

3.9 SUBSISTENCE

Subsistence is the way of life for many cultural groups in Alaska, including the Dena'ina Athabascan of Southcentral Alaska, the Central Yup'ik of Southwest Alaska, and the Sugpiaq-Alutiiq of lower Cook Inlet and Alaska Peninsula. Subsistence encompasses hunting, fishing, trapping, gathering, camping, and ceremonial activities, as well as the processing, sharing, use, consumption, trade, and barter of wild resources. Subsistence resources include fish, mammals, birds, marine invertebrates, edible and medicinal plants, mushrooms, and firewood. These renewable resources provide food, fuel, and materials to make clothing, shelter, tools, and art.

The Environmental Impact Statement (EIS) analysis area for subsistence includes the resources that could be affected by the mine site, port, transportation corridor, and natural gas pipeline corridor for each alternative. This includes habitat and migration routes for subsistence resources, community subsistence search and harvest areas, and areas used by harvesters to access resources.

For indigenous people, subsistence activities are rooted in traditional cultural values, spirituality, and a sense of community. The harvesting and processing of subsistence resources is meaningful community- and family-based multi-generational work. Subsistence activities help transmit language and cultural knowledge between generations, maintain the connection of people to their land and environment, and are a source of pride and identity (Boraas and Knott 2013; SRB&A 2011b). In addition to its inextricable roots in traditional Alaska Native culture, subsistence is integral to the contemporary mixed economic system in rural Alaska. For many, subsistence is a way of life. Wage employment opportunities are scarce in rural Alaska, and residents face high prices for store-bought goods; some may have to travel to other communities to visit a store. Cash incomes typically supplement and support subsistence activities, which have provided considerable nutritional and economic value for rural households for generations (SRB&A 2011b). Part-time work or commercial fishing can provide enough income to purchase tools for support of subsistence activities: boats, all-terrain vehicles, snowmachines, guns, ammunition, fishing nets, and other gear; as well as provide fuel for home and engines (see Section 3.3, Needs and Welfare of the People—Socioeconomics, for more information on cash incomes and socioeconomic conditions). Assigning a monetary valuation to subsistence harvests is difficult because most of the wild foods and resources are not for sale, and few store-bought items can match the nutritional and cultural values of wild fish, game, and plants. However, if families did not have subsistence resources, substitutes would need to be purchased (Fall and Kostick 2018).

The sharing of resources is a fundamental characteristic of the subsistence way of life. Sharing of subsistence foods in and between communities reinforces social bonds and helps recipients meet economic, material, and nutritional needs. For example, communities on the Nushagak River that harvest a lot of Chinook salmon might share or trade with relatives on the upper Kvichak River or Iliamna Lake who catch fewer Chinook salmon. Much of the sharing is generalized reciprocity, where food items are gifted without direct expectation for reciprocal returns. This is culturally fundamental among subsistence communities, because of the unpredictable prospects of relying on wild foods. Sharing is one method of adaptation for reducing risk among subsistence users (Hutchinson-Scarborough et al. 2020). The percentage of households giving and receiving subsistence resources for Iliamna, Newhalen, Pedro Bay, Nondalton, Igiugig, and Kokhanok is provided below. Information on other communities in the EIS analysis area is provided in Appendix K3.9. Sharing is an indicator of resilience of the culture to variations in household abilities to harvest and process wild foods (SRB&A 2011b).

A further indication of the importance of sharing practices in integrating communities is seen in the fact that some households are especially highly productive in their subsistence pursuits and

provide a particularly large proportion of all subsistence harvest in a community. Studies conducted by the Alaska Department of Fish and Game (ADF&G) Division of Subsistence have documented a pattern in Alaska Native communities where 30 percent of a community's households produce 70 percent of the community's total subsistence harvest in terms of edible weight (known as the 30-70 rule) (Wolfe et al. 2010). This pattern is consistent despite wide variation in community and household harvest profiles. The households that produce at a high level tend to be those with several older adult members who have access to cash and the necessary equipment; these households are typically successful in both the subsistence and cash sectors of the mixed economy. The extra subsistence foods produced by high-harvesting households are usually shared with elders, single mothers with young children, young couples, and other segments of the community, including vulnerable populations (ADF&G no date). Resources are shared widely through kinship and friendship relationships, among households in the community, and in other communities in Alaska, including Anchorage and other urban centers. The 30-70 rule also illustrates the specialization in production of wild foods in the subsistence sector; particular individuals or individual households may benefit from technological ability, financial resources, or traditional knowledge. For example, although nearly all households participate in the harvest of salmon in the study area communities, there are a smaller number of individuals who have the equipment, expertise, and time necessary to harvest certain resources (e.g., moose). Therefore, a relatively small group of hunters meet the community need for moose meat through long-established sharing patterns.

Subsistence activities take place on federal, state, and private land, including Native Allotments and lands owned by Alaska Native corporations. Native Allotments are owned by individuals; many were originally selected by Alaska Native people for their importance to subsistence activities (e.g., fish camp sites) (BIA 2019). Subsistence activities in Alaska are regulated by both the federal and state governments. The Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, gives "rural" Alaskans priority for subsistence harvest of fish and wildlife on federal public lands and waters. The multi-agency Federal Subsistence Board is the decision-making body that regulates subsistence hunting and fishing on federal lands and waters, with technical support from the US Fish and Wildlife Service (USFWS) Office of Subsistence Management. There would be no project components on federal lands where the subsistence management provisions of ANILCA would apply (see Section 3.2, Land Ownership, Management, and Use); however, federal fisheries regulations do apply in the Kvichak/Iliamna-Lake Clark drainage, and federal hunting regulations apply on lands managed by the National Park Service and the Bureau of Land Management. Although project activities would take place primarily on State and Native corporation lands, fish and wildlife in other jurisdictions may be impacted.

On state and private lands and waters, including those affected by the project, all Alaskans are qualified to harvest subsistence resources since the 1989 Alaska Supreme Court *McDowell* decision. With technical support of the ADF&G, the Alaska Board of Fisheries and the Board of Game have ultimate decision-making responsibility for hunting and fishing on lands in the state jurisdiction.

Harvest of certain species is also regulated by additional laws such as the Marine Mammal Protection Act (MMPA) and the Migratory Bird Treaty Act (MBTA); therefore, these species are managed by different federal agencies. Pacific halibut and most marine mammals are managed by the National Marine Fisheries Service (NMFS). Sea otter and walrus are managed by the USFWS. Migratory birds are jointly managed by state and federal governments and a co-management body representing eligible Alaska Native tribes.

This section focuses primarily on the communities of Iliamna, Newhalen, Pedro Bay, Nondalton, Igiugig, and Kokhanok, and are referred to in this section as the six communities closest to project

infrastructure. Additional information related to these six communities, as well as information on another 13 communities in the EIS analysis area, can be found in Appendix K3.9.

3.9.1 Traditional Ecological Knowledge

The detailed results of a study done by Stephen R. Braund & Associates (SRB&A), in coordination with the ADF&G, are documented in SRB&A (2011b). Methods included conducting systematic household surveys and mapping interviews to update harvest data and subsistence use area maps. The study also documented traditional knowledge on “changes in resource use, abundance, quality, distribution, and migration,” as well as other factors like climate change and development projects (SRB&A 2011b). The data (tables, charts, and maps) used to determine the environmental baseline for this section reflect the findings of this study, and a subsequent data review of the six communities closest to project infrastructure, performed by SRB&A in 2018. Traditional ecological knowledge (TEK) and the cultural value of subsistence as a lifestyle, as described by Boraas and Knott (2013), were also reviewed during development of this section. Boraas and Knott concluded, based on elder and culture-bearer interviews, that this lifestyle has built strong networks of connected extended families in the Nushagak and Kvichak drainages based on sharing, traditional knowledge, and a respect for the environment, with salmon and clean water as the foundation of culture. A summary of specific TEK comments from Boraas and Knott (2013) is provided in Appendix K3.1. TEK regarding areas of subsistence use and harvest data, processing and sharing, and how information is transmitted over generations are incorporated into the analysis of Section 4.9, Subsistence. Scoping comments related to TEK were also considered in the analysis of impacts in Section 4.9, Subsistence, and are summarized in Appendix K3.1.

3.9.2 Seasonal Round

Subsistence users harvest a wide variety of resources throughout the year, and they often target specific species during certain seasons of the year, following a cyclical harvest pattern called the “seasonal round.” In general, communities in southwest Alaska share a similar seasonal round, with some variations depending on the area, available resources, and applicable hunting and fishing regulations. For example, coastal, lakeside, and riverside communities each rely on a somewhat different mixture of subsistence resources. Non-salmon fish are harvested throughout the year. Freshwater seals are also available throughout the year; however, many subsistence users prefer to harvest freshwater seals at pressure cracks in the lake ice from March through May. In the spring, migratory birds, gull and waterfowl eggs, and Chinook salmon are harvested. Sockeye salmon are targeted in the spring or summer, depending on the run timing in different areas. Other salmon species, marine invertebrates, and green plants are harvested in summer. In late summer and into fall, spawning sockeye salmon and berries are harvested. During fall, subsistence users harvest migratory birds and upland game birds (grouse and ptarmigan); however, ptarmigan are harvested year-round in Dillingham. Some hunters also like to hunt freshwater seals in the fall, which is when hunters said seals appear most often in the Kvichak River. Moose and caribou hunting typically occur in fall and/or winter. Caribou hunting during August through October is mostly done opportunistically in conjunction with moose hunting along the rivers traveled by subsistence users searching for moose. The coldest part of winter is the best time to harvest small, furbearing mammals. Hunting efforts targeting caribou specifically usually occur in February through April, when snow conditions are good for overland travel by snowmachines and daylight hours are longer; however, recent warmer winters and earlier spring thaws have made the annual timing of spring caribou hunts more unpredictable, and access to caribou hunting more challenging (Fall et al. 2006; Krieg et al. 2009; Holen et al. 2011, 2012; Evans et al. 2013; Burns et al. 2016; Van Lanen et al. 2018). The general gathering cycle of when harvests occur in the six communities closest to project infrastructure is shown in Table 3.9-1.

Table 3.9-1: Generalized Seasonal Round of Subsistence Activities, Project Area Communities

Resource	Winter					Spring		Summer			Fall	
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Sockeye (red) salmon												
Chinook (King) salmon												
Dolly Varden												
Grayling												
Lake trout												
Whitefish												
Northern pike												
Seal												
Moose												
Caribou												
Black bear												
Brown bear												
Dall sheep												
Hare												
Porcupine												
River Otter												
Red fox												
Lynx												
Beaver												
Ptarmigan												
Spruce Grouse												
Ducks/ Geese												
Bird Eggs												
Clams												
Berries												
Other green plants												

Notes:

gray = occasional harvest; black = usual harvest

Seasonal harvest is generalized for these communities, and patterns may differ slightly from community to community

Source: SRB&A 2011b

Residents of Cook Inlet communities (i.e., Ninilchik and Seldovia) harvest many of the same resources at the same times of year as southwest Alaska communities, with some variations. In spring, green plants, mushrooms, and kelp are harvested. In summer, subsistence users gather berries, greens, marine invertebrates, and seaweed. The moose-hunting season occurs in late summer to early fall. During fall and winter, the residents hunt for upland game birds. Winter is the typical time for gathering firewood (Jones and Kostick 2016).

