COOK INLET

Geography

The Cook Inlet Region encompasses 106,864 km² in the Southcentral area of Alaska. The landscape that is roughly the size of the state of Kentucky is very diverse with an estimated 3421 km² of lowland river floodplain and dense icefields and glaciers. The primary salmon rivers include the Kenai, Kasilof, and Susitna, with all five species of Pacific salmon present.



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

As of 2015, over 60% of Alaska's 712,898 residents live in this region. The presence of people on the landscape translates into the highest index of a human 'footprint' compared to other regions and could be considered the most 'urban' of Alaska's regions. Over 1,000 stream culverts are known in this region with approximately one out of every three having known or potential impacts to fish passage. The presence of non-native invasive species are more common here than in other regions, with concern about effects of introduced predatory northern pike and a prolific growing aquatic plant called Elodea. Although not widely acknowledged, northern pike have functionally extirpated several populations of sockeye salmon in the Susitna River basin and driven the extinction of a rare form of stickleback (an important freshwater fish and vital member of fish communities in lakes) in the Willow area. Future work is needed to identify locations and salmon populations most at risk to invading species. We encourage readers to review the excellent synthesis by Schoen et al. (2017) that explores the potential future of salmon in the Cook Inlet region.

Early people and salmon systems

In contemporary time, the Cook Inlet region has been home to the majority of the entire Alaska human population, but in deep time these waters and lands have been home to the Dena'ina and Alutiiq peoples. These Indigenous groups have and continue to rely heavily on the water and coastal areas for access to rich food sources, transportation, and cultural practices. Salmon has contributed to a diversity of marine resources utilized, in varying degrees, by these groups.



Sport fishing at Bird Creek on the Seward Highway south of Anchorage In the early 1950s. Credit: National Archives, US Fish and Wildlife

During the 18th century, early Russian fur traders explored the coastal regions of Alaska including Cook Inlet. The Russian occupation of the area left its imprint with persisting practice of Russian Orthodoxy and the intensive hunting of sea otters, which had social and environmental implications for the Indigenous peoples.

The region transformed quickly with the founding of Anchorage in 1912 in conjunction with the construction of the Alaska Railroad. The mining of gold and coal, military expansion during WWII and the Cold War, homesteading, commercial fisheries and associated processing plants, and road construction all played a role in transforming the region into the most populated area of Alaska. Sport fishing for salmon has been an important activity of regional residents and expanded along the road systems as they developed, and population increased following World War II.

Currently 40% of the state population lives in the Anchorage Municipality, 14% in the Matanuska-Susitna Borough and 8% in the Kenai Peninsula Borough. The primary salmon fishery ports have consolidated to towns on the road system, with Homer, Seward, and Kenai serving as primary ports for the commercial salmon fishing fleet and Kenai and Soldotna remaining primary destinations for recreational and personal use salmon fishing (NMFS 2010).

Changes in systems

Shocks to the salmon fisheries in the area included the 1964 earthquake that destroyed commercial fishery infrastructure in towns including Seldovia and Seward, and the 1989 Exxon Valdez Oil Spill. Though the effects of the spill were felt most directly in the Prince William Sound area, uncertainty about the safety of consuming salmon, fishery closures, and an influx of cash from the clean-up efforts all transformed how people of the Cook Inlet region interacted with salmon systems.



Credit: Alaska State Library, John E. Thwaites Photo Collection (P18-139)



Population estimates based on U.S. Census Data for 1940-2010, and ACS data for 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. <u>doi:10.5063/F1XW4H3V</u>

Regional Snapshot Today

Salmon and habitat

The diverse habitat in the Cook Inlet region provides spawning and rearing habitat for all five species of Pacific salmon, in addition to steelhead and non-anadromous species such as rainbow trout. In terms of total abundance, sockeye salmon are most common (average over 6 million returns per year), followed by pink salmon (approximately 2.5 million per year). However, the returns of Chinook salmon (approximately 160,000) and coho salmon (approximately 470,000) are vital to vibrant sport fishing economies and cultures. Like most other regions, Chinook salmon in Cook Inlet began to decline in total abundance in the mid-2000s creating a management conundrum. Given the less numerically abundant, but highly prized species co-migrate with the more abundant species such as sockeye salmon and pink salmon how can managers maximize harvest opportunities on sockeye salmon and pink salmon but not over harvest coho salmon or Chinook salmon? These

challenges are nested onto already complex management with the largest number of escapement goals (80) compared to the rest of Alaska's regions. Hatchery enhancement, primarily of pink salmon in Lower Cook Inlet, has been variable through time, building to a maximum of approximately 150 million salmon released in the early 2000s, followed by a decline to less than 15 million, and currently is building again.



Schoen, E. R. et al. 2017. Future of Pacific Salmon in the Face of Environmental Change: Lessons from One of the World's Remaining Productive Salmon Regions. Fisheries 42, 538–553.



Cumulative annual count of Cook Inlet Chinook escapement and harvest, 2001 - 2015. Jeanette Clark and Robyn Thiessen-Bock. Estimate of total Alaskan salmon abundance by region, 2000-2015. Knowledge Network for Biocomplexity. doi:10.5063/F1BR8QG4

Salmon and people

Today, the region supports a mixture of salmon uses: commercial, recreational, personal use, and subsistence. From a salmon management and sociocultural perspective, the Cook Inlet Region is often considered in two parts: Lower Cook Inlet and Upper Cook Inlet. Lower Cook Inlet consists of the waters west of Cape Fairfield, north of Cape Douglas, and south of Anchor Point, including: Kachemak, Kamishak, Nuke, and Resurrection Bays along with Port Dick and waters around the Barren Islands. Upper Cook Inlet encompasses all Cook Inlet waters north of Anchor Point, including: the Kenai, Kasilof, and Susitna Rivers. The heavy use of the Cook Inlet salmon stocks has been partially supported by a hatchery-based enhancement program, which began as early as 1923 in the Cook Inlet area and picked up in 1971 with the creation of the Fisheries Rehabilitation, Enhancement and Development Division.

The different uses are primarily separated geographically, with the timing of commercial openings also used to provide opportunities for upriver user groups. Opportunities for subsistence salmon fishing are limited to the Port Graham and Koyuktolic Subdistrict; Seldovia Subsistence Subdistrict; Tyonek Subdistrict; and Upper Yentna River Fish Wheel Fishery (Fall, Brown, Evans, et al. 2011). These areas include the communities of Tyonek, Beluga, Seldovia, Port Graham, and Nanwalek (Fall, Brown, Evans, et al. 2011).

