A PROPOSAL TO ESTABLISH

THE YUKON DELTA National Wildlife Refuge

evaluation report

Errata

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EVALUATION REPORT

A Proposal to Establish the Yukon Delta National Wildlife Refuge

[P. L. 92-203 -- Sec. 17(d) (2) (A)]

U.S. DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

Bureau of Sport Fisheries and Wildlife

April 1973

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ABSTRACT

The outstanding value of the Yukon Delta for production of migratory birds and its limited potential for other land uses clearly demands a type of management oriented primarily to maintenance of these wildlife values. The Bureau of Sport Fisheries and Wildlife, as the national agency assigned responsibility for migratory bird management, proposes to meet this management objective by designation of this area as a unit of the National Wildlife Refuge System. This will assure protection of the unique habitat and wildlife resources the Delta supports without precluding other compatible uses.

The Yukon-Kuskokwim Delta is located in western Alaska where the State's two largest rivers empty into the Bering Sea, creating a vast lowland plain of nearly 20 million acres. The most notable feature of the Delta is its innumerable lakes and ponds varying in size from less than an acre to many thousands of acres. Over much of the region more than half of the surface area is covered by water. The variety and abundance of both freshwater and estuarine habitat supports large populations of fish and wildlife, of which migratory birds are in unique abundance. Vegetation over most of the Delta is characteristic of Arctic tundra but forest vegetation occurs in limited areas inland and along streams.

Habitat encompassed in the proposed Yukon Delta National Wildlife Refuge includes approximately 2,753,700 acres of the present Clarence Rhode National Wildlife Range and Hazen Bay National Wildlife Refuge, as well as 215,500 acres replacing lands deleted from the Clarence Rhode Range

by provisions of the Alaska Native Claims Settlement Act of 1971; about 5,727,700 acres of conservation withdrawal (ANCSA) lands, about 664,400 acres of unreserved public domain, about 1,740,200 acres of village deficiency lands, and about 8,255,700 acres of village selection lands. Only those Native withdrawals that are not selected by the village corporations, regional corporation, or by the State would be included in the proposed refuge.

Of the 170 species of birds found on the Delta, only 13 are resident. More than 100 species and a great majority of individuals are associated with aquatic habitats. Waterfowl are best represented with 33 species and are of the greatest recreational and economic importance. Fall populations, excluding migrants from other breeding grounds, average 50,000 swans, 720,000 geese, and 2,290,000 ducks for a total of more than three million waterfowl. The Delta is particularly important for species such as black brant and cackling and emperor geese as well as the white-fronted goose and whistling swan of the Pacific Flyway for which the Delta provides the principal nesting habitat. Ducks nesting in abundance include Pacific and spectacled eiders, found nowhere else in the United States but Alaska, as well as familiar species such as pintail, widgeon, green-winged teal, and scaup. In migration they disperse across the continent to nearly every state, as well as Mexico, Central America, and the Caribbean.

Other shore and water birds depending on lake or estuarine habitats number more than one hundred million. In migration they spread through North and South America to countries of Asia bordering the Pacific and south to Australia, New Zealand, and Antarctica.

Large mammals on the Delta include moose, caribou, black and grizzly bears, and wolves, but only moose enter importantly into the recreation or economy of the area. Furbearing animals, including Arctic and red foxes, otters, mink, muskrats, and beaver, once provided a primary source of income to residents but are of declining economic importance. Marine mammals, including walrus and four species of seals, are still hunted extensively by Natives for food and for skins or ivory used in manufacture of clothing or handicraft objects.

Salmon migrating through the Delta to upstream spawning areas form the basis of important commercial and subsistence fisheries. Resident fishes, including northern pike, sheefish, whitefish, and blackfish, are primarily important in the subsistence fishery. Some of these, as well as trout and grayling that occur in a few streams, are sought for recreation.

Except for residents of the Delta, on-site recreational opportunities will be limited on the Wildlife Refuge because of adverse climatic conditions and because other recreation is available closer to major population centers. However, the area is of major importance to wildlife-oriented recreation throughout North America because of the annual flight of three million waterfowl produced on the Delta and the much larger number of other migratory birds.

The economic potential of natural resources, other than fish or wildlife, appears to be limited, with the possible exception of reindeer grazing and potential for discovery of oil and gas. Significant development of mining, agriculture, or timber is not considered likely or feasible.

It would be Bureau policy to provide for regulated, compatible use of the natural resources of the Yukon Delta National Wildlife Refuge as a component of the National Wildlife Refuge System.

Introduction

INTRODUCTION

INTRODUCTION

Objectives

The Alaska Native Claims Settlement Act of 1971 (Public Law 92-203) requires the Secretary of the Interior to withdraw from all forms of appropriation up to eighty million acres of the public lands in Alaska deemed suitable for addition to or creation as units of the National Wildlife Refuge, Park, Forest, and Wild and Scenic Rivers Systems. The Act further requires the Secretary to advise Congress of his recommendations for inclusion of suitable lands as National Wildlife Refuges, Parks, Forests, and Wild and Scenic Rivers.

The special mission of the National Wildlife Refuge System is to provide, manage, and safeguard a national network of lands and waters sufficient in size, diversity, and location to meet people's needs for areas where the entire spectrum of human benefits associated with migratory birds, other wild creatures, and wildlands are enhanced and made available.

The objective of this report is to evaluate, at the direction of the Secretary of the Interior, the suitability of the Yukon Delta Study Area, or a portion thereof, for inclusion in the National Wildlife Refuge System. The Delta was selected for study because of the unique abundance of aquatic habitats which support an average fall population of three million waterfowl and countless other shore and water birds. Other areas being evaluated for inclusion in the National Wildlife Refuge System are discussed in Appendix A.

Location and Description

The Yukon Delta Study Area is located in western Alaska where the State's two largest rivers, the Yukon and the Kuskokwim, empty into the Bering Sea. Here ancient delta deposits mingle with recent alluvium to form a vast fan-shaped plain stretching 250 miles from Kuskokwim Bay to Norton Sound, and inland 200 miles to the Kuskokwim Mountains. Except in the outermost part of the Delta, lowlands terminate abruptly on the north where the Yukon River flows past mountainous topography. To the south and east of the Kuskokwim River, lowlands gradually merge with foothills of the Kilbuck Mountains.

The lands studied for inclusion in the proposed Wildlife Refuge include nearly all the Delta lowland as well as a small area of mountainous terrain north of the Yukon which is drained by the Andreafsky River. The study area totals approximately 19,355,200 acres and includes lands of withdrawal or ownership classifications as summarized below:

Existing Refuge Lands	2,753,700 acres
Refuge Replacement Lands (22-e)	215,500 acres
Unreserved Public Domain	664,400 acres
Four Systems Withdrawal (d-2)	5,725,700 acres
Village Selection Withdrawals	8,255,700 acres
Village Deficiency Withdrawals	1,740,200 acres
Total	19,355,200 acres

Of the total area studied, approximately 14 to 16 million acres (including lands in existing refuges) may be available for refuge designation. Lands not available include up to 759,000 acres in the Clarence Rhode and Hazen Bay Refuges, and from 5 to 8 million acres of Native selection withdrawals

that will be deeded to Native village and regional corporations. Neither precise acreages nor the locations of land that will be deeded to Native corporations can be determined until the selection processes are completed in December 1975.

The most characteristic feature of the Delta is its innumerable ponds and lakes varying in size from less than an acre to many thousands of acres (Figure 1). In much of the region, more than half of the surface area is covered by water. The nearly level plain of the Delta is broken only occasionally by small mountain ranges. They include the Askinuk Mountains north of Hooper Bay and unnamed mountains on Nelson Island. Kusilvak Mountain, a lone peak, lies between Scammon Bay and the Yukon. Several small volcanic peaks, the Ingakslukwat Hills, rise abruptly from lowlands north of Baird Inlet. Tops of these peaks are craters which frequently contain small lakes or ponds.

Vegetation is characteristic of Arctic tundra, although plant growth is generally more vigorous, and ground cover more complete than in tundra of more northern regions of Alaska. Inland, away from the cooling effect of the Bering Sea, tundra merges with a sparse, spruce-birch forest, particularly along streams or rivers where soils are better drained.

The climate is influenced by the adjacent Bering Sea. Temperatures near the coast average less than 56 degrees in summer months but are somewhat higher inland (Figure 2). Rivers and lakes become free of ice during late May in inland portions of the Delta, but in coastal areas breakup is usually delayed until early June. Freezeup of lakes and ponds normally occurs in early October and is nearly simultaneous for the entire

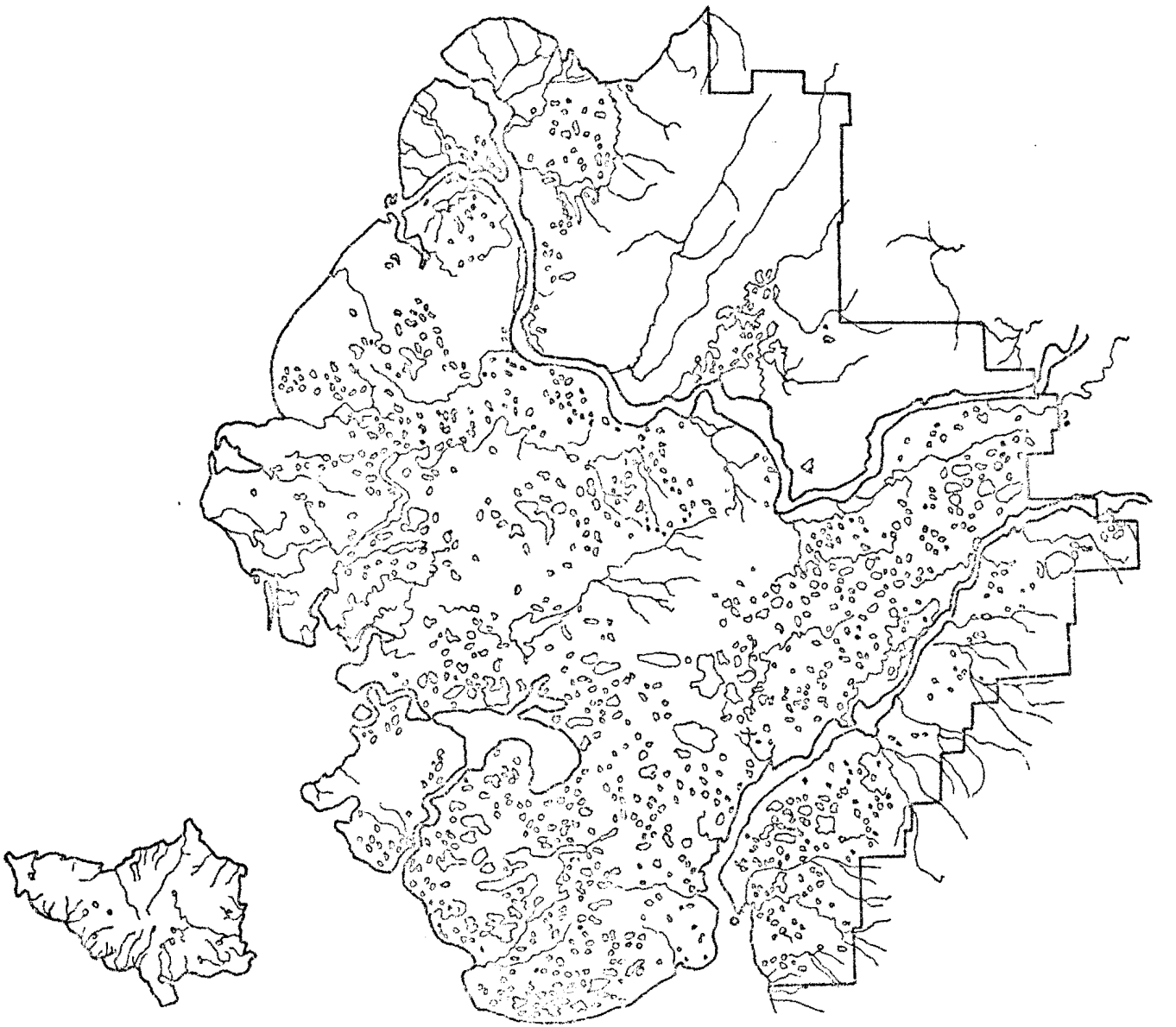


Figure 1. Major Drainages and Lakes of the Yukon Delta

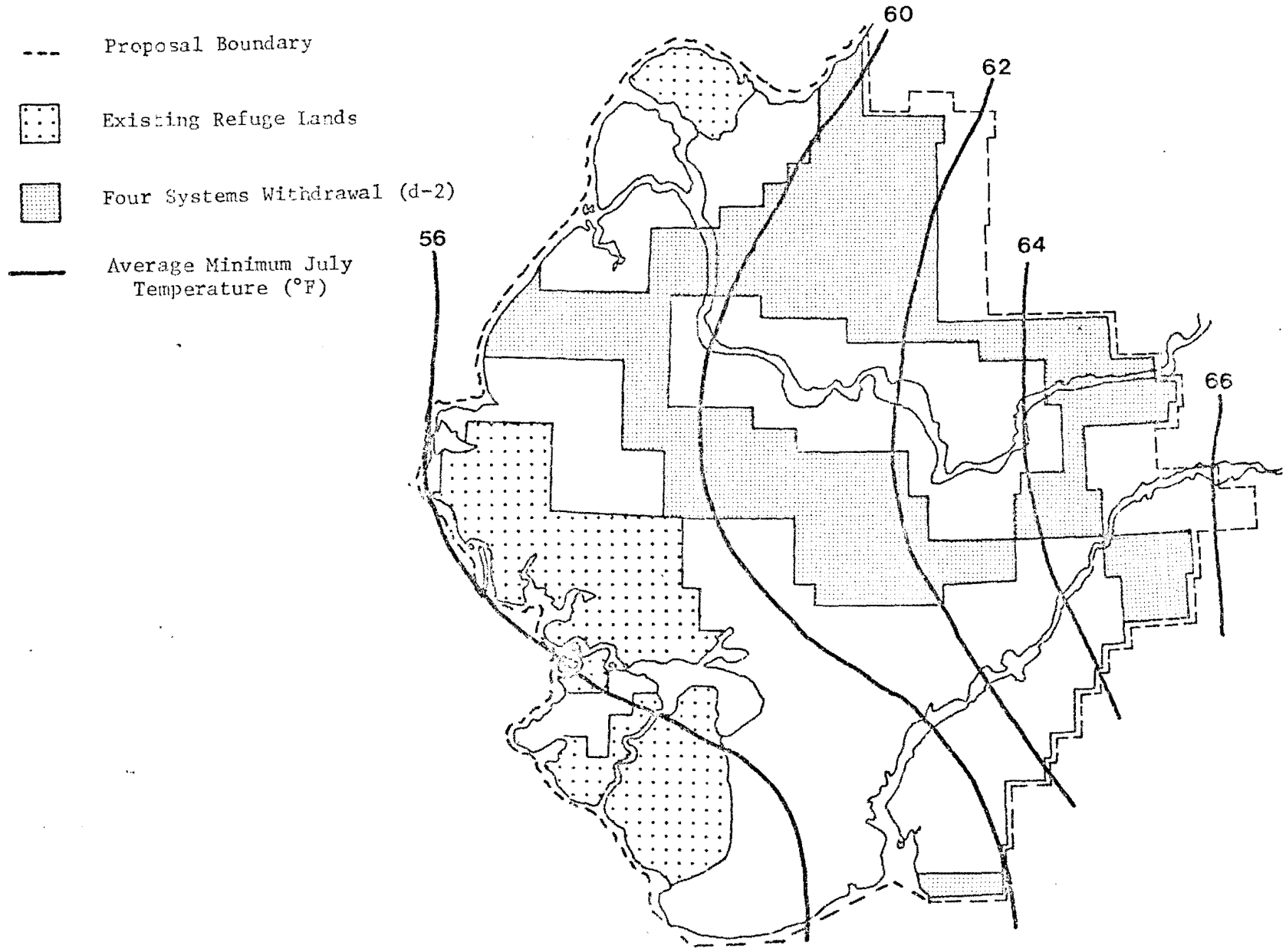


Figure 2. Average July Temperatures

region. Winters are cold and frequently windy. Temperatures average near 0°F in January, but from December through February may frequently dip to -30° F and record temporatures ror most locations are colder than -40° F (Figure 3). Snowfall exceeds 50 inches, but winter thaws usually permit accumulation of only a fraction of this amount (Figure 4).

The region is sparsely populated, averaging only one person to 2-1/2 square miles. The 12,000 to 13,000 persons in or adjacent to the proposal area are mostly Eskimos living in 45 villages. The largest community is Bethel, an important trade and transportation center with a population of approximately 3,000. The majority of Caucasian residents of the Delta live in this community. Bethel can be reached only by air; daily jet service is available from Anchorage, about 400 miles to the east. Fairbanks, 500 miles to the northeast, can only be reached via Anchorage. There are no roads within the region and travel between villages is by either scheduled or chartered aircraft, and by boat in summer or snow machine in winter.

Commercial development of resources is limited to the salmon fisheries of the Yukon and Kuskokwim Rivers. An overwhelming majority of the population remains dependent on subsistence use of fish, wildlife, and plants for a livelihood.[31] Supplementary income is provided by commercial fishing, trapping, or manufacture of handicrafts. Government agencies and service and construction industries offer temporary employment. Permanent jobs also are available primarily with government agencies or in service industries. State and Federal welfare programs are a major element in the region's economy.

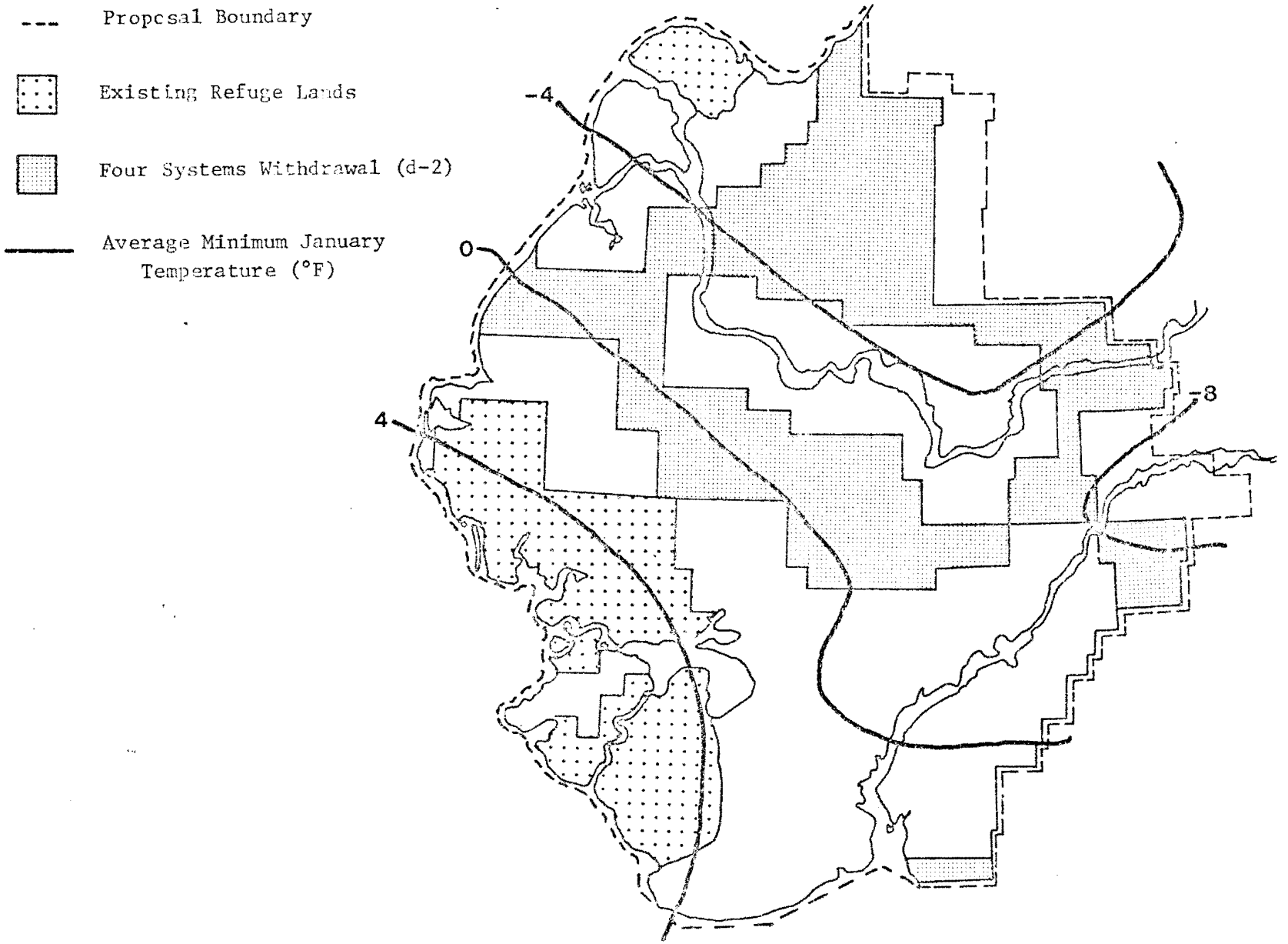


Figure 3. Average January Temperatures

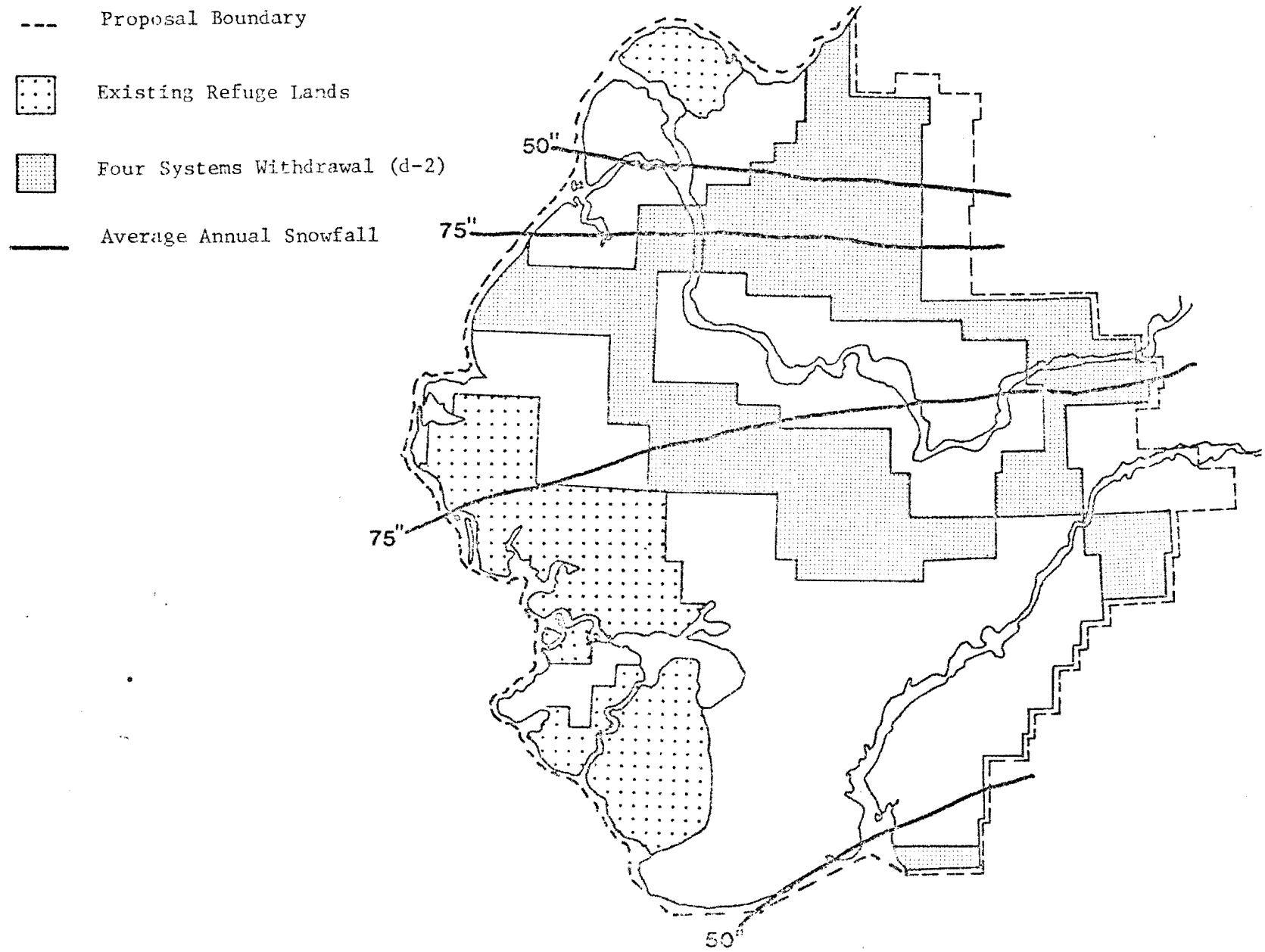


Figure 4. Average Annual Snowfall

HISTORY

HISTORY

The aboriginal population of the Yukon-Kuskokwim Delta was among the largest of any similar region occupied by Eskimos. The existence of this large population was undoubtedly related to the abundance of fish, migratory birds, and other wildlife associated with lakes, rivers, and estuarine waters of the Delta. The population was widely scattered in small villages, many used only seasonally (Figure 5).[42] These were connected by traditional routes and trails usually following waterways (Figure 6).

A total of 110 historic villages were identified by the Federal Field Committee for Development Planning in Alaska.[23] Other sites of historic or archeological interest have been identified by the Calista Corporation and the Alaska Department of Natural Resources.[8] However, the archeological record of the Delta is virtually unexplored, and observations by biologists of the Alaska Department of Fish and Game and the Bureau of Sport Fisheries and Wildlife suggests that sites of potential value may number several hundred with the area.[19] Approximate locations of more than 150 sites are indicated in Figure 5, many of which correspond with existing village locations. Sites vary from one or a few house pits of seasonal camps to the many house pits and *kasghees* (the large, men's house) indicative of large villages. Few sites have been evaluated more than superficially.

Some of the sites may be selected by Native groups under provisions of ANCSA, but it is likely that relatively few will be identified for this

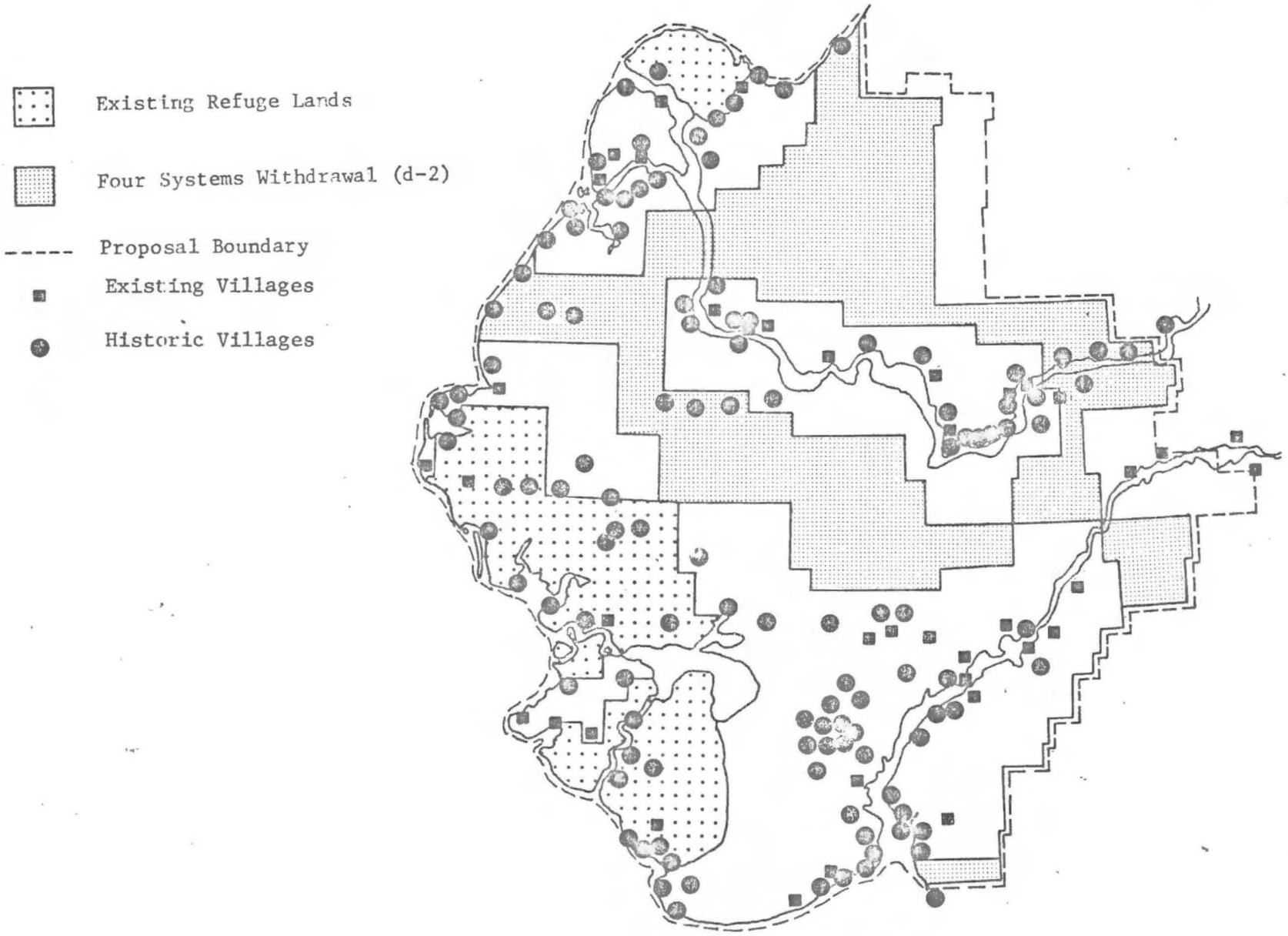


Figure 5. Existing and Historic Villages[19 23 62]

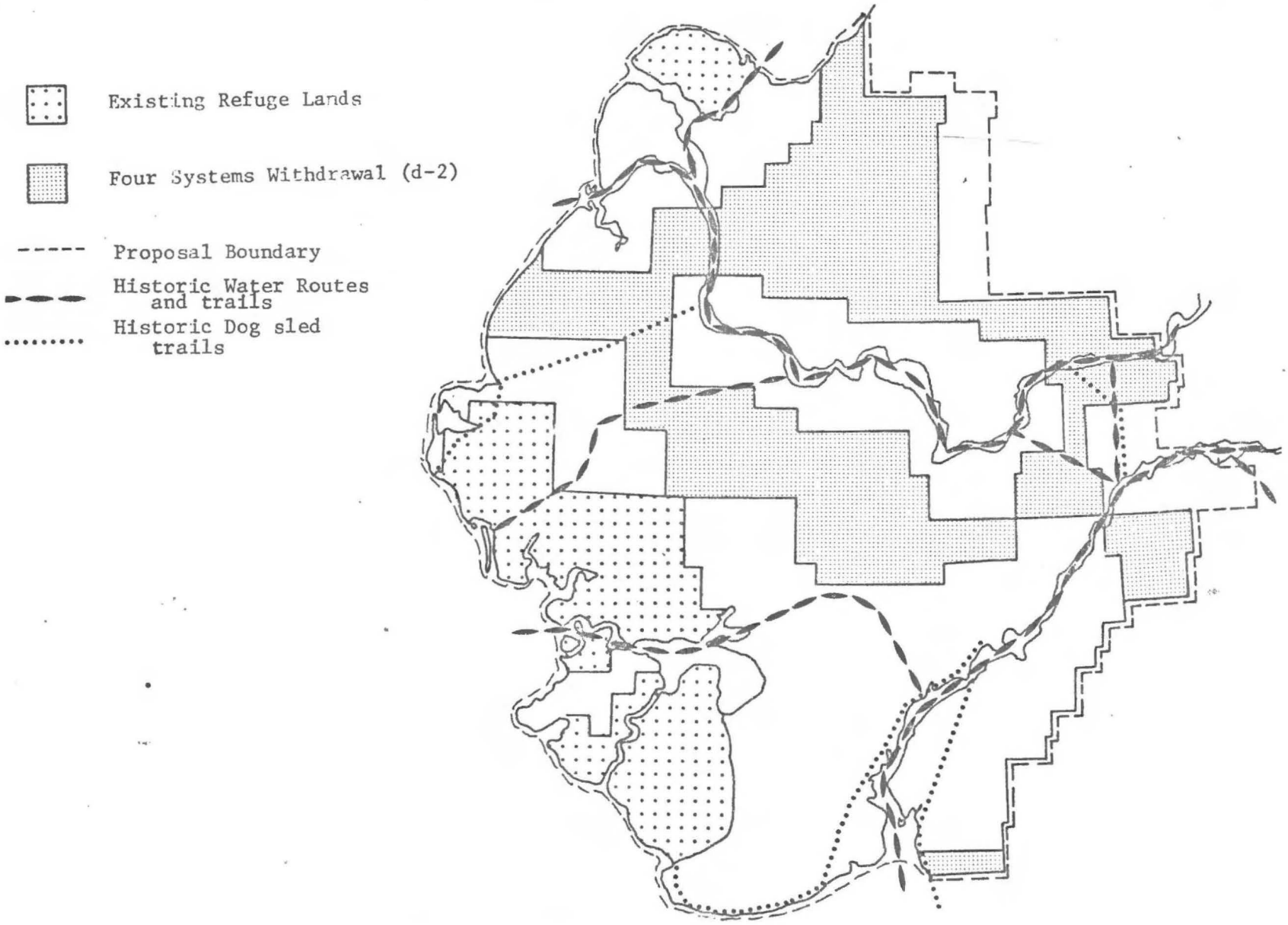


Figure 6. Historic Routes of Travel

purpose. However, under both the Antiquities Act and Bureau policy, all sites discovered within existing or proposed refuges would be cataloged and protected.

