Cook Inlet Water Quality Summit

October 24th – 25th, 2023

Presented by

ACAT Alaska Community Action on Toxics

ALASKA WILDLIFE ALLIANCE

INLETKEEPER

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era environmental investigation agency

KENAI WATERSHED FORUM

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This version of the Cook Inlet Water Quality Summit Program Book was updated December 2023 to include the full PowerPoint presentations for each speaker topic and a summary of the panel discussion.

Cook Inlet Water Quality Summit

Program Book

October 24-25, 2023

Anchorage Downtown Marriott

Fairbanks/Kenai Conference Room

A copy of this program book and other Summit-related information is available at www.akwildlife.org/cook-inlet.

The webpage may be updated with additional information after the conclusion of the Summit.

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A Note from the Planning Committee Coordinator

The initial idea of organizing a Cook Inlet Water Quality Summit was a result of several groups wanting to help improve the quality of habitat for the endangered Cook Inlet beluga whales. As they thought about what steps they could take, they realized they didn't understand the landscape surrounding water quality issues – what is known, what is unknown, who is doing what, who enforces what? Without a basic understanding of these types of questions, they didn't know what actions were needed to help improve the situation for belugas. Thus, the idea of a organizing a large-scale meeting started to grow as discussions with others in the water quality arena were held. The planning committee diversified and grew into a collaboration of eight groups, with different interests and knowledge of various facets of Cook Inlet's water quality. In the spring of 2023, the planning of the Cook Inlet Water Quality Summit began in earnest.

To the knowledge of the planning committee, there has not been a similar effort to look at the Cook Inlet watershed ecosystem at this scale, from a water quality perspective. We didn't know exactly what topics would be covered, but we knew we had a lot of questions ourselves, such as: What contaminants are in the water? How are the waters changing? What human activities are occurring or are planned that may positively or negatively affect the waters? How are the fish and wildlife doing? Who is responsible for the management of the waters? How do we engage with those regulators and policy-makers? Thus, we came up with the overall goals of the Summit and session themes, and put those out to the community to decide the specific topics covered. Given the often-controversial nature and strong opinions surrounding water quality issues, the planning committee wanted to ensure that the purpose of the Summit was not to advocate for any particular position, but rather to educate participants (including ourselves) on a myriad of issues surrounding Cook Inlet's water quality so everyone can make informed decisions.

Cook Inlet is the most populated watershed in Alaska, home to a diverse array of people, cultures, wildlife, and economic interests. Thus, the planning committee decided that at the Cook Inlet Water Quality Summit, knowledge will be shared about Cook Inlet water quality, biodiversity, research, regulations, policy and more. At this Summit, we seek to:

- Improve understanding of the status of Cook Inlet waters and ecosystems;
- Improve understanding of the regulatory framework regarding water quality issues, and engagement with decision-makers;
- Identify data gaps and opportunities for collaboration; and
- Share data concerning Cook Inlet water quality, for the benefit of people and wildlife.

We were excited to see so much interest in sharing information by a variety of presenters, including those representing the private sector, non-profit organizations, tribal entities, and various levels of government. We actually had to modify our original plan for the agenda because we had more interest in presenting information than anticipated! There are also registrants from nearly 60 organizations, as well as over a dozen individuals attending on their own behalf for their personal interest. This lets us know we are on the right track and many people also want to learn more about these issues.

Thank you for your participation in the Cook Inlet Water Quality Summit, and maybe, if the interest is there, we'll see you at another Summit in the future.

With Gratitude,
Mandy Migura, on behalf of the Cook Inlet Water Quality Summit planning committee

Cook Inlet Water Quality Summit Daily Agenda

Anchorage Downtown Marriott Hotel, Fairbanks/Kenai Conference Room

Tuesday, October 24, 2023

9:00 Welcome, Opening Remarks – Nicole Schmitt, Alaska Wildlife Alliance; CT Harry, Environmental Investigation Agency; Mandy Migura, Broad Conservation LLC

Keynote Presentations

9:15 *Contaminant Monitoring in Cook Inlet's Physically Dynamic and Complex Environment* - Sue Saupe, Cook Inlet Regional Citizens Advisory Council

9:45 *The State of the Inlet 2023* - Sue Mauger, Cook Inletkeeper

10:15 Break

Session 1: Status of Cook Inlet Waters

10:30 *West Cook Inlet Stream Temperatures in the Tyonek Tribal Conservation District* - Jillian Jablonski, Tyonek Tribal Conservation District

10:50 *Addressing PFAS and Pesticides in the Cook Inlet Watershed: Science and Policy* - Pamela Miller, Alaska Community Action on Toxics

11:10 *The Municipality of Anchorage's Waterways and Cook Inlet* - Cherie Northon, Anchorage Waterways Council

11:30 *Alaska's Kenai River Water Quality Monitoring Project: 23 Years of Community Supported Research* - Benjamin Meyer, Kenai Watershed Forum

11:50 Lunch Break (on your own)

12:50 *The Kachemak Bay Watershed Collaborative* - Hal Shepherd, Water Quality Consulting, LLC

1:10 *U.S. Geological Survey Water Quality Data for Cook Inlet, Alaska* - Jeff Conaway, U.S. Geological Survey

1:30 Q&A with Session 1 Speakers

Session 2: Status of Human Activities Affecting Cook Inlet Watershed (includes Restoration/Pollution-Reducing Activities)

1:50 *History and Trajectory of the West Susitna Industrial Corridor* - Margaret Stern, Susitna River Coalition

2:10 *Port MacKenzie: The History and Future of a Small Industrial Port in Upper Cook Inlet* - David Griffin, Port MacKenzie / Mat-Su Borough

2:30 *Recovering and Recycling Deicing Fluid at Ted Stevens Anchorage International Airport* - Sean Dolan, NorthLink Aviation

2:50 Break

3:10 *Methods and Impacts of Diverting Organic Waste from the Anchorage Landfill and Building Healthy Soils* - Nick Riordan, Alaska Community Action on Toxics / Yarducopia

3:30 *Cook Inlet Tidal Energy: Opportunities and Challenges* - D. Douglas Johnson, Ocean Renewable Power Company

3:50 *Green Infrastructure Storm Water Management Projects in Homer, Alaska* - Janette Keiser, City of Homer

4:10 *Cook Inlet Offshore Oil & Gas Platforms: Dismantlement, Disposal and Restoral Obligations & Opportunities for More Intensive Monitoring, Management and Restoral of the Cook Inlet Biome & Accelerating the Transition to Clean Energy* - Mark Foster, MAFA

4:30 Q&A with Session 2 Speakers

4:50 Day 1 Wrap-up and Remarks – Hal Shepherd, Water Quality Consulting, LLC

5:00 End of Day 1

Wednesday, October 25, 2023

9:00 Welcome and Day 2 Opening Remarks – Ben Meyer, Kenai Watershed Forum; Ragen Davey, Defenders of Wildlife

Session 3: Status of Cook Inlet Fish & Wildlife

9:10 *It Takes a Village: Meeting the Complex Challenges Presented by HABs in Cook Inlet Through the Alaska Harmful Algal Bloom Network* - Thomas Farrugia, Alaska Ocean Observing System

9:30 *Cook Inlet: A Newly Discovered Pathway for Invasive Pike* - Parker Bradley, Alaska Department of Fish and Game

9:50 *The Status of the Endangered Cook Inlet Beluga Whales* - Mandy Migura, Alaska Wildlife Alliance

10:10 Break

10:30 *European Green Crab a Marine Invader Threatening AK Fisheries and Coastal Habitats* - Katherine Schake, Kachemak Bay National Estuarine Research Reserve

10:50 Q&A with Session 3 Speakers

Session 4: Regulatory Landscapes

11:10 *An Introduction to the Clean Water Act* - Matthew LaCroix, U.S. Environmental Protection Agency

11:40 Lunch Break (on your own)

1:00 *USACE Regulatory 101* - Andrew Gregory and Jennifer Mercer, U.S. Army Corps of Engineers, Pacific Ocean Division

1:30 *Cook Inlet Fish Consumption and Regional Tribal Environmental Programs* - Michael Opheim, Chugach Regional Resources Commission & Stephen Payton, Seldovia Village Tribe

2:00 Break

2:20 Panel Discussion: *Management of Cook Inlet water quality is complex. From City Government to the State capital, Tribal Councils, and agencies, there are many decision-makers who influence Cook Inlet pollution and restoration. This panel seeks to understand the roles of these various authorities, their silos, and ways Summit participants can connect with decision-makers on water quality issues. Panelists include:*

Christopher Constant, Anchorage Assembly, District 1
David Griffin, Port MacKenzie / MatSu Borough
Andrew Josephson, Alaska State House Representative, District 13
Janette Keiser, City of Homer
Matthew LaCroix, Environmental Protection Agency
Michael Opheim, Chugach Regional Resources Commission
Jonathon Ross, Ocean Conservancy, Kenaitze Indian Tribe and Salamatof Tribe member
Michael Salyer, US Army Corps of Engineers

3:50 Closing Remarks - Nicole Schmitt, Alaska Wildlife Alliance and CT Harry, Environmental Investigation Agency

4:00 End of the Cook Inlet Water Quality Summit

Keynote Speaker Biographies

SUE SAUPE, Director of Science and Research for Cook Inlet Regional Citizen Advisory Council (CIRCAC), will start off the Cook Inlet Water Quality Summit by giving an overview of the dynamic history of water quality studies and issues in Cook Inlet.

Presentation Title: *Contaminant Monitoring in Cook Inlet's Physically Dynamic and Complex Environment*

Ms. Saupe received a B.S. in Chemistry (1985) and an M.S. in Chemical Oceanography (1990) from the University of Alaska Fairbanks. During the mid- to late 1980s, she worked on multiple stable isotope food-web studies in the Bering, Chukchi, and Beaufort seas, including for her thesis "Nutrient dynamics and carbon supply to the north Aleutian Shelf nearshore ecosystem." In 1988, she moved to Woods Hole, MA, to work with a team developing stable isotope methods for assessing dissolved organic flow through east coast estuarine ecosystems. She returned to Alaska to conduct damage assessment studies for the University of Alaska Fairbanks following the Exxon Valdez Oil Spill until 1996 when she joined CIRCAC's staff. At CIRCAC, Ms. Saupe developed a multi-disciplinary science program, focusing on physical oceanography, water and sediment quality, and coastal habitat mapping, by partnering with multiple organizations, agencies, and industry. She was the Lead Scientist for Alaska's first Environmental Monitoring and Assessment Program (EMAP) survey and initiated a web-based ShoreZone coastal imaging and mapping program in the western Gulf of Alaska that has since developed into a state-wide program administered by NOAA. She is currently working with a team to compile historical contaminants data from Cook Inlet and surrounding waterbodies.

SUE MAUGER, Science & Co-Executive Director of Cook Inletkeeper, will provide an overview of the findings presented in Cook Inletkeeper's new "State of Cook Inlet" report. Cook Inletkeeper is a community-based organization with a mission to protect the Cook Inlet watershed and the life it sustains.

Presentation Title: *The State of the Inlet 2023*

Sue Mauger studies Alaska's wild salmon streams and leads Inletkeeper's efforts to bring the science of climate and land-use change into local decision-making. After growing up outside of Boston, doing her undergraduate work at Duke University, and earning a MS in Fisheries Science at Oregon State University, Sue finally made it to Alaska's Cook Inlet. Since 2000, she has coordinated regional water temperature monitoring networks and used thermal infrared imagery to map and protect cold-water habitats: the stepping stones salmon will need to move up and down otherwise warming stream channels. Based in Homer, Sue is a lover of ski and hiking trails, Kachemak Bay State Park, brass bands, and days spent in waders with her dog by her side.

Presentation Abstracts

Abstracts are presented in order following the agenda.

Keynote Presentations

Title: *Contaminant Monitoring in Cook Inlet's Physically Dynamic and Complex Environment*
Speaker: Sue Saupe, Cook Inlet Regional Citizens Advisory Council
Presentation on Page: 32

Historical Cook Inlet water and sediment quality studies each include unique combinations of sampling locations and methods, matrices (e.g., sediments, water, or tissues), target contaminants, and analytical methods. Many of these historical studies are not known or accessible to users seeking Cook Inlet data. Through the lens of Cook Inlet Regional Citizens Advisory Council's (CIRCAC) efforts to monitor environmental impacts of Cook Inlet oil industry operations, the challenges of designing a meaningful monitoring program will be presented. Current efforts to compile and provide on-line access to historical contaminant data will be discussed, as will issues of how to design future studies based on historical lessons, improved technologies, and emerging contaminants of concern.

Cook Inlet is influenced by extreme tidal ranges and currents, significant seasonal freshwater influxes, extremely high glacial silt loads entering the upper Inlet, seasonal dynamic broken ice, and tectonic and volcanic activity. The Inlet's environmental threats include anthropogenic influences from a watershed that drains through Alaska's largest population center, military bases, and one of the busiest cargo airports in the world. In addition, Cook Inlet's shipping industry provides goods to the majority of Alaska's population and a robust oil and gas industry includes active production platforms, subsea pipelines, and product tanker traffic. It is within this complex mix of environmental conditions, threats, habitats, and resources that water and sediment quality studies are carried out. Unfortunately, funding and other limitations make it impossible to detect status and trends in all ecosystem components over all geographic and spatial dimensions. These are all challenges to designing meaningful water and sediment quality studies and emphasis will be on the special challenges of doing so for Cook Inlet.

Title: *The State of the Inlet 2023*
Speaker: Sue Mauger, Cook Inletkeeper
Presentation on Page: 58

Cook Inletkeeper's first *State of the Inlet* report came out in 1997. It was the first attempt to convey to the public the types and sources of water pollution in Cook Inlet's vast watershed. Although much has changed since then, chronic sources of pollution persist and the need for clean water protections and stewardship goes on. In preparation for the 2nd edition of the *State of the Inlet* report, Cook Inletkeeper solicited input through an online survey and held a series of community conversations from 2021-2023. Our goal was to understand community-specific concerns about threats to water resources and consider the question: What does a thriving & equitable Cook Inlet look like in the next 25 years? The new report has just been released and highlights priority topics and key takeaways for future actions aimed at preserving and improving water quality and quantity in Cook Inlet's coastal communities.

Session 1: Status of Cook Inlet Waters

Title: *West Cook Inlet Stream Temperatures in the Tyonek Tribal Conservation District*
Speaker: Jillian Jablonski, Tyonek Tribal Conservation District
Presentation on Page: 71

Tyonek Tribal Conservation District has been collecting stream temperature data on five West Cook Inlet systems since 2015: Threemile Creek, Chuit River [Ch'uit'nu], Indian Creek [Qaggeyshlat], Tyonek Creek, and Robert's (Old Tyonek) Creek. In 2023, we expanded our existing project by adding 12 new temperature loggers on remote West Cook Inlet streams known to be important for Chinook salmon spawning and rearing. Our long-term data indicates that the Chuit River is the warmest of the five monitored by TTCD, with temperature maximums averaging 21.6°C during May - September 2015-2020. This temperature data indicates possible future implications for spawning and rearing Chinook in this once productive system's culturally and regionally significant fishery and highlights the need to identify and protect thermal refugia within these systems as the climate warms. Our data also demonstrate the heterogeneity of stream temperatures across a watershed and will also aid in landscape-scale conservation planning for fisheries and fish habitat-related climate-induced changes within the tribal conservation district.

Title: *Addressing PFAS and Pesticides in the Cook Inlet Watershed: Science and Policy*
Speaker: Pamela Miller, Alaska Community Action on Toxics
Presentation on Page: 82

PFAS (per- and polyfluoroalkyl substances) are a complex class of more than 12,000 chemicals used in consumer products and industrial applications. PFAS-based firefighting foams, also known as aqueous film forming foams (AFFF), are used to extinguish class B petroleum and chemical fires at airports, military bases, and training areas. PFAS are used in many consumer products such as food packaging, non-stick pans, textiles, and apparel because of their stain, grease, and water resistance. PFAS are known as "forever chemicals" because they are extremely persistent in the environment and virtually indestructible. PFAS are also highly mobile, and some are bioaccumulative. Exposures to PFAS are associated with adverse health effects such as kidney and testicular cancer, ulcerative colitis, adverse reproductive health outcomes, low birth weight, liver disease, thyroid disease, elevated cholesterol levels, and immunotoxic effects. In Alaska, the dispersive use of PFAS-based firefighting foams known as aqueous film forming foams (AFFF) on military bases and airports has contaminated surface and groundwater sources of drinking water in communities throughout Alaska. PFAS contamination in Alaska has been confirmed at nearly every site that has been investigated in which aqueous film forming foam (AFFF) has been or is currently being used. Currently, there are 469 sites in Alaska where PFAS contamination has been identified in soil and water according to the Alaska Department of Environmental Conservation. This presentation will summarize sampling results conducted by Alaska Community Action on Toxics for PFAS in waterbodies of the Anchorage area. The presentation will also include a discussion of pesticide issues of concern within the watershed. Finally, the presentation will summarize policy recommendations to protect water quality and human health from harms associated with PFAS and pesticides.

Title: *The Municipality of Anchorage's Waterways and Cook Inlet*
Speaker: Cherie Northon, Anchorage Waterways Council
Presentation on Page: 101

The Municipality of Anchorage (MOA) encompasses about 1,960 sq. mi. (5,070 sq. km.) with 26 watersheds whose 2,200 miles (3,540 km.) of waterways empty into Cook Inlet. These creeks and rivers begin in some of the more pristine areas, and many eventually run through the city of Anchorage carrying the effects of urbanization into the inlet. The Anchorage Waterways Council (AWC) was born nearly 40 years ago as a response to the worsening condition of local creeks and lakes that carried the burden of raw sewage and other waste through town and out into Cook Inlet. In the early '80s, alarm for the health of local citizens was raised by Dr. Rodman Wilson, Director of Public Health under then-mayor Tony Knowles, and AWC was born. Since then, AWC has striven to clean up and improve local creeks and lakes through action and education. Today, AWC continues an unfunded long-term water quality monitoring program, oversees the Annual Creek Cleanup, has programs on stormwater education for residents and businesses as well as outdoor experiential education for youth, and participates in other programs, such as reducing the impact of monofilament fishing line and lead weights on wildlife and 6 PPD quinone on coho salmon and other fish species.

Title: *Alaska's Kenai River Water Quality Monitoring Project: 23 Years of Community Supported Research*
Speaker: Benjamin Meyer, Kenai Watershed Forum
Presentation on Page: 111

The Kenai River in southcentral Alaska is among the world's most famed wild salmon rivers, and continues to support diverse fisheries and the people who rely on them as it has for millennia. In the year 2000 a group of local residents concerned about water quality issues worked with scientists to develop a water quality monitoring plan, which has been carried out continuously each year to present day. Today the nonprofit Kenai Watershed Forum coordinates the efforts of state, federal, tribal, municipal, and nonprofit partners to monitor water quality trends throughout the river. The twenty-two year continuous dataset represents a long and robust water quality dataset and has been applied successfully to identify and solve critical local conservation issues. For example, in the mid-2000's increases in hydrocarbon pollution from two-stroke boat motors led to their ban, as well as a tribal-supported motor buy-back program, gradually transitioning all boats to cleaner four-stroke engines. More recently, observed increases in levels of dissolved zinc and copper have helped focus future efforts towards solutions including green storm water infrastructure. The partnership serves as a model of diverse interests and institutions joining to support the common cause of keeping rivers healthy for fish, wildlife, and humans.

Title: *The Kachemak Bay Watershed Collaborative*
Speaker: Hal Shepherd, Water Quality Consulting, LLC
Presentation on Page: 123

This abstract addresses potential on-going projects that came out of the Kachemak Bay Watershed Collaborative relating to the water quality studies in Kachemak Bay including:

1) Homer Harbor Expansion - Treatment station to reduce commercial spread of invasive species at the harbor, Understand impacts of increasing tourism from port expansion;
2) Wetlands & Climate Change Impacts - Guidance for prioritizing wetland protection with regulations for material sites to maintain salmon stream connectivity to tributaries and wetlands, Protect habitat corridors before development and increase buffer zone in Homer area to 100’, Identification and protection of groundwater recharge locations, Identification of fish passage and obstructions, Easements between agricultural and wetlands, stormwater management, municipal comprehensive planning and building codes including policy- level strategies to mitigate population growth and climate change impacts, Ensure drinking water N and S side of the bay through climate adaptation and mitigation, Ensure drinking water N and S side of the bay, climate adaptation and mitigation and address warming water concerns through climate adaptation and mitigation planning;
3) Planning - Coordinated database for all relevant research and documents – interactive map/data for individual land/areas to help in decision-making; and
4) Amending/Updating City of Homer Comp Plan;
5) Complete a Watershed Management Plan.

Title: *U.S. Geological Survey Water Quality Data for Cook Inlet, Alaska*
Speaker: Jeff Conaway, U.S. Geological Survey
Presentation on Page: 131

The U.S. Geological Survey’s National Water-Quality Assessment (NAWQA) Program focused on Cook Inlet from 1997 to 2004. The long-term goals of this program were to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources, and to provide a sound, scientific understanding of the primary factors affecting the quality of these resources. This presentation will provide a summary of these findings and sources for obtaining access to data and publications relevant to water quality in the Cook Inlet Basin. These data provide the most comprehensive baseline assessment to date for stream chemistry and ecology and ground water chemistry in the Cook Inlet Basin.

Session 2: Status of Human Activities Affecting Cook Inlet Watershed (includes Restoration/Pollution-Reducing Activities)

Title: *History and Trajectory of the West Susitna Industrial Corridor*
Speaker: Margaret Stern, Susitna River Coalition
Presentation on Page: 142

The Susitna River Coalition (SRC) is a grassroots organization based in Talkeetna, Alaska. The SRC engages residents of the Susitna Valley on issues relevant to healthy habitat and water quality in the watershed. The proposed West Susitna Industrial Corridor currently poses substantial risk to the health of the Susitna watershed's ecosystem. This proposed 100-mile mining access road through the currently roadless West Susitna Drainage would open up the culturally and biologically significant West Susitna Drainage. Initially proposed as a Road to Resources project in 2014, the mining access project has taken many different shapes in an effort to hide the true trajectory and impacts to the region. This presentation will discuss the history and anticipated trajectory of the West Susitna Industrial Corridor over the coming years.

Title: *Port MacKenzie: The History and Future of a Small Industrial Port in Upper Cook Inlet*
Speaker: David Griffin, Port MacKenzie / Mat-Su Borough
Presentation on Page: 154

Located in Upper Cook Inlet across from Anchorage, Port MacKenzie was developed as a bulk commodity export facility in 1999/2000. The port has a deep-draft dock, a barge dock, 15-acres of laydown area, and thousands of acres of uplands set aside as a "port district". Over the years the port has been envisioned as a tidewater gateway for southcentral Alaska. Plans for passenger ferry services never quite materialized, as well as a rail extension linking the port to the Parks Highway in Houston. These days the port is managing a variety of barge operations and a couple of cargo ships. With a variety of resource development projects associated with mining, timber, and sustainable energy, the port is being evaluated by national and international corporations. In this talk participants will get an overview of the history of the port, as well as current use, and get an update on future growth and development of the port facility, and the role the port plays in the maritime industry of Upper Cook Inlet.

Title: *Recovering and Recycling Deicing Fluid at Ted Stevens Anchorage International Airport*
Speaker: Sean Dolan, NorthLink Aviation
Presentation on Page: 167

Deicing fluid applied to airplanes at Ted Stevens Anchorage International Airport (ANC) flows directly into neighboring water bodies, including Cook Inlet. During the 2021-2022 winter, 949,646 gallons of propylene glycol (the primary ingredient in deicing fluid) was applied at ANC. NorthLink Aviation is working with stakeholders on a solution to recover and recycle deicing fluid at ANC and other airports in Alaska.

Title: *Methods and Impacts of Diverting Organic Waste from the Anchorage Landfill and Building Healthy Soils*
Speaker: Nick Riordan, Alaska Community Action on Toxics / Yarducopia
Presentation on Page: 175

For the last 10 years, Alaska Community Action on Toxics has supported Anchorage residents interested in growing their own healthy food without the use of toxic pesticides or synthetic fertilizers through a program called Yarducopia. The program models and supports a range of gardening and farming practices centered around the diversion of organic waste (mostly manure, food scraps, and yard debris) from the landfill towards composting and animal feed. Most of our work is on the residential and neighborhood scale – backyard gardens, garden depots, community composting efforts, etc. – and takes place on residential and commercial property shared with us or on loan. If not repurposed, water-heavy, organic materials such as food waste are landfilled, where they contribute to the production of methane and landfill leachate. By diverting from the landfill, we not only reduce these harmful effects, but also create biologically rich soils that have the capability of breaking down some harmful chemicals before they reach local waterways (e.g. mycoremediation). The program also aims to inform and inspire our next generation of Alaskan farmers, gardeners, and environmental stewards.

Title: *Cook Inlet Tidal Energy: Opportunities and Challenges*
Speaker: D. Douglas Johnson, Ocean Renewable Power Company
Presentation on Page: 183

ORPC has been working in Alaska since 2006. With efforts focused on both the tidal and riverine environments. In 2021 the National Renewable Energy Laboratory published a report titled "Marine Energy in the United States: An Overview of Opportunities". In this first of a kind document, Cook Inlet stood out as the most energetic tidal resource in the US with an amazing 80 Terawatt hours per year of resource, enough to power 7,500,000 average US homes. This report quantified what ORPC had known since 2006 and sparked international interest in the quest to harvest this amazing resource. Not only is Cook Inlet a truly an amazing tidal energy resource it is also home to unique marine wildlife, both sport and commercial fisheries and is one the most cargo trafficked waterways in Alaska. Cook Inlet also has existing oil and gas infrastructure and significant winter ice conditions as well as extreme turbidity in the upper inlet. It will not be an easy environment to develop tidal energy. ORPC's diligent persistence in pursuing tidal energy production in Cook Inlet is getting closer to fruition with the planned deployment of the first demonstration device in 2024.

Title: *Green Infrastructure Storm Water Management Projects in Homer, Alaska*
Speaker: Janette Keiser, City of Homer
Presentation on Page: 188

Homer's first Drainage Management Plan, developed in 1979, focused on moving storm water in culverts and drainage ditches to protect the built environment. There wasn't much talk about erosion, water quality, or how the built environment had a responsibility to protect the natural environment and certainly, not how they could work together. In 2019, Homer commissioned Kinney Engineering, LLC, to author the Low Impact Development Study, which dramatically changed Homer's perception of storm water management. The study opined that Homer could improve water quality and save millions of dollars by investing in "green infrastructure" rather than culverts. Inspired, Homer explored ideas for green infrastructure projects. The City developed conceptual designs for four projects where green infrastructure could reduce erosion, manage extreme storm water flows, and improve water quality. The City is now actively developing two projects - the Kachemak Sponge and the Beluga Slough Wetlands, supported by grants from the ADEC's Alaska

Clean Water Action program as well as NOAA, through a collaboration with the University of Alaska, Anchorage and the Kachemak Bay National Estuarine Research Reserve. The Kachemak Sponge involves the acquisition of over 50 acres of high-quality wetlands, to which storm water will be directed. The wetlands will act as a "sponge" to absorb the water and use the natural vegetation to remove hydrocarbons, silt and other contaminants. The Bunnell Avenue Wetlands involves re - directing storm water from roadside ditches and storm drains to a sedimentation chamber where silt and contaminants will be filtered out before the storm water is introduced, through infiltration chambers, into natural wetlands. The presentation will discuss the City's changing perspectives about storm water and how its collaborations with environmentally friendly organizations made these two projects possible.

Title: *Cook Inlet Offshore Oil & Gas Platforms: Dismantlement, Disposal and Restoral Obligations & Opportunities for More Intensive Monitoring, Management and Restoral of the Cook Inlet Biome & Accelerating the Transition to Clean Energy*
Speaker: Mark Foster, MAFA
Presentation on Page: 205

Cook Inlet Offshore Platform dismantlement, disposal and restoral obligations may be on the order of $2 billion (2023$) and come due in about a dozen years. Extending the life of the platforms for potential wind and tidal technology assessment and development creates an economic windfall by delaying DR&R expenditures; a modest four-year life extension may create an economic windfall on the order of $200 million associated with a delay in DR&R expenditures (2023$). Potential high value investments of the economic windfall from delays in DR&R include monitoring, managing and cleaning up the fossil fuel legacy midden piles & accelerating investments in the transition to clean energy, e.g., wind, tidal, and energy storage.

Session 3: Status of Cook Inlet Fish & Wildlife

Title: *It Takes a Village: Meeting the Complex Challenges Presented by HABs in Cook Inlet Through the Alaska Harmful Algal Bloom Network*
Speaker: Thomas Farrugia, Alaska Ocean Observing System
Presentation on Page: 215

Oceans play an integral part in the social, cultural, and economic well-being of Alaska. Marine living resources are a primary source of food throughout the state, and harmful algal blooms (HABs) are a growing but unpredictable risk to many stakeholders and communities. Subsistence and recreational shellfish harvesting, commercial aquaculture operations, and wildlife are all potentially impacted by the toxins produced by HABs. Cook Inlet is home to many people and wildlife, with several areas being used for shellfish harvesting. As climate change continues to impact the physical characteristics of Alaska’s coastal waters, HABs are responding in unpredictable ways and there is a growing need to better understand the factors that lead to HAB events and how their effects can be mitigated. Due to these complexities, there are many researchers, environmental coordinators, regulators, state and federal agencies, and community members that have come together to become the Alaska Harmful Agal Bloom Network. The network provides a statewide approach to the awareness, research, monitoring, and response to HABs with the goal of reducing the risk to humans and wildlife. This presentation will describe the current state of knowledge on HABs in Cook Inlet, present ongoing research, and monitoring activities, and discuss the importance of this work to protect the well-being of Alaskan communities.

Title: *Cook Inlet: A Newly Discovered Pathway for Invasive Pike*
Speaker: Parker Bradley, Alaska Department of Fish and Game
Presentation on Page: 225

Northern pike, a species not native to southcentral Alaska, was initially introduced to this region in the 1950's, and to the Kenai Peninsula in the 1970's. As one of the most popular sport fish in the U.S., this top-level predator is commonly and illegally moved around by people, often with dire consequences. In Southcentral, northern pike are now known to occupy over 150 waterbodies, and they are continuing to spread. Once introduced in a new location, they can quickly reproduce and spread through all interconnected habitat. Eradication efforts began in 2008, focusing on infested waterbodies in Anchorage and on the Kenai Peninsula. Over a decade of work has resulted in full eradication from all known locations on the Kenai. It was believed that, with this accomplishment, there would be no natural way for northern pike to return to the Kenai Peninsula. However, some relatively recent information has confirmed that pike are moving through the upper parts of Cook Inlet, most likely from the Susitna Drainage, and have established multiple populations in Anchorage/Kenai Peninsula via this pathway. In 2022, ADF&G conducted salinity trials with northern pike to determine their tolerances at various salinity levels. Results indicated that pike are capable of surviving for several days in northern Cook Inlet waters south to approximately Nikiski based on modeled salinities by NOAA. This previously unknown pathway puts many more waterbodies that flow into Cook Inlet at risk of invasion than previously thought, making the development of prevention tools and risk assessments extremely important.

Title: *The Status of the Endangered Cook Inlet Beluga Whales*
Speaker: Mandy Migura, Alaska Wildlife Alliance
Presentation on Page: 243

Cook Inlet beluga whales (*Delphinapterus leucas*), small white whales, are an iconic species with cultural importance to Alaskans. In the US, wild beluga whales only reside in Alaska, and can be found in many coastal waters around the state. There are five stocks of beluga whales recognized in Alaska, with the belugas of Cook Inlet being the only ones protected by the Endangered Species Act due to the small and declining population size. It was estimated there were about 1,300 belugas in Cook Inlet in the late 1970s, but there are only around 300 belugas left today. Pollution has been identified as a threat to the recovery of Cook Inlet belugas. This presentation will provide an overview of the background on the plight of these endangered whales, highlight prior studies looking at contaminants in belugas or their prey, and work that is being done by various groups to help understand why the population hasn't grown as anticipated.

Title: *European Green Crab a Marine Invader Threatening AK Fisheries and Coastal Habitats*
Speaker: Katherine Schake, Kachemak Bay National Estuarine Research Reserve
Presentation on Page: 257

Invasive species represent one of the most significant threats to the ecological, economic, and cultural integrity of habitats in Alaska. In July of 2022 invasive European green crabs were found for the first time in Alaska, following several years of rapid northerly expansion and population growth in the Northeast Pacific. The European green crab (*Carcinus maenas*, EGC) is a globally damaging invasive species that poses a threat to native shellfish, crabs, eelgrass beds and estuary habitat critical for juvenile salmon and other culturally and commercially important species. Where EGC have become established, mussels are excluded, clam beds and commercial mariculture operations are impacted, and native crab species are threatened. The introduction and establishment of EGC populations in Alaska's coastal ecosystems will have economic, ecological, cultural and social impacts. To address and minimize the threats of this invasive species will require the enhancement of coordinated statewide efforts and resources dedicated to rapid response and long-term removal efforts.

Session 4: Regulatory Landscapes

Title: *An Introduction to the Clean Water Act*
Speaker: Matthew LaCroix, U.S. Environmental Protection Agency
Presentation on Page: 284

I will provide an overview of the major provisions of the Clean Water Act and discuss how the statutory framework provides for federal support of local action to restore and maintain the physical, chemical, and biological integrity of the nation's waters. I will discuss elements of the CWA which EPA directly implements, and how EPA supports implementation of other elements by states, tribes, local governments, and the U.S. Army Corps of Engineers.

I will briefly identify recent regulatory changes that affect implementation of CWA programs.

Title: *USACE Regulatory 101*
Speaker: Andrew Gregory and Jennifer Mercer, U.S. Army Corps of Engineers, Pacific Ocean Division
Presentation on Page: 298

The Department of the Army Regulatory Program is one of the oldest in the Federal Government. Initially it served a fairly simple, straightforward purpose: to protect and maintain the navigable capacity of the nation's waters. Time, changing public needs, evolving policy, case law, and new statutory mandates have changed the complexion of the program, adding to its breadth, complexity, and authority. The Regulatory Program is committed to protecting the Nation's aquatic resources and navigation capacity, while allowing reasonable development through fair and balanced decisions. The Corps evaluates permit applications for essentially all construction activities that occur in the Nation's waters, including wetlands.

Title: *Cook Inlet Fish Consumption and Regional Tribal Environmental Programs*
Speaker: Michael Opheim, Chugach Regional Resources Commission & Stephen Payton, Seldovia Village Tribe
Presentation on Page: 313

In this presentation we will talk about the first Tribally conducted fish consumption survey done in the state of Alaska along with the follow up fish tissue sampling on important fish resources in these communities in Cook Inlet. We will also be talking about Tribally run environmental and Fish and Wildlife programs run by the Seldovia Village Tribe (SVT) and the Chugach Regional Resources Commission (CRRC). All of these program projects are important to the communities in Cook Inlet and Kachemak Bay.

Panelist Biographies

Panel members are listed in alphabetical order by the Panelist's last name.

Debra Call, Cook Inlet Villages

Debra Call, Dena'ina Athabascan represents the 8 villages of Cook Inlet region on the Alaska Federation of Natives Board of Directors. She earned an MBA from Washington State University. After completing her degree served as an instructor in Native American History and Literature as well as Small Business Management at WSU. Debra's first job was serving as Business Analyst and eventually promoted to Executive VP at Community Enterprise Development Corporation of Alaska traveling throughout Alaska working on rural economic development projects. She has also worked Alyeska Pipeline as the Alaska Native Hire Manager and managing 50 interns throughout the company. Her last position was HR and Operations Manager at the Alaska Native Heritage Center. Since her retirement she has volunteered to work with the 8 Cook Inlet villages discussing concerns of declining salmon numbers in Cook Inlet waters and its effect on our people.

Christopher Constant, Anchorage Assembly, District 1

Since 1998, Christopher Constant has resided in the downtown Anchorage district. Professionally, Christopher is a licensed real estate agent as well as a Grants and Contracts Director for a statewide nonprofit substance abuse and behavioral health treatment provider. During his past involvement with the Fairview Community Council, to include serving twice as President, Christopher led an effort to improve public safety in his neighborhood. He achieved great success which was the catalyst that led him to consider serving as an Assembly Member. Christopher is a strong supporter for improving key infrastructure, strong schools and advocating for intensive services needed by Anchorage's homeless population. Christopher currently serves as the Chair of the Anchorage Assembly, Rules Committee-of-the-Whole, and Ethics and Elections Committee. He is also the Co-Chair of the Personnel Committee, Vice Chair of the Legislative Committee, and member of the Budget and Finance Committee-of-the-Whole, Housing and Homelessness Committee, Community and Economic Development Committee, Enterprise and Utility Oversight Committee-of-the-Whole, Public Safety Committee-of-the-Whole, Ex Officio Member of the Anchorage Chamber of Commerce, and Liaison to the Federation of Community Councils and National League of Cities.

David Griffin, Port MacKenzie Operations Manager / MatSu Borough

David began his professional career as a natural resources manager in 2004 working as a Natural Resource Specialist in the Division of Mining, Land and Water. In 2006 he became the first land manager of the legislatively designated Knik River Public Use Area and developed a management plan and regulations package for the area. David has worked closely with other state agencies and special interest groups to craft land management policy. In 2011 David was hired by the Division of Parks and Outdoor Recreation to coordinate and manage development of the South Denali Project in Denali State Park. This project required significant coordination amongst federal and state agencies, state and federal legislators, and the Alaska tourism industry. He was also the point of contact for a variety of large-scale renewable energy and gas pipeline projects and managed park staff tasked with permitting use in the Kenai River Special Management Area. In 2015 David began working as a Natural Resource Manager for the Trust Land Office. As the point of contact for southeast Alaska properties, he traveled to remote communities to meet with municipal planners, legislators, special interest groups, and property owners regarding land use issues and resource development pertaining to timber and road building. In 2022, David was hired to manage the Division of Land and Resources at the Matanuska-Susitna Borough. He managed a staff of seven professionals tasked with overseeing development of land, timber, and earth materials. In the fall of 2022, he began working as the Port Operations Manager for Port MacKenzie. The port has a barge dock, a bow ramp, and a deep-draft dock, and 10,000 acres of uplands managed as a port district. David loves living and working in Alaska, spending his free time exploring in the mountains, navigating rivers, and hiking in the woods with his family.

Andrew Josephson, Alaska State House Representative, District 13

Andrew Josephson graduated from Whitman College in 1986 with a bachelor's degree in history. He also earned a master's degree in teaching from the University of Alaska Anchorage in 1992 and a JD from Penn State in 1997. He has spent almost his entire life in Alaska, mostly in Anchorage. Josephson served as an intern for Senator Ted Stevens. He also worked as a legislative aide and a teacher. He worked as an assistant district attorney in Kotzebue, Alaska from 1999 to 2001, before going into private practice. Josephson was elected to the Alaska House of Representatives in 2012, where he currently serves District 13. In the legislature, Andrew has served on many committees, including co-chairing House Resources, and serving on or chairing Finance subcommittees on Law, Natural Resources, Environmental Conservation, Health and Social Services, and more.

Janette Keiser, City of Homer

Jan Keiser is a registered professional engineer with a BS in civil engineering from the U. of Alaska, Fairbanks, a MS in engineering management from the U. of Alaska, Anchorage and a law degree from the U. of Washington. She is currently serving as the Public Works Director and City Engineer for the City of Homer. She is passionate about creating strategies that protect the best interests of the natural environment with the built environment.

Matthew LaCroix, Environmental Protection Agency

Matthew LaCroix is a biologist in the Wetlands & Oceans Section of EPA's Region 10 Water Division, is based in the Alaska Operations Office in Anchorage. Matthew has been a staff member in EPA's Clean Water Act Section 404 program for the past sixteen years. In this capacity he reviews proposed projects requiring CWA 404 permits, manages contracts, and provides technical support to grantees and others. Within EPA's Section 404 program, he is the Regional Lead for oil and gas projects and the Alaska lead for mitigation. Prior to his time at EPA, Matthew worked for the Alaska departments of Fish & Game and Natural Resources in Anchorage and Palmer. He has Master's degrees in

Environmental Science and Public Affairs from Indiana University and Bachelor of Science degrees in Biology and Wildlife Management from the University of Wisconsin-Stevens Point.

Michael Opheim, Chugach Regional Resources Commission

Michael Opheim is the Tribal Fish and Wildlife Liaison for the Chugach Regional Resource Commission (CRRC). He works to build Tribal capacity within the Chugach region for successful subsistence advocacy and management, working in collaboration with Tribal, state, federal, and private entities. Michael also performs duties associated with CRRC's Subsistence Alliance, including reviewing proposals and meeting materials to disseminate to the Subsistence Alliance. Michael spent almost 19 years working for the Seldovia Village Tribe as their Environmental Coordinator. He and his staff worked on various projects, such as ambient air quality, ocean acidification, silver salmon restoration, clam projects, fish consumption survey of Cook Inlet Tribes, culture camps, e-waste, water quality in Seldovia Bay, water quality on local streams, dead and injured animal recovery, indoor air quality, and recycling. Michael sits on the Kachemak Bay Research Reserve Community Council, Cook Inlet Regional Citizens Advisory Council, Seldovia Advisory Committee, and the Southcentral Regional Advisory Council.

Jonathon Ross, Ocean Conservancy, Kenaitze Indian Tribe and Salamatof Tribe member

Jonathon Ross is the son of Linda Ross (Mann) who is Yaghanen Ht'ana Dena'ina from Kahtnu Qayeh (Kenai, Alaska) and Alan Ross who is Scottish Gasht'ana from Vancouver Island, British Columbia (BC). Jonathon grew up in Kenai, Prince George, BC, and Kodiak. He received a bachelor's degree in psychology and counseling from Toccoa Falls College (Georgia) and a master's degree in business administration from University of Alaska Anchorage. Formerly a commercial fisher in the Aleutians, Jonathon has worked with Alaska Native healthcare in Anchorage at Southcentral Foundation and later served as president and CEO at the Alaska Native Heritage Center. Jonathon is married to Leanndra (Bergeron) who is Eagle Killerwhale Clan (Tlingit) from southeast Alaska, and they live in Peter's Creek/Chugiak north of Anchorage. They have four grown daughters. He has taught language and culture for the Salamatof Tribe in Kenai and enjoys sharing the Dena'ina language and culture with others. Jonathon has been involved in tribal leadership for the past 20 years; he has a passion for Tika'a, the ocean, and Alaska Quht'ana, the local people. In his new position as Director of Arctic Indigenous-led Conservation, Jonathon works with Indigenous peoples to hear and understand their priorities and to support their goals for a healthy ocean and the wildlife and communities that depend on it. Jon is a Kenaitze Indian Tribe and Salmatof Tribe member from Kenai, and serves on the Cook Inlet Tribal Fisheries Group.

Michael Salyer, US Army Corps of Engineers

Michael Reed Salyer holds a M.S. in Wildlife Management from Louisiana State University. Michael currently serves as Deputy Regulatory Division Chief, Pacific Ocean Division, U.S. Army Corps of Engineers. Mr. Salyer has served as a supervisory biologist for over 18 years, as well as an environmental coordinator and resource specialist on issues such as arctic ecology, restoration planning, mitigation design, environmental monitoring and fish studies. Prior to attending Louisiana State University, Michael served 4 years in the US Navy. Mr. Salyer has worked as an endangered species biologist and land manager for Florida Game and Freshwater Fish Commission for 3 years. He then accepted a position with the New Orleans District USACE where he worked as a biologist, water resource planner and NEPA coordinator for 8 years. In pursuit of a lifelong dream to work in Alaska as a biologist, Michael accepted a position with the Department of Interior, Bureau of Minerals Management Service for 2 years as a NEPA coordinator. To date, Michael has worked in the Alaska District for 19 years where he worked as Environmental Resources Chief, Civil Works for 11 years and Regulatory Branch Chief for 6 years in the Alaska District, Regulatory Division. Mr. Salyer has managed and authored many Environmental Impact Statements and Environmental Assessments along with a multitude of other environmental compliance documents. Work for Federal agencies has included; Climate Change Science; Ecosystem Restoration; Plan Formulation and National Environmental Act processes for wetland restoration; Long-range water resources planning; Creating endangered Species Act monitoring programs; Forestry management; Biological proposal writing; Developing watershed management scenarios for specific habitat types; Range management; Management of mitigation projects.

Panel Discussion Questions and Summary

Each panelist was asked a unique question based upon their expertise and organizational responsibility, then two general questions were asked to the panel at large. The questions are duplicated verbatim, however, the “answers” provided below are not necessarily direct quotes from the panelists. The “answers” are summaries of the panelists’ responses as captured by two volunteer notetakers. These summaries should be considered as general reference only. Any questions should be directed to the panelist for clarity.

<u>Jan Keiser, City of Homer</u>

Question: Yesterday, you spoke about Green Infrastructure Stormwater Management Projects in Homer. In your experience as City Works Director and City Engineer, can you tell us a little more about the role of City Government in water quality management/monitoring outside of stormwater?

> **Answer:** The city has 2 major responsibilities - Cities provide services for water quality, such as water supply and stormwater. They have a fundamental reasonability to protect water and regulate and have the will to enforce. Cities can regulate land use development and that impacts water quality. We can regulate water quality at a city level. It is important to have regulations and must have the will to enforce regulations. For example, City code said land development could not take adverse impact downstream. The city did not enforce this regulation. Took a change in administration to get to the point to have the will to enforce the negative impacts of stormwater downstream to other landowners.

<u>Chris Constant, Chair of Anchorage Assembly</u>

Question: You currently serve as the Chair of the Anchorage Assembly and have been engaged in the Port modernization effort for years. Can you describe the water quality issues taken up by the Assembly, including the Port, and provide an overview of how you see your authority as an Assembly member on Anchorage water quality?

> **Answer:** The assembly is involved with protection of water quality and land use and development. They created a Storm Water Quality Commission; however, the current administration has no interest and thus it has not been developed. Subsequently the city has no enforcement ability to deal with down land and down stream impacts. Waste Water facility – there has been a waiver issued for many years. Port of AK services 85% of AK and they have been doing Port reconstruction. The biggest impact they have seen has been on belugas and the need to maintain water quality. There was an argument to have more relief for belugas during redevelopment of the port. Chris’ favorite project now is the restoration of Eklutna river to restore fish runs and thus restore the region’s cultural heritage.

<u>Andy Josephson, State House Representative</u>

Question: You have served in the legislature for 11 years with many committee assignments in your resume, including co-chairing House Resources, and serving on or chairing Finance subcommittees on

Law, Natural Resources, Environmental Conservation, Health and Social Services, and more. In your experience, how do water quality issues in Cook Inlet reach the legislature? In other words, what authority does the legislature express when it comes to Cook Inlet waters?

Answer: The legislature expresses a lot of authority in regard to Cook Inlet Water Quality. The legislature has taken a piecemeal approach to dealing with water quality, not a systematic approach. The legislature touches it in many ways. The following is a sample of issues for funding or legislation that deal with water quality.

- Legislature involved with potential building of Susitna Dam 2013-15. He did not support.
- Fight about Chuitna River – issue was temporary water use permits and if tribe or village could qualify for the permit. State sat on the permits and the judge finally said they had to deal with it.
- There is a current dispute about 404 permit and primacies - was defeated – glad for financial reasons and for policy concerns.
- House bill 199 - was going to reform anadromous fish act and was to be aggressive towards making mines actually protect streams.
- Cruise ship issue - bill dealing with effluents and discharge – this was rolled back.
- The spill prevention and response team – there was legislation that wanted to increase surcharge on crude oil as this group cannot operate if there is a spill.
- PFAS - hot issue are bills that would codify who is allowed to classify types of waters – who is it that gets to decide the types of waters (currently DEC). He believes that DEC is not always the best group to make these decisions for all water bodies.
- Bill on critical habitat areas - there was a map of critical areas developed. He was instructed to fix boundaries of critical habitats – in the end it got very messy.
- Plastic bag band and Micro bead ban – also issues he worked on.

<u>David Griffin, Port Mackenzie/MatSu Borough</u>

Question: Yesterday, you spoke about the history and future of a small industrial port in Upper Cook Inlet, Port MacKenzie. As Port Operations Manager, what kinds of water quality measures are within your authority? How do you and the Matanuska Susitna Borough think about water quality as you are developing the port and the industry it serves?

Answer: He does not know what the Borough's intentions are about water quality.

- The Borough did put money aside to get rid of junk vehicles recently. Lots of properties with junk vehicles and there is code that makes it illegal. Working on a plan to get rid of vehicles. Costs about $200 to remove a vehicle and they had only $50,000 to spend and used that already. Can possibly cube vehicles that are collected and then leave them at port for distribution to scrap metal.
- There has been some debate on the 75-foot set back from structures – some people want to remove this restriction that requires structures to be 75 feet away from water body – currently you can't build a house that close to water.
- Jim Creek – they removed 250 vehicles by Knik River. Then they allowed general uses to happen along the Knik River. First recreational area that had a bail schedule to regulate uses

– like shooting, ATVs, abandon cars, etc. This has helped with water quality issues in this region.

- There are 3 cities in Borough - they have sewer systems. The borough uses primarily wells and septic systems. There is new regulation now that a developer must have at least one acre now to develop a well and septic system. In the past you could develop wells and septic on smaller parcels. Enforcement of this requirement remains a problem.
- Education and awareness as to where to take things for disposal will be important to reduce water quality issues.

Matthew LaCroix, Environmental Protection Agency (EPA Alaska)

Question: If folks have a water quality concern in Cook Inlet, what is your recommendation for their route to learn more and have their concerns heard?

> **Answer:** Depending on the nature of your concern on water quality in Cook Inlet – it directs where you go and who you ask. If you have a general concern like about PFAS, you can go to agency websites and scientific literature and get information. But if you want to know what is being done in your community then you go to your local community level information. If concern is that you are seeing something unusual – brown water out of a stream - that is a 402-permit issue and DEC issues those permits or you might call the city government. Always go to local source first and work your way up the chain.   EPA does do enforcement for State and Corps of Engineers. EPA has NPDS permitter in the Anchorage office. If concern is about lower Cook Inlet and beyond state waters then you contact the EPA in Anchorage or Seattle. There are 2 permit programs – non point source and point source.   Do a lot of sharing of information via our websites on what is permitted. The Watershed Academy is great training and talks about watershed issues and pollution issues. He recommends going to the EPA website for AK as it is a great source of information.

Michael Salyer, U.S. Army Corps of Engineers (USACE)

Question: In a given year, approximately how many applications does the USACE Regulatory Program address that have a connection to Cook Inlet rivers and harbors? In your experience, what regulatory processes (concerning Cook Inlet water) occupy most of your time, or serve as the highest priority?

> **Answer:** The USACE receives about 130 – 150 applications a year that are connected to Cook Inlet. 87% are nationwide permits, which are small action permits. Most of our time is focused on talking to project managers and regulatory people and dealing with the applicants and trying to avoid any violations and thus trying to minimize impacts to resources. Some permits are quick and others lengthy depending on complexity. USACE has a lot of programs and regulatory authority. They work a lot on outreach and education to get people educated.

Debra Call, Cook Inlet Villages

Question: You've had a long career and vast personal experience working with Tribes in Cook Inlet - what have you been working on these past few years to understand tribal water quality concerns?

Answer: The tribal fishery group has been in existence since 2019. They discuss issues about Cook Inlet fisheries issues and how do we enhance our fishery and fishing opportunities. She is shocked and mortified about the water quality issues that extend all the way to Seldovia. We should be in protest for what we have done to the water quality. Her ancestors fished this area for many years. "It has maybe been only 80 years since we developed this region - how have we created such a mess?" She is stunned by the information she heard about in this conference. She was stunned by the amount of toxins. I hope that in 15 years there are still fish. How old is Anchorage – since 1910 - we are a young city.

- Her focus is to figure out why we have less fish, why they smaller, and why Chinook in Kenai River have almost disappeared.
- The Tribal fishery group has a meeting on Nov 7 to talk about water quality in Cook Inlet.
- She referenced a resolution at AFN this year with regards to water quality (see AFN resolutions).

Jonathon Ross, Ocean Conservancy, Kenaitze and Salmatof tribe member

Question: In addition to your role as the Director of Arctic Indigenous-led Conservation for the Ocean Conservancy, you are a member of a Cook Inlet Tribal Fisheries Group. In your work with Cook Inlet Tribes, what are the water quality issues they are most concerned about, and how are they exercising Tribal authority to find solutions?

Answer: Pollutants, toxins, contaminants going into Cook inlet. They are just getting more aware of the severity of the issue and are very concerned. He just heard about the annual landfill waiver that allows Anchorage not to meet the Clean Water Act (CWA) standards. He does not understand why they get a waiver to not meet the standards. The wastewater standards also have waivers that allow them to violate CWA standards. He is concerned with the amount of toxins added to Cook Inlet every year by oil and gas rigs. A major concern is king salmon population in Kenai River. We have none left. Guides pulling out too many. Ocean temperatures are a concern. He could not fish last year due to low king salmon escapement. Health of salmon and the number of contaminants in the fish is a concern. Many misguided regulations out there have affected their way of life drastically. Lively hoods have been affected. Commercial fishing is impossible to make a living in the Cook Inlet anymore. The tribes have been meeting together since 2018 and learning about our situation and trying to respond to federal and state regulations. They are working on tribal initiatives – trying to plan and organize together.

