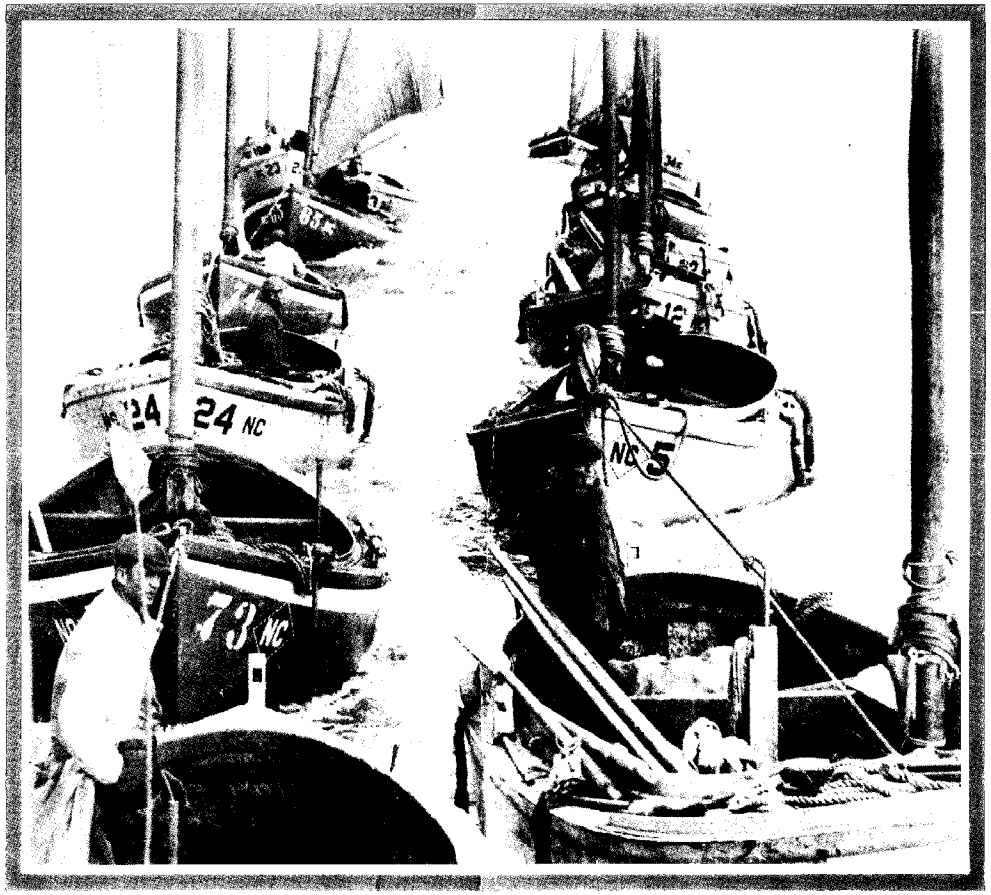
COASTAL MANAGEMENT PROGRAM
VOLUME I – RESOURCE INVENTORY



COASTAL MANAGEMENT PROGRAM
VOLUME I – RESOURCE INVENTORY

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ALASKA COASTAL MANAGEMENT PROGRAM

BRISTOL BAY BOROUGH

ACKNOWLEDGMENTS

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COVER PHOTO

Bristol Bay gill-netters in the 1930s were towed from port to their fishing grounds. Sailboats could catch as much fish as power boats can today. One sail fisherman brought in about 300,000 pounds of red salmon in a single season. By 1951, however, power fishing had completely replaced sail fishing, because the sailboats were more vulnerable in storms.

Cover photo from the J. Johannesen Collection
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CHAPTER ONE-INTRODUCTION

Background

The coast of the United States has long been one of our country's greatest assets. The coastal area contains a wealth of resources that have both natural and economic value. America's coast is unique, productive, and diverse. Though the coast seems endless and the coastal areas vast, both have limits. America's history is reflected in its coastline with the multitude of uses and development supporting generation after generation. With much of our coastal areas settled and pressure for development and use increasing, Congress in 1972 passed the Coastal Zone Management Act. The act provides incentives for coastal states to protect, manage and, where possible, rehabilitate the resources in the coastal areas. In 1977, the Alaska legislature passed the Alaska Coastal Management Act which established a process for protecting and managing the coastal resources of Alaska. The legislature made local government responsible for managing the coast within its jurisdiction and required each to prepare a District Coastal Management Plan.

The Bristol Bay Borough, as an organized local government, is a Coastal Resource District. As a Borough, it has authority for planning and zoning within its boundaries, and as a Coastal Resource District it has responsibility for developing and implementing a Coastal Management Program that meets the requirements of the Alaska Coastal Management Act and also meets the standards of the Alaska Coastal Management Program.

The Bristol Bay Coastal Management Program contains the following:

1. *Goals and objectives*: the identification of the concerns and desires for the future by the people living within the Bristol Bay Borough.

2. *Coastal boundaries*: the designation of the boundaries that allow the district to manage activities that could have a significant impact on coastal areas.

3. *Resource inventory*: an identification and description of the natural, physical, and cultural resources within the district. The resource inventory emphasizes those resources that are basic to man's well-being, and it forms the basis for both a Coastal Management Plan and a Comprehensive Plan.

4. *Resource analysis*: a synthesis of the resource inventory that determines generalized land sensitivity, that is, the sensitivity of land and water to man's future activities. Land sensitivity is determined by giving equal consideration to the sensitivity of both the natural and the physical systems within the district and by considering man's historic and future use of the land and water within the district. The land sensitivity analysis forms the basis for the remaining elements of the district program and also forms the basis for an updated Comprehensive Plan.

5. *Management classifications*: using the sensitivity analysis, the district classified land according to management objectives. These objectives serve to promote protection and conservation of the resources and encourage the balanced use of the resources within the district.

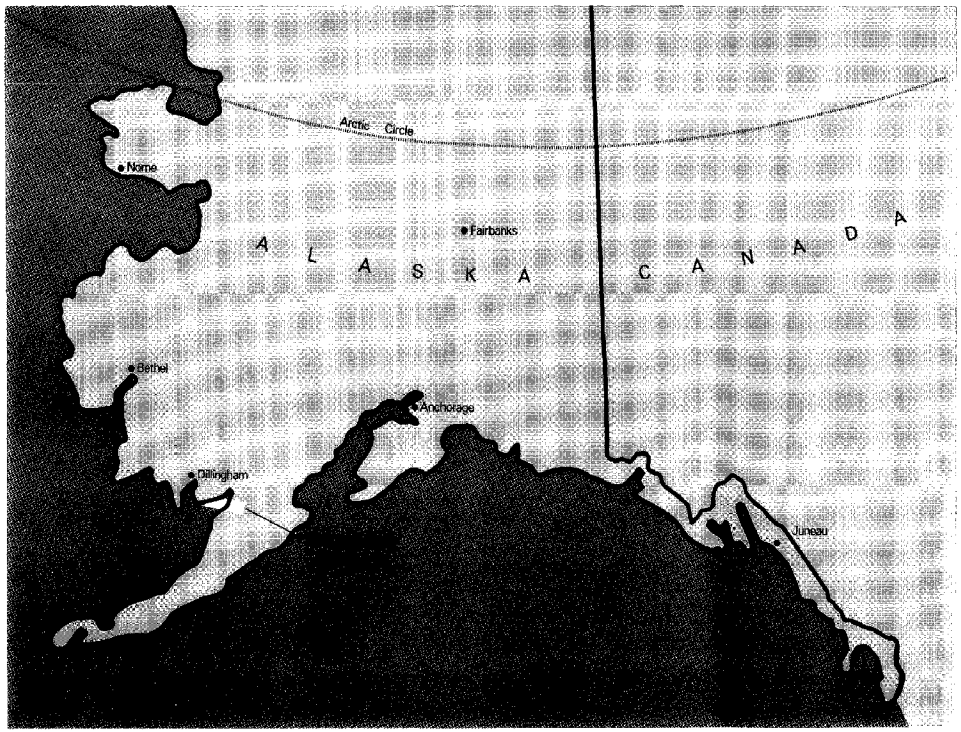
6. *Proper and improper uses*: again using the land sensitivity analysis, the determination of the proper and improper land and water use within each management classification.

7. *Coastal management policies*: policies that apply to uses within the management classification that is used to determine whether specific uses and activities will be allowed.

8. *Implementation*: a description of the method and activity used to implement the district program.

It is important to keep in mind while considering any aspect of the Bristol Bay District Program that the program was designed and developed not just to satisfy the requirements of the act or the standards and guidelines, but to establish a foundation on which a comprehensive planning program could be built. The program is a comprehensive planning tool that provides the Borough with the information necessary to make reasonable planning and zoning decisions that could impact the communities and their resources long into the future.

This report is the resource inventory, one element of the district program. The remaining elements of the program are detailed in the *Management Plan*.



Resource Inventory

Each district program is required to include an inventory of the resources within and adjacent to its boundaries. The purpose of the inventory is to identify and to locate important resources and to determine size and importance of each within the district.

The Bristol Bay Borough Resource Inventory is organized into four main sections. They are as follows:

The Physical Setting. This section is an inventory of the topography, surficial geology, soils, permafrost, and surficial hydrology. It identifies and describes the Borough's physical features, surface conditions, and soil composition.

The Natural Setting. This section is an inventory of fish, mammals, birds, and vegetation within the Borough. The inventory describes seasonal habitats, migration routes, and calving, spawning, and nesting areas.

Man's Use. This section inventories industrial, commercial, and residential use of the land, recreational and subsistence use of both land and water, commercial fishing, prehistoric and archaeological sites as well as transportation throughout the Borough. It identifies and

describes major land and water use within the Borough as it occurred historically and as it exists today. The section also inventories the communities within the Borough as well as the Borough's economy.

Land Status. This section inventories land ownership and federal, state, borough, and private land and water management responsibilities.

The information contained within this report was developed from current literature and maps, and from individuals who have lived, worked, hunted, and fished in the area. This information has been field checked and carefully reviewed by the Bristol Bay Borough Planning and Zoning Commission, state and federal agencies, and a number of helpful individuals. A bibliography and map source are included for reference.

The Region

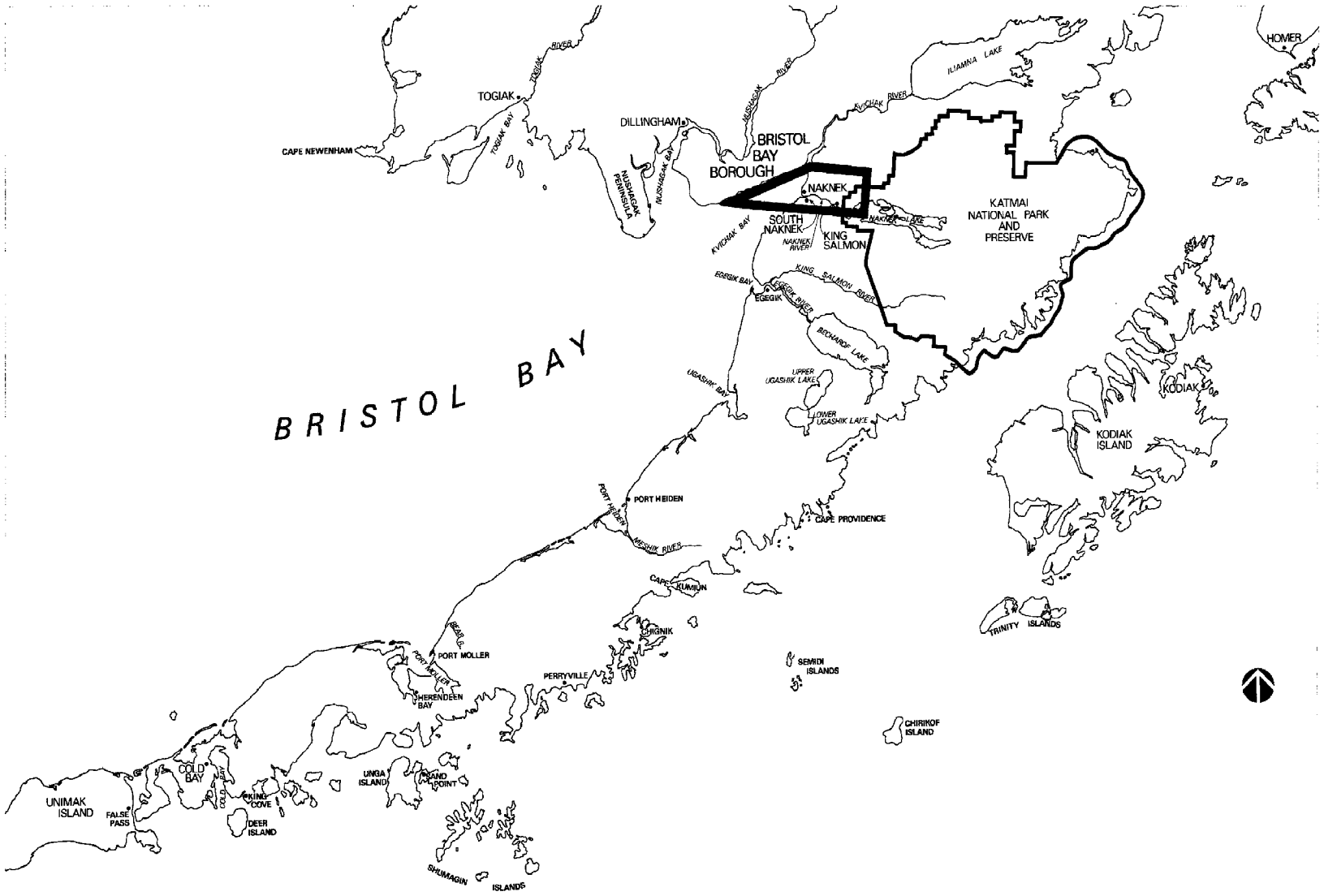
It is important to keep in mind that the land area within the Bristol Bay Borough is only part of the physical, natural, and cultural system of the region and that the entire system extends well beyond the Borough boundaries. For example, the Bristol Bay salmon fishery, the world's largest, is dependent upon fish traveling through the Borough to primary spawning areas in the Kvichak and Naknek River systems outside Borough boundaries. This is also the case for caribou, moose, and bear. A regional map is used to introduce each major section of the resource inventory and is intended to illustrate how the Borough fits into the region and how the physical, natural, and cultural settings within the Borough are part of a regional system.

The regional map extends from Unimak Island in the south to Lake Iliamna in the north, and Kodiak Island in the east to the Kuskokwim Delta in the west.

The Borough

There are two base maps for the Bristol Bay Borough area. The format and scale were selected for easy interpretation, and convenience in mapping and publication. The base maps depict the east and west portions of the Borough. The east side encompasses the majority of the usable land and the communities of Naknek, South Naknek, and King Salmon. The west side primarily contains Kvichak Bay and land area extending to the western boundary of the coastal watershed. The western Borough boundary runs along the western coastline of Kvichak Bay. The base map was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the Borough.

Regional Map

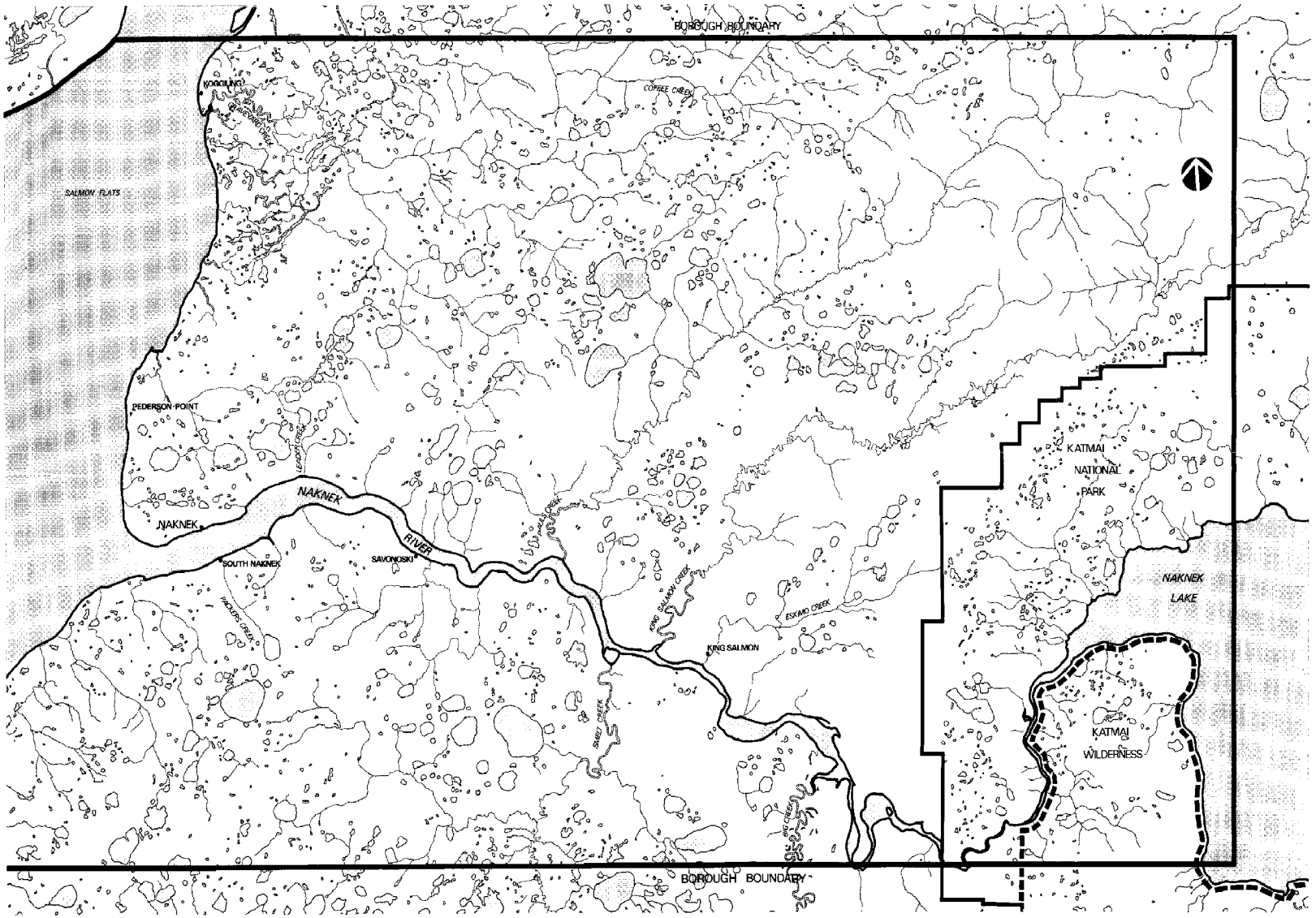


SCALE: miles

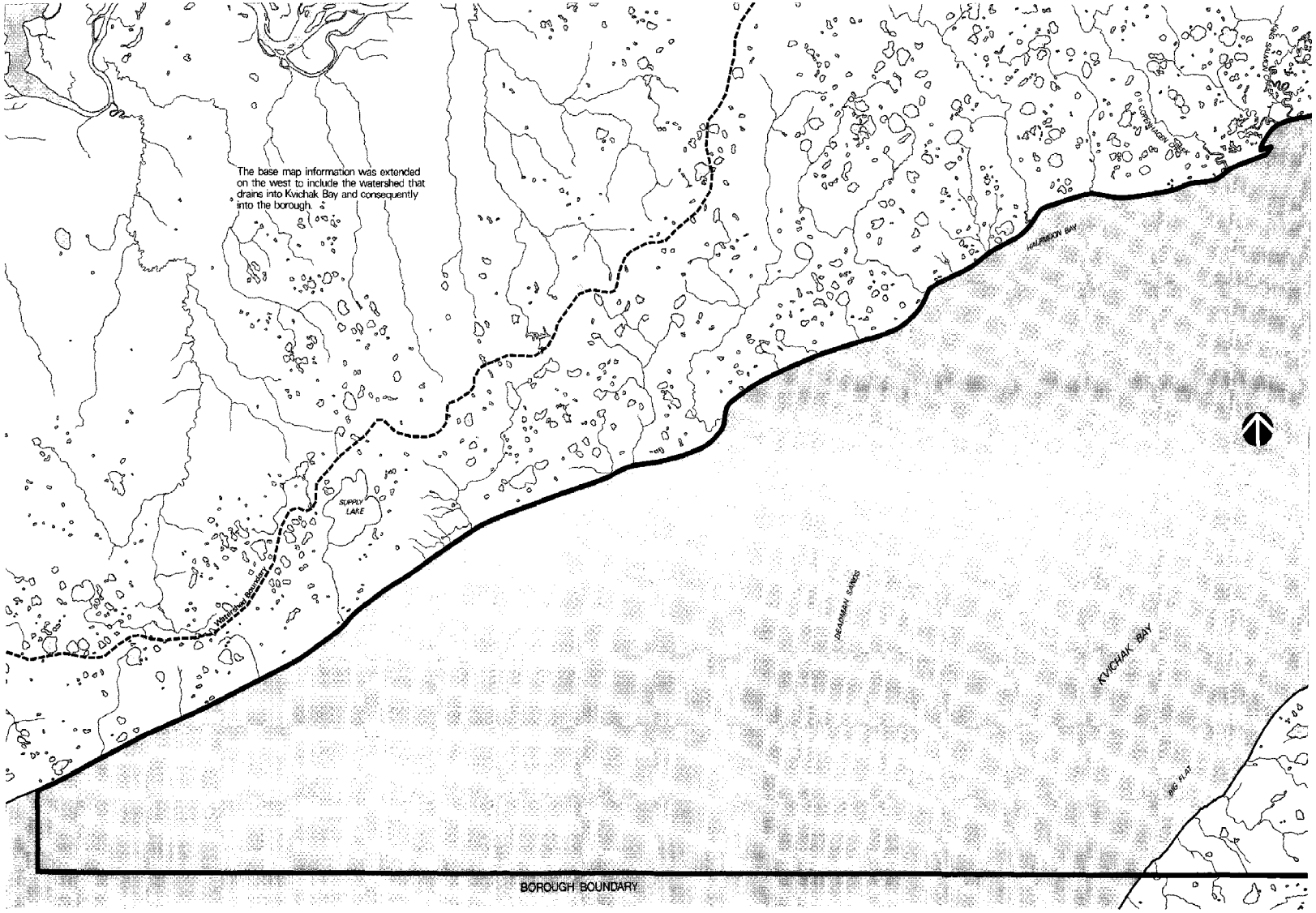
0 1 2 3

BRISTOL BAY BOROUGH/RESOURCE INVENTORY

Borough Map (East)



Borough Map (West)



CHAPTER TWO - THE PHYSICAL SETTING

The Region

CLIMATE AND WEATHER

The Bristol Bay region has a maritime climate with cloudy skies, relatively mild temperatures, and moderate precipitation. The area has cool summers with average summer maximum temperatures of 50°F to 60°F. Winters are warm with average minimum temperatures of 6°F to 20°F. Extreme temperatures are -42°F and 88°F. Annual rain averages about 20 inches, while snow averages about 45 inches. Fog is often present in the summer and may be an impediment to surface and airborne activities. Sea and river ice is usually present in the area from mid-November to early April. In winter, winds blow from the north to northeast and change to prevailing southwesterly winds in the summer months. Wind speeds throughout the year average about 9 knots. Easterly winds are the strongest, usually averaging 13.1 knots. Extreme winds, in the range of 40 to 70 knots, occur periodically during the year, usually blowing from the east.

OCEANOGRAPHY

Bristol Bay is approximately 58,000 square miles in area, with an average depth of 192 feet. The Inner Bay, extending northward from Port Heiden to Cape Newenham, covers 9,700 square miles and splits at its head forming Kvichak Bay and Nushagak Bay.

Tidal fluctuations in the bay are extreme, with higher ranges toward the head. The mean tidal range at Port Heiden is 7.5 feet and at Naknek, 18.5 feet. The large tidal range prevents shore-fast ice from forming.

Bristol Bay is estuarine and is fed fresh water from several major river systems. Both the salinity and temperature of the bay characterize estuarine conditions. Mean salinity is 28.9 °/oo, and the mean water temperature is 11.4°C. This is less saline and considerably warmer than the outer bay waters where mean salinity is 32.0 °/oo and mean temperature is 8.6°C.

Wind speeds and direction in the bay are extremely variable, creating locally derived wave patterns and heights. During severe storms from the southwest, the shallowness of the bay causes steep, irregular waves rather than long swells.

The Nushagak, Kvichack, and Naknek Rivers carry high volumes of fresh water during the summer months when ice and snow melt from the Kuskokwim Mountains and the Alaska Range. Although the runoff carries large amounts of nutrients, it also carries finely ground sediments which limit light penetration and photosynthesis.

The sediments of Bristol Bay are classified as sands with coarse-grained materials (fine sands and coarse silts) at the edge of the continental shelf. Quartz and feldspar sands are dominant; they tend to be poorly sorted and have low concentrations of organic carbons.

Kvichak Bay forms a northeastern arm and the headwaters of Bristol Bay. It is fed by the Kvichak River (the drainage for Lake Iliamna), and the Naknek River (the drainage for Naknek Lake). The depth of the bay ranges from 11 to 66 feet and has an extreme tidal range of 18.5 feet. At low tide numerous shoals and banks are uncovered. At 2.5 knots, the current in Kvichak Bay is considered strong.

HYDROLOGY

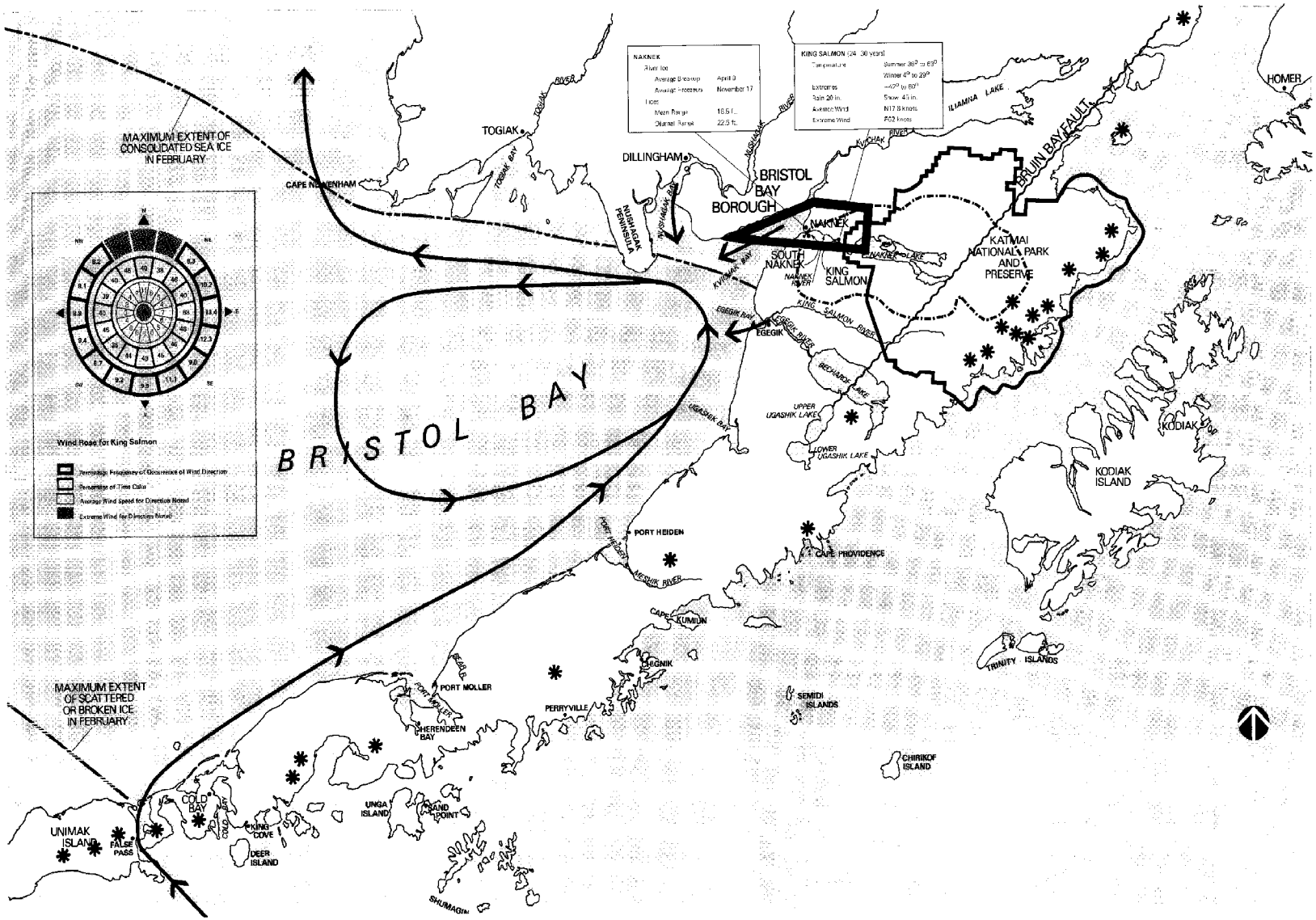
The Naknek River drainage area is approximately 3,700 square miles. The Naknek River watershed includes seven interconnecting lakes: Murray, Hammersly, Coville, Grosvenor, Brooks, Idavain, and Naknek, and the Naknek River itself, as well as the streams connecting the lakes. In addition, 16 streams with midsummer flows in excess of 3 m^3/second flow into the Naknek River. As illustrated on the regional map, the watershed extends well beyond the limits of the Bristol Bay Borough. Though little hydrologic information exists for the Borough, it has been recorded that the water quality is good with relatively low (114 mg/l) dissolved solids and less than 500 mg/l suspended sediments. Concentrations of minerals are within U.S. Public Health Service standards for potable water.

