

Kenai River Watershed Conservation Area Plan



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KENAI RIVER WATERSHED CONSERVATION AREA PLAN

I. Area Profile:

Site Name: Kenai River Watershed

Location: The Kenai River is located on the Kenai Peninsula in south-central Alaska at approximately 60°30'N latitude and 151°W longitude.

U.S.G.S. Quadrangle: (1:250,000 series) Kenai and Seward Quads.

Ecoregion Location: The site is located partially within two ecoregions- The lower half of the watershed is in the Cook Inlet ecoregion and the upper half is in the Gulf of Alaska, mountains and fjord lands. It is not officially designated a phase 1 or capital campaign site, but is one of the Conservancy's top priority sites in Alaska.

Size: Approximately 2,200 square miles or 1,400,000 acres.

Directions to Site: The area can be reached by regularly scheduled commercial flights from Anchorage to Kenai, approximately 60 miles southwest of Anchorage. Additionally, the area is readily accessible by car from Anchorage by driving south on the Seward Highway for approximately 100 miles, then west on the Sterling Highway for another 50 miles to the community of Soldotna, where the Conservancy's community based partner, the Kenai Watershed Forum office is located. The Sterling Highway begins in the headwaters of the Kenai and traverses the length of the watershed nearly to the mouth of the river at Cook Inlet. Most of the watershed, however, is only accessible by foot, boat, ATV, snow machine, or aircraft.

Conservation Area Profile: The Nature Conservancy identified the Kenai River as a site with exceptional biodiversity values shortly after establishment of the Alaska program in 1988. The watershed supports 37 species of fish, 21 species of waterfowl, and numerous mammal species. Significant populations of snow geese, double-crested cormorants, trumpeter swans, king salmon, and bald eagles accentuate the biological values of the watershed.

In 1994, the Conservancy made the decision to implement a community-based approach to conservation in the Kenai River watershed, including investing in a full-time, on-site staff position in 1995.

By 1998, the Conservancy had made significant progress in developing a compelling model of community-based work. As conditions on the Kenai changed (in terms of community institutions and capacity, changes in the funding landscape, and evolving roles of key partners), we re-evaluated our program, and examined ways the program should evolve to reflect changing conditions. The 1998 site conservation-planning framework outlined two years of implementation actions during a planned transition to closing the TNC field office while local conservation partners' capacity increased and stabilized.

The 1998 plan focused on three primary conservation targets: brown bears, salmon, and riparian plant communities. This plan retains two of these three targets, brown bears and salmon, while changing the riparian plant communities to low gradient 1st through 3rd order Kenai River tributaries in the Cook Inlet Ecoregion.

II. Physical Environment

Climate

The climate of the site is affected by continental and maritime influences. The Kenai Peninsula is subarctic, with temperatures rarely exceeding 80°F (26°C) in the summer or falling below -30°F (-34°C) in the winter. The area climate is moderated by Cook Inlet, so temperatures rarely drop below 0°F (-18°C) for extended periods of time. Wind velocities average about 6 knots, and the wetlands have an annual precipitation averaging close to 20 inches. The area is free of permafrost, and May through September is usually frost-free.

Over the last century, the average temperature in Anchorage has increased 3.9°F (USEPA, 1998). This temperature increase has similarly affected the Kenai Peninsula and is a possible systemic driving mechanism for change in the physical and biological characteristics of the area; however, there is little empirical evidence from the Kenai Peninsula to link changes to increased temperatures.

Large-scale Ecological Patterns:

The Kenai River watershed straddles two ecoregions and includes diverse natural communities ranging from tundra to coastal salt marsh. In the headwaters of the Kenai, large glaciers, tundra communities and stunted boreal forests dominate the terrain. This area, part of the Coastal Mountains Ecoregion, supports brown bear, dall sheep, wolverines, and numerous other species dependent on large blocks of unfragmented habitat.

In the lower watershed the diversity of natural communities are influenced more by the ocean processes associated with the presence of Cook Inlet. Heavily glaciated, the relatively flat coastal plain of the lower watershed supports diverse natural communities such as salt marshes, fens, bogs, muskeg, sedge meadows, fresh sedge marshes, and numerous forest and shrub communities. These communities support numerous species including brown bear, salmon, moose, aquatic invertebrates, and several rare plant species. This area is part of the Cook Inlet Ecoregion.

Key Processes:

1. Fire: Disturbance from fire has played a role in the distribution of plants, animals and natural communities within the Kenai River watershed. Studies have indicated that fire occurred on nearly all upland forest sites at an unknown frequency prior to European settlement (Lutz 1960). Four fires are known to have burned significant acreage on the Kenai lowlands between 1851 and 1900 (Oldemeyer and Regelin 1984,1987). Between 1900 and the present, two large fires (125,000 ha in 1947 and 34,800 ha in 1969) burned within the watershed. Numerous other smaller fires have occurred in all vegetation types within the project area (Potkin 1997; Oldemeyer and Regelin 1984, 1987).

Most fires within the Kenai project area are human caused. There are few lightning events in the area and only rarely are fires attributed to lightning. Prior to European settlement, Native Alaskans are likely to have used fire to aid in hunting or improving travel corridors as indigenous cultures have done in other parts of North America (Pyne 1992). Since settlement wildfires have mostly originated from recreational fires (Potkin 1997).

Fire impacts vegetation communities and dependent species in several ways. Early successional and light loving species tend to colonize an area after a burn. These species are favored by moose, and to a lesser degree brown and black bears. As larger trees start to dominate, the quality of moose habitat declines with the decline of light dependent understory species.

Fire Return Frequency: Potkin (1997) estimates fire return frequencies in the Lutz spruce forests of the watershed at an average of once every 100 – 300 years. The return frequency within the lowlands may be less than once every 100 years due to a drier climate and more volatile fuels.

Fire Intensity: Nearly all fires within the watershed are stand-replacing fires with intensity varying according to terrain and weather. This intensity variation influences the mosaic of vegetation and community types and their distribution within the watershed.

2. Spruce Bark Beetle: Although a native species, spruce bark beetles are very damaging to native spruce forests within the Kenai watershed. Spruce bark beetles have been impacting the forests of the Kenai Peninsula for centuries causing the death of the majority (in certain areas) of the older spruce trees over about 6” diameter about breast height (dbh). Historic infestations tended to occur in small areas (300 to 3,000 acres) at random spatial and temporal intervals, but would occasionally affect areas up to 500,000 acres as it did around Cooper Landing in 1982 (U.S. Forest Service 1996). The current infestation, the most massive in recent Alaska history, has affected at least 3 million acres in Alaska (U.S. Forest Service 1996). This has prompted increased logging and concerns about forest health and human safety. There are numerous theories about why this infestation appears to be at a larger scale than has been previously recorded. Large-scale disturbances in the late 1800s or early 1900s could have encouraged even-aged stands conducive to beetle spread. Climatic changes resulting in an increase in warmer summer weather may have decreased tree vigor, incited the beetles to migrate, or stimulated beetle activity within this part of Alaska (Boggs 1997).

Whatever the cause, spruce bark beetles are a dominant natural process within the Kenai watershed. The death of larger trees encourages a flush of growth from young spruce and grassland communities. This change in community structure benefits light dependent forbs and graminoid species and the fauna dependent on this growth at the expense of species that require mature forest habitat. Fire intensity and return interval may increase as a response to drought and the fine fuels present after spruce kill. This, in turn may encourage the spread of more fire dependent species.

3. Flooding (Lehner, 1992): The occasional low impact floods that occur within the Kenai watershed influence to a minor degree the structure of riparian wetland communities. The rise in the water table during and following flood events causes limited tree mortality, increases alluvial deposits within the floodplain, may alter the river and tributary channels (especially in the lower watershed), may alter riverbanks, and may cause the scouring of exposed graminoid communities adjacent to the river. The Kenai River is subject to three types of flooding.