Michael Opheim, Chugach Regional Resources Commission

Question: You have served on many Boards and programs, including as the Environmental Coordinator for the Seldovia Village Tribe, and as a member of the Kachemak Bay Research Reserve Community Council, Cook Inlet Regional Citizens Advisory Council, Seldovia Advisory Committee, and the Southcentral Regional Advisory Council. In your experience, how have Tribes exercised their authority or worked with agencies and government to resolve water quality issues?

Answer: He has been working with Seldovia Tribe on various issues, including the fish consumption survey. Working with State to increase the daily fish consumption number that is currently in regulations. It is much lower than what people are consuming and thus needs to modify to properly alert people of potential consumption safety issues. The State has not done this. We have done clean ups in Seldovia – getting things out of slews, and wetlands. Pulling out plastic. The Seldovia landfill is built on 2 wetlands. One side leached into a person's well and the other leached into a stream. We sampled the macro-invertebrates for about 6 years and noticed changes in macroinvertebrates over time due to the impacts of landfill leaching into the stream.

General Question to All #1: Which sources of pollution are you most concerned with?

- **Jan Keiser** - wastewater treatment plant is pretty advanced in Homer – but then she realized there is a lot of other stuff that comes out of wastewater discharge so she is committed to getting funds to do more sampling of waste water discharge.
- **Matthew LaCroix** – stormwater is a major focus for EPA. In 2019 congress mandated that EPA share information about green infrastructure. MatSu and Fairbanks have done some green infrastructure. EPA trying to develop a national standard to deal with wastewater discharge in a green infrastructure way.
  - There is a billion dollars available to look at emerging contaminants. In AK one is the PFAS – there are no water quality standards and now the EPA is working with communities to determine levels in surface and ground water. What are ways to reduce these chemicals. So, trying to figure out extent of these chemicals and ways to mitigate or clean them up. This is an issue for AK in groundwater and indirectly in surface water.
  - Tire contaminants - this is a stormwater runoff issue – green infrastructure can help reduce this toxin. Trying to determine if this is a big issue in AK. How to best regulate this non-point source is a big concern.
  - The above actions have been well funded in past few years in AK.
- **Debra Call** – We are concerned with military installations – there is toxic pollution issues with these sites. JBER, etc. White Alice Stations are often very contaminated with PCBs and radiation. High levels of cancer. Goose Bay and Fort Rich bases here are of concern.
  - Matthew (EPA) in response to Debora's concerns - military bases are primarily ground water contamination issues. EPA has 3 full time superfund managers that work exclusively with military sites. They have a good idea of what is out on sites in AK - they are actively involved with cleanups. They are continuing to discover additional sites unfortunately but diligently looking for offsite contamination. EPA has new program to look at ANSCA lands – to see about contaminants. Should be a new database to look at contaminated lands in conjunction with DEC. Database should be helpful to prioritize clean up.
- **Chris Constant** - Assembly did pass a plastic bag ban. This annual connection to clean the waterways focused on dog waste but now we are looking at human waste. We will have a bond to put out toilets to mitigate and reduce human waste into water ways. These are small bites but starts to address the big issues.
- **Andy Josephson** – A bill in 2017 house bill to increase fees and penalties for oil spills. The penalties per gallon were set in 1970's and 1980's fees – they are trying to increase the penalties. We are getting some momentum.

<u>General Question to All #2: What are your recommendations for how we can collectively and effectively continue discussions about protecting or restoring Cook Inlet water quality – what is the next step?</u>

- **Andy Josephson**: Start a group to continue the focus on Cook Inlet water quality – give it a name and fund it and be intense about it.
- **Chris Constant:** Recommend reaching out to local tribal entities to share the values and processes and to speak together – the unity will make the difference when talking to state and federal entities.
- **David Griffin**: Education and outreach - information overload can be challenging. Cook Inlet harbor safety committee is a group of folks that are striving to enhance environmental stewardship in Cook Inlet. They are looking for ways to reach out. Makeup is primarily with AK marine exchange, Coast Guard, harbor masters, etc. They are trying to educate users of harbors to reduce contamination. Focus on grass roots education and get everyone on same page. Advocate for best practices to be put into day-to-day activities.
- **Matthew LaCroix**: To effect change use the middle out approach, instead of bottom up or top down. Making an issue visible is important, making it digestible. Human social behavior is most effectively modified by peer interactions and people making connections. Trying to make sustainable changes in your own life and be the change you want to be – be a good example for others to see. When you have an issue that you want to solve try and put forth a solution at the same time. Take small bites as you work to solve a problem. Make it something that is implementable.
- **Michael Salyer**: Working at the local level is a good place to start. Being organic at a local level. Educating people and making sure people understand the issue. Everything starts at home. This effort of this meeting is a great start.
- **Debra Call**: Excellent first step is this meeting. We have facts and we have folks that know how to fix it because we now have the information and data. The regulations are here, and the experts and it is our responsibility to take the next steps to deal with abandoned cars and other wastewater issues. More meetings like this – great gathering - this is a turning point for a positive direction to move forward. Great sharing of a diversity of stakeholders.
- **Jan Keiser**: Continuing partnering with local nonprofits that are doing education and outreach – she just relies on them to do outreach as they are the experts. City will update new comprehensive plan and update codes for water quality. We know PFAS is at the airport - so she will go see what the airport is doing about it and maybe city council can ban PFAS. She is going to look into de-icing at Homer airport and see what she can do. She is outraged. She can declare nuisances - and she will use this power to reduce water quality issues. She will see if Homer will get into formal tribal to tribal relationships started.

Acknowledgements & Gratitude

The Cook Inlet Water Quality Summit Planning Committee

Planning an event like this is no small task, and it truly is a collective effort. The success of this Summit is due to the dedicated work of the following individuals and organizations over the past six months. Planning committee members are listed in alphabetical order by the committee member's last name.

Ragen Davey
Defenders of Wildlife
https://defenders.org/regions/alaska

CT Harry
Environmental Investigation Agency
https://us.eia.org

Sue Mauger
Cook Inletkeeper
https://inletkeeper.org

Ben Meyer
Kenai Watershed Forum
https://www.kenaiwatershed.org

Mandy Migura
Broad Conservation, LLC
https://www.broadconservation.com

Pam Miller
Alaska Community Action on Toxics
https://www.akaction.org

Nicole Schmitt
Alaska Wildlife Alliance
https://www.akwildlife.org

Hal Shepherd
Water Quality Consulting, LLC
https://www.waterpolicyconsulting.com

Financial Sponsors

One of the major hurdles to sharing information on this scale is to make it as accessible to as many people as possible. That means recognizing that registration fees and travel expenses to get to the event venue can be a barrier to attendance. We were fortunate enough to have several financial sponsors who believed in the need for and purpose of the Cook Inlet Water Quality Summit. Their generous donations covered the expenses of hosting such an event so we did not have to charge a registration fee, and so we could provide morning and afternoon snacks, parking vouchers, supplies and printed materials, and offer travel scholarships for those who would have to incur expenses to travel to the Summit. The Cook Inlet Water Quality Summit planning committee wants to recognize the following donors, plus one anonymous donor, and give them a very special thank you to express our gratitude. Without them, this Summit could not have occurred.

McPZ FOUNDATION

Founded in 2016, the McPike-Zima Foundation provides philanthropic support to help organizations meet ambitious goals. They bring a business mindset to their funding decisions, evaluating an organization's potential impact and ability to attain long-term effectiveness. The McPike-Zima Foundation focuses on funding local organizations, which are best positioned to make a difference in their respective communities. The McPike-Zima Foundation is dedicated to improving people's lives globally by fostering sustainable change across the areas of health, education, and the environment. Learn more at https://mcpzfoundation.org.

DEFENDERS OF WILDLIFE

Defenders of Wildlife is dedicated to the protection of all native animals and plants in their natural communities. Founded in 1947, Defenders of Wildlife is the premier U.S.-based national conservation organization dedicated to the protection and restoration of imperiled species and their habitats in North America. Defenders' approach is direct and straightforward – They protect and restore imperiled species throughout North America by transforming policies and institutions and by promoting innovative solutions. Defenders of Wildlife speaks with one voice informed by scientific, legal and policy expertise, hands-on wildlife management experience and effective advocacy. Learn more at https://defenders.org/regions/alaska.

CITY OF HOMER ALASKA March 31, 1964

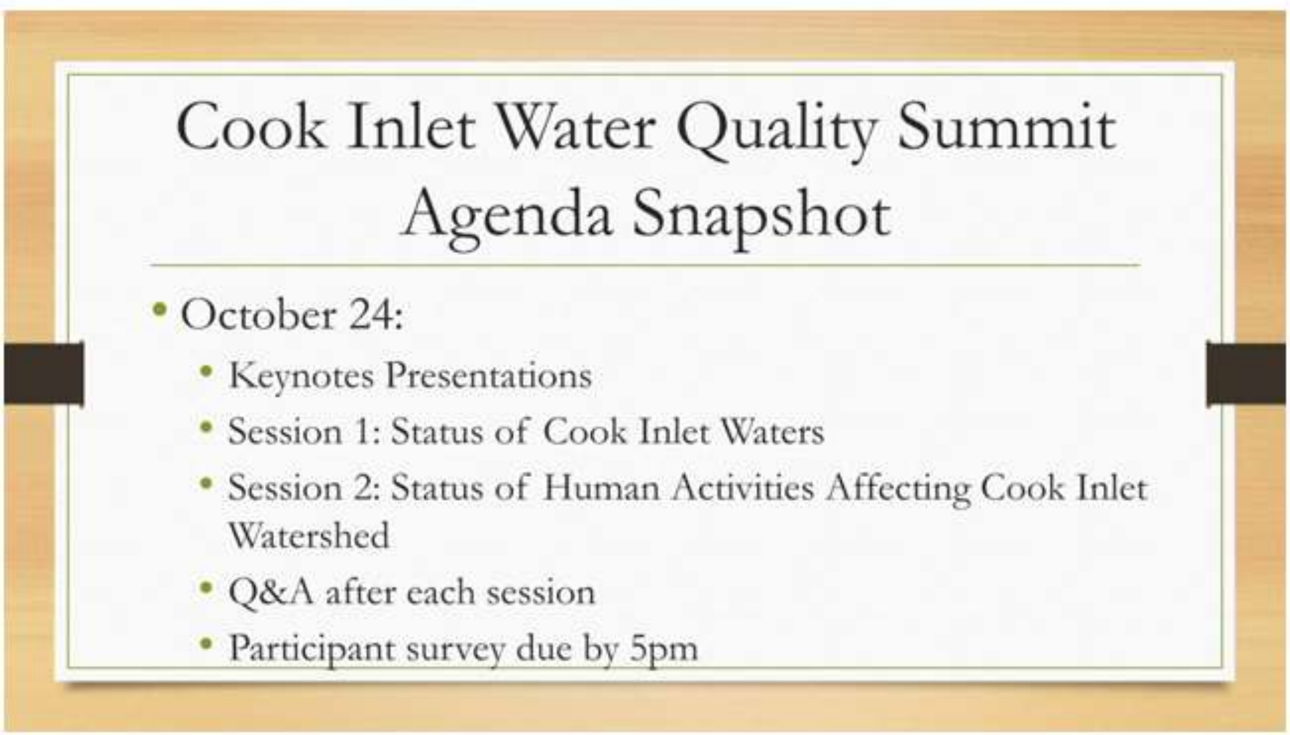
The City of Homer's Public Works Department maintains the City's roads, drainage, water distribution, wastewater collection, buildings & facilities, and motor vehicles. Public Works is responsible for the placement of utilities in street right-of-ways; works with developers in conjunction with the planning department on proposed subdivisions, land use variances, right-of-way vacations, zoning changes, and building site plans. Public Works maintains records on all City facilities and issues all right-of-ways permits, including utility, driveway, and water/sewer permits. Public Works reviews all plats, storm water plans and oversees the construction of new subdivisions. This Department also manages the planning, design, permitting, and construction inspection of the City's capital projects. Learn more at https://www.cityofhomer-ak.gov/publicworks.

Founded in 1980, the Alaska Conservation Foundation is the only public foundation solely dedicated to conservation in Alaska, connecting thousands of committed donors and businesses worldwide with more than a hundred grassroots conservation organizations in Alaska. Alaska Conservation Foundation serves as a funder and supportive resource for a diverse community of nonprofits working to protect and wisely manage Alaska's natural resources. Over the last four decades, Alaska Conservation Foundation has awarded more than $52 million in grants to hundreds of Alaskan organizations and individuals. Through strategic funding, Alaska Conservation Foundation supports Alaska's most critical issues, fosters problem-solving and innovation, and protects Alaska's incredible yet vulnerable ecosystems, communities and economies. Learn more at https://alaskaconservation.org.

Alphabetical Author Index for Abstracts and Presentations

Appendix: Presentations

The presentations are displayed below in the order they were presented during Summit, according to the agenda. Several logistical slides about the Summit were omitted, however, agenda slides were retained to show clear separation between presentations.



Cook Inlet Water Quality Summit Agenda Snapshot

- October 25:
  - Session 3: Status of Cook Inlet's Fish & Wildlife
  - Group Q&A
  - Session 4: Regulatory Landscape
  - Panel Discussion

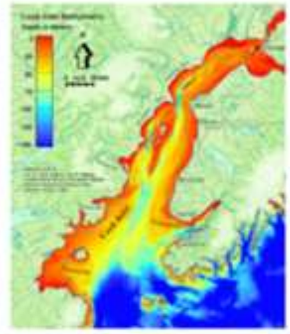
Keynote Speaker: Sue Saupe

SUE SAUPE, Director of Science and Research for Cook Inlet Regional Citizen Advisory Council (CIRCAC), will start off the Cook Inlet Water Quality Summit by giving an overview of the dynamic history of water quality studies and issues in Cook Inlet.

Presentation Title: *Contaminant Monitoring in Cook Inlet's Physically Dynamic and Complex Environment*

Contaminant Monitoring in Cook Inlet's Physically Dynamic and Complex Environment

Cook Inlet Water Quality Summit, Anchorage, AK, 24-25 October 2023
Susan Saupe, Cook Inlet Regional Citizens Advisory Council (CIRCAC)



Water quality

The chemical, physical, and biological characteristics of water, typically described with respect to its suitability for a particular purpose and referenced to a set of standards

- salinity, temperature, DO, bacteria, pH, nutrients, turbidity, contaminants, harmful algae, sediment conditions, biological assemblages…
- Recreation; Protection and propagation of fish, shellfish and wildlife; Drinking water.
- Water Quality Standards: Defines water quality goals through designation of use and criteria for protection of designated uses.

Noaa Fisheries ASMI.org Scott Dickerson, kuhl.com NPS.gov Media.alaskapublic.org

Statute: Clean Water Act

Regulations: Alaska Water Quality Standards – specify the degree of degradation that may not be exceeded in a waterbody as a result of human actions.

Designated Use

- Defined uses of state's waters
- Protected by criteria

For marine waters:

- Water supply
  - Aquaculture
  - Seafood Processing
  - Industrial
- Water Recreation
  - Contact
  - Secondary
- Growth & propagation of fish, shellfish, other aquatic life, and wildlife.
- Harvesting for consumption the of raw mollusks or other raw aquatic life.

Criteria

- Criteria developed to protect uses of state's waters (use-specific)
- WQ levels that will protect the designated use.
- Can be numeric or narrative.

Anti-degradation

- Water quality necessary to protect existing uses must be maintained and protected
- If WQ exceeds levels necessary for "fishable, swimmable," must be maintained at that level unless ADEC authorizes reduction in WQ…

Implementation

- Short term variances
- APDES Permits
- Mixing Zones
- Impaired Waterbodies
- TMDL
- 401, 404

POLLUTANT & WATER USE	CRITERIA
(18) **pH, FOR MARINE WATER USES** (variation of pH for waters naturally outside the specified range must be toward the range)	
(A) Water Supply (i) aquaculture	May not be less than 6.5 or greater than 8.5, and may not vary more than 0.2 pH unit outside of the naturally occurring range.
(A) Water Supply (ii) seafood processing	May not be less than 6.0 or greater than 8.5.

POLLUTANT & WATER USE	CRITERIA
(23) TOXIC AND OTHER DELETERIOUS ORGANIC AND INORGANIC SUBSTANCES, FOR MARINE WATER USES	
(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife	The concentration of substances in water may not exceed the numeric criteria for aquatic life for marine water and human health for consumption of aquatic organisms only shown in the *Alaska Water Quality Criteria Manual* (see note 5), or any chronic and acute criteria established in this chapter, for a toxic pollutant of concern, to protect sensitive and biologically important life stages of resident species of this state. There may be no concentrations of toxic substances in water or in shoreline or bottom sediments, that, singly or in combination, cause, or reasonably can be expected to cause, adverse effects on aquatic life or produce undesirable or nuisance aquatic life, except as authorized by this chapter. Substances may not be present in concentrations that individually or in combination impart undesirable odor or taste to fish or other aquatic organisms, as determined by either bioassay or organoleptic tests.

POLLUTANT & WATER USE	CRITERIA
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POLLUTANT & WATER USE	CRITERIA
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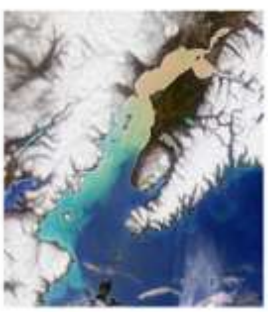
Sediment Quality in Alaska WQS, Sediment Guidelines



- Alaska Water Quality regulations include sediments in the applicability section
- Solid material of organic or mineral origin that is transported by, suspended in, or deposited from water;
- Alaska WQS disallow "concentrations of toxic substances in water or in shoreline or bottom sediments, that singly or in combination, cause or reasonably can be expected to cause, toxic effects on aquatic life, except as authorized…"

Oil Pollution Act of 1990: Section 5002

(a) SHORT TITLE AND FINDINGS-

(1) SHORT TITLE- This section may be cited as the `Oil Terminal and Oil Tanker Environmental Oversight and Monitoring Act of 1990'.

(2) FINDINGS- The Congress finds that--

(A) the March 24, 1989, grounding and rupture of the fully loaded oil tanker, the EXXON VALDEZ, spilled 11 million gallons of crude oil in Prince William Sound, an environmentally sensitive area;

(B) many people believe that complacency on the part of the industry and government personnel responsible for monitoring the operation of the Valdez terminal and vessel traffic in Prince William Sound was one of the contributing factors to the EXXON VALDEZ oil spill;

(C) one way to combat this complacency is to involve local citizens in the process of preparing, adopting, and revising oil spill contingency plans;

(D) a mechanism should be established which fosters the long-term partnership of industry, government, and local communities in overseeing compliance with environmental concerns in the operation of crude oil terminals;

(E) such a mechanism presently exists at the Sullom Voe terminal in the Shetland Islands and this terminal should serve as a model for others;

(F) because of the effective partnership that has developed at Sullom Voe, Sullom Voe is considered the safest terminal in Europe;

(G) the present system of regulation and oversight of crude oil terminals in the United States has degenerated into a process of continual mistrust and confrontation;

(H) only when local citizens are involved in the process will the trust develop that is necessary to change the present system from confrontation to consensus;

(I) a pilot program patterned after Sullom Voe should be established in Alaska to further refine the concepts and relationships involved; and

(J) similar programs should eventually be established in other major crude oil terminals in the United States because the recent oil spills in Texas, Delaware, and Rhode Island indicate that the safe transportation of crude oil is a national problem.

Oil Pollution Act of 1990: Section 5002

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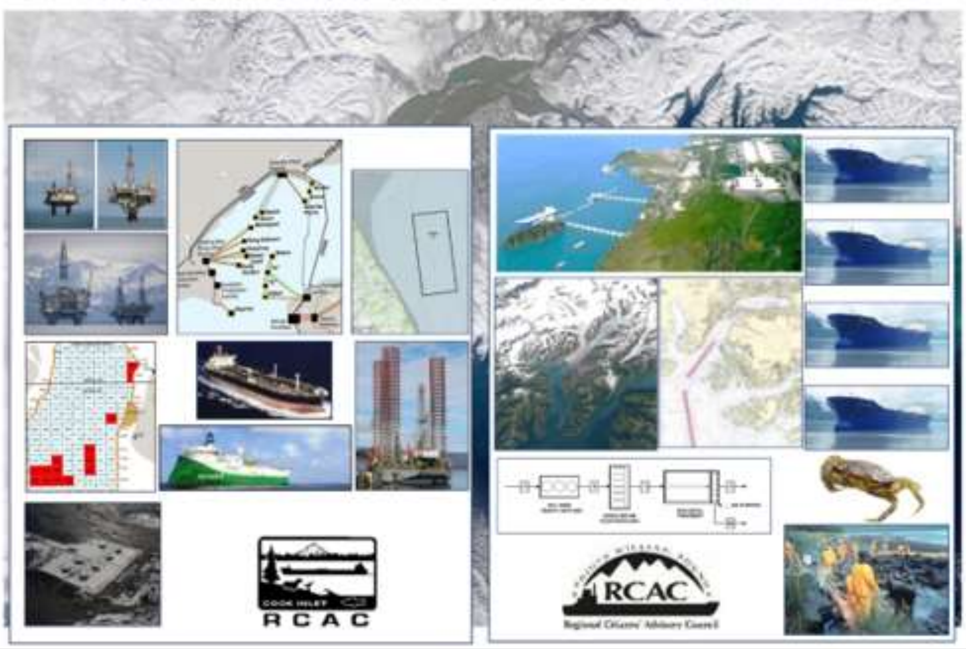
(J) similar programs should eventually be established in other major crude oil terminals in the United States because the recent oil spills in Texas, Delaware, and Rhode Island indicate that the safe transportation of crude oil is a national problem.

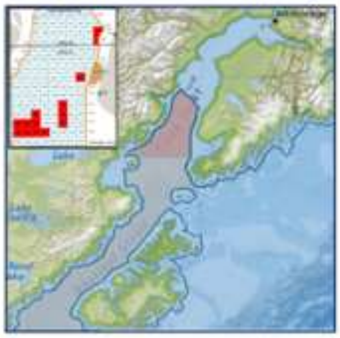
OPA 90

- *"...devise and manage a comprehensive program of monitoring the environmental impacts of the operations …"*
- *Study wind and water currents and other environmental factors…which may affect the ability to prevent, respond to, contain, and clean up an oil spill*
- *ID highly sensitive areas which may require specific protective*

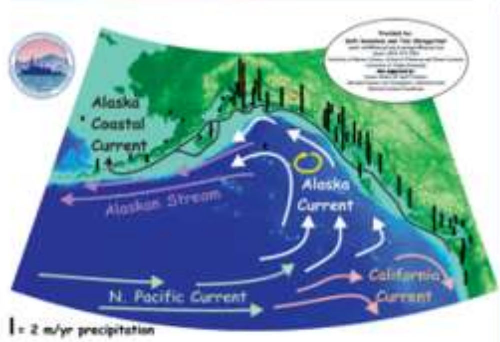
Oil industries and risks differ for Cook Inlet and PWS

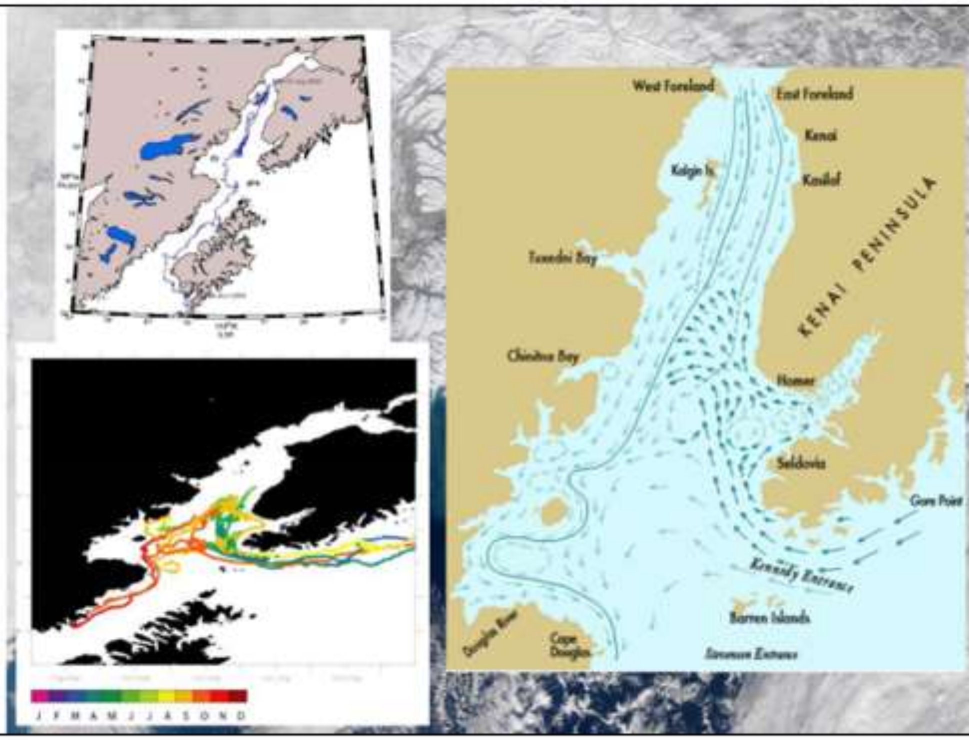


Cook Inlet - Oil Industry

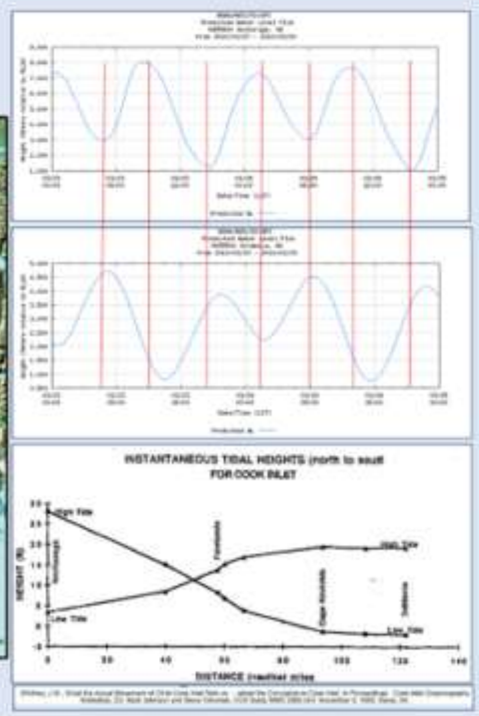


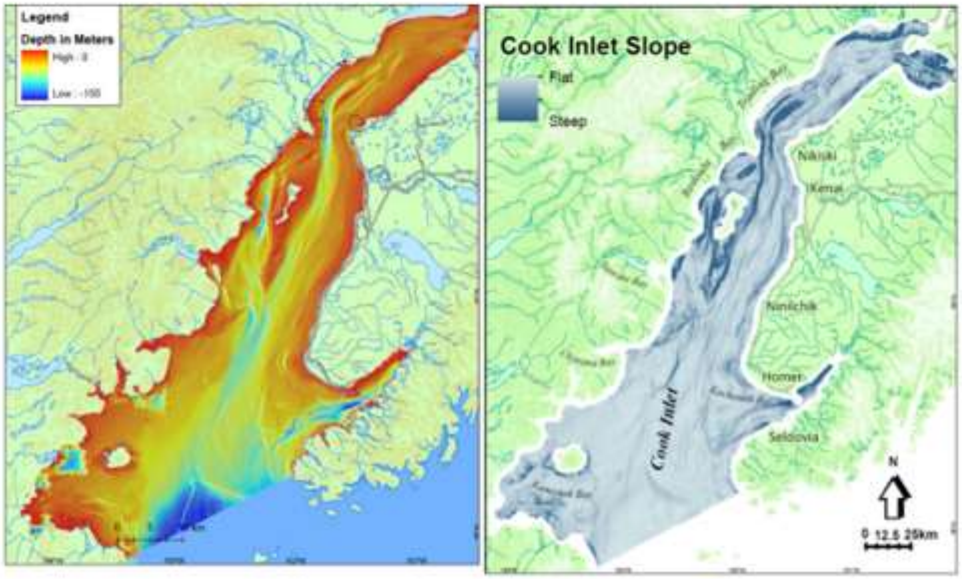
- •Fourteen active platforms producing oil and/or gas in Cook Inlet. Active production since 1960s.
- •Surface and sub-sea pipelines
- •Crude Oil Tankers, Tank Farms
- •"Cook Inlet Exemption" in Effluent Guidelines

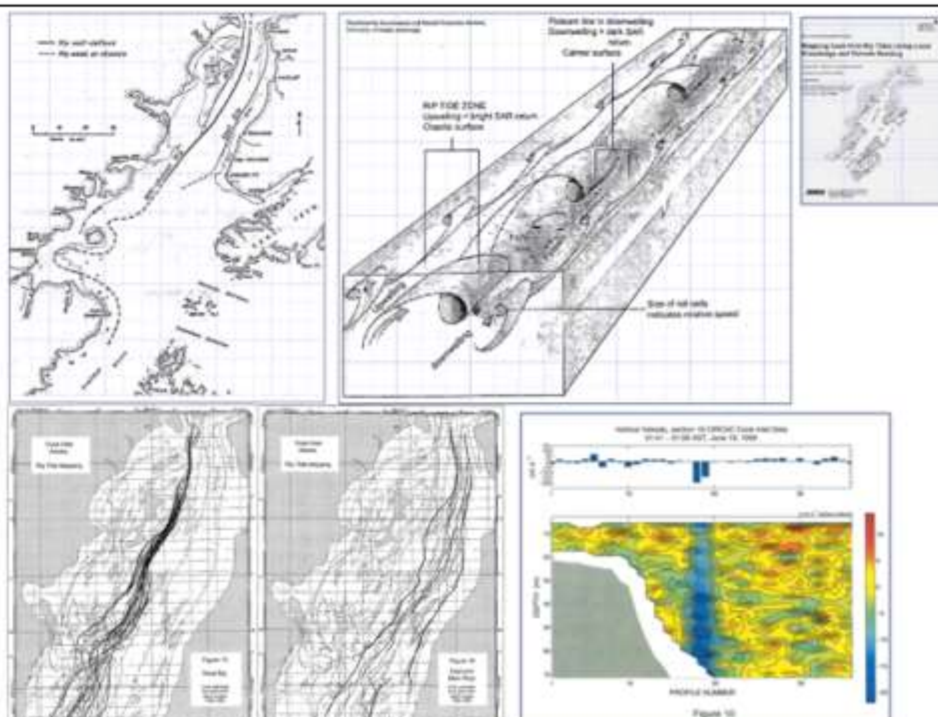


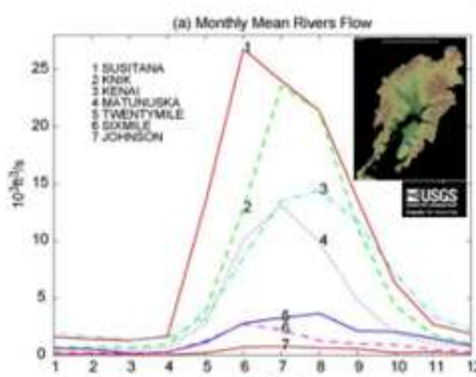


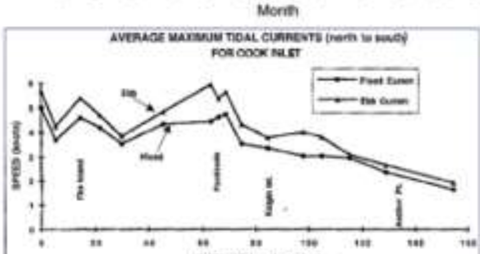
Cook Inlet Tides

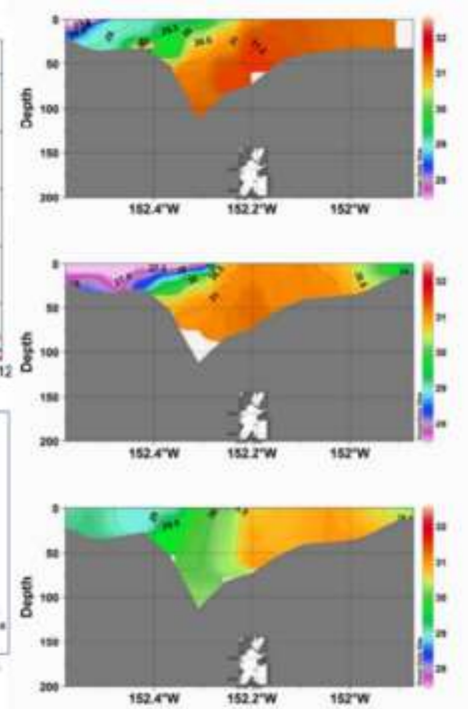


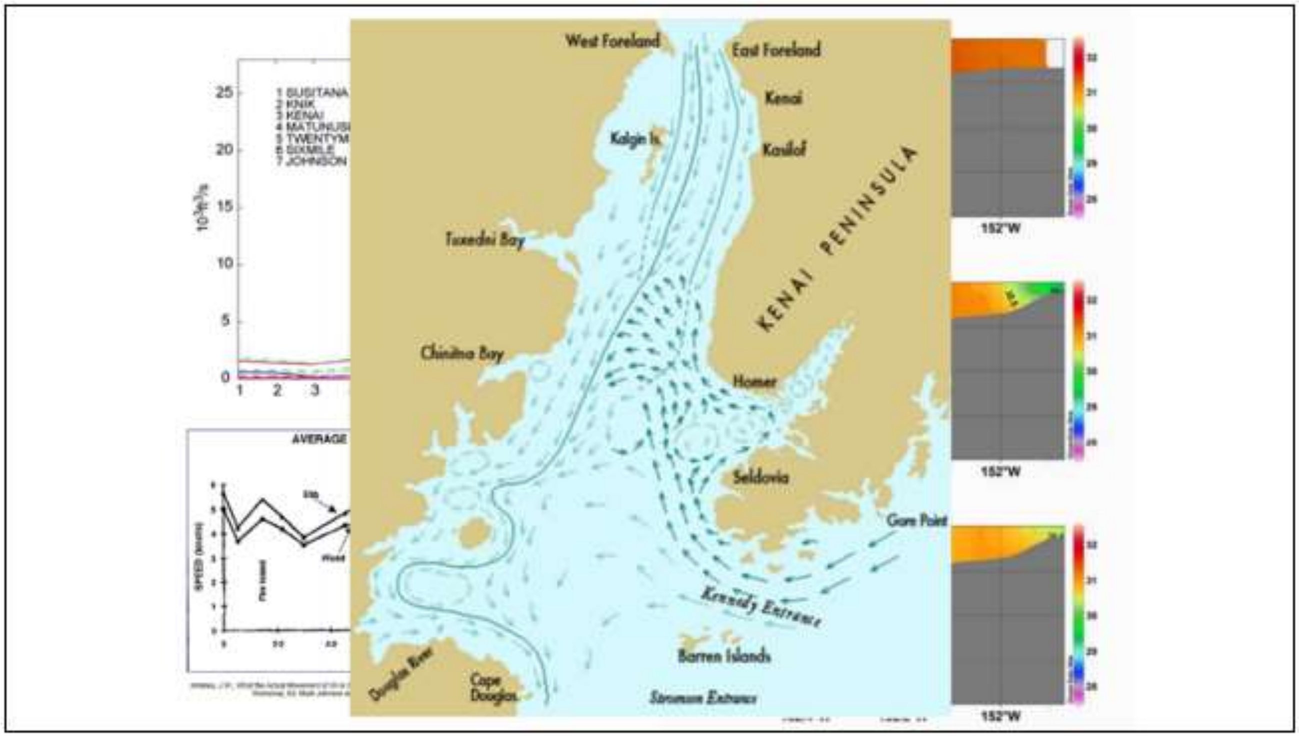

Legend
Depth in Meters
Cook Inlet Slope
Flat
Steep
Nikiski
Kenai
Ninilchik
Homer
Seldovia
Cook Inlet
N
0 12.5 25km


RIP TIDE ZONE
Figure 10

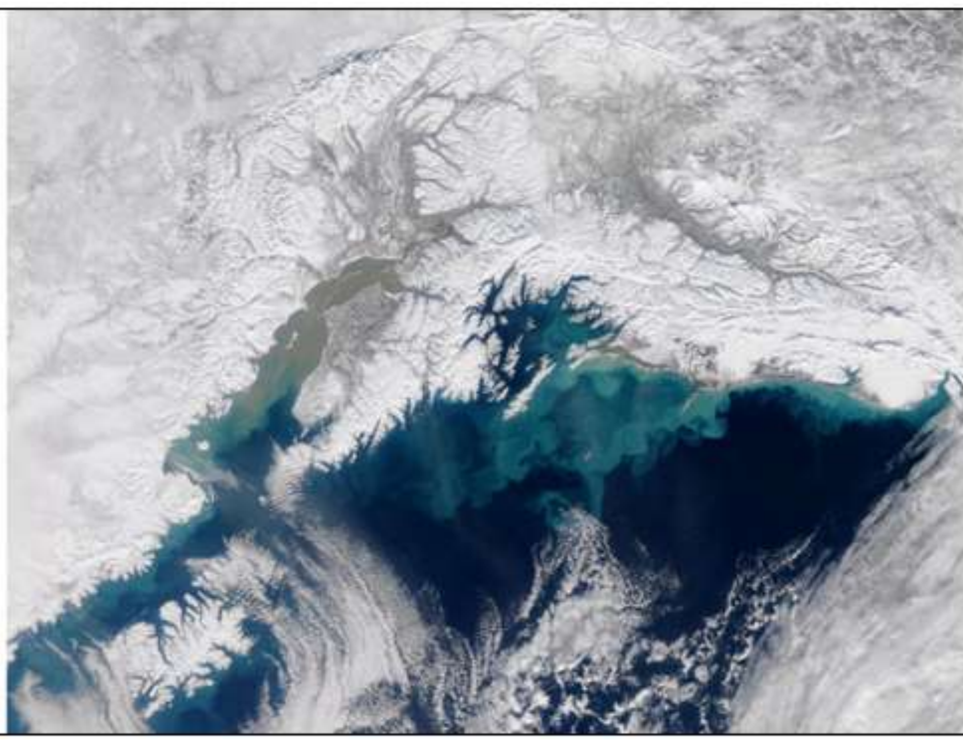

(a) Monthly Mean Rivers Flow
1 SUSITANA
2 KNIK
3 KENAI
4 MATUNUSKA
5 TWENTYMILE
6 SIXMILE
7 JOHNSON
USGS
Month


AVERAGE MAXIMUM TIDAL CURRENTS (north to south)
FOR COOK INLET
Ebb
Flood
DISTANCE (nautical miles)


Depth
152.4°W
152.2°W
152°W

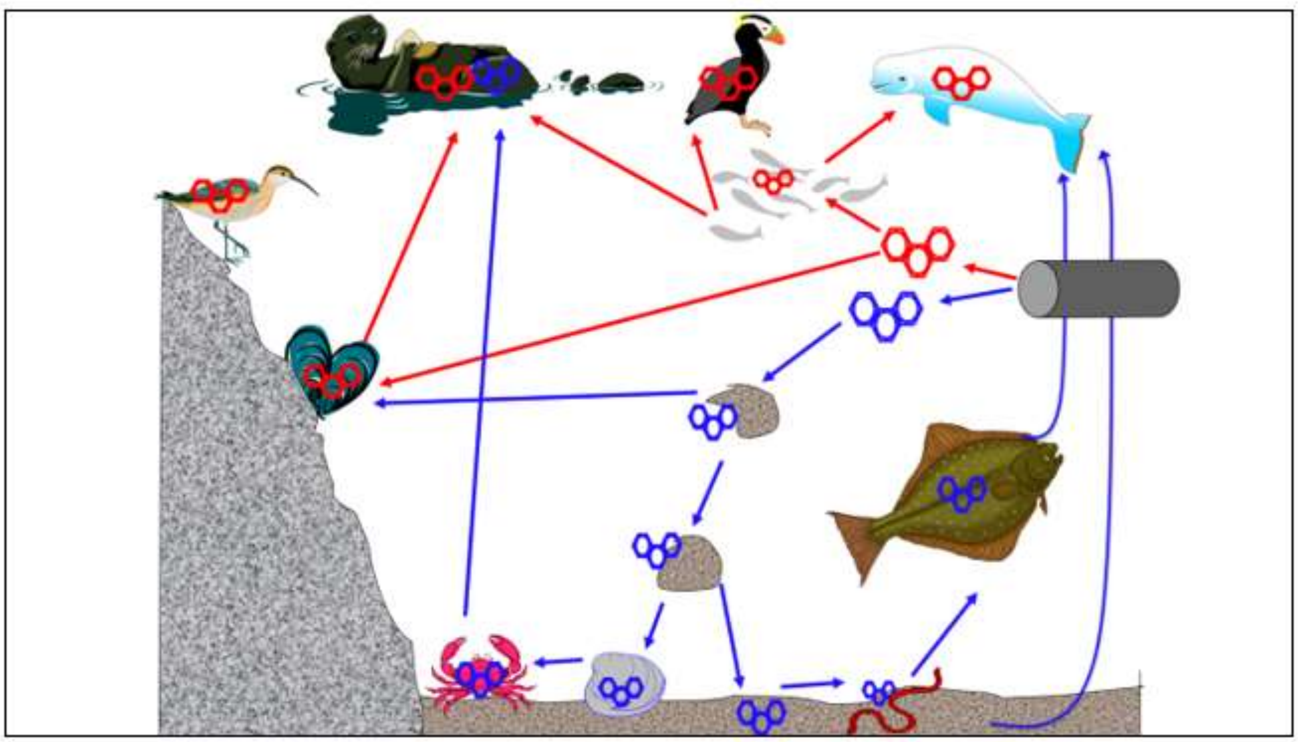


West Foreland
East Foreland
Kenai
Kalgin Is.
Kasilof
KENAI PENINSULA
Tuxedni Bay
Chinitna Bay
Homer
Seldovia
Gore Point
Kennedy Entrance
Barren Islands
Douglas River
Cape Douglas
Stevenson Entrance
1 SUSITANA
2 KNIK
3 KENAI
7 JOHNSON
AVERAGE
152°W



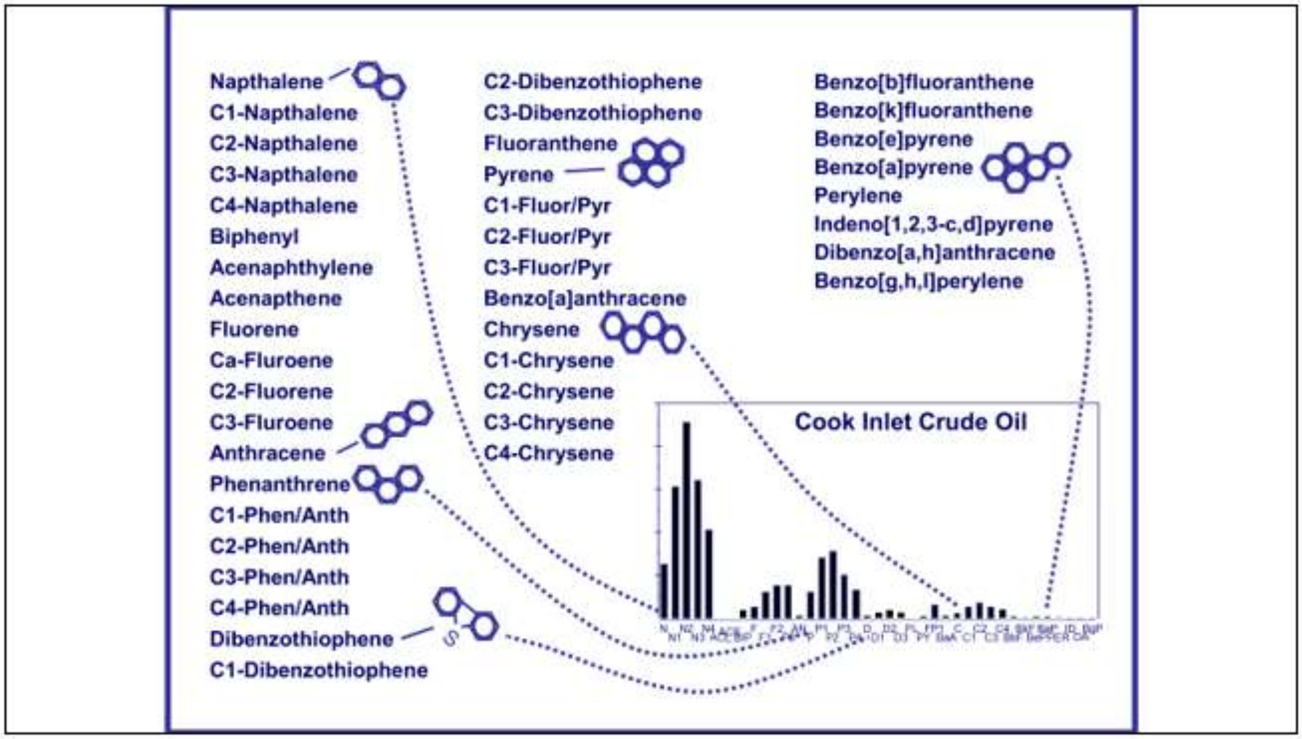
Monitoring/Assessment Study Design Considerations

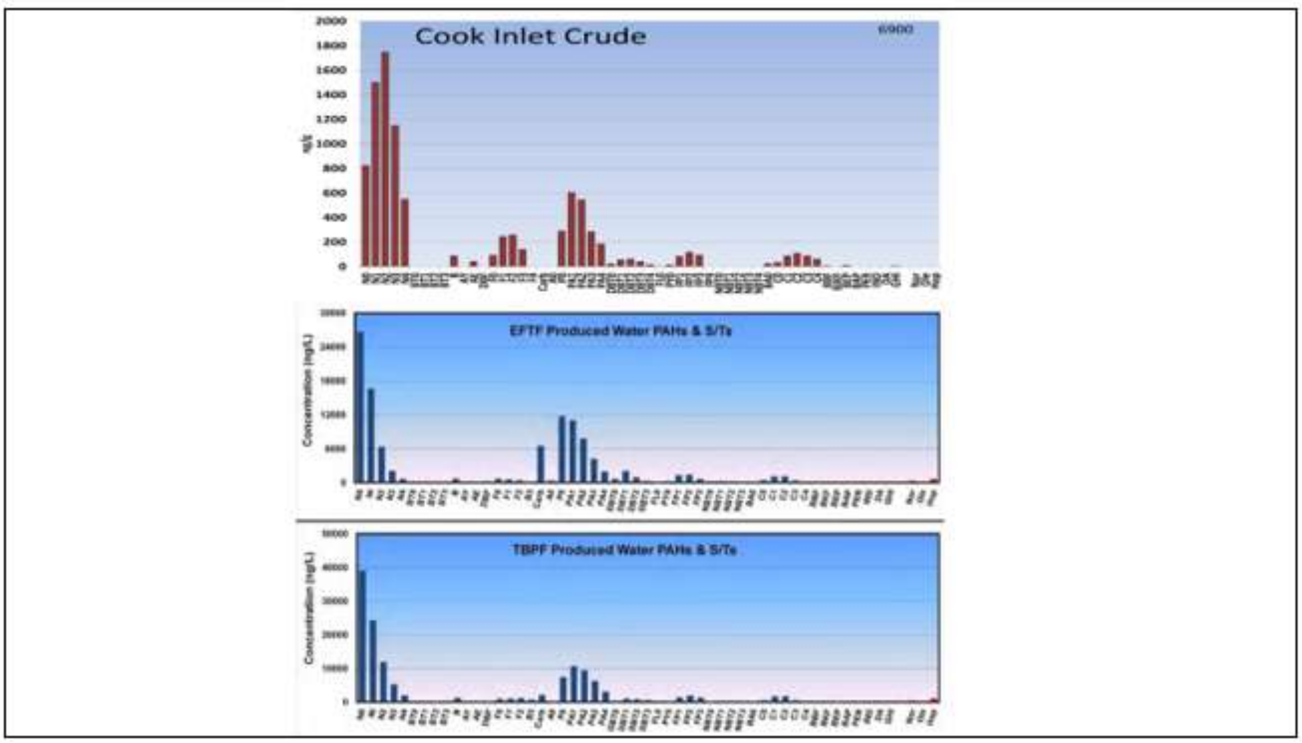
- Threats, risks, vectors
- Habitats, resources at risk
- Matrix, parameters
- Meaningful study design, sampling methods, analytical methods
  - Targeted, systematic, random
  - Temporal and spatial scales
  - Analytes, receptors
  - MDL, RL
  - Thresholds, Standards, Limits
- Concomitant Measures
- Context
- Physical Environment



Sediment Quality Triad-
Interpreting Results

Contamination (Chemistry)	Toxicity	Alteration (Biol. Effects)	Possible Conclusion
+	+	+	Evidence of pollution-induced degradation
-	-	-	No evidence of pollution-induced degradation
+	-	-	Contaminants not bioavailable
-	+	-	Unmeasured chemicals or conditions with potential to cause degradation
-	-	+	Alteration not due to toxic chemicals
+	+	-	Toxic chemicals are stressing environment
-	+	+	Unmeasured toxic chemicals causing degradation
+	-	+	Chemicals not bioavailable or alternation not due to toxic chemicals

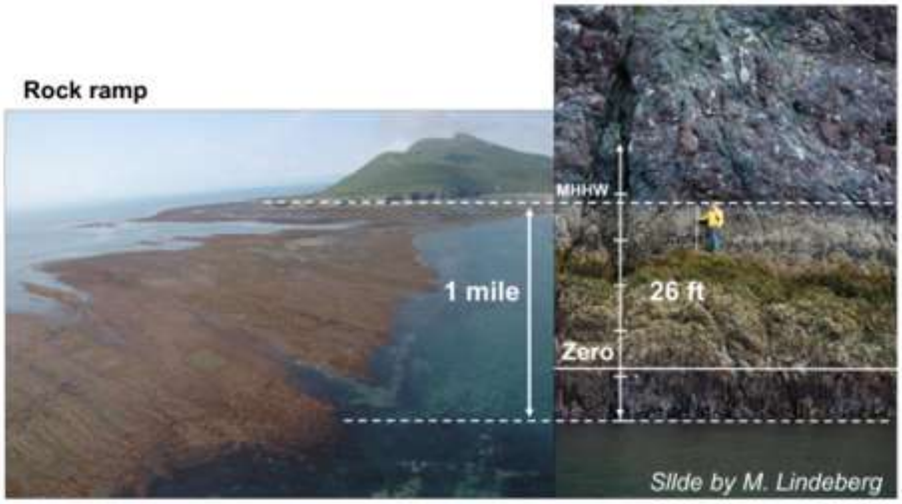

Napthalene
C1-Napthalene
C2-Napthalene
C3-Napthalene
C4-Napthalene
Biphenyl
Acenaphthylene
Acenapthene
Fluorene
Ca-Fluroene
C2-Fluorene
C3-Fluroene
Anthracene
Phenanthrene
C1-Phen/Anth
C2-Phen/Anth
C3-Phen/Anth
C4-Phen/Anth
Dibenzothiophene
C1-Dibenzothiophene
C2-Dibenzothiophene
C3-Dibenzothiophene
Fluoranthene
Pyrene
C1-Fluor/Pyr
C2-Fluor/Pyr
C3-Fluor/Pyr
Benzo[a]anthracene
Chrysene
C1-Chrysene
C2-Chrysene
C3-Chrysene
C4-Chrysene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[e]pyrene
Benzo[a]pyrene
Perylene
Indeno[1,2,3-c,d]pyrene
Dibenzo[a,h]anthracene
Benzo[g,h,I]perylene
Cook Inlet Crude Oil


Cook Inlet Crude
EFTF Produced Water PAHs & S/Ts
Concentration (ng/L)
TBPF Produced Water PAHs & S/Ts
Concentration (ng/L)

Coastal Habitat (Intertidal)

Rock wall

Rock ramp



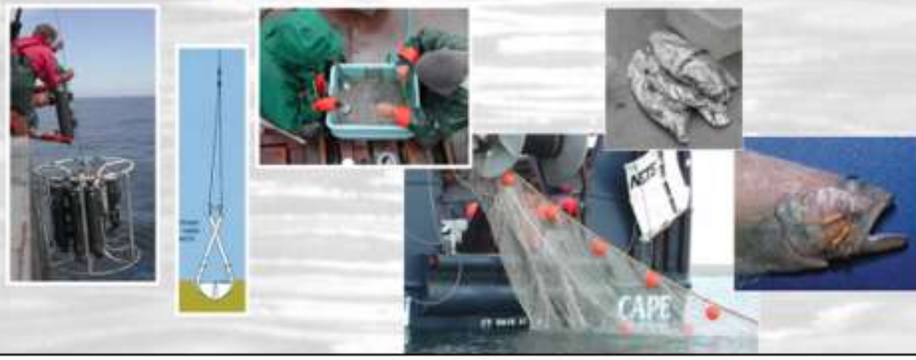
Intertidal/Nearshore Surveys

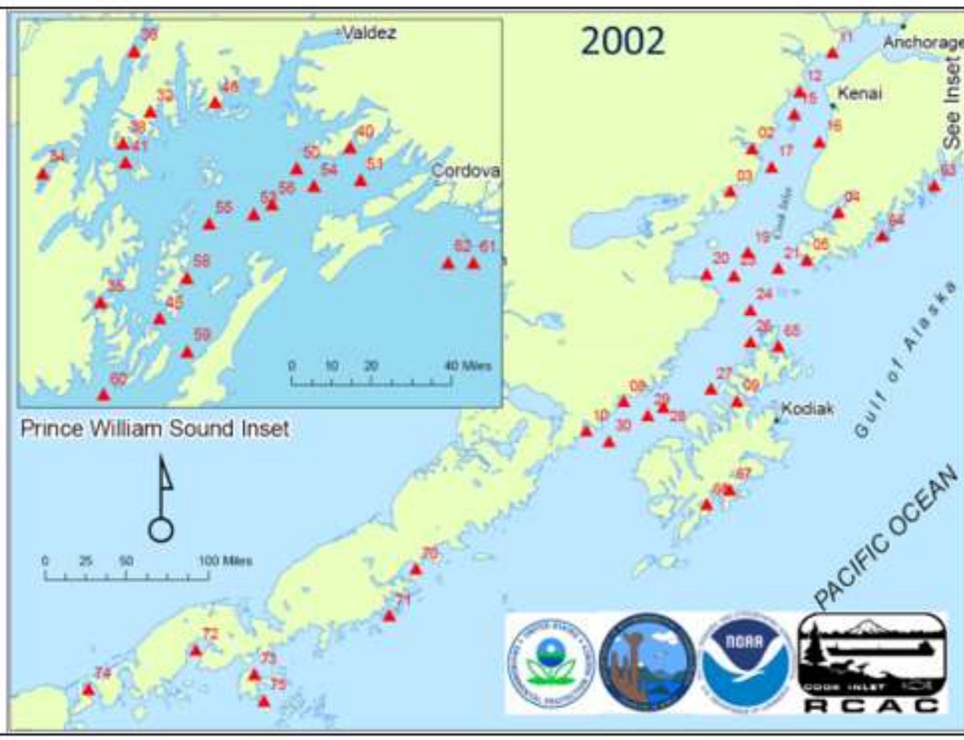
- describe intertidal species and identify sentinel populations
- analyze tissue and sediment hydrocarbons
- link biological and geomorphological data
- shoreline risk assessment


photo by Robert E. Gill, Jr., USGS

Assessment of U.S. coastal ecosystems' status and trends with a known statistical confidence.