Subsistence hunters have observed that habitat change in southwest Alaska is affecting the Mulchatna caribou herd harvest in the Iliamna Lake and Bristol Bay areas (Van Lanen 2018). Many respondents said that the herd has moved away from these areas, and caribou hunting often requires traveling too far to make harvest worthwhile; moose are closer and more easily accessible. Hunters have adapted to changes in species availability by switching to greater reliance on increasing numbers of moose, rather than the more difficult to access caribou. Moose harvest data have verified local knowledge observations that habitat change is occurring, which benefits moose. It was reported that since the late 1990s, moose harvests by local residents have increased significantly in the southern portion of game management units (GMUs) 9B, 9C, and 17; and during the current decade, in the western portion of GMU 18. Increasing range expansion of moose in Alaska's tundra areas has been linked to warming, and has increased the shrub habitat (willows) that moose prefer (Tape et al. 2016). Changing winter conditions and more recent low snow and ice conditions are creating challenges in terms of access via snowmachine travel for winter caribou and moose hunting, and efforts focus on the fall season instead of the winter season.

3.9.3 Subsistence Harvest Patterns by Community

Construction and operations would primarily affect the subsistence areas of six Iliamna Lake communities near the mine site, transportation corridor, and port site. This section summarizes the most recent available comprehensive subsistence harvest surveys for the six communities near Iliamna Lake that would be most likely to be impacted by the project. Most of these surveys were conducted more than 10 years ago, and each covers a single calendar year; however, they are high-quality studies with consistent methods across all communities, and offer a good basis for comparison among different communities. The age of the data does introduce uncertainties, and there may be some instances of change in harvest areas in the subsequent years. For information on traditional use areas, refer to Section 3.7, Cultural Resources. Subsistence use areas vary somewhat from year to year based on environmental conditions and the availability of resources. Subsistence information collected from previous years has been compiled by SRB&A (2011b) and incorporated to supplement the 1-year comprehensive harvest data. Harvest area maps for each of the six Iliamna Lake communities are provided. Supplementary harvest area maps for these six communities by subsistence resource category (e.g., salmon, non-salmon fish, large land mammals) are provided in Appendix K3.9. A summary of the subsistence harvest surveys for other communities in the project area and nearby watersheds is provided in Appendix K3.9. The results are organized geographically from the communities closest to the project around Iliamna Lake, followed by more distant communities down the Kvichak River drainage, across to the Nushagak River drainage, and two Cook Inlet communities. Study years range from 1998 to 2014, depending on the community. Communities with older (e.g., Homer with a study year of 1982) or unavailable (e.g., Happy Valley, Anchor Point) comprehensive harvest data were not included. Data available through ADF&G technical papers and the ADF&G Community Subsistence Information System were reviewed and incorporated into this analysis.

Table 3.9-2 shows subsistence harvest amounts by community for eight subsistence resource categories. These eight categories (i.e., salmon, non-salmon fish, large land mammals, small land mammals, marine mammals, birds and eggs, marine invertebrates, and plants and fungi) are the same categories used by the ADF&G in their comprehensive subsistence surveys reports. The six Iliamna Lake communities show a particularly high level of reliance on salmon. Annual per-capita (i.e., per year-round resident) harvests of salmon ranged from 205 pounds in Igiugig to 513 pounds in Kokhanok. In another indicator of high reliance, for example, salmon represent 79 percent of total subsistence harvest for Iliamna, and 73 percent for Newhalen. Additional information is shown on species diversity and proportions of total harvest in subsequent community accounts.

Sockeye salmon is the most important subsistence species for Kvichak watershed residents. Table 3.9-3 shows the subsistence harvest of sockeye salmon for communities in the Kvichak River drainage from 1997 to 2016. In that timeframe, the largest subsistence harvest of sockeye salmon in terms of the total number of fish was in 1997, and the smallest harvest was in 2016. The subsistence harvest of sockeye salmon has decreased over the past 20 years. The most recent 10-year average (2007-2016) was lower than the previous 10-year average by 6 percent (ADF&G 2018m).

Fish camps have deep cultural and social significance; often considered the peak social gathering of the year, fish camps are where many families pass on traditional skills and values, and where individual and community identity is reaffirmed (Deur et al. 2018). Salmon harvesting also provides an important cultural context for applying, sharing, and learning traditional skills and knowledge. Whether based in fish camps, as in Nondalton, or at processing sites near people's homes, as in Newhalen and Iliamna, subsistence fishing and processing promotes the health and well-being of the community through cooperation and interdependence (Fall et al. 2010).

Compared to salmon, EIS analysis area communities have smaller harvest amounts for non-salmon fish; although it is important to note that these fish are often taken throughout the year, providing a fresh food resource during winter months. Harvest levels of large land mammals, such as moose and caribou, are also smaller, although they too play an important role in subsistence food diversity.

Subsistence use areas represent another important dimension of subsistence activities. Communities have subsistence use areas that have been harvested on for generations, and represent a sophisticated cumulative body of knowledge about where animals in prime condition are likely to be available throughout the year. Subsistence search and harvest areas for some species are relatively constant, such as salmon fishing areas; while use areas for other species, such as moose, caribou, and furbearers, would vary with changes in abundance and distribution. Harvest patterns are dynamic and strategic, because subsistence users concentrate their efforts in areas with current abundance and distribution of resources that are likely to be productive. In addition, traditional place names identify significant locations and further indicate the long-term use patterns (see Section 3.7, Cultural Resources). Figure 3.9-1 shows the combined subsistence use areas from 1996/1997 through 2005/2006 for 12 communities in the EIS analysis area (Iliamna, Newhalen, Pedro Bay, Nondalton, Igiugig, Kokhanok, Port Alsworth, Koliganek, Levelock, New Stuyahok, Ekwok, and Portage Creek) in relation to project infrastructure. Subsistence users search for and harvest resources over broad areas, and may travel great distances via snowmachine, all-terrain vehicle, and boat.

Table 3.9-2: Estimated Per Capita Subsistence Harvests in Edible Weight (lbs.) by Community for the Most Recent Study Years

Community	Year	All Resources	Salmon	Non-Salmon Fish	Large Land Mammals	Small Land Mammals	Marine Mammals	Birds and Eggs	Marine Invertebrates	Plants and Fungi
Iliamna	2004	469.4	370.1	34.1	32.1	0.6	6.5	4.4	1.6	20.0
Newhalen	2004	691.5	502.2	31.8	101.3	3.1	4.4	16.2	2.5	30.0
Pedro Bay	2004	305.5	250.3	15.3	30.0	0.0	0.0	2.9	0.0	6.9
Nondalton	2004	357.7	219.4	33.9	74.4	7.4	0.0	3.8	0.4	18.4
Igiugig	2005	542.0	205.2	59.4	202.9	4.9	29.2	11.8	0.0	28.5
Kokhanok	2005	679.6	512.8	36.3	94.4	1.5	1.7	7.8	0.5	24.6
Port Alsworth	2004	132.8	89.0	12.0	23.4	1.3	0.0	1.6	1.1	4.4
Koliganek	2005	898.5	564.7	90.4	177.9	8.3	0.0	9.1	0.0	48.1
Levelock	2005	526.7	151.8	39.9	251.9	5.5	37.7	14.7	2.9	22.3
New Stuyahok	2005	389.2	188.3	28.0	138.8	4.6	0.0	6.2	0.2	23.0
King Salmon	2007	313.0	255.7	5.3	34.5	2.1	0.4	6.7	3.9	4.3
Naknek	2007	264.2	177.4	18.1	32.0	0.6	12.9	3.4	4.6	15.1
South Naknek	2007	267.5	200.8	8.1	7.1	0.6	21.1	1.2	3.6	25.0
Aleknagik	2008	296.0	143.4	25.6	63.5	2.6	9.5	12.6	0.3	38.5
Clark's Point	2008	1,210.1	637.2	33.8	209.1	15.4	127.1	53.0	2.3	132.1
Manokotak	2008	298.4	135.0	43.7	44.5	3.1	14.7	17.3	4.7	35.4
Dillingham	2010	212.1	130.6	7.3	49.4	2.2	4.4	5.7	1.1	11.4
Ninilchik	1998	163.8	42.5	38.3	65.6	0.5	0.0	1.43	11.0	1.0
Seldovia	2014	138.3	47.5	36.0	17.2	<0.1	1.1	0.9	5.5	30.0

Note:

The first six communities listed are those closest to the project. Small mammals harvested but not typically eaten are excluded from edible weight estimates. The marine mammals category includes saltwater and freshwater seals.

Sources: Fall et al. 2006; Krieg et al. 2009; Holen et al. 2011, 2012; Evans et al. 2013; Jones and Kostick 2016

Table 3.9-3: Subsistence Harvest of Sockeye Salmon by Community, in Number of Fish, Kvichak River Drainage, 1997-2016

Year	Levelock	Igiugig	Pedro Bay	Kokhanok	Iliamna-Newhalen ¹	Nondalton	Port Alsworth	Other ²	Total
1997	1,062	2,067	5,501	8,722	19,513	17,194	2,348	3,101	59,508
1998	2,454	1,659	3,511	10,418	16,165	13,136	2,678	3,635	53,656
1999	1,276	1,608	5,005	10,725	14,129	17,864	4,282	2,834	57,723
2000	1,467	1,981	1,815	7,175	6,679	11,953	3,200	2,720	36,990
2001	908	779	2,118	9,447	8,132	7,566	1,958	1,901	32,808
2002	625	2,138	2,687	9,847	9,417	5,508	1,201	1,578	33,001
2003	737	1,081	2,135	9,771	13,824	8,016	1,370	1,591	38,495
2004	1,000	1,026	4,803	11,869	21,652	8,789	2,455	1,631	53,225
2005	914	1,017	4,162	16,801	12,010	8,824	2,457	2,078	48,263
2006	0	1,252	4,319	19,028	11,487	8,885	2,418	2,461	49,850
2007	102	1,803	5,487	15,105	11,453	7,902	3,211	2,410	47,473
2008	30	1,558	4,884	14,755	13,569	8,916	3,307	2,544	49,563
2009	759	1,457	7,802	15,759	9,871	5,709	3,155	2,260	46,772
2010	940	2,901	5,609	13,973	8,815	3,185	3,250	2,015	40,688
2011	933	1,931	3,898	9,895	15,433	7,947	4,026	1,163	45,226
2012	750	2,608	4,028	16,530	12,933	9,247	4,420	1,855	52,370
2013	984	345	3,971	13,392	7,632	10,550	3,377	2,305	42,556
2014	1,170	513	3,999	6,440	11,388	9,004	4,296	4,206	41,016
2015	398	1,153	2,519	8,098	9,691	8,722	6,588	2,207	39,377
2016	1,265	297	2,036	7,087	9,900	2,320	4,196	3,548	30,649
20-Year Average	881	1,459	4,014	11,742	12,185	9,062	3,210	2,402	44,960
1997-2006 Average	1,044	1,461	3,606	11,380	13,301	10,774	2,437	2,353	46,352
2007-2016 Average	733	1,457	4,423	12,103	11,069	7,350	3,983	2,451	43,569
2012-2016 Average	913	983	3,311	10,309	10,309	7,969	4,575	2,824	41,194