SEISMICITY

The Bristol Bay area is north of the major area of seismic activity in the state, and those earthquakes which do occur are at great depths and of low strength. Along the northern foothills of the Alaska Range, the Bruin Bay Fault extends southward from Kamishak Bay to Becharof Lake. The fault crosses the Naknek lake system in Katmai National Park.

VOLCANISM

The Alaska Peninsula forms part of the "ring of fire," caused by the movement of crustal plates along the Aleutian Trench. Volcanoes on the peninsula are extremely active; more than 40 of the 60 volcanic centers have been active in the last 300 years. Eruptions have spread ash and lava over large areas, creating some of the soil stratas found in the Bristol Bay Borough. Table 2.1 presents a summary of past local volcanic activity.



Physical Setting – Regional Map

LEGEND

- Surface Circulation
- Active or Recent Volcano
- Naknek Lake Watershed

SCALE: miles

0 1 2 3

TABLE 2.1

LOCAL VOLCANIC ACTIVITY

Name	Approximate Summit Height	Number of Eruptions Since 1700	Date of Last Eruption	Remarks on Activity
Martin	6,050 ft.	0	–	Intermittent steaming since 1912.
Mageik	7,295 ft.	4	1946	Ash eruptions–1912, 1927, 1926, 1953; active–1929, 1946.
Novarupta	2,760 ft.	1	1912	Vent breached during 1912 Katmai eruption. Vent believed to be one of main sources for ash and pumice flow deposits in Valley of 10,000 Smokes.
Trident	6,830 ft.	3	1968	Steaming 1912; lava eruption–1953; explosive, ash-charged vapor columns–April 1963 and May 1964; vent clearing explosions plus ash eruptions–Dec. 1967 to Feb. 1968, Nov. 1968.
Katmai	7,540 ft.	7	1931	Explosive eruption with vast pumice and ash deposits accompanied by caldera collapse caused extensive damage to buildings and crops on Kodiak Island and corrosive rains at Seward and Cordova–1912, steam–1931.

The Borough

TOPOGRAPHY

The Bristol Bay Borough slopes from the foothills of the Aleutian Range in the east to the Naknek River and Kvichak Bay in the west. Maximum elevation is 1,061 feet at the northeastern corner of the Borough and the lowest elevation is Kvichak Bay at sea level. Typically, the land in the Borough is flat with over 75 percent below 200-foot elevation. Naknek and King Salmon are located at elevation 50 feet and South Naknek at elevation 100 feet. The elevation on the northwest side of Kvichak Bay ranges from 383 feet to sea level. The land slopes from the rolling hills of the Kvichak drainage to the bay.

SURFICIAL GEOLOGY

The surficial geology of that portion of the Alaska Peninsula containing the Bristol Bay Borough consists of moraine and glacial drift features as well as some alluvial floodplain and glacial outwash deposits in low-lying areas. The region is characterized by low moraine hills and many shallow lakes. The coastline includes sandy beach areas and bluff escarpments along the Naknek River, as well as several areas of low-lying brackish tidal marsh. The coastal and river bluffs are composed of glacial drift and fluvial deposits which are unconsolidated and unstable. Erosion due to wind, wave, and tidal action can be severe in these areas.

Table 2.2 illustrates the types of deposits, their origin, and general engineering applications.

SOILS

A detailed soil survey was conducted in 1968 by the Soil Conservation Service (SCS) (Furbush and Wiedenfeld, 1969). The SCS survey covered a 40-square-mile area along the Naknek River near Naknek, South Naknek, and King Salmon. The SCS conducted a field investigation and air photo analysis to identify soil series. Air photos were interpreted at a large scale and are relatively accurate. Four soils comprise 98 percent of the area, with several other minor features present.

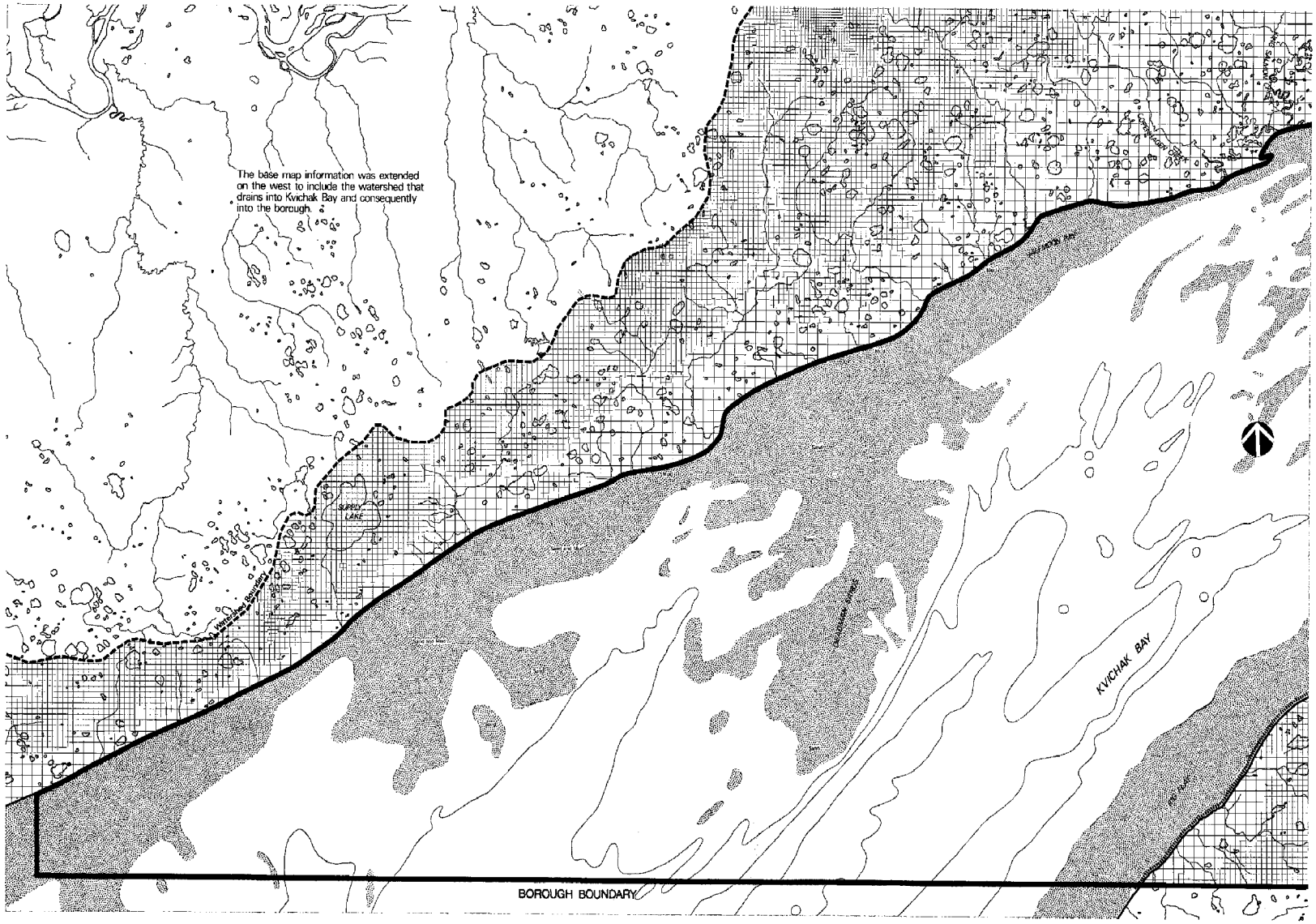
Information for the rest of the Borough was drawn from the Arctic Environmental Information and Data Center (AEIDC). The AEIDC survey includes generalized soil types in its Alaska Regional Profile for the Southwest Region. The map scale, however, is small and too generalized for engineering application.

Information from both surveys is included in the inventory maps and tables. A line has been drawn on the soils map separating the area surveyed by SCS from the area surveyed by AEIDC.

TABLE 2.2

SURFICIAL GEOLOGY

Type	Origin	Engineering Application
Moraine and Drift	Extensive moraines and associated glacial drift	Poor foundation material Poorly drained High ice content Frost susceptible
Glaciolacustrine	Produced by glacially-dammed lakes, high silt content	Poor foundation material Poorly drained High ice content Not frost susceptible
Glaciofluvial	Outwash deposits slightly-to-moderately sorted	Well-drained Not frost susceptible
Alluvial	Flood plain, terrace and alluvial fan deposits from rivers and streams	Good foundation material Well-drained Not frost susceptible
Coastal	Interlayered alluvial and marine sediments Beaches, spits, bars and deltas	Fair-to-good foundation material Well-drained Not frost susceptible
Tertiary	Basalt and volcanic rock with layer of ash	Good foundation material Steep slopes



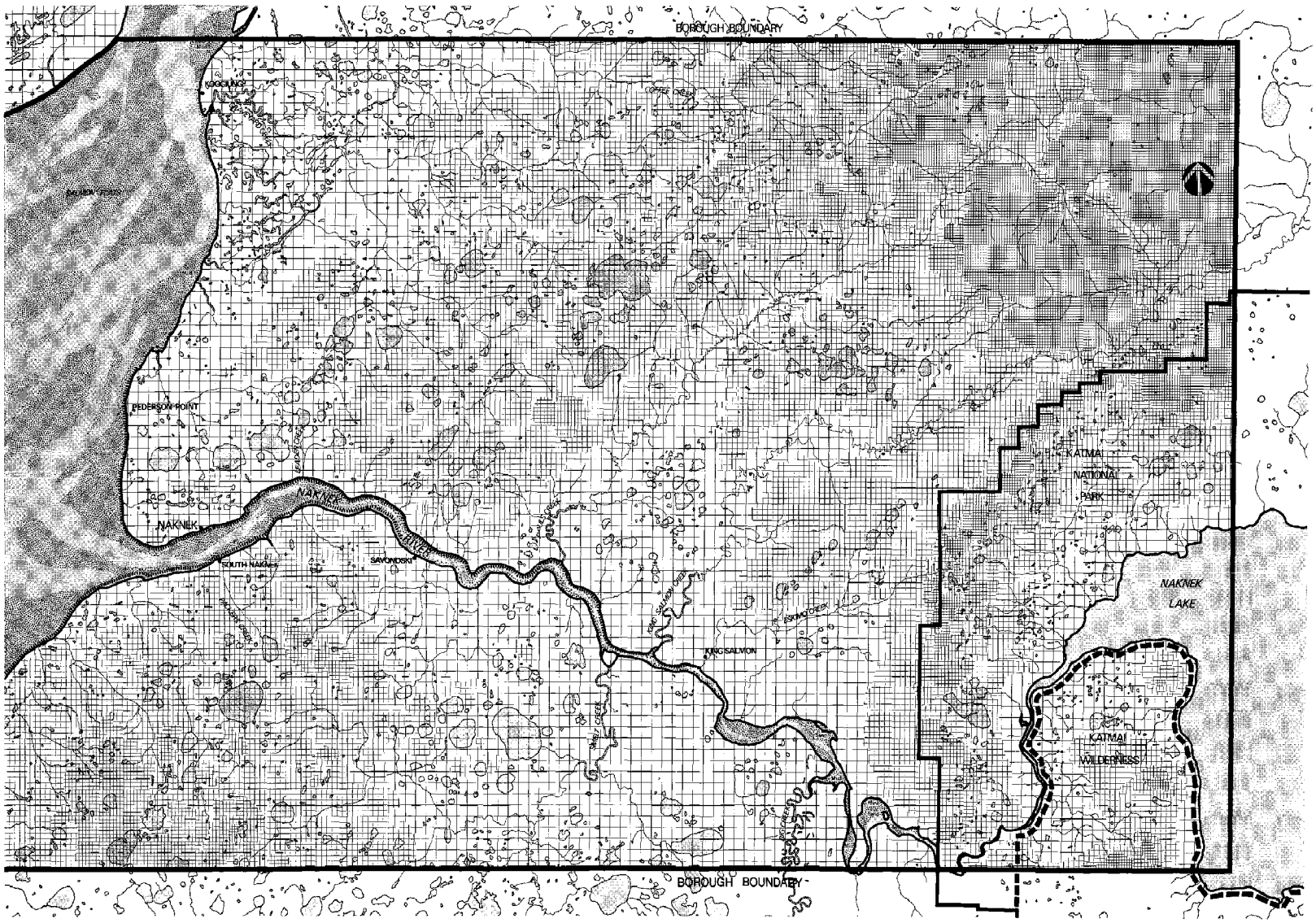
Topography & Coastal Morphology – Borough Map (West)

LEGEND

- 0 – 99'
- 100 – 199'
- 200 – 299'
- Above 300'
- Coastal Bluffs
- Tide Flats

SCALE: miles

0 1 2 3



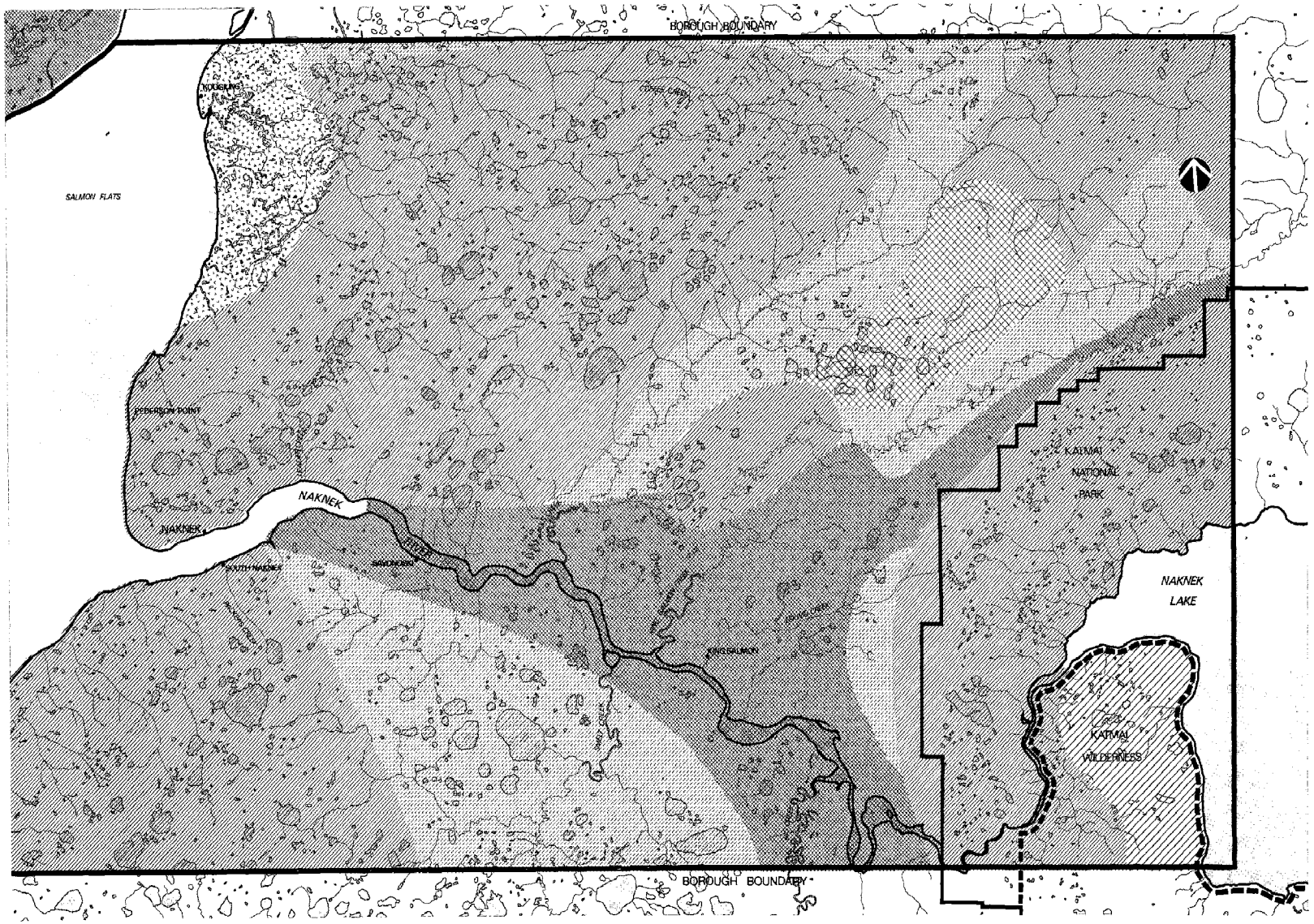
Topography & Coastal Morphology – Borough Map (East)

LEGEND

- 0 – 99'
- 100 – 199'
- 200 – 299'
- Above 300'
- Coastal Bluffs
- Tide Flats

SCALE: miles

0 1 2 3



Surficial Geology – Borough Map (East)

LEGEND

- Moraine Drift
- Glacio Lacustrius
- Glaciofluvial
- Alluvial
- Coastal
- Tertiary

SCALE: miles

0 1 2 3

The Soil Conservation Service identified the following soil series (see Table 2.3 and Figure 2.1):

1. Kvichak Series. This series is a well-drained soil consisting of a layer of volcanic ash over strata of loam, sandy loam, and sand. It is a very acid soil, and is found on terraces bordering the Naknek River and adjacent tributaries, and on some low hills. Slopes are generally less than 7 percent. These soils were found on approximately 32 percent of the area mapped in the survey.

2. Naknek Series. This is a poorly-drained, perennially frozen soil consisting of a peaty surface mat, sphagnum moss and sedge, over mineral layers often consisting of volcanic ash. This soil is found in most low-lying areas, with slopes less than 7 percent, and constitutes about 50 percent of the soils found in the area.

3. Pustoi Series. This series is a well-drained soil consisting of volcanic materials overlain by a silt-loam or loamy sand. It is found on the stream terraces and sides of valleys where slopes range from 0 to 12 percent, and constitutes about 9 percent of the area mapped.

4. Tolsona Series. Tolsona soils are sand, generally poorly drained, with a shallow permafrost table. They are covered with a thick organic mat of moss and sedge and are most often found in floodplains draining into the Naknek River. Tolsona sands cover about 8 percent of the area surveyed.

5. Nk Series. The Nk series is poorly drained loam, sandy loam, and silt loam with, at most, a very thin organic mat at the surface. These soils are strongly acid and are found on slopes of less than 0.5 percent. They are perennially frozen at depths greater than about 42 inches. The soils are not extensive and are generally closely associated with the Naknek soils.

6. Other Features. Cliffs and escarpments of exposed glacial drift are found along the Naknek River; these are exposed to moderate-to-severe erosion

TABLE 2.3

SUITABILITY OF MAJOR SOIL SERIES FOUND IN SCS SURVEY

Soil Series	Texture	Potential Frost Action	Suitability For: Buildings & Highways	Topsoil	Sand	Gravel
Kvichak	0–21", loam 21"–39", sandy loam	High in upper horizons; low in substratum	Good to fair	Good	Poor above 40"; good below	Poor
Naknek	0–3", loam +3", permafrost	High	Poor (permafrost)	Poor	Poor (permafrost)	Poor
Pustoi	0–4", loam 4"–24", sandy	Low	Good	Poor (shallow material)	Good	Poor
NK	0–5", loamy 5"–42", sandy	High	Poor (high water table)	Poor	Poor	Poor
Tolsona	0–6", sand +6", permafrost	High	Poor (permafrost)	Poor	Poor	Poor

from tidal action and storm surges in the river. Tidal marshes are found along the Naknek River and its major tributaries.

The AEIDC identified the following soil types:

1. IAHP/IM E-2. This series is a poorly drained, loamy, soil with a peaty surface layer and a shallow permafrost table. Slopes are generally less than 12 percent and erosion potential is medium.

2. INT—IAHP/IC E-2. This series is the same as the preceding one but it is mixed with well-drained soil and formed in mostly coarse volcanic ash or in shallow ash over other material.

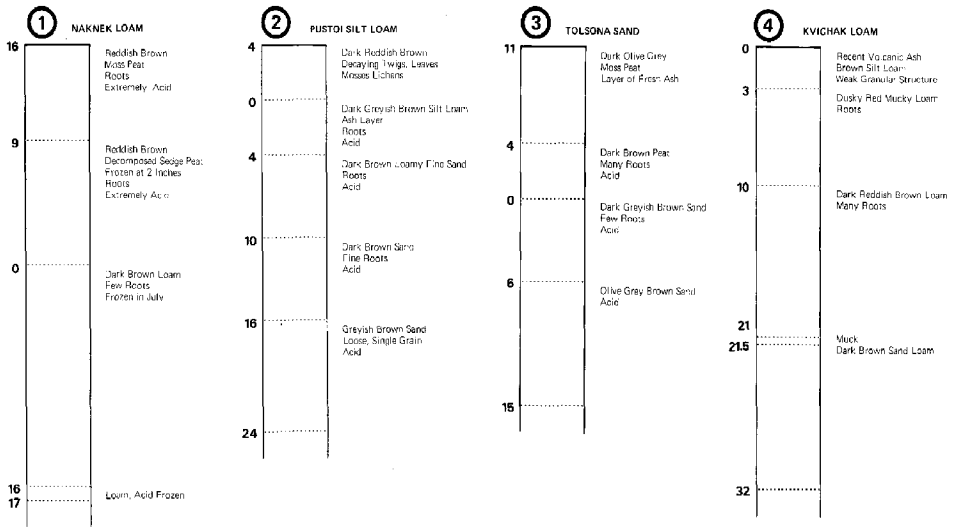
SURFICIAL HYDROLOGY

The Bristol Bay Borough lies within two major watersheds. They are the Naknek lake and river system and the Kvichak Bay or coastal watershed. The Naknek lake and river system is the most significant hydrologic feature within the Borough. Feeding the Naknek River are four major tributaries with drainages that form a major portion of the Borough. The major tributaries are King Salmon Creek, Paul's Creek, Smelt Creek, and Big Creek. In addition, there are numerous surface-fed streams that run into Naknek Lake and Naknek River.

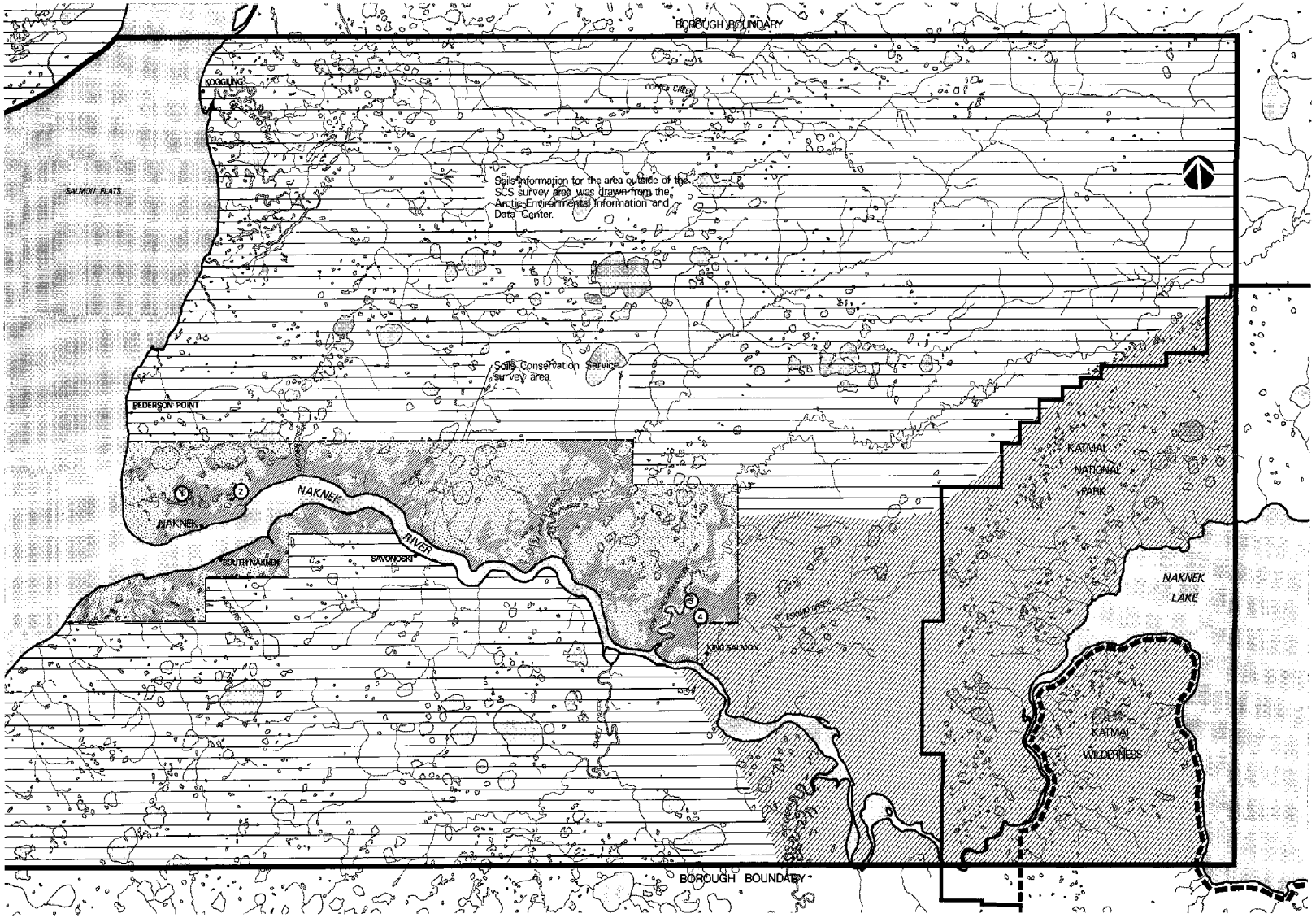
The Kvichak Bay or coastal watershed is comprised primarily of tidal marshes and surface-fed streams that are often tidally influenced. On the northwest side of the Borough there are two major creeks feeding Kvichak Bay. They are Copenhagen Creek and King Salmon Creek.

