

### 3. Affected Environment

#### 3.1 Geographic and Ecosystem Setting

##### *3.1.1 The Bristol Bay and Kodiak Ecosystem*

The Togiak Refuge lies within the Bristol Bay and Kodiak Ecosystem. This ecosystem encompasses approximately 60,615 square miles of southwestern Alaska from the Kodiak Archipelago to the Togiak Refuge and includes the southernmost part of the Kuskokwim Bay area south of Bethel and Yukon Delta National Wildlife Refuge.

This ecosystem is one of Alaska's most productive regions for fish and wildlife. The ecosystem's large, diverse, and productive fishery resources are its driving force. Salmon are the principle mode by which nutrients from the ocean are transported to this system. As salmon return to spawn and die, their bodies provide the critical nutrients to support the primary producers in the food chain such as micro invertebrates, insects, and vegetation, which in turn provide food and shelter for the next generation of young salmon. At the same time, salmon supply food for animals much higher in the food chain such as bears, fox, birds, and people.

These salmon are the driving force behind not only the ecosystem, but also the area's culture and economy. Local people have relied on, and continue to rely on, this ecosystem to provide not only food and income, but also a way of life. The region's commercial and recreational fisheries provides millions of dollars in income and thousands of jobs for people from Alaska, the lower 48 states, and other countries throughout the Pacific.

The management of the Refuge plays an important role in the continuing function of the Bristol Bay and Kodiak ecosystems by providing a healthy environment for fish, wildlife, and people.

#### 3.2 Land Status

This plan applies to the Togiak Refuge and Hagemeister Island of the Alaska Maritime Refuge. In this document, the two units will be referred to as Togiak Refuge or the Refuge. Management direction discussed in this plan will be applied only to lands under the jurisdiction of the Service within the boundaries of Togiak Refuge and Hagemeister Island.

The land status on Togiak Refuge continues to change because refuge lands selected by the State of Alaska, Native corporations, and individuals are in the process of being conveyed, rejected or relinquished. In addition, some private

lands within the boundary have been acquired from willing sellers, primarily within the Togiak Wilderness Area.

Figure 3-1 shows, in general, the status of lands within the Togiak refuge and Hagemeister Island. Of the 4,713,000 million acres of land within the Togiak Refuge boundary, approximately 4,127,000 acres are under Service jurisdiction. A military withdrawal of approximately 2,290 acres at Cape Newenham is under the jurisdiction of the US Air Force.

The State of Alaska has approximately 3,200 acres of selected lands within the boundary that have not yet been adjudicated.

Currently, private entities, including Native corporations and individual Native Alaskans, have selected approximately 235,000 acres that have not yet been adjudicated and approximately 553,000 acres that have been conveyed. Included in those acres are 456 Native allotment parcels. The Alaska Native Allotment Act of 1906, as amended, allowed individual Natives to select as many as four parcels of land totaling 160 acres. At this time, 428 of those claims have been conveyed. There are 28 remaining parcels to be adjudicated. A 1998 amendment to ANCSA (Section 432 of Public Law 105-276 [43 U.S.C 1629g]) allowed for certain Alaska Native Vietnam veterans to have a renewed opportunity to apply for Native allotments. Nineteen allotments totaling 913.23 acres have been selected within the Togiak Refuge. No Alaska Native Vietnam veteran allotments have been conveyed on the refuge.

Hagemeister Island includes 73,884 acres within the Alaska Maritime refuge boundary. Of that, the Fish and Wildlife Service manages 73,097 acres. Native Corporations have selected approximately eight acres that have yet to be adjudicated. There are five conveyed Native Allotments on the island totaling 796 acres.

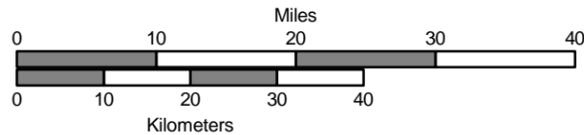
Figure 3-1.  
**Generalized Land Status**



**Togiak National Wildlife Refuge**

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Other refuge lands

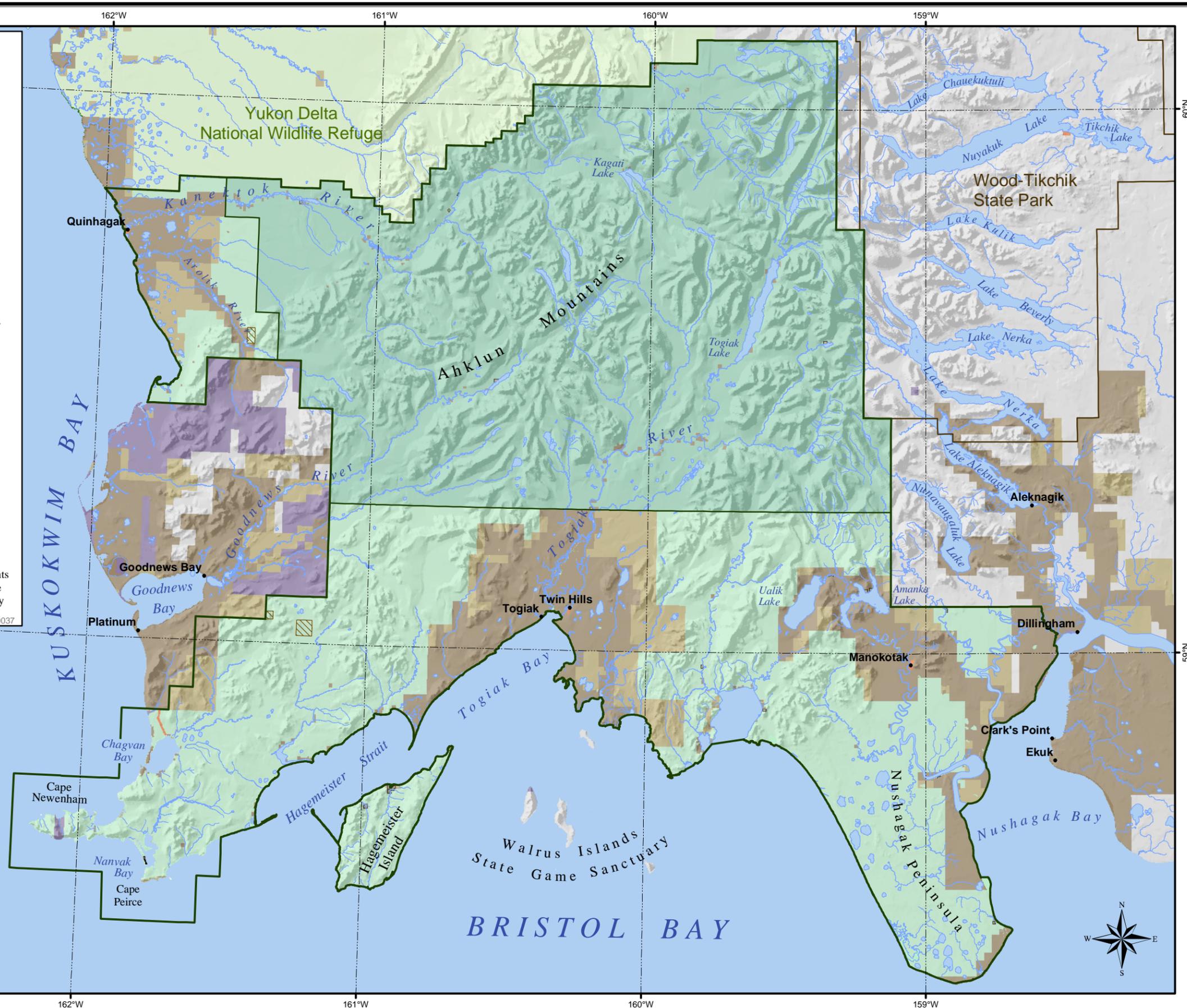
- |   |                                   |
|---|-----------------------------------|
| <b>Private</b>                                  | <b>Other Public Land Managers</b> |
| Native Private Fee                              | Other Federal                     |
| Native Private Selected                         | State Patent or TA                |
| Other Private                                   |                                   |
| Regional Corporation Selected (subsurface only) |                                   |



Universal Transverse Mercator Projection - Zone 4. 1927 North American Datum.

The Togiak Refuge management area is comprised of Togiak NWR and Hagemeyer Island (Alaska Maritime NWR). Land status within Togiak refuge boundary represents USFWS interpretation of BLM records, and is current to 8/2006. Land status outside Togiak refuge boundary is section level data provided by the BLM. Small parcels may not be visible at this scale.

14-0037





### 3.3 Physical Environment

#### 3.3.1 *Area of Influence*

The Refuge's area of influence includes the Bering Sea, coastal lands and inland waters, and other lands adjacent to the Refuge, including lands within the Yukon Delta Refuge, the Wood-Tikchik State Park, and portions of the middle Kuskokwim River basin. The geology, water, and soils of the Refuge have a variety of physical features, including glacial lakes and moraines. Interior lands and waters are linked to the bays by several rivers. The Refuge boundary encompasses all, or portions of, 35 major rivers, 25 major lakes, and hundreds of smaller lakes, ponds, and streams. These features, combined with the influence of the Bering Sea, affect the climate and weather of the refuge and provide habitat and migration pathways for fish, wildlife, and plants.

#### 3.3.2 *Climate*

The Refuge is located in a transitional climatic zone, and weather conditions are widely variable throughout the Refuge at any given time. Both the maritime climate of the Bering Sea and the continental climate of interior Alaska affect the Refuge, with the majority of the year being overcast or cloudy. Temperatures in the area range from an average minimum of four degrees Fahrenheit to an average maximum of 60 degrees Fahrenheit. Fall is the wettest time of year, while the least precipitation occurs in spring. Average annual precipitation averages 25 inches. Annual snowfall ranges from 60 inches along the coast to more than 150 inches in the mountains.

#### 3.3.3 *Landforms*

A variety of landforms occur throughout the Refuge including jagged peaks, cirque lakes, wide U-shaped valleys, broad coastal wetlands, and sea cliffs. The most prominent landforms are the Ahklun and Wood River mountains; the Kanektok, Goodnews, and Togiak river basins; and the coastal lowlands of the Nushagak Peninsula.

#### 3.3.4 *Geology and Soils*

A variety of events have shaped the landscape, rocks, soils, and minerals of the area. All of these physical features in turn affect fish, wildlife, and their habitats. Over the last two million years, ice sheets repeatedly covered much of the Refuge. Glaciers scoured the broad U-shaped valleys of the Kanektok, Goodnews, and Togiak drainages.

The glaciers deposited silt, sand, gravel, cobbles, and boulders on the Refuge, commonly in unsorted glacial drift. Moraines appear in many places as broad ridges curving across modern drainages, in places damming lakes behind them. Water and wind have transported and formed surficial deposits. Alluvium, consisting of floodplain mud, silt, sand, gravel, cobbles, and boulders, is found along streams. Colluvium, mainly loose, frost-broken rubble, is present throughout the Refuge.

The parent materials for Refuge soils vary considerably: along valleys and flood plains, the parent material consists of glacial gravel and outwash; on the uplands, it is decomposed bedrock and colluvium; and along most of the coastal areas, the parent material consists of silty alluvium.

Several deposits of valuable minerals lie within and near the Togiak Refuge boundary, with only a few on refuge-administered lands. Most of these deposits are of gold, mercury, and platinum, with the majority found in the upper Arolik basin, the lower Goodnews River and its tributaries, and near the Salmon River.

One of the unique geological features found within the refuge boundary is a dormant tuya located northeast of the village of Twin Hills. A tuya is a low, flat-topped volcano that forms as the volcano erupts beneath a glacier. Because of the thick layer of ice above the volcano, lava flows extend outward, rather than building up the more familiar volcanic cone-shaped mountain.

According to BLM resource assessments for the region, it is unlikely that there are oil or gas deposits within the Refuge. Portions of the Nushagak Peninsula and the northwestern area of the Togiak Refuge near Quinhagak (much of which is privately owned) have been classified as having low potential for hydrocarbons. However, these areas of low potential are thought to comprise volcanic deposits and/ or igneous intrusions, which are not favorable for hydrocarbon generation and accumulation. The remaining Refuge areas are classified as having no hydrocarbon potential (Gibson, et al. 1988).

### **3.3.5 Water**

#### **3.3.5.1 *Rivers and Lakes***

Four major river systems (Kanektok, Goodnews, and Togiak rivers; see Figure 3-2) drain waters into Kuskokwim and Bristol bays. The Kanektok River (Figure 3-3) begins at Kagati Lake in the Ahklun Mountains and flows southwest for about 90 miles before emptying into Kuskokwim Bay. This river and its tributaries drain an estimated 870 square miles. The upper portions of the Kanektok River flow through a mountain valley,

while the lower portion flows through flat tundra. Numerous gravel bars and islands occur along the length of the river, particularly where the channel meanders across the coastal plain.

The Goodnews River (Figure 3-5) consists of three river forks, which drain approximately 1,050 square miles. The North Fork flows from Goodnews Lake for approximately 25 miles before leaving the Togiak Refuge and an additional 22 miles before entering into Goodnews Bay. The Middle Fork is a 42-mile tributary that parallels the North Fork. The rivers have fine-to-medium gravel and cobble bottoms. Gravel bars and islands are not as numerous as on the Kanektok and are scarce when the water level rises. The South Fork is the shortest of the three forks at approximately 25 miles long.

The Togiak River (Figure 3-5) is the largest drainage basin in the Refuge, flowing southwestward from Togiak Lake about 55 miles before draining into Togiak Bay. This river's watershed covers an area of about 1,765 square miles. The river varies in size and depth, and is more than 500 feet wide in many places. The river is primarily a single channel, currents are swift, and occasional gravel bar islands are present. Five major tributaries drain into the Togiak River: the Gechiak, Pungokepuk, Nayorurun (Kashaiak), Kemuk, and Ongivinuck drainages.

Lakes in the Refuge range in size from potholes and beaver ponds to the 13-mile long Togiak Lake. About 70 percent of the lakes are less than 100 acres in size, and 22 percent range from 100 to 500 acres.

### **3.3.6 Water Quality**

Waters within the Refuge are known for their clarity and unspoiled conditions. Nutrients in the water increase for periods of time as spawning salmon decompose and when snowmelt or rain increase runoff from marsh and tundra vegetation. Runoff in the region varies widely depending on changes in topography and climate conditions. Freeze-up on the Refuge usually occurs between late October and late November; break-up usually occurs in early- to mid-May.

Pollution from litter, motors, petroleum products, previous mining, and human waste may also occur on the Refuge. The amount of pollution from these sources is of concern to people who live in and visit the Refuge.

Sampling efforts have collected baseline physical, biological, and chemical data for waters throughout the Togiak Refuge. Analyses indicate water quality remains high and has been affected very little by human activities (MacDonald 1996; Collins 2001a).

### 3.3.6.1 *Heavy Metal Contamination*

Areas within and adjacent to the Refuge have a long history of mining and mineral extraction. One of the largest platinum deposits in the United States is located south of Goodnews Bay. These deposits are privately owned and have been actively mined sporadically over the past 100 years. Because parts of these operations have taken place upstream from waters within the Togiak Refuge, the possible contamination of these waters from heavy metals associated with mining and metal extraction are of concern.

In 1990, the Service conducted a study to determine the level of contaminants from platinum mining in the Salmon River. This study found no significant increases in samples collected from mined areas or from fish samples (Jackson 1990). Additional water quality sampling is being conducted in the area by BLM and ADF&G. There are very few data for other portions of the Refuge, and it is unknown whether natural mineral deposits and/or historic mining activities within or upstream of the Refuge have contributed heavy metals to watersheds within the Refuge.

**Human Waste Contamination**—Potential degradation of Togiak Refuge water quality due to improper disposal of human waste by visitors along the Kanektok, Goodnews, and Togiak rivers has been a concern for many years. A discussion of significant planning issues related to human waste can be found in chapters 1 and 2.

Waste from warm-blooded animals (including humans) contributes a variety of intestinal bacteria that are pathogenic to humans. Body contact with water containing pathogens from the genera *Salmonella*, *Shingella*, and *Vibrio* can result in several types of disease in humans, including gastroenteritis and bacillary dysentery, typhoid fever, and cholera. Fecal indicator bacteria are used to assess the quality of water because they are correlated to the presence of several waterborne disease-causing organisms. The presence of *E. coli* in water is direct evidence of fecal contamination from warm-blooded animals and indicates the possible presence of pathogens (Dufour 1977).

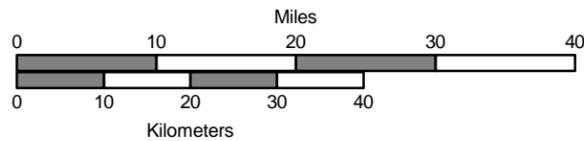
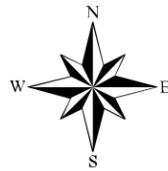
In 1990, Togiak Refuge staff collected water samples from several sites throughout the Togiak Refuge and had these analyzed by a private laboratory in Anchorage, Alaska. These tests were conducted to identify and enumerate fecal coliform and fecal streptococci bacteria. Results indicate that these bacteria were present but at levels well below allowable Environmental Protection Agency (EPA) water-quality

Figure 3-2.  
**Major Drainages**



**Togiak National Wildlife Refuge**

-  Togiak Refuge - Minimal Management
-  Togiak Refuge - Designated Wilderness
-  Other refuge lands
-  Lands Not Administered by Togiak Refuge



Universal Transverse Mercator Projection - Zone 4. 1927 North American Datum.

The Togiak Refuge management area is comprised of Togiak NWR and Hagemeyer Island (Alaska Maritime NWR). Land status represents USFWS interpretation of BLM records. 14-0049

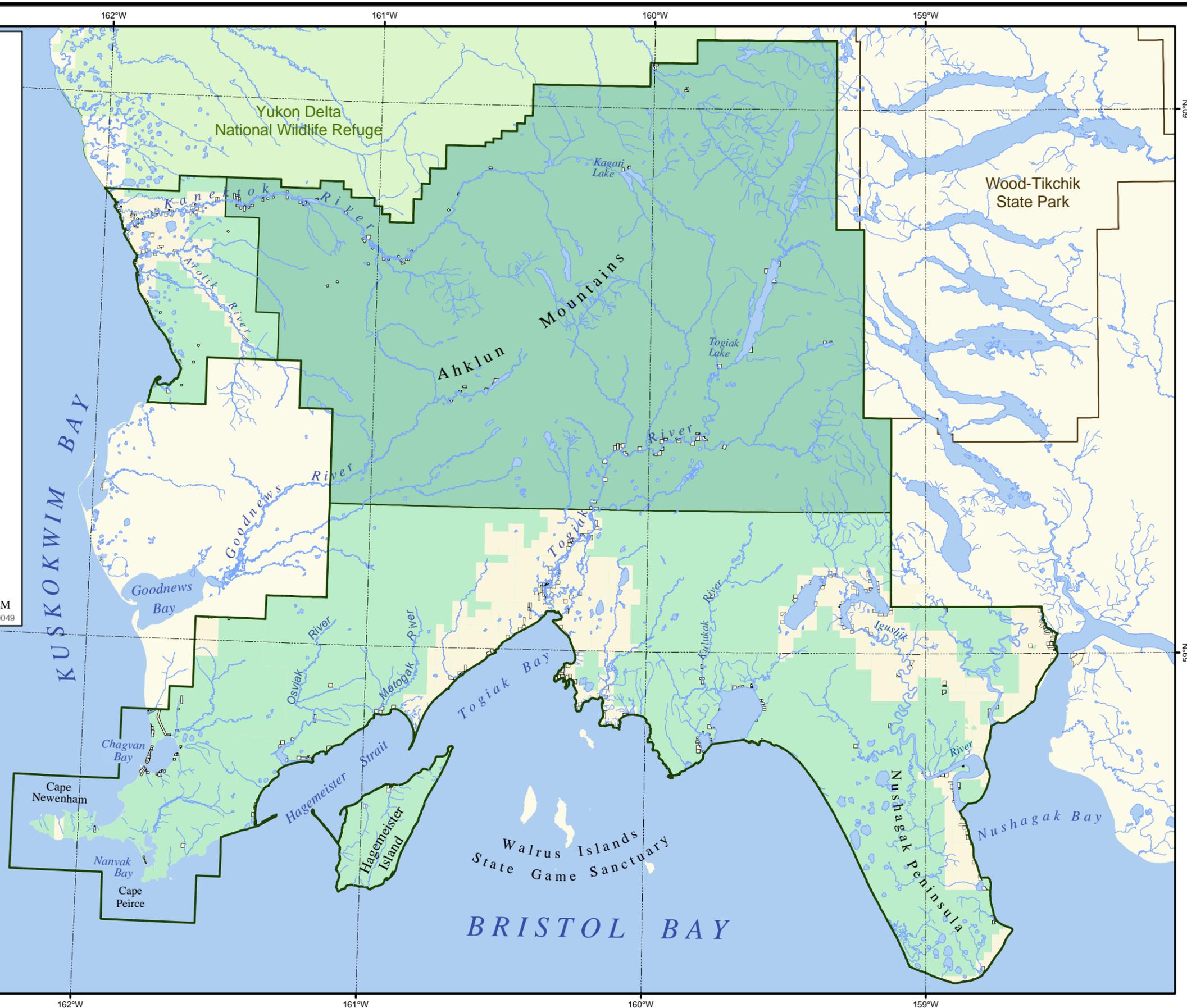




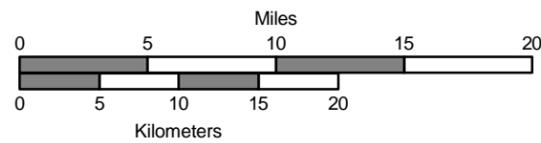
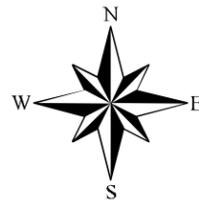
Figure 3-3.

# Arolik / Kanektok Drainage



## Togiak National Wildlife Refuge

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Other refuge lands
- Lands Not Administered by Togiak Refuge



Universal Transverse Mercator Projection - Zone 4. 1927 North American Datum.

