

# ***KENAI MOUNTAINS TO SEA***

**A Landscape Conservation Strategy  
to Sustain Our Way of Life on the Kenai Peninsula**



**Kachemak Heritage Land Trust  
Audubon Alaska  
Cook Inlet Keeper  
Kenai Watershed Forum  
U.S. Fish and Wildlife Service**

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The 6 million-acre Kenai Peninsula is a spectacular place to call home. Much of our economy is based on the Kenai's abundant natural resources that support commercial, recreational and subsistence fishing, charter services for hunting and wildlife viewing, tourism and other derivative benefits. However, the downside of this natural bounty is that the Kenai is one of the fastest-growing and most visited areas in Alaska.

Although almost three-fourths of the peninsula is managed in three Federal conservation units by the U.S. Forest Service, U.S. Fish and Wildlife Service and National Park Service, road and home building, groundwater withdrawal, logging practices, recreational activities, loss of salmon habitat and increasing human-wildlife conflicts fray at the ecological and cultural integrity of the peninsula. There is a need for a peninsula-wide land conservation strategy to sustain our way of life by promoting natural resource-based community assets.

The *Kenai Mountains to Sea* partnership proposes to leverage existing land conservation by focusing on interjurisdictional anadromous stream corridors that pass from the Federal conservation estate through nonfederal lands (including private parcels) to reach the sea. Our goal is to build a broad-based partnership to support and strengthen long-standing and effective private-public partnerships dedicated to voluntarily conserving and enhancing fish and wildlife habitats for the continuing economic, recreational and cultural benefits to residents and visitors of the Kenai Peninsula Borough.

Voluntary habitat protection by land trusts will be one of many tools considered for conservation and development of these corridors. We will also use less-than-fee-simple approaches such as voluntary compliance, perpetual easements, stream bank restoration, aquatic species passage projects, short-term agreements on private parcels as part of publicly-funded restoration projects, and land agreements with tribal and local governments.

Disclaimer: All estimates of parcel values are appraised values from the Kenai Peninsula Borough parcel viewer and are intended for comparative purposes. Information on anadromous fisheries is from the Alaska Department of Fish and Game's Atlas and Catalogue of Waters Important for Spawning, Rearing, or Migration of Anadromous Fish. Spatial data for streams and rivers are from the USGS National Hydrography Dataset.

## A NEW APPROACH TO LAND CONSERVATION

The nearly 6 million-acre Kenai Peninsula in south-central Alaska is widely recognized as a great place to live and visit. George Shiras III, a famous nature photographer for the National Geographic Society, wrote at the turn of the last century that “were all of Alaska erased from the map except the Kenai Peninsula and its immediately adjacent waters, there would yet remain in duplicate that which constitutes the more unique and that which typifies the whole of this wonderful country”.

To protect this exceptional landscape, Congress established predecessors to the current Chugach National Forest in 1907, Kenai National Wildlife Refuge in 1941, and Kenai Fjords National Park in 1978. When the boundaries of the three units were redrawn by the Alaska National Interest Lands Conservation Act in 1980, the 1.7 million acres outside the Federal conservation units were parsed into its current ownership by the State of Alaska, Kenai Peninsula Borough, tribal entities and municipalities, including almost 56,000 parcels in private hands (Table 1).

**Table 1. Ownership and assessed value of the 6 million-acre Kenai Peninsula.**

<b>Ownership</b>	<b>#Parcels</b>	<b>Total Acreage</b>	<b>Assessed Value</b>
BOROUGH	1,029	62,218	\$ 815,695,700
FEDERAL	530	3,783,844	\$ 1,999,335,800
MUNICIPAL	986	17,686	\$ 433,280,800
NATIVE	1,438	481,687	\$ 356,419,600
NATIVE ALLOTMENT	210	10,810	\$ 25,484,600
PRIVATE	55,844	239,759	\$ 6,601,914,100
STATE	2,296	919,098	\$ 1,047,767,200
<b>Grand Total</b>	<b>62,333</b>	<b>5,515,101</b>	<b>\$ 11,279,897,800</b>

With a population exceeding 56,000 and a growth rate averaging 2.2% per year, 1,000 new residents move to the Kenai Peninsula Borough annually, translating into 1.5 new housing units each day. Road and home building, groundwater withdrawal, logging practices, recreational activities, loss of salmon habitat and increasing human-wildlife conflicts fray at the ecological and cultural integrity of the peninsula.