FIGURE 2.1

SOIL PROFILES[a]



a. Locations where soil profiles were taken are indicated by circled numbers on the Soils map (east). Those numbers correspond to the profile numbers above.



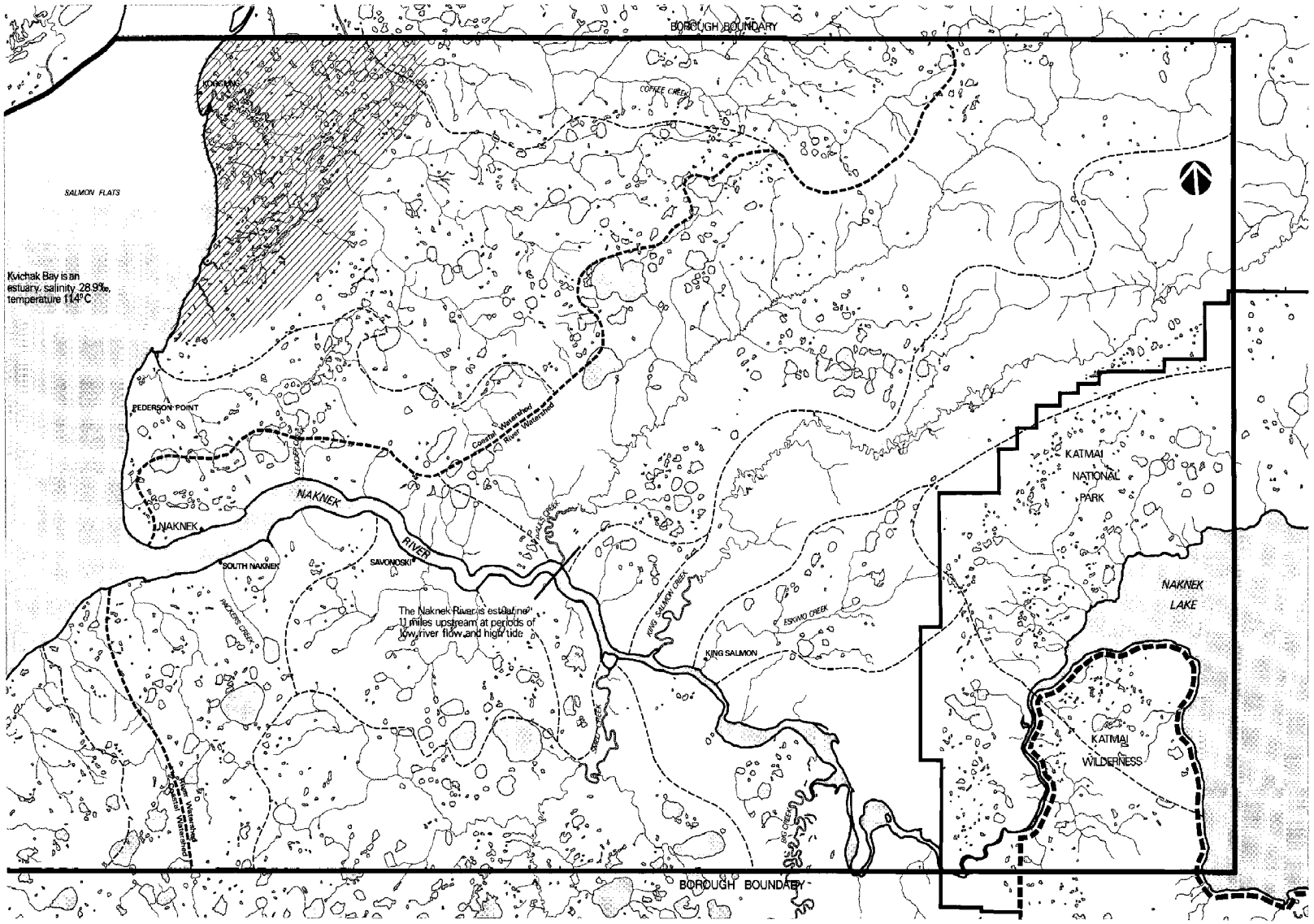
Soils – Borough Map (East)

LEGEND

- IAHP E2 / IM
- INT-IAHP E2 / IC
- Kvichak, Pustoi Series
- Naknek, NK Tolsona Series

SCALE: miles

0 1 2 3



Surficial Hydrology – Borough Map (East)

LEGEND

- Watershed
- Drainage Basin
- Coastal Marsh

SCALE: miles

0 1 2 3

BRISTOL BAY BOROUGH/RESOURCE INVENTORY

CHAPTER THREE-THE NATURAL SETTING

The Region

The Bristol Bay region is one of the most productive areas for fish and wildlife in Alaska. It is the heartland of the world salmon fishery and abounds with caribou, moose, bear, waterfowl, and many fur bearers. In addition to commercial salmon fishing, fish and wildlife are taken for subsistence and recreation purposes by both local and nonlocal hunters and fishermen.

A number of fish, mammal, and bird species are migratory and spend only a portion of the year in the Bristol Bay Borough. The remainder of the year is spent traveling in or out of the Borough to seasonal habitats. Salmon, caribou, bear, and a variety of birds are migratory and travel through the Borough at various times of the year.

The appendices contain a description and map reference for coastal habitats as defined by 6HAC 80.130. It also contains a complete list of important plants and animals by community.

FISH

All five species of Pacific salmon migrate into Bristol Bay from the Gulf of Alaska. The majority of these salmon spawn in the river drainages feeding Kvichak Bay. The Kvichak river system, including Lake Iliamna, is the largest single spawning area in Alaska. The Naknek river system, including Naknek Lake, is also a primary salmon spawning area.

CARIBOU

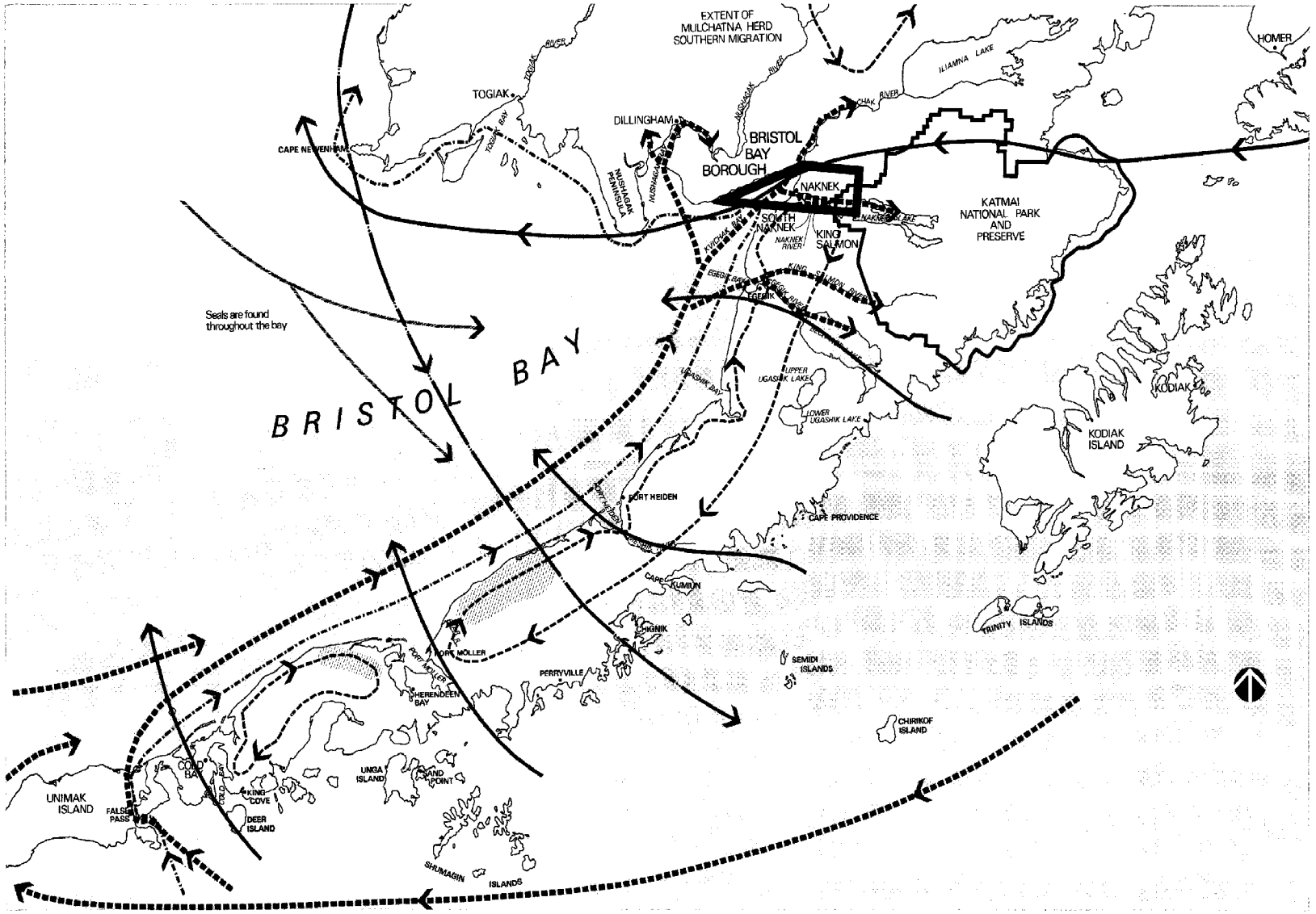
There are, essentially, two major herds of caribou present in the Bristol Bay region. The Mulchatna herd ranges centrally in the region, extending as far south as the southwestern shore of Lake Iliamna. The Alaska Peninsula herd ranges between its wintering grounds along the southern banks of the Naknek River to its calving grounds south of Port Heiden.

MARINE MAMMALS

Walrus, seals, and whales migrate into Bristol Bay and can be found periodically in Kvichak Bay. The migration of each species is seasonal and dependent upon weather, ice conditions, and food sources.

BIRDS

The Bristol Bay region is located along the major flyway for waterfowl, swans, shore birds, and cranes. The coastal and river waters of Bristol Bay support a large number of migratory birds that cross the Alaska Peninsula from the Gulf of Alaska. The Naknek river system and Kvichak Bay serve as a major staging area for those birds migrating north to nest in the Yukon Delta.



Natural Setting – Regional Map

LEGEND

- Caribou Calving Grounds
- Caribou Migration
- Salmon Migration
- Bird Migration, Waterfowl, Shorebird (Spring)
- (Fall)
- Grey Whale Migration
- Walrus Migration (Winter)

SCALE: miles

0 1 2 3

The Borough

FISH

The salmon fishery in Bristol Bay provides a major segment of the economy in the Bristol Bay Borough, and, as such, is probably the most important resource for both commercial and subsistence use. Five major species of salmon comprise the stocks in the area, including: Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*), chum salmon (*O. gorbuscha*), and the most abundant, the sockeye salmon (*O. nerka*). Historically, the total run of salmon in the Naknek-Kvichak estuary has been the largest in the world.

Chinook salmon is a prime sport fish species and is taken in the Naknek River in June and July. Chinook spawn in King Salmon Creek, Big Creek, Paul's Creek, and the Upper Naknek River, with a peak in late July and early August. The fish is taken for both sport and subsistence purposes. Coho salmon, also an important sport and subsistence fish, spawns somewhat later in the year, moving into the Naknek River in late August and early September. Spawning has been observed in King Salmon Creek, Paul's Creek, and Big Creek. Chum salmon are not common in the Naknek River drainage, although they are utilized as part of the subsistence fishery. These fish spawn in Big Creek, King Salmon Creek, Smelt Creek, and Paul's Creek during July and August. Pink salmon are utilized by both sport and subsistence fishermen.

Sockeye salmon are by far the most abundant commercial fish species in the Bristol Bay Borough. Extensive work has been done to depict their life history, distribution, movements, and catchment in the Kvichak drainages. Escapement of adult sockeye within the Naknek River drainage ranges from approximately 330,000 to 2.7 million; approximately 50 to 70 percent of the total number of returning adults are taken by commercial fishermen in the Naknek-Kvichak estuary. Most of these fish have returned after two to three years at sea to spawn throughout the Naknek River drainage basin. The fish migrate primarily along the south bank of the Naknek River and spawn mainly in the Brooks River drainage during late July and early August. Eggs overwinter and hatch in January. Fry remain within the gravel until spring breakup, when they move into the various nursery lakes of the Naknek River drainage. Here they feed and grow, moving gradually downstream, and migrate to the ocean early the following summer. Females tend to spend three years at sea before returning to spawn, while males may spend two or three years.

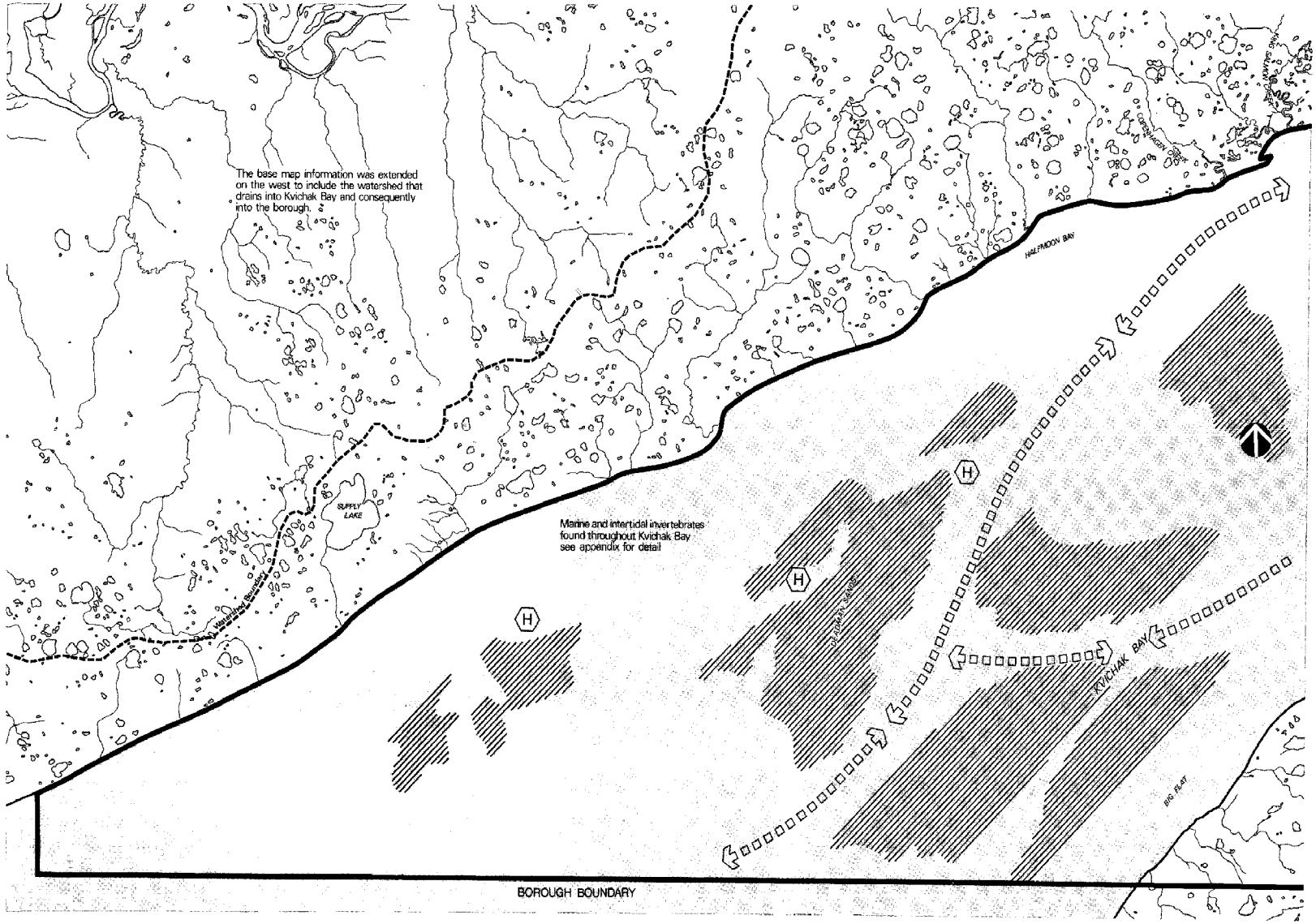
Diving birds, larger fish, seals, and beluga whales are the main predators of salmon smolt. Whales, seals, sea lions, bears, and bald eagles are the main predators of the adult fish returning to spawn.

Other fish present and utilized in the Naknek-Kvichak estuary and the Naknek River include whitefish, grayling, rainbow and lake trout, northern pike, arctic char, Dolly Varden, herring, and smelt.

Rainbow trout is abundant throughout the area. The Naknek River is one of the primary spawning areas for trout in Alaska.

MAMMALS

Caribou. Caribou is an especially important species in the Bristol Bay Borough because of its subsistence value. Communications with persons in Naknek and South Naknek indicate the possibility of two distinct herds being present on either side of the Naknek River. Historically, caribou distribution in the area of the Borough has been erratic, with animals probably responding to population pressures, forage availability, snow conditions, and weather. The Alaska Department of Fish and Game considers the area to contain two herds, the Mulchatna and the Alaska Peninsula herds. Skoog (1968) considers the area to contain a single herd, with varying boundaries depending on the year. Residents of the Borough indicate that there is a local herd of caribou on the north side of the river that migrates northward in the winter and spends the summer west of King Salmon Creek. The Alaska Peninsula herd utilizes the area north of Becharof Lake and south of the Naknek River as wintering grounds, with calving grounds between the Bear and Meshik rivers to the south. State Fish and Game inventories from 1978 indicated a total of approximately 15,000–20,000 animals on the Alaska Peninsula. Population analysis at that time



Fish – Borough Map (West)

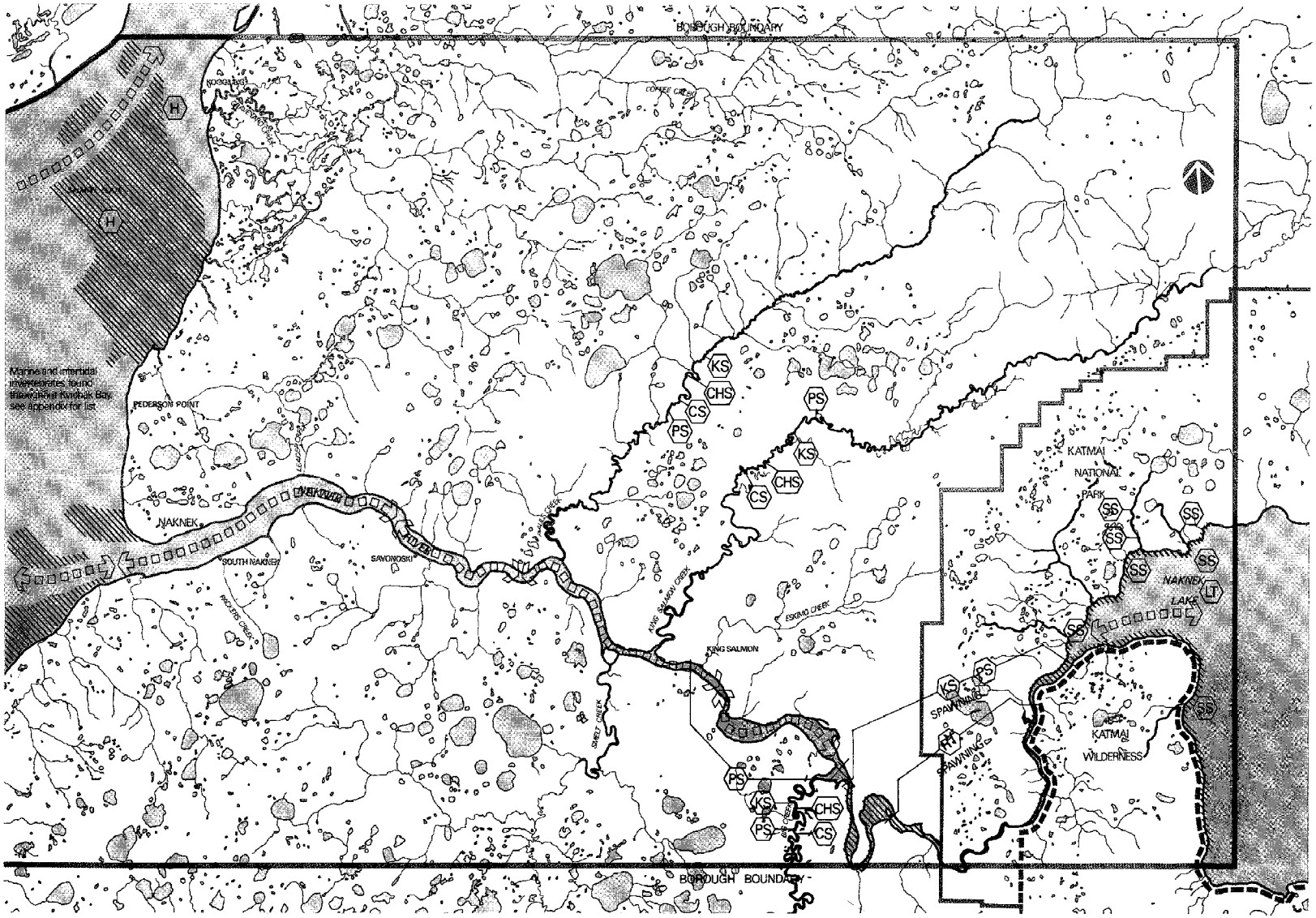
LEGEND

- Halibut
- Spawning Areas
- Migratory Route

Migratory Species Include Salmon, Smelt, Whitefish, Arctic Char

SCALE: miles

0 1 2 3



Fish — Borough Map (East)

LEGEND

- H — Halibut
- SS — Sockeye Salmon
- KS — King Salmon
- CS — Coho Salmon
- PS — Pink Salmon
- CHS — Chum Salmon
- RT — Rainbow Trout
- LT — Lake Trout
- Spawning Areas
- Spawning Areas
- Migration Route

Northern Pike, Dolly Varden, Smelt, Pike, Arctic Char, Burbot Greyling, Rainbow Trout, Whitefish, Blackfish throughout Rivers, and Tributaries

Migratory Species Include: Salmon, Smelt, Whitefish, and Arctic Char

SCALE: miles

0 1 2 3

demonstrated that the Alaska Peninsula herd appeared to be increasing. Calving success in this area is quite high (50 to 60 calves per 100 females), indicating a recruitment rate higher than the natural mortality rate.

Biologists as well as residents note that the migration patterns of the Alaska Peninsula herd have been erratic over the last four to five years. Alaska Fish and Game speculates that this may be a response to increasing herd density, and may precede an emigration of the herd and subsequent decline in numbers throughout the range. Emigration appears likely to occur northward across the Naknek and Kvichak Rivers.

Caribou are opportunistic feeders, utilizing lichens, sedges, grasses, mushrooms, and green tips and leaves of willow and dwarf birch. The Alaska Peninsula herd winters north of Becharof Lake where it can forage only lichens and sedges. Forage during the other three seasons of the year is not difficult to obtain.

Moose. Moose are found throughout the Bristol Bay Borough during the year, with winter concentrations along King Salmon Creek, Smelt Creek, Big Creek, and Paul's Creek. Calving occurs in the higher elevations between King Salmon and Paul's Creek and along the lower reaches of King Salmon and Big Creek. Trends in calving, natural mortality, and hunter harvest indicate a steady decline in productivity of the herd. This decline can be related to deficient habitat and hunger in adult animals (Faro and Franzmann, 1978). Moose winter habitat in the Borough is limited and that which is present has been over-browsed. Moose browse is limited in this area to willow and dwarf birch found along stream bottoms. Winter browse of high quality is thus very difficult to maintain. It is speculated that hunger has caused lower birth rates and poor calf survival. Predation from bears is also an important factor in calf mortality (Moose Inventory, 1979). Moose productivity is not expected to increase within the next few years, because of the age structure and bull:cow ratios.

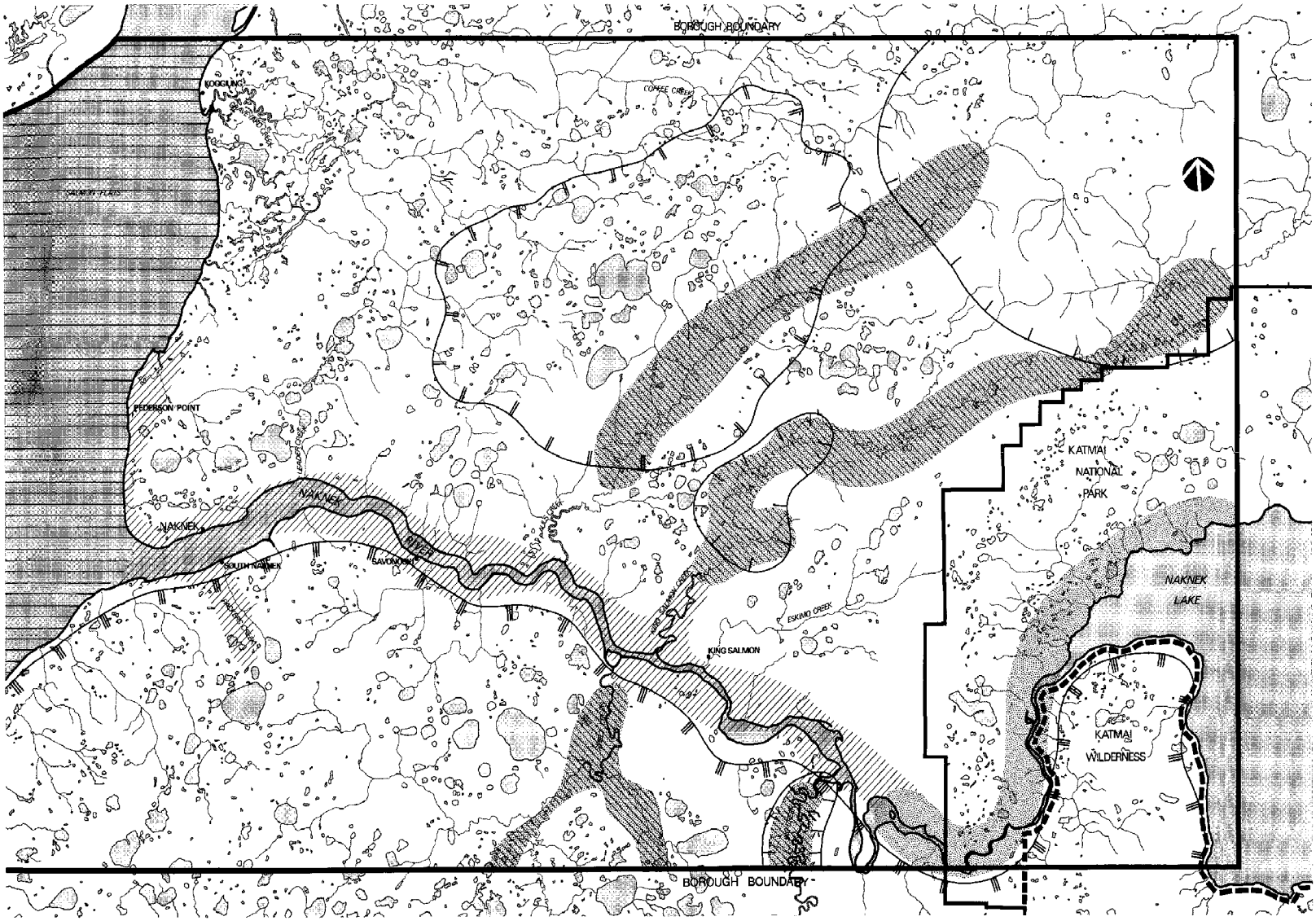
Brown Bears. Brown bears are abundant on the lower drainages of the Naknek River. These bears come mainly from the high density bear areas of the Katmai National Park. Bears concentrate on the major salmon spawning drainages off the Naknek River during the summer months; during winter, they move to higher elevations for denning.

