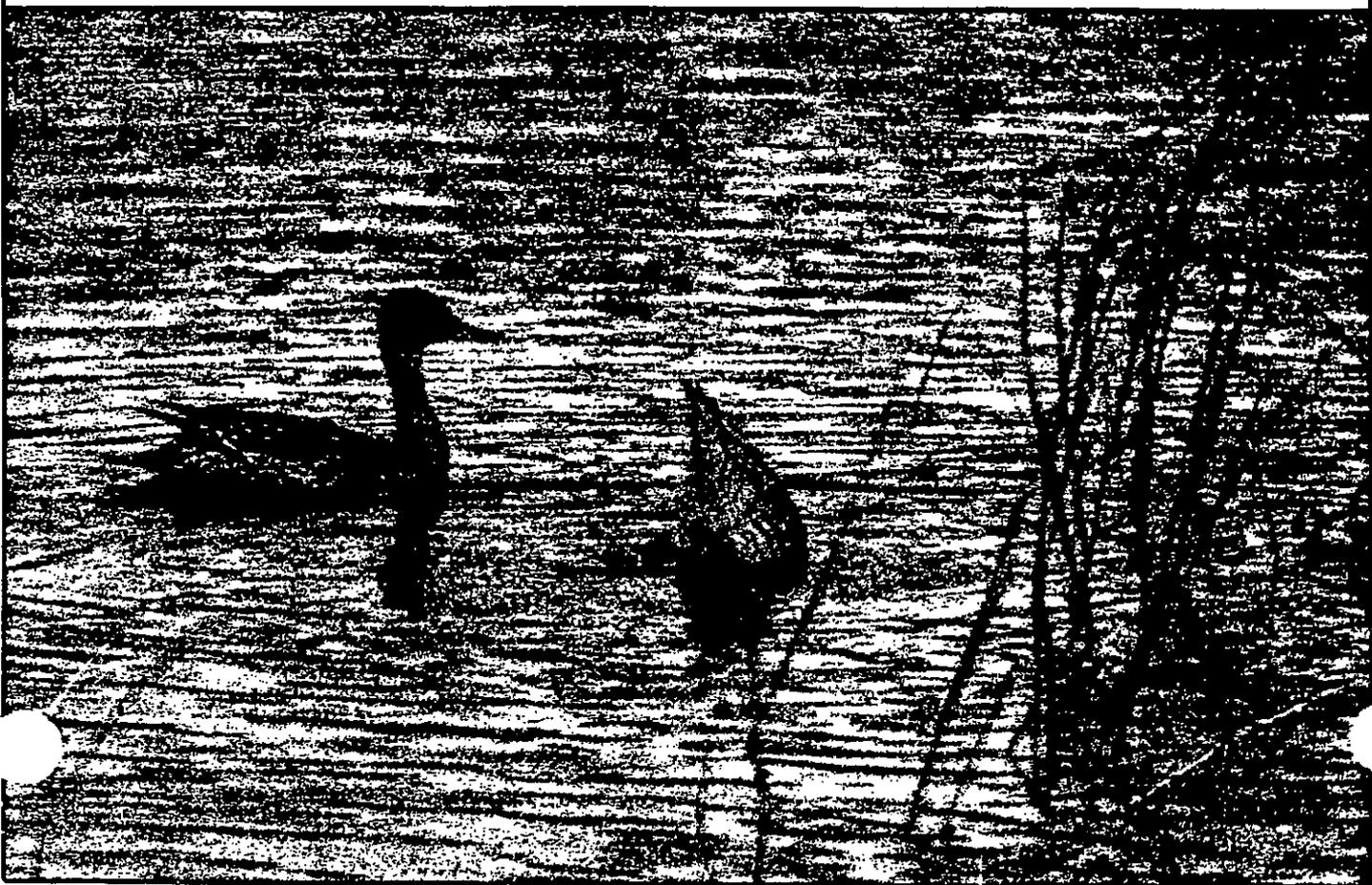

Yukon Flats

National Wildlife Refuge FINAL

Comprehensive
Conservation
Plan

Environmental
Impact
Statement

Wilderness
Review





United States Department of the Interior



IN REPLY REFER TO:

PSS-PL/0522K

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503

23 OCT 1987

Dear Reader:

Enclosed is the Final Comprehensive Conservation Plan, Environmental Impact Statement, and Wilderness Review (Plan) for the Yukon Flats National Wildlife Refuge, Alaska. This Plan has been prepared pursuant to Sections 304(g), 1008, and 1317 of the Alaska National Interest Lands Conservation Act of 1980 (Alaska Lands Act), Section 3(d) of the Wilderness Act of 1964, and Section 102(2)(C) of the National Environmental Policy Act of 1969. The Plan describes five alternative strategies for long-term management of the Yukon Flats Refuge.

When producing long-term management plans for the nation's national wildlife refuges, the U.S. Fish and Wildlife Service (Service) actively seeks comments from the general public on the development of management alternatives and on the choice of a preferred management strategy. The management of national wildlife refuges in Alaska must conform to the legal and administrative requirements listed in the first section of this document. Requirements that have a direct impact on the development of the long-range plan and on the choice of the preferred management alternative are discussed below.

According to the National Wildlife Refuge System Administration Act and Section 304(b) of the Alaska Lands Act, no use of a national wildlife refuge will be permitted unless it is first determined to be compatible with the purposes for which the refuge was established. Section 304(g) of the Alaska Lands Act requires the preparation of a comprehensive conservation plan such as this for each unit of the National Wildlife Refuge System established or enlarged by the Alaska Lands Act. The Yukon Flats Refuge Plan designates areas within the refuge according to their resources and values, outlines programs for conserving fish and wildlife resource values, and specifies uses within each area that may be compatible with the major purposes of the refuge. In addition, the Plan discusses opportunities that will be made available for fish and wildlife oriented recreation, ecological research, environmental education and interpretation, and economic use of refuge lands.

designation include (1) the need for wilderness unit boundary adjustments and (2) the addition of selected areas with outstanding resource values that may have been inadvertently overlooked during the original wilderness review and subsequent designations undertaken by Congress. A summary of public comments on the Service's recommended wilderness proposal will be included in the final plan which is part of the wilderness package sent to Congress.

Comments provided on the draft plan have been taken into account in preparation of this Plan. A record of decision will be published no sooner than 30 days following the publication of the document, and the Service will begin implementing the management directions in the preferred alternative.

Requests for further information should be directed to the Regional Director, U.S. Fish and Wildlife Service, 1011 E. Tudor Road, Anchorage, Alaska, 99503, Attention: Bill Knauer or contact Mr. Knauer at (907) 786-3399.

Sincerely,

Walter O. Stieglitz

Regional Director

Enclosure

YUKON FLATS NATIONAL WILDLIFE REFUGE
COMPREHENSIVE CONSERVATION PLAN,
ENVIRONMENTAL IMPACT STATEMENT,
AND
WILDERNESS REVIEW

FINAL

October 1987

U.S. FISH AND WILDLIFE SERVICE
REGION 7
1011 EAST TUDOR ROAD
ANCHORAGE, ALASKA 99503



The Yukon Flats National Wildlife Refuge, created in 1980 by an act of Congress, lies approximately 150 miles north of the City of Fairbanks in interior Alaska. This final comprehensive conservation plan and environmental impact statement describes five alternatives for managing the Yukon Flats Refuge and analyzes the effects of implementing each alternative. An alternative reflecting current management is included as one of the management strategies. The U.S. Fish and Wildlife Service's preferred alternative is identified and the criteria used in its selection are presented. The plan also includes a wilderness review, which evaluates the suitability of lands for wilderness designation under each management alternative.

For further information contact William W. Knauer at the above address or by calling (907) 786-3399.

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IMMARRY

SUMMARY

This document is the final comprehensive conservation plan, environmental impact statement, and wilderness review (CCP/EIS/WR) for the Yukon Flats National Wildlife Refuge. It describes five alternatives for managing the refuge and identifies the possible consequences of implementing these alternatives. Each alternative provides broad policy guidance for managing the refuge. Each alternative also identifies lands suitable for wilderness designation.

The Yukon Flats Refuge encompasses approximately 8,480,000 acres of federal lands and an additional 2,696,000 acres of selected and conveyed lands in east central Alaska. Extending 220 miles east-west along the Arctic Circle, the refuge lies between the Brooks Range (to the north) and the White-Crazy Mountains (to the south). The Trans-Alaska pipeline corridor runs along the refuge's western boundary while the eastern boundary extends to within 30 miles of the Canadian border. The Yukon River bisects the refuge, creating the dominant terrain features of the refuge. The refuge is roughly divided into three physiographic zones: riparian and wetlands (48 percent of the refuge); uplands (29 percent of the refuge); and mountains (23 percent of the refuge). Water, in the form of lakes, ponds, sloughs, and streams, is a dominant feature of the refuge landscape. A total of 147 bird, 39 mammal, and 24 fish species occur or potentially occur on the refuge.

Congress established the Yukon Flats Refuge in 1980 when it enacted the Alaska National Interest Lands Conservation Act (ANILCA). Section 302(9)(B) of ANILCA sets forth the following major purposes for which the Yukon Flats Refuge was established and shall be managed:

- (i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, canvasbacks and other migratory birds, Dall sheep, bears, moose, wolves, wolverines and other furbearers, caribou (including participation in coordinated ecological studies and management of the Porcupine and Fortymile caribou herds) and salmon;
- (ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;
- (iii) to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and
- (iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

PLANNING PROCESS

The first step in developing a comprehensive conservation plan for the Yukon Flats Refuge was to collect information. Field inventories, remote sensing, and literature searches produced information about refuge resources

After a 30-day waiting period following publication of the final CCP/EIS, the Service will issue a Record of Decision and will begin implementing the selected alternative.

Implementation and Revision of the Comprehensive Conservation Plan

Implementation of the proposed actions in this plan will depend on the availability of funds and personnel and the coordination of many governmental activities and agencies. These factors will determine the extent of development, management, and maintenance the refuge receives in any given year. Following adoption of the plan, the Service will, as necessary, undertake detailed "management planning" to guide implementation of the plan and operation of the refuge. In accordance with Service policy, detailed management plans will be prepared to address specific resource and public use management activities such as wilderness, fire, habitat, wildlife, fisheries, and recreation management.

The Yukon Flats Refuge CCP/EIS provides broad policy guidance for managing the refuge over the next 10 to 15 years. It should be viewed as a dynamic document, requiring periodic review and updating. Every three to five years the Service will review public comments, local and state government recommendations, staff recommendations, and research studies, among other sources, to determine if revisions to the plan are necessary. If major plans are proposed, public meetings may be held, or new environmental assessments/ environmental impact statements may be necessary. Full review and updating of the plan will occur every 10 to 15 years, more often if necessary.

COMMON MANAGEMENT DIRECTIONS

Management of the refuge under any alternative is governed by federal and state law, Service policy, and principles of sound resource management--all of which restrict the range of potential activities. Accordingly, certain management directions must be implemented in all the management alternatives for the Yukon Flats Refuge. These common management directions include:

- o coordinating management with other resource management agencies and cooperating with owners of refuge inholdings and adjacent lands;
- o studying possible land exchanges and cooperative agreements that would ensure consistent management and protect fish and wildlife habitats;
- o working with the village corporations on the use and development of village lands;
- o cooperating with the Alaska Department of Fish and Game (ADF&G) and other agencies in collecting data on waterfowl, fish, and big game species, public use, and other topics that are of management concern;
- o cooperating with the ADF&G in ensuring that fish and wildlife populations and habitats necessary to conserve natural diversity are maintained;
- o ensuring that water quality and quantity, air quality, and visual resources are protected in compliance with federal and state laws and regulations;

being manipulated, although the Service has prepared a prescribed burning plan for the refuge in order to improve moose habitat, to return a portion of the habitat to an earlier vegetational state, and to reduce hazardous fuel loadings. Public and economic uses of the refuge would continue to be allowed using existing access methods. Opportunities for hunting, fishing, and other recreational use, for subsistence resource harvest, and for scientific research would be maintained. No oil and gas leasing would be allowed on the refuge now, although oil and gas studies, including seismic, would be allowed where site-specific stipulations can be designed to ensure compatibility with refuge purposes and consistency with management objectives set forth in the CCP.

The pristine conditions and fish and wildlife values found on the refuge would be maintained, but no refuge lands would be protected by potential designation as wilderness.

Management Directions

The following management directions summarize Alternative A:

- o maintain the refuge in a basically undeveloped state;
- o emphasize the maintenance of the refuge's natural diversity and key fish and wildlife populations and habitats;
- o maintain traditional access opportunities;
- o provide opportunities for continued subsistence use of refuge resources;
- o maintain opportunities for hunting, fishing, and other recreational activities;
- o permit the continuation of current economic activities;
- o maintain current management of the Beaver Creek National Wild River (as per approved management plan); and
- o propose no areas of the refuge for wilderness designation.

Environmental Consequences of Alternative A

Vegetation

- o Successional changes primarily from wild and prescribed fire, flooding, and oil and gas exploration.

Fish and Wildlife

- o All species and habitats protected to preserve natural diversity.
- o Changes in populations and habitats would result primarily from natural fluctuations and increasing human population and associated activities.
- o Set back in plant succession from wildfire, flooding, and limited activities currently occurring would benefit some species.

Water Quantity and Quality

- o No appreciable change from current conditions.

Social Conditions

- o Negligible change in traditional lifestyles anticipated.

Economic Conditions

- o No significant change from current conditions.

increased development and habitat manipulation activities allowed under this alternative, although stipulations and mitigation measures would be employed to minimize impacts. Recreational use of the refuge would also be encouraged, with areas of the refuge open for development of public use facilities if the demand exists. Subsistence opportunities, though generally maintained throughout the refuge, could be altered by the increased economic and recreational use occurring in some areas of the refuge. No proposal for designating areas of the refuge as wilderness would be made.

In this alternative, all refuge lands would be placed in one of three management categories - intensive, moderate, or minimal management. Two areas of the refuge would be designated for intensive management - an area south of the communities of Birch Creek and Fort Yukon and an area encompassing most of the Black River country south and east of Chalkyitsik. About 22 percent of the refuge would be in intensive management.

Moderate management would be the designation for most of the remaining land included in the area identified as having a moderate geologic potential for oil and gas (Banet 1987). This area extends from the Porcupine-Kaltag fault north of the Yukon and Porcupine rivers southward into the uplands adjacent to the White-Crazy Mountains and includes the remainder of the Black River country. This category includes 46 percent of the refuge.

Approximately 32 percent of the refuge, much of it in the Hodzana Highlands, would remain under minimal management in this alternative. These areas would continue to receive a high level of protection in this alternative.

Management Directions

Alternative B shares the following management directions with Alternative A (the Current Situation). Alternative B would:

- o maintain much of the refuge in a basically undeveloped state;
- o emphasize the maintenance of the refuge's natural diversity and key fish and wildlife populations and habitats;
- o maintain traditional access opportunities;
- o provide opportunities for continued subsistence use of refuge resources;
- o maintain opportunities for hunting, fishing, and other recreational activities;
- o permit the continuation of current economic activities;
- o maintain current management of the Beaver Creek National Wild River (as per approved management plan); and
- o propose no areas of the refuge for wilderness designation.

The following management directions indicate the major differences between Alternative B and Alternative A. Alternative B would:

- o provide opportunities for oil and gas leasing and development, if compatible with refuge purposes, on approximately 68 percent of refuge (approximately 1,880,000 acres in intensive management and 3,910,000 acres in moderate management);
- o provide opportunities for habitat manipulation (other than prescribed burning) on approximately 68 percent of the refuge; and
- o provide opportunities for commercial timber harvest on approximately 68 percent of the refuge.

Prescribed Burning

- o The wilderness proposal would have no effect on prescribed burning on the refuge. Prescribed burning would be allowed throughout the refuge, including in designated wilderness.

Commercial Timber Harvest

- o The wilderness proposal would have no effect on the level of commercial timber harvest on the refuge. Commercial timber harvest could occur on 68% of the refuge under this alternative, although only limited harvest would be anticipated (20 acres annually).

Mineral Development

- o The wilderness proposal would have no effect on mineral development on the refuge. Only a limited number of claims currently exist on the refuge and no new mining claims can be filed on the refuge under Section 304(c) of ANILCA.

Oil and Gas Exploration, Leasing, and Development

- o The wilderness proposal would have no effect on oil and gas exploration, leasing, and development. Exploration activities would be allowed throughout the refuge and 68% of the refuge would be open for leasing and development under this alternative.

ALTERNATIVE C

Alternative C emphasizes the protection of fish and wildlife populations and habitats in their present state on the refuge, but would provide for a limited amount of development activity to occur on the refuge. Oil and gas studies, including seismic activities, may be allowed throughout the refuge and oil and gas leasing may be allowed on an area of the refuge encompassing the central portion of the Yukon oil and gas basin (26 percent of the refuge) where site-specific stipulations can be designed to ensure compatibility with refuge purposes and consistency with management objectives set forth in the CCP. Mechanical, chemical, and water level manipulation could occur on areas of the refuge under moderate management. A significant portion of the refuge would be managed in the minimal management category, but none of the refuge would be recommended for designation as wilderness. Subsistence harvest opportunities would be maintained throughout the refuge, as would recreational opportunities.

In Alternative C, refuge lands would be placed in either of two management categories - moderate management or minimal management. The moderate management category, which accounts for 26 percent of the refuge, encompasses the central portion of the Yukon oil and gas basin (from the south bank of the Yukon and Porcupine rivers southward into the upland area - to approximately the 1,000 foot elevation line). The remainder of the refuge (74 percent) would be managed under the minimal category. A significant area of the refuge, therefore, would continue to receive a high level of protection in this alternative.

Management Directions

Alternative C shares the following management directions with Alternative A (the Current Situation). Alternative C would:

Economic Conditions

- o Increased employment opportunities.
- o Significant local/regional economic growth could occur.

Recreational Use

- o Increase in recreational use of the refuge would occur, although this increase would not be significant.

Subsistence Management

- o Opportunities for participation in traditional activities would be maintained.
- o Year-round conflicts between users would increase.
- o More competition for resources would occur.

Environmental Consequences of the Wilderness Proposal (no areas proposed)

Wilderness Values

- o Both short and long-term impacts to wilderness values could result from oil and gas exploration, leasing, and development activities, mining, and other allowed activities, although impacts would be localized.

Prescribed Burning

- o The wilderness proposal would have no effect on prescribed burning on the refuge. Prescribed burning would be allowed throughout the refuge, including in designated wilderness.

Commercial Timber Harvest

- o The wilderness proposal would have no effect on the level of commercial timber harvest on the refuge. Commercial timber harvest could occur on 26% of the refuge under this alternative, although only limited harvest would be anticipated (20 acres annually).

Mineral Development

- o The wilderness proposal would have no effect on mineral development on the refuge. Only a limited number of claims currently exist on the refuge and no new mining claims can be filed on the refuge under Section 304(c) of ANILCA.

Oil and Gas Exploration, Leasing, and Development

- o The wilderness proposal would have no effect on oil and gas exploration, leasing, and development. Exploration activities would be allowed throughout the refuge and 26% of the refuge would be open for leasing and development under this alternative.

ALTERNATIVE D The Preferred Alternative

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

Water Quantity and Quality

- o No appreciable change from current conditions refuge-wide or over the long term.

Social Conditions

- o Negligible impacts to traditional lifestyles.

Economic Conditions

- o Negligible increase in local economy if wilderness designation occurs.

Recreational Use

- o Slight increase in use levels if wilderness designation occurs.

Subsistence Management

- o Current opportunities for participation in traditional activities would be maintained.

Environmental Consequences of the Wilderness Proposal (8% of refuge proposed)

Wilderness Values

- o Proposal would help maintain wilderness values on 600,000 acres.
- o Both short and long-term impacts to wilderness values could result from oil and gas exploration and placer mining, although impacts would be localized.

Prescribed Burning

- o The wilderness proposal (8% of the refuge) would have no effect on prescribed burning on the refuge. Prescribed burning would be allowed throughout the refuge, including in designated wilderness.

Commercial Timber Harvest

- o The wilderness proposal would have no effect on the level of commercial timber harvest on the refuge. Commercial timber harvest could not occur under Alternative D as all refuge lands would be managed under the minimal management category (commercial timber harvest not allowed). The area proposed for wilderness designation is not an area where timber harvest would occur, so no opportunities for future harvest would be lost.

Mineral Development

- o The wilderness proposal would have no effect on mineral development on the refuge. Only a limited number of claims currently exist on the refuge (none in the area proposed for designation) and no new mining claims can be filed on the refuge under Section 304(c) of ANILCA.

Oil and Gas Exploration, Leasing, and Development

- o The wilderness proposal would preclude leasing on 8% of the refuge; leasing would not be allowed at this time on other areas of the refuge, but could occur in the future if in the national interest and compatible with refuge purposes.
- o Exploration activities could occur throughout the refuge, but would be limited in wilderness areas.

