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US FISH & WILDLIFE SERVICE--ALASKA

ANADROMOUS FISH INVENTORY

ARCTIC NATIONAL WILDLIFE REFUGE, ALASKA
and Associated Area of Ecological Concern

Prepared for
Fish and Wildlife Service
by
Arctic Environmental Information and Data Center
University of Alaska, Anchorage

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Anadromous Fish Inventory Information Framework

a. Bibliography

The files of the Arctic Environmental Information and Data Center were utilized for the compilation of an initial bibliography. Referenced titles were then obtained and citations pertaining to the area and species of interest which appeared in these reports were added to expand the initial bibliography. References were deleted if, when obtained, the study was not found to pertain to the area or species of interest. In a few cases where references were unobtainable, such citations are followed by the note "(not seen)" to indicate that any pertinent data contained in this reference is not included in the remainder of the inventory.

All possible reference sources are listed with the exception of those containing extremely general subject matter, most early (before 1910) exploratory reports, and annual report series such as Alaska Fishery and Fur-Seal Industries in (year) which were issued prior to 1960.

b. Species Lists

A list of anadromous and coastal marine fishes for each proposed refuge or proposed additions to existing refuges was compiled. An initial list was taken from each final environmental statement; however, three major taxonomic references were consulted to add to, or delete from this initial list - List of Fishes of Alaska and Adjacent Waters with a Guide to Some of Their Literature (Quast and Hall 1972), Pacific Fishes of Canada (Hart 1973), and Freshwater Fishes of Canada (Scott and Crossman 1973). Species on the lists which were considered to be coastal marine inhabitants were verified with A List of Common and Scientific Names of Fishes from the United States and Canada (Bailey

inhabiting Alaskan waters are needed - e.g. Cottidae - since some species have not been included in the American Fisheries Society list because their taxonomic status has not been determined. Species which have been included in some of the earlier ichthyological literature and have not recently been verified are not included in the present lists.

An anadromous species was considered to be one which spawns in fresh water, and at some point in its early life cycle, undergoes a migration to salt or brackish water. In some regions (Koyukuk, Yukon Flats) a non-migratory form of an anadromous species (inconnu, some whitefish) was determined from the literature, and therefore, this species was not included in the list. Coastal marine species were considered to be residents of nearshore neritic, lagoon, or estuarine habitats. Species which generally inhabit fresh water, but have been found to enter coastal, brackish water, were included as coastal marine forms and were indicated thus - e.g. ninespine stickleback.

c. Histories of Commercial, Sport, and Subsistence Fisheries

Historical references were consulted as well as management reports and periodicals for any data which document the commercial, sport, or subsistence utilization of anadromous fish within the boundaries of ecological concern for each proposed refuge. Knowledgeable research and management personnel with state and federal agencies also were consulted to provide additional unpublished data. In many refuge areas, historical information was sparse. However, considerable use was made of descriptions of subsistence life styles documented in Alaska Natives and the Land (Federal Field Committee 1968). Sport and commercial historical information was largely

taken from Alaska Department of Fish and Game publications.

Each refuge historical summary is a brief description of trends of activity rather than a year-by-year account. For example, some publications have traced the history of cannery operation in a particular region and have indicated when and where each company began or ceased operation. These types of data were synthesized into a general account of the contribution and significance of cannery operation in that area. Significant sources of information are appropriately referenced.

d. Habitat

Anadromous fish habitat was regularly calculated to the most upstream record for any species. All habitat, except the largest lakes, was measured in linear statute miles from drainage mouth to most upstream record using a fine string to follow the main channel as charted on standard U.S. Geological Survey 1:250,000 scale quadrangle sheets. For major lakes, habitat areas are recorded in square miles.

For major rivers such as the Yukon, Kobuk and Kuskokwim, standard mileage reference points utilized by the Alaska Department of Fish and Game were used.

In the Wood River and Kvichak River drainages, extensive spawning ground catalogs have been published (Demory, Orrell and Heinle 1964; Marriott 1963). In these two systems linear miles of habitat are taken directly from these previous calculations.

In the tabular record of this data, tributaries are listed immediately following and indented from the larger watercourse into which they flow. Each refuge listing begins at the northwesternmost corner of the area of interest.

Where species are not known but anadromous fish are recorded as present (Alaska Department of Fish and Game 1975), waterways are so indicated. All other systems are recorded by species present. A series of annotated U.S. Geological Survey quadrangles compiled by the Alaska Department of Fish and Game, Habitat Division, was helpful in clarifying certain habitat areas and species.

e. Key Spawning and Rearing Areas

This section is one of the weakest of this report. Almost all information came from Atkinson, Rose and Duncan (1967) except for the excellent data in the spawning ground catalogs for the Wood River and Kvichak River drainages (Demory, Orrell and Heinle 1964; Marriott 1963). Little other compiled information exists and that in Atkinson, Rose and Duncan (1967) was, at times, found to be questionable in its accuracy—for example, the existence of spawning grounds in the main channels of the lower Yukon River and above the Tazimina River falls in the Lake Iliamna area is suspect.

Areas of major lakes which are prime rearing areas for sockeye salmon, are recorded in square miles. In the Wood River and Kvichak River drainages, spawning grounds are measured in both linear miles of waterway and in acres of utilized or potentially utilizable area.

