KANUTI NATIONAL WILDLIFE REFUGE

Fairbanks, Alaska

ANNUAL NARRATIVE REPORT

Calendar Year 1994

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U.S. Department of the Interior

Fish and Wildlife Service

NATIONAL WILDLIFE REFUGE SYSTEM

REVIEWS AND APPROVALS

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Fairbanks, Alaska

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Calendar Year 1994

Refuge Manager — Date 3/4/96

Refuge Supervisor Review — Date 3/16/96

Regional Office Approval — Date 4/1/96

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Fairbanks, Alaska

INTRODUCTION

Kanuti National Wildlife Refuge was established on December 2, 1980 by Public Law 96-487, the Alaska National Interest Lands Conservation Act. The refuge includes approximately 1,430,000 acres of public lands. The Lands Act required interim management by the refuge of unconveyed Native lands within the refuge that were selected under the Alaska Native Claims Settlement Act. The acreage of the refuge is constantly changing as lands are conveyed to Native regional corporations, village corporations and to individuals. At the present rate, it will be years before all lands are conveyed, surveys are completed, and easements are established for access to Native and refuge lands.

The Kanuti Comprehensive Conservation Plan was initiated in Spring 1984. It was completed in Spring 1987, and a Record of Decision was signed by the Regional Director in the Fall 1987. Current refuge programs include gathering baseline data, documenting refuge resources, and recording their present and historical use.

The refuge was primarily established as a waterfowl breeding area, especially for white-fronted geese. Species referred to in the Lands Act {Section 302(4) (B)} include white-fronted geese and other waterfowl, migratory birds, moose, caribou and furbearers. The purpose of the refuge is to "conserve fish and wildlife populations and habitats in their natural diversity." The Lands Act also states that the refuge will fulfill treaty obligations, furnish the opportunity for continued subsistence use by local residents, and ensure adequate water quantity and quality for fish and wildlife populations and habitats.

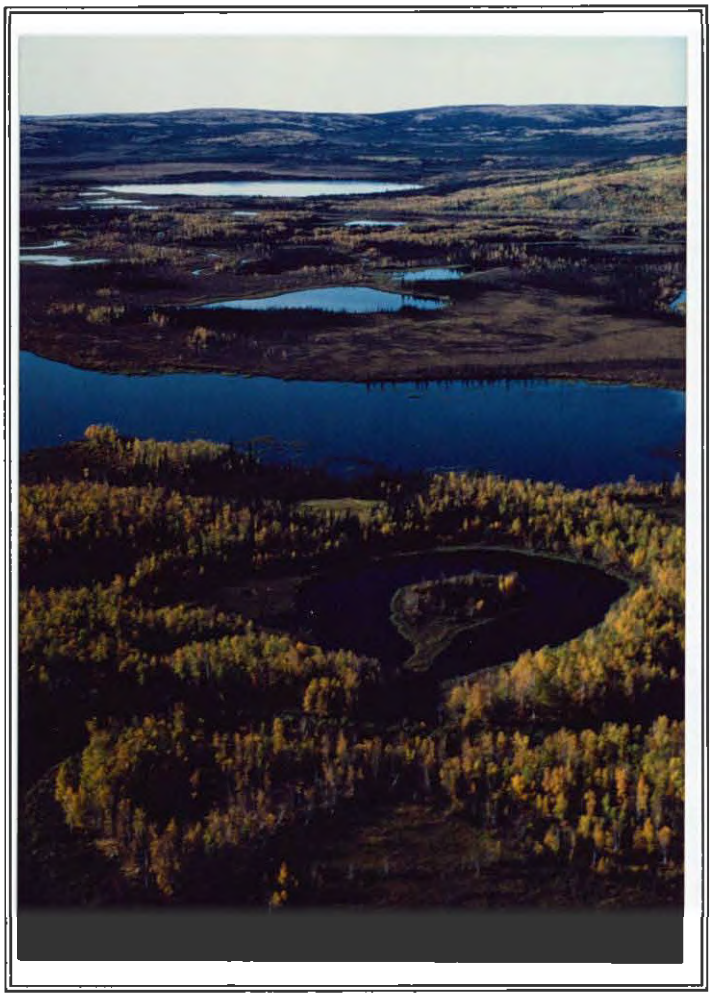
The refuge is a roadless area larger than the State of Delaware, located in a broad basin formed by the Kanuti and Koyukuk River valleys. The area is bound by the southern foothills of the Brooks Range on the north, east, and west. The Ray Mountains rise to the south of the refuge. Elevations range from 500 feet to over 3,000 feet in the surrounding mountains. The refuge is on the Arctic Circle between 66° and 67° north latitude, and 151° and 153° west longitude. It is about 150 miles northwest of Fairbanks. The trans-Alaskan Oil Pipeline/Dalton Highway corridor passes within eight miles east of the refuge.

The refuge office is in Fairbanks where other land management agencies and organizations that have lands in or adjacent to the refuge are headquartered. A field station for the refuge is located at Bettles Field (Bettles), which is shared with the Gates of the Arctic National Park and Preserve. There are no roads to the refuge so all operations are by air to large lakes and rivers. Ground work is conducted from boats and on foot.

The climate of the refuge is continental, with slightly higher precipitation than other Interior Alaskan areas. Summers are short with moderate temperatures; winters are very long and cold. Spring and fall are brief and abrupt. Thaw begins in April, and the rivers break up in mid-May. The temperature range, from -70°F to 93°F, is among the widest on earth. Almost all the snow that falls during the winter accumulates until spring because thaws are rare. The

average annual precipitation for the area is 12-13 inches.

Most of the refuge is boreal forest and taiga. The area is a complex of small, diverse plant communities formed by many physical, seral and fire factors. Predominant plant communities include closed forests of white spruce/paper birch on uplands, and white spruce/cottonwood along the Koyukuk River. Poorly-drained areas support open black spruce forests with sphagnum moss/sedge/grass under stories. Muskegs cover much of the lower valleys. In wet areas, muskegs grade into treeless bogs dominated by small shrubs. Tall shrub thickets occur along water courses and on some upland sites.



The Kanuti River drainage with Taiholman Lake in the distance.
9/94 P. Martin

The diversity of the habitat provides an equally diverse wildlife population of approximately 157 bird, 34 mammal, and 16 fish species. The zillions of mosquitos found on the refuge during the summer months fuel many of these species. Nesting waterfowl include white-fronted geese, Canada geese, northern pintails, American wigeon, scaup spp., and scoter spp. The white-fronted geese are mainly Central Flyway birds, the Canada geese are mainly Pacific Flyway birds, while the ducks come from all of the major flyways in North America.

Four villages are adjacent to the refuge boundaries: Evansville/Bettles Field are north and Allakaket/Alatna are west. The villages and other scattered, permanent dwellings in the area have a population of about 400. The majority are Athabascan Indians, with some Eskimos and Caucasians. Most of the people use the refuge for a part of their subsistence lifestyles.

Allakaket residents preparing salmon and sheefish.
8/94 B. Whitehill

Historically, gold mining was widespread in the area. Several settlements existed in the late 1800's along the rivers. No mining or claims are currently active in the refuge, and no remains from the historic activity are obvious. However, there are active gold placer mines upstream from the refuge on the tributaries of the Koyukuk River.

Several archaeological sites exist in the refuge. Some have been identified as cemetery and historical sites, and have been selected by Native groups. Others probably exist, but are unidentified.

INTRODUCTION

TABLE OF CONTENTS

Page

I. EQUIPMENT AND FACILITIES

J. OTHER ITEMS

A. HIGHLIGHTS

- Flood floats the villages of Allakaket and Alatna down the Koyukuk River (Section B).
- Wildlife Biologist leaves; refuge not allowed to refill position (Section E.1).
- Grizzly shot in defense of life by refuge staff (Section E.6).
- Several On-the-Spot awards for refuge staff (Section E.8).
- Breeding Bird Surveys and Point Counts expanded (Section F.7).
- Banded 144 white-fronted geese at Lake Todatonten (Section G.16).
- Allakaket Elder's Wildlife Camp developed with Challenge Grant monies (Section H.2).

B. CLIMATIC CONDITIONS

The nearest weather station to Kanuti National Wildlife Refuge is the National Weather Service Station at Bettles Field, three miles outside the refuge's northern boundary. The refuge is diverse, so climatic conditions vary throughout the refuge. For example, unofficial temperatures in Allakaket, two miles outside the west-central refuge boundary and 36 miles from Bettles, are often 10°F to 20°F colder than Bettles. Wind, precipitation and other weather conditions also vary across the refuge.

The refuge's climate is typical of Interior Alaska. Summer days are long and mild, with usual maximum temperatures in the 60°F to 70°F range. The sun does not set from June 2 to July 9 on the refuge areas north of the Arctic Circle. Spring and fall are dramatic transitions that occur in a span of a couple of weeks. River break-up usually occurs by mid-May, and the Koyukuk River freezes in October or early November. Winters are long and cold with temperatures that average below 0°F from November through most of March. Occasional lows between -45°F to -65°F occur each year. Annual snowfall is 40-130 inches. Winds average 6.7 miles per hour from the north or northwest. Stronger winds occur in late summer and early winter.

In 1994 the highest temperature reading recorded was 88°F on August 6, while the lowest reading of -54°F occurred November 23 and 24. The total precipitation for 1994 was 16.7 inches, which is 2.96 inches above average. Data for 1994 is summarized in Table 1.

Table 1. 1994 temperature, total precipitation and snow pack at Bettles Field, Alaska.

Month	Temperatures (°F) Max.	Min.	Avg.	Departure	Precipitation (inches) Precipitation	Departure	Snow Pack (month's end)
January	28	-40	1	+13.2	.49	-.20	40"
February	27	-42	-8	+.7	.24	-.40	37"
March	45	-44	0	-3.3	1.16	+.48	30"
April	57	-20	24	+3 6	.24	-.40	6"
May	70	28	48	+4 8	0.76	+.15	0"
June	85	33	55	-2 0	.76	-.68	0"
July	86	40	62	+2.5	1.10	-.84	0"
August	88	30	54	+.8	7.41	+5.03	0"
September	63	19	40	+ 3	.32	-1.40	0"
October	48	-8	18	-.2	1.21	+.01	13"
November	30	-54	-12	-10 2	1.85	+.95	38"
December	28	-52	-11	-1 2	1.16	+.26	51"
			Totals	+9 0	16.70	+2.96	

The Koyukuk River breaking up at Allakaket
5/94 B Whitehill

The year started with temperatures during January being 13°F warmer than average This

general trend contributed to the Koyukuk River freeing itself from winter's grasp a week earlier than in 1993. Break-up occurred in Allakaket at 1:55 a.m. on May 3. Weather on the Arctic Circle however, is prone to be measured in frozen milestones. The last snowfall for the 1993-94 season was on May 28 while the first snowfall for 1994-95 was August 15. A scant 2½ snowless months! Snow fell and stayed in Bettles on October 5. The final note for winter came when the Koyukuk River froze on November 4th.

Alaska's big weather event of 1994 happened in and around the refuge during August. The Koyukuk River swept away the villages of Allakaket and Alatna. The flood was the result of heavy rains that occurred in the region between August 16 and August 27. Just over 6 inches of rain were measured in Bettles during this period. For the month of August a record 7.41 inches of rain was recorded in Bettles which "drowned" the previous record of 5.91 inches set in 1963. Flood waters rose quickly to cover Allakaket and Alatna with 6-10 foot depths by August 27.

Allakaket minus "Main" Street.
9/94 P. Martin

All of the log structures in the villages, save four, were lifted off their foundations. Several of the houses and the community center came to rest fairly intact four miles downstream on a river bend that villagers now call "South Allakaket". One structure was reported to have traveled 86 miles. Fortunately residents were evacuated to Fairbanks by Chinook helicopters without incident. Two of the refuge staff were in Allakaket but managed to catch the last plane flight out on August 26 before the runway was inundated.

The region was declared a federal disaster area. According to the Federal Emergency Management Agency, an estimated $52 million will be spent on immediate disaster relief in 13 Interior villages by the time repairs are completed. Plans to move Alatna and Allakaket to new locations on higher ground are proceeding.

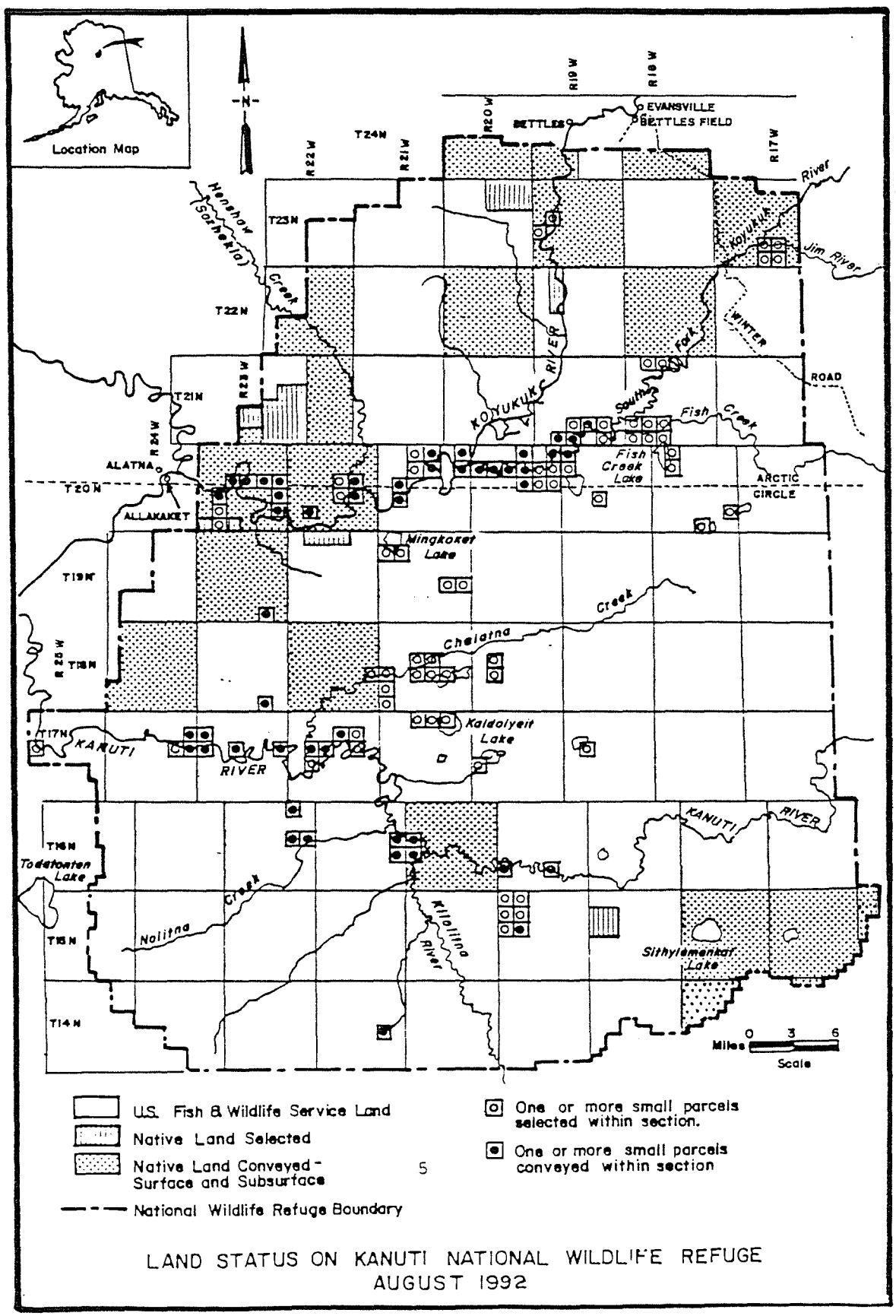
Silt deposited a mile from the Koyukuk River after the big flood.
9/94 P. Martin

Standing water covered all low lying areas in the upper Koyukuk River region for weeks after the main flood. Many residents were concerned that this excess water would cause very bad traveling conditions in winter. Overflow did cause some problems in early winter but temperatures to -54°F at Thanksgiving time froze much of the excess water. Moose harvests were difficult because the animals were not in the usual sloughs and lakes. Many of the animals moved to higher ground and stayed there into winter.

C. LAND ACQUISITION

1. Fee Title

The refuge's boundary encloses about 1,635,000 acres. Approximately one quarter of the area within the refuge's borders has been selected by or conveyed to Native corporations and individuals (Figure 1). These lands become privately owned when they are conveyed.



LAND STATUS ON KANUTI NATIONAL WILDLIFE REFUGE
AUGUST 1992

2. Easements

No final access or transportation easements exist on the refuge, but several are pending. When the easements are settled, the refuge will be in charge of enforcing regulations for them. We prefer foot trail easements which limit traffic to less than 3,000 pounds gross weight. It is hoped that all easements will continue to be used as they are today for snowmobile and sled traffic. If the Revised Statutes 2477 easement issue is decided in favor of unlimited vehicle access, the effects on refuge lands could be significant.

The Ninth Circuit Court ruled that the exact location of these trails and roads may vary depending upon the season of use. This is a major concern for public land managers and may seriously limit our control on the development and possible use of these trails.

No mining or other commercial interests are currently in locations that require access through the refuge. The winter road to Bettles Field does not cross refuge lands as it now exists, although an older route does. The older winter road (part of the "Hickel Highway") is not the best route and has not been used in several years except as a trapping trail. This route has no easement status. Neither the Doyon Corporation nor the refuge are requesting it for an access easement.

D. PLANNING

1. Master Plan

The Comprehensive Plan for Kanuti Refuge was signed September 18, 1987. The management directions for the preferred alternative were:

- Restore or maintain the refuge's natural diversity and key fish and wildlife populations and habitats;
- Maintain traditional access opportunities;
- Provide for continued subsistence use of refuge resources;
- Provide continued opportunities for recreational hunting, fishing, and wildlife observation;
- Provide off-site opportunities for interpretation and environmental education; and
- Recommend no areas for wilderness designation.

2. Management Plan

Detailed plans that identify specific actions needed to implement the Comprehensive Conservation Plan will be prepared for administration and operations, inventories, habitat, economic uses, populations and public use.

The Refuge Operations Plan was finalized and submitted to the regional office in January. This plan was initiated in 1991 and several drafts were submitted to the regional office. To date no comments have been received from the regional office regarding the final version.

Wildlife inventory plans for such species as moose, white-fronted geese, and neotropical migrants will be developed for the refuge. All of these plans are on hold pending a Region 7 effort to develop biological monitoring strategies. Biologist Martin and Refuge Manager Early are on the Habitat Inventory Committee and Martin coordinates the Carnivore Inventory Committee.

Early serves as the Chair of the Regional Habitat Committee. Committee meetings were held in March, April and November in an effort to develop plans for monitoring several parameters of the habitat, including; landforms, water, climate and plants. The goal of the committee is to develop techniques to monitor important aspects of the habitat to enable refuges to develop species specific habitat maps.

Carnivore Inventory Committee. Martin coordinated the carnivore committee for the regional baseline inventory plans. The draft plans were supposed to be completed by 1 January 1995, but the date was delayed to accommodate a new regional focus on ecosystem and partner management. The drafts for wolves, snowshoe hares, lynx, wolverine and polar bears were completed. The drafts for small mammals and marten will be completed when the recommendations from the final report from a fire/furbearer report from Nowitna NWR is completed in spring, 1995. The drafts for black and grizzly bears and will be completed by October, 1995.

Refuge Wildlife Inventory Plan. Martin prepared a draft matrix for the refuge inventory plan. The plan will be completed when the regional inventory committees complete their reports. The matrix is a six-year plan for obtaining minimum baseline information on the species mentioned in the enabling legislation of Alaska National Interest Lands Conservation Act (1980), and other ecosystem indicator species. The goals of the plan are to monitor the major components of the ecosystem with emphasis on the lower trophic level species, and to conduct inventories during both summer and winter. The plan includes annual projects, triennial projects, projects conducted every five years, and some short-term monitoring projects (Table 2). The refuge will not be able to implement the plan, even though it is the minimum amount of monitoring that can be done on the refuge to meet legal mandates, unless the region approves a long-term, biological technician position for the refuge.

If the refuge is adequately staffed and the six-year plan is implemented, the refuge should have reasonable baseline population inventories and monitoring plans for its significant species by the year 2000. By that time, we hope that habitat inventory procedure tests being conducted on Innoko Refuge will have been completed, adopted by the Habitat Committee, and tested on one or two other refuges. If techniques have been developed, Kanuti will begin a habitat inventory and develop a long-term plan for monitoring both the species and their habitats.

Table 2. Frequency of inventory and monitoring projects for Kanuti NWR.