Changing cultural patterns of recent years have caused abandonment of many villages and movement of the population to others more favorably situated or where schools, churches, or stores had been established. However, dependence on fish and wildlife resources remains a dominant element in the economy of the area.[23]

Intrusion into the region by Caucasians was generally later and with less lasting effect than in most regions of Alaska. Captain James Cook reached the vicinity of Cape Newenham in 1778, but then cruised far offshore to avoid the shallows opposite the Delta and failed to see even the mountainous terrain of Nunivak or Nelson Islands. The Russian explorer, Etolin, may have observed the Delta on his exploration of the Bering coast, 1822-24, but the first significant impact by Russians was the establishment of a trading post at St. Michael in 1833. Five years later Russian traders ascended the Yukon River to establish a trading post at Nulato, but this post was destroyed by Indians, rebuilt, destroyed again, and did not become a permanent settlement until 1854. First extensive explorations of the lower Yukon and Kuskokwim Rivers were by the Russian explorer Lt. Lavrenti Zagoskin from 1842 to 1844.[37] Zagoskin reached inland regions of the Delta while crossing between the two rivers and his accounts provide much of the information concerning the Delta's inhabitants.

American penetration followed a pattern similar to that of the Russians with first contact at St. Michael which remained an import trading center and gateway to the Yukon.

Between 1877 and 1881, E. W. Nelson was stationed at St. Michael by the Signal Service of the U.S. Army and made an intensive study of the natural history and ethnology of the Delta.[38 39] His work remains a basic source of data on the fauna and aboriginal people. W. H. Dall's work in 1865 to 1866 is also important for information of the lower and middle Yukon River.[22]

Although the Yukon and Kuskokwim Rivers became major routes of travel during and after the discovery of gold in Alaska (from about 1900), contact between Causcasians and Eskimos remained insignificant, particularly in villages located away from the major rivers. Influence of missionaries, first Russian Orthodox and then primarily Moravians and Jesuits, and of local traders provided a more significant impact on the aboriginal culture. Until after World War II, however, few Eskimos could speak or read English, and their basic way of life was essentially unchanged.

Changes in cultural patterns since World War II, particularly in the last decade, have been rapid and frequently dramatic. Among the many changes which have occurred, it is possible to list vastly improved health, housing (though still generally substandard), education, and command of English and an increasing dependence on a cash economy. Not least among the changes have been those in communication and travel. Radio telephones now extend to most villages, and all are reached by scheduled and charter aircraft. Kayaks have been replaced by outboard powered boats; and dogs, by snow machines.

Changing cultural patterns of Eskimos and increased use of fish and wildlife by other races have had significant effect on ways in which the Eskimo utilizes wildlife resources. In some instances, the size or

probable trend of fish and wildlife populations are affected. Fishery resources, particularly salmon, ascending the Yukon and Kuskokwim Rivers are utilized increasingly as a commercial product rather than as a subsistence item. Other fishes continue to be most important as subsistence foods. Trapping declined in importance as other income became available and is now much less important economically than before. Subsistence hunting of waterfowl and egg gathering has declined in economic importance, although harvest is still substantial.

Initial formalization of government in most villages occurred with establishment of village councils required by the Indian Reorganization Act. Within the past decade many of the villages have also incorporated under State law. On the Delta, articulation of Native views and requirements was furthered by the establishment of the Southwest Alaska Association of Village Council Presidents in 1962 and about the same time by the formation of the Kuskokwim Valley Association. Native land rights were an important common cause with these and other Native regional associations.[20]

Under provisions of ANCSA, Native village and regional corporations were established to administer lands and monies received. The Calista Corporation is responsible for the entire region in which the proposed Yukon Delta National Wildlife Refuge is located. Because of the close association of Natives with land and their continuing requirement for subsistence use of fish and wildlife resources, these various organizations will be vitally interested in management programs or policies of the proposed Wildlife Refuge.

Land Status

LAND STATUS

LAND STATUS

The Alaska Native Claims Settlement Act (ANCSA) of 1971 provides the means whereby the Natives of Alaska will receive ownership of approximately 40 million acres of land within the State. To implement this Act the Secretary of the Interior has withdrawn certain lands from the public domain.

Village Selection Lands

Under provisions of ANCSA each eligible village will receive all lands within the township in which the village is located, and two to six additional townships, depending upon the village population. The Act directed the withdrawal of lands within each township which is contiguous to, or corners on, the township that encloses the village, and the withdrawal of each township which is contiguous to, or corners on, any of these lands. In general this means that up to 25 townships have been withdrawn for each village and that the village will receive ownership of from three to seven of these townships. The Act excluded lands in the National Park System and lands withdrawn for national defense purposes and limited selections from existing National Wildlife Refuges and National Forests to a maximum of three townships.

Because of geographic location and existing withdrawals, sufficient lands are not available adjacent to every village to permit withdrawal of adequate selection lands. To provide the opportunity for selection, additional withdrawals have been made from the public domain as village deficiency lands.

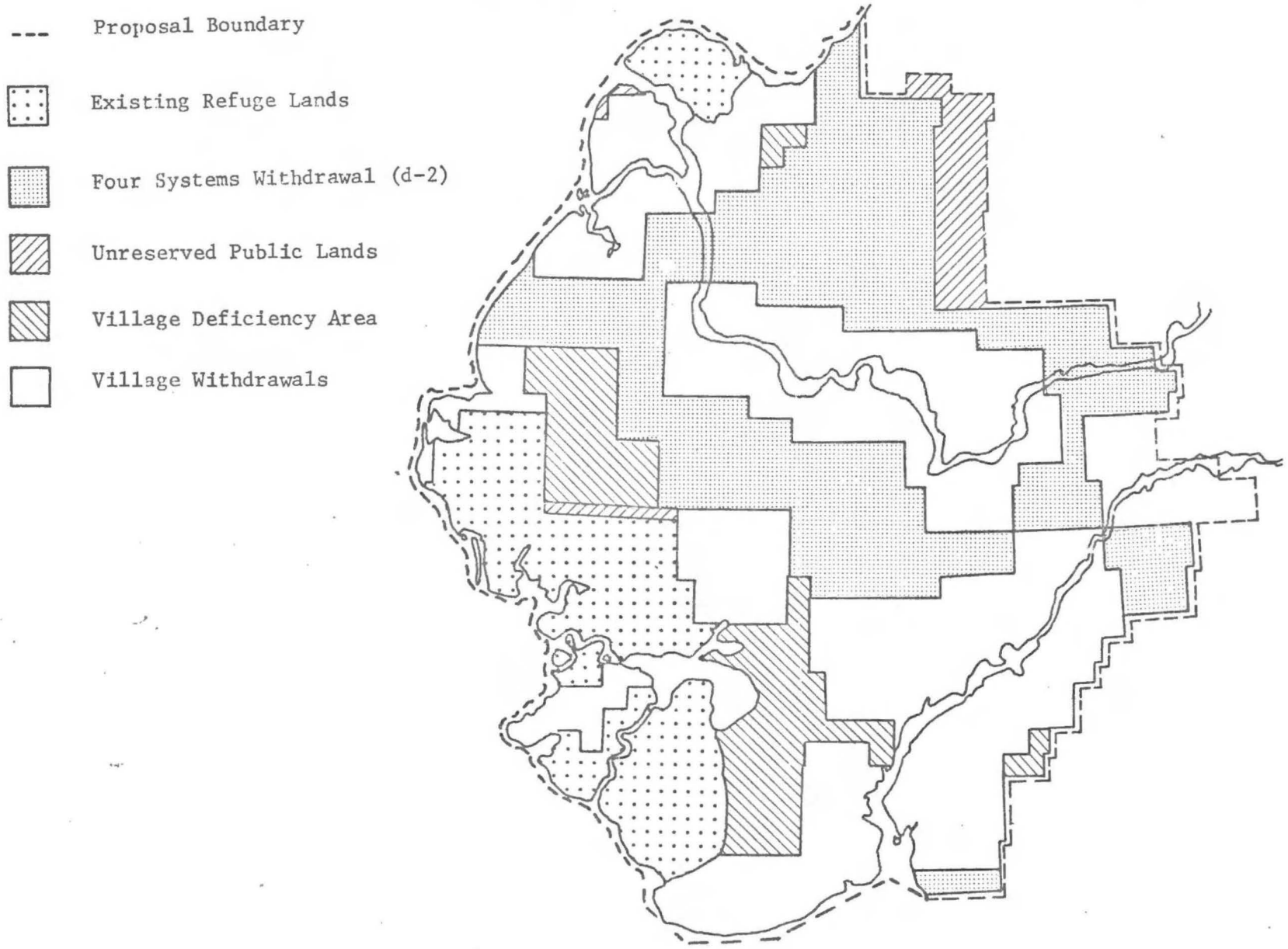


Figure 7. Withdrawal Classification of Proposal Lands

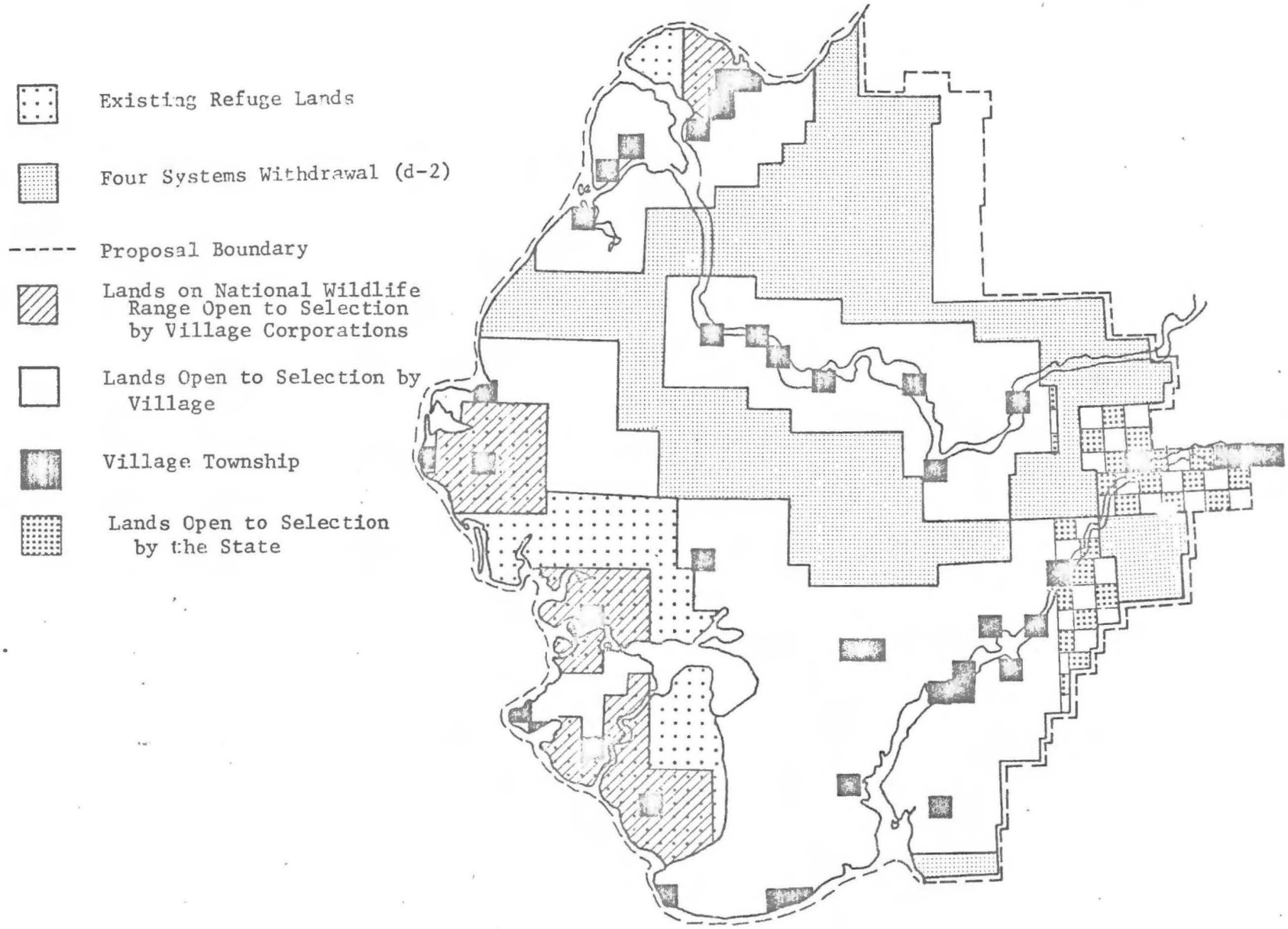


Figure 8. Potential Land Selections Within the Proposal

Village rolls have not been completed but an estimate of the village Native populations as reported in the 1973 enrollment report[51] indicates that 4,078,100 acres will probably be selected by the 42 villages listed in Table I.

Regional Selection Lands

ANCSA provides that the difference between the total Native entitlement and the lands selected by the villages shall be allocated among the regional corporations. The regional corporations may select unreserved lands from alternate townships within village withdrawals that the village does not select (Figure 8). Additional withdrawals have been made from the public domain for regional deficiency lands, but there are no regional deficiency lands within the Yukon Delta proposal area (Figure 7). Selection by the villages within Calista will probably approach the total Native entitlement with few selections being made by the regional corporation.

Conservation System Lands

ANCSA stipulates that up to 80 million acres of public domain may be withdrawn for possible addition to the four national conservation systems: the National Wildlife Refuge, Park, Forest, and Wild and Scenic Rivers Systems. The Secretary of the Interior has withdrawn approximately 80 million acres which are generally referred to as Section 17 (d) (2), or d-2, lands.

National Interest Lands

ANCSA also directed the Secretary of the Interior to review public domain lands in Alaska and determine whether any portion of these lands

TABLE I

NATIVE VILLAGE SELECTIONS

Village Name	Enrollment[1]	Probable Selection (revis.)
Akiachak	344	115,200
Akiak	197	92,160
Alakanuk	462	138,240
Andreafsky	78	69,120
Atmautluak	126	92,160
Bethel	1,918	161,280
Bill Moore's	0	0
Chanilliut	0	0
Chefornak	184	92,160
Chevak	459	138,240
Chukwuktoligamute	0	0
Eek	202	115,200
Emmonak	487	138,240
Hamilton	19	0
Hooper Bay	629	161,280
Kalskag[2]	158	92,160
Kasigluk	314	115,200
Kipnuk	354	115,200
Kongiganak	253	115,200
Kotlik	297	115,200
Kwethluk	464	138,240
Kwigillingok	228	115,200
Lower Kalskag[2]	164	92,160
Marshall	205	115,200
Mountain Village	502	138,240
Napakiak	256	115,200
Napaskiak	215	115,200
Newtok	142	92,160
Nightmute	124	92,160
Nunapitchuk	325	115,200
Ohogamiut	1	0
Oscarville	46	69,120
Pilot Station	325	115,200
Pitkas Point	83	69,120
Russian Mission	141	92,160
St. Mary's	286	115,200
Scammon Bay	181	92,160
Sheldon's Point	126	92,160
Toksook Bay	289	115,200
Tuluksak	193	92,160
Tuntutuliak	207	115,200
Tununak	318	115,200
TOTALS	11,302	4,078,100[3]

[1]Native enrollment as reported February 1973[51]

[2]Only a portion of the withdrawn lands for Kalskag and Lower Kalskag are located within the proposal boundary

[3]Two villages, Aniak and Little Russian Mission, are located near the proposal boundary and a portion of their withdrawal lands lie within the proposal.

should be withdrawn, under authority provided for in existing law, to insure that the public interest in these lands is properly protected. The Act further authorized the Secretary to withdraw any lands identified and to classify or reclassify any lands so withdrawn. The Secretary has withdrawn approximately 43,240,000 acres which are generally referred to as Section 17 (d) (1), or d-1, lands.

Refuge Replacement Lands

Section 22 (e) of ANCSA provides for the addition of public lands to the National Wildlife Refuge System to replace those lands selected by the village corporations. The Secretary of the Interior has withdrawn approximately 681,600 acres which are generally referred to as Section 22 (e), or 22-e, lands.

Native Allotment Lands[53]

The Alaska Native Allotment Act of 1906 authorized the Secretary of the Interior to allot individual Natives title to 160 acres in up to four separate tracts of lands they use and occupy. No improvements were necessary, and all that had to be certified was "substantially continuous use and occupancy." Although the Alaska Native Claims Settlement Act repealed the Alaska Native Allotment Act, more than 9,000 claims had already been filed. Very few of these claims have been finalized by issuance of a certificate of title. Persons with Native allotment claims pending now have the option of continuing a claim for certification or dropping their claims and obtaining title to land under the "primary place of residence" provisions of ANCSA.

The Bureau of Land Management is now recording and mapping these Native allotment claims; however, the records for any given township are subject to change as the task of mapping is completed. Allotment tracts totaling about 180,900 acres have been identified in the Yukon Delta Study Area.[5] The majority of these Native allotment applications are located along the Yukon and Kuskokwim Rivers and along the coast. The status of these applications is uncertain, but any claims finalized will have the status of private lands and will include a right of access.

State Selection Lands

The State of Alaska is entitled to select lands under provisions of the Alaska Statehood Act (72 Stat. 339). These selections are restricted to unreserved public domain lands. Within village withdrawals, selections are further restricted by ANCSA to those townships not available for selection by the regional corporation. Public Land Order 5184 withdrew all Native selection lands between 58°N and 64°N latitude, and west of 161°W longitude, from selection by the State of Alaska. These conditions limit State selections within the proposal boundary to 43 townships as shown in Figure 8.

Yukon Delta National Wildlife Refuge Lands

The Yukon Delta Refuge proposal evaluates approximately 19,355,200 acres of lands, including about 2,753,700 acres of the present Clarence Rhode National Wildlife Range and the Hazen Bay National Wildlife Refuge, about 215,500 acres of refuge replacement (22-e) lands, about 5,725,700 acres of conservation withdrawal (d-2) lands, about 664,400 acres of unreserved public domain, about 1,740,200 acres of village deficiency lands, and

about 8,255,700 acres of village selection lands. Only those Native withdrawals that are not selected by the village corporations, regional corporation, or by the State would be included in the proposed refuge. Excluded from the figures above are 38 townships within the proposal boundary in which Native villages are located since they must be selected by the village corporations.

The proposal surrounds withdrawals for selection by 40 villages, four parcels of village deficiency withdrawals, and includes a portion of another withdrawal for selection by two additional villages. Because of their high wildlife values, all of these lands within the proposal boundary as shown in Figure 8 which are not selected by Native corporations or by the State should become a part of the National Wildlife Refuge System.

ANCSA states that the Secretary of the Interior may withdraw and convey to the appropriate regional corporation fee title to existing cemetery sites and historical places located outside of the Native withdrawals. The Act apparently intends that these sites be identified within four years of the date of enactment [Section 22 (h) (1)]. Any sites within the proposed refuge that are not identified by the regional corporation will receive protection under provisions of the Antiquities Act (34 Stat. 225).

Existing Land Commitments[58]

Approximately 2,142,700 acres of navigable water lie within the boundaries of the proposal. Lands under these waters are in State ownership and

this acreage was not included in the figure estimating the size of the Yukon Delta Refuge.

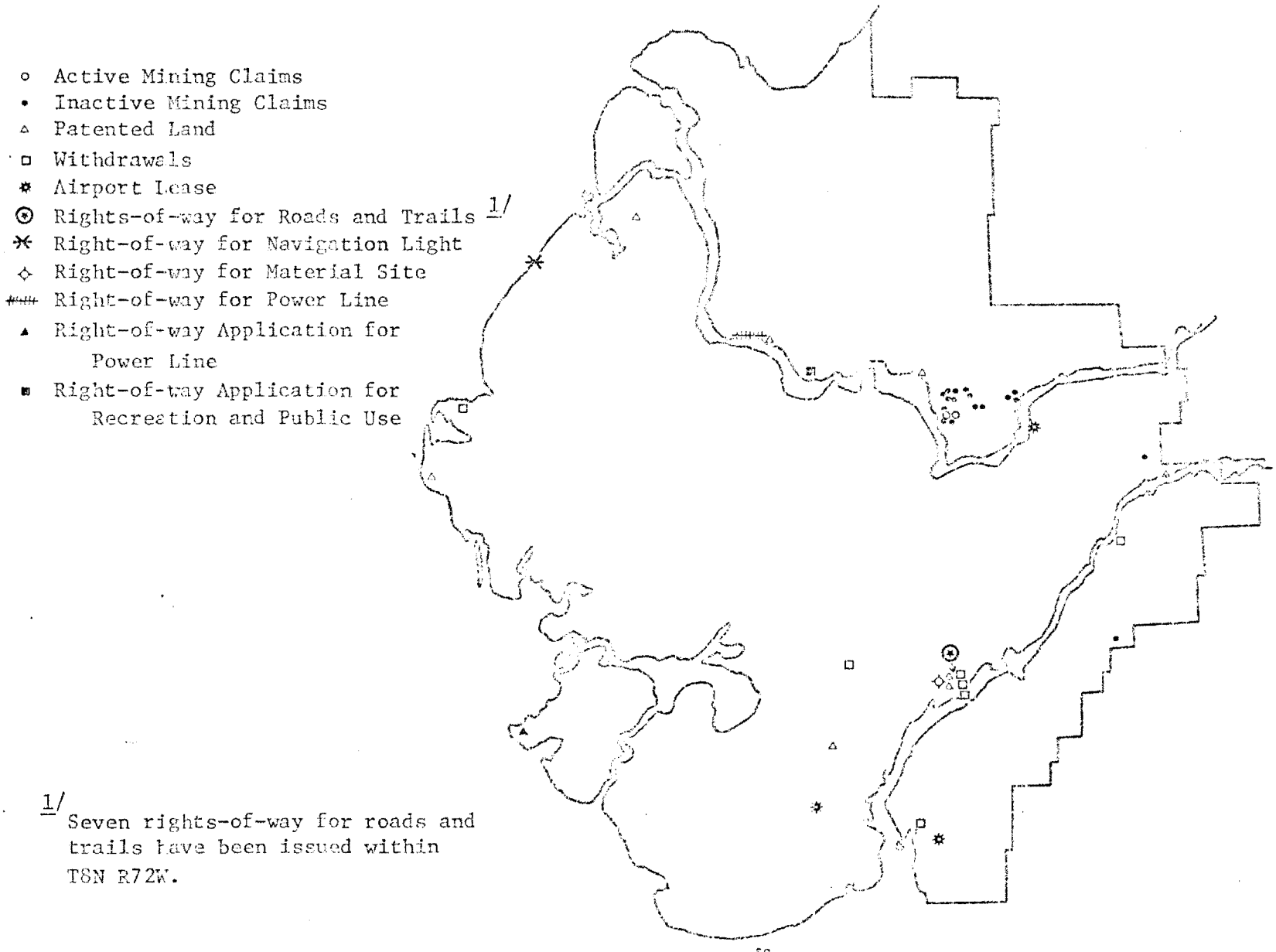
There are eight tracts of patented lands within the proposal boundary. These lands include a total of 5,200 acres and are all located within village withdrawals (Appendix F).

A withdrawal of 40 acres that was made for State school lands is located within conservation system lands as shown in Figure 9.

Eight withdrawals have been made from village selection lands: 4,900 acres for use of the Department of the Air Force for military purposes; two tracts totalling 3.22 acres for use of the Department of the Army as National Guard sites; 3.90 acres as State school lands; 53.22 acres at two sites for use of FAA for air navigation aids; and 28.50 acres for the Bureau of Land Management to use as an administrative and fire control site. These tracts are shown in Figure 9.

Three leases have been issued within the proposal, all to the State for airport facilities and all located within village withdrawals. These leases include a total of 177 acres and are shown in Figure 9.

Nine rights-of-way have been issued within the proposal boundary. A 0.13-acre right-of-way has been issued to the Coast Guard for a navigation light within refuge replacement lands. The remaining eight rights-of-way are all located on village withdrawal lands: one totalling 12,034 acres to the Alaska Village Electric Cooperative Inc. for distribution lines; one to the State of Alaska for a 48.35-acre material site; and six to the



1/ Seven rights-of-way for roads and trails have been issued within T8N R72W.

Figure 9. Land Commitments[58]

Bureau of Land Management for trails and access roads (Appendix F). A right-of-way application has been filed by the Alaska Village Electric Cooperative Inc. for a distribution line and an application has been filed by the State of Alaska for recreational and public purposes. Both of these applications are on village withdrawal lands.

No oil and gas lease has been issued within the proposal; however, applications have been filed on approximately 2,410,725 acres within the boundary. The intent of these applications is to establish priority rights for the applicant should the area be opened to leasing at some future date.

There are no patented mining claims within the proposal. Mining claims within Alaska are filed with local magistrates at 32 locations. The Bureau of Land Management has no record of unpatented claims within the proposal. Mineral Industry Research Report Number 2, dated 1972,[27] lists 19 unpatented mineral claims within the area of interest (Figure 9). These include 13 for placer gold; two for gold and silver; one for gold and platinum; one for gold, platinum, and silver; one for gold, lead, and molybdenum; and one claim with the commodity unknown. The validity of these claims is unknown with all but two of the gold claims shown as inactive. Other recorded claims may be present. Valid mining claims have access rights and access to any of the known claims would cross proposal lands. A validity determination of these and any unrecorded claims should be made.

Village residents utilize timber as building materials and as firewood. Neither use is for commercial purposes and there are no timber harvesting permits within the proposal. There is no grazing within the proposal boundaries.

The withdrawal status of lands adjacent to the proposal is shown in Figure 10.

Establishment of the Yukon Delta National Wildlife Refuge would be subject to any of the above rights and uses which are determined to be valid.

Transportation

To date, surface transportation within the Delta has been limited to boats, dog teams, snow machines, and other off-road vehicles. Because there are no roads or highways connecting the villages, use of such modes of transport as mentioned above is of economic necessity, and implies a commitment for continued access through the proposed refuge by this means.

Small ships and large barges go up the Kuskokwim River as far as Bethel. Two transport companies are licensed by the United States Coast Guard to move smaller barges up the river northeast of Bethel. From late May until early October, Eggleston Towing and United Transportation Companies make a combined total of 45 to 50 barge trips northeast of Bethel. Thirty of these reach McGrath and one goes to Nikolai, which is on the South Fork of the Kuskokwim.

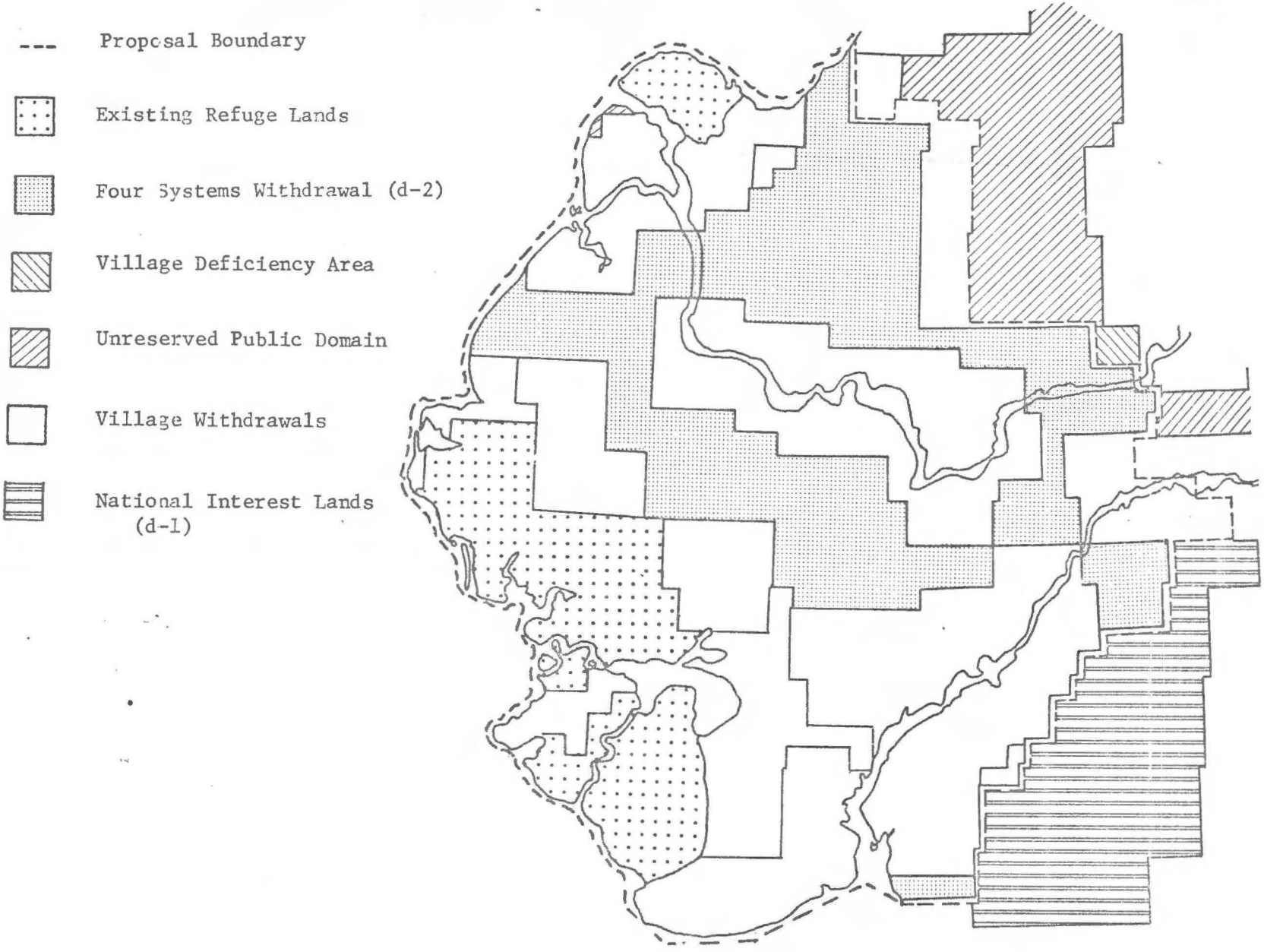


Figure 10. Withdrawal Classification of Lands Adjacent to Proposal

Barge traffic through the proposal area via the Yukon River is limited to two trips per year. The Yutana Barge Line travels down river from Nenana to Marshall.

Air transportation is a major means of delivering freight to the Delta villages. It is also the major transportation mode for white travelers. With Bethel serving as the air center, Wien Consolidated Airline serves most of the area's villages at least weekly. Munz Airline also provides charter service to a few of the villages, including Bethel. Airports are generally located within village townships, hence, do not represent a commitment of refuge lands.

The State of Alaska envisions the need for a road entering the proposal area from the southeast and ending in Bethel. This would connect east of the proposed refuge with a north-south road going from Dillingham to Fairbanks. Neither road has been formally proposed.

The State also predicts the need for two supplemental roads through the proposal area. One would go from Holy Cross to Scammon Bay on the coast. It would then go south along the coast to the Kuskokwim River and up the river to a point north of Aniak. The other supplemental road would go down the Kuskokwim River and Bay from Tuluksak to Platinum. Unless unforeseen resource developments should occur within the region, the low economic potential of the area suggests that these roads are unlikely to be constructed.

