

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

KOYUKUK/NOWITNA
REFUGE COMPLEX

Galena, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year

1992

3 4982 00021240 6



US FISH & WILDLIFE SERVICE--ALASKA

R



ANNUAL NARRATIVE REPORT

1992

KOYUKUK NWR

NORTHERN UNIT, INNOKO NWR

KOYUKUK/NOWITNA NATIONAL WILDLIFE REFUGE COMPLEX



Galena, Alaska

REVIEW AND APPROVALS

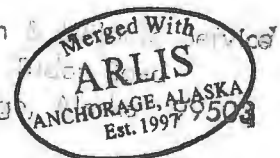
F. Paul Stearns 9/29/93
Complex Manager Date

G. Paul Brown 1/16/94
Associate Manager Date

Lawrence H. Hould
Regional Office Approval

1/18/94
Date

Library
U.S. Fish & Wildlife Service
1011 E. 1st Avenue
Anchorage, Alaska 99501



INTRODUCTION

This Annual Narrative Report is for the Koyukuk and Nowitna Refuges, and the Northern Unit of Innoko Refuge (Kaiyuh Flats). These three refuges are administered collectively as the Koyukuk/Nowitna Refuge Complex. Narrative items common to all three units are discussed in the Koyukuk 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, an area slightly smaller than the state of New Jersey. This refuge lies within the roughly circular floodplain basin of the Koyukuk River. The extensive forested floodplain is surrounded by hills 1500' - 4000' on 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 10,000 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.

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.

Perhaps the greatest value of the Koyukuk Refuge is its productive breeding areas 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 Koyukuk's 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 economically important to several countries for the thousands of dollars in income they generate.

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

The Complex staff currently has: 10 permanent, 3-7 temporary (varies seasonally), 2 term appointments, and 5 YCC positions. Facilities are an office, cold storage, hanger, three administrative cabins, eight government residences, and several smaller cold storage buildings.

The Koyukuk/Nowitna Refuge Complex headquarters is in Galena, a small town 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 Anchorage and 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 833 persons, of which 533 persons live in Galena proper (approximately equal numbers of Alaska natives and caucasians) and 300 Air Force personnel. Most 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 supports two F-15 Eagle interceptor aircraft that are kept on 24 hour alert. Galena is the closest outpost to the Russian air space in Siberia. (formerly the Soviet Union) and in the past had the most intercepts with Soviet aircraft.

INTRODUCTION

TABLE OF CONTENTS

A. HIGHLIGHTS

B. CLIMATIC CONDITIONS

C. LAND ACQUISITION

1. Fee Title	10
2. Easements	10
3. Other	Nothing to Report

D. PLANNING

1. Master Plan	10
2. Management Plan	11
3. Public Participation	Nothing to Report
4. Compliance with Environmental and Cultural Resource Mandates	Nothing to Report
5. Research and Investigations	11
6. Other	Nothing to Report

E. ADMINISTRATION

1. Personnel	12
2. Youth Programs	14
3. Other Manpower Programs	Nothing to Report
4. Volunteer Program	15
5. Funding	16
6. Safety	16
7. Technical Assistance	17
8. Other	17

F. HABITAT MANAGEMENT

1. General	18
2. Wetland	18
3. Forests	19
4. Croplands	Nothing to Report
5. Grasslands	Nothing to Report
6. Other Habitats	Nothing to Report
7. Grazing	Nothing to Report

8. Haying	Nothing to Report
9. Fire Management	19
10. Pest Control	Nothing to Report
11. Water Rights	Nothing to Report
12. Wilderness and Special Areas	21
13. WPA Easement Monitoring	Nothing to Report

G. WILDLIFE

1. Wildlife Diversity	22
2. Endangered and/or Threatened Species	22
3. Waterfowl	23
4. Marsh and Water Birds	35
5. Shorebirds, Gulls, Terns and Allied Species	35
6. Raptors	35
7. Other Migratory Birds	36
8. Game Mammals	37
9. Marine Mammals	Nothing to Report
10. Other Resident Wildlife	48
11. Fisheries Resources	52
12. Wildlife Propagation and Stocking	Nothing to Report
13. Surplus Animal Disposal	Nothing to Report
14. Scientific Collections	52
15. Animal Control	Nothing to Report
16. Marking and Banding	52
17. Disease Prevention and Control	Nothing to Report

H. PUBLIC USE

1. General	55
2. Outdoor Classrooms - Students	57
3. Outdoor Classrooms - Teachers	58
4. Interpretive Foot Trails	58
5. Interpretive Tour Routes	Nothing to Report
6. Interpretive Exhibits/Demonstrations	59
7. Other Interpretive Programs	59
8. Hunting	60
9. Fishing	Nothing to Report
10. Trapping	64
11. Wildlife Observation	Nothing to Report
12. Other Wildlife Oriented Recreation	Nothing to Report
13. Camping	Nothing to Report
14. Picnicking	Nothing to Report
15. Off-Road Vehicling	Nothing to Report

16. Other Non-Wildlife Oriented Recreation	Nothing to Report
17. Law Enforcement	65
18. Cooperating Associations	66
19. Concessions	Nothing to Report
20. Subsistence Management	66

I. EQUIPMENT AND FACILITIES

1. New Construction	Nothing to Report
2. Rehabilitation	68
3. Major Maintenance	69
4. Equipment Utilization and Replacement	69
5. Communications Systems	69
6. Computer Systems	70
7. Energy Conservation	Nothing to Report
8. Other (Aircraft)	70

J. OTHER ITEMS

1. Cooperative Programs	72
2. Other Economic Uses	72
3. Items of Interest	Nothing to Report
4. Credits	72

K. FEEDBACK

A. HIGHLIGHTS

- Wildlife production, field work and hunting season were squeezed by a late spring and early freeze-up.
- Thick ice from the long winter caused extreme flooding at spring breakup.
- A subsistence management program began with the hiring of new Refuge Operations Specialist for Subsistence Pete DeMatteo.
- New Fire Management officer Tom "Troop" Lugtenaar arrived with new and appropriate ideas for presuppression and prescribed burning.
- A YCC youth program was supplemented by the new RAPS program, and both kept us busy during the summer.
- Lower than normal waterfowl production was related to a late spring and severe flooding. An estimated 86,162 young ducks were produced on the Koyukuk in 1992.
- Moose density continued to rise at Three Day Slough to an estimated 13 moose/mi². Overall density on the refuge was estimated at 1 moose/mi².
- A study of the Galena Mountain Caribou herd was initiated with collaring of 20 caribou.
- Wolf populations were stable or rising and moose/wolf ratios were of concern on Kaiyuh Flats.
- Duck and goose banding quotas were met.
- A guiding plan was implemented with five exclusive areas on Koyukuk and one on Kaiyuh.
- Bioskills camp was a success for selected high school students from villages.
- EE efforts continued to expand with school programs, video showings, and seminars.
- Moose hunter kill was down 31% while number of hunters were also down 13% compared to 1991, mainly due to the inclement weather.
- Subsistence harvest surveys were initiated in five area villages.

-The duplex was reconverted from office to housing.

-Radio, aircraft, and communications maintenance has improved with more reliability.

B. CLIMATIC CONDITIONS

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 late 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 $+20^{\circ}\text{F}$) with clouds, snow, and light to moderate winds. The moderating effects from Bering Sea and Pacific storm fronts increases the farther west one proceeds. By late winter, snowpack in the valley bottoms averages 2-3 ft. The months of April and May are transitional, with the arrival of most waterfowl occurring in late April, and breakup of the Yukon River ice occurs 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 $50-70^{\circ}\text{F}$, but extreme highs have exceeded 90°F . Summers in the Galena area are generally cooler, cloudier, and more moist than summers in Fairbanks, which is in the east central Interior. Perhaps the most pleasant time of 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.

January of 1992 in Galena was cold and snowy, with a mean temperature of -6.7°F (Figure 1). February began with relatively cold temperatures of -50° on the 3rd and 4th but soon rose to a high of 16°F on the 9th. By month's end, the total accumulated snow near Galena was approximately two feet with less to the north and more to the southeast. Precipitation in March was below normal, with temperatures slightly warmer than normal. April and May were colder than average and precipitation was scant. Ice in the rivers and lakes was 5-6 feet thick, prompting ice jams in the last part of May at Bishop Rock. Yukon ice-out was May 25, much later than normal. The lack of runoff aggravated the flooding due to ice jams and soon after above average rainfall caused more high water in many locations starting in June. Rainfall for June, July and August was above average and resulted in high water and good access to many berry-picking and fishing locations. The late spring and flooding of nesting grounds likely contributed to the lack of waterfowl production. September brought a very early cold snap and winter. Below zero weather started in the third week of September with our first snow on the 18th. By September 26, the Yukon was full of ice floes and remained so for another three weeks. The river ice stopped moving on October 20. A warm and wet winter started in earnest in November and continued into December, bringing the year to a warmer than usual end.



"Newest addition to the refuge fleet!" is what our pilots wished as they toured the Air Force C-5 at Galena. (MB)



The first Iditarod since moving to our new office put us a stone's throw away from the checkpoint. (MB)

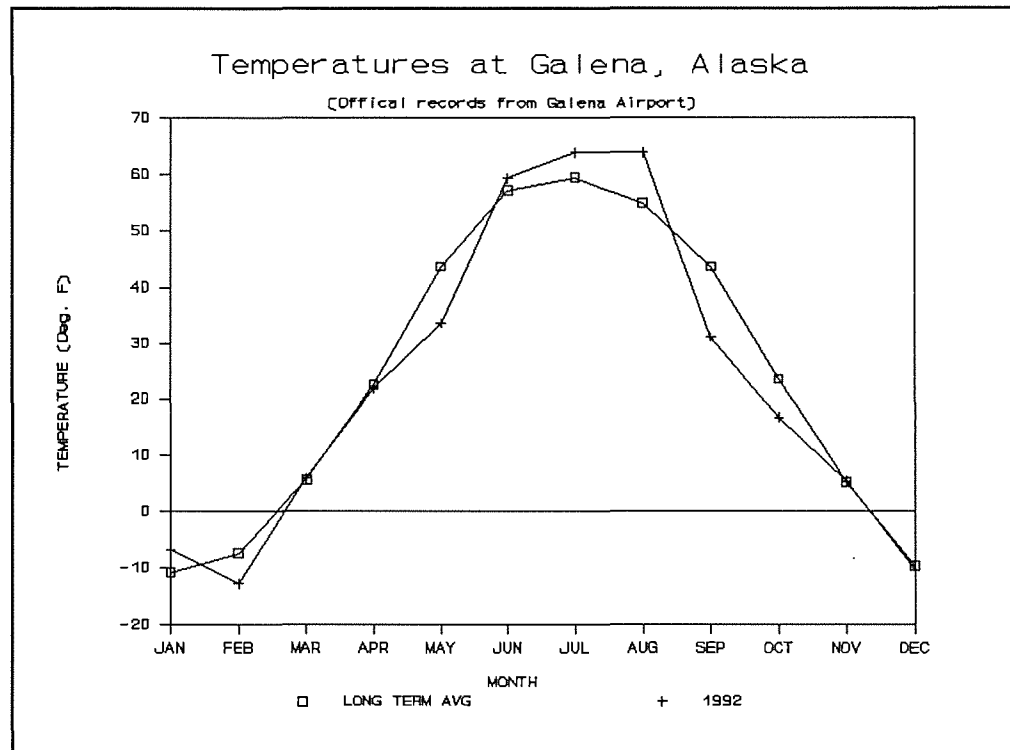


Figure 1. Long term average and observed temperatures in 1992.

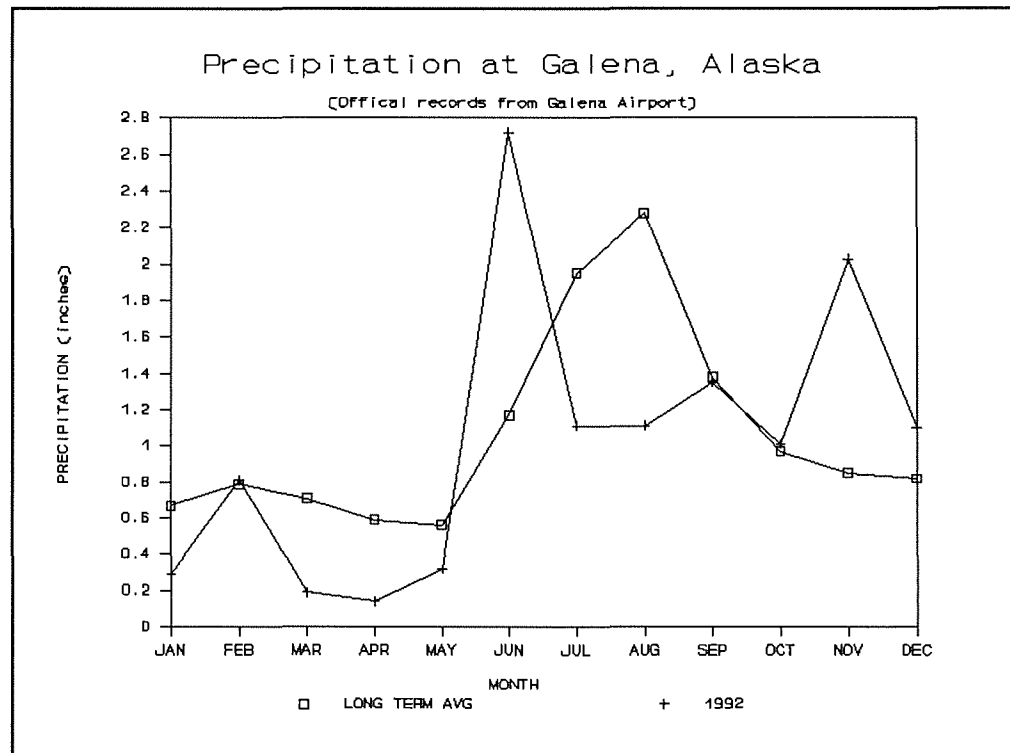


Figure 2. Long term average and observed precipitation in 1992.



Record high waters of 128 ft. caused extensive flooding. This compares with the last big flood of 1971 when waters reached 131 ft.. (MB)

C. LAND ACQUISITION

1. Fee Title

In 1990, a Land Acquisition Priority System was completed for all refuges in Alaska. As a result of this prioritization system, a Land Protection Plan will be developed for the Koyukuk Refuge. Land Protection Plans have been started for several refuges in Alaska and the Koyukuk is scheduled to begin the planning process in late 1994.

2. Easements

The Service has a Land Bank Agreement with one of the major refuge inholders, Gana-A' Yoo, Ltd., the local native corporation for the villages of Galena, Koyukuk, Nulato, and Kaltag. The agreement provides: 1) resource protection on those lands "...in a manner compatible with the management plan for the Koyukuk National Wildlife Refuge...", 2) mutual access, 3) limits to major development or mineral exploration without mutual agreement, and 4) gives immunity from tax liabilities to the corporation. The agreement is flexible and allows for amendments, withdrawal of selected parcels, and cancellation. There is a total of 437,000 acres under the agreement. Technical assistance is also available from the refuge staff for land use decisions.

No withdrawals were made from the Land Bank in 1992. A Challenge Grant proposal was submitted during the year requesting funds to cooperate with Gana-A' Yoo Ltd. on a land use plan on lands within the Land Bank. The Corporation hired two employees to work on the plan and requested the assistance of refuge staff. The proposal was funded for \$54,200 and will start in Fiscal Year 1993.

D. PLANNING

1. Master Plan

No significant work was done on updating the Comprehensive Conservation Plan (CCP) during the year. The original CCP was completed in 1986 and was scheduled for review no later than 1992. However, due to regional priorities obligating the planning team's time, and pending directions on how to proceed with the review, we will not complete the update in the near future.

2. Management Plan

The Complex's Operational Plan finally made its way to completion and approvals on October 2. The operational plan is designed to fill a void between the yearly annual work plan advices and the long term Comprehensive Conservation Plan. Now that the plan is finalized, we are hopeful that funding will follow for implementation.

4. Research and Investigations

An evaluation of the impact of the spruce bark beetle on spruce stands and associated plant communities along the lower Yukon River.

This three-year study was funded in Fiscal Year 1991 and field work was scheduled to begin in 1992. The U.S. Forest Service, Institute of Northern Forestry was contracted to do the work and as of April they were on line to go mid-summer. The next word we received was when they returned the funding (\$16,000) with the explanation that the work wasn't warranted due to a subsidence in the beetle activity. It was too late to put the funds to effective use. We support this decision if, in fact, their assessment is accurate. The issue of beetle killed spruce in the Interior was only an issue when there was a push for developing a large timber industry. Since that prospect has diminished, so has the zeal to subdue the spruce bark beetle.

Seasonal movements and range of three wolf packs on the Koyukuk National Wildlife Refuge Project No. 75615-85-01).

Primary objectives of the study were to determine pack sizes, location, home ranges, predation rates, seasonal habitat use, and to develop an estimate of wolf/prey ratios in an area of known prey density. A progress report was written by ROS/P Spindler and distributed in October 1992. Results from 1992 are summarized in the Koyukuk and Nowitna reports, Section G.10.

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

This study was originally proposed and approved for the Nowitna NWR in 1987, with a progress report completed in 1988. Due to low numbers of geese, the study was moved to the Koyukuk NWR in 1991. A progress report was written in 1992 following two spring seasons of goose capture attempts.

E. ADMINISTRATION

1. PERSONNEL

Permanent

1. F. David Stearns, Refuge Manager, GS-485-12, EOD 6/17/90, 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-485-7, EOD 12/01/91, PFT
5. Colin B. Brown, Airplane Pilot, GS-2181-12, EOD 4/84, PFT, Local Hire
6. Thomas K. Lugtenaar, Fire Management Officer, GS-401-9, EOD 1/26/92, PFT
7. Walter N. Johnson, Wildlife Biologist, GS-486-11, EOD 5/21/89, PFT
8. Mark R. Bertram, Wildlife Biologist, GS-486-11, EOD 4/10/88, PFT
9. Maudrey M. Honea, Administrative Technician, GS-318-6, EOD 10/85, PFT, Local Hire
10. Theresa Burley, Refuge Clerk, GS-303-4, EOD 2/10/91, PFT, Local Hire

Term

1. Thomas F. Paragi, Wildlife Biologist, GS-486-9, EOD 6/17/90, FT

Temporary

1. Peter R. Reaman, Biological Technician, GS-404-5, EOD 6/16/91, Terminated 4/18/92, TFT
2. Bernard Attla, Maintenance Worker, WG-4749-8, EOD 9/23/91, TFT
3. Heather N. Johnson, Park Ranger, GS-025-5, EOD 7/8/91, TFT
4. George M. Wholecheese, Biological Technician, GS-404-5, EOD 6/13/90, Local Hire, Intermittent
5. Jenny M. Lowe, Biological Technician, GS-404-5, EOD 6/17/90, Local Hire, Intermittent
6. Pamela S. Nelson, Biological Technician, GS-404-5, EOD 6/17/90, Terminated 6/16/92, Intermittent
7. Edward Pitka Jr., YCC Group Leader, GS-186-5, EOD 6/2/92, Terminated 8/8/92, TFT
8. Donovan D. Williams, Biological Technician, GS-404-5, EOD 6/2/92, Terminated 8/15/92, TFT
9. Pollock Simon Jr., Biological Technician, GS-404-5, EOD 6/2/92, TFT

Youth Conservation Corps

1. Mariah Pitka
2. Sandy Johnson
3. Chris Eggleston
4. Leon Thurmond

Volunteers

1. Jacque Russell
2. Myron S. Olson
3. Mary-Lou Gurdon
4. John Aitchison
5. Cheryl Quade
6. Misty Conrath
7. Richard Davis
8. Kimberly Jackson
9. Michael Giese
10. Len Spellman
11. Bob Johnson
12. Victor Wilson

Two permanent staff position changes occurred during the year. The Fire Management Officer position which had been vacated the previous September was filled on January 26 by Tom Lugtenaar. Tom brought over 20 years experience as a smokejumper and firefighter. Part of his distinction is that he has more jumps on fires than any other smokejumper in the country. The new Refuge Operations Specialist position for subsistence was actually filled in December of 1991 but Pete DeMatteo reported for duty in January of this year. Pete had previously been a biological technician at this station and prior to transferring back had worked for the Office of Subsistence Management in Anchorage.

The refuge hosted a Resource Apprenticeship Program for Students (RAPS) program and a Youth Conservation Corps (YCC) program this year. These programs are discussed in Section E.2.

Training/Meetings

Stearns:

Project Leader's Meeting; November 18-20; Anchorage, AK
LE Refresher; March 2-6; Marana, AZ

Spindler:

Unusual Attitude Flight Training; January 27-31; Santa Paula, CA
 FWS/OAS Annual Ground School; December 7-11; Anchorage, AK

Liedberg:

FWS Basic LE add-on; January 27-February 7; FLETC
 Fire Management for Line Officers; February 11-13; Anchorage, AK
 LE Refresher; March 19-25; Marana, AZ
 FWS/OAS Annual Ground School; December 7-11; Anchorage, AK

Brown:

FWS/OAS Annual Ground School; December 7-11; Anchorage, AK

B. Johnson:

LE Refresher; March 19-25; Marana, AZ
 Fire in Resource Management; March 30-April 11; Marana, AZ

Lugtenaar:

Arctic Survival; March 2-6; Eielson AFB, AK
 RX-90 Burn Boss Class; May 10-15; Boise, ID

Attla:

Watercraft, Bear, and Firearms Train-the-Trainer; April 6-11; Seward, AK
 Boiler Maintenance and Repair; April 27-May 8; Seward, AK

Burley:

DOS and Wordperfect; April 9-11; Anchorage, AK

H. Johnson

Region 7 Environmental Education Training; September 21-25; Anchorage, AK

2. Youth Program

The refuge hosted its first Resource Apprenticeship Program for Students (RAPS) this year. Jeff Huntington, a former YCC enrollee from Galena, and Mike Hill also from Galena, participated in the program. The RAPS program provides Alaska Native high school juniors and seniors with a 6-8 week summer work experience in resource management related activities and encourages students to consider resource studies in college. The students participated in a wide range of duties including waterfowl brood surveys, goose production surveys, goose banding, and computer data entry. They completed workbooks that introduced them to the Service and provided background information in resource management. The refuge feels the RAPS program has the potential to help meet long term goals of

training young people from the local communities in the field of resource management. The greatest drawback is the program occurred during our busiest months of field work and demanded a considerable amount of staff time for supervision, guidance and tutoring.

In addition to the RAPS program, the refuge had an eight week Youth Conservation Corps Program. Four enrollees ages 15-17 and one group leader participated, with one enrollee leaving the program early for another job. Overall attendance was better than average. Enrollees worked on a number of projects which included painting refuge quarters and storage buildings, ground maintenance, small construction projects, and finishing a school nature trail. Several enrollees enjoyed the opportunity to travel by helicopter to the top of a small mountain to clear a site for a radio repeater. One enrollee spent the second half of the program assisting as an office receptionist and became very adept. YCC enrollees participated in several educational sessions in the boreal forest and aquatic habitats. They also visited black spruce and white spruce habitats to compare habitat characteristics and fire ecology within each habitat. To simulate the effects of fire on black spruce, they did the activity "Unlocking the Seed" from the Role of Fire in Alaska curriculum. Enrollees spent one afternoon in aquatic habitats investigating invertebrates and canoeing in two small lakes to observe nesting grebes and to learn how brood surveys are conducted.

3. Volunteer Program

Volunteers contributed a total of 1,297 hours to station operations. This represents a 75% increase over last fiscal year, however operating costs were more than double. Misty Conrath, an undergraduate student at the University of Washington, contributed 700 hours on a small mammal project in conjunction with the Wildfire-Furbearer Project. Misty assisted graduate student Cheryl Quade of University of Washington and was a real asset during the field season. Rich Davis, during his one year tour of duty at the Galena Air Force Base, donated 370 hours while working on a variety of projects. Rich's first 100 hours were recognized by the refuge manager with a certificate of appreciation and a copy of Wildlands for Wildlife. At the end of his tour of duty, the refuge staff gave Rich a farewell party. A number of volunteers from the Air Force Base assisted with clearing vegetation for fire protection around government residences. FMO Lugtenaar treated his crew of volunteers to a moose/bear barbecue in appreciation for their efforts.



Complex Manager Stearns exemplifies what happens to hair under stress (this caption was written by the subject on a Friday afternoon). (PL)



Refuge Operations Specialist/Pilot (ROS/P) Spindler delights in the opportunity to be freed from report writing during a goose production float trip. (MH)



ROS/P Liedberg appropriately poses with the refuge map as his backdrop since he is involved with public use issues. (HJ)



ROS/P DeMatteo keeps the ball rolling as subsistence coordinator along with other managerial duties. (PL)



"Rider of the Skies" Pilot Brown keeps flying safe and his passengers satisfied. (MB)



FMO Lugtenaar "Troop" torches shrub palmetto habitat in Georgia during a prescribed burn detail.



Wildlife Biologist (WB) Johnson "Buddy" serves as principal investigator for the Wildfire/Furbearer Project. (PR)



WB Bertram gets a few shots of white-fronted geese while "undercover" during spring banding. (BJ)



Administrative Technician (AT) Maudrey Honea, (local hire) is taking care of business with the refuge budget.(HJ)



Refuge Clerk Theresa Burley, (RC) (local hire) does her best in figuring who does what, when for time/ attendance and travel. (HJ)



WB Paragi, serves as Field Investigator for the Wildfire/Furbearer Project.
(MS)



(BT) Pete Reaman, gained some great
experience during his year with the
Wildfire/Furbearer project. (BJ)



Maintenance Worker Attla brings talent, community involvement and a good sense of humor to his job. (HJ)



Park Ranger Johnson "fires up" her pursuit of environmental education with surrounding villages. (PL)



The field savvy of BT (local hire) Wholecheese was a real asset to refuge field projects. (MB)



In her third year as a BT (local hire), Lowe excels in her attitude, ability and commitment to her work. (TP)



BT (local hire) Simon pictured for a moment in a serious mode of concentration while berry plot sampling. (BJ)



RAPS Student Mike Hill helps during a goose production survey which was one of several field projects he was involved in this summer. (MS)



RAPS Student Jeff Huntington received a hardy handshake and certificate of recognition for participating in the program. (DS)



YCC Enrollees (left to right) Chris Eggleston, Mariah Pitka and Leon Thurmond check out some "wild" looking aquatic insects. (HJ)



In her thesis work on small mammal abundance in different age burns, Cheryl Quade works diligently with a cheery heart. (BJ)



Volunteer Misty Conrath assisted with small mammal work for the Wildfire/Furbearer Project. (BJ)



Volunteers John Aitchison and Mary-Lou Gurdon, professional filmmakers, shot eight hours of film for a refuge video. (MB)



Pilot Brown receives recognition for 10 years in government service. (MB)

4. Funding

Total funding remained relatively stable this year as compared to Fiscal Year 91. However, the station had several added fixed expenses including \$70,000 for office and hangar leases. Funding from other sources - mainly Subsistence (1260) and Fire (91XX) - helped in the accomplishment of ongoing studies and surveys.

A summary of funding for the past five years follows:

Table 1. Koyukuk/Nowitna Refuge Complex Funding, 1988-1992.

Program	FY88	FY89	FY90	FY91	FY92
1221			30,000		
1230		15,000	5,000	6,000	6,000
1241			116,000		
1260	812,000	927,000			
1261		575,000	708,000	652,000	646,000
1262		190,000	336,500	295,000	301,000
8610	67,800	48,600	39,500	40,000	29,300
9110				61,000	125,000
9120				81,700	145,000
Totals	879,800	1,165,600	1,082,000	1,220,700	1,252,300

5. Safety

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. During the week of June 8-12, the staff conducted field safety orientation classes which included first aid, CPR, aviation safety, firearms/bear safety, and watercraft safety. We used a combination of videos from the Regional Library, hands-on demonstrations, and participatory exercises as well as lectures. Also, during several of our weekly staff meetings, safety in other job-related subjects was discussed: hazards around the office such as CRT screens and computers, use of PFD's in all water operations, use of fire extinguishers and alarms, use of personal protective equipment; use of chain saws; hypothermia; and use of aircraft survival kits. All this training apparently paid off as there were no lost-time accidents on the Complex in 1992.



Permanent staff along with summer employees hear opening comments during safety orientation training. (BJ)



AT Honea, RC Burley and YCC Enrollee Pitka join the staff in firearms safety training. (HJ)

6. Technical Assistance

We provided a helicopter to the City of Galena during the flood on May 27-29 to transport the mayor, city manager, electrical workers, and disaster relief personnel from Galena's new site to old site, which were separated by a road washout during the flood.

In mid-May 1992, WB Johnson travelled to Togiak NWR to assist with enforcement of the closed season waterfowl policy.

FMO Lugtenaar began work on a written guide that provides procedures for refuge inholders to use to protect their property from wildland fires.

In June 1992, Lugtenaar held a training session with the BLM, Air Force, and City of Galena firefighters regarding protection of structures in the wildland interface. He provided another wildland fire training class to the Air Force in October.

In November 1992, WB Bertram and Pilot Brown assisted Yukon Flats NWR with a moose census. Bertram helped with on-site coordination and analysis, as well as served as an observer, while Brown flew one station aircraft with other observers brought in for the census.

Considerable effort went in to a proposal for a Challenge grant project with Gana-A-Yoo Limited for cooperative land use planning. The Fiscal Year 93 plan included \$54,200 from the Service and a \$30,000 state grant to produce resource and land status maps. The Service was to provide all the wildlife, fisheries, habitat, and land status information and ADP equipment.

In November 1992, Park Ranger Heather Johnson helped integrate fisheries studies into the grade K-12 curricula at a Yukon-Koyukuk school district teacher in-service in Huslia.

CM Stearns sat in on the Regional Fisheries program review panel, which required a few trips to Fairbanks and Anchorage. In December, Stearns was detailed to Washington, D.C. to help rewrite the Refuge Manual chapter on wildlife inventories.

