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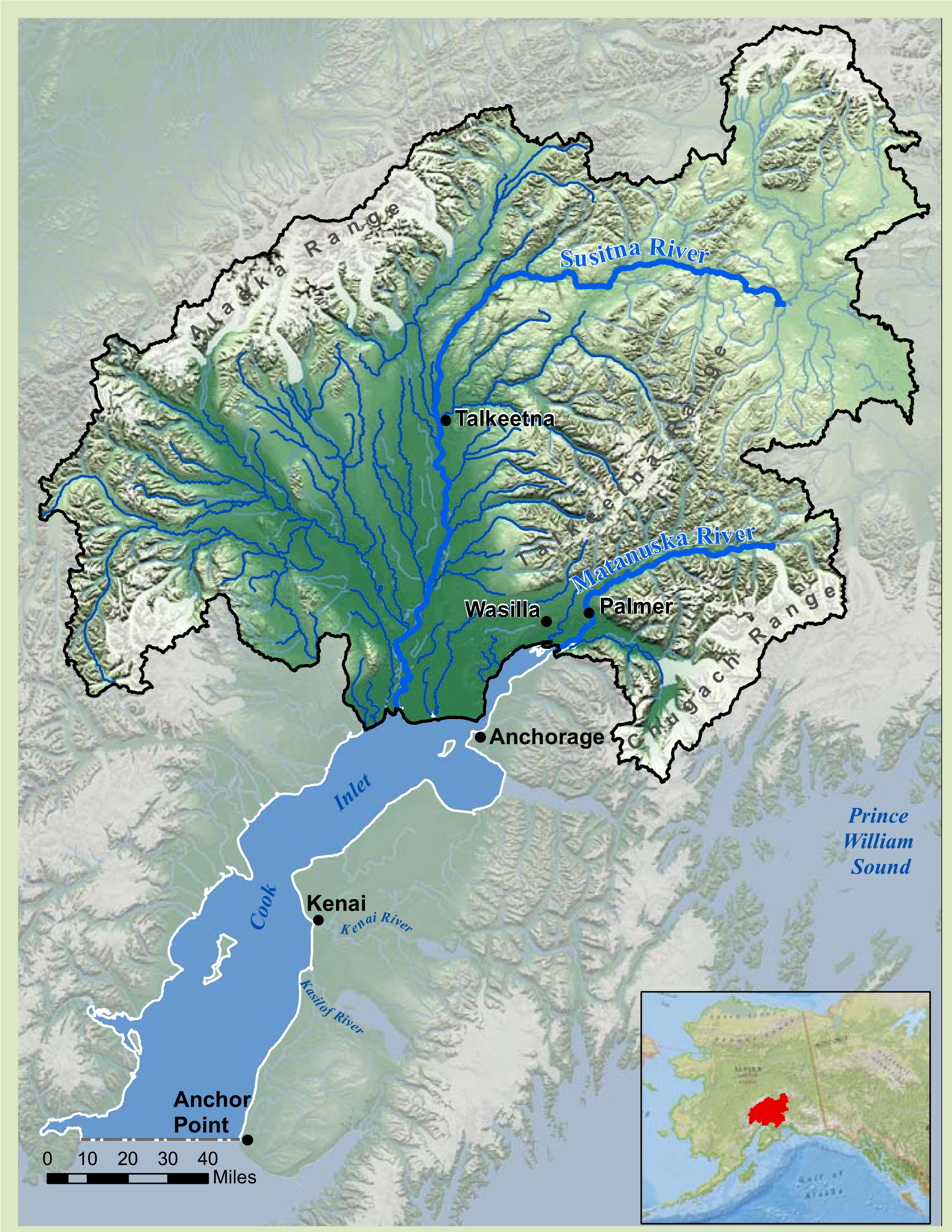
A Watershed Perspective on Salmon Production in the Mat-Su Basin



The Matanuska and Susitna Watersheds

A Watershed Perspective on Salmon Production in the Mat-Su Basin

Southcentral Alaska's Cook Inlet is a stunning exemplar of natural beauty and natural bounty. For thousands of years the salmon returning to the Inlet's rivers, lakes and streams have nourished people, wildlife and the land itself. Inhabitants of this region have always had the benefit and pleasure of consuming salmon. Five species of salmon return to spawn in the diverse landscapes of Cook Inlet's watersheds. The particular habitat required by sockeye salmon is abundant enough to generate Alaska's second largest sockeye runs. Today there are many natural resources that contribute to the economy of Southcentral Alaska but salmon continue to support traditional subsistence lifestyles, sportfishing enthusiasts and businesses, tourism, commercial fishermen, seafood processors, retailers and supporting industries.

While natural wild salmon runs are typically variable and cyclical, some salmon returns to rivers in the Matanuska-Susitna Basin have been in a recent decline. The primary response has been to restrict commercial fisheries in central Cook Inlet with the intent of allowing more salmon to reach the Mat-Su rivers to the north.

Unfortunately, the cause of declining salmon numbers in the Mat-Su Basin is linked to the decreasing ability of the salmon to successfully reproduce in its freshwater systems. It doesn't matter how many fish return to the Mat-Su rivers if they can't spawn or the young salmon can't survive there long enough to migrate out to sea. **Invasive northern pike, beaver dams, deadly parasites, pollution, improperly constructed culverts and other unmitigated effects of urbanization, over-escapement and rising water temperatures are slowly but surely chipping away at the future of salmon in the valley.**

The purpose of this publication is to bring together all of the issues facing salmon production in the Mat-Su Basin. Policy makers and concerned citizens need to change their focus toward prioritizing efforts and directing resources to solving the problems at the source. Harvestable surpluses of sockeye, king and coho salmon populations in the Mat-Su Basin cannot be sustained without addressing the serious problems within the river systems.

Contents

This report was compiled and produced for the United Cook Inlet Drift Association, Soldotna, Alaska, June, 2013.

Physical Characteristics of the Mat-Su Basin

The Matanuska-Susitna watersheds cover about 24,500 square miles. Dense networks of small streams and braided river channels fill the lowlands of the basin. The countless miles of waterways provide abundant fish habitat but some of the system's natural characteristics are counter-productive to the consistent and reliable generation of large numbers of salmon, particularly sockeye salmon.

There are many lakes in the watersheds but the lakes are small and generally shallow. The largest lake in the Mat-Su Basin, Chelatna Lake, has a surface area of only 4,181 acres. The basin's 24 largest lakes have a combined surface area of less than 15,000 acres. For comparison, the Kenai River watershed contains Kenai Lake and Skilak Lake with a combined lake surface area of almost 38,000 acres. The Kasilof River connects to Tustumena Lake with a surface area of over 73,000 acres. Large lakes within a watershed provide benefits like buffering flood waters and stabilizing water temperatures. They also provide enormous capacity for rearing and over-wintering juvenile fish, especially sockeye salmon.

Susitna River

The extensive complex of braided rivers and tributaries, side channels and sloughs found in the Mat-Su basin spread the water out. **Shallow river systems like these are more susceptible to a variety of risks.** Spawning beds and riparian areas are easily scoured out by flood waters. Warm sunny weather can quickly raise the water temperatures to levels unhealthy or lethal for salmon. Hatching and rearing salmon are utterly dependent on adequate ground water flow during the winter; minor changes in water tables and flows can have major impacts in streams. The natural characteristics of the Mat-Su watersheds, the small lakes and shallow, relatively slow moving waters, create a delicate balance that is easily disrupted.

The importance of the topography and hydrology of a system can be clearly observed by comparing salmon runs in different Upper Cook Inlet rivers. **The Susitna River watershed is over eight times the size of the Kenai River watershed but on average produces less than twenty percent of the amount of sockeye salmon.**

The natural capacity for sockeye production in the Mat-Su basin is on a different, much smaller scale due to the absence of large lakes. Other species of salmon are better adapted to the physical characteristics of the basin but their numbers still don't reflect the inherent size advantage of the larger watershed.

Relative Sockeye Salmon Productivity of Susitna River

	Size of Watershed	Average Annual Sockeye Return
Susitna River	18,919 square miles	437,000 (2006-2012)*
Kenai River	2,200 square miles	3,792,000 (1986-2012)
Kasilof River	860 square miles	962,000 (1986-2012)

Return numbers from ADF&G Upper Cook Inlet Annual Management Reports

* The Susitna return average is for the period 2006-2012 because earlier count numbers are inaccurate. Research conducted from 2005 through 2008 determined that the sonar counting systems used in the Susitna for almost 30 years were under-counting the actual sockeye escapements by 50 to 100 percent.

The physical characteristics of these river systems have also made it difficult for fisheries managers to reliably count salmon returns, escapements and out-migrations of smolt. Even without definitive measures, the various methods used to estimate run sizes have indicated recent downturns in sockeye, coho and king stocks.