The harvest limits, targeted species, and fishery openings differ among the subsistence areas, and are outlined in detail in the following section. Additionally, residence of Cooper Landing, Hope, and Ninilchik are allowed to harvest salmon within the Kenai National Wildlife Refuge under federal regulation. Today, the region supports a mixture of salmon uses: commercial, recreational, personal use, and subsistence.

From a salmon management and sociocultural perspective, the Cook Inlet Region is often considered in two parts: Lower Cook Inlet and Upper Cook Inlet. Lower Cook Inlet consists of the waters west of Cape Fairfield, north of Cape Douglas, and south of Anchor Point, including: Kachemak, Kamishak, Nuke, and Resurrection Bays along with Port Dick and waters around the Barren Islands. Upper Cook Inlet encompasses all Cook Inlet waters north of Anchor Point, including: the Kenai, Kasilof, and Susitna Rivers. The heavy use of the Cook Inlet salmon stocks has been partially supported by a hatchery-based enhancement program, which began as early as 1923 in the Cook Inlet area and picked up in 1971 with the creation of the Fisheries Rehabilitation, Enhancement and Development Division.

In the Anchorage Non-subsistence Area of Cook Inlet, people rely on recreational and personal use fisheries to access salmon for home consumption (Loring, Gerlach, & Harrison, 2013). Commercial fishermen are also permitted to retain fish for home

consumption (Fall, Brown, Evans, et al. 2011; Loring, Gerlach, & Harrison, 2013). Over two-thirds of Kenai Peninsula residents reported salmon was an important part of their household's diet, and about three-quarters have someone in their household involved in salmon fishing (Loring, Harrison, & Gerlach, 2014). With migration from rural areas to urban centers like Anchorage, large numbers of people living in the Cook Inlet Region utilize salmon systems in other regions of Alaska, either directly or through sharing networks. People living in the Cook Inlet region often travel to subsistence areas in other regions of the State, particularly the Copper River region, and commercial salmon fishermen also commonly hold permits for waters outside of the Cook Inlet region, including Bristol Bay, Kodiak, Prince William Sound, and Southeast Alaska.

Commercial salmon fishing in Lower Cook Inlet utilizes purse seine nets and set gillnets. In 2016, 19 purse seine and 21 set gillnet permit holders reported <u>deliveries</u>. With the relatively low number of seine boats many of the boats have formed cooperative groups in which total catches are shared among the boats. The financial success of the Lower Cook Inlet commercial fleet often relies on strong returns of pink salmon. These pink salmon runs, and many of Lower Cook Inlet's sockeye runs, are heavily enhanced by hatchery production. Commercial fishing boats participate in cost recovery and pay a 2% salmon enhancement tax to the Cook Inlet Aquaculture Association. Personal use salmon fisheries of Lower Cook Inlet include the Kachemak Bay setnet fishery, which requires a permit and targets coho salmon, and the China Poot dip net fishery, which does not require a permit and targets enhanced sockeye salmon (Fall, Brown, Evans, et al. 2011). Recreational fishing in Lower Cook Inlet typically targets non-salmon species, although coho salmon are targeted, especially in the waters near Seward.

Commercial salmon fishing in Upper Cook Inlet utilizes drift and set gillnets, with the total number of commercial permits being held around 1,300. Approximately 568 Upper Cook Inlet drift permits are fished, and about 735 commercial set net permits have been issued, the majority of which are held by Alaskan residents. The high cost of drift permits causes it to have one of the lowest ratios of earning to permit cost. Personal use salmon fisheries in the Upper Cook Inlet Area were first established in 1981. Upper Cook Inlet personal use salmon fisheries include the Kasilof River setnet, Kasilof River dip net, Kenai River dip net, Fish Creek dip net, and Beluga River personal use (for residents over 60 years of age) fisheries. These fisheries are open to Alaskan residents who possess a sport fishing license and an Upper Cook Inlet Personal Use permit for their household. In Upper Cook Inlet, the Kenai and Kasilof Rivers have seen a significant increase in the personal use dip net salmon fisheries over recent years, with an increase from 100,000 fish harvested in 1996 to over 500,000 in 2011 and 2012 (Knapp, 2012). In 2010, approximately 75% of the permits issued and fish harvested went to households of the Anchorage Municipality and Matanuska-Susitna Borough areas (Fall, Brown, Evans, et al. 2011). An increase in recreational salmon fishing on the Kenai, Kasilof, Russian, and Susitna Rivers also occurred in the past twenty years, bringing additional income to the area, and 8,358 angler days by nonresident fishers to the area (Sigurdsson & Powers, 2011).

Recreational salmon fishing in the region tends to target the large Chinook salmon and the coho salmon (Sigurdsson & Powers, 2011).

Conflict among the multiple user groups of Upper Cook Inlet has emerged in recent years in reaction to restrictions implemented to conserve Chinook salmon returns (Loring, 2016). The conflict has primarily occurred between commercial and recreational users, including guides and lodges, of Upper Cook Inlet. In 2012, commercial set net sites along the eastern shore of Upper Cook Inlet were allowed only one day of fishing, and in-river recreational fishing in the Kenai was closed (Loring & Harrison, 2013). The commercial drift fleet experienced a reduction in openings and had 21 days of fishing, with only four days during which the full Central Subdistrict was open. Following 2012, members of the Kenai River Sportfishing Association advocated for the complete closure of the commercial set net fishery prompting litigation (Caldwell 2014). In 2013, the Upper Cook Inlet Drift Association (UCIDA) filed suit challenging federal exclusion of Upper Cook Inlet salmon fisheries from the federal fishery management plan (FMP) that allowed continued management of the salmon fisheries by the State of Alaska. The conflict has proven extremely divisive with parties in both user groups expressing frustration that their livelihoods are not being valued (Harrison & Loring, 2014).

The Cook Inlet region provides an example of how weak Chinook returns hold implications for access to other salmon species and the ability for multiple user groups to reach consensus for how fish should be allocated. The legal and political aspects of the conflict in Cook Inlet also provide insights on the formation and influence of use-specific advocacy groups. The conflict holds implications for trust among community members, trust in the management system, perceptions of representation, and confidence in the longevity of salmon systems (Loring, Gerlach & Harrison 2013; Harrison 2013).