Storm Runoff -The most common flood event is from high storm runoff, this type of flooding usually occurs in the fall season. Due to the lowering of water levels over winter months in the two large lakes (Skilak and Kenai) the Kenai River rarely flood in spring due to winter melt. However, flooding from storm events alone, can cause significant flood events on the Kenai.

Sudden release from glacially dammed lake- This type of flooding is caused when a glacier damming a lake is breached. There are two lakes within the Kenai watershed that are glacially

dammed and have been known to breach. The glacial lake in the Snow River drainage releases typically every two years, where as the Skilak Glacier Lake is much less predictable.

Ice-jam flooding- Ice chunks can become jammed where the river meanders or is obstructed in some other way. When ice jams occur the river backs up behind them until the jam is breached and the water releases down stream. Although this type of event can occur anywhere on the river it is more common in the lower river, particularly where the river makes sharp bends such as on the Big Eddy. At this location, river meander ice jams have caused significant flooding and ice scars are noticeable as high as 20 feet on spruce trees in the floodplain. Ice jams like this can increase the possibility of meander neck cutoffs and chute cutoffs, which in turn impact stream velocity.

III. Biological Environment:

In 1995, the Conservancy developed a broad, standardized approach to evaluating ecosystem-based conservation priorities for the Kenai River watershed. The first step in the process was to identify the watershed's hydrological subsystems that are interdependent and contribute collectively to the health of the watershed. These are grouped into eight generalized subsystems and include:

- **Upland Terrestrial Subsystem:** Includes the well-drained terraces above the Kenai River and tributaries, as well as the mountainous areas in the upper river drainage, and ridges between the lowland wetlands. Water from components of this subsystem drains into the remainder of the watershed. The communities within this subsystem are impacted by fire, and glaciation.
- **Tributary Riverine Subsystem:** Is defined as any water flow in channels at or below ordinary high water (OHW) that join the mainstem. The Tributary Riverine subsystem includes distributaries, tributary side channels, sloughs, and any permanently flooded open water channels of rivers that are subject to tidal floods, but are located upstream of the influx of ocean-derived salinity. In tidally influenced areas, the Tributary Riverine subsystem is defined to begin at salinities of less than 0.5%. The subsystem is delimited by uplands, the mainstem, the channel bank above OHW, lakes, or wetlands.
- **Mainstem Riverine Subsystem:** Includes water flowing in the Kenai River mainstem at levels up to OHW. This includes distributaries, side channels, mainstem sloughs, and tidally influenced areas of the mainstem upstream of ocean-derived salinities greater than 0.5%. Uplands, lakes, wetlands, the tributary subsystem, the channel banks above OHW, and estuarine areas delimit the subsystem.
- **Contiguous Wetlands and Riparian Habitat Subsystem:** Occurs adjacent to the mainstem, tributaries, and lakes. This subsystem is subject to both surface water and groundwater exchange with the mainstem and riverine subsystems. Some wetlands may be permanently connected to the stream subsystems. This subsystem includes shallow lakes and backwater sloughs incidental to temporarily flooded wetland complexes, seasonally flooded mudflats without vegetation, or permanently flooded lake areas with floating-leafed vegetation.
- **Lakes Subsystem:** Includes lakes that contribute directly to the mainstem (Kenai and Skilak lakes) and lakes that contribute to the Tributary Riverine subsystem. Lakes are defined in

this context as permanently flooded open-water areas with water depth generally in excess of 2 meters.

- **Lowland Wetlands Subsystem:** Consists of wetlands areas scattered across the glacial till and outwash of the Kenai lowlands. These wetlands are fed primarily by precipitation, by regional groundwater, and to a far lesser extent, by surface water flows. Unlike the Contiguous Wetland and Riparian Habitat subsystem, the Lowland Wetlands subsystem only conveys water flows; it does not exchange flow with other components of the watershed.
- **Estuarine Subsystem:** Consists of deep-water tidal habitat outside the river's mouth and adjacent tidal wetlands, and the tidally influenced reaches of the mainstem and tributary subsystems with ocean-derived salinity greater than 0.5% during annual low-discharge periods. Some wetland and riparian habitat areas influenced by brackish water over 0.5% salinity are functionally similar to Contiguous Wetlands and Riparian Habitat, but are considered part of the Estuarine subsystem.
- **Ocean:** Is defined as the pelagic area outside the brackish plume of the Kenai River in Cook Inlet.

Generally, subsystems in their natural, unaltered states provide optimum benefit to the watershed. However, some subsystems are more susceptible than others to various degrees of anthropogenic stresses that need to be prevented, lessened, or eliminated in order to protect the overall health of the watershed. Such is the case with the Contiguous Wetlands and Riparian Habitat subsystem and estuarine subsystem. An understanding of the linkages between the terrestrial-wetland and aquatic systems is critical for the maintenance of a health and productive Kenai River, especially for salmon production.

Threats to wetlands and floodplains adjoining the Kenai River have increased due to development in these habitats. Contiguous wetlands provide a natural water filtration process for the removal of pollutants, reduce flooding by acting as retention areas for floodwaters, and supplying continuous water discharges during times of low river flows (Kenai River Special Management Area Advisory Board 1986, Alaska Dept. of Natural Resources 1986, The Nature Conservancy 1994). Floodplains and wetlands provide organic debris, which serves as food and habitat for aquatic and terrestrial invertebrates, which are a primary food source for many fishes. Bankside vegetation provides protective cover for fish, and is the source of woody debris for fish habitat. Wetlands are also a rearing habitat for young coho salmon. If inputs into the aquatic system from the terrestrial are high, then alterations of terrestrial and wetland habitats could have a major impact on aquatic resources.

In 1994, the Conservancy defined and ranked stresses that could have the potential to negatively affect the subsystems. The Conservancy used a matrix analysis to evaluate potential effects of the identified stresses and the sources of those stresses on the watershed subsystems. An evaluation of the tables concluded that contiguous wetlands were an essential component to the hydrological and biological health of the Kenai River but were also identified as the subsystem most highly impacted by human-caused disturbances and, therefore, most in need of attention. Wetland draining and filling arose as the most active and persistent source of stress and was primarily occurring within private lands along the lower river. This initial study identified the importance of protecting the integrity of contiguous wetlands and riparian habitat to overall ecosystem health (The Nature Conservancy 1994).

Because of the importance of identifying and protecting contiguous riparian wetlands the Conservancy should initiate a program to identify and map riparian communities within the Kenai Watershed. Based on this map and an overlay of ownership we can determine where the highest priority acquisition projects are located, and initiate protection activities.

Important faunal habitats and dominant species

1. Brown Bears- There are an estimated 39,000 brown/grizzly bears (*Ursus arctos*) in Alaska. Brown bears on the Kenai Peninsula number somewhere between 200-300. Del Frate (1993) estimated the population at **277**. The Kenai population is unique in that they are geographically isolated from other populations of Alaska's grizzlies. The 15 mile isthmus of land that connects the Peninsula to the rest of Alaska has numerous barriers to the movement of bears, (i.e. glaciers, icefields, roads, railroad tracks, campgrounds, residential development and other human intrusions). Such barriers to geographic movement prevent significant exchange of genetic information or numbers supplementation from Alaska's mainland populations of bears.

Viability Concerns-

The isolation of this population makes Kenai's brown bears extremely susceptible to the stresses that can increase mortality and morbidity. Such stresses include various forms of habitat degradation, general disturbance, and decreased access to food sources important to bear health (especially to sows and cubs). Potential over hunting and human-bear conflicts resulting in an increase of "defense of life and property" (DLP) shootings are two key concerns.

Schwartz *et al.*(1997) report that the brown bear population on the Kenai Peninsula can remain viable at only a 7% annual sustained yield (allowable human kill) (i.e. 14-21 bears) The natural mortality rate of Kenai brown bears is 5% or 10-14 bears. Assuming 50% of the yield would be females, any more than 7-10 females dying or being killed per year would have a serious negative impact on the sustainability of this population.