The reasons for decreasing salmon production in the valley can be found in the valley. Multiple factors are affecting salmon's ability to spawn and rear in the Mat-Su Basin. These include -

- **invasive northern pike predation on juvenile salmon**
- **beaver dam proliferation**
- **salmon fatalities due to parasites**
- **urbanization - including -**
    - **water pollution (hydrocarbons, turbidity, fecal coliform bacteria/sewage)**
    - **the presence of hundreds of improperly constructed road culverts blocking fish access to hundreds of miles of spawning and rearing areas**
    - **loss of riparian and wetland habitats**
    - **water table disruption**
- **rising water temperatures**

These factors threaten the very existence of the salmon resources that we all enjoy. Without a comprehensive and long-term plan, and an equally long-term commitment to solving or mitigating the issues affecting salmon production, the continued decline of salmon returns to the valley streams can be expected. Extinction and endangered species listings may not be far away.

The large stocks of pink and chum salmon that spawn in the Mat-Su basin are not monitored. These species are also impacted by the same threats but the effects are not measured at this time.

Habitat problems and changes cause gradual, incremental decreases to salmon stocks. We are seeing the effects now of changes that have occurred over the past few decades in the Mat-Su Basin. Repairs take time and fish population recoveries are also slow and incremental.

Invasive Northern Pike

Pike were illegally introduced into waters in the Susitna Basin beginning in the 1950s. The slow, shallow waters there provide ideal pike habitat. Fisheries research has long documented the danger of northern pike predation on native stocks of fish and pike's voracious predation on juvenile salmon in particular. Over the decades the pike spread throughout the Mat-Su basin while additional research evidence was accumulating of the hazard of non-native pike to salmon stocks. ADF&G did very little about the threat until after pike had nearly wiped out the king salmon run in Alexander Creek, a tributary of the Susitna River, previously one of the most productive king salmon systems in northern Cook Inlet (Yanusv & Rutz, 2009). Pike in some systems were even protected under trophy fish regulations passed by the Board of Fisheries in the early 1990s. Other systems in the Mat-Su Basin had seasons, bag and possession limits on pike.

During the 1980s and 1990s Alexander Creek supported a multimillion dollar king salmon sportfishing industry that included nine lodges, float plane charter and guide operations and cabin and boat rentals. In 2007 king salmon escapements had dropped to 480, from a previous average of 3,500. Annual angler days in the system had dropped to 2,666 from a previous high of 26,000. In 2008 ADF&G had to close Alexander Creek to king salmon fishing. In 2009 ADF&G published the Alexander Creek/ Lake White Paper attributing the king salmon decline and subsequent closure to pike predation on juvenile king salmon (Yanusz & Rutz, 2009). In the report the authors stated that other salmon species and resident fish stocks were also affected but they couldn't say to what extent because only the king salmon had been monitored. By 2010 the king escapement count had dropped to 177.

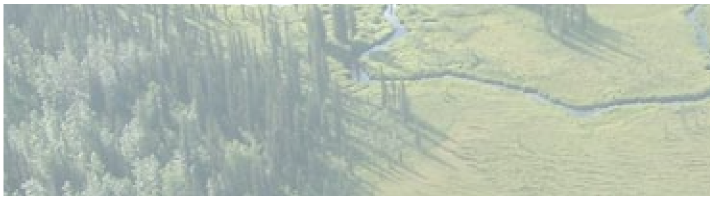
The threat was understood well before Alexander Creek's closure. ADF&G's Division of Sport Fish conducted a study in 1996 and 1997 in four Susitna River tributaries on pike movement and stomach contents. The report, published in 1999, stated:

> **"Given the immense size of the Susitna River drainage and the vast range of northern pike expansion, it is probable that northern pike predation may result in a severe, yet unquantifiable, loss of salmonid production within individual tributaries. However, if we focus our effort on major problems areas identified below, we believe a successful northern pike removal program will be effective in reducing predation on selected salmonid populations…. Eradication efforts have been inadequate given the magnitude and the consequences of the proliferation of pike" (Rutz, 1999).**

In spite of this clear recommendation, pike suppression or eradication programs were not begun in the Mat-Su until more than ten years later. The devastating consequences of the pike invasion are occurring all over the drainage but have only been measured in the few areas where salmon numbers have been under close observation by fisheries managers.

Sockeye, coho and king salmon are very vulnerable to pike in the lakes and waterways where they spend their first year of life. A recent study on pike diets in two Susitna River tributaries, the Deshka River and Alexander Creek, found that salmonids were the pike's dominant prey during the summer (Sepulveda et al, 2013). The researchers discovered up to 47 salmonids per pike stomach. Juvenile sockeye salmon have a better chance of escaping predation in lakes with deep water but those are rare in the Mat-Su watersheds.

This pike had recently consumed over 50 juvenile salmon. Many studies have documented pike's appetite for juvenile salmonids in northern waters around the world. Research has also been done in the Mat-Su to confirm this feeding habit here. ADF&G conducted one such study in 1996 and 1997 that captured 389 pike in four tributaries of the Susitna River. Among the 249 pike that had something in their stomachs, 80% had eaten juvenile salmonids (Rutz, 1999). The recent study in the Deshka River and Alexander Creek confirmed that salmonids are the pike's dominant prey. Those and other studies have shown that when pike run out of their preferred prey, they will eat anything, including other pike. (ADF&G photo)



In 1989 ADF&G studied 24 of the sockeye producing lakes in the Susitna River drainage to measure their biological capacity for rearing sockeye salmon (Tarbox, 1989). The results from the study indicated a potential capacity for a sockeye return to the Susitna of around one million fish. Actual returns are now about half of that.

Data collection in the Mat-Su basin has been very irregular over the years and methodologies have been inconsistent. Since 2006, ADF&G and the Cook Inlet Aquaculture Association have been counting sockeye spawners and smolts in some of the lakes that were in the 1989 sockeye rearing capacity study. This recent data shows:

- At least 14 of the original 24 lakes studied are known to contain pike.
- Six of the lakes with pike (Chelatna, Fish, Fish Creeks, Hewitt, Shell and Whiskey) had a combined potential production capacity of 596,800 adult sockeye but now have a combined average of less than 62,000 adult spawners per year.
- Five of the lakes with pike, (Caswell, Neil, Red Shirt, Sucker and Trapper) had a combined potential capacity of 116,000 sockeye but now have zero adult spawners returning.
- Chelatna Lake, the largest in the system, has pike but also has deep water which increases the chances of salmon fry survival. Chelatna Lake's potential capacity was measured at 389,200 sockeye. Adult sockeye escapement into the lake averaged 41,444 from 2008 through 2012.
- Judd and Larson Lakes do not have pike. Their combined potential capacity was measured at 104,600 sockeye. The actual escapement of adult reds averaged 77,900 from 2006 through 2011. If you add the number of fish harvested in the commercial and sport fisheries (combined average rate of 39-42%) to the average escapement, then the average return has been 108,000-110,600 sockeye in these lakes.

Judd and Larson Lakes' average escapement and return numbers are over the maximum level for their production capacity. Since we are using average escapement numbers then obviously in some years the goal was significantly exceeded. Escapements over and above the lakes' capacity for production cause compounding cyclical fluctuations in the returns. Over-escapement is a serious risk when escapement goals are based on a functioning multi-lake system in which, now, many lakes have few or no returning salmon. Efforts to maintain or increase system-wide escapement levels will inevitably cause over-escapement into the functioning parts of the system.

As of 2010, ADF&G had identified 135 lakes, rivers and streams in the Mat-Su Basin as pike infested. Many additional tributaries and lakes are still at risk in those watersheds and around Cook Inlet. This is the consequence of ADF&G management treating Mat-Su pike like a sport fish instead of an invasive species for decades - against the advice of their own biologists.

ADF&G has recently begun some pike suppression efforts in northern Cook Inlet at Alexander Creek. Without a multi-year, multi-million dollar plan for suppressing and eradicating pike, the affected salmon populations will not recover.

The Mat-Su Borough has been slow to acknowledge the threat of invasive northern pike. In the Matanuska-Susitna Borough Mayor's Blue Ribbon Sportsmen's Committee's publication "Upper Cook Inlet 2011 Fishery Issues & Recommendations," more than five pages are devoted to their concern about sockeye returns and escapements to Susitna River lakes but pike are not mentioned once. Beaver dams rated one brief mention.

Pike caught in Chelatna Lake by Cook Inlet Aquaculture staff.

Beaver Dams

In many circumstances the presence of beaver dams improves fish habitat. Dams can help maintain stream flows and provide habitat for rearing salmon. Unfortunately, a large, well-constructed beaver dam can also stop adult salmon from migrating upstream to spawning areas and block juvenile salmon from migrating downstream to the sea. Records show that beaver dams have been a recognized problem in Cook Inlet for at least the past eighty years (ADFG, 1960). During the 1930s, 40s and 50s one or two teams of men were sent out every summer to blow up beaver dams in the Knik, Susitna, Kenai, Kasilof and other drainages around Cook Inlet. The work was paid for by the Territory, salmon canning companies and the U.S. Fish and Wildlife Service. In 1948 fifty-three dams were blown downstream of Red Shirt Lake in the Susitna River watershed; the report mentioned that salmon were able to reach spawning areas around that lake for the first time in three years.

