the other was in a grass-sedge meadow within the floodplain. (6/95 MS)



was down to 50-70% and moats were beginning to form along edges of waterbodies within the Koyukuk NWR on April 28th. In the Galena area, snow cover was down to 10% with a major arrival of migrant birds on April 30th. When waterfowl arrived in late April and early May they encountered normal temperatures, snow cover, and water levels.

Spring ice breakup along the Yukon occurred early, on May 2nd. Along the Yukon and Koyukuk river drainages, there was minimal flooding in most areas. This was in contrast to the 1993 and 1994 breakups along the Koyukuk and Kaiyuh Flats that caused above average water levels and flooded much of the available waterfowl habitat. In 1995 early availability of waterfowl habitat was very favorable for brood production. On April 28th, the Dulbi River was largely open all the way to the mouth. On the same date Bear Creek was clear of ice almost to the mouth. Snow cover was observed to be down to 5% on May 4th and the Koyukuk River ice was flowing freely. There was no snow observed within the Koyukuk NWR on May 11th aerial surveys. The birches, cottonwoods, and willows were all observed to be leafed out and green on May 22nd, and there was no snow or ice observed anywhere on the refuge.

#### Ducks

Duck production surveys were conducted on the Koyukuk NWR from 1983 to 1993. Production survey methods continuously improved since 1984, so that during the period 1987-89 a stable sample base and reliable estimates were obtained. In 1990 the method was again refined to obtain statewide estimates as well as relative estimates on a refuge basis. These procedures, however, were too costly to continue annually. WB Saperstein was tasked with summarizing the results of more than a decade of duck production surveys. Results of these surveys will be summarized in a progress report entitled, "A summary of ten years of duck production surveys, Koyukuk National Wildlife Refuge, Alaska, 1983-1993" (Saperstein, 1997) that is currently in its initial draft.

Another indication of trends in duck abundance on the refuge is the aerial duck breeding pair survey conducted by the Service's Division of Migratory Birds in Juneau. Estimates of the abundance of key duck species in the Koyukuk stratum (including Koyukuk <u>and</u> Kanuti NWRs) are presented in Table G1. The estimate for total number of ducks in 1995 was 4% below the mean for the last eleven years. Species that were down in 1995 compared to the eleven year mean included pintail, scaup, and scoters. Four species were above the 11 year mean: mallard, wigeon, green-winged teal and shoveler. It should be noted that the estimates in Table G1 apply to the entire Koyukuk stratum, of which Koyukuk NWR is only a part. A comparison of the breeding pair estimates for the Koyukuk stratum in Table G1 with estimates of adults summering on the refuge (based on brood survey extrapolations) suggested that, depending on the year, the Koyukuk NWR represented approximately 36-65% of the ducks estimated for the entire Koyukuk stratum.



A moose census in November 1995 indicated that the population declined 34% since 1990, a trend that was not statistically significiant. Over a 15 year period, similar censuses showed a decrease from 1980 to 1986 and an increase from 1986 to 1990.



Observations of Canada geese continued to decline on the Nowitna River, and the totals from the July 1995 float survey were the lowest ever observed. The Nowitna was the only river surveyed that experienced a sharp decline in 1995, and we hope to examine it more closely in future years.

	YEAR													
Species	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Mean	c.v.
Mallard	18.8	9.4	17.5	8.8	28.2	20.7	14.9	18.7	12.3	10.2	22.0	22.3	17.0	0.34
Wigeon	49.5	19.6	50.9	36.5	49.3	46.5	40.9	39.7	29.4	29.6	41.0	43.8	39.7	0.23
G.wteal	13.7	15.6	36.1	20.5	20.5	26.4	11.7	19.6	14.1	22.8	19.1	39.6	21.6	0.38
Shoveler	11.0	6.3	19.3	22.4	19.7	10.2	14.9	10.7	14.4	24.4	16.1	25.8	16.3	0.36
Pintail	80.2	38.1	75.1	53.8	47.7	44.7	48.3	32.1	20.8	24.4	19.8	24.3	42.4	0.45
Scaup	47.7	28.2	38.7	39.7	38.6	48.6	27.1	31.5	33.6	24.6	35.3	17.5	34.3	0.26
Scoters	6.1	8.9	10.6	9.3	6.5	5.2	7.5	2.8	6.4	5.0	3.3	2.5	6.2	0.40
Other	17.3	13.4	24.1	14.8	19.7	14.9	19.7	15.2	8.0	19.5	13.2	9.8	15.8	0.28
Totals	244.3		272.3		230.2		185.0		139.0		169.8		193.3	0.21
		139.5		205.8		217.2		170.3		160.5		185.6		

Table G.1. Estimated ducks (in thousands) for the Koyukuk stratum, including Koyukuk and Kanuti NWRs, based on aerial breeding pair survey, USFWS, Migratory Birds, Juneau, AK.

In an effort to improve the precision of duck breeding pair estimates on a refuge basis the Division of Migratory Birds in Anchorage has performed expanded aerial breeding pair surveys on selected refuges. These surveys, although not affordable on an annual basis, provide excellent baseline data on duck abundance and inherent trends. In 1995, an expanded aerial breeding pair survey was conducted within the Northern Innoko, and estimates were calculated (R.M. Platte, 1996 water bird abundance and distribution on Innoko National Wildlife Refuge, AK, Anchorage, AK 24pp). A summary of key duck species estimates for the Kaiyuh Flats calculated with no visibility correction is presented in Table G.2. However, the duck population estimates presented in Table G.2 should be considered a bare minimum, because no visibility correction factor was incorporated (see Table G.3).

Species	Density	$(\text{km}^2)$			Popul	ation			
····	Mean	SE	Total <sup>b</sup>	SE	%CV	lo95CI	up95CI	%C I	
Canada Goose	0.044	0.015	402	140	35	128	675	68	
White-fronted Goose	0.086	0.037	787	339	43	121	1452	85	
Tundra Swan	0.074	0.019	680	173	26	340	1020	50	
Sandhill Crane	0.016	0.008	146	71	48	8	285	95	
Red-throated Loon	0.016	0.008	146	70	48	10	283	93	
Pacific Loon + Unid.	0.099	0.026	912	243	27	435	1388	52	
Common Loon	0.053	0.017	484	159	33	172	796	64	
Mallard	0.489	0.083	4488	763	17	2992	5983	33	
Gadwall	0.004	0.004	36	36	100	0	107	196	
American Wigeon	0.885	0.099	8125	904	11	6352	9898	22	
Green-winged Teal + U	n.0.421	0.053	3864	486	13	2910	4817	25	
Northern Shoveler	0.457	0.058	4198	536	13	3147	5249	25	
Northern Pintail	0.653	0.090	5993	828	14	4371	7616	27	
Canvasback	0.044	0.021	402	196	49	17	786	96	
Scaup	0.670	0.105	6146	963	16	4259	8033	31	
Goldeneve	0.199	0.038	1827	351	19	1138	2515	38	
Bufflehead	0.149	0.032	1365	291	21	795	1935	42	
Oldsquaw	0.004	0.004	36	37	102	0	108	199	
Black Scoter + Unid.	0.016	0.008	148	70	47	11	285	92	
White-winged Scoter	0.036	0.026	333	235	71	0	794	139	
Surf Scoter	0.033	0.018	300	165	55	ñ	624	108	
Red-breasted Merg + U	0.016	0 010	146	90	61	0	322	120	
Common Merganser	0.032	0.031	290	286	99	0	851	194	

Table G.2. Stratified duck population estimates (weighted ratio estimate without a visibility correction factor) from the Northern Unit of the Innoko NWR, Alaska, 1995.

Visibility Correction Factor = VCF

<sup>b</sup> Indicated Total Birds

To compensate for sightability on the Kaiyuh Flats, duck population estimates were also calculated using species-specific visibility correction factors derived from studies on coastal tundra (Table G.3). Although coastal tundra visibility factors are better than no correction factors, it should be noted that duck sightability in interior Alaska is less than on the coastal tundra and interior visibility correction factors would probably be greater if they were available. Because the visibility correction factors in Table G.3 are still not representative of waterfowl habitat within the Kaiyuh Flats, the estimates should again be considered minimum.

Species	Dens	ity			Popu	lation			VCF <sup>1</sup>
	Mean	SE	Total <sup>2</sup>	SE	%CV	lo95CI	up95CI	%C I	
Mallard	1.745	0.297	16021	2724	17	10681	21360	33	3.57 <sup>3</sup>
Gadwall	0.012	0.012	110	110	100	0	326	196	3.04 <sup>3</sup>
American Wigeon	3.231	0.360	29657	3301	11	23186	36127	22	3.65 <sup>3</sup>
Green-winged Teal + Un.	3.738	0.471	34310	4319	13	25844	42776	25	8.88 <sup>3</sup>
Northern Shoveler	1.532	0.196	14063	1797	13	10542	17585	25	<b>3.35</b> <sup>3</sup>
Northern Pintail	1.639	0.226	15044	2077	14	10972	19115	27	2.51 <sup>3</sup>
Canvasback	0.106	0.052	976	476	49	42	1910	96	2.43 <sup>3</sup>
Scaup	1.219	0.191	11186	1752	16	7751	14620	31	1.82 <sup>3</sup>
Goldeneye	0.719	0.138	6595	1268	19	4109	9081	38	3.61 <sup>3</sup>
Bufflehead	0.277	0.059	2539	541	21	1478	3599	42	1.86 <sup>3</sup>
Oldsquaw	0.008	0.008	72	73	102	0	216	199	1.99 <sup>3</sup>
Black Scoter + Unid.	0.017	0.008	160	75	47	12	308	92	1.08 <sup>3</sup>
White-winged Scoter	0.039	0.028	359	254	71	0	857	139	1.08 <sup>3</sup>
Surf Scoter	0.035	0.019	324	178	55	0	673	108	1.08 <sup>3</sup>
Red-breasted Merg + Un.	0.020	0.012	186	114	61	0	409	120	1.27 <sup>3</sup>
Common Merganser	0.040	0.040	368	364	99	0	1081	194	1.27 3

Table G.3. Stratified duck population estimates (weighted ratio estimate) from the Northern Unit of the Innoko NWR, Alaska, 1995.

<sup>1</sup> Visibility Correction Factor = VCF

<sup>2</sup> Corrected Indicated Total Birds

<sup>3</sup> Coastal Tundra Visibility Correction Factor

#### Geese

<u>Production.</u> River float-trip surveys have been conducted annually on the Koyukuk NWR to assess goose production and record observations of other wildlife. In 1995, float surveys were conducted on three areas specified in the wildlife inventory plan: Dulbi River, Dulbi Slough, and Kaiyuh Slough. The results of the surveys were summarized by BT Lowe and WB/Pilot Spindler in progress report FY96-01, entitled: <u>Goose production surveys on Koyukuk and Nowitna National Wildlife Refuges, Alaska, 1995</u>. A brief summary of the report follows.

River float-trip surveys were conducted annually on the Koyukuk NWR to assess goose production and record observations of other wildlife. Surveys began on the Dulbi River, a tributary of the Koyukuk River, in 1983. Geese were more abundant during the period from 1983 to 1990 than during the period 1991-1993. The observed decline in goose abundance from the 80's to the 90's on Koyukuk NWR appeared to reverse slightly in 1994 and 1995. Surveys in 1995 in most areas showed small increases over 1994 goose numbers, while some surveys experienced sharp increases, with some of the highest numbers ever seen (Canada geese at Dulbi Slough). Continued decline was seen in the survey estimates for greater-white-fronted and Canada geese at Kateel River, and greater-white-fronted geese at Kaiyuh Flats.

<u>Greater-white-fronted goose nesting and staging study.</u> A radio-telemetry project was initiated in 1994 to determine possible causes of the observed decline in white-fronts on



BT Simon stopped to rest during the Dulbi Slough goose survey. These float surveys have been conducted on the refuge since 1983. During 1991 to 1993, white-fronted geese were less abundant than previous years, but a slight recovery in numbers was noted in 1995. (7/94 MAS)



In August 1995, refuge staff cooperated with Migratory Birds to conduct a statewide trumpeter swan census. On Koyukuk NWR a total of 1,006 swans was estimated, representing a 12% annual growth rate of adults since the last census in 1990. (MS 6/95)

the Koyukuk NWR. Specific objectives were to: (1) develop a reliable inventory procedure for the Koyukuk subpopulation; (2) assess spatial variation in goose abundance on the refuge; (3) identify geographic use areas and discreteness of the subpopulation; (4) determine preferred nesting, brood rearing and staging habitats; (5) determine factors affecting the breeding population and production; and (6) assess the impact of flooding and hunting. Progress on the study to date was summarized in a poster display by WB/Pilot Spindler, that was presented at the Alaska Bird Conference. An abstract of the presentation entitled: <u>Nesting and staging of Koyukuk River White-fronted geese: A progress report</u> follows:

Female white-fronted geese (n=42) likely to have attempted nesting (evidenced by brood patch) were radio-collared in July 1994 and 1995 on Koyukuk NWR. Geese were relocated by aircraft weekly from late April to late August 1995 to determine nesting, brood rearing, and staging habitats. Of 12 geese captured in 1994, 6 returned from their mid-continental wintering grounds in May 1995. Two of these radioed geese were found on nests; a third nest was found incidentally. Two nests were in upland black sprucedwarf birch-Eriophorum woodland, and one was in the floodplain on a 0.5 m tall hummock within a *Carex-Calamgrostis* meadow. During brood rearing, geese used riparian mudflats where newly greened sedges and grasses were grazed as water levels dropped during the summer. Radioed geese remained on the Koyukuk until early August, when most birds (80% and 88% in 1994 and 1995, respectively) moved 170-230 km northwest to stage near Kotzebue Sound. During staging, marked geese were found grazing in estuarine meadows of river deltas (Kiwalik, Buckland, Kauk, and Kobuk) where grasses and sedges were delayed phenologically by proximity to coastal waters. Some geese also fed on *Vaccinium* berries in adjacent upland tundra where, compared to the interior, ripe berries were available later in the summer. In late August radioed geese overflew the Koyukuk, but apparently did not stop, on their way to Saskatchewan and Texas, where numerous collar sightings occurred. After winter mortality, up to 30 radioed geese could return to the study area in 1996, which should allow increased efforts to sample habitat use.

### Swans

Swans are considered a key indicator species because their production trends tend to correlate well with that of other waterfowl species, they are sensitive to nest disturbance, and swan sightability is high during aerial surveys. Swan surveys have been conducted on the Koyukuk NWR by refuge staff since 1989 to determine trends and locate nesting and staging areas. The staff selected six 1:63,360 trend maps to monitor swan population and production according to the refuge wildlife inventory plan. Both trumpeter and tundra swans nest on the refuge. Preliminary surveys in 1985 and 1987 indicated that abundance of tundra swans increased as one proceeds north of the Koyukuk, therefore, fall aerial production surveys have necessarily grouped the two species simply as "swans".
Complete statewide censuses of trumpeter swan summer populations in Alaska were conducted by the U.S. Fish and Wildlife Service in 1968, 1975, 1980, 1985, 1990, and most recently in 1995. The survey covers 51,364 statute miles of aerial survey transects. All maps with swan habitat within the entire Koyukuk NWR were surveyed in 1990 and 1995. The purpose of this survey is to accurately detect any long-term population changes in Alaska. This effort is coordinated and funded by the Migratory Bird Management Field Office in Juneau.

The results of the past decade of aerial swan surveys were summarized by BT Lowe and WB/Pilot Spindler in Progress Report FY96-02 entitled: <u>Aerial swan production surveys</u> on Koyukuk and Nowitna NWRs, Alaska, 1985-1995. A brief summary follows:

Aerial censuses of all swan habitat on Koyukuk NWR and Kaiyuh Flats indicated that the population has increased. In the five years between the 1990 and 1995 censuses, swan estimates on the Koyukuk and Kaiyuh Flats increased 63% from a total of 617 to a total of 1,006. The estimated annual growth rate of the adult component was 12%. Annual aerial surveys of a sample of six trend maps indicated that adult swan populations on the Northern Innoko gradually increased from 1985 to 1995. On the Koyukuk NWR during the same period they were highly variable, but increased in 1995. Slight declines in percent young were noted on the Koyukuk NWR in 1991, and on the Kaiyuh in 1992-93. The declines noted on the Kaiyuh Flats were partially reversed in 1995, when percent young increased. However, on the Koyukuk a production decline which started in 1991, continued in 1995.

# 4. Marsh and Water Birds

A number of marsh and water birds are commonly observed on the refuge, including: common, Pacific, and red-throated loons, red-necked and horned grebes, and sandhill cranes. Yellow-billed loons are occasionally observed. Past duck production surveys indicated that red-necked grebes, common loons, and sandhill cranes were the most common marsh and water bird species.