Tabular data, including the method of listing tributaries, is handled in the same manner as the habitat information.

f. Runs/Escapement

Escapement counts estimates of total spawning run were obtained almost entirely from Alaska Department of Fish and Game management reports and surveys conducted by the University of Washington's Fisheries Research

Institute on the Kvichak River and Wood River drainages. These counts are a variety of weir, aerial and tower counts and are so indicated. In a few cases, population estimates from tagging studies are available.

g. Harvest Data

Harvest includes separate statistics for the subsistence, commercial and sport fisheries. Data are in numbers of fish as reported to the managing agency.

Harvest data were obtained almost entirely from Alaska Department of Fish and Game management reports and International North Pacific Fisheries Commission Statistical Yearbooks. Where possible, commercial harvest data are tabulated by statistical district sub-units. Often such detail is not readily accessible, and data are portrayed by entire statistical district. Subsistence data are listed by village or by statistical district. Sport harvest data are almost nonexistent except for a few selected survey sites in the Kvichak River and Naknek River drainages.

h. Effort

Effort includes the amount of gear used, number of licenses and time fished where these data are available. Commercial effort is moderately documented while little sport and subsistence effort is available.

Effort information has been derived almost entirely from Alaska Department of Fish and Game management reports. The statistical divisions used in reporting the data vary. In some cases, entire areas may not have been subdivided for effort statistics, while in other parts of the state, this information is available by statistical district or even subdistrict.

Value of catch to the fisherman has been calculated from "price per fish" data provided in Alaska Department of Fish and Game management reports.

1. Mylar Overlays

The following information was plotted on mylar overlays of U.S. Geological Survey 1:250,000 scale quadrangles:

1. All waterways inhabited by anadromous fish are indicated to their most upstream record of any species of interest.
2. Anadromous inhabitants are named for all waterways where present.
3. Spawning and rearing areas are identified and are rated in value for each species. This rating is most often based on a minimum of data and should be used with extreme care and recognition that, at most, only the relative abundance of spawners utilizing such an area is indicated. Where data for salmon are more readily available, a low rating indicates a spawning population of less than 5,000 fish; a medium rating indicates a spawning population of between 5,000 and 20,000 fish; and a high rating indicates in excess of 20,000 spawners may regularly use such an area. Much of the information base for this section was obtained from escapement statistics reported in Alaska Department of Fish and Game management reports and in Demory, Orrell and Heinle (1964) and Marriott (1963).
4. Recorded harvest areas are indicated as commercial, sport or subsistence along with major species harvested. Again, much of this information involved the interpretation of data presented in Alaska Department of Fish and Game management reports.
5. All operating or recently operating federal or state research research stations or field sites are plotted.
6. Various activities which might become sources of impact on the fisheries resources were plotted including potential gas pipeline stream crossings (Arctic National Wildlife Refuge), oil and gas wells (Arctic

National Wildlife Refuge), potential dam sites, existing airfields, and locations of mineral occurrence of potential economic value including concentrations of existing mineral claims.

j. Statewide Mylar Overlay of Major Anadromous Fish Streams

"Major" is defined as having a regular run of the indicated species in excess of 50,000 fish. Primary data for this section was obtained from Atkinson, Rose and Duncan (1967).

Coastal Marine and Anadromous Fishes
Arctic National Wildlife Refuge

	Pacific Herring	<u>Clupea harengus pallasii</u>
o	Arctic Cisco	<u>Coregonus autumnalis</u>
(o)	Broad Whitefish	<u>Coregonus nasus</u>
*	Humpback Whitefish	<u>Coregonus clupeaformis</u>
o	Least Cisco	<u>Coregonus sardinella</u>
o	Pink Salmon	<u>Oncorhynchus gorbuscha</u>
o	Chum Salmon	<u>Oncorhynchus keta</u>
(o)	Arctic Char	<u>Salvelinus alpinus</u>
	Capelin	<u>Mallotus villosus</u>
	Smelt	<u>Osmerus spp.</u>
	Arctic Cod	<u>Boreogadus saida</u>
	Saffron Cod	<u>Eleginus gracilis</u>
	Canadian Eelpout	<u>Lycodes polaris</u>
	Polar Eelpout	<u>Lycodes turneri</u>
	Unnamed Zoarcid	<u>Lycodes agnostus</u>
*	Ninespine Stickleback	<u>Pungitius pungitius</u>
	Fourline Snakeblenny	<u>Eumesogrammus praecisus</u>
	Slender Eelblenny	<u>Lumpenus facricii</u>
	Arctic Shanny	<u>Stichaeus punctatus</u>
	Langbarn	<u>Leptoclinus maculatus</u>
	Pacific Sand Lance	<u>Ammodytes hexapterus</u>
	Hamecon	<u>Artediellus scaber</u>
	Arctic Hooknose Sculpin	<u>Artediellus uncinatus</u>
	Arctic Staghorn Sculpin	<u>Gymnocanthus tricuspis</u>
	Threaded Sculpin	<u>Gymnocanthus pistilliger</u>
	Twohorn Sculpin	<u>Icelus bicornis</u>
	Spatulate Sculpin	<u>Icelus spatula</u>
	Fourhorn Sculpin	<u>Myoxocephalus quadricornis</u>
	Arctic Sculpin	<u>Myoxocephalus scorpioides</u>
	Shorthorn Sculpin	<u>Myoxocephalus scorpius</u>
	Ribbed Sculpin	<u>Triglops pingeli</u>
	Unnamed Cottid	<u>Onocottus hexacornis</u>
	Arctic Alligatorfish	<u>Aspidophoriodes olriki</u>
	Bartail Snailfish	<u>Liparis herachelinus</u>
	Gelatinous Seasnail	<u>Liparis koefoedi</u>
	Striped Seasnail	<u>Liparis liparis</u>
	Arctic Flounder	<u>Liopsetta glacialis</u>
	Starry Flounder	<u>Platichthys stellatus</u>

- o Anadromous
- (o) Both anadromous and resident
- * May enter coastal, brackish water

History of Subsistence
Arctic National Wildlife Refuge, Alaska

The proposed addition to the Arctic National Wildlife Refuge encompasses an area of about 3.73 million acres of land. Within its boundaries are contained 270 residents inhabiting two villages - Kaktovik and Arctic Village. Most of the people who reside in the area of influence are native and are dependent upon lands and waters within the area for at least a portion of their subsistence.