That almost three quarters of the Kenai Peninsula is protected within three Federal land management units does not accurately reflect the vulnerability of its watersheds to degradation by human activities. Most headwaters on the Kenai Peninsula are within Federally-managed lands – glacial waters originate in the Harding Icefield, Wosnesenski-Grewingk Glacier complex, and the Sargent Icefield; and nonglacial waters originate in the Kenai Lowlands, Tustumena Benchlands, and Caribou Hills. However, the boundary of Federal conservation lands does not extend to the ocean everywhere. In particular, the 175-mile urban interface that extends along the Kenai National Wildlife Refuge from Point Possession in the north to the Fox River Valley in the south ensures that the waters of almost every anadromous stream that originates on the western Kenai Peninsula must pass through a gauntlet of homes, boat launches, eroded banks and urban runoff enroute to the sea. The Sterling and Spur Highways, and Kenai North Road Extension, mean that most streams and rivers pass under a high-volume paved road as well. Road crossings and invasive species have found their way into many of the 99 watersheds on the Kenai Peninsula with anadromous streams: 44 have culverts, 26 have reed canary grass, nine have northern pike, and two have Elodea.

The Kenai Peninsula is also warming and drying rapidly in response to contemporary climate change, and its effects do not recognize jurisdictional boundaries. Over the past 50 years, treeline in the Kenai Mountains has risen 50 meters, wetlands in the Kenai Lowlands have decreased 6—11% per decade, the Harding Icefield has shrunk 5% in surface area and 21 meters in elevation, and available water has declined by 55%. Late summer canopy fires in spruce are being replaced by spring fires in bluejoint grasslands, and a 2005 wildfire in mountain hemlock was outside historic fire regimes. These observations support climate-envelope models that forecast continued deforestation of what was Lutz spruce in the southern Kenai Peninsula, and afforestation of alpine tundra in the Kenai Mountains, through at least this century. In addition, summer stream temperatures are reaching lethal levels for salmon in many non-glacial streams, and increased sediment loads in glacial streams are reducing weights of sockeye salmon fry.

The *Kenai Mountains to Sea* partnership seeks to sustain our local natural resource-based economies by minimizing the impacts of a rapidly warming and developing landscape. It is precisely because the Kenai Peninsula is changing so dramatically that this partnership has focused on the role of riparian corridors as fixed components on the landscape that will continue to provide connectivity for salmon, marine-derived nutrients, wildlife movement, and plant dispersal through thick and thin. Stream-based corridors maintain connectivity between the freshwater headwaters high in the Kenai Mountains and Caribou Hills, and their salty mouths in the Cook Inlet and Gulf of Alaska. The *Kenai Mountains to Sea* partnership will work to ensure the maintenance of that connectivity into the future, working with willing landowners, agencies and tribal entities in a non-regulatory context.

## THE STRATEGY

Envision a landscape of connected private and public lands to sustain our way of life on the Kenai Peninsula. Anadromous streams are our target because they have great intrinsic ecological, economic and cultural values. Additionally, streams and their vegetated riparian edge tend to be natural movement corridors for wildlife and dispersal routes for both native and invasive plants. Importantly, stream corridors have more persistence on the landscape than existing vegetation which will change in response to a warming climate, ecological processes, succession and human use. Other things being equal, conserving anadromous riparian corridors is smart — they save salmon, maintain hydrology, provide for wildlife movement, provide contiguous and linear green infrastructure for recreation and access, protect cultural resource site, connect conservation estates, and in a world of rapidly changing vegetation due to climate change, is the one sure bet (Figure 1).

But which riparian corridors? With 384 anadromous streams (representing 1,800 miles of salmon habitat!) intersecting The Kenai's coastline, the strategy invokes a pragmatic approach that focuses on land ownership and management. The 212 corridors wholly within the federal conservation estate and the 152 corridors completely outside federal boundaries were taken off the table. Instead, the *Kenai Mountains to Sea* strategy focuses on 20 interjurisdictional streams, comprising 958 anadromous stream miles, which flow from federal lands through a gauntlet of multiple ownerships to the sea. Collective conservation efforts by the partnership on those 20 interjurisdictional corridors (over 50% of the total anadromous stream miles) are the biggest bang for the buck, leveraging existing but only partial protection within federal lands.