Fish and Wildlife

- o Maximum protection of all species and habitats to preserve natural diversity with wilderness designation.
- o Changes in populations and habitats would result primarily from natural events (wildfire and flooding), prescribed fire, oil and gas exploration, mining, and limited growth in public use.
- o Set back in plant succession from natural events, prescribed fire, oil and gas exploration, and mining would benefit moose.

Water Quantity and Quality

- o No appreciable change from current conditions refuge-wide and over the long term.

Social Conditions

- o Negligible impacts to traditional lifestyles.

Economic Conditions

- o Negligible increase in local economy if wilderness designations occur.

Recreational Use

- o Slight increase in use over current levels if any wilderness designation occurs.

Subsistence Management

- o Current opportunities for participation in traditional activities would be maintained.
- o Negligible increase in competition if wilderness designations occur.

Environmental Consequences of the Wilderness Proposal (100% of refuge proposed)

Wilderness Values

- o Proposal would help maintain wilderness values throughout refuge.
- o Both short and long-term impacts to wilderness values could result from oil and gas exploration and placer mining, although impacts would be localized.

Prescribed Burning

- o The wilderness proposal (100% of the refuge) would have no effect on prescribed burning on the refuge. Prescribed burning would be allowed throughout the refuge, including in designated wilderness.

Commercial Timber Harvest

- o Although commercial timber harvest would not be allowed under this alternative, designation of the entire refuge as wilderness would preclude all potential for future commercial timber harvest on the refuge.

Mineral Development

- o The wilderness proposal would have negligible effect on mineral development on the refuge. Only a limited number of claims currently exist on the refuge and no new mining claims can be filed on the refuge under Section 304(c) of ANILCA.

I. INTRODUCTION

INTRODUCTION

PURPOSE AND NEED FOR THE ACTION

The purpose of this planning action is to develop a comprehensive conservation plan (CCP) for the Yukon Flats National Wildlife Refuge, Alaska. The CCP is a congressionally mandated plan that provides broad policy guidance for managing the Yukon Flats Refuge. The CCP defines the end products or benefits toward which refuge management activities are directed, which uses may be compatible with the purposes of the refuge, and what general management strategies will be followed. It should be viewed as a dynamic document, requiring periodic review and updating. Management plans will be prepared following adoption of the final CCP, specifically addressing the management of wilderness, recreation, fish and wildlife, and other resources in meeting refuge objectives.

This document is a final environmental impact statement (EIS) describing five alternative plans (including a preferred plan) for management of the Yukon Flats Refuge. It includes a description of the existing environment on the refuge and an assessment of the long-term effects of implementing these alternatives on refuge resources. Each alternative provides differing choices for addressing internal management concerns and for resolving public issues.

Federal statute requires preparation of a plan to guide management of the Yukon Flats National Wildlife Refuge. Section 304(g) of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) directs the Secretary of the Interior to prepare, and from time to time revise, a ". . . comprehensive conservation plan . . . for each refuge (in Alaska) . . . "

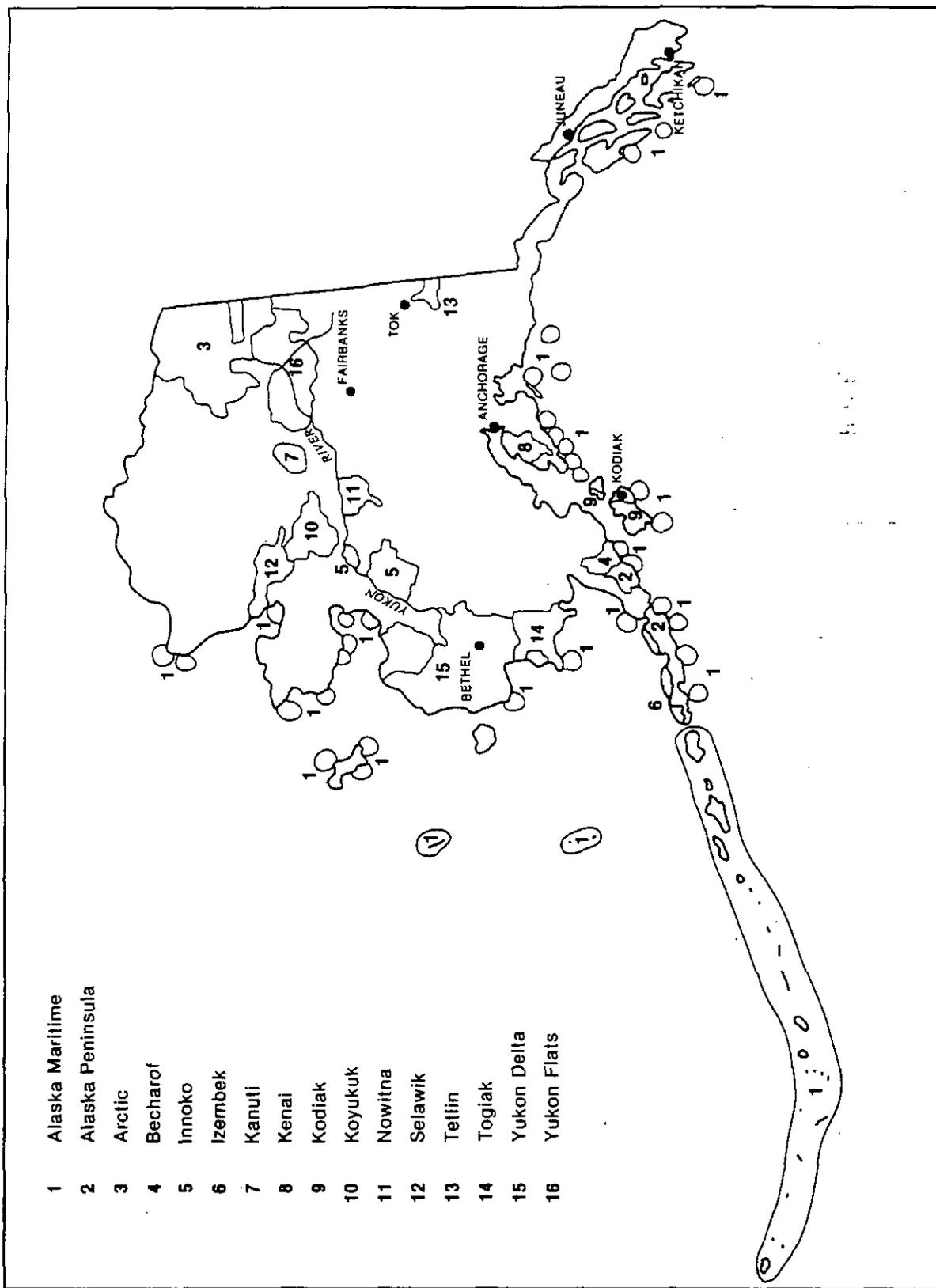
This document also serves as the wilderness review for the Yukon Flats Refuge. Section 1317 of ANILCA directs the Secretary to study all lands in the refuge and make recommendations as to areas considered suitable for inclusion in the National Wilderness Preservation System. Each alternative presented in this document identifies lands suitable for wilderness designation, considering the management direction of the alternative.

HISTORICAL OVERVIEW

A long and rather complex history preceded the designation of the Yukon Flats as a National Wildlife Refuge. Prior to 1971, the Flats were part of the public domain administered by the Bureau of Land Management. With the passage of the Alaska Native Claims Settlement Act (ANCSA; 88 Stat. 688) in 1971, the Secretary of the Interior withdrew the lands now within the refuge from all forms of appropriation. Lands were identified for potential Native selection (Section 11(a)); as potential "national interest lands" (Section 17(d)(2)); and as "public interest lands" (Section 17(d)(1)).

On November 16, 1978, the Secretary of the Interior invoked his emergency withdrawal powers under Section 204(e) of the Federal Land Policy and Management Act (90 Stat. 2743), withdrawing approximately 110 million acres throughout Alaska. Including what is now the Yukon Flats Refuge, these lands were withdrawn for three years from settlement, location, entry, and selection under the public land laws, the intent being to preserve and protect the

Figure 1. National wildlife refuges in Alaska.



International Treaties. Several treaties affect how the Service manages the Yukon Flats Refuge. Among these are migratory bird treaties with Canada, Mexico, Japan, the USSR, and the Convention on Nature Protection and Wildlife Conservation in the Western Hemisphere. These treaties differ in emphasis and species of primary concern, but collectively provide clear mandates for identifying and protecting important habitats and ecosystems and for protecting and managing individual species. These treaties are identified and their purposes summarized in Appendix G.

Treaties for migratory bird protection include management provisions such as: (1) prohibiting disturbance of nesting colonies; (2) allowing the Secretary of the Interior to establish seasons for the taking of birds and collection of their eggs by "indigenous inhabitants" of Alaska for their own nutritional and other essential needs; (3) directing each Nation to undertake, to the maximum extent possible, measures necessary to protect and enhance migratory bird environments and prevent and abate pollution or detrimental alteration of their habitats; (4) requiring each Nation to provide immediate notification to the other when pollution or destruction of habitats occurs or is expected; (5) stipulating that each Nation shall, to the extent possible, establish preserves, refuges, protected areas, and facilities for migratory birds and their habitats and manage them to preserve and restore natural ecosystems; and (6) providing that protective measures under the Treaty may be applied to species and subspecies not listed in the specific convention, but which belong to one of the families containing listed species. Of the migratory bird species of concern in the treaties, those which utilize the Yukon Flats Refuge include loons, swans, geese, ducks, hawks, eagles, harriers, ospreys, falcons, cranes, plovers, sandpipers, jaegers, gulls, terns, owls, and passerines.

The Treaty of Washington provides for the free passage of salmon and other migratory fish species in the Yukon and Porcupine rivers which spawn in Canadian waters. The U.S./Canada Salmon Interception Treaty requires negotiations between the two nations regarding Yukon River salmon. These ongoing negotiations were begun in 1985.

National Wildlife Refuge System Administration Act of 1966. This act provides guidance and direction for administration and management of all areas in the National Wildlife Refuge System, including the Yukon Flats Refuge. It provides that the system be administered by the Secretary of the Interior through the Fish and Wildlife Service. It defines key terms, established criteria for opening refuges to migratory bird hunting, and established procedures for divestiture of lands. It also established the concept of "compatibility," requiring that uses of refuge lands must first be determined to be compatible with the purposes for which individual refuges were established.

Alaska Native Claims Settlement Act of 1971 (ANCSA). This law provided for settlement of the aboriginal claims of Alaska's Eskimos, Aleuts, and Indians through grants of land and money. It provided for the establishment of Native corporations to manage the land and money that was granted by ANCSA. In exchange for this settlement, all aboriginal titles and claims, including any fishing and hunting rights, were extinguished. The corporations were the vehicle by which each Native "enrolled" and, directly or indirectly, receives benefits under ANCSA. Section 17(d)(2)(A) provided the basis for the enactment of ANILCA.

(3) Mandate the inventory and evaluation of all sites on government owned and managed lands. Inventory is the responsibility of the individual federal agency involved.

(4) Require that all projects with state or federal involvement be conducted in such a way as to protect any significant cultural resources that may be present. This includes, but is not limited to, the performance of archeological surveys, site evaluations, and, if necessary, mitigation of adverse impacts on such resources.

PLANNING PROCESS

Legal and Administrative Planning Requirements. Section 304(g) of ANILCA sets forth standards to be achieved in the development of comprehensive conservation plans for national wildlife refuges in Alaska. Specifically, prior to developing a plan for any refuge, the Secretary of the Interior is required to identify and describe:

(A) the populations and habitats of the fish and wildlife resources of the refuge;

(B) the special values of the refuge, as well as any other archeological, cultural, ecological, geological, historical, paleontological, scenic, or wilderness values of the refuge;

(C) areas within the refuge that are suitable for use as administrative sites or visitor facilities, or for visitor services, as provided for in Sections 1305 and 1306 of this Act;

(D) present and potential requirements for access with respect to the refuge, as provided for in Title XI; and

(E) significant problems which may adversely affect the populations and habitats of fish and wildlife identified and described under subparagraph (A)."

In addition, each plan shall:

"(A). . . based upon the identifications and the descriptions required . . .(as noted above) -

(i) designate areas within the refuge according to their respective resources and values;

(ii) specify the programs for conserving fish and wildlife and the programs relating to maintaining the values referred to in paragraph (B) (see above), proposed to be implemented with such areas; and

(iii) specify the uses within each such area which may be compatible with the major purposes of the refuge; and

(B) set forth those opportunities which will be provided within the refuge for fish and wildlife-oriented recreation, ecological research, environmental education and interpretation of refuge resources and values, if such recreation, research, education, and interpretation is compatible with the purposes of the refuge."

In preparing the plans, the Secretary is required to ensure adequate interagency coordination and public participation. Specifically, interested

Figure 3. The planning process.

Step 1 -- PREPLANNING

- o Identify laws, regulations, and policies affecting refuge management
- o Develop analysis methods and capabilities
- o Prepare public involvement plan
- o Hold public scoping meetings
- o Identify management issues and concerns

Step 2 -- INVENTORY AND ANALYSIS

- o Identify and compile resource information needed for planning
- o Describe the physical, biological, economic, and social environments
- o Establish data base
- o Determine capability of resources to respond to issues and concerns

Step 3 -- FORMULATE MANAGEMENT ALTERNATIVES

- o Develop management categories with specific management strategies and allowed uses
- o Apply management categories to "homogeneous" areas of the refuge
- o Develop refuge-wide management alternatives using various mixes of management categories
- o Determine management emphases of each alternative

Step 4 -- EVALUATION OF ALTERNATIVES

- o Evaluate the effects of implementing each alternative on the physical, biological, and human environments
- o Evaluate the ability of each alternative to achieve refuge purposes and resolve issues and concerns
- o Identify changes from base-line resource information

Step 5 -- PLAN SELECTION

- o Select a preferred alternative
- o Prepare and distribute a draft plan describing the alternatives and their expected effects if implemented
- o Provide opportunities for public review and comment

Step 6 -- SELECT COMPREHENSIVE CONSERVATION PLAN

- o Review and evaluate public comments received on the draft CCP/EIS
- o Prepare and distribute a final plan that responds to public comments
- o Provide opportunities for public review and comment
- o Prepare a Record of Decision

Step 7 -- PLAN IMPLEMENTATION

- o With appropriate state and public involvement, prepare a detailed management plan(s) identifying specific actions necessary to implement the CCP and achieve its goals and objectives
- o Begin implementing the plan

Step 8 -- PLAN REVISION

- o Every three years review all public comments
 - o Review all local, state, and federal recommendations, scientific data, and other information to update the plan as needed
 - o Publish minor changes as appendices to the plan following approval by Regional Director, notifying affected agencies and individuals
 - o Make major changes by going through the CCP planning process
-

IDENTIFICATION OF ISSUES

IDENTIFICATION OF ISSUES

Section 304(g)(4) of ANILCA requires the Service to consult with appropriate state agencies and Native corporations to ensure public interests and concerns are addressed in the plans. It also requires hearings to assure that residents affected by the administration of the refuge have an opportunity to present their views. Therefore, one of the first steps in the planning process was to develop a public participation and interagency coordination program to assist in identifying the issues which need to be addressed in the plan.

PUBLIC INVOLVEMENT

During the fall of 1982 the Fish and Wildlife Service began a public involvement program for the Yukon Flats Refuge. Information regarding the comprehensive conservation planning process was distributed and public input on issues to be addressed in the plan was sought. In October and November, 1982, nine communities in interior Alaska were visited - Beaver, Birch Creek, Central, Chalkyitsik, Circle, Fairbanks, Fort Yukon, Stevens Village, and Venetie. Interested individuals were contacted and public meetings were conducted to identify local issues. Meetings were held with state and local government leaders, Native organizations, and conservation groups to get their input. A notice in the Federal Register, advertisements in newspapers, and mailed notices were used to request written comments from interested citizens.

PUBLIC CONCERNS

A summary of the information provided by those who participated in this public involvement process follows. In evaluating the input received, an attempt was made to summarize the concerns expressed by the public relative to management of the refuge and to identify the important issues for the Yukon Flats Refuge which can be addressed in the Comprehensive Conservation Plan.

Access and Transportation. People commented more about access and transportation than about any other issue. There was considerable opposition to construction of roads, particularly any roads near the villages. Many people stated that roads would bring too many people into the area. Though some expressed concern about the impacts that an influx of people would have on wildlife, more spoke of concern about the effect that roads would have on village life. A few comments favored building roads if there is a proven need for them. Some stated that roads would enable more people to enjoy the refuge.

Attitudes toward other forms of transportation (i.e., snowmobiles, boats, airplanes, all-terrain vehicles) were more mixed. While there was recognition that local villagers depended on all these craft to some extent, there was considerable concern about their use by people from outside the area. People also spoke of concern about vehicles that would damage the environment.

People were also concerned about the use of traditional access trails between villages. Concern was expressed that individual trappers might try to claim trails as their private traplines and prevent others from traveling them.

Recreation. There were many complaints about "floaters" or river runners. It was said that they litter, steal, start forest fires, take game illegally, and travel without adequate equipment for their own safety. A few people, however, were less critical.

Many people expressed opposition to development of campgrounds. There was concern that campgrounds would draw too many people, that these people would interfere with hunting and other traditional uses, and that the natural beauty of the area would be diminished and the concept of the refuge destroyed.

Those not opposed to campgrounds suggested that a limited number be developed and that they should retain the natural environment as much as possible, should be open only at certain times of the year, and that there should be a limit to the number of people allowed entrance.

Some young people stated that a visitors' center would be a good idea as a point of information for the area, but one person indicated it would be a waste of taxpayers' money. Fort Yukon and Circle were suggested as possible sites for a visitor center.

Private Lands. Some people suggested the government purchase all inholdings from willing sellers or give inholders lands outside the refuge in exchange for their inholdings. Others objected to any government purchase of private lands, fearing they might lose access to lands that local people have used for generations. The need for sufficient access across refuge lands to private inholdings was also identified as an issue.

Mineral Exploration and Development. There were numerous concerns about the water pollution that has resulted from the present mining operations outside the refuge. For this reason, many people were opposed to mining on the refuge. Others supported mining as an activity on the refuge.

Oil and Gas Exploration and Development. People spoke both for and against oil and gas development. Those opposed to it stated that it would harm wildlife and habitat and that traditional uses should have priority over oil and gas development. Those who favored oil and gas development saw an opportunity for employment for local people and a possibility that fuel costs might go down.

Wilderness. Wilderness designation was seen as imposing more restrictions on local people and bringing more outsiders to the area. A suggestion was made to consider the lower Brooks Range and the north side of the White Mountains for wilderness designation.

Managing the Refuge. It was suggested that someone from the Fish and Wildlife Service spend more time living and working in each village to develop a better understanding of the communities. There were many comments that local people should share in the final decisions in the planning process. Several people said that the land should be left as it is. Others talked of the difficulty in getting permits from the refuge office in Fairbanks. It was suggested that people in the villages should be hired to issue permits locally.

Miscellaneous. People were worried that local concerns would not be met and that their comments would be ignored. They requested that they be kept informed at all stages of the planning process and that all comments be made available to the public.

The State advocated adoption of a liberal approach to public access. All refuge trails, waterways, and aircraft landing areas that are now open should remain so. Off-road vehicles are a traditional means of access for hunters, anglers, trappers, and other recreationists and their continued use should be allowed. Public use of cabins on the refuge should continue, facilitating recreational and subsistence uses and providing for public safety. Cabins should be maintained and replaced with new cabins, if necessary.

The importance of protecting key wildlife areas, such as stream confluences, spawning areas and fishery migration routes, mineral licks, nesting and calving areas, and winter ranges, is stressed in the state's recommendations. Any resource exploration or development activities, or the development of refuge facilities (such as support facilities, trails, or campgrounds) should avoid these areas.

The Service should maintain the State's opportunity to implement established fisheries enhancement techniques and to conduct future research on the refuge. Opportunities for ADF&G to conduct aerial, ground, and boat surveys of fish and wildlife should not be unduly restricted by cumbersome permit requirements. The erection and maintenance of any facilities or structures necessary for fish and wildlife management should be allowed.

The State requests that the Service adopt management plans that are in substantial agreement with state wildlife management plans. Development and implementation of habitat management plans on the refuge should be done in cooperation with the state. Such plans should consider various means of habitat management, developing plans consistent with the needs of fish and wildlife populations. Continued cooperation in developing fire management plans was stressed.

MANAGEMENT CONCERNS

In addition to public involvement in identifying issues, Section 304(g) of ANILCA requires the Service to identify and describe "significant problems which may adversely affect the populations and habitats of fish and wildlife" found on the refuge. Significant problems affecting the Yukon Flats Refuge were identified by the planning team, including the refuge staff, and are discussed in detail below.