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

The following shorebird species are commonly observed on the refuge: lesser and greater yellowlegs, Arctic tern, glaucous, Bonaparte's, mew, and herring gulls, long-tailed jaegar, semipalmated plover, common snipe, spotted, least, pectoral, and solitary sandpipers, northern phalarope, Hudsonian godwit, and whimbrel.

# 6. <u>Raptors</u>

The refuge supports a diversity of raptor species. Raptors are generally sensitive to disturbance and, therefore, act as important indicator species. Raptors that nest on the

refuge include rough-legged hawks, merlin, sharp-shinned hawks, northern harriers, red-tailed hawks, goshawks, great-horned owls, great gray owls, boreal owls, northern hawk owls, American peregrine falcons, and bald eagles.

Raptor surveys have been conducted periodically on the Yukon River between the villages of Ruby and Kaltag and along the Koyukuk River just above Koyukuk village. The purpose of this survey is to monitor general trends in the number of raptors utilizing nesting sites along the river. The USFWS Endangered Species Office conducted the survey from 1979 to 1991 while the refuge conducted the survey from 1992-1994. No surveys were conducted during 1995 because WB Saperstein was detailed to Yukon Delta NWR and other staff were fully committed to other projects.

### 7. Other Migratory Birds

Numbers and species composition of passerine birds fluctuate with the seasons. Monitoring efforts of passerines in the Galena area in 1995 included surveys of spring bird migration phenology (collection of arrival dates and North American Migration Count), breeding birds (Standard Breeding Bird Survey - BBS), and wintering birds (Christmas Bird Count).

<u>Phenology</u>. These analyses are used to relate annual differences in temperature, precipitation, timing and duration of flooding, etc. with observed patterns in wildlife populations and productivity. To compare spring migration phenology among years, records of annual spring arrival dates for common and conspicuous birds were summarized (Table G.4). Eight of 12 species were early among those for which we have long-term data (1982-1995). Two species arrived on time (robin and mew gull), and only one species was late (olive-sided flycatcher).

Species	1995	Mean (1982-94)	
Snow Bunting	22 Ma	30 Ma	
Pintail	21 A	25 A	
Mallard	18 A	27 A	
Canada Goose	29 A	27 A	
Dark-eyed Junco	9 A	27 A	
Ruby-cr. Kinglet	16 A	29 A	
Mew Gull	30 A	30 A	
Robin	14 A	1 M	
Am. Tree Sparrow	2 M	2 M	
Common Snipe	30 A	6 M	
Tree Swallow	1M	9 M	
Olive-s. Flycatch.	25 M	24 M	

Table G.4. Spring arrival dates of common birds at Galena, Ak.

Months are indicated by letters: Jan=January, F=February, Ma=March, A=April, M=May, J=June. Data collected by T. Osborne, ADF&G, Galena, and refuge staff. Data from 1982 to 1995 in refuge files and in 1994 Annual Narrative.

<u>Migration Counts.</u> On May 13, 1995 the refuge participated in the third annual North American Migration Count. This was the second year of refuge participation in the survey. Galena was both the most northern and western site surveyed in the state. Totals of 268 individuals of 33 species of birds were recorded in the Galena area, compared to 510 individuals and 43 species the year before.

Breeding Bird Survey. The refuge assists with national monitoring of songbirds, many of which are neotropical migrants, by conducting standardized Breeding Bird Survey routes in taiga habitats near Galena. Two breeding bird survey routes were conducted on Koyukuk NWR in 1995 and a third route along the Ruby to Poorman road was surveyed for the first time in 1994. The 1995 results appear in the Nowitna NWR annual narrative. Species commonly seen in the summer include alder flycatcher, olive-sided flycatcher, tree swallow, gray jay, robin, Swainson's thrush, gray-cheeked thrush, varied thrush, Bohemian waxwing, yellow warbler, blackpoll warbler, orange-crowned warbler, yellow-rumped warbler, rusty blackbird, savannah sparrow, dark-eyed junco, American tree sparrow, white-crowned sparrow, fox sparrow, and Lincoln's sparrow.

#### MAPS Station.

In response to the Ecosystem Management initiative in Region 7 and the Boreal Partners

in Flight program, we initiated a passerine banding effort this year in Galena. Our banding station was established in cooperation with the Monitoring Avian Productivity and Survivorship (MAPS) program coordinated by the Institute for Bird Populations (IBP). The MAPS program coordinates the efforts of bird banders all over North America with the goal of providing long-term population data on neotropical migrants. Our station was one of many operating in Alaska in 1995 and the first representing western interior Alaska.

Before the banding season began, WB Johnson and BT Moore completed an intensive three-week training program put on by the Alaska Bird Observatory (ABO) in Fairbanks. The training was specifically designed to develop the skills and knowledge needed to run a MAPS station. Classroom sessions were held in the evenings and birds were captured and banded every day at a spring migration station near North Pole. After returning to Galena, ABO staff made two visits to our station to provide additional on-site training. The whole experience contributed greatly to the success of our pilot effort.

We established our MAPS site five miles east of Galena in a closed stand of alder/willow scrub. The site is adjacent to the Yukon River and subject to periodic flooding. It is bordered on one side by white spruce and a few small cottonwood stands occur within the transition between spruce and alder/willow. We chose a location close to town (versus a remote site on the refuge) to reduce operational costs. Our hope is that by reducing logistical and fiscal constraints, we will increase our chances of operating the station during "lean" years and meet the five year commitment requested by the IBP.

We followed the MAPS program's standardized procedures for constant-effort mist netting. The banding station was run once during seven standardized MAPS sampling periods beginning in June and ending in August. A detailed account of the methodology will be available in 1996 in the report: <u>Monitoring Neotropical Birds on the Koyukuk/Nowitna Refuge Complex.</u>

We banded 388 individuals of 20 species during 420 net hours (Table G5). Given our location (interior Alaska) and available work force, we were pleased with our overall capture rate of 104 captures/100 net hours (range, 48-197). The distribution and placement of individual nets on the site also seemed adequate based on the capture success of individual nets (Table G6). Incidental mortality of birds from netting and handling was 0.6 %.

		Age Class <sup>1</sup>		
Species	AHY	HY	UNK	Total
Olive-sided flycatcher		2		2
Alder flycatcher	6	4		10
Grav jav	_	-	2	2
Black-capped chickadee	2	8	_	10
Boreal chickadee	-	1		1
Ruby-crowned kinglet	1	29		30
Gray-cheeked thrush	1	1		2
Swainson's thrush	33	12		45
American robin	1			1
Orange-crowned warbler	17	18		35
Yellow warbler	13	8		21
Myrtle warbler	14	40		54
Blackpoll warbler	3	4		7
Northern waterthrush	14	13		27
Wilson's warbler		3		3
Fox sparrow	1	1		2
Lincoln's sparrow	2	25		27
White-crowned sparrow	5	18		23
Slate-colored junco	8	65		73
Common redpoll	4	9		13
Totals .	125	261	2	388

Table G.5. Age composition of passerine birds banded at a MAPS station in Galena, Alaska, June 13 - August 15, 1995.

<sup>1</sup> AHY = After Hatch Year (Adults & Sub-Adults), HY = Hatch Year (Young of the Year), UNK = Age class not determined



A radio tracking activity lead by WB Saperstein was popular with the kids at the refuge open house. (HJ 10/95)



During a Galena community program, WB Johnson explains what data are taken at the MAPS bird banding station located just outside of town. (PL 8/95)

F' 5

Net #	1	2	3	4	5	6	7	8	9	10	Total
Captures	54	52	37	25	60	45	51	31	29	55	439
Net Hours	42	42	42	42	42	42	42	42	42	42	420
Capture Rate <sup>1</sup>	129	124	88	59	143	107	121	74	69	131	104

Table G.6. Summary of individual mist net efficiency for banding efforts at MAPS station in Galena, Alaska, 1995.

<sup>1</sup>Captures/100 Net Hours

Overall, 67 % of our captures were hatch year (HY) birds and predictably some early breeders such as ruby-crowned kinglets and juncos had the highest percentages. Our total recapture rate was 10.3 % and highest for northern waterthrush (37%).

Wintering birds. Frequently seen winter residents in the Galena area include common and hoary redpolls, common raven, gray jays, black-capped and boreal chickadees, and pine grosbeaks. Wintering birds were monitored during the standardized Christmas Bird Count that was conducted by refuge and ADF&G staff as well as local volunteers on December 20. A total of 12 species, higher than the long-term average of nine, was recorded on the count. The count turned up 339 individual birds, fewer than the longterm average of 382. In 1995 temperatures were mild (above zero). Fewer miles than average were covered, but the number of party hours was about 20% above average. Observations included one each of northern goshawk, ruffed grouse, downy woodpecker, and three-toed woodpecker. Other observations were: seven willow ptarmigan, two spruce grouse, 26 gray jays, 188 ravens, 31 black-capped and 33 boreal chickadees, 40 common and 9 hoary redpolls.

A Galena resident sighted a raven on November 23 (Thanksgiving) with a white wing marker numbered 48. After a few phone calls we found out that the bird had been captured in Eagle River in January and tagged by ADF&G Biologist Rick Sinnott. Eagle River is approximately 340 miles (as the raven flies) from Galena and the Alaska Range and Mt. McKinley fall directly between the two points.

#### 8. Game Mammals

#### Moose

In years following refuge-wide censuses, moose survey efforts consisted of intensive aerial surveys of standardized trend count areas (40-70 mi<sup>2</sup> in size) where hunting pressure was thought to be greatest, or where other conservation concerns dictated a need for the information. Results of the moose trend surveys were summarized by WB/Pilot Spindler in Progress Report FY96-03 entitled: <u>Moose trend surveys on the Koyukuk and Nowitna National Wildlife Refuges, 1980-95</u>. The portion of the abstract pertinent to Koyukuk NWR and Kaiyuh Flats follows:

Aerial trend surveys indicated that moose populations on Koyukuk and the Northern Innoko NWR's (Kaiyuh Flats) have generally increased between the early 1980s and mid-1990s. In 1995, the Three Day Slough herd showed signs of decreased recruitment and increased mortality, and a decline in adult numbers, particularly bulls, was noted (Figure G.1 and G.2). On the N. Innoko, moose numbers at Kaiyuh Slough increased through the past decade. At Pilot Mountain Slough and Squirrel Creek adult moose numbers appeared stable, but the total moose declined due to a decrease in number of bulls and calves (Figure G.3).



Fig. G1. Moose composition ratios for the Three Day Slough trend area, Koyukuk NWR, Alaska, 1981-95 (data courtesy ADF&G, Galena).



Fig. G.2. Moose counted during aerial surveys of the Three Day Slough trend area, Koyukuk NWR, Alaska, 1981-95 (data courtesy ADF&G, Galena).



Fig. G.3. Moose observed during aerial surveys of combined Pilot Mountain Slough and Squirrel Creek trend areas, Kaiyuh Flats, Northern Unit of Innoko NWR, Alaska, 1987 and 1985.

### Caribou

Two caribou herds occur on the refuge: The Galena Mountain Herd (GMH) and the Western Arctic Herd (WAH). The GMH is a small resident herd of approximately 300 animals that winters north of Galena and calves outside the refuge in the western Kokrines Hills. The migratory WAH is estimated to contain over 450,000 animals. Portions of the WAH usually winter on northern and western sections of the refuge, but in the winters of 1989-1990, 1990-1991, and 1992-1993 WAH animals wintered southeast of the Koyukuk River and south of the Dulbi River in areas usually occupied only by the GMH. Normally, caribou hunting is closed in Game Management Unit 21D to protect the GMH, which is not large enough to sustain a significant winter harvest. When the WAH enters the unit in sufficient numbers, the Alaska Department of Fish and Game opens a hunting season by emergency order. Few WAH caribou have occurred on the refuge since 1993, however, and hunting has not been permitted during winter.

Calving surveys were conducted May 18-19. A total of 109 caribou, consisting of 11 calves, 73 cows and yearlings, and 25 bulls were observed during these flights (Table G7), and it appeared that the calves had been born within a day or two. It was often difficult to distinguish between cows and yearlings, but 26 of the 73 cows and yearlings were positively identified as cows. Of these, 61.5% retained hard antlers and one had a calf. It was estimated that the peak calving period would occur around May 21-22. Ratios were calculated as 34 bulls:100 cows and 15 calves:100 cows and yearlings. A

post-calving count was conducted on June 19, and 18 calves and 191 adults were observed. Observers did not separate adults by sex, but calves comprised 8.6% of the observed caribou. This is similar to a post-calving flight conducted June 17, 1994 when calves comprised 7.5% of the 241 caribou observed.

Sex or Age	May 27,1993	May 23,1994	May 18-19,1995 <sup>2</sup>
Calves	12	13	11
Cows and Yearlings	66	56	73
Bulls	15	40	25
Total Caribou	93	109	109
Percent Calves	12.9%	11.9%	10.1%

Table G.7.	Composition	of Galena Mo	untain Caribou	Herd of	bservations	around	the
peak calving	g period, Koy	ukuk National	Wildlife Refug	e, Alasl	ka.1993-199	$95.^{1}$	

<sup>1</sup> Calving was first observed on May 25 in 1993, May 20 in 1994, and May 18 1995.
 <sup>2</sup> 1995 surveys conducted prior to peak calving period.

On October 13, ADF&G biologists conducted a composition count of the GMH. Some caribou were likely above the fog line and were not counted. A total of 310 caribou was classified and composition was as follows: 211 cows, 40 calves, and 59 bulls (9 small, 22 medium, and 28 large). The bull:cow ratio was 54:100 cows, and the calf:cow ratio was 26.5:100 cows. The calf:cow ratio was lower than the 40 calves:100 cows observed in 1994, but was similar to the 1993 ratio of 25 calves:100 cows. The yearling calf percentage was only 2%.

<u>Caribou Study</u>. A cooperative study with ADF&G, the Bureau of Land Management (BLM), and the Alaska Fish and Wildlife Research Center was initiated in 1992 to monitor movements of the GMH and to determine population size, sex and age structure, calving rate, calving sites, and wintering areas. Blood samples were collected from GMH animals to compare their genetic characteristics to caribou from other herds in Alaska and to caribou/reindeer hybrids. Three and eight "short-yearling" calves in the neighboring Wolf Mountain Herd (WMH) were collared in spring 1994 and 1995, respectively, to determine their distribution. The WMH range is outside refuge boundaries, and the caribou were tracked primarily by BLM and ADF&G biologists.

Caribou were radio-tracked monthly except for February, July, August, and December when poor weather, mechanical problems, or government shutdowns prevented flights. Eighteen caribou retained active collars as of January 23, 1995, and three collared caribou had died by the last flight of the year on November 18, 1995. Caribou C4, an eight-year-old female collared in April 1992, was transmitting a mortality signal on May 18 and was last heard alive on April 14. The collar was not recovered and cause of death is unknown. Caribou C32, a yearling collared in 1994, died between June 12-19 from unknown causes. The third mortality, C23, an adult female collared in October 1992, was first heard on mortality signal September 27 and last heard alive on June 19. No bones or hair were found when the collar was retrieved and the fate of this animal is unknown.

Genetic analyses of GMH and WMH blood samples collected between 1992 and 1994 were completed by LGL Alaska Research Associates, Inc. in 1995. Samples from the two herds were combined into one sample (n=29) and the results were reported in a paper by Cronin et. al. (Cronin, M.A., Renecker, L., Pierson, B.J., and J.C. Patton. In press, Animal Genetics 26). Mitochondrial DNA, the major histocompatibility complex, and the K-casein protein from Alaskan reindeer, caribou, and caribou/reindeer hybrids were analyzed. Most of the alleles examined occured in both reindeer and caribou, but the frequencies of the alleles differed between the two subspecies. Results indicate that there is considerable genetic differentiation between reindeer and caribou, but not as much differentiation among herds of each subspecies. The GMH/WMH sample contained a mitochondrial allele that was not observed in any other reindeer or caribou, but the significance of this rare allele, if any, is unknown. Genetic analyses gave no indication that the GMH or WMH possess allele frequencies commonly found in reindeer or caribou/reindeer crosses. This is contrary to theories that the GMH originated from a reindeer herding operation in the Kokrines Hills that ended in 1930.

#### 10. Other Resident Wildlife

#### Beaver

Beaver populations are presently high in much of interior Alaska and beaver are frequently observed on the Complex in summer. Local hunters and trappers have noted a significant increase in the Koyukuk River drainage beaver population near the Hogatza River mouth, northeast of the village of Huslia. Beaver is an important subsistence species for local resource users, although current trapping levels are lower than they were historically. The fur is used for hats, mitts, and for trim on gloves and mukluks. Beaver meat is prized for its high fat content and is a welcome change from moose in the diet of local residents. From a biological perspective, beaver activity has an impact on wetland regimes and, therefore, on fish and waterfowl distribution. Native elders suspect that the increase in beaver activity due to lower trapping pressure has resulted in increased abundance of pike. Decreased subsistence use of pike



Caribou of the Galena Mountain Herd use this alpine valley and surrounding ridgetops in the Kokrines Hills east of Koyukuk NWR, as a calving area in mid May and remain in the general vicinity until migrating to the flats on and near the refuge beginning in August. (LS 7/95)



Radio telemetry showed that most Koyukuk-nesting white-fronted geese depart the refuge in early August to stage along the coast of Kotzebue Sound. Deltas of the Buckland River (pictured here), Kiwalik River, and Kobuk River were the main areas used by staging Koyukuk white-fronts. (JM 8/95)

combined with increased habitat created by beaver may have allowed pike to increase. Increased pike abundance may be related to decreased duck numbers on the refuge.