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*Kuskokwim Bay*

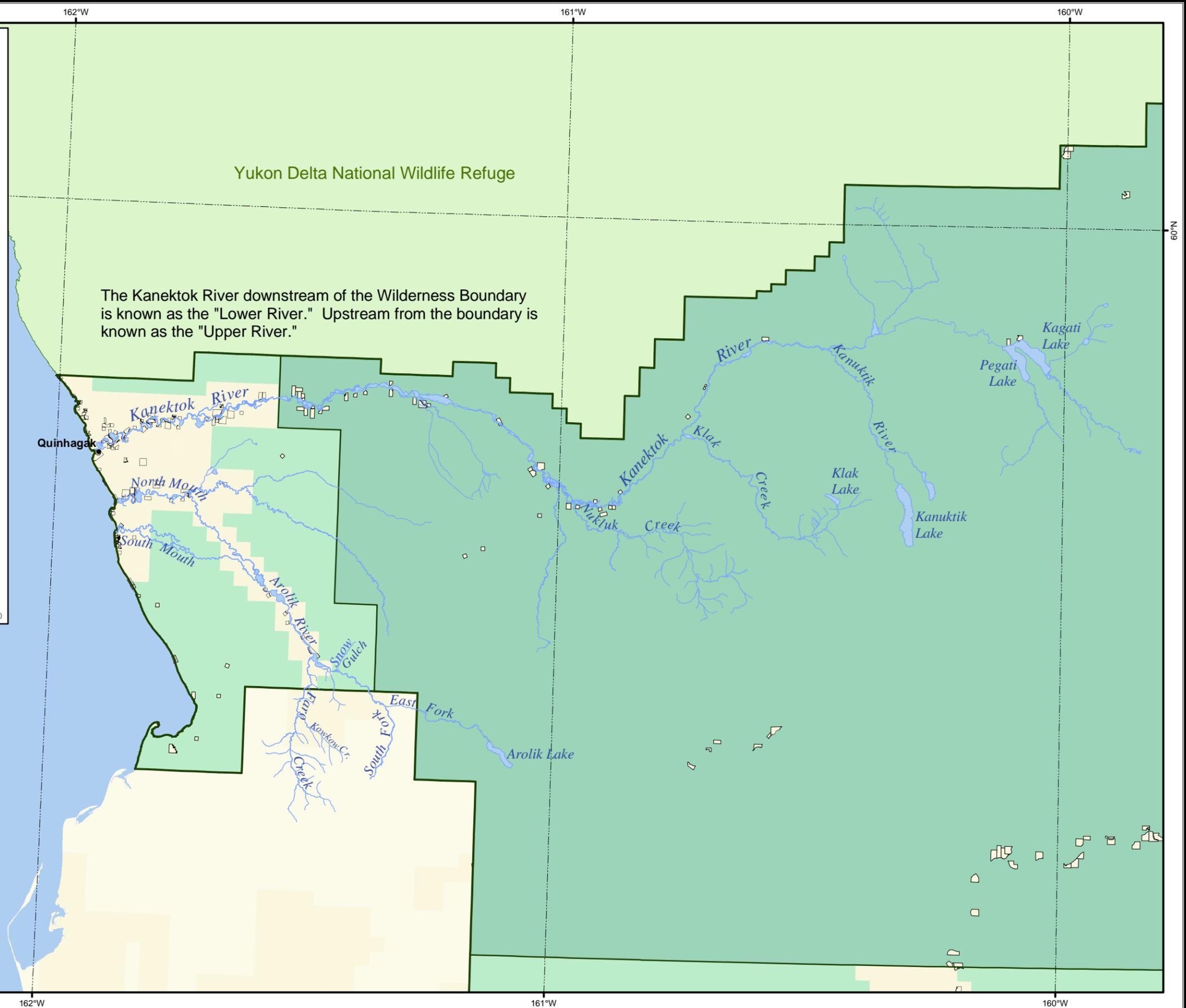




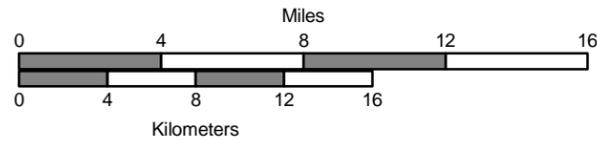
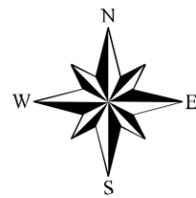
Figure 3-4.

# Goodnews Drainage



## Togiak National Wildlife Refuge

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Lands Not Administered by Togiak Refuge



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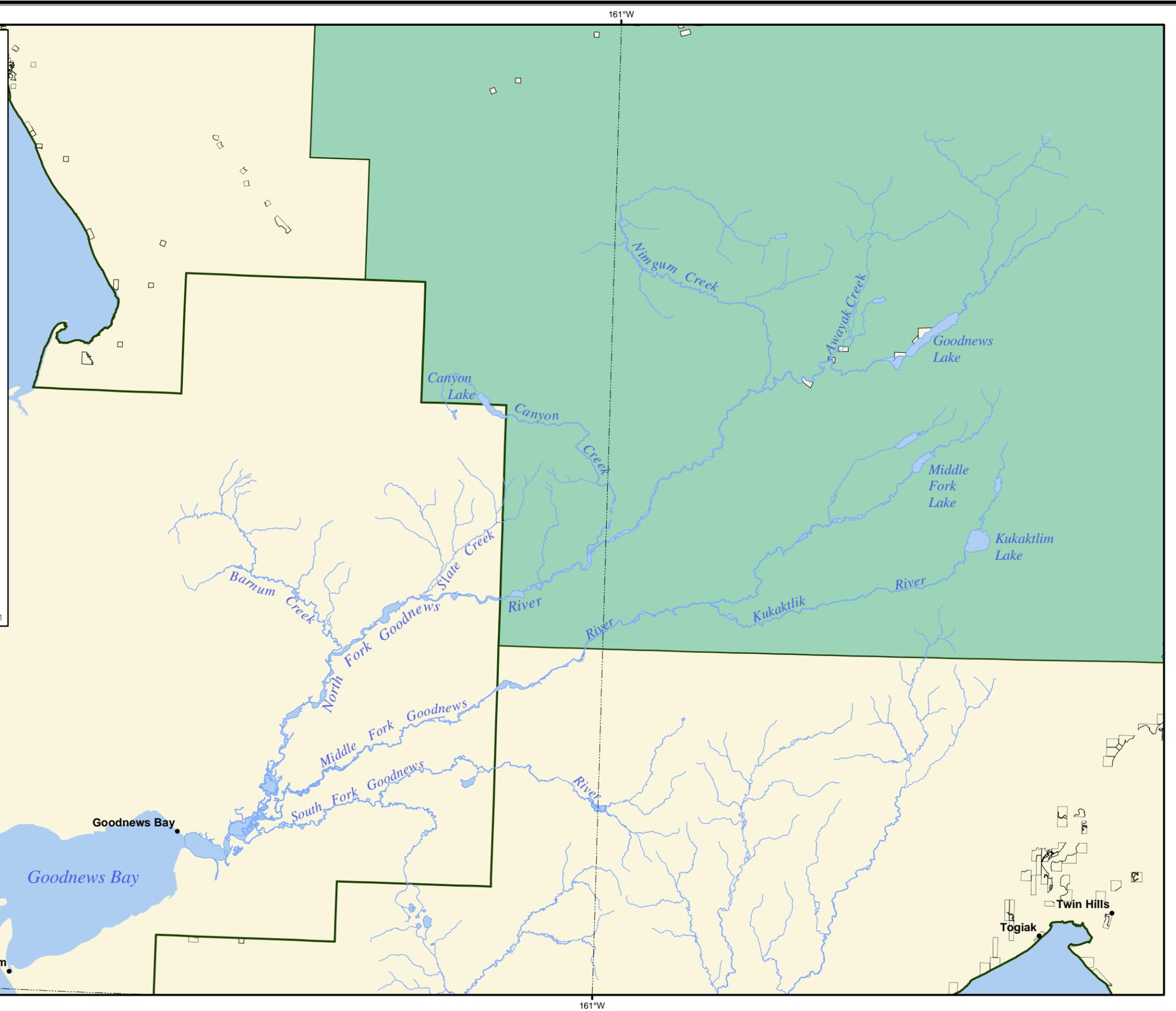
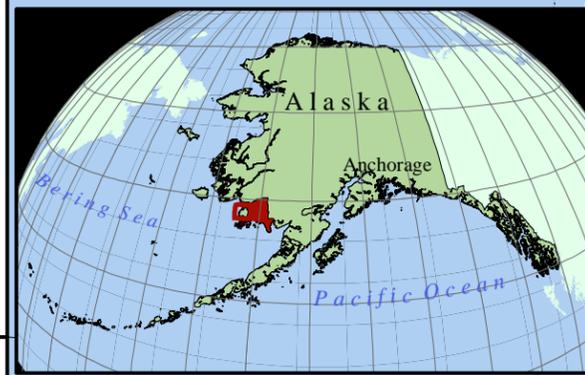




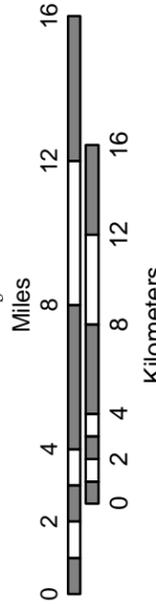
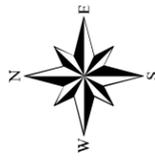
Figure 3-5.

# Togiak Drainage

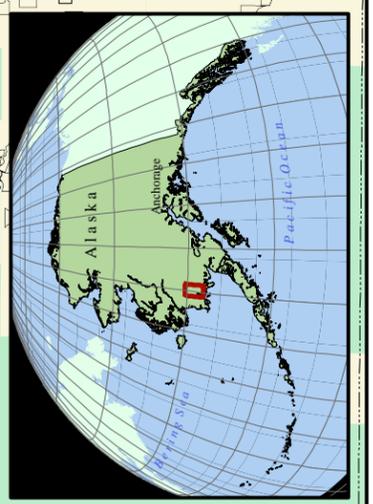
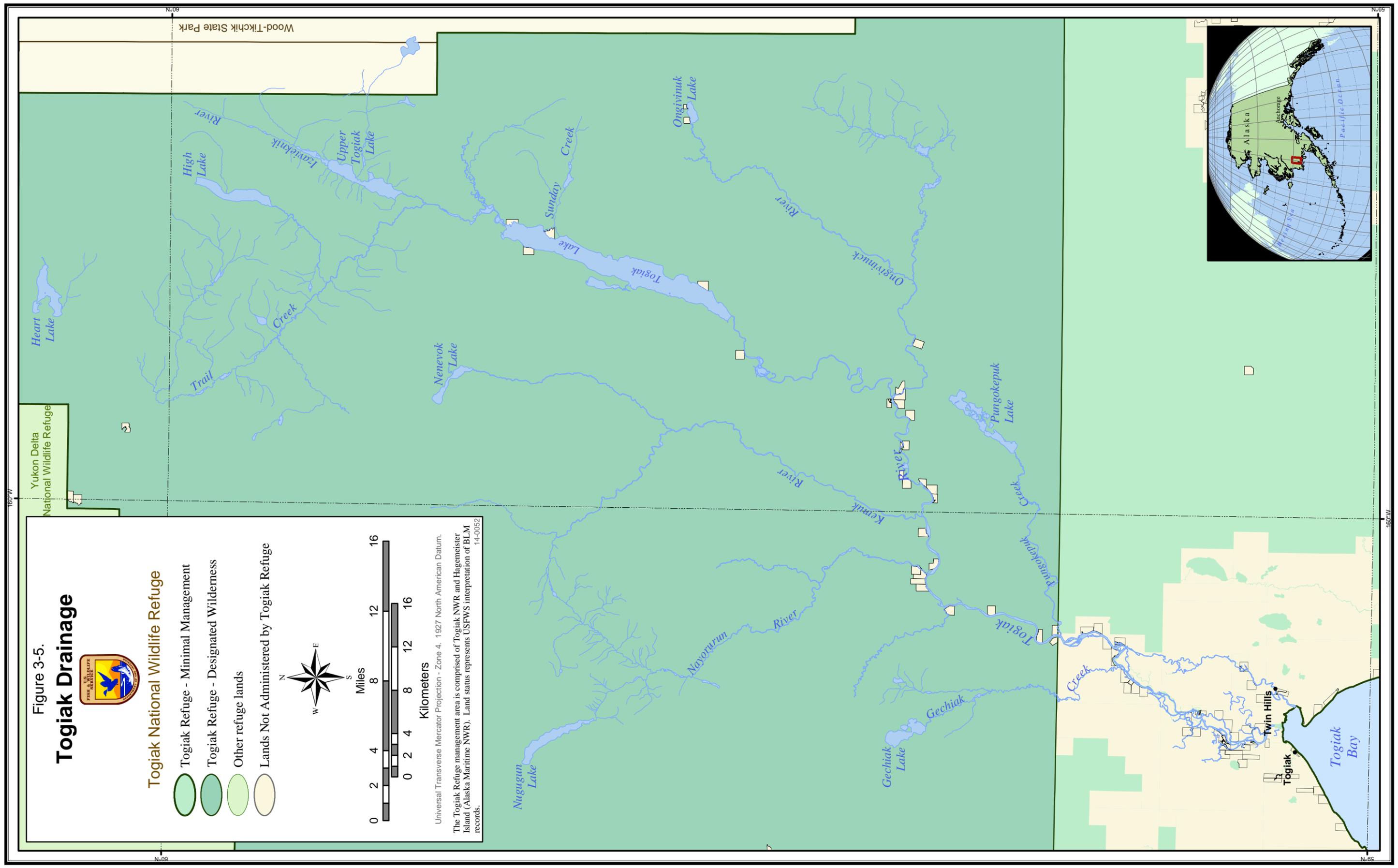


## Togiak National Wildlife Refuge

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Other refuge lands
- Lands Not Administered by Togiak Refuge



Universal Transverse Mercator Projection - Zone 4, 1927 North American Datum.  
The Togiak Refuge management area is comprised of Togiak NWR and Hagemeister Island (Alaska Maritime NWR). Land status represents USFWS interpretation of BLM records.  
14-0052





standards for recreational waters. Lab reports ranged from 0 to 29 colonies per 100 milliliter of water at various locations throughout the Togiak Refuge (A. Collins 2001 [unpublished]-a).

From 1996 through 2000 and again in 2002, the Native Village of Kwinhagak (NVK), collected water samples from various locations along the Kanektok River within the Togiak Refuge and below the Wilderness boundary. NVK contracted a private laboratory in Anchorage to test for fecal coliform and enterococci bacteria. Tests were conducted throughout the summer use season and compared with estimated use of the Kanektok River from data collected by Togiak Refuge staff during the same time period. Results did not exceed EPA standards for recreational waters, although there continues to be local concern about water quality and increased levels of public use.

During the summer of 2001, additional water-quality samples were collected from the Kanektok River at the Wilderness Area boundary and analyzed by the Service. Results from these samples indicate that *E. coli* levels are very low and are at or below levels that occur in river systems with little or no human use (A. Collins 2001 [unpublished]-a). Counts of bacterial colonies from samples collected ranged from 0 to 43 colonies per 100/mL.

The fact that contamination of Kanektok River water was found to be very low does not mean human waste is not a problem along rivers within the Togiak Refuge. Village residents continued to voice concerns about water quality related to visitor use of the Kanektok River. Discussions under the public-use section of this Plan illustrate the importance of the visual impact to visitors and local residents caused by the inappropriate disposal of fecal material.

## 3.4 Biological Environment

### 3.4.1 Vegetation

The Refuge includes plants common to both arctic and subarctic regions. During the period of 1992 through 1995, more than 500 plant species were collected and documented representing 62 families and 202 genera. The major habitat type within the Refuge is moist tundra with low-growing shrubs, herbs, grasses, and sedges rooted in a continuous mat of mosses and lichens. Using satellite imagery, nine major cover types can be identified in the area. Table 3-1 lists these cover types and their estimated acreages.

**3.4.1.1 *Nonnative and Invasive Plants***

There are at least 12 species of nonnative plants in eight taxonomic families occurring within the Refuge. Examples include dandelion (*Taraxacum officinale*) and clover (*Trifolium repens*). While these plants are not native, they generally do not spread rapidly and pose less risk to native habitats than noxious weeds and other invasive species found throughout North America.

**3.4.1.2 *Fire***

Wildfires occur infrequently with approximately 12,000 acres burned from 1984 through 2004. Lightning and people are the most common causes of fire within the Refuge. Due to the mostly treeless landscape, these fires burn through the tundra relatively slowly.

Table 3-1 Estimated vegetation area by general cover type

<b>Cover Type</b>	<b>Approximate Acres</b>	<b>Approximate Percentage Total Cover</b>
Marine waters	217,185	5.0
Fresh waters	50,174	1.2
Barren ground	125,468	2.9
Grass and herbaceous marsh	25,313	.6
Peatland	805,402	18.6
Dwarf shrubland	1,065,193	24.6
Forest	7,610	0.2
Deciduous shrub	1,996,550	46.2
Snow, clouds, or light barren ground	28,617	0.7
<b>Total</b>	<b>4,321,512</b>	<b>100.0</b>

**3.4.2 *Fish and Wildlife***

The geology and climate of the region influence the occurrence and diversity of vegetation and wildlife habitat within the Refuge. It is this diversity of habitats that supports the variety and abundance of wildlife found on the Refuge. Togiak Refuge is home to at least 283 species of wildlife, including 33 species of fish, 201 species of birds, 31 land mammal species, 17 marine mammal species, and 1 amphibian species (Appendix F).

**3.4.2.1 *Fish***

***Fisheries Data Collection***

The ADF&G Sport Fish Division’s mail survey is the primary tool used to monitor sport fisheries within the Refuge. Salmon

escapements to Togiak Lake, Amanha Lake, and the Kanektok, Middle Fork Goodnews, and Ongivinuck rivers are monitored by ADF&G and the Service by means of a counting tower at Togiak and Amanha Lakes, fish weirs on the Kanektok and the Middle Fork Goodnews rivers, and aerial surveys on approximately 12 additional rivers. In addition, on-site creel and fishery survey projects are conducted periodically on the most active recreational fisheries such as the lower Kanektok and Togiak rivers during the peaks of chinook and coho salmon runs. ADF&G also tracks commercial harvest and subsistence harvest each year. A subsistence permit is required for the Togiak drainage. When combined, these sources of information provide the most accurate estimates of fish harvest and escapement within the Kanektok, Goodnews, and Togiak River drainages.

Since 1985, the Togiak Refuge has required sport fishing guides and air-taxi transporters to complete daily activity reports as part of their Refuge special-use permits. Sport fishing guides report the number of clients fishing in a particular area, the number of hours fished, and the number of each species caught and kept. For smaller fisheries and tributary streams, guide-use reports provide the most accurate estimate of guided angling effort, catch rates, and harvest.

The level of unguided angling effort is estimated by trip reports that are required to be completed by each group that uses an air-taxi service to visit the Togiak Refuge. These reports state the number of people in the group, the days spent on the river, and the drop-off and pick-up locations. No fish catch or harvest information is required. Reports from Refuge permitted sport fishing guides and air-taxi operators are the most reliable and accurate sources of data available with respect to recreational sport fishing effort within the Refuge.

Togiak Refuge River Rangers collect information on all recreational and subsistence activities occurring in the Kanektok, Goodnews, and Togiak river drainages. The information they collect translates into “use days,” which would include anglers and the number of guides and pilots accompanying them and even the camp personnel present on the river. These estimates provide the level of effort per day and allow a breakdown between wilderness (upper river) and nonwilderness (lower river) levels of activity. This information provides the most accurate and reliable estimates of the types and level of public uses occurring in throughout the Kanektok, Goodnews, and Togiak river drainages.

### *Anadromous Fish*

Anadromous fish are those species that migrate up rivers from the ocean to spawn in fresh water. There are several anadromous species that occur within the Refuge. Five species of Pacific salmon—chinook, sockeye, chum, pink, and coho—and Dolly Varden char migrate up the numerous rivers throughout the Bristol Bay and Kuskokwim Bay regions. These species are key components of the ecosystem, the economy, and people's lifestyles.

**Salmon**—The salmon runs that return to the Refuge are the single most important driving force behind the region's ecosystem and economy. Because of this, commercial harvest, escapement past the fishery into the rivers, recreational harvest, and subsistence harvest of this resource have been well studied and documented. The estimates of returning and spawning populations presented here are based on an average of data reported by ADF&G from 1993 through 1999 (Burkey, et al. 2001; Weiland, et al. 2001). The spawning population is considered to be the average estimated escapement; the returning population is based on the average total run estimate (escapement and harvest) for each species. From 1980 to 2003 (years where complete estimates are available), estimates of salmon bound for rivers within the Togiak Refuge showed the normal variability in abundance expected in wild fish stocks

Other than the environmental factors encountered during their lifecycle (predation, environment, availability of food), the largest factor affecting salmon abundance in the waters within the Togiak Refuge is the regulated commercial harvest in the near shore waters of the Bering Sea. This accounts for approximately 60 percent of the known run. Additional harvests by subsistence fishermen in both the rivers and the near shore marine area accounts for less than 2 percent of the total run. The recreational harvest (those fish intentionally harvested or that are estimated lost as a result of the recreational fishery), consist of less than 1 percent of the run. The ADF&G, along with the cooperation and support of the USFWS and other organizations, has carefully monitored the commercial, subsistence, and recreational harvests of salmon and has implemented management plans and other actions over the years to ensure that these salmon populations remain healthy and viable (Burkey, et al. 2001, Weiland, et al. 2001).

**Char**—Three species of char are found within the Refuge: Dolly Varden, Arctic char, and lake trout. Dolly Varden are an important component of the subsistence harvest and recreational harvest throughout the Refuge. Most streams and lakes with ocean access contain both Dolly Varden and Arctic

char, and certain streams on Hagemeister Island also support Dolly Varden (Gwinn, D. 2005). Arctic char have not been found on Hagemeister. Dolly Varden migrate down the Togiak, Kanektok, Goodnews, and other rivers in late May. They reside in nearshore marine areas and return to freshwater during July through September to spawn and overwinter. Dolly Varden do not necessarily return to their home waters to overwinter. Some fish may also migrate from the ocean into one stream to spawn, then migrate back to the ocean and enter a different river to overwinter, usually in a lake. This complex life cycle means it is very difficult to determine population size or trends, or estimate likely effects of sport and subsistence fisheries. Recent genetic research strongly suggests tributaries of the Togiak River support genetically distinct populations of Dolly Varden (Crane, et al. 2003).

More Dolly Varden are caught in the recreational fishery than any other species in Kanektok, Goodnews, and Togiak rivers. When the recreational and subsistence catch and harvest data are combined, it suggests populations are supporting large catches and annual average harvests of tens of thousands of fish for each of these three rivers (USFWS 1990; BBNA and ADF&G 1996; Dunaway and Sonnichensen 2001).

