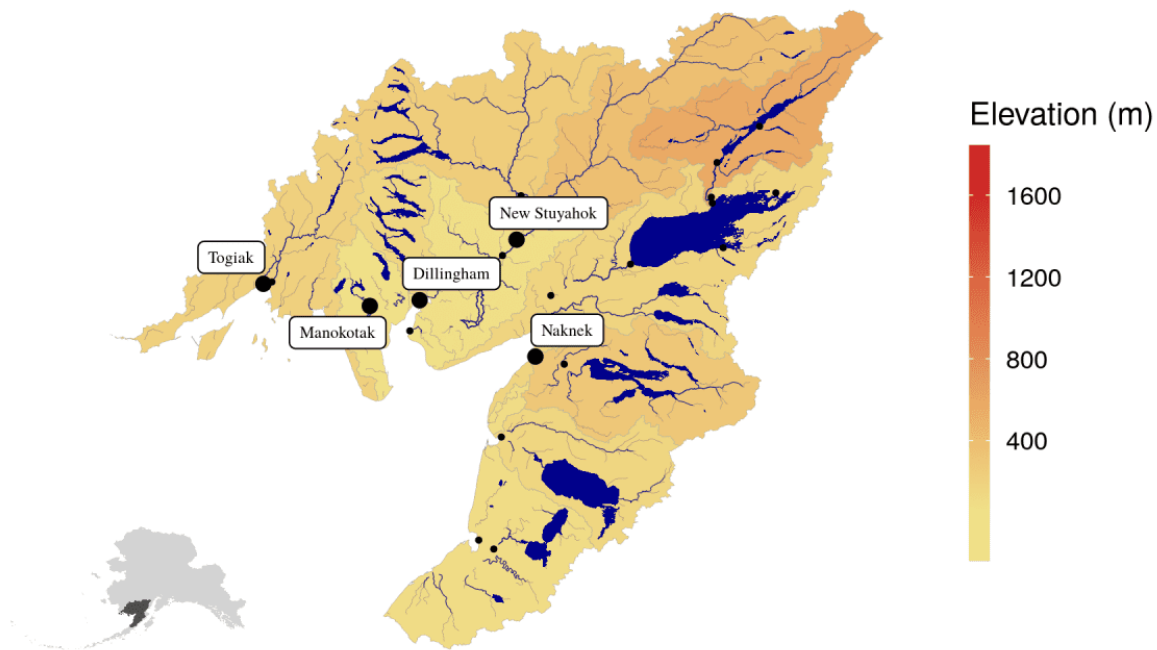


BRISTOL BAY

Geography

Bristol Bay is sockeye salmon country. The region is a land of great inland lakes, ideally suited to the juvenile life of sockeye salmon that are tied to lakes for growth and survival prior to migrating to the ocean (Hilborn et al. 2003). Variation within sockeye salmon leads to stability and options for all salmon lovers – from caddisflies to rainbow trout and brown bears to people around the world. Bristol Bay offers a pristine and intact ecosystem with a notable absence of mining and offshore oil and gas exploration in the region.

Mean Elevation per Watershed: Bristol Bay



Jared Kibele, Rachel Carlson, and Marie Johnson. 2018. Elevation per SASAP region and Hydrologic Unit (HUC8) boundary for Alaskan watersheds. Knowledge Network for Biocomplexity. [doi:10.5063/F1D798QQ](https://doi.org/10.5063/F1D798QQ).

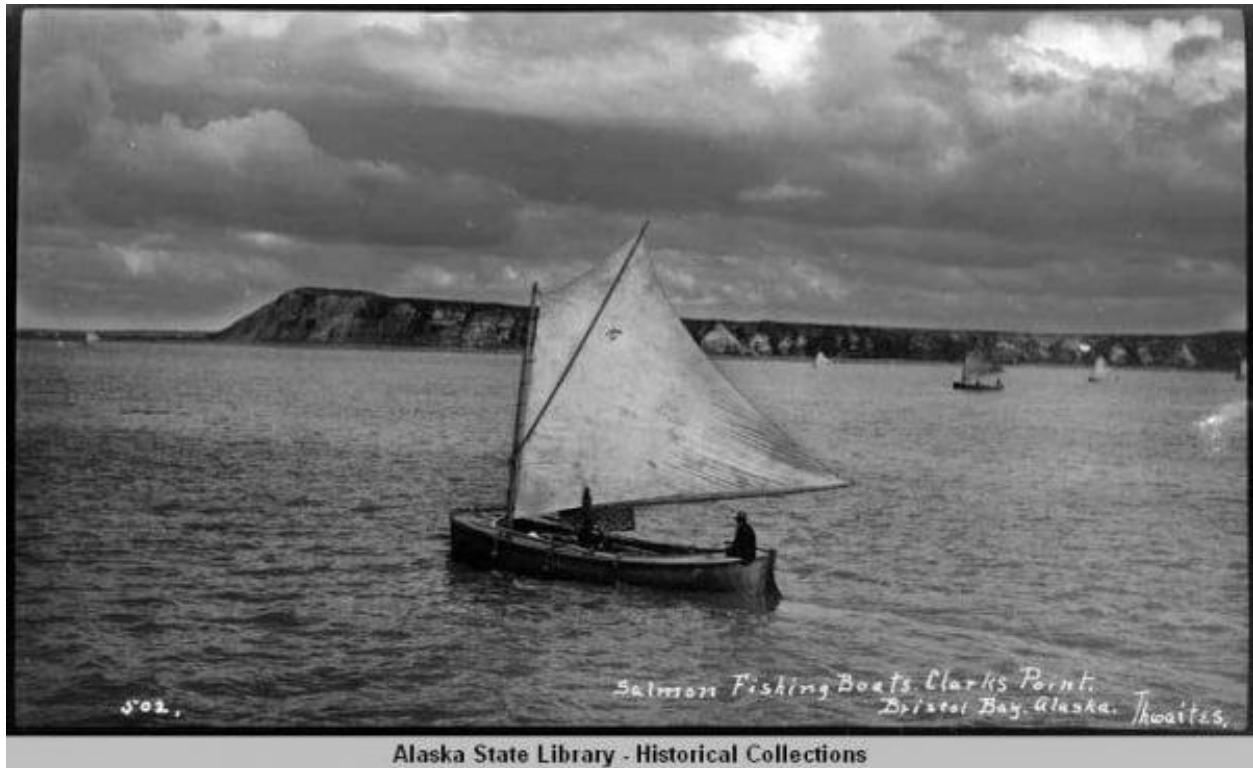
Numerous networks of stream-connected lakes provide extraordinary sockeye salmon rearing habitat. The variety of lake and riverine spawning and rearing habitats in the region mean that the salmon runs in Bristol Bay are uniquely diverse, which contributes to the long-term sustainability of the salmon resource (Schindler et al. 2010).

The long-proposed Pebble Mine, situated at the intersection between the Nushagak River and Kvichak River watersheds, would unquestionably and permanently change this salmon landscape. The landscape that features so prominently in Ellam yua [the Yup'ik belief system] is one of low coastal mountains that give way to rolling tundra.