- •Compatible, probabilistic design
- •Common set of environmental indicators
- •multiple indicators
- •Aggregate and assess at state, regional, biogeographical, and national levels
- •Leveraging – EPA, ADEC, NOAA, UW, CIRCAC





Sediment Quality

- Composition (SGZ)
- TOC
- metals
- PAHs
- PCBs
- Pesticides
- Aliphatics

Water Quality

- *TSS and SGZ*
- *DO, T, S, pH, depth*
- *Optical Backscatter, secchi*
- *nitrate, nitrite, ammonia, total phosphate*
- *Chlorophyll-a*

Benthic Sediments: Chemistry Samples

Polynuclear Aromatic Hyrdrocarbons

Napthalene
C1-C4 Napthalene
Biphenyl
Acenaphthylene
Acenaphthene
Fluorene
C1-C3Fluorene
Phenanthrene
Anthracene
C1-C4 Phenanthrene/Anthracene
Dibenzothiophene
C1-C3 Dibenzothiophene
Fluoranthene
Pyrene
C1 Fluoranthene/Pyrene
Benzo(a)anthracene
Chrysene
C1-C4 Chrysenes
Benz(a)anthracene
Benzo(a)pyrene
Biphenyl
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(e)pyrene
Benzo(a)pyrene
Perylene
Indeno(1,2,3-c,d)pyrene
Dibzneo(a,h)anthracene
Benzo(g,h,i)perylene
Total PAH

Aliphatic Hydrocarbons

n-C_{12} - n-C_{36}
pristane
phytane

21 PCB Congeners

8	2,4'-dichlorobiphenyl
18	2,2',5-trichlorobiphenyl
28	2,4,4'-trichlorobiphenyl
44	2,2',3,5'-tetrachlorobiphenyl
52	2,2',5,5'-tetrachlorobipheyl
66	2,3'4,4'-tetrachlorobiphenyl
101	2,2',4,5,5'-pentachlorobiphenyl
105	2,3,3',4,4'-pentachlorobiphenyl
110/77	2,3,3',4',6-pentachlorobiphenyl/ 3,3',4,4'-tetrachlorobiphenyl
118	2,3,4,4',5-pentachlorobiphenyl
126	3,3,4,4',5-pentachlorobiphenyl
128	2,2',3,3',4,4'-hexachlorobiphenyl
138	2,2',3,4,4,5'-hexachlorobiphenyl
153	2,2',4,4',5,5'-hexachlorobiphenyl
170	2,2',3,3',4,4',5-heptachlorobiphenyl
180	2,2',3,4,4',5,5'--heptachlorobiphenyl
187	2,2',3,4',5,5',6-heptachlorobiphenyl
195	2,2',3,3',4,4',5,6-octachlorobiphenyl,
206	2,2',3,3',4,4',5,5',6-nonachlorobiphenyl
209	2,2',3,3',4,4',5,5'6,6'-decachlorobiphenyl

Other Parameters

Sediment Grain Size (additional size classes)
Total Organic Carbon

DDT and metabolites

2,4'-DDD
4,4'-DDD
2,4'-DDE
4,4'-DDE
2,4'-DDT
4,4'-DDT

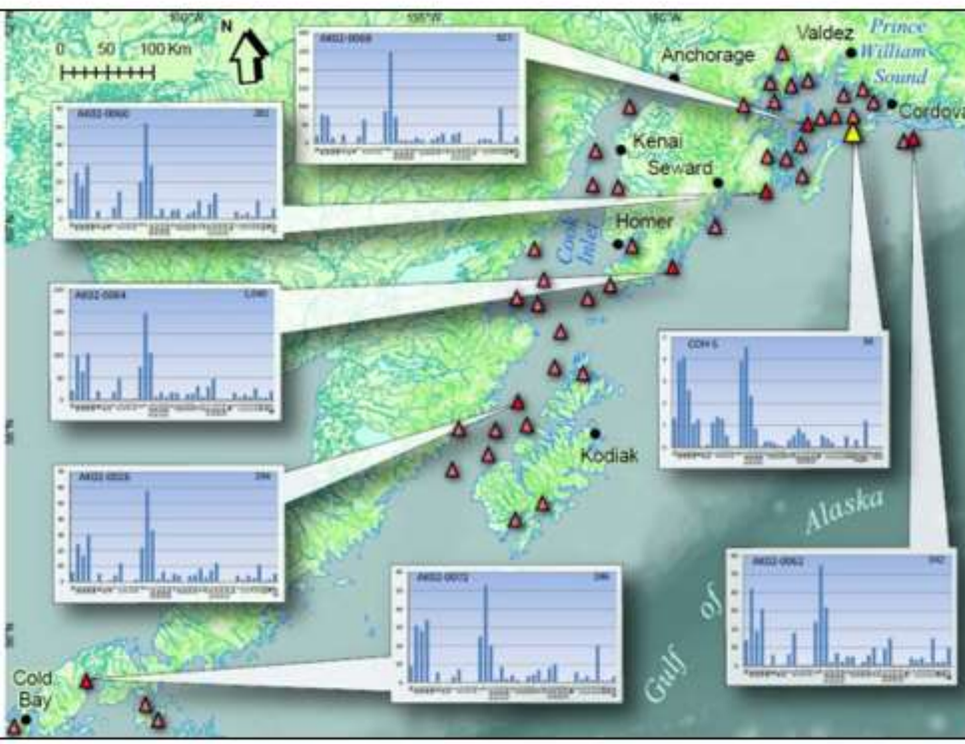
Other Chlorinated pesticides

Aldrin
Alpha-Chlordane
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Heptachlor
Heptachlor epoxide
Hexachlorobenzene
Lindane (gamma-BHC)
Mirex
Toxaphene
Trans-Nonachlor

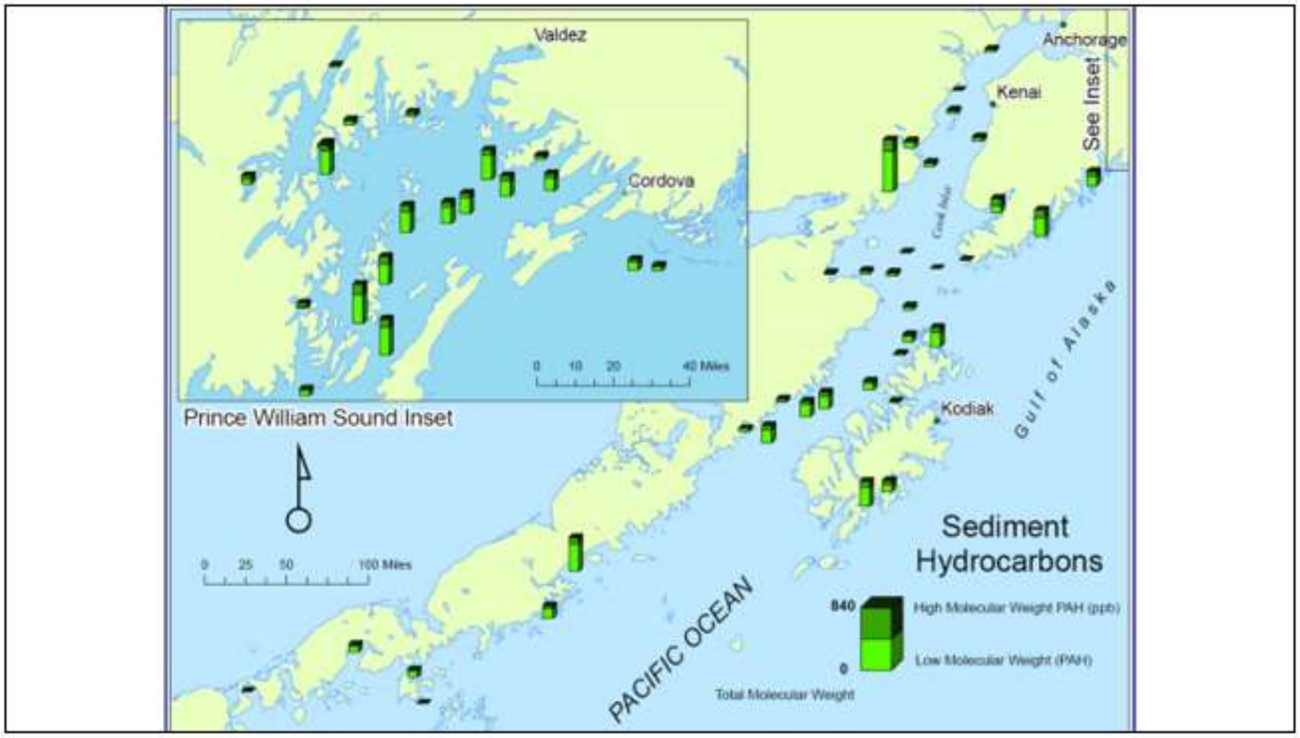
Trace Elements

Aluminum
Antimony
Arsenic
Cadmium
Chromium
Copper
Iron
Lead
Manganese
Mercury
Nickel
Selenium
Silver
Tin
Zinc

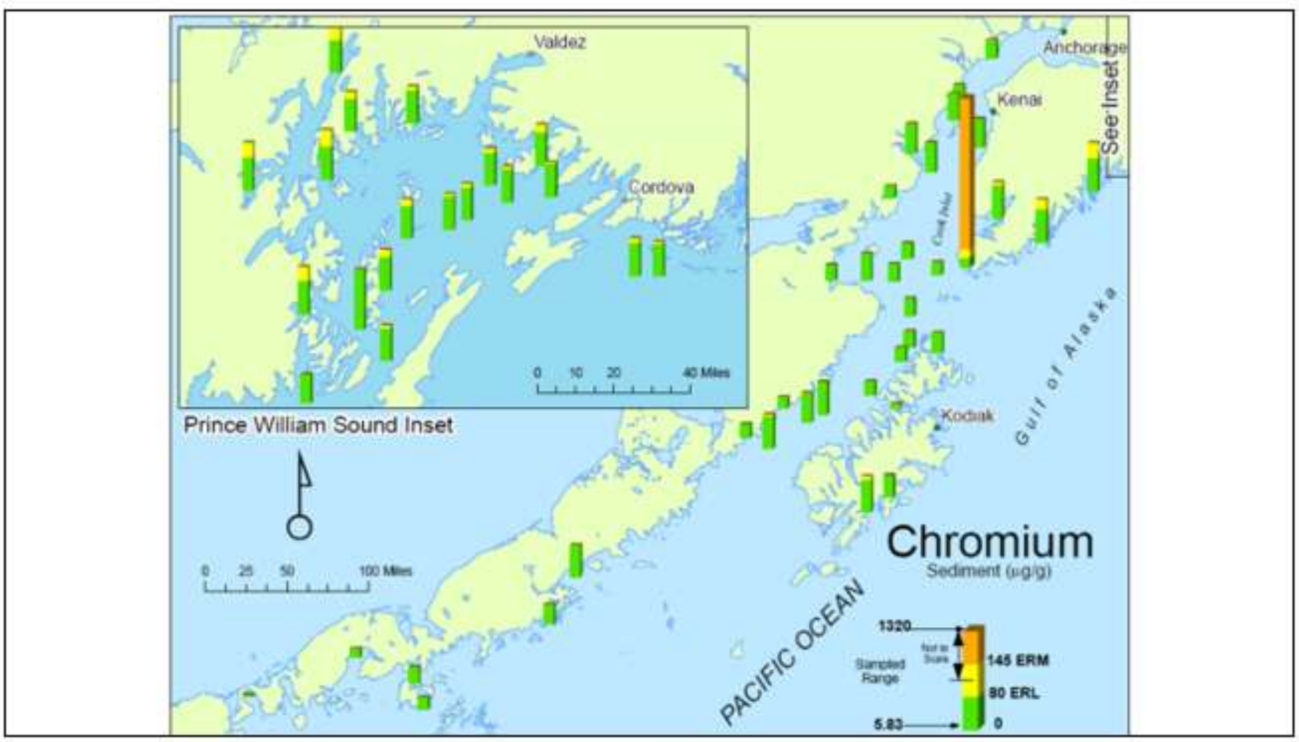
Benthic Sediments: Infaunal Samples-
species abundance and biomass
Bottom Trawls - Fish species, lengths, pathology;
Invertebrate species, abundance, and biomass
NETS
OCEAN
CAPE
Fish Tissue: Composited whole-body
contaminants



0 50 100 Km
N
Anchorage
Valdez
Prince
William
Sound
Cordova
Kenai
Seward
Homer
Cook
Inlet
Kodiak
Cold
Bay
Gulf
of
Alaska



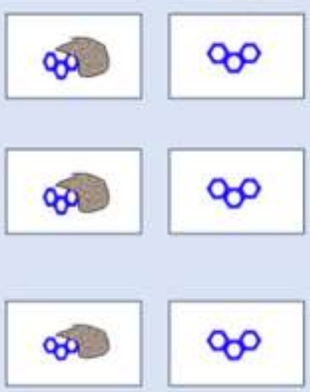
Valdez
Anchorage
Kenai
See Inset
Cordova
Cook Inlet
Gulf of Alaska
Kodiak
Prince William Sound Inset
0 10 20 40 Miles
0 25 50 100 Miles
Sediment Hydrocarbons
840
0
High Molecular Weight PAH (ppb)
Low Molecular Weight (PAH)
Total Molecular Weight
PACIFIC OCEAN



Valdez
Anchorage
Kenai
See Inset
Cordova
Cook Inlet
Gulf of Alaska
Kodiak
Prince William Sound Inset
0 10 20 40 Miles
0 25 50 100 Miles
Chromium
Sediment (µg/g)
PACIFIC OCEAN
1320
Not to Scale
Sampled Range
145 ERM
80 ERL
5.83
0

Integrated Cook Inlet Monitoring and Assessment Program (ICIEMAP) 2008-2009

Integrated Cook Inlet Monitoring and Assessment Program (ICIEMAP)



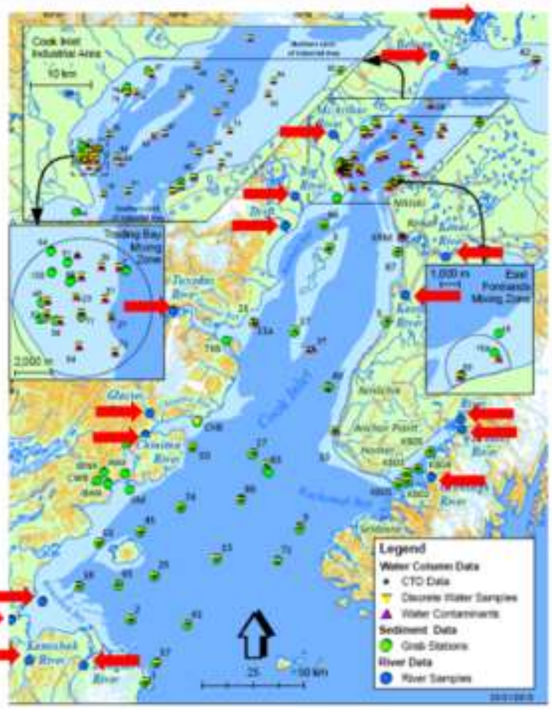
Water Column Contaminants

- Dissolved Trace Metals
- Particulate Metals
- Total Hydrocarbons
- BTEX
- PAH Fingerprints

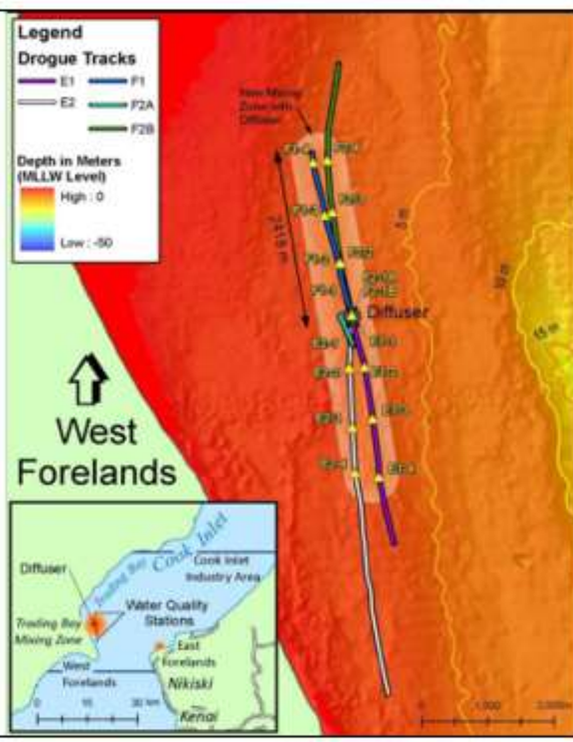
Water Quality

- TSS and SGZ
- DO, T, S, pH, depth
- Optical Backscatter, secchi
- nitrate, nitrite, ammonia, total phosphate
- Chlorophyll-a

Composition (SGZ), TOC, metals, PAHs, Aliphatics, PCBs, Pesticides, Benthic Infauna



Background Sources: Hydrocarbons and Metals



Synthesis of Contaminants Data for Cook Inlet: Evaluation of Existing Data as "Baseline Conditions" and Recommendations for Further Monitoring

BOEM Project Officer:

Caryn Smith
Environmental Sciences Management
Office of Environment, BOEM

Principal Investigator/Project Director:

Susan Saupe
Cook Inlet RCAC

Co-Principal Investigators:

Dr. Mark Savoie
Kinnetic Environmental Inc.

Dr. Jim Payne Payne
Bill Driskell
Payne Environmental Consultants, Inc.

Rob Bochnek
Axiom Data Science

BOEM

RCAC

KINNETIC ENVIRONMENTAL

PECI

Axiom DATA SCIENCE

Task 1: Conduct a meta-analysis, compile data, and develop data access tools

A. Conduct a meta-analysis to identify contaminant and associated data to collect, collate, and synthesize [focus on hydrocarbons, metals, priority pollutants, and TENORMs in water column, sediments, and benthic infauna in the Cook Inlet region.]

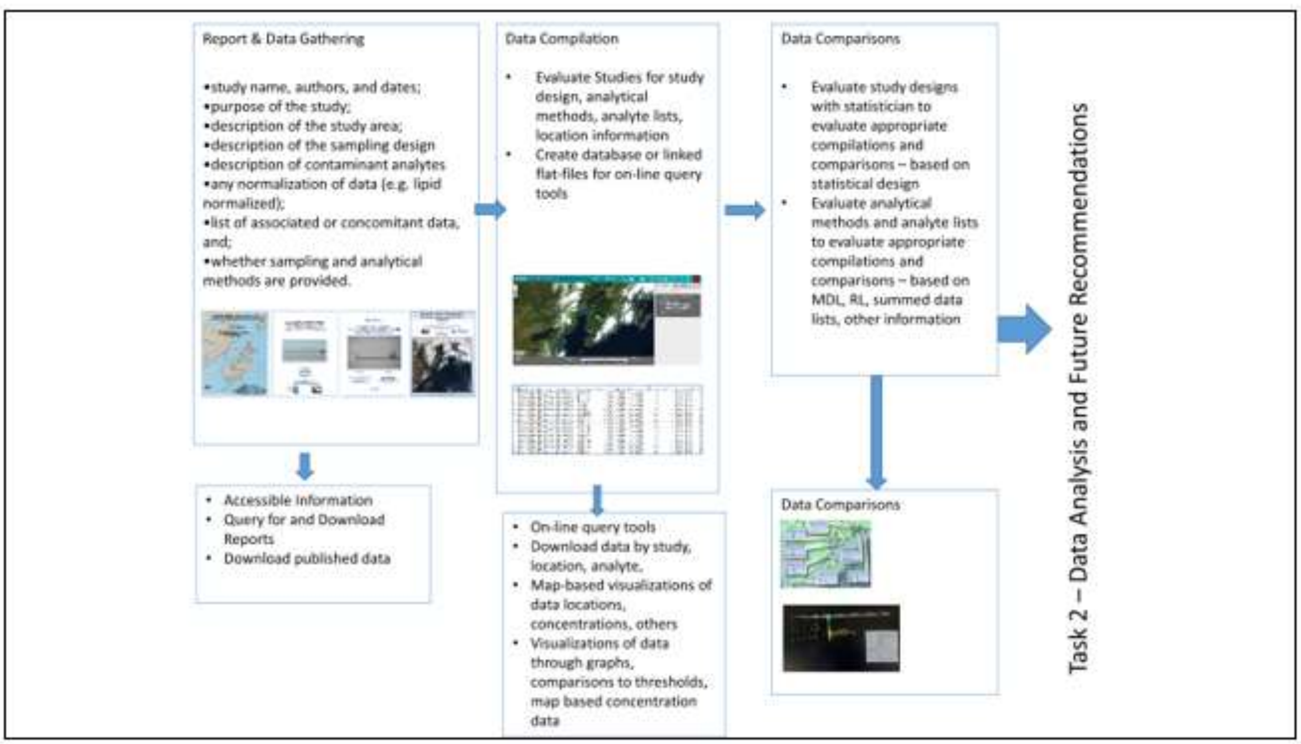
B. Using the results of the meta-analysis compile a data set of comparable contaminant data and their associated data.

C. Enhance public platforms to host data to facilitate contaminant data visualization, exploration, and comparisons.

Task 2: Develop sampling and monitoring plan recommendations

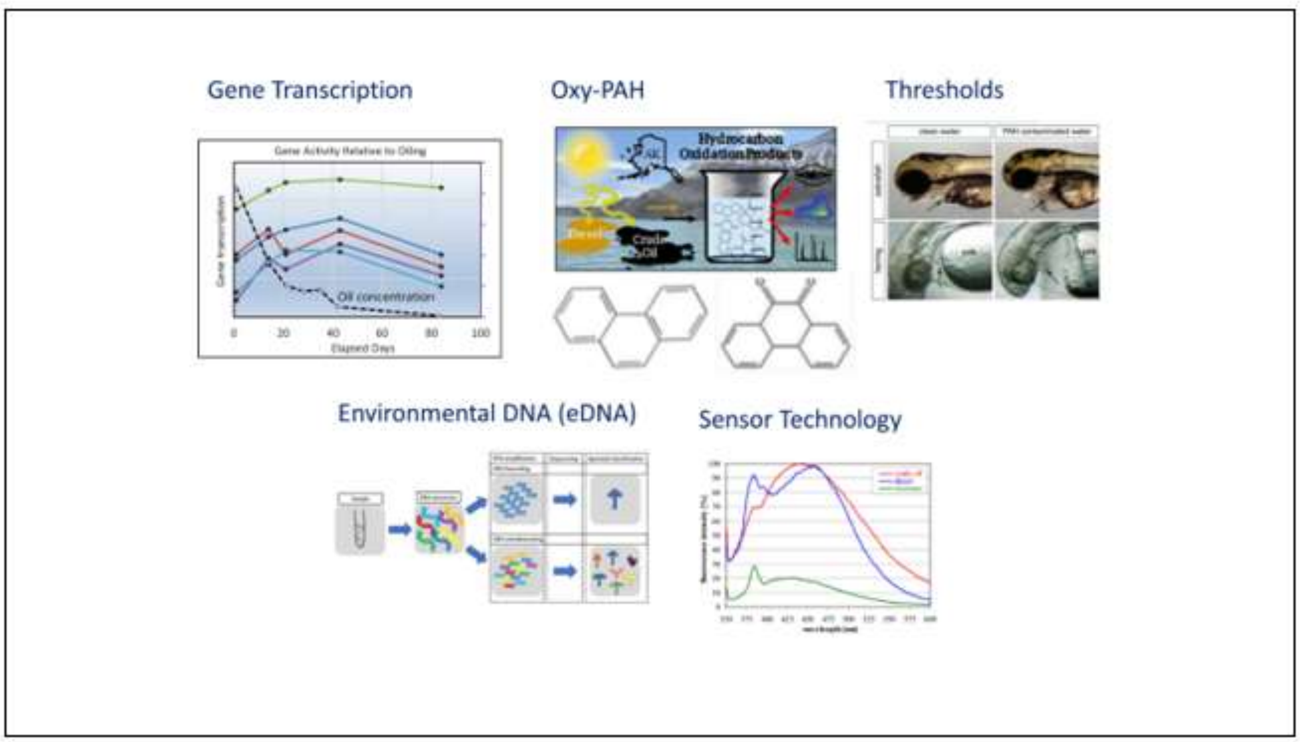
A. Evaluate the resulting contaminant data set for comparability of results and its "representativeness" of conditions in the Cook Inlet Planning Area.

B. Recommend future sampling and monitoring in lower Cook Inlet where collated contaminant literature and data suggest additional information is needed for better comparisons against established thresholds.



Report & Data Gathering
•study name, authors, and dates;
•purpose of the study;
•description of the study area;
•description of the sampling design
•description of contaminant analytes
•any normalization of data (e.g. lipid normalized);
•list of associated or concomitant data, and;
•whether sampling and analytical methods are provided.
• Accessible Information
• Query for and Download Reports
• Download published data
Data Compilation
• Evaluate Studies for study design, analytical methods, analyte lists, location information
• Create database or linked flat-files for on-line query tools
• On-line query tools
• Download data by study, location, analyte.
• Map-based visualizations of data locations, concentrations, others
• Visualizations of data through graphs, comparisons to thresholds, map based concentration data
Data Comparisons
• Evaluate study designs with statistician to evaluate appropriate compilations and comparisons – based on statistical design
• Evaluate analytical methods and analyte lists to evaluate appropriate compilations and comparisons – based on MDL, RL, summed data lists, other information
Data Comparisons
Task 2 – Data Analysis and Future Recommendations

Physical Oceanography
Coastal Habitat Mapping
Oil Fate and Transport
Related Contaminant Projects



Gene Transcription
Gene Activity Relative to Oiling
Gene Transcription
Oil concentration
0
20
40
60
80
100
Elapsed Days
Oxy-PAH
Hydrocarbon Oxidation Products
Crude Oil
Thresholds
Environmental DNA (eDNA)
Sensor Technology

Keynote Speaker: Sue Mauger

SUE MAUGER, Science & Co-Executive Director of Cook Inletkeeper, will provide an overview of the findings presented in Cook Inletkeeper's new "State of Cook Inlet" report. Cook Inletkeeper is a community-based organization with a mission to protect the Cook Inlet watershed and the life it sustains.

Presentation Title: *The State of the Inlet 2023*

Cook Inletkeeper

Protecting Alaska's Cook Inlet watershed and the life it sustains

Sue Mauger
Co-Executive Director
sue@inletkeeper.org

Cook Inletkeeper was formed in 1995 as part of a settlement for over 4000 Clean Water Act discharge violations into Cook Inlet in the 1990s.

1997
THE STATE OF THE INLET

1997
2023
?
Health Assessment
• Vital signs
• Risk factors
• Community concerns
• Treatment plan

Vital Signs

Marine Life & Coasts

+	?	-
Northern Sea Otters Humpback Whales Sockeye Salmon	Herring Hooligan Minke Whales Tanner Crab	Halibut Pacific Cod Razor Clams Scallops Shrimp & Crab Beluga Whales Common Murres Chinook Salmon

We are limited in our ability to assess populations trends because long-term datasets are lacking, particularly for non-commercial species.

Vital Signs

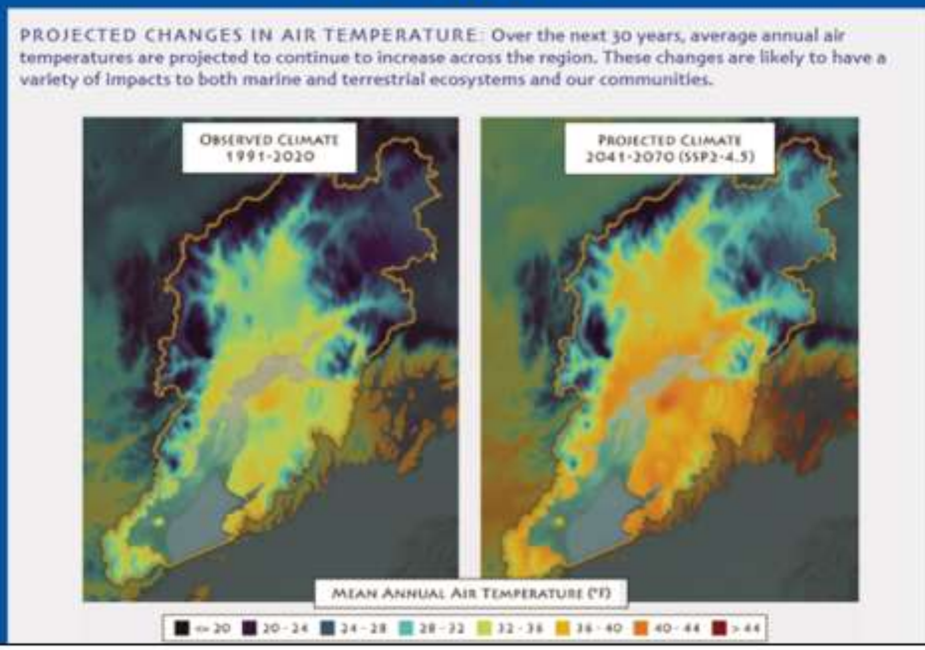
Energy & Economy

+	?	-
Tourism Agriculture Marine trades Fishing	Renewables Mining Fishing	Oil & Gas Industry Fishing

The Cook Inlet Watershed's human population and its diverse economic bases are growing, posing both opportunities and challenges to maintaining healthy waters.




Risk Factors



Major threats to the marine waters of Cook Inlet identified through publicly-available spatial data, include:

- industrial and military dischargers
- municipal wastewater treatment facilities
- toxic release sites
- oil pipelines
- ship traffic routes

Threats are concentrated in the state waters of Upper Cook Inlet and significantly overlap with beluga whale critical habitat zones.

Major threats to the freshwaters of Cook Inlet identified through publicly-available spatial data, include:

- active contamination cleanup sites
- active mining claims
- lode deposits
- mining lease and prospecting areas

Risk Factors

Regulatory Changes

In 2011, Alaska eliminated its Coastal Zone Management Program

- only qualifying state without the ability to cooperatively plan coastal development and receive federal grants for such work

In 2012, the state of Alaska assumed full authority from EPA to oversee pollution discharges under the Clean Water Act (the National Pollution Discharge Elimination System, or NPDES)

- With this new authority, the state issued a new general permit in 2022 allowing industry to continue, and in some instances increase, toxic discharges from multiple oil and gas platforms and facilities in Upper Cook Inlet.

In 2023, the Supreme Court changed the definition of "Waters of the United States" shifting the balance away from protecting streams and wetlands.

- Implications are still being assessed across the country

Risk Factors

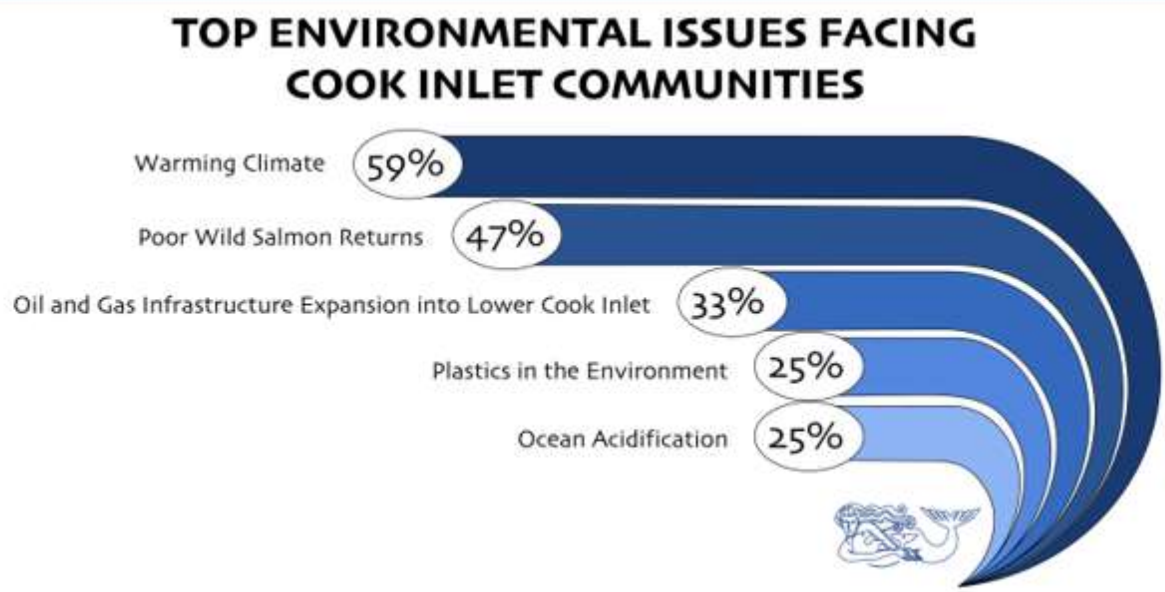
Lack of Regulatory Changes

Cook Inlet remains the only major port in North America that lacks tug escorts for laden tankers, despite the region's notorious tides, ice, and difficult navigational conditions.

Anchorage's wastewater treatment facility provides only primary treatment; this has been the case since 1985, when it received a 301(h) waiver because it could not meet the Clean Water Act requirement of secondary treatment.

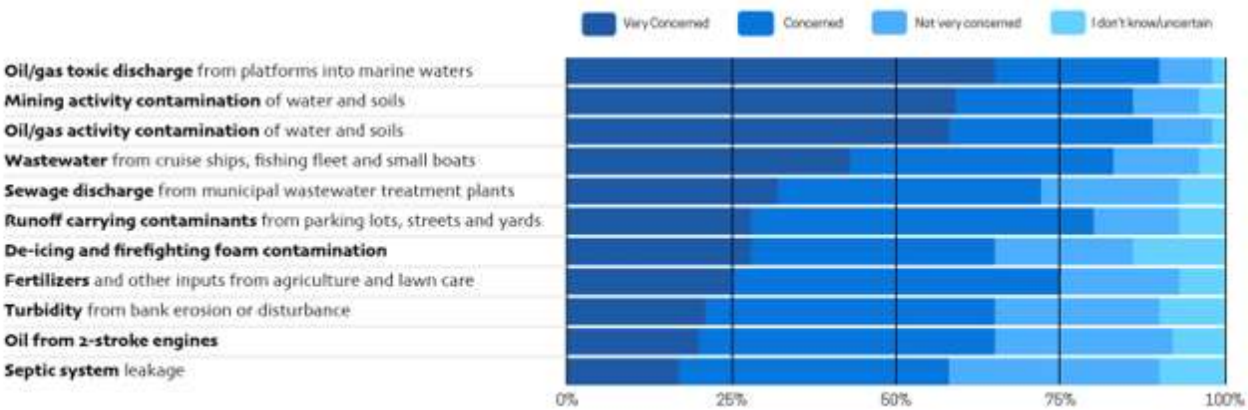
PFAS - "forever chemicals" - are widely used human-made chemicals linked to cancer and other health risks and are highly soluble in water.

Community Concerns



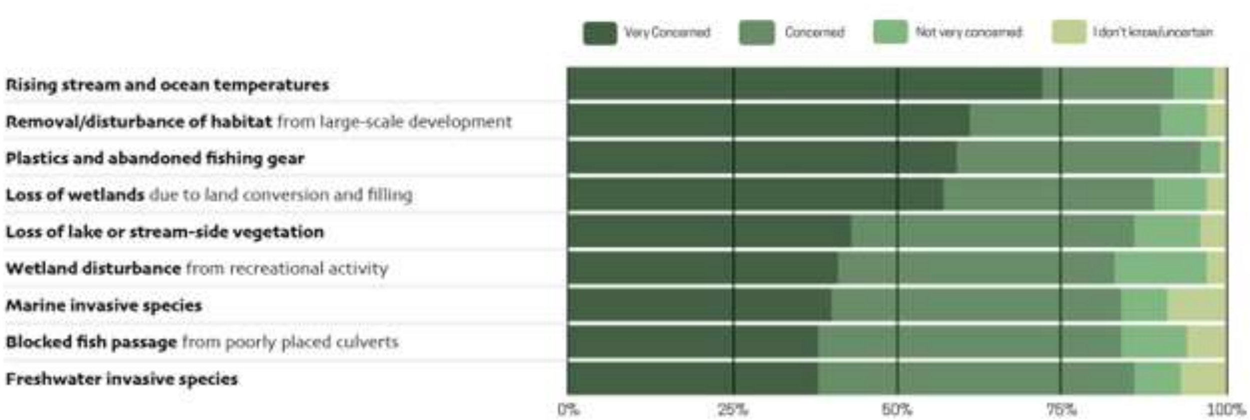
Community Concerns

Concern about Pollution Sources in Marine and Freshwaters of Cook Inlet



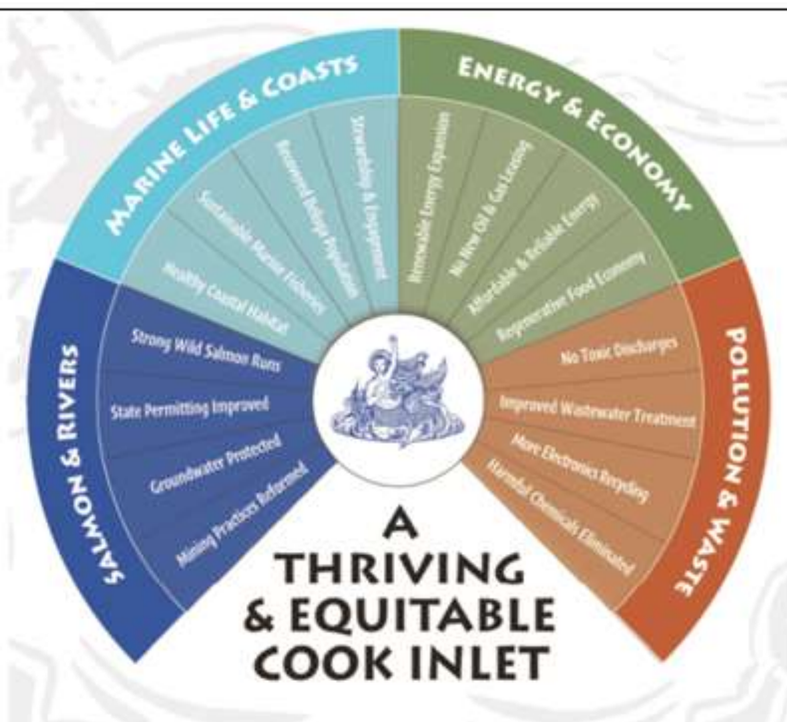
Community Concerns

Concern about Habitat Issues in the Marine and Freshwaters of Cook Inlet



Community Concerns


OUR VISION FOR THE FUTURE
Based on recent community conversations and decades of science, outreach, and advocacy, Cook Inletkeeper has identified the following outcomes reflecting our vision for Cook Inlet in the next 25 years.
MARINE LIFE & COASTS
ENERGY & ECONOMY
SALMON & RIVERS
POLLUTION & WASTE
Strong Wild Salmon Runs
State Permitting Improved
Groundwater Protected
Mining Practices Reformed
No Toxic Discharges
Improved Wastewater Treatment
More Electronics Recycling
A
THRIVING
& EQUITABLE
COOK INLET


MARINE LIFE & COASTS
Healthy Coastal Habitat
Sustainable Marine Fisheries
Recovered Beluga Population
Stewardship & Engagement
ENERGY & ECONOMY
Renewable Energy Expansion
No New Oil & Gas Leasing
Affordable & Reliable Energy
Regenerative Food Economy
SALMON & RIVERS
Strong Wild Salmon Runs
State Permitting Improved
Groundwater Protected
Mining Practices Reformed
POLLUTION & WASTE
No Toxic Discharges
Improved Wastewater Treatment
More Electronics Recycling
Harmful Chemicals Eliminated
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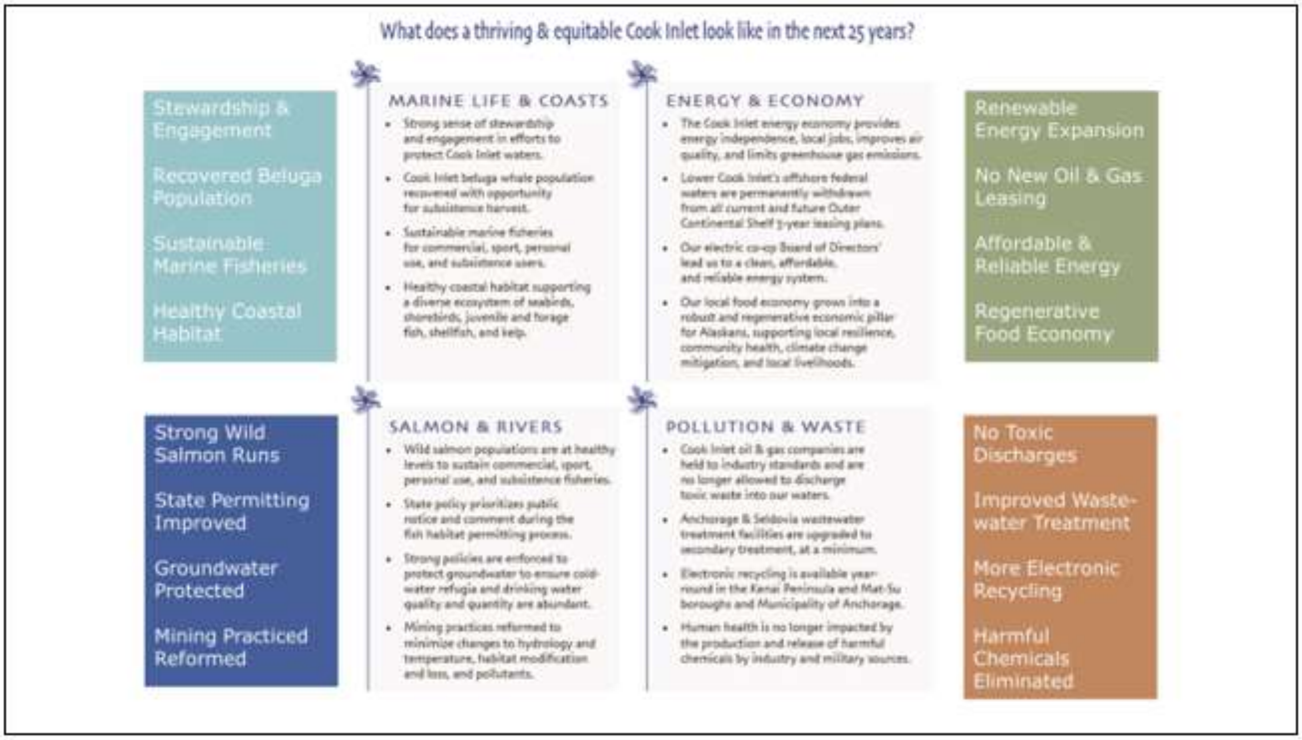
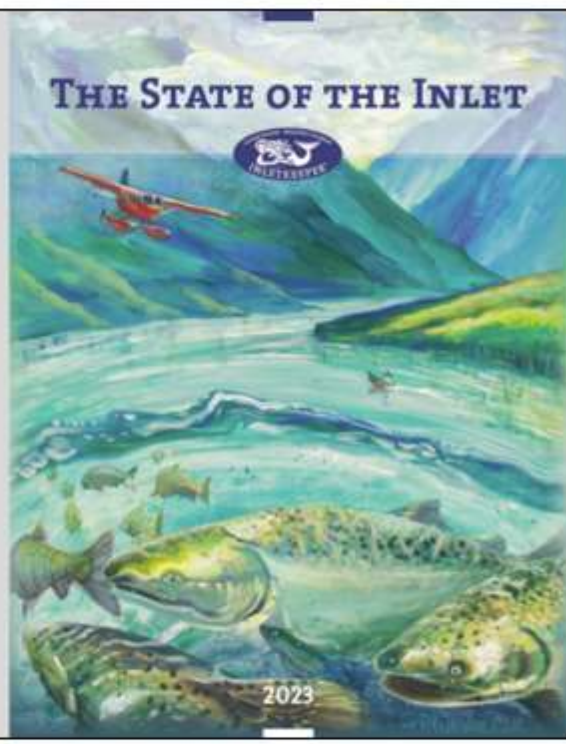
THRIVING
& EQUITABLE
COOK INLET

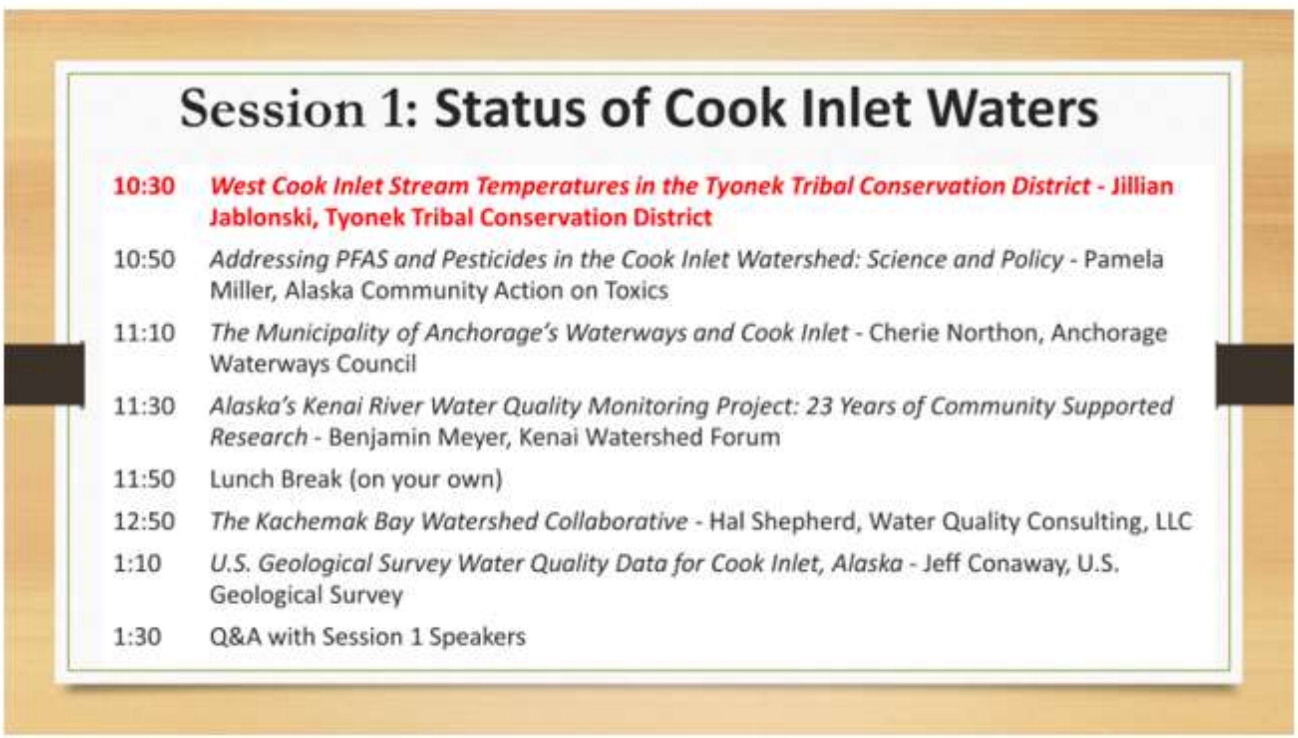

What does a thriving & equitable Cook Inlet look like in the next 25 years?
Stewardship & Engagement
Recovered Beluga Population
Sustainable Marine Fisheries
Healthy Coastal Habitat
MARINE LIFE & COASTS
• Strong sense of stewardship and engagement in efforts to protect Cook Inlet waters.
• Cook Inlet beluga whale population recovered with opportunity for subsistence harvest.
• Sustainable marine fisheries for commercial, sport, personal use, and subsistence users.
• Healthy coastal habitat supporting a diverse ecosystem of seabirds, shorebirds, juvenile and forage fish, shellfish, and kelp.
ENERGY & ECONOMY
• The Cook Inlet energy economy provides energy independence, local jobs, improves air quality, and limits greenhouse gas emissions.
• Lower Cook Inlet's offshore federal waters are permanently withdrawn from all current and future Outer Continental Shelf 5-year leasing plans.
• Our electric co-op Board of Directors' lead us to a clean, affordable, and reliable energy system.
• Our local food economy grows into a robust and regenerative economic pillar for Alaskans, supporting local resilience, community health, climate change mitigation, and local livelihoods.
Renewable Energy Expansion
No New Oil & Gas Leasing
Affordable & Reliable Energy
Regenerative Food Economy
Strong Wild Salmon Runs
State Permitting Improved
Groundwater Protected
Mining Practiced Reformed
SALMON & RIVERS
• Wild salmon populations are at healthy levels to sustain commercial, sport, personal use, and subsistence fisheries.
• State policy prioritizes public notice and comment during the fish habitat permitting process.
• Strong policies are enforced to protect groundwater to ensure cold-water refugia and drinking water quality and quantity are abundant.
• Mining practices reformed to minimize changes to hydrology and temperature, habitat modification and loss, and pollutants.
POLLUTION & WASTE
• Cook Inlet oil & gas companies are held to industry standards and are no longer allowed to discharge toxic waste into our waters.
• Anchorage & Seldovia wastewater treatment facilities are upgraded to secondary treatment, at a minimum.
• Electronic recycling is available year-round in the Kenai Peninsula and Mat-Su boroughs and Municipality of Anchorage.
• Human health is no longer impacted by the production and release of harmful chemicals by industry and military sources.
No Toxic Discharges
Improved Waste-water Treatment
More Electronic Recycling
Harmful Chemicals Eliminated


1997
2023
2048
Future Health Assessments
• Require that we invest in the data collection needed to track our progress.
• Identify shared values that move us toward a shared vision.

A beautiful and special place with many names, Cook Inlet, *Cangacig*, and *Tikahtnu* all describe this region's expansive watershed. The Inlet is currently named after Captain James Cook, who mapped and explored this area in 1778. *Cangacig* is the Sugpiaq/Alutiiq placename for the Inlet and is thought to come from the word for "blue." The Dena'ina word for the Inlet is *Tikahtnu*, which translates directly to "Big Water River." Big Water River speaks to the dynamic motion of the water as it floods in and out with dramatic tidal ferocity. From the Susitna River to Augustine Island, Cook Inlet with its diverse names and ecosystems encompass an equally diverse and vibrant history.

Cook Inletkeeper acknowledges that the Inlet and surrounding lands have been home to the Dena'ina, Sugpiaq/ Alutiiq people of Alaska's Southcentral region for thousands of years, long before the occupations of settler culture. Sacred relationships to traditional lands and ways of life endure to this day and are essential matters of any developing environmental or economic solution for Alaska's future generations.

