



Chapter 2

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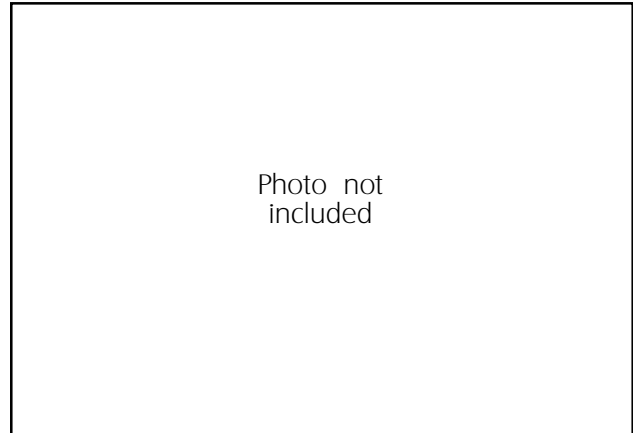
CHAPTER 2

BACKGROUND INFORMATION

1.0 Introduction

The Kenai River, its tributaries, and the hydraulically connected wetlands are complex ecological and hydrological systems resilient to external pressures to some unknown degree. However, individual impacts together can cause cumulative impacts that will harm the system and jeopardize its continued health. It is important to understand the attributes of this system, the factors that may be affecting its continued integrity, and the degree to which the system has been harmed by external influences.

This chapter provides background information on the most important attributes of this system. Included are descriptions of the seven principal river segments, information on the amount and distribution of fish and wildlife resources, upland and water recreation activities, and the results of the ADF&G '309' Cumulative Impact Study. This study identified critical habitat locations for the rearing period of the Chinook salmon, identified by ADF&G as an indicator species for the Kenai River.



2.0 Natural Conditions

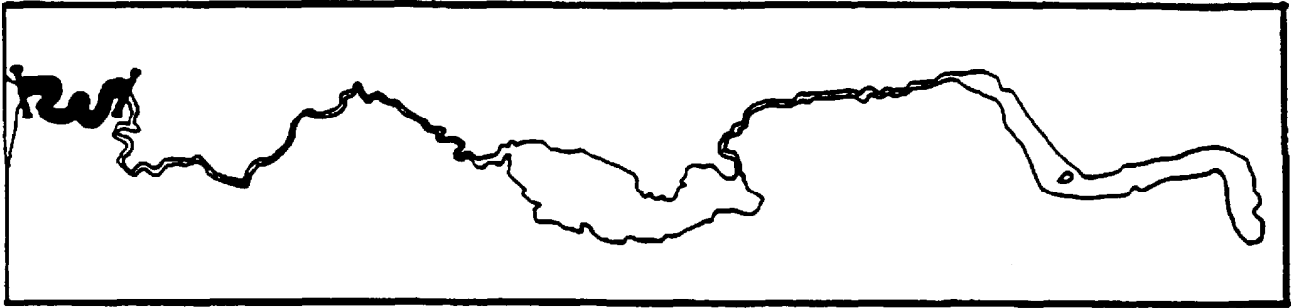
The Kenai River drains more than 2,000 square miles of diverse landscape, including glaciers, icefields, large lakes, high mountains and extensive lowlands. From headwaters in the Kenai Mountains, numerous tributary rivers - including the Snow and Trail rivers - flow into Kenai Lake. From the western end of Kenai Lake at Cooper Landing, the upper Kenai River flows 18 miles before emptying into Skilak Lake. From the lake's outlet, the lower Kenai River flows 50 miles before emptying into Cook Inlet.

The Kenai River is an "underfit" river. This means that the river is flowing at lower levels than the river system is capable of holding. The reduced water levels are due to glacial retreat and changing climatic conditions. Because of the lower flows, portions of the river bed have become "armored" with coarse gravel and rocks that do not migrate in the lower water velocities. These armored sections provide an especially stable, or "entrenched," river bed, and also provide valuable habitat.

2.1. Description of River Reaches within River Segments

For purposes of this plan, the river is divided into three major segments: Lower River, Middle River, Upper River/Kenai Lake. Each segment is divided into reaches. Map 2-1 depicts the segments. The term, "RM", refers to the number of river miles from the mouth of the Kenai River.

LOWER RIVER; REACH 1: COOK INLET TO EAGLE ROCK (RM 0 - RM 11.4)



This reach of the Kenai River is tidally influenced, with estuarine conditions extending to approximately River Mile (RM) 9. These lower nine miles are meandering, with the channel free to migrate. The erosion potential of this reach is considered moderate. The reach between RM 9 and RM 11.5 is sinuous, and is highly prone to erosion, especially near the mouth of Beaver Creek.

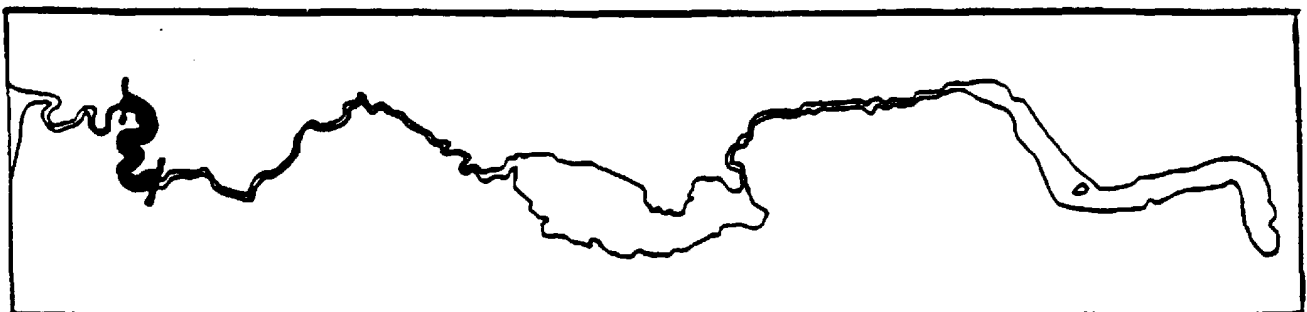
The tidal marshes and associated wetlands adjacent to the river in this reach are extensive and biologically productive. They provide a major migration and resting area for many waterfowl and other waterbirds.

The boundary of KRSMA begins at approximately RM 4.3 of the Kenai River and extends upriver. Included in KRSMA are parcels of riverbank land at RM 5, RM 8, and RM 11. Most of the riverbank in this reach is publicly owned (City of Kenai and State of Alaska).

The upper part of this reach of the River (Cunningham Park to Eagle Rock) has one of the highest concentrations of sport fishermen during the king, red, and silver salmon seasons.

The Bridge Access Road and accompanying Warren Ames Bridge are principal means of access between the City of Kenai and the Sterling Highway, and provide access for bird and wildlife viewing and photography, and by dipnetters and bank fishermen accessing the fishing areas adjacent to the Warren Ames Bridge.

LOWER RIVER; REACH 2: EAGLE ROCK TO SOLDOTNA BRIDGE (RM 11.4 - RM 21)

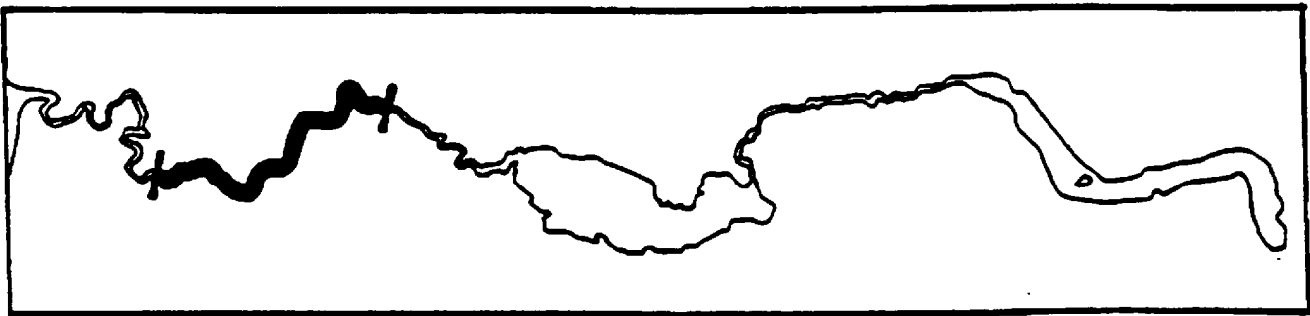


This reach of the Kenai River is tidally influenced to approximately RM 12. The lower portion of this reach is sinuous, slightly underfit, and highly prone to natural erosion; the upper portion of this reach is meandering, entrenched, and underfit. This reach provides valuable spawning and rearing habitat for all species of salmon, especially for a significant portion of the second run of king, sockeye, and pink salmon. It should be noted that naturally eroding banks contribute to the biological template of a river, removing material from one area and depositing it in another, sustaining gravel bars, island maintenance, etc. However, the natural propensity to erode is accelerated by human activities (boat wakes, bank trampling).