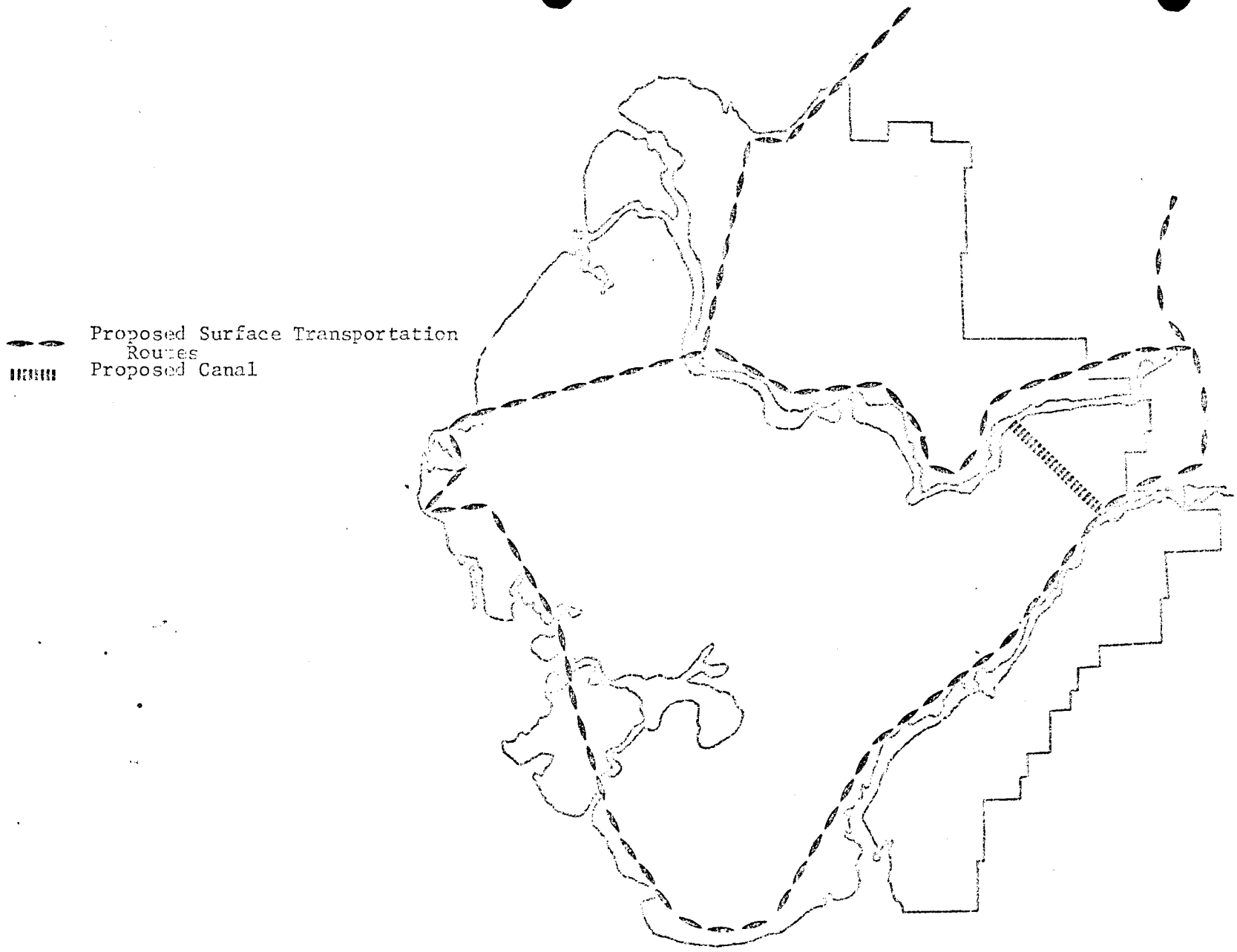


Figure 11. Proposed Transportation Routes

Suggestions for improvement of water transportation have included dredging shallows of the Kuskokwim River and connecting the Yukon and Kuskokwim Rivers by a barge canal in the vicinity of Kaltag. These possibilities have not been formally proposed by any government agency.

RESOURCES

Water

The abundance of water in lakes and streams is the most significant characteristic of the Delta: in many areas water covers more than half of the land surface. Water-based resources, principally fish and wildlife, historically have dominated the economy of the area, providing a major source of food, determining the location of villages, and dictating primary routes and means of transportation.

Rivers and Streams

The Yukon and Kuskokwim are the dominant rivers of the Delta. Their sources and major tributaries are several hundred miles from the Delta--the Yukon begins at Marsh Lake in Canada, 2,300 miles from its mouth. The Kuskokwim begins near Lake Minchumina in Interior Alaska more than 350 miles from its mouth and drains the adjacent slopes of the Alaska Range and Kuskokwim Mountains. Thus, climatic events in remote regions may cause changing water levels on the lower rivers and may have significant influence on the Delta. All other rivers flowing through the Delta are relatively short and have headwaters in adjacent mountains or are contained entirely within the Delta lowlands. Eastward the Kenektok, Eek, Kwithluk, Kisaralik, and many smaller streams flow from the Kilbuck Mountains into the Kuskokwim River or Bay. These streams are relatively straight, clear, and swift. Water levels may fluctuate violently as a result of snowmelt or summer rains. In the vast lowland area between the Yukon and the Kuskokwim Rivers, meandering streams such as the Kvichak,

Gweek, Pikmiktalik, and Tagayaruk are relatively sluggish, having insignificant elevation between their headwaters and mouth. Water levels are relatively stable, and by midsummer sections of many may become choked with aquatic vegetation. Still other types of rivers are characteristic near the coast. Here, several large rivers--the Kokechik, Kashunuk, Aphrewn, Manokinak, and Azoon--are former channels of the Yukon. Inland, these may be similar to other rivers of the lowlands, but as a result of tidal currents which surge inland twice daily, they broaden into major estuaries 30 to 40 miles upstream from their mouths. Numerous smaller tidal streams drain adjacent lowlands. During high tides or storm tides, waters flow inland in these channels and flood much of the coastal habitat.

Drainages north of the Yukon River empty into the Yukon without flowing through lowlands of the Delta. Two river systems, the Andreafsky with its East Fork, and the Atchuelinguk are of importance. The Andreafsky is a clear-water stream of about 120 miles length, occupying a narrow mountain valley and flowing southward to enter the Yukon at St. Mary's. It has been recommended for study as a potential Wild and Scenic River by several Bureaus of the Department of the Interior as well as by the State of Alaska.[7] The mouth of the river and the lower six miles of its course are within the village township of St. Mary's, but the remainder of its course is within the proposed Wildlife Refuge. The Atchuelinguk River flows parallel to the Andreafsky 20 to 30 miles to the east. About half of its course is within the proposal area including lower portions where it enters a large valley with numerous lakes of significance as

nesting areas for waterfowl. Both streams contain grayling, northern pike, and whitefish and are important spawning areas for salmon.

Lakes and Ponds

No attempt has been made to count the number of ponds and lakes, or miles of stream except on a small portion of the Delta located within the Clarence Rhode National Wildlife Range. In this area of about 1.8 million acres--less than a tenth of the total Delta--63,000 lakes and ponds are shown on topographic maps. These average about 15 acres, and in aggregate, equal the area of dry land.[61] A majority (55,000) are less than 10 acres, and ground checks indicated many others were too small to map. Fifty lakes are over 640 acres in size, and the largest is 25,000 acres. Within the same area are more than 5,000 miles of rivers and streams (Table II). The entire Delta probably contains more than 500,000 lakes and ponds.

Lakes and ponds of the Yukon Delta are uniformly shallow, few exceeding a depth of six feet, and even large lakes may average less than one or two feet deep. In other characteristics--size, water supply, origin, and productivity--lakes and ponds may vary significantly. Those in the most recent fluvial and deltaic deposits of coastal areas are generally small and result from natural depressions left during formation of the Delta or subsequent changes in river channels. Water supply of most such lakes and ponds depends primarily on snowmelt and on tidal flooding. By midsummer some smaller coastal ponds may be dry or contain only shallow puddles.

Lakes in geologically older parts of the Delta are generally much larger than those in coastal regions and are formed primarily in

TABLE II

WATER AREAS ON CLARENCE RHODE NATIONAL WILDLIFE RANGE[61]

Total Area, Land & Water *		
Square Miles		2,922
Acres		1,870,000
Lakes & Ponds		
Total Number		62,700
Average Size in Acres		15
Total Area in Acres		940,000
Number by Size Class		
Less than 10 acres		55,200
10-320 acres		7,200
320-640 acres		150
Over 640 acres		50
Largest in Acres		25,000
Streams		
Major (Miles)		400
Medium		1,400
Minor		3,500
	Total	5,300

* Area considers only that within the original boundaries of the Wildlife Range.

depressions caused by thawing of frozen ground. Such lakes are best illustrated in the region near Kasigluk west of Bethel where old stream channels and brush that lined their shores are still visible through the clear water of the expanding lake basin. Smaller lakes are generally in closed basins having no inlet or outlet, but larger lakes are drained. Along major rivers, oxbow lakes or remnants of former river channels may predominate.

Ponds in coastal areas are nearly all brackish, the degree of salinity depending on frequency of flooding and distance from the sea. Most waters, both coastal or inland, are brown from organic stains. Similarly, many are infertile and relatively unproductive of plant or invertebrate life because nutrients are quickly absorbed by vegetation. Waters in the warmer, inland parts of the Delta are somewhat more fertile because of the more rapid decomposition of plants releasing nutrients.

Recreational Use

Recreational use of lakes and streams is negligible except for the Kisaralik and Kwithluk Rivers which are accessible by boat from Bethel. In addition, the Andreafsky River and its East Fork have Wild and Scenic River potential. Because of generally unfavorable summer weather, poor accessibility to most lakes, and generally monotonous landscapes, it is unlikely that recreational canoeing or boating will increase significantly. Primary use of waterways will be as routes of transportation for subsistence hunters or fishermen or for travel between villages.

Potential Hydroelectric Development

The low relief of the Yukon Delta precludes the existence of sites for potential hydroelectric developments. Within the area none have been identified by the Alaska Power Administration.

Soils

Most of the region of the Yukon Delta is covered by deep deposits of fine alluvial or eolian silts resulting from the meandering of the ice-age Yukon and Kuskokwim Rivers. Glacial deposits are found only near mountains as in the foothills of Kilbuck Range or interbeded with alluvial deposits to depths of 400 feet. Within the study area exposed bedrock may be found in mountains north of the Yukon River and locally in coastal regions where basalt, rhyolite, tuff, or granitic rocks are exposed on Nelson Island, in the Askinuk Mountains, and on several small volcanic hills scattered from Kuskokwim Bay to the Yukon (Figure 12).[60]

Most soils of the Yukon Delta have developed from fine alluvial or eolian silts. Surface layers usually are characterized by undecomposed organic materials (peat) which are acidic and low in nutrients. The organic material at the soil surface acts both as a sponge and an insulating blanket and subsurface horizons are frequently wet and cold. Permafrost is continuous and may be encountered at a depth of a few inches. Where organic layers are undeveloped or have been destroyed, the thawed surface layer may reach a depth of several feet by late summer. Below the active layer, permafrost may extend to a depth of 200 to 600 feet.

The fine alluvial or eolian materials on which soils are formed are conducive to rapid erosion when unprotected by vegetative cover. Streambanks

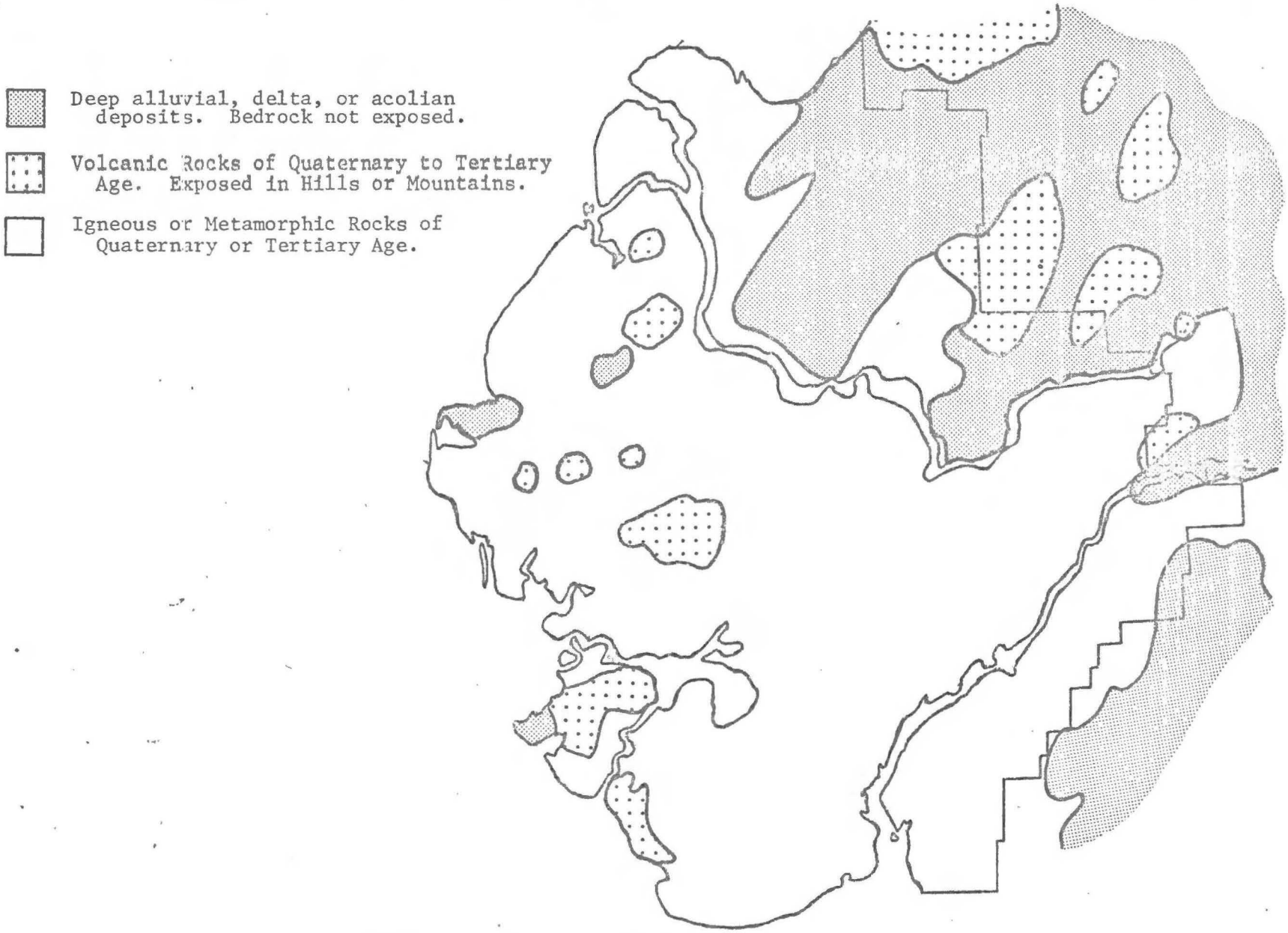


Figure 12. Geologic Formations[63]

may be cut or rapidly altered during periods of high water. West of Bethel, sand blowouts have formed in ancient dunes. However, over most of the region the dense vegetative cover and low gradient act to prevent erosion.

Soils are generally infertile, particularly in tundra areas where cool temperatures prevent decomposition of organic material and release of nutrients. At Bethel, attempts at gardening have met with indifferent success, and garden soils must be conditioned and supplied with large amounts of fertilizer. Gardens and lawns in inland portions of the Delta are generally more successful, but the potential for extensive agriculture is nil.[30] Agriculture as normally conceived in temperate regions of the United States is not possible. A potential for small scale market gardening exists in some areas, but sale of products, even in the Delta region is unlikely to be competitive with products imported from other regions of Alaska or the contiguous states.

Vegetation

Dominant vegetation of the Yukon Delta is typical of Arctic tundra. Woodland vegetation is found in regions bordering streams and in inland areas where summer temperatures are higher (Figure 13). Aquatic vegetation includes species common to northern regions where waters are frequently acidic and infertile although nutrient-rich lakes occur. Within each vegetative association, considerable variation may occur.

Forest fires are uncommon in contrast to the much drier interior basins. Lightning storms, a primary cause of fire in interior forests,

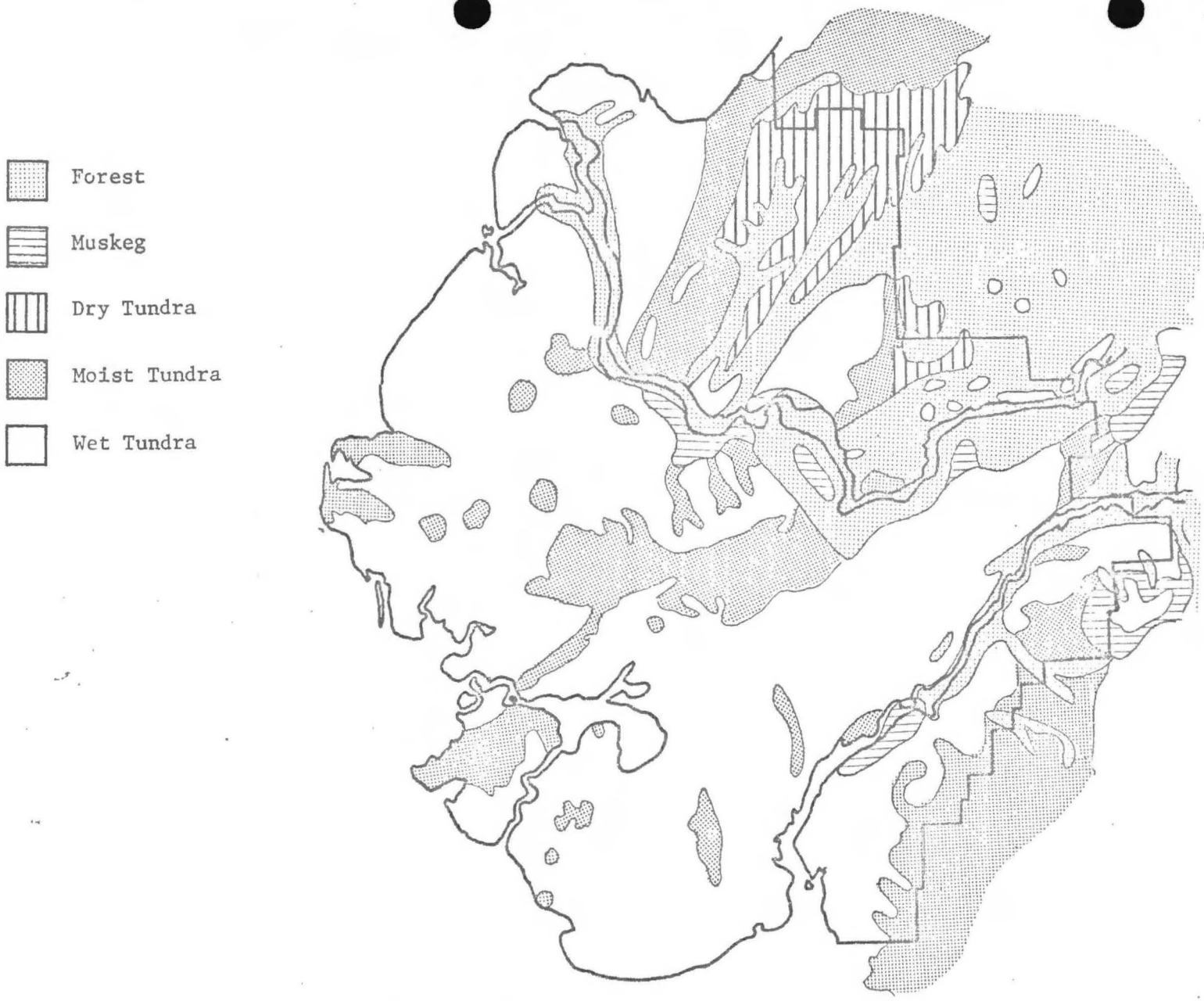


Figure 13. Vegetation[60]

also are less frequent. Tundra fires are rare: when they occur, they usually burn only small areas before dying. Suppression is seldom necessary.

Tundra

Despite its superficial monotony, heath tundra is one of the most complex of vegetative associations. Minute variations in exposure, drainage, or disturbance cause marked change in species composition. As many as 50 plant species may be found within an area of a few feet. Heath tundra is formed in all uplands. Margins between heath and vegetation of tidal meadows, marshes, or lake or stream shores may be abrupt due frequently to changes in elevation of a few inches.

Heath tundra is characterized nearly everywhere by a moss and lichen mat on which other plants are superimposed. Various sedges and grasses are abundant. In depressions or poorly drained areas, cotton grass may dominate. Woody plants usually are restricted to prostrate or dwarf shrubs such as dwarf birch or willows. Berry-producing shrubs such as blueberry, lingenberry, crowberry, and cloudberry are common.

Coastal portions of the Delta are scarcely above sea level and frequently inundated by tides. Vegetation on such areas is more homogenous than heath tundra. A single low-growing sedge usually dominates, but other sedges, grasses, and forbes are abundantly dispersed within the dominant type. Where tidal lowlands are intersected by sloughs, spear and beach rye grasses, both tall and coarse, are prominent. Otherwise, the general appearance of tidal lowlands is on an ill-kept lawn.

Marsh and bog vegetation is of limited occurrence over much of the Delta, usually found in narrow zones adjacent to lakes. However, large areas of marsh are found just north of Baird Inlet. In marshes, large, coarse sedges are particularly common and may grow as emergent species or in wet areas on shore. Bog mats surrounding some lakes or filling depressions are primarily of sphagnum with marsh cinquefoil, buckbean, cotton grass, and various sedges superimposed.

The entire region of the Yukon Delta is of potential value for grazing reindeer. Numbers of reindeer would undoubtedly be limited by the amount of winter range which comprises a small fraction of the total area. Conflict between grazing by reindeer and production of waterfowl would occur, but could be minimized by appropriate herding practices.

Grazing by cattle, sheep, or other domestic stock is precluded by the harsh winter conditions and inability to grow supplementary winter forage crops within the area.

Aquatic

Aquatic vegetation is sparse and poorly developed compared with that of ponds and lakes in the warmer solar basins of Interior Alaska. In coastal areas narrow-leaf pondweeds are common and mare's tail may grow profusely in shallow ponds. Some lakes and ponds, however, may be almost devoid of submerged vegetation. Duckweek, burreed, and bladderwort are found commonly in bog lakes. Emergent vegetation usually is limited to tall sedges or, occasionally, horsetail. In many lakes sedges grow in a patter of concentric circles or in rows paralleling the shore. This pattern results

When nitrogen is depleted in the initial area of growth, and plants extend gradually outward into new soil but die in their original site. This diagramatically illustrates the infertility of the water and underlying lake basin.

In inland portions of the Delta, east of Bethel, and along the Yukon River, where temperatures are higher or where soils may be better, growth of aquatic vegetation is much improved and dense beds of aquatic plants occur in many lakes. These usually consist of pondweeds of several species. Bog lakes with stable water levels may contain extensive beds of water lilies. Muddy edges or bottoms of drying lakes throughout the Delta may contain extensive stands of marsh marigolds or marsh fleabane.

Woodland

Less than 10 percent of the Delta is forested (Figure 13). In the central Delta and along the Kuskokwim River, forest growth begins upstream in the vicinity of Bethel, approximately 100 miles from the coast. Along the northern edge of the Delta, however, a narrow band of forest fringes the Yukon River nearly to the Bering Sea. Elsewhere, woody growth is limited to dwarf or prostrate shrubs of the tundra; or occasionally, in protected areas along lakes or hillsides, small clumps or fringing stands of alder or willow brush grow but seldom exceed 10 feet in height.

Riparian woodland along the Yukon and Kuskokwim Rivers and other streams consists primarily of willow and cottonwood in their lower reaches. Inland, black spruce, white spruce, tamarack, birch, and aspen become increasingly important. Much of the forest growth is in relatively small stands interspersed by scrub growth or areas of muskeg or tundra. Few stands are

extensive, and trees are generally of small size, much branched, and of little commercial value.[29] Esthetic values, however, are considered significant as woodlands support populations of birds and other wildlife not found elsewhere on the Delta.

Small strands of potentially marketable timber occur only along the Yukon and Kuskokwim Rivers. Stands are generally of inferior quality and total volume is low. Except for limited local application, commercial utilization of timber resources within the area is not feasible.

Minerals

There are no known mineral deposits in the vast lowland area between the Yukon and Kuskokwim Rivers, nor are there reports that suggest a significant potential for discovery of minerals in this area.[59]

There are no identified mines or prospects within the area of the d-2 withdrawal. Prospects and mines within the area of village withdrawals include only small gold placer deposits near the villages of Marshall and Russian Mission. These areas have little recorded mineral production and only two claims are presently active.[27]

East of the Kuskokwim River several claims or deposits have been located, but none are within the proposal area. Mining activity has terminated where placer deposits of gold, silver, and platinum were formerly worked.

A potential metalliferous province identified by the Bureau of Mines extends along the eastern boundary and protrudes into the area slightly.[21]

Other potential metalliferous provinces include the Askinuk and Kusilvak Mountains near the outer Delta and the Yukon Mountains in the northeast part of the proposed refuge area (Figure 14).[21] Locatable minerals occur within each of the provinces east of the Kuskokwim and north of the Yukon Rivers.[27]

Coal bearing rocks have been identified on Nelson Island within the study area. These are sub-bituminous and of no commercial value.[56] [18]

Recent increase in the value of gold has heightened interest in Alaska mining and may result in further exploration of areas surrounding proposed refuge lands. It is not anticipated that such potential developments will conflict with refuge objectives.

Petroleum

The entire Yukon Delta lies within a sedimentary basin that is a potential petroleum province (Figure 15). Four test wells were drilled approximately 30 miles west of Bethel between 1959 and 1961.[10] All proved dry and were abandoned. The deepest was stopped at nearly 15,000 feet in Cretaceous sediments and had penetrated 30 feet of porous rock containing some indication of oil. There has been no further drilling within the proposal area. Surface geology and geomagnetic studies have been conducted more recently, but data or conclusions from these studies have not been released.

Geothermal

An area having potential for geothermal steam has been identified by geological inference in the easternmost part of the area. Considerable

1 Currently producing mines or once productive deposits

2 Known mineral occurrences or high metal resource potential

3 Considered favorable for metal resources

Figure 14. Possible Metalliferous Provinces[54]

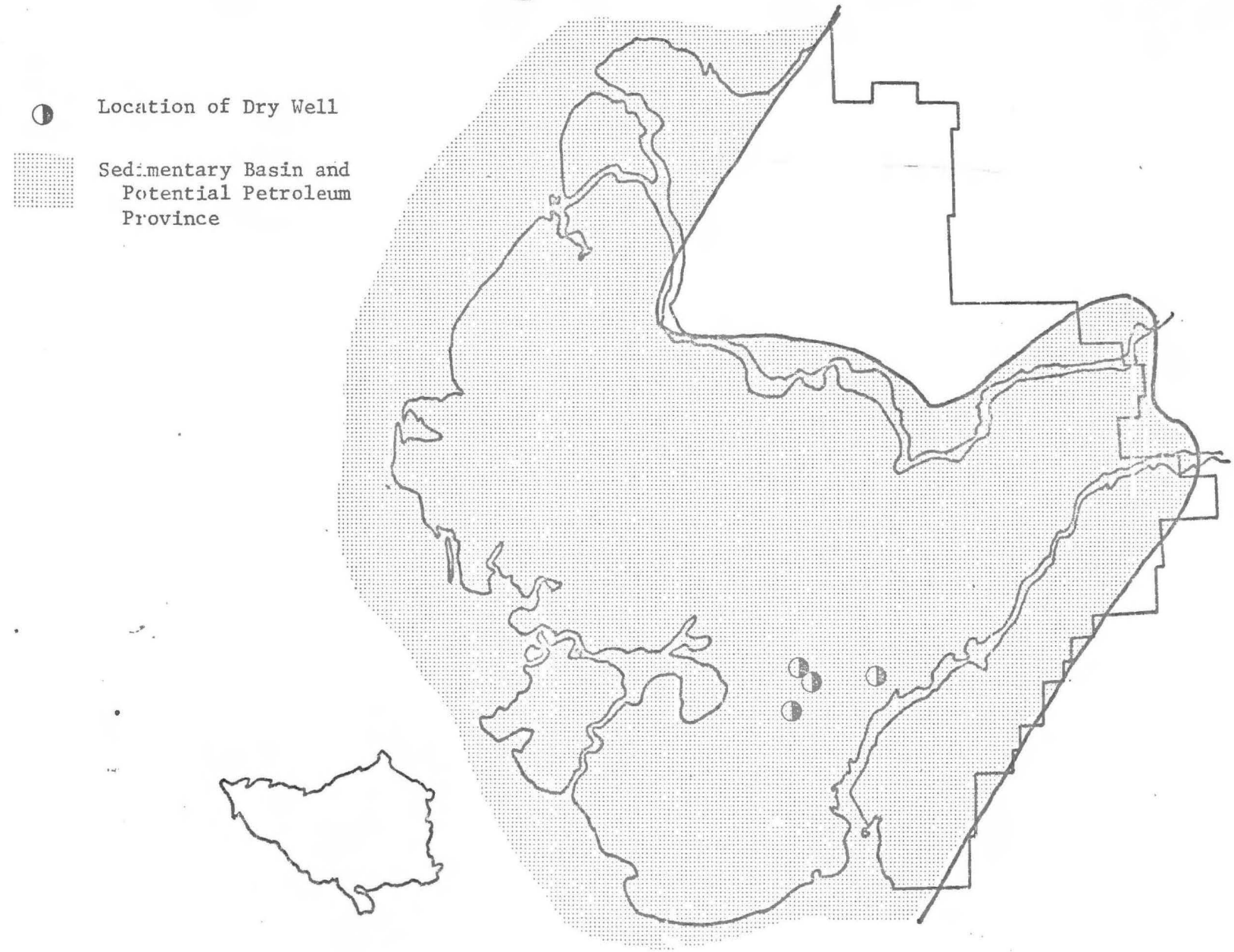


Figure 15. Possible Petroleum Province[10 30]

further exploration would be necessary to determine whether or not geothermal development would be feasible.[55]

Wildlife

Birds

A total of 170 species of birds have been observed on the Yukon Delta. Of these, 136 species probably nest there, and many are common migrants. A few visitors from Asia have been recorded infrequently. Only 13 species are year-round residents. During migration, some birds from the Yukon Delta probably reach most provinces of Canada, every state in the United States, every state of Mexico, all countries in Central and South America, Antarctica, all Pacific Islands, all Asian countries bordering the Pacific, Australia, and New Zealand (Appendix B).

Birds on the Delta are divided into 31 families of which 20 are land birds and 11 are water birds. However, 100 species and the great majority of individuals are associated with the aquatic habitats which distinguish the Delta.

WATERFOWL: Nearly three million waterfowl departing the Delta each fall constitute a recreational and economic resource of major international importance. Primary benefits accrue in regions far from the Delta--the other 49 States, Canada, Mexico, and the Soviet Union (Tables III-V).[32]

Field studies of waterfowl began in 1878 with the work of E. W. Nelson.[38] Nelson's work is still of historical interest, and many of his observations have not been duplicated. Bureau of Biological Survey personnel first visited the area in 1924 when a number of waterfowl were banded. A

TABLE III

WATERFOWL POPULATIONS OF THE YUKON DELTA[32 61]

Species	Breeding Population a/	Percent Composition	Percent of Continental Population c/
Swans			
Whistling	40,000	100	45
Trumpeter	t	t	t
	40,000	100	
Geese			
Cackling goose	100,000	17.4	100
Taverner's Canada goose	50,000	8.7	30
Black brant	100,000	17.4	60
Emperor goose	125,000	21.7	80
White-fronted goose	200,000	34.8	65
Snow goose	t	t	--
	575,000	99.9	
Ducks			
Mallard	33,500	2.6	0.3
Pintail	287,000	22.6	4.9
Green-winged teal	44,000	3.5	1.5
Widgeon	43,300	3.4	1.2
Shoveler	5,000	0.4	0.3
Redhead	100	t	t
Canvasback	1,200	0.1	0.2
Scaup (2 spp)	335,000	26.3	5.0
Goldeneye (2 spp)	20,500	1.6	2.8
Bufflehead	2,500	0.2	0.3
Oldsquaw	292,000	23.0	18.8
Eider (4 spp)	51,000	4.0	--
Scoter (3 spp)	157,000	12.3	14.3
Merganser (2 spp)	200	t	t
	1,272,300	100.0	
Total Breeding Population	1,887,300		
Projected Fall Flight, Adults and Young b/			
Swans	50,000		
Geese	720,000		
Ducks	2,292,000		
	3,062,000		

a/ Breeding populations for swans and geese are estimated from winter inventories as well as from general information and surveys on the Delta. Estimates for ducks are based on averages for aerial censuses conducted each spring for the 14-year period 1957 to 1970 (Figure 15). Eiders are not sampled adequately and the Delta population probably exceeds 100,000.

b/ Fall flights are estimated by adding the average number of young produced to the breeding population. The figures do not include migrants which occur briefly on the Delta in spring and fall.

c/ Estimates for percentage of continental population are based on aerial censuses conducted throughout North America for the same period as on the Delta. Continental data for oldsquaw probably reflect underestimated populations; hence, the proportion indicated for Yukon Delta may be high. No estimates for continental populations of eiders are available.

