AFFECTED ENVIRONMENT

AFFECTED ENVIRONMENT

CULTURAL RESOURCES

The monument's resources are a combination of dynamic and interacting elements. Following the description of each element, a brief list of implications for planning or management of the monument is presented.

Prehistoric

Northwest Alaska in general, and the monument specifically, is not the empty, trackless wilderness that many people might perceive it to be. Humans have continuously explored and lived here and utilized its resources for more than 12,500 years. In fact it is the preservation of the remains of these people's lives, their houses, tools, and artifacts that creates a major reason for the existence of the monument. Cape Krusenstern National Monument contains some of the most important prehistoric sites in the Arctic.

It has been well established (Hopkins 1967, 1982) that the great continental glaciers of the last ice age locked up vast amounts of water as ice. As a result sea levels were lowered, exposing a large land mass called Beringia (more than 1,000 miles wide at one point) that functioned as a land bridge between Alaska and Siberia and was above sea level from 25,000 to 14,000 years ago. Although the rising seas broke through about 14,000 years ago (Anderson 1981), the present sea levels were not reached until 4,500 years ago.

Even today the Bering Strait, about 90 miles wide, is easily crossed and is not really a barrier to human passage, especially in winter when choked with ice. It was across the Bering Land Bridge, and later across the inundated strait itself, that successive cultural groups of people entered northwest Alaska. Some groups continued on, eventually spreading over the face of the New World, all the way to the tip of South America. Other groups stayed to explore, settle, and adapt to Alaska and the Arctic. The prehistoric record of northwest Alaska contains the story of this process. However, our knowledge of the regional prehistory is hampered by a lack of information. Much of the area has not been thoroughly investigated. The Cape Krusenstern area in the monument, along with Onion Portage in Kobuk Valley National Park, provides the best information available about northwest Alaska prehistory, although more can still be learned at the cape, elsewhere in the monument, and in the region.

The archeological record in the monument reveals several main streams of cultural development and adaptation in northwest Alaska. The earliest people, the Paleo-Arctic tradition (a tundra culture), arrived in the region 12,500 or more years ago. Traces of their presence are few. We do know that they came from northern Asia and were nomadic hunters and gatherers, living off the land and traveling in small groups. Unlike many later groups, these early people did not depend on sea mammal hunting for their subsistence, but depended on caribou and other land animals (Anderson 1981). (See Cultural Sequence map.)

The next wave of people apparently moved into northwest Alaska from the forested regions to the south and east. These Northern Archaic peoples arrived about 6,500 years ago and had a distinctively different material culture, apparently depending on caribou and stream-caught fish for their livelihood and staying inland and near treeline most of the time. Because of their interior origin, many archeologists consider that these people represent an Indian rather than an Eskimo culture.

Around 4,200 years ago Arctic-oriented cultures again appeared on the scene in northwest Alaska. Either a new wave of people or new ideas swept into Alaska from Asia. This Arctic Small-Tool tradition, named after their finely made stone tools, was a dynamic one, adapting to efficient use of a wide range of arctic resources. The first people of this tradition (the Denbigh Flint culture) spread as far south as Bristol Bay and as far east as Greenland, occupying interior and coastal areas.

The spread of Arctic Small-Tool tradition people throughout arctic Canada, the first to do so, and their long timespan (the tradition lasted over 1,000 years) show that they were adept at the use of both coastal the interior resources. Major settlements have been found in coastal areas in the region, like the beach ridges at Cape Krusenstern and the Choris Peninsula, which was the home of the Choris people who were direct descendents of the Denbigh people.

By about 2,500 years ago people of the Arctic Small-Tool tradition and the related Norton/Ipiutak tradition had shifted much of their emphasis to coastal living and the use of marine resources. There are some indications that whaling had begun and was gaining importance. Interior resources, such as caribou from the tundra and the forest, were still sought and used extensively. Norton settlements sprang up in most productive coastal locations from the Alaska Peninsula around to a point east of the U.S.-Canada border. Fishing with seine nets became a primary source of food. The later Ipiutak people developed an advanced art style based on ivory carving.

Around 1,600 years ago a new cultural group appeared. It is not known whether these people came from Asia or developed from the earlier arctic peoples in Alaska. Whatever their origins, this group developed the full-fledged Eskimo lifestyle of utilizing marine resources such as seal, walrus, and whale and interior resources such as caribou and musk-ox. These people of the Northern Maritime tradition developed from the Birnirk culture into the Western Thule culture, which spread all across the Arctic from Norton Sound to Greenland. From the Western Thule culture came the modern Eskimo, the Inupiaq (identifiable in the archeological record by around 900 years ago). The Inupiaq used advanced fishing and hunting techniques such as the drag float and the sinew-backed bow. The first archeological evidence for the use of dogs to pull sleds shows up about 500 years ago. Before this, sleds were pulled by people and dogs were used as pack animals. Some people moved inland full time; others moved to the rivers (for example, the Arctic Woodland culture on the Kobuk River) and developed more specialized lifestyles. However, extensive trading networks were maintained throughout northwest Alaska.

CULTURAL SEQUENCE IN NORTHWEST ALASKA

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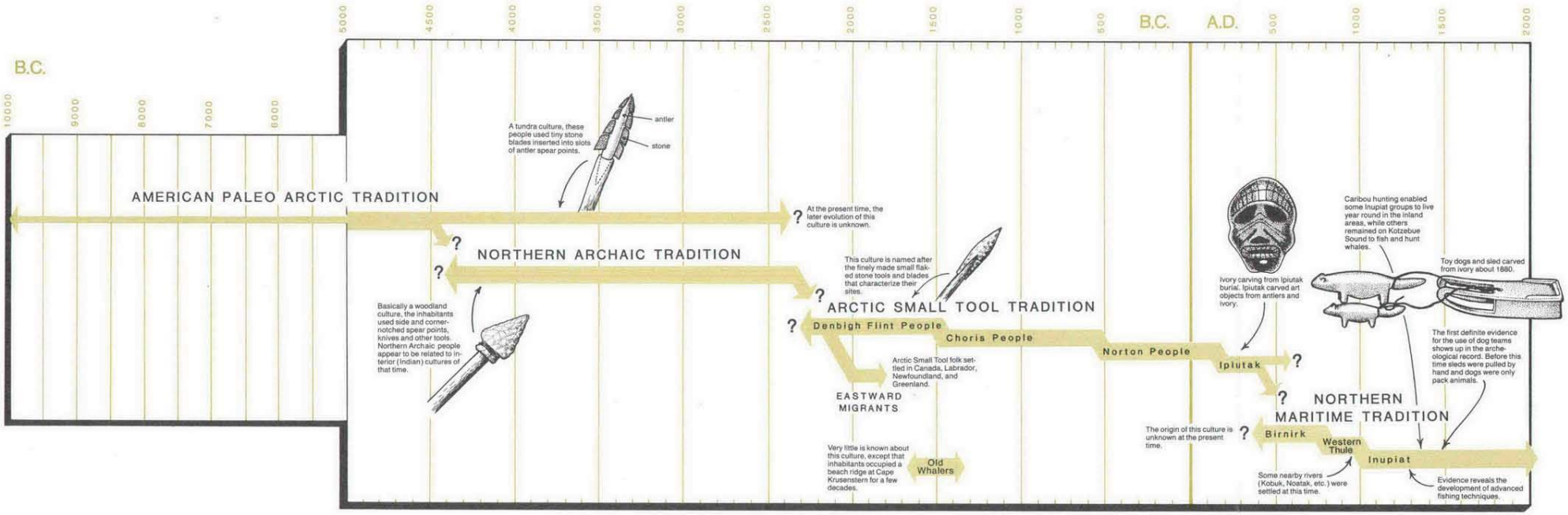

(Adapted from Anderson, 1981: 56)

The traditional lifestyles of the Inupiaq remained fairly stable until about 1850. Russian trade goods had reached northwest Alaska during the 18th century through trade with Siberian peoples across the Bering Strait, but these goods had not significantly affected local people. Eskimo culture began to change significantly in response to outside contact after 1850.

In the late 1800s, when contacts with the outside world were significant, the fur trade expanded in economic importance and the use of sophisticated dogsledding methods became common. These concurrent developments allowed greater mobility and resulted in people spreading out over larger areas in winter and abandoning many of the larger villages. It was not until schools, post offices, and trading posts were set up around 1900 that large villages were again established (Anderson 1981:57).

Because of the national and international significance of prehistoric sites in Cape Krusenstern National Monument, in 1973 the monument area was designated as a national historic landmark and as a national archeological district on the National Register of Historic Places. (It should be noted that the landmark and district boundaries encompass an area much larger than that of the monument.) The monument has also been entered on the list of potential World Heritage nominations and could be only the second U.S. national park on the world cultural list (see Cultural Resources map).

Within the boundaries of the monument, 16 Alaska Native Claims Settlement Act (ANCSA) 14(h)(1) sites (native cemetery and historic sites) have been identified and selected by NANA (see Cultural Resources map).

The core of the archeologic district lies in the monument at Cape Krusenstern where the complex of approximately 114 marine beach ridges occurs. These beach ridges run roughly east-west, parallel to the present shoreline. They are composed of alluvium, are only about 10 feet above sea level, extend from 1-1/2 to 3 miles toward the sea, and are about 9 miles long. These beach ridges, formed of gravel deposited by major storms and regular wind and wave action, record in horizontal succession the major cultural periods of the Arctic over the last 4,500 years. The prehistoric inhabitants of northwest Alaska occupied the cape seasonally to hunt marine mammals, especially seals. As new beach ridges were formed, camps were made on the ridges closest to the water. Thus, over the centuries, a chronological "horizontal stratigraphy" was laid down in which the oldest cultural remains are found on the fossil beach ridges furthest from the ocean, with more recent remains and modern camps found on beach ridges closer to the water. The discoveries made at Cape Krusenstern, especially when used in conjunction with those at Onion Portage in Kobuk Valley National Park, provide a definite, datable outline of cultural succession and development in northwest Alaska.

The present coastline in the monument is the center of subsistence activities of present-day users from Kotzebue, Noatak, Kivalina, and the general area around the monument. Immediately behind the active shoreline at Cape Krusenstern, the first eight beach ridges contain evidence of the presence of modern to late prehistoric Inupiaq, dating back to about 600 years ago. Beaches 9 through 44, dating from about 1,000 to 2,400 years ago, contain in sequence, remains of campsites, house ruins, and artifacts of the Western Thule, Birnirk, Ipiutak, and Norton cultures. The Birnirk and Western Thule

cultures, which are part of the Northern Maritime tradition, evolved directly into the present-day Inupiat cultures of the Arctic.

The next group of beaches contain campsites of several stages of the Choris culture, dating from 2,500 to 3,500 years ago.

On beach 53, Giddings (1967) found the ruins of winter and summer houses of a unique whale-hunting group, including large stone tools and weapons never found before or since anywhere else. Named the Old Whaling culture, it dates from around 3,500 years ago and represents the earliest evidence in northwestern Alaska of year-round coastal life (Anderson 1977).

The oldest beaches contain evidence of the Denbigh culture, a remarkable stone-working complex that epitomizes the Arctic Small-Tool tradition. These people produced some of the most finely made stone tools ever found. Denbigh artifacts are related not only to those found in regions to the south (as far as Bristol Bay) and east (as far as Greenland), but also to cultural complexes in Siberia. At Cape Krusenstern ridges 78 to 80 exhibit artifacts of an early Denbigh phase (4,500 years ago), and the inner beach ridges (83 to 104) have artifacts dating from around 5,000 years ago.

The prehistoric cultural resources of the monument are not limited to the beach ridges but may be found throughout the area. In northwestern Alaska the only existing shore-edge features dating to earlier than 5,000 years ago (when the post-Pleistocene sea levels stopped rising) are the higher sea cliffs where perhaps earlier coastal archeological sites may be found. In the monument these cliffs exist only at Battle Rock, the western face of the Kakagrak Hills, and the bluffs around Ingitkalik Mountain.

Major sites have been found at several of these locations. One of these is the Lower Bench site. Two benches extend from Ingitkalik Mountain on the northeast shore of Krusenstern Lagoon, probably representing ancient shorelines formed before the beach ridges. On the lower bench, J.L. Giddings found a site that he dated around 3,500 B.C., just slightly older than the inner beach ridges and possibly from the Denbigh culture. Anderson (1977) feels that this site could be even older, from 4,500 to 8,000 years in age. Higher up on the slopes of the mountain, Giddings found another site called the Palisades site. Two components were identified. One of them, Palisades II, is at least 6,000 years old and is part of the Northern Archaic tradition. Related sites have been found at Onion Portage on the Kobuk River and at Anaktuvuk Pass (the Tuktu site) in the Brooks Range. This tradition appears to be a culture that is related to cultures in interior, forested Alaska and that expanded to the north and west for a short period of time about 8,000 years ago. The other component, Palisades I, could contain the oldest cultural material in the monument (Giddings thought so), but further investigation is needed before its full significance can be determined.