7. Other Items

CM Stearns accompanied Deputy Associate Manager Jerald Stroebele, Regional planner Helen Clough, and DNR planner Alice Iliff on an inspection of the Nowitna River to determine the need for a wild river management plan. It was decided that interagency coordination will supplant the need for a full plan at the present time.

F. HABITAT MANAGEMENT

1. General

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

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

Open, low growing spruce forests 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 tamarack, paper birch and willows and is locally interspersed with treeless bog. These tree species are found on north facing slopes and poorly drained lowlands usually underlaid by permafrost.

Treeless bogs 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.

2. Wetlands

The rivers in the refuge lowlands are characterized by low gradients, meandering courses and heavy spring flooding. Flooding during spring is common and subsidence of the waters frequently continues through most of the summer. The rivers, in particular the Yukon and Koyukuk, carry a heavy silt load at flood stage. Creeks are typically shallow, slow, and meandering with steep banks. Narrow bands of white spruce line the higher banks, while willow and alder thickets are found in the lower areas.

Lake and pond wetlands include upland basin, ice-formed lakes on the flats, river flooded lowlands, oxbows and bog lakes. Spring runoff, rain and river flooding recharges lakes, resulting in variable water depths and shorelines from year to year. Lake depths seldom exceed 15 feet and are usually 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 (Lemna), 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. Bog lakes usually contain water lilies (Nuphar).

Several species of sedge (Carex), bluejoint grass (Calamagrostis), foxtail (Hordeum) and fleabane (Erigeron) provide cover on exposed shorelines. These shallow basins are common along the Koyukuk River and are locally called "grass lakes". They are usually wetlands during spring breakup and flooding, but otherwise are dry meadows and many have the beginnings of shrub and forest succession. During flooding, sedges and, occasionally, bluejoint grass survive as emergent vegetation to water depths exceeding four feet. Shorelines of bog lakes vary in character but nearly always contain buckbean (Menyanthes), wild calla (Calla), and various sedge species. Cattails (Typha) are found in only a few lakes.

Waterfowl use is related to the type and density of aquatic and shoreline vegetation present. Preference is given to lakes with abundant submergents such as pondweeds, water milfoil, and horsetail and to wetlands with shoreline vegetation that is moderately dense and interspersed with openings. These attractive basins are either closed drainage lakes maintained by infrequent flooding and long periods of gradually receding water levels or lakes connected to river systems that are more frequently flooded but also have gradually receding water levels.

A contaminant study entitled "Investigation of Mercury and Other Metal Concentrations in Fish and Wildlife Resources on the Koyukuk/Nowitna Refuge Complex" was submitted to the Regional Office for approval in August 1992. See Section D.5 for a description of study objectives. This study was first initiated on the refuge in 1986. Results from this study are expected in 1993.

3. Forest

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

9. Fire Management

On January 27, Tom Lugtenaar arrived to assume the Fire Management Officer (FMO) duties. Tom brought with him some 25 years of smokejumping experience, fifteen years with the U.S. Forest Service in the lower 48 and ten more years in Alaska. Tom has some 522 smokejumps to his credit. Fire Management Plans for the Koyukuk and Nowitna Refuges were begun this year.

The refuge's fire management program objectives, consistent with the Alaska Fire Management Plans, are as follows:

1. To manage wildfire in a manner that returns it to a role which mimics as closely as possible the natural occurrence of wildfire prior to concentrated fire suppression efforts.
2. To protect life and property through a program of suppression, vegetative management around critical refuge sites and selection of appropriate protection options.

Presuppression activities on the refuge are guided by the Alaska Interagency Fire Management Plan. This plan is an allocation of resources based on predetermined priorities of values at risk. Alaska Fire Service is responsible for suppression of wildfires on the Complex. The 1992 fire season was quiet with no wildfires recorded on the Complex. There were no wages earned in the eight villages of this region. This compares to a total of \$650,368 earned by the eight villages in 1991. These wages are important to the local economies and are often the main source of cash income for families the entire year. An alternative source of income is to hire local firefighters to do presuppression work. This pre-fire work would greatly improve fire protection of structures and villages. In addition, it would be done on an annual basis to provide a more stable and steady cash flow to local communities than fire suppression.

With the expertise of FMO Lugtenaar, we have initiated a more active presuppression program for critical sites on the refuge. Lugtenaar's knowledge of fire behavior and fuel loads has been fundamental in developing the procedures for our presuppression program. Our interest is in reducing the wildfire threat to cabins and other inholdings in areas where fire will be allowed to burn under a natural regime. Although we recognize that suppression forces will still be required to save the structures, we anticipate a much reduced effort and expense. Presuppression work was done around the Koyukuk, Innoko and Kanuti administrative cabins and three refuge residences in Galena. The Koyukuk Refuge administrative cabin was treated in August by local hires from Huslia. Three rings of protection were established around the cabin. Each two foot wide ring was dug to mineral soil. The first ring was placed immediately around the foundation, the second ring 50 feet from the cabin and the third ring 120 feet from the cabin. All trees were thinned and pruned so that a 20 foot space existed between the crowns of all conifer trees. All brush and intermediate fuels were eliminated. The Innoko and Kanuti Refuge cabins required the assistance of BLM smokejumpers because of limited accessibility. BLM incurred most of the expense of the smokejumpers. Volunteers who serve as structural fire fighters for U.S. Air Force were involved with the work around the residences. They were very interested in learning about wildland fire management and their help was

much appreciated. These presuppression projects have proven to be a good interagency effort.

Another element of the presuppression program is the development of two brochures that explain the concept and benefits of presuppression. The brochures will explain what needs to be done to accomplish the presuppression of a site in order to neutralize a wildfire and allow it to pass with minimal or no damage to the structure.

Meetings will be scheduled with individuals who have allotments and/or permitted cabins on the refuges. Refuge staff will also conduct presuppression training sessions. A key element to successful subscription to the program will be financial incentives. Because Alaska Fire Service is charged with protecting allotments, and therefore most cabins, there is little incentive for most cabin owners to expend the time, energy, and cost to do presuppression work on a site. The Forest Stewardship Program under the U.S. Forest Service (USFS) allots money to Alaska State Department of Forestry to give private landowners incentives for land management. Our brochures lay out a good blueprint that meets these forestry incentive programs.

Permanent photo plots were installed at various locations on fires dating back to the 1950's. Photographs and video were taken along with field observations on plant succession. Soil samples from the sites were sent to Roger Ottmar at the U.S. Forest Service Pacific Northwest Research Station in Seattle, Washington. He will attempt to analyze the core samples for additional information on previous fires in these areas and their degree of severity.

The village council of Huslia corresponded directly with the Secretary of the Interior to request funding for clearing trails littered with deadfalls from a wildfire in 1990 (A-204). After discussions with the Regional Fire Coordinator, it was determined that this trail rehabilitation would not qualify for funding at this late date.

12. Wilderness and Special Areas

The 400,000 acre 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). The Koyukuk Wilderness surrounds the geographically unique Nogahabara Sand Dunes and the Three Day Slough. It is theorized that the dunes are wind-blown deposits of sand that originated in glaciated areas to the northwest and were deposited in the unglaciated Koyukuk area. 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 (and hunters) (see Sec. G.8.).



Refuge residences situated among congested fuels would be very difficult to defend against a wildland fire. (TL)



Three refuge residences received presuppression treatment. Two protection rings dug to mineral soil were established at the foundation and 50 feet out. Trees were pruned and thinned and all brush and intermediate fuels removed. (TL)



Several unique plant species have recently been discovered in the Nogabahara Sand Dunes within the Koyukuk Wilderness Area.

G. WILDLIFE

1. Wildlife Diversity

The Koyukuk National Wildlife Refuge has a high diversity of habitat types primarily resulting from a rich fire history. 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 19 fish species are estimated to occur on refuge lands.

Included among the refuge biodiversity monitoring efforts are surveys of spring bird migration phenology, breeding birds (Standard BBS), and wintering birds (Christmas Bird Count). Phenology 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 phenology among years, records of annual spring arrival dates for common and conspicuous birds were summarized (Table 2). Arrival of snow buntings and waterfowl were generally early in 1992, while the remaining species arrived on the average or later than normal dates.

Table 2. Arrival dates of common birds at Galena, AK., 1982-1992.

Species	MEAN	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Snow bunting	29Ma	17A	6A	7A			17Ma	7A	28Ma	6A		21F
Mallard	25A	4M	27A	29A	30A	30A	27A	25A		19A	20A	18A
Pintail	25A	5M	19A	29A	30A	1M	28A	22A		20A	20A	20A
Canada Goose	27A	7M	6M	29A	29A	28A	29A	22A		20A	19A	26A
Dark-eyed junco	28A	10M	15A	24A	9M	3M	27A	23A		11M	19A	26A
Ruby-crowned kinglet	30A	29M	30A	7M		3M	29A	25A		10M		25A
Mew Gull	1M	4M	27A	29A	9M	1M	1M			30A	15M	3M
American Robin	1M	8M	1M	29A	9M		30A	26A		2M	24A	6M
American tree sparrow	3M	6M	3M	24A	9M	6M	3M		13M	3M	26A	
Common Snipe	5M	12M	6M	6M	11M	6M	30A	29A		10M	29A	11M
Tree Swallow	10M	10M	14M	5M	12M	11M	7M	8M		8M		19M
Olive-sided flycatcher	25M	29M	17M	28M	3J	2J	1J	12M	12M		2J	

Months are indicated by the letters: F=February, Ma=March, A=April, M=May, J=June. Data collected by T. Osborne, ADFG, Galena, and refuge staff.

2. Endangered and/or Threatened Species

The American Peregrine Falcon is the only endangered species known to occur on the Koyukuk refuge. A total of 23 active nesting sites have been identified on or near the three refuge units. Four nests were monitored by ADFG and refuge staff in 1992 in or near the refuge. A discussion of peregrines observed in the raptor survey is included in Section G.6.

3. Waterfowl

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

Waterfowl inventories conducted on the Koyukuk NWR in 1992 included duck, goose, and swan production surveys. Duck breeding pair counts are conducted annually by the Division of Migratory Birds, Juneau. Swan nesting surveys and fall production surveys were first initiated in 1986. The fall production surveys have been repeated annually. We also cooperated with Kanuti Refuge and the Division of Migratory Birds in a comparison study of helicopter/ground duck production survey techniques.

Weather Conditions and Waterfowl Migration Chronology

Break-up on the upper Koyukuk River in 1992 occurred in mid to late May. Colder than average temperatures in late March resulted in delayed snowmelt and a late breakup. In Galena, the ice didn't move on the Yukon River until May 25. Spring phenology was unlike recent years when breakup was characterized by early warming and early breakup. Large lakes on the refuge were still solid for aircraft landing on May 24. Major flooding transpired in most of the Koyukuk River and extensive ice-jam flooding occurred between the Dulbi River and Treat Island. The Koyukuk River floodplain which includes prime waterfowl nesting grounds was underwater through most of June and into early July.

As a result of extensive flooding during and following breakup, nesting waterfowl did not fare well in 1992. First hatch dates and peak hatch dates for northern pintails were notably later than the previous four years, indicating that late break-up and delayed nesting phenology could be related (Figure 3). It is interesting to note that arrival of pintails was not delayed in 1992 and was similar to 1991, 1990 and 1988. Previous to 1992, 1985 was the only other year in which such a late break-up and delayed nesting phenology was recorded (Figure 3).

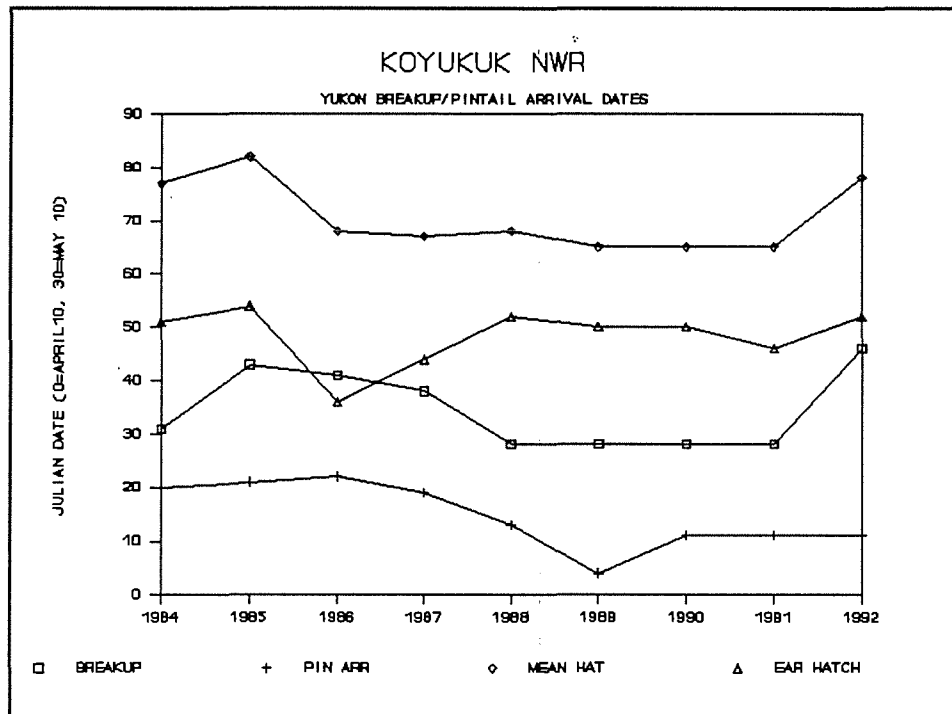


Figure 3. Comparison of Yukon River breakup and pintail arrival dates in Galena and mean and earliest pintail hatch dates 1984-1992.

Duck production

Waterfowl brood surveys have been conducted on the Complex since 1983. The refuge has participated with the Division of Migratory Birds in a state-wide waterfowl production survey since 1990. The Koyukuk Refuge and Kaiyuh Flats are part of Koyukuk Production Unit Six and include the Kanuti Refuge and BLM lands (see Figure 4).

Sampling scheme and methods have varied from year to year. The Koyukuk Refuge was initially stratified in 1986 into high, medium, and low density strata

KOYUKUK/NOWITNA REFUGE COMPLEX

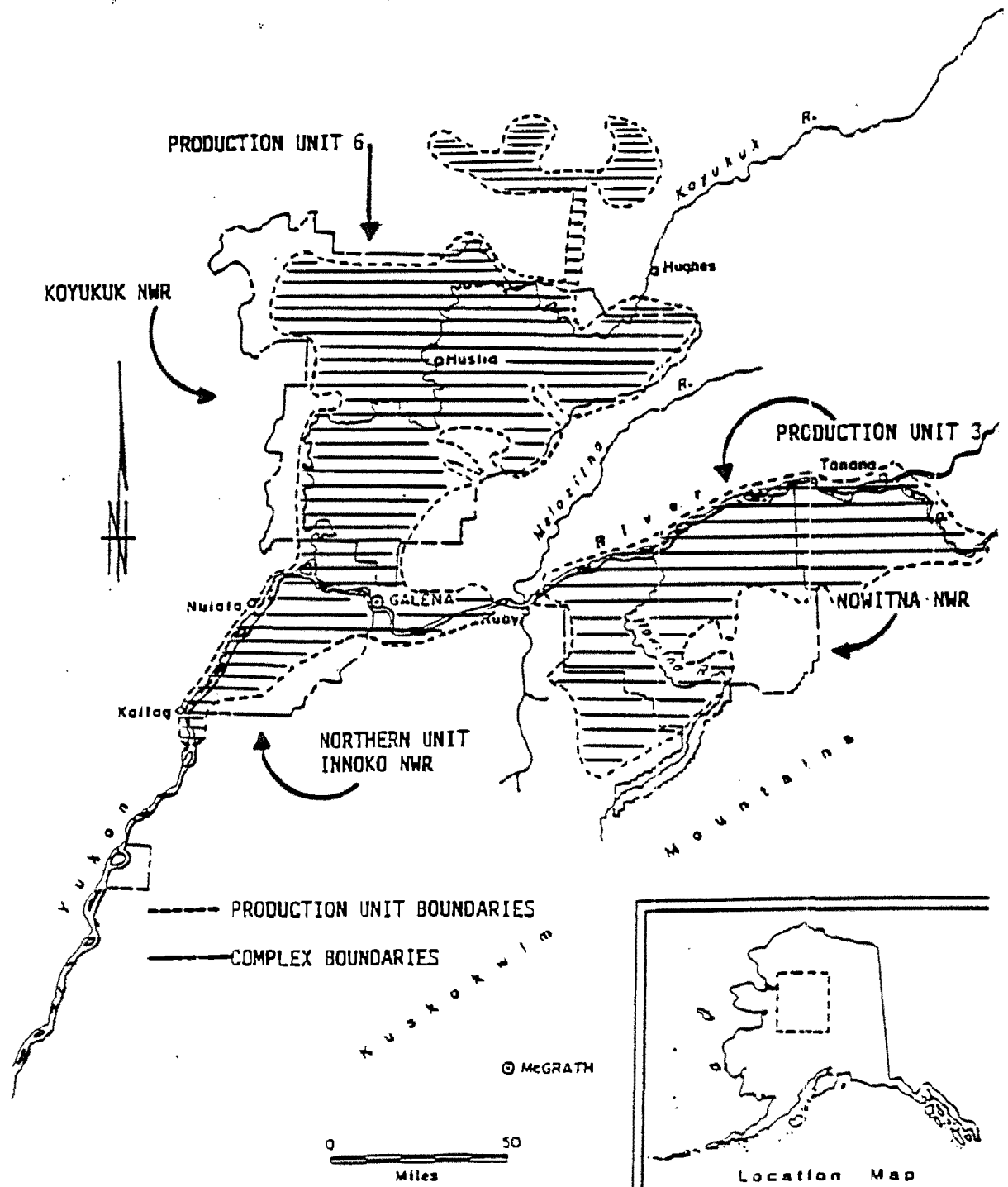


Figure 4. Location of waterfowl production sample units in the Koyukuk/Nowitna Refuge Complex, Alaska, 1992.

based on the proportion of total water area and habitat characteristics (eg., bog vs. river connected). In 1990, the Northern Unit of the Innoko Refuge was similarly stratified and the Koyukuk Refuge was re-stratified. The refined stratification technique used color infra-red CIR photos instead of topographical maps originally used in 1986. All one-square mile sections within refuge boundaries were classified as habitat or non-habitat based on the presence or absence of water. Plots within waterfowl habitat were then assigned to one of three strata representing expected waterfowl density (low, medium, or high). Density was based on the amount of water and the presence or absence of bog habitat as determined by distance from the plot to the nearest river-connected waterway.

Cessna 185 and PA-18 floatplanes provided access into medium and high density strata plots. All low density stratum plots were accessed and surveyed by helicopter. About 50% of the medium and high density strata plots were surveyed by canoe, walking, or both; the remaining 50% were surveyed by helicopter. Good weather and lack of the normal fire-related smoke conditions enabled us to complete the 1992 surveys in 10 days, compared to 25 days in 1991 and 18 days in 1990.

Three hundred forty-nine broods were observed during waterfowl production surveys on the Koyukuk and Northern Unit of the Innoko Refuge from July 18-27. Total brood observations were down 17% compared to 1991. Dabbling duck broods accounted for 79% of the observations. As in past years, the most commonly observed dabbling brood was American wigeon and the principal diving species was scaup. Of dabbling ducklings observed, 48% were class 1A and 1B; 36% were class 1C and 2A; 11% were age class 2B and 2C and 5% were class 3. Nearly all diver broods (99%) were age class 1.

An estimated 16,060 duck broods were produced on the Koyukuk and Northern Unit of the Innoko Refuge in 1992. The coefficient of variation (or CV = variation relative to the means of the sample) for this estimate was 0.34. Dabbling brood estimates were highest for American wigeon ($n=5,918$, $CV=0.23$), mallard ($n=861$, $CV=0.45$), and green-winged teal ($n=2,899$, $CV=0.72$), scaup were the most abundant of the diver broods ($n=3,053$, $CV=0.45$). Surf scoters were the most numerous sea duck with expanded brood estimates of 2,681 ($CV=0.78$). Total brood estimates were down 44% compared to the 1988-1992 mean. Estimated number of dabbling broods were 12,001 ($CV=0.35$) and for divers 3,288 ($CV=0.42$), both down 25% and 40%, respectively, from the 1988-1992 mean.

The production estimate for all species in 1992 was 86,162 ducklings. The coefficient of variation for this estimate was 0.34 and the 90% confidence level was $\pm 56\%$. Dabbling production estimates were highest for American wigeon (32,400), mallard (4,162), and green-winged teal (14,831). (Table 3). Diver

production estimates were highest for scaup spp. (18,806). Surf scoter estimates were 2,681. Dabbler production was estimated at 61,822 and diver production at 20,092 both down 14% and 39%, respectively, from the 1988-1992 mean.

Adult population estimates by species were also made but should be interpreted with caution. Although some adult dabbler species estimates increased markedly in 1992 compared to the 1988-1992 mean, the variance was extremely high ($CV=0.65$) due to high variance between plots in the low density stratum ($CV=0.82$). However, divers exhibited a comparably low variance of 0.31 and may provide more reliable population estimates. Scaup, which comprise over 95% of the estimated adult diver population, decreased by only 2%. Total population estimates for adult divers increased by 38% in 1992 compared to the 1988-1992 mean.

Due to the high variance among adult dabbler estimates, 43 individual plots were examined for abundance of observed adults in 1992 and compared with previous years in hopes of obtaining more reliable adult trend information. Slightly more adult dabblers were observed in 1992 than in previous years increasing only 7% over the 1990-1992 mean. Adult diver observations increased 37% in 1992 compared with the three year mean. Overall adult observations increased 12% compared with the three year mean (Figure 5).

Production during 1988-1991 has ranged from 62,648 in 1989 to 199,155 in 1990, and averaged 119,348. (Table 3). See Figure 6 to compare production of ducklings on the Koyukuk and Northern Unit of the Innoko Refuge since 1988.

Total cost for the waterfowl production surveys on the Koyukuk and Northern Unit of the Innoko Refuge was \$41,436.00. Because of these high costs, 1993 may be the last year of refuge-wide production estimates. Future duck production monitoring will probably be limited to sampling a few selected trend areas.

This year we assisted Kanuti Refuge in a study entitled "Helicopter versus Ground Counts in Waterfowl Production Surveys in Interior Alaska." The objective of the study was to compare effectiveness of ground and helicopter survey methods for estimating duck production. Results have not yet been summarized pending 1993 field work.

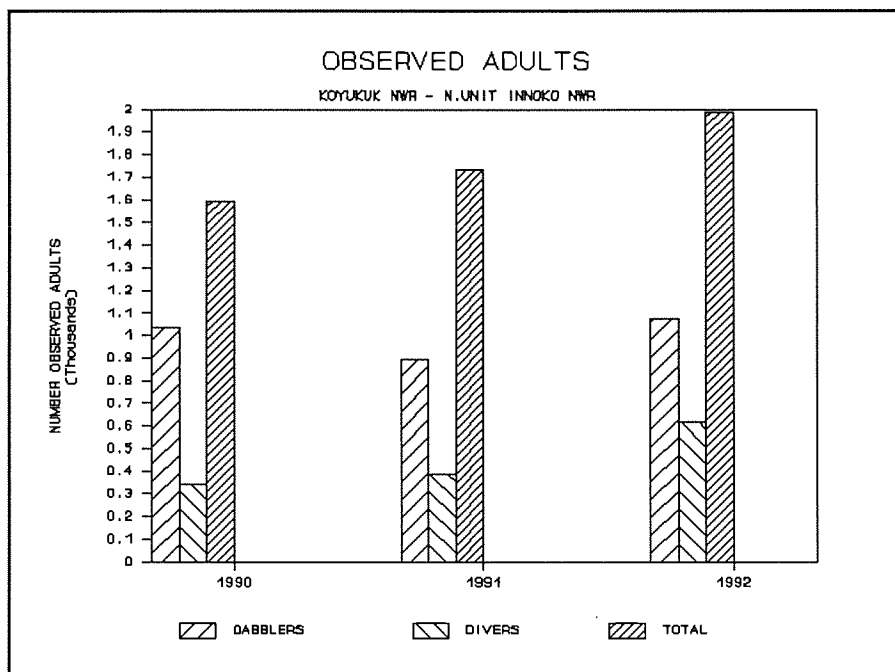


Figure 5. Observed adult waterfowl on production surveys, Koyukuk NWR and Kaiyuh Flats, Alaska, 1990-1992.

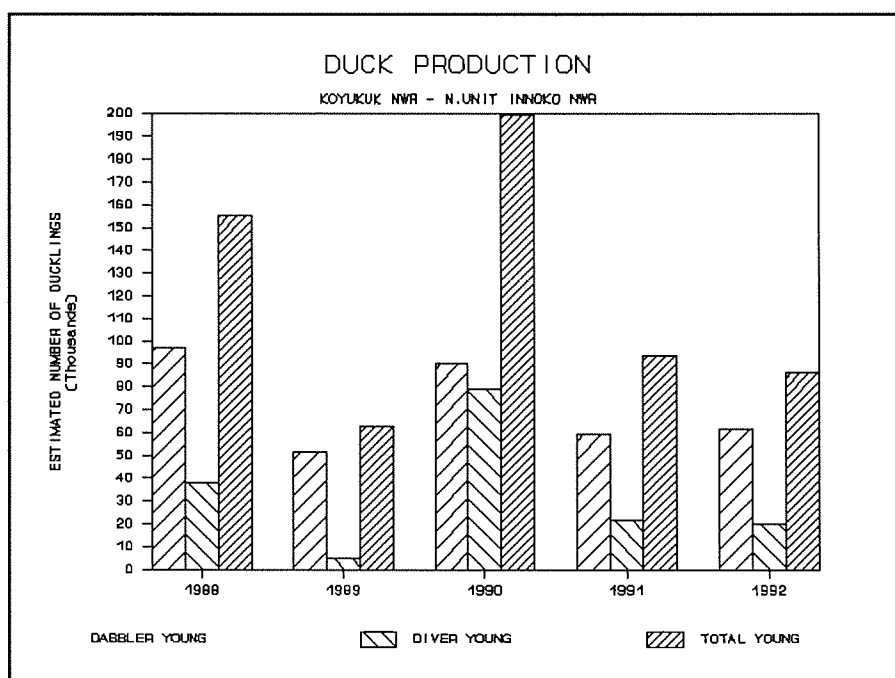


Figure 6. Comparison of estimated waterfowl production on the Koyukuk NWR and Kaiyuh Flats, Alaska, 1988-1992.

Table 3. Estimated production of young ducks by species, Koyukuk NWR and Northern Unit of the Innoko NWR (Kaiyuh Flats), Alaska, 1988-1992 (CV = coefficients of variation).

Species	Estimated Young ¹					1988-92(CV) ³
	1992 (CV)	1991 (CV)	1990 (CV)	1989 (CV) ²	1988 (CV) ²	
Wigeon	32,400 (0.21)	26,392 (0.26)	40,292 (0.44)	22,619 (0.56)	48,084 (0.29)	33,957(0.35)
G-W Teal	14,831 (0.75)	8,871 (0.38)	20,495 (0.42)	19,039 (0.64)	21,123 (0.35)	16,872(0.51)
N. Pintail	5,569 (0.31)	6,855 (0.29)	9,541 (0.48)	1,448 (0.44)	17,353 (0.33)	8,153(0.37)
N. Shoveler	4,860 (0.78)	6,233 (0.61)	7,394 (0.48)	505 (0.62)	2,955 (0.76)	4,389(0.65)
Mallard	4,162 (0.46)	10,974 (0.32)	12,487 (0.44)	8,128 (0.67)	7,402 (0.55)	8,631(0.49)
<u>DABBLERS</u>	61,822 (0.33)	59,325 (0.22)	90,209 (0.29)	51,739 (0.60)	96,917 (0.34)	72,002(0.36)
Canvasback	575 (0.64)	1,892 (0.91)	0 (0.00)	290 (0.99)	1,030 (0.98)	757(0.88)
Scaup spp.	18,806 (0.49)	18,489 (0.49)	71,787 (0.94)	3,634 (0.47)	23,209 (0.40)	27,185(0.56)
Ring-necked	456 (0.85)	479 (0.60)	393 (1.00)	0 (0.00)	6,122 (0.83)	1,490(0.82)
Goldeneye spp.	0 (0.00)	290 (0.63)	3,132 (0.88)	0 (0.00)	2,628 (0.72)	1,210(0.74)
Bufflehead	199 (0.69)	741 (0.62)	3,553 (0.86)	691 (0.70)	5,078 (0.65)	2,052(0.70)
Redhead	57 (1.00)	0 (0.00)	0 (0.00)	297 (0.59)	116 (0.57)	94(0.72)
<u>DIVERS</u>	20,092 (0.46)	21,890 (0.41)	78,866 (0.88)	4,852 (1.00)	38,183 (0.54)	32,777(0.66)
Oldsquaw	0 (0.00)	0 (0.00)	0 (0.00)	60 (0.95)	1,398 (0.49)	292(0.72)
W.W. Scoter	0 (0.00)	1,825 (0.62)	27,242 (0.98)	505 (0.78)	4,281 (0.48)	6,771(0.72)
Surf Scoter	2,681 (0.78)	9,242 (0.55)	1,842 (0.50)	373 (0.44)	8,912 (0.41)	4,610(0.54)
Black Scoter	57 (1.00)	0 (0.00)	772 (0.96)	4,816 (0.57)	4,687 (0.59)	2,066(0.78)
C. Merganser	0 (0.00)	14 (1.00)	0 (0.00)	0 (0.00)	0 (0.00)	3(1.00)
R.B.Merganser	0 (0.00)	246 (1.00)	0 (0.00)	0 (0.00)	0 (0.00)	49(1.00)
Unknown	1,510 (0.43)	978 (0.48)	225 (0.47)	243 (0.66)	877 (0.59)	767(0.53)
TOTALS	86,162 (0.34)	93,520 (0.23)	199,155 (0.60)	62,648 (0.49)	155,255 (0.24)	119,348(0.38)

¹ Sampling strategies differed between 1988-89 and 1990-92; production estimates are provided from previous years for trend or abundance comparisons only.