Bears are opportunistic feeders and eat moose, caribou, berries, insects, small mammals, fish, grasses, and garbage found at dump sites. Waste from the local landfills in the communities and waste from the canneries have attracted a great many bears into the area.

BIRDS

Waterfowl, seabirds, and raptors are present on land and water within and adjacent to the Bristol Bay Borough. The entire Bristol Bay region forms a major staging area for migratory waterfowl. Pacific black brant, Canada geese, pintails, mallards, teal, oldsquaw, eider, scoter, goldeneye, and scaup heavily use this area in both spring and fall as a major stopover. In addition, the Kvichak River is a major migration corridor for both whistling swans and sandhill cranes. Data (King and Lensink, 1971) indicate that autumn migration of 572,000 dabbling ducks and 10,600 whistling swans can be expected in Bristol Bay and the adjacent lake/stream systems. Geese (snow, Canada, American emperor, and black brant) may number as high as one million. Diving duck numbers may be even higher. Eel grass, freshwater rooted aquatic vegetation, and marine and freshwater invertebrates form a major food source for these species.

In addition to waterfowl, raptors such as bald eagles, gyrfalcons, rough-legged hawks, and snowy owls are present in the area. Other birds include shorebirds and passerine birds of various kinds. Willow ptarmigan and spruce grouse are also present.



Mammals – Borough Map (East)

LEGEND

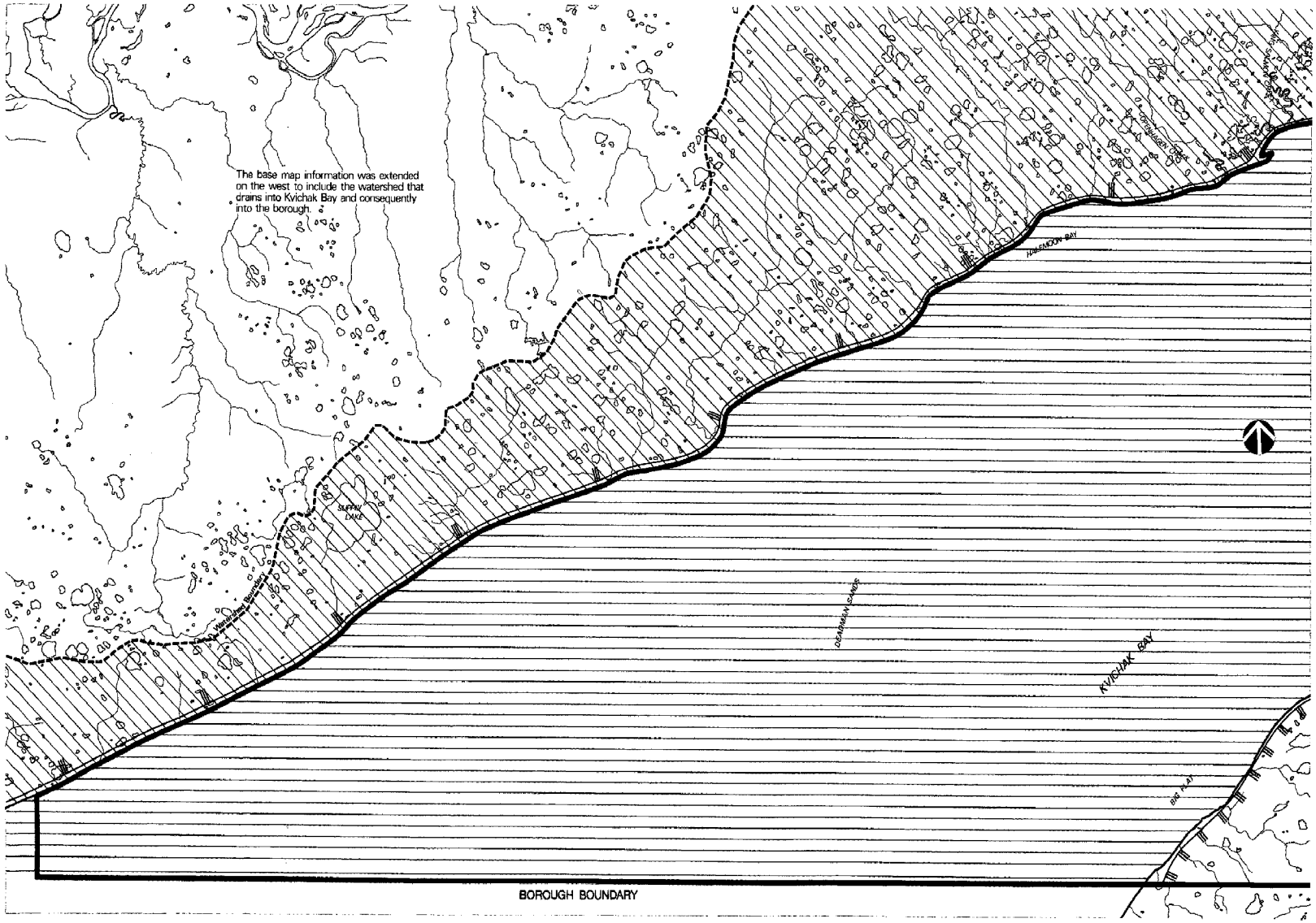
- Beluga Grey Whales
- Harbor Seals
- Sea Lions
- Fur Seals
- Bear: Summer High Concentration Fishing
- Bear: Summer High Concentration Foraging
- Moose—Fall/Winter Range
- Moose Calving Ground
- Caribou—Local Herd—40 to 50 Head
- Caribou—Alaskan Peninsula Herd

NOTE: Beavers, Red Squirrels, Martin, Mink, Lynx, and Muskrat throughout the Area

SCALE: miles

0 1 2 3

Mammals – Borough Map (West)



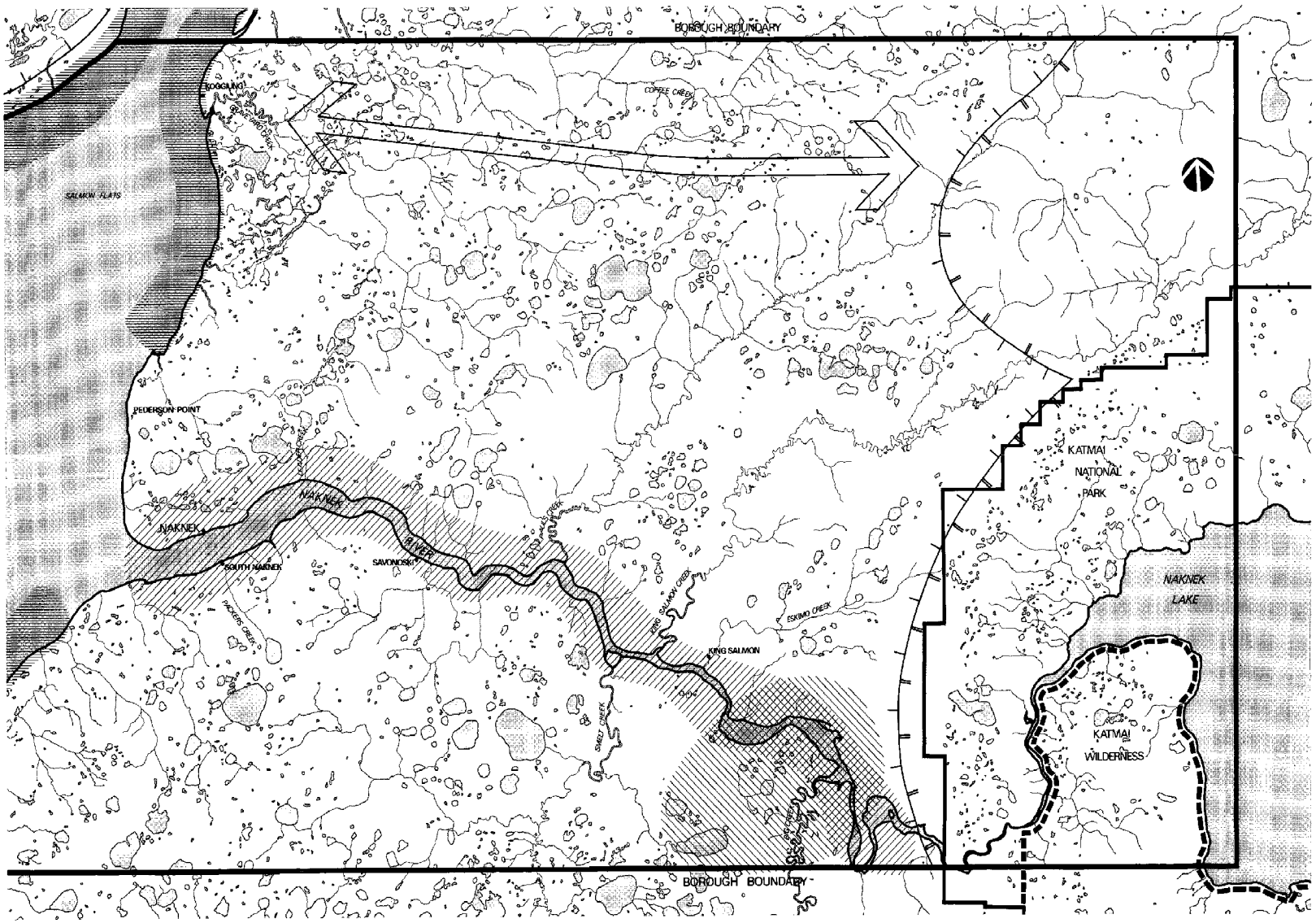
LEGEND

- Beluga Whales, Harbor Seals, Sea Lions, Fur Seals
- Moose Low Concentrations
- Caribou Alaskan Peninsula Herd
- Caribou Low Densities

NOTE: Beavers, Red Squirrel Martin, Mink, Lynx, Muskrat throughout the Area.

SCALE: miles

0 1 2 3



Birds — Borough Map (East)

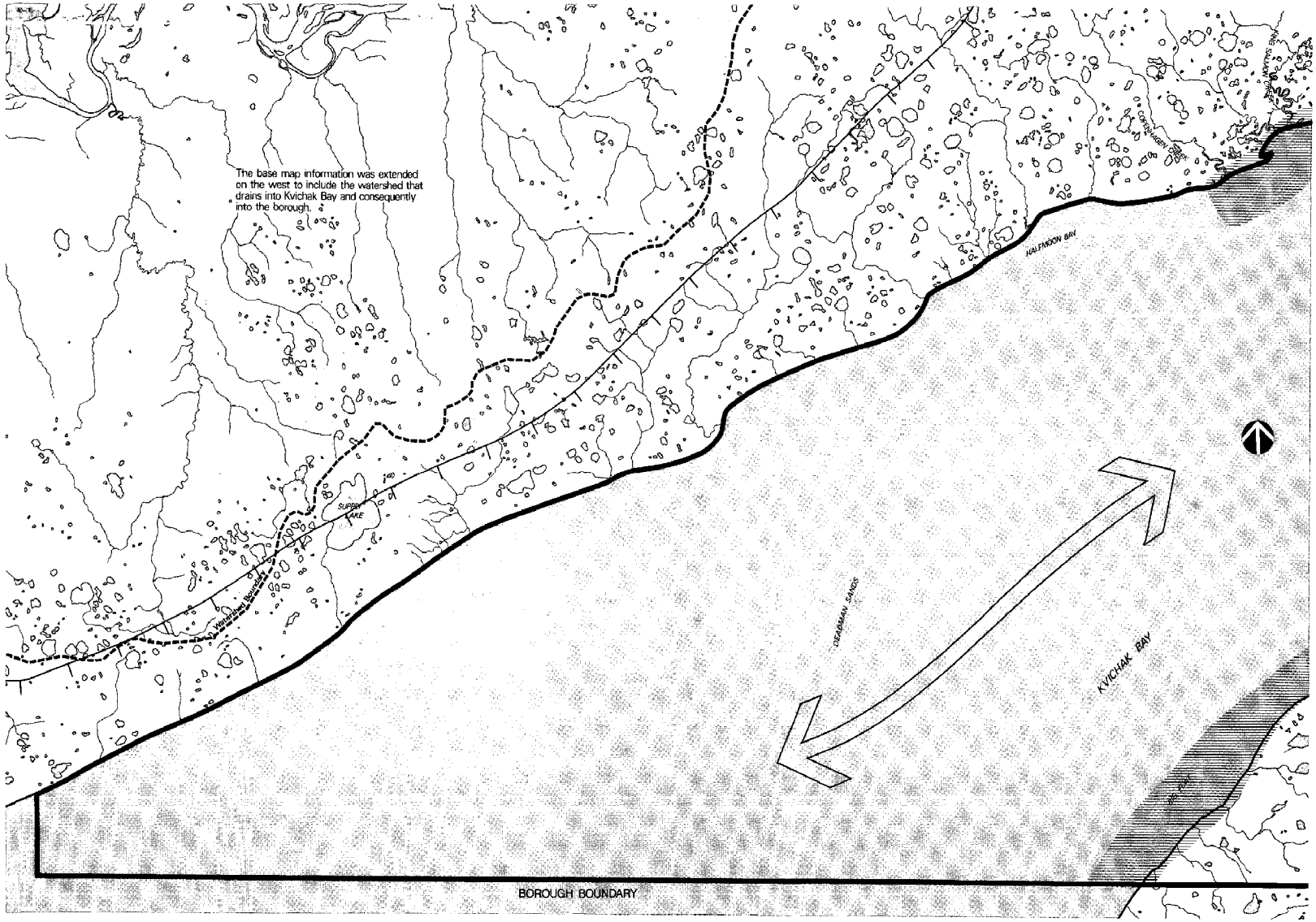
LEGEND

- Shorebirds, Ducks and Geese Staging Area Spring Concentrations
- Waterfowl and Whistling Swan Staging Area Spring Concentrations
- Waterfowl and Whistling Swan Fall Concentrations
- Spruce Grouse
- Waterfowl, Sandhill Crane, and Whistling Swan Nesting Area
- Waterfowl Migration Route

NOTE: Willow Ptarmigan throughout Land Area

SCALE: miles

0 1 2 3



Birds — Borough Map (West)

LEGEND

- Shorebirds, Ducks and Geese Staging Area Spring Concentrations
- Waterfowl, Sandhill Crane, Whistling Swan Nesting Area
- Waterfowl Migration Route

NOTE: Willow Ptarmigan throughout Land Area.

SCALE: miles

0 1 2 3

VEGETATION

The vegetation of the Bristol Bay region is transitional between subarctic forest and arctic tundra. Trees in the area are few and distributed sporadically. Distributions seem to be closely associated with soil conditions.

The following are plant communities found most often in the Bristol Bay Borough (Alaska State Housing Authority, 1966):

Alpine Tundra. This low-lying growth of mosses and shrubs appears on the unforested sand dunes and at the higher local elevations. It thrives in the driest local areas and those with the best drainage. Among this group are various mosses and the local variety of cranberry.

Wet Tundra. On much of the outwash plain, soil conditions favor the growth of sphagnum or bog moss. Where permafrost prevents drainage, overlying soils are water saturated, though there may not be open water. The dampness of the air also favors the growth of sphagnum.

The growth characteristics of sphagnum are such that, once firmly established, it may expand into adjacent areas. If this is the case, it is likely that in time, areas of spruce lichen growth will be converted into areas of moss.

Moist Tundra. Near the shore in almost all the small lakes and ponds, more or less submerged plants live and die to form a mass of humus which builds up the lake bottoms. This condition is a forerunner of cotton grass–sedge marsh. With the continual building up of the bottom of the lake, more and more marsh is created, and the pond shrinks in size.

The dominant shrub of the plant community is a small species of willow, while the most common herb is cotton grass, which is often found in pure stands. This "cotton" tuft was once twisted by natives for oil lamp wicks.

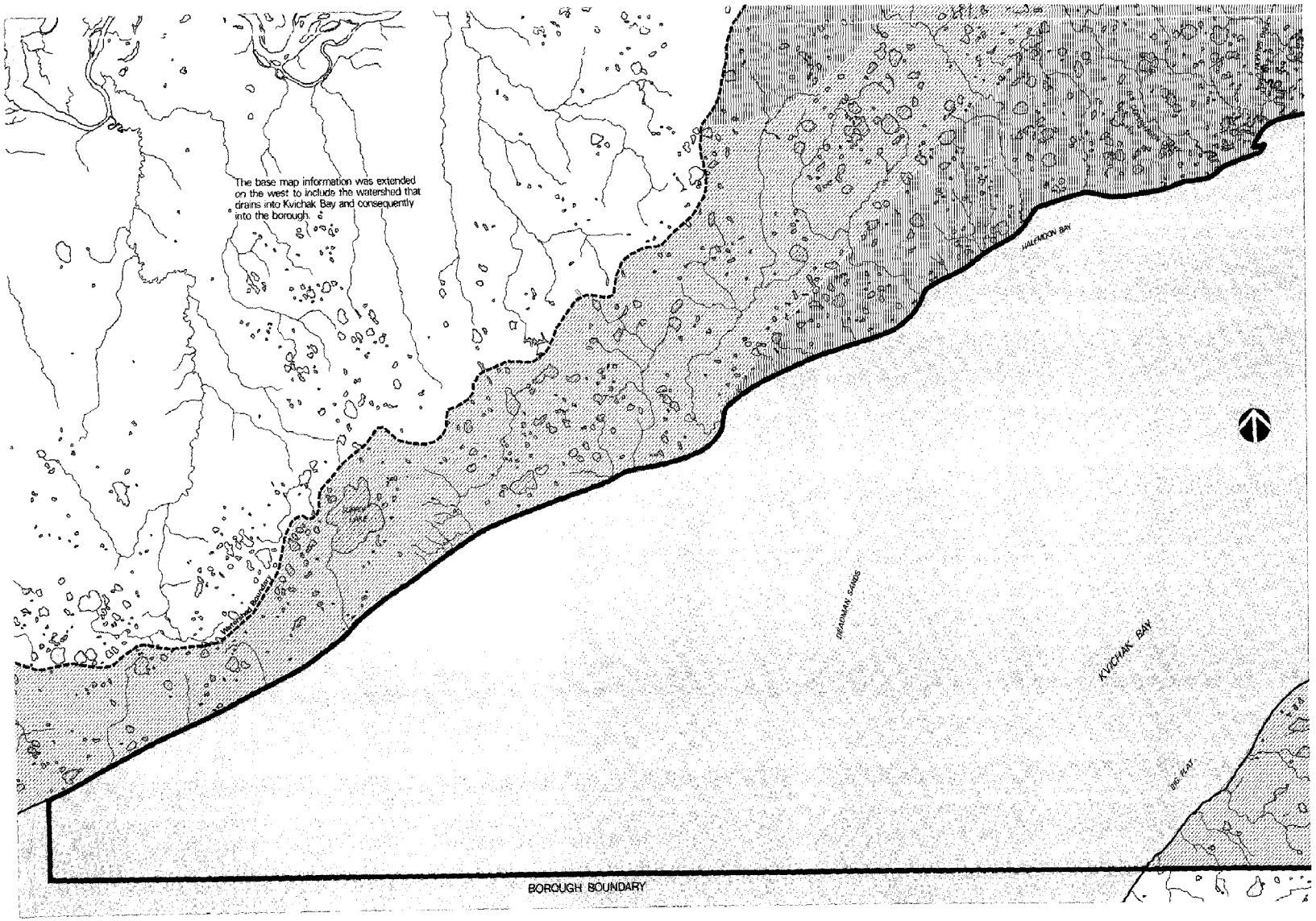
Lowland Forest. White spruce grows on sand dunes, on damp rocky areas where the subsoil is porous and on well-drained parts of the outwash plain. The densest stand of spruce is at King Salmon on the eastern part of a sand dune by the air base. Here soil conditions are most favorable because the soils are well-drained, relatively warm, and the least acidic. The largest and perhaps the oldest tree in the region is located here. Its height is estimated to be 36 feet, its diameter 22 inches, and its age at least 160 years. Most spruces in the Naknek region are less long-lived because they are shallow-rooted and are easily overturned by strong winds.

Mixed Thicket. Along the banks of the Naknek River and its tributaries, and on ice-pressure ridges around the numerous lakes and ponds where there are sandy, well-drained soils, shrubs of various kinds flourish. Kenai birch is one of the two commonest shrubs and grows individually and in clumps rising generally about 2 to 5 feet high. Its squat form and strong root system enables it to withstand the frequent strong winds, and it attains great age. Alder, the other dominant shrub, rarely grows singly but usually in dense and almost impenetrable clumps, 8 to 12 feet high.

Estuarine Plants. Because of the tidal nature of the Naknek River, salt-loving plants that normally grow only along the seashore are found along the edge of the river and its tributaries, nearly as far inland as the Naknek moraine.

Riparian Plants. A small but separate community of "watergrowers," dominated by reeds and five-finger, is recognized along the edges of the Naknek River and its tributaries beyond the upper tidal limit.

Lacustrine Plants. Bordering the shores of the lakes and generally growing in the water, there is a distinctive community of plants. This includes water lilies rooted in the soft, unconsolidated muck that forms the bottom of most of the ponds.



Vegetation — Borough Map (West)

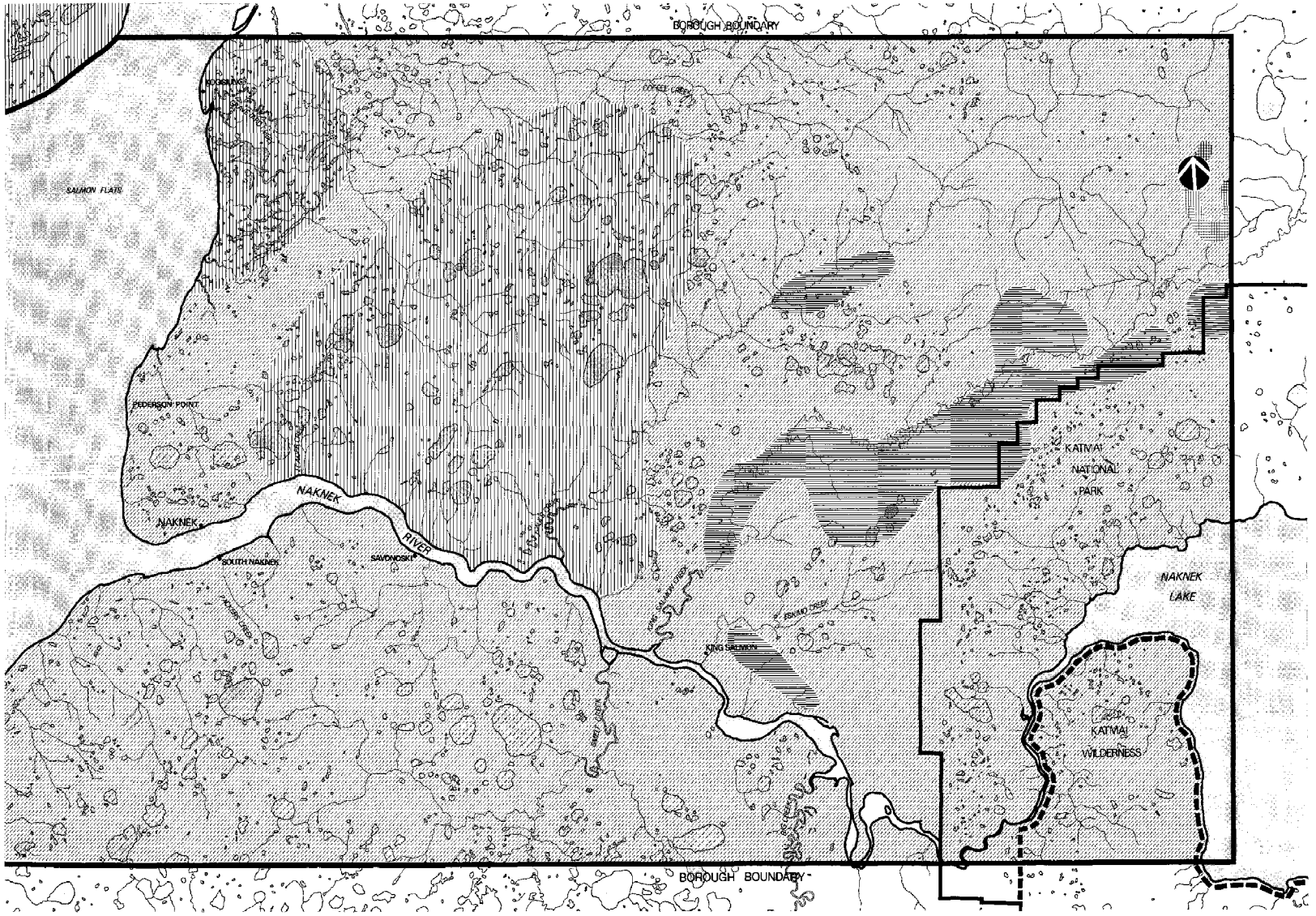
LEGEND

- Wet Tundra
- Moist Tundra

SCALE: miles

0 1 2 3

BRISTOL BAY BOROUGH/RESOURCE INVENTORY



Vegetation – Borough Map (East)

LEGEND

- Wet Tundra
- Moist Tundra
- High Brush/Marsh Bog Areas
- Lowland Forest

SCALE: miles

0 1 2 3

CHAPTER FOUR-MAN'S USE

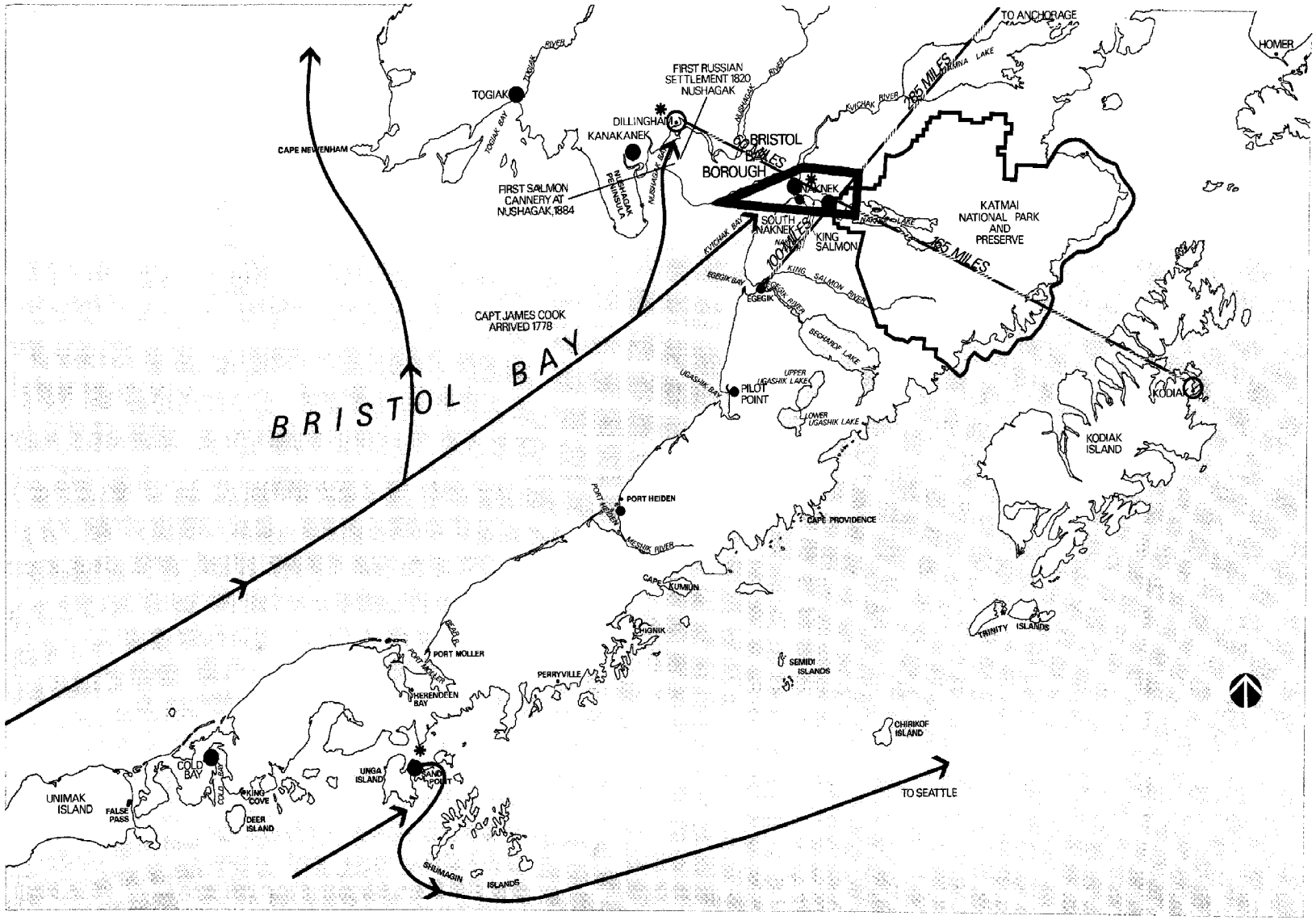
The Region

SETTLEMENT

Settlement in the Bristol Bay region first occurred over 6,000 years ago. A hunting camp has been identified on the Naknek River (Dumond, 1973) that dated 3,000 to 4,000 B.C. Yupik Eskimo and Athapascan Indians jointly occupied the region for an extended period of time. The Eskimo residents of the region inhabited the coastal areas while the Indians inhabited the uplands around Lake Iliamna.