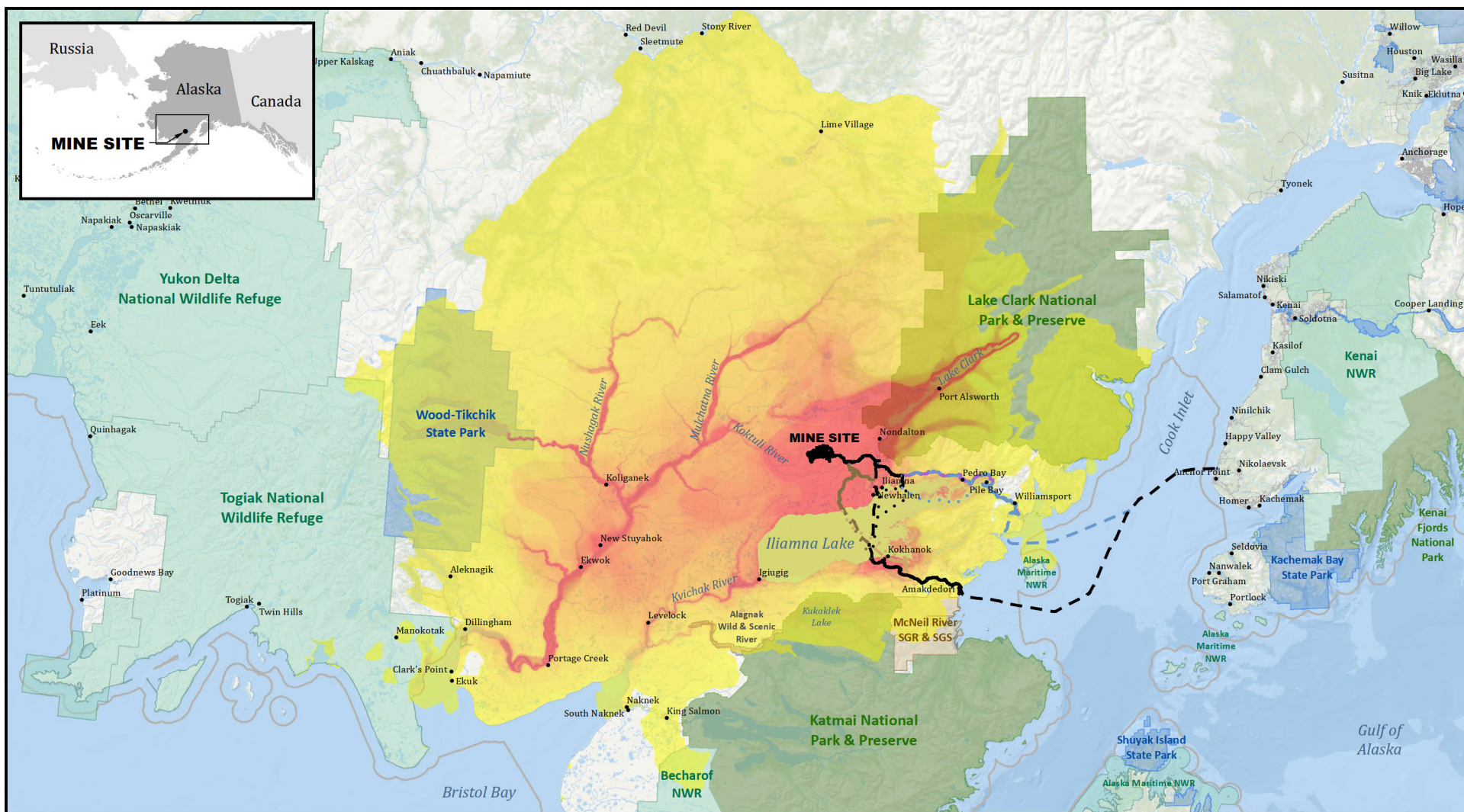
Notes:

Harvests are extrapolated over areas for all permits issued, based on those returned. Harvest estimates are based on community of residence and include fish caught only in the Naknek-Kvichak District

¹ Includes Chekok

² Subsistence harvests by non-Kvichak River watershed residents

Source: ADF&G 2018m



Sources: PLP 2020; ADNRC
Subsistence Use Areas by
Stephen R. Braund & Associates



**US Army Corps
of Engineers®**



10 0 10 20
Miles

Action Alternatives

- Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

Other Features

- Local Roads
- Three Nautical Mile Line
- National Park
- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

Overlapping Subsistence Use Areas
All Resources
12 Communities*
1996/97 - 2005/06
(SRB&A 2018)

*The 12 communities are Ekwok, Igiugig, Iliamna, Kokhanok, Koliganek, Levelock, New Stuyahok, Newhalen, Nondalton, Pedro Bay, Port Alsworth, and Portage Creek.

SUBSISTENCE USE AREAS

PEBBLE PROJECT EIS

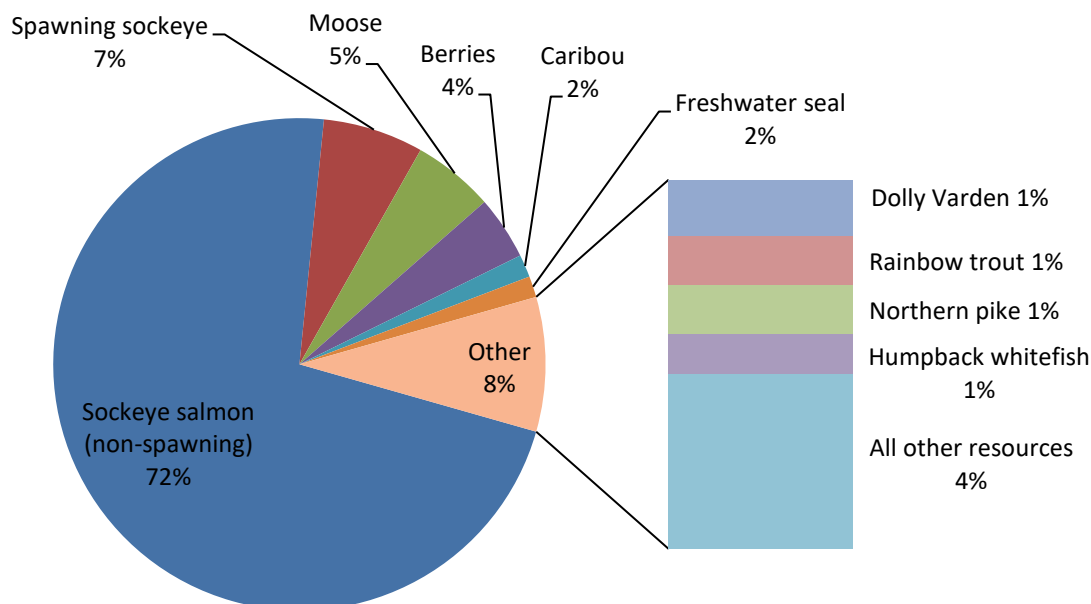
FIGURE 3.9-1

3.9.3.1 Iliamna

Iliamna was established at its current location on the northern shore of Iliamna Lake when the Dena'ina Athabascan community of Old Iliamna moved from the mouth of Iliamna River in 1935. Today, this majority Alaska Native community is a cultural mosaic of Dena'ina, Yupik, Alutiiq, and Euro-American peoples. In 2004, Iliamna had an estimated year-round population of 73 people in 22 households. Fall et al. (2006) surveyed households about their 2004 subsistence activities and found that Iliamna residents harvested an estimated total of 34,160 pounds (469 pounds per capita) of wild foods. Salmon dominated the subsistence production of Iliamna residents, as seen in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Iliamna residents in 2004 in terms of edible weight are shown in Figure 3.9-2.

In addition to pounds harvested per capita, another measure of a resource's importance is the percentage of households in the community that used the resource. In 2004, salmon was the most widely used resource category (100 percent of households), followed by non-salmon fish (92 percent), plants and fungi (85 percent), large land mammals (77 percent), birds and eggs (69 percent), and marine invertebrates (46 percent) (Fall et al. 2006). Sharing and distribution of subsistence foods extend widely across households. In 2004, 77 percent of Iliamna households received wild resources, and 54 percent of households gave resources away (Fall et al. 2006). Table 3.9-4 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested salmon, non-salmon fish, plants and fungi, and birds and eggs.

Figure 3.9-2: Composition of Iliamna Subsistence Harvest by Estimated Edible Weight, 2004



Note: The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall.
Source: Fall et al. 2006

Table 3.9-4: Iliamna Subsistence Harvest Estimates by Resource Category, 2004

Resource	Percent of Households					Estimated Edible Harvest ¹			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	54	77	34,160	1,553	469	100.0
Salmon	100	100	100	31	39	26,935	1,224	370	78.8
Non-Salmon Fish	92	77	77	31	39	2,478	113	34	7.3
Large Land Mammals	77	54	15	31	69	2,335	106	32	6.8
Small Land Mammals	31	31	23	8	15	44	2	1	0.1
Marine Mammals ²	31	31	23	23	8	474	22	7	1.4
Birds and Eggs	69	62	62	39	23	317	14	4	0.9
Marine Invertebrates	46	23	23	15	39	118	5	2	0.3
Plants and Fungi	85	85	85	23	31	1,459	66	20	4.3

Notes:

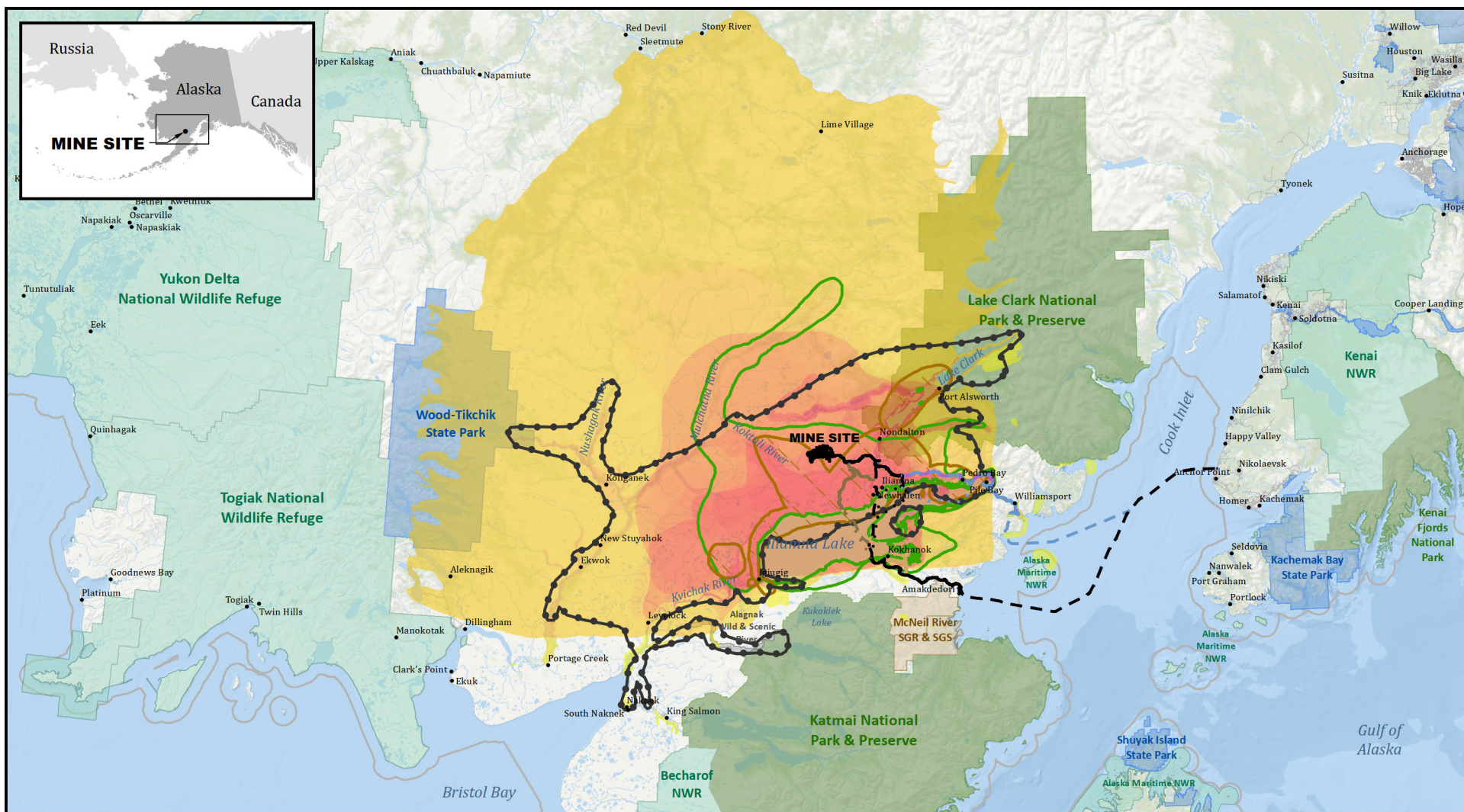
¹Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

²The marine mammals category includes saltwater and freshwater seals

Source: Fall et al. 2006

Trends in Iliamna subsistence harvest over time indicate that recent overall harvests and uses in 2004 were the same as the recent past, with some notable variations among uses of specific resources (Fall et al. 2006; SRB&A 2011b). Households reported changes in the uses of individual resources, with 46 percent reporting that their use of salmon had increased, while another 46 percent of households said their use of salmon stayed the same. Forty-two percent of households said they used fewer large land mammals in 2004 compared to recent years, while 50 percent said they used about the same (Fall et al. 2006). Survey respondents noted competition, weather, animal population changes, and personal reasons as explanations for changes in their use of these resources (Fall et al. 2006; SRB&A 2011b). Iliamna residents expressed concern that non-local hunters were overharvesting caribou from the Mulchatna caribou herd. They also observed that lichen had become too thin to support the formerly large herd near the Mulchatna River, and it may be a decade before they can return to this area (Fall et al. 2006).