Approximately 120 people are residents of Arctic Village. All but about five are Athapascan Indians. For most in this village, hunting and fishing were and are now the primary occupation and source of income. No historical information traces the early fishery activities of this village, and it is doubtful that residents obtain any subsistence from anadromous species.

Kaktovik has approximately 150 residents, 125 of whom are Inupiak-speaking Eskimos whose culture and life style are based upon hunting and fishing. Fishing effort by villagers is primarily for subsistence. The two major fisheries are the Hulahula River and the saltwater lagoons adjacent to Barter Island. The Hulahula River is fished from mid-April to the end of May in its upper drainage. Catches are made by hook and line through the ice of small resident char and grayling. During July and August subsistence fishing effort shifts to saltwater adjacent to the island, primarily by means of gill nets. The main catch is anadromous Arctic char during July and Arctic cisco during August. Cisco are preferred by the Eskimo and are caught in abundance during this period. Kaktovik residents may take several hundred pounds of fish from these areas each season.

Subsistence fishing effort by Kaktovik Eskimos is partly dependent on

the abundance of caribou in the area. During years when game is more plentiful, fishing effort declines. Alternately, subsistence fishing is more prevalent in years, such as 1973, when caribou are more scarce in the area. Fishing also is partly influenced by the presence of a DEW line site in the village. Those Natives employed at the DEW line still fish on their one day off per week, primarily because of its cultural importance. Natives who are not employed at the site, however, hunt, fish and trap as their main occupation.

An early account of subsistence fishing in the area is provided by Leffingwell (1919). Favored subsistence harvest areas are outside the area of interest at Oliktok, the east side of Beechey Point, and the north side of Brownlow Point. However, within the area of concern, along the coast, Natives used gill nets in the fall just before freeze-up. In the rivers in fall, the water level is so low that the shoals may be waded in order to seine the more productive pools. Leffingwell noted that on the Shaviovik River, abundant quantities of fish could be taken in this manner, enough perhaps to provide fish for two years of use. In winter, Natives were observed to jig for fish through the ice, providing a day-to-day subsistence catch. Leffingwell also referred to "salmon-trout," probably Arctic char, which were harvested both on the coast and in the rivers, averaging one and one-half pounds, but occasionally attaining eight pounds in weight. Whitefish were apparently taken along the coast only.

The Hulahula River was fished in early years at three principal sites: one-half mile upstream from the mouth of Old Man Creek, ^{and 10 to 20 miles upstream} and 10-20 miles downstream from this site on the Hulahula River. Fishing occurred during all months of ice cover, but in recent years, peak effort has been expended during March through May. The principal catch was Arctic char, both anadromous and resident forms. Fishing was

pursued during ice-free months in coastal lagoons for Arctic char, least cisco, and other whitefish. In addition, historical Native subsistence fishing occurred on the Jago and Aichilik Rivers.

Rostlund (1952) has concluded that although some Natives depended heavily upon subsistence fishing in other areas of Alaska, the Arctic Natives did not, even though a considerable resource was available. Harvest methods during these early times included harpoons or spears; hooks made of pieces of bone, wood, or metal attached to a shank; and various types of nets. The principal methods of preserving fish were air drying and storage, or by burial which allowed the flesh to undergo partial decomposition for the purpose of making a delicacy or seasoning.

**History of Commercial Fishery
Arctic National Wildlife Refuge, Alaska**

No commercial fishery presently exists within the area of ecological concern.

History of Sport Fishery Arctic National Wildlife Refuge, Alaska

Very little information is available documenting historical sport utilization of anadromous fish in the area. At present, sport fishing is minimal, although Kaktovik and Arctic Village Natives may engage in some local sport activity. A few people from the DEW line site fish the shores of Barter Island in mid-summer for Arctic char. Airplane charter service is available in Kaktovik, and has catered to small numbers of sport fishermen for trips to Schrader Lake in the spring, primarily for lake trout. A small charter operation is also available for fly-in fishing at Elusive Lake. Some sport fishing occurs in many of the area's rivers for char. Prime fishing period extends from the end of August to freeze-up. Effort is expended around char spawning grounds and along the entire length of the Ivishak River (Yoshihara 1973).

Sport fishing effort has increased in the Prudhoe Bay area on the Sagavanirktok River, primarily by personnel associated with the oil development in this area. Roads and airstrips have provided the access to this area.