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. <u>doi:10.5063/F189144V</u>



Commercial salmon fishery permit holdings among communities in the Alaska Peninsula and Aleutian Islands 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.

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/F1H70D1X.



Tyonek family processes Chinook salmon at their fish camp in 2016. Credit: Bronwyn Jones

Salmon and economy

Commercial salmon fisheries in the Cook Inlet region are the state's third largest in value having generated \$2.3 billion in revenue since 1975 (inflation-adjusted 2017 dollars) and the state's sixth largest in volume. The region is also important for personal use and sport fishing underlining the political complexity of salmon management in this region. In Cook Inlet, the potential for large revenue comes at a cost, because historically fishing revenue variability in this region has been greater than anywhere else in the Gulf of Alaska. Only salmon fisheries in Western Alaska have experienced higher revenue variability.

Cook Inlet has the most diverse set of salmon users in the state, including commercial, sport, subsistence, and personal use fishers. Historically, the largest catch volume has gone to the commercial salmon fleet, followed by sportfish, subsistence, and personal use. Since 1995, the total volume of fish allocated to personal use, subsistence, and sport fishing has been relatively stable ranging between 5 and 15 million lbs/year. In contrast, the commercial harvest has varied much more over this time period between little over 10 million and almost 40 million lbs harvested per year.

Particularly, the dramatic decline in Chinook abundance in this region since 2000 has affected all sectors. For example, in the 1980s and 1990s, the Chinook and coho salmon sport fisheries on the Little Susitna River attracted between 40,000 and 50,000 angler days a year and generated over \$4 million in net economic value, the amount of net benefits anglers receive beyond the cost of fishing. By 2013, angler days had declined by 75%, consistent with poor Chinook returns across this region resulting in multi-year-long closures. Cook Inlet is also Alaska's ground zero for habitat degradation due to human sprawl. This trend is especially evident in the Matanuska-Susitna Borough. Over the past 40 years, this area has seen the fastest population growth in the state and one of the fastest in the nation, growing from a population of 6,509 in 1970 to over 98,000 in 2010. This urbanization has resulted in significant changes to salmon habitat.



Mean Horse Power of Salmon fishing boat has increased dramatically since 1980s. Since 1990, the mean Horse power for boats owned by residents has grown more for drift gillnet compared to purse seine. The mean horse power for boats owned by nonresidents has grown in similar pace for both purse seine and gillnet. Commercial vessel characteristics by year, state, Alaskan census area and city, 1978-2017. Knowledge Network for Biocomplexity. <u>doi:10.5063/F14F1P20</u>



The number of new entrants to Cook Inlet has been fluctuated as people make decision on previous year's prices and harvest level. Overall, there was a downward trend, showing fewer and fewer new entrants each year. Commercial Fisheries Entry Commission CFEC and Tobias Schwoerer. 2016. Commercial Fisheries Entry Commission Public Permit Database from 1975-2016. Knowledge Network for Biocomplexity. <u>doi:10.5063/F1CV4G17</u>



Real (inflation adjusted) earnings by permit holder in Cook Inlet salmon history has been much higher in the first two decades since 1975. The proportion of earnings of resident local rural residents has slightly increased. The proportion of earnings going to permit holder living in urban has decreased. Tobias Schwoerer. Regional commercial salmon permit earnings by residency status, Alaska, 1975-2016. Knowledge Network for Biocomplexity. <u>doi:10.5063/F1WW7FZ2</u>.

SASAP | 12

Salmon and subsistence

The Cook Inlet Management Area has the most complex regulatory structure for subsistence and personal use fisheries in Alaska, reflecting the relatively high population density (in 2017, about 62% of the state's population lived in Anchorage, the Kenai Peninsula Borough, or the Matanuska-Susitna Borough). Accessibility to most fisheries by road, and strong interest in salmon fishing as a source of food (subsistence and personal use fisheries), recreation (sport fisheries), and income (commercial fisheries) among residents of the area's communities account for high levels of salmon harvest.

Most of the Cook Inlet Area is with the Anchorage-Matsu-Kenai Non-subsistence Area as defined by the State Joint Board of Fisheries and Game (5 AAC 99.015(a)(3)). The Board of Fisheries may not permit subsistence fisheries in nonsubsistence areas. Therefore, the board provides noncommercial net fishing opportunities through personal use fisheries in much of the Cook Inlet Area.

As of 2017, seven state personal use salmon fisheries operated in the Cook Inlet Management Area. More detail can be found at 5 AAC 77.540, 545, and 549. Participants in personal use permits must hold a state sport fishing license.

- 1. Kenai River Dip Net Fishery. This fishery is open in a portion of the lower Kenai River for 17-hour periods seven days a week from July 10 through July 31 and may be extended to 24 hours a day if the abundance of late Kenai River sockeye is greater than 2.3 million fish. Only one king salmon may be retained per household.
- Kasilof River Dip Net Fishery. This fishery is open in a one-mile portion of the lower Kasilof River 24 hours a day from June 25 through August 7. Retention of king salmon is prohibited.
- 3. Fish Creek Dip Net fishery. This fishery in the west Knik Arm tributary of Fish Creek only opens by emergency order from July 10 through July 31 if the projected escapement into Fish Creek is more than 50,000 sockeye salmon. No king salmon may be retained in this fishery.
- 4. Kasilof River Set Net Fishery. This fishery is open in two, one-mile areas along Cook Inlet near the mouth of the Kasilof River from June 15 through June 24. King salmon may be retained.

These four personal use fisheries had a single permit and a combined seasonal limit of 25 salmon for the head of household and ten salmon for each additional household member.

- 1. Beluga River Dip Net. This fishery, open in a portion of the lower Beluga River (west Cook Inlet), is only open to persons 60 years of age or older. It is open from July 10 through August 31 or until 500 salmon are taken. No king salmon may be retained in this fishery.
- 2. Kachemak Bay Set Net. This fishery is open for several periods a week from August 16 to September 15. There is a guideline total harvest of 1,000 2,000 coho salmon.
- 3. China Poot Dip Net Fishery. This fishery takes place in China Poot Creek from July 1 through August 7 and exclusively targets excess enhanced sockeye salmon returning to Leisure Lake. Other salmon must be returned to the water unharmed. The bag limit is six sockeye salmon. There is no permit requirement for this fishery and the harvest has not been monitored or estimated since 1995.

