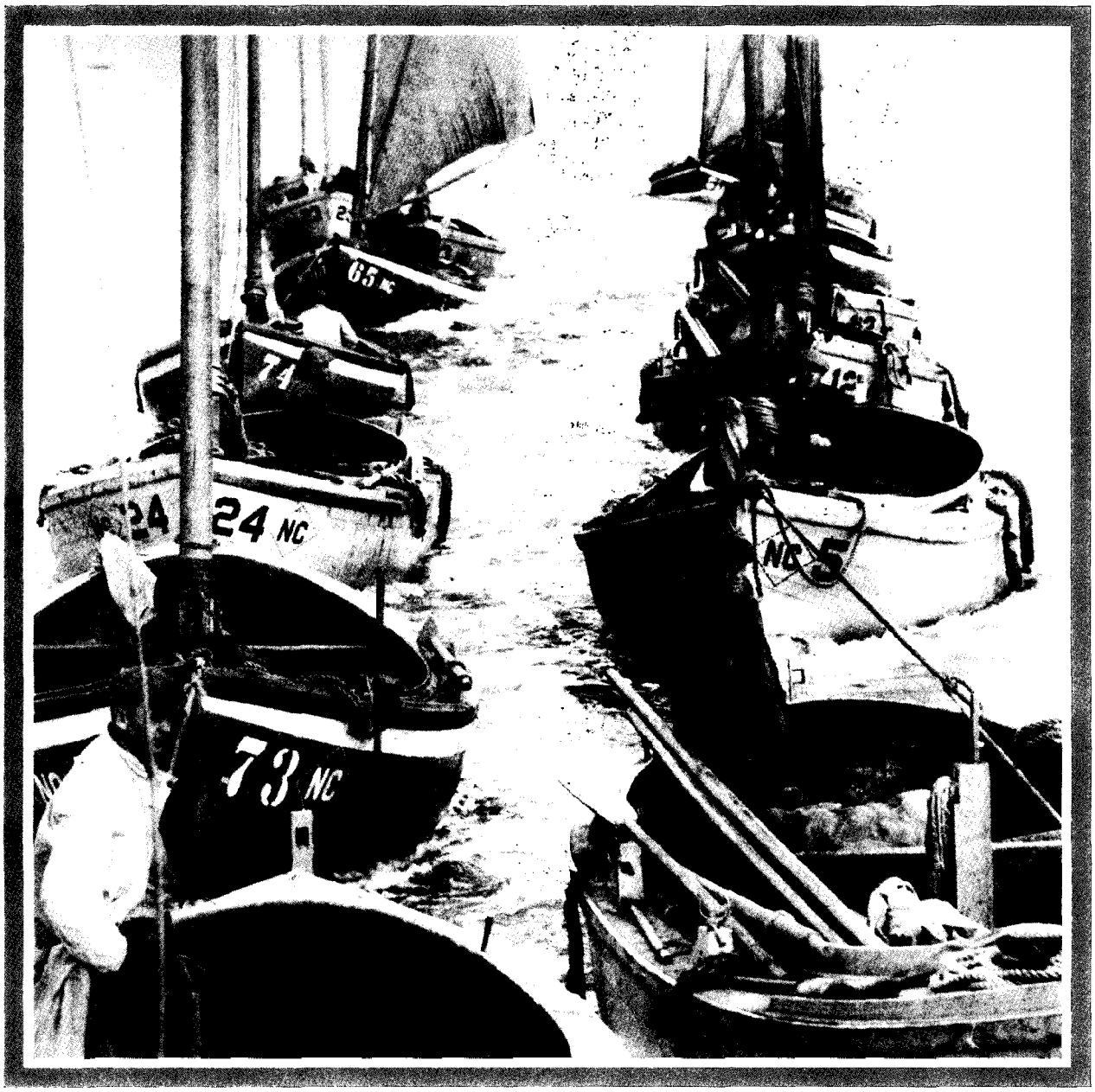
Coastal Management Program Description



North Carolina Coastal Management Program

Coastal Management Program Description

Prepared by
Kramer, Chin & Mayo, Inc.
1113 West Fireweed Lane, Suite 101
Anchorage, Alaska 99503

Alaska Coastal Management Program

The preparation of this report was financed in part by funds from the Alaska Coastal Management Program and the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, administered by the Division of Community Planning, Department of Community and Regional Affairs, and Bristol Bay Borough.

June, 1983

B R I S T O L B A Y B O R O U G H

Acknowledgements

This report consolidates findings originally submitted to the Bristol Bay Borough in two separate publications. The Resource Inventory, which was issued in May 1981, was prepared by Kramer, Chin & Mayo, Inc. (KCM) in association with Science Applications, Inc. and Frank Orth and Associates. It is reprinted in this volume as Part I.

Part II of this report contains the Coastal Management Plan which was submitted to the Borough as a draft for public discussion in October 1982. The current version of the proposed Management Plan incorporates a number of revisions suggested during the original review process.

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, San Francisco Maritime Museum.

Officers: Mayor: **Jim D. Clark** Assembly Members: **Donald Bill, President, Steven Angasan, Daniel J. O'Hara, George Tibbetts, Robert Whicker** Planning and Zoning Commission Members: **John Eckert, Chairman, Mel Coghill, Frank Hill, Len Mundorf, Mike Swain** Bristol Bay Borough Community Development: **Don Penner, Director** Technical Assistance: **Division of Community Planning, Department of Community and Regional Affairs**

Table of Contents

List of Tables

List of Tables (continued)

LIST OF FIGURES

List of Maps

Summary

THE LAW

With coastal lands faced by mounting pressure for development and use, Congress in 1972 passed the Coastal Zone Management Act providing incentives for coastal states to protect, manage, and, where possible, rehabilitate the coastal resources. In 1977 the Alaska Legislature passed the Alaska Coastal Management Act making local governments responsible for managing the coast within their jurisdiction and requiring each to prepare a district coastal management plan.

THIS REPORT

This report is divided into two segments. Part I contains information first printed in May 1981 as a Resource Inventory for the Bristol Bay Borough. This section describes the region's physical characteristics as well as the animals, fish, birds and plants which are native to the region. Detailed maps define the topography, habitats, migratory paths and other patterns of use which characterize the Bristol Bay Borough. Man's use and the current status of land ownership also are described in Part I.

Part II contains the proposed coastal management program. It includes the community's goals and objectives, a resource analysis, management recommendations, a definition of areas which merit special attention, coastal policies, and an implementation process. These recommendations originally were submitted as a draft for public discussion in October 1982. Corrections and revisions which were suggested during that review have been incorporated into this volume.

GOALS AND OBJECTIVES

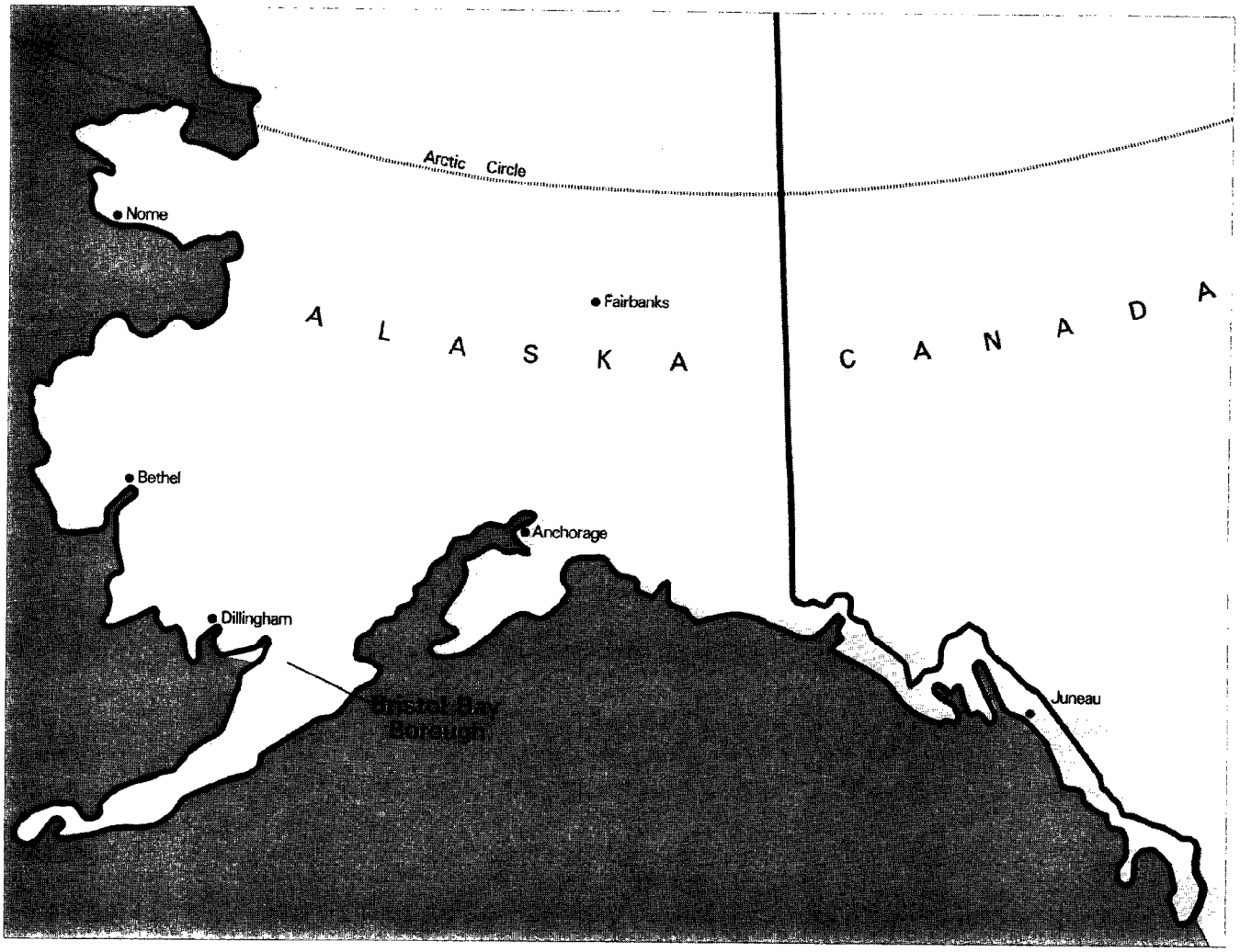
The Bristol Bay Borough, working with community representatives and the coastal management steering committee, developed goals and objectives detailing needs and future plans for the Borough. A series of five community meetings was held in the Borough during development of the program. The goals and objectives of the management plan are the result of that community involvement.

RESOURCE INVENTORY

The Physical Setting

The majority of the land has poor surface drainage resulting in standing water and wet or moist tundra. Most of the Borough is moraine and glacial drift and, in the low-lying areas, alluvial floodplain and glacial outwash deposits.

Location Map
Bristol Bay Borough



The Borough's communities, although protected from tsunami hazards, are threatened by high-energy coastal erosion. The earthquake potential is low but the coastal and river bluffs present significant landslide and erosional hazards due to unstable geologic formation and soils. Volcanic activity in the area is high, and ash deposition is the primary hazard.

The Natural Setting

Marine mammals, moose, caribou, birds and a variety of fish are migratory and spend a portion of the year in the Borough. Kvichak Bay and the Naknek River serve as primary migration corridors for most of Bristol Bay's salmon. Paul's Creek, King Salmon Creek, Big Creek, Naknek Lake, and the Naknek River are primary salmon spawning and rearing areas.

Because only a small portion of Bristol Bay's 500 square miles is accessible by road, mapping of habitats by onsite analysis was impossible. A variety of means was used to establish habitats, but the main source was a land cover map developed from digital Landsat and digital topographic data and coded for a range of vegetation cover types. This process allows, for the first time, reliable determination of habitat in the Borough's inaccessible areas.

Human Use

Fish processing represents the majority of industrial land use in the Borough. There are about 20 cannery or processing sites that occupy up to 40 acres each. Adequate land for future housing and commercial development is available for growth over the next 20 years, based on demand forecasts. Most land in the Borough is in its natural state and is used for recreational purposes and subsistence hunting, trapping, and gathering. Water bodies in the Borough are more intensively used than the land, mainly for fishing and transportation.

Population growth has been slow to moderate in the past 10 years and is expected to remain so in the future; however, the population increases from just over 1,000 to about 4,000 during the salmon season. Commercial fishing is the mainstay of the Borough economy. Government employment, seasonal construction and subsistence activities also contribute significantly. Seasonal unemployment is a chronic problem.

RESOURCE ANALYSIS

Because of the area's relatively isolated location and cultural heritage, commercial fishing, subsistence hunting and fishing, and, to a lesser extent, recreational hunting and fishing play an important part in the lives of many residents. It is difficult to evaluate the sensitivity of habitats and the effects of development on habitat quality since impacts are so site- and project-specific; however, as Bristol Bay Borough continues to grow, losses in types and quality of habitat are unavoidable.

To effectively evaluate land and water uses and develop management recommendations, lands in the Borough were divided into the following categories.

Offshore areas
Estuary
Tideflats
Exposed high-energy coasts
Rivers, streams, and lakes
Uplands
Wetlands

Generally, upland tundra receives the least amount of wildlife use. The Naknek River, major creeks, fresh and saltwater marshes, and associated riparian areas receive the most intense wildlife use.

POLICIES

Policies developed as part of the management plan will be used by the Borough Planning Commission and Assembly to determine proper and improper uses of resources and the acceptability of proposed plans and projects. Policies will be applied as long as they are consistent with sound engineering practice and do not result in economic, social, or environmental problems that outweigh the public benefit derived from strict compliance with the policy.

General Policies

When planning waterfront development development, priority shall be given in the following order to:

Water-dependent uses and activities
Water-related uses and activities
Other uses and activities for which there is no feasible inland alternative

High priority shall be given to maintaining and increasing public access to coastal water. Recreational and visual access to coastal areas shall be provided where consistent with public safety and private property rights. Transportation and utility routes and facilities must be sited inland from beaches and shorelines unless the route or facility is water-dependent or no feasible inland alternative exists.

Maintenance and enhancement of fisheries shall be given priority consideration in reviewing proposals which might adversely impact fisheries habitat, migratory routes, and harvest of fish or shellfish species.

Multiple use of the shoreline shall be encouraged where new uses or activities do not interfere with priority uses. Permitted development and activities shall not significantly degrade the quality of the natural environment, nor contribute to erosion or other deleterious effects on adjacent land.

Permitting activities or uses in the Borough must conform with all applicable federal and state regulations, and implementation of government services and

facilities for the public shall be in conformance with applicable plans, policies, and programs of the Bristol Bay Borough.

Subsistence use, where predominant within the publicly owned areas of the coastal zone, shall be given primary consideration in determining resource allocations.

Specific Policies

Offshore and Estuarine Areas

As an offshore area Kvichak Bay must be managed as a fisheries conservation zone to maintain or enhance the state's sport, commercial, and subsistence fishery. As an estuary, Kvichak Bay and the lower 10 miles of the Naknek River must be managed to assure adequate waterflow, natural circulation patterns, nutrients, and oxygen levels, and to avoid the discharge of toxic wastes, silt, and destruction of productive habitat.

Exposed High-Energy Coasts

High-energy coasts must be managed by assuring the adequate mix and transport of sediments and nutrients and avoiding redirection of transport processes and wave energy. Development along the coastal bluffs shall be designed in consideration of these natural processes.

Important Upland Habitat

Uplands must be managed to maintain or enhance the biological characteristics of the habitat which contribute to its capacity to support living resources. Highways, residential and secondary roads shall be constructed using overlay methods. Roads shall not be routed through marshes or wet bogs and meadows, and drainage patterns should be maintained.

Both caribou and moose calve from May 20 through June 8 and general ranges are mapped in the resource inventory. Construction activities through these areas shall be avoided during this critical period.

Wetlands and Tideflats

Wetlands and tideflats must be managed to assure adequate water flow, nutrients, and oxygen levels and avoid adverse effects on natural drainage patterns, destruction of important habitat, and discharge of toxic substances.

Rivers, Streams, and Lakes

Rivers, streams, and lakes must be managed to protect natural vegetation, water quality, important fish or wildlife habitat and natural water flow. To preserve stream bank and channel integrity, new construction or land clearing shall be designed in accordance with these natural processes and so as to preserve them.

IMPLEMENTATION PROCESS

For a district coastal management program to work effectively and efficiently, it must meet the regulatory needs and administrative capabilities of the local government. Depending on the type and scale of a project, the Bristol Bay Borough provides routine approval or formal review. Formal review is required for all federal and state consistency determination recommendations requiring "great weight" consideration, for all major activities needing only local approval as determined necessary by the Borough Planning Commission, and for all activities involving a performance standard established by a management policy.

When a project must be reviewed for consistency with the management program, the reviewer uses the checklist shown on page 110. If the project or activity is not consistent, the reviewer states what specific portion of the program is affected, the specific remedial action recommended, and the rationale for requesting action.

Part I Resource Inventory and Analysis

1. Introduction

INVENTORY BACKGROUND

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. See Chapter 3, Part II.

2. Coastal Boundaries. The designation of the boundaries that allow the district to manage activities that could have a significant impact on coastal areas. See Chapter 2, Part II.

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. See Part I.

4. Resource Analysis. A synthesis of the resource inventory that determines generalized findings about land sensitivity, that is, the sensitivity of land and water to the future activities of human occupants. 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 human historic and future use of the land and water within the district. See Chapter 4, Part I.

5. 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. See Chapter 4, Part II.

6. Implementation. A description of the method and activity used to implement the district program. See Chapters 5 and 6, Part II.

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. See Chapter 2, Part I.

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. See Chapter 3, Part I.

RESOURCE ANALYSIS

This section addresses the requirement calling for an assignment of the sensitivity of the natural environment to change. See Chapter 4, Part I.

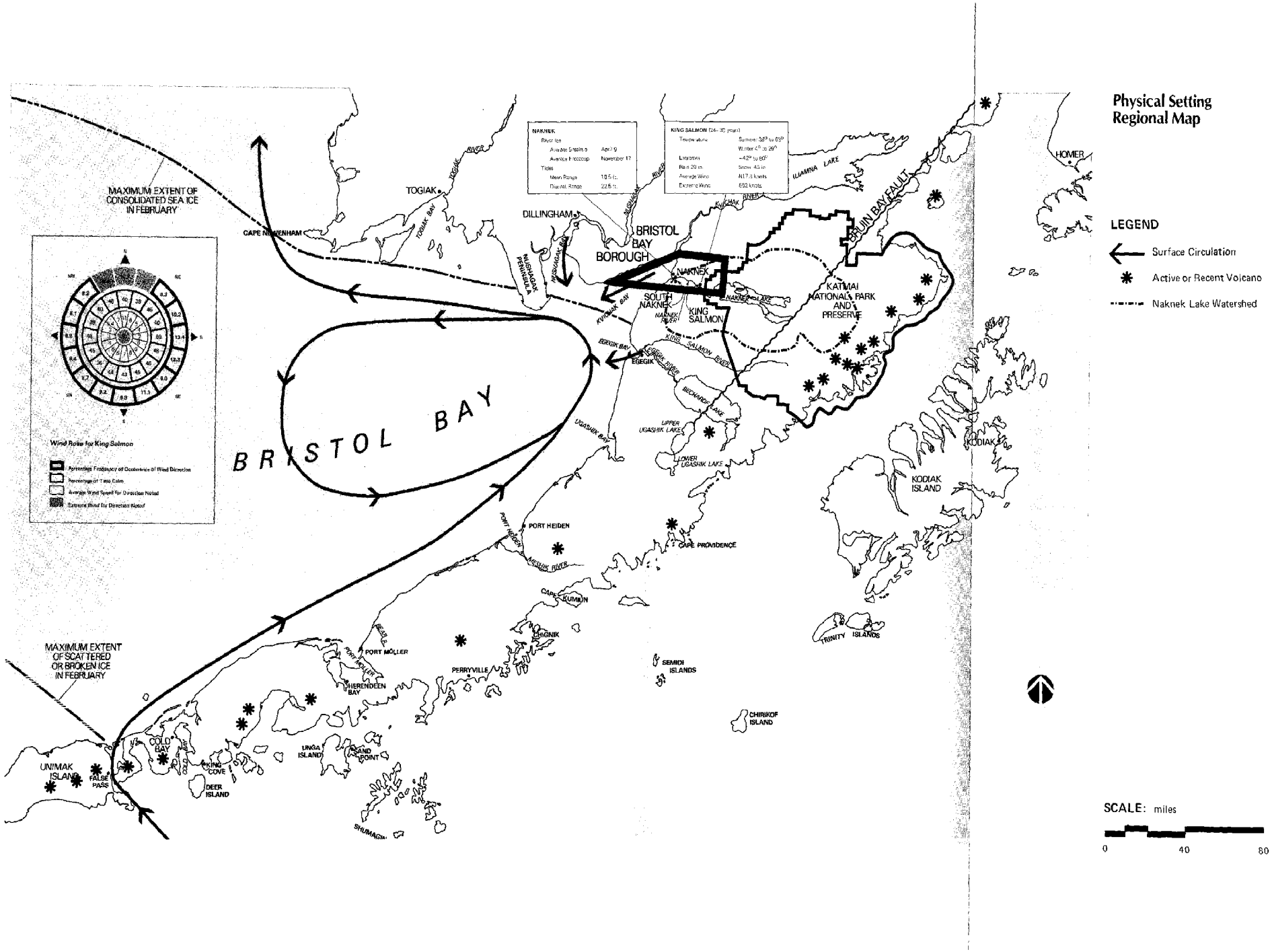
HUMAN USE

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. See Chapter 5, Part I.

LAND STATUS

This section inventories land ownership and federal, state, borough, and private land and water management responsibilities. See Chapter 6, Part I.

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, Citizen's Advisory Committee, state and federal agencies, and a number of helpful individuals. A bibliography and map source are included for reference.


Physical Setting
Regional Map
LEGEND
Surface Circulation
Active or Recent Volcano
Naknek Lake Watershed
SCALE: miles
0
40
80
MAXIMUM EXTENT OF CONSOLIDATED SEA ICE IN FEBRUARY
MAXIMUM EXTENT OF SCATTERED OR BROKEN ICE IN FEBRUARY
BRISTOL BAY
BRISTOL BAY BOROUGH
NAKNEK
SOUTH NAKNEK
KING SALMON
KATMAI NATIONAL PARK AND PRESERVE
BRUIN BAY FAULT
TOGIAK
DILLINGHAM
CAPE NEWENHAM
HOMER
KODIAK
KODIAK ISLAND
PORT HEIDEN
CAPE PROVIDENCE
PORT MOLLER
HERENDEEN BAY
PERRYVILLE
SEMIDI ISLANDS
CHIRIKOF ISLAND
TRINITY ISLANDS
UNIMAK ISLAND
FALSE PASS
COLD BAY
KING COVE
DEER ISLAND
UNGA ISLAND
SAND POINT
SHUMAGIN
NAKNEK
River Ice
Average Freezeup
Tides
Mean Range
Diurnal Range
April 9
November 17
19.5 ft.
22.5 ft.
KING SALMON (24–30 years)
Temperature
Summer: 38° to 69°
Winter: 4° to 29°
Extremes
–42° to 89°
Rain 20 in.
Snow 43 in.
Average Wind
Extreme Wind
NE 7.8 knots
69.2 knots
Wind Rose for King Salmon
Percentage Frequency of Occurrence of Wind Direction
Percentage of Time Calm
Average Wind Speed for Direction Noted
Extreme Wind for Direction Noted

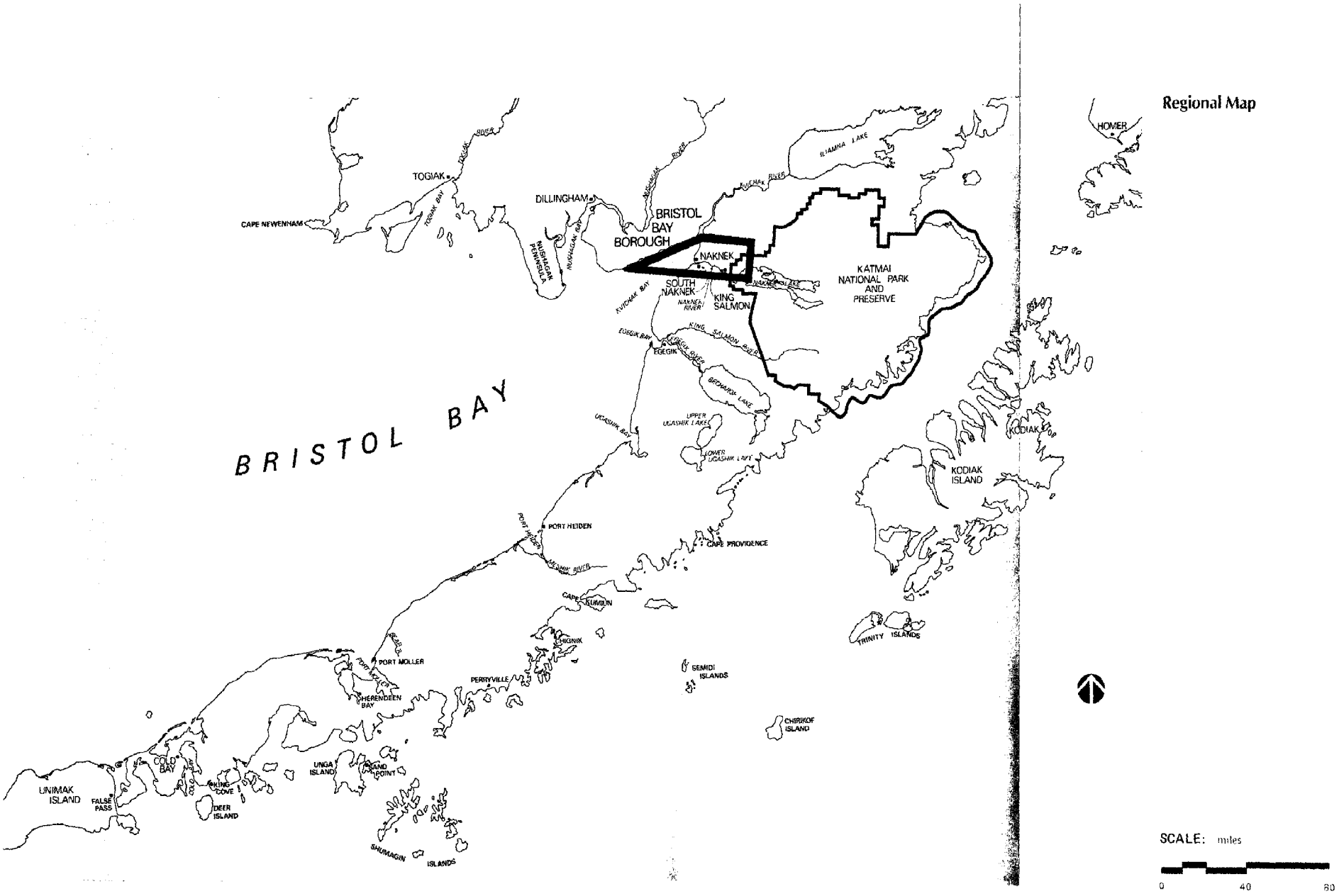
THE REGION

The land area within the Bristol Bay Borough is only part of the physical, natural, and cultural system of the region. 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 this resource inventory and is intended to illustrate 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

This report uses 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 40 80

2. 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 degrees F to 60 degrees F. Winters are warm with average minimum temperatures of 6 degrees F to 20 degrees F. Extreme temperatures are 42 degrees F and 88 degrees 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 usually is 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 parts per thousand, and the mean water temperature is 11.4 degrees C. This is less saline and considerably warmer than the outer bay waters where mean salinity is 32.0 parts per thousand and mean temperature is 8.6 degrees 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, Kvichak, 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

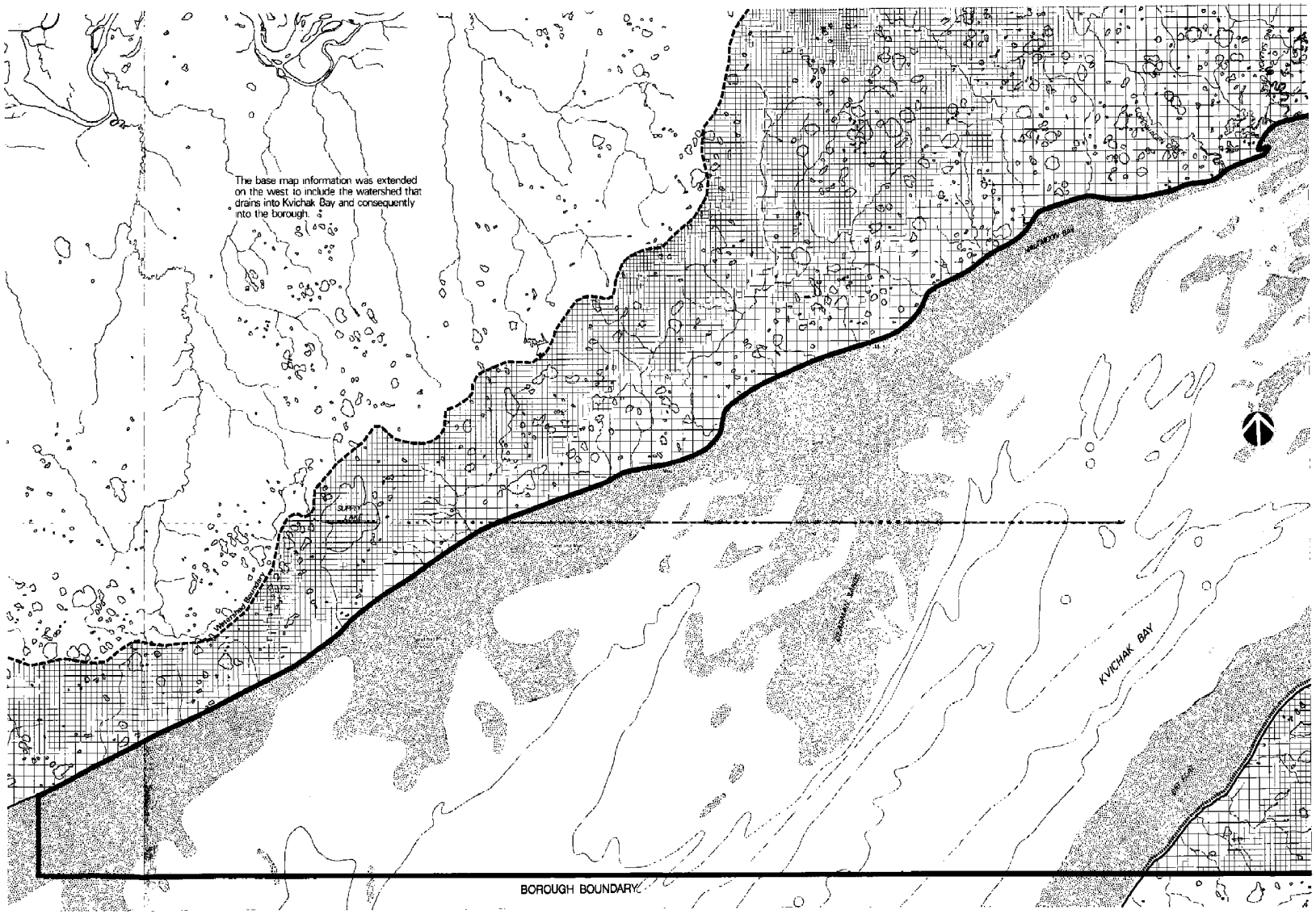
The Naknek River drainage area is approximately 3,700 square miles. The Naknek River watershed includes seven interconnecting lakes: Murray, Hammersly, Coville, Grosvenor, Brooks, Idavain, and Naknek, and the Naknek River itself, as well as the streams connecting the lakes. In addition, 16 streams with midsummer flows in excess of 3 cubic meter/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.