In the 1970s ADF&G stopped monitoring and managing beaver dams in the Mat-Su Basin, apparently for budgetary reasons. Beaver trapping was a small help in reducing the number of dams but trapping has declined and dams have proliferated. Staff in the Commercial Fisheries Division of ADF&G tried at various times to develop beaver dam management plans for the Mat-Su but never received departmental support.

The problem has not gone away. Trapper Creek, a 20 mile long tributary of the Susitna River, contained 20 beaver dams in 2009, twelve of them large enough to block salmon (CIAA, 2012). During the summer of 2012 there were six dams across Shell Creek below Shell Lake. Three of the dams were large enough to block fish passage. The Cook Inlet Aquaculture Association (CIAA) is the only entity that has been systematically mitigating beaver dam impediments to salmon migration. In recognition of the benefits that beaver dams can provide, CIAA "notches" dams by manually opening up a section to allow fish passage. Limited funding has limited the scope of CIAA's ability to cope with the growing problem. Managing beaver dams requires regular effort with consistent funding.

Cook Inlet Aquaculture Association staff "notching" a beaver dam.

Fish passage is once again allowed.

Loma Parasite

In 2012 a new threat to Mat-Su salmon stocks was discovered. While Cook Inlet Aquaculture Association staff members were working on a sockeye rehabilitation and enhancement project at Shell Lake in the Susitna drainage they noticed that a number of adult sockeye salmon were dying before spawning. Tissue samples were collected and sent to the ADF&G Pathology Laboratory in Anchorage. Analysis determined that the gills of the dead fish were infested with a parasite, Loma salmonidae. The Loma parasite causes the gill tissues to swell and impedes the transfer of oxygen. In other words, the fish suffocate. An investigation into the parasite's presence in the Susitna is beginning.

What Wild Salmon Need

Spawning salmon:

- abundant quantity of clean, cool, well oxygenated water
- clean, sediment-free gravel of relatively small size - 1/2" to 3" - depending on species

Rearing salmon:

- abundant quantity of clean, cool, well oxygenated water
- an abundance of food such as aquatic and terrestrial insects
- a diversity of habitats including shallow riffles and pools, undercut stream banks and deep pools with lots of cover from logs, trees and boulders
- a constant source of relatively uniform stream flow
- healthy riparian vegetation
- stream flows or water levels sufficient to support and provide connections to other habitats such as beaver ponds, side channels and estuaries
- appropriate habitat in winter that protects salmon from ice scours and predators
- migratory access within the stream system to locate needed habitats and food
- an open connection to saltwater for rearing, smolt transformation, and adults returning to spawn

Shell Lake Disaster

In the 1989 study on the sockeye production potential in Susitna drainage lakes, Shell Lake's production capacity was estimated at 103,800 fish. In 2006 it had an escapement of 69,800 sockeye, the highest escapement of any lake in the system. When you add a commercial and sport average harvest rate of 39-42% to the escapement, Shell Lake was producing close to capacity. In 2011, only five years later, the escapement in this pike and Loma-infested lake had dropped to 973.

The Cook Inlet Aquaculture Association reduced long-standing sockeye hatchery programs to make room for a Shell Lake rehabilitation and enhancement project in 2012. That was when the Loma parasite was discovered to have killed some of the few returning sockeye. CIAA took the initiative to collect 34 living females and 34 living males as broodstock. Their eggs and milt were taken to Trail Lakes Hatchery to ensure conservation of the genetic line of Shell Lake sockeye.

During the 2012 study period at the lake, staff members also captured 248 northern pike. It is estimated that an adult pike can consume over 50 juvenile salmon every two to three days. At that rate, 248 pike could eat well over a million young salmon in one year.

Pike captured in Shell Lake by Cook Inlet Aquaculture Association staff in 2010.

Urbanization

Our scientific understanding of what salmon need in their freshwater environment has increased tremendously in the past few decades. It is not enough just to get adult salmon back to the mouths of rivers and streams where they came from. To successfully reproduce they require all the moving and living parts of their complex habitat to function just the right way. From the trees shading the banks of a stream all the way down to the tiniest microorganisms digesting organic matter in wetlands, a multitude of factors contribute to salmon reproduction.

Urbanization can alter and damage salmon habitat in a variety of very significant ways when development is allowed without any consideration or mitigation for fish. The alterations happen incrementally, so it is hard to convince people that their individual actions can threaten salmon stocks, but the cumulative effect is devastating. In the Pacific Northwest, the Columbia River now has less than 3% of the enormous salmon runs that it once had. This not only can happen in Alaska, it is happening in Alaska. The human population of the Mat-Su Basin has doubled in the past 20 years to almost 90,000. It is expected to continue to be one of the fastest growing areas in the United States. Much damage has already been done.

Improperly Constructed Culverts

ADF&G has identified over 430 improperly constructed culverts in the Mat-Su Basin that act as barriers to fish (ADF&G Fish Passage Inventory Database as of 5/13). Of the 668 culverts that have been evaluated to date, 65% block the passage of juvenile and/or adult salmon. These "migration impediments" effectively cut off hundreds of miles of spawning and rearing habitat for salmon, particularly cohos. Coho salmon can spawn in seemingly inconsequential little creeks and streams. The juveniles spend a year or two moving around through these small waterways, sloughs and wetlands to find food and unfrozen over-wintering areas. Research supporting the problem and impacts of improperly constructed culverts has been meticulously documented in the Matanuska-Susitna Basin Salmon Habitat Partnership Fish Passage Working Group's report published in 2011 (www.matsusalmon.org/resources/).

The Mat-Su Borough has estimated the cost of restoring one improperly constructed waterbody crossing (culvert) at $200,000 to $500,000. In the past ten years the Borough and the U. S. Fish and Wildlife service have spent millions of dollars repairing 80 improperly sized and constructed crossings over salmon streams. At some point it should become apparent that prevention, i.e. building the structures correctly in the first place, would be far less costly than repair. The Kenai Peninsula Borough made that calculation and changed their standards for culverts in road construction in 2008. In 2013 the Mat-Su Borough Assembly is considering a resolution that would incorporate modern standards for fish passage culverts into their Subdivision Construction Manual. That manual has not been amended since 1991.

In April of 2012, the Mat-Su Borough passed a "Title 43" that relaxed their subdivision platting regulations (not to be confused with the Construction Manual.) Changes in the new regulations included allowing waivers for "pioneer road standards" to replace "residential road standards" within Road Service Areas (Mat-Su Borough, 2012).

Pollution

The Clean Water Act works to ensure that Alaska's waters remain swimable and fishable. When those standards are violated, the water is considered polluted.

Big Lake in Wasilla has been polluted by sewage since at least the early 1970s. It is currently also polluted with hydrocarbons from motorized watercraft (ADEC, 2012). Lake Lucille in Wasilla is polluted with urban runoff. Cottonwood Creek in Wasilla is polluted with urban runoff and "unspecified septic sources". The Matanuska River in Palmer is polluted with all kinds of residues and debris from an active open dump located beside and in the river. In 1949 the Little Susitna River no longer had salmon in it due to cyanide leaching from gold mining operations (Lawrence, 1949). Mining sites were never cleaned up or remediated and no one knows if cyanide is still present in the watershed. Currently the Little Susitna River is known to be polluted with hydrocarbons and excessive turbidity from motorized watercraft (Davis, 2011). That research project, published in 2011, showed that juvenile salmon and macroinvertebrates (food source for the salmon) decreased in abundance in areas of the river where hydrocarbon and turbidity levels increased. The published study also fully documented the research base for understanding how elevated turbidity harms salmon.

There are additional water quality problems in the valley that don't show up on the Department of Environmental Conservation's Impaired Water Bodies list. For example, in 2011 the owner of a Mat-Su septic pumping business was caught, and later convicted of, dumping raw sewage into a tributary of the Little Susitna River. A downstream neighbor had been trying to get authorities to do something about the illegal dumping for some time (ADN, 8/29/2012).

The Mat-Su Borough has a volunteer program for water-quality monitoring of its lakes. That's a good first step but the program does not measure or monitor many of the potential pollutants that harm salmon such as hydrocarbons or bacteria (sewage) (MSB Volunteer Lake Monitoring Program, http://www.matsugov.us/planning/divisions/environmental-division/wq/vlmp).

There are over 21,000 septic systems and outhouses in the Mat-Su and more being added all the time as new development spreads out further and further into the valley. The 2006 Update to the "Mat-Su Comprehensive Economic Development Strategy" contained the following statement: **"Since most of the Borough relies on on-site septic systems and wells, the proper installation and maintenance of these systems is a concern. In some areas, inadequate systems are leaching into lakes and streams. This impacts both water quality and natural aquatic systems and needs to be addressed."** It has not been addressed and in fact the Mat-Su Borough's new Title 43 removed the requirement of an engineer's report stating the suitability of some subdivided lots to contain an on-site septic system (Mat-Su Borough, 2012).

The proliferation of impervious surfaces - roads, parking lots and rooftops - associated with urbanization causes pollution. Run-off from rain and snow-melt collects contaminants and flows unfiltered into waterways. The rapid flow of water off impervious surfaces also contributes to flooding and reduces the amount of water that percolates down into the soil to replenish the ground water supply. When the ground water supply is diminished, salmon habitat in shallow streams and wetlands disappears. Wells and drinking water supplies can also suffer from the deleterious effects of impervious surface run-off and contamination. Research, including studies conducted in Anchorage, have defined ways that the negative impacts can be mitigated but it requires dedicated land-use planning (Ourso, 2003).