² During 1988-89 Kaiyuh Flats was not stratified and had total CV's of 0.48 and 0.66. CV on the stratified Koyukuk Refuge during these years was much lower with a mean CV of 0.37.

³ Coefficient of variation mean includes only years when a species was observed.

Goose Production

Goose production surveys have been done on the Dulbi River and Dulbi Slough since 1984 and 1986, respectively (Figures 7 and 8). On 24-26 June 1992, production surveys for white-fronted geese and Canada geese were conducted along the Dulbi River and Dulbi Slough. The Huslia River from near the junction of the North and South Forks and ending near Tom Cook Hill was also surveyed. All geese observed were tallied and recorded by species, sex, and age-class when possible. Other wildlife observations were also documented on these waterways.

Two hundred thirty adult and 73 gosling white-fronted geese and 20 adult and 31 gosling Canada geese were observed on 56.75 river miles of the Dulbi River. Observations of white-front adults and goslings were down 67% and 60%, respectively in 1992. Observations of Canada adults and goslings were down 31% and up 3%, respectively. On the 69 mile stretch of Dulbi Slough, 239 adult and 30 gosling white-fronted geese and 1 adult and 0 gosling Canada geese were observed. White-front adult and gosling observations were down 58% and 42%, respectively. Canada adults were also down 92% from 1991. Lack of goose production on the Dulbi Slough is likely due to the extended flooding conditions of the Dulbi Flats which lasted into mid-July.

A 73 mile stretch of the South Fork of the Huslia River was surveyed by motorized rubber raft from June 24-26, 1992 to assess goose production and record observations of other wildlife. Fifty adult greater white fronted geese and 44 goslings in 9 broods were counted. This compares to a total of 70 broods seen during a float trip June 11-18, 1976 that covered the same area, plus an additional 15 miles to the mouth of the Huslia River. Nearly all the broods during the 1976 trip were seen above the North Fork, which suggests the 1992 production was drastically lower than production in 1976.

White-fronted goose study

This study was originally initiated on the Nowitna Refuge in 1988. Since 1990, the project has been conducted on the Koyukuk Refuge due to a greater abundance of white-fronted geese. However, there has been little trapping success of adult female geese in spring which has severely hampered the study.

The objectives of the study are: 1) to document the breeding biology of white-fronted geese on the Koyukuk Refuge, including breeding phenology and nest success; 2) to identify and assess factors affecting nesting success of white-fronted geese on the refuge, including environmental conditions and predation; and 3) to identify the habitat requirements of nesting white-fronted geese on the refuge.

Attempts were made to capture white-fronted geese between April 22 and May 11, 1992 on a study area near Dubin Point in the Koyukuk Refuge. Colder than average temperatures during late April resulted in delayed snowmelt and a late breakup on the Koyukuk River provided an unprecedented period of time to attempt trapping geese. Two geese were captured during 240 trap-hours with one launch of a rocket net. An adult female was fitted with a radio-transmitter, leg band, and neck collar. Attempts were made to relocate the female, but the radio-transmitter apparently became detached and a nest site was not located.

Rolled oats and cracked corn as an attractant failed and limited success was realized with decoys. It was observed that selection of a trap site with good



The Koyukuk took part in a comparative study of duck observation done by ground and helicopter surveys to compare the effectiveness of one survey technique over the other. (MB)



Poor trapping success during attempts to capture pre-breeding white-fronted geese suggested that multiple rocket nets, better trap sites and attractants could improve success. (MB)



The Goose Production survey float trip on Dulbi Sough yielded 239 adult white-fronted geese, but no production due to extreme flooding. Overall goose production on the Koyukuk has been estimated to range from 1,500-6,600 white-fronted and 0-1,300 Canada geese. (BJ)



At the confluence of Hogatza River and High Creek naturally occurring silt sediment was seen during an overflight of the Hog River Mine and Caribou Creek to look for mining effluent. No significant turbidity was seen; water and fish samples were taken. (MB)

loafing habitat was essential. Trap sites in thawing grass lakes were more easily camouflaged than trap sites on exposed sandbanks. The exact sites where flocks congregated were also easier to predict in grass lakes. Using multiple rocket nets at one or more trap sites will likely increase capture success. A progress report including detailed descriptions of attempted capture techniques and locations and future recommendations was completed by WB Bertram.

Swan Production

The northern half of Koyukuk NWR is located in a transition zone between tundra and taiga, and as a result both tundra and trumpeter swans nest on the refuge. During aerial and ground surveys of nest sites in 1988 and 1989, 32% and 48% of nests (n=19, 27), respectively, were of tundra swans. Prior to these surveys it was presumed that a majority of the Koyukuk swans were trumpeters. Discussions of swan populations and trends on the Koyukuk therefore must be qualified to include substantial numbers of both species until such time as further habitat and distribution studies can be undertaken.

In 1989, six 1:63,360 "trend maps" were selected as trend units to monitor swan population and production. As with other waterfowl, swans in 1992 experienced a poor production year, with the lowest number of pairs and average brood size observed on the Koyukuk Refuge since 1985 (Figures 9 and 10). The number of young produced on the Koyukuk in 1992 was lower than the previous year, but higher than 1985-1990 levels. Similarly, in 1992 the Kaiyuh Flats showed record low average brood size and production of young, but a surprising increase in numbers of pairs was observed (Figures 11 and 12). The opposite pattern in numbers of pairs between Koyukuk and Kaiyuh suggests a shift in abundance of non-breeding adults in the summer which could have been related to extreme flooding on the Koyukuk.

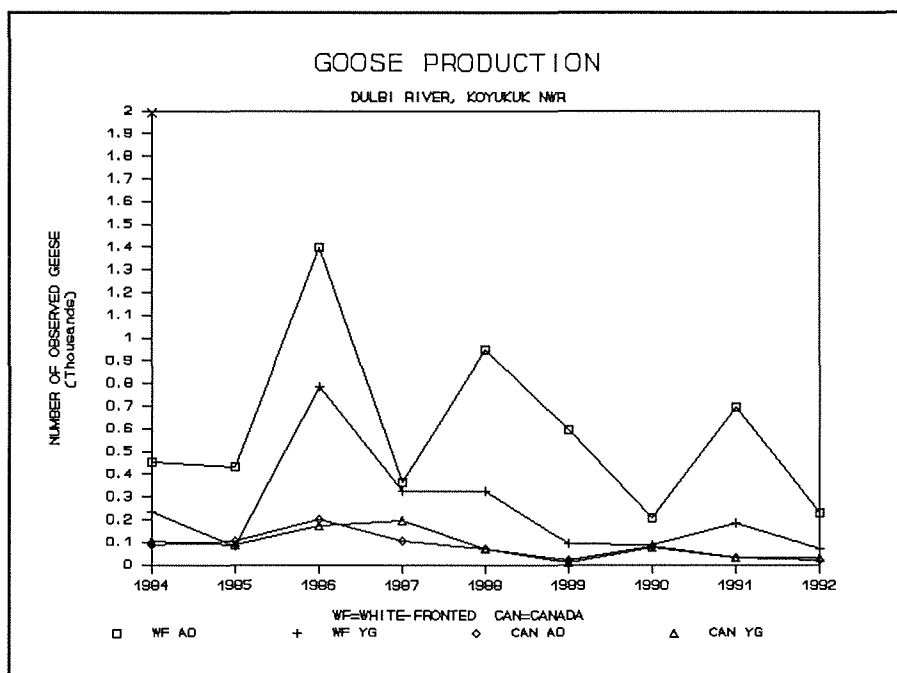


Figure 7. Observed goose production during surveys of the Dulbi River, Koyukuk NWR, Alaska, 1984-1992.

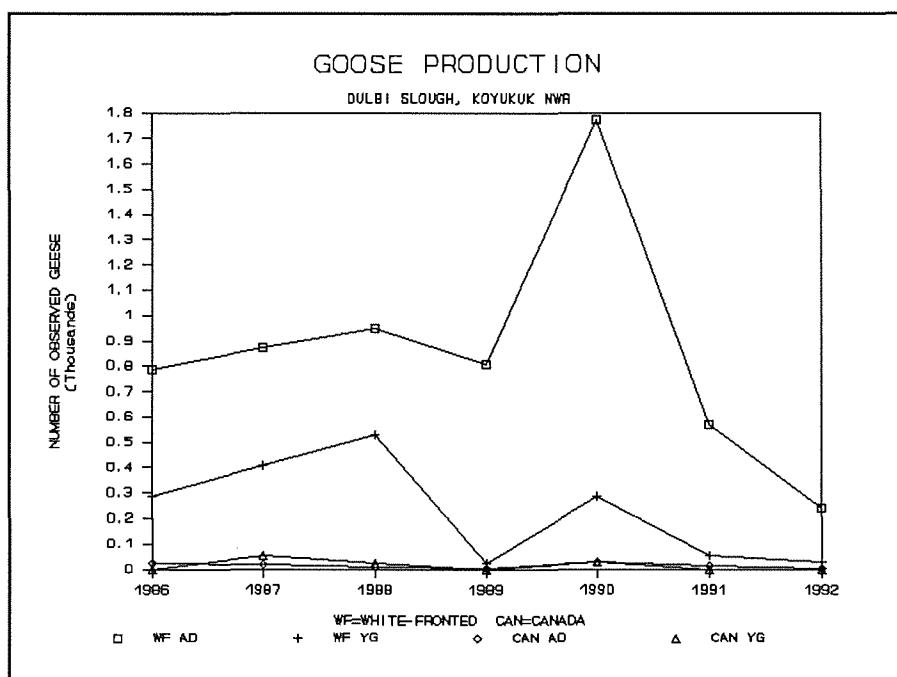


Figure 8. Observed goose production during surveys of the Dulbi Slough, Koyukuk NWR, Alaska, 1986-1992.

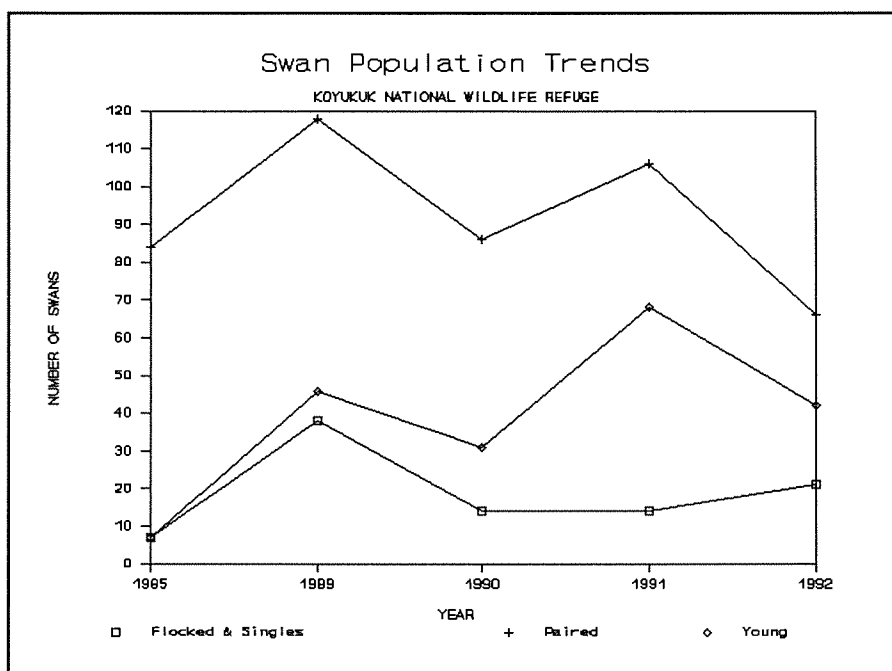


Figure 9. Swan numbers observed on surveys of Kateel River A2, C1, D1, and D3 trend maps.

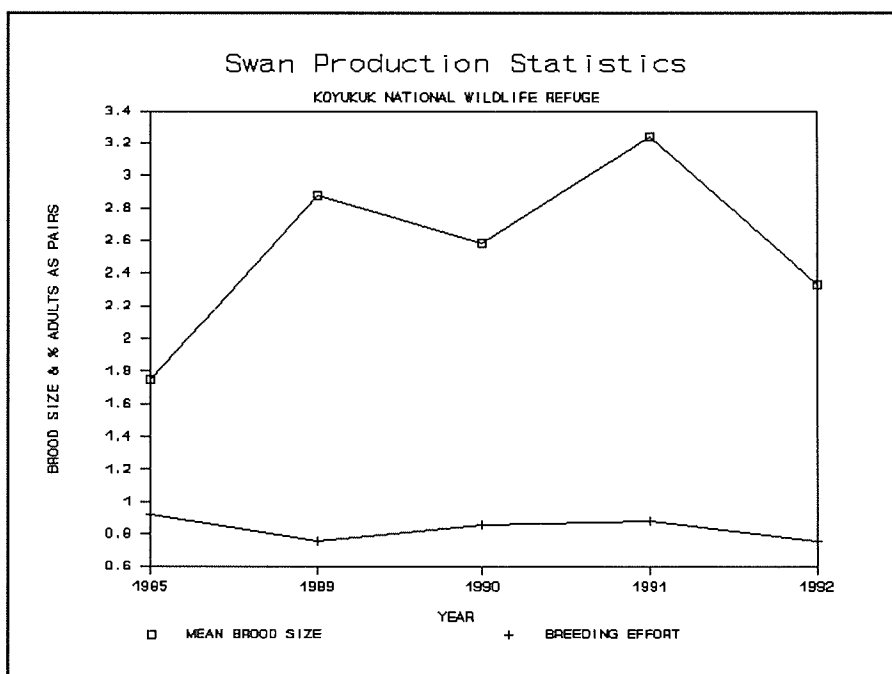


Figure 10. Swan production statistics from surveys of Kateel River A2, C1, D1, and D3 trend maps.

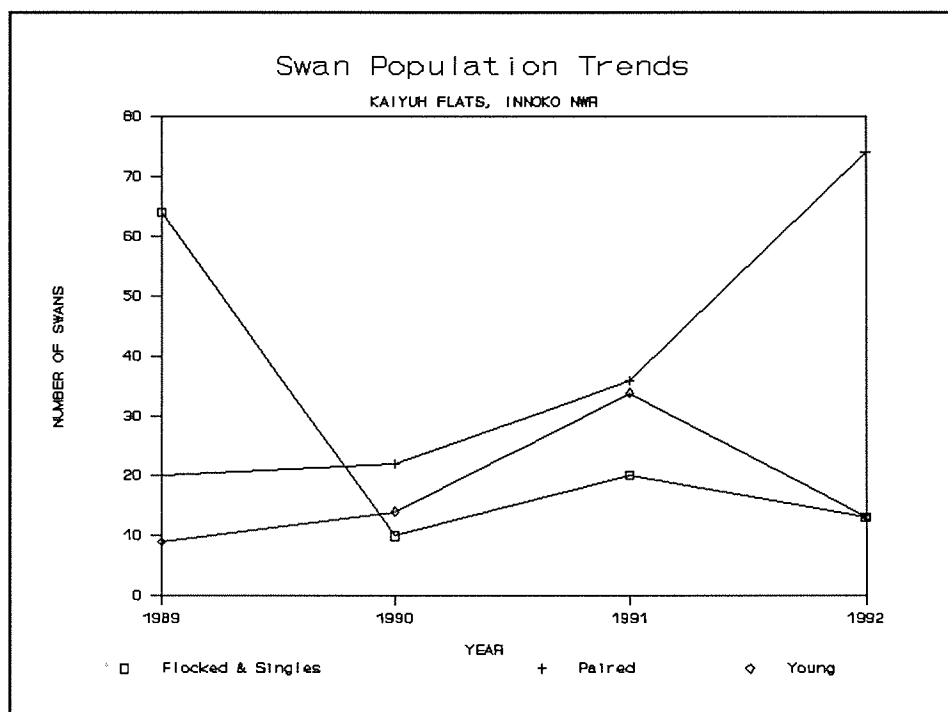


Figure 11. Swan numbers observed during late summer or fall aerial surveys of the Nulato B4 and B5 trend maps.

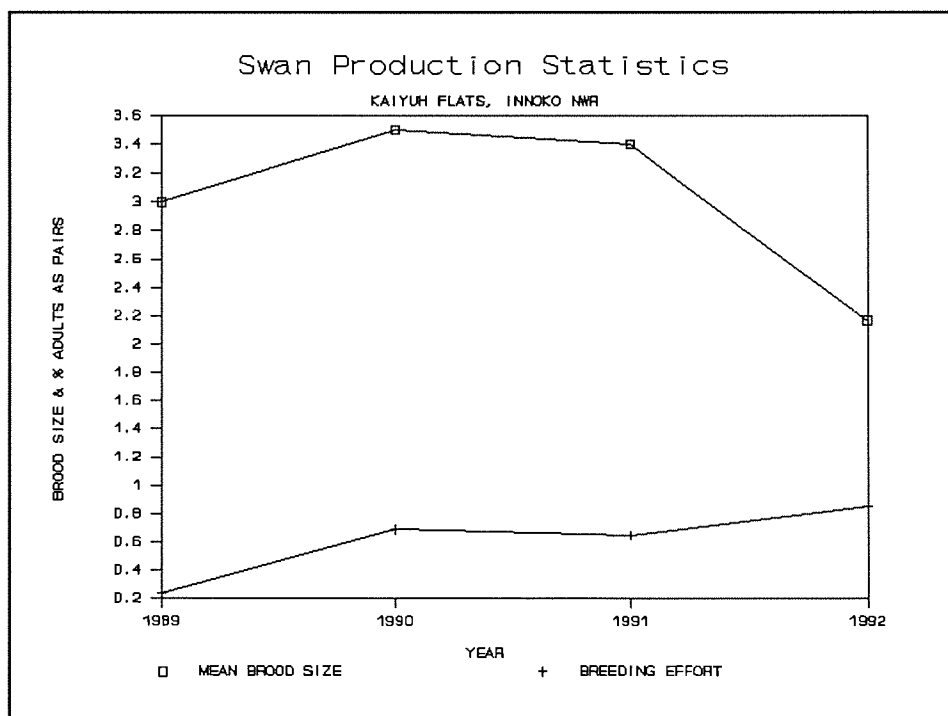


Figure 12. Swan production statistics based on late summer or fall surveys of the Nulato B4 and B5 trend maps.

4. Marsh and Water Birds

Common, Pacific and red-throated loons; red-necked and horned grebes; and sandhill cranes are common on the refuge. Yellow-billed loons are occasionally observed.

5. Shorebirds, Gulls, Terns, and Allied Species

Numerous species of shorebirds inhabit the refuge. These species include: lesser and greater yellowlegs, Arctic tern, glaucous gull, mew gull, Bonaparte's gull, herring gull, long-tailed jaeger, semipalmated plover, common snipe, spotted sandpiper, least sandpiper, pectoral sandpiper, solitary sandpiper, northern phalarope, Hudsonian godwit, and whimbrel. We collected no trend data on any of these species in 1992.

6. Raptors

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

Raptor surveys were conducted on the Yukon and Koyukuk rivers 29 June and 8-11 July. The purpose of the surveys was to ascertain general trends in certain raptor numbers. This survey had been conducted independently by the Endangered Species Office since 1979 to document peregrine falcon use of the Yukon River. During the survey, two historically active peregrine nest sites were visited between Galena and Koyukuk; defensive adults were observed at both sites. One site had a failed nesting attempt and an egg was collected and later sent to the Endangered Species office. In addition, two sites above the Hog River cabin were visited in July. The site near the mouth of the Hog River was inactive and the other site \pm 20 miles upstream was active.

An abandoned peregrine falcon chick, fallen from a nest site near Nulato, was brought to the office by a local resident on 27 July. The falcon was sent to the rehabilitation center in Fairbanks.

7. Other Migratory Birds

Numbers and species composition of passerine birds fluctuate with the seasons. 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, and especially in 1992, white-winged crossbills. Wintering birds were monitored during the standardized Christmas Bird Count that was conducted by refuge and ADFG staff and local volunteers on December 19 (Table 4). A total of ten species was seen, which is about average. Differences this year from other years were fewer ravens but more crossbills and grosbeaks.

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, tree sparrow, white-crowned sparrow, fox sparrow, and Lincoln's sparrow. The refuge assists with national monitoring of songbirds, many of which are neotropical migrants, by conducting two standardized Breeding Bird Survey Routes in taiga habitats near Galena. One route, number 883, follows the Galena road system, while the other, number 284, follows Bear Creek and Nikolai Slough. Both routes have been surveyed since 1985 in cooperation with ADFG. Also of note in 1992 was an irruption of white-winged crossbills which were abundant all summer and into the winter. This irruption was apparently related to the bumper crop of white spruce cones.

Table 4. Results of the Galena Christmas Bird Count, 1982-92.

Species	Year											
	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	
Northern Goshawk	2						1		cw	2	1	
Willow Ptarmigan	cw		cw		cw	5	23	6	44	cw	4	
Spruce Grouse			2					2				
Ruffed Grouse						3	6	3				
Hawk Owl	1						1					
Great Gray Owl			cw	cw	1		1			1		
Great Horned Owl							cw					
Downy Woodpecker			2		1				1	1	1	
Hairy Woodpecker									1	1		
North.3-toed Wood.	1			2	2							
Gray Jay	5	8	21	9	5	8	29	8	6	11	16	
Common Raven	206	152	121	240	230	276	334	226	225	391	148	
B.C. Chickadee	5	2	13	11	10	10	30	3		34	17	
Boreal Chickadee	7	1	20	41	1	9	58	3	8	30	41	
Siberian Tit			2									
Northern Shrike			cw									
Snow Bunting		cw			20	80						
Pine Grosbeak	1	28	13	7			2	40	cw	6	9	
W.W. Crossbill			50						2		15	
Common Redpoll	65	74	144	101	19	102	45	153	15	244	91	
Total Species	8	6	10	7	8	8	12	9	9	12	10	
Participants	4	2	6	5	4	4	5	9	9	15	8	
Party Hours	14	10.5	22	17	11	10.5	21	23.7	27.7	29	17.5	
Party Miles	94	76	121	69	65.5	48	137	134	86.5	122.5	81.3	
Lowest Temp.	-10	18	18	25	-40	25	20	-35	-42	-52	-3	

† cw=seen during count week

8. Game Mammals

Moose, caribou, black and grizzly bear, wolf, marten, beaver, wolverine, lynx, otter, red fox, and snowshoe hare are found throughout the refuge. Moose, caribou, and black bear are the common game mammals harvested by subsistence and sports hunters. Marten and beaver are the most economically important furbearers.

Moose

Moose are presently the most important game and subsistence mammal on the Complex. They are found in almost all habitats, but are most numerous in the riparian habitat. Historically, moose were first reported in this area in the early 1940's. Moose projects conducted during the year included twin rate surveys, fall trend counts, and harvest surveys. ADFG operated a hunter check station on the Koyukuk River in September. Moose hunting and the hunter check station are discussed in Section H.8.

Moose population trend surveys

The incidence of twinning was monitored with flights on 22 and 23 May. We obtained an adequate sample size ($n=45$) only for the Three Day Slough area, where 52% of all cows with calves had twins. This healthy and high rate is similar to 1990 values. A flight on the Northern Unit of the Innoko refuge yielded limited sample size due to low moose density and thick vegetation.

Trend surveys have been conducted annually on the refuge in cooperation with ADF&G since 1981 (except for 1990 when weather prevented completion). A moose inventory plan delineating priorities and schedules for trend surveys was completed in 1991 after reviewing past survey data. Trend areas outlined in the plan are presented in Figure 13.

In 1992, surveys were completed 9-18 November for Three Day Slough, Kaiyuh Slough, and Dulbi River Mouth trend areas. Snow conditions were excellent early in the month for the first time in recent years. At Three Day Slough, a very unique area of ideal habitat that is about 100 mi^2 in size, moose density increased from 10.91 moose/mi^2 in 1991 to 13.06 moose/mi^2 in 1992 (Figures 14 and 15). Although the bull:cow ratio at Three Day Slough is stable at 35:100 (Figure 14) and the herd continues to increase, the low percentage of large adult bulls (14% of all bulls and 3% of the herd) is a concern in this heavily hunted population.

Although moose density declined in the Kaiyuh Slough trend unit from previous surveys, levels were still higher than a decade earlier (Figures 16 to 17). At Kaiyuh Slough, bulls:100 cows and calves:100 cows decreased from previous years, while yearlings increased slightly. Numbers of cows have increased steadily while numbers of adult bulls have declined (Figures 16-17). At the Dulbi River Mouth the bulls:100 cows ratio has decreased since 1987, and is similar to 1982-1984 levels, while the calves:100 cows and yearlings:100 cows ratios have been stable (Figures 18-19). This suggests that the population in most of the unit is probably stable. At this writing we were concerned that the deep snow of winter 1992-93 could cause high mortality and begin a decline in some areas.

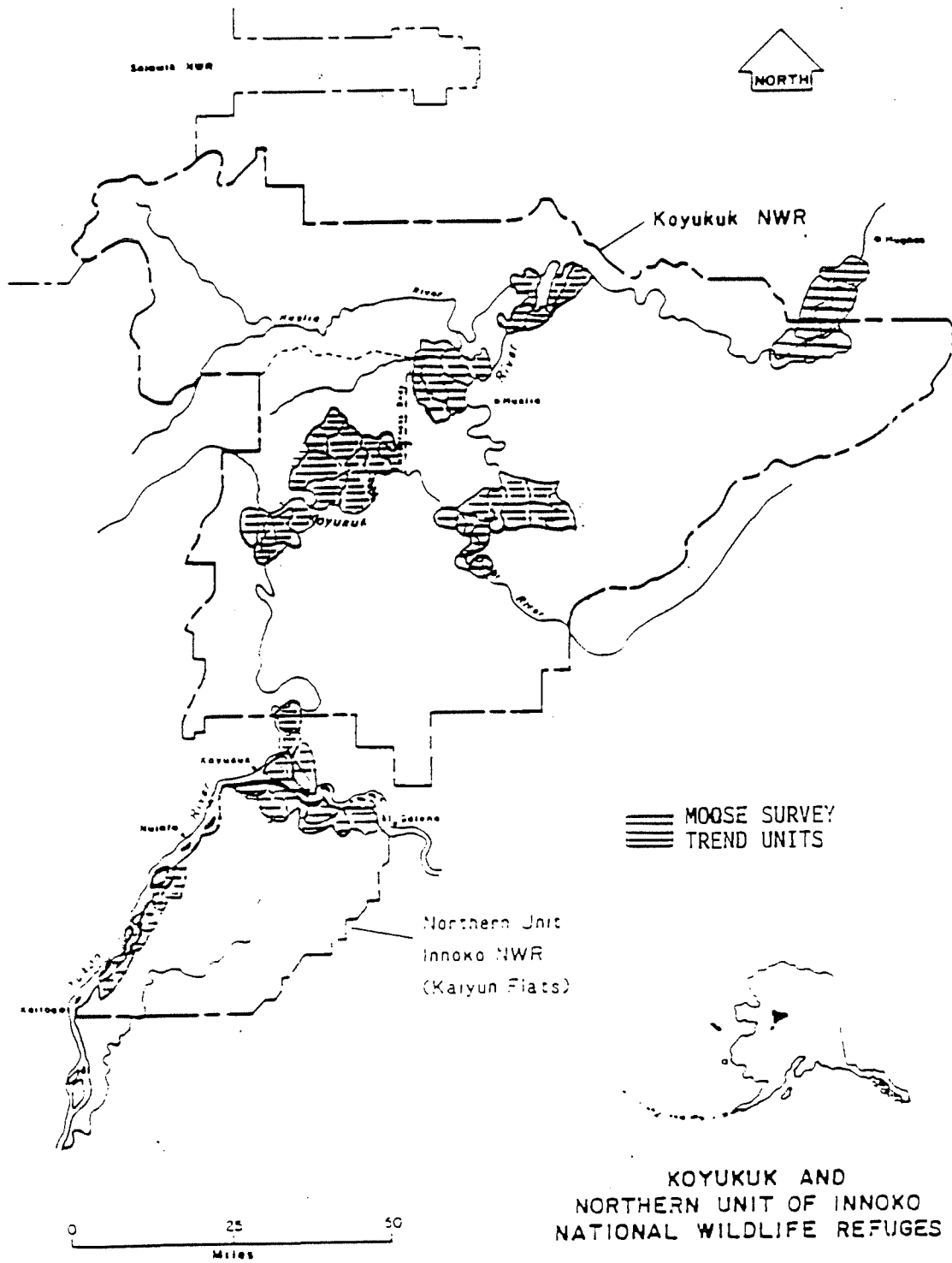


Figure 13. Moose trend areas for the Koyukuk Refuge and Northern Unit of the Innoko Refuge.

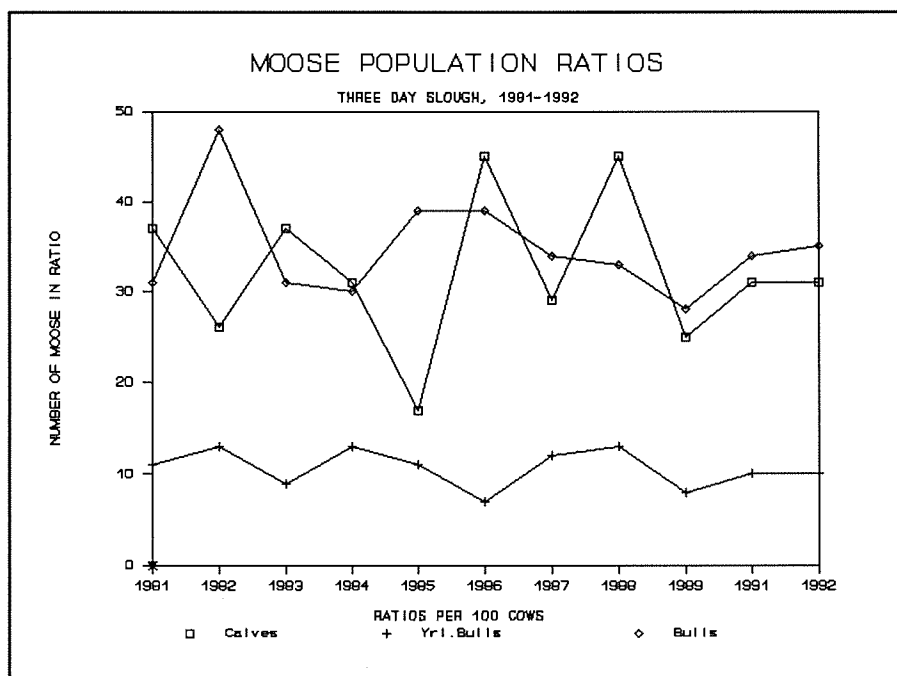


Figure 14. Moose population ratios of Three-Day-Slough trend surveys, Koyukuk NWR, Alaska, 1981-1992.