Early people and salmon systems

The earliest record of human occupation in the Bristol Bay region dates to 10,000 years before present (Boraas and Knott 2014). Salmon use in the region by Yup'ik peoples has been occurring for at least 4,000 years, based on evidence collected from sites on the Kvichak River near salmon-bearing streams. It follows then that Bristol Bay Yup'ik people are believed to be the descendants of Siberian salmon fishermen that emigrated across the Bering Land Bridge. Archaeological data are less clear as to how long the Dena'ina in Bristol Bay have been dependent on salmon, but evidence exists to suggest that they have occupied the Lake Iliamna region (and the Susitna River drainage, Cook Inlet, and middle Copper River) for nearly 1,000 years.

Changes in systems



Credit: Alaska State Library, John E. Thwaites Photo Collection (P18-118)

In contrast to the patterns of contact in other parts of Alaska, Russians and Euro-Americans arrived in Bristol Bay later and in fewer numbers (Boraas and Knott 2014). Even so, the effects of contact were similarly devastating for the Yup'ik and Dena'ina people living in the region. Entire communities were decimated from disease in the 1830s, and again with the influenza epidemic of the early 1900s (Pullar 1992). Russian Orthodox Christianity was spread throughout the region coincident with the growing presence of the Russian-American Company in the 1820s. Fur trading, gold mining, and commercial fishing all developed during the latter half of the 19th century, with fishing being the only activity in the region that proved to be worth the effort.

The beginning of the commercial fishing era in Bristol Bay was marked by the construction of the first cannery at Clark's Point in 1888. From then on, the seasonal influx of fishermen, cannery workers, equipment, materials, foodstuffs, and packaging became a cycle that continues today. For the first sixty years of the fishery, boats were powered by wind and fishermen were largely imported from far beyond the Bristol Bay watershed (e.g., Italy, Scandinavia, Finland). Alaska Natives were discriminated against by white cannery foremen in gaining access to fishing opportunities (Moore 1998). During the sailboat period, very few Yup'ik and Dena'ina fishermen were allowed to fish commercially despite their extensive knowledge of the surrounding sea and landscapes, and their generations-long ties to harvesting and processing salmon (Fall et al. 2010). Canneries owned by Seattle-based companies were initially the only entities that owned nets, boats, and gear sufficient to fish

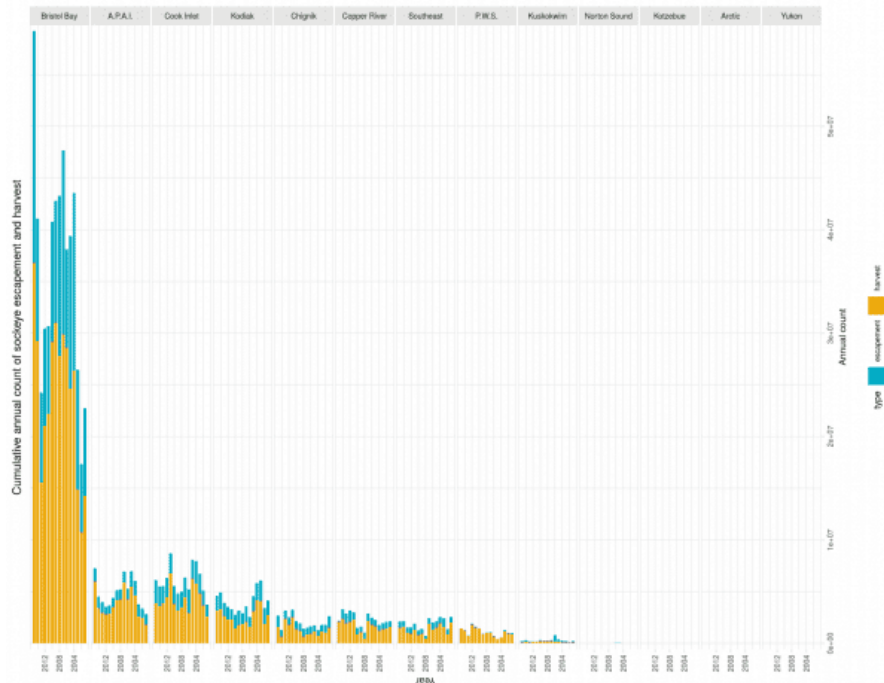
commercially, though as the fishery developed, more and more “independent” fishermen joined the fleet.

In 1951, the prohibition on power boats in the Bristol Bay region—which was strongly supported by the canneries to keep from losing control over the fishery—was lifted, and local fishermen—including Alaska Natives—joined the fishery. Soon after, a period of poor returns and harvests caused the newly formed state of Alaska to rethink its means of granting access to fisheries under its jurisdiction. After several failed attempts to limit access to fisheries in the 1960s, an amendment to the state constitution was passed in 1972 to allow limitations of fishery access to conserve fish stocks. The Limited Entry Act was implemented in 1973, and fishing rights were awarded to individuals based on their economic dependence on and documented history of participation in the fishery during the qualifying years of 1965-1971. The process of allocating fishing permits, adjudicating appeals, and defending allocation decisions in court lasted for over 20 years.

Shortly after the implementation of the limited entry permit system, the Alaska State Legislature commissioned a report to determine some of the initial effects of limitation. In that report, Steve Langdon’s findings foreshadowed the exodus of locally held fishing rights from the Bristol Bay region that continues today (Langdon 1980). Compared to other salmon fisheries across the state, the decrease in local ownership of set and drift gillnet permits in Bristol Bay over the past 40 years is stark (Gho and Farrington 2017). In other fisheries and regions, the loss of locally held permits is largely a product of permit holders moving away from communities adjacent to the fishing grounds. In Bristol Bay, however, the outflow has occurred through sale of rights to nonlocal fishermen. As fishing and fishermen become increasingly seasonal, the ties weaken between communities and the economic, cultural, and social foundations provided by the local salmon fisheries.

Regional Snapshot Today

Salmon and habitat



Cumulative annual count of sockeye escapement and harvest in Bristol Bay, 2002 – 2004. Jeanette Clark and Robyn Thiessen-Bock. Estimate of total Alaskan salmon abundance by region, 2000–2015. Knowledge Network for Biocomplexity. [doi:10.5063/F1BR8QG4](https://doi.org/10.5063/F1BR8QG4).

Since 2001, the Bristol Bay region has averaged an annual return of 36.5 million adult sockeye salmon, making it the largest sockeye salmon fishery on Earth. For perspective on just how abundant sockeye salmon remain in Bristol Bay, 10 to 16 million adult salmon of all species combined entered the Columbia River in its hey-day prior to arrival of Euro-Americans (Lichatowich 2001). Currently over 9,300 km (or approximately 5800 miles) of stream are documented to contain sockeye salmon. Though coho salmon are less numerically abundant than sockeye salmon, nearly 11,000 km of stream are home to spawning and rearing coho salmon with particular importance on small headwater areas used by young fish.

Across regions, Bristol Bay has among the smallest human footprint on the landscape, reflecting the region's small population (6947 local residents in 2015) and essentially pristine, cool, complex, connected and clean habitats. There are virtually no roads and only 25 documented culverts. Logging, mining and invasive species remain absent at this moment in time. Bristol Bay is a stand out exception in the rest of Alaska and the world with respect to sockeye salmon abundance.