The 2006 Mat-Su Comprehensive Economic Development Strategy also contains the following language: "Rapid development has also replaced vegetation with paved or impervious surfaces. As development occurs, traditional drainage patterns are disturbed, rerouted, confined or eliminated. Frequent high flows and unimpeded run-off can directly impact lakes and streams by causing excessive erosion and destroying habitat for fish and aquatic life. The pollutants carried with such runoff (gasoline, oil, sediment, heavy metals, and herbicides) can potentially contaminate water supplies for those who depend on wells." The Borough acknowledges the problems but asks its citizens only for "voluntary practices" for conservation.

Riparian and Wetland Damage

Cutting vegetation, excavating and building near the edges of lakes, rivers and streams used by salmon harms the fish in various ways. Riparian zone vegetation provides shelter to juvenile salmon and helps keep water temperatures cooler. Debris from shore-side vegetation adds nutrients to the water and shelter for adult and juvenile fish. Clearing, excavation and building in riparian zones causes siltation and pollution. Siltation can make gravel spawning beds unusable for salmon or suffocate eggs already laid. Polluted run-off into lakes and streams can kill juveniles and returning adult salmon before they have a chance to spawn.

The Mat-Su Borough has regulated setbacks from waterbodies for buildings and septic systems but has not codified any other protections for riparian zones. The Kenai Peninsula Borough enacted riparian zone protection on the Kenai River in 1996 to preserve and restore essential fish habitat along the banks of the Kenai River and its tributaries. Other salmon streams were subsequently added and the Kenai Peninsula Borough is currently working to extend riparian zone protection to all of the waterways used by salmon in the borough. It is not easy, popular or inexpensive but these types of regulations are essential for sustaining salmon.

Wetlands are another critical component of salmon habitat, and much more. **The Matanuska-Susitna Borough Wetlands Management Plan Executive Summary contains the following language:**

> **"Wetlands link land and water, and in doing so, afford the residents of Mat-Su with many lifestyle, environmental, and economic benefits. These benefits often include:**
> - **Lifestyle Benefits: open space, clean water, and recreation opportunities**
> - **Economic Benefits: tourism, hunting , fishing, skiing, snow machining, and other outdoor recreation activities; stormwater management; flood control; and clean water**
> - **Environmental Benefits: clean water; flood reduction; erosion control; habitat for moose, salmon, and waterfowl; and groundwater recharge and purification."**

Again, the Mat-Su Borough appears to recognize the function and importance of the natural system but is unwilling to commit to any pro-active management.

An additional source of damage in the Mat-Su Basin is the use of ATVs near and in waterbodies, including wetlands. Swiftwater Creek, a tributary of the Little Susitna River with valuable coho habitat, has long had an ATV trail running along, and through, the stream. ATV use along McRoberts Creek in the Jim Creek watershed eroded the bank of the creek to the point where the water was diverted out of the stream channel and into the trail. These are just two examples of human-caused damage to salmon streams. There are hundreds of miles of ATV trails throughout the valley and likely hundreds of other examples of stream damage that individually may seem innocuous but collectively have a large, unmonitored impact on salmon migration, spawning and rearing.

The Mat-Su Borough's Title 43 relaxed access standards for subdivisions outside of Road Service Areas: road access is not required; trail access is sufficient; and the access trails don't have to be designed or built for to subdivision approval. Trail standards were also eased and allow wetland crossings and open-water stream and river crossings. The plat approval requirements for drainage management, erosion control and flood hazard indications were reduced by Title 43. The requirement for a plat note concerning setbacks from shorelines was eliminated (Mat-Su Borough, 2012). All of these changes, enacted in 2012, will increase the amount of damage done to salmon habitat by development in the borough.

The State of Alaska Department of Natural Resources is not taking responsibility to protect salmon habitat from motorized vehicles in the Knik River Public Use Area and on other state-owned lands.

Illegal ATV trails crossing Upper Jim Creek in the Knik River Public Use Area. Bottom photo shows coho spawners in precisely the same location.

Photos by R. Howard, KRWG

Hydroelectric Dam

The habitat problems resulting from urbanization described in the preceding sections have been contributing to recent salmon declines. A future hazard is currently in the planning stages and should be of great concern to people and entities who want to maintain salmon stocks in the Susitna River.

The Alaska Energy Authority is proposing to construct a hydroelectric power facility in the upper Susitna River, 184 miles from Cook Inlet and 87 river miles above Talkeetna. The facility would include a 735-foot dam creating a 24,000 acre reservoir stretching 42 miles in length above the dam.

The project is the early stages of a permitting process with the Federal Energy Regulatory Commission (FERC). This is the preliminary study period of the project. The Alaska Energy Authority has identified 58 research studies to be conducted over two years covering 186,000 acres along the Susitna River. Information about all of the studies is available at the project's website (www.susitna-watanahydro.org).

Many of the planned studies are focused on salmon. Project planners have already identified many ways in which the dam will affect salmon and salmon habitat. Much of the research is oriented toward determining how to reduce and mitigate negative impacts to fish.

Generating hydroelectric power requires changing the natural flow of the river. Less water would flow below the dam in the spring because water would be stockpiled during the snowmelt season. River water levels would be higher in the winter, and river water would be warmer, as water is released to meet demand for electricity. The planners also expect to release water on a daily basis according to demand, so water levels would change significantly during the course of each day in the 184 miles of river downstream of the dam.

Among other things, researchers will be trying to determine exactly how these altered water levels will affect stream temperatures, stream ice processes, water levels and fish passage between the main river and tributaries, side channels and sloughs, and water levels and siltation in spawning beds. Another study focus is the risk of mercury contamination of fish in the Susitna. Newly created reservoirs have a well-studied natural tendency to concentrate highly toxic methylmercury in the food chain leading to fish and fish-eating wildlife.

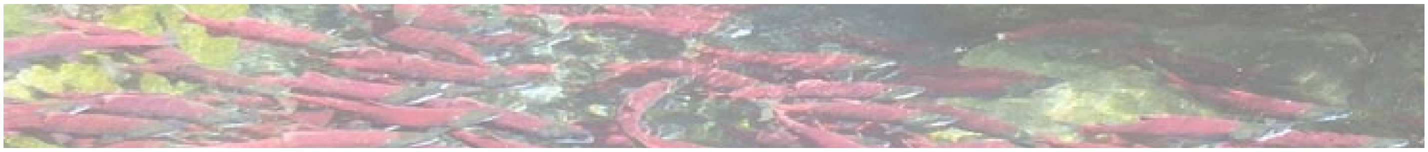
The Alaska Energy Authority's Study Plan makes it clear that there would be inevitable negative impacts on salmon from a hydroelectric dam. Most effects would happen slowly through subtle changes to the system. For example, the dam reservoir will trap much of the larger particulate-sized sediments. The consequences for salmon spawning beds downstream is poorly understood. Winter ice cover on the river is known to create hydrostatic pressure that maintains the upwelling of groundwater into the system essential to providing winter habitat for juvenile salmon. The release of warm water and the fluctuating flows from the reservoir during winter months will reduce the ice cover. These are just two examples demonstrating the complexity and vulnerability of fish habitat. It is not possible to dam the Susitna River without ultimately and inevitably harming the salmon production. Opponents of the dam argue that the dam and its footprint in the Susitna watershed is likely in legal conflict with Alaska's Sustainable Fisheries Policy as set forth in 5AAC 39.222 (Coalition for Susitna Dam Alternatives, 2013).

The Susitna-Watana hydroelectric project would provide flood control and infrastructure that would accelerate residential and other development in the valley. That development, in the absence of any regulatory protections for fish habitat, would also accelerate the decline of salmon.

Urbanization is just one piece of the matrix of problems causing the decline of some salmon stocks in the Mat-Su Basin. Growth and development aren't bad things. Unlimited, unregulated, unmitigated development, however, is simply incompatible with the conservation of natural systems required for salmon production. It is not possible to have both. The story of salmon extinction in the Pacific Northwest is the story of short-term economic gains inevitably prevailing over long-term resource planning and conservation.

"Declines in salmon production due to habitat loss are masked and hard to detect relative to the time frame of institutional decision-making. The failure of institutions to adequately protect the resource over the rights of the entrepreneur is predictable because it is usually politically easier to favor economic growth over conservation, and by the time the affected natural resources have collapsed, the original policymakers are usually gone, leaving a fresh group of policymakers to respond to the public outcry to bring back these lost resources. Reclamation, however, is usually prohibitively expensive or socially or technologically impossible, leaving accomplishments largely in the token range."

Tarbox, K.E., and Bendock, T., 1996. Can Alaska Balance Economic Growth with Fish Habitat Protection? A Biologist's Perspective.



Fisheries Management

Invasive northern pike and beaver dams are not the only problems that haven't been handled adequately by ADF&G management. Coho salmon stocks are being harmed by poor management decisions as well as habitat losses.