Long-term Annual Monitoring Projects:
- Traplines/Caribou/Winter Public Use
- Furbearer Track Counts
- Small Mammal Trap Lines

Triennial Monitoring Projects:
- Fire Effects on Lake Limnology and Waterfowl
- Fire Effects on Vegetation and Fuels
- Fire Effects on Small Mammals

Populations Inventoried Every Five Years:
- Moose Census
- Wolf Census

Short-term or Cyclic Inventory Projects:
- Furbearer Carcass Collection (5 years 1994-1998)
- White-fronted Goose Inventory (4 years 1995-1998, continued pending results of intensive inventory)
- Beaver Cache Inventory (once in 1995) repeated every 5-10 years
- Neotropical Birds (3 years 1993-1995, continued pending Regional completion of analyses of statewide survey data and technique recommendations)

3. Public Participation

Refuge staff attended a Allakaket Village Council meeting on May 5. Early, Whitehill, Zirkle, and Tom Paragi, Biologist from Koyukuk/Nowitna NWR discussed refuge projects, fires/furbearers, fire/caribou, and moose concerns at the meeting.

4. Compliance with Environmental and Cultural Resource Mandates

One of the primary mandates from the Alaska National Interest Lands Conservation Act that created Kanuti Refuge was to ensure "water quality and necessary water quantity within the refuge."

Although there are no active mines or mining claims on the refuge, placer gold was mined throughout much of the area from the 1890's until the refuge was established in 1980. In addition, sediments from active mines upstream of the refuge are currently being deposited within the refuge. Ever-changing river channels expose old dump sites of mercury, which was used in the extraction of gold and other heavy metals such as arsenic, copper, lead, zinc,

cadmium, chromium, iron, manganese, and nickel associated with gold deposits. Our contaminant program is designed to determine base levels of pollution and to locate their sources.

Water quality was tested on streams throughout the refuge from 1985 to 1989. Sediments, water and tissues from fish were collected from all major refuge streams. The Fish and Wildlife Ecological Services Office in Fairbanks guided the sampling with various refuge staff members participating. Ecological Services will provide the final summary report in 1995.

Refuge Manager Early and Refuge Operations Specialist Whitehill attended back-to-back training sessions for National Environmental Policy Act mandates and Refuge Compatibility at the end of February in Anchorage. A questionnaire on secondary activities was completed by the refuge staff in early August. Compatibility determinations were completed in October for Guided Sport Hunting, Commercial Transporters, Guided Tours, and for uses allowed by the Final Comprehensive Plan/Environmental Impact Statement/Wilderness Review for the Kanuti National Wildlife Refuge done in 1987.

5. Research and Investigations

The possibility of a multi-agency habitat/herbivore/predator-prey relationship study was discussed with Tom McCabe, National Biological Survey (NBS). A preliminary study proposal was drafted and in January the feasibility and rationale for this work was discussed with ARD Gould. Questions remain as to the funding responsibilities of NBS for such a study. Discussions with biologists from the Arctic and Kobuk Districts of the Bureau of Land Management and with the Gates of the Arctic National Park indicated interest but similar concerns about funding from their agencies.

"Characteristics of Riverine Habitats on the Kanuti National Wildlife Refuge, Alaska"
University of Missouri Graduate Student Jim Wortham provided the refuge with his Masters of Science thesis that was result of 1992 and 1993 field work. The thesis compared limnology and waterfowl use of river-connected, non-connected, and beaver-influenced wetlands in the Kanuti River drainage. Field work involved aquatic vegetation sampling, waterfowl surveys, and analyzing water samples for nitrogen, phosphorus, trace elements, chlorophyll a and other characteristics.

6. Other

Kanuti, Arctic and Yukon Flats refuges worked together early in the year to recommend ecosystem regions within Alaska. We used the Joint Federal-State Land Use Planning Commission guidelines developed in the 1970's as a basis and sent our recommendations on to the Regional Office. The final map closely resembles the product developed in Fairbanks. Eleven ecosystems were delineated within the state. Kanuti refuge is located within the Interior Ecosystem, which is the state's largest. It also encompasses Koyukuk, Nowitna,

Yukon Flats, Tetlin and a portion of Arctic refuges.

Early serves as a member of the Interior Ecosystem Team along with the refuge managers of the above refuges, and project leaders from Northern Alaska Ecological Services, Fisheries Resource Office, Migratory Birds and Law Enforcement. He served as Co-Chair of the team from October through January. Several meetings were held for the team in June, August and November. Team Leaders gathered in Anchorage in October to offer recommendations and try to improve the work and structure of this type of management. After initial discussions with the Regional Director, our comments appeared to receive little acceptance from the Region and Washington offices.

Comments were submitted through the Northern Alaska Ecological Services office in January regarding alternative proposals for the Allakaket runway location. The Alaska Department of Transportation (ADOT) intends to move the runway to higher ground above the 100 year flood level. All alternatives listed were off refuge lands and no significant impacts to the refuge identified.

Inquiries were made by the ADOT regarding land status and regulations on and near VOR Lake, just south of Bettles/Evansville for use as a proposed seaplane base for the community. The Koyukuk River poses many risks and can't be accessed during periods of high water. Alternatives to the river have been discussed for several years, but since the flood late this summer, action on this alternative was taken a step higher. All lands surrounding the lake have been conveyed to Evansville, Inc., the Village corporation representing Evansville. Pending economic and environmental analyses, the new site may become operational in 1997.

The Western Interior Federal Subsistence Board meeting was held in McGrath at the end of October. Refuge Operations Specialist Whitehill attended and updated the board on Kanuti activities through a slide show.

Quarterly subsistence meetings for the three Fairbanks refuges are held to discuss items of mutual concern and to update the Subsistence Coordinator.

E. ADMINISTRATION

1. Personnel

1. Early, Tom J. — Refuge Manager
   Photo page 77 — GS-0485-12; Permanent, Full-time, EOD 9/25/88

2. Whitehill, Barry — Refuge Operations Specialist
   Photo page 27 — GS-0485-11; Permanent, Full-time, EOD 12/27/92

3. Brubaker, Rachel — Wildlife Biologist
   Photo page 15 — GS-0486-11; Permanent, Full-time, EOD 11/03/91; Transferred to NPS - Gates of the Arctic National Park effective 10/16/94

4. Martin, Patricia A. — Wildlife Biologist/Pilot
   Photo page 34 — GS-0486-12; Permanent, Full-time, EOD 9/25/88

5. Rizzi, Anne-Marie — Administrative Technician
   Photo page 89 — GS-0303-6; Permanent, Full-time, EOD 6/18/89; Transferred to NPS Death Valley National Monument effective 9/18/94

6. Generous, Mabel — Administrative Technician
   Photo page 16 — GS-0303-5; Permanent, Full-time, EOD 11/13/94

7. Schmitz, Betty Jo — Biological Science Technician
   GS-0404-7; Term, Intermittent, EOD 7/01/85

8. Eley, Tom* — Refuge Operations Specialist/Subsistence
   GS-0485-11; Permanent, Full-time, EOD 3/22/92;
   Transferred to Koyukuk/Nowitna NWR effective 5/01/94

9. James, David* — Refuge Operations Specialist/Subsistence
   Photo page 13 — GS-0485-11; Permanent, Full-time, EOD 8/21/94

10. Grissom, Perry* — Wildlife Biologist/Fire Management Officer
    Photo page 14 — GS-0486-11; Permanent, Full-time, EOD 6/26/94

* Positions based with Yukon Flats NWR but are shared positions with Arctic NWR and Kanuti NWR.

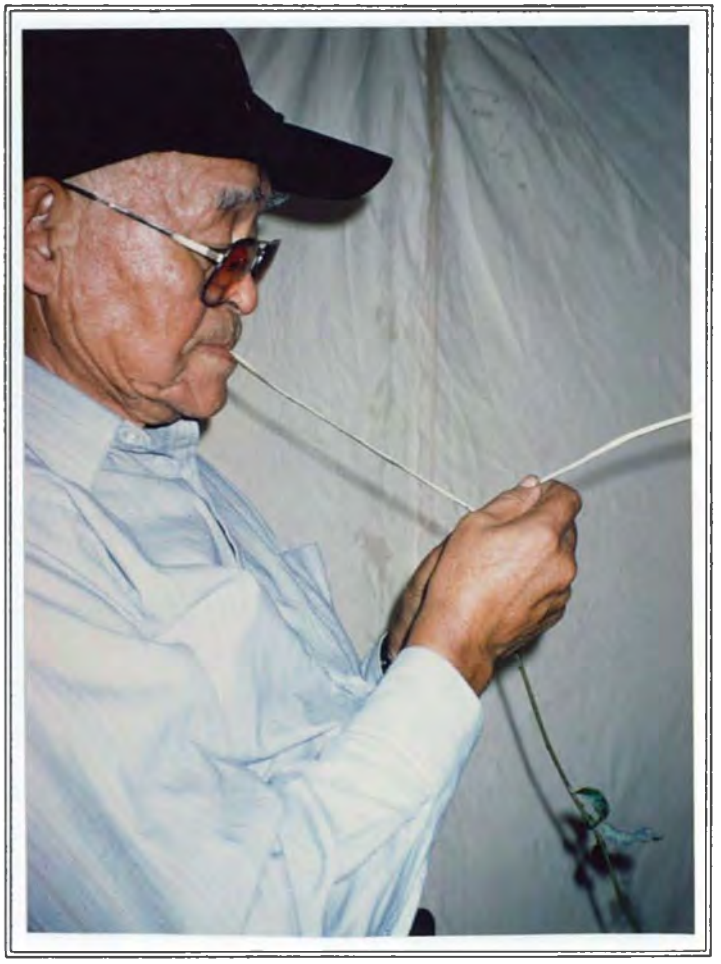
11. Zirkle, Aliy H. — Biological Science Technician
    Photo page 92 — GS-0404-6; Temporary, Intermittent, EOD 5/16/93

12. Lovely, Patrick J. — Biological Science Technician
Photo page 39 — GS-0404-5; Temporary, Full-time, EOD 5/15/94; Terminated 9/30/94

13. Henderson, Denali — Biological Science Technician
Photo page 68 — GS-0404-5; Temporary, Full-time, EOD 5/15/94; Terminated 9/30/94

14. Yatlin, Sharon — Park Ranger
GS-0025-5; Temporary, Full-time, Local Hire, EOD 6/13/94; Terminated 8/24/94

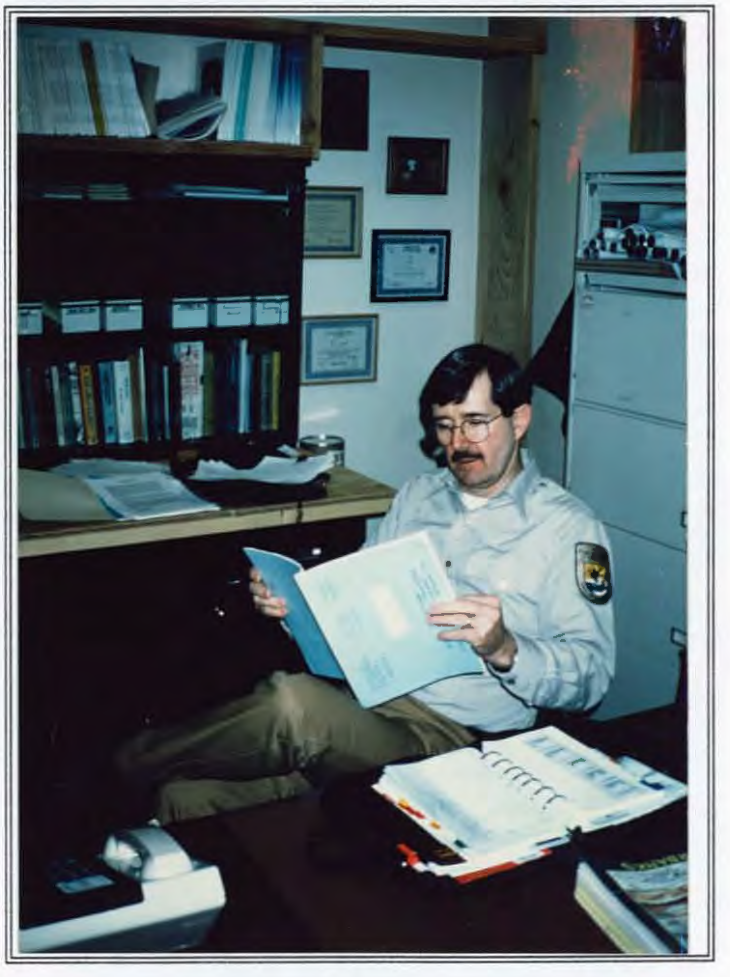
15. Andrea Fletcher — Youth Conservation Corps Enrollee
Photo page 17 — 5/31/94 to 9/02/94; Position shared with Yukon Flats NWR



Johnson Moses demonstrates splitting roots for cordage
8/94 B Whitehill

A retirement party for Refuge Information Technician Johnson Moses was held on January 14 in the Federal Building. Johnson formally retired in November 1993. His family and friends, FWS employees and others came to bid Johnson the best of luck. Johnson gave the refuge credibility in the early years of our history by helping the staff understand Native traditions and needs. He also did an outstanding job of communicating the refuge's purposes to the Native community.

There were changes in personnel for both joint positions that share responsibilities for all three Fairbanks based refuges. ROS/Subsistence Coordinator Tom Eley was selected as the Refuge Manager of the Koyukuk/Nowitna NWR. Tom left at the start of May for Galena. The ROS/Subsistence Coordinator job was filled by David James in mid-August. Previous to his appointment David was the Regional Coordinator for the Western and Eastern Interior Federal Subsistence Boards.



David James deciphering Federal Subsistence proposals.
11/94 B. Whitehill

The Wildlife Biologist/Fire Management Officer position for the three refuges, left vacant when Fred Deines was selected as the Deputy Manager for Yukon Flats NWR, was refilled on June 26. Perry Grissom transferred from the Lower Rio Grande Valley NWR.

Perry Grissom takes a break from the high learning curve.
6/94 K. Sowl

The Fairbanks offices were selected as a test site for the Region to hire summer seasonal employees through the Fairbanks Jobs Service Office. In late February, two people from the Regional Personnel Office instructed Fairbanks offices on the proper procedures for recruiting and selecting such employees. Through the Fairbanks Job Service Office, only people residing in Alaska can apply and the Regional Office mandated that for each position we could use only the Fairbanks Job Service list or the Regional Office, but not both. Even though several offices chose to use the local office, Kanuti did not. We were able to reinstate one candidate plus hire a highly qualified individual from outside Alaska.

Pat Lovely and Denali Henderson started as biological technicians for the refuge on May 15 and worked until September 30. They helped do the neotropical bird surveys, vegetation sampling, goose banding, small mammal trapping and data processing, maintenance projects in Bettles and at the refuge cabin, all manner of logistics projects, and just about anything else we asked of them. We would not have been able to complete our projects without their capable and willing help.

Sharon Yatlin was selected as a local hire Park Ranger to organize the Allakaket Elders Wildlife Camp that was initiated through the Challenge Grant Program (see Section H.2). Sheri started officially on June 13 after volunteering her services for nearly two weeks. She was terminated after the successful completion of the camp in August.

Wildlife Biologist Rachel Brubaker made the transition to her new position with Gates of the Arctic National Park over the course of a couple of months by working part-time at both Kanuti and Gates of the Arctic after officially ending with the refuge on October 16. Her new position is job shared with another National Park Service biologist. The regional office refused to replace her position at Kanuti. She is missed by the refuge staff, especially Patsy Martin who has had to assume responsibility for the full biological program in addition to her flying.

Rachel and Lois Brubaker celebrate surviving "the trip from hell" (see Section E.6).
6/94 B. Whitehill

Aliy Zirkle was promoted to a GS-06 Biological Technician in May. She truly earns her salary by being the lone staff member in Bettles, nearly 200 miles from the refuge administrative office.

Mabel Generous was selected as the Administrative Technician and entered on duty officially November 13. Mabel was a part-time employee at Arctic NWR prior to assuming this full-time position.

Mabel Generous is a bright addition to the staff.
2/95 B. Whitehill

Administrative Technician Anne-Marie Rizzi transferred to Death Valley National Monument on September 17. Quite a change! Anne-Marie helped the office a great deal in maintaining and upgrading our computer systems, had innovative ideas for many facets of business and finance plus kept meticulous track of the budget for our station. She will be

missed. Melinda Rollo from Tetlin assisted us in early September for a week and others in the Fairbanks offices also helped a great deal during the end of the year.

2. Youth Programs

A recruitment notice for a YCC enrollee was completed and mailed to area high school counselors, Bettles and Allakaket schools and Tanana Chiefs Conference. The position, shared by Kanuti and Yukon Flats NWR, was geared toward clerical and logistical support for the refuges. Andrea Fletcher was selected for the YCC position. She proved to be an extremely capable and bright 18-year old. On top of a very pleasant and outgoing personality, she required very little supervision.

Andrea Fletcher did an outstanding job working between two offices.
8/94 B. Whitehill

4. Volunteer Program

Six volunteers worked at Kanuti NWR during 1994 (Table 2). Their work ranged from assisting in a fish and wildlife survey on the Kilolitna River and refuge snowmachine travels to school environmental education presentations and shuttling vehicles. All contributions were much appreciated.

Arnold Brown in particular helped the refuge with a myriad of backlogged maintenance projects in Bettles. Starting December 9 Arnie volunteered 20 hours per week in exchange for room and board. He became a much needed fixture through the winter doing repairs and snowplowing.

Table 2. 1994 Kanuti NWR Volunteers.

Volunteers	Hours Donated
Acevedo, Cathy	8
Brown, Arnold	72
Brubaker, Lois	60
Swearingin, Jim	42
Witmer, Dennis	16
Yatlin, Sharon	68
Total	266

5. Funding

Table 3. Kanuti NWR Funding.

Fiscal Year	Total Funding	Fixed & Overhead $	% Fixed	Construction $*
1985	275,000	175,000	65%	389,100
1986	290,000	194,000	57%	---
1987	408,000	229,000	56%	355,000**
1988	445,000	294,000	66%	---
1989	429,000	292,000	68%	190,500***
1990	420,000	344,000	82%	20,000
1991	521,000	380,000	73%	22,000
1992	512,000	403,000	79%	20,000
1993	572,000	476,000	83%	33,000
1994	587,000	438,800	75%	---

*Construction funds not included in Total Funding.
**Includes $328,000 for hangar construction and $27,000 for renovation materials.
***Includes $156,800 for renovation and $33,700 for shop construction.

The RONS minimal funding package was submitted to the regional office. This exercise identified funding and staffing needs to bring us up to minimal acceptable standards to meet refuge purposes and legal mandates. We estimated that we are presently funded at only 78% of the total needed to fulfill our legal mandates.

A Challenge Cost Share work agreement between the Tanana Chiefs Conference, Yukon-Koyukuk School District and the refuge to implement a wildlife education camp with Allakaket School was approved (see Section H.2).

6. Safety

Early is Chairman of the Watercraft Safety Committee and also an instructor for watercraft safety. Several committee meetings were held in during the course of the year in Anchorage. A student manual was written for the basic course and several additional training modules were developed. Early also attended watercraft training for instructors in Homer on September 20 through 24 where he successfully completed the Motorboat Operator Instructor Certification Course. This training also included the initial session of the Flowing Water (River) Module.

Early and several other instructors in Fairbanks held a basic watercraft training session in May. He also assisted the Aleutian Islands Unit of the Alaska Maritime Refuge in Adak to conduct a session in May.

A safety presentation by Alaska State Trooper Johnson in March was arranged by refuge staff for FWS employees at the Fairbanks Federal Building. His talk dealt with avoiding burglaries and other crimes.

Refuge staff that regularly visit villages were administered hepatitis A&B shots.

Volunteer Brown inspected all fire extinguishers in Bettles. Outdated extinguishers were returned to Fairbanks for recharging. He also completed a safety inspection of the Bettles facilities. Several deficiencies were corrected as they were discovered.

Table 4. Kanuti NWR Safety Training for Employees - 1994.

TRAINING	EMPLOYEE(S)
Watercraft Safety Training	Henderson
Bear Safety Training	Henderson
Bear Firearms Certification	Brubaker, Henderson, Early, Lovely, Martin, Whitehill, Zirkle
Aviation Safety Training	Early, Henderson, Rizzi, Schmitz
CPR Refresher	Brubaker, Early, Martin, Whitehill, Zirkle

Bear Incident - Kilolitna Hot Spring - June 21, 1994

Volunteer Lois Brubaker, Biologist Rachel Brubaker, and Refuge Operations Specialist Barry Whitehill were dropped off by helicopter on a gravel bar next to the lower portion of the Kilolitna River Hot Springs. A ten day float of the Kilolitna River was planned to assess white-fronted goose brood use areas. At 4:15 p.m. Pilot Paul Walters bade the team farewell in a chilling rain along with his observations that it was prime bear country.

Tents were immediately set up on the gravel bar. This was followed by a ¼ mile hike upstream, to check two lease cabins near the upper hot springs at the request of the Bureau of Land Management. To get to the cabins meant crossing one channel of the Kilolitna River on two downed trees, follow a path across a wooded island, and then fording a second channel.