In 1992, the total annual kill was 27 bears for Game Management Units 7 and 15 that encompass the entire Kenai Peninsula. The harvest of brown bears has recently exceeded estimates of sustained yield despite shortened hunting seasons. In 1995 and 1996 the fall hunting seasons were closed by emergency order. Brown bear hunting has not reopened on the Kenai.

In addition, DLP shootings have increased as well. Nearly 33% of all DLP killed bears are shot at a residence. Such trends, if they continue, will seriously threaten this population of bears.

The great overshadowing threat to Kenai Peninsula brown bears, however, is the loss or fragmentation of important habitat that constitutes part or all of their home range. This is due mainly to the increase in development and recreational activities over the last 20 years. Brown bears need large tracts of undisturbed habitat in which to feed, travel, reproduce, and den. A stress/source analysis for brown bears on the Kenai indicates that human activities (including recreational use, housing, increased logging, mineral and energy exploration and development, and water impoundment) have led to modifications or destruction of habitat for brown bears¹. There are growing concerns by brown bear managers that the peninsula population may become listed as threatened or endangered if this continues. Already, the Kenai population is genetically isolated, and there is virtually no gene flow from the interior

¹ Suring's et al. cumulative effects model was applied to the northeast portion of the KP managed by the Chugach National Forest. The model indicates that effective habitat quality for brown bears on a large portion of the KP has been reduced by more than 70% as a result of disturbance and mortality associated with human facilities and activities

Alaska populations. As the Kenai population becomes more restricted, these brown bears could become less adaptable to change, making them more susceptible to a population crash following a catastrophic event.

It is important to note that brown bears are a management indicator species both for the Chugach National Forest and the Kenai National Wildlife Refuge. Therefore, significant negative impacts to brown bears could indicate eminent declines for species that require large areas of undisturbed habitat, especially quality riparian areas.

Areas of critical importance to brown bears

Denning Areas: Most denning areas are located on slopes above tree-line. Adequate sites for denning are located mostly in the upper watershed in the foothills of the Kenai Mountains where elevations exceed 2,000 feet. Most of the denning sites are protected within the Kenai National Wildlife Refuge or the Chugach National Forest.

Feeding areas: All of the anadromous streams within the Kenai watershed are potential feeding areas for brown bears. However, the Kenai, Russian, and Killey rivers tend to have a very high concentration of brown bears due to the relative ease of catching fish in these streams. Brown bears also forage in every other vegetation community within the project area, but definitely concentrate around the salmon producing streams during spring and summer runs.

Travel Corridors: Brown bears move between feeding areas, to denning areas, and around the watershed through preferred routes. The following corridors or routes support large concentrations of bears during the summer season. Resting and hiding cover for sows and cubs is very important in these travel corridors.

Specific geographic locations within the Kenai River watershed that are known to be important for bears are highlighted below. With the exception of the Killey River, the areas that are not protected should be identified for potential protection work.

- **Killey River-** a major travel/feeding corridor(in conjunction with the Kenai River) between Skilak, Tutsumena and Browns lake. May be used also by bears traveling between the northern and southern half of the KNWR.
- **Kenai River above Skilak Lake** where the river empties into the lake and on nearby Hidden Creek. Radio collared bears indicates that this is an important travel corridor and feeding area. These lands are within the KNWR but are relatively accessible to recreational users.
- **The ends of large lakes** have been identified as important travel corridors (i.e. Tutsumena, Skilak, Kenai, Cooper and Upper Trail Lake). Several of these routes follow important salmon spawning streams. Some of these areas are protected.
- **The Russian River/Lakes** has been identified as important bear habitat that receives a great deal of pressure from human activity, primarily sport fishing. Some areas of this system have been recommend by the Interagency Brown Bear Study Team to be managed as “bear only” areas, other portions as “bear-people” areas and some as “people only” areas. Upper Russian

Lake has a 160 acre private in-holding at the outlet of the lake. Biologists have identified this parcel as an important area to protect from development.

- **Goat Creek, also known as Russian Creek**, has been identified as a critical concentration area. Bears use this area heavily to feed on red salmon. There is great concern for the increased likelihood of negative human-bear conflicts resulting in the shooting of bears.

2. **Salmon** (*Salmon stock and habitat descriptions excerpted from Davis and Milner 1997*)

The Kenai River supports 37 species of fish, including healthy runs of four species of Pacific Salmon: king salmon, sockeye salmon, coho salmon and pink salmon. The river holds International Game Fish Association all-tackle world records for three of the five species of Pacific salmon which indicates how well the river accommodates the needs of these salmon species. The appropriate conditions where fish spawn and juveniles live are essential for the continued productivity of the system. The water must be around 55 degrees F during spawning, be chemically balanced, be free of high concentrations of toxins and have sufficient oxygen. Spawning gravels must be free of sediment so that water can flow through it bringing oxygen to the eggs and alevins. Juveniles must have an adequate food supply of insects and other invertebrates. Lastly, young salmon need special river bank habitat where the current is slowed by rough banks and woody debris, and where overhanging plants or undercut banks provide shade and shelter from predators.

With all these habitat requirements, salmon are an obvious example of the links between all aspects of a watershed - the correct type of river morphology, proper surface and groundwater qualities and the appropriate riparian plant communities providing rearing and shelter structure for juvenile salmon. Salmon integrate between ocean and freshwater systems and are thus a key indicator of global ecosystem health. Salmon are also a key food source for many species found in the watershed, especially brown bears. Their decaying bodies add nutrients to the water that other freshwater species use and they are an essential component of the local human economy.

IV. Human Influences

Pre-European Settlement-

The Kenaitze people, Athabascans of the Tanaina tribe, had inhabited the Kenai Peninsula for approximately 6,000 years when Europeans first appeared in 1778. At least 20 villages were known to have occurred on the Peninsula (Pederson 1983). The total Peninsula population was estimated at 3,000 in 1805, but by 1840 had decreased to less than 800 principally due to smallpox and drastic changes in their lifestyle. The survivors eventually migrated to trading posts. Native peoples in the area mainly subsisted on hunting and gathering, and may have used fire to a limited degree to aid in hunting.

Early Settlement-

The first non-native settlement on the northwest coast of the Kenai Peninsula was begun in the 1700's as Russian trappers established a fort at what is now the City of Kenai (U.S. Army Corps of Engineers 1978). After the purchase of Alaska by the United States in 1867, a U.S. Army fort was established in Kenai in 1869, but abandoned in 1870. In 1880 there were 168 people in Kenai and the surrounding villages. With the discovery of gold in the Cook Inlet area

in 1896 the population of Kenai increased to 332 by 1920. Kenai and surrounding areas were opened to homesteading in 1947 and the population, including isolated homesteads, increased to 498 by 1950. Up to 1950, there is little information on the ecological impact from the small mines, subsistence hunting and trapping, fishing, and the widespread homesteads. However, it is likely that the fishery was heavily impacted during the 1940s and 1950s.

Recent Changes-

The population increased rapidly to 9,757 by 1970 primarily due to the construction of a U.S. Army communications center north of Kenai, construction of the Sterling Highway, and the discovery of oil and gas at Swanson River in 1957. The population increased to 19,614 by 1990 due to a variety of economic opportunities such as tourism, recreation activity, and oil and gas development, including construction of an oil refinery at Nikiski and use of the Kenai area as a support base for offshore oil development in Cook Inlet. The 2000 census predicts a 2% increase in population for the Kenai Peninsula for the next 10 years.

The lower portion of the Kenai River watershed has undergone rapid and substantial change in land use since oil was first discovered in 1957 (Lins 1979). From 1957 to 1972, the area of urban land increased tenfold, primarily for industrial supportive commercial activities, residences, and a localized complex of petro-chemical and related industrial facilities (Lins 1979; U.S. Army Corps of Engineers 1978). This development was spread in a narrow band along the main road through the region. Actual drilling structures and petrochemical facilities were minor components of the Kenai's development, compared to the expansion of residential, commercial, and service land uses. The conversion of natural areas to urban, residential and commercial areas during this time has had the greatest ecological impact.