Returns of coho salmon to the Mat-Su Basin are measured against escapement goals at only three places in northern Cook Inlet - the Little Susitna River, Fish Creek, and Jim Creek, a tributary of the Knik River. Escapement counts from these three systems are used by Fish and Game to make decisions regarding coho stocks in the entire Mat-Su drainage and Upper Cook Inlet. **These three waterbodies should not be used at all for counting returns because they are among the dirtiest, most urbanized and most exploited streams in Southcentral Alaska.** It is wrong to make coho management decisions based on these systems. It is unacceptable to allow coho returns to these rivers to influence the management decisions for the central district sockeye fishery during the peak of the sockeye runs.

The Little Susitna River is not only polluted, but the coho stocks there now aren't even native to the river. A 1949 study by the U. S. Geological Survey determined there were no longer any salmon in the river due to toxic run-off from mining (Lawrence, 1949). From the 1960s through 1993 the Little Su was stocked regularly with hatchery coho and kings that originated from stocks in northern Cook Inlet, the Kenai Peninsula, Resurrection Bay, Kodiak, Washington and Oregon. A total of 11,838,251 juvenile coho were stocked in the Little Susitna River between 1982 and 1993. The coho stocking was suspended in 1993 with the purpose of determining if the non-hatchery stock could sustain the sport fishery. It cannot sustain the sport-fishing pressure but stocking has not been resumed. Escapement goals for the river are still based on data from the years during which there was significant stocking of hatchery fry and smolt. Pike are present in the watershed. The escapement in this river should not be used as an indicator of coho returns in Upper Cook Inlet.

Fish Creek also has pike in its drainage. Fish Creek flows out of Big Lake. This lake has been intensively developed for residential use in the past four decades and its water currently exceeds state standards for hydrocarbon pollution. From 1977 through 1993 a total of 13.4 million juvenile cohos were stocked in Fish Creek. A hatchery was operated in the watershed from 1977 through 1993. Hatchery activities changed seasonal water flows and introduced infectious hematopoietic necrosis virus (IHNV). A weir blocking all fish passage was used above the hatchery for some time to prevent the spread of the IHNV (Litchfield, 2002). Juvenile salmon survival rates in Big Lake have been abnormally low since the 1970s for both wild and hatchery stocks. Sockeye stocking was discontinued in 2008 due to poor smolt survival (ADF&G, 2011). Fish Creek is not representative of coho or sockeye systems in the Mat-Su Basin and should not be used to make management decisions affecting the entire Upper Cook Inlet.

Jim Creek doesn't have as unlikely a history as the Little Su or Fish Creek but it is very questionable as a return indicator for coho stocks. Jim Creek, a.k.a. "Circus Creek" is heavily accessed not only by sport fishermen but also by ATVs, dirtbikes and off-road trucks. In fact, the Mat-Su Borough Assembly voted in February, 2013 to turn their 471 acres of land around the mouth of this heavily fished salmon creek into an ATV motor park. McRoberts Creek is a major tributary of Jim Creek and is the same creek mentioned previously for having had the water from its channel diverted down a trail as a result of ATV traffic.

This photo shows damage by airboats in Leaf Lake and Swan Wetlands in the Jim Creek drainage. This is a coho salmon rearing area. (Photo by T. Cox)

Using these three waterbodies for counting coho escapements to the entire Upper Cook Inlet is also inappropriate because of their extremely high rates of in-river exploitation. For the past 30 years the Little Susitna has had an average in-river harvest rate of 50% on returning coho salmon. An escapement count there is clearly not comparable to a stream system that is not so accessible or intensively fished. Using these heavily exploited rivers as return indicators for the whole valley

does not provide an accurate picture and almost guarantees over-escapement into the less accessible areas. Over-escapement leads to major population fluctuations. Coho escapement counts should be conducted on multiple streams that are not heavily exploited or in urbanized areas. This would generate a realistic picture of overall escapement into the Mat-Su drainage and Upper Cook Inlet.

The Mat-Su's increasing population (and proximity to Anchorage) results in intensive concentration of fishing effort on any accessible sites. Streams with good access get inundated with fishermen and effort. If more salmon are allocated, then some additional fish may be caught in those streams; but inaccessible streams, without much sport harvest, get too many fish, which leads to the large fluctuations, or "cycling", in returns.

ADF&G Sportfish Division management has demonstrated an irresponsible unwillingness to manage in-river sportfishing exploitation of stocks in the Mat-Su. The most egregious example is their management of catch and release fishing. In 1993 ADF&G biologists published the results of their study on the mortality of caught and released coho salmon in the Little Susitna River (Vincent-Lang, 1993). **The research showed that coho salmon hooked and released in the lower Little Susitna River suffered a 69% mortality rate.** The mortality rate for cohos hooked and released in the river above the estuary was 12%. These were the rates for coho salmon caught and released a single time. The study did not examine the effect of multiple hooking of a fish nor whether the salmon that survived were able to spawn after being caught and released.

Fish and Game's escapement goals for the Little Susitna were not met in 2009, 2010 or 2011. The escapement goal may have been artificially high, as it was still based on data from the years during which the river was heavily stocked, but nonetheless, the escapement goal was not met in those years. If ADF&G was concerned about the coho returns in the Little Su it seems reasonable that they would have, at the very least, curtailed catch and release fishing in the lower river knowing that particular activity would result in a large number of dead, discarded coho. ADF&G did not restrict catch and release fishing. Based on the sportfish survey data for the Little Susitna, the 69% mortality rate for hooked and released coho resulted in over 2,000 dead and discarded coho salmon in 2009, over 1,500 in 2010 and over 950 in 2011.

In 2009 and 2010 the escapements were close to the goals; minor adjustments to in-river exploitation would have achieved the goals. In 2011 the coho escapement in the Little Susitna was 5,000 fish short of the goal. Still, ADF&G made no changes in 2012 until the season was almost over. When you have a highly accessible stream that is not reaching escapement goals and ADF&G does nothing to reduce in-river exploitation rates, there appears to be a management deficit.

ADF&G estimates that an average of 68,650 coho were caught and released annually in northern Cook Inlet between 1996 and 2009. At the most conservative measure of a 12% mortality rate we are looking at over 8,200 cohos killed and discarded every year. That adds up to 82,000 every ten years - at the minimum estimated mortality rate. The actual number of dead and discarded coho could easily be as high as 30,000 fish per year. A completely unmonitored effect is the impact on salmon's ability to spawn after having been hooked and released one or more times.

ADF&G has encouraged, not discouraged, catch and release fishing. Restricting catch and release fishing is a management tool that could be utilized with relative precision to conserve thousands, and even tens of thousands, of spawning salmon in northern Cook Inlet. Instead, ADF&G has tried to manage northern Cook Inlet salmon using only the inefficient and ineffective tools of restricting the commercial fisheries in central Cook Inlet.

Causes of Catch and Release Mortality

Catch and release fishing kills salmon through fatal wounding or stress. When they are hooked, fish have a stress reaction that includes the release of hormones like adrenaline. Adrenaline elevates the heart rate, blood flow and blood pressure. These effects produce systemic lactic acid, require extra energy consumption, decrease protective exterior mucus production and reduce immune response. Adrenaline also disturbs ion transport at the gill membrane, interfering with the fish's ability to absorb oxygen or osmoregulate. Salmon's ability to osmoregulate is also stressed during their transition from salt water to fresh water. This additional stressor may be the reason that almost 70% of cohos hooked and released in the lower Little Susitna River die shortly after they are released.

(Nilsson, Stefan. 2000. Maule, A.G. 1987. Mazeaud, M.M. 1977. Clarke, W.C. 1995.)

Salmon in Hot Water

Water temperature is critically important for salmon production. Stream and lake temperatures affect egg and fry survival, food supply, migration timing, the amount of oxygen available in the water and salmon's ability to use oxygen. Excessively high water temperatures cause salmon physiological stress. The fish then become more vulnerable to additional stressors like predators, parasites and pollution. Water temperature is a factor affecting a salmon's ability to survive after being hooked and released in a sport fishery.

Extensive research has delineated temperature parameters and limits for salmon health and survival. When stream temperatures reach 17°C (63°F) there is not enough dissolved oxygen in the water to allow salmon to swim upstream. The shallow, meandering character of much of the waterways in the Mat-Su Basin increase the systems' vulnerability to rising temperatures.