Anadromous Species: Abbreviations

AL = Arctic lamprey

AC = Arctic char

PS = Pink salmon

CS = Chum salmon

RS = Sockeye salmon

KS = King salmon

SS = Coho salmon

In = Inconnu

BWF = Broad whitefish

ACI = Arctic cisco

LC = Least cisco

WF = Whitefish (species unidentified)

RBS = Rainbow smelt

BC = Bering cisco

UN = Species unidentified

Anadromous Fish Habitat
Arctic National Wildlife Refuge, Alaska
and Associated Areas of Ecological Concern

Drainage Name	Anadromous Species (Habitat in miles)							
	AC	PS	CS	ACI	LC	BWF	UN	
Sagavanirktok	20	20	20	20	20	20		
Ivishak	50							
Echooka	30							
Gilead	10							
Saviukviayak	15							
Floou	10							
Lupine	25		X					
Ribdon	30				12			
South Branch	5							
Accomplishment	5							
Section	X							
Shavirovik	35			X	X			
Kavik	55							
Canning	105							
Marsh Fork	35							
unnamed tributaries	23							
Katakturuk							X	
Sadlerochit	X							
Hulahula	X							
Okpilak	X							
Jago	X							
Kogotpak	X							
Aichilik	X							
Total Habitat								

Anadromous Species (Habitat in miles)

Drainage Name

**Key Anadromous Fish Spawning and Rearing Areas
Arctic National Wildlife Refuge, Alaska
and Associated Areas of Ecological Concern**

Drainage Name	Anadromous Species (Key Area in miles)							
	AC	PS	GS	ACI	LC	BWF	UN	
Sagavanirktok	5							
Ivishak	20							
Echooka	3							
Gilead								
Saviukviayak	2							
Flood	3							
Lupine	5							
Ribdon	8							
South Branch								
Accomplishment	3							
Section								
iovik	3							
Kavik	6							
Canning	35							
Marsh Fork	15							
unnamed tributaries	8							
Katakturuk								
Sadlerochit								
Hulahula								
Okpilak								
Jago								
Kogotpak								
Aichilik								
Key Area Total								

Key Anadromous Fish Spawning and Rearing Areas Arctic National Wildlife Refuge, Alaska and Associated Areas of Ecological Concern

[illegible]

Magnitude of Runs or Escapements

Arctic National Wildlife Refuge, Alaska

Sagavanirktok Arctic Char (Ivishak River)				Sagavanirktok Arctic Char (Echooka River)			
Year	No. of Fish	Year	No. of Fish	Year	No. of Fish	Year	No. of Fish
1971	12,808			1971	1,137		
1972	12,292			1972	1,688		
1973	9,757 - 10,262			1973	1,829 - 2,376		
Notes: Aerial survey				Notes: Aerial survey			
Sagavanirktok Arctic char (Saviukviayak River)				Sagavanirktok Arctic Char (Gilead Creek)			
Year	No. of Fish	Year	No. of Fish	Year	No. of Fish	Year	No. of Fish
1971	321			1971	0		
1972	378			1972	0 *		
1973	266 - 298			1973	---		
Notes: Aerial survey				Notes: Aerial survey * Poor survey - low count			

Magnitude of Runs or Escapements
Arctic National Wildlife Refuge, Alaska

Sagavanirktok (Flood Creek)		Arctic Char		Sagavanirktok (Lupine River)		Arctic Char	
Year	No. of Fish	Year	No. of Fish	Year	No. of Fish	Year	No. of Fish
1971	350			1971	---		
1972	508			1972	---		
1973	473 - 551			1973	310 - 327		

Notes: Aerial survey

Notes: Aerial survey

Sagavanirktok (Ribdon River)		Arctic Char		Sagavanirktok (Accomplishment Creek)		Arctic Char	
Year	No. of Fish	Year	No. of Fish	Year	No. of Fish	Year	No. of Fish
<u>Main Branch</u>		<u>South Branch</u>		1971	178		
1971	400	1971	49 *	1972	322		
1972	467	1972	276 *	1973	374 - 553		
1973	1,095	1973	1,306				

Notes: Aerial survey

Notes: Aerial survey

* Poor survey - low count

Magnitude of Runs or Escapements
Arctic National Wildlife Refuge, Alaska

Shaviovik Arctic Char				Canning Arctic Char			
Year	No. of Fish	Year	No. of Fish	Year	No. of Fish	Year	No. of Fish
1972	more than 1,000			1972	3,300 to more than 6,000		
1973	more than 1,000			1973	6,300 to more than 9,000		
Notes: Aerial survey Incomplete survey.				Notes: Aerial survey			
Year	No. of Fish	Year	No. of Fish	Year	No. of Fish	Year	No. of Fish
Notes:				Notes:			

Subsistence Harvest

Arctic National Wildlife Refuge, Alaska

Arctic Char				Arctic Cisco			
Northern 330				Northern 330			
Note: Average annual harvest: 2,500 pounds, value - \$2,500.00				Note: Average annual harvest: 2,500 pounds, value - \$2,500.00			

Commercial Harvest

Arctic National Wildlife Refuge, Alaska

No reported commercial harvest	
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Sport Harvest

Arctic National Wildlife Refuge, Alaska

No data available.

Anadromous Fish Inventory Update System
Arctic National Wildlife Refuge, Alaska

The prime source of information each year is the Division of Sport Fish, Alaska Department of Fish and Game under the Federal Aid in Fish Restoration study program. These studies are usually coordinated through the Department's Fairbanks office, and the current biologist assigned to these studies is Rick Furniss. These studies are usually conducted during the summer with results compiled during the autumn and winter. For the previous year's studies, a contact during the early spring months of March or April should be opportune for obtaining the latest updated information. Recently, reports dealing with the area in question have been titled Monitoring and Evaluation of Arctic Waters with Emphasis on the North Slope Drainages.