Salmon and people

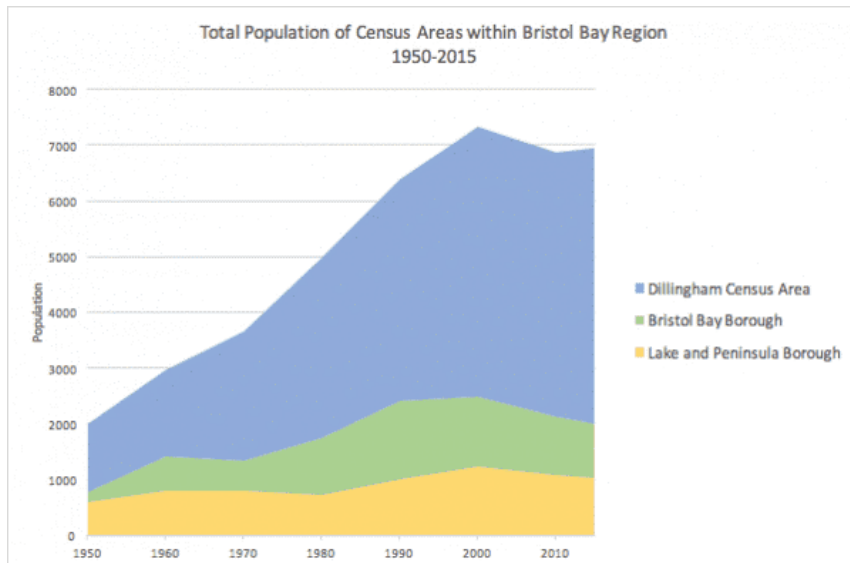
Despite the volatility of the commercial fishery era, subsistence fisheries have persisted. The methods and means of subsistence salmon fishing have adapted through time—incorporating outboard motors, monofilament nets, and chest freezers, for instance—but the knowledge, sharing, social ties, and cooperation that have always defined subsistence continue unchanged (Fall et al. 2010). For Indigenous subsistence fishers, the practice of catching, processing, sharing, and eating salmon encompass spiritual beliefs that are as old as the Yup'ik culture itself:

The drum beats represented the heartbeat of Ellam yua [the Yup'ik belief system]. Thus, the celebrations were spiritual in the deepest sense. They were also material, involving the exchange and sharing of wild subsistence foods from both animals who had given themselves willingly to the hunters and plants gathered from the landscape, considered to be spiritually alive.

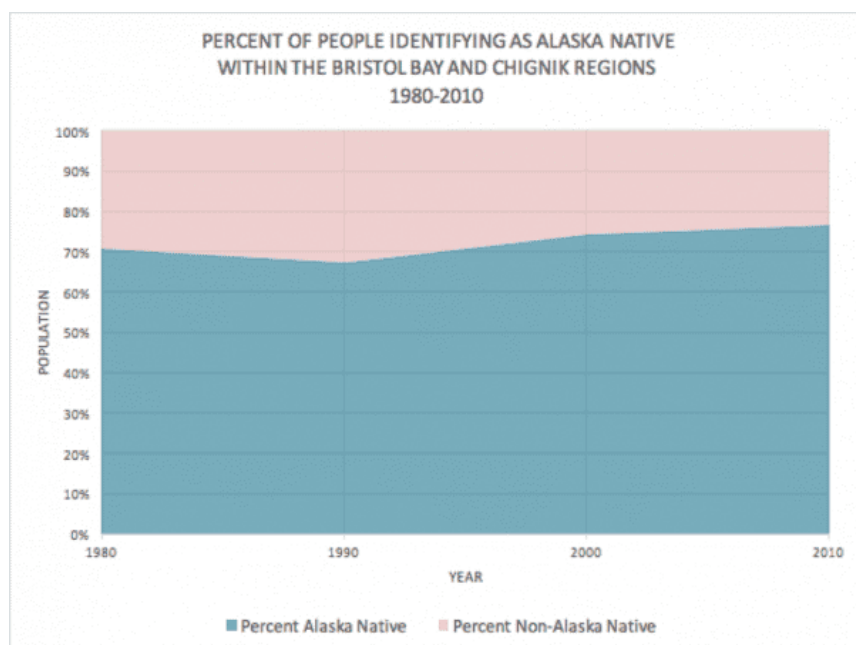
—EPA Watershed Assessment Vol. 2, Appendix D, Boraas and Knott 2014 p. 43

Chinook and coho salmon are also present but in much smaller numbers than returning sockeye salmon. The commercial and subsistence salmon fisheries in the region target sockeye, although sport fisheries for Chinook, coho, and rainbow trout are highly regarded and support many commercial fishing guide businesses (Dye and Schwanke 2012).

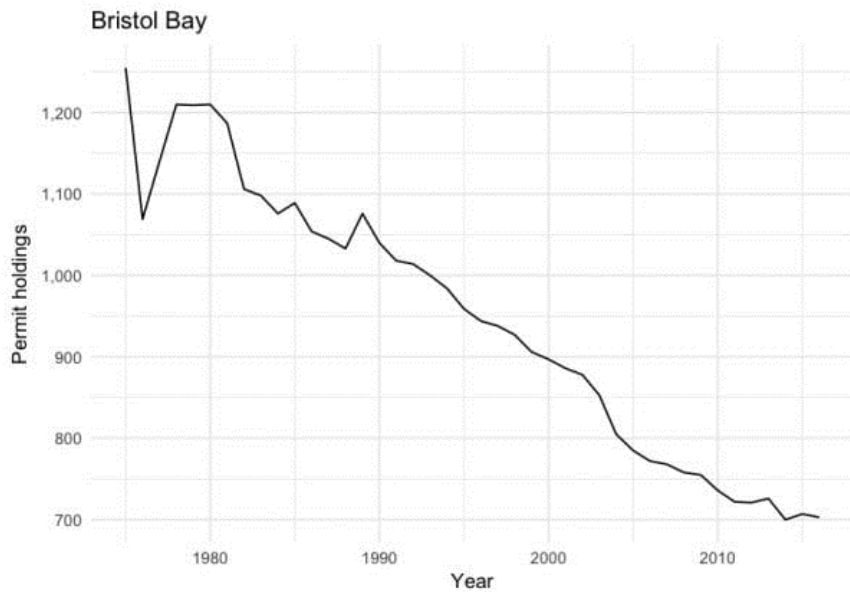
The sockeye salmon populations in Bristol Bay comprise the world's largest wild run, and the set and drift gillnet fisheries supply half of the world's wild-caught sockeye salmon. The value of Bristol Bay salmon, however, is immeasurable for the region's residents. The Alaska Native populations of the Bristol Bay coast (Yup'ik tribes) and Lake Iliamna region (Yup'ik and Dena'ina Athabascan) have depended on salmon for food security, sharing, and cultural and ceremonial traditions for thousands of years (Fall et al. 2010). Subsistence fishing is a major part of life for both Alaska Native and non-Native residents and is supported by commercial fishery participation and cooperative efforts among social/kin networks (Holen 2014; 2017). Both commercial and subsistence fishing, and the cultural heritage and knowledge contained within both traditions, are threatened by the development of mineral deposits in the bay's headwaters (Braund 2016).