The first cabin, which was boarded shut, had a two tier cache behind it. The bottom tier was at least 14' above the ground on telephone pole sized trees that were banded in metal near the top. This tier was destroyed, with much of the contents on the ground. Judging from hair and the condition of ravaged items, the raiding of the cache had occurred by a grizzly during the recent spring.

Nearer to the river, 150 yards upstream, was located a second cabin. This beautiful, two-story cabin was unlocked. Inside were three nicely furnished rooms. The setting was marred by a recent hole in the ceiling that had been created by a bear above the main living room. On the living room wall was a ominous note, dated June 1982, thanking the cabin owners for leaving the cabin unlocked since the writer needed to take refuge from a "persistent young grizzly." After reading this, and suffering from the effects of a constant rain, it was decided to retreat back across the river to soak in the hot springs.

The path was retraced to the channel with the downed trees. Barry crossed first, carrying the shotgun, and waited when he reached the bank on the other side. Rachel came next while Lois stood at the head of the trees, on the beach, waiting to cross. Rachel was only part of the way across the trees when a grizzly stepped onto the beach from the path and locked eyes with Barry. In a flash the bear turned and silently went after Lois. As the grizzly quickly bore down on Lois, the image of a coyote about ready to pounce on a mouse came to mind. The bear was running high on his toes, ears erect and all attention focused on Lois. Yells and waves from all three of the team brought only a slight, momentary hesitation in it's step.

When the distance was less than twenty feet, Lois headed into the river towards Barry with the bear right behind her. Rachel repeated a chant of "Shoot!, Shoot!, Shoot!" as Lois and the grizzly splashed past. As she moved to Barry, Lois communicated, "I'll get down so you can shoot!" Lois traversed into chest deep water, only four feet from Barry. The bear finally presented a clear shot when it stopped a mere three feet from Lois. Since it was up to it's hump in water, the only target was it's head. Just as the bear was coiling for a lunge to cover the distance to Lois, Barry shot for it's right eye. The bear stiffened like it had been punched

Lois is impressed by the dental work.
6/94 B. Whitehill

in the nose but otherwise appeared untouched by the slug. Fortunately it raised out of the water and turned which provided a shot at mid-point behind the right shoulder. This shot knocked it's feet out from under it. The final shot was into the right armpit as it spun around in the water. The last view, or so it was thought, of the bear was straight out of the movie "Deliverance." A lone paw rose from the white water as it swept downstream from sight.

From first appearance to it's disappearance down river, less than 2 minutes had elapsed. The whole episode, for everyone, had occurred in slow motion. Most importantly nobody had panicked. After reflecting on what had happened, the nearby hot spring afforded a remedy to the mix of adrenalin and hypothermia. Warmed by the hot springs, the crew cautiously picked their way through the brush back to camp.

To everyone's surprise, the bear was at camp. It was beached in shallow water near the tents. It took a combined effort to roll it onto shore. The grizzly was a boar, later judged to be 6 or

7 years old by a ADF&G bear biologist. Due to the hypothermic rain it was decided to wait until morning before skinning him. After a fretful night the crew awoke to find the camp in the midst of a flood. The bear was gone again.

The Kilolitna River at flood stage.
6/94 B. Whitehill

Around 6 p.m. the waters seemed to subside enough to attempt a launch. Upon rounding the first bend it was apparent that the river was determined to prove that the bear encounter was only a minor inconvenience. Within a mile of the put-in a sharp, frothing bend loomed ahead. Everyone made it to shore, luckily at a spot just large enough for a tent.

In the morning Barry scouted a side channel that would allow diversion around the white water. As the boats were being lined down this channel, the bear's body appeared in the river once again. This time the skull and hide were salvaged. Looking at his head wound it revealed the first slug had entered immediately behind the right eye, then deflected

downward, through the lower jaw, into neck muscle.

The lessons were not over. After stowing the bear in Rachel's boat, two more days of river problems were endured before she capsized on a sweeper. At this point heed was paid to the strong Athabaskan tradition of not "mixing" bears and women. The bear was moved to Barry's boat, an offering of coffee was made to the "river gods" and prayers were said to appease the spirits. The river and weather immediately improved. However, not leaving anything to chance, a helicopter was called to extract the group from the Kilolitna.

7. Technical Assistance

The staff provided information and assistance during flood relief efforts for the Villages of Allakaket and Alatna. Refuge staff help ranged from assisting in the evacuation of sled dogs from the villages to procuring game meat for the families displaced to Fairbanks. After several weeks into the relief, the Federal Emergency Management Authority (FEMA) took over the recovery operations. Several of the meetings organized by FEMA were attended by refuge staff. Most of the villagers were evacuated to Fairbanks and temporarily housed in the Carlson Sports Arena in Fairbanks. A few individuals were able to move back to the village, but only after extensive cleanup had occurred. Most of the families remained in Fairbanks through the end of the year.

Biological Technician Zirkle helped Gates of the Arctic National Park and Preserve with a snowmachine transfer during March. Three machines were moved from Bettles to Anaktuvak Pass, a two day journey. Zirkle also assisted Koyukuk/Nowitna NWR with a moose census from November 13-18.

Martin attempted to assist Gates of the Arctic National Park and Preserve with a moose census in November. An unusual barrage of storms made it necessary to cancel the census because crews were stranded or buried in snow in Kotzebue.

Martin assisted the Fairbanks Migratory Bird Management Office with an eagle survey from Fairbanks to Tok in May.

8. Other

The Land Managers in Fairbanks hold monthly meetings during September through May each year. The agenda is very informal which encourages open and frank discussions by all individuals. This forum provides an excellent opportunity to establish and expand ecosystem partnerships. The hosting and location of these meetings is shared by each agency.

Early and Martin attended a biological workshop in January to begin developing inventory and monitoring plans for wildlife populations and habitat on refuge lands. Early is the Chair the Habitat Committee and Martin is the Chair for the Carnivore Committee. Presently the wildlife committees are to develop standardized inventory plans for use by 1996 and the

habitat group by 1997.

A Quality Improvement Questionnaire briefing was held in Fairbanks on February 14 for Service employees by Regional Quality Improvement Coordinator Peggy Fox. Also in attendance was retiring Regional Director Walt Steiglitz for his final Fairbanks appearance.

Table 5. Non-safety Training, Meeting & Workshop Attendance - 1994.

EVENT	DATE(S)	EMPLOYEE(S)
Managing Projects, Priorities and Deadlines	1/24	Early
Quality Improvement Questionnaire Brief	2/14	Early, Rizzi, Whitehill
Compatibility and NEPA Training	2/29-3/04	Early, Whitehill
Accessibility Training	4/20-22	Whitehill
Wilderness Training	4/24-29	Early
Initial Factory Check Ride - CIA-1 Husky	5/11	Martin
Annual Wheel Check - CIA-1 Husky	5/11	Martin
Annual Float Check - CIA-1 Husky	5/25	Martin
Annual Ski Check - PA-18 Super Cub	10/24	Martin
Western Interior Regional Council Meeting	10/27-28	Whitehill
R-7 Environmental Education Workshop	10/17-21	Whitehill
Alaska Partners in Flight Meeting	12/06-07	Zirkle
Alaska Project Leaders Meeting	12/12-15	Early, Whitehill

A group of three Russian professional land managers and administrators visited refuge field offices in Alaska following classroom instruction in Washington D.C. The group was taking part in the Fish and Wildlife Service's "Protected Areas Management Training Course for Russians" organized by Steve Kohl of the Office of International Affairs. They visited Kanuti, Yukon Flats, Koyukuk/Nowitna and Selawik refuges from June 20 to July 1. A briefing was held in Fairbanks on Yukon Flats and Kanuti refuges prior to their field assignments. They visited Kanuti at Bettles from June 23-26. A community pot luck was held in Bettles in their honor with about 50 community people participating. We discussed several field projects with them and showed them several aspects of field operations.

Director Mollie Beattie visited Fairbanks on July 15 and held an all Fish and Wildlife Service employee meeting.

A Fairbanks FWS Project leaders meeting was held in October to discuss several items of concern including parking, pilot sharing, office space, and warehouse space.

The Bureau of Land Management held the first Dalton Highway (pipeline) Corridor meeting in October. This is intended to become a working group to discuss issues and concerns for the corridor. The Dalton Highway was opened to the public officially on December 1.

A refuge staff meeting was held in Bettles in December which gave the staff an opportunity to attend the annual Bettles Christmas party on December 21. The party was held this year at our office and was a great success with practically everyone from town showing up.

F. HABITAT MANAGEMENT

1. General

The vegetation of Kanuti Refuge was mapped for the Comprehensive Conservation Plan, which was finalized in 1987, at the 1:250,000 scale using a July 1979 Landsat photo. Table 6 reflects the vegetation class and associated acreage for the entire area encompassed by the refuge based on this photo. It should be noted that since 1979 several hundred thousand acres have burned on the refuge.

Table 6. Relative Abundance of Vegetation Classes on Kanuti Refuge - 1979.

VEGETATION CLASS	ACRES
Open needleleaf forest	10,900
Needleleaf woodland	751,000
Broadleaf forest	173,600
Mixed forest	17,300
Closed broadleaf scrub	48,600
Open broadleaf scrub	94,400
Prostrate dwarf shrub tundra	6,100
Dwarf shrub-graminoid tundra	27,300
Dwarf shrub-graminoid tussock peatland	435,100
Graminoid marsh	14,800
Aquatic forb	31,000
Clear water	11,200
Turbid/shallow water	3,000
Scree - scarcely vegetated	300
Floodplain - scarcely vegetated	7,500
Cloud/Snow	1,200
Cloud/Shadow	1,700
	TOTAL: 1,635,000

The vegetation on the refuge is part of the circumpolar northern coniferous forest which extends south from the Brooks Range into Canada. On Kanuti, forests dominate at levels below the 3,200' treeline elevation. Open stands of black spruce are particularly common in low-relief terrain. White spruce, occasionally growing with white birch and aspen, can be

found in better drained and warmer sites. Willow, dwarf birch, lingonberry, Labrador tea, and alder are common on most sites. Feathermoss carpets the ground in well-drained areas and in forests. Poorly drained wetlands consist primarily of tussocks of sheath cottongrass. Above treeline, dwarf birch, willow, lingonberry, crowberry, and white mountain avens predominate.

Overlooking the Kanuti River on the refuge's eastern boundary.
5/94 B. Whitehill

Wildfire is the only major terrestrial habitat management tool on Kanuti Refuge. Projects related to habitat management are discussed in the fire management section (see Section F.9).

2. Wetlands

Wetland management on Kanuti Refuge is indirect. There are no water or pond manipulation projects. Water quality is monitored (see Section D.4), and we hope to install snow courses and water flow gauges to document the importance of insuring periodic flooding and natural flow patterns in the major drainages. The water and snow levels will be compared to duck brood distributions and densities; moose, marten and wolf distributions; fish populations, etc.

Barry Whitehill investigates the source of the Kilolitna River.
6/94 R. Brubaker

Wildfire Effects on Limnology and Waterbirds

In 1990 through 1992, over 460,000 acres were burned by wildfires on Kanuti Refuge. Water samples were collected from pairs or groups of burned and unburned lakes in 1991, 1992 and 1993 to obtain baseline figures for the wetland characteristics that affect waterbird densities. Waterfowl were censused on the lakes in August 1992 and 1993. The project objectives are:

1. Determine if fires around lake and wetland margins affect the flow of nutrients into the wetlands;

2. Determine if an increased flow of nutrients into wetlands from fire influences waterbird densities on the wetlands; and

3. Predict the effects of the Alaskan fire management zone strategies on nutrient flow in aquatic systems, and the consequent effects of the strategies on waterbird use of wetlands.

The project is divided into two phases. The objective of the first phase is to collect baseline limnological and waterbird density information from refuge wetlands with unburned and recently-burned margins. The objectives of the second phase are to recruit a cooperative education Master's degree student to evaluate the baseline data, develop a project to monitor the nutrient flow and waterbird densities in the sampled lakes, and determine the potential effects the fire management strategies have on wetlands and waterbirds. A summary report for the project will be prepared in 1995.

Wetlands on the Kanuti River flats.
9/94 P. Martin

3. Forests

Most of the refuge is boreal forest and taiga. The area is a complex of small, diverse plant

communities formed by many physical, seral and fire factors. Predominant plant communities include closed forests of white spruce/paper birch on uplands, and white spruce/cottonwood along the Koyukuk River. Poorly-drained areas support open black spruce forests with sphagnum moss/sedge/grass under stories. Muskegs cover much of the lower valleys. In wet areas, muskegs grade into treeless bogs dominated by small shrubs. Tall shrub thickets occur along water courses and on some upland sites.

9. Fire Management

Burning history, pre-suppression vegetation and fire ecology are essentially undocumented for Kanuti. "Normal" burn rotations for open black spruce-lichen forest, closed black spruce forest and white spruce forest in Interior Alaska are estimated to be 30, 100 and 300 years, respectively. It is, nevertheless, impossible to accurately evaluate the ecological impacts of 40 years of fire suppression.

Fireweed growth on 1990 burn south of Fish Creek Lake.
7/94 P. Martin

Kanuti National Wildlife Refuge lies within an area that has had active fire suppression on all fires from about 1940 through 1983. As with much of the Alaskan Interior, Kanuti experiences low precipitation, high summer temperatures and frequent lightning strikes. Most of the area was probably a fire dependent ecosystem prior to suppression activities.

Recently, philosophical and economic changes in Alaska fire management have occurred. Suppression activities have been reduced because of high suppression costs and a more balanced attitude toward fire management. These actions have made prescribed burning a management option in refuge areas not encumbered with inholdings. Prescribed burns are the most powerful and, in some cases, the only habitat management tool available.

The Alaska Interagency Fire Management Council functions to develop fire management solutions through guidance in cost-effective fire protection and in coordinating regional interagency fire management plans. Through the cooperation of all landowners, the Seward/Koyukuk Fire Plan was implemented in April 1984. This fire plan established the refuge's general fire plan by delineating Limited, Modified and Full protection areas (Figure 2).

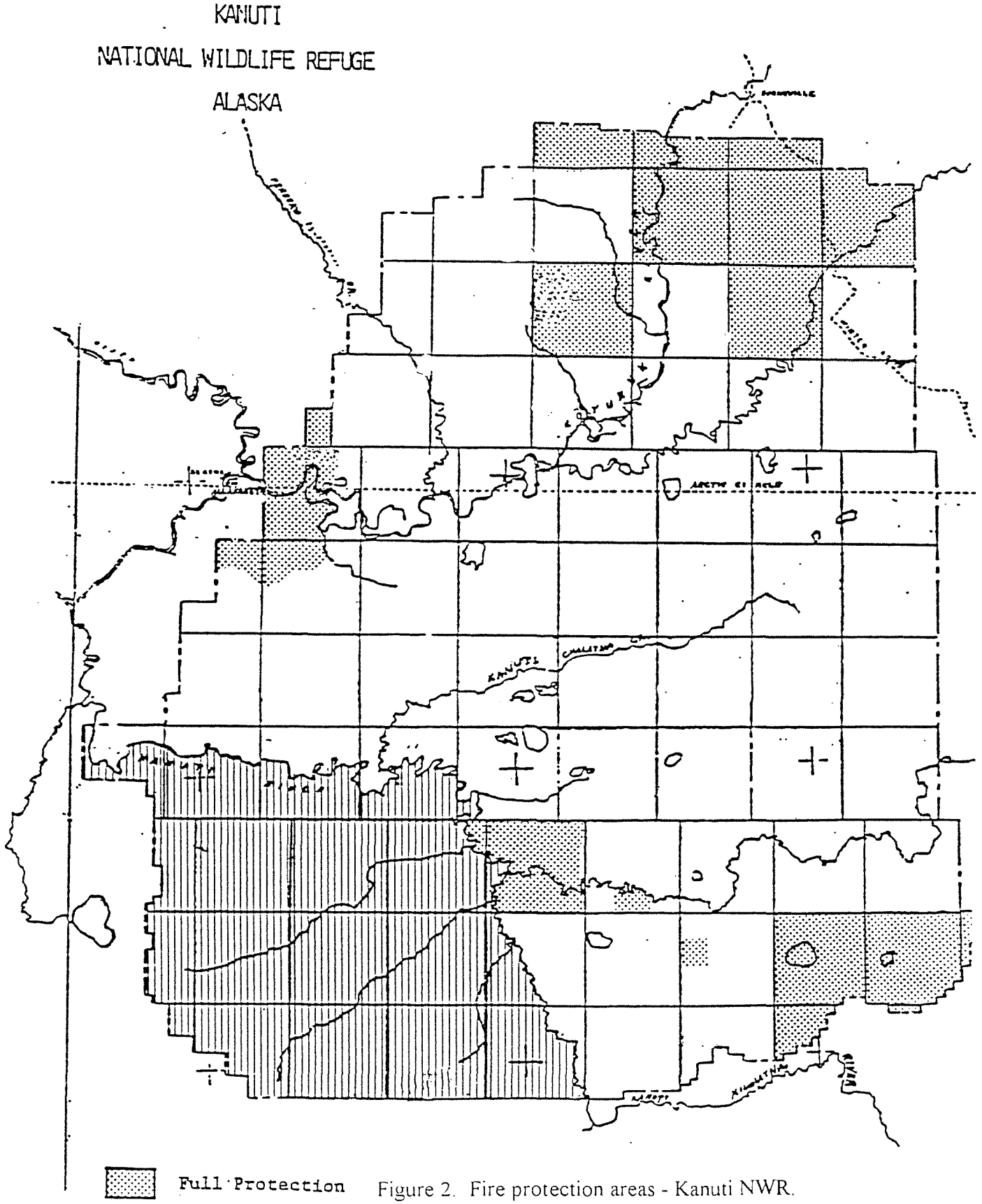


Figure 2. Fire protection areas - Kanuti NWR.

Dry weather created fairly hot burning conditions early in the fire season; however wet weather late in June shut down the fires for the rest of the year. Three fires were reported on the refuge during the year, and all were attributed to lightning. The fires burned about 6,700 acres on refuge, with nearly 90% of that acreage burned before June 15th. One fire also burned 3,446 acres of Doyon Corporation land. The 1994 fire season on the refuge is summarized in Table 7.

Table 7. 1994 Fire Season on Kanuti NWR.

Fire #	Suppression Category	Size in Acres	Suppression Cost	Discovery Date
A203[1]	Modified	4,795	1,149.94	6/08/94
A235	Limited	1,984	727.16	6/10/94
A537	Limited	5	890.81	8/06/94
	TOTAL:	6,784	$2,767.91	

[1] fire also burned 3,446 acres of Doyon Corporation lands.

Fire A203 was discovered on June 8th at 0.8 acres. The fire was located in a modified protection zone, but it was not suppressed because of low values at risk, and because surrounding burns and natural fire breaks were likely to contain the fire. Gary Lee, Land Manager of the Doyon Corporation, concurred with the decision. On June 10th, fire A203 was at 40 acres, and a new fire, number A235 was discovered burning in limited protection at 80 acres. Dry conditions contributed to fairly rapid growth of both fires. On June 12th, both fires were reported at 250 acres, and A203 was reported as "running and crowning" in spruce and hardwoods. On the 13th, A235 was at 1,252 acres, and on the 14th, strong winds pushed A203 to 10,237 acres. Starting on the 13th numerous calls were received from Allakaket residents requesting that the fires be put out. The smoke plumes were visible from the village and their fire crews were not working. However, wet weather followed for the next two weeks, which greatly suppressed fire behavior. On June 29th, A203 was at 10,940 acres and A235 was at 1,984 acres. Neither fire grew after that, and the fires were declared out on July 15th and July 18th, respectively without direct intervention by fire crews..

On August 6th, a 3-acre fire was discovered in limited protection near Bettles. The fire exhibited little activity and was declared out ten days later at 5 acres.

The Alaska consolidated interagency fire management plan allows fires in modified protection to be monitored and not suppressed if suppression costs are not warranted. This reasoning was used in the decision to not attack fire A203. In such an instance, the plan calls for that area's modified designation to be evaluated for appropriateness before the next fire season. Refuge staff discussed changing parts of the refuge from modified protection to limited protection with AFS personnel, and will meet with adjacent landowners next year to achieve some changes.

Fire costs were about $2,800, almost entirely for detection and monitoring flights. That amount is about half the amount one air tanker drop would cost and is about one-fourth the amount to fly in a hand crew and have them do one day of work. This thriftiness is highly fitting in this time of cut-backs. However, since bush villages derive major portions of their cash income from their residents whom are firefighters, it is unpopular in the villages to have Limited Suppression, especially when there are not many fires burning for crews to fight.

Kanuti staff submitted information on the refuge in January to be incorporated into the Firepro computer program.

On March 29, Kanuti and Yukon Flats refuges met with Mike Silva, Fire Management Officer for the Alaska Fire Service Tanana and Yukon Zones to discuss procedures for the 1994 fire season. The two zones were combined this year for the first time and the main goal of the meeting was to make the seasons operations and communications as efficient as possible.