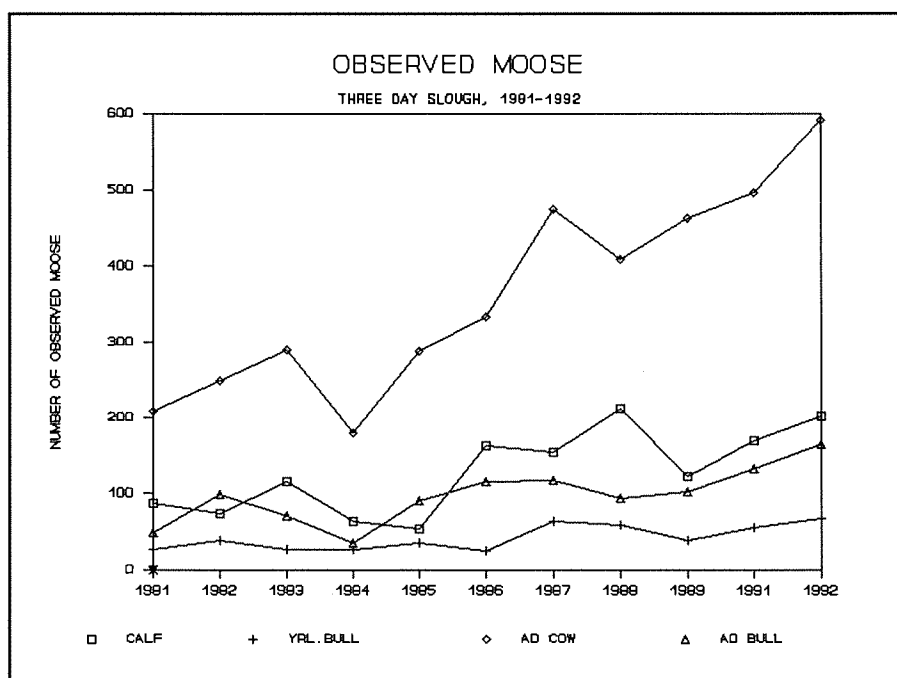


Figure 15. Observed moose during trend surveys, Three Day Slough, Koyukuk NWR, Alaska, 1981-1992.

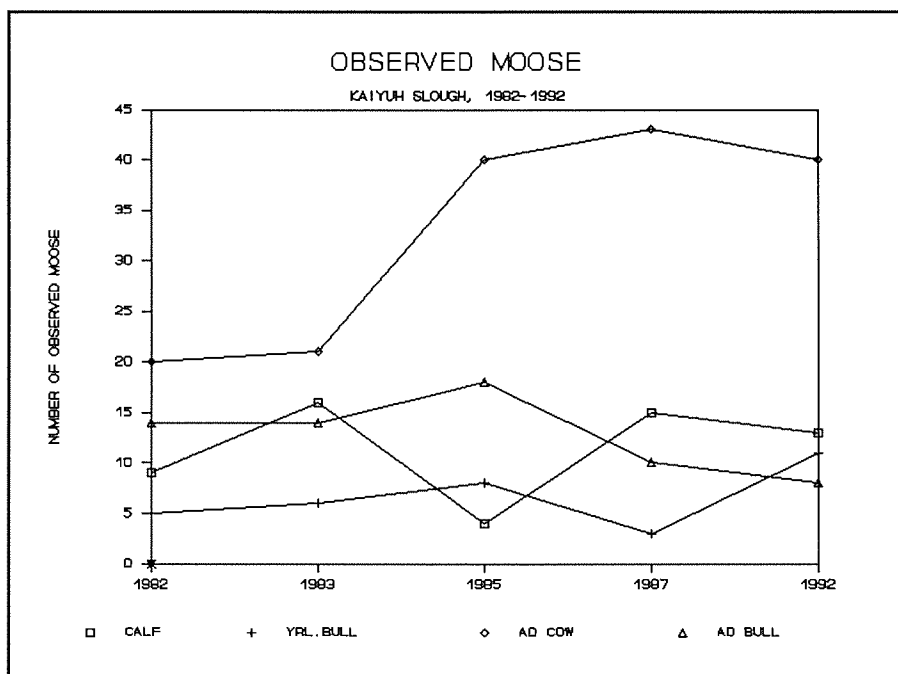


Figure 16. Observed moose during Kaiyuh Slough trend surveys, Koyukuk NWR, Alaska, 1982-1992.

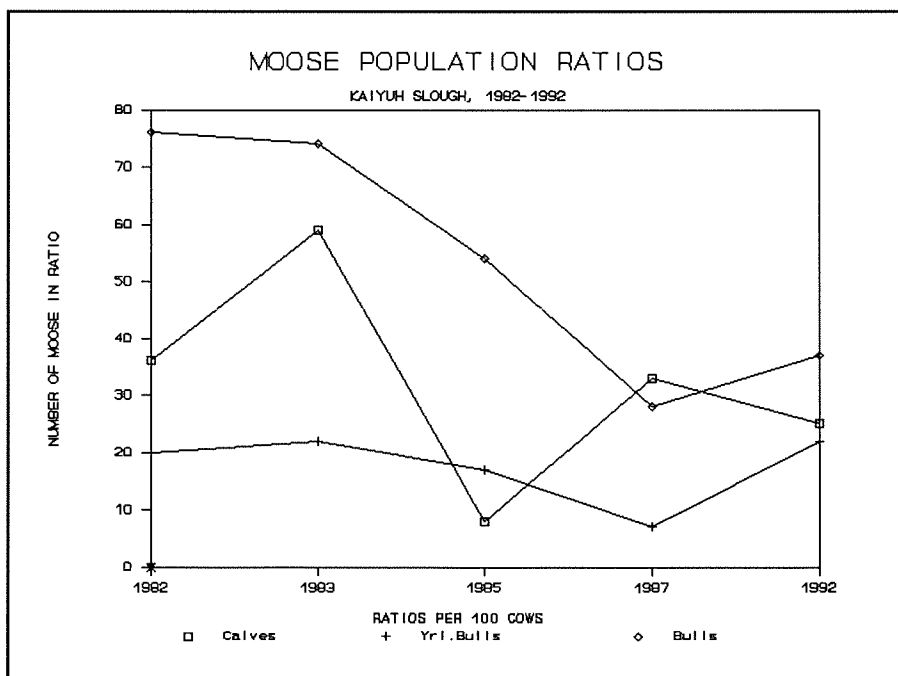


Figure 17. Moose population ratios of Kaiyuh Slough trend surveys, Koyukuk NWR, Alaska, 1982-1992.

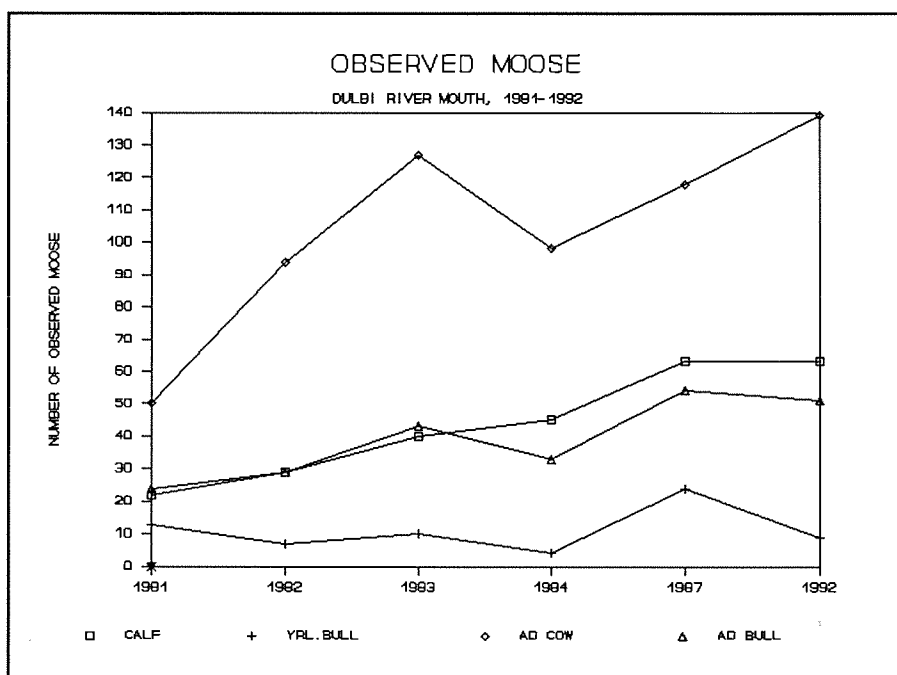


Figure 18. Observed moose during Dulbi River Mouth trend surveys, Koyukuk NWR, Alaska, 1981-1992.

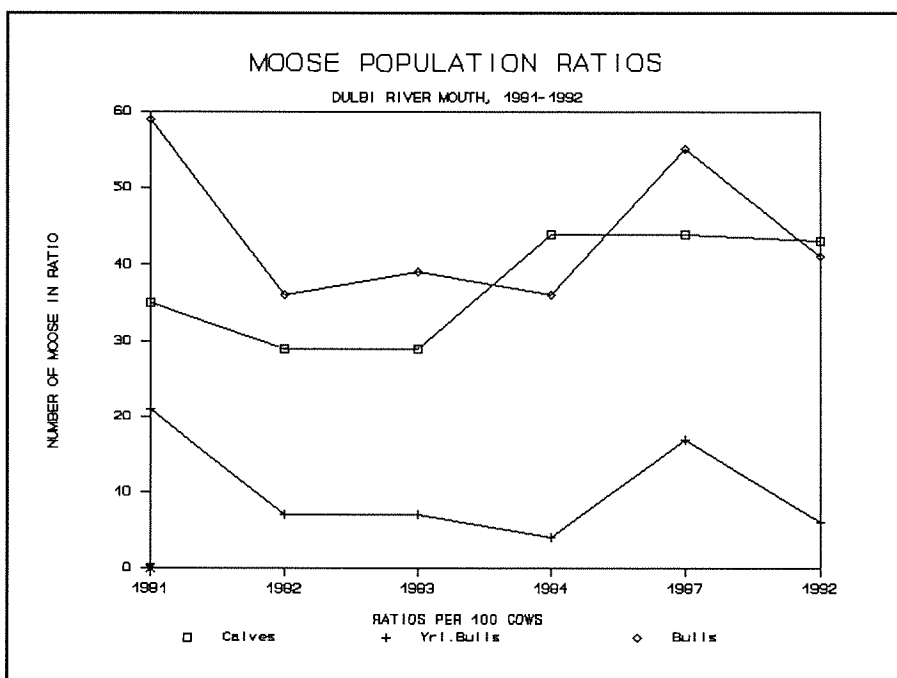


Figure 19. Moose population ratios of Dulbi River Mouth trend surveys, Koyukuk NWR, Alaska, 1981-1992.

Caribou

The ranges of two caribou herds overlap portions of the refuge. The Galena Mountain Herd (GMH), a small herd of about 300 that calves in the foothills near Galena Mountain and in the Melozitna River drainage, winters on the southern Koyukuk flats near Hozatka Lake (Figure 20). A small portion of the winter range of the Western Arctic Herd (WAH), the largest caribou herd in Alaska, has utilized the same area as the GMH in recent years but typically uses other northern and western sections of the refuge. The WAH has been growing steadily since its crash in the 70's, and is presently estimated at about 420,000. During the winters of 1989-1990, 1990-1991, and this year the Western Arctic herd shifted migration patterns and travelled through areas in the southwestern and southern regions of the refuge normally only occupied by the GMH (Figure 21).

In late October and early November 1992, the WAH migrated southwest through the Nulato Hills and crossed the lower Koyukuk River into the Natlaratlen River drainage on the refuge. By early to mid-November several thousand WAH caribou had settled into the Hozatka Lake vicinity and joined the GMH. The Federal Subsistence Board opened a winter season for WAH on November 11, 1992 which coincided with an emergency opening sport season by Alaska Department of Fish and Game. The intent of the hunts were to allow local residents the opportunity to harvest caribou from the expanding WAH without risking overharvest of the GMH.

An estimated 2,000+ caribou were observed on an aerial tracking flight November 24 in the Hozatka Lake area. An additional 1,000+ caribou were observed travelling southwest down the Cottonwood Creek drainage. About one week later both herds migrated into the Natlaratlen drainage. Very few caribou were harvested in the fall and early winter of 1992 due to inaccessibility caused by overflow. Over 75 were harvested in late winter and spring 1993.

Caribou Study

The mixing of the two herds in recent years prompted initiation of a radio telemetry study to closely monitor the GMH during the State and Federal hunting seasons. A cooperative study with ADFG, BLM, and AFWRC was begun in April 1992 to monitor the herd's movement, determine population size, sex and age structure, age at first reproduction, natality and mortality rates, location of calving grounds, migration routes, and wintering areas. In addition, blood samples were taken from GMH and WAH animals to examine genetic similarities or differences between the two herds.

Twenty caribou from the GMH were collared on 10 and 11 April. Three additional cows were collared by ADFG on 11 and 12 October. Caribou have since been monitored bi-weekly or monthly. Within a month of the April collaring three bull caribou were killed by wolves. A fourth bull mortality occurred in August, the collar had been heavily chewed on by a porcupine.

Calving was initiated between 18 and 22 May, but had not peaked by 22 May. Two cows were observed with calves on 22 May near the Dulbi River. Because of bad weather and lack of plane availability (due to flooding in the Galena townsite) peak calving dates and natality rates were not determined in 1992.

Caribou were first seen aggregating on 6 June. Two aerial census crews using Super-cubs observed 239 GMH caribou on a post-calving aggregation survey flight 18 June with the largest concentrations east of Galena Mountain. An additional 595 caribou were observed on the middle and headwaters of Hot Springs Creek, just south of Wolf Mountain. These latter animals were believed to be part of the Wolf Mountain Herd and not the GMH because there were no radio collars present. During the post calving aggregation surveys several black bears were seen in the tundra habitats occupied by caribou.

Aerial composition surveys via helicopter were flown by ADF&G on 11 and 12 October during the recollaring effort. A total of 181 caribou were censused indicating a bull/cow ratio of 40:100 and a calf/cow ratio of 7:100. The latter calf ratio indicated high calf mortality despite apparent good nutrition of the cows. Bear and wolf predation is suspected.

Twenty-two relocation flights were made during the year, averaging one flight every 12 days. Thirteen cow caribou ranged as far east as Horner Hot Springs, as far north as upper Cottonwood Creek, and as far west as Natlatratlen Lakes. All cows and 6 of the 10 bulls summered east of Galena Mountain. Three bulls were possibly with the WAH during the summer and were later located in the Nulato Hills in October. They were later with the GMH on Natlatratlen Lakes in November. One bull has not been located since May and may have rejoined the WAH. During November and December, all collared members of the GMH were mixed with WAH caribou from Cottonwood Creek to Natlatratlen Lakes.

During collaring efforts, morphometric measurements and blood samples were taken for later analysis to examine differences between the GMH and WAH. Initial impressions were that body sizes and weights were much larger in the GMH than the WAH. According to ADF&G caribou biologist Pat Valkenberg, GMH yearlings collected were the heaviest to be weighed in any herd in the state. Blood samples from the GMH, WAH, Central Arctic Herd, Kilbuk Herd, and domesticated reindeer were analyzed by the USFWS Region 8 genetics lab in a



For the Three Day Slough area on the Koyukuk, moose densities increased from 10.9 moose/mi² in 1991 to 13.1 moose/mi² in 1992. These are among the highest densities in the state. (MB)



A radio telemetry study on the Galena Mountain Herd was initiated in April. The herd is estimated at 300 with a low recruitment rate of 7 calves:100 cows. (MB)

preliminary screening using mitochondrial DNA and amplified nuclear casein gene techniques. This initial effort detected polymorphisms among the sub-samples, indicating that a full analysis of all the samples may be able to identify genetic differences among the herds; this work is planned in 1993.

Bears

Black bears are abundant in the lowland forest habitat of the refuge. Hunting pressure is low and habitat quality is excellent. Grizzly bears, while uncommon, can be found on the refuge in open upland areas. No grizzly bears were sighted by the staff on the refuge in 1992. Our knowledge of grizzly bear numbers is extremely limited. We conclude that their density is low, but local residents in Huslia and Hughes reported an increase over previous years.

ANNUAL RANGE OF GALENA MOUNTAIN CARIBOU HERD

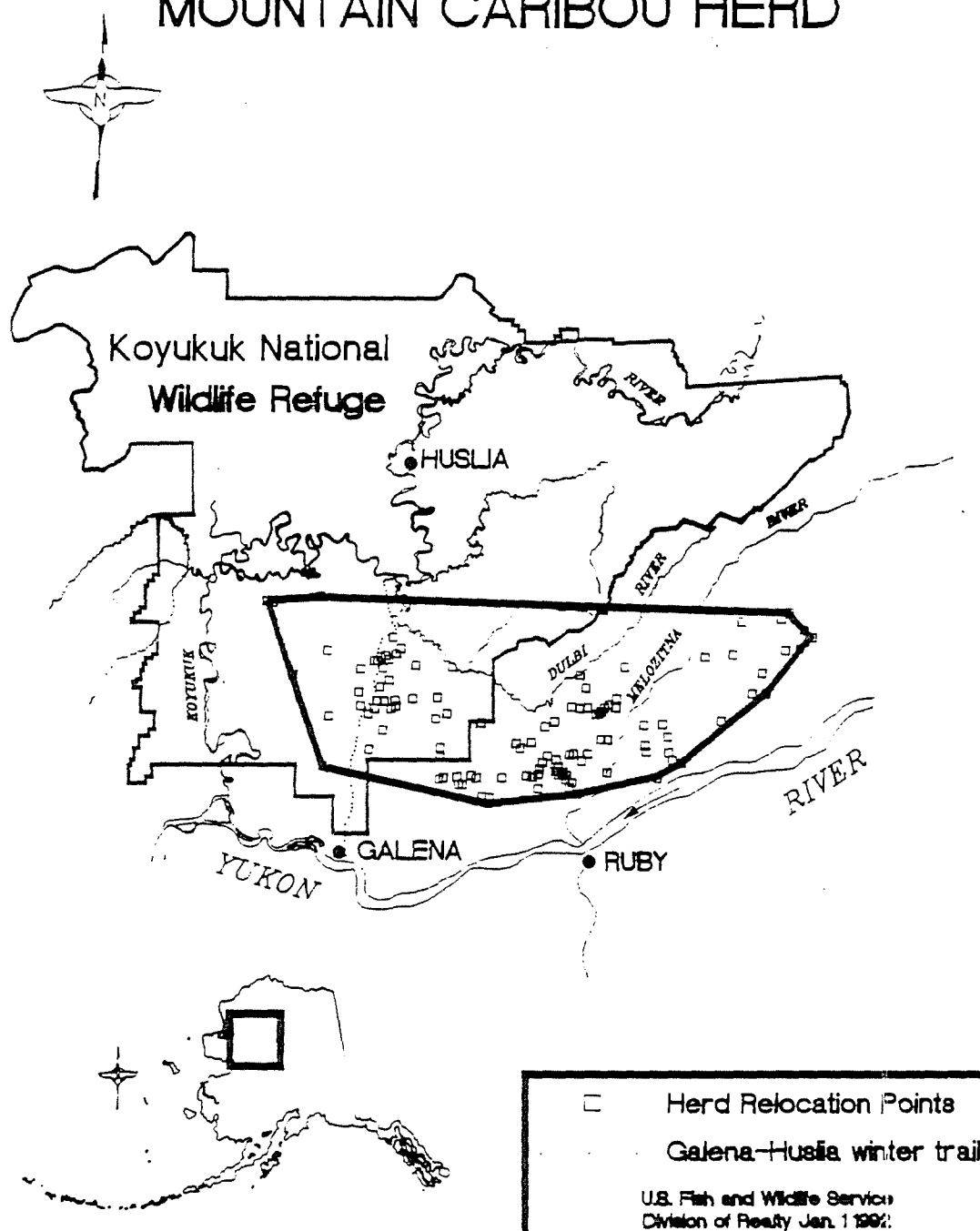


Figure 20. Annual distribution (based on radio telemetry) of the Galena Mountain Caribou Herd, Koyukuk NWR, Alaska.

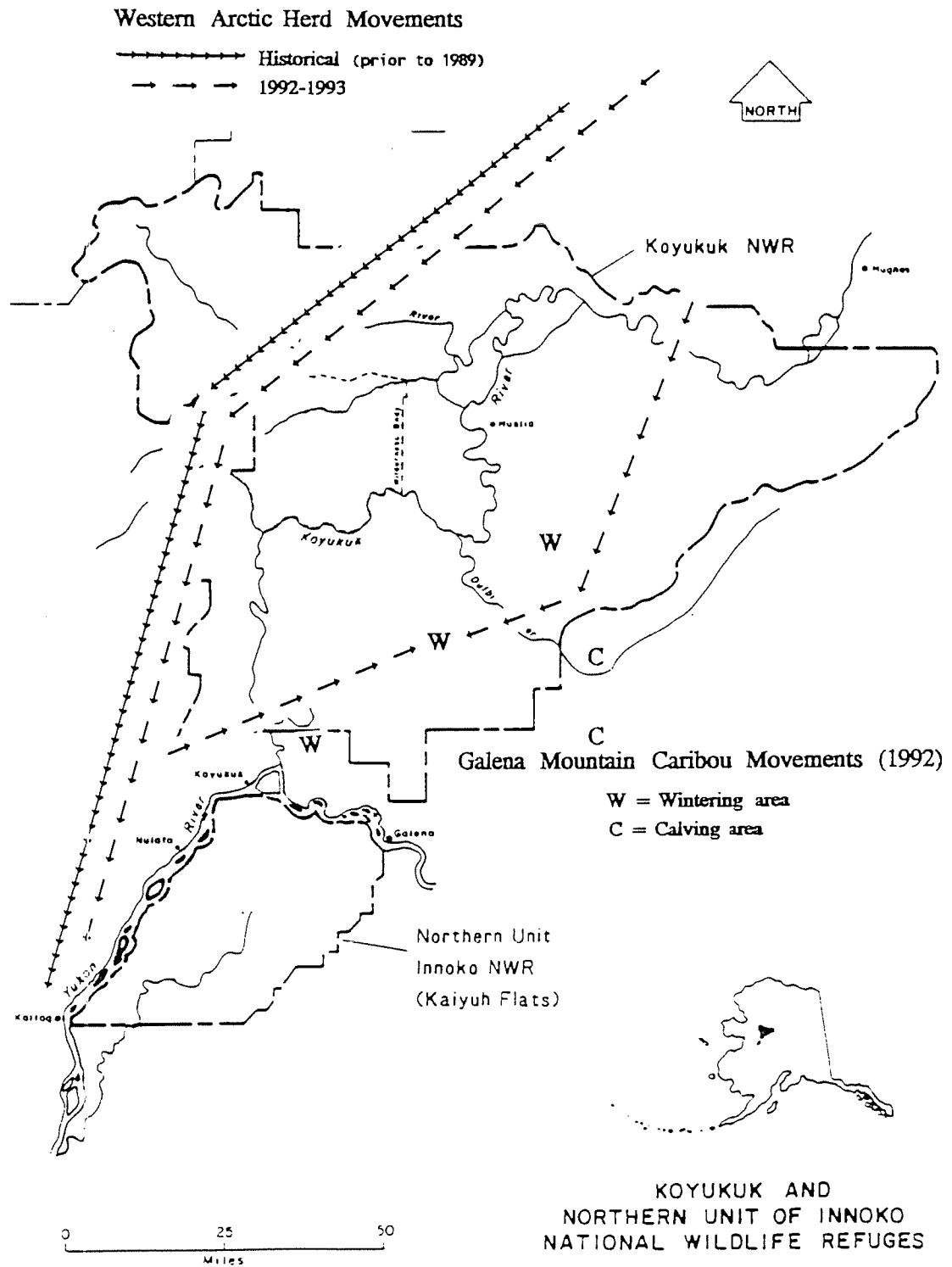


Figure 21. Annual distribution (based on radio telemetry) of the Western Arctic Caribou Herd, Koyukuk NWR, Alaska.

10. Other Resident Wildlife

Furbearers

A number of furbearers commonly occur on the Koyukuk Refuge and Kaiyuh Flats Unit. They include marten, mink, beaver, lynx, otter, red fox, wolverine, muskrat, red squirrel, shorttail weasel, coyote and wolf. Marten, beaver, and lynx are the primary species of interest to local trappers. Little is known about the distribution and population status of most furbearers. Refer to Section H.10 for a summary of trapping of these furbearers. Also refer to Nowitna Section G.10 for discussion of the Fire/Furbearer Project.

Beaver

Beaver populations in much of interior Alaska are presently high. They are common throughout the refuge and are frequently seen during the summer. Beaver is an important source of fur and food for local resource users and accounts for a large portion of the fur harvest. The fur is used for hats and as trim on gloves and mukluks. Beaver meat is also highly prized for its fat content and is a welcome change from moose in the diet of local residents or their dogs.

Little is known about the status and distribution of beaver on the refuge. When time and dollars permit, beaver cache surveys are flown in October to determine trends in the relative abundance of beaver within the Complex. Although surveys were not flown in 1992 data collected in 1991 indicates that active beaver cache density is about 1/mi².

Wolverine

Relatively little is known about the status of the refuge wolverine population. They are occasionally harvested by refuge trappers.

Lynx, Marten, Mink, Red Fox, and River Otter

The population status of these furbearer species have not been determined on the refuge. Population fluctuations are known to occur in accordance with fluctuations in prey species populations, primarily microtine rodents and/or snowshoe hare. All are occasionally harvested by refuge trappers.

Wolves

Wolves are found throughout the Koyukuk NWR and Kaiyuh Flats Unit. Although wolves may prey on a wide variety of species, they depend primarily on large ungulates for food. Consequently, wolf numbers are often highest where

moose and/or caribou are abundant. Another factor that affects wolf populations is harvest intensity. Presently, healthy populations of wolves and moose occur on the Koyukuk NWR and Kaiyuh Flats Unit.

Wolf Telemetry Study

A telemetry study was initiated in 1986 to examine the seasonal movements and home range of three wolf packs on the Koyukuk NWR. The study objectives were to determine pack size, locations, home ranges, seasonal habitat use, and estimate wolf/prey ratios. During the original study, seven transmitters were fitted on wolves between April 1986 and March 1987. Unfortunately, most of these animals quickly "left the air" with at least four wolves killed by hunters, one apparently killed by another wolf, one radio failure, and one moving more than 650 km to the north. The study was amended in 1989 to include the entire Complex and in 1990 twenty wolves were captured and fitted with radio collars on the Koyukuk and Nowitna refuges. Twelve wolves were collared from 5 packs on the Koyukuk and 8 wolves were collared in three packs on the Nowitna. At the end of 1991, only three of the 12 wolves collared on the Koyukuk and two of the eight collared on the Nowitna remained on the air.

In April 1992, eight additional wolves were collared on the Koyukuk Refuge and Kaiyuh Flats Unit. Two wolves were collared in packs currently being monitored on the Koyukuk and six wolves were collared in two new packs, one pack on the Koyukuk Refuge and the other pack on the Kaiyuh Flats. The status of collared wolves is given in Table 5.

A progress report on the status of the wolf telemetry study was completed in October 1992. The report summarized all work done on all three refuges since 1986 and included information on wolf pack distribution, movements, abundance, and predation. The total estimated wolf population for the Koyukuk Refuge was 111 and comprised of 17 packs. Wolf estimates for the Kaiyuh Flats were 44 wolves from six packs. On the Nowitna Refuge, estimates were 90 wolves from 11 packs. Wolf densities were highest on the Kaiyuh Flats with 10.8 wolves/1,000km². Wolf density on the Galena subunit of the Koyukuk Refuge was 8.4 wolves/1,000km². Density on the Nowitna Refuge was lowest with 6.7 wolves/1,000km². Wolf predation pressure on moose was estimated to be highest on the Kaiyuh Flats with a moose/wolf ratio of 38.0 moose/wolf. The ratio on the Galena subunit of Koyukuk NWR was lowest with 60.9 moose/wolf. By comparison, the ratio on the Nowitna NWR was intermediate at 46.0 moose/wolf. Humans harvested 34% of the collared wolf sample (n=35), and overall hunting and trapping mortality was estimated at 26% of the population. Wolf populations have likely increased on the Complex in the last five years. The completion of the progress report is timely because we anticipate the State will be drafting a wolf management plan for Game Management Unit 21 in the next year.

Table 5. Status of wolves radio-collared through December 1992 on the Koyukuk/Nowitna Refuge Complex, Alaska.