Land Ownership Within the Watershed:

Land Owner	Percentage of Watershed
Federal Lands – U.S.F.S., & Kenai National Wildlife Refuge	30%
Private	28%
Local Government- Kenai Peninsula Borough, City of Soldotna, City of Kenai	23%
State of Alaska-	19%
Kenai River State Special Management Area Managed by Alaska DNR	Water Column of the Kenai River

Fishing, tourism, oil and gas production and refining, and government continue to be the backbone of the local economy. The major soft spot in the local economy is the current downsizing of the oil industry that may lead to a local increase in unemployment. Currently, however, the unemployment rate on the Kenai Peninsula is higher than the state average possibly due to Peninsula residents that are employed elsewhere in the State but return home to Kenai when they become unemployed.

The next decade for the Kenai Peninsula is going to mirror the employment sector changes that are occurring across Alaska. High paying oil jobs are slowly giving way to lower wage service sector jobs. Jobs related to natural resource extraction like commercial fishing and sport-fishing tourism will become increasingly sought after. There is much growing expectation

for employment in the developing local timber industry (Alaska Economic Trends, Alaska Dept. of Labor, 1995).

Economics and Employment:

Service	Percentage of Economy
Retail	19%
Service	18%
Manufacturing	16%
Local Government	11%
Mining	8%
Transportation, Communication, Public Utilities	7%
Construction	6%
State Government	6%
Agriculture, Forestry and Fishing	1%

(Source: Kenai Peninsula Borough Quarterly Report, Economic Development District, Inc. 1998)

A change in the use of wildlife resources has also occurred. Hunting, fishing, and gathering wild resources in the economies and way of life of the local residents were found to be now subordinate to cash-producing activities (Reed 1985). Compared to other communities in Alaska with subsistence-based economies, resource harvests at the community level were low for the communities on the Kenai Peninsula.

More recent land use trends along portions of the lower Kenai River corridor have been mapped or summarized (Lehner 1992; Liepitz and Muhlberg 1993; Liepitz 1994). All of the state owned river-access sites have been badly overused. Furthermore, 1/2 of the private land has some level of human development. The development has led to riverbank disturbance from trampling, and grazing. Land has been cleared for construction of new homes and buildings which has further disturbed natural vegetation. Finally, roads have been built to gain access to private tracts and to the river. Federal, state and City of Kenai lands are still in an undeveloped status. Bank trampling, however, is extensive on federal lands. Interpretations of aerial photography of the Kenai River from 1963-1964 were compared to 1993 field surveys to evaluate rates of development. Results indicated that over 76% of the modified banks and structures that were observed in the 1993-1994 field surveys have been introduced since 1963-64. The majority of these changes were due to increased bank stabilization efforts and the construction of boat docks and groins or jetties.

The Kenai River Comprehensive Management Plan (revised 1997) listed increasing recreational pressures on the Kenai River since 1986 (when the original plan was completed). There has been increasing pressure from bank anglers, resulting in increased damage to riparian habitat from bank trampling, increased trespass incidence on private property, and a demand for more access areas. The quality of the recreational experience has also declined due to crowding and increased competition for space. Boat use has increased significantly, resulting in

competition for fishing holes, conflicts between fishing methods, and conflicts between guided and non-guided groups, and fishing and non-fishing groups. A recent survey by USGS indicated that boat use, under certain conditions of passenger loading, location of operation in river and type of hull design, create varying levels of stream bank erosion. Jet-ski use on Kenai Lake is also increasing and is becoming controversial because of noise impacts and wake disturbance to lake-banks. Furthermore, even with development of many new recreational facilities, peak demand for day use, access, bank fishing, and camping still cannot be accommodated. While constructing additional facilities would accommodate some of this use, there is concern that this would increase use of the river and exacerbate many current problems.

In general, the increasing population of the area has increased the demand for river front lots and generally put high development pressures on land in the river watershed. Especially of concern are the riparian habitat, wetland, and floodplain areas.

Recent water quality studies have documented water quality problems in the more developed sections of the river (i.e. presence of hydrocarbons, elevated coliform levels, loss of diversity of indicator species of invertebrates) (Kenai River Comprehensive Management Plan 1997).

Another significant land use change could result from the fact that large portions of the Kenai River watershed have been infested with the spruce bark beetle. Although a native species, this spruce bark beetle infestation, the most massive in recent Alaska history, has affected at least 700,000 acres of spruce within the 1.7 million acres of forest in the Kenai Peninsula Borough. This has prompted increased logging and concerns about forest health and human safety.

Laws and Policy - Relationship to Other Plans -

Kenai River Comprehensive Management Plan: The Management Plan will form the basis for decision making the State Division of Parks and Outdoor Recreation (DOPOR) and ADF&G in their management of the Kenai River State Management Area. This means that decisions within the Kenai River Special Management Area by these agencies will follow the recommendations of the Management Plan. Certain recommendations in this plan will require enactment through regulations or department orders adopted by the DNR Commissioner. Inclusion of recommendations in the Management Plan will not ensure their use until necessary implementation tools are enacted.

Kenai Area Plan: DNR manages state lands through area plans. These plans identify state lands to be retained in state ownership and those to be disposed of, classifies state lands into resource categories, and forms the basis for other DNR decision making in its management of state resources, including forestry, and mineral management and development. The Management Plan and the Kenai Area Plan will be closely coordinated in their development, with consistent recommendations in each. The Kenai Area Plan is currently under revision with final plans expected in 1999.

Upper Kenai Cooperative Plan: The Upper Kenai Cooperative Plan is a cooperative planning effort by federal and state agencies (primarily USFS and USFWS, and DOPOR) to prepare a coordinated management plan for the Upper River (area between Skilak and Kenai Lakes). The recommendations of this plan have been incorporated in the Management Plan.

State management authority exists to implement the recommended actions, either independently or in coordination with USFS and USFWS.

Chugach National Forest Land and Resource Management Plan and Kenai National Wildlife Refuge Comprehensive Conservation Plan: These plans are developed by the USFS and USFWS to manage the lands and resources within the Chugach National Forest and the Kenai National Wildlife Refuge. Both are currently under revision.

Kenai Peninsula Borough Comprehensive Plan: The Borough Comprehensive Plan is used by the Kenai Peninsula Borough (KPB) to manage the resources under its jurisdiction and to provide a consistent guide to Borough decision making on environmental and development issues. The Comprehensive Plan is currently being updated.

Kenai Peninsula Borough Coastal Plan: The Borough Coastal Plan is used by KPB to guide decision-making in project reviews where a state coastal determination of consistency is required. This review is made according to the 'enforceable policies' of the Coastal Plan. "Enforceable policy" is that term used in the State Coastal Management Program to refer to specific requirements for standards that are applied in coastal project reviews.

Cultural attitudes and values:

TNC commissioned a survey of Kenai River Watershed residents in 1994 by Craciun & Associate. Based on the survey, fish and wildlife habitat protection is an important issue to Kenai River Watershed residents. Nearly all (90%) of the respondents, including 49% of the respondents favoring property owners' development of their personal property, agreed that protection of fish and wildlife habitat is important and needed.

A majority of the respondents felt that fish and wildlife habitat were threatened at least somewhat by: clearing of vegetation from riverbanks, riverbank alteration from construction, drainage of wetlands, motorboat wakes, certain types of erosion protection, hazardous waste pollution, and riverbank trampling.

A majority of the respondents favored the following habitat protection measures (most to least favored): pollution runoff protection, logging buffers along streams and rivers, boardwalks along heavily-used riverbanks, limiting access to sensitive stream banks, private property owner agreements to not develop sensitive lands, riverbank and wetland restoration, increased enforcement of state watershed regulations, zoning laws and ordinances designed to maintain fish runs, tax breaks to owners for habitat restoration projects and for not developing their lands, and state purchase of private lands for conservation purposes.