Beaver populations are not monitored annually on the Koyukuk or the N. Innoko NWRs. However, baseline surveys of fall caches were conducted on the Complex in 1991.

#### Wolves

Wolves are common to abundant on the refuge and are sought after by local hunters and trappers. Wolf furs are prized for parka ruffs and a wolf pelt is a distinguished gift in local Athabascan potlatches. Wolves are the most significant predator to the refuge's major subsistence resources, moose and caribou, therefore, population and predation rate information is important to ungulate management decisions. Recent population estimates for wolves on the Koyukuk NWR indicated healthy and stable populations (Table G.8) in 1992 and 1994. Data from surveys conducted prior to these years, although less comprehensive, suggested that wolves were more abundant in the early 1990s compared to the 1980s. Total harvest of wolves on the refuge in 1992 was estimated at 26% of the total population, a level thought to be sustainable over the long-term.

Table G.8. Combined wolf population estimates for Koyukuk NWR and N. Unit of the Innoko NWR (Kaiyuh Flats), Alaska, 1992 and 1994.

Parameter	1992ª	1994 <sup>ь</sup>	
Number of Wolves (±80%C.I.)	106 па	89 76-104 (17%)	
Area surveyed (km <sup>2</sup> )	12,641	10,236	
Wolves/1000 km <sup>2</sup>	8.3	8.7	

<sup>a</sup>1992 survey included all of Kaiyuh and Galena moose survey subunits for moose/wolf ratio comparisons. Stephenson drainage/ridge survey method was used.
<sup>b</sup>1994 survey included all of Kaiyuh subunit, and all of Galena subunit except for Cottonwood Creek drainage resulting in omission of one pack of 5-6 wolves. Becker SUPE random plot/probability sampling was used.

<u>Wolf Study</u>: A study entitled <u>Seasonal movements and home range of three wolf packs</u> on the Koyukuk National Wildlife Refuge was initiated in 1990 and continued in 1995. Wolves were collared in 1990, 1992, and 1994 for home range and predation studies, which were nearly complete at year's end. Progress reports for the movements and predation portions of the study were prepared in 1992 and 1993, respectively. By 1994, a total of 50 wolves had been monitored during the course of the study. Since study initiation, wolves with active collars were monitored monthly to obtain movements, home range, pack size, and predation data. Most of these data were summarized on computer database and GIS files by the end of 1995. Analyses and report writing will continue during 1996, with a final report planned by 1997.

#### 11. Fisheries Resources

Of the 19 fish species with published ranges that include the Koyukuk NWR, 14 have been documented by field investigations in the last two decades. Major fish resources on the refuge include anadromous species such as salmon, dolly varden, and sheefish, and resident species such as pike, burbot, whitefish, blackfish, and suckers. Salmon are of particular importance to subsistence and commercial fisheries. For example, the Yukon River had a peak reported annual salmon catch of 1.2 million, of which an estimated 200,000 were from sections of the Yukon adjacent to or within the refuge (Koyukuk NWR Fisheries Management Plan). In addition to salmon, other important subsistence fisheries include pike, whitefish, and burbot.

Fisheries work on the Complex was coordinated by ROS DeMatteo, while the Gisasa salmon weir was supervised by FB Jeff Melegari and the Kaiyuh pike study was supervised by FB Brian Lubinski, both of the Fishery Resources Office (FRO) in Fairbanks. The FRO, the Alaska Fish and Wildlife Research Center in Anchorage, ADF&G, Sport and Commercial Fisheries Divisions in Fairbanks, and the Tanana Chiefs Conference in Fairbanks also cooperated. There were two major baseline fish studies conducted on the Complex in 1995: (1) Investigation of salmon stock abundance on the Gisasa River; and (2) Investigation of Northern Pike movement on the Kaiyuh Flats (Northern Unit of the Innoko NWR). The following report is on file at the Refuge Complex office in Galena, and is summarized below:

Melegari, J.L. 1996. Abundance and Run Timing of Adult Salmon in the Gisasa River, Koyukuk National Wildlife Refuge, Alaska, 1995. U.S. Fish and Wildlife Service, Fishery Resources Office, Fishery Data Series Number 96-1.

The mainstem of the Yukon River and other rivers within the drainage are subject to commercial and subsistence fishing. Part of the Yukon River drainage lies within the Koyukuk Refuge. The villages of Kaltag, Nulato, Koyukuk, Galena, Huslia, and Hughes depend upon the fish resources of the Koyukuk Refuge for subsistence.

Annual surveys to determine escapement estimates of chinook and chum salmon were conducted on the Gisasa, Kateel, Hogatza, Indian, and Dakli Rivers by ADF&G in 1960 and 1961. No surveys were conducted again until 1974. Since then, ADF&G has surveyed selected index streams every year, although the same streams are not surveyed each year. Index stream escapement data (1960 - present) for chinook and summer chum salmon are available for the Gisasa, Dakli, and Hogatza Rivers. Based on surveys conducted since 1987, it appears that the Dakli drainage supports higher numbers of summer chum salmon, while the Gisasa River supports higher numbers of chinook salmon.

Escapement estimates for salmon stocks using the Koyukuk Refuge rivers are limited to five tributary streams with multi-year data; these are the Gisasa, Kateel, Hogatza, Indian, and Dakli Rivers. The distribution of chum and coho salmon within the Koyukuk River drainage has not been documented. Escapement estimates over the years have been highly variable, so it is unknown how many salmon are using the drainage for spawning and migration. It is known that escapement estimates of salmon in the Yukon River drainage have been declining since the early 1980's; therefore, it is likely that this decline is also affecting the Koyukuk River drainage stocks.

In order to provide baseline information toward cooperative management, the Fairbanks FRO established a weir site in 1994 on the Gisasa River, a major tributary of the lower Koyukuk River. Previous multi-year escapement estimates in conjunction with reliable boat access to its lower reaches, made the Gisasa a practical choice for the weir site of the five rivers considered, the Gisasa, Kateel, Hogatza, Indian, and Dakli Rivers. Logistics were also a major consideration, where all weir materials, tools, camping equipment, provisions, and personnel had to be transported by boat from the mouth to the weir site. Local hire for the weir project was Jason Saunders of Kaltag who served as a biological technician. RAPS student Ed Sommer and Volunteer Adam Eley also assisted the FRO staff at the weir site. Weir construction began on June 15 and it was operational by June 21, 1995. The first chinook salmon passed through the weir on June 22. The weir was operational through August 3, 1995. A total of 4,023 chinook salmon and 136,886 chum salmon passed through the weir this year, and total weir counts were 9.8 and 21.2 times greater than aerial survey counts respectively.

The Complex provided aerial support to transport food and personnel for crew changes. Storage space and bunkhouse lodging in Galena were also provided by the Complex. Daily escapement counts were radioed to the refuge office in Galena where refuge staff relayed counts to the ADF&G commercial fisheries biologist on a daily basis. Weir panels were disassembled after the 1994 season and stored on-site for the winter, while the rest of the equipment and camp gear was hauled back to Galena.



Seasonal BT Jason Saunders from Kaltag ferrys local residents to the Gisasa Weir from the river's mouth during the successful open house. (RC 7/95)



A floating weir was installed near the mouth of Gisasa River by the Fairbanks Fisheries Resouces office in 1994 to measure salmon escapement. In 1995, the total escapement was 136,886 chum salmon and 4,023 chinook salmon. These counts were 9.8 and 21.2 times larger than the previous aerial estimates.

#### Northern Unit of the Innoko NWR pike studies

In 1991 a small controversy arose when a commercial fishing guide began operating on Native lands within the Kaiyuh. Complaints of dead pike were received from local subsistence users; however, the guide insisted that his trophy catch and release fishing practices were low-impact and that fish were being handled carefully. The Complex in cooperation with the Fairbanks FRO felt that because very little is known about pike biology in the western Interior, it would be difficult to determine actual impacts or sustainable harvest. The ADF&G Division of Sport Fisheries was interested in pursuing a pike study in the area, so a cooperative project was proposed. Finally, late in 1993, funds in our budget coincided with ADF&G's funding for the study. This station's 1995 contribution to the study included aerial support, two staff members for five days in June, use of the 24-foot and Alumaweld boats, storage space, and lodging in the bunkhouse.

The study was designed to determine: (1) summer and winter pike habitats; (2) habitat preference; (3) fidelity to seasonal habitats; (4) areas where fish are especially vulnerable to capture, especially overwintering areas; (5) the movement patterns between habitats; (6) describe the mechanics driving movements over large areas; and (7) the population structure in terms of length, weight, and age.

Results from the study will assist the Complex in dealing with the issues which initiated the project: (1) Can this system support an increase in sport and subsistence fishing on the Kaiyuh Flats northern pike fishery; and (2) is the increase in concern for the overexploitation of this world class fishery valid? Results from the study will also facilitate mapping of Kaiyuh Flats pike and their critical habitats.

FB Brian Lubinski of the Fairbanks FRO continued as principal investigator and field supervisor for the project throughout the year. Mark and recapture work was conducted June 12-22 with the assistance of FB Mike Millard and PL Monty Millard, also of the Fairbanks FRO, and ROS Pete DeMatteo and RAPS student Ed Sommer of the Complex staff. Fish recaptured (N=868) by fyke net (n=675), hook and line (n=171), and gill net (n=22) were measured for fork length in millimeters, weighed and tagged with Floy anchor tags for recapture identification. Of the original fifty adult pike implanted with very high frequency radio transmitters in July of 1994, 34 remained on the air on December 13. Telemetry tracking flights for 1995 were conducted in January, March, April, May, June, and December and totalled 46.7 hours.

A flight was made on March 28 to the study site to underwater video tape pike winter habitat. Two ferry flights were made to the study site for crew changes on June 15 and 19. Total flight time for the Kaiyuh pike study during 1995 was 49.7 hours. Telemetry

flights are scheduled for the remainder of the 1995/1996 winter season. A final report is scheduled for 1996.

# 14. Scientific Collections

<u>Small Mammal Study</u> - Small mammals were collected with snap-traps and conical pitfall traps during August and September as part of a long-term monitoring effort (see Nowitna Section G.10.). The primary species collected were red-backed vole, yellow-checked vole, and common shrew. Skulls of shrews and skulls and skeletons of other species were prepared and donated to the mammals collection at the University of Alaska Fairbanks Museum. Ectoparasites were collected and forwarded to a researcher in Nevada for identification.

Passerine birds inadvertently killed during small mammal trapping or mist netting (Section G.7), were collected and saved for study skins.

# 16. Marking and Banding

During July, 145 white-fronted geese were banded as part of a continuing study examining nesting and staging of Koyukuk River White-fronted geese (see Section G.3, Goose Study). For those birds whose sex and age were determined, we recorded 54 males, 77 females, 51 second year/after-second year, and 87 locals. Thirty individuals were fitted with transmitters mounted on collars (ATS Model 16m, freq. 164.442 - 164.715). Birds were banded and radio-marked at three locations on the Koyukuk Refuge: Dulbi Oxbow-West, 27 banded, 1 radio-collared; Koyukuk Oxbow East, 68 banded, 15 radio-collared; and Willow Lakes, 50 banded, 14 radio-collared. At each site, we recaptured four geese banded in previous years.

We banded 627 ducks (221 northern pintail, 405 green-winged teal, and 1 mallard) at Willow Lake, located 8 miles east of Huslia, on the Koyukuk NWR between August 1-14, 1995. (Table 6.9). The majority of birds were hatching-year females. All birds were captured in medicine-hat traps on the northern lobe of the lake.

We banded 388 passerines representing 20 species during mist netting operations on our MAPS project (see Section G.7).

	Fem	ale	M	ale		
Species	L	AHY	L	AHY	Únknown	Total
American green-winged teal	132	71	96	105	1	405
Northern pintail	84	44	82	11		221
Mallard	1	0	0	0		1
TOTAL	217	115	178	116	1	627

Table G.10. Summary of ducks banded at Willow Lake, Koyukuk NWR, August 1-14, 1995.<sup>1</sup>

 $^{1}$  HY = hatching year, AHY = after hatching year

#### H. <u>PUBLIC USE</u>

#### 1. General

Public use on the Koyukuk and Northern Unit of the Innoko NWRs almost exclusively takes the form of subsistence or recreational consumptive uses of hunting, fishing, trapping, and gathering (berries and firewood) or other activities associated with these uses. Subsistence by far dominates recreational use with activities ranging from putting meat, fish, and berries on the table to cutting house logs and firewood. Recreational activities include sport fishing for pike and grayling and hunting for moose, bear, and wolves. Some recreational floating (canoeing and kayaking) takes place on the Koyukuk River, but most is done above the refuge boundary closer to the river's headwaters in the Brooks Range.

Several commercial use permits are issued each year. Two hunting guides conducted their third year of operations after being awarded five year permits to operate on the refuge. Virgil Umphenour guided eleven hunters in the fall for moose and black bear. All hunters were successful in taking moose and one black bear was taken. Virgil now has four assistant guides employed that are residents of Huslia and Galena. Much of his hunting takes place on corporation lands and it is largely because of Virgil's efforts in working with the local villages that the program has gone smoothly for the refuge. Virgil's hunters spent a total of 98 days on the refuge. He operates in Use Areas KOY-04, 05, and 06.

Brian Simpson who is guiding on Use Area KOY-03 guided five moose hunters who were all successful. Simpson spent only 17 hunt days on the refuge with the remaining days on BLM lands.

Steve Williams was permitted to conduct air taxi operations on the Upper Innoko and Koyukuk Refuges. His only client for these areas was a fellow he took to the Upper Innoko. No moose were taken.

<u>Permittee</u> Virgil Umphenour Hunt Alaska	<u>Use</u> Guide/Outfit	<u>Fee Collected</u> \$980.00 User Fee	<u>Clients</u> 11	<u>Species Taken</u> 8 moose 1 black bear 1 wolf
Brian Simpson Taiga Hunting	Guide/Outfit	\$90.00 User Fee	2	2 moose 1 wolf
Steve Williams Ptarmigan Air	Air Taxi	\$100.00 Admin \$4.00 User Fee	1	0
Don Duncan Kniktik Outfitters	Guided Fish	\$100.00 Admin	0	0

Table H.1. Commercial Use Permits Issued in 1995 - Koyukuk/Upper Innoko NWR.

Only one family lives year-round on the Koyukuk Refuge - Lloyd and Amelia Dewilde. Lloyd settled on the North Fork of the Huslia River long before the refuge was established. Of their 14 total children, only one son still lives at home. Lloyd has never had a permit for his main cabin or two trapping cabins on the refuge. Because of his reluctance to secure a permit and the fact that the land he is on will likely be turned over to Doyon Regional Corporation some day, we have never pushed the issue. However, in March we approached Lloyd to point out the advantages and legalities of having his cabins under permit. He didn't sign the permit during our visit and we were a bit surprised to see it in the mail a week or so later. This ends a long-standing issue that could have negatively impacted our village relations.

#### 2. Outdoor Classrooms - Students

The refuge focused on migratory songbirds and salmon in it's school programs for the year. ROS/Pilot Liedberg, PR Johnson and ROS DeMatteo gave programs to approximately 600 students in seven schools on estimating salmon populations and the operation of the Gisasa River weir on the Koyukuk Refuge. The different techniques used to estimate fish populations were compared in terms of accuracy versus manpower and money invested. Students watched a video of the weir in operation and the process biologists use to collect data on the spawning salmon.

The classes at Galena School were involved in learning about local songbirds during the school year. WB Johnson gave a program on the breeding bird survey to 18 third graders as part of their extensive unit on local birds, migration, and breeding. PR Johnson took 17 second graders on a field trip later in the spring to identify local birds around the school ground and surrounding community. Once these little ones mastered the binoculars, they were very involved and skilled in identifying birds that were seen. These school programs complemented several community programs done during the year (see Section H.6).

RM Eley gave hunter safety programs to 114 Galena students from 2nd grade to high school.