Recorded history began in Bristol Bay in 1818, with the arrival of Russian traders. The first Russian settlement was established in 1820. In 1841, the first Russian Orthodox mission was built at Nushagak and from there the Russians explored and maintained dominance over the region until 1867. In 1884, the first salmon cannery was built at Nushagak and, in 1890, Cress P. Hale built the first cannery on Kvichak Bay at Pederson Point. By 1900, there were a dozen canneries on the shores of Bristol Bay.

The community of Naknek formed around the Russian Orthodox church, the first recorded land owner on the north side of the Naknek River. South Naknek was settled after the turn of the century as a result of the cannery development on the south shore of the Naknek River. In the 1930s, an air navigation site was built at the present site of King Salmon. An Air Force base was established at this site at the advent of World War II. In 1949, a road was built connecting King Salmon and Naknek, and the settlement of King Salmon began.



Man's Use — Regional Map

LEGEND

- Over 500
- 250–499
- 100–249
- 0–99
- Navigation Route
- Transshipment Point
- (Airmiles) Air Route

SCALE: miles

0 1 2 3

BRISTOL BAY BOROUGH/RESOURCE INVENTORY

Table 4.1 shows archaeological and historical sites in the area. Numbers on the table correspond to numbers on the Borough land and water use map.

TRANSPORTATION

Historically transportation, both within the region and to other parts of Alaska has been limited to dog team during the winter, and boat after breakup. The airplane opened up Alaska and, today, air transportation is the most efficient and available means of travel in and out of the region. There are commercial airlines and air charters servicing Bristol Bay airports and air strips throughout the region.

Captain Cook, sailing one of the first ships into Bristol Bay in 1778, was impressed by the multitude of salmon. Marine transportation remains a mainstay for moving bulk goods in and out of the bay. Goods from Anchorage and Seattle are shipped into the region to supply residents of the region as well as fishermen working in Bristol Bay. During the fishing season, canned and frozen fish are shipped to Japan and the West Coast ports.

The Borough

LAND AND WATER USE

The Bristol Bay Borough is approximately 900 square miles in total area. There are about 500 square miles of land area and an additional 400 square miles of water area. Type and intensity of land use within any area is dependent upon economic activity and population. Industrial activity in the Borough is seasonal and centralized around salmon processing. Commercial activity supports the fishing industry on a seasonal basis and a resident population year-round. Considering the seasonal nature of the economic activity in the Borough and the small resident population, both the intensity and the densities associated with land use are minimal.

Canneries. There are presently 20 canneries or salmon processing sites in the Borough. Four of these canneries are abandoned or no longer operate. Canneries have developed on the shores of Kvichak Bay or on the banks of the Naknek River on fairly compact sites of 40 to 60 acres.

Residential/Commercial, Moderate Density. In the communities of Naknek, South Naknek, and King Salmon, residential and commercial development has occurred to support the Borough's resident population. The approximate total area for commercial and residential use in the three communities is 3,000 acres. The figure is a gross estimate including community facilities, governmental offices, and roads.

Residential/Commercial, Low Density. A portion of the resident population of the Bristol Bay Borough lives outside the limits of the three communities. The majority of these people live along the Naknek-King Salmon Road corridor. The vicinity where the road meets King Salmon Creek and Paul's Creek is developing as a residential/commercial area. There are approximately 7,700 acres of easily accessible land along the road corridor between Naknek and King Salmon. The amount of residential and commercial use of this land is minimal and both the density and intensity of use is low. In addition to the road corridor, there are some scattered cabins and fish camps along the Naknek River and along Kvichak Bay at Pederson Point.

Recreation, Subsistence, Wilderness. Most of the land in the Borough remains in its natural state and is used solely for recreational or subsistence hunting. Recreational or sport hunting within the Borough occurs to a much lesser extent, by comparison, than in other parts of the region or the Alaska Peninsula.

There is a substantial amount of subsistence hunting and trapping as well as subsistence gathering throughout the Borough. Caribou is hunted primarily on the south side of the Naknek River. Smelt Creek and Big Creek are used to travel farther into the herds' wintering grounds. Moose is hunted in the foothills of the Alaska Range in the northeast corner of the Borough and also at the headwaters of King Salmon and Paul's Creek. Trapping for mink, martin, and beaver takes place throughout the Borough and berry picking occurs in the areas south of South Naknek and north of Naknek around Pederson Point.

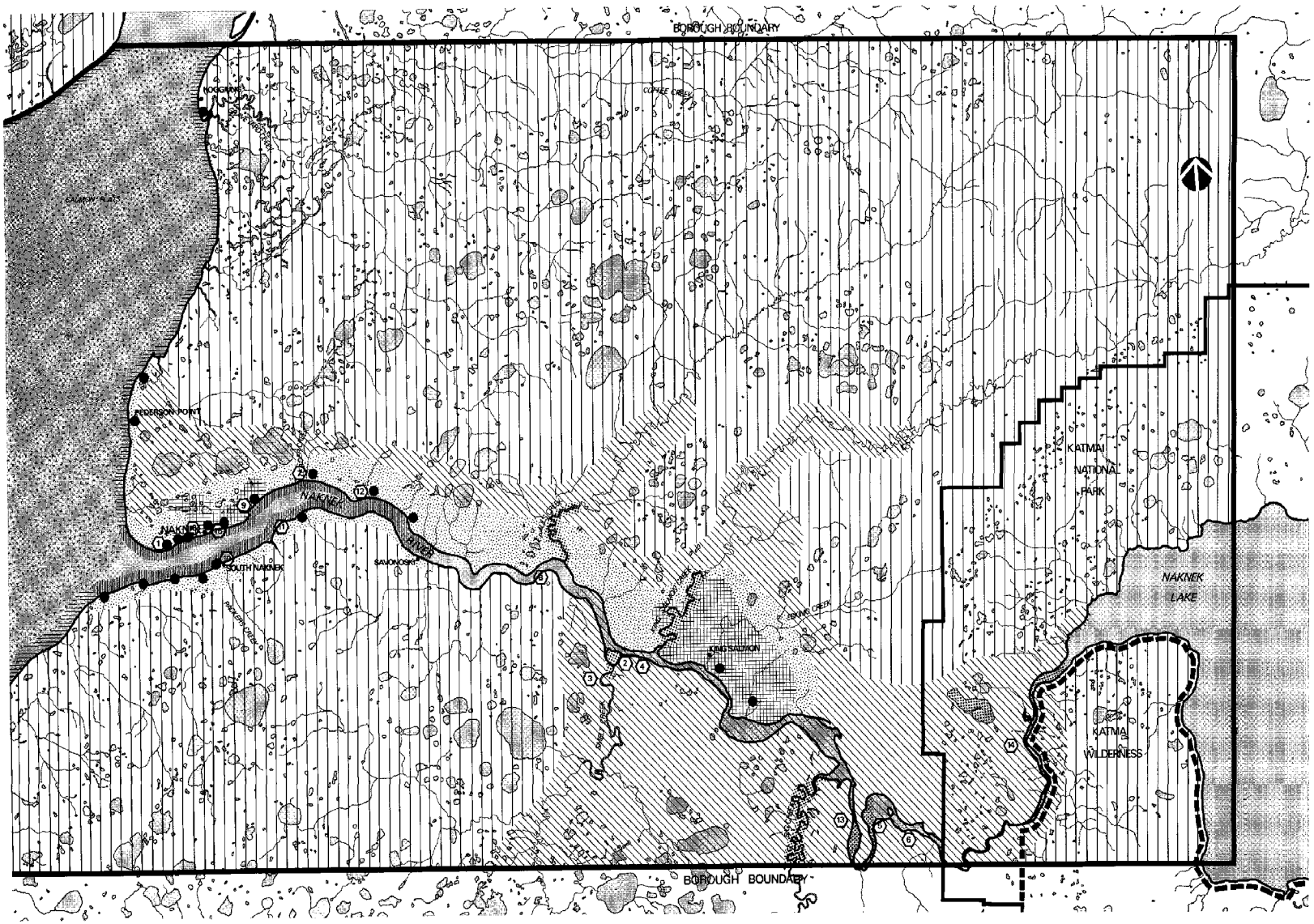
Water Use. Kvichak Bay and the Naknek river and lake system are used both for fishing and for transportation. Intense gill-netting for salmon migrating into the Nushagak and Kvichak Rivers occurs in Kvichak Bay. In addition, commercial set-nets line the shores of the bay and subsistence nets line the banks of the Naknek River. There is also sport fishing along the Naknek River and its major tributaries.

TABLE 4.1

ARCHAEOLOGICAL AND HISTORICAL VILLAGE SITES

Map Number	Name	Date	Ownership	Condition	Environment
1	Smelt Creek	200 BC	Private	Partially excavated	Riverine, moist tundra
2	Pavik	1000 AD	Private	Partially excavated, disturbed	Riverine, moist tundra
3	Naknek No. 4	c. 1900 AD	Private	Undisturbed	Riverine, moist tundra
4	Naknek No. 5	c. 1900 AD	Private	Site tested only	Riverine, moist tundra
5	Naknek No. 6	500 AD	Private	Partially excavated	Riverine, moist tundra
6	Naknek No. 7	c. 1900 AD	Private	Partially excavated	Riverine, moist tundra
7	Naknek No. 8	1400 AD	Private	Partially excavated	Riverine, moist tundra
8	Naknek No. 9	c. 1900 AD	Private	Undisturbed	Riverine, moist tundra
9	Naknek No. 11	1400 AD	Private	Partially destroyed	Riverine, moist tundra
10	Naknek No. 12	1820 AD	Private	Site tested only	Riverine, moist tundra
11	Naknek No. 13	c. 1900 AD	Private	Undisturbed	Riverine, moist tundra
12	Naknek No. 14	c. 1900 AD	Private	Site tested only	Riverine, moist tundra
13	Naknek No. 16		Private	Site tested only	Riverine, moist tundra
14	Naknek No. 17		Private	Undisturbed	Riverine, moist tundra
15	Naknek No. 18	5920 BC	Private	Disturbed, partially excavated	Wave beaten coast, moist tundra
16	Naknek	c. 1900 AD	Local Government	Undisturbed	Riverine, moist and wet tundra

Source: Alaska Heritage Resource Survey, 1976, State of Alaska



Land & Water Use – Borough Map (East)

LEGEND

LAND USE

- Fish Processing Moderate Density
- Residential/ Commercial Moderate Density
- Residential/ Commercial Low Density
- Residential/Subsistence Low Use
- Wilderness/Subsistance Low Use
- Archaeological and Historical Sites

WATER USE

- Commercial Fishing High Use
- Commercial Fishing Moderate Use
- Subsistence Fishing Moderate Use
- Sport Fishing Low Use

SCALE: miles

0 1 2 3

TRANSPORTATION

The Bristol Bay Borough has the region's only paved road, the regional airport, numerous landing strips, and dock facilities for marine transportation. There is an established road network in each of the three communities and a paved road connecting Naknek and King Salmon. At present there is a road planned to connect Naknek and Pederson Point, and a bridge planned to connect Naknek and South Naknek.

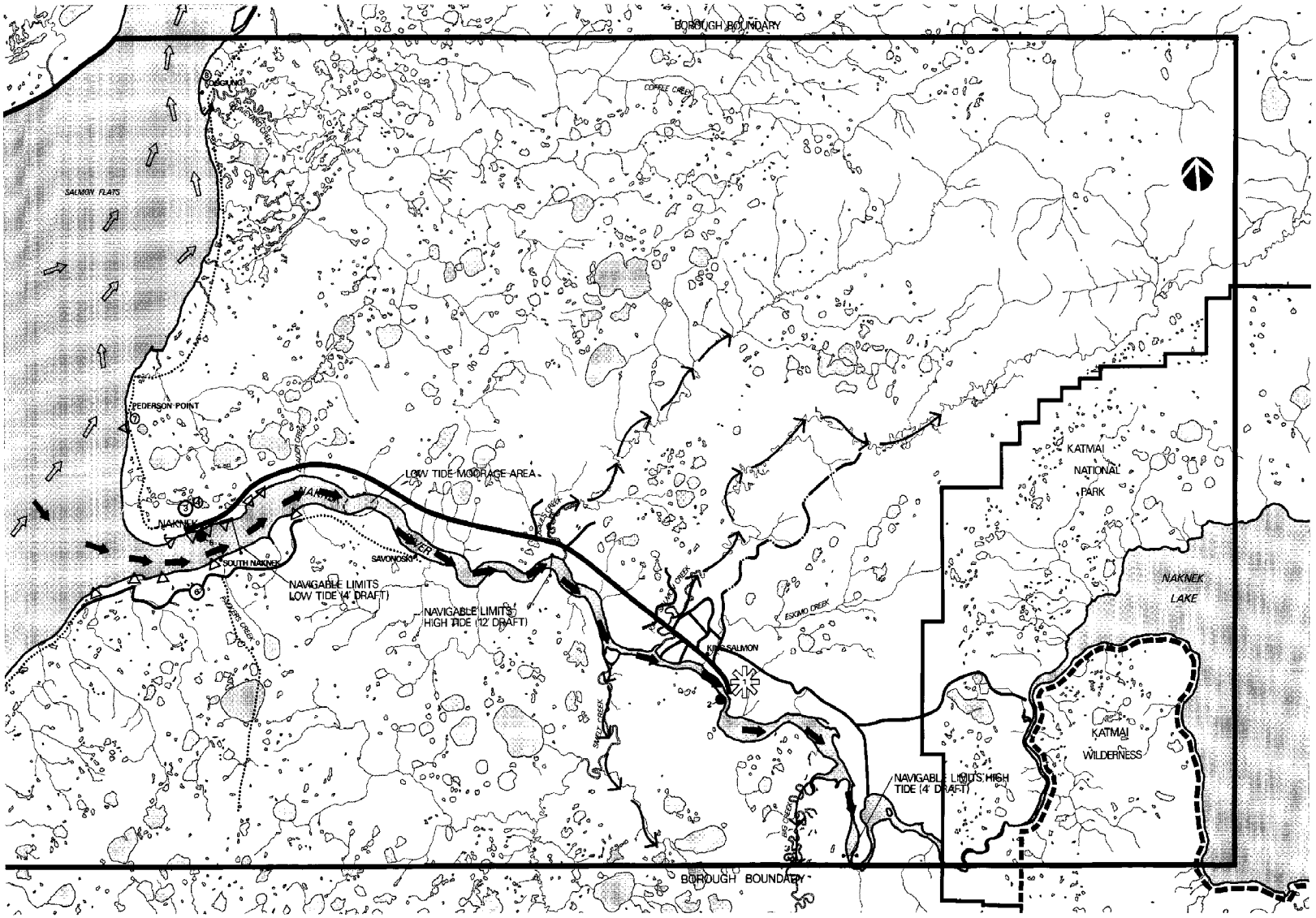
King Salmon Airport shares a modern, paved runway with the King Salmon Air Force Base. The runway is capable of landing a DC-8 and has an apron for airplane storage. A new passenger terminal is being completed at this time. Table 4.2 lists the airport and landing strips within the Borough. Numbers on the table correspond to numbers found on the transportation map.

The Bristol Bay Borough is serviced by barge and ship. Freight is moved in and out of the Borough by sea during the ice-free months of the year. Due to the extreme tidal fluctuation (18.5 feet), the Naknek River at low tide is navigable only to South Naknek, for crafts and drafts of 4 feet or less. At high tide, power scows with drafts of 12 feet or less can navigate 12 miles up river, and those crafts with 3-foot drafts or less can proceed to the rapids. There are docking facilities at the canneries and the Bristol Bay Borough is in the process of completing its own dock facility east of Naknek.

TABLE 4.2

AIRPORT AND LANDING STRIPS

Location	Type	Length	Surface	Owner	Comments
1. King Salmon	Airport	8,515 ft/4,995 ft	Asphalt	Public	Major regional airport, lighted
2. King Salmon	Seaplane base	3,000 ft	Naknek River	Public	Runways, apron, and terminal
3. Naknek	Landing strip	1,700 ft	Gravel	Private	Peninsula air service
4. Naknek	Landing strip	1,700 ft	Dirt	Public	Lighted
5. Naknek	Floatplane base	3,000 ft	Nornek Lake	Public	
6. South Naknek	Landing strip	3,000 ft/1,350 ft	Gravel	Public	Lighted
7. Pederson Pt.	Landing strip	1,200 ft/800 ft	Dirt	Private	Primary access to beach/closed
8. Koggiung	Landing strip	1,000 ft	Dirt	Public	



Transportation – Borough Map (East)

LEGEND

AIR TRANSPORTATION

- Regional Airport
- Major Landing Strip
- Minor Landing Strip
- Seaplane or Float Plane Base

WATER TRANSPORTATION

- Major Sea Routes
- Major River Routes
- Tributary Routes
- Docks and Wharfs

LAND TRANSPORTATION

- Naknek King Salmon Road-Paved
- Gravel Road
- Four-Wheel Drive Road
- Trail

SCALE: miles

0 1 2 3

The Communities

NAKNEK

The earliest evidence of man's presence in the Bristol Bay Borough places him in Naknek approximately 5,000 to 6,000 years ago (Dumond, 1973). In recent history, Naknek developed around a Russian Orthodox church, built on the banks of the Naknek River in the 1800s. The community grew out of the salmon fishery and, today, is the heart of the Pacific salmon fishing and processing industry and the seat of Borough government, and has the largest permanent population in the Borough. Naknek, with its four canneries, offers the largest variety of goods and services in the Borough, and, over the past few years, has experienced continued moderate growth. There is a regional high school in Naknek that serves the entire Borough, a grade school, and a preschool for the community. There is a hotel, two restaurants, a health clinic, civic center, fire station, and a variety of offices including Paug Vik, the village corporation for Naknek and major landowner in the Borough.

SOUTH NAKNEK

South Naknek, an early Native village, developed around the canneries built at the mouth of the Naknek River. The community is the smallest in the Borough. There is an elementary school in South Naknek, but students are flown to Naknek daily to attend high school. The community has a recreation hall that houses an office for the Alaska Peninsula Corporation and the village council, and has the only telephone in the village. The Alaska Packers Diamond NW cannery is located in Packer's Creek in the center of the village, and four other canneries are located close to South Naknek on the river bluff. Two of these canneries are not functioning at this time. The community has a store and an airstrip. A firehouse is being built by the Borough at this time.

KING SALMON

The community of King Salmon originated as an air navigation site built in the 1930s. In 1943, the site was converted to the Naknek Air Force Base and subsequently became the King Salmon Air Force Base. King Salmon grew as a result of World War II and was connected to Naknek by road in 1949. A long, paved runway and modern facilities make King Salmon the major airport in the region. State and federal government agencies located in King Salmon because of the accessibility, land availability, and the convenience of the services supporting the Air Force base.

King Salmon has a store, a hotel, and two restaurants. A dock facility and boat launch is provided on the Naknek River for recreational users. The community has modern housing and a planned residential area along King Salmon Creek. King Salmon is a departure point for sportsmen and recreational users traveling to other parts of the region and to Katmai National Park. It is possible to drive from King Salmon to the mouth of Naknek River in Katmai National Park.

See Tables 4.3 and 4.4 for a listing of the communities' facilities, services, and utilities.

TABLE 4.3

COMMUNITY FACILITIES AND SERVICES

	Schools	Health Facilities	Transportation	Churches	Halls	Commercial	Government
Naknek	Elementary and high school (for both Naknek and South Naknek)	Health clinic/ health aide half time	Roads Airport Dock facilities	Lutheran Catholic Russian Orthodox Community chapel	Civic center	Alaska Commercial Co. Naknek Trading Company	Bristol Bay Borough Library Post office Fire station Police station Jail Magistrate
South Naknek	Elementary grades K–6 10 pupils	Health center/ health aide half time	Roads Airport Dock facilities	Lutheran Russian Orthodox	Recreation hall	Johnson's Store	Library Post office Village council
King Salmon	—	Health clinic	Roads Airport Dock facilities	Community chapel	Katmai club	King Salmon Commercial Company Bank	Library Post office National Park Service Federal Aviation Administration Alaska Department of Fish & Game NOAA U.S. Fish & Wildlife

TABLE 4.4

COMMUNITY UTILITIES

	Water Supply	Sanitary System	Solid Waste	Electric	Communication
Naknek	Ground and surface water well	Septic tanks Sewer system scheduled 1982	Landfill shared with King Salmon	Naknek Electric Assoc.	Radio reception Television (USAF) Telephone
South Naknek	Groundwater well	Septic tanks Municipal sewer system scheduled for HUD housing 1981	Open dump	Naknek Electric Assoc.	Radio reception Television (USAF) Telephone
King Salmon	Groundwater well	Septic tanks Municipal sewage 1984	Landfill shared with Naknek	Naknek Electric Assoc.	Radio reception Television (USAF) Telephone

The Economy

POPULATION

According to 1980 preliminary U.S. Census data, the Bristol Bay Borough has a population of 1,083. In 1970, the U.S. Census showed 1,147 persons in the Borough. Borough officials believe that the current population estimates are low. This assumption is based on higher population projections from 1970 data, and on a sense by long-time residents that the community has grown in the past 10 years.

Bristol Bay Borough is characterized by great fluctuations in population between the winter and summer months. Population changes are primarily due to the influx of fishermen and cannery workers in the area. It is estimated that the population increases from just over 1,000 to 4,000 during the fishing season. Table 4.5 shows present population estimates and those for 1970. The Village Council estimates population of Naknek and South Naknek to be 381 and 146 persons, respectively. The Bristol Bay Native Corporation estimates that King Salmon has 200 civilian residents during the winter months.

TABLE 4.5

POPULATION
BRISTOL BAY BOROUGH

	1970 Census	1980 Census	1980 Village Council Estimates	1980 Borough Estimate[a]
King Salmon	202	196	N/A	N/A
King Salmon AFB	403	340	340	N/A
Naknek	318	317	381 (212 Natives 169 whites)	N/A
South Naknek	154	147	146 (58 school age and below)	N/A
Other	70	94	N/A	
TOTAL[b]	1,147	1,094	N/A	1,685[a]

a. Total used by Borough. There are no official Borough population figures by community.

b. Total population is expected to increase to approximately 4,000 during the summer months.

Source: U.S. Bureau of the Census and Bristol Bay Borough

EMPLOYMENT

Employment and unemployment figures for the Borough are shown in Table 4.6 and Figure 4.1. Employment figures in Table 4.6 are for nonagricultural industries only and do not include fishing. It is estimated that there is almost full employment among year-round residents during the fishing season. As can be seen in Figure 4.1, the third quarter of the year, the fishing season, has the lowest unemployment rate. During the rest of the year there are few jobs available, the major employer being local, state, and federal government.

It should also be noted that Table 4.6 does not include employment of Air Force base personnel who provide some of the labor for Borough restaurant and transportation services. Construction also provides a few jobs to civilian residents during the winter months. Some jobs that require specialized skills, such as plumbing and electrical work, call for labor from outside the Borough. Other nongovernment winter sources of employment include the air services, guiding, trapping, and restaurant and hotel services.

TABLE 4.6

BRISTOL BAY BOROUGH
AVERAGE ANNUAL EMPLOYMENT NONAGRICULTURAL INDUSTRIES
(1978–1979)

	1ST QUARTER		2ND QUARTER		3RD QUARTER		4TH QUARTER	
	No. of Employees	Avg. Mo. Wage	No. of Employees	Avg. Mo. Wage	No. of Employees	Avg. Mo. Wage	No. of Employees	Avg. Mo. Wage
Mining	0	$ 0	0	$ 0	0	$ 0	0	$ 0
Construction	*	*	14[a]	4,343[a]	*	*	24[a]	2,652[a]
Manufacturing	13	647	135	1,213	552	2,323	96	1,192
Transportation, communication, utilities	45	1,291	46	1,370	46	1,629	45	1,563
Wholesale trade	*	*	*	*	*	*	*	*
Retail trade	17[b]	715[b]	31[b]	651[b]	35[b]	676[b]	64[b]	432[b]
Finance, insurance, real estate	*	*	*	*	*	*	*	*
Services	59[b]	565[b]	76[b]	610[b]	71[b]	666[b]	*	*
Federal government	82	1,690	82	1,880	81	1,665	83	1,911
State and local government	243	1,130	245	1,372	166	760	230	1,406
Miscellaneous	*	*	0	0	0	0	0	0
TOTAL[c]	522	$1,092	692	$1,219	1,034	$1,779	659	$1,227

* Not shown to avoid the disclosure of data for individual firms.

a. In 1979 only.

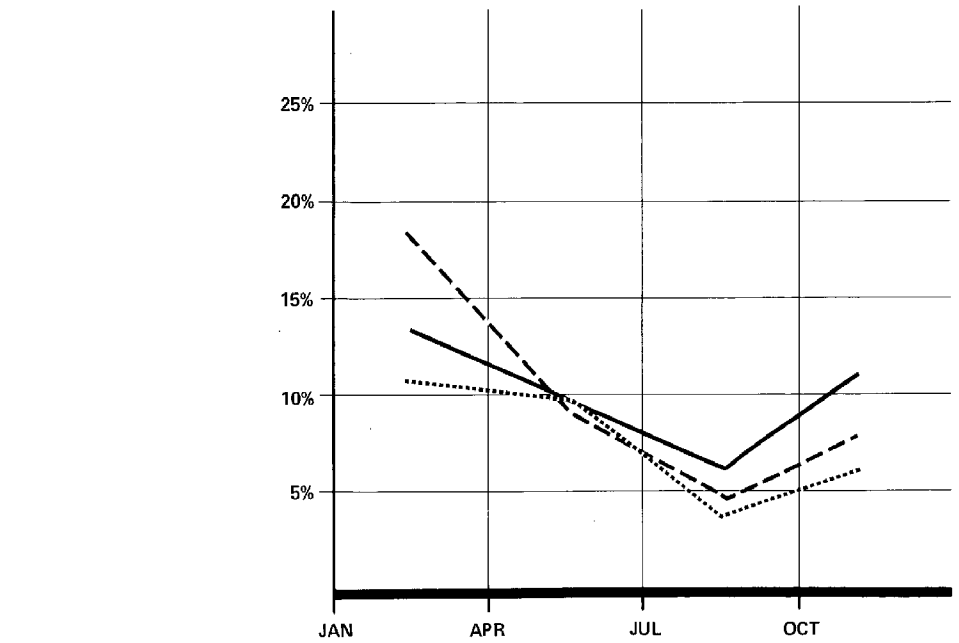
b. Based upon 1978 only.

c. Total includes undisclosed data and so is not additive.