Refuge Inholdings. The Yukon Flats Refuge boundary encloses over 11 million acres. Of this land, 8.63 million acres were designated by ANILCA for inclusion in the National Wildlife Refuge System (8.48 million acres according to Bureau of Land Management (BLM) land status records as of July 1986). Almost completely enveloped within this acreage is about 2.7 million acres of private inholdings represented by six Native village corporations and Doyon, Ltd. (the regional Native corporation). The amount and location of these large blocks of private inholdings create a significant long-term management concern for the Yukon Flats Refuge.

At present, the private inholdings remain relatively intact and highly productive from a fish and wildlife standpoint. These lands, though, could be developed in the future for a variety of uses including oil and gas development, agriculture, and commercial timber harvesting. Although such development is more likely to occur on private inholdings than on the refuge proper, a number of effects on surrounding refuge lands could result from development (i.e., loss and/or alteration of habitat, water pollution, increased exploitation of resources).

the Environmental Protection Agency, the BLM, and the Alaska Department of Environmental Conservation to develop a plan to rectify this problem).

Coordination between federal and state agencies during all land-use planning activities is necessary to assure management integrity between adjacent lands. Even with coordination, the goals, objectives, and regulations under which various federal and state agencies operate may result in significant management variation along contiguous boundaries or on the same river. In addition to land-use planning, specific programs and activities such as the BLM and state land disposal programs and fire suppression activities can result in inconsistencies with refuge plans and programs and can adversely affect refuge resources without a coordinated planning effort.

Lack of Data on Wildlife Populations, Habitats, and Their Uses. There are large gaps in our understanding of wildlife and fish populations, habitats, and their uses on the Yukon Flats Refuge. The Yukon Flats is a new refuge in an isolated area where little research has been undertaken to date.

The continued presence of wildlife and fish species on the refuge depends on management. The key to good management is adequate data. Information on wildlife and fish resources on the Yukon Flats is needed for four main reasons. 1) As a basis for developing harvest recommendations for resident fish and wildlife species on the refuge and for migratory bird and fish species on and off the refuge. 2) To make knowledgeable habitat management decisions, such as where to prescribe burn or regulate human access. 3) To assess the effect of development and plan for development in areas where impacts would be minimal. Oil and gas exploration and development, transportation corridors, and agricultural development are potential activities on the refuge that can affect wildlife and fish resources. 4) To expand scientific knowledge about wildlife and fish species both for the sake of science and for the general benefit of people using fish and wildlife resources.

Waterfowl populations are the best studied wildlife resource on the refuge, although research has been limited to population trend surveys. Important data gaps exist concerning waterfowl/habitat relationships, particularly for those national resource species found in significant numbers on the refuge such as canvasbacks, pintails, sandhill cranes, and white-fronted and Canada geese. The effect of subsistence use on waterfowl populations is unknown.

Less is known about other species. Very low moose populations/densities (as low as one moose per ten square miles) are common on the refuge. Why such low populations occur is not fully understood. This lack of understanding indicates a need for more information on the relationships between moose/predators/humans/habitat. Similarly, despite the importance of furbearers to residents of the upper Yukon, little is known about furbearer ecology in the area. The Yukon and its tributaries constitute major fishery habitat. Continued protection of critical coho, chinook, and chum spawning grounds and migratory streams is dependent on knowing where these areas are. Overwintering areas for resident fish species also require protection. Although some areas have been located, many overwintering areas remain to be identified. In addition, serious gaps in fish species life histories and fish/habitat relationships still exist. Fisheries management is difficult without this supporting scientific data.

Without adequate data the Service is unable to optimally meet the combined goals of wildlife, fish, and water conservation as well as continued local subsistence use of these resources. With little data the Service will tend to adopt conservative management policies which may preclude maximizing public benefits.

Water quality standards are well defined, however, without enforcement effort or an economical method of water treatment, the problems of Birch Creek will continue. Impacts are associated with two primary factors: excessive sediment load in the stream system and toxic heavy metal precipitation on bedload sediment particles.

A loss of aquatic habitat has occurred in the upper reaches of Birch Creek as the result of placer mining activities in the area. Studies underway by the Alaska Cooperative Fishery Research Unit have found that streams where miners discharged their wastes into the water had far less aquatic life. Levels of sediments were found to be 5 to 95 times the legal effluent discharge limits. Few invertebrates were found within Birch Creek and no algae growth was found.

Both settleable and non-settleable solids are plentiful. Settleable solids will drop out when water slows down. The non-settleable solids are very fine and give the water a cloudy appearance called turbidity. Fish avoid the highly turbid waters of this portion of Birch Creek. Sight feeding fish are unable to feed as well as in clear water, thus limiting their growth. Some gill abrasion has been noted. Excessive sediment loads have also caused loss of spawning habitat due to clogging of spawning gravels. Deposition of sediments has also reduced or blocked the interchange of surface and subsurface water. Within the Yukon Flats Refuge, turbidity is the primary factor affecting aquatic habitats and fisheries. Turbidity standards can be met through the use of a closed system with complete recycle capabilities, though such systems involve considerable expense.

An ADF&G study supports these findings, concluding that "Placer mining in the Birch Creek watershed resulted in (1) elimination of the riparian vegetation; (2) increased particle embeddedness and a higher proportion of silt and sand deposited on the stream bottom below mining; (3) elimination of fish habitat; (4) depressed aquatic invertebrate populations; and (5) elimination of all fish from mined streams and from streams above active mining" (Weber and Post 1985).

Heavy metal studies have been undertaken on the upper reaches of Birch Creek. Recent studies by the Cooperative Unit indicate that sediments contain considerable amounts of heavy metals - elevated amounts of copper, zinc, lead, and arsenic. The effects of high concentrations of heavy metals are not fully understood or documented on Birch Creek.

Although most studies of Birch Creek have occurred in the vicinity of placer mining activities upstream of the refuge, impacts to the water quality of Birch Creek have been noted by the residents of the community of Birch Creek. ". . . data from the Alaska Department of Natural Resources shows that in certain instances in 1985, turbidity levels at the village exceeded the drinking water standard by 1,400 percent" (letter from Mack, hydrologist for the Alaska Department of Natural Resources, to Barnett, attorney for plaintiffs, in Sierra Club et al. 1986). Birch Creek residents have not caught grayling in the river for years and trapping harvests along the river are down by fifty percent (declaration of Susan James, vice president of the Birch Creek Village Council, in Sierra Club et al. 1986).

How the impacts of mining on Birch Creek are affecting other wildlife species, such as waterfowl, are not understood. Little knowledge of the health and safety problems which may be associated with downstream use of Birch Creek. "The water, which was formerly crystal clear, must be sanitized with clorox or boiling before drinking. Even so, there have been unexplained cases of sickness that the people attribute to drinking the river water." (declaration of Susan James in Sierra Club et al. 1986).

The lack of staff and limited amount of field time are also major factors contributing to the lack of biological data on the refuge. This concern was discussed previously.

IDENTIFICATION OF SIGNIFICANT PLANNING AND WILDERNESS ISSUES

In identifying significant planning and wilderness issues for the Yukon Flats CCP/EIS, the planning team reviewed the public concerns identified during the scoping process and the management concerns identified by the refuge staff and other Service personnel. Table 1 summarizes the issues and areas of concern which have been identified through the scoping process for the Yukon Flats Refuge. While this table does not identify all the issues and concerns identified, it does attempt to focus attention on those the Service considers to be the most important. These issues and concerns were then analyzed in more detail in order to determine which issues are significant planning and wilderness issues for the Yukon Flats CCP/EIS.

Access and Transportation

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on the continued use of traditional methods of access?

Continued use of traditional methods of access is not a significant issue in terms of the CCP. Under Section 1109 of ANILCA, valid existing rights of access are guaranteed. Section 1110(a) allows the use of snowmachines, motorboats, airplanes, and nonmotorized surface transportation methods for traditional activities and for travel to and from villages and homesites, subject to reasonable regulation. Section 811 permits, for subsistence purposes, appropriate use of snowmobiles, motorboats, and other means of surface transportation traditionally employed for such purposes by local residents, subject to reasonable regulation.

- o What impact will the comprehensive conservation plan have on the continued use of traditional access routes?

The continued use of traditional access routes on the refuge is not a significant issue in terms of the CCP. See the above discussion on use of traditional access methods.

- o What impact will the comprehensive conservation plan have on the construction of roads for public use on the refuge?

Construction of roads for public use on the refuge is not a significant issue in terms of the CCP. Under Section 1109 of ANILCA, valid existing rights of access are guaranteed. Section 1110(a) allows the use of snowmachines, motorboats, airplanes, and nonmotorized surface transportation methods for traditional activities and for travel to and from villages and homesites, subject to reasonable regulation. Section 1110(b) assures that the state or private owner or occupier of state owned or privately owned land, including subsurface rights, or a valid mining claim or other valid occupancy

shall be given such rights as may be necessary to assure adequate and feasible access for economic and other purposes to these lands, subject to reasonable regulations. Construction of roads, pipelines, and transmission lines not subject to the above provisions could occur depending on the management category proposed in the CCP. However, the probability of roads or other utility corridors not covered by Section 1110(b) being requested during the life of the plan are low. Service roads and other utility corridors required for possible oil and gas development are discussed under oil and gas later in this chapter.

Wilderness Designation

- o What will be the impact of wilderness designation on the continued use of traditional methods of access on the refuge?

The continued use of traditional methods of access is not a significant wilderness issue. See the discussion above. Whether an area is or is not wilderness will not affect the use of traditional methods of access.

- o What will be the impact of wilderness designation on the continued use of traditional access routes on the refuge?

The continued use of traditional access routes is not a significant wilderness issue. See the discussion under CCP above. Whether an area of the refuge is or is not designated wilderness will not affect the use of traditional access routes.

- o What will be the impact of wilderness designation on road construction on the refuge?

Wilderness designation would not have a substantial impact on the construction of roads or other utility corridors on the refuge, therefore this is not a significant wilderness issue. No proposals to build transportation corridors through the refuge have been made, and the probability of such proposals during the next 50 years is low. Any transportation corridors which may be proposed would probably be to provide access to private inholdings for economic or other purposes or for travel to and from villages and homesites, activities which are guaranteed under provisions of Title XI of ANILCA. Service roads and utility corridors related to oil and gas development are discussed under oil and gas later in this chapter. Transportation corridors can be built through designated wilderness, subject to the provisions of Title XI. These provisions include Congressional concurrence.

Fish and Wildlife Populations and Habitats

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on the amount of habitat and the population level of fish and wildlife on the refuge?

This is not a significant issue. The purposes for establishing the Yukon Flats Refuge are set forth in Section 302(9)(B) of ANILCA and include:

established. Congressional designation of all or part of the refuge as wilderness would provide a long-term level of protection that Service management does not provide. Wilderness designation, therefore, would enhance this purpose of the refuge.

- o What will be the impact of wilderness designation on the level of predator control on the refuge?

Predator control is not a significant wilderness issue. Where biologically justified and implemented in accordance with provisions of NEPA, predator control will be permitted on all areas of the refuge, including designated wilderness, regardless of management category or alternative being implemented.

- o What will be the impact of wilderness designation on the amount of prescribed burning on the refuge?

Prescribed burning on the refuge is a significant wilderness issue. As discussed above, the Service has an approved prescribed burning plan for the refuge and will be undertaking prescribed burning in the future.

- o What will be the impact of wilderness designation on the amount of other methods of habitat improvement on the refuge?

This is not a significant wilderness issue. Wilderness designation would preclude the use of most habitat improvement techniques (such as crushing and chaining) other than prescribed burning. As discussed above, the Service has no plans to undertake any habitat improvement activities other than prescribed fire, even in the long term. The economic and physical feasibility of undertaking such activities is not likely to change over the next 50 years.

Subsistence

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on subsistence hunting, fishing, and trapping levels on the refuge?

This is not a significant issue in the CCP. The continued provision of opportunities to participate in subsistence activities is a purpose of the refuge. Title VIII of ANILCA provides policy and direction on the Service's role in subsistence management and use. Subsistence use would be managed in the same manner under all management categories and in all the alternatives. The State of Alaska, through the Department of Fish and Game, regulates hunting, fishing, and trapping on the refuge. The relationship between the Service and ADF&G is a matter of policy and law and does not vary across the alternatives. Fish and game harvest regulations are set by the Alaska Boards of Fisheries and Game and administered by ADF&G. These regulations apply uniformly to all refuge lands.

- o What impact will the comprehensive conservation plan have on subsistence harvest levels of refuge timber?

Harvest of timber for subsistence purposes is not a significant issue in the CCP. Subsistence use of timber would continue to be allowed in all

Cabins

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on the level of cabin construction on the refuge?

Construction of cabins on the refuge is not a significant issue in terms of the CCP. Service policy on the construction and use of cabins on the refuge will not be affected by the management alternative chosen. Service regulations on existing cabins within Alaskan refuges (50 CFR 36.33[b][1]) state that traditional and customary use of existing cabins will be allowed to continue provided their use is compatible with refuge purposes. Construction of new cabins for private recreational use is prohibited by Section 1303(b) of ANILCA. However, new cabins may be permitted if compatible with refuge purposes and if use of the cabin is either directly related to administration of the area or is necessary to provide for continuation of an ongoing activity or use otherwise allowed within the area. This policy will be carried out the same under all management categories and in all the alternatives.

Wilderness Designation

- o What will be the impact of wilderness designation on the level of cabin construction on the refuge?

Construction of cabins in wilderness areas is not a significant wilderness issue. Wilderness designation would have no effect on the construction and use of cabins as outlined in the policy discussed above.

Commercial Timber Harvest

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on harvest levels of timber for commercial purposes on the refuge?

Harvest of timber for commercial purposes is a significant issue in the CCP. Commercial harvest of timber would be allowed in areas of the refuge under intensive and moderate management (in Alternatives B and C). Interest in such harvest has been expressed by local residents as a possible commercial activity for individuals or for village corporations and may be proposed within the life of the plan.

Wilderness Designation

- o What will be the impact of wilderness designation on harvest levels of timber for commercial purposes on the refuge?

Harvest of timber for commercial purposes is a significant wilderness issue. Commercial timber harvest on the refuge has been identified as a possible economic activity for local residents or village corporations to undertake on the refuge. Proposals for this activity are likely within the next 50 years. Wilderness designation would preclude the possibility of

Recreation

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on the level of construction of campgrounds and other facilities on the refuge?

Recreational use of the refuge is not a significant issue in the CCP. Recreational hunting, fishing, and trapping will be permitted subject to state and federal regulations, regardless of management category. Improved campsites would be permitted in all management categories if necessary to prevent resource degradation. Primitive camping would be permitted throughout the refuge. Recreational uses, such as backpacking, river floating, and associated activities, would be permitted throughout the refuge in all alternatives. Because of limited resources and the remoteness of the refuge, the probability of any significant growth in recreational use on the refuge is low. Currently, almost no guiding occurs on the refuge and the probability of any significant increase within the life of the plan is very low.

Wilderness Designation

- o What will be the impact of wilderness designation on the level of development of campgrounds and other facilities on the refuge?

Recreational use of the refuge is not a significant wilderness issue. Wilderness designation would preclude development of most visitor facilities. There is low probability of recreational use increasing to levels which would require any visitor facilities outside of easily accessible areas (i.e., villages within or near the refuge, along the Dalton Highway). Improved campsites could be provided, including in designated wilderness, if necessary to prevent resource damage. Most recreational pursuits occurring on the refuge currently, such as backpacking, recreational hunting and fish, river floating, and associated activities, would not be affected by wilderness designation. Guiding activities are expected to remain very low over the next 50 years. Only a slight increase in recreational use is anticipated if wilderness is designated. Based on the remoteness and physical characteristics of the refuge, it is unlikely that use levels would increase over the next 50 years to the point that refuge resources, including wilderness values, would be affected or that visitor facilities on refuge lands would be necessary.

Private Lands

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on the level of access to inholdings and traditional use areas?

Access to inholding and traditional use areas is not a significant issue in terms of the CCP. Under Section 1109 of ANILCA, valid existing rights of access are guaranteed. Section 1110(a) allows the use of snowmachines, motorboats, airplanes, and nonmotorized surface transportation methods for traditional activities and for travel to and from villages and homesites, subject to reasonable regulation. Section 1110(b) assures that the state or private owner or occupier of state owned or privately owned land, including

to cooperation with inholders and owners of adjacent lands are presented later in this document. The Service does not have the authority to regulate the use of private inholdings or use of lands where valid occupancy rights exist.

- o What will be the impact of wilderness designation on the amount off-refuge development and the impacts of such development?

This is not a significant wilderness issue. The Service has no authority to regulate the use of lands outside the refuge or the activities which occur on those lands, even if these activities are occurring adjacent to designated wilderness. When refuge resources, including resources within designated wilderness, are adversely affected by off-refuge development, the Service will notify the appropriate agency(ies) with enforcement authority and will cooperate with said agency(ies).

Mineral Development

Comprehensive Conservation Plan

- o What impact will the comprehensive conservation plan have on the level of mineral development on the refuge?

Mineral development is a significant issue in terms of the CCP. Management of mineral exploration and development would be the same regardless of management category or alternative. Section 304(c) of ANILCA withdrew all public lands in each National Wildlife Refuge in Alaska from location, entry, and patent under the mining laws (hardrock minerals), but not from operation of mineral leasing laws (see Oil and Gas discussion below). Mining activity would, therefore, not be allowed on the refuge except on claims existing prior to December 2, 1980. Four mining claim case files remain in active status (BLM records), all on Chandalar Creek in the northeastern area of the refuge. There is moderate potential for more intensive mining activity to occur at these sites within the life of the plan. Such activity could result in some adverse impacts to refuge resources. The Service will monitor off-refuge mining activities to ensure that impacts to refuge resources are not occurring or are limited to the maximum extent feasible, regardless of management category.

Wilderness Designation

- o What will be the impact of wilderness designation on the level of mineral development on the refuge?

Mineral development is a significant wilderness issue. No mining is allowed on designated wilderness lands with the exception of claims (if valid) existing prior to December 2, 1980. Four mining claim case files remain in active status (BLM records), all on Chandalar Creek in the northeastern area of the refuge. There is moderate potential for more intensive mining activity to occur at these sites within the next 50 years. Such activity could result in some adverse impacts to wilderness values. In addition, adequate and feasible access to valid mining claims within designated wilderness is guaranteed under Section 1110(b) of ANILCA. Such access may impact the suitability of lands for designation as wilderness. Impacts from off-refuge mining will be dealt with regardless of wilderness status, as discussed above.

rights and property. The Service has sought, and will continue to seek, the input of local residents relative to the planning and management of the Yukon Flats Refuge.

This issue is related only to the CCP and will not be affected by designation or non-designation of areas of the refuge as wilderness.

SIGNIFICANT ISSUES

The following issues were determined to be significant in terms of the CCP through the preceding analysis process:

- o What impact will the comprehensive conservation plan have on the amount of prescribed burning on the refuge?
- o What impact will the comprehensive conservation plan have on harvest levels of timber for commercial purposes on the refuge?
- o What impact will the comprehensive conservation plan have on amount of wilderness designation on the refuge?
- o What impact will the comprehensive conservation plan have on the quality of wilderness values on the refuge (need to protect refuge resources)?
- o What impact will the comprehensive conservation plan have on the level of mineral development on the refuge?
- o What impact will the comprehensive conservation plan have on the level of oil and gas exploration, leasing, and development on the refuge?

The following issues were determined to be significant wilderness issues through the preceding analysis process:

- o What will be the impact of wilderness designation on the amount of prescribed burning on the refuge?
- o What will be the impact of wilderness designation on harvest levels of timber for commercial purposes on the refuge?
- o What will be the impact of wilderness designation (or non-designation) on the quality of wilderness values of the refuge?
- o What will be the impact of wilderness designation on the level of mineral development on the refuge?
- o What will be the impact of wilderness designation on the level of oil and gas exploration, leasing, and development on the refuge?

PUBLIC REVIEW OF THE DRAFT PLAN

The Draft Yukon Flats Comprehensive Conservation Plan/Environmental Impact Statement (CCP/EIS) was made available for public review and comment early in September, 1985. A ninety day review was established. Following a restatement of the Service's policy on oil and gas exploration and leasing on National Wildlife Refuges in Alaska, a supplement to the Draft CCP/EIS was prepared and made available for public review in early December, 1985. The comment period was extended for an additional sixty days at this time. During the comment period the Service received 58 written comments from local, state, and federal agencies, industry, local interests, conservation groups, and other interested parties and individuals. These letters and the Service's responses are printed as Appendix K of this document.

Table 2. Analysis of public comments on the draft plan.