The coast north of the cape and the drainages flowing to it comprise a nearly continuous archeological zone whose resources have only been partially investigated. The density of site occurrence appears to be less than at the Cape and at Sheshalik Spit, but they are equally important because they represent a different part of the life cycle and seasonal rounds of the early inhabitants. The most significant of these sites was found by Giddings in

CULTURAL RESOURCES

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve

United States Department of the Interior
National Park Service

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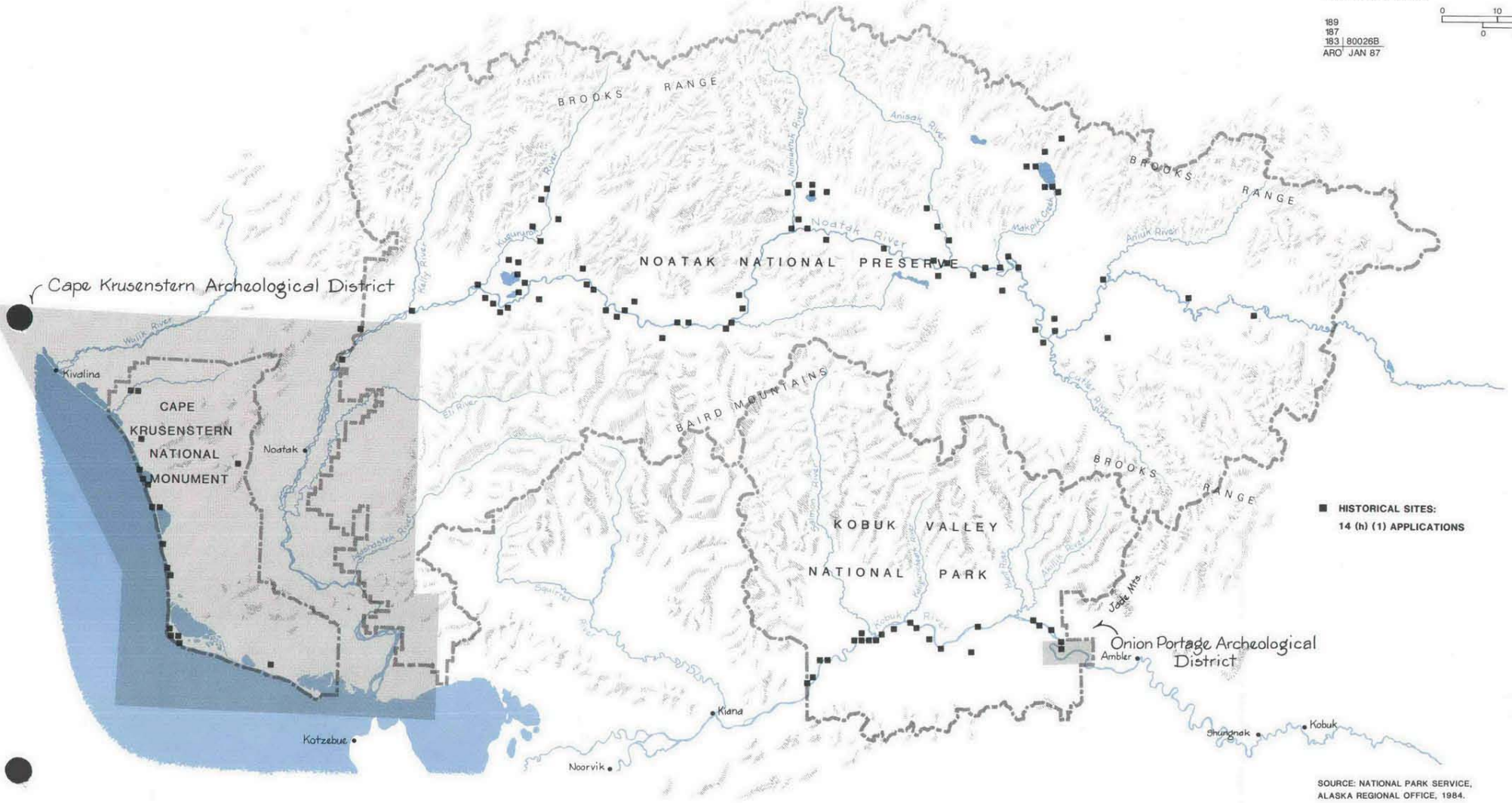

SOURCE: NATIONAL PARK SERVICE, ALASKA REGIONAL OFFICE, 1984.

ON MICROFILM

1967 on a rounded coastal limestone outcropping with a thin tundra sod. It was called Battle Rock by him because it was the location of a legendary fight between people from the cape and Point Hope. However, its history proved to be more complex than that. Stone-lined graves from the Western Thule or related cultures were found. Also there was evidence that people of the Arctic Small-Tool tradition cultures (Ipiutak, Choris, Norton, and Denbigh) had used Battle Rock. Also discovered were the remains of a large stone-lined, multiple burial containing the parts of more than one human skeleton and other artifacts, including 300 antler projectile points. It was assigned to a unique complex and named the Battle Rock phase (Giddings 1967). This phase is probably related to the Norton culture (of the Arctic Small-Tool tradition), but has some intriguing differences that need further research and interpretation.

More recent surveys of the northern part of the monument (Anderson 1977, Hall 1983) indicate that there are more sites scattered over the noncoastal areas. Sites found by Anderson on Rabbit Creek and New Heart Creek indicate a long-term use of that area extending over several thousand years (from pre-Denbigh times up to the late prehistoric period). Hall has found several more sites along the route of the proposed Red Dog mine road, including another stone-lined grave site and one from the Northern Archaic period (8,000 years ago).

Historic

Exploration and use of the Cape Krusenstern area by western civilization was preceded by more than 150 years of trade and contact along the coast of northwest Alaska. Russian trade goods reached people of the Kotzebue Sound through extensive trade ties across the Bering Strait between the native people of eastern Siberia and those of northwestern Alaska. Several voyages of exploration opened the era of European contact. In 1730 Michael Gvozdef and Ivan Fedorov reached the Diomede Islands and sailed along the Seward Peninsula. Both Vitus Bering (1741) and James Cook (1776) missed Kotzebue Sound on their voyages. It was Otto von Kotzebue who made the official discovery of the sound in 1816. He named the cape marking the northern entrance of the sound after his former commander, Admiral A.J. Krusenstern (Orth 1967). In 1816 Kotzebue noted permanent habitations at Cape Krusenstern. (H.W. Elliott also reported the cape as occupied in 1874.) In 1819 an American named Gray explored the area for John Jacob Astor, thereby establishing an American presence in the area. In 1820 G.S. Shishmaref surveyed the coast between Cape Krusenstern and Icy Cape. Captain F.W. Beechey from England entered Kotzebue Sound in 1826 and explored Hotham Inlet, which he named.

After this time, the increasingly frequent visits to the area by traders and whalers began to seriously affect the native way of life. Trading upset older habits and introduced new technologies, the reduction of the whale and caribou populations threatened the subsistence hunt, and diseases were introduced. When H. Zagoskin of the Russian Navy visited Kotzebue in 1842, he found that more than half the population had died during the smallpox epidemic of 1838-39.

Between the mid and late 1800s the interior country was penetrated by various military expeditions. Cantwell explored the Kobuk River, and McLenegan went up the Noatak. Further exploration in the area took place during the winter of 1885-86 when Stoney and his men explored the Kobuk River country and parts of the western Brooks Range. In 1897 a reindeer station was established in Kotzebue to offset the severe decline in the caribou population that was eroding the native way of life. In 1899 a post office made the name Kotzebue official, and the Society of Friends opened a mission and a school in town. The pressure for acculturation continued to grow. The desire for schooling, interest in Christianity, and access to trade goods and work drew many people to Kotzebue to live. Seasonal use of the Cape Krusenstern area continued, however, as people from Kotzebue, Kivalina, and Noatak traveled there to harvest marine and land resources. By 1958, when Giddings visited, the Cape was used only sporadically and seasonally (Giddings 1967).

Sheshalik Spit, which is at the southern end of the monument, has been heavily used for more than a century. It is extremely likely that an intensive archeological survey there would reveal evidence from earlier times. Today it is the most heavily used part of the monument, with intensive subsistence activities occurring during much of the year, especially in the late spring and summer months.

Near the outlet to Krusenstern Lagoon are the remains of an Alaska Road Commission mail cabin. The date of construction is unknown. Without a roof, the cabin is rapidly deteriorating.

Implications. The cultural resources in the monument have national and international significance and require the fullest attention available in the management of these resources. Because a baseline survey has never been carried out to identify additional cultural resources within the monument and because the potential for discovery in the area is so high, it should be presumed that additional sites will be discovered. Existing prehistoric and historic sites offer an outstanding opportunity to interpret a variety of themes that revolve around the monument's cultural resources. Cultural resources in the monument are protected by a number of overlapping state and federal laws. These laws mandate various types of protection and mitigation actions in the event of certain actions or disturbances.

NATURAL RESOURCES

Climate

The climate of Cape Krusenstern is essentially maritime, influenced by the adjacent Kotzebue Sound and Chukchi Sea. Cloudy skies, frequent fog, westerly winds, and minor fluctuations in daily temperatures are normal. In October when offshore waters become frozen, a more continental climate prevails. Temperatures decrease dramatically and fluctuate over a greater range during the winter months.

Average daily temperatures for the summer months (June, July, August) at Kotzebue range from 43°F to 53°F, with the highest temperatures occurring in July. Temperature extremes have reached as high as 85°F (during July 1958 at Kotzebue) and as low as 20°F (in June 1948) (NOAA 1982). The coldest months

are from January until early March, when average daily temperatures range between -40°F and 0°F. Temperature extremes at Kotzebue for the same period reached a low of -52°F in February 1980 (NOAA 1982).

During the winter months, lower temperatures and windchill dramatically affects and influences biological systems in the region and require that persons outside take precautions against the cold. An air temperature of 0°F, for example, influenced by a 15-mph wind reduces the temperature to a windchill of -30°F.

Precipitation at Kotzebue is light, with only about 9 inches falling annually. More than half of this moisture falls between July and September, when a warm, moist movement of air from the southwest predominates. August is the wettest month, with a mean monthly precipitation of 2.26 inches. In total, precipitation occurs on an average of 110 days per year.

Snowfall can occur during 10 months of the year, July and August usually being the exceptions. Annual snowfall averages less than 50 inches. An extreme high in monthly snowfall occurred during March 1954 when 21.9 inches fell.

Winds are common in the monument, particularly along the coastline, with mean annual speeds of approximately 13 mph. Mean monthly winds at Kotzebue are above 12 mph from September until April and blow from the east. Cyclonic storms are frequent during this time and are often accompanied by blizzard conditions. Wind speeds can reach 100 mph. Mean monthly wind speeds are comparable for the summer months but are from the west. Summer storms can cause coastal flooding in Kotzebue and other coastal communities.

The monument has extreme seasonal variations in daylight because of its northern location. The sky remains light for three continuous months in summer, while in midwinter a diffuse light occurs for only two to three hours per day. Clear skies are experienced on approximately 95 days each year, while cloud cover blankets the area on 70 days annually.

Freeze-up at Kotzebue occurs generally in late October and breakup in late May or early June.

Climatic conditions, including low temperatures and long seasons of light and darkness, play a major role in the lives of the area's inhabitants and monument visitors.

Implications. Cold temperatures, the windchill factor, and other rigors of weather influence public use and safety in the monument. The weather and its extremes will also influence the monument's staff while performing all aspects of outdoor work. Intense cold will also affect all structures and the performance of machinery.

Air Quality

Although comprehensive data are not available for the monument, the air quality of the monument and surrounding area is considered to be excellent. Arctic haze occurs in the region, but data are very scarce. The National

Park Service installed an air particulate sampler at the Red Dog Mine site in spring 1986 to begin generating air quality data for the area. This will enable the National Park Service to compare readings taken now with those taken in future years and better compare any changes that might occur. The monument and surrounding area have a class II air quality classification, which allows slight deterioration associated with moderate, well-controlled, industrial and population growth. The lack of concentrated point sources of pollution and the fluxing of air, particularly along the coast, should deter the accumulation of air pollutants well into the future.

Implications. Until systematic, on-site, air quality monitoring occurs, no truly accurate baseline data for the monument will be available.

Geology

The geological framework of the northwest Alaska region was set by the late Paleozoic era, 600 million years ago (see Geological and Paleontological map). During the Triassic period, 225 million years ago, the site of the present Brooks Range was stablized, and limestone and chert were formed. The process of mountain-building began during the mid-Jurassic period.

Then, 135 million years ago the land was intensely folded and faulted, and the existing east-west fault trends within the area were established. In late Miocene time, 25 million years ago, seas flooded much of the formerly dry area of the Chukchi zone but retreated somewhat to form a land bridge between Siberia and Alaska. This land area was again overlain by seas about 4 million years ago and remained so until approximately 1 million years ago.

The ice advances that occurred during Pleistocene time, 1 million years ago, caused a substantial drop in sea level and a consequent exposure of the land mass known as Beringia. Continental ice sheets did not cover all of northwest Alaska at this time, although glaciers did encompass most upland areas. The last retreat of the glaciers established the present sea level approximately 4,500 years ago.

Bedrock geology of the inland area north and east of the Krusenstern Lagoon includes rocks from Precambrian to Devonian times. Limestone, dolomite, chert, and phyllite are greatest in abundance. The southern extension of the Mulgrave Hills within the monument, known as the Tahinichok Mountains, contains dolomite, sandstone, shale, and limestone from the Devonian to Mississippian periods.

Glaciofluvial deposits are found over an area between the Noatak River to Kotlik Lagoon and between the Kilikmak and Jade Creek drainages. Within the monument this area was twice affected by glacial advances during the Pleistocene epoch. The first glacial advance occurred during the middle Pleistocene time (Hopkins, 1977). This event occurred between 250,000 and 1,250,000 years ago. The second, and more recent, glaciation correlates with the Illinoisian glaciation of the central United States and occurred between 125,000 and 250,000 years ago. During both periods of glaciation large glaciers extended down the Noatak River drainage, across the lowland area east of the Kotlik Lagoon, and left the present glaciofluvial deposits. The monument has not been glaciated for approximately 125,000 years. A unique

GEOLOGY & PALEONTOLOGY

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve

United States Department of the Interior

National Park Service

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PALEONTOLOGY

(FOSSIL COLLECTION SITES)

SITE 1. CONODONTS / RADIOLARIANS
SITE 2. CONODONTS / RADIOLARIANS
SITE 3. CONODONTS / RADIOLARIANS
SITE 4. BRACHIOPODS
SITE 5. CONODONTS
SITE 6. STROMATOPOROIDS / CORALS
SITE 7. CONODONTS
SITE 8. PLANTS (MESOZOIC)
SITE 9. CONODONTS
SITE 10. ECHINODERMS / BRACHIOPODS / SPONGE
SITE 11. CORALS / BRACHIOPODS / CONODONTS
SITE 12. RADIOLARIANS / PELECYPODS / CONODONTS
SITE 13. ECHINODERMS / CORALS / BRACHIOPODS

SOURCE: (FOR SITES 1-13) MF-1441, *GEOLOGY OF THE SINIKTANNEYAK MOUNTAINS AND MT. OPHIOLITE, HOWARD PASS QUAD*, BY STEVEN W. NELSON AND WILLIS H. NELSON, 1982.