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10:30 West Cook Inlet Stream Temperatures in the Tyonek Tribal Conservation District - Jillian Jablonski, Tyonek Tribal Conservation District
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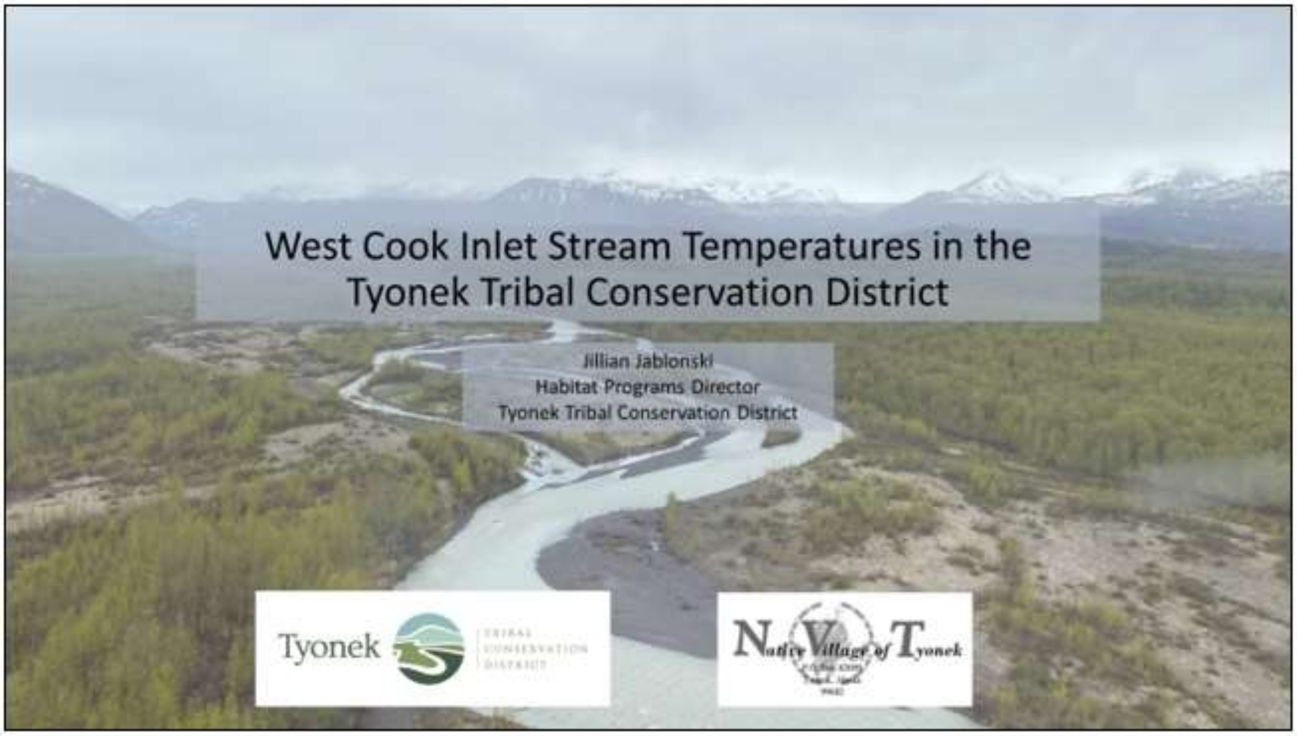
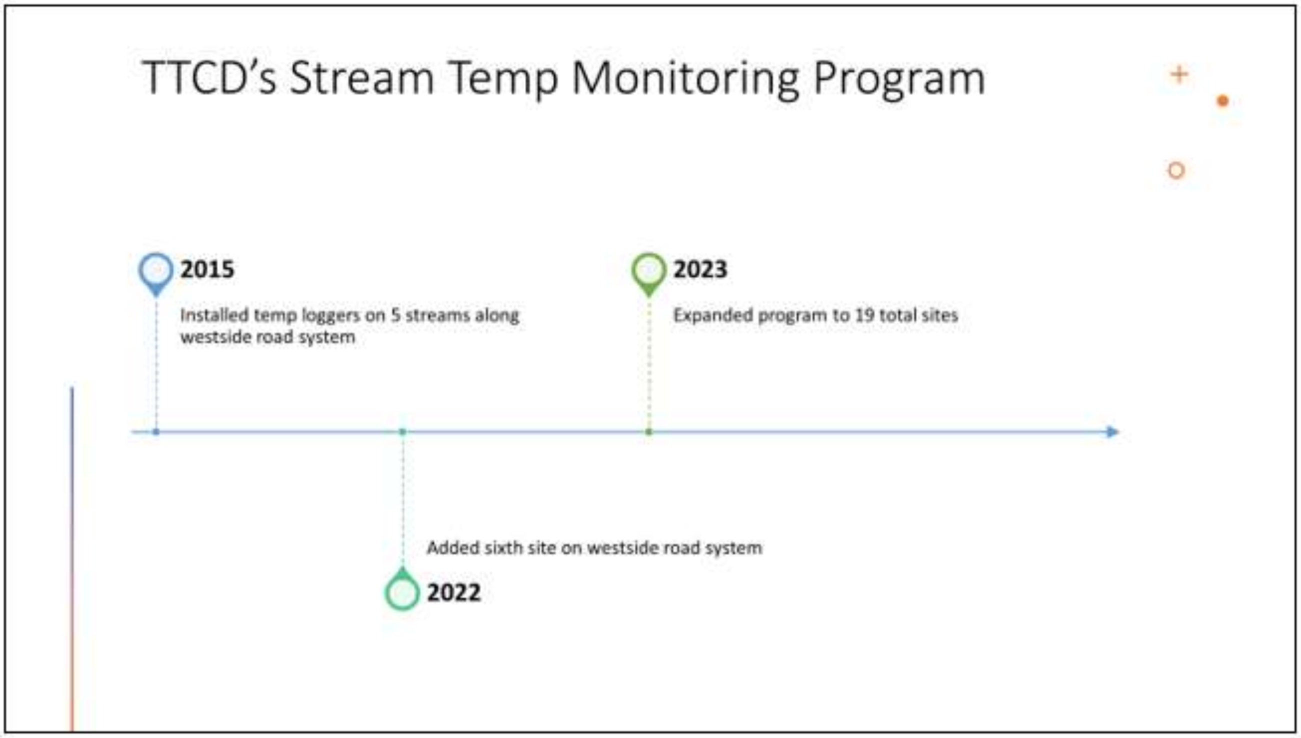


Tyonek Tribal Conservation District (TTCD)

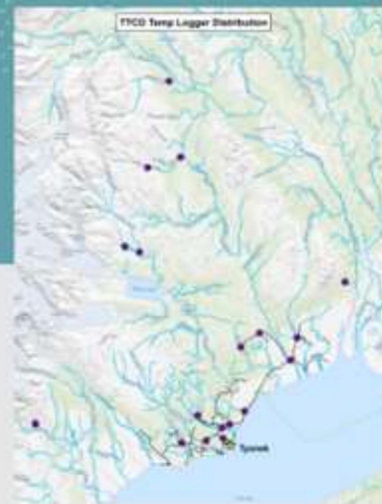
- Tribal non-profit established in 2005 through MOU between Native Village of Tyonek, Tyonek Native Corp, and NRCS
- 6.6 million acres in West Cook Inlet
- Fully remote, small road system in Tyonek, Beluga
- Addresses invasive northern pike, salmon population monitoring, fish passage, etc.


TTCD’s Stream Temp Monitoring Program
2015
Installed temp loggers on 5 streams along westside road system
2023
Expanded program to 19 total sites
Added sixth site on westside road system
2022


2023: Project Expansion
• Overview of Freshwater Streams Resources Important for Chinook Salmon Spawning/Rearing in the Tyonek Tribal Conservation District

Site Selection

- Non-glacial
- Attempted to capture thermal heterogeneity within and between systems
- Sites spanning 9 sub watersheds covering 14 drainages
- Sites specifically selected based on documented Chinook salmon spawning/rearing
  - 16/19 sites listed for King s/r/p in the AWC



Data collection

- Water quality parameters: Temp, DO, pH
- Flow
- Substrate
- Bankfull and wetted width
- Riparian vegetation classifications

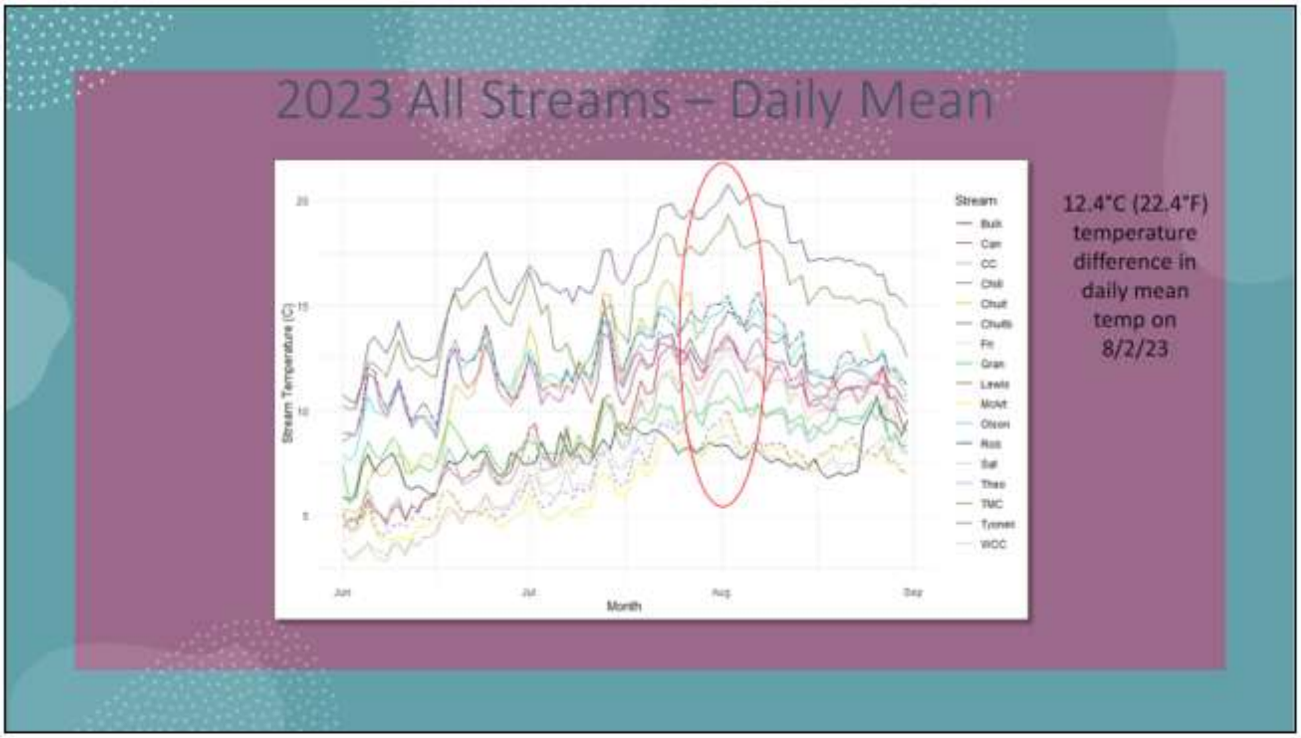
2023 Results

- All sites were visited at least twice, May - October
- We lost one logger and designed logger housing improvements to implement in 2024

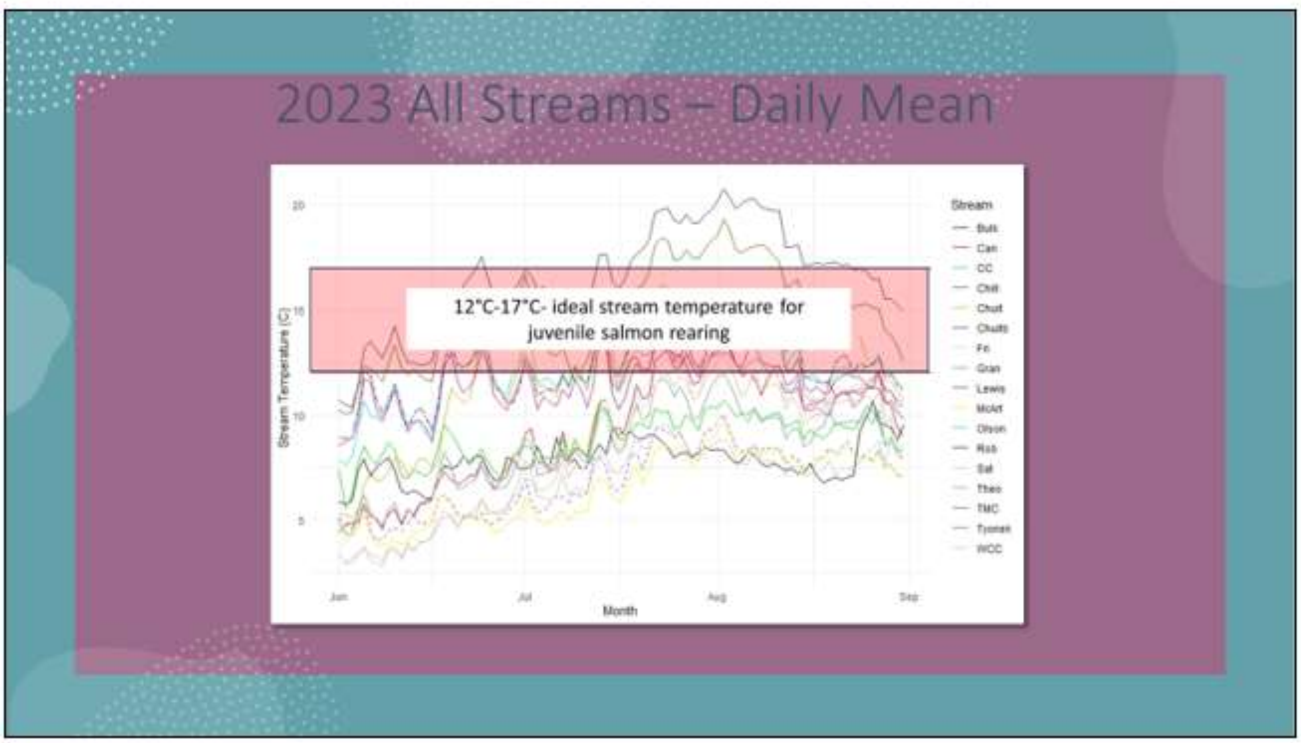
2023 Results

- Mean July 2023 stream temps: 6.7°C – 17.5°C (44.1°F – 63.5°F)

Date	Temp	Stream
6/3/23	2.2°C/36.0°F	West Fork Coal Creek
7/7/23	4.3°C/40.0°F	McArthur trib
8/2/23	22.7°C/72.9°F	Chuitbuna Creek



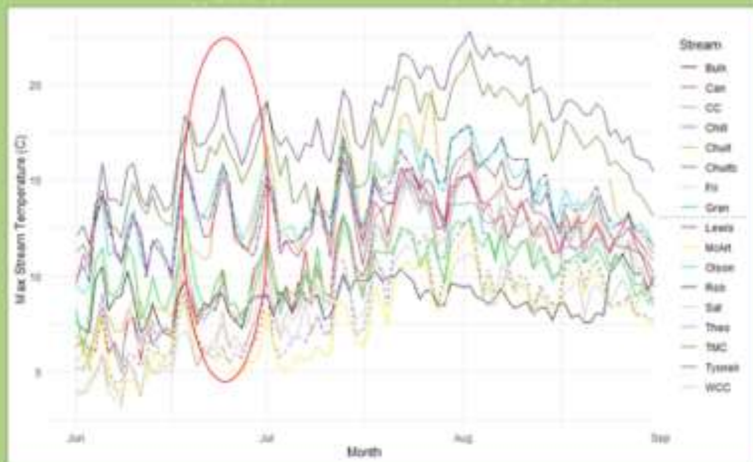
2023 All Streams – Daily Mean
Stream Temperature (C)
Month
Jun
Jul
Aug
Sep
Stream
12.4°C (22.4°F) temperature difference in daily mean temp on 8/2/23



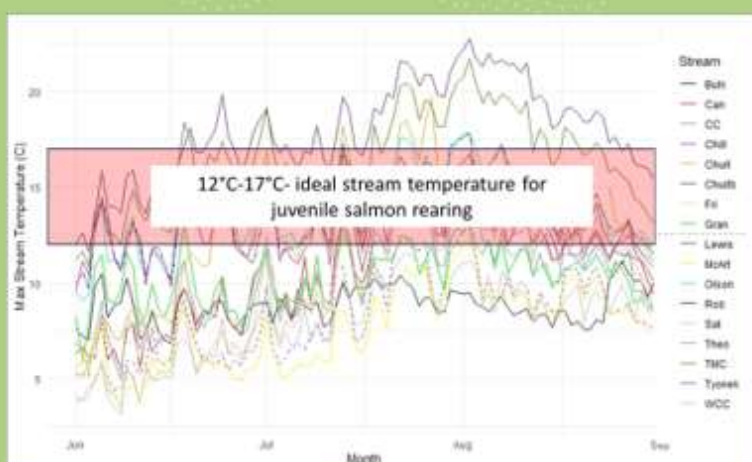
2023 All Streams – Daily Mean
12°C-17°C- ideal stream temperature for juvenile salmon rearing
Stream Temperature (C)
Month
Jun
Jul
Aug
Sep
Stream

2023 All Streams – Daily Max

13.8°C (24.9°F) temperature difference in daily mean temp on 6/24/23

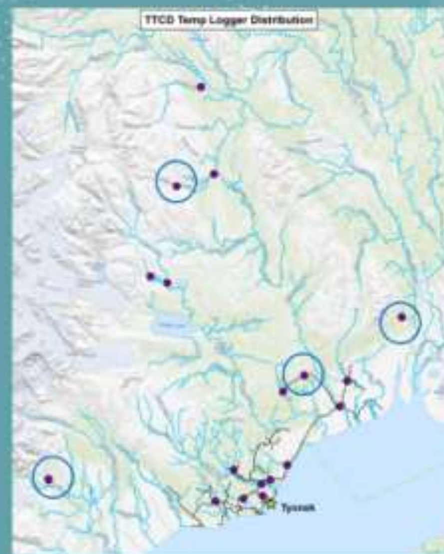


2023 All Streams – Daily Max



Cold vs. Warm Streams

- 2023 Cold streams
  - July mean < 8.5°C



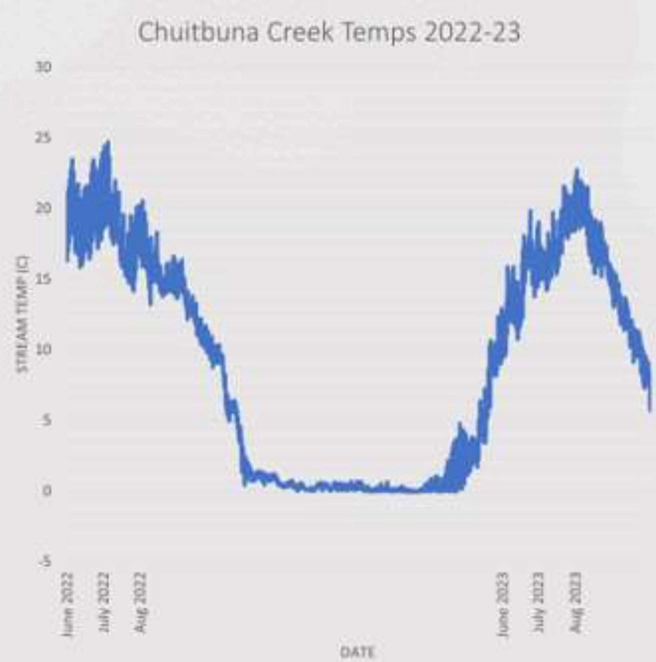
Cold vs. Warm Streams

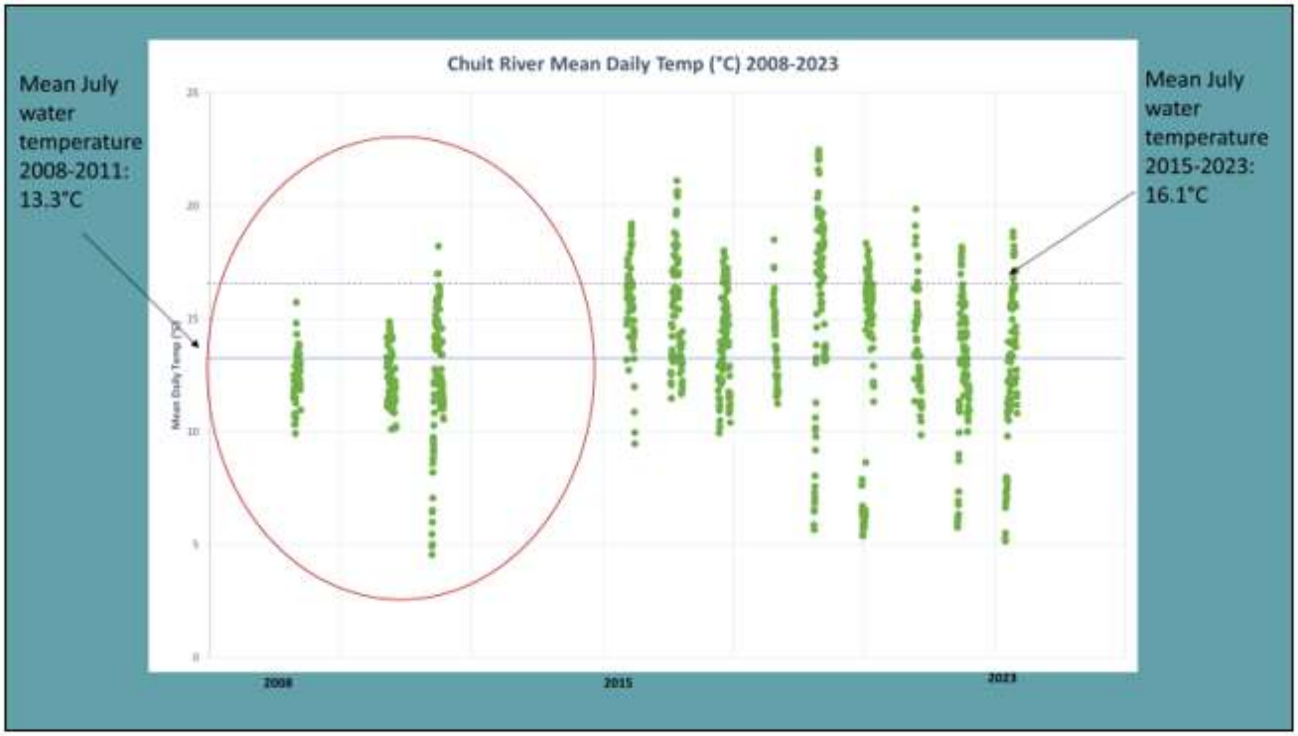
- 2023 Cold streams
  - July mean < 8.5°C
- 2023 Warm streams
  - July mean > 13.0°C
  - Chuitbuna July mean = 17.5°C

Site Photos

McArthur River tribs

Warm Stream: Chuitbuna Creek




Chuit River Mean Daily Temp (°C) 2008-2023
Mean July water temperature 2008-2011: 13.3°C
Mean July water temperature 2015-2023: 16.1°C
2008
2015
2023


Conclusions and Thoughts
• Long-term dataset:
• More analyses yet needed
• Appears to capture overall increasing temperature trend (no surprise!)
• 2023 dataset:
• Substantial thermal diversity on streams supporting Chinook salmon
• 2023 was a "cool" year- what will 2024 look like?

Conclusions

- Thermal diversity of nearby creeks and influences shaping thermal regimes:
  - Olson & Pretty: Seemingly similar in many ways, but notably different thermal regimes
  - McArthur area tribs- differences in a very small landscape scale
- Utilizing this data to highlight areas of particular conservation importance and/or concern

Chuit River Considerations

- Pursuing funding to investigate freshwater reasons for Chinook decline, increasing temperature studies to identify thermal refuges/cold water inputs

Thank you!
jjablonski@ttcd.org
Partners:
Funder:
Native Village of Tyonek
ALASKA
DEPARTMENT OF FISH AND GAME
U.S. FISH & WILDLIFE SERVICE

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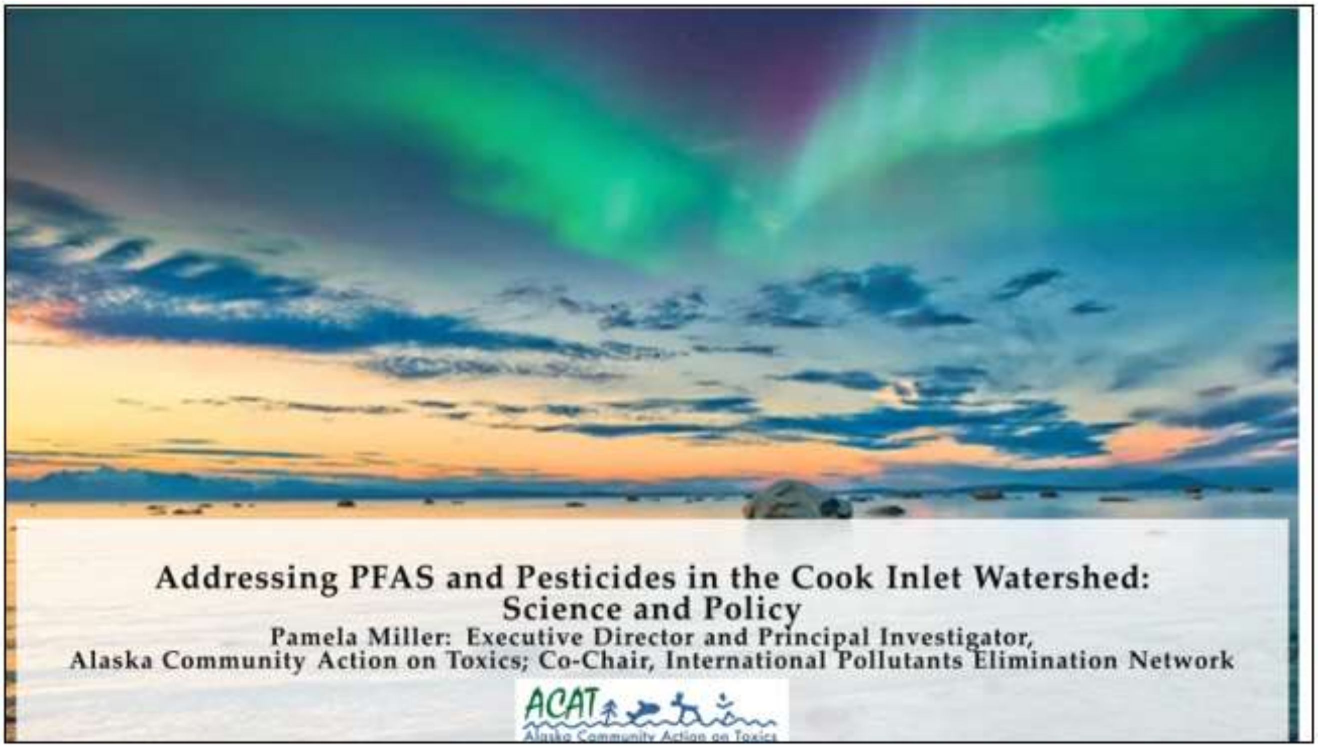
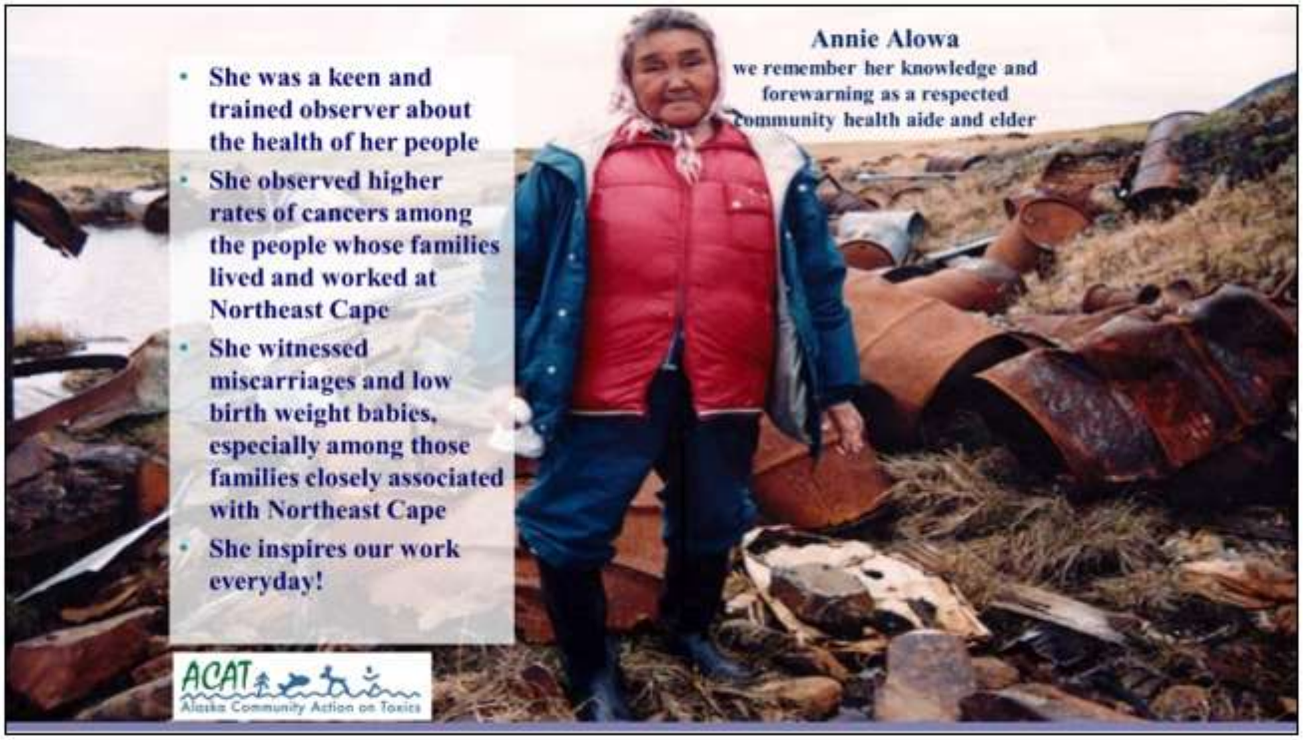
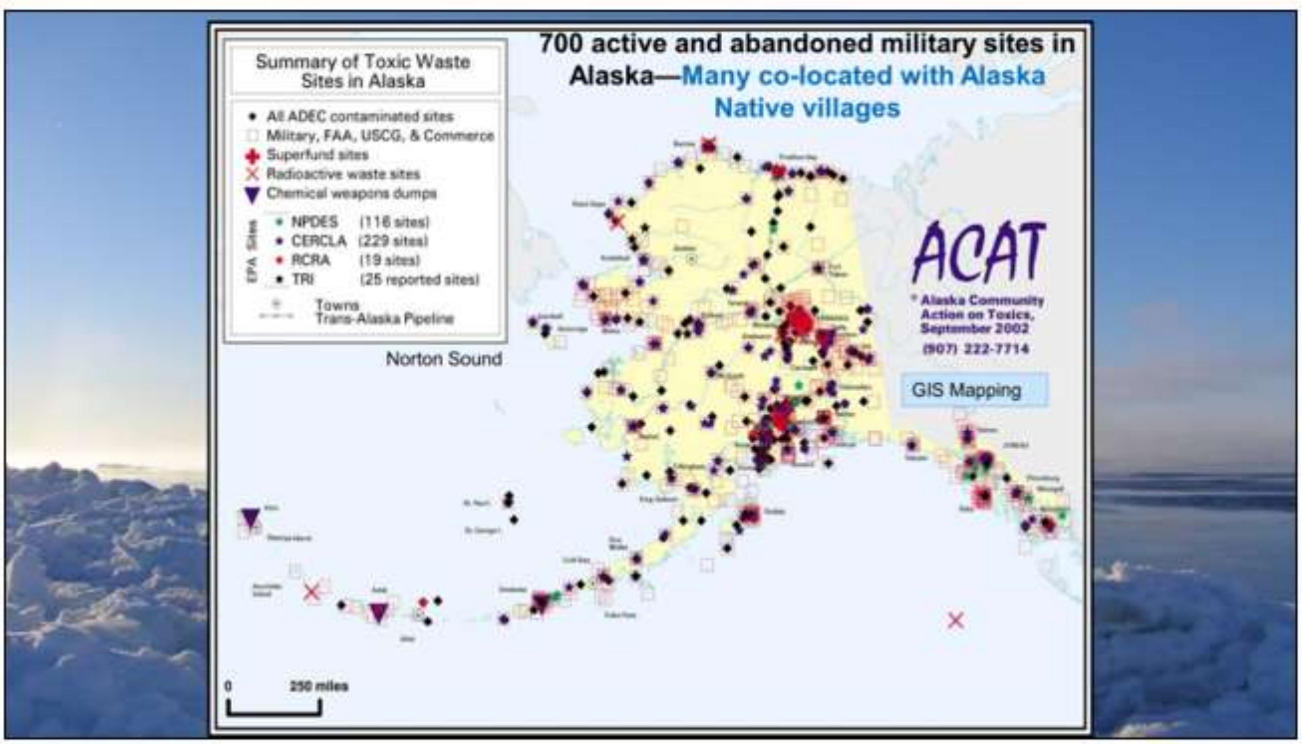

Addressing PFAS and Pesticides in the Cook Inlet Watershed:
Science and Policy
Pamela Miller: Executive Director and Principal Investigator,
Alaska Community Action on Toxics; Co-Chair, International Pollutants Elimination Network
ACAT
Alaska Community Action on Toxics


ACAT
Alaska Community Action on Toxics
Alaska Community Action on Toxics (ACAT):
Mission: We believe everyone has the right to clean air, clean water, and toxic-free food. Driven by a core belief in environmental justice, ACAT empowers communities to eliminate exposure to toxics through collaborative research, shared science, education, organizing, and advocacy. We are committed to protecting the health of future generations.
Our methods include:
Community-based and participatory scientific research
Public education and training
Community organizing and advocacy
Achieving policy change at the local to international levels



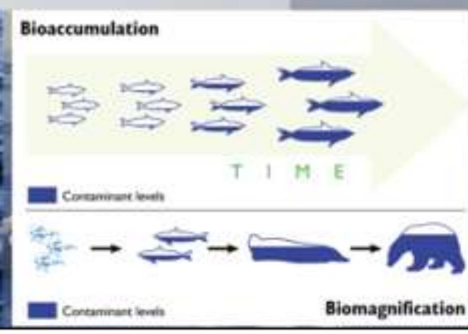
Annie Alowa
we remember her knowledge and forewarning as a respected community health aide and elder
- She was a keen and trained observer about the health of her people
- She observed higher rates of cancers among the people whose families lived and worked at Northeast Cape
- She witnessed miscarriages and low birth weight babies, especially among those families closely associated with Northeast Cape
- She inspires our work everyday!
ACAT
Alaska Community Action on Toxics



700 active and abandoned military sites in Alaska—Many co-located with Alaska Native villages
Summary of Toxic Waste Sites in Alaska
All ADEC contaminated sites
Military, FAA, USCG, & Commerce
Superfund sites
Radioactive waste sites
Chemical weapons dumps
EPA Sites
NPDES (116 sites)
CERCLA (229 sites)
RCRA (19 sites)
TRI (25 reported sites)
Towns
Trans-Alaska Pipeline
Norton Sound
ACAT
* Alaska Community Action on Toxics, September 2002
(907) 222-7714
GIS Mapping
0
250 miles

Global Transport of Persistent Chemicals and Climate Crisis in the North/Arctic

- The north is a hemispheric sink for persistent industrial chemicals and plastics
- Indigenous Peoples in the Circumpolar North face disproportionate exposures to toxic chemicals, and children are at highest risk
- Arctic Indigenous Peoples who rely on a traditional diet are particularly vulnerable to exposure and have levels of persistent contaminants in blood and breast milk that are among the highest of any population on Earth
- The mobilization and transport of contaminants into and within the Arctic is exacerbated by climate warming.
- The Arctic is warming four times as fast as the rest of the world. Melting of Arctic ice, glaciers, and permafrost is releasing sequestered chemicals and microplastics into our environment and food web.



Indigenous Peoples' knowledge is at the foundation of our community-based research—and a call to action

"We are overwhelmed with concern about the health harms associated with climate change, the loss of sea ice and melting permafrost and the mobilization of chemicals and plastics — these are all interconnected. We are running out of time!" *– Delbert Pungowiyi, Native Village of Savoonga*

"We have always been a vigilant people. Our community-based research enables us to be vigilant at the molecular level." *– Merle Apassingok, Native Village of Gambell*

"We don't just eat one chemical. We eat the whole fish." *– Violet Yeaton, Native Village of Port Graham*

ACAT Alaska Community Action on Toxics

What are PFAS?
Per- and poly-fluoroalkyl substances
also known as highly fluorinated chemicals

What makes this class of chemicals unique?

- Persistence

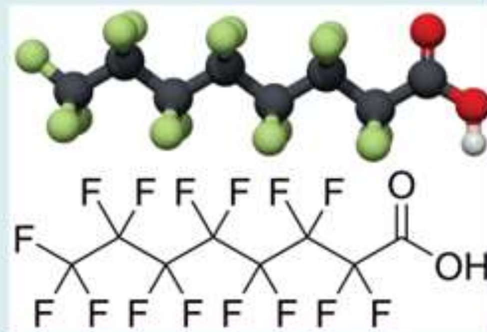
"Forever chemicals"

- Complexity

More than **12,000** substances

- Versatility

Used in many products



Perfluorooctanoic acid (PFOA) or C8

Definitions
Per- and Poly-Fluorinated Chemicals

- Per = fully fluorinated

PFOA and PFOS

perfluorooctanesulfonic acid

- Poly = partly fluorinated (8:2 FtS Fluorotelomer sulfonate)

Widely used in products

- Fire fighting foam
- Carpets, upholstery
- Waterproof fabrics
- Waxes (floor, skis)
- Non-stick cookware
- Paints and coatings
- Food packaging
- Personal care products
- Dental floss
- Electronics—semiconductors
- Metal plating

Sources of Drinking Water Contamination

- AFFF (aqueous film-forming foam) for fuel fires
- Production facilities
- Waste disposal sites
- Wastewater
- Other industries


EPA

News Releases

News Releases from Region 02

EPA Adds Saint-Gobain Performance Plastics Site in Hoosick Falls, N.Y. to the Federal Superfund List

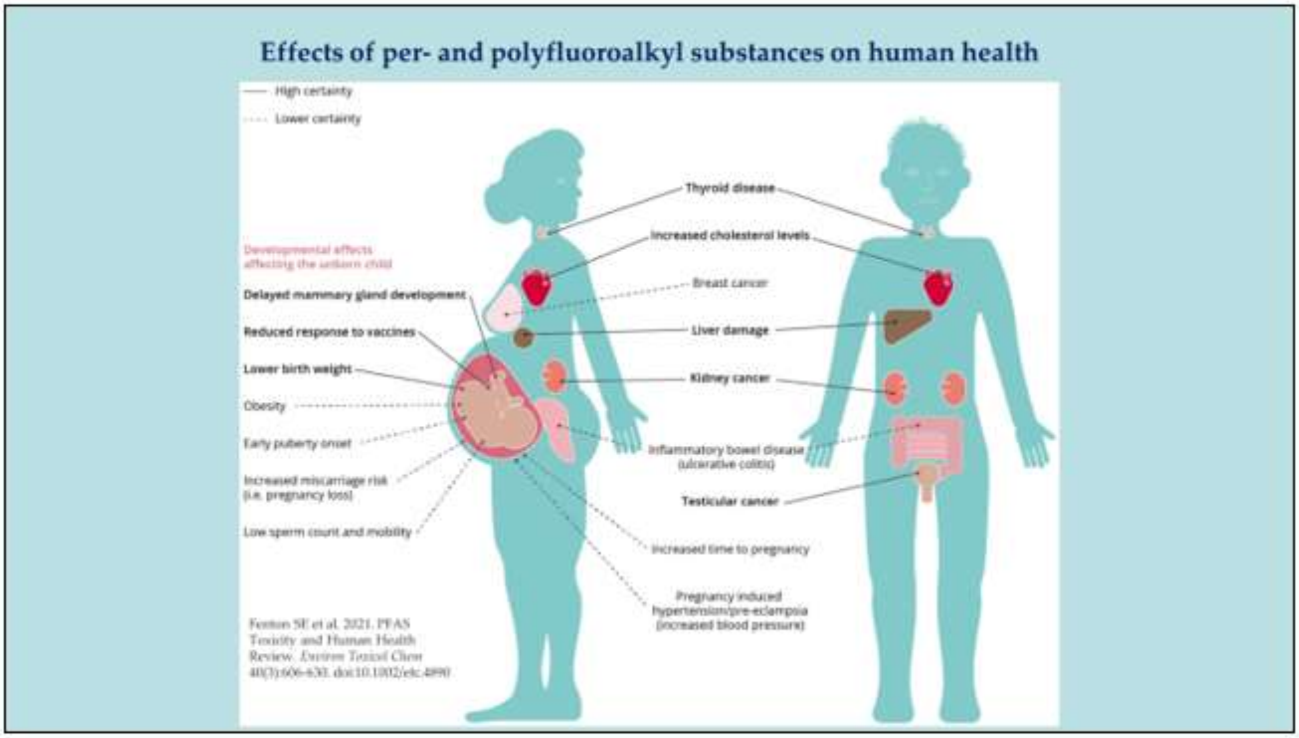
How are we exposed to PFAS?

- Contaminated drinking water
- Food
- Direct contact with products
- Household dust
- Air
- Cord blood
- Breast milk
- Infant formula

Health outcomes associated with PFAS exposure

PFAS have been linked to:

- Pregnancy-induced hypertension/ pre-eclampsia
- Liver Damage
- Increased cholesterol
- Increased risk of thyroid disease
- Increased risk of asthma
- Decreased fertility
- Decreased birth weight
- Decreased antibody response to vaccines
- **People who are exposed to PFAS may be more vulnerable to COVID-19 and its complications. PFAS can harm the immune system which has broad implications ranging from reduced ability to fight off viral infections to increasing the number of people who remain unprotected from a disease after they've received a vaccination.**

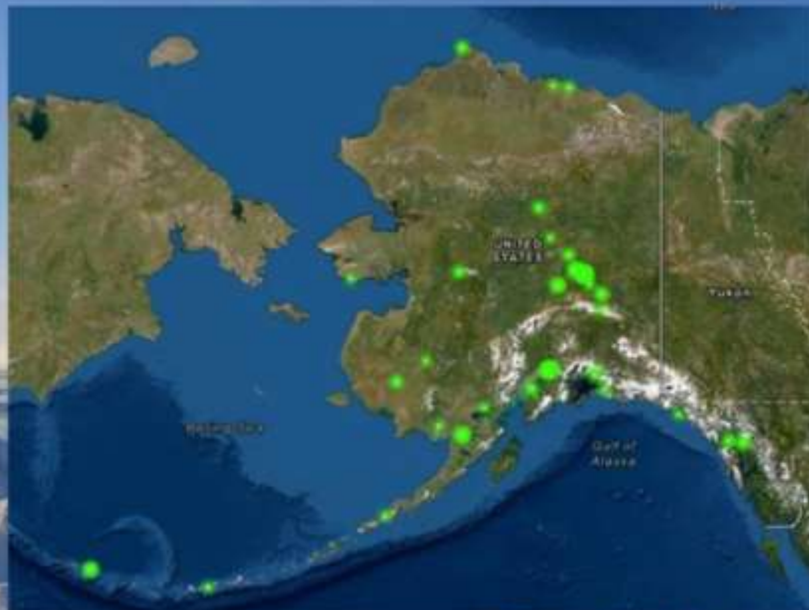


Effects of per- and polyfluoroalkyl substances on human health
High certainty
Lower certainty
Developmental effects affecting the unborn child
Delayed mammary gland development
Reduced response to vaccines
Lower birth weight
Obesity
Early puberty onset
Increased miscarriage risk (i.e. pregnancy loss)
Low sperm count and mobility
Thyroid disease
Increased cholesterol levels
Breast cancer
Liver damage
Kidney cancer
Inflammatory bowel disease (ulcerative colitis)
Testicular cancer
Increased time to pregnancy
Pregnancy induced hypertension/pre-eclampsia (increased blood pressure)
Fenton SE et al. 2021. PFAS Toxicity and Human Health Review. Environ Toxicol Chem 40(3):606-630. doi:10.1002/etc.4890

Investigative reports on PFAS in Alaska
1) https://www.akaction.org/new-investigative-report-from-alaska-community-action-on-toxics-threats-to-drinking-water-and-public-health-in-alaska/
2) https://www.akaction.org/publications/pfas/alaska-community-water-quality-report-pfas-contamination-of-municipality-of-anchorage-and-fairbanks-north-star-borough-waters/
THREATS TO DRINKING WATER AND PUBLIC HEALTH IN ALASKA
The Scope of the PFAS Problem, Consequences of Regulatory Inaction, and Recommendations
ALASKA COMMUNITY WATER QUALITY REPORT: PFAS CONTAMINATION OF MUNICIPALITY OF ANCHORAGE AND FAIRBANKS NORTH STAR BOROUGH WATERS
February 2023
ACAT

PFAS in Alaska

- In 2019, PFAS had been discovered at over 100 individual sites (mostly "AFFF source areas") in nearly 30 locations.
- Currently, there are 469 sites in Alaska where PFAS contamination has been identified in soil and water according to the ADEC.
- Communities throughout Alaska have unsafe levels of PFAS in drinking water.
- Lakes closed to fishing include: Kimberly, Bear, Moose, and Polaris Lakes; Bathing Beauty Pond, Piledriver Slough, Moose Creek.



PFAS in Anchorage Waters

Water Body Name	Average Total PFAS (ppt)	Average PFOS (ppt)	Average PFOA (ppt)	Range Min-Max Total PFAS (ppt)
Connors Lake	12.30	1.73	2.65	10.1 – 15.2
DeLong Lake	26.82	19.85	5.00	22.2 – 32.9
Jewel Lake	20.90	2.67	6.70	18.2 – 23.6
Lake Hood	626.20	154.30	67.57	583.3 – 698.7
Lake Spenard	763.30	149.93	68.58	674.7 – 952.2
Little Campbell Lake	12.35	1.47	2.70	10.5 – 13.7
Sand Lake	13.03	2.73	3.93	11.5 – 14
Ship Creek	22.6	9.14	3.3	4.3 – 32

Methods: Sample analyses were performed in the Cyclopure laboratory using LC-MS/MS. Measurements were quantified to 1-2 ppt for all PFAS compounds. The laboratory uses isotope dilution methods for the measurement of PFAS on LC-MS/MS, with validated extraction and recovery criteria for 55 PFAS analytes. The analysis of drinking water samples is validated to the requirements of EPA Methods 537 and 533.

EPA proposed maximum contaminant levels for drinking water (March 2023):

PFOA	**4 parts per trillion (ppt)**
PFOS	**4 ppt**
PFNA **PFHxS** **PFBS** **HFPO-DA (GenX chemicals)**	**Hazard index of 1.0**

PFAS in drinking water and serum of the people of a southeast Alaska community

- Published in the scientific journal *Environmental Pollution*: https://pubmed.ncbi.nlm.nih.gov/35367506/
- Collaborative research of ACAT, Gustavus PFAS Action Coalition, and Indiana University
- Key findings:
- Our study found fourteen distinct PFAS in Gustavus water samples and seventeen different PFAS in serum.
- Perfluorooctanesulfonic acid (PFOS) and perfluorohexanesulfonic acid (PFHxS) were the most abundant PFAS in both water and serum samples.
- We also found that contaminated drinking water from private wells contributes to the overall PFAS body burden in Gustavus residents.

Community-Based Research and Science to Action

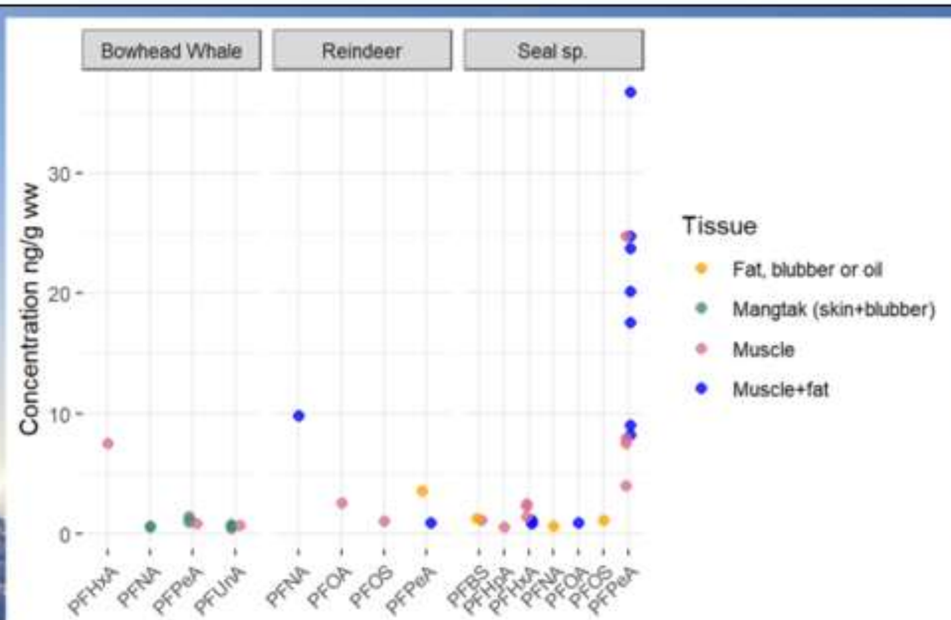
- Foundation of elder knowledge and community leadership
- Established community working group to design and implement research, community reporting, and interventions
- Training and hiring of local Yupik-speaking community health researchers
- Emphasis on community-right-to-know, capacity building, education and empowerment
- Support tribes in government-to-government consultation requirements with agencies
- Work with tribes to hold military and agencies accountable for responsible cleanup
- Foster collaborations with academic researchers
- De-colonize science – traditional and academic science mutually valued and respected
- Engage in environmental health policy change locally to internationally
- Long-standing solidarity with tribes in work to hold military and corporate polluters accountable
- Building effective partnerships with environmental justice and health groups locally to globally, health care providers, universities, tribes, agencies
- College-credited Community-based Research Institute
- Training for health care providers

Community researchers conduct field work

Traditional Food Sampling

- Sampling of harvested animals.
- Community members donate traditional food samples.

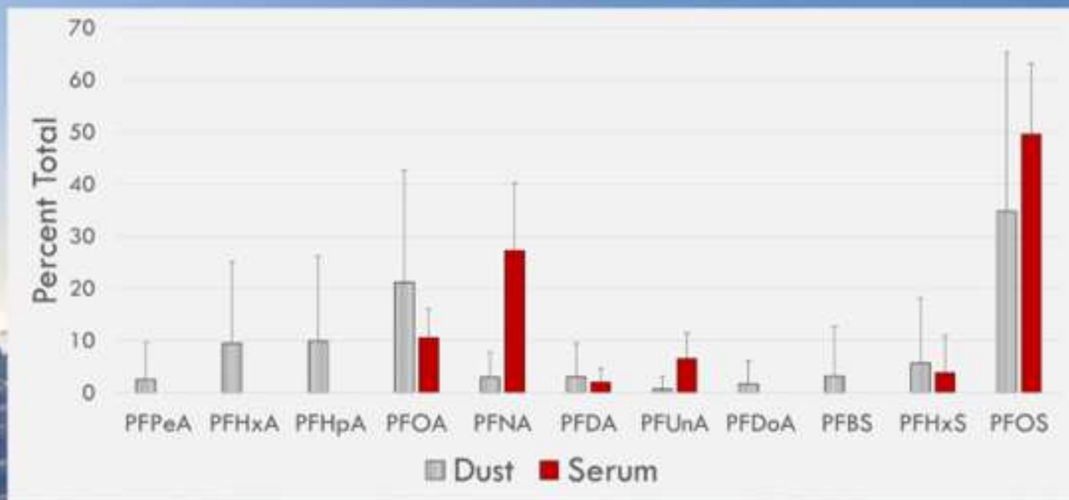
Community Researcher Morgan Apatiki



NOT DETECTED: PFBS, PFHpA, PFOA, PFDA, PFBS, PFHxS, PFOSA

Byrne et al, 2022

Relative Concentrations In Dust And Serum



Byrne et al., 2017

Protecting Future Generations: key findings concerning sentinel fish species

- Despite extensive site remediation of the former military site at NE Cape, stickleback and blackfish remain heavily contaminated with PCBs.
- PCBs are disrupting endocrine function of fish (thyroid, reproductive) and decreasing expression of genes important in repairing gene mutations.
- Vitellogenin concentrations in male stickleback indicate exposure to estrogenic contaminants (such as certain PCB congeners).
- Widespread health disruption in the fish is consistent with health problems of people on the island. Stickleback are an important sentinel species.
- Even after site remediation, contaminants from Cold War FUD sites in remote regions of the Arctic remain a potential health threat to local residents, in this case, Yupik people who had no influence over site selection and use by the United States military.
- Exceptionally high levels of PBDEs (especially BDE-47) and PFAS (especially PFOS and PFNA) in stickleback of Troutman Lake indicate local source, such as landfills.

Protecting Future Generations: Key findings concerning human exposures

- Six PBDEs were detected in 100% of the serum samples and another ten were present in 95% of the serum samples.
- Serum PBDEs are higher than those of Canadian Inuit.
- PFOS and PFNA were detected in more than 98% of the serum samples and PFOA was detected in 92% of the samples.
- Serum PFAS comparable to levels in the U.S. general population, however PFNA and PFUnDA elevated.
- We demonstrated that certain PBDE congeners and PFAS disrupt thyroid homeostasis.