### 3. Outdoor Classrooms - Teachers

The refuge took advantage of several opportunities to present four teacher workshops in the surrounding villages this year. In February, 12 Nulato teachers attended a Wetlands and Wildlife workshop that PR Johnson and Laurel Devaney of the Fairbanks FRO presented. Laurel's involvement in the workshop gave a fisheries "spin" that the teachers appreciated. In September, PR Johnson worked with Ruby teachers on developing school activities and class units to be done on their recently completed nature walkway. The one day fall workshop began with discussing the process and philosophy of environmental education (E.E.), community issues that E.E. could address, brainstorming and thematic unit planning. In October, nine Kaltag teachers participated in a two-day Role of Fire in <u>Alaska</u> workshop. A presentation to the community school board on the teacher workshop and the involvement of the school in the curriculum has prompted the community to consider a prescribed burn. At the request of village representatives, the refuge is working with Gana-a-Yoo Corporation to plan a prescribed burn on an area outside of the village. The last workshop for the year was at a home school correspondence conference for state coordinators in Fairbanks. PR Johnson and Regional Education Coordinator Betsy Whitehill presented two three-hour workshops on the Wetlands and Wildlife and Role of Fire in Alaska curricula, respectively. These coordinators were very receptive to Fish and Wildlife Service materials because they compliment the teaching style of the home school correspondence program.

### 4. Interpretive Foot Trails

PR Johnson reviewed the draft of a handbook developed by teacher Anne Titus for the nature walkway at Merreline A. Kangas School in Ruby. In September, the refuge facilitated a teacher workshop on developing a school wide program and class units that utilized the trail (see Section H.3). Activities generated at the workshop were done several weeks later during a theme week.

#### 6. Interpretive Exhibits/Demonstrations

On August 15, the refuge hosted an outdoor demonstration at the MAPS bird banding site located three miles from the headquarters. The event started with a discussion in the office conference room and then the group traveled to the banding site. Twenty-two adults and young people attended and the event was considered a resounding success. In addition, the local radio station program assistant was on hand and she put together a three minute spot that was broadcast to all the villages in the listening area.

On Saturday, July 29, the refuge hosted an open house for nearby village residents at the Gisasa River salmon weir operated by the Fairbanks Fisheries Assistance Office. Since the weir is a  $3\frac{1}{2}$  hour boat ride from Galena this was no small feat to arrange. The goal was to show the project to residents from neighboring villages - particularly members of the village councils. To provide some enticement the refuge provided a maximum of 50 gallons of gasoline to each village council if they were able to put a boat together for the trip. We expected anywhere from 0 to 10 people to show up. Two refuge boats with staff and several residents departed Galena at 8:30 AM. The trip to the weir was interesting. The open house was scheduled for 1:00 to 5:00 PM and by 1:30 there were people waiting to be ferried the  $1\frac{1}{2}$  miles up the Gisasa River by jet boat to see the weir. The tour consisted of displays provided by the FRO staff, and a walk out to the weir trap where people were told about the project and could see chum and king salmon migrating upstream. The turnout greatly exceeded our expectations with 27 people from seven villages making the trip. The jet boat was busy ferrying people for five hours and the food barely met demand. We were fortunate to have Associate Manager George Constantino visiting the refuge during the open house and he was able to meet many of the visitors. The long day ended at 11:00 PM when the refuge boats returned to Galena.

On October 13, the Complex hosted an open house at the headquarters in Galena for community residents. The event coincided with the National Wildlife Refuge Week celebrations throughout the country. Ten different stations held demonstrations or discussions on different refuge projects including GIS, fire management, Gisasa salmon weir, small mammal trapping, duck banding, radio tracking, and others. In addition, the premier showing of the new refuge video ran continuously and was a big hit. The highlight, however, was the unveiling of the new 8' x 24' mural which had been

installed on the side of the building several days earlier. At least half of the community's 500 residents attended and it inspired all of us to continue our outreach efforts in the villages. We were fortunate to have Refuge Coordinator Jerry Stroebele attend the event.

# 7. Other Interpretive Programs

Fish and Wildlife radio reports continued as an important outreach effort to inform local people on wildlife issues and work of the Service. Each report (a maximum of two minutes in length) taped by its author, aired daily for one week.

April	Bird Banding Maureen deZeeuw
May	Spring Waterfowl Law Enforcement
	Paul Liedberg
September	Gisasa Salmon Weir
	Heather Johnson
October	Teacher Workshops and Student Programs
	Heather Johnson
December	Managing Area Moose Populations
	Gunnar Carnwath

Paul Liedberg judged at the Galena Science Fair in February.

### 8. Hunting

The ADF&G Area Game Biologist has conducted a hunter check station on the Koyukuk River just south of the refuge boundary since 1983. The entire Koyukuk River within the refuge boundary is part of a controlled use area which Prohibits aircraft access for moose hunting. The check station, therefore, provides a consistent source of harvest information for the majority of refuge hunters who gain access to the refuge from the Yukon River. This includes most residents on the Yukon and virtually all non-resident hunters. The check station has been a mandatory stop since 1990.

Temperatures during the September 1995 moose season were well above normal and very little rain fell. Many hunters had problems caring for meat in the warm temperatures resulting in much more meat spoilage than in most years. The refuge received numerous complaints from local villagers, but the spoilage problem was not limited to non-local hunters.

Hunters checked 286 moose through the station during September 1995. This harvest was up almost 30% from 1994 and up 34% from the previous five year average of 189 (Tables H.2 & H.3). Numbers of hunters also rose to an all-time high exceeding the previous high by 14%. The number of non-residents hunting the area continues to rise



Kaltag teachers examine vegetation along transects as a part of a two day Role of Fire in Alaska workshop. (HJ 10/95)



Ruby teacher Wayne Young leads a field workshop on developing class units for the recently completed school nature walkway. (HJ 9/95)

while the number of local residents has declined. Although some displacement probably does occur, the decline in local resident hunting on the Koyukuk River may be because moose are available closer to home.

Year	Non-Local AK.	Non-Res.	Local Unit Res.	Total Hunters
1983	29	3	132 <sup>2</sup>	164
1984	67	9	92 <sup>2</sup>	168
1985	74	4	117 <sup>2</sup>	195
1986	80	9	$140^{2}$	229
1987	92	21	151	264
1988	121	17	158	299
1989	125	23	154	302
1990	133	36	137	306
1991	189	55	136	380
1992	153	28	149	330
1993	132	34	115	281
1994	194	56	106	356
1995	258	62	124	444

Table H.2. Number of moose hunters by residency class checked through the Koyukuk River Check Station<sup>1</sup>. Data courtesy ADF&G, Galena.

<sup>1</sup> checking in and out was not mandatory until 1990 and compliance was lower during the first year, 1983.

<sup>2</sup> includes every trip made by hunter

Table H.3. Harvest by moose hunters and harvest rate by residency class checked through the Koyukuk River Check Station<sup>1</sup>. Data courtesy of ADF&G, Galena.

Year	Non-Local AK.	Non-Res.	Local Unit Res.	Total Harvest
1988	88 (73%)	17 (100%)	73 (46%)	181 (61%)
1989	89 (71%)	14 (61%)	55 (36%)	158 (52%)
1990	107 (79%)	30 (83%)	48 (35%)	183 (60%)
1991	121 (64%)	38 (69%)	49 (36%)	208 (55%)
1992	96 (63%)	18 (64%)	51 (34%)	165 (51%)
1993	109 (82%)	28 (82%)	48 (42%)	185 (66%)
1994	127 (65%)	41 (73%)	34 (29%)	202 (57%)
1995	186 (72%)	51 (82%)	49 (40%)	286 (64%)

<sup>1</sup> checking in and out was not mandatory until 1990.

# 9. Fishing

Most fishing within the boundaries of the refuge takes place as part of commercial or subsistence activities which commonly use gill nets. The more traditional sport fishing (at least within the context of this section) is mainly limited to angling for northern pike in the summer and fall. Other species that receive some attention are grayling and sheefish. One commercial use permit was issued for guided fishing during the year but the guide did not make use of the permit. Don Duncan with Kniktik Outfitters intended to take clients to both the Nowitna and Upper Innoko but only conducted business on the Nowitna. We can expect to see him again next year. No air taxi operators transported clients with the main purpose of fishing.

Interest in the northern pike fishing on the Upper Innoko is drawing more attention each year. The quality of this fishery equals or exceeds that of any other place in the state. Fifteen or larger pound, pike are not uncommon during the summer and winter in this area. The state record pike was taken just a short distance south of this area.

# 10. Trapping

Trapping provides an important source of supplemental income for many residents in the villages of Galena, Huslia, Kaltag, Koyukuk, Nulato and Hughes. The reported harvest of furbearers (sealing records) on the Koyukuk and the Northern Innoko is shown in Table H.4. These figures provide a conservative or "minimum" estimate of harvest because some skins, especially beaver and wolves, are kept by trappers for personal use. There are no sealing requirements for marten or mink.

Compared with the 94-95 trapping season, trapping success (or more likely effort), decreased last year for all species except wolves (Table H.5). However, the number of beaver, lynx, otter, and wolverine sealed was close to the mean for all years.

Traplines are not registered, but are generally passed down from person to person or generation to generation. Thus, claims to certain areas for trapping are usually recognized and respected by local residents. Beaver trapping, however, is not always done within strictly controlled trapping territories. Areas are often shared by several people, perhaps because of the importance of this species as a food item.

Snowmobiles are the primary means of transportation for trapping with some individuals traveling up to 200 miles round trip on the trapline. Most dog teams in Galena are used for recreation and we are not aware of any trappers using teams for transportation on their lines. Some trappers use airplanes for access and a few simply walk their traplines. Marten, the biggest catch, are generally taken using pole sets and/or cubby sets. Beavers are taken with snares through the ice while most wolves are shot or trapped with snares around kill sites.

	Species						
Area	Beaver	Lynx	Otter	Wolverine	Wolf		
Kaiyuh Flats <sup>2</sup>	67	0	3	1	0		
Lower Dulbi	0	0	0	1	1		
Koyukuk Mouth	0	0	0	0	0		
3-Day Slough	15	0	0	0	2		
Coffee Can	0	0	0	0	0		
Gisasa-Kateel	0	0	0	0	0		
Nikolai <sup>2</sup>	39	0	3	1	2		
Bear Creek <sup>2</sup>	0	1	1	0	3		
Huslia West <sup>2</sup>	4	0	0	0	18		
Huslia East <sup>2</sup>	129	7	4	1	5		
Total	254	8	11	4	31		

Table H.4. Furbearer harvest on the Koyukuk NWR and Northern Unit of the Innoko NWR (Kaiyuh Flats) during the 1994-95 trapping season.<sup>1</sup>

<sup>1</sup>Based on sealing records obtained from Tim Osborne, Area Biologist ADF&G. <sup>2</sup>This area contains several drainages and some fall outside refuge boundaries

Table H.5.	Minimum	number of	f furbearers	harvested	on the K	Koyukuk	NWR	and
Northern U	nit of the In	nnoko NW	'R (Kaiyuh	Flats) 1989	9-90 thru	ı 1994-95	5.1	

	Trapping Season						
Species	89-90	90-91	91-92	92-93	93-94	94-95	×
Beaver	258	272	215	106	353	254	243
Lynx	7	5	17	7	22	8	11
Otter	2	9	11	8	24	11	11
Wolf	13	1	14	54	34	31	24
Wolverine	2	12	4	3	8	4	6
Total	282	299	261	178	441	308	295

<sup>1</sup>Minimum number harvested based on sealing records obtained from Tim Osborne, Area Biologist ADF&G.

# 17. Law Enforcement

More attention was devoted to conducting LE patrols during the September moose season than in previous years. Because of the high number of hunters now traveling to the refuge - 444 this year - three trips were made to the Three Day Slough area to conduct patrols. Refuge Officers Liedberg and Johnson were assisted in patrols by RO Mark Koepsel from Selawik NWR from September 7-12 and by RO Perry Grissom from the Yukon Flats NWR from the 22nd through 25th. Approximately 160 hunters were contacted during the patrols. Three cases were turned over to the State Fish and Wildlife Protection officer and all were cited - two for not salvaging all the moose meat and one for failure to punch a harvest tag. Three other citations were issued by the refuge for littering when camps were not cleaned of debris. One other case is under investigation.

One camp which was identified as a problem in 1994 was cleaned of debris and all the items were taken into FWS custody. An attempt was made to clean the camp up after the 1995 season and then take legal action against the party but cold weather prevented travel to the site. In the meantime, the individual responsible had been sentenced to 10-40 years for a drug related charge in Kansas. In May, a variety of camp gear including a boat were removed from the site.

One flight was made to patrol for same-day airborne wolf hunters. This activity has dropped off significantly in the past five years - largely due to a case made at this station in 1990 where an airplane was confiscated.

A meeting in Galena to discuss the policy on closed season waterfowl harvest was held on April 25. Five people attended and a good discussion was held. These meetings, with virtually the same message have been held for about five years now and the interest in the subject has dropped. It is still a good chance however to discuss other refuge projects.

# 18. Cooperating Associations

The Middle Yukon Branch of the Alaska Natural History Association exceeded its sales expectations for FY 1995. This increase is in part due to several locally relevant publications and "word of mouth" advertising of our USGS maps. Sidney Huntington, a well known elder in this region, tells of his family history through Jim Rearden in <u>Shadows on the Koyukuk</u>. The <u>Race to Nome</u> features Edgar Nollner, another respected elder of Galena, who is the last of the original mushers of the 1925 Serum Run.

To top off a successful year, we are coming out with several new refuge products for Christmas. We have finally finished our two-part refuge video <u>Lands and Rivers of the Koyukon Region</u> and <u>Natural Resources of the Koyukon Region</u> and plan to sell copies



Wildlife Biologist/Refuge Officer Johnson heading out on river patrols during moose hunting season on the Koyukuk. (PL 9/95)



Although this is not common, occassionally we get a hunter that thinks he can cache a camp until the following season. Usually bears get into the camp. This camp was cleaned up in May. The responsible person is now in jail on unrelated charges. (PL 5/95)

through the outlet. We have also ordered T-shirts and coffee mugs with the refuge logo. We expect all three items to be good sellers as we launch into the coming year.

#### 20. Subsistence Management

The Koyukuk and Nowitna Refuges support uses which occur on a checkerboard of Federal, State, Native corporation, and privately owned lands within refuge boundaries. Subsistence activities conducted on State and Native corporation lands, navigable waters, and on certificated Native allotments within the Complex, are managed by the ADF&G. Subsistence activities occurring on Federal lands and waters are administered by the various agencies depending upon ownership. As a result, user group conflicts between subsistence and non-subsistence moose hunters on the Koyukuk River continued this year. The present arrangement of dual Federal-State subsistence management has presented the Complex with many new challenges since 1990.

ROS Pete DeMatteo continued to serve as subsistence coordinator for the Complex. In fiscal year 1995 the Complex received \$58,000 in subsistence funds:

Subsistence Coordinator Salary	\$50K
Galena Mountain caribou study	<u>\$ 8K</u>
	\$58K

### **Federal Subsistence Board**

The Federal Board met April 10-14 where it made rulings on 68 statewide proposals concerning changes to Subpart D of the Federal subsistence regulations on seasons and bag limits. A proposal submitted by the Western Interior Subsistence Advisory Council to extend the fall moose season for GMU 21A was adopted by the Federal Board. The September 5-25 bull only season for GMU 21A was changed to an August 20 - September 25 season by the Board. This action changed the alignment of the GMU 21A season with that of the opening of the GMU 21B season on September 5.

The Federal Board also continued the arduous task of prioritizing the many customary and traditional use (C&T) proposals it has received since 1990. A 1993 analysis by the Office of Subsistence Management (OSM) staff concluded that the process could take five to ten years to complete. Three C&T proposals concerning uses occurring on the Complex are pending Board action; however, it may be some years before we see Board C&T decisions considering the remaining 200 proposals waiting for staff analysis.

### **Proposals**

A proposal was submitted to the Federal Board by Harold Huntington, a member of the Western Interior Advisory Council and resident of Koyukuk, that would create a closure area on Federal land within the Koyukuk Controlled Use Area of GMU 21D on the lower Koyukuk River. The proposed boundaries of the closure area are from a point 40 miles above the mouth of the Koyukuk River to the lower end of Three-Day Slough, one-half mile either side of the river above the ordinary high water mark. The proposal would permit only local hunters to harvest bull moose within the closure area. The originator's objective was to decrease the competition between local and non-local user groups during September on the lower Koyukuk River; however, realization of the objective is obscured by the fact that the majority of the harvest occurs below ordinary high water. The originator presented his proposal to the Western Interior Council at the October meeting in Aniak and asked for its support. The Council is scheduled to comment on the proposal during its next meeting to be held in Holy Cross in February 1996. The Federal Board will make its ruling on the proposal in April 1996.

