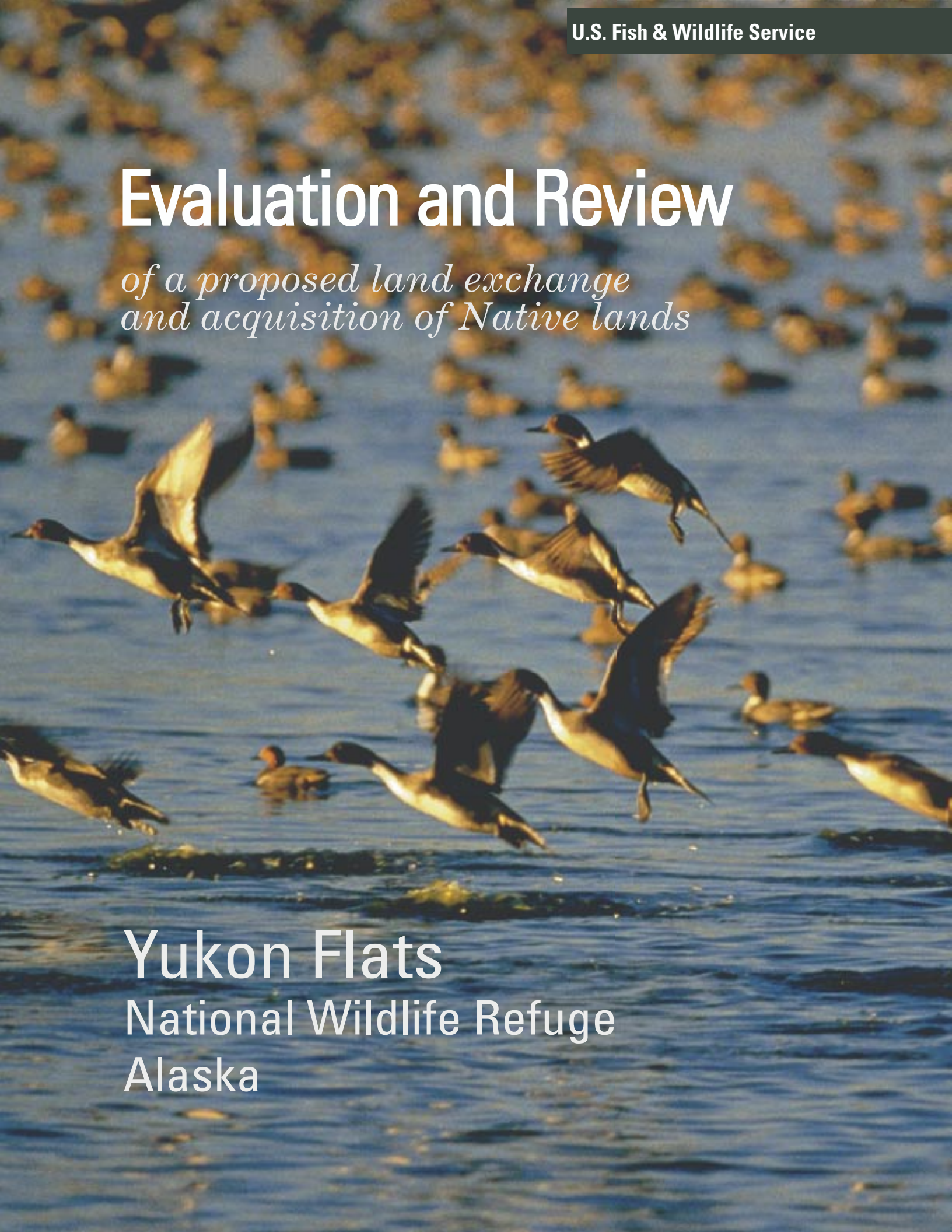
U.S. Fish & Wildlife Service

Evaluation and Review

of a proposed land exchange and acquisition of Native lands



Yukon Flats
National Wildlife Refuge
Alaska

Refuge Purposes

The major purposes of the Yukon Flats National Wildlife Refuge include:

> *...(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 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.*

Alaska National Interest Lands Conservation Act of 1980

Executive Summary

Negotiators for the Yukon Flats National Wildlife Refuge and Doyon, Limited have agreed in principle to an equal-value land exchange. In Phase I, Doyon will receive approximately 110,000 acres of Refuge lands (1.3% of the total) with oil and gas potential and 97,000 acres of oil and gas interests where no surface occupancy will be allowed. In exchange, the United States will receive from Doyon an equal-value amount of lands (estimated at about 150,000 acres), with quality fish and wildlife habitats. In addition, Doyon will reallocate 56,517 acres of their remaining 12(b) entitlement outside the Refuge. Both parties will pursue additional township-level exchanges to consolidate Doyon and Refuge lands. The U.S. will acquire more lake, riparian, and wetland habitats than will be relinquished. If Doyon produces oil or gas, the Service will receive production payments which will be used to purchase additional land in the Refuge and in other national wildlife refuges in Alaska (Phase II).

Impacts to the environment will depend on the extent and type of development. If Doyon fails to locate commercial quantities of oil or gas, impacts to fish, wildlife and habitats will likely be minor, short-term, and restricted to Doyon lands. If oil or gas is produced, the range of potential environmental impacts will depend on the extent of the oil field, the timing and method of drilling, pipeline and access routes, and the application of mitigating measures through Federal and State permitting processes. Potential effects include disruptions in the natural hydrology, erosion at stream crossings, decreased water and air quality, wildlife displacement, increased predator populations because of anthropogenic food sources, loss of naturalness, and diminished biological integrity and environmental health in the affected area. Doyon's lands, and transportation corridors, would be most affected. The most significant impact to Refuge lands would likely be diminished wilderness values.

The Service believes the exchange will be beneficial to the Refuge by adding important wetland habitats, restricting development to private lands, and increasing the amount of public lands within the Refuge and other national wildlife refuges in Alaska. If all provisions are implemented, the exchange could result in a net gain of up to 220,000 acres (344 square miles) of Refuge fish and wildlife habitats and will consolidate Refuge and Doyon lands. This will facilitate management and improve our ability to protect biological integrity, species diversity, and environmental health on our lands.

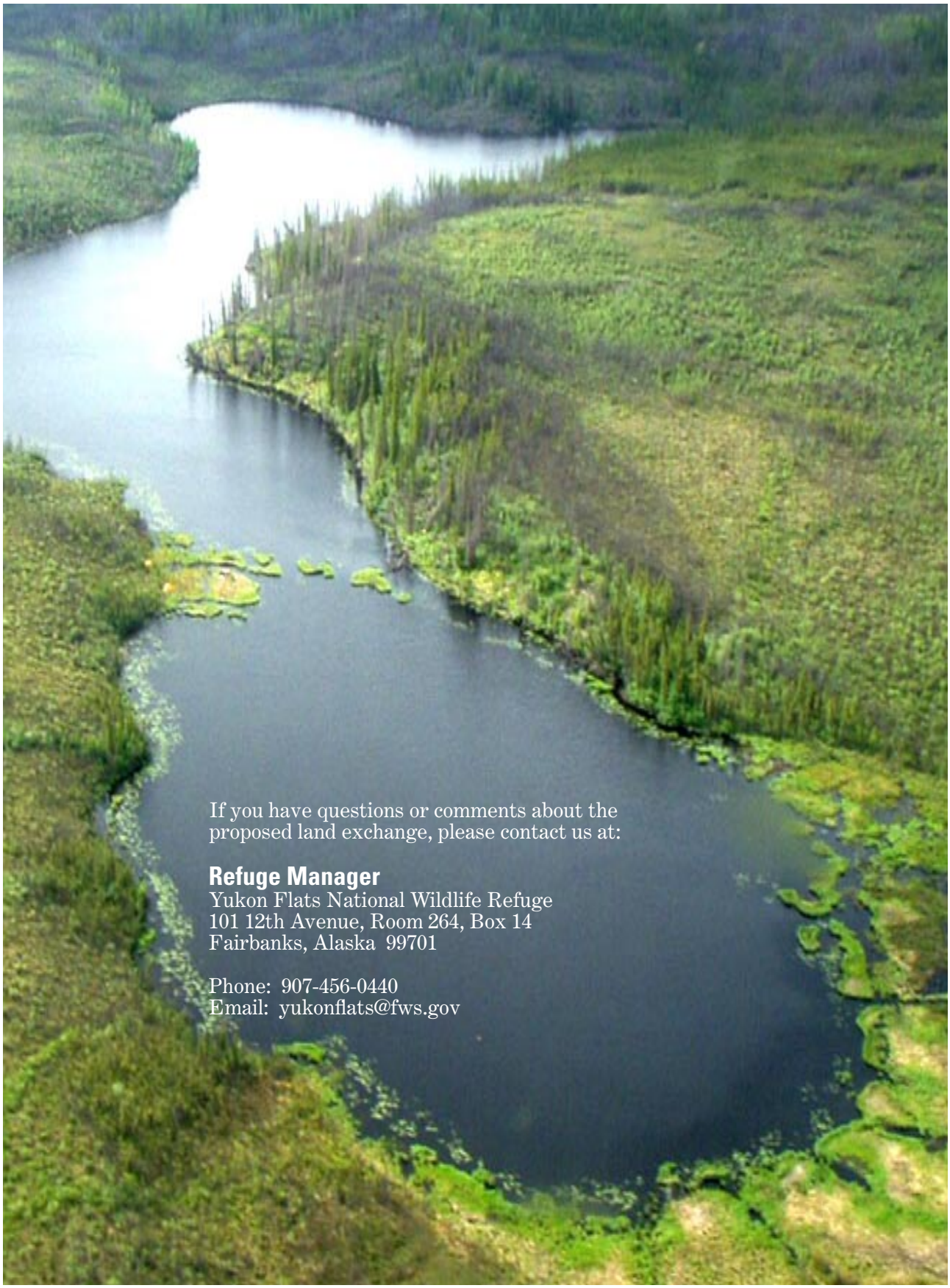
We welcome public review and comments. We will consider these comments as we finalize the exchange.

Evaluation and Review

of a Proposed Land Exchange and Acquisition of Native Lands within the Yukon Flats National Wildlife Refuge, Alaska

U.S. Department of the Interior
Fish and Wildlife Service
Region 7
Anchorage, Alaska

February 2005



If you have questions or comments about the proposed land exchange, please contact us at:

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Mark Bertram, U.S. Fish and Wildlife Service

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Acronyms

ADFG - Alaska Department of Fish and Game

ADNR – Alaska Department of Natural Resources

ANCSA – Alaska Native Claims Settlement Act of 1971

ANILCA – Alaska National Interest Lands Conservation Act of 1980

BLM – Bureau of Land Management

CATG – Council of Athabascan Tribal Governments

CCP – Comprehensive Conservation Plan

COE – U.S. Army Corps of Engineers

DOI – U.S. Department of the Interior

FWS – U.S. Fish and Wildlife Service

NEPA – National Environmental Policy Act

NMFS – National Marine Fisheries Service

NWRS – National Wildlife Refuge System

ROD – Record of Decision

TAPS – Trans-Alaska Pipeline; also called Alyeska Pipeline, the name of the consortium owner company.

UMBZ – Upper Montane Boreal Zone

U.S. – United States

USFWS – U.S. Fish and Wildlife Service

USGS – U.S. Geological Survey

VSM – Vertical Support Member

I. Introduction

A. Purpose of the Document

The purpose of this document is to inform the reader about an "Agreement in Principle" (Agreement) between the U.S. Fish and Wildlife Service (Service) and Doyon, Limited (Doyon) to exchange and acquire lands within the Yukon Flats National Wildlife Refuge (Refuge). In this document we explain the Agreement and review the management implications and potential environmental impacts of proceeding with the proposed exchange.

B. Agreement in Principle

The Agreement (Appendix 1) summarizes key elements tentatively agreed upon by the Service and Doyon. These elements represent nearly two years of negotiations between the two parties. We will consider public comments on this document before developing a final exchange document.

Under the terms of the proposed exchange, Doyon will receive fee title to certain lands with oil and gas potential. The U.S. will receive quality wildlife lands with the same cash value.

Under the terms of the Agreement, Doyon will receive fee title to approximately 110,000 acres of Refuge lands (surface and subsurface) and oil and gas rights to approximately 97,000 acres ("halo lands") adjacent to these fee-title lands. Doyon will have no surface occupancy or access rights to the halo lands.

The United States will receive fee title to an estimated 150,000 acres of Doyon lands (surface and subsurface) with quality fish and wildlife habitats. These lands will be administered by the Yukon Flats Refuge. The exact acreage of land the U.S. receives will be based on the appraised value of the lands acquired by Doyon. Land appraisals likely will be conducted this spring (2005).

A total of 56,517 acres of 12(b) selections will be reallocated outside the Refuge.

In addition, Doyon will reallocate most of their remaining 12(b) entitlement (56,517 acres) under the Alaska Native Claims Settlement Act (ANCSA) to an area outside the Yukon Flats Refuge. Without this agreement, Doyon would likely allocate their remaining 12(b) entitlement to villages within the Refuge, reducing total Federal holdings inside the boundaries.

The U.S. would receive production payments if oil and gas development occurs.

If Doyon produces oil and/or gas on the lands acquired from the Service, Doyon will pay the U.S. a production payment of 1.25% of the resource value at the wellhead. These payments would increase to 1.5% if a transportation corridor crosses Refuge lands. The funds, deposited into a special account in the U.S. Treasury, would allow the U.S. to acquire additional lands within national wildlife refuges in Alaska and to construct needed refuge facilities. If production occurs, Doyon has agreed to sell to the U.S. an additional 120,000 acres of land (surface and subsurface) within the Refuge. A land status map for each step in the exchange process is included in Appendix 2 (Maps 1 through 7). These maps illustrate the changes in ownership patterns and acreages as the exchange proceeds.

C. Overview: the Yukon Flats Region, the Refuge, and Doyon

1. The Yukon Flats Region

The Yukon Flats basin is dotted with more than 20,000 lakes and wetlands. Meandering, braided streams periodically drain and recharge the basin.

The Yukon Flats is a large relatively flat basin in east-central Alaska, located between the Trans-Alaska Pipeline (TAPS) and the Alaska-Canada border. Dotted with over 20,000 lakes and wetlands, the basin is drained and periodically recharged by many meandering and braided streams that flow into the Yukon River. The basin is surrounded by uplands: the Porcupine Plateau to the north and east; the Hodzana Highlands to the west; and the Yukon-Tanana Uplands, which include the White and Crazy Mountains, to the south.

The villages of Beaver, Birch Creek, Central, Chalkyitsik, Circle, Fort Yukon, Stevens Village, and Venetie are within, or adjacent to, the Yukon Flats basin.

There are eight rural villages within, or adjacent to, the Yukon Flats. Approximately, 1,300 people reside within these villages (U.S. Census Bureau 2000). Many village residents depend on fish and wildlife resources to support their subsistence lifestyle.

The Yukon Flats is one of the most productive waterfowl breeding and nesting areas in North America, largely due to an abundance and diversity of wetlands. It has been called the most productive Arctic wildlife habitat in North America (McNab and Avers 1994).

2. The Yukon Flats National Wildlife Refuge

The Yukon Flats is one of the most productive waterfowl breeding and nesting areas in North America.

The Refuge includes virtually all of the Yukon Flats basin and some of the surrounding uplands. The exterior Refuge boundaries encompass about 11.2 million acres, including about 2.6 million acres conveyed to, or selected by, six Native village corporations and Doyon. Lands in Federal ownership total about 8.6 million acres, larger than the State of Maryland. The Refuge is the third largest of 545 units in the National Wildlife Refuge System.

3. Doyon, Limited

Doyon is one of thirteen Native regional corporations established by ANCSA. Headquartered in Fairbanks, Doyon is the regional corporation for interior Alaska. Doyon's mission is to:

> *...continually enhance our position as a financially strong Native corporation in order to promote the economic and social well being of our shareholders and future shareholders, to strengthen our Native way of life and to protect and enhance our land and resources* (Doyon, Limited 2004).

Doyon, Limited is the Native regional corporation for interior Alaska, including the Yukon Flats basin.

Doyon has over 14,000 shareholders and a land entitlement of 12.5 million acres. It is the largest private landowner in Alaska and one of the largest private landowners in North America. Doyon's lands extend from the Brooks Range in the north to the Alaska Range in the south, as far east as the Alaska/Canada border, and west nearly to Norton Sound.

II. History of the Refuge & Relevant Legal Authorities

A. Rampart Dam

A long and complex history led to the establishment of the Refuge. In 1954, the U.S. Army Corps of Engineers suggested constructing a hydroelectric project on the Yukon River at Rampart Canyon. This proposal sparked extensive public debates in the late 1950s and 1960s. Over a 20-year period, the proposed "Rampart Dam" would have flooded an area about 200 miles long and 40 to 90 miles wide. The resulting impoundment would have covered approximately 10,000 square miles, virtually the entire Yukon Flats. The reservoir would have been larger than Lake Erie and would have inundated the villages of Beaver, Birch Creek, Chalkyitsik, Circle, Fort Yukon, Rampart, and Stevens Village.

The proposed dam would have produced more electrical power than Grand Coulee and Hoover Dams combined. Project proponents believed the supply of cheap electrical power would facilitate large-scale industrialization in Alaska (Coates 1993).

Wildlife inventories in the 1960s revealed the incredible productivity of the Yukon Flats basin.

In 1962, the Service was given two years to analyze the environmental impacts of the proposed project. In spite of the very short deadline, the Service undertook one of the most intensive fish and wildlife resource inventories ever conducted (King et al. 1970). The Service's report, released in April of 1964, projected wildlife losses to include 200,000 to 400,000 salmon (a vital subsistence food for Native villagers), 1,500,000 ducks, 20,000 loons, 20,000 grebes, 12,800 Canada geese, 10,000 sandhill cranes, and "countless numbers" of shorebirds and songbirds. The report concluded that,

> *Nowhere in the history of water development in America have the fish and wildlife losses anticipated to result from a single project been so overwhelming . . . Accordingly, we strongly oppose authorization of the Rampart Canyon Dam and Reservoir Project* (Ross 2000).

Outdoorsmen, conservation agencies, and environmentalists, in Alaska and across the nation, joined the Service and the affected villages in opposing the project.

Interest in the project finally dwindled in the late 1960s. More economically feasible ways to supply power and the discovery of oil at Prudhoe Bay overshadowed any lingering appeal of the proposed dam (Coates 1993). However, the national controversy over Rampart Dam focused attention on Alaska and the importance

The Rampart Dam controversy focused national attention on the importance of the Yukon Flats basin to waterfowl and other wildlife.

of the Yukon Flats basin to waterfowl and other species of wildlife. This increased national awareness laid the ground work for the designation of "national interest lands" in Alaska in 1980.

B. Alaska Native Claims Settlement Act

Before 1971, the Bureau of Land Management (BLM) administered the public domain lands that are now Refuge lands. On December 18, 1971, Congress passed ANCSA. The intent of this Act was to provide: "a fair and just settlement of all claims by Natives and Native groups of Alaska, based on aboriginal land claims" (ANCSA, Section 2).

ANCSA was the major factor determining the current land ownership patterns within the Refuge. Several provisions of the Act are pertinent to the Agreement and are summarized below.

Section 7 of ANCSA required the Secretary of the Interior to divide the State into twelve geographic regions to establish "for profit" Native regional corporations, including Doyon, Limited. A thirteenth regional corporation, with no land entitlement, was created for nonresident shareholders.

Section 8 required Native villages to form either "for profit" or nonprofit corporations under State law before the village could receive land or other benefits under the Act.

ANCSA shaped land ownership patterns within the Refuge.

Sections 11 and 12 identified the lands available for selection by village and regional corporations and established rules governing the selection process. In general, villages could select lands within a 25-township block surrounding their village. These 25-township blocks are apparent on Map 1.

Under Section 12(b), the difference between 22 million acres and the total acreage selected by village corporations was to be allocated to the regional corporations according to the number of shareholders in the region. The regional corporations were to reallocate the acreage to the village corporations. Doyon has 56,517 acres of remaining 12(b) entitlements to reallocate within its region. All of these 12(b) selections are either within the Refuge or near the village of Circle (Map 1).

Section 12(c)(3) specified that regional corporations could only select even-numbered townships in even-numbered ranges, and odd-numbered townships in odd-numbered ranges. The result was a "checkerboard" land ownership pattern around some villages.

ANCSA also established conveyance rules for the subsurface estate. In general, the regional corporation acquires the subsurface estate beneath lands that are conveyed to a village under Sections 12(a) or 12(b). The regional corporation acquires both the surface and subsurface estates of lands conveyed under 12(c). An amendment to ANCSA allowed Doyon to acquire the reserved minerals (oil and gas) of Native allotments wherever the Allotment subsurface estate is surrounded by, or contiguous to, subsurface estate that Doyon obtained under the Act. Doyon elected to obtain the oil and gas estate (less than 500 acres) of allotments in some of the townships that the U.S. will acquire under the Agreement. If the exchange proceeds, Doyon will convey to the U.S. the reserved mineral estate of these allotments.

ANCSA set the stage for the creation of national parks, refuges, and other "national interest lands" in Alaska.

Section 17(d)(2) of ANCSA directed the Secretary of the Interior to set aside up to 80 million acres of unreserved public lands the Secretary deemed suitable for national wildlife refuges, national parks, national forests, and wild and scenic river systems. The Secretary had nine months from the date of the Act to withdraw the lands. They were to remain withdrawn "until such time as the Congress acts on the Secretary's recommendations, but not to exceed five years from the recommendation dates." During the next several years, Alaska "national interest land" legislation was discussed and debated in Congress, but no legislation passed.

Section 22(f) of ANCSA, as amended, authorizes the Secretary of Interior to exchange lands or interests in lands with village and regional corporations, individuals, or the State to consolidate land ownerships, or to facilitate management or development of the land. The provision specified that exchanged lands shall be equal in value, except if the Secretary determines it is in the public interest, the exchange may be made for other than equal value.

C. Alaska National Interest Lands Conservation Act of 1980

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, to withdraw 110 million acres throughout Alaska, including what is now Refuge land, from settlement, location, entry, and selection under the public land laws. His stated intent was to protect the "integrity of Alaska lands" and protect Congressional options for national interest lands legislation.

On December 1, 1978, President Jimmy Carter used his authority under the Antiquities Act of 1906 to designate seventeen national monuments in Alaska, including two areas, Becharof (1,200,000 acres) and Yukon Flats (10,600,000 acres), to be managed by the Service. President Carter emphasized this action was necessary because of Congress' failure to act before the expiration of the withdrawals mandated by Section 17(d)(2) of ANCSA.

ANILCA (Public Law 96-487) established the Yukon Flats National Wildlife Refuge in 1980. The boundaries contained large tracts of Native selected and conveyed land.

In November 1980, Congress passed the Alaska National Interest Lands Conservation Act (ANILCA), which President Carter signed on December 2, 1980. Under ANILCA, existing refuge boundaries were readjusted and the Yukon Flats National Wildlife Refuge was officially established as a unit of the National Wildlife Refuge System.

Section 302(9)(B) of ANILCA sets forth the following major purposes for which the 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.

The major purposes of the Yukon Flats Refuge are listed in ANILCA §302(9)(B).

Several other provisions of ANILCA are relevant to the Agreement. Section 304(b) adopts the compatibility standard of the National Wildlife Refuge System Administration Act. The compatibility standard is used to determine the types of uses that may be allowed on national wildlife refuges in Alaska:

The Secretary may not permit any use, or grant easements for any purpose described in such section 4(d) unless such use (including but not limited to any oil and gas leasing permitted under paragraph (2)) or purpose is compatible with the purposes of the refuge.

ANILCA provides guidance concerning allowable uses of refuge lands.

Section 304(g) requires that the Secretary shall prepare, and from time to time, revise a comprehensive conservation plan (CCP) for each refuge. These plans are to describe the resource values of the refuge, the programs for conserving these values, and the uses within the refuge that may be compatible with refuge purposes.

Land exchanges between the Service and a Native corporation are exempt from the provisions of NEPA.

Section 910 exempts land conveyances to Alaska Natives or Native Corporations from National Environmental Policy Act of 1969 (NEPA) compliance when those conveyances are pursuant to ANCSA or ANILCA. **Under this provision, a NEPA document, such as an Environmental Assessment or Environmental Impact Statement, is not required when the Service and a Native corporation exchange lands.** However, the Service will generally prepare a written assessment of the potential impacts that could result from the exchange.

Section 1008 requires that the Secretary of the Interior establish an oil and gas leasing program on the Federal lands of Alaska. It exempts "those units of the National Wildlife Refuge System where the Secretary determines, after having considered the national interest in producing oil and gas from such lands, that the exploration for and development of oil or gas would be incompatible with the purpose for which such unit was established."

Section 1110(b) guarantees access to private and/or State-owned lands within the Refuge:

The Service must guarantee "adequate and feasible" access to private inholdings within refuge boundaries.

Notwithstanding any other provisions of this Act or other law, in any case in which State owned or privately owned land, including subsurface rights of such owners underlying public lands, or a valid mining claim or other valid occupancy is within or is effectively surrounded by one or more conservation system units, national recreation areas, national conservation areas, or those public lands designated as wilderness study, the State or private owner or occupier shall be given by the Secretary such rights as may be necessary to assure adequate and feasible access for economic and other purposes to the concerned land by

such State or private owner or occupier and their successors in interest. Such rights shall be subject to reasonable regulations issued by the Secretary to protect the natural and other values of such lands.

Section 1302(h) provides authority for land exchanges:

The Service is able to exchange lands, under authority of ANILCA §1302(h).

Notwithstanding any other provision of law, in acquiring lands for the purposes of the Act, the Secretary is authorized to exchange lands (including lands within conservation system units and within the National Forest System) or interests therein (including native selection rights) with the corporations organized by the Native Groups, Village Corporations, Regional Corporations, and the Urban Corporations, and other municipalities and corporations or individuals, the State (acting free of the restrictions of section 6(i) of the Alaska Statehood Act), or any Federal agency. Exchanges shall be on the basis of equal value, and either party to the exchange may pay or accept cash in order to equalize the value of the property exchanged, except that if the parties agree to an exchange and the Secretary determines it is in the public interest, such exchanges may be made for other than equal value.