#### *Resident and Freshwater Fish*

Resident, or freshwater fish are another important component of the ecosystem. Arctic char, rainbow trout, Arctic grayling, lake trout, pike, burbot, blackfish, and round whitefish are considered resident fish. These fish rely on the supply of nutrients that salmon bring from the ocean, nutrients that are consumed either by means of loose salmon eggs eaten as they float downstream, or by eating insects that have fed on dead salmon carcasses. In turn, these resident fish provide an important source of food for raptors (e.g., osprey and bald eagles), other fish (e.g., lake trout and pike), and local people who catch these fish year round.

**Rainbow Trout**—Rainbow trout are found in most waters within the Togiak Refuge, with major concentrations occurring in the Togiak, Goodnews, Kanektok, and Arolik river systems. Populations appear to be stable, but it is possible the average size of fish in the Kanektok and Goodnews river populations has decreased. These results may represent normal fluctuations in population structure, variations in sampling methods, or effects due to a fishery (Adams 1996).

**Arctic Char**—Little is known about these resident char within the Refuge except that they are most common in headwater

lakes, in deep pools, and in mainstream rivers, and they spawn in lake tributary streams.

**Lake Trout**—Lake trout are known to exist in several deep lakes throughout the Togiak Refuge but primarily in the Kuskokwim drainage. Lake trout live and spawn in these lakes and are not known to migrate. There are very few data about lake trout populations within the Refuge. Between 2,000 and 7,000 lake trout were estimated to be in Kagati lake during a 1989 and 1990 tagging study (Fair 1995; Lisac and MacDonald 1995).

**Arctic Grayling**—The majority of streams within the Refuge contain Arctic grayling. Annual movements between spawning, feeding, and wintering sites may be extensive. Juvenile and adult grayling migrate upstream just before or during spring break-up. Before freeze-up on the tributaries, Arctic grayling are thought to migrate to lakes and spring areas to overwinter.

**Northern Pike**—Pike are an important subsistence fish caught primarily through the ice on lakes throughout the Togiak Refuge. Many of the rivers, creeks, lakes, and ponds in watersheds on the Bristol Bay side of Togiak Refuge support pike. However, pike are less abundant in waters on the Kuskokwim Bay side of Togiak Refuge. Pike winter in lakes and near springs in rivers and creeks where the danger of oxygen depletion is minimal. As soon as the ice breaks up, the pike move inshore or upstream to marshy areas to spawn. Pike spend the summer and fall in the warm, slow-moving water of shallow lakes and meandering rivers. Little information is available for populations within the Refuge, but they appear to be healthy and possibly expanding, according to local residents.

#### *Kanektok and Arolik River Fisheries*

The Refuge conducted a subsistence harvest survey in Quinhagak to collect harvest data on resident fish species (USFWS 1990). Of 84 households interviewed, 79 percent (66 households) reported harvesting fish other than salmon. Expanding these interview results to the 140 households in Quinhagak gives a rough estimate of a subsistence harvest for that year of 7,625 Dolly Varden and Arctic char, 2,585 rainbow trout, 543 Arctic grayling, and 22 lake trout.

Since 1983, when effort estimates were first available, participation in the recreational fishery increased rapidly to peak in 1988 (Figure 3-6). Approximately 60 percent of the total sport fishing effort occurs on the lower 20 miles of the Kanektok River, where anglers target chinook, chum, and coho salmon (Dunaway and Bingham 1992; Dunaway and Fleischman 1995). The upper 70 miles of the river primarily support recreational

angling for rainbow trout, Arctic grayling, Dolly Varden, lake trout, and Arctic char.

Catches of Dolly Varden and Arctic char from the Kanektok River are the largest among the non-salmon fish species, with an annual average recreational catch of more than 20,000 fish. From 1996 through 2002, the seven-year average annual catch of other resident species was 11,684 rainbow trout, 120 lake trout, and 4,074 Arctic grayling. The seven-year average recreational harvests for 1996–2002 were 529 Dolly Varden and Arctic char, 62 rainbow trout, 22 lake trout, and 59 Arctic grayling annually (Lafferty 2004).

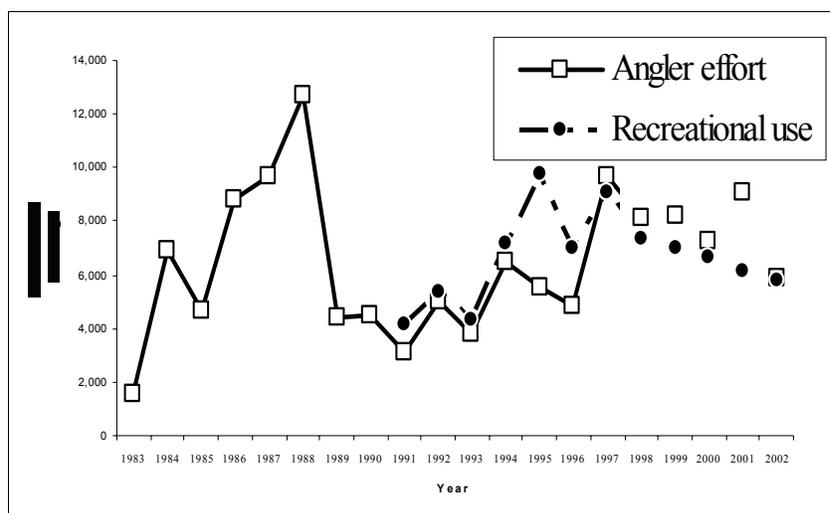


Figure 3-6. Kanektok River angler effort (USFWS 1991–2002 [unpublished]; Lafferty 2004)

Studies conducted by the Service, ADF&G and others have indicated that the impact of recreational and subsistence fisheries has the potential to change the length structure of rainbow trout populations in the Kanektok River (Adams 1996) and other rivers. Management actions taken by the Board of Fish to reduce impacts of recreational fishing of rainbow trout were enacted in 1990 under the Southwest Alaska Rainbow Trout Management Plan and with other regulatory action in 1997. Recreational fishing for rainbow trout in the Kanektok River is restricted to catch-and-release only from June 8 through October 31, and tackle is restricted to unbaited artificial lures with a single hook. These actions are intended to reduce the potential for dramatic changes in the age structure of rainbow trout. Ongoing monitoring of fish populations should be adequate to detect and suggest necessary change to the management of these fish.

Available information suggests subsistence harvest represents the majority of rainbow trout mortality in the Kanektok River drainage. In 1990, the Service estimated rainbow trout harvest by Quinhagak residents was in excess of 2,000 fish. Using a maximum of 12 percent catch-and-release mortality (Taylor and White 1992) and the 1991 ADF&G sport fishing estimates reported by Dunaway and Sonnichsen (2001) of 5,856 rainbow trout caught and 182 fish harvested, total annual mortality due to sport fishing would be no more than 863 fish. This represents a maximum, and a catch-and-release mortality rate of three to five percent is probably more realistic for Kanektok River rainbow trout.

*Goodnews River Fisheries*

The Alaska Department of Fish and Game has estimated recreational catch of rainbow trout on the Goodnews River since 1991 (Figure 3-7). Estimated catch was variable from 1991 (2,776) through 2002 (2,915), ranging from a low of 945 in 1994 to a high of 9,703 in 1997. The 1996-2002 annual average sport harvest of rainbow trout was approximately 103 fish (Lafferty 2004). Analyses of data collected indicate changes in the Goodnews River rainbow trout populations are similar to those described for the Kanektok River (Adams 1996). In her paper, Faustini (1996) suggested a change had occurred in the historic length-frequency and may be the result of sport fishing harvest, sport fishing hooking mortality, and subsistence fishing harvest.

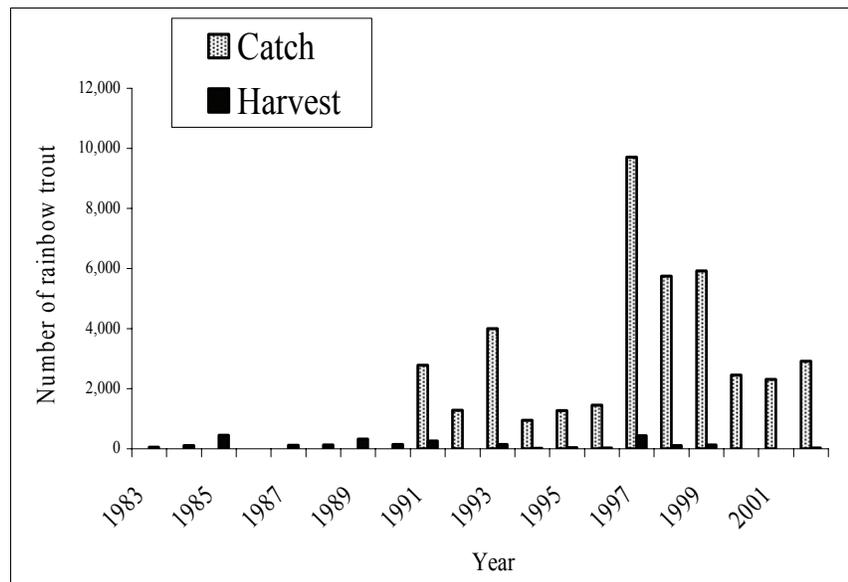


Figure 3-7. Goodnews River rainbow trout sport fishery harvest and catch (Lafferty 2004)

Other estimated annual average sport catches from 1996-2002 include 14,462 Dolly Varden and Arctic char, 227 lake trout, and 2,271 Arctic grayling. Annual average harvests during this same time period were 633 Dolly Varden and Arctic char, 16 lake trout, and 73 Arctic grayling. Similar estimates for subsistence harvest are not available.

#### *Togiak River Fisheries*

Dolly Varden and Arctic char have been captured in all tributaries of the Togiak River with the greatest concentrations being in the Izavieknik River (Lisac and MacDonald 1996; Lisac and Nelle 2000). More of these fish are caught in the recreational and subsistence fisheries than are any other species in the Togiak River. A household survey of Togiak area residents estimated the harvest of several non-salmon species of fish in 1994-95 (BBNA and ADFG 1996) and in 1999-2000 (Coiley-Kenner, et al. 2003). Estimated numbers of individuals harvested are shown in Table 3-2.

Table 3-2 Estimated Subsistence Harvest of Non-salmon Fish from the Togiak River during 1994-95 and 1999-2000

Fish species	Estimated Number of Fish Harvested	
	1999-2000	1994-1995
Arctic grayling	50	124
Pike	593	1285
Dolly Varden and Arctic char	4,087	10,847
Lake trout	107	270
Rainbow trout	29	897
Whitefish	4,599	9350

Recreational catch estimates for the Togiak River have increased from 1994 through 1998, with a five-year average catch of 3,837 Dolly Varden and Arctic char (Dunaway and Sonnichsen 2001). It is unknown whether this is the result of angler preference, angler effort, or increases in stock abundance. Of the more than 3,800 Dolly Varden and Arctic char caught, an annual average of 437 fish was harvested by sport anglers during this time period.

Rainbow trout were not found to be present upstream of the Togiak Lake outlet and were primarily concentrated in lower tributaries (Lisac and MacDonald 1996). From 1993 through 1995, the Togiak Refuge conducted baseline fisheries inventories on Togiak River tributaries; these inventories provided the first documentation of age, weight, length, and

species distribution for rainbow trout, Arctic grayling, pike, Dolly Varden, and Arctic char in the Togiak area (Lisac and MacDonald 1996). Recaptures of marked fish have shown movements of rainbow trout between the tributary streams and the main Togiak River, and additional work in 1998 and 2000 demonstrated rainbow trout in Gechiak and Pungokepuk creeks are distinct populations that overwinter in headwater lakes (Nelle and Lisac 2001; Krueger et al. 1999).

Recreational anglers caught an increasing number of rainbow trout during the 1990s. From 1994 through 1998, the average annual catch was about 1,900 trout, but most of these fish were released. The estimated average harvest during this time period was less than 25 fish per year (Dunaway and Sonnichsen 2001).

#### **3.4.2.2 *Birds***

**Waterfowl**—The Refuge and the Cape Newenham State Game Refuge (of which Chagvan Bay is a primary feature) are host to a wide variety of migratory and resident waterfowl. Lakes, rivers, tundra ponds, and coastal wetlands combine to offer nourishment and resting areas for staging, breeding, and molting waterfowl. Major areas of importance include the Nushagak Peninsula, Kulukak Bay, Osviak Slough, Nanvak Bay, Chagvan Bay, Carter Bay, and Jacksmith Bay. A large portion of the world's black brant population feeds or rests on Nanvak and Chagvan bays during migration. A large portion of the North American west coast populations of emperor geese, king, and Steller's eiders migrate through or adjacent to the Refuge. Significant numbers of common eiders, harlequin ducks, and black scoters also stop in the area. Less common, but still abundant, are migrating greater scaup, long-tailed ducks, and red-breasted mergansers. The Refuge also provides nesting habitat for several waterfowl and water bird species, including tundra swans and Canada geese. Common nesting species are mallard, northern pintail, green-winged teal, greater scaup, common eider, harlequin duck, black scoter, common merganser, and red-breasted merganser. Nesting populations in the lowlands of the Nushagak Peninsula and north of Goodnews Bay have been estimated at 31 ducks and 1.3 tundra swans per square mile (USFWS 1990).

One species of particular concern is the harlequin duck. The low reproductive success and specialized habitat requirements of harlequin ducks make them particularly vulnerable to human disturbance (Genter 1992). They appear to be most sensitive to disturbances during the early stages of nesting (Clarkson 1992). Public-use levels within the Togiak Refuge are low or nonexistent during the sensitive early stages of nesting. There is no evidence

that harlequin duck abundance has been negatively impacted on the Togiak, Goodnews, and Kanektok rivers.

**Marsh and Water Birds**—A large portion of the North American west coast population of Pacific loons migrates past the Refuge. Red-throated, Pacific, and common loons nest on the Togiak Refuge, as do red-necked and horned grebes. Based on their 1983 surveys, Pogson and Cooper (1983 [unpublished]) concluded nesting densities of sandhill cranes on the Nushagak Peninsula are among the highest recorded in Alaska.

**Shorebirds**—At least 39 species of shorebirds use the bays and lowlands of the Refuge as staging areas enroute to and from the arctic. Eighteen species of shorebirds have been documented breeding on the Togiak Refuge, with the most common nesters being semipalmated plovers, greater yellowlegs, spotted sandpipers, western sandpipers, least sandpipers, common snipe, and red-necked phalaropes. Nushagak Bay's importance to shorebirds resulted in its designation as a regional site in the western hemisphere shorebird reserve network because at least 60,000 shorebirds have been documented in this area at one time.

**Marine Birds**—Cape Newenham, Cape Peirce, Bird Rock, and Shaiak Island support the largest population of cliff-nesting birds in the eastern Bering Sea mainland. The birds nest and roost on the ledges and in the cracks of the cliff faces, and they forage at sea. The two most common species are the common murre and black-legged kittiwake. Other common species include tufted and horned puffins, pelagic and double-crested cormorants, parasitic and long-tailed jaegers, glaucous and mew gulls, pigeon guillemot, and parakeet auklet. Several hundred Aleutian terns nest in Goodnews Bay, and Arctic terns are abundant throughout the Togiak Refuge. The population and productivity of black-legged kittiwakes, common murres, and pelagic cormorants have been monitored annually at Cape Peirce since 1984.

Cliff-nesting seabirds along the coastline of the Refuge are affected by human-induced and natural disturbances that may reduce their breeding performance. Ecological factors relating to forage-food availability, climatological factors, and predation can also affect breeding performance. Disturbances to seabirds are especially critical during times of egg-laying, incubation, and chick-rearing, when disturbances may cause flushed adults to dislodge eggs or chicks so that they fall to their demise. For these reasons, potential human disturbance is of particular concern.

Marine bird eggs are an important subsistence resource with gull and murre eggs most commonly gathered. It is estimated more than 10,000 eggs are gathered annually by residents of

Togiak, Twin Hills and Manokotak (Coiley-Kenner, et al. 2003). Similar harvest estimates by Quinhagak, Goodnews Bay, and Platinum residents are not available.

**Raptors**—At least 21 species of raptors are known to occur on the Togiak Refuge, with 16 species known to breed here. The most common are bald eagles, northern harriers, rough-legged hawks, merlins, and short-eared owls. In addition, golden eagles, gyrfalcon, peregrine falcons, and northern hawk owls are seen every year.

Because bald eagles are a highly visible species found mainly in association with aquatic habitats, they are more vulnerable than many other species to human disturbance, especially at nest areas (Anthony, et al. 1982). This sensitivity varies among individuals, but generally adult eagles are more sensitive during courtship, egg-laying, and incubation, with sensitivity decreasing as young develop (Fraser 1981). Public use along rivers, including boating, camping, or fishing near nesting areas, can be a major disturbance and can alter normal raptor activity patterns by altering the distribution of raptors, disrupting nest-attentiveness patterns, causing abandonment of breeding territories, reducing productivity, and affecting foraging (Knight and Skagen 1986).

Based on surveys conducted from 1984 through 1988, the Togiak Refuge bald eagle population was 80–90 individuals during the summer, with approximately 20 remaining through the winter. The population appeared stable and showed a small, steady increase (Hotchkiss and Campbell 1989).

**Upland Birds**—Spruce grouse and willow, rock, and white-tail ptarmigan all occur on the Togiak Refuge, and each is a confirmed breeder. Willow ptarmigan are the most common of these species, with flocks of several hundred or more birds occurring. Rock ptarmigan are found on mountain slopes throughout the Togiak Refuge, while spruce grouse occur on the eastern boundary of the Togiak Refuge where coniferous trees are found. These birds are an important subsistence resource throughout the Refuge, with several thousand harvested each year (Coiley-Kenner, et al. 2003).

**Passerines**—The diverse habitats on the Refuge support a variety of landbird species. Numerous species common throughout the Refuge include alder flycatchers; black-billed magpies; common ravens; tree swallows; black-capped chickadees; Arctic warblers; gray-cheeked and hermit thrushes; American robins; yellow wagtails; orange-crowned, yellow, blackpoll, and Wilson's warblers; northern water thrushes; Savannah, fox, and golden-crowned sparrows; Lapland

longspurs; and common redpolls. Other landbird species that are common in certain habitats scattered throughout the Togiak Refuge are bank and cliff swallows; ruby-crowned kinglets; Swainson's and varied thrushes; American pipits; yellow-rumped warblers; American tree and white-crowned sparrows; snow buntings; and gray-crowned rosy finches. The Togiak Refuge participates in various local, regional, and global monitoring efforts for landbirds, which include breeding bird surveys, area searches, checklists, and public bird counts.

#### 3.4.2.3 *Land Mammals*

**Caribou**—Several significant changes in caribou migration, population, and distribution have occurred since the original Togiak Refuge Plan was completed in 1985. At that time, there were seldom more than 50 caribou on the Togiak Refuge at any given time, despite the fact there was suitable habitat available (USFWS 1985). Caribou were abundant in the Nushagak, Togiak, and Yukon-Kuskokwim deltas prior to 1900 (ADF&G 1973; ADF&G 1976) but were eliminated from the area by over harvesting, competition with introduced reindeer herds, wildfire, or a possible shift in migration patterns (ADF&G 1973). A small remnant herd remained to the north of the Togiak Refuge in the Kilbuck Mountains, possibly because of the optimum habitat and the inaccessibility of the area to hunters (Skoog 1968). In 1980, the Kilbuck or Qauiinguut herd was estimated to be at least 50 animals; more accurate surveys in the mid-1980s showed the population to be 200–300 caribou. By 1995, the population had grown steadily to more than 4,000 animals, and more caribou were being counted within the Togiak Refuge (Qauiinguut [Kilbuck] Caribou Herd Cooperative 1995; Miller 1995 [unpublished]).

In the early 1980s, the range of another, much larger herd known as the Mulchatna herd was beginning to shift westward toward the Kilbuck herd and the lower Yukon-Kuskokwim Delta (Shepherd 1980). A large influx of Mulchatna caribou in the winter of 1994 may have contributed to the 1995 Qauiinguut (Kilbuck) population estimate. Near the end of 1994, approximately 30,000 caribou from this Mulchatna herd migrated through the area in which the Qauiinguut herd lived. As these caribou left, most of the Qauiinguut herd went with them. This was the first known migration of Qauiinguut caribou from their traditional range in the Kilbuck Mountains into areas that were traditionally used by the much larger Mulchatna herd (Qauiinguut [Kilbuck] Caribou Herd Cooperative 1995). It is debatable whether or not the Qauiinguut caribou herd still exists as a separate herd. The Mulchatna herd was estimated to be approximately 200,000 animals in 1996 (ADF&G 1999). However, since 1996, it has steadily declined in numbers. In

2006, it was estimated at 45,000 animals. This herd often moves through the Togiak Refuge, especially near the upper Kanektok, Goodnews, Arolik, and Togiak rivers. Surveys have estimated as many as 30,000 caribou wintering in the Togiak Drainage (USFWS 2000). The migration of this herd ranges from the lower Kuskokwim River, east to Lake Illiamna, south toward the lower Nushagak and Kvichak rivers, and north to the area near McGrath.

In the southeastern portion of the Togiak Refuge, another change in caribou populations occurred in 1988. To more quickly restore caribou populations to their historic level, 146 barren-ground caribou were reintroduced to the Nushagak Peninsula in 1988. Because of exceptional range conditions, low predation, and closed hunting season, this herd grew to more than 1,000 animals by 1993. In 1995, a limited Federal subsistence hunt was allowed and is estimated to be removing 3 percent of the population each year (Collins, et al. 2003).

Management of this caribou herd is conducted through the Nushagak Caribou Herd Management Plan (USFWS 1994). Until February 2000, most individuals in this herd resided entirely on the Nushagak Peninsula, the exception being a small group of animals inhabiting the area between Twin Hills and the Kulukak River. More recently, temporary movements off the Nushagak Peninsula by a majority of the herd occurred on at least four occasions. Lichen utilization by caribou has become more noticeable, especially in the southern half of the peninsula. Population counts indicate the herd peaked around 1,300 animals in 1998–1999 (Aderman and Woolington 2001 [unpublished]) and then declined to less than 1,000 by 2003. Caribou from the Mulchatna Herd move through and seasonally occupy many areas within and adjacent to the Refuge. In response, the Federal Subsistence Board and Alaska Board of Game have greatly expanded subsistence and recreational hunting opportunities. In addition, the Nushagak Peninsula Caribou Herd has also provided expanded subsistence hunting opportunities. Beginning in the mid-1990's, this herd became an important subsistence hunting resource to residents from Manokotak and Dillingham primarily, and secondarily to residents of Aleknagik, Clarks Point, Togiak, and Twin Hills. This use persisted until 2006, at which time the caribou population had declined in number to a point at which hunting was no longer sustainable.