ADF&G Area Biologist Tim Osborne presented the Middle Yukon Advisory Committee in December with a proposal that mirrors the design and intent of the Department's proposal for the Nowitna drainage. The proposal bears the intent to decrease competition on the Koyukuk River in September by establishing a registration permit hunt that could possibly discourage participation by some non-local and nonresident hunters. The proposal, if adopted by the State Board of Game, would establish a permit hunt for GMU 21D and 24 within the Koyukuk Controlled Use Area during the September moose season. Resident hunters could harvest a cow or bull without antler size restrictions by registration permit during 1-25 September; however, antlers would be devalued by Department personnel at the Koyukuk check station. Residents and non-residents seeking trophy bulls (50 inches or wider) or cows could obtain a "trophy" registration permit eliminating the antler devaluation requirement. The proposed season for non-resident hunters for GMU 21D and 24 within the Koyukuk Controlled Use Area is September 5-25. ADF&G stated for the Committee that a permit hunt may discourage some non-local participation in September. The Committee voted to oppose the Federal proposal that would create a closure area on the Koyukuk River and to support the Department's proposal to the State Board of Game. The Board will make its ruling on the proposal in April 1996.

#### **Federal Advisory Councils**

The Western Interior Subsistence Advisory Council (Council 6) completed its second year of operation. The Council represents the residents of the western Interior region with nine seats. The function of the Councils is to convey the needs and opinions of their constituencies to the Federal Subsistence Board and to submit regulation proposals





Steven Attla, lifelong resident of Huslia, donated his stories about subsistence to the <u>Raven's Story</u> series to share with listeners of public radio in Interior Alaska. Among his many talents, Steven builds sleds from raw birch logs. (95 MS)



and comments. Included on the Council are Harold Huntington (Chair through October 11, 1995) of Koyukuk and William Derendoff of Huslia.

The Western Interior Council held its 1995 meetings in Huslia (February) and in Aniak (October). Vince Mathews of the OSM succeeded David James as Regional Council Coordinator for the Western Council in May of this year. The five council coordinators are employed by OSM as they oversee council operations and interface between their respective councils and the Federal Board and its staffs. Many new challenges face the Councils and their Coordinators.

# Alaska State Local Advisory Committees

State funding for Regional Advisory Committee Coordinators was cut in 1993 and subsequently the Interior Regional Coordinator was dismissed (Royce Purinton of Nulato). The Middle Yukon and Koyukuk River Advisory Committees continued to function without formal coordination by the State Boards of Game and Fish. The Complex will continue to work with the Committees regardless of any changes which may occur as a result of the Federal Advisory Committee Act funding cutbacks of 1993.

ROS DeMatteo and RM Eley attended the March Middle Yukon Advisory Committee meeting in Galena and ROS DeMatteo and WB Huntington attended the December meeting in Galena. No one from this station attended the February meeting of the Koyukuk River Advisory Committee due to inclement weather conditions. Our plans to attend the November meeting in Huslia were canceled by the furlough. ROS/P Spindler, ROS DeMatteo, and WB Huntington attended the November Tanana-Rampart-Manley Advisory Committee meeting in Tanana. The Ruby Advisory Committee remained inactive throughout the year.

# I. EQUIPMENT AND FACILITIES

# 3. Major Maintenance

Maintenance Management System funds totaling \$15,000 were received for adding insulation and new siding to the duplex, Quarters 108A&B. Plans were drawn up and materials ordered by the engineering office. The project was done force account with MW Barney Attla supervising the project. George Yaska, Sr. from Huslia was hired on a 30-day special appointment to assist. Two underutilized smokejumpers from Alaska Fire Service were used through an interagency agreement for a week to help with tearing off old siding and placement of 3 1/2" of additional insulation. All doors

and windows were moved out and new vinyl siding was installed. The project took approximately three weeks to complete.

The long unused flagpole was erected on the lawn of the headquarters building with the assistance of the city electrical department and the volunteer assistance of residents Dan Patrick and Dave Cassou.

# 4. Equipment Utilization and Replacement

A new 1,000 gallon vaulted fuel tank was received in August. The tank will replace an above-ground auto gas tank sited on a lot leased from the state. The tank will be wired and made operational when the ground thaws in 1996.

A new 150 HP Mercury outboard was purchased to replace a 10 year old unit on the 24' river boat. The local boat shop did the installation.

Two new vehicles were ordered with FY95 funds. The 1988 Mini Van will be replaced with a small pickup and the 1988 Dodge pickup will be replaced with a similar (albiet newer) vehicle.

# 5. Communications Systems

Reliable radio communications are essential to conducting safe and efficient field work in the remote parts of the refuges. Due to the size of the complex, a fairly complicated radio system has evolved. The first remote facilities were installed in 1988, but reliable communications were not attained until 1992, when several required improvements in mountain-top equipment became a reality. The system has since worked well.

The Complex is serviced by a network of mountain-top VHF-FM radio repeaters that provide coverage to most of the areas in which we work. The main hub of the radio network is located on Totson Mt., 35 mi south-southwest of Galena. The Totson site receives VHF signals from the field directly on local channel 1, or indirectly through two repeaters on the Koyukuk (Roundabout Mt., channel 2 and Purcell Mt., channel 3) and two repeaters on the Nowitna (Peak 2321, channel 5, and VABM Kokrines, channel 7). In addition, the Totson site has a repeater (channel 4) that allows portable-to-portable communication without relaying through the office. Communications between the office and the field, and repeater control, are established through a UHF link from the base console in the office to Totson Mt. A telephone interconnect is available for emergency communications after office hours.
#### 6. Computer Systems

Every permanent, professional, administrative, and technical staff member has their individual computer workstation. At year end the Complex had 11 desktop PC-compatible workstations, and six laptop/notebook PC-compatible computers, for a total of 17. The laptops have proved excellent in meeting short-term and portable computing needs, from retrieving remote weather station data to late night report writing at home. Unfortunately, the laptops have proved a major headache to connect to the office network. Most desktops are connected using Chipcom network hardware and <u>Windows for Workgroups</u> software. The refuge network is also tied to an adjacent office building that houses ADF&G, Louden Village council, and Gana-A'Yoo, Ltd.

The refuge shares a geographic information system (GIS) with the lands department of Gana-A'Yoo, Ltd. (GYL), a cooperator on land bank and challenge cost share agreements (See sections C.3 and J.1). The GIS, in combination with the network, has proved to be valuable for producing and sharing maps used for management of wildlife, fish, and land resources, as well as fire management. The GIS uses ArcView and PC-ARC software, and includes a Summagraphics E-size digitizer and a HP color plotter.

# 8. Other (Aircraft)

The complex uses three aircraft, one Cessna 185 (N714KH) and two Piper Super Cubs (N4343 and N13833), to conduct most field operations. All three aircraft are on floats during the summer and on skis during the winter. Wheels are used only for a few weeks during transitions between seasons. The three airplanes were flown a total of 676 hours during FY95. This was done without accident, and represents this station's twelfth year without an aviation accident or incident.

The three aircraft are essential to accomplish field operations over the entire Complex because most of the flying occurs in seasonal peaks (summer waterfowl and furbearer work) and winter surveys with narrow phenological and weather windows (moose, wolf and caribou surveys, furbearer track surveys, etc.). Three pilots work on the staff, two dual-function GS-485 Refuge Operations Specialists (Liedberg and Spindler) and one full time GS-2181 pilot (Brown). The three pilots on staff and three aircraft provide the flexibility to schedule several types of work, or similar comparative work in several areas of the complex, and accomplish it despite the unpredictable weather and limited daylight of the subarctic winter.

Aircraft are "owned" and maintained by the Office of Aircraft Services who bill the Service for hourly flight time and daily availability rates. In FY 1995, the total flying bill for our three aircraft was \$116,402. That represents a 5% increase compared to 1994 costs, even though we flew 18% fewer hours in 1995 compared to 1994. Of the total flying bill, 55% was for hourly charges, 28% for daily availability, 12% for

aviation fuel, and 4% for OAS surcharges for field maintenance. A total of \$461 was spent on a helicopter charter. Maintenance for our remotely-located aircraft was made easier by our use of Northland Aviation, the OAS Contract maintenance facility in Fairbanks. During the year there were no private mechanics in Galena who could assist with emergency breakdowns.

# J. OTHER ITEMS

#### 1. Cooperative Programs

In 1992, Gana-A'Yoo, Ltd. (GYL) requested cooperation and technical assistance to guide land use decisions on Corporation Land Bank holdings within and around the Koyukuk and Northern Unit of Innoko NWR (see Section C.3). It is of mutual interest to both the Service and GYL to cooperate so that their adjacent lands are managed in a way that is compatible and complementary and that minimizes conflict and degradation of habitat. The corporation's goal is to provide shareholders with a land base that continues to meet their subsistence needs and optimally can provide commercial uses at a profit while maintaining the land's biodiversity and productivity. GYL would like to develop some land-based economic activities to improve local employment opportunities. Possible economic developments include commercial timber harvesting, guided recreational wildlife observation tours, guided and outfitted hunting, fishing, and dog sled trips, and cabin/camp site permits. Additionally, the corporation would like to conduct habitat enhancements, particularly prescribed burning, to improve moose populations and berry production for subsistence and commercial leasing opportunities.

For the third consecutive year, the Service signed a challenge cost-share agreement with GYL. The agreement recognized that the Service and GYL share a great need for efficient access to land status, natural resource, and public use data. The agreement was the vehicle for continued funding of the Geographic Information System (GIS). Both land-managing organizations now share easy access to the same high quality information upon which land use planning and management decisions can be based.

Benefits to the refuge and Gana-A'Yoo include:

1) Ability to cooperatively manage Land Bank and adjoining federal, state, and private lands as one ecosystem.

2) Ability to produce a cooperative land use plan that will have as a goal the maintenance of existing biodiversity in the nearly pristine ecosystem, protect subsistence and endangered wildlife species, but allow wise beneficial uses of these resources.

3) Guidance of economic development activities so that wildlife and fish habitats are protected and enhanced rather than degraded.

Several major projects were continued as part of the agreement in 1995.

BT Marlene Marshall continued to be employed to make additions to the GIS database. During the year she generated maps on land status, wolf, swan, moose, and caribou distribution, wildfire history, and vegetation. She also assisted with numerous other tasks that could take advantage of the GIS capabilities.
 Development of a vegetation map.

The Challenge Cost Share program has been an excellent way for us to cooperate with an adjacent landowner to achieve many common goals. The funding source and project goals will be pursued in future years.

#### 4. <u>Credits</u>

WB/Pilot Mike Spindler D5; G1,2,3-part,4,5,6,7-part,8-part;I5,6,8,J1,Highlight-part
WBOrville Huntington G3-part,8-part,10,Highlight-part
WB/LE Buddy Johnson G7-part,14,16,H10
WB Lisa Saperstein G8-part,Highlight-part
ROS/Pilot Paul Liedberg C3, E1
PR Heather Johnson E1,Highlight-part
FMO Bob Rebarchik F9,Highlight-part
ROS Pete DeMatteo E6
RM Tom Eley D4-5
ARM Jim Good, Editing, and Feedback section
AT Maudrey Honea, Editing
RC Rosie Cassou, Word processing & formatting

# K. FEEDBACK

# **ANNUAL NARRATIVE REPORT**

1995

# NOWITNA NWR

# KOYUKUK/NOWITNA NATIONAL WILDLIFE REFUGE COMPLEX

Galena, Alaska

# **REVIEW AND APPROVALS**

acting Complex Manager

5-2-97 Date

 $\frac{0.5/30}{\text{Date}}$ GARD-Nhye Supervisiv

Regional Office Approval

Date

# **INTRODUCTION**

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

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

The refuge lies approximately 200 miles west of Fairbanks in the Central Yukon River Valley. It comprises 2.1 million acres of forested lowlands, hills, lakes, marshes, ponds, and streams. The Nowitna River, a nationally designated Wild River, drains the refuge from south to north. The lowlands along this river are prime waterfowl production and migration habitat. The river and its tributaries support king and chum salmon runs, a large pike population, and one of only three resident sheefish populations in the state. The Yukon River, which forms the northern boundary of the refuge, has a salmon fishery of international significance and is an important transportation corridor. The refuge's very productive marten habitat prompted specific reference in ANILCA to its outstanding furbearer value. Other species of interest common on the Nowitna are moose, wolves, black and grizzly bears, beaver, wolverine, lynx and several species of raptors including nesting bald eagles.

Access to the refuge is possible by airplane, boat, snowmachine, foot, or dog sled. The Complex's aircraft, two Super Cubs and a Cessna 185, as well as three river boats and several snowmobiles provide transportation. The refuge headquarters is located in Galena, a village of approximately 500 people. See the Koyukuk report for a description of Galena. In 1989, the Nowitna Refuge was fused into a complex with the Koyukuk NWR and the Northern Unit of the Innoko NWR. Items common to all refuges are presented in detail under the Koyukuk report.

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# K. FEEDBACK

# A. HIGHLIGHTS

-A moose census was completed along the lower Nowitna and Sulatna Rivers on Nowitna NWR. This population has been censused four times over a 15 year period, during which two population highs (1980 and 1990) and two population lows (1986 and 1995) were documented. The latest estimate was 908 ( $\pm$ 19%) moose on a 1,338 mi<sup>2</sup> area, an annual decline of 6.9% since the 1990 census.

-The mildest wildfire season since 1978 brought only one fire to the Nowitna Refuge for a total of four acres burned.

-A one day fall workshop at Merreline A. Kangas School in Ruby was presented by the refuge. The workshop focused on how teachers could best utilize their newly developed nature walkway.

# B. <u>CLIMATIC CONDITIONS</u>

# D. PLANNING

#### 4. Compliance with Environmental and Cultural Resource Mandates

Little attention has been focused on cultural resource mandates on the Nowitna NWR given other priorities, mandates, budgets and human resources. On the Nowitna NWR, staff is particularly concerned with identifying important cultural resource sites and effecting appropriate protection. During 1995, a Cultural Resource Management Guide was developed with the aid of Archaeologist Debra Corbett and Planner Margaret "Maggi" Arend. This guide will help direct the Complex in protection and education related to these valuable resources.

Élders in Ruby, Tanana and Galena have been contacted concerning important areas and locations. Determining the exact location of the old village of Novikaket is a primary object. Novikaket was a relatively large village located near the mouth of the Nowitna River and was occupied until the turn of the century. The Palisades, bluffs along the Yukon River near the up river boundary of the refuge, produces large quantities of palentological material, most famously bison skulls and mammoth tusks and may represent the oldest cross section of Pleistocene stratigraphy in Alaska. The Palisades have experienced a long history of illegal bone and tusk collecting and refuge staff have expended considerable law enforcement attention to the area. The Complex's staff is endeavoring to build partnerships with other organizations, such as the University of

Alaska, to provide cultural resource information and sites. Research activity in these culturally important areas also could function to deter illegal activities.

During June, 1995, Dr. Paul Matheus and Dr. Owen Mason from the Department of Biology and Wildlife, University of Alaska Fairbanks, with the able assistance of ROS DeMatteo, visited the Palisades to conduct a quick palentological survey. In their letter to Refuge Manager Eley detailing their initial findings, Drs. Matheus and Mason reported:

We have analyzed about 90% of the large bone remains. Based on the species composition, they represent a fairly typical late Pleistocene faunal assemblage, but with a conspicuously low frequency of horse remains (except for the bones you showed us in the barn, we found no horse fossils). Of course, this may be an artifact of the sample size. Bison and mammoth are well represented, however, as is common for Pleistocene sites.

One of the most valuable aspects of Palisades is the concentration of rodent and invertebrate remains we found in the bone producing layer at the location you and Paul Liedberg visited. With Pete's help we screened a fair amount of sediment from this layer and I have begun to sort through the material. It contains a high concentration of small mammal remains, including microtines (so far *Lemmus* spp. and *Microtus* spp.), ground squirrels, and possibly some mustelids. We also recovered some bird bones, which are usually quite rare. Currently, the bird remains are unidentified, but are possibly from a duck. There are also valuable insect, bivalve, and gastropod fossils in the screened material, which are useful for reconstructing paleoclimates and paleoenvironments.

The history of environments responsible for creating the Palisades bluffs appears to be complex and dynamic. At this point, we believe that parts of the Palisades preserve a thaw lake deposit, or even possibly a back slough or overbank environment. This conclusion is based on the presence and abundance of fresh-water bivalves and gastropods in concentrated strata. In addition, some of the sedimentary features seem characteristic of thermokarst ponds and are cryoturbated, indicating ancient permafrost features. Not all of the Palisades sediments are of this type, however. A large portion of the massive silts appear to be eolian (wind-deposited), or may be fluvial, or perhaps are both (we are still undecided about this). In either case, the Palisades environment was probably alternating between periods of high silt deposition interspersed with periods of more static environments such as a thaw lake or overbank.