A large proportion of land in this reach is privately owned. Land uses along this reach range from intensive private recreation development to private residences to undeveloped units of the Alaska State Park System. Private campgrounds, recreational vehicle campgrounds and second homes are especially numerous between Big Eddy Hole and Poachers Cove. Erosion is actively taking place on a number of riverbanks, and is being accelerated by bank trampling and boat wakes. The Division of Parks and Outdoor Recreation manages some parcels of state land in this reach.

Of all the king, pink, and silver salmon taken in the Kenai River, most are generally caught in this reach. Bank fishing is popular in several locations, and boat fishing is generally heavy throughout the entire section with the exception of an area from about RM 20 to the Soldotna Bridge (RM 21), where boat fishing is closed during the king salmon season.

MIDDLE RIVER; REACH 3: SOLDOTNA BRIDGE TO NAPTOWNE RAPIDS (RM 21- RM 36.5)



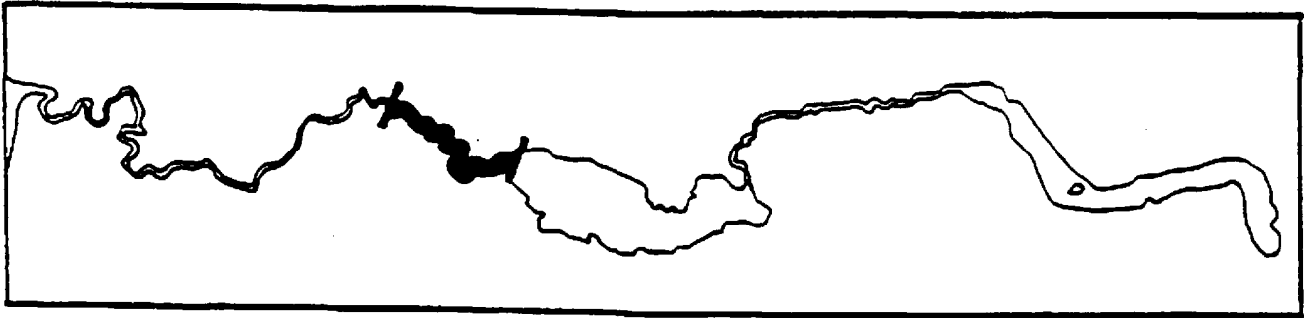
This reach is entrenched within the Soldotna terrace in a highly confined floodplain. The erosion potential for this section of the River has been classified as low.

The lands adjacent to this reach are primarily in private ownership. Presently, the largest landowner is the Salamatof Native Corporation, which owns the shoreline and uplands between RM 25 to 28 south to the Funny River Road (Moose Range Meadows). The corporation has subdivided portions of its holdings. Some of the Native lands along this reach are subject to land exchange negotiations with the US Fish and Wildlife Service, or are being considered for purchase with Exxon/Valdez Oil Spill settlement funds.

From the Soldotna Bridge to approximately RM 22.5, commercial, industrial, and residential uses abut the river, and much of the riverbank here has been cleared of vegetation to the high water mark. On the south bank of this segment, residential development has accelerated. The Alaska Department of Transportation and Public Facilities is evaluating the feasibility of a public bridge to Funny River Road. The construction of the bridge is likely to lead to increased residential and recreational home development on the south side of the Kenai River.

Fishing effort between the Soldotna Bridge and Moose River accounts for about 18% of all fishing effort in the Kenai River drainage. There are many popular bank fishing locations throughout this segment, especially along the 25' public access easement along Salamatof lands. Boat fishing is moderate throughout the entire section. DOPOR operates three facilities (all providing overnight camping, bank fishing, and sanitary facilities) within this river reach.

MIDDLE RIVER; REACH 4: NAPTOWNE RAPIDS TO SKILAK LAKE (RM 36.5 - RM 50)



In the lower portion of this reach (downstream from River Mile 39.4), the channel is entrenched, partly armored, and has undergone rates of bank erosion that are very low to undetectable. From RM 39.4 to RM 45.7 bank erosion rates are more typical of glacial streams - as high as five feet per year. The outlet of Skilak Lake (RM 50.3 to RM 45.7), is highly stable because of the presence of large gravel dunes emplaced by a pre-1950 flood surge.

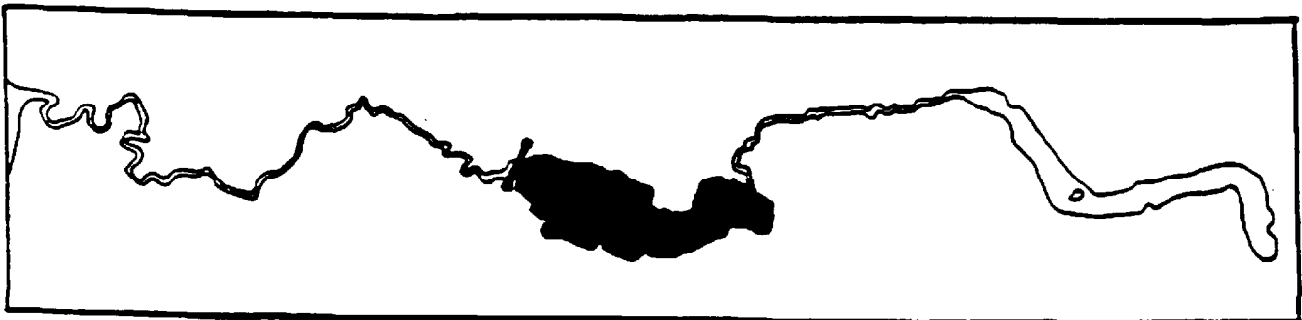
Since Skilak Lake serves as a sediment trap, most of the sediment occurring below the lake is a result of bank erosion and sediment transport from the Killey River drainage, this reach's major tributary. Extensive wetlands are found contiguous to the mainstream Kenai River in this segment, particularly between RM 45 to RM 50. In addition, extensive wetlands are associated with the tributaries and in upland areas adjacent to this stretch.

Most of the land in this reach below RM 45 is privately owned. The river from RM 45 to Skilak Lake is within the Kenai National Wildlife Refuge. The Kenai Native Association selected lands adjacent to the river from approximately RM 45.5 to RM 47.5. These lands must be managed in accordance with refuge laws and regulations. These lands are also subject to land exchange negotiations with the US Fish and Wildlife Service.

This reach of the river and its tributaries contain important habitats for spawning and rearing salmon. Most of the late run Kenai River sockeye salmon spawn above the Moose River in the mainstem and tributaries. The Killey River supports nearly 50% of the early run kings in the Kenai drainage. Other important salmon spawning areas occur from RM 45 to 50 and just below Skilak Lake, where kings, silvers, reds, and rainbow trout spawn.

Several species are targeted by recreational anglers in this reach, including king, coho and sockeye salmon, rainbow trout and Dolly Varden. DOPOR currently manages two parks in this reach: Bing's Landing (developed facilities) and Kenai Keys (undeveloped).