A source of updated information on possible anadromous fishes in drainages on the south side of the Brooks Range (tributaries into the Yukon River system) can be obtained from the Division of Commercial Fisheries, Alaska Department of Fish and Game. Generally, these studies are coordinated through the Department's Anchorage office and have been recently conducted under the National Marine Fisheries Service Grant-in-Aid Study Program. Recently, these reports have been titled Yukon River Anadromous Fish Investigations. The current research coordinator for this project is James Mauney. Again, the opportune time to contact this agency for the most recent data would be early spring when results from the previous field season will have been compiled.

Also active in this area are projects of the Arctic Gas Pipeline consortium. Their consultants are regularly doing a number of studies on aquatic environments in the area of interest. These studies should be regularly obtained from the

Alaskan Arctic Gas Pipeline Company, P.O. Box 979, Anchorage, Alaska 99510, tele. 274-8511.

The University of Alaska's Institute of Marine Science has conducted a number of studies on the Alaskan Arctic coast and might in the future conduct research pertaining to the proposed refuge or its area of ecological concern. This Institute might be regularly queried as to their current Arctic anadromous fisheries research in order to determine if material has been derived pertinent to the area of interest.

The most efficient way to conduct an annual update of the anadromous fish inventory of this refuge would be to request the information for the previous year each March or April of the following year. For example, 1975 data should be requested during March or April 1976.

Anadromous Fish Inventory Study Needs
Arctic National Wildlife Refuge, Alaska

1. Surveys of spawning populations in the Canning River and Shaviovik River drainages should be scheduled similar to those currently conducted each year on the Sagavanirktok River by the Alaska Department of Fish and Game.
2. Sport harvest data (creel census) should be collected for the Sagavanirktok River drainage to assess the impact of increased sport fishing due to increasing accessibility, development activities, and local population.

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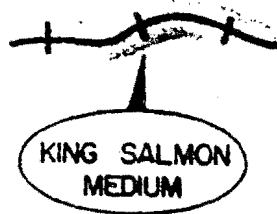
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Anadromous Fish Stream with Identified Species