Section 1317 required the Secretary to review, in accordance with the provisions of Section 3(d) of the Wilderness Act, all National Wildlife Refuge lands not already designated as Wilderness by ANILCA, for suitability (or non-suitability) as wilderness. The Service completed these wilderness reviews in conjunction with the comprehensive conservation plans in the 1980s.

D. Other Legal and Policy Guidance Relevant to the Agreement

1. National Wildlife Refuge Administration Act

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, provides the legal framework for managing national wildlife refuges. This Act specifies that the mission of the National Wildlife Refuge System is:

The National Wildlife Refuge Improvement Act provides guidance on administering the refuge system.

...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Several provisions of this act apply to the proposed land exchange and are referenced below:

In administering the System, the Secretary shall:

(a)(4)(B) ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of present and future generations of Americans;

The Service is authorized to exchange lands for others having a similar value, or to equalize values with a cash payment.

> *(a)(4)(E) ensure effective coordination, interaction, and cooperation with owners of land adjoining refuges and the fish and wildlife agency of the States in which the units of the System are located;*
>
> *(a)(4)(I) ensure that opportunities are provided within the System for compatible wildlife-dependent recreational uses;*

Under Section (b), the Secretary is authorized to take a number of actions, including:

> *(b)(3) Acquire lands or interests therein by exchange (A) for acquired lands or public lands, or for interests in acquired or public lands, under his jurisdiction which he finds to be suitable for disposition, or (B) for the right to remove, in accordance with such terms and conditions as he may prescribe, products from the acquired or public lands within the System. The values of the properties so exchanged either shall be approximately equal, or if they are not approximately equal the values shall be equalized by the payment of cash to the grantor or to the Secretary as the circumstances require.*

2. Refuge Comprehensive Conservation Plan

The Refuge CCP allows land exchanges if they are in the public interest.

The Refuge competed the "Yukon Flats National Wildlife Refuge Comprehensive Conservation Plan, Environmental Impact Statement, Wilderness Review" (CCP) in 1987. The Regional Director signed the Record of Decision (ROD) in December (USFWS 1987). In the ROD, the Service recommended Wilderness designation for about 658,000 acres along the southern boundary of the Refuge (Map 1). The Department of the Interior (DOI) decided not to forward the recommendation to the President.

Under the management directions common to all alternatives, the Refuge CCP states that:

> *The Service may exchange lands if these exchanges would benefit fish and wildlife resources, satisfy other purposes for which the refuge was established, or are necessary to satisfy other national interests. The Service will discuss with any concerned parties, the resource values, management needs and requirements, potential impacts, and the feasibility of any potential exchanges.*

In the ROD, the Service chose the preferred management alternative (Alternative D). The CCP addresses the effects of implementing Alternative D on oil and gas activities. That section states:

> *Under this alternative, 92 percent of the refuge would not be proposed for wilderness designation. Oil and gas exploration, including seismic, may occur on refuge lands under all management categories. However, seismic, core drilling, and other oil and gas studies involving the use of motorized equipment would not be permitted in designated wilderness unless conducted by (or for) an Interior Department agency pursuant to Section 1010 of*

The Yukon Flats CCP addresses oil and gas activities on Refuge lands.

ANILCA. Oil and gas leasing and development would not be permitted on the refuge under this alternative. However, leasing could occur in the future on areas of the refuge under minimal management which are not designated as wilderness (92 percent of the refuge). This area of the refuge could be open to leasing in the future through revision of the plan if leasing is determined to be in the national interest and is determined to be compatible with refuge purposes. Leasing would only be precluded if areas of the refuge were designated as wilderness.

Any new lands acquired by the U.S. within the exterior boundary of the Refuge, as a result of the exchange and acquisition agreement will be managed under any CCP guidance currently in effect.

The Land Protection Plan identified important wildlife habitats on private lands within the Refuge.

3. Yukon Flats Land Protection Plan

In 1997 the Service developed a "Land Protection Plan" for the Refuge (U.S. Fish and Wildlife Service 1997). The Service does not own all of the quality wildlife habitats within the exterior boundary of the Refuge. The Land Protection Plan sets priorities and provides guidelines for working with private landowners to protect these habitats. This plan identifies high-value wildlife habitats on private lands. When we began exchange negotiations with Doyon, we used the Land Protection Plan, updated with more recent biotic information, to help decide which tracts of Doyon lands we wanted to acquire.

4. Biological Integrity Policy

In 2001, the Service developed a refuge policy on "Biological Integrity, Diversity, and Environmental Health" (U.S. Fish and Wildlife Service 2001). The policy responded to a directive in the National Wildlife Refuge System Improvement Act that requires the Secretary to ensure the biological integrity, diversity, and environmental health of the System. The policy guides how the Service will manage habitats and species to meet this directive. The following provisions apply to the exchange and acquisition:

The Service strives to maximize contiguous blocks of habitat and maintain viable populations.

3.10 B. (3) We strive to maintain populations of breeding individuals that are genetically viable and functional. We provide for the breeding, migrating, and wintering needs of migratory species. We also strive to maximize the size of habitat blocks and maintain connectivity between blocks of habitats, unless such connectivity causes adverse effects on wildlife or habitat (e.g., by facilitating the spread of invasive species.)

3.17 How does this policy affect the acquisition of lands for the Service? A. We consider the mission, goals, and objectives of the System in planning for its strategic growth. We will take a proactive approach to identifying lands that are critical for maintaining or restoring the biological integrity, diversity, and environmental health of the System at all landscape scales. We will integrate this approach into all Service strategies and initiatives related to the strategic

growth of the System. We will incorporate the directives of this policy when evaluating an area's potential contribution to the conservation of the ecosystems of the United States.

5. Submerged Lands

Doyon holds title to large acreages of submerged lands beneath surface waters intended for exchange with the Service. Federal and Native Corporation lands in Alaska include a large, unquantified acreage of submerged lands beneath streams, lakes, and ponds. Generally, whether or not a water body is navigable determines the ownership of lands beneath inland waters.

Navigability determination criteria are based on long-established Federal case law. If the water body is non-navigable, the upland landowner(s) have title to the bed of the water. If the water body is "navigable" as defined by Federal case law, the State of Alaska has title to the submerged lands, unless withdrawn and reserved by the United States before statehood. The State acquired lands beneath "navigable waters" at statehood on the basis of the Equal Footing Doctrine, the Submerged Lands Act of 1953, and the Alaska Statehood Act of 1958.

Ownership of much of the submerged lands within the Refuge is unsettled. Areas considered for exchange include large acreages of submerged land.

Where navigability of a water body is undecided, ownership of the submerged lands can only be finally resolved through quiet-title action in Federal courts (judicial actions),[1] or by recordable-disclaimer-of-interest-in-land decisions by the DOI (administrative actions).[2] Neither Federal court action nor DOI disclaimer action has resolved title to any submerged lands within areas under consideration for exchange. Ownership of much of this submerged land is unsettled and may be disputed by the State of Alaska.[3] In the past, the State has filed quiet-title actions for submerged lands of water bodies within the Refuge and Doyon lands.[4] However, none of these have occurred in lands involved in this exchange. The State applied to DOI for recordable-disclaimer-of-interest-in-lands for submerged lands of water bodies within some areas considered for exchange.[5] The final agreement will address adjusting acreage owned by the Service and Doyon if either are affected by State actions following the exchange or later acquisitions. [1-5] *See End Notes on page 93.*

6. Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act, enacted in October 1968, prescribed the national policy for preserving pristine rivers:

> *It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.*

A 127-mile section of Beaver Creek is a unit of the National Wild and Scenic River System.

Section 10 (a) of the Wild and Scenic Rivers Act states:

> *Each component of the national wild and scenic rivers system shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system . . .*

The values of designated rivers must be protected and enhanced, regardless of classification and ownership.

The Beaver Creek Wild River is managed to provide a primitive recreational experience for visitors.

ANILCA designated the upper portions of Beaver Creek as part of the National Wild and Scenic Rivers System. A total of 111 miles of the designated Beaver Creek National Wild River flows through the White Mountains National Recreation Area, administered by the BLM. The lower 16-mile designated segment of the river flows through the Refuge.

By classifying Beaver Creek as "Wild", Congress mandated that the Beaver Creek National Wild River shall:

> *...be managed to be free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.*

ANILCA also directed the Secretary of the Interior to establish detailed boundaries and prepare a river management plan for the Beaver Creek Wild River. Because the river flows through both the White Mountain National Recreation Area and the Refuge, the Service and BLM jointly prepared the river management plan. The current river management plan was approved in December 1983. The plan specified that Beaver Creek be managed to provide a "primitive recreational experience" for the visitor. The Yukon Flats CCP, approved in December 1987, also states that the designated Beaver Creek corridor be managed under the guidelines developed in the approved river management plan.

7. Recent Legislative Direction

Fiscal Year 2003 Appropriation. In Fiscal Year (FY) 2003, the Service received a one-time appropriation of $500,000 for land acquisition in the Refuge. The language in the appropriations bill encouraged the Service to conduct "environmental reviews and other activities in preparation for a land exchange within the Refuge." Because the Service had limited biological information on the area that Doyon is interested in acquiring, much of this funding was used for a two-year baseline biological assessment of the area (Bertram and Person 2004).

FY 2005 Omnibus Spending Bill. The FY 2005 Omnibus Spending Bill provides $750,000 to the Service to complete the proposed exchange. Also, it authorizes the Service to establish an account in which to deposit the production payments received from Doyon, if oil or gas is produced on lands acquired from the U.S.

> *. . . provided further, that notwithstanding any other law, all revenues, fees and royalties received by the Federal Government from oil and/or gas production from the lands, and interests in land, acquired by Doyon, Limited, pursuant to the exchange of lands located within the Yukon Flats National Wildlife Refuge shall be deposited in a special account in the Treasury of the United States to be called the Alaska National Wildlife Refuge Land Acquisition and Facility Account ("Acquisition Account"): Provided further, that all amounts deposited in the acquisition account shall be available until expended without further act of appropriation to the Director of the U.S. Fish and Wildlife Service for only the following purposes: (1) To acquire lands from Doyon, Limited, located within the Yukon Flats National Wildlife Refuge in accordance with the Exchange Agreement; (2) To acquire lands from other willing sellers in the Yukon Flats National Wildlife Refuge, or from other willing sellers in other units of the National Wildlife Refuge System located within the State of Alaska; and (3) To construct facilities and infrastructure for Alaska refuges: Provided further, that none of the funds appropriated for specific land acquisition projects, other than the appropriations for the Yukon Flats National Wildlife Refuge exchange and acquisition provided for under this heading, can be used to pay for any administrative overhead, planning or other management costs. . . .*

III. Agreement to Exchange Lands

A. Negotiation History

In 1993, Doyon approached the Service with a proposal to exchange land interests.

Discussions of an exchange in land interests between Doyon and the Refuge began in November 1993. Doyon contacted the Service and suggested exchanging a noncompetitive oil and gas lease on Refuge lands for conservation easements or restrictive covenants on Native lands. The Service response, dated December 1993, acknowledged that a large percentage of important fish and wildlife habitat within the Refuge boundary is under Native ownership. However, the Service identified a number of legal, regulatory, and policy issues that needed to be addressed before reaching an agreement. The Service expressed reservations about the long-term benefits of acquiring conservation easements, but did express interest in acquiring fee title interest to important wetland habitats. Exactly how the Service would benefit from the 1993 proposal was unclear.

In April 1995, Doyon submitted a formal "management partnership" proposal to the Service (Doyon, Limited 1995). This proposal refined the agreement suggested in 1993. The proposal stated that:

> *...in return for the conservation easements and other habitat protection tools by Doyon, the USFWS [Service] would grant noncompetitive oil and gas leases on refuge lands adjacent to and in the vicinity of Doyon lands. The leases would be similar to those for federal uplands for which Doyon would pay a production royalty and would be of limited duration.*

In early exchange proposals, Doyon sought a noncompetitive oil and gas lease in exchange for conservation easements. These proposals were rejected by the Service.

Because of legal uncertainties, the Service asked the DOI Solicitor's Office to review the proposal. The review was completed in May 1997, and in January 1998 the Service responded. The response stated that: (1) oil and gas leasing and development were not consistent with the selected management alternative in the Refuge CCP, and (2) noncompetitive oil and gas leases could not be issued under the authority of the Minerals Leasing Act of 1920; however, the Service could exchange interests in land. The response also stated that to justify such an exchange, the Service must: (1) acquire lands (or interests therein) that were consistent with the purposes for which the Refuge was established, and (2) the exchanged land interests must be of equal value. The Service's response concluded, "we would certainly be interested in considering any such proposal that is both in the public interest and consistent with the purposes for which the Yukon Flats Refuge was established."

In December 1999, Doyon asked the DOI to consider a competitive oil and gas lease sale within the Refuge, under the Mineral Leasing Act of 1920. The Service response, dated January 2000, stated that the Refuge CCP does not allow for oil and gas leasing on the Refuge. Before a lease could be issued, the CCP must be amended.

The Refuge CCP does not allow oil and gas leasing on Refuge lands.

Oil and gas leasing and development would have to be determined compatible with the purposes for which the Refuge was established. The response also stated it was unlikely that any large-scale development activities on Refuge lands, which would negatively impact wildlife habitats, would be determined to be compatible.

In November 2002, the Service and Doyon began discussions that led to the current Agreement in Principle. A number of key differences exist between these negotiations and the earlier proposals from Doyon:

Lengthy negotiations led to a proposal to exchange fee title ownership, rather than limited land interests.

1. Most importantly, Doyon offered the U.S. fee title ownership of quality wetland habitats.

2. Doyon is willing to exchange fee title ownership (both surface and subsurface estates), ensuring development activities occur on Doyon's lands, not on Refuge lands. Therefore, a determination that oil and gas development is compatible with the purposes of the Refuge will not be required.

3. Doyon is willing to reallocate 56,517 acres of remaining ANCSA 12(b) entitlements outside the Refuge.

4. Doyon is willing to mitigate oil/gas development impacts by: (a) selling about 120,000 acres of additional land to the U.S.; (b) increasing production payments from 1.25% to 1.5%, if access is through the Refuge; and (c) transferring to the U.S. one section of Doyon land for every linear mile of access corridor across the Refuge.

Negotiations leading to the draft Agreement lasted almost two years. To facilitate these negotiations, Doyon and the Service enlisted assistance from the Conservation Fund. The Conservation Fund representative attended the negotiation meetings and suggested alternative approaches when the negotiators were unable to reach an agreement.

B. How the Service Set Acquisition Priorities for the Agreement

Shortly after exchange discussions began in November 2002, the Refuge staff recognized the need to prioritize Doyon's lands in terms of wildlife habitat value. The Refuge Land Protection Plan identified high, medium, and low land protection priorities on private lands within the Refuge. However, additional biological data had been collected since the land protection plan was completed, and we needed a more detailed stratification system to rank one township against another.

1. Biotic Values

Native corporations own, or have selected, a total of 123 townships within the Refuge.

We numbered all 123 townships (about 2.8 million acres) within the exterior Refuge boundary either selected by, or conveyed to, Doyon or a Village Corporation. A total of 57 townships are conveyed to Doyon, 42 are conveyed to village corporations and 24 are selected by (not yet conveyed to) corporations. We scrutinized our existing

biological data to see which data sets covered these areas. The Service has collected site-specific biological information on bears, furbearers, moose, songbirds, vegetation, and waterfowl, but only two data sets were available for all 123 townships: (1) waterfowl breeding pair densities (Map 8), and (2) trumpeter swan surveys. We concluded that using these data sets to evaluate the biotic resource values of each township would be appropriate, since the Refuge was established primarily to conserve significant waterfowl habitats.

Swan nest site locations and waterfowl breeding pair survey data were the only data available for all 123 townships.

Swan surveys are repeated every five years. Locations of swans and swan nests are recorded on United States Geologic Survey (USGS) topographic maps. We combined swan data from six separate surveys, conducted from 1975 to 2000, and overlaid this information on the 123 conveyed and selected townships to identify important swan habitats (Map 9).

A 1991-92 survey found that approximately 56% of waterfowl nesting in the Yukon Flats were using private land.

In 1991 and 1992, the Service conducted intensive aerial waterfowl breeding pair surveys on the Yukon Flats, in response to the possibility of oil and gas development on Refuge inholdings. If private landowners were to develop oil and gas on their lands, this information could be used to minimize potential impacts to waterfowl on adjacent Refuge lands (Platte and Butler 1992). In the two years of the study, the Service flew about 5,300 miles of survey lines over the Yukon Flats. Waterfowl and other waterbirds sighted along these lines were recorded by species, and densities were estimated. These surveys emphasized the importance of Doyon and village corporation lands to waterfowl production. Approximately 56% of the waterfowl were using Native conveyed or selected lands.

We used these survey data to help set our acquisition priorities. We separately examined data sets for dabbling ducks, diving ducks, swans, and other waterbirds, such as grebes, loons, and shorebirds. We weighted each data set equally and summed the four values. We prioritized all 123 townships based on this biotic rank.

2. Abiotic Values

Digital hydrography data provided important abiotic criteria for ranking habitat values.

Digital hydrography data were available for all 123 townships. In general, wetland habitats are some of the most productive wildlife habitats in the Yukon Flats. Lake margins are important nesting areas for shorebirds and many species of passerine birds. Several species of furbearers (e.g., beaver, mink, muskrat, and otters) are totally dependent on wetlands. Riparian areas along streams are usually among the most diverse and nutrient-rich habitats within an ecosystem. Stream corridors often provide important travel routes for large mammals, such as bears, moose, and wolves. Obviously, all fisheries resources are associated with either streams or lakes.

Because we lacked comprehensive biological data for species other than waterfowl, we used four abiotic measures to help us rank our acquisition priorities: (1) total number of lakes within the township, (2) total lake acres within the township, (3) number of miles of streams within the township, and (4) number of acres of the Yukon River (if within the township). Quantifying these abiotic factors gave us a relative measure of riparian habitat, an important biotic factor. We gave each of the abiotic factors equal weight and summed the total scores for each township. We prioritized all 123 townships based on their abiotic rank.

3. Final Acquisition Priorities

We combined the biotic ranking and the abiotic ranking and came up with an overall rank for each of the 123 townships. However, other important considerations influenced our selection of the highest priority townships. Was the township owned by Doyon? Was Doyon willing to make this township available for exchange or purchase? Would acquiring the township provide the Refuge with a large contiguous block of habitat? Was the township adjacent to other Refuge lands? Were there other special values within the township, such as important fish spawning areas? Our final priorities reflected both the biotic/abiotic ranking process and our best professional judgment of which lands would contribute the most to Refuge purposes. If both phases of the exchange are completed, the Service will acquire many of the high-priority fish and wildlife habitats identified on Doyon's lands.

C. Remaining Steps Before an Exchange/Acquisition Document Can Be Signed

Public input and land appraisals could influence the details of the final exchange document.

Several tasks must be accomplished before an exchange and acquisition agreement can be finalized. We will solicit and evaluate public comments on this document and the Agreement. Appraisals of surface and subsurface lands, conforming to the *Uniform Appraisal Standards for Federal Land Acquisitions*, must be conducted by the DOI Appraisal Services Directorate. Finally, a detailed exchange document will be prepared and reviewed by legal representatives of both parties. These remaining steps will take several months. We do not anticipate that a final agreement could be signed before late summer 2005.

IV. Potential for Oil/Gas and other Minerals

A. Oil and Gas Resources

Oil and gas investigations in the Yukon Flats basin date to the 1940s (Ebbley 1944). In 1987, at the Service's request, the BLM prepared an oil and gas resource assessment of the Refuge (Banet et al. 1987). The report indicated that much of the Refuge had a "moderate" oil and gas potential.

In 1988, the Refuge permitted a helicopter-supported winter seismic survey. The permit stipulated that the data be shared with the Service. These proprietary data were to remain confidential to the extent permissible by law. The BLM's data analysis resulted in a confidential report that concluded "significant hydrocarbon resource potential for sizable portions of the YFNWR [Refuge]" existed.

The USGS recently released mean estimates of "technically recoverable resources" in the Yukon Flats Basin.

The U.S. Geological Survey recently released a new hydrocarbon potential study of the Yukon Flats Basin (Stanley et al. 2004). This USGS Fact Sheet provides mean estimates of "technically recoverable resources" in the Yukon Flats basin at 173 million barrels of oil, 5.46 trillion cubic feet of natural gas, and 127 million barrels of natural-gas liquids (see Appendix 3).

B. Metallic Minerals

National Wildlife Refuge System lands in Alaska are closed to "location, entry, and patent under the mining laws" by Section 304(c) of ANILCA. Gold has been the only major commodity mined in the region. The White Mountains (along the southern boundary of the Refuge) and the Ray and Davidson mountains (in the Brooks Range north of the Refuge) are included in provinces of potential economic importance for tin, gold, silver, lead, zinc, and tungsten. None of the highland areas of the Refuge have been explored to determine possible mineral resources. Presently no metallic mineral deposits are known to exist in the Refuge. Small-scale placer mining for gold is the only regularly occurring mining activity in the vicinity of the Refuge. Opportunities for hardrock mining within the area that Doyon will acquire appear to be limited (A. B. Till, pers. comm. 2004).

C. Coal

Coal has been found in three areas of the Refuge – the Hodzana River, the upper Dall River, and near Fort Yukon. Coal seams (up to one foot thick) are exposed on the Hodzana River. U.S. Bureau of Mines auger holes encountered coal beds 12 and 18 feet thick near the Dall River (Barker, 1981).

D. Geothermal Resources

Hot springs occur near the Dall River but there have been no studies to determine the potential for their use.

E. Other Minerals

Alkali salt is contained in many of the lakes on the Refuge. Analysis of samples from the lakes identify this alkali material to be primarily trona, a sodium bicarbonate industrial mineral used in the manufacture of glass and paper (Clautice and Mowat 1981). However, no trona beds have been documented. Sand and gravel are found in abundance on the Refuge.

U.S. Fish & Wildlife Service

Winter view of the southern Yukon Flats foothills.

V. Description of Phase I Lands

A. Lands to be Acquired by Doyon

1. Topography, Geology and Soils

The nearly 110,000-acre parcel to be acquired by Doyon (parcel) is situated in the southern Yukon Flats, about 15 to 40 miles southwest of Birch Creek Village. The parcel lies between the Yukon Flats basin and the northern foothills of the White Mountains (Map 2). The parcel is comprised of upland terrain ranging in elevation from 800 to 1,000 feet. Approximately 22 miles of Beaver Creek flow through the eastern half of the parcel; lands adjacent to the creek flood seasonally. Soils are shallow, formed from silty alluvium and loess, poorly drained, and underlain by discontinuous permafrost (Rieger et al. 1979).

A total of 173 lakes, one per square mile, are scattered across the parcel.

2. Water Resources

The parcel includes 173 lakes (Table 1), ranging in size from less than 1 acre to 181 acres (mean = 15 acres). Averaging one water body per square mile, water comprises 2% of the landscape.

Table 1. Summary of abiotic and biotic resources on Phase I lands to be acquired by Doyon.

Village Association	Location	Total Area* (acres)	Total Area (mi^2)	Number of Lakes	Lake Area (mi^2)	River Length (Miles)	2000 Swan Density (mi^2)	2000 Duck Density (mi^2)
Birch Creek	T13N R6E	23,000.81	35.94	23	0.56	0.72	0	2.29
Birch Creek	T13N R5E	11,519.77	18.00	16	0.5	0.00	0	0.88
Birch Creek	T12N R6E	5,497.37	8.59	4	0.03	0.00	0	0
Birch Creek	T12N R5E	6,104.4	9.54	2	0.003	0.00	0	0
Birch Creek	T11N R5E	120.19	0.19	0	0	0.00	0	0
Birch Creek	T13N R7E	15,962.19	24.94	39	0.68	12.43	0	0
Birch Creek	T13N R8E	5,730.94	8.95	10	0.23	0.00	0	0
Birch Creek	T14N R5E	1,919.91	3.00	6	0.24	0.00	0	0
Birch Creek	T14N R6E	7,649.50	11.95	15	0.3	0.00	0	0
Birch Creek	T14N R7E	14,031.24	21.92	30	0.78	15.75	0	0
Birch Creek	T14N R8E	17,803.14	27.82	28	0.78	5.72	0	4.75
Total		**109,339.46**	**170.84**	**173**	**4.10**	**34.62**		

**Total area is the GIS-calculated acreage of each land parcel.*

Baseline water chemistry data were collected from six larger lakes (> 39 acres) within the parcel (Bertram and Person 2004). These lakes (mean size = 66 acres) had a mean water volume of 783 acre-feet (213 million gallons), steep bottom profiles with water depths up to 58 feet, and soft water with oxygen levels sufficient to support fish.

Beaver Creek flows through the parcel.

Beaver Creek is a clear-water stream flowing south to north through the eastern third of the parcel. The gradient of Beaver Creek is moderate; substrate is gravel to cobble. Beaver Creek changes character downstream from the parcel: the gradient becomes low; the channel meanders; the flow velocity decreases; the banks become steep; and the substrate is sand and silt.

Streamflows peak in the spring, but summer thunderstorms cause short-duration high flows.

Stream flow (discharge) information exists at five locations along Beaver Creek, including one site within the parcel. A gaging station south of the parcel, near the confluence of Victoria and Beaver Creeks, recorded mean monthly summer discharges ranging from 777 to 3,461 cubic feet per second (Collin et al. 2002). At present, gaging stations are located only in the headwaters of Beaver Creek (J. Kostohrys, BLM hydrologist, pers. comm. 2004). From July 1994 to September 1998, the Service operated a gaging station within the parcel, approximately 20 miles downstream of Victoria Creek. Annual hydrographs indicate peak flows occur in the spring and are associated with snow melt and ice dams in some locations. Flows generally decrease in the summer. However, brief thunderstorms are common and produce short-duration, high-flow events. As temperatures cool in the fall, flows decrease and reach a minimum just before breakup (late March to early April). Springs in the upper watershed are a source of winter water and create areas of thin ice or ice-free flows in the winter. Winter river conditions change where the river leaves the foothills and enters the lowlands. Ice thickness increases significantly and flow is reduced.

In 2002, the Service filed several instream flow water right applications with the Alaska Department of Natural Resources (ADNR). The intent was to ensure adequate stream flows to protect fish and wildlife habitat, migration, and propagation. The Service filed water rights applications for a 124-acre lake in the parcel (Bayha and Wolfe 1999), and for a flow reservation in Beaver Creek. The ADNR has not processed either application. The Service plans to withdraw the water right application for the lake if the exchange proceeds. The application for Beaver Creek, however, will remain on file. The requested instream flow reservation for Beaver Creek extends beyond the boundaries of the parcel to be acquired by Doyon and is ecologically connected to the Refuge and Service trust resources.