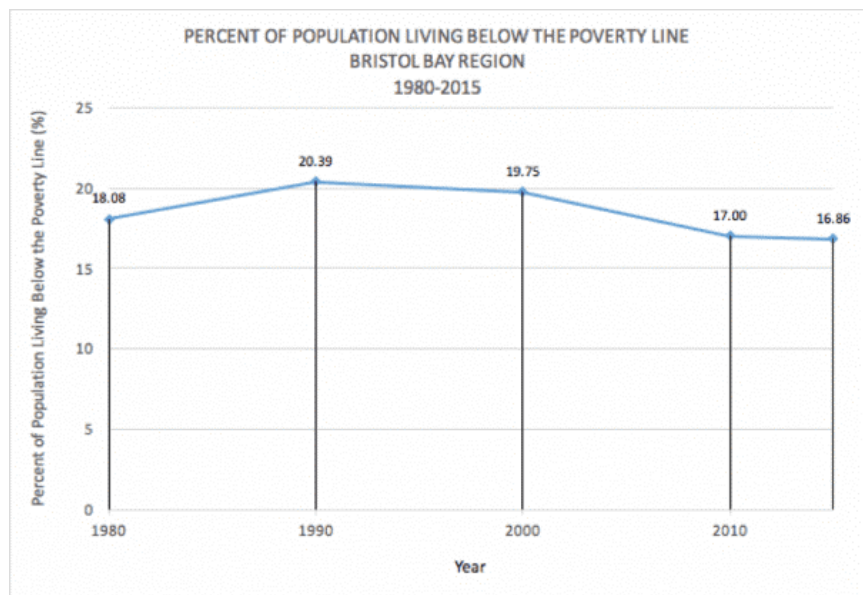
Total population of Bristol Bay region census areas, 1950 – 2015. United States Census Bureau, Juliet Bachtel, John Randazzo, and Erika Gavenus. 2018. Alaskan Population Demographic Information from Decennial and American Community Survey Census Data, 1940-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F1XW4H3V](https://doi.org/10.5063/F1XW4H3V)



Percent of people identifying as Alaska Native within the Bristol Bay and Chignik regions, 1980 – 2010. Note: Census questionnaires in 2000 and 2010 allowed reporting of Alaska Native in combination with other ethnicities, whereas 1980 and 1990 did not. Data presented here for 2000 and 2010 represent all people identifying as Alaska Native, either alone or in combination. This graph combines the Chignik and Bristol Bay Regions. United States Census Bureau, Juliet Bachtel, John Randazzo, and Erika Gavenus. 2018. Alaskan Population Demographic Information from Decennial and American Community Survey Census Data, 1940-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F1XW4H3V](https://doi.org/10.5063/F1XW4H3V)

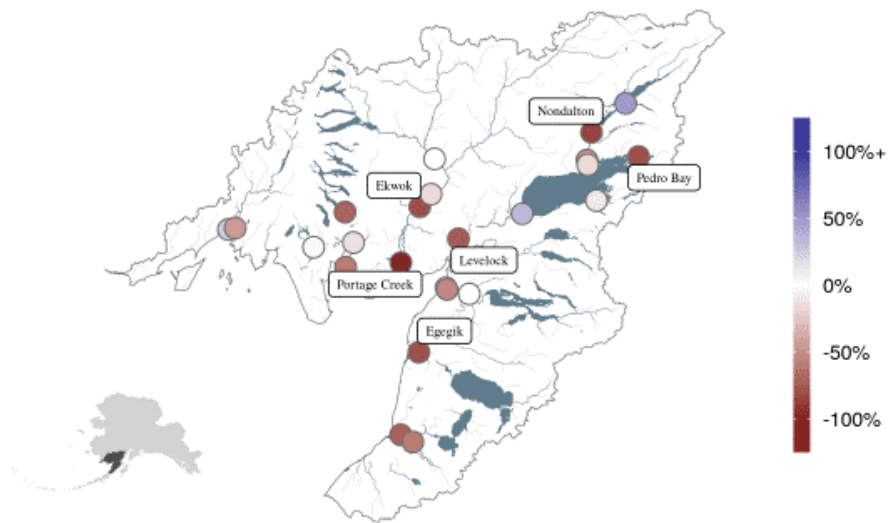


Commercial fishery permit holdings among communities in Bristol Bay from 1975 to 2016. Alaska Department of Fish and Game, Commercial Fisheries Entry Commission. 2017. Commercial Fisheries Entry Commission (CFEC) Public Permit Holders by Community of Residence 1975-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F189144V](https://doi.org/10.5063/F189144V).



United States Census Bureau, Juliet Bachtel, John Randazzo, and Erika Gavenus. 2018. Alaskan Population Demographic Information from Decennial and American Community Survey Census Data, 1940-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F1XW4H3V](https://doi.org/10.5063/F1XW4H3V)

Percent Change from Number of Initially Issued Commercial Permits to Number of Permits in 2016



Percent change from number of initially issued (ranging from 1975-1982) permanent commercial salmon permits held by Alaska residents to number of permits in 2016 by community. Alaska Department of Fish and Game, Commercial Fisheries Entry Commission. 2017. Commercial Fisheries Entry Commission (CFEC) Public Permit Holders by Community of Residence 1975-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F189144V](https://doi.org/10.5063/F189144V).

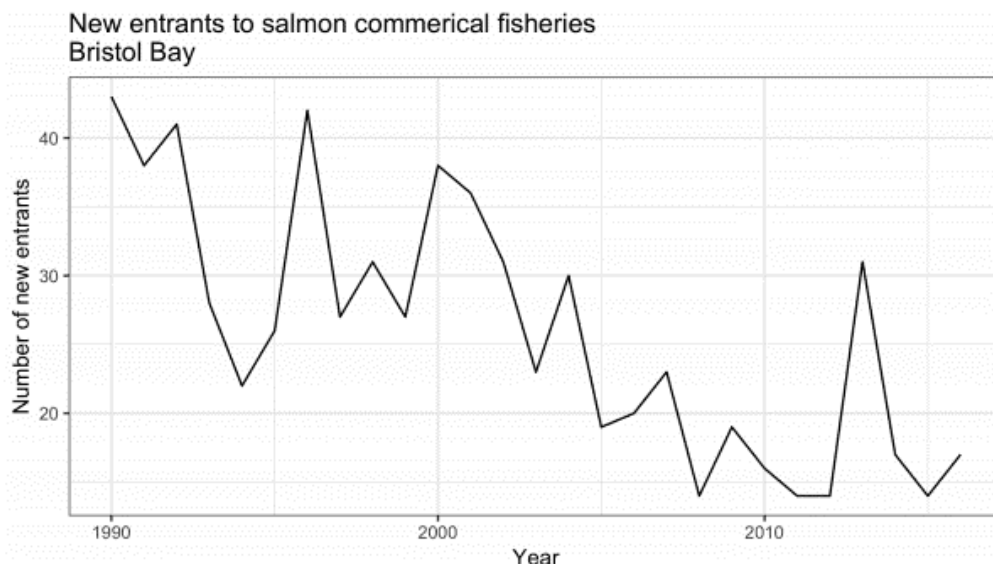
Salmon and economy

The Bristol Bay salmon fishery is the world's most valuable. Historically, the fishery has generated over \$8.3 billion in revenue to harvesters since 1975 (2017 inflation adjusted dollars). Even though Bristol Bay harvest is second in volume to Southeast Alaska, its historical revenue is twice the size of revenue generated by Southeast Alaska salmon fisheries. Most notably, the Bristol Bay salmon fishery is also the lowest risk for permit holders, as fishing revenues have varied significantly less compared to revenues in all other Alaska salmon regions.