Figure 3.9-3 illustrates the 1996/1997 to 2005/2006 overlapping subsistence search and harvest area for Iliamna in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals, and all resources for other time periods. The primary areas used are north and west of Iliamna Lake, extending around to Lake Clark and to the Koktuli and Stuyahok rivers, and over the flats to the Kvichak River. The Chulitna River (north of the mine site) and the islands in Iliamna Lake (near and to the east of the ferry routes) are high use areas. Hunting and harvesting occur along the Nushagak, Mulchatna, and Kvichak rivers. Iliamna residents travel along the lakeshore and rivers to harvest moose, caribou, waterfowl, and plants and berries. During the winter, inland use occurs for hunting and trapping small land mammals and furbearers, along with caribou, moose, and ptarmigan. Egg harvest, berry picking, and plant harvest occurs on the islands in Iliamna Lake (SRB&A 2018). Hunters from Iliamna harvest freshwater seals in the northeastern portion of Iliamna Lake in the waters around Rabbit Island, Eagle Bay, Triangle Island, Flat Island, Knutson Bay, the mouth of Chekok Creek, Porcupine Island, and two different islands referred to as “seal island” (Burns et al. 2016). Boats, snowmachines, and all-terrain vehicles (ATV) were the most common method of travel; there is a direct snowmachine route across Iliamna Lake between Iliamna and Kokhanok (PLP 2018-RFI 088). Although whitefishes are not widely abundant in the vicinity of Iliamna, residents reported receiving whitefishes from family and friends, or traveling to harvest (Hazell et al. 2015).



Sources: PLP 2020; ADNIR
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Action Alternatives

- Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

Other Features

- Local Roads
- Three Nautical Mile Line
- National Park
- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

- Large Land Mammals, 1980-2002 (Holen et al., 2005)
- All Resources, 2004 (Fall et al., 2006)
- All Resources, 1960-82 (Wright, Morris, and Schroeder, 1985)

- Overlapping Subsistence Use Areas All Resources 1996/97 - 2005/06 (SRB&A 2018)

SUBSISTENCE USE AREAS, ALL RESOURCES - ILIAMNA

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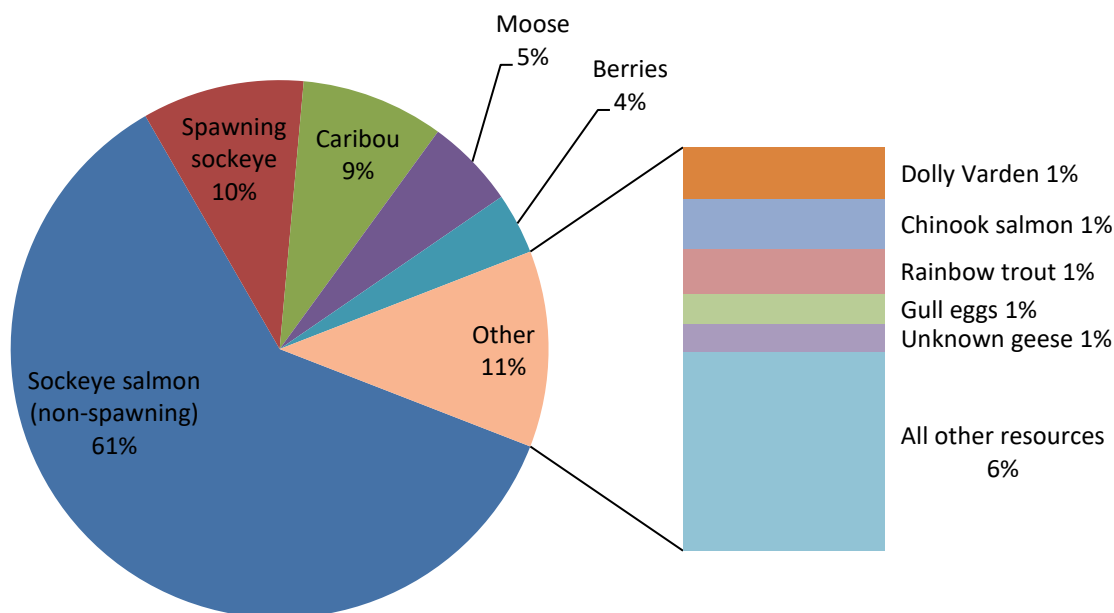
FIGURE 3.9-3

3.9.3.2 Newhalen

The Yup'ik village of Noghelingamiut was listed on the 1890 census in the location of present-day Newhalen at the mouth of Newhalen River on Iliamna Lake. Today, Newhalen is a predominantly Yup'ik community, but is also home to Alutiiq, Dena'ina, and Euro-American peoples. In 2004, Newhalen had an estimated year-round population of 125 people in 39 households. Newhalen residents were highly productive in subsistence activities, harvesting an estimated total of 86,607 pounds (692 pounds per capita) of wild foods in 2004. Salmon dominated the subsistence harvests, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Newhalen residents in 2004 in terms of edible weight are shown in Figure 3.9-4.

Household participation in subsistence activities was very high. Salmon was the most widely used resource category (100 percent of households), followed by plants and fungi (92 percent), birds and eggs (92 percent), large land mammals (92 percent), non-salmon fish (88 percent), marine invertebrates (56 percent), and marine mammals (52 percent). Sharing and distribution of subsistence foods extend widely across households. In 2004, 96 percent of Newhalen households received wild resources, and 80 percent of households gave resources away (Fall et al. 2006). Table 3.9-5 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested salmon, plants and fungi, non-salmon fish, and birds and eggs.

Figure 3.9-4: Composition of Newhalen Subsistence Harvest by Estimated Edible Weight, 2004



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall.

Source: Fall et al. 2006

Table 3.9-5: Newhalen Subsistence Harvest Estimates by Resource Category, 2004

Resource	Percent of Households					Estimated Edible Harvest ¹			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	80	96	86,607	2,794	692	100.0
Salmon	100	92	92	64	32	62,890	2,029	502	72.6
Non-Salmon Fish	88	88	88	52	56	3,980	128	32	4.6
Large Land Mammals	92	52	44	60	76	12,693	409	101	14.7
Small Land Mammals	32	28	28	20	20	392	13	3	0.5
Marine Mammals ²	52	32	24	36	32	556	18	4	0.6
Birds and Eggs	92	84	84	52	56	2,032	66	16	2.3
Marine Invertebrates	56	36	36	16	20	313	10	3	0.4
Plants and fungi	92	92	92	60	28	3,752	121	30	4.3

Notes:

¹Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers).

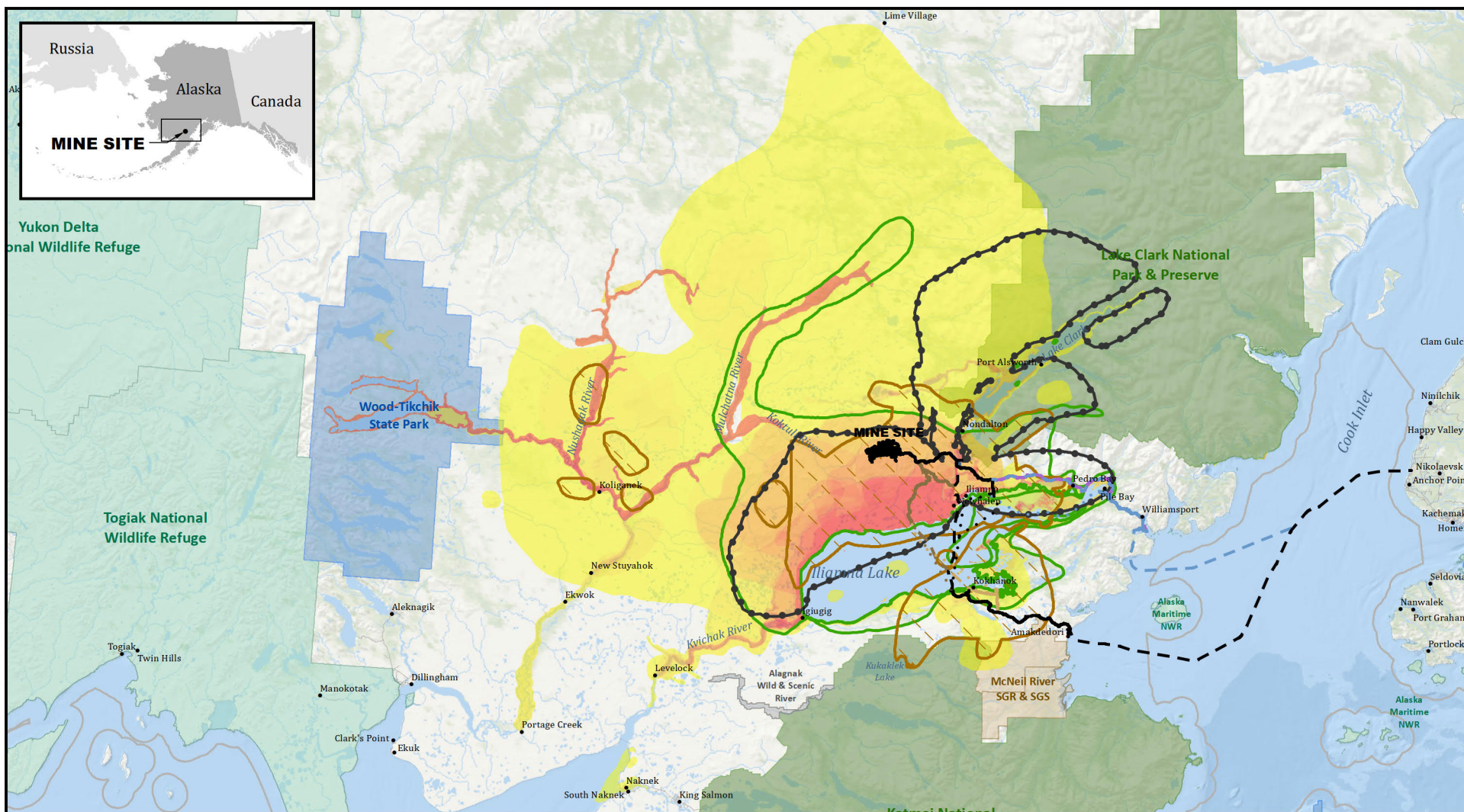
²The marine mammals category includes saltwater and freshwater seals.

Source: Fall et al. 2006

Trends in Newhalen subsistence harvest over time indicate that overall harvests were similar across all study years. Sockeye salmon, spawning sockeye salmon, and caribou were the top three harvested resources. Most Newhalen households reported that their harvest and use of wild resources in 2004 was about the same as in the preceding 5 years, although many households said they used fewer furbearers and large land mammals in recent years (Fall et al. 2006). Changes in resource populations have caused lower harvests in 2004, especially for large land mammals. A majority (61 percent) of respondents that reported reduced uses of at least one subsistence resource category cited personal reasons (such as having more cash employment, which reduced time available to participate in subsistence activities) as the cause. Newhalen residents expressed similar concerns as Iliamna residents that overharvesting from non-local hunters and thinning lichen are reducing the Mulchatna caribou herd (Fall et al. 2006).