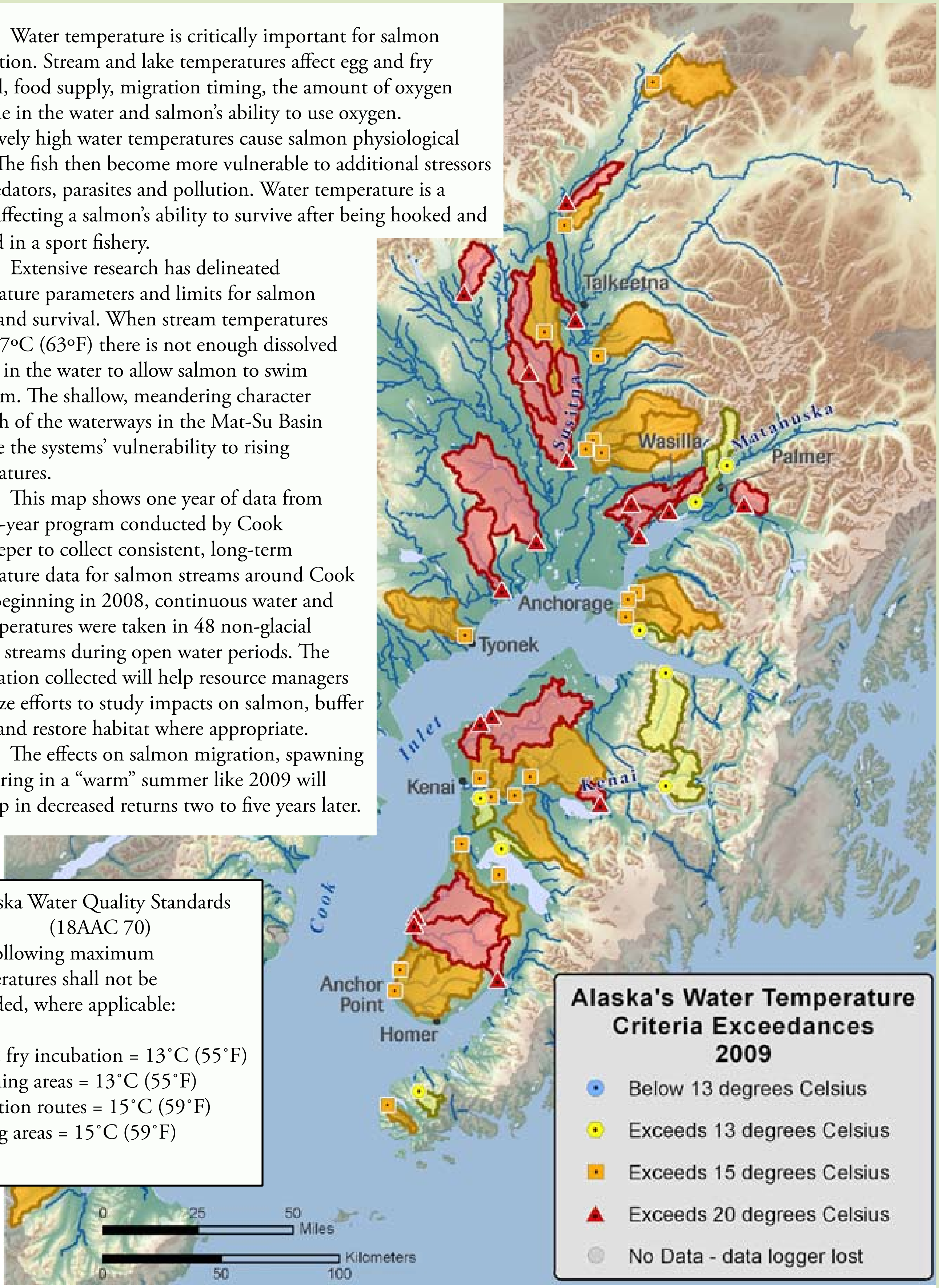
This map shows one year of data from a multi-year program conducted by Cook Inletkeeper to collect consistent, long-term temperature data for salmon streams around Cook Inlet. Beginning in 2008, continuous water and air temperatures were taken in 48 non-glacial salmon streams during open water periods. The information collected will help resource managers prioritize efforts to study impacts on salmon, buffer effects and restore habitat where appropriate.

The effects on salmon migration, spawning and rearing in a "warm" summer like 2009 will show up in decreased returns two to five years later.

Alaska Water Quality Standards (18AAC 70)

The following maximum temperatures shall not be exceeded, where applicable:

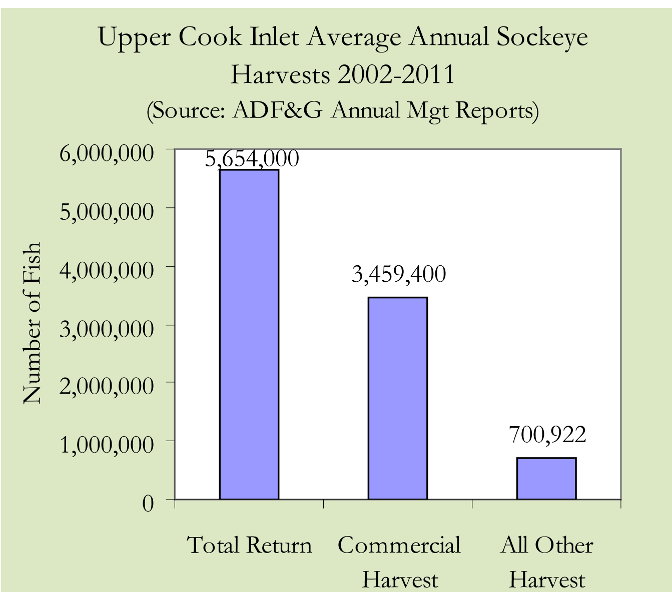
egg & fry incubation = 13˚C (55˚F)
spawning areas = 13˚C (55˚F)
migration routes = 15˚C (59˚F)
rearing areas = 15˚C (59˚F)



Mauger, S. 2011. Stream Temperature Monitoring Network for Cook Inlet Salmon Streams 2008-2010. Alaska Clean Water Action Grant 11-01, FY2011 Final Report. Cook Inletkeeper, Homer, Alaska.

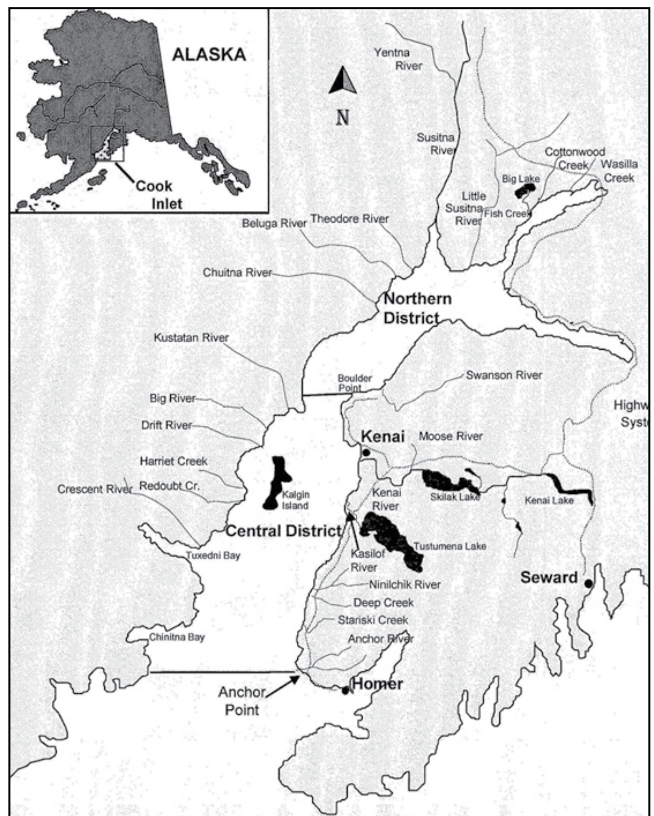
Commercial Fishing

The commercial fishing industry has been sustainably harvesting salmon in Cook Inlet for over 130 years. Upper Cook Inlet has produced the second largest runs of sockeye in Alaska and contributes at least 5% of the world's supply of sockeye salmon (Ruggerone, 2010 and Pinsky, 2009). The commercial harvest of sockeye in Cook Inlet averaged almost 3.5 million fish per year between 2002 and 2011. Total other harvests, including sportfishing and personal use, averaged over 700,000 sockeye salmon per year. The abundant harvestable surplus of high-value sockeye in upper Cook Inlet is what makes the commercial fishery such an important contributor to the region's economy and provides more fish for recreational users than any other species.



Over twenty years ago ADF&G began restricting commercial fisheries with the aim of increasing sockeye escapements into the Susitna River. Unfortunately, the escapement numbers they were using were from the inaccurate sonar counters that were underestimating actual sockeye escapements by 50 to 100%. While it is not possible to go back and re-calculate exact figures, we now know that escapement goals were being exceeded and the restrictions on the commercial fisheries were, in all likelihood, not necessary. When the extreme level of inaccuracy was determined in 2008, the restrictions on the commercial fisheries were not changed accordingly.

In addition, recent research has refuted much of the theory behind the commercial fishing restrictions. Closures and restricted fishing areas were presumed to allow Susitna salmon to migrate through central Cook Inlet. But salmon don't travel in segregated groups, nor do they migrate in straight lines to their destinations. **The latest research incorporating genetic testing with Off-shore Test Fishing in the central district has demonstrated that sockeye stocks are intermingled and dispersed throughout the inlet as they migrate.** Studies have shown that Kasilof and Kenai sockeye salmon often account for more than half of the catch in Northern District setnets - far to the north of their destinations. Susitna sockeye catches vary between 14% and 26% of the sockeye harvest in the Northern District (Barclay, 2010).