UPPER RIVER; REACH 5: SKILAK LAKE



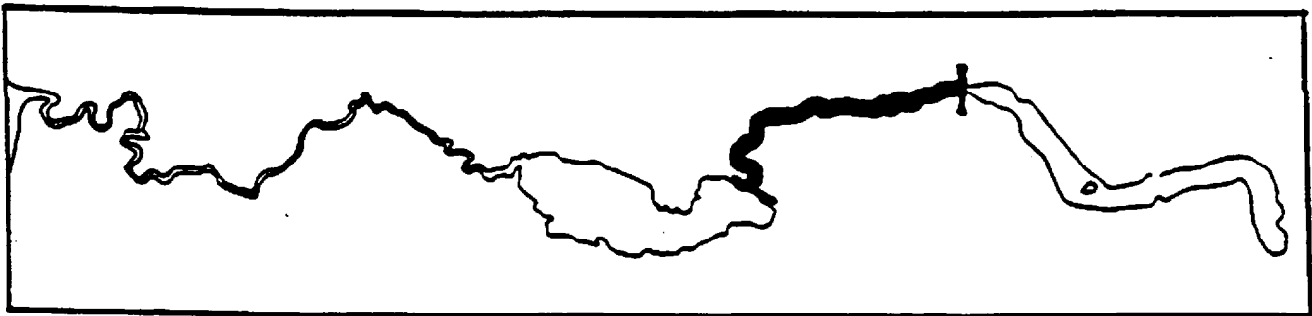
Located at the mid-point of the Kenai River is 25,000-acre Skilak Lake. Most of the water feeding the lake comes from the upper Kenai River and Skilak River. Both rivers are silt laden from glacial runoff. The cold water and limited level of light penetration reduce biological productivity of the lake. How-

ever, high oxygen content and relatively constant water temperatures create an essential part of the cycles of wintering and spawning resident fish populations, and of many waterbirds. Skilak Lake is a major sockeye salmon rearing area.

Skilak Lake and lands surrounding Skilak Lake are managed by the Kenai National Wildlife Refuge. All lands south of the lake are also designated as Wilderness by Congress. There are two small private inholdings on the south shore of Skilak Lake. Caribou Island, in the southcentral portion of the lake, is also privately owned and is currently subdivided into approximately 200 lots.

Skilak Lake supports a moderate amount of boat traffic for fishing, hunting, hiking, and access to private lands. Two campgrounds, Upper and Lower Skilak campgrounds, are located on the north shore and are accessible by automobile. Fishing is the most popular recreational activity on Skilak Lake. The heaviest fishing pressure occurs at the outlet of Skilak Lake and at the junction of the lake with Hidden Creek and the upper Kenai River.

UPPER RIVER; REACH 6: SKILAK LAKE TO KENAI LAKE



The gradient of the Kenai River changes more rapidly in this reach than in any other segment, especially in the Kenai River Canyon. Due to the mountainous topography, the floodplain and wetland areas of the upper Kenai River are not as extensive as in other parts of the watershed. However, because of their limited nature, they are extremely important for moose and other wildlife habitat, for nutrient exchange with the river, and as flood water passages during the floods that occur three to four times per decade. The river segment from Russian River to Skilak Lake is among the most pristine, scenic, and wild portions of the Kenai River.

Other than the private lands at Cooper Landing, most of the land along this segment is public. With the exception of some state and municipal lands at Cooper Landing, the majority of public lands above RM 73.6 are within the Chugach National Forest. The public lands and waters adjacent to KRSMA below RM 73.6 are within the Kenai National Wildlife Refuge.

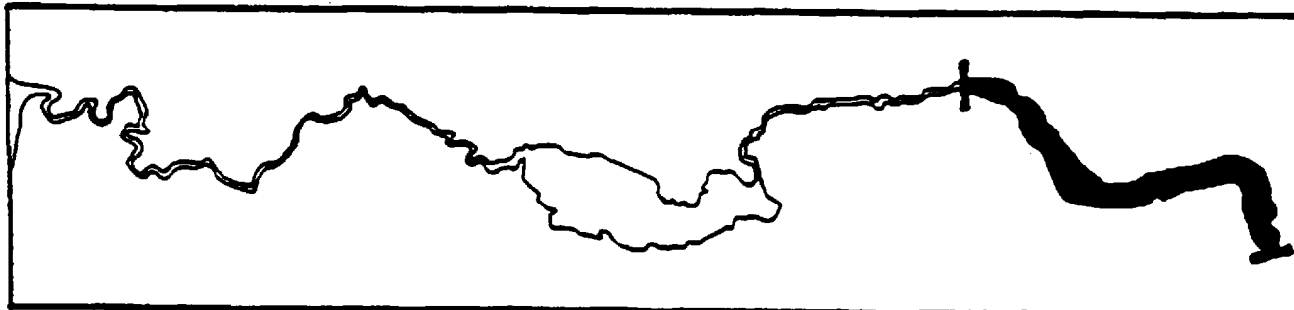
This reach, along with its tributaries, provides important spawning and rearing habitat for king, silver, and sockeye salmon, and resident species (such as rainbow trout and Dolly Varden). King and silver salmon use this reach and the Russian River for spawning and rearing. Early and late runs of sockeye salmon use the mainstem of the Kenai, the Russian River, and other lesser tributaries. The Upper and Lower Russian lakes also provide important spawning and rearing habitat for sockeye salmon. The two lakes and the Upper Russian River have significant concentrations of rainbow trout.

This reach is often ice-free and provides important habitat for wildlife during the winter. Approximately 200 bald eagles overwinter and feed along the river between October and April.

The Russian River, which enters this reach of the River, is the most heavily fished tributary in the Kenai River drainage. The Sterling Highway parallels this stretch of the River for the majority of the reach, allowing easy access for bank fishermen. Popular bank fishing areas occur at several locations in this segment. Boat fishing for this section is increasing, especially for sightseeing.

Access points and campgrounds along the River include Cooper Creek and Russian River campgrounds managed by the USFS; and the Russian River Parking Area, Jim's Landing, Kenai River, and Hidden Creek trails managed by US FWS.

UPPER RIVER; REACH 7: KENAI LAKE



Kenai Lake is a large, glacially-fed lake of approximately 14,500 acres located at the headwaters of the Kenai River. The lake elevation is 436 feet and it is 22 miles in length. The shoreline of Kenai Lake is fairly uniform, with very few inlets or irregularities. Adjacent topography is characterized by steep fjord-like mountains, dropping sharply four to five thousand feet to the lake. Most of the shoreline is undeveloped, with the greatest beach development occurring at the inlets of the Snow River and Quartz Creek, and near the lake outlet into the Kenai River at River Mile (RM) 82.

Most of the land adjacent to Kenai Lake is within Chugach National Forest. There is some state and municipal land at the western portion of the lake, and some state land around the outlet of Trail River. There is some private land at the western end of the lake and along the southern and eastern shore.

Kenai Lake is used by resident species, such as rainbow trout and Dolly Varden and sockeye salmon for one to two years as a rearing area. Sockeye salmon also use Upper Trail Lake for rearing, and all tributaries of Kenai Lake for spawning. King salmon use Quartz Creek for spawning and rearing, and Kenai Lake for rearing. Silver salmon use Quartz Creek, Trail River, and Snow River for spawning and rearing, and Kenai Lake for rearing.

Sport fishing on Kenai Lake takes place both from banks and from boats. The outlets of clear-water tributaries are popular bank fishing areas; boat fishing on Kenai Lake is light.

There are three U.S. Forest Service campgrounds located on Kenai Lake, and three small boat-accessible-only picnic areas at Porcupine Island, Ship Creek, and Meadow Creek.

2.2. Fish and Wildlife

This section describes fish and wildlife habitat, fish resources, and wildlife resources of the Kenai River watershed.