Interviews with residents of Togiak, Twin Hills and Manokotak indicate the combined total harvest (which included caribou taken from both within and outside the Togiak Refuge) from these three communities during the 1999-2000 hunting season

was approximately 333 animals (Coiley-Kenner, et al. 2003). Comparable information was not available for Quinhagak, Platinum, Goodnews Bay, and other communities adjacent to the Refuge.

**Moose**—Little written information is available about moose abundance on the Togiak Refuge prior to the 1970s. Generally, it is believed moose populations have historically been at low densities in areas of southwestern Alaska and that moose populations have expanded their range and increased in number in this region during the 20th century (Machida 1987; Van Daele 1992).

In 1981, the first major survey of Game Management Unit (GMU) 17A, (see Figure 3-8) the majority of which is within the Togiak Refuge, was conducted. During five and one-half survey hours, only three moose were observed, resulting in the Board of Game's decision to close the hunting season. When the first Togiak Refuge Plan was written in 1985, it was estimated that fewer than 35 moose lived within the Togiak Refuge (USFWS 1985). Through the 1980s, ADF&G aerial surveys indicated moose numbers along the eastern edge of the Togiak Refuge (Unit 17C) continued to increase, while just to the west in Unit 17A, densities remained low despite the availability of suitable habitat (Taylor 1990). Illegal harvest was thought to be the principal reason for the low moose population in Unit 17A (Taylor 1990; Van Daele 1993; Jemison 1994). In 1990, winter hunting in western Unit 17C was eliminated in an effort to promote moose expansion into Unit 17A. In the mid-1990s, aerial surveys confirmed large increases in the number of moose in the Togiak and Kulukak River drainages (Jemison 1994; Aderman, et al. 1995). Table 3-3 shows the results of various surveys conducted in Unit 17A.

Table 3-3. Number of moose observed during aerial counts within Game Management Unit 17A

Year	Number of Moose
1992	6
1994	84
1995	136*
1997	234
1998	429
1999	509
2002	652
2004	777
2005	1023

\*estimate based on survey

The dramatic increase in numbers is attributed to a number of situations, including continued immigration from neighboring GMU 17C; regulation changes implemented by the Alaska Board of Game; an apparent reduction of illegal harvests as a result of poor travel conditions and changing attitudes of local residents; the availability of the expanding Mulchatna Caribou Herd in GMUs 17 and 18 for subsistence; and good productivity and survival of GMU 17A moose due to mild winters, few predators, and pristine habitat (Aderman, et al. 1998; Aderman, et al. 1999; Aderman, et al. 2000).

In the fall of 1997, hunting was reestablished in GMU 17A, and hunters reported harvesting 15 moose. Fall hunting has continued, and hunt reports indicate seven to 10 moose have been harvested annually. Interviews with residents of Togiak, Twin Hills and Manokotak indicate the combined total harvest (which included moose taken from within and outside the Togiak Refuge) from these three communities was approximately 106 moose during the 1999-2000 hunting season (Coiley-Kenner, et al. 2003). A winter hunt (as many as 14 days during the period December 1–January 31) was established for 2002–2003. Unfortunately, mild temperatures and lack of adequate snow cover precluded opening the hunt.

Until the late 1990’s, moose were virtually absent in the western half of the Togiak Refuge (GMU 18), although suitable habitat occurs in all river drainages. The population began growing, primarily in the Goodnews River watershed, in the early 2000’s (Table 3-4), and is expected to reach a harvestable level by approximately 2008. The population growth is a function of immigration of moose from GMU 17A, and high reproduction and survival of moose on the western half of the refuge.

Table 3-4. Number of moose observed during aerial counts within Game Management Unit 18

<b>Year</b>	<b>Number of Moose</b>
1992	0
1994	0
1995	2
1997	1
1999	4
2002	5
2004	12
2005	25
2006	64

**Furbearers**—Beaver, fox, wolves, coyote, river otters, mink, marten, lynx, Arctic ground squirrels, weasels, muskrats, marmots, and wolverines are all known to occur within the Refuge. Beaver cache surveys monitor trends in relative abundance and distribution of beaver food caches, but no other studies have been conducted to determine the distribution, abundance, seasonal movements, or immigration of any other furbearers on the Refuge.

Beaver cache surveys have been conducted annually beginning in 2002 for several rivers, including the Kanektok, Ongivinuck, Togiak, and Weary rivers. Survey results indicate cache densities are highly variable over time, although recent results are within the range of cache density determined by ADF&G surveys results dating back to 1975 (Collins 2002).

**Bear**—Both brown and black bears occur within the Togiak Refuge, with black bears considered rare and brown bears considered common throughout the area. Brown bears are seasonally abundant along salmon-spawning areas, particularly along tributaries of the Togiak and Kulukak rivers, and encounters between bears and people are common in these areas. To date, few surveys have been completed on brown bear population in the Togiak Refuge; consequently, the density, population trends, key habitat areas, and other aspects of the population are not well understood. In 1884, brown bears were reported to be abundant in the Togiak River drainage (Petrof 1884). An aerial survey conducted by the Service and ADF&G in 1974 reported sighting 22 brown bears and two black bears after more than eight hours of flight time. This survey covered all of the major drainages in what is now the Togiak Refuge. Most of the reported sightings were in the drainages around Togiak Lake and those in the vicinity of Ualik and Amanka lakes (USFWS 1974). In 2003 and 2004, Togiak Refuge conducted a population estimate of brown bears refuge wide. Estimated population density was 40.3 bears per 1000 square kilometers.

#### *3.4.2.4 Marine Mammals*

The Bering Sea is the third largest semi-enclosed sea in the world and has one of the most extensive continental shelves (Williams, et al. 1998). The broad shelf, enhanced by nutrient upwelling and intermixing of Pacific Ocean and the Bering Sea waters along the Aleutian Chain, provides extremely favorable habitat for a host of marine birds, marine mammals, and fish that are of international and domestic importance.

The Refuge's 600 miles of rocky coast and sand beaches support a diverse and abundant marine mammal population. The Cape Peirce and Cape Newenham areas are particularly rich in

marine mammals, providing haul-out areas for Pacific walrus, harbor seals, spotted seals, and the endangered Steller sea lion.

At least 17 marine mammal species are known to occur within or near the Refuge. This list includes gray, sei, minke beluga, goosebeak, and killer whales; Pacific white-sided dolphin; harbor and Dall's porpoises; Steller sea lion; Pacific walrus; and northern fur, harbor, spotted, ribbon, ringed, and bearded seals.

The objective of the Refuge's marine mammal inventory and monitoring program is to estimate the abundance, haul-out use, and production of marine mammals on the Refuge and in northern Bristol Bay. The main tasks of this program are to estimate the number of Pacific walrus at Cape Peirce and Cape Newenham, estimate the number of harbor seals and spotted seals at Cape Peirce, estimate the number of sea lions at Cape Newenham, and document behavioral responses of marine mammals to aircraft, subsistence, and visitor use.

**Pacific Walrus**—Male, female, and young Pacific walrus that winter in and near Bristol Bay and Kuskokwim Bay migrate north in the spring. Some of the males remain behind, however, and haul out at Cape Peirce and Round Island or Cape Seniavin (Frost, et al. 1982; Fay 1982). Cape Peirce was historically used as a haul-out but was abandoned sometime during the first half of the twentieth century. Pacific walrus began re-using the haul-out in 1981 and have returned every summer since. Walrus haul-out history is listed in Figure 3-9 and is discussed below.

Walrus eat a variety of prey, ranging in size from small crustaceans to adult seals, but primarily on benthic mollusks (Fay, et al. 1990; Sheffield 1997). Prey density is thought to be an important determinant of walrus distribution.

For walrus, coastal haul-outs appear to be important principally as places to rest between feeding forays (Frost, et al. 1982). Because terrestrial haul-outs are few, they may be of particular importance. Probably the most important consideration for terrestrial haul-out sites is isolation from disturbance. Proximity to feeding areas, social behavior, learning, and other factors as yet unknown play a part in determining those habitats the animals will actually use.

Pacific walrus counts from 1981 through 2000 show a high degree of variability. Figure 3-9 lists the peak counts for Pacific walrus at Cape Peirce from 1983 through 2006. The Pacific walrus population has remained relatively stable during this timeframe and cannot be used to explain this variability. The issue is complicated by not understanding the dynamics between the U.S. and Russian terrestrial Pacific walrus haul-outs.

Figure 3-8.

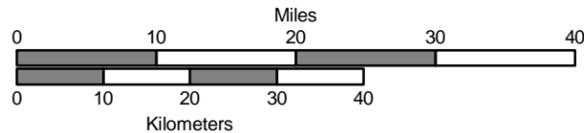
# Game Management Units



## Togiak National Wildlife Refuge

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Other refuge lands

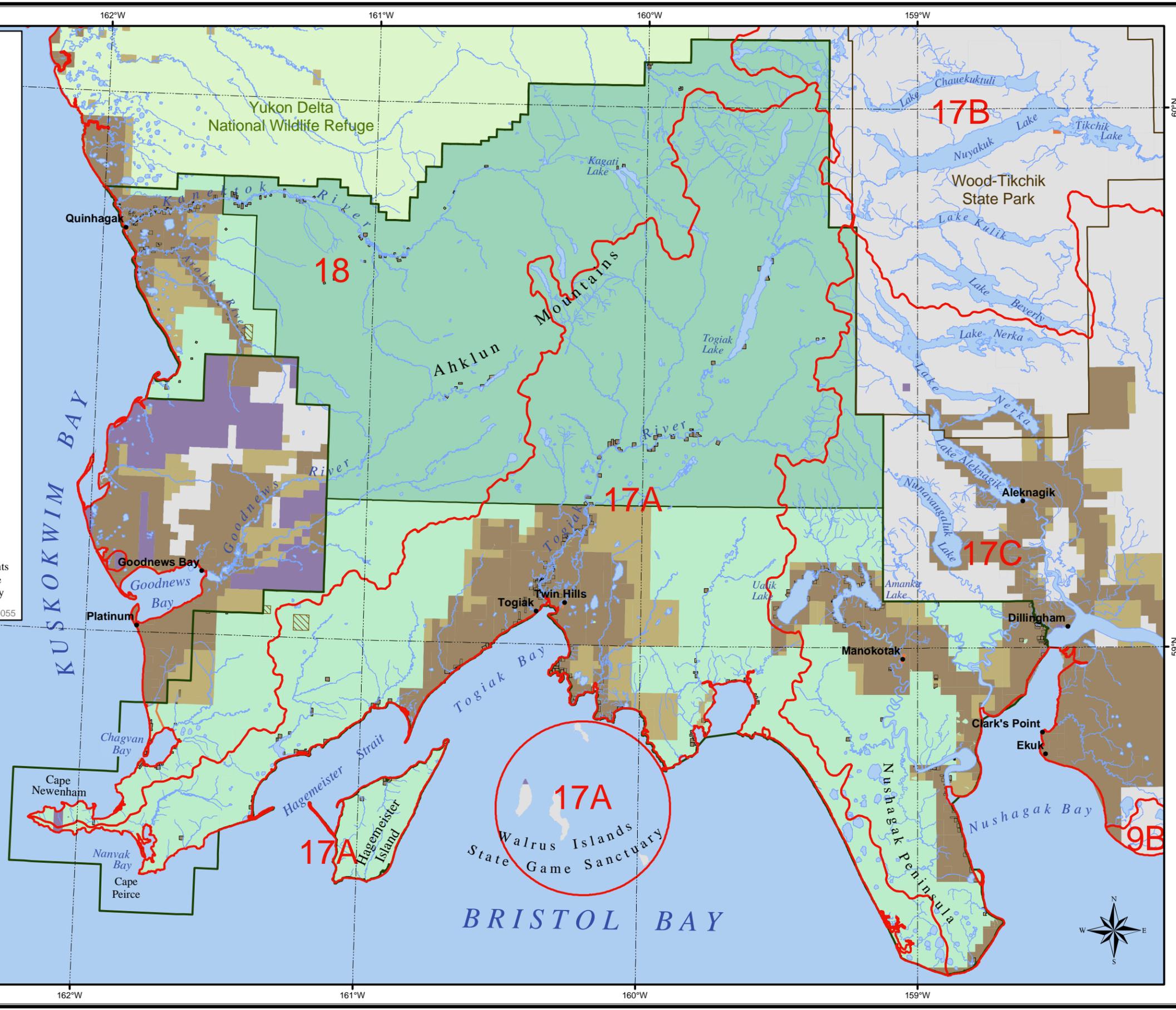
- | Private |   | Other Public Land Managers |                    |
|---------|---|----------------------------|--------------------|
|         | Native Private Fee                              |                            | Other Federal      |
|         | Native Private Selected                         |                            | State Patent or TA |
|         | Other Private                                   |                            |                    |
|         | Regional Corporation Selected (subsurface only) |                            |                    |



Universal Transverse Mercator Projection - Zone 4. 1927 North American Datum.

The Togiak Refuge management area is comprised of Togiak NWR and Hagemester Island (Alaska Maritime NWR). Land status within Togiak refuge boundary represents USFWS interpretation of BLM records, and is current to 8/2006. Land status outside Togiak refuge boundary is section level data provided by the BLM. Small parcels may not be visible at this scale.

14-0055





Refuge staff has monitored the numbers of walrus hauling out at Cape Peirce since 1981. Counts have been variable (Fig. 3-9). The variation in walrus numbers using Cape Peirce is not a function of overall Pacific walrus population size, and is hypothesized to be related to local rather than population-wide conditions.

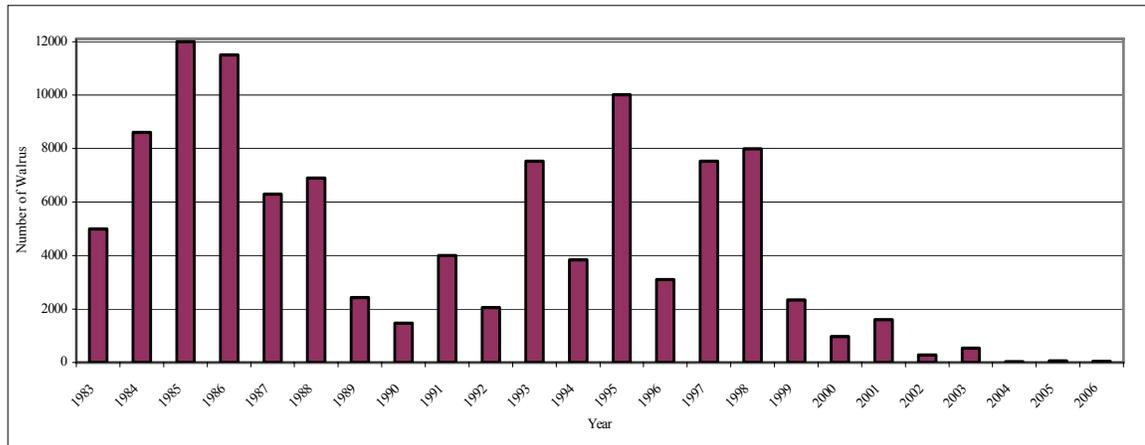


Figure 3-9. Peak Pacific walrus haul-out counts at Cape Peirce, Alaska

**Harbor and Spotted Seals**—Harbor seals and some spotted seals haul out along the Refuge coast, with the highest concentrations at Nanvak Bay (Cape Peirce) and Hagemeister Island. Nanvak Bay is the northernmost pupping area and the largest haul-out for harbor seals in northern Bristol Bay (Frost, et al. 1982). The number of seals hauling out in Nanvak Bay declined from the mid-1970s through 1990 (Jemison 1991). However, the numbers of seals at Nanvak Bay has remained relatively stable since 1990.

Causes for the decline in harbor seal numbers (in Alaska) have not been identified (Lewis 1995). Factors that may be affecting seal numbers include direct and indirect interactions with fisheries, subsistence harvests, disease, predation, pollutants, and disturbance.

Coastal haul-outs appear to be important for harbor seals principally as a place to rest, give birth, care for and nurture their young, and molt on land (Frost, et al. 1982). There are indications that hauling out may be particularly important during the molt. Ready access to water, isolation from disturbance, protection from wind and wave action, and access to food sources have all been mentioned as prerequisites for haul-out selection (Burns 1984).

**Steller Sea Lions**—Cape Newenham and Round Island support the two largest Steller sea lion haul-outs in northern Bristol Bay. ADF&G has monitored sea lion populations at

Round Island since the late-1970s. The Service began monitoring sea lions at Cape Newenham in 1990 and continued through 1993. From the late 1950s to the mid-1980s, sea lion numbers declined in Alaska (Hoover 1988), and Steller sea lion abundance has declined by more than 80 percent in the past 30 years in the southeastern Bering Sea (Williams, et al. 1998). On April 10, 1990, the Steller seal lion was designated as endangered in the population west of 144 degrees west longitude, which includes the coastline of the Refuge.

In 1991, Cape Newenham was identified as a Steller sea lion haul-out. Steller sea lions usually begin using the Togiak Refuge haulout in April and are seen feeding along the coast during the herring spawning migration, which usually occurs in May. Pupping at this haulout is rare. They normally feed heavily on herring in Chagvan Bay during May and June. Average annual sea lion counts have ranged from 166 to 300 at Cape Newenham.

## **3.5 Human Environment**

### ***3.5.1 History***

The Cape Newenham and Togiak region of southwestern Alaska has been continuously occupied for 9,000 years and possibly longer. Kusququagmiut Eskimos occupied the area from Chagvan Bay north to the Kuskokwim River. The Chingigumiut Eskimos were a subgroup of the Kusququagmiut Eskimos who occupied the area around Cape Newenham. Tuyuyarrmiut Eskimos lived within the areas between Cape Newenham and Nushagak Bay.

At the time of the 1880 census, approximately 2,300 Eskimos lived within what is now the Togiak Refuge. Elliot (1887) wrote that the Togiak River was remarkable for the density of population along its banks. At that time, 1,926 people lived in seven villages along the river from Togiak Lake to Togiak Bay—reflecting the abundance of fish and wildlife and size of this river system.

The Tuyuyarrmiut, unlike most coastal Eskimos, did not depend entirely on marine resources. In the spring and fall, they hunted moose, caribou, and brown bear in the interior mountains and valleys. In midsummer, they returned to their villages to harvest salmon.

Kusququagmiut, who occupied the area west and north of the Tuyuyarrmiut, depended more upon the sea and spent little, if any, time hunting land animals. The Chingigumiut people living

in the vicinity of Cape Newenham, for example, obtained meat, blubber, and oil from seals, beluga whales, and Pacific walrus. Pacific walrus were especially prized for their ivory, which was used in tools and for trade. Seabirds provided meat and eggs, and feathers for clothing. Salmon and trout were also important items in the Kusququagmiut diet.

As forms of transportation in the Bristol Bay and Kuskokwim Bay regions began to shift from kayaks and dog sleds toward large sea-going ships owned by fishing and trading companies, the population of the region began to congregate near the coastal bays these ships used. This, along with the widespread epidemics that led to sharp population declines, caused many village sites throughout the region to be abandoned. Today, communities in and around the Togiak Refuge include Quinhagak, Goodnews Bay, Platinum, Togiak, Twin Hills, Manokotak, Aleknagik, Dillingham, and Clark's Point.

### **3.5.2 Cultural Resources**

The Togiak Refuge has been inhabited for at least 9,000 years and includes hundreds of important cultural sites, many of which are likely to be located in areas where public use is concentrated. This concentration makes these resources particularly vulnerable to looting and damage. Illegal digging and looting are notable concerns in this area of Alaska.

Portions of the Refuge have been surveyed for cultural sites fairly extensively but with little excavation. Almost 200 sites have been documented within the Refuge, and another 50 sites have been documented nearby. Most sites documented are associated with major river drainages, lakes, and bays. It is assumed that some sites have been destroyed because of natural soil erosion along rivers and bays.

Distributions of remains on the Refuge is not uniform. Before 4000 BCE (Before Common Era), people living in what is now the Togiak Refuge were primarily inland caribou hunters. After 4,000 BCE, inland hunting continued, but people in the area also began exploiting coastal resources, particularly in the Security Cove area. Dumond (1987) states the coastal area of the Refuge has been the center of human activities for the past 2,500 years, and he expects most sites to be found there and along the major rivers. Interior site distribution is spotty, and the sites there are more ephemeral.

Natural areas and landscape features may be culturally significant. These sites are important in maintaining the cultural traditions and beliefs of local people.

### 3.5.3 Local Population and Economy

#### 3.5.3.1 Population

Table 3-5 shows the population changes in the nine principle Refuge-area communities since 1960 (Goldsmith, et al. 1998; DCED 2005).

Table 3-5. Local population census data for communities within and adjacent to the Togiak Refuge

	1970	1980	1990	2000	2005
Aleknagik	128	154	185	221	241
Clark's Point	95	79	60	75	65
Dillingham	914	1,563	2,017	2,466	2,370
Manokotak	214	294	385	399	437
Quinhagak	340	412	501	555	642
Togiak	383	470	613	809	779
Platinum	55	55	64	41	38
Goodnews Bay	218	168	241	230	238
Twin Hills	67	70	66	69	71
Total	2,414	3,265	4,132	4,865	4,881

The populations of these communities are predominantly Alaska Native, with most non-Native Alaskans living in Dillingham. The commercial fishing industry draws a very large nonresident population to the region each year. Dillingham is most affected by this seasonal influx of workers. Local residents are also drawn from outlying communities to Dillingham during the commercial fishing season. Government spending has been an attractive force, serving to keep populations in the region higher than they might otherwise have been.

#### 3.5.3.2 Economy<sup>1</sup>

In the 1800s, Russian American Company traders established a fur trading fort on the Nushagak River, which was soon handling more than 4,000 pelts annually from brown and black bears, wolves, wolverines, beavers, martins, mink, marmots, muskrats, river otters, ground squirrels, lynx, seals, and foxes. The trade in furs waned around World War I, although some trapping continues today.

<sup>1</sup>Except where otherwise noted, this section is derived from a report commissioned by the U.S. Fish and Wildlife Service: Goldsmith, O.S., A. Hill, T. Hull, M. Markowski, and R. Unsworth. 1998. *Economic Assessment of Bristol Bay Area Refuges: Alaska Peninsula/Becharof, Izembek, Togiak*. Institute of Social and Economic Research, University of Alaska Anchorage, and Industrial Economics Incorporated. Anchorage, Alaska.