3. Vegetation

The parcel is located primarily in the Yukon-Old Crow Basin ecoregion.

The Yukon Flats region is described as the Upper Montane Boreal Zone by Nowacki et al. (2001) in the Unified Ecoregions of Alaska map. The parcel is largely within the Yukon-Old Crow Basin ecoregion of the boreal zone. A small southern portion of the parcel is within the Ray Mountains ecoregion. These ecoregions are described by Nowacki et al. (2001) according to ecological and geomorphic processes, associated vegetation, glaciation, lithology and presence of permafrost.

Upland vegetation consists of black and white spruce stands, interspersed with mixed needleleaf/broadleaf forests.

The predominant vegetation cover of this upland region is open needleleaf, black spruce (*Picea mariana*) and white spruce (*P. glauca),* with some areas of open and closed mixed needleleaf/broadleaf forests. South-facing ridges support quaking aspen (*Populus tremuloides*) and include prickly rose (*Rosa acicularis*), kinnikinnick (*Arctostaphylos uva-ursi*), lowbush cranberry (*Vaccinium vitis-idaea*) and fireweed (*Epilobium angustifolium*). The region includes large expanses of tussock tundra, comprised of scattered, stunted black spruce, shrub birch (*Betula nana*), Labrador tea (*Ledum palustre*), bog blueberry (*Vaccinium uliginosum*), and sedge tussocks of Alaska cotton grass (*Eriophorum* and *Carex spp.)*.

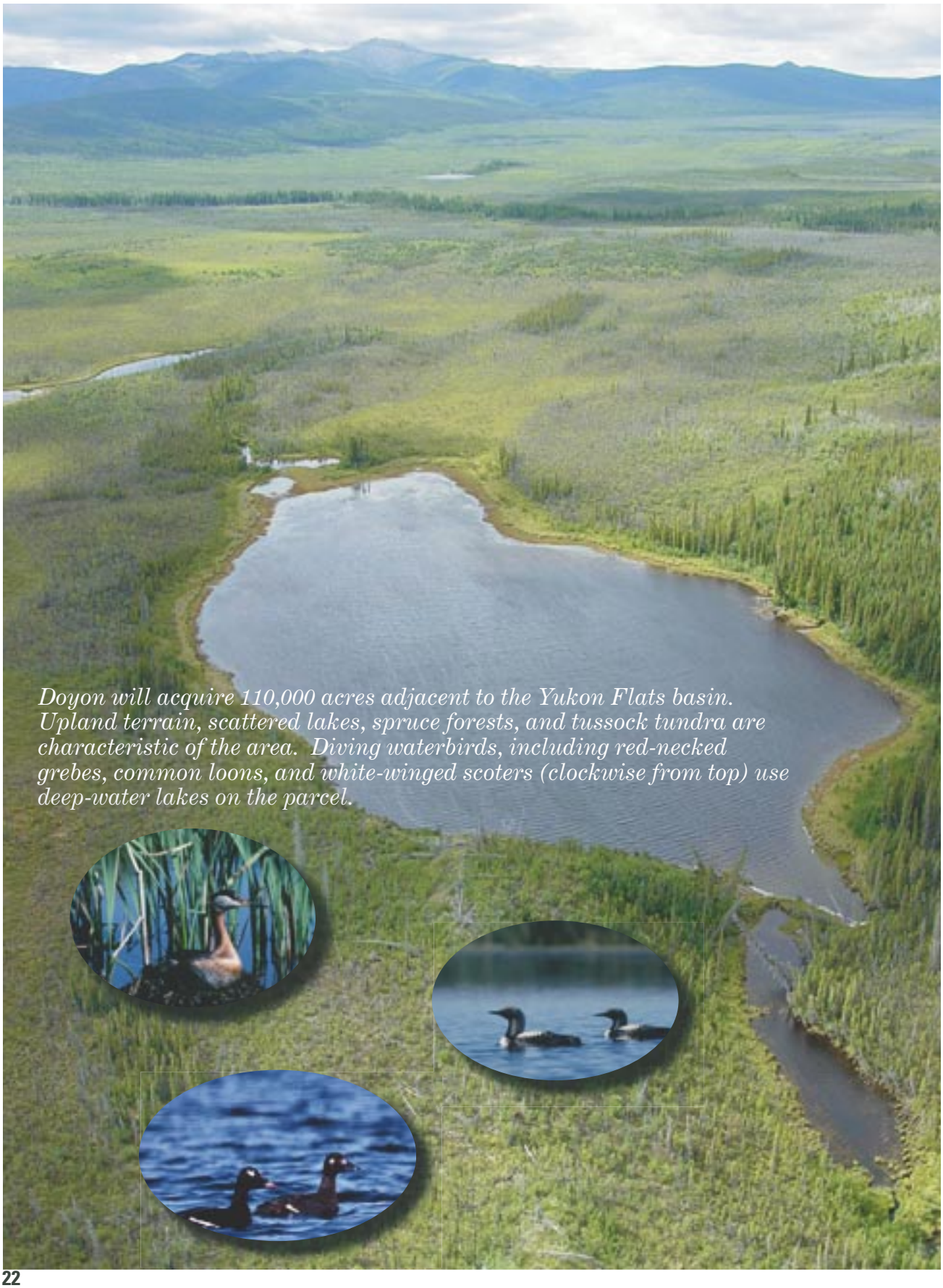
Large expanses of tussock tundra occur in the region.

Upland lake shorelines vary from relatively flat to steep-sided. Some of the upland lakes are deeply cut into the terrain, with bluffs ringing the lake shore. Plants growing on the unstable slopes include *Artemesia* spp., Pumpelly's brome grass (*Bromopsis pumpellianus*), *Poa* spp., *Erysimum cheiranthoides* and strawberry spinach (*Chenopodium capitatum*). Lake shoreline vegetation includes moss and *Carex*, *Eriophorum* and *Eleocharis* graminoid species. Forbs such as willow herb (*Epilobium*), *Rorripa*, and *Potentilla* are found interspersed among the graminoids. The shrub zone consists of willow (*Salix*) including *S. arbusculoides*, *S. pulchra*, *S. bebbiana*, shrub birch, and shrubby cinquefoil (*Potentilla fruiticosa*). Black spruce is the dominant tree species wherever surrounding upland vegetation has not burned.

The Beaver Creek floodplain is bounded on the west by a series of east to southeast-facing loess bluffs. Bluff species include *Calamagrostis purpurascens*, *Potentilla pennsylvanica*, *Arabidopsis mollis*, and *Pentstemon gormani* (Bertram and Person 2004). Vegetation communities in the floodplain vary depending on their distance from Beaver Creek. Forests adjacent to Beaver Creek include mixed stands of white spruce, poplar (*Populus balsamifera*), birch (*Betula papyrifera*), dwarf aspen, and alder (*Alnus viridus*) with understory vegetation that includes fireweed, bedstraw (*Gallium*), and horsetail (*Equisetum* spp.). Gravel bars include poplar, willow shrubs, grasses, lupine and elegant hawksbeard (*Crepis elegans*). Oxbow lake shoreline vegetation includes grasses and sedges (*Carex aquatilis*, *C. rostrata*, *C. canescens*, *Calamagrostis canadensis*, and *Glyceria pulchella*) and horsetail. Aquatic plant species include *Potamogeton*, *Polygonum*, and *Sparganium* species. Wetlands include open low scrub vegetation communities of sweet gale (*Myrica gale*), sedges (*Carex chordorrhiza*, *C. diandra*, and *C. limosa*), and bog cranberry (*Oxycoccus microcarpus*). Bogs support *Sphagnum* moss, buckbean (*Menyanthes trifoliata*), graminoids (*Eriophorum* and *Carex spp.*), and minute sundews (*Drosera anglica* and *D. rotundifolia*).

Two rare or uncommon plant species are known to occur on the parcel.

Plant inventories of the parcel identified two plants uncommon to the region (Bertram and Person 2004). A grass-like monocot, *Scheuchzeria palustris*, was present at a bog east of Beaver Creek. It is considered rare or uncommon in Alaska with 21 to 100 documented occurrences (Alaska Natural Heritage Program 2004). A grass, *Glyceria pulchella*, was collected at two sites in the west Beaver Creek floodplain. It is considered imperiled in the State, or other factors make it vulnerable to extirpation in Alaska, with 6 to 20 registered occurrences (Alaska Natural Heritage Program 2004).



Doyon will acquire 110,000 acres adjacent to the Yukon Flats basin. Upland terrain, scattered lakes, spruce forests, and tussock tundra are characteristic of the area. Diving waterbirds, including red-necked grebes, common loons, and white-winged scoters (clockwise from top) use deep-water lakes on the parcel.

Delia Person, U.S. Fish & Wildlife Service

4. Fish and Wildlife

Nine fish species have been documented in area waters.

a. Fish. Nine fish species have been documented in Beaver Creek and adjacent wetland habitats in the vicinity, or upstream, of the parcel (Table 2). Arctic grayling and slimy sculpin are thought to be residents of the drainage throughout their lives. Inconnu (sheefish) probably migrate outside the drainage at times, possibly traveling all the way to the Bering Sea. Chinook and chum salmon are anadromous and migrate to sea for one or more years before returning to the river to spawn. Juvenile chum salmon leave the river soon after hatching and go immediately to sea. In the Yukon River drainage, juvenile Chinook salmon stay in freshwater rivers for two years before going to sea. Longnose sucker, northern pike, round whitefish, and burbot may remain in the drainage or migrate out to the Yukon River and beyond. Other fish species common to the Yukon River drainage are probably present in the Beaver Creek watershed as well, but there are no comprehensive studies for this drainage.

Only northern pike have been documented in the upland lakes in the parcel. They appear to be isolated populations without access to other nearby lakes or to the waters of Beaver Creek. Sampling efforts have been limited to a very small number of lakes, so species diversity in the upland lakes could be greater than is currently known.

Table 2. Fish documented in Beaver Creek and adjacent wetland habitats.

Family and Scientific Name	Common Name
Salmonidae	
Stenodus leucichthys	inconnu (sheefish)
Prosopium cylindraceum	round whitefish
Oncorhynchus tshawytscha	Chinook salmon
Oncorhynchus keta	chum salmon
Thymallus arcticus	Arctic grayling
Esocidae	
Esox lucius	northern pike
Catostomidae	
Catostomus catostomus	longnose sucker
Gadidae	
Lota lota	burbot
Cottidae	
Cottus cognatus	slimy sculpin

b. Birds. Waterbird densities are relatively low compared to adjacent wetlands in the Yukon Flats lowlands. Deep-water lakes are sparsely distributed in uplands and provide habitat for diving waterbirds such as red-necked grebes (*Podiceps grisegena*), white-winged scoters (*Melanitta fusca*), lesser scaup (*Aythya affinis*), and pacific loons (*Gavia pacifica*). Wetlands adjacent to Beaver Creek provide shallow lake habitats for dabbling ducks, such as American

Dave Menke

A 2003 survey found that white-crowned sparrows were the most widely distributed songbird species on the parcel.

wigeons (*Anas americana*), and mallards (*Anas platyrynchos*). Service biologists surveyed 26% of the lakes in the parcel in 2000 and observed waterbirds on approximately half the lakes. Pacific loons were the most common species and were observed on 37% of all lakes (Bertram and Vivion 2000). A second aerial survey in 2000 estimated density ranges of white-winged scoter (8 to 19 ducks/mi^2), American wigeon (1 to 4 ducks/mi^2), mallard (2 to 3 ducks/mi^2) and scaup (2 to 3 ducks/mi^2) (Hodges et al. 2001).

During June 2003, the Service conducted songbird point count surveys adjacent to Beaver Creek and on six upland lakes within the parcel; 1,231 birds, representing 61 species were counted. The five most common species included white-crowned sparrow (*Zonotrichia leucophrys*), Swainson's thrush (*Catharus ustulatus*), dark-eyed junco (*Junco hyemalis*), American robin (*Turdus migratorius*), and fox sparrow (*Passerella iliaca*). Of these species, white-crowned sparrows were the most widely distributed. Species of continental importance included rusty blackbird (*Euphagus carolinus*) and olive-sided flycatcher (*Contopus cooperi*) (Rich et al. 2004) which have also been observed in other locations on the Yukon Flats. The Beaver Creek survey detected more bird species than the other locations.

c. Mammals. The parcel provides habitat for a variety of mammals, including moose (*Alces alces*), grizzly (*Ursus arctos*) and black bear (*Ursus americanus*), wolf (*Canis lupus*), and marten (*Martes americana*). Early winter densities of moose are low, similar to other areas in the western Yukon Flats. During a 2004 moose survey stratification flight, we observed moose concentrations on the Beaver Creek riparian corridor and in burned habitats to the east (Bertram, unpublished data). Limited data from collared moose suggest that Beaver Creek may be a movement corridor between lowland and upland habitats (Nowlin and McLean 1985).

Moose, bears, and wolves use Beaver Creek as a movement corridor.

Predators, including bears and wolves, also use Beaver Creek as a movement corridor. Wolves have been observed on Beaver Creek (Stephenson et al. 1997). Wolf densities in the parcel are estimated to be low, about one wolf per ten square miles (ADFG and CATG 2000). A local trapper harvested 13 wolves from the parcel in 1998.

Black bears are common throughout the area. Densities are probably similar to other areas in interior Alaska (Hechtel 1991, Schwartz and Franzmann 1991, and Miller 1994). Bears may use Beaver Creek as a travel corridor to upland habitats and as a denning area. The Service documented five dens in the area between 1995 and 1997 (Bertram and Vivion 2002).

The area includes portions of three burns. These wildland fires burned over 50,000 acres between 1987 and 1999. The resulting mosaic of burned and unburned terrain created habitat favorable for marten. Historical aerial furbearer track counts in the parcel identified medium to high densities of marten tracks in the mid-1980s (Golden 1987). A local trapper harvested 312 and 132 marten from the area in 1996 and 1999, respectively.

5. Public Use and Access

Information related to public visitation on the parcel is limited. However, Refuge records and BLM monitoring efforts along Beaver Creek indicate less than 200 people per year float the Refuge portion of Beaver Creek, or access lands in the parcel. Recreational moose hunting in this area is prohibited by a Federal subsistence management regulation. This factor may affect the amount of public use.

In addition to limited hunting opportunities, no road accesses the parcel. It can be reached by snowmachine in the winter, however. Airplanes can access specific areas, such as large lakes or long, straight gravel bars along Beaver Creek. The only air taxi operator offering "flight-seeing" tours of the Refuge often lands on large lakes in this area. Occasionally, private individuals in float-equipped airplanes land on large lakes, such as Burman Lake, to fish for northern pike. The most common mode of access is by boat, and the most numerous visitors are those who float Beaver Creek during the summer and early fall. These visitors typically use the area for hiking, camping, wildlife observation, photography and fishing.

Some trapping also occurs within the parcel. There is one known trapline and two Service-permitted cabins on the parcel (Map 13). In addition, other agencies and institutions occasionally use the Refuge for scientific research.

6. Subsistence

Subsistence use on the parcel is probably very limited. The villages of Central and Birch Creek are the closest to the area. The parcel appears to lie within the historical lands of the Deendu Gwich'in of Birch Creek. In surveys to record traditional Gwich'in place names, both Birch Creek and Fort Yukon residents could list names for Burman Lake (Luk Choo Van – "Big Fish Lake"). Burman Lake lies on the northeastern edge of the lands to be acquired by Doyon. Historical reports indicate the Deendu Gwich'in hunted sheep on Victoria Mountain, southwest of the parcel. A traditional portage site between Beaver and Birch Creeks lies just north of the parcel. Birch Creek residents have used this portage since at least the 1800s. In recent years, most subsistence activities on lands south of Birch Creek village occur within 25 miles of the present village site, in the vicinity of Burman Lake and west to Beaver Creek. Residents of Circle and Central also may occasionally trap along streams that border the eastern boundary of the parcel.

Subsistence use on the parcel is probably very limited.

The "halo lands" (lands for which Doyon would acquire oil and gas rights only) lie partly within the traditional use area for Birch Creek residents. Birch Creek flows through the eastern halo lands accessed through private (Birch Creek and Doyon) lands. Burman Lake also is within the halo lands. Birch Creek residents have traditionally used the Beaver Creek corridor, Burman Lake, and the Birch Creek corridor for moose and bear hunting and furbearer trapping. Circle and Central residents use Birch Creek for hunting and trapping, though probably not downstream of the confluence with Preacher Creek.

7. Fire Management

The parcel is in a "Limited" fire suppression area. Fires are monitored, not suppressed.

Upland black spruce and related fire-driven successional stages are the primary fuel types on the parcel. The fire suppression category of the area is currently designated as "Limited" (Table 3). Fires are monitored, not suppressed, although point control or partial suppression to protect cabins or other sensitive sites may occur. Vegetation patterns in the area suggest an active fire history. Repeated fires have created a mosaic of burned and unburned habitats. The level of fire protection would likely increase to "Full" or "Critical" if structures are built on the parcel. The increase in fire protection and expense would be the responsibility of Doyon and the Alaska Fire Service, the Federal fire suppression agency, not the Service. However, inclusions of "Full" or "Critical" within a larger "Limited" management area may require the Service to take action to prevent fire spreading from Refuge lands onto Doyon lands. This action may be either hazard fuel reduction before fires occur, or point control suppression at the management boundary during an active fire.

Table 3. Fire Management Categories

Fire Management Category	Definition
Critical	Human life and property are at risk (such as near village sites); fires are immediately and aggressively suppressed
Full	Cultural, historical, or other resource values (such as historical cabins or high-value white spruce stands used as house logs) are present on private or uninhabited public lands; fires are suppressed
Modified Action Area	Uninhabited lands receiving fire protection from May to about July 10th, or whenever unusually dry periods prevail. Otherwise, fires are monitored.
Limited Action Area	Remote, uninhabited areas; fires are monitored unless lands in other categories are threatened.

8. Service-recommended White-Crazy Mountain Wilderness Area (1987)

In 1987, the Service recommended wilderness designation for 658,000 acres in the White-Crazy Mountains. The southern portion of the parcel lies within this area (see Section II.D.2 and Map 12).

This area was selected for wilderness designation based on its size, Federal ownership of surface and sub-surface, natural integrity, apparent naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive recreation. The Wilderness Act describes wilderness as:

A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its 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.

The recommended wilderness area is characterized by rugged and scenic white limestone mountains. Access into the area is difficult and limited. This isolation has protected the White and Crazy Mountains from human development and habitation. Because of remoteness, low fur-bearer populations, and limited gold resources, this area has received little historical use. Recreational use also is light. However, there is an increasing number of visitors who hunt Dall sheep or hike in the White Mountains. Scientific research occasionally occurs in the area.

The recommended wilderness area is rugged and remote. However, an increasing number of visitors come to hunt Dall sheep.

Beaver Creek Wild River flows through the area and receives limited visitation. This area also adjoins two BLM conservation units – the White Mountains National Recreation Area and the Steese National Conservation Area (Map 7). The northwest portion of the White Mountains National Recreation Area, adjacent to the Service-recommended wilderness area, is managed as a "Primitive Management Unit." Few, if any, facilities exist, including developed trails, cabins, signs, maps, or brochures. Management presence is low with few on-site visits or patrols.

The next step in the official wilderness area nomination process did not occur. Over the ensuing 18 years, no Secretary of Interior has forwarded this recommendation to the President of the United States. Therefore, the area is not managed under the guidance of the Wilderness Act.

B. Lands to be Acquired by the United States

1. Topography, Geology and Soils

Lands to be acquired by the U.S. are within the Yukon Flats, a low marshy basin patterned with lakes and meandering streams.

The lands identified for acquisition by the U.S. (Map 2) total approximately 174,500 acres. The exact acreage acquired by the U.S. will depend on the appraised value of the lands transferred to Doyon; the U.S. will acquire an equal-value amount of land. All lands identified for acquisition are within the Yukon Flats lowlands near the villages of Stevens Village, Beaver, Birch Creek, and Chalkyitsik. They lie within the Yukon Flats, a flat, marshy basin, patterned by braided and meandering streams and hundreds of thaw and oxbow lakes. Elevations range from 300 to 550 feet. Terrain is generally flat and drained by the Yukon River. Rivers include the Porcupine and Dall Rivers and Meadow, Pat, Beaver, and Lower Mouth Birch Creeks. Soils near these drainages are silty and sandy sediments that are flooded seasonally. Away from main river channels, low, flat areas have poorly-drained soils, overlain by peat, and a shallow permafrost table. Permafrost is present throughout the region, but absent beneath rivers and large lakes.

2. Water Resources

There are 1,395 lakes and 110 stream miles within the lands the U.S. will acquire.

The lands to be acquired by the U.S. include 1,395 lakes or 5.1 lakes per square mile (Table 4). Water comprises 12% of the landscape. An earlier study collected samples from 129 lakes in the Yukon Flats basin. These lakes are fertile, shallow-water lakes with depths ranging from 2 feet to 20 feet (mean = 6 feet). Lake water is fresh to slightly brackish and is among the most nutrient-rich waters described in Alaska (Heglund and Jones 2003). The U.S. will acquire lands bordering about 110 linear miles of creeks and rivers, primarily Beaver Creek and the Porcupine River. These drainages are low-gradient, meandering streams with sand, silt, and gravel substrates. Sloughs and oxbow lakes are common and may recharge during high-water events. These rivers are tributaries to the Yukon River and are subject to flooding or backwater effects of the Yukon or Porcupine Rivers. During winter, low-gradient streams develop thick ice and flow is significantly reduced.

3. Vegetation

Lands near Stevens Village are vegetated with mixed spruce and birch, aspen, and poplar stands, with open to closed canopies. Tall shrub communities of willow and alder line rivers and creeks. Lakes and sloughs contain both emergent and submergent vegetation. Lake shorelines are vegetated with graminoids, horsetail, and willow shrubs. Alkaline grass meadows occur in this region and contain grasses such as squirrel tail (*Hordeum jubatum*) and arrow grass (*Triglochin maritimum*).

Areas near Beaver and Birch Creeks include a mosaic of white and black spruce, and mixed conifer, birch, aspen, and balsam poplar stands. Willow, alder, prickly rose, red-osier dogwood (*Cornus sericea*), and high bush cranberry (*Viburnum edule*) are common understory shrubs. Herbaceous plants include horsetail, *Calamagrostis* grass, wintergreen (*Pyrola* spp.), and mosses. Lakes in this region have wide margins with large stands of willow (*Salix pulchra*, *S. bebbiana*, and *S. alaxensis*), and numerous grasses

Table 4. Summary of abiotic and biotic resources on Phase I lands to be acquired by the U.S.

Village Association	Location	Total Area* (acres)	Total Area (mi^2)	Number of Lakes	Lake Area (mi^2)	River Length (Miles)	2000 Swan Density (mi^2)	1991-92 Duck Density (mi^2)
Stevens	T16N R8W	15,615.94	24.40	352	3.82	0.225	0.12	70.4
Stevens	T15N R9W	17,084.92	26.70	97	1.85	0.82	0.15	40.48
Beaver	T17N R3E	13,426.8	20.98	89	3.29	18.33	0.00	25.8
Birch Creek	T17N R7E	19,591.2	30.61	104	1.31	17.6	0.00	45.35
Beaver	T16N R4E	22,767.37	35.57	165	5.68	15.47	0.06	38.88
Stevens	T16N R6W	18,123.58	28.32	112	4.32	7.72	0.14	14.09
Beaver	T16N R2E	22,553.4	35.24	140	4.53	13.6	0.00	27.04
Chalkyitsik	T23N R19E	22,837.79	35.68	145	2.18	0.53	0.00	90.86
Chalkyitsik	T23N R17E	22,446.04	35.07	191	6.71	35.19	0.00	14.92
Total		**174,447**	**272.57**	**1,395**	**33.69**	**109.49**		

**Total area is the total GIS-calculated acreage of each land parcel.*

and sedges. Creeks and sloughs may be forested up to the edge and/or fringed with willow and alders. Sloughs contain emergent vegetation such as cattail (*Typha latifolia*), bulrush (*Scirpus* spp.), mare's tail (*Hippuris vulgaris*) and sedges. Alkaline meadows may occur in this region.

The Porcupine River is the dominant feature near the Chalkyitsik lands. The river has large riparian zones with numerous interconnecting lakes and sloughs. Gravel bars are widespread and include common wormwood (*Artemesia tilesii*), red-osier dogwood, willow (*Salix alaxensis*), Jacob's ladder (*Polemonium* sp.), river beauty (*Epilobium latifolium*), common plantain (*Plantago major*), *Oxytropis* spp., wild sweet pea (*Hedysarum mackenzii*), *Polygonum* sp., and silverberry (*Elaeagnus commutata*). Stands of white spruce, birch, and balsam poplar are located adjacent to the riparian zones. Lakes in the area have wide margins that include herbaceous vegetation and willow shrubs.

4. Fish and Wildlife

The U.S. will acquire lands with diverse fishery habitats. Nineteen fish species have been documented in the Refuge.

a. Fish. The Yukon Flats basin (including the exchange lands) has a variety of fish habitats, including upland areas drained by first and second order headwater streams; lowland areas with marshes, lakes, and connecting streams; lands encompassing tributary rivers; and lands adjacent to the Yukon River mainstem and sloughs. Different fish species occupy these different habitat types, and some habitats are only used at particular seasons of the year. Nineteen fish species have been documented in Refuge waters (Table 5). Arctic grayling, Dolly Varden, round whitefish, and slimy sculpin occur in the upland areas drained by certain headwater streams.

Table 5. Fish documented in the Yukon Flats basin.