Comments from:	#	Alternative Supported					No Pref.	Oil and Gas	Wilderness	RS 2-77	Com. Timber	Mult. Use	Local Advis. Comm.	Local Wild
		A	B	C	D	E								
Federal Agencies	7	-	-	-	-	-	7	-	-	-	-	-	-	
State of Alaska	1	-	-	-	-	-	1	1	-	-	-	-	-	
Regional, Local, and Native Organizations	4	1	-	-	4	-	-	1	1	-	-	-	-	
Organizations	9	-	-	-	-	4	5	1	3	1	-	-	-	
Industry	8	-	7	1	-	-	1	7	0	-	-	5	-	
Individuals								0	11	0				
Alaska	22	-	-	-	2	11	9	0	10	0	4	-	-	
Lower 48	7	1	-	-	-	5	1	0	3	-	-	-	-	
Total Written	58	2	7	1	6	20	24	9	20	1	1	5	4	
Anchorage Hearing	5	-	2	-	-	-	2	2	2	-	-	-	-	
Fairbanks Hearing	27	-	-	-	-	3	4	0	3	1	-	-	2	
Village Meetings ¹	57	1	1	1	6	4	-	0	4	-	5	-	1	
								3	0		0		0	

Note: numbers listed under the various issues represent the number of people supporting (upper left) or opposing (lower right) the particular issue.

¹ Numbers represent the number of meetings where support for an alternative or views on an issue were voiced, not the actual number of people supporting an alternative or with views on an issue.

- 5) the public use section of the Affected Environment chapter has been changed to three separate section - Subsistence, Access and Transportation, and Recreational Use - with the Subsistence section immediately following the section on economic conditions because of the importance of subsistence as part of the local economy;
- 6) an expanded discussion of access and transportation relative to Title XI of ANILCA has been included in the Affected Environment chapter and in the common management section of the Management Alternatives chapter;
- 7) the category of designated wilderness has been added to the management categories section and the management activities table (Table 13) of the Management Alternatives chapter;
- 8) several changes have been made in the management activities table (Table 13) involving habitat improvement, fisheries activities, commercial timber harvest, agricultural development, and other activities;
- 9) common management directions have been added discussing administrative and visitor facilities and services, management emergencies, and mitigation;

SPECIAL VALUES

SPECIAL VALUES

In response to requirements of Section 304(g) of ANILCA, the Service has identified the following special values of the Yukon Flats Refuge:

The White Mountains. A very scenic area of white limestone mountains lying along the southern boundary of the refuge. The mountains are isolated, receive only limited use, and remain virtually undisturbed by human development. The area also provides habitat for the only known population of Dall sheep found in the refuge. Beaver Creek, a National Wild River, is located in the White Mountains.

The Yukon River and its Tributaries. The Yukon River, along with its tributaries, provides the major transportation corridor through the refuge. Historical use of the river system for travel is evidenced by the many cultural sites found along the rivers. The Porcupine and Yukon Rivers were of particular importance in the expansion of the fur trapping and trading activities of the Hudson's Bay Company into the region in the mid-1800's. Today, subsistence activities (such as the cutting of house logs, fishing, and moose hunting) and recreational activities (primarily river floating and sport hunting) are concentrated along the Yukon and its tributaries.

Important wildlife habitat is found in association with the Yukon River and its tributaries, as well. Moose, furbearers, waterfowl, and other wildlife use the riparian/wetland areas found in association with the rivers while numerous fish species, including chum, coho, and chinook salmon, are found in the rivers. The Sheenjek River and the Fishing Branch River (headwaters of the Porcupine River) are two of the most important fall chum salmon producing streams in the entire Yukon River system. American peregrine falcons, an endangered species, are found along segments of the Yukon and Porcupine Rivers.

The Yukon Flats. Consisting generally of the wetlands and lowland lakes below the 640 foot elevation, this area is the prime waterfowl habitat on the refuge. One of the major purpose for designation of the area as a National Wildlife Refuge was the protection of this waterfowl habitat, one of the most consistent waterfowl production areas in North America. Waterfowl raised on the Yukon Flats have been harvested throughout North and Central America.

Size and Configuration of the Refuge. The refuge encompasses over 11 million acres of which 8.48 million acres (as of July 1986 Bureau of Land Management land status records) are designated as refuge lands. These are generally natural and undisturbed lands. Access to the area is limited and the refuge remains as "defacto" wilderness. Within the refuge boundary are several entire watersheds - the Hodzana, Hadweenzic, Grass, and Sucker - as well as a number of ecosystems. These areas remain in their natural condition. The opportunity to study basically undisturbed watersheds and ecosystems is provided. Historic caribou range is also found throughout much of the refuge.

IV. AFFECTED ENVIRONMENT

AFFECTED ENVIRONMENT

Containing the largest interior basin in Alaska, the Yukon Flats Refuge encompasses 11.18 million acres of land (8.48 million acres in federal ownership) in east central Alaska. Extending 220 miles east-west along the Arctic Circle, the refuge lies between the Brooks Range (to the north) and the White-Crazy Mountains (to the south). The "pipeline corridor" runs along the refuge's western boundary while the eastern boundary extends to within 30 miles of the Canadian border. The Yukon River bisects the refuge, creating the dominant terrain features of the refuge.

As many as 40,000 lakes and ponds may occur on the refuge, most concentrated in the flood plain along the Yukon and other rivers. Upland terrain, where lakes are less abundant, is the source of important drainage systems.

The abundance of water in lakes, ponds, and streams provides habitat for waterfowl from all four North American flyways. Though the refuge supports a varied population of mammals, fish, and birds which are important in maintaining the traditional subsistence lifestyle of local residents, it is the waterfowl nesting and rearing habitat which are of national significance. The Yukon Flats is a segment of the continental waterfowl breeding grounds almost unequaled in extent and continuous high productivity. It has been estimated that waterfowl from the Yukon Flats provide 400,000 days of recreation annually to sport hunters in Canada, Mexico, and the continental United States (USDI-BSFW 1974).

LAND STATUS

Major legislation affecting land ownership in the Alaska refuges includes the Alaska Statehood Act, the Alaska Native Claims Settlement Act of 1971 (ANCSA), and the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). These laws implemented the transfer of lands from federal to state and Native ownership.

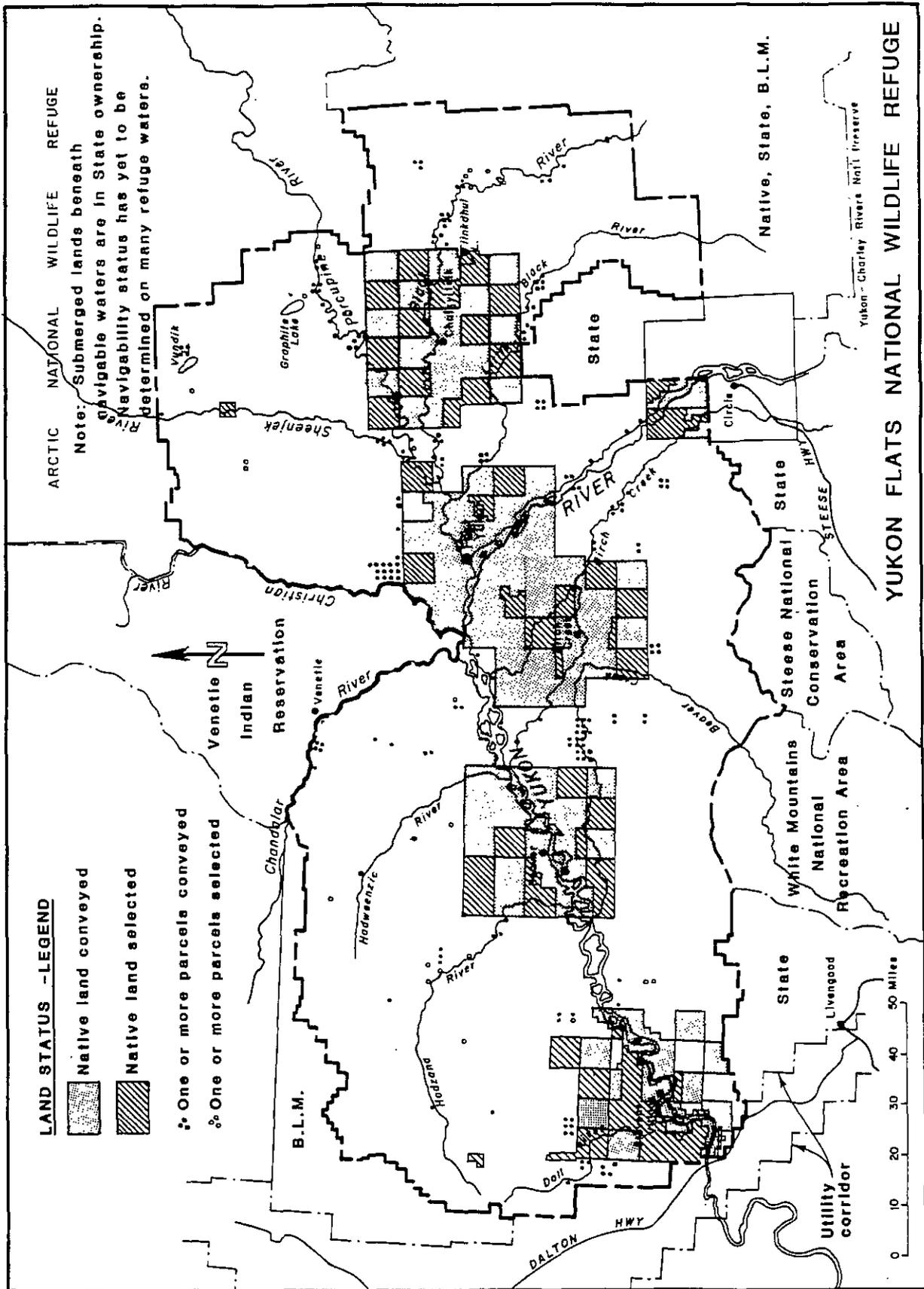
The land status of the Yukon Flats Refuge is constantly changing because lands within the refuge boundary selected by Natives and Native corporations are in the process of being conveyed, relinquished, or invalidated (rejected).

Of the 11,176,000 acres of land within the refuge boundary, approximately 8,480,000 acres (76 percent of the land within the refuge boundary) are under the jurisdiction of the federal government. Table 3 identifies how much refuge land has been selected and conveyed as of July 1986. Figure 4 shows the location of selected and conveyed lands.

As of July 1986, a total of approximately 1,734,000 acres or 16 percent of the land within the refuge boundary had been conveyed to Native corporations. This acreage includes lands conveyed to six villages and the Doyon Limited Regional Corporation.

An additional 842,000 acres or 11 percent of the lands within the refuge boundary have been selected by Native groups, Natives, and private interests. Doyon Limited has filed historical place applications (under Section 14(h)(1) of ANCSA) totaling 70,400 acres in addition to its other selections.

Figure 4. Land status, Yukon Flats Refuge, October 1985. Source: Division of Realty, FWS-Region 7.



average date for the first killing frost in the fall is August 21. Despite the short growing season, the long hours of sunlight produce lush vegetation on the Flats. Daylight is continuous for 84 days (illumination exceeding civil twilight), from May 13 to August 4. The sun does not rise on the shortest days of winter, but twilight lasts for several hours.

Precipitation is low, averaging about 6.5 inches annually at Fort Yukon. July and August are the two wettest months. Precipitation occurs mainly as showers, with large variations occurring over relatively short distances. Because of the accumulation of snow for over half the year, a low evaporation rate, and the presence of permanently frozen subsoil, the low precipitation is considerably more effective for plant growth than might be expected in more temperate regions.

Freeze-up of ponds and lakes usually occurs in October; the average freeze up date for the Yukon River is October 28. Break up occurs as water builds up in the headwaters and begins moving downstream. Average date of break up at Fort Yukon is May 15. Edges of small lakes and ponds may have open water a week before break up on the Yukon, but larger lakes are not free of ice for a week or more after the Yukon.

Extensive flooding of lowland areas frequently accompanies break up. This flooding is the primary source of water for many of the lakes in the Yukon Flats, as precipitation is insufficient to maintain water levels.

TOPOGRAPHY

The refuge includes three features: the Yukon Flats at the center, surrounding uplands, and all-encircling highlands.

The Yukon Flats, consisting of about 6.5 million acres, is mostly flat to undulating lowlands dotted with shallow lakes, sloughs, and meandering and braided streams. Elevation is about 300 feet in the west and 600 to 900 feet in the north and east. Local relief, on flood plains, well-developed river terraces, and alluvial fans, generally does not exceed 150 feet (Williams 1962). The Yukon River is the principal drainage. It drops only about 200 feet in elevation in 300 miles as it meanders across the Yukon Flats as a complexly braided stream. The lower stretches of the Yukon's tributaries are intricately braided streams with meandering channels, swelling in flood stage to a labyrinth of reticulated waterways (particularly those streams draining the areas south and east of the Yukon).

The Yukon Flats are surrounded by older river terraces, alluvial fans, and flood plain deposits that rest on bedrock. These deposits are mostly flat lying and are separated from the Yukon Flats by a 100- to 500-foot high marginal escarpment (Williams 1962). Overall topography is that of a rock-floored bench, covered with gravel and silt. These deposits are largely dissected by erosion on the north and west, but are somewhat preserved on the south and east. Elevations do not generally exceed 1,200 to 1,300 feet.

Encircling the Yukon Flats are highlands and mountains. The Porcupine Plateau, an area of low ridges with gentle slopes and rounded to flat summits, lies along the northern and eastern boundary of the refuge. Elevations reach to 2,500 feet with a few domes and mountains rising to 3,500 feet. The Chandalar, Sheenjok, and Coleen Rivers drain the northern portion of the plateau; the Black and Little Black Rivers, which originate in the Ogilvie Mountains southeast of the refuge, drain the area south of the Porcupine River. Along the western boundary of the refuge are the Hodzana Highlands, an area of

deformation in the area and the wide variations in stratigraphies are more accurately considered as belonging to separate entities called terranes rather than as vaguely related parts of a single geologic domain.

The Yukon Flats Refuge includes both in-place continental rocks and drifted and welded accretionary terranes. Underlying the Porcupine Plateau are primarily in-place undeformed and unmetamorphosed sediments (Paleozoic and Mesozoic clastic and carbonate rocks) lying in an undisturbed position over a crystalline basement. Bedrock over the rest of the refuge is found in a number of accretionary terranes, is tectonically disturbed, with widely divergent rock types in crushed, mixed, and metamorphosed assemblages.

Bedrock in the Porcupine Plateau is generally limestone, chert, sandstone, argillite, siltstone, and shale. Bedrock in the highlands north of the Yukon Flats and west of the Porcupine Plateau is mainly metamorphic and volcanic, including schist, phyllite, basalt, diabase, and gabbro. Throughout the Hodzana Highlands these latter rocks are intruded by Cretaceous granite. Locally they include light-colored Cretaceous and Tertiary volcanics at Lone Mountain and iron/magnesium-rich igneous rock at Twin Sisters. In the White-Crazy Mountains along the southern boundary of the refuge are highly deformed Paleozoic sedimentary and volcanic rocks. Conspicuous limestone units here have been overturned and thrust to the north. The White Mountains are thus aptly named, for these distinctive white limestone outcroppings occur throughout the range. Bedrock between the mountains and the flats crop out only in gullies and along the escarpment. They are, except for a coaly Eocene sediment in the upper Dall River area, similar to those in the mountains. The coal probably represents the beginning of subsidence of the Yukon Flats basin.

A mosaic of 17 terranes emerges from the relationships between the severely deformed metamorphic rocks, mafic oceanic rocks, and continental margin sequences mapped in the area. Nine of these terranes or microterranes are identified in or contiguous to the Yukon Flats Refuge. Two of these terranes, the Yukon Basin and Tatonduk, are considered important as possible oil and gas sources. The White Mountains, Crazy Mountains, Takoma Bluffs, and Beaver terranes are predominantly sedimentary assemblages which could be favorable for oil and gas reserves, but have limited areal extent along the boundaries of the refuge. The Tozitna, Ruby, and Circle terranes are predominantly volcanic, mafic, oceanic, or metamorphic with low oil and gas potential.

Surficial Geology. On the Yukon Flats, underlying the modern river flood plain alluvium, the most extensive deposits are alluvial fans deposited by major streams during the Pleistocene glacial age. The largest fans were generated by tributaries from the north, which carried abundant loads of outwash from glacial deposits in the southern Brooks Range. More recent alluvial fans drain locally from the uplands and along the escarpment north of the Yukon Flats, most extensively in the west. Deposits of wind-blown sand, probably dating from the glacial age, occur in dune fields above the flood plain north of the lower Yukon River and in broad blankets flanking higher terraces and parts of the upland farther north.

Uplands south of the Yukon River are covered with loess (wind-blown glacial flour) up to 100 feet (30 m) thick, probably of the Pleistocene glacial age. Dune shape and sediment size distribution indicate wind direction was from the Brooks Range glaciers to the north. Underneath the loess south of the Yukon, and laid bare in areas of the uplands to the north, are stratified locally-cemented deposits of sand, silt, and gravel as much as 100 feet (30 m) thick.

LEGEND

GEOLOGY OF YUKON FLATS NATIONAL WILDLIFE REFUGE

SURFICIAL DEPOSITS IN YUKON FLATS CENOZOIC BASIN

Recent  modern river alluvium

Pleistocene and earlier  alluvial fans

BEDROCK OF ENCIRCLING HIGHLANDS

 edge of highlands

Tertiary and Cretaceous  felsic volcanic rocks; rhyolite, porphyry, and breccias

Cretaceous  granitic rocks; monzonite and quartz monzonite

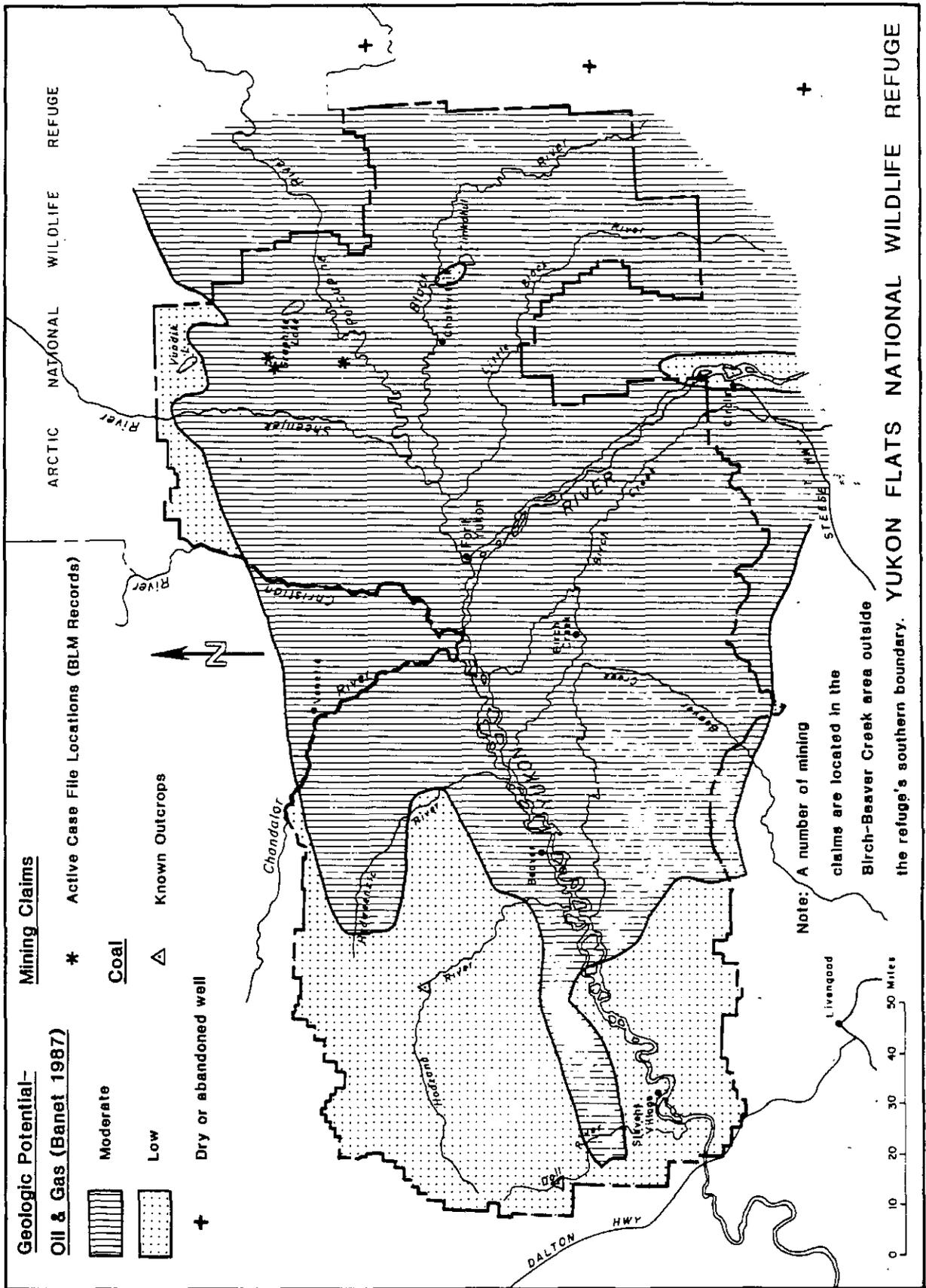
Permian to Jurassic  mafic volcanic rocks; basalt, gabbro, etc.