The western Susitna River drainage, the Tyonek Subdistrict along a portion of western upper Cook Inlet, and the waters around Seldovia, Port Graham, and Nanwalek in lower Cook Inlet are outside the nonsubsistence area. The four subsistence salmon fisheries in these waters were, in 2017, as follows. (Note that separate permits were required for each fishery and regulations stated that "only one permit may be issued to a household each year" (5 AAC 01.580(a)). For more details, consult 5 AAC 01.550 – 595.)

- Tyonek Subdistrict Set Net Fishery. This fishery opens on May 15. Through June 15, there are three 16-hour openings per week; from June 16 through October 15, openings are for 12 hours on Saturdays. Permit holders may take up to 70 king salmon, plus 25 other salmon, and ten other salmon for each household member. Access to this fishery by land is exclusively through property owned by the Tyonek Native Corporation. The ANS for this fishery is 700 2,700 king salmon and 150 500 other salmon.
- 2. Yentna River Fish Wheel Fishery. Until 2018, this fishery was open in a portion of the Upper Yentna River only from July 15 through August 7 during three 16-hour periods per week. Annual limits were 25 salmon for the head of household and ten salmon for each additional household member, except king salmon could not be retained. In 2018, the Board of Fisheries modified these regulations to allow the subsistence harvest of king salmon (five per household head and two for each additional

household member) in a season from June 1 to June 30 (with the same three openings per week schedule as in the later season). The ANS for this fishery is 400 - 700 salmon.

- 3. Seldovia Set Net Fishery. This fishery is open in waters of Seldovia Bay along the southern shore of Kachemak Bay. There was a limit of 20 king salmon per permit, but no limit on other salmon. There is no ANS finding for this fishery.
- Port Graham, Koyuktolik, Port Chatham, and Windy Bay Subdistricts Set Net Fishery. Fishing is open from April 1 through September 30 in the first two subdistricts, and from April 1 through August 1 in the second two districts. There are no annual limits in this fishery. The ANS is 4,800 – 7,200 salmon.

Federal regulatory framework

In the Cook Inlet Area, in addition to state subsistence and personal use fisheries, in 2017 there were federal subsistence salmon fisheries in the Kenai and Kasilof rivers. Unlike the state's Joint Board, the Federal Subsistence Board had designated several communities along the Kenai Peninsula's road system as rural, including Ninilchik, Cooper Landing, and Hope. Residents of these three communities were eligible for federal subsistence permits to harvest salmon with dip nets or rod and reel in the portion of the Kenai River within the Kenai National Wildlife Refuge and the Chugach National Forest. The Ninilchik Traditional Council was eligible to operate a community gillnet in a portion of the Kenai River. Only residents of Ninilchik were eligible for federal permits for the Kasilof River to harvest salmon with dip nets, fish wheel, or rod and reel. There was also an experimental community gillnet fishery available to residents of Ninilchik in a portion of the Kasilof River. The fishery was scheduled to expire five years after the approval of the first fishery operational plan in 2015. Also, any residents of the Tuxedni Bay area on west Cook Inlet could obtain a federal permit authorizing salmon harvests in waters within Lake Clark National Park with rod and reel in conformance with Alaska sport fishing regulations.

Special regulatory conditions

As discussed in the summary of the several Kenaitze cases, the modification of regulations governing the issuing of educational fishery permits in the late 1980s was one of the results of the litigation in state courts. Beginning in 1989, ADF&G has issued educational fishery permits to several Alaska Native tribes whose traditional fisheries are entirely within the non-subsistence areas of the Cook Inlet Management Area, as well as other organizations that submit permit applications that meet the conditions for an educational fishery program found in 5 AAC 93.200-235.

From 1989 through 2016, harvests in Cook Inlet educational fisheries averaged 6,941 salmon with a range of 2,708 salmon in 1995 to 11,166 salmon in 2011 (Figure 5-1). For the most recent five-year period from 2012 through 2016, 12 different groups held educational permits for the Cook Inlet Area in at least one year; the annual harvest was 8,700 salmon. Since 1989, the Kenaitze Indian Tribe's educational fishery has been by far the largest, accounting for 75% of the harvest for all years combined. Since 1994 (the first year for which harvest by species data have been available), the Cook Inlet educational fishery harvest was 74% sockeye, 16% coho, 5% pink, 4% Chinook, and 2% chum (Figure 5-2) (Nelson et al. 1999; Oslund, Ivey, and Lescanec 2017).



Fig. 5-1. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. <u>doi:10.5063/F18P5XTN</u>.



Fig. 5-2. 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.

Subsistence and personal use salmon harvest patterns

Figure 5-3 shows estimated harvests in Cook Inlet subsistence and personal use fisheries since 1967. Very few subsistence permits were issued before 1980, and harvests were likely substantially underestimated (Braund 1982). In the 1980s, estimated harvests increased for several reasons, including: better documentation of fisheries at Tyonek, Nanwalek, and Port Graham; publicity surrounding the state's 1978 subsistence law and availability of Cook Inlet subsistence permits; and the creation of personal use salmon fisheries (see below). A major regulatory change took place beginning in 1996 when the Alaska Board of Fisheries created fixed seasons and openings for the personal use dip net fisheries in the Kenai and Kasilof rivers. Until then, primarily due to court decisions and legislation, personal use fishing regulations for Cook Inlet changed frequently in the 1980s and early 1990s. Through 1995, these fisheries opened only after achievement of escapement goals was projected, and in some years the fisheries did not open at all. A fixed season created more predictability, and participation and harvests in these two dip fisheries grew rapidly as a result. The average five-year harvest in all Cook Inlet personal use fisheries for 1991 - 1995 was 121,897 salmon; for the five years from 2012 - 2016, the average annual harvest was 513,707 salmon, a 321% increase (Figure 5-3) (Fall et al. 2018:184-187).



5-3. Alaska Department of Fish and Game, Division of Subsistence. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. <u>doi:10.5063/F18P5XTN</u>.

As shown in Figure 5-4, for the 21-year period from 1996 through 2016, upper Cook Inlet personal use fisheries accounted for almost 97% of the total estimated noncommercial, non-sport salmon harvests in the Cook Inlet Area; the Kachemak Bay personal use fishery added less than 1%, and all subsistence fisheries combined added less than 3%



5-4. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. <u>doi:10.5063/F18P5XTN</u>

Sockeye salmon provide the largest portion of the harvests in all Cook Inlet subsistence and personal use fisheries except the Tyonek Subdistrict, in which Chinook salmon provide 79% of the total, and the Kachemak Bay personal use fishery, which is composed of 76% coho salmon (Figure 5-5).