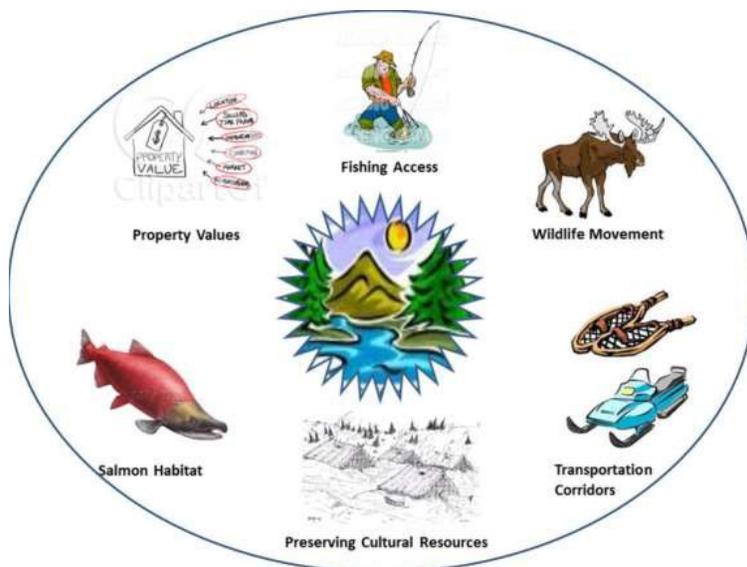


Figure 1. Mountain-to-sea corridors, as contiguous green infrastructure, are a means to promote and sustain natural resource-based community assets that may be different in rural versus urban settings.

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## DEFINING CONNECTIVITY

There is no magic formula for ensuring connectivity. Recommended corridor widths depend, in part, on the design objectives: for which species, for which purpose (migration, movement, seed dispersal, hydrologic function) or perhaps simply as contiguous green infrastructure used for bike and foot trails, or to buffer sounds emanating from the urban interface. There are also site-specific variables that make a hard and fast rule for corridor width unrealistic. For example, streams that have a wetland edge, as many do in the Kenai Lowlands, may need a corridor width that encompasses adjacent forest to ensure its use by some wildlife. Also, it may not be critical to ensure that both sides of a riparian corridor are equally conserved for the purposes of facilitating wildlife movement. Lastly, in an urbanizing landscape that may already be highly fragmented (as on the Kenai River), it may be too expensive and too controversial to realistically consider restoration to a pre-determined buffer.

We find it useful to consider defining (and monitoring) connectivity at three spatial scales:

- 1) The first is at a width to ensure minimum hydrological function (allow for groundwater flow, buffering of surface runoff, minimize bank erosion and maintenance of riparian vegetation). The 50-foot setback for future development on both sides of State-listed anadromous streams, defined by the Kenai Peninsula Borough, is an appropriate metric which can be remotely monitored with high resolution aerial photography.
- 2) 400 meters (1/4 mile) is an appropriate and reasonable width to ensure wildlife movement of even the largest mammals (bears, moose) and seed dispersal. However, unlike the previous metric, 400 meters is inclusive of both banks. For example, this metric would allow 200 m on both sides of the stream or 400 m on one side only (with the 50-foot setback still enacted on both sides), and can be monitored with aerial photography or satellite imagery.
- 3) At its greatest width, a corridor ensures all ecosystem services associated with a riparian corridor are maintained, even subsidizing adjacent agricultural productivity in altered systems. Riparian ecosystems are known to be generally higher in species richness and higher in soil productivity, partly because of the allochthonous energy carried down the river but also, in an anadromous system, because of the marine-derived nutrients carried up rivers by returning salmonids and dispersed away from streams by bears, eagles, and other predators and scavengers as much as 500 meters (i.e., 1 km corridor width). This is an amorphous corridor width, perhaps best determined and monitored by analyzing riparian vegetation uptake of marine-derived nutrients using stable isotopes.

**Table 2. Implementing stewardship and conservation actions on these 20 anadromous stream corridors, whose headwaters are already protected within Federal conservation units, would ensure habitat connectivity on over 50% of total stream miles on the Kenai Peninsula reach the sea.**