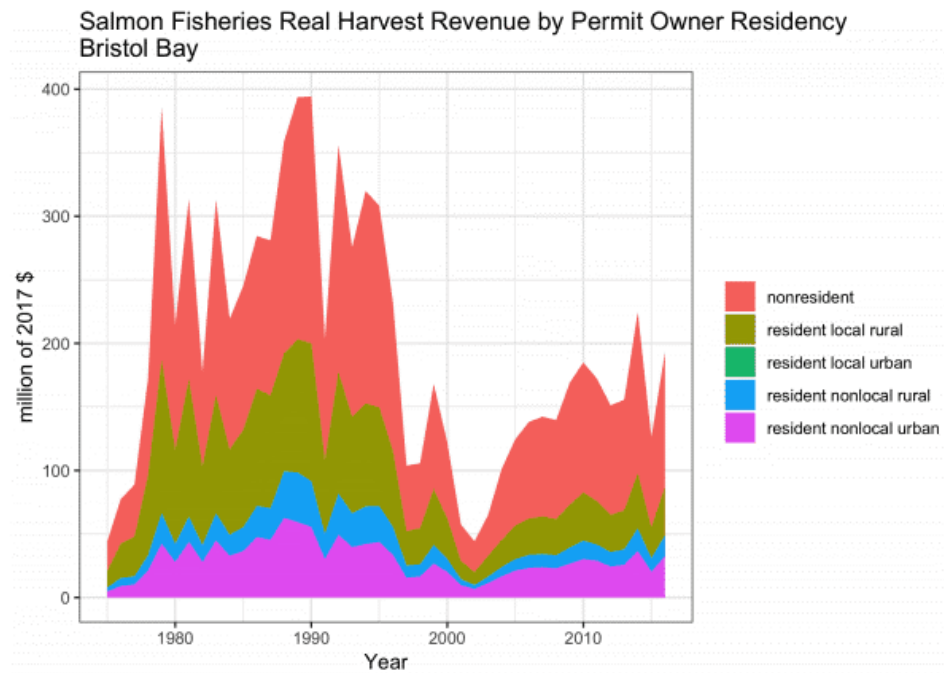
The value generated by the Bristol Bay fishery goes far beyond fishermen's harvest value and benefits economies particularly on the West Coast including Washington, Oregon, and California. About one third of Bristol Bay fishermen and two-thirds of Bristol Bay processing workers live in these states.

In order to illustrate the ripple effect of the Bristol Bay sockeye salmon fishery, in 2010, the harvest value associated with 29 million sockeye salmon being caught was \$165 million. Salmon processing added another \$225 million to this value for a total wholesale value of \$390 million. The total value of Bristol Bay seafood exports in that year was \$250 million, which amounted to about 6% of the total U.S. seafood export. In 2010, the Bristol Bay sockeye salmon fishery supported about 12,000 fishing and processing jobs during the summer fishing season. If those seasonal jobs are measured as year-round jobs, and the jobs created in other industries that supply harvesting, processing, transportation, and retail operations, then an equivalent of 10,000 jobs are supported year-round across the United States. More than \$500 million in income is associated with these jobs.

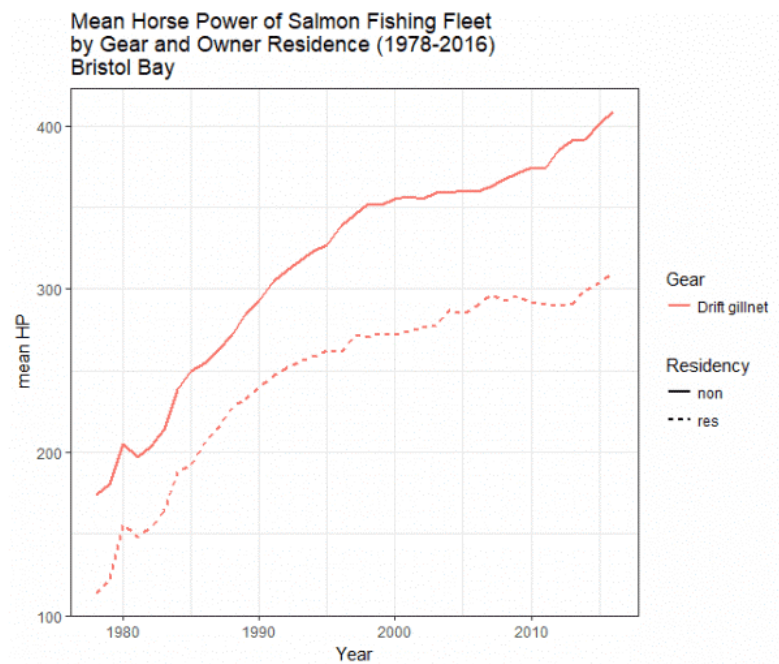
As the value generated in the Bristol Bay's harvesting and processing sectors ripples through the U.S. economy, every dollar paid in Bristol Bay will generate two additional dollars of economic output value in other industries. Similarly, every job in Bristol Bay's harvesting and processing is associated with three additional jobs in industries supporting Bristol Bay operations. In the 1990s, the rapid and sustained growth of farmed salmon production in other parts of the world led to price declines for Alaska wild salmon products and low revenues for fishermen in the early 2000s. U.S. domestic consumption of Bristol Bay frozen sockeye salmon products has increased thanks to effective marketing by industry, new product development, and other factors. Consequently, in Bristol Bay and other salmon fisheries of Alaska, revenues recovered more recently, in part due to these efforts.



Historical number of commercial salmon permits sold to new permit holders who are residents of the Bristol Bay region. Similar to most other regions, the annual number of new entrants into commercial salmon fisheries has declined over the past 25 years, consistent with declining permit numbers held by local residents of the region. Commercial Fisheries Entry Commission CFEC and Tobias Schwoerer. 2016. Commercial Fisheries Entry Commission Public Permit Database from 1975-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F1CV4G17](https://doi.org/10.5063/F1CV4G17)



Earnings by permit owner type, Bristol Bay region, 1975 - 2016. Tobias Schwoerer. Regional commercial salmon permit earnings by residency status, Alaska, 1975-2016. Knowledge Network for Biocomplexity. [doi:10.5063/F1WW7FZ2](https://doi.org/10.5063/F1WW7FZ2).