Key Spawning or Rearing Area

SUBSISTENCE
PINK SALMON

Key Area Value for Identified Species

Significant Harvest Locale
with Important Species Named

SELAWIK NWR

-Proposed Refuge Name



Boundary of Proposed Refuge
and Area of Ecological Concern



Existing Refuge Boundary



Fisheries Research Station



Airfield



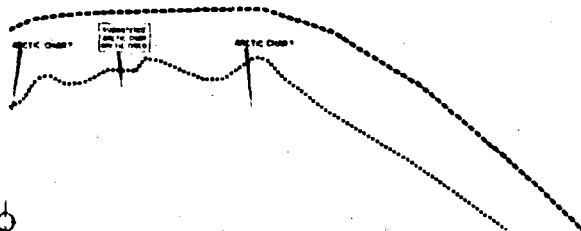
Mineral Location



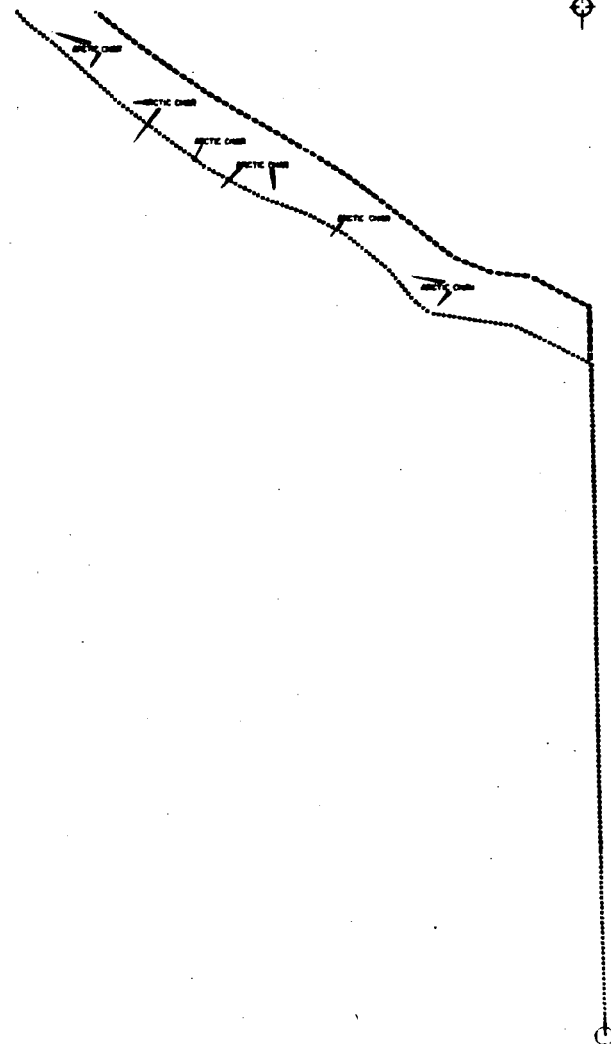
Hydroelectric Dam Site



Oil or Gas Well



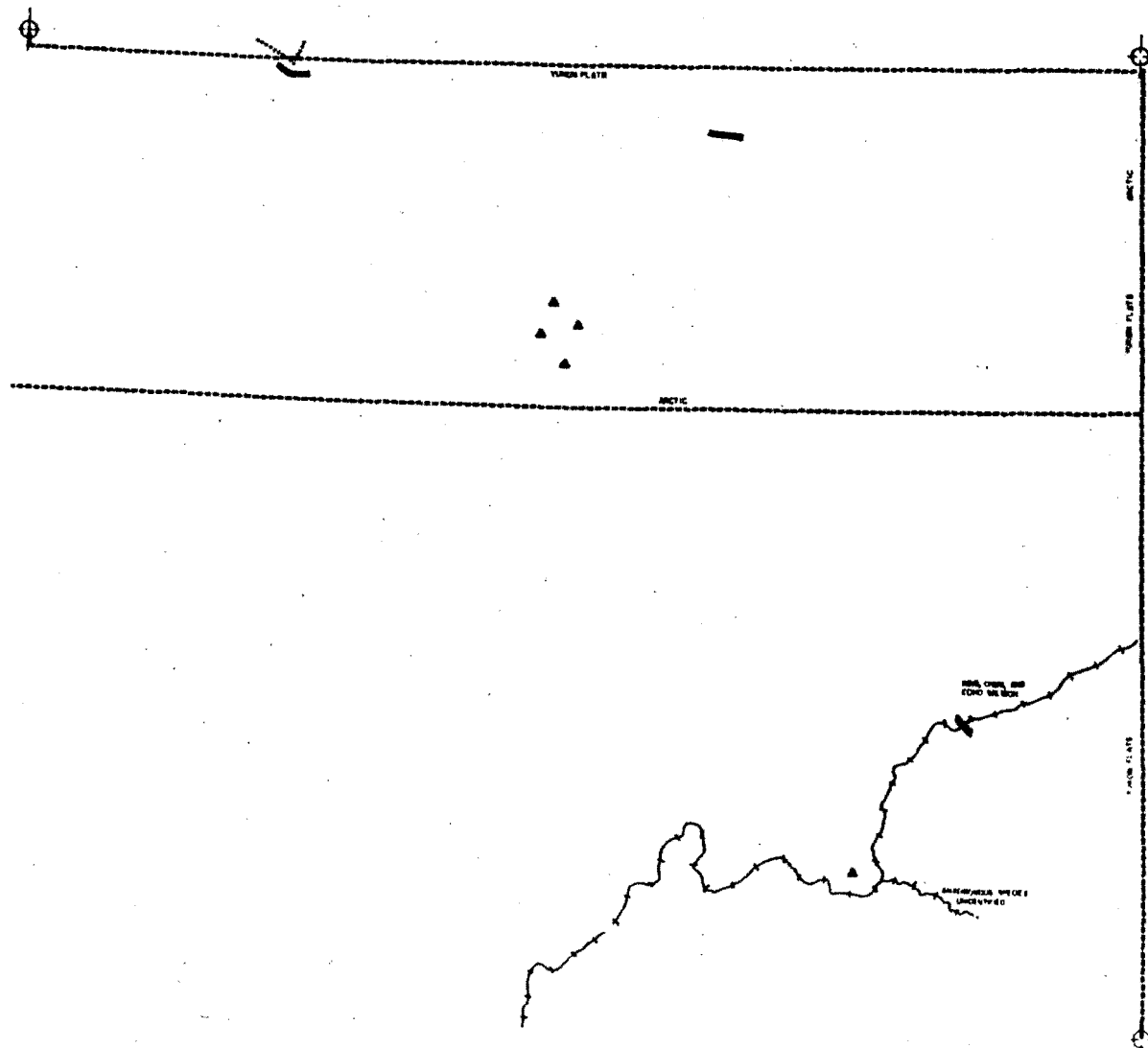
BARTER ISLAND
ARCTIC NWR



DEMARCATION POINT
ARCTIC NVR

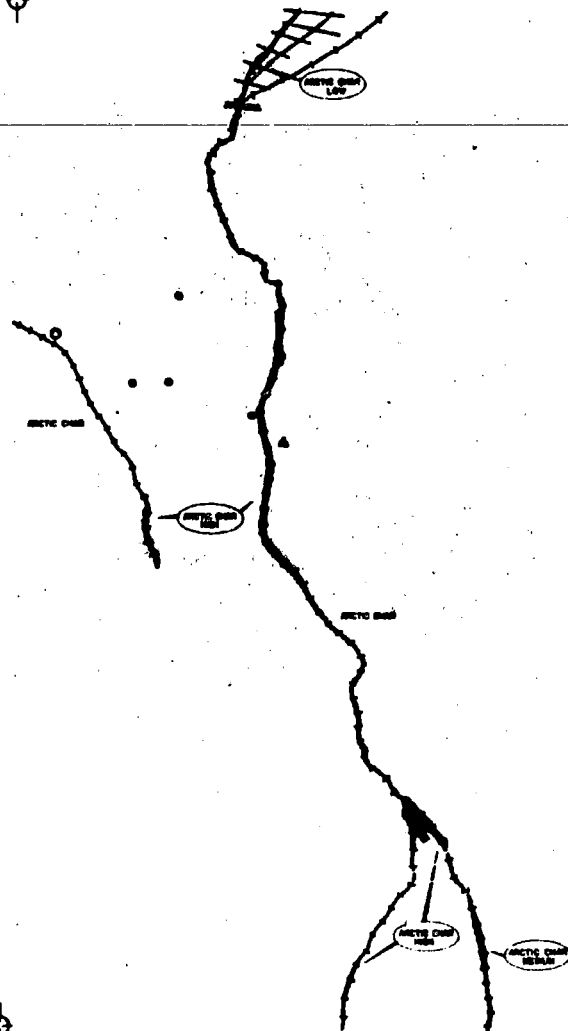
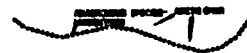