Based upon the results of the most recent comprehensive surveys administered in communities of the Cook Inlet Area outside the non-subsistence area, salmon made up 48% of the total harvest for home use, with land mammals (19%), other fish (18%), and wild plants (10%) making up most of the rest of the harvest (Figure 5-6). For residents of the non-subsistence area, salmon was 54% of the total noncommercial harvest of wild foods (this includes subsistence, personal use, and sport salmon harvests), with land mammals at 28% and other fish at 17% (Figure 5-7).



5-6. 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..



5-7. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. <u>doi:10.5063/F18P5XTN</u>.

A study prepared for the Alaska Joint Board of Fisheries and Game when it reconsidered non-subsistence area boundaries in 2013 found that for the period 2007 -2011, personal use fisheries (primarily those of Cook Inlet and the Chitina Subdistrict of the Copper River) provided 49% of the total noncommercial salmon harvest as estimated in usable pounds for residents of the Anchorage-Kenai-MatSu nonsubsistence area; sport fisheries provided 46%; and subsistence fisheries 5%. Personal use fisheries ranked highest for Anchorage (50% of the salmon harvest) and Mat-Su Borough (49%) residents. Sport harvests ranked first for Kenai Peninsula residents at 51% followed closely by personal use at 47% (Figure 5-8) (Fall 2013:20). Most of the noncommercial, non-sport salmon harvest by residents of Anchorage-Kenai Matsu Nonsubsistence Areas derives from Cook Inlet personal use fisheries. For example, in 2015, 74.2% of this harvest by residents of the Anchorage Municipality was taken in Upper Cook Inlet personal use fisheries, 17.6% in the Chitina Subdistrict personal use fishery, 5.5% in the Glennallen Subdistrict subsistence fishery, 2.0% in the Bristol Bay Area subsistence fishery, and 0.7% in all other subsistence and personal use fisheries (Figure 5-9).



5-8. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. <u>doi:10.5063/F18P5XTN</u>..



5-9. Alaska Department of Fish and Game, Division of Subsistence. Subsistence and personal use harvest of salmon in Alaska, 1960-2012. Knowledge Network for Biocomplexity. <u>doi:10.5063/F18P5XTN</u>.

Despite the recent growth in personal use harvests since 1996, noncommercial harvests remain a relatively small portion of the total salmon take in the Cook Inlet Area. For the period 2010 -2014, of the average annual Cook Inlet harvest of about 6 million salmon, commercial fisheries took 79%, followed by sport (12%), personal use (9%), and subsistence (0.2%). By species, commercial fisheries harvested most of the chum (98%), pink (97%), and sockeye (77%). However, sport fisheries harvested the largest portion of Chinook (76%) and coho (53%). Personal use fisheries took 12% of the sockeye harvest. The only species for which subsistence fisheries took more than 1% of the total harvest was Chinook, at 2.4% (Figure 5-10).



Salmon and governance

Governance issues are numerous in the Cook Inlet region, including "fish wars" over allocation before the Board of Fisheries, controlling habitat impacts from urban development in the Mat-Su valley and on the Kenai River, and challenging major environmental impacts on salmon in the Chuit River from coal development and the construction of the Watanta Dam on the Susitna River. As the most densely populated area of the state, residents of Cook Inlet are the overwhelming participants in sportfishing and personal use fisheries but there are also subsistence and commercial fisheries in region as well. A large majority of the citations issued statewide for sport and personal use salmon violations are received by Cook Inlet residents. Land holding, and jurisdiction is complex in Cook Inlet, with federal jurisdiction applying on the Kenai Peninsula National Wildlife Refuge and the Chugach National Forest and the region includes large amounts of state and private land holding. State fisheries management predominates, and all of the road connected sections of the region are classified as state non-subsistence areas. The Federal Subsistence Board has faced controversial decisions regarding a federal subsistence gillnet fishery on the Kenai and Kasilof rivers. The Mat Su and Kenai boroughs fund major programs to protect salmon habitat impacted by culvert presence in their jurisdictions. Cook Inlet drift gillnet fishermen who fish in federal waters governed by the North Pacific Fishery Management Council brought suit against state and ADF&G management of Cook Inlet salmon fisheries contending that it was not in compliance with federal standards and was mismanaged resulting in low returns. The fishermen prevailed setting in motion a court-ordered process to bring state and federal management systems into alignment. Between 2000-2018, Cook Inlet salmon fisheries were declared a disaster on two occasions.

Land Ownership

The Cook Inlet region has the highest proportion of state and private land ownership in the state. State and private lands are concentrated in the central part of the region. There are four state parks in the region. Federal jurisdictions include the Chugach National Forest, one national park and portions of three others, and small areas of land under the jurisdiction of the Bureau of Land Management are also found in the region.

Land ownership by Alaska Native corporations, village and regional, are located primarily in the central and southern portions of the region.

There are three boroughs in the region – Kenai Peninsula, Anchorage, and Mat-Su. The Mat-Su Borough has its own Fish and Game Committee that reviews Board of Fish proposals relevant to the region and meets with state officials on topics of interest to residents of the region. The Anchorage Borough recently conducted a major project – Salmon in the City – to improve salmon habitats through mitigation and restoration of streams in the city. The project included the development of signage displaying historic Dena'ina (Alaska Native group) names and uses of the area including salmon fish camps.

The Mat-Su and Kenai Peninsula both have established departments and budgeted staff to monitor salmon stream crossings, inventory culvert status, and coordinate and assist the state in undertaking needed culvert replacements in the region.

There are ten federally-recognized tribes in the region. The village of Tyonek, through a consortium of local institutions, has created a Conservation District aimed at, among other things, protecting salmon habitat. The Chickaloon tribe has participated in the Mat-Su Watershed Partnership whose goal is to protect and enhance salmon habitats in the watersheds of the Mat-Su Borough.

Governance actors are numerous in the Cook Inlet region. For the commercial limited entry salmon fisheries there are the United Cook Inlet Driftnetters' Association (UCIDA) and the Cook Inlet Setnetters' Association. The Cook Inlet Fishermen's Fund (CIFF) represents all of the commercial limited entry fisheries in Cook Inlet. Kenai River Sportfishing Guides represents the interests of sport fishing guides and also provides training and certification for sport fishing guiding activities. Sport fishing interests are represented and advocated for by the Kenai River Sportfishing Association.