Family and Scientific Name	Common Name
Petromyzontidae	
Lampetra japonica	Arctic lamprey
Salmonidae	
Stenodus leucichthys	inconnu (sheefish)
Coregonus sardinella	least cisco
Coregonus laurettae	Bering cisco
Prosopium cylindraceum	round whitefish
Coregonus nasus	broad whitefish
Coregnus pidschian	humpback whitefish
Salvelinus malma	Dolly Varden
Oncorhynchus tshawytscha	Chinook salmon
Oncorhynchus keta	chum salmon
Oncorhynchus kisutch	coho salmon
Thymallus arcticus	Arctic grayling
Umbridae	
Dallia pectoralis	Alaska blackfish
Esocidae	
Esox lucius	northern pike
Cyprinidae	
Couesius plumbeus	lake chub
Catostomidae	
Catostomus catostomus	longnose sucker
Percopsidae	
Percopsis omiscomaycus	trout-perch
Gadidae	
Lota lota	burbot
Cottidae	
Cottus cognatus	slimy sculpin

Arctic grayling, Dolly Varden, and round whitefish move into small streams to feed during the summer months and retreat to larger streams or rivers for overwintering. Slimy sculpin are found in small streams, but it is unknown whether they migrate to larger waterways for overwintering or remain in small streams. Juvenile coho and Chinook salmon use small stream habitats for rearing in some areas and may be present in these habitats in the Refuge as well. Adults or juveniles of other species such as longnose sucker, lake chub, northern pike, burbot, trout perch, Alaska blackfish, or Arctic lamprey would be expected in these habitats at various times of the year.

Northern pike, burbot, Alaska blackfish, humpback whitefish, broad whitefish, least cisco, longnose sucker, and lake chub would be expected in lowland areas with marshes, lakes, and connecting streams. Alaska blackfish prefer these habitats and can be found there at all times of the year. Humpback whitefish, broad whitefish, and least cisco move into these lowland habitats from

open waterways through connecting streams, to feed in the early summer, and leave them by late summer. Northern pike spawn in these habitats in the spring, and then feed on other fish through the summer. They migrate to open waterways for overwintering. Burbot are occasionally found feeding on other fish in these lowland habitats. Lake chub and longnose sucker also are present at times in these habitats. Few fish of any species except Alaska blackfish would be expected to remain in these lowland habitats during the winter season.

Nearly all fish species that occur in the Refuge use tributary rivers for migration, feeding, spawning, and/or overwintering.

Tributary rivers are used as migration corridors, feeding habitat, spawning habitat, and/or overwintering habitat by nearly all species of fish found in the Refuge. Spawning adult Chinook and chum salmon have been documented in all of the major tributary drainages in the Yukon Flats. Juvenile Chinook salmon remain in flowing freshwater habitats for two years in the Yukon drainage before migrating to sea. They have been found in the tributary rivers of the Refuge anytime appropriate sampling techniques were used. Longnose suckers migrate into tributary rivers in early summer. The life history of longnose suckers is not well understood. They are known to spawn in early summer and thought to enter tributary rivers to spawn and feed. Slimy sculpins are omnipresent. Lake chubs are found in backwaters and connected waterways in the lower reaches of tributary rivers. Northern pike and burbot are common in the lower reaches of tributary rivers, and are present but less common in the upper reaches. Anadromous Arctic lamprey are thought to spawn in the tributary rivers, as their ammocetes, the juveniles, are present in areas of sandy substrate. Trout perch have been documented in tributary rivers of the Refuge, but virtually nothing is known of their life history. Arctic grayling and Dolly Varden feed and spawn in tributary rivers. Some individuals may remain in a particular tributary river throughout their lives, while others may migrate to the Yukon River for overwintering. Inconnu (sheefish), least cisco, broad whitefish, humpback whitefish, and round whitefish use tributary rivers for feeding, some remaining in the lower reaches, other migrating farther upstream. Least cisco spawning has been documented in tributary rivers. Round whitefish may use tributary rivers for spawning as well. There is a constant flow of fish of many species, both adult and juvenile, into and out of tributary rivers in the Yukon Flats.

The Yukon River mainstem is a major migration corridor for many fish species.

The Yukon River mainstem and slough habitats are major migration corridors for nearly all species of fish found in the Refuge. In addition, they serve as spawning and overwintering habitats for many species, and feeding habitats for some species. Many thousands of adult Chinook, chum, and coho salmon migrate upstream through the Yukon Flats each year. Some move into tributary rivers to spawn, but a large majority pass through the Yukon Flats on their way to spawning areas farther upstream. While adult salmon migrate upstream to spawn, a much larger number of juveniles migrate downstream to feed in the ocean. Anadromous populations of inconnu (sheefish), Bering cisco, humpback whitefish, and broad whitefish migrate into the upper reaches of the Yukon Flats to spawn in Yukon River mainstem habitat each fall and early winter. These species survive spawning and many overwinter in mainstem habitats after spawning. Juveniles of these species get swept to downstream feeding habitats when they hatch the following spring. Returning anadromous Arctic lamprey migrate under the ice to their upstream spawning

destinations each winter, and juveniles migrate downstream to sea after growing for several years. Northern pike overwinter in the Yukon River mainstem. Burbot feed readily in mainstem habitats. They spawn under the ice in large river systems in mid-winter, and probably behave similarly in mainstem habitats in the Yukon Flats. Many of the other fish species present in the Refuge are found at times in mainstem habitats, but their life history connections with these habitats are not fully understood.

The U.S. will acquire lands important to nesting swans.

Birds. Diverse and abundant wetlands provide significant nesting habitats for a variety of waterbirds, including pacific loons, red-necked and horned grebes *(Podiceps auritus)*, trumpeter swans *(Cygnus buccinator)*, lesser scaup, canvasbacks (*Aythya valisineria)*, white-winged scoters, American wigeons, northern pintails *(Anas acuta)*, mallards, and green-winged teals *(Anas crecca)*. Since 1975, swan nesting densities have been increasing annually across the Yukon Flats wetland basin (Conant et al. 2000). The 2000 survey estimated 0.02 swans per square mile across the entire Yukon Flats basin. Lands north of Stevens Village, southeast of the village of Beaver, and northwest of Circle include quality nesting habitats with mean densities of 0.12 swans per square mile (Table 4).

In general, the lands we will acquire support greater waterfowl densities than the lands we will transfer to Doyon.

Systematic aerial surveys conducted in 1991 and 1992 characterized waterfowl densities across the entire Yukon Flats wetland basin (Platte and Butler 1992). The mean density for the basin was 18 birds per square mile; densities ranged from 0 to 146 (Map 8). On the lands to be acquired by the U.S., the mean density was 41 birds per square mile.

These surveys indicate waterfowl densities are generally greater on lands the U.S. will acquire than on lands the U.S. will transfer to Doyon (Map 8). However, there are important waterfowl nesting habitats throughout the Yukon Flats.

Aerial waterfowl monitoring surveys conducted in 2003 estimated breeding densities of white-winged scoters and scaup at 4.2 and 6.1 per square mile across Yukon Flats wetlands, including lands to be acquired by the U.S. (Mallek and Lysne 2003).

U.S. Fish & Wildlife Service

The exchange lands near Chalkyitsik provide quality lynx habitat. This area is among the most productive lynx habitat in Alaska.

Mammals. Lands to be acquired by the U.S. provide habitat for a variety of mammals including moose, grizzly bear, black bear, wolf, beaver (*Castor canadensis*), lynx (*Lynx canadensis*), and marten. Standardized moose surveys have been conducted annually since 1999 over many of the lands to be acquired by the U.S. (Bertram 1999-2004, ADFG and CATG 1999-2004). Moose densities are low throughout the Yukon Flats region. Riparian corridors on these parcels provide quality early winter habitat. Predators including bears and wolves are found throughout all lands to be acquired by the U.S.. Density estimates are reported in Section V.A.4.

The abundant lakes and streams on the land to be acquired by the U.S. provide good beaver and muskrat habitat. From 1982 to 2002, the Service conducted beaver cache surveys adjacent to lands north of Stevens Village and southeast of Beaver. From these surveys, we estimated 10 to 50% of available lakes had active beaver lodges (USFWS 2002). Lands north of Chalkyitsik include some of the most consistent, quality lynx producing areas in Alaska (USFWS 1987).

American wigeon

Dave Menke

Green-winged teal

The U.S. will acquire wetlands important to nesting waterfowl.

Canvasback

Gary Kramer

Lee Karney

Lesser scaup

5. Public Use and Access

Public use information on these lands is limited. However, communications with local residents and Refuge staff observations indicate that village residents access some of these areas for various purposes. No road accesses these lands; however, most can be reached by snowmachine in winter. Airplanes can access large lakes or long, straight gravel bars along major rivers.

Doyon does not allow non-shareholder access or use without a permit, which limits public use. Doyon has issued two 2.5-acre non-commercial cabin site leases in one of the areas the Service would acquire (Township 23 North, Range 17 East, Map 13). The Service would acquire this township subject to these third-party interests.

6. Subsistence

Lands to be acquired by the U.S. under Phase I of the exchange include all or parts of nine townships: three north of Stevens Village; three south of Beaver; one west of Birch Creek; and two north of Chalkyitsik.

Lands to be acquired by the U.S. are used for subsistence purposes.

Stevens Village. The exchange lands are within the traditional use area of Stevens Village, particularly for moose and waterfowl hunting, furbearer trapping, and non-salmon species fishing. About 38% of the households in Stevens Village reported harvesting moose in the 2002/03 season, and 55% reported using moose (CATG 2003). About 54% of Stevens Village households reported harvesting waterfowl and about 92% of households reported using them (Andersen and Jennings 2001). About 80% of Stevens Village households reported harvesting freshwater fish species (non-salmon), and 70% of the households had at least one member that trapped furbearers (Sumida 1988). For the 2002 fishing season, 11 households reported fishing for salmon (Brase and Hamner 2003).

Beaver. The exchange lands contain portions of Beaver Creek and numerous lakes and sloughs, south and west of Mud Lakes and east of Twin Lakes. These townships are within an area heavily used by Beaver residents for moose and bear hunting, furbearer trapping, and fishing (non-salmon species), with opportunistic waterfowl hunting in conjunction with other activities. About 88% of Beaver households harvest moose and/or bear, and about 93% reported using moose and/or bear (CATG 2003). About 46% of the households hunt waterfowl and 89% reported using them (Andersen and Jennings 2001). About 62% of Beaver households participated in furbearer trapping, and about 65% harvested non-salmon fish species (Sumida 1989). A total of 11 households reported fishing for salmon during the 2002 fishing season (Brase and Hamner 2003).

Birch Creek. The township west of Birch Creek contains portions of both Beaver and lower mouth Birch Creeks, plus numerous lakes and sloughs. This area is downstream of the village and within an area used extensively for hunting, particularly moose, bear, waterfowl, and muskrat, furbearer trapping, and fishing. Harvest reports indicate that 100% of Birch Creek households hunt and use moose and/or bear (CATG 2003), and 83% hunt and harvest waterfowl (Andersen and Jennings 2001). No data are available

on the number of Birch Creek households that trap furbearers or harvest non-salmon fish species. For the 2002 fishing season, three households reported fishing for salmon (Brase and Hamner 2003).

Chalkyitsik. Of the two townships north of Chalkyitsik, one contains portions of the Porcupine River with some interconnecting lakes and sloughs, and the other contains numerous lakes and sloughs. These two townships are within the traditional use area of Chalkyitsik residents, particularly for hunting moose, bear, caribou, and waterfowl along the Porcupine River corridor. Traplines also extend along the Porcupine River corridor, and some fishing for non-salmon species occurs in the area. No specific harvest data are available for Chalkyitsik, other than waterfowl. About 41% of the Chalkyitsik households reported harvesting and 100% reported using waterfowl (Andersen and Jennings 2001). For the 2002 fishing season, six households reported fishing for salmon (Brase and Hamner 2003).

Fort Yukon. The township north of Chalkyitsik, containing part of the Porcupine River, is within the traditional use area of Fort Yukon residents. Traditional uses include moose and caribou hunting, and furbearer trapping. Waterfowl may be harvested in conjunction with hunting other species in the area. Harvest reports indicate that about 80% of Fort Yukon households hunted moose and/or bear and 89% used them (CATG 2003). About 51% reported hunting waterfowl and 77% reported using them (Andersen and Jennings 2001). About 20% of the households reported trapping furbearers, and about 13% reported hunting caribou. About 73% reported using caribou (Sumida and Andersen 1990). A total of 36 households reported fishing for salmon during the 2002 fishing season (Brase and Hamner 2003).

7. Fire Management

Under the terms of the Agreement, the U.S. would receive title to lands in four principal areas, each having different fire histories and management strategies. Each area is addressed separately below.

Stevens Village. The three townships to be acquired northwest of Stevens Village are dominated by a mixed lowland deciduous/white spruce habitat type, bordering hilly, upland black spruce terrain. The area surrounding the village is in "Modified" protection status, largely at the request of the local community. However, two partial townships to the northwest of the village are afforded "Limited" suppression. In normal fire years, wildland fires are suppressed until approximately July 10th, after which fires are monitored. However, in very dry years, fire suppression activities may be extended. During the hot, dry summer of 2004, repeated lightning strikes ignited portions of the hilly area between the Dalton Highway and Stevens Village, which burned actively throughout the summer. To protect structures along the Dalton Highway, fire suppression activities continued all summer. After acquisition by the U.S., the townships surrounding Stevens Village will likely remain in "Modified" status because of fire history, proclivity to lightning strikes, and proximity to the community and the Dalton Highway. The Service will work with Stevens Village to assess the risk of future fires and risk-reduction opportunities.

Under Service management, lands near Beaver, Birch Creek and Chalkyitsik would likely receive "Limited" fire protection.

The Service will manage for the natural fire regime, whenever possible.

Beaver. Lowland, riparian white spruce is the dominant vegetation type in the three townships to be acquired south of the village of Beaver. Occasional balsam poplar stands and various other deciduous shrub stages, bordering small lakes, also occur in the area. Part of this area receives "Modified" protection, and part receives "Full" protection. There is no evidence of extensive fire history, although very tall white spruces in the area are subject to occasional lightning strikes and resulting small fires. Several small lightning-caused fires were suppressed by initial attack in 2004, in accordance with the "Full" protection status. If acquired by the U.S., the dominance of a fire-resistant fuel type and apparent lack of fire history would likely justify placing this area in "Limited" fire suppression status, provided the risk to the village is manageable.

Birch Creek. Until the summer of 2004, the single township to be acquired west of the village of Birch Creek was dominated by an extensive stand of mature, lowland white spruce with a senescent aspen understory. In 2004, a large fire escaped suppression efforts. The lightning-ignited fire burned a total of 70,000 acres throughout July, August, and into September. This white spruce stand-replacement fire, known as the Lower Mouth Fire, was located south of the Yukon River and northwest of Birch Creek. The fire burned most of the township. The area had not burned since at least the early 1940s. A sixty-year fire interval is quite short for a white spruce stand replacement fire, which would normally have a return interval of approximately 150± years. Because of minimal fire threat to the community, the Service would probably place this area in "Limited" status to promote natural ecological processes.

Chalkyitsik. The two townships to be acquired north of the village of Chalkyitsik have an active fire history. A mosaic of burns in the area date from 1950, 1969, and 1988. The primary fuel type is black spruce, but fire-driven successional deciduous stages of birch, alders, and willows predominate, interspersed with extensive boggy wetlands. In this area, lightning tends to repeatedly strike the same isolated low hills or knobs, forested with black spruce and birch, and ignites dead and downed fuels. This area currently receives "Full" protection status, largely at the request of the village of Chalkyitsik. Because the fire risk to the community of Chalkyitsik is manageable, the Service would likely place these lands in "Limited" suppression status to promote natural ecological processes.

C. Doyon ANCSA 12(b) Reallocations

There are about 420,000 acres of ANCSA 12(b) selections in the Refuge; however most (363,252 acres) are overselections that will eventually be rejected or relinquished. Doyon plans to reallocate the remaining 56,517 acres of their 12(b) entitlement to Yukon Flats villages. If the exchange takes place, Doyon has committed to allocating these entitlements outside of the Refuge. Otherwise, most of the entitlement would likely be taken inside the Refuge. We do not know exactly which 12(b) selections would be conveyed to the villages, and which would be relinquished. However, much of the entitlement would likely be taken in the townships south of Beaver because these townships appear to have higher potential for oil and/or gas development (Mery, pers. comm. 2004).

1. Topography, Geology and Soils

The 12(b) selections are primarily in the Yukon Flats lowlands near the villages of Stevens Village, Beaver, Fort Yukon, Circle and Chalkyitsik (Map 2). The Service will likely retain some upland habitats north of Beaver near Twenty-one Mile Ridge and northwest of Chalkyitsik on Frozen Calf Mountain. Topography, geology and soils, previously described in Section V.B.1, apply to these lands, except that elevations approach 1,500 feet. Drainages within these lands include the Dall, Sucker, Porcupine, Sheenjek and Yukon Rivers and Beaver, Squirrel, and Fishhook Creeks.

Tiinkduhl Lake is unique to the area. Its shoreline, and an island, are comprised of rock.

A unique landform occurs southeast of Chalkyitsik at Tiinkduhl Lake. Tiinkduhl Lake is volcanic in origin; the shoreline and an island are comprised of rock. Although not indicated on Map 3, the Service and Doyon are discussing alternatives for the consolidation exchange that would transfer this area to the United States.

2. Water Resources

The 12(b) selected lands contain 1,705 lakes, or 2.6 lakes per square mile (Table 6). Water comprises 7% of the landscape. Approximately 128 linear miles of creeks and rivers flow through these lands, primarily Beaver Creek and Grass, Sucker, and Porcupine Rivers. Water resource descriptions in Section V.B.2 apply to these lands.

3. Vegetation

Upland vegetation consists of black spruce stands on north facing slopes, and willow and shrub birch in drainages. Lowland vegetation is described in Section V.B.3.

4. Fish and Wildlife

a. Fish. Fish resources in these lands are described in Section V.B.4.a.

b. Birds. Waterbird species composition on these lands is described in Section V.B.4.b. Numbers of swans observed on these lands are low to medium, with a mean density of 0.04 swans per square

Table 6. Summary of abiotic and biotic resources on 12(b) selections[1] that will remain in public ownership.

Village Association	Location	Total Area[2] (acres)	Total Area (mi^2)	Number of Lakes	Lake Area (mi^2)	River Length (Miles)	2000 Swan Density (mi^2)	1991-92 Duck Density (mi^2)
Stevens	T16N R9W	15,156.63	23.68	137	0.75	0.00	0.00	27.27
	T15N R8W	9,405.54	14.70	85	2.11	0.00	0.04	43.51
Beaver	T20N R1W	22,762.30	35.57	37	0.86	0.00	0.00	21.91
	T20N R1E	22,762.00	35.57	18	0.27	0.00	0.00	0.00
	T19N R2E	15,193.77	23.74	44	0.86	0.00	0.00	36.26
	T16N R1W	15,120.41	23.63	103	4.07	13.98	0.08	29.71
	T16N R1E	22,200.86	34.69	91	5.92	28.00	0.00	12.07
	T16N R3E	22,767.51	35.57	144	5.83	12.30	0.06	26.13
	T17N R4E	15,999.61	25.00	164	1.67	0.00	0.00	29.71
Fort Yukon	T20N R13E	11,475.04	17.93	41	0.59	10.16	0.00	9.30
	T19N R14E	22,836.05	35.68	53	0.25	3.39	0.00	15.41
Circle	T14N R17E	11,519.80	18.00	9	0.05	0.00	0.00	6.53
	T13N R16E	5,760.03	9.00	12	0.02	0.00	0.00	22.84
Chalkyitsik	T23N R16E	22,488.04	35.14	122	4.22	25.03	0.03	10.98
	T23N R18E	22,455.67	35.09	203	5.51	13.09	0.00	20.75
	T23N R20E	22,837.81	35.68	74	0.96	0.00	0.00	40.61
	T22N R19E	9,905.42	15.48	80	4.25	0.00	0.00	31.16
	T22N R21E	22,918.64	35.81	4	0.14	0.00	0.00	0.00
	T21N R20E	15,331.92	23.96	39	0.63	0.00	0.00	10.33
	T20N R21E	22,743.39	35.54	30	3.67	0.00	0.03	3.68
	T19N R20E	22,841.43	35.69	19	0.37	0.00	0.00	16.08
	T19N R18E	2,2524.71	35.19	174	1.91	19.49	0.03	33.75
	T20N R17E	22,762.35	35.57	22	0.50	2.49	0.00	10.90
Total		**419,768.93**	**655.91**	**1,705**	**45.41**	**127.93**		

[1] *The exchange would release 419,789 acres of Refuge land from 12(b) selection encumbrances. Doyon has 56,517 acres of 12(b) entitlements to reallocate to Yukon Flats villages; 12(b) lands are "overselected" by 363,252 acres. Section 906(o)(2) of ANILCA requires these lands be managed as Refuge lands until conveyed.*

[2] *Acreages are GIS-calculated estimates of each parcel.*

mile. Nesting swans were observed on one-third of ANCSA 12(b) selected lands (Table 6, Map 9). The mean waterfowl densities on these lands is 20 birds per square mile (Table 6, Map 8).

c. Mammals. ANCSA 12(b) selected lands provide habitat for a variety of mammals including moose, grizzly bear, black bear, wolf, beaver, lynx and marten. Moose habitats and furbearer resources are comparable to those discussed in Section V.B.4.c. Moose have

been consistently observed in parcels south and east of Beaver in the Beaver Creek and Mud Lakes region and along the Porcupine and Black Rivers, north of Chalkyitsik. Density estimates for predators, presented in Section V.A.4.c., apply to these lands.

5. Public Use and Access

Public use information on these 12(b) selected lands is limited. However, personal communications with local residents and Refuge staff observations indicate these areas are used by local residents.

The Service's regional policy on the "interim management of Native and State selected land" (USFWS 1989) may be a factor limiting public use. The policy states the Service will not issue Refuge special use permits on selected lands without seeking the views of the concerned Native corporation. There are currently two big-game guide permits issued for Refuge lands. These permits do not authorize guides to use Native-selected lands. If the selections are relinquished, these areas will be open to the general public, including big-game guides.

There is no road access to these areas; however, many can be reached in the winter by snowmachine or by airplanes equipped with skis. In summer, airplanes can access large lakes or long, straight gravel bars along major rivers. Occasionally, private individuals using float-equipped airplanes land on large lakes in pursuit of northern pike. Other types of public use include floating and camping along navigable rivers, and an occasional scientific research project.

6. Subsistence

Lands selected under ANCSA 12(b) include all or parts of 23 townships: two townships northwest of Stevens Village; three north and four south of Beaver; two east-southeast of Fort Yukon; five north, one east, and four south of Chalkyitsik; and two north of Circle. Section 906(o)(2) of ANILCA requires these lands be managed as Refuge lands until conveyed.

Stevens Village. The 12(b) lands are within the traditional use area for the village. Stevens Village will eventually take title to the Dall River corridor; the remainder will remain Refuge land. The Dall River corridor and surrounding lakes and sloughs are heavily used for moose and waterfowl hunting, access to caribou, furbearer trapping, and non-salmon species fishing. Section V.B.6 above outlines hunting, non-salmon species fishing, and furbearer trapping statistics for Stevens Village residents.

Beaver. The 12(b) lands north of Beaver contain some wetland areas, but have more upland areas than adjoining townships to the south. Beaver residents use these northern townships for moose hunting and furbearer trapping. The 12(b) lands south of the Yukon River contain considerable wetland habitat. Beaver Creek, including its mouth at the Yukon River, flows through three of the townships. Numerous lakes and sloughs, including Twin Lakes, are within these townships. The fourth township, lying farthest east, also contains numerous lakes and sloughs, including the Mud Lakes area. Beaver Village will take title to the land immediately surrounding Mud

Lakes. This area is heavily used by Beaver residents for moose and bear hunting, furbearer trapping, non-salmon species fishing, and some waterfowl hunting in conjunction with other activities. Section V.B.6 above outlines hunting, non-salmon species fishing, and furbearer trapping statistics for Beaver residents.

Fort Yukon. Of the two townships southeast of Fort Yukon, the Little Black River flows through one, and the other contains wetland areas associated with the Little Black River. These townships are within the area traditionally used by Fort Yukon residents for moose and waterfowl hunting, furbearer trapping, and non-salmon species fishing. The Porcupine River flows through the two townships north of Chalkyitsik, which are also within the traditional use area of Fort Yukon residents. Uses include moose and caribou hunting, furbearer trapping, some waterfowl hunting, and non-salmon species fishing in conjunction with caribou hunting. Section V.B.6 above outlines hunting, non-salmon species fishing, and furbearer trapping statistics for Fort Yukon residents.

Chalkyitsik. Of the five townships north of Chalkyitsik, the Porcupine River flows through two, one contains lakes and sloughs associated with the Porcupine, one (the easternmost) is more upland, and the Black River flows through one immediately north of the village, continuing through the township east of the village. Chalkyitsik will take title to the Black River corridor through the latter two townships. All of these townships are within the traditional use area of Chalkyitsik residents; however, the township with the most upland habitat appears to be a lesser used area. In the remaining townships to the north, village residents hunt moose, bear, caribou, and waterfowl, as well as hunt and trap furbearers and small mammals, and fish for non-salmon species. The township to the east is important for moose and bear hunting and furbearer trapping. The area to the south is important for hunting moose, bear, and waterfowl, trapping furbearers, and fishing. Section V.B.6 above presents additional use statistics for Chalkyitsik residents.

Circle. Portions of two townships, one on either side of the Yukon River will remain in Federal ownership. Village selections along the Yukon River corridor will eventually be conveyed to the village corporation. The upper reaches of Birch Creek flow through the township on the south side of the Yukon River. The upper Birch Creek-Preacher Creek area is within the traditional use area of Circle residents. Moose, bear, and waterfowl hunting and furbearer trapping could occur in this area. Salmon and non-salmon fishing could occur along rivers. A total of 11 households reported fishing for salmon during 2002 (Brase and Hamner 2003). About 96% of Circle households harvest moose and/or bear, with nearly 100% reporting using moose and/or bear (CATG 2003). About 35% of the households hunt waterfowl and 75% reported using waterfowl (Andersen and Jennings 2001).

7. Fire Management

The fire management and fire history of each of the 12(b) selected lands are discussed below.

After the exchange, current fire management strategies will likely remain unchanged on selected 12(b) lands near Stevens Village, Beaver, and Fort Yukon.