The joint Kanuti, Yukon Flats and Arctic refuges' Fire Management Officer position was vacated by FMO Deines and readvertised. The position description and performance standards were revised to reflect greater refuge-wide sharing of fire duties and responsibilities. The position was filled on June 26 by Perry Grissom. Martin gave Perry Grissom a tour of the refuge on September 23. They looked at several different-aged burns, small mammal and vegetation transects, visited Kanuti Lake Cabin and toured the Bettles facilities.

In September an end of the season meeting was held with the Alaska Fire Service and all agencies to discuss events of the summer, appropriate and inappropriate responses, individual fires, etc.

Long-term Effects of Large Wildfires on Vegetation Communities and Fuels
The objectives of the project are:

1. Install intensive transects in burned and unburned stands that represent the major vegetation and fuels types on the refuge;

2. Develop a fuels maps for the refuge;

3. Use the information from the intensive transects to predict vegetation and fuels responses to prescribed fires. Develop recommendations for types of prescribed fires to create fire breaks around allotments, inholdings and administrative facilities on Kanuti refuge;

4. Work with land owners, adjacent villages and the Alaska Fire Service to change much of the area on Kanuti Refuge that is currently in the "Modified" fire management zone to a "Limited" classification. The vegetation and fuels information and the prescribed

fire recommendations will be used to determine appropriate areas to reclassify, and to assist land owners with deciding how to protect their property while meeting our goals for habitat management; and

5. Relate long-term changes in vegetation to results from small mammal and water quality inventories collected concurrently from adjacent stands and water bodies.

Patsy Martin conducting vegetation transect surveys.
6/94 P. Lovely

Eight vegetation and fuels transects were established, sampled and photographed in 1991. The transects were established in different vegetation types representative of the dominant types on the refuge (Table 8). All the transects were sampled in 1992. Transects 1, 3, 4, and 5 were sampled and photographed in 1993. Transects 3, 4, 6 and 7 were sampled in 1994. Transects 3 and 4 were sampled annually because they were adjacent to small mammal

trapping grids. The results of the vegetation transects will be compared to the small mammal results. Transects 2 and 8 were control transects in vegetation types that were not burned by the 1990 fire. They will be sampled at longer intervals than the burned transects because changes will not occur as rapidly on the unburned transects.

Table 8. Vegetation types of eight vegetation succession and fuels monitoring transects established in 1991 on Kanuti National Wildlife Refuge after a 1990 wild fire. Numbers in parentheses refer to Level IV vegetation classifications from Vierek et al. 1992.

Transect Number	Vegetation Type
1	Black Spruce Woodland (I.A.3.d)
2	Black Spruce Woodland (I.A.3.d)
3	Closed Spruce-Paper birch forest (I.C.1.a)
4	Open Black Spruce Forest (I.A.2.f)
5	Closed Quaking Aspen-Spruce Forest (I.C.1.d)
6	Open Low Shrub Birch-Ericaceous Shrub Bog (II.C.2.d)
7	Open Low Shrub Birch-Ericaceous Shrub Bog (II.C.2.d)
8	Open Low Shrub Birch-Ericaceous Shrub Bog (II.C.2.d)

Transects 1 and 2. Transect 1 represented much of the lowland, wet, non-riverine tussock cover type on the refuge. The organic layer was very thick. The permafrost was very close to the surface before the burn, but receded rapidly from less than 20 cm in 1991 to greater than 62 cm deep in 1993. The burn intensity on the transect was moderate with a few intense areas. Revegetation occurred at different rates depending on the burn severity (Photos 1-4). Transect 2 was an unburned control plot for Transect 1 (Photo 5).

Photos 1-5. Comparison of vegetation growth in one-meter square plots the first and third growing seasons after a wildfire in a black spruce woodland cover type on Kanuti National Wildlife Refuge.

Photo 1. Transect 1, Plot 3 - 1991. First growing season after wildfire-moderate burn.

Photo 2. Transect 1, Plot 3 - 1993. Third growing season after wildfire.

Photo 3. Transect 1, Plot 7 - 1991. First growing season after wildfire-intense burn.

Photo 4. Transect 1, Plot 7 - 1993. Third growing season after wildfire.

Photo 5. Transect 2, Plot 5 - 1991. Unburned, control transect for Transect 1.

Transect 3. Fire intensity on transect 3 was moderate to severe. Before the 1991 fire, the Transect 3 site was dominated by medium-diameter (12-20 cm) paper birch trees with some white spruce and a few large-diameter paper birch "nurse" trees that survived the last fire. It was representative of much of the upland mixed forest cover type on the refuge.

The birch trees blew down shortly after the fire. A thin organic layer (less than 3 cm) was covered by a thick (1-3 cm) layer of ash. In 1991, the first growing season after the fire, the ground was covered by a thick layer of liverworts growing on the ash. The soil was slightly moist, and the liverworts were exceedingly slippery. Liverworts and rosettes of small fireweed plants were the only vegetation in the plots (Photo 8).

By the second growing season (1992), most of the liverworts on Transect 3 were dried but still present, and the site was dominated by beautiful blooming fireweed 45-60 cm high. The soil was no longer slippery from the ash (Photos 6 and 9).

During the third growing season (1993), the fireweed was still present and dominant, but little of it was blooming (Photos 7 and 10).

By 1994, paper birch and spruce seedlings were common in the vegetation plots. The fireweed bloomed again in 1994 with a flourish. The liverworts that were abundant on the ash-covered soils in 1991 were dead in 1994.

Photo 6. Transect 3 - 1992.
Fireweed bloomed.

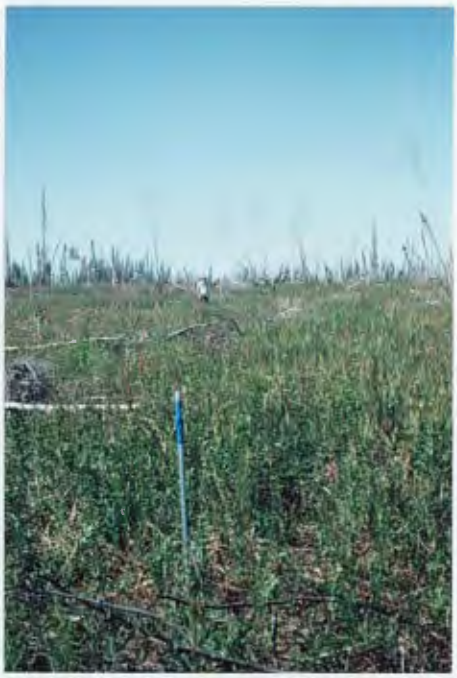


Photo 7. Transect 3 - 1993
Fireweed bloom limited.

Photos 8-10. Comparison of liverwort and fireweed growth in one-meter square plots after a wildfire in a closed spruce-paper birch cover type on Kanuti National Wildlife Refuge.

Photo 8. Transect 3, Plot 7 - 1991. First growing season after wildfire-liverwort growth.

Photo 9. Transect 3, Plot 7 - 1992. Second season after wildfire-fireweed growth.

Photo 10. Transect 3, Plot 7 - 1993. Third season after fire. Fireweed reduced. Liverworts dead.

Transect 4. Transect 4 represented a majority of the needleleaf forested areas on the refuge. These very flammable, 50- to 75-year-old stands were dominated by small-diameter (less than 2.5 cm) black spruce with a thick organic layer and shallow permafrost before the fire. The permafrost receded rapidly after the burn from 10 cm to over 50 cm.

Downed trees on the ground from the previous fire were the same diameter as the dead standing trees from the 1990 fire which indicated that the stand was approximately the same age when it burned in 1990 as it was the last time it burned. In other words, the length of the fire cycle was the same.

Patrick Lovely conducting a survey of Vegetation Transect 4.
6/94 P. Martin

Burn intensity on Transect 4 was moderate to severe. The thick *Sphagnum* moss layer was unevenly burned, and the lichens were killed by the fire. Willows were common on the site by 1994 (Photos 11-16).

Transect 4 was adjacent to small mammal trapping Grid 3. Transect 3 was in the middle of small mammal Grid 1. Preliminary analyses of the small mammal data indicated that meadow voles were more common around Transect 3, but tundra voles were more common around Transect 4. Red-backed voles and masked shrews were common on both sites.

Photo 11. Transect 4- 1991

Photo 12. Transect 4 - 1994

Photos 13-16. Comparison of vegetation growth in one-meter square plots after a wildfire in an open black spruce forest cover type on Kanuti National Wildlife Refuge.

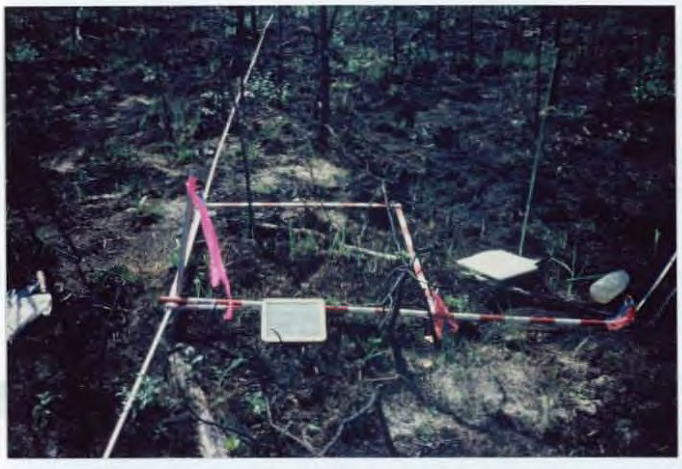


Photo 13. Transect 4, Plot 5 - 1991. First growing season after wildfire-moderate burn.

Photo 14. Transect 4, Plot 5 - 1994. Fourth season after wildfire.

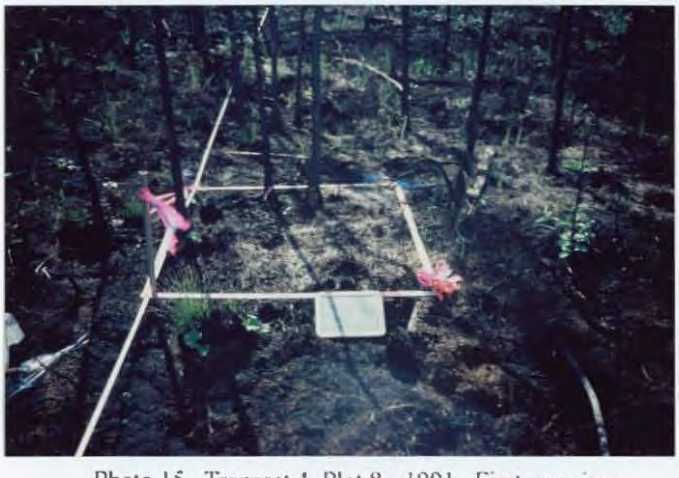


Photo 15. Transect 4, Plot 8 - 1991. First growing season after wildfire.

Photo 16. Transect 4, Plot 8 - 1994. Fourth growing season after wildfire.

Transect 5. Transect 5 represented the upland, spruce-dominated cover type on shallow, well-drained soils with a very thin organic layer. It burned in early July when the wildfire first started. The burn intensity was very light. It resembled an under story controlled burn. Even though the burn intensity was light, most of the thin organic layer was consumed, and plant cover on the soil was sparse three years after the fire (Photos 17-18). Quaking aspen suckers were common in the stand by 1993. Transect 5 was the only transect where forbs other than fireweed were common.

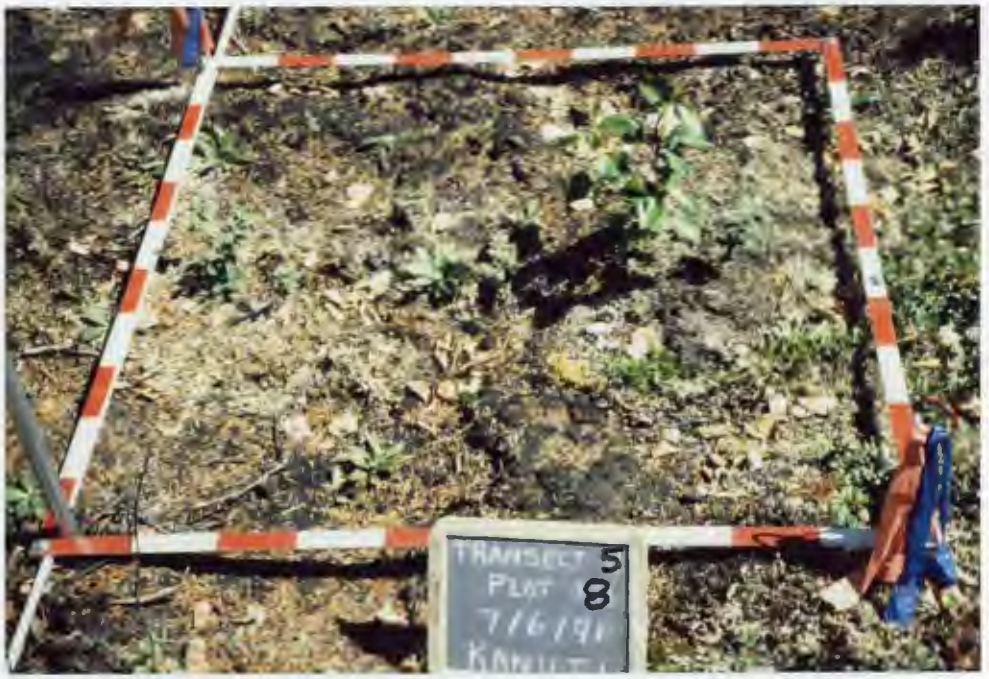


Photo 17. Transect 5, Plot 8 - 1991. First growing season after wildfire - light intensity burn on dry, shallow soil with rocky substrate.

Photo 18. Transect 5, Plot 8 - 1993 Third growing season after wildfire.

TRANSECTS 6, 7, AND 8. Transects 6, 7 and 8 represented different burn intensities of a low shrub bog type. Transect 6 was a moderate-to-severe burn, Transect 7 was light-to-moderate, and Transect 8 was an unburned control for Transects 6 and 7. Each of Transects 6, 7 and 8 have only 5 plots instead of 10. The size of the area and variability of the burn would not accommodate 10-plot transects.

The dwarf birch and Labrador tea responded impressively to the fire, even on the more severely-burned Transect 6. (Photos 19-21). However, some areas were still unvegetated in 1994, especially on Transect 6.

Photo 19. Transect 6, Plot 4 - 1991. First growing season after wildfire.

Fig. 20. Transect 6, Plot 4 - 1994. Fourth growing season after wildfire.

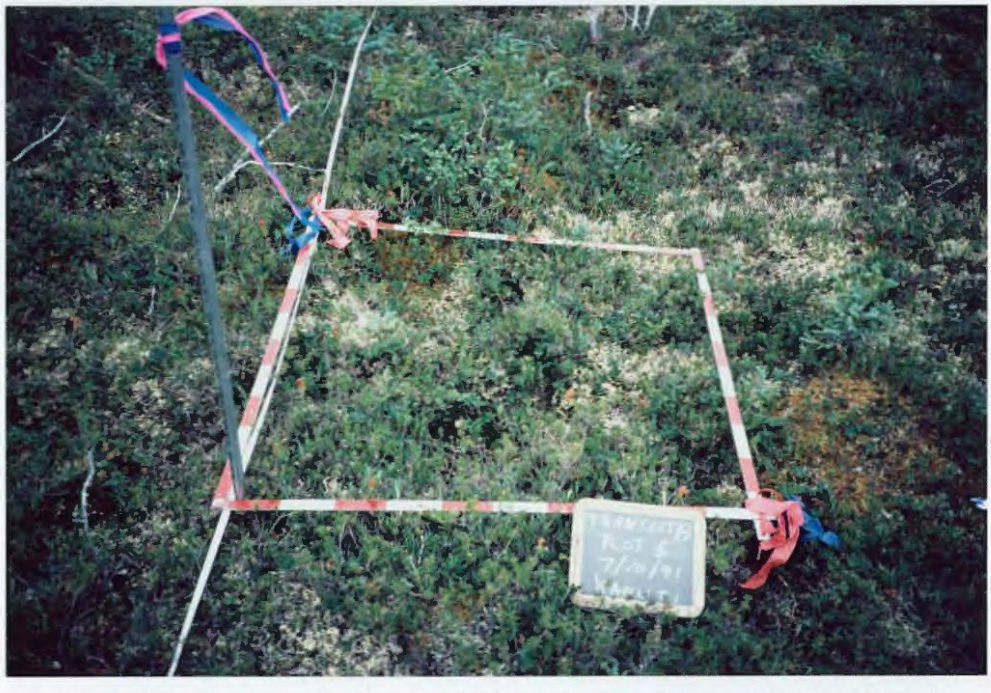


Photo 21. Transect 8, Plot 5 - 1991. Control transect for Transect 6.

11. Water Rights

The regional office is currently involved with a plan to establish water rights for Alaskan refuges. A prioritized list of streams was furnished in the later part of 1984. Projects have been proposed to monitor water flow and levels within the refuge to establish base data and thus support Kanuti water rights. Stream flow gauges and snow courses are planned but to date no funding has been available.

12. Wilderness and Special Areas

Part of Kanuti Refuge was considered for wilderness classification in one alternative of the Comprehensive Conservation Plan. This alternative was not the preferred and none of the refuge is classified as wilderness.

Early attended the Alaska Interagency Wilderness Training for Land Managers in Cooper Landing, Alaska on April 24-29. The session was sponsored by the Arthur Carhart National Wilderness Training Center. The session was an excellent course providing both practical and classroom sessions which gave various perspectives of wilderness management.

G. WILDLIFE

1. Wildlife Diversity

Prior to the establishment of the refuge, there was little documentation of flora and fauna. Over the years, the list of species, their status and habitat affinities has grown, but there is much more to be learned.

In 1988, the "Kanuti National Wildlife Refuge Bird List" was published and is included in the back of this report. The "list" includes 157 species, of which only 122 have been seen on the refuge. The birds that have never been positively identified on the refuge are mainly species migrating to and from the coast. We believe many of these birds pass through the refuge on their journey, such as the dunlin that was seen on the Kanuti River in May (see Section G.5). In addition to the birds, an estimated 34 mammals and 16 fish species occur within the refuge.

Early and Martin attended a biological workshop in Anchorage from January 10 through 13. This was the initial meeting in an effort to establish more standardized wildlife and habitat monitoring techniques for refuges across the region. Various committees were established to work up monitoring techniques for key species, species groups, or habitats. Martin was selected as the chair of the Carnivore Committee and Early became the chair of the Habitat Committee.

2. Endangered Species

The American peregrine falcon (Falco peregrinus anatum) was removed from the list of threatened and endangered species effective November 4, 1994. This species is a breeder on the refuge. Two territorial pairs were sighted this year. One pair in the Kanuti River canyon and the other along the Kanuti River near the refuge's eastern boundary.

3. Waterfowl

Geese

Conservation of white-fronted goose populations is one of the refuge purposes. White-fronted geese from Kanuti are in the mid-continent flyway. The population is characteristic of Interior Alaska nesting goose populations: they are low density and distribution is not uniform.

Historically, the Kanuti River was known as a locally-important production area for geese, but numbers have apparently declined in the last 10-12 years. The refuge attempted several ways to identify nesting and brooding areas for white-fronted geese. None of the methods were successful. Motor boat surveys were used to define which areas of the river were most used by goose broods, but brooding areas were not identified. Molting white-fronted geese at Todatonten Lake west of the refuge were banded and collared for a number of years (see Section G.16), but collars were not relocated on the refuge.

The refuge would like to monitor goose production with an index survey precise enough to detect significant annual changes in the number of adults, and in the number of young produced in each area. In 1995, the refuge will radio collar 20 adult white-fronted geese. The radios will transmit until the end of August, turn off for the winter, then begin transmitting again in May, 1996. The radios will help the refuge identify nesting and brooding areas.

The river boat surveys will be continued, but surveys from non-motorized boats will be compared with motorized surveys, and with surveys from a PA-18 Super Cub to determine which methods will provide the most accurate information. The information from the radios and the river surveys will be used to write the white-fronted goose inventory plan for the refuge.

Geese arrived in Bettles in late April/early May. Canada geese were seen as early as April 24th while white-fronted geese were observed on May 6th.

During the Kanuti River float trip, May 22-31, white-fronted geese were observed frequently on the lower river. Flocks of 50-75 were feeding in the backwaters west of the canyon. This is a popular hunting area for the villagers from Allakaket/Alatna since it is only 20 miles from the town.

Geese were evident in the two Breeding Bird Surveys (BBS) as well. Thirteen white-fronted geese were counted on the Kanuti River route and fourteen Canada geese were seen on the Koyukuk River route (see Section G.7).