Senate Bill (SB) and 121 House Bill (HB) 171

An Act relating to pollutants; relating to perfluoroalkyl and polyfluoroalkyl substances (PFAS); relating to the duties of the Department of Environmental Conservation; relating to firefighting substances; relating to thermal remediation of perfluoroalkyl and polyfluoroalkyl substance contamination; and providing for an effective date.

- **SB 171** introduced by Senator Jesse Kiehl and co-sponsored by Senators Gray-Jackson, Kawasaki, Stevens, Begich, Costello, Wielechowski
- **HB 121** introduced by Representative Sara Hannan and co-sponsored by Representatives Tuck, Drummond, and Tarr.
- Go to www.akleg.gov to follow action on legislation and sign up to testify.

- SB 171 and HB 121 (companion bills) have the following key provisions:
  - Establish health-protective drinking water standards for 7 PFAS substances.
  - Prevent the use of PFAS-based firefighting foam unless required by federal law.
  - Establish stricter requirements for thermal remediation/incineration of PFAS waste.
  - Provide for testing of water that might be affected by PFAS in the area of the water supply source.
  - Provide for safer drinking water for affected households.
  - Provide for voluntary blood serum testing of affected community members and first responders.

HB 51
Short title: PFAS Use, Disposal; Refrigerants

- "…a person may not use a firefighting substance that contains a PFAS substance in the state unless the use is permitted under (b) of this section or required by federal law…"
- Effective January 1, 2024

- Sponsors: Representatives Wright, Mears, Ruffridge, Schrage, Josephson, Galvin; Senators Kiehl, Tobin, Kawasaki, Wielechowski, Dunbar, Gray-Jackson, Olson, Bishop, Claman
- Passed the Senate 18 to 2 (nays Stedman and Wilson) on 5/15/23
- Passed the House 38 to 2 (nays Carpenter and Eastman) on 5/17/23
- Vetoed by Gov. Dunleavy on 8/26/23

Recommendations for PFAS Legislation

- Create health protective, enforceable drinking water standards to reflect current science.
- Provisions to phase out PFAS in fire-fighting foam should be modeled after laws passed in WA, CO, and CA. No exemption should be allowed for the oil and gas industry, as safe and economical alternatives are available and in use.
- No incineration of PFAS wastes should be permitted. Incineration is a false solution, does not destroy PFAS, and results in air contamination and wider exposures to communities that are already overburdened with pollution sources. NY and IL have banned incineration.
- Include provisions for comprehensive monitoring of surface and groundwaters, fish, wildlife, garden produce.
- Pass comprehensive legislation to phase out uses of PFAS including food packaging, textiles, cosmetics and other non-essential uses—model after states such as MN and ME.
- Minnesota passed a bill in May 2023, "Amara's Law," that will ban the sale of non-essential uses of PFAS-containing products from 13 categories, including menstrual products, cookware, children's goods, and firefighting foam.

The Language of the Stockholm Convention

- "Aware of the health concerns…in particular **impacts upon women and children and, through them, upon future generations."**
- "Conscious of the need for **global action**…"
- "Acknowledging that **precaution underlies the concerns of all the Parties and is embedded within this Convention…"**
- "Determined to **protect human health and the environment…"**
- "Acknowledging that the **Arctic ecosystems and Indigenous communities are particularly at risk**…"

PFAS Chemicals and the Stockholm Convention

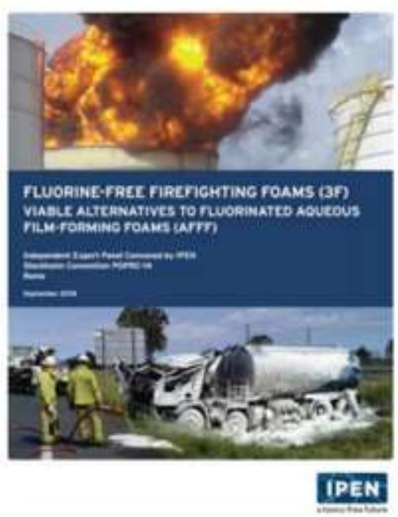
- **PFOS** listed in 2009 with exemptions and "acceptable purposes" closing of major loopholes in 2019
- **PFOA** listed for a global ban in 2019 with time-limited exemptions
  - Special restrictions on firefighting foams containing PFOA and related substances including a ban on production, no export or import except for environmentally sound disposal, no use in training, and no use in testing unless all releases are contained.
  - Warning about PFAS as a class noting that, *"fluorine-based fire-fighting foams have negative environmental, human health and socioeconomic impacts due to their persistency and mobility."*
- **PFHxS** nominated by Norway in 2017—recommended for global elimination with no exemptions; COP decision in 2022
- **Long-chain perfluorocarboxylic acids** nominated by Canada in 2021 and under evaluation by the expert committee.

"The chemicals present in our bodies are passed onto our Indigenous children and harm their ability to learn our languages, songs, stories, and knowledge."

Intervention of Vi Waghiyi, Sivuqaq Yupik Mother and Grandmother, Representing the Global Indigenous Caucus at the Stockholm Convention on Persistent Pollutants

Independent expert panel convened by IPEN

- ***"The continued use of PFAS (per- and polyfluorinated substances) foams is not only unnecessary but would continue to add to the legacy and on-going contamination that is responsible for the substantial, widespread and growing socio-economic and environmental costs being experienced globally."***



The Global PFAS Problem and Fluorine-Free Alternatives as Solutions

- 13 independent experts—chemistry, health, fire safety, engineering
- Investigates sources and dispersive uses including fire fighting foam, textiles
- Necessity of addressing PFAS as a class
- Short chain fluorinated chemicals should not be used due to their persistence, mobility, and harm to health and environment

College-Credited Community-Based Research Institute

Recommendations and Actions

- Enact comprehensive chemicals policy reform at state, national and international levels necessary to protect vulnerable populations and prevent harm
- Phase out all "non-essential" uses of PFAS
- Shift burden of proof; adopt "polluter pays" principle
- Work with communities to hold polluters accountable for prevention and clean up, including DoD
- Precautionary approach
- Train scientists in methods of community-based participatory research; cultural awareness and sensitivity
- Public health and regulatory agency officials must respect Indigenous and community-based knowledge in assessing the health of tribal communities
- Create a responsive, integrative, and inclusive health care system that incorporates traditional healing, primary prevention, diagnosis, and treatment to protect the health and well-being of present and future generations
- Observe the Jemez Principles and Louisville Charter

Thank you!

Alaska Collaborative on Health and the Environment monthly webinars

https://www.akaction.org/media/webinars/


House bill would regulate so-called 'forever chemicals'

pamela@akaction.org
www.ipen.org
www.akaction.org

ACAT
Alaska Community Action on Toxics

Published papers

- Carpenter, David O. Anthony P. DeCaprio, David O. Hehir, Farooq Akhtar, Glenn Johnson, Ronald J. Scrudato, Lucy Apatiki, Jane Kava, Jesse Gologergen, Pamela K. Miller, Lorraine Eckstein. 2005. Polychlorinated biphenyls in serum of the Siberian Yupik People from St. Lawrence Island, Alaska. *International Journal of Circumpolar Health* 64 (4):322-335.
- Welfinger-Smith, Gretchen. Judith L. Minholz, Sam Byrne, Vi Waghiyi, Jesse Gologergen, Jane Kava, Morgan Apatiki, Eddie Ungott, Pamela K. Miller, John G. Arnason, David O. Carpenter. 2011. Organochlorine and metal contaminants in traditional foods from St. Lawrence Island, Alaska. *Journal of Toxicology and Environmental Health*. 74:1195-1214
- Hoover, Elizabeth. Katsi Cook, Ron Plain, Kathy Sanchez, Vi Waghiyi, Pamela Miller, Renee Dufault, Caitlin Sislin, David O. Carpenter. Indigenous Peoples of North America: environmental exposures and reproductive justice. 2012. *Environmental Health Perspectives 120(12):1645-1649.*
- Scrudato, Ronald J. J.R. Chiarenzelli, P.K. Miller, C.R. Alexander, J. Arnason, K. Zamzow, K. Zweifel, J. Kava, V. Waghiyi, D.O. Carpenter. 2012. Contaminants at Arctic formerly used defense sites. *Journal of Local and Global Health Sciences*. 2012:2-12.
- Miller, Pamela K. Viola Waghiyi, Gretchen Welfinger-Smith, Samuel Carter Byrne, Jane Kava, Jesse Gologergen, Lorraine Eckstein, Ronald Scrudato, Jeff Chiarenzelli, David O. Carpenter, Samarys Seguinot-Medina. 2013. Community-based participatory research projects and policy engagement to Protect Environmental Health on St. Lawrence Island, Alaska. *International Journal of Circumpolar Health; Circumpolar Health Supplement* 72: 21656 (pp 1-11).
- Byrne, Samuel. Pamela Miller, Viola Waghiyi, C. Loren Buck, Frank A. von Hippel, David O. Carpenter. 2015. Persistent organochlorine pesticide exposure related to a formerly used defense site on St. Lawrence Island, Alaska: data from sentinel fish and human sera. *Journal of Toxicology and Environmental Health* 78 A (15): 976-992.
- Byrne, S. S Seguinot-Medina, P Miller, V Waghiyi, FA von Hippel, CL Buck, DO Carpenter. 2017. Exposure to polybrominated diphenyl ethers and perfluoroalkyl substances in a remote population of Alaska Natives. *Environmental Pollution* 231(Pt 1): 387-395.
- Byrne, SC, PK Miller, S Seguinot-Medina, V. Waghiyi, CL Buck, FA von Hippel, DO Carpenter. 2017. Associations between serum polybrominated diphenyl ethers and thyroid hormones in a remote Alaska Native population. *Environmental Pollution* 231: 387-305.

Published Papers (continued)

- von Hippel FA, PK Miller, DO Carpenter, D Dillon, L Smayda, I Katsiadaki, T Titus, P Batzel, JH Postlethwait, CL Buck. 2018. Endocrine disruption and differential gene expression in sentinel fish on St. Lawrence Island, Alaska: health implications for indigenous residents. *Environmental Pollution* 234:279-287.
- Byrne, S et al. 2018 Exposure to perfluoroalkyl substances and associations with serum thyroid hormones in a remote population of Alaska natives. *Scientific Reports* 8:2198-2207.
- Guomao Zheng, Pamela Miller, Frank von Hippel, C. Loren Buck, David O. Carpenter, Amina Salamova. 2020. Legacy and emerging semi-volatile organic compounds in sentinel fish from an Arctic formerly used defense site in Alaska. *Environmental Pollution* 259: 113872.
- Byrne, Samuel, Samarys Seguinot-Medina, Vi Waghiyi, Erika Apatiki, Tiffany Immingan, Pamela Miller, C. Loren Buck, Frank A. von Hippel, David O. Carpenter. 2022. PFAS in traditional foods of the Yupik people of Sivuqaq. *Environmental Science and Pollution Research* 29 (51):1-12.
- Renee Jordan-Ward, Frank A. von Hippel, Guomao Zheng, Amina Salamova, Danielle Dillon, Jesse Gologergen, Tiffany Immingan, Elliott Dominguez, Pamela Miller, David Carpenter, John H. Postlethwait, Samuel Byrne and C. Loren Buck. 2022. Elevated mercury and PCB concentrations in Dolly Varden (*Salvelinus malma*) collected near a formerly used defense site on Sivuqaq, Alaska. *Science of the Total Environment* 826:154067.
- Miller, Pamela. 2023. Protecting the health of future generations in the Arctic through community-based participatory research and action. *Explore* 19(2):271-272.
- Ian L Moran, Lane Tidwell, Michael Barton, Molly Kile, Pamela Miller, Diana Rohlman, Samarys Seguinot-Medina, Bobby Ungwiluk, Vi Waghiyi, Kim Anderson. 2023. Diffusive fluxes of persistent organic pollutants between Arctic atmosphere, surface waters and sediments. *Science of the Total Environment* 892:164566.

ACAT Alaska Community Action on Toxics

Papers available here: https://www.akaction.org/media/publications/

Session 1: Status of Cook Inlet Waters

10:30	*West Cook Inlet Stream Temperatures in the Tyonek Tribal Conservation District* - Jillian Jablonski, Tyonek Tribal Conservation District
10:50	*Addressing PFAS and Pesticides in the Cook Inlet Watershed: Science and Policy* - Pamela Miller, Alaska Community Action on Toxics
11:10	***The Municipality of Anchorage's Waterways and Cook Inlet* - Cherie Northon, Anchorage Waterways Council**
11:30	*Alaska's Kenai River Water Quality Monitoring Project: 23 Years of Community Supported Research* - Benjamin Meyer, Kenai Watershed Forum
11:50	Lunch Break (on your own)
12:50	*The Kachemak Bay Watershed Collaborative* - Hal Shepherd, Water Quality Consulting, LLC
1:10	*U.S. Geological Survey Water Quality Data for Cook Inlet, Alaska* - Jeff Conaway, U.S. Geological Survey
1:30	Q&A with Session 1 Speakers

The Municipality's Waterways, Cook Inlet, and Anchorage Waterways Council

Cherie Northon, Ph.D., Executive Director
Anchorage Waterways Council
October 24, 2023

Anchorage Waterways Council (AWC)

- In the early '80s, alarm for the health of local citizens was raised by Dr. Rodman Wilson, public health director under then-mayor Tony Knowles.
- He reported that local creeks and lakes were contaminated with raw sewage and other waste that ran through town and into Cook Inlet.
- A group of concerned individuals came together, and the Anchorage Waterways Council, a 501 (c)(3), was born in 1984 as a response to the worsening conditions.
- ***Mission:*** *To promote the prevention of further environmental degradation; and the protection, restoration, and enhancement of waterways, wetlands, and associated uplands within the Municipality of Anchorage.*

1968

2007

Campbell Creek Classic Race
was also a victim and was ended in 1985.

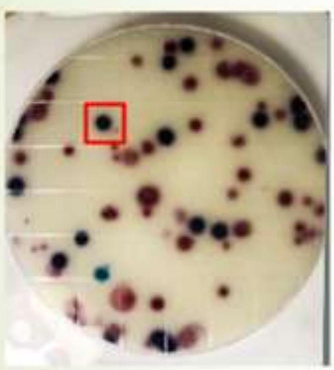
Who manages the health of our waterways?

- Environmental Protection Agency (EPA)
- Alaska Department of Environmental Conservation (DEC)
- DEC oversees the **Alaska Water Quality Standards** which provide a framework for categorizing waterways in regard to 24 parameters for fresh and saltwater.
  - Standards include: **bacteria, dissolved oxygen, petroleum hydrocarbons, pH, turbidity, radioactivity, temperature, etc.**
- Waters that do not meet these standards are placed on **Alaska's Impaired Waters List**, which is difficult to be removed from.
- Every major creek and lake/lagoon in the Anchorage **"Bowl"** has been classified as impaired due to the presence of **Fecal Coliform**.

Fecal Coliform

- Fecal coliform (FC) are organisms that are present in the **environment**, live in the **gut** of warm-blooded animals (includes humans) and are found in their **feces**.
- FC does not necessarily cause illness, but its presence in a water sample **indicates** that disease-causing organisms (pathogens) could be in the water sample.
- Major sources of FC contamination:
  - Humans
  - Pet waste left on the ground, e.g. dog parks, backyards, trails
  - Wildlife where large groups congregate, e.g. geese and ducks at Cuddy Pond
  - Failing septic systems
  - Livestock

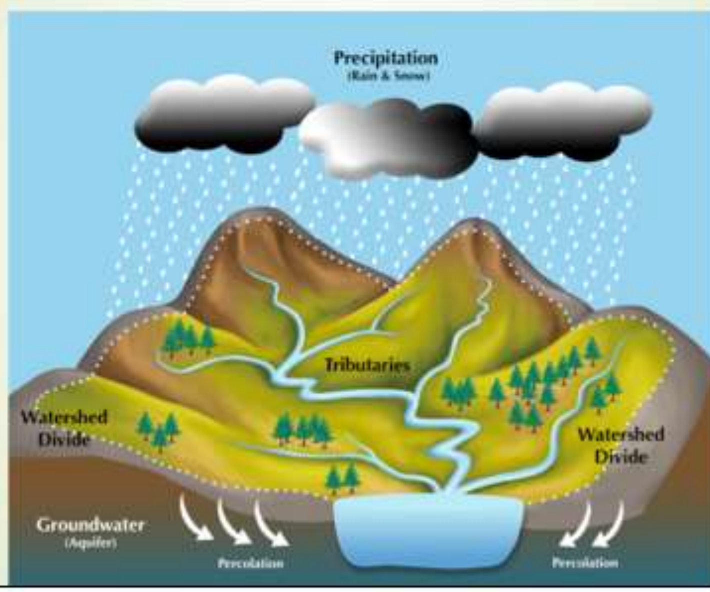
5 ml sample from the outfall
at Westchester Lagoon
Feb. 26, 2023
Blue/purple colonies are *E. coli*



~20 FCU = **400 FCU/100 ml**
Standard for drinking water is 20 FCU/100 ml
Primary contact recreation is 126 FCU/100 ml
Secondary contact recreation is 200 FCU/100 ml

Westchester Lagoon monitoring site

How does fecal contamination make its way to local waterways?




HOUSEHOLD WASTEWATER
DITCH
SANITARY SEWER
STORM DRAIN
CATCH BASIN
TREATMENT PLANT
WATERWAY

Who manages the health of our waterways on the Municipal level?

- Alaska Department of Environmental Conservation (DEC)
- Municipality of Anchorage Watershed Management Services (WMS)
  - Tasked with keeping the Municipality in compliance with its MS4* Permit
    - Obtain an Alaska Pollutant Discharge Elimination System (APDES) permit.
    - Develop a stormwater management program that is designed to prevent harmful pollutants from being washed by stormwater runoff into local waterbodies.
    - Stay in compliance with the permit.

    - *Municipal Separate Storm Sewer System

Anchorage Waterways Council's role

- Municipality of Anchorage Watershed Management Services (WMS) contracts with AWC
- Tasked with public outreach and education on stormwater since 2010
- AWC has developed stormwater education programs on:
  - Scoop the Poop!
  - Yard care and chemicals
  - Ice melt additives information
  - Vehicle maintenance, such as washing, repairs
  - Green Infrastructure (GI), such as rain gardens

https://youtu.be/6QR7w9zpy8k

Other AWC Programs:

- **Citizens' Environmental Monitoring Program (CEMP):** an unfunded volunteer water quality monitoring program begun in 1998
  - Samples for: FC, dissolved oxygen, turbidity, pH, temperature, and electrical conductivity
- **Annual Creek Cleanup:** initiated 39 years ago
  - Thousands have participated over the years
- **Loons, Line and Lead:**
  - placing monofilament recycling bins at 28 locations in Anchorage and on JBER
  - educating on the toxicity of lead fishing tackle which especially affects loons
- **Creeks as Classrooms:** outdoor experiential education for Anchorage's youth
- **Plastic reduction**
- **6PPD quinone** and salmon toxicity work
- **Responding to issues**/citizen reporting form

How are things today?

Flows to Little Campbell Creek

Little Campbell Creek

Removed from Rabbit Creek


Outflow to Campbell Creek
Campbell Creek
Little Campbell Creek


Little Campbell Creek
Storm Drain to Fish Creek
Chester Creek

AWC is a small group of committed science professionals and local residents who remain dedicated to and focused on continuing the goals and vision that the original 1984 group put in motion to protect and improve Anchorage's waterways.

Thank you!

anchoragecreeks.org

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Kenai River Baseline Water Quality Monitoring

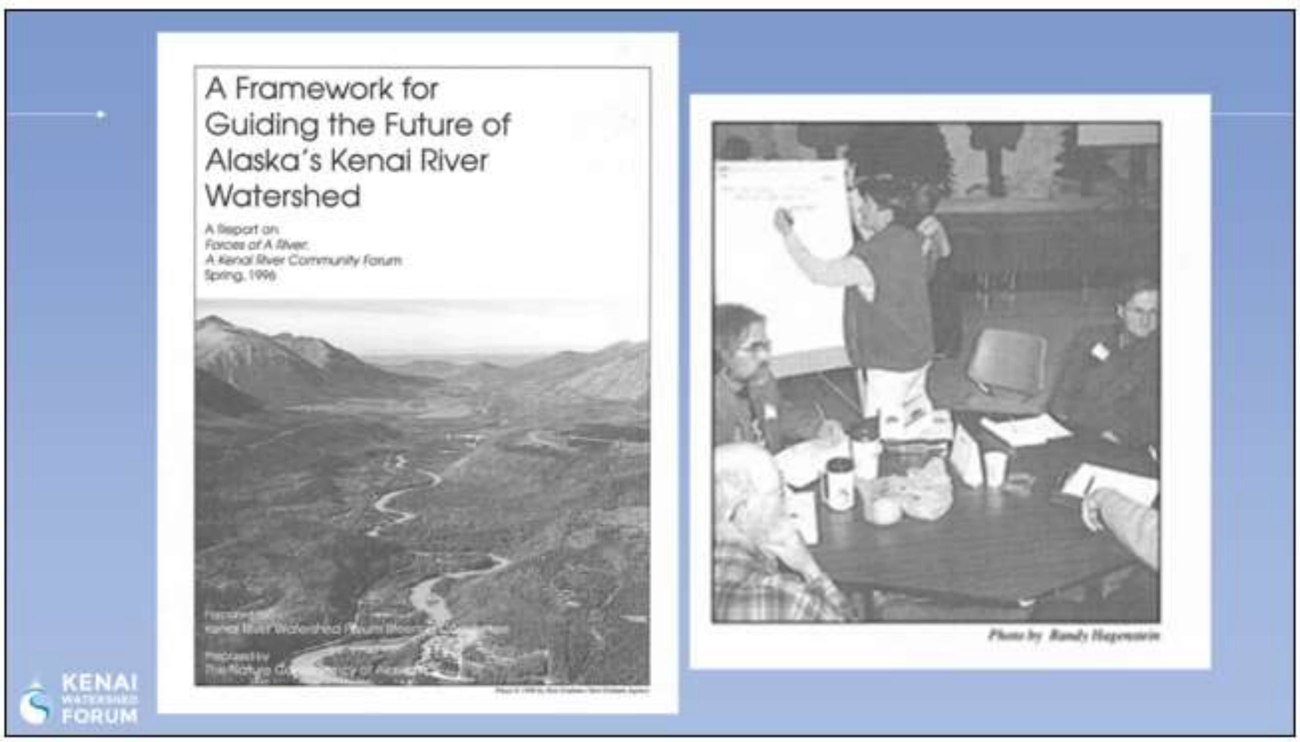
23 Years of Community Supported Research

Benjamin Meyer
Kenai Watershed Forum
October 24th, 2023
Cook Inlet Water Quality Summit

KENAI WATERSHED FORUM

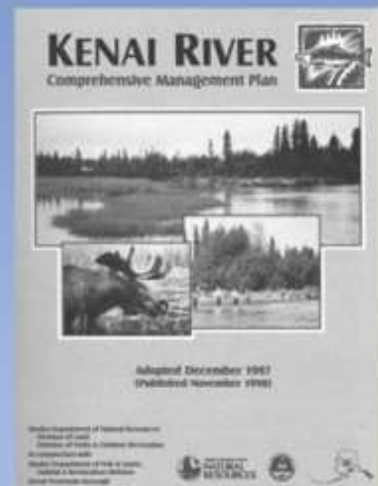
KENAI WATERSHED FORUM


Why monitor water quality?
Clean Water Act
KENAI
WATERSHED
FORUM


A Framework for
Guiding the Future of
Alaska's Kenai River
Watershed
A Report on
Forces of A River:
A Kenai River Community Forum
Spring, 1996
Photo by Randy Hagenstein
KENAI
WATERSHED
FORUM

Kenai River Comprehensive Management Plan recommendation 4.5.10.2.2:

"Water quality information should be collected on a systematic, long-term basis [...] to identify trends over a long period of time and/or to establish baseline conditions." (AKDNR 1997)



KENAI WATERSHED FORUM

Where is the Kenai River?

KENAI WATERSHED FORUM

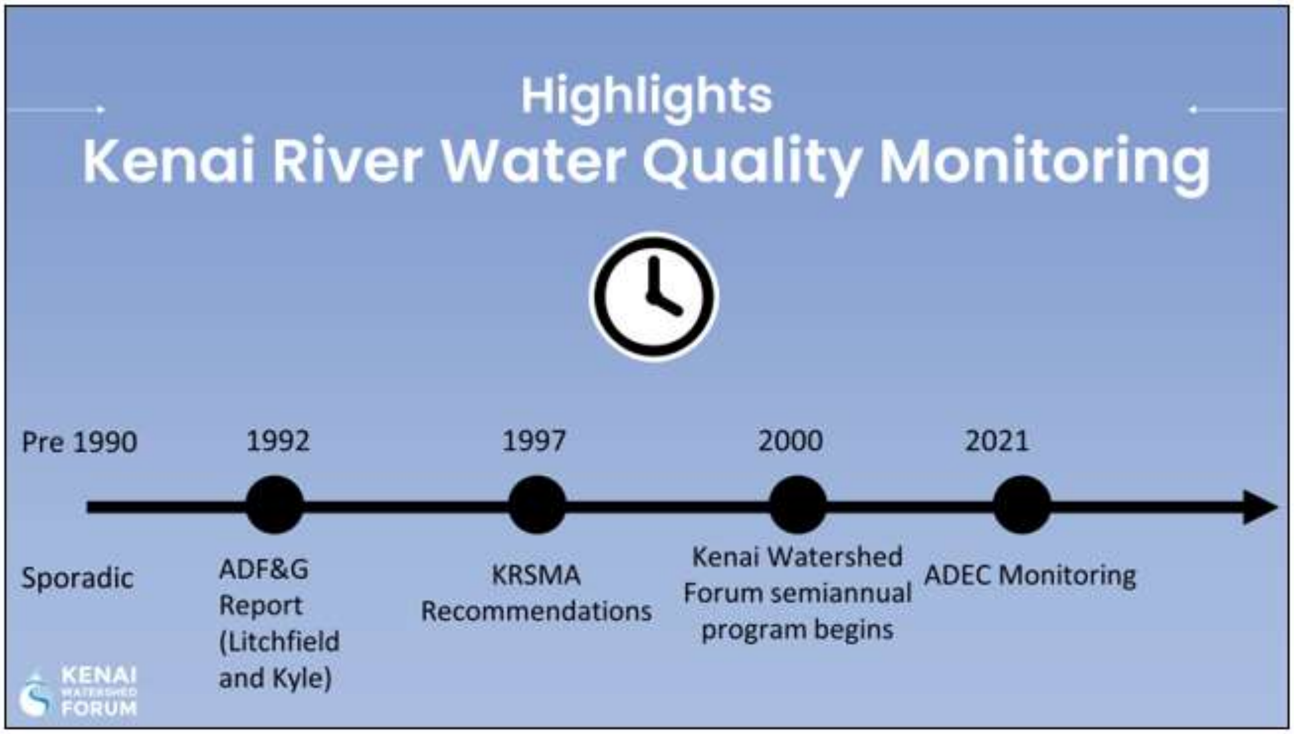
Where is the Kenai River?

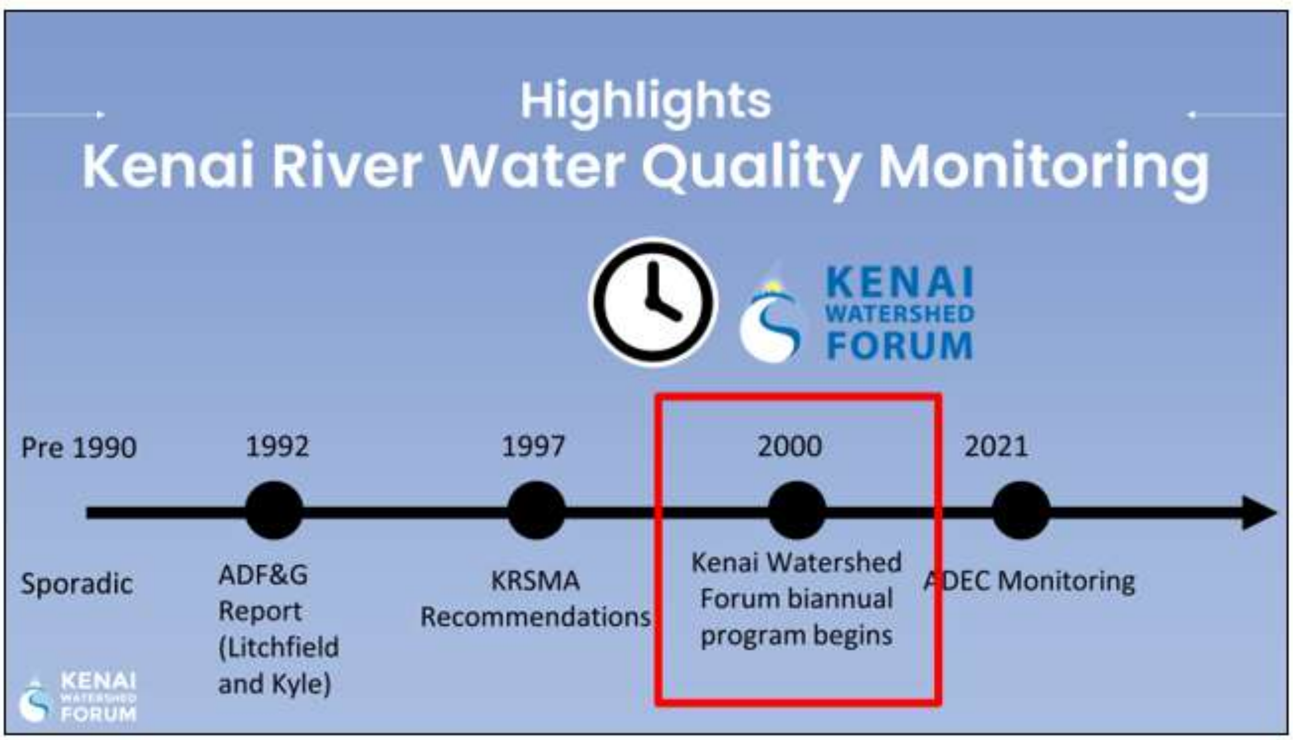
Alaska's Kenai Peninsula

Figure from https://alaskariveradventures.com

KENAI WATERSHED FORUM

Why is the Kenai River Special?


Highlights
Kenai River Water Quality Monitoring
Pre 1990
1992
1997
2000
2021
Sporadic
ADF&G Report (Litchfield and Kyle)
KRSMA Recommendations
Kenai Watershed Forum semiannual program begins
ADEC Monitoring
KENAI WATERSHED FORUM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KRSMA Recommendations
Kenai Watershed Forum biannual program begins
ADEC Monitoring
KENAI WATERSHED FORUM

2000 - Present
Kenai River Baseline Water Quality Monitoring

2 annual sample events
11 partner organizations
22 sites
23 years continuous data
39 substances analyzed
< 11,000 data points

KENAI WATERSHED FORUM

What Are We Monitoring?

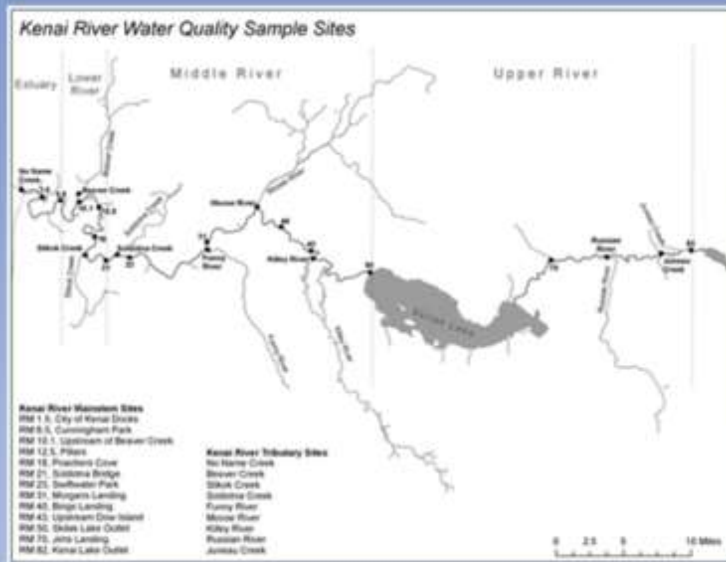
Hydrocarbons

Bacteria

Nitrogen & Phosphorus

Total Suspended Solids

Metals



Our Partners

Results & Actions

Comprehensive Data Reviews

- **2007**
- **2016**
- **2023** (in progress)

Highlights

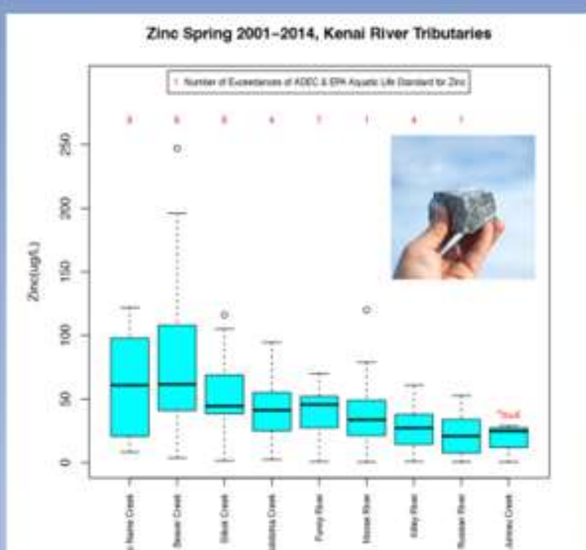
- **2008:** two-stroke motor ban & exchange program; hydrocarbon reduction
- **2016:** Copper/Zinc trends

KENAI WATERSHED FORUM


Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Alaska
Upgrading Boat Motors Reduces Hydrocarbon Pollution
Waterbody Improved

KENAI WATERSHED FORUM

Example Parameter: Zinc



- 2016 comprehensive report showed higher Zn and Cu levels in lower watershed
- AK Dept of Environmental Conservation performed follow-up sampling 2021-2022; results pending

From Guerron Orejuela 2016

Current Efforts

Fieldwork

Semi-annual monitoring; spring and summer each year

Analysis

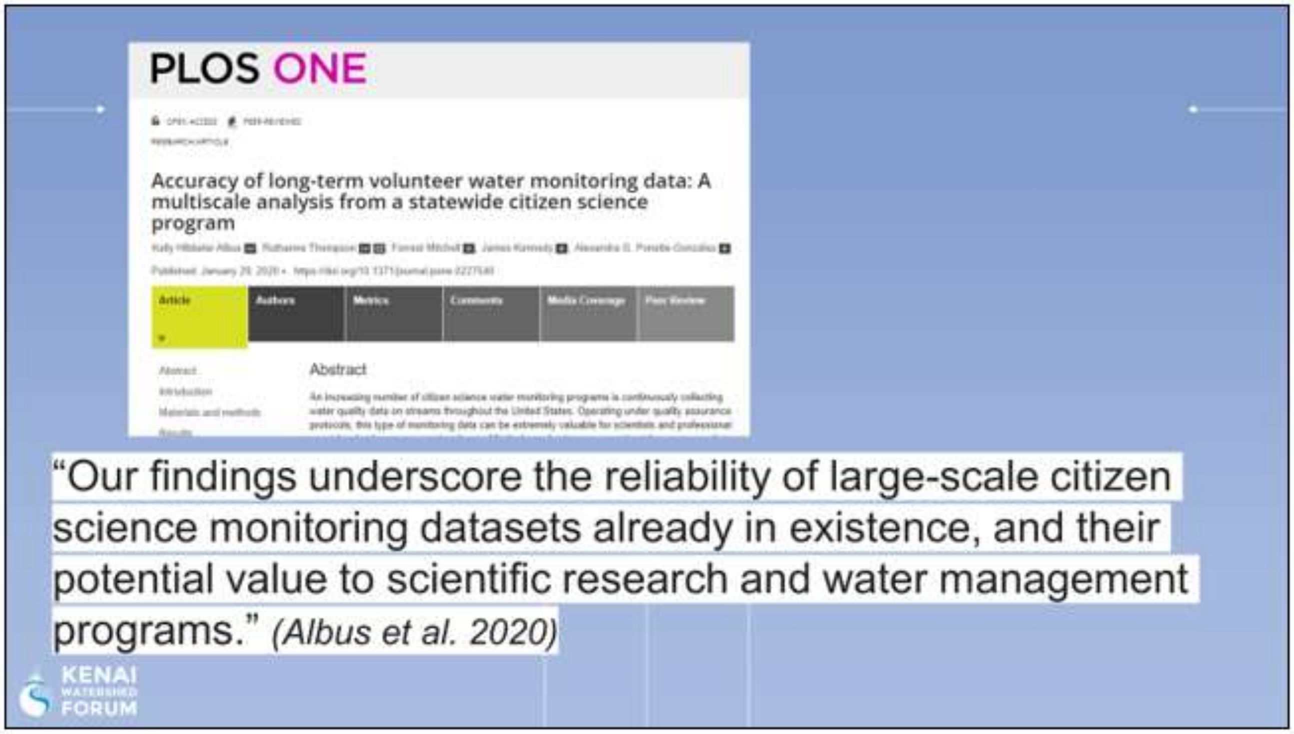
BUREAU OF RECLAMATION

Kenai River Water Quality Action Framework (2022-2024)

Project Needs

- Continue to expand/improve training (videos)
- Assess sampling needs: new/old sites and parameters
- Consistent funding source for annual data assessment and management
- Renewed Memorandum of Understanding

KENAI WATERSHED FORUM


PLOS ONE
Accuracy of long-term volunteer water monitoring data: A multiscale analysis from a statewide citizen science program
Article
Authors
Metrics
Comments
Media Coverage
Peer Review
Abstract
An increasing number of citizen science water monitoring programs is continuously collecting water quality data on streams throughout the United States. Operating under quality assurance protocols, this type of monitoring data can be extremely valuable for scientists and professional
"Our findings underscore the reliability of large-scale citizen science monitoring datasets already in existence, and their potential value to scientific research and water management programs." (Albus et al. 2020)
KENAI WATERSHED FORUM


Thank you!
ben@kenaiwatershed.org
www.kenaiwatershed.org
KENAI WATERSHED FORUM

References

Albus, K. H., R. Thompson, F. Mitchell, J. Kennedy, and A. G. Ponette-González. 2020. Accuracy of long-term volunteer water monitoring data: A multiscale analysis from a statewide citizen science program. PloS one 15(1):e0227540.

AKDNR. 1997. Kenai River Comprehensive Management Plan.

EPA. 2011. Nonpoint Source Program Success Story, Alaska: Upgrading Boat Motors Reduces Hydrocarbon Pollution. Environmental Protection Agency, EPA 841-F-11-001B.

Guerron Orejuela, E. 2016. Water Quality Assessment of the Kenai River Watershed from July 2000 to July 2014. Kenai Watershed Forum.

Loring, P. A., H. L. Harrison, and S. C. Gerlach. 2014. Local perceptions of the sustainability of Alaska's highly contested cook inlet salmon fisheries. Society & natural resources 27(2):185–199.

KENAI WATERSHED FORUM

Session 1: Status of Cook Inlet Waters

10:30	*West Cook Inlet Stream Temperatures in the Tyonek Tribal Conservation District* - Jillian Jablonski, Tyonek Tribal Conservation District
10:50	*Addressing PFAS and Pesticides in the Cook Inlet Watershed: Science and Policy* - Pamela Miller, Alaska Community Action on Toxics
11:10	*The Municipality of Anchorage's Waterways and Cook Inlet* - Cherie Northon, Anchorage Waterways Council
11:30	*Alaska's Kenai River Water Quality Monitoring Project: 23 Years of Community Supported Research* - Benjamin Meyer, Kenai Watershed Forum
11:50	Lunch Break (on your own)
12:50	***The Kachemak Bay Watershed Collaborative* - Hal Shepherd, Water Quality Consulting, LLC**
1:10	*U.S. Geological Survey Water Quality Data for Cook Inlet, Alaska* - Jeff Conaway, U.S. Geological Survey
1:30	Q&A with Session 1 Speakers

THE KACHEMAK BAY WATERSHED COLLABORATIVE

Watershed Restoration Plan
Hal Shepherd, Water Policy Consulting, LLC

Kachemak Bay Fox River Watershed Collaborative

Established In 2014 - made up of local stakeholders;

Mission: To act as a scientific and policy data and information sharing entity with the goal of informing agencies and policymakers who make decisions affecting the Bay;

Created the Kachemak Bay Fox River Watershed Climate Risk Assessment, which evaluated primarily pelagic, rocky intertidal, and estuary/wetlands habitats' vulnerability to climate change.

KBWC Risk Assessment (Cont.)

- Climate change is a potential risk to salmon in the including temperature increases, altered precipitation patterns, and ocean acidification;
- "The Blob"
  - Large mass of water that ranged from 4 to 10 degrees warmer than-normal;
  - Has contributed to altered snowpack in mountain ranges and drought throughout watersheds, along with more flash storm events, increased glacial melt, and changing water chemistry.

KBWC Risk Assessment (Cont.)

Rivers and streams located within the Fox River Watershed are largely fed by snowmelt;

Due to increasing temperatures in the region, rain is becoming more prominent than snow in the fall and winter, resulting in increased flooding among rivers and streams;

Scours stream beds used by fish and wildlife;

When a winter with little snow (and thus minimal snowmelt) is followed by an extremely hot summer, many streams containing salmon have begun to run dry or heat up during critical spawning times.

KBWC Risk Assessment (Cont.)

- In early July of 2019, stream temperatures in Southcentral Alaska exceeded eighty-one degrees, breaking all prior temperature records.
  - For spawning adult salmon or growing juvenile fish, temperatures above eighty degrees can be lethal due to heat stress and the loss of oxygen in the water.
    - "Alaska Salmon Stream Hits High Temperature During Heat Wave," *The Seattle Times*, July 21, 2019 https://www.seattletimes.com/seattle-news/northwest/alaska-salmon-stream-hits-high-temperature-during-heat-wave/.

KBWC Risk Assessment Non-Climate Stressors

Effects of climate change on salmon habitat can be exacerbated by existing non-climate stressors such as marine-source pollution, oil and gas spills, energy production, resource extraction, development, population growth, nonpoint pollution, land and recreational uses, aquaculture and water withdrawals.

KBWC Risk Assessment Non-Climate Stressors

Climate change may interact with marine-source pollution spills and temperature.

Combination of development, population growth, and increased temperature can cause low flows to occur at key times when higher flows are needed.

Pollutants including non-point sources can further stress fishery and other species sensitive to low flows and increased water Temperature .

Fragmented Management

Other considerations for the Kachemak Bay Watershed include fragmented management by oversight agencies:

- Jurisdictional lines drawn around Kachemak Bay and Fox River Critical Habitat Areas, Kachemak Bay State Parks, and Kachemak Bay State Wilderness.
- In order to protect fish and wildlife habitat and use of Planning Areas, it's time for holistic management of the entire Watershed.

Management Inclusiveness

- Lack of tribal entities in Katchamak Bay planning and management efforts.

- Watershed Collaborative includes Alaska Native tribes who have been sustainably managing Watershed resources in South Central Alaska for a millennia.

Stakeholder Consensus

- On-going projects that came out of the Kachemak Bay Watershed Collaborative relating to the water quality studies in Kachemak Bay include:
  - Homer Harbor Expansion:
    - Treatment station to reduce commercial spread of invasive species at the harbor,
    - Understand impacts of increasing tourism from port expansion.

Stakeholder Consensus (Cont.)

Wetlands & Climate Change Impacts:

- Regulations needed to maintain salmon stream connectivity to tributaries and wetlands,
- Protect habitat corridors before development and increase buffer zone in Homer area to 100',
- Identification and protection of groundwater recharge locations;
- Identification of fish passage and obstructions;
- Easements between agricultur[e] and wetlands;

Stakeholder Consensus (Cont.)

- Stormwater management;
- Municipal comprehensive planning and building codes including policy- level strategies to mitigate population growth and climate change impacts;
- Ensure drinking water N and S side of the bay through climate adaptation and mitigation;

Stakeholder Consensus (Cont.)

Planning - Coordinated database for all relevant research and documents – interactive map/data for individual land/areas to help in decision-making; and

Ensure drinking supply, climate adaptation and mitigation, address warming water concerns through climate adaptation and mitigation planning.

Amending/Updating City of Homer Comp /Water Master Plan.

Issues Not Addressed By KBWRA

ADF&G Strategic and Fish Enhancement Management Planning

Dixon Creek Amendment to Bradley Lake Hydro Plant

Tribal Land management and use

Cottonwood Eastland IPLA

Cooperative Agreement between ADF&G and ADNR

K Bay Critical Habitat management Plan revision

Legal, Policy, jurisdiction & management issues

Issues Not Addressed By RA (Cont.)

- Federal Trust Responsibility
- Co-Management, Partnerships with Federal & State agencies & other stakeholders
  - E.g. 30 x 30 Initiative; ATB4All

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USGS Alaska Science Center

The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

With the goal of providing:

- Actionable science to inform decision makers, managers, and the public

Jeff Conaway
Associate Center Director
jconaway@usgs.gov
(907)786-7041

U.S. Department of the Interior
U.S. Geological Survey

USGS Alaska Science Center

- A multidisciplinary science center of approximately 165 employees
- Locations in Anchorage, Juneau, and Fairbanks
- Research Vessel

USGS Mission Areas represented

- Ecosystems
- Energy and Minerals
- Water
- Natural Hazards
- Core Science Systems

Cook Inlet NAQWA

Total resource assessment—NAWQA assessments are long-term and interdisciplinary, and include information on water chemistry, hydrology, land use, stream habitat, and aquatic life. Assessments are not limited to a specific geographic area or water-resource problem at a specific time. Therefore, the findings describe the general health of the total water resource, as well as emerging water issues, thereby helping managers and decision makers to set priorities.

U.S. Department of the Interior
U.S. Geological Survey

Cook Inlet NAQWA

National Water Quality Assessment

In 1991, Congress established the National Water-Quality Assessment (NAWQA) Project to address where, when, why, and how the Nation's water quality has changed, or is likely to change in the future, in response to human activities and natural factors.

From 1991-2001, the **first decade**, the NAWQA Project conducted interdisciplinary assessments and established a baseline understanding of water-quality conditions in 51 of the Nation's river basins and aquifers, referred to as Study Units.

Cook Inlet NAWQA began in 1997.

-First two years retrospective
-Three years of SW, GW, and biological sampling (high intensity phase)
~~-QW monitored at select sites for an additional 6 years (low intensity phase)~~

U.S. Department of the Interior
U.S. Geological Survey

NAQWA

Influences on Water Quality from:

- Suburbanization
- Intense recreational use
- Timber harvesting and associated road building
- Mining
- Petroleum and petrochemical development
- National parks and undeveloped areas

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U.S. Geological Survey

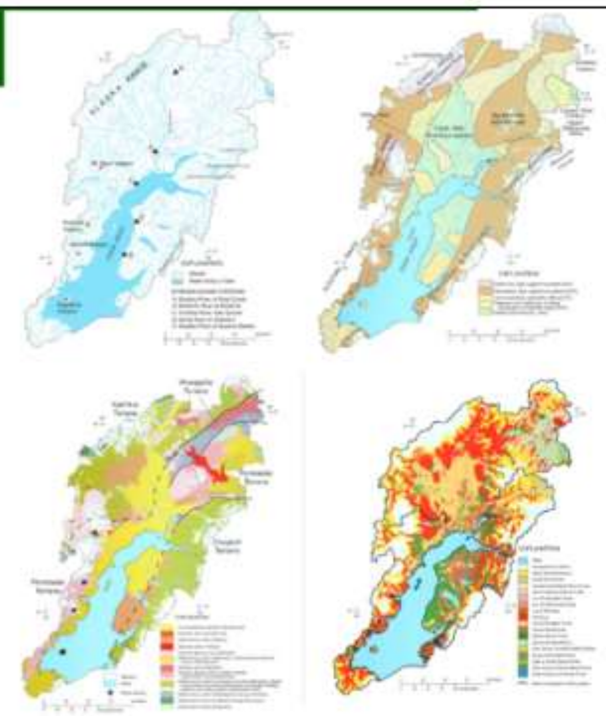
NAQWA

Retrospective

Existing data and results from previous studies are reviewed to understand the primary physical, chemical, and biological factors that affect water quality in the study unit and to identify gaps in the current data. Descriptions of how land use and land cover, soils, geology, physiography, climate, and drainage characteristics may influence water quality are to be included in technical and nontechnical reports.

Water-Quality Assessment of the Cook Inlet Basin, Alaska– Environmental Setting

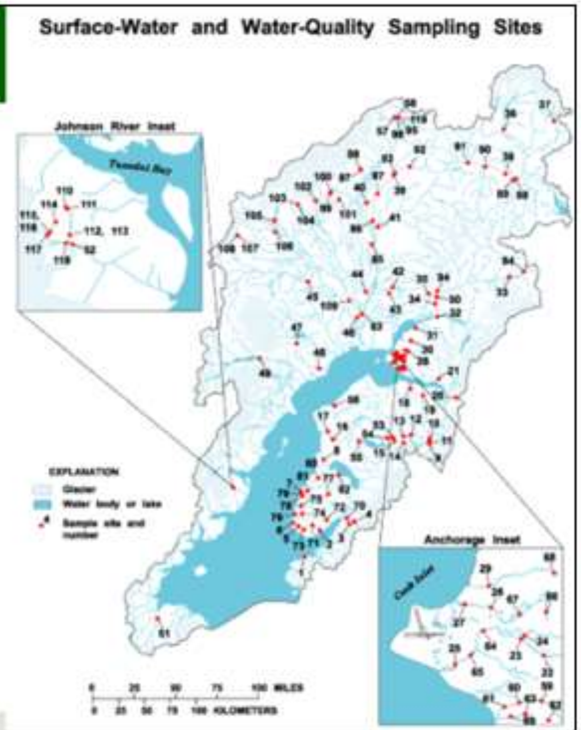
U.S. Department of the Interior
U.S. Geological Survey



Cook Inlet NAWQA

119 Sample Sites

https://alaska.usgs.gov/science/water/nawqa/sample_sites.php

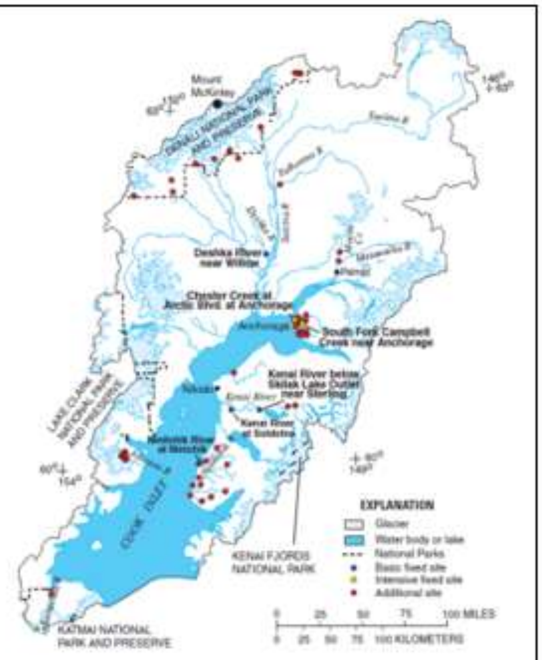


USGS

Cook Inlet NAWQA

Monthly sampling at 6 sites

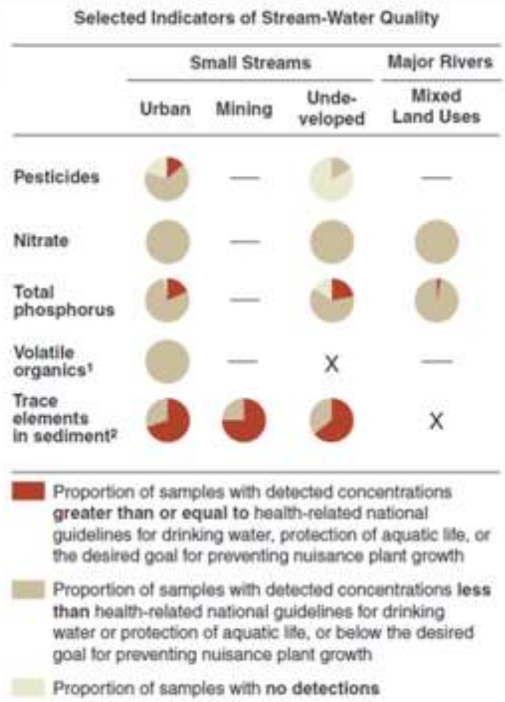
1-4 samples at 26 additional sites



In addition to monthly water-quality sampling at 6 sites, less frequent sampling (1 to 4 times during the study) at 26 other sites across the study area provided data related to specific land uses.

USGS

Surface Water

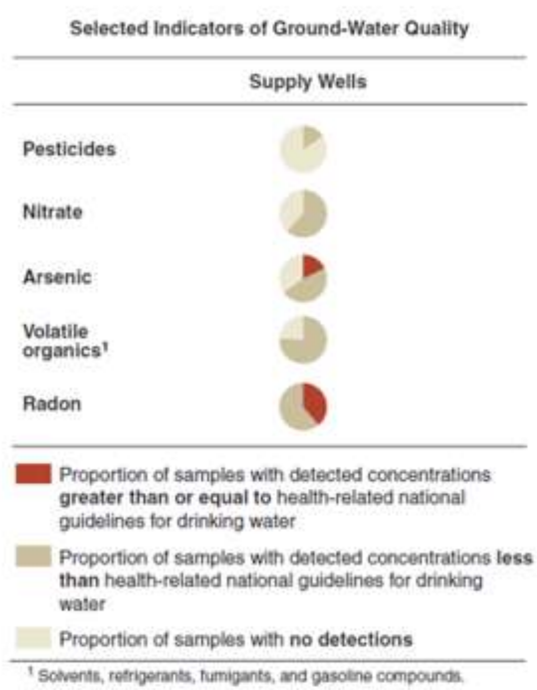


Pesticides & VOCs prevalent in Chester, below standards. Except carbaryl.