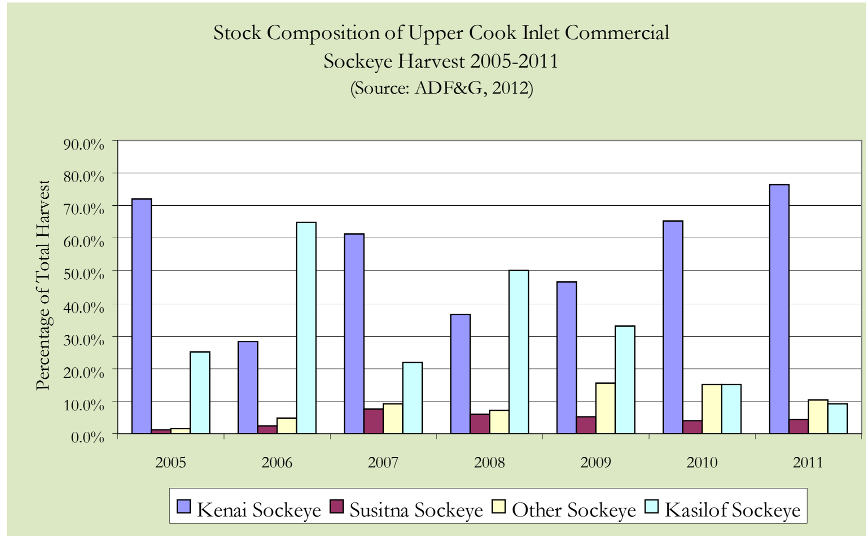


ADF&G Map

Genetic testing of sockeye caught commercially has also indicated that the percentage of northern-bound sockeye caught by drift fishermen in restricted corridors is not significantly different than the percentage caught during a district wide opening.

In 2011 drift fishermen caught 781,146 sockeye while restricted to the Corridor. Of these, 6.8% were genetically identified as Susitna salmon. While not restricted to the Corridor during the same season, drift fishermen caught 2,261,582 sockeye of which 5.7% were identified as Susitna salmon (ADF&G, 2012).

An average of 35% - 38% of the returning Mat-Su sockeye stocks are commercially harvested each season (P. Shields, Pers. Comm. 2013). This is a relatively low rate, well below what is considered a sustainable rate of exploitation. Commercial fisheries harvest 55-70% of the sockeye runs in the Kenai and Kasilof Rivers. The difference in the exploitation rates is related to geography. The northern limit of the central district commercial fishing area is nearly 50 miles away from the mouth of the Susitna River. The majority of fishing effort takes place well south of that northern limit.

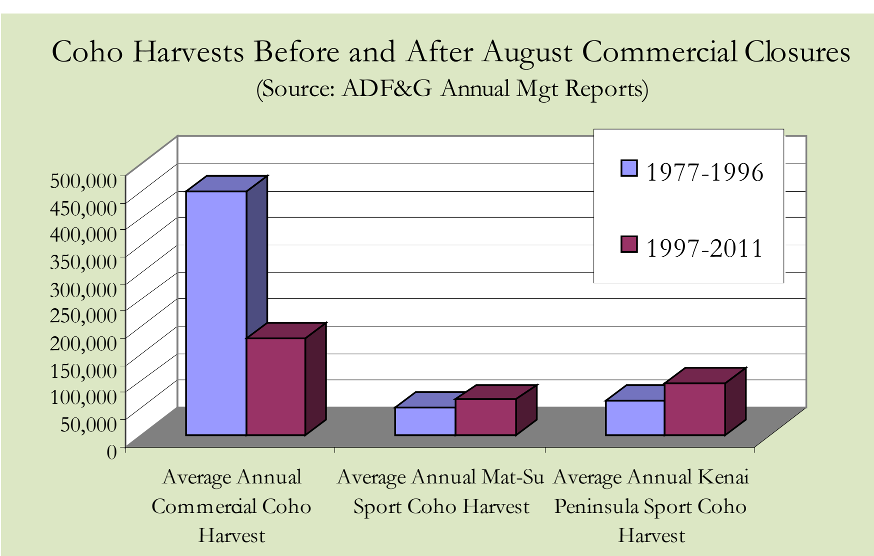


All of the in-river problems facing spawning and rearing salmon in the Mat-Su Basin should make it obvious that simply putting more fish in the streams is not a solution. **The ADF&G 2011 Upper Cook Inlet Management Report states it very clearly: "…unless the impacts from pike predation and beaver dams can be significantly reduced, the total sockeye salmon production in the Susitna River drainage will continue to suffer, regardless of the amount of restrictions placed on commercial fisheries."** In fact, current Susitna escapement goals need to be re-evaluated in light of the decreasing production capacity.

Mandatory restictions placed on the commercial fisheries since 1990 related to Susitna sockeye were based on bad science and flawed assumptions. Susitna River sockeye salmon make up an average of only four percent of the total commercial sockeye harvest. Trying to base fishery management decisions on a stock that makes up only 4% of the total can have exponential effects on the larger components of the harvest.

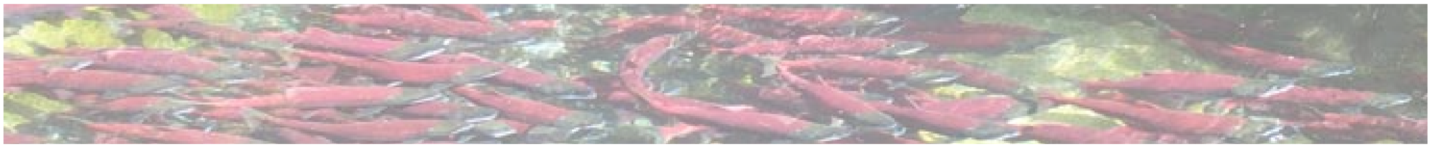
Besides being ineffective, attempts to manage Susitna sockeye by manipulating commercial fisheries has caused other problems. Fisheries managers require the flexibility to respond to salmon returns in real time. None of the salmon run on timetables or in discrete areas. Decisions need to be made day-to-day based on data received within 24 hours. Pre-determined rigid schedules of closures, corridors and other restrictions has resulted in over-escapements and lost harvest opportunities, all of which cost the industry and local communities millions of dollars.

Tens of millions of dollars in ex-vessel revenue have been lost since 2002 due to unharvested, surplus over-escapements of sockeye into the Kenai River. This does not include the loss of the direct, indirect and induced revenues to the processors, supporting businesses, local and state economy or the loss of the value of the future diminished return.



Similar effects have resulted from efforts to manage coho runs. In the past the Upper Cook Inlet commercial fishery was open from early May through October. The beginning of the commercial season was changed to late June to prevent the commercial harvest of early run king salmon. The season has been progressively shortened in an effort to prevent the commercial harvest of coho salmon.

Beginning in 1997 the commercial fisheries lost most of their normal fishing time after early August. The consequences for the commercial industry were dramatic.

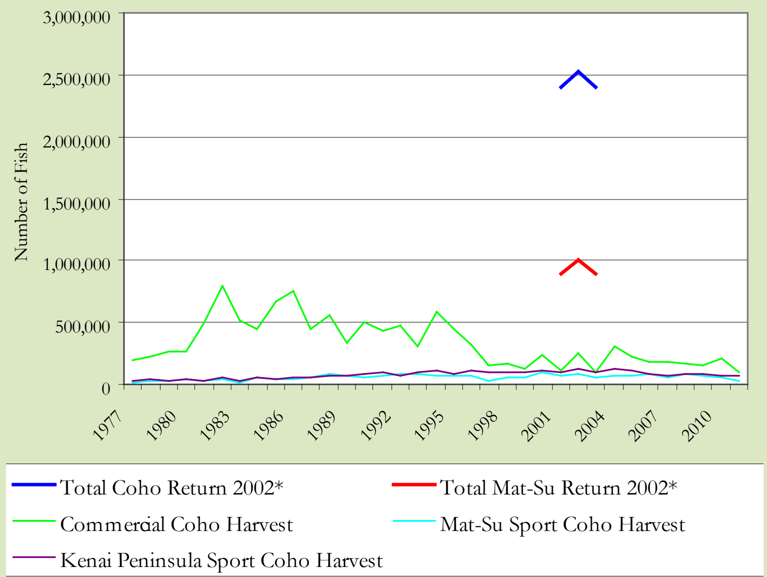


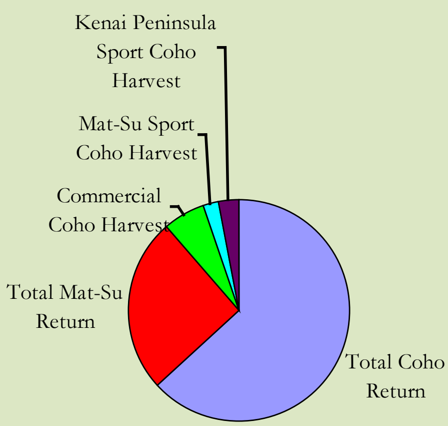
The annual average commercial harvest of coho salmon from 1977 through 1996 was 451,000. After the restrictions began, from 1997 through 2011, the average annual coho harvest dropped to 177,000; a decrease of 274,000 fish. Average annual sport harvest of coho after 1996 in the Mat-Su Basin increased by 13,000 fish. The Kenai Peninsula annual average sport coho harvest increased by 30,600 fish.