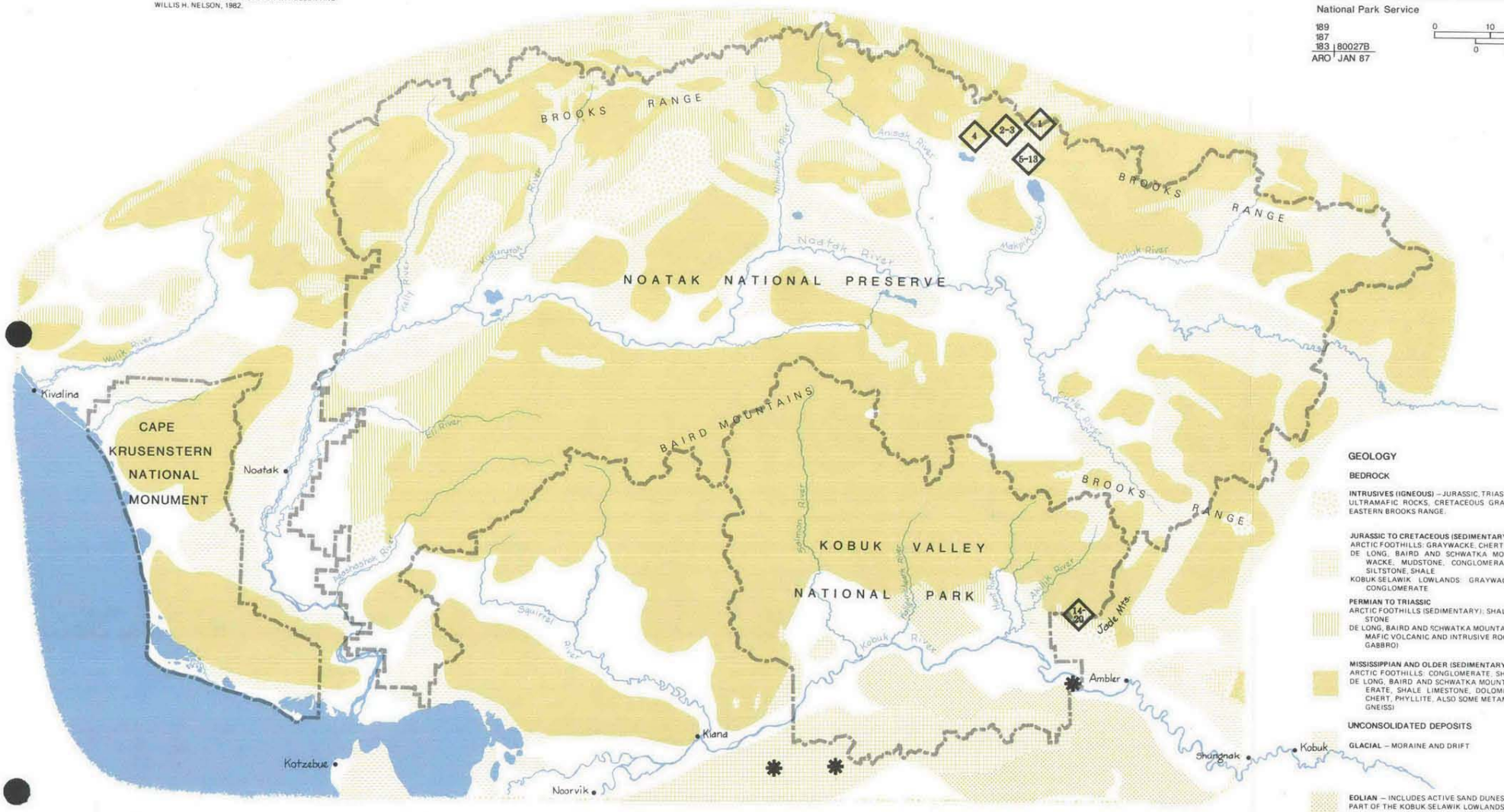
SITE 14. CORALS (MISSISSIPPIAN)
SITE 15. CORALS (MISSISSIPPIAN)
SITE 16. CORALS (MISSISSIPPIAN)
SITE 17. CORALS (MISSISSIPPIAN)
SITE 18. CORALS, STROMATOPOROIDS, GASTROPODS
SITE 19. CORALS, STROMATOPOROIDS, GASTROPODS
SITE 20. CORALS, STROMATOPOROIDS, GASTROPODS

SOURCE: (FOR SITES 14-20) I-554, *REGIONAL GEOLOGIC MAP OF THE SHUNGNAK AND SOUTHERN PART OF THE AMBLER RIVER*, BY W.W. PATTON, JR., T.P. MILLER AND IRVIN L. TAILLEUR, 1968.

SITE LOCATIONS

OTHER MAPPED SITES

OTHER UNMAPPED PALEONTOLOGICAL RESOURCES OCCUR IN THESE PARKS.



GEOLOGY

BEDROCK

INTRUSIVES (IGNEOUS) – JURASSIC, TRIASSIC AND PERMIAN ULTRAMAFIC ROCKS, CRETACEOUS GRANITIC ROCKS IN EASTERN BROOKS RANGE.

JURASSIC TO CRETACEOUS (SEDIMENTARY)
ARCTIC FOOTHILLS: GRAYWACKE, CHERT
DE LONG, BAIRD AND SCHWATKA MOUNTAINS: GRAYWACKE, MUDSTONE, CONGLOMERATE, SANDSTONE, SILTSTONE, SHALE
KOBUK SELAWIK LOWLANDS: GRAYWACKE, MUDSTONE, CONGLOMERATE

PERMIAN TO TRIASSIC
ARCTIC FOOTHILLS (SEDIMENTARY): SHALE, CHERT, LIME STONE
DE LONG, BAIRD AND SCHWATKA MOUNTAINS (IGNEOUS): MAFIC VOLCANIC AND INTRUSIVE ROCKS (BASALT, GABBRO)

MISSISSIPPIAN AND OLDER (SEDIMENTARY)
ARCTIC FOOTHILLS: CONGLOMERATE, SHALE, LIMESTONE
DE LONG, BAIRD AND SCHWATKA MOUNTAINS: CONGLOMERATE, SHALE, LIMESTONE, DOLOMITE, SANDSTONE, CHERT, PHYLLITE, ALSO SOME METAMORPHIC (SCHIST, GNEISS)

UNCONSOLIDATED DEPOSITS

GLACIAL – MORAINE AND DRIFT

EOLIAN – INCLUDES ACTIVE SAND DUNES IN THE EASTERN PART OF THE KOBUK SELAWIK LOWLANDS

FLUVIAL/COASTAL/UNDIFFERENTIATED DEPOSITS:
ALLUVIAL (FLUVIAL) – FLOODPLAIN, TERRACE AND ALLUVIAL FAN DEPOSITS ASSOCIATED WITH STREAMS AND RIVERS
COASTAL – OLDER INTERLAYED ALLUVIAL AND MARINE SEDIMENTS AND MODERN BEACHES, DELTAS, BARS AND SPITS

SOURCE: *ALASKA REGIONAL PROFILES – NORTHWEST REGION*, BY LIDIA L. SELKREGG FOR STATE OF ALASKA, UNIVERSITY OF ALASKA, ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER, ANCHORAGE, AK, NO DATE. P. 63.

ON MICROFILM

feature within the monument is a recognizable Illinoisian glacial esker or gravel ridge marking the bed of a subglacial stream (Hopkins 1977). An esker of this age (over 100,000 years old) is considered rare.

The coastal area of the monument north of Kotzebue Sound is a beach ridge plain, which has received sediments deposited by longshore currents over the last several thousand years. The primary purpose of the Cape Krusenstern National Monument is to protect and interpret this beach ridge complex, which contains archeological sites depicting every known cultural period in arctic Alaska over a 6,000-year period.

Moore postulated that the primary components of Cape Krusenstern sediment (sandstone, chert, limestone) are derived from the bedrock cliffs and bluffs from Cape Thompson south to Kisimilok Mountain (Hopkins 1977). Limestone in the beach ridges is thought to originate from the cliffs flanking Battle Rock; gravel is thought to be derived from alluvium south of Rabbit Creek and north of Krusenstern Lagoon (Hopkins 1977).

Fossil mollusks apparent on the beaches of Cape Krusenstern suggest that gravels of the nearby sea bottom have also been a significant contributor to the beach ridges. In addition, a more recent study suggests that the locally northward drift of sediment from Kotzebue Sound and the mouths of the Noatak and Kobuk rivers also plays a role in deposition and ridge formation at Cape Krusenstern. In general, it can be assumed that several sources collectively contribute to beach formation at Cape Krusenstern. Today there are 114 discernible ridges, which extend up to 9 miles from east to west. These beach ridges record the post-glacial (Wisconsin) rise in sea level during warm spells and consequent deposition of sediments over older rock.

Not all of the 114 beach ridges at Cape Krusenstern are complete. At places unconformities appear, either where the sea has eaten back into part of a ridge series or where the direction of beach formation has changed. Shifts in beach formation are generally attributed to changes in wind direction. Northwest winds now prevail, and studies of sediments show that the beaches were built largely of gravels that slowly shifted with the presistent currents along the shoreline.

The likelihood of the occurrence of significant amounts of metallic minerals and nonmetallic minerals is considered to be low. The monument occupies a small portion of a broad east-west-trending belt across northwest Alaska within which the potential for the occurrence of oil and gas is rated as moderate (Selkregg 1975).

Implications. The monument affords the opportunity for scientific study and interpretation of the 114 recognizable beach ridges and other significant geologic sites that also contain prime archeologic resources of national and international importance. The monument contains glacial features of the Illinoisian period that lend themselves to scientific interpretation.

Paleontology

Little is known about paleontological resources that exist within the boundaries of the monument. Fossil mollusks and some ivory have been found along the beaches (see Geological and Paleontological map).

Oceanography

The climatic, geologic, and biological processes that have influenced the landscape and human activities at Cape Krusenstern are inseparably tied to the adjacent marine environment.

The Chukchi Sea includes that ocean area along the northwest coast of Alaska, as far south as the Bering Strait and the westernmost extension of the Seward Peninsula. It also encompasses a portion of the Arctic Ocean, which spans the entire northern coast of Alaska. The monument faces a southeastern portion of the Chukchi Sea and a portion of Kotzebue Sound along its southern boundary.

A number of shallow lagoons along the monument's coastline are formed by barrier spits and islands. Today these barrier formations and lagoons often provide important habitat for birds, fish, marine mammals, and terrestrial mammals. The most biologically stable and productive lagoons are those with outlets, allowing a free-fluxing action between marine and fresh waters. The longest lagoon in the monument is Krusenstern Lagoon, which is 9 miles long. Kotlik Lagoon is the next largest, at 4 miles in length.

The circulation of waters off Cape Krusenstern in the southern Chukchi Sea is generally northward through the Bering Strait and into the Arctic Ocean. A vast counterclockwise movement of water occurs within the Chukchi Sea, although wind, bottom contours, and coastline configurations also play an important part in circulation within localized areas (Selkregg 1975).

Tidal range for the Chukchi Sea is about 11 inches (Resource Analysts 1983). Wave heights are generally less than 6 feet, but the greatest wave heights in August have reached 22 feet.

The salinity of Chukchi Sea water is relatively low during the ice-free season because of the high volume of freshwater runoff and ice melt. Waters passing northward through the Bering Strait into the Chukchi Sea are of relatively low salinity because of the effects of the outflow of Yukon River water in the Norton Sound area. This pattern is reversed in winter when the upper layer freezes and salts are concentrated at lower depths (Selkregg 1975).

The Chukchi Sea is ice-covered from November until May. Ice formation begins in October, with the ice edge from the permanent polar ice pack extending progressively southward until late March. Although the sea ice in the Chukchi Sea is fairly solid, reaching 2 or more feet in thickness, several leads and breaks occur along the coastline. The northward retreat of the ice edge begins in April and continues until late September.

The relatively warm waters of the Bering Sea flow northward, bringing into the Chukchi Sea a continuous supply of plankton, microscopic floating plant and animal organisms that are basic components in food chains. Plankton production in open waters and along ice leads provide important feeding areas for fish, birds, and marine mammals. Plankton production peaks in July. The Chukchi Sea is considered relatively fertile, although the diversity and abundance of organisms are not as great as in the Bering Sea to the south.

Implications. High tides in association with storms can cause coastal flooding in the monument and in Kotzebue. Before construction any development in coastal areas should be evaluated for this environmental hazard. The addition of man-made structures in coastal areas or offshore waters could inadvertently affect natural oceanographic forces, which could in turn adversely affect the archeological resources at Cape Krusenstern and other coastal areas in the monument.

Soils

A variety of factors affect the development of soils in the monument. These include extreme low temperatures, strong winds, and low precipitation. Together they cause the physical processes of weathering to take precedence over chemical factors in soil development. Topography and soil drainage, or the lack of effective drainage as a result of underlying permafrost, are also important factors.

The major soil types associated with the monument include the upland or mountain slope soils and those associated with the lowland areas nearer the coast.

The lower slopes of the western Igichuk Hills and the Mulgrave Hills are covered with poorly drained, gravelly or loamy soils with a surface layer of peat. Depth to permafrost is variable. The upper slopes of these hilly areas have well-drained gravelly or loamy soils with a deep permafrost table.

Along the coastline of the monument and flanking Krusenstern, Kotlik, and other major lagoons are marine and alluvial deposits that form beaches, spits, and deltas. Soils of lowland areas along the coast are poorly drained, with a surface layer of fibrous peat and a shallow permafrost table. The peat layer ranges from 8 to 24 inches in depth.

Soil temperatures at nearby Kotzebue at a depth of 1 foot range from a high of 40°F during July and August to less than 15°F during most of February and March (Selkregg 1975). Because of the lag time between summer temperature highs near the surface and those at greater depths, the maximum depth of soils at more than 30°F is reached in Kotzebue in December. Soils within the monument are generally considered to be unsuitable for farming.

Implications. Soils at Cape Krusenstern are highly subject to erosion when the overlying vegetation mat is disturbed or removed. Compression and tearing impacts of heavy vehicles on the vegetative mat or overlying snowcover can induce or accelerate erosion. Permafrost at shallow depths in the monument and in Kotzebue present severe limitations for the construction of building foundations and utility lines. The removal of vegetation at the

surface can cause a change in the depth of the active layer overlying permafrost, with consequent heaving and sagging action at the surface.

Hydrology

The lands within the monument are drained by a number of streams that flow from the uplands and empty into the Chukchi Sea or coastal lagoons.

During the ice-free season, some of these streams and associated coastal lagoons provide important habitat for anadromous and freshwater fish populations, and migrating birds and terrestrial mammals. During the winter, streamflow at the surface ceases as waters freeze. In areas where substantial springs exist, water may continue to flow out at the surface and then freeze into successive thin sheets or layers of ice. The resultant thick ice formation, known as aufeis, may expand well beyond the normal stream channel. Such expansion can cause a shifting or modification in the direction of streamflow or channeling during successive periods of breakup. Both Jade and Rabbit creeks are subject to aufeis formation and have numerous channels and low intervening gravel bars.

Springs within the monument are often associated with limestone deposits that, through absorption and dissolution, can conduct large volumes of groundwater. Streams in the Igichuk Hills run dry where they cross limestone zones (Hopkins 1977). The best potential sources of groundwater within the monument are from limestone zones such as the one in the upper Jade Creek.

Permafrost plays an important role in the topographic development and appearance of lands within the monument. The lowland areas of the monument are underlain by thick continuous permafrost. Permafrost can reach depths of 2,000 feet, but generally reaches a maximum depth of 1,400 feet within the inland portions of the monument. At nearby Kotzebue permafrost depths are generally less than 240 feet because of saltwater intrusion at that depth (City of Kotzebue 1971).