Source: Alaska Department of Labor, Statistical Quarterlies, 1978–1979.

FIGURE 4.1

BRISTOL BAY BOROUGH UNEMPLOYMENT RATE
BY QUARTER: 1978, 1979, 1980



Source: Alaska Department of Labor, *Labor Force Highlights*

COMMERCIAL FISHING AND FISHERIES

Commercial fishing is the most important industry in the Borough and regional economy. Table 4.7 shows annual catches and gross income to fishermen in the Bristol Bay Region from 1975 through 1979. Salmon, particularly red salmon, is the primary fishery for the area and constitutes the main source of income for area residents. The other species of king, chum, pinks (in even years), and coho also produce income, but do not return to the Bristol Bay region in the same quantities as the red salmon. Table 4.8 shows historical catch statistics by species for the Bristol Bay Borough. During the past five years, herring has also become a minor fishery in the area and provides some supplemental income to the local residents.

TABLE 4.7

ANNUAL CATCHES AND GROSS INCOME

BRISTOL BAY FISHERIES
(In Thousands of Pounds and Thousands of Dollars)

	Salmon Drift Gill-Net		Salmon Set Gill-Net		Herring Drift Gill-Net		Herring Set Gill-Net	
	Pounds	Gross Income	Pounds	Gross Income	Pounds	Gross Income	Pounds	Gross Income
1975	26,630.6	$ 10,456.1	2,593.7	$ 1,024.8	51.6	$ 2.0	3.9	$ 0.2
1976	43,981.6	19,848.7	4,132.9	1,933.1	–	–	–	–
1977	43,002.5	23,957.4	4,035.5	2,504.3	310.0	24.8	474.2	37.9
1978	78,449.3	50,470.3	9,660.1	6,251.9	618.1	105.1	646.6	109.9
1979	121,017.6	104,182.5	17,017.1	14,765.6	1,587.0	587.2	5,129.6	1,897.9

Source: Alaska Commercial Fisheries Entry Commission

TABLE 4.8

COMPARISON OF HISTORICAL COMMERCIAL CATCH

BY SPECIES, BRISTOL BAY BOROUGH
(In Thousands of Fish)

Period	Sockeye	King	Chum	Pink [a]	Coho	Total
1960–69 (10-yr avg)	8,612	102	577	1,439	42	10,772
1970–79 (10-yr avg)	8,182	106	844	1,550	70	10,750
1960–79 (20-yr avg)	8,397	104	711	1,494	56	10,761
1975	4,899	30	325	+	46	5,301
1976	5,619	96	1,329	1,037	27	8,108
1977	4,878	131	1,598	5	107	6,718
1978	9,896	175	1,166	5,187	82	16,505
1979	21,958	202	930	2	300	23,393
1980	23,674	96	1,405	2,650	335	28,160

a. Includes only even-numbered years.

Source: Alaska Department of Fish and Game

TABLE 4.9

BRISTOL BAY BOROUGH COMMERCIAL FISHING PERMIT HOLDERS (1980)

	Herring Gill-Net (Western Region)	Salmon Gill-Net	Salmon Set-Net
Residents	183	94	113
Nonresidents	1,297	1,811	873
Residents as a percent of total	14%	5%	13%

Source: Alaska Department of Fish and Game

Table 4.9 compares the number of permits between local residents and nonresidents for the salmon and herring fisheries in 1980. The number of permits that belong to local residents is far exceeded by the number that belong to those from outside the Borough. This is also true of the Bristol Bay region as a whole.

It is difficult to estimate the income that accrues to fishermen from inside the Borough as compared to those from outside. A report by the University of Alaska, Institute of Social, Economic, and Government Research, indicates that there is a differential in income between regional resident and nonresident fishermen due to different gear types and motivational factors. When comparing set-net fleets with drift gill-net fleets, it is apparent that set-nets are not as productive as drift gill-nets. A greater proportion of Bristol Bay Borough resident commercial fishermen are set-net rather than drift gill-net fishermen. It is possible that nonresident fishermen are more highly motivated because of the increased costs of transporting their gear and vessels to Bristol Bay (Kresge, et al., 1974).

TABLE 4.10

BRISTOL BAY BOROUGH
SALMON FISHERY COSTS AND EARNINGS IN 1979

	Salmon Drift Gill-Net (252 Respondents)	Salmon Set-Net (120 Respondents)
Participation and Investment		
Time spent fishing	29 days	29 days
Fuel consumption	866 gallons	334 gallons
Crew size	2.6	3.9
Investment		
Vessel	$ 38,569	$11,709
Entry permit	107,721	30,996
Fishing gear	9,775	3,553
Fishing site	0	8,567
Costs and Returns		
Total fishery income	$ 71,968	$16,493
Operating expenses	30,289	5,243
Capital equipment expenses	11,329	4,416
Depreciation	11,079	1,585
Net Income		
Net cash available	$ 30,372	$ 6,833
Returns to labor and management	16,620	6,468
Range of Gross Income	$25,000–$125,000	

Source: Alaska Fishermen's Journal, February, 1981. Reprinted from Alaska Sea Grant Report.

Unfortunately, recent information on income to fishermen who reside in Bristol Bay Borough is unavailable and average income figures must be used as an indicator. As shown in Table 4.7, Borough fishermen combined received a gross income of $104.8 million from drift nets and $16.6 million from set-nets in 1979. These figures represent gross earnings to the permit holders and boat owners. In order to derive net income, operating and capital equipment expenses should be subtracted from these figures. Approximately 10 to 15 percent of gross earnings go to each crew member. Other costs include fuel, food, and gear. Table 4.10 shows cost and earnings information for Bristol Bay salmon fishermen in 1979. It should be noted that 1979 was an unusually good year because the catches of fish and the exvessel price for the fish were high. Presently the operating costs for fishing vessels are rising, largely because of increased fuel costs.

For set-netters, costs consist of maintaining the gear and, depending upon the location of the set-net, maintaining a camp at the set-net site. Set-netters who are located on the west side of the Kvichak River must also pay for transportation costs between the buyer and the "west side." In 1980, these transportation costs averaged out to 12 to 15 cents a pound. In order to put the 1979 figure in perspective, actual fishing incomes from 1969–1976 for Bristol Bay Borough fishermen are shown in Table 4.11. During these years Borough fishermen earned greater average incomes than did Alaska fishermen who were not Borough residents.

As previously noted, the income from fishing is a function not only of the number of fish available for harvest but the price received for the fish. Representative exvessel prices in Bristol Bay for the past several years are shown in Table 4.12. Exvessel prices for salmon differ from species to species and year to year. For example, in 1979 sockeye salmon for freezing sold for $1.25; in 1980 sockeye for freezing sold for $0.40.

Two main fishermen's organizations now exist in Bristol Bay for price negotiations between fishermen and processors: Alaska Independent Fishermen's Marketing Association and the Western Alaska Cooperative Marketing Association. The purpose of both organizations is to obtain the highest possible price for their members' fish. One primary negotiating tool used by the fishermen is to strike until the price settlement is made. In some years, the strike can last well into the run and create lost earnings for many fishermen. One of the reasons why negotiations are necessary is that salmon prices fluctuate from year to year. This fluctuation is dependent upon many variables which include:

- The number of salmon available in the world market
- The quality of the salmon available
- The costs of processing, transporting, and storing various product forms
- The price the consumer is willing to pay for the product

TABLE 4.11

AVERAGE GROSS EARNINGS FOR BOROUGH AND STATE FISHERMEN 1969–1976

	Gear Operators Reporting	Borough Fishermen's Average Gross Earnings	Alaska Fishermen's Average Gross Earnings
1969	164	3,735	1,803
1970	156	8,362	1,803
1971	154	4,776	2,673
1972	144	1,213	1,006
1973	130	1,479	4,115
1974	97	7,349	3,699
1975	120	4,353	1,926
1976	118	7,349	4,115

Source: Rogers, George W., Richard F. Listowski, and Donna Mayor. 1980. *Measuring the Socioeconomic Impacts of Alaska's Fisheries.* University of Alaska, Institute of Social and Economic Research.

Thus, Bristol Bay salmon prices reflect not only the current availability of raw product in Bristol Bay but the current inventory of processed product on the world market and the current costs of processing and obtaining the fish.

Appendix I shows the number of operating land-based and floating processors that operate in the Bristol Bay Borough. The number of canneries has fluctuated during the past few years. Only 10 canneries and land-based processors, with or without fish camps, still operate in the area. The canneries and processing plants are owned by nonresidents of the Borough and, as most residents are fishing during the salmon season, employ very few local people. For this reason, labor for the processing of the fish is generally imported from areas outside the Borough. One plant does hire a large number of students from the area. It is estimated that approximately 50 of the 160 plant workers are Bristol Bay Borough students. Other local employment includes:

- Preseason preparation at the canneries and fish camps
- Winter watches of the cannery grounds and equipment
- Military personnel who will work in the canneries on leave from the base

Salmon returns in Bristol Bay have peaked during the past two seasons. Processors have utilized these large runs by increasing production in several ways:

- Floating processors have entered the fishery in increasing numbers, freezing the catch that is received from fishermen.
- Tenders have transported a portion of the catch to other areas in Alaska and Canada.
- Fish have been flown from King Salmon to other processing plants in Alaska for canning or freezing.

The Borough provides a market to fishermen and the fishermen utilize many of the support services provided by Borough residents, principally equipment rental and flying services. The Borough also collects a 3 percent raw fish tax from those landing fish there. It is not anticipated that the present pattern of impacts will significantly change in the future.

TABLE 4.12

REPRESENTATIVE EXVESSEL FISH PRICES IN BRISTOL BAY
1975–1980
(in $/lb)

	1975	1976	1977	1978	1979	1980
King	.35	.45	.45			.57 (for canning) 1.00 (for freezing)
Sockeye	.37	.32	.595	.68	.80 (canning) 1.25 (freezing)	.57 (for canning) .40 (for freezing)
Chum	.18	.32	.375			.37
Pink	.19	.31	.36			.25
Coho	–	.405	–			.57 – 1.00 range

Source: Alaska Department of Fish and Game and AIFMA.

TABLE 4.13

FEDERAL, STATE, AND LOCAL GOVERNMENT ESTIMATED EMPLOYMENT FOR BRISTOL BAY BOROUGH

	No. of Year-Round Employees
Federal Government	
U.S. Air Force	340
Federal Aviation Administration	33
Fish and Wildlife Service	1
National Park Service	4
National Weather Service	3
U.S. Post Office	5
State Government	
Department of Transportation	9
Public Health Nurse	2
Department of Fish & Game	6
State Trooper	1
Local Government	
Bristol Bay Borough	9
Bristol Bay School District	39
Police	1
Martin Monsen Regional Library	1
Village Councils	4

Source: Interviews with government employees

GOVERNMENT

Government services are the primary source of year-round employment in the Borough. Jobs exist at the federal, state, and local levels and are listed in Table 4.13. In addition to those listed, temporary positions have been made available on a regular basis.

U.S. Air Force. The largest government employer is the U.S. Air Force with 340 personnel presently working on the base. King Salmon Air Force Base is considered to be a remote site, and only five men have brought their families to the area. All other personnel live on the base. Base officials have stated that personnel do not contribute significantly to the area economy, as all goods and services for their use are provided on base. It was pointed out, however, that some military personnel do work in the local economy. Some work in the canneries during the fishing season, some in local restaurants, some with the flying services, and some act as assistant guides to hunting parties.

It is anticipated that the population at the base will decline slightly in the near future. The radar system is expected to be changed to a minimally manned radar system. This action should reduce the base population by 40 persons.

Federal Aviation Administration. The Federal Aviation Administration (FAA) presently employs 33 personnel. This number is expected to remain stable in the near future. There is, however, a modernization plan currently under consideration. Under this plan only a few main airports would operate as hub facilities while others would be operated under a remote control system. It is estimated that if this system were implemented 10 of the present 33 FAA employees would be relocated from King Salmon.

Other Federal Agencies. Other federal agencies are located principally in King Salmon and, with few exceptions, maintain steady year-round employment. Three of the agencies do increase employment during the summer months. These include the Fish and Wildlife Service, the National Park Service, and the U.S. Post Office.

State Government. The state employs a total of 18 year-round personnel in the Borough. This number grows to approximately 38 during the summer months.

Local Government. The Borough government employs a total of 9 people on a year-round basis. In past years many of these employees have supplemented their incomes by fishing during the summer season. The Borough is also planning several public works projects which may affect the future economy of the Borough.

SUBSISTENCE AND SPORT FISHING AND HUNTING

In addition to commercial uses of the wildlife resources in the area, both subsistence and sport fishing and hunting take place in the Borough. There have been ambiguities between the definition and distinction of subsistence versus sport fishing and hunting. For the purposes of this report subsistence will be defined as animals or fish taken in order to be used as a major component of the user's diet.

Subsistence fishing is distinguished from sport fishing by the Alaska Department of Fish and Game primarily by gear type. Subsistence fishing is defined as "the taking, fishing, or possession of fish, shellfish or other fisheries resources for subsistence use with gill-net, seine, fish wheel, longline or other means defined by the Board of Fisheries" whereas sport fishing applies to noncommercial fish taken by a hook and line.

Subsistence users in the Bristol Bay Borough reside in all parts of the state. Table 4.14 shows the place of residence of 1980 subsistence fishermen in the Bristol Bay Borough area and Table 4.15 shows the subsistence catches for the past five years in the Borough area.

It is estimated that all civilian residents of the Borough are dependent, to some extent, on salmon for food during the winter months. This salmon can be either a portion of a fishermen's commercial catch, fish caught for sport, or fish caught in the subsistence fishery.

TABLE 4.14

SUBSISTENCE PERMIT HOLDERS PLACE OF RESIDENCE, 1980 FOR NAKNEK/KING SALMON AREA (Preliminary)

Bristol Bay Area Residents	211
Anchorage	84
Eagle River	10
Fairbanks	5
Wasilla	4
Kenai	5
Kodiak	5
Juneau/Douglas	6
Soldotna	4
Palmer	2
Chugiak	2
Homer	4
Kasilof	2
Seward	2
McCarthy	1
Cordova	1
Cold Bay	1
Hope	1
Kepnuk	1
Paxson	1
Intra	1
Trapper Creek	1
Ketchikan	1
Big Lake	1
Dutch Harbor	1
McGrath	1

Source: Alaska Department of Fish and Game

TABLE 4.15

KING SALMON/NAKNEK AREA
SUBSISTENCE SALMON CATCHES[a]
(In Numbers of Fish)

	1975	1976	1977	1978	1979	1980
Kings	576	675	1,093	1,023	1,044	1,421
Sockeye	7,097	6,262	9,420	9,192	9,547	15,570
Chums	116	228	339	339	232	708
Pinks	16	1,099	53	970	26	1,775
Cohos	216	208	263	226	897	809
TOTAL	8,021	8,472	11,168	11,750	11,746	20,283
No. of permits		145	203	219	243	358

a. Based on extrapolations made from survey data.

Source: Alaska Department of Fish and Game

TABLE 4.16

SPORT FISH AND EFFORT
NAKNEK RIVER AND NAKNEK LAKE
1979
(Numbers of Fish)

	Naknek River[a]	Naknek Lake[b]
King salmon	2,264	299
Silver salmon	300	109
Sockeye salmon	236	18
Pink salmon	0	18
Coho salmon	18	18
Rainbow trout	954	9
Dolly Varden/ artic char	527	
Lake trout	9	
Northern pike	36	
Grayling	300	
Smelt	65,238	

a. 5,691 days fished
b. 770 days fished

Source: Alaska Department of Fish and Game

Aside from being used for food by local residents, sport fish also plays an important role in attracting tourists to the area. Sport fishermen are from inside and outside the Borough. When sport fishermen come from outside the Borough, they may use local guides and the hotel, restaurant, and air charter facilities within the Borough. Two main types of fish, rainbow trout and salmon, are the principal target species of the sport fishermen. In addition, Dolly Varden, grayling, and smelt are caught in significant numbers. Table 4.16 shows the 1979 sport fish catch in the Naknek River and Naknek Lake.

Wild game is also used for subsistence purposes by the Borough residents, although ADF&G does not make any distinction between subsistence game hunting and sport hunting. The three principal types of large game in the area are caribou, moose, and bear. Infrequently, wolf, wolverine, and lynx are also taken. Both caribou and moose are used by local residents as a part of their winter food supply. In addition, duck, goose, ptarmigan, and other small game are hunted both by residents and nonresidents of the Borough. Table 4.17 shows the estimated numbers of large game hunters who use the Borough as a base for hunting.

TABLE 4.17

BRISTOL BAY BOROUGH
RESIDENT AND NONRESIDENT HUNTERS
(Estimated Annual Average)

	Resident Hunters	Nonresident Hunters
Bear		100–150
Moose	25	40–45
Caribou	150	700

Source: Alaska Department of Fish and Game

Nonresidents are required to use guides for hunting brown bear and dall sheep. Guides are also used by some nonresidents for hunting caribou and moose. Approximately five regular guides live within the Borough. It is estimated that these guides may take three to four hunters out per year at a price of approximately $7,000 per hunter. In addition, guides from other parts of the state may use King Salmon as a base of operations for some of their trips. Support services used by the hunters include air charter services, hotels, and restaurants.

TRAPPING

Commercial trapping takes place in the Borough during the winter months. The major species that are taken include fox, beaver, otter, wolverine, and lynx. It is estimated that 20 to 30 residents of the Borough regularly trap to supplement their income. This number varies according to the prices that are being offered for pelts. The fur market is highly cyclical and is largely dependent upon the fashion industry. It is estimated that, on an average, commercial trapping in the Borough has a total annual value of $10,000 to $20,000.

NATIONAL PARKS AND REFUGES

Closely related to the popularity of sport fishing and hunting in the area is the close proximity of the Borough to federal parks and refuges. Bristol Bay Borough is located adjacent to Katmai National Park and Becharof National Wildlife Refuge. Many individuals are drawn to the area to use these federal lands for camping and sport fishing during the summer months. Katmai National Park has averaged over 10,000 visits per year in the past five years.

SUPPORT SERVICES

The primary support services used for both commercial fishing and tourism in the area are air services, hotels and restaurants, and commercial and recreational rental equipment. In addition, boat storages, hardware and dry goods stores, and gas stations receive increased business from the influx of the summer population. Table 4.18 shows the number of land-based businesses by type, quantity, and locality. A small influx of support services does take place in the summer for the fishing industry. These are primarily small flying services, helicopters, and repair services.

TABLE 4.18

LAND-BASED BUSINESSES IN BRISTOL BAY BOROUGH

Type of Business	Naknek	King Salmon	South Naknek
Boat storage	3	2	
Banks		1	
Dry goods and grocery stores	3	1	1
Lumber	1		
Bars and restaurants	4	2	1
Air services	4	4	
Gas	1		
Contractors		2	
Rental equipment		2	
Repair		1	
Hotels	1	2	

Source: Bristol Bay Telephone Cooperative, telephone directory, and conversations with local residents.

COST OF LIVING

The cost of living in the Borough is high when compared to many other locations in Alaska and the United States. The Alaska Bureau of Commerce and Economic Development estimates that in 1978 it cost 2.2 times as much to live in Bristol Bay Borough as it did to live in the lower United States, and to live in the Borough cost 1.5 times as much as to live in Anchorage.

Tables 4.19 and 4.20 show various barge and air freight rates.

HOUSING

Housing in the Borough is considered to be expensive and in short supply. One reason for the shortage is the high cost of building a house and the high price of land in the area. Currently, one acre of residential property sells for approximately $10,000. a two-bedroom home with running water and electricity was recently assessed at $107,000.

TABLE 4.19

BARGE FREIGHT RATES
1980

SEATTLE TO BRISTOL BAY BOROUGH

Commodity	Cost per Hundred Pounds [a]
Cement, sand, gravel	$13.77
Building material	15.54
Cans	7.81
Frozen fruits and vegetables	29.63
Motor vehicles	
Passenger car (min. $1,238.45)	30.59
Truck (min. $1,238.45)	30.59
Over 1 ton (min. 10,000 lbs)	29.64
Iron and steel	9.79
Lumber	9.35
Compressed gas	11.33
Salt	6.85
Plywood	9.65
Eggs	19.04
Meat (frozen)	40.06

FROM BRISTOL BAY BOROUGH TO SEATTLE

Canned fish	45,000	$ 7.47
Frozen fish	20,000	18.53
	30,000	13.09
	40,000	10.81

a. Based on a 30,000-pound container.

Source: Sealand Freight Service, Inc.

TABLE 4.20

AIR FREIGHT RATES
KING SALMON, ANCHORAGE, AND SEATTLE

GENERAL COMMODITY RATE

Seattle–Anchorage		Seattle–King Salmon	
Weight	Rate	Weight	Rate
≤ 100 lbs	$.42/lb	≤ 100 lbs	$.707/lb
≥ 1,000 lbs	.37/lb	≥ 1,000 lbs	.67/lb

SEAFOOD COMMODITY RATE

King Salmon–Anchorage		King Salmon–Seattle	
Weight	Rate	Weight	Rate
	Minimum–$23		Minimum–$27
< 100 lbs	$.23/lb	< 100 lbs	$.78/lb
≥ 100 lbs	.2005/lb	≥ 100 lbs	.5560/lb
≥ 1,000 lbs	.1945/lb	≥ 1,000 lbs	.53/lb
		≥ 3,000 lbs	.51/lb
		≥ 5,000 lbs	.39/lb

Source: Wien Alaska

The shortage of housing is particularly evident in the summer months with the large influx of seasonal workers. For this reason the canneries offer housing to imported workers and some operate "fish camps." Fish camps are operated by companies that process products in the Borough and companies that only buy products to be processed elsewhere.

Recently, to help alleviate the housing shortage, a Housing and Urban Development Project took place in Naknek and South Naknek. This project provided 30 houses for Borough residents at an advantageous payment schedule of $82 per month.

ENERGY

Table 4.21 shows the types of energy used by various sectors in the community in 1977. The Bristol Bay Borough uses diesel-generated electricity supplied by the Naknek Electric Association. This energy is extremely expensive, averaging $0.27/kWh. Some individuals have started to experiment with wind-generated electricity in conjunction with a central power source. The result of this effort in reducing the cost of energy is presently unknown.

TABLE 4.21

TYPES OF ENERGY AND NUMBER OF USERS IN BRISTOL BAY BOROUGH

CONSUMER		ENERGY FORM CONSUMED					
Type	No.	Diesel	Gasoline	Propane	Jet Fuel	Aviation Gas	Electricity
Residential	203	X	X	X			X
Commercial	76	X	X				X
Large users[a]	4	X	X		X	X	X
Fishing vessels	N/A	X					
Public building	8	X					X
Military	1	X					X
TOTAL	292						

a. Includes canneries

Source: U.S. Department of Energy, Alaska Power Administration, *Draft Bristol Bay Energy and Electric Power Potential, Phase I*, October, 1979.

CHAPTER FIVE-LAND STATUS

The Region

Land ownership and land management jurisdiction are two of the most complicated and important issues in Alaska today. With the passage of the Alaska National Interest Land Conservation Act, long-standing questions about land ownership, management, and jurisdiction will be answered.

There are essentially four major landowners in the Bristol Bay region. They are the state, federal, and Borough governments as public owners and the local village corporations as private owners. The federal government, on behalf of the general public, is by far the largest landowner in the region. The following is a list of the national parks and the wildlife refuges that were established by Congress in November 1980.

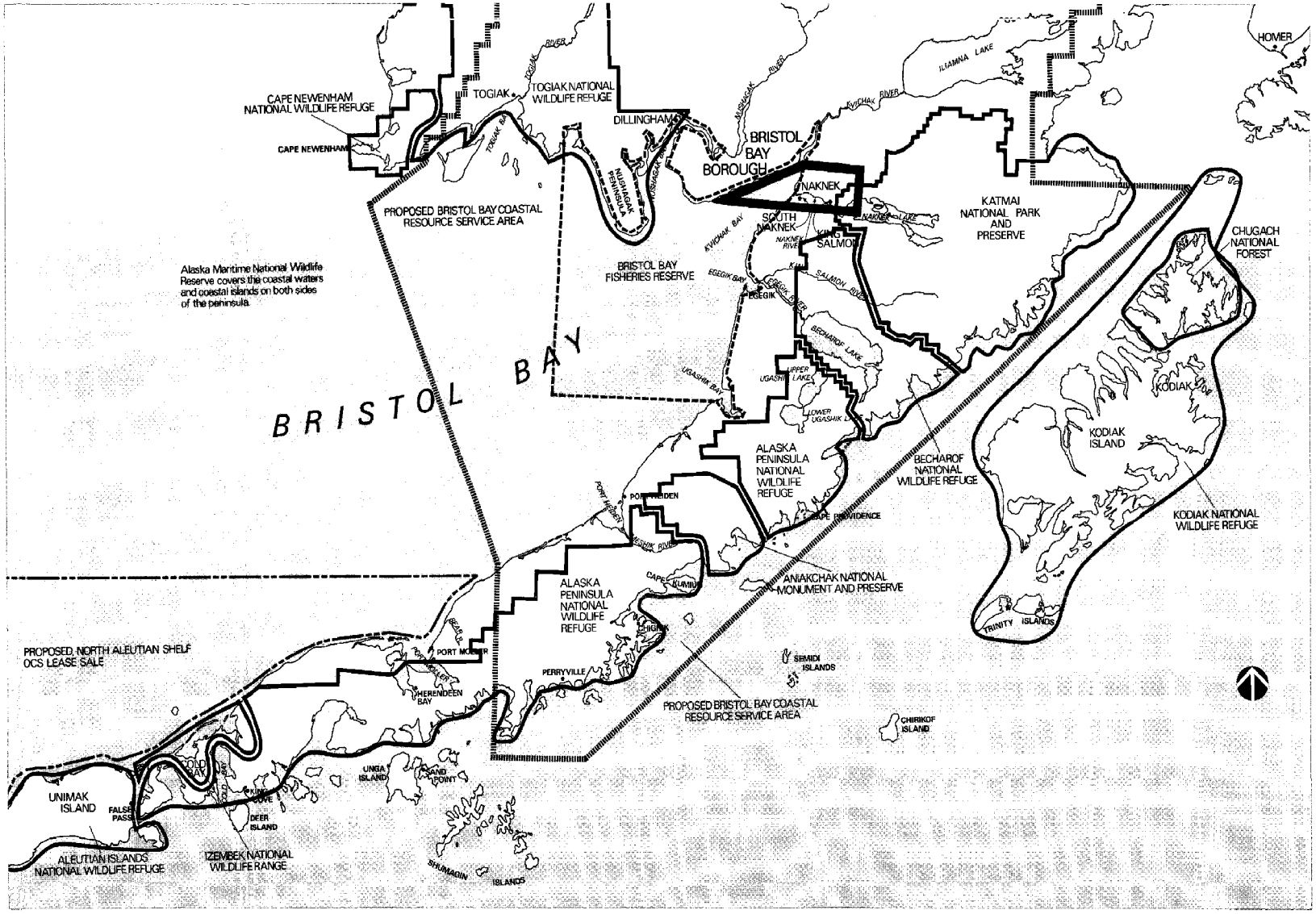
- Aniakchak National Park
- Katmai National Park (Extension)
- Lake Clark National Park
- Alaska Peninsula National Wildlife Refuge
- Becharof National Wildlife Refuge
- Alaska Maritime National Wildlife Refuge
- Togiak National Wildlife Refuge

In addition to the new national parks and national wildlife refuges, Congress created the Bristol Bay Cooperative Region for the purpose of "preparing and implementing a comprehensive and systematic cooperative Management Plan." The Management Plan will involve both federal and state land, potentially including land within the Bristol Bay Borough.