Fish and Wildlife Habitat

Overview Perpetuating Kenai River fish and wildlife resources depends on the maintenance of habitats which directly or indirectly support these species. Habitat requirements for salmon and trout are very complex, changing both with season and life stage. Growth, survival, and reproductive success are limited by the interplay of factors including water velocity and depth, water temperature and chemistry, nutrient and sunlight input, instream vegetation, and overhanging bankside cover.

Four habitat types are important to protecting the fish and wildlife resources of the Kenai River and its tributaries. These types are riparian ecosystems, contiguous wetlands, those habitat types encompassed by the 100-year floodplain, and tidal marshes. These types have been identified as critical to the maintenance of the Kenai River as a dynamic entity; the value of these is based on readily observed natural functions. These functions are described in the following sections.

Riparian Ecosystems Riparian ecosystems include stream bank and flood plain areas, and are defined for this report as the vegetation portion of the streamside habitat. The importance of riparian (stream bank) vegetation to fish and wildlife values cannot be overestimated. Riparian vegetation maintained in a healthy condition should be recognized as a valuable natural resource and a legitimate land use. The following are several of the more important attributes of riparian vegetation:

- ❖ River bankside vegetation is important to the well-being of salmon and trout because, along with undercut banks and streamside debris, it provides fish with protective cover. Research has shown that within the Kenai River drainage there is a strong association of king and coho salmon with stream bank areas in summer months.
- ❖ Streamside vegetation is a source of debris which is a primary food of aquatic invertebrates, and habitat for terrestrial insects and other invertebrates. In turn, these insects and invertebrates are an important component of the diet of young salmon and resident species such as Dolly Varden and rainbow trout.
- ❖ Due to its structural diversity and complexity, riparian vegetation can support greater numbers and diversity of terrestrial wildlife populations than other habitats.
- ❖ Riparian vegetation protects the riverbank and adjacent bottomlands from erosion, and damage by ice, log debris, or trampling.
- ❖ Riparian vegetation removes pollutants from run-off or groundwater biologically with micro-organisms or plants; physically by filtration, absorption, or deposition; and chemically by oxidation or other reactions.
- ❖ Riparian vegetation functions as a buffer mechanism in protecting areas from flood damage by slowing runoff action and adding stability to the soil banks.
- ❖ The riparian zone acts as an area for groundwater recharge, which helps recharge streams during periods of low precipitation.
- ❖ Riparian areas provide essential feeding and migration corridors for moose and brown bears, and feeding and nesting areas for eagles and waterfowl.

Contiguous Wetlands Wetlands are those areas which are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Typical plant communities in wetlands include species such as black spruce, sedges, grasses, low and tall shrubs, willows, labrador tea, and mosses. Contiguous wetlands are those wetlands which are immediately adjacent to the river, tributaries, and lakes and are hydrologically connected to these waterbodies. These wetlands perform the following general functions:

- ❖ Wetlands adjacent and connected to the Kenai River serve, at least seasonally, as rearing areas for young coho salmon.
- ❖ In addition to serving as valuable salmon habitat, wetlands naturally regulate water flow and quality by acting as discharge areas for groundwater and natural retention areas for floodwaters.
- ❖ Wetlands provide the basis for aquatic food chains by producing enriched detritus.
- ❖ Wetlands provide spawning, rearing, nesting, feeding, and resting habitat for aquatic and terrestrial species.
- ❖ Wetlands establish drainage characteristics, sedimentation and current patterns, salinity gradients (in estuarine areas), and flushing characteristics of upland and lowland water flows.
- ❖ Wetlands shield adjacent areas from storm and flood waters.
- ❖ Wetlands act as ground water recharge/discharge and water holding areas when surface and ground water are directly interconnected.

- ❖ Wetlands provide natural water filtration processes for water purification (e.g., act as sediment accretion sites that reduce nutrient and sediment loads and increase oxygen content of waters which pass through them).

It should be noted that these functions are not restricted to contiguous wetlands, but apply to slope wetlands that may not be immediately adjacent to the river. The latter may, in fact, play an even greater role in performing these functions than the contiguous wetlands.

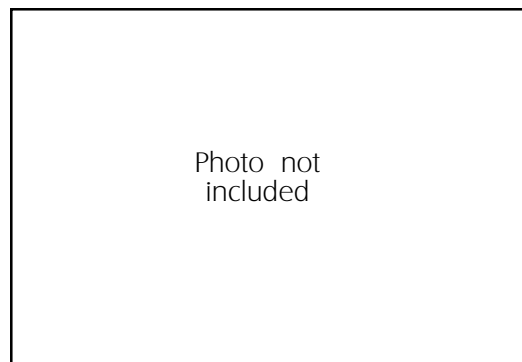
Habitats within the 100-year Floodplain The 100-year floodplain is the area subject to a one percent or greater chance of flooding within any given year. Habitats within the 100-year floodplain may contain riparian ecosystems, contiguous wetlands, and/or upland and forest communities. Undeveloped areas within the 100-year floodplain are critical for at least two reasons:

- ❖ Habitats within the 100-year floodplain carry out all the natural functions listed in the preceding two sections, such as recharging groundwater, providing the basis for food chains, filtering pollutants; and
- ❖ Habitats within the 100-year floodplain help dissipate flood flows and protect from storm and flood waters.

Unaltered habitats within the 100-year floodplain are not only critical for the life functions of Kenai River fishes, but serve to buffer structures from flood damage. Encroachment on floodplains, such as fill, reduces the flood carrying capacity and increases flood heights in areas beyond the encroachment itself. Therefore, it is important to maintain these areas in natural vegetation to absorb flood waters and buffer adjacent development.

Tidal Marshes Tidal marshes in the Kenai River Delta are particularly valuable. In addition to the general functions listed above, these wetlands display certain characteristics which make them both unique, and especially productive, biologically.

Tidal marshes are classified as either estuarine or freshwater depending upon the presence or absence of ocean-derived salts. The Kenai River Flats contain both estuarine and freshwater tidal wetlands.



The high biological productivity of tidal marshes is a result of the physical and biological processes which characterize these areas. Nutrient-rich estuarine waters periodically bathe these intertidal areas. In addition, dissolved organic nutrients and detrital materials enter these wetlands from inflowing river water. These influences continually fertilize the wetland, resulting in high plant productivity. Plant detritus and invertebrates produced on the Flats are in turn carried back into the river by retreating tide and floodwaters. This high productivity makes this habitat type especially valuable to fish and wildlife resources.

The Kenai Flats tidal marshes are particularly valuable to moose, caribou, waterfowl, and other wildlife resources because in addition to their high plant productivity, these wetlands are among the first suitable habitat to become ice-free in Cook Inlet. Consequently, the Kenai River Flats are a major migration and resting area for many waterfowl and other waterbirds, including red-throated loons, swans, Canada geese, white-fronted geese, snow geese, mallards, pintails, widgeons, other puddle ducks, sandhill cranes, gulls, and arctic terns.

In addition, the Kenai River Flats also serve as important calving and summer range for the Kenai lowland caribou herd.

Snow River Alluvial Flats These alluvial Flats are a complex of several wetland types intermixed with willow/alder riparian vegetation. The high biological productivity of alluvial Flats is a result of both the diversity of the area, and frequent flooding. The Flats thus are characterized by the general functions

listed for contiguous wetlands. In addition, the frequent flooding results in the introduction of nutrients. Just as in the tidal marshes, the fertilizing effect of the nutrient input results in high biological productivity.

Equally important is the complex intermixing of different habitat types (habitat diversity) which characterize alluvial flats. Habitat diversity and edge effect result in high wildlife population level, and numbers of species.

The alluvial Flats immediately adjacent to Kenai Lake provide nesting habitat for mew gulls and Arctic terns. Waterfowl also utilize this area. Waterfowl which have been observed here include mallards, pintails, green-winged teal, American widgeon, shovellers, and common mergansers.

Bald eagles congregate on the mudflats and gravel bars of the Snow River in September through November to pick up salmon carcasses deposited on the shoreline as the water recedes in the fall. The alluvial Flats are also considered an important moose wintering area.