Other Waterfowl

The Breeding Bird Survey was a good representation of waterfowl using the Koyukuk and Kanuti Rivers during early summer. American wigeons have been the most abundant bird recorded on the Koyukuk River Breeding Bird Survey for the past two years with 122 birds seen in 1994. Green-winged teal, northern pintail, northern shoveler, and common goldeneye were also seen. On the Kanuti River BBS American wigeons, greater scaup and common mergansers were recorded (Tables 10-11). The refuge no longer conducts waterfowl brood surveys due to a lack of funding and changes in Migratory Bird Management Office survey techniques.

Both tundra and trumpeter swans were observed nesting on the refuge in 1994, but no surveys specific to swans were conducted.

4. Marsh and Water Birds

Information on the distribution and status of marsh and water birds is currently limited to observations recorded incidental to other field work and through the BBS and point counts (PC). Pacific and common loons, red-necked grebes, horned grebes and lesser sandhill cranes are among the common nesters on the refuge.

A Pacific loon was recorded on the Kanuti River BBS in an area where pairs have been seen for the past two years.

Sandhill cranes were recorded on the Kanuti River BBS and on the Bettles Road PC. Cranes arrived in Bettles on April 29th. A pair has nested right behind the Kanuti Bunkhouse for several years.

Red-necked grebes have been recorded on both the Broadleaf Forest PC and the Broadleaf Scrub PC in 1993 and 1994.

5. Shorebirds, Gulls, Terns and Allied Species

Information on shorebirds, gulls, and terns are also limited to observations recorded incidental to other field work and through BBS and PC. Bonaparte's gulls, spotted sandpipers, arctic terns semipalmated plovers, lesser yellowlegs, and mew gulls are common nesting species on the refuge.

During the May 22-31 Kanuti River float a dunlin was seen on the Kanuti River below the canyon. This is the first record of a dunlin observed on the refuge. Red-necked phalaropes and American dippers were observed on the float as well.

On both BBS routes spotted sandpipers were very common. Common snipe and lesser yellowlegs were fairly common on both routes. Semipalmated plovers were recorded on the Koyukuk River BBS.

Breeding pairs of whimbrels have been recorded in 1993 and 1994 on the Taiholman Tundra PC. Long-tailed jaegers breed in approximately the same area as the whimbrels. A pair was recorded on the Taiholman Tundra PC in 1994.

6. Raptors

At least nineteen different kinds of raptors are known to occur on the refuge.

On the May 22-31 float of the Kanuti River by refuge staff several raptors were seen. In the upper portion, to Kanuti Lake Cabin, two bald eagle nests with brooding adults and a pair of peregrine falcon defending a suspected nest site were noted. In addition, a golden eagle and numerous red-tailed hawks and great horned owls were observed. In the Kanuti River Canyon an intensive survey of raptors was initiated. A total of eleven birds were observed in approximately 20 river miles. Four great horned owls were seen flying along the river's edge. Two pairs of red-tailed hawks were observed near their nests and another was seen alone. An immature bald eagle was observed on a cliff and a peregrine falcon was seen circling high above its nest.

An immature bald eagle was recorded on the Koyukuk River BBS and a pair of red-tailed hawks were seen on the Kanuti River BBS.

Northern harriers are fairly common on the refuge. They are observed often while boating or walking about. Harriers have arrived in Bettles as early as April 23 in 1994.

Patrick Lovely taking part in bird surveys on the Kanuti River.
5/94 B. Whitehill

7. Other Migratory Birds

Fifty-eight species of passerine birds are thought to occur in the refuge. Thirty-nine species have thus far been observed. Most of these migrate outside Alaska to spend the winter. Some of the migrations cover long distances. Gray-cheeked thrushes from central Alaska winter in the Amazon Basin while Arctic warblers head to Southeast Asia.

Snow buntings were observed on March 30 in 1994. The mean first arrival of all migratory bird species occurs early in May and are shown in Table 9. Common waterfowl species tend to arrive a few days earlier than passerines.

Table 9. Mean Dates of Observed First Arrival of Migratory Birds Around Bettles, Alaska; 1987-1991 and 1994 Observations.

Species	Mean Date	1994
Swan spp.	7 May	-
Greater White-fronted Goose	6 May	6 May
Snow Goose	8 May	29 April
Canada Goose	23 April	22 April
Green-winged Teal	1 May	-
Mallard	28 April	28 April
Northern Pintail	1 May	29 April
Northern Shoveler	12 May	-
American Wigeon	3 May	29 April
Bufflehead	4 May	-
Common Merganser	3 May	-
Northern Harrier	7 May	22 April
Rough-legged Hawk	1 May	-
Peregrine Falcon	14 May	-
Sandhill Crane	1 May	29 April
Greater Yellowlegs	6 May	-
Lesser Yellowlegs	15 May	8 May
Yellowlegs spp.	2 May	1 May
Common Snipe	6 May	12 May
Long-tailed Jaeger	26 May	25 May
Mew Gull	2 May	30 April
Gull spp.	30 April	-
Northern Flicker	8 May	-
Horned Lark	4 May	24 April
Tree Swallow	2 May	11 May
Bank Swallow	26 May	10 May
Cliff Swallow	26 May	1 May
Ruby-crowned Kinglet	4 May	9 May
Gray-cheeked Thrush	27 May	16 May
Swainson's Thrush	27 May	18 May
American Robin	2 May	4 May
Water Pipit	1 May	-
Yellow Warbler	8 May	1 May
Orange-crowned Warbler	28 May	2 May
Yellow-rumped Warbler	4 May	21 May
Northern Waterthrush	27 May	20 May
Wilson's Warbler	14 May	23 May
American Tree Sparrow	27 April	20 May
Savannah Sparrow	11 May	23 May
Fox Sparrow	5 May	2 May
Lincoln's Sparrow	15 May	20 May
Golden-crowned Sparrow	5 May	16 May
White-crowned Sparrow	4 May	1 May
Dark-eyed Junco	30 April	-
Rosy Finch	3 May	-
Lapland Longspur	11 May	12 April
Rusty Blackbird	4 May	13 May

Zirkle continued neotropical bird work on the refuge that was initiated in 1993. Two breeding bird surveys were run, one on the Koyukuk River and another in the Kanuti River canyon between June 7 and 10. On the Koyukuk River 35 species were identified and on the Kanuti River route there were 36 species. The most abundant birds on the Koyukuk River were American wigeons and bank swallows, whereas on the Kanuti River the most abundant bird was the bank swallow. Tables 10 & 11 summarize the birds seen on the breeding bird surveys.

Table 10. Kanuti River Breeding Bird Survey - 1994.

SPECIES	TOTAL INDIVIDUALS	# STOP POINTS SEEN
Pacific loon	1	1
Greater white-fronted goose	13	4
American wigeon	2	1
Greater scaup	2	1
Common merganser	4	3
Red-tailed hawk	2	1
Sandhill crane	1	1
Lesser yellowlegs	4	4
Spotted sandpiper	30	22
Common snipe	15	13
Great horned owl	3	3
Belted kingfisher	2	2
Northern flicker	4	4
Olive-sided flycatcher	6	5
Alder flycatcher	34	24
Violet-green swallows	18	6
Bank swallows	80	8
Gray jay	3	2
Common raven	2	1
Black-capped chickadee	1	1
Gray-cheeked thrush	1	1
Swainson's thrush	39	31
Hermit thrush	4	4
Varied thrush	7	6
American robin	18	15
Bohemian waxwing	5	3
Orange-crowned warbler	8	7
Yellow warbler	33	24
Myrtle warbler	5	5
Blackpoll warbler	1	1
Northern waterthrush	20	18
American tree sparrow	1	1
Fox sparrow	8	8
White-crowned sparrow	30	26
Slate-colored junco	29	22
Common redpoll	15	12

Table 11. Koyukuk River Breeding Bird Survey - 1994.

SPECIES	TOTAL INDIVIDUALS	# STOP POINTS SEEN
Canada goose	14	2
Green-winged teal	1	1
Northern pintail	2	2
Northern shoveler	4	2
American wigeon	122	11
Common goldeneye	1	1
Bald eagle	1	1
Semipalmated plover	2	2
Lesser yellowlegs	8	5
Spotted sandpiper	13	13
Common snipe	8	8
Mew gull	2	1
Herring Gull	4	2
Olive-sided flycatcher	4	4
Alder flycatcher	6	6
Bank swallow	78	12
Gray jay	1	1
Ruby-crowned kinglet	3	2
Gray-cheeked thrush	1	1
Swainson's thrush	42	35
Hermit thrush	1	1
Varied thrush	5	5
American robin	6	4
Orange-crowned warbler	8	8
Yellow warbler	24	21
Myrtle warbler	6	6
Blackpoll warbler	2	1
Northern waterthrush	16	14
American tree sparrow	2	2
White-crowned sparrow	13	12
Savannah sparrow	1	1
Fox sparrow	4	2
Slate-colored junco	5	5
Rusty blackbird	1	1
Common redpoll	6	5

Alaska Off-Road Point Counts were set up on two mile transects through different habitats - needleleaf forest, broadleaf forest, broadleaf scrub, tundra and several burned habitats. Seven Point Counts were run in 1994, three for a second year. Interesting observations had to do with the burn/non burn comparisons. The burned habitats seemed to support significantly more bird numbers. Table 12 summarizes species and number seen on each Point Count route.

Table 12. Species and Total Individuals Seen for Each Point Count - 1993 vs 1994.

BROADLEAF DWARF SCRUB

SPECIES	TOTAL INDIVIDUALS 1993	TOTAL INDIVIDUALS 1994
Swainson's thrush	22	11
Dark-eyed junco	11	13
Gray jay	4	-
American robin	7	6
Alder flycatcher	3	4
Olive-sided flycatcher	-	4
Common redpoll	9	3
White-crowned sparrow	21	14
Fox sparrow	8	11
Northern flicker	3	1
Common raven	-	1
Gray-cheeked thrush	-	10
Orange-crowned warbler	-	6
Yellow warbler	-	3

TUNDRA

SPECIES	TOTAL INDIVIDUALS 1993	TOTAL INDIVIDUALS 1994
Swainson's thrush	9	8
Dark-eyed junco	7	8
Alder flycatcher	5	1
Olive-sided flycatcher	-	7
Gray jay	2	1
White-crowned sparrow	5	13
Short-eared owl	1	-
Red-necked grebe	2	-
White-winged crossbill	3	1
Long-tailed jaeger	2	2
Whimbrel	2	2
Yellow-rumped warbler	5	-
Black-capped chickadee	1	-
Boreal chickadee	-	1
Black-polled warbler	4	2
Common redpoll	2	5
Fox sparrow	4	1
Wilson's warbler	3	-
Orange-crowned warbler	2	-
Northern flicker	-	1
Rusty blackbird	-	4
American tree sparrow	-	2
Lincoln sparrow	-	2

NEDDLELEAF

SPECIES	TOTAL INDIVIDUALS 1993	Not run in 1994
Dark-eyed junco	14	
Olive-sided flycatcher	9	
Common redpoll	11	
Swainson's thrush	14	
Gray jay	15	
Yellow warbler	1	
Black-capped chickadee	3	
Wilson's warbler	1	
Varied thrush	1	
Ruby-crowned kinglet	4	

KOYUKUK NEEDLELEAF

SPECIES	TOTAL INDIVIDUALS 1994	Not run in 1993
Common redpoll	22	
Gray jay	1	
Ruby-crowned kinglet	9	
Swainson's thrush	10	
Varied thrush	1	
Hermit thrush	1	
American robin	2	
Northern waterthrush	1	
Dark-eyed junco	12	

BROADLEAF FOREST

SPECIES	TOTAL INDIVIDUALS 1993	TOTAL INDIVIDUALS 1994
Swainson's thrush	16	21
Varied thrush	-	6
Bohemian waxwing	-	2
Spruce grouse	1	-
Common redpoll	2	20
Gray jay	7	5
Red-necked grebe	1	1
White-crowned sparrow	2	3
Alder flycatcher	1	1
Dark-eyed junco	7	15
American robin	2	-
Yellow-rumped (Myrtle) warbler	1	3
Yellow warbler	-	1
Common raven	-	1
Black-capped chickadee	-	1
Boreal chickadee	-	3

KOYUKUK BURN

SPECIES	TOTAL INDIVIDUALS 1994	Not run in 1993
Swainson's thrush	4	
Varied thrush	2	
Dark-eyed junco	13	
Alder flycatcher	8	
White-crowned sparrow	34	
American tree sparrow	4	
Fox sparrow	5	
Myrtle warbler	1	
Yellow warbler	1	
Common redpoll	40	
Common snipe	5	
Three-toed woodpecker	3	
Northern flicker	1	
Gray jay	2	

TUNDRA BURN

SPECIES	TOTAL INDIVIDUALS 1994	Not run in 1993
Swainson's thrush	5	
American robin	1	
Slate-colored junco	3	
Alder flycatcher	3	
Olive sided flycatcher	1	
White-crowned sparrow	33	
American Savannah sparrow	1	
Savannah sparrow	2	
Fox sparrow	3	
Yellow warbler	1	
Northern waterthrush	3	
Common redpoll	12	
Three-toed woodpecker	5	
Northern flicker	3	
Boreal chickadee	5	
Canada goose	3	
Northern pintail	1	
Greater scaup	2	
Common merganser	1	
Lesser yellowlegs	18	
Common snipe	13	
Tree swallow	4	
Common raven	1	
Rusty blackbird	9	

BETTLES ROAD

SPECIES	TOTAL INDIVIDUALS 1994	Not run in 1993
Swainson's thrush	4	
American robin	3	
Dark-eyed junco	11	
Alder flycatcher	15	
White-crowned sparrow	26	
American tree Sparrow	3	
Myrtle warbler	1	
Yellow warbler	6	
Common redpoll	20	
Fox sparrow	1	
Orange-crowned warbler	7	
Common raven	4	
Common snipe	4	
Sandhill crane	2	
Cliff swallow	1	
Bank swallow	3	

8. Game Mammals

Moose

Pound for pound the moose is the second most important subsistence species on the refuge after salmon. Most of the moose harvested are taken by local residents. Moose hunting by nonresidents of Game Management Unit 24 is not allowed by the State in the Kanuti Controlled Use Area which takes in most of the refuge.

A complete aerial moose census was last conducted on the refuge in November 1993. The estimated size of the moose population in the 2,644 square mile survey area was 1,759 (90% Confidence Interval +/- 22%). The sightability correction factor was 1.14, so the total population estimate was 2,010. The estimated moose density for the survey, using the sightability correction factor was 0.76 moose/mi^2. The population estimate and the density were higher than the estimates from a similar census done on the refuge in 1989. However, the upper limits of the confidence interval estimate in 1989 overlapped the lower limits of the 1993 estimate. The sightability correction factor in 1989 was an unexplainable 1.00. The area surveyed in 1993 was slightly larger than the area in 1989, but many of the subunits were the same.

It appears that the population is stable, or slightly increasing. Another census is planned for 1998 that will duplicate the 1993 census exactly so population trends can be determined.

Cow moose trying to shake a trailing black bear.
5/94 B. Whitehill

Caribou

Kanuti Refuge is mandated by Alaska National Interest Lands Conservation Act (1981) to assist with inter-agency studies and management of the Western Arctic Caribou Herd (WACH). The number of animals using the refuge has been monitored with periodic flights during the winter since 1990. The monitoring flights meet the requirements of the mandate. At present no more in-depth work is planned. Table 13 reflects the monitoring flights done for caribou in 1994.

In the late 1960's and early 1970's, caribou assumed to be from the Western Arctic Caribou Herd (WACH), migrated down the Wild and John Rivers onto the Kanuti flats each year. Some years they wintered there; other years they passed through and continued up the Alatna River. In the 1970's and 1980's, caribou use on the flats dwindled and became erratic. In

1985, 1,500-3,000 caribou migrated down the Wild River and spent about three weeks on the refuge.

More caribou have been using the refuge in the 1990's, but the numbers still fluctuate from year to year. In 1990, 200-500 animals wintered in two groups on the refuge. In November of 1992, around 60,000 animals migrated down the John River and spread out over the western Kanuti flats. Radio collars on animals in the herd suggested that the concentration was mostly WACH animals, but there were also some animals from the Central Arctic and Porcupine herds in the group. Most of the animals spent less than two weeks on the refuge, and then moved up the Alatna. However, about 1,200-2,000 animals wintered on the refuge in the Chalatna drainage and moved south toward Indian Mountain in late April and early May of 1993.

In the fall of 1993 and early 1994, a few hundred caribou wintered just east of the refuge, and about 200 wintered in the Kanuti River drainage. The WACH apparently used the refuge very little in winter, 1994-1995. Less than 50 animals spent the winter west of the Koyukuk River. None were seen in the Chalatna drainage where small concentrations had spent the previous two winters.

Table 13. Caribou surveys on Kanuti NWR - Winter 1994-1995.

Date	Number Seen	Location
11/15/94	0	
12/12/94	12	W. Koyukuk River, N. Hawzerah Lake
2/7-8/95	0	
3/06/95	0	

The fluctuations in caribou use on the refuge have not coincided with fluctuations in the size of the WACH herd. In the early 1970's, the herd size was about 240,000. It declined to 75,000 in 1976, but has grown steadily since then. In 1992, the herd size was estimated at 540,000 with an annual growth rate of 20%.

The caribou are an important source of food for wolves when they are on the refuge. Numerous kills and wolves are seen around most of the concentrations.

Wolves

There is no information on the current status of wolves on the refuge other than that gathered incidental to other refuge work. The 5 year, 1990-1994 wolf study was never fully funded, and received no funding in FY-93 or FY-94. The data acquired during the wolf project in 1990-1992 was finally compiled and analyzed. A final report is due out early 1996.

Several caribou kills were observed in March along the Bettles winter road and wolf sign

was commonplace on the Bettles/Allakaket trail, especially in the Henshaw Creek drainage. During the neotropical bird work in June much wolf sign was found around Taiholman Lake, including what looked like a den site.

Local trappers estimate Kanuti wolf population to be quite healthy. A trapper on the eastern border of the refuge caught 8 wolves in 1994 and Allakaket trappers caught at least one.

Wolf and grizzly tracks along the Kanuti River.
5/94 B. Whitehill

Black and Grizzly Bear

Both species of bear occur on the refuge, but in unknown numbers. Minimal biological information exists for grizzly and black bears at northern latitudes and known techniques for censusing bear populations are very expensive.

The federal government took over managing the game guide system on federal lands in 1993. Prior to this, the State managed the guides. Under the new system, Kanuti got its first game guide, and a grizzly bear harvest limit was written into the Special Use Permit.

Several bears were observed in 1994. During the Kanuti float in May, three black bear and a grizzly with two cubs were seen. The privy at the Kanuti cabin was vandalized by a bear in the springtime. In July a black bear walked into the goose banding site on Todatonden Lake.

10. Other Resident Wildlife

Lynx, pine marten, wolverines, mink, river otter, red fox, snowshoe hare, arctic ground squirrel, beaver, muskrat, weasel, hoary marmot, red squirrel, porcupine and a host of smaller mammals occur on the refuge in unknown numbers. Willow ptarmigan, spruce, sharp-tailed and ruffed grouse have been seen and probably nest on the refuge. Rock and white-tailed ptarmigan are seen in the lowlands in the winter and probably occur on the higher elevation areas of the refuge in the summer. Other resident bird life include common and hoary redpolls, black-capped and boreal chickadees, gray jays and common ravens, which are especially noticeable in winter. The wood frog is occasionally encountered during field work, but only enough to serve as a reminder that the amphibian family is represented on the refuge.

Small Mammal Inventory and Monitoring. Two of the purposes listed in the Alaska National Interest Lands Conservation Act (1980) for Kanuti National Wildlife Refuge are to conserve populations and habitats of furbearers, and to provide for continued subsistence use by local residents. Marten are the most abundant furbearers on the refuge, and they are the most important species for subsistence trappers.

Wildfires are the primary habitat influence on interior Alaskan Refuges, but their effects on marten populations are not understood. Some trappers report increased success the first year after a wildfire, others trap burns that are 15-25 years old. Still others claim that wildfires cause long-term declines in the numbers of marten they catch on their traplines. The answer may be that prey availability varies in different types of fires.

A project was begun on Nowitna National Wildlife Refuge to study the effects of wildfire on marten. Part of the project was to study microtine populations in different-aged wildfires. They sampled areas that were burned in 1985, 1966, and over 100 years ago. They did not sample a new burn. The vegetative changes that occur in a stand the first five years after a wildfire are dramatic, and some of the answers to differences in marten distributions may be explained by the changes that occur in those first few years. Therefore, Kanuti Refuge decided to sample microtines in stands that were burned by a large wildfire in 1990 to supplement the information obtained on the Nowitna study. The same sampling methods were used in both areas. In addition, Kanuti Refuge established intensive vegetation transects on or adjacent to the small mammal sampling grids. The objectives of the project are:

1. To see if small mammal populations vary over time in different vegetation types after a wildfire;

2. Relate changes in small mammal populations to changes in vegetation determined from intensive vegetation plots;

3. Predict effects of wildfire in different vegetation types on small mammal populations, and extrapolate those results to estimate effects of wildfire on marten populations; and

4. Collect small mammal study skins and frozen tissue samples for the museum at the University of Alaska, Fairbanks to be used for genetic and environmental pollution studies.