Despite whitefishes not being widely available locally, 85 percent of households noted that they typically use whitefishes (Hazell et al. 2015).

Figure 3.9-5 illustrates the 1996/1997 to 2005/2006 overlapping subsistence search and harvest areas for Newhalen in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals, and all resources for other time periods. Harvest areas extend from Lime Village to Naknek, and from Tikchik Lakes to the eastern edges of Lake Clark and Iliamna Lake, with some use in Cook Inlet. The primary areas of overlapping use are near the Newhalen, Kvichak, Nushagak, and Mulchatna river drainages for hunting of caribou, moose, waterfowl, and other game; and also for fish, berries, and plants in the summer and fall. Overlapping use areas occur inland, close to the community, along the northwestern shore of Iliamna Lake across the mine access road and north ferry terminal, and toward Nondalton and the eastern shoreline (SRB&A 2018). The primary means of travel are via snowmachine, boat, ATV, and truck. Hunters from Newhalen harvest freshwater seals in the northeastern portion of Iliamna Lake in waters west of Porcupine Island and the waters surrounding Flat Island, Triangle Island, two different islands referred to as "seal island," Rabbit Island, Eagle Bay, Eagle Bay Island, Tommy Point, Tommy Islands, Squirrel Point, and Knutson Bay (Burns et al. 2016). Travel routes to access resources were close to the Iliamna Lake shoreline, and there is a direct route across Iliamna Lake between Newhalen and Big Mountain, and a similar direct route from Newhalen to Kokhanok (PLP 2018-RFI 088).



Sources: PLP 2020; ADNRC
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Action Alternatives

- Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

Other Features

- Local Roads
- Three Nautical Mile Line
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- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

■ Large Land Mammals, 1980-2002
(Holen et al., 2005)

■ All Resources, 2004
(Fall et al., 2006)

■ All Resources, 1960-82
(Wright, Morris, and Schroeder, 1985)

■ Overlapping Subsistence Use Areas
All Resources
1996/97 - 2005/06
(SRB&A 2018)

SUBSISTENCE USE AREAS, ALL RESOURCES - NEWHALEN

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FIGURE 3.9-5

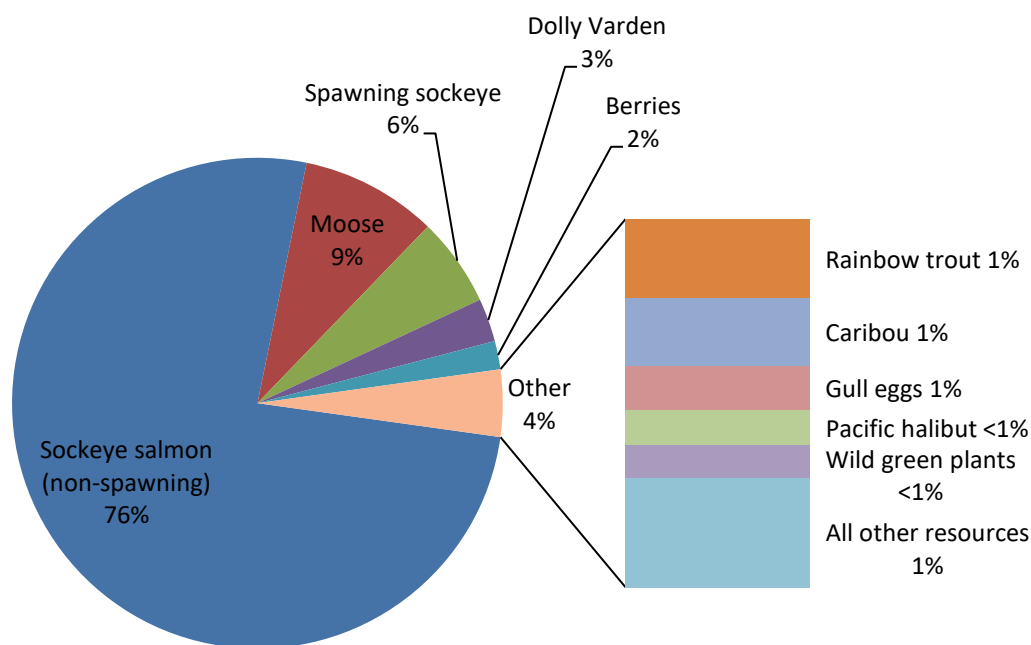
3.9.3.3 Pedro Bay

Pedro Bay is a Dena'ina Athabascan community at the eastern end of Iliamna Lake. In 2004, Pedro Bay had an estimated year-round population of 69 in 21 households. Pedro Bay residents harvested an estimated total of 21,026 pounds (306 pounds per capita) of wild food in 2004. Salmon dominated the subsistence production of Pedro Bay residents, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Pedro Bay residents in 2004 in terms of edible weight are shown in Figure 3.9-6.

Salmon, as well as plants and fungi, were the most widely used resource categories (100 percent of households), followed by birds and eggs (94 percent), non-salmon fish (89 percent), and large land mammals (78 percent). Sharing and distribution of subsistence foods was widespread. In 2004, all Pedro Bay households received wild resources and almost all (89 percent) households gave resources away (Fall et al. 2006). Table 3.9-6 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested plants and fungi, salmon, birds and eggs, and non-salmon fish.

Trends in Pedro Bay's overall subsistence harvest over time indicate that they remained relatively unchanged over the study years. Salmon accounted for the majority of the total harvest, and large land mammals and non-salmon fish contribute to the yearly subsistence harvest. Pedro Bay residents described sociocultural changes that were affecting harvest patterns. People have stopped harvesting smaller land mammals (e.g., beaver, snowshoe, and porcupine) as a food source as the community loses elders and there is less demand. Additionally, people were not spending as much time on subsistence activities because wage labor increased and caused people to spend less time hunting and fishing for subsistence. Residents reported that Dolly Varden in the Iliamna River were being overharvested by the sport fishery and that motorized boats were disturbing stream habitat. They observed that moose were being adversely affected by increased populations of wolves and bears (Fall et al. 2006).

Figure 3.9-6: Composition of Pedro Bay Subsistence Harvest by Estimated Edible Weight, 2004



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall.
Source: Fall et al. 2006

Table 3.9-6: Pedro Bay Subsistence Harvest Estimates by Resource Category, 2004

Resource	Percent of Households					Estimated Edible Harvest ¹			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	89	100	21,026	1,001	306	100.0
Salmon	100	89	83	72	78	17,232	821	250	82.0
Non-Salmon Fish	89	61	61	39	83	1,053	50	15	5.0
Large Land Mammals	78	72	22	22	61	2,065	98	30	9.8
Small Land Mammals	11	6	6	6	6	0	0	0	0.0
Marine Mammals ²	0	11	0	0	0	0	0	0	0.0
Birds and Eggs	94	72	67	44	61	198	9	3	0.9
Marine Invertebrates	28	0	0	11	28	0	0	0	0.0
Plants and Fungi	100	100	100	56	50	478	23	7	2.3

Notes:

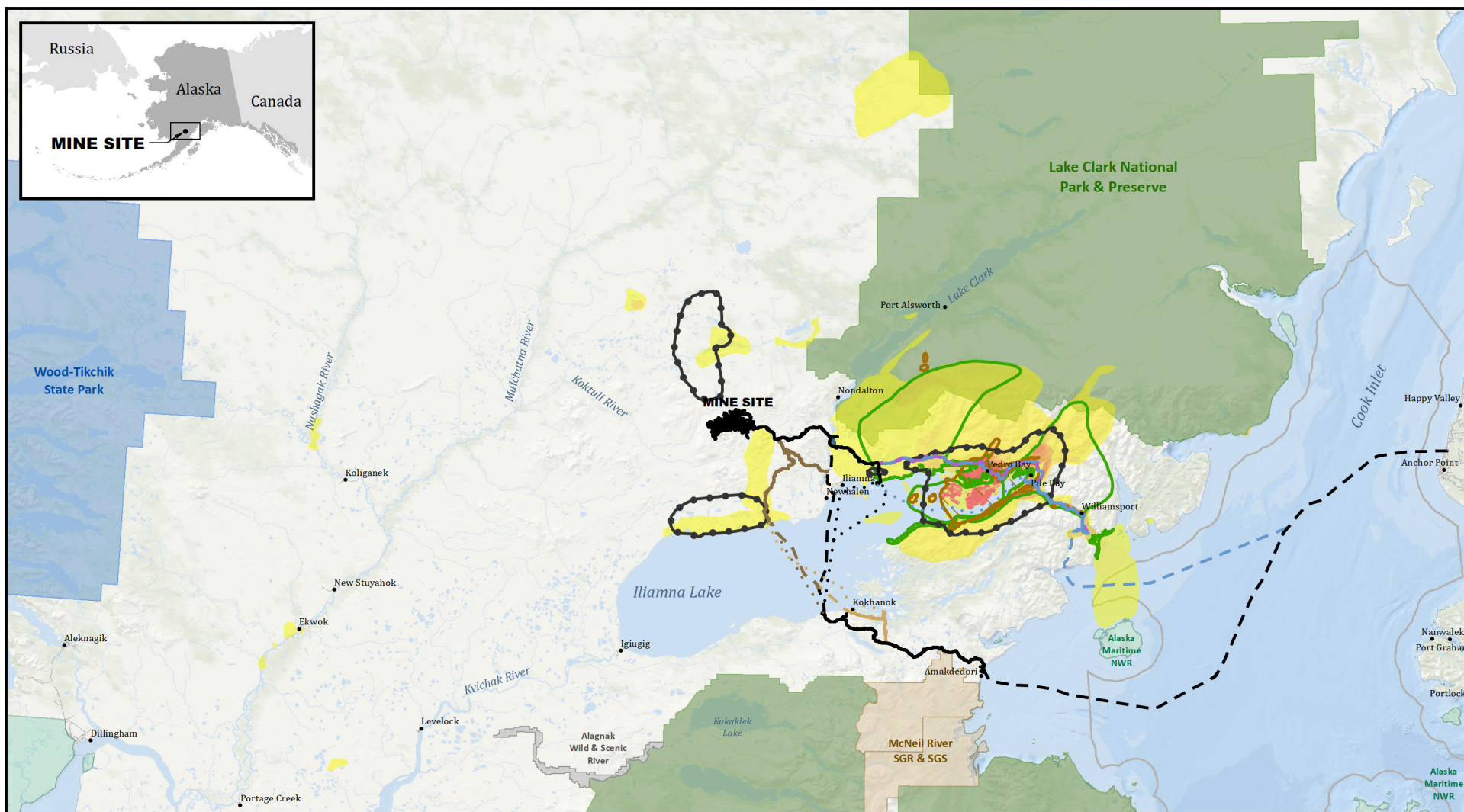
¹Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

²The marine mammals category includes saltwater and freshwater seals

Source: Fall et al. 2006

Changes have also occurred in the years since the 2004 subsistence survey that may be impacting the subsistence harvest patterns in Pedro Bay. In 2010, the public school in Pedro Bay closed due to the loss of State funding as a result of low enrollment. School closures can lead to declining services and declining economic opportunities, which can lead to population declines (LPB 2012). Declines in population could result in a reduction in the overall subsistence harvest for the community, while the loss of the jobs at the school could have resulted in an increase in time to participate in subsistence activities, as well as a reduction in cash income to spend on fuel and equipment.