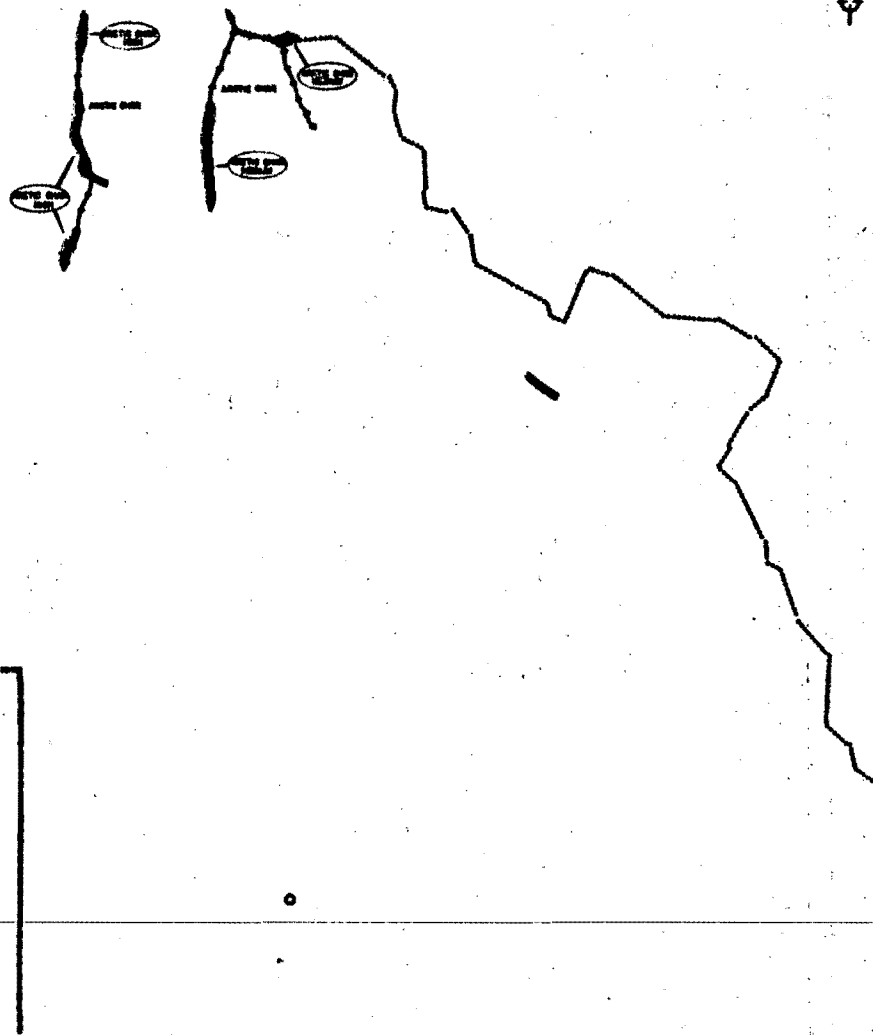
TABLE MOUNTAIN
ARCTIC NWR



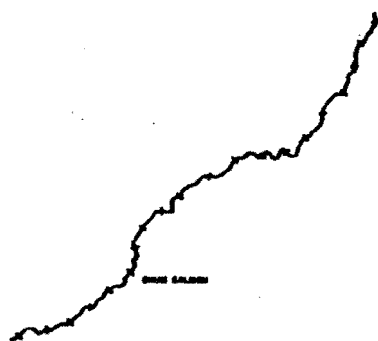
COLEEN
ARCTIC NWR
YUKON PLATEAU NWR



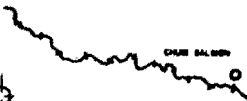




ARCTIC
ARCTIC NWR
YUKON FLATS



ONE SALON



ONE SALON



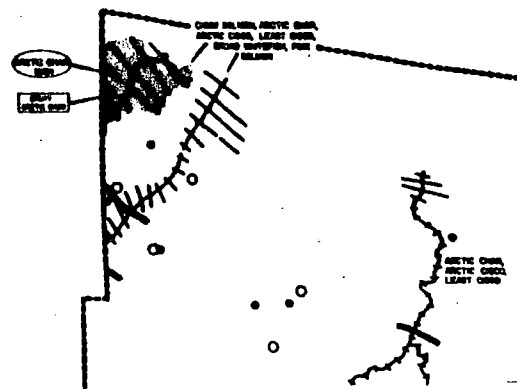