The bones appear to be deposited not continually throughout the Palisades, rather they are concentrated in perhaps as few as one (but probably more) bone layer. Probably, this layer was formed during one of the more static thaw lake or riparian phases. The bones appear to be concentrated by a low-energy water source. The bodies of animals buried there were not extensively disturbed, since we found what appears to be several skeletal elements from the same individuals. It is unlikely that animals were being drawn to the area and were dying there. It appears more likely that the carcasses of dead animals were being concentrated there by flowing water and dropped out of suspension at a shallow, low energy point. Subsequent fluvial or eolian sedimentation buried and preserved the bones. Based on the type of damage on some of the bones, some ancient scavenging occurred at the site. The lack of carnivore remains, however, supports our conclusion that this was not a natural trap environment.

In regards to the age of these bones, we can conservatively estimate an age of at least 25,000 to 30,000 years old. This age places them at a transition period between a brief interstadial warming and the peak of the late Wisconsonian glaciation. Most of the Pleistocene bones from Alaska date to this period or are slightly younger. If the Palisade bones are of this suspected age, then they have less critical scientific significance. However, from an academic standpoint, sites of this type are very valuable for getting at taphonomic and environmental questions, and for teaching.

Even more important, since the Palisades produces such a large number of bones, it is likely that the site contains specimens of rare or as yet unknown species (carnivores, for example). Late Pleistocene fossil material is superabundant, but it often consists of the same few species. Yet some species from that period are difficult to study and are basically unknown because we find so few of them. The Palisades is the only site in Alaska today which may be useful for reconstructing biogeographic patterns and migration histories between the Old Word and New World, in which Alaska plays such a key role as the avenue of interchange. And since we are talking about the comparatively recent past, these events set the stage for our modern communities, in an evolutionary sense.

Our basis for assigning a probably young age to the material is the faunal composition and the fact that the microtine teeth appear to have a fairly modern form. It is possible, however, that the assemblage is much older, especially considering that its stratigraphic position is so low in the section and because an interglacial tephra (140,000 years old) may lie close to the bone layer. Still, it is not likely to be older than the penultimate (Illinoian) glaciation--about 150,000 to 200,000 years old. If this is the case, their importance increases, since there are very few sites in Alaska of that age, and it is a time of certain suspected animal migrations into North America, which are as of yet undocumented.

We also collected fossil wood from peat layers at the site, and if we can identify and date these samples then they too will be important finds, since they may represent some of the oldest identifiable Pleistocene plant remains in Alaska. We would like to run a radiocarbon date on one or two samples of bone and wood so that we can begin honing in on the age of the fossils, the peat beds, and the bone layer. If they are of late Wisconsinan age, they will fall within the <sup>14</sup>C range. If they have infinite <sup>14</sup>C dates, then we can begin to think older.

Of course, these conclusions are based solely on the material collected on our short trip. Aside from the bones, the sediments at the Palisades certainly are older, perhaps extending back to the early Pleistocene or even late Pliocene (two to three million years). In this regard, the Palisades could become most important sites for reconstructing late Cenozoic environments and climatic changes. And if bones could be found at numerous levels at the Palisades and correlated to stratigraphic markers (ie. Tephras, peats, etc...), that would be something big because it has been difficult to correlate faunal events with the climatic and environmental changes that drove them. At this point we are contacting tephra experts to have the volcanic ashes we collected identified and dates. This information will be useful for dating the lower strata and the bone layer. We have also started the slow process of sorting through the screened sediment and identifying the smaller fossils. Hopefully, when the semester starts we can find a student interested in helping with the work. There are still a few larger bones that we have not specifically identified yet, but at this point we do not expect anything unusual to pop up. We are currently composing the photographic panorama so that we can trace those peat layers and reconstruct some of the paleotopgraphy. That will help us draw a more definitive reconstruction of the depositional environment.

Considering the difficulty of managing this resource, we would recommend two steps at this time. First, we suggest showing a highly visible presence at the site as often and as continuously as possible, especially at the end of break--up since that is when the most bones will be exposed (and the bone pirates know this). Having an active excavation at the site may be the simplest way to achieve this goal. Secondly, we recommend a program of community education and involvement to the extent that the local people (especially in Ruby and Tanana) feel a vested interest and ownership in the resource and want to see it preserved. There is always a risk in public awareness approaches because you are essentially advertising the site, but it seems there already is a severe problem that is only going to get worse.

# 5. Research and Investigations

The following approved refuge wildlife studies were active during 1995. Progress reports are available from the Complex office or the Regional Office Library. Brief reports from the studies are included in the appropriate section of this narrative.

The relationship of wildfire to lynx and marten populations and habitat in interior Alaska (Project No. 75620-90-01).

The purpose of this project is to examine the response of marten, lynx, and small mammals to differing stages of habitat succession following wildland fire. This four year project was initiated in August 1990. The overall project has developed into three subprojects specifically addressing 1) marten, 2) lynx and 3) small mammal prey species. Although the furbearer field research has focused on the Nowitna NWR, major consideration has been given to larger regional databases, e.g. small mammals, fire history, fur sales records, and interviews with trappers. A final project report was nearing completion at the end of 1995. For a summary, see Section G.10.

Investigation of mercury and copper concentrations in fish and wildlife resources on the Koyukuk/Nowitna Refuge Complex.

This ongoing study was initiated on the Complex in 1985. Periodic sampling is being conducted on the Koyukuk, Nowitna, and Northern Unit of the Innoko Refuges. The

objectives of the study are to quantify the level and distribution of elevated mercury concentrations, compare heavy metal concentrations between watersheds with placer mining and those known to be free of previous mining activity, and determine the level of contaminants in wildlife resources that use known contaminated watersheds. A final report summarizing sampling efforts in the 1980's was completed in 1992, and a final report of 1991 field sampling was still in progress by Northern Alaska Ecological Services.

# E. ADMINISTRATION

#### 1. Personnel

Refer to the Koyukuk section of this report.

# 2. Youth Programs

Refer to the Koyukuk section of this report.

#### 4. Volunteer Program

Refer to the Koyukuk section of this report.

#### 5. Funding

Refer to the Koyukuk section of this report.

#### 6. Safety

Refer to the Koyukuk section of this report.

#### 7. Technical Assistance

Refer to the Koyukuk section of this report.

## 8. <u>Other</u>

Refer to the Koyukuk section of this report.

# F. HABITAT MANAGEMENT

#### 1. General

Habitat types on the Nowitna NWR are characteristic of interior Alaska but an unusual feature of the refuge, compared to most other Alaska refuges, is that 88% of its lands are forested. The lower Nowitna drainage has some especially high quality white spruce measuring over 18 inches in diameter and over 100 feet high. Approximately 36 % of the refuge is dominated by black spruce, whereas, an estimated 2% is dominated by white spruce. The primary use of spruce by local residents is for house logs and firewood, although small commercial sawmills have operated in Tanana, Ruby and Galena. The majority of the highest quality timber on the refuge precludes commercial timbering. Local interest in commercial logging operations on islands of the Yukon River has been expressed.

#### 2. Wetlands

The Nowitna's many river watersheds and thousands of lakes provide the basis for the refuge's abundant aquatic resource. The principal rivers on or adjacent to the refuge include the Yukon, Nowitna, Sulatna, Big Mud, Little Mud and Grand Creek. With the exception of the Nowitna, all of these rivers carry a heavy sediment load.

The Nowitna River is the heart of the refuge. This meandering river is constantly creating a diversity of new habitats for fish and wildlife. The river's main channel is 283 miles long, of which 223 miles are within the refuge. The river width ranges from 150 to 450 feet wide and has a mild gradient with all Class I water. The main channel in the lower river is typically 20-30 feet deep in early summer. Limestone in the Kuskokwim Mountains near the headwaters of the Nowitna, contributes carbonates which buffer the acidic qualities of the river and make it more productive than many of its interior Alaskan counterparts. The river flows into the Yukon River which is the fifth largest river system in North America.

Placer mining for gold and other minerals, which was stimulated by the lifting of federal restrictions on gold prices in the early 1970s, has gone through a resurgence since that time. A number of placer mines operate within the Nowitna River drainage to the west of the refuge. This mining technique is a source of aquatic and riparian habitat destruction and potential downstream impacts are a concern.

Lowlands of the Nowitna Refuge are dominated by ponds and marshes, most of them smaller than ten acres. There are approximately 14,000 lakes and ponds on the refuge,

and wetland acreage is estimated at about 30,000. No active manipulation of the wetland habitats takes place on the Nowitna Refuge.

# 3. Forests

The Nowitna's vegetation forms part of the circumpolar northern coniferous forest. On the Refuge, forests dominate at elevations below treeline. Open stands of black spruce are common in low-relief terrain. White spruce, occasionally growing with white birch and aspen, can be found in the better-drained and warmer sites. White birch and aspen may dominate following a disturbance such as fire; however, some stands are considered to be mature or climax in certain habitats.

Seven major vegetation classes were distinguished in a mapping process conducted by Talbot and Markon in 1985 using Landsat images. (Talbot, S. S., and Carl J. Markon. 1986. Vegetation Mapping of Nowitna NWR, Alaska Using Landsat MSS Digital Data. Photogrammetric and Remote Sensing. Vol 52, No. 6. June 1986, pp 791-799.) They defined the forest class site as one with trees at least 16 feet tall. Included in this category are intermediate successional stages, or secondary tree growth temporarily less than 16 feet. Forests are the most widespread vegetation type, covering 88% of the refuge. Of the five recognized subclasses, open needleleaf forest and broadleaf forest are the most extensive, comprising almost 1.5 million acres or 72% of the surface area of the Refuge.

The five forest subclasses are described as following:

<u>Closed needleleaf forest</u> - This subclass has 60 to 100% cover, occurs on moist to welldrained sites from the lowlands to mountain slopes and is particularly well developed on alluvial sites along the Nowitna River and on some islands in the Yukon River. The dominant tree species is white spruce, which may grow in excess of 100 feet tall along the Nowitna River. White birch and balsam poplar are secondary species. This subclass comprises 2% of the Refuge surface area.

<u>Open needleleaf forest</u> - This subclass has 25 to 60% tree cover and is found on moderately to poorly-drained soils. It is usually dominated by black spruce or larch. This subclass comprises 42% of the Refuge surface area. This subclass comprises 42% of the Refuge surface area.

<u>Needleleaf woodland</u> - This subclass which is sometimes called "muskeg" has 10 to 25% tree cover and is found on moderately to poorly drained soils. Black spruce is the most common tree and dwarf shrubs such as Labrador tea, bog blueberry, lingonberry, and small cranberry are important in the understory. Sphagnum moss covers much of the ground, insulating the permafrost layer beneath. This subclass comprises 10% of the Refuge surface area.

<u>Broadleaf</u> - This subclass has 25 to 100% cover and occurs in well to imperfectly-drained sites. White birch, aspen, and balsam poplar dominate the overstory. Other types of broadleaf deciduous forests occur on hills where strips of birch forest line many hillside streams, and aspen is present on south-facing sandy hillsides. This subclass comprises 30% of the Refuge surface area.

<u>Mixed forest</u> -This subclass has 25 to 100% cover. It consists of deciduous broadleaf and evergreen needleleaf trees over large areas of moderately to well-drained soils on the lower mountains. It grows tallest in lowlands along rivers and on islands in the Yukon River. Principal species are white birch, aspen, and white spruce. This subclass comprises 4% of the Refuge surface area.

# 6. Other Habitats

In addition to the forest vegetation classes described in F. 3, Talbot and Markon went on to describe several other classes that occur on the Nowitna Refuge. With the exception of the water classes, the others are described here.

A vegetation class of <u>scrub</u> was described in the mapping process which includes over 4% of the refuge surface area. Sites in this vegetation class are composed predominantly of deciduous shrubs ranging from 1.5 to 16 feet in height. Three subclasses occur within the scrub type and include lowland broadleaf, alluvial broadleaf, and subalpine broadleaf. Dominant species within these subclasses include *Alnus crispa*, *A. incana*, *Salix planifolia*, and *S. ale-xensis*. Chief understory species include *Vaccinium vitis-idaea*, *Linnaea borealis*, *Calamagrostis canadensis*, and *Equisetum arvense*.

The <u>dwarf scrub class</u> is also called tundra and contains slow-growing dwarf shrubs less than 1.5 feet tall, chiefly in the heath and crowberry families. One subclass includes dwarf scrub-graminoid tussock peatland which is located on poorly drained organic soils. Mosses and lichens cover the surface. Dominant species include *Ledum decumbens*, *Vaccinium uliginosum*, *V. vitis-idaea*, *Betula glandulosa*, *Eriophorum vaginatum*, *Carix bigelowii*, *Rubus chamaemorus*, *Sphagnum* spp., *Dicranum spp.*, *Cladina* spp. and *Cetraria* spp. The second subclass is prostrate dwarf shrub tundra which characterizes relatively bare alpine communities. It is dominated by matted dwarf shrubs and is also rich in lichens. Dominant species include *Dryas octopetala*, *Salix phlebophylla*, *Vaccinium uliginosum*, *V. vitis-idaea*, *Empetrum nigrum*, *Diapensia lapponica*, *Salix arctica*, *Arctostaphylos alpina*, *Sphaerophorus globosus*, *Cetraria nivalis*, *C. cucullata*, *Alectoria ochroleuca*, *Thanmolia subuliformis*, and *Sterocaulon* spp. The dwarf scrub class accounts for 1.9% of the Refuge surface area.

A <u>herbaceous vegetation class</u> is dominated by herbaceous plants and includes grasses, sedges, and flowering plants. The primary subclass is graminoid bog, marsh, and meadow. Graminoid bog has a mossy surface underlain by peat which is often saturated

with water. Typical graminoids in this subclass are *Eriophorum russeolum*, *Carex limosa*, *Carel chordorrhiza*. Graminoid meadow is relatively dry and dominated by *Calamagrostis canadensis*. It is often associated with old river meander scars. Graminoid marsh primarily occurs at the margins of lakes and ponds. The most important graminoids in this subclass are *Carex aquatilis*, *and Carex rostrata*. This class occurs along the margins of most wetlands on the refuge. Approximately 1. 8 % of the Refuge is comprised of this class.

A <u>scarcely vegetated areas class</u> includes subclasses of scarcely vegetated floodplain and scarcely vegetated scree. In this class, plants are scattered or absent and bare mineral soil or rock dominates. The scarcely vegetated floodplain subclass includes river alluvium areas recently colonized by *Populus balsamifera*, *Salix alaxensis*, *Epilobium angustifolium*, *E. Latifolium*, *Artemisia tilesii*, *Achillea sibirica*, *Equisetum arvense*, *Arenaria physodes* and several grasses. Less than 0. 2 % of the Refuge is comprised of this class.

# 9. Fire Management

This was one of the quietest fire years on record in Alaska. The Nowitna refuge had only one wildfire in 1995. Lightning started fire number 7514 in mid-July, for a total of 4.0 acres burned.

In October of 1995, the Bureau of Land Management (BLM) hosted an initial meeting to discuss suppression boundary changes to a large area of land on the west side of the Nowitna Refuge extending to the east side of the Upper Innoko Refuge (south of the village of Ruby). Agencies involved in the discussions included the BLM, Doyon Regional Corporation (Doyon), State of Alaska, and the U. S. Fish and Wildlife Service. Because of the proximity to the village of Ruby, the Refuge felt it was important to solicit input from the area, so a public meeting was held in November. That meeting included representatives from the BLM, Doyon, Tanana Chiefs Conference, the U. S. Fish and Wildlife Service and locals from the area. The initial recommendations were for the reduction in suppression levels from Modified and Full to Limited.

There was little or no opposition to the proposal. The majority of people were willing to allow us to manage fire in a more natural regime and understood the goals. The majority of the comments indicated the need to have fire in order to maintain a healthy diverse ecosystem. The suggested changes should go into effect in 1996. This will change the suppression strategy from Modified to Limited on more then 32,500 acres of refuge lands.

#### 12. Wilderness and Special Areas

The Nowitna River within the Nowitna NWR was designated a Wild River by ANILCA per provisions of the Wild and Scenic Rivers Act. The main river channel is 283 miles long, of which 223 miles are within the refuge. The watershed of the Nowitna is 7,244 mi<sup>2</sup>, of which only 31% lie within the boundaries of the Refuge. Except for nine trapper cabins and two refuge administrative cabins along the river, there are no improvements within the corridor. Two State of Alaska R.S. 244 Rights-of-Way (ROW) are recorded within the boundaries of the Nowitna Refuge. One of these (No. 219) encroaches on the Wild River corridor in several places and could present management problems should the state choose to exercise use of the ROW. During May, 1995, Refuge Manager Eley received River Manager's training at Cooper Landing, Alaska. The training and field trips were excellent.

#### G. WILDLIFE

#### 1. Wildlife Diversity

The Nowitna Refuge supports a diverse group of wildlife representing most of the species found in interior Alaska. Thirty-seven species of mammals, 147 birds, 20 fishes, and 1 amphibian are known to occur on or near the refuge. A draft bird list for the refuge was completed in 1992. It will not be published until adequate field and literature review can be accomplished. Particularly lacking are observations and documentation of upland and alpine-breeding species.