Fecal-indicator bacteria in urban streams. Chester exceeded state and federal standards

U.S. Department of the Interior
U.S. Geological Survey

Groundwater



34 Water supply wells sampled.

Concentrations meet State and Federal drinking water standards

Age dating indicates recharge within last 50 years

Arsenic exceeded the USEPA drinking-water standard in 18 percent of the wells sampled. Arsenic is a naturally occurring element in rocks throughout the basin

Radon is a naturally occurring radioactive gas that forms during the decay of uranium in rocks

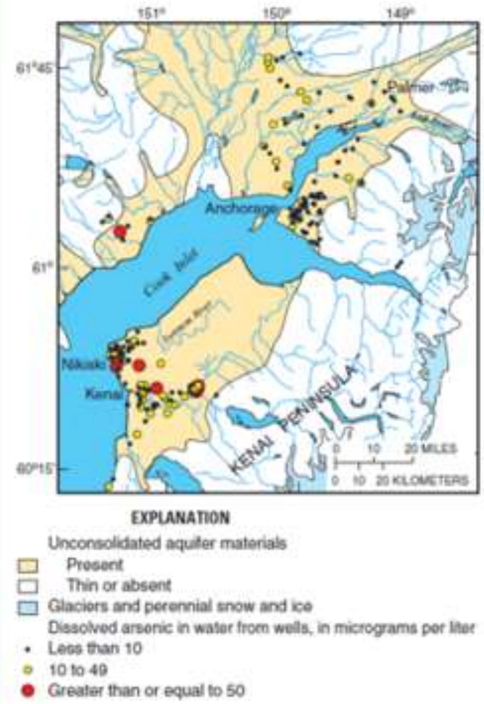
U.S. Department of the Interior
U.S. Geological Survey

Groundwater-Arsenic

109 wells sampled in the Kenai Peninsula Borough—40 percent > 10-µg/L standard

35 wells sampled in the MatSu Borough—29 percent > 10-µg/L standard

Arsenic concentrations in Cook Inlet likely from natural sources



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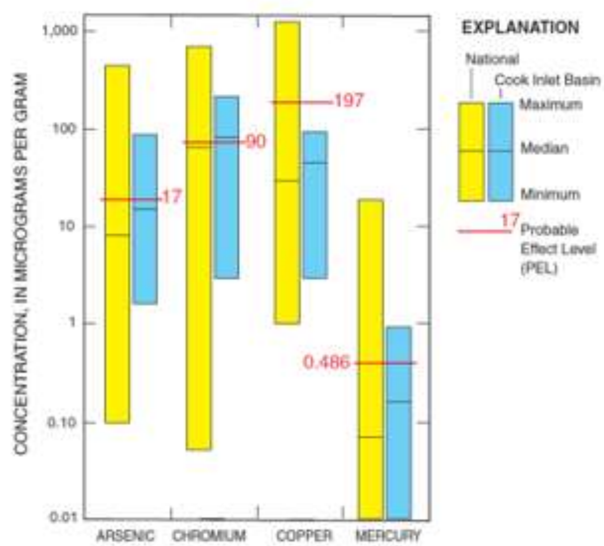
Streambed and Lakebed Sediment

Trace elements in sediments high at 23 of 47 sites

DDT and PCBs low except Westchester (2x aquatic life guidelines)

Median concentrations exceed national medians



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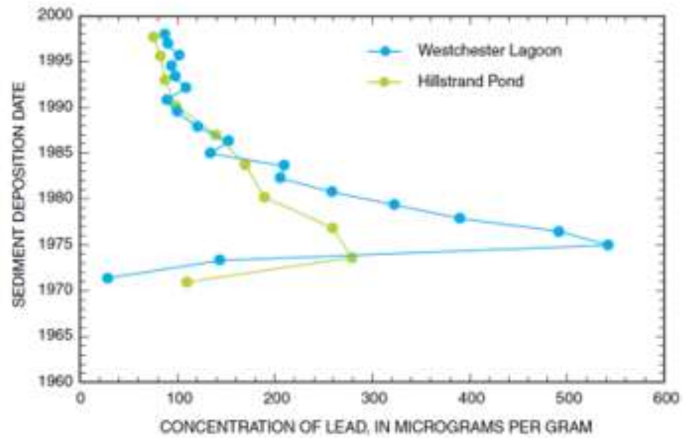
Streambed and Lakebed Sediment

Sediment cores age dated and analyzed for trace elements and organic contaminants

Decrease in lead attributed to elimination of lead in gasoline



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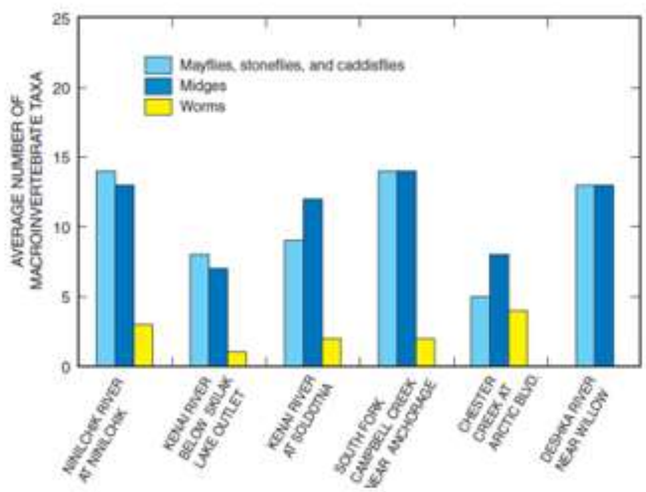
Aquatic Invertebrates

Chester Creek at Arctic Boulevard, had the fewest number of mayfly, stonefly, and caddisfly taxa and the greatest number of worm taxa, indicating degraded conditions. As much as 79 percent of the invertebrate individuals in samples from Chester Creek were worms.



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Surface Water

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Fecal-indicator bacteria in urban streams. Chester exceeded state and federal standards

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DDT and PCBs low except Westchester (2x aquatic life guidelines)

U.S. Department of the Interior
U.S. Geological Survey

Data Sources

Study component	What data were collected and why	Types of sites sampled	Number of sites	Sampling frequency and period
		Stream Chemistry and Ecology		
Basic fixed sites – General water chemistry	Measured dissolved oxygen, pH, alkalinity, specific conductance, temperature, major ions, nutrients, organic carbon, and suspended sediment to determine concentrations and seasonal variations. Continuously monitored streamflow and water temperature.	Streams draining 27 to 1,951 square miles reflecting shrub/tundra, forest, urban, and mixed land uses.	6	Monthly from April or May to November, and January and March, plus storms; October 1998–September 2001
Intensive fixed sites – Pesticides and VOCs	Analyzed samples for pesticides and volatile organic compounds to describe concentrations and seasonal variability.	Includes two of the basic fixed sites. One reference and one urban site, 29 and 27 square miles.	2	Pesticides: 1998–1999 VOCs: 1999
Synoptic sites – Forest	Determined spatial distribution of major ions, nutrients, organic carbon, and suspended sediment in forested areas.	Streams on the southern Kenai Peninsula: Fixed site. Additional sites.	1 11	Once in 2001
Synoptic sites – Urban-gradient study	Measured major ions, nutrients, organic carbon, fecal-indicator bacteria, and suspended sediment to assess the effects of urban land uses.	Streams in Anchorage draining areas ranging from 2.8 to 113 square miles: Fixed sites. Additional sites.	2 12	Three to four times; 1999–2000
Contaminants in streambed sediments	Measured concentrations, as dry weight, of trace elements, organochlorine, and semivolatile organic compounds; percent major elements; and percent organic content in recently deposited streambed sediment to assess occurrence and distribution of contaminants.	Fixed and urban-gradient sites. Additional sites (trace elements and organic carbon only). Several sites are in national parks near mines or in mineral-rich areas.	18 30	One or two samples in 1998–2000
Lakebed-sediment core study	Measured trace elements, semivolatile organic compounds, and organochlorine compounds in sediment to determine their historical occurrence in an urban watershed.	Sites in depositional zones of two ponds on Chester Creek in Anchorage.	2	Once in 1998
Contaminants in fish	Determined occurrence and distribution of trace elements, PCBs, SVOCs, and organochlorine pesticides in whole nonmigratory fish (slimy sculpin).	Fixed sites. Selected forest and urban gradient sites. Selected sites in Denali National Park and Preserve.	6 10 4	Once; 1998–2000
Aquatic biology	Assessed biological communities and stream habitat and quantitatively sampled fish, macro-	Fixed, forest, and urban-gradient sites.	29	One to three times; 1998–2001

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Data Sources

https://www.usgs.gov/centers/alaska-science-center/science/cook-nawqa-data-clearinghouse

Biology

1999 NAWQA Fish Data (28k) - This data is a MS Excel spreadsheet available in a .zip format. It includes fish data collected at the COOK NAWQA fixed sites, as well as data from related projects.

2000 NAWQA Fish Data (157k) - This data is a MS Excel spreadsheet available in a .zip format. It includes fish data collected at the COOK NAWQA Urban Gradient Study sites, as well as data from related projects.

1999 NAWQA Invertebrate Data (90k) - MS Excel spreadsheet of all invertebrate data collected in the Cook Inlet Basin in 1999, in a .zip format.

2000 NAWQA Invertebrate Data (190K) - MS Excel spreadsheet of all invertebrate data collected in the Cook Inlet Basin in 1999, in a .zip format.

Water Chemistry

1999 NAWQA Urban Gradient Nutrient Data - This data is a MS Excel spreadsheet available in a .zip (6k) format. It includes the nutrient data collected at 14 Anchorage urban gradient study sites in 1999. It is also available in .pdf (6k) format.

1999 NAWQA Urban Gradient Major Ion Data - This data is a MS Excel spreadsheet available in a .zip (8k) format. It includes the major ion data collected at 14 Anchorage urban gradient study sites in 1999. It is also available in .pdf (8k) format.

Water Temperature

2000 NAWQA Water Temperature Data (1.6M) - MS Excel spreadsheet of water temperatures collected during the 2000 water year for selected Anchorage COOK NAWQA Urban Gradient Study sites in a .zip format.

2001 NAWQA Water Temperature Data (3.2M) - MS Excel spreadsheet of water temperatures collected during the 2001 water year for selected Anchorage COOK NAWQA Urban Gradient Study sites in a .zip format.

Bed Sediment

1999 Trace Elements in Bed Sediment Data (5k) - MS Excel spreadsheet containing trace element data for the 14 Anchorage **urban gradient** study sites in a .zip format.

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U.S. Geological Survey

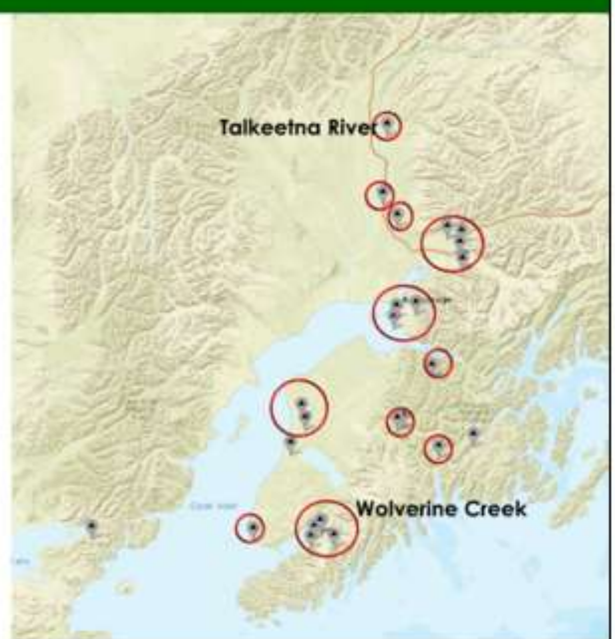
Current Data Sources

Continuous Water Temperature and QW Sampling

USGS Data Mapper

https://maps.waterdata.usgs.gov/mapper/index.html

Additional Sediment &QW Data collected for Su Hydro Studies (2011-2012)



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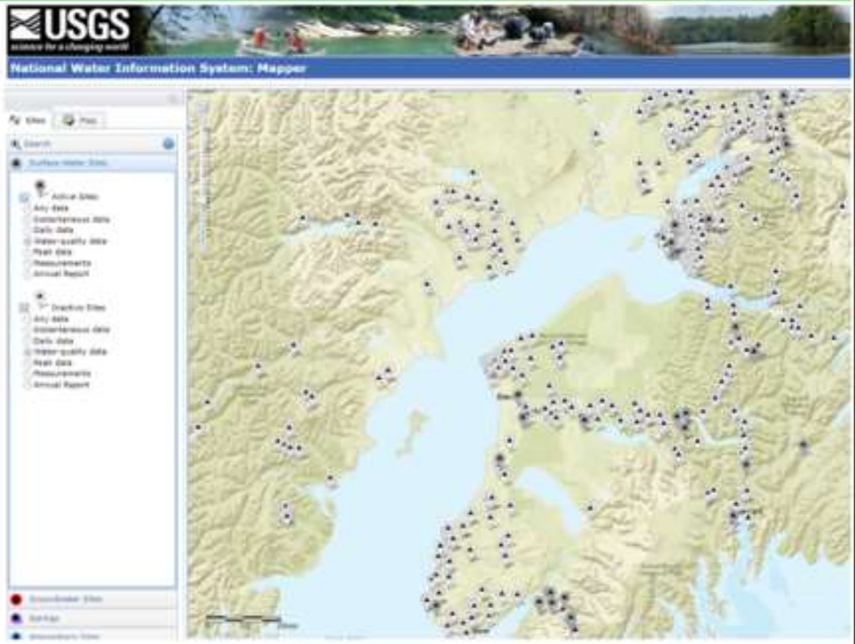
Data Sources

USGS Data Mapper

https://maps.waterdata.usgs.gov/mapper/index.html



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NAWQA Cook Inlet Basin Study Unit

COMPLETED

By Alaska Science Center August 20, 2015

Overview | **Publications**

Below are publications associated with this project.

Filter Total Items: 18

Type | Year

JUNE 1, 2004

Water quality in the Cook Inlet Basin Alaska, 1998-2001

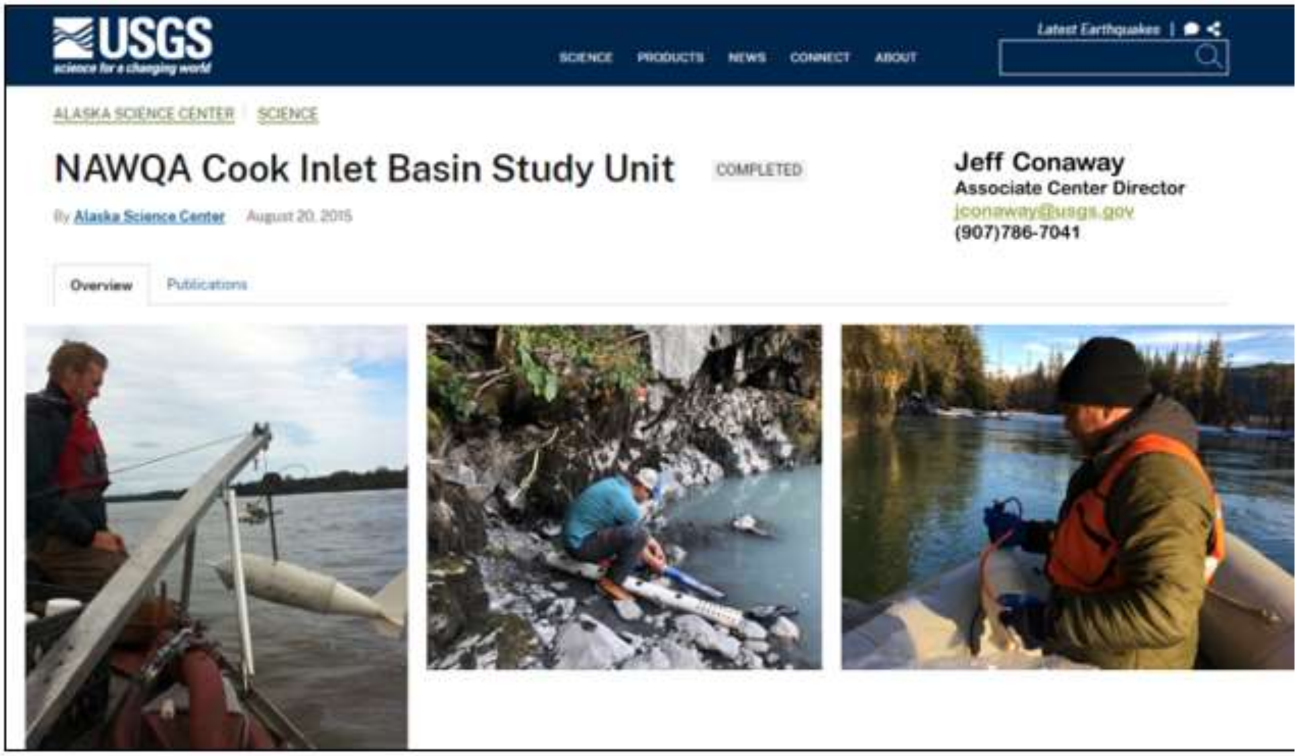
This report contains the major findings of a 1998?2001 assessment of water quality in the Cook Inlet Basin. It is one of a series of reports by the National Water-Quality Assessment (NAWQA) Program that present major findings in 51 major river basins and aquifer systems across the Nation. In these reports, water quality is discussed in terms of local, State, and regional issues. Conditions

Authors: Roy L. Glass, Timothy P. Brabets, Steven A. Frenzel, Matthew S. Whitman, Robert T. Ourso
By: Ecosystems Mission Area, Water Resources Mission Area, Alaska Science Center

JANUARY 1, 2003

Identification of linear and threshold responses in streams along a gradient of urbanization in Anchorage, Alaska

We examined biotic and physiochemical responses in urbanized Anchorage, Alaska, to the percent of impervious area within stream basins, as determined by high-resolution IKONOS satellite imagery and aerial photography. Eighteen of the 86 variables examined, including riparian and instream habitat



Session 2: Status of Human Activities

1:50	***History and Trajectory of the West Susitna Industrial Corridor*** **- Margaret Stern, Susitna River Coalition**
2:10	*Port MacKenzie: The History and Future of a Small Industrial Port in Upper Cook Inlet* - David Griffin, Port MacKenzie / Mat-Su Borough
2:30	*Recovering and Recycling Deicing Fluid at Ted Stevens Anchorage International Airport* - Sean Dolan, NorthLink Aviation
2:50	Break
3:10	*Methods and Impacts of Diverting Organic Waste from the Anchorage Landfill and Building Healthy Soils* - Nick Riordan, Alaska Community Action on Toxics / Yarducopia
3:30	*Cook Inlet Tidal Energy: Opportunities and Challenges* - D. Douglas Johnson, Ocean Renewable Power Company
3:50	*Green Infrastructure Storm Water Management Projects in Homer, Alaska* - Janette Keiser, City of Homer
4:10	*Cook Inlet Offshore Oil & Gas Platforms: Dismantlement, Disposal and Restoral Obligations & Opportunities for More Intensive Monitoring, Management and Restoral of the Cook Inlet Biome & Accelerating the Transition to Clean Energy* - Mark Foster, MAFA

History & Trajectory of the West Susitna Industrial Corridor

Margaret Stern, Susitna River Coalition
margaret@susitnarivercoalition.org

What to Expect


Photo Credit: Susitna River Coalition

I. Who is the Susitna River Coalition?

II. How do Cook Inlet and the Susitna Relate

III. West Susitna Industrial Corridor Basics

IV. History of West Susitna

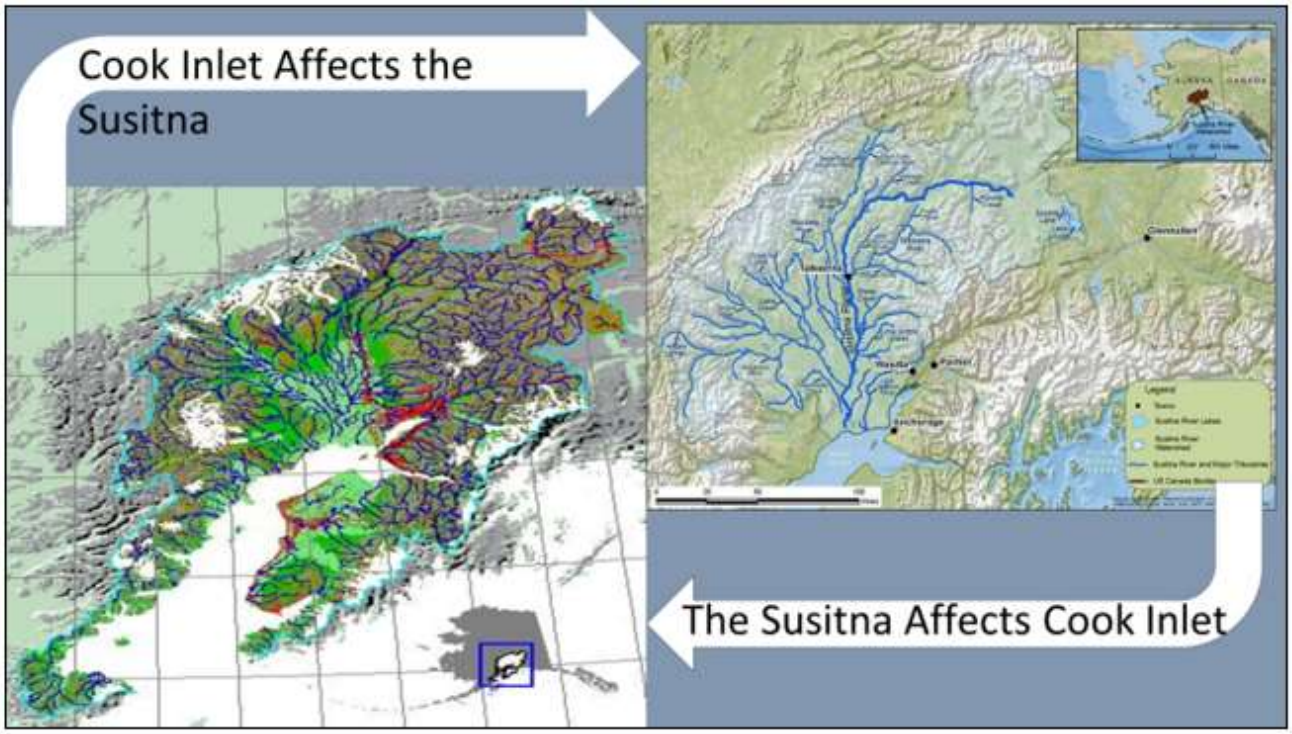
V. Where is this Project Going

VI. Water Quality Concerns

V. How to Track the Project

The Susitna River Coalition

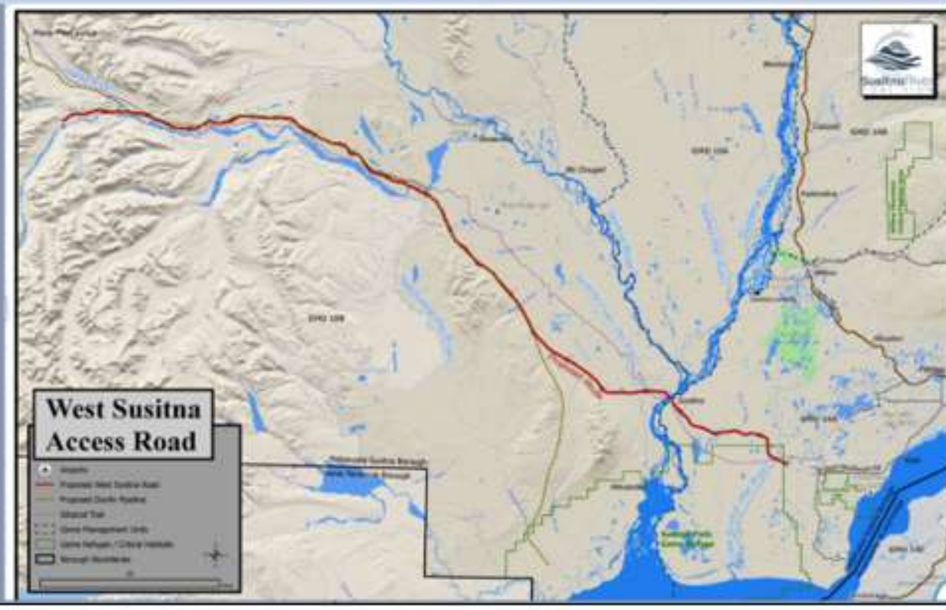
- Grassroots organization based in Talkeetna, Alaska
- Represents the entire Susitna Watershed
- Monitors and engages in watershed issues
- Watershed Watchdog



Cook Inlet Affects the Susitna
The Susitna Affects Cook Inlet

What's Special about the West Su?
"The point of this magnificent landscape is that it's accessible wilderness. It's hunting. It's fishing. It's recreation. It's snowmachining. It's the opportunity for the majority of (the) Alaskan populace, based in Anchorage, Wasilla and Palmer, to have access to Alaska…. "And here are these grandiose projects that would utterly devastate the quality of Alaskan life that those of us who either know the Susitna Valley, live here or have visited value most about it."
Rick Leo, ADN, 2013

West Susitna: Mega-Project Basic Stats



2013: Roads to Resources

Money Spent:
$250,000

Overview

The Alaska Department of Transportation and Public Facilities' (DOT&PF) Roads to Resources Program initiated the West Susitna Access Reconnaissance Study in January 2013. The purpose of this reconnaissance-level study is to evaluate and consider the need for surface access to resource development opportunities west of the Susitna River in Southcentral Alaska. This study aims to identify locations that may benefit from a proposed surface connection. The study will:

- Identify resource development opportunities west of the Susitna River.
- Identify one or more potential crossings of the Susitna River.
- Identify one or more potential transportation corridors to access identified resources.

Phase I Predevelopment: 2019-2020

- First agreement between 3 major players
- Goal to study feasibility of routes
- Minimal opportunity for public input

Money Spent on Phase I: $200,000

Money Spent to Date: $450,000

AIDEA Alaska Industrial Development and Export Authority

NOVA MINERALS LIMITED

Phase II Predevelopment: 2020-2021

- Explore two potential routes more intently
- Major goal of outreach.
- One AIDEA open house: locals opposed

Money Spent on Phase II: $310,000

Money Spent to Date: $760,000

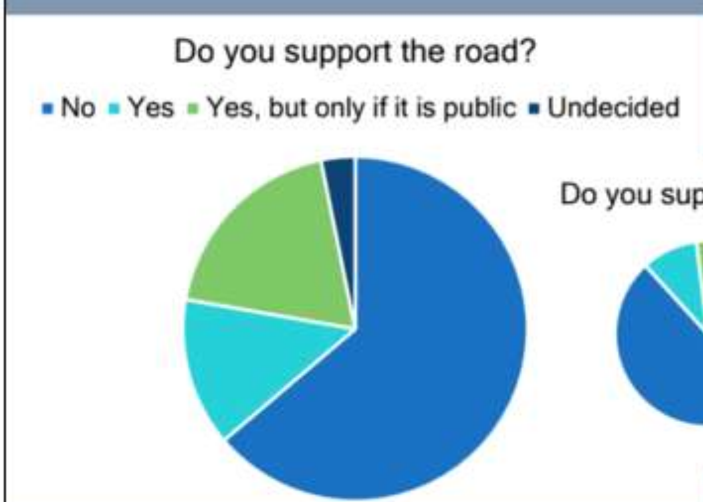
Phase III Predevelopment 2021-2022

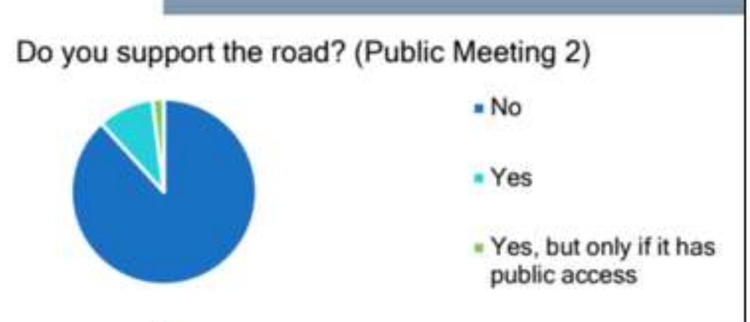
- Introduced 12/7/21 to MSB Assembly: AIDEA unable to answer basic questions
- 12/21/21: Heard again before a new MSB Mayor & Assembly
- Phase III approved: MSB tasked with public outreach

Money Spent on Phase II:
$8.5 million

Money Spent to Date:
$9.26 million

Mat Su Borough Outreach 2021-2022





404 Wetland Permitting: 2022-?

- May 2022: AIDEA submitted 404 Wetland permit to the Army Corp. of Engineers
- Deemed incomplete after 1st submission
- September 23, 2022, permit application deemed complete pending more information
- AIDEA unable to provide more information, application shelved

AIDEA Information Purchase: 2022

AIDEA

Purchase Order#

PO#010344

- Data was bought from unknown studies in 2022
- Data intended to fill many significant knowledge gaps

Money Spent on AIDEA information Purchase: $490,000

Money Spent to Date: $9.75 million

DOT draft STIP Plan:
A Brand Shift

Ryan Anderson, P.E.
Commissioner

www.DOT.Alaska.Gov

Department of Transportation
and Public Facilities

Juneau, Alaska

STATE OF ALASKA

PRESS RELEASE

FOR IMMEDIATE RELEASE: July 27, 2023

Press Release: 23-0025

Contact: Shannon McCarthy, 907-269-0448, shannon.mccarthy@alaska.gov

West Susitna Access Changes Agencies, Changes Focus to Public Rec Road

Project will now be a 15-mile public roadway and bridge across the Susitna.

Money Spent if DOT moves forward:
$82.5 million

Total Money Spent if DOT moves Forward:
$92.25 million

Accurate Cost Estimates?

Sections ☰ ANCHORAGE DAILY NEWS Alaska News • Politics • Opinions • Talk to us

Cooper Landing highway project estimate more than doubles in cost

By Elizabeth Earl for the Anchorage Daily News
Updated: August 3, 2023
Published: August 3, 2023

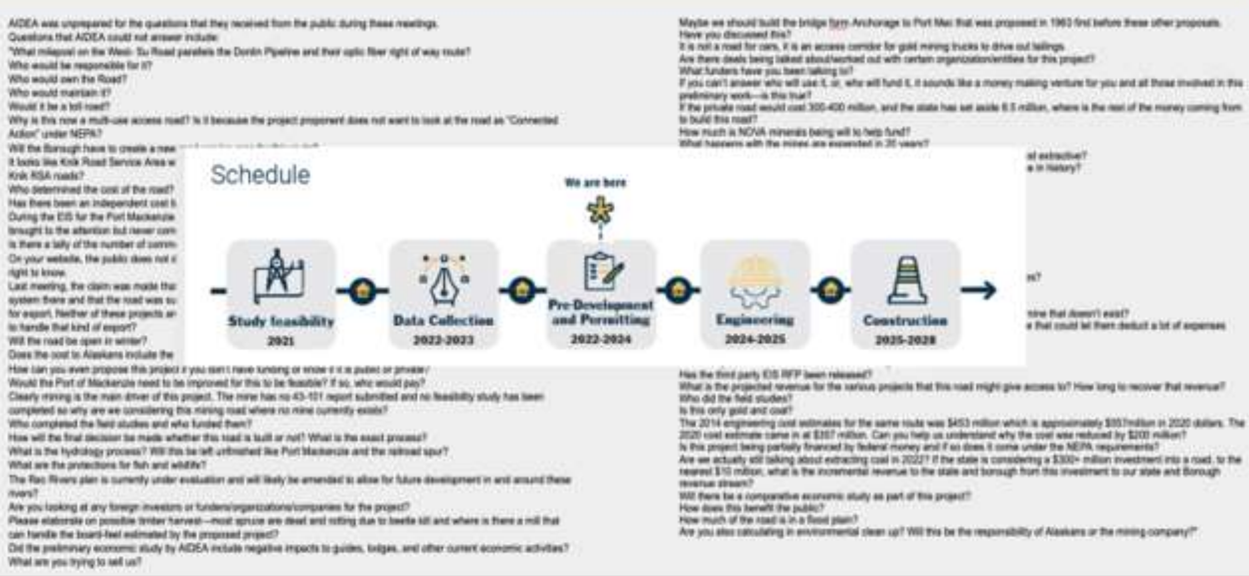
Using Cooper Landing Example:

First 15 miles and a bridge across the Su: >$165 million

$450 million in 2017 is
>$1 billion in 2023

Water Quality Concerns

Rushed Timeline




Segmentation & Permitting
Decrease the overall impact of any one project in permitting
Segmentation has already begun for West Susitna: DOT Draft STIP
Allows industry to bypass checks and balances
795F


How can you stay informed?
Keep in touch with the Susitna River Coalition!
Contact us:
Margaret@susitnarivercoalition.org
Susitna River Coalition phone: 907-733-5400
www.susitnarivercoalition.org

Sources:

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Session 2: Status of Human Activities

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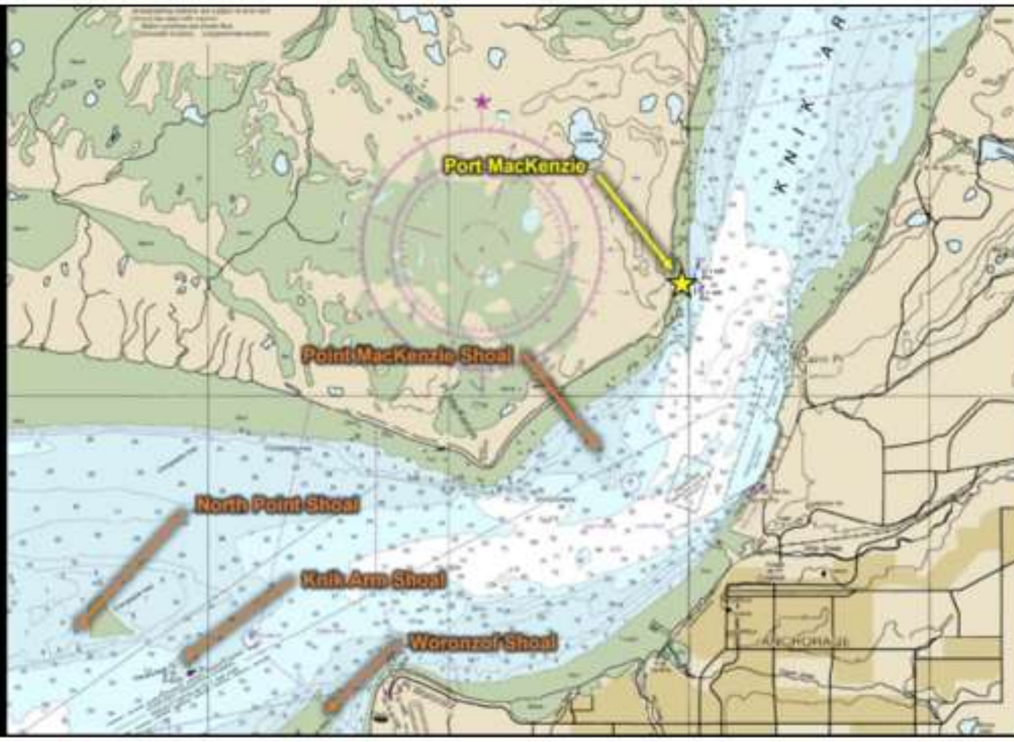
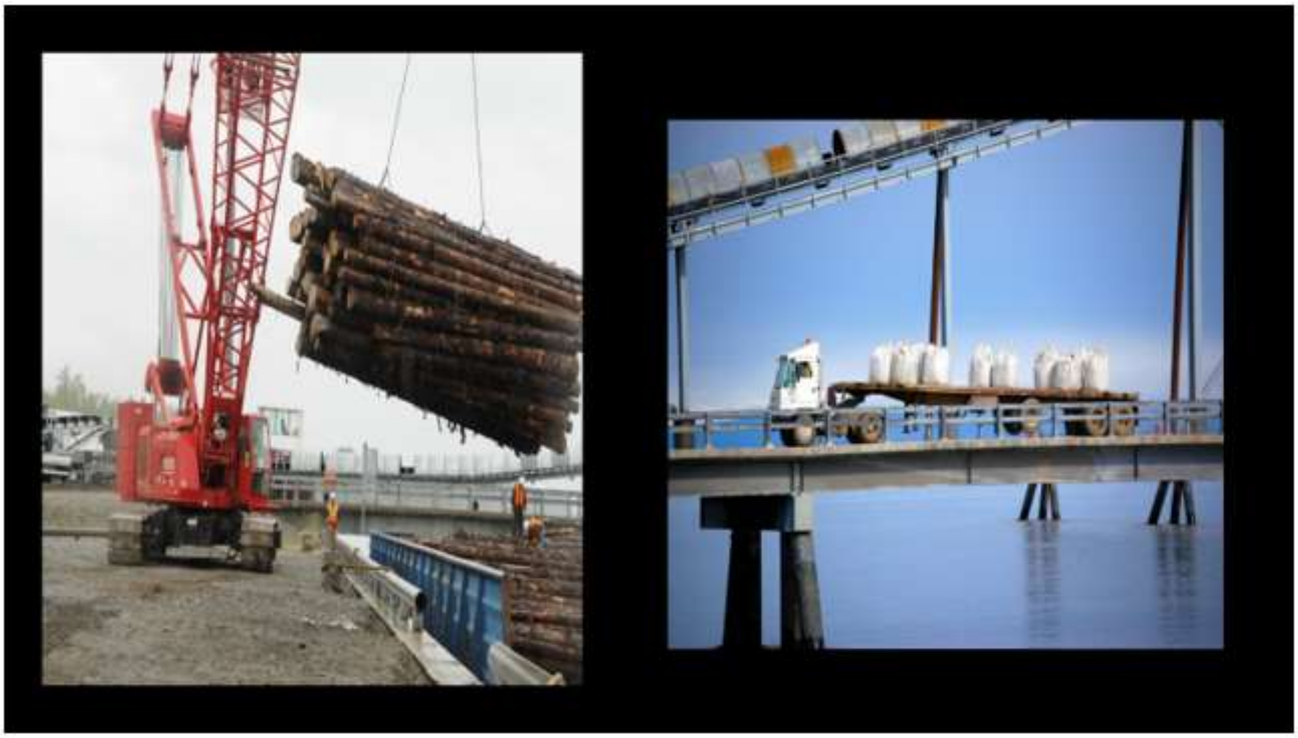
Port MacKenzie: The History and Future of a Small Industrial Port in Upper Cook Inlet

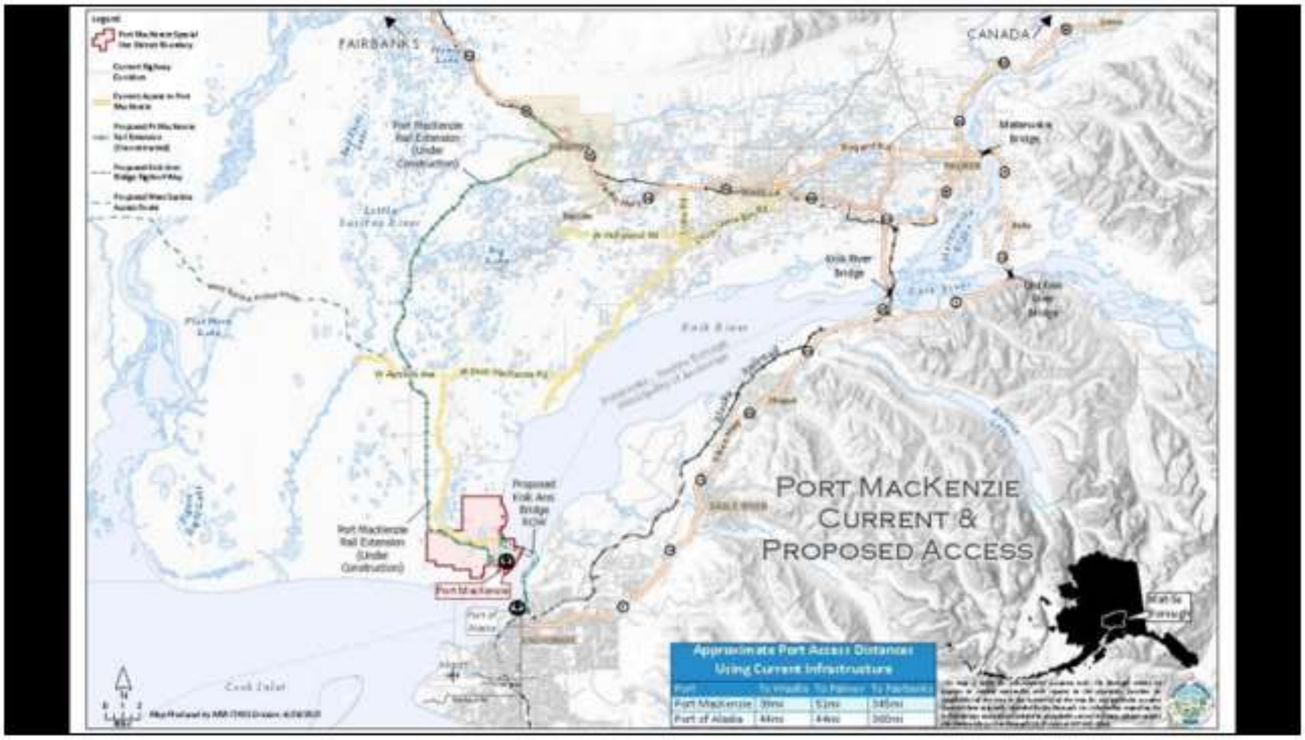
David Griffin – Port Operations Manager

Cook Inlet Water Quality Summit - 2023

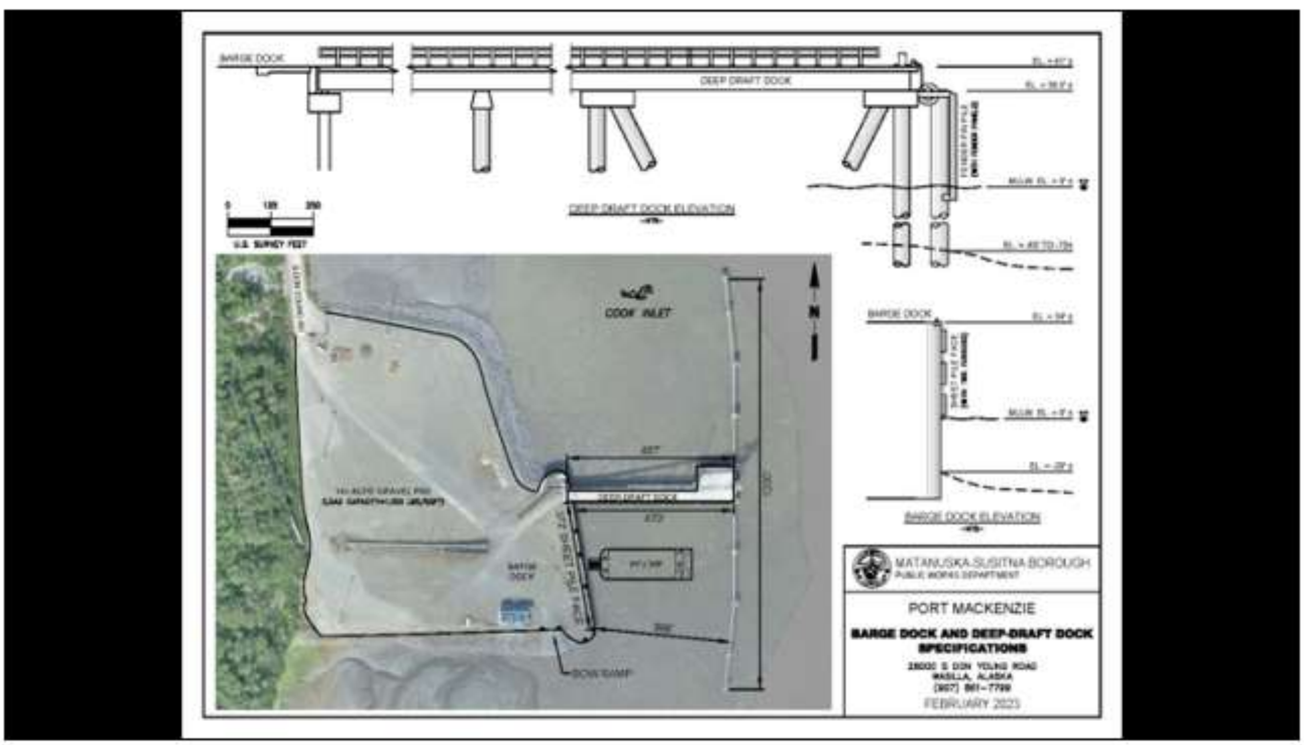

Port MacKenzie
Point MacKenzie Shoal
North Point Shoal
Knik Arm Shoal
Woronzof Shoal
ANCHORAGE


BOROUGH
Knik Arm
Cook Inlet
Point MacKenzie Area Overview
Land Status

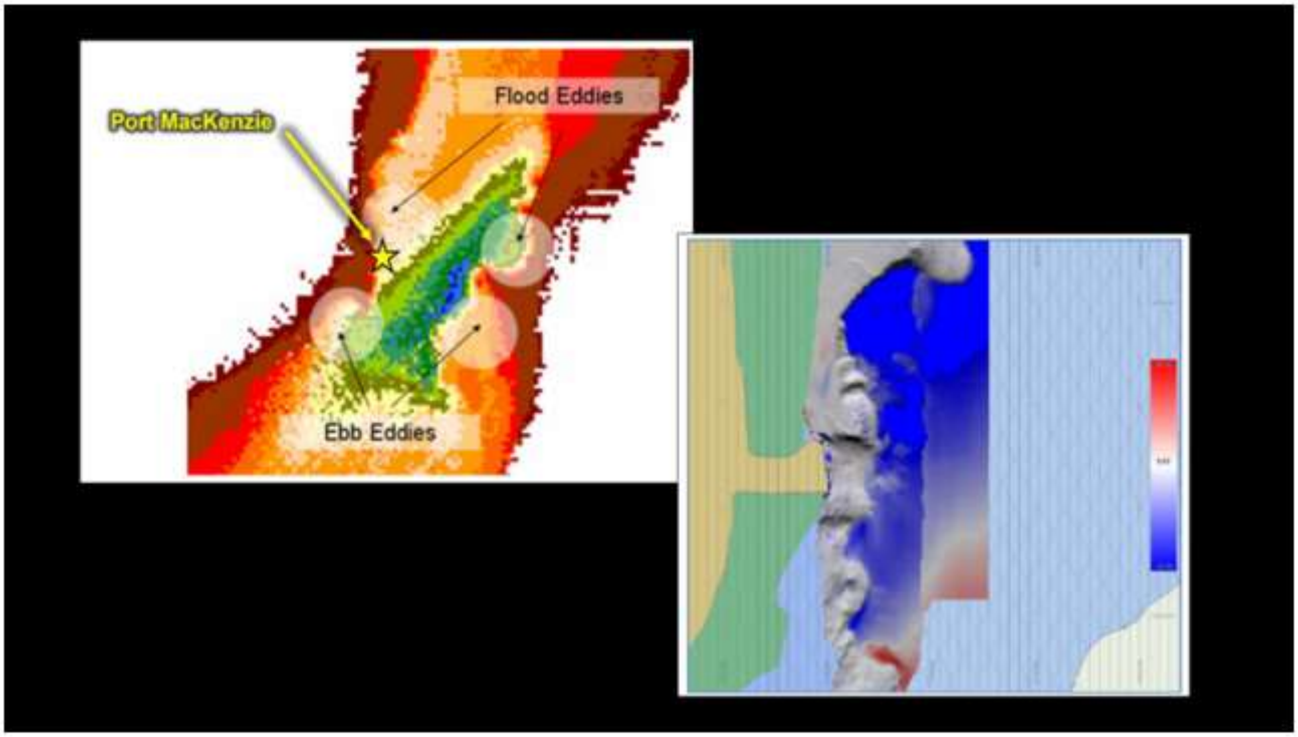


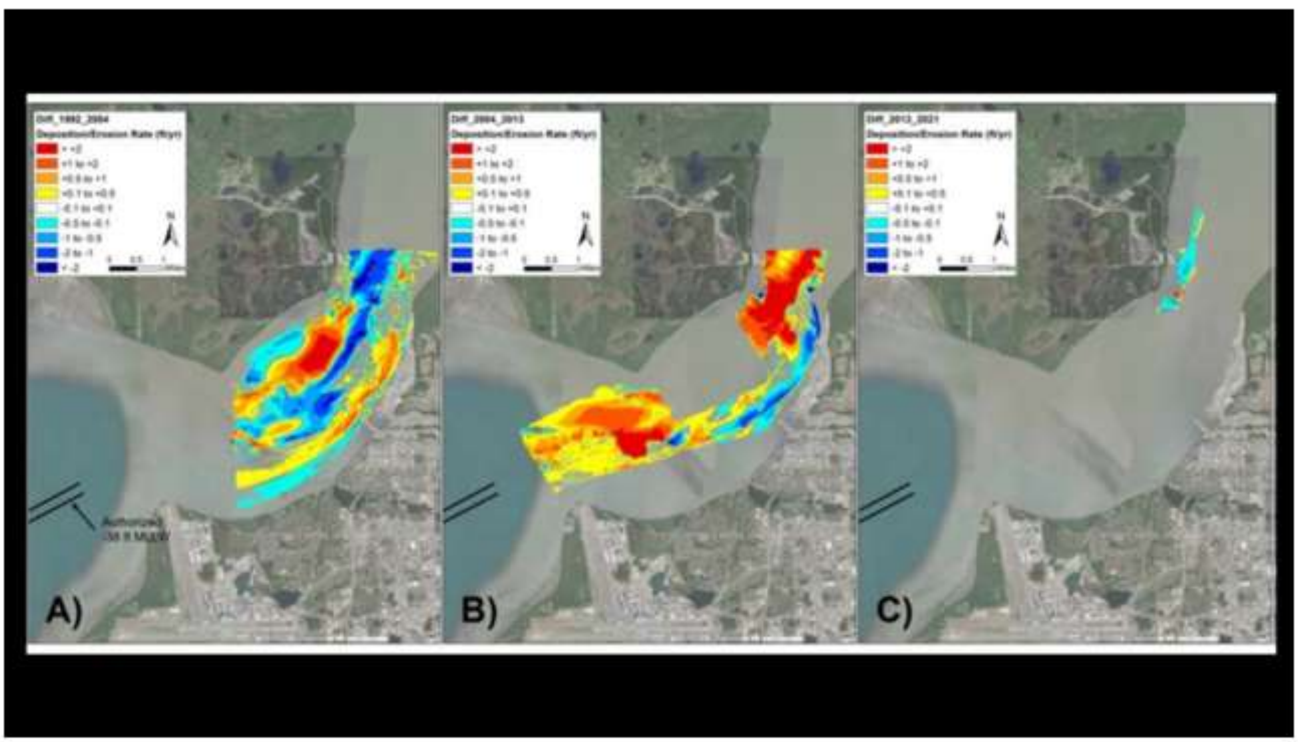

FAIRBANKS
CANADA
Port MacKenzie Rail Extension (Under Construction)
Knik River Bridge
Proposed Knik Arm Bridge ROW
Port MacKenzie Rail Extension (Under Construction)
Port MacKenzie
PORT MACKENZIE CURRENT & PROPOSED ACCESS
Approximate Port Access Distances Using Current Infrastructure
Port
Port MacKenzie
Port of Alaska


LIVENGOOD
Money Knob-gold
Shorty Creek - copper, molybdenum, gold
Globe Creek - limestone/cement
Fort Knox - gold
Examples of mines and mineral prospects along rail corridor
Shorty Creek extension - copper, gold -
FAIRBANKS
NENANA
lead, zinc prospects
HEALY
coal
copper
copper
MAN Prospect - nickel, platinum, copper -
SUSITNA DAM SITE
copper
Denali Prospect - copper
copper
PORT MACKENZIE



BARGE DOCK
DEEP DRAFT DOCK
DEEP DRAFT DOCK ELEVATION
U.S. SURVEY FEET
COOK INLET
BARGE DOCK ELEVATION
MATANUSKA-SUSITNA BOROUGH
PUBLIC WORKS DEPARTMENT
PORT MACKENZIE
BARGE DOCK AND DEEP-DRAFT DOCK
SPECIFICATIONS
FEBRUARY 2023


Flood Eddies
Port MacKenzie
Ebb Eddies


A)
B)
C)


1000 ft
N
6/2012
7/2018
5/2022


SITE ACCESS ROAD
300' x 200' BARGE RAMP
AT 7% GRADE
200' x 100' GRADED
TRANSITION AREA
DEEP DRAFT
DOCK
CONVEYOR
TERMINAL
BUILDING
BULKHEAD
DOCK
BARGE LANDING

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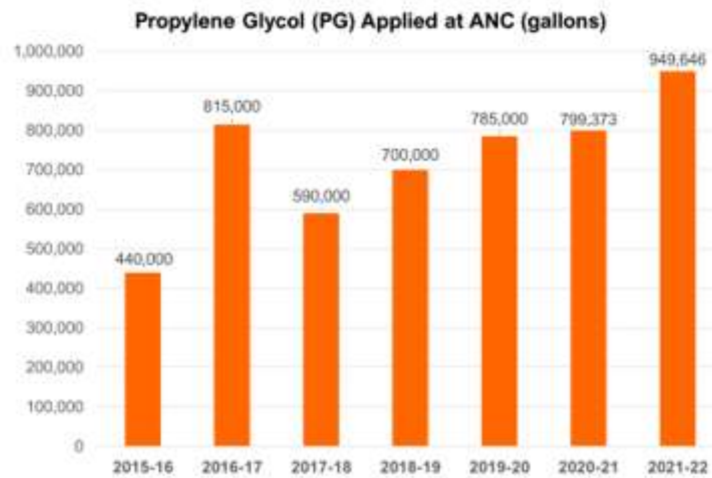
COOK INLET WATER QUALITY SUMMIT

Recovering and Recycling Deicing Fluid at
Ted Stevens Anchorage International Airport (ANC)
October 2023

NORTHLINK AVIATION

BACKGROUND – WHAT IS THE PROBLEM?