Stevens Village. Selected 12(b) lands near Stevens Village consist of portions of two townships located along the Dall River, northwest of the village. These two townships contain lowland riparian habitats along the Dall River and nearby sloughs. If the exchange proceeds, the river corridor will eventually be conveyed to Stevens Village, but the surrounding lowland habitats, containing many small lakes, will remain in Federal ownership. Vegetation types in these two townships are lowland riparian white spruce, balsam poplar, white birch, alders, and willows surrounding the lakes. Except in extreme circumstances, this productive lowland vegetation community is not conducive to wildland fire. The area has been placed in a "Modified" suppression category. However, the northernmost township is adjacent to fire-driven black spruce uplands with an active contemporary fire history. In 2004, the Dall City Fire, ignited by lightning, burned over 400,000 acres of extensive black spruce stands on hills north and west of Stevens Village, before crossing the Dalton Highway. The Yukon Crossing Complex fire also burned west of Stevens Village in 2004 and threatened structures along the Dalton Highway north of the Yukon River Bridge. These two townships will probably remain in "Modified" protection status, given their proximity to the village and relative lack of fire history in the lowland vegetation type, although recent fire history in the adjacent black spruce areas has been quite active.

Beaver. Selected 12(b) lands north and south of Beaver consist of four entire townships, and portions of three additional townships. Large fires in 1988 burned an extensive upland area that lies to the south of these 12(b) selections. These lands are in a "Full" fire suppression category and would likely remain in this category after the exchange. For additional information on fire management in the Beaver area, see the discussion in Section V.B.7.

Fort Yukon. Selected 12(b) lands southeast of Fort Yukon consist of one entire township and most of a second township. The area has an active fire history. Fires burned portions of the area in 1953 and 1969. The area is currently in "Full" protection status. Most of the area lies within a mosaic of deciduous successional stages dominated by birch and emergent spruce. These successional stages surround wetlands, numerous small lakes, and bogs. Similar areas bordering the Yukon River to the south (townships not involved in the exchange), have not burned recently and are currently dominated by mature white spruce. These isolated tall white spruce are susceptible to lightning strikes. In time, these areas are likely to burn and return to earlier successional stages. After the exchange, these lands will likely remain in a "Full" fire suppression category because of their proximity to Fort Yukon. However, the current vegetation structure is not especially conducive to wildfire. The Service will work with Fort Yukon to assess the fire risk to the community and assess opportunities to reduce risk.

Circle. Selected 12(b) lands along the Yukon River, northwest of the village of Circle, consist of portions of two townships that are currently afforded "Full" fire protection. If the exchange proceeds, the river corridor will ultimately be conveyed to Circle, but the adjacent lands will remain in Federal ownership. Lowland areas are dominated by mature white spruce and an associated deciduous understory. In areas eroded by the river, however, sediment

After the exchange, fire management levels may change on certain lands near Circle and Chalkyitsik.

deposits provide vigorous growing conditions for willows, alders, balsam poplars, birch and, eventually, the return of emergent young, white spruce. Both the mature lowland riparian white spruce and its wetter deciduous successional stages are fire-resistant in normal years. However, tall white spruce are subject to lightning strikes. Given the right conditions, lowland white spruce stands occasionally burn from lightning ignition. Drier forested areas, farther from the river, burn with a higher frequency (most recently in 1993). After the exchange, these lands would likely be placed in a "Limited" fire protection category. However, "Full" fire protection areas, surrounded by "Limited" protection areas, increase the management complexity. The Service will evaluate the fire management risks in this area before changing protection status.

Chalkyitsik. All, or portions of, ten townships form a checkerboard pattern of selected 12(b) lands surrounding the village-conveyed lands of Chalkyitsik. The fire history and fire management of these ten townships is similar to that of Fort Yukon, because the same large 1969 fire burned near both villages. All ten areas currently receive "Full" fire protection. After the exchange, the townships closest to Chalkyitsik would likely remain in "Full" protection. Townships farther from the village might be placed in "Modified" or "Limited" fire protection status, depending upon the risks to human safety and/or resource value.

D. Doyon and Refuge Lands Consolidation

1. Topography, Geology and Soils

The U.S. and Doyon will consolidate ownerships by pursuing additional land exchanges.

Consolidating land ownership around the villages will affect approximately 132,000 acres each of Doyon and Refuge land (264,000 acres total). These "consolidation lands" are located near the villages of Stevens Village and Chalkyitsik (Map 3). To consolidate ownerships in the Stevens Village area, the Service will exchange lowlands in the Dall River drainage and uplands along the southwest Refuge boundary, for uplands in the adjacent Rogers Creek drainage. Near Chalkyitsik, the Service will exchange: (1) lowlands adjacent to the Black and Grass Rivers; and (2) uplands adjacent to and including Tiinkdhul Lake (see Section V.C.1) and Frozen Calf Mountain, for: (1) lowlands near the Grass and Sucker Rivers; and (2) uplands adjacent to the Little Black River and Frozen Calf Mountain. Topography, geology and soils described in Section V.B.1 apply to these lands.

2. Water Resources

Doyon will receive lands with 234 lakes (1.1 lakes per square mile) and 2.5 linear miles of the Grass River; water is 4% of the landscape. The Service will receive lands containing 203 lakes (1.0 lakes per square mile) and 27 linear miles of the Grass and Sucker Rivers (Table 7); water is 2% of the landscape. Water resource descriptions from Section V.B.2 apply to these lands.

3. Vegetation

Lowland vegetation descriptions presented in Section V.B.3 applies to these lands. Associated upland vegetation is comprised of white spruce, birch, and aspen. Creek drainages are vegetated with willow, alder, and shrub birch.

4. Fish and Wildlife

a. Fish. Fish resources in these lands are previously described in Section V.B.4.a.

b. Birds. Waterbird species composition and density on the "consolidation lands" varies by location. Southeast of Stevens Village, the U.S. will acquire uplands that contain no significant wetland habitat. Lands acquired by Doyon in this area are primarily uplands, but also include wetlands supporting medium densities (0.04 birds per square mile) of swans (Table 7, Map 9), and medium to high densities (20 to 44 birds per square mile) of waterfowl (Table 7, Map 8).

Lowlands to be acquired by the U.S. in the Chalkyitsik Village area include medium densities of swans (0.02 birds per square mile) and low to high densities of waterfowl (15 to 39 birds per square mile). Doyon will acquire lowlands supporting medium densities of nesting swans (0.02 birds per square mile) and low to medium densities (4 to 31 birds per square mile) of waterfowl (Table 7, Maps 8 and 9).

Table 7. Summary of abiotic and biotic resources on consolidation lands.

Lands to be received by the United States

Village Association	Location	Total Area* (acres)	Total Area (mi^2)	Number of Lakes	Lake Area (mi^2)	River Length (Miles)	2000 Swan Density (mi^2)	1991-92 Duck Density (mi^2)
Stevens Village	T13N R5W	23,000.70	35.94	13	0.05	0.00	0.00	0.00
	T12N R6W	18,310.74	28.61	0	0.00	0.00	0.00	0.00
Chalkyitsik	T19N R17E	22,841.91	35.69	98	0.76	8.62	0.03	6.86
	T19N R19E	22,720.49	35.50	91	1.90	18.42	0.00	14.74
	T19N R21E	22,841.13	35.69	23	0.48	0.00	0.00	39.24
	T23N R21E	22,837.82	35.68	2	0.00	0.00	0.00	0.00
Total		132,552.79	207.11	227	3.19	27.04		

Lands to be received by Doyon

Village Association	Location	Total Area* (acres)	Total Area (mi^2)	Number of Lakes	Lake Area (mi^2)	River Length (Miles)	2000 Swan Density (mi^2)	1991-92 Duck Density (mi^2)
Stevens Village	T15N R8W	9,405.54	14.70	85	2.11	0.00	0.04	43.51
	T13N R8W	3,199.78	5.00	20	0.16	0.00	0.00	19.92
	T12N R9W	5,215.11	8.15	1	0.00	0.00	0.00	0.00
	T11N R9W	640.03	1.00	1	0.00	0.00	0.00	0.00
	T11N R8W	5,722.71	8.94	1	0.00	0.00	0.00	0.00
	T11N R7W	2,522.77	3.94	0	0.00	0.00	0.00	0.00
	T12N R7W	14,411.29	22.52	0	0.00	0.00	0.00	0.00
Chalkyitsik	T20N R17E	22,762.35	35.57	22	0.50	2.49	0.00	10.90
	T20N R21E	22,743.39	35.54	30	3.67	0.00	0.03	3.68
	T22N R21E	22,918.64	35.81	4	0.14	0.00	0.00	0.00
	T22N R19E	7,370.50	11.52	41	1.24	0.00	0.00	31.16
	T21N R20E	15,331.92	23.96	39	0.63	0.00	0.00	10.33
Total		132,224.03	206.65	244	8.45	2.49		

**Total area is the total GIS-calculated acreage of each land parcel.*

c. Mammals. Consolidation lands provide habitat for a variety of mammals including moose, grizzly bear, black bear, wolf, beaver, lynx and marten.

Moose habitats and furbearer resources are comparable to those discussed in Section V.B.4.c. Lands south of Chalkyitsik, both those to be acquired by the U.S. and by Doyon, include some tracts of moose habitat. Density estimates for predators in Section V.A.4.c apply to the "consolidation lands."

5. Public Use and Access

Information about public uses on these lands is limited. However, personal communications with local residents and observations by Refuge staff indicate some local use of these areas. Use by non-locals is probably very limited. Doyon does not currently allow non-shareholders to access or use their lands without a permit.

Access is limited to snowmachine, small airplanes, and river boats.

These areas have no road access; however, they may be reached in the winter by snowmachine. In winter, ski-equiped airplanes can land on frozen lakes or rivers and snow-covered flats. In summer, airplanes can access large lakes or long, straight gravel bars along major rivers. Occasionally, private individuals in float-equipped airplanes may land on large lakes to fish for northern pike. Other types of public use include floating and camping along rivers, and the occasional scientific research project.

6. Subsistence

Consolidating land ownership near the villages will involve all or part of 18 townships – some lands will be acquired by the U.S. and some will be acquired by Doyon. The townships involved include: nine around Stevens Village, and nine around Chalkyitsik.

Stevens Village. The U.S. will acquire two full townships in exchange for portions of seven townships around Stevens Village. All townships are within an area traditionally used by Stevens Village residents. The two townships to be acquired by the U.S. are along the Rogers Creek drainage, southwest of the village. Although these two townships are within the traditional moose hunting and furbearer trapping area, they are on the periphery and probably receive less use than areas closer to the village. Doyon will receive part of one township, encompassing a large part of the Dall River watershed, north of the village. This area is heavily used by Stevens Village residents for hunting, trapping, and fishing as discussed in Section V.C.6. The Yukon River flows through two of the townships south of Stevens Village, and the remaining townships to the south extend to the Refuge boundary and contain portions of Waldron and Rogers Creeks. The Yukon River corridor is heavily used for subsistence activities. The southernmost townships are within the traditional use area for moose and furbearers, but are probably less important than areas closer to the village. Section B.6 above outlines hunting, non-salmon species fishing, and furbearer trapping statistics for Stevens Village residents.

Chalkyitsik. The U.S. will acquire four full townships, one northeast, and three south of the village of Chalkyitsik. Doyon will acquire one township northeast of the village, a portion along the Black River

corridor north of the village, a township east of the village through which the Black River flows, a township southeast of the village containing part of Tiinkdhul Lake, and one township southwest of the village containing wetlands between the Black and Little Black Rivers. The two townships northeast of the village are within the traditional use area, but appear to receive less use because of their distance from the village and lack of river access. The areas that Doyon will receive along the Black River corridor and the township containing Tiinkdhul Lake are within moose and bear hunting areas, as are the two townships the U.S. will receive to the south and southwest of Chalkyitsik. The land south of Tiinkdhul Lake (to be acquired by the U.S.) has more upland habitats and appears to be a lesser-used area. The southwestern most sections (one each for the U.S. and Doyon) are within traditional harvest areas for waterfowl. See Section V.B.6 above for additional use data available for Chalkyitsik residents.

7. Fire Management

Refuge and Doyon lands to be exchanged during the Consolidation Exchange include three principal areas near the villages of Stevens Village and Chalkyitsik. The fire history and current fire management strategies for each area are discussed below.

Stevens Village. A partial township (northwest of Stevens Village) to be acquired by Doyon consists of lowland white spruce habitat surrounding many lakes and ponds bordering the Dall River. This lowland habitat, currently given "Full" fire protection status, has no recent fire history (see previous discussions of Stevens Village). Doyon would also acquire portions of four townships (south of Stevens Village) that are currently afforded "Full" protection status. These areas exclude the river corridor of the Yukon River, but include the elevated transitional habitats immediately adjacent to the village-conveyed riparian zones. There have been no recent fires in the area.

The U.S. would acquire two townships (southeast of Stevens Village) that are dominated by upland black spruce habitats, currently afforded "Modified" protection status. Portions of these townships burned in 1978, in the very large fires of 1988, and in 1991. These upland black spruce areas are highly flammable and are subject to recurring fires. If returned to Federal ownership, these areas will likely remain in "Modified" status because of their proximity to Stevens Village.

Chalkyitsik. Doyon would acquire three townships (east and southwest of Chalkyitsik) that currently receive "Full" fire protection. Two of the townships (east of the village) are dominated by upland black spruce and transitional habitats. The other (southwest of the village) is a lowland area of small lakes and ponds, bordering the riparian zone of the Grass River. In addition, Doyon would receive portions of two lowland townships (north and east of the village) along the Black River. These habitat types are similar to those described in previous Chalkyitsik exchange sections. Most of the area to the north and southwest of Chalkyitsik burned in a large fire in 1969 and now consists of a mosaic of successional stages.

The U.S. would acquire four townships (northeast and south of the village). Two townships located to the northeast and southeast of Chalkyitsik support upland black spruce habitats. The two townships to the south and southwest of the village are lowland habitats along the Grass River. All of these areas currently receive "Full" fire protection (see previous discussions of exchange lands in the vicinity of Chalkyitsik). Under Service control, the townships near the village are likely to remain in "Full" protection status because of the fire history in the vicinity of the village. However, lands in the outer periphery are likely to be placed in "Modified" protection. The Service will work with Chalkyitsik residents to determine if a buffer of "Modified" would provide adequate protection to reduce fire risk in the "Full" protection area, or if additional management actions are needed.

E. Proposed Public Use Easements

The U.S. will reserve a public use easement along 22.1 river miles of Beaver Creek. The easement, extending 0.5 mile on either side of Beaver Creek, will protect public access to and use of the river along that portion flowing through lands to be acquired by Doyon. The easement boundary (Map 13) was described along ¼ section lines to facilitate description, mapping, and location. All public uses that are allowed on the Refuge (such as hunting, fishing, camping, wildlife observation, and photography) will be allowed within this easement. These public uses will be governed by the same laws and regulations that apply to other Refuge lands.

There are currently two permitted cabins within this easement. If transferred to Doyon, the title to these lands would be subject to the pre-existing rights of the cabin permittees. Other public uses within the easement area that would require a Refuge permit will continue to be administered by the Service. However, the Service would issue no new permits for structures or surface disturbing activities on these lands.

The U.S. will reserve two linear public access easements (Map 13) across lands conveyed to Doyon. These easements will ensure legal access across conveyed land to public lands and waters. Public uses, such as recreation and hunting, will not be authorized on the easement or on the surrounding private lands.

F. Doyon Subsistence Use Easement

Doyon will retain an easement for subsistence uses, on all lands transferred to the Service.

Doyon will retain an access easement for subsistence purposes on all lands transferred to the U.S. in Phases I and II. All subsistence activities on these lands shall be in accordance with the Federal regulations implementing Title VIII of ANILCA. Title VIII of ANILCA provides that the non-wasteful subsistence use of fish, wildlife, or other renewable resources, shall be the priority consumptive use on Federal public lands when it is necessary to restrict the taking of these resources in order to assure the continued viability of fish, wildlife, or other renewable resource populations. This easement will ensure that local rural residents will always have access to these lands for lawful subsistence purposes.

The Service will enforce easement provisions. No difference will exist between the consumptive uses within this area and other Refuge lands. All laws and regulations that apply to other Refuge

lands will apply to these lands. However, if it becomes necessary to restrict general access to these lands, the easement would protect the access and subsistence rights of local residents.

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To protect public access and use along Beaver Creek, a public use easement will extend for 22.1 river miles along the river corridor.

VI. Potential Effects of Phase I

A. Management Implications/Potential Effects to Refuge Resources

1. Refuge Purposes and Biological Integrity

Refuge management is guided by the purposes for which the Refuge was established (as provided in ANILCA), the National Wildlife Refuge System mission, and other legal and policy guidance discussed in Section II — including the Service's Biological Integrity, Diversity, and Environmental Health Policy. This policy provides that the highest measure of biological integrity, diversity and environmental health is viewed as those intact and self-sustaining habitats and wildlife populations that existed during historic conditions. Biological integrity is evaluated by the extent the biological composition, structure, and function of an area has been altered from its historic conditions.

Exploration activties will heighten the need for resource monitoring on Service lands adjacent to, and downstream of, the parcel.

The proposed actions in Phase I affect management of the Refuge to varying degrees. Lands to be acquired by Doyon will likely be explored for oil and gas. Exploratory drilling will be confined to Doyon's lands; however, Doyon may request access to public lands to collect seismic data. Any seismic work on Refuge lands would require a Refuge special use permit and would be subject to a Refuge compatibility determination. Access to Doyon's lands through adjacent Refuge land is possible. However, activities on Doyon's lands may influence surrounding Refuge lands. For instance, water withdrawal or gravel extraction from Beaver Creek may affect downstream riparian habitats and anadromous and resident fish. Exploration activities on Doyon's lands will heighten the need for resource monitoring adjacent to and downstream of these activities. Increased monitoring will require an increase in Refuge resources or a reassignment of priorities, which may interfere with efforts to achieve Refuge purposes. Exploratory drilling on Doyon's lands may diminish their natural character and negatively affect environmental health; however, impacts to the biological integrity, diversity, and environmental health of Refuge lands are expected to be minimal.

Phase I acquisitions will increase the proportion of wetland habitats in the Refuge.

Consolidating land ownerships around villages will increase continuity of Refuge habitats. Large, contiguous blocks of intact habitats help ensure healthy populations.

Lands to be acquired by the U.S. in Phase I include a net gain of approximately 100,000 acres of habitats [includes 12(b) reallocations] or about 4% of the private lands currently within the Refuge. This acquisition will increase the proportion of wetland habitats in the Refuge and will increase the Service's ability to maintain the biological integrity, diversity, and environmental health of these lands over the long-term.

Exchanging scattered parcels of lands owned by the U.S. and Doyon (consolidation exchange) will increase the continuity of Refuge habitats, provide better defined management boundaries, and will improve the Service's ability to maintain the biological integrity, diversity, and environmental health of these lands.

2. Public Use and Access

Changes in land ownership would affect access and public use of all lands involved in the exchange. Doyon does not allow non-shareholders to use or access their lands without a permit. In contrast, Refuge lands are open to the public (with reasonable regulations to protect Refuge resources). Except for easements specified in the exchange agreement, all lands acquired by Doyon would be closed to use by non-shareholders.

The U.S. will reserve a public use easement, 0.5 mile wide on either side of Beaver Creek, to protect public use and river access after the surrounding lands are conveyed to Doyon. In addition, the U.S. may reserve two ANCSA 17(b) public access easements across Doyon lands to ensure legal access to Refuge lands. These easements would enable Refuge visitors to access public lands from either side of the conveyed Doyon lands, or from Beaver Creek (Map 13).

Overall, Phase I will increase opportunities for public use and access. The amount of public land within Refuge boundaries will increase by approximately 100,000 acres (156 square miles). All of these lands will be open to public use. Phase I will benefit public use and access by: (1) increasing the amount of Refuge lands; (2) reallocating Doyon's remaining 12(b) entitlement to an area outside the Refuge; (3) adding two additional 17(b) access easements; and (4) protecting access to Beaver Creek by reserving a public use easement within the parcel to be acquired by Doyon.

Both Doyon and the Service have issued permits for cabins on the lands to be exchanged in Phase I. Doyon has issued permits for two, 2.5 acre cabin sites along the Porcupine River in Township 23 N, Range 17 E. This township would be conveyed to the U.S., subject to these pre-existing rights. The Service has issued permits for two cabins along Beaver Creek. These cabins are within the proposed public-use easement. The Service would continue to manage these two existing cabins under applicable regulations for special use permits (Map 13).

Consolidating land ownership patterns around the villages could also affect Refuge access. The current "checkerboard" pattern has created islands of Refuge land, surrounded by Native corporation land. The consolidation process will likely result in no net gain, or loss, of public lands. However, opportunities for public use may improve due to fewer land ownership divisions.

3. Subsistence

Providing opportunities for continued subsistence uses by local rural residents is one of the purposes for which the Refuge was established by ANILCA. When the State of Alaska failed to recognize a rural priority for subsistence, the Federal government assumed subsistence management on Federal public lands. The Federal Subsistence Board, whose members include the

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If the exchange is completed, there will be more public land near village sites. Local residents would have a subsistence priority on these lands. However, there is the potential for increased conflicts between local subsistence users and non-local sport hunters/fishers.

Alaska directors of the U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, and the U.S. Forest Service, promulgates regulations governing subsistence harvest of fish and wildlife resources on Federal public lands. The land manager implements the Federal subsistence regulations at the conservation unit level. In contrast, lands owned by Doyon, Native villages, and Native allottees are private properties subject to State of Alaska hunting and fishing regulations.

Implementing Phase I of the land exchange will cause shifts in jurisdiction for subsistence management. Lands transferred to the U.S. from Doyon will be under Federal subsistence management, while lands transferred from the U.S. to Doyon will become private lands subject to State game and fish regulations. Hunting and fishing are allowed on national wildlife refuges in Alaska under State regulations, unless preempted by Federal regulations. The Federal Subsistence Board has the power to close Federal public lands to non-rural users. The Yukon Flats lies within Game Management Unit 25D, as defined by the ADFG. The Unit is subdivided into 25D East and West. The line between the two subunits is roughly Preacher Creek to Birch Creek and along the Lower Mouth of Birch Creek to the Yukon River, north along the Hadweenzic River to Forty-and-one-half Mile Creek, then west to the Refuge boundary. All lands acquired by Doyon and lands around Birch Creek, Beaver, and Stevens Village that will be acquired by the U.S. in Phase I are within Unit 25D West. The Federal Subsistence Board restricted moose hunting within Unit 25D West to residents of that unit only (essentially residents of Beaver, Birch Creek, and Stevens Village).

Lands owned by Doyon or village corporations are closed to non-shareholders. The general public does not have access to these lands without landowner permission. Clearing land for seismic lines likely would result in increased use of these new winter trails by Doyon shareholders. After the exchange, more land near villages will be under Federal jurisdiction than at present; these lands will be open to the general public. If allocating wildlife resources becomes necessary (as happened for moose in Unit 25D West), local residents would have priority on these public lands. However, because there will be more public land near villages, non-local hunters may begin to hunt in areas local residents have traditionally viewed as theirs. This creates a potential for increased user-group conflicts.

Oil/gas exploration could cause habitat degradation. The area is primarily thick boreal forest. Wildlife displacement and/or loss of fish habitat could adversely affect subsistence users. However, the parcel Doyon would acquire appears to be less important to subsistence users than areas closer to the villages. Loss of fish habitat, particularly salmon spawning habitat, could have far-reaching effects. The Alaska Board of Fisheries has listed Yukon River salmon (Chinook and chum) as stocks of concern. Losing spawning habitat for these species could further deplete populations.

4. Fire Management

Doyon Lands to be Acquired by the United States. In general, these lands are located at the periphery of large blocks of private lands surrounding five villages. They lie adjacent to the lowland riparian habitats surrounding the village sites and are dominated by habitat types that transition from lowlands to upland black spruce. These lands are generally assigned "Full" protection status ("Modified" near Stevens Village), whereas the lowland riparian areas surrounding village sites are either in "Critical" or "Full" fire protection status. If undisturbed by river action, well-drained, lowland riparian areas near the villages are typically dominated by white spruce stands that are resistant to wildfires and burn infrequently (generally, every 150 to 400 years).

If the exchange proceeds, fire protection levels likely will be reduced in some areas. White spruce/deciduous lowlands are unlikely to burn, but are currently afforded "Full" protection under Doyon's ownership. Fire management strategies in these areas would likely be reduced to "Modified" or "Limited" status under Service management. "Full" suppression status would likely be retained in areas closest to village sites.

U.S. Lands to be Acquired by Doyon. Doyon would receive uplands with an active fire history, representing a natural fire regime. These lands are dominated by black spruce and related successional stages. Because there are few structures in this area, these lands are currently afforded "Limited" fire suppression. In this "Limited" response zone, lightning-caused fires are monitored, but not suppressed. If these lands are developed, fire protection would likely increase from "Limited" to "Full" or "Critical" to protect oil field structures. This decision would be the responsibility of the new landowner, not the Service.

5. Service-recommended White-Crazy Mountains Wilderness Designation (1987)

Phase I would have an adverse effect on the wilderness aspects of the Service-recommended White-Crazy Mountains Wilderness Area. The recommended wilderness area totals about 658,000 acres. Under Phase I of the Agreement, Doyon will acquire 26,270 acres of this land. This will effectively split the potential wilderness area into two disjunct areas on either side of the Doyon-acquired lands. Active seismic work and visual evidence of this work would degrade the wilderness character of the area. The land exchange and seismic exploration may jeopardize the wilderness qualities of the area and the possibility of wilderness designation.

6. Beaver Creek Wild River

The River Management Plan for Beaver Creek National Wild River, dated December 1983, states that the Beaver Creek Wild River will be managed for the following long-term objectives. These are the "outstandingly remarkable" values and conditions that need to be protected and enhanced:

- preserve the river and its immediate environment in its natural, primitive condition;
- preserve the free-flowing condition of the waters;
- protect water quality and quantity;
- provide high quality primitive recreational opportunities for present and future generations;
- provide a variety of opportunities for interpretive, scientific, educational, and wildlands oriented uses;
- assure protection of significant historic and archaeological values; and
- maintain and improve fish and wildlife habitat.

The Beaver Creek Wild River experience would likely be diminished by the sights and sounds of oil and exploration.

The proposed land exchange area is immediately outside of the western boundary of the Beaver Creek Wild River. The corridor boundary generally extends for a half mile on either side of the creek's normal high-water mark. No development or access corridors would be permitted within the Wild River segment. However, development on adjacent lands could negatively impact the "outstandingly remarkable" values of the Beaver Creek National Wild River. Under the provisions of Section 10 (a) of the Wild & Scenic Rivers Act, the river must be managed to protect and enhance those values which led to its designation as a National Wild River.