The majority of respondents felt that conservation efforts should be paid for with user fees. However, there was strong support for direct appropriations from the state and federal governments. Local taxes were not favored as a source of habitat protection dollars.

Over 91% of the respondents felt that community groups should play at least a "medium" role in watershed conservation. However, only one quarter of the respondents belong to such a group.

Finally, a majority of the respondents had "moderate" or "stronger" interest in Kenai River Watershed science and want to learn more about watershed conservation activities.

Demographics:

Population: The population of the total Borough has increased from 40,802 in 1990 to 46, 790 in 1996 and 49,691 in 2000. The projected growth rate to the year 2010 is 2% annually.

Visitors: The general trend has been towards increasing tourism.

Partnership Opportunities/Stakeholder Assessment:

Stakeholder	Type	Supportive of Goals			Importance to Work with High, Med, Low	Likelihood of Funding TNC Work
		Salmon	Bear	Wetlands		
Alaska Fly Fish.	Non Profit	Yes	No	Yes	Med	Donors
KHLT	Non Profit	Yes	Yes	Yes	High	Coop.
Kenai Pen. Fisherman's Assoc.	Non Profit	Yes	No	Neut.	Low	Donors
Kenai River Prop. Owner's Assoc.	Non Profit	Yes	No	No	High	Donors
Kenai River Sportfishing Inc.	Non Profit	Yes	No	Yes	Med.	Yes
Trout Unlimited	Non Profit	Yes	No	Yes	Med.	Yes
United Cook Inlet Drift Assoc.	Non Profit	Yes	No	No	Med.	Yes
K W F	Non Profit	Yes	Yes	Yes	High	Possibly
Friends of Cooper Landing	Non Profit	Yes	Yes	Yes	Med.	Yes
City of Kenai	Local Govt.	Yes	No	No	High	Yes
City of Soldotna	Local Govt.	Yes	Yes	Yes	High	Yes
Kenai Pen Borough	Local Govt.	Yes	Neut.	No	High	Yes
Alaska DEC	State Govt.	Yes	Neut.	Yes	Med.	Yes
Alaska Fish and Game	State Govt.	Yes	Yes	Yes	High	Yes
Kenai N. W. R.	Federal Govt.	Yes	Yes	Yes	High	Yes
Chugach N. F.	Federal Govt.	Yes	Yes	Yes	High	Yes
N RC S	Federal Govt.	Yes	Yes	Yes	Med.	Yes
Kenai River Special Mgt. Area Advisory Board	Quasi – government	Yes	Yes	Yes	High	Yes
Kenai Peninsula Borough Economic Development District	Quasi government	Yes	No	Neut.	Med.	Yes
Civic & Business Orgs.	NGO	Yes	Neut.	Neut.	Med.	Yes

Adv. Planning Commissions	Local govt.	Yes	Neut.	No Yes	High	No
Guide Association	NGO	Yes	Yes	Neut.	Med.	Yes
Kenai River Center	Quasi govt.	Yes	Yes	Yes	High	No

V. Conservation Planning

Goal and process

The long-term and overarching goal in developing a Kenai Watershed Conservation Area Plan (CAP) is to maintain the health of the area ecosystem and its' biodiversity. The plan was developed using guidelines described in "The Five-S Framework for Site Conservation" (June 2000) and a customized Excel workbook designed by The Nature Conservancy entitled "Conservation Area Planning / Measures of Success" (version CAP_v3d.xls 19-Mar-03). The methodology provides a systematic means to ensure conservation efforts undertaken by the Nature Conservancy and its partners are focused, well reasoned and cost efficient. This plan was developed under contract and in partnership with the Kenai Watershed Forum (KWF), a community-based conservation organization located in Soldotna, Alaska. The KWF consulted with a number of area biologists, government officials and local experts over a nine month period in an iterative planning process, producing several draft plans and seeking comments that led to a finished product. Like any good plan, this should be considered a living document, open to changes when new or better information becomes available.

Plan organization outline and overview

System targets

The conservation area plan is developed by evaluating the ecological systems and selecting focal conservation targets within the area. Consideration is first given to broad systems that exist within the conservation area, such as: aquatic, terrestrial, and marine systems. The composition of each system and the scale of its occurrence (local, regional or intermediate) is considered. The idea is to choose targets from within those systems to serve as key or umbrella targets to focus conservation efforts. The plan reviewers play a significant role in selecting appropriate targets that best characterize the conservation area. There are four targets selected in this plan: 1) Kenai Brown Bear, 2) Salmon and 3) 1st through 3rd order, low gradient Kenai River Tributaries within the Cook Inlet Ecoregion and 4) Small lake systems.

Target stresses

Once targets are selected, stresses to each target are listed and ranked. Every stress to each target cannot be identified, much less evaluated, but in consultation with local experts using best professional judgment, a list of major stresses likely to have an impact on the conservation target over the next ten years are ranked.

Comparative Ranking of stresses to 4 selected targets

Active Threats Across Systems	Salmon (4 species)	Kenai Peninsula Brown Bears	Low gradient 1-3 order streams	Small lakes	Overall Threat Rank
Development of roads or utilities	High	High	High	Medium	High
Residential Development	High	High	Medium	Medium	High
Existing Roads	Medium	High	High	-	High
Invasive/alien species	Medium	-	High	High	High
Inappropriate Recreational Use	Medium	Medium	Medium	High	Medium
Construction of ditches, dikes, drainage or diversion systems	Low	-	Medium	Low	Low
Forestry practices	Low	Medium	Low	-	Low
Inappropriate Fisheries Mgmt	Medium	-	-	-	Low
Commercial/Industrial development	-	-	-	-	Low
Fire suppression	-	-	-	-	Low
Livestock production practices	-	Low	-	-	Low
Threat Status for Targets and Site	High	High	High	High	High

Each stress ranking occurs under well defined criteria with a numerical scoring of 1-4 for the stress' scope of severity and a score of 1-4 for scope of damage. These two scores yield a combined rank for each stress on the target.

Sources of stress

After system targets and associated stresses are defined, sources contributing to each stress are ranked using a similar process. The source ranking is based on the contribution and irreversibility to each stress for each target. Often a given source will affect more than one target and it is the combined source ranking that helps prioritize which sources need to be addressed by designing appropriate conservation strategies. The final step is to craft the strategies to abate stresses to targets. Strategy ranking is a simple yes or no based on the assumption that if the strategy is successfully implemented, it would have an effective abatement of the stress to the given target by at least 25% or 1 ranking value.

Planning overview

By identifying specific conservation targets in the site, the methodology develops an organized and systematic plan toward protecting and maintaining the health of the entire ecological community. The philosophy behind the chosen targets were their dependence and interconnectedness to the site as a whole. For example the Kenai Brown Bear conservation target, if properly protected, will require maintaining the health and viability of several habitat types including; riparian vegetation communities and old growth upland forest. These habitat types that support bears and provide habitat for many other species and those species will also benefit from the conservation actions that protect brown bears.

Conservation Planning Methodology

The method for choosing the conservation targets was based on both qualitative and quantitative information. A target was selected if any species of flora or fauna was threatened with declining population numbers or if persistent stress was noted. Additionally, physical

systems of ecological importance were considered as potential targets. Once the potential targets are identified they are prioritized to key “umbrella” species or systems that subsume others in the same site, while also considering critical threats and persistent stresses. The next step, and perhaps the most important, is the development of stress and threat abatement strategies that require the alliance of key community partners and stakeholders. A successful conservation planning process requires the support and action of numerous stakeholders and provides a realistic means to monitor the status of the conservation targets, assess the threats, and revise actions with the passing of time, knowledge, and experience.