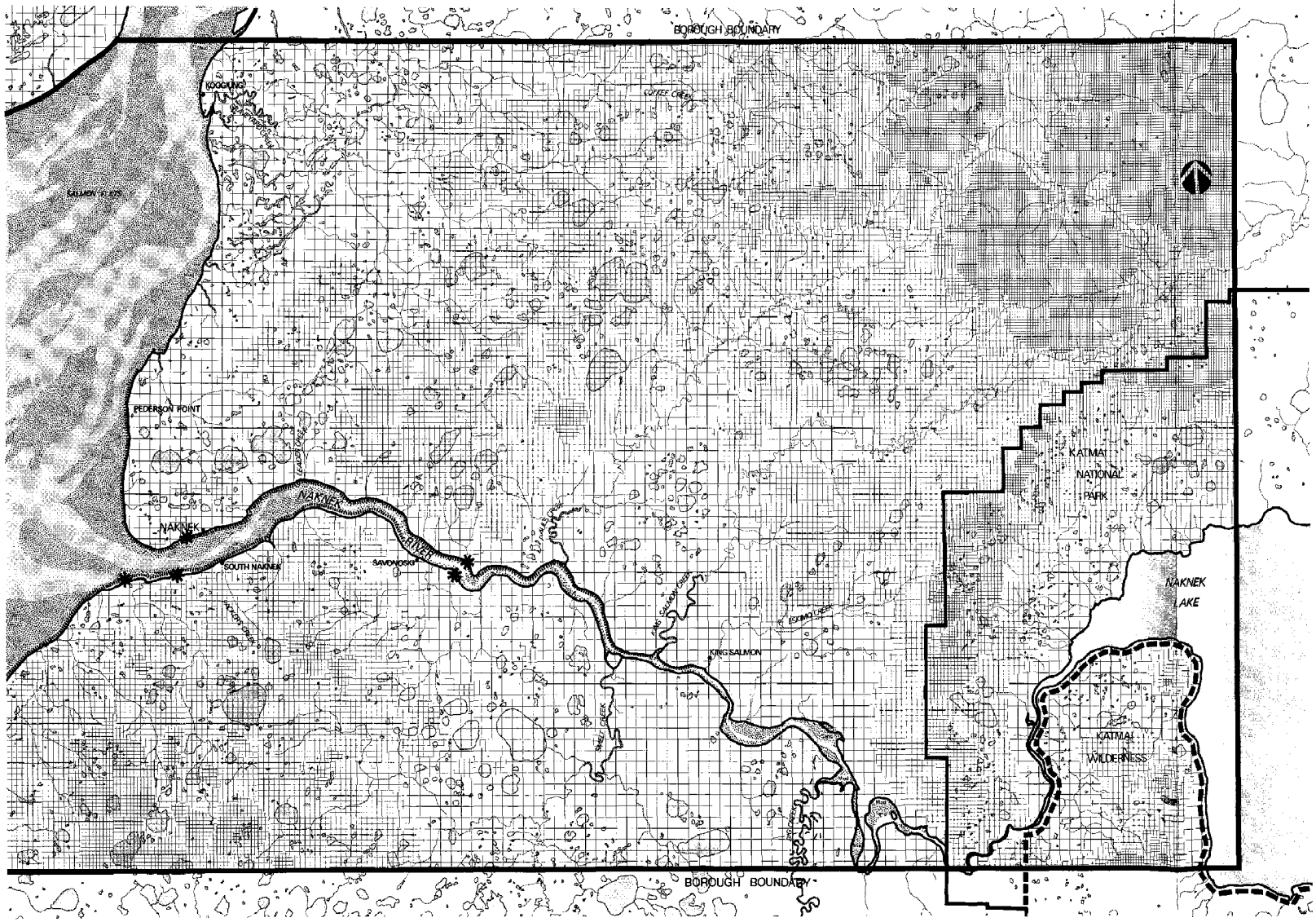
SEISMICITY

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 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.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
SUPPLY LAKE
KVICHAK BAY
BOROUGH BOUNDARY



Topography and Coastal Morphology Borough Map

LEGEND

- 0 – 99′
- 100 – 199′
- 200 – 299′
- Above 300′

} Elevation above sea level

- Coastal Bluffs
- Tide Flats
- ✱ Access Points

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.

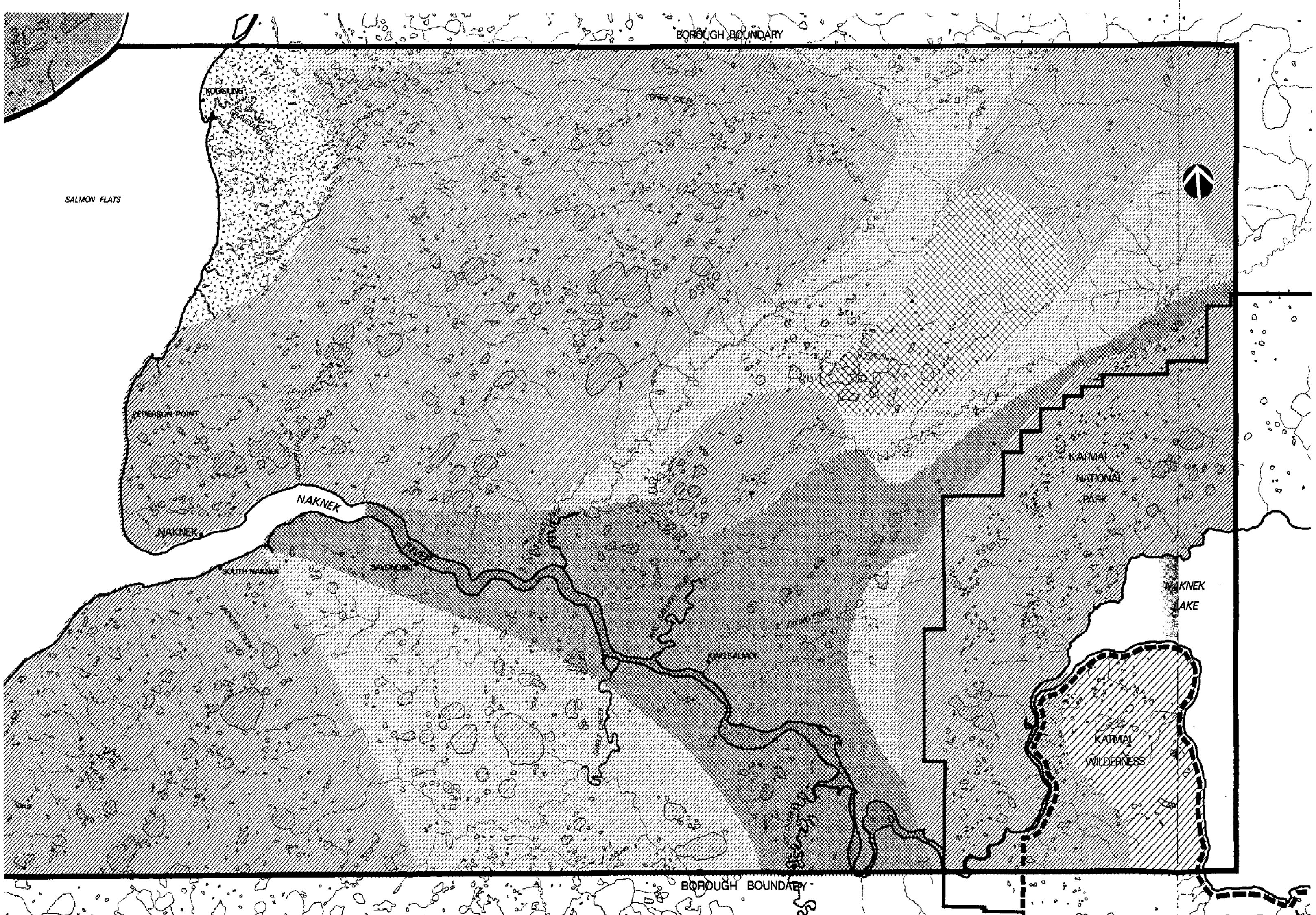
SOILS

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.

Surficial Geology Borough Map (East)



LEGEND

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

SCALE: miles

0 1 2 3

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

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

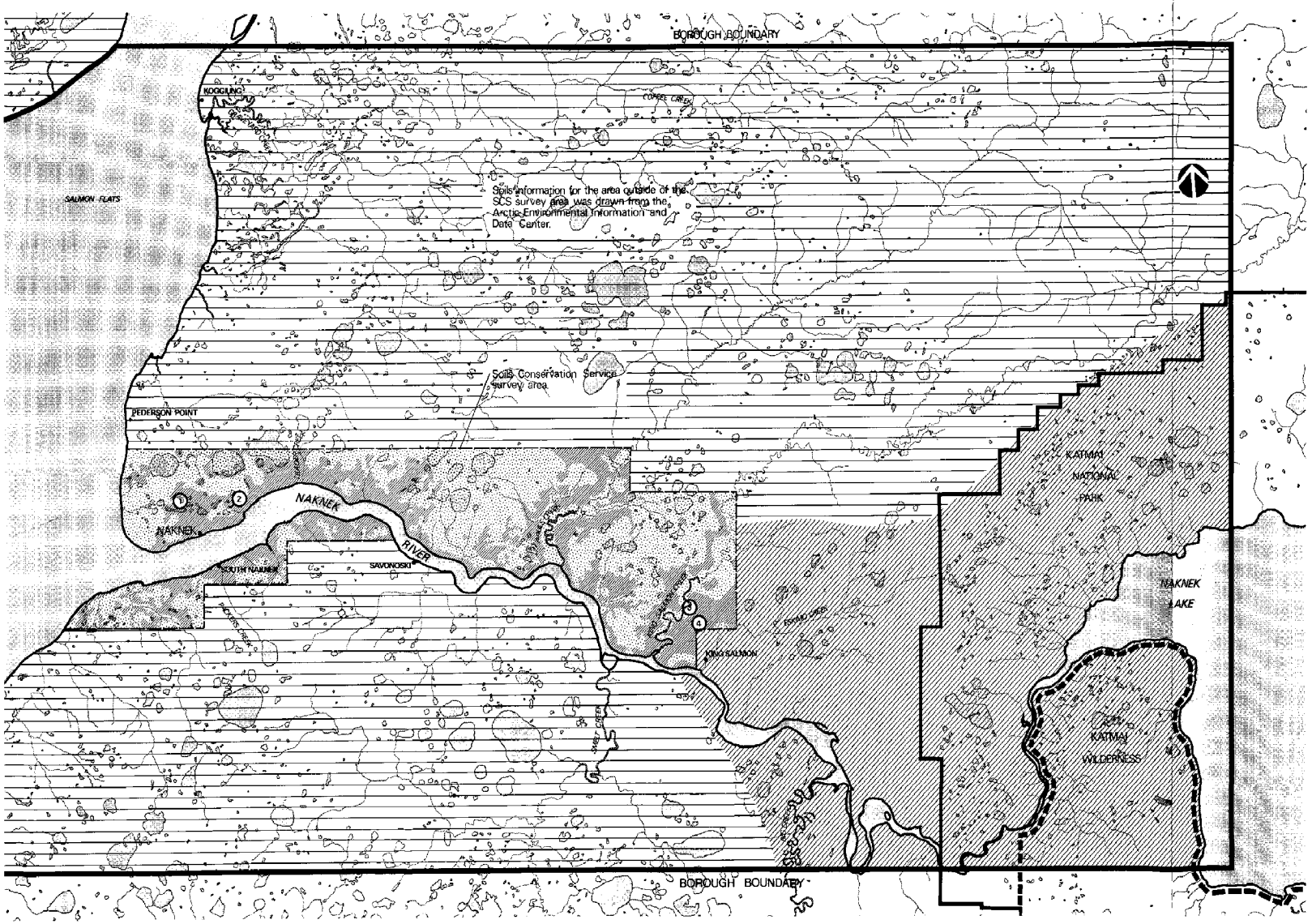
The AEIDC identified the following soil types:

1.	IAHP ---- E-2 IM	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 ---------- E-2 IC	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.

TABLE 2.3

SUITABILITY OF MAJOR SOIL SERIES
FOUND IN SCS SURVEY

Soil Series	Texture	Potential Frost Action	Buildings & Highways	Suitability For:		
				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	Good	Poor (shallow material)	Good
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



Soils
Borough Map (East)

LEGEND

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

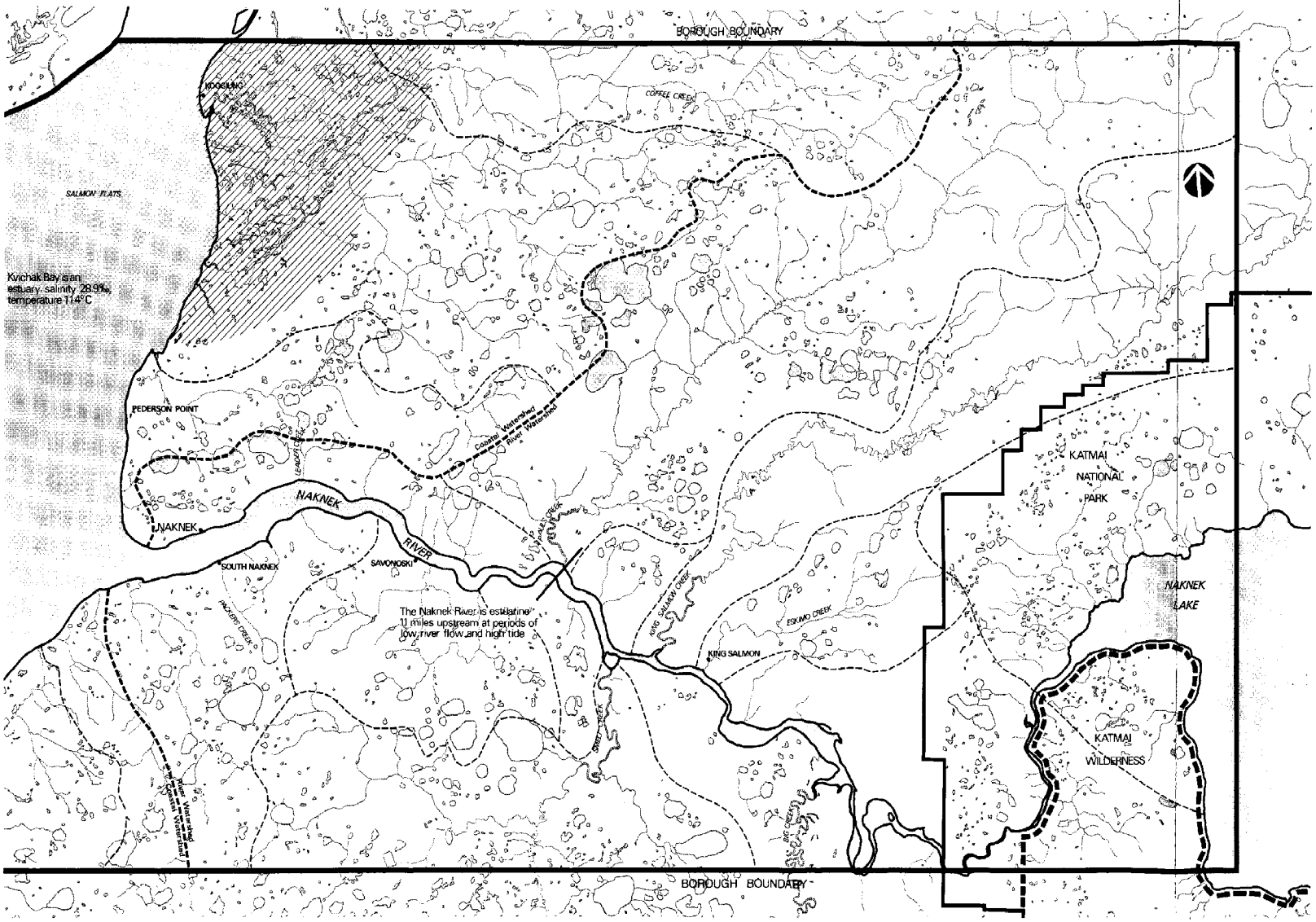
SCALE: miles

0 1 2 3

SURFICIAL HYDROLOGY

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.



Surficial Hydrology Borough Map (East)

LEGEND

- Watershed
- Drainage Basin
- Coastal Marsh

SCALE: miles

0 1 2 3

3. 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 beavers. 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 to this report contain a description and map reference for coastal habitats as defined by 6AAC 80.130. A complete list of important plants and animals by community is also included in this section.

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

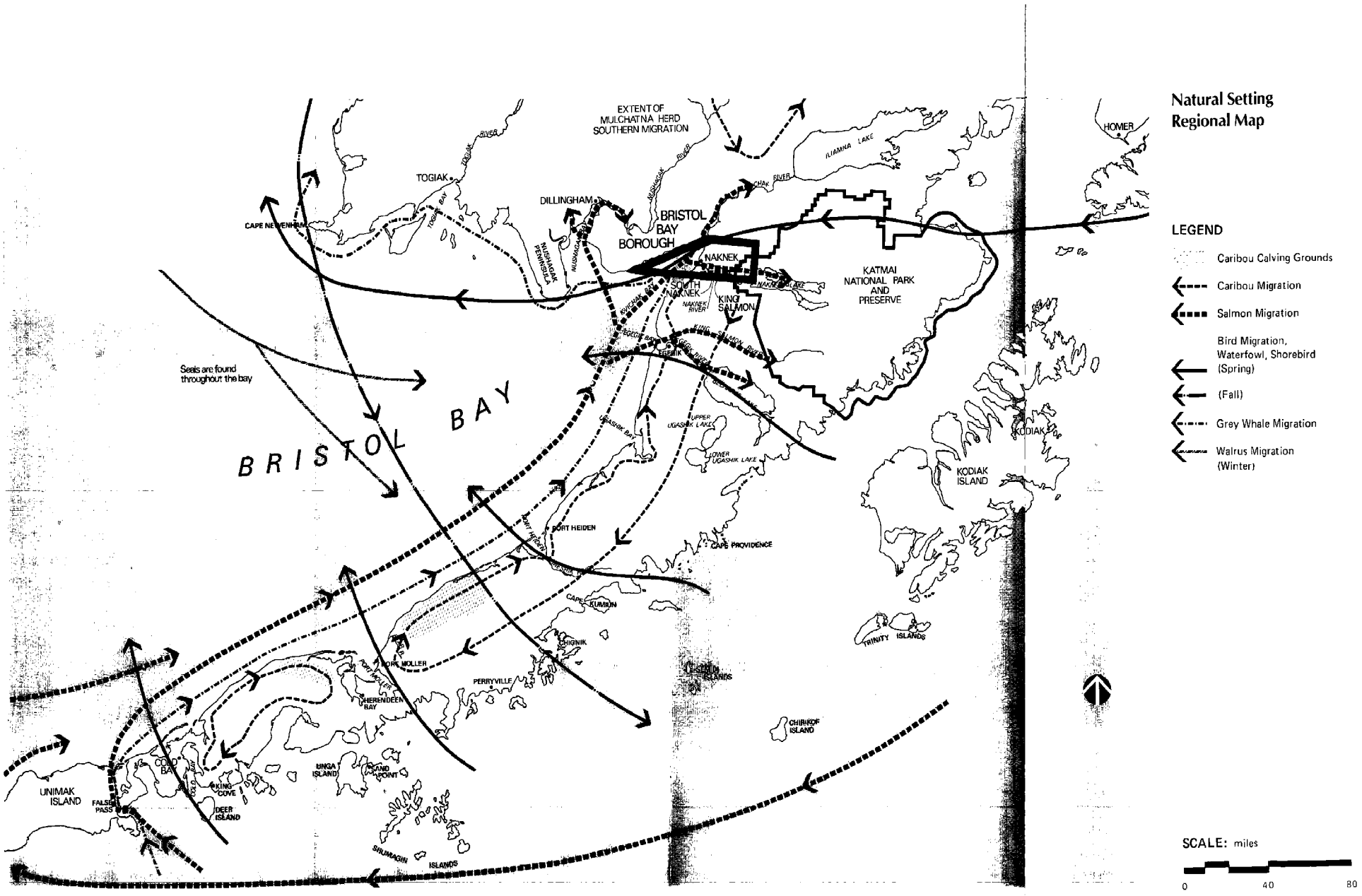
There are, essentially, two major herds of caribou present in the Bristol Bay region. The Mulchatna herd ranges centrally in the region, extending as far south as the southwestern shore of Lake Iliamna. The Alaska Peninsula herd ranges between its wintering grounds along the southern banks of the Naknek 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
40
80
BRISTOL BAY
Seals are found throughout the bay
EXTENT OF MULCHATNA HERD SOUTHERN MIGRATION
BRISTOL BAY BOROUGH
DILLINGHAM
TOGIAK
HOMER
NAKNEK
SOUTH NAKNEK
KING SALMON
KATMAI NATIONAL PARK AND PRESERVE
ILIAMNA LAKE
KODIAK
KODIAK ISLAND
TRINITY ISLANDS
PORT HEIDEN
CAPE PROVIDENCE
CAPE KUMUN
PORT MOLLER
PERRYVILLE
CHIGNIK
CHIRIKOF ISLAND
UNIMAK ISLAND
FALSE PASS
KING COVE
DEER ISLAND
UNGA ISLAND
SAND POINT
SHUMAGIN ISLANDS
CAPE NEWENHAM
NUSHAGAK PENNINSULA
EGEGIK
UGASHIK BAY
UPPER UGASHIK LAKE
LOWER UGASHIK LAKE

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.

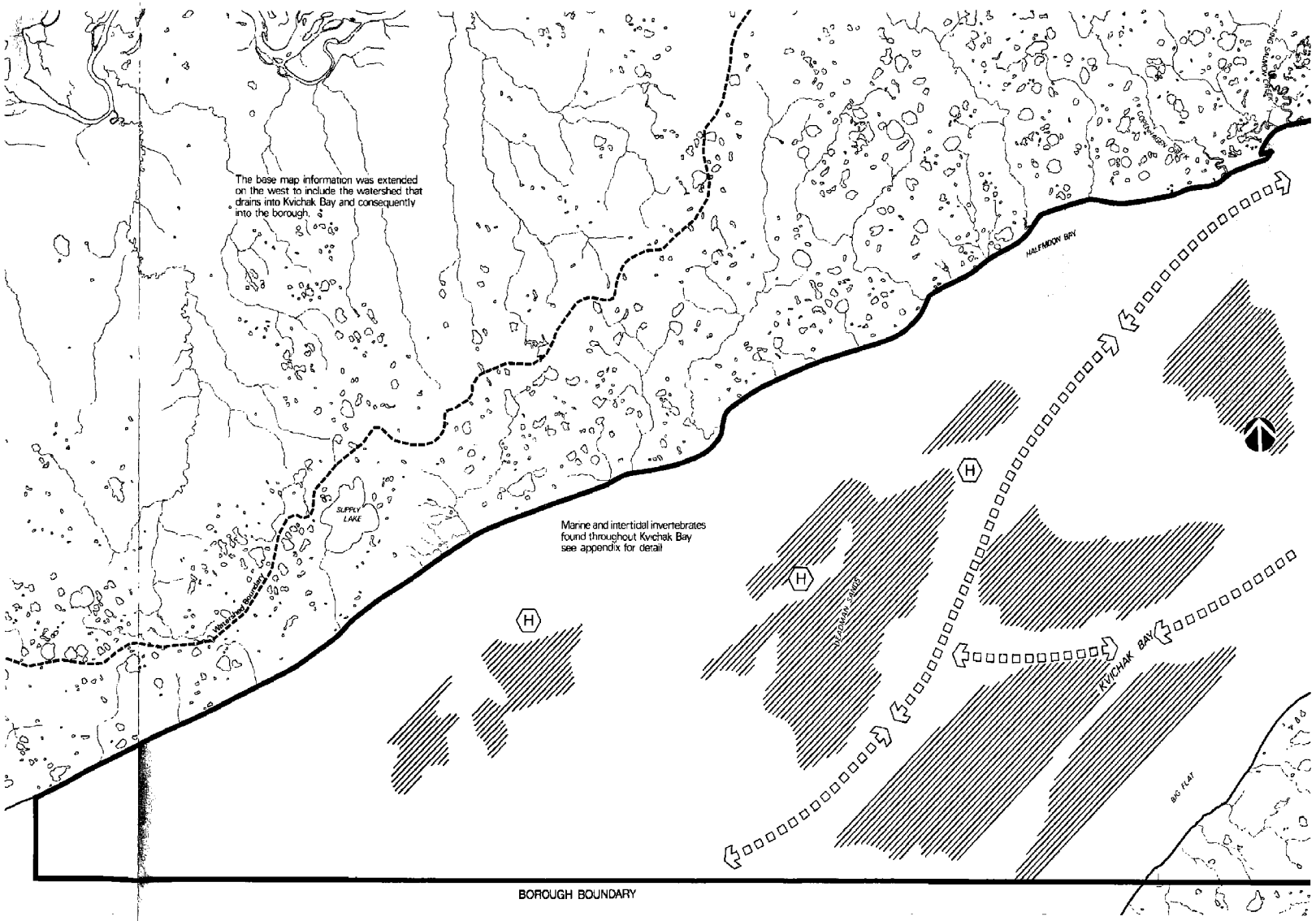
Chinook salmon is a prime sport fish species and is taken in the Naknek River in June and July. Chinook spawn in King Salmon Creek, Big Creek, Paul's Creek, and the Upper Naknek River, with a peak in late July and early August. The fish is taken for both sport and subsistence purposes. Coho salmon, also 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.