- Deicing fluid, consisting of propylene glycol, is critical to the operation of ANC
- Deicing fluid enters the storm water system and is discharged into Cook Inlet
- Propylene glycol removes oxygen from water, negatively impacting marine life
- Almost one million gallons of propylene glycol was discharged during the winter of 2021-22

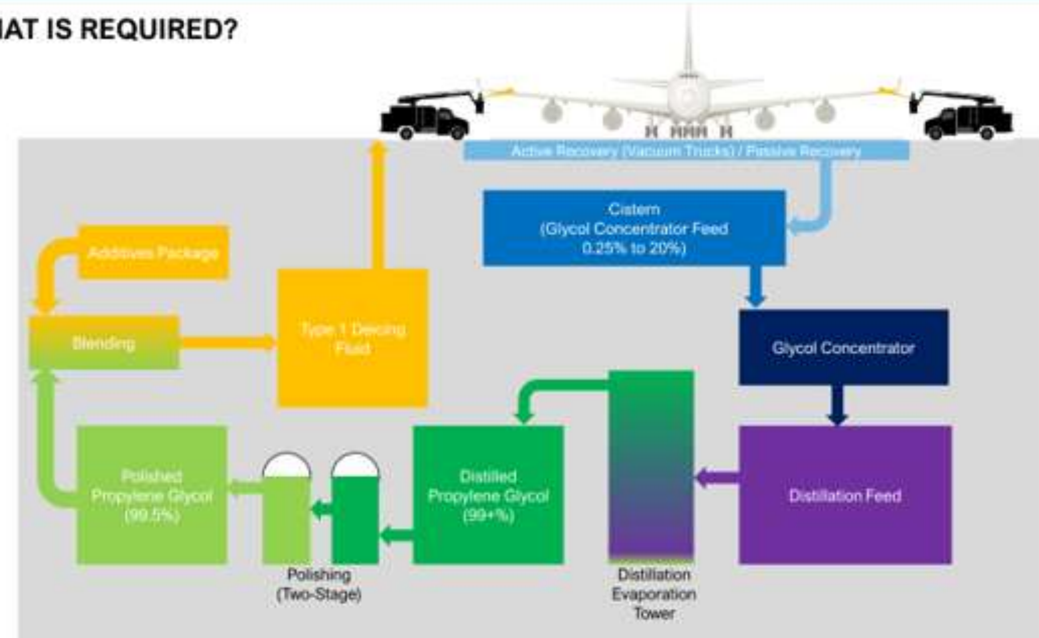


Source: EA Engineering, Science and Technology, 8/30/22 End of Season Report

HOW HAVE OTHER AIRPORTS ADDRESSED THIS PROBLEM?

- Airports in Europe and NA have addressed the PG pollution problem
- In most cases, regulatory pressure was the catalyst for action
- Recovery and recycling is recognized as best practice
- Existing facilities demonstrate that it is profitable to protect the environment

WHAT IS REQUIRED?



HOW WILL RECOVERY AND RECYCLING WORK AT ANC?

REGULATORY SITUATION

- ANC operates under a General Permit (GP) (AKR061000) issued by the Alaska Department of Environmental Conservation on 9/19/2019
- Permit expires 10/31/2024
- Under the GP, operators at ANC are allowed to discharge deicing fluid via the airport's storm sewer system
- ANC is required to use the "best available technology" (BAT) to reduce the discharge of deicing fluid
- The current BAT is source reduction using blend-to-temperature (BTT)

ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM

GENERAL PERMIT - TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT (ANC-GP)

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT

Outfall	Receiving Water or Body	Latitude	Longitude
[illegible]	Lake Spenard	[illegible]	[illegible]
[illegible]	Lake Hood	[illegible]	[illegible]
[illegible]	Lake Hood	[illegible]	[illegible]
[illegible]	Knik Arm/Cook Inlet	[illegible]	[illegible]
[illegible]	[illegible] Creek	[illegible]	[illegible]

Signature

Date

Printed Name

Program Manager

Title

WHO IS NORTHLINK AVIATION?

- Cargo terminal development on the south campus of ANC
- Sponsored by Tiger Infrastructure
- Received Finding of No Significant Impact / Record of Decision from FAA in August 2023
- Began construction in August 2023
- Besides deicing fluid recycling, focused on:
  - Providing modern cargo infrastructure
  - Making ANC a hub for the distribution of cross-border e-commerce good

CONCLUSION

- A million gallons a year of propylene glycol going into Cook Inlet is unacceptable
- This problem can be fixed with recovery and recycling
- Other airports have demonstrated this is achievable (and profitable)
- NorthLink Aviation's new terminal will provide a recovery and recycling solution using private capital
- Recycling solution can work for the entire airport (as well as neighboring airports)
- Coordination with all stakeholders is essential
- Now is the time to act!

TYPE I VS. TYPE 4 FLUID

Type I Fluid (Deicing)

- Used for deicing – removing frozen deposits from aircraft surfaces
- Approximately, 50% glycol and 50% water when sprayed on aircraft (can be adjusted based on outside air temperature - OAT)
- Heated to approximately 180 degrees before application
- Orange dye added so it is easy to identify/monitor visually on aircraft
- Typically drips off plane abundantly depending on weather

Type IV Fluid (Anti-Icing)

- Used for anti-icing – ensuring control surfaces do not ice-up
- 50% glycol
- Applied at ambient temperature (cold)
- Weather determines "holdover time" – amount of holdover time a plane has to take-off before deicing process needs to start over
- Green dye added so it is easy to identify/monitor visually on aircraft
- Thickened fluid applied only on critical surfaces. Does not drip off plane as much given viscosity properties and lower volume applied

RECOVERING DEICING FLUID

- **Active:**
  - Requires fleet of vacuum trucks, often referred to as glycol recovery vehicles (GRVs)
  - GRVs will vacuum the spent deicing fluid that runs off planes after deicing
  - A key component of active recovery is making sure that storm drains can be closed so that fluid does not enter the storm water system before it can be recovered
  - Active recovery will be used throughout ANC (other than NorthLink's terminal) and at all other neighboring "spoke" airports that participate in recycling

GRVs

- **Passive:**
  - Utilized at NorthLink's terminal
  - All the fluid entering the storm drains can be directed to a centralized storage facility (cisterns or above ground storage tanks)

Storm Drain with Ability to Close

STORING RECOVERED VOLUMES

- An essential part of the recycling economics is making sure that the recycling system operates at least 10 months out of the year
- To ensure that the recovered volumes are available throughout the year, meaningful storage is required
- To optimize this storage, it is likely that "satellite" concentrators will need to be deployed
- Glycol concentrators can bring the recovered low concentration fluid up to a 50/50 mix of water and propylene glycol
- The storage that is typically used is "frac tanks," which resemble semi-trailers with wheels and are portable

Glycol Concentrator

Frac Tank

DEICING FLUID RECYCLING

- The main components of the recycling process are:
  - Filtration & Concentration
  - Distillation
  - Blending Type I
  - Storage of finished product
- The systems are designed as "closed loop" so that the manufactured AMS1424-certified end-product can be used at the airport
- A recycling system that runs on electricity (preferably with renewable energy) generates additional environmental benefits

Distillation Tower

3D Rendering of Syracuse, NY Recycling Facility

NEIGHBORING "SPOKE" AIRPORTS

- While NorthLink is focused on creating a recycling solution for ANC, we do not want to ignore the opportunity to recycle fluid from neighboring "spoke" airports
- The most logical candidates include:
  - Joint Base Elmendorf Richardson (Anchorage)
  - Ladd Army Airfield (Fairbanks)
  - Fairbanks International Airport (FAI)
  - Eielson Air Force Base (Fairbanks)
- The drive from Fairbanks to Anchorage is approximately 360 miles

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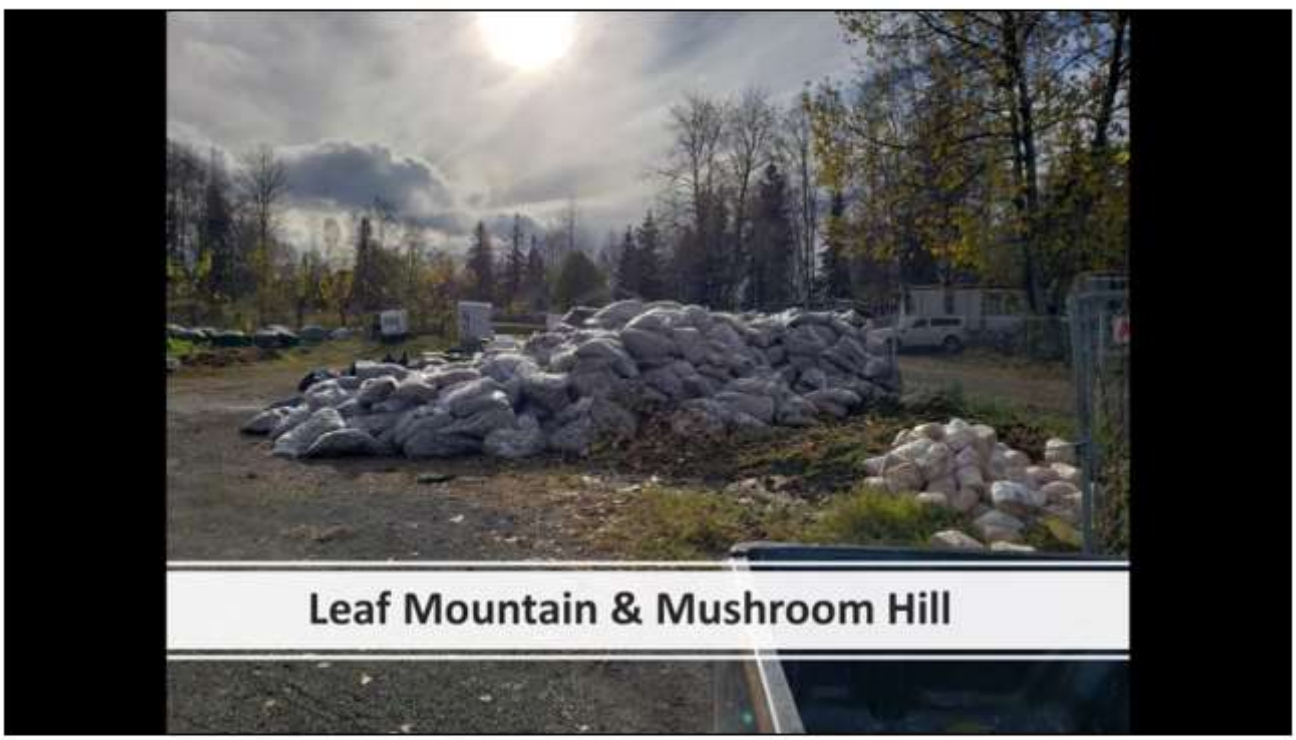
Yarducopia.org
garden@akaction.org
ACAT
Methods and impacts of diverting organic waste from the Anchorage landfill and building healthy soils


COMMUNITY COMPOST
grab a bucket
feed chickens not landfills
Organic 'waste streams'


Backyard and Community Composting


Providence Hospital food waste as animal feed


Midtown Garden Depot: Material Stockpiles


Leaf Mountain & Mushroom Hill


Manure Middleman

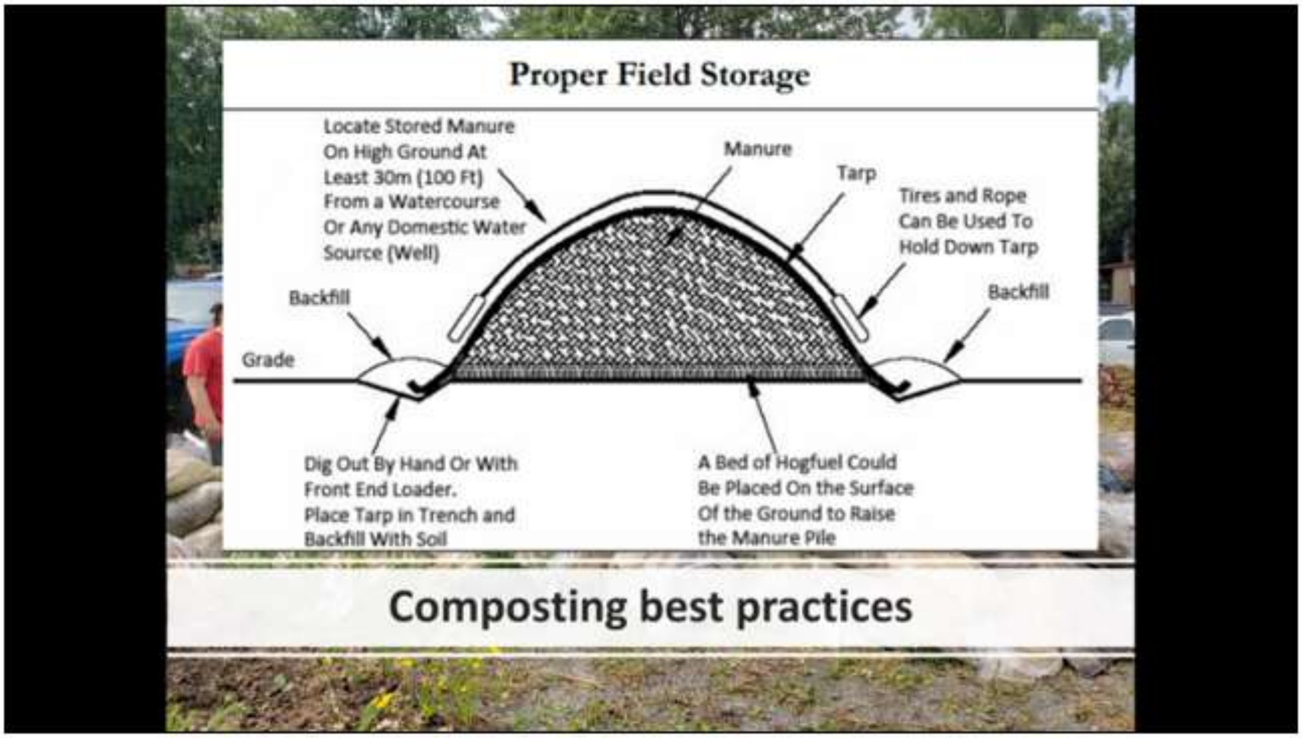

Anchorage
MRI
Spenard
ME
ME
H
Campbell
Ted Stevens
Anchorage
International
Airport
Far North
Bicentennial Park
Distributing Organics through ShareWaste.com

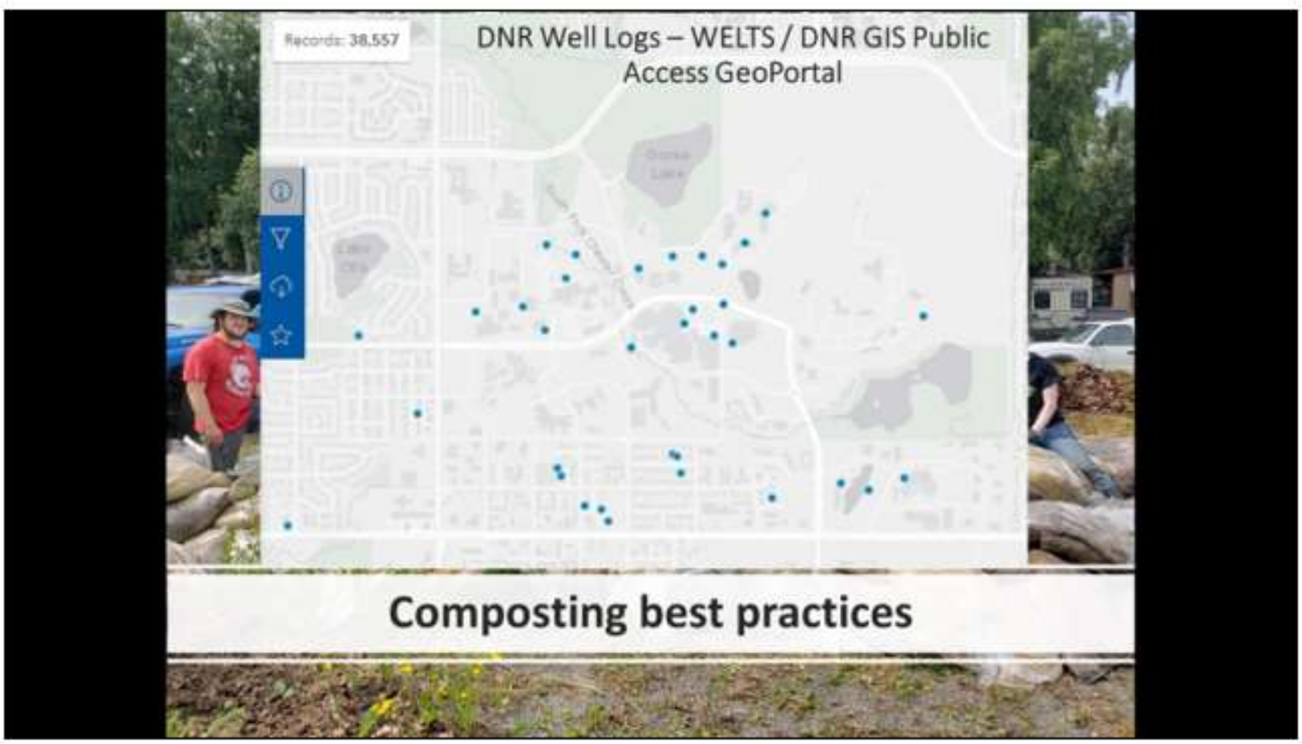

Primary outcome: Organics-rich gardens


Other benefits of organics-rich soils


Secondary outcomes: Diversion from landfill


Future Opportunities: More compost?


Proper Field Storage
Locate Stored Manure On High Ground At Least 30m (100 Ft) From a Watercourse Or Any Domestic Water Source (Well)
Manure
Tarp
Tires and Rope Can Be Used To Hold Down Tarp
Backfill
Backfill
Grade
Dig Out By Hand Or With Front End Loader. Place Tarp In Trench and Backfill With Soil
A Bed of Hogfuel Could Be Placed On the Surface Of the Ground to Raise the Manure Pile
Composting best practices


Records: 38,557
DNR Well Logs – WELTS / DNR GIS Public Access GeoPortal
Composting best practices

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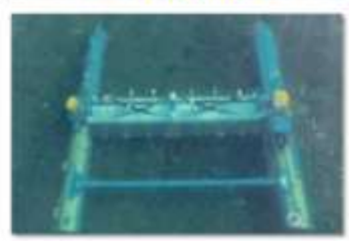
Patented technology, proven through 17 successful deployments since 2007

ORPC

Who we are
- Founded 18 years ago, in Portland, Maine, US
- 41 employees
- Subsidiaries in Canada, Ireland & Chile

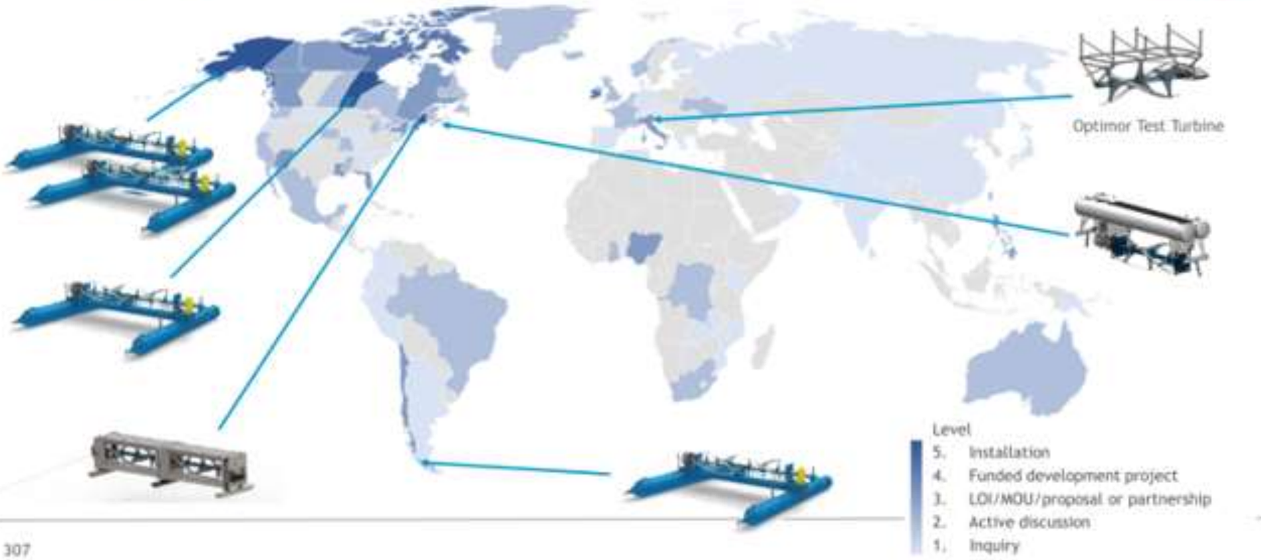
What we do
- Convert kinetic energy in water currents into clean, predictable, affordable sources of renewable electricity
- Provide smart microgrid solutions powered by ORPC power systems

ORPC's objectives
- Develop clean energy solutions for remote communities and critical infrastructure
- Create local jobs for installing and maintaining equipment



ENERGY EU Horizon 2020 seai Natural Resources Canada

ORPC 2023—Product Line & International Expansion
Deploying 3 Product Lines with Outreach from 50 Countries



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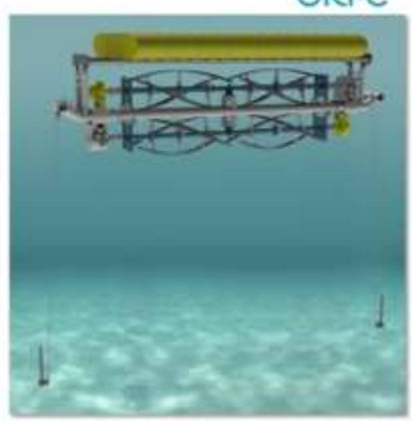
TidGen System - Eastport, Maine



One-year deployment of 4-turbine TidGen device commencing in Q1 2024

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Tidal Energy: Targeting Electricity & Electrofuels

ORPC is using its RivGen design principles to develop two different tidal devices
Targeting 2024 testing and 2026 scale up of ORPC's two Cook Inlet sites

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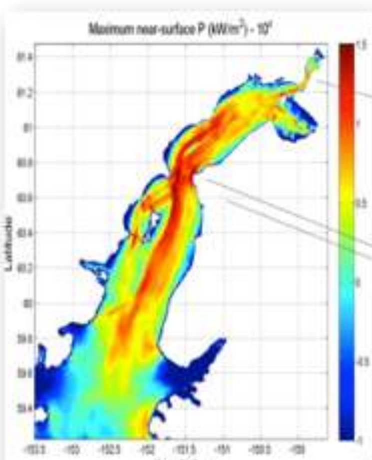
Cook Inlet: The Hydrokinetic Energy Elephant in the Room



Port MacKenzie project site

East Foreland project site

- A world class resource, estimated at 18 gigawatts[1]
- 80 TWh of extractable annual energy
- ORPC targeting first deployment in 2024 with full development 2026-2030

Graph: Cook Inlet – Tidal Power for the Railbelt NOAA & AEA project to assess Cook Inlet tidal energy, 2012. Insets from UAA modeling of ORPC investigated sites, 2013. [1]Haas et al., Assessment of energy production potential from tidal streams in the United States (DOE/GO/1817-6). Georgia Tech Research Corporation, 2011

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Cook Inlet Beluga

- Endangered distinct population segment of Cook Inlet Beluga pose significant challenge
- ORPC has conducted passive acoustic monitoring and visual observations at multiple sites
- Recently completed an internal state of the science initiative, including engaging with technical experts and regulatory officials

Turbidity & Salinity

Seasonal variation in fresh-water runoff dramatically affects the water's turbidity and salinity. Glacial silt concentrations as high as **440 ppm** usually make the water opaque, causing cumbersome underwater inspection operations. Salinity varies as much as 22 percent between summer and winter.

Author: S.L. Barrett, J.M. Taylor

Publish Year: 1978

Seasonal Ice

Pan Ice and Agglomerated Shore ice
November-March

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Thank You

Doug Johnson, Senior Advisor-Alaska
djohnson@orpc.co

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GREEN INFRASTRUCTURE STORMWATER MANAGEMENT

IMPROVING WATER QUALITY – ONE WETLAND AT A TIME

CITY OF HOMER PUBLIC WORKS DEPARTMENT

OCTOBER 2023


WATER, WATER EVERYWHERE
• History of drainage management in Homer
• What's missing?
• Drainage problems
• Concepts for Green Infrastructure Projects
• Next Steps


EARLY RESEARCH
• 1979 Drainage Management Plan
• 1981- 82 Revised Drainage Management Plan
• Focused on traditional drainage management
• Did not address groundwater, erosion, water quality, etc.


"MODERN" RESEARCH
• 2003 – Wetland Functional Assessment Guidebook; ADEC
• 2004 – Soil Survey of Western Kenai Pen. USDA, NRCS…
• 2005-2006 – Multiple agencies identified wetlands & management strategies
• 2007 – Homer Stormwater and Meltwater Management and Mitigation Handbook; Allegra Bukojemsky & David Scheer
• 2004-2009 – Privately-funded work – Coble, McCarthy


MORE RESEARCH "RECENT" TIMES
• 2014 Beluga Area Planning Reference – Homer SWCD
• 2020 Low Impact Dev. Planning – Kinney Engineering
• 2020 - Coastal Bluff Stability; AK DGGS

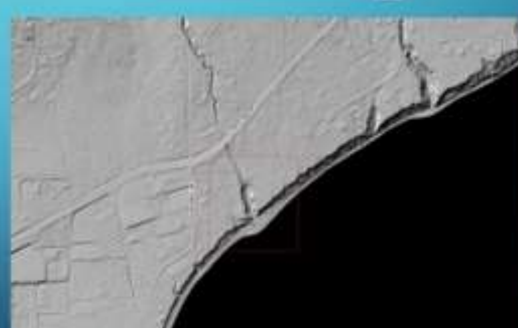

WHAT'S BEEN MISSING?
• Connection between the research findings
• Implementation of the recommendations
• Consistent link with land development regulations
• Focus on water quality


WE STILL HAVE DRAINAGE PROBLEMS
• Drainage is damaging private property.
• Near-surface ground water is triggering bluff erosion.
• Drainage is threatening slope stability.
• Silt-laden storm water is flowing into streams & tidewaters.

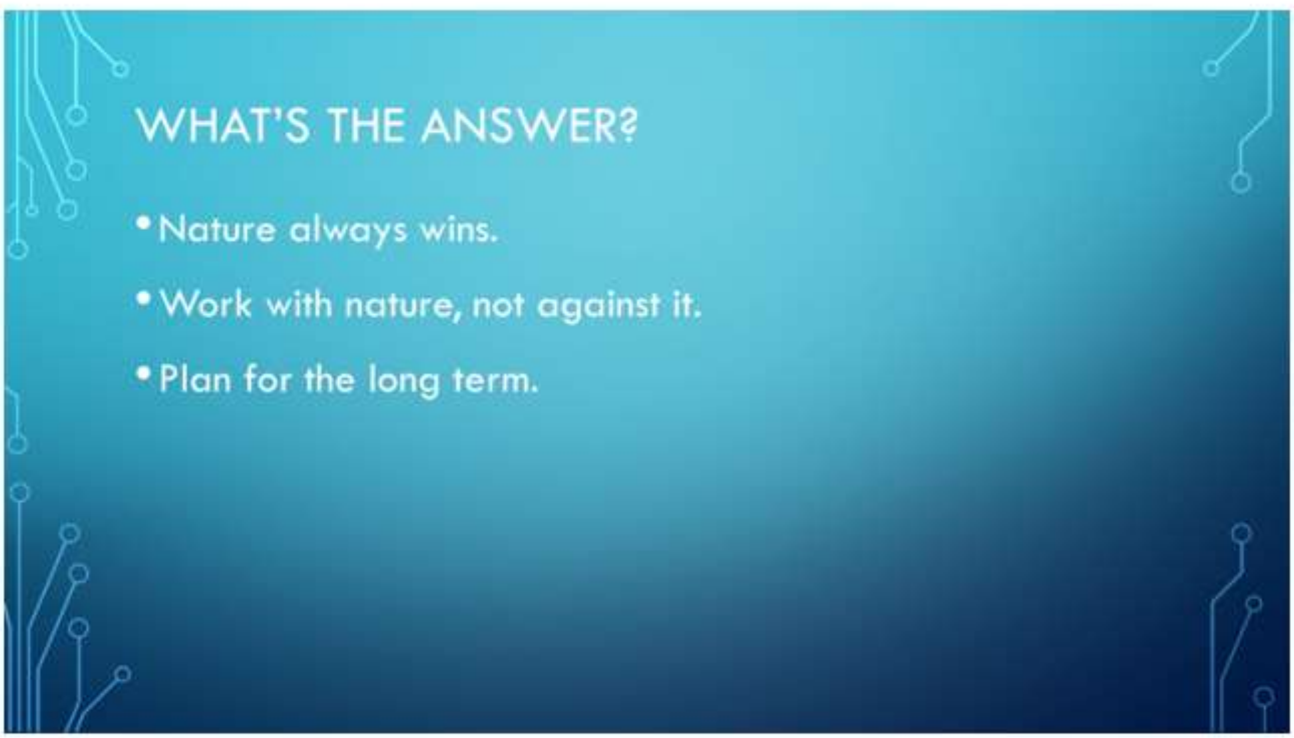
SHORT TERM SOLUTIONS = LONG TERM PROBLEMS

- Private developments don't always look downstream.
- Inspection efforts don't address all development activity.
- Maintenance focuses on efficiency, not sustainability.
- Water quality not always a priority.
- Windows of opportunity to use natural systems are closing.

FLOODING & EROSION




BAYCREST SUBDIVISION
KACHEMAK DRIVE
KACHEMAK DRIVE
Storm water erodes channels and deposits on beach
Sediment laden storm water discharges to Kachemak Bay
Homeowners create private solutions


WHAT'S THE ANSWER?
• Nature always wins.
• Work with nature, not against it.
• Plan for the long term.

GREEN STORMWATER MANAGEMENT SYSTEM

- Includes four Green Infrastructure sub-systems
- Uses natural resources to diffuse water quantity and protect water quality
- Manages water flow to mitigate bluff erosion

NATURAL RESOURCES AROUND US

Peatland Pool

Riparian

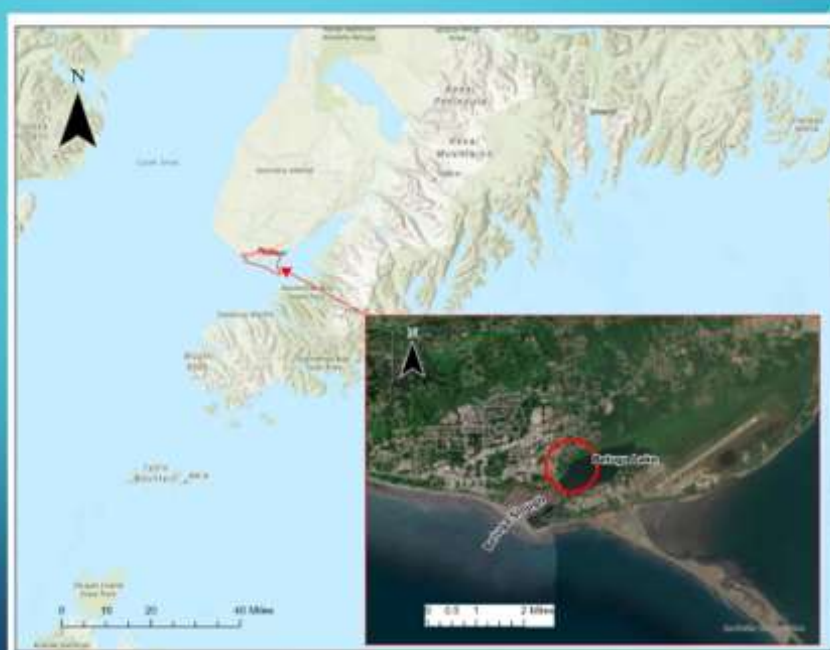
Old Glacial Lakebed

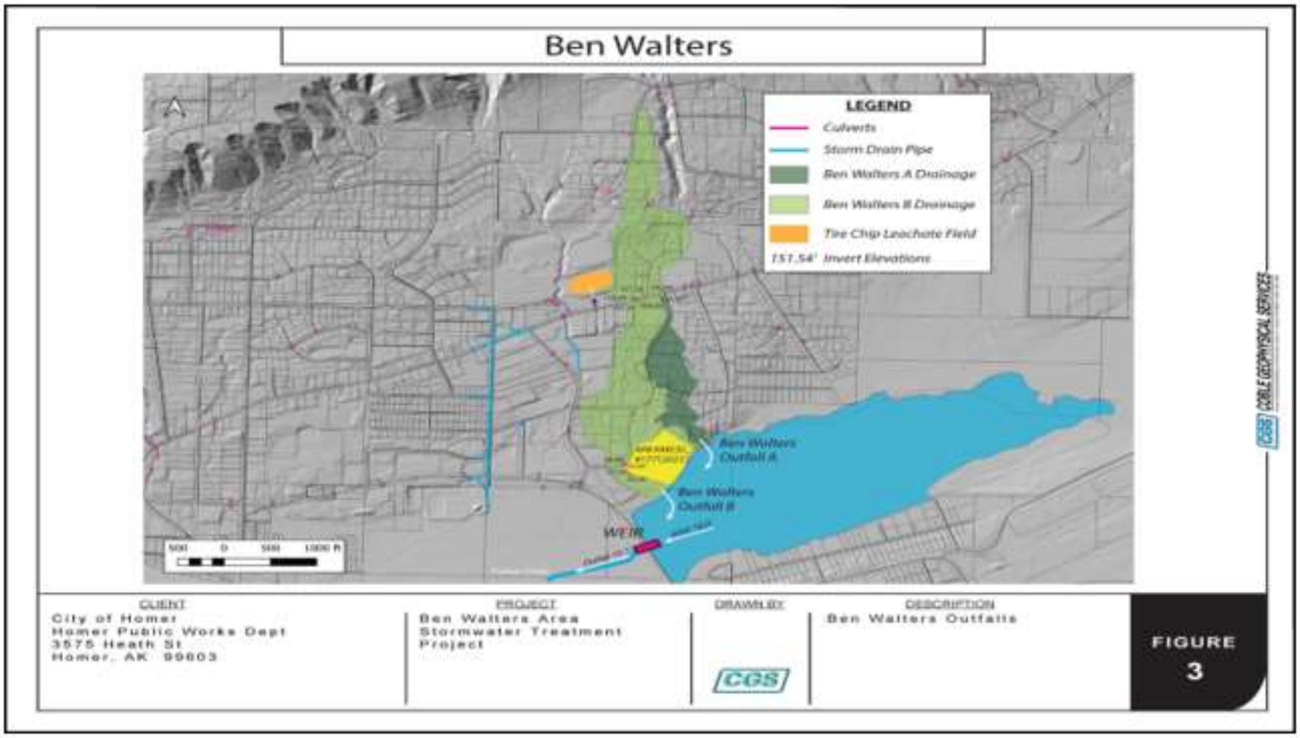
Headwater Fen

GREEN INFRASTRUCTURE ELEMENT #1 – BEN WALTERS STORM WATER TREATMENT SYSTEM

- Uses existing wetlands to store and treat storm water from Ben Walter's Way and upstream watershed
- Diffuses water volumes flowing into Beluga Lake
- Protects water quality of Beluga Lake, Beluga Slough and Kachemak Bay
- Ties into Ben Walters Park

BEN WALTERS





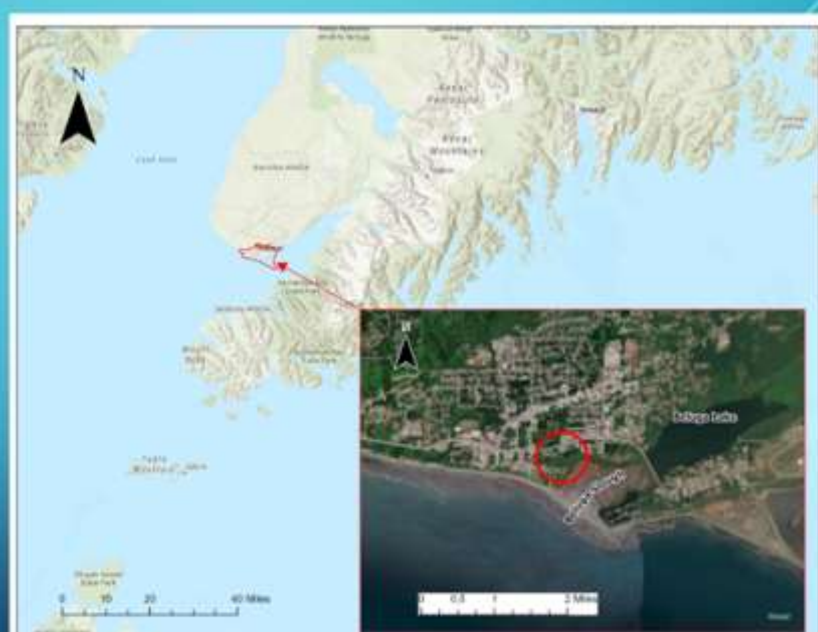
BEN WALTERS PARK SYSTEM – STATUS

- Working with adjacent property owner to acquire rights to wetlands.

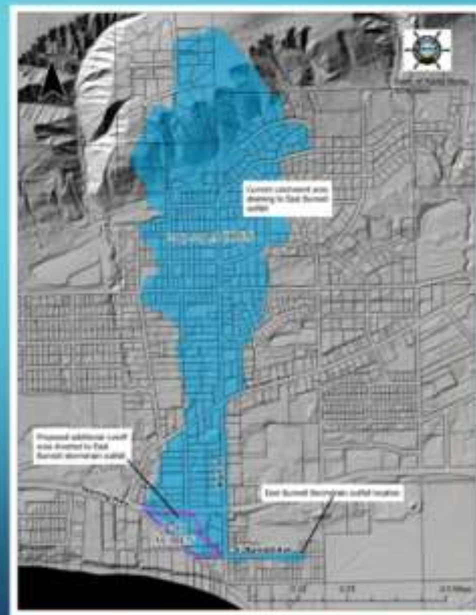
GREEN INFRASTRUCTURE ELEMENT #2 –
BUNNELL AVENUE STORM WATER TREATMENT SYSTEM

- Uses existing wetlands to store/treat storm water from Main Street and Old Town storm drains
- Protects water quality of Beluga Slough & Kachemak Bay

BUNNELL AVE

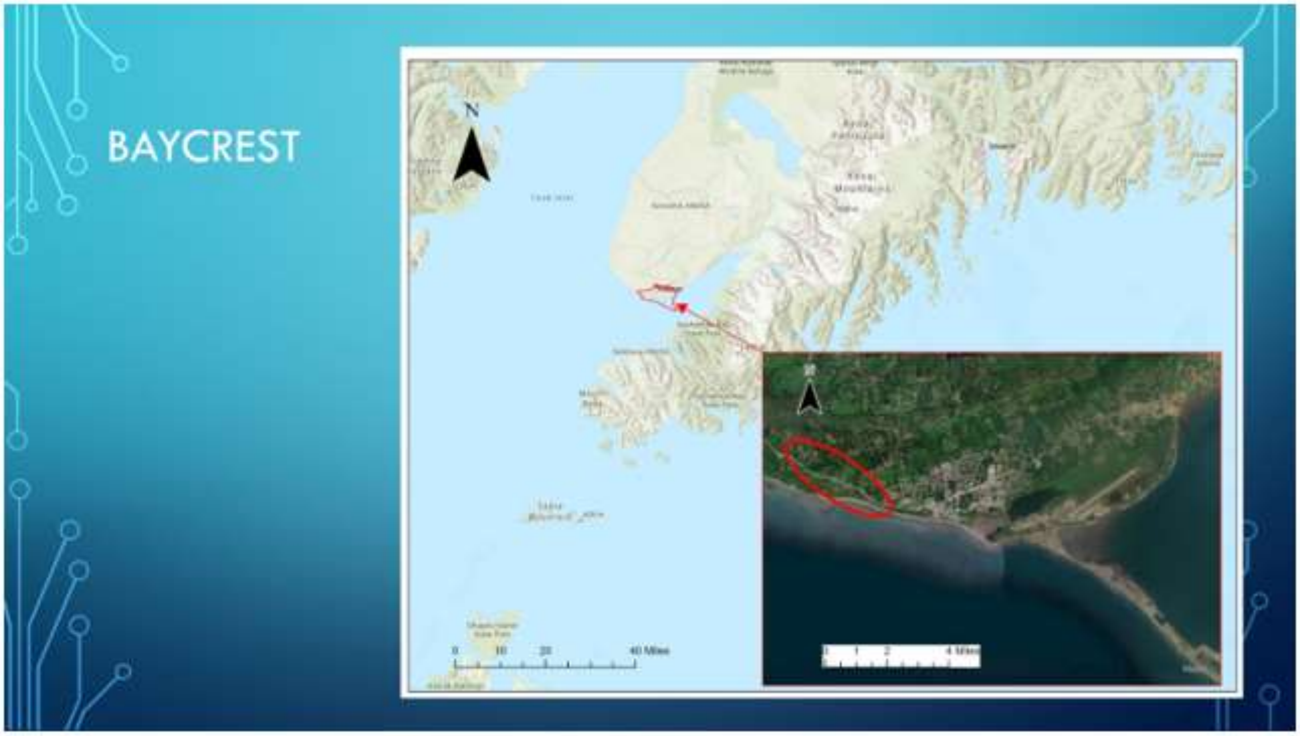


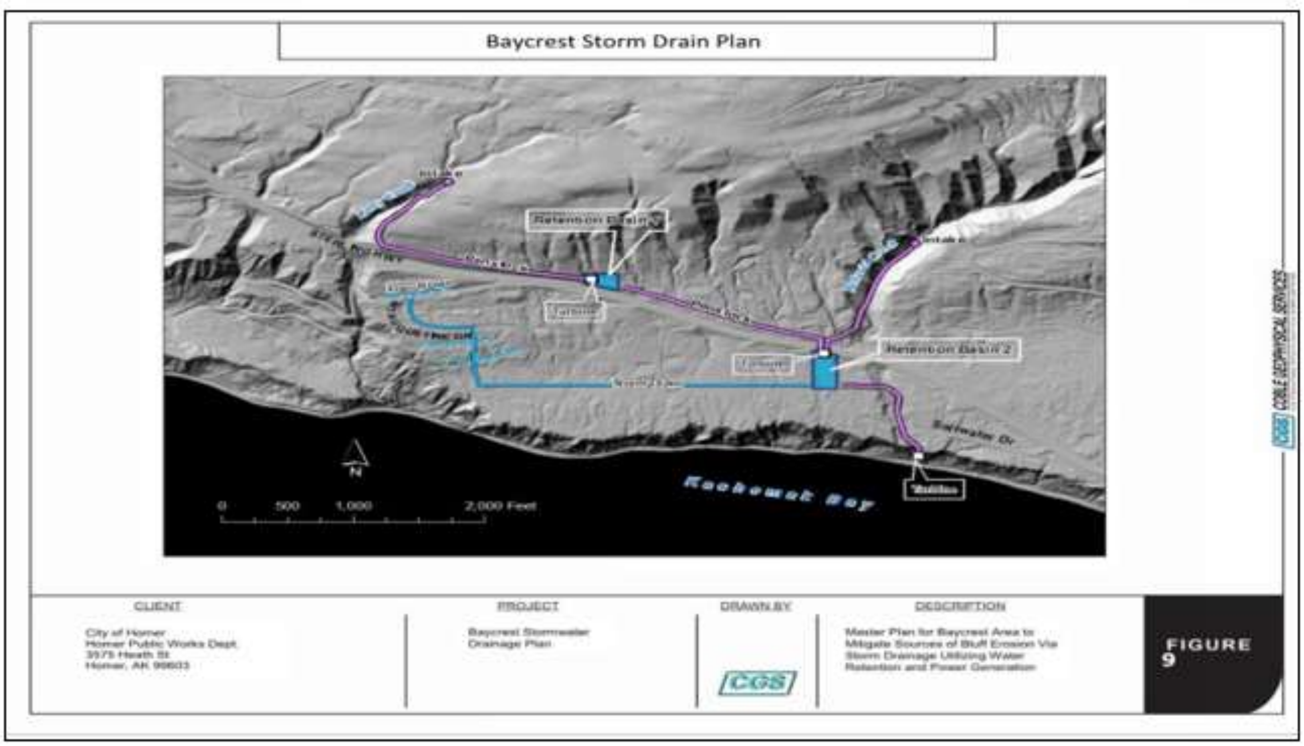
WATERSHED FLOWING INTO BUNNELL AVENUE STORM DRAIN SYSTEM




BUNNELL AVENUE SYSTEM - STATUS
• Acquired ADEC ACWA grant
• Completed 50% design
• Issued contracts for fabrication
• Triggered 2nd generation project – Hansen Avenue Sponge
• Seeking for easement rights & funding


GREEN INFRASTRUCTURE ELEMENT #3 – BAYCREST STORM DRAIN
• Carries drainage from Baycrest Hill to Bidarki Creek
• Reduces potential for bluff erosion and slope instability
• Protects water quality of Kachemak Bay
• Provides opportunity for mini-hydro facility


BAYCREST
N
0 10 20 40 Miles
0 1 2 4 Miles


Baycrest Storm Drain Plan
Retention Basin 1
Turbine
Retention Basin 2
Kachemak Bay
0 500 1,000 2,000 Feet
N
CLIENT
City of Homer
Homer Public Works Dept.
3575 Heath St
Homer, AK 99603
PROJECT
Baycrest Stormwater
Drainage Plan
DRAWN BY
CGS
DESCRIPTION
Master Plan for Baycrest Area to
Mitigate Sources of Bluff Erosion Via
Storm Drainage Utilizing Water
Retention and Power Generation
FIGURE
9

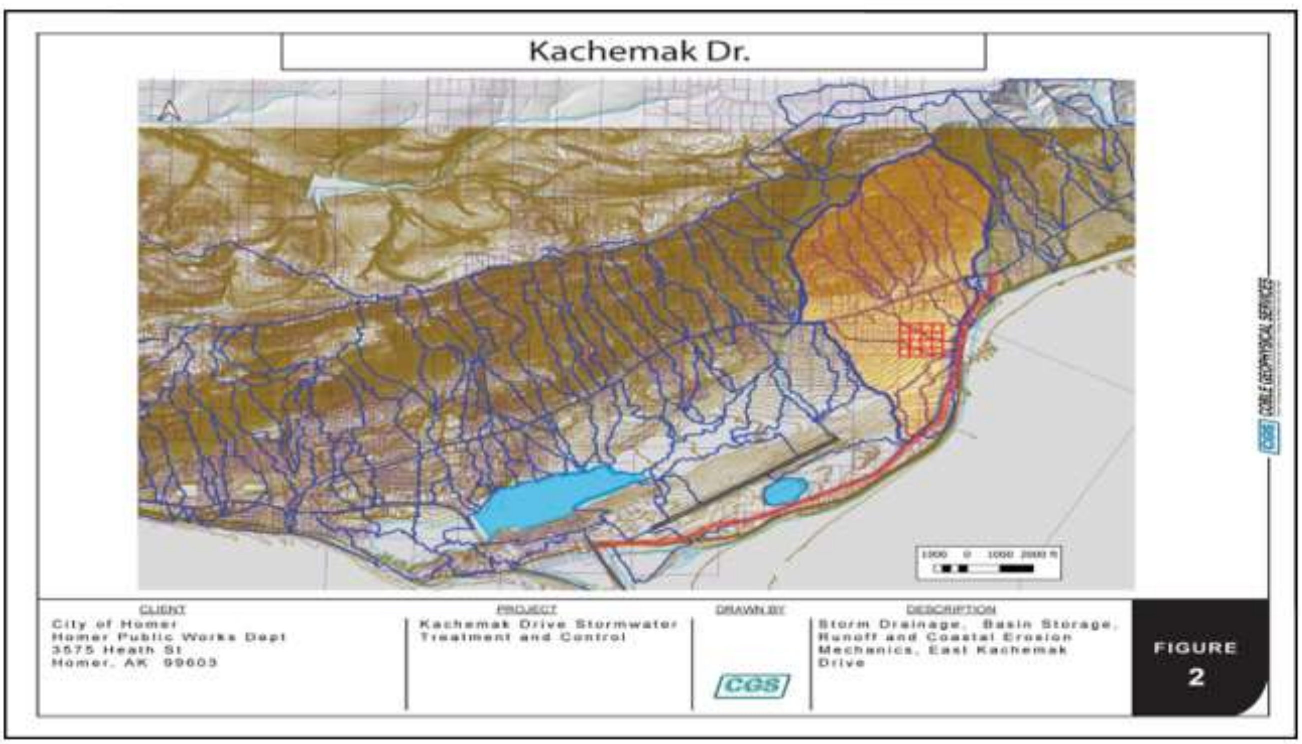
BAYCREST SYSTEM – STATUS

- Have some City funding for design.
- Waiting to see how AK DOT/PF will affect the drainagae with the Sterling Highway renovation project.