Kenai Watershed Conservation Targets

1. Kenai Brown Bear: The Kenai’s brown bears are an ideal conservation target for two primary reasons. First, it is a population of concern. Second, bears generally require a large amount of intact, relatively pristine habitat. As such, they serve well as an “umbrella species” (i.e., if sufficient bear habitat is protected, habitat for a wide array of other species is also protected *de facto*).
2. Salmon: The Kenai River supports commercial, sport, subsistence, and personal use fisheries of four species of Pacific salmon (king, sockeye, pink and coho). Salmon are also prey to brown and black bear, bald eagles, river otters, mink, and others. The salmon also provide vital nutrients to a wide array of freshwater organisms. Salmon provide such an important influx of nutrients to the system that they can be considered a “keystone” species in a river system (Wilson and Halupka, 1995) whose presence serves to structure energy flow, trophic interactions, and overall productivity of the watershed.
3. 1st through 3rd order, low gradient Kenai River Tributaries within the Cook Inlet Ecoregion: Small, low gradient tributaries provide critical habitat for resident and anadromous fish. With a watershed approach in mind, small streams are excellent early indicators of changes in land use patterns that affect aquatic resources.
4. Small lake systems: Provide important rearing habitat for both anadromous and resident fish. Dramatic fish populations changes in certain lakes have occurred with the introduction of non-native northern pike. In addition to the fish habitat these aquatic systems provide, there are also a large number of nesting waterfowl, particularly the Common Loon that utilize these small lakes.

1) Brown Bear

Coarse/ Intermediate Scale/ Species

The brown bear is an important species target listed by the State of Alaska as a species of special concern. Brown bears are extremely sensitive to habitat fragmentation and need large tracts of uninterrupted land. Male brown bears have approximately 500 square miles of ranging territory, and the females 250 square miles (Hall, 8/13/02). The primary habitat of brown bear often shares and conflicts with human recreation sites like fishing, camping, hiking, etc. There are an estimated 250-300 brown bears on the Peninsula. Though the population numbers are considered strong, there are rising concerns about habitat fragmentation and the increasing numbers of bear/human interactions ending in a Defense of Life and Property (DLP) bear mortality. As the Kenai Peninsula communities continue to grow, DLP bear kills are shifting from mostly hunters shooting bears in defense, to people shooting bears on their private residence (Spraker, 8/12/02). Much of this conservation area lies within the KNWR on the northern Kenai Peninsula and this area is presently one place where brown bears roam with little disturbance from humans.

Fall telemetry data from the refuge shows that brown bears can be found almost exclusively by riparian zones (Jozwiak, 8/29/02). Bears also use the Chickaloon estuary in early spring for foraging of early greening horsetail (*Equisetum*) and bluejoint reedgrass (USDA, 2001). Increased road development and right-of-way clearance will interfere with foraging and denning habitat, as well as the loss of overstory vegetation in riparian corridors for bear travel. Increased development correlates with increases in the number of bear encounters over the years. From 1973 to 1989, 38 DLP bear deaths were recorded on the Kenai Peninsula. From 1990 to 1996, 40 DLP bear deaths were recorded. Thus, the annual rate of DLP kills on bears has tripled. The maximum harvest of brown bears per year is 14, and only a portion is allowed to be female. In 1995, 1996, 1997, and 1998, the fall brown bear hunting season remained closed by emergency order, because the number of female bears lost from the population exceeded allowable harvest numbers. Human disturbance can interrupt feeding and even cause bears to permanently move out of their dens, particularly when disturbed in the winter. Field workers on a seismic crew disturbed three brown bears in two dens during seismic exploration within KNWR during 1997-8 winter, causing three brown bears to leave their dens and not return. One seismic crew worker was attacked and killed by one of these bears (USDA, 2001).

According to a computer model on brown bear cumulative effects (Suring et al., 1994), the Kenai Peninsula brown bear population meets the criteria of being threatened in the lower 48 United States. Bevins et al. (1984) supports the model criteria as there is limited information on brown bears population size, movement, and seasonal habitat needs. This information gap should be given more attention, and the brown bear status should continue to be monitored (EPA, 1997).

SUBSUMED BROWN BEAR TARGET	STATUS	HABITAT	CONCERNS
Moose	Slowly declining	Early stage forest (0-20 years)	Fire suppression leads to less early stage forests
Wolves	-Endangered in the rest of the US. -Declining on the Peninsula	Intermediate and Early stage forests (0-70 years)	Same threat as brown bear but not given as much protection from human mortality factors
Lynx	-not enough local data -threatened in rest of United States	Intermediate stage forest (40-70 years)	Not much is known about lynx population
Wolverine	-not enough data	Subalpine shrub	Not much is known about wolverine population
Salmon	Declining populations	Rivers and lakes	Wild stock is under continual habitat threat
Black bear	Seemingly stable	Intermediate to Mature stage forests (40-200 years)	

Stresses to Brown Bears

THREAT	SPECIFIC THREAT	SOURCE OF THREAT
Habitat disturbance	- growing number of human interactions	* Growing recreational use * Site access/ road development * Residential development
Habitat fragmentation	- blocked corridors due to road and utility development - sprawling rural residences - presently have less contiguous square miles (500) than average male needs to range.	*Residential development *Highway traffic *Development of roads and utilities
Bear/human encounters; DLPs	- rising numbers of bear deaths due to defense of life and property shootings	* Commercial development * Growing recreational use * Site access/ road development * Residential development * Illegal harvest

Important subsumed species under the brown bear are wolves, lynx, and wolverine (which are exceptionally rare in lowlands). Similar to bears, these species need roadless habitats, and large blocks of contiguous habitat. Abundant prey is very important, the wolves prey on moose and the lynx prey on hares. Diverse habitat is important for them since their prey may depend on early succession vegetation, though the species of concern may den in more mature forests (Bailey, 8/16/02). These subsumed target species are all affected by the same human-related threats as the brown bear, but are given less legal protection from human mortality factors.

2) Salmon – 4 Species

Coarse/ Intermediate Scale/ Species

The Kenai River Watershed supports 4 of the 5 species of Pacific salmon: Chinook (king), Sockeye (red), Coho (silver) and Pink Salmon. The general consensus is that these species are healthy and well managed within the watershed. However, these fish are so critically important to the local economy, relation to other species in the watershed and the quality of life that they merit special attention in almost any plan dealing with the economy or natural resources of the area.

***Subsumed species** – All other aquatic species depend, to varying degrees on the marine derived nutrients carried back to the freshwater environment. This includes other anadromous and resident fish species in addition to an unknown number of invertebrate species.*

Stresses to Salmon

THREAT	SPECIFIC THREAT	SOURCE OF THREAT
Habitat Fragmentation	- road crossing	* Inadequate culvert design and maintenance
Toxics / contaminants	- motorboat use, particularly 2 stroke engines - urban runoff - soldotna waste water discharge - Contaminated sites	*Recreational fishing *Impervious surface *Wastewater treatment plant * Contaminated sites
Bank Erosion / Vegetation Loss / Habitat destruction or conversion	- Bank trampling, coupled with boat wake induced erosion	* Sockeye recreational bank fishing * Boat traffic - recreational fishing
Extraordinary predation	- Non-native species introduction and potential spread	* Northern Pike - illegal stocking * Yellow Perch - illegal stocking