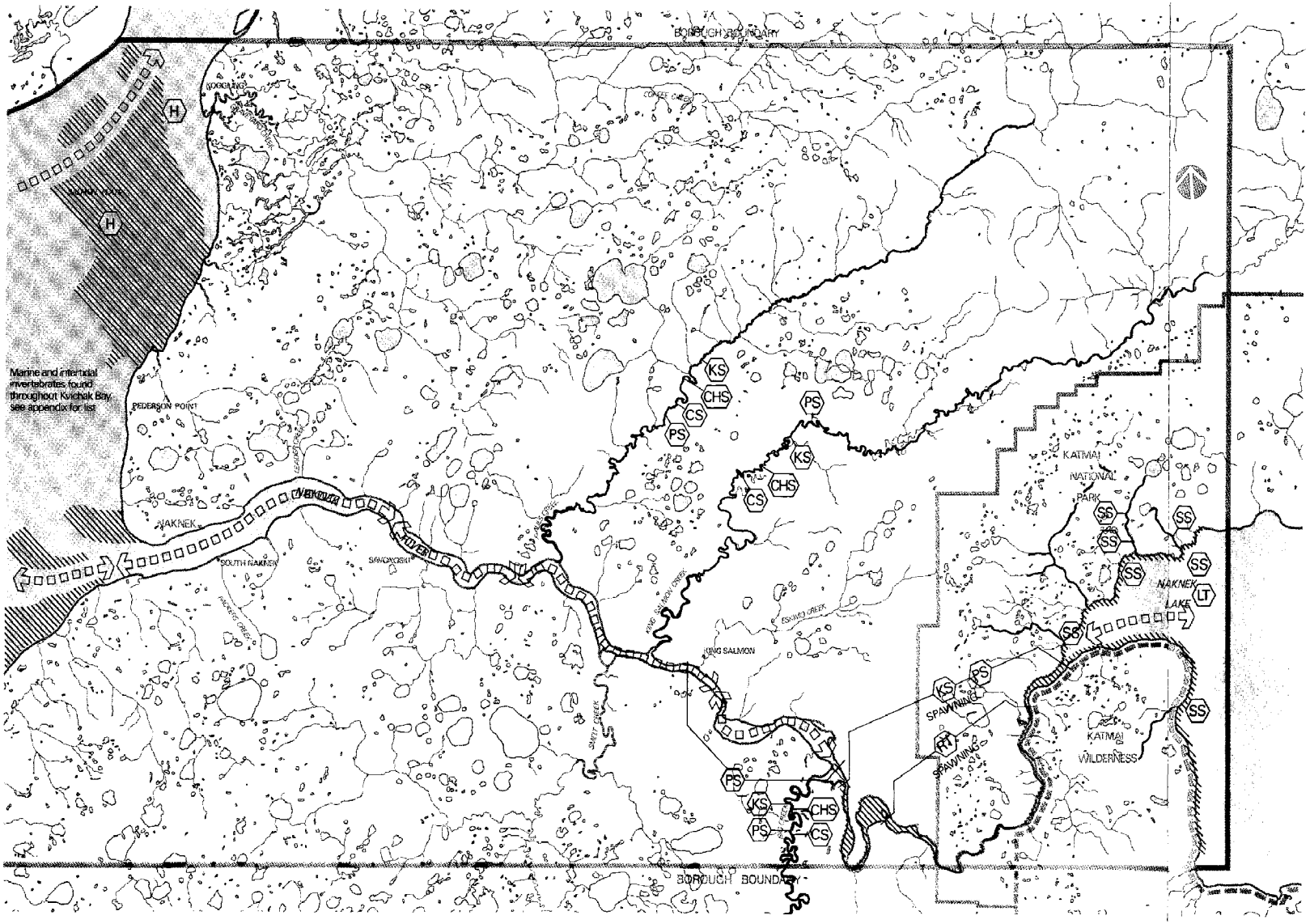
Sockeye salmon are by far the most abundant commercial fish species in the Bristol Bay Borough. Extensive work has been done to depict their life history, distribution, movements, and catchment in the Kvichak drainages. Escapement of adult sockeye within the Naknek River drainage ranges from approximately 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.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
SUPPLY LAKE
Marine and intertidal invertebrates found throughout Kvichak Bay see appendix for detail
HALEMKOON BAY
KVICHAK BAY
BIG FLAT
BOROUGH BOUNDARY



Fish Borough Map

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

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. 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 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

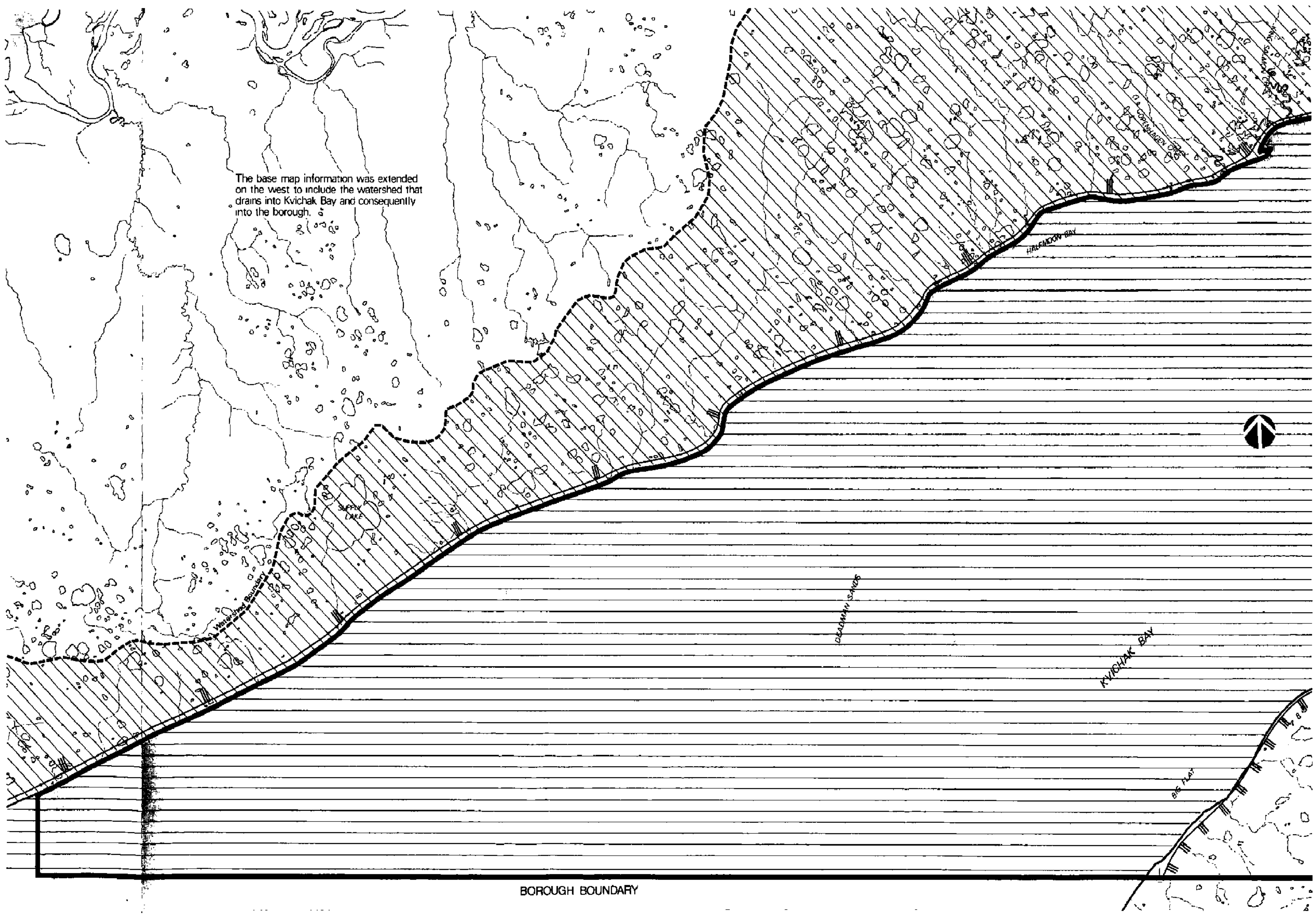
Brown bears are abundant on the lower drainages of the Naknek River. These bears come mainly from the high density bear areas of the Katmai National Park. Bears concentrate on the major salmon spawning drainages off the Naknek River during the summer months; during winter, they move to higher elevations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

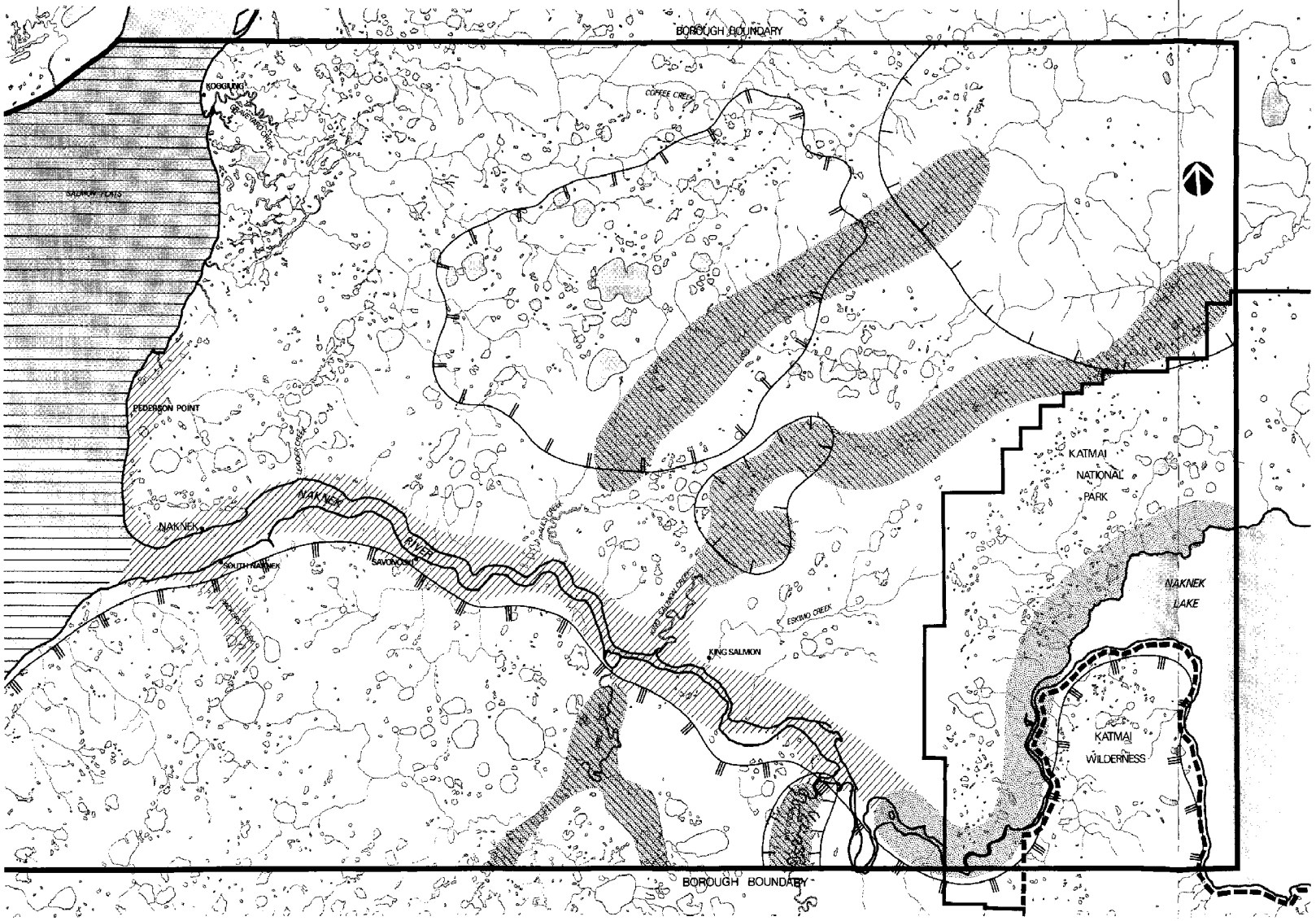
Bears are opportunistic feeders and eat moose, caribou, berries, insects, small mammals, fish, grasses, and garbage found at dump sites. Waste from the local landfills in the communities and waste from the canneries have attracted a great many bears into the area.

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 use this area heavily 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 also are present.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
Watershed Boundary
KVICHAK BAY
DEADMAN SANDS
BIG FLAT
BOROUGH BOUNDARY



Mammals Borough Map

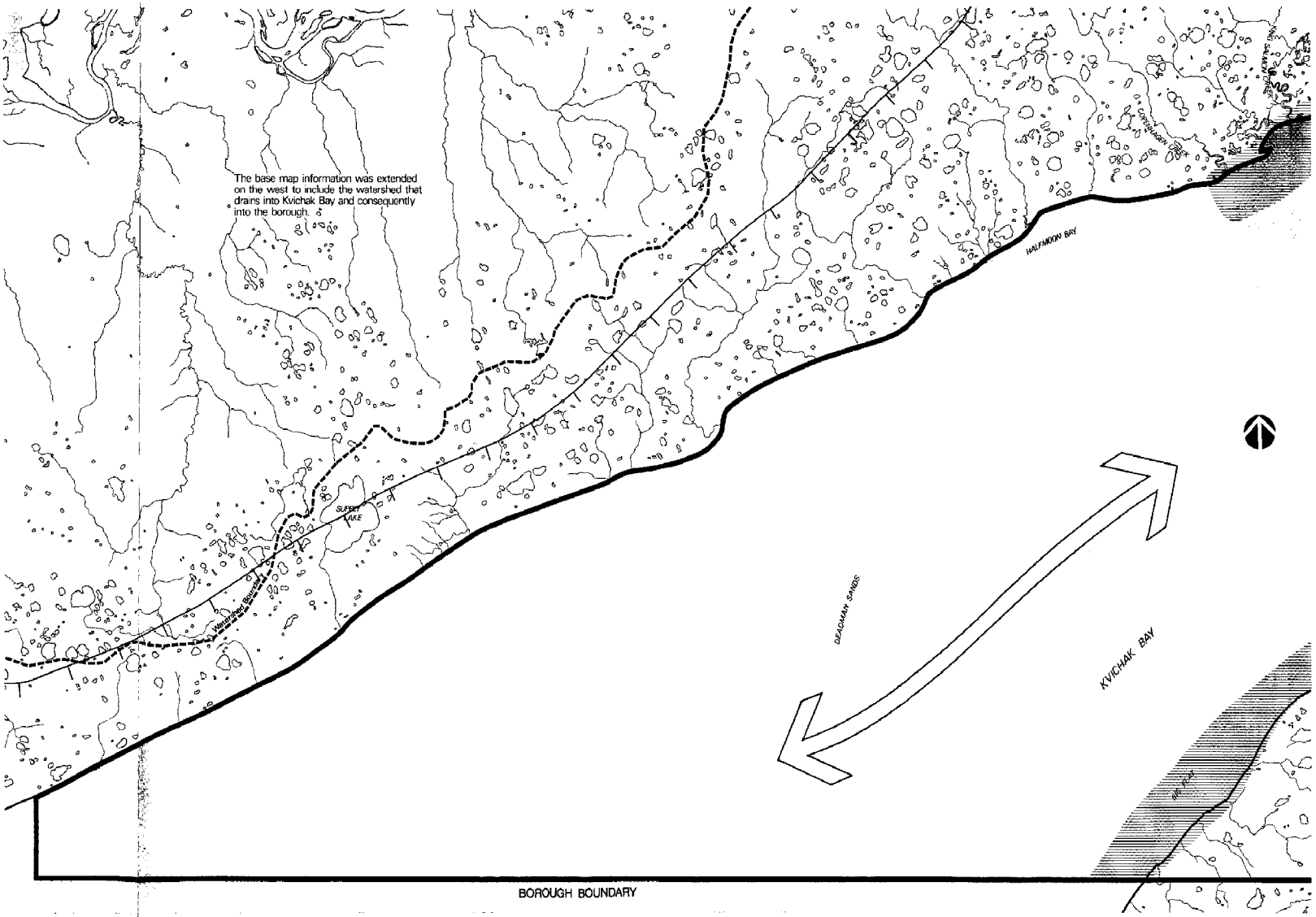
LEGEND

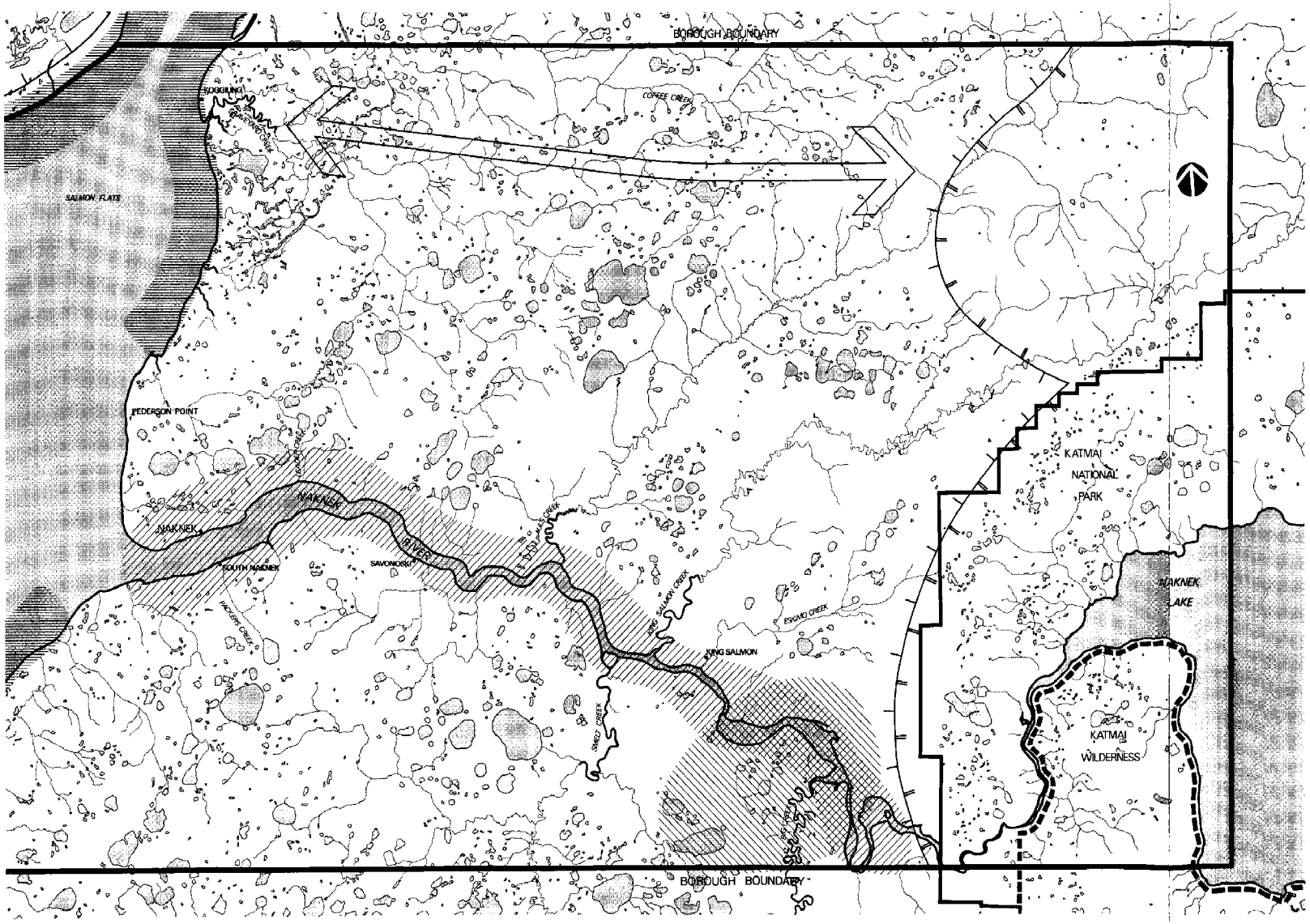
- Beluga Grey Whales
- Harbor Seals
- Sea Lions
- Fur Seals
- Bear: Summer High Concentration Fishing
- Bear: Summer High Concentration Foraging
- Moose—Fall/Winter Range
- Moose Calving Ground
- Moose Low Concentrations
- Caribou Low Densities
- Caribou—Local Herd—40 to 50 Head
- Caribou—Alaskan Peninsula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

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

SCALE: miles

0 1 2 3


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
HALFMOON BAY
SUSPY LAKE
DEADMAN SANDS
KVICHAK BAY
BOROUGH BOUNDARY



Birds
Borough Map

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

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

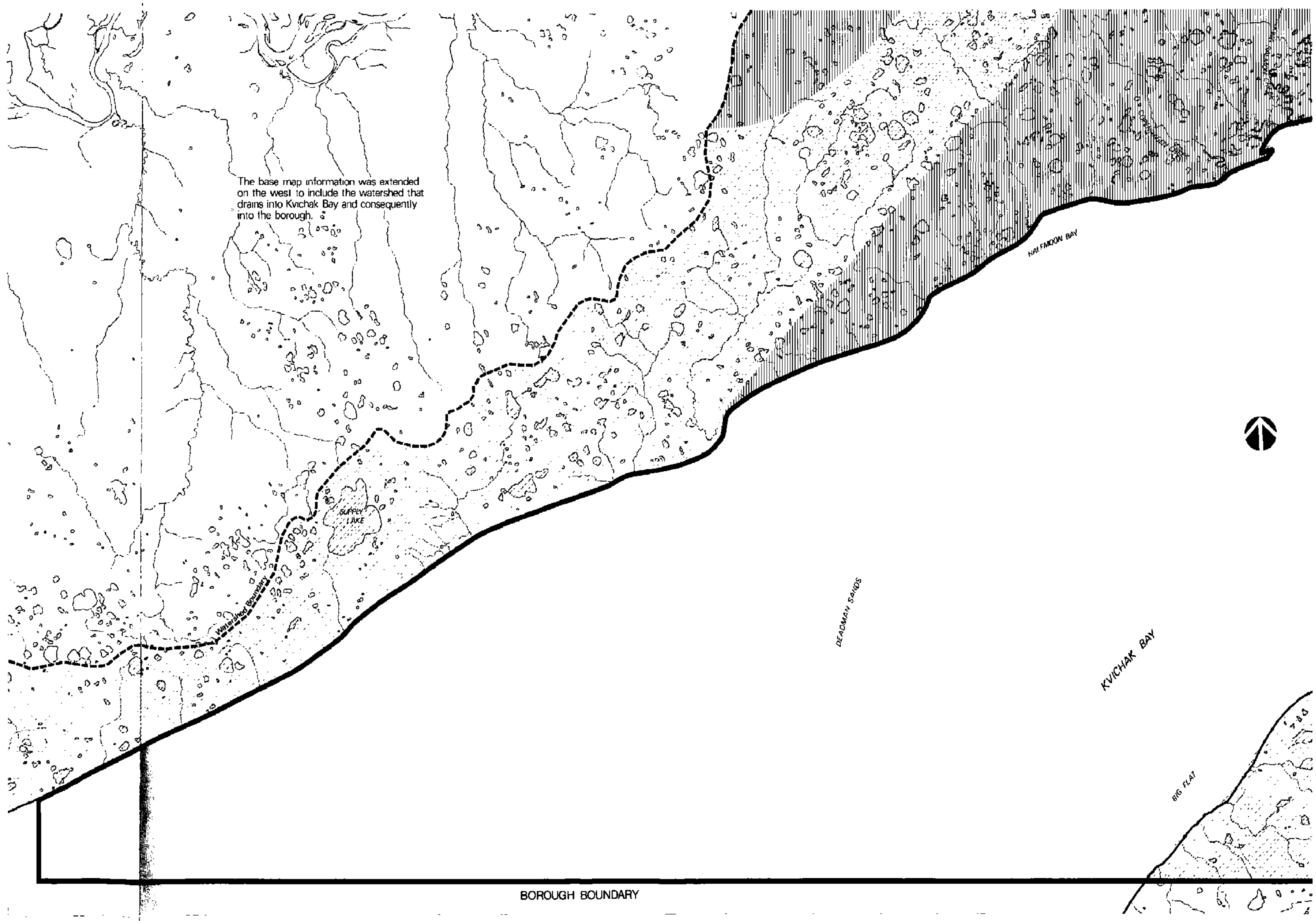
Because of the tidal nature of the Naknek River, salt-loving plants that normally grow only along the seashore are found along the edge of the river and its tributaries, nearly as far inland as the Naknek moraine.

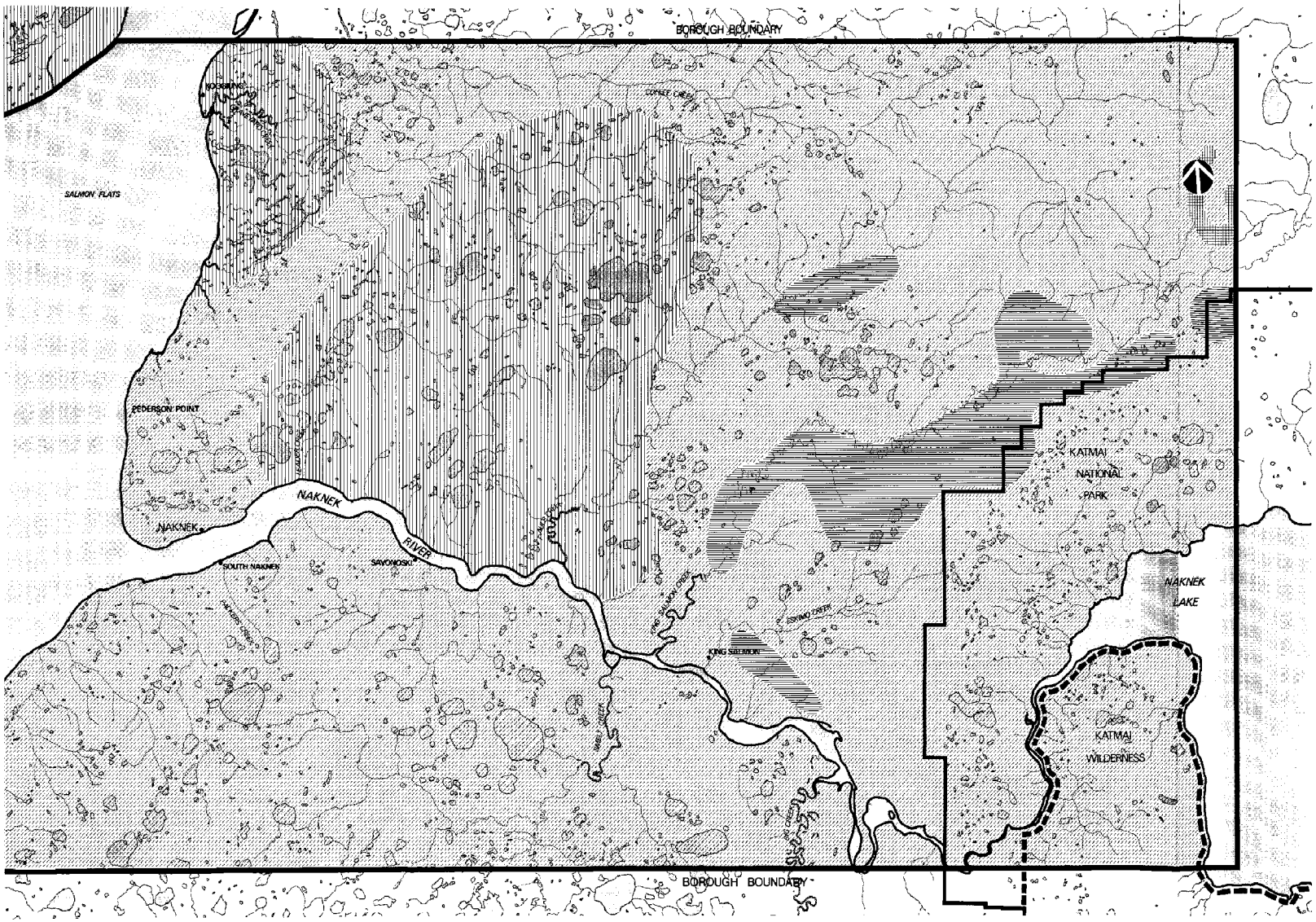
Riparian Plants

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.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
HALFMOON BAY
SUPPLY LAKE
Watershed Boundary
DEADMAN SANDS
KVICHAK BAY
BIG FLAT
BOROUGH BOUNDARY



Vegetation Borough Map

LEGEND

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

SCALE: miles

0 1 2 3

4. Resource Findings

RESOURCE INVENTORY FINDINGS

This section summarizes the results of the resource inventory found in Part I of the Borough's coastal management program, and forms the basis for designating appropriate land and water uses, management policies and the identification of areas which merit special attention. The findings report the essential elements of the resource inventory, and the conclusions suggest areas which need thorough consideration by the Borough as part of its coastal management program.

THE PHYSICAL SETTING

Topography

Finding

The land area within the Borough is relatively flat with over 75 percent below 200-foot elevation. The topography slopes gently from the high elevation of 1,061 feet in the northeast to the coastal bluff along the Naknek River and Kvichak Bay.

Conclusion

The majority of the Borough land has poor surface drainage, which is characterized by standing water and wet or moist tundra. Poor drainage is typical in large areas of relatively flat terrain.

Finding

King Salmon, Naknek and South Naknek are situated at elevations 50, 100, and 75 feet, respectively. Naknek and South Naknek are located on the bluffs above the Naknek River.

Conclusion

The Borough's communities, though protected from tsunami hazards due to shallow marine waters, are threatened by high-energy coastal erosion.

Surface Geology

Finding

The primary surface geological features of the Borough are moraine and glacial drift. Alluvial floodplain and glacial outwash deposits, to a lesser extent, form the low-lying areas.

Conclusion

Moraine and drift deposits are characterized by poor drainage, high ice content and frost-susceptible material. Alluvial and glacial outwash deposits are suitable foundation material, well drained and nonfrost susceptible.

Finding

The coastal bluffs supporting the communities of Naknek and South Naknek are composed of unconsolidated glacial and fluvial deposits. This material tends to be unstable during seismic activity.

Conclusion

The landslide hazard in the developed areas of the Borough is significant and could cause property damage or loss of life. A public awareness program should be established by the Borough to assure public knowledge of this hazard and to help design means to assure safe development.

Finding

Gravel is a key material for most of development in the Borough, yet it is a relatively scarce commodity.

Conclusion

A gravel resource needs and availability evaluation should be undertaken jointly by all three levels of government in association with the private sector.

Seismicity

Finding

The Bristol Bay Borough is north of the major areas of seismic activity. Typically, earthquakes that affect the Borough are at great depths and of low strength.

Conclusion

The earthquake potential within the Borough is low, though the coastal and river bluffs present increased hazards due to their geologic formation and soils.

Volcanism

Finding

Volcanic activity within the Bristol Bay area is extreme. Forty of the sixty volcanic centers have been active over the last three decades.

Conclusion

Ash deposits present the primary hazard related to volcanic activity in the region.

Soils

Finding

The Kvichak and Pustoi soils, identified by the Soil Conservation Service, comprise approximately 41 percent of the Borough's developed land area. Kvichak and Pustoi soils are suitable for highway and building foundation material and are a good source of topsoil and sand.

Conclusion

There is adequate land within the developed area of the Borough to support highway and building construction, and to provide the necessary construction materials. However, gravel resources are limited, as noted earlier.

Finding

The Naknek and Tolsona soils comprise approximately 58 percent of the land within the Borough's developed area. These soils are generally poorly drained with high water content and permafrost. They are poor construction materials due to high frost susceptibility.

Conclusion

Naknek and Tolsona soils should be avoided when possible for construction sites and materials due to potential structural damage and high development costs.

Hydrology

Finding

The Bristol Bay Borough lies within two major watersheds which include the major inland creeks, the Naknek River and Kvichak Bay. These watersheds extend beyond the limits of the coastal management district.

Conclusion

Land and water use within the Borough could impact both local and regional water bodies. Development activity outside the coastal management district could impact resources within the Borough. Cooperative management is necessary to assure adequate protection of Borough resources.

THE NATURAL SETTING

Migratory Fish and Wildlife

Finding

Marine mammals, caribou, birds and a variety of fish are migratory and spend a portion of the year in the Bristol Bay Borough. The remainder of the year is spent out of the Borough in other seasonal habitats.

Conclusion

When considering the fish and wildlife resources of the Borough, it is important to understand their migratory nature and the need for a cooperative approach to resource management.

Migration Corridors

Finding

The Kvichak Bay and Naknek River serve as primary migration corridors for a majority of Bristol Bay salmon.

Conclusion

Salmon migration corridors are essential to the maintenance and enhancement of salmon stocks, and should be protected.

Spawning Areas

Finding

Paul's Creek, King Salmon Creek, and Big Creek are primary spawning and rearing areas for red, king, chum, coho, and pink salmon. The Naknek River, between the communities of King Salmon and the mouth of Naknek Lake, is a primary spawning and rearing area for pink and king salmon and rainbow trout. Naknek Lake and its tributaries are primary spawning and rearing areas for coho salmon.

Conclusion

There are a number of significant salmon and trout rearing areas within the Bristol Bay Borough. These areas should be protected against land and water uses that would adversely impact the species.

Caribou

Finding

The Bristol Bay Borough provides wintering habitat for both the Alaska Peninsula herd and for a small local herd. The Alaska Peninsula herd winters south of Naknek River and the local herd winters north of the river.

Conclusion

The number of caribou wintering within the Borough varies annually, depending upon migration patterns and weather. Caribou is an important subsistence food source for many of the Borough's residents. Wintering habitat should be protected from detrimental land and water uses to maintain and enhance the subsistence resources.

Moose

Finding

Moose range in the riparian habitat associated with Paul's Creek, Smelt Creek, Big Creek, and King Salmon Creek during the fall and winter. They calve along the lower Big Creek, King Salmon Creek, and in the higher elevations in the northeast portion of the Borough during the spring.