In 1991, the first growing season after a major wildfire, two permanent grids were established and sampled for small mammals in two vegetation cover types. One grid was sampled in 1992. The other was sampled for only one night because an early snow storm covered the traps and prevented the trappers from getting to the grid to sample it. In 1993, two more replicate grids were established and sampled. In 1994, two of the grids were sampled in late August, but record rainfall filled the pitfall traps with water, floated the snap traps, and generally soaked the trappers. The traps were pulled, then reset in September when the weather improved and the ground dried. All four grids were sampled in September.

Grids 1 and 2 were in a white spruce/paper birch cover type. Grids 3 and 4 were in a black spruce/sphagnum cover type. Each grid was 100 meters x 100 meters with 100 trapping stations located with an aluminum stake at 10-meter intervals. One metal cone pitfall and two snap traps were placed within 1.5 meters of each stake in trails or runs. Rolled oats and peanut butter were used for bait.

The numbers of animals captured and the capture rates were very low in 1994 compared to 1993 (Tables 14-16 and Figure 3). We initially thought it was because of the high rainfall and flooding in August, but mouse trappers from other areas in the Interior reported similar declines. Nowitna NWR had lower rates when they trapped in August than in previous years. Capture rates in Denali National Park and at Creamer's Field in Fairbanks were low June through August (E. Rexstad, pers. comm.). Rexstad thought it may have been related to low snow pack the previous winter. The small mammals would have been less insulated and more exposed to predators.

More red-backed voles were caught in snap traps than in pitfalls (Figure 4). Meadow voles were generally caught in pitfalls, except on Grid 4 in 1993 when almost equal numbers were caught in snaps and pitfalls. However, the 1993 sample may have been biased because of the very high densities on Grid 4. There were so many meadow voles that they may have just encountered the snaps in their abundant trails. Two-thirds of the masked shrews were caught in pitfalls and one-third in snaps.

Typical trap station.
8/94 P Martin

Table 14. Small mammal capture rates per trap night for four grids on Kanuti National Wildlife Refuge, 1992-1994

Year	Grid Number	Night 1	Night 2	Night 3	Average
1992	Grid 1	07	Snowed Out	Snowed Out	-
	Grid 2	.05	04	02	.04
1993	Grid 1	058	065	023	049
	Grid 2	097	061	.064	.074
	Grid 3	.061	081	.058	067
	Grid 4	299	183	070	184
1994	Grid 1	041	020	024	028
	Grid 2	044	037	027	036
	Grid 3	023	017	007	016
	Grid 4	.027	003	0	009

Table 15. Numbers of common small mammals caught on two grids in white spruce/paper birch burn sites on Kanuti National Wildlife Refuge - 1993 and 1994.

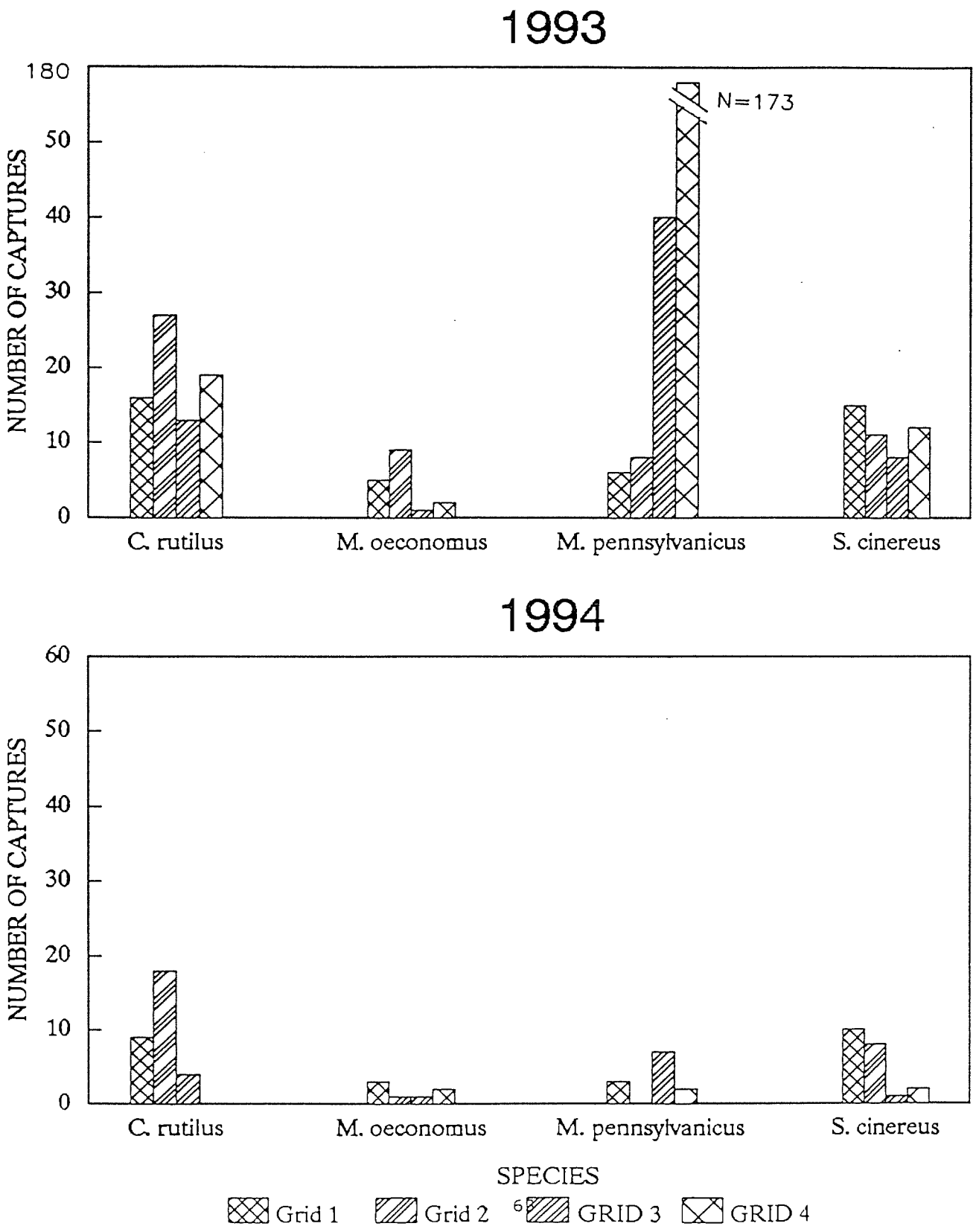
	GRID 1		GRID 2	
Species	1993	1994	1993	1994
Red-backed vole	16	9	27	18
Tundra vole	5	3	9	1
Meadow vole	6	3	8	0
Masked shrew	15	10	11	8

Table 16. Numbers of common small mammals caught in two grids in black spruce/*Sphagnum* burn sites, Kanuti National Wildlife Refuge - 1993 and 1994.

	GRID 3		GRID 4	
Species	1993	1994	1993	1994
Red-backed vole	13	4	19	0
Tundra vole	1	1	2	2
Meadow vole	40	7	117	2
Masked shrew	8	1	12	2

We had intended to try Sherman live traps on the grids in 1994 to compare with the snaps and pitfalls. We would like an alternative to snaps and pitfalls, but the densities were too low, and logistics after the rain and floods prevented it.

Figure 3. Numbers of common small mammals caught on four grids on Kanuti NWR - 1993 and 1994.



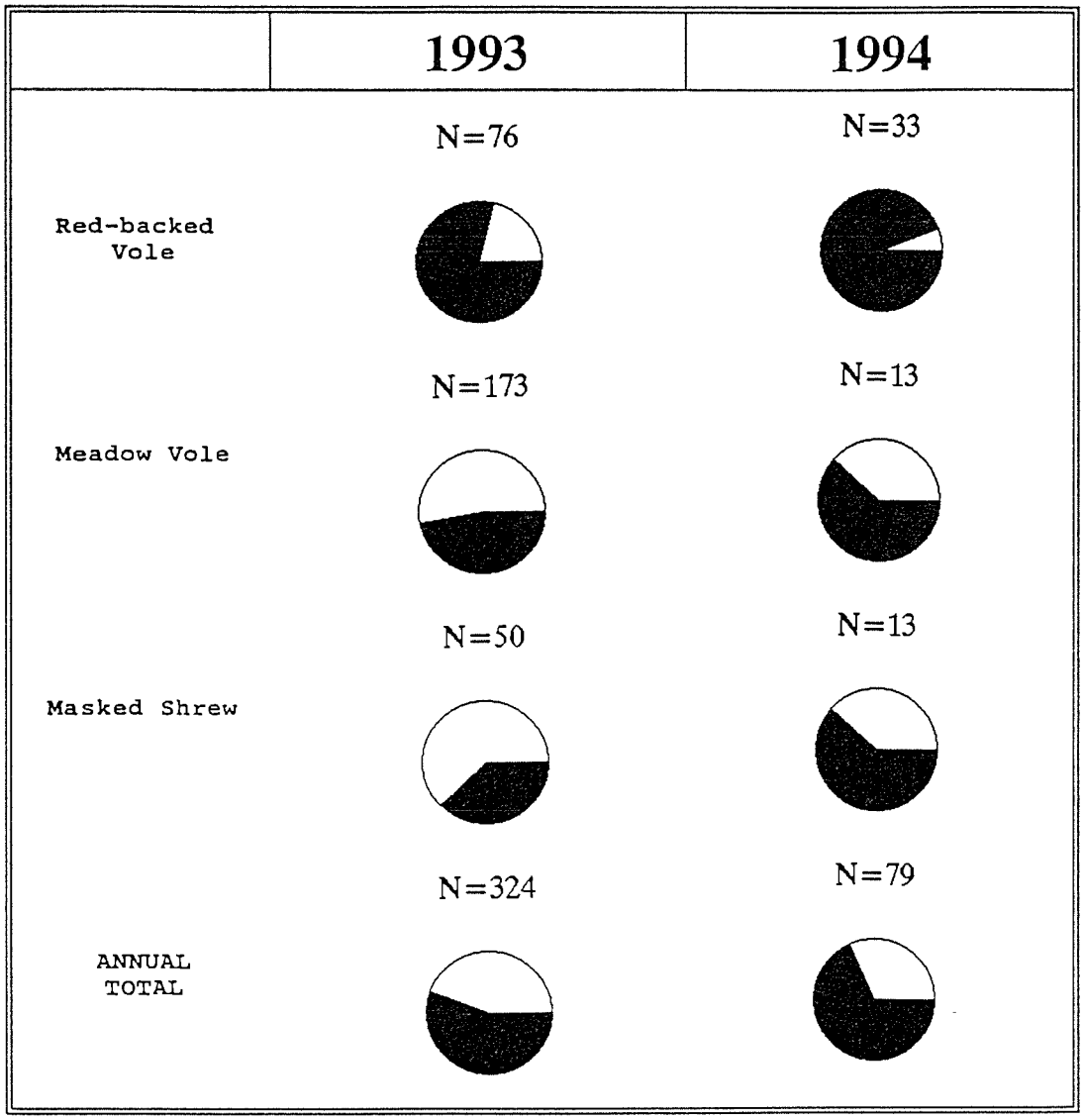


Figure 4. Percents of common small mammals caught in snap traps (shaded) vs pitfall traps (unshaded) on Kanuti NWR - 1993 and 1994 (Totals include all mammals caught, so will not equal the sums of the columns).

Snowshoe Hares

Based on the number of tracks seen during aerial surveys and information from trappers and local residents, the hare population appears to have crashed on the refuge. The peak was about 1992.

Furbearers

Furbearers are an important economic resource on the refuge and are listed as one of the refuge purposes. Much of subsistence trapping is opportunistic, or according to immediate needs, e.g. a villager will trap a few marten for a new hat, or someone snowmachining between villages cuts wolf tracks and sets some snares where it appears that a pack is spending time. Fur prices remain at an all time low and the trappers of yesteryear are few and far between. Traplines are sporadic and few on refuge lands, however some people still try and make a winter living by trapping. Local trappers from Allakaket reported much lower catch rates for lynx on their lines during 1994 (L. Bergman, pers. comm), probably as a result of a crash in the hare population.

Marten trappers from Bettles and Fairbanks reported significantly lower catches than in past years. One trapper near Bettles had about 300 sets out for 2-3 months and caught only 10 marten. Other Bettles trappers had similar results, and pulled their sets early in February. The Bettles trappers speculated that the decline was related to the rainfall and floods, but we believe it was also affected by the low small mammal populations. Whatever the exact cause, it will be interesting to observe the populations in the coming years. A memorandum documenting this observation was sent to the Associate Manager.

Attempts were made to establish ground transects with snow machines for furbearer track counts in November and December, but heavy snow fall and low temperatures prevented the project from succeeding. Zirkle and Volunteer Brown established a trail in mid-December from Bettles to the South Fork of the Koyukuk River, but no fresh snow fell after that so tracks could not be counted.

The refuge purchased furbearer carcasses from trappers who had traplines on and adjacent to the refuge from 1992-1994 (Table 17). Our objectives were:

1. To determine physical condition of refuge furbearers; and

2. To collect traditional ecological knowledge from the primary and historic refuge users.

The information from the carcasses will be used with data from ground and aerial track counts and discussions with local trappers to develop the refuge inventory plan for furbearers.

The expense of collecting the information was low. Prices paid to trappers were high enough to make it worth their time to haul the carcasses back to the village, but low enough to not increase the trapping effort. We agreed with village leaders to dispose of the carcasses in the

traditional manner after the necropsies. More effort was put into purchasing carcasses in 1992-1993 and 1993-1994 then the first year (1991-1992). Trappers will save their carcasses if they know they can sell them otherwise they will dispose of them directly after skinning.

Table 17. Numbers of furbearers purchased from trappers on Kanuti National Wildlife Refuge, 1992-1994.

	1991/92	1992/93	1993/94
Marten	-	51	61
Lynx	-	16	17
Red Fox	-	-	4
Wolf	4	6	8
Wolverine	-	-	1
Beaver	-	4	-

Most of the carcasses were purchased from trappers who sold their pelts to fur buyers or kept the pelts to tan at home. Four of the trappers were from Allakaket, one from just south of Bettles (A. Maness) and another trapper lives in a cabin on the east side of the refuge (M. Johnson). Some of the village trappers with the longest traplines would not discuss furbearers with us or agree to carcass necropsies, so our sample does not include all of the trapped animals.

All of the marten carcasses bought during the winter of 1992-93 and most of the marten carcasses bought in the winter of 1993-1994 were analyzed for sex and age data. Table 18 compares this information for the two winter periods.

Table 18. Sex/Age data from marten caught by trappers on Kanuti National Wildlife Refuge, Winters 1992-1993 and 1993-1994.

Age	Sex	1992-1993	1993-1994
Adult	Male	9	11
Juvenile	Male	12	19
Adult	Female	12	7
Juvenile	Female	18	12
		Total 51	Total 49

Lynx caught by trappers on or near the refuge in 1992-1993 were necropsied during 1994 (Table 19). Of the 16 lynx purchased in 10 males and 3 females were processed.

Table 19. Necropsy data from lynx caught by trappers on Kanuti National Wildlife Refuge, Winter, 1992-1993.

	Body Length (cm)	Tail Length (cm)	Skull Length (cm)	Canine Length (mm)	Heart Girth (cm)	Xiphoid Fat (mm)
Mean:						
Total	95.7	10.9	16.5	18.0	35.8	19.2
Males	95.6	10.8	16.7	18.2	36.0	21.0
Females	96.3	11.4	15.8	17.4	35.1	12.9
Sample size:						
Total	13	14	16	15	12	13
Males	10	11	13	12	9	10
Females	3	3	3	3	3	3
Range:						
Total	83.0-104.7	9.5-12.5	12.9-20.6	12.9-20.6	23.6-44.8	5.6-30.4
Males	83.0-104.7	9.5-12.5	14.7-18.1	12.9-20.6	23.6-44.8	11.3-30.4
Females	94.5-99.1	10.3-13.0	15.7-15.9	17.3-17.5	32.8-38.9	5.6-18.5

Floaters on the Kanuti River trip surprised a large lynx drinking from the river near the Kanuti Hot Springs. Many beaver and muskrats were also observed along the Kanuti River. River otter tracks are common on sand bars.

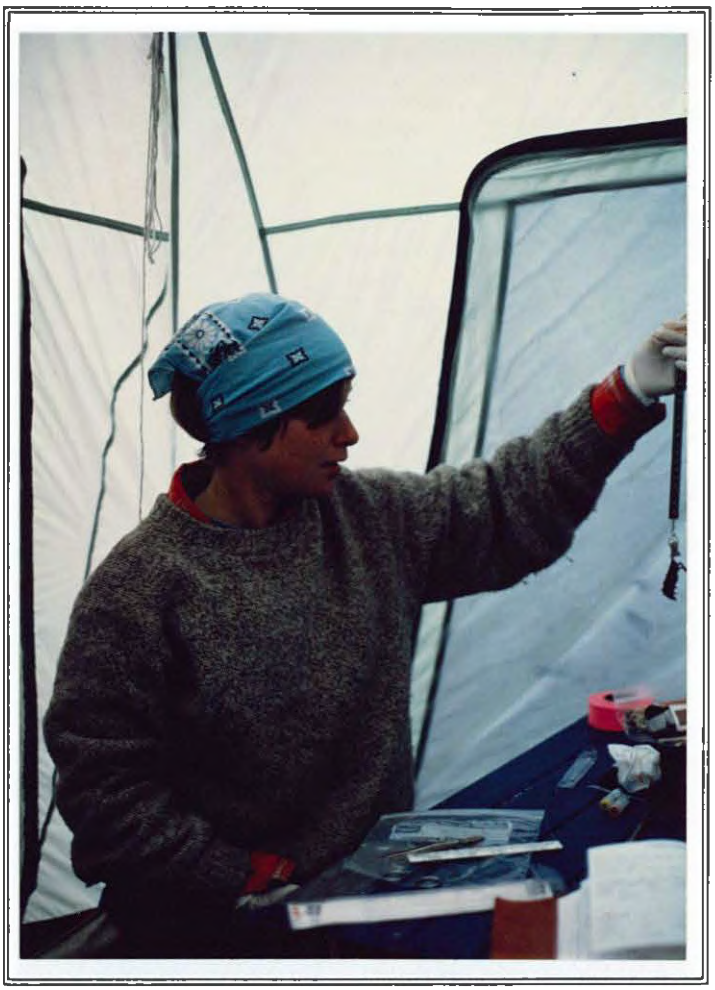
11. Fisheries Resources

Martin took David Wiswar (Fairbanks Fisheries Assistance Office) to the South Fork of the Koyukuk River on September 26 to look for a suitable site to install a fish weir. Wiswar examined a couple of possible sites. This weir is planned to be operational in 1996 to count salmon stocks using the South Fork drainage.

14. Scientific Collections

The University of Alaska - Fairbanks received a request from the Center for Disease Control for frozen tissues from the small mammals that were collected on Kanuti for the "Small Mammals Inventory and Monitoring" project. The tissues were tested for *Hanta* virus, along with specimens from many areas of western North America. The specimens will be valuable in such studies for areas far from Alaska. The tests from the Kanuti samples were negative.

Biological technicians Patrick Lovely and Denali Henderson spent many hours preparing skeletons, tissues and study skins of the small mammals that have been collected since 1992. The University also prepared many of the specimens. They were catalogued and deposited at the University of Alaska - Fairbanks museum.



Denali Henderson weighs a shrew.
9/94 P. Martin

16. Marking and Banding

The refuge began banding white-fronted geese in 1987. Canada geese that were incidentally taken during trapping were also banded. Refuge staff attempted to catch geese at several sites, but they had the most success with molting flocks on Todatonten Lake southwest of the refuge on Bureau of Land Management lands.

White-fronted geese nesting on Kanuti are part of the mid-continent population that winters primarily in Louisiana and Texas. Most of the returns from geese banded on Todatonten Lake were reported from central Canada and the Arkansas/Louisiana area (Table 20). Eleven percent of the recoveries were reported from Mexico C. J Lensink (Alaska Fish and Wildlife Research Center [retired]) estimated that perhaps 10-20% of both the Pacific and

mid-continent populations of white-fronted geese winter in Mexico.

Banding white-fronted geese at Lake Todatontan.
7/94 T Early

Table 20. Recovery locations for white-fronted geese banded on Kanuti Refuge and Todatonten Lake, Alaska - 1987-1994.

State/Province	Number of Returns
Alberta	11
Saskatchewan	12
Alaska	2
Arkansas	7
Illinois	1
Iowa	1
Kansas	2
Louisiana	6
Nebraska	2
Oklahoma	1
Texas	6
Mexico	2

Migration patterns and wintering areas may be discrete for each Alaskan nesting area. Lensink thought that populations from individual nesting areas may be affected differently by harvest, disease and other mortality factors. Therefore, a multi-refuge white-fronted goose banding program was begun to determine migration patterns, discrete wintering areas, fidelity to breeding areas, and morphometric differences between populations that nest in Interior Alaska. The last year of the project was 1994.