Summary of known spatial and temporal distribution of salmon by species

STOCK	Enter Time	Spawn Time	Exits River	Known Spawning Areas	Known Rearing Areas
Early Run Chinook <i>Oncorhynchus tshawytscha</i>	Early May	Mid July-Mid Aug.	May-July after one year	Primarily tributaries, but also on mainstem. Spawning takes place on river margins, or at the heads of vegetated islands on gravel bars.	Associated with some type of cover including macrophytes, macroalgal mats, overhanging riparian vegetation, undercut banks or large woody debris. Juveniles prefer low water velocity.
Late Run Chinook	Late June	Mid Aug. to Early Sept.	May –July after one year	Primarily tributaries, but also on mainstem. Spawning takes place on river margins, or at the heads of vegetated islands on gravel bars.	Associated with some type of cover including macrophytes, macroalgal mats, overhanging riparian vegetation, undercut banks or large woody debris. Juveniles prefer low water velocity.
Early Run Sockeye <i>Oncorhynchus nerka</i>	Mid May	July	May – June after one year.	Upper Russian River drainage including mainly Upper Russian Creek, but also Jean Lake.	Upper Russian Lake
Late Run Sockeye	July	Aug-Sept.	May-June after one year.	Tributaries and margins of Skilak Lake, Hidden Lake, Upper Russian Lake, Kenai Lake, Upper Trail Lake, Ptarmigan Lake and within tributaries and the mainstem of the Kenai River.	Skilak and Kenai Lakes or in pools associated with jetties or basins of creek mouths, or emergent macrophytes in creek-mouth pools.
Early Run Coho <i>Oncorhynchus kisutch</i>	Late July	Sept.-Oct.	May-June after two years	Mostly in the tributary streams.	Low velocity areas near river margins, creek mouth basins, backwater pools and canals. Usually found in association with cover provided by large woody debris, macrophytes, and undercut banks.
Late Run Coho	Sept. – Dec.	Oct.-Feb.	May –June after two years	Mainstem of the Kenai 75% between naptown rapids and Skilak Lake.	Low velocity areas near river margins, creek mouth basins, backwater pools and canals. Usually found in association with cover provided by large woody debris, macrophytes, and undercut banks
Pink Salmon <i>Oncorhynchus gorbuscha</i>	July-Aug.	Aug-Sept.	January after <1 yr.	Mainstem below Skilak Lake and in intertidal areas.	Cook Inlet

C. Ecological Goals:

1. Maintain sustainable brown bear populations (a minimum of around 275 bears.)
2. Maintain viable populations of wild stocks of the four species of salmon present in the Kenai River.
3. Maintain 3 unfragmented representative examples of all riparian community types with high degree of connectivity between protected community types.

D. Programmatic Goals:

1. Develop and maintain relations with key partners throughout the watershed including conservation interests, economic and development interests, Native corporations and tribes, important landowners and landowner organizations, government agencies, and other important stakeholders.
2. Build on success of Kenai River watershed program by:
 - a) continuing to foster a successful, community-based program.
 - b) identifying “best practices” and lessons learned.
 - c) seeking opportunities to convey lessons to others engaged in similar work in Alaska and elsewhere.
3. Use this project as a model for sustainable development and community-based conservation within Alaska to increase fundraising levels outside of the project area.

III. Stresses and Sources of Stress:

Threat Level 1=low, 10=high	Source of Stress	Stress to Targets and Site	Current/Potential Likelihood of happening
8	New roads, and development (Urban, residential, & remote recreational)	<ul style="list-style-type: none"> -Loss of connectivity -Decreased habitat size -Fragmentation -Increased DLP bear shootings -Inhibited opportunities for salmon to reach spawning areas -Impeded migratory routes -Loss of riparian wetlands to development -Altered water quality, chemistry and temperature -Increased erosion and sedimentation 	Current, and there is a high likelihood that development will increase.
7	Increased recreational use of river, banks, and public lands within watershed	<ul style="list-style-type: none"> -Damaged riparian habitat for juvenile and spawning salmon. -Damaged riparian wetland communities. -Increased incidence of DLP bear shootings -Fragmentation from roads -Wildlife disturbance impedes migratory routes and disrupts breeding 	Current and likely to continue & increase.
4	Timber Harvesting	<ul style="list-style-type: none"> -Increased erosion alters water quality -Fragmentation -Loss of habitat structure -Impeded migratory corridors for bears -new roads cause greater fragmentation, and easier recreational access 	Future; Appears that eminent threat of salvage logging on public lands has passed. This threat will arise again when stands reach maturity or when access roads are improved for fire protection
3	Inappropriate Fisheries Management Practices	<ul style="list-style-type: none"> Unsustainable escapement rates -Exotic species -Hatchery salmon 	Future, and could be a bigger problem
2	Mining	<ul style="list-style-type: none"> -Increased erosion and sedimentation alters water quality and chemistry 	Current, minor in extent.

		-Decreased habitat size	
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IV. Conservation Strategies (See Action Table):

A. Protection Strategies (See Zone Map)

1. Killey River fee simple and conservation easement acquisitions

Action A1a: Identify landowners and tract boundaries within Killey River Protection Zone (KRPZ).

Action A1b: Contact landowners within KRPZ and negotiate acquisitions where appropriate.

2. Through collaboration with KHLT and other partners, evaluate protection measures for high value riparian habitat, typically through conservation easements and/or fee acquisition.

Action A2a: Identify and prioritize high quality representative riparian community types and develop a Riparian Community Protection Zone (RCPZ).

Action A2b: Assess degree of protection to date and gaps in protection of riparian communities.

Action A2c: Contact private landowners within RCPZ and negotiate acquisitions where appropriate.

Action A2d: Contact public landowners within RCPZ and work to develop sustainable land use practices.

3. Evaluate other areas for protection to ensure adequate representation of brown bear habitat, riparian and other habitats (e.g., tidal flats at mouth)

Action A3a: Evaluate other natural community representation within watershed for protection needs.

Action A3b: Analyze land ownership patterns in other known high value brown bear habitat.

B. Management Strategies

1. Strengthen the role of the Kenai River Center.

Action B1a: Ensure all relevant government agencies are housed in the center.

Action B1b: Broaden to include non-governmental organizations as resources for Kenai River landowners to use.

Action B1c: Assist in developing a long-term vision and funding strategy.

2. Work with KRSMA Board to ensure coordination of all interests in addressing top priority threats along river corridor.

Action B2a: Participate in board meetings, and provide relevant information when necessary.

3. Encourage management activities on public lands that protect brown bear habitat and reduce human/bear encounters.

Action B4a: Provide information to public lands partners through written correspondence and participation in meetings.

4. Encourage planning and economic activity consistent with maintenance of biological values and with site plan ecological goals.

Action B5a: Participate in borough, state, federal, and municipal planning processes to ensure that proposed economic activities are consistent with conservation goals of the project.

5. Ensure appropriate stewardship on TNC owned lands.

C. Research Strategies

1. Study on distribution and status of major riparian habitat types.

Action C1a: Complete maps of major vegetation communities of the Kenai watershed with focus on riparian communities.

2. Watershed/landscape analysis for entire watershed.

Action C2a: Invite representative from USFS Northwest Region to discuss Watershed analysis process with TNC and Forest Service.

Action C2b: Develop proposal (to Refuge and Forest Service) to support analysis.

Action C2c: Include an analysis of effects on hydrology and salmon of urban/residential growth scenarios under various levels of regulation (i.e. cumulative effects analysis).

3. Research on economic costs of current development trends and economic value of open space.

Action C4a: Compile information through literature searches and summarize in paper to appropriate stakeholders.

D. Community Relations/Education Strategies

1. Continue to build capacity of local conservation partners, especially KWF and KHLT.

Action D1a: Work with conservation partners by participating on boards and committees and providing information and training where appropriate.

Action D1b: Assist with identifying funding sources, providing letters of support, and collaborating on projects of mutual interest.

2. Maintain relations with key individuals in government, public service, and special interest organizations, and develop new relationships with the

economic community, including incorporation of compatible economic development principles and projects.

Action D2a: Provide regular updates on Conservancy projects to key individuals in government and NGOs through periodic meetings and informal visits.

Action D2b: Remain active in the chamber of commerce and service clubs.

Action D2c: Provide materials to the municipalities and borough that help them to develop better growth management and land use planning policies.

Action D2d: Evaluate establishing a local advisory board to maintain and enhance connection to local community.

3. Work w/ partners to develop educational programs on living with conservation targets (bears, habitat, natural history, and biodiversity). Focus education materials on key systems and threats.