As the fur industry declined, mining and commercial fishing grew. Several placer gold mines operated near the Arolik River between 1900 and World War II. Platinum mining near Goodnews Bay began in 1926, continued until 1975, and has been intermittent since then. During the 1920s, 1930s, and into the 1940s, a number of placer mining operations were active in the Arolik, Goodnews, Eek, and Kanektok River systems, and on Trail Creek. Varying amounts of gold and platinum were recovered, with the most extensive operations within the Refuge occurring on a tributary of the Arolik River prior to establishment of the refuge. Abandoned cabins, airstrips, tractor trails, rusting machinery, empty barrels, and tailing piles are evidence of these past operations scattered throughout the region. At present, there are approximately 20 unpatented mining claims held by two claimants on Refuge lands.

For at least the past 30 years, commercial fishing and fish processing—supported by the highly productive Bristol Bay fishery—have dominated the Refuge-area economy. These activities are highly seasonal, with a very distinct peak from May through September. Government spending and tourism, built primarily around recreational fishing, are also important contributors to the local wage economy. Because most area communities are so small, the trade and service sectors are not well developed; the small villages depend on the regional center of Dillingham and on Anchorage to provide most support services and retail opportunities.

*Commercial fishing and fish processing.* From 1985 through 1996, the annual value of salmon harvested in the Bristol Bay-area commercial fishery fluctuated around \$200 million (in 1997 dollars). A poor salmon harvest in 1997 marked the beginning of a dramatic reduction in the value of the fishery. Since that time, a series of poor harvests, combined with declining salmon prices caused by competition from farmed salmon, have held the average annual value of the fishery below \$70 million (Table 3-6).

The commercial fishery is a limited-entry fishery, and many permits are owned by nonresidents who come to the state for only a few weeks in the summer. Moreover, many of the permits held by Alaskans belong to fishermen who live outside the region. Employment in fish processing is also dominated by workers from outside the region and outside the state; in a given year, usually less than 20 percent of processing employees are Alaska residents. The short fishing season, combined with the large nonresident share of permit holders, crew, and processing workers means much of the economic impact of this harvest falls elsewhere, as dollars earned in the region are spent outside the region or outside the state.

*Government.* Government employment at all levels accounts for about one in three jobs in this part of Alaska. Most of these are local government jobs. The federal and state government jobs tend to be concentrated in the regional service centers of Bethel and Dillingham. Most local government employment is with municipal governments or school districts. All of the financial support for rural schools, and much of the financial support for local municipal governments, comes from state government because local tax bases are small in most of the region's communities. Many government positions are relatively high-paying, year-round jobs, which provide some stability to the regional economy that otherwise depends heavily on commercial fishing.

Table 3-6. Annual Value of Bristol Bay Salmon Harvest

Year	Harvest (million of fish)	Value (million)	Value in \$1997 (million)
1985	25.005	\$120.731	\$165.235
1986	17.680	\$141.063	\$189.480
1987	17.739	\$135.667	\$181.558
1988	16.662	\$176.858	\$235.811
1989	30.274	\$177.787	\$230.471
1990	35.215	\$202.259	\$246.940
1991	27.259	\$106.384	\$124.229
1992	33.560	\$193.745	\$218.832
1993	41.460	\$154.411	\$169.128
1994	36.530	\$193.550	\$207.600
1995	45.520	\$190.810	\$198.915
1996	30.740	\$140.870	\$142.943
1997	12.740	\$66.400	\$66.400
1998	10.720	\$71.230	---
1999	26.390	\$115.070	---
2000	21.120	\$81.080	---
2001	15.060	\$41.000	---
2002	11.200	\$32.393	---
2003	15.790	\$48.330	---
2004	27.286	\$76.986	---

Source: Goldsmith et al. 1998 and Alaska Department of Fish and Game Division of Commercial Fisheries website: <http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/salmhome.php> accessed on August, 9 2005.

State and federal government grants and assistance also support a large number of jobs in social service delivery in Togiak Refuge-area communities, particularly in the health care and day care fields. Federally supported rural housing authorities provide money for construction of housing.

State and federal agencies provide construction grants through a variety of programs for economic development projects, water and sewer construction, transportation facilities, and other capital projects. These grants provide construction employment throughout the region.

Finally, federal and state transfers to individuals are important components of household income in most of the region. These transfers include the Alaska Permanent Fund dividend, Social Security payments, unemployment insurance, and welfare benefits.

*Tourism.* Tourism is centered on the recreational fishery, which draws people from throughout the world to the lakes and rivers that flow into Bristol Bay. Wood Tikchik State Park, to the east of Togiak Refuge, has a number of exclusive fishing lodges catering to catch-and-release anglers. Guests from these lodges are able to reach many sites by floatplane and raft during their visits. As with the commercial fishery, the tourist season is short so economic activity related to tourism tends to be conducted to a large degree by non-residents. As a result, even though tourists may spend a lot of money to get to the Bristol Bay area and spend a lot more money while in the region, little of that money stays in the region. It escapes because most of the jobs in the tourist industry are taken by non-residents and because the seasonality of demand makes it difficult for other economic activity within a community to build up around a tourist base.

*Economic Significance of Togiak Refuge.* Economic significance is a measure of the employment (in terms of average annual jobs) and household income generated by activities associated with the Refuge. These activities include refuge management, public recreation use (fishing, hunting, and non-consumptive activities), commercial fishing, and subsistence uses. In 1997, the total economic significance of Togiak Refuge was estimated at 560 average annual jobs and \$20.4 million (Table 3-7).

Estimating the economic significance of the Refuge is difficult in part due to a number of attribution challenges. For example, salmon caught in Bristol Bay may rely on spawning and rearing habitat within Togiak Refuge for part of their life-cycle, but there is no single, “correct” method for determining what portion of the income generated by commercial fishing in

Bristol Bay is attributable to Togiak Refuge. Likewise, travel and equipment expenditures made by recreational visitors and subsistence users are not wholly attributable to Togiak Refuge, so there is no single “correct” attribution.

For the purposes of this assessment, the Institute of Social and Economic Research at the University of Alaska Anchorage (ISER) reviewed the distribution of the Bristol Bay salmon harvest by river system. Based on that review, only the portion of the harvest associated with Togiak Refuge river systems was attributed to the Refuge. The estimates of economic significance presented here assume that if a fish is hatched in a Togiak Refuge stream, the Refuge receives credit for the entire economic impact generated by the harvest and processing of that fish. Harvest data used for calculations are from 1995, a year in which the value of the harvest was better than the average value during the 1990s. Since 1997, the annual value of the harvest has been less than half what it was in 1995. Due to the highly variable nature of the commercial salmon fishing and processing industry, estimates of economic significance presented here (Table 3-7) should be viewed in context as a “snapshot” in time.

For recreational activities, economic significance is determined from visitation and expenditure data for four types of use: fishing, big-game hunting, waterfowl hunting, and non-consumptive use (e.g. photography, kayaking). Visitation data used to calculate economic impacts are from mid-1990s records kept by Togiak Refuge and the Alaska Department of Fish and Game. Expenditure data are estimated for 1997, based on spending patterns identified in several studies conducted in the late 1980s and early 1990s.

The economic significance of subsistence activities is based solely on subsistence-related expenditures for equipment and fuel made by residents of communities within and adjacent to Togiak Refuge. Annual subsistence-related spending in these communities is estimated at \$1.7 million in 1997 dollars.

The economic significance of refuge management activities is based on the three-year average annual operating budget for Togiak Refuge, which was estimated to be \$1,327,000 (in 1997 dollars). Only the costs of normal operations and maintenance are included in this figure; large capital expenditures and expenditures made at the regional and national levels are not included.

Table 3-7. Estimated economic significance of activities associated with Togiak Refuge in 1997

Activity	Income (\$1997)	Employment (annual average jobs)
Commercial Fishing	\$14,840,000	333
Recreational Activities		
Fishing	\$3,570,000	155
Big Game Hunting	\$300,000	1
Non-Consumptive Use	\$300,000	1
Refuge Management	\$1,050,000	32
Subsistence	\$880,000	38
<b>TOTAL</b>	<b>\$20,400,000</b>	<b>560</b>

### 3.5.4 Access and Transportation

*Mining Activities 1900-1980.* By the early 1920's, mineral prospecting had occurred throughout the Bristol Bay and Kuskokwim Bay regions. As early as 1926, drilling activities were occurring on claims along Kow Kow Creek (a tributary of the Arolik River), and shoveling operations were underway along Wattamus, Olympic, and Bear creeks (tributaries of the Goodnews River) (Holzheimer 1926).

In the summer of 1937, barges had delivered materials to construct an eight cubic foot dredge south of Goodnews Bay to work claims for the Goodnews Bay Mining Company. Freight for the company was being hauled by Caterpillar tractor from Platinum, along the coast to the mouth of the Salmon River, and then upriver to the mining camp. The Clara Creek Mining Company was operating a dragline in the area at that time, and the company was in the process of taking a drill inland from the north side of Goodnews Bay to Snow Gulch, a tributary of the Arolik River.

By November of 1937, the Goodnews Bay Mining Company had operated the dredge 40 days and was operating two draglines on Platinum Creek. At this time, a Caterpillar road led from Platinum around the northeast end of Red Mountain to the Clara Creek Mining Company camp. The road was being reconstructed into a permanent road by the Alaska Road Commission and was planned to reach the Goodnews Bay Mining Company camp at Squirrel Creek two miles further south. On a mining claim two miles up Fox creek from its junction with Slate Creek, an airplane drill was used in 1936 and a "small hydraulic outfit" was used the next year (USGS 1937).

After hauling a drill overland from Goodnews Bay the previous year, the Goodnews Bay Mining Company reported considerable drilling along Snow Gulch. The Clendon Company also used an airplane drill to test claims along Trail, Faro, Deer, and Kow Kow creeks. (USGS 1937). This 1937 USGS report contains several photos of an open crawler tractor towing a fully erected wall tent on skids across open tundra.

In 1939, mining in the region was probably at its most active stage. Operations were located at Rainey Creek (a tributary of the Eek River), Trail Creek (a tributary of the Izavieknik River), Wattamus Creek (a tributary of the Goodnews River), Butte Creek, Kow Kow Creek, Peluck Creek, Snow Gulch, and Sulutak Creek. Placer mining also occurred along headwater streams of Kagati Lake, and an abandoned crawler type tractor remains in this area.

By 1939, the improved road had been constructed from Platinum southward to Clara and Squirrel creeks and supplies were being hauled by truck instead of Caterpillar (Roehm 1937). Past and present day Clara Creek and Goodnews Bay Mining Company activities south of Platinum are outside the Togiak Refuge boundary.

Operations in the Arolik River drainage and overland transportation of equipment to this area took place on what are now State of Alaska lands, Bureau of Land Management lands, and private lands within the Togiak Refuge boundary. However, if the 1939 planned bulldozing activity along Keno and Sulutak creeks (probably Flat Creek on USGS maps) did occur, these motorized activities would have occurred on selected lands within the Refuge and possibly Refuge lands further upstream as well. A cabin site noted on USGS maps near the confluence of Keno and Flat Creeks is located on selected lands and is within two miles of Refuge administered lands.

*Resident Subsistence Activities 1940-1986.* On January 1, 1960, 50 CFR 26.14 was revised to state “Travel in or use of vehicles is prohibited in wildlife refuge areas except on public highways and on roads, campgrounds and parking areas designated and posted for travel and public use by the officer in charge.” On January 20, 1969, the Secretary of the Interior issued Public Land Order 4583, withdrawing approximately 265,000 acres from the public domain to establish Cape Newenham National Wildlife Refuge. At this time, there were no public roads, highways, campgrounds, or parking areas designated within the Cape Newenham Refuge. Therefore, the use of motorized vehicles within the Cape Newenham Refuge was prohibited under 50 CFR 26.14.

Annual Narratives for the Cape Newenham National Wildlife Refuge completed in 1969, 1970, and 1971 mention the use of snowmachines and airplanes within the Refuge. No other Annual Narratives were written for the Cape Newenham Refuge.

Sometime around 1970, three-wheeled all-terrain vehicles became available to the general public. Their use did not become widespread in Alaska until the 1980s, but Bristol Bay area villages—which were relatively wealthy compared to many interior Alaska villages—were among the first places to adopt them (Sinnott 1990).

The 1974 Final Environmental Impact Statement (EIS) for the proposed Togiak Refuge is the most comprehensive pre-1980 documentation of natural resources, economies, subsistence, and other uses within the present day Togiak Refuge. The EIS suggests that snowmachines and motorboats were integral to subsistence activities at the time: “Cash expenditures that are now necessary in order to successfully compete for subsistence resources include guns, shells, nets, snowmachines, boats and motors, gas and oil and maintenance costs” (Alaska Planning Group 1974). Other portions of the EIS mention off-road vehicles. The “Description of the Environment” chapter describes transportation in the proposal area as follows: “Aircraft provide the primary means of transportation to the villages; other travel is by boat, dog teams, snow machines and other off-road vehicles” (page 26). The impact discussion of the proposed action on page 81 states, “Ground transportation routes in the Togiak region are presently limited to sled trails and winter tractor haul trails... use of trails and snowmobiles is expected to continue” (Alaska Planning Group 1974). The motorized vehicles mentioned in this document include boats, airplanes, snowmachines, and tractors. It is assumed that the tractors and tractor trails mentioned were associated with the mining activities described previously. There is no mention of tractors being used for subsistence or recreational purposes.

The 1981 Togiak Refuge Annual Narrative mentions the use of three-wheelers within the Togiak Refuge boundary on coastal beaches, uplands, and during winter months. No specific locations or uses are described (USFWS 1982).

In 1981, DOWL engineers and others working under contract for the Alaska Department of Community and Regional Affairs prepared Village Profiles for each Bristol Bay community, including: Togiak, Twin Hills, Manokotak, Dillingham, and Aleknagik (Alaska Department of Community and Regional Affairs 1982). These reports indicate three-wheeled ATVs were widely used in most Bristol Bay communities, and were primarily used only on roads within the communities while

boats, airplanes, snowmachines, and dog teams were used for travel between communities.

Profiles for Twin Hills and Manokotak indicate that “Three-wheel all-terrain vehicles (ATVs) are the primary method of motorized transportation within the village.” It was noted that virtually every household in Aleknagik had a snowmachine, a three-wheel ATV, and/or a trail bike. While no specific uses of three-wheel ATVs were noted in Togiak, a photograph in the Village Profile shows two three-wheel ATVs and a Jeep in front of the Togiak Village Co-op. The authors were specific in their discussion of transportation modes and appear to have made a distinction between ATV use within the villages and the use of ATVs outside the village. Outside Togiak Refuge at New Stuyahok, for example, it was noted: “Skiffs are used to some extent for transportation to other villages, and during the frozen winter season snow-gos and 3-wheel all-terrain-vehicles are used extensively” (Alaska Department of Community and Regional Affairs 1982).

In the summer of 1982, 60 residents of Aniak, Sleetmute, Crooked Creek, and Chuthbaluk were interviewed, in part to delineate traditional subsistence use areas. Respondents indicated harvesting subsistence resources as far south as Aniak Lake, which lies in the mountains north of what is now Togiak Refuge. They also reported using 16 to 20 foot aluminum or wood boats powered by 15 to 35 horsepower outboard motors, some of which were equipped with jet units. In winter, travel was by dog team or snowmachine. Airplanes were reported to be rarely used for harvesting locally available resources (Charnley 1982).

A detailed report prepared by Robert Wolfe and others (1984) describes the 1982-1983 subsistence activities for residents of Quinhagak, Goodnews Bay, Platinum, and Togiak. At this time, three wheeled ATVs were common, and four wheeled ATVs began arriving in Togiak during the spring of 1983. Quinhagak residents were using three wheelers with trailers to haul drinking water. Wolfe and others (1984) noted that stores in Quinhagak, Platinum, and Togiak sold three-wheelers in 1982. Togiak Natives Ltd. acquired a Suzuki franchise prior to 1983, and had sold 15 four-wheelers by the summer of 1983.

From May 3 through June 1 of 1984, Togiak Refuge staff documented waterfowl numbers and subsistence hunting at Chagvan Bay. During their stay at Chagvan Bay, the staff observed 16 hunting groups. Five groups used boats, the other 11 groups used two, three, and four wheeled ATVs, including one hunter who flew from Togiak to Platinum before riding to Chagvan Bay (Pogson, et. al. 1984). A map included in the 1984

report shows the use of these ATVs occurred along beaches of the north spit of Chagvan Bay (not on Refuge lands).

The 1986 Comprehensive Conservation Plan and Final Environmental Impact Statement for Togiak Refuge states: “Goodnews Bay, Quinhagak, and Platinum residents all travel by skiffs or 3-wheeler to hunt geese in spring at Chagvan Bay” (USFWS 1986). Another section of the document reads: “3-wheelers are commonly used in and around all of the villages, on adjacent local roads outside of the refuge, and on coastal beaches.” The plan also states: “Access to refuge lands by traditional means will be permitted for subsistence purposes in accordance with Section 811 of ANILCA. Traditional means, as defined in Service regulations (50 CFR 36), include snow machines and boats (excluding air boats) on Togiak Refuge.” The consistent message from this collection of early 1980s subsistence reports and from FWS documents is that three- and four-wheeled ATVs were common in villages and along certain coastal areas, but they were not used for subsistence on Refuge lands.

Two documents from the second half of the 1980s indicate that ATVs were occasionally used in upland areas during periods of poor snow cover. Fall and others (1986) reported that of 153 Dillingham households surveyed, 28 percent had all-terrain vehicles. Dillingham residents who were interviewed reported using ATVs to access set net sites along Snag Point, and trappers who were interviewed in 1984 reported using snowmachines, although ATVs were sometimes used during periods of poor snow cover. The local trapping area defined for Dillingham residents who were interviewed included the Nushagak Peninsula. Schichnes and Chythlook (1988) reported that in 1986, travel within the Igushik fish camp was most frequently by all-terrain vehicle, which was also essential to the commercial fishing operation. During interviews, Manokotak residents stated the most common method of transportation for trapping was snowmachine, but all-terrain vehicles were also used during periods of poor snow cover.

*Contemporary Refuge Access.* Access to the Refuge is primarily by plane, boat, or snowmachine. Most visitors fly from Anchorage to Dillingham or Bethel. From there, visitors hire an air taxi to either take them directly into the Refuge by landing on one of the rivers or lakes or to one of the smaller communities. From there, visitors can use a motorboat to go upriver into the refuge. Other visitors who stay at lodges outside the Refuge are taken by floatplane to these same rivers and lakes.

Most people who live within Togiak Refuge use motorboats, snowmachines, or personal aircraft to access various parts of

the Refuge, but they occasionally charter an air taxi to take them to more inaccessible locations. During winter months, local residents are able to travel over much greater areas of the Togiak Refuge by snowmachines. Hagemeister Island is rarely used by recreational visitors, and infrequently visited by local residents.

Access to the Refuge is often influenced by weather. Wind, fog, water levels, and snow or ice conditions dictate where and when people are able to travel within the Refuge. Mountainous terrain confines travel to the wide U-shaped glacial valleys and coastal plains. Travel by foot is difficult due to thick alder and willow stands along rivers, and tundra and wetlands throughout the river valleys and coastal plains. There are a few well-known winter trails that can be used to travel across the entire Refuge.

There are no roads on lands administered by the Refuge. The majority of all public use during the summer months occurs by boat along the Kanektok, Goodnews, and Togiak rivers and their major tributaries. The lower reaches of the Kanektok and Togiak rivers are within the boundary of the Togiak Refuge, but the uplands along these reaches are privately owned by Alaska Native corporations and individuals, and the lands below the ordinary high water mark of navigable waters are owned by the State of Alaska. Use of these river sections is predominantly by motorboats for subsistence activities and recreational fishing. The Togiak Refuge manages the non-navigable upper reaches of these rivers which also lie within the Federally designated Togiak Wilderness Area. Several private inholdings are located along the Wilderness portion of these rivers. Use of these river sections within the Wilderness Area is predominantly by guided motorized groups or rafting parties in the Kanektok, Goodnews, and Togiak river drainages. The upper Togiak River is primarily accessed by motorboat for subsistence and guided recreational use because of this river's low gradient and deeper water.

### **3.5.5 Subsistence**

In 1980, the U.S. Congress passed the Alaska National Interest Lands Conservation Act (ANILCA), which established Togiak Refuge, among other conservation system units. One of the purposes of the Act, and of the Refuge, is to provide the opportunity for rural residents engaged in a subsistence way of life to continue to do so (ANILCA sec. 101(c)). Subsistence is therefore regarded as a way of life, rather than just an activity. The meanings of subsistence are based on family traditions, religion, relationships with particular places, and a preference for natural foods.

Several communities rely on the resources of the Refuge for subsistence purposes: Manokotak, Togiak, Twin Hills, Goodnews Bay, Platinum, Quinhagak, Dillingham, Aleknagik, and Clark's Point are all either within, or proximate to, the Refuge. The primary subsistence-use areas within the Refuge are the Kanektok, Goodnews, Osviak, Matogak, Igushik, and Togiak rivers.

A wide variety of subsistence activities occur year-round on the Refuge, and other activities last a short time, depending upon the resource. In late winter, spring, and fall, hunting for seals, Pacific walrus, beluga whale, and waterfowl is common. Fishing for herring, smelt, and char, and gathering herring roe deposited on the kelp leaves and gull and murre eggs are also typical in late spring. As spring progresses and changes to summer, salmon fishing is in full swing, starting with chinook, sockeye, and chum, and then progressing to pink and coho salmon in late summer. Caribou and moose hunting, berry-picking, firewood-gathering, and the gathering of other plants are primarily fall activities. As fall progresses, Dolly Varden, lake trout, Arctic char, rainbow trout, round whitefish, Arctic grayling, and pike are targeted; as lakes begin to freeze, jigging through the ice for these fish is common. Animals hunted include ptarmigan, ground squirrel and brown bear. With winter comes trapping. Fox, mink, wolf, beaver, otter, wolverine, and lynx are the major species trapped. Several areas also have winter hunting seasons for moose and caribou.

Area residents use a variety of plants for food, medicines, and firewood. As an example, approximately 80 percent of households in Togiak, Twin Hills, and Manokotak are each estimated to harvest 22-31 gallons of wild berries annually. Over 50 percent of households in these three communities cut a combined total of roughly 632 cords of wood annually for smoking fish and other meat, home heating, and other household uses (Coiley-Kenner, et al. 2003). Much of the wood cutting probably occurs on private lands near the communities.