Figure 3.9-7 illustrates the 1996 to 2005 overlapping subsistence search and harvest area for Pedro Bay in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. Pedro Bay subsistence use areas are concentrated on the eastern end of Iliamna Lake and across the transportation and pipeline corridors for Alternative 2—North Road and Ferry with Downstream Dams, and Alternative 3—North Road Only. Lower-use areas extended to near Upper and Lower Talarik creeks and along the Chulitna, Mulchatna, and Nushagak rivers. Use areas extend toward Iliamna near Tazimina Lakes and east to Cook Inlet. The highest numbers of overlapping use areas are close to Pedro Bay and along the coast to the Iliamna River for moose, other large land mammals, furbearers, small land mammals, waterfowl upland birds, berries, and plants (SRB&A 2018). Flat and Porcupine islands were the prime harvesting locations for moose, seal, waterfowl, berries, and plants (Fall et al. 2006). In addition, hunters from Pedro Bay harvest freshwater seals in the waters and ice pressure cracks around Pedro Bay, the Little Chutes and Big Chutes near Pedro Bay, and Lonesome Bay (Burns et al. 2016). Salmon and trout are taken in overlapping use areas near the community and near Pile Bay. Pedro Bay residents do not travel far to harvest sockeye salmon; they harvest “bright” or non-spawning sockeye in the bays of Iliamna Lake, and spawning sockeye in the rivers, streams, and fish ponds above the lake (Fall et al. 2006). Travel routes to access subsistence areas were reported to extend west along the lake to Dillingham, and east to Pile Bay and to Williamsport (PLP 2018-RFI 088).



Sources: PLP 2020; ADNRS
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Action Alternatives

- Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

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Other Features

- Local Roads
- Three Nautical Mile Line
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- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

- Large Land Mammals, 1980-2002 (Holen et al., 2005)
- All Resources, 2004 (Fall et al., 2006)
- All Resources, 1960-82 (Wright, Morris, and Schroeder, 1985)

- Overlapping Subsistence Use Areas All Resources 1996-2005 (SRB&A 2018)

SUBSISTENCE USE AREAS, ALL RESOURCES - PEDRO BAY

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FIGURE 3.9-7

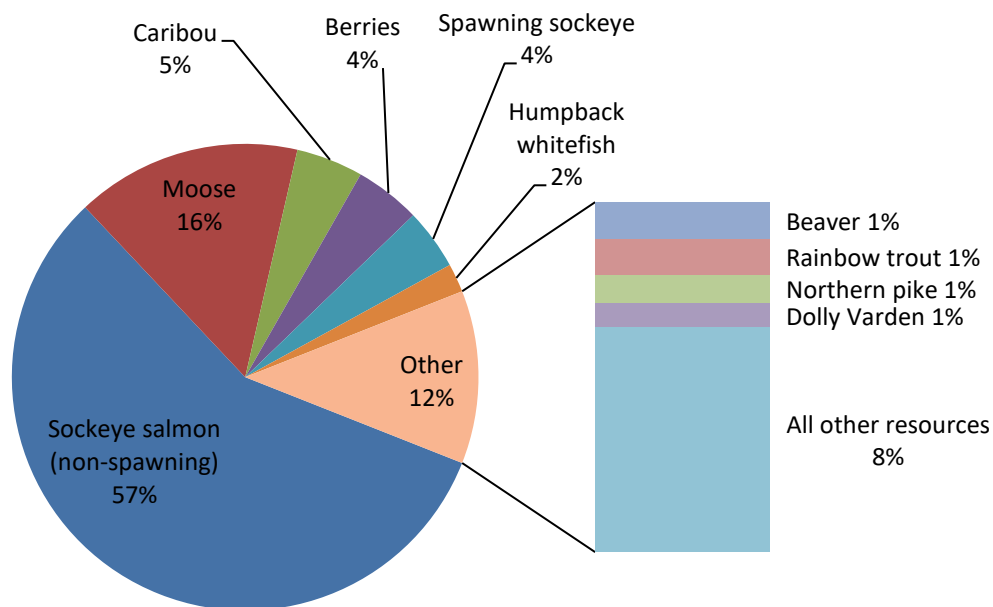
3.9.3.4 Nondalton

Nondalton is a primarily Dena'ina community on Sixmile Lake. In 2004, Nondalton had an estimated year-round population of 164 people in 43 households. In 2004, Nondalton residents pursued a diverse range of productive subsistence activities, and harvested a total of 58,686 pounds (358 pounds per capita) of wild food (Fall et al. 2006). Salmon dominated the subsistence production of Nondalton residents, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Nondalton residents in 2004 in terms of edible weight are shown in Figure 3.9-8.

Plants and fungi was the most widely used resource category (97 percent of households) followed by salmon (92 percent), large land mammals (84 percent), non-salmon fish (82 percent), small land mammals (58 percent), and birds and eggs (50 percent). Sharing and distribution of subsistence foods was widespread. In 2004, 97 percent of Nondalton households received wild resources, and 92 percent of households gave resources away (Fall et al. 2006). Table 3.9-7 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2004. Most households tried for and harvested plants and fungi, salmon, non-salmon fish, and small land mammals.

Trends in Nondalton subsistence harvest over time indicate that the estimated harvest in 2004 was lower than in previous study years. Nondalton residents cited changes in animal populations as the primary explanation for reduced harvests in at least one resource category. Other factors for harvesting less were personal reasons and poor or unusual weather. Survey participants commented that caribou numbers have declined, affecting subsistence resources, and that locals could not compete with non-local hunters. They also noticed that disturbance from helicopter traffic causes the caribou herd to move farther away, and they were seeing a trend of overharvest of caribou and moose by non-locals (Fall et al. 2006).

Figure 3.9-8: Composition of Nondalton Subsistence Harvest by Estimated Edible Weight, 2004



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall
Source: Fall et al. 2006

Table 3.9-7: Nondalton Subsistence Harvest Estimates by Resource Category, 2004

Resource	Percent of Households					Estimated Edible Harvest ¹			Percent of Total Edible Harvest
	Use	Try to Harvest	Harvest	Give	Receive	Total Pounds	Average Household Pounds	Per Capita Pounds	
All Resources	100	97	97	92	97	58,686	1,365	358	100.0
Salmon	92	87	87	55	63	36,005	837	219	61.4
Non-Salmon Fish	82	76	76	53	45	5,562	129	34	9.5
Large Land Mammals	84	45	26	47	79	12,210	284	74	20.8
Small Land Mammals	58	50	50	45	21	1,207	28	7	2.1
Marine Mammals ²	8	3	0	0	8	0	0	0	0.0
Birds and Eggs	50	47	47	40	24	624	15	4	1.1
Marine Invertebrates	13	8	8	3	13	66	1.5	0.4	0.1
Plants and Fungi	97	92	92	55	40	3,012	70	18	5.1

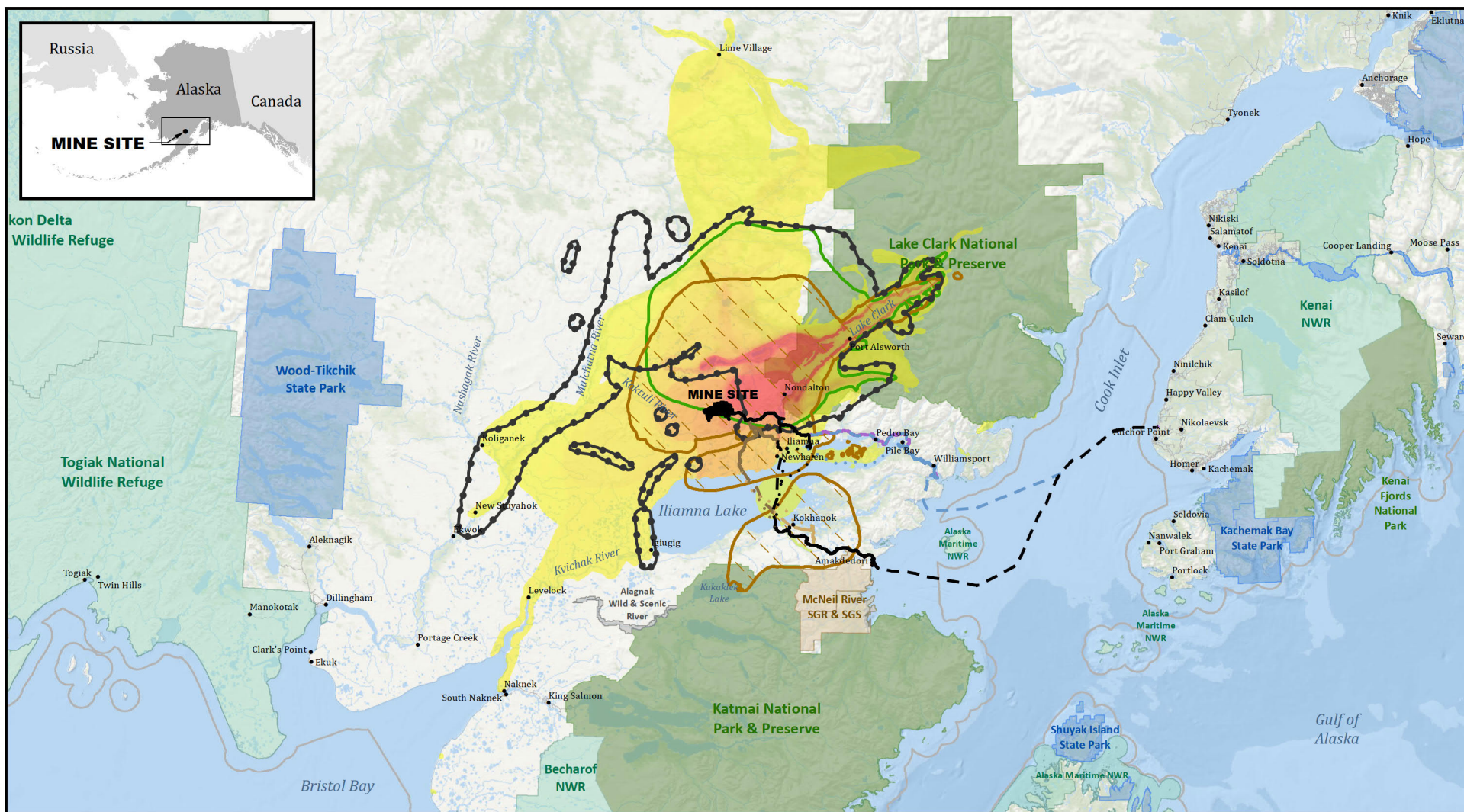
Notes:

¹Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

²The marine mammals category includes saltwater and freshwater seals

Source: Fall et al. 2006

Figure 3.9-9 illustrates 1996/1997 to 2005/2006 overlapping subsistence search and harvest area for Nondalton in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. Use areas for caribou, moose, black bear, and brown bear hunting were from the headwaters of the Mulchatna River and toward the Koktuli River system (Fall et al. 2006). Residents traveled south to Iliamna, to the headwaters of Upper Talarik Creek, and to the eastern end of Little Lake Clark (Fall et al. 2006). Fishing for salmon and freshwater fish occurred primarily at fish camps south of Nondalton at the outlet of Sixmile Lake. Fish camps have deep cultural and social significance; often considered the peak social gathering of the year, fish camps are where many families pass on traditional skills and values, and where individual and community identity is reaffirmed (Deur et al. 2018). Trapping of small game and furbearers occurred near Nondalton, close to the headwaters of Upper Talarik Creek, and in the Chulitna River valley. Waterfowl and upland bird hunting occurred in these same areas. Fishing also occurred in the Newhalen River near Petrof Falls, and on Lake Clark in Chulitna Bay. The area around the northern and southern shores of Iliamna Lake, into the headwaters of the Koktuli River near Groundhog Mountain and Frying Pan Lake, was used for berry picking. Wild plant harvest occurred in the area immediately around Nondalton and on islands in Iliamna Lake, including Flat Island (Fall et al. 2006). Nondalton has strong cultural and kinship ties to Lime Village (a community outside the EIS analysis area) that influence sharing networks. For example, residents of the two communities share caribou meat with one another, and residents of Nondalton travel to the Lime Village area to hunt when caribou are scarce closer to home (Holen and Lemons 2010; Deur et al. 2018). The community of Nondalton is also recorded as sharing salmon with the Bristol Bay community of Perryville (Hutchinson-Scarborough et al. 2020).