Permian to Jurassic  ultramafic rocks; serpentinite

Lower Paleozoic and Precambrian  metamorphic rocks; chiefly schist and phyllite, includes White Mountains assemblage

Lower Paleozoic and Precambrian  sedimentary rocks; shelf and slope carbonates and clastics, includes Quaternary volcanics east of Chalkyitsik

Figure 7. Yukon Flats oil and gas potential, known coal outcrops, and active mining claims. (Sources: Banet et al. 1987, Barker 1981, Bureau of Land Management mining recordation files-May 20, 1987.)



Paleozoic sediment contours are drawn as deep as reasonable above granite or other crystallines. (Note: The basin configuration delineated by Ehm is only one possible interpretation, based on a limited amount of preliminary data - magnetic and gravity data limited by what is apparent from surface geology. Revisions incorporating more definitive data may result in significant changes in the basin configuration.)

Geophysical - Publicly available geophysical data on this area consists of two partial aeromagnetic surveys, a Bouger Gravity survey, and a single CDP seismic line shot immediately east of the refuge's east boundary and west-southwest of the Doyon No. 2 well (Ehm 1983 in Banet et al. 1987). This line crosses the Takoma Bluff terrane and an alluvium-covered area possibly overlaying some Tertiary rocks. Reflector continuity is poor on the line, but there is enough coherence to show some southward vergence, a possible indication of thrust faults emplacing older rocks over younger rocks. There is no clear indication of Tertiary rocks or distinct terrane junctures.

The two aeromagnetic surveys (Decker and Karl 1977 in Banet et al. 1987) show shallow-seated anomalies in the west part of the refuge and deep anomalies in the east. The shallow, positive anomalies appear to be buried extensions of the Tozitna terrane (predominantly volcanic, mafic, oceanic, or metamorphic with low oil and gas potential). This enlarges the area of low potential for petroleum discovery (Figure 7) at the expense of the moderate potential area. Also, the deep-seated positive aeromagnetic anomalies identified in the eastern part of the area partially coincide with the Bouger Gravity minimums in the area north of Circle. These possibly indicate thin veneers of sediment and possible basement uplift.

The Bouger Gravity survey identifies several minimums. One minimum, some 40 miles south-southwest of Fort Yukon, is of similar setting and magnitude to a minimum tested by the Doyon No. 1 well. Doyon No. 1 encountered 11,044 feet of Lower Paleozoic to Cretaceous sediment. The Fort Yukon low should also indicate a thick sedimentary sequence, although possibly not as thick since rock densities are probably dissimilar. Bouger Gravity minimums northwest of the refuge are associated with Cretaceous granite plutons, not sediments.

Geochemical - There are no published quantitative geochemical analyses to demonstrate source rock potential in this area. However, certain Tatonduk terrane rocks were found to have a strong petroliferous odor upon fresh fracture (along Yukon River southeast of refuge). Oil seepage has been reported along Trout Creek (southeast of refuge) (Morgridge personal communication in Banet et al. 1987). Oil shale lithologies have been described near Nation (Mertie 1937 in Banet et al. 1987). The lithology and fossil assemblages of the lower part of the Glenn Shale (in the Tatonduk terrane) show that it is laterally equivalent to the Shublik Formation, a demonstrated North Slope petroleum source rock. These qualitative observations, combined with limited unpublished proprietary surface outcrop geochemical data indicate that potentially petroleum-bearing rock types have been deposited and are at least partially preserved in the region east of the refuge.

These observations also show that at least the Glenn Shale and younger rocks are within the physical-chemical oil generating and preserving constraints (oil window) in this area. Most of interior Alaska Lower Paleozoic carbonates are at thermal maturities exceeding the base of the oil preservation window, although these thermal maturities are less closer to Canada where oil and gas have been recovered (Blodgett 1978 in Banet et al. 1987).

of shearing and thrust faulting of low potential terranes over the sedimentary terranes is unknown. It is incorporated with the low potential area until further data are available, as the physical conditions created during extensive shearing and thrust faulting are not favorable to the preservation of hydrocarbons.

Note: Much of the information presented above can be found in greater detail in Petroleum Geology of the Yukon Flats National Wildlife Refuge (Banet et al. 1987), a report prepared by the Bureau of Land Management for the U.S. Fish and Wildlife Service. This document is available for public review at the Yukon Flats National Wildlife Refuge headquarters in Fairbanks, Alaska, and at the USFWS Regional Office in Anchorage. A limited number of copies are also available on request at the Regional Office.

Geothermal Resource. Evidence of possible geothermal resources within the refuge is limited. Hot springs occur near the Dall River (in T. 16 N., R. 10 W., Sec. 7, F.M. and T. 16 N., R. 11 W., Sec. 12 and 13, F.M.) (Gassaway and Abramson 1978). No studies to determine the potential for use of these hot springs have been undertaken.

Other Minerals. Alkali salt is contained in many of the lakes on the refuge. These lakes are recognized by the milky white color of their water and by evaporative crust on dried-out beds. Analysis of samples from the lakes identify this alkali material to be primarily trona (Clautice and Mowat 1981), a sodium bicarbonate industrial mineral used in the manufacture of glass and paper. Source of the trona is suggested to be groundwater emanating from supposed evaporative beds at depth. Such beds could be speculated from an ancient evaporated lake, now buried (Barker 1981), however, no trona beds are known. Bicarbonates and carbonates have been correlate with productivity in freshwater lakes (Moyle 1970).

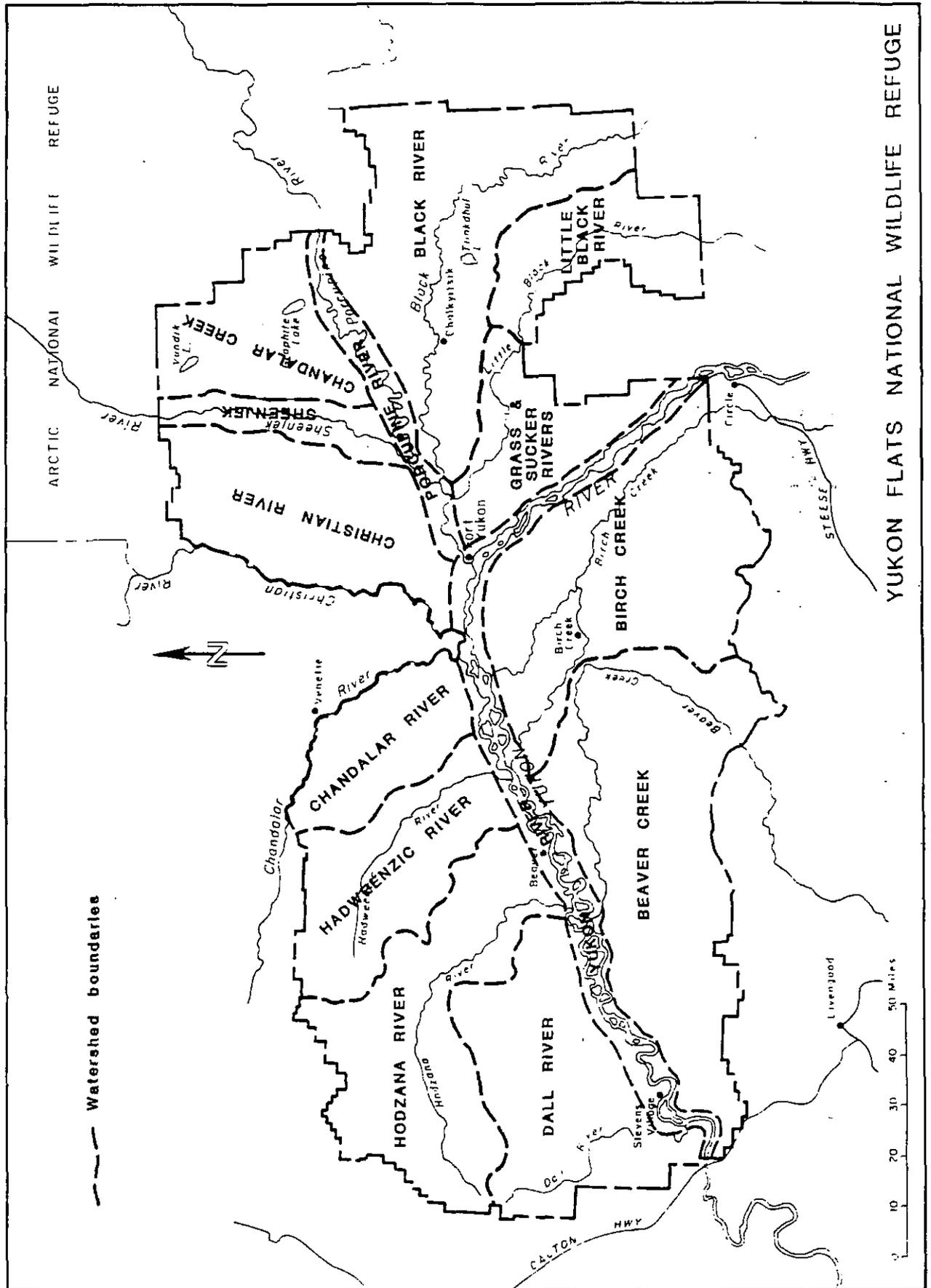
The felsic volcanics around Lone Mountain may include water-laid tuffs and ash falls (Barker 1981). Such deposits may contain zeolite, a group of hydrous aluminum silicate minerals important in industry as a water softener. No deposits are known and most of the rock in the area is rhyolite (Brosge et al. 1973).

Sand and gravel, which are found in abundance on the refuge, are too remote to be marketed economically.

WATER RESOURCES

Lakes, sloughs, and streams dominate the landscape of the Yukon Flats Refuge. There are an estimated 17,000 lakes and over 7,100 miles of rivers and streams (from Landsat imagery). Other sources, including the 1974 BSWF EIS for the proposed Yukon Flats National Wildlife Refuge, estimate the number of lakes on the refuge upwards of 40,000 and stream miles as high as 25,000. The variation in estimates of lake numbers is caused by several factors. Water levels on refuge wetlands fluctuate seasonally as well as yearly. Estimates of lake numbers have been based on samples, not on actual counts. Landsat counts lakes, but because of technical limitations misses some waterbodies. The abundance of water features has a major impact on the fish and wildlife populations, human use, and management of the refuge. Surface water provides for such diverse purposes as domestic and institutional uses, navigation, sites for small aircraft landings, fish and wildlife habitat, and recreation.

Figure 8. Watersheds on the Yukon Flats Refuge.



the Service, the Environmental Protection Agency, the Bureau of Land Management, and the Alaska Department of Environmental Conservation needs to be undertaken to develop a plan to rectify the current water quality impacts on Birch Creek.

BIOLOGICAL ENVIRONMENT

VEGETATION AND LAND COVER TYPES

General Description of Vegetation. The Yukon Flats is within the northern boreal subzone of central Alaska. Vegetation patterns on the refuge are complex--primarily the result of fire history, sediment deposition during periodic flooding, a braided drainage system, and discontinuous permafrost.

The refuge is roughly divided into three physiographic zones. These are:

Riparian and Wetlands. Areas less than 600 feet in elevation or along major rivers. This zone includes 8,300 square miles (48 percent of refuge).

Uplands. Areas between 600-1,000 feet in elevation. This zone includes 5,000 square miles (29 percent of refuge).

Mountains. Areas of the refuge over 1,000 feet in elevation. This zone includes 4,000 square miles (23 percent of the refuge).

Forests predominate at lower elevations with timberline at 2,300 to 3,000 feet (700 to 900 m). Forest vegetation is dominated by several tree species that form five distinct forest communities based on tree species dominance. Picea glauca (white spruce) reaches its optimum growth adjacent to stream channels, but is also found on a diversity of sites up to treeline. Picea mariana (black spruce) typically grows in open stands and is common on sites with restricted drainage such as muskeg and north-facing slopes (usually with a shallow thaw zone). Betula papyrifera (white birch) is characteristically an upland species and often occurs mixed with white spruce. Populus tremuloides (quaking aspen) predominates on well to extremely well drained south-facing slopes, while Populus balsamifera (balsam poplar) is primarily a riparian species forming forest communities often associated with Picea glauca.

Shrub communities of Alnus (alder) and Salix (willow), are most abundant on riparian sites. Dwarf shrubs, Betula glandulosa (glandular birch), Ledum decumbens (needleleaf Labrador tea), Empetrum nigrum (crowberry), Vaccinium uliginosum (blueberry), and Dryas octopetala (mountain avens), are common above timberline.

Field studies were conducted prior to classifying Landsat spectral data. Vegetation patterns on the ground were analyzed in a number of study blocks within the refuge. The data collected from these blocks was then used to define the spectral patterns as seen by Landsat. Thirteen land cover types were defined and used to describe the vegetation on the refuge. These types are described in Table 5. Acreage by cover type for all lands in the refuge, both federal and private, are shown in Table 4. Figures 9 through 12 graphically display the general location of the cover types on the refuge.

Table 4. Acreage summary of land cover classes on Yukon Flats Refuge.

Land Cover Class	Federal	Private*	Percentage Total Refuge
Closed needleleaf forest	985,100	274,100	11
Open needleleaf forest	2,969,100	842,100	34
Deciduous forest and scrub	1,133,500	765,300	17
Closed deciduous scrub	752,400	277,300	9
Mixed forest	1,576,500	398,900	18
Open deciduous scrub	119,500	12,400	1
Graminoid marsh	117,200	163,600	2
Alpine scrub	53,200	8,500	1
Prostrate dwarf shrub tundra	162,000	23,800	2
Alpine barren	54,100	10,900	0
Lowland alluvium and mud	13,300	12,200	0
Clear water	142,200	117,200	2
Sedimented water	66,500	112,100	2
TOTAL	8,144,600	3,018,400	

* Does not include acreage in scattered allotments.

Figure 9. Land cover classes - forests.

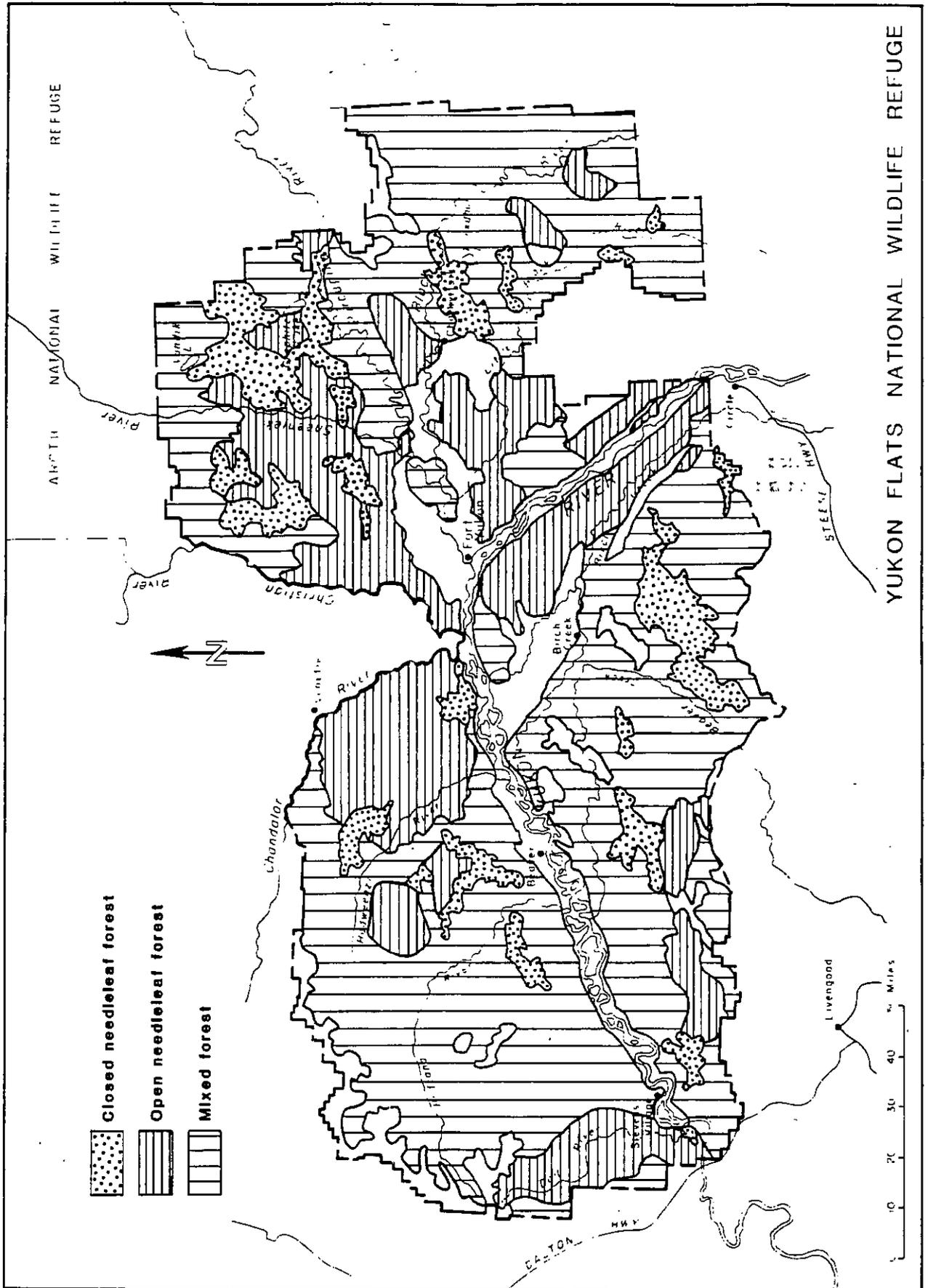
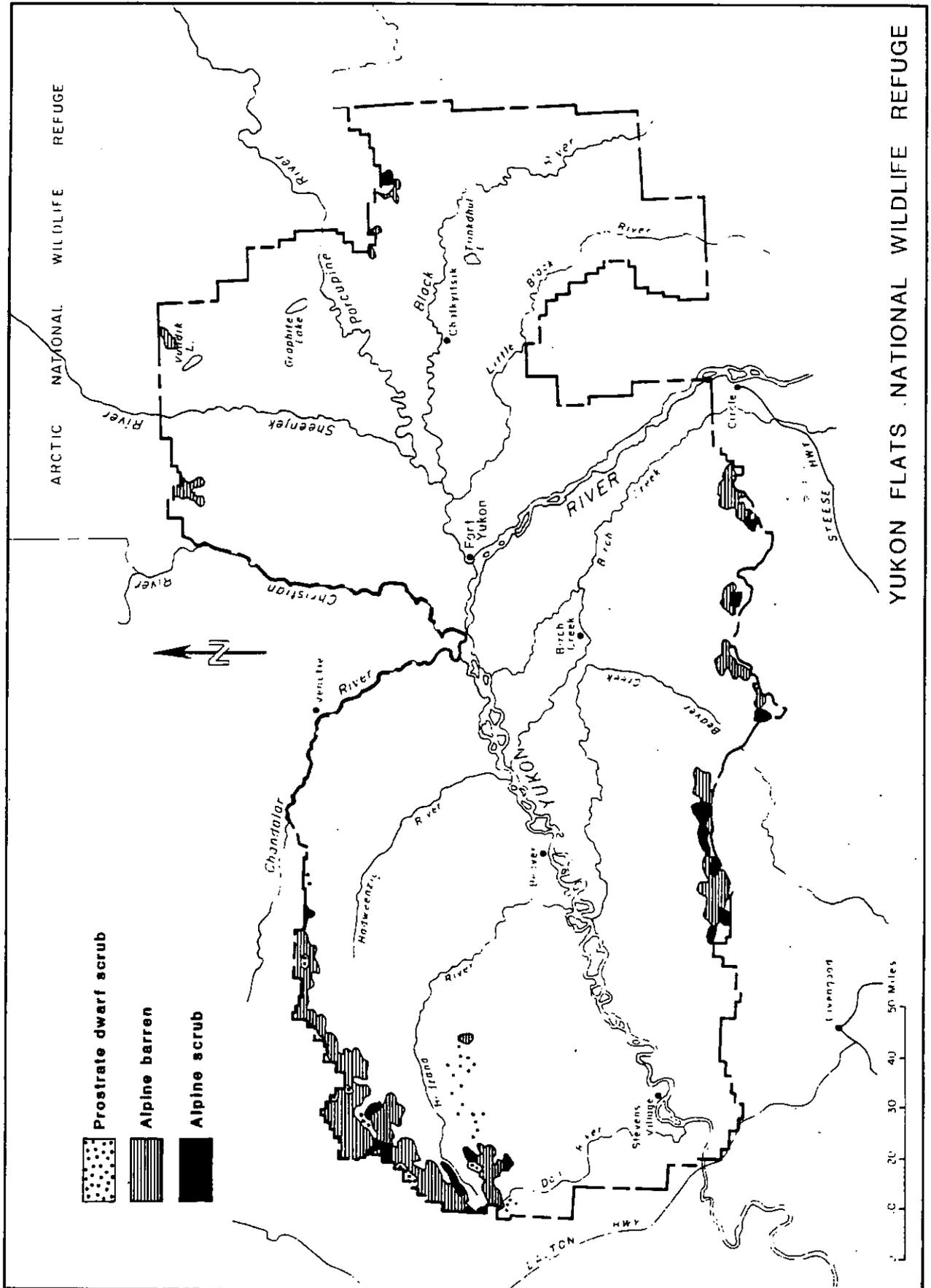


Figure 11. Land cover classes - scrub.