Similar habitat values are found in the Skilak River alluvial Flats.

Fish Resources

Overview The Kenai River supports 34 fish species representing 16 taxonomic families. Thirty species are native to the Kenai River and four are exotic species, which have been introduced. Twelve species are residents of the river, 11 are anadromous and 11 are found in the lower area of the river and associated with the marine or brackish water environment.

Salmon species include Chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), and pink salmon (*O. gorbuscha*). These species are the most important to humans in terms of consumptive use. Pink salmon occur predominantly during years ending in even numbers, but small numbers are also present during odd numbered years. Chum salmon (*O. keta*) are present, but are rarely observed in the Kenai River. All five species of Pacific salmon are anadromous. They migrate from the ocean to freshwater streams to spawn. Salmon die after spawning and the carcasses provide nutrients which increase the productivity of the system.

Other salmonids that occur in the Kenai River drainage include rainbow trout (*O. mykiss*), Dolly Varden (*S. malma*), lake trout (*Salvelinus namaycush*), arctic grayling (*Thymallus arcticus*) round whitefish (*Prosopium cylindraceum*) and Bering cisco (*Coregonus laurettae*). Rainbow trout inhabit all areas of the Kenai River and as far as is known all are resident of the drainage. Anadromous rainbow trout (steelhead) are not known to occur in the Kenai River. Dolly Varden are also found throughout the river. Observations suggest that both resident and anadromous Dolly Varden are present. However, research has not been conducted to confirm this observation. Lake trout reside in Skilak, Kenai, Hidden, and the Trail lakes and are known to seasonably frequent the outlets of these lakes. Arctic grayling were first introduced to Crescent Lake in the 1950's. They have now become established in the upper Kenai River drainage where they are occasionally caught by anglers. Bering cisco (*Coregonus laurettae*) inhabit the lower reaches of the river commonly referred to as the "delta". Other species found in the "delta" area are Pacific herring (*Clupea harengus pallasii*), longfin smelt (*Spirinchus thaleichthys*), Pacific cod (*Gadus macrocephalus*), Pacific tomcod (*Microgadus proximus*), walleye pollock (*Theragra chalcogramma*), Pacific sandfish (*Trichodon trichodon*), slender eelblenny (*Lumpenus fabricii*), rock greenling (*Hexagrammos lagocephalus*), Pacific staghorn sculpin (*Leptocottus armatus*), sturgeon poacher (*Agonus acipenserinus*), snailfish (*Liparis* spp.), and starry flounder (*Platichthys stellatus*).

Eulachon (*Thaleichthys pacificus*) and longfin smelt are both anadromous species. Eulachon return to the Kenai River in spring; longfin smelt in the fall.

The Pacific (*Lampetra tridentata*) and arctic lamprey (*L. japonica*) inhabit the main-stem Kenai River and have been observed in the Moose River. The longnose sucker (*Catostomus*) inhabits numerous lakes in the drainage. The coastrange sculpin (*Cottus aleuticus*), slimy sculpin (*Cottus cognatus*), threespine stickleback (*Gasterosteus aculeatus*) and ninespine stickleback (*Pungitius*) are widely distributed throughout the drainage.

In addition to arctic grayling, Alaska blackfish (*Dallia pectoralis*), northern pike (*Esox lucius*) and burbot (*Lota lota*) inhabit the Kenai River drainage. Blackfish were first identified from samples taken

from fresh water ponds in the delta area but in their natural range are more commonly found in lakes. Northern pike were introduced in the Soldotna Creek drainage in the mid-1970s. These fish have used the Kenai River as a migratory corridor and are now known to inhabit the Moose River drainage. Burbot are believed to have been first introduced into Juneau Lake. They entered the Kenai River via Juneau Creek and have been documented as being caught by anglers in Skilak Lake.

Spawning and Rearing Distribution Chinook salmon exhibit two distinct spawning runs in the Kenai River drainage. An early run (May through late June) spawns primarily in tributaries while a late run (late June through August) spawns primarily in the main stem. The entire main stem below Kenai Lake is used by late run chinook salmon for spawning except for the area from about Eagle Rock (RM 11.25) to the mouth. Highest use areas are between RM 10-21 and RM 40-50. The Killey and Funny rivers are the primary tributaries utilized by the early run. Other tributaries used by early run Chinook salmon for spawning include Beaver Creek, Slikok Creek, Moose River, Russian River, Juneau Creek, Quartz Creek, Grant Creek, and Ptarmigan Creek. Rearing Chinook salmon may be found seasonally distributed throughout the entire main stem of the Kenai River. They have also been found in the lower reaches of several tributaries not documented as spawning streams, and in Skilak and Kenai lakes. Juveniles typically rear in the Kenai River and large tributaries for just over one year.

The majority of Chinook juveniles in the main stem Kenai River rear within about six feet of undisturbed riverbanks where natural bank indentations provide cover. The most heavily used sections of the Kenai River by juveniles (RM 10 to 21 and RM 40 to 50) are the same areas used by late-run adults for spawning. These two areas contain a lower gradient, more river meanders, and a greater number of vegetated islands than does, for example, the fairly straight and swifter section from the Soldotna Bridge to Naptowne (RM 21 to 40). In the two meandering sections of the river, adults often spawn near the upstream tips of vegetated islands, where loose, clean gravels accumulate. Because the two sections of the main stem from RM 10 to 21 and RM 40 to 50 are heavily used by both rearing juveniles and adult spawners, they are viewed as key areas for the continued productivity of Chinook salmon in the Kenai River.

Coho salmon also exhibit two distinct spawning runs in the Kenai River. Early run fish arrive in late July while late run coho enter after the first week in September. It is believed, but not yet documented, that early run fish spawn primarily in tributaries; late run fish primarily in the main stem. Main stem spawning has been documented between RM 40-50 and RM 70-82. Tributary spawning is more widespread than with Chinook salmon and generally extends further upstream. Tributary streams used by spawning coho salmon include Beaver Creek, Slikok Creek, Soldotna Creek, Funny River, Moose River, Killey River, Hidden Lake Outlet, Jean Lake Outlet, Russian River, Juneau Creek, Quartz Creek, Grant Creek, Ptarmigan Creek, and Snow River. The distribution of rearing coho salmon is the most widespread of any salmonid species in the Kenai River drainage. The coho rearing strategy of upstream movements within tributaries used by spawners and into tributaries not documented as spawning streams and not used by other salmon species suggests potential rearing throughout the entire drainage where suitable habitat exists, and where there are no barriers to upstream migration. Of particular note is the Moose River, an important overwinter rearing area, which produces an estimated 20% of the total Kenai River smolt. Those fish which rear in the Moose River have been documented as the progeny of fish which spawned in Russian River, Tern Lake tributaries and the outlet of Skilak Lake.

Sockeye salmon spawning is most often associated with streams having lakes within their drainages that are used for juvenile rearing. Spawning has been documented in lake outlets and inlets as well as within the lakes themselves. Skilak, Kenai, and Russian lakes are associated with the largest sockeye spawning runs. Spawning also occurs in Hidden and Jean lakes and streams entering Trail and Tern lakes. A small sub-stock also utilizes the Moose River drainage. Juvenile sockeye typically rear in lakes for up to two years. Skilak Lake is the major rearing lake with over 70% of the river's rearing sockeye found here. Kenai Lake and the lower Kenai River also provide known summer rearing habitat for sockeye salmon. Speculatively, sockeye rearing in the river may result from the dispersal of fry produced directly downstream from Skilak Lake and/or from suspected spawning in the lower River.

Pink salmon exhibit strong spawning runs in the Kenai River drainage during even numbered years. Spawning has been documented throughout most of the main stem below Skilak Lake as well as the

lower reaches of Slikok Creek, Funny River, Killey River, Russian River, and Ptarmigan Creek. Adult pink salmon have also been observed in the Moose River, Quartz Creek, and Trail River drainages. No juvenile rearing occurs in the drainage because pink salmon fry emigrate to saltwater as soon as they emerge from spawning gravel.