A variety of permafrost features are evident within the monument, particularly in the lowland areas. These include thaw lakes, ice wedge polygons, pingos, frost mounds, and solifluction lobes. Many of these features are caused by localized melting of ground ice, resulting in settling or "caving in" of the ground surface. These features are collectively referred to as "thermokarst topography." Thaw lakes are formed by the collection of standing water in a surface depression underlain by permafrost. The collection of water in a pool causes the melting of some permafrost underneath. Because there is no downward percolation through the frozen material, the water expands in the direction of the wind across a broader surface area to form a shallow lake.

Ice wedge polygons occur when contraction of the ground surface because of extreme temperatures causes cracks, which accumulate water and snow. This moisture turns to ice and exerts a "wedging" effect that causes a polygonal patterning at the surface. Pingos are ice-cored hills raised by frost action above the permafrost layer. Frost mounds are essentially small pingos of heights up to 4 feet, and often occur in drained lake basins. Solifluction lobes often occur as tearlike terrace features on mountainsides or hillsides.

They are caused by the saturation of earth material overlying permafrost, resulting in a downslope slumping or solifluction. This feature is common on the steep slopes of the Igichuk Hills to the southeast of the monument.

Implications. Jade and Rabbit Creeks are known to experience aufeis. These locations and all other coastal and streamside areas should be carefully evaluated for this environmental hazard before any developments are constructed by a qualified hydrologist or hydraulic engineer. The best sources of groundwater for drinking water wells will occur in limestone formations. Permafrost may be encountered in any location within the monument or in Kotzebue; its effects on proposed facilities should be analyzed prior to design.

Water Quality

The most recent and thorough water quality studies in the region have been completed as part of the "Environmental Baseline Studies for the Red Dog Project" by Cominco Ltd. These studies, when interpolated, are thought to be accurate for the monument as a whole even though the New Heart Creek station was the only one inside the monument.

Typically the flowing streams of the monument are like other streams in the region. These clear water streams are unpolluted and exhibit low levels of color, suspended solids, turbidity, and nutrients. Water is highly oxygenated, moderately hard to hard, and of the calcium bicarbonate type. The pH is essentially neutral, and levels of most trace elements fall within the ranges acceptable for freshwater acquatic life (Cominco 1983 and 1984).

At the Red Dog Mine site outside the monument waters are naturally contaminated with cadmium, lead, and zinc. This contamination occurs because the ore in the ground is of sufficent quantity and concentration to alter the water as it passes over the ore deposit. None of these waters flows into the monument.

Most lagoons in the monument are brackish and are presumed to have sluggish circulation during much of the year.

Accumulations of naturally occurring, spawned-out, rotting fish may seasonally lower the water quality in some areas.

Some small lakes and small meandering streams in the monument's lowlands also have sluggish waters, which may have locally high accumulations of organic matter.

According to the Bureau of Land Management, wells in the region are generally deep, and the water from them is of poor quality (BLM 1974).

Implications. Surface waters in the monument are generally unpolluted, but seasonally local conditions may change the quality of water. Ground water information for the monument is currently very scarce. Development of wells for public water supplies could be very costly.

Vegetation

The majority of the monument is characterized by a moist tundra vegetation community there is a strip of wet tundra on the southern boundary, facing the Kotzebue Sound, and alpine tundra or barren ground is found in isolated upland areas. A community of salt-tolerant plants inhabits the coast. Isolated patches of white spruce trees are found in the southeast portion of the monument. As many as 300 vascular plants, 100 mosses and liverworts, and 81 lichens were found by Albert Johnson in his 1966 analysis of the vegetation in the tundra community at Cape Thompson, 80 miles north.

The moist tundra zone, encompassing virtually all lower slope and lowland areas back from the coastline, is characterized by extensive cottongrass tussocks with mosses and lichens in-between. Some areas are dominated by dwarf shrubs. Hiking through tussocks, is slow, wet, and usually strenuous. Shrubs and other species in the moist tundra include willow, dwarf birch, Labrador tea, Lapland rosebay, mountain alder, mountain avens, and saxifrages. In the wet tundra area along the southern boundary, a mat vegetation is found rather than tussocks. Grasses and sedges are dominant and include arrow grass, pendant grass, snow grass, and bog rosemary, louseworts, and woodrush.

At higher elevations (generally from 750 to 1,600 feet) on windswept, well-drained, and rocky slopes of the western Igichuk Hills and the Tahinichok Mountains to the north is an alpine tundra community. Vegetation is sparse and consists of willow, heather, and mountain avens in combination with grasses, sedges, herbs, and mosses. Lichens and saxifrages are common on drier areas. The alpine tundra is composed of a plant mat ,which is no more than a few inches high.

Along the coast wave action and scouring by ice largely restrict plant growth to the lagoon side of the barrier islands and dunes. The succession of rows of ancient beaches at Cape Krusenstern, occurring as horizontally stratified ridges, are distinguishable by slight vegetational differences between the low ridges and their intervening swales. The vegetation of the coastal lagoons along the coast is abundant because of the high accumulation of nutrients in shallow waters. A variety of freshwater and brackish water plankton are found, depending upon salinity, as well as numerous algal forms. Eelgrass is common in marine waters, and pendant grass and mare's tail are more common near freshwater.

The white spruce is an important wood source for the people of this area and is used for the construction of boat frames, sled runners, spear handles, oars, drying racks, tent stakes, and log homes (Uhl 1980). Spruce is also the most common source of fuel for those with wood stoves. The wood of the balsam poplar is used considerably less than spruce for construction material and fuel.

Local residents of the region have traditionally used berries, roots, and leaves of edible plants in the monument. Salmonberries are picked in great quantities in mid-August when ripe and are eaten as a fruit dessert all winter long. Blueberries, blackberries, and cranberries are also eaten. The leaves of sourdock are collected, stored, and eaten or fermented for use

as a brine solution for pickling meats. Sea lovage, wild chives, beach greens, and willow leaves are other local greens that are harvested. The starchy roots of masu and cottongrass are also eaten (Uhl 1980).

Implications. Tundra vegetation is highly vulnerable to disturbances and recovers slowly after disturbance. Disturbance should be kept to a minimum to prevent scarring and to help protect fish and wildlife habitat. Trees of appreciable size are very limited within the monument. Management of their timber use could be coordinated with surrounding landowners to relieve the pressure on the resource and to adequately maintain opportunities for wood use for customary and traditional needs.

Fish and Wildlife

Wildlife is a major resource of Cape Krusenstern National Monument. ANILCA requires the protection of habitat for seals, other marine mammals, birds, fish, and other wildlife of the monument. Twenty-one species of terrestrial mammals are thought to use lands within the monument boundaries (NPS 1974), and 21 species of marine mammals use the adjacent waters of the Chukchi Sea and Kotzebue Sound. Included among terrestrial mammals are caribou, grizzly bear, musk-ox, moose, Dall sheep, wolf, fox, weasel, and wolverine. Marine mammals include ringed seal, bearded seal, Stellar sea lion, walrus, bowhead whale, finback whale, beluga whale, and harbor porpoise.

Caribou. Caribou found within the monument are part of the western arctic herd that ranges over the entire northwest Alaska region. The herd declined from a population of at least 242,000 in 1970 to an estimated 75,000 in 1976. Since that time the herd has increased in size and was estimated to be 171,699 in 1982 (ADF&G 1984). The 1984 herd size is projected to be approximately 200,000 (J. Davis, personal communication 1984).

In modern times, caribou were first reported moving in the area encompassed by the monument in 1949 (Uhl 1980). Successive migrations in the early 1960s included up to 10,000 caribou moving through the Cape Krusenstern area. During recent years, as many as 60,000 caribou have been recorded moving through the monument, with as many as 10,000 wintering along the Kivalina drainage and within the Mulgrave Hills (Resource Analysts 1983). A maximum of 2,500 animals were reported wintering in the Wulik and Kivalina drainages in 1982. This "stopover" activity on the southward migration route appears to be related to the abundance of food and the availability of escape routes during predation (Uhl 1980).

During the post-calving period, animals aggregate for the spring migration northward toward the Arctic Coastal Plain. Between 20,000 and 30,000 animals moved south and east across the Wulik River during early July in recent years, although the majority of the herd moves farther north.

In general, the movement of a portion of the western arctic herd in the area of the monument varies greatly from year to year. Although herd size may, in part, be responsibile for regional herd movements, a variety of more localized factors are also important. These may include wolf concentrations, hunting activity, and behavior of leading caribou (see Caribou and Musk-Ox map).

Moose. Moose within the region are most abundant in areas of transitional vegetation, which include mixed willow and spruce forest. These areas are limited within the monument boundaries, although moose numbers regionally have increased in recent years. Uhl (1980) reports that moose were generally not known to occur within the area now encompassed by the monument until 1947.

The moose population increased and expanded its range during the 1950s and 1960s, particularly in the nearby timbered areas of the lower Noatak. Approximately 1,500 moose were estimated to inhabit the Noatak drainages in 1980 (ADF&G 1981) and approximately 2,227 were estimated to be in the middle Noatak drainage in 1985 (ADF&G/NPS 1985). Moose also moved into less timbered areas (including willow patches) within the monument. It is likely that no more than 50 moose inhabited the monument at one time (Uhl 1980), with a summer influx possibly related to the cooler temperatures and the breezes near the coast that reduced irritating insects. Today, moose densities appear to be high within the region.

Although moose have been used as a source of meat by subsistence hunters near the monument during years when caribou were scarce, caribou are preferred by local residents. The moose population appears to be highly variable because of its relationship to wolf numbers, caribou numbers, and icing conditions on major drainages (Uhl 1980). No major shifts in population composition were noted in the region in 1983, except for a somewhat reduced late-winter calf percentage, which dropped from 22 percent in 1982 to 14 percent in 1983 (ADF&G 1983) (see Dall Sheep and Moose map).

Bears. Comprehensive information regarding the abundance, distribution, food habits, and reproductive biology of the grizzly bear does not exist for the region or monument. Population estimates for an area encompassing the Kivalina, Noatak, Kobuk, Selawik, and Buckland drainages range between 700 and 2,400 (Darbyshire and Science Applications 1983).

Grizzly bears, not plentiful within the monument, are common visitors along stream courses and the shoreline near more mountainous terrain. Uhl (1980) estimated that fewer than 10 bears inhabited the monument at any one time. Greater densities are known outside the monument in the Noatak drainage.

Grizzly bears have an omnivorous diet. They usually forage along streams, wet meadows, and tundra slopes during the summer months for grasses, shrubs, and riparian vegetation. Salmon, ground squirrels, carrion (including marine mammals washed ashore), and berries are often eaten in the fall. Denning starts in mid-October and lasts until April or May, depending on the severity of the winter. Den sites are excavated in riverbanks or well-drained mountain slopes prone to snowdrift. Breeding occurs from May until July. Two cubs are generally born in the den in December. The interval between breeding and weaning is usually four years.

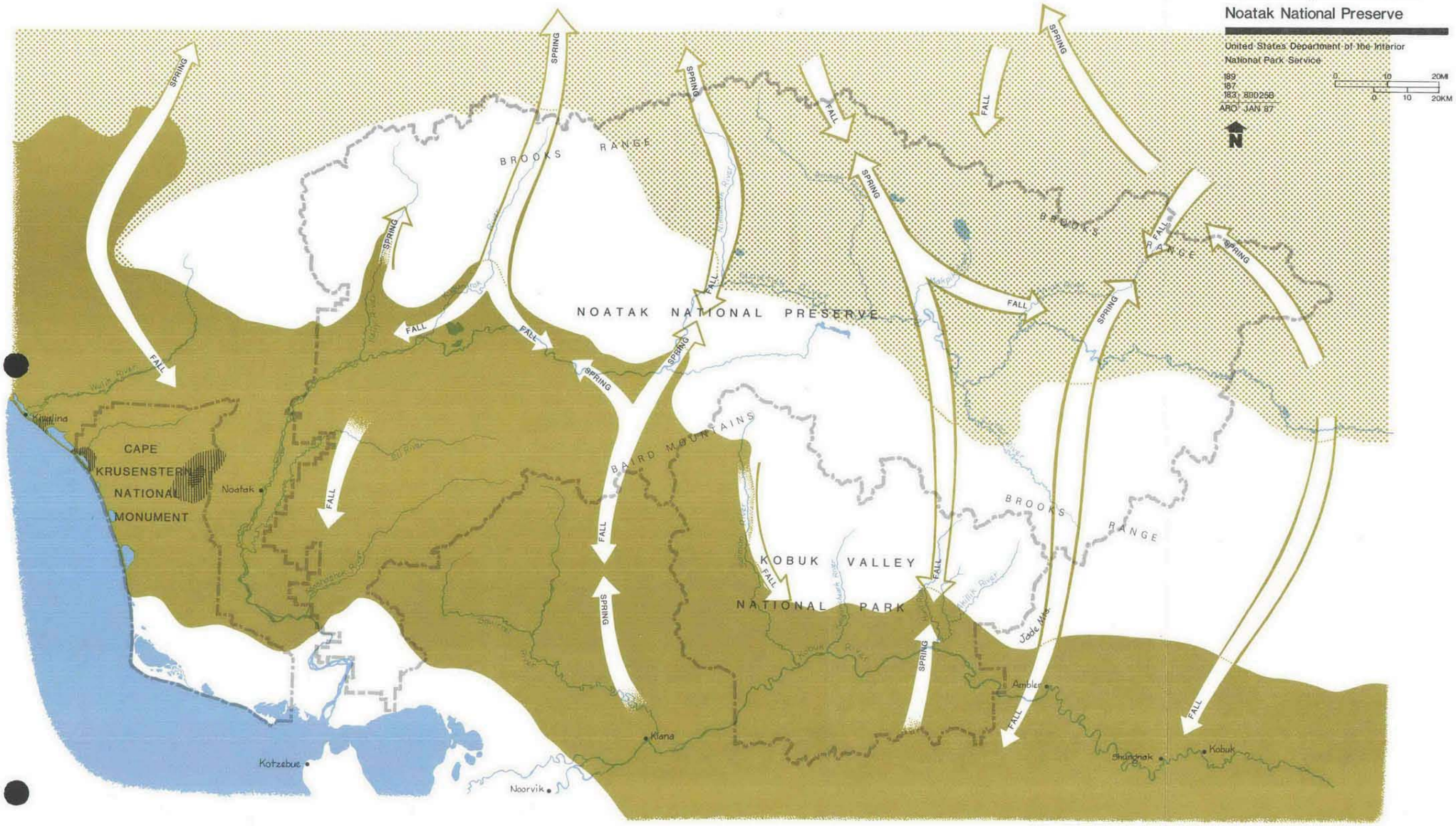
Black bears are known to inhabit the forested Kobuk drainage, but there are no recorded sightings from the tundra and forested areas within the monument (see Arctic Fox and Black Bear map).