Wolf ID.	Freq.	Age	Date collared	Last observed	Status	Pack Name (or most recent location if dispersed)	Fate
W1FG	1.920	imm.	4/10/86	2/17/87	Dead	Three Day Slough	killed by wolf
W2MG	1.661	ad.	4/13/86	2/28/87	Dead	Honhosa River/Long Stretch	hunted (aerial L&S)
W3MG	1.610	ad.	4/13/86	3/13/88	Dead	North Ck./Eddy Ck.	hunted (aerial L&S)
W4MB	1.620	ad.	4/23/87	3/7/88	Dead	Bear Creek	hunted (aerial L&S)
W5FG	0.920	ad.?	3/24/87	3/13/88	Dead	North Ck./Eddy Ck.	hunted (aerial L&S)
W6FG	0.970	imm.	3/25/87	5/29/87	Unknown	Bonanza Ck./Camp Ck.	unknown
W7FG	1.038	imm.	3/26/87	10/88	Disper.	Bonanza Ck.; dispersed to North Slope, ANWR	
W8MB	1.620	ad.	3/14/90	5/5/92	Active	Upper Dulbi	
W9MG	0.450	ad.	3/14/90	2/15/91	Dead	Upper Dulbi	unknown, prob. natural ¹
W10MG	1.610	ad.	3/14/90	4/23/92	Active	Dakli	
W11FB	0.900	ad.	3/14/90	3/18/90	Unknown	Three Day Slough	unknown, slipped collar
W12MB	0.460	ad.	3/14/90	4/30/92	Active	Three Day Slough	
W13MB	0.870	ad.	3/16/90	4/30/92	Active	Lower Dulbi moved to Nikolai Sl.	
W14FB	0.860	ad.	3/16/90	11/5/90	Dead	Nayuka/Indian River	trapped Indian Mtn.
W15MB	0.940	ad.	3/16/90	9/20/90	Unknown	Nayuka/Indian River	unknown
W16FB	0.841	ad.	3/17/90	1/9/92	Dead	Ham Island	hunted, Ruby
W17MG	0.920	ad.	3/17/90	3/9/91	Dead	Ham Island moved to Yuki River	hunted (aerial L&S)
W18FG	0.959	ad.	3/17/90	4/1/91	Dead	Ham Island moved to Yuki River	trapped, Yuki River
W19MB	0.820	imm.	3/17/90	5/1/92	Active	Monzonite	
W20FG	0.890	ad.	3/17/90	10/30/91	Dead	Monzonite	unknown, prob. natural ¹
W21FG	0.850	ad.	3/17/90	4/1/91	Unknown	Monzonite	unknown
W22MG	0.880	imm.	3/17/90	1/24/91	Dead	Lower Nowitna	trapped, Nowitna mouth
W23MG	0.920	imm.	3/18/90	3/18/90	Dead	Lower Dulbi -slow drug recovery	hunted (aerial L&S)
W24FB	0.830	imm.	3/18/90	4/19/91	Unknown	Lower Dulbi	unknown
W25MG	0.930	imm.	3/18/90	4/9/91	Dead	Three Day Slough	trapped, Huslia
W26FB	0.910	imm.	3/18/90	3/18/91	Dead	Three Day Slough	hunted, Huslia
W27MB	0.790	ad.	3/22/90	4/1/91	Dead	Lower Nowitna	hunted (aerial L&S)
W28FB	0.920	ad.	4/11/92		Active	Lower Dulbi	
W29MG	0.450	ad.	4/11/92		Active	Lower Dulbi	
W30FG	0.790	ad.	4/12/92		Active	Three Day Slough	
W31FG	1.180	imm.	4/12/92		Active	Nikolai Slough	
W32MB	1.669	ad.	4/12/92		Active	Happy Slough/Squirrel Creek	
W33FG	0.900	ad.	4/16/92		Active	Galena	
W34MB	1.240	ad.	4/16/92		Active	Galena	
W35MG	0.510	ad.	4/16/92		Active	Galena	

¹Carcass found and examined, collar retrieved. Cause of death could not be determined.



Eight wolves were collared as part of a study to examine movements and home ranges of local wolf packs. An estimated 111 wolves from 17 packs inhabit the Koyukuk Refuge. (MB)

11. Fishery Resources

Significant anadromous fish species found in the Koyukuk River include chum, chinook and coho salmon. Chum salmon, summer and fall runs, and chinook salmon are the primary subsistence fish for the villages near the refuge. Coho and sockeye are occasionally taken while pinks are rarely harvested.

We assisted the Fairbanks Fisheries Assistance Office (FAO) in the collection of 100 chum salmon from the Dakli River on 28-29 July. The fish were collected in order to look at genetic characteristics of individual fish stocks as baseline information for the Yukon River salmon resources. This is part of a study between the U.S. and Canada to better manage the shared resource of salmon on the Yukon River and its tributaries. We hope to assist FAO in similar sampling on the Gisasa River in Fiscal Year 93. Results will appear next year.

Northern pike, sheefish, broad and humpback whitefish, and burbot are among the fresh water species of interest to subsistence and sport fishers using the refuge. Other freshwater species which occur on the refuge include Alaska blackfish, least cisco, arctic grayling, longnose sucker, and ninespine stickleback.

In the future we plan on participating with ADFG and FAO on a northern pike telemetry study. The objective of the study is to determine the status of northern pike stock composition and compare it through time. Stocks to be examined include the drainages of the Khotol River on the Kayiuh Flats and the Nowitna River. Our main objectives with increased fishery work is identification of spawning and rearing sites, and proper allocation of harvest for subsistence.

14. Scientific Collections

In cooperation with the FAO, 100 chum salmon were collected from the Dakli River on the Koyukuk Refuge for genetic stock identification (see Section G.11). In cooperation with ADFG, 3 caribou calves from the Western Arctic Herd were collected from the Koyukuk Refuge, primarily for body weights (see Section G.8) and secondarily for liver samples to test for presence of heavy metals.

16. Marking and Banding

The Koyukuk Refuge has had an active banding program for white-fronted geese and northern pintail since 1989. All banding activities have been a cooperative effort with the Division of Migratory Birds. We have received 50 band return reports back from the Bird Banding Laboratory in Laurel, Maryland since 1989 (Table 6). Seventeen reports were received in 1992. Most of the returns were



Liquid nitrogen was used to preserve salmon tissues for a Yukon River genetic stock identification study that included tributaries of the Koyukuk. The sampling was done by Steve Miller, of the Regional Office Fisheries Resources Office. (MB)



WB Bertram extracts a fluid sample from the eye of a chum salmon on the Dakli River. The fluids are analyzed using electrophoresis for a genetic stock identification study aimed at collecting baseline data to identify individual stocks. (SM)



Tissue samples from salmon are taken for genetic stock inventory analysis on the Dalki River. (MB)



Keith Mueller of Ecological Services uses an electrofisher to collect fish for contaminant sampling. (MB)

from hunters and the recapture of banded birds. Of the recaptures and recoveries so far, most interesting is that of one AHY white-fronted goose (887-28923) banded by Bruce Conant in July 1976 and recaptured in the same location 16 years later, making it at least 17 years-old last summer! There were a few others that were 12-15 years old. The longevity of these birds, and the alternating years of good and poor production, indicate clearly how vulnerable they could be to overharvest and habitat loss or disturbance.

Efforts were made 7-10 July to band and collar white-fronted geese, but were met with uncooperative birds and limited success. Only one of four drive attempts was successful in capturing birds. During most drives, birds were dispersing and going up the cutbanks before we could "push" them close to the drive nets using PA-18's. It was observed that often the birds that led the groups up the banks were birds collared in previous years. We captured and collared 33 birds on the last attempt as the remainder of the group (n=150) headed up the bank. We theorized that a majority of the older birds had experienced our capture techniques in previous years and had "wised up" to our methods.

Despite a poor year for duck production, we were able to capture and band our quota of 240 pintails in 1992. A total of 247 pintails was banded August 11-21 at Willow Lake. In addition, 14 green-winged teal and 5 mallards were also banded. Birds were captured in "King" box traps and medicine hat traps positioned on the shore. Traps were baited with cracked corn and barley. Nearly 70% of the pintails captured were locals (immatures). Thirty-eight percent of the birds captured were recaptured at least once during subsequent trap nights. Of the 95 birds recaptured, 28 were recaptured twice, 14 were recaptured three times and seven birds were captured four times. The duck banding operation cost \$5500 in FY92. Banded duck sex and age composition data is in Table 7.

Table 6. Band returns on the Koyukuk Refuge 1989-1992.

Species	Band Number	Collar	Banding Site	Recovery Location	Dates Banded/Recovered
White-fronted goose					
	0887-26757		Treat Is., AK	Willow Lake, AK	07/01/76 07/30/90
	0887-28923		Dulbi River, AK	Dulbi River, AK	06/29/76 07/10/92
	1067-23509		Dulbi River, AK	Willow Lake, AK	07/14/79 07/02/90
	1067-23800		Willow Lake, AK	Dulbi River, AK	07/12/79 07/04/90
	1067-24942		Dulbi River, AK	Willow Lake, AK	07/14/79 07/02/90
	1067-11637		Dulbi River, AK	Willow Lake, AK	07/22/77 07/02/90
	0887-27125		Dulbi River, AK	Dulbi River, AK	06/28/75 07/07/89
	0807-61258		Dulbi River, AK	Alberta	07/07/89 09/16/89
	0807-61243		Dulbi River, AK	Saskatchewan	07/07/89 09/28/89
	1227-36673		Dulbi River, AK	Alberta	07/11/89 10/07/89
	0807-61256		Dulbi River, AK	Saskatchewan	07/07/89 10/20/89
	0807-61255		Dulbi River, AK	Galena, AK	07/07/89 05/01/90
	1067-24516		Dulbi River, AK	Dulbi River, AK	07/12/79 07/05/90
	1067-11904		Dulbi River, AK	Koyukuk River, AK	07/22/77 07/05/90
	1067-24635		Dulbi River, AK	Dulbi River, AK	07/12/79 07/05/90
	1067-12740		Dulbi River, AK	Koyukuk River, AK	07/10/78 07/05/90
	0807-61049	J6R	Willow Lake, AK	Delta Jct., AK	07/03/90 09/01/90
	1227-36211	A6M	Cloverleaf, AK	Alberta	07/05/90 09/06/90
	1227-36001	Z6F	Dulbi River, AK	Alberta	07/04/90 09/08/90
	1227-36243	C6P	Cloverleaf, AK	Alberta	07/05/90 09/22/90
	0807-61120	H6X	Dulbi River, AK	Saskatchewan	07/03/90 09/29/90
	1227-36269	T5E	Cloverleaf, AK	Alberta	07/05/90 10/01/90
	1227-36741		Dulbi River, AK	Saskatchewan	07/11/89 10/04/90
	1227-36713		Dulbi River, AK	Alberta	07/07/90 10/06/90
	0807-61214		Dulbi River, AK	Arkansas	07/07/89 01/28/91
	1227-36308	K5U	Cloverleaf, AK	Arkansas	07/05/90 10/14/91
	1227-36100	A6C	Cloverleaf, AK	S. Dakota	07/05/90 11/08/91
	0807-61155	J6Z	Dulbi River, AK	Alberta	07/04/90 12/26/91
	1367-98445	YZU	Innoko NWR, AK	Galena, AK (Natla)	07/03/90 07/02/92
	1227-36010	A5J	not rec'd	Galena, AK	not rec'd 07/02/92
	0887-26330		Dulbi River, AK	Galena, AK	07/02/76 07/02/92
	1097-48868		not rec'd	Fort Yukon, AK	not rec'd unk.
	1227-36011	E5M	W. Dulbi Oxbow, AK	W. Dulbi Oxbow, AK	07/04/90 07/10/92
	1227-36212	Z6J	Cloverleaf, AK	W. Dulbi Oxbow, AK	07/05/90 07/10/92
	0807-61289		Cloverleaf, AK	W. Dulbi Oxbow, AK	07/07/89 07/10/92
	1227-36047	A5Y	Cloverleaf, AK	W. Dulbi Oxbow, AK	07/04/90 07/10/90
	1227-36016		Dulbi River, AK	Texas	07/04/90 01/09/93
	1227-36101		Dulbi River, AK	Texas	07/04/90 01/10/93
	0807-61201		Dulbi River, AK	Saskatchewan	07/07/89 10/09/92
	1227-36026		Dulbi River, AK	Alberta	07/04/90 09/10/92
	1227-36248		Three Day Slough	Delta Jct., AK	07/05/90 09/01/91
Northern Pintail					
	0976-81833		Willow Lake, AK	British Columbia	08/13/92 11/13/92
	0976-81726		Willow Lake, AK	California (Salton Sea Refuge)	08/16/89 01/05/91
	0706-58835		not rec'd	Kaltag, AK	not rec'd 05/28/92
	0976-81930		Willow Lake, AK	British Columbia	08/18/92 11/ /92
	0976-81842		Willow Lake, AK	Bozeman, MT	08/15/92 11/20/92
	0976-61612		Willow Lake, AK	California	08/16/92 12/25/92
	0976-81892		Willow Lake, AK	Louisiana	08/17/92 01/10/93
	0976-81900		Willow Lake, AK	Louisiana	08/17/92 01/13/93
	0976-81776		Willow Lake, AK	Washington	08/14/92 11/22/92

Table 7. 1992 Banding summary of ducks captured at Willow Lake, Koyukuk Refuge, Alaska, 11-21 August, 1992.

	Female		Male		Totals
	<u>HY</u>	<u>AHY</u>	<u>HY</u>	<u>AHY</u>	
N. Pintail	86	55	86	20	247
Gr.-W. teal	3	6	1	4	14
Mallard		3		2	5

HY = Hatching year

AHY = After hatching year

H. PUBLIC USE

1. General

A meeting to receive comments on the proposed Migratory Bird Treaty Act amendments was held in Galena on April 8. The meeting was conducted by a representative of the Migratory Bird office in the Regional Office. Amendments would potentially provide for a subsistence waterfowl harvest of migratory birds outside of the normal September 1 to March 10 period.

Additional meetings conducted by the refuge staff were held in Tanana, Huslia, Kaltag, Nulato, and Koyukuk. In all, cases the meetings were constructive and the attendees were cordial. Several of the villages commented that FWS needs to have law enforcement present during a legal spring season and the others generally agreed that the traditional Native Councils need to be involved in setting regulations and enforcement. The best encouragement to have restraint during spring harvest came from testimonials from elders telling about the decline in waterfowl populations over the years. To date we feel the information exchange with villages has been good and confident we can work together on the issue.

One new cabin permit was issued during the year to Gilbert Huntington. The cabin located on the Koyukuk River near Three Day Slough, is for subsistence uses - mainly trapping.



Limited success with collaring white-fronted geese 1992 appeared to be due to experienced birds leading other geese to an escape route. (MB)



Medicine hat traps (pictured above) and "king" box traps baited with cracked corn and barley resulted in 240 pintails being banded at Willow Lake in 1992. (MB)

The Unalakleet River Lodge, which for the past two years had been providing fly-in northern pike fishing on the Kaiyuh Flats Unit operated again in 1992. No permit was issued since these operations take place on navigable waters and the camp site is located on a native allotment. Activity was much reduced this year compared to previous years. The lodge was sold to the Unalakleet Native Corporation last summer. No complaints were received from local villagers about the operation.

An individual from Galena contacted the office about conducting outfitted trips for tourists using dog sleds and boats and a transporting business for hunters.

The village of Huslia began the first phase of their tourism business this year when they hosted reporters and travel agency representatives in camps where traditional subsistence activities were demonstrated. The program is scheduled to be fully operational in 1993 when they begin taking clients. Most of the activities take place on Native allotments within the Koyukuk NWR.

One old and long neglected camp on Tachanlowa Lake was cleaned up by a resident of Galena.

The competitive process to select big game hunting guides/outfitters for the refuges began in earnest during this year. This process resulted from a state supreme court decision which ruled that exclusive guide areas in the state, which in effect were on refuges, were unconstitutional. The failure of the state to enact a program in compliance with the court ruling forced the FWS to initiate a program for competitive guide/outfitter selection specific to refuges.

Five guide units were identified on the Koyukuk Refuge, one on the Kaiyuh Flats Unit and three on the Nowitna Refuge. Three applicants submitted proposals for the Koyukuk and Kaiyuh Flats and two applicants submitted proposals for the Nowitna. One guiding unit had competition, one unit had no applicants, and seven units had a single guide. A ranking panel met in December to review the applications and make tentative selections. Permits are scheduled for issuance early in 1993.

No hunting guides have operated on the Complex since 1988 and 1989 when a single guide had four clients. Although the process appears to have fair competition, it does not address the impact of transporters - mainly air taxi operators. These transporters have the potential to cause far more impact by hauling multiple hunters into the same area one guide is working. We have been advised that transporters will be addressed when, and if, a public use management plan is done on the refuge. No such plan is in place or scheduled for the Complex.

The following special use permits were issued during the year for commercial public use activities:

<u>Operator</u>	<u>Purpose</u>	<u>Refuge</u>	<u>Clients</u>
Trail Ridge Air	Air Taxi	Koy/Now	5 hunters (2 moose)
Fairbanks Floatplanes	Air Taxi	Now	0
Tundra Air	Air Taxi	Now	8 Hunters (0 moose)
Denali West	Guided	Now	Fishing

2. Outdoor Classroom - Students

A variety of programs were done with students in local villages throughout the year which included snow activities, waterfowl banding program, waterfowl field trips, forest and aquatic studies, and hands-on activities from refuge biological studies. The first program entitled "To Know Snow" was given during Christmas vacation. This afternoon program discussed the different types of snow and how it affects animal survival. Eight youngsters made field notebooks, tested what they learned in an active game of facts and walked the local nature trail looking for winter wildlife signs.

From late February to mid March, refuge staff visited the villages of Hughes, Kaltag, Koyukuk, Ruby, Nulato, Huslia, Tanana and Galena to present a school program on waterfowl banding. A total of 455 students and 8 community members attended the presentations. Key points of the program were: why and when banding is done, the different kinds of waterfowl bands, how a bird is banded, what information is needed when a band is turned in and the certificate received in return. Students had the opportunity to band a "rope" leg, view the video "Arctic Nesting Geese" banding program and write a letter with the information to report the band.

In conjunction with America's Wetlands Month in May, Galena 7th grade students perfected their skills in waterfowl identification during the spring migration. Seasonally flooded areas offered a great opportunity for a class of 11 students to observe many species of spring waterfowl during three short morning field trips lead by refuge staff.

In late spring, Galena elementary students enjoyed several outdoor studies conducted by the refuge staff on the school nature trail. The hands-on activities reinforced unit concepts taught during the school year. First grade students collected several different seeds from trees and plants which were later dissected back in the classroom. Second grade students found evidence of terrestrial insect activity and investigated aquatic insects in a bog and seasonally flooded pond. Third/fourth grade students identified local plant species and made tree rubbings.

The fifth grade class talked about native uses of forest resources and human activities, in addition to identifying local plant species.

The refuge's greatest environmental education success with students for the year was the Biological Skills Camp held in early August. The Biological Skills Camp was an idea conceived from the need to prepare and involve community members in the work of the Fish and Wildlife Service. The Skills Camp introduced and trained students (ages 15-19) in some of the skills for an entry level biological technician position. Five students from the villages of Huslia, Kaltag and Nulato, spent the week conducting brood surveys and learning waterfowl identification; trapping, identifying, and drawing some conclusions about small mammal populations in wildfire burn sites; dissecting tissue samples from fish and obtaining benthic samples during a session on contaminants; and learning about fisheries management programs of the Service - something in which every resident on the Yukon and Koyukuk Rivers has a personal interest. The students were taken through several problem solving management scenarios on real resource allocation problems the Refuge faces. An event like the Biological Skills Camp brings us closer to achieving our goals of having more community involvement in our programs, modifying behavior where resources may be threatened, and enhancing the opportunities for employing more local people in the Service.

3. Outdoor Classroom - Teachers

As a follow-up to the teacher workshop in late November 1991, packets of requested information were sent to 13 teachers. Teachers were interested in information on local plants and animals, endangered species, waterfowl activities and curricula.

4. Interpretive Foot Trails

The Galena School Nature Trail was used for a number of activities associated with units studied over the school year and independent activities conducted by the refuge over Christmas vacation. Activities included a study of seeds from boreal forest plants and trees, terrestrial and aquatic insect sampling, plant identification, and snow tracking (see Section H.2 for more detail on the activities). The trail was established in 1991 as a challenge grant project. A large portion of the cooperators' contribution was volunteer efforts in trail construction from the boy scouts, 4-H and local community members. The trail continues to be enjoyed by students and teachers.



The refuge visited village schools with a waterfowl banding program. Students banded "rope" legs and completed letters with band return information as part of the program. (HJ)



High school students listen to the concerns on area resources from community leaders during our first skills camp designed to give them hands-on skills training of a bio tech. (HJ)

6. Interpretive Exhibits/Demonstrations

To celebrate National Fishing Week, the refuge had two displays on local fisheries at the Galena Air Force Base and local grocery store. Each display offered nine different fact sheets on local species. The information was so popular, the displays were kept up throughout the month of July.

The refuge participated in the Galena Air Show and the Fall Jamboree with displays, information and AHNA books for sale. The Air Show had an average attendance of 250 people, similar to the previous year when the refuge first exhibited. At the Fall Jamboree, attendance at the refuge exhibit was limited due to the time available for exhibitors.

7. Other Interpretive Programs

The refuge made a concerted effort during the months of January through March to offer videos to the Galena community and Air Force Base. The refuge showed a total of 15 videos during 7 showings at the local library and various locations on Base. The refuge will continue this outreach program next year in hopes of promoting the Service and its objectives, as well as providing some entertainment during the cold weather.

The following presentations were given on the Fire/Furbearer Project:

Johnson, W. N. "The Wildfire-furbearer project." Fire in Resource Management Marana, AZ, April 2, 1992, (60 people in attendance).

Paragi, T. F. "Wildfire-furbearer project." Alaska Trappers Assn., Fairbanks, 7 January 1992, (30 in attendance).

Paragi, T. F. "Wildfire-furbearer relationships in the Alaskan taiga: a progress report." College of Forest Resources, Univ. of Maine, Orono, 7 October 1992, (40 in attendance).

Quade, C. A. "Seasonal abundance of microtine rodents in post-fire forest communities of the Nowitna National Wildlife Refuge." Washington Coop. Fish and Wildl. Res. Unit, Annual Cooperators Meeting, University of Washington, Seattle, 2 December 1992, (30 in attendance).

Simon, Jr., P. "Wildfire-furbearer project." Slide talk presented as part of a USFWS environmental education program on fire given in local schools (Galena, Huslia, Kaltag, Koyukuk, Nulato, Ruby, Tanana) during October and November, (Total attendance 275).

8. Hunting

The primary big game species targeted by subsistence and sport hunters on the refuge are moose, caribou, and black bear. Ducks, geese, sandhill cranes, snowshoe hare, spruce and ruffed grouse, and grizzly bears are also taken. Subsistence surveys done in Huslia, Hughes, Nulato, Ruby, Galena, and Koyukuk over the last several years have provided us with a general estimate of subsistence harvest. More accurate interview-based harvest estimates from the surrounding villages were initiated in mid-1992.

A large portion of the refuge including most of the Koyukuk River corridor is contained within a controlled use area established by the Alaska Board of Game. This essentially closes the area "during all open moose hunting seasons to the use of aircraft in any manner for hunting moose, including transportation of moose hunters into or within this area, and the transportation of moose parts to or within this area." The Controlled Use Area likely results in fewer moose being harvested and reduces the interest of commercial hunting guides in the area, however it concentrates the majority of hunters on the refuge to the navigable waterways. The area is within prime moose habitat attracting non-local hunters who travel more than 600 miles round trip by boat. Conflicts between local hunters and non-local hunters do exist. Although often called for by local residents, the state is unable to separate user groups to reduce the conflicts. An alternative involving a federal subsistence season on federal lands only would be loaded with problems.

No permits were issued for commercially guided hunts during 1992. Only one guide has been issued permits over the last few years and he was inactive in 1992. The entire system of allocation of guide use areas has been handled historically by the State but their system was ruled unconstitutional by Alaska State Courts in 1988. After the State failed to pass legislation in 1990, the Alaska Big Game Commercial Service's Board (Board) was established to develop a guide allocation system. The Board has developed guidelines but the State has failed to implement the system to date. The Service developed a guide allocation system for refuge lands to be started in 1992. See Section H.1 for more details.

Air taxi operators were not affected by this new guide allocation system. Trail Ridge Air was issued a Special Use Permit in 1992 to operate in the refuge. They transported one hunting party, including three hunters, into Unit 21D during September. These hunters harvested two moose. Due to early freeze-up of their drop off lake in mid-September this hunting party was stranded until a private helicopter transported them to open water in the Koyukuk river for floatplane access. This same company had about a dozen hunting parties similarly stranded on the Innoko and Selawik NWR's as well as other federal and state lands

surrounding Galena. Because of the early freeze-up, the Alaska State Troopers chartered a helicopter to locate any other stranded hunters--two groups were found on the Yuki river.

Caribou from the Western Arctic Herd crossed the Koyukuk River moving east, and mingled with the much smaller Galena Mountain Herd late in October 1992. Local interest in harvesting Western Arctic Caribou prompted ADFG to issue an "emergency opening" for caribou west of the Huslia-Galena Trail. A subsistence season, issued by the Federal Subsistence Board, coincided with the sport opening. The opening was issued November 11, 1992 and was scheduled for closure March 31, 1992. See Section G.8. for further discussion on caribou status.

Hunter Check Station

ADF&G Area Game Biologist Tim Osborne has conducted a hunter check station on the Koyukuk River just south of the refuge boundary since 1983. Because the entire Koyukuk River within the Refuge boundary is part of a controlled use area barring aircraft access for moose hunting, the check station provides a constant source of harvest information for the majority of refuge hunters who gain access from the Yukon River. This includes many of the local residents and virtually all hunters who do not reside in the local area. The check station has been a mandatory stop since 1990.

Moose season in 1992 was much colder than average, with one of the earliest freeze-ups that local residents can remember. Many small tributaries to the Yukon and Koyukuk rivers were running ice as early as September 18. By September 19 the Yukon River was running ice. By September 23, the Koyukuk was blocked by ice as far down as Three Day Slough. As a result many hunters bagged the last week of the hunting season as they raced back to Fairbanks to try and beat freeze up on the Yukon River. Unfortunately many hunters lost this race with Mother Nature and were froze in at their hunting camps and had to be airlifted back home leaving their boats behind. Many Fairbanks hunters that did make it out could not negotiate the ice on the Yukon River and stored their boats in Galena and other upstream villages. These early access problems and the shortened season in 1992 caused both a decrease in the number of hunters and moose harvested compared to 1991.

Hunters checked 165 moose through the station during September 1992. This harvest was down 21% from 1991 and down 9% from the previous four year average of 182 (Figure 22, Table 8). Numbers of hunters decreased 13% in 1992 compared to 1991. Of the 330 hunters, 149 (45%) were local game management unit (GMU) 21D residents, 153 (46%) were non-local state residents, and 28 (9%) were out of state residents (Figure 23, Table 9). A breakdown of local moose hunters by village is given in Table 10.

Wolf Hunting

Wolf hunting in the Complex has been done both with the use of snowmachines and airplanes. Wolves may be harvested under a trapping license from November 1 to March 31 with no harvest limit. The hunting season runs from August 10 through April 30 with a limit of 10 wolves. Most wolf hunting occurs by snowmachine in March when a combination of warming temperatures, adequate daylight (approximately 14 hours), and deep snow for tracking and limiting wolf movement, all combine to make hunting more effective.

Aerial hunting of wolves was historically done by federal agents and later as a state sanctioned population control method or as a legal sport hunting method. This activity is under close scrutiny by all types of users and land managers in this part of Alaska. Illegal aerial hunting of wolves occurs, especially in the northern reaches of the boreal forest and in the open tundra of the Koyukuk. Each year in late winter several land-and-shoot wolf hunters come to Galena. Although legal land-and-shoot wolf hunting does occur, the temptation also exists to shoot while airborne, communicate between aircraft, or herd animals into large lakes or openings suitable for landing, which are all illegal. Another more common illegal method is the use of snowmachines to "run down" the wolves just before they are shot. The number of wolves taken with the use of aircraft in 1992, legal or illegal, is not known.

Fur sealing records indicate a reported harvest of 6 wolves on the Kaiyuh and 22 wolves on the Koyukuk, for a total of 28. Based on village interviews for Galena, Koyukuk, Nulato, Kaltag, Hughes and Huslia, total harvest in fall-winter 1991-92 to spring 1992 was 46. The annual harvest was estimated at 26% of the population which is sustainable according to scientific literature.

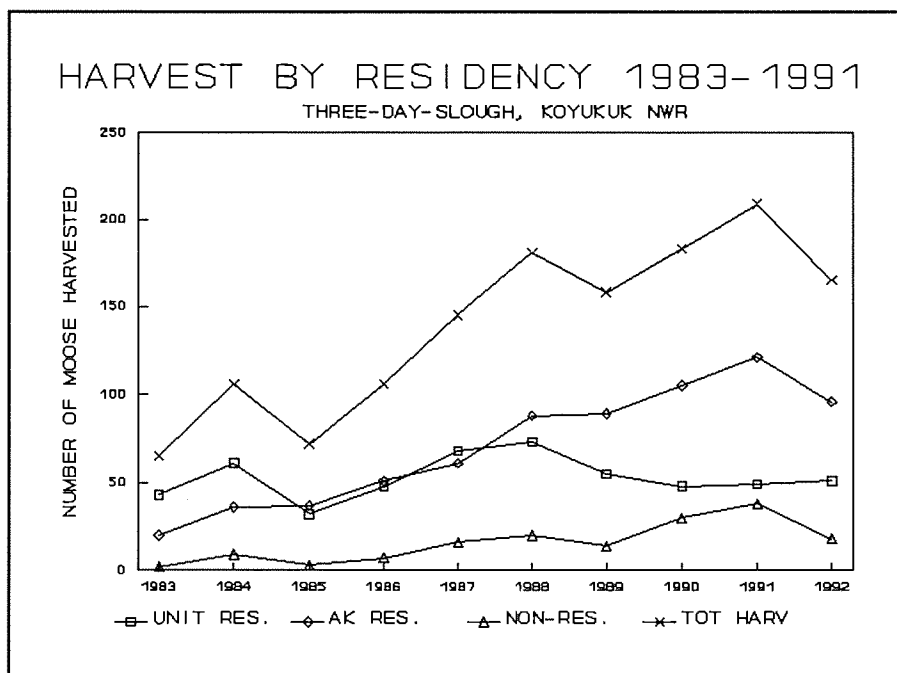


Figure 22. Moose harvest by residency checked through the Koyukuk River Check Station, Koyukuk NWR, Alaska, 1983-1992 (data courtesy ADFG, Galena).