Fruits of the labor.
7/94 P. Martin

With the help of Rod King (Migratory Birds, Fairbanks), Kanuti Refuge banded and collared 141 white-fronted geese on Todatonten Lake on July 6, 1994. Forty-five previously-banded white-fronted geese were also captured. All of the recaptured birds were originally banded on Todatonten Lake between 1987 and 1993.

H. PUBLIC USE

1. General

Most of the public use on Kanuti Refuge is by local residents who subsistence hunt and trap on the refuge. Allakaket and Alatna villages are adjacent to the west side of the refuge. Their population is approximately 200. Allakaket is a Koyukon Athabascan village while Alatna is mostly Kobuk Eskimo. The villages of Bettles and Evansville are adjacent to the northern boundary of the refuge. Bettles is mainly a white community while Evansville is primarily Native Americans. Their residents do not depend on the refuge resources as much as the residents of Allakaket and Alatna. As Alaska's population grows and highway improvements are made, the Dalton Highway will facilitate access for more and more refuge visitors.

Sourdough Outfitters of Bettles obtained a special use permit to conduct guided recreational backpacking and float trips from June 1 through December 1994. However, no clients were taken on the refuge during 1994. Sourdough is beginning to offer dog sled trips during the winter months with increasing popularity. To date these trips are from Bettles to areas north of the refuge.

Brooks Range Aviation got a special use permit to transport hunters from September 2 through 1994. Two hunters were taken to Kanuti Lake to hunt moose from September 5-11.

Bettles Lodge was issued a special use permit from August 1 through December. They transported three hunters to Kanuti Lake in September.

Donald Duncan of Alaska Private Guide Service was the successful bidder for the Kanuti big game guide-outfitter area. A 5-year special use permit was issued in 1993 (see Section H.8).

The air taxi operators in Bettles reported that their business flying hunters in August and September was severely affected by the floods. One operator estimated that he lost $90,000. Even though the rivers dropped to normal or below-normal levels by the end of August, most hunters canceled their trips.

2. Outdoor Classrooms - Students

Biological Technician Zirkle traveled to Allakaket by snowmachine on January 6. She gave presentations to all of the grades over the next couple of two days. Job opportunities in wildlife related fields was the topic with the older students.

Migration was the focus of activities shared with two groups of students on March 23 at Denali Elementary School in Fairbanks by Refuge Operations Specialist Whitehill.

After a long process of gaining approval from the Allakaket principal and the city council,

Whitehill taught a hunter education course to fifteen students in the Allakaket school as part of the school curriculum. The program was held April 4-7 and May 2-6. School staff, Alaska Fish and Wildlife Protection Trooper Jim Low, FWS Special Agent Mark Webb, and Allakaket elder and former refuge employee Johnson Moses assisted with the classes. Zirkle made several Alaska wildlife presentations and played "species interaction" games with the 3rd-5th graders while the older students attended the hunter education classes. These classes created a great opportunity for refuge staff to get to know individual students and make stronger ties in the community.

Hunter education class at Allakaket.
4/94 B. Whitehill

The Evergreen State College professor Pete Sinclair returned to Kanuti with a vanload of students on June 30. The previous year Pete was "rescued" by refuge staff after his solo float of the Kanuti River took longer than he anticipated. Refuge Operations Specialist Whitehill and Biological Technician Lovely camped with the students a night at the Kanuti River

crossing on the Dalton Highway so they could share information on FWS careers, the refuge system, and bird point counts. Following the presentations by the staff, the students hiked into the Kanuti Hot Springs to evaluate trail access as volunteers for the Bureau of Land Management.

Patrick Lovely demonstrates the use of a GPS to The Evergreen State College class.
9/94 P. Martin

Using Challenge Grant monies the Allakaket Elder's Wildlife Camp was developed for 3rd-5th graders from Allakaket School. Sheri Yatlin was hired to organize the camp designed to have Allakaket elders and refuge staff share wildlife values with the students. Several last minute complications threatened to cancel the camp. Sheri became sick and was unable to work during the period the camp was scheduled. Continual August rains forced the cancellation of plans to fly students and elders to Kanuti Lake cabin. At the last minute Whitehill and Zirkle arranged to use a fish camp downriver from Allakaket from August 23-26 and rent boats from Allakaket residents for transportation. Despite the rain, elders Don

and Carrie Bergman, Johnson Moses, Lindberg and Lydia Bergman, and Moses Henzie took part in sharing their knowledge and appreciation of wildlife with the students. Students did activities and listened to stories in the fish drying sheds. As the river rose to lap at tents and fill the fish nets with debris the elders reminisced about the great Flood of 1937 that covered Allakaket. Whitehill and Zirkle returned to Allakaket on August 26 to find the runway threatened by high water. A hasty decision was made to board a commercial flight promptly leaving Allakaket instead of waiting for the later scheduled flight. As it turned out the only later flights were evacuation helicopters on August 27.

Moses Henzie shares his knowledge of wildlife with Allakaket students.
8/94 B. Whitehill

Allakaket students happy to be out of the rain
8/94 B. Whitehill

As part of a Challenge Grant between Badger Elementary School and the Fairbanks Ecological Services Office, Whitehill gave an evening presentation on September 29 to a gymnasium full of parents and students on different aspects of working with Alaska wildlife. Ecological Services staff were not available for the presentation necessitating refuge staff to once again save the Service's honor.

Zirkle conducted a Arctic food chain presentation with a "large" group of Bettles 3rd-6th graders on October 5th. The school enrollment in Bettles had grown from 7-8 students to 25 following the flood in Allakaket.

Weller Elementary School in Fairbanks initiated having "scientists" give presentations during lunch period as an alternative for students not wanting to brave sub-zero playground temperatures. On December 7 Whitehill used "Cargo for Conservation" wildlife items to illustrate ecosystem connections with three groups of 20-25 students each during their lunch period.

3. Outdoor Classroom - Teachers

A slide show highlighting Kanuti NWR activities was shown to Alaska Public Lands Information Center staff during their training session on June 1. Alaska Public Lands Information Center in Fairbanks is one of several in the State using multi-agency funds to direct visitors and answer their questions.

6. Interpretive Exhibits/Demonstrations

Zirkle spiced up the visitor contact area of the Bettles Kanuti office prior to tourist season. Both a moose and a goose exhibit were constructed to add an Alaskan view of Fish and Wildlife. A television and VCR were also purchased and were put to good use during the August rains.

Members of the staff worked the USFWS booth at the Tanana Valley Fair on August 5. A large jar of chum salmon eggs was used to solicit guesses from the public as to the number of eggs it held.

The Dalton Highway completed kiosk panels were received from Wilderness Graphics. These panels were installed at the Finger Mountain wayside overlooking the headwaters of the Kanuti River. The panels highlight wildlife values downriver from the display that are tied to the river.

8. Hunting

About three-quarters of Kanuti Refuge is included in the Kanuti Controlled Use Area (KCUA). This is a State designated controlled use area. Hunting of moose in the area is restricted to nonaircraft access by the State regulations and to residents of Game Management Unit 24 by the Federal Subsistence regulations. These restrictions were applied to limit conflicts between sport and subsistence hunters. Subsistence hunters do not usually turn in the State's harvest tickets, so it is difficult to determine how many moose are taken. A household survey in 1984 reported that people in Bettles and Evansville took 12 moose on the refuge, and Allakaket and Alatna took 32.

Caribou were on the flats just east of Allakaket in February and March and several were known to have been taken. There was also a herd that stayed along the Bettles winter road and were heavily hunted during the first part of the year.

The spring moose hunt from March 1-10 is popular with people who can drive over the Bettles winter road. Most hunting during this season however is done just north of the refuge due to the extensive trail system heading north.

Spring waterfowl hunting is a tradition that is widely practiced, especially in Allakaket and Alatna. Several hunters inquired about "yellowlegs" (white-fronted geese) when Zirkle, Henderson and Lovely passed through Allakaket from the Kanuti river float in May. Again this year, villagers wondered where all the oldsquaws were.

Very few people from Allakaket and Alatna hunted during fall 1994 because of the flood in August that forced their evacuation and subsequent rebuilding. The Alaska State Game Board extended moose hunting season under emergency order to January 15, 1995 to allow the villagers the opportunity to get moose in the Kanuti Controlled Use Area.

Two parties of sport hunters were at Kanuti Lake on September 5. One party of two harvested a medium bull. The other party of three hunters took three bulls. The second party reportedly used a refuge canoe to transport meat across the lake. Both parties accessed the lake with air taxi operators from Bettles.

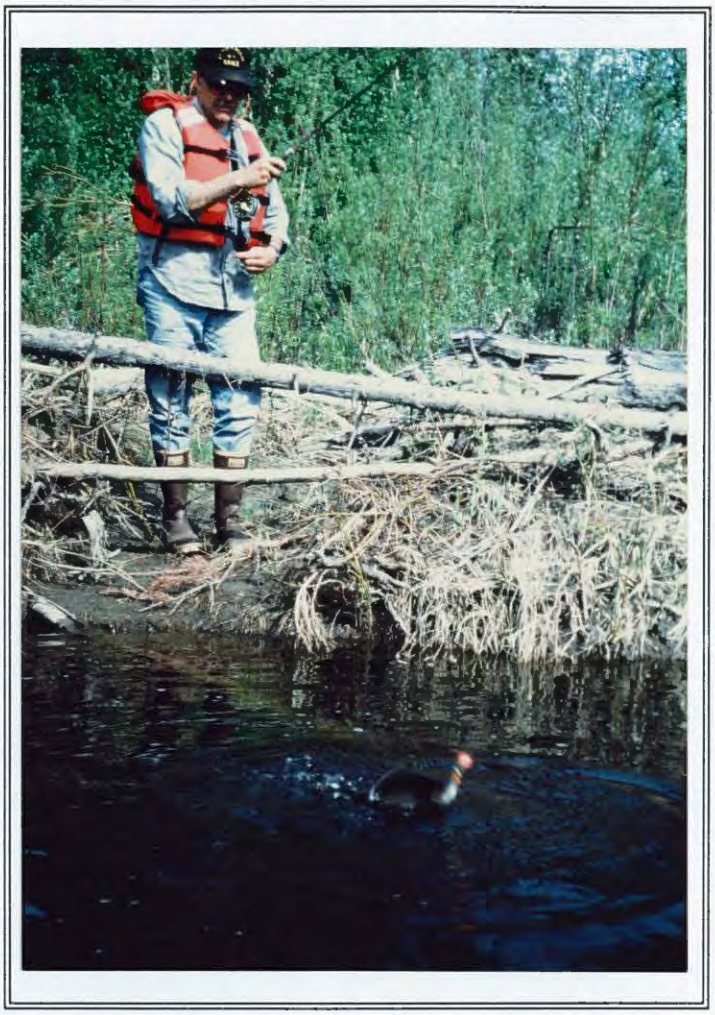
In 1992, Region 7 implemented a new policy and system for allocating Special Use Permits to big game guides on refuges. Each refuge identified boundaries for the proposed guide-outfitter areas. Kanuti listed only one area based on discussions with the ADF&G district biologist, the limited number of big game species available and the fact that the Kanuti Controlled Use Area covers most of the refuge thus eliminating the possibility of guided hunts for moose in that area. A Special Use Permit was issued in 1993 to Big Game Guide and Outfitter Don Duncan for a hunting operation on the refuge. The permit is for a five-year period. As in 1993, Mr. Duncan did not guide on the refuge in 1994.

9. Fishing

National Fishing Day activities were held at the Alaska Department of Fish and Game regional headquarters on June 4. Early and Whitehill, along with Fairbanks Fisheries Assistance Office staff, helped young folks fishing a stocked pond for trout. Youngsters were enthusiastic despite warm temperatures created an algae soup in the pond that yielded only a few snagged fish.

Tom Early tells fish stories.
9/94 P. Martin

Due to the remoteness and inaccessibility of the refuge, very little sport fishing takes place on the refuge. Grayling and northern pike are the primary targets of sport fishing while sheefish, whitefish, chum and chinook salmon are the focus of subsistence nets.



Tom Early tests the Kanuti River for grayling.
5/94 B. Whitehill

10. Trapping

The refuge monitors trapping on the refuge with two projects:

1. Carcass purchase and analyses; and

2. Aerial surveys of active trap lines.

Furbearer carcasses were purchased from trappers to determine sex, age, and body condition

of the animals (see Section G.10). This project ties in with work the National Park Service was doing on areas to the north. Native trappers were assured that carcasses purchased from them would be disposed of properly, according to their culture.

Active trap lines have been mapped on the refuge since 1990 with aerial surveys. In 1994, one survey was flown March 3 and one March 17. Seven lines were active (Figure 5). The trapper from the east side of the refuge said the winter was late getting started. He did not open much of his line until late November or December because he could not get over creeks. He also said the winter ended early and abruptly in mid-March. He caught 9 wolves, 50 marten, 1 wolverine and 2 lynx.

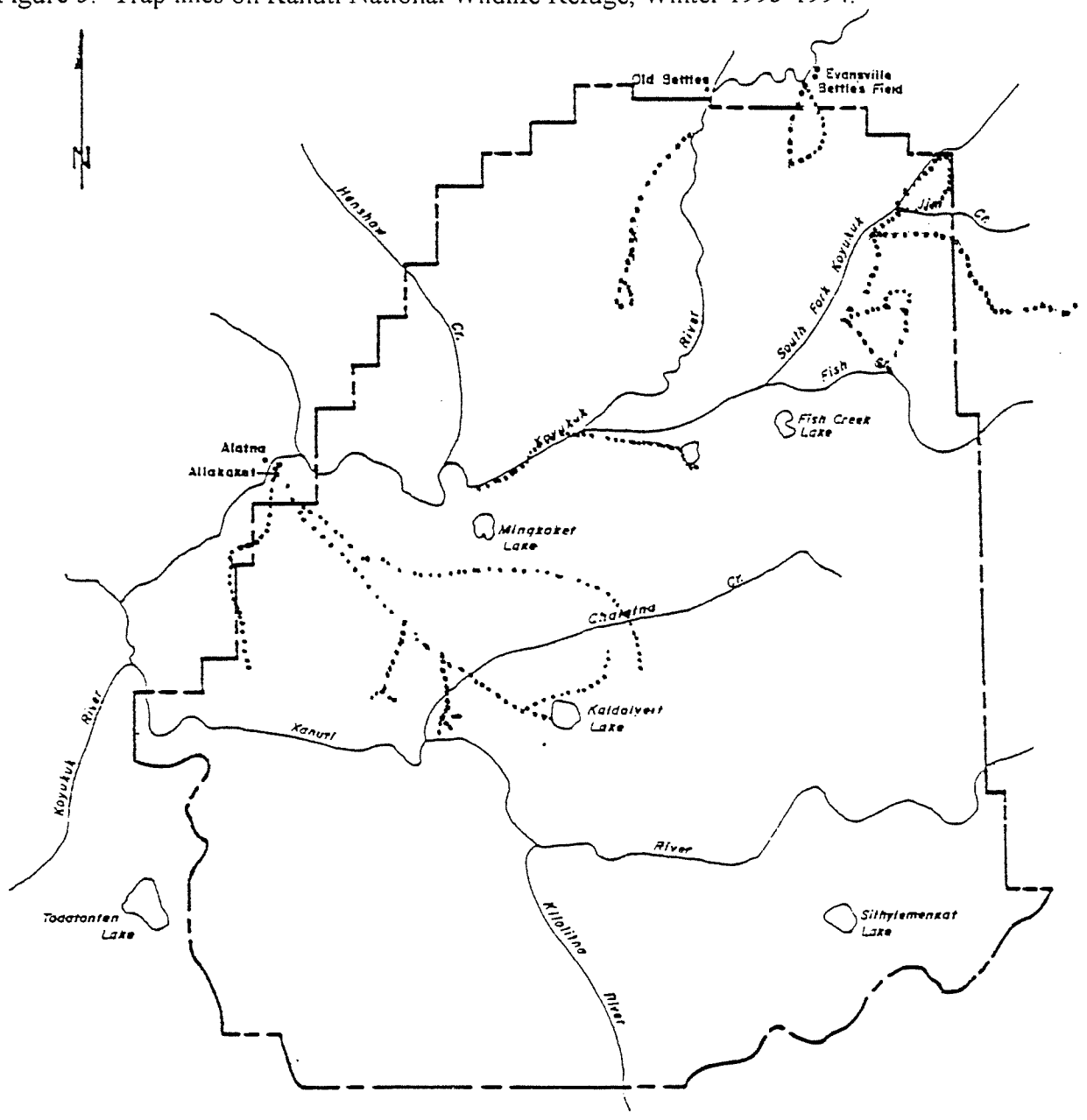
The number of trap lines on the refuge have remained about the same since 1990, but the locations of some lines have changed. One trapper died. His line has not been active for three years. One trapper left the area, but another moved in. The new trapper traps about the same area, but with different lines. A major wildfire affected two trap lines, one in the southeast part of the refuge, and one adjacent to the refuge. Neither has been active since the fire. One new trapper began trapping on the east side of the refuge in 1992, and has been active each year.

Beaver trappers were more active than they had been in the last few years during the second survey. The snow was not deep, the skies were clear and the temperatures were very moderate. They were trapping in the Minnkoket and Chalatna areas. No one trapped in the Kanuti drainage upstream from the mouth of the Chalatna, and in the Kilolitna or Nolitna drainages to the south.

Fall trapline surveys were flown November 5 and December 12, 1994. The trapper on the east side of the refuge had his lines open, and one west of the Koyukuk was active, but no lines were active out of Alakaket or Alatna. People were busy re-building after the flood.

Zirkle traveled to Allakaket on March 11 and 12 to buy carcasses and visit residents. Early and Zirkle visited a trapping cabin on March 14 to buy carcasses.

Figure 5. Trap lines on Kanuti National Wildlife Refuge, Winter 1993-1994.



KANUTI
NATIONAL WILDLIFE REFUGE

Total acreage within refuge: 1,535,000 ± Ac.

USFWS DIVISION OF REALTY ANCHORAGE, AK.

Other Wildlife Oriented Recreation

The refuge staff embarked on their annual, temporary employee orientation/breeding bird tune-up/recreational assessment float, this year on the Kanuti River. On May 22 refuge staff Early, Whitehill, Zirkle, Henderson, Lovely, along with Regional Archaeologist Chuck Diters and Ecological Services - Fairbanks Biologist Keith Mueller launched on the Kanuti River after a 5½ hour drive from Fairbanks to where the Dalton Highway crosses the river. Water temperature was 40°F, ambient air temperature 78°F with sunny conditions, and the current was approximately 3 miles/hour with water level moderate. The boats used were two Mark III Scout Avon framed rafts and three Aire Super Lynx inflatables.

Keith Mueller checks the temperature at the Kanuti Hot Springs.
5/94 B. Whitehill

Three river miles downstream from the put-in the river changes character from slow water, with deep channels to a fast, shallow and rocky gradient. Camp was made at a nice gravel bar fifteen river miles downstream five hours later. The faint sulphur smell from the Kanuti

Hot Springs could be detected at camp. Wildlife seen between the Dalton Highway and camp were: Bohemian waxwing, American tree sparrow, white-crowned sparrow, common snipe, spotted sandpiper, gray jay, lesser yellowlegs, yellow-rumped warbler, Swainson's thrush, red-tailed hawk, common merganser, harlequin duck (4 pr.), Canada goose (2 pr.), two black bear, and a large lynx drinking from the river across from camp.

Just over five miles from leaving the hot spring camp an intense boulder field was encountered that got progressively worse as it was negotiated. This extended for over a mile to a point where the river was impassable without hanging up on rocks with all craft. The river flow was high enough to create the potential for "wrapping" boats on the rocks. One of the Aire boats sustained a 8" rip in the outer fabric. Camp was made at 9:00 p.m. on a gravel bar approximately 38½ miles from the put-in. Bug jackets were a necessary item to help

Charting unknown channels.
5/94 B. Whitehill

ward off mosquitos. Wildlife seen during this segment of the trip included: white-crowned sparrow, Swainson's thrush, yellow-rumped warbler, harlequin duck (6 pr.), peregrine falcon (1 pr.), golden eagle, a grizzly bear sow with two cubs and two grayling caught for dinner.

On May 24 nice weather was replaced by heavy rain in evening. Snow patches were still evident along the river in sheltered spots. The river had changed to a slow, oxbowed meander. Camp was made at 9:45 p.m. up a steep bank, in heavy vegetation during a downpour. However, it was a pleasant surprise to find few mosquitos. Camp, according to the GPS, was at river mile 63. Wildlife along this segment of the river were: common merganser, a bald eagle on its nest, red-breasted merganser, a bank swallow colony, American wigeon, northern waterthrush, mew gull, common goldeneye, Canada goose, green-winged teal, Pacific loon, scaup, a white-spotted cow moose, grayling and pike.