CARIBOU & MUSK OX

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve



CARIBOU: SUMMER, WINTER, MIGRATION ROUTES

MUSK OX: SUMMER, WINTER

SOURCE: *ALASKA'S WILDLIFE & HABITAT*, ADF&G, 1973.

ON MICROFILM

DALL SHEEP & MOOSE

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve

United States Department of the Interior
National Park Service

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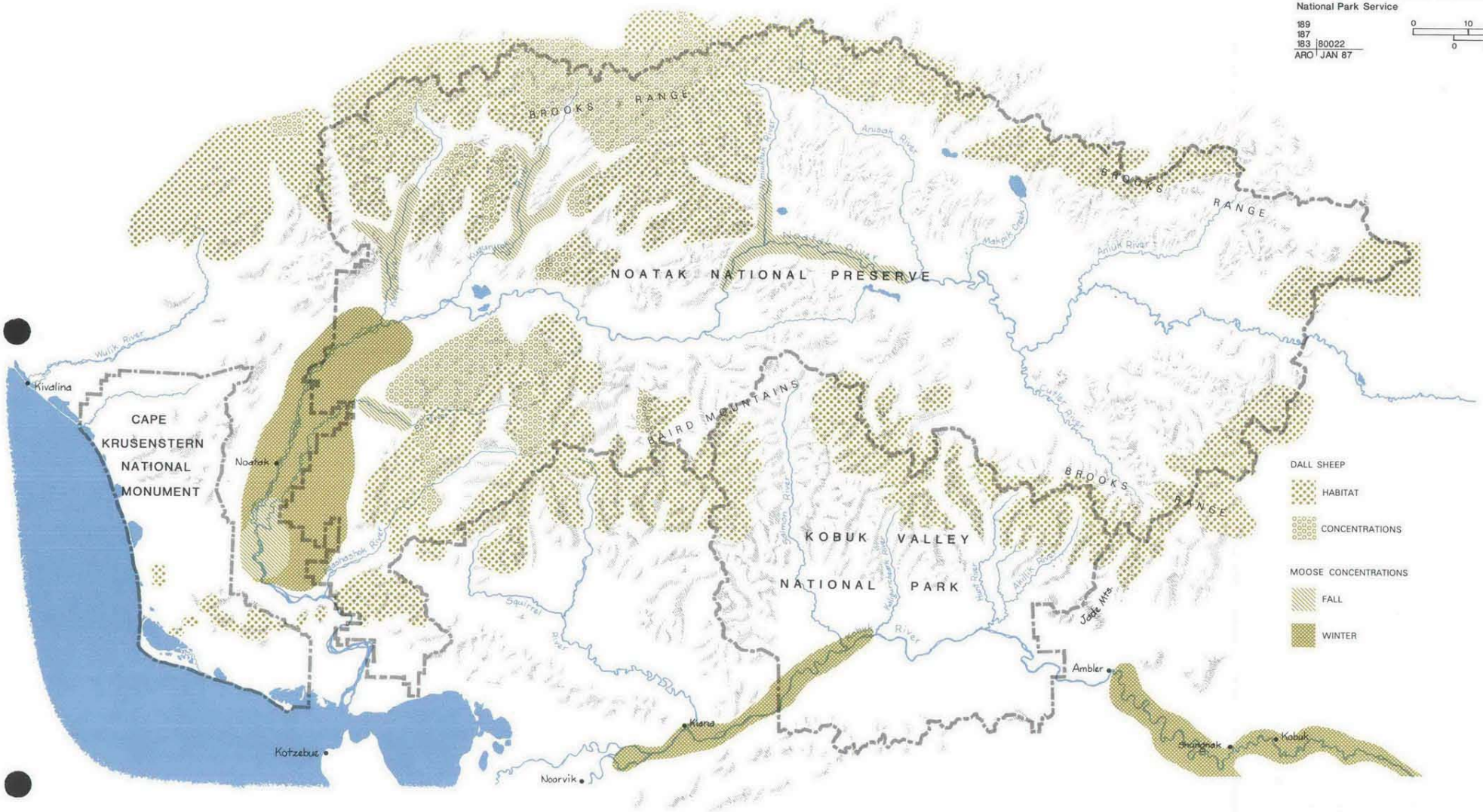

SOURCES: *ALASKA'S WILDLIFE & HABITAT*, ADF&G, 1973. ADDITIONAL DALL SHEEP RANGE DATA: F. SINGER, NPS, 1983.

ON MICROFILM

ARCTIC FOX & BLACK BEAR

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve

United States Department of the Interior
National Park Service

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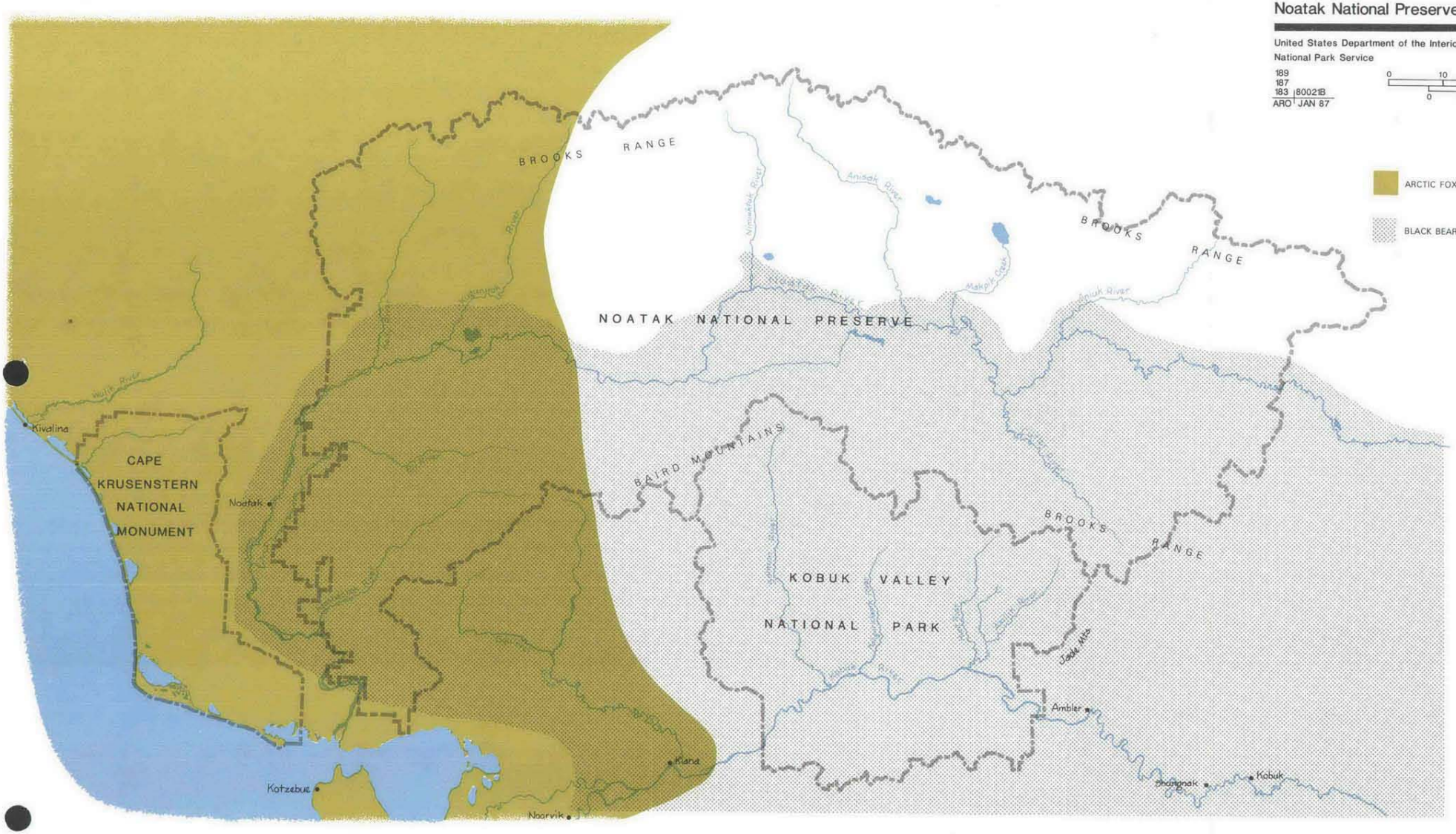

SOURCE: *ALASKA'S WILDLIFE & HABITAT*, ADF&G, 1973.

BROWN BEAR ARE FOUND THROUGHOUT REGION

ON MICROFILM

Musk-Ox. Musk oxen are present in the region in small numbers. The musk-ox is a hoofed, horned mammal with a long coat of brown hair. The last naturally occurring musk-ox died in Alaska in 1865, but musk-ox were reintroduced to the state from Greenland in 1936. Grasses, sedges, wood rushes, and dwarf birch are their primary food sources.

The release of 36 musk-ox near Cape Thompson (60 miles northwest of the monument) in 1970, and a second release of 30 animals in the same area in 1977, have resulted in the dispersion of musk-ox into the monument in recent years. An area in the Mulgrave Hills 8 to 10 miles west of the village of Noatak was identified by the ADF&G as summer and winter musk-ox range. Approximately 80 animals currently inhabit the area outlying Cape Thompson (Resource Analysts 1983). In July 1980 the U.S. Fish and Wildlife Service observed 67 musk-ox 20 miles northeast of Point Hope, and another group was present in the Mulgrave Hills between the Noatak and Wulik river drainages in the monument (see Caribou and Musk-Ox map).

Wolves. Wolves inhabit the major drainages within the monument. Food sources for wolves include caribou, moose, hare, mice, and salmon, depending on availability. An increase in the availability of caribou as prey in recent years is assumed to have caused a corresponding increase in the wolf population in the region. Wolf densities for the Wulik and Kivalina drainages during spring 1982 were approximately one wolf per 76 square miles. The estimate for the nearby Noatak drainage was one wolf per 325 square miles. The average for the region was one wolf per 90 square miles (ADF&G, 1982).

Dall Sheep. Dall sheep are present throughout the Baird and DeLong mountains west to the Wulik Peaks; the area is the northwestern limit of their range. Dall sheep feed on grasses, forbs, lichens, and willow. The sheep remain near rugged and rocky areas, which provide escape routes from wolves, bears, and other predators.

Dall sheep move in and out of the monument's western Igichuk Hills in sparse numbers. Recent surveys of these animals by the National Park Service showed 14 animals living in these hills and crossing from the Noatak drainage periodically. Although ADF&G surveys (1976-1981) indicate that sheep populations are on the increase, their density is substantially lower than in other areas of the state. Formerly prized by subsistence hunters for their fine skins, which make excellent parkas and inner clothing, the Dall sheep have become less important in recent years because of the greater use of down and synthetic garments (Uhl 1980) (see Dall Sheep and Moose map).

Other Smaller Mammals. Red fox, arctic fox, snowshoe hare, and arctic hare are present within the monument. Large grassy areas and a high population of voles and ground squirrels make the monument a highly suitable area for red fox. Their current population is high and stable despite substantial subsistence harvest. The arctic fox generally prefers coastal and delta areas, mostly within the Arctic Slope area, but it is wide-ranging in its feeding activities. Although dens are found within the monument, the arctic fox spends much of its life searching on the ocean ice for carrion.

Snowshoe hares are found in the western Igichuk Hills in timbered areas and within large patches of willow near the coast. These hares depend on willow growth for food and may starve during heavy snow years in areas of sparse willow growth. The arctic hare, with its characteristic long legs and ears, inhabits the monument east of Krusenstern Lagoon and in other areas where willow, alder, and spruce are located.

Wolverine within the monument are light colored and have nearly black legs. The wolverine is prized by subsistence hunters for its fine fur, which is used for parka ruffs. The population is very limited within the monument.

Porcupines are numerous in the monument and feed on the bark of willow and spruce. Usually restricted to the timber zones, porcupines are sometimes seen along the beach areas in mid-summer. Weasel, mink, lynx, river otter, and muskrat are also found within the boundaries of the monument.

Marine Mammals. Marine mammals inhabiting the estuarine and ocean waters in and abutting the monument are very important local resources. The ringed seal (Natchiq), the smallest of the northern seals, averages 150 pounds in weight and is a life-sustaining species for people in the region. Distinguished by the yellowish rings or splotches on its dark coat, the ringed seal provides skin, meat, and oil to subsistence users, who have traditionally hunted this species off Cape Krusenstern. In fact, Cape Krusenstern itself is known traditionally by subsistence hunters as "Sealing Point." The greatest densities of ringed seal off Cape Krusentern are found in June.

Bearded seals (Ugruk), the largest of the western arctic seals, weigh up to 800 pounds. They appear in June in the waters adjacent to the monument. Despite its short seasonal presence, the light grey bearded seal is a highly important subsistence resource. This seal is widely distributed in the Chukchi and Bering seas, where it feeds on shrimp, bottomfish, clams, and worms.

Spotted seals (Qusigiaq) and ribbon seals (Quigutlik) are also found off Cape Krusenstern. The spotted seal is of medium size, up to 300 pounds, and feeds on herring, salmon, and whitefish along the coast of Chukchi Sea. The animals concentrate generally along the southern extent of the ice pack. The ribbon seal, with its distinctive white bands against a black body, is found in greatest abundance south and east of the Seward Peninsula in the central Bering Sea.

Beluga whales, small whales about 16 feet long, occur throughout the Chukchi and Bering seas. These white whales travel in groups and are prized by subsistence hunters for their edible skin, blubber, and meat. A few beluga are taken from year to year along the monument's coastline when they appear in open leads in the ice during sealing time (Uhl 1980), although most are taken after the shoreline becomes ice-free.

Bowhead, gray, and finback whales have been observed within the waters of the Chukchi Sea off Cape Krusenstern. Walrus are uncommon off Cape Krusenstern, although stray animals and carcasses washed ashore are taken for their ivory, blubber, and meat, if usable.

Fish. In addition to the marine mammals, the coastal and inland waters of the monument support a variety of fish. Of primary importance to subsistence users are whitefish (Uhl 1980). Four species are used; they include humpback whitefish, least cisco, Bering cisco, and broad whitefish. They are taken seasonally at many locations, but Sheshalik Spit and Tukruk River are particularly important areas.