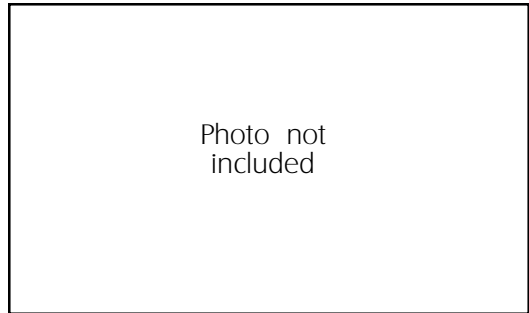
Rainbow trout occur throughout the Kenai River drainage. Reproducing populations occur in the drainages of Beaver Creek, Soldotna Creek, Moose River, Russian River, and streams tributary to Kenai and Trail lakes. The Upper Kenai River supports a major segment of the drainage's population. The Kenai and Russian rivers are believed to be the primary rainbow trout spawning areas in the Kenai River drainage, spawning is also known to occur in the main stem Kenai River between Skilak and Kenai lakes, and at the outlet of Skilak Lake.

Dolly Varden occur throughout the drainage. These char spawn in the fall as opposed to trout which spawn in spring. Current research is being conducted to determine spawning areas. Preliminary results indicate over-wintering in Kenai and Skilak Lakes. However, given the universal distribution of adults in the drainage, it is reasonable to assume that spawning and rearing occurs in both the main stem Kenai River and its tributaries.

Life history knowledge of the remaining species is limited to generalized observation. Pacific and arctic lamprey have been observed in the main stem Kenai River. Pacific lamprey have been observed in spring apparently spawning in the Moose River. Lake trout spawn and rear in Skilak, Kenai, Hidden and Trail lakes. Arctic grayling are known to spawn at the outlet of Crescent Lake and presumably in upper Kenai River tributaries. Eulachon are believed to be main stem spring spawners with longfin smelt entering the river and spawning in the fall. Northern pike are known to spawn in the Soldotna Creek drainage. The longnose sucker spawns in small tributaries and rears in the drainage's lakes, as do the threespine and ninespine stickleback. Round whitefish are found throughout the main stem Kenai and its major lakes with spawning occurring in fall. The coastrange and slimy sculpin presumably spawn and rear in the main stem. The remaining species are associated with the delta area. There is no specific information relative to these species' life history in the Kenai River.

It is very important for readers to understand that in all areas of the Kenai River and its tributaries and all habitat types are critical to the rearing of juvenile salmon (not just Chinook) and other species. These habitat types are linked to form an ecosystem which supports 34 fish species. These species utilize different habitat types depending on the season, the species of fish and the stage of the fish's life cycle. Maintenance of all habitat types is therefore central to the continued health of all fish species inhabiting the Kenai River.

Sport Fishery The Kenai River supports Alaska's largest freshwater sport fishery. The Chinook salmon fishery is world renowned because of the size of the fish harvested and is the largest fresh water sport fishery for this species in Alaska. Annual harvests from 1990-1994 ranged from 8,000-23,000. The coho and sockeye salmon sport fisheries are also the largest fresh water sport fisheries in Alaska for these species. Annual coho salmon harvest from 1990-1994 has ranged from 51,000-87,000. Annual sockeye salmon harvest for this same period in the main-stem Kenai River ranged from 94,000-242,000. The Russian River, a major Kenai River tributary, also supports one of Alaska's largest sockeye salmon fisheries. Harvest here from 1990-1994 has ranged from 57,000-97,000. Sockeye salmon also support a personal use dip net fishery. The fishery occurs in the lower five miles of river. Maximum harvest in the fishery has approximated 100,000 fish. Pink salmon support a relatively minor fishery on even years. Although this species is abundant and easily caught on even years, angler preference for Chinook, coho and sockeye salmon are reflected in the small harvest. Harvest in 1992 and 1994 was 10,000 and 9,000 respectively. The number of pink salmon caught and released is about five times greater than the actual harvest.



Rainbow trout and Dolly Varden are supporting an expanding fishery. In recent years, restrictive regulations and changing angler attitudes have fostered catch-and-release fishing for both species. The focal point of this fishery is in the Upper Kenai River between Skilak and Kenai Lakes. Both species are, however, caught and harvested throughout the Kenai River and its tributaries. Catch of trout in the Kenai River from 1990-1994 ranged from 23,000-62,000. Most trout are released and actual harvest during this same period ranged from 2,000-3,500 fish. The Dolly Varden harvest during this same period ranged from 12,000-14,000; catch ranged from 35,000-79,000.

Kenai River sport fisheries to a lesser degree provide recreational opportunity to harvest arctic grayling and northern pike. A personal use fishery in the spring in the lower Kenai River harvests eulachon.

In 1994, participation in Kenai River sport and personal use fisheries was estimated at 340,000 days fished by approximately 100,000 participants. This is approximately 13% of all participation expended in Alaska's sport fisheries.

Commercial Fishery The Kenai River is also a major producer of sockeye salmon for the Cook Inlet commercial fishery. From 1990 through 1994 sockeye salmon production from the Kenai River ranged from 1.8-8.0 million fish. The corresponding harvest range was 1.1 million-7.0 million fish. Lesser numbers of coho, pink and chinook salmon produced by the Kenai River also contribute to the commercial harvest.

Wildlife Resources

Overview Up to 200 species of birds and mammals, and one species of amphibian may live in the Kenai River basin. However, only those species dependent on the Kenai River corridor and its tributaries for food and/or cover are emphasized in the following discussion.

Bald Eagles Of the 12 species of raptors which seasonally use the Kenai River, the bald eagle is the species most dependent on the habitat resources of the River. The Kenai River supports the second largest concentration of over-wintering bald eagles in Alaska, surpassed only by the Chilkat Valley near Haines. At least 29 pairs of bald eagles nest in the Kenai River watershed. Currently, eleven nesting territories occur along the Kenai River itself: five in the Kenai National Wildlife Refuge, one in the Chugach National Forest, four within Chugach National Forest, one on state land and one on private land. The remaining 18 nesting territories occur outside the Kenai River corridor but within its drainage.

Additionally, bald eagles rely heavily on the River and its tributaries for feeding. The numerous salmon and other fish species provide a year-round food source. Shallow, swift flowing areas of the Kenai River (especially between RM 40 and 82) frequently remain ice-free during winter months allowing bald eagles to feed on spawned-out salmon. Bald eagle over-wintering areas are also located at the lower end of the Snow River.

Numbers of bald eagles over-wintering along the Kenai River gradually increase from October, peak in January (numbering 300 to 600 birds), and begin to decline in March. Up to 20 bald eagles per river mile have been observed below Skilak Lake. Tagging and telemetry studies suggest that bald eagles from as far away as Kodiak Island, the west side of Cook Inlet, Seward, and Homer may over-winter along the upper Kenai River. Ravens and magpies are commonly associated with over-wintering bald eagles, scavenging fish left behind by bald eagles.

Essential to the bald eagle life history on the Kenai River are the numerous mature cottonwood and spruce which line the Kenai River. These trees provide nesting habitat and perches from which bald eagles can hunt and roost. Without the aforementioned habitat features, there would be few, if any, bald eagles inhabiting the Kenai River corridor.

There are no laws concerning development near eagle nesting trees. Only the tree itself is protected. Guidelines concerning development at or around eagle nesting trees have been established by US FWS.

Waterfowl and Shorebirds Approximately 21 species of waterfowl seasonally use the Kenai River for staging, nesting, and/or feeding. Because the Kenai River reach between RM 40 and 82 is frequently ice free in the winter, this area provides valuable wintering habitat for goldeneyes and mergansers. Over 570 goldeneyes (51/river mile) and 150 mergansers (15/river mile) have been counted in the winter along the 10-mile section of the Kenai River below Skilak Lake.