The State of Alaska also owns and manages Bristol Bay itself. The state has jurisdiction from the tidelands to 3 miles offshore, which includes all of Kvichak Bay. The Alaska State Legislature, in 1972, created a Bristol Bay Fisheries Reserve within its jurisdiction, for the purpose of limiting oil and gas development that would prove dangerous to the salmon fishery. The federal government, however, plans to lease high-potential oil and gas reserves on the north Aleutian shelf in October of 1983.

The Bristol Bay Borough, as an organized regional government, is a Coastal Resource District. This is not the case for the Bristol Bay region. Regions that are not organized governments must organize into Coastal Resource Service Areas for the purpose of developing a district plan. The Bristol Bay region was formed by joining two Rural Education Attendance Areas. The Bristol Bay Native Association is now in the process of presenting the service area concept to the residents of the region.

Land Status – Regional Map



SCALE: miles

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The Borough

LAND OWNERSHIP

Land ownership in Bristol Bay Borough is as complex as it is throughout the state. There are four basic categories of landowners in the Borough. They are federal, state, and borough governments, and private landowners (see Table 5.1). Land ownership is in a state of flux due to the recent passage of the Alaska National Interest Land Conservation Act. The changes to Katmai National Park are reflected in the land area table and on the ownership map, but there will be future changes to federal land that are impossible to predict at this time.

Federal Ownership. There are about 292 square miles of federal land in the Borough, 71 square miles of which are Katmai National Park and Katmai Wilderness. The remaining 221 square miles are in a block, primarily in the northeast corner of the Borough. This land includes the drainage of both Paul's Creek and King Salmon Creek and abuts the National Park. This federal land has been withdrawn for village corporation selection and has also been selected by the State of Alaska. The village corporation selections within the Borough, for the most part, have been made, adjudicated, and patented. Any further selections will most likely be outside of the Borough. It appears that both the federal and state governments are interested in the northeastern corner of the Borough for control and management of the salmon spawning areas. It is likely that this area will be included in the Bristol Bay Cooperative Region and will be jointly managed.

The townsite of South Naknek is legally entrusted to the federal government on behalf of the Native village. The Department of the Interior manages the townsite and has indicated that patents will be forthcoming for 20 or so villages, including South Naknek.

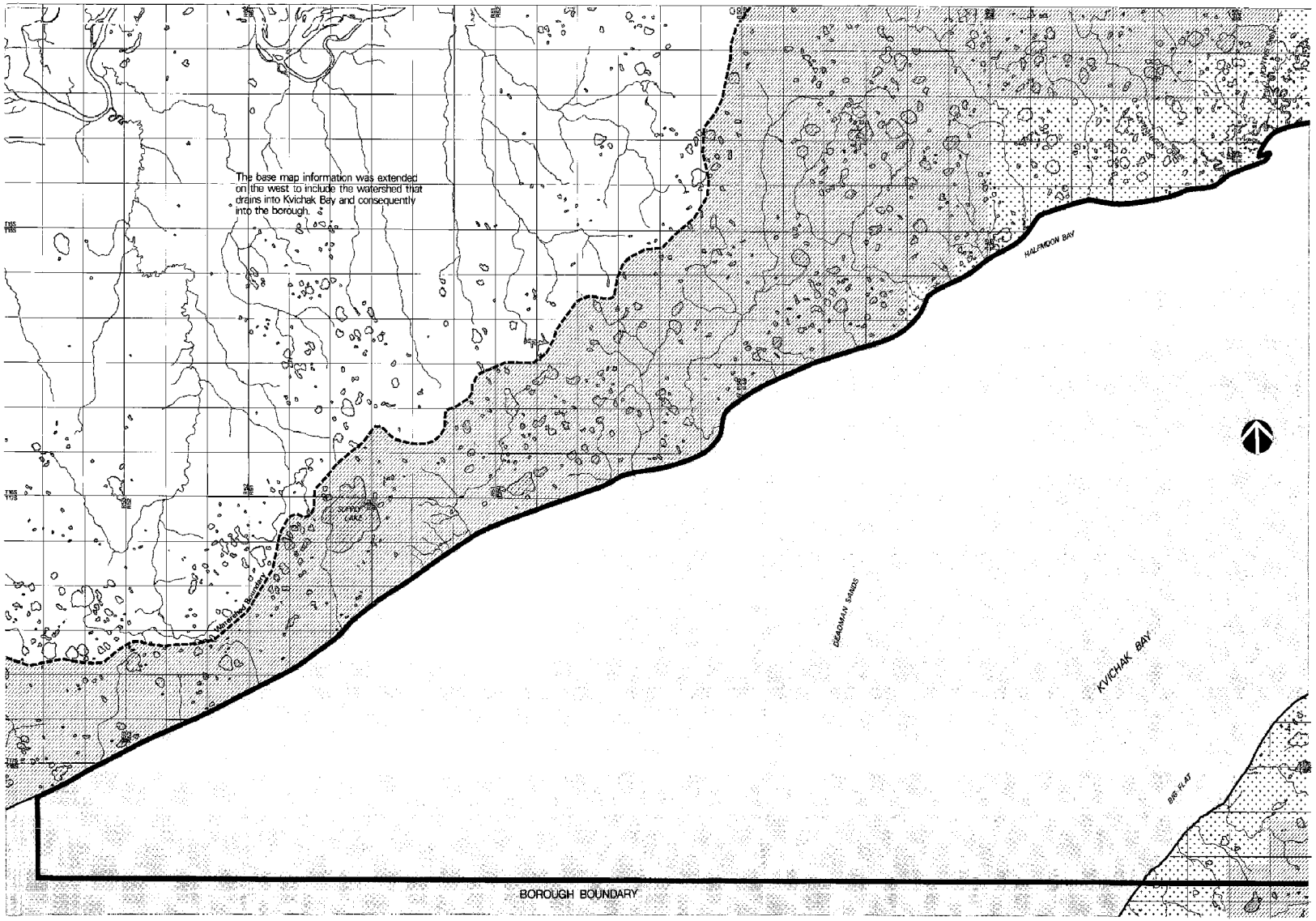
State Ownership. There is a minimal amount of state land in the Borough. The state land consists of small sites to house state agencies, land leased for the King Salmon Airport, material sites for common use, or land being selected by the Borough. A portion of all of the state's selections of federal land within the Borough may be approved in the future under the Statehood Land Entitlement.

Borough Ownership. The Bristol Bay Borough has an entitlement of 2,898 acres from the state, according to legislation passed in 1978. The entire amount of land has been selected, but only 1,592 acres have been patented to the Borough.

TABLE 5.1

LAND STATUS

Ownership	Square Miles	Acres	Percent of Total	Comments
Federal	292	189,000	59	Katmai National Park Federal/multiple selections
State	4	2,600	1	Material sites Airport leases
Borough	5	3,000	1	Patented land
Private	201	129,000	40	Paug Vik Corporation Alaska Peninsula Corporation Private landowners
TOTAL	502	324,000	100	–



Land Ownership – Borough Map (West)

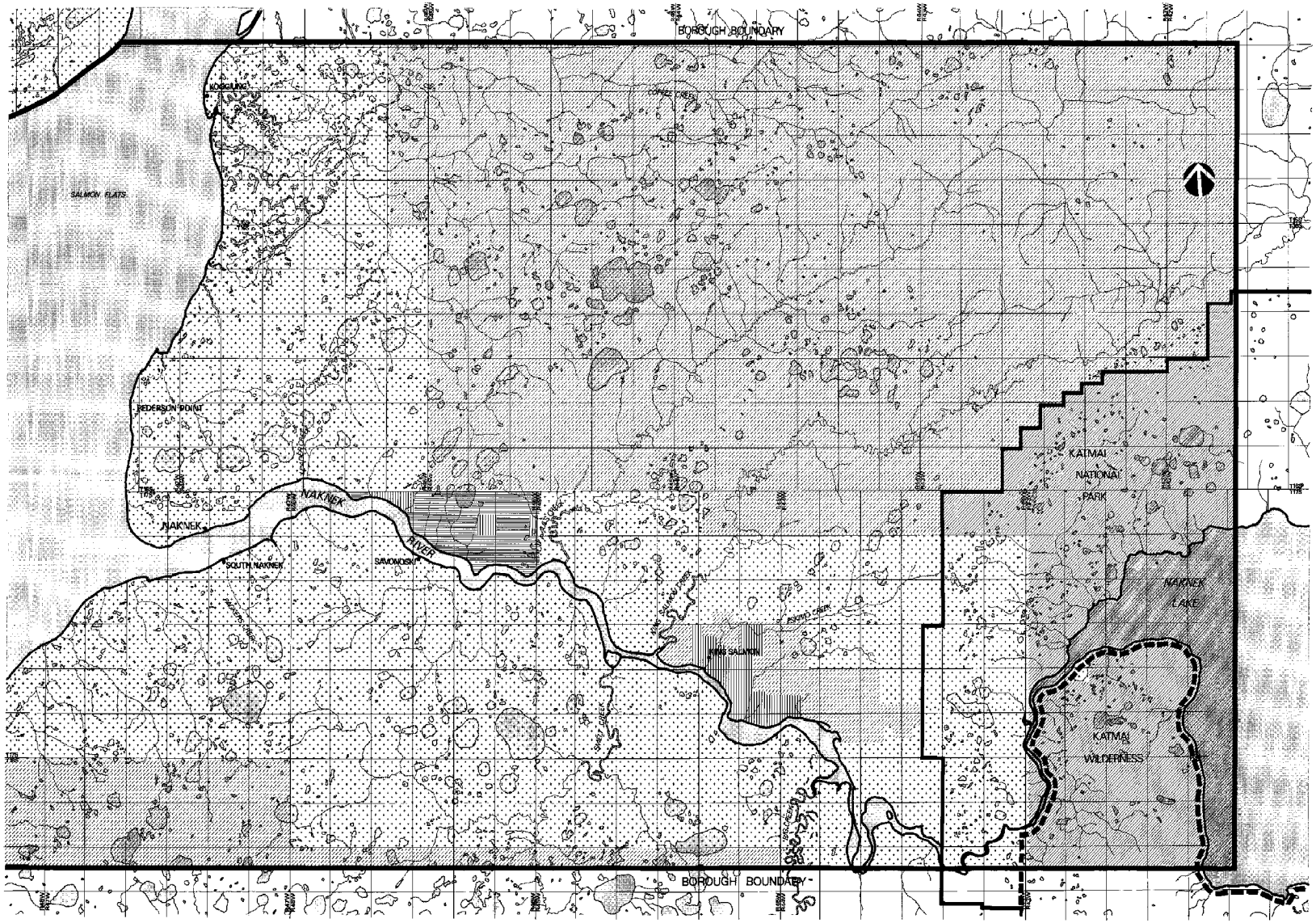
LEGEND

- Federal/Multiple Selections
- Private

SCALE: miles

0 1 2 3

BRISTOL BAY BOROUGH / RESOURCE INVENTORY



Land Ownership – Borough Map (East)

LEGEND

- Borough
- State
- Federal/National Monument
- Federal/Multiple Selections
- Private

SCALE: miles

0 1 2 3

Private Ownership. The amount of private ownership in the Borough is significant, when considering the population. There are about 129,000 acres of privately owned land. The surface rights to over 90 percent of this land are owned by either Paug Vik, the Naknek village corporation, or Alaska Peninsula Corporation, representing the village of South Naknek. The subsurface rights below village corporation lands are owned by the Bristol Bay Regional Corporation. During the Native land selection process, the village corporations of Naknek and South Naknek worked out an agreement restricting land selections by both communities to their side of the river. Today, the majority of private land on each side of the river is owned by the representative corporation. Private land that is not held by either corporation is owned in the form of lots, homesteads, or Native allotments.

LAND MANAGEMENT

The management of land within the Bristol Bay Borough is the responsibility of federal, state, and Borough government. Each level of government has jurisdiction over some portion of the Borough's land area, with jurisdictions often overlapping.

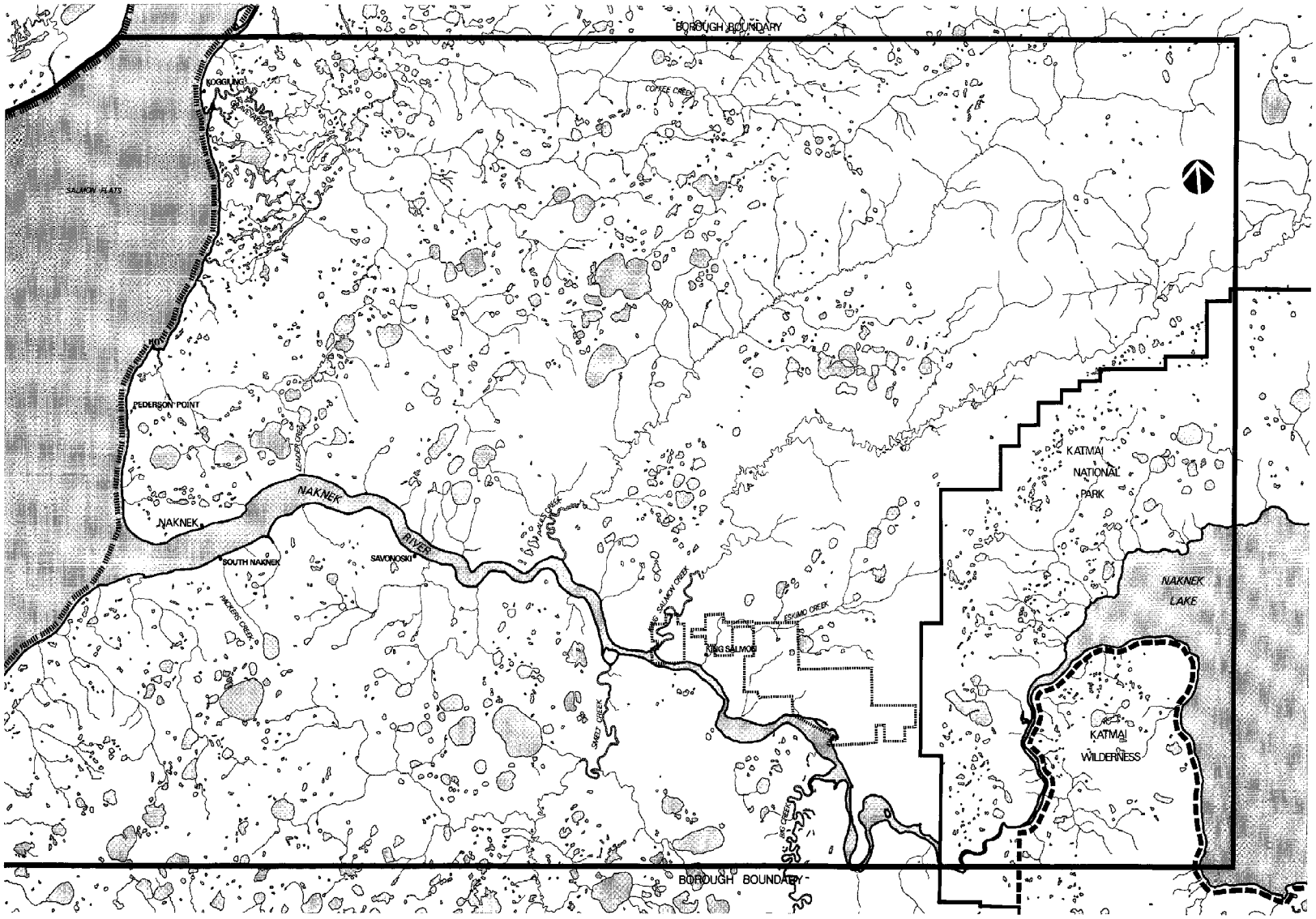
Federal Jurisdiction. The federal government has jurisdiction over the following areas within the Borough:

Land Category	Agency
1. Federally owned land	Bureau of Land Management
2. Katmai National Park	National Park Service
3. King Salmon Air Force Base	Department of Defense
4. South Naknek townsite	Bureau of Land Management
5. Public easements (Native Land Claims Settlement Act)	Bureau of Land Management
6. Navigable waters	U.S. Corps of Engineers
7. Migratory birds, polar bear, sea otter, walrus, endangered species	U.S. Fish & Wildlife Service
8. All other marine mammals	National Marine Services

As mentioned previously, the Alaska National Interest Conservation Act established a Bristol Bay Cooperative Region for the purpose of jointly planning and arranging federal and state land. In the future, the unreserved federal land may become part of this cooperative program.

State Jurisdiction. The State of Alaska has jurisdiction over state land within the Borough. In addition, the state manages the waters of Kvichak Bay. The Alaska Department of Fish and Game manages the fishery within the bay and the wildlife in upland areas.

Borough Jurisdiction. The Bristol Bay Borough, with second class status, has three basic powers. They are taxations, education, and planning and zoning. The Borough has adopted a zoning ordinance and has a comprehensive plan. In addition to the basic powers, the voters have given the Borough the responsibility for police, libraries, fire protection, telecommunication, roads, sewer, water, and health.



Land Management – Borough Map (East)

LEGEND

- Bristol Bay Fisheries Reserve
- King Salmon Air Force Base

SCALE: miles

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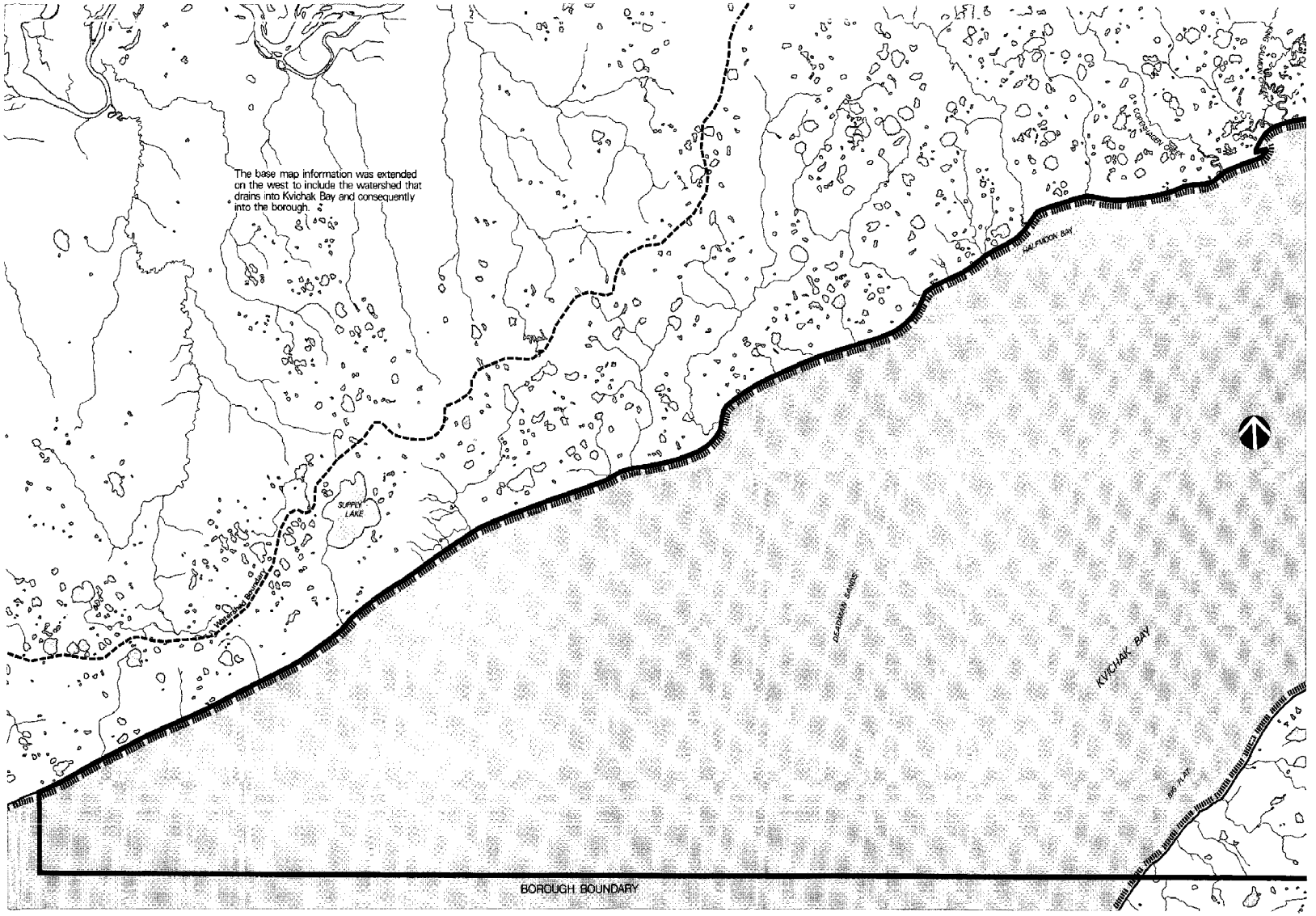

Land Management — Borough Map (West)

LEGEND

Bristol Bay Fisheries Reserve

SCALE: miles

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BRISTOL BAY BOROUGH/RESOURCE INVENTORY

APPENDICES

Appendix I

HABITATS

The following habitats, as defined by 6AAC 80.130, are located in the district.

OFFSHORE AREAS

The offshore area is Kvichak Bay within the Borough boundaries. See Borough maps, pages 7 and 9.

ESTUARIES

Estuarine conditions exist in both Kvichak Bay and the Naknek River. In the river, esturaine conditions extend 11 miles upstream at periods of low river flow and high tides. See Surficial Hydrology map, page 22.

WETLANDS

The coastal marsh in the northwest corner of the Bristol Bay Borough, as illustrated on the Surficial Hydrology map, page 22, is the only identifiable wetland within the Borough. Detailed information about vegetation type and hydrology is insufficient for further distinction. Further wetland classification should be conducted when more detailed information is available.

TIDE FLATS

There are extensive tide flats throughout Kvichak Bay and extending along the Naknek River to King Salmon Creek. See coastal morphology on Topgraphy maps, pages 16 and 17.

HIGH ENERGY COASTAL BLUFFS

Exposed coastal bluffs are along the east side of Kvichak Bay and extend up the Naknek River. See Topography maps, pages 16 and 17.

RIVERS, STREAMS, AND LAKES

These hydrologic features are found throughout the Borough. See Surficial Hydrology map, page 22.

IMPORTANT UPLAND HABITAT

Important upland habitat is found throughout the Borough. See Mammals maps, pages 29 and 30, Birds maps, pages 31 and 32, and Vegetation maps, pages 34 and 35.

Appendix II

IMPORTANT PLANTS IN THE BRISTOL BAY REGION

IMPORTANT PLANTS OF THE MARINE COMMUNITY

Diatoms

Asterionella kariana
A. japonica
Bacteriastrum delicatulum
Biddulphia aurita
B. sinensis
Chaetoceros atlanticus
C. compressus
C. concovicornia
C. constrictus
C. convolutus
C. debilis
C. didymus
C. furcellatus
C. laciniosus
C. radicans
C. similis
C. socialis
Coscinodiscus curvatulus
C. radiatus
Coscinosira polychorda
Leptocylindrus danicus
Melosira sulcata
Nitzschia pacifica
N. closterium
N. delicatissima
N. seriata
Rhizosolenia hebetata
R. semispina
Skeletonema costatum
Synedra sp.
Thalassionema nitzschioides
Thalassiosira aestivalis
T. decipiens
T. gravida
T. nordenskioldi
T. rotula
Thalassiothrix longissima

Dinoflagellates

Ceratium furca
C. fusus
C. longipes
C. pentagonum
C. tripos
Dinophysis acuminata
D. acuta
D. arctica
D. caudata
D. ellipsoides
D. ovum
D. rotundata
Gonyaulax tamarenis
Peridinium crassipes
P. depressum
P. divergens
P. ovatum
P. pentagonum
P. steinii
Phalacroma rudgei
Protocentrum micans

Brown algae

Agarum cribrosum
Alaria crispa
A. fistulosa
A. praelonga
A. taeniata
A. tenuifolia
A. valida
Chorda filum
Costaria costata
Cymathere triplicata
Desmarestia sp.
Fucus furcatus
F. inflatus
F. latifrons
Hedophyllum sessile
Laminaria bullata
L. dentigera
L. groenlandica
L. longipes
L. saccharina
L. setchellii
L. yezoensis
Nereocystis leutkeana
Scytosiphon lomentaria
Thalassiophyllum clathrus

Red algae	*Laurencia spectabilis*
	Porphyra perforata
Green algae	*Chaetomorpha* sp.
	Ulva latuca
Eelgrass	*Zostera marina*
Arctic rush	*Juncus arcticus*
Large-flowered spear grass	*Poa emines*
Sedges	*Carex* spp.
Rye grass	*Elymus crenarius*

IMPORTANT PLANTS OF THE FRESHWATER COMMUNITY

Diatoms	*Melosira* sp.
	Stephanodiscus sp.
	Fragilaria sp.
	Asterionella sp.
	Tabellaria sp.
	Synedra sp.
	Navicula sp.
Green algae	*Phaeotus* sp.
	Pediastrum sp.
	Ankistrodesmus sp.
	Dictyosphaerium sp.
Blue-green algae	*Microcystis* sp.
	Lyngbya sp.

Seed Plants

Mare's tail	*Hippuris vulgaris*
Pondweed	*Potamogeton* spp.
Bur reed	*Sparganium* sp.
Sedge	*Carex* spp.
Cottongrass	*Eriophorum* spp.
Duckweed	*Lemna trisulca*
Yellow pond lily	*Nuphar polysepalum*
White pond lily	*Nymphaea tetragona*
Bladderwort	*Utricularia vulgaris*

IMPORTANT PLANTS OF THE WET TUNDRA COMMUNITY

Characteristic Species

Bog orchid	*Platanthera dilatata*
Cotton grass	*Eriophorum angustifolium* ssp. *subarcticum*
Sphagnum moss	*Sphagnum rubellum*

Additional Species

Shrubs

Dwarf birch	*Betula nana* ssp. *exilis*
Blueberry	*Vaccinium uliginosum*
Labrador tea	*Ledum palustre* ssp. *decumbens*
Willow	*Salix fuscescens*

Herbs

Bistort	*Polygonum bistorta* ssp. *plumosum*
Bur reed	*Sparganium* sp.
Bog cranberry	*Oxycoccus microcarpus*
Mare's tail	*Hippuris vulgaris*
Marsh marigold	*Caltha palustris* ssp. *arctica*
Pond weed	*Potamogeton* sp.
Wild flag	*Iris setosa* ssp. *setosa*

Grasses and sedges

Beach rye grass	*Elymus arenarius* ssp. *mollis*
Marsh arrowgrass	*Triglochin palustris*
Oat grass	*Hordeum brachyantherum*
Rush	*Luzula Wahlenbergii* spp. *Piperi*
Sedge	*Carex pluriflora*
Spear rye grass	*Poa eminens*

Fern relatives

Fir clubmoss	*Lycopodium selago* ssp. *selago*
Quillwort	*Isoetes maricata* ssp. *maritima*

Lichens, mosses, and liverworts

IMPORTANT PLANTS OF THE MOIST TUNDRA COMMUNITY

Characteristic Species

Crowberry	*Empetrum nigrum* ssp. *nigrum*
Sedge	*Carex saxatilis*
Hair moss	*Dicranum* sp.
Reindeer lichen	*Cladonia* sp.