<b>Name</b>	<b>Miles Outside Federal</b>	<b>River Miles Inside Federal</b>	<b>Total River</b>	<b>Anadromous River Miles</b>	<b>Watershed Acres</b>
Aialik Bay (unnamed)	0.4	1.9	2.3	1.0	1,580
Beaver Creek	4.0	17.9	21.8	20.1	39,500
Crooked Creek	16.8	29.2	45.9	31.6	35,141
Deep Creek (North Fork)	34.3	16.7	51.0	34.8	138,528
Fox River	10.3	106.8	117.1	47.5	102,443
Funny River	4.5	62.4	67	17.5	95,012
Harding Gateway	3.8	19.7	23.5	7.1	69,992
Harris Bay (unnamed)	2.0	0.3	2.3	2.1	11,714
Kasilof River	14.0	307.8	321.8	104.9	527,324
Kenai River	48	471.6	519.6	127.8	1,380,758
Killey River	2.7	198.4	201.1	60.5	150,112
Moose River	2.2	135	137.2	65.5	145,750
Nuka Bay (Ferrum Creek)	1.5	3.7	5.2	2.7	9,821
Nuka Bay (unnamed 1)	0.4	8.2	8.7	1.6	30,759
Nuka Bay (unnamed 2)	0.7	6.4	7.1	1.1	
Otter Creek	3.3	4.3	7.6	5.4	26,146
Resurrection Creek	0.5	198	198.5	22.4	108,165
Resurrection River	6.2	145.3	151.5	46	141,729
Seven Egg Creek	4.7	8.1	12.8	6.0	23,300
Sheep Creek	8.2	56.1	64.3	22.2	83,746
Sixmile Creek	10.2	194.6	204.8	40.3	168,512
Swanson River	1.4	106.1	107.5	88.5	182,014

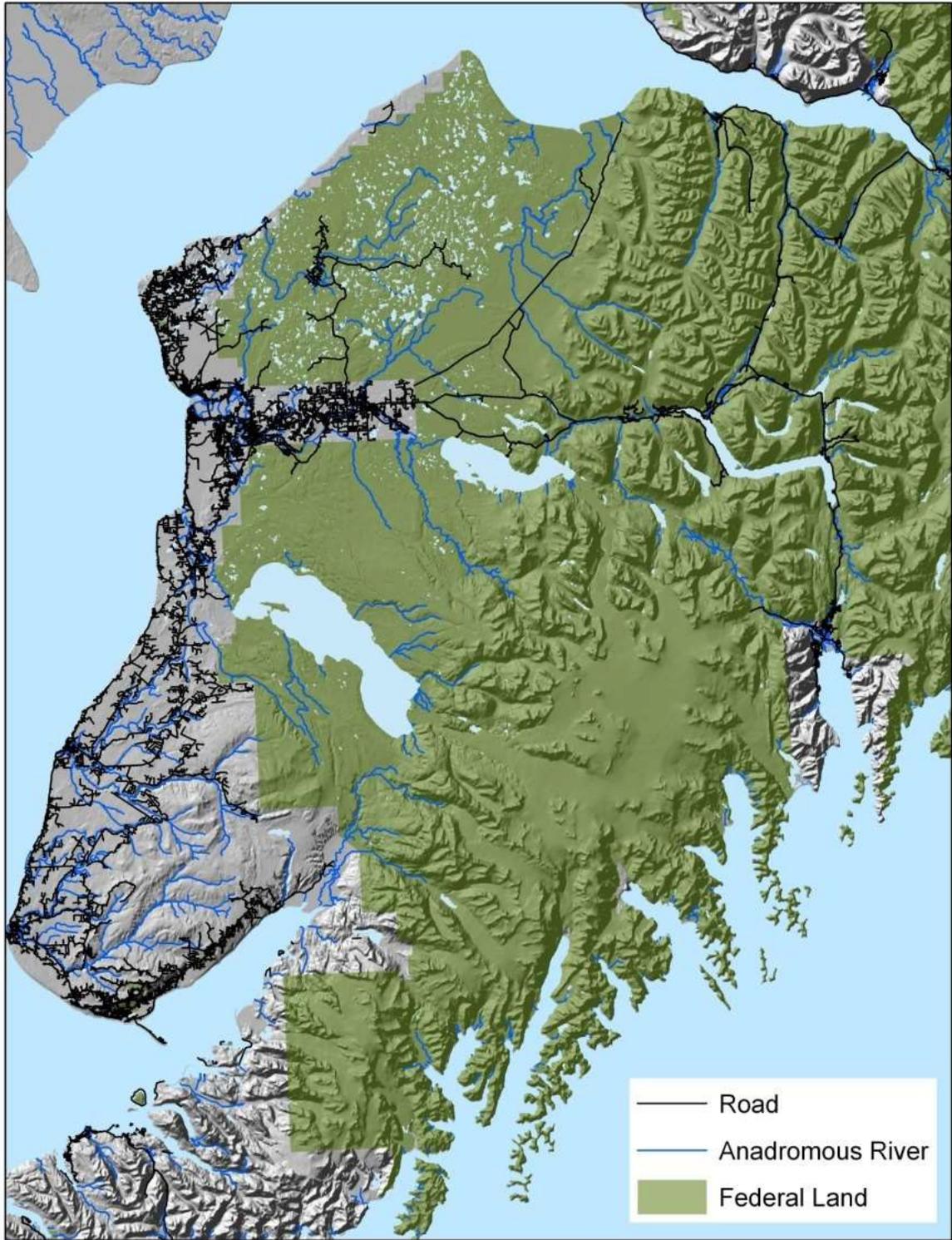


Figure 2. The existing road network puts many glacial and non-glacial anadromous streams on the Kenai Peninsula at risk. Despite the headwater of most streams being protected within three Federal conservation units, many streams must pass through private lands and under roads to reach the sea.