Noise and visual impacts associated with oil and gas exploration could affect the natural, primitive experience for visitors to the Beaver Creek Wild River. Impacts would be greater if exploration occurs in the summer when river use is heaviest (early-June through mid-September).

Oil and gas exploration activities could affect the experience of visitors to both the Refuge and BLM-managed portions of the river. The severity of impacts would depend on the type and timing of oil and gas activities, as well as the siting of any associated infrastructure.

Impacts to water quality and quantity in Beaver Creek could result from oil and gas exploration activities. This in turn may adversely affect fish populations, including small, sensitive runs of Chinook and chum salmon, and a dense population of Arctic grayling. Chinook salmon, in particular, spawn within the Refuge portion of the Beaver Creek Wild River. These spawning beds could be vulnerable to decreased water quality and quantity resulting from oil and gas exploration.

B. Potential Effects to Doyon Lands

Potential effects associated with exploration will depend on the timing of exploration, the methodologies used, and the mitigation measures applied. It is impossible to predict with certainty the impacts that will result from exploration on Doyon's lands. However, in this section we describe impacts associated with oil and gas exploration in Alaska. It is important to note that exploration on Doyon's lands would be subject to applicable State and Federal

regulations and permits designed to minimize the adverse impacts associated with those activities. Although the Service does not have jurisdiction over development on Native Corporation lands, the Service does review certain permits and development plans and provides recommendations to State and other Federal agencies to mitigate impacts to fish and wildlife.

1. Exploration Methodologies

Ground-based seismic exploration would require clearing vegetation along the seismic lines.

Seismic exploration is the first phase of oil exploration in an area with unproven reserves. Seismic exploration is usually conducted in winter, using vibrating equipment or explosives and receivers (geophones) placed along a rectangular grid pattern. A mobile survey camp lays out the grid, collects the data with a seismic recording system, and moves the grid to the next location. The camp is usually moved with a caterpillar tractor or roller-tracked vehicle. Forested areas would require some vegetation clearing to transport the equipment. Seismic exploration can be two-dimensional (2-D) or three-dimensional (3-D). Line spacing is much closer in 3-D seismic operations.

Another method of collecting seismic data is a helicopter-supported survey. Helicopter-supported seismic does not require clearing vegetation along the seismic lines and is less invasive than land-based operations. This technique was permitted on the Refuge in the 1980s.

Winter exploratory drilling may require constructing ice airstrips or ice roads.

Exploratory drilling would most likely be conducted in winter to early spring. Winter exploration may require constructing an ice airstrip capable of handling cargo airplanes (C-130s) and ice or snow roads to access exploration areas. An alternate method for winter exploration would be to access the area with tracked vehicles from the Dalton Highway to the west or the Steese Highway to the south. This type of access would require permits from the appropriate land managers. These permits would specify mitigation requirements. Equipment and materials could also be flown into Birch Creek and delivered to exploration sites via tracked vehicles. During the winter, wells would likely be drilled from snow and ice pads with drilling materials and supplies stored on site. A temporary drilling camp to house personnel could also be established within the parcel on an ice and snow pad.

Summer exploration is more expensive than winter exploration and has more environmental impacts.

Summer exploratory drilling would likely require constructing gravel pads and roads, and developing a borrow source within the parcel. Summer exploratory drilling is unlikely due to the cost. Exploratory drilling during the summer from remote gravel pads, with no road access, may be possible if the rigs are small enough to be broken down and transported by helicopter.

2. Topography, Geology and Soils

Winter seismic exploration would probably result in minimal impacts to topography and soils. If explosives are used, soils would be disturbed around the drill hole. Soils also could be affected if snow cover is insufficient to provide protection from Caterpillar tractors or tracked vehicles. Air-supported seismic activities would result in the fewest impacts to soils.

Winter exploratory drilling would preclude the use of gravel; impacts to soils could be localized to an area immediately surrounding the well head. Drilling wastes (excess drilling mud and drill cuttings) produced during exploratory drilling could be re-injected down the hole, if the geologic formations in the area will allow re-injection (CPAI 2004, NRC 2003). Alternate storage methods include permanent reserve-pits adjacent to the well-head, temporary pits for the storage of muds and cuttings until transported off-site for disposal, or encapsulation of drilling wastes on site (S. Schmitz, ADNR, pers. comm. 2004). Encapsulation is a technique used on the Kenai Refuge, whereby drilling wastes are emptied into a lined pit, allowed to freeze, and then encased in cement. The capsule is then covered with soils and revegetated, forming a small mound. Permanent storage of drilling wastes in an open pit would require soils to be bermed and a permanent liner placed in the pit. Drilling wastes can be temporarily stored in ice and snow bermed storage cells located on the drill pad and transported off-site for disposal before breakup.

Impacts to soils from bank erosion also may occur at ice and snow road stream crossings if the ice and snow pack is not sufficient to protect the ground (Pullman et al. 2003). In addition, soils could be compressed if ice and snow roads are constructed before an adequate snow depth has accumulated. In interior Alaska, the ADNR requires a minimum snow depth of 12 inches before ice and snow roads can be constructed (B. Morris, ADNR, pers. comm. 2004).

Summer drilling from gravel pads, or using gravel during winter drilling, will affect the soils and topography of the area. Gravel pads and roads must be several feet thick to insulate the permafrost, generally four to five feet thick (CPAI 2004, NRC 2003). Gravel roads and pads may be removed and the area restored upon abandonment. However, even after restoration some gravel will remain in the surface soils. If gravel pads and roads are left in place, they will remain as part of the landscape for decades, eventually becoming vegetated ridges and mounds (Kidd et al. 2004, McKendrick 1997).

3. Water Resources

Seismic activity would result in minimal impacts to water resources. Water will be needed to support the camp associated with seismic activities.

Winter exploratory drilling requires large quantities of water for constructing ice roads and drill pads.

Exploratory drilling during the winter will require large amounts of water to construct roads and pads, and for rig and camp use. Ice roads in the interior of Alaska are constructed primarily of snow with a layer of ice on the surface. Depending upon the type of construction used for ice and snow roads in the parcel, 1,000,000 gallons per mile is likely the maximum amount of water required for snow and ice road construction. Drill pads constructed from ice and snow could vary in size, but are generally about 500 feet x 500 feet, and could require up to 1,700,000 gallons of water to construct (CPAI 2004). Ice pads supporting a drill rig are between 1-2 feet thick; storage pads are about 6 inches thick. Drilling and storage pads built with snow and ice likely will require less water.

Exploratory camps are typically designed to accommodate approximately 70 people. Water usage at the camps averages 5,000 gallons per day and water use at the rigs averages 20,000 gallons per day (CPAI 2004). Water sources likely will be identified near the camp sites and drill rigs within the parcel. Current ADNR regulations for interior Alaska water-use require that withdrawal not exceed 15% of the lake volume below 4 to 5 feet of ice in all fish-bearing lakes (B. Morris, ADNR, pers. comm. 2004). The required State temporary water use permit or permit to appropriate water would specify mitigation measures.

4. Vegetation

Impacts to vegetation as a result of seismic activity would depend on the type of seismic exploration. Land-based 3-D seismic, requiring the clearing of closely-spaced grid lines, would result in the most extensive impacts to vegetation, essentially setting back succession within forested areas. Unless the underlying soils were disturbed and the permafrost layer disturbed, the area would eventually become reforested. However, some seismic lines would likely be visible for decades. Five seismic lines cleared in the early 1970s, before the Refuge was established, are still obvious on the Yukon Flats. Helicopter-supported seismic activity would result in minimal impacts to vegetation. Impacts to vegetation associated with support camps would vary with the size and location of the camp.

A properly constructed snow and ice road should do minimal damage to the underlying vegetation.

Impacts to vegetation during exploratory drilling will vary with the methods, timing of drilling, and location of the drill site (McKendrick 2000). Should exploration occur during the winter from ice and snow roads and without the use of gravel, impacts to vegetation should be minimal. Studies of properly constructed ice roads indicate that overall damage to the tundra is usually slight (Pullman et al. 2003). Potential impacts include areas of crushed tussocks, scuffed tundra, clearing of forested areas, and crushed or broken branches of willows and other shrubs in riparian areas (McKendrick 2003). Some studies have found thaw depths under ice roads to exceed those in the adjacent tundra; however, long-term impacts such as thermokarsting have not been found. The ADNR recommends a minimum of 12 inches of snow cover before ice and snow roads are constructed in interior Alaska (B. Morris, ADNR, pers. comm. 2004).

Impacts to stands of spruce or shrub communities could be limited to the road corridor and pad site. The impact to these communities could be somewhat greater if an airstrip is constructed within the parcel during exploration. A temporary winter runway could be constructed on a lake, thereby minimizing long-term impacts to vegetation.

This discussion of potential impacts has assumed winter exploration with no gravel used for roads and pads. However, should gravel roads and pads be constructed, long-term impacts to the vegetative communities within the parcel can be expected. The location of the borrow source potentially would have the greatest impact to the vegetation within the parcel. If material is dredged from a river or stream, direct impacts to vegetation may be minimized. However, the riparian community along the river banks may be damaged at the point of access, leading to possible erosion and further

degradation of the bank downstream from the area of excavation. In addition, a haul road must be constructed from the borrow source, as well as pads to store overburden (non-riverine source) and equipment. Refer to Section VIII.B.4 for additional information on the impacts of a borrow source and gravel roads to vegetative communities within the parcel. State and Federal permits would likely be required and would stipulate mitigation measures.

5. Fish and Wildlife

Seismic blasting, gravel extraction, and water withdrawal for ice roads could impact fish populations.

Impacts to fish and wildlife resources in the area resulting from seismic activity would depend on the type and intensity of the activity. If seismic activities are conducted with explosives, fish could be exposed to rapid changes in ambient pressure. Current ADNR standards for blasting near or in fish-bearing waters require that the instantaneous change in pressure resulting from any explosion must remain below 0.02 megapascals (MPa) or 2.7 pounds per square inch (psi) (NRC 2003). Vibrators on 4-foot thick ice produced instantaneous pressure changes of 0.01 MPa (1.57 psi) in the water (NRC 2003). The ADNR would monitor the use of explosives for seismic activity near or on fish-bearing waterbodies (B. Morris, ADNR, pers. comm. 2004). A permit from ADNR would be required before seismic equipment could cross anadromous fish streams.

Seismic lines and increased human activies may influence large mammal migration patterns and habitat use.

The increased density of seismic lines associated with 3-D procedures and the attendant human activity may impact species such as moose or Dall sheep by preventing access to preferred winter habitat areas. In studies on woodland caribou, seismic-related disturbance influenced movement patterns and increased winter weight loss (Bradshaw et al. 1998, Dyer et al. 2001).

Potential impacts to fish resources within the parcel during exploration depend on timing and methods used. Winter exploration from ice and snow roads could potentially affect fish in water source lakes through water withdrawal. In the interior of Alaska, ADNR usually limits the amount of water withdrawn from fish-bearing lakes to a maximum of 15% of the lake volume under approximately 4 to 5 feet of ice (B. Morris, ADNR, pers. comm. 2004). Continual withdrawal from the same lakes from season to season will depend on the recharge rates of individual lakes. In addition, screens would be required on all intake hoses to prevent the entrapment of fish (CPAI 2004).

Water withdrawal for ice road construction could impact fish in some lakes.

Gravel extraction from Beaver Creek or its tributaries could have impacts on local fish populations, including salmon and grayling. Impacts could destroy feeding, overwintering, and spawning areas, as well as cause direct mortality. State and Federal permits would stipulate the timing and location of gravel extraction to reduce these impacts. Removing gravel from a stream supporting populations of anadromous fish would require a permit from ADNR and coordination with the National Marine Fisheries Service (NMFS). Placing gravel fill in wetlands or navigable waters may require a permit from the U.S. Army Corps of Engineers (COE). Gravel roads and pads also could affect fish by disrupting natural hydrology. Insufficiently-sized culverts or bridges at stream or wetland crossings could block fish passage, erode and scour stream channels,

Impacts to wildlife could be minimized by drilling in winter.

and/or drain or flood wetlands (Ott 1993). Additional information regarding the potential impacts of borrow sources and gravel pads and roads to fish resources can be found in Section VIII.B.5.

If exploratory drilling is conducted in winter, impacts to wildlife populations likely would be minimal. Most avian species are absent from the area during the winter and therefore would not be disturbed. Water withdrawal from lakes could affect water levels the following spring, if recharge during break-up is insufficient. This could result in loss of nesting habitat for loons and other waterbirds. Individual animals of several species, such as moose, black and grizzly bear, and wolf could be disturbed and temporarily displaced because of drilling activities. Bears denning in areas adjacent to drill sites and access routes could be disturbed, resulting in den abandonment and the potential loss of cubs.

VII. Description of Phase II Lands

A. Lands to be Acquired by the United States

If oil and/or gas production takes place, Doyon has agreed to sell additional land (at fair market value) to the U.S. as mitigation for development impacts. The U.S. will use the production payments to acquire additional lands within the Refuge. At a minimum, the net gain in Refuge habitats acquired by the U.S. during Phases I and II will be 220,000 acres. This land may be acquired from Doyon or from other willing sellers within the Yukon Flats — whoever offers lands containing better quality habitats. This document identifies and evaluates only those lands the Service would acquire from Doyon, assuming no other willing sellers.

The Service has identified about 163,000 acres of Doyon lands for possible acquisition in Phase II. The minimum acreage to be acquired by the U.S. in Phase II will be equal to 330,000 acres, minus the acreage acquired by the U.S. in Phase I (including the 56,517 acres of 12(b) reallocations).

1. Topography, Geology and Soils

Phase II lands are situated in the Yukon Flats lowlands, near the villages of Beaver, Birch Creek, Fort Yukon, Circle and Chalkyitsik (Map 5). Topography, geology and soil descriptions from Section V.B.1 apply to these lands. Drainages within these lands include the Hodzana, Yukon, Grass, Sucker, and Porcupine Rivers and Lower Mouth Birch Creek.

2. Water Resources

There is an average of 3 lakes per square mile on the Phase II lands to be acquired by the U.S..

Lands to be acquired by the U.S. contain 768 lakes and 77 linear river miles, including portions of the Yukon, Hodzana, and Porcupine rivers (Table 8). The landscape is 9% water. Water resource descriptions in Section V.B.2 apply to these lands.

3. Vegetation

Areas near the villages of Beaver and Birch Creek include large, shallow lakes with submergent and emergent vegetation (*Potamogeton* spp., cattails, bulrush reeds, and *Carex* spp.). Emergent stands produce ample seeds in late summer for foraging waterfowl. Gravel habitats on the Hodzana River north of Beaver likely contain vegetation characteristic of the upper reaches of the drainage and include willows, various grass (*Poa*) species, hawksbeard, and *Wilhelmsia physodes*. Additional vegetation descriptions from Section V.B.3 apply to these and Chalkyitsik lands. Vegetation along the Yukon River corridor include stands

Table 8. Summary of abiotic and biotic resources on Phase II lands to be acquired by the U.S.

Village Association	Location	Total Area* (acres)	Total Area (mi^2)	Number of Lakes	Lake Area (mi^2)	River Length (Miles)	2000 Swan Density (mi^2)	1991-92 Duck Density (mi^2)
Chalkyitsik	T22N R20E	17,190.30	26.86	40	1.28	0.00	0.04	40.12
Chalkyitsik	T22N R16E	11,207.95	17.51	97	2.58	8.71	0.06	22.95
Beaver	T19N R1W	22,676.48	35.43	66	4.41	14.45	0.06	31.29
Beaver	T18N R4E	22,920.86	35.81	192	2.42	5.82	0.00	12.95
Birch Creek	T18N R7E	22,797.85	35.62	145	3.38	7.25	0.00	10.05
Birch Creek	T19N R7E	22,841.83	35.69	99	1.14	3.72	0.00	13.18
Circle	T14N R16E	20,151.16	31.49	27	6.95	37.41	0.03	4.14
Fort Yukon	T20N R14E	22,764.84	35.57	102	1.38		0.00	22.56
Total		**162,551.27**	**253.98**	**768**	**23.54**	**77.36**		

**Total area is the total GIS-calculated acreage of each land parcel.*

of white spruce, balsam poplar, and birch. Dense stands of willow, including *Salix alaxensis*, *S. interior*, and *S. lasiandra*, occur on depositional areas of the Yukon River and adjacent sloughs.

4. Fish and Wildlife

a. Fish. Fish resources on these lands are previously described in Section V.B.4.a.

Waterbird surveys counted an average of 20 birds per square mile on lands the U.S. will acquire.

b. Birds. Waterbird species composition on these lands is described in Section V.B.4.b. Parcels near Beaver, Circle, and Chalkyitsik have mean swan densities of 0.04 birds per square mile. Mean waterfowl densities are 20 birds per square mile (Table 8, Map 8).

c. Mammals. These lands provide habitat for a variety of mammals including moose, grizzly bear, black bear, wolf, beaver, lynx, and marten. Moose habitats and furbearer resources are comparable to those discussed in section V.B.4.c. Moose have been consistently observed on lands east of Beaver, east of Fort Yukon, and north of Chalkyitsik. Density estimates for predators presented in Section V.A.4.c apply to these lands.

5. Public Use and Access

Public use information for these lands is limited. However, observations by Refuge staff and communications with local residents indicate these areas are used by local residents. Residents access these areas by snowmachine and watercraft. A Federal subsistence hunting regulation has restricted public uses on some of the lands the Service would acquire. The Federal Subsistence Board has closed Game Management Unit 25(D) West (approximately half of the Refuge) to moose hunting by non-local residents, due to a low-density moose population.

There are no permitted cabins or other structures on Phase II lands.

Both Refuge and Doyon lands are occasionally accessed for scientific research. There are no Doyon-permitted cabins or other permanent structures located on Phase II lands.

6. Subsistence

In Phase II, the U.S. might acquire all or portions of eight additional townships, including two near Beaver, two near Birch Creek, portions of two townships near Chalkyitsik, one near Circle, and one near Fort Yukon.

All Phase II land acquisitions would be in traditional subsistence use areas.

Beaver. Of the two townships near Beaver, one is northwest of the village and the other is east of the village. The Hodzana River flows through the northwest township, which also contains Nelson and Long Lakes. Several Native allotments are located on Nelson Lake. The township to the east of Beaver is south of the Yukon River main channel, but contains portions of sloughs, including Lower Birch Creek Slough, and numerous lakes. The township along the Hodzana River is within the traditional moose hunting and furbearer trapping area for Beaver residents. The eastern township is within their traditional moose and bear hunting and furbearer trapping areas. Fishing for non-salmon species occurs in the lower reaches of the Hodzana River, and can occur in conjunction with other activities in the area. Section V.B.6 lists hunting, trapping, and fishing statistics for Beaver residents.

Birch Creek. The two townships near Birch Creek are northwest of the village. The northern township borders the Yukon River, just downriver of the Upper Mouth of Birch Creek. The Yukon River flows just north of the township boundary, and it contains numerous sloughs, lakes and backwater areas. The southern township contains a portion of the Lower Mouth of Birch Creek and numerous adjoining sloughs and lakes. Both townships are within the traditional use area of Birch Creek residents. The northernmost township is at the periphery of moose and bear hunting areas. The southern township is more heavily used because the Lower Mouth of Birch Creek flows through this area. Moose, bear, and waterfowl hunting and furbearer trapping historically occur in this area. Section V.B.6 lists hunting, trapping, and fishing statistics for Birch Creek residents.

Fort Yukon. Both of the townships near Birch Creek and the one near Fort Yukon are within the traditional use area for Fort Yukon residents. Moose, bear, and waterfowl hunting as well as furbearer trapping occur within the area. The township just east of Beaver

is within the traditional moose, waterfowl, and bear hunting areas for Fort Yukon residents. Both townships near Chalkyitsik and the one north of Circle are all within the Fort Yukon's traditional moose hunting area. Section V.B.6 lists hunting, trapping, and fishing statistics for Fort Yukon residents.

Chalkyitsik. The U.S. will acquire parts of two townships north of Chalkyitsik (totalling one township). The western township borders the Porcupine River, and the eastern township borders the Black River. Numerous sloughs, lakes, and backwater areas are contained within these townships. Both of these areas are within Chalkyitsik residents' traditional moose, bear, waterfowl, and possibly caribou hunting areas, as well as furbearer trapping areas. Section V.B.6 lists hunting, trapping, and fishing statistics for Chalkyitsik residents.

Circle. The U.S. will purchase one township downriver of Circle; the Yukon River flows through this township, which also contains the historical camp site, locally known as "Twenty-two Mile Village." This township is within the traditional moose and waterfowl hunting area, salmon and non-salmon fishing areas, and furbearer trapping area for Circle residents. Section V.B.6 lists hunting, trapping, and fishing statistics for Circle residents.

7. Fire Management

Fire management and history on lands that might be acquired in Phase II are as follows:

Beaver. The township east of the village of Beaver is a productive lowland riparian area near the Yukon River with many small lakes and ponds. The township northwest of the village lies along the Hodzana River and contains similar productive lowland riparian habitats.

Neither area has a recent fire history, although portions of both townships are in the "Full" Protection category; the remainder is in "Modified." Under Service management, these lands will likely be placed in a "Limited" response category, because of their relatively fire-resistant lowland vegetation type and lack of fire history. See Section V.B.7 for a more detailed description of the Beaver area.

Chalkyitsik. The two partial townships near Chalkyitsik lie to the northeast and northwest of the village. The township northeast of Chalkyitsik consists of mixed lowland habitats with many small lakes, and a low ridge of upland black spruce habitat. The township has not had a recent fire history, although the upland black spruce area is highly flammable. The township northwest of Chalkyitsik is primarily forested lowlands between the Porcupine and Black River riparian areas. This area burned in 1954 and reburned in 1969. The township is a mosaic of early and middle successional stages and currently receives "Full" fire protection. Part of the township northeast of Chalkyitsik is afforded "Full" protection, but other areas receive "Modified" protection. Under Service management, fire protection levels may be reduced to "Modified" or "Limited" status.

Circle. The township northwest of Circle borders the Yukon River. Portions of this lowland riparian area are in "Full" and "Modified" Protection. Under Federal ownership, this township would likely be placed in "Limited" protection to promote natural ecological processes, as long as the risk to Circle is manageable.

Birch Creek. The townships northwest of the village of Birch Creek and near the Yukon River support a mature stand of white spruce, with an understory of senescent aspen. Most of the area receives "Full" protection. It is located north of the area burned in the extensive Lower Mouth Fire (Alaska Fire Service 2004). To promote natural ecological processes, this township will likely receive lowered fire protection under Service management.

B. Access Route Alternatives and Mitigation

Doyon has identified two potential routes for transportation corridors that could be used if oil and/or gas is found within the Refuge. The route will not be selected until: (1) economically viable oil or gas deposits are found, (2) Doyon completes further engineering studies, (3) Doyon applies for a right-of-way permit, (4) the land management agency reviews the application, solicits and reviews public comments, completes an Environmental Assessment or an Environmental Impact Statement. Full analysis of impacts on natural resources, fire, public use, and subsistence will be conducted in the right-of-way permit review process

The Southern Route. Doyon's preferred route is through Victoria Creek in the White Mountains National Recreation Area. This route would travel south from the oil field, paralleling the western boundary of the Beaver Creek Wild River Corridor to the Refuge boundary. From the boundary, it would follow Victoria Creek, through the White Mountain National Recreation Area, to the headwaters of Victoria Creek, cross into the headwaters of the Tolovana River, and terminate on the haul road about 8 miles south of Livengood (Map 7). The corridor would extend approximately 70 miles and traverse elevations of 2000 feet at Victoria Mountain and in the headwaters of the Tolovana River.

The Northern Route. A second potential route would extend westward for 35 miles from the oil field, across the northern foothills of the White Mountains (within the Refuge), Big and Jefferson Creeks and numerous small unnamed drainages. From there, the route would either turn south towards Victoria Creek or southwesterly to Hess Creek, terminating north of Livengood (Map 7). This northern route would extend 100 miles, at elevations ranging from 1,500 to 2,800 feet.

Mitigation. A transportation corridor though the Refuge would result in additional impacts to Refuge resources. Doyon's preferred route is outside of the Refuge. However, if the transportation corridor crosses Refuge lands, Doyon has agreed to additional mitigation measures. At a minimum, Doyon would convey to the U.S. one section of land, identified by the Service to contain high-value wildlife habitat, for every linear mile of transportation corridor on Refuge lands. Doyon also would increase the production payment on any oil or gas produced from the lands that Doyon acquires from the Service from 1.25% to 1.50%. Additional site-specific mitigation measures might be required to protect Refuge resources.

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In Phase II, the U.S. would acquire lands along the eastern edge of Canvasback Lake. Canvasback Lake is an important foraging and nesting area for many species. The lake's productive waters teem with aquatic invertebrates and support dense stands of submerged and emergent aquatic vegetation. Waterfowl nest and raise broods on the lake; songbirds feed on swarms of hatching invertebrates; predators and scavengers, such as bears, foxes and raptors, feed on waterfowl, eggs, and berries.

Ted Heuer, U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service

VIII. Potential Effects of Phase II

A. Management Implications/Potential Effects to Refuge Resources

1. Refuge Purposes and Biological Integrity

As discussed in Section VI.A.1., management of the Refuge is guided by the purposes for which the Refuge was established (as specified in ANILCA), the National Wildlife Refuge System mission, and other legal and policy guidance discussed in Section II—including the Service's Biological Integrity, Diversity and Environmental Health Policy.

The greatest direct impacts to Refuge resources will occur if corridors and/or roads cross Refuge lands and waters. To help mitigate adverse impacts from an access corridor across Refuge lands, Doyon has agreed to convey additional land to the Service (one square mile of land for every linear mile of access corridor that crosses the Refuge).

Doyon has agreed to additional mitigation measures if a road is constructed across Refuge lands.

Oil field infrastructure will require large amounts of gravel and water and will increase the possibility of impacts to the Beaver Creek watershed, downstream Refuge riparian habitats, and resident and anadromous fish. Increased public use of the Refuge is expected if an access road is developed and opened to the public (or limited to local residents), regardless of location. Oil field developments and the associated impacts will require increased monitoring of Refuge resources and increased staffing to ensure that impacts of Refuge lands are minimized. The natural character of the adjacent Refuge lands will be diminished, and the biological integrity, diversity, and environmental health of the area will be affected.