Arctic char are the second most important fish for local use, with quantities usually being taken at Sheshalik Spit. They are also found and spawn in Rabbit, Jade, and Kilikmak creeks and in the Situkuyok River. Grayling are known to overwinter in the Rabbit Creek drainage and in the streams draining the Igichuk Hills. All five salmon species are found within Kotzebue Sound, but only the chum (dog) Salmon is found in any major quantity. Currently the chum in offshore waters is the source of the area's only commercial fishery. Spawning pink (humpy) and chum salmon are found in the Wulik River immediately north of the monument, as are king (chinook) and red (sockeye) salmon, and in the Noatak River immediately to the east of the monument (ADF&G 1978; AOMB 1985). The biologic resources map made for the NANA Coastal Zone Management Plan indicates that both chum and pink salmon are found in Rabbit Creek, two small drainages northwest of Sheshalik Spit (Resource Analysts 1984).

Northern pike are present in many streams in the monument south of Krusenstern Lagoon and east to Sheshalik Spit. Occasionally burbot are found in the same areas (ADF&G 1978). Dolly Varden are known to spawn in Rabbit Creek. Herring spawn in Krusenstern Lagoon and in the shallow coastal waters north of Sheshalik Spit, where sheefish also overwinter (Resource Analysts 1984).

Other species that are occasionally used for human and dog food include: saffron cod, arctic cod, rainbow smelt, starry flounder, 4-horned sculpin, nine-spined stickleback, and herring. Some crabbing in ice-free periods has been done, but only with very limited success (Uhl 1980) (see Fish and Salmon maps).

Birds. Most birds found in the monument are summer nesters or migrants. Moist tundra lowlands and wet sedge meadows near the coast are especially important habitat areas. A total of 120 bird species was recorded at nearby Cape Thompson in 1966; 65 of these species are known to nest there. At Cape Krusenstern species include mallard duck, green-winged teal, shoveler, old squaw, greater scaup, common eider, black scoter, red-breasted merganser, Canada goose, snow goose, American widgeon, American pintail, horned and red-necked grebes, and the common, yellow-billed, and arctic loons. The two largest fowl within the monument are the swan and the tundra sandhill crane. Both migrate south in the fall, although the swans are late migrants and usually are in the monument until October (Uhl 1980). Seabirds in the monument include the long-tailed jaeger, common murre, arctic tern, and the willow and rock ptarmigan, goshawk, and snowy owl.

Although the importance of the monument to migrating birds in the spring probably varies with snow and ice conditions, the lagoons between Cape Krusenstern and Sheshalik are heavily used by migrating waterbirds when conditions permit. This area is also an important subsistence hunting area

for waterfowl and for an egg gathering area. It is an important fall staging area for thousands of geese, ducks, shorebirds, and gulls (USFWS 1984) (see Seabirds and Waterfowl map).

Implications. Fish and wildlife are major resources in the monument. Any actions that could affect them should be carefully analyzed for their impacts upon the populations and upon subsistence opportunities (ANILCA, section 810). Some wildlife species, particularly the grizzly bear, can pose a threat to monument visitors. Some species migrate to or through the monument. Careful consideration should be given to actions that would affect migrating species.

Threatened and Endangered Species

Cominco Ltd. reports that three peregrine falcon nests were found in the Wulik and Kivalina drainages north of the monument in 1982 and two nests were found in the Omikviorok River drainage in the monument. Additional survey work in 1983 failed to find these nesting birds.

Arctic peregrine falcons have also been reported to nest within the southern half of the monument. The total extent of nesting is unclear, and the area is not considered to be one of the more important peregrine nesting areas (USF&WS 1984). No other threatened or endangered species are known to occur within the monument (see appendix D for additional information).

Implications. Information on threatened and endangered species within the monument, especially the peregrine falcon, is neither up-to-date nor comprehensive for all of the monument.

Scenic Character

Cape Krusenstern National Monument is a broad, relatively flat coastal plain, with foothills rising eastward to the monument's boundary. The foothills are composed of two series of hills, the Mulgrave Hills in the north and the Igichuk Hills in the south. Both are predominantly limestone that has eroded to produce hills that present soft flowing forms. Numerous small drainages drop from the hills across the east-west breadth of the monument. As they wind to the coastal plain, they create large boggy lowlands, sometimes interlaced with meandering waterways or large coastal lagoons only thinly separated from the Chukchi Sea. The coast itself is flat, windswept, and always changing. During summer some areas of the coastal tundra come alive with brightly blooming flowers visible only from a short distance. The flatness of the coastal plain also brings the sky into prominent view.

Lastly, most visitors will notice the lack of man-made objects. Although some cabins and buildings do exist, they are mostly on private lands and are typically small, one-story, weathered structures that impose little upon the natural scene. Overall, visitors will likely realize that this landscape, although regularly used by man, is dominated by natural forces.

Implications. The scenic character of the monument is dominated by natural features; any NPS structures should be designed to blend into the natural environment.

FISHES

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve

United States Department of the Interior
National Park Service

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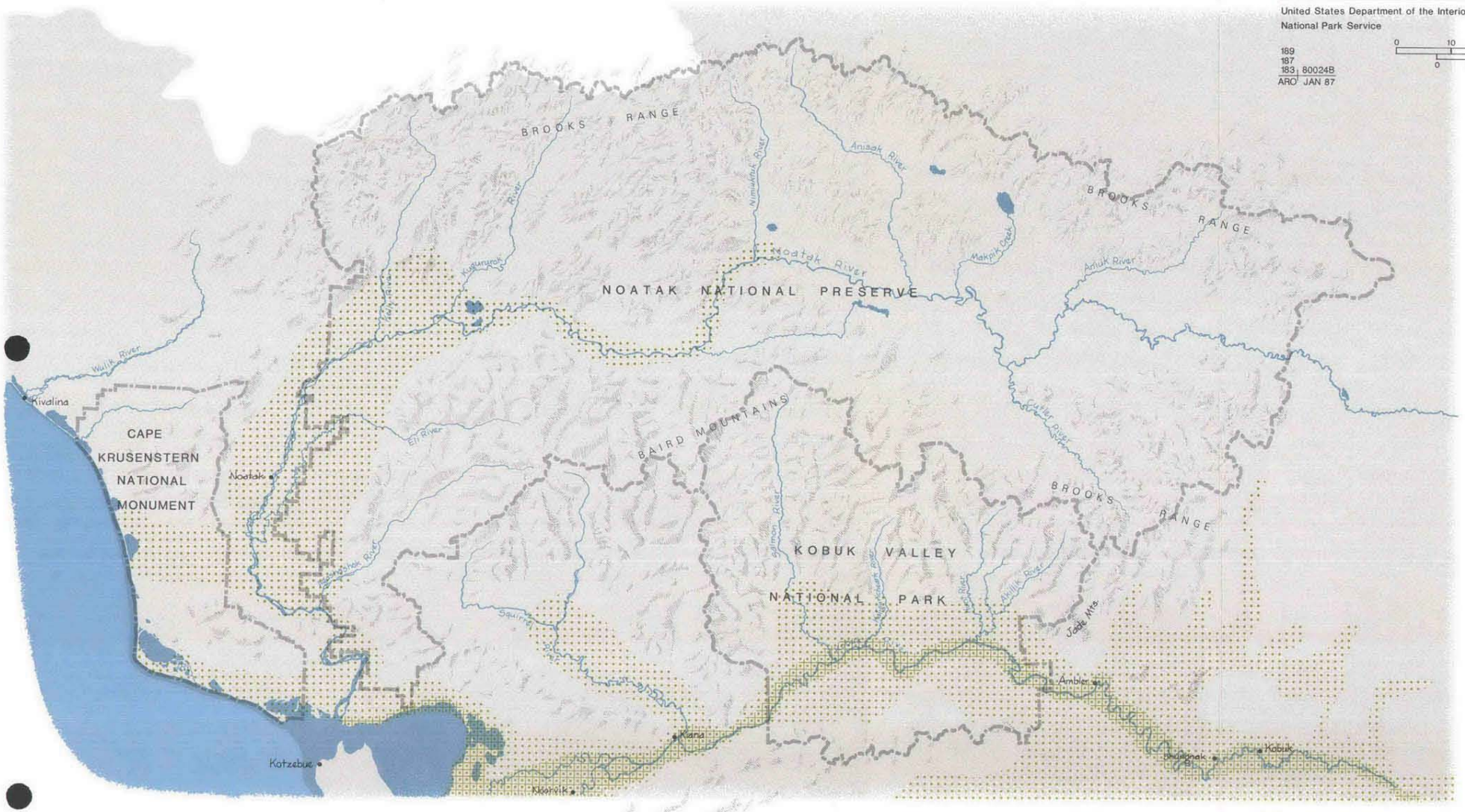


ARCTIC CHAR/DOLLY VARDEN

NORTHERN PIKE

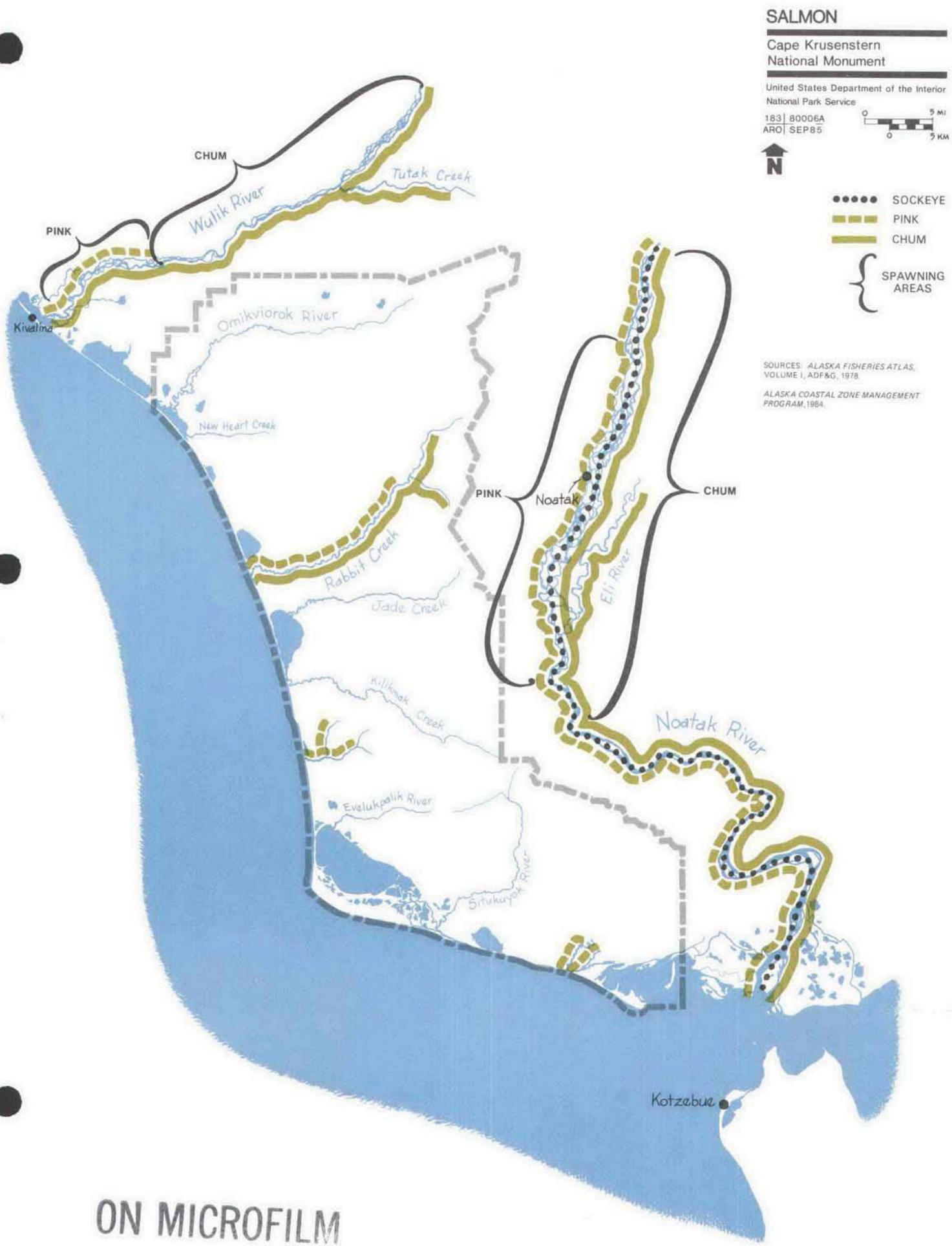
SHEEFISH/BURBOT & NORTHERN PIKE

SOURCE: *ALASKA'S FISHERIES ATLAS*, VOLUME I, ADF&G, 1978.

THE RANGE OF FISH ON THIS MAP CONFORMS TO THE FISH "PRESENT" CATEGORY ON THE SOURCE LISTED ABOVE: THE "OCCASIONAL" CATEGORY IS NOT SHOWN ON THIS MAP.

GRAYLING & WHITEFISH PRESENT THROUGHOUT REGION

ON MICROFILM



ON MICROFILM

SOCIOECONOMIC CHARACTERISTICS

Population

Northwest Alaska, an area of approximately 38,000 square miles, has 11 communities with a total 1980 population of 4,048. Of these residents, 85 percent are native, primarily Inupiat, and 14 percent are Caucasian.

Kotzebue, with a 1983 population of 2,981, represents about 40 percent of the region's residents. It has a larger Caucasian population (23 percent) than the outlying villages. In 1910 less than half of the population lived in villages, but by 1920 the number increased to 75 percent, and by 1950 it was 96 percent (Darbyshire & Associates 1983). Today aggregation into villages is occurring again; nonetheless, mobility within the region is still characteristic.

Three major factors have influenced changes in lifestyles in the region: availability of health care, economic opportunity, and cultural persistence. These factors may cause people to move between the villages or to leave the region. A 200-percent increase in the population of Kotzebue from 1950-1960 is attributed largely to in-migration from outlying villages.

The overall trend in the regional population is growth, although this growth has been occurring at a decreasing rate. Two sources (Darbyshire & Associates 1982 and Dames & Moore 1983) forecast that the regional population will continue to grow, increasing by 30 to 34 percent between 1980 and 1990, or at an average annual rate of about 3 percent. The growth rate for Kotzebue is expected to be even greater than that of the region.

Implications. The projected growth rate for the region will help keep subsistence activity levels up even though other factors might reduce individual use.

Regional Economy

Northwest Alaska's economy is characterized by a mixture of subsistence, wage employment, and other forms of income. It is typified by a large percentage of government spending, seasonal variations in economic activity, and the prominance of Kotzebue as an economic center.