Federal, State, and Native Land in Kodiak

Emily O'Dean and Jeanette Clark. Land status in Alaska, 2018. Knowledge Network for Biocomplexity. <u>doi:10.5063/F1NK3C9X</u>

Environmental associations in the region are numerous and include Cook Inlet Citizen's Regional Advisory Committee (certified under the Oil Pollution Act of 1990), Cook Inlet keeper, Mat-Su Watershed Partnership, and Kenai River Watershed Forum among others. Nature Conservancy has produced an ecosystem assessment for the Cook Inlet region.

There are two hatcheries in the region operated by the Cook Inlet Regional Aquaculture Association.

Board of Fisheries

Cook Inlet ranks first in terms of the number of proposals submitted to the Board of Fisheries between 2000 and 2017. With 1575 proposals, Cook Inlet regional proposals more than doubled those of the second-ranked Southeast region. Individuals submitted over 50% of the proposals, with associations second and advisory committees third. Village Council/Tribes submitted four proposals over the period.

Unlike other regions, proposals from Cook Inlet interests were distributed widely across categories and did so throughout the study period (Fig. 1). Boundaries/closed waters and seasons tended to have the most proposals.

Reflecting the predominantly urban character of the Cook Inlet region, sport fishing proposals, unlike any other region, were the most numerous during the study period. Commercial proposals were typically second with personal use being third. Almost no subsistence proposals were submitted (Fig. 2).

State actors – ADF&G, Board of Fish and Hatcheries – experience high rates of success with their proposals. Advisory committees, associations, and individuals had success rates of 20% or less. No Village Council/Tribe proposal was successful (Fig. 3)

Advisory committees.

There are 14 <u>advisory committees</u> in the Cook Inlet region, second only to Southeast. Four committees are of the urban, multi, road variety. Eight are urban, single, road type committees. Three are rural, single, no road type. There are two rural Alaska Native communities that do not have advisory committees. The Cook Inlet region has the most active advisory committees in the state. Anchorage, Mat-Su, and Kenai-Soldotna committees met on average more than 10 times per year during the study period.

Federal Subsistence Board

Cook Inlet region rural communities participate in federal subsistence governance through the Region 2 Southcentral regional council. Cook Inlet ranks fourth in number of proposals submitted over the study period with 22, nearly half of which were submitted by Village Council/Tribes. Under both state and federal regulations, virtually all of the Cook Inlet region communities are ineligible for subsistence fisheries. Exceptions to this overall pattern in the state system are non-road connected communities including Tyonek, Nanwalek, Port Graham, Seldovia, and Skwentna.

Proposals submitted to the Southcentral RAC from Cook Inlet have most frequently addressed C and T determinations of eligibility, customary trade (limited cash sales of subsistence salmon) and gear specifications (Fig. 4)

Cook Inlet subsistence proposals have succeeded more than failed in decisions made by the Federal Subsistence Board. Village Council/Tribes, who submitted nearly 50% of Cook Inlet programs were success more than 50% of the time (Fig. 5).

Enforcement

Citations for salmon fishery violations are the highest in the Cook Inlet region reflecting the size of the region's population and the concentration of sport fishing (by Alaska residents and nonresidents) and personal use fisheries in the region. Personal use violations include excessive take, lack of permit, and closed season violations. Sport fishing violations include exceeding bag limits, lack of license or permit, and closed waters violations. Commercial fishing violations are less than 10% of total violations in all seasons (Fig. 6).



Fig. 1. Stephen Langdon, Taylor Brelsford, Jim Fall, and Jeanette Clark. 2018. Salmon Proposals to the Alaska Board of Fisheries, 2000-2017. Knowledge Network for Biocomplexity. doi:10.5063/F1D21VW7



Fig. 2. Stephen Langdon, Taylor Brelsford, Jim Fall, and Jeanette Clark. 2018. Salmon Proposals to the Alaska Board of Fisheries, 2000-2017. Knowledge Network for Biocomplexity. doi:10.5063/F1D21VW7



Cook Inlet: Proposal Result by Proponent Group, Board of Fisheries, 2000-2017

Fig. 3. Stephen Langdon, Taylor Brelsford, Jim Fall, and Jeanette Clark. 2018. Salmon Proposals to the Alaska Board of Fisheries, 2000-2017. Knowledge Network for Biocomplexity. doi:10.5063/F1D21VW7



Fig. 4. Taylor Brelsford, Steve Langdon, and Jeanette Clark. 2018. Alaska Federal Subsistence Board Proposals 2000-2015. Knowledge Network for Biocomplexity. doi:10.5063/F1HT2MMN



Kodiak: Proposal Result by Proponent Group, Federal Subsistence Board, 2000-201 With number of proposals in bars

Fig. 5. Taylor Brelsford, Steve Langdon, and Jeanette Clark. 2018. Alaska Federal Subsistence Board Proposals 2000-2015. Knowledge Network for Biocomplexity. doi:10.5063/F1HT2MMN



Fig. 6. Alaska Department of Public Safety, Division of Alaska Wildlife Troopers. 2018. Violations and Enforcement of Salmon Fishing Regulations, Alaska, 2014-2017. Knowledge Network for Biocomplexity. doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32">doi:10.5063/F1VH5M32"</doi

CASE STUDIES

Participatory Planning for Potential Futures on the Kenai By Meagan Krupa

The glacially fed Kenai River drains the Kenai Peninsula of Alaska in Southcentral Alaska. It runs 82 miles (132 km) westward from <u>Kenai Lake</u> in the <u>Kenai Mountains</u> through the <u>Kenai</u> <u>National Wildlife Refuge</u> and <u>Skilak Lake</u> to its outlet into <u>Cook Inlet</u>. Its salmon-rich waters draw anglers from all over the world. Approximately 40 species of resident and anadromous fish

live within the waters of the Kenai River and its tidal area. Chinook (*Oncorhynchus tshawytscha*), sockeye (*Oncorhynchus nerka*), and coho (*Oncorhynchus kisutch*) salmon are among the most commonly fished species.