There is very little return on the sacrifice. The increase to the Mat-Su's average coho harvest was less than 5% of the harvest lost to commercial fisheries.

Harvest numbers are the data used because total coho escapements into Upper Cook Inlet are not normally counted, nor total returns calculated, with the exception of the returns in 2002.*

Upper Cook Inlet Coho Harvests and Return
(Source: ADF&G Annual Mgt Reports; Willette, 2003)





2002 Upper Cook Inlet Coho Returns and Harvests
(Source: ADF&G Annual Mgt Reports; Willette,2003)

* A tagging study conducted by ADF&G in 2002 estimated the population of coho salmon returning to Upper Cook Inlet to be 2.52 million fish (Willette, 2003). That did not include the entire return of coho because the initial tagging period of the study ended before the Kenai Peninsula and Turnagain Arm runs were complete.

- **Commercial fisheries harvest 10% or less of the entire coho return to Upper Cook Inlet, and 7% or less of the coho returns to the Mat-Su Basin (Willette, 2003).**

- The average annual sport harvest of coho salmon in Cook Inlet from 1996 through 2011 was 180,175 fish. This figure does not include any catch and release mortality data.

- The average annual commercial harvest of coho salmon from 1996 through 2011 was 186,086 fish. This figure includes harvest of coho stocks by all gear types, including drift and setnet in the Central District, Northern District setnet and the late season openings on the West side of Cook Inlet including Chinitna Bay.

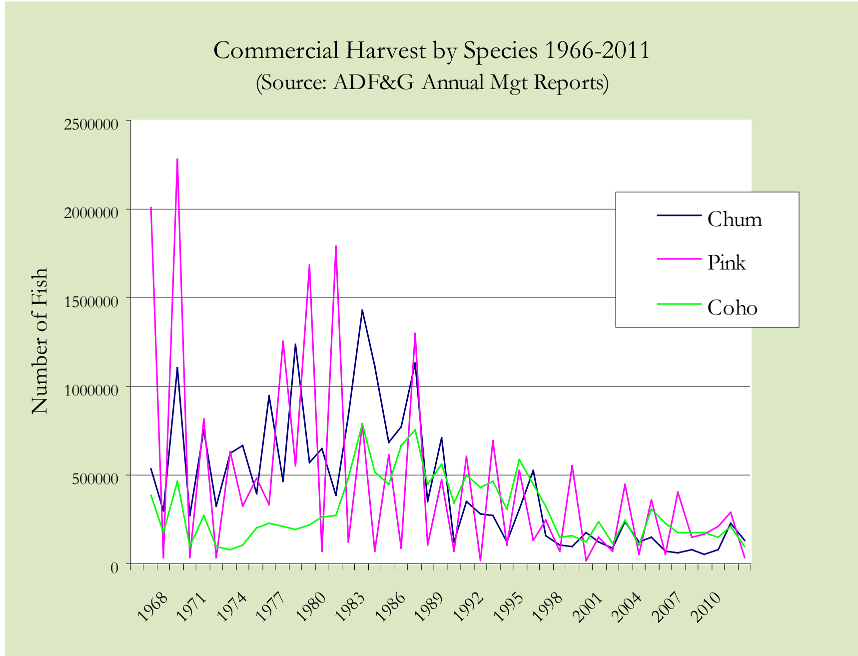
The significant reduction in commercial harvest of coho salmon has not prevented the recent coho return declines in the systems under observation.

Efforts to manage coho runs by restricting commercial fishing has very limited effectiveness and excessive economic consequences for the commercial fishing industry. Restricting commercial fishing, particularly in August when the bulk of the northern-bound coho have already passed through the central inlet, has almost no measurable effect on those coho runs (Willette, 2003). Analysis has shown that commercial harvests of Kenai River coho are also quite low (ADFG, 2011). But August closures and restrictions on commercial fishing during July and August significantly decrease the harvest of robust stocks of upper Cook Inlet chum and pink salmon. Commercial exploitation rates for pink salmon are less than 12% and rates for chum salmon are only around 6% (Willette, 2003).

If the commercial harvest on the 2001-2011 pink and chum runs in Cook Inlet had an average exploitation rate of 40% the ex-vessel value could have been, on average, an additional 4 million dollars per season. Including direct, indirect and induced economic effects, the pink and chum harvest could have realized in excess of 14 million dollars to the local and state economy per year.

In 2011 the Mat-Su Borough petitioned the Board of Fish to completely close the Upper Cook Inlet commercial fishing season on August 5 and discourage expansion of the commercial fishery targeting chum and pink salmon in order to (possibly) allow a slightly higher number of coho to reach northern drainages. Salmon population declines in northern Cook Inlet have not been caused by commercial fishing but efforts to solve the problems by restricting commercial fishing are costing the industry and the local communities many millions of dollars. The Mat-Su Borough and the ADF&G Sportfish Division have expected the commercial fishing industry to bear destructive costs while they have taken very little responsibility and made few effective changes.

It is in everyone's interest to conserve and sustain wild salmon in all of Cook Inlet's drainages. Commercial fishermen have been putting millions of dollars into habitat restoration and stocking programs in the Mat-Su Basin through the Cook Inlet Aquaculture Association.



This non-profit association was started by commercial fishermen in 1976 and funded with a self-imposed 2% tax on the gross value of salmon harvested. The purpose was to use commercial fishing money to create an organization that could provide a science-based infrastructure to protect, rehabilitate and enhance salmon stocks and habitat for all users.

Since 1980 Cook Inlet commercial fishermen have contributed an annual average of $775,000 to the Cook Inlet Aquaculture Association. This money has been leveraged with state grants and other income sources to fund many monitoring, rehabilitation and stocking programs in the Mat-Su Basin that have benefited everyone. In the past ten years the Cook Inlet Aquaculture Association has expended $4.2 million dollars on Mat-Su basin projects directly related to improving salmon production including: pike management and suppression; beaver dam management; sockeye spawner and smolt enumerations; and sockeye enhancement.

The commercial fishing industry will continue to support science-based problem solving and promote sustainability of the salmon resources in the Cook Inlet watersheds.

Conclusion

Many groups, governmental and non-governmental, are concerned about and studying various aspects of salmon production and the general health of the ecosystem in the Mat-Su Basin.* The threats are clear, the lessons have been learned during the experience of losing thousands of wild salmon stocks in the Pacific Northwest over the past 100 years (NRC, 1996). The Mat-Su Basin Salmon Habitat Partnership has begun a process of bringing everyone together to develop goals, plans and priorities. What is needed is the public and political will to choose pro-active prevention over expediency.

For over twenty years ADF&G restricted commercial fishing in the central district of Cook Inlet in various ways to try to increase escapement into the Susitna River. The problem they were attempting to solve turned out to be inaccurate counters, not over-exploitation. Those decades of experience with many permutations of commercial fishing restrictions in the central district did demonstrate that restrictive lines and corridors only reduce the efficiency of the fleet and are ineffective at conserving or targeting any specific stock.

Now that problems with Mat-Su salmon production have been found to be in freshwater, ADF&G and policy makers are still attempting to fix the situation with restrictions on saltwater fisheries in spite of the fact that there is no scientific basis for that tactic and plenty of evidence to the contrary. It appears that the department has lost sight of its mission and is more interested in managing public perception than in managing fishery resources.

Only the willfully uninformed can maintain the opinion that the problem with Mat-Su salmon production is not enough adult fish making it back to northern Cook Inlet streams. Continued denial of the facts will effectively prevent necessary steps from being taken to conserve salmon in their endangered habitats in the Mat-Su Basin. This would not only eliminate the economic and cultural benefits of salmon in the Mat-Su but would also undermine, if not destroy, an entire sustainable commercial salmon fishery that is a critical part of the economy of the Kenai Peninsula Borough and Southcentral Alaska.

The state legislature recently granted over seven million dollars to ADF&G and the Mat-Su Borough for Mat-Su Basin salmon research, restoration, protection and enhancement. This is an opportunity to implement some major projects for suppressing pike and improving fish passage through culverts and beaver dams. If the funds are spent judiciously, and additional money is allocated in the future, salmon population numbers could begin showing improvements within a decade.

Alaska's Fish and Game Act requires the Department of Fish and Game to "…manage, protect, maintain, improve, and extend the fish, game and aquatic plant resources of the state in the interest of the economy and general well-being of the state." (AS 16.05.020) In the best interest of the state, the salmon resources and all the user groups, ADF&G needs to carry out its mission.

(* USGS, USFWS, ADF&G, Cook Inletkeeper, Chickaloon Native Villlage, Wasilla Soil & Water District, Palmer Soil & Water District, AKDNR Divisions of Agriculture and Parks and Recreation, US Army Corps of Engineers, UAA, Mat-Su Borough, The Nature Conservancy, Cook Inlet Aquaculture Association, National Marine Fisheries Service, Alaska Salmon Alliance.)

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