WILDLIFE

There are at least 210 species of birds, mammals, and fish which use the Yukon Flats Refuge. Appendices D, E, and F contain species list of the birds, mammals, and fish found on the refuge. A total of 147 bird, 39 mammal, and 24 fish species occur or potentially occur on refuge lands.

Endangered Species. The American peregrine falcon is the only endangered species known to occur on the Yukon Flats Refuge. Surveys (concentrating on the major rivers) have identified nesting sites on the Porcupine River, middle Yukon River, and Black River (Ritchie 1984, Bente et al. 1983, Roseneau et al. 1980, Mindell and Craighead 1981) within the refuge boundary. All of these sites are associated with cliffs or bluffs near the respective rivers. Two active nests are known on refuge lands. More than two young per nesting pair per year have been produced from these sites (1982 and 1983). Based on intensive surveys of small rivers and isolated rock outcrops in other areas of the state, it is likely that 20 to 30 pairs of peregrines nest on the refuge. With peregrine populations in the state increasing, the number of nesting pairs in the refuge will also likely increase.

Prey remains were collected in the Porcupine and middle Yukon River areas. Shorebirds, passerine, and waterfowl were the principal prey species groups with lesser yellowlegs, common snipe, and gray jay being species most commonly represented in the collections (Bente et al. 1983, Ritchie 1983).

National Resource Species. The Service categorizes 13 wildlife species found on the Yukon Flats Refuge as National Resource Species (formerly called National Species of Special Emphasis). National Resource Species are an internal Service designation used to focus management direction on selected species. National Resource Species found on the Yukon Flats Refuge include:

Tundra swan	Northern pintail	Bald eagle
Trumpeter swan	Mallard	Golden eagle
Greater white-fronted goose	Canvasback	Peregrine falcon
Canada goose	Ring-necked duck	Sandhill crane
	Red head	

The Yukon Flats Refuge provides important nesting, breeding, or migrating habitat for all of the above listed species. In July of 1985, the Service issued the Regional Resource Plan Cycle 2. Included in this document are strategies for management of National Species of Special Emphasis (now called National Resource Species) found in Alaska.

Since our knowledge of wildlife populations and habitats in Alaska is limited, the preferred strategy for all National Resource Species includes assessing population and habitat parameters. Additional management strategies for the identified waterfowl species are: to evaluate subsistence harvest; to manage the hunted species for populations of a determined size allowing for recreational harvest; to preserve and protect wetlands habitats on the refuge system; and to participate in planning on non-refuge system lands to minimize the impacts of development.

Preferred strategies for raptors include participating in planning economic development on non-refuge lands to minimize impacts; monitoring contaminants affecting raptors, and coordinating with other countries to reduce pesticide use.

sharp-shinned, rough-legged, and Swainson's hawks; merlins; American kestrels; osprey; and Northern harriers are found on the refuge.

Moose. Moose are currently the dominant ungulate on the Yukon Flats Refuge. Historical records of moose activity in the area are unclear. Moose have ranged throughout the Yukon Flats for at least the last 100 years. The first settlers in interior Alaska observed moose south of the Yukon River (Gasaway, personal communication). Indians and trappers claimed that moose had only been found west of Fort Yukon since about 1850.

During the winter, moose in Alaska have been observed to depend heavily on willow as forage. Four species of willow are favored--Salix interior, S. alaxensis, S. arbusculoides, and S. pulchra. In addition balsam poplar, aspen, and red osier dogwood are preferred browse. Aquatic plants are key spring and summer food.

Preliminary results from an ongoing cooperative moose study (FWS and ADF&G) indicate that, at least for females, refuge moose can be divided into three segments. One group migrates from winter range along the rivers to summer habitat in the uplands. A second segment is more sedentary, spending the entire year in small, localized areas along the Yukon River. The third segment winters in the mountains and migrates onto the flats or lower foothills during the spring and summer, returning to the higher elevations in the fall (McLean and Nowlin 1984).

Game Management Subunit (GMS) 25D includes most of the Yukon Flats Refuge. See Figure 14. Currently the moose population in the refuge is extremely low, particularly in the western two-thirds (6,740 square miles) of GMS 25D. This area is presently managed as a special permit hunt because of the low populations. ADF&G and the Service are cooperating in a study of moose in this area. The preliminary moose density estimate for GMS 25D is 0.11 moose/sq. mile (Nowlin, personal communication). This density translates into an estimated population of about 800 moose in GMS 25D (USDI-FWS 1983), a number considerably lower than moose densities estimated in 1962. At that time estimates were 0.3, 0.8, and 1.8 moose/sq. mile in low, medium, and high density areas respectively (Leopold 1966).

The reason for the low moose population in the western part of the Flats is not fully understood. Hunting, predation, and less than favorable habitat conditions probably combine, resulting in the low moose population. The study currently in progress on the refuge is intended to define the nature of seasonal moose movements and habitat use.

The moose population in the eastern portion of the Flats is not as depressed. Habitat conditions are more favorable in the Black and Porcupine drainages.

Residents of the Yukon Flats depend on moose as a primary source of meat. Local residents are responsible for the majority of the moose harvest in the refuge. The current low moose population, the lack of roads, and the long distance from any major population center discourage recreational hunting. The special permit hunt area in the western section of the refuge makes that area essentially a subsistence moose hunt area. Approximately 23 to 33 moose are harvested annually in the special permit hunt area, a number significantly below the estimated 110 animals needed to satisfy even local needs (Nowlin 1984b). However, a harvest greater than 35 animals cannot be sustained by the present moose population (Nowlin 1984b).

Dall Sheep. Dall sheep are found in the White Mountains on the southern boundary of the refuge. Most available sheep habitat is in the White Mountains National Recreation Area and the Steese National Conservation Area which are managed by the BLM. However, sheep are found on the northern side of Mt. Schwatka which lies on the southern boundary of the refuge. In addition, there is a heavily used mineral lick in the Jefferson Creek drainage on the refuge. Dall sheep range includes approximately 53,000 acres of refuge lands on the northern slopes of the White Mountains. See Figure 15 for current Dall sheep distribution on the refuge.

Surveys and studies made by Jack Gross in 1957 and ADF&G (alone or in conjunction with USFWS or BLM) in the early 1960's, 1970's, and early 1980's indicate that the population declined about 56% from pre-1970 to 1977 (Gross 1963, Jones 1960-62, Smith 1977). Since 1977 the population has risen slightly. A movement and distribution study being conducted by BLM and ADF&G shows movement among adjacent mountains. Three ewes collared on Victoria Mountain have since been located on Mt. Schwatka (Durtsche 1983a).

Escape habitat is limited in the White Mountains (Durtsche 1983a). This lack of habitat may account for the relatively low population of Dall sheep found here. Hunting pressure is not a factor on the sheep population because of generally poor access into the area.

Table 8 shows population and composition data from the ADF&G surveys. Mt. Schwatka data is separated from the total White Mountain population data to indicate the importance of Refuge habitat for Dall sheep.

Table 8. Dall sheep population and composition data.

<u>Year</u>	<u>Mt. Schwatka Sheep</u>					<u>Other White Mountain Sheep</u>				
	<u>Rams</u>	<u>Ewes</u>	<u>Yrls.</u>	<u>Lambs</u>	<u>Total</u>	<u>Rams</u>	<u>Ewes</u>	<u>Yrls.</u>	<u>Lambs</u>	<u>Total</u>
1970	18	55	--	28	101	29	116	--	42	187
1977	14	31	--	11	56	21	25	--	9	65
May 1982	7	23	9	--	39	13	39	6	8	66
July 1982	18	52	1	3	74	25	22	2	10	59

Caribou. The Yukon Flats Refuge contains seasonal or year-round habitat for three Alaskan caribou herds. The largest herd using the refuge is the Porcupine herd. This herd summers in the coastal plain and foothills of Alaska and the Yukon Territory along the Beaufort Sea north of the Brooks Range. This herd migrates in the fall along three main routes to three primary winter ranges. Two of the three routes and winter ranges are primarily in Canada. The third, the Chandalar route, runs westward along the southern foothills of the Brooks range into the Coleen, Sheenjek, and Chandalar drainages (Whitten and Cameron 1982). Animals using this route generally winter in Alaska between the Brooks Range and the Yukon River and from the Chandalar River eastward. The northeastern portion of the refuge is encompassed in this large winter range area.

Occasionally animals follow the Old Crow route in the Yukon Territory to the Porcupine River and then turn westward to follow the Chandalar route (Whitten and Cameron 1982).

Despite considerable effort, caribou movements are still not well understood. Migration corridors and wintering areas are generally defined, however, specific drainages within general migration corridors or wintering areas may not be used for many years. The portion of the Porcupine herd using any one route or wintering area varies annually. In addition, small segments of the herd may winter in other areas, such as the Mackenzie River Delta, along the Arctic coast, or along the northern slopes of the Brooks Range.

The Forty Mile herd centered in the Tanana Hills, has traditionally included the White Mountains as part of their range. Although most of the White Mountains are administered by the BLM, the northern edge of the range forms the southern boundary of the refuge. Prior to the 1930's the Forty Mile herd made large scale movements (Davis et al. 1978) and migrated north of the Yukon on occasion. The White Mountains were used as one of three major wintering areas and the major calving area by the Forty Mile herd prior to the decline of the herd's population in the late thirties. Since that time use of the White Mountains has declined. The herd's range has shrunk commensurate with the decline in animal numbers, leaving the chief wintering area south of the White Mountains (Davis et al. 1978). In addition, the herd switched its primary calving area from the White Mountains to the Tanana Hills in 1963.

Caribou still winter and calve in the White Mountains (Durtsche 1983b), but not in the numbers of earlier times. A small group of non-migratory animals may be present in the White Mountains. See Figure 16 for caribou use areas on the refuge.

Wolves. Wolves range throughout the Yukon Flats. Although wolves prey on a variety of species, they are primarily dependent on large ungulates. Their numbers tend to respond to population fluctuations of the large ungulates on which they prey. Thus the low moose population on the Flats supports a low wolf population. Surveys in the western portion of GMS 25D indicate a wolf population of approximately 45 animals. This number, though low, represents a ratio of one wolf per eighteen moose (Nowlin 1984a). This ratio is significant because it is thought that when there is more than one wolf per twenty moose that wolves can control the moose population. The extent to which the wolf population controls moose numbers on the Yukon Flats Refuge is not known. The ADF&G is currently surveying wolf numbers in conjunction with the cooperative study on moose in GMS 25D.

Bears (Grizzly and Black). Both grizzly and black bear inhabit the refuge. The Yukon River valley is the northern limit of black bear range. Primarily a forest-dwelling species, they are most common in the forested river bottoms and lowlands. In the refuge, black bears are heavily dependent on blueberries as a source of food. Salmon are also part of the diet of the black bear on the refuge. Few other traditional black bear foods are found in the refuge to support the population in years of poor blueberry harvest (Hatler 1972). Black bear predation may be a significant cause of moose calf mortality.

Grizzly bears range throughout the refuge, but are most common in the upland and mountainous zones. Largely an open country animal, their preferred habitat is alpine and subalpine scrub and riparian zones.

Marten. Marten, along with lynx, are the most economically important furbearer on the refuge. Marten are usually associated with mature coniferous forests where they feed on tree squirrels. In Alaska, however, brush fields and burned areas are important marten habitat because of the high rodent populations.

Lynx-Snowshoe Hare. Lynx are abundant on some areas of the Yukon Flats. The Black River drainage is probably the most consistently productive lynx producing area in Alaska. The lynx population rises and falls in synchrony with, but slightly behind, the snowshoe hare cycle. The cycle is about ten years long and has been intensively studied by biologists for years but is still not fully understood.

Beaver. The Yukon Flats provides good beaver habitat. The refuge has conducted a beaver food cache survey on sample areas of the refuge. The survey is intended to identify trends in beaver populations. Within the study area a food cache-activity/lodge ratio of 58 to 100 and a lodge/lake-pond ratio of 17 to 100 were observed. Food cache-activity/lodge ratio describes the number of beaver food caches per beaver lodge. It is used in conjunction with data on colony size related to number of food caches to estimate beaver populations. Since the relationship between colony size and cache number is still unknown, it is not possible to provide reliable estimates of the beaver population on the Flats. This information will be obtainable in the future.

Other Furbearers. Muskrat are abundant in the refuge wetlands and waterbodies. They have been, and continue to be, extensively trapped on the refuge. Red fox and wolverines are found in low numbers throughout the refuge.

Other Bird and Mammal Species. Many other species of birds and mammals use the refuge. A complete list of these species and the habitats they utilize are found in Appendices D and E.

FISH

The Yukon River fisheries are a complex resource that is only now beginning to be understood. The Yukon River (and 12 major tributaries) flow through the refuge. In addition, there are thousands of lakes on the refuge. Appendix F contains a list of fish species found on the refuge.

Residents of villages lying within the refuge boundary depend heavily on fish for subsistence. Table 9 provides information on subsistence fishing by resident of the villages on the Yukon Flats. Chinook and chum salmon are

Table 9. Yukon River subsistence salmon catch, Yukon Flats villages.
Source: ADF&G 1984c, ADF&G 1985.

Village	No. of Families	Chinook	Summer Chum	Fall Chum	Coho	Total Salmon	Whitefish/Sheefish
Stevens Village ¹	25	2763	3046	11679	182	17670	629/154
Beaver ²	6	506	263	1761	1	2531	307/43
Fort Yukon ¹	25	2900	4410	12719	3	20032	2430/490
Circle ¹	10	2259	930	4096	0	7285	50/38
Venetie ³	4	52	0	4345	0	4396	221/3

¹ 1985 catch.

² Village not surveyed in 1985. Data are averages from 1980 to 1984.

³ Village not surveyed in 1985. Data are averages from 1979 to 1983.

Table 10. Escapement surveys completed on the Yukon Flats Refuge. Source: Barton 1984.

Stream	Drainage	Year	King	Chum	Coho	Stream Mouth	
						Latitude	Longitude
Chandalar	Yukon	1960	-	-	-	66-36-35N	146-00-20W
		1973	-	-	-		
		1974	-	17,455	-		
		1975	-	6,345	-		
		1976	-	58	-		
		1977	-	4,183	-		
		1980	-	3,366	-		
		1981	-	4,906	-		
Sheenjek	Porcupine, Yukon	1960	-	-	-	66-44-30N	144-34-30W
		1973	-	1,288	-		
		1974	-	40,507	14		
		1975	-	78,060	6		
		1976	-	11,866	-		
		1977	-	20,506	-		
		1978	-	14,610	-		
		1979	-	41,140	-		
		1980	-	13,027	-		
		1981	-	69,043*	-		
		1982	-	29,093*	-		
		1983	-	45,733*	-		
Salmon Fork	Black, Porcupine, Yukon	1974	-	1,222	-	66-33-00N	142-32-00W
		1975	-	2,099	-		
		1976	-	-	-		
		1977	-	200	-		
		1980	-	31	-		
Black	Porcupine, Yukon	1960	-	-	-	66-41-30N	144-42-00W
		1973	-	-	-		
		1975	-	50	-		
		1976	-	-	-		
Hodzana	Yukon	1960	-	-	-	66-17-30N	147-46-30W
		1976	-	-	-		
		1983	-	31	-		
Birch	Yukon	1960	-	-	-		
		1971	-	-	-		
		1977	-	-	-		
Hadweenzic	Yukon	1976	-	-	-	66-27-00N	146-51-00W
Dall	Yukon	1973	-	-	-	66-00-30N	149-15-30W
Beaver	Beaver Creek Slough, Yukon	1954	-	-	-	66-14-00N	147-32-00W
		1960	-	-	-		
		1975	-	-	-		
		1976	-	-	-		
		1982	-	-	-		

* Side-scan sonar count

Humpback Whitefish. Most common on the larger river systems of the refuge, humpback whitefish prefer the slower moving waters in the river/lake/slough systems. They are also found in landlocked lakes. Sexually mature (age five to seven) whitefish migrate to spawning areas during mid-September to mid-October. The humpback whitefish is often confused with the broad whitefish. All of the whitefish are important subsistence fish.

Least Cisco. Least cisco are abundant on the Yukon Flats Refuge in lakes and slow moving streams. Spawning runs begin during mid-September to spawning areas in the upper reaches of clearwater streams. Eggs winter in the gravel and hatch in early spring. The least cisco is an important subsistence fish and also an important food fish for eagles, hawks, and predatory fish.

Burbot. Found in rivers and lakes on the refuge, burbot are especially abundant in deepwater lakes and slow moving turbid water areas, though they use clear water areas for spawning activity. Spawning migrations of up to 50 miles have been recorded (Sterns, personal communication). Spawning begins in January or February. Age at maturity is four to seven years. Evidence exists that suggest burbot are alternate year spawners. They are an important subsistence fish.

Northern Pike. Northern pike are found in most rivers and in lakes that are deep enough and have an adequate oxygen supply to "overwinter" fish populations. The availability factor makes the northern pike an important subsistence fish. Spawning takes place in weedy areas in lakes, sloughs, and flood areas in river systems as soon as the ice breaks up. Spawning is usually associated with lengthy spawning runs. Northern pike mature in three or four years in Alaska (Cheney 1976 as cited in Morrow 1980). Sport fishing using charter planes out of Circle or Fairbanks is becoming more popular in the upper Yukon area. Whitefish provide an important food item for northern pike, but the mature northern pike forage items include anything from small insects to small mammals.

Other Fish Species. Alaska blackfish, longnose sucker, lake chub, and slimy sculpin are also found on the refuge and are important as prey species to other fish, birds, and mammals. Occasionally, these species are used for subsistence, dog food, or trapline bait.

HUMAN ENVIRONMENT

HISTORY

Prehistory. Interior Alaska's prehistory is still imperfectly known though recent discoveries have indicated potential existing in the area for discovery of the earliest sites in North America. The interior of the state remained essentially ice free during the last glaciations, when the area was the logical route for entry of immigrants into the New World from northeast Asia. Dated materials from the Old Crow Flats in the Yukon Territory, less than 100 miles northeast of the refuge, suggest that man was present in the area at least 27,000 years ago.

In the 1920's, with fur at its zenith, Fort Yukon was the most important fur center in Alaska, the depression of the 1930's followed by World War II ended the heyday for fur on the Yukon Flats, though it still is an important activity for many local residents.

Archeological Sites. There are thirty-five sites in the area listed on the Alaska Heritage Resource Survey, many from the historic period. Surveys along the Porcupine River have located a substantial number of prehistoric sites. Surveys immediately west of the refuge along the trans-Alaska Pipeline corridor have been similarly productive. Work in progress can be expected to add more sites to the catalog.

It is probable that several hundred archeological sites potentially eligible for listing on the National Register of Historic Places remain to be discovered in the area. Such sites are expected to be more prevalent along stream sources (especially on stable banks and bluffs and at the confluence of tributary streams) and at lake inlets and outlets, although the presence of such sites virtually anywhere on the refuge cannot be ruled out.

POPULATION AND SETTLEMENT PATTERNS

Residents of seven communities within or adjacent to the Yukon Flats Refuge regularly take fish, wildlife, and plant materials from the refuge. These communities are Beaver, Birch Creek, Chalkyitsik, Circle, Fort Yukon, Stevens Village, and Venetie. Except for Fort Yukon, these are small bush communities typical of rural interior Alaska.

Population Trends. In the 1980 census, the seven local communities using the refuge had a population of 1,126 - about 0.3 percent of Alaska's total population of 401,851. In 1984, the State projected the population for these communities at 1,183 (Alaska Department of Labor 1985). The population of these communities are listed in Table 11.