TABLE IV

WATERFOWL BANDED ON THE YUKON-KOSKOKWIM DELTA[32]

Species	Banded		Recovered	
	Number	Percent of Average Population	Number	Percent of Number Banded
Whistling swan	447	1.1	41	9.2
Geese				
Canada goose	240	0.5	41	17.1
Cackling goose	5,060	5.1	666	13.2
Black brant	24,213	24.2	2,490	10.3
Emperor goose	779	0.8	16	2.1
White-fronted goose	4,945	4.9	584	11.8
Snow goose	16		3	18.8
	35,253		3,800	10.8
Ducks				
Mallard	1	0	0	0
Pintail	154	t	13	
Green-winged teal	2	0	0	0
Widgeon	0	0		
Shoveler	0	0		
Canvasback	50	4.0	7	14
Greater scaup	2,295	0.7	169	7.4
Lesser scaup	31	0.1	2	6.5
Common goldeneye	108	0.5	3	2.8
Barrow's goldeneye	6	t	1	16.7
Bufflehead	204	8.0	6	2.9
Oldsquaw	1,791	0.6	31	1.7
Steller's eider	22		2	0.9
Common eider	4	t	0	0
Spectacled eider	124	0.4	1	0.8
Common scoter	1	t	0	0
	4,713		235	5
Total all species	40,493		4,076	10.1

TABLE V

DISTRIBUTION OF RECOVERIES FROM PRINCIPAL SPECIES OF WATERFOWL BANDED ON THE YUKON DELTA[32]

Area of Recovery	Canada Goose	Cackling Goose	Black Brant	Whistling Swan	White-Fronted	Pintail	Greater Scaup	Oldsquaw
Alaska								
Banding location	6	70	218		33		28	17
Other location		1	257	1	10	1	1	
	6	71	475	1	43	1	29	17
Pacific Flyway								
Washington	5	25	194	3	3		21	
Oregon	8	139	27		15	1	3	
Idaho		1		1				
California	21	423	1025	16	471	8	35	
Nevada				2	1			
Utah	11							
	34	589	1246	33	490	9	59	0
Central Flyway								
Montana							1	
South Dakota			2					
Nebraska		1			1			
Colorado			1					
Texas				1			1	
	0	1	3	1	1	0	1	0
Mississippi Flyway								
Wisconsin							4	
Michigan							11	
Iowa				1				
Illinois							1	
Louisiana							1	
	0	0	0	1	0	0	17	0

TABLE V (CONT'D)

Area of Recovery	Canada Goose	Cackling Goose	Black Brant	Whistling Swan	White-Fronted	Pintail	Greater Scaup	Oldsquaw
Atlantic Flyway								
Connecticut							4	
Rhode Island							1	
New York							19	
New Jersey							8	
Maryland							7	
Virginia							2	
Georgia				1				
				1			41	
Total United States	40	661	1734	37	534	10	148	17
Canada								
Yukon						1		1
Northwest Territories			31					
British Columbia		5	296	4		1	8	
Alberta				1				
Saskatchewan					2		1	
Manitoba							1	
Ontario							8	
Quebec							3	
		5	327	5	2	2	21	1
Mexico	1		394		2	1		
Central America			1					
USSR			43					13
TOTAL ALL AREAS	41	666	2489	41	538	13	169	31

reconnaissance survey in 1941 filled in further details, but extensive studies did not begin until 1949. Aerial surveys and/or ground studies conducted annually since then resulted in establishment of the Clarence Rhode National Wildlife Range in 1960. This Wildlife Range encompasses habitat that includes the primary nesting area for black brant and cackling and emperor geese. Up to 759,000 acres of critical habitat for these species will be deleted from the Wildlife Range under provisions of ANCSA.

With establishment of the Wildlife Range, work on waterfowl was expanded: censuses and production surveys were extended; definitive studies on the ecology of several species were initiated; and banding programs were refined. More than 40,000 banded waterfowl have produced 4,076 recoveries to date (Tables IV-V).[61]

The Delta produces about 80 percent of the swans of the Pacific Flyway and part of those migrating to the Atlantic Flyway. It produces nearly all of the white-fronted geese of the Pacific Flyway, more than half the continental population of black brant, 80 percent or more of emperor geese, and all of the cackling geese. Probably there is no area of similar size as critical to so many species.[26 32 40 45]

Ducks are three times as numerous as geese. Greater scaup, oldsquaw, and pintail are the most numerous species, comprising more than 70 percent of the population (Table III). Other species forming an important segment of the population are the common scoter, green-winged teal, mallard, and widgeon. Common and spectacled eiders probably are much more numerous

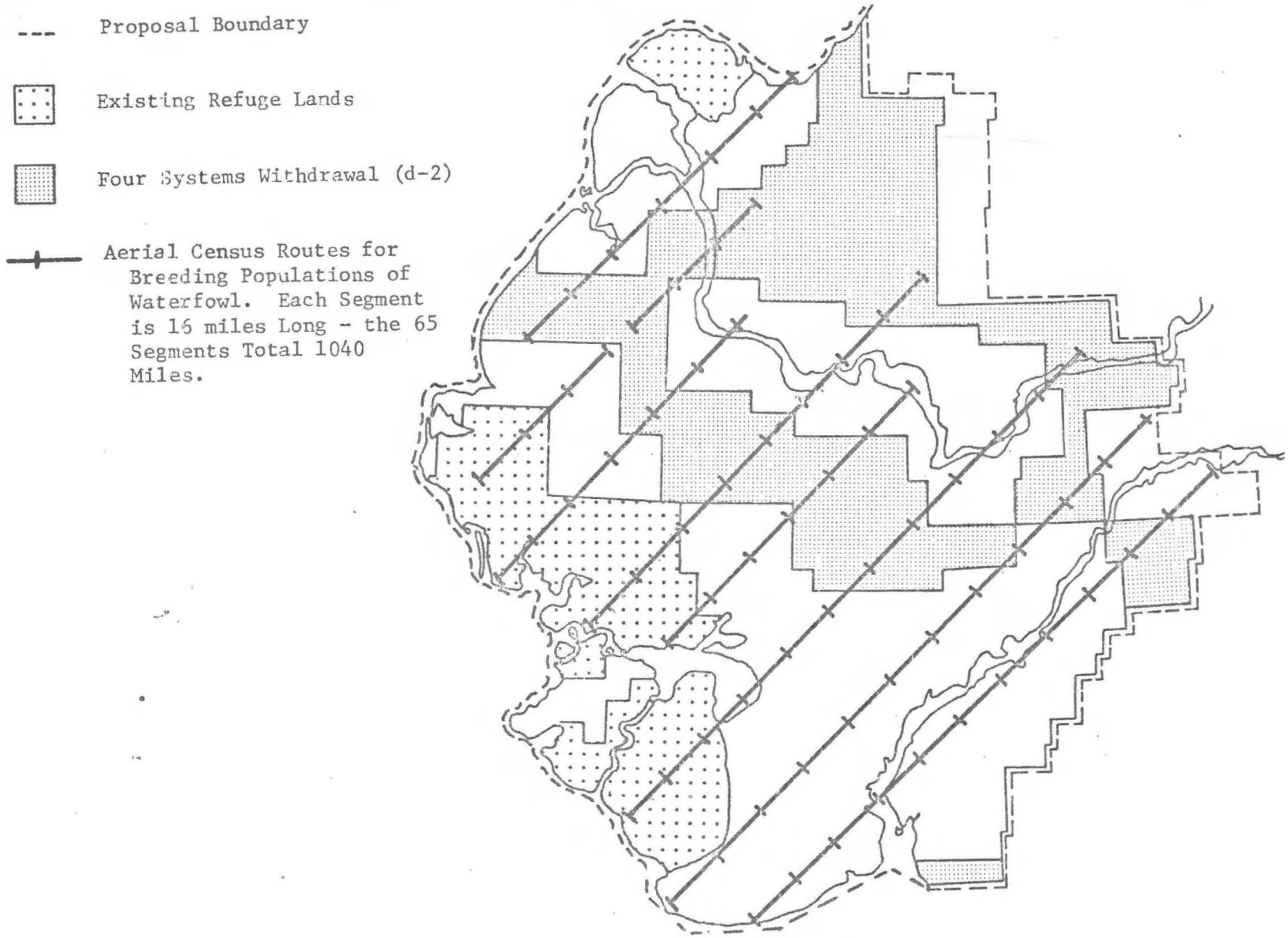


Figure 16. Aerial Waterfowl Census Routes

than censuses indicate because their nesting area is confined to a narrow, coastal zone not sampled adequately. Eiders are among the most beautiful ducks, and although they do not contribute recreation to other states, they are used extensively by subsistence hunters. They are among the most unique species of the Delta and add significant esthetic value to the area.

The Yukon Delta is large and not all habitats are equally important. Some species--whistling swan, Canada and white-fronted geese, pintail, scaup, oldsquaw, and green-winged teal--are well dispersed throughout the area, however. Other ducks or geese with more specific habitat requirements are confined to a relatively small part of the Delta. Estuarine and coastal lowland habitats are clearly the most important areas for many species (Figure 17). Nesting of all black brant, cackling geese, emperor geese, and common, spectacled, and Steller's eiders is confined to this narrow zone. More than 100 broods may be produced for each square mile of habitat in much of the coastal area. In some parts of the extreme coastal fringe between Cape Romanzof and Nelson Island production may reach a brood for each acre of habitat. Vegetation surrounding lakes and ponds is grazed short by the large numbers of geese in such areas.

Not only is the coastal habitat most critical to waterfowl, it is the habitat which would be most adversely affected by development, pollution, or other influences that could alter its present characteristics. A pollutant, such as oil, originating either on land or in the adjacent Bering Sea, could be trapped in the tidal estuaries, endangering large segments of continental populations of several species. Shorebirds, numbering millions, would be equally affected. Inland, the relatively

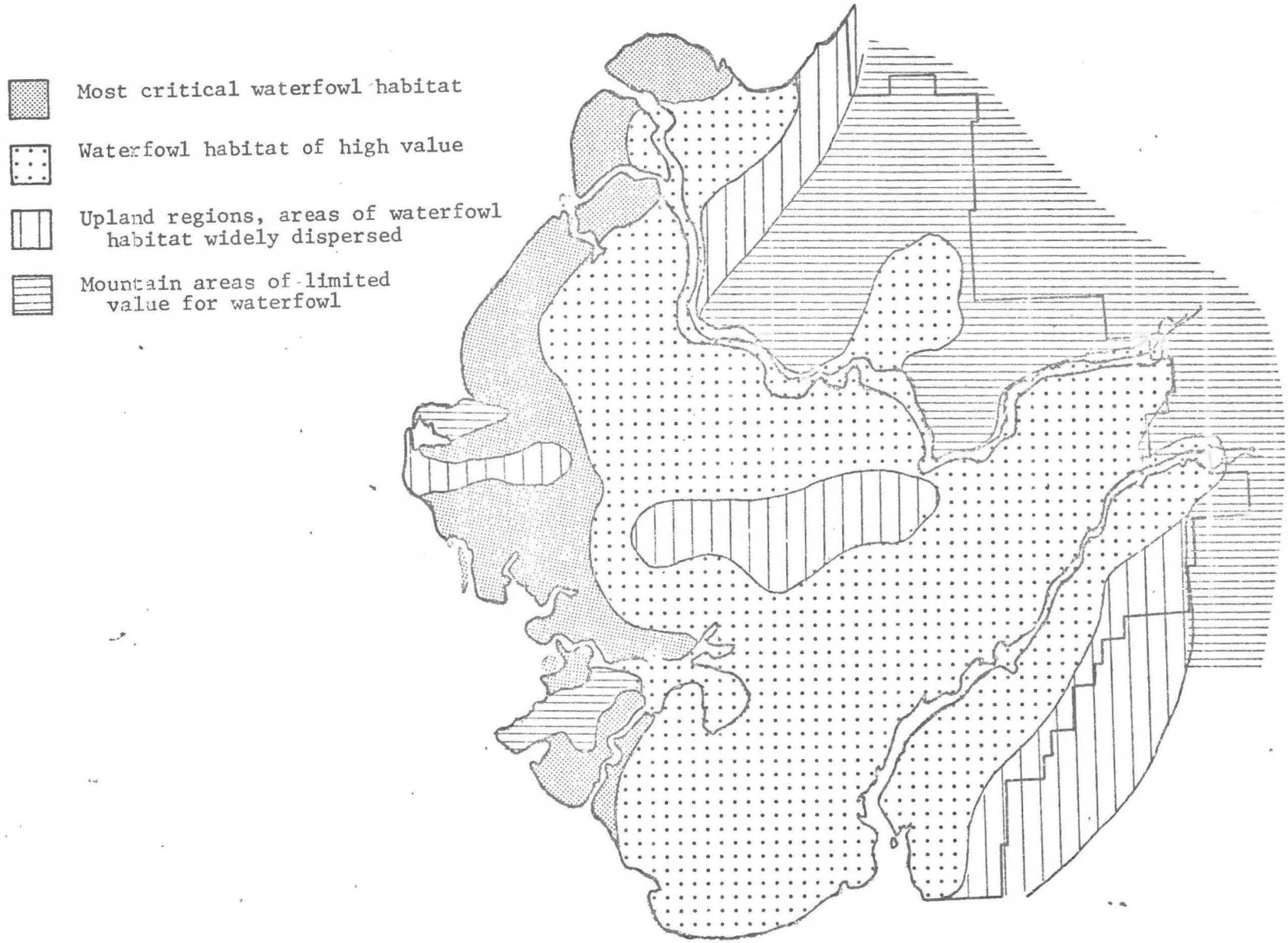


Figure 17. Waterfowl Habitat

low gradient of land and rivers and the lesser concentration of birds would serve to confine effects to relatively limited areas and much smaller numbers of wildlife.

Away from the coast, quality of habitat is related largely to the number of lakes and ponds. Highest production occurs in areas of many small lakes, but larger lakes are essential in that they are used extensively by large numbers of molting birds in summer and often are important staging areas for migrants. Other important staging areas are located on coastal tideflats and on sandbars and islands of the Yukon River.

Waterfowl species arrive on their nesting grounds in late April or early May. Frequently, first arrivals may find the tundra still snow covered and rivers and ponds locked in ice. By breakup in late May or early June, nesting has already begun. First broods may appear in mid-June, although in coastal areas peak of hatch may be delayed some years until early July. Growth of young is rapid, and most broods of ducks and geese are fledged by mid-August. Some swans, however, may not gain flight until early September. Brant are among the first waterfowl to depart the Delta. Adults without broods leave first, about mid-August, but families move soon thereafter. By early September, few remain. First steps of migration for brant are short hops to Nunivak Island, Cape Newenham, and to Izembek Bay, a major staging area on the Alaska Peninsula. Brant will remain at Izembek until early November. Then, choosing weather providing favorable winds, most depart within a period of a few hours and cross the Gulf of Alaska non-stop, making their first landfall off Vancouver Island. From there they migrate along the Pacific Coast to their final destinations in

the waters of California, Baja California, or the Mexican mainland. Other brant nesting in Northern Canada or Siberia fly the Arctic and Bering Sea coasts of Alaska to the Delta: then, from the Delta onward, the entire world population is mingled.

Other species may not depart until September although their distribution on the Delta may be quite different in late summer than during the breeding season. The gradually diminishing numbers to late September or the first days in October do not match the drama of the spring migration.

Information on migration routes is incomplete for many species and details can only be surmised from the location of their wintering areas, but for other species recoveries of banded birds provides considerable insight on distribution patterns (Figures 18-22).

Most waterfowl are oriented to states of the Pacific Flyway. Routes of travel for a given species may be inland through Interior Alaska and British Columbia or via a coastal route. Segments of a population may differ. For example, widgeon migrate mostly inland; pintails both inland and along the coast; and greater scaup of the Pacific Flyway, only along the coast. However, about half the greater scaup from the Delta migrate southeasterly across Canada to the Great Lakes and eventually to the Atlantic Coast, perhaps via the Hudson River Valley. Canvasbacks probably duplicate the two routes followed by scaup.

Other species have equally distinctive migration patterns. White-fronted geese, for instance, appear to move non-stop for at least 2,500 miles from the Delta to interior valleys of California. From there a few drift

Figure 18. Recoveries of Banded Whistling Swans

Figure 19. Recoveries of Banded Black Brant

Figure 20. Recoveries of Banded Cackling Geese.

Figure 21. Recoveries of Banded White-Fronted Geese .

Figure 22. Recoveries of Banded Greater Scaup

southward into Mexico. Most oldsquaw ducks move only as far as the Bering Sea, mingling there with ducks from the Soviet Union. Band recoveries indicate courtship and pairing will take place at sea in winter or early spring. Females seem certain to return to their place of origin, but males from Alaska may follow mates from the Soviet Union to nesting grounds on the Anadyr River or the Lena Delta in Siberia.

SHORE AND WATER BIRDS: Birds included in this group are seabirds, gulls, jaegers, cranes, loons, grebes, plovers, and the vast family of sandpipers, snipe, godwits, and curlews. Members of this group using Delta habitats as a nesting area or as an area for resting and foraging during migration dwarf the number of waterfowl in abundance. There is no means to calculate total numbers accurately, but the population of water birds is at least 100 million and could greatly exceed this number.

within the proposal area

Murres, auklets, puffins, and kittiwakes nest only in small rookeries on cliffs of Cape ~~Newenham~~ Romanzof and Nelson Island. They occur on lowlands only when blown inland by storms.

Arctic, red-throated, and common loons are all present throughout the Delta, but the Arctic loon is far the most common, averaging more than five pairs per square mile. In spring, their vociferous presence is seldom in doubt. Red-necked and horned grebes are relatively uncommon on coastal parts of the Delta and become more numerous inland.

Lesser sandhill cranes are abundant. The Delta may be among the most important nesting areas for this species.

Sandpipers, plovers, and phalaropes are among the most abundant species on the Delta. If none other were present, this group alone would qualify the Delta as a unique habitat for birds. Northern phalaropes, western sandpipers, dunlins, and black turnstones are most numerous in the order named. Bar-tailed godwits are more conspicuous, however, because they are large and call vociferously whenever danger threatens their nesting territory. Whimbrels and bristle-thighed curlews occur on the Delta during migration and from early summer when non-breeders return to forage on coastal lowlands. The bristle-thighed curlew nests only in the mountains north of the Yukon River in the area proposed for the Wildlife Refuge. The entire population of this species occurs within the region of the Yukon Delta during the summer. Hopefully its survival is more secure than that of the Eskimo curlew, which Nelson reported to be the most abundant of migrant curlews on the Delta,[87] but now may be extinct.

Plovers, sandpipers, and phalaropes are among the greatest travelers of the avian world (Figures 23-26). Golden plovers, bar-tailed godwits, bristle-thighed curlews, and ruddy turnstones migrate to islands throughout the South Pacific and may reach New Zealand or Australia. Red and northern phalaropes winter at sea in the same region and off the coast of South America, while other birds--whimbrels, Hudsonian godwits, black-bellied plovers, sanderlings, dowitchers, and spotted, solitary, least, pectoral, western, and semipalmated sandpipers--migrate along the Pacific Coast or inland through North America to wintering areas extending through Mexico, Central America and countries of South America to Cape Horn or Tierra del Fuego.[24]

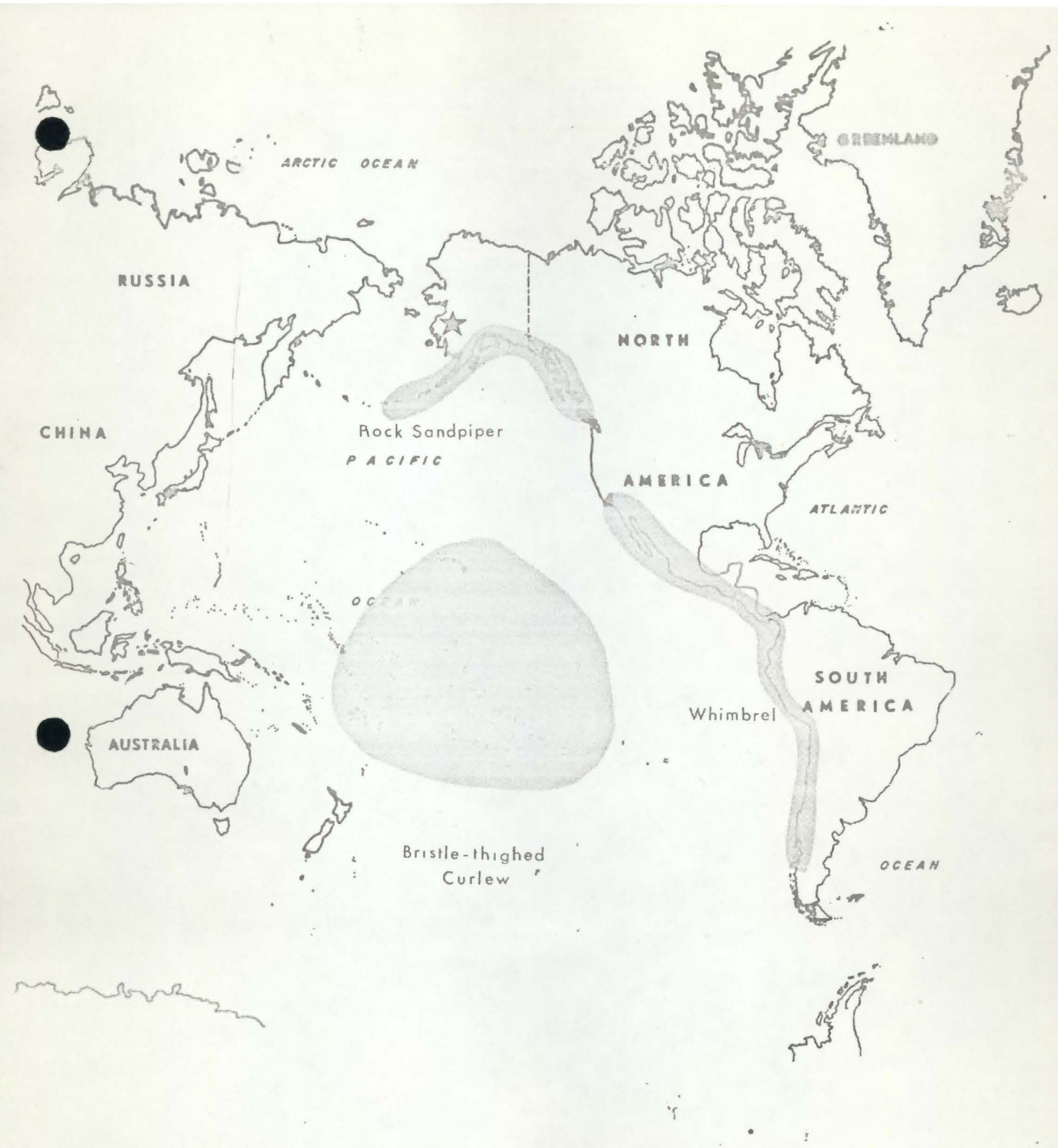


Figure 23. Winter Ranges of Bristle-Thighed Curlews, Whimbrels, and Rock Sandpipers.

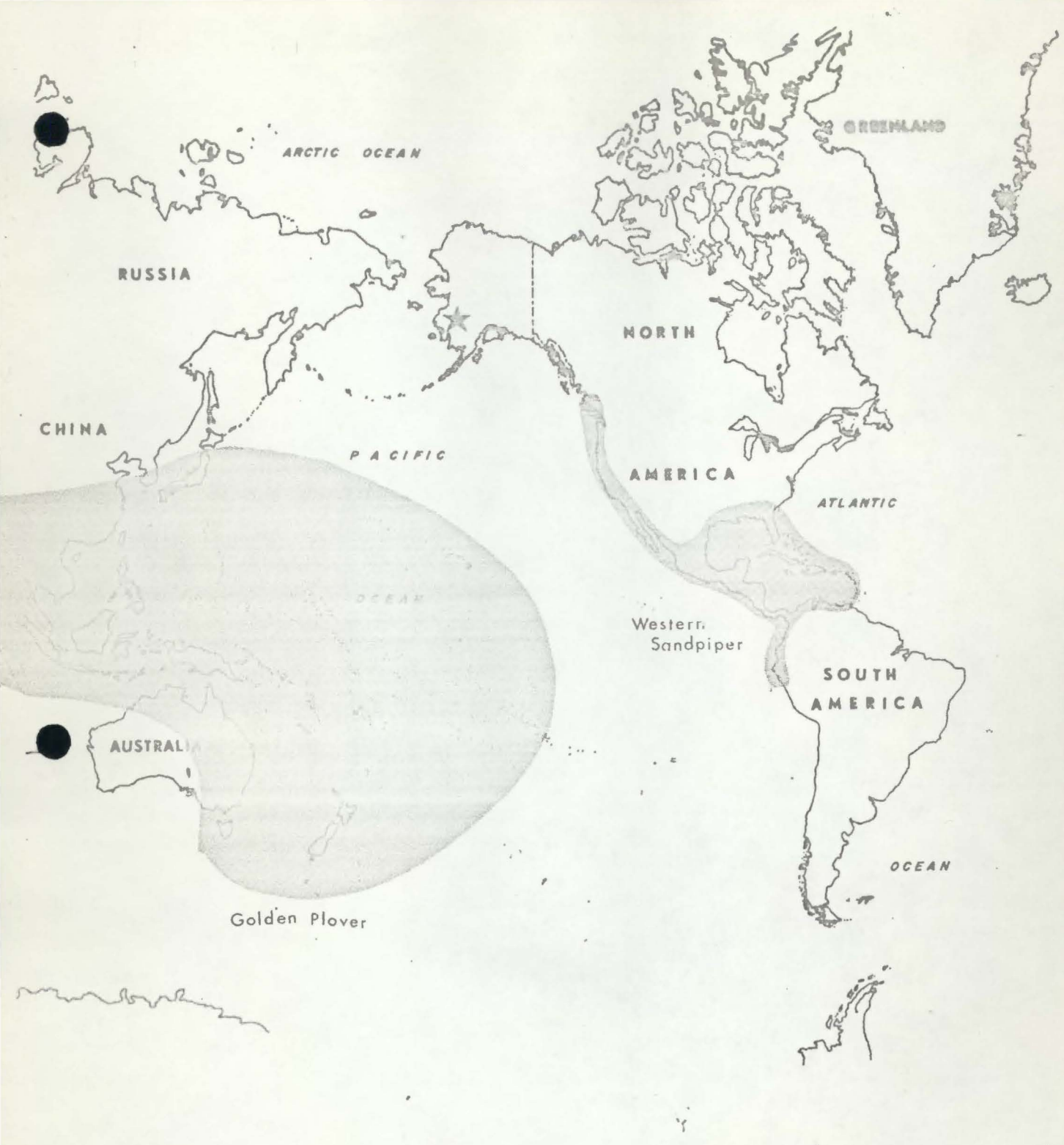


Figure 24. Winter Ranges of Western Sandpiper and Golden Plover.

Figure 25. Winter Range of Black-Bellied Plovers.

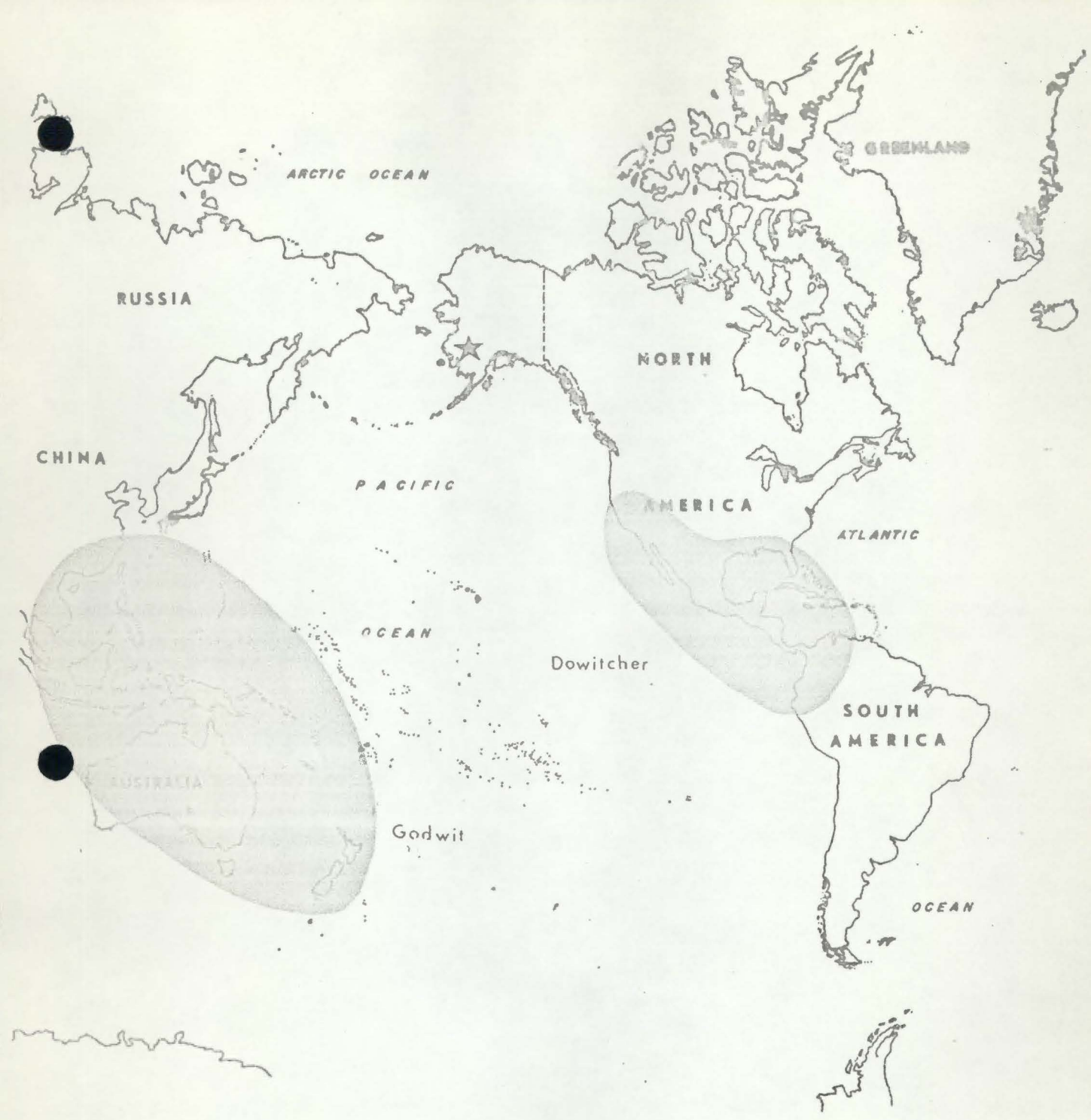


Figure 26. Winter Ranges of Bar-Tailed Godwits and Long-Billed Dowitcher.

As might be expected with the extensive estuarine and lake habitat, gulls and terns are abundant and widespread over the area. The large glaucous gull nests in small colonies or singly in coastal lowlands. The slightly smaller and less abundant glaucous-winged gull nests primarily in cliff habitat. Both prey extensively on nests and young of waterfowl, although fish and invertebrates they catch or scavenge in estuarine and coastal waters provide their primary food. Mew gulls are similar in appearance but smaller and more widely distributed, nesting in all habitats. Both Sabine's gulls and Bonaparte's gulls are common in their preferred habitats. Sabines nest on the tundra and Bonapartes primarily in forested habitats. Oldsquaw ducks frequently nest near colonies of Sabine's gulls, suggesting such sites may be selected for safety because the small gulls vigorously attack any predator approaching the nesting territory. Arctic terns, smallest of gulls inhabiting the area, are distributed through all habitats. Their migrations take them to Cape Horn and the Antarctic contintent (Figure 27). The very similar Aleutian tern nests only in Alaska and remains in the Northwestern Pacific area during winter.

Three species of jaegers or skuas occur on the Delta, but the pomarine jaeger is only a migrant on its way to nesting areas in Arctic Alaska or Canada. Parasitic and long-tailed jaegers found throughout the area are among the most efficient predators in arctic regions, readily pursuing and capturing many small birds and robbing nests. Their primary food, however, is lemmings and other small rodents. They winter at sea from California to Chile and across the Pacific to New Zealand.

Figure 27. Winter Ranges of Aleutian and Arctic Terns.

TERRESTRIAL BIRDS: Terrestrial birds of the Delta include most species common to forested habitats of Interior Alaska as well as those confined to the tundra. In tundra habitats which most characterize the Delta, the Alaska longspur is most abundant. Savannah sparrows are most common in marshes or areas of tall grass, as they are throughout Alaska. Yellow wagtails, much less common than other species, prefer small patches of shrub or occasionally tall grass for nesting. Redpolls and tree sparrows also are associated with brush patches, but otherwise small land birds are few on the open tundra. Other species (Appendix B) are found primarily in woodland habitat.