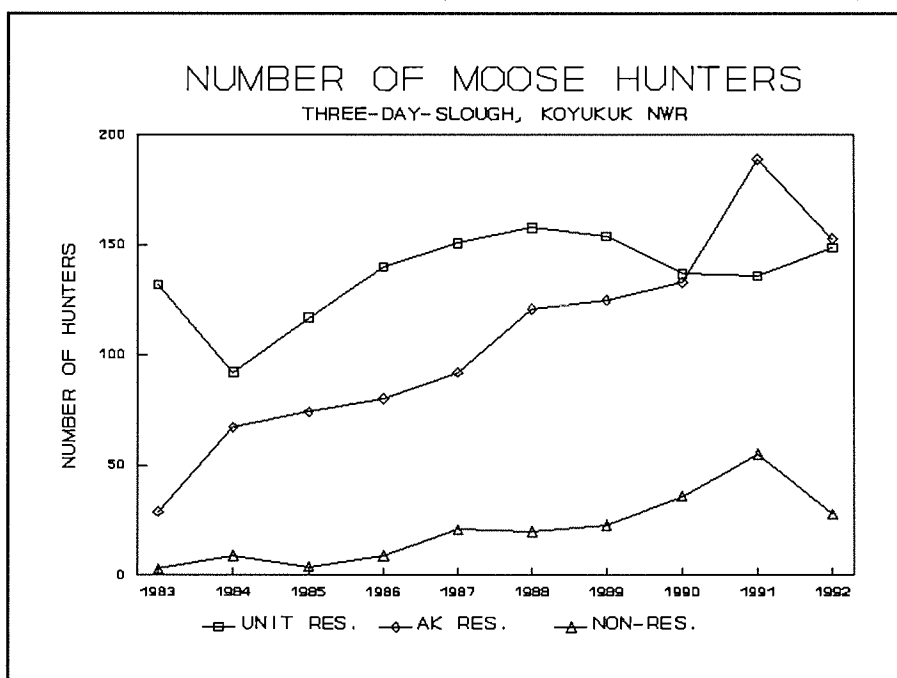


Figure 23. Number of moose hunters by residency through the Koyukuk Check Station, Koyukuk NWR, Alaska, 1983-1992 (data from ADFG, Galena).

Table 8. Number of moose hunters by residency class checked through the Koyukuk River Check Station¹. Data courtesy ADFG, Galena.

Year	Non-Local Ak.	Non-Res.	Local Unit Res.	Total Hunters
1983	29	3	132 ²	164
1984	67	9	92 ²	168
1985	74	4	117 ²	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

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

² includes every trip made by hunter

Table 9. Harvest by moose hunters and hunter success by residency class checked through the Koyukuk River Check Station¹. Data courtesy ADFG, 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	105 (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 %)

¹ checking in and out was not mandatory until 1990.

Table 10. Number of moose hunters from local villages (Unit Residents) checked through the Koyukuk River Check Station, 1987-1990. Data courtesy ADFG, Galena.

Year	Galena	Koyukuk	Nulato	Kaltag	Ruby\Huslia*
1987	84	40	23	0	4
1988	82	45	29	1	1
1989	84	40	23	0	4
1990	68	37	27	2	3
1991	60	40	35	0	1
1992	61	33	46	1	0

* Most Huslia hunters do not pass through the check station, but hunt near the village or above the check station.

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 Unit of the Innoko are shown in Table H10-1. These figures provide a conservative estimate of harvest since some skins, especially beaver and wolves, are kept by trappers for personal use. There are no sealing requirements for marten or mink.

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 other local residents. When disputes do occur; however, they can be heated at times. Beaver trapping is not done within strict privately controlled trapping territories, but rather 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 although a few trappers still use dogs 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. Beaver are taken with snares through the ice while most wolves are shot or trapped with snares around kill sites.

Table 11. Furbearer harvest on the Koyukuk NWR and Northern Unit of the Innoko NWR (Kaiyuh Flats) during the 1991-92 trapping season.¹

Area	Species				
	Beaver	Lynx	Otter	Wolverine	Wolf
Kaiyuh Flats ²	80	8	1	2	8
Lower Dulbi	23	1	3	1	0
Koyukuk Mouth	0	1	0	1	1
3-Day Slough	8	0	1	0	1
Coffee Can	8	5	5	0	0
Gisasa-Kateel	16	0	0	0	1
Nikolai ²	40	2	1	0	0
Bear Creek ²	0	0	0	0	2
Huslia West ²	16	0	0	1	1
Huslia East ²	24	0	0	0	0
Totals	215	17	11	5	14

¹Based on sealing records obtained from Tim Osborne, Area Biologist ADFG.

²This area contains several drainages and some fall outside refuge boundaries

17. Law Enforcement

CM Stearns and WB Johnson worked the Three Day Slough area on the Koyukuk Refuge. No citations were issued by refuge officers although information on several cases was passed on to the LE office in Fairbanks.

A 12' pack canoe which had been taken from a waterfowl survey plot on the Kaiyuh Flats Unit was retrieved in Kaltag. No charges were filed in the case.

18. Cooperating Associations

The Middle Yukon Branch of the Alaska Natural History Association showed an 62% increase in 1992 sales from last year, its first year of operation. USGS topographic maps were the most popular sales items and accounted for 30% of 1992 sales. New items added to this year's inventory included Our National Wildlife Refuge Calendar, Wildlife Notebook Series and An Expedition to the Copper, Tanana and Koyukuk Rivers. Carry over money from 1991 and 1992 will fund a sales display area and assist with editing costs of a refuge video in 1993.

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 Alaska Department of Fish and Game. Subsistence activities occurring on Federal lands and waters are administered by the various DOI agencies depending upon ownership. As a result user group conflicts on the Koyukuk River increased this year and were manifested by the decreased success among subsistence hunters and increased success for non-local and non-resident sport hunters. The present arrangement of dual Federal-State subsistence management has presented the Complex with many new challenges.

The second year of administering the new program consisted of adding a subsistence coordinator position to our permanent staff. ROS Pete DeMatteo was hired from the Subsistence Division in January to guide the subsistence management program for the Complex. DeMatteo's first year was spent reviewing and making proposals for regulation changes to the Federal Subsistence Board and the Alaska Board of Game, assisting village leaders in the formulation of proposals to the Federal board, developing and administering a village harvest survey in five villages within the Complex, attending State Fish and Game Advisory Committee meetings, and conducting informational meetings in eight local villages.

Public meetings

This year a number of public meetings concerning subsistence issues were held in the eight local villages. The first of these, was a regional meeting on possible amendments to the Migratory Bird Treaty with Canada. This gathering was held in Galena in April and was facilitated by Mimi Hogan of Migratory Bird Management. Twelve local residents attended and had definite, but sometimes conflicting opinions on the issue. ROS DeMatteo and ROS/P Liedberg also met

with the village leaders of Galena, Huslia, Koyukuk, Nulato, and Kaltag in April to present the protocol for our village harvest surveys and to accept proposals to be transmitted to the Federal Subsistence Board. ROS DeMatteo also made presentations regarding operation of the new Federal Regional Councils and the functions of the Regional Subsistence Coordinators. The villages of Hughes, Huslia, Nulato, Tanana, and Galena, and the Koyukuk River Advisory Committee (State) were contacted in October. Nominations to the Federal Advisory Councils for the western interior of Alaska were also accepted at the meeting.

Federal Subsistence Board

One proposal and three endorsements of local proposals were made to the Federal Board with the intent of improving the local Federal subsistence opportunities. Acting upon the issues, the Board passed two of the four proposals which extended the moose season for local people and also extended the wolf trapping season. The remaining two proposals were deferred as Customary and Traditional Use Determinations to be made by the Board at a later date.

CM Stearns chaired a Federal proposal review panel while on detail to the Office of Subsistence Management in March. Stearns and the interagency panel formulated recommendations to the Board for seventy proposals in the Interior.

Alaska State Board of Game

The refuge staff transmitted several statements of support for extension of seasons, additional harvest opportunity, and relaxed regulations for methods and means of harvest for furbearers and big game. The harvest of caribou was facilitated by the FWS agreeing to drop the boundary for the winter hunt north of Galena.

Alaska State Local Advisory Committees

Four local Fish and Game Advisory Committees exist in the Complex. Members of the staff attended all of the meetings to comment on the actions of each committee and also pass on information concerning the Federal Subsistence Program.

Village Harvest Surveys

The Federal Subsistence Program prompted the need for a database for each village in the Complex. The area has several very adequate published reports done from a social anthropological point of view. From a biological standpoint we needed data on the number of animals and fish harvested by area. In April 1992,

we started a one year census of all of the households in the villages of Galena, Koyukuk, Kaltag, Nulato and Huslia. The staff visited local village leaders to obtain a list of names of harvest surveyors who would be best received by the community. A surveyor was selected from each village. The survey used was modified from the Yukon Delta NWR's migratory bird harvest report form to include all species in this area. The surveyors were paid ten dollars per household per quarter to gather the data. The final report will be assembled as a cooperative report between the Office of Subsistence Management, ADF&G and the Complex. The report is expected to be completed by late 1993.

I. EQUIPMENT AND FACILITIES

2. Rehabilitation

Field equipment was moved into a newly rented cold storage area during the year. Shelving was constructed to hold equipment and we were finally able to provide a higher degree of organization than was possible in any facility we had previously occupied. MW Attla also moved the shop into a heated parking stall that we have leased for one vehicle. Although the area is still too small for an adequate shop facility, it is far superior to anything we have had to date. An expansion of this facility would give us enough space for a good shop.

The duplex, formerly occupied as an office, was converted back to housing units by MW Attla with completion taking place in March. The rehab included new sheetrock on many walls, new carpeting, bathroom fixtures, countertops in kitchens, and much other work to provide comfortable quarters. In terms of energy efficiency, this is still a substandard facility and we are hopeful that funds can be made available soon for window and insulation work.

New windows (Alaska Windows) were installed in the upper level of Q-1 by the maintenance staff. This house will be the test to see if the superior windows contribute to energy savings as well as reducing the cold drafts in the living area. If the improvements are substantial, all residences will receive similar rehab.

Four residences received new applications of stain during the summer. A boom truck and an individual with a spraying unit were contracted to do much of the work, but it was still a major job to construct scaffolding around much of each house not accessible with the truck.

All oil lines supplying heating fuel to the boilers in the residences were replaced with larger 5/8" lines during October. At temperatures reaching down to -50°F and beyond, the old supply lines have been just too small to allow the sluggish

heating oil to keep flowing. Even if the fuel oil would flow through the lines, it would often be so cold when it reached the filter that it would stop there and the boiler would shut down. We hope this simple change provides more reliable boiler operation.

3. Major Maintenance

New wood stoves were purchased in FY91 for installation in lower levels of the residences. The first installation was nearly completed by year's end in Q-5. The stove has a plenum which will be used to duct warm air to the living area upstairs.

If the installation proves to work well we will replicate the job in the other five residences. Assistance from Engineering was received for the early stages of the job.

A fuel tank berm made of treated lumber with a liner was constructed for two above ground fuel tanks and a small supply of barrels.

4. Equipment Utilization and Replacement

Three snowmachines were sold in small lot sales during the year. A ski-doo Alpine removed from the Hog River Cabin was sold in Huslia for \$3,020. The bidder reneged on its bid so we went with next highest bidder. A Skandic and a Citation were sold in Galena for \$680 and \$520, respectively. We acquired a more suitable Yamaha Bravo which was shipped to the Nowitna for use on the fire/furbearer study. We are now down to a manageable seven snowmachines on the station. A new 4x4 crew cab pickup was ordered during the year for delivery in the summer of 1993.

5. Communications Systems

With the addition of NICAD batteries and a fully-enclosed antenna/radio shelter on Totson Mountain in 1991, the Complex radio system seemed to be finally working well. Previous problems with damage to exposed antennas and battery discharge appeared to have been solved--until cold weather hit. Failure in the system during the winter of 1991-92 required us to use the standby HF single sideband radios for communications to field camps. The problem at Totson Mt. was caused by a failure at the connectors on the batteries due to contraction in extreme cold temperatures. Once the batteries were reconnected and the radio equipment was tuned up in March 1992, the system functioned better than ever before. New Daniel's equipment purchased in 1991 to replace the less reliable old

radios could not be installed during either the March emergency repair trip or the annual June maintenance trip due to lack of proper interfaces and boards, as well as an infancy failure during configuration. The old equipment will have to hold on for at least the summer and maybe another year. We had a minor repeater outage on the Nowitna during winter 92-93 due to discharged batteries and no sun, but once the sun returned in late winter, the repeater resumed operation. We are gradually getting this \$250,000 system working, and are optimistic that expenses will diminish and hope that the annual preventive maintenance trip will handle future radio maintenance needs. Major problems remaining with our system included poor coverage in some areas (more repeaters needed, e.g., Roundabout Mountain and Kokrine Hills) and a non-functioning repeater on Totson Mountain. These were planned to be addressed in 1993.

6. Computer Systems

During 1992 three new Dell 486 IBM compatible computers were added to our existing fleet of seven desktop PC's and three laptop PC's. One 8088 Kaypro desktop PC was retired. Most permanent professional, clerical and administrative staff member now have their own work station, however, there are two shared workstations. A new HP Laserjet III printer was purchased along with a peripheral sharing device called Logical Connection. Now all downstairs PC's share one HP Laserjet II and all upstairs PC's share the new Laserjet III. The system also allows exchange of files within and outside of the office by modem but we haven't explored that option. The Logical Connection system proved to be very time-consuming to install. After a week of running wires, making connections and configuring the system, only half the system (downstairs) worked. Hedy Saccone from the Regional IRM office had to come to Galena to get the whole Logical Connection system running. While she was in Galena, Hedy also implemented the electronic mail system.

During 1992 Corel Draw software was purchased, which combined with some ADFG custom software, allows us to make maps of animal territories and movements from telemetry studies. Other software in use includes Wordperfect 5.1, Lotus 123, dBase III, dBase IV, CC Mail, Procomm, Bitcomm, Harvard Graphics, Systat, SPSS-Pc, PC Tools, Pro-Cite, and Windows. Four of our 13 PC's are capable of running Windows software.

8. 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 1024.4 hours during the 1992 calendar year. This was done without accident, and represents this station's ninth 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 and three aircraft provide the flexibility to schedule several individual flights or similar comparative work in several areas of the Complex.

This air support allows us to accomplish our work load under the constraints of 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 Fiscal Year 1992, the total flying bill was \$ 97,898. Prior to 1992, we had major difficulties in obtaining adequate maintenance of our aircraft. Delays for simple inspections sometimes ran over two weeks and an inspection of an aircraft with some minor extra work took almost two months. This year we had the luxury of two OAS-approved local A&P mechanics living in Galena, Mr. Shawn Shoultys and Mr. William Dayton. These two mechanics did four inspections, seven gear changes, and eight miscellaneous repairs. This saved over \$ 10,000 in ferry, travel and per diem costs compared to otherwise necessary trips to Fairbanks and Anchorage. We also used Northland Aviation, the OAS Contract maintenance facility in Fairbanks for five inspections, seven other repairs, and three gear changes. Use of local mechanics and the commercial shop in Fairbanks has significantly reduced the delays and costs associated with aircraft maintenance.

There were a few unusual maintenance actions related to aircraft operations in 1992. In February, the engine on N13833 developed a low-level vibration caused by a bent crank which required ferry of the aircraft to Northland and replacement of the engine. A hard beaching on N714KH caused a leaky float and required field repairs. The engine on N4343 required an engine change because it unknowingly could have had unauthorized parts installed by a disreputable overhauler.

A hangar owned by Gana-A'Yoo Limited, the local native corporation, was leased by the Service during the year. We found the hangar to be very useful for all the maintenance done by local mechanics, especially in winter. We thought preflight preparation would be easier and safer by eliminating the need for wing covers, pre-heaters, engine covers, etc. However, preflight preparation was burdened by

the doors of the hangar which were extremely difficult to open and close. The use of the hangar was worthwhile only for maintenance and long term storage. Daily flight activities were much easier the old way-- with all the covers and preheating. The landlord resisted making improvements in the door situation and at year's end we were considering ending the lease.

J. OTHER ITEMS

1. Cooperative Programs

The Defense Mapping Agency was issued a special use permit to access the Nowitna Refuge by helicopter. The purpose of the request was to collect gravity data to measure differences in the local gravity field. The information is necessary to support various mapping projects. Measurements were taken at 11 sites.

2. Other Economic Uses

The saga surrounding recovery of a crashed and abandoned B-17 aircraft on the Nowitna Refuge continued during the year. At least two parties continued to express their interest in finding an interested restorer and then obtain a permit to remove the aircraft. Restorers who have looked at photos have determined that restoration is not possible, but the individual parts would have some value. No formal requests for a permit were received by year's end and it appears that interest has lessened. The regional archeologist traveled to Galena in June to look at the aircraft but poor weather prevented an overflight.

4. Credits

ROS/P Liedberg was responsible for Sections C.1-3, D.1-4, E.1&5, F.1-3, H.1&17, I.1-4. Sections D.5-6, E.6-8, G.1, I.5-6 and 8 were written by ROS/P Spindler. WB Bertram was responsible for Sections G.2-11. The G.10 (Furbearer section) was written WB Johnson. Sections E.2-4, H.2-7, and 18 were done by PR Johnson. RM Stearns wrote Sections J.1-3. Section G.14 was written by WB Paragi. RC Burley was responsible for the table of contents, picture captions and editing. RM Stearns, ROS/P Spindler and PR Johnson edited and AT Honea proofread the report. RC Burley and BT Simon assembled the narrative.

K. FEEDBACK

The Fiscal Year 1993 funding shortfall has caused, as usual, an inordinate amount of priority reassessments, closer scrutiny of cost-benefits and many last minute program adjustments. The obvious benefits from this "belt tightening" is familiar to most managers. However, the spin-offs are often adverse in terms of reduced staff morale, less efficient use of long or mid-term project funding, and loss of opportunity to complete environmental assessment of short-term events.

After quarter of a century in our outfit, this manager has two observations: 1) The tremendous efforts of the Washington and Regional Office folks to mitigate these occurrences deserve considerable praise; and 2); a current and workable project priority document would help a tremendous amount to expedite the implementation of the shortfall, and incidentally would help to fully utilize the few extra bucks that come along all to infrequently.

Refuges and Regions badly need a comprehensive station by station document to lay out the projects in an agreed priority listing. For the sake of discussion, let's call this document an operational plan (5 year life). Once this simple and short item is in hand, we in the FWS could avoid a bunch of ulcers and late hours, plus obtain a more consistent, higher quality management program that would be better understood and supported by the public, Congress, and the Service in general.

ANNUAL NARRATIVE REPORT

1992

NOWITNA NWR

KOYUKUK/NOWITNA NATIONAL WILDLIFE REFUGE COMPLEX

Galena, Alaska

REVIEW AND APPROVALS

<hr/>	<hr/>		
Complex Manager	Date	Associate Manager	Date
			
	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 for 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. 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 aircraft, two Super Cubs and a Cessna 185, as well as two river boats and several snowmobiles provide transportation. The refuge headquarters is located in Galena, a village of approximately 900 people, of which 300 are military personnel stationed at the Galena Air Force Station. The base is scheduled to close 9/30/93. 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.

INTRODUCTION

TABLE OF CONTENTS

A. HIGHLIGHTS

B. CLIMATIC CONDITIONS

D. PLANNING

1. Master Plan	Nothing to Report
2. Management Plan	7
3. Public Participation	Nothing to Report
4. Compliance with Environmental and Cultural Resource Mandates	Nothing to Report
5. Research and Investigations	7
6. Other	Nothing to Report

E. ADMINISTRATION

1. Personnel	8
2. Youth Programs	8
3. Other Manpower Programs	Nothing to Report
4. Volunteer Program	8
5. Funding	8
6. Safety	8
7. Technical Assistance	8
8. Other	9

F. HABITAT MANAGEMENT

1. General	9
2. Wetlands	9
3. Forests	10
4. Croplands	Nothing to Report
5. Grasslands	Nothing to Report
6. Other Habitats	Nothing to Report
7. Grazing	Nothing to Report
8. Haying	Nothing to Report
9. Fire Management	11
10. Pest Control	Nothing to Report
11. Water Rights	Nothing to Report
12. Wilderness and Special Areas	11
13. WPA Easement Monitoring	Nothing to Report

G. WILDLIFE

1. Wildlife Diversity	12
2. Endangered and/or Threatened Species	12
3. Waterfowl	12
4. Marsh and Water Birds	20
5. Shorebirds, Gulls, Terns and Allied Species	20
6. Raptors	20
7. Other Migratory Birds	20
8. Game Mammals	21
9. Marine Mammals	Nothing to Report
10. Other Resident Wildlife	26
Fire/Furbearer Project	27
11. Fisheries Resources	30
12. Wildlife Propagation and Stocking	Nothing to Report
13. Surplus Animal Disposal	Nothing to Report
14. Scientific Collections	30
15. Animal Control	Nothing to Report
16. Marking and Banding	Nothing to Report
17. Disease Prevention and Control	Nothing to Report

H. PUBLIC USE

1. General	30
2. Outdoor Classrooms - Students	31
3. Outdoor Classrooms - Teachers	31
4. Interpretive Foot Trails	31
5. Interpretive Tour Routes	Nothing to Report
6. Interpretive Exhibits/Demonstrations	31
7. Other Interpretive Programs	31
8. Hunting	31
9. Fishing	34
10. Trapping	34
11. Wildlife Observation	Nothing to Report
12. Other Wildlife Oriented Recreation	Nothing to Report
13. Camping	Nothing to Report
14. Picnicking	Nothing to Report
15. Off-Road Vehicling	Nothing to Report
16. Other Non-Wildlife Oriented Recreation	Nothing to Report
17. Law Enforcement	38
18. Cooperating Associations	38
19. Concessions	Nothing to Report

I. EQUIPMENT AND FACILITIES

1. New Construction Nothing to Report
2. Rehabilitation Nothing to Report
3. Major Maintenance Nothing to Report
4. Equipment Utilization and Replacement 39
5. Communications Systems 39
6. Computer Systems 39
7. Energy Conservation Nothing to Report
8. Other 39

J. OTHER ITEMS

1. Cooperative Programs Nothing to Report
2. Other Economic Uses Nothing to Report
3. Items of Interest Nothing to Report
4. Credits 40

K. FEEDBACK

A. HIGHLIGHTS

--A study to examine the response of furbearers to wildfire entered its second year. Significant progress was made in gathering abundance, movement, and habitat data on martens while patterns in abundance and habitat use of their small mammal and berry food sources was documented.

--One of the latest springs in a decade that was also accompanied by flooding caused an estimated 42% decline in numbers of duck broods produced in 1992. Duck production was estimated at 5671. Likewise goose production declined by 73% for white-fronted and 83% for Canada geese. The lowest mean brood size yet observed, for trumpeter swans was also likely related to the delayed breakup and flooding.

--Moose densities declined from 2.6 to 2.2 moose/mi² on the middle Nowitna/Sulatna area and 3.2 to 2.3 moose/mi² at the Nowitna mouth. The declines were thought to be related primarily to male mortality through hunter harvest and secondarily to predation. The moose/wolf ratio on the Nowitna was 46, indicating that predation was probably not severe and the lowest bull/cow ratio observed on the Complex (20 bulls/100 cows) occurred on the Nowitna.

--Wild river management planning was put on hold after an interagency VIP team floated the river and decided that continued interagency coordination would be adequate for the foreseeable future.

--Cabin permits continued to be controversial on the Nowitna in 1992. A special use permit was issued to Mark Freshwaters (on orders from the regional office) for a third pre-ANILCA trapline cabin, even though the cabin was in such disrepair that a complete rebuild would be necessary to make it useable. Similarly, a cabin permit was renewed for a person who since moved out of the local subsistence area to urban Fairbanks.

--Two law enforcement cases involving mining of mastodon ivory at the Palisades resulted in fines and bail forfeiture.

B. CLIMATIC CONDITIONS

Refer to the Koyukuk section of this report.

D. PLANNING

2. Management Plan

Refer to the Koyukuk section of this report.

5. Research and Investigations

The following are summaries of approved refuge studies:

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

This project will examine the response of marten, lynx, and small mammals to differing stages of habitat succession following wildfire. 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. The project leader, WB Buddy Johnson, was assisted by WB Tom Paragi, BT P.J. Simon, University of Washington graduate student Cheryl Quade, volunteer Misty Conrath and occasionally by BT's George Wholecheese and Jenny Lowe. The work has been coordinated with other Alaskan refuges, notably Tetlin and Kanuti, as well as NPS, ADFG, USFS and UAF. At the end of four years, there will be a minimum of four study areas in interior Alaska where comparable methods were used simultaneously. For results during 1992, see Sections G.10 and H.10.

Seasonal movements and range of three wolf packs on the Koyukuk National Wildlife Refuge Project No. 75615-85-01).

This project was amended to include the Nowitna NWR. Field work was initiated in Spring 1990. Primary objectives of the study were to determine pack sizes, location, home ranges, predation rates, seasonal habitat use, and to develop an estimate of wolf/prey ratios in an area of known prey density. Results from 1992 can be found in the Koyukuk and Nowitna reports, 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 compared to those known to be free of previous mining activity, and determine the level of contaminants in wildlife resources that use known contaminated watersheds.

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. Other Items

Refer to the Koyukuk section of this report

F. HABITAT MANAGEMENT

1. General

Habitat types on the Nowitna NWR are characteristic of interior Alaska. The majority of refuge lands are forested and belong to three major plant communities: spruce/poplar forest, lowbush and muskeg, and lowland spruce/hardwood. Extensive bottomland spruce/poplar forests are found along the flood plains of the Yukon River and Nowitna River drainages, and to a lesser extent, along smaller streams and tributaries. Bottom spruce/poplar forest is composed of black spruce, white spruce, balsam poplar, quaking aspen and paper birch. Shrubs include alder, willows, rose, cranberries and blueberries. Herbs, grasses, ferns, mosses, and lichens are also present. The low-bush bog and muskeg community, found predominantly in the northern lowlands of the refuge, is comprised of black spruce and tamarack. Shrubs of the bog muskeg community include Labrador tea, crowberry, willow, bog cranberry, rose, blueberry, alder, resin and dwarf birch. Sedges, rushes, and cottongrass, as well as mosses and lichens, are also present. The largest plant community on the refuge is the lowland spruce-hardwood forest. This forest type is dominated by black spruce, but white spruce, tamarack, paper birch, balsam poplar and quaking aspen are also present. Understory vegetation includes willows, dwarf birch, blueberry, rose, Labrador tea, crowberry, bearberry, cottongrass, ferns, horsetail, lichens, and sphagnum and other mosses.

2. Wetlands

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 Yukon River at Ruby carries an estimated seventy million tons of sediment per year.

The Nowitna River is the heart of the refuge. This meandering river constantly creates a diversity of habitats for fish and wildlife. The Nowitna's floodplain extends for 8-10 miles on both sides of the river. Annual spring floods bring nutrients to oxbow lakes and sloughs.

Limestone, 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 lower half of the river ranges from 150-450 feet wide and flows at an estimated rate of 2-4 miles per hour. The main channel in the lower river is typically 20-30 feet deep in early summer. From the refuge's southern boundary, the Nowitna River flows approximately 220 miles north through the refuge to the Yukon River.

Placer mining for gold and other minerals was stimulated by the lifting of Federal restrictions on gold prices in the early 1970's and has gone through a drastic resurgence in the past decade. In 1983, more than 300 placer miners were in operation throughout the state, producing an estimate 169,000 ounces of gold. Large amounts of soil are removed to reach gold, and active streams are frequently used to wash the site. This technique makes placer mining a major source of aquatic and riparian habitat destruction in Alaska. The only active mining that occurred in the region was south and west of the refuge, primarily on the Sulatna River and its tributaries, Beaver Creek and Big Creek. The refuge staff is concerned about potential downstream impacts of this mining activity.

A technical report entitled "Contaminant baseline data for water, sediments, and fish of the Nowitna National Wildlife Refuge, 1985-1988" was completed in August 1992 by Ecological Services in Fairbanks, with cooperation of previous and present refuge staff. This initial study reported significantly higher turbidity, iron, and manganese in waters of the Sulatna River as compared to several sites on the Nowitna River. The Titna River showed high iron. Mercury concentrations in sediments were high in all sites except for one (California Creek). Fish tissue concentrations of mercury were highest in northern pike from the unmined Sulukna River, and exceeded the FDA action level. Northern pike from the mouth of the Nowitna River also contained elevated mercury levels, but did not exceed the FDA action limit.

As a result of this initial work, further sampling, primarily of fish, was undertaken in 1991, and we are awaiting results of laboratory analyses. A follow-up contaminant study entitled, "Investigation of Mercury and Other Metal Concentrations in Fish and Wildlife Resources on the Koyukuk/Nowitna Refuge Complex," was submitted to the Regional Office for approval in August 1992.

3. Forest

An unusual feature of the Nowitna NWR, compared to most other Alaska refuges, is that over 80% 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 highest quality timber on the refuge grows along the Nowitna River, whose Comprehensive Conservation Plan (CCP) and Wild River designation precludes commercial timbering. Local interest in commercial logging operations on islands of the Yukon River has been expressed. This activity is addressed in the Nowitna CCP which prohibits commercial timber harvesting.

9. Fire Management

There was no fire activity on the refuge in 1992. Refer to the Koyukuk section of this report.