Moose are hunted as a subsistence food source by many of the Borough's residents.

Conclusion

Though the moose population in the Borough is presently stable, disturbance to calving areas or reduced food sources could negatively affect the stock. Moose habitat should be protected from disruptive uses.

Birds

Finding

The Naknek River and the coastal areas along Kvichak Bay serve as primary staging areas for both the fall and spring migration of shorebirds, ducks, geese and swans. In addition, the uplands of the Borough provide nesting grounds for a number of migratory birds.

Conclusion

Staging and nesting areas are essential for maintaining migratory bird populations. Many species of migratory birds are managed under international treaties and provide a subsistence food source for rural Alaskans. Staging and nesting areas should be preserved to maintain present bird populations.

MAN'S USE

Settlement

Finding

Settlement in the Bristol Bay region occurred over 6,000 years ago. One hunting camp discovered on the Naknek River dates back to 3000 to 4000 B.C.

Conclusion

The Bristol Bay Borough holds a wealth of historic and prehistoric resources. The existing and future sites should be protected as a valuable resource illustrating the community's heritage.

Industrial Land Use

Finding

Fish processing represents the majority of industrial land use within the Borough. There are approximately 20 cannery or salmon processing sites that occupy up to 40 acres each.

Conclusion

Fish processing is a priority land use within the Borough due to its importance to the regional economy. Industrial land should be maintained and future sites reserved to protect and promote economic development.

Commercial and Residential Land Use

Finding

Mixed commercial and residential land use is concentrated within the communities of King Salmon, Naknek and South Naknek. Lower density use is developing along the Naknek-King Salmon Road, with increasing concentration in the vicinity of King Salmon and Paul's Creek.

Conclusion

While there are presently 10,000 acres of private land in and around the communities of King Salmon, Naknek, South Naknek, and along the Naknek-King Salmon Road, much of this land is unavailable due to limited roads or large block ownerships. The majority of the private land is owned by the Borough's village corporations. Based on demand forecasts for future housing and commercial development, adequate land is available for development over the next 20 years, assuming access and disposition hurdles are overcome.

Recreational and Subsistence Land Use

Finding

The largest amount of land in the Borough remains in its natural state and is used for recreational purposes and subsistence hunting, trapping, and gathering.

Conclusion

The value of subsistence food sources and recreational pursuits is well documented and contributes to the Borough residents' lifestyles. Adequate land for subsistence and recreational use should be reserved and protected.

Water Use

Finding

The water bodies within the Bristol Bay Borough tend to be more intensively used than the land. Kvichak Bay is used for marine transportation and is a primary commercial fishing area. The Naknek River is used as a marine transportation corridor to service the Borough communities and to supply fish to the canneries and fish processing sites. The river shores are intensively used for subsistence set-netting and sport fishing.

Conclusion

Commercial, subsistence and sport fishing, and transportation access are primary water uses for Kvichak Bay and the Naknek River. These uses should be protected and maintained, and public access to these waterways should be guaranteed.

Population

Finding

The population of the Borough has remained consistent over the past 10 years. Seasonal influx of transient labor increases population to approximately 3,000 people during the salmon season.

Conclusion

The Borough population will increase slightly over the next 10 years based on a low, but constant, growth in the resident fishing industry. Seasonal population expansion will continue to place pressure on the Borough housing market and infrastructure.

Employment

Finding

Commercial fishing and fish processing employ the majority of Borough residents on a seasonal basis. During the 1979 salmon season, Borough fishermen received a gross income of $104.8 million from drift netting, and $16.6 million from set nets.

Conclusion

Commercial fishing is the mainstay in the Borough economy. Priority should be given to those land and water uses necessary to maintain and enhance the fishing industry.

Finding

Government employment, seasonal construction and subsistence activities also contribute significantly to the Borough economy.

Conclusion

As the Borough grows, employment opportunities will increase proportionately and subsistence use will remain stable.

Land Ownership

Finding

The federal government is the largest landowner in the Bristol Bay Borough, occupying approximately 189,000 acres, or 59 percent of the land area. However, much of the federally-owned land will probably become state-owned land. Paug Vik and the Alaska Peninsula village corporations own a majority of the private land. Individual landowners make up a lesser portion of the 129,000 acres, or 40%, in private ownership. The Borough and state governments each own less than one percent, or about 3,000 acres of land.

Conclusion

Land ownership in the Borough is varied with large holdings in both private and federal ownership. Village corporations own the surface rights and the Bristol Bay Native Corporation owns the subsurface rights to most of the privately owned land. Future major development activities will depend upon market forces and land and resource availability. The coastal management program should serve as a guide to government and private landowners, by determining appropriate land and water uses and setting policy guidelines. As land moves from federal ownership to state or other ownership, such land will automatically fall under state and local management jurisdiction.

Land Management

Finding

Land management within the Borough is the responsibility of a variety of federal and state agencies, as well as the Borough government. In addition, the Bristol Bay Cooperative Planning Area* has been established to oversee land planning and land and water use decisions on federal and state land.

Conclusion

It is in the best interest of the Borough to complete its coastal management program and work in cooperation with the various levels of government involved in the Bristol Bay region.

---

* Established under ANILCA as a special planning and management region.

HABITAT EVALUATION

Maintaining rich wildlife habitat is very much in the interest of Bristol Bay Borough. Because of its relatively isolated location and cultural heritage, commercial fishing, subsistence hunting and fishing, and, to a lesser extent, recreational hunting and fishing, play an important part in the lives of many residents. In addition to socioeconomic values, recreational and less tangible aesthetic benefits accrue from managing wildlife habitat in a sensitive and ecologically consistent manner.

Evaluation of development impacts on habitat quality is difficult at a general level. The impacts vary from one type of development to another, and from one site to another. The impacts can occur at the immediate site, by displacement of the habitat or offsite such as by siltation of streams. As the Bristol Bay Borough continues to grow, some losses in habitat quality and type are unavoidable.

Generally, tundra upland receives the least amount of wildlife use. The Naknek River, major creeks, fresh and saltwater marshes, and associated riparian areas receive the most intense wildlife use. Borough management and residents must assume responsibility for determining the type and degree of habitat disruption from future development permitted by the Borough. Cooperative effort and communication between residents, Borough management, resource managers, government regulators and developers are necessary for a coastal management program to be effective.

In order to effectively evaluate land and water uses and develop management recommendations commensurate with the Alaska Coastal Management Act of 1977, habitats were mapped according to definitions contained in the Alaska Coastal Management Program (ACMP) Standards and Guidelines (6AAC80.900). Definitions of the nine habitat types follow (see Coastal Habitat map following page 37):

1. Offshore areas - submerged lands and waters seaward of the coastline.

2. Estuary - a semiclosed coastal body of water which has a free connection with the sea and within which seawater is measurably diluted with fresh water derived from land drainage.

3. Tideflats - mostly unvegetated areas that are alternately exposed and inundated by the falling and rising of the tide.

4. Exposed high-energy coasts - open and unprotected sections of coastline with exposure to ocean-generated wave impacts and usually characterized by coarse sand, gravel, boulder beaches, and well-mixed coastal water.

5. Rivers, streams, and lakes - undefined.

6. Upland - drainages, aquifers, and land, the use of which would have a direct and significant impact on coastal water.

7. Wetlands - includes both freshwater and saltwater wetlands; freshwater wetlands are those environments characterized by rooted vegetation which is partially submerged either continuously or periodically by surface fresh water with less than 0.5 part per thousand salt content

and not exceeding three meters in depth; saltwater wetlands are those coastal areas along sheltered shorelines characterized by halophytic hydrophytes and macroalgae extending from extreme low tide to an area above extreme high tide which is influenced by sea spray or tidally induced water table changes. (Please note that the scale of the map is not adequate to be relied upon for regulating purposes.)

8. Rocky islands and seacliffs - islands of volcanic or tectonic origin with rocky shores and steep faces, offshore rocks, capes, and steep rocky seafronts.

9. Barrier islands and lagoons - depositional coastal environments formed by deposits of sediment offshore or coastal remnants which form a barrier of low-lying islands and bars protecting a saltwater lagoon with free exchange of water to the sea.

Bristol Bay Borough has approximately 500 square miles of land area (and another 400 square miles of water area). Only a small portion of this region is accessible by road. Consequently, onsite analysis of most of the area was infeasible. Although a variety of means was employed in delineating habitat, a land cover map developed from digital Landsat and digital topographic data for the Bristol Bay Cooperative Study Region and coded for a range of cover types was the primary source.

Vegetated land cover consists of plant communities. A plant community is an association of plants of different species which are responding to similar environmental conditions such as soil type, moisture, slope, temperature, and aspect. Vegetation communities indicate particular habitat types. Based on a number of variables, but primarily reflectance, plant communities will code as different colors based on digital computerized data.

Habitat types as defined by ACMP are broad, and some of them contain a variety of more specific habitats. For example, uplands include lichen-covered rocky alpine slopes; coniferous, deciduous, and mixed forest; lichen shrub tundra; and drier types of ericaceous and graminoid shrub tundra. Wetlands cover saline tidal marsh, freshwater marsh and wet bogs and meadows.

Three ranges of cover types characterized the largest portion of terrestrial/wetland portions of Bristol Bay Borough.

- Open low shrub ericaceous/conifer woodland/mesic bog/ericaceous shrub tundra

- Open low shrub graminoid/mesic bog/graminoid shrub tundra

- Lichen shrub tundra

The most difficult task was delineating upland from wetland. For this evaluation, areas color-coded for marsh/very wet bog and wet bog/wet meadow were mapped as wetlands (See Coastal Habitat map). Where these areas occurred in association with the above three most common cover types, the above types were mapped as wetland. A large area in the northwest section of the Borough was designated as wet on U.S.G.S. topographic map although

color coding was ambiguous. Since observation from the air indicated it was extensively wet, it was mapped as wetland.

Uplands were characterized by mixed coniferous-deciduous forest, miscellaneous deciduous forest/scrub and those portions of ericaceous shrub tundra, graminoid shrub tundra and lichen shrub tundra which grew in areas of topographic relief and were probably fairly well drained.

A conditional habitat category was established for mapping purposes to deal with areas which were difficult to place in an upland or wetland category. These areas were of generally low relief and vegetated with mainly ericaceous or graminoid shrub tundra. Because of the variety in microrelief, onsite analysis would be required to determine if the area would be considered wetland or upland. Undoubtedly some of the lower areas would be covered with surface water during spring thawing, satisfying the ACMP wetland definition.

Detailed descriptions of different plant associations which actually form specific subhabitats under each broad habitat category are discussed in Viereck, et al. (1982). These references should be investigated for a more detailed enumeration of plants and ecological characteristics.

OFFSHORE AREAS

Approximately 40 percent of Bristol Bay Borough consists of Kvichak Bay, the northernmost portion of Bristol Bay. The eastern boundary of the Borough follows the western shoreline of Kvichak Bay.

Large tidal ranges prevent the formation of shorefast ice during winter months. Tidal ranges increase toward the head of the bay; in Naknek, the mean tidal range is 18.5 feet.

Much of Kvichak Bay is relatively shallow with large tide flats, exposed at low tides. The long fetch to the southwest and the relative shallowness of the water cause steep, irregular waves, rather than long swells.

Water quality in Kvichak Bay is good with excellent flushing because of the large tidal ranges and large flows from the rivers. Turbidity varies but can be high because of the shallow bay, large waves, and spring melt waters.

Kvichak Bay abounds in wildlife on a seasonal basis. All five species of Pacific salmon migrate through the coastal waters to the Kvichak and Naknek Rivers for spawning. Walrus, seal, and whale migrate through Bristol Bay proper and occasionally can be found in Kvichak Bay. Whistling swans, sandhill cranes, numerous species of ducks and shorebirds, and several species of geese all rest and feed at times in the shallow water of the bay.

ESTUARY

Because of the freshwater influence of the Kvichak and Naknek Rivers, and general coastal drainage, the waters of Kvichak Bay are considered estuarine with salinity ranging from 12.4 to 31.2 parts per thousand. Because of the higher water flows from the drainages during spring and early summer,

salinity tends to be less at those times. In addition, a saline wedge of water protrudes up both the Kvichak and Naknek Rivers creating estuarine conditions in their lower sections. In the Naknek River, salinities of up to 10 parts per thousand have regularly been detected eight miles up from the mouth and may extend several miles past this point during a combination of high tide and low river flow (Buck, et al., 1978).

Estuarine ecosystems are characteristically highly productive when compared to most terrestrial or open water areas. River and streams supply terrestrially derived nutrients and deep and cold oceanic waters contribute marine nutrients to relatively shallow basins which result in high primary production capable of supporting a high diversity of wildlife.

TIDEFLATS

Tideflats occur throughout Kvichak Bay and approximately four miles up the Naknek River. Tideflats occurring in Kvichak Bay and the estuarine portion of Naknek River are strongly influenced by the saline character of the water and are mainly unvegetated.

Tides also cause fresh water upriver of the estuarine areas of the Naknek River to rise and fall uncovering sand, mud, or silt substrate. These periodically wetted lands are also mainly unvegetated.

Both the Fish Wildlife Service (FWS) and Corps of Engineers (COE) consider tideflats as wetlands and the COE maintains permit authority over alteration to these habitats.

EXPOSED HIGH-ENERGY COASTS

North of the Naknek River, coastal bluffs consisting of glacial drift and fluvial deposits occur upriver of the town of Naknek, around Cape Suworof, and up the coast approximately three miles. South of the Naknek River, coastal bluffs occur from upriver of South Naknek, west toward the mouth of the river, and south down the coast past the southern Borough boundary line. Riverine bluffs also occur up the Naknek River on the north and south side of the river. Generally, these bluffs are highest at Naknek and South Naknek where they reach 75 to 100 feet in height. Upriver and around the mouth of the river to the north and south, bluffs vary between 25 and 75 feet high.

The steep sides of the bluffs are generally unvegetated consisting of unconsolidated materials. Deciduous thickets of Kenai birch. Sitka alder, and willow occur along the top of the bluffs.

RIVERS, STREAMS, AND LAKES

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.

Land adjacent to rivers and creeks consisting of relatively flat floodplains and steeper terrain leading up to relatively level tundra or diciduous forests is termed "riparian." Grasses, primarily bluejoint and sedges, are common along with herbaceous plants such as bunchberry, fireweed, yarrow, northern water carpet, northern rockcress, cloudberry, nagoon-berry, and violets. Kenai birch, willow, and alder comprise a tall shrub or tree layer depending on where they grow. Frequently on the low, active floodplain areas, dense thickets of these trees occur.

On the edge of the streams and rooted in the water, marsh fivefinger and sedges predominate. Water buttercup and mare's tail occur as submerged aquatics.

Lakes and ponds of varying sizes and depths occur throughout the Borough. Many of the shallower ponds are constantly filling with decayed plant material and sediment as they change to marshes and wet meadows. A number of ponds on the 1951 U.S.G.S. topographic maps appeared as marshy areas on the 1981 Landsat photographs.

Emergent aquatic plants such as sedges, marsh fivefinger, swamp horsetail, and buckbean grow in the shallow margins of the lakes. Occasionally, yellow pond lily, a floating aquatic plant, will cover a portion of a pond.

Although described under "rivers, streams, and lakes" in this analysis, the COE considers active floodplains along riparian areas and lakes and ponds with depths less than 6.6 feet as wetlands for permitting purposes.

The Naknek River and Paul's and King Salmon Creeks are excellent fish habitat. Salmon hatch, rear, migrate, and spawn in these waters. In addition, rainbow trout, grayling, Dolly Varden, and whitefish and several nongame species of fish, including sculpin and stickleback, reside year-round in these waters. The stretch of river above Rapids Camp is especially noted for rainbow trout fishing.

Naknek Lake and a number of other smaller lakes are also noted for fishing. Northern pike, rainbow trout, lake trout, and Arctic char are the main species in these lakes.

Riparian areas up and down the major creeks and along the Naknek River provide excellent habitat for a number of larger mammals including brown bears, moose, beaver, mink, wolverine, otter, muskrat, lynx, caribou, red fox, and wolf. These animals venture out on the flat tundra vegetation, mainly to feed.

Whistling swans and numerous species of waterfowl nest and stage along the Naknek River. The area along the section of the river between Naknek Lake and Smelt Creek is a noted whistling swan and pintail staging area.

UPLANDS

A number of distinct plant communities characterize upland habitats in Bristol Bay Borough depending on environmental factors such as soil type, slope, aspect, and evaluation.

Mixed Coniferous-Deciduous Forest

This habitat type generally occurs on moderate to moderately well drained soil and parallels much of the higher ground along the lower portion of Paul's Creek, most of King Salmon Creek, and along a shelf running north-south in the eastern portion of the study area. Coniferous species are limited to white and black spruce. Kenai birch dominates the deciduous upper story. The shrub layer consists of dwarf birch and scattered shrub willows. Crowberry, narrow leaf Labrador tea, alpine azalea, moss, and grasses cover the ground.

Miscellaneous Deciduous Forest/Scrub

This habitat characterizes well-drained soils in the Kvichak and Pustoi series frequently occurring in riparian areas on floodplains and also on higher ground along the Naknek River and raised areas scattered about the tundra. The lower areas located on active floodplains, which would experience flooding yearly or every several years, are considered wetland. Trees include Kenai birch, Sitka alder, and willow. Usually in mature stands, there is an open canopy and all these species are present in varying proportions. Associated shrubs include blueberry, dwarf birch, and willow. Fireweed, yarrow, roseroot, bunchberry, nonsphagnum type mosses, and grasses comprise a few of the groundcover species.

Lichen Shrub Tundra

The lack of trees and tall shrubs and the dominance of lichen and low ericaceous (heath) and dwarf shrubs are the most characteristic aspects of this relatively drier and well-drained habitat. Herbaceous nongraminoid plants are poorly represented. Crowberry, alpine bearberry, Labrador tea, blueberry, and dwarf birch comprise a low shrub community. Groundcover consists of mostly lichen, moss, and sedge.

WETLANDS

The importance of wetlands to the ecology of a region is well-documented. Wetlands provide buffers from storms and flooding by absorbing excess water into the organic matrix which serves as substrate. Wetlands serve as hydrological reserves where they slowly release stored water to ground and surface water reservoirs which is especially needed during times of drought.

Wetlands can also filter out pollutants, such as suspended solid material, as water flows through the vegetation and organic matrix. Wetlands supply nutrients to marine and aquatic habitats thereby enhancing productivity and

serving as habitat, nursery grounds, and food sources for a large variety of plants and animals.

Wetlands are defined in a variety of ways depending on who is defining and what purpose the definition serves. There are many different types of wetlands and, because the difference between upland and wetland lies on a continuum, there is no one indisputable ecologically sound definition.

For the purpose of developing and implementing a coastal management program, however, there are two particular definitions that must be considered. The Alaska Coastal Management Program (ACMP) provides a definition in its regulations which was used in the resource inventory and analysis. The U.S. Army Corps of Engineers (COE) also has a definition which is important because their wetlands permitting and regulatory system is based on this definition. Both are shown below:

- COE: ". . . those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." (33 CFR 323.2(c).)

- ACMP: "include both freshwater and saltwater wetlands; freshwater wetlands are those environments characterized by rooted vegetation which is partially submerged either continuously or periodically by surface fresh water with less than 0.5 part per thousand salt content and not exceeding three meters in depth; saltwater wetlands are those coastal areas along sheltered shorelines characterized by halophytic hydrophytes and macroalgae extending from extreme low tide to an area above extreme high tide which is influenced by sea spray or tidally induced water table changes." (6 AAC 80.900.)

A question arises over how compatible these definitions are. ACMP staff apparently feel that there is very little practical difference between them and have proposed that the coastal policy council (CPC) drop the existing ACMP definition instead. At its April 28, 1983 meeting, the CPC tentatively agreed with this idea, and called for public notice to propose the change. This rule-making action should occur before CPC action on the Bristol Bay Borough coastal management program.

The COE definition of wetlands will be the operative definition henceforth in the implementation of this program.

The COE considers wetlands as under their jurisdictional authority based on Section 404 of the Clean Water Act. Consequently, active floodplains considered in the program under "miscellaneous deciduous forest scrub" and large areas of the Borough which are considered conditional upland/wetland for this analysis because of the ACMP definition and its emphasis on submergence by surface water would be considered wetland by the COE.

Readers should be aware that delineation of the COE wetlands definition is not always obvious. The COE provides onsite determinations in cases of doubt, so they should be contacted if a given site seems to have any wetland characteristics. Areas not shown as wetlands on the maps in this document

may indeed be found to fall under COE jurisdiction after an onsite inspection.

Freshwater Marsh

Fresh standing water, occasionally obscured by vegetation, supports plants which generally only occur in this type of mostly aquatic habitat. Buckbean, marsh fivefinger, and swamp horsetail are dominant forbs; sedges also occur in thick stands.

Wetbog - Meadow

These very wet habitats support a moderate diversity of plants with mosses and sedges predominating. Shallow standing water occurs in pools and wet barren soil is scattered throughout the habitat, but very little vegetation grows in these areas. Mounds characterize the microrelief vegetated with bog rosemary, dwarf birch, and blueberry.

Tidal Marsh

Tidal marshes occur throughout most of the low areas along Kvichak Bay, and they extend inland along some of the creeks which drain the lowlands. Much of the ground is barren and covered with water at higher tides. Vegetation consists of plants which can tolerate tidal fluctuations and saline water. Sedges, mainly Carex Lyngbye and cottongrass, comprise most of the vegetation.

CONDITIONAL UPLAND/WETLAND

These habitats include tundra vegetation and probably correspond to areas Viereck and Little (1972) mapped as wet tundra. Along with the definite marsh and wet bog and meadow areas, Landsat revealed two main habitat types: ericaceous shrub tundra and graminoid shrub tundra. These occur on both poorly drained and moderately well drained soils.

Visits to a number of these sites during mid-June 1982 showed relatively dry areas with a minimum of standing water and cottongrass tussocks as the dominant vegetation. Below the surface layers of vegetation, soil was damp. None of the vegetation was actually submerged. Small pothole like depressions were present and contained wet soil or shallow water with no vegetation. Conceivably during spring thaw, some of the lower areas and portions of the plants are under standing water for periods of time.

Ericaceous Shrub Tundra

This plant community has little structural diversity. Ericaceous shrubs such as Labrador tea, bog rosemary, alpine azalea, dwarf birch, and low willow comprise the very low shrub layer. The ground layer consists of mat willows, cloudberry, grasses, and sedges, primarily cottongrass.

Graminoid Shrub Tundra

This species composition resembles ericaceous shrub tundra, but with grasses and sedges, mainly cottongrass, occurring more abundantly.

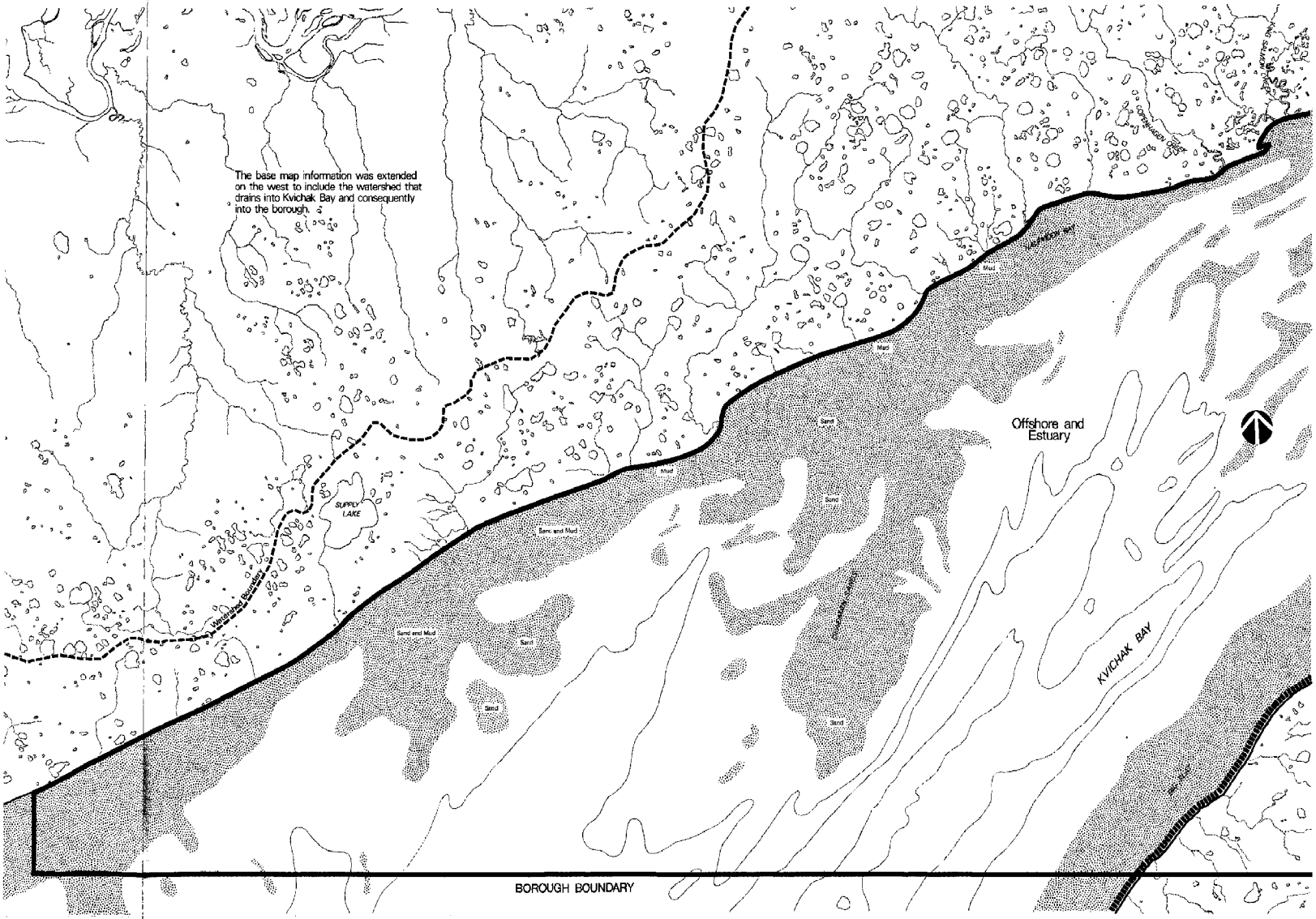
ROCKY ISLANDS, SEA CLIFFS, BARRIER ISLANDS, AND LAGOONS

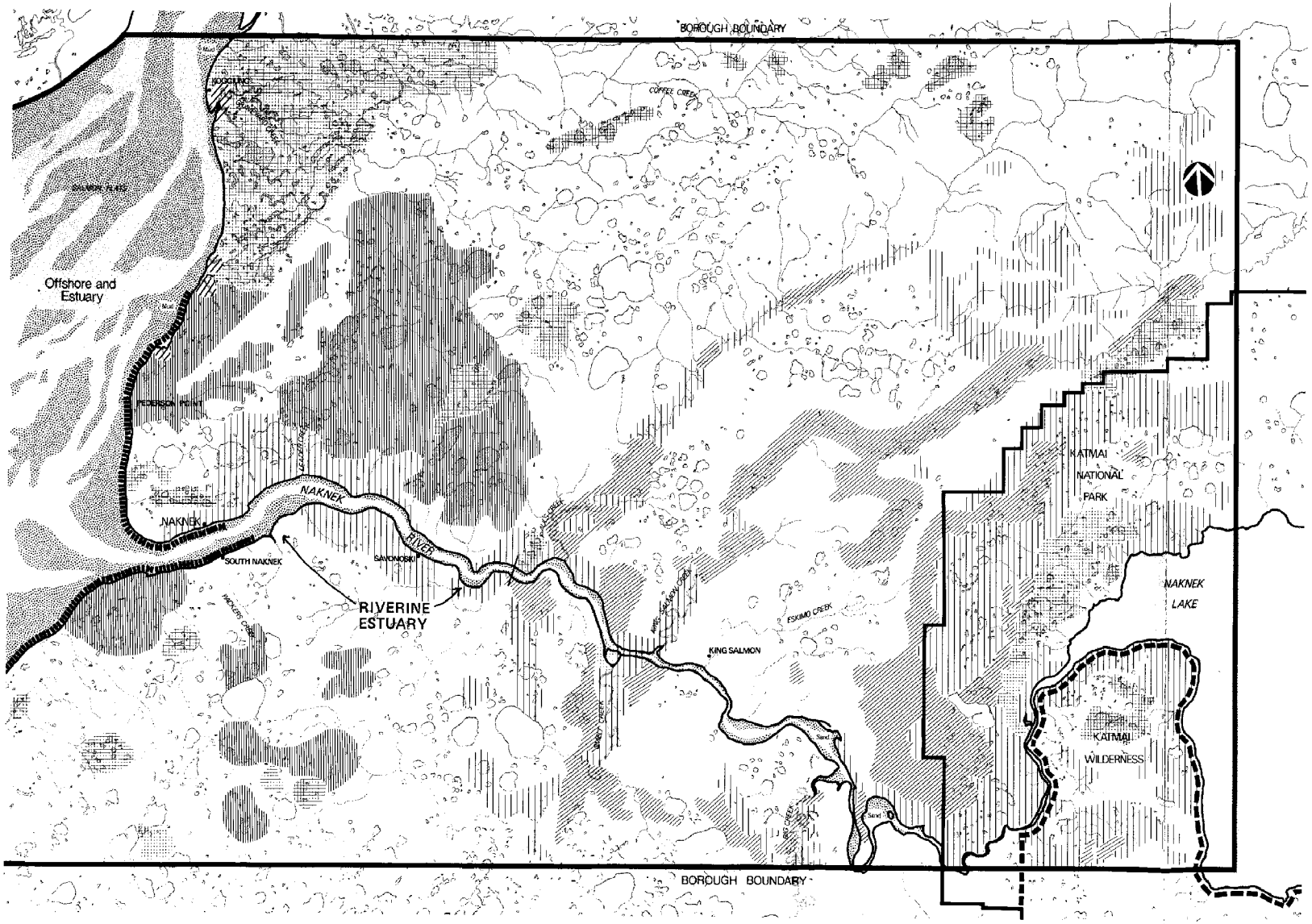
These features do not occur in Bristol Bay Borough.