Lands to be acquired by the U.S. in Phase II include a gain of approximately 120,000 acres (if an access corridor does not cross Refuge lands). This acquisition will increase the Service's ability to conserve a greater proportion of wetland habitats within the Refuge, over the long term, and to better protect and maintain the biological integrity, diversity and environmental health of these lands.

2. Public Use and Access

Oil Field Development. Oil/gas development will require additional infrastructure and transportation corridors, including roads and/or airstrips. The infrastructure itself will have a direct impact on the immediate environment, but the indirect effects could have more far-reaching impacts. Along with the benefits of improving access

to more public lands, new access routes into this remote area and increased human activity associated with oilfield activities could affect wildlife and fish populations in the area.

The severity of these impacts is difficult to assess, because impacts will vary significantly depending on the type of infrastructure. The State and Federal regulations in effect at the time of development, and the extent to which they are enforced will also be a factor.

If an access corridor from TAPS (Map 12) is constructed and maintained, the level of human activity both along this corridor and in the Yukon Flats could increase significantly. Existing restrictions on moose harvest in the area would prevent significant impacts on this important subsistence resource. Improved access to the western White Mountains would likely require additional restrictions on Dall sheep hunting in that area. Currently, access to this sheep population is severely constrained by rugged physical features and distance from access points. Access to or near Beaver Creek could impact the resource values of the Beaver Creek Wild River, including impacts to Arctic grayling, and other fish.

If a pipeline is constructed without an access road, the primary impacts from development would be improved access within the area. Birch Creek, and perhaps Fort Yukon, may have a road connection to portions of the oil field, but these would only cross private lands. If it becomes economically feasible to provide natural gas from a central facility, small diameter gas distribution pipelines may be constructed to villages in the region. These small diameter gas distribution pipelines to villages other than Birch Creek and Fort Yukon would have rights of access across Refuge lands.

Public access and use would increase somewhat under either scenario. However, the greatest human impacts would likely stem from increased human activity associated with oil development. The density of black and grizzly bears in the area makes it likely that human/bear conflicts may occur, if there is human activity in the summer months. Waste disposal must be carefully controlled to minimize impacts to bears and other species. Because most oil production scenarios require workers to work long hours, workers would likely have little free time to recreate while in the production area.

Acquired Lands. Changes in land ownership would affect public use on all lands involved. Doyon restricts non-shareholder access and use without a permit. In contrast, Federal lands are open to the public (with reasonable regulations to protect Refuge resources). In Phase II of the Agreement, public access and use opportunities will increase as the U.S. acquires more lands in fee title. In addition, Doyon will retain a limited subsistence easement for all local rural residents on lands transferred to the Service (see Section V.F.).

The Federal Subsistence Board has closed moose hunting to non-local residents in Game Management Unit 25 (D) West (approximately half of the Refuge) due to a low-density moose population. Acquired lands in this unit may receive less public use because of the restriction.

Access for scientific research takes place on both Service and Doyon lands. No change in research access is expected from Phase II of the Agreement.

U.S. land acquisitions in Phase II will eliminate the need for more than 50 miles of 17(b) access easements and three site easements on private lands. Two Doyon-permitted cabins or other permanent structures are located on lands to be acquired by the U.S. Phase II of the Agreement could add 120,000 acres of public lands to the Refuge that would be available to the public for compatible, legal access, subsistence, and recreation.

3. Subsistence

As a result of Phase II acquisitions, more land closer to the villages will be under Federal jurisdiction than at present. Management implications will be the same as described under Phase I (see Section VI.A.3). If allocation of wildlife resources becomes necessary, local residents would have priority on more public land than they do now. However, because there will be more public land closer to the villages and some of these areas contain or abut the Yukon River or major tributaries, a greater opportunity exists for increased user conflicts within the Refuge.

Wildlife impacts would be similar to those discussed in Section VI.A.3. Production facilities could introduce noise as a further disturbance to wildlife populations.

Building a permanent road into the area could affect subsistence users. Although the areas identified as potential access corridors receive very limited subsistence use, a permanent road could create access for urban hunters and fishers and thus increase competition for wildlife resources. Increased competition could lead to more restrictive hunting and fishing regulations, which could lower subsistence opportunity, and increase user conflicts. While road access could stimulate the economy through more jobs, higher incomes generally mean a lower reliance on subsistence resources (Wolfe and Walker 1986).

4. Fire Management

Lands acquired in Phase II are adjacent to the lowland/riparian habitats surrounding the principal Yukon Flats villages. Vegetation types are transitional from lowland white spruce/deciduous broadleaf to upland black spruce and may include both vegetation types. The townships to be acquired near Beaver, Birch Creek, Fort Yukon, and Chalkyitsik lie at the periphery of "Full" protection areas, but may include areas that are under "Modified" protection. Stevens Village has generally requested lower levels of fire protection. Thus, lands to be acquired near Stevens Village are located at the periphery of "Modified" protection areas and border "Limited" protection areas.

Under Service management, fire protection levels may decrease in some areas. The Service will work with local communities to assess the fire risk.

Under Service management, lands designated "Full" or "Modified" protection near Beaver, Fort Yukon, and Chalkyitsik will likely be placed in the next lower fire response category. The Birch Creek area, currently afforded "Full" protection, would likely be placed in a "Limited" protection area. This area recently burned (Alaska Fire Service 2004) and exhibits very low flammability. Townships near Stevens Village will likely remain in "Modified" and "Limited" protection levels.

Fire protection levels will likely increase from "Limited" to "Full" or "Critical" to protect oil/gas infrastructure on the Doyon parcel. However, this would be the responsibility of Doyon, not the Service.

The Service will manage forested lands for the natural fire regime if there is no risk to human safety, cultural, historical, or other resource values. The Service also will employ graduated levels of increasing fire protection near villages. This may include Wildland-Urban Interface hazard reduction projects and similar fuels reduction projects, such as fuel breaks, near villages.

5. Service-recommended White-Crazy Mountains Wilderness Area (1987)

Oil field development and pipeline/road development associated with Phase II of the proposed agreement would adversely affect the recommended 658,000-acre White-Crazy Mountains Wilderness Area. The land exchange would split the potential wilderness area into two areas: a west and east section on either side of the Doyon-acquired lands. The land exchange would reduce the potential wilderness area by 26,270 acres – the portion of the Beaver Creek drainage that would be acquired by Doyon (Map 12).

Oil field development in the Beaver Creek watershed would be visible from much of the potential wilderness area. The northern, panoramic views afforded from the White-Crazy Mountains would include not only the vast, undeveloped expanse of the Yukon Flats basin, but also an industrial complex in the Beaver Creek valley. A view of the oil field infrastructure would conflict with the values the Service sought to protect through its wilderness recommendation.

Visitors seeking a wilderness experience may be disturbed by the sights and sounds of oil field activities.

A pipeline and associated road from the oil field would pass south through Doyon lands and continue southwest through the White Mountains National Recreation Area, or run south approximately 38 or 30 miles (alternate routes) on Service lands through the western portion of the potential wilderness area (Map 12). An industrial road and construction in the western portion of the potential wilderness would negate the rationale for wilderness designation.

The 1987 Service-proposed White-Crazy Mountain Wilderness Area was specifically selected based on its size, Federal ownership of surface and sub-surface, natural integrity, apparent naturalness, outstanding opportunities for solitude, and outstanding opportunities for primitive recreation. While the industrial complex and the associated pipeline and road associated with Phase II of this Agreement would be relatively small, the wilderness character and aesthetic values of a vast area would be diminished.

6. Beaver Creek Wild River

Noise and visual impacts could detract from the "Wild River experience".

Phase II would likely result in greater impacts than Phase I. Noise and visual impacts associated with oil and gas development are likely to detract from the natural, primitive experience sought by most visitors to a Wild and Scenic River.

Noise and visual impacts may affect both the 16-mile segment administered by the Refuge, as well as portions of the Wild River administered by the BLM. The severity of the impacts would depend on the type and timing of oil and gas activities as well as the placement of associated infrastructure.

Oil development activities could affect water quality and quantity in Beaver Creek.

The potential for impacts to water quality and quantity of Beaver Creek also exists. Oil and gas development activities could result in unintentional pollution from run-off or spills that could find its way into surface waters. Pollutants can easily spread long distances through waterways, thus affecting fish, wildlife, and water quality far from the source. Decreased water quality or quantity would likely have adverse affects on fish populations. This portion of Beaver Creek has small, sensitive runs of Chinook and chum salmon, and a dense population of Arctic grayling. Chinook salmon spawn within the Refuge portion of Beaver Creek Wild River. These spawning beds would be vulnerable to decreased water quality and/or quantity, resulting from nearby oil and gas development activities.

Section 12(a) of the Wild & Scenic Rivers Act states that:

> *The Secretary of the Interior, the Secretary of Agriculture, and the head of any other Federal department or agency having jurisdiction over any lands which include, border upon, or are adjacent to, any river included within the National Wild and Scenic Rivers System ...shall take such action respecting management policies, regulations, contracts, plans, affecting such lands, …as may be necessary to protect such rivers in accordance with the purposes of this Act…Particular attention shall be given to scheduled timber harvesting, road construction, and similar activities which might be contrary to the purposes of this Act.*

Therefore, Congress directs Federal agencies to protect river values, in addition to meeting their agency mission. This directive would have bearing on a potential road and pipeline route through the White Mountain National Recreation Area. The "remarkable values" of the Beaver Creek Wild River could be degraded if obtrusive structures are within sight or hearing distance of the river corridor. In particular, the two values at risk are: (1) preserving the river and its immediate environment in its natural, primitive condition; and (2) providing high quality primitive recreational opportunities for present and future generations.

Road and pipeline development, especially through Victoria Creek, could have negative impacts on moose, caribou, and Dall sheep populations that travel from the high country into the Beaver Creek National Wild River corridor. Road/pipeline construction could alter migration routes and patterns, degrade or reduce habitat availability, and increase hunting access. Moose, caribou, and Dall sheep are often sighted by floaters on Beaver Creek, even outside the Wild River boundary. A small population of sheep in the upper Victoria Creek drainage is especially vulnerable. These animals are often seen from the river, but are extremely difficult to approach.

Constructing a road into the area immediately downstream of the Wild River corridor could give floaters additional access options if the road is open to the public. Currently, floaters must be picked up by airplanes landing on gravel bars below Victoria Creek, or float for an additional two weeks, down Beaver Creek and the Yukon River, to the Yukon River Bridge. A road would provide an easier and cheaper access alternative that could increase the number of floaters on the Wild River beyond the current management threshold for visitor use during peak use periods. Presently, visitors can expect to have three or fewer contacts per day with other visitors. However, management strategies, such as a permit system, could be initiated to maintain a high quality primitive recreational experience while accommodating increased use.

7. Oil and Gas Development without the Exchange

We can only speculate whether Doyon would produce oil or gas on lands they currently own within the Refuge, without exchanging lands with the Service. The new USGS assessment of oil and gas resources of the Yukon Flats (Stanley et al. 2004) estimates resource potential of the entire basin and does not identify precise locations of oil and gas reserves. Among other indicators, the assessment is based partly on the presence of deep sediment basins. The largest of these occurs below both Doyon and Service lands near Beaver Creek. We do not know when (or if) world oil and gas prices might provide the economic incentive to explore for oil on Doyon's lands. Nor do we know if producing oil on these lands would drain Federal resources. However, if Doyon discovers producible resources on its lands, the Service will have to provide "adequate and feasible" access, including a road and pipeline, across Refuge lands to Doyon's inholdings, under the provisions of Title XI of ANILCA. In this case, the U.S. would not receive the additional lands to be provided by the Agreement in Principle.

B. Potential Effects to Doyon Lands

1. Oil Field Development

In Phase II, Doyon lands will support oil field infrastructure, including well pads, processing facilities, pipeline corridors and access roads. Given the uncertainties associated with this potential development, it is impossible to precisely predict the environmental impacts. In this section we briefly describe potential impacts associated with oil and gas development in Alaska. If Doyon decides it is economically feasible to proceed to Phase II, Doyon will apply to the BLM for pipeline and road rights-of-way across Federal lands. Proposals to construct transportation and utility systems on Federal lands in Alaska are governed by Title XI of ANILCA. Regulations at 43 CFR Part 36 implementing Title XI require specific procedures and time constraints for right-of-way application processing, NEPA compliance, decision making, and issuing permits. Issuing a permit for pipeline/road construction would be a major Federal action requiring an environmental impact statement. The EIS would address the impacts of the entire project, including oil field development on Doyon lands. Any development on Doyon's lands would be subject to applicable State and Federal regulations and permits designed to minimize adverse impacts associated with oil and gas development. Although the Service does not have

Developing an oil field would require additional infrastruction, including roads, drilling pads, and airstrips.

jurisdiction over development on Native Corporation lands, the Service does review permits and development plans and provides recommendations to mitigate impacts to fish and wildlife.

In general, the active drilling phase of an oil field generates more activity and requires more personnel than the production phase, when most of the activity at the drill sites is associated with well inspection and periodic maintenance. Winter construction minimizes damage to vegetation and reduces wildlife impacts. Once the pads and roads are constructed, drilling continues 24-hours per day, year-round, until completed. Processing facilities also operate year-round (CPAI 2004).

An oil field access road would likely connect to the Dalton Highway through BLM or Refuge lands.

Doyon has suggested three development scenarios (30,000-acre, 70,000-acre, and 127,000-acre fields) with surface disturbances ranging from 137 to 448 acres (Appendix 4). All scenarios require in-field roads to access pads from a processing facility and camp. Oil would be transported from the pad to the processing facility through a pipeline, processed at the facility, and transported through another pipeline to the existing TAPS line. The TAPS pipeline was generally buried wherever there is no permafrost. Where there is permafrost, the pipeline was elevated five or more feet above ground by vertical support members (VSM). Pipelines on Doyon lands would likely be a combination of buried and VSM-supported elevated pipelines. Access to the field would be either by all-season road or air. The all-season road likely would connect to the Dalton Highway through either BLM land to the south of the Refuge, or through the southern portion of the Refuge. Another access alternative would be an all-season road from Circle or Central. A pipeline route would either run through BLM land or through the southern portion of the Refuge and tie into the existing TAPS line.

Constructing pads, roads, and airstrips within an oil field requires a large amount of gravel. The quality of the gravel, depth of permafrost, number of well heads, and usage will determine the actual amounts of gravel necessary. Pad size will be determined by the number of well heads, supporting infrastructure, and storage requirements. Pads supporting 16-20 well heads may be approximately 10 acres, while pads with 25-30 well heads would require approximately 12–13 acres (PAI 2001). A gravel pad to support a moderately-sized processing facility could be 30-40 acres, or more, and would be 5-feet thick. The amount of gravel used in road construction also will vary with the intended use. A 4-foot thick, 30-foot wide (crown) road generally requires 45,000–50,000 cubic yards of gravel per mile. Airstrips require the largest amount of gravel. A 5-foot thick airstrip would require 15,000-16,000 cubic yards of gravel per acre (PAI 2000).

Borrow sources can be a major component of oil field development. Likely sources of gravel include Beaver Creek, the floodplain, or outcroppings.

Other alternatives for developing the parcel include drilling from isolated pads with winter-only in-field road support, helicopter support during the summer or seasonal (winter-only) drilling, or a combination of the two. Depending on the number of wellheads, the drilling phase on some pads could be completed during the winter. During production, wells could be monitored remotely through video cameras and pressure-sensing equipment. This scenario would reduce the amount of gravel needed for in-field roads.

Borrow sources potentially are a major component of oil field development (NRC 2003). The location of gravel within the parcel will determine where sites are developed, and ultimately, the impacts associated them. Likely sources of gravel include Beaver Creek, its floodplain, and outcroppings or ridges in the parcel. Developing a borrow source within a stream will require State and possibly Federal permits. These permits may dictate the location, timing of mining, restoration of the site, and other mitigation measures. Borrow sources located within wetlands will require a COE permit if overburden is stored within wetlands or a gravel access road is constructed from the source. The COE permit likely will require a mining plan that includes the timing of cell development and a restoration plan for the site. A borrow source located within uplands may require no COE permits if overburden is stored, and the access road is constructed, in uplands.

2. Topography, Geology, and Soils

Developing an oil field within the parcel will affect the soils and topography of the area. Gravel roads, pads, and/or airstrips must be several feet thick to insulate the underlying permafrost. Although gravel pads, roads, and airstrips may be removed and the area restored upon abandonment, some gravel will remain in the surface soils. If gravel is left in place, it will remain as part of the landscape for decades, eventually becoming vegetated ridges and mounds (McKendrick 2000).

Borrow sites potentially alter the landscape in significant ways, creating lakes in wetlands and cliff sites or scrapes in ridges. If not restored, exposed mineral soil in upland areas is prone to erosion. Riverine borrow sources may change stream alignments by altering flow patterns. Access roads to borrow sites located within rivers or streams may erode the soils along the stream banks. Careful planning and permit stipulations can lessen many of these effects.

Oil field infrastructure also may affect the topography of the parcel. The construction of a landfill and/or a sewage lagoon within the parcel may require the use of lined gravel pits. Impacts associated with camp waste and sewage could be minimal if the materials are trucked to existing disposal sites (NRC 2003). Creating on-pad reserve pits to handle drilling muds and cuttings requires the use of more gravel and larger pads. Storing muds and cuttings for offsite disposal also would require constructing a lined storage pit.

ADNR regulates water uses. Summer use must not impact the flow regime within the watershed.

Contaminant spills in tundra soils can remain in the environment for years if not completely removed. If contaminants become trapped in soils, preventing weathering, the impacts to adjacent areas such as ponds or streams can persist, as the contaminants seep from the soils. Contaminated soils can be treated by removal and disposal, in situ bioremediation, and/or flushing with water and swabbing with sorbent (Cater et al. 1999).

3. Water Resources

Water resources within the parcel will be affected by oil field development. Production drilling requires approximately 50,000 gallons of water per day at each pad (PAI 2000, 2001). Most of this water may be re-injected into the well to maintain pressure. The amount of water needed depends on the production at the well head

Production drilling requires large volumes of water. Local hydrology could be affected

and the amount of water in the produced fluids. Produced water (water associated with the oil and gas in the oil and gas bearing rocks) is separated at the processing facility and sent back to the drill sites for re-injection. Additional water for camp use (75-100 gallons per person per day) and road maintenance also will be needed.

Water sources likely will be identified near the facilities. Water also could be piped or delivered by truck if facilities are located away from available water sources. Current ADNR regulations for winter water use in the interior of Alaska require that withdrawal not exceed 15% of the lake volume below 4-5 feet of ice in all fish-bearing lakes (B. Morris, ADNR, pers. comm. 2004). Summer use cannot impact the flow regime within the watershed and will be monitored by ADNR. The required State permit to appropriate water would specify mitigation measures.

The hydrology of the parcel area could be altered by developing oil and gas resources. Constructing gravel pads, roads, and an airstrip could impede natural drainage patterns if drainage structures, such as culverts and bridges, are installed improperly or are insufficient in number and/or size to allow free passage of water during peak runoff (NRC 2003). Bridges are the preferred method to cross rivers and streams, but culverts are normally used for smaller stream crossings. If not properly maintained, icing in culverts during spring may disrupt flow, resulting in flooding and possible scouring and erosion of the road (Ott 1993). Culverts also may become perched, due to thermokarsting, bowing, or incorrect placement, resulting in reduced flow during periods of low-water. Impounded water adjacent to pads and roads may be an indication that drainage is insufficient or that thermokarsting has occurred (McKendrick 2000). Where fill for roads are placed on wetlands, a COE permit is required. The COE permit process would review the size and placement of culverts, and include stipulations to lessen impacts.

If spills enter rivers and streams, downstream resources potentially could be affected.

Bridges with instream supports can cause scouring of the streambed, with deposition of materials downstream of the crossing. Erosion also can occur at the abutments at the ends of the bridge. On larger streams, ice jams during spring breakup can cause temporary flooding and/or erosion of the road and stream bank (Ott 1993). Most bridges are subject to COE permit review.

Contaminants can enter the environment through oil well blowouts, pipeline breaks, wrecked fuel trucks, or releases of muds and cuttings from reserve pits. Contaminants entering ponds or lakes could persist in the system for prolonged periods. If oil becomes trapped in sediments and is released slowly into the environment, impacts to water quality can occur (Miller et al. 1978). Contamination of major streams or rivers during spring breakup will be difficult to contain with booms. Cleaning oiled areas may be difficult due to ice. Oil will affect stream banks, becoming stranded and eventually weathered on vegetation, rocks, and soils.

4. Vegetation

Two rare or uncommon plant species were identified in the Beaver Creek floodplain during plant inventories conducted in 2003 (Bertram and Person 2004). Both of these species, a monocot, *Scheuchzeria palustris*, considered rare in Alaska, and a grass,

Glyceria pulchella, considered imperiled, were found in wetland areas to the east and west of Beaver Creek, respectively. A COE permit for wetland fill would probably include stipulations protecting the wetlands associated with these species.

Impacts to plant communities within the area include the direct loss of vegetation from gravel, roads/airstrips, and borrow sources, and clearing stands of spruce and brush (McKendrick 2000). Clearing black spruce in transportation corridors will result in a setback of succession, resulting in brush and shrub communities. Plant communities adjacent to gravel structures also may be altered. Gravel pads, roads, and airstrips can impound water and may result in changes to the plant community. Snow accumulation on the downwind side of gravel structures may cause a delay in melt and result in delayed spring growth.

Vegetation may be destroyed by construction activities and clearing, or indirectly impacted by dust accumulation or changes in the natural hydrology.

Dust shadows, the accumulation of dust on the downwind side of heavily-used gravel roads, can alter vegetation along road alignments (Walker and Everett 1987). Dust accumulation during the winter can accelerate snow melt in the spring and result in early growth. In the summer, accumulation on the downwind side of roads may impede growth and flowering and can result in localized die-offs of certain species.

Riparian communities also may be affected if road alignments at stream crossings are insufficiently engineered. Channeling of streams through culverts or bridges may increase water velocity causing bank erosion and loss of stream-side vegetation downstream of the crossing (Ott 1993). Impounding water upstream of the crossing caused by icing during spring runoff or summer floods also could affect plant communities (McKendrick 2000). Plant communities along lake edges could be affected if water levels are lowered by water withdrawal.

Natural plant communities could be reestablished in areas of gravel deposition after abandonment of the field, if gravel structures are removed and the area is rehabilitated. The length of time for reestablishing natural systems will depend on the amount of gravel removed and the methods used for rehabilitation (Kidd et al. 2004). Habitat changes from gravel deposition and removal may be so severe (thermokarsting) that the original plant communities will never reestablish (Jorgenson and Joyce 1994, Kidd et al. 2004, NRC 2003). Leaving gravel structures in place is an alternative to gravel removal. Plant communities can become reestablished on these sites; however, they may be substantially different than those of the surrounding area (McKendrick 1991).

5. Fish and Wildlife

Impacts to fish and wildlife resources on Doyon's lands depend on the type, size, and timing of the development (NRC 2003). Impacts may be very different in the Yukon Flats than in other areas of Alaska due to climate, soil, and vegetation differences. If pads, roads/airstrips, and pipelines are constructed during the winter, impacts to certain species will be minimized. For example, many avian species are absent from the area during winter. Gravel placement, therefore, would not directly affect nesting or result in "take" of migratory birds. Moose could be displaced from preferred, but limited winter habitats (such as areas of willow) during winter

construction. Both black and brown bears are prone to disturbance while in maternal den sites. Construction activities during winter could result in displacement and the potential loss of cubs. Wolves also could be displaced from portions of their winter range through disturbance.

Impacts to birds could be minimized by restricting certain activities during the nesting season.

Construction activities involving the placement of gravel and clearing of spruce and willow during summer likely will result in the loss of nests, eggs, and nestlings of some bird species. Establishing "timing-windows" during the peak nesting season, when clearing vegetation and placing gravel are not allowed, would minimize impacts. If habitat is not limiting, impacts associated with habitat loss through gravel deposition and clearing during summer would be minimal.

Additional potential impacts on birds and mammals associated with developing an oil and gas field include the following: bird strikes on elevated power lines, direct oiling in open reserve pits, and increased predator populations because of availability of artificial food sources. Bird strikes on elevated power lines are not uncommon; however, the extent of the problem is difficult to document. Power lines may be placed in conduit strung on the VSMs, eliminating the potential for bird strikes (PAI 2001). Incidences of birds becoming oiled in open reserve pits have been documented in other areas (NRC 2003). Adequate fencing, in addition to wires and flagging to deter birds from flying into the pit, may reduce the incidence of oiling.

Potential impacts to wildlife include direct losses during construction and operations, habitat loss or degradation, displacement from preferred habitats, increases in certain predator populations, or alteration in movement patterns.

The increased availability of anthropogenic food sources may increase some predator species, such as ravens and foxes (Day 1998, NRC 2003). Constructing a landfill to handle camp waste potentially could have significant impacts on bird and mammals within the area. Increases in predator populations from a year-round food source can have secondary impacts on nesting birds and small mammals. Avian predators, such and gulls and ravens, are adept predators of nesting birds. There is some evidence that during nesting these avian predators may switch from anthropogenic food sources to higher-quality natural sources, such as eggs and nestlings, to feed their young (Boarman and Heinrich 1999). Localized impacts to nesting birds could occur as a result of the increased predation pressure. Strict management of a landfill could minimize the impacts. However, the transfer of waste off-site, or complete burning of waste, would be the only method to eliminate the impacts.

Impacts of oil and gas development to fish resources depend on the timing of construction and location of the development (NRC 2003). Potential sources of impact include road crossings and borrow sources. Road crossings of streams and rivers, if not installed correctly, can affect flow, bank vegetation, and water quality (Ott 1993). Insufficiently-sized culverts at stream crossings can block fish passage and scour stream beds and banks. Culverts, if not properly maintained, can become perched or filled with debris, reducing or blocking fish passage, especially during periods of low water. Culverts also can become blocked during high-water events. For example, culverts are often filled with drifting snow during winter. These culverts may not thaw sufficiently before spring breakup to allow floodwater to move freely, blocking fish passage during flood events. This can be especially problematic for fish dependent on high-water events to move upstream. Impounded water at

crossings during flood events can erode bank vegetation upstream of the crossing, as well as scour the streambed downstream of the crossing, potentially affecting fish habitat (Ott 1993).