Additional Species

Shrubs

Arctic willow	*Salix arctica* ssp. *crassijulis*
Blueberry	*Vaccinium uliginosum*
Cranberry	*V. Vitis-idaea* ssp. *minus*
Dwarf birch	*Betula nana* ssp. *exilis*

Herbs

Aster	*Aster sibiricus*
Bistort	*Polygonum bistorta* ssp. *plumosum*
Buttercup	*Ranunculus Eschscholtzii*
Goldthread	*Coptis trifolia*
Lousewort	*Pedicularis Kanei* ssp. *Kanei*
Monkshood	*Aconitum delphinifolium* ssp. *delphinifolium*
Violet	*Viola epipsila* ssp. *repens*

Grasses and sedges

Bentgrass	*Agrostis borealis*
Bluejoint reed grass	*Calamagrostis canadensis*
Cottongrass	*Eriophorum angustifolium* ssp. *subarcticum*
Hair grass	*Deschampsia caespitosa*
Mountain timothy	*Phleum commutatum*
Wood rush	*Luzula parviflora*
Sedge	*Carex pluriflora*

Fern relatives

Alpine clubmoss	*Lycopodium alpinum*
Fir clubmoss	*L. selago* ssp. *selago*

Lichens and mosses

IMPORTANT PLANTS OF THE ALPINE TUNDRA COMMUNITY

Characteristic Species

Blueberry	*Vaccinium uliginosum*
Crowberry	*Empetrum nigrum* ssp. *nigrum*
Lichens	

Additional Species

Shrubs

Alpine azalea	*Loiseleuria procumbens*
Arctic willow	*Salix arctica*
Bearberry	*Arctostaphylos uva-ursi*
Cinquefoil	*Potentilla fruticosa*
Cranberry	*Vaccinium vitis-idaea* ssp. *minus*

Herbs

Anemone	*Anemone parviflora*
	A. narcissiflora ssp. *villosissima*
Aster	*Aster sibiricus*
Cow parsnips	*Heracleum lanatum*
Gentian	*Gentiana algida*
Lousewort	*Pedicularis Kanei* ssp. *Kanei*
Lupine	*Lupinus nootkatensis*
Moss campion	*Silene acaulis*
Mountain avens	*Geum Rossii*
Saxifrage	*Saxifraga bronchialis* ssp. *funstonii*
Sweet coltsfoot	*Petasites frigidus*
Yarrow	*Achillea borealis*

Grasses

Fescue grass	*Festuca altaica*
Mountain timothy	*Phleum commutatum*
Tufted hairgrass	*Deschampsia caespitosa*

Ferns and fern relatives

Fragile fern	*Cystopteris fragilis* ssp. *fragilis*
Rockbrake	*Cryptogramma crispa* var. *achrostichoides*
Spike moss	*Selaginella sibirica*

Lichens and mosses

IMPORTANT PLANTS OF THE BOTTOMLAND SPRUCE-POPLAR COMMUNITY

Characteristic Species

White spruce	*Picea glauca*
Balsam poplar	*Populus balsamifera*

Additional Species

Trees

Paper birch	*Betula papyrifera*

Shrubs

Blueberry	*Vaccinium uliginosum*
Green alder	*Alnus crispa*
Littletree willow	*Salix arbusculoides*
Low bush cranberry	*Vaccinium vitis-idaea*
Narrow leaf Labrador tea	*Ledum palustre* ssp. *decumbens*
Rose	*Rosa acicularis*

Herbs

Bluebell	*Mertensia paniculata*
Columbine	*Aquilegia brevistyla*
Fireweed	*Epilobium angustifolium*

Grasses

Bluejoint reed grass	*Calamagrostis purpurascens*

Ferns and fern relatives

Oak fern	*Dryopteris dilatata*
Fir clubmoss	*Lycopodium selago*
Horsetail	*Equisetum arvense*

Lichens and mosses

IMPORTANT PLANTS OF THE LOWLAND SPRUCE-HARDWOOD COMMUNITY

Characteristic Species

Black spruce	*Picea mariana*
Tamarack	*Larix laricina*
Paper birch	*Betula papyrifera*

Additional Species

Trees

Aspen	*Populus tremuloides*
Balsam poplar	*Populus balsamifera*
White spruce	*Picea glauca*

Shrubs

Low brush cranberry	*Vaccinium vitis-idaea* ssp. *minus*
Bebb willow	*Salix bebbiana*
Littletree willow	*S. arbusculoides*
Net leaf willow	*S. reticulata*

Herbs

Arctic dock	*Rumex arcticus*
Northern water carpet	*Chrysosplenium tetrandrum*
Sidebells pyrola	*Pyrola secunda*
Sweet coltsfoot	*Petasites frigidus*

Grasses and sedges

Grass	*Poa paucispicula*
Bluejoint reed grass	*Calamagrostis canadensis*
Polar grass	*Arctagrostis latifolia*
Sedge	*Carex lugens*

Fern relatives

Horsetail	*Equisetum scirpoides*

Lichens and mosses

Appendix III

IMPORTANT ANIMALS IN THE BRISTOL BAY REGION

IMPORTANT ANIMALS OF THE MARINE COMMUNITY

Invertebrates

Bacteria	*Schizomycetes* (Phylum)
Protozoa	*Sarcodina* (Phylum)
Jellyfish	*Scyphozoa* (Class)
Sea anemones	*Anthozoa* (Class)
Marine worms	*Polychaeta* (Class)
Comb jellies	*Ctenophora* (Phylum)
Shrimp	*Pandalus* and *Pandalopsis* spp.
Dungeness crab	*Cancer magister*
King crab	*Paralithodes camtschatica*
Tanner crab	*Chionoecetes bairdi*
	C. opilio
Other crabs	*Decapoda* (Order)
Other crustaceans	*Isopoda* (Order)
	Amphipoda (Order)
	Copepoda (Order)
	Mysidacea (Order)
	Euphausiacea (Order)
Clams	*Pelecypoda* (Class)
Chitons	*Amphineura* (Class)
Sea urchins	*Echinoidea* (Class)
Sea stars	*Asteroidea* (Class)
Brittlestar	*Ophiuroidea* (Class)
Sea cucumbers	*Holothuroidea* (Class)

Fish

Pollock	*Theragra chalcogrammus*
Pacific cod	*Gadus macrocephalus*
Blackcod	*Anoplopoma fimbria*
Pacific herring	*Clupea harengus pallasi*
Red (sockeye) salmon	*Oncorhynchus nerka*
Silver (coho) salmon	*O. kisutch*
King (chinook) salmon	*O. tshawytscha*
Chum (dog) salmon	*O. keta*
Pink (humpback) salmon	*O. gorbuscha*
Pacific ocean perch	*Sebastes alutus*
Sculpin	*Cottidae* (Family)
Halibut	*Hippoglossus stenolepis*
Rock sole	*Lepidopsetta bilineata*
Turbot	*Atheresthes stomias*
Flathead sole	*Hippoglossoides elassodon*
Yellowfin sole	*Limanda aspera*
Other flatfish	*Pleuronectidae* (Family)

Birds

Whistling swan	*Olor columbianus*
Black brant	*Branta migricans*
Emperor goose	*B. leucopareia*
Canada goose	*B. canadensis*
Pintail	*Anas acuta*
Mallard	*A. platyrhynchos*
Green-winged teal	*A. crecca carolinensis*
Peregrine falcon	*Falco peregrinus*
Gyrfalcon	*F. rusticola*
Northern bald eagle	*Haliaeetus leucocephalus*
Red-legged kittiwake	*Rissa brevirostris*
Common eider	*Somateria molissima*
King eider	*S. spectabilis*
White-winged scoter	*Melanitta deglandi*
Red-breasted merganser	*Mergus serrator*
Red phalarope	*Phalaropus fulicarius*
Glaucous-Winged gull	*Larus glaucescens*
Arctic tern	*Sterna paradisaea*
Common murre	*Uria aalge*
Thicked-billed murre	*U. lomvia*
Pigeon guillemot	*Cepphus columba*
Kittlitz's murrelet	*Brachyramphus brevirostris*
Ancient murrelet	*Synthliboramphus antiquum*
Cassin's auklet	*Ptychoramphus aleutica*
Parakeet auklet	*Cyclorrhynchus psittacula*
Crested auklet	*Aethia cristatella*
Least auklet	*A. pusilla*
Whiskered auklet	*A. pygmaea*
Horned puffin	*Fratercula corniculata*
Tufted puffin	*Lunda cirrhata*
Black oystercatcher	*Haematopus bachmani*
Semipalmated plover	*Charadrius semipalmatus*
Rock sandpiper	*Erolia ptilocnemis*
Least sandpiper	*E. minutilla*
Albatross	*Diomedeidae* (Family)
Shearwaters and fulmars	*Procellaridae* (Family)
Storm petrels	*Hydrobatidae* (Family)
Cormorants	*Phalacrocoracidae* (Family)
Loons	*Graviidae* (Family)
Phalaropes	*Phalaropodidae* (Family)
Grebes	*Podicepedidae* (Family)
Jaegers	*Stercorardae* (Family)

Mammals

Killer whale	*Orcinus orca*
Gray whale	*Eschrichtius gibbosus*
Beluga whale	*Delphinapterus leucas*
Harbor porpoise	*Phocoena phocoena*
Walrus	*Odobenus rosmarus*
Northern fur seal	*Callorhinus ursinus*
Harbor seal	*Phoca vitulina*
Steller sea lion	*Eumetopias jubata*
Sea otter	*Enhydra lutra*

IMPORTANT ANIMALS OF THE FRESHWATER COMMUNITY

Invertebrates

Bacteria	*Schizomycetes* (Phylum)
Rotifers	*Rotifera* (Class)
Flagellates	*Mastigophora* (Phylum)
Ciliates	*Ciliophora* (Phylum)
Flatworms	*Turbellaria* (Class)
Aquatic earthworms	*Oligochaeta* (Class)
Crustaceans	*Copepoda* (Order)
	Cladocera (Order)
	Anostraca (Order)
	Notostraca (Order)
Midge larvae	*Chironomidae* (Family)
Mosquito larvae	*Culicidae* (Family)
Dragonfly larvae	*Odonata* (Order)
Stonefly larvae	*Plecoptera* (Order)
Mayfly larvae	*Ephemeroptera* (Order)
Caddisfly larvae	*Trichoptera* (Order)
Water beatles	*Coleoptera* (Order)
Clams	*Pelecypoda* (Class)
Snails	*Gastropoda* (Class)

Fish

Arctic char	*Salvelinus alpinus*
Lake trout	*S. namaycush*
Dolly Varden	*S. malma*
Rainbow trout	*Salmo gairdneri*
Arctic grayling	*Thymallus arcticus*
Northern pike	*Esox lucius*
Sculpin	*Cottidae* (Family)
Whitefish and cisco	*Coregonus* spp.
Burbot	*Lota lota*
Ninespine stickleback	*Pungitius pungitius*
Threespine stickleback	*Gasterosteus aculeatus*
Blackfish	*Dallia pectoralis*

Birds

Canada goose	*Branta canadensis*
Black brant	*B. nigricans*
Oldsquaw	*Clangula hyemalis*
Whistling swan	*Olor columbianus*
Pintail	*Anas acuta*
Green-winged teal	*A. crecca carolinensis*
Peregrine falcon	*Falco peregrinus*
Common eider	*Somateria mollissima*
King eider	*S. spectabilis*
White-winged scoter	*Melanitta deglandi*
Red-breasted merganser	*Mergus serrator*
Arctic tern	*Sterna paradisaea*
Dipper	*Cinclus mexicanus*
Semipalmated plover	*Charadrius semipalmatus*
Least sandpiper	*Erolia minutilla*
Other geese	*Anserinae* (Subfamily)
Other diving ducks	*Aythyinae* (Subfamily)
Other surface-feeding ducks	*Anatinae* (Subfamily)
Phalaropes	*Phalaropodidae* (Family)
Loons	*Gaviidae* (Family)
Grebes	*Podicepedidae* (Family)

Mammals

Beaver	*Castor canadensis*
Mink	*Mustela vison*
Land otter	*Lutra canadensis*
Muskrat	*Ondatra zibethica*

IMPORTANT ANIMALS OF THE WET TUNDRA COMMUNITY

Mammals

Common shrew	*Sorex cinereus*
Tundra shrew	*Sorex tundrensis*
Beaver	*Castor canadensis*
Northern bog lemming	*Synaptomys borealis*
Muskrat	*Ondatra zibethica*
Arctic fox	*Alopex lagopus*
Grizzly bear	*Ursus arctos*
River otter	*Lutra canadensis*
Caribou	*Rangifer tarandus*

Birds

Whistling swan	*Olor columbianus*
Canada goose	*Branta canadensis*
Black brant	*Branta nigricans*
Emperor goose	*Philacte canagica*
White-fronted goose	*Anser albifrons*
Pintail duck	*Anas acuta*
Greater scaup	*Aythya marila*
Oldsquaw	*Clangula hyemalis*
Spectacled eider	*Lampronetta fischeri*
Northern phalarope	*Lobipes lobatus*
Western sandpiper	*Ereunetes mauri*
Dunlin	*Erolia alpina*
Black turnstone	*Arenaria melanocephala*
Bar-tailed godwit	*Limosa lapponica*
Whimbrel	*Numenius phaeopus*
Bristle-thighed curlew	*Numenius tahitiensis*
Lesser sandhill crane	*Grus canadensis*
Rough-legged hawk	*Buteo lagopus*
Marsh hawk	*Circus cyaneus*
Snowy owl	*Nyctea scandiaca*
Short-eared owl	*Asio flammeus*
Common eider	*Somateria mollissima*
King eider	*S. spectabilis*
White-winged scoter	*Melanitta deglandi*
Red-breasted merganser	*Mergus serrator*
Red phalarope	*Phalaropus fulicarius*
Parasitic jaeger	*Stercorarius parasiticus*
Arctic tern	*Sterna paradisaea*

Invertebrates

Spiders and mites	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

IMPORTANT ANIMALS OF THE MOIST TUNDRA COMMUNITY

Mammals

Common shrew	*Sorex cinereus*
Tundra shrew	*Sorex tundrensis*
Dusky shrew	*Sorex obscurus*
Brown lemming	*Lemmus trimucronatus*
Red-backed vole	*Clethrionomys dawsoni*
Tundra vole	*Microtus oeconomus*
Gray wolf	*Canis lupus*
Red fox	*Vulpes fulva*
Black bear	*Ursus americanus*
Grizzly bear	*Ursus arctos*
Ermine	*Mustela erminea*
Wolverine	*Gulo gulo*
Caribou	*Rangifer tarandus*
Musk-ox	*Ovibos moschatus*
Moose	*Alces alces*

Birds

Canada goose	*Branta canadensis*
Rough-legged hawk	*Buteo lagopus*
Golden eagle	*Aquila chrysaetos*
Bald eagle	*Haliaeetus leucocephalus*
Marsh hawk	*Circus cyaneus*
Gyrfalcon	*Falco rusticolus*
Peregrine falcon	*Falco peregrinus*
Northern phalarope	*Lobipes lobatus*
Western sandpiper	*Ereunetes mauri*
Dunlin	*Erolia alpina*
Black turnstone	*Arenaria melanocephala*
Bar-tailed godwit	*Limosa lapponica*
Whimbrel	*Numenius phaeopus*
Bristle-thighed curlew	*Numenius tahitiensis*
Lesser sandhill crane	*Grus canadensis*
Lapland longspur	*Calcarius lapponicus*
Yellow wagtail	*Motacilla flava*
Tree sparrow	*Spizella arborea*
Raven	*Corvus corax*
Willow ptarmigan	*Lagopus lagopus*
Parasitic jaeger	*Stercorarius parasiticus*
Arctic tern	*Sterna paradisaea*
Least sandpiper	*Erolia minutilla*

Invertebrates

Spiders and mites	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

IMPORTANT ANIMALS OF OTHER HABITATS (INCLUDES LOW BRUSH BOG AND MUSKEG; BOTTOMLAND SPRUCE-POPLAR FOREST; UPLAND SPRUCE-HARDWOOD FOREST; LOWLAND SPRUCE-HARDWOOD FOREST; AND HIGH BRUSH)

Mammals

Black bear	*Ursus americanus*
Ermine	*Mustela erminea*
Land otter	*Lutra canadensis*
Least weasel	*Mustela rixosa*
Lynx	*Lynx canadensis*
Marten	*Martes americana*
Mink	*Mustela vison*
Red fox	*Vulpes vulpes*
Wolf	*Canis lupus*
Wolverine	*Gulo gulo*
Moose	*Alces alces*
Beaver	*Castor canadensis*
Snowshoe hare	*Lepus americanus*

Birds

Black-backed three-toed woodpecker	*Picoides arcticus*
Northern three-toed woodpecker	*Picoides tridactylus*
Yellow-shafted flicker	*Colaptes auratus*
Hairy woodpecker	*Dendrocopos villosus*
Downy woodpecker	*Dendrocopos pubescens*
Gray jay	*Perisoreus canadensis*
Bareal chickadee	*Parus hudsonicus*
Black-capped chickadee	*Parus atricapillus*
White-winged crossbill	*Loxia leucoptera*
Bank swallow	*Riparia riparia*
Dipper	*Cinclus mexicanus*
Winter wren	*Troglodytes troglodytes*
Yellow warbler	*Dendroica petechia*
Gray-crowned rosy finch	*Leucosticte tephrocotis*
Common redpoll	*Acanthis flammea*
Savannah sparrow	*Passerculus sandwichensis*
Song sparrow	*Melospiza melodia*
Snow bunting	*Plectrophenax nivalis*

Invertebrates

Spiders and mites	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

IMPORTANT ANIMALS OF THE ALPINE TUNDRA COMMUNITY

Mammals

Tundra shrew	*Sorex tundrensis*
Tundra hare	*Lepus othus*
Hoary marmot	*Marmota caligata*
Arctic ground squirrel	*Citellus parryi*
Greenland collard lemming	*Dicrostonyx groenlandicus*
Tundra vole	*Microtus oeconomus*
Norway rat	*Rattus norvegicus*
Gray wolf	*Canis lupus*
Red fox	*Vulpes fulva*
Black bear	*Ursus americanus*
Grizzly bear	*Ursus arctos*
Wolverine	*Gulo gulo*
Caribou	*Rangifer tarandus*
Moose	*Alces alces*

Birds

Canada goose	*Branta canadensis*
Golden plover	*Pluvialis dominica*
Western sandpiper	*Ereunetes mauri*
Ruddy turnstone	*Arenaria interpes*
Rock ptarmigan	*Lagopus mutus*
Lapland longspur	*Calcarius lapponicus*
Willow ptarmigan	*Lagopus lagopus*
Common murre	*Uria aalge*
Thick-billed murre	*U. lomvia*
Pigeon guillemot	*Cepphus columba*
Kittlitz's murrelet	*Brachyramphus brevirostris*
Ancient murrelet	*Synthliboramphus antiquum*
Cassin's auklet	*Ptychoramphus aleutica*
Parakeet auklet	*Cyclorrhynchus psittacula*
Crested auklet	*Aethia cristatella*
Least auklet	*A. pusilla*
Whiskered auklet	*A. pygmaea*
Horned puffin	*Fratercula corniculata*
Tufted puffin	*Lunda cirrhata*
Water pipit	*Anthus spinoletta*
Solitary sandpiper	*Tringa solitaria*
Rock sandpiper	*Erolia ptilocnemis*
Aleutian tern	*Sterna aleutica*

Invertebrates

Spiders and mites	*Arachnida* (Class)
Insects	*Insecta* (Class)
Flatworms	*Platyhelminthes* (Phylum)
Roundworms	*Nematoda* (Class)

Appendix IV

BRISTOL BAY BOROUGH
SALMON PROCESSORS—1980

Processors	Operation	Product Form
A. Kemp	Floating processor	Salted and cured
Alaska Blue Sea	Flying fish	
*Alaska Far East	Land-based processor, Naknek	Frozen
Alaska Fisheries Company	Floating processor	Frozen
Alaska Gourmet	Flying fish	Fresh
*Alaska Packers Association	Land-based processor, Naknek	Canned
*All Alaskan Seafood, Inc.	Floating processor	Frozen
Al-Lous	Flying	
American Eagle Seafoods	Floating processor	Frozen
America, Ltd.	Tendered via Canadian and U.S. tender	
Ball Brothers, Inc.	Flying fish	
Baronof Fisheries	Floating processor	Frozen
*Bountiful (Trident Seafoods)	Floating processor	Frozen
*Bristol Monarch (Trident Seafoods)	Floating processor	Frozen
*Bumble Bee Seafoods	Land-based processor, South Naknek	Canned
*Cigale	Floating processor	Frozen
Comeau	Floating processor	Cured and frozen
Courageous	Floating processor	Frozen
Denali	Floating processor	Frozen
Double Star Fish	Floating processor	Frozen
Dutch Harbor Seafoods	Floating processors	Frozen
Fish West	Floating processors, flying fish	
*Icicle Seafoods	Flying and tendered	Frozen, canned
Ikari Ak.	Canadian tenders, floating processor	
International Seafoods	Flying fish	
Kenai Packers	Tender, flying fish (maintains fish camp at Naknek)	
Kodiak Island Seafood	Tendered	
Keijah Saltery	Land-based	Salted
Lafayette	Floating processor	

Processors	Operation	Product Form
Lake Country Lodge	Flying fish	
Mariner Seafoods	Flying fish	
Martin's Seafoods	Flying fish	
Mystic Way	Floating processor	
Narilla Inc.	Floating processor	
Nelbro	Flying fish and Canadian tender, land-based processor - Naknek	Canned, frozen
North Coast Seafoods	Floating processor	Frozen
Northern Peninsula Fish	Flying fish	
Northland Sea Products	Floating processor	Frozen
Nika Island Seafoods	Floating processor, tender	Cured
Pacific International	Flying fish	
*Pacific Mist Corporation	Floating processor	Frozen
*Kodiak King Crab	Land-based processor, Naknek, tender	Frozen
*Peter Pan	Tendered and maintains fish camp in Naknek and South Naknek	Frozen, canned
Polar Seafood	Flying fish	Fresh
Putman Fish	Flying fish	Fresh
Queen Fish	Flying fish and maintains fish camp	
*Red Salmon Company	Land-based processor, Naknek	Canned, frozen
Royal Pacific	Flying fish	
Salamatof	Flying fish	
Skagit	Floating processor, tender via Canadian boat	Frozen, cured
Starboard, Inc.	Flying fish	
Sterling Seafoods	Floating processor	Frozen, cured
Taditim Corporation	Floating processor	
Trans Alaska	Floating processor	Frozen
Tempest (Trident Seafoods)	Floating processor	Frozen
10th & M	Flying fish	
*Whitney-Fidalgo Seafoods, Inc.	Land-based processor, Naknek	Canned, frozen

* Over 1% of total

Source: Alaska Department of Fish and Game

Appendix V

ALASKA DEPARTMENT OF FISH AND GAME

FISHERIES RESEARCH AND MANAGEMENT SITES

SONAR JUVENILE SOCKEYE ENUMERATION SITE

Site Description

This site is located on the east bank of the Naknek River approximately 1 mile south of the Air Force "Rapids Camp." The site includes about a half mile stretch along the Naknek River and is about 300–500 yards inland from the water's edge. Currently there are no permanent sturctures located on this site.

Legal Description

Not available. The area indicated on the map incorporates the approximate area needed for the sonar smolt enumeration program. This site may be relocated up or down river pending future research.

Access

Access via road to Rapids Camp and river access.

Past and Current Use

Specially designed sonar equipment has proven in many streams to be the most accurate and consistent means to enumerate salmon smolt. This technology was first employed in the Naknek River in 1978 with equipment designed to be used in the Kvichak River. It was found that modifications of the Kvichak sonar equipment would be needed before it could be successfully used in the Naknek River. The department has recently acquired the funds to purchase the needed equipment and is expected to continue the use of sonar. Slight siting variations may occur over the next several years until an optimal location for the equipment has been identified. The area would be used extensively from May 15 to July 31.

Future Anticipated Use

Once the equipment is purchased and employed (1981 or 1982) sonar will be used every year to enumerate outmigrating sockeye smolt.

Justification of Research/Management Site

The Naknek River is a significant contributor to the Bristol Bay sockeye salmon fishery. To properly manage this fishery, information on smolt outmigration is necessary to predict the future run to the river. Maintenance of access and use of this area is essential to the proper management of the fishery. This region of the Naknek River may prove to be the only region where sonar can be successfully employed. Successful operation of sonar smolt enumeration equipment requires a region with minimal wind, relatively deep water, and very little, if any, boat traffic.

ADULT AND JUVENILE SOCKEYE SAMPLING SITE

Site Description

This site encompasses approximately 40 acres of land directly across the Naknek River from the Air Force Rapids Camp. It is used as a field camp base and as an escapement sampling site and, to a lesser extent, as an adult sampling site for sockeye salmon. There are three cabins built by ADF&G now occupying the site.

Legal Description

All land within the following area. N 1/2 NW 1/4 NE 1/4, SE 1/4 SE 1/4 NW 1/4, N 1/2 NE 1/4 SW 1/4 of Section 14, Township 18 S., Range 44W. Seward Meridian.

Access

Access via road to Rapids Camp and river access.

Past and Current Use

The area was first used by the Bureau of Commercial Fisheries in 1929. In that year and in succeeding years a weir was installed for the purpose of adult enumeration. Towers eventually replaced the weir as an enumeration technique and ADF&G took over the enumeration program. The salmon smolt enumeration was first initiated in 1956 and has continued to the present. Escapement sampling may occur anywhere adjacent to the site. The existing cabins are used to house supplies and a field crew during the field season (May 15 to August 15). From three to eight men operate the smolt and adult enumeration programs.

Future Anticipated Use

No change expected.

Justification of Research/Management Site

The Naknek River is a major contributor to the Bristol Bay sockeye salmon fishery. Smolt and adult enumeration are essential elements of the proper management of the fishery. Maintenance of access and use of the area is essential to the effective management of the fishery.

ADULT SOCKEYE ENUMERATION SITE

Site Description

This site encompasses approximately 24 acres of land located on the first large bend above the "rapids" on the Naknek River. It is the counting tower site for the Naknek River and has one ADF&G cabin located on the north shore of the river (on the inside bend).

Legal Description

All the land contained in the following area: SE 1/4 SE 1/4 NW 1/4, SW 1/4 SW 1/4 NE 1/4, NE 1/4 NE 1/4 SW 1/4, NW 1/4 NW 1/4 SE 1/4 of Section 14, Township 18S, Range 44 W. Seward Meridian.

Access

Access via road to Rapids Camp and river access.

Past and Current Use

Salmon escapement enumeration has been conducted on the Naknek River since 1955. This specific location is the most readily suited for tower enumeration, though in some years environmental factors may warrant moving the actual tower site locations several yards either way. The site is presently used as it has been in the past years. Actual use is from June 15 to July 31 in most years. One two-room cabin is located on the site. A counting tower is assembled and used for the duration of the program. The structure is later stored in the cabin.

Future Anticipated Use

Use of the site is expected to continue at present levels.

Justification of Research/Management Site

Sockeye salmon migrate upstream along both banks. Any type of encroachment which would affect this behavior pattern would render our present program ineffective. As the Naknek River is a major contributor to the Bristol Bay fishery and escapement enumerations are critical to proper management, this enumeration site is important to the effective management of the Bristol Bay salmon fishery.

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