Salmon, non-salmon fish species, large land mammals such as moose and caribou, and wild plants comprise 80-90 percent of all subsistence resources harvested (on a usable weight basis) by residents of many communities within and adjacent to Togiak Refuge. The remaining 10 percent is mainly comprised of small land mammals, marine mammals, various bird eggs and bird species, and marine invertebrates (Coiley-Kenner, et al. 2003).

Wolfe, et al. (1984) reported that traditional rights to salmon fishing areas are influenced by customary law, and that communities view certain areas as their traditional territories. Drift and seine fishing areas are viewed as common property; a

first-come basis of use appears to prevail. However, setnet areas and salmon fish camps tend to be recognized as “traditional-use areas of particular kinship groups or clusters of kinship groups.” Several campsites along the Kanektok and Goodnews rivers are named after people, and even when not used for several years, these sites retain identification with the kinship group. Other members of the community may use these locations after requesting permission from the appropriate kinship group.

#### *3.5.5.1 Kanektok River*

Gill nets are the primary means of harvest used in Kuskokwim Bay and in the lower Kanektok River. Sweep seining and short setnets are used in the Kanektok River upstream of the Wilderness Area boundary. Residents also use rod and reel gear for subsistence harvest of salmon (Wolfe 1987). Salmon harvested from summer commercial salmon fishing activities are also retained for subsistence use, as are Dolly Varden and rainbow trout. Residents of Quinhagak have identified 51 traditional-use sites (fish camps, hunting camps, and other locations) along the Kanektok River (Wolfe 1987). Twenty-nine of these sites are located upstream of the Wilderness Area boundary. Quinhagak residents reportedly travel to Kagati Lake more in winter than at any other time of the year. Kwethluk residents periodically visit Kagati Lake in fall for hunting and squirrel trapping and also during winter for trapping and hunting furbearers (Wolfe, et al. 1984; Coffing 1991).

#### *3.5.5.2 Goodnews River*

Most subsistence fishing for char, whitefish, Arctic grayling, and rainbow trout in the Goodnews River occurs within the lower 10 to 15 miles (Wolfe, et al. 1984; Wolfe 1987). From late May through early July, chinook, chum, sockeye, and pink salmon are taken with gill nets along the shore of Goodnews Bay. Salmon are also harvested a short distance up the Goodnews River with drift, set, or seine nets. Most salmon are taken with subsistence nets in Goodnews Bay before commercial season begins (Wolfe 1987). Small quantities are taken throughout the summer from commercial nets in the ocean or the river (Wolfe 1987). Trips are made upriver in summer to gather firewood, hunt beaver and birds, and harvest freshwater fish.

In late summer, coho salmon are harvested in the river, and berries are gathered along the shores. Day trips are also made upriver to collect firewood and to harvest Arctic ground squirrel and waterfowl. Some hunters make longer trips far upriver for moose. After the river freezes, trips are made to gather firewood and to hunt small game and the occasional moose. Trapping occurs throughout the area. Jigging through the ice

for char, round whitefish, Arctic grayling, and rainbow trout occurs throughout the winter until breakup (Wolfe, et al. 1984). Subsistence use maps that include the community of Platinum suggest a harvest pattern similar to that of Goodnews Bay, but subsistence fishing sites have not been mapped specifically for the Platinum community.

#### *3.5.5.3 Osviak and Matogak Rivers/Hagemeister Island*

Much of the property surrounding the mouths of the Osviak and Matogak rivers is privately owned. Subsistence use is concentrated on the lower stretches of these rivers, particularly the Osviak, where several subsistence and commercial fishing cabins are located. Few data exist on the extent and intensity of use, but traditional sites are probably used primarily for fish camps during spring, summer, and fall. Of Togiak households interviewed, 23 percent reported using this area for freshwater fishing (BBNA and ADF&G 1996). Togiak residents use this area to harvest a small number of Dolly Varden, during the summer, and occasionally smelt and rainbow trout (BBNA and ADF&G 1996). Other associated subsistence activities occur opportunistically.

Hagemeister Island is only used occasionally for subsistence purposes. Distance and swift tidal currents of Hagemeister Strait deter frequent access by small skiff from Togiak. Other subsistence access is by airplane or larger boats, particularly during the herring fishery.

#### *3.5.5.4 Togiak River*

The Togiak is an important river system for residents of Togiak and Twin Hills, both located near the mouth of the river on Togiak Bay. Residents of both communities use the river drainage for subsistence activities such as fishing, hunting, berry-picking, trapping, and firewood-gathering (Wolfe, et al. 1984). The lower river section, below the Wilderness Area boundary, receives most of the subsistence net fishing for salmon (Wolfe 1987) and ice fishing in the winter for char.

Unlike other rivers in the Togiak Refuge, the entire Togiak River is accessible by motorboat as long as it is ice-free. For this reason, there are a number of important subsistence sites located within the Togiak Wilderness Area (Wolfe 1987). The tributaries of the Togiak River are valued as important reserves for fish and fish habitat.

Wolfe (1989b) states that subsistence salmon and char fishing occurs primarily in the Togiak River, with some fishing also occurring in marine waters of the bay. Research conducted in 1987 documented subsistence net fishing at 95 sites along

Togiak River and Togiak Lake. The greatest concentration of sites was along the lower 12 miles of the river (well below the Wilderness Area boundary) and averaged 4.6 sites per river mile. Early in the salmon season, day trips are made by elders accompanied by younger children to harvest chinook, sockeye, pink, and chum salmon. Adult males harvest coho and char from mid-August through mid-October.

Residents of Togiak and Twin Hills utilize the upper Togiak River for subsistence purposes. The 1987 study by the ADF&G Subsistence Division (Wolfe 1989a) documented 24 subsistence salmon net-fishing sites in the 41 miles of the upper river in the Togiak Wilderness Area. Nine sites were documented along the shores of Togiak Lake. The Refuge staff have identified 18 “fishing holes” on the upper Togiak River that correspond very closely with the 24 subsistence net sites. Some subsistence setnet sites are within a very short distance of each other, thus potential still exists for some level of displacement.

Based on a 1996 report by Bristol Bay Native Association (BBNA) and ADF&G, more than 26 percent of Togiak households reported harvesting freshwater fish from the Pungokepuk Creek (a tributary of the Togiak River) area from 1985 through 1994. Harvests included pike, Dolly Varden, Arctic grayling, whitefish, and rainbow trout (BBNA and ADF&G 1996). More than 50 percent of Togiak households responding also reported fishing Togiak Lake and in the upper Togiak and Ongivinuck areas during the same 10-year period. Subsistence harvests of salmon (other than spawned-out sockeye salmon harvested at Togiak Lake) are fewer in the upper river than in the lower part of the Togiak River, where fresher fish can be found. Some backwaters are seined for sockeye, chum, and coho salmon. Most of the Togiak River is fished with seines, drift nets, or setnets for chinook, sockeye, chum, and coho salmon. During late August and September, many parties from Togiak and Twin Hills travel to Togiak Lake to harvest freshwater fish and spawned-out sockeye salmon and to hunt furbearers, caribou, and brown bear (Wolfe, et al. 1984).

### **3.5.6 Recreation**

#### **3.5.6.1 *Overview***

The Togiak Refuge provides opportunities for all of the “Big Six” wildlife-dependent recreational activities: hunting and fishing, wildlife observation and photography, and education and interpretation. Refuge visitors can observe, photograph, and learn about a variety of animals, including walrus, seals, seabirds, and caribou; and they can hunt for various waterfowl

and upland birds, and big game. It is fishing, however, that attracts the vast majority of visitors.

The river systems within Togiak Refuge and nearby Wood-Tickchick State Park attract anglers from around the world. The Kanektok, Goodnews, and Togiak River systems are the most popular fishing areas on the Refuge. The headwaters and upper stretches of these rivers are located within the remote Togiak Wilderness—which, for many visitors, is an attraction equal to the opportunity to catch fish (Whittaker 1996). Fishing trips on the Refuge typically involve several nights of tent camping, although fly-in, day-use opportunities are available as well. Commercial support services, including guiding, outfitting, and air taxis are well-established on the Refuge. The vast majority of recreational visitors rely on air taxis for access, and about half rely on guides.

Recreational fishing use on the Refuge increased substantially during the 1980s, and along with that increase came concerns about litter, levels of motorboat use, loss of wilderness values, and other issues. The Togiak Refuge Public Use Management Plan (PUMP), completed in 1991, was developed to address these issues. The PUMP restricts the number of permits available for guided fishing operations and calls for regulating the timing of guided trip starts, party sizes, and camping in the most popular fishing areas. The PUMP does not restrict the amount of unguided use, but it does indicate that long-term management should be directed toward a 50/50 allocation of guided and unguided use. In most areas of the Refuge, unguided fishing has increased as a proportion of all fishing so that, in a typical year, it accounts for at least 50 percent of total use-days.

Although it only accounts for a fraction of the use-days that fishing does, big-game hunting is an increasingly popular activity on the Refuge since the State of Alaska made additional brown bear and caribou hunts available in 2002. Caribou hunting in the vicinity of Kagati Lake, which is also the launch point for popular Kanektok River float and fishing trips, increased substantially between 2002 and 2005. It now appears to be in decline, however, due to a shift in the number and location of caribou. It is likely that hunting use in this area will continue to cycle up and down somewhat unpredictably in accordance with changes in caribou availability.

Big-game hunting guide permits are allocated among exclusive guide-use areas on the Refuge. These permits are awarded every five to ten years through a prospectus system that is managed at the regional (statewide) level.

Another refuge activity that has increased in popularity is wildlife observation at Cape Peirce. Demand for this opportunity increased sharply beginning in 2000, mirroring an increase in the number of walrus hauled out at the site and the increased demand for wildlife viewing across Alaska and the nation. Since about 2005, visitation has dropped considerably as a result of much smaller numbers of walrus hauling out at the site, and the reduction or discontinuance of commercial eco-tourism operations by two companies that contributed to the bulk of the visitation.

Overall, recreational use on Togiak Refuge has increased about 60 percent since 1990. Guided use, which is limited by permit availability and permit stipulations, has fluctuated around the same level for most of that time. In contrast, unguided use, almost all related to fishing, has increased more than 200 percent. Figure 3-10 shows annual guided and unguided fishing use-days from 1990 through 2004.

Use data for 2005 and 2006 has not been included in the following analysis, but does not appear to deviate significantly from earlier trends.

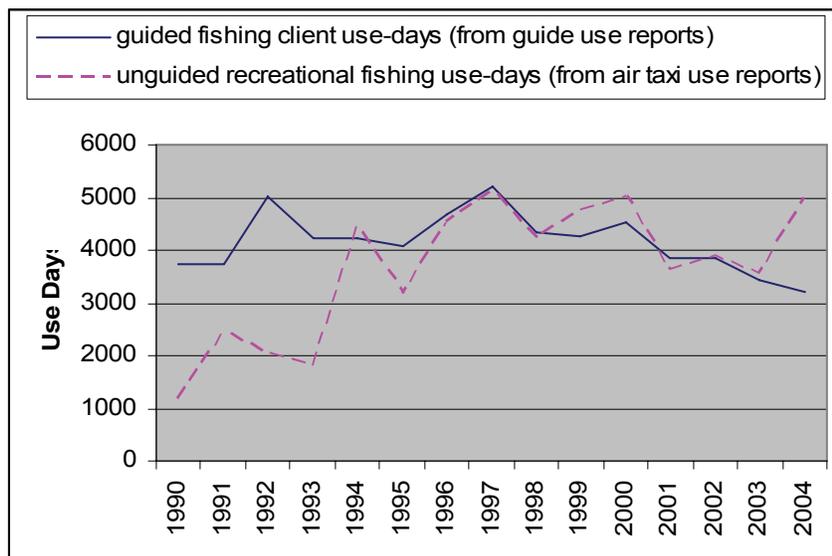


Figure 3-10 Togiak Refuge recreational fishing 1990–2004

**3.5.6.2 Kanektok River**

The Kanektok River has become known around the world as a premier recreational salmon and trout fishing destination. Few articles or books written about Alaska fly fishing fail to mention this remote 90-mile wilderness river. Like most other major rivers in southwestern Alaska, opportunities to fish Pacific salmon species and several resident fish species, spectacular

scenery, and a variety of wildlife are what makes this river a popular attraction for recreational anglers. Fishing use on the Kanektok has been variable from year to year, but the River is consistently the most popular destination on Togiak Refuge.

*Guided Recreation*

Within the Togiak Wilderness Area, guided float operators are permitted to start at Kagati Lake every other day during the summer months. On average, there are about 23 guided float starts between June and August each year. Specific float start dates for each permit are awarded through a competitive prospectus bid system. Annual guided float use has averaged close to 870 client use days from 1996 through 2004.

Guided motorized operations are also allowed within the Togiak Wilderness Area through a competitive prospectus bid system. All permits for the wilderness portion of the Kanektok River drainage limit the number of clients and the number of boats allowed at one time. These limits are likely a factor in the relatively consistent amount of guided use that has occurred within the Wilderness since 1990 (Figure 3-11).

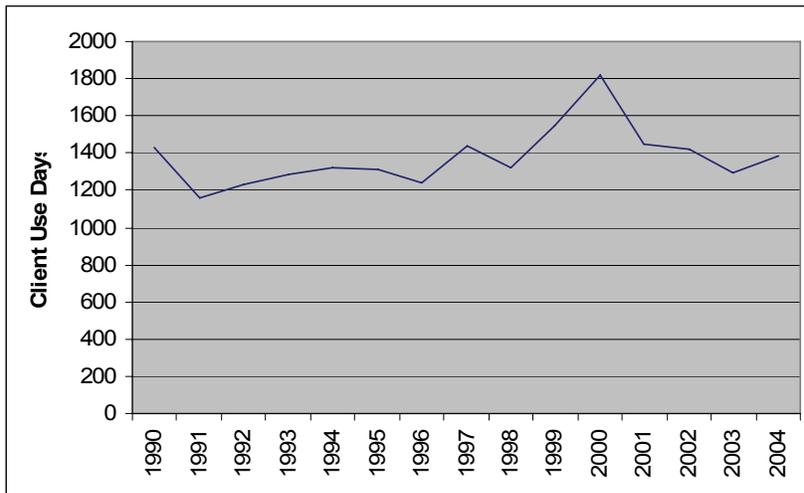


Figure 3-11. Upper Kanektok River Guided Fishing (Within Togiak Wilderness), 1990-2004

Guided motorized use within the Wilderness area has averaged nearly 600 client use days since 1996. During peak use periods, there are typically three guided float groups on the river, using as many as 12 rafts, and five or six guided motorboat groups.

Recreational fishing opportunities along the lower Kanektok River (below the Wilderness Area boundary) are in high demand. Four guides operated along the lower part of the

Kanektok in 2004. Permits for guide camps along this portion of the Kanektok are not managed by the Refuge; rather, they are obtained through private land holders or through Qanirtuuq Incorporated, which is the Native village corporation in the village of Quinhagak. Observations by Togiak Refuge River Rangers and reports from visitors indicate that use on the lower river has increased substantially over time, but multiple access points and limited jurisdiction make it difficult to obtain accurate assessments of the annual amount of use.

*Unguided Recreation*

Unguided fishing on the Kanektok River, which is not constrained by any permit requirements, has nearly doubled in the last 15 years, from an average of about 1000 use-days during 1990-1994 to an average of 1900 use-days during 2000-2004<sup>2</sup> (Figure 3-12). About 40 unguided trips begin from the put-in at Kagati Lake each summer. In recent years, an additional 6-10 unguided, fall hunting trips have begun from Kagati Lake as well. According to data gathered through the Refuge River Ranger program, unguided fishing now accounts for about 51 percent of recreational use along the Wilderness section of the Kanektok River. Ranger reports also show that during peak fishing periods (during the chinook and coho salmon runs), there are typically 10–14 recreational fishing groups along this 58-mile stretch of river at one time.

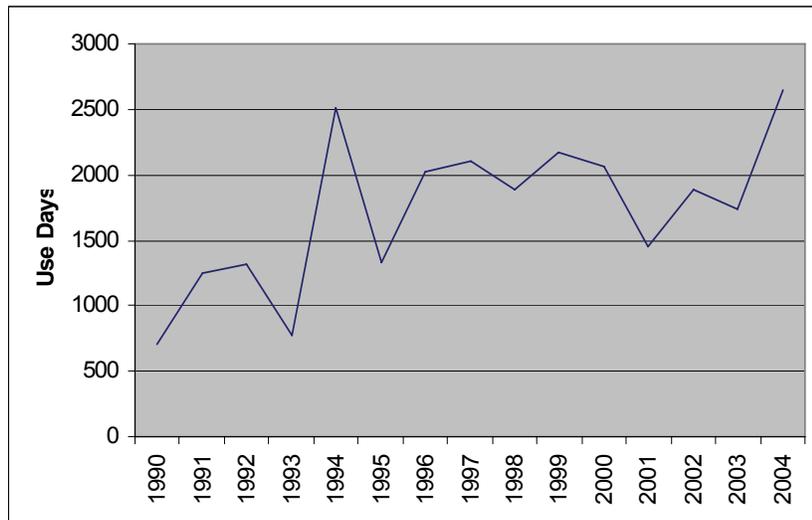


Figure 3-12. Upper and Lower Kanektok River unguided fishing, 1990-2004

<sup>2</sup> These numbers, gathered from air taxi reports, represent use on both the upper (Wilderness) and lower (non-wilderness) portions of the river, so they may not be directly compared to the guided use figures which represent upper (Wilderness) use-days only.

### 3.5.6.3 *Goodnews River*

Most recreational fishing on the Goodnews River occurs on two major tributaries referred to as the North Fork and the Middle Fork. Of these, the North Fork receives the majority of use (guided and unguided combined). Most anglers seek opportunities to catch rainbow trout, coho salmon, and Arctic char in this river.

Unlike the lower sections of the Togiak and Kanektok rivers, the lower Goodnews River is not within the Togiak Refuge boundary. Recreational fishing pressure along the lower Goodnews River steadily increased until the late 1990s and has been variable since then. The Alaska Department of Natural Resources has primary management authority on the lower river, below ordinary high water, and the Kuitsarak Native Corporation owns and manages the adjacent uplands.

#### *Guided Recreational Fishing*

Commercial guides operate both float and motorboat trips on the Goodnews River. The number of permits available for commercially guided recreational sport fishing on the Goodnews River within the Refuge boundary has been limited since 1984. Visitor participation in guided fishing on the upper Goodnews River increased substantially through the 1990s, growing from about 200 client use-days in 1990 to a high of over 500 use-days in 2001. However, overall use levels have not yet approached the maximum of 1,635 guided client use-days allowed under current management. In fact, overall use-days have declined slightly in recent years; there were just over 300 guided client use-days on the Wilderness portion of the Goodnews River in 2004 (Figure 3-13).

Since 1990, motorized, guided use of the Middle Fork Goodnews River and its associated summer guide camp has remained close to the maximum permitted level of 280 use days (spread over an average of 70 trips) per year. No guided float fishing is currently permitted on the Middle Fork.

Guided motorized use on the North Fork has averaged about 87 use-days (42 trips per year) since the mid 1990s. Guided float use has averaged just six trips per year during the same period, but these trips account for an average of about 72 use days per year. One guided float start is authorized per week, and these trips typically occur late in the summer during the coho salmon run.

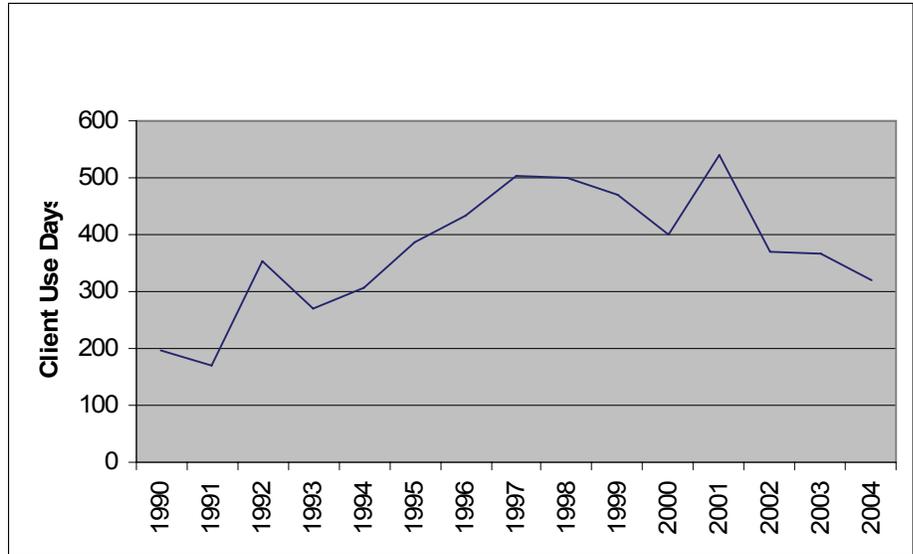


Figure 3-13. Upper Goodnews River guided fishing (within the Togiak Wilderness) 1990-2004

*Unguided Recreational Fishing*

There are no Refuge restrictions on the amount of unguided fishing on the Goodnews River. Unguided use originates at Goodnews Lake, Middle Fork Goodnews Lake, or Kukaktlim Lake. Access is by floatplane, and most groups are required to pull rafts through the shallow upper reaches of the rivers to reach water deep enough to float. Unguided use of the upper Goodnews River grew steadily through the early 1990s, reaching a peak of more than 2500 use-days in 1997. Since that time, unguided fishing has accounted for an average of about 1600 use-days per year (Figure 3-14)<sup>3</sup>.

<sup>3</sup> These numbers, gathered from air taxi reports, represent use on both the upper (Wilderness) and lower (non-wilderness) portions of the river, so they may not be directly compared to the guided use figures which represent upper (Wilderness) use-days only.