Camp was departed on May 25 at 9:30 a.m. under bright and sunny conditions but the weather soon changed to threatening rain. It was a race to Kanuti cabin (river mile 76) to beat the rain and make the prearranged airplane pick-up. Arrival at the cabin was at 3 p.m., seconds before rain commenced and 45 minutes before the plane arrived. Early, Whitehill, Diters, and Mueller departed on the plane. Wildlife observed during the day were: another bald eagle on its nest, and a cow moose trailed by black bear.

Zirkle, Henderson, and Lovely continued on down the Kanuti River in the Aire inflatables. The Kanuti River current became noticeable again at the mouth of the Kilolitna and retained a slow steady flow for the next 45 miles. The last 35 miles the current increased slightly as the river flowed through the canyon and into the Koyukuk. The entire Kanuti Canyon BBS was relocated and flagged during the float thus reducing the amount of time and gas that would have to be spent there while running the survey later. Fifteen gallons of gas were also cached along the survey route for future use. As prearranged, Don Acker from Allakaket picked up the remaining crew and gear in his boat and returned them to Bettles.

The float provided an excellent overview of the refuge. The 185 mile river trip connected the hills in the east, to the flats in the center, to the canyon in the west. It also provided the refuge staff with firsthand knowledge of a stretch of river that the public has been increasingly inquiring about due to easy access on the Dalton River.

13. Camping

Local residents use the refuge for picnics, day outings and camping trips. Summer camping is mostly by boat and winter camping by either snowmachines or dogs. Camping opportunities for outsiders on Kanuti present logistical challenges without road access. A boat, airplane, or snowmachine are required. All are costly adventures.

17. Law Enforcement

A spring law enforcement survey was flown on May 17 by Whitehill and Martin. No waterfowl hunters were seen on the refuge during the patrols.

Aerial hunter surveys were flown over refuge rivers during moose season in September. The Kanuti River was flown from the Dalton Highway to the mouth on September 1 and 12. One truck with a boat trailer was parked at the access on the highway. A john boat with a tarp was about 2 miles downstream. No people were seen. No boats were seen during the second survey.

The Jim and South Fork of the Koyukuk Rivers were surveyed on September 2 and 15. No boats were seen on the Jim River or at the access point off the Dalton Highway. Four flat-bottomed john boats were seen on the South Fork on the 15th. There were also three boats in the river at the access point on the Dalton Highway. We were not able to contact the hunters because there was no suitable landing place. All the boats were upstream of refuge lands.

Annual law enforcement refreshers were attended in Tucson from January 18-23 by Whitehill and from February 15-19 by Martin. Martin completed her semi-annual pistol qualification on August 8 while Whitehill completed his September 20..

National Refuge Law Enforcement Coordinator Steve Wonderley and Regional LE Coordinator Bob Bartels met with Fairbanks based Refuge Officers. This was part of a regional review of law enforcement programs.

USFWS Wildlife Inspector James Fuller gave a presentation on wildlife import/export laws and associated problems to the Fairbanks offices in February.

I. EQUIPMENT AND FACILITIES

1. New Construction

A propane holding shed for the Bettles Bunkhouse was built by part-time Fisheries Maintenance worker/volunteer Arnold Brown. This will keep propane tanks from freezing during -50° temperatures.

Several discussions were held with the Gates of the Arctic National Park staff on the proposed Bettles multi-agency bunkhouse to be constructed in FY95. In the latest negotiations, we maintain at least half of our existing bunkhouse upstairs in the administrative building and will obtain two small two bedroom apartments in the new facility. Comments were submitted to the National Park Service contract architect on the proposed plans. This facility is to be built by the NPS and shared with the refuge according to the Interagency Agreement.

2. Rehabilitation

The shop was renovated by Brown. He then spent considerable time and effort in organizing shop tools, sorting hardware, and ordering replacement items.

Volunteer Brown shows off the newly organized shop.
9/94 P. Martin

The fuel shed in Bettles was lined on the inside to contain possible spills. It was also moved away from the property boundary to meet Department of Transportation lease specifications.

The Bettles hangar equipment storage area was fully inventoried and cleaned in April. It became obvious that several items needed to be surplused.

Henderson painted new lines, marking areas were items cannot be placed, inside the Bettles hangar. This is a safety precaution to keep items from being stored in aircraft areas.

3. Major Maintenance

We received $15,000 to complete action on deferred maintenance projects at Bettles. We advertised and awarded a bid to a local Bettles citizen to paint the office and bunkhouse. By the end of the season he completed only 85% of the project. Volunteer Brown completed additional maintenance projects during the course of the summer. He replaced plexiglass on the porch windows, installed shower stalls, replaced shelving in the shop and fuel shed, and erected refuge information and directional signs.

Arnold Brown admires his handiwork.
12/94 B. Whitehill

Early, Lovely, Henderson and Yatlin spent four days in late July at the Kanuti Lake cabin conducting maintenance, moving and organizing the equipment storage shed, digging a new latrine, plus leveling and staining the cabin. This work made the field camp much more efficient and livable.

Tom tests rustic handle on new screen door for the cabin.
7/94 P. Lovely

Denali gets a different view of life.
7/94 T. Early

4. Equipment Utilization and Replacement

The refuge Super Cub, N1364P, is one of the oldest planes in OAS's fleet, yet it continues to be a safe, reliable and inexpensive aircraft. It was flown over 240 hours in 1994 with an average cost of $40/hr-the least expensive Cub in the fleet.

The refuge Super Cub, along with all other Alaskan Office of Aircraft Services Cubs, was granted a waiver for operating over the certificated gross weight and out of the published center-of-gravity on floats. The waiver is good for 2 years. The refuge needs an aircraft that can safely access small lakes on hot summer days; land in deep, soft snow; and fly low and slow for aerial surveys. The refuge Cub fulfills those needs very well. However, if the waiver is rescinded or not renewed, our operations will be severely curtailed.

Martin also flew 44.5 dual hours in a C-185, mostly on floats out of Bettles, to become familiar with and qualify as a C-185 pilot.

Minor repair and replacement parts for the pickup truck in Bettles were purchased and sent up. Brown gave the truck a tune-up and brake job as well as repaired its winch. He also maintained the boats/motors, snowmachines and four-wheelers.

Zirkle drove a snowmachine back to Bettles from Prospect Creek on March 8th after repairs were made in Fairbanks. With it came several new Siglin sleds and some additional winter gear.

A new snowmachine was purchased from a local Bettles distributor and after several payment difficulties the machine was used to break trail for a furbearer track count survey.

The GSA sedan was replaced with a four-wheel drive van in April.

A large load of excess equipment was transferred to the Defense Reutilization Marketing Office (DRMO) at Ft. Wainwright in February.

5. Communications Systems

An electronic mailing machine, with scale interfaced to the meter, was installed. It sure beat licking stamps!

The Administrative Technician's computer has E-mail capabilities. Until the other refuge employees get E-mail at their computers, the messages are routed via floppy disk.

6. Computer Systems

End of year funds from Kanuti's budget, amounting to several thousand dollars, were contributed to purchase equipment for computer networking the Fairbanks offices.

A new 486 computer with a CD ROM was purchased to replace an older 286 model. A 14.4K baud modem, primarily for use with cc:Mail , was installed on a dedicated line. The Norton anti-virus software was installed to screen all "foreign" files entering the office.

Anne-Marie Rizzi kept the computers running.
9/94 B. Whitehill

Rizzi attended a meeting in Anchorage to address revision of the budget tracking system and establishment of cc:Mail protocols. At our objection, the majority of those in attendance felt that the Region should retain the existing Lotus-based tracking system with some revisions.

7. Energy Conservation

The Fairbanks office started recycling aluminum cans and paper in 1989. Our office temperatures are controlled by GSA in Fairbanks. The temperatures in our Bettles office are kept warm to keep the pipes from freezing in winter.

8. Other

Tetlin NWR's new Chevy Suburban, that was totaled in an accident, was put up for sale in Fairbanks. Kanuti staff agreed to be the contact for prospective buyers. In hindsight this was a mistake as the phone and office was filled with bidders attracted by the possibility of an inexpensive Suburban.

It was decided to not renew the lease on the Marika Street storage area. Storage space in Federal Building was negotiated with GSA and the other Service offices. An area in the basement was designated as Kanuti's storage area.

The staff reviewed the landscape plan for the Bettles facilities that were drafted by the Regional landscape architect. We will begin to implement selected aspects of this plan as funds become available.

Nearly 60 folks attended the Bettles Community Christmas Party the evening of December 20. The party was held at the Kanuti bunkhouse since it is the largest heated building in the community. This was a great opportunity for refuge staff to interact with community members and Santa Claus.

Santa comes to the Bettles bunkhouse.
12/94 B. Whitehill

J. OTHER ITEMS

1. Cooperative Programs

Early, Whitehill and Zirkle met with NPS staff in Bettles to discuss the day-to-day functionality of the Joint Facilities Operation Plan on June 16. No major changes were made to the operations plan but some items were clarified..

Martin and Ed Forner (Gates of the Arctic National Park and Preserve) participated in the annual review of the Interagency Pilot and Aircraft Sharing Agreement. The agreement was renewed without amendment.

4. Credits

The narrative was written by the Kanuti National Wildlife Refuge team

Enjoying the view from the Kanuti Cabin deck
7/94 T. Early

K. FEEDBACK

Aliy Zirkle takes a brief, well deserved rest.
5/94 D. Henderson

APPENDIX

Appendix 1. Some of the scientific and common names of plants and animals mentioned in the Kanuti National Wildlife Refuge 1994 Annual Narrative Report.

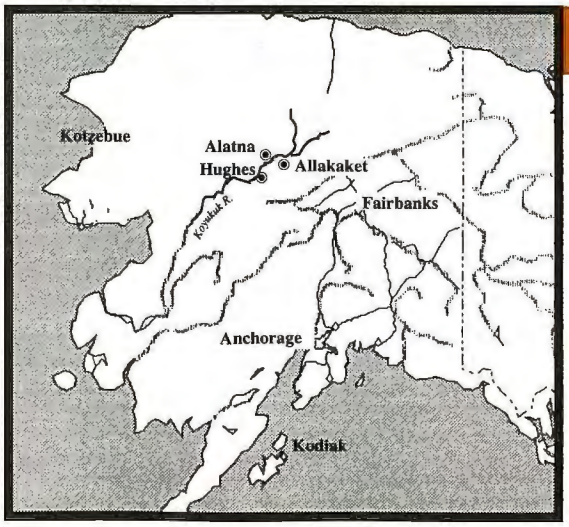
Common Name	Scientific Name
Liverworts	*Marchantia sp.*
White spruce	*Picea glauca*
Black spruce	*Picea mariana*
Quaking aspen	*Populus tremuloides*
Willow	*Salix spp.*
Dwarf birch	*Betula nana*
Paper birch	*Betula papyrifera*
Fireweed	*Epilobium angustifolium*
Labrador tea	*Ledum palustre*
Canada goose	*Branta canadensis*
Greater white-fronted goose	*Anser albifrons*
Masked shrew	*Sorex cinereus*
Pygmy shrew	*Sorex hoyi*
Black bear	*Ursus americanus*
Grizzly bear	*Ursus arctos*
Marten	*Martes americana*
Wolverine	*Gulo gulo*
Gray wolf	*Canis lupus*
Red fox	*Vulpes vulpes*
Beaver	*Castor canadensis*
Northern bog lemming	*Mictomys borealis*
Brown lemming	*Lemmus trimucronatus*
Boreal red-backed vole	*Clethrionomys rutilus*
Meadow vole	*Microtus pennsylvanicus*
Tundra vole	*Microtus oeconomus*
Yellow-cheeked vole	*Microtus xanthognathus*
Snowshoe hare	*Lepus americanus*
Moose	*Alces alces*
Caribou	*Rangifer tarandus*

Fall Flood Destroys Alaskan Villages

Can you help them rebuild?

The Koyukuk River Athabascan Indians and Inupiat Eskimos are in dire need of assistance. Their homes need to be rebuilt and the tools used in their subsistence, or "off the land", lifestyle need to be replaced.

Before the flood, adults shared the labors of hunting, gathering, and storing food. The average family's cash income was $3,000 - $6,000 per year. Now, precious time is being spent on restructuring homes and the remains of their community.



The Disaster

"When we got into the chopper with its deafening roar, young and middle aged people were holding onto crying, screaming babies and terrified elders."

— Irene Henry, Allakaket Resident

Severe storms and heavy rains starting in late August caused flooding throughout Northwestern Alaska. This region, drained by the Koyukuk River system, received the equivalent of 30 days of rain in a three day period. Drainage capability was quickly exceeded and severe flooding occurred. The hardest hit were the villages of Allakaket, Alatna, and Hughes, where residents had to be airlifted by military transport helicopter. In the dead of night villagers were flown to Fairbanks and put into military barracks not knowing what would happen next. It was a terrifying experience.

"Flood waters took their homes, their clinics and stores, their gardens, berries and fish, their guns, snowmobiles and wood supplies. ***Everything***. The last impression was of cabins floating by the school house at 15 mph and an overwhelming stench of diesel from overturned fuel tanks." (*Fairbanks Daily News-Miner*, August 31, 1994). Homes and buildings floated off their foundations in water depths from 8 to 15 feet, including a community center weighing 35 tons. Most villagers escaped only with the clothes on their backs and a duffel bag containing a few personal belongings.

"As I walked throughout the villages, I wondered, 'Can any of the caribou and moose skins, handmade leather boots, mitts, head work, and furs ready to sew, all soaked with silty water, be saved?' Tears again nudged the corner of my eyes, but I remembered the voices of the elders a few days earlier, 'Don't worry, niece. We can always rebuild, no lives were lost, we're all safe.' "

— Alaska State Senator Georgianna Lincoln

"Houses were floating, personal goods were floating...everyone was panicking...we were surrounded by water. We're safe now, but we lost all our homes...we'll never get them back."

— Clara Sam,
Alatna Resident

"We just got up right there, grabbed our sleeping bags and a little something to eat. That's all."

— Susie Williams,
Hughes Elder

The lasting effects of the disaster are profound. Many sled dogs drowned during the peak storms of the flood, and villagers recount horrifying stories of their animals struggling to keep their noses above water. The water, or the mud and silt contained therein, damaged essentials like snowmobiles, four-wheelers, boats, and hunting equipment. These items took literally *years* to save for. Although they may seem frivolous or recreational, these items are the villagers only functional means of transportation and gathering food due to the lack of adequate roads and supermarkets. The Koyukuk River area of Alaska is not only remote and physically isolated (180 miles from Fairbanks), but it is separated from the 20th century by culture and infrastructure.

Current Situation

Now, many families in these devastated communities are separated, dispersed to various locations around the region. Some residents have remained at the village sites to begin reconstruction and are housed in emergency shelters; many are living and working elsewhere until they have homes and a community to return to.

The emergency and the recovery work have been operating almost simultaneously, and are taking place apart from, or parallel to, the natural subsistence cycle of life and work. The Alaska Division of Emergency Services (ADES) and the Federal Emergency Management Agency (FEMA) have been helping villagers restore damaged structures, setup emergency housing, and reestablish infrastructure such as airport runways. Due to the villages' remote location, airport runways are essential for the transportation of people and materials.

However, many of the daily use items mentioned earlier are not covered by federal or state grants, and several families affected by the flood do not qualify for assistance under FEMA regulations. These regulations require strict adherence to guidelines, many of which are alien to the rural subsistence lifestyle.

Life is stark at best in the arctic, and almost impossible when you don't have the proper equipment to ensure your survival. The following list details items that are *desperately* needed, and we would appreciate any donation of these goods that you might be able to offer. Further information on the items themselves, and the quantities needed, is available upon request.

1.) **Cash donations** — Please make checks payable to the Koyukuk Community Fund. This tax deductible fund will be used to purchase items such as those listed below.

2.) **Building materials** — Several homes in Allakaket do not meet FEMA's or ADES's guidelines for assistance. The materials needed for the completion of these homes include: *three-sided logs, foam core panels, Alaska windows, 1/2" plywood, 1/2" sheetrock, fasteners, 2" x 6" lumber, 2" x 4" lumber, fiberglass insulation, exterior insulated doors, interior doors, woodstoves/monitors, light fixtures, electrical wiring, electrical outlets, metal roofing, exterior paint, interior paint,* and *vinyl composition tiles (VCT).*

3.) **Snowmobiles** — Are the villagers' main method of transportation in winter, and are used for various towing tasks.

4.) **Snowmobile sleds** — Complement the snowmobiles, and help make difficult towing tasks possible.

5.) **Four-wheelers** — Also a main method of transportation. Used to perform various towing tasks on stable ground.

6.) **Firearms** — Rifles used in gathering subsistence food.

7.) **Boats (skiffs) and boat motors** — Or the materials used in building them, such as *20' x 4' marine plywood, marine varnish paint, glue, silicon caulk, bolts, nuts,* and *screws.*

8.) **Fishing supplies** — Rods, reels, and fish nets (spring, summer, and fall seining nets).

9.) **Sewing/knitting supplies** — Sewing, knitting, beading, and skin needles. Beads, fabric, thread and yarn.

"Please remember that you have friends and neighbors on all sides who keep you in their thoughts and prayers. Although in some ways the worst may be over, there will still be frustrating times ahead when that thought may be of comfort to you."

— Alaska State Senator Al Adams

Other needed items include:

Axes
Bicycles
Canvas Tents
Carpets & Rugs
CB Radios
Chainsaws
Clothes Dryers
Cooking Stoves
Dishes
Electric Fans
Freezers
Furniture
Furs/Skins
Hand Tools (Hammers, Saws, Screwdrivers, Shovels, Rakes, Toolsets, etc.)
Linens (Blankets & Sheets)
Linoleum
Metal Washing Tubs
Pails (Buckets)
Pots & Pans (Pot Roasters)
Radios
Rain Gear
Refrigerators
Washing Machines (Wringer-washers)
Rope
Rubber Boots
Small Appliances (Toasters, Blenders, Mixers, etc.)
Snares
Snowshoes
Tarps/Canvas
Televisions
Towels
Traps (Animal Traps)
Winter Boots

If you would like to donate any of these items before **August 31, 1995**, please contact **Deric Gurley** at:

Koyukuk Flood Recovery Project
5525 Airport Industrial Way
Fairbanks, AK 99709
(800) 478-5850 — Phone
(907) 474-4229 — Fax

"As we left Allakaket I was thinking 'I hope we come home tomorrow.' "

Annie Koyukuk , Allakaket Resident, still in Fairbanks six months later.

After this date, please refer all monetary donations and inquiries to:

The Doyon Foundation
Koyukuk Community Fund
201 First Avenue
Fairbanks, AK 99701

(907) 452-4755 — Phone
(907) 456-6785 — Fax

Thank you for your time and patience. We look forward to hearing from you!

Production and Design: Deric J. Gurley, Koyukuk Flood Recovery Project

KANUTI NATIONAL WILDLIFE REFUGE

Wild Things

WHAT'S SO SPECIAL ABOUT THE KANUTI REFUGE?

- It is larger in size than the State of Delaware.
- White-fronted and Canada geese nest on the refuge. The white-fronts winter in Louisiana, Texas, and Mexico, while Canada geese go to Washington and Oregon.
- Lightning caused fires burn the refuge's boreal forest on a 30 year cycle, the fastest in Alaska.
- Numerous cultural sites, including Inupiaq Eskimo hunting sites, Athabascan Indian fish camps, and turn-of-the-century gold mining camps exist on the refuge.
- The refuge contains a diverse assortment of plant life ranging from wetland to desert species.
- Nearly 160 species of birds are found there, including 64 kinds of waterfowl and shorebirds.
- More than 1/3 of the refuge has burned since 1990. Fires like these create diverse habitats that support a wide variety of wildlife on the refuge.
- Caribou from the Western Arctic herd occasionally winter on the refuge.
- Ducks banded on the refuge migrate along all four North American flyways.
- Temperatures range from -70˚F to more than 90˚F, among the widest on earth.
- One of the major wetland areas on the refuge was formed 50,000 years ago from a 200 square mile ice-dammed lake.
- Chinook, chum, and coho salmon travel 1,000 miles up the Yukon River to spawn in the Koyukuk River system, which runs through the heart of the refuge.
- The longest run of sheefish in Alaska travels through the refuge on their way to spawn in the Alatna River.
- Athabascan Indians from nearby villages rely on refuge resources to maintain their traditional lifestyle.
- The refuge is open to boating, camping, fishing, hiking, hunting, wildlife viewing, photography, and other types of recreation.
- No roads or developments exist on the refuge.

DEPARTMENT OF THE INTERIOR
U.S. FISH & WILDLIFE SERVICE
REGION 7 - ALASKA

AMERICA'S NATIONAL WILDLIFE REFUGES...
where wildlife comes naturally!