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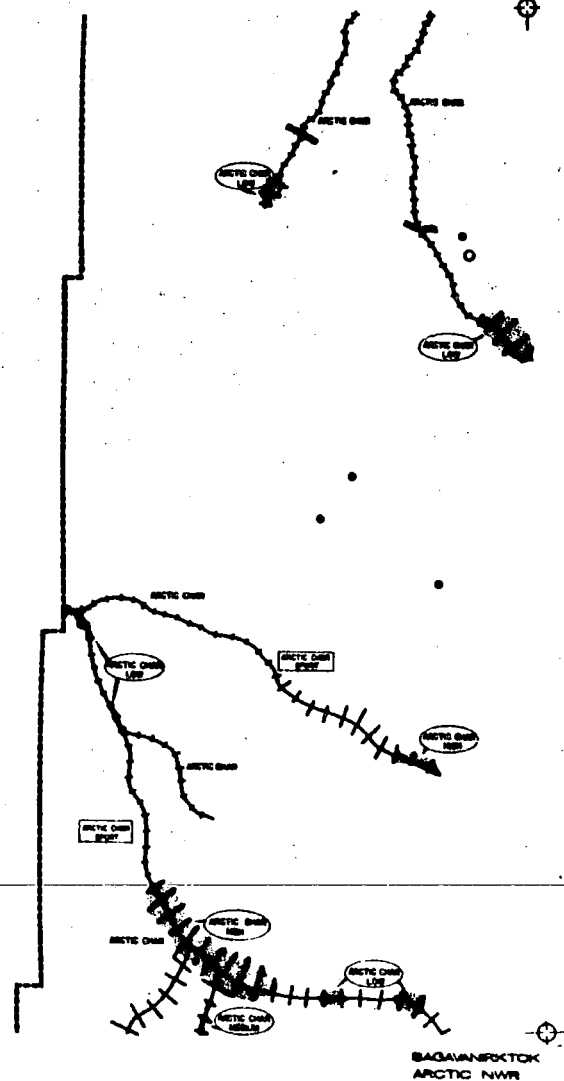
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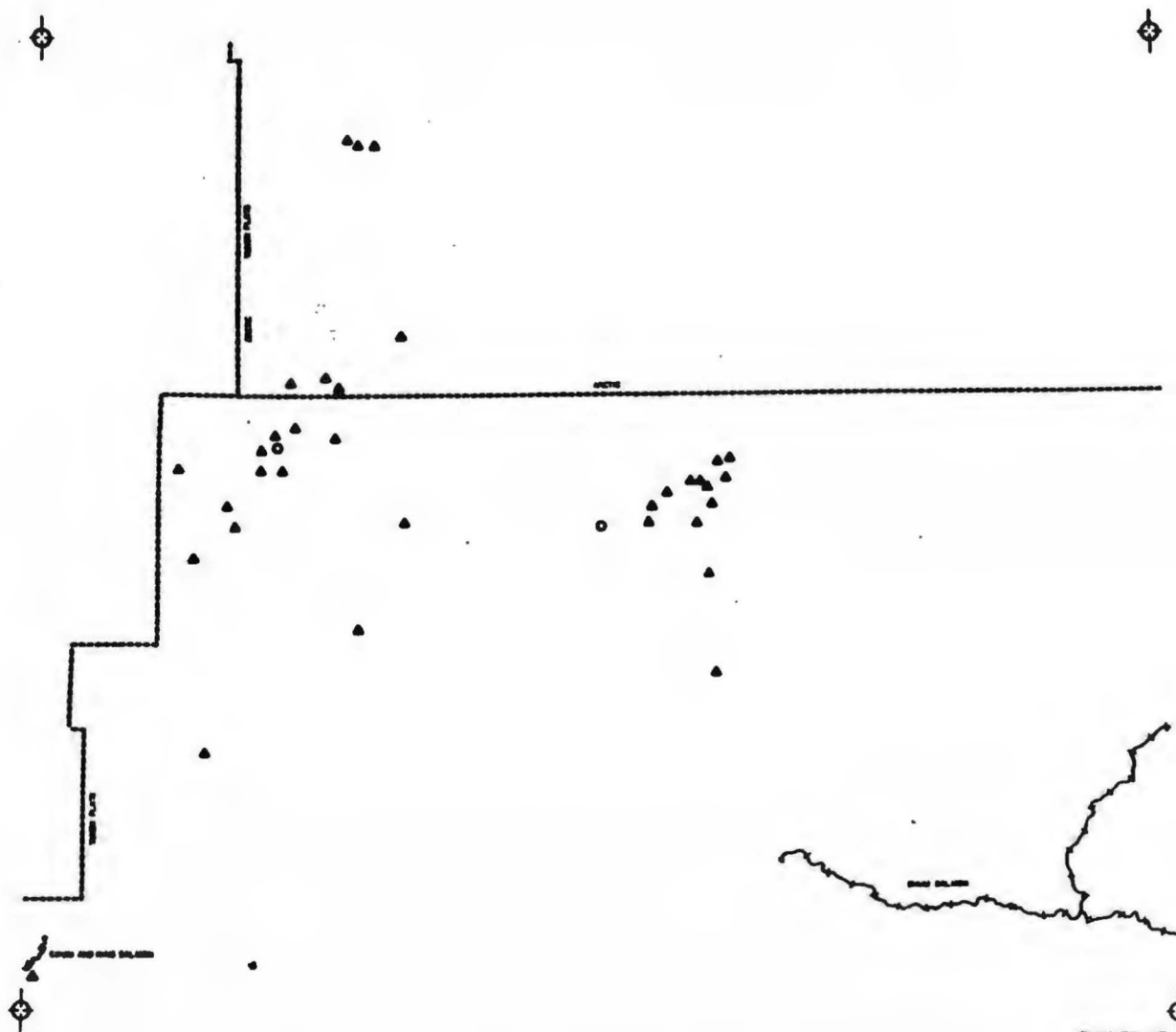


CHRISTIAN
ARCTIC NW
YUKON FLATS NW



BEECHHEY POINT
ARCTIC NWR





CHANDALAR
ARCTIC NWR
YUKON FLATS NWR