SOURCES

In mapping and analyzing Bristol Bay coastal habitats, the following information sources were utilized:

- Site visits
- Aerial reconnaissance
- U.S.G.S. topographic maps and overlays (1:63,360 or 1 inch = 1 mile)
- Aerial photographs (1 inch = 1,000 feet)
- Satellite information (Landsat) - geometrically corrected, scaled photographs and computer data coding land cover types
- Bristol Bay Land Cover Map Users Guide (draft).


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
Watershed Boundary
SUPPLY LAKE
Mud
Sand
Sand and Mud
Offshore and Estuary
KVICHAK BAY
BOROUGH BOUNDARY



Coastal Habitat Borough Map

LEGEND

Upland

- Lichen Shrub Tundra/Graminoid-Ericaceous Shrub Tundra
- Miscellaneous Deciduous Forest/ Scrub
- Mixed Coniferous-Deciduous Forest

Conditional (Upland/Wetland)

- Graminoid-Ericaceous Shrub Tundra/Mesic Bog

Wetland

- Marsh/Wet Bog/ Wet Meadow
- Tidal Marsh
- Tide Flat and River Bars
- Streams and Lakes
- Coastal Bluffs

Note: The Borough boundaries coincide with the proposed management boundary.

SCALE: miles

0 1 2 3

5. Human 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 settled 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.

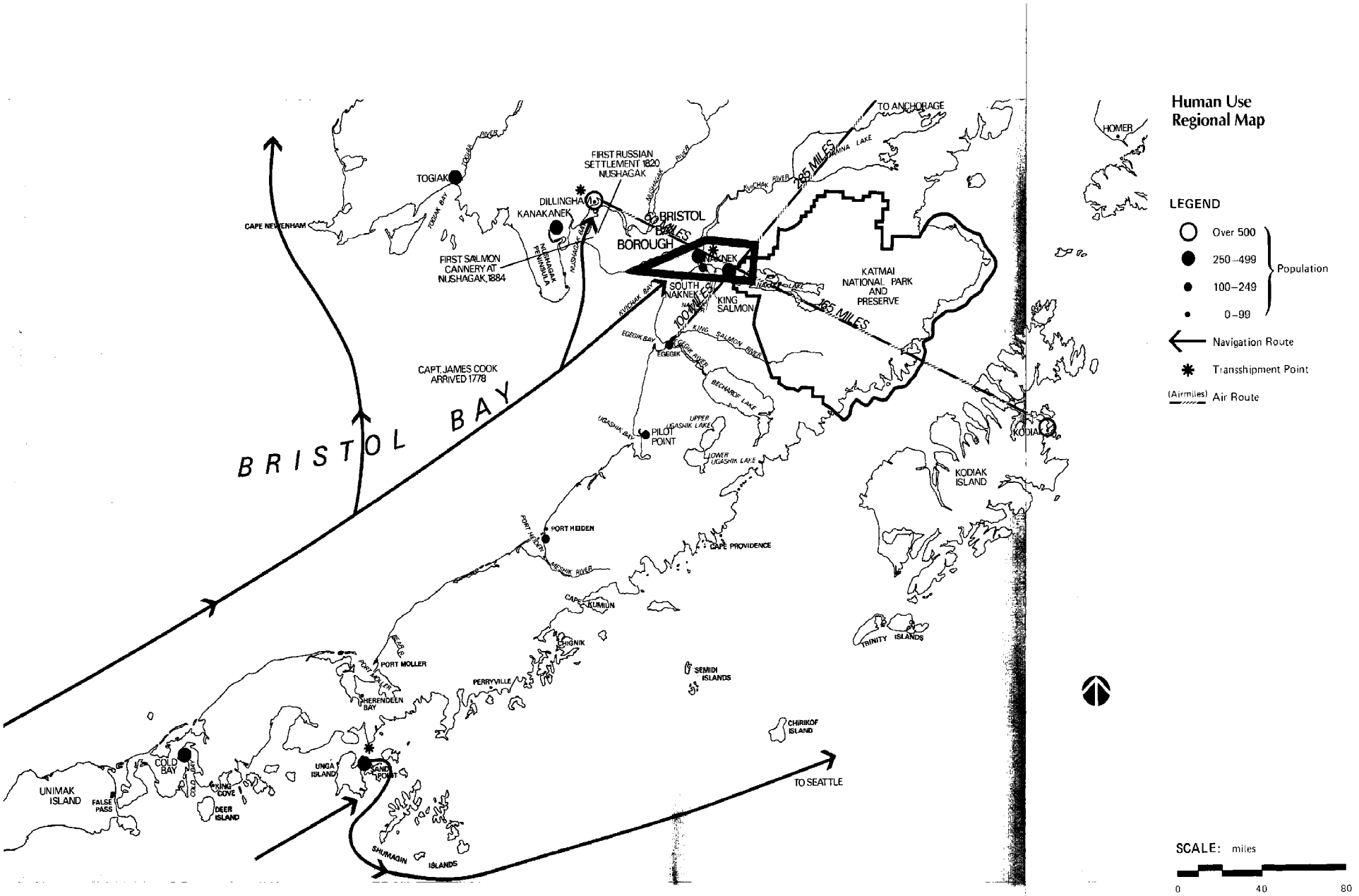
Table 5.1 shows archaelogical and historical sites in the area. Numbers on the table correspond to numbers on the Borough Land and Water Use map.

TABLE 5.1

ARCHAEOLOGICAL AND HISTORICAL VILLAGE SITES

Map (1) Number	Name	Date	Ownership	Condition	Environment
1	Smelt Creek	200 BC	Private	Partially excavated	Riverine, moist tundra
2	Pakik	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
(1) See map following page 40.


Human Use
Regional Map
LEGEND
Over 500
250–499
100–249
0–99
Population
Navigation Route
Transshipment Point
(Airmiles) Air Route
SCALE: miles
0
40
80
BRISTOL BAY
TO ANCHORAGE
HOMER
TOGIAK
TOGIAK RIVER
TOGIAK BAY
CAPE NEWENHAM
FIRST RUSSIAN SETTLEMENT 1820 NUSHAGAK
DILLINGHAM
KANAKANEK
NUSHAGAK RIVER
NUSHAGAK BAY
NEMAHAGAK PENINSULA
FIRST SALMON CANNERY AT NUSHAGAK, 1884
BRISTOL BAY BOROUGH
NAKNEK
SOUTH NAKNEK
KING SALMON
KVICHAK RIVER
KVICHAK BAY
285 MILES
TAZIMINA LAKE
KATMAI NATIONAL PARK AND PRESERVE
100 MILES
165 MILES
NAKNEK LAKE
KING SALMON RIVER
EGEGIK BAY
EGEGIK
EGEGIK RIVER
BECHAROF LAKE
CAPT. JAMES COOK ARRIVED 1778
UGASHIK BAY
UPPER UGASHIK LAKE
PILOT POINT
LOWER UGASHIK LAKE
KODIAK
KODIAK ISLAND
PORT HEIDEN
CAPE PROVIDENCE
PORT HEIDEN
MESHIK RIVER
CAPE KUMUN
ORIGNIK
TRINITY ISLANDS
PORT MOLLER
BEAR R.
SEMIDI ISLANDS
PERRYVILLE
HERENDEEN BAY
CHIRIKOF ISLAND
COLD BAY
UNGA ISLAND
SAND POINT
UNIMAK ISLAND
FALSE PASS
KING COVE
DEER ISLAND
SHUMAGIN ISLANDS
TO SEATTLE

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

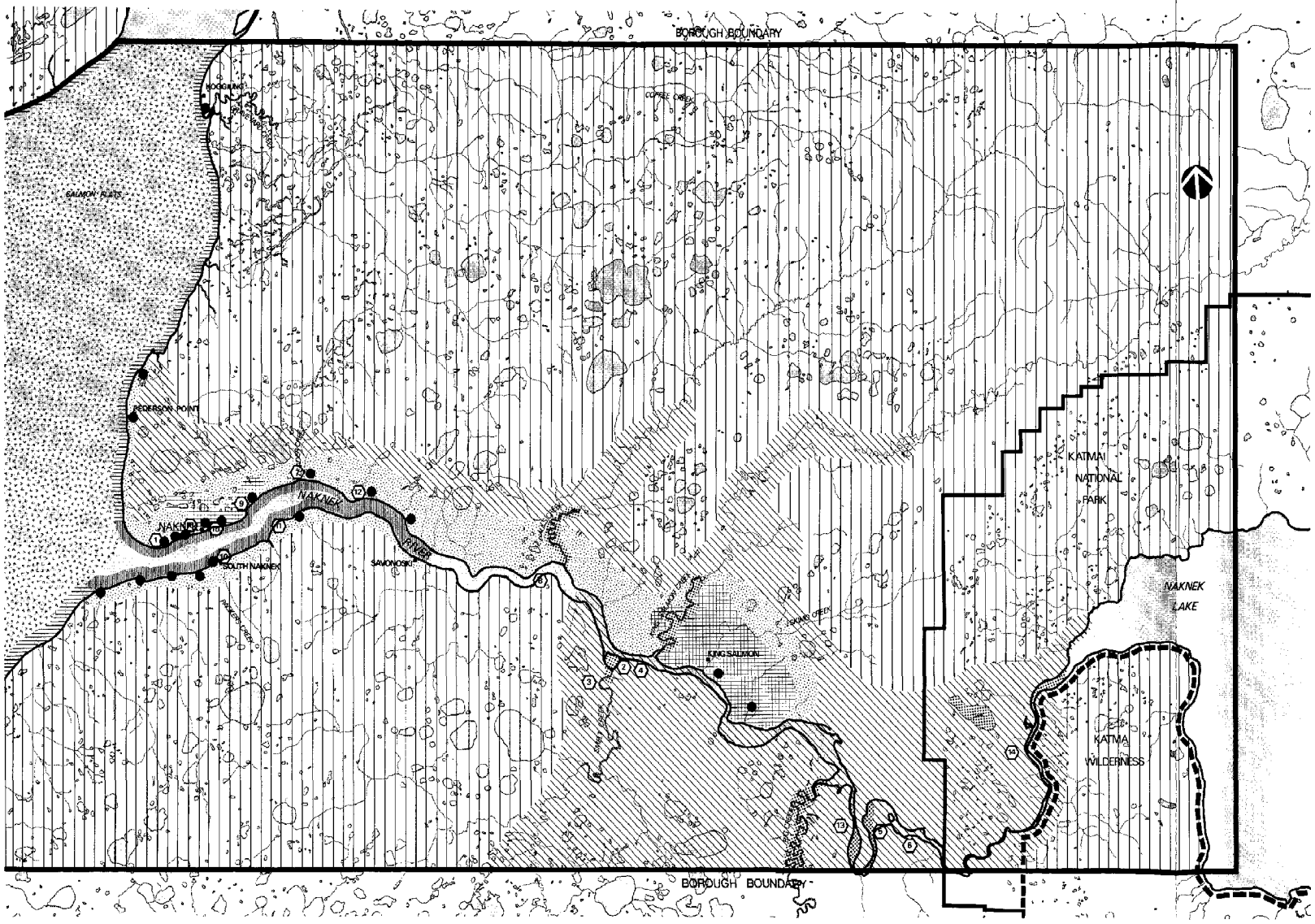
In the communities of Naknek, South Naknek, and King Salmon, residential and commercial development has occurred to support the Borough's resident population. The approximate total area for commercial and residential use in the three communities is 3,000 acres. The figure is a gross estimate including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



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

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.

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 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 jet aircraft and has an apron for airplane storage. A new passenger terminal has been completed. Table 4.2 lists the airport and landing strips within the Borough. Numbers on the table correspond to numbers found on the transportation map.

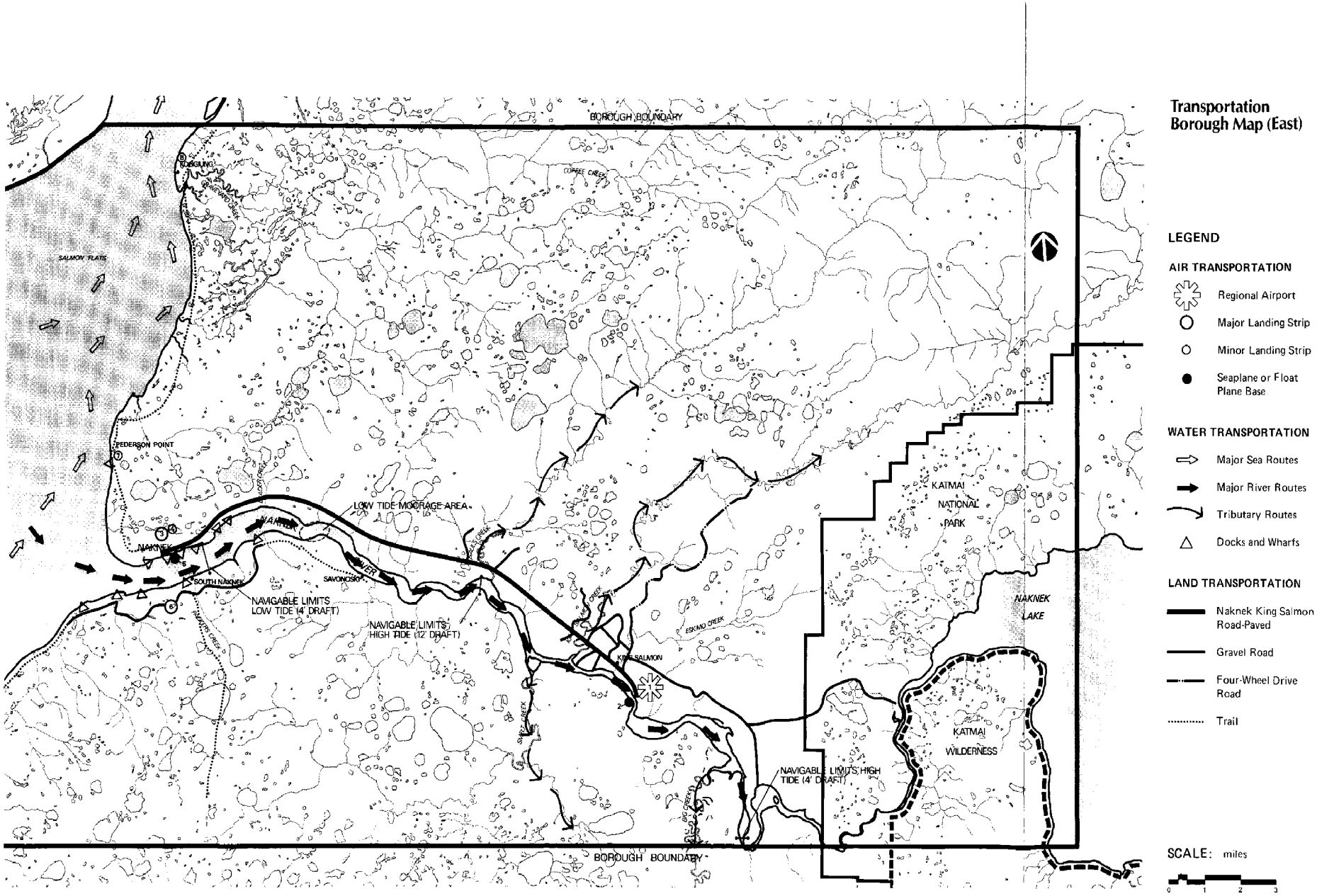
The Bristol Bay Borough is serviced by barge and ship. Freight is moved in and out of the Borough by sea during the ice-free months of the year. Due to the extreme tidal fluctuation (18.5 feet), the Naknek River at low tide is navigable only to South Naknek, for crafts and drafts of 4 feet or less. At 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 5.2

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 feet	Naknek River	Public	Runways, apron, an terminal
3.	Naknek	Landing strip	1,700 feet	Gravel	Private	Peninsula air service
4.	Naknek	Landing strip	1,700 feet	Dirt	Public	Lighted
5.	Naknek	Landing strip	1,700 feet	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 feet	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. 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 was recently built by the Borough.

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 5.3 and 5.4 for a listing of the communities' facilities, services, and utilities.

TABLE 5.3

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	Roads Airport Dock facilities Marine industrial park (planned)	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 Dept. of Fish & Game NOAA U.S. Fish & Wildlife

TABLE 5.4

COMMUNITY UTILITIES

	Water Supply	Sanitary System	Solid Waste	Electric	Communication
Naknek	Ground and surface water well	Septic tanks Sewer system scheduled 1983	Landfill shared with King Salmon	Naknek Electric Assoc.	Radio reception Television (Alaska Satellite Sys.) Telephone
South Naknek	Groundwater well	Septic tanks Municipal sewer system scheduled for HUD housing 1981	Open dump	Naknek Electric Assoc.	Radio reception Television (Alaska Satellite Sys.) Telephone
King Salmon	Groundwater well	Septic tanks Municipal sewage 1984	Landfill shared with Naknek	Naknek Electric Assoc.	Radio reception Television (Alaska Satellite Sys.) 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 among long-time residents that the community has grown significantly in the past 10 years. The Borough conducted a census on December 12, 1981 and counted 1,250 residents.

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 5.5 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 5.5

POPULATION
BRISTOL BAY BOROUGH

	1970 Census	1980 Census	1980 Village Council Estimates	1980 Borough Estimate(a)	1981 Borough Census(b)
King Salmon	202	196	N/A	N/A	374
King Salmon AFB	403	340	340	N/A	371
Naknek	318	317	381 (212 Natives 169 whites)	N/A	369
South Naknek	154	147	146 (58 school age and below)	N/A	136
Other	70	94	N/A		
TOTAL(b)	1,147	1,094	N/A	1,685(a)	1,250(b)

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

b. Borough conducted a census using high school seniors as census takers; December 12, 1981.

c. 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 5.6 and Figure 5.1. Employment figures in Table 5.6 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 5.1, 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 5.6 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.

In the Bristol Bay Borough, as in the region, commercial fishing is the industry most important to the economy. Fishing and fish processing provide ample summer employment for both the permanent and seasonal residents of the Borough and contribute the highest proportion of total annual employment. Unemployment in the Borough remains a chronic problem which permanent residents face during the remainder of the year. Figure 1 illustrates the nature of seasonal employment and the extent of unemployment throughout the year. It is important to note that unemployment in the Borough has been typically well above the statewide average. Government, traditionally one of the most important employers in Alaska, provides the largest amount of year-round jobs in the Borough. There are approximately 36 land-based businesses located in the Borough that supply goods and services to both the permanent and seasonal residents and support government activity, including the 340 people at King Salmon Air Force Base.

Subsistence hunting and fishing is an important part of the Borough residents' livelihood. There were approximately 211 subsistence permit holders from the Borough and an additional 147 permit holders from outside the area in 1980. A total of 358 permit holders took over 20,000 salmon during the season. Moose, caribou and waterfowl also provide subsistence food sources to the Borough residents.

MAJOR ECONOMIC ACTIVITY

The Borough's economy is very basic. Fishing, the Borough's primary industry, provides seasonal employment for permanent residents. Local, state and federal governments provide the largest amounts of year-round employment. Subsistence hunting and fishing continues to play a significant role in the local economy. Tourism and the construction industry are primarily limited to the summer months.

TABLE 5.6

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.

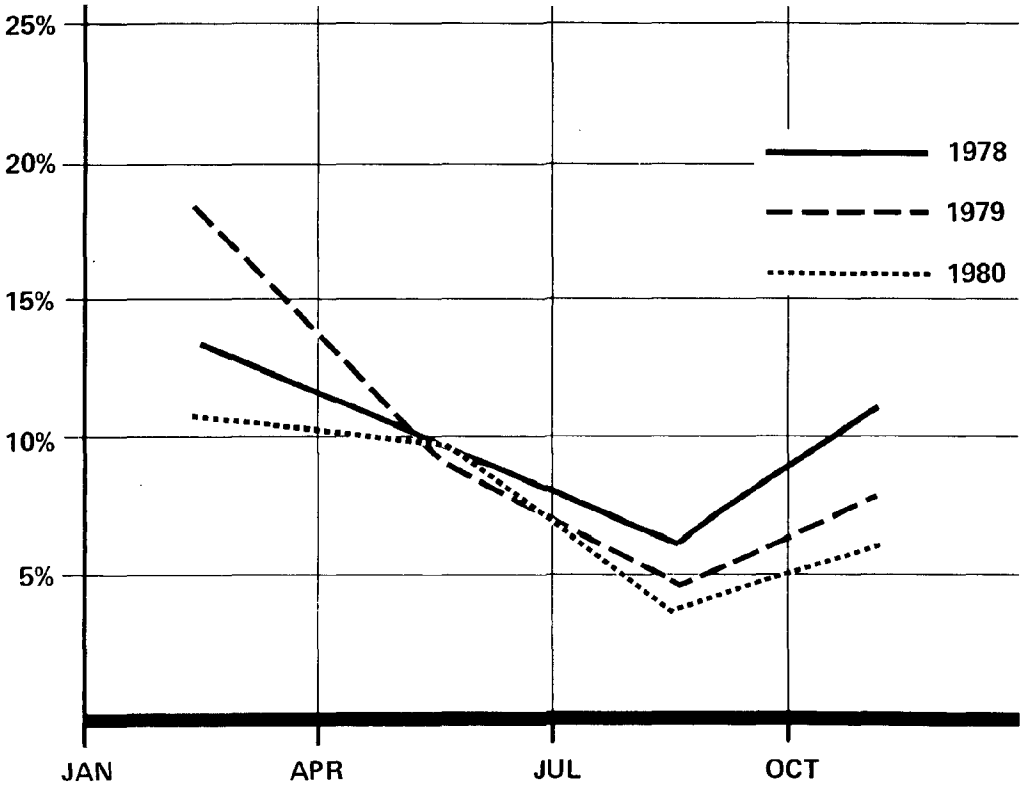
Source: Alaska Department of Labor, Statistical Quarterlies, 1978–1979.

There are basically two types of impacts that could have a major effect on the local economy. The first is any occurrence that could affect the fishing industry itself, i.e., changes in technology, availability of fish, etc. The second is any occurrence that could generally affect the seasonal nature of the present Borough's employment base, i.e., year-round employment opportunities, longer fishing season, etc.

The fishing industry, despite the drastic fluctuation in numbers of fish, appears to be a fairly stable element in the local economy. Technology is changing, but the changes are occurring slowly. Generally, there is a reduction in the number of shore-based canneries and an increase in the number of fast-freeze processing sites to support air freighting salmon to market. There is a slow to moderate growth in the demand for shore-based facilities. The length of the fishing season is changing with the addition of a herring fishery and the potential for bottomfishing in the Bering Sea.

FIGURE 5.7

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



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

Two major oil and gas lease sales close to Bristol Bay are presently scheduled. They are the St. George Basin sale, scheduled for February of 1983, and the North Aleutian Basin sale, scheduled for April of 1985. With proper environmental attention to the salmon grounds, neither sale should

have a significant impact on the Bristol Bay Borough. Communities located further south on the Alaska Peninsula have been identified as better able to provide support services to leasable lands. In addition, tidal waters in the Borough are extremely shallow and hamper movement in and out of the port. However, the Borough airport is one of the most fully developed in southwest Alaska.

A state uplands sale is scheduled for the area around Bristol Bay Borough in September of 1984. Oil and gas potential in these areas is presently estimated as moderate to high. An uplands federal lease sale also has been under consideration. If upland oil and gas lands were to develop, that could create year-round employment opportunity within the Borough. In addition, support services and population would increase in order to accommodate the influx of industry.

Tourism, outdoor recreation and sport hunting and fishing are activities that could expand due to the recent passage of the Alaska National Land Conservation Act. In addition to enlarging Katmai National Park, the Act established the following parks and wildlife refuges in November of 1980:

- Lake Clark National Park and Preserve
- Alaska Peninsula National Wildlife Refuge
- Becharof National Wildlife Refuge
- Alaska Maritime National Wildlife Refuge
- Togiak National Wildlife Refuge
- Aniakchak National Monument and Preserve

The Bristol Bay Borough is the logical staging area for serving park and refuge users and presently services many of the 10,000 annual visitors to Katmai. These activities attract visitors six months of the year and could expand seasonal employment opportunities.

COMMERCIAL FISHING AND FISHERIES

Commercial fishing is the most important industry in the Borough and regional economy. Table 5.8 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 5.9 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 5.10 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).

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 5.8, 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 5.11 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.

TABLE 5.8

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 5.9

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 5.10

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 5.11

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.

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 also must 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 5.12. During these years Borough fishermen earned greater average incomes than did Alaska fishermen who were not Borough residents.

TABLE 5.12

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	3,689
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.

As previously noted, the income from fishing is a function not only of the number of fish available for harvest but also of the price received for the fish. Representative exvessel prices in Bristol Bay for the past several years are shown in Table 5.13. 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.

TABLE 5.13

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.

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.

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.

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 5.14. 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.

TABLE 5.14

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	12
Public Health Nurse	2
Department of Fish & Game	6
State Trooper	1
Local Government	
Bristol Bay Borough	12
Bristol Bay School District	39
Police	1
Martin Monsen Regional Library	1
Village Councils	4

Source: Interviews with government employees

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 12 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 conducting 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 5.15 shows the place of residence of 1980 subsistence fishermen in the Bristol Bay Borough area and Table 5.16 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.

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 fisherman come from outside the Borough, they may use local guides and the hotels, restaurants, 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 5.17 shows the 1979 sport fish catch in the Naknek River and Naknek Lake.

TABLE 5.15

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 5.16

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 5.17

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/arctic 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

Wild game also is 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 also are 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 5.18 shows the estimated numbers of large game hunters who use the Borough as a base for hunting.

TABLE 5.18

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 also are 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. An estimated 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 5.19 shows the number of land-based business 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.

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 5.20 and 5.21 show various barge and air freight rates.

TABLE 5.19

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.

TABLE 5.20

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 5.21

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

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 $12,000. A two-bedroom home with running water and electricity was recently assessed at $140,000.

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 5.22 shows the types of energy used by various sectors in the community in 1977. The Bristol Bay Borough used 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.

LOCAL DEVELOPMENT ACTIVITY

The following projects are typical of development activity within the Bristol Bay Borough. These projects will provide direct economic benefits to the Borough, particularly during the construction phase. However, many of the projects will be built during the summer months which will coincide with the salmon season, the period of highest employment. Also, the construction may require specialized labor which would be imported from outside the Borough. Construction that begins in the spring and extends into the fall periods on either side of the salmon season could offer additional employment opportunities to the local work force.

Public Dock

A pile-supported, concrete dock was constructed in 1982. The new facility is the only public dock in the Borough. Prior to its completion, small barges either unloaded at the cannery docks or were beached for unloading.

The new dock facility can accommodate 200-foot vessels. Two cranes are available, one capable of unloading containers and one smaller crane for unloading break bulk cargo. The channel adjacent to the dock is dredged to 16 feet below mean low tide, allowing deeper draft vessels to remain afloat at low tide. An upgraded road access and an expanded staging area remain to

be constructed as part of the dock facility. Once complete, the cost of the dock, staging area, and road is estimated at $7 million.

Marine Industrial Park

An industrial park is planned adjacent to the public dock facility to support marine cargo handling and storage and encourage industrial development. The complex will contain a warehouse structure and possibly a public works facility. The warehouse will be used for cargo storage and may include cold storage. The marine industrial park is estimated to cost $3 million.

Sewage Disposal System

The U.S. Public Health Service recently constructed a sewage disposal system in South Naknek that will tie 15 existing homes to the existing system servicing the 11 recently constructed HUD houses. The system provides primary treatment and pump outfall through a 900-foot buried line into the Naknek River. The construction cost of the South Naknek system was approximately $1.1 million.

Sewage disposal systems are also planned for Naknek and King Salmon. A $3.5 million system has been designed for Naknek that includes primary and secondary treatment using a sewage lagoon. The project will be partially funded with funds projected to be available in 1983.

Solid waste disposal sites are planned for both Naknek/King Salmon and South Naknek. The Naknek/King Salmon site will include a trash compactor and will cost $1.5 million to construct. South Naknek will use an earthfill disposal site with a bearproof fence at the cost of $0.5 million.

Airport Improvement

Improvements are anticipated for both the Naknek airstrip and the King Salmon Airport. Naknek airstrip improvements costing approximately $2 million are presently scheduled for the summer of 1982. Improvements include straightening, gravel resurfacing and improved lighting of the airstrip. In King Salmon, two airport projects are under consideration. An improved surface on the east-west runways is considered necessary by the Air Force in order to better accommodate the high-speed, high-performance aircraft found at the King Salmon installation. Another improvement for the King Salmon airport is the expansion of the east apron. King Salmon, a major regional airport serving the fishing industry, the Air Force and the general public, experiences crowded conditions during the peak of the red salmon run. The expansion of the east apron is expected to partially alleviate this problem. Benefits expected from the projects include increased employment during construction and a better air facility for the area.

Public Facilities

A $4 million addition to the school in Naknek was recently completed and added classrooms and an auditorium to the facility. Fire stations were recently completed in South Naknek and to support fire protection on both sides of the river.

The Borough intends to broaden its health care responsibility by constructing a 2,500-square-foot health clinic in Naknek. The clinic will include an emergency room, offices, examination rooms, X-ray equipment, and provisions for eye, dental, and medical care.

Industrial and Commercial Development

There is a moderate amount of new industrial and commercial development recently constructed or planned for the Borough fish processing facilities, boat storage, transportation facilities, maintenance yards; lodges and cabins are representative of the type of construction occurring presently. The location of these facilities are logically related to the Naknek River or its tributaries because they service fishing or fish processing.

Residential Development

The Bristol Bay Borough has begun site development for a subdivision located on 800 acres of land overlooking the Naknek River. A community cemetery and residential lots are developed and ready for disposition to individual owners. In addition, the Alaska Peninsula Corporation is discussing the possibility of a subdivision in the South Naknek area and Paug Vik, the village corporation of Naknek, is planning a 5-acre, 99-year lease program along the rapids section of the Naknek River. Fifteen to 20 single-family residences will have been constructed during 1982, and it is expected that an equal number of residential units will be constructed during 1983.

TABLE 5.22

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.

6. 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 may 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 Coastal Resource Service Area was organized in 1981 and a board was elected in 1982. They are now actively undertaking the preparation of the service area coastal management program.