Between 1960 and 1970, a 14 percent decline in the regional population occurred. Most of this loss occurred in Fort Yukon, the region's largest community. The large population loss in Fort Yukon masked the growth (25 percent) which occurred in the smaller communities during the same period. Several factors may have influenced population shifts which occurred during the period. The 1968 discovery of oil at Prudhoe Bay and the subsequent prospect of wage employment in Fairbanks and Anchorage may have drawn some residents from the Yukon Flats area. The possibility also exists that residents of Fort Yukon may have returned to more traditional lifestyles by relocating in the smaller communities. Some of this resettlement may have been in response to the imminent settlement of the aboriginal land claims of the Alaska Natives. Caulfield (1983) suggests that improved census data collection and consolidation of smaller outlying camps into larger communities are other possible contributing factors.

During the period from 1970 to 1980, the overall population of the Yukon Flats area grew by 18 percent. Three communities, Beaver, Birch Creek, and Chalkyitsik, experienced a decline in population. Again the large population shift in Fort Yukon (a 38 percent increase) significantly influenced the areal population picture. The six smaller communities experienced a slight decline (one percent) in population over this decade.

For most Athapaskan bush communities the concept of resident population is difficult to apply. It is necessary to understand the desire of people to

loss in the least favorable economic model to 34 percent increase in the most favorable economic model.

It is important to note that the base population figures from which projections are made are the most recent figures issued for the state and its census divisions by the Alaska Department of Labor and that the regional projections are based on a simple procedure that allocates total state population to the regions so that regional projections are consistent with the state totals. This procedure does not take into account all possible demographic information for each region. Goldsmith (1986) provides additional detail on the assumptions under each case and how the projections should be interpreted.

Population Composition. A large majority of the regional population, 79 percent, is Native peoples. Most Natives on the Flats are Kutchin Indians, members of the Athapaskan people, though Koyukon Athapaskans and interior and coastal Eskimos are also present in the Native population. Exclusive of Fort Yukon, the regional center of government and economic activities, an even higher percentage of the population is Native (87 percent).

SOCIOCULTURAL SYSTEMS

The Athapaskan peoples of the region have used the lands and resources now in the refuge for many centuries. Although social, cultural, and economic change has been occurring throughout this period, recent decades have seen this change accelerate greatly.

The single most important factor in the recent acceleration of sociocultural changes has been the Alaska Native Claims Settlement Act of 1971. ANCSA created village and regional corporations, providing financial assets and a land base for the Native peoples of the region.

Other significant factors that are now and will continue to affect local residents include the Molly Hootch decision which directs the state of Alaska to provide public school facilities for all villages with at least eight high school students; federal programs which are providing additional housing in the region (often suburban-style houses with technological systems that depend on imported parts and fuels); and satellite communication which is bringing increasing numbers of televisions and telephones to the villages.

Subsistence and Economic Orientations. Cash and subsistence economies are becoming more closely interrelated in the Native society as are traditional and western social needs. Natives are participating freely within segments of both cash and subsistence economies. Variations in people's way of life depends on the degree to which they pursue subsistence activities as opposed to wage activities (ISER 1978). Diverse sets of motivations are important to those who engage in subsistence activities. Technological advances now enable users to obtain subsistence resources more quickly than with traditional techniques. Today, subsistence activities can be successfully pursued even if the individual is employed full-time (ISER 1978).

Acculturation of the Kutchin Athapaskan people of the Yukon Flats has occurred rapidly, changing the pure subsistence economy of the region to a mixed cash/subsistence base. The future trend will probably be away from the subsistence lifestyle (Nelson 1973), although most local residents stress the importance of the subsistence-based socioeconomic system to their way of life

younger, better educated people tend to move out of the communities to seek employment elsewhere, leaving the less competitive workers in the villages. Most people want work, but the opportunities are limited in rural Alaska.

Income. The region's communities are primarily inhabited by Athapaskan speaking Natives who engage in a mixed cash and subsistence economy. Much of the cash income supporting the economy is generated through seasonal wage labor, such as fire fighting for the Bureau of Land Management. Other forms of cash income include trapping and transfer payments. Unemployment insurance also provides cash income as residents who leave a wage job to participate in subsistence activities are eligible for these payments in the State of Alaska. The cash income of Natives and other residents is an essential part of the mixed economic lifestyle present in the Yukon Flats region. Cash expenditures are necessary to successfully compete for subsistence resources as opportunity costs escalate. Improved technologies which allow for greater efficiency in renewable resource exploitation has resulted in increasing cash expenses. Cash is needed for purchasing firearms, ammunition, fishing gear, snow machines, boats, and associated materials and maintenance costs.

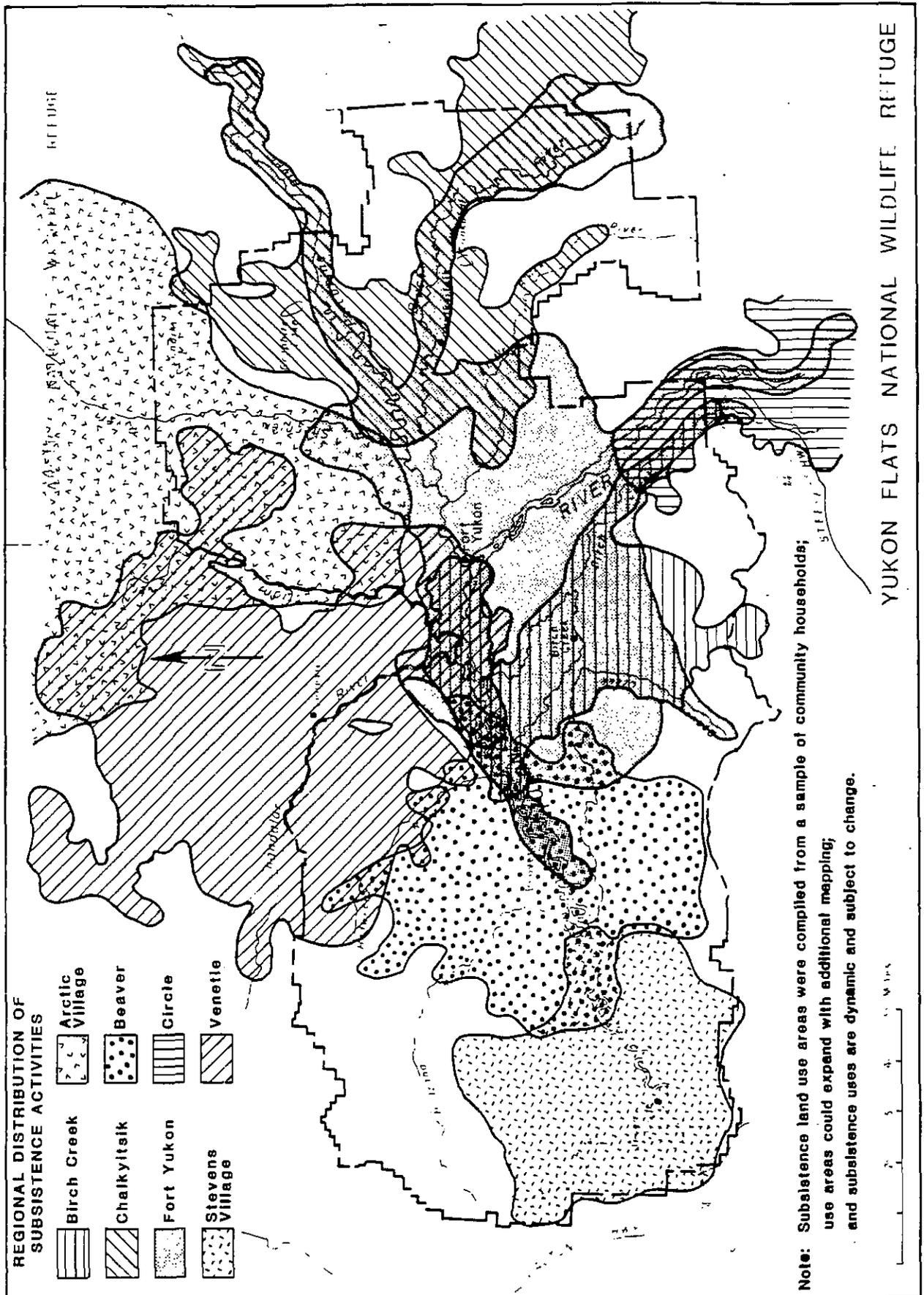
Subsistence activities are the other vital part of the local economy in the region. Although Kutchin Athapaskans generally "place a high value on money and dislike the discomforts of life out in the bush" (Nelson 1973), the lack of regular employment (as well as cultural and historic ties) make subsistence activities a necessary and integral part of daily life for local residents. The subsistence portion of this economy consists of food products, firewood, and other materials taken directly from the land for local consumption. Although subsistence is often viewed as a biological, social, and cultural issue, the pure economics of the lifestyle are quite important. Subsistence resources and activities are discussed in more depth in the following section.

SUBSISTENCE

Subsistence uses are defined in the Alaska National Interest Land Conservation Act (ANILCA) as "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade." Thus virtually all harvest of refuge resources by local residents potentially qualifies as subsistence use. Lacking further definition, all local harvests are considered to be subsistence (for the purpose of the plan). Fish, wildlife, and vegetative materials are harvested on the Yukon Flats Refuge by residents of all the communities within and near the refuge.

Information on the subsistence activities of the residents of Birch Creek, Chalkyitsik, Fort Yukon, and Venetie was taken primarily from the Caulfield study of subsistence use in the upper Yukon-Porcupine region done for the Alaska Department of Fish and Game, Division of Subsistence (Caulfield 1983). Members of the planning team and refuge staff visited each community to review the information in Caulfield's report with the local residents. Minor modifications of the areal extent of some subsistence activities occurred as a result of these visits.

Figure 17. Regional distribution of subsistence activities. (Sources: Caulfield 1983, FWS Planning Team.)



focuses on the Black River which originates in the rugged uplands which surround the Flats to the east and south. Just upriver from Chalkyitsik the river begins to change character and blend into the maze of sloughs, lakes, and streams which make up the Flats. A number of large lakes, including Ohtig and Tiinkdhul, are situated near the Black River and are used for hunting, fishing, and trapping. North of the community, the Porcupine River flows southwesterly from Canada to its confluence with the Yukon River. In winter, a trail is broken from the village to the Porcupine River, providing access to important hunting, fishing, and trapping areas. The distribution of subsistence activities by residents of Chalkyitsik is shown in Figure 18.

Moose hunting activity generally occurs on the Black River (including the Salmon Fork), on the Porcupine River, and in grassy, meadow-like areas to the south of Chalkyitsik. On the Black River, hunters travel by boat, generally from the vicinity of "Englishshoe Bar" upstream to Kiivinjik Creek on the Salmon Fork. Moose are taken by trappers at outlying camps on the Black, Little Black, and Porcupine Rivers. Black bear are generally hunted over the same range as are moose. Caribou are harvested occasionally by Chalkyitsik residents on the Porcupine River and near the headwaters of the Salmon and Grayling forks of the Black River. Caribou have, as in 1982, infrequently migrated close to Chalkyitsik thus allowing harvest near the village.

Trappers from the community travel considerable distances on the Black, Little Black, Salmon Fork, Grayling Fork, Porcupine, and Coleen rivers in search of fur. Muskrat and waterfowl harvest activities are centered in the extensive lake, slough, and creek systems found from the area just north of the Porcupine River south to the vicinity of the Little Black and Grass rivers. Ohtig Lake is a particularly productive waterfowl hunting area.

The Black River and its tributaries are the most productive sources of fish for local residents. Salmon, whitefish, burbot, and pike are caught with gillnets in the main river. Grayling are also taken, both in nets and with hook-and-line. Pike and whitefish are taken in large lakes near the community.

Fort Yukon. Largest of the regional communities with a population of 619 (1980), Fort Yukon is located near the confluence of the Yukon and Porcupine rivers. It has served as an important transportation, trading, supply, and administrative center for the upper Yukon-Porcupine region. Its central location in the Flats has fostered expansive land and resource use patterns. It is surrounded by a vast lake-covered flood plain containing bottomland spruce-poplar and lowland spruce-hardwood forests, lowbrush bog, and muskeg. The Flats provide abundant habitat for aquatic species such as muskrat, beaver, whitefish, and waterfowl. The Yukon and Porcupine rivers serve as transportation corridors, providing access to upland areas. Figure 19 depicts the distribution of subsistence activities by residents of Fort Yukon.

Areas used for moose and bear hunting include the Yukon, Porcupine, lower Sheenjek, and Black rivers, and Birch Creek. Generally, moose hunting occurs downriver on the Yukon to Beaver and upriver to above Circle. On the Porcupine, activity was reported as far up as Old Rampart. Hunters from Fort Yukon also use the Black River below "Englishshoe Bar" and Birch Creek from its lower mouth to the Steese Highway. Caribou hunting usually only occurs on the Porcupine River in the vicinity of Old Rampart and Canyon Village, though infrequent migrations occur which result in hunting in other areas (such as along the Yukon River upstream to Circle as in 1982).

Salmon fishing by Fort Yukon residents occurs mainly along the Yukon River. A number of fish camps are concentrated 12 to 16 miles downriver of Fort Yukon.

Others are scattered upriver to Twentytwo Mile Village. Other species, such as whitefish, pike, grayling, burbot, and sheefish, are caught on the Yukon, Porcupine, Sheenjek, Black, Grass, and Sucker rivers and on nearby lakes.

Trapping by residents of Fort Yukon occurs up the Porcupine River to Shuman House, up the Yukon River to Twentytwo Mile Village, and on the Grass, Sucker, and Little Black rivers. Several trappers based in Fort Yukon use areas on the upper Black River, while others run traplines on Birch and Beaver creeks. Fort Yukon also serves as a supply center for households living full-time near distant traplines throughout the region, including those on the Coleen, Sheenjek, Porcupine, Chandalar, and Black rivers. This use is not community-based and was not included on the maps prepared for the study.

Waterfowl hunting occurs over much the same area as moose hunting, though it does not extend as far upstream on the Yukon River (only to Twentytwo Mile Village) or the Porcupine River (only to near Shuman House). The lakes and sloughs around Fort Yukon are used extensively for waterfowl hunting.

Venetie. The community of Venetie is located on the north side of the Chandalar River, 45 air miles northwest of Fort Yukon and about 45 miles by river from the mouth of the Chandalar. It has a population of 132 (1980). Venetie's location, on the Yukon Flats near the foothills of the Brooks Range, provides access to resources found in the extensive lake, river, and slough systems of the Yukon Flats as well as those of the upland region. Upriver from the village, the East and Middle Forks of the Chandalar River extend into the treeless alpine tundra regions of the Brooks Range. To the east the Christian River flows circuitously from the uplands between the Sheenjek and Chandalar rivers to its confluence with the Yukon a few miles below Fort Yukon. The Yukon Flats extend to the west of Venetie, toward a cluster of small lakes, and to the Hadweenzic and Hodzana rivers. The Chandalar River flows southeasterly past Venetie toward its confluence with the Yukon. Figure 20 depicts the distribution of subsistence activities by the residents of Venetie.

The area of use identified by Venetie residents extends from fish camps on the south side of the Yukon River near the mouth of the Chandalar River north to the East Fork of the Chandalar near Big Rock Mountain. The use area extends west of the Chandalar River to include the lakes area near the Hadweenzic River and then north to include the Ackerman Lake area and the Middle Fork of the Chandalar.

In the past, areas of the Middle Fork drainage above of Ackerman Lake have been used for trapping and for sheep, moose, and caribou hunting. Use of the East Fork drainage, primarily for hunting moose and caribou and for trapping, is concentrated at Gold Camp and downriver from Big Rock Mountain and Brown Grass Lake. Low water during the fall usually restricts moose hunting on the main course of the Chandalar to areas downstream of the Middle and West forks.

Christian Village is used as a seasonal trapping camp and for moose and caribou hunting. Trapping from Christian Village extends as far east as Kwittevunkid Lake and Alexander's Village. Both Venetie and Arctic Village trappers use this area. The extensive lake and slough systems lying between the Christian and Chandalar rivers are utilized for fishing, trapping, hunting, and gathering activities.

Beaver. The community of Beaver, located on the north bank of the Yukon River some 65 air miles west of Fort Yukon, has a population of 66 (1980). It is surrounded by extensive lake, river, and slough systems characteristic of the Yukon Flats. Black spruce forest, brush, and muskeg are common. To the

north are the uplands of the Hodzana and Hadweenzic drainages. Figure 21 depicts the distribution of subsistence activities by the residents of Beaver.

Moose and other large game, as well as waterfowl, are hunted primarily in the area across the Yukon from Beaver between the Yukon River and Beaver Creek. Moose hunting is done primarily by boat along water courses in this area. Fishing occurs in the Yukon and its major tributaries where currents are strong enough to operate a fish wheel. Most salmon fishing is done in the Yukon, particularly at the mouth of sloughs across from Beaver and at White Eye upstream from Beaver. Use on the Yukon and its extensive slough system occurs upstream nearly to Venetie Landing while downstream use occurs as far as the vicinity of Kings Slough Village (preliminary findings from the ADF&G Division of Subsistence study recently initiated in Beaver indicate that local residents also hunt and trap in the vicinity of Moose Island, further downstream than was indicated in preliminary work undertaken by the Service).

Furbearer trapping takes place along established trails running north into the Hadweenzic and Hodzana drainages and south into the Beaver Creek area and the White Mountains. Wood gathering generally occurs upriver from the community where rafts can be used for hauling or it occurs near the community where overland hauling is relatively simple.

Stevens Village. Located on the north bank of the Yukon River, Stevens Village has a population of 96 people (1980). Approximately 120 air miles southwest of Fort Yukon, Stevens Village is the westernmost community on the refuge (some 22 river miles upstream from the Yukon River Bridge on the Dalton Highway). Upstream of the community, the Yukon River flows through the western Yukon Flats characterized by an extensive system of lakes, rivers, and sloughs. Downriver, the Yukon carves its way through rugged hills of up to 4,000 feet which form its "lower ramparts." To the north lies the Dall River drainage and the southern portion of the Hodzana Highlands. The distribution of subsistence activities for Stevens Village is shown in Figure 19.

Preliminary data gathered in the spring of 1984 indicate that residents of Stevens Village utilize most of the southwestern portion of the refuge including much of the Dall River drainage and the highlands south of the Hodzana River. Use on the Yukon River extends upriver beyond Marten Island and Purgatory while downstream use extends to the Dalton Highway and beyond. Preliminary data focused primarily on furbearer trapping and moose hunting, so additional data collection could alter the areal pattern of use.

More recent information provided by the ADF&G Division of Subsistence indicates that the Stevens Village resource use area extends upriver to the community of Beaver. Fall moose hunting occurs primarily along the main channels and sloughs of the Yukon River. Winter hunting takes place along the river as well as throughout the flats and surrounding foothills, in conjunction with trapping activities. Black bears are harvested primarily along certain portions of the flats north of the community. Small game is harvested throughout the area, often in conjunction with other activities. Salmon fishing camps are downriver from the community along the canyon to below the Dalton Highway bridge.

Circle City. Located on the Yukon River approximately ten river miles upstream from the refuge's southern boundary, Circle City has a population of 81 (1980). The last bluff of the Yukon's "upper ramparts" end just across from Circle; just below are the islands and sloughs which characterize the Yukon Flats. Land and resource use by Circle residents is a split between the hills

and bluffs upstream and the flat country downstream. Subsistence use areas identified from this information are shown in Figure 20.

Activities occurring on the refuge consist primarily of salmon fishing on the Yukon River, moose and bear hunting along the Yukon and on Birch Creek, and trapping of beaver and other furbearers on Birch Creek. The areal extent of these and other subsistence activities on the Yukon Flats Refuge was not well documented in the study (Caulfield 1979) which emphasized the Yukon-Charley rivers upstream of Circle. Only a brief visit (five days) was made to Circle.

Arctic Village. Though not specifically discussed in this plan, Arctic Village does utilize a small portion of the refuge for subsistence activities, primarily furbearer trapping. This use occurs in the northeastern portion of the refuge in the area around Christian Village, the Sheenjek River, and Vundik Lake. Figure 21 shows this distribution as defined by Caulfield (1983).

Annual Cycle. The annual cycle of resource harvest activities, as shown in Caulfield (1983), is depicted in Figure 22 for the communities of Birch Creek, Chalkyitsik, Fort Yukon, and Venetie. The data presented in this summary were compiled from interviews with local resource experts and from observations by the author. The annual cycle summary reflects the period from 1970 to 1982 and includes only major activities. Subsistence activities and when they occur may vary from year to year. The annual cycles for the other villages would be similar to the cycles depicted here.

ACCESS AND TRANSPORTATION

The accessibility of refuge lands is influenced by natural features such as lakes, rivers, terrain, vegetation types, and by human influences such as roads, trails, seismic lines, and regulations. The availability and character of access directly influence use of the refuge. Access to the refuge is primarily by air and water. Limited overland travel occurs on the refuge, primarily during the winter months.

Air Access. Scheduled commercial and charter air service is available to all the refuge communities. A few constructed airstrips, as well as numerous lakes and sand or gravel bars, make most areas of the refuge accessible by light aircraft. No areas of the refuge have been closed to the landing of fixed-wing aircraft. See Figure 23 for the location of major airstrips.