Raptors are sparse in tundra habitats but are more common in mountainous areas where rough-legged hawks, falcons, and eagles find aeries for nesting. Short-eared owls are the most abundant raptors. Like the larger snowy owl, their numbers fluctuate widely from year to year, depending on the cyclic abundance of lemmings or other rodents.

Mammals

With the exception of Dall sheep, mountain goats, deer, sea otters, and a few species of small rodents or shrews, most mammals present in Alaska occur on the Yukon Delta, but many only in low numbers (Appendix C). Most are inconspicuous and not as obvious as the large populations of migratory birds.

Caribou occasionally reach extreme eastern edges of the area where the Beaver and Mulchatna herds range mountain areas bordering the Delta.[285] A small herd is also present in the Andreafsky drainage north of the Yukon

River.[5] This herd and perhaps the Beaver herd may be interbred with reindeer which were dispersed on the Delta in the early 1940's. Until the middle of the last century, caribou were abundant on the Delta and perhaps ranged from Bristol Bay to the Seward Peninsula. Herds had greatly decreased by 1870 and had vanished by 1880.[5] Caribou bones which are found in many ancient village sites verify the historical record.[62] Habitat appears satisfactory or even excellent for this species over much of the area, but their re-establishment on the Delta appears unlikely. Probably one of the first casualties to the introduction of firearms, the caribou is now even more vulnerable to a larger, better armed, and more mobile populace.

Moose are associated primarily with forested sections of the Delta although they are observed occasionally on the tundra. Populations in the vicinity of the Yukon River in the eastern part of the area are high. A considerable number of animals are harvested by hunters from villages on the Delta.

Black bears are common throughout forest areas but grizzlies are uncommon. Neither occurs on lowland tundra of the Delta although the grizzly is common in alpine tundra of surrounding mountains. Polar bears have been recorded along the coast, but so rarely their occurrence there is considered accidental.

Fur animals of primary importance include weasels, mink, Arctic and red foxes, beaver, and muskrats. River otters and mink are found on tundra, but wolverines, lynx, and wolves are found primarily on peripheral or woodland

sections of the region. Mink of the Yukon Delta are larger and of better quality than those from other regions of North America, and have commanded consistently highest prices in fur markets. Beaver, found mostly in forest areas, and muskrats, although common, are not as plentiful as in Alaska's interior valleys. Arctic foxes occur commonly only in coastal portions of the Delta, but red foxes are found throughout the area.

Marine mammals, including beluga whales, walrus, and bearded, ringed, ribbon, and harbor seals historically have provided one of the most important segments of the subsistence economy of coastal villages. Walrus are usually present briefly in spring on their annual northward migrations. Seals also are most abundant in spring when animals inhabiting pack ice occur near shore, but many remain in coastal areas and in estuaries during summer. Largest numbers are found near Kipnuk where harbor seals congregate on the offshore bars. Greater abundance there may be attributed to their relative inaccessibility to hunters as compared with populations in other areas. Belugas occur in low numbers and are observed only occasionally in estuaries. They once were more abundant in Kuskokwim Bay, Hooper Bay, and the mouth of the Yukon. Cause of their diminished populations is unknown, but probably is related to introduction of firearms, outboard motors, and other improved hunting equipment.

Smaller mammals are primarily important in the food chains of predatory birds and mammals. These links include showshoe hares in forested areas and Arctic hares on the tundra, as well as ground squirrels, tree squirrels, lemmings, voles, and shrews. Both species of hares and the smaller rodents are highly cyclic in abundance; however, cycles of smaller rodents may not be concurrent throughout the region.

Fishes

The large fishery resource of the Delta undoubtedly was the primary factor permitting development of the large aboriginal population of the region. Although salmon occur seasonally, they provide a relatively stable food source throughout the year. These include king, chum, red, pink, and silver salmon. In addition, smelt that migrate in the Kuskokwim and Yukon Rivers are also used for food. Common resident fishes of lakes and streams include northern pike, blackfish, stickleback, sheefish, least cisco, and several species of whitefish. Rainbow trout, Arctic char, and grayling are found in river systems draining surrounding mountain areas, but they are not found in the vast lowland area between the Yukon and Kuskokwim Rivers. Because lakes of the region are shallow and cannot support large populations of fish during winter, most resident species migrate from lake to river systems in fall or early winter.

Human Uses

Subsistence utilization of wildlife historically has been of primary importance on the Yukon Delta. Although patterns of subsistence use are changing rapidly and diminishing in importance to other economic activity, wildlife remains an essential part of the local economy (Table VI), and total harvest of wildlife is perhaps undiminished. Several factors have significantly affected the manner in which fish and wildlife resources are utilized. The most important include:

1. Availability of firearms, steel traps, non-rotting gillnet materials, outboard motors, snow machines, and other equipment that greatly increase efficiency of hunters or fishermen.

TABLE VI

WILDLIFE POPULATION AND HARVEST a/

Species	Population	Harvest Average Yearly	1958-68 Trend	Probable Future Trend
Big Game				
Caribou	3,000	100	Increase	Increase
Moose	1,500	250	Increase	Increase
Muskox	700			
Black Bear	Common	50	No Trend	Increase
Grizzly Bear	300	10	Increase	Increase
Furbearers				
Beaver	Common	850	Decrease	Increase
Muskrat	Common	8,000	Variable	Variable
Lynx	Common	300	Variable	Variable
Marten	Uncommon	100	No Change	No Change
Mink	Abundant	3,000	No Change	Decrease
River Otter	Common	800	No Change	No Change
Weasel	Common	200	No Change	No Change
Wolverine	Uncommon	10	No Change	No Change
Arctic Fox	Common	300	No Change	No Change
Red Fox	Common	250	No Change	No Change
Wolf	Uncommon	10	No Change	No Change
Marine Mammals				
Bearded Seal	Common)			
Harbor Seal	Common)			
Ribbon Seal	Common)	3,000	No Change	Decrease
Ringed Seal	Common)			
Walrus	Common	50	No Change	Slight Decrease
Sea Lion	Uncommon	25		No Change
Waterfowl b/				
Ducks	1,870,000	280,000		No Change
Geese	650,000	130,000		No Change
Swans	40,000	5,000		Decrease

a/ Table modified from Federal Field Committee report, "Alaska Natives and the Land."[23]

b/ Harvest of waterfowl includes that of contiguous states, Canada, and Mexico. Other species are harvested only by residents of the Delta. Waterfowl harvested by residents include an estimated 5,585 swans, 82,793 geese, 37,515 ducks, and 1,033 cranes. In addition, an estimated 39,795 eggs are removed from nests.

2. Increasing opportunity for monetary employment as well as greater benefits from numerous welfare programs.

3. Increasing concentration of residents in larger villages.

Caucasian residents of the Delta are nearly all associated with government and service industries and nearly all live in Bethel. Although their use of fish and wildlife is largely recreational, it is also of obvious subsistence value.

Recreational hunting and fishing by residents of the area is expected to increase, at least partially offsetting the possible decline in subsistence harvests. It is not anticipated that many persons from other regions will be attracted to the Delta because equally good or better recreational opportunities exist nearer to major population centers.

FURBEARING ANIMALS: Aboriginal use of furbearing animals was limited to local requirements for food and cloting or occasionally for use in barter with northern Eskimos or Indians over well established routes of trade. Entry of Russian fur traders into Bristol Bay and later at St. Michael immediately changed the pattern of use and an increasingly larger harvest entered the fur trade. Fur remained the primary means of obtaining manufactured goods for the next century, first by barter, and eventually by direct cash sale. White trappers did not enter directly into the harvesting of fur animals on the Delta as they did in other regions of Alaska, probably because they were ill-equipped to face the rigors of a harsh winter on the tundra. In recent decades, other means of obtaining needed

cash has become available. Although fur harvests remained nearly constant, the relative contribution of fur to the economy gradually diminished. As recently as 1968, it was reported that there had been no significant change in harvest for the preceding decade, nor was any subsequent change predicted.[23] However, dramatic changes had already been initiated, primarily through welfare programs and changing social status of Eskimos. Since 1969, harvest of furs has appreciably diminished, the above prediction notwithstanding. Trapping is compatible with refuge objectives and will be permitted although it is anticipated that harvest of furbearing animals will continue to decline.

MARINE MAMMALS: Marine mammals, including bearded, ringed, ribbon, and harbor seals, walrus, sea lions, and belugas, have been used almost exclusively in the subsistence economy by Eskimos of coastal villages. Meat and oil from these animals are highly desired as food, and skins are used in the manufacture of garments, waterboots, and various household or hunting equipment. Excess skins of seals are made into various salable items or sold raw to provide supplemental income. Carvings made from walrus ivory are also an important source of income for some craftsmen.

It has not been possible to detect any recent changes in the number of marine mammals or in numbers that are harvested. However, it is clear from examining areas that are unharvested that hunting has a controlling influence on the population. It is not possible to predict trends in harvest. The passage of the Marine Mammal Protection Act of 1972 probably has little effect on harvest by Eskimos of the Delta but prevents utilization by other persons. Changing cultural patterns may gradually

reduce the size of harvests. In any case, it is not anticipated that any population of marine mammals on the Delta will be endangered by hunting, although belugas were drastically reduced in numbers soon after introduction of outboard motors. Subsistence hunting would be compatible with refuge objectives as it is presently on the Clarence Rhode National Wildlife Range.

RESIDENT WILDLIFE: Big game species present on the Delta include moose, caribou, muskox, and black and grizzly bears. Caribou so seldom enter lowlands of the Delta that they are rarely taken. Muskox were introduced onto Nelson Island in 1967 and 1968. The future of this transplant and its eventual distribution of muskox on the Delta is uncertain. Black and grizzly bears occur primarily in forest areas and are seldom hunted specifically although a number are taken incidental to other activities or as opportunity permits. Grizzly bears are heavily hunted in regions adjacent to the Delta. None of the above animals have significant impact on the subsistence economy or recreational potential of the area.

Moose are an important element in the subsistence economy and contribute recreation as well. The harvest has increased significantly in recent years as a result of a high population of moose in the Innoko and lower Yukon region and because of the greatly improved access to animals provided by use of snow machines and charter aircraft. Harvest is entirely by residents of the Delta or adjacent regions. It is not anticipated that persons from elsewhere will be attracted to the Delta because better known hunting areas are more accessible.

Hunting of big game would be compatible with refuge objectives.

Arctic and snowshoe hares and spruce and ruffed grouse, and willow ptarmigan are hunted for both subsistence use and for recreation by residents of the Delta. Populations of these species fluctuate widely, and hunting has no effect on numbers available, nor is it conceivable tha hunting could affect the population at any future date. Hunting of resident wildlife would be compatible with refuge objectives.

MIGRATORY BIRDS: Subsistence hunting of ducks, geese, swans, and cranes is traditional with Natives of the Delta and is inseparable from the significant element of recreation attached to it. Studies made of harvest and harvest patterns by residents of the area during 1964 and 1965 indicated a total harvest of approximately 82,800 geese, 37,500 ducks, 5,600 swans, and 1,000 cranes (Table VII).[33] In addition, an estimated 40,000 eggs of all species, but mostly of geese, are removed from nests. No detectable change in harvest has occured since the completion of this study. Migratory waterfowl also provide recreation in areas remote from the Delta--Canada, the contiguous states, Mexico, and the Soviet Union. The total annual harvest is at least 280,000 ducks and 130,000 geese. Hunters, exclusive of those in Alaska, benefit by an estimated 600,000 days of recreation. Recreation provided to non-hunters may equal or exceed this figure.

Without doubt, the harvest of waterfowl during spring and fall for subsistence use increased considerably with the introduction of modern firearms, although the number of eggs and flightless birds taken in summer

TABLE VII HARVEST OF WATERFOWL ON THE YUKON DELTA [a/]

Species	Number Harvested Spring	Fall	Total
Swans			5,585
Cranes			1,033
Geese			
Cackling and Canada	20,000	18,200	38,200
Black Brant	2,500	5,500	8,000
Emperor	6,500	1,700	8,200
White-fronted	13,500	9,100	22,600
Snow	5,400	400	5,800
	47,900	34,900	82,800
Ducks			
Mallard	4,700	4,800	9,500
Pintail	12,000	10,500	22,500
Eider	3,300	0	3,300
	20,000	15,300	35,300

[a/] Data are from Klein's "Waterfowl in the Economy of Eskimos."[33]

In addition to the above species, others (mostly scaup and oldsquaw) are shot or taken in drives during summer while molting or still not fledged. Total take in this manner may be as high as 1,000 to 2,000 geese and 3,000 to 5,000 ducks. The number of shotgun shells sold in villages at the present time suggest these estimates may be low.

has declined. Because of increased human population and its concentration in a few large villages, wildlife resources near villages may be exploited excessively while remote areas are not as heavily utilized as in the past. This pattern of utilization has resulted in a measurable decline in waterfowl population in areas accessible to villages. The circle of destruction enlarges as nearby resources are depleted and better means of travel--motor boats and snow machines--permit hunting at greater distances. Gathering of eggs and hunting during spring or summer when waterfowl are on nesting areas are most destructive and have the most enduring effect on a population. Fall hunting probably has negligible effect on the population of waterfowl or subsequent use of nesting areas. Hunting of migratory birds during spring and summer is contrary to both State and Federal regulations and to migratory bird treaties with Canada and Mexico and would conflict with objectives of the proposed Wildlife Refuge.

With continued growth of the human population on the Delta and its further concentration in larger villages, recreational hunting by residents can be expected to increase significantly. It is not anticipated, however, that waterfowl hunting on the Delta will attract significant number of persons from other regions or population centers in Alaska. Legal hunting would not adversely affect nesting areas or populations, hence, would be compatible with refuge objectives.

Recreational use of wildlife resources, other than by residents, is expected to grow only slowly.[7] Although most wildlife found on the Delta is found also in other more accessible areas, there is no similar

nesting concentration of waterfowl and other migratory birds in the United States. Further, many of the species found on the Delta cannot be observed elsewhere during the breeding season. The large concentrations of birds will lure some visitors to the area, but the cost of such visits will be prohibitive to most individuals. Presence of a limited number of visitors, if carefully supervised, would be compatible with refuge objectives and should be encouraged. However, disturbance of waterfowl or other migratory birds during the nesting or brood seasons casuses a significant increase in predation as well as frequent desertion of nests and young. Therefore, unrestricted use of the area by visitors would not be possible.

FISHERIES: The subsistence and commerical fisheries are the most important elements in the economy of the Yukon Delta, dwarfing all other economic values based on natural resources. The commercial fishery has depended primarily on salmon, although a few whitefish are sold locally. The subsistence fishery utilizes all fishes found in significant numbers.

Five species of salmon--king, chum, pink, red, and silver--are taken primarily in the Yukon and Kuskokwim Rivers as they migrate to spawning areas above the Delta. Smaller numbers are caught in coastal estuaries or in tributaries of the Yukon or the Kuskokwim.

The commercial salmon fisheries are regulated by the State of Alaska (and formerly by the Fish and Wildlife Service) to insure that subsistence requirements are satisfied. Thus, the commercial fisheries developed later, and more slowly, than fisheries elsewhere in the State and may

continue to grow as the requirement for subsistence harvest declines. The wholesale value of the commercial catch for 1971 was approximately $2,778,800 (Table VIII).[3]

Recent statistical data, except for salmon, is lacking for the subsistence fishery. There is no doubt, however, that the subsistence fishery has declined as increased cash income permitted purchase of other foods. Other important reductions in the fishery occurred as snow machines replaced dogs, eliminating a need for fish as winter dog food.

The various species of whitefish are perhaps most important in the subsistence fishery, as they are available throughout the year. Most are caught with nets set in sloughs during fall migration or in the rivers during fall and winter. Northern pike and sheefish are taken incidental to the catch of whitefish and salmon, although they are fished heavily during winter through the ice by hook and line. Blackfish are taken in late winter in traps; sticklebacks by dip nets in the late winter; and burbot in the early winter by hooking and in traps. In coastal regions herring, tomcod, flounder, and Arctic whitefish are important additions to the catch.

The sport fishery is relatively confined: Arctic char or grayling are available in a few streams tributary to the Yukon or Kuskokwim Rivers; northern pike are sought after by ice-fishermen. The sport fishery is not sufficiently attractive to entice persons from other regions of Alaska, but it is expected to grow in importance for residents of the area.

None of the fisheries--subsistence, commercial, or sport--will conflict with refuge objectives.

TABLE VIII

SALMON IN THE COMMERCIAL AND SUBSISTENCE FISHERIES OF THE YUKON AND KUSKOKWIM RIVERS IN 1971. a/,b/,c/

Species	Number of Fish Commercial	Subsistence	Total
King	155,443	70,285	225,728
Chum	389,107		
Silver	34,209		
Red	6,054	331,962	751,345
Pink	13		
Total	574,826	402,247	977,073

a/ Data provided by Alaska Department of Fish and Game.

b/ Value of the commercial fishery included $1,154,200 paid to fisherman, and $438,200 paid to cannery workers. Total wholesale value of pack was $2,778,800.

c/ See Table XIII for 1972 data.

SOCIO-ECONOMIC CONSIDERATIONS

SOCIO-ECONOMIC CONSIDERATIONS

Populations

The Yukon Delta socio-economic area of influence contains 45 Eskimo villages, plus 5 additional settlements with populations under 25 (Table IX).[51]

Boundaries for this area of influence are based on the use patterns of each village. These use patterns tend to follow ethnic lines. For example, the predominantly Indian village of Holy Cross is located only about 15 miles from the Yukon Delta proposal boundary, but most of its people travel upstream on the Yukon River to hunt and fish, in an opposite direction from the proposal area. On the other hand, Eskimo residents of Sleetmute--80 miles away--tend to travel down the Kuskokwim River towards or into the proposal area to hunt and fish.

The Yukon Delta area represents the largest concentration of Eskimos in the State of Alaska. About 11,600, of the 12,700 residents are Yupik-speaking Eskimos. In addition there are about 125 Athapascan Indians living mostly in Bethel and in the inland villages near the socio-economic boundary of the area.[34 48 51]

Bethel is the largest town and the service center for the area. It contains about one-fourth of the area's total population. However, over one-half of the area's approximately 1,000 non-Native residents live in Bethel. The only other villages less than 90 percent Native are Aniak, Red Devil, and Stony River. The few non-Natives living in other villages are usually teachers and their families.[34 48 51]

TABLE IX

CURRENT POPULATION ESTIMATE
AND
NATIVE ENROLLMENT*** 34 48 51

Village	Native Enumeration Feb. 1973	Non-Native Population U.S. Census 1970	Total Current Population Estimate	% Native	Native Enrollment Feb. 1973
Akiachak	302	12	314	96%	344
Akiak	160	2	162	99	197
Alakanuk	414	18	432	96	462
Andreafsky	73	included with St. Marys	73		78
Aniak	166	35	201	83	249
Atmautluak	122	included with Nunapitchuk	122		126
Bethel	2285	546	2831	81	1918
Chefornak	163	5	168	97	184
Chevak	385	11	396	97	459
Chuloonavik	20		20		24
Crooked Creek	81	4	85	95	120
Eek	176	19	195	90	202
Emmonak	460	18	478	96	487
Georgetown	1		1		1
Hamilton	6		6		19
Hooper Bay	516	13	529	98	629
Kalskag	121	16	137	88	158
Kasigluk	274	5*	279	98	314
Kipnuk	324	5	329	98	354
Kongiganak	168	7	175	96	253
Kotlik	264	4	268	99	297
Kwethluk	409	18	427	96	464
Kwigillingok	174	3	177	98	228
Lower Kalskag	151	6	157	96	164
Marshall (Fortuna Ledge)	168	6	174	97	205
Mekoryuk	272	15	287	95	208
Medfra	0	8**	8	0	0
Mountain Village	412	25	437	94	502
Napamute	2		2		6
Napakiak	238	4	242	98	256
Napaskiak	196	4	200	98	215
Newtok	125	3	128	98	142

TABLE IX (Cont'd)

CURRENT POPULATION ESTIMATE
AND
NATIVE ENROLLMENT*** 34 48 51

Village	Native Enumeration Feb. 1973	Non-Native Population U.S. Census 1970	Total Current Population Estimate	% Native	Native Enrollment Feb. 1973
Nightmute	111	5	116	96	124
Nunapitchuk	304	10	314	97	325
Oscarville	44	3	47	94	46
Pilot Station	275	3	278	99	327
Pitkas Point	65	2	97	97	83
Quinhagak	301	8	309	97	340
Red Devil	45	59	104	43	60
Russian Mission (Yukon)	129	8	137	94	141
Russian Mission (Chuathbaluk)	118	4	122	97	87
St. Mary's	303	34	337	90	286
Scammon Bay	160	0	160	100	181
Sheldon's Point	116	4	120	97	126
Sleetmute	117	14	131	89	155
Stony River	69	13	32	84	86
Toksook Bay	278	6	284	98	289
Tuluksak	161	2	163	99	193
Tuntutuliak	179	4	180	98	207
Tununak	257	4	261	98	318
TOTALS	11,657	995	12,652		

* 1969 Estimate - Federal Field Committee

**Estimate - Alaska Department of Fish & Game, Fairbanks

***Natives must enroll at a particular village to receive benefits under ANCSA. Enumeration figures indicate only Natives actually residing in the village at time of enrollment. There has been some duplicate enrollment and enumeration which BIA will correct by December 1973.

Over the past several years, there has been a trend towards consolidation of villages. Families that once led a semi-nomadic life are becoming more stationary so that their children can attend school.

Bethel attracts most of the displaced villagers. From 1960 to 1970 Bethel's population doubled, whereas the area as a whole grew by only 25 percent. This trend reflects the general move away from a nomadic, subsistence economy towards a cash-oriented one.[48]

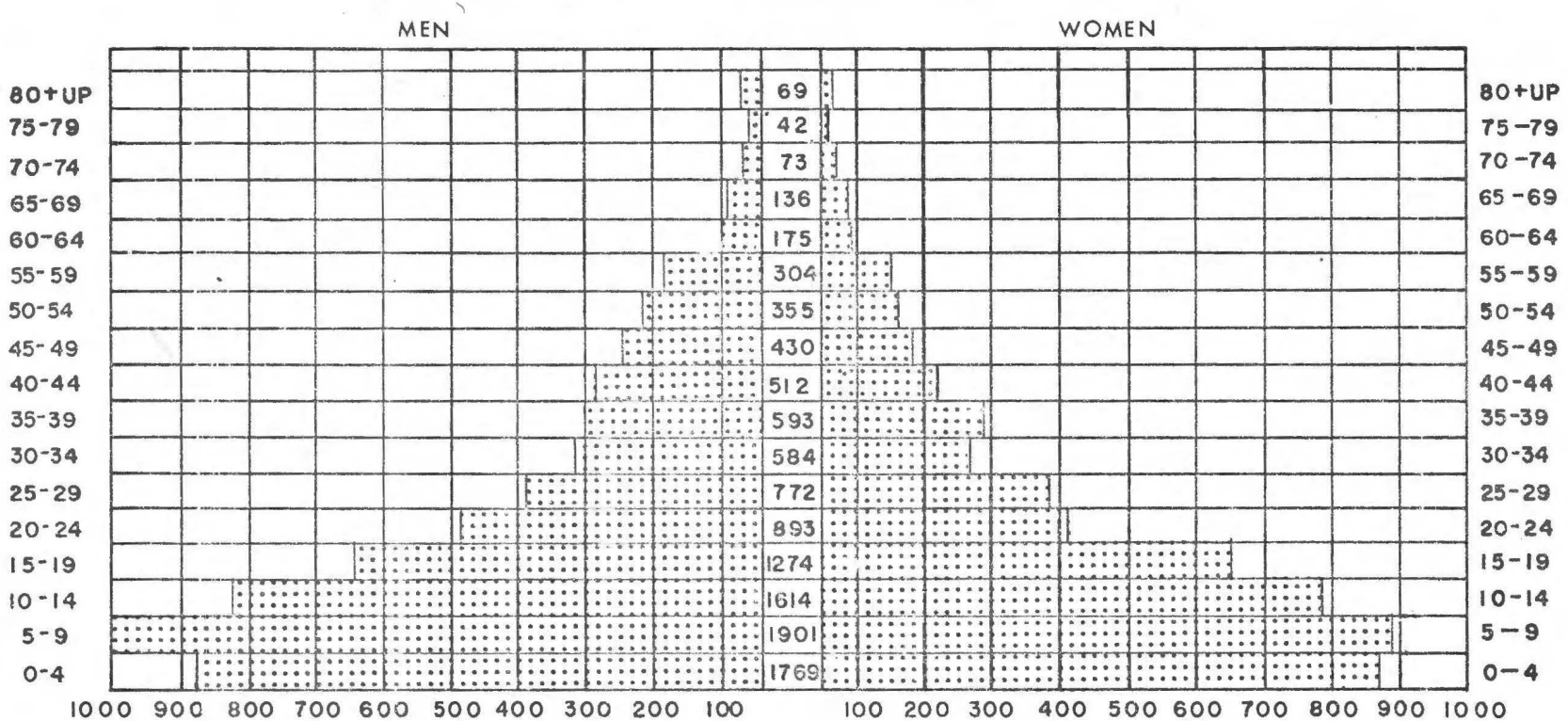
The Native population of the Yukon Delta area is a younger than average population. Fifty-nine percent of the residents are under age 20 and the median age is 15. Median age for Natives throughout the State is 17. Median age for whites in the State is 23.

A postwar baby boom was aided by a decreasing infant mortality rate during the 1950's and early 1960's as modern medicine and health care became widespread (Table X). Medical benefits--first disease control, then birth control--have been slower in reaching this area than any other area of the State. The birth rate probably has declined somewhat in the last five years though not nearly as rapidly as it has in other rural areas of the State. The following figures illustrate the number of youngsters in each age bracket in 1970, indicating the probable declining birth rate:

Age	No. of Individuals[17]
4-5	388
3-4	395
2-3	343
1-2	330
0-1	313

TABLE X

AGE-SEX DISTRIBUTION of ALL RACES, YUKON DELTA*

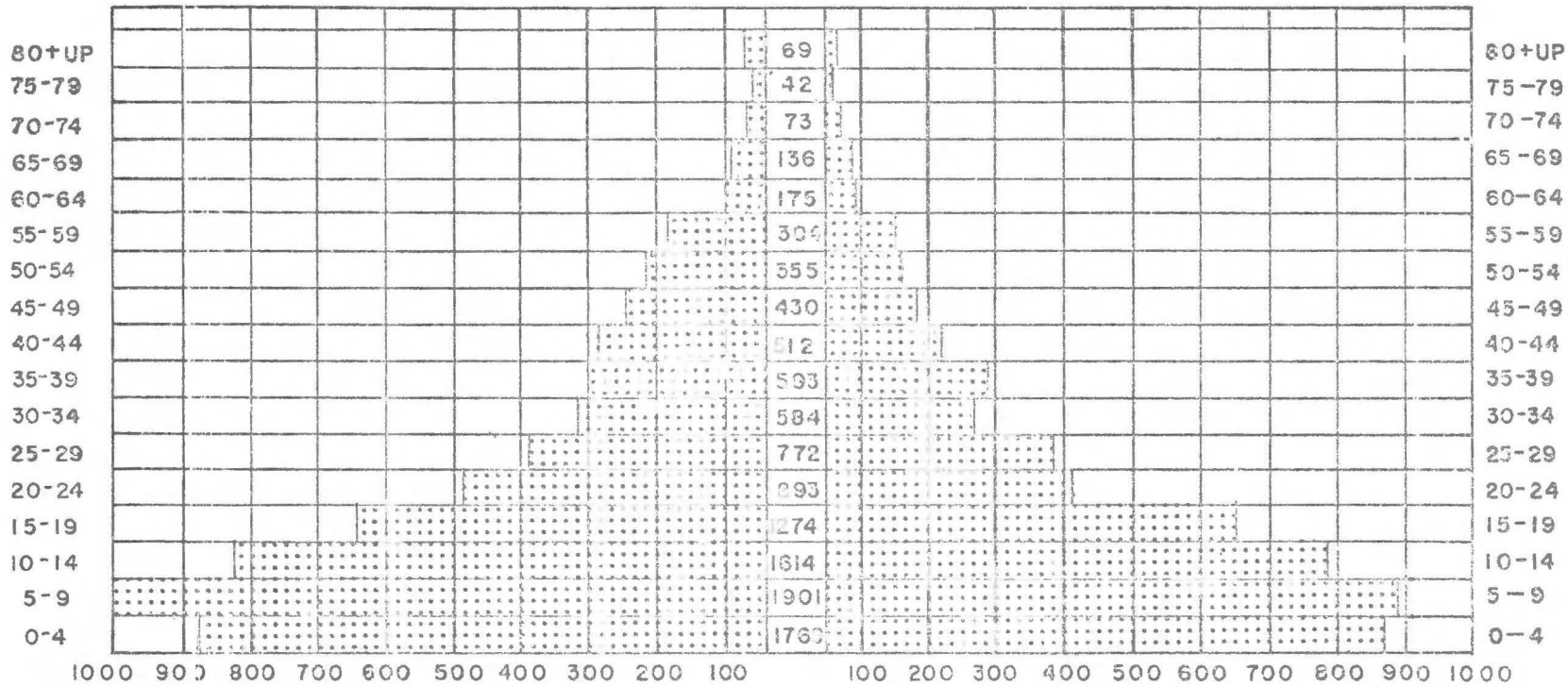


* Does not include Aniak, Chuathbaluk, Crooked Creek, Holy Cross, Kalskag, Lower Kalskag, Red Devil, Sleetmute, Stony River. Total Population 1126.

Source: "Age-Sex Characteristics of Alaska's Population" Bethel and Wade-Hampton Census Districts, U.S. Census 1970. In Review of Business and Economic Conditions University of Alaska, Institute of Social, Economic, and Government Research, March, 1972.

TABLE X

AGE-SEX DISTRIBUTION of ALL RACES, YUKON DELTA*



* Does not include Anvik, Chuathbaluk, Crooked Creek, Holy Cross, Kalskag, Lower Kalskag, Red Devil, Sleetmute, Stony River. Total Population 4126.

Source: "Age-Sex Characteristics of Alaska's Population" Bethel and Wade-Hampton Census Districts, U.S. Census 1970. In Review of Business and Economic Conditions University of Alaska, Institute of Social, Economic, and Government Research, March, 1972.

The area's population appears to be increasing despite the apparent declining birth rate of the last few years. It will undoubtedly continue to grow for the next several years as the number of persons born each year still exceeds the number dying plus the net out-migration.[17]

Income

Subsistence

Subsistence income is the economic mainstay of the villages in the Yukon Delta. Fish is the single most important resource, accounting for from 30 to 60 percent of the yearly food supply in most villages.[19]

The extent to which the people live off the land is hard to measure since records of fish and game harvest generally are not kept. Limited survey data on summer subsistence salmon fishing are available for those villages located on or near the Yukon and Kuskokwim Rivers. Subsistence salmon catch statistics for 1972 are included in Table XI.

In general, more residents from Kuskokwim River villages than from Yukon River villages fish for subsistence. Their per capita catch of salmon in 1972 was twice the per capita catch of the Yukon villagers. Instead, Yukon River villagers concentrate on commercial fishing.

Subsistence salmon catch, however, has declined over the past few years: the substitution of snowmobiles for dog teams has reduced the need for chum or "dog" salmon as dog food.[25 43 65]

A household survey was conducted during the summer of 1972 by three University of Alaska professors to determine the economic impact of Native-owned cooperative stores in Akiachak on the Kuskokwim and Mountain

TABLE XI

AVERAGE YEARLY HARVEST ESTIMATES
AND APPROXIMATE DOLLAR VALUES
OF MEAT, FISH, AND SKINS[1]

Species	Harvest[2]	Average Utilizable Weight	$ Value per Pound of Meat or Fish[3]	Average $ Value of Skin[4]	$ Value per Animal	Total $ Value
Big Game						
Moose	250	700 lbs.	$1.35/lb.	$ 15.00	$ 810.00	$ 202,500
Caribou	100	100 lbs.	$1.35/lb.	3.00	135.00	13,500
Black Bear	50	150 lbs.	$1.35/lb.	Not determined	229.00	11,450
Grizzly Bear	10	225 lbs.	$1.35/lb.	Not determined	303.75	3,038
Furbearers						
Beaver	850	20 lbs.	.69/lb.	32.00	13.80	11,730
Muskrat	8,000	2 lbs.	.69/lb.	2.00	3.38	27,040
Lynx	300			80.00	80.00	24,000
Marten	100			25.00	25.00	2,500
Mink	3,000			40.00	40.00	120,000
Land Otter	800			45.00	45.00	36,000
Weasel	200			1.00	1.00	200
Wolverine	10			70.00	70.00	700
Arctic Fox	300			28.00	28.00	8,400
Red Fox	250			45.00	45.00	11,250
Wolf	10			100.00	100.00	1,000
Snowshoe & Arctic Hare	4,000	3 lbs.	.69/lb.		2.07	8,280
Waterfowl & Birds[5]						
Ducks	280,000	1 lb.	.69/lb.	Not determined	.69	193,200
Geese	130,000	3 lbs.	.69/lb.	Not determined	2.07	269,100
Swans	5,000	10 lbs.	.69/lb.	Not determined	6.90	34,500
Cranes	1,000	4 lbs.	.69/lb		2.76	2,760
Ptarmigan	25,000	1 lb.	.69/lb.	Not determined	.69	17,250
Fish						
King Salmon	50,264	15 lbs.	1.43/lb.	Not determined	21.45	1,078,163
Other Salmon	176,677	4.3 lbs.	1.09/lb.	Not determined	4.69	828,615
Whitefish	500,000	1.5 lbs.	1.00/lb.	Not determined	1.50	750,000
Other Species	500,000 lbs.		1.00/lb.	Not determined		500,000
Sea Mammals						
Seal	4,000	100 lbs.	1.35/lb.	17.00	152.00	608,000
Walrus	50	800 lbs.	.69/lb.	120.00	672.00	33,600
						$4,796,776

[1] Approximate dollar values are in terms of Anchorage store prices for similar products if the wild game or fish were not available.