12. Wilderness and Special Areas

A portion of the Nowitna Wild River from the Big Mud to the mouth was floated by a team from the refuge (Stearns), Regional Office (DAM Jerald Stroebele and Public Use Planner Helen Clough), and Alaska DNR (Alice Iliff) from September 9-11. The purpose of the trip was to assess use of the river corridor and make recommendations on the need for, and direction of a river management plan. The river corridor receives substantial use for an Interior river and has several conflicts that require close attention, most notably cabin permits.

The result of the review was that a framework agreement among users and administrators will be written. The RO decision was that an insufficient amount of use and associated conflicts existed to warrant an intensive planning effort at this time. We will begin to build a working group so that in three to four years we can embark on a limited planning effort.

Regional Archaeologist Deiters, along with Complex Manager Stearns and ROS/P Liedberg, inspected the area known as the Palisades or "Boneyard" in June. The area has been the site of continuing law enforcement problems relating to mining of fossilized ivory as discussed in Section H.17. The silt bluffs stand as high as 100 feet and extend for about seven miles along the river. The bluffs contain numerous prehistoric bones and plant material. As the river cuts into the bank, and as the ice wedges and ice lenses occurring at the top of the bluffs melt throughout the summer, the scattered ivory tusks and bones are exposed. It is illegal to dig into these deposits.

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 revised draft of the bird list for the refuge was completed in 1992). It will not be published until adequate field and literature review can be accomplished.

2. Endangered and/or Threatened Species

The only endangered species known to occur on the refuge is the American peregrine falcon. Six traditional nest sites in or near the refuge were visited in 1992. See Section G.5. for a discussion on falcons observed during the raptor survey.

3. Waterfowl

Wetlands within the Nowitna and Yukon river floodplain support large numbers of waterfowl. Principal duck species include American wigeon, northern pintail, mallard, green-winged teal, white-winged scoter, common and Barrow's goldeneye, and lesser scaup. Other breeding ducks include northern shoveler, red-breasted merganser, greater scaup, canvasback, redhead, surf scoter, oldsquaw, harlequin duck, and bufflehead. Arctic, red-throated and common loons, and horned and red-necked grebes also nest on the refuge. Canada geese, white-fronted geese, and trumpeter swans use the refuge in moderate numbers. The greatest concentrations of waterfowl occur along the rivers during the spring and fall migrations. Waterfowl inventories conducted on the Nowitna NWR in 1992 included duck production, goose production, and swan production surveys.

Weather Conditions and Waterfowl Migration Chronology

Break-up on the Nowitna River in 1992 occurred in mid to late May. It was one of the latest breakups in the last decade. On May 18, ice on the portion of the Nowitna River above the lower cabin was 50% broken up and flowing; below the cabin the ice was solid. Snow cover was still 10-25% in the wooded flats on May 18 and most lakes were solidly frozen with some still landable by wheelplane. In late May, flooding was extensive on the Yukon and Nowitna River corridors and continued until mid-June. As a result of high water, many nesters did not fare well in 1992.

Duck Production Survey

Waterfowl brood surveys have been conducted on the refuge since 1983. Since 1990, the refuge has participated with the Division of Migratory Birds in a state-wide waterfowl production survey. The Nowitna Refuge is included in the Tanana Kuskokwim Production Unit (Unit No. Three) which also includes the Tetlin Refuge, Tanana Valley, Minto Flats State Wildlife Refuge, and Department of Defense and National Park Service lands (see Koyukuk Section G.3, Figure G1).

Sampling schemes and methods varied until they were standardized in 1990. Between 1987 and 1989 the Nowitna Refuge was divided into five broad geographic strata based on expected differences in waterfowl production. In 1990 the Nowitna was re-stratified into high, medium, and low units using the same methods employed by the Koyukuk and Northern Unit of the Innoko refuges (See description of method in Koyukuk Section G.3.).

A Cessna 185 and two PA-18 Super Cubs equipped with floats provided access into medium and high density strata plots. All medium and high density plots were surveyed by canoe, walking, or both. All low density stratum plots were surveyed by helicopter. In 1992, duck production surveys were conducted under favorable conditions and completed in four days. Eight of 12 low density plots were also completed. A primary objective to survey 12 low density plots by helicopter simultaneous to ground work in 1992 was not met.

Between July 12-24, 128 broods were observed during waterfowl production surveys on the Nowitna Refuge. Total brood observations were down 18% compared to 1991. Dabbling duck broods comprised 81% of the observations. American wigeon were the most commonly observed dabbling brood and the principal diving species was scaup. About 51% of the ducklings observed were class 1A and 1B, 38% were class 1C or 2A, while 16% were in class 2B and 2C. There were no class 3 dabblers seen. Nearly all (98%) of the divers seen were in age class 1.

An estimated 1,047 duck broods ($CV=0.52$) (coefficient of variation) were produced on the Nowitna Refuge in 1992. Dabbling brood estimates were highest for mallard ($n=408$, $CV=0.86$), followed by American wigeon ($n=361$, $CV=0.53$), and green-winged teal ($n=189$, $CV=0.93$). Diver brood estimates were highest for scaup spp. ($n=43$, $CV=0.66$). Total estimated broods were down 42% compared to the 1988-1992 mean. Dabbling and diver brood estimates were 984 ($CV=0.55$) and 61 ($CV=0.49$), respectively. These estimates were down 28% and 78%, respectively, from the 1990-1992 mean.

An estimated 5,671 ducklings were produced in 1992 (Table G1). The coefficient of variation for this estimate was 0.52. Dabbler production estimates were highest for mallard (2,324), American wigeon (1,852), and green-winged teal (946). Diver production estimates were highest for scaup spp. (324). Dabbler production was estimated at 5,244 and diver production at 413, down 22% and 76%, respectively, compared to 1990-1992 means. Production during other years has ranged from a minimum of 4,209 in 1989 to a maximum of 17,140 in 1988 (Table 1).

Adult population estimates in 1992 by species were also made for the Nowitna Refuge but are not presented due to very high variances ($CV=0.92$ for dabblers and $CV=0.60$ for divers). The adult estimates in 1990 and 1991 were more reliable with lower variances ($CV=0.36-0.54$), and ranged from 3,026 to 3,590 for dabblers and 1,461-2,210 for divers. Large increases in dabbler observations in the low density stratum raised adult 1992 estimates forty fold over 1991 estimates. Adult diver estimates increased over 250% compared to 1991 estimates due to increases in canvasback and scaup.

Due to the high variance among dabbler and diver adult estimates, 22 individual plots were also examined for abundance of observed adults in 1992 and compared with previous years in hopes of obtaining more reliable adult trend information. Observations of all adult dabbler species decreased 56% in 1992 compared with the 1990-1992 mean. However, most diver species increased and 11% more divers were observed compared to the previous years mean. Overall adult observations were down 11% compared to the 1990-1992 mean (Figure 2). Total cost for the production surveys was \$17,139.60.

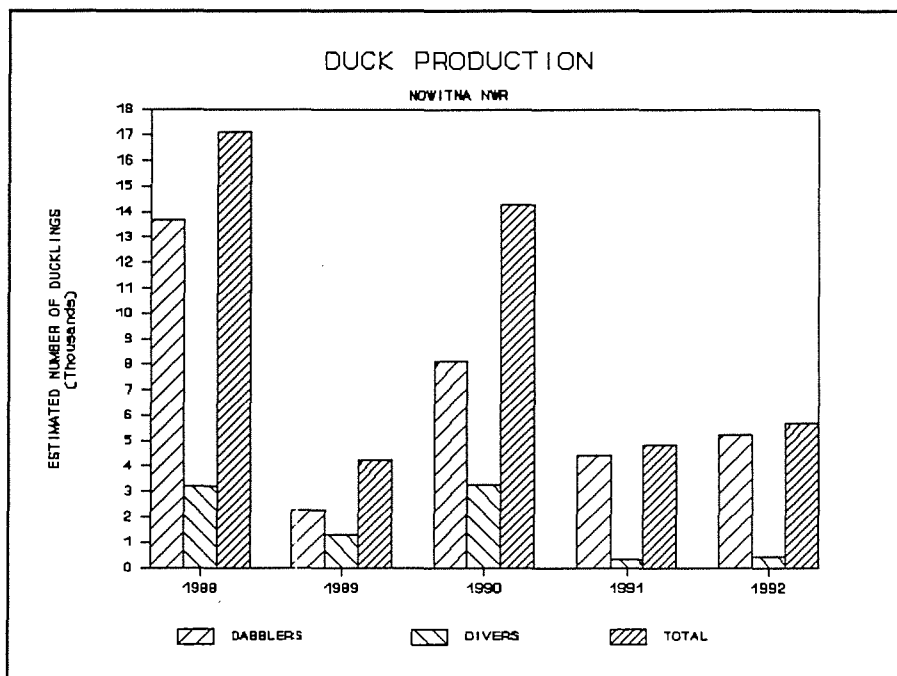


Figure 1. Comparison of estimated waterfowl production on the Nowitna NWR, Alaska, 1988-1992.

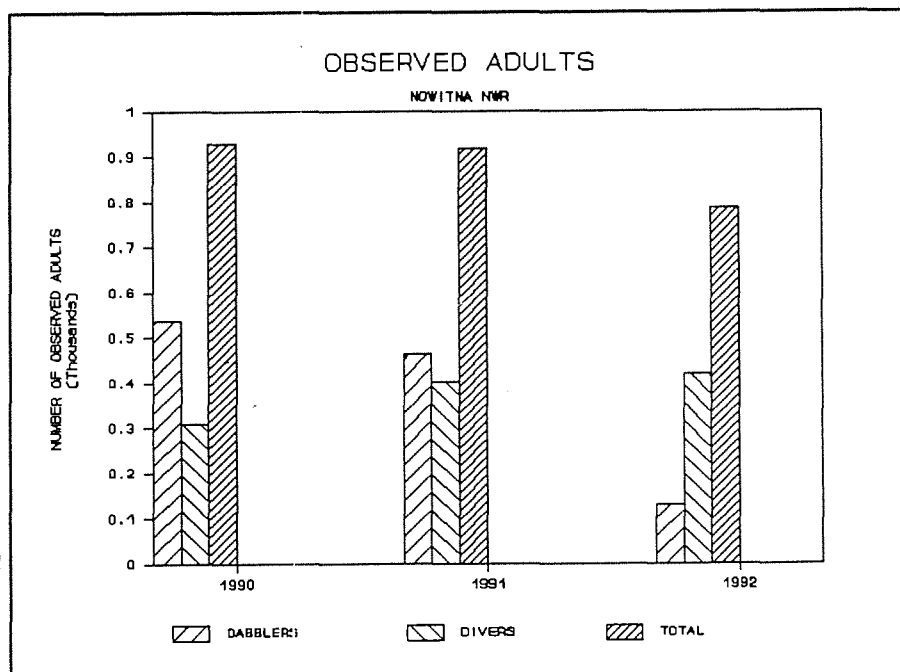


Figure 2. Observed adult waterfowl on production surveys, Nowitna NWR, Alaska, 1990-1992.

Table 1. Estimated production of young ducks by species with coefficient of variation, Nowitna NWR, Alaska, 1988-1992.

Species	Estimated Young ¹					
1992 ³	1992 (CV)	1991 (CV)	1990 (CV)	1989 (CI) ²	1988 (CI) ²	MEAN 1988-
Wigeon	1,852 (0.45)	2,299 (0.51)	3,296 (0.30)	1,427 (0.19)	4,720 (0.23)	2,719 (0.42)
G-W Teal	946 (0.93)	242 (0.38)	933 (0.52)	108 (0.53)	2,424 (0.27)	931 (0.61)
N. Pintail	111 (0.56)	101 (0.62)	1,368 (0.69)	153 (0.35)	2,623 (0.31)	871 (0.62)
N. Shoveler	12 (1.00)	131 (0.48)	296 (0.39)	354 (0.12)	716 (0.47)	302 (0.62)
Mallard	2,324 (0.87)	1,476 (0.65)	2,194 (0.85)	205 (0.34)	3,204 (0.34)	1,840 (0.79)
DABBLERS	5,244 (0.56)	4,448 (0.42)	8,096 (0.33)	2,247	13,687	6,744 (0.44)
Canvasback	31 (1.00)	19 (0.72)	6 (1.00)	0	9 (0.79)	13 (0.91)
Scaup spp.	324 (0.61)	141 (0.44)	1,780 (0.80)	859 (0.41)	1,977 (0.46)	1,016 (0.62)
Ring-necked	35 (0.60)	0 (0.00)	46 (0.94)	0	0	16 (0.77)
Goldeneye sp	33 (0.46)	140 (0.55)	173 (0.48)	240 (0.45)	637 (0.42)	245 (0.50)
Bufflehead	0 (0.00)	0 (0.00)	1,200 (0.97)	40 (0.73)	553 (0.44)	359 (0.97)
Redhead	0 (0.00)	10 (1.00)	61 (0.81)	151 (1.00)	35 (1.00)	51 (0.91)
DIVERS	413 (0.48)	310 (0.33)	3,266 (0.79)	1,290	3,211	1,698 (0.53)
W.W. Scoter	8 (1.00)	0 (0.00)	0 (0.00)	140 (0.45)	0	30 (1.00)
Surf Scoter	6 (1.00)	75 (0.70)	2,866 (0.98)	10 (0.80)	163 (0.80)	624 (0.89)
Black Scoter	0 (0.00)	10 (1.00)	0 (0.00)	0	3	3 (1.00)
C. Merganser	0 (0.00)	6 (0.70)	0 (0.00)	0	0	6 (0.70)
R.B.Merganser	0 (0.00)	0 (0.00)	0 (0.00)	0	0	0 (0.00)
Unknown	0 (0.00)	5 (1.00)	42 (0.58)	522 (0.15)	76 (0.16)	129 (0.79)
TOTALS	5,671 (0.52)	4,855 (0.38)	14,270 (0.35)	4,209	17,140	9,229 (0.42)

¹ It should be noted that sampling strategies in 1987-88 differed from 1990-92 and production estimates are provided for trend or abundance comparisons only.

² Estimated young calculated at the 90% confidence level.

³ Coefficient of variation mean includes only years 1990-1992 when a species was observed.

Goose Production

A 61 mile stretch of the upper Nowitna River was surveyed by canoe from June 24-26 to assess goose production in this area and to record observations of other wildlife. All geese observed were tallied and recorded by species, sex, and age-class when possible. One hundred twenty-seven adult and 15 gosling Canada geese and 29 adult and 39 gosling white-fronted geese were observed. Age-class estimates were difficult to make because of the evasive action of the broods when encountered, but all broods were class 1. Observations of white-front goslings decreased 73% in 1992 (Figure G3). Canada gosling observations decreased 83%.

A second goose production survey of the Nowitna River was conducted on July 2 from the administrative cabin to a point 20 miles downstream from Grand Creek. Only three goose broods and one duck brood were observed on the 50 mile stretch.

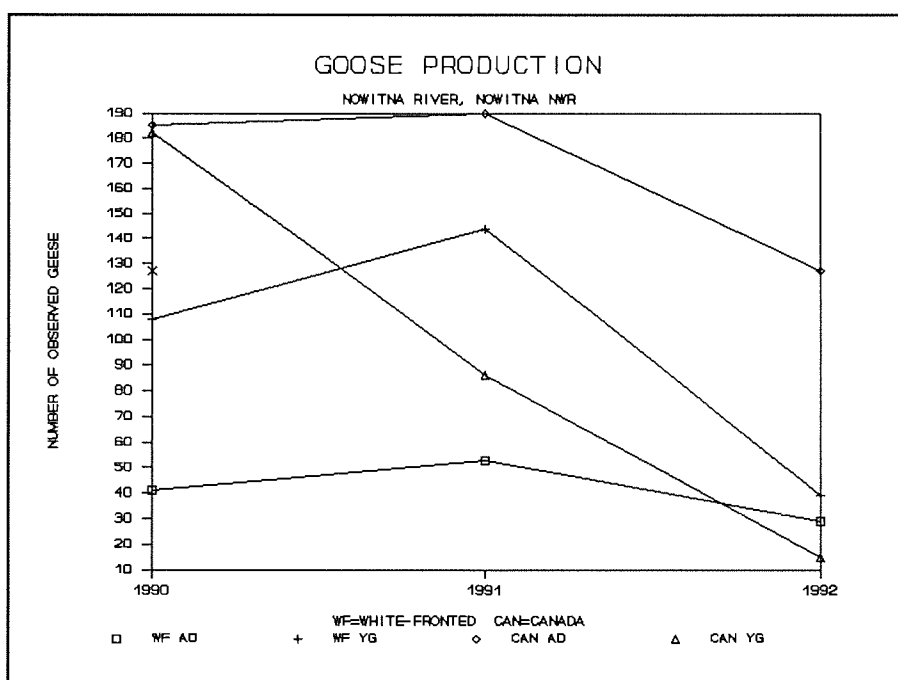


Figure 3. Observed geese on production surveys of the Nowitna River, Nowitna NWR, Alaska, 1990-1992.

Swan Production

On the Nowitna, the majority of swans identified were trumpeter swans, although tundra swans also occur infrequently (Loranger and Lons 1987). A selection of seven "trend maps" has been surveyed to monitor trends in swan population and production. In 1992, the decline in the number of cygnets that began in 1990 continued. The decline of paired swans that began in 1991 continued into 1992. Conversely, the number of non-breeders (flocked and singles) increased (Figure 4). Mean brood size was 2.4, the lowest observed since surveys began (Figure 5). During the spring breakup of the Nowitna River, a local ice jam resulted in extreme flooding near the lower administrative cabin. Evidence of flooding was also apparent along the Yukon River corridor near the Nowitna mouth. The decrease in young and pairs and the increase of non-breeders (flocked and singles) was likely related to the late breakup and flood conditions which lowered the success rate of breeding pairs. The last complete swan census on the Nowitna was in 1990, when a total of 292 adults and 76 young was counted.

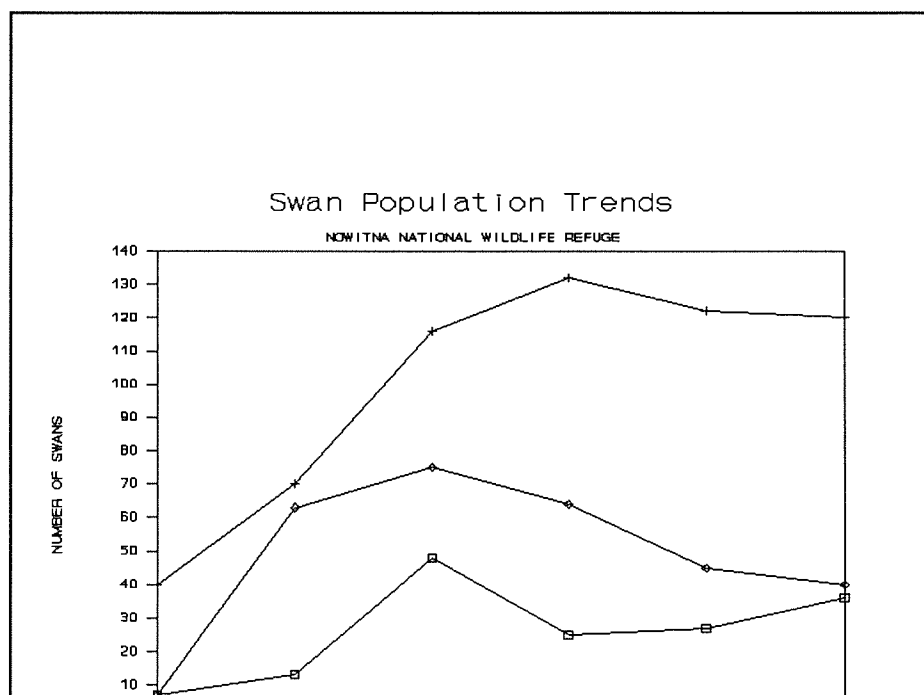


Figure 4. Swan numbers observed on the Ruby C3, C4, D2, D3, D4, and Melozitna A1 and A2 trend maps.

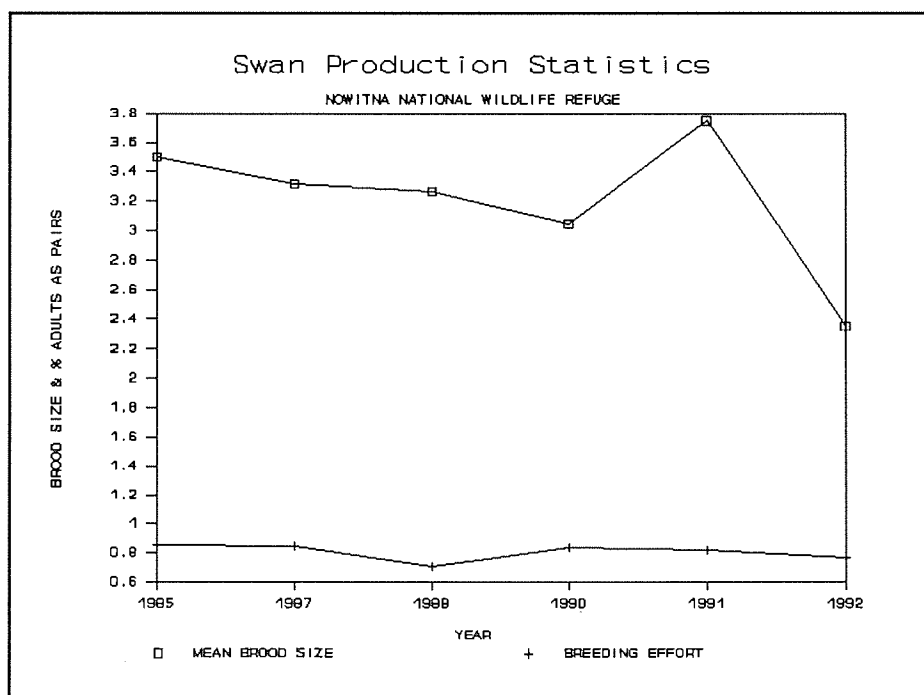


Figure 5. Swan production statistics based on surveys of the Ruby C3, C4, D2, D3, D4, and Melozitna A1 and A2 trend maps.

4. Marsh and Waterbirds

The following waterbird observations were made in July 1992 during the duck production surveys (number of adult birds counted): lesser sandhill cranes (3), Pacific (1) and common loons (11), and horned (20) and red-necked grebes (68). All are confirmed nesters on the refuge. Yellow-billed loons are an occasional visitor.

5. Shorebirds, Gulls, Terns and Allied Species

Some of the more common Charadriiform species that have been reported on the refuge are: common snipe; whimbrel; semipalmated, least, spotted, solitary, and upland sandpipers; lesser and greater yellowlegs; golden and semipalmated plovers; long-billed dowitcher; and northern phalaropes. Mew, herring, and Bonaparte's gulls are common; as are Arctic terns and long-tailed jaegers. No active survey or studies are being conducted to assess population, distribution, or status of the species.

6. Raptors

The refuge supports a diverse raptor population. Northern harrier; rough-legged hawk; red-tailed hawk; goshawk; osprey; American kestrel; merlin; peregrine falcon; sharp-shinned hawk; golden and bald eagle; and great-horned, great gray, boreal, short-eared and hawk owls are all seen frequently and most of the listed species nest on the refuge. Snowy owl, Swainson's hawk, and gyrfalcon are occasional visitors.

A peregrine survey was conducted on the Yukon River from Galena to Ruby on July 8. The purpose of the survey was to ascertain general trends in peregrine falcon numbers and record other incidental raptor sightings. This survey had been conducted independently by the Endangered Species Office since 1979 to document peregrine falcon use of the Yukon River. During the survey 6 traditional peregrine nest sites were visited between Galena and Ruby. Of the six sites visited three had confirmed young and a fourth site had adults with behavior indicative of young at the site.

7. Other Migratory Birds

A diverse group of migratory bird species use the refuge throughout the spring and summer months. Of the 50 passerines occurring on the refuge, the most commonly observed are Swainson's and grey-cheeked thrushes; yellow-rumped,

yellow and blackpoll warblers; tree, white-crowned, and Savannah sparrows; alder and olive-sided flycatchers, Bohemian waxwings; and cliff and tree swallows. Common non-passerine birds nesting on the refuge include the belted kingfisher and downy and hairy woodpeckers.

The number of bird species using the refuge declines from 145 to 28 during the winter months. Most wintering birds are passerines, and of these, ravens, gray jays, redpolls, black-capped and boreal chickadees and pine grosbeaks are the most commonly observed.

Refuge staff again participated in the Galena Breeding Bird Survey and Christmas Bird Count. Results of this survey and past surveys are presented in the Koyukuk Refuge narrative in section G.7.

8. Game Mammals

Moose, black and grizzly bear, wolf, marten, beaver, wolverine, lynx, otter, red fox, and snowshoe hare are found throughout the refuge. Moose and black bear are the most commonly harvested game mammals. Marten are the most economically important furbearers.

Moose

Moose are present throughout the refuge, their highest densities occurring along the lower Nowitna River. The refuge moose population is an important subsistence resource for local residents and a significant recreational resource. Moose hunting during September represents the greatest portion of the refuge's public use.

Two major field projects concerning moose were conducted during the year. A hunter check station was operated on the lower Nowitna River during the September moose hunting season and population trend surveys were conducted in November. Moose hunting and the hunter check station are discussed in Section H.8.

Moose population trend surveys

Trend surveys have been conducted annually on the refuge since 1980 to assess the relative abundance and demographics of the population. A moose inventory plan was completed in 1991 after a historical review of past survey data. Trend areas outlined in the plan are presented in Figure G6. Observed moose densities and age-sex composition data for trend areas surveyed from 1980-1992 are given in Tables 2 and 3, and Figures 7 and 8.

The Nowitna River/Sulatna Confluence trend area was surveyed 16-17 November 1992. Overall moose density decreased slightly from 2.6 to 2.2 moose/mi² between 1991 and 1992. The 1992 estimate exceeds the nine year average population density of 2.1 moose/mi². Low bull:cow (18:100) and yearling:cow (1:100) ratios were observed in 1992. The overall population level remained stable in spite of decreases in the bull component.

The Nowitna Mouth trend area was surveyed 18 and 20 November. Moose density decreased from 3.2 to 2.3 moose/mi² between 1991 and 1992. The 1992 estimate is less than the seven year average of 2.8 moose/mi². Bull:cow ratios were low (20:100) and no yearling bulls were observed in over 63 mi² of habitat.

The depressed bull segment and the absence of yearlings in the herd is a concern. This information will be provided to local Fish and Game Advisory Committee members during 1993 meetings. At least four yearling bulls were taken by moose hunters on the lower Nowitna River in 1992.

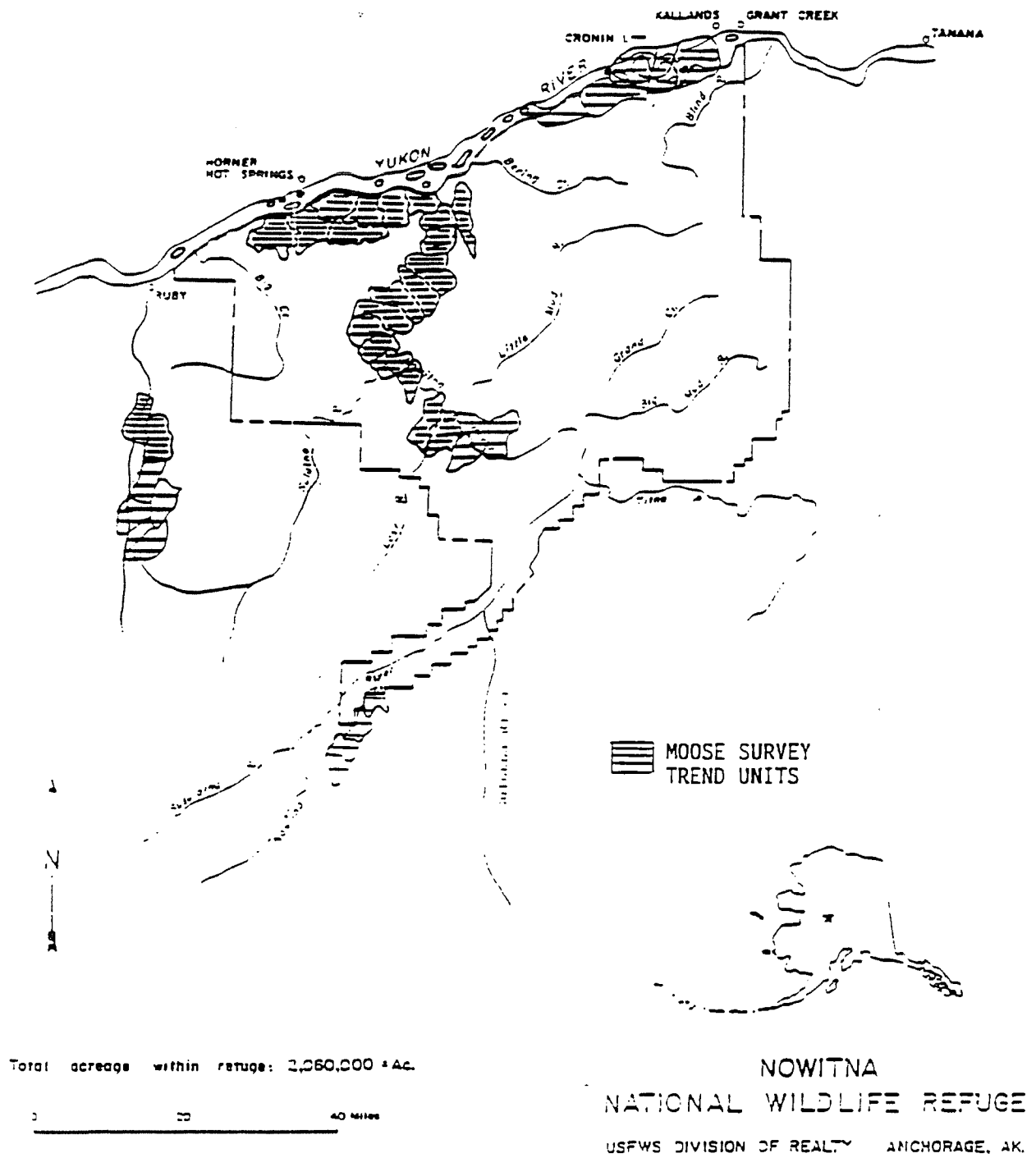


Figure 6. Map of moose trend areas for the Nowitna Refuge.