#### 2. Endangered and/or Threatened Species

The American peregrine falcon is the only endangered animal species known to breed on the Nowitna refuge. Delisting has been proposed for the American peregrine; Region 1 is responsible for acting upon the proposal and is gathering information. There is also a proposal to delist the threatened arctic peregrine falcon, which migrates across the refuge. ADF&G has recommended that the American and arctic peregrine falcons be removed from the state's endangered species list but should be considered "species of special concern."

#### 3. <u>Waterfowl</u>

Wetlands in the Nowitna River floodplain support large waterfowl populations. Principle duck species breeding on the refuge include American wigeon, northern pintail, mallard, green-winged teal, surf scoter, white-winged scoter, common and Barrow's goldeneye, bufflehead, and lesser scaup. Less abundant breeding ducks include northern shoveler,

red-breasted merganser, greater scaup, canvasback, ring-necked duck, redhead, black scoter, and oldsquaw. Arctic, red-throated, and common loons also nest on the refuge, as do horned and red-necked grebes. Canada geese, white-fronted geese, trumpeter swans, and tundra swans are found on the refuge in moderate to high numbers. The greatest concentrations of waterfowl occur during spring and fall migrations on large, shallow floodplain waterbodies, especially connected oxbow lakes that are partially drained..

# Weather Conditions and Waterfowl Migration Chronology

In 1995, spring breakup on the Yukon occurred early (May 2nd at Galena), and flooding was light along the Yukon and Nowitna River drainages. Habitat conditions were estimated to be very favorable for waterfowl brood production. This was in contrast to significant breakups of flooding that occurred along the lower Nowitna River during 1989 and 1992 that caused widespread flooding. Most recently, in 1994, an ice-jam flood on the Yukon just above Ruby caused record water levels and flooded much of the available waterfowl habitat in the Nowitna floodplain as far up as the Loop.

Nesting conditions for ducks, geese, and swans were observed on the Nowitna NWR during a Cessna 185 overflight on May 10th. The majority of lakes and sloughs on the Nowitna NWR were observed to be largely open water. Patchy snow was observed on the hillsides around Wood Creek (eastern side of Sulatna Crossing), and mud and small gravel bars were present along the Nowitna River drainages.

#### Ducks

Duck production surveys were initiated on the refuge in 1983, but since 1992 no duck production surveys have been conducted on the Nowitna NWR. Duck production survey methods continuously improved as they evolved, but data sets were small and staff turnover caused inconsistencies in methodology. In 1990, surveys were standardized to produce refuge & statewide estimates, but these methods were too costly to continue annually. WB Saperstein was tasked with preparing a summary of the results of all duck production surveys. Results of these surveys were presented in a draft report, "A summary of ten years of duck production surveys, Nowitna National Wildlife Refuge, Alaska, 1983-1992." The report is scheduled to be finalized in 1996.

The only other indication of trends in duck numbers available for the refuge is the aerial duck breeding pair survey conducted by the Service's Division of Migratory Birds in Juneau. A summary of key duck species estimates for the Tanana-Kuskokwim stratum is presented in an unpublished report entitled "Alaska-Yukon waterfowl breeding pair survey, May 15-June 7, 1995." The Nowitna NWR comprises <10% of the Tanana-Kuskokwim stratum, and therefore, these data will not be presented here.

#### Geese

<u>Production.</u> River float-trips are conducted on the Nowitna River to assess goose production. Results of the surveys were summarized by BT Lowe and WB/Pilot Spindler in Progress Report FY96-01 entitled: <u>Goose production surveys on Koyukuk and Nowitna National Wildlife Refuges. Alaska, 1983-1995</u>. A brief summary of the Nowitna portion of the report follows:

River float-trip surveys have been conducted annually on the Nowitna NWR to assess goose production and record observations of other wildlife. Surveys were initiated on the Nowitna in 1985. During the period from 1985 to 1993, a trend of declining goose abundance was observed. This trend partially reversed in much of the Koyukuk/Nowitna Refuge Complex in 1994 and 1995. Surveys in most areas of the Complex showed small increase over 1994 goose numbers. The 1995 survey showed a sharp increase in greater-white-fronted goose numbers on the Nowitna. Observations of Canada geese continued to decline on the upper Nowitna River, and the 1995 totals were the lowest ever observed. The Nowitna River was the only river surveyed that experienced a sharp decline in 1995.

#### Swans

Both Trumpeter and Tundra Swans nest on the refuge but species composition has differed by area and year; therefore, fall aerial production surveys have necessarily grouped the two species as simply "swans." Swans are considered a key indicator species because their production trends tend to correlate well with that of other waterfowl species, swan sightability is high during aerial surveys, and they are sensitive to nest disturbance. Swan surveys have been conducted on the Nowitna NWR by refuge staff since 1985 to determine trends and locate nesting and staging areas. The staff selected eight 1:63,360 trend maps to monitor swan population and production, according to the wildlife inventory plan.

Complete statewide censuses of Trumpeter Swan summer populations in Alaska were conducted by the U.S. Fish and Wildlife Service in 1968, 1975, 1980, 1985, 1990, and most recently in 1995. The survey covers 51,364 statute miles of aerial survey transects in the known range of Trumpeter Swans. All maps with swan habitat within the entire Nowitna NWR were surveyed in 1990 and 1995. The purpose of this survey was to accurately detect any long term population changes in Alaska. This effort was coordinated and funded by the Migratory Bird Management Field Office in Juneau.

Results of refuge aerial swan surveys were summarized by BT Lowe and WB/Pilot Spindler in Progress Report FY96-02 entitled: <u>Aerial Swan production surveys on</u>

Koyukuk and Nowitna NWRS. Alaska. 1985-1995. A brief summary follows:

Aerial surveys of a sample of eight trend maps indicated that adult swan populations on the Nowitna NWR increased from 1985 to 1995. Slight declines in percent young were noted on the Nowitna NWR in the years between 1990-93. The declines were partially reversed in 1995, when percent young increased. Censuses of all swan habitat on all units of the Nowitna NWR in 1990 and 1995 also indicated that the total population has increased. In the five years between these two most recent censuses, swan estimates on the Nowitna NWR increased 68% from a total of 292 to a total of 492. The estimated annual growth rate of the adult component was 12%.

# 4. Marsh and Water Birds

A number of marsh and water birds are commonly observed on the refuge, including: common, Pacific, and red-throated loons, red-necked and horned grebes, and sandhill cranes. Yellow-billed loons are occasionally observed.

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

Some of the shorebird species commonly seen on the refuge include the following: common snipe, whimbrel, semipalmated, least, spotted, solitary, and upland sandpipers, lesser yellowlegs, golden and semipalmated plovers, long-billed dowitcher, and northern phalaropes. Mew gulls and arctic terns are common breeders and Bonaparte's and Herring gulls are regular nesters. No trend surveys are conducted to determine the status and distribution of these species, but observers on goose production surveys were encouraged to record sightings of any *Charadriiform* birds they identified.

# 6. Raptors

The Complex has nesting populations of rough-legged hawks, merlin, sharp-shinned hawks, ospreys, northern harriers, red-tailed hawks, goshawks, great horned owls, great gray owls, boreal owls, northern hawk owls, American peregrine falcons, and bald eagles. Snowy owl, Swainson's hawk, and gyrfalcon are occasional visitors. Northern hawk owls were seen on a regular basis during the Fire/Furbearer study in the 1985 burn. This burn is in the tall shrub-sapling stage and supports a diverse microtine community.

### 7. Other Migratory Birds

A Breeding Bird Survey (BBS) route, established in 1994 on the Ruby Road, was completed on June 9, 1995. The BBS route follows the Ruby Road, a 50-mile long gravel road that provides access to several mining areas south of Ruby. The route was designed to be run from south to north (toward Ruby) so that the observer could become familiar with the route while on the way to the start, remain overnight, and then run the survey the next day on the way back to Ruby. The survey was conducted following procedures established by the BBS and began approximately ½ hour before sunrise at 03:22 and was completed at 07:48, an elapsed time of four hours, 26 minutes.

Observations were recorded for 354 individuals of 22 species. The most frequently encountered species were Swainson's thrush (113 individuals recorded at 46 stops), slate-colored junco (45 individuals at 28 stops), ruby-crowned kinglet (37 individuals at 29 stops), and alder flycatcher (37 individuals recorded at 25 stops). This is a substantial increase from last year when 281 individuals of 17 species were recorded. The number of individuals of most species was greater this year except for yellow warbler, orange-crowned warbler, and alder flycatcher. Alder flycatchers declined from 50 individuals in 1994 to 37 in 1995 possibly due to a later arrival in 1995.

# 8. Game Mammals

#### Moose

A moose census was conducted on the Nowitna NWR during the fall of 1995. A regression estimation technique designed by ADF&G was used to estimate the total population within the Lower Nowitna/Sulatna River drainages. Estimates from former census efforts using the ADF&G MOOSEPOP program were compared among years to test for significant population changes within the study area. The results of the census were summarized by WB Huntington, WB/Pilot Spindler, and M. Bertram (Yukon Flats NWR) in Progress Report FY96-04 entitled: <u>1995 Moose Census: Lower Nowitna River and Sulatna River Drainages</u>. The final report is expected to be completed in mid 1996. A brief summary follows:

An aerial moose population survey was conducted on 1,338 mi<sup>2</sup> of the lower Nowitna and Sulatna River drainages from November 6-10, 1995. The 1995 census area was within areas previously surveyed in 1980, 1986, and 1990 (Figure G.1). The sightability-corrected total regression estimate for the 1995 census area was 908  $\pm$  19% moose at the 90% confidence level. Although this estimate represents a 34% population decline from the estimated 1990 population total, it was not statistically significant. Trends in regression estimates over a fifteen year period included a 3.3% average annual decline from 1980-86, a 14% average annual increase from 1986-90, and a 6.9% average annual decline from 1990-95. The 1995 sex and age composition in the subunit indicated a population with moderaterly low productivity and recruitment, and high exploitation.



Figure G.1. Summary of total bulls, cows, and calves estimated on a 1,338  $mi^2$  moose census area along the lower Nowitna and Sulatna River drainages in 1980, 1986, 1990, and 1995, Nowitna NWR, Alaska.



Figure G.2. Moose composition ratios for lower Nowitna River trend count areas combined, Nowitna NWR, Alaska, 1980-95 (1980-85 data courtesy ADF&G, Galena).

In years intervening between refuge-wide censuses, moose survey efforts consisted of intensive aerial surveys of standardized trend count areas (40-70 mi<sup>2</sup> in size) where hunting pressure was thought to be greatest, or where other conservation concerns dictated a need for the information. The results of the surveys were summarized by WB/Pilot Spindler in Progress Report FY96-03 entitled: <u>Moose trend surveys on the Koyukuk and Nowitna National Wildlife Refuges. 1980-95</u>. The portion of the abstract pertinent to Nowitna NWR follows:

Aerial trend surveys indicated that on the Nowitna NWR moose numbers along the lower Nowitna River (from the Sulatna confluence to the Nowitna Mouth, and along the Yukon River at Deep Creek) increased from 1986 to the early 1990's. After 1993, a decline in abundance was noted at Nowitna Mouth and Sulatna/Nowitna Confluence, while Deep Creek numbers increased slowly. Elsewhere on the Nowitna, increases in moose numbers were noted at Little Mud River/Nowitna confluence and Mason Slough while a decrease in moose numbers occurred at Our Creek. Bull/cow ratios have generally decreased in all Nowitna areas, likely a result of hunting. Recent trends in moose abundance and composition on selected areas of the Nowitna NWR are depicted in Figure G.2.

# 9. Marine Mammals

In prior years beluga whales have been observed in the Yukon River as far upstream as Tanana. The most recent observation was in 1993.

### 10. Other Resident Wildlife

#### **Furbearers**

Twelve species of furbearers regularly occur on the Nowitna NWR: marten, mink, beaver, lynx, otter, red fox, wolverine, muskrat, red squirrel, shorttail weasel, coyote and wolf. All species are harvested by refuge trappers, however, marten and beaver are by far the most economically important. Arctic ground squirrels and least weasels, species trapped in other parts of Alaska, are present on the refuge but are not harvested by local trappers.

#### Beaver

Beaver populations are presently high in much of interior Alaska and beaver are frequently observed on the Nowitna NWR in summer. Beaver is an important subsistence species for local resource users, although current trapping levels are lower than they were historically. The fur is used for hats, mitts, and for trim on gloves and mukluks. Beaver meat is prized for its high fat content and is a welcome change from moose in the diet of local residents. From a biological perspective, beaver activity has an impact on wetland regimes and, therefore, on fish, wildlife, and waterfowl distribution. Native elders and local trappers suspect that the increase in beaver activity may be due to lower trapping pressure and has resulted in increased abundance of pike. Beaver populations are not monitored annually on the Nowitna NWR; however, baseline surveys of fall caches were conducted in 1991.

#### Wolves

Wolves are common to abundant on the Nowitna NWR, and are sought after by local hunters and trappers. Wolf-furs are prized for parka ruffs and a wolf pelt is a distinguished gift and part of the ceremony in local Athabascan potlatches. Significant predation by wolves on moose within the refuge is a point of concern to the hunting public; therefore, population and predation rate information is important to ungulate management decisions.

The most recent wolf data available for the refuge are from an aerial census survey conducted March 18-21, 1991. The wolf density was estimated at 7 wolves/1,000 km<sup>2</sup>, and the moose:wolf ratio was estimated to be 46:1. These data indicated intermediate predation levels when compared to the Koyukuk NWR and Kaiyuh Flats (Northern Innoko) wolf and moose data. A cooperative wolf census to update wolf density data on and adjacent to the Nowitna NWR was discussed by Koyukuk/Nowitna NWRComplex staff and ADF&G. Initially the work was planned for 1995, but the census was not conducted due to lack of funds. The census was rescheduled for 1996, when we plan to use the Becker- SUPE method that was employed on the Koyukuk in 1994.

Field work for a telemetry study of wolf distribution and predation on Nowitna NWR began in 1990 and was completed in 1992. Data analysis and report preparation are in progress.

#### Marten

To obtain long-term information on the demographics of the marten population and harvest intensity, the Nowitna Refuge began purchasing marten skulls from refuge trappers in 1987. Tooth sectioning and analysis of cementum annuli and radiographs are being used to age animals. Trapper questionnaires are providing estimates of annual trapping effort. This information has been used to develop a better understanding of the relationship between harvest characteristics (total harvest, sex-and age composition) and the status of the Nowitna marten population. A detailed account of the most recent marten harvest can be found in a progress report by WB Johnson entitled: <u>Analysis of the 1994-95 marten harvest on the Nowitna National Wildlife Refuge.</u> (Progress Rep. FY97-01, USFWS, Galena AK). A summary of that report follows:

Two trappers operating on or near the Nowitna NWR provided 145 marten carcasses from the 1994-95 harvest. Juvenile martens comprised 54% of the harvest sample. The overall ratio of males to females was 1.4:1 and the ratio of juveniles to adult females was 6:1. Harvest data continue to be within ADF&G management objectives of maintaining > 50 % males and a ratio of young:adult females of  $\ge$  2.1 in the annual harvest. Trapping effort for martens continues to be reduced due in part to low fur prices.

#### Wildland Fire/Furbearer Project

After four years of field work and two years of data analysis and writing, the final report of the Wildland Fire Furbearer project was nearing completion by the end of the year. Four separate manuscripts for scientific publications were drafted: marten, lynx, small mammals, and berries. The first two manuscripts were near completion at year's end. A summary of the final project report follows:

Several large forest fires occurred in interior Alaska during the summer of 1988. Many rural residents subsequently voiced concern over recent changes in fire management policy that had placed some remote areas in zones of limited fire suppression. A primary concern was the effect of fire on traplines and the immediate and long-term effects of fire on furbearer populations. Marten (*Martes americana*) and lynx (*Lynx canadensis*) were of particular concern because of their economic contribution to the trapping industry in Alaska. We began a project in 1990 to examine the relationship between wildland fire and furbearer populations in interior Alaska.

A literature review was conducted and an annotated bibliography was published as part of developing the study plans. We conducted field studies on marten, lynx, and their prey and forage on the Nowitna NWR during 1991-94. The study site contained three post-fire seral stages: a 1985 burn (133 km<sup>2</sup>) mostly in the shrub-sapling stage; a 1966 burn (197 km<sup>2</sup>) mostly in the dense tree stage; and mature coniferous forest (50 km<sup>2</sup>) that had not burned in 100-115 years. We also used a mail survey and interviews to learn about fire-furbearer relationships from experienced fur trappers. Finally, we synthesized study results and existing information into preliminary models of how fire affects lynx and marten abundance in the taiga of interior Alaska.