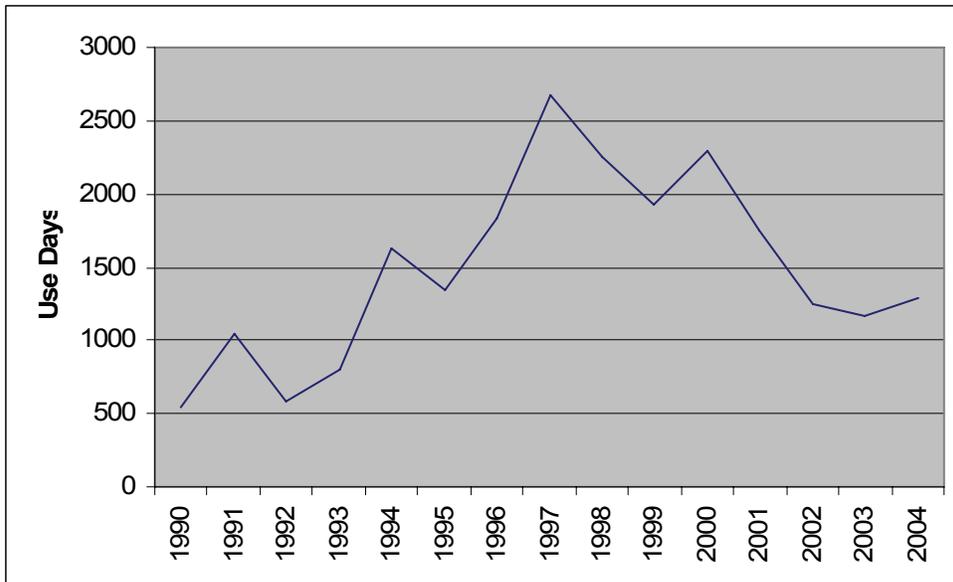


Figure 3-14. Unguided fishing on the Goodnews River (all forks, upper and lower sections) 1990-2004

3.5.6.4 Togiak River

There are numerous tributaries in the Togiak River drainage with headwater lakes accessible by floatplane. These tributaries are generally shallow, small, and narrow, with many sweepers and other obstacles to navigation. The Togiak River itself pours from the largest lake in the Togiak Wilderness Area. While the river is not difficult to navigate and there are no difficult rapids, access through Togiak Bay can be hazardous because of braided tidal channels and often windy conditions. Most recreational fishing occurs from June through September. Opportunities to catch chinook, coho, sockeye, chum, and pink salmon are present. Fishing for coho and chinook salmon is the main attraction for anglers, with rainbow trout and sockeye targeted as well.

Due to the limited number of good fishing sites along the river and concerns about impacts from subsistence use and public recreational fishing, The 1991 Refuge PUMP designated three management zones for the upper Togiak River (within the Wilderness Area). Within each zone, guided fishing is limited but there are no limits on unguided fishing. The State of Alaska has primary management authority below ordinary high water on the lower Togiak River, where numerous guides operate. Guided motorboat fishing accounts for most use on both the upper and lower portions of the Togiak River. Overall, the upper river receives less recreational fishing use than the lower river.

*Guided Recreational Fishing*

There are six commercial sport fishing permits granted for the three zones on the upper (Wilderness) portion of the Togiak River. Two permits are for non-motorized (float) boats, three that are limited to the three zones and that use motorboats, and one motorboat permit that accesses the river from below the refuge boundary. Since 1990, annual guided use along the upper river has averaged 455 client use days (Figure 3-15). Most of this use is concentrated in late summer during the coho salmon migration.

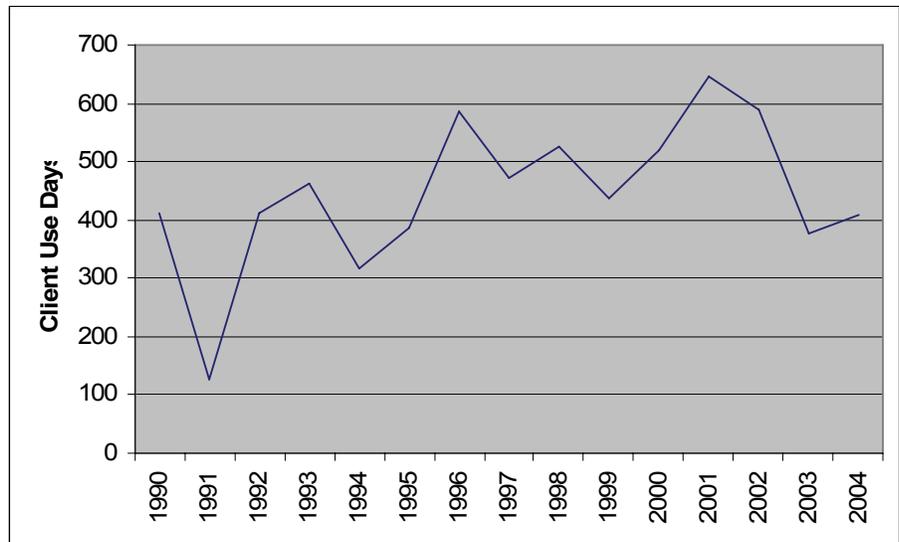


Figure 3-15. Guided fishing on the Upper Togiak River (within the Togiak Wilderness), 1990-2004

*Unguided Recreational Fishing*

Float groups typically access the Togiak drainage through Togiak Lake or Ongivinuk Lake. Floaters do not use the same waters until these two tributaries eventually meet, and from that point, many people continue on down river to a popular pick-up located at the Wilderness Area boundary. Available data indicate unguided use of the Togiak River has ranged from 50 to 176 use-days since 1993, while unguided use of the Ongivinuck River ranged from 15 to 285 use days during the same time period. Because the Ongivinuck is a tributary of the Togiak River, its recreational use is added to that reported for the Togiak River alone to accurately represent unguided visitation below the confluence of the Ongivinuck and Togiak rivers. Overall, during the period from 1990-2004, there has been an annual average of 10 unguided groups representing about 210 use-days. Use levels have been variable from year to year, apparently influenced by fluctuations in water levels or weather patterns rather than any persistent trends.

#### 3.5.6.5 Osviak and Matogak Rivers/Hagemeister Island

The Osviak and Matogak rivers flow south from headwater areas, emptying into Bristol Bay. The Osviak and Matogak rivers are floatable for most of their lengths, but a lack of aircraft landing areas within or adjacent to the rivers makes access difficult. Float-equipped aircraft may land in the bay. Otherwise, access is limited to small, wheeled planes landing on tundra ridges, river gravel bars, or ocean beaches at low tide. Access is also possible by boat from the village of Togiak, which takes several hours. Several privately held Native allotments are located along the lower reaches of these rivers and along the coast, making public access more difficult because permission from land owners is required for use of uplands.

Because of the access difficulties, recreational use of these rivers is negligible. Recreational use is estimated at 10 visitor days (or less) per year. This area is managed primarily for subsistence uses and is uniquely valuable because it receives so little use.

A few miles across Hagemeister Straight from the mouths of the Osviak and Matogak Rivers lies Hagemeister Island. Recreational use of the island is sporadic, and people occasionally visit the island by boat or plane for beach combing.

#### 3.5.6.6 Kulukak River

The Kulukak River is a remote river within the Refuge but mostly outside the Togiak Wilderness Area. Temporary tent camps are permitted for guided motorized recreational fishing through a competitive prospectus bid system. Commercial guide permits limit length of stay, the number of clients, and number of boats to ensure an uncrowded, remote fishing experience compatible with conserving the area's fishery resources. Largely because of limited access, use has remained relatively low, with only occasional visits by recreational anglers.

#### 3.5.6.7 Wilderness Lakes

Five permits are currently issued for fly-in recreational fishing at a number of lakes throughout the Togiak Wilderness Area. To maintain subsistence opportunities, high-quality recreational opportunities, wilderness values, and healthy wild fishery stocks, several stipulations are included as part of these wilderness-lake, guided sport fishing permits.

Many of these lakes are not used on a regular basis by guides often, only three or four times per year. Use of Kagati, Goodnews, Togiak, and Ongivinuk lakes is discussed in the Kanektok, Goodnews, and Togiak river sections of this chapter. Unguided use is also very sporadic.

### *3.5.6.8 Cape Peirce and Cape Newenham*

This area encompasses the former Cape Newenham National Wildlife Refuge, which was established prior to ANILCA. The area was included as part of the Togiak Refuge under ANILCA and includes the majority of lands currently proposed for addition to the National Wilderness Preservation System, as described in the 1985 Togiak Refuge Plan. Cape Peirce has historically served as a walrus haulout and also provides opportunities for viewing a variety of other wildlife. Cape Newenham is a spectacular basalt promontory on a coastline comprised of 1000-foot volcanic cliffs.

Because many of the marine mammals, seabirds, and other wildlife found in this unique area are very sensitive to human disturbance, public use is managed to minimize that disturbance and to maintain the area's primitive natural character. The southeastern portion of this area has been identified as a "wildlife viewing area." The 1991 PUMP recommends that visitation within the viewing area be limited to no more than six people at one time through a first-come, first-served permit system in place from May 1 to November 30. At those times when either Pacific walrus are hauled out at Maggy Beach or seals are hauled out on sandbars in Nanvak Bay, boat and aircraft landings are limited. Instead, aircraft would be permitted to land just outside the wildlife-viewing area at Sangor Lake or at the far northern end of Nanvak Bay. There are also a number of conditions as part of special-use permits that minimize other potential wildlife-viewing disturbances. Regulations to enforce the permit program have not been promulgated, although an informal permit program was in place for several years. At the current time, no permits are required to enter the Wildlife Viewing Area.

Frequent inclement weather can make flying to or from Cape Peirce more difficult than at most other locations within the Togiak Refuge. Visitor use in the area has remained well below maximum permit levels, although there is some evidence of increased demand since 2000 (Table 3-8).

Table 3-8. Visitor Use at Cape Peirce

Year	Number of Flights	Number of Guides	Number of Clients	Total Use-Days (Guides & Clients)
1991	3	0	11	49
1992	0	0	0	0
1993	1	0	3	15
1994	0	0	0	0
1995	1	0	4	4
1996	0	0	0	0
1997	3	0	6	12
1998	3	0	10	10
1999	1	0	5	5
2000	6	9	17	26
2001	15	24	60	108
2002	15	24	57	91
2003	19	30	60	90
2004	12	18	38	68
2005	5	7	20	27

### 3.5.7 Social Conditions and Visitor Experiences in Popular Fishing Areas

Impacts on social conditions within the Refuge may not directly threaten wildlife or habitats, but they remain a concern because they do threaten the nature and quality of visitor and resident subsistence-user experiences. Within the Togiak Wilderness Area, experiential dimensions, including solitude or a “primitive and unconfined type of recreation,” are protected by law; and throughout the entire Refuge, managers are compelled—at a minimum—to consider the safety of visitors and minimize conflict between user groups participating in appropriate activities.

The purpose of this section is to describe important characteristics of recreational visitors and the social conditions they encounter on the Refuge, as revealed by two principle studies. The first of these studies—a recreational angler survey conducted in 1995—was developed and conducted by a contractor with input and support from Togiak Refuge and the Alaska Department of Fish and Game (Whittaker 1996). The second study, conducted in 2001, was a replication of the 1995 effort, conducted to measure changes over time. Relevant results from these studies are summarized here and discussed in more detail in Appendix E.

### 3.5.7.1 Visitor Motivations and Expectations

As noted previously, the majority of Togiak Refuge recreational visitors participate in fishing on one of three main river systems: the Kanektok River, the Goodnews River, or the Togiak River. The vast majority (90 percent) of these anglers come from outside Alaska; they plan their trips months or even years in advance, and they place a high degree of importance on fishing in a natural, wilderness setting where they can view scenery and wildlife, and experience solitude. Most anglers surveyed in 1995 and 2001 indicated that they expected to find “primitive recreation” within the Togiak Wilderness, defined as a setting “where one can expect to find solitude and very few traces of previous use.” On average, surveyed anglers expected a more primitive setting than what they actually encountered on the Refuge (Appendix E).

Research commissioned by the Alaska Department of Fish and Game in 1997 suggests that many Togiak Refuge anglers might best be characterized as “technique-setting specialists” (Rohmberg 1999). According to this research, technique-setting specialists consider aesthetic conditions, including scenery and solitude, to be the most important factors when choosing a fishing location, and they tend to support limits on the number of anglers who can participate in some fisheries in order to maintain quality fishing opportunities. Consistent with this general characterization, the majority of Togiak anglers support limits on the number of unguided float trip starts within the Togiak Wilderness; levels of support, however, vary between different subgroups of anglers.

### 3.5.7.2 User Tolerances and Conditions of Concern

Within the broadly uniform Togiak Refuge angler population, it is possible to identify three distinct subgroups based on fishing style and closer analysis of specific motivations and expectations. *Guided float anglers* tend to place the highest importance on solitude and natural setting conditions and tend to be the least tolerant of impacts to those conditions. *Guided motorized anglers* tend to place the least importance on setting conditions and tend to be the most tolerant of impacts. *Unguided (float) anglers* usually fall between these two groups.

Among the various factors that could impact visitor experiences, Togiak Refuge anglers identified litter, human waste, and competition for fishing sites and campsites as the things that would have the greatest negative influence on their trips. Togiak Refuge anglers have especially low tolerances for litter and human waste. Despite improvements over time, these items continue to negatively impact their experiences. In 2001, about 55 percent of surveyed anglers indicated that they saw as much

or more litter and human waste as they could tolerate before their experiences were diminished. While anglers on the Refuge's three main river systems frequently travel, fish, and camp near one another, outright competition for fishing and camping sites affects a somewhat smaller proportion of Refuge anglers. About 40 percent of them indicated that the number of fishing sites they had to pass up was at or above their tolerance level and about 25 percent responded similarly with respect to passing up campsites.

In addition to litter, human waste, and competition impacts, survey responses suggest that inter-group encounters on the lower stretches of the Goodnews and Kanektok Rivers may warrant concern. While boat traffic in these areas is not directly managed by Togiak Refuge, visitors who begin their trips within the Refuge Wilderness do contribute to crowding on the lower rivers. About one-third of Goodnews anglers surveyed in 2001 indicated that their experiences were diminished by the number of motorboat groups they encountered on the lower river, and 24 percent indicated that they saw too many float groups as well. Similarly, 41 percent of Kanektok anglers indicated that they encountered too many motorized groups on the lower river, and 28 percent reported seeing too many float groups.

## 3.6 Special Area Designations and Resource Value

### 3.6.1 Wilderness Values

Section 304(g) of ANILCA requires the Service to identify and describe the special values of the Refuge, including wilderness values. The term "values" is often viewed synonymously with a range of similar terms, from subjective beliefs and preferences (e.g., family values) to more objective functions, services, and benefits (e.g., ecological values). Of interest here are the objective kinds of values, specifically those that are related to the condition and character of the natural environment.

The 1964 Wilderness Act recognized wilderness as a resource in and of itself and also established a mechanism for preserving that resource in a national system of lands. The definition of wilderness found in the Act provides a framework for identifying and describing wilderness values. According to the Act, the fundamental qualities of wilderness are: *undeveloped, untrammeled, natural, and outstanding opportunities for*

*solitude, or a primitive and unconfined type of recreation.* In addition, The Act states that wilderness “may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.”

***Undeveloped.*** This is the most immediately observable and easily measured wilderness quality. Undeveloped simply means free from roads, structures, and other evidence of modern human presence or occupation. The undeveloped quality strongly influences other core wilderness values, in particular experiential opportunities for solitude and primitive recreation. A lone structure may have only minimal impacts on natural processes while still serving as a constant reminder of human influence for recreational visitors. Certain kinds of structures or improvements may be considered desirable in a given wilderness setting (e.g., trails) or acceptable according to specific legislation, but that does not diminish their negative impact on the undeveloped quality.

***Untrammeled.*** The Wilderness Act states that wilderness is “an area where the earth and its community of life are untrammeled by man.” In other words, wilderness is essentially uncontrolled or unrestricted by purposeful human actions. Synonyms for untrammeled include unhindered, unencumbered, free-willed, and wild (Landres, et al. 2005). The untrammeled quality of the wilderness resource is diminished when ecological events or processes are constrained or redirected to suit modern human ends (e.g., by suppressing naturally ignited fires or introducing non-native plants or animals).

***Natural.*** Naturalness is a measure of the overall composition, structure, and function of native species and ecological processes in an area. In contrast to untrammeled-ness, the natural condition of an area may sometimes be enhanced through purposeful human action (e.g., to restore an eroded stream bank or eradicate an invasive weed).

***Outstanding Opportunities for Solitude.*** Solitude in the wilderness context is generally understood to mean freedom from sights, sounds, and other evidence of modern man (Landres, et al. 2005). While the relative amount of freedom from these things necessary to *experience* solitude is highly personal and variable, the Wilderness Act states only that outstanding *opportunities* for solitude be provided. Accordingly, encountering other people, hearing mechanized sounds (from aircraft overflights, for example), or seeing the lights of a distant population center are all examples of things which may negatively impact solitude opportunities; while remoteness, low visitor density, and vegetative or topographic screening are things that may enhance solitude opportunities.

***Outstanding Opportunities for a Primitive and Unconfined Type of Recreation.*** Primitive and unconfined recreation is nonmotorized, nonmechanized activity that occurs in an undeveloped setting and is relatively free from social or managerial controls. Primitive recreation is also characterized by experiential dimensions such as challenge, risk, and self-reliance. Dispersed use patterns, which frequently occur where there are no facilities to concentrate use, enhance opportunities for self-reliance and also enhance opportunities for solitude. Conversely, some actions aimed at maintaining opportunities for solitude, such as restricting visitor access or behaviors, may negatively impact opportunities for unconfined experiences.

***Other Special Features.*** Lands that exhibit the core wilderness values described previously may also contain additional special features with scientific, educational, scenic, or historic value. While the Wilderness Act makes it clear that these features are not wilderness qualities in and of themselves, their presence may distinguish one area with wilderness values from another. In the context of Alaska refuges, special features might include such things as active volcanoes, unique abundance or concentrations of a given species, fossil deposits, or evidence of prehistoric cultures.

As directed by Sections 304(g) and 1317 of ANILCA, all Refuge lands were reviewed during the first Refuge planning process in the early 1980s “as to their suitability or nonsuitability for preservation as wilderness.” Several recommendations for designating refuge lands as Wilderness were evaluated in the Final Comprehensive Conservation Plan and Environmental Impact Statement. The Record of Decision for the final plan included a recommendation that an additional 334,000 acres of the Togiak Refuge be designated as part of the National Wilderness Preservation System.

Refuge lands are either currently designated as wilderness or fall within the boundaries of the wilderness review units identified during the 1980s review. Those same boundaries are used here to facilitate description of the wilderness values found within Togiak Refuge. In general, all eight areas are largely undeveloped, untrammled, and natural; and they provide abundant opportunities for solitude and primitive recreation. Therefore, only distinguishing or extraordinary features are described.

#### ***3.6.1.1 Togiak Wilderness Area***

The 2.37 million acre Togiak Wilderness is the second largest Wilderness area in the National Wildlife Refuge System. It consists of all Refuge lands in the Kanektok, Kwethluk, Eek, and Togiak river watersheds; nearly all refuge lands within the

Goodnews River watershed; and the headwaters of the Arolik River. By law, this area exhibits all of the core wilderness values. In addition, it has special value due to its long, unbroken history of indigenous human use. Evidence suggests people have hunted, trapped, fished, and participated in other subsistence activities within what is now the Togiak Wilderness Area for 9,000 thousand or more years (Dumond 1987). The long and continuing relationship between local people and the land was one of the primary reasons for the creation of the Togiak Wilderness Area (U.S. Congress 1978).

#### *3.6.1.2 Oyak Creek-Arolik River Area*

This area encompasses 151,468 acres in the northwestern corner of the Refuge, and consists of three separate tracts. Two tracts are on either side of the Arolik River and are separated by Native conveyed private lands. The third tract lies north of the Kanektok River.

*Undeveloped and Natural*—These tracts are undeveloped and provide important habitat for various fish, waterfowl, furbearers, and large mammals such as bear, moose, and caribou.

*Opportunities for Solitude or a Primitive and Unconfined Type of Recreation*—During the summer, access to lands within these units is difficult due to the lack of aircraft landing sites and the distance of Jacksmith Bay from Quinhagak. Winter access is somewhat easier by snow machine. The difficulty of access to these lands provides exceptional opportunities for solitude for visitors who do manage to get there.

#### *3.6.1.3 South Fork of the Goodnews River Watershed*

Along with the currently designated wilderness portion of the Goodnews River, the South Fork's 92,000 acre area is one of the three primary watersheds within the Refuge.

*Undeveloped and Natural*—This watershed supports Pacific salmon, Arctic char, Arctic grayling, Dolly Varden, rainbow trout, and lake trout. It also provides important habitat for raptors such as the goshawk, rough-legged hawk, bald eagle, gyrfalcon and peregrine falcon. Brown bear, beaver, caribou and moose also are found in this drainage. The only development in this unit is a small temporary summer camp.

*Opportunities for a Primitive and Unconfined Type of Recreation*—Upper portions of the Middle Fork Goodnews River provide one of the best combinations of accessibility and opportunities for wilderness angling within the Togiak Refuge. One commercial operator is permitted to use a small temporary summer camp along the Middle Fork Goodnews River which is

accessible by float plane or motorboat. Commercial motorized use is limited to maintain opportunities for solitude.

#### 3.6.1.4 Cape Peirce/Cape Newenham Area

This area of coastal headlands is approximately 242,000 acres in size.

*Undeveloped and Natural*—The Cape Peirce/Cape Newenham area provides some of the most important mainland nesting, staging and haulout habitat on the North American continent for a number of waterfowl, marine mammals, seabirds, and shorebirds. A variety of fish and terrestrial wildlife species are also found. These wildlife species depend on the unique, undisturbed habitat in this area.

*Other Special Features*—This area also has an especially long history as a traditional hunting and fishing place for Native Alaskans. Local traditions, oral history, and archaeological sites provide evidence of the area’s cultural and historical significance.

#### 3.6.1.5 Osviak/Matogak Rivers Area

The lowland tundra, alpine tundra, and coastline of this southern part of the Refuge cover approximately 296,000 acres.

*Other Special Features*—Historically, this area contained several villages and was very important for local residents. Today, there are no year-round residents, but people from the community of Togiak continue to visit for subsistence activities. With the exception of a few small cabins, private lands remain primarily undeveloped. This coastal area of Togiak Refuge is used very little by people for recreation but remains a historically and culturally important area.

#### 3.6.1.6 Hagemeister Island

This 73,890-acre island lies in Togiak Bay less than five miles from the Togiak Refuge.

*Natural*—The island provides important nesting habitat for seabirds, haulout areas for marine mammals; it is also home to many smaller mammals and landbirds. Hagemeister Island is one of the few parts of Alaska Maritime Refuge that supports runs of chum salmon and Dolly Varden.

*Untrammelled*—In the past, a herd of domesticated reindeer were grazed on the island. The reindeer were removed in 1993, and the vegetation is recovering from overgrazing.

#### 3.6.1.7 Kulukak Bay

The Kulukak Bay area encompasses approximately 438,000 acres of the Togiak Refuge between the Nushagak Peninsula

and the Togiak River on the Bristol Bay coastline. Except for a short period during the commercial herring fishing season, this area receives relatively little use.