Mean horse power of salmon fishing fleets by owner residence 1976 - 2016 (drift gillnetters). Alaska Department of Fish and Game, Commercial Fisheries Entry Commission and Tobias Schwoerer. 2018. Commercial vessel characteristics by year, state, Alaskan census area and city, 1978-2017. Knowledge Network for Biocomplexity. [doi:10.5063/F14F1P2Q](https://doi.org/10.5063/F14F1P2Q)

Salmon and subsistence

State regulatory framework

Participants in the Bristol Bay Management Area subsistence salmon fishery must obtain a permit from the Alaska Department of Fish and Game, record their harvests on the permit, and return the permit to ADF&G at the end of the season. There are no annual harvest limits. Legal gear under state regulations includes set nets in all open areas; drift gill nets in areas open to commercial fishing and in a portion of the Togiak River; seines in Lake Clark, Six Mile Lake, and Iliamna Lake; and spears in Lake Clark and the Togiak River. For a complete summary of state regulations, see 5 AAC 01.300 – 349.

The current ANS finding for Bristol Bay salmon dates to 2001. The Alaska Board of Fisheries had made an administrative ANS finding for Bristol Bay of 157,000 – 172,171 salmon in 1993 based on harvests estimated from subsistence salmon permits. In 2001, the board classified sockeye salmon returning to the Kvichak River watershed as a stock of concern. A more precise ANS was needed to evaluate fishing opportunities for the communities engaged in subsistence uses of this stock. The board adopted the previous area-wide finding in regulation and embedded a finding of 55,000 – 65,000 Kvichak River sockeye salmon (based on recent 10-year permit data) within this broader range (5 AAC 01.336(b)(1)).

Federal regulatory framework

Federal regulations also allow subsistence salmon fishing with rod and reel, bow and arrow, and bare hands in Lake Clark and its tributaries, without a permit. With a federal permit, fyke nets (fish traps) and leads may be used in tributaries of Lake Clark and Six Mile Lake within the boundary of Lake Clark National Park and Preserve. More generally, federal subsistence fishing regulations apply on the waters within or adjacent to the Togiak National Wildlife Refuge (NWR), Becharof NWR, Alaska Peninsula NWR, Alagnak Wild and Scenic River corridor, Katmai National Preserve (but not the park, except as noted below), and Lake Clark National Park and Preserve, as well as non-navigable waters of general domain lands managed by the Bureau of Land Management.

Special regulatory conditions

When Katmai National Park was created in 1912 (and expanded in the 1930s), subsistence fishing in the park was prohibited. When ANILCA expanded the park boundaries in 1980, additional areas traditionally used by local Naknek River communities to harvest “redfish” (spawning sockeye salmon) at the Naknek Lake outlet were also closed. In 1996, through federal legislation, the Council of Katmai Descendants gained access to the park to engage in this traditional fishery. The Alaska Board of Fisheries subsequently adopted specific regulations for this fishery, including gear (spear, dip net, beach seine, gillnet), open areas (portions of the shore of Naknek Lake, Johnny’s Lake, outlet of Idavain Creek, outlet of Brooks River), and seasons (August 30 – December 31, except outlet of Brooks River, Sept. 18 – Dec. 31), first in 1998 and with modifications in 2015 (5 AAC 01.320((b)(2)-(3)). Under NPS rules, only local rural residents with historical family ties to the fishery may participate (Ringsmuth 2013:171-173).

Subsistence salmon harvest patterns

From 1983 through 2016, the average annual subsistence harvest of salmon in the Bristol Bay Management area was 143,713 fish (Figure 3-1). Since 1994, the largest portion of the Bristol Bay subsistence harvest (annual average of 129,549 salmon) has been sockeye (78%) (including spawning sockeyes taken as “redfish”), followed by Chinook (12%), coho (6%), chum (4%), and pink (1%) (Figure 3-2). Most participants in the Bristol Bay Management Area subsistence salmon fishery live in local communities; 80% of permit issued for 2012 – 2016 were local residents. During the same period, local residents accounted for 89% of the subsistence salmon harvest in the area, and averaged a harvest of 120.8 salmon per permit. Non-local residents held 20% of permits, took 11% of the harvest, and averaged 61.4 salmon per permit (Figure 3-3).

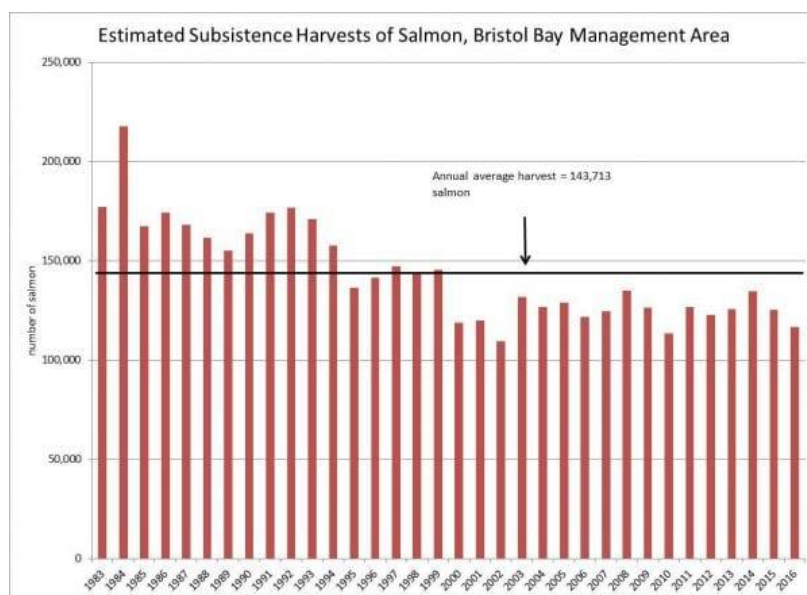


Fig. 3-1. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN).

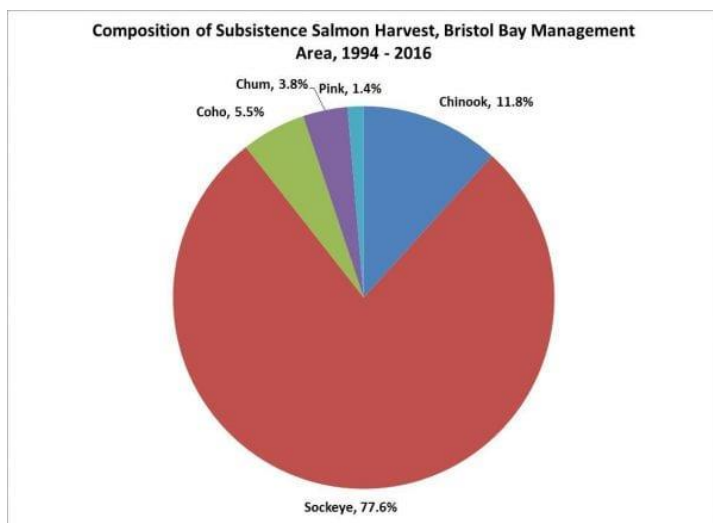
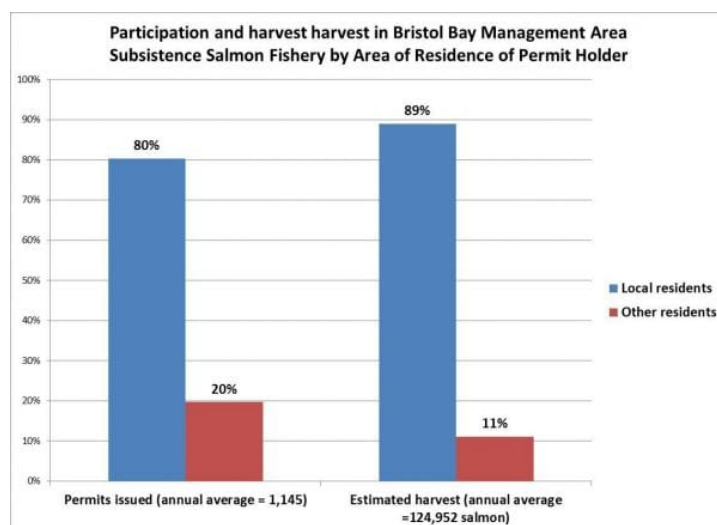


Fig. 3-2. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN).