Most studies on marten-habitat relationships from lower latitudes indicate that marten require mature coniferous forest with  $\geq$  30% canopy cover and avoid open areas, such as burns or clearcuts. However, a few recent studies from Alaska and northwest Canada have shown that marten will use recent burns in the taiga that lack overhead cover but have post-fire deadfall. We tested whether all post-fire seres are equally used by, and of equal quality to, marten and their prey.

Lynx depend on cyclic populations of snowshoe hare (*Lepus americana*), and hare find optimal habitat in the dense cover and browse associated with mid-successional forest seres. Fire, flooding/ice scouring, and logging (in limited areas) influence the distribution of mid-successional seres over time across the taiga. Refugia (areas of dense cover) are important to hare during the low of their population cycle and often define the few areas where resident lynx remain when hare are scarce. We tested whether habitat selection by hare and lynx occurred as predicted according to their position in the population cycle during 1991-94.

To understand habitat selection by furbearers, we estimated abundance of prey and forage important to the furbearers. During late-August to mid-September, 1991-94, we estimated abundance and biomass of small mammals with snap and pitfall traps placed in three replicate grids (100 stations each) per seral stage. During autumn 1992-94, we also counted berries and mushrooms. Track intersections of snowshoe hare, gallinaceous birds, and red squirrel (*Tamiasciurus hudsonicus*) were counted along snowmachine trails during 1991-94 to estimate relative abundance among seres.

We examined habitat use of marten by livetrapping and radiotelemetry during 1991-92. A map of habitat cover types was created from satellite imagery, field reconnaissance, and aerial photo interpretation to estimate habitat availability. Habitat selection among seral stages and cover types was estimated as proportion used divided by proportion available. We also examined habitat use and hunting behavior of marten by backtracking along marten trails during three winters. Marten scats were collected during backtracking to assess food habits. Population demography was inferred from livetrapping and from marten carcasses obtained from trappers. We estimated habitat selection of marten, lynx, and hare by counting track intersections along snowmachine trails (stratified by topographical habitat) during three winters and evaluated position of hare and lynx in their population cycle by track counts, pelt sealing records, and other observations.

Red-backed voles (*Clethrionomys rutilus*) were the most abundant and widespread arvicoline (mouse) and their numbers fluctuated widely between years in the mature forest and 1966 burn. Shrew abundance fluctuated among years with a one year lagtime behind red-backed voles. Arvicoline biomass was different among seres largely due to the presence of the yellow-cheeked vole (*Microtus xanthognathus*) in the 1985 burn. Yellow-checked voles were absent from the 1966 burn, where arvicoline diversity was low. Voles were segregated along the mature forest/1985 burn ecotone, with yellowcheeked voles occurring primarily on the burn side. Red-backed voles were most abundant on the mature forest side of the ecotone in 1991-92 but were evenly distributed across the ecotone in 1993-94. Abundance of berries and mushrooms differed among years and seres; berries were consistently least abundant in the 1966 burn; whereas, mushrooms were always least abundant in the mature forest. For marten, our landscape-scale analysis (position of home ranges within study site) was unclear because of problems in defining habitat availability, but selection was implied by virtue of few martens with home ranges containing all three post-fire seres. Habitat selection based on track counts was highest for the 1985 burn and lowest for the 1966 burn. Frequency of marten track crossings and foraging investigations during backtracking were also highest in the 1985 burn and lowest in the 1966 burn. No selection for forest cover types or burn features by marten occurred at the stand-scale (within home ranges).

We speculate that the 1985 burn was a population sink for transient, non-breeding marten that dispersed from natal sites in the mature forest outside the study site. Marten in the 1985 burn were younger than in the mature forest within the study area, which were in turn younger than marten in mature forest outside the study area. Also, reproductive potential (counts of corpora lutea) was higher outside than within the study area. Unburned inclusions composed only 6% of the 1985 burn, but deadfall density was highest in the 1985 burn, affording cover in lieu of coniferous forest and access to subnivean forage and resting sites. Also, arvicoline biomass was highest in the 1985 burn, potentially supporting a higher density of marten compared to adjacent post-fire seres. However, until the habitat needs of adult females during the natal period are better understood, we recommend caution in using fire to manipulate the mosaic of post-fire seres on the landscape-scale in the taiga. Many features we measured (e.g., abundance of berries, mushrooms, arvicoline rodents, deadfall) were distributed in patches at a site scale, hindering prediction of habitat suitability from the stand-scale attributes often obtained from satellite imagery (e.g., forest cover type). Finally, trapping in recent burns where non-breeding marten are abundant could be a productive and conservative harvest strategy, but harvest data are needed from several sites to determine if burns act as population sinks elsewhere.

Snowshoe hare, gallinaceous birds, and lynx were more abundant in the 1966 burn than in the mature forest or 1985 burn. Lynx abundance declined on the study area during 1991-94, whereas hare abundance seemed low and declining, which suggested that the hare were near the low of the population cycle. Hare showed the highest preference for the 1966 burn and for ridges during all three years of snow tracking. Cover and browse were densest in these areas, suggesting that ridges, particularly those in the 1966 burn, were hare refugia.

Trapper opinions about fire were obtained from mail questionnaires (n = 56) and subsequent interviews (n = 25). Opinions were difficult to generalize because of regional and often site-specific differences in topography soils (proportion of organic layer in soil that is burned), and fire severity which influence rates of post-fire plant regeneration. Within regions, fires in lowland or poorly-drained areas were often described by trappers as having less of a negative effect on lynx or marten than fires in hilly or better-drained areas. The influence of fire on lynx and hare populations seemed to be greater with increasing distance from rivers in which flooding and ice scouring serve to maintain early mid successional habitats. We discussed weather, topography, and antagonistic species interactions as factors that can bias inferences on furbearer abundance and habitat selection.

We incorporated study results and existing knowledge of fire-furbearer relationships into preliminary models of how fire influences lynx and marten abundance in the taiga. The models included decision statements on pre-fire furbearer and prey density, trapping effort, fire history, existing vegetation, soil type, soil moisture, and growing season within ecological units. Decision statements are evaluated with respect to the likelihood of a *negative* effect on the rate of post-fire vegetative regeneration and recolonization by furbearers during the first 40 years post-fire (i.e., length of a trapper's career). Specifically, *n* ecological units in the area of interest are ranked from 1 (least) to *n* (greatest) for each decision statement. Average scores can be used to rank several adjacent units by the expected negative effect of fire (i.e., the highest rank would have the slowest recolonization rate or the lowest density of the furbearer of interest at a given point in time).

To further knowledge of fire effects on furbearers, fire managers could test ecological predictions of our model using treatments and controls. Managers would need to clearly define population goals and procedures with which to assess progress toward goals, recognizing that it can be difficult to complete furbearer inventories with statistical rigor.

If fire suppression is proposed as a tool for resource management, we recommend that the public be informed as to the likelihood of achieving a resource goal in a specified period. Catastrophic (i.e., intensive and large) wildland fires are rare, frightening events that often have immediate economic effects and long-lasting ecological and social effects. Ecological effects, even when acknowledged to be natural and beneficial to future generations, may take many years to become evident and thus be at odds with the immediate concerns of resource users. Fire managers should also educate the public that fire has limited predictability but is a natural component of the taiga ecosystem.

# **Small Mammals**

During 1991-1995 we studied the abundance, biomass, and species diversity of small mammals among three stages of post-fire succession on the Nowitna NWR. This study was initiated as part of a larger effort examining the relationship of wildland fire to furbearers, primarily marten and lynx. We have continued to trap at these sites to document the response of arvicolnes (mice) to fire over time. In addition, we hope to learn more about population cycles of these rodents, and this requires a sampling effort encompassing at least two cycles (6 - 10 years).

We used two snaptraps and a pitfall trap, set for three 24-hour periods at each of 100 stations in 100 x 100 m grids. Three grids (replicates) were located in a 1985 burn in the tall shrub-sapling stage, three in a 1966 burn in the dense tree stage, and three were in mature black spruce forest >100 yrs old (Figure G3). Trapping occurred in late August-early September when most small mammals are at peak abundance.

In 1995, we captured 624 animals representing 5 genera and 8 species in over 8,000 trapnights (TN). Trap success among grids ranged from 0.0 to 18.89 captures/100 TN during 1991-94. Red-backed voles (*Clethrionomys rutilus*) were the most ubiquitous arvicoline, occurring on all grids at all sites. *Microtus* species were most prevalent in the early post-fire seres.

We plan to begin work with a graduate student in 1997 as part of a cooperative effort with UAF (Dr. Eric Rexstad) and the UAF museum (Dr. Joe Cook). This effort would focus on rodent cycling and post-fire micro-habitat relationships emphasizing yellowcheeked voles and the rare tiny shrew (*Sorex Minutissimus*). We also hope to initiate an Atlas Project for mammals of interior Alaska. This effort would coordinate a comprehensive specimen-based survey to determine species distribution, status, and habitat associations of all mammals occurring in the interior. A final product would be a zoogeographic information base that would provide valuable layers of data usable in a GIS and could form the basis for future GAP analysis (to be used in acquisition planning, compatibility assessments etc.)

# 11. Fisheries Resources

See Section G.11 in Koyukuk report.

#### 14. Scientific Collections

See Section G.14 in Koyukuk report.

#### 16. Marking and banding

See Section G.16 in Koyukuk report.

#### H. PUBLIC USE

#### 1. General

In March, ROS Liedberg sat on a panel to rank and make selections for guide use areas NOW 01, 02, and 03. Alex Tarnai applied for all three units. Unit 03 had two other applicants. Tarnai was awarded all three units and issued a special use permit to

conduct guided hunts for the 1995 season. He guided one successful moose hunter for eight use days in unit 03. Alex was also issued a permit for commercially guiding floaters and fishermen. Under this permit he guided six clients for a total of 18 days on the Nowitna River.

Table H.1. Commercial Use Permits Issued in 1995 - Nowitna NWR.

<u>Permittee</u> Alex Tarnai Timberwolf Guiding	<u>Use</u> Guide/Outfit (hunting)	<u>Fee Collected</u> \$300.00 Admin Fee \$80.00 User Fee	<u>Clients</u> 1	<u>Species Taken</u> 1 moose
	Guide/Outfit (fish/float)	\$100.00 \$36.00	6	NA
Steve Williams Ptarmigan Air	Air Taxi	\$100.00 Admin \$4.00 User Fee	6	5 moose
Jack Hayden Denali West Lodge	Guide/Outfit (fish/float)	\$100.00 Admin Fee \$20.00 User Fee	10	NA

# 2. Outdoor Classrooms - Students

See Section H.2 in Koyukuk report.

#### 3. Outdoor Classrooms - Teachers

See Section H.3 in Koyukuk report.

# 4. Interpretive Foot Trails

See Section H.4 in Koyukuk report.

# 6. Interpretive Exhibits/Demonstrations

See Section H.6 in Koyukuk report.

# 7. Other Interpretive Programs

See Section H.7 in Koyukuk report.

#### 8. Hunting

# 9. Fishing

# 10. Trapping

Trapping continues to be an important public use activity on the refuge and provides a source of supplemental income for several residents in the villages of Ruby and Tanana. Traplines in Alaska are not registered but are generally passed down from generation to generation within a family and are usually associated with a cabin or camp of some sort. Occasionally, traplines and accompanying cabins and equipment are sold to outsiders or newcomers. At least one trapper on the Nowitna uses an airplane to reach remote lakes and then traps their periphery. Most trappers use snowmobiles for transportation; however, some use dog teams, and at least one hardy trapper walks (snowshoes) his entire line. Martens are generally taken using pole sets and/or cubby sets. Beavers are taken with snares through the ice and most wolves are shot or trapped with snares placed around moose or caribou kills.

The reported harvest of those furbearers required to be sealed is shown in Table H4. These figures may be slightly inflated because they include some areas adjacent to the refuge. Sealing records are generally considered conservative estimates of harvest as some fur, especially beaver, is often kept for personal use and not sealed. Although the reported harvest of beavers appears to have declined since the mid-80's (Table H5), it continues to represent most of the fur sealed each year.

Marten is the most economically important species in the Nowitna region and most trappers focus their efforts on this species. There are no sealing requirements for marten or mink in interior Alaska.

Area	Beaver	Lynx	Otter	Wolverine	Wolf	
Deep Creek <sup>2</sup>	1	0	0	0	0	
Lower Nowitna	Ô	0	Ő	Ő	4	
Grand Creek	0	0	Ő	0	0	
Pilot Creek	0	0	Ő	0	0	
Lost RSulukna	0	0	0	0	0	
Sulatna/						
Monzonite	0	0	0	0	0	
Sulatna-Poorman	0	0	0	0	0	
Lost River	0	0	0	0	0	
Titna <sup>2</sup>	55	1	0	1	0	
Susulatna <sup>2</sup>	8	0	0	0	4	
Palisades <sup>2</sup>	10	1	0	0	0	
Big Mud	0	0	0	0	0	
Big Creek	0	1	0	1	0	
Little Mud	0	0	0	0	0	
Boney Creek	3	0	3	0	0	
Total	77	3	3	2	8	

Table H.4.	Furbearer harvest	on the N	owitna NWR	during the	1994-95	trapping
season.1						

<sup>1</sup>Based on sealing records obtained from Tim Osborne, Area Biologist, ADF&G. <sup>2</sup>Part of this area falls outside the refuge boundary.

Trapping Season											
Species	86-87	87-88	88-89	89-90	90-91	91-92	92-93	93-94	94-95	×	
Beaver	176	141	45	36	57	5	43	76	77	73	
Lynx	4	6	25	6	6	27	10	13	3	11	
Otter	4	12	7	0	2	1	2	1	3	4	
Wolf	14	15	0	1	19	15	2	13	8	10	
Wolverine	2	1	0	1	5	7	1	15	2	4	
Total	200	175	77	44	89	55	58	118	93	102	

Table H.5. Minimum number of furbearers harvested on the Nowitna NWR during trapping seasons 1986-87 to 1994-95.<sup>1</sup>

<sup>1</sup>Minimum number harvested based on sealing records obtained from Tim Osborne, Area Biologist ADF&G.

# 17. Law Enforcement

## 18. Cooperating Associations

See Section H.18 Koyukuk report.

# 20. Subsistence Management

#### **Proposals**

As an attempt to decrease user-group conflicts and competition with non-local hunters during the fall moose season on the Nowitna River, the Tanana IRA Council submitted a proposal to the Board that would close Federal land on the Nowitna to non-local hunters. ROS/P Spindler made a presentation to the Tanana-Rampart-Manley Advisory Committee and to the Chair of the Tanana IRA Council in November on the 1995 moose census conducted on the Nowitna Refuge. ROS DeMatteo addressed the Committee and the IRA Council Chair on the relationship of Federal jurisdiction on the Nowitna River to the objective of the Councils proposal. WB Toby Boudreau of the ADF&G Division of Wildlife Conservation echoed how its lack of jurisdiction below ordinary high water

would prevent the Federal Board from meeting the proposal's objectives. In an attempt to decrease competition between September user-groups on the Nowitna, the Department presented the Committee and the IRA Chair with an innovative proposal bearing the intent to decrease the number of non-local hunters. The proposal, if adopted by the State Board of Game, would establish a permit hunt for GMU 21B during the September moose season. Resident hunters could harvest one bull by registration permit without antler size restrictions during the proposed September 5-25 season; however, antlers would be devalued by Department personnel at the Nowitna check station. Residents and non-residents seeking trophy bulls (50 inches or wider) could obtain a "trophy" registration permit eliminating the antler devaluation requirement. The proposed season for non-resident hunters for GMU 21B is September 5-20. Boudreau stated that a permit hunt may discourage some non-local participation during the September season. The Council Chair presented the Tanana IRA with the State proposal the first week of December. The IRA voted to withdraw its original proposal to the Federal Board and encouraged the Tanana-Rampart-Manley Committee to support the Department's proposal to the Board of Game. The Committee intends to support the Department's proposal to the Board of Game. The Board will make its ruling on the proposal in April 1996.

# I. EQUIPMENT AND FACILITIES

# 2. Rehabilitation

# J. OTHER ITEMS

## 3. Items of Interest

#### 4. <u>Credits</u>

Resource Sections: Mike Spindler prepared Sections D5, G1-2,9, and edited sections F,G,H. Orville Huntington prepared Sections G3,8, 10 (part). Buddy Johnson wrote Sections G4,5,6,7,10 (part), and H10. Bob Rebarchik wrote F9 Jim Good, editing Maudrey Honea, editing Rosie Cassou, Word processing & formatting


These two red-backed voles, captured in the fall, illustrate the pelage variation found in this species. These were trapped in the "old-burn" part of the Round Lake study area in fall 1995. (BJ 8/95)



As another day ends over the Koyukuk River, so does the final chapter of our 1995 NR. But, alas, we know that now we must start thinking about the 1996 edition! (BJ 9/95)

## K. <u>FEEDBACK</u>

See Koyukuk NWR Section.