Subsistence is defined in the NANA Region Coastal Management Plan (Darbyshire 1982) as "those activities providing food, fiber and shelter requirements of living and maintaining a household whose end products do not involve the exchange of cash." Preservation of a subsistence lifestyle is a primary goal of the people of northwest Alaska (Dames & Moores 1983).

Although participation in the cash economy has substantially increased over the last decade, and is expected to continue to increase in the future, this does not mean that subsistence efforts will necessarily decline. A 1979 survey of 311 native households in the region revealed that subsistence is still an important part of the local economy (Dames & Moores 1983). When the residents were asked how much of their food they obtain from subsistence, the responses were: most--35 percent, one-half--24 percent, some--35 percent,

SEABIRDS & WATERFOWL

Cape Krusenstern National Monument

Kobuk Valley National Park

Noatak National Preserve

United States Department of the Interior
National Park Service

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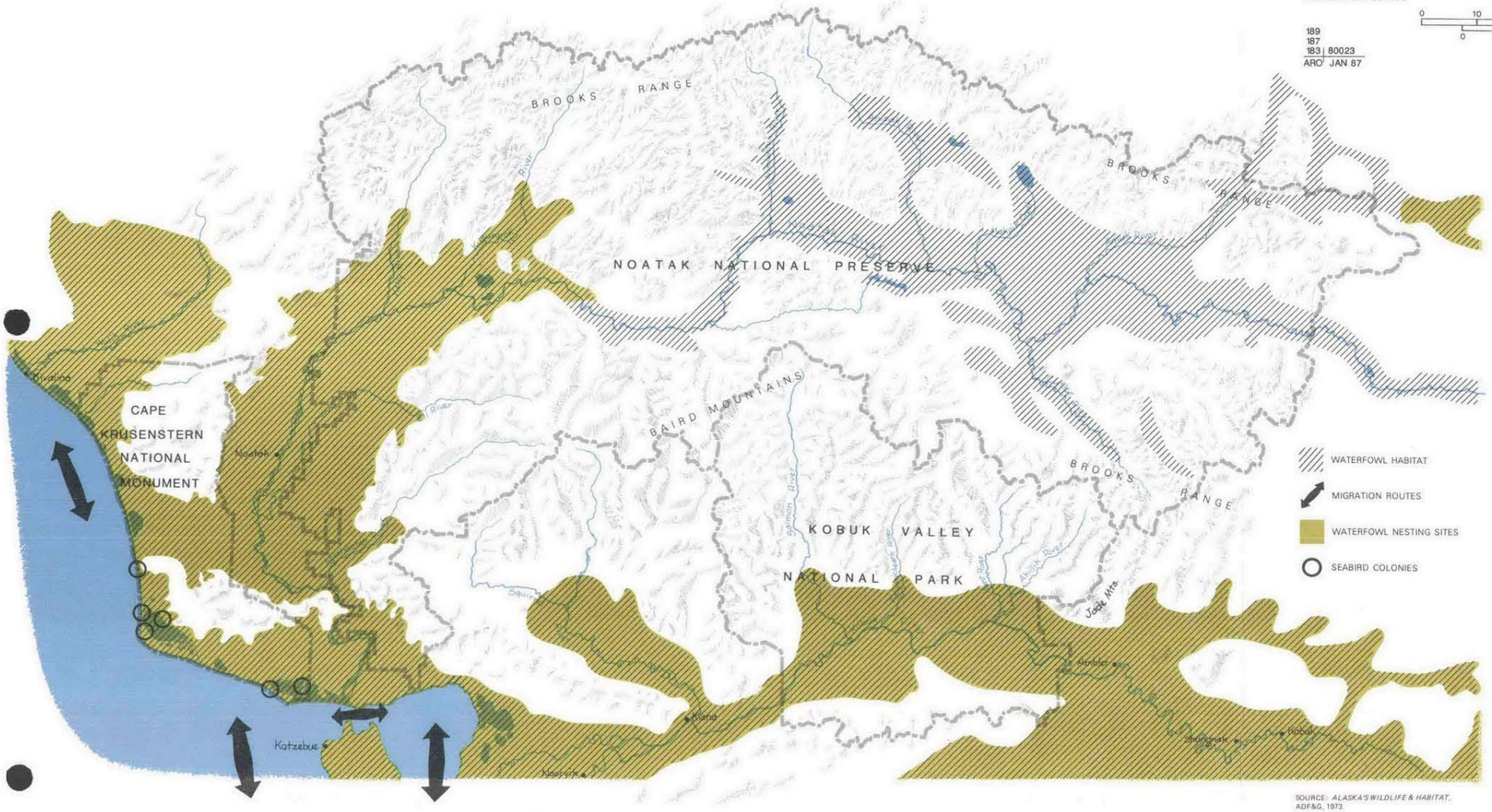

SOURCE: *ALASKA'S WILDLIFE & HABITAT*, ADF&G, 1973.

ON MICROFILM

and none--6 percent. The survey also showed that as income increased, no less time was spent on subsistence activities.

Thirteen sectors make up the region's cash economy. These include renewable resource harvest, mining and exploration, construction, household manufacturing, transportation, warehousing and distribtion, communications and private utilities, trade and private services, finance, real estate, quasi-public and nonprofit organizations, local and regional governments, state agencies and services, and federal agencies and services (Darbyshire and Associates 1982).

Local and regional governments are the largest dollar contributors to the economic base of the entire region and of Kotzebue. Transfer payments (payments directly to households for public assistance, GI bill benefits, pensions, etc.) and income brought home by persons working outside the region are together the largest contributors to the economic base of the outlying villages.

Ninety percent of the region's income is directly or indirectly generated as a result of government spending, with over 40 percent derived from federal expenditures. Sixty percent of all personal income is earned through the government sector, and 21.6 percent is specifically from transfer payments (Dames & Moore 1983). State and local governments employ the region's workers; the federal government employs another 13-20 percent.

The most important private sector economic activities are construction, fishing, transportation, and communication. The construction industry is the second largest contributor to the regional economic base and the greatest source of jobs for residents of outlying villages.

Income and employment rates for northwest Alaska are well below that of the state, and income levels of the outlying villages are lower than those of Kotzebue. In 1980 the average per capita income for the region was $7,225; statewide it was $12,633. The average annual unemployment rate for the region (Kobuk Division) in 1981 was 10.5 percent (U.S. Department of Labor 1982) compared to a state rate of 9.4 percent (Dames & Moore 1983).

A notable characteristic of employment in the region is its seasonality. A 1978 survey (Darbyshire & Associates 1982) showed that 54 percent of the region's adults had been employed in the past 12 months, and of those 44 percent had worked less than 6 months. Some of the residents wish to work wage jobs only part of the year so they can participate in subsistence activities during the appropriate seasons. The highest rates occur in the late spring, and the lowest are in September, when construction and school-related jobs are available.

Kotzebue is the center of demand for services, trade and transport in the region. Sixty four percent of the region's employment opportunities are found in Kotzebue even though it contains only 40 percent of the population. One-third of this Kotzebue-based employment and income is directly attributable to the provision of services for outlying villages.

The overall net growth in employment is expected to be very small over the next 10 years, yet population increases will be comparatively large. Although the average regional income increased through the 1970s, two recent studies predict a leveling of the economy at 1980 figures (Darbyshire & Associates 1982; Dames & Moore 1983). These projections include estimated employment at the Red Dog mining development.

Implications. Although cash incomes may increase, local residents within the time frame of this plan are not expected to lessen their dependence upon subsistence resources. If cash incomes do increase, many local hunters may utilize the income to purchase more efficient and sophisticated hunting, fishing and trapping gear and equipment. If job requirements and work schedules change, like the use of a two-weeks-on/two-weeks-off schedule, hunting, fishing, and trapping may occur during successively shortened time periods.

Access

Access to the Monument. Access to the monument most typically occurs by snowmachine and occasionally by airplane, ATVs, or dogsled. In the summer months people use small, shallow, draft boats and skiffs. Typically users come from Kotzebue, Noatak, or Kivalina to hunt, fish, trap, commercial fish, harvest wood, reach their private land, travel from one village to another, or to recreate. No roads exist within the monument or anywhere nearby.

An often-used winter trail (Coastal Winter Trail) exists between the communities of Kotzebue and Kivalina along the coastline of the monument. This trail is annually marked, with funds coming from the Alaska Department of Transportation and Public Facilities. It has been maintained since the 1920s and may be a right- of-way under federal Revised Statute 2477. No determination of the trail's legal status has yet been made. A portion of the trail on NANA lands within the monument, approximately six miles, is an ANCSA 17(b) easement.

Revised Statute 2477. Formally codified at 43 USC 932 and enacted in 1866 RS 2477 provides that: "The right of way for the construction of highways over public lands, not reserved for public uses, is hereby granted." The act was repealed by PL 94-579 as of October 21, 1976, subject to valid existing claims.

The monument is subject to valid existing rights, including rights-of-way established under RS 2477. The validity of these rights-of-way will be determined on a case-by-case basis. One right-of-way that the state contends may be valid under RS 2477 is #21, the Coastal Winter Trail (see appendix G). This route is not all-inclusive. Private parties or the state of Alaska may identify and seek recognition of additional RS 2477 rights-of-way within the monument. Supporting material regarding potential rights-of-way identified by the state may be obtained through the Alaska Department of Transportation and Public Facilities or the Alaska Department of Natural Resources.

ANSCA 17(b) Easements. Pursuant to Section 17(b) of the Alaska Native Claims Settlement Act, easements have been reserved on native lands where necessary to provide for continued access to public lands. From the village of

Kivalina, running southeast, a winter trail with a 25-foot-wide easement provides access to the northern-most coastline of the monument. This also connects with the Kotzebue-Kivalina Coastal Winter Trail.

Uses allowed by the Bureau of Land Management, which presently administers all 17(b) easements for the above-described, 25-foot-wide easements include travel by foot, dogsled, and small all terrain vehicles (ATVs) less than 3,000 pounds gross vehicle weight.

Maps and descriptions of 17(b) easements are available at National Park Service offices in Kotzebue and Anchorage. There may be additional 17(b) easements designated in the monument in the future as additional lands are conveyed to native corporations. The management of 17(b) easements is discussed in the "Access" section in chapter III.

Aircraft. Fixed-wing aircraft access is unrestricted in the monument with one exception--local subsistence users cannot land aircraft within the monument if undertaking subsistence hunting or fishing (unless a permit has been issued by the superintendent for such use as allowed by 36 CFR 13.51). This restriction does not apply to private lands, nor does it apply if the user is not engaging in subsistence hunting or fishing. Helicopter landings are not permitted in the monument unless authorized by written permit from the superintendent or by use of a designated landing site. There are no designated landing sites in the monument (43 CFR 36.11(f)).

Circulation in the Monument. Nonmotorized travel within the monument is unrestricted. Snowmachines can be, and often are, used anywhere in the monument provided snowcover is adequate. ATVs may be used where allowed by the terms and conditions of ANCSA, sections 17(b), 34, and 35, and on easements when and where a valid access permit has been issued according to 36 CFR 13.31 and 43 CFR 36.10. National Park Service observations since 1980 indicate that ATV use in the monument has occurred primarily at or below the mean high tide line along the monument's coastal beaches.

To Private Lands Within the Monument. ANILCA guarantees private property owners reasonable access to their lands. Typically private owners will reach their lands either by snowmachine, ATV, or boat. Most small private parcel owners use the Kotzebue to Kivalina trail (Coastal Winter Trail) for access because their land is adjacent to this winter trail. Access by boat in coastal waters is governed by the state of Alaska, and no restrictions are known to exist at this time. The use of inland waterways is currently unrestricted.

Implications. Several types of access are allowed by law within the boundaries of the monument. Some access is, or could be in the future, managed by the state of Alaska.

Pre-ANILCA Use and Activities

ANILCA provides for the continuation of certain activities that occurred in the monument before the passage of the legislation. These include commercial fishing, navigational markers, and valid mining claims.

Commercial Fishing. Commercial fishing dates back to 1914 in the Kotzebue area. From 1914 to 1918 the Midnight Sun Packing Company processed 10,130 cases and 300 barrels of hard salt salmon in the vicinity of Kotzebue. Today's fishery dates back to July 1962 when the effort was renewed.

A consideration of the 96th Congress when it created the monument was the continuation of commercial fishing that occurs along the sea coast of the Kotzebue area. ANILCA section 205 specifically allows this use, but does not allow a significant expansion of monument use beyond 1979 levels. Although the fishery occurs outside of the monument's boundary, onshore activities like camping, waiting out storms, and setting up small base camps do occur within the monument. Some of these activities occur on what will become private land as the Bureau of Land Management conveys ownership of native allotments to private individuals.

Navigational Markers. One navigational-aid marker, a day board and beacon, is at the western tip of Cape Krusenstern on VABM 13. The U.S. Coast Guard recently requested and received a permit to maintain the marker. ANILCA section 1310 allows for maintenance, access to, and reasonable expansion of such facilities.

Mining Claims. Although some mining claims were filed within the present monument boundaries, none of these claims remain in effect today according to NPS records.

Abandoned Military Site. One surplused military site exists within the boundaries of the monument. In the Igichuk hills an old landing strip approximately 3,000 feet long with a surface of mineral soil remains. About 1,500 feet is in usable condition. A dirt trail/road orignates at the airstrip and winds to the top of a nearby hill and ends. A less well-defined and somewhat overgrown trail also originates at the site and provides foot access to the coast. At the site and in the vicinity, several hundred 55-gallon drums are strewn about the ground, some a mile or more away from the airstrip.

Implications. Allowances for activities mandated by ANILCA must be recognized in long-term planning and in the daily management of the monument.

Current Recreation Uses, Activities, and Trends

Although both local residents and visitors to the region recreate in the monument, it is often difficult to accurately distinguish when local residents are recreating or subsisting. In reality the two are intermixed in a fashion unique to the Inupiat culture. It is safe to say that as local people carry out subsistence activities, socializing activities and recreation do occur, but to measure the amount of one compared to the other is difficult.

Currently, the best estimate of visitation by recreationists from outside the region is 50 persons per year (NPS 1983a). These visitors typically come to Kotzebue knowing about the special archeological features of the monument, and they arrange air transportation to and from the monument. Camping, hiking, and photography are typical associated activities. No definitive map

of this use can be made at this time because of the low use levels and the lack of historic data.

Because statistical information for use levels within the monument is sparse, predicting future trends to aid in planning has involved the blending of information gathered through interviews and public meetings and from impressions of park staff, planning team members, and contributors to the plan. Use by local residents at Sheshalik Spit is increasing. Although this use is on private land, it is within the boundaries of the monument and can have a spillover to adjacent public lands. In the winter two people are known to reside in the monument, but in summer up to 300 stay for several months. Summer use at Sheshalik Spit has grown substantially in the past few years and may continue to do so. However, this growth is limited by the number of native allotments and by the land use policies of the NANA, the major landholder in the area.