[2] Harvest data are averages for 1967-1972 excepting salmon which are for 1972.

[3] Big game and seal prices are based on average price of beef; furbearer, waterfowl, game bird, walrus prices are based on price per lb. of whole chicken; salmon prices are based on average prices of canned red and chum salmon. All prices from Gambell Street Safeway Store, Anchorage, February 1973. Values are underestimated insofar as bush store prices are usually from 25 to 100 percent higher than Anchorage prices.

[4] ADF&G statistics, based on current taxidermy and Seattle Fur Exchange prices, and other fur auction prices - Feb. 1973.

[5] About 13 percent of ducks, 64 percent of geese, and all swans, cranes, and ptarmigan are taken by the local residents (See Table VII). Dollar value of ducks and geese to local residents amounts to $196,000.

Village on the Yukon. About 26 percent of the Akiachak population and 30 percent of the Mountain Village population was surveyed. One of the questions asked each household was the proportion of meat and fish that was supplied directly by hunting and fishing. Here are the results from the households surveyed:

	Akiachak	Mountain Village
100%	10	9
75 - 100%	1	3
50 - 75%	2	2
25 - 50%	0	2
0 - 25%	0	3
0	4	2
TOTAL	17	21

[41]

Recent changes in lifestyles in the area have meant increased dependence on a cash economy. The snowmobiles that replaced dog teams require fuel bought with cash. New housing, with more space to heat, and the switch from wood to oil-burning stoves also demands cash. So will sewer, water, and electricity which are not yet available in most of the Delta villages. Nevertheless, hunting and fishing are expected to continue as important sources of subsistence income for the area's people.

Subsistence harvest plus trapping activities (Table XI) bring to the local residents an average equivalent dollar return per capita of $360 per year when meat and fish are valued in terms of Anchorage prices. (If bush food prices were used, which are usually 25 to 125 percent higher, the per capita figure could be much higher). This figure is underestimated because:

1) No estimates are available for bird's eggs, red squirrel, and grouse harvest, firewood, greens, or berries--all significant parts of subsistence living.

2) Values for hides, skins, and feathers are not always included. Natives utilize them both personally and in manufacture of handicrafts for sale.

3) The actual return to the area's economy from trapping activities is about 20 percent greater than the value accrued by the trapper if a local fur dealer is involved. Such a middleman is typical on the Delta. This additional 20 percent has not been included in Table XI.[4]

4) The economic potential of the area's subsistence and trapping resources is greater than the present harvest value.

5) No recreation values have been assigned. These are of actual and potential value to tourism in Alaska and an important source of revenue to support industries.

Cash

Commercial fishing is the most important industry and source of cash income for Yukon Delta residents (Table XII). In 1972 a total of 1,067 residents bought commercial fishing licenses. About 500 more were employed by fish processing plants in the area.

Area catch statistics for 1972 are shown on Table XIII. These statistics are broken down by commercial fishery subdistrict. Subdistrict boundaries are shown in Figure 28.

The Yukon River from below Mountain Village to the mouth is the most important area for commercial fishing. Virtually all residents here fish commercially each summer or work in the fish processing plants located at Emmonak and Alakanuk. Members of the Native-owned fishing cooperative at

TABLE XII

DOLLAR VALUE ESTIMATES OF
YUKON AND KUSKOKWIM
COMMERCIAL FISHERIES
1964 - 1971[3]

	TOTAL INCOME TO DISTRICT (Money to fishermen; wages to tender boat operators & processing plant employees.)		WHOLESALE VALUE OF PACK (Based on type of processing when fish are shipped out of the district.)	
Year	Yukon	Kuskokwim	Yukon	Kuskokwim
1964			$1,203,800	$ 409,700
1965			1,412,700	370,000
1966			1,308,100	406,500
1967	$ 856,400	$ 158,647	1,864,800	727,000
1968	799,000	330,370	1,655,156	1,135,000
1969	753,000	357,668	1,976,179	
1970	808,900	489,797	2,113,100	1,300,000
1971	1,140,700	451,730	2,106,600	672,180

TABLE XIII

APPROXIMATE COMMERCIAL SALMON CATCH IN POUNDS*
1967 - 1972 [3] [25] [65]

	Lower & Middle Kuskokwim Subdistricts 335-10 & 20**	Quinhagak Subdistrict 335-40	Yukon Delta 334-10	Lower Yukon 334-20	Totals
1967	1,166,894 lb.	72,797 lb.	2,899,888 lb.	496,911 lb.	4,636,490 lb
1968	1,733,896 lb.	859,978 lb.	2,723,511 lb.	578,566 lb.	5,895,951 lb
1969	1,517,379 lb.	687,868 lb.	2,986,348 lb.	386,352 lb.	5,577,947 lb
1970	1,035,295 lb.	838,351 lb.	3,513,252 lb.	533,823 lb.	5,920,721 lb
1971	1,548,253 lb.	352,725 lb.	3,830,155 lb.	473,625 lb.	6,204,758 lb
1972	1,657,634 lb.	565,048 lb.	3,614,390 lb.	663,906 lb.	6,500,978 lb

COMMERCIAL FISHING LICENSES - 1972 [3] [25] [65]

	335-10	335-20	335-40	334-10	334-20	
Area						
Resident	380	14	66	434	192	1111***
Outside	6	0	0	39	1	46
Total	386	14	66	473	193	1132
Estimated Dollars to Fishermen-						
1972	$254,752	$10,117	$95,747	$618,370	$128,233	$1,107,219
Average Income per Fisherman						Overall Average
1972	$ 660	$ 723	$ 1,451	$ 1,307	$ 664	$ 978

* These figures were derived by multiplying the salmon catch by the mean weights of each species for each year for each district (Yukon or Kuskokwim) 1972 mean weights for the Yukon district were not available, so 1971 weights were used.

** See Figure 28

*** Includes 25 fishermen from subdistrict 334-30. Since most of this subdistrict is outside the area of influence, and since it is unknown how much of the catch occurs within the area of influence, catch statistics for 334-30 have not been included.

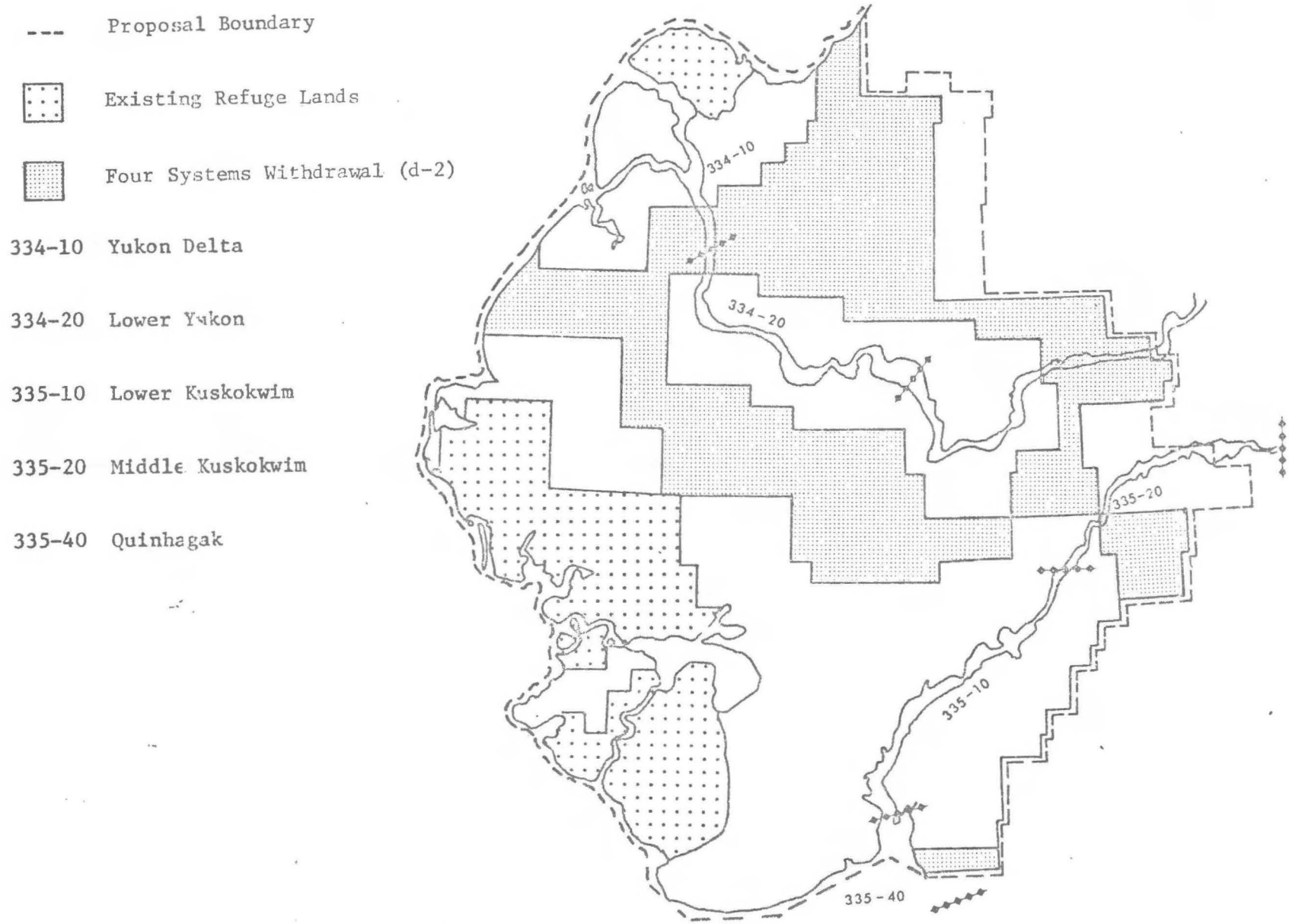


Figure 28. Commercial Fisheries Subdistricts [3]

Emmonak include 240 fishermen and about 200 processing employees. This fishing cooperative has been instrumental in raising the prices paid to fishermen by all processors in the area. In the Yukon District, king salmon prices have increased by 60 percent since 1964; silver salmon prices have almost doubled; and chum salmon prices have tripled.

Along both the Yukon and Kuskokwim Rivers, commercial fishing employs most residents of several other villages during the summer (Table XIV). The ratio of commercial fishermen to total village population is equally high in the village of Quinhagak in the Quinhagak subdistrict and the village of Tuntutuliak in the Lower Kuskokwim subdistrict. Fish processing plants are located at Mountain Village, St. Mary's, and Bethel.[3 25 43 65]

In terms of dollar revenue, trapping is the only other significant industry in the area relying on a natural resource. Its relative importance is much less on the Delta than in other areas of the State; but it is still an important source of income for many, especially those living in the villages farthest inland.

Trapping activity has declined since World War II, as wild fur prices have remained low due to competition from synthetics and ranch furs. Most persons who still trap do not rely on it as their sole source of cash income. Instead, trapping has become more of a part-time economic activity and even a recreational pursuit for some.

Since the first of 1973, however, the world market price for wild furs has risen sharply. Some fur prices, such as fox and lynx, have risen

TABLE XIV

MAJOR SOURCES OF EMPLOYMENT - 1972
(Not Including Trapping & Government)

Village	Current Population Estimate[34 51]	Commercial Fishing Licenses[25 65]	Emergency Firefighters[57]	National Guard[11]
Akiachak	314	27	0	30
Akiak	162	17	0	15
Alakanuk	432	99	32	30
Andreafsky	73	included with St. Mary's		
Aniak	201	7	42	0
Atmautluak	122	18	included with Nunapitchuk	
Bethel	2,831	30	2	59
Chefornak	168	0	0	13
Chevak	396	1	4	18
Chuloonavik	20	0	0	0
Crooked Creek	85	0	20	0
Eek	195	28	0	8
Emmonak	478	105	18	27
Georgetown	1	0	0	0
Hamilton	6	1	0	0
Hooper Bay	529	0	60	26
Kalskag	137	6	52	0
Kasigluk	279	30	0	20
Kipnuk	329	1	0	22
Kongiganak	175		0	0
Kotlik	268	70	4	15
Kwethluk	427	61	0	27
Kwigillingok	177	3	0	26
Lower Kalskag	157	included with Kalskag	0	0
Marshall (Fortuna Ledge)	174	40	26	0
Mekoryuk	287	0	0	8
Medfra	8	0	0	0
Mountain Village	437	117	45	28
Napamute	2	0	0	0
Napakiak	242	46	0	14
Napaskiak	200	23	0	22
Newtok	128	0	0	0
Nightmute	116	0	0	11
Nunapitchuk	314	35	0	23
Oscarville	47	5	0	0
Pilot Station	278	63	31	0
Pitkas Point	67	14	2	0
Quinhagak	309	66	0	39
Red Devil	104	0	5	0
Russian Mission (Yukon)	137	18	1	0
Russian Mission (Chuathbaluk)	122	0	0	0
St. Mary's	337	62	27	20
Scammon Bay	160	38	0	15
Sheldon's Point	120	24	0	0
Sleetmute	131	1	22	0
Stony River	82	0	0	0
Toksook Bay	284	0	0	14
Tuluksak	163	7	14	23
Tuntutuliak	180	44	0	12
Tununak	261	0	0	19
Totals	12,652	1,111	407	584

by as much as 200 percent over last year. Whether or not this indicates a future upward trend in prices remains to be seen. This could increase the trapping activity.[4] [16] [36]

Income from arts and crafts production is important to many families, especially to residents of Nelson Island (Table XV). Products range from grass baskets and ivory carvings to sealskin and fur parkas and mukluks. A pottery enterprise is being revived at Toksook Bay on Nelson Island where there are clay deposits. Estimates on the dollar value of arts and crafts production have not been made.

Most wage employment in the area is seasonal, with opportunities for work greatest in the short Alaskan summer. During the ice-free months of June, July, and August, persons are employed by river freight companies to haul groceries, fuel, and supplies in preparation for the long winter ahead. Construction activity is highly dependent on village housing projects. Some persons travel to other villages for construction jobs. Construction is important in the local economy, but cannot be counted upon to provide a steady and permanent source of income. The number of persons employed in river freight and construction activites is not available.

Residents are also employed on an emergency basis by the Bureau of Land Management to fight forest fires (Table XIV). The number employed each summer varies directly with the number, frequency, and size of fires. In 1971, 313 persons were employed by the Bureau of Land Management to fight fires with income per person averaging $613. In 1972, 405 were employed, for an average income per person of $807.[57]

TABLE XV

YUKON DELTA
BUSINESSES [1] [4]

Village	General Store	Lodge	Fish-Food Processing	Water Transportation	Flight Service	Electri-city	Tele-phone	Saw-mill	Arts & Crafts	Other *
Akiachak	XX									
Akiak	X									
Alakanuk	XXX		X			X				
Aniak	XX				X	X	X	X		
Atmautluak	X									
Bethel	XXXX	XX	X	XXX	XXX	X			X	*
Chefornak	X								X	
Chevak	X					X			X	
Crooked Creek	X									
Eek	X					X			X	
Emmonak	X		XXX			X				
Hamilton	X									
Hooper Bay	X					X			X	
Kalskag	X					X				
Kasigluk	X					X				
Kipnuk	X								X	
Kongiganak	X									
Kotlik	X									
Kwethluk	X									
Kwigillingok	X									
Lower Kalskag	X					X				
Marshall (Fortuna Ledge)	X					X				
Mekoryuk	X		X			X			X	
Mountain Village	XXX	?	X			X			X	
Napakiak	X									
Napamute	X									
Napaskiak	X									
Newtok	X			X					X	

TABLE XV (Cont'd)

Village	General Store	Lodge	Fish-Food Processing	Water Transportation	Flight Service	Electri-city	Tele-phone	Saw-mill	Arts & Crafts	Other *
Nightmute	X								X	
Nunapitchuk	X					X				
Oscarville	X									
Pilot Station	X		X			X				
Pitkas Point						X				
Quinhagak	X					X				
Red Devil	X									Mining
Russian Mission (Yukon)	X									
Russian Mission (Chuathbaluk)	X									
Scammon Bay	XX					X				
Sheldon's Point										
Sleetmute										
St. Mary's	X	X	X	?		X	X			
Stony River	X	X								
Toksook Bay	?					X			X	
Tuluksak	X									
Tuntutuliak	X								X	
Tununak	X					X			X	

* Bethel has the following other businesses: Construction - 2; taxicab - 4; trucking - 1; liquor - 1; fuel and ice - 2; professional - 2; broadcasting - 2.

The Army National Guard provides part-time employment for 570 persons (Table XIV). Average annual income for these people is $1,100, except in Bethel where it is $1,300. In addition 12 Guardsmen are employed full-time in Bethel for an average annual income of $15,000.[11]

A small percentage of the people are employed full-time year around, mostly by schools, post offices, and health and welfare agencies. Statistics show 415 people employed by the schools--215 as teachers, the rest as teacher aides, maintenance men, janitors, and cooks. In addition, a few people are employed by the village stores and businesses.[2] [52] [66]

Public Assistance

In addition to limited unemployment compensation payments and social security benefits, the residents receive three types of income assistance: B.I.A. welfare payments; food stamps; and State welfare payments, including Old Age Assistance, Aid to the Blind, Aid to the Disabled, and Aid to Dependent Children. The number of recipients and the average dollars received per household have increased in recent years (Table XV). This increase has been accompanied by a general decline in subsistence activities. The material living standard for some persons who now utilize both subsistence and public assistance has undoubtedly risen.

Judging from recent statistics (available only for the month of October 1973) about 35 percent of the households on the Delta currently receive welfare payments from the State of Alaska. B.I.A. welfare payments, tabulated by fiscal year, vary spazmodically with the percentage of households receiving payments ranging from 20 to 40 percent in recent years. Food stamp records,

TABLE XVI

WELFARE TRENDS

STATE OF ALASKA [6]

Village	October 1967 *Cases	Total $	October 1968 *Cases	Total $	October 1969 *Cases	Total $	October 1970 *Cases	Total $	October 1971 *Cases	Total $	October 1972 *Cases	Total $
Akiachak	14	$ 1,283	20	$ 2,350	21	$ 2,730	22	$ 5,074	29	$ 6,812	34	$ 7,835
Akiak	11	$ 956	15	$ 1,627	14	$ 1,336	16	$ 3,300	18	$ 3,573	21	$ 3,776
Alakanuk	23	$ 2,292	23	$ 2,818	24	$ 2,284	26	$ 4,691	24	$ 4,582	28	$ 4,719
Andreafsky												
Aniak	14	$ 1,503	17	$ 2,395	21	$ 2,650	21	$ 4,609	22	$ 5,007	29	$ 7,130
Atmautluak												
Bethel	68	$ 7,303	85	$11,729	100	$14,541	136	$32,363	153	$35,902	159	$36,171
Chaniliut	1	$ **										
Chefornak	7	$ 840	7	$ 954	8	$ 1,161	6	$ 1,755	9	$ 2,465	10	$ 2,640
Chevak	15	$ 1,766	19	$ 2,762	24	$ 3,922	23	$ 7,373	28	$ 8,697	36	$ 9,481
Crooked Creek	4	$ 710	8	$ 1,359	7	$ 1,124	10	$ 2,688	10	$ 2,603	9	$ 2,510
Eek	4	$ 369	12	$ 1,522	11	$ 1,448	15	$ 2,759	15	$ 2,942	14	$ 2,491
Emmonak	11	$ 1,298	16	$ 2,115	16	$ 2,450	17	$ 4,004	21	$ 4,628	23	$ 4,628
Hamilton												
Holy Cross	11	$ 1,406	13	$ 1,741	11	$ 1,755	14	$ 2,456	13	$ 2,358	11	$ 2,023
Hooper Bay	25	$ 2,904	24	$ 4,040	26	$ 4,105	26	$ 5,808	36	$ 7,459	41	$ 8,717
Kalskag	6	$ 698	9	$ 1,152	9	$ 1,563	14	$ 2,701	6	$ 1,145	10	$ 1,850
Kasigluk	15	$ 1,855	21	$ 3,072	24	$ 3,636	21	$ 5,000	23	$ 5,750	26	$ 6,115
Kipnuk	14	$ 1,754	15	$ 2,177	18	$ 2,929	23	$ 6,150	24	$ 6,345	30	$ 7,455
Kongiganak					2	$ 290	4	$ 860	6	$ 1,285	8	$ 1,655
Kotlik	9	$ 944	8	$ 911	8	$ 505	10	$ 1,651	12	$ 2,203	16	$ 2,988
Kwethluk	18	$ 1,638	23	$ 2,981	24	$ 3,518	31	$ 7,512	35	$ 8,045	32	$ 7,568
Kwigillingok	4	$ 296	7	697	6	$ 683	6	$ 1,146	8	$ 1,765	11	$ 2,000
Lower Kalskag	14	$ 1,799	15	$ 2,389	14	$ 2,124	17	$ 4,286	20	$ 4,521	19	$ 4,301
Marshall (Fortuna Ledge)	7	$ 838	7	$ 975	1	$ **	9	$ 2,237	15	$ 3,169	16	$ 3,017
Mekoryuk	10	$ 1,060	14	$ 2,097	16	$ 2,282	19	$ 4,499	20	$ 4,452	19	$ 4,145
Mountain Village	18	$ 1,486	20	$ 2,225	18	$ 2,191	19	$ 4,391	25	$ 5,388	31	$ 6,443

TABLE XVI (Cont'd)

Village	October 1967 *Cases	October 1967 Total $	October 1968 *Cases	October 1968 Total $	October 1969 *Cases	October 1969 Total $	October 1970 *Cases	October 1970 Total $	October 1971 *Cases	October 1971 Total $	October 1972 *Cases	October 1972 Total $
Napakiak	15	$ 1,605	22	$ 2,794	26	$ 2,992	26	$ 5,278	29	$ 6,071	30	$ 6,141
Napamute			1	**								
Napaskiak	19	$ 1,734	17	$ 2,051	18	$ 2,353	20	$ 4,499	21	$ 4,373	24	$ 4,675
Newtok	4	$ 575	4	$ 745	5	$ 885	5	$ 1,760	4	$ 1,335	5	$ 1,835
Nightmute	5	$ 523	3	$ 488	10	$ 1,110	10	$ 2,235	10	$ 2,390	14	$ 3,205
Nunapitchuk	15	$ 1,308	20	$ 2,340	22	$ 2,559	23	$ 4,713	23	$ 4,582	25	$ 4,882
Oscarville	1	**	1	$ **	1	$ **	1	$ **	2	$ 260	2	$ 260
Pilot Station	13	$ 1,326	15	$ 1,840	15	$ 1,833	14	$ 3,178	18	$ 3,649	20	$ 3,700
Red Devil			2	$ 232	3	$ 457	2	$ 560	4	$ 1,016	7	$ 1,007
Russian Mission (Chuathbaluk)									5	$ 850	7	$ 1,205
Russian Mission (Yukon)	13	$ 1,175	11	$ 1,017	13	$ 1,522			none		1	$ **
Scammon Bay	9	$ 694	10	$ 1,072	10	$ 1,163	11	$ 2,017	18	$ 3,082	16	$ 2,609
Sheldon's Point	3	$ 282	5	$ 442	5	$ 447	7	$ 1,206	6	$ 1,240	5	$ 1,227
Sleetmute	8	$ 804	10	$ 1,277	12	$ 1,717	12	$ 2,510	12	$ 2,387	15	$ 3,536
St. Mary's	16	$ 1,496	17	$ 1,838	22	$ 2,726	28	$ 5,600	29	$ 6,230	30	$ 5,696
Stony River	12	$ 1,403	12	$ 1,724	11	$ 1,430	11	$ 2,345	13	$ 2,860	11	$ 2,696
Toksook Bay	6	$ 618	10	$ 1,261	15	$ 2,007	18	$ 3,765	30	$ 7,856	35	$ 9,260
Tuluksak	16	$ 1,360	17	$ 1,919	15	$ 1,822	14	$ 2,970	14	$ 3,010	17	$ 3,606
Tuntutuliak	9	$ 1,001	10	$ 1,391	10	$ 1,503	11	$ 2,786	14	$ 3,499	18	$ 4,219
Tununak	13	$ 1,682	13	$ 1,526	14	$ 1,640	22	$ 4,790	25	$ 5,960	29	$ 6,426
Totals	500	$52,731	598	$78,260	650	$89,197	740	$167,710	849	$191,746	946	$206,028
Corrected for Inflation:		104.2		109.8		116.3		121.3		125.0		
Price Index *** 1967 =100		$52,731		$75,105		$81,235		$144,205		$158,075		$164,822

* Each case is a family, not an individual.
** Figures removed to protect confidentiality of individuals, but included in totals.
*** Federal Reserve Bulletin Vol. 59, No. 1, Jan. 1973, p. A68.

TABLE XVI (Cont'd)

BUREAU OF INDIAN AFFAIRS

Village	FY 1967 *Cases	FY 1967 Total $	FY 1968 *Cases	FY 1968 Total $	FY 1969 *Cases	FY 1969 Total $	FY 1970 *Cases	FY 1970 Total $	FY 1971 *Cases	FY 1971 Total $	FY 1972 *Cases	FY 1972 Total $
Akiachak	21	$ 6,388	19	$ 3,840	5	$ 425	4	$ 1,418	11	$ 4,220		
Akiak	6	$ 1,152	7	$ 1,961	4	$ 272	2	$ 695	3	$ 885		
Alakanuk	15	$ 3,143	12	$ 2,084	19	$ 3,664	8	$ 1,842	12	$ 4,474		
Andreafsky												
Aniak	16	$ 6,156	21	$ 5,099	29	$ 3,188	12	$ 6,069	9	$ 4,166		
Atmautluak	New village, originated in 1970 by former residents of Nunapitchuk						7	$ 6,377	10	$10,154		
Bethel	86	$34,038	68	$24,099	382	$36,659	105	$54,296				
Chefornak	12	$ 4,574	17	$ 9,251	19	$ 6,536	9	$ 3,593				
Chevak	33	$10,483	28	$ 7,034	36	$17,504	13	$ 5,570	18	$ 9,608		
Chuloonavik												
Crooked Creek	14	$ 6,701	6	$ 3,157	9	$ 1,952	8	$ 5,287	4	$ 900		
Eek	6	$ 1,004	26	$12,894	40	$11,043	7	$ 4,091	13	$ 7,222		
Emmonak	3	$ 806	13	$ 3,117	19	$ 3,188	6	$ 847				
Georgetown			4	$ 1,941			1	$ **				
Hamilton												
Hooper Bay	38	$11,434	36	$12,254	42	$10,809	45	$21,988				
Kalskag	12	$ 3,291	4	$ 1,361	15	$ 4,316	9	$ 2,782	2	$ 154		
Kasigluk	13	$ 2,164	12	$ 3,063	16	$ 4,948	13	$ 7,332	15	$ 9,599		
Kipnuk	18	$ 6,048	27	$11,638	15	$ 3,842	13	$ 6,122	16	$ 8,772		
Kongiganak							11	$ 5,304	7	$ 7,341		
Kotlik	7	$ 1,427	3	$ 778	9	$ 2,840	14	$ 5,489	18	$14,089		
Kwethluk	9	$ 3,214	19	$ 4,678	42	$16,109	38	$11,524				
Kwigillingok	27	$ 8,699	24	$ 8,574	26	$11,575	7	$ 3,995	3	$ 1,820		
Lime Village												
Lower Kalskag	13	$ 5,659	10	$ 4,823	4	$ 2,740	5	$ 3,289	2	$ 1,340		
Marshall (Fortuna Ledge)	6	$ 1,851	6	$ 1,830	5	$ 872	3	$ 1,410	16	$10,430		
Mekoryuk	14	$ 5,158	18	$ 6,019	16	$ 3,686	30	$ 8,200				
Mountain Village	13	$ 3,040	15	$ 4,200	24	$ 5,017	12	$ 4,694				

TABLE XVI (Cont'd)

Village	FY 1967 *Cases	FY 1967 Total $	FY 1968 *Cases	FY 1968 Total $	FY 1969 *Cases	FY 1969 Total $	FY 1970 *Cases	FY 1970 Total $	FY 1971 *Cases	FY 1971 Total $	FY 1972 *Cases	FY 1972 Total $
Napamute	2	$ 100	1	$ **								
Napakiak	15	$ 3,216	24	$ 6,718	19	$ 6,006	10	$ 4,744	14	$ 4,353		
Napaskiak	8	$ 2,373	10	$ 1,529	7	$ 820	9	$ 2,839	10	$ 5,629		
Newtok	1	$ **	9	$ 2,079	16	$ 3,834	12	$13,335				
Nightmute	4	$ 3,399	14	$ 2,565	18	$ 2,677	11	$ 5,170				
Nunapitchuk	13	$ 2,698	27	$ 7,808			10	$ 7,183	16	$ 9,788		
Oscarville	4	$ 3,004	8	$ 2,307	3	$ 1,050	2	$ 2,745				
Pilot Station	7	$ 1,200	6	$ 1,407	11	$ 1,838	9	$ 1,556	15	$ 6,533		
Pitkas Point	1	$ **	3	$ 236	3	$ 273	4	$ 593	4	$ 2,685		
Quinhagak	25	$ 7,821	33	$11,266	36	$ 9,281	26	$ 7,731				
Red Devil	1	$ **			3	$ 296						
Russian Mission (Yukon)	15	$ 1,790	10	$ 1,789	9	$ 781	8	$ 3,229	3	$ 656		
Russian Mission (Chuathbaluk)	1	$ **	1	$ **	5	$ 438				$ 1,930		
St. Mary's	9	$ 2,246	8	$ 2,280	16	$ 3,099	10	$ 5,493		$ 2,400		
Scammon Bay	8	$ 845	10	$ 1,173	21	$ 5,248	9	$ 5,838	6	$ 2,932		
Sheldon's Point	14	$ 1,744	10	$ 2,142	10	$ 1,886	5	$ 2,108	10	$ 4,119		
Sleetmute	7	$ 2,350	7	$ 3,217	5	$ 640	9	$ 4,597	6	$ 1,994		
Stony River	7	$ 3,666	7	$ 3,238	11	$ 1,332	1	$ **	5	$ 2,584		
Toksook Bay	12	$ 4,287	22	$ 9,908	27	$10,419	29	$20,535				
Tuluksak	13	$ 4,375	14	$ 3,981	16	$ 4,332	14	$ 1,839	3	$ 1,231		
Tuntutuliak	13	$ 3,531	12	$ 4,186	18	$ 6,433	19	$ 8,192	11	$ 7,870		
Tununak	6	$ 2,412	21	$ 8,157	32	$15,451	22	$19,809				
Totals	568	$179,020	652	$210,682	1062	$227,319	601	$290,759	Total figure not meaningful due to lack of complete data.			
Corrected for Inflation:				104.2		109.8		116.3				
Price Index *** 1967 =100		$179,020		$202,190		$207,030		$250,007				

* Each case is a family, not an individual.
** Figures removed to protect confidentiality of individuals, but included in totals.
*** Federal Reserve Bulletin Vol. 59, No. 1, Jan. 1973, p. A68.

kept by month, show that an average of about 42 percent of the population was receiving food stamps in 1971. The extent to which these three types of income assistance each serve the same group is unknown. Average annual household income from State welfare payments, judging from October 1972, is about $2,500. Average annual income from food stamps is unknown, but is probably between $1,000 and $2,000 per year per household.[6]

Development

Commercial

Bethel is the service center for the Delta. Judging from data furnished by the Alaska Department of Economic Development, the number of businesses on the Delta has increased by about 25 percent over the past two years. The fish processing plants are probably the most important commercial developments. Some will expand in future years as more of the processing is done locally, thereby increasing the economic return of the resource to the local residents.[1]

Education

Of the 45 villages included in the Yukon Delta area of influence, all but one have elementary schools. Contrary to other areas in rural Alaska, most of these schools are still run by the Bureau of Indian Affairs. The B.I.A. has 31 schools, almost all of which include kindergarten through eighth grade. Twelve other schools, usually including first through eighth grades, are run by the State of Alaska, Department of Education.