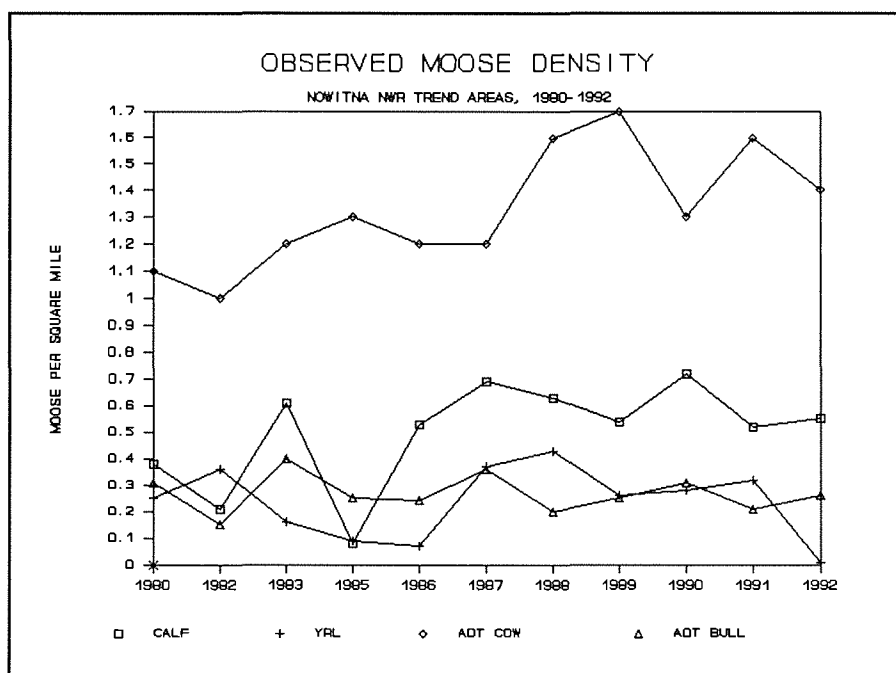


Figure 7. Observed moose density of lower Nowitna River trend surveys, Nowitna NWR, Alaska, 1980-1992.

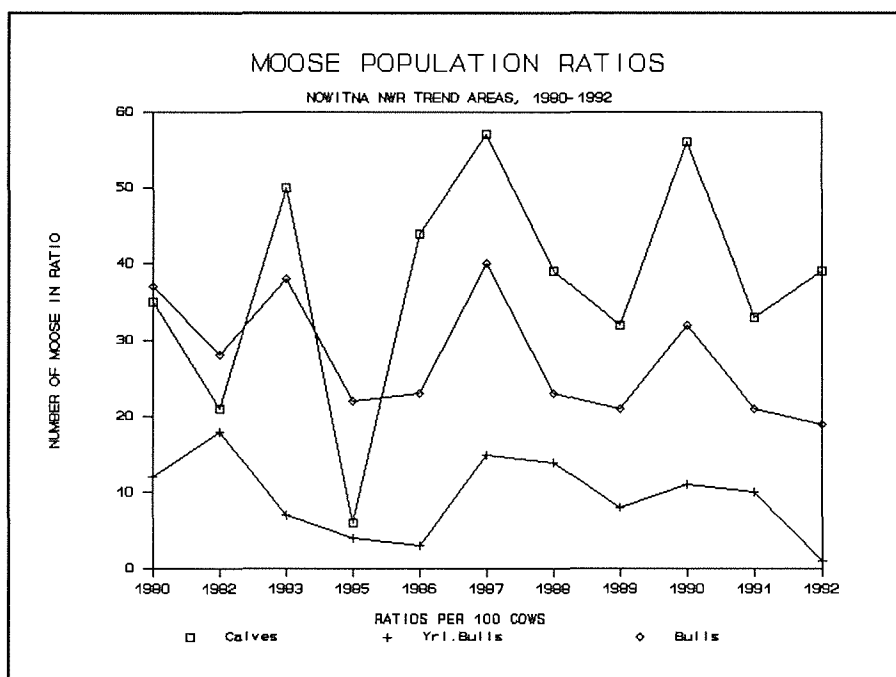


Figure 8. Moose population ratios of lower Nowitna River trend surveys, Nowitna NWR, Alaska, 1980-1992.

Table 2. Observed moose density based on trend surveys of the Lower Nowitna River Subunit, 1980-92, Alaska.

Year	Area (mi ²)	Density (#/mi ²)					
		Moose	Calves	Yearling	Females	Males	Total
1980	78	39	0.38	0.25	1.1	0.31	2.0
1981		No surveys conducted					
1982	66	114	0.21	0.36	1.0	0.15	1.7
1983	63	148	0.61	0.16	1.2	0.40	2.4
1984		No surveys conducted					
1985	106	186	0.08	0.09	1.3	0.25	1.7
1986	108	221	0.53	0.07	1.2	0.24	2.0
1987	129	330	0.69	0.37	1.2	0.36	2.6
1988	92	260	0.63	0.43	1.6	0.20	2.8
1989	143	391	0.54	0.26	1.7	0.25	2.7
1990	116	303	0.72	0.28	1.3	0.31	2.6
1991	75	200	0.52	0.33	1.6	0.21	2.7
1992	140	313	0.55	0.01	1.4	0.26	2.2
<hr/>							
means	98	231	0.50	0.24	1.3	0.27	2.3

Table 3. Herd composition and adult age structure of the Lower Nowitna River Subunit, 1980-92, Alaska.

Year	Composition (% of herd)				
	Ad.Bulls	Ad.Cows	Yrlgs	Calves	Bulls/100 Cows
1980	16	53	13	19	37
1981	No surveys conducted				
1982	8	57	21	12	28
1983	17	50	7	26	38
1984	No surveys conducted				
1985	14	75	5	5	22
1986	12	58	4	26	23
1987	14	45	15	27	40
1988	7	55	15	22	23
1989	6	61	10	20	21
1990	12	50	10	28	32
1991	8	61	12	20	21
1992	12	63	<1	25	19
<hr/>					
means	12	57	10	21	28

Bears

Black bear densities on the refuge are believed to be high. They are commonly observed along rivers and in lowland areas. They were the major predator on moose calves on the refuge according to a moose calf mortality study conducted in 1988-89. Black bears are occasionally harvested in the spring and summer by local residents, especially in the vicinity of fish camps. Most harvest is incidental to moose hunting in September.

Brown bears occur throughout the refuge, but are less numerous than black bears. Highest densities occur in the foothills of the Kuskokwim Mountains located in the southern portion of the refuge. The Kokrine Hills on the northern border support moderate brown bear densities. Salmon runs in the Yukon River and its tributaries attract some of these bears during the summer months. Of 53 radio-collared moose calves killed by predators, two were taken by grizzly bear during the summers of 1988 and 1989. Grizzly bear harvest generally occurs during the summer months and during the September moose season.

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 in much of interior Alaska are presently high. They are common throughout the refuge; active beaver lodges were observed in the majority of wetlands surveyed during the 1992 duck production survey. Beaver is an important source of fur and food for local resource users. Beaver meat is highly prized and is a welcome change from moose in the diet of local residents.

Wolverine

Relatively little is known about the status of the refuge wolverine population. They are occasionally harvested by refuge trappers but are rarely seen.

Lynx, Marten, Mink, Red Fox, and River Otter

The population status of these furbearer species have not been determined on the refuge. Population fluctuations are known to occur in accordance with fluctuations in prey species populations, primarily microtine rodents and/or snowshoe hare. All are occasionally harvested by refuge trappers.

Wolves

An ongoing radio telemetry study was continued on the refuge in 1992. At year's end, only one wolf was still on the air. A progress report on the status of the project was completed in October. Wolf densities on the refuge in 1991 were estimated at 6.7 wolves/1,000km², the lowest on the Complex. An estimated 90 wolves from 11 packs inhabit the refuge and adjacent areas. The moose/wolf in March 1991 was estimated at 46.0. Refer to Koyukuk Section G.10 for more information regarding the wolf telemetry project.

Fire/Furbearer Project

A combination of unusually hot and dry weather and an extended period of fuel accumulation caused many large fires in interior Alaska during the summer of 1988. After the fire season, local residents voiced concern over fire management policies that provide only limited fire suppression in some remote areas. Although these fires undoubtedly affected many wildlife species, one of the primary concerns of the resource users most affected by these fires, was the impact of fire on traplines and furbearer populations. Generally, the concerns associated with furbearers focused on two areas: the immediate loss of trapping cabins and personal property, and the immediate and long-term effects of fire on furbearer populations, particularly marten and lynx.

In response to this issue, a project examining the relationship between wildfire and furbearer populations in interior Alaska was begun in 1991. Several complementary studies and tasks were initiated to obtain baseline ecological data on marten (*Martes americana*) and lynx (*Lynx canadensis*) habitat relationships, seasonal distribution, population parameters, and prey/forage relationships. The following is the abstract from the 1992 progress report.

Field work on the marten study continued during the reporting period. The relative abundance (tracks/days after snowfall/km) of martens and weasels was determined from track intersections along snowmachine trails from December 1991 through March 1992. Martens were most abundant in the tall shrub-sapling stage (1985 burn) until mid-late March, when they were most prevalent in the mature forest. Weasel abundance was highest in the tall shrub-sapling stage until late March, when all 3 seral stages had a similar abundance of tracks.

Livetrapping success during both snow (spring) and snow-free (autumn) periods has generally suggested that marten abundance is greatest in the tall shrub-sapling stage and lowest in the dense tree stage.

Diurnal telemetry provided 528 relocations and livetrapping provided 90 relocations (total = 618 relocations on 42 martens). Most (69%) of the 602 habitat relocations were in the tall shrub-sapling stage, while 29% were in the mature forest and 2% were in the dense tree stage. Habitat-activity associations were estimated by backtracking along marten trails. An activity ratio (investigations: investigations + travelling) of behavior was calculated. The activity ratio was higher in the mature forest (0.164, $\bar{n} = 55$ trails; $0.01 < P < 0.025$) than in either the tall shrub-sapling stage (0.094, $\bar{n} = 85$) or the dense tree stage (0.069, $\bar{n} = 29$), which were not different from each other ($P > 0.50$). Sinking depths of marten tracks were greatest in the tall shrub-sapling stage ($P < 0.004$) but not different between the mature forest and the dense tree stage. Sinking depths were greater ($P < 0.001$) in the scrub cover type (mostly in the tall shrub-sapling stage) than in the black spruce cover type (mostly in the mature forest), which together accounted for 93% of the 511 observations. Berry and mushroom production was sampled across all seral stages. After pooling data from all habitat types within seral stages, we tested for differences among seral stages and found that the mature forest and dense-tree stage provided more berries and mushrooms ($P \leq 0.01$) than the tall shrub-sapling stage.

A complementary lynx study was initiated in 1992 in conjunction with other field work. Snowshoe hares were most abundant in the dense tree stage, and lynx tracks were found almost exclusively in the dense tree stage. No family groups of lynx were detected (tracks of adult and kittens).

A broad-scale objective of both the marten and lynx studies attempts to link data on furbearers and their prey to habitat changes and fire conditions on specific sites. As pilot work for this objective, a questionnaire was mailed to experienced trappers throughout the Interior to determine whether trapper opinions about burns have changed since a similar survey in 1982-83 and whether site-specific information on fire-furbearer-prey relationships exists and is available to project personnel.

Field work on a companion small mammal study begun in July 1991 continued during the reporting period. Twice as many animals were caught with the same trapping effort in 1992 as in 1991, and another new species (*Zapus hudsonicus*) was detected. The number of microtines (lemmings and voles) captured in 1992 was more than five times that in 1991, with the dense tree stage showing a 13.5-fold increase. *Clethrionomys rutilus* accounted for most of this difference with an almost 15.5-fold increase in the dense tree stage. Estimates of relative microtine biomass for 1991 were highest in the tall shrub-sapling stage and lowest in the



The 1985 burn on the Nowitna NWR is one of three post-fire seral stages being studied in the Wildfire/Furbearer Project. Cotton grass (Eriophorum sp.) has begun colonizing.



This remote automated water station (RAWS) on the Nowitna NWR near the base camp of the Wildfire/Furbearer Project provides weather data for predicting fire and flying conditions, plus records weather for the project. (BJ)

dense tree stage, but projections for 1992 (using estimates of mean species biomass by seral stage from 1991) were very similar among seral stages. The two most abundant microtine species, *C. rutilus* and *Microtus xanthognathus*, continued to segregate along the forest edge in 1992. The pattern was maintained on the additional 1992 transects and the 1991 transects that were retrapped in 1992. Despite the high numbers of *C. rutilus* in 1992, the majority of *C. rutilus* was still captured in the mature forest and the majority of *M. xanthognathus* in the tall shrub-sapling stage.

A cooperative study to test the capability of snowtracking to monitor marten and lynx population trends was begun in 1992. The deposition and accumulation of the tracks of furbearers and selected prey species were recorded daily along snowmachine trails in the mature forest and the tall shrub-sapling site. The deposition and accumulation rate (tracks/km) for marten was generally linear in the tall shrub-sapling stage but curvilinear in the mature forest. Weasel track deposition was variable in the tall shrub-sapling stage while accumulation was generally linear.

A cooperative effort was initiated among several organizations conducting investigations of small mammal populations (voles, shrews, and lemmings) throughout interior Alaska. Small mammals were trapped on 13 grids at three study sites within the Interior that provided a range of post-fire seral stages. *C. rutilus* and *M. xanthognathus* were the predominant microtines captured, with *C. rutilus* distributed across all seral stages and *M. xanthognathus* most common in the earlier seral stages.

An informational leaflet is being prepared to provide a summary of what is known about the effects of wildfire on furbearer populations and habitat. A draft of the leaflet has been completed and is being reviewed by personnel at ADFG. It is anticipated that it will be ready for joint publication in 1993.

Satellite imagery is being used to develop a vegetative cover map for the study area. A LANDSAT Thematic Mapper scene was purchased via a cooperative agreement with the Earth Resources Observation Systems (EROS) field office. The scene was acquired in computer-compatible tape and geo-referenced to UTM Zone 7.

WB Paragi was co-author on a furbearer paper from his graduate work at the University of Maine:

Arthur, S. M., R. A. Cross, T. F. Paragi, and W. B. Krohn. 1992. Precision and utility of cementum annuli for estimating ages of fishers. Wildlife Society Bulletin 20:402-405.

11. Fishery Resources

No field work was completed in 1992, however, contacts were made with the Fairbanks Fisheries office and budgetary planning began for baseline fisheries surveys.

14. Scientific Collections

Two types of collections were made as part of the fire-furbearer project (see Section G.10). First, small mammals were trapped on the Nowitna Refuge, with voucher specimens being deposited at museums in Fairbanks (University of Alaska Museum) and Seattle (Burke Museum, University of Washington). Second, graduate student Cheryl Quade collected voucher specimens of vascular plants, mosses, and lichens from the Nowitna Refuge for her master's thesis on small mammals, and these specimens were deposited at the Burke Museum.

H. PUBLIC USE

1. General

One new cabin permit was issued during the year to Mark Freshwaters. The cabin was a pre-ANILCA cabin, but its state of disrepair left some question of whether it should be handled as a new, rather than an existing cabin. The roof is totally collapsed, the walls are no longer intact, and the structure will require total rebuilding. Our appeals to the regional office and solicitor resulted in the decision to issue the permit. The permittee now has a total of five cabins on a 25 mile length of the Nowitna River corridor, one as near as 2.5 miles from the newly permitted cabin.

Another issue arose during the year regarding qualifications for subsistence cabin permits. Several permittees on the Nowitna were issued cabin permits when they lived in the local area but have since moved to Fairbanks while retaining the permits. With the issuance of subsistence regulations applicable to federal lands, Fairbanks was determined to be a non-qualifying area. The question arose as to whether the individuals now living in a non-qualifying area could maintain a permit for a cabin for which use was limited to subsistence related activities. At least three cabin permittees were affected by this question on the Nowitna. The issue was elevated to the regional office and although the solicitor's opinion was that the affected permittees did not qualify to retain their permits, the regional office decided that no permits would be revoked.



This radio-collared marten recovering from general anesthetic will provide clues to movements and habitat use. Note the ear tags used as additional identification if the collar slips off.

2. Outdoor Classroom - Students

Refer to the Koyukuk section of this report

3. Outdoor Classroom - Teachers

Refer to the Koyukuk section of this report

4. Interpretive Foot Trails

Refer to the Koyukuk section of this report

6. Interpretive Exhibits/Demonstrations

Refer to the Koyukuk section of this report

7. Other Interpretive Programs

Refer to the Koyukuk section of this report

8. Hunting

Over the years subsistence and recreational hunting has comprised a substantial portion of the public use on the Nowitna Refuge. The refuge is popular for Fairbanks residents who access the refuge primarily by boat, but also by plane. The primary big game species targeted by subsistence and sport hunters on the refuge are moose and black bear. Ducks, geese, sandhill cranes, hare, grouse, and grizzly bears are also taken. Although annual harvest from the surrounding villages is not known, subsistence surveys done in Tanana, and Ruby over the last several years have provided us with a general estimate of subsistence harvest (see Koyukuk Section H.8.).

Tundra Air, Denali West Lodge, and Fairbanks Floatplanes were all issued Special Use Permits to operate in the refuge in 1992. Tundra Air transported four clients into Unit 21B during the month of September, no moose were harvested. No reports have been received from other carriers.



An example of one of our hunting camps. This is one of many camps we are working to clean up and prevent from occurring in the future. (PL)

The Nowitna River Hunter Check Station (voluntary) was in place again for the September 5-25 moose season. The station was staffed by ROS/P Liedberg, ROS DeMatteo, and volunteer Mike Bank. Numerous law enforcement contacts were made along the lower 55 miles of the river by Refuge Officer Liedberg during the season.

The weather did not cooperate at any point during the month. By the 9th the temperature was down to 32°F and it didn't warm up much after that. The coldest temperature recorded at the check station was 11°F on the 24th but colder temperatures and up to four inches of snow were recorded several miles off the Yukon. Hunters who were not prepared for the unusually cold temperatures were either uncomfortable or forced to leave. The check station was set up early on the fourth but was forced to move out on the 24th - a day before the end of the season - because of ice running continuously across the Nowitna River. When the check station was dismantled there were still seven boats upriver. A pilot flying the river late on the 24th reported that the river ice had stopped flowing. This was just hours after we had left with the two refuge boats and all the check station materials. All the boats were able to move down the river and out into the Yukon when the ice moved again, but several boats had to eventually be pulled out in Tanana when their jet units plugged with ice flowing in the Yukon.

The weather, which was worse up the Yukon and Tanana Rivers where many hunters launched their boats, undoubtedly had something to do with the reduced number of hunters and moose harvested compared to previous years. The tables below provide information on harvest data, residency, and success by day as recorded at the check station (Tables 4, 5, and 6). Both harvest (34) and the numbers of hunters (125) were down in 1992 (Table 4). As in recent years, non-local hunters, specifically Fairbanks residents, comprised the bulk of hunters stopping at the check station (Table 5). A total of 615 use days was incurred for those hunters reporting through the check station. This resulted in an average of 18.1 days of hunting effort per moose. Only about 20% of the hunters on the river claimed residency in the local villages. Twenty-four local residents spent 86 days on the river and harvested three moose for an average of 28.7 days per moose.

The success rate figures must be viewed carefully. In many cases parties of hunters are not interested in harvesting a moose for each hunter. The success rates discussed here are considered a rate per hunter and does not necessarily reflect the desired number of moose sought by the party of hunters.

Table 4. Nowitna River moose hunter check station data 1988-92. Data represent only those hunters stopping at the mouth of the Nowitna River, and does not include fly-in hunters or those hunting only the sloughs of the Yukon River.

	Harvest	Total Hunters	Success rate	Parties
1988	56	178	31.1%	66
1989	48	168	29.0%	74
1990	54	130	42.0%	46
1991	46	154	30.0%	56
1992	34	125	27.2%	43

Table 5. Residency (N), harvest (n), and success (S%) of moose hunters stopping at the Nowitna NWR hunter check station 1988-92.

<u>Local Villages</u>			<u>Fairbanks</u>		<u>Other Residents</u>				<u>Non-resident</u>		<u>Unknown</u>		<u>Total</u>					
N	n		S%	N	n	S%	N	n	S%	N	n	S%	N	n	S%	N	n	S%
1988	33	9	27%	103	40	39%	14	5	36%	11	5	46%	9	0	0%	178	56	31%
1989	31	6	19%	94	29	31%	23	9	39%	12	6	50%	6	0	0%	168	48	29%
1990	23	7	30%	67	32	48%	26	12	46%	14	4	29%	0	0	0%	130	54	42%
1991	21	9	43%	72	24	33%	44	11	25%	17	2	12%	0	0	0%	154	46	30%
1992	24	3	12%	38	19	50%	53	10	19%	10	2	20%	0	0	0%	125	34	27%

Table 6. Chronology of moose checked through the Nowitna NWR hunter check station, 1992.

SEPTEMBER																									
5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	?				
	1?	1		1			1	3	4	2	6	8	2	1	1				2						

9. Fishing

Northern pike and sheefish are the most popular non-anadromous species for recreational fishing on the refuge. Fishing pressure is light from June through August, and is done primarily by floaters and guided fly-in anglers who arrived by float-equipped aircraft.

No formal surveys are conducted to assess fishing pressure on the refuge. Use of the Nowitna River by floaters is very light. Put-in and take-out points are not conducive for refuge contacts. Unless we have incidental contact with floaters when working in the area, they go undetected.

10. Trapping

Trapping continues to be one of the major subsistence activities on the refuge and provides an important source of supplemental income for many residents in the villages of Ruby and Tanana. The reported harvest of furbearers (sealing records) on the Nowitna is shown in Table 7. While these figures may be somewhat inflated because they include some areas adjacent to the refuge, sealing records are generally considered to be conservative estimates of harvest as some fur, especially beaver, is often kept for personal use and not sealed. There are no sealing requirements for marten or mink.

Traplines 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. 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 and a few occasionally use dog teams. Martens are generally taken using pole sets and/or cubby sets. Beaver are taken with snares through the ice and most wolves are shot or trapped with snares placed around kill sites.

Marten are the most economically important species in the Nowitna region and most trappers focus their efforts on this species. Studies are presently underway examining several aspects of marten ecology and refuge trappers have been very cooperative in our efforts (see Sect. G.10).

Table 7. Furbearer harvest on the Nowitna NWR during the 1991-92 trapping season.¹

Area	Species				
	Beaver	Lynx	Otter	Wolverine	Wolf
Deep Creek ²	4	0	0	0	6
Lower Nowitna	1	1	0	0	0
Grand Creek	0	2	0	4	0
Pilot Creek	0	0	0	0	1
Lost R.-Sulukna	0	0	0	0	1
Sulatna/ Monozonite	0	1	0	0	0
Sulatna-Poorman	0	0	0	0	1
Lost River	0	1	0	0	0
Titna ²	0	1	1	1	0
Susulatna ²	0	0	0	0	1
Palisades ²	0	8	0	2	1
Big Mud	0	2	0	0	2
Big Creek	0	4	0	0	0
Little Mud	0	7	0	0	0
Total	5	27	1	7	15

¹Based on sealing records obtained from Tim Osborne, Area Biologist, ADFG.

²Part of this area falls outside the refuge boundary.

Marten

The Nowitna region is considered by many to be some of interior Alaska's premier marten habitat. As many as 18 trappers (most from Ruby and Tanana), have active traplines on the refuge, although not all may trap in a given year. Because there are no sealing requirements for marten in interior Alaska, only limited information is available on annual harvests. Known harvest on the refuge (based on skull and carcass collections and trapper logbooks) has ranged from 188 to 602 animals annually. Actual harvest would likely be higher as not all trappers participate in skull or carcass collection programs. To obtain long-term information on the demographics of the marten population and the level of 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 will be used in concert with the ongoing Fire/Furbearer Project 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.

Age-sex distribution

Refuge trappers provided carcasses of 2 lynx, 3 wolverines, and 126 martens from the 1991-92 harvest. The summaries presented here only cover the 101 martens harvested in or near the Nowitna Refuge. The percentage of juveniles in the harvest (35%; Tables 8 and 9) was well below the range of previous seasons (49-77%) since carcass collections began in 1984-85. The sex ratio (1.2 males:1 female; Table 8) was similar to previous seasons. The number of juveniles per adult female (age 2 years or older) was also low (Table 8), suggesting that the level of harvest, particularly for trapper 05, has been heavy on this trapline. However, age-sex ratios for individual traplines are sometimes misleading when harvests (sample sizes) are small.

Reproductive indices

The reproductive organs of female martens were examined to obtain estimates of litter size by 3 different methods. First, we looked for "corpora lutea" (CL) in the ovaries, which are a measure of how many eggs were ovulated during the breeding season. Second, we counted "blastocysts" (BC), which are the fertilized eggs that form after breeding and are found in the uterus. Third, we looked for "placental scars" (PS), which are dark spots on the uterus where young had been attached during pregnancy the previous year. The ovaries were sent to Matson's laboratory in Montana for preparation and analysis.

CL from martens ≥ 1 year old indicated that 37% of the females in this age class were pregnant vs. 70% of martens ≥ 2 years old (Table 4). Similarly, a higher percentage of martens \geq age 2 were pregnant based on the presence of (BC). Rodney Mead at the University of Idaho who has experience in using chemical staining is examining the ovaries and counting PS. We are waiting for the results of his efforts.

Trapline data

Trapline data was sparse in 1991-92, as only two trappers provided most of the carcasses and only one completed a calendar and questionnaire (partially). Moreover, several trappers decided not to trap and consequently the overall effort on the refuge was likely much less than in previous years.

By knowing how many traps are set and for how long, we were able to calculate how many "trapnights" (24-hour periods a trap is available for capturing an animal) of effort was used to capture a certain number of martens. Studies elsewhere have determined that success rate of capture is indirectly related to the number of animals in the population. We hope to use capture success by fur trappers as a means of monitoring trends (increasing, stable, decreasing) in the marten population on the refuge.

Only one trapper filled out a trapline calendar to record numbers of traps set and martens harvested. Consequently, we did not have enough information to determine capture success for the refuge. We hope that we will have more cooperation next year in obtaining this information as we would like to compare trapper success to the number of marten tracks seen during snow-tracking surveys on the wildfire/furbearer survey.



Habitat use is closely revealed by backtracking marten. Here a marten investigates the roots of a fallen tree in the 1985 burn. Root wads and leaning dead trees give access for hunting small mammals, insulation against the cold, and escape from predators. (PR)

Table 8. Total number and age-sex ratios of martens harvested by 3 trappers during the 1991-92 trapping season, Nowitna NWR, Alaska.

Trapper Number	Total Marten	Ratios in harvests				
		Males/ female (all ages)	Males/ female (both \geq 1.5 yr.)	Juveniles per female ≥ 2.5 yr.	Juveniles per female ≥ 1.5 yr.	% Juveniles
01	36	1.6	4.3	15	3.8	42
05	64	1.1	1.7	2.2	1.3	32
07	1	-	-	-	-	0
Total	101	1.2	2.0	3.5	1.6	35

Table 9. Age distribution of martens harvested by 3 trappers during the 1991-92 trapping season, Nowitna NWR, Alaska.

Trapper	Age Class											
Number	0	1	2	3	4	5 ... 7	... 10	... 11	... 13	Total		
<u>Male martens</u>												
01	5	13	2	2	0	0	0	0	0	22		
05	6	16	5	3	0	1	1	0	1	33		
07	0	0	0	0	0	0	0	0	0	0		
Total	11	29	7	5	0	1	1	0	1	0	55	
<u>Female martens</u>												
01	10	3	0	0	0	1	0	0	0	14		
05	14	8	3	3	0	1	0	1	0	31		
07	0	1	0	0	0	0	0	0	0	1		
Total	24	12	3	3	0	2	0	1	0	1	46	
Both Sexes	35	41	10	8	0	3	1	1	1	101		

17. Law Enforcement

Activity took place on two cases involving the "mining" of mastodon ivory and related bones in the Palisades area of the Nowitna Refuge. In 1991, two individuals (one being a minor) were apprehended with several mammoth tusks and three sacks of bones and other artifacts. Before a citation was issued to the



The Palisades or "Boneyard" continues to have law enforcement problems related to the mining of fossilized ivory. (PL)

adult he left the state. When he did not return the citation was sent to him in Washington where an arrest was made in early October to obtain the bond forfeiture of \$500.00.

A second case occurred during the reporting period. In September, the office received a call that someone was using a hydraulic dredge to uncover ivory in the same location. An investigation led to the citation of one individual and confiscation of several tusks and bones. On December 30, at a bench hearing in Fairbanks District Court, the individual was found guilty and all confiscated items were surrendered. The individual was fined \$250.00.

All three refuge officers conducted law enforcement during the September moose season. ROS/P Liedberg worked the lower Nowitna River in conjunction with running the hunter check station.

18. Cooperating Associations

Refer to the Koyukuk section of this report.

I. EQUIPMENT AND FACILITIES

4. Equipment Utilization and Replacement

Refer to the Koyukuk section of this report.

5. Communications Systems

Refer to the Koyukuk section of this report.

6. Computer Systems

Refer to the Koyukuk section of this report.

8. Other

Refer to the Koyukuk section of this report.

J. OTHER ITEMS**4. Credits**

Refer to the Koyukuk section of this report.

K. FEEDBACK

Refer to the Koyukuk section of this report.



Ridge in mature forest overlooking Round Lake.
(PR)

Once man can no longer walk among beauty and wonder at nature, his character, his spirits and his happiness will wither and die.

Anonymous