THE BOROUGH

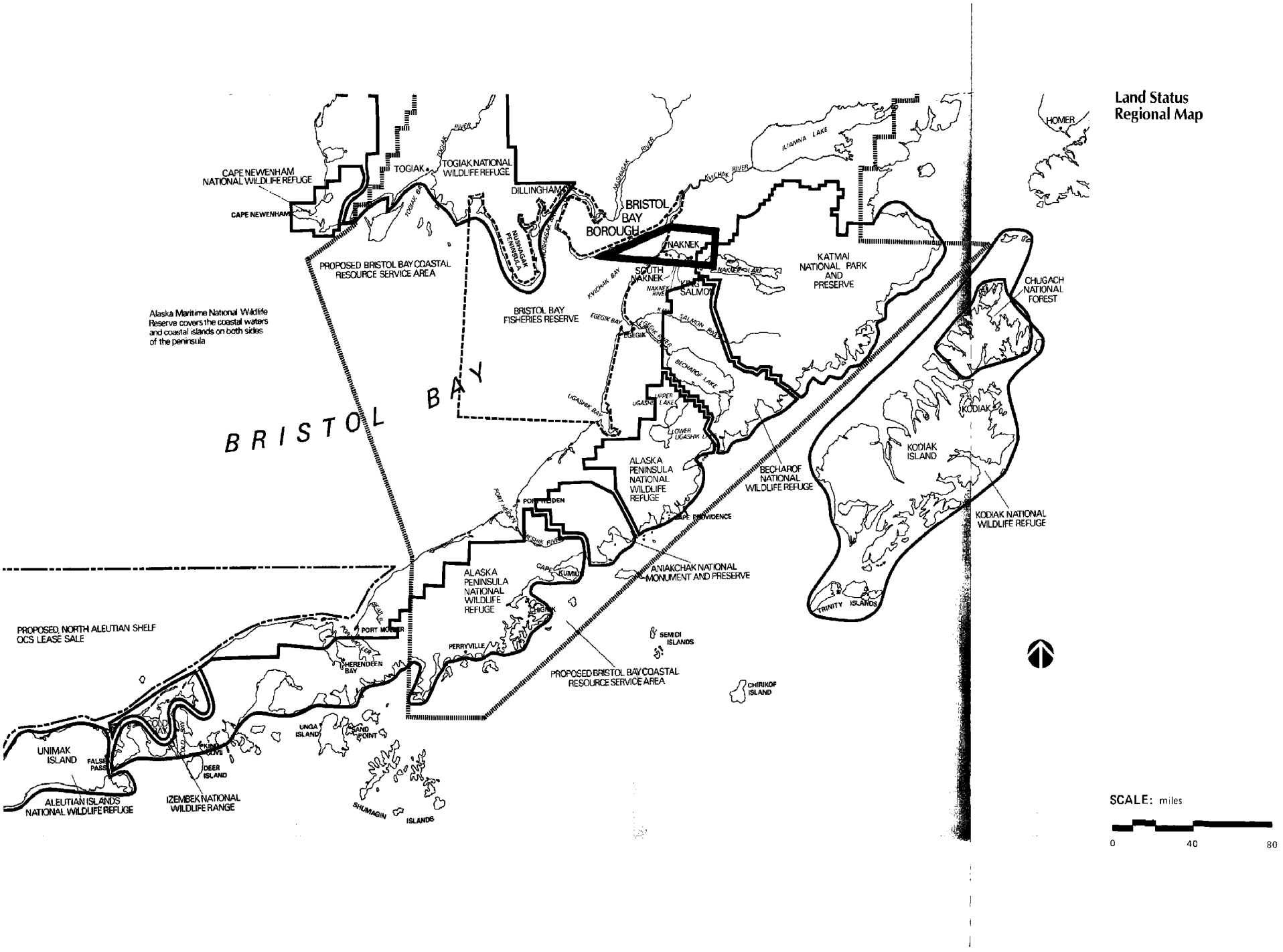
LAND OWNERSHIP

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 6.1). 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.

TABLE 6.1

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	323,600	101	---


Land Status
Regional Map
CAPE NEWENHAM NATIONAL WILDLIFE REFUGE
CAPE NEWENHAM
TOGIAK
TOGIAK NATIONAL WILDLIFE REFUGE
DILLINGHAM
BRISTOL BAY BOROUGH
NAKNEK
SOUTH NAKNEK
KING SALMON
HOMER
ILIAMNA LAKE
KVICHAK RIVER
KATMAI NATIONAL PARK AND PRESERVE
CHUGACH NATIONAL FOREST
PROPOSED BRISTOL BAY COASTAL RESOURCE SERVICE AREA
BRISTOL BAY FISHERIES RESERVE
Alaska Maritime National Wildlife Reserve covers the coastal waters and coastal islands on both sides of the peninsula
BRISTOL BAY
EGEGIK
EGEGIK BAY
BECHAROF LAKE
UGASHIK BAY
UPPER UGASHIK LAKE
LOWER UGASHIK L.
ALASKA PENINSULA NATIONAL WILDLIFE REFUGE
BECHAROF NATIONAL WILDLIFE REFUGE
KODIAK
KODIAK ISLAND
KODIAK NATIONAL WILDLIFE REFUGE
PORT HEIDEN
CAPE PROVIDENCE
ANIAKCHAK NATIONAL MONUMENT AND PRESERVE
CAPE KUMLIK
PERRYVILLE
SEMIDI ISLANDS
TRINITY ISLANDS
CHIRIKOF ISLAND
PROPOSED NORTH ALEUTIAN SHELF OCS LEASE SALE
PORT MOLLER
HERENDEEN BAY
UNIMAK ISLAND
FALSE PASS
KING COVE
DEER ISLAND
UNGA ISLAND
SAND POINT
ALEUTIAN ISLANDS NATIONAL WILDLIFE REFUGE
IZEMBEK NATIONAL WILDLIFE RANGE
SHUMAGIN ISLANDS
SCALE: miles
0
40
80

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

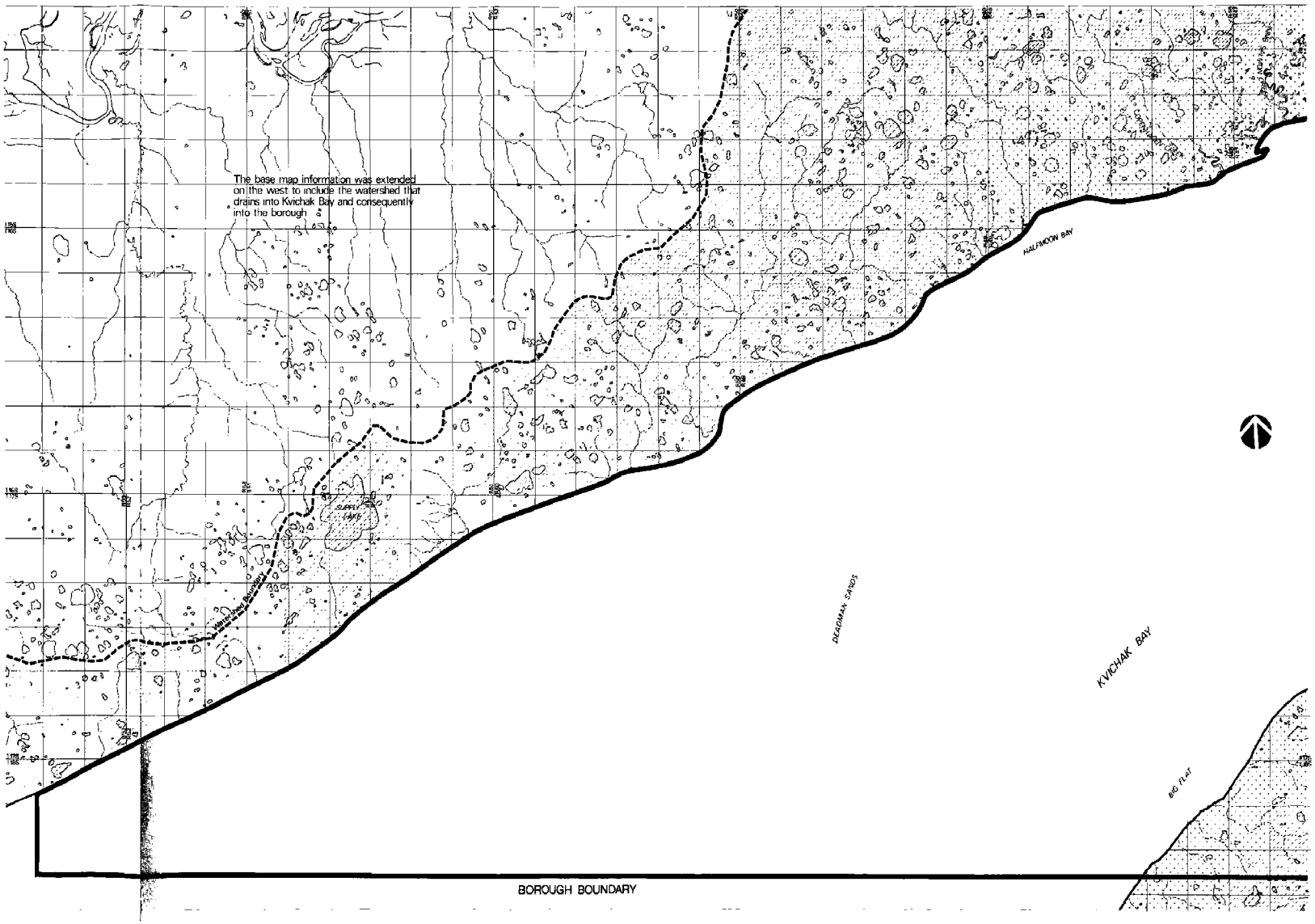
There is a minimal amount of state land in the Borough. The state land consists of small sites to house state agencies, land leased for the King Salmon Airport, material sites for common use, or land being selected by the Borough. A portion of all of the state's selections of federal land within the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

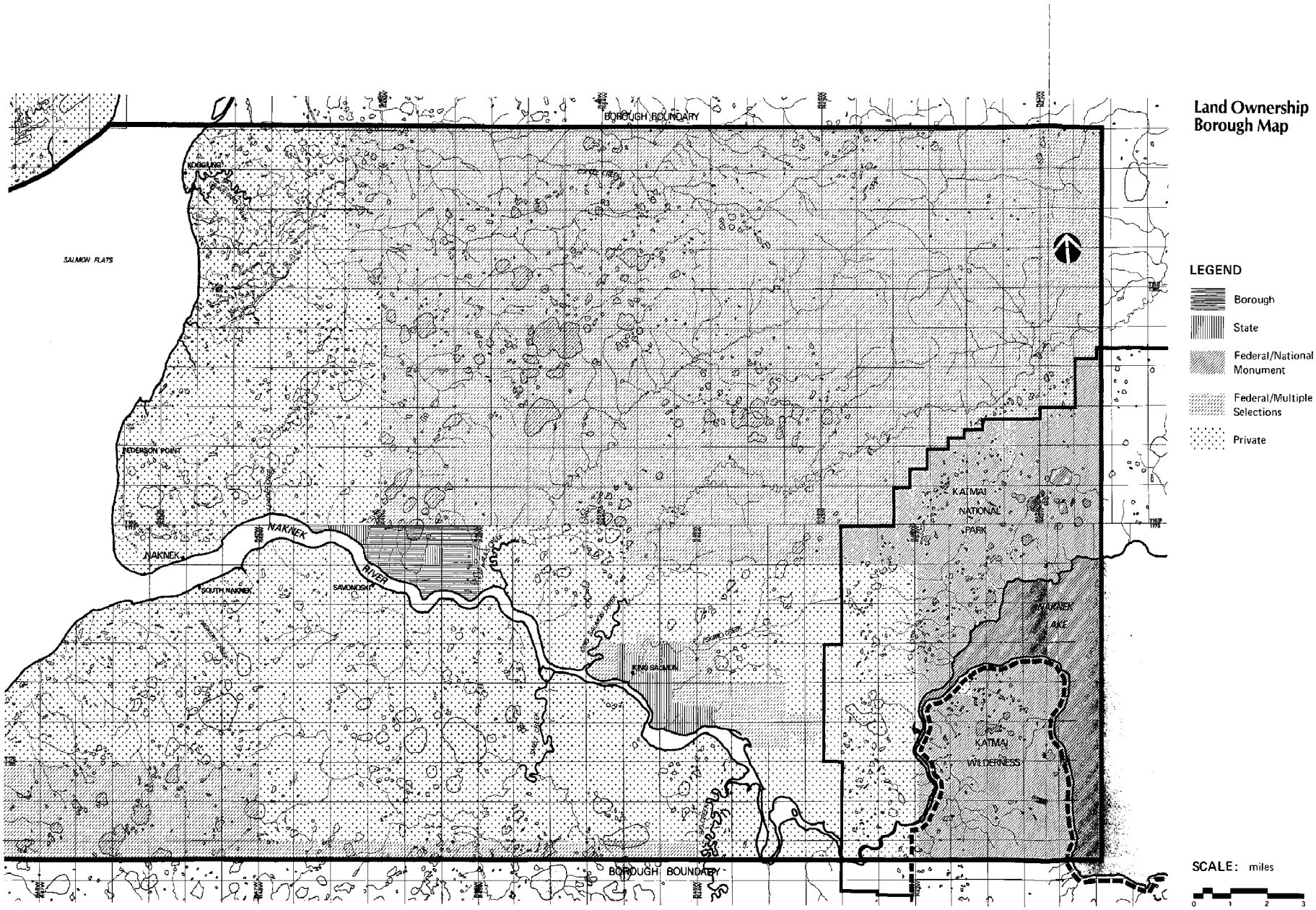
Borough Ownership

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.

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.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough
HALFMOON BAY
DEADMAN CANDS
KVICHAK BAY
BIG FLAT
BOROUGH BOUNDARY


Land Ownership
Borough Map
LEGEND
Borough
State
Federal/National Monument
Federal/Multiple Selections
Private
BOROUGH BOUNDARY
KOGGIUNG
SALMON FLATS
PEDERSON POINT
NAKNEK
NAKNEK
RIVER
SOUTH NAKNEK
SAVONOSKI
KING SALMON
KATMAI
NATIONAL
PARK
NONVIANUK
LAKE
KATMAI
WILDERNESS
BOROUGH BOUNDARY
SCALE: miles
0
1
2
3

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 Fisheries Services

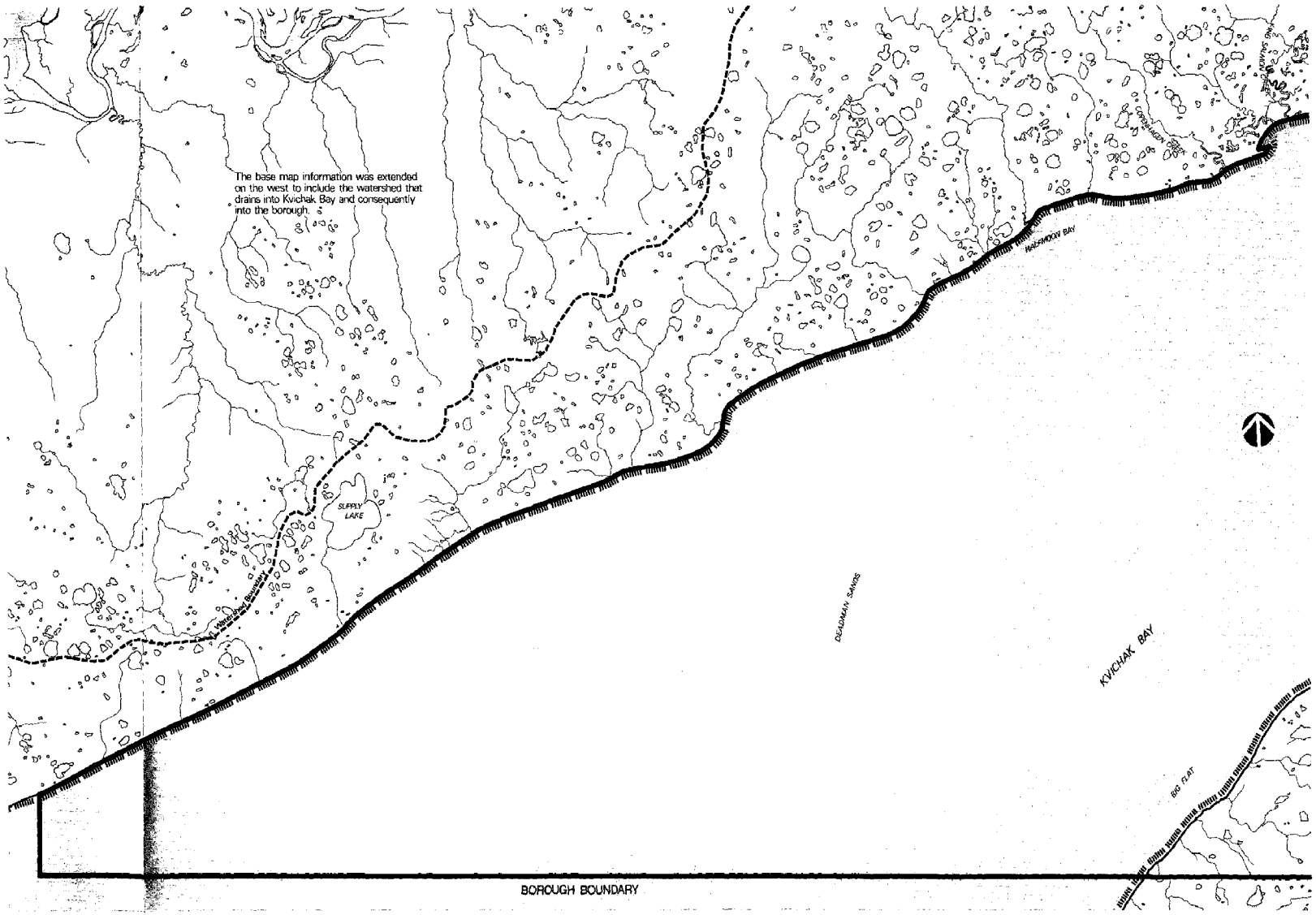
State Jurisdiction

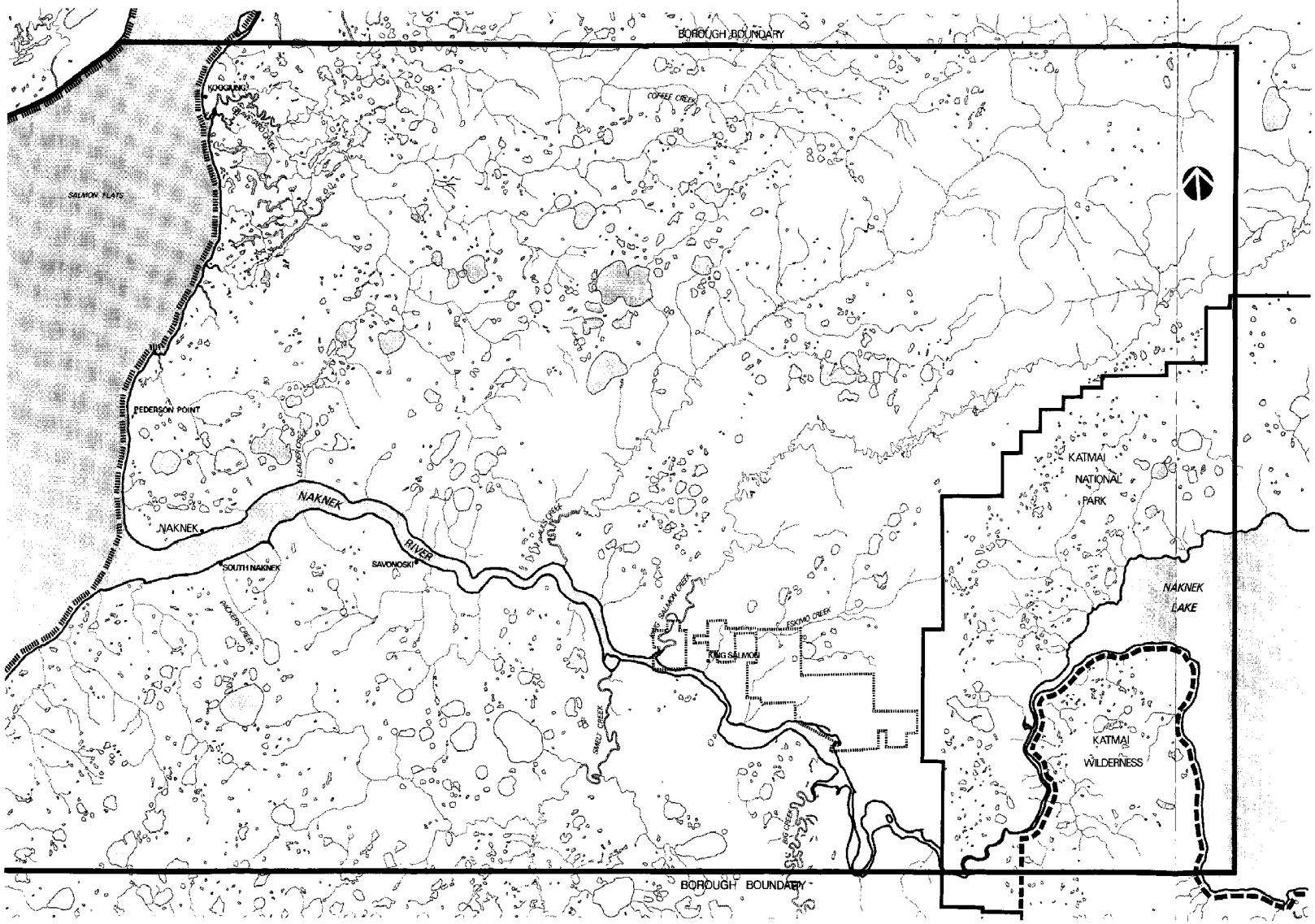
The State of Alaska has jurisdiction over state land within the Borough. In addition, the state manages the waters of Kvichak Bay. The Alaska Department of Fish and Game manages the fishery within the bay and the wildlife in upland areas.

Borough Jurisdiction

The Bristol Bay Borough, with second class status, has three basic powers. They are taxation, 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.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
SUPPLY LAKE
DEADMAN SANDS
KVICHAK BAY
BIG FLAT
BOROUGH BOUNDARY



Land Management Borough Map

LEGEND

- Bristol Bay Fisheries Reserve
- King Salmon Air Force Base

SCALE: miles

0 1 2 3

Part II Management Plan

1. The Program

BACKGROUND

The coast of the United States has long been one of our country's greatest assets. Coastal habitats contain 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 which must be acknowledged and respected. 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 coastal resources. In 1977, the Alaska Legislature passed the Alaska Coastal Management Act which established a process for protecting and managing the coastal resources of the state. The legislature made most local governments and special planning boards in the unorganized Borough responsible for managing the coast within their jurisdictions 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 standards and guidelines of the Alaska Coastal Management Program.

- Implementation: A description of the method and process 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.

MANAGEMENT PROGRAM, PART I AND PART II

The Bristol Bay Borough Coastal Management Program is divided into two halves. Part I is the resource inventory and analysis and Part II is the management plan which includes goals, a management framework, coastal policies and an implementation approach.

PART I, RESOURCE INVENTORY AND ANALYSIS

The resource inventory contains a review of the physical, natural, and man-made resources within the Bristol Bay Borough. It consists of a narrative and a series of maps, which describe the nature and distribution of the resources found throughout the coastal district.

PART II, MANAGEMENT PLAN

The management plan includes the remainder of the program requirements. It includes a narrative and maps, which present:

- Description of community goals and objectives
- Boundary identification
- Management recommendations
- Recommended areas which merit special attention (AMSA)
- Uses within the management area
- Coastal policies
- Implementation process

2. The Boundary

THE BOROUGH

The Bristol Bay Borough is approximately 500 square miles in area and extends from the foothills of the Aleutian Range in Katmai National Park to the western shore of Kvichak Bay.

The east side of Bristol Bay Borough encompasses the majority of the usable land and the communities of Naknek, South Naknek, and King Salmon (see Borough Map). The west side primarily contains Kvichak Bay and land extending to the western boundary of the coastal watershed. The western Borough boundary runs along the western mean high tide line of Kvichak Bay. The base map extends west of the mean high tide line to include the coastal watershed that drains into Kvichak Bay and consequently into the Borough.

The biophysical boundary, delineating the coastal zone in the Borough, is established by the Biophysical Boundaries of Alaska's Coastal Zone, and illustrated on the Topography and Coastal Morphology map. This boundary approximates the 200-foot contour and includes over 75 percent of the land and water area within the Borough boundaries. All transitional and intertidal areas, salt marshes, saltwater wetlands, islands and beaches are within the biophysical boundary.

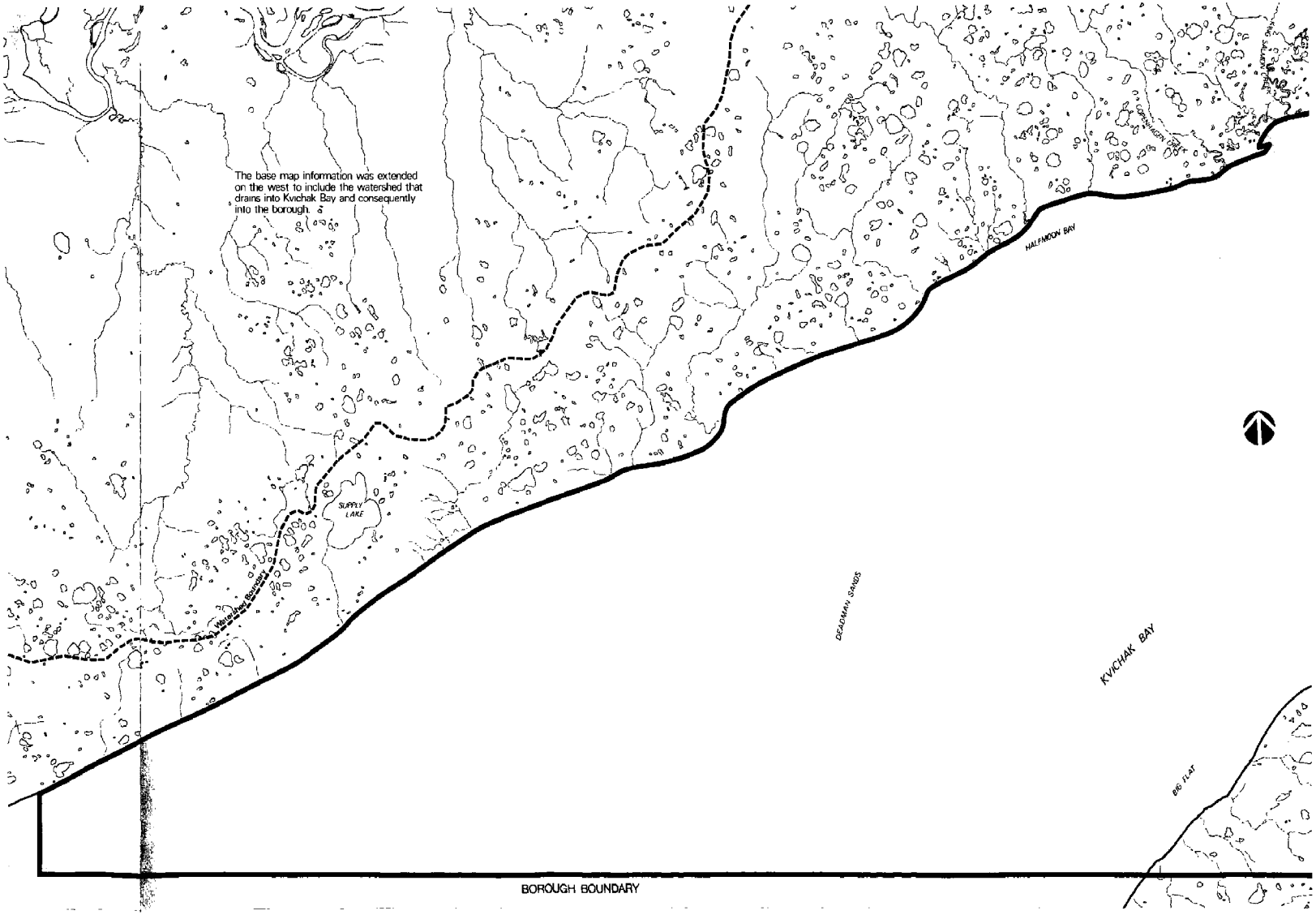
The Bristol Bay Borough chose to extend the district boundaries beyond the established biophysical boundaries to include important areas of direct influence and to conform to the Borough's political jurisdiction. Establishing the Borough boundaries as the program boundary incorporates the following areas above 200 feet elevation found in the Borough:

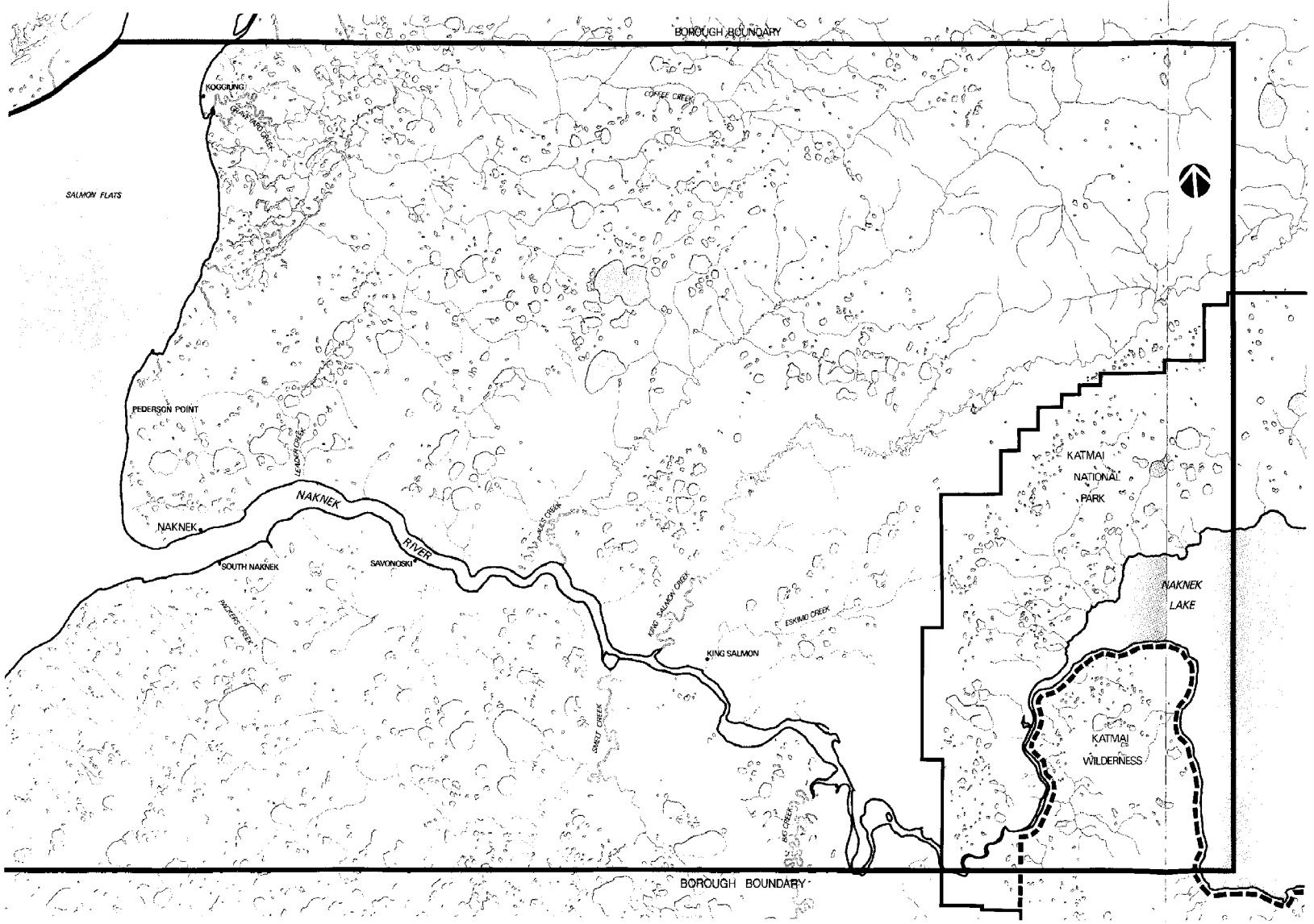
- The foothills of the Aleutian Range found in the northeast corner of the Borough. These hills provide important uplands habitat and form the upper drainage of King Salmon and Paul's Creeks.