Within the next few years, all schools in the area will probably either become State-Operated Schools, or be administered by a future unincorporated

borough school district. Two villages, Aniak and Hooper Bay, have a ninth grade. More villages are expected to add a ninth grade in the near future. Bethel is the site of the new regional high school, where about 500 students in grades nine through twelve are enrolled. The school has a State-operated boarding facility housing 128 students.[2] [52] [66]

St. Mary's on the Yukon River has had a Catholic high school for several decades. It attracts students from the entire Yukon Delta area as well as other adjacent areas.

Each village usually has at least two non-Native teachers and two or more Native education aides who teach various aspects of Native culture such as language, boat-building, skin-sewing, basketry, and beadwork.

Utilities

Nineteen Yukon Delta villages have electricity (Table XV). Most of these villages are members of the Alaska Village Electric Cooperative. Some individuals in other villages own private light plants.[13]

Sanitation

Thirty-six of the 45 Delta villages are without sewer facilities. Three have sewer facilities and running water. About half the houses in the six other villages have sewer connections. In some cases, sewage is dumped in nearby bodies of water that are also used for drinking. Some of the villages that lack running water and sewer facilities have community wells. The Public Health Service has community wells and water and sewer systems under design for several more villages.[49]

Communications

Communication on the Yukon Delta is mostly by radio-transmitter and by mail. Almost all villages have postal service. RCA Alaska Communications is working to install a single dial telephone within every village in Alaska. At present, the following Delta villages have, or will soon have, single dial telephones: Akiachak, Akiak, Atmautluak, Chevak, Chuathlaluk, Hooper Bay, Kalskag, Kasigluk, Kwethluk, Lower Kalskag, Napakiak, Napaskiak, Nanapitchuk, Oscarville, Scammon Bay, Sheldon's Point, and Tuluksak. This represents over one-third of the area's villages. In addition, Bethel and Aniak have telephone service available to anyone upon subscription.[12]

MANAGEMENT
AND
DEVELOPMENT

MANAGEMENT AND DEVELOPMENT

The habitats of the Yukon Delta are unique. No area is found on the North American continent with a similar array or abundance of marsh, lake, and estuarine habitat. The administration of lands of the Delta is now divided between the Bureaus of Land Management and Sport Fisheries and Wildlife of the Department of the Interior. Implementation of the Alaska Native Claims Settlement Act will transfer significant portions of the area to Native village or regional corporations, and perhaps eventually to private ownership.

As the Nation's principal conservation agency, the Department of the Interior is vitally concerned with the preservation of habitats and wildlife on the Yukon Delta. The primary purpose for establishing the Yukon Delta National Wildlife Refuge within the Bureau of Sport Fisheries and Wildlife is to insure continued protection of this unique habitat and associated wildlife values. This protection would not preclude rational utilization of the area's other natural resources, but preservation of natural qualities which make the area unique must remain a paramount objective.

Economic and recreational values derived from fish and wildlife dependent on the Yukon Delta extend far beyond Alaska. A fall flight of more than three million waterfowl and at least a hundred million other migratory birds disperses over North America and to all continents and countries bordering the Pacific Ocean. A total of 170 species of birds have been

observed on the Delta, most of them nesting there. The Delta is of particular importance to species such as the black brant, cackling goose, emperor goose, white-fronted goose, whistling swan, and bristle-thighed curlew. Over 60 percent and in some cases nearly all of the continental population of each of these species nest there. Other species or populations require Delta habitats for their survival during migration.

Management Objectives

The following management objectives have been defined for the Yukon Delta National Wildlife Refuge to fulfill the Bureau's responsibilities in regard to the natural resources of the area.

1. To manage habitats of the Yukon Delta as nearly as possible in their natural condition in order to perpetrate the unique values represented by migratory birds, and resident wildlife and fishes which depend on them. Of particular concern are cackling geese, emperor geese, black brant, white-fronted geese of the Pacific flyway, and bristle-thighed curlews for whose welfare the Delta is vital.
2. To provide a variety of opportunities for interpretive, scientific, educational, and wildlife-oriented recreational use.
3. To permit recreational and subsistence use of fish and wildlife resources within the framework of appropriate State and Federal laws.
4. To assure preservation of historic and archeological sites.
5. To develop the area only to the extent necessary to enhance the natural environment and to provide for utilization of both renewable and nonrenewable resources.

Management Programs

Management programs of the Yukon Delta National Wildlife Refuge will be coordinated with programs of the Nunivak National Wildlife Refuge and the proposed Togiak and Bering Sea National Wildlife Refuges. The geographic distribution of these refuges, and nature of programs each requires will permit the sharing of manpower, equipment, and facilities which will significantly expand the capabilities of each staff.

The proposed refuge will surround or adjoin large tracts of private lands managed by Native village and regional corporations and eventually by private individuals. In addition most residents of the Delta will remain dependent on fish, wildlife, or plant resources of the refuge for subsistence foods. For these reasons, refuge programs and regulations must consider the special requirement of the area's residents to a far greater extent than smaller refuges in the contiguous states where economic opportunity for the local population is greater. To accomplish this objective it will be necessary to maintain close liaison with village and regional corporations or their representatives. Cooperative management agreements will be written for Native lands withdrawn from existing refuge land by ANCSA.

Development Programs

The diversity and abundance of fish and wildlife on the Yukon Delta are ample evidence of the excellence of existing habitat. The area of the proposed Yukon Delta National Wildlife Refuge is wilderness. There is neither dam nor dike or other physical development which attempts improvement on natural conditions. Management of nesting habitat for migratory

birds centers upon maintaining the environment essentially as it is today. Potential management and development opportunities must be weighed carefully against environmental values inherent in the area. Although the potential to enhance habitats for increased production exists, at the present level of ecological knowledge, implementation of definitive programs for manipulation of habitat is neither feasible nor desirable.

Research and Inventory Programs

If non-refuge habitats of the Delta are altered, or if destruction of wetlands in other regions of the Nation or in Canada continues, migratory bird production of the Wildlife Refuge will assume increased importance. It is imperative, therefore, that changing conditions on the Delta are monitored, and that studies be initiated to determine the feasibility and full range of implications for habitat or population management. Thus, if enhancement of habitats of the Wildlife Refuge becomes desirable, adequate information for planning will be available.

Existing wildlife populations of the Wildlife Refuge may not be as large as its habitat can support. Studies will be initiated to determine if additional protection of wildlife afforded by enforcement of appropriate laws and regulations will result in increased populations and production.

Habitats of the Delta are in a state of continual change: extensive areas of coastal and estuarine habitat are being lost to the Bering Sea, while in other areas silt from the Yukon is creating additional land. Studies to determine the extent and implications of this process are in progress by the Bureau of Sport Fisheries and Wildlife and will be accelerated.

Habitat requirements for most species of wildlife nesting on the Delta are inadequately known. Definitive ecological studies of several important species--the black brant, cackling goose, emperor goose, and whistling swan--have been initiated, but additional species must be considered.

Fire plays a significant role in maintaining excellence of habitat in forested regions of Alaska. The role of fires in the ecology of tundra is unknown. Studies of tundra fires occurring naturally will be initiated to determine their effect, and to evaluate the potential for the use of controlled fires to enhance habitat for migratory birds and other wildlife of the tundra.

Inventories of wildlife populations are basic to nearly all management and research programs. Long-term census data will provide the basis for monitoring alterations in the environment that may affect population size or distribution, including changes that may occur or migration routes or wintering areas.

Recreational Programs

Public use of the refuge by persons not resident on the Delta is expected to be limited to a few highly motivated persons interested in observation or study of the unique wildlife species or populations. Hunting, fishing, or other types of recreation, other than by Delta residents, will be precluded by the high cost of transportation and the availability of equal or superior recreational areas closer to major centers of population. The small number of persons, as well as their limited objectives, will permit the refuge staff to provide maximum assistance to each individual or group.

Extension Programs

Educational programs interpreting the local, national, and international values of Delta wildlife habitat will be extended to all villages within or adjacent to external boundaries of the Wildlife Refuge. This program, conducted by the refuge staff, will be coordinated with a program seeking maximum input from Delta residents for planning of refuge programs which may affect their culture or way of life.

An interpretive center to be located at Bethel will permit its maximum utilization by residents of the Delta, as most persons visit this city at frequent intervals.

Economic Programs

Subsistence hunting, fishing, and trapping are at present the only economic activities conducted on refuge lands. These activities are currently controlled by State and Federal regulations. On the National Wildlife Refuge these activities could continue. Refuge regulations of hunting, fishing, or trapping would be coordinated with programs of other State and Federal agencies. In all foreseen instances, seasons and bag limits will be identical with regulations established by the Alaska Department of Fish and Game for areas adjoining the refuge.

No immediate need or requirement to alter existing legal hunting practices is foreseen. However, an increased population or use of refuge lands may eventually require designation of landing and camping sites and restriction of amount and type of transportation during certain periods or in certain areas to distribute public use and prevent destruction of habitat or disturbance to wildlife.

Designation as a National Wildlife Refuge will remove the area from entry under mining laws, but mineral development could be permitted under provisions of mineral leasing laws. Timber harvesting, grazing of reindeer, and mineral exploration can be permitted under current policies of the National Wildlife Refuge System.

Historical Sites

The Antiquities Act of 1906 bans the appropriation, excavation, injury, or destruction of any prehistoric or historic ruin, monument, or other object of antiquity on any Federal land. Evidence of ancient Eskimo camps and villages is scattered throughout the region of the Delta. They may number several hundred. It will be an objective of the refuge to identify and evaluate all such sites. Study of these sites by qualified investigators will permit interpretation of the historic occurrences and abundance of wildlife on the Delta in addition to interpreting the cultural development of a people uniquely adapted to survive in one of earth's harshest environments.

Wild and Scenic Rivers

The Andreafsky and its East Fork are the only rivers located within the proposed Wildlife Refuge that have been studied for potential designation as a Wild or Scenic River. Most of the course of this river is within the Wildlife Refuge and will merit special protection. Developments, including but not limited to mining, that would alter the natural appearance or values of this stream will be prohibited within a two-mile corridor or within sight, whichever is more, on each side of this stream in any portion within the refuge. In addition developments on tributary or

headwater streams or in adjacent uplands will be regulated and, if necessary, prohibited to prevent activities that would alter the characteristics of the present stream and detract or preclude its continued management or value as a Wild or Scenic River.

Additional rivers and streams within the proposed Wildlife Refuge have similar wild or scenic values as well as having major significance to wildlife populations. These will merit regulation and management more restrictive than on other portions of the refuge.

Wilderness Areas

A portion of the area within the existing Clarence Rhode National Wildlife Range which is to be incorporated within the Yukon Delta National Wildlife Refuge is currently being studied for its potential value as part of the National Wilderness System. The complications and uncertain land status of much of the study area resulting from ANCSA preclude the completion of an adequate or definitive study or meaningful recommendations at this time. This study will be completed when land selecitons by Native groups are completed and the status of lands remaining in the refuge are known.

Administration

The proposed Yukon Delta National Wildlife Refuge will be administered from a headquarters located at Bethel. This city is centrally located within the region and is its major population center. The location would permit the most flexible and efficient use of personnel and would facilitate coordination of programs with residents of the Delta, with other Federal or State agencies, and with programs on other refuges. The Bureau of Sport Fisheries and Wildlife has maintained a facility at Bethel since 1962.

A field station has been maintained at Old Chevak since 1949. This station will be continued and will be a major center of activities in summer months. Additional field facilities may be required with access to the Yukon River. The location of this facility has not been determined, but may be located in the village of St. Mary's at the mouth of the Andreafsky River.

CONCLUSIONS

CONCLUSIONS

The Yukon Delta, comprising a total of about 20 million acres is one of the most important nesting areas for waterfowl and other migratory birds on the continent. Fall populations of waterfowl include 50,000 swans, 720,000 geese, 2,292,000 ducks, and perhaps more than 100 million shore and other water birds. In addition, the region is important for many terrestrial birds of tundra and forest, as well as a wide variety of other wildlife.

The unique wildlife values of the Yukon Delta are clearly of major significance both locally and in regions far removed from the Delta. Evaluation of all resource values suggests that Federal lands on the Delta should be managed for wildlife, especially migratory waterfowl and other birds. For them there is no similar vast area of suitable habitat.

Management of the area can be achieved most efficiently by inclusion of Federal lands in the National Wildlife Refuge System of the Bureau of Sport Fisheries and Wildlife. The Bureau is legally charged with the preservation and management of unique wildlife habitats and is specifically responsible for protection and management of migratory birds.

Management of the area as a National Wildlife Refuge will permit continued recreation or subsistence use of wildlife resources, within State and Federal regulations, as well as compatible development of other resources that may exist.

APPENDICES

APPENDIX A

EXISTING AND PROPOSED NATIONAL WILDLIFE REFUGES IN ALASKA

In response to requirements of the Alaska Native Claims Settlement Act of 1971, the Secretary of the Interior withdrew 80 million acres from the public domain for study as possible additions into the National Wildlife Refuge, Park, Forest, and Wild and Scenic Rivers Systems. Of this area, the Bureau of Sport Fisheries and Wildlife is evaluating approximately 36 million acres for possible inclusion in the National Wildlife Refuge System.

Other lands withdrawn by the Secretary under provisions of the Act provided for selection by Native village and regional corporations, as well as for classification so that public interests were properly protected. Certain of these lands which abut or are largely surrounded by the "Four Systems Withdrawals" are also considered for inclusion in the Refuge System, should any portion thereof be available following selections by village or regional corporations or the State of Alaska.

Lands in unreserved public domain are also included in several of the proposed refuges, but comprise only a small proportion of the area considered.

Lands evaluated for the Wildlife Refuge System represent all major habitats and thus contain the entire variety of birds, mammals, fishes, and plants found in Alaska. They include: scattered islands along the coast from

APPROXIMATE AREA AND SOURCE OF LANDS IN PROPOSED REFUGES

Proposed Refuge	Approximate Area of Proposed Refuge in Acres 1/						Native Selection Withdrawals 3/
	Existing Refuge Lands 2/	Refuge Deficiency Withdrawal	Unreserved Public Domain	Four Systems Withdrawal	National Interest Withdrawal	Total	
Aialik	0	0	16,350	0	0	16,350	3,190
Arctic	8,894,600	136,600	37,600	2,529,800	0	11,598,600	227,800
Barren Islands	0	0	20	10,000	0	10,020	0
Bering Sea	74,000	0	3,980	0	570	78,550	2,500
Chukchi	0	0	0	80,360	0	80,360	9,300
Iliamna	0	0	0	2,820,000	565,000	3,385,000	1,679,000
Kodiak	1,815,000	0	440	0	0	1,815,440	8,920
Kotzebue Sound	0	0	460,000	4,275,000	790,000	5,525,000	2,346,000
Koyukuk	0	0	22,800	7,633,500	68,500	7,724,800	2,528,300
Shumagin Islands	10,440	0	1,550	4,300	0	16,290	38,550
Togiak	265,000	767,000	0	2,760,000	368,000	4,160,000	1,403,000
Yukon Delta	2,753,700	215,500	664,400	5,725,700	0	9,359,300	9,995,900
Yukon Flats	0	0	0	10,607,300	1,836,900	12,444,200	3,963,500
Total	13,812,740	1,119,100	1,207,140	36,445,960	3,628,970	56,313,910	22,206,960

1/ Acreages are gross approximations because of incomplete surveys and mapping, unrecorded and unsurveyed inholdings, and pending land selections by Native village and regional corporations.

2/ Approximately 1,242,000 acres will be deleted from existing refuge lands through selection by Natives under provisions of the ANCSA.

3/ Lands of interest for inclusion in proposed refuges but subject to prior selection by Native village and regional corporations and by the State of Alaska. Only a small fraction of these land areas will be available to the refuge.

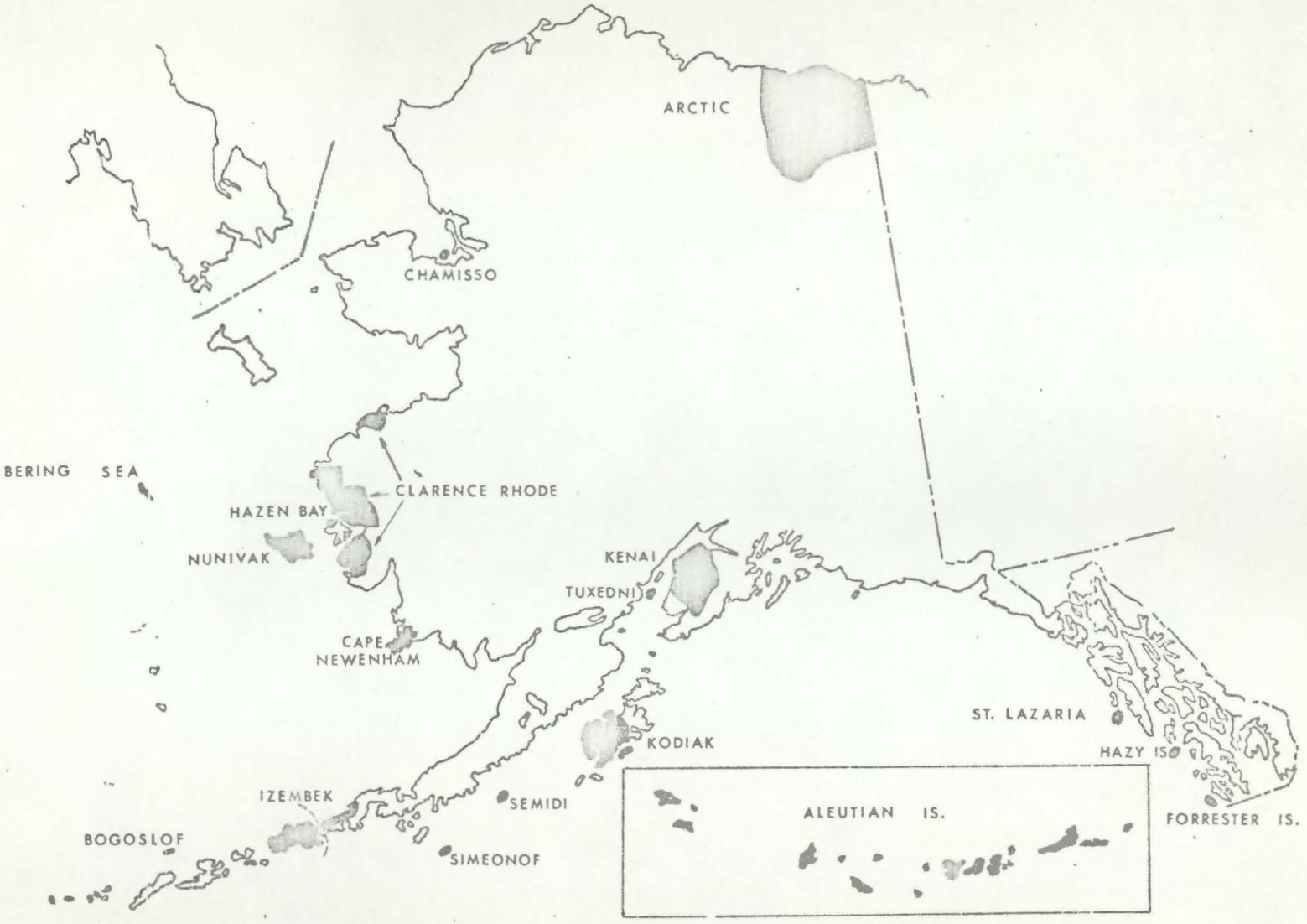
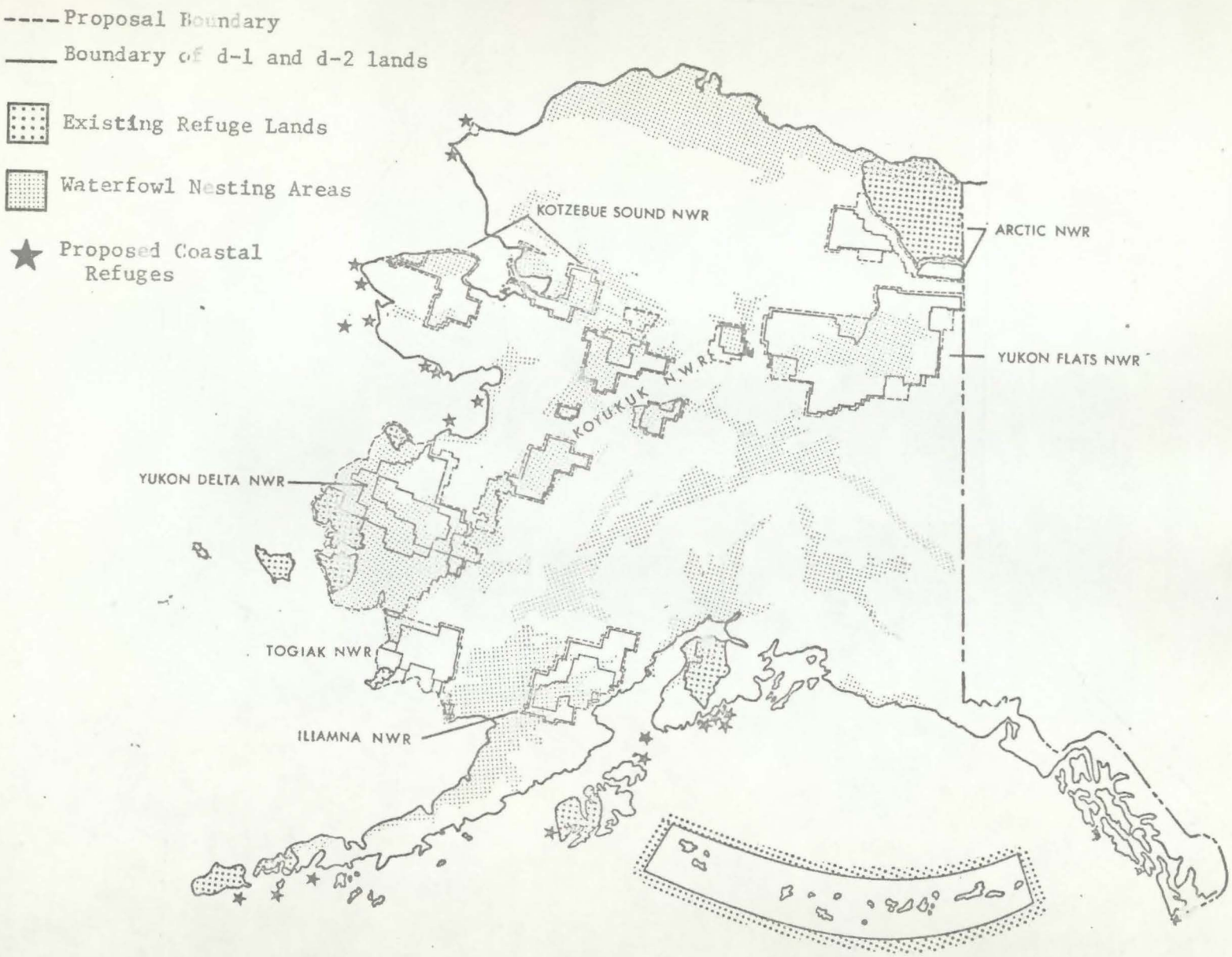


Figure 3. Existing National Wildlife Refuges in Alaska


Proposal Boundary
Boundary of d-1 and d-2 lands
Existing Refuge Lands
Waterfowl Nesting Areas
Proposed Coastal Refuges
KOTZEBUE SOUND NWR
ARCTIC NWR
YUKON FLATS NWR
KOYUKUK N.W.R.
YUKON DELTA NWR
TOGIAK NWR
ILIAMNA NWR

the Gulf of Alaska to the Arctic Ocean; lowlands of the Yukon Delta and Kotzebue Sound; inland valleys of the Yukon, Koyukuk, and Innoko Rivers where these spread over lake-dotted flood plains and furnish habitat for 12 million waterfowl and other wildlife; and mountainous areas that are of primary importance for resident wildlife including Dall sheep, caribou, grizzly bears, wolves, and wolverines.

Refuge designation would not preclude development of natural resources where such developments are in the National interest and not in conflict with preservation of wildlife habitats or other significant recreational and esthetic values which must remain paramount. In other states, marshes once teeming with wildlife have been drained and now are farms or developed communities. Sprawling cities are encroaching on bays and estuaries; their factories and docks replacing tide flats where sandpipers foraged; their effluent polluting waters and destroying its life. Much of Alaska is still nearly untouched by the "progress" of man, but evidence of his intrusion is growing at an accelerating pace, and is becoming visible in the most remote regions. Many of Alaska's habitats are fragile - the marks of a tracked vehicle on the tundra may last a century causing erosion scars, changing frost patterns, and destroying the denning place of a mink or the nest of a plover. Abuse of land in Alaska is less easily avoided and has more serious and enduring effects than abuse of lands in more temperate regions.

The Bureau of Sport Fisheries and Wildlife is dedicated to the philosophy that unique habitats can and must be preserved for our enjoyment and that of future generations. The existing and proposed refuges described on the

following pages are such areas, covering the variety of Alaska's landscape - the islands, deltas, river valleys, and mountains; the marshes, tundra, and forest. Here waterfowl, plovers, curlews, and other birds may return each spring to more than a million lakes and ponds, to tide flats and tundra hummocks of lichens, mosses, and dwarf Arctic shrubs. Moose, caribou, wolverines, and wolves may range forest or tundra as they have for centuries and sheep may occupy the mountain slopes. These proposals represent the last opportunity for integrating refuge areas with land use planning in Alaska.

PROPOSED REFUGES

AIALIK

The Aialik Refuge occupies several small islands and forested promontories at the sourthern tip of the Kenai Peninsula. The area is highly scenic and supports large numbers of kittiwakes, puffins, sea lions, sea otters, and seals. Although uninhabited, the area is accessible by boat from Seward.

ARCTIC

The existing Arctic Wildlife Range in the northeasternmost corner of Alaska will be expanded on the south and southwest. The Range represents the only portion of the Arctic environment, either existing or proposed, that is large enough to be biologically self-sufficient. The objectives of the Range are to preserve the unique wildlife, wilderness, scientific, and recreational values. Among the wildlife of importance are grizzly, black, and polar bears, caribou, Dall sheep, moose, wolverines, and wolves. Birds include numerous species of ducks and geese, gyrfalcons,

and the endangered peregrine falcon. The extensions to the Range are mountainous areas necessary to protect important drainages. They contain important habitat for caribou, wolves, wolverines, and grizzly bears and have significant scenic and wilderness values.

BARREN ISLANDS

The Barren Islands as the name implies are an uninhabited group of small islands lying between the Kodiak Archipelago and the tip of the Kenai Peninsula. Although located on a major shipping and ferry route and close to the major population centers of south-central Alaska, the islands are surrounded by dangerous waters and are rarely visited. Because of their isolation and physical features and the productivity of surrounding waters, the islands contain one of the largest seabird and sea lion colonies in the Gulf of Alaska and also provide important habitat for harbor seals and sea otters.

BERING SEA

The Bering Sea Refuge consists of the existing refuge with the addition of several small islands and segments of marine cliffs of the Seward Peninsula. The islands are important for large nesting colonies of seabirds and as hauling grounds for walrus and several species of seals. Other mammals and birds are relatively unimportant except on St. Mathew and Hall Islands in the existing refuge, as elsewhere land areas are not sufficiently large to support extensive wildlife populations. The most spectacular areas are perhaps Pinnacle Island and Fairway Rock which rise abruptly as spires to several hundred feet, with the rock faces of the spires literally covered with nesting birds during summer months.

CHUKCHI

The Chukchi Refuge is located on the Chukchi Sea, a broad arm of the Arctic Ocean. It is one of five proposed refuges of coastal Alaska that would provide protection to colonial nesting seabirds and to hauling areas for marine mammals. The Chukchi Refuge contains the northernmost of the large colonies of murres, kittiwakes, and puffins which nest on the precipitous marine cliffs of Cape Thompson and Cape Lisburne which are the principal physiographic features of the area. Inland habitat is typical of arid Arctic tundra and supports typically Arctic mammals and birds including caribou, muskox, wolves, and barren ground grizzlies.

ILIAMNA

The Iliamna Refuge located in the Bristol Bay region of western Alaska contains nearly the entire variety of Alaska wildlife. The primary value of the area however, may be in the protection of the numerous streams of the Lake Clark and Iliamna Lake watersheds which contribute substantially to the red salmon fishery of Bristol Bay. The region also contains one of Alaska's most noteworthy sport fisheries for rainbow trout, Dolly Varden, and grayling.

KODIAK

The existing Kodiak Refuge is noted primarily for the famous Kodiak bears. The proposal would add more than 800 offshore rocks and islets which would significantly increase diversity of the refuge and provide protection to numerous colonies of seabirds and hauling places for marine mammals including sea otters, sea lions, and harbor seals. The existing portion of this refuge is ruggedly mountainous and contains extensive stream systems used by salmon which support the valuable Kodiak commercial fishing industry.

KOTZEBUE SOUND

Lowlands bordering Kotzebue Sound in northwestern Alaska are similar to the Yukon Delta but are somewhat less productive, perhaps because of more rigorous climatic conditions. In addition to being an important production area for waterfowl, the Serpentine Flats and adjacent lagoons to the north of the Seward Peninsula are a major staging area and migration route. Many birds cross the Bering Strait to Siberia. Observers may commonly encounter species not found elsewhere in North America. Other birds and mammals are typical of northern Alaska.

The refuge on Kotzebue Sound together with the Yukon Flats, Yukon Delta, and Koyukuk Refuges would insure continued protection of large segments of all major waterfowl production areas in Alaska, with the exception of those on the Arctic slope.

KOYUKUK

The Koyukuk Refuge has values similar to those of the Yukon Flats, but consists of several smaller flood plain valleys of the Koyukuk, Kanuti, Kaiyuk, Nowitna, and Innoko Rivers. Large waterfowl populations include about 800,000 ducks and 300,000 geese. Other wildlife including moose, wolves, caribou, and various furbearing animals historically have been of major economic importance to residents of the region.

SHUMAGIN ISLANDS

The Shumagin Islands Refuge would consist of the existing Simeonof Refuge and more than 470 uninhabited islands and rocks bordering the western tip of the Alaska Peninsula. The islands of this refuge together with the existing Semidi and Tuxedni Refuges contain most of the seabird

colonies of the Alaska Peninsula and are also of major importance to sea otters, sea lions, and harbor seals.

TOGIAK

Togiak will be a multi-purpose refuge located between Bristol and Kuskokwim Bays. The refuge will incorporate the existing Cape Newenham Refuge as well as varied additional lands. The general character of the area is mountainous but three enclosed bays provide major staging areas for migrant waterfowl and a large number of harbor seals usually may be observed near their entrance. The Nushagak Peninsula is part of an ancient delta with large nesting populations of waterfowl. Wave-cut cliffs bordering Cape Newenham contain nesting colonies of seabirds that are among the largest in Alaska with a population certainly exceeding a million. Except for grizzly bears which are abundant in mountain areas, large mammals are relatively scarce. Several large lakes located in scenic mountain valleys are drained by clear-water streams. Both lakes and streams abound with trout, salmon, and other fishes. Two streams, the Togiak and Kanektok, have been recommended for consideration as Wild or Scenic Rivers.

YUKON DELTA

The Yukon Delta on the Bering Sea Coast is the most important area in Alaska for migratory birds. Fall populations may average more than three million waterfowl including 2.3 million ducks, 0.7 million geese, and 50,000 swans. If there were no waterfowl, the area would still be of unique importance for the vast number of shore and water birds, which include loons, plovers, curlews, and godwits and which dwarf the number of

waterfowl in their abundance. The refuge would encompass approximately half of the Delta in area, but about two-thirds of its wildlife resource. Remaining lands will be obtained by Native village and regional corporations to which the wildlife resource is also a significant social and economic concern. Hence, ultimate management objectives on refuge and non-refuge lands may be similar.

YUKON FLATS

The Yukon Flats, located in northeastern Alaska, is the most important nesting area for waterfowl in interior Alaska, producing a fall flight of two million ducks which migrate through all of the contiguous states. Some may winter in Mexico, the islands of the Caribbean, and the northern parts of South America. In addition to the lowlands of the Yukon Flats, the refuge would include surrounding uplands and mountain areas with drainage into the important lowland areas. The uplands provide representative habitat for caribou, Dall sheep, grizzly bears, and other mammals of northern Alaska, and significantly increase recreation values for the refuge. Among the many streams, the Beaver, Porcupine, and Sheenjek possess features which recommend their management for their value as Wild or Scenic Rivers.