Sources: PLP 2020; ADNIR
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Action Alternatives

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- State Game Refuge/Sanctuary

■ Large Land Mammals, 1980-2002
(Holen et al., 2005)

■ All Resources, 2004
(Fall et al., 2006)

■ All Resources, 1960-82
(Wright, Morris, and Schroeder, 1985)

■ Overlapping Subsistence Use Areas
All Resources
1996/97 - 2005/06
(SRB&A 2018)

SUBSISTENCE USE AREAS, ALL RESOURCES - NONDALTON

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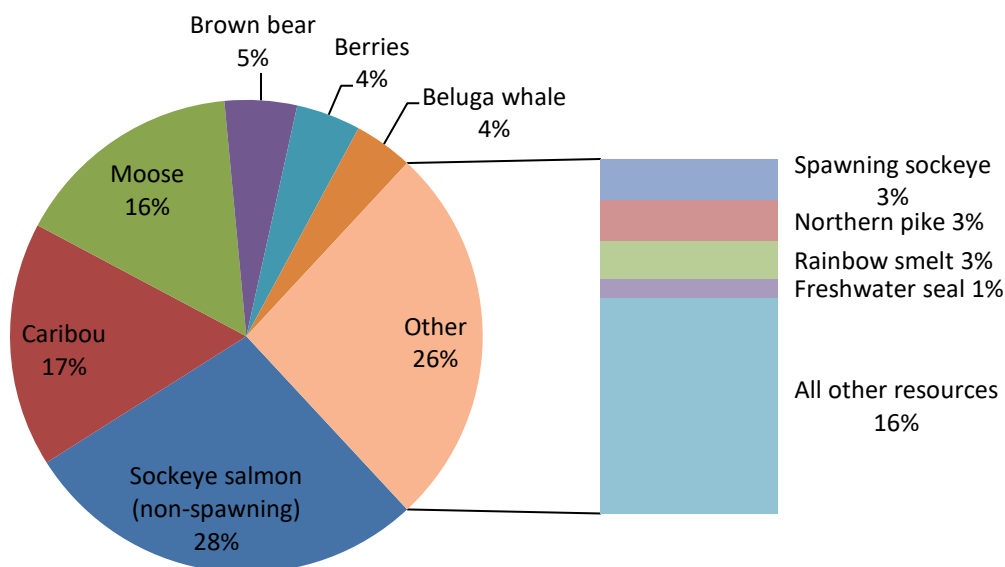
FIGURE 3.9-9

3.9.3.5 Igiugig

Igiugig is on the southeastern side of Iliamna Lake at the mouth of the Kvichak River, and was formerly a portage point for a reindeer station established at Kukaklek Lake in the early 1900s (Deur 2008). It was historically a Yup'ik village, and is now home to primarily Alutiiq, Yup'ik, and Dena'ina peoples. In 2005, Igiugig had an estimated year-round population of 41 people in 13 households. Residents pursue a wide array of productive subsistence activities. Krieg et al. (2009) surveyed residents about their 2005 subsistence activities, and found that Igiugig households harvested an estimated total of 22,310 pounds (542 pounds per capita) of wild foods. Although salmon dominate the subsistence food production of residents, moose and caribou provide a larger portion of total subsistence food when compared to the other Iliamna Lake communities for per-capita harvests, as shown in Table 3.9-2. The top 10 resources harvested in 2005 in terms of edible weight are shown in Figure 3.9-10.

In 2005, salmon, non-salmon fish, plants and fungi, and large land mammals were the most widely used resource categories in Igiugig (100 percent of households). Other widely used resource categories included birds and eggs (92 percent of households), marine mammals (67 percent), and small land mammals (50 percent). Sharing and distribution of subsistence foods is widespread. All households received and gave away at least one subsistence resource in 2005 (Krieg et al. 2009). Table 3.9-8 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2005. Most households tried for and harvested salmon, non-salmon fish, large land mammals, small land mammals, birds and eggs, and plants and fungi. In addition to relying heavily on subsistence hunting and fishing, the community relies on commercial fishing for cash income, with some families holding commercial fishing permits, and other working in the canneries (Deur 2008).

Figure 3.9-10: Composition of Igiugig Subsistence Harvest by Estimated Edible Weight, 2005



Note:

The term "spawning sockeye" refers to late-run sockeye salmon that have a distinctive red color and white meat, and are harvested in the fall

Source: Krieg et al. 2009

Table 3.9-8: Igiugig Subsistence Harvest Estimates by Resource Category, 2005

Resource	Percent of Households					Estimated Edible Harvest ¹			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	100	100	100	22,310	1,716	542	100.0
Salmon	100	92	92	83	83	8,447	650	205	37.9
Non-Salmon Fish	100	83	83	58	92	2,445	188	59	11.0
Large Land Mammals	100	75	58	83	92	8,353	643	203	37.4
Small Land Mammals	50	42	33	42	17	203	16	5	0.9
Marine Mammals ²	67	33	33	42	58	1,204	93	29	5.4
Birds and Eggs	92	83	83	67	50	487	38	12	2.2
Marine Invertebrates	17	0	0	0	17	0	0	0	0.0
Plants and Fungi	100	100	100	83	67	1,172	90	29	5.3

Notes:

¹Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

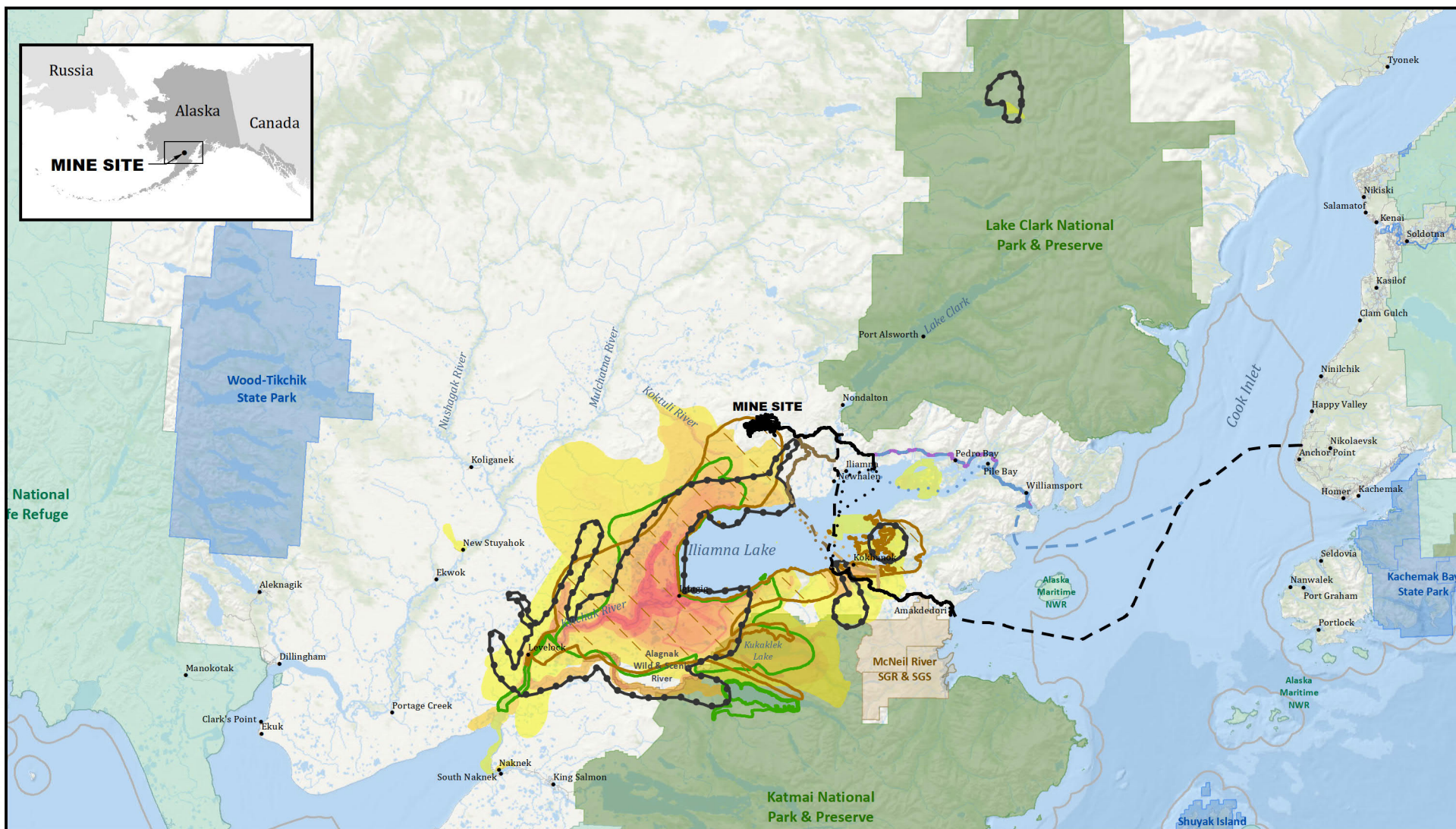
²The marine mammals category includes saltwater and freshwater seals

Source: Krieg et al. 2009

Trends in Igiugig subsistence harvest over time indicate that overall harvests remained relatively unchanged over the study years. Salmon use decreased, and harvest of large land mammals increased (SRB&A 2011b). Reasons residents cited for changes were personal reasons and change in animal populations. It was noted that personal reasons accounted for 75 percent of households using less salmon, and 50 percent of households using fewer non-salmon fish, birds and eggs, and wild plants. Residents noted that these declines were from a need for fewer resources due to smaller families. All households reported that they were using fewer furbearers due to lower fur prices and higher costs of transportation (fuel) (Krieg et al. 2009).

Figure 3.9-11 illustrates the 1996/1997 to 2005/2006 overlapping subsistence search and harvest area for Igiugig in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. The Igiugig subsistence use area encompasses a large area that extends around much of Iliamna Lake, and along the entire Kvichak River to Naknek. Travel for subsistence extends into Katmai National Park and Preserve and to the Mulchatna River. The majority of Igiugig's high-use areas are close to the community along the western shore of the lake, and along Kaskanak Creek, and the Kvichak and Alagnak river corridors. Medium- to low-use areas for overlapping resources for waterfowl, upland birds, berries, and plants in the summer and fall are in the vicinity of the northern mine access roads and ferry terminals. Igiugig residents harvest beluga whales near the mouth of the Kvichak River near the community of Levelock, and harvest freshwater seals in the Kvichak River (SRB&A 2018). In addition, hunters from Igiugig harvest freshwater seals in the northeastern portion of Iliamna Lake on two different islands known as "seal island," and in the waters surrounding Flat Island, Knutson Bay, and around the mouth of the Newhalen River (Burns et al. 2016). Travel routes were across the same areas as harvest areas, with a lake route crossing occurring close to the shorelines (PLP 2018-RFI 088).

Igiugig has ties to Port Heiden (a community outside the EIS analysis area, in the Bristol Bay), and is recorded as sharing salmon with Port Heiden (Hutchinson-Scarborough et al. 2020).