- The ridge separating the Naknek Lake and Naknek river systems which drain into primary salmon spawning areas.

- The hills in the southwest corner of the Borough which drain into the Naknek River and Kvichak Bay, both important anadromous fish migration routes.

The Bristol Bay Borough coastal management district is surrounded by the Bristol Bay region coastal resource service area. This service area has been designated, organized, and is presently developing its coastal management program. The Borough's district boundaries were designated to be compatible with the contiguous service area, and now include the entire jurisdiction of the Borough.


The base map information was extended on the west to include the watershed that drains into Kvichak Bay and consequently into the borough.
SUPPLY LAKE
Watershed Boundary
DEADMAN SANDS
HALFMOON BAY
KVICHAK BAY
BIG FLAT
BOROUGH BOUNDARY



Boundary Borough Map

Note: The Borough boundaries coincide with the proposed coastal management boundaries.

SCALE: miles

0 1 2 3

3. Goals and Objectives

SETTING

The Bristol Bay Borough, working with community representatives and the coastal management citizen advisory committee, developed goals and objectives detailing needs and future plans for the Borough. Five community meetings were held in Naknek, South Naknek, and King Salmon during development of the program. The following goal statements are a result of the community involvement.

LAND USE PLANNING

Goal: Actively pursue sound land use planning which helps guide the future growth and development of the Borough and its communities.

The Bristol Bay Borough has responsibility for planning and zoning within its boundaries. There is a need for sound land use planning within the Borough to guide the development of the area according to the desires of its residents. (The Borough is currently undertaking a detailed rewrite of the zoning code).

Long-Range Development Plan

Objective: Prepare and periodically update a comprehensive development plan.

The current comprehensive plan for the Bristol Bay Borough is obsolete. To adequately plan for the future needs of the Borough it is necessary to prepare a long-range development plan, taking into consideration potential developments such as servicing the petroleum industry and future bottomfish processing.

Coordination of Efforts

Objective: Coordinate land planning, development, and management with state and federal entities.

To date, intergovernmental coordination has been lacking, and governmental planning and programs have been redundant. Due to recent efforts by state and federal governments, coordination in the Bristol Bay region is beginning to take place. The opportunity exists for the Borough to work in concert with a variety of government agencies in the area of planning, data collection, program development and implementation, and land management.

Data Update

Objective: Develop a current data base including base maps, resource inventory, etc., to support wise planning and land use decisions.

Land use planning decisions need to be based on current information. At present, resource data and base mapping for the Borough is sketchy and outdated. (The Borough is planning on mapping the entire borough at a scale of 1" = 500' during 1983).

Natural Hazards

Objective: Identify potential hazards and minimize potential impacts through wise land use planning.

Natural hazards such as landslides and flooding have threatened lives and caused property damage. Though difficult to prevent, it is possible to lessen the impact of these natural occurrences.

COMMUNITY DEVELOPMENT

Goal: Plan for and guide the present and future development of the Borough and its communities.

Areas of the Bristol Bay Borough have been settled and used for centuries. Since 1900 the villages of Naknek, King Salmon, and South Naknek have grown and developed into permanent communities that support a resident population. It is important to maintain the health of these communities and guide their future development.

Housing

Objective: Plan for and promote housing rehabilitation and adequate new housing to meet both the current and future demand.

Currently, there is a demand for suitable housing in the Bristol Bay area. Many of the dwelling units are old and in need of repair. There is also a shortage of adequate rental housing in the area. The housing situation is multifaceted including such problems as the lack of buildable land, high land costs, mortgage rates, etc.

Objective: Plan for and assist in providing adequate seasonal housing for the seasonal work force.

During the Bristol Bay commercial fishing season, there is an influx of several thousand transient workers. Most of the canneries provide some housing for their workers. However, there are far more workers than there are accommodations. Hundreds of people are forced to camp throughout the area, causing sanitation problems and destruction of private property, and negatively impacting the environment and scenic values.

Commercial Development

Objective: Maintain existing commercial services within the Borough.

Objective: Identify and set aside primary commercial land within the Borough for future commercial development.

Objective: Encourage and give priority consideration to water-dependent commercial development for future waterfront use.

Objective: Encourage marine and related commercial activity to support an existing and expanding fishing industry.

Commercial development within the Borough supports both the resident population and a seasonal in-migration related to the fishing industry. Commercial activities and development provide positive economic benefits to the Borough and its communities. As the population grows and the fishing industry expands, new commercial opportunities will evolve. To take advantage of these opportunities it is necessary to plan for and promote commercial activity.

Public Facilities

As in any regional center, a need exists for public facilities to support a variety of activities involving the communities and their residents. The areas important to the Borough and in need of consideration are: schools, fire protection, public safety, sports/recreation, and transportation.

Objective: Work with the school district and the communities to maintain and enhance existing schools to serve both educational and community needs.

Education is a primary responsibility of the Borough, assumed by the Borough school board. Public schools within the district serve not only as educational facilities, but also as meeting places and community centers, offering a variety of recreational opportunities. The facilities are important to the community and need to be maintained for the benefit of the entire area.

Objective: To maintain existing fire protection to serve the communities within the Borough and to expand the fire protection capacity to fight industrial and marine fires.

Fire protection is essential to minimize personal injury and property damage. A basic need within the Borough is to expand the fire protection capability to cover industrial and marine related facilities. In the past, boats and canneries have been severely damaged by fire, due to the lack of adequate equipment. (Fire halls in Naknek and South Naknek have recently been completed).

Objective: Plan for and develop a public safety facility that includes a detention center, residence, offices, etc.

The Borough is in need of a public safety facility. At the present time, there is no such facility; persons arrested for infractions requiring detention are held in an interim holding facility recently constructed in the basement of Borough hall.

Objective: Maintain existing sport and recreational facilities within the Borough and plan and develop additional facilities on an as-needed basis.

The school gym and the rifle range are good examples of the kind of sports and recreational facilities that can be made available to the Borough residents. The need and value of these facilities are well known and the benefits to both young and old are immeasurable.

Transportation

Objective: Repair the highway from King Salmon to Naknek and maintain the road year-round.

Objective: Upgrade the existing local roads to a service road standard and set standards for all new local road construction.

Transportation within the Borough is essential for moving goods and services and for maintaining the industrial base. At present, there is a paved highway in need of repair connecting Naknek and King Salmon and a variety of local roads which remain unimproved. The main highway between Naknek and King Salmon is badly deteriorated.

Objective: Work with the State Department of Transportation and Public Facilities to determine the feasibility, to plan for and to develop the appropriate elements of a regional transportation system including ferry service between the Borough, other regional centers, and the Alaska highway system, and a bridge servicing Naknek and South Naknek and making the Alaska Peninsula accessible to the Bristol Bay Borough.

Utilities

Objective: Develop, if feasible and cost effective, an area-wide utility system that provides adequate service to each of the Borough's communities.

A utility system including sewer, water, waste disposal and electricity is a basic service to be provided by local government. The need for these utilities exists in all three communities.

Parks and Recreation

Objective: Maintain and increase recreational opportunities within the Borough by developing a park and recreation master plan which identifies the demand for recreation within the Borough, identifies and recommends conservation of primary recreation and scenic areas, increases and maintains controlled public access to the waterfront, and recommends recreational programs for Borough residents.

Outdoor recreation within the Borough is a matter of lifestyle and widely affects the quality of life of the Borough residents. The benefits of recreational opportunities can be measured in terms of healthy families and individuals, reduced crime rates and increased tourism. Ways to promote recreational opportunities include conserving land and water used for recreation, providing access and facilities for recreational areas and planning and developing area-wide recreational programs.

Economic Development

Goal: Strengthen the economy of the Bristol Bay Borough by encouraging economic development that provides employment opportunities on a year-round basis and maintains and expands the existing employment base.

The economy in the Bristol Bay Borough is primarily dependent upon commercial fishing, an industry characterized by its short, intensive seasons. A majority of the Borough residents are employed in the fishing industry between May and August. The construction industry, to a lesser extent, also provides employment opportunities, but it is also seasonal and coincides with commercial salmon fishing. State, federal, and local government is the major year-round employer.

Commercial Fishing

Objective: Prepare a fisheries development plan that identifies opportunities for maintaining and expanding the commercial fishing industry in the Borough, and recommends a program for taking advantage of the opportunities available to the community.

Objective: Set aside primary coastal areas and uplands for priority use by the commercial fishing industry and develop the necessary infrastructure (i.e., waste disposal, transient housing water sources, etc.) necessary to accommodate industrial development.

The potential exists for expanding the fishing industry by encouraging bottomfish and shellfish harvest and processing, by developing fish waste processing and by promoting the development of small-scale processing and marketing of salmon outside of the peak season.

Tourism

Objective: Increase the opportunities for tourism and recreational use in the Borough that stimulates economic development and minimizes negative environmental and social impacts.

Objective: Promote the development of tourist and recreational facilities within the Borough.

The Bristol Bay region contains a wealth of natural beauty, fish and wildlife and wilderness areas. The area is intensively used by backpackers, boaters, hunters, fishermen, and tourists from both inside and outside of Alaska. With the creation of a number of new national parks and the expansion of the Katmai National Park, the use of the region as a recreational and tourist area will continue to increase.

Industrial Development

Objective: Encourage industrial development that is compatible with community values and the natural resources within the region.

Objective: Identify and set aside land suitable for industrial development within the Borough.

Objective: Assess and, if feasible, develop support facilities and management programs to encourage oil, gas and mineral extraction and timber harvest that promotes positive economic impacts and minimizes negative environmental impacts.

In addition to commercial fishing there are other industries that could locate or develop within the Bristol Bay Borough, such as boat haul-out, repair and storage, service of oil and gas development, mining, etc. These industries could provide year-round employment or employment opportunities that may be compatible with the fishing industry.

LAND AND WATER MANAGEMENT

Goal: Protect important cultural and historic areas as well as critical natural habitat in the Bristol Bay Borough.

Objective: Prepare and implement an integrated land and water management program, including intergovernmental coordination, comprehensive planning, Borough-wide zoning, and subdivision regulations.

Subsistence hunting and fishing occurs on land and water within the Borough having important fish and wildlife habitat.

Subsistence

Objective: Identify and conserve areas predominantly used for subsistence hunting, fishing and foraging.

Objective: Provide public access to these areas traditionally used by Borough residents.

Subsistence hunting, fishing, and foraging represents an important part of the Borough residents' lifestyle and culture and contributes to their health and well being.

Historic and Cultural Preservation

Objective: Identify archaeological, prehistoric and historic areas and sites within the Borough.

Throughout the Borough there are areas of historic value that represent the beginning of man's history and his use of the land and water.

Fish and Wildlife

Objective: Minimize impacts of increased pressure and maintain populations by protecting important spawning and migration areas of salmon and resident sport fish species.

There are a variety of fish species found in the river, stream and lake systems in the Borough. Salmon are valuable both as a commercial and subsistence food source and as sport fish stock. Other species are harvested as a food source and for sport. A number of these species migrate and spawn throughout the Borough. Increased sport fishing has placed undue pressure upon some fish stocks.

Objective: Maintain and increase large mammal populations by protecting important wintering grounds, calving grounds, denning areas, and migration routes.

Increased sport and subsistence hunting of moose, bear, and caribou is putting pressure on these large land mammals.

Objective: Maintain the existing water quality within the Borough and protect marine mammal feeding and haul-out areas.

Marine mammals are found in the Naknek River system and in Kvichak Bay. The mammals are sensitive to polluted water and to the disturbance of feeding and haul-out areas.

Objective: Provide suitable wetland areas for local nesting and migratory waterfowl by protecting coastal and inland areas from draining, pollution, and other detrimental impacts.

Land and water within the Borough provide nesting and staging areas for a variety of waterfowl species. Adequate water levels and unpolluted water is important to maintain in these areas.

Objective: Provide ample opportunity to use all wildlife species for recreation by protecting denning, feeding, nesting, and wintering areas for small animals and birds.

Small fur-bearers and nongame birds are not only important for aesthetic and recreational value, but also are integral to the total ecology of the area. Many of the game animals need large populations of these smaller animals to feed upon.

4. The Management Framework

FRAMEWORK

The management framework chapter of this report focuses on the following topics required by the standards and guidelines:

- Subject Uses. Those land and water activities considered in the Borough's program.
- Policies. Statements that guide development and land and water uses within the Borough.
- Areas which merit special attention (AMSA). Those areas with unique and valuable resources needing special management attention.

SUBJECT LAND AND WATER USES

The following land and water activities and uses are subject to the Bristol Bay Borough Coastal Management Program.

- Coastal development. Residential, commercial, and industrial
- Recreation. Land and water areas
- Energy facilities. Oil and gas exploration, processing, and transport; electric and hydroelectric facilities; and transmission lines
- Transportation. Highway, air, and marine facilities
- Utilities. Water and sewer lines and facilities, wells and treatment sites, solid waste disposal
- Fisheries. Seafood processing, fisheries enhancement and rehabilitation.
- Mining and mineral processing. Hard rock mining; gravel, sand, and related extraction
- Subsistence. Areas used for subsistence activities

USES OF STATE CONCERN

The Bristol Bay Coastal Management Program addresses uses of state concern through its policies and implementation strategy. Uses of state concern, meaning those lands and water uses which significantly affect the long-term public interest, are outlined and defined according to the following five categories:

1. Uses of national interest, such as the use of resources for the siting of ports and major facilities which contribute to meeting national energy needs, construction and maintenance of navigational facilities and systems, resource development of federal land, and national defense and related security facilities that are dependent upon coastal locations.

2. Uses of more than local concern, such as land and water uses which confer significant environmental, social, cultural, or economic benefits or burdens beyond a single coastal resource district.

3. Siting of major energy facilities, activities pursuant to a state oil and gas lease, or large-scale industrial or commercial development activities which are dependent on a coastal location and which, because of their magnitude or the magnitude of their effect on the economy of the state or the surrounding area, are reasonably likely to present issues of more than local significance.

4. Facilities serving statewide or interregional transportation and communication needs.

5. Uses in areas established as state parks or recreational areas under AS 41.20 or as state game refuges, game sanctuaries, or critical habitat areas under AS 16.20.

Appendix V of the resource inventory lists and describes fisheries research and management sites nominated by the Department of Fish and Game as supporting uses of state concern. The uses are salmon enumeration and sampling sites located within the Naknek River drainage.

PROPER AND IMPROPER USES

It is the Bristol Bay Borough's intent to evaluate and to make decisions upon the appropriateness of land and water uses and activities on a case-by-case basis. Proposed uses will be measured according to the performance standards stated in the policy section of this report. The standards will be applied with due consideration to the resource inventory and analysis. A discussion of the review process is included in the implementation chapter of this report.

Additional discussion of uses of state concern is appropriate here. The reader will note that no uses of any kind are categorically excluded or restricted by this program. Thus, the test for doing so set forth in AS 46.40 for uses of state concern need not be addressed here. It is impossible to catalog all possible variatins of hypothetical uses of state concern that might be proposed for location in the Borough (or to catalog other possible uses that might impact an existing use of state concern in the Borough) and compare each possibility with the performance standards of this program.

It is possible that a use of state concern may be proposed in the future for location in the Borough; and that the review of this proposal could result in a denial or restrictive conditioning of the proposal. The test of AS 46.40 will be used if such an eventuality becomes likely.

MANAGEMENT POLICIES

The following policies are to be used to guide the Bristol Bay Borough Planning Commission and Assembly in determining proper and improper use and the acceptability of proposed plans and projects within the coastal district.

The management policy section is divided into two areas: (1) general policies applicable to all activities and uses, and (2) management guidelines and policies specific to the various habitats found in the Bristol Bay Borough.

NOTE: Each of the following policies is to be preceded by the phrase, "where feasible and prudent." Feasible and prudent means consistent with sound engineering practice and not resulting in economic, social, or environmental problems that outweigh the public benefit to be derived from strict compliance with the policy.

GENERAL POLICIES

1. When planning for and approving waterfront development, priority shall be given in the following order to:

    - o Water-dependent uses and activities
    - o Water-related uses and activities

- o Uses and activities which are neither water-dependent nor water-related for which there is no feasible and prudent inland alternative to meet the public need for the use or activity.

2. High priority shall be given to maintaining and, where appropriate, increasing public access to all public waters.

3. Transportation and utility routes and facilities must be sited inland from beaches and shorelines unless the route or facility is water-dependent or no inland alternative exists to meet the public need for the route or facility.

4. Maintenance and enhancement of fisheries shall be given priority consideration in reviewing proposals which might adversely impact fisheries habitat, migratory routes and harvest of fish or shellfish species. Alternate designs shall be seriously considered for such proposals, if such potential adverse impacts are significant. Shorelines having banks, beaches, and beds critical to the fisheries resource base shall be maintained in a productive natural condition.

5. Multiple use of the shoreline shall be encouraged where new uses or activities do not interfere with priority uses. Uses or activities which will interfere with the fishing industry shall be located in geographically separate areas.

6. Permitted development and activities shall not significantly degrade the quality of the natural environment, nor contribute to erosion or other deleterious effects on adjacent land.

7. Recreational and visual access to coastal areas shall be provided where consistent with public safety and private property rights.

8. Implementation of governmental services and facilities within the Bristol Bay Borough shall be in conformance with applicable plans, policies, and programs of the Bristol Bay Borough.

9. Permitting activities or uses in the Bristol Bay Borough shall be contingent upon conformance with all applicable federal and state regulations.

10. Subsistence use, where predominant within the publicly owned areas of the coastal zone, shall be given primary consideration in determining land use designations.

SPECIFIC MANAGEMENT GUIDELINES AND POLICIES

1. Offshore and Estuarine Areas

Guidelines: As an offshore area Kvichak Bay must be managed as a fisheries conservation zone so as to maintain or enhance the state's sport, commercial, and subsistence fishery.

As an estuary, Kvichak Bay and the lower 10 miles of the Naknek River must be managed so as to assure adequate waterflow, natural circulation patterns,

nutrients, and oxygen levels, and avoid the discharge of toxic wastes, silt, and destruction of productive habitat.

Policies:

1.1 In conformance with AS 38.05.140, "the submerged and shore lands lying north of 57 degrees, 30 minutes north latitude and east of 159 degrees, 49 minutes west longitude within the Bristol Bay drainage are designated as the Bristol Bay Fisheries Reserve. Within the Bristol Bay Fisheries Reserve, no surface entry permit to develop an oil or gas lease may be issued on state-owned or controlled land until the legislature specifically finds that the entry will not constitute danger to the fishery." All of Kvichak Bay located in the Bristol Bay Borough is in the Bristol Bay Fisheries Reserve.

1.2 Development in or over water, such as piers, docks, and protective structures shall be located, designed, and maintained in a manner which prevents decreases in water quality and disruptions to fish and other wildlife habitat.

1.3 Open pile or pier support structures shall be used in lieu of filled areas for piers or docks which project into the water.

1.4 Dredging and filling shall be permitted only where it is essential to the activity or use proposed. Areas which will require frequent or periodic maintenance dredging are less preferred than self-maintaining channels or basins.

1.5 Dredging for the sole purpose of obtaining materials for landfill shall not be permitted. Selective dredging for sand and gravel resources may be permitted on a case-by-case basis.

1.6 Dredging or pile-driving activities shall be conducted in a manner that minimizes pollution to marine water. Dredging or pile-driving activities will be conducted at times when they interfere as little as possible with migrating smolt and adult salmon, as recommended during consultation with the Alaska Department of Fish and Game.

1.7 Permitted activities or uses in or over the water shall be contingent upon conformance with all applicable federal and state regulations.

2. Exposed High-Energy Coasts

Guideline: "High-energy coasts must be managed by assuring the adequate mix and transport of sediments and nutrients and avoiding redirection of transport processes and wave energy."

Policies:

2.1 Open pile or pier support structures shall be used in lieu of filled areas for piers or docks which project into the water.

2.2 Dredging for the sole purpose of obtaining materials for landfill or construction shall not be permitted.

2.3 Development along the coastal bluff shall be designed and conducted in recognition of erosion hazard.

3. Important Upland Habitat

Guideline: Uplands "must be managed so as to maintain or enhance the biological physical and chemical characteristics of the habitat which contribute to its capacity to support living resources."

Policies:

3.1 Clearing and grading operations shall be conducted so as to minimize soil erosion. Erosion control measures shall be undertaken from the beginning of clearing. Vegetation shall be restored or control measures instituted at the earliest possible date. The Soil Conservation Service should be consulted for techniques and plants which are most appropriate. All clearing and grading near to or involving flowing water courses shall be conducted in such a fashion so as to minimize material entering the water. Runoff through construction areas shall be controlled from beginning to end of project.

3.2 Off right-of-way traffic and vegetation disturbance shall be minimized in all projects. All clearing and grubbing activity shall be in coordination with the present season construction schedule.

3.3 To the greatest extent possible, avoid disrupting the organic mat in permafrost areas and the vegetation along cut banks.

3.4 Upland borrow sites opened or expanded after the effective date of this program shall be restored with topsoil and revegetated.

3.5 Local Fish and Game biologists shall be consulted in the initial planning phases for the routing of roads, pipelines, and transmission lines, so that such prime wildlife habitat as moose calving and riparian areas and marshes can be avoided.

3.6 Highways and residential and secondary roads shall be constructed using "overlay" methods. Roads should not be routed through marshes or wet bogs and meadows, and drainage patterns should be maintained.

3.7 Both caribou and moose calve from May 20 through June 8 and general ranges are mapped in the resource inventory. Construction activities through these areas shall be avoided during this critical period.

4. Wetlands and Tideflats

Guideline: "Wetlands and tideflats must be managed so as to assure adequate water flow, nutrients, and oxygen levels and avoid adverse effects on natural drainage patterns, the destruction of important habitat, and the discharge of toxic substances."

Policies:

4.1 Dredging and filling shall not be permitted where valuable wetlands or tideflats would suffer significant harm.

4.2 Disposal of dredge material shall be in upland areas; except where dredge spoil may be utilized in shoreside landfills, if permitted under applicable regulations.

4.3 Roads and pipeline pads shall not be constructed through freshwater or tidal marshes where alternatives exist. Where roads and pipeline pads must be constructed in such areas, they shall be designed, constructed and maintained to avoid alteration of drainage patterns.

4.4 The local Department of Fish and Game office shall be consulted when routing roads and utility corridors, so that prime wildlife habitat such as marshes and riparian areas and seasonally critical habitat such as moose calving areas can be avoided, or activities limited to less critical time periods.

5. Rivers, Streams, and Lakes

Guideline: "Rivers, streams, and lakes must be managed to protect natural vegetation, water quality, important fish or wildlife habitat, and natural water flow."

Policies:

5.1 Development in or over water, such as piers, docks, and protective structures shall be located, designed, and maintained in a manner which prevents decreases in water quality and disruptions to fish and other wildlife habitat.

5.2 Open pile or pier support structures shall be used instead of filled areas for piers or docks which project into the water.

5.3 Dredging and filling shall be permitted only where it is essential to the activity or use proposed. Areas which will require frequent or periodic maintenance dredging are less preferred than self-maintaining channels or basins.

5.4 Dredging for the sole purpose of obtaining gravel or materials for landfill or construction shall not be permitted. Selective dredging may be allowed on case-by-case review.

5.5 Dredging or pile-driving activities shall be conducted in a manner that minimizes pollution to marine water. Dredging or pile-driving activities will be conducted at times when they interfere as little as possible with migrating salmonids, as recommended during consultation with the Alaska Department of Fish and Game.

5.6 Permitted activities or uses in or over the water shall be contingent upon conformance with all applicable federal and state regulations.

5.7 Pipelines and roads which cross streams shall be minimized and grouped in one area to lessen the number of areas where any one drainage has to be crossed.

5.8 Bridges shall be used to cross streams whenever feasible, so that the natural character of a stream bed will not be disrupted. Culverts are usually unable to carry the high flows from winter runoff unless greatly oversized and can cause blockage to fish passage. The Alaska Department of Fish and Game have developed installation standards for culverts which should be followed when their installation is a necessity (Appendix 1). For temporary right-of-ways, consideration should be given to removing culverts at project completion.

5.9 Facilities for storing and distributing fuel shall not be located within the active floodplain of a fish-bearing stream.

5.10 A 1,500-foot buffer zone shall be required to separate adjacent sewage ponds and oil storage facilities from freshwater supplies and fish-bearing streams. Exceptions may be made where impermeable berms would be able to contain the spread of sewage or oil.

5.11 Review shall be required with the local office of Fish and Game and appropriate federal and state agencies before any activity in a water body, including the Naknek River, streams, and lakes, is undertaken. A number of activities cause less damage when undertaken during certain periods of the year as prescribed by the Department of Fish and Game. Salmon fry and smolts migrate into the Naknek River estuary between May 10 and June 30. Adult fish migrate upriver and spawn from June 15 through October 15.

5.12 Water intake pipes shall be designed with screens of sufficient size that fry and juvenile fish are not entrained or impinged upon the screen. Maximum water velocity at the surface of the screen should be less than 0.1 foot per second. Screen openings shall not be larger than 0.04 inch (1 millimeter). Where other techniques achieve similar results or in water where no young fish are present, exceptions can be granted.

5.13 Extraction of floodplain gravel from the Naknek River and streams in the Borough shall not be permitted because of bluff instability and disruption of fishery habitat. Preferred sources for gravel are: (1) existing gravel pits, (2) reuse of gravel from abandoned areas, (3) new upland pits; (4) dredging of nonfish-bearing lakes; and (5) approved offshore gravel sources. Offshore gravel deposits may be the ony viable sources for certain forms of development, and properly conducted extraction of offshore deposits will be allowed upon a showing that they are the only feasible source available to an otherwise acceptable development. Such a showing also must demonstrate that the integrity of the general marine habitat will not be threatened.

5.14 Refuse disposal sites shall not be located within floodplains - prime wildlife habitat, or where it could pollute groundwater.

5.15 To preserve stream bank and channel integrity, new construction or land clearing shall set back from the water's edge in accordance with all applicable state and federal regulations.

All ACMP regulations, the subjects of which have not been addressed herein, remain in effect, and are a part of this program. The regulations of 6 AAC 80.007 regarding energy facilities are especially noted in this regard.

5. Implementation Process

AUTHORITY

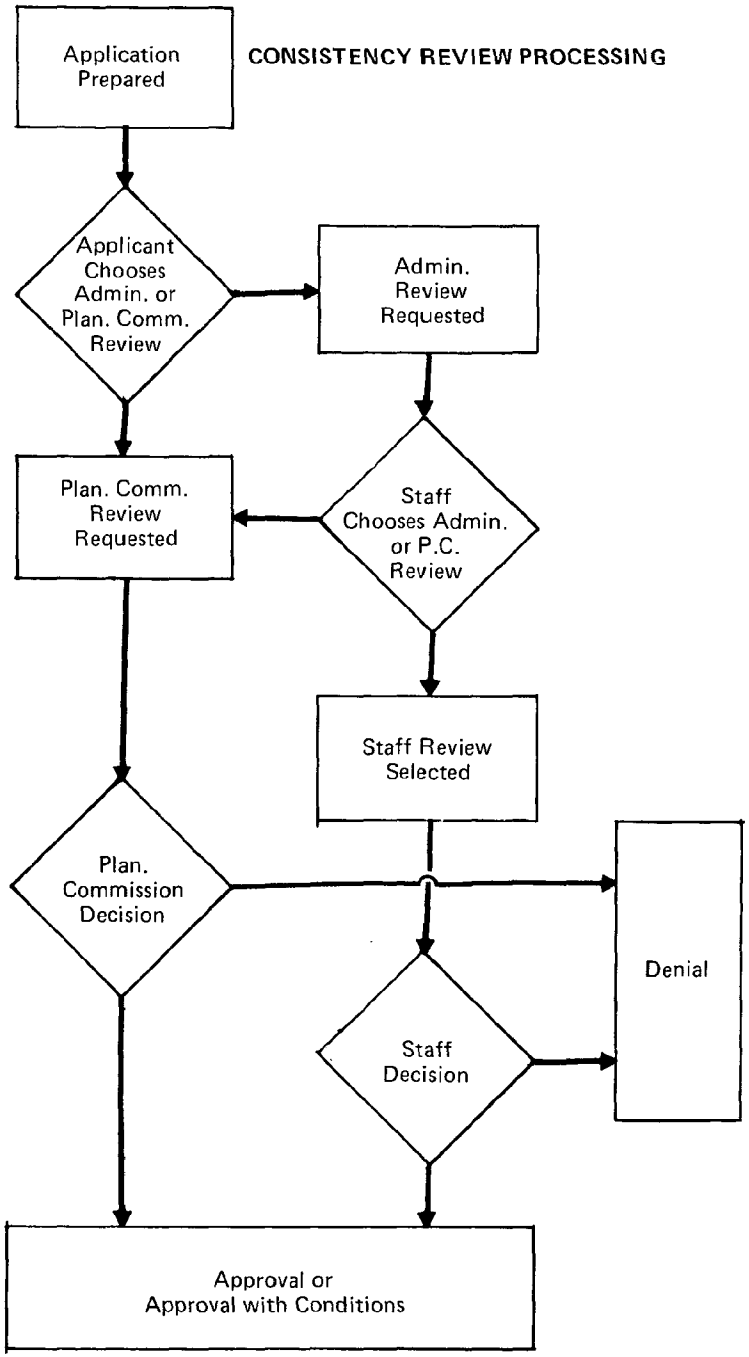
The Bristol Bay Borough is a small, remote, local government that exercises its regulatory authority on a modest scale. For a district coastal management program to work effectively and efficiently, it must be tailored to meet the regulatory needs and the administrative capabilities of the local government. The challenge, as outlined in the legislative policy forming the Alaska Coastal Management Act, is to develop an implementation scheme, that, to the maximum extent possible, uses existing Borough, state and federal regulations and does not unnecessarily require more government or more regulations.