Action D3a: Complete brochure on living with bears.

Action D3b: Distribute brochure to schools, lodges, businesses, borough landowners, realtors, and partners and within the newspapers.

Action D3c: Become active partner with A.C.E. and others in the design and development of a Peninsula Brown Bear Festival.

Action D3d: Feature Kenai Peninsula brown bear information at the Kenai Peninsula Sportsman Show.

4. Develop a coordinated approach on education/outreach for Kenai River conservation.

Action D4a: Facilitate the establishment of an education/outreach coalition.

E. Programmatic Strategies:

1. Maintain staff presence; evaluate Conservancy role periodically.

Action E1a: Generate core funding for staff and operations (\$85k/yr) as well as special projects (\$25k/yr) by submitting foundation and government grant proposals, and seeking support from local constituency (Kenai Giving Club).

2. Assist Kenai Watershed Forum in generating fund for operating and project expenses. (\$100k/yr)

Action E2a: Help I.D. funding sources and assist with writing grant proposals and target individual donor leads for KWF.

3. Work with community interests to develop a dedicated Kenai River Fund to support conservation.

Action E3a: Target key corporate and business donors as well as project partners to initiate and fund the development of a Kenai River Fund.

Action E3b: Identify strategies and approaches for creating dedicated funds from “automatic” sources.

Conservation Zones:

Zone 1: The Killey River Protection Zone (KRPZ) contains lands that need to be either acquired in fee simple or as conservation easements. This zone is a critical area for Kenai Brown Bear feeding and travel and is highly prone to human - bear encounters. (See Killey River Site Plan)

Zone 2: The Riparian Community Protection Zone (RCPZ) contains unfragmented high quality riparian communities representative of the watershed. These tracts are in need of protection through fee simple acquisition or conservation easements. The specific boundaries for this zone have not yet been developed.

Zone 3: This zone contains the lower watershed where development is occurring at a rapid rate and where activities to encourage good planning and zoning are needed.

Zone 4: This zone is mainly composed of the upper watershed and includes public lands as well as some private inholdings. In this zone the Conservancy will work with partners and private landowners to encourage sustainable landuse appropriate to the landowner and site constraints. This zone also contains brown bear travel and feeding routes, and riparian natural communities that are in public ownership.

Future Zones: Other critical brown bear habitat areas may be added based on future research. Additional zones may also be required as the Kenai River watershed is evaluated in the context of the broader ecoregion.

Implementation:

A. Protection Implementation:

Owner	Contact	Acres	Priority	Strategy	Cost
Various owners of 22 old Homestead Tracts	7-Landowners	120	1- Zone 1	K,E	\$260,000
Two Private Lots		20	1- Zone 1	K,E	62,000
CIRI		360	2- Zone 1	K,E	362,000
22 CIRI Parcels		177	2- Zone 1	K,E	764,600

8 Private Parcels	TBD	14.4	2- Zone 1	K,E	229,700
Mental Health Land Trust	Steve Planchon	160	3 Zone 1	K,E	81,000
CIRI		1500	3 Zone 1	E	753,000
Various owners of riparian communities	Research Needed		Zone 2		

K= Acquire and Keep

E= Conservation Easement

Total Estimated Protection Cost: Zone 1= \$2,512,300.00

Zone 2=

B. Action Implementation:

Action	Person Responsible	When	Priority
Protection:			
I.D. landowners in Zone 1	Paul	Ongoing	1
Contact Landowners in Zone 1	Paul	Ongoing	1
Negotiate acquisitions in Zone 1	Paul	Ongoing	1
I.D. Representative Riparian (Zone 2) Community types in need of protection	Michelle, David	Sp. '99	2
Contact Landowners in Zone 2	Michelle	W. '99-00	4
Evaluate other protection needs	David and Randy	W. '99-00	4
Management:			
Ensure all agencies are housed in KRC	Michelle	W. 98-99	3
Action	Person Responsible	When	Priority
Include NGOs as resource in KRC	Michelle	W. 98-99	3
Develop long term vision for KRC	Michelle	W. 98-99	3
Participate in KRSMA Board meetings and provide relevant information	Michelle	Ongoing	3
Provide Brown Bear Info to partners	Michelle	Ongoing	2
Participate in Planning process of area	Michelle	Ongoing	2
Research:			
Contract w/ Heritage or others to conduct vegetation survey of watershed	Michelle	Spring- '99	3
Invite Watershed Analysis person to speak	Michelle	Winter '98-99	2
Develop Watershed Analysis proposal	Michelle, Paul, David	Winter 99	2
Encourage ADF&G or watershed analysis to do urban impact on salmon	Michelle	Spring '99	4

study			
Summarize information on economic impact of sprawl and economic value of open space and provide to partners	Michelle	Spring '99	3
Community Relations/Education: Participate on boards and committees of project partners	Michelle	Ongoing	1
Help target funding sources for KWF and KHLT	Michelle	Ongoing	2
Provide regular updates to key partners	Michelle	Ongoing	1
Remain active in the Chamber of Commerce and service clubs	Michelle	Ongoing	2
Provide information on Growth mgt. And land use planning to local govt.	Michelle	Fall '99	3
Help complete Brown Bear Brochure and festival	Michelle	Fall '98	2
Facilitate the establishment of an education/outreach coalition	Michelle	Winter 98-99	2
Program: Generate core funding for staff and program by submitting proposals	Michelle, Randy, Board and dev staff	Ongoing	1
Help write grant proposals and target individual donor leads for KWF	Michelle, and development staff	Ongoing	2
Develop Strategies for funding Kenai River Fund	Michelle	Winter 98-99	1
Target key donors for Kenai River Fund including "automatic sources" of funds	Michelle, development staff, and board.	Ongoing	3

Feasibility Analysis:

Community relations Strategies and Actions are feasible with current staff and funding levels. Core staff funding will need to come increasingly from private sources.

Acquisition of Sites in Zone 1 and 2 is not currently feasible. An increased level of fundraising would have to ensue to make protection goals a reality. Zone 1 acquisitions could initially be funded through a grant from Goldman.

Research strategies need additional funding. Likely sources of funding include agency and foundation grants for research that could help fund programmatic costs as well.

V. Measures of Success:

Brown Bears

Goal: Maintain brown bear populations at a minimum of 275 bears.

Biological/Ecological Measures:

1. Population estimates of brown bear by ADF&G personnel and other agency biologists.
2. Number of DLP killings within project area and in Kenai Peninsula.
3. Hunter harvest levels (if hunting reinstated).
4. Protect key tracts of land that bears depend upon for travel and feeding (indicated in zone 1).

Salmon Species

Goal: Maintain viable populations of all four salmon species within Kenai Watershed.

Biological/Ecological Measures:

1. Meeting of annual escapement goals.
2. Population estimates by ADF&G personnel.
3. Fish catch records within the watershed and in adjacent Cook Inlet.
4. Protect key riparian communities (Zone 2).
5. Shift the development from river banks to more compatible areas of the watershed.

Riparian Communities

Goal: Maintain unfragmented, representative examples of all riparian community types with high degree of connectivity between protected sites.

Biological/Ecological Measures:

1. Protect at least 3 examples of each community type within the watershed.
2. Ensure that all examples are linked by natural vegetation at least .5 miles in width (may involve some restoration).
3. Ensure adequate protected buffer to riparian communities represented.

Programmatic

Goal: Develop and maintain relations with key partners throughout the watershed

Measures of Success:

1. Establish formal and informal ties to all partners within watershed.
2. Avoid negative relations with partners.
3. Complete projects coordinated with partners.

Goal: Build on success of Kenai River Project.

Measures of Success:

1. Continue to foster a successful community based program.

2. Identify at least 10 best practices or lessons learned that can be shared with other projects.

Goal: Use the Kenai program as a fundraising tool throughout Alaska.

Measures of Success:

1. Raise at least \$200,000 per year for conservation work in the project area.

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