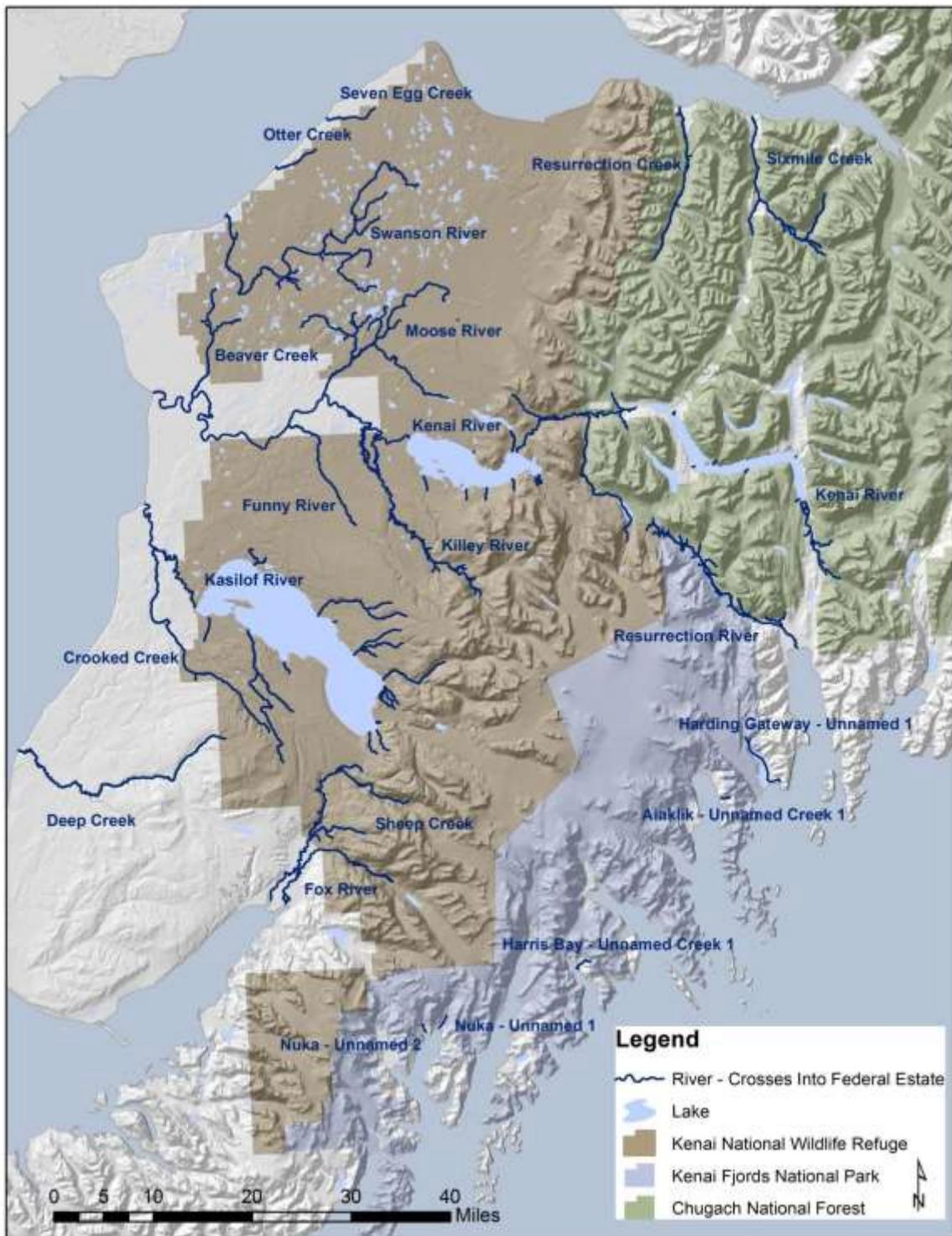


Figure 3. Of 206 named anadromous streams on the Kenai Peninsula, 141 are completely, and 20 are partially, within the three Federal conservation units. Only 45 anadromous streams flow completely outside Federal lands.

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