EXISTING REFUGES

Existing refuges not discussed in the above proposals would continue to be a significant part of the Refuge System in Alaska, in most cases providing values that are not contained in the new units.

ALEUTIAN ISLANDS

The Aleutians are a chain of volcanic islands extending a thousand miles westward from the Alaska Peninsula and dividing the Bering Sea from the North Pacific Ocean. The islands are swept by storms and are often shrouded by fog. Vegetation consists of grasses, mosses, lichens, many flowering plants, and low-growing shrubs common to tundra regions. The islands provide important habitat for many species of sea mammals of which the sea otter is of primary interest. Seabirds are among the most obvious wildlife residents. Bald eagles are abundant, nesting on the rock pinnacles or sea stacks along the shores of major islands. Because of the isolation of the islands many species of birds have developed distinct races or subspecies, most important of which is the endangered Aleutian Canada goose.

BOGOSLOF

Bogoslof is a small island in the Bering Sea north of the Aleutians noted for its large rookeries of thick-billed and common murres and for one of Alaska's largest colonies of sea lions. Remote and uninhabited, the refuge is not easily visited.

FORRESTER, HAZY, AND ST. LAZARIA

These refuges are all small islands in southeastern Alaska established for protection of several species of seabirds not found on islands of the Bering Sea, the Aleutians, or adjacent to the Alaska Peninsula.

IZEMBEK

The Izembek Refuge is most significant for the protection it offers bays and lagoons which support vast populations of migrant waterfowl which

include nearly the entire world populations of black brant and emperor geese. Upland portions of the refuge contain spectacular scenic features and provide important habitat for brown bears and caribou. Streams within the refuge support important sport fisheries and provide important spawning areas for salmon.

KENAI

The diverse habitats of the Kenai Refuge on Cook Inlet in southcentral Alaska furnishes some of the State's most important recreational areas. Topography varies from rugged mountains and mountain glaciers above timberline to forested lowlands abounding in lakes and ponds. Large mammals include not only moose, for which the area is most noted, but also Dall sheep, mountain goats, caribou, and brown and black bears. Lowlands provide important waterfowl habitat and are particularly significant for a large population of trumpeter swans, only recently removed from the list of endangered species. Lakes and streams also provide important sport fisheries as well as spawning and rearing habitat for salmon of a large Cook Inlet fishery.

NUNIVAK

Nunivak is a large island located in the Bering Sea adjacent to the Yukon Delta. The refuge includes all offshore rocks and islands, bays, and lagoons. Much of the island is low, but interior regions are broken by small volcanic mountains, many containing explosion craters and crater lakes. Vegetation is typical of sub-Arctic tundra. Wildlife is diverse, but largely related to the marine environment. Wave-cut cliffs provide habitat for some of the largest colonies of kittiwakes, murres,

and other seabirds in Alaska. Lowland areas provide important nesting habitat for waterfowl and shorebirds but the island is much less important for nesting than as a staging area for many thousands of migrant waterfowl which utilize bays and lagoons. Seals, sea lions, walrus, and several species of whales may be in offshore portions of the refuge. A herd of more than 500 muskox was the source of animals for reestablishing this animal in parts of Alaska where it was exterminated more than a century ago.

SEMIDI

The several small islands composing this refuge located south of the Alaska Peninsula contain rookeries of puffins, auklets, petrels, murres, and kittiwakes together with an enormous colony of fulmars. A large colony of sea lions as well as sea otters and harbor seals are also protected by the refuge.

SUMMARY

The existing and proposed refuges will provide an integrated system of National Wildlife Refuges for perpetuation of Alaska's important wildlife resources. Habitats are representative of nearly all the diverse regions, wildlife, fishes, and plants. They contain habitat of major significance to 10 percent or more of continental waterfowl populations. They protect nesting habitat for the majority of seabirds of the Bering Sea and the North Pacific Ocean as well as resting or breeding areas for marine mammals. All of the large mammals of Alaska - caribou, moose, muskox, black, brown, and polar bears, Dall sheep, and mountain goats - may be found on the refuges as will as all the fur-bearing

animals including wolves, wolverines, and sea otters which are rare or absent in other states.

The establishment of these areas as National Wildlife Refuges would insure perpetuation of a large segment of Alaska's wildlife resource despite the accelerating pace of development which extends to the most remote regions and the rapidly changing status of public lands.

APPENDIX B

Checklist of Birds from the Yukon Delta [24 61 62]

Birds of the Yukon Delta are listed with keys to their abundance or status and primary areas in which they winter. Abbreviations used to indicate abundance or probable status are:

Abundance

a	abundant
c	common
o	occasional
u	uncommon or rare

Status

n	nesting
m	migrant
r	resident throughout the year
v	vagrant or stray

Abundance is considered relative to both numbers elsewhere and to its occurrence in preferred habitat on the Yukon Delta. For example, black brant are listed as abundant because they are numerous on the Delta and occur in greater numbers there than in any other part of their range. Although bristle-thighed curlews are present in relatively low numbers, they are listed as common because most, perhaps all, individuals of this species are present on the Delta in summer and fall. When information on wintering areas is not based on recoveries of birds banded on the Delta, the most likely area within the known distribution of the species is given. Usually a western distribution is assumed when species range over the continent, but this may be incorrect. An asterisk (*) is used to indicate species of which more than half the world population utilizes the Delta for nesting or foraging during migration.

Species	Status		Wintering Areas
Common loon	o	n	S.E. Alaska south to Baja California
Yellow-billed loon	u	m	S.E. Alaska south to British Columbia
Red-throated loon	c	n	Aleutian Islands south to Baja California and Sonora
Arctic loon	a	n	S.E. Alaska south to Baja California and Sonora
Red-necked grebe	c	n	S.E. Alaska south to central California
Horned grebe	o	n	S.E. Alaska south to southern California
Double-crested cormorant	u	n	Bering Sea
Pelagic cormorant	c	n	Bering Sea
Red-faced cormorant	c	n	Bering Sea
Whistling swan*	a	n	British Columbia south to California, Nevada and Utah, occasionally to Atlantic Coast
Trumpeter swan	u	n	S.E. Alaska and British Columbia
Taverner's Canada goose	c	n	Washington, Oregon, and California
Cackling Canada goose*	a	n	Washington, Oregon, and California
Black brant*	a	n	British Columbia south to Baja California and Mexico
Emperor goose*	a	n	Aleutian Islands, Alaska Peninsula, Kodiak
Pacific white-fronted goose*	a	n	California and Mexico
Lesser snow goose	a	m	California (summers in USSR)
Mallard	c	n	British Columbia, Washington, and Oregon
Gadwall	u	v	California
Pintail	a	n	Washington to California and Mexico
Aleutian teal	u	v	Aleutian Islands

Species	Status		Wintering Areas
Green-winged teal	a	n	Washington, Oregon, and California
American widgeon	c	n	British Columbia south to California
Shoveler	c	n	Washington,Oregon, and California
Redhead	u	v	California
Canvasback	o	n	California, Texas, Maryland
Ring-necked duck	u	m	California, Gulf Coast, south through Mexico
Greater scaup	a	n	British Columbia south to California, Great Lakes, Louisiana, Connecticut south to Virginia
Lesser scaup	o	n	British Columbia south to Mexico, Texas, Great Lakes, Connecticut south to Florida
American goldeneye	c	n	Alaska south to California
Barrow's goldeneye	o	n	Alaska south to California
Bufflehead	o	n	British Columbia south to California (USSR)
Oldsquaw	a	n	Bering Sea (USSR, northern Canada)
Harlequin	u	m	Aleutian Islands
Steller's Eider	o	n	Bering Sea
Pacific common eider	a	n	Bering Sea
King eider	c	m	Bering Sea
Spectacled eider	a	n	Unknown, probably Bering Sea
White-winged scoter	u	n	Kodiak, S.E. Alaska
Surf scoter	u	n	S.E. Alaska
Common scoter	c	n	Aleutian Islands, Kodiak, S.E. Alaska
American merganser	u	v	S.E. Alaska
Red-breasted merganser	c	n	Aleutian Islands, to S.E. Alaska
Goshawk	o	n	Alaska, possibly south to British Columbia and California

Species	Status		Wintering Areas
Sharpshinned hawk	o	n	British Columbia and possible south to Central America
Rough-legged hawk	o	n	British Columbia possible south to California
Golden eagle	u	n	Alaska, possibly south to Montana and other mountain states
Bald eagle	u	n	S.E. Alaska
Marsh hawk	c	n	British Columbia, Alberta, possibly south to Central America
Osprey	o	n	California, possibly south to South America
Gyrfalcon	o	n	Alaska
Peregrine falcon	o	m	British Columbia, possible south to California and Central America
Pigeon hawk	o	n	California, probably south to Baja California
Sparrow hawk	o	v	California, probably south to Mexico
Spruce grouse	c	r	Alaska
Ruffed grouse	c	r	Alaska
Willow ptarmigan	a	r	Alaska
Rock ptarmigan	o	r	Alaska
Sharp-tailed grouse	u	r	Alaska
Lesser sandhill crane	a	n	Southern California, Texas, south to Baja California and Sonora
Semipalmated plover	o	n	California south to Sonora
Mongolian plover	u	v	Southern Asia and south to Pacific Islands
Killdeer	u	v	British Columbia south to Mexico
Golden plover	u-c	n-m	South Pacific Islands to New Zealand
Black-bellied plover	a	n	British Columbia, California, south to Peru

Species	Status	Wintering Area
Surfbird	u m	S.E. Alaska south to Cape Horn
Ruddy turnstone	c n	California south to Chile, South Pacific Islands to New Zealand
Black turnstone	a n	S.E. Alaska south to Baja California and Sonora
Wilson's snipe	a n	British Columbia south to Mexico Central America, Venezuela
Whimbrel	u-c n-m	California, south to southern Chile
Bristle-thighed curlew*	a n	Hawaiian Islands south to Fiji, Samoa, other South Pacific Islands
Eskimo curlew	Probably extinct, once most abundant migrant of large curlews	
Spotted sandpiper	o n	British Columbia south to Peru
Solitary sandpiper	o n	Baja California south to Equador, Boliva, and Argentina
Wandering tattler	u v	Baja California to Equador, South Pacific Islands
Greater yellowlegs	o n	California south to Central America
Lesser yellowlegs	o n	Texas south to Central and South America
Eurasian knot	c m	Washington to California
Rock sandpiper	c n	Aleutian Islands to S.E. Alaska
Sharp-tailed sandpiper	a m	Alaska south to California
Pectoral sandpiper	o n	Bolivia, Argentina
Baird's sandpiper	u n	Andes Mountains, Ecuador, Bolivia and Chile
Least sandpiper	o n	Oregon, California south to Central America and northern Peru
Dunlin	a n	S.E. Alaska south to California, Baja California and Sonora
Long-billed dowitcher	c n	California south to Central America and Ecuador

Species	Status		Wintering Areas
Semipalmated sandpiper	o	n	Gulf Coast to Central America and West Indies and widespread in South America
Western sandpiper	a	n	California through Mexico, Central America to Ecuador
Bar-tailed godwit	a	n	Philippines, Malaya, south to Australia, Tasmania and New Zealand
Hudsonian godwit	o	m	Southern Chile, Tierra del Fuego and Falkland Islands
Sanderling	o	m	British Columbia south through Mexico, Central America to Chile
Red phalarope	a	n	At sea, South Pacific to Falkland Islands and New Zealand
Northern phalarope	a	n	At sea off South America, Malaya and Philippines
Pomarine jaeger	c	m	At sea, California to Peru
Parasitic jaeger	a	n	At sea, California to southern Chili, Australia, New Zealand
Long-tailed jaeger	a	n	At sea off South America
Glaucous gull	a	n	Bering Sea, Aleutians, to Kodiak
Glaucous-winged gull	c	n	Aleutians and S.E. Alaska south to Baja California and Sonora
Slate-backed gull	u	v	Bering Sea
Herring gull	o	n	Alaska south to Central America
Mew gull	a	n	S.E. Alaska south to California
Bonaparte's gull	c	n	Washington south to Baja California and Jalisco
Pacific kittiwake	c	n	S.E. Alaska to Baja California
Sabine's gull	a	n	At sea south to Peru
Arctic tern	a	n	Cental Chile south to Antarctica
Aleutian tern	c	n	Northwestern Pacific, Sakhalin to Honshu

Species	Status		Wintering Areas
North Pacific murre	c	n	Bering Sea
Black guillemot	o	m	Bering Sea
Pigeon guillemot	o	m	Bering Sea
Parakeet auklet	o	m	Bering Sea to coasts off Washington and Oregon
Crested auklet	o	m	Seas adjacent to Aleutian Islands
Horned puffin	c	n	Bering Sea
Tufted puffin	c	n	Bering Sea
Great horned owl	c	n	Alaska
Snowy owl	o	n	Alaska
Hawk owl	o	n	Alaska south to northern United States
Short-eared owl	c	n	Alaska south to British Columbia, Washington and Montana
Boreal owl	o	n	Alaska
Kingfisher	o	n	S.E. Alaska south to Baja California, northwestern Mexico
Boreal yellow-shafted flicker	o	n	California
Downy woodpecker	o	n	Alaska
Northern three-toed woodpecker	o	n	Alaska
Northern Say's phoebe	o	n	California
Alder flycatcher	o	n	Honduras south to Peru and northern Argentina
Horned lark	o	m	British Columbia, Washington and Oregon
Violet-green swallow	o	n	California south to Cental America
Tree swallow	c	n	California south to Baja California and northern Mexico
Bank swallow	c	n	Central South America
Barn swallow	u	n	Central South America to northern Chili and Argentina

Species	Status	Wintering Areas
Cliff swallow	o n	Brazil south to Chile Argentina
Alaska gray jay	c n	Alaska
American black-billed magpie	u m	Alaska south to Puget Sound
Northern raven	a r	Alaska
Black-capped chickadee	c r	Alaska
Gray-headed chickadee	o r	Alaska
Boreal chickadee	c r	Alaska
Robin	c n	Gulf Coast, Florida south to Veracruz
Varied thrush	c n	Idaho, California and south to Baja California
Hermit thrush	c n	British Columbia south to Baja California
Gray-cheeked thrush	c n	Central America south to Peru and northeastern Brazil
European wheatear	o m	S.E. Asia
Arctic warbler	o n	Philippines, East Indies, and Indochina
Ruby-crowned kinglet	o n	British Columbia south to California
White wagtail	u v	South China, Borneo, Philippines
Yellow wagtail	c n	Oregon and Nevada to Baja California and western Mexico
Water pipit	u n	Eastern China and Japan
Red-throated pipit	u v	Southern China, Borneo
Bohemian waxwing	o n	S.E. Alaska south to California
Northern shrike	c n	Alaska south to Oregon, eastern California, Nevada and Utah
Orange-crowned warbler	o n	California to Baja California
Yellow warbler	c n	Southern Baja California and Campeche to Panama

Species	Status		Wintering Areas
Myrtle warbler	c	n	Oregon and California south through Mexico to Panama
Blackpoll warbler	c	n	Guiana and Venezuela to Brazil and Ecuador
Northern waterthrush	c	n	Baja California and Mexico to northern South America
Wilson's warbler	c	n	Mexico to Panama
Rusty Blackbird	c	n	Gulf of Mexico
Pine Grosbeak	o	n	Alaska south to Oregon and Montana
Gray-crowned rosy finch	o	n	Alaska
Hoary redpoll	o	r	Alaska
Common redpoll	c	r	Alaska
White-winged crossbill	o	r	Alaska
Savannah sparrow	a	n	Western Oregon and Utah to Sonora and Baja California
Slate-colored junco	o	n	Minnesota, Michigan, and New England States to Gulf Coast
Tree sparrow	c	n	Nevada, Arizona, New Mexico, and Texas
White-crowned sparrow	c	n	British Columbia, Wyoming, Utah to Baja California and southern Mexico
Golden-crowned sparrow	o	n	British Columbia to California
Fox Sparrow	c	n	Texas, Louisiana, Alabama, and northern Florida
Lincoln's sparrow	o	n	Baja California, Mexico, and Central America
Alaska longspur	a	n	Northeastern California and Colorado to Texas
Snow bunting	o-c	r-m	Alaska
McKay's snow bunting	c	m	Alaska

APPENDIX C

MAMMALS OF THE YUKON-KUSKOKWIM DELTA[35 62]

Scientific Name	Common Name*
Sorex cinereus	Masked shrew
Sorex tundrensis	Tundra shrew
Sorex obscurus	Dusky shrew
Myotis lucifugus	Little brown bat (u, f)
Lepus othus	Arctic hare (t)
Lepus americanus	Snowshoe hare (f)
Marmota caligata	Hoary marmot (m)
Cittellus parryi	Arctic ground squirrel (f,m)
Tamiasciurus hudsonicus	Red squirrel (f)
Castor can densis	Beaver
Dicrostonyx groenlandicus	Collared lemming
Synaptomys borealis	Bog lemming (?)
Lemmus trimucronatus	Brown lemming
Clethrionomys rutilus	Red-backed vole
Microtus pennsylvanicus	Meadow vole (?)
Mocrotus oeconomus	Tundra vole
Ondatra zebethicus	Muskrat
Zapus hudsonius	Meadow jumping mouse (r)
Erithizon dorsatum	Porcupine (f)
Delphinapterus leucas	Beluga (white whale) (u,e)
Canis lupus	Wolf (u)
Alopex lagopus	Arctic fox (t)
Vulpes fulva	Red fox
Ursus americanus	Black bear
Ursus arctos	Grizzly or Brown bear (f,m)
Thalarctos maritumus	Polar bear (r)
Mustela americana	Pine marten (f)
Mustela erminea	Short-tailed weasel or Ermine
Mustela rixosa	Least weasel
Mustela rison	Mink
Gulo gulo	Wolverine
Lutra canadensis	River otter
Lynx canadensis	Lynx (f)

Scientific Name	Common Name*
Callorhinus ursinus	Alaska fur seal (r,e)
Eumelopius jubata	Steller sea lion (r,e)
Odobenus rosmarus	Pacific walrus (r,e)
Phoca vitulina	Harbor seal (e)
Histriophoca fasciata	Ribbon seal (e)
Pusa hispida	Ringed seal (e)
Erignatus barbatus	Bearded seal (e)
Alces alces	Moose (f)
Rangifer tarandus	Caribou (l)
Ovibos moschatus	Muskox (l)

*Mammals are common throughout the area unless indicated by following symbols: l, occurs locally only; t, primarily in tundra areas; f, primaril in forest areas; e, restricted to tidal estuaries; m, in mountain areas; u, uncommon; and, r, rare.

APPENDIX D

FISHES OF THE YUKON-KUSKOKWIM DELTA
Including unvarified species
reported from the area

SCIENTIFIC NAME	COMMON NAME
Lampetra japonica Martens	Arctic lamprey
Entesphenus tridentatus Gairdner	Pacific lamprey
Stenedus leucichthys Pallas	Sheefish
Coregonus pidschian Gmelin	Humpback
Coregonus nasus Pallas	Broad whitefish
Coregonus sardinella Valenciennes	Least cisco
Coregonus autumnalis Pallas	Arctic cisco
Prosopium cylindraceum Pallas	Round whitefish
Prosopium coulteri Eigenmann & Eigenmann	Pygmy whitefish
Oncorhynchus tshawytscha Walbaum	King salmon
Oncorhynchus nerka Walbaum	Red salmon
Oncorhynchus kisutch Walbaum	Coho salmon
Oncorhynchus gorbuscha Walbaum	Pink salmon
Oncorhynchus keta Walbaum	Chum salmon
Salmo gairdnerii Richardson	Rainbow trout
Salvelinus alpinus Linnaeus	Arctic char
Salvelinus malma Walbaum	Dolly Varden
Salvelinus namaycush Walbaum	Lake trout
Thymallus arcticus Pallas	Grayling

Osmerus eperlanus linne	Boreal smelt
Hypemesus elidus Pallas	Pond smelt
Dallia pectoralis Bean	Black fish
Esex lucius Linnaeus	Pike
Leta leta Cuvier	Lush, burbot
Cottus aleuticus Gilbert	Bullhead
Cottus cognatus Richardson	Bullhead
Arctegadus berisovi Drjagin	Arctic cod
Bereogadus saida Lepechin	Polar cod
Eleginus gracilis Tilesius	Saffron cod
Oligocottus maculosus Girard	
Catostomus catostomus Forester	Longnose sucker
Percopsis omiscomaycus Walbaum	Trout perch
Hybopsis plumbea Agassiz	Northern chub
Gasteresteus aculeatus Linnaeus	Threespine stickleback
Pungitius pungitius Linnaeus	Ninespine stickleback
Pleurenectes stellatus Pallas	Starry flounder
Liopsetta glacialis Pallas	Arctic flounder

APPENDIX E

SCIENTIFIC NAMES AND NOTES ON PLANTS DISCUSSED IN TEXT

Few botanists have visited the region of the Yukon Delta and there is no group of plants which is adequately known. Collections in the Clarence Rhode National Wildlife Range are perhaps most complete, containing about 60 species of mosses, 45 species of lichens, and 300 species of flowering plants. Inland areas are poorly represented in this collection.

The following lists of plants discussed in the text includes many of the most important species, usually those dominating or characteristic of particular habitats. Many plants not listed may be equally important or widespread.

Mosses and Lichens

Mosses and lichens, "reindeer mosses" characterize heath tundra habitats, frequently forming mats on which other plants grow. More than 60 mosses and 45 lichens have been identified from the coastal region near Chevak. The lichens were collected in less than an hour within a space of an acre. Despite their importance, the mosses and lichens, abundant in forest and tundra areas, are least known of the Delta plants.

Grasses and Sedges

Grasses and sedges are an important part of the tundra, appearing in scattered clumps in areas of moss or lichens; or in broad or dense stands in disturbed areas, tideflats, marshes; or on some river banks

or lake shores. Their abundance with the lack of trees probably led Ernest Thompson Seton to describe tundra as "Arctic Prairie," a term which is much more accurate than the "Barrens" a common designation of tundra areas in Canada. Species of particular importance include:

Calamagrostes canadensis, bluejoint grass	Most common in disturbed areas throughout Delta region.
Eriophorum angustifolium, cotton grass Eriophorum scheuchzeri, cotton grass	The "Alaska cotton" common in wet areas thoughout Delta.
Elymus crenarius, rye grass	Common in coastal regions on dunes, tideflats, or along rivers and sloughs.
Poa emineus, spear grass	Common on tideflats, frequently occurs with rye grass.
Carex aquatilis, sedge Carex lyngebyei, sedge	This & following species are tall sedges dominant in marshes & edges of some streams & lakes. Seeds are used extensively as food by many waterfowl.
Carex rariflora, sedge	A small sedge dominant on tidal meadows. Probably the most important food item for most gees & many swans.
Carex Mackenzie, sedge	A low sedge of wet areas on tidal meadows. A choice food of geese when available.

Shrubs on Sub-shrubs

Although the tundra is far from devoid of woody vegetation most woody plants are decumbent or creeping, or grow to heights varying from only a few inches to little more than a foot. A few, alders and some willows, may grow to several feet in height, but are usually found in isolated thickets on hillsides or lake margins. They become more abundant inland where the climate is less severe. All of small woody plants of the tundra are also common in the thinly forested portions of the Delta. Most common shrubs include:

Alnus crispa, alder	In thickets on mountain slopes.
Alnus incaner, alder	In thickets along inland lakes & streams.
Arctostaphylos alpina, bearberry	Common on heath tundra.
Betula nana, dwarf birch	Common on heath tundra
Cornus succica, bunchberry	Most common on fringe between heath tundra & lowlands.
Empetrum nigrum, crowberry *	Common in heath tundra.
Ledum decumbens, Labrador tea	Common on heath tundra.
Loiseleuria procumbens,	Common on heath tundra.
Rubus arcticus,	Most common on moist grassy areas near lakes.
Rubus chamaemorus, cloudberry *	Common on heath tundra. Most important of berries used by Eskimos.

Salix ovalifolium,	Common on heath tundra & usually the first woody plant to invade tideflats.
Salix spp., willows	Several species common on hill slopes.
Vaccinium uliginosum, blueberry *	Common on tundra & forest areas.
Vaccinium vitis-idaea, crowberry *	Sub-shrub common throughout Delta.

* Berries used commonly by Eskimos. All are also used extensively by many species of waterfowl, ptarmigan, and other wildlife.

Tundra Flowers

Both tundra and forest regions of the Yukon Delta are noteworthy, as are other Arctic and sub-arctic regions, for their variety and abundance of brightly colored plants. Most species are ephemeral, blossoming of short periods, usually in spring; but for some species, into late summer. Only a few of the most prominent forbes are listed below:

Aconitum delphinifolium, monk's hood	Moist places, frequently in tall grass.
Campanula lassiocarpa, bellflower	Usually on drier hillsides.
Chrysanthemum arcticum, Arctic chrysanthenum	Common throughout region but most abundant on tidal meadows.
Claytonia sarmentosa	Most abundant in tidal meadows.
Geranium erianthum, wild geranium	Usually in disturbed areas.

Iris setosa, blue flag	Wet places on protected banks or hills. Frequently near older thickets.
Mertensia paniculata	Usually disturbed areas.
Pernassia palustris	Moist areas, particularly tidal meadows.
Pedicularis spp., louswort	Several species found throughout Delta.
Prinula cuneifolia, primrose	Most abundant in tidal meadows.
Senecio congestus	Most abundant on mudflats of receding lakes.
Stellaria spp., chickweed	Common in moist places, especially on tidal meadows.

Aquatic

Aquatic plants are more poorly known than terrestrial plants, most botanical collections being obtained from near villages or highways. On the Yukon Delta, coastal regions are best known, although growth of aquatic plants is more abundant and diverse inland. Most common plants in Delta lakes include:

Caltha palustris	Mud flats of receding lakes.
Equisetum fluviatile	Most common on shores of inland lakes.
Hippuris tetraphylum, marestail	Coastal ponds.
Hippuris vulgaris, marestail	Upland freshwater ponds.

Lemna trisulca, star duckweed	Common in bog lakes.
Lemna minor, little duckweed	Uncommon.
Menyanthis trifoliata, buckbean	Shoreline of bog lakes.
Nuphar polysepalum, yellow pond lily	Inland bog lakes.
Nymphaea tetragona, white pond lily	Inland bog lakes.
Potamogeton filiformis, pondweed	Common throughout Delta.
Potamogeton perfoliatus, pondweed	Most common inland.
Potamogeton porsildorum, pondweed	Coastal ponds.
Potamogeton vaginatus, pondweed	Most common inland.
Potentilla palustris, marsh cinquefoil	Edges of bog lakes & ponds.
Sparganium spp., burreed	Bog lakes.

Trees

Forest growth is limited primarily to inland regions, extending outward toward the coast only in narrow bands adjacent to the Yukon and Kuskokwim Rivers. Growth rates are slow and trees are scrubby and scattered, frequently interspersed with areas of muskeg or bog. Species are few, including only:

Betula papyrifera, paperbirch	Sparcely distributed in spruce forest
Laria laricina	Sparce in muskeg and black spruce forest
Picea glauca, white spruce	Well-drained sites
Picea mariana, glack spruce	Poorly drained sites - includes most of spruce in Delta region

Populus balsamifera, cottonwood	Riverbanks
Populus tremuloides, aspen	Successional species along rivers or in burned areas

APPENDIX F

LAND USE COMMITMENTS OF THE PROPOSED
YUKON DELTA NATIONAL WILDLIFE REFUGE

Location	Acres	Description
T5N R77W Section 13	4.99	Patented land - Cemetery site
T8N R72W Sections 12, 13, 23, 24	1,055.91	Patented land - Airport conveyance
T16, 17N, R94W	390.62	Patented land - Airport conveyance
T17N R60W Sections 19, 20, 29, 30	23.15	Patented land - Indian mission patent
T22N R70W Section 31	39.18	Patented land - Titled Native allotment
T23N R77W Section 22	33.20	Patented land - Titled Native allotment
T23N R77W Sections 12, 13, 24-26, 36	3,585.29	Patented land - Airport conveyance
T28N R82W Section 6	67.66	Patented land - Indian mission patent
T2N R74W Section 31 T7N R73W Section 20	1.15 2.07	Withdrawal (PLO 2020) for Department of the Army for use as National Guard Sites
T8N R72W Sections 11, 14	43.22	Withdrawal (PLO 3445) for FAA for air navigation aid site
T8N R72W	28.50	Withdrawal (PLO 3413) for BLM for use as administrative site and fire control station
T8N R72W Section 15	10.00	Withdrawal (PLO 3956) for FAA for use as an air navigation site
T9N R76W Section 29	3.90	Withdrawn for State school use 7/5/55

Location	Acres	Description
T14N R62W Section 6	40.00	Withdrawal for State school use 1/24/38
T 19,20N R92W	4,900.00	Withdrawal (PLO 1813) for Department of Air Force for military purposes
T1N R73W Section 6	10.00	Airport lease to State issued 5/29/72
T2S R79W Sections 28, 32, 33	127.09	Airport lease to State
T19N R66W Section 6	40.00	Airport lease to State issued 12/30/63
T8N R72W Section 12		R/W to BLM for 60-foot access road
T8N R72W Sections 12, 13		R/W to BLM for 100-foot trail
T8N R72W Sections 12, 14		R/W to BLM for 20-foot access road
T8N R72W Section 15	48.35	R/W to State for material site
T8N R72W Section 13		Three R/W's to BLM for trails
T22N R76W T23N R77, 78W	12,034.00	R/W to ALaska Village Coop. Inc. for distribution line
T26N R87W Section 11	0.13	R/W to Coast Guard for navigation light
T5N R91W Section 1	7.78	R/W application by Alaska Village Coop. Inc. for distribution line
T22N R76W Section 6	10.00	R/W application by State for recreation and public purposes

APPENDIX G

BUREAU OF OUTDOOR RECREATION STATEMENT
CONCERNING WILD AND SCENIC RIVER STUDIES
WITHIN THE YUKON DELTA

Within the study area the Andreafsky River (including the East Fork) has been identified by the Bureau of Outdoor Recreation as having high potential for inclusion in the National Wild and Scenic Rivers System. Based upon an aerial reconnaissance and available information, it is the conclusion of the Bureau of Outdoor Recreation that the Andreafsky River meets the criteria established by the Congress for inclusion in the National Wild and Scenic Rivers System in that:

The river is in a free-flowing natural condition.

The river and its immediate environment possesses outstandingly remarkable values.

Water quality is excellent.

There is sufficient volume of water during normal years to permit, during the recreation season, full enjoyment of river related outdoor recreation activities.

The river and its immediate environment are capable of being managed to protect and interpret special values and protect the user.

The river is of sufficient length to provide a meaningful experience to the river user.

After careful consideration of the resource values involved and the Guidelines for Evaluating Wild, Scenic and Recreational River Areas...

adopted by the Departments of Agriculture and the Interior in February 1970, it is the conclusion of the Bureau of Outdoor Recreation that the Andreafsky River qualifies as a wild river area.

The outstanding values of the river area include its combination scenic, recreational, and fish and wildlife resources. These resources are exceptionally well illustrated in this river area and are associated with no other of the 40 rivers in Alaska identified by the Bureau of Outdoor Recreation as having high potential for inclusion in the National Wild and Scenic Rivers System.

The Andreafsky River and the East Fork are medium-sized clearwater streams located approximately 440 miles west of Anchorage and about 125 miles north of Bethel. The river flows southerly 120 miles to its confluence with the Yukon River. The East Fork parallels the Andreafsky for approximately 125 miles before joining it 5 miles above the Yukon confluence. Both rivers flow through low, tundra-covered hills. The rivers meander gently in valleys lined with spruce-birch forests. Swift currents and many open vistas offer good canoeing or rafting potential.

In addition to excellent populations of Arctic char and grayling, the river provides spawning grounds for four varieties of salmon: king, chum, pink, and silver (coho). Not only does the fishery enhance recreational values of the river, but the king salmon and chum salmon runs contribute to the commercial and subsistence catches in the lower Yukon area. Based on aerial surveys conducted by the Alaska

Department of Fish and Game, this river is one of the most significant king salmon spawning areas in the entire Yukon River drainage.

The Andreafsky River area is reported to be one of the few nesting locations of the endangered bristle-thighed curlew.

The Bureau of Outdoor Recreation believes that the management concepts presented in this report recommending the establishment of the Yukon Delta National Wildlife Range are compatible with the intent of preserving selected river areas in a free-flowing condition for the benefit and enjoyment of present and future generations as prescribed by the Wild and Scenic Rivers Act. Consequently, separate legislation to designate portions of this river as components of the National Wild and Scenic Rivers System will not be recommended by the Bureau of Outdoor Recreation if the Yukon Delta National Wildlife Range is authorized by Congress.

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