The Kenai River Flats provides habitat which is used heavily by a variety of waterfowl, seabirds, and shorebirds. The Flats are especially important to northward migrating snow geese. Snow geese are protected by international treaty and virtually the entire population of Wrangell Island (Siberia) snow geese pass through the Kenai River Flats each spring, usually between mid-April and May 1. Up to 6,500 snow geese per day rest and feed for a 3- to 10-day period, building fat reserves crucial to their migration to Wrangell Island. Taverner's Canada geese, cackling Canada geese and white-fronted geese bound for the Yukon-Kuskokwim River Delta often remain longer than the snow geese. Black brandt and emperor geese have been observed on the Flats but rarely. Some swans rest and feed on the Flats during the spring migration. The most abundant migratory ducks utilizing the Kenai River Flats include northern pintail, mallard, green-winged teal, northern shoveler, and American widgeon. Other migrating duck species which commonly utilize the Kenai River Flats include bufflehead, common goldeneye, and common and red-breasted merganser. Less commonly observed migrating waterfowl on the Kenai River Flats include gadwall, harlequin duck, canvasback, Barrow's goldeneye, eurasian widgeon and teal, scoters and scaups. Nesting waterfowl include Taverner's Canada geese, mallard, pintail and green-winged teal. Sandhill crane arrive as the geese depart and hundreds have been observed on the Kenai River Flats during the spring and fall migrations. Most of these birds are migratory but some remain to nest on the Flats. Shorebirds nesting on the Kenai River Flats and wetlands upstream of the Flats include semi-palmated plover, greater and lesser yellowlegs, least sandpiper, short-billed dowitcher, red-necked phalarope and spotted sandpiper. Migratory shorebirds include pectoral sandpiper, western sandpiper, Hudsonian godwit, black-bellied plover, whimbrel, dunlin, common snipe and Pacific and American golden plover. Common snipe are most abundant in the fall and thousands of pectoral sandpipers have been observed on the Flats during fall migration. Rare shorebird migrants include sharp-tailed and solitary sandpipers, and surfbirds. Predatory birds dependant upon the ducks and geese include the peregrine falcon and northern harrier. Large colonies of herring and mew gulls are present on the Flats and some glaucous-winged and Bonapart's gulls also nest there. Nesting of parasitic jaegers has been documented. In all, over one hundred species of birds have been documented on the Kenai River Flats.

Trumpeter Swans Trumpeter swans rely on specific areas within the Kenai River Basin. In the past several years, 20 to 70 adult trumpeter swans, perhaps representing the majority of the trumpeter swans nesting on the entire Kenai Peninsula, stage on the lower Moose River prior to territory establishment (March through April), and fall migration (October). Banding and telemetry studies indicate that many Kenai Peninsula nesting trumpeter swans utilize the lower Moose River for feeding. Due to recent management efforts trumpeter swans are once again using the outlet of Skilak Lake throughout the year, especially during spring staging.

Seabirds Seabirds are found throughout the entire Kenai River Basin. However, the greatest amount of use is concentrated along the Kenai River corridor. Small rock islands in Skilak Lake and the outlet of Snow River provide the only known nesting areas for seabirds within the River corridor (except the gull colonies on the Kenai River Flats). An unusual glaucous winged/herring gull hybrid colony and a double-crested cormorant colony both occur on Skilak Lake islands. Surveys indicate at least 470 pairs of gulls and two to six pairs of cormorants nest on the islands. During the late summer and early fall, gulls and cormorants feed on spawned-out salmon along the entire length of the Kenai River. A second gull colony, composed of mew gulls, has been documented on the Snow River Flats, where the Snow River empties into Kenai Lake. Tern Lake supports approximately 15 pairs of arctic terns and a colony of about 20 pairs of mew gulls.

Bears Bears are prevalent throughout the area, with black bear being more common than brown bear. The largest black bear concentrations are north of the River, ranging from Beaver Creek and the Swanson River east to the Kenai Mountains. The heaviest concentrations of brown bear observed coincide with salmon migration up the Kenai River and its tributaries. Brown bear feed on Kenai River salmon (predominantly carcasses) between the Kenai River/Russian River confluence and Skilak Lake, and for approximately ten miles below Skilak Lake. The areas downstream from Skilak Lake is critical habitat for brown bear travel and feeding. Brown bear also utilize salmon in the Russian, Moose, Killey, Snow, and Funny rivers, and in Juneau, Quartz, Trail, and Johnson creeks.

The food habits of black and brown bears are different. Brown bear fish in late summer and early fall, with the primary species taken being sockeye and coho salmon. Black bear feed heavily on berries and forbs, but both species will prey on moose calves.

Moose Moose are the most common ungulates found in the Kenai River drainage. Moose surveys conducted in 1979 and 1982 on the Kenai Peninsula indicated average densities within one mile of the Kenai River of 4.2 and 6.7 moose per square mile respectively. Currently, fewer moose winter in this area.

Preferred moose browse varies by area and season. Willow is the favored winter food. Burned-over areas north and south of the Kenai River offer such habitat. Birch and aspen are also used as a food source and are found along both sides of the Kenai River. Moose will browse in early spring on emergent plants along rivers, bogs, and muskegs. The Moose River Flats, because of their numerous muskegs, bogs, and ponds provide ideal calving areas for moose.

Moose calving areas are scattered throughout the Basin. One high-value calving area has been documented along the Kenai River above Skilak Lake between RM 69 and 74. This area's numerous wetlands, pond, bogs, and sloughs provide cover for successful calving.

Caribou Caribou, which were eliminated on the Kenai Peninsula by about 1913, were reintroduced north of the Kenai River in the mid-1960s. An important calving and summer range for the lowland caribou herd now exists in the Kenai River Flats and extends to wetlands north of the Kenai Airport. Wintering areas exist in the Moose River Flats. The current over-wintering populations in the Moose River Flats vary between 60 and 70 animals. Additional reintroduction efforts were made in 1985/86 on the benchlands between Skilak and Tustumena lakes. These animals sometimes range to the Skilak Lake outlet. An upland caribou herd, estimated to number between 300 and 400 animals, uses only the fringes of the mountains in the northeastern portion of the Kenai River drainage.

Mountain Goat and Dall Sheep Other ungulates using the Kenai River Basin include mountain goats and Dall sheep drainage wide. Dall sheep movements are primarily made during summer months. Movements during the winter months are restricted to wind-swept snow-free areas of higher elevations and cliffs. In the spring, sheep move downslope to feed on early growing vegetation. As the snow retreats, sheep progress upslope following the seasonal progression of vegetation growth. The primary foods of Dall sheep are grasses and forbs of the alpine tundra.

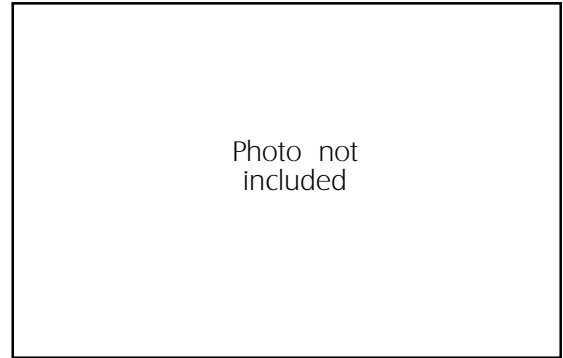
Furbearers Beaver and other aquatic furbearers are distributed throughout the Kenai River drainage, with areas of abundance between RM 64 and 74. Stable water levels and food supplies commonly associated with the numerous side channels combine to form quality furbearer habitat. Otter are more common in the more remote areas of the drainage than on the mainstem Kenai. Muskrat populations are relatively low or absent along the Kenai River because of the scarcity of food and seasonally fluctuating water levels.

Other mammals which use the Kenai River Basin include wolf, wolverine, lynx, coyote, short-tailed weasel, red fox, marten, red squirrel, snowshoe hare, and several species of voles and shrews.

Five to seven wolf packs are known to occur within the Basin. Wolverines, lynx, red fox, and marten are uncommon to rare and are limited to remote regions of the Kenai River drainage.