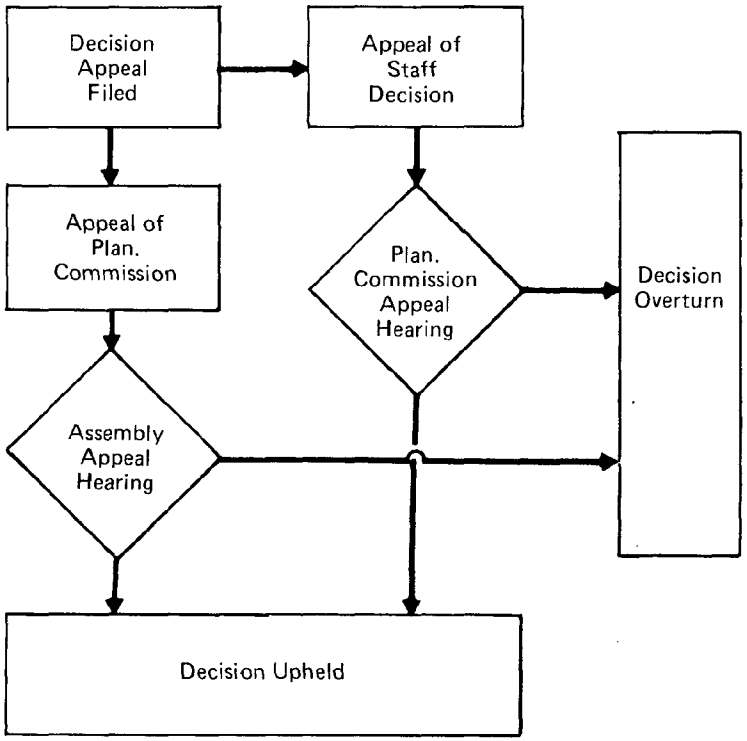
RESPONSIBLE PARTIES

The borough manager or a designee will receive and process all materials relevant to state, federal, and Borough consistency determinations. The director also is responsible for field checking, enforcement, and overall program management and coordination.

The borough manager or designee will participate in all consistency decisions and recommendations, as well as recommendations for enforcement actions or appeals to the courts or the Coastal Policy Council, unless the significance of the matter warrants or the applicant requests, initial review by the Planning Commission.

The Borough Planning Commission will participate in consistency decisions and recommendations and recommendations for enforcement action when such matters are referred to them at the request of the borough manager or designee, or applicant. The Borough Planning Commission shall stand as the initial body to rule on any appeal to an action of the borough manager or designee.


Application Prepared
CONSISTENCY REVIEW PROCESSING
Applicant Chooses Admin. or Plan. Comm. Review
Admin. Review Requested
Plan. Comm. Review Requested
Staff Chooses Admin. or P.C. Review
Staff Review Selected
Plan. Commission Decision
Denial
Staff Decision
Approval or Approval with Conditions


APPEAL OF CONSISTENCY REVIEW
Decision Appeal Filed
Appeal of Staff Decision
Appeal of Plan. Commission
Plan. Commission Appeal Hearing
Decision Overturn
Assembly Appeal Hearing
Decision Upheld

The Borough Assembly, on appeal from an action of the Borough Planning Commission, will either affirm or overturn recommendations and decisions made by the Planning Commission. This includes:

1. The Borough's own consistency determinations on borough-controlled activities;

2. The Borough's comments and recommendations on state and federally controlled or initiated activities; and

3. All forms of enforcement actions including appeals.

The Borough Assembly, on a categorical basis, may delegate final approval authority to the Planning Commission or Community Development Director as the need arises.

Figure 2, page 105 illustrates the process of permit reviews, actions and appeals.

REGULATORY AUTHORITY

The coastal management policies described in 6 AAC 85.090 and detailed in Chapter Four are the foundation of the Borough's program. They are the enforceable rules used to determine proper and improper land and water uses and used to guide coastal development within the district. In addition to the management policies, the following Borough ordinances are also used to implement the Coastal Management Program.

- Title 20, Bristol Bay Borough zoning code

- Title 18, Bristol Bay Borough subdivision regulations

- Title 20, building permit process

The Bristol Bay Borough Coastal Management Program will be adopted by resolution as part of the Borough's land use regulations, prior to Coastal Policy Council review, and will be enacted by ordinance following CPC approval.

FEDERALLY REGULATED OR INITIATED ACTIVITIES

The State of Alaska is responsible for deciding, on behalf of the Alaska Coastal Management Program, whether or not particular federal actions are consistent with the state coastal management program. Presently, this function is carried out by the Alaska governor's office, but the responsibility may shift or be reorganized in the future. Whether the current system remains, or changes, the Bristol Bay Borough will be given an opportunity to review all federal actions of substance that occur in or could affect the Borough's coastal resources. The Borough will assist the state in making these decisions and has the option of seeking review and relief from the Coastal Policy Council if it is felt that the state has not appropriately complied with the enforceable provisions of this program.

STATE REGULATED OR INITIATED ACTIVITIES

The Bristol Bay Borough has selected as a minimum the following state and federal activities and permits for receiving notification prior to an agency decision.

- Anadromous fish protection, Alaska Department of Fish and Game AS 16.05.870.
- Land selection, leases (including minerals), classification or land disposals issued by the State Department of Natural Resources AS 38.05.045-.110, AS 38.05.181, AS 38.05.150, AS 38.05.185-.280, AS 38.05.180, AS 38.05.035, AS 38.05.345.
- Designation of any "critical habitat" under AS 16.20.220-270 by ADFG.
- Designation, expansion, or deletion of any state land holdings within or adjacent to Borough receiving special management attention (e.g., refuges, parks, sanctuaries, national monuments, and scenic rivers).
- State Department of Environmental Conservation water quality standards - certificate of reasonable assurance (AS 46.03.010-.750, 18AAC70).
- Solid waste disposal.
- Section 404 of the federal Clean Water Act and federal Section 10 of Rivers and Harbors Act permits issued by Corps of Engineers.
- Construction of public facilities and projects.

Written recommendations on the project's consistency will be forwarded to the agency in a timely manner (maximum 30 days) and "great weight" shall be given to the views of the district.

As with state consistency decisions or federally-regulated or initiated activities, the Borough may obtain review by, and seek relief from, the Coastal Policy Council if it believes that a state agency has not complied with the enforceable provisions of this program.

CHECKLIST AND PROCESS

The process below will be used in completing the checklist. Each consistency decision or recommendation to be made by the Borough will have a checklist completed for it.

1. Using the included checklist, review the project for consistency with the local program.

2. If the project or activity is consistent, write consistent or approved on line 8. The Borough may want to encourage the state and federal government in their determination. This can be accomplished by outlining the positive aspects of the project along with the consistency determination.

3. If the project or activity is not consistent, state the portions of the program affected and recommended remedial action. The comments should include, at a minimum:

   - o Specific remedial action
   - o Rationale for requesting action
   - o Binding provisions of the district program, cited by policy.

4. The review should be completed within 30 days, or within the timeframe of the agency involved.

FIELD CHECKING AND ENFORCEMENT

Periodic checking of major projects and routine field inspections will be conducted concurrently with the administration of zoning, regulating subdivisions and issuing building permits. If projects or activities are found in violation of the program, the Borough will use local, state and federal enforcement to correct the situation. Enforcement will depend upon the nature and jurisdiction of the violation.

QUARTERLY REPORT

On the first meeting following the last day of March, June, September and December, the Borough Manager or designee will send a quarterly report to the Borough Planning Commission and Assembly. The report will summarize all reviews and actions taken during the reporting period.

ANNUAL REPORT

On December 31 of each year, the borough manager or designee will send an annual report to the Coastal Policy Council. The report will summarize all changes and improvements to the Borough's coastal program and will include copies of all the checklists completed for activities and copies of all the enforcement actions taken.

BRISTOL BAY BOROUGH
COASTAL MANAGEMENT PROGRAM

CONSISTENCY CHECKLIST

1. Project description _____

2. Level of government _____

3. General effects upon coastal area and resources _____

_____

4. Uses, activities, resources and habitats that will be significantly affected:

____ a. Offshore and estuaries ____ d. Wetlands and tideflats

____ b. Exposed high-energy coasts ____ e. Rivers, streams and lakes

____ c. Uplands habitat

5. Area which merits special attention affected _____

_____

6. Does project or activity require written response _____

7. Is the action consistent with:

a. Local land and water use controls _____

b. Goals and objectives (if not, indicate which) _____

c. Management policies _____

d. Areas which merit special attention _____

8. What action is necessary to make project or activity consistent

_____

_____

_____

_____

Date _____ Signed _____

(Use other side for comments as necessary).

6. AMSA Recommendations

AREAS WHICH MERIT SPECIAL ATTENTION

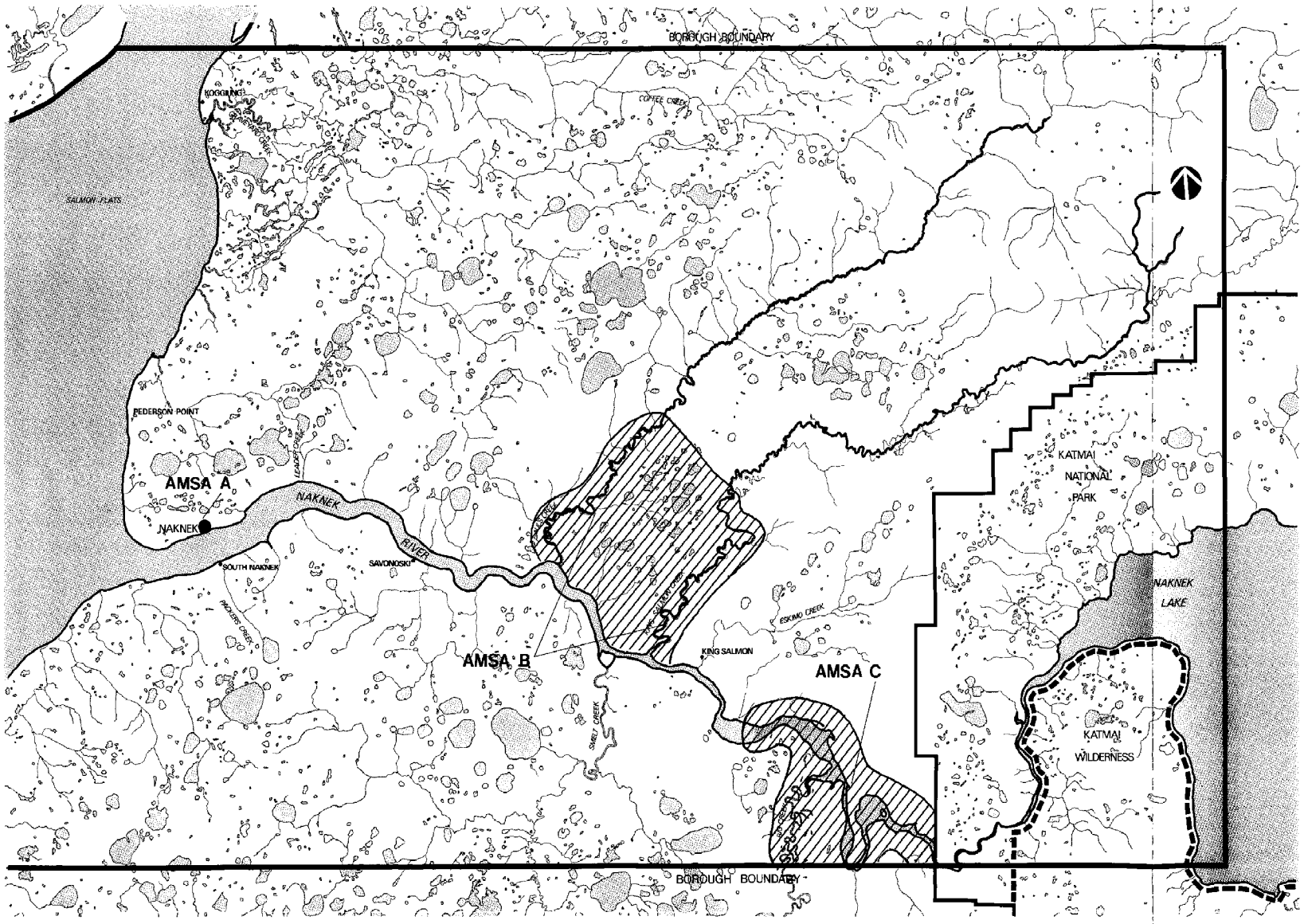
"Areas which merit special attention" (AMSA) is a designation created by the Alaska Coastal Management Act for geographic areas requiring special management. To receive this special consideration, an area must be one of the following:

- Unique, fragile natural habitat, of cultural value, of historical significance or scenic importance
- Of substantial recreational value
- Where development of facilities is dependent upon the utilization of, or access to, coastal waters
- Susceptible to industrial or commercial development
- A significant hazard
- Needed to protect, maintain, or replenish coastal land or resources, including coastal floodplains, aquifer recharge areas, beaches, and offshore sand deposits.

In the Bristol Bay Borough, there are three such geographic areas requiring special consideration (see Areas Which Merit Special Attention map). It is recommended that these areas be considered for designation as areas which merit special attention. A management plan should be developed for each area that allows both planned development to occur, while protecting the natural, physical, and man-made resources.

AMSA A: MARINE INDUSTRIAL PARK

This area surrounds the newly constructed public dock facility located between the Naknek-King Salmon Road and the Naknek River. It is recommended as an AMSA because of the proposed port facilities and industrial park developing adjacent to the Naknek River, a critical salmon migration corridor. The area includes the Naknek River bluffs which are both hazardous and have a high erosion potential.



Recommended Areas Which Merit Special Attention

SCALE: miles

0 1 2 3

Selection Criteria

AMSA A is an industrial area adjacent to an important salmon migration and rearing area. Potential hazards include land slides, storm surges, erosion, and accidental petroleum spills.

Area Description

The area in and around the newly constructed public dock is included along with the Naknek River coastline and uplands.

Status of Area

The area includes both private and public ownership and has mixed residential use surrounding the proposed marine industrial park. The Bristol Bay Borough owns the public dock and has planning and zoning responsibility for the area.

Status of Adjacent Area

The ownership management jurisdiction and use are similar to that within the AMSA.

Management Objectives

The management objective for this AMSA is to protect the salmon migration and rearing areas in the Naknek River and to allow the marine industrial park to develop while minimizing resource conflicts and natural hazards.

AMSA B: PAUL'S CREEK/KING SALMON CREEK AREA

This area includes both Paul's Creek and King Salmon Creek. The reason for the designation is the potential conflict between development along the Naknek-King Salmon Road and adjoining areas and two highly productive salmon spawning creeks.

Selection Criteria

AMSA B is an area of high natural productivity and of essential habitat for wildlife, especially salmon, trout, bear, and moose.

Area Description

The area includes the upland and floodplain around Paul's Creek and King Salmon Creek. It extends from approximately 1/2 mile west of Paul's Creek to 1/2 mile east of King Salmon Creek, and from the Naknek River, 4 miles north to the rolling uplands. The area includes the intersection of the Naknek-King Salmon Highway and two of the Borough's most important salmon spawning creeks.

Status of Area

The area is primarily privately owned by individuals and is under the planning and zoning jurisdiction of the Bristol Bay Borough. Low density residential and commercial use presently exists within the area. Paul's Creek and King Salmon Creek serve as marine access routes and moorages to a limited degree.

Status of Adjacent Area

The ownership, management, jurisdiction, and use are similar to that within the AMSA.

Potential Conflicts

The uplands along Paul's Creek and King Salmon Creek are developable areas. They are privately owned with easy access and are surrounded by a pleasant natural setting. Presently, a number of residences and businesses are located in the area and indications are that this trend will continue. As development occurs, the potential for disturbance and destruction to watersheds will increase. Poor construction practices causing erosion, dredging and filling, and toxic waste spillage are examples of the potential hazards. A management plan developed to accommodate special considerations in this area could promote appropriate development and still protect the Borough's valuable resources.

Management Objective

The management objective for this area is to promote planned development of a type and scale that protects the salmon migration corridor and spawning beds. Proper and improper uses would be determined, design guidelines established, and a regulatory process recommended as part of the management scheme.

ASMA C: BIG CREEK AND RAPIDS SECTION OF THE NAKNEK RIVER

This area includes the Big Creek and rapids section of the Naknek River. The reason for the designation is the high spawning concentration of king, coho, pink, and chum salmon and rainbow trout in an area that is privately owned and being leased for residential development.

Selection Criteria

The area is an area of high natural productivity and of essential habitat for wildlife. In addition to containing prime salmon spawning reaches, the lower reaches of Big Creek serve as a staging area for a large population of swans.

Area Description

This AMSA extends from King Salmon along the Naknek River to the federally owned land of Katmai National Park. It includes the upland on both sides of the river as well as the first three miles of Big Creek.

Status of Area

The area north of the Naknek River is owned by Paug Vik Corporation and the area south of the river is owned by the Alaska Peninsula Corporation. The Bristol Bay Borough has planning and zoning jurisdiction over the area; the state and federal government have specific jurisdiction over the river. This area is presently used for recreation, fisheries research and management, and subsistence and sport hunting and fishing.

Status of Adjacent Area

Katmai National Park is east of the recommended AMSA. The community of King Salmon is directly to the west. All of the remaining contiguous land has similar ownership, management jurisdiction and use.

Potential Conflict

The uplands area north of the Naknek River that border the rapids area and Katmai National Park is some of the most attractive and developable land in private ownership within the Borough. There has already been some discussion of a 5-acre, 99-year lease program for residential development by Paug Vik Village Corporation. Along with being attractive and developable, this area also contains the largest concentration of king and pink salmon spawning beds in the Borough and is reputed to hold one of the most significant rainbow trout spawning areas in North America. Lower Big Creek also serves as a staging area for a large population of swans. Uncontrolled development, or poor construction procedures could disturb or destroy an area that is both valuable and irreplaceable. Any development in this sensitive area must be approached cautiously and in a way that maintains the natural values and unique resources.

Management Objective

This AMSA contains a variety of natural values, is privately owned, and is attractive for development. A management plan would determine the highest and best use of the area. Once a use determination has been made, a management plan would be developed that outlines guidelines to protect the migration corridor and important salmon and trout spawning beds.

APPENDIX

CULVERT INSTALLATION STANDARDS*

Each culvert placed in a river or stream frequented by fish should be installed so that at last one-fifth of the diameter of each round culvert and at least six inches of the height of each elliptical or arch type culvert is set below the streambed at both the inlet and outlet of the culvert. This does not apply to bottomless arch-type culverts. A variance may be granted to avoid solid rock excavation.

Table 1 of this appendix represents water velocities through different culvert lengths which can be successfully negotiated by several Alaska fish species. Average cross-sectional velocities at the outside of the culvert should not exceed the velocities in Table 1 of this appendix except for a period not exceeding 48 hours during the mean annual flood.

Adequate water depths must be maintained during low flow periods to provide passage through culverts. Existing water depths at crossing site must be measured and maintained after culvert installation. It should be the responsibility of the developer to design a culvert to accommodate upstream movement of the slowest swimming fish species or age class using the system. Proposed dimensions must be submitted to the Department of Fish and Game for approval.

Each culvert should be placed in and aligned with the natural stream channel. All bank cuts, slopes, fills, and exposed earthwork attributable to culvert installation in streams, rivers, or lakes should be stabilized to prevent erosion during and after the project. Culverts should not be installed in areas used for fish spawning or rearing. Alternative drainage structures should be installed if these requirements cannot be met. Alternative drainage structures may include bridges or modified culverts approved on a site-specific basis.

The following references can be used to compute culvert diameter when given the known fish passage criteria from Table 1 of this appendix, and the stream discharge data for mean annual flood. These references are available for inspection at state or federal libraries in Juneau, Anchorage, or Fairbanks.

Alaska Department of Highways. Hydraulics Manual. Juneau: Alaska Department of Transportation and Public Facilities.

Evans, W.A. and F.B. Johnston. 1980. Fish Migration and Fish Passage - A Practical Guide to Solving Fish Passage Problems. U.S. Department of Agriculture, Forest Service, Region 5.

---

* Seaman et al., 1981.

Lauman, J.E. 1976. Salmonid Passage at Streamroad Crossings. Portland, Oregon: Department of Fish and Wildlife, Environmental Management Section.

McPhee, C. and F. Watts. 1976. Swimming performance of Arctic Grayling in Highway Culverts. U.S. Fish and Wildlife Service.

U.S. Forest Service. 1979. Roadway Drainage Guide for Installing Culverts to Accommodate Fish. Engineering and Aviation Management Division, Alaska Region, U.S. Forest Service, Department of Agriculture, Report No. 42.

TABLE 1

AVERAGE CROSS-SECTIONAL VELOCITIES IN FEET PER SECOND MEASURED AT THE OUTLET OF THE CULVERT

Group I - Upstream migrant salmon fry and fingerlings when upstream migration takes place at mean annual flood.

Group II - Adult and juvenile slow swimmers: grayling, longnose suckers, whitefish, burbot, sheepfish, northern pike, Dolly Varden/ Arctic char, upstream migrant salmon fry and fingerlings when migration not at mean annual flood.

Group III - Adult moderate swimmers: pink salmon, chum salmon, rainbow trout, cutthroat trout.

Group IV - Adult high-performance swimmers: king salmon, coho salmon, sockeye salmon, steelhead.

Length of Culvert (in feet)	Group I	Group II	Group III	Group IV
30	1.0	4.6	6.8	9.9
40	1.0	3.8	5.8	8.5
50	1.0	3.2	5.0	7.5
60	0.9	2.8	4.6	6.6
70	0.8	2.6	4.2	6.0
80	0.8	2.3	3.9	5.5
90	0.7	2.1	3.7	5.1
100	0.7	2.0	3.4	4.8
150	0.5	1.8	2.8	3.7
200	0.5	1.8	2.4	3.1
250	0.5	1.8	2.4	3.0

Appendix

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.

ESTUARIES

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

WETLANDS

The tidal marsh, freshwater marsh, and wet bays and meadows, as illustrated on the Coastal Habitat map, are the only identifiable wetlands 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 Topography maps.

HIGH ENERGY COASTAL BLUFFS

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

RIVERS, STREAMS, AND LAKES

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

IMPORTANT UPLAND HABITAT

Important upland habitat is found throughout the Borough. See Mammals, Birds and Vegetation maps.

Appendix

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

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

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	

Processors	Operation	Product Form
*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	
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

Processors	Operation	Product Form
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

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.

Bibliography

PART I

Alaska Department of Fish and Game (ADF&G). 1973. *Alaska's Wildlife and Habitat.* Anchorage, Alaska.

Alaska Department of Fish and Game (ADF&G). 1977. *A Fish and Wildlife Resource Inventory of the Alaska Peninsula, Aleutian Islands and Bristol Bay Areas, Vol. 2—Fisheries.* Prepared under contract to the Alaska Coastal Management Program, Division of Policy Development and Planning.

Alaska State Housing Authority. 1966. *Bristol Bay Borough Comprehensive Development Plan.* Anchorage, Alaska.

Alves, W., et al. 1978. *The Effects of Regional Population Growth on Hunting for Selected Big Game Species in Southcentral Alaska 1976—2000.* A report for the Coastal Fish and Wildlife Resource Profile of Southcentral Alaska. USRWS Contract No. 14-16-0009-77-077, AEIDC.

Arctic Environmental Information and Data Center (AEIDC). 1974. *The Bristol Bay Environment, A Background Study of Available Knowledge.*

Arctic Environmental Information and Data Center (AEIDC). 1976. *Alaska Regional Profiles, Southwest Region.* Lidia Selkregg, ed., University of Alaska, Anchorage.

Bartonek, James C. and Daniel G. Gibson. 1972. Summer distribution of pelagic birds in Bristol Bay, Alaska. Reprinted from *The Condor,* Vol. 74, No. 4.

Bristol Bay Borough. 1980. *Bristol Bay Borough Comprehensive Plan.* Naknek, Alaska.

Bristol Bay Borough. 1980. *Overall Economic Development Program.* Naknek, Alaska.

DMJM Forssen. 1980. *Aleutian and Southwest Alaska Coastal Ferry Study.* Anchorage, Alaska.

Faro, J.B. and A.W. Franzmann. 1978. *Alaska Peninsula Moose Productivity and Physiology Study.* Alaska Department of Fish and Game. Juneau, Alaska.

Furbush, C.E. and C.C. Wiedenfeld. (No Date). *Soils of the King Salmon-Naknek Area.* Soil Conservation Service, USDA.

Golia, A. 1980. *Bristol Bay: Energy Report.* Bristol Bay Native Association. Dillingham, Alaska.

Golia, A. 1980. *Bristol Bay: The Herring Fishery.* Bristol Bay Native Association. Dillingham, Alaska.

Golia, A. 1976. *Bristol Bay: Economic Development Plan.* Bristol Bay Native Association. Dillingham, Alaska.

Hemming, J.E. 1971. *The Distribution and Movement Patterns of Caribou in Alaska.* Alaska Department of Fish and Game, Technical Bul. No. 1.

Hood, Donald W. and E.J. Kelley. 1974. *Oceanography of the Bering Sea.* University of Alaska, Fairbanks, Institute of Marine Science, Occasional Publication No. 2.

Irvine, C. 1976. *Population Size of the Alaska Peninsula Caribou Herd.* Alaska Department of Fish and Game, Project W-17-7, 17-8, Job 3.17R.

King, J.G. and C.J. Lensink. 1971. *An Evaluation of Alaskan Habitat for Migratory Birds.* Fish and Wildlife Service/DOI.

Kresge, Fison and Gasbarro. 1974. *Bristol Bay, A Socio-economic Study*. University of Alaska, (ISER). Anchorage, Alaska.

Lensink, Calvin J. and James C. Bartonek. 1976. *Preliminary Catalog of Seabird Colonies and Photographic Mapping of Seabird Colonies*. U.S. Fish and Wildlife Service, Quarterly Report. Anchorage, Alaska.

Skoog, R. 1968. *Ecology of the Caribou in Alaska*. U.C. Berkeley, Ph.D. Thesis. Berkeley, California.

State of Alaska. 1980. *Inventory and Condition of Public Facilities, Lake and Peninsula Region, Vols. 1 and 2*. Anchorage, Alaska.

U.S. Department of Commerce. 1979. *United States Coast Pilot*. Washington, D.C.

U.S. Fish and Wildlife Service. 1977. *Subsistence in Bristol Bay, Harvest Estimates and Economic Perspectives*. Anchorage, Alaska.

PART II

Alaska Department of Environmental Conservation. 1979. *Transportation Corridors—Water Quality Management Study*. State of Alaska.

Alaska State Housing Authority. 1966. *Bristol Bay Borough Comprehensive Development Plan*. State of Alaska.

Balten, Alan R. 1980. *Proposed Classification Framework for Alaskan Wetland Aquatic Vegetation*. Institute of Arctic Biology. Fairbanks: University of Alaska.

Buck, Bowden, Baldridge, and Wilson. 1978. *Bibliography, Synthesis and Modeling of Naknek River Aquatic Systems Information*. Seattle, Wash: AEIDC for USDI/National Park Service.

Hulten, E. 1968. *Flora of Alaska and Neighboring Territories*. Stanford University Press.

Kramer, Chin and Mayo, Inc. 1980. *Cordova Coastal Management Program*. City of Cordova.

Kyle, A. D. 1982. *Local Planning for Wetland Management, Office of Coastal Management*. State of Alaska, Office of the Governor.

Piatkowski, F. J. 1981. *Construction Under Sub-Arctic Conditions*. Kramer, Chin & Mayo, Inc.

Seaman, G.A., G.F. Tande, D. Clauser, and L. Trasky. 1981. *Mid-Beaufort Coastal Habitat Evaluation Study: Colville River to Kuparuk River*. Alaska Department of Fish and Game, Habitat Division.

State of Alaska. 1979. *Alaska Coastal Land and Water Use Guide*. Office of Coastal Management.

U.S. Bureau of Sport Fisheries and Wildlife. 1973. *Proposed Iliamna National Resource Range, Alaska DEIS*.

Viereck, L.A., C.D. Dyrness, and A.R. Batten. 1982. *Revision of the Preliminary Classification System for the Vegetation of Alaska*.

Viereck, L.A. and C.D. Dyrness. 1980. *A Preliminary Classification System for Vegetation of Alaska*. General Technical Report PNWD 106, USDA Forest Service.

Viereck, L.A. and E.L. Little (eds). 1972. *Alaska Trees and Shrubs*. U.S. Department Agriculture, Forest Service Handbook No. 410.

Map Sources

Alaska Department of Fish & Game. 1973. *Alaska's Wildlife and Habitat*. Anchorage, Alaska.

Alaska Division of Land and Water Management, Department of Natural Resources. (No Date). Status Plats. Anchorage, Alaska.

Federal-State Land Use Planning Commission (FSLUPC). 1976. Resource Overlay Collection. Anchorage, Alaska.

University of Alaska, Arctic Environmental Information and Data Center. 1974. Alaska Regional Profile, Southwest Regional Resource Maps.

U.S. Department of Agriculture, Soil Conservation Service. 1968. Naknek-King Salmon Area, Alaska, 1:31, 680.

U.S. Department of Interior, Bureau of Land Management. Status Plats. Anchorage, Alaska.

U.S. Department of Interior, U.S. Geological Survey. Alaska, Scale 1:2,500,000

U.S. Department of Interior, U.S. Geological Survey. Naknek Series, 1:63,360.