Fig. 3-3. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN).



Participation in the Bristol Bay subsistence salmon fishery as indicated by the number of subsistence permits issued has been quite stable since 1990 (Figure 3-4). The average since 1990 is 1,143 permits issued and the recent 10-year average (2007 – 2016) is 1,123 permits. Over this period, 83% of permits were issued to local community residents. There was a slight increase in permits issued to nonlocal residents in 2014 – 2016 (21% of all permits issues). Estimated subsistence salmon harvests in the Bristol Bay Area dropped during the 1990s, but have been relatively stable since about 2000, with an annual average of 123,998 fish (Figure 3-5). Local residents have taken 92% of

the harvest since 1990. As with total harvests, average harvests per permit dropped in the 1990s but have been relatively stable since 2000 (Figure 3-6). This relative stability in participation and harvest patterns can be contrasted with the subsistence salmon fishery in the Glennallen Subdistrict (Copper River Basin), which has changed markedly since the early 1990s due to a large increase in participation by nonlocal, urban residents connected to the fishery by Alaska's road system (see SASAP's Copper River overview: [Copper River Region](#)).

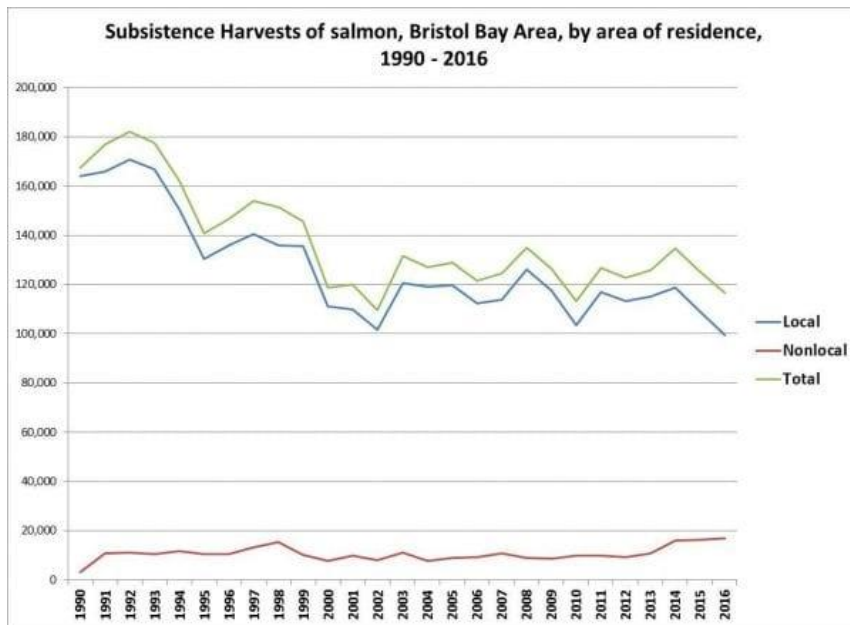


Fig. 3-4. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN).

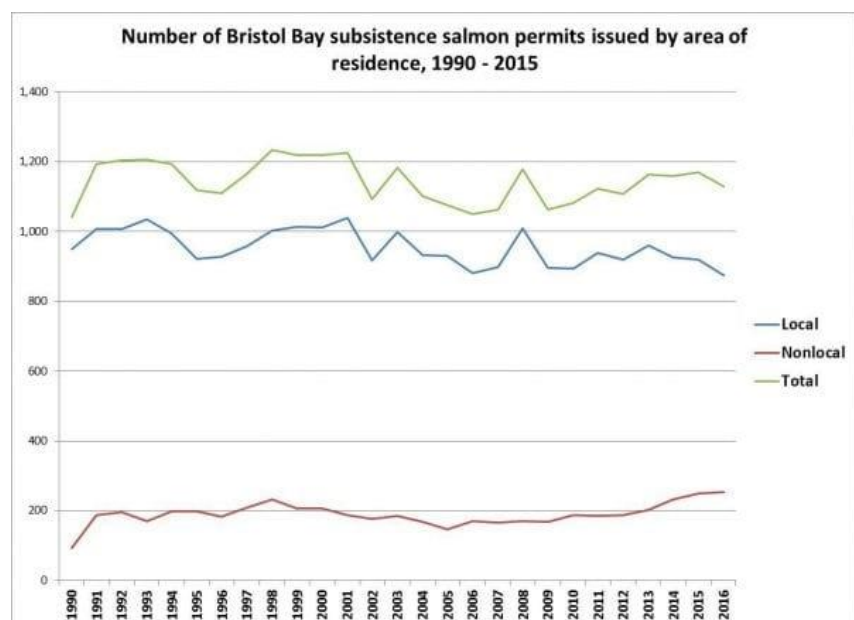


Fig. 3-5. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN).

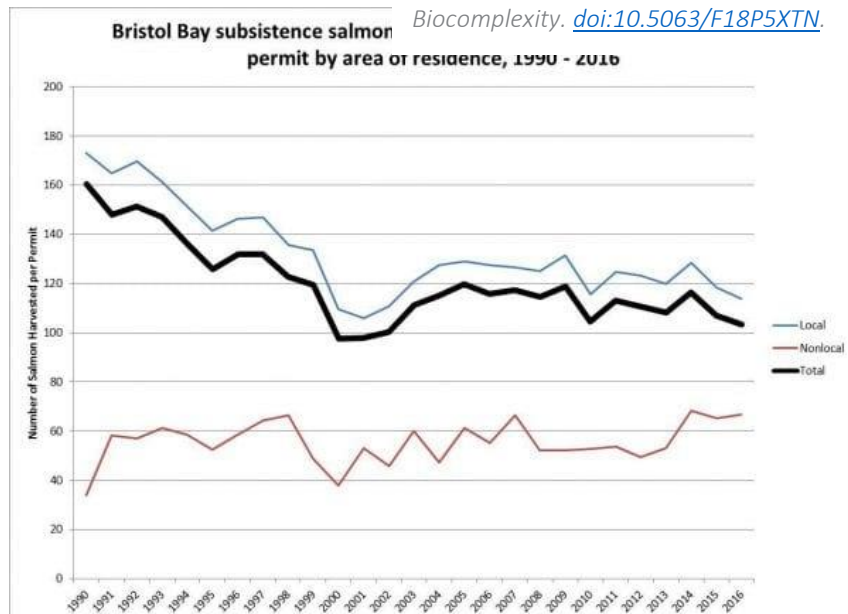


Fig. 3-6. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN).