2.3. Recreation

Recreation use patterns have changed considerably since the original Management Plan was completed in 1986. Fishing is still by far the primary recreational activity along the Kenai River. More people are now participating in this activity, due in part to growing population and the recently increased popularity of sockeye angling. Increased sockeye angling has also resulted in more crowding and habitat damage in previously unimpacted locations. Participation in other recreational activities has also increased in recent years.



Fishing

Chinook (King) salmon fishing occurs during May, June, and July throughout the length of the Kenai River below Skilak Lake, with the primary concentration of activity from Centennial Park to the Warren Ames Bridge. There has been a trend for earlier season fishing in May and for an annually increasing number of boats and fishermen causing congestion and safety problems. There is an increasing number of private guide boats fishing for Chinook salmon above the Soldotna Bridge. The overall trend is for a small annual increase in the number of shore fisherman, with increasingly crowded conditions occurring at prime access points to the Kenai River.

Conflict exists between the guided anglers and non-guided anglers due to competition for prime fishing locations. Conflict also exists between the various methods of fishing. Back trolling and drifting are not always compatible techniques. Drifting requires the boat move with the speed of the current; back trolling requires the boat be held under power in the current and slowly backed downstream at less than the speed of the current. There has been a trend towards increasing use of the back trolling, though drifting still remains the most popular method.

There has been increasing use of the upper river between the outlet of Skilak Lake and the Kenai Keys area by guided and unguided anglers during muddy water periods caused by flooding of the Killey River. Increased use of this area also occurs in early to mid-July as anglers target early run Chinook salmon destined for the Killey River. Conflicts here during peak use periods are identical to the conflicts noted for the lower river.

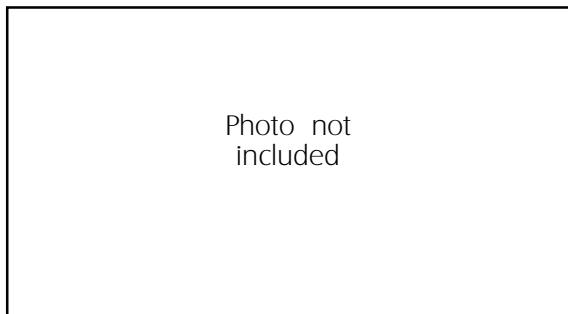
Sockeye (red) salmon fishing begins in June at the confluence of the Kenai and Russian River. Beginning in mid-July and continuing through early August, sockeye salmon fishing occurs over the entire length of the Kenai River. Anglers concentrated at public sites accessible by road and the number of anglers participating in the fishery have increased dramatically. Conflict occurs between anglers for space at crowded public access points. Damage to vegetated streambanks by sockeye fishermen is becoming a major biological and social issue.

Pink (humpy) salmon fishing occurs in even years only, during July and August. This is primarily a shore based fishery on the entire River below Skilak Lake, with concentrations of activity at all public access areas below the Moose River. The trend is for increasing numbers of anglers to target this fishery since the fish are easily caught.

Fishing for Dolly Varden/arctic char occurs year-round. Fishing for lake trout is primarily in the early spring. Fishing for rainbows occurs from June 15 to April 14. Dolly Varden and rainbow trout angling takes place in the entire Kenai River system with concentrations of activity on the upper River between Kenai and Skilak lakes and at the outlet of Skilak Lake. The trend has been towards increasing pressure on the harvest of trout species and for an increase in trout fishing from boats. This pressure has resulted in the establishment of a catch and release trophy trout program for the Kenai River. Hooligan fishing occurs during the months of April and May in the entire River below the Kenai Keys with most fishing for this species occurring downstream from Beaver Creek.

Bank fishing is a popular activity which occurs at many locations along the Kenai River system primarily during the months of April through September and during the winter through the ice. Prime fishing locations such as the banks of the Kenai River between the confluence of the Russian River and Jim's Landing and at the confluence of the Moose River commonly have several hundred fishermen standing shoulder to shoulder during the peak periods. There is increasing pressure on existing facilities as more and more visitors participate in this activity.

Bank fishermen are a major cause of bank erosion due to the heavy foot traffic at prime locations, which destroys the protective vegetation. Bank erosion is also caused by wakes generated from the use of boats.



Other Recreation

The Kenai River sees considerable rafting, kayaking, and canoeing throughout much of the river. The trend is for an increase in use of the river for non-motorized boating activity, especially between Kenai Lake and Skilak Lake. Most conflicts are between motorized and non-motorized users. Sailboating and sail-boarding occur sporadically on Kenai and Skilak lakes. Jet-skiing and water-skiing occur occasionally on Kenai Lake (all other areas are closed). These uses are minor at the present time but jet-skiing use is increasing in popularity. There has been increasing concern over the increased erosion rates associated with power boat use on the Kenai River.

Moderate levels of hunting activity occur during the fall and winter months at several locations along the Kenai River system. Hunting related boat use occurs throughout the Kenai River system in the Fall. The discharge of weapons from boats for big game hunting presents a hazard to all other users on the Kenai River system, except in the areas of Kenai and Skilak lakes. Aircraft operation occurs on a limited but reoccurring basis throughout the year in several portions of the Kenai River system—gravel bars are utilized by wheel planes, and the river and the lakes are used by float planes.

Moderate levels of snow-machining occur on several of the trails adjacent to the Kenai River if winter snow conditions permit. The Russian River and Juneau/Resurrection Pass Trails and the lake ice of both Kenai and Skilak lakes are popular snow-machining areas. Conflicts with cross-country skiers and snowshoers occur in all of these areas and the USFS has tried to minimize this problem by closing the Juneau/Resurrection Pass Trail to snowmachines after February 15 of each year. Conflicts caused by illegal ATV use on the Torpedo Lake Trail at Kenai Keys is also common. When snow cover is insufficient, snow-machining can also cause serious damage to vegetation by direct injury and by causing "freeze-down" due to snow compaction.

Off-road all-terrain vehicle riding occurs at moderate levels at several locations along the Kenai River system. Though prohibited on all State Park and USFWS and most USFS lands, this activity does occur illegally often enough to conflict with other recreational users and cause serious environmental damage through destruction of vegetation and erosion. This activity contributes to erosion of the river banks and potential damage to salmon spawning beds on exposed gravel bars. Operation of vehicles below the ordinary high water line of the Kenai River and its anadromous tributaries is illegal without a permit from DOPOR or ADF&G, but has increased in recent years.

Landscape/wildlife photography and viewing occurs throughout the year at all locations throughout the Kenai River system with the primary concentration of activity from Kenai Lake to the Moose River. There has been a dramatic increase in this activity particularly by persons observing the snow geese and caribou at Kenai Flats and eagles, trumpeter swans and other waterfowl along the upper Kenai River below the outlet of Skilak Lake.

Hiking occurs primarily during the months of May through September at a number of locations along the Kenai River system. There is increased interest in this activity, especially on short improved trails which can be used by people of all ages. There is a shortage of suitable improved trails and facilities.

Both auto and boat camping are common activities at a number of locations along the Kenai River system during the months of May through October. Nearly all public and commercial campgrounds are filled to capacity during the peak summer months of June, July and August. The trend is towards annually increasing pressure on existing facilities as more and more visitors participate in this activity. Conflict occurs when inadequate facilities are utilized beyond capacity, causing resource damage and confrontations between users. There are also conflicts between different types of campers such as tenters and recreational vehicle users.

Other recreational activities occurring along the Kenai River include recreational gold panning, primarily during the summer months at a number of the tributary streams and occasionally in the mainstem Kenai River. This recreational gold panning is often conducted with 4 inch and 6 inch suction dredges and is only seasonally authorized on streams such as Quartz Creek, which are also important spawning and rearing streams. Also, exploratory pits have been permitted to determine the feasibility of commercial mining operations. All of these activities are permitted by law, and there is the possibility that their scale and scope may expand in the future. Although prohibited by borough ordinance, fireworks discharge is common throughout the Kenai River area, and can pose a danger to wildfire.