To help address the future uncertainty of the Kenai River Fishery, a team of interdisciplinary researchers from the University of Alaska Anchorage developed a participatory research program called Salmon 2050. The program was funded by the National Science Foundation's Established Program to Stimulate Competitive Research (#OIA-1208927) and the State of Alaska. Salmon 2050 analyzed biological, physical, economic, and social data to identify stakeholders and then worked with these stakeholders to produce five scenarios for the Kenai River Fishery.

The team utilized a research process called participatory scenario planning (PSP), which enables local communities to envision their response to future uncertainties through the development of scenarios. As PSP researchers strive to improve stakeholder engagement by increasing the legitimacy and transparency of the process, the initial identification of stakeholders has the ability to jeopardize or enhance the overall process.



Graph: Communication network for the elected officials of Kenai Borough

(a) **Person-to-person projection:** Circles represent stakeholders and the lines connecting two stakeholders represent the communications. Interviewed elected officials are circles with dashed border. The node size is proportional to the node's Eigenvector centrality and the same node color groups highly interconnected stakeholders into communities.

(b) **Agency-to-agency projection:** Network circles represent agencies and the lines represent people communicating across agency boundaries. The self-leading lines represent the communication patterns among multiple stakeholders belonging to the same agency. The node size and line thickness is proportional to the total number of communication exchanges.

The team discovered that Social Network Analysis (SNA) provides an efficient and transparent way to identify and characterize stakeholders for the scenario planning process (Krupa et al. 2017). SNA is the study of the relations between actors. It is a quantitative methodology that employs graph theory and sociograms to analyze and visualize social relationships, where nodes in the graph represent the actors (or sometimes other observations of interest, such as organizations), and the edges or lines between them represent their relationships.

After the SNA was completed, the team invited the individuals identified in the SNA to two PSP workshops to design the scenarios. Scenario development is one way that scientists can work with local communities to build a decision support tool that enables a diverse group of participants to step out of their usual management routines and identify pathways to achieve shared models of the future (Beach and Clark 2015). Scenario planning considers multiple plausible futures with multi-faceted variables that have high uncertainty. It links past and present events with hypothetical courses that examine the relationships of driving forces (Trammell et al. 2017). The goal of scenarios is to create more robust planning for events that may be unpredictable (Peterson et al. 2003, Ralston and Wilson 2006, Weeks et al. 2011).

The stakeholders produced five scenarios and identified six key future uncertainties, which were used to produce the table below (Trammell and Krupa, in prep.). The scenarios range from the Kenai River as a retirement community; an industrial area with a small fishery; a global fishing destination; small commercial and sport fisheries; to an entirely hatchery-supported local personal use fishery.

	Freshwater Climate	Economic Development	Ocean Conditions	Pop. Increase Local Demand	Personal Use Fishery	Sport Fisherman User Days
Retirement Paradise	Moderate	Low	Moderate	High	Moderate	High
Industrial Boom	High	High	Moderate	Moderate	Low	Low
Fishing Capital	Low	High	Low	High	Moderate	High
No More (warm) NPO	Moderate	Low	High	Low	Low	Low
Personal Use Boom	High	Low	Moderate	Low	High	Moderate

Given the future uncertainties, it is difficult to predict exactly how the Kenai River Fishery will look in the future. What is known is that the future will largely be the result of both the intended and unintended consequences of decisions that are made by communities. Therefore, local communities will benefit from thinking about the potential for change and how their actions today can lead them to a more desired future landscape.Scenarios Cross Comparison – This table shows how the narratives compare to one another in relation to the key uncertainties defined at the first workshop.

References

Alaska Department of Fish and Game (ADFG). 2018. The Kenai River. Recreational Fishing Series, Division of Sport Fish, Southcentral Region, Anchorage, AK. Online: <u>https://www.adfg.alaska.gov/static-sf/Region2/pdfpubs/kenairiver.pdf</u>

Beach, D. M., and D. A. Clark. 2015. Scenario planning during rapid ecological change: lessons and perspectives from workshops with southwest Yukon wildlife managers. Ecology and Society 20(1): 61. <u>http://dx.doi.org/10.5751/ES-07379-200161</u>.

Cook Inlet Aquaculture Association (CIAA). 2015. Fry/Smolt Release Data. Online: http://ciaanet.org/data/fry-smolt-release.html.

Krupa, M.B., M. Cenek, J. Powell, and E.J. Trammell. 2017. Mapping the Stakeholders: Using Social Network Analysis to Increase the Legitimacy and Transparency of Participatory Scenario Planning. Society and Natural Resources, DOI: 10.1080/08941920.2017.1376140

Peterson, G. D., T.D. Beard, Jr, B.E. Beisner, E.M. Bennett, S.R. Carpenter, G.S. Cumming, C.L. Dent, and T.D. Havlicek. 2003. Assessing future ecosystem services: a case study of the Northern Highlands Lake District, Wisconsin. Conservation Ecology 7(3): 1. [online] URL: http://www.ecologyandsociety.org/vol7/iss3/art1/.

Ralston, B., and I. Wilson. 2006. The scenario planning handbook: a practitioner's guide to developing and using scenarios to direct strategy in today's uncertain times. Texere, New York, New York, USA.

Trammell, E. J., S. Thomas, D. Mouat, Q. Korbulic and S. Bassett. 2017. Using alternative land use scenarios to facilitate natural resource management across jurisdictional boundaries. Journal of Environmental Planning and Management, DOI: 10.1080/09640568.2017.1289901

Trammell, E.J. and M.B. Krupa. In prep. Participatory Scenario Planning on Alaska's Kenai Peninsula.

Weeks, D., P. Malone, L. Welling. 2011. Climate change scenario planning: a tool for managing parks into uncertain futures. Park Science 28(1):26-40.

Salmon Habitat, Development, and Management in Cook Inlet by Steve Langdon

Meeting the State Constitutional requirement to manage for sustainable fisheries faces substantial challenges in the Cook Inlet region. Salmon habitats are potentially exposed to degradation through the development of roads, residential expansion and urbanization. These activities create substantial threats through culvert construction, storm water run-off and wetlands destruction among other effects. There are laws and policies in place requiring permits for developments that affect salmon streams identified in the Anadromous Waters Catalog (AWC) maintained by the state Department of Environmental Conservation.