#### ***3.6.1.8 Nushagak Peninsula***

This coastal lowland area encompasses approximately 521,000 acres in the southeast corner of the Refuge.

*Natural*—The Nushagak Peninsula is important calving and grazing habitat for the Nushagak Peninsula caribou herd. Because of numerous tundra ponds, lakes, and other wetland habitats, the Nushagak Peninsula supports large numbers of migrating waterfowl. This area supports some of the highest nesting densities of sandhill cranes in Alaska (Pogson and Cooper 1983).

*Opportunities for a Primitive and Unconfined Type of Recreation*—The Nushagak Peninsula is visited primarily by subsistence users. A number of large ponds, lakes, and sand beaches make this area easily accessible by plane for much of the year. During winters with adequate snow cover, access is also possible by snow machine.

#### ***Existing Wilderness Recommendation***

Several recommendations for designating refuge lands as Wilderness were evaluated in the final Conservation Plan and Environmental Impact Statements for Togiak and Alaska Maritime refuges. (USFWS 1985; USFWS 1988). The record of decision for the final plan included a recommendation that approximately 334,000 acres of the Togiak Refuge be designated as part of the National Wilderness Preservation System. This recommendation includes the Cape Peirce/ Cape Newenham Unit and the Goodnews River Unit, which would include the remaining portions of the South and Middle forks of the Goodnews River currently not within the Wilderness Area (see Figure 3-16).

### **3.6.2 River Values**

Rivers are among the most important features of the Refuge environment: they both influence and reveal the Refuge's topography. In the rugged Refuge landscape, rivers serve as important transportation corridors for people and wildlife. They provide essential spawning and rearing habitat for resident and anadromous fish, which in turn support wildlife concentrations. Collectively, these resources have long supported human subsistence users, and they also attract modern recreational visitors.

Table 3-9. Rivers possessing outstanding values

River Segment	Segment Length (miles)	Outstanding Values
Kanektok River	90	Fish, wildlife, recreation, cultural importance
Arolik River	40	Fish, wildlife, scenic, recreation
Goodnews River	47	Fish, wildlife, recreation, cultural importance
Trail Creek	27	Fish, wildlife, scenic, geology/topography, recreation
Ongivinuck River	16	Fish, wildlife, scenic, recreation
Narogurum River (Kemuk River)	28	Fish, wildlife, geology/topography, scenic, recreation
Togiak River	30	Fish, wildlife, recreation, cultural importance

Based on the general attributes described previously—topography and geology, fish and wildlife populations, recreation opportunities, and cultural importance—seven river segments have been identified as exceptional examples of Togiak Refuge rivers. The outstanding values of these rivers are described in the following text. The river segments are depicted in Figure 3-17. Table 3-9 presents the rivers, their length, and the values identified for each river.

#### 3.6.2.1 *Kanektok River*

The Kanektok River starts at Kagati Lake in the north central portion of the Refuge, where it flows through a glacial valley surrounded by mountains and continues 90 miles through a wide open tundra coastal plain and into Kuskokwim Bay. It is a shallow low gradient system with several braided channels in the lower half.

*Fish and Wildlife Populations*—Five species of Alaska native Pacific salmon, rainbow trout, Dolly Varden, Arctic char, Arctic grayling, northern pike, sheefish, and round whitefish all live in this river. Burbot and lake trout are found in Kagati Lake. Several wildlife species such as brown bear, caribou, peregrine falcon, harlequin duck, and beaver live in the river corridor.

*Recreation Opportunities*—Since the 1970s, the Kanektok River has become an increasingly popular recreational fishing destination. Today, the Kanektok has a world renowned

reputation for its diversity of salmon, large trout, and spectacular scenery. The Kanektok River flows from Kagati Lake, which makes aircraft access possible for many float anglers and sport hunters. Motorboat access is also possible from the mouth of the river near the village of Quinhagak. Several commercial operators provide lodge and guide services along the Kanektok River. This mixture of transportation types, services, and activities creates a diversity of recreational opportunities along the Kanektok River from late May through September.

*Cultural History*—The Kanektok River has been and continues to be vitally important to the subsistence lifestyle of area residents. At Kagati Lake, where the Kanektok River begins, evidence has been found that indicates this river basin has been used continuously for approximately 9,000 years (Dumond 1987.) Today, subsistence use continues as people hunt, fish, trap, pick berries, and gather firewood along the Kanektok River. The village of Quinhagak at the mouth of the river is the largest population center in the area. Residents of Quinhagak use motorboats on the river to access subsistence fishing, hunting, and berry picking areas. A number of small cabins, fish racks, and set net sites scattered along the Kanektok River are evidence of its continuing role in rural Alaskan and Yupik Eskimo culture.

#### **3.6.2.2 *Arolik River***

The Arolik River flows approximately 40 miles from Arolik Lake through part of the Togiak Wilderness Area and on to Kuskokwim Bay.

*Topography and Geology*—The Arolik River begins at Arolik Lake, a remote glacially formed lake wedged between two high ridges. Downstream, the stream is extremely shallow with a bed of coarse gravel and small cobble. It flows through a high plateau area of tundra with alder and willows along its banks. Below the confluence of East Fork and South Fork Arolik rivers, its volume nearly doubles but remains a narrow shallow stream of large gravel and cobble. After passing through Arolik Gap, the river enters the coastal plain and gradually turns into a slow meandering stream with sharp cutbanks on either side. Approximately 10 miles from Kuskokwim Bay, the river divides into its North and South mouths.

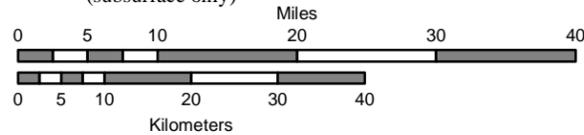
Figure 3-16.  
**Wilderness Values  
 Description Units**



**Togiak National Wildlife Refuge**

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Yukon Delta Refuge
- Description Units

- |  |                                   |
|--|-----------------------------------|
| <b>Private</b>                                     | <b>Other Public Land Managers</b> |
| Native Private Fee                                 | Other Federal                     |
| Native Private Selected                            | State Patent or TA                |
| Other Private                                      |                                   |
| Regional Corporation Selected<br>(subsurface only) |                                   |



Universal Transverse Mercator Projection - Zone 4. 1927 North American Datum.

The Togiak Refuge management area is comprised of Togiak NWR and Hagemester Island (Alaska Maritime NWR). Land status within Togiak refuge boundary represents USFWS interpretation of BLM records, and is current to 8/2006. Land status outside Togiak refuge boundary is section level data provided by the BLM. Small parcels may not be visible at this scale.

14-0057

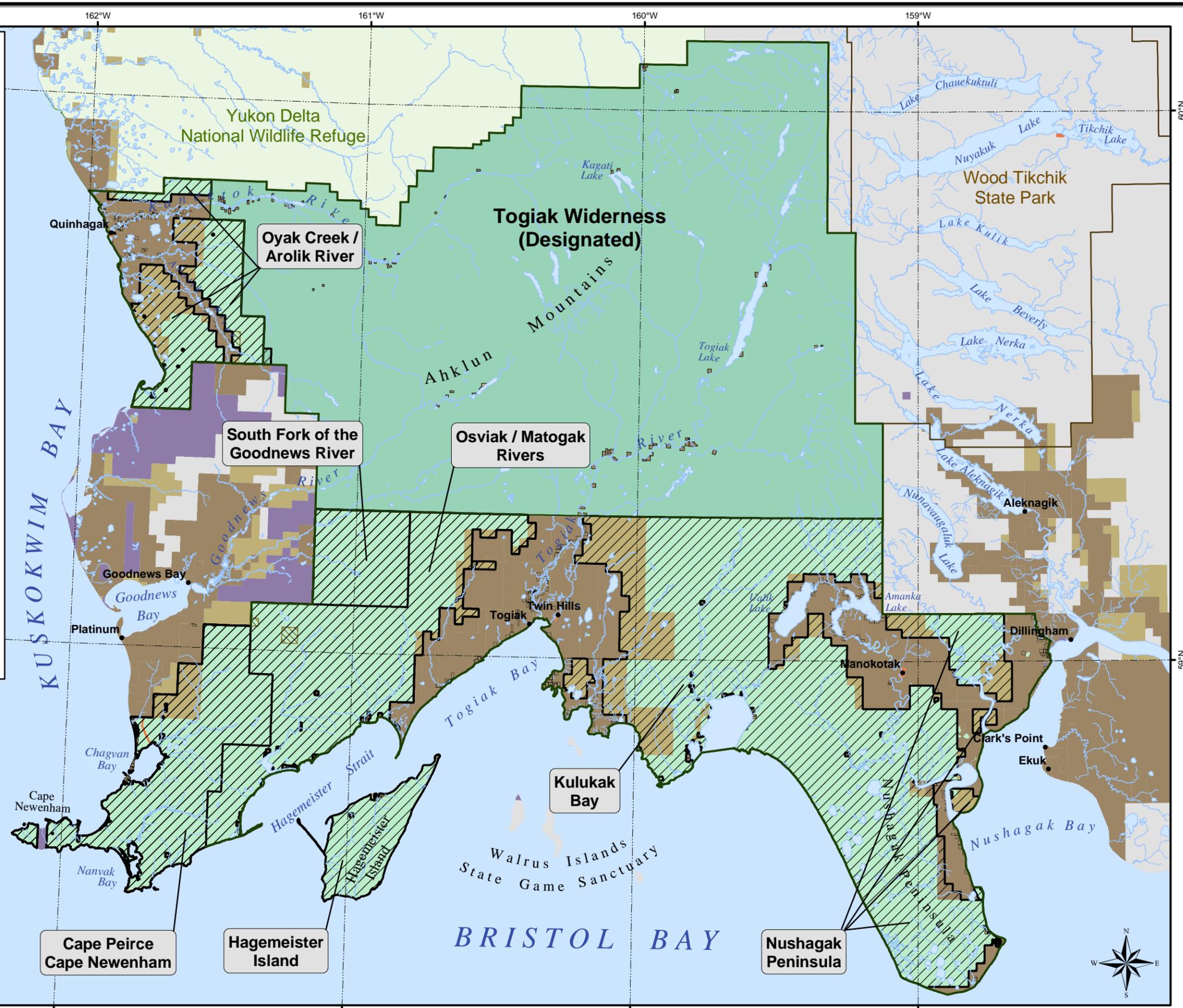




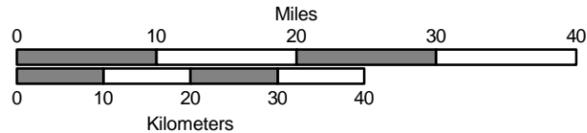
Figure 3-17.  
**River Values**



**Togiak National Wildlife Refuge**

- Togiak Refuge - Minimal Management
- Togiak Refuge - Designated Wilderness
- Other refuge lands
- Exceptional Rivers

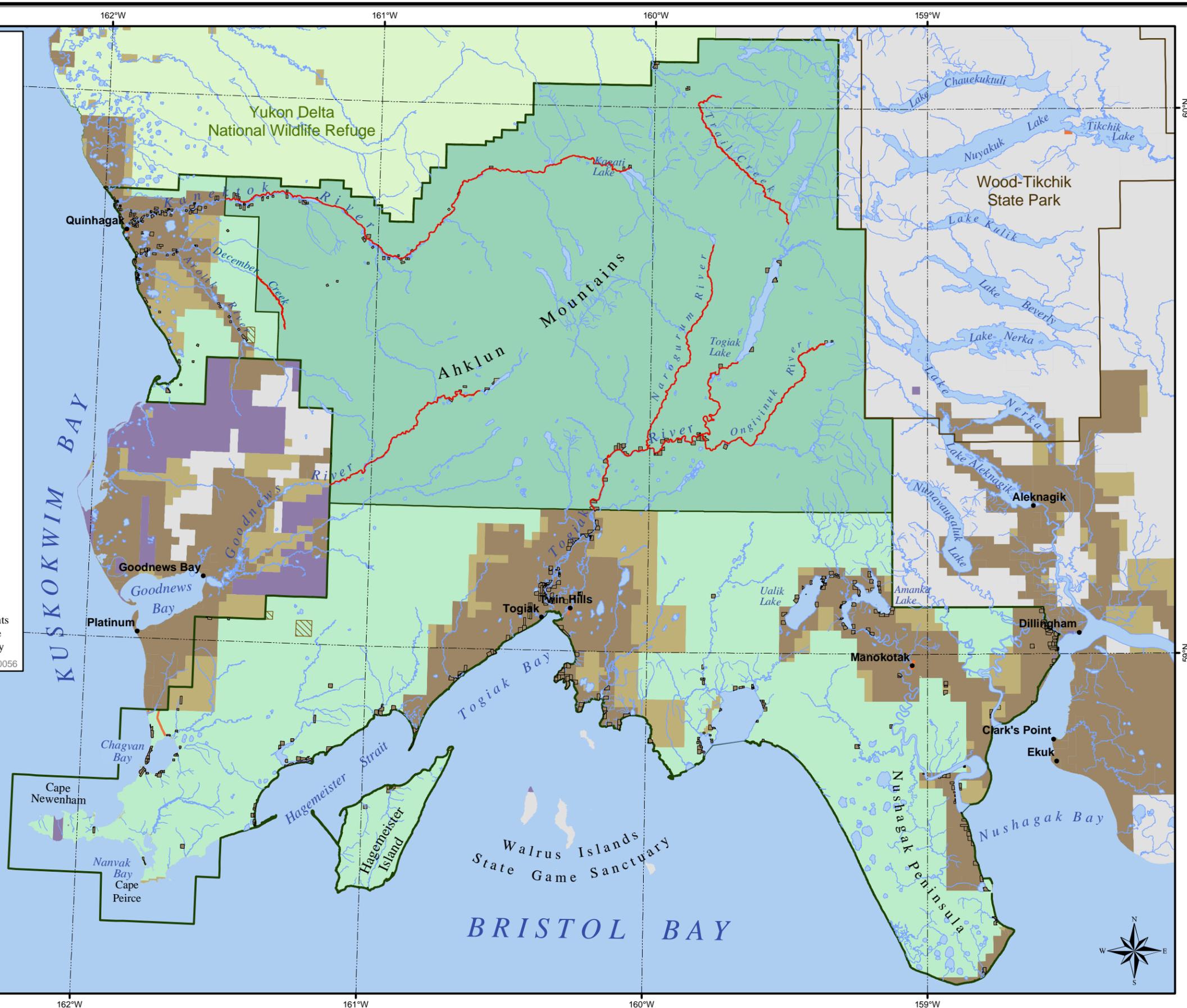
- | Private |  | Other Public Land Managers |                    |
|---------|--|----------------------------|--------------------|
|         | Native Private Fee                                 |                            | Other Federal      |
|         | Native Private Selected                            |                            | State Patent or TA |
|         | Other Private                                      |                            |                    |
|         | Regional Corporation Selected<br>(subsurface only) |                            |                    |



Universal Transverse Mercator Projection - Zone 4. 1927 North American Datum.

The Togiak Refuge management area is comprised of Togiak NWR and Hagemeister Island (Alaska Maritime NWR). Land status within Togiak refuge boundary represents USFWS interpretation of BLM records, and is current to 8/2006. Land status outside Togiak refuge boundary is section level data provided by the BLM. Small parcels may not be visible at this scale.

14-0056





*Fish and Wildlife Populations*—The Arolik supports populations of Arctic grayling, rainbow trout, whitefish, lake trout, Arctic char, and Pacific salmon. A variety of wildlife are found along the Arolik. Most species found along the river are small mammals, furbearers, and birds. Brown bear, moose, and caribou occasionally use the area seasonally.

*Recreation Opportunities*—Unlike other rivers used by anglers in the region, the Arolik receives little use or fishing pressure. Available areas for camping on public lands are severely limited. All camping on Native Corporation land is restricted by a permit system. The number of permits issued by Qanirtuuq Inc. is very low. Due to this very low amount of use, the Arolik River provides some of the best opportunities for extreme solitude, self-reliance, and quality fishing found anywhere in America. This combination of recreational and wilderness values is found on few other rivers in the region.

### 3.6.2.3 *Goodnews River*

The Goodnews River lies between the two other larger drainages, the Kanektok and Togiak rivers, and flows approximately 47 miles from its headwaters at Goodnews Lake to Goodnews Bay.

*Fish and Wildlife Populations*—The Goodnews River supports Pacific salmon, Dolly Varden, rainbow trout, lake trout, Arctic char, Arctic grayling, and whitefish. Wildlife such as brown bear, caribou, raptors, waterfowl, landbirds, beaver, otter, mink, and fox are also found along the river.

*Recreation opportunities.* In many ways, recreational opportunities are similar to those found on the Kanektok River but on a smaller scale. Opportunities are characterized by a more remote setting with less evidence of and contact with other people.

*Cultural history.* The human population in the Goodnews drainage is less than that in Kanektok or Togiak drainages, but like those areas, this area has a long history of subsistence use by rural residents and Yupik Eskimos. While the lower 22 miles of this river are most heavily used for subsistence, the upper portion is important for fishing, hunting, trapping, berry picking, and other subsistence activities.

### 3.6.2.4 *Trail Creek*

Trail Creek is approximately 27 miles in length and flows from its headwaters in the Ahklun Mountains to the Izavieknik River, which then flows into Togiak Lake

*Topography and Geology*—Trail Creek differs from most other rivers in southwest Alaska and is characterized by its steep narrow canyon with high cliffs on either side (up to 150 feet). It has a steep gradient with deep pools, followed by long riffles and small rapids. Particle size ranges from coarse sand to large boulders. There are very few gravel bars. Beyond the river canyon are the tall peaks of the Ahklun Mountains. These features combine to create scenery not found along any other rivers in the Refuge or the region.

*Fish and Wildlife Populations*—Trail Creek provides outstanding habitat for nesting raptors such as gyrfalcons, northern harriers, merlins, rough-legged hawks, sharp-shinned hawks, peregrine falcons, and bald eagles. The habitat that this river provides for harlequin ducks can be found on few other rivers in the region. In addition to wildlife such as caribou, moose, brown bear, fox, wolf, beaver, lynx, otter, and mink found along this and other rivers within Togiak Refuge, black bear have also been sighted along Trail Creek. Because black bear have not been documented in other parts of the Refuge, this is a unique wildlife value in the region. Fish species including chinook, sockeye, chum salmon, Dolly Varden, rainbow trout, Arctic grayling, and Arctic char are also found in this river.

*Recreation Opportunities*—Some use does exist along Trail creek, but it is mostly confined to the lower reach, which can be accessed by jet boat at higher water levels. For the adventurous and determined visitor, Trail Creek offers some of the most remote and challenging recreational opportunities within Togiak Refuge. A remote rugged tundra landing strip located almost two miles from Trail Creek is the closest access.

#### ***3.6.2.5 Ongivinuck River***

The Ongivinuck River flows from the outlet of Ongivinuk Lake 30 miles to its confluence with the Togiak River.

*Topography and Geology*—A single main channel with occasional deep holes and gravel bars characterizes this river. Particle size ranges from sand to large cobble and small boulders. Much of the bank is undercut on the outside bends of the river, with gravel bars along the inside bends. The river is surrounded by towering mountains and rolling foothills. Cottonwood, willow and alder line the banks. There are several gravel bars and deep holes along the river. This type of scenery is found on few other rivers in the region.

*Fish and Wildlife Populations*—Pacific salmon, rainbow trout, Arctic grayling, Dolly Varden, Arctic char, and round whitefish are found in this drainage. Wildlife such as brown bear, caribou,

moose, porcupine, weasel, ptarmigan, raptors, waterfowl, landbirds, and beaver all live along the river.

*Recreation Opportunities*—The use of motorboats is practical along the lower reaches, and anglers use float planes, rafts and motorboats to access the river. Recreational use is typically from anglers flying to Ongivinuk Lake and floating this tributary of the Togiak River. Recreational opportunities are characterized by this river's isolation and scenery, which provide a rewarding experience for self-reliant anglers of all experience levels.

#### ***3.6.2.6 Naragurum (Kemuk) River***

The Kemuk is one of the five major tributaries of the Togiak River and flows approximately 28 miles from its source at Nenevok Lake to its confluence with the Togiak River.

*Topography and Geology*—A steep narrow canyon with several sections of rock cliff and several gravel bars characterize this river. It has a relatively steep gradient, and particle size ranges from coarse sand to large boulders. The river varies from 40 to 80 feet in width but generally is narrow. Willow, alder, and cottonwood trees grow along the banks.

*Fish and Wildlife Populations*—Pacific salmon, rainbow trout, Arctic char, Dolly Varden, and Arctic grayling are found in this river. Wildlife species include moose, brown bear, caribou, fox, porcupine, beaver, wolf, and various raptors.

*Recreation Opportunities*—Only the lower few miles are accessible by jet boat; the rest is accessible only by floating from Nenevok Lake. This river offers opportunities for a challenging recreational experience characterized by remoteness and solitude.

#### ***3.6.2.7 Togiak River***

This segment of the Togiak River flows approximately 30 miles from the outlet of Togiak Lake to the Togiak Wilderness boundary near the confluence of Pungokepuk Creek.

*Topography and Geology*—There are five major tributaries to the Togiak. They are the Gechiak, Pungokepuk, Nayorurun (Kashiak), Kemuk (Narogurum), and the Ongivinuck. A single main channel in the Wilderness Area with occasional small islands, deep holes, and gravel bars characterize the river. Particle size ranges from sand to large cobble and medium size boulders. Much of the bank is undercut on the outside bends of the river with gravel bars along the inside bends.

*Fish and Wildlife Populations*—Pacific salmon, rainbow trout, Arctic grayling, Dolly Varden, Arctic char, northern pike, and round whitefish are found in this drainage. Wildlife such as brown bear, caribou, moose, porcupine, weasel, ptarmigan, raptors, and beaver all live along the river.

*Recreation Opportunities*—Both guided and unguided anglers use floatplanes and motorboats to access the river. Unlike other rivers within the Togiak Refuge, the Togiak River is wide enough and deep enough for float planes and most types of motorboats. The large gravel bars along the river provide a number of suitable campsites for float anglers as well. This combination of access and transportation provides a diversity of recreational opportunities in an undeveloped and remote setting.

*Cultural History*—The Togiak River (Elliot 1887) historically was home to one of the largest populations of Yupik Eskimos in southwest Alaska. Today, residents live near the mouth of this river in the communities of Togiak and Twin Hills. People use motorboats to access traditional hunting and fishing site areas, cabins, and other areas up to and beyond Togiak Lake. Several small cabins, fish racks, and other associated structures are built on private property along the river.

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