While bridges are preferable to culverts for stream crossings, they also can have adverse impacts on fish habitat. Bridges should be designed to span the entire floodplain of a river or stream. However, bridges often only span the active channel; a gravel road or causeway crosses the floodplain. During flood events, the causeway can channel water through the bridge at increased velocities, causing erosion of the stream bed around bridge supports and the stream banks of the active channel. Eroded material will be deposited downstream, potentially covering spawning areas.

Culverts, bridges, and instream gravel extraction potentially can affect fish habitat.

Instream borrow sources also could affect fish populations. Any borrow source located in a fish-bearing stream or river will require a permit from ADNR, COE, and if the stream contain anadromous fish, coordination with NMFS. However, it is unlikely the State would allow active mining within a salmon stream. Depending on the season and location, extracting gravel from a stream could affect feeding, overwintering, and spawning habitat, as well as cause direct mortality of fish (B. Morris, ADNR, pers. comm. 2004). Winter gravel excavation is possible, and may be preferable, if the stream is fully frozen. However, material extracted from a partially-frozen stream is difficult to handle, and these sites likely would not be used until summer. Summer mining should be timed to avoid impacts to hatching or spawning fish. Gravel extraction from a stream or river will change the morphology of the streambed, at least temporarily. In some cases, extraction may be deep enough to create overwintering habitat for some species of fish. Borrow sources located immediately adjacent to a stream, could be connected to the stream by a channel once mining is completed, creating additional overwintering habitat (Hemming 1988).

Impacts to fish and wildlife resources from spills or leaching of contaminated material into the environment can range from chronic, low-level impacts to direct mortality through oiling. Contaminated ponds and waterways may contain a lower diversity and abundance of invertebrates (West and Snyder-Conn 1987), which can affect fish populations, and a variety of birds, including shorebirds and waterfowl. In addition, persistent compounds can bioaccumulate in invertebrates, fish, and potentially birds (Thorsen et al. 2004). Direct oiling of spawning areas also may cause mortality of fish eggs and young.

Spill may cause chronic low-level impacts or direct mortality of wildlife.

Direct ingestion of oil and petroleum products can affect avian reproductive success and growth (Fairbrother et al. 1999). In addition to direct ingestion, waterbirds (such as loons, grebes, and swans) can become oiled through contact with contaminated water. External oiling causes feathers to mat and disrupts their insulative properties. Oiled birds generally die from hypothermia and drowning (Albers 2003). Eggs oiled through direct exposure or from the oiled feathers of incubating birds can affect embryo development and hatching of young (Albers and Szaro 1978).

Mammals, especially those exposed to water, such as beaver and mink can become oiled and die from hypothermia. Large mammals, such as moose, could become oiled by walking through or feeding in contaminated water. Ingesting contaminated plants and prey items also could occur. Impacts to fish and wildlife can be

mitigated through proper planning, including stipulations in the required permits issued by ADEC, ADFG or COE, conscientious construction, maintenance and operation practices, and monitoring and enforcement.

6. Contaminant Spills

Accidental contaminant spills within an oil field can occur at exploration, production and processing facilities, along pipelines, and on roads and pads. The impacts associated with spills are related to the type of product involved and the size, timing, and location of the spill. ADEC requires industry to develop a contaminant spill contingency plan or C-Plan for each phase of oil development and to have significant spill response capability on site. The C-Plan usually outlines the type and placement of spill response equipment and the time line for spill response under different scenarios.

Spills are a potential source of contamination. The severity of the impact can vary widely, depending on the amount spilled, time of year, and presence of conduits, such as ground or surface waters.

Contaminant spills within an oil field can vary in size from a few teaspoons to large-scale well blowouts. Small spills generally result in fewer impacts because they are typically contained and cleaned up on site (pad or road). Large spills can affect areas off pad and usually pose more difficult clean-up problems, resulting in greater impacts. Large scale, uncontrolled well blowouts, while not common, can occur [about one incident per 1000 wells drilled (NRC 2003)]. Timing, weather patterns, and location of the spill will ultimately determine the extent of impacts.

Spills occurring in winter are generally easier to clean up than spills occurring at other times of the year. The combination of frozen ground and snow cover may prevent oil from soaking into the soil or vegetative mat. Winter cleanup of a small or lightly covered area may simply entail scraping and removing snow and affected vegetation. Larger spills may require creating snow berms to contain the spill. Impacted soil, if still frozen, would be scraped free of contaminated material. Spills that melt through the soil surface and run down-slope need to be impounded with sheet-piling or other barrier before cleanup can begin—a difficult task in frozen soil. The affected soils and vegetation are then removed.

Winter spills are generally easier to clean up and do less damage to the environment.

Summer spills are technically more difficult to contain and clean up. Containment barriers need to be placed down-slope to prevent movement of the spill. Techniques to remove the oil vary with the area affected, but may include using sorbent material, flushing with water, removing heavily contaminated soils and vegetation, and bioremediation (Cater et al. 1999). Spills in rivers and lakes will require booms, skimmers, and sorbent materials. Spills contained within gravel pads and roads are cleaned up by removing the contaminated gravel to an ADEC-approved disposal/decontamination site. Decontaminated gravel may be reused in later construction.

7. Air Quality

Power generation for oil exploration, production, and the running of trucks and equipment can emit substantial amounts of pollutants into the air. Data from other areas indicate that oxides of nitrogen (NO_x) constitute the largest component of airborne pollutants (about 70,000 metric tons (t) per year) (ADEC 2002). Other pollutants include CO (11,000 t), SO_2 (1,334 t), particulates (5,400 t) and

volatile organic compounds (2,400 t) per year (U.S. Army Corps of Engineers 1999). Emissions from oil and gas facilities can cause localized haze, increased air turbidity, and decreased visibility. Emissions would be limited to the levels allowed by an EPA Clean Air Act Permit.

Air quality within the Yukon Flats region could be impacted by local industrial development, especially when combined with fugitive emissions from other industrialized areas. The extent of localized impacts to air quality (haze and decreased visibility) from the development will depend upon the size of the field. Pollution from airborne particles, generated from vehicle traffic on gravel roads and construction activities, can significantly affect adjacent vegetation through dust shadows. The impacts associated with dust will be determined by the extent of the road network for the proposed development.

C. Pipeline and Road Development

Doyon has identified two potential pipeline routes. A northern route would run west from the Doyon lands through the southern portion of the Refuge. A southern route would pass through the BLM's White Mountains National Recreation Area. Doyon has stated this is the shorter and preferred route. Either route would tie into the existing TAPS line north of Fairbanks. Doyon would apply to the BLM for pipeline and (likely) road rights-of-way across Federal lands. The ROW permit would stipulate mitigating measures that would apply to Federal lands. ADEC permits would stipulate mitigating measures that would apply to the pipeline on Doyon lands. Although Doyon has not specifically identified a method of access, several likely scenarios exist. One method would be an all-season road constructed along the chosen pipeline route from the Dalton Highway, a distance of approximately 80 miles. Another all-season road route could extend from the Steese Highway near Circle (approximately 40-50 miles), north into the southern end of the Doyon lands, although this route would not follow the proposed pipeline. Non-road access options include an airstrip located within the proposed oil field. A combination of air support and road options could also be used. Materials could be flown into the existing airfield in Birch Creek and subsequently trucked into the development area over an all-season or winter-only road. Materials could be barged into Fort Yukon during the summer and transported to the oil field on an all-season or winter road.

1. Topography, Geology, and Soils

Pipeline and road development could affect the soils and topography along the pipeline/transportation corridor in similar ways as described in Section VIII.B.2. A pipeline without an adjacent all-season road would minimally affect the soils and the topography of the area. Soils under a winter-only road may become compressed if snow depth is not sufficient. The banks of streams and rivers at winter road crossings may become eroded during breakup if the crossings are designed with insufficient snow depth.

Impacts of an all-season access road on the topography and soils along the chosen route will be similar to those described in Section VIII.B.2. Aside from the road itself, borrow sources would likely have the largest impact on the topography and the soils. An

all-season road could be 50 to 100 miles in length, depending on the route. To minimize haul distances of gravel material during construction, several borrow sources may be needed along the route. As described in the previous section, these sources may be developed in wetlands, uplands, or in rivers and streams. Impacts to the local topography and soils associated with borrow sources are discussed in Section VIII.B.2 and would be mitigated by permits issued by ADEC, ADFG, COE, and by BLM and the Service, if their lands are affected.

2. Water Resources

Water resources along a pipeline-only corridor likely would be minimally affected. Pipeline crossings of rivers and streams may entail the installation of mid-stream VSM, depending upon the length of the crossing. Pipeline supports in rivers and streams could cause localized scouring of the streambed. However, if a pipeline is buried at a stream crossing, as TAPS frequently was, significant downstream siltation could occur. Impacts to water resources would be similar to those described in Section VIII.B.3. Water sources for constructing an ice road would have to be located along the entire route. The amount of water needed would depend on the type of construction used for the winter-only road.

An all-season road likely would affect water resources more than an ice road.

An all-season access road potentially could impact the water resources along the transportation corridor more significantly than a winter-only road. A gravel road would need to allow for adequate drainage along its entire route. Insufficiently designed culverts and bridges can affect cross-drainage as well as flow within streams and rivers. Culverts can become blocked in winter with packed snow and ice, thawing later in spring than the surrounding snow pack. The delay in thaw can impede water movement in the culverts, causing flooding during spring breakup. Water also may need to be applied to the road surface during summer, to control the impacts associated with dust.

3. Vegetation

The impacts to vegetation from developing a pipeline/transportation corridor could range from minimal to severe, depending on the type and timing of construction. A right-of–way will be cleared on either side of a pipeline, similar to the TAPS line. The clearing will be minimal if the pipeline is located in a tundra environment, but could be extensive if the pipeline is located within a boreal forest. Forested and brushy areas would require periodic clearing or use of herbicides to keep the vegetation from affecting the pipeline. Potential rights-of-way identified by Doyon (Maps 6 and 7) traverse both boreal forest and alpine tundra. Of the two routes, the “Northern Route” would involve clearing more forested areas. Extensive clearing and re-vegetation along a transportation corridor always has the potential to allow colonization of invasive (non-native) plant species. Impacts to vegetation from constructing an all-season access road would be similar to those described for the in-field roads within the development area and would be mitigated by permits issued by ADEC, ADFG, COE, and on their lands, BLM and the Service.

4. Fish and Wildlife

Road and pipeline development could fragment or degrade wildlife habitats, modify migration patterns, and provide increased hunting access.

Impacts to migratory species, such as caribou, could be minimized if the pipeline is at least 5 feet high.

Impacts to fish and wildlife resources along a pipeline/transportation corridor will be similar to those described for developing oil fields (see Section VIII.B.5). As previously described, the severity of the impacts will depend on the type and timing of construction. However, additional impacts to wildlife may occur with the development of a pipeline/transportation corridor. The linear nature of a pipeline and road may impede movement of wildlife by bisecting traditional movement corridors, blocking access to important habitats, such as winter range or calving/nursery areas. Impacts could be minimized if the pipeline is at least 5 feet high. Some newer pipelines on the North Slope have been built to a 7-foot minimum. While the additional height of 7 feet may allow for free movement of wildlife, it also would allow for safer winter travel by snow machines. In winter, snow can accumulate under pipelines, significantly reducing the clearance, and making snow machine travel more difficult and dangerous. Similar impacts could occur along the pipeline corridor for the proposed development, not only for snow machine travel, but for wildlife species that winter in the area, such as moose and Dall sheep.

Summary

Phase I would add important wetland habitats to the Refuge.

Phase I. In Phase I of the proposed exchange, Doyon would acquire approximately 110,000 acres (surface and subsurface) of public lands, and oil and gas rights only (no surface occupancy) for 97,000 acres of adjacent lands (the "halo lands"). In exchange: (1) the U.S. would receive an equal-value amount of Doyon lands (estimated at approximately 150,000 acres of surface and subsurface estate), and (2) Doyon would agree to reallocate 56,517 acres of remaining 12(b) entitlements outside of the Refuge. Both parties would pursue additional township-level exchanges to consolidate Doyon and Refuge lands and facilitate management.

The U.S. would acquire more lake and wetland habitats than would be relinquished. These wetland areas support high concentrations of waterfowl and other wetland-dependent species. The lands Doyon would acquire contain 173 lakes and approximately 35 miles of rivers and streams. The lands the U.S. would acquire contain 1,395 lakes and approximately 109 miles of rivers and streams.

In addition, Doyon has agreed to reallocate their remaining 12(b) entitlement outside of the Refuge. There are about 420,000 acres of ANCSA 12(b) selections in the Refuge; however, Doyon has only 56,517 acres of remaining 12(b) entitlement to reallocate to Yukon Flats villages. If the exchange takes place, Doyon has committed to allocating this entitlement outside of the Refuge. Otherwise, most of the entitlement would likely be taken in the Refuge. Without the exchange, we do not know which selections would be conveyed and which would be relinquished. Because of this uncertainty, it is difficult to estimate how many lakes and other wetlands will remain in public ownership as a result of the 12(b) reallocation. However, we do know that many of the 12(b) selections contain quality wetland habitats.

In Phase I, the U.S. would be divesting ownership of lands adjacent to 22.1 river miles of Beaver Creek, downstream from the designated Beaver Creek National Wild River. However, the U.S. would be acquiring or retaining public lands along 62.3 river miles of Beaver Creek, including: (1) lands adjacent to 41.2 river miles of Beaver Creek, acquired in Phase I, and (2) lands adjacent to 21.1 river miles of Beaver Creek that will remain in public ownership when Doyon reallocates their 12(b) selections. In addition, the U.S. will retain a public use easement along that portion of Beaver Creek conveyed to Doyon.

If oil and/or gas is produced, the U.S. would receive additional land and monetary compensation.

Phase II. If oil and/or gas is produced, Doyon would sell to the U.S. an additional 120,000 acres of quality wildlife habitats within the Refuge. In addition, Doyon would pay the U.S. a production payment of 1.25% of the well-head value of any resources produced[1]. The U.S. would use these funds only for acquiring additional lands within the Refuge, lands in other national wildlife refuges in Alaska, and for constructing needed Refuge facilities.

Doyon's preferred route for a pipeline/transportation corridor is through BLM lands.

Doyon's preferred route for a transportation corridor is through the BLM's White Mountains National Recreation Area. However, if a pipeline corridor and/or roads are constructed through the Refuge, Doyon has agreed to additional mitigation. For every linear mile crossing Refuge lands, Doyon would transfer one section (1 square mile) of land to the U.S. In addition, Doyon would increase production payments from 1.25% to 1.50%.

The lands the Service identified for possible acquisition in Phase II support quality wetland habitats and contain 768 lakes and about 77 miles of rivers and streams. Of course, these lands will only be acquired by the U.S. if oil and/or gas production takes place. No Refuge lands would leave public ownership under Phase II.

Potential Impacts. The trade-off for increasing the quantity and quality of Refuge wildlife habitats is the potential impacts to fish, wildlife, habitats, and wilderness qualities that could result from oil field/transportation corridor development. Several unknowns make it impossible to predict the exact nature and extent of these impacts:

- Will commercial quantities of oil or gas be discovered?
- If so, how much infrastructure would be necessary?
- How would the Doyon lands be accessed?
- Where would the transportation corridor be routed?

The range of impacts depends on the extent of development, siting of transportation corridors, and other factors.

If exploration activities fail to find commercial quantities of oil or gas, the impacts to fish, wildlife, and habitats within the Yukon Flats Refuge would likely be minor, short-term, and restricted to Doyon lands. If development does occur, the range of impacts could vary markedly, as discussed in Section VIII. Those impacts could include disruptions in the natural hydrology, direct loss of vegetation from infrastructure construction, vegetation loss from borrow pits and gravel pads (which are difficult to rehabilitate), changes in vegetation due to dust accumulation, erosion at stream crossings, decreased water quality, displacement of wildlife, increased predator populations due to anthropogenic food sources, loss of wilderness character, and diminished biological integrity and environmental health of the area affected by development. The most measurable impacts would occur on Doyon's lands and on lands surrounding the transportation corridor. The most significant impact to Refuge lands likely would be the loss of wilderness values.

[1]Producing 173 million barrels of oil (mean estimate of the recoverable quantity in the Yukon Flats basin) at $30 per barrel would result in production payments of nearly $65 million dollars. Payments would be used to acquire additional habitat.

The exchange would increase the quality and quantity of wildlife habitats in the Refuge.

Potential Benefits. The proposed exchange is attractive to the Service because we will be increasing the quality and quantity of wildlife habitats within the Refuge, in excess of what is divested. For example, if Doyon discovers an economically-viable oil or gas field, approximately 330,000 acres of Doyon lands (or entitlements) will become public lands, while about 110,000 acres of existing public lands and wildlife habitats will be conveyed to Doyon. This would be an impressive net increase in the size of the Refuge. To illustrate the magnitude, if these acquired lands (220,000 acres or 343.75 square miles) were to be designated a separate unit of the National Wildlife Refuge System, this new unit would be larger than 97% of the refuges in the 48 contiguous states and would rank 29th of 545 national wildlife refuges.

Consolidating Refuge lands will help us maintain the health and integrity of the system.

In addition, consolidating Refuge and Doyon lands by exchanging scattered parcels (consolidation exchange), will increase the continuity of Refuge habitats, provide better-defined management boundaries, and should improve the Service's ability to maintain the biological integrity, diversity, and environmental health of these lands. If oil/gas production occurs, production payments would make it possible for the U.S. to acquire more lands within the Refuge and other Alaskan national wildlife refuges, and to fund needed refuge facilities.

It is important to note that the Service is not determining or implying that oil and gas development is "compatible" with the purposes for which the Refuge was established or the mission of the National Wildlife Refuge System. The Service considers the proposed exchange to be a way to restrict development to private lands, increase public lands within the Refuge, and acquire important wetland habitats currently on private lands. The Service believes the elements of the proposed exchange and acquisition, when viewed in aggregate, will benefit the Refuge, the National Wildlife Refuge System and the Service's trust responsibilities to fish and wildlife resources.

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End Notes

[1] A real property quiet-title action is a Federal judicial proceeding to establish clear title to land. See 28 U.S.C. 2409(a) at: http://frwebgate4.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=67718525671+0+0+0&WAISaction=retrieve

[2] The Secretary of the Interior is authorized under the Federal Land and Policy Management Act of 1976 to issue a recordable-disclaimer-of-interest-in-land. This Federal administrative action, managed by the BLM, disclaims real Federal property interests in lands and removes clouds on land title when certain determinations are made and conditions met. In early 2003, the BLM recordable disclaimer regulation (43 CFR 1864) was amended, thereby enabling State application for submerged lands (See Federal Register Volume 68, Number 3, Pages 494-503, January 6, 2003.) For the current code, see 43 U.S.C. 1745(a) at: http://frwebgate6.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=678657347515+0+0+0&WAISaction=retrieve

[3] See SLIP law, Chapter 42 Session Law of Alaska 2004. Following the 2004 Alaska legislative session, Senate Bill 305, "Relating to State ownership of submerged land underlying water that was navigable at the time Alaska achieved statehood," was signed into law by Governor Murkowski on June 4, 2004. The law became effective September 2, 2004. The Act, also called the "Asserting State Title to Submerged Land Act," mandates the Alaska Department of Natural Resources to notice BLM and all regional and village corporations established under ANCSA, and advise them of possible erroneous conveyances of submerged lands within 180 days of the passage of the Act. For Chapter 42 SLA 2004, see the State of Alaska BASIS website at http://www.legis.state.ak.us/basis/get_bill_text.asp?hsid=SB0305Z&session=23

[4] See the 9th Circuit Court decision, Alaska v. United States, No. 96-36401, CV-93-00437-JKS, January 28, 2000. This case involved a dispute between the State of Alaska and the United States over title to the submerged lands of three rivers of eastern Interior Alaska; the Black, Kandik, and Nation Rivers. See this 9th Circuit Court decision at: http://www.ca9.uscourts.gov/ca9/newopinions.nsf/04485f8dcbd4e1ea882569520074e698/fea76df4f194b2828825695200757892?OpenDocument

[5] Black River and Porcupine River disclaimer information is available on the BLM recordable disclaimers website at: http://www.ak.blm.gov/ak930/rdi/index.html

Glossary

12(a) – Section of the Alaska Native Claims Settlement Act that provides for the selection of public lands in Alaska for Village Corporations of each Alaska Native village.

12(b) – Section of the Alaska Native Claims Settlement Act that allows for the difference between 22 million acres and the total acreage selected by Native Village Corporations under Section 12(a) to be distributed to the Regional Corporations on the basis of the number of shareholders within each region. The Regional Corporations then distribute the acreage to the Village Corporations on an equitable basis.

12(c) – Section of the Alaska Native Claims Settlement Act that provides for the selection of public lands in Alaska by Alaska Native Regional Corporations; states that Native Regional Corporations will select even numbered townships in even numbered ranges and odd numbered townships in odd numbered ranges.

17(b) – Section of the Alaska Native Claims Settlement Act that provides for the establishment of public easements across lands conveyed to Native corporations to guarantee public access to public lands or waters.

Abiotic – The non-living part of the environment; as used in this evaluation, it refers to physical characteristics of the environment like water, soil, minerals, etc.

Agreement – The "Agreement in Principle;" a document that specifies key elements tentatively agreed upon by the U.S. Fish and Wildlife Service and Doyon, Limited. These key elements would provide the framework for an exchange, if it takes place.

Anadromous – Refers to fish that spawn (breed and lay eggs) in freshwater environments, but spend at least part of their adult life in a seawater environment.

Alaska State Natural Heritage Program – A part of NatureServe (a network of natural heritage programs), is Alaska's clearinghouse for information on plant and animal species of conservation concern, natural communities of conservation concern, and invasive nonnative plant species.

Alkaline meadows – Meadows that contain alkaline type soils which have a pH of more than 7.0.

Biological integrity – The biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms, and communities.

Biotic – Refers to plants and animals; the living organisms of the environment.

Compatibility Standard – A legal standard that is used to decide whether or not a proposed use (or existing use) of a National Wildlife Refuge can be allowed. A compatible use is one that, based on the sound professional judgment of the refuge manager, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes for which a refuge was established. Public or private economic uses of the natural resources of any national wildlife refuge may only be authorized, in accordance with 16 U.S.C 715s, if it is determined that the use contributes to the achievement of the national wildlife refuge purposes or the National Wildlife Refuge System mission.

Comprehensive Conservation Plan – The Alaska National Interest Lands Conservation Act of 1980, Section 304(g) directed the Secretary of Interior to prepare a comprehensive conservation plan for each refuge established under the Act. The plans are to identify and describe natural resources, special values, areas suitable for visitor facilities, potential requirements for access, and significant problems that may adversely affect the populations and habitats of fish and wildlife.

Critical protection – Human life and property are at risk (such as near village sites); fires are immediately and agressively suppressed.

Doyon – Doyon, Limited. One of thirteen Native regional corporations established by Congress under the Alaska Native Claims Settlement Act.

Environmental health – The composition, structure, and functioning of soil, water, air, and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment.

Full protection – Cultural, historical, or other resource values (such as historical cabins or high-value white spruce stands used as house logs) are present on private or uninhabited public lands; fires are suppressed.

Equal-value exchange – The appraised value of lands (or interests in land) to be exchanged are of equal value.

Graminoids – Grasses and grass-like plants such as sedges.

Halo lands – Lands where Doyon would receive only oil and gas interests. No surface occupancy by Doyon would be allowed on these lands. Access to these lands would be through directional drilling from the adjacent Doyon-owned lands.

Herbaceous – Referring to a plant that has little or no woody tissue.

Initial attack – small, mobile crews of smoke jumpers or helicopter borne firefighters who put out small fires quickly before the fires become large.

Limited protection – Remote, uninhabited areas; fires are monitored unless lands in other categories are threatened.

Mission of the National Wildlife Refuge System – The mission of the System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Modified protection – Uninhabited lands receiving fire protection from May to about July 10th, or whenever unusually dry periods prevail. Otherwise, fires are monitored.

Monocot – One of two main divisions of flowering plants (the other being dicots), characterized by having a single cotyledon (seed leaf), for example grasses.

Natural diversity – The number and relative abundance of indigenous species, which would occur without human interference.

Navigable Waters: The legal definition of navigable waters is : [Bodies of water] must be regarded as public navigable [water bodies] in law which are navigable in fact and they are navigable in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water....” (The Daniel Ball, 77 U.S. (10 Wall.) 557, 563 (1871).

Outstandingly remarkable value - A quality possessed by a river in the National Wild and Scenic River System that is to be protected and enhanced. The Wild and Scenic Rivers Act (Public Law 90-542, October 2, 1968) required protection of the free flowing condition, water quality, and each river’s special “outstandingly remarkable value”, which could include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values.

Permafrost – Soil or other earth material that remains below 32 degrees Fahrenheit for two or more years.

Phase I – That portion of the exchange and acquisition that would take place before any oil and/or gas is produced. This includes an initial equal-value exchange, Doyon’s reallocation of remaining 12(b) entitlement, and the consolidation exchange (see Maps 2 through 4).

Phase II – That portion of the exchange and acquisition that would take place after the production of oil and/or gas. This would include the payment of production payments by Doyon to the Service, and the Service’s acquisition of additional lands from Doyon at fair market value (see Maps 5 through 7).

Recommended wilderness area – An area along the southern boundary of the Yukon Flats National Wildlife Refuge (approximately 658,000 acres) that was recommended by the U.S. Fish and Wildlife Service for wilderness designation in 1987. This recommendation has not been formally proposed to Congress.

Refuge – Yukon Flats National Wildlife Refuge.

Riparian – Refers to zones along rivers and streams where terrestrial and aquatic environments interface.

Section – a land measure; one mile square or 640 acres.

Service – U.S. Fish and Wildlife Service.

Service mission – The mission of the U.S. Fish & Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people.

Special use permit – A permit issued by a refuge manager that authorizes a commercial visitor service or other activity restricted by law or regulation on a national wildlife refuge.

Submerged lands – For the purpose of land conveyances, submerged lands lie below the ordinary mean high water mark of rivers, streams, and lakes. The ordinary high water mark generally refers to "The line on the shore established by the fluctuation of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area" (33 CFR 328.3(e)).

Technically recoverable resources – The amount of resources that can be recovered using current technology.

Township – A division of land containing 36 sections or 36 square miles (Each square on Maps 1 through 8 represent one township.)

Uniform Appraisal Standards for Federal Land Acquisition – The code that all government appraisers use to ensure consistency in establishing land values in real estate transactions among the agencies acquiring property on behalf of the United States.