However, many of the state and regions waters have not been examined concerning their status as anadromous habitat. Furthermore, there are ongoing changes to salmonid streams and habitats due to various environmental forces. The Mat-Su Watershed Council has developed a strategic plan to address key issues and has undertaken the challenge of mapping salmon habitat in the borough in an effort to improve the ability to protect those habitats. Borough zoning ordinances concerning types of stream and landscape impacts are limited in their attention to these matters. Incremental degradation that accumulates over the years is likely to pose major threats to sustaining Chinook, coho and possibly sockeye salmon stocks that are presently and have been for some years considerably below levels needed to maintain stocks at historically identified levels of abundance.

In addition to challenges to salmon sustainability from processes of settlement expansion, there have been two recent large-scale development projects proposed in the region both of which could potentially significantly impact Cook Inlet. On the west side of Cook Inlet, there are substantial coal fields that have received development interest for many years. Permits were sought for the Chuit Coal Mine in 2006 that would have rerouted a significant tributary of the Chuit River as part of project operations. The Chuit is a historically significant salmon river used by the Tyonek Athabascans who live nearby. It is a five-species river also accessed by sports fishermen. The Tyonek tribe organized a consortium of opponents to the mine and objected to permitting. In addition, they undertook research to document cultural uses of the Chuit River and submitted a successful application to have the river declared a cultural landscape. In 2017 Pacific Rim Coal development withdrew from the project.

'The other major development project in the region is the massive hydroelectric dam on the Susitna River. Major planning for the proposed damming of the gorge in the upper portion of the river was begun in the 1980s. Project development under FERC by the state was suspended in the 1990s but resurrected again in the 2008. A coalition of environmental groups opposed the dam and Governor Walker vetoed the project in 2016. In both cases – the Chuit coal mine and Watana dam – a crucial issue was that project developers proposed mitigation of impacts on salmon stocks in the two rivers that would be damaged by the development would occur in other locations and regions.

Cook Inlet has long been a site of oil and gas developments with oil rig and pipeline structures moving extracted hydrocarbons from under the inlet floor since the late 1950s. Smaller spills and ruptures have periodically occurred causing oil spills in the inlet but to date no significant linkage of those incidents to short or long-term impacts on salmon or their habitats. The Cook Inlet Citizens' Regional Advisory Council is the certified entity authorized to maintain oversight of inlet hydrocarbon extraction and transportation.

Cook Inlet salmon fisheries have enormous demands for them and stresses on them. There have been recent initiatives to address the issues through new forms of organization. A stakeholder process organized under the UAA Epscor program brought together leaders and participants from many sectors to develop a plan based on jointly determined findings about status and impacts and necessary steps toward moving toward sustainability (Krupa et al 2015). In July 2018, Governor Walker convened a Cook Inlet Task Force designed to bring stakeholders together to share experiences and visions in order to find paths to common

ground and shared commitments. He required that ADF&G fishery management biologists participate in the task force.

The management of Cook Inlet salmon fisheries has been challenged in state and federal courts. In 2013, the Cook Inlet Fishermen's Fund challenged the legality of state management of openings in terms of locations and timing of fisheries openings that led to massive allocation differences in Kenai River king salmon harvests between drift and set gillnetters. Due to concerns about low levels of king returns, ADF&G managers authorized more time for drift gillnetters due to their low incidental harvests of kings and cut back time of the set netters. The set netters sought an injunction that would require ADF&G to make decisions based on the management plan in place and asserted that ADF&G engaged in willful and negligent mismanagement. The case was appealed to the Supreme Court that found that the Commissioner (ADF&G) had not abused her discretionary authority and found in favor of the state.

The other significant case was brought by UCIDA in federal court in 2017. In that case the fishermen asserted the failure of the federal government to certify that state management of Cook Inlet salmon fisheries occurring in federal waters met the federal standards for sustainable management found in the Magnuson-Stevens Conservation Act. The fishermen were upheld on their appeal to the 9th circuit; the current status of the case is discussed at greater length in the governance overview.

Upper Cook Inlet salmon fishermen submitted materials in November 2018 seeking a disaster declaration for the 2018 fishery during which the harvest was about one-third of the ten-year average.

References

Braund, Stephen R. 1982. Cook Inlet Subsistence Salmon Fishery. Submitted by Stephen R. Braund and Associates to the Division of Subsistence, Alaska Department of Fish and Game. Technical Paper 54. Anchorage.

Fall, James A. 1989. The Subsistence King Salmon Fishery at Tyonek, Alaska: A Case Study of Alaska's Subsistence Law. Paper presented at the Symposium on Indian Fisheries, sponsored by the Native American Fisheries Committee of the American Fisheries Society, Western Division. Seattle, WA, July 1989. Fall, James A., editor. 2013. Report on Proposed Changes to Nonsubsistence Areas. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 386. Anchorage.

Fall, James A. and Ronald T. Stanek. 1990. An Overview of Subsistence and Personal Use Salmon Fisheries in the Cook Inlet Area. A Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Subsistence. Anchorage.

Loring, P. A., & Harrison, H. L. (2013). "That's what opening day is for:" social and cultural dimensions of (not) fishing for salmon in Cook Inlet, Alaska. Maritime Studies, 12(1), (p. 12). Retrieved from https://maritimestudiesjournal.springeropen.com/articles/10.1186/2212-9790-12-12

Loring, P. A., Harrison, H. L., & Gerlach, S. C. (2014). Local Perceptions of the Sustainability of Alaska's Highly Contested Cook Inlet Salmon Fisheries. Society & Natural Resources, 27(2), 185–199. https://doi.org/10/gd53pq

Nelson, Dave, David Athons, Patricia Berkhahn, and Sandra Sonnichsen. 1999. Area Management Report for the Recreational Fisheries of the Kenai Peninsula, 1995-1997. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Management Report No. 99-3. Anchorage.

Oslund, Samantha, Sam Ivey, and Daryl Lescanec. 2017. Area Management Report for the Recreational Fisheries of Northern Cook Inlet, 2014-2015. Alaska Department of Fish and Game, Divisions of Sport Fish and Commercial Fisheries, fishery Management Report No. 17-07. Anchorage.

Schoen, E. R. et al. 2017. Future of Pacific Salmon in the Face of Environmental Change: Lessons from One of the World's Remaining Productive Salmon Regions. Fisheries 42, 538–553.

Stanek, Ronald T., James A. Fall, and Davin L. Holen. 2006. West Cook Inlet Ethnographic Overview and assessment for Lake Clark National Park and Preserve. Alaska Department of Fish and Game, Division of Subsistence and National Park Service, Lake Clark National Park and Preserve. Anchorage.