Sources: PLP 2020; ADNIR
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10 0 10 20
Miles

Action Alternatives

- Ferry Routes
- Natural Gas Pipelines
- Alternative 1a
- Alternative 1

- Alternative 1 Kokhanok East Ferry Terminal Variant
- Alternative 2
- Alternative 2 Newhalen River North Crossing Variant
- Alternative 3

Other Features

- Local Roads
- Three Nautical Mile Line
- National Park
- National Wildlife Refuge
- Alaska State Park
- Wild and Scenic River
- State Game Refuge/Sanctuary

- Large Land Mammals, 1980-2002 (Holen et al., 2005)
- All Resources, 2004 (Fall et al., 2006)
- All Resources, 1960-82 (Wright, Morris, and Schroeder, 1985)

- Overlapping Subsistence Use Areas All Resources 1996/97 - 2005/06 (SRB&A 2018)

SUBSISTENCE USE AREAS, ALL RESOURCES - IGIUGIG

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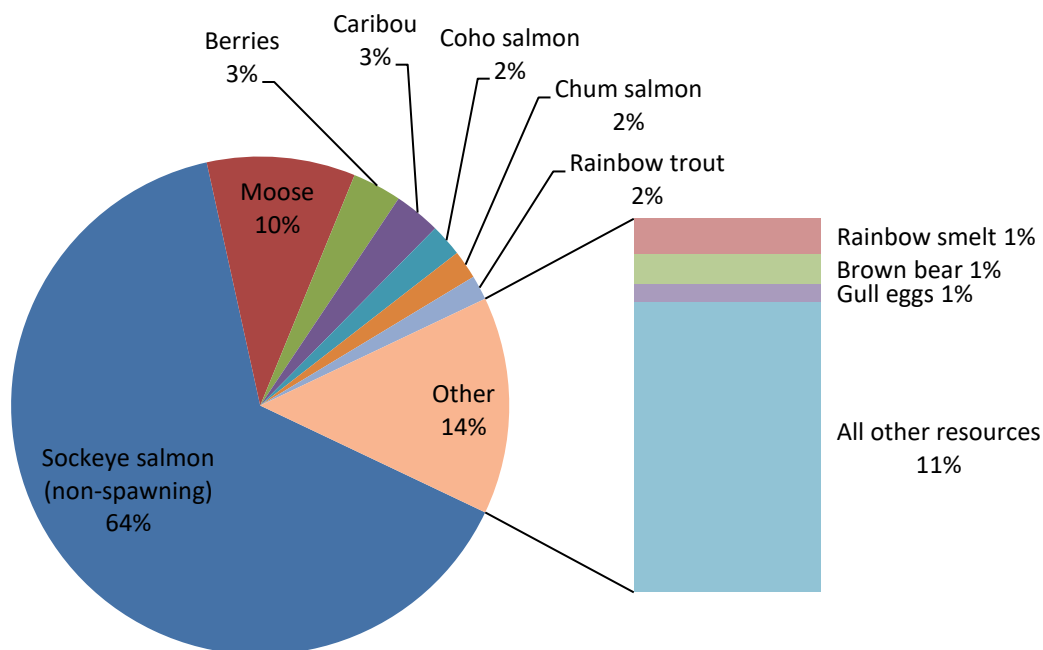
FIGURE 3.9-11

3.9.3.6 Kokhanok

Kokhanok is a predominantly Alaska Native community on the southern shore of Iliamna Lake. The Alaska Native population is a mix of Alutiiq, Yup'ik, and Dena'ina peoples. Economically, Kokhanok residents are highly dependent on subsistence fishing and hunting, with little industrial or tourist-based economic development; with subsistence hunting, fishing, and gathering representing a significant source of non-cash income (Deur 2008). In 2005, Kokhanok had an estimated year-round population of 158 people in 42 households. Kokhanok residents pursued a diverse range of productive subsistence activities, and harvested an estimated total of 107,645 pounds of wild foods (680 pounds per capita) in 2005. Salmon dominated the subsistence production of Kokhanok residents, as shown in Table 3.9-2, which displays per-capita harvests by resource category. The top 10 resources harvested by Kokhanok residents in 2005 in terms of edible weight are shown in Figure 3.9-12.

Salmon, as well as plants and fungi, were the most widely used resource categories (97 percent of households), followed by birds and eggs (91 percent), large land mammals (89 percent), non-salmon fish (74 percent), small land mammals (43 percent), and marine mammals (40 percent). Sharing and distribution of subsistence foods is widespread. In 2005, 94 percent of Kokhanok households received wild resources, and 83 percent of households gave resources away (Krieg et al. 2009). Table 3.9-9 describes the rates of households using, attempting to harvest, harvesting, giving away, and receiving different categories of resources during 2005. Most households tried for and harvested salmon, non-salmon fish, birds and eggs, and plants and fungi.

Figure 3.9-12: Composition of Kokhanok Subsistence Harvest by Estimated Edible Weight, 2005



Source: Krieg et al. 2009

Table 3.9-9: Kokhanok Subsistence Harvest Estimates by Resource Category, 2005

Resource	Percent of Households					Estimated Edible Harvest ¹			Percent of Total Edible Harvest
	Use	Attempt to Harvest	Harvest	Give Away	Receive	Total Pounds	Average Pounds Per Household	Pounds Per Capita	
All Resources	100	100	97	83	94	107,645	2,563	680	100.0
Salmon	97	89	83	63	60	81,222	1,934	513	75.5
Non-Salmon Fish	74	66	66	57	51	5,752	137	36	5.3
Large Land Mammals	89	63	46	40	71	14,957	356	94	13.9
Small Land Mammals	43	40	37	20	14	239	6	2	0.2
Marine Mammals ²	40	23	11	14	23	269	6	2	0.2
Birds and Eggs	91	89	89	69	43	1,237	30	8	1.1
Marine Invertebrates	9	9	9	6	3	74	2	1	0.1
Plants and Fungi	97	97	97	34	34	3,894	93	25	3.6

Notes:

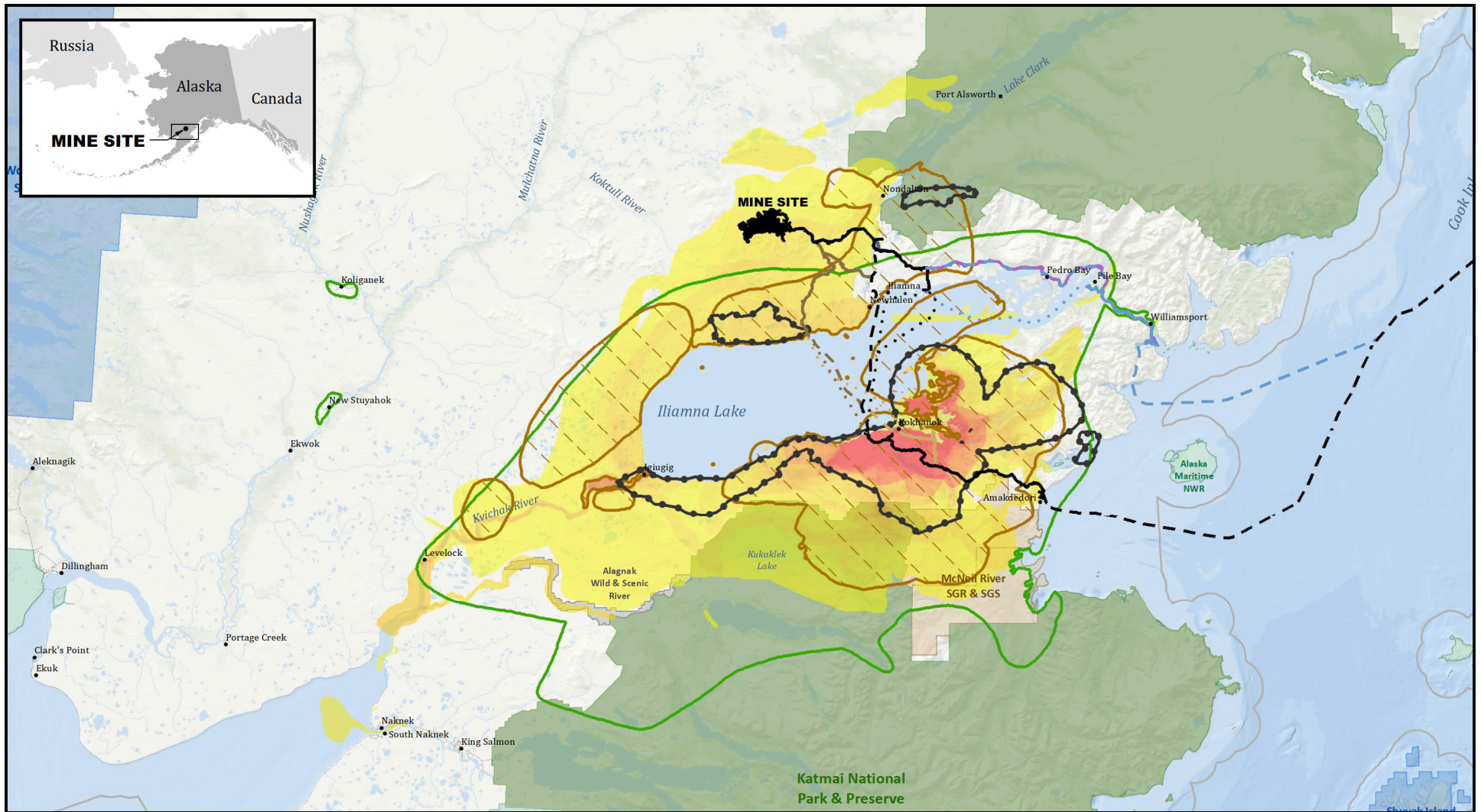
¹Estimated pounds include only edible pounds, and therefore do not include estimates for resources that are not typically eaten by community residents (e.g., furbearers)

²The marine mammals category includes saltwater and freshwater seals

Source: Krieg et al. 2009

Trends in Kokhanok subsistence harvest over time indicate that the 2005 harvest was lower than in previous study years. This was primarily due to declines in large land mammal harvests. In 2005, Kokhanok residents most frequently cited animal population changes as the reason for changes in subsistence harvests and uses, particularly scarcity of moose and caribou. Weather was cited as another reason for changes in resource harvests and uses; weather can impact the abundance of resources, as well as travel conditions (Krieg et al. 2009).

Figure 3.9-13 illustrates the 1996 to 2005 overlapping subsistence search and harvest area for Kokhanok in relation to project infrastructure. The figure also shows the search and harvest areas for large land mammals and all resources for other time periods. The highest-use areas for all resources were the areas closest to the community along the Iliamna Lake shoreline towards Big Mountain, near the south ferry terminal, and along the south mine access road. The areas of use for all resources extend as far north as the Chulitna River, and west from Nondalton and Newhalen to the upper Koktuli River, Kaskanak Creek, and the Kvichak and Alagnak rivers. To the south of the community, use areas extend into Katmai National Park and Preserve, and east into Cook Inlet. Overlapping resource use areas are between Dennis Creek to the west near the southern ferry terminal, to the south along the south access road near Gibraltar Lake and east to Tommy Point, as well as the islands near Kokhanok and Intricate, Leon, and Kokhanok bays. The lands to the south of Kokhanok are overlapping use areas for caribou, moose, bear, fish, waterfowl, upland birds, berries, and plants (SRB&A 2018). Hunters from Kokhanok harvest freshwater seals in the northeastern portion of Iliamna Lake in waters around Triangle Island, two different islands known as “seal island,” Flat Island, Tommy Point, Tommy Islands, Tommy Creek area, Leon Bay, the mouth of the Gibraltar River, and Knutson Bay (Burns et al. 2016). Travel routes occur close to the Iliamna Lake shoreline, and would cross the south ferry terminal location, with a direct route to Igiugig along the shoreline and a route directly across Iliamna Lake between Iliamna and Kokhanok (PLP 2018-RFI 088).



Sources: PLP 2020; ADNRC
Subsistence Use Areas by
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Miles

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- All Resources, 1960-82 (Wright, Morris, and Schroeder, 1985)

- Overlapping Subsistence Use Areas All Resources 1996-2005 (SRB&A 2018)

SUBSISTENCE USE AREAS, ALL RESOURCES - KOKHANOK

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FIGURE 3.9-13