Water Access. Boats are used extensively for summer travel on the refuge with all major rivers and streams being used. Local residents use river boats for hunting, fishing, and other subsistence activities and for travel to and from fish camps and allotments and between communities. River boats, canoes, and other small watercraft are used for river floating and other recreational activities on most of the major drainages in the refuge. Some commercial barge activity also occurs on the refuge, primarily on the Yukon River, carrying supplies to many of the communities along the river.

Rivers and streams on the refuge which are used heavily for commercial, subsistence, and recreational access include the Dall and Little Dall rivers, the Hodzana River to Pitka Fork, the lower stretches of the Christian and Grass rivers, all of the Yukon, Porcupine, Chandalar, and Sheenjek rivers, all of Beaver Creek and Birch Creek (including the Lower Mouth), and the Black River.

Figure 23. Major air and overland access on the Yukon Flats Refuge and public access (17(b)) easements across Native corporation lands.

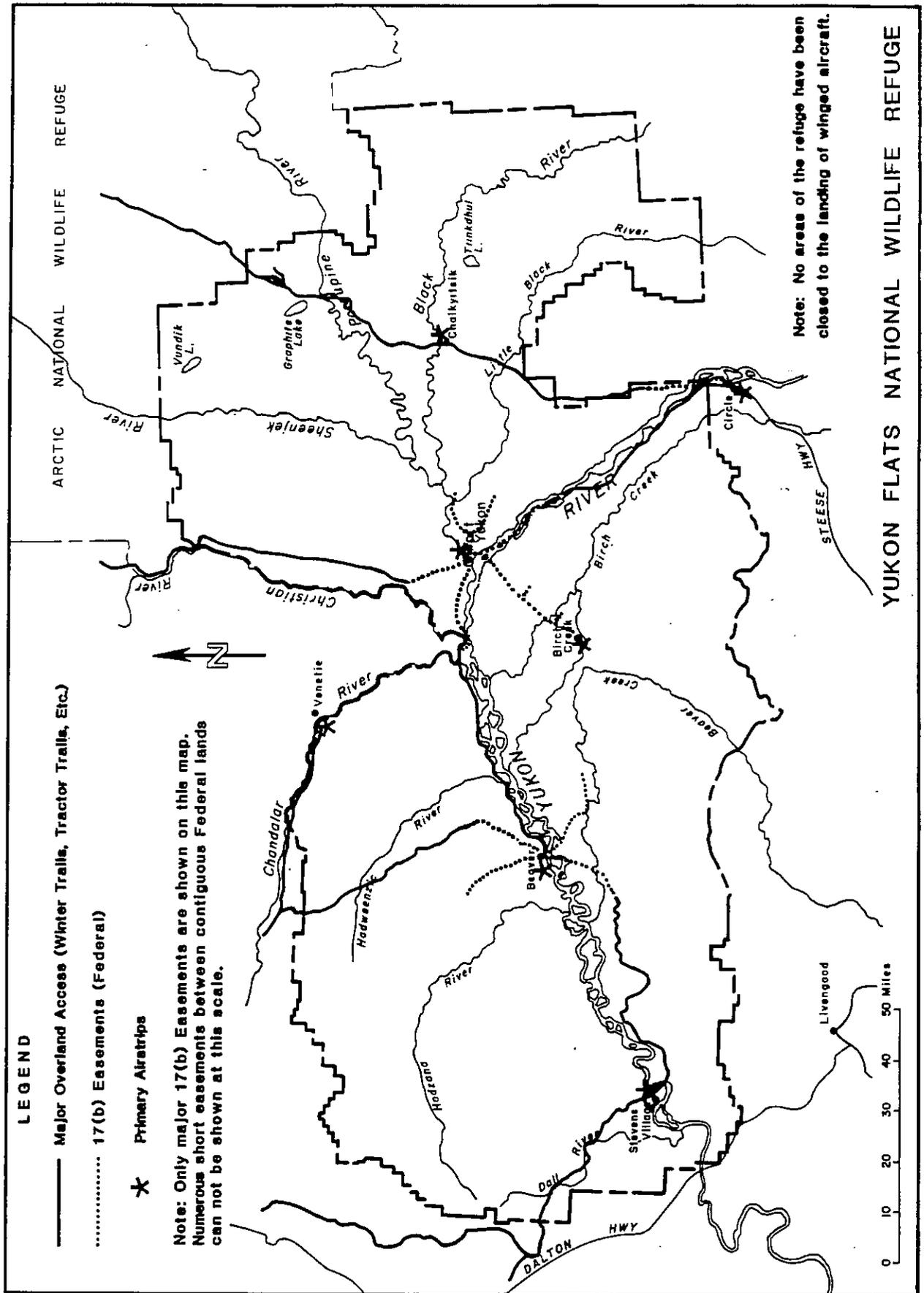


Figure 23 shows the major 17(b) easements which have been reserved to date, though many of these easements can not be depicted at this scale. As all Native conveyances have not been completed, not all the 17(b) easements have been reserved.

RECREATIONAL USE

Subsistence activities (hunting, fishing, trapping, and the collection of vegetative materials) account for over 90 percent of the public use occurring on the refuge. Various recreational activities, centered primarily around sport hunting and river floating, comprise the remaining segment of public use. For the purposes of this discussion, recreation refers to use by people other than residents of the local communities unless otherwise noted.

Recreational use comprises less than 10 percent of the public use on the refuge (less than 1000 visitor days per year). Although past recreational data are scarce, recreational use over the recent past has probably grown only slightly. Hunting opportunities on the refuge are restricted by low moose populations, scenic quality is not outstanding, and access into the area is limited, all of which affect the area's potential for recreational growth. Only with additional developments on private inholdings or the provision of new (or improved) recreational opportunities and facilities on refuge lands will recreational use show any significant growth.

River Floating. Float trips down the boatable rivers in the refuge, coupled with hunting comprise most of the recreational use on the refuge. The most commonly floated rivers include Beaver and Birch creeks and the Yukon, Porcupine, Sheenjek, and Chandalar rivers.

Very little information is available on the recreational use of these rivers. Reliable observations made for the refuge by a family living on Beaver Creek identified 29 individuals in 8 parties who floated that river in 1980. The Fort Yukon Air Taxi operator estimated that 25-30 people floated the Sheenjek River in 1981. In most cases, the 4 to 7 days the floaters spend in the refuge are the terminus of a longer trip originating upstream from the refuge. The most important aspects of the river floating experience are wilderness dependent, including the opportunity to view wildlife and untouched country and to experience solitude, self reliance, adventure, and challenge.

Hunting. The Yukon Flats Refuge is open to both sport and subsistence hunting, subject to state and federal regulations. Very little information is available on hunter effort and harvest in the area. Compliance with Alaska Department of Fish and Game (ADF&G) reporting requirements is low and harvest estimates for the refuge are difficult to extrapolate from ADF&G reports because game management units do not coincide with the refuge boundary. The refuge is within Game Management Unit 25, with portions in Subunits 25A, 25B, and 25D. (See Figure 14.)

The residents of the seven communities in and adjacent to the refuge rely heavily on large and small game found on the refuge. An undetermined, but relatively small, number of non-local hunters travel to the refuge (by aircraft or riverboat) to hunt moose, bear, and other game. Little commercial guiding occurs on the refuge.

Moose - Though the most important game species on the refuge, low population densities throughout much of the refuge and the expense associated with access to the area have significantly restricted recreational moose

can be substantial as nearly all of the Yukon Flats refuge and its inholdings provide habitat for furbearers.

Historically, beaver have been the most important furbearing animal in the Yukon region. Muskrats have also been significant, exceeding the value of beaver in some years. The key to profits has often been the abundance of beaver and muskrat (the size of the harvest), not necessarily the per unit price of the pelts. Lynx is probably the most important furbearer in the region today, with the Yukon Flats area providing the most abundant harvest of lynx in the state.

Over the years, trapping has been the activity people returned to after short periods of wage-labor provided by road construction, mining, fire fighting, military service, and other limited wage opportunities. Despite variations in prices paid for furs, the trapping opportunity has been consistently available. Today trapping remains a highly labor-intensive activity, demanding long hours and hard work for relatively small and often uncertain returns for the investment costs.

Trapping activities are cyclic in nature, often responding to the rise or fall of fur prices. Trapping has generally been on the decline since World War II, due to competition from synthetics and ranch furs. Nevertheless, data compiled from a joint BSW-Doyon, Ltd. subsistence survey in 1973 indicated that with the current (1973) prices of fur \$900,000 could be generated by trapping in the Yukon Flats in 1973 (DOI 1974). Resident trappers at that time did not rely on the activity as their sole source of cash income. It remains today a part-time occupation for many people participating in the traditional subsistence lifestyle.

Other Uses. Other economic activities on the refuge have been limited in recent years. There is little interest in commercial guiding on the refuge with only one special use permit issued for this activity in 1984.

Only limited commercial fishing activity occurs on the refuge. Table 12 identifies the number of commercial fisheries entry permits held by residents of villages on the Yukon Flats, though several of these permittees operate off the refuge.

A limited amount of commercial shipping (by barge) occurs on the Yukon. A few freight trips per year are made, generally between Nenana and Fort Yukon, although some barge activity also occurs between Circle and Fort Yukon. In addition, bonded freight is shipped from Dawson or Whitehorse, The Yukon Territory, via the Yukon and Porcupine rivers to Old Crow. This navigational use of the Yukon and Porcupine rivers by Canada is guaranteed under the Treaty of Washington between the United States and Great Britain, dated May 8, 1871.

Table 12. Commercial fisheries entry permits, Yukon Flats area, 1982. Source: Geiger et al. 1982.

Village	Gill Net Permits	Fishwheel Permits
Stevens Village	1	2
Circle City	2	0
Fort Yukon	0	1

natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historic value.

Seven criteria, based on the Wilderness Act, have been developed to evaluate the wilderness qualities of the wilderness review units. These criteria are described below.

Size. The Wilderness Act requires that a wilderness be 5,000 acres or be large enough to allow for its preservation and use in an unimpaired condition.

Land Ownership. Only areas where the federal government owns both surface and subsurface rights are suitable for wilderness designation. Specifically, conveyed lands and lands with encumbrances in the refuge are unsuitable for wilderness designation. Selected lands may or may not be suitable for designation depending on the final determination of the land status. About 76 percent of the land within the refuge boundary is administered by the federal government and is eligible for wilderness designation. (Current land status is discussed at the beginning of this chapter.)

Natural Integrity. This criterion refers to the degree to which an area retains its primeval character and influence from an ecological perspective.

Apparent Naturalness. Apparent naturalness refers to the degree to which a landscape appears natural and unaffected by human activities.

Outstanding Opportunities for Solitude. Solitude refers to the degree of isolation from the sights, sounds, and presence of others. According to the Wilderness Act, a wilderness must provide either "outstanding" opportunities for solitude or "outstanding" opportunities for primitive recreation.

Outstanding Opportunities for Primitive Recreation. To experience primitive recreation, visitors should perceive a vastness of scale, feel they are a part of the natural environment, and experience a high degree of isolation, challenge, and risk. Primitive recreation requires outdoor skills and meeting nature on its own terms without comforts or convenience facilities.

Special or Unique Features. This criterion refers to special ecological features (e.g., threatened or endangered species, wilderness dependent species, unusual plant or animal communities), landforms that represent significant examples of geologic processes (e.g., natural bridges, mass movement areas, caves, lava flows, glaciers), scenic values, and cultural features. Special features are optional in wilderness areas. The Wilderness Act states that wilderness areas "may" have these features.

Evaluation of Wilderness Review Units. For the purposes of evaluation, the refuge has been divided into five wilderness review units: the White Mountains Unit, the Hodzana River Unit, the Black River Unit, the Flats Unit, and the Sheenjek/Porcupine Unit. Figure 24 displays these units.

White Mountains Unit. The white limestone mountains which dominate this unit are very scenic and rugged. Access into the area is difficult and limited. This isolation has protected the White Mountains from human development. Few people come here and none stay long. During the summer water is scarce to nonexistent in the high country. The porosity of the limestone in the area causes the limited amount of rainfall in the area to drain rapidly away.

The only population of Dall sheep on the refuge, numbering about 75 animals, is found in the White Mountains. Caribou, moose, grizzly and black bear, waterfowl, wolves, and lynx are also found in this unit. The American peregrine falcon is a user of this unit, although no active peregrine nests have been confirmed within the unit.

The area of the unit east of Preacher Creek includes the Crazy Mountains. Though less scenic than the White Mountains, this area has been an important wintering area for portions of the Porcupine and Forty Mile caribou herds.

Due to its remoteness from settlement, the lack of abundant fur animal populations, and limited gold resources, much of this area has received little use historically. Recreational use, because of the area's remoteness and lack of access, is extremely light. Beaver Creek, a designated National Wild River (primarily in the White Mountains National Recreation Area (NRA)), flows through the unit onto the Yukon Flats, eventually emptying into the Yukon River near White Eye. Recreational use on Beaver Creek is increasing, but at a relatively slow rate.

The White Mountains unit lies adjacent to two federal conservation units administered by the Bureau of Land Management, the White Mountains NRA and the Steese National Conservation Area (NCA). Management plans for these areas have recently been completed. Lands adjacent to the refuge have been designated either primitive or semi-primitive motorized. The primitive classification will preserve the wilderness qualities of those areas, while the less restrictive semi-primitive motorized designation will allow for limited development. Increasing recreational use is expected in these conservation units, though access to the refuge will remain difficult.

Though lacking prime waterfowl habitat, this area is truly outstanding in all other wilderness criteria and contains an unique combination of ecosystems within the refuge. This unit is an area where ecological processes should be allowed to operate as naturally as possible to provide a standard for comparison with future management and development in the adjacent areas.

Size. This unit meets the size criterion for designation as wilderness. It is approximately 1.4 million acres or 16 percent of the Yukon Flats Refuge.

Land Ownership. This unit is primarily in federal ownership. All inholdings are subject to valid existing rights, including the right to access under Title XI of ANILCA. No developments which would affect the wilderness qualities of the surrounding lands are anticipated on any of these inholdings.

Natural Integrity. The fish and wildlife populations and ecosystems found in this unit are generally unaffected by human activities. Subsistence and recreation activities, including hunting, fishing, trapping, and river floating, occur in this unit. These activities, though, have not affected the natural integrity of the area.

Natural Integrity. The fish and wildlife populations and ecosystems found in this unit have generally been unaffected by human activities. Subsistence and recreation activities, including hunting, fishing, trapping, and river floating, occur in this unit. These activities, though, have not affected the natural integrity of the area. Two virtually undisturbed watersheds, the Hodzana and Hadweenzic drainages, are located entirely within the unit.

Apparent Naturalness. The unit is natural in appearance. Only limited development has occurred in the unit, related primarily to subsistence activities. Little physical evidence of past activities that would be annoying to the wilderness user is present.

Outstanding Opportunities for Solitude. This unit is large and remote. Access into the area is difficult with access limited primarily to boats on the Dall, Hodzana, and Hadweenzic rivers. Opportunities for airplane landings within the unit are limited. Because of its remoteness and the steep terrain in the unit, overland travel (including on foot) to and within the unit is difficult. A visitor to the unit is unlikely to encounter other humans with the possible exception being along the major rivers in the unit.

Outstanding Opportunities for Primitive Recreation. The Hodzana Highlands provide outstanding opportunities for primitive recreation to those who travel to this area. Challenge, isolation, and risk are a part of any recreation experience that a person might undertake while visiting the unit.

Special and Unique Features. The watersheds of the Hodzana and Hadweenzic rivers are entirely within this unit, providing an opportunity to preserve basically undisturbed watersheds and the diversity of ecosystems of which they consist. This unit also contains a large number of archeological sites.

Conclusion. The Hodzana River unit meets all the wilderness criteria for size, land ownership, natural integrity, apparent naturalness, solitude, and primitive recreation opportunities.

Black River Unit. The Black and Little Black rivers both meander through the southeastern portion of the refuge. The lands are best described as rolling hills forested with spruce and hardwoods.

Throughout recorded history, the area has had a reputation for being rich in fur. This still holds true today. Though a difficult area to trap, it is worked by some of the best trappers in the region. These trappers consistently bring in quality fur. Local Natives in the region refer to this area as the "cradle of the lynx."

This area of the refuge is part of one of the wildest remaining regions in North America. When Soapy Smith's gang split up some of its members migrated here. Legend has it that the last known bushman (native outcast) lived in a cave somewhere in the region.

Size. This unit meets the size criterion for designation as wilderness. It is approximately 1.25 million acres or 15 percent of the Yukon Flats Refuge.

Land Ownership. Most of the unit is in federal ownership. All inholdings are subject to valid existing rights, including the right to access under Title XI of ANILCA. No developments which would affect the wilderness qualities of the surrounding lands are anticipated on any of these inholdings.

fire. Lands remaining in federal ownership should be protected to allow ecological processes to operate naturally.

The Yukon Flats basin is the largest interior basin in Alaska. Its configuration and size create a unique solar basin unlike any other found at such extreme latitudes. Summer temperatures on the Yukon Flats are higher than at any other place of comparable latitude in North America. It is the only place in the world where temperatures of 100 degrees Fahrenheit have been recorded north of the Arctic Circle. The protective mountains surrounding the basin which make possible these high summer temperatures create a giant natural frost pocket in the basin where winter temperatures approach the coldest of any inhabited area in the world.

Size. This unit meets the size criterion. It is approximately 2.25 million acres or 27 percent of the Yukon Flats Refuge. Each of the individual subunits would also meet the size criterion.

Land Ownership. Most of this unit is in federal ownership, although large blocks of Native selected and conveyed lands surrounding the communities of Stevens Village, Beaver, Birch Creek, Fort Yukon, and Chalkyitsik result in the unit be divided into three subunits. In addition, a large number of Native allotments are located along the Yukon River and its major tributaries. All inholdings are subject to valid existing rights, including the right to access under Title XI of ANILCA. No developments which would affect the wilderness qualities of the surrounding lands are anticipated on any of these inholdings.

Natural Integrity. The fish and wildlife populations and ecosystems found in this unit have generally been unaffected by human activities. Subsistence and recreational activities, including hunting, fishing, trapping, and river floating, do occur in the unit. These uses, though, have not significantly affected the natural integrity of the area. The Yukon River and its major tributaries are the primary routes of travel for local people.

Apparent Naturalness. The unit is natural in appearance. Although numerous Native allotments are located in the unit, the cabins and other developments (primarily used for subsistence activities) on these allotments would not be particularly annoying to the wilderness user.

Outstanding Opportunities for Solitude. This unit is large and much of it is remote. Most travel occurs on the Yukon River and its major tributaries, either by motorboat, raft, or canoe. Float planes land on the river or larger lakes in the summer and ski planes land in the winter. Wheel planes may land on some gravel bars in the river also. Snowmobiles are common transportation in the winter with most use occurring on frozen rivers or on long used winter trails. Opportunities are plentiful for solitude over most of the area. A visitor to the unit would seldom encounter other humans except along the Yukon River and its major tributaries.

Outstanding Opportunities for Primitive Recreation. The Yukon River is a good river for floating. It provides good wildlife viewing and fishing. Sand bars for camping are plentiful. Venturing away from the main stream would take a visitor to areas rarely visited by others.

are primary routes of travel for both local people and the limited number of recreationists using the area.

Apparent Naturalness. The unit is natural in appearance. Only limited development has occurred in the unit, related primarily to subsistence activities. Little physical evidence of past activities that would be annoying to the wilderness user is present.

Outstanding Opportunities for Solitude. This unit is large and remote. Most travel occurs by motorboat on the Porcupine and Sheenjek rivers. Float planes land on the larger lakes and rivers during the summer and ski planes are used occasionally in the winter. Wheeled aircraft can land on some gravelbars. Snowmobiles are common transportation in the winter with the majority of the use occurring on frozen stream courses or winter trails. Opportunities are plentiful for solitude over most of the area. A visitor to the unit would seldom encounter other humans except along the Porcupine and Sheenjek rivers.

Outstanding Opportunities for Primitive Recreation. The Porcupine and Sheenjek rivers are good rivers for floating. Sand and gravelbars for camping are plentiful. Those who are willing to venture away from the main rivers would soon be in areas rarely visited by others. Travel on foot is difficult under the best of conditions. Visitors would soon be aware of the challenge and risk that comes with traveling in this area.

Special and Unique Features. Both the Sheenjek and Porcupine rivers are special features of the unit. These rivers were identified in ANILCA for study as possible additions to the National Wild and Scenic Rivers System. (See Wild and Scenic River section of this chapter.)

Conclusion. The Porcupine/Sheenjek unit meets all the wilderness criteria for size, land ownership, natural integrity, apparent naturalness, solitude, and primitive recreation opportunities.

ALTERNATIVES