Use by visitors from outside the region is expected to grow very slowly, if at all, during the life of this plan. No more than 50 to 100 out-of-region recreational users are expected in the monument annually.

Commerical Visitor Services. Overall, the number of user days in the monument has been very low. In 1982 one commercial company reported six user days for a photography trip. In 1983 ten companies held commercial use licenses, but only one actually took clients to the monument. That involved a total of eight user days spent fishing and taking pictures. In 1984 the number of operators dropped to seven and use dropped to two visits to native allotments. In 1985 the number of commercial operators has risen to 12 companies (use figures for the season were not available at the time of this writing).

Implications. The current lack of information on recreation use by local residents makes day-to-day application of statutes and regulations difficult for the monument staff. The current lack of reliable scientific/statistical information on recreational uses and trends makes planning for these activities difficult.

Subsistence Uses, Activities, and Trends

Modern users of the monument are predominantly Inupiat people who reside in the villages of Kivalina, Noatak, Kotzebue, and Sheshalik, a small settlement developing on native-owned lands at Sheshalik Spit. All these areas lie within resident zones as defined by 36 CFR 13.62. All lands and waters in the monument are open to subsistence use as defined by existing laws and regulations.

In conjunction with the shift in settlement patterns during the last century, alterations in subsistence technology and practices have also occurred. Muscle power has, in part, been replaced or supplemented by machine power. The modern snowmachine has all but replaced the dog team as the primary mode of winter surface travel. Boats constructed of wood, metal, or fiberglass and powered by large outboard motors have virtually made the paddle-propelled skin boat obsolete. Three-wheeled ATVs carry local residents back and forth in the villages and along the monument's ocean beaches, where only summer

foot travel once occurred. Items such as CB radios, chain saws, and gasoline-powered ice augers are also seen as positive advances by users who now participate in subsistence activities in a modern technological world.

Subsistence activities continue to make a substantial contribution to the economic makeup of the region. Protein gained through hunting and fishing activities is, in varying degrees, a major contributer to the local diet. Without this source of food many families would find it difficult if not impossible to purchase the supplies necessary to live in the area. Within the monument a limited amount of trapping provides residents with furs, which can either be used for personal clothing or converted into cash for the purchase of necessary subsistence tools. Berries, roots, and other edible plants help to round out the diet. Wood taken from the beaches and from the limited stands of spruce in the monument provides fuel for heating homes during the long cold winters.

Subsistence serves not only as an economic support but also as a cultural and social focus of the local residents. Land and resource uses are directly tied to cultural history, spiritual beliefs, sharing patterns, status, territoriality, and value systems. Participation in, even if peripheral, and identification with subsistence pursuits are unifying forces in the local culture. Without subsistence, the relevance of many customs and traditions would be diminished and ultimately would be lost. This in turn would diminish the viability of the culture as a whole.

The monument is part of a much broader area used by residents for subsistence activities. Although a few activities are relatively specific to the monument, most subsistence pursuits occur across the landscape, without regard to political boundaries. Depending on such variables as weather, wildlife movements, surface conditions affecting travel, and changing socioeconomic conditions, an activity that is intense one year may be light or even absent the following year in the monument. A description of the typical subsistence use pattern over an annual cycle follows:

> Late winter (February-March)--hunting ringed seal, arctic hare, caribou; gathering driftwood and wood for firewood; fishing for Bering cisco and whitefish; trapping white fox, red fox, wolverine, wolf, and occasionally lynx
>
> Early spring (March-April)--hunting ringed seal, early spring waterfowl, ptarmigan, grizzly bear; trapping white fox; collecting firewood
>
> Mid-spring (May)--hunting ringed seal, migratory waterfowl, ground squirrels; collecting bird eggs; gathering willow leaves and other edible plants
>
> Late spring (June-July)--hunting bearded seal, ringed seal, spotted seal, beluga whale; collecting bird eggs; fishing for Arctic char, whitefish, tomcod herring, smelt; gathering edible plants; collecting driftwood for fuel

Summer (July-mid August)--occasional hunting of waterfowl and caribou; gathering edible plants and berries; fishing for whitefish and chum salmon

Early fall (mid August-mid October)--hunting waterfowl, caribou, grizzly bear, Dall sheep, ptarmigan, and occasionally walrus; fishing for whitefish; collecting mussels and clams

Late fall (mid-October to November)--hunting caribou, waterfowl, seals, ptarmigan; fishing for whitefish, arctic cod; trapping wolf, wolverine, white fox, red fox, and occasionally lynx; gathering driftwood and wood for firewood

Mid-winter (mid-December to January)--occasional hunting of caribou; trapping furbearers; gathering firewood

Additional subsistence data can be obtained by reviewing publications from the NANA Coastal Resources Service Area Board, Maniilaq Association, Alaska Department of Fish and Game (Subsistence Division), Bob and Carrie Uhl's publication Taqiumsinaagmiit, and the Joint Federal-State Land Use Planning Committee.

Among the most recent studies of subsistence use patterns in the area of the monument are environmental baseline studies undertaken for the proposed Red Dog Mine (Cominco Ltd. 1983). These studies include information that is limited to a geographic area that the proposed Red Dog mine might affect. In general this means that the more detailed information presented does not consider the southeast half of the monument or use by residents from Kotzebue or Sheshalik Spit.

Residents from Noatak intensively hunt caribou in the Mulgrave Hills. Char fishing occurs in lower Rabbit Creek, and sea mammals are hunted along the entire coastline of the monument. Waterfowl hunting is concentrated around Imik Lagoon and along the lower portion of Kilikmak Creek.

Residents of Kivalina similarly hunt caribou in the Mulgrave Hills but also seek them out in the Kakagrak Hills south of Kilikmak Creek and north of Krusenstern Lagoon. Sea mammals are hunted along the monument's coastline but normally only south to Imik Lagoon. Bowhead whales are hunted in the same area. Similarly, trapping, hunting waterfowl, and gathering greens, eggs, and berries occur in a zone near the coast from Imik Lagoon north.

The NANA Coastal Resource Service Area Board (1984) reports intensively used portions in the monument include the Sheshalik Spit area, Cape Krusenstern, the mouth of Rabbit Creek, and the Ipiavik Lagoon area.

Residents of Noatak, Kivalina, Kotzebue, and Sheshalik travel widely in pursuit of subsistence resources, and "no one year can be taken as a normal year. . . subsistence living and all it entails does not function that way" (Uhl 1980). It is understood by the National Park Service that subsistence activities take place over a wide ranging area within the monument from year to year.

In response to economic, social, and technological changes subsistence strategies have changed. Individual, or a relatively small number of persons, can usually accomplish hunts and other activities that once required the cooperative effort of a large number of participants. The time and effort once required to obtain food for dog teams is now directed toward acquiring cash to purchase and support mechanical vehicles. Wage employment, schools, modern homes, and other factors tend to limit the time that can be allotted to subsistence, and harvest activities often occur in "bursts" of intense activity rather than long-term sustained practices. Also fewer persons tend to carry out subsistence harvests for their families, and others pursue wage earning employment or offer other types of support.

Residents have continually adapted to changes in their environment and to fluctuations in the availability of natural resources, and changes can be expected to continue. Perhaps the only trend that could be safely predicted is that change will come more quickly than it has in the past. Programs, such as NANA's Spirit Program, have been established in the region in an attempt to retain important cultural links to the Inupiat past.

Implications. Rapid loss of subsistence opportunities would severely affect the social fabric of the Inupiat people. Local people's use of subsistence resources in the monument varies seasonally and annually. Although many good sources of information do exist, consistent, long-term information on subsistence use in all the monument is not available. Economic, social, and technological changes will continue to alter subsistence use patterns of people in the region and in the area of the monument. Some modern tools of subsistence users (like ATVs) can damage or conflict with archeologic resources and natural resources in the monument.

Subsistence Resource Commission. As directed by ANILCA section 808, the National Park Service has established the Cape Krusenstern National Monument Subsistence Resource Commission. The commission is charged with broad powers that could affect regulations governing subsistence hunting in the monument. Specifically, they are to propose a subsistence hunting program to the secretary of the interior and the governor of Alaska. At its first meeting in Kotzebue on May 3 and 4, 1984, the commission elected its officers, listed immediate concerns of members, and scheduled future meetings. Through these meetings the commission is expected to begin to fulfill its mandate. All meetings are open to the public and are announced in the Federal Register.

Implications. The National Park Service must continue to work closely with the Subsistence Resource Commission, providing staff support and analysis of their work and recommendations. Recommendations of the commission have dramatic potential to change subsistence hunting regulations in the monument.

Water Rights

In Alaska, two basic types of water rights doctrines are recognized: federal reserved water rights and appropriative water rights. The reservation doctrine established federal water rights on lands reserved, withdrawn, or set aside from the public domain for the purposes identified in the documents establishing the unit. State appropriative rights exist for beneficial uses recognized by the state, including instream flows, and are applied to lands

where federal reserved water rights are not applicable. No appropriative rights (federal or state) have been applied for in the monument to date.

Implications. Filing for a "reservation of instream flow" with the state of Alaska is a mechanism that could be used by the national Park Service to afford increased protection of natural and subsistence resources within the monument.

Communications

Two automated radio repeater stations have been set up in park units in northwest Alaska to broaden the coverage of radio contact within the NPS units. One of these repeaters is in Kobuk Valley National Park, on Mount Angayukaqsraq; the other is located on Mount Noak, the highest peak in the Cape Krusenstern National Monument.

Uses, Activities, and Trends on Adjacent Lands

Uses and activities on lands adjacent to the monument are similar to those inside the monument. Land managers include the state of Alaska, Bureau of Land Management, NANA, and the Kikiktagruk Inupiat Corporation (KIC). A very small percentage of land is also privately owned. Typically, people hunt, fish, and trap on these lands, as well as travel across them from village to village. Snowmachines and boats are the most typical modes of transportation used. Other subsistence activities, including gathering berries and eggs and cutting wood, occur throughout the area. Some recreational activities may occur on these lands and waters, although very little information is readily available on their extent.

Primary users of these lands are residents of Kotzebue, Kivalina, and Noatak, although other people throughout the region are known to occassionally utilize them too. Kotzebue is only 7 miles from the southeast corner of the monunment. Kotzebue residents commonly use a broad area of land within and around the monument, as well as land to the south and to the east of Kotzebue itself.

People from Noatak, only 9 miles from the monument's eastern boundary, typically hunt, fish, and trap throughout the year. In the summer months some people move south to Sheshalik Spit (within the monument) to fish and hunt marine mammals. Other people move seasonally so they can work in wage-earning jobs.

People from Kivalina live on a narrow barrier island between the Chuckchi Sea and Kivalina Lagoon. Only 10 miles north of the monument, they hunt, fish, and trap throughout the year. Their location on the coast affords them better access to marine mammals, and therefore, they spend more time hunting these species than people from Noatak or Kotzebue. Like their neighbors in Noatak, some people move to work in a segment of the cash economy during the summer months. Throughout most of the year, however, residents depend upon the land for their subsistence.

Although not much information is available for use in forecasting base trends, some things can be projected with some confidence. Foremost are the changes that the Red Dog Mine will bring. Construction and operation activities of the mine will bring hundreds of people, some from local villages and some from outside the region, along with equipment and machinery, to an area where similiar previous activity is unknown. The road linking the mine site and the port would open access to the area, although actually getting to the port by water would remain difficult for nonindustrial vehicular traffic.

There are local concerns that industrial activities could disrupt various subsistence activities, especially the caribou migrations. This topic has been and continues to be discussed between private parties and governmental agencies associated with the management of lands in the region.

The Western and Arctic Alaska Transportation Study (WAATS), completed in 1981 for the Alaska Department of Transportation and Public Facilities, indicated a potential transportation route across the monument. In that study a road, railroad, and coal slurry line that crossed the southern third of the monument, from east to west, were shown as possibilities. A port site at Cape Krusenstern was also indicated.

Other uses in the area such as fishing, hunting, trapping, travel, commercial fishing, and recreational activities are anticipated to continue at about the same level. As additional new technology emerges, and as population in the region changes, so might the levels of use.

Further mineral exploration may occur on state-selected and patented lands to the north and east of the monument.

Implications. Land use decisions by adjacent land managers can affect resources inside the monument. Decisions by land managers other then the National Park Service will affect decisions about the Red Dog Mine proposal. Development of the Red Dog Mine and continued mineral exploration in the area may affect the monument's resources.

Proposed Red Dog Mine. The proposed Red Dog lead and zinc mine is approximately 25 miles northeast of the monument's northeast corner, or 90 miles north of Kotzebue. A right-of-way through the monument for the road was authorized by an amendment to ANCSA on September 25, 1985. The proposed mine and port site and ore storage facility are on land owned by NANA and would be developed in cooperation with Cominco, Ltd. The proposal calls for the development of an open pit mine, a mill, and an accommodation complex on-site. A 57-mile road, approximately half of which would be in the monument, will be built to connect the site with the coast. To be built at the coast are a 20-acre port facility and a 9-acre storage facility for the ore awaiting shipment.

It is predicted by Cominco, Ltd., that the mine is of sufficent size to influence world markets for several decades. An infusion of money into the region's cash economy would undoubtedly occur during both construction and operation. The operations phase is expected to last approximately 50 years. Cominco, Ltd., has made commitments to NANA to train and hire local residents

for jobs during both phases, which could provide greater stability to the regional economy.

Implications. Proposed Red Dog Mine facilities inside the monument can be constructed only after the National Park Service reviews and approves a plan of operation submitted by Cominco, Ltd. The Red Dog Mine proposal can affect subsistence resources within the monument, and a subsistence evaluation (ANILCA section 810) has been completed. Exploration, reconaissance, survey, construction, and operational activities could affect cultural resources in the monument. The National Park Service must protect these resources with every available means to preserve, protect, and interpret these resources. Exploration, recconaissance, survey, construction, and operational activities that can be reasonably expected to occur have the potential to affect natural resources in the monument. The National Park Service must protect these resources with every available means to preserve, protect, and interpret these resources. Construction and operational activities could affect opportunities for subsistence use in the monument, especially the caribou hunting. The National Park Service must protect opportunities for subsistence use, especially opportunities for caribou hunting, because this resource is particularly important to subsistence users in the region and protection is mandated by ANILCA, section 810. The National Park Service must review and approve a plan of operations for the road through the monument. Thereafter monitoring the construction and use of the road throughout its lifespan must occur by NPS staff.