Traditionally, and to a more limited extent today, residents of many Bristol Bay communities traveled to fish camps in late spring and summer for subsistence salmon fishing. Contemporary examples include Igushik on Nushagak Bay, used by families from Manokotak (Schichnes and Chythlook 1988:90-122); Lewis Point on the lower Nushagak River, used by New Stuyahok families (Stariwat and Krieg 2016); and sites along Six Mile Lake and the Newhalen River used by Nondalton residents (Fall et al. 2010:101-102).

Based upon most recent comprehensive household harvest surveys, salmon comprise approximately 58% of the total harvests of wild resources for home use by residents of Bristol Bay Management Area communities. This includes salmon harvested in subsistence fisheries, sport fisheries, and retained by commercial fishers for home use (“home pack”) (Figure 3-7) (ADF&G 2017).

In addition to subsistence fisheries, residents of Bristol Bay communities obtain salmon for home use through rod and reel harvests and by retaining salmon from their commercial catches. Based on the most recent household survey data available, for all Bristol Bay communities combined, about 80% of the salmon taken for home use was produced in subsistence fisheries, about 16% was retained from commercial harvests, and about 4% was harvested with rod and reel (Figure 3-8). In most communities, subsistence fishing provided most of the salmon, but in King Salmon and Ugashik,

commercial retention accounted for more than 50% of the local use. Commercial retention also provided over 25% of the total salmon for home use in Aleknagik, Clark's Point, Egegik, Naknek, South Naknek, and Togiak. Only in Aleknagik and New Stuyahok did rod and reel provide more than 10% of the total salmon for home use in the study year.

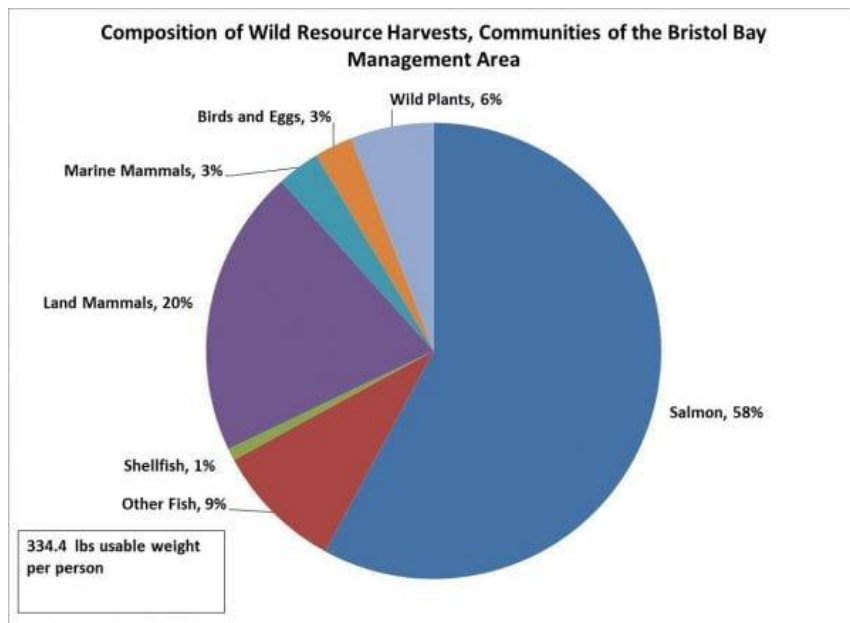


Fig. 3-7. Alaska Department of Fish and Game, Division of Subsistence. 2018. Subsistence harvest information by region, community, resource, and year, 1964-2015. Knowledge Network for Biocomplexity. [doi:10.5063/F1S75DNC](https://doi.org/10.5063/F1S75DNC)

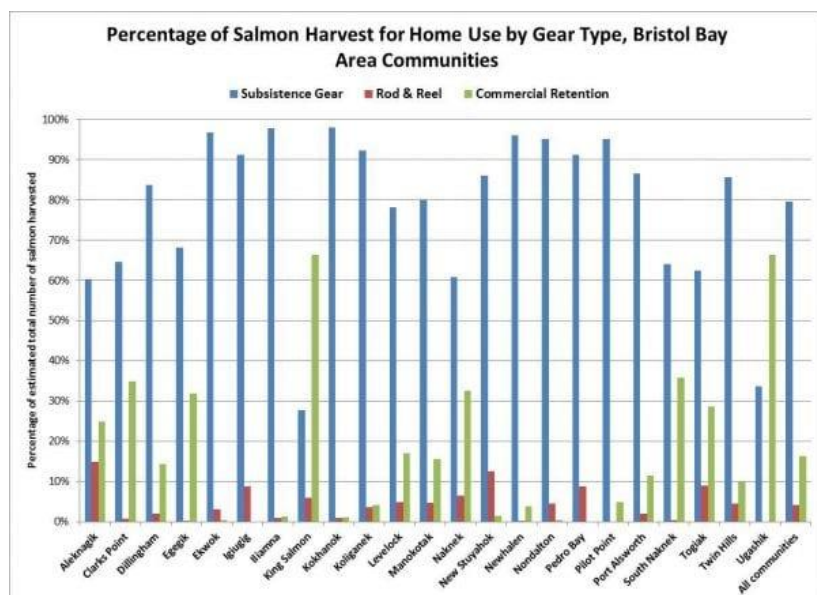


Fig. 3-8. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. [doi:10.5063/F18P5XTN](https://doi.org/10.5063/F18P5XTN)

Salmon and governance

Home to the largest wild sockeye salmon fishery in the world, Bristol Bay salmon governance has faced challenges of declining local ownership of limited entry permits and the highly controversial proposed development of the Pebble Project.

Subsistence fisheries have been relatively stable since about 2000, and recent salmon runs have been at historic levels. Commercial salmon fisheries arrived early in Bristol Bay, starting in the 1890s. Cannery dominance of the fishery was a matter of controversy among local Alaskan Natives, changing only after WWII when Alaskan Natives began to operate, and later own fishing vessels.

Bristol Bay residents developed a foundation of skill in regulatory processes and this continues today with robust participation in state and federal regulatory regimes. With declining runs in the 1970s, Bristol Bay figured prominently in the implementation of the Limited Entry permit system, with the second largest number of permits issued, after Southeast Alaska. Market conditions and demographic changes have resulted in migration of many permits from local to nonlocal and nonresident fishermen.

In recent years, a wide array of salmon stakeholders responded to the proposed Pebble Mine project with a major campaign of opposition, achieving a significant victory when the Environmental Protection Agency used authority under the Clean Water Act to prohibit development of the mine. This was subsequently overturned, and the project is currently the subject of an ongoing Environmental Impact Statement.

Local residents often combine participation in the commercial fisheries with a stable pattern of subsistence production since 2000. Salmon runs have recently been at historic levels, but between 2000-2018, Bristol Bay salmon fisheries were declared a disaster on two occasions.

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