GREEN INFRASTRUCTURE ELEMENT #4 – KACHEMAK SPONGE

- Uses existing wetlands to store/treat drainage from industrial/commercial land and upstream watersheds, including those in Kachemak City
- Reduces potential for bluff erosion on Kachemak Dr. East
- Protects water quality of Kachemak Bay


KACHEMAK
SPONGE


Kachemak Dr.
CLIENT
City of Homer
Homer Public Works Dept
3575 Heath St
Homer, AK 99603
PROJECT
Kachemak Drive Stormwater
Treatment and Control
DRAWN BY
CGS
DESCRIPTION
Storm Drainage, Basin Storage,
Runoff and Coastal Erosion
Mechanics, East Kachemak
Drive
FIGURE
2
COBLE GEOPHYSICAL SERVICES

LAYOUT OF THE KACHEMAK SPONGE STORM WATER WORKS

THE KACHEMAK SPONGE –

KACHEMAK SPONGE SYSTEM – STATUS

- Partnered with KBNERR to apply for NOAA Grant
- Have issued professional service contracts
- Partnering w/ KHLT for property purchases

NEXT STEPS

- Acquire real estate
- Design/build the projects
- Review/adjust regulations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Cook Inlet Offshore Oil & Gas Platforms:
Dismantlement, Disposal and Restoral Obligations
&
Opportunities for More Intensive Monitoring,
Management and Restoral of the Cook Inlet Biome &
Accelerating the Transition to Clean Energy
Developed for: Cook Inlet Water Quality Summit
Presentation: Tuesday, October 24th, Anchorage, Alaska
Developed by: Mark Foster, MAFA
MAFA
Page 1
Draft: 21 Oct 2023

Table of Contents

Abstract

- Cook Inlet Offshore Platform and associated pipelines dismantlement, disposal and restoral (DR&R) obligations may be on the order of $2 billion (2023$) and come due in the next 10-20 years. Extending the life of the platforms for potential wind and tidal technology assessment and development creates an economic windfall by delaying DR&R expenditures; a 10-year life extension may create an economic windfall on the order of $260 million (2023$). Potential high value investments of the economic windfall from delays in DR&R include: 1) monitoring, managing and mitigating the fossil fuel legacy midden piles (including impacts on water quality), 2) accelerating investments in the assessments and project development in support of the transition to clean energy, e.g., wind, tidal, and CCUS, and 3) analyzing and developing opportunities for restoring and enhancing critical habitat in/around the Cook Inlet

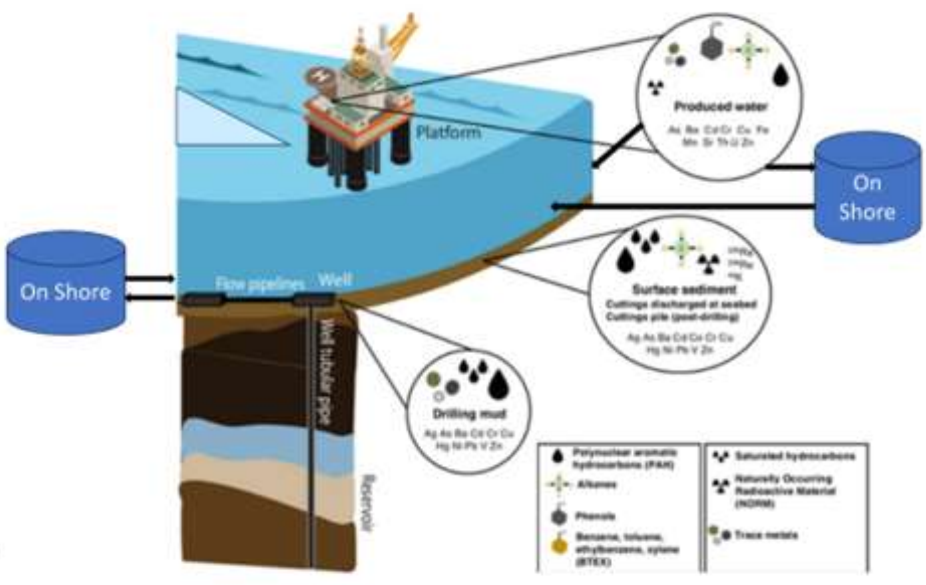
Overview

- Offshore oil & gas platform environmental sources overview
- Cook Inlet Offshore Infrastructure Snapshots (2023)
- What to do with platforms after the end of their oil & gas economic life?
  - Dismantle, Remove and Restore (DR&R) obligations
- Cook Inlet Offshore Oil & Gas Platform Developments
  - Tidal, Wind resource assessment and potential development
- Cook Inlet Dismantle, Remove and Restore Obligation Estimates
  - 1980 National Science Academy Estimates
  - 2005 Cook Inlet Regional Citizens Advisory Council, Anne Rothe Report
  - 2012 Pacific Energy Bankruptcy; Federal DR&R Estimate for Osprey Platform
  - 2022 Beluga River Unit DR&R Update; PRA Study; On-shore facilities DR&R unit costs
  - 2023 MAFA Cook Inlet Offshore Platform DR&R Class 5 Cost Estimate Updates
- Cook Inlet DR&R deferrals
  - Estimated magnitude of potential delays in DR&R
  - Impact of delay on the net present value of DR&R expenditures
- Potential high value investments of economic windfall associated with Delayed DR&R

Offshore Oil & Gas Platforms

Key environmental sources and offshore activities related to potential release, discharge or accumulation of offshore petroleum-associated contaminants during operations that may be present at decommissioning...

...the potential midden pile constituents...



Adapted from Watson, et al, Offshore decommissioning horizon scan (2023)

Offshore Oil & Gas Platforms

Cook Inlet Platforms and Pipelines

Figure 1.1-1 Pipelines in the Central Cook Inlet area, showing both in-scope and out-of-scope pipelines

Source: Cook Inlet Pipeline Infrastructure Assessment, Nuka Research and Planning Group, LLC, ADEC/CIRCAC, 2020

Offshore Oil & Gas Platforms

Cook Inlet Platforms and Pipelines with Petroleum Production Units

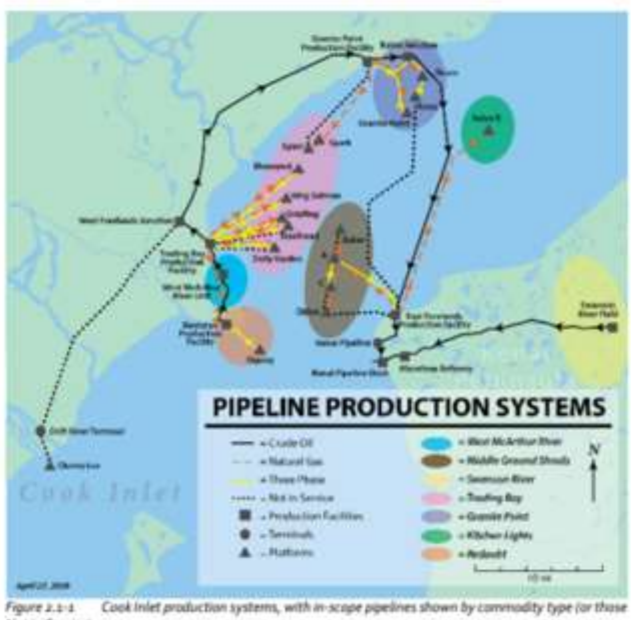


Figure 2.1-1 Cook Inlet production systems, with in-scope pipelines shown by commodity type (or those Not in Service)

Source: Cook Inlet Pipeline Infrastructure Assessment, Nuka Research and Planning Group, LLC, ADEC/CIRCAC, 2020

Offshore Oil & Gas Platforms

Cook Inlet Platforms and Pipelines

SOA DNR DOG June 2023 Oil & Gas Activity Map

NB:
Middle Ground Shoals unit terminated; Hilcorp evaluating North of Baker; considering wind, tidal and CCS on "lighthouse" [no longer producing] platforms

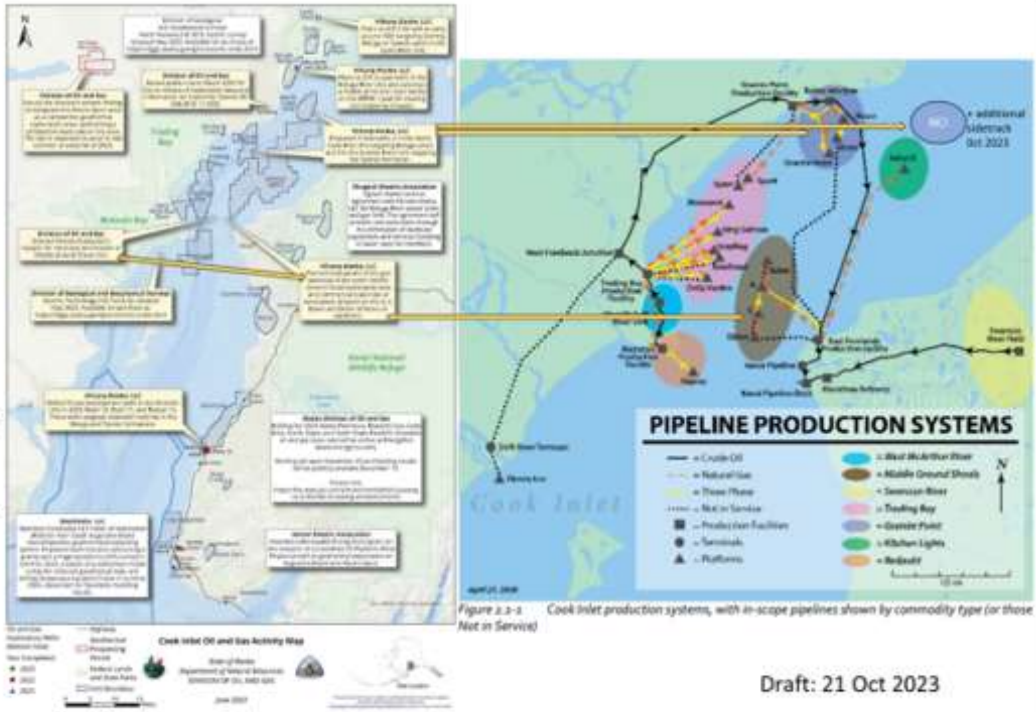


Figure 2.1-1 Cook Inlet production systems, with in-scope pipelines shown by commodity type (or those Not in Service)

MAFA

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Offshore Oil & Gas Platforms

What options do we have with offshore platforms after the end of their oil & gas lease economic production life?

Source: Offshore decommissioning horizon scan, Watson, et al, Science of the Total Environment, 878 (2023) 163015

MAFA annotations → Restore

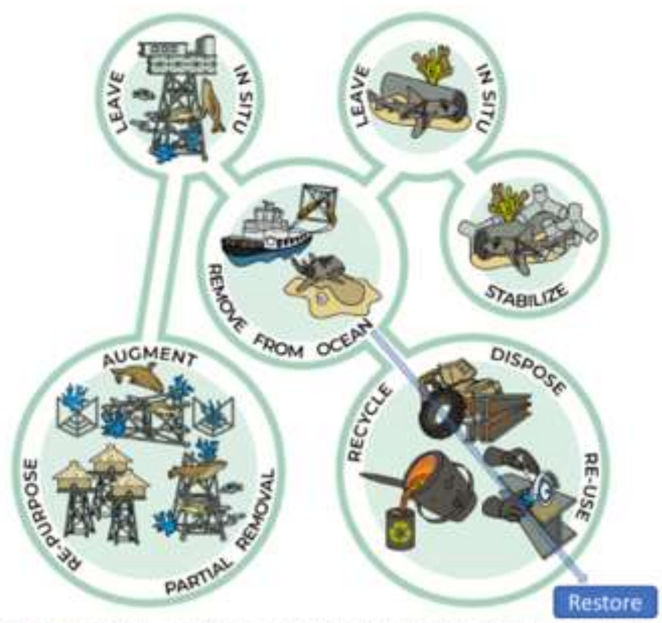

Fig. 2. Range of alternative options for decommissioning offshore platforms and subsea pipelines. Not pictured here is the potential for augmenting any retained structures with purpose-built modules to enhance the 'reef'.

MAFA

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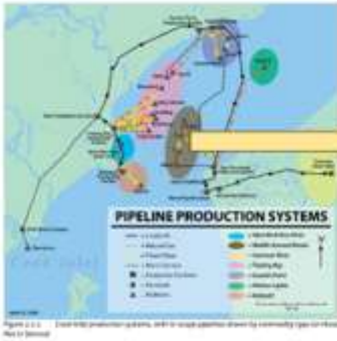
Offshore Oil & Gas Platforms

Cook Inlet Platforms and Pipelines

Middle Ground Shoal Lease Plan of Operations (September 1, 2023)



The Baker platform has a total of 25 wells which are currently shut in. Platform A has a total of 24 wells which are currently shut in. Platform C has a total of 24 wells which are currently shut in. Hilcorp is considering a Plugging and Abandoning campaign on Platform C.

The Baker platform was constructed in 1965 with 4 legs in -102' mean low water (MLW). It is currently light housed but could be returned to production at a later date. Baker has an 8" nominal oil pipeline and an 8" nominal gas pipeline, both are 11,000' in length and route to Platform A. Platform A was constructed in 1964 with 4 legs in -90' (MLW). It is currently shut in and averaged 880 BOPD prior to being shut in. Platform A has an 8" nominal oil pipeline flowing gas and an 8" nominal gas pipeline NIS (not in service). Both are 7 miles in length that route to the MGS onshore facility. Platform C was constructed in 1967 with 4 legs in -73' (MLW). It is currently shut in and averaged 450 BOPD prior to being shut in. Platform C has an 8" nominal oil pipeline (NIS) and an 8"/10" nominal gas pipeline (NIS) that are 2.5 miles in length and route to Platform A.

1. Hilcorp intends to conduct various field studies to determine the potential for future production on ADLS 17595, 18754 and 18756. Hilcorp will provide the Division of Oil and Gas with annual updates on such efforts beginning no later than April 1, 2024 until 2026 or the return of production, whichever is first. Hilcorp plans to conduct a field study on MGS exploration area to identify potential drilling targets. This study will also evaluate the potential to drill from the Baker Platform or whether a new exploration/ production platform would be required. Hilcorp anticipates evaluating costs related to construction of new drilling and production platform. A new offshore platform, if built, would also likely require installation of new pipelines to shore. This creates a contingency to potentially reactivate Platform A in the future.

Section IX: Rehabilitation Plan.

Proposed Level of Infrastructure, Facilities and Equipment Removal:

This operations plan is focused on returning the leases, lands and facilities to production, however Hilcorp is also concurrently exploring the future utilization of such facilities and lands for alternative energy objectives, including tidal, wind and CCUS. As a result, Hilcorp's plan for the rehabilitation of the applicable leases, lands and facilities is subject to ongoing discussions with the state related to such future utilization. Hilcorp will continue to coordinate with the state, and will prepare any required plans, to ensure the proper rehabilitation measures are accomplished in a manner that takes into consideration the ultimate use of the leases, lands and facilities at the end of their useful life.

Description of Restoration and Rehabilitation Activities for Vegetation, Habitat, Impacted Wildlife and Other Applicable Resources:

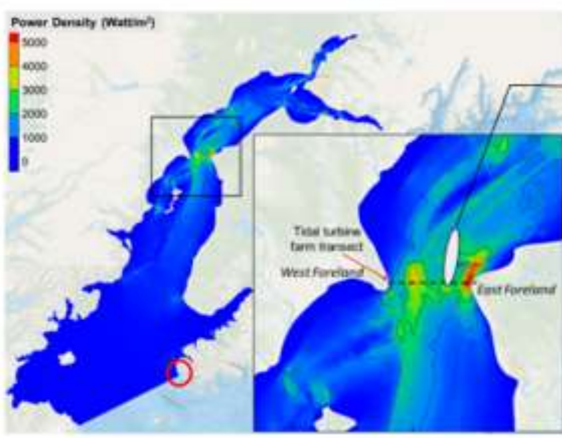
Restoration and Rehabilitation Activities will be determined when formal abandonment plans are submitted.

Offshore Oil & Gas Platforms

Cook Inlet Platforms and Pipelines

Tidal Prospects

Dillon, C, and A platforms over the voluntarily terminated Middle Ground Shoals Unit (2023)



Baker, A, C, & Dillon platforms sit between high tidal flow / high power density tidal resource

Cook Inlet theoretical tidal power estimate

46MW mean annual power rate, assuming 20% blockage rate, X 8760 hours per year = 402,960 MWh/year.

Value of avoided natural gas fired electrical generation at $12-14/mmbtu (imported LNG)

~$40 million a year

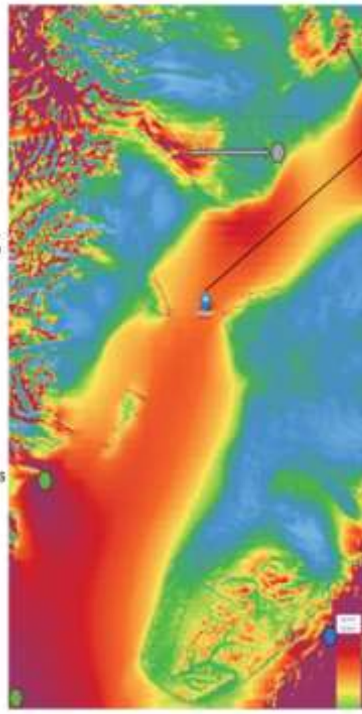
Source: A Tidal Hydrodynamic Model for Cook Inlet, Alaska, to Support Tidal Energy Resource Characterization, Wang & Yang, Pacific Northwest National Laboratory, Journal of Marine Science & Engineering, 2020, 8 (4), 254. https://doi.org/10.3390/jmse8040254

Offshore Oil & Gas Platforms

Cook Inlet Platforms and Pipelines

Wind Prospects

Dillon, C, and A Platforms over the voluntarily terminated Middle Ground Shoals Unit



Baker, A, C, & Dillon Platforms sit in modest offshore wind resource area:
wind density$_{p10}$ ~700W/m^2 at 100m

Higher value on-shore wind resources exist in vicinity of the **Beluga Power Station** and associated transmission system,
wind density$_{p10}$ >1200-1880W /m^2 at 100m

and **Bradley Lake Hydro Power Station,**
wind density$_{p10}$ >2000-4000W /m^2 at 100m

Higher value off-shore wind resources exist in vicinity of Chisik Island and Augustine
wind density$_{p10}$ > 1200-1700W/m^2 at 100m

Source: Global Wind Atlas, Mean Power Density, w/m^2

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Cook Inlet Dismantle, Remove and Restore Obligation Estimates

- Aggregate Offshore Cook Inlet Oil & Gas Platforms DR&R Class 5 Estimate
  - $1.4 to $2.6 billion (2023$) [MAFA Class 5 Estimate, October 2023]
- Sources:
  - 1980 National Science Academy Estimates
  - 2005 Cook Inlet Regional Citizens Advisory Council, Anne Rothe Report
  - 2012 Pacific Energy Bankruptcy; Federal DR&R Estimate for Osprey Platform
  - 2022 Beluga River Unit DR&R Update; PRA Study; On-shore facilities DR&R unit costs
  - 2023 MAFA Cook Inlet Offshore Platform DR&R Cost Escalation Estimates

MAFA Page 13 Draft: 21 Oct 2023

Analysis / Discussion
Outlook for Economic Life of CI Offshore Platforms

- Oil & Gas Exploration and Development Outlook
  - SOA DNR DOG Cook Inlet Gas Forecast (January 2023)
  - ENSTAR / Berkeley Research Group (June 2023)
  - Chugach Electric / Black & Veatch Cook Inlet Gas Supply Options (June 2023/August 2023 RCA Filing)
  - MAFA Cook Inlet Energy Outlook; Value of Clean Energy & Energy Storage Investments (October 2023)
- Potential life extension of Cook Inlet platforms for clean energy technology and economic opportunity assessments, e.g., wind, tidal, energy storage, CCUS
  - Tidal: Ben Loeffler, University of Alaska Fairbanks, Alaska Center for Energy and Power, "estimated it will be **10 to 20 years** before a company can make a meaningful foothold on the Railbelt's grid with a tidal project." [KDLL Kenai-Soldotna Public Radio, https://www.kdll.org/local-news/2023-01-25/hilcorp-to-demo-tidal-tech-from-cook-inlet-platforms]
  - Offshore Wind: Atin Jain, Senior Wind Analyst, Bloomberg New Energy Finance, "total US [offshore wind] capacity to reach 16.4 gigawatts by the end of the decade and 44.2 GW by 2035 [compared to 0.2 gigawatts in 2023] [Bloomberg, October 18, 2023]
    - MAFA: While Bloomberg NEF is still projecting substantial compound annual growth rates for U.S. offshore wind industry despite recent inflation and performance issues, the early rapid growth remains concentrated on the East Coast. MAFA expects West Coast development to lag and Alaska offshore wind to lag behind the West Coast, depending in part on development of a robust offshore wind industry on the West Coast, including purpose-built ships, ship-cranes, and support vessels in addition to offshore wind turbine components. Alaska offshore wind developments in the Cook Inlet may be on the order of 12-15 years out from 2023.
  - Energy Storage: Young, et al, NREL, Electrical energy storage using compressed gas in depleted hydraulically fractured wells, iScience, November, 2021, comparing hydraulically fractured wells instead of salt dome formations to store compressed natural gas that can be released to spin an expander/generator when electrical demand is high.
    - MAFA: In early stages of technology modeling. Technology development and field pilot projects may be 10-15 years out.
  - CCUS: Paskvan, et al, UAF Institute of Northern Engineering, Petroleum Engineering, Alaska CCUS Workgroup Roadmap to Commercial Deployment, preprint (2023)
    - MAFA Interpolation: Alaska's most economically attractive CCUS opportunities benefit from low-cost fuel, e.g., natural gas fired power plants located on the North Slope. Natural gas carbon capture might become attractive on the North Slope with an increase in 45Q tax credits (beyond the IRA increments) to make up for the high cost of construction on the North Slope [Trans Canada/Exxon, UBS Carbon Capture Project Cost Estimate, 2012, escalated to 2023$]. The high and rising cost of natural gas in the Cook Inlet drives up CCUS costs and require a substantial increase in the 45Q tax credits (beyond the IRA increments) to become economical. In the absence of a substantive increase in the 45Q tax credits for CCUS for high-cost frontier regions, e.g., Cook Inlet, technology improvements to drive down cost and increase performance to drive CCUS economics toward break-even may be 10-20 years out for the Cook Inlet.

Conclusions

- In aggregate, Cook Inlet Offshore Platform and Associated Pipeline Infrastructure dismantlement, disposal and restoral obligations may be on the order of $1.4-2.6 billion (2023$).
- Some Cook Inlet Offshore Platforms have already discontinued oil and gas production and been "lighthoused", the remaining platforms appear nearing the end of their economic life associated with oil & gas lease exploration and development over the next ten to twenty years.
- Extending the useful life of the offshore platforms, including for potential tidal and wind technology assessment and development creates an economic windfall by delaying large DR&R expenditures; a 10-year life extension may create an economic windfall on the order of $182 to 341 million (mean = $261 million) associated with delayed DR&R expenditures (2023$)
- High value investments of the economic windfall from delays in DR&R include:
  - Monitoring, managing and cleaning up the fossil fuel legacy midden piles in/around the platforms and associated pipeline infrastructure
  - Accelerating investments in the transition to clean energy (tidal, wind, energy storage, CCUS?)
  - Analyzing and developing opportunities for restoring and enhancing critical habitat

Supplemental Materials

- References
- Excel workbook available upon request (mafa@alaska.net):
  - DR&R cost estimates; Cook Inlet Offshore Platform and Pipeline Cost Escalation Estimates net of technology improvements, oil & gas economic life of platforms, economic value of platform life extension
- MAFA statement of interests, consulting engagements, relevant experience

References

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- Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Artificial Reef Plan (undated, downloaded October 16, 2023)
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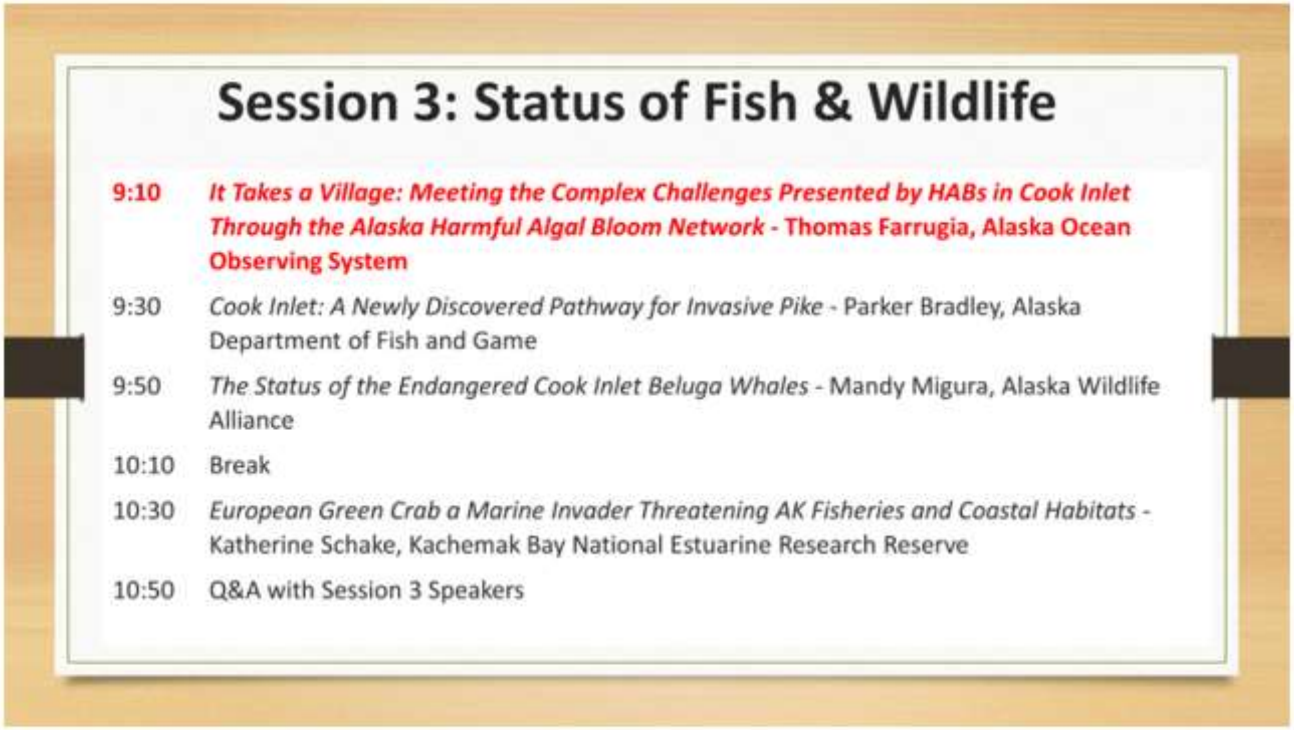
Reference Quick Summary

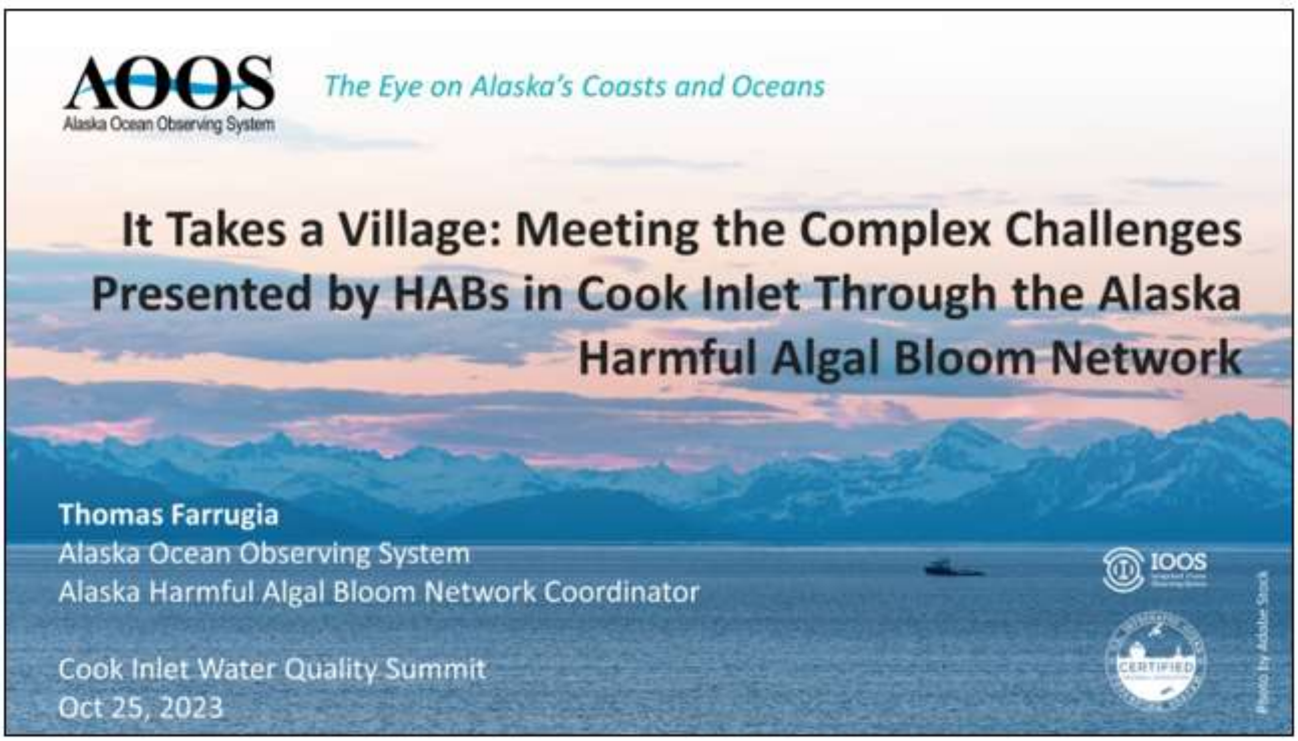
Offshore decommissioning horizon scan: Research priorities to support decision making activities for oil and gas infrastructure, Watson, et al, Science of the Total Environment, Volume 878, 2023, 163015, ISSN 0048-9697, 24 March 2023

- Key research priorities
  - Contaminants
    - Figure 6. Key environmental sources and offshore O&G associated activities related to potential release, discharge and/or accumulation of offshore petroleum-related contaminants during operations that may be present at decommissioning. Adapted from MacIntosh, et al. (2021)
    - Whilst there are existing regulatory requirements that cover basic environmental protection from offshore waste and produced water, all contaminants need to be identified and assessed carefully as part of the risk assessment framework (e.g., OSPAR Commission,, 2019)
    - The spatial extent and temporal legacy of many contaminants has not often been studied, although there is evidence of drill cuttings impacting biological communities over 1 km away and over timescales of decades (Henry, et al., 2017)
    - Understanding the long-term, site-specific environmental rate and consequence of contaminants of primary concern is key to adequately assess the risks from each of full removal, partial removal and leave in situ decommissioning options.
    - Complementing lab studies for less studied contaminants, e.g., Naturally Occurring Radioactive Materials (NORMs), includes in-situ investigations of before and after impacts of contaminant concentrations, pre- and post-removal, because such operations can re-suspend contaminants and a post-removal restart of sea-bed fishing at the site may increase resuspension of contaminants in local sediments.
  - Risk acceptability & thresholds
    - Most environmental, societal, technical and economic factors associated with offshore decommissioning activities do not have well defined baselines from which to measure potential impacts.
  - Ongoing cost and responsibility; Reuse or repurposing feasibility
    - Who pays? For baseline, maintenance, monitoring and management activities.
  - Ecosystem services and metrics
    - Develop explicit estimates of the value of ecosystem services and tradeoffs to increase the transparency of the decision-making process
  - Ecological connectivity; Ecosystem production vs. attraction
    - Ecological diversity, productivity and connectivity through movement and dispersal

MAF statement of interests, selected consulting engagements/relevant experience

- No competing financial interest
- Selected consulting engagements/relevant experience:
  - Cook Inlet Keeper: Cook Inlet Natural Gas Outlook: Donlin Mine Gas Demand Implications & Mitigation (2023)
  - State of Alaska, State Senate President: Due Diligence (2023)
  - University of Alaska Fairbanks, Alaska Center for Energy & Power: Augustine Geothermal Potential Assessment; Arctic/Subarctic Energy Transmission System Cost Outlook, Railbelt Energy Option Scoping (2023)
  - Renewable Energy Alaska Project: Railbelt Energy Outlook (2022-2023)
  - Pacific Environment: Alaska Energy Outlook (2022-2023)
  - Peter Pan Seafood, LLC: Litigation Support (2022-2023)
  - AML&P Board of Directors Audit Committee Chair: Review of BRU DR&R Obligations, (2009)
  - Kuukpik Corporation: Alpine Natural Gas Supply for Nuiqsut Heat & Power, Surface Use Agreement Negotiation Support, Oil & Gas Project Development Due Diligence (2004-2015)
  - North Slope Borough: Service Area Ten Utility Rate Development, Alaska North Slope DR&R Obligation Assessments (2004)
  - Danube University MBA Program Lecturer (2000-2004)
  - Trans Alaska Pipeline System DR&R Obligations in TAPS Tariff Methodology; Cook Inlet Pipeline Tariff (APUC, 1990-1993, nnka RCA)
  - Stanford University, Petroleum Engineering, Professor A.J. Horn (1980)


Session 3: Status of Fish & Wildlife
9:10 It Takes a Village: Meeting the Complex Challenges Presented by HABs in Cook Inlet Through the Alaska Harmful Algal Bloom Network - Thomas Farrugia, Alaska Ocean Observing System
9:30 Cook Inlet: A Newly Discovered Pathway for Invasive Pike - Parker Bradley, Alaska Department of Fish and Game
9:50 The Status of the Endangered Cook Inlet Beluga Whales - Mandy Migura, Alaska Wildlife Alliance
10:10 Break
10:30 European Green Crab a Marine Invader Threatening AK Fisheries and Coastal Habitats - Katherine Schake, Kachemak Bay National Estuarine Research Reserve
10:50 Q&A with Session 3 Speakers


AOOS
Alaska Ocean Observing System
The Eye on Alaska's Coasts and Oceans
It Takes a Village: Meeting the Complex Challenges Presented by HABs in Cook Inlet Through the Alaska Harmful Algal Bloom Network
Thomas Farrugia
Alaska Ocean Observing System
Alaska Harmful Algal Bloom Network Coordinator
Cook Inlet Water Quality Summit
Oct 25, 2023
IOOS
CERTIFIED

What is AOOS?

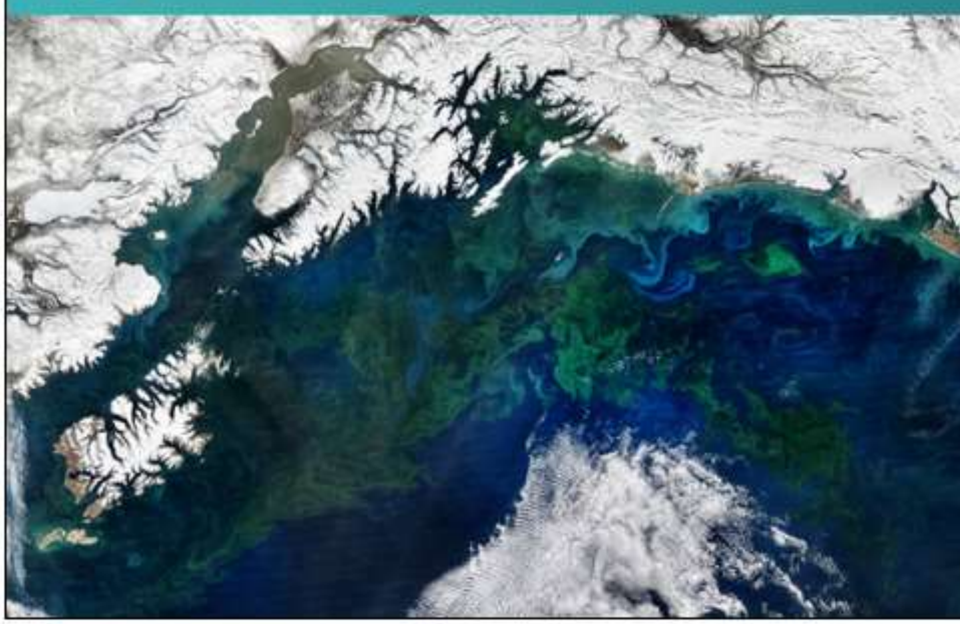
AOOS

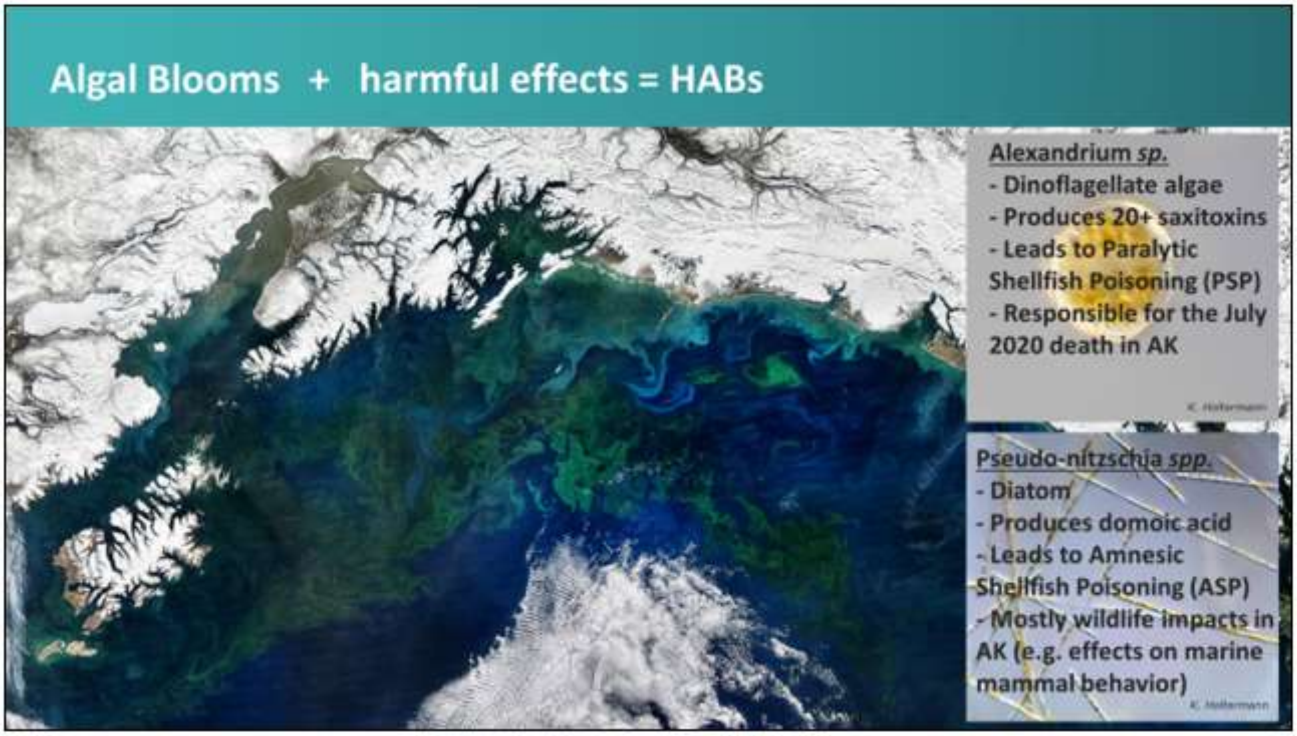
1 of 11 regional associations of Integrated Ocean Observing System (NOAA)

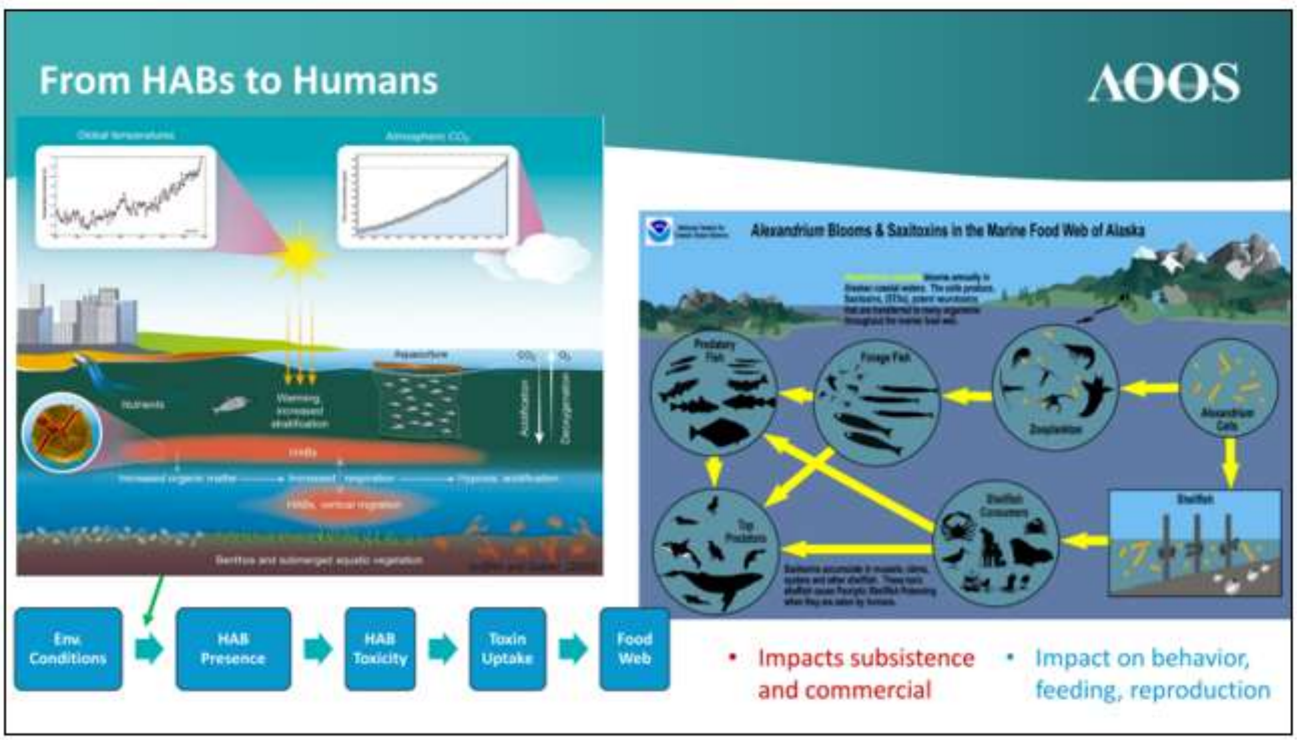
Mission: increase observing and forecasting capacity

1) Sustain observation assets + data portal
2) Fund/test new tech
3) Collaborations and partnerships

Algal Blooms + harmful effects = HABs




Algal Blooms + harmful effects = HABs
Alexandrium sp.
- Dinoflagellate algae
- Produces 20+ saxitoxins
- Leads to Paralytic Shellfish Poisoning (PSP)
- Responsible for the July 2020 death in AK
Pseudo-nitzschia spp.
- Diatom
- Produces domoic acid
- Leads to Amnesic Shellfish Poisoning (ASP)
- Mostly wildlife impacts in AK (e.g. effects on marine mammal behavior)


From HABs to Humans
AOOS
Alexandrium Blooms & Saxitoxins in the Marine Food Web of Alaska
Env. Conditions
HAB Presence
HAB Toxicity
Toxin Uptake
Food Web
• Impacts subsistence and commercial
• Impact on behavior, feeding, reproduction

Minimizing Risks to Food Safety/Security

Need 3 approaches used simultaneously:

I. Monitoring of phytoplankton
   - Simple, good for understanding blooms

II. Toxin testing of food web species
   - Requires labs, can aid in food safety

III. Communication/Outreach
   - Increase awareness, limit impacts locally

Alaska Harmful Algal Bloom Network

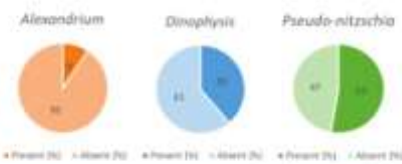
- AHAB Network formed in 2017
- Platform to communicate and support HAB monitoring, research and outreach across Alaska
- Strength of the network comes from our members who contribute to a shared goal

Phytoplankton Monitoring – KBNERR

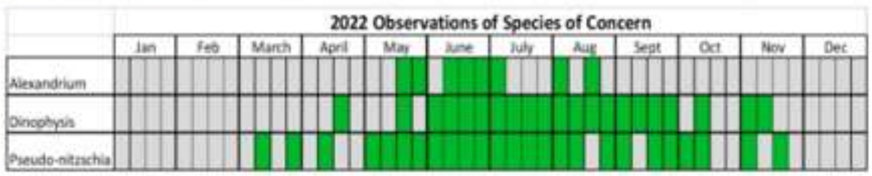
AOOS

2022

- 129 samples from 23 locations
- No blooms detected

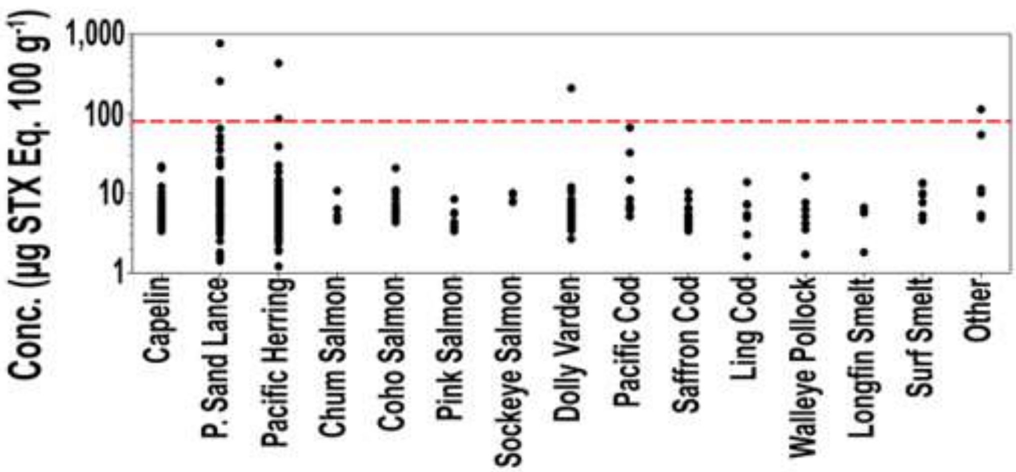


Data from KBNERR



Impacts to Wildlife and Fish – NOAA

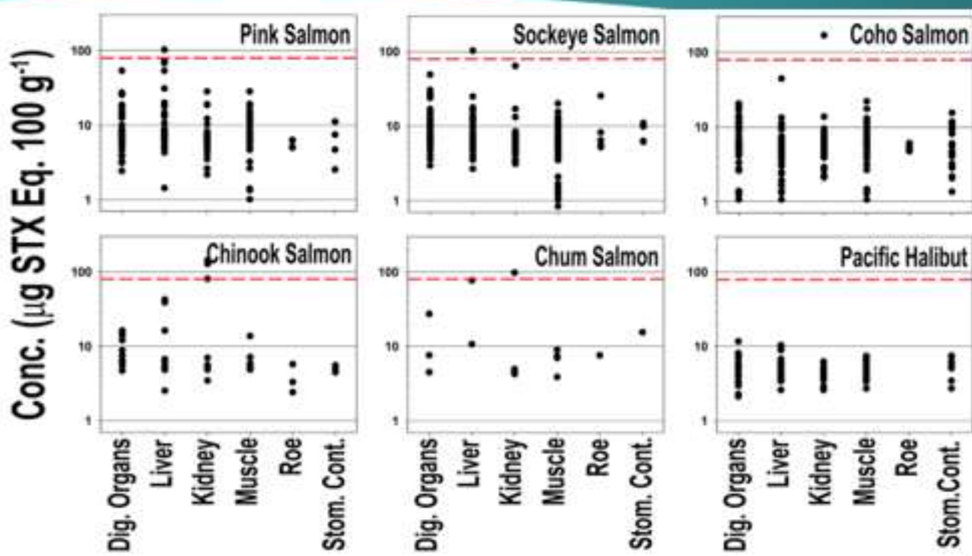
AOOS



Steve Kibler, NOAA

Impacts to Wildlife and Fish – NOAA

AOOS



Steve Kibler, NOAA

Impacts to Wildlife and Fish

AOOS

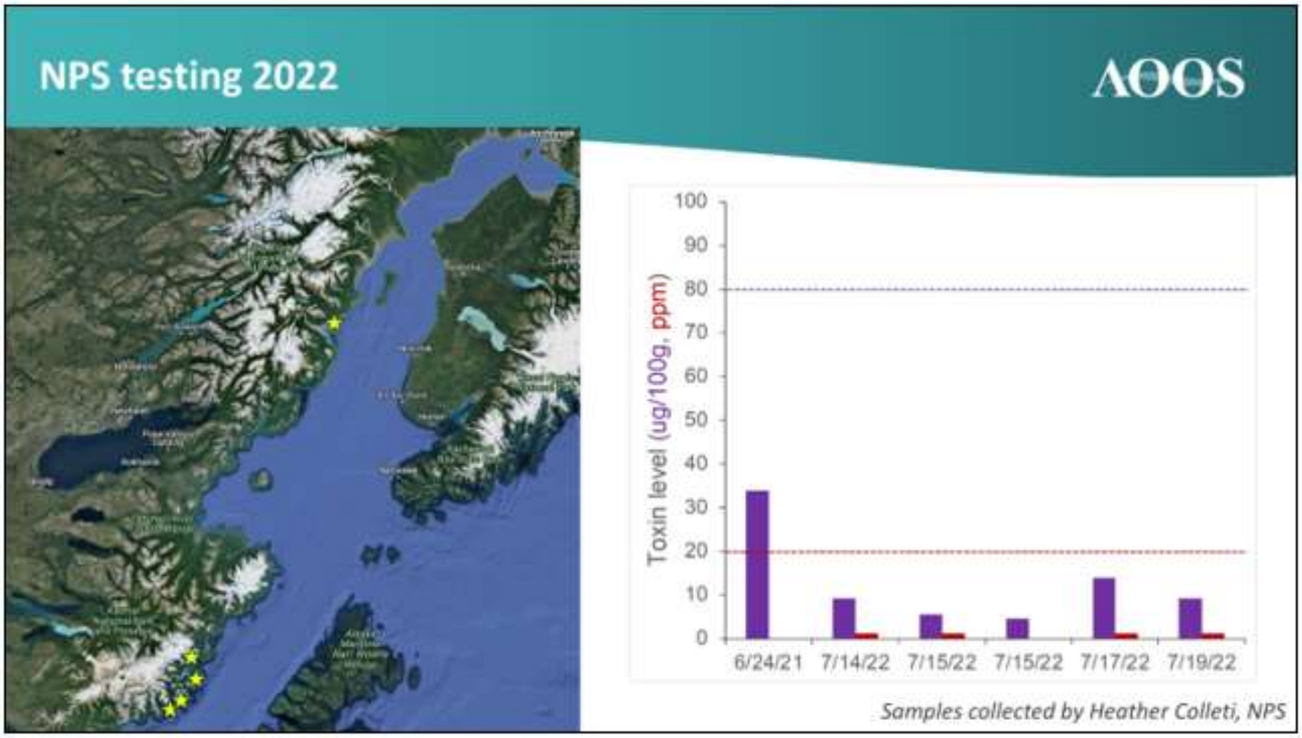
Toxins found in fish, birds and mammals in Alaska

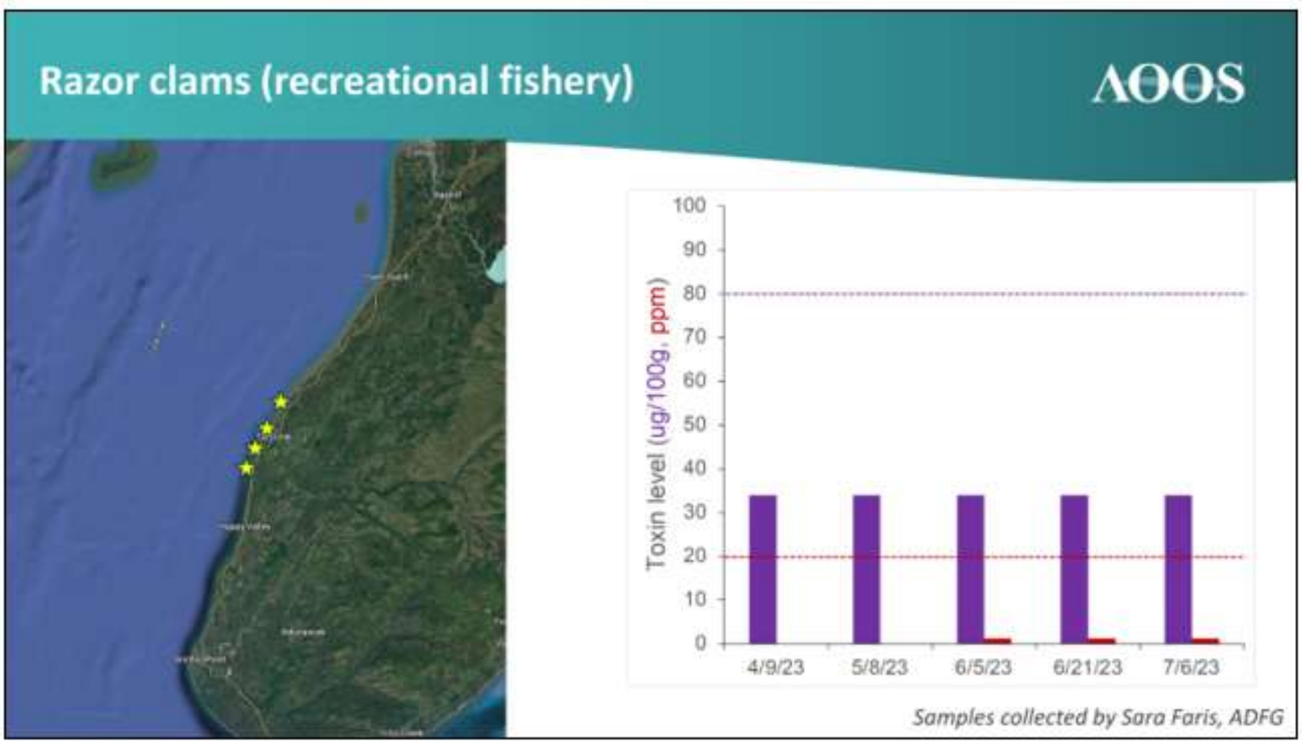
But are these toxin levels harming these populations?

Around the Cook Inlet area:

- Beluga (DA)
- Sea lion/harbor seals (DA)
- Sea otter (PST and DA)

Lefebvre et al. 2016

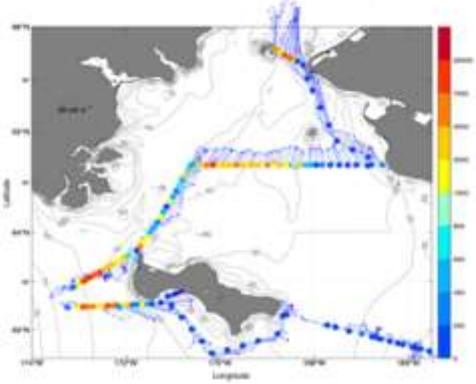

NPS testing 2022
AOOS
Toxin level (ug/100g, ppm)
100
90
80
70
60
50
40
30
20
10
0
6/24/21
7/14/22
7/15/22
7/15/22
7/17/22
7/19/22
Samples collected by Heather Colleti, NPS


Razor clams (recreational fishery)
AOOS
Toxin level (ug/100g, ppm)
100
90
80
70
60
50
40
30
20
10
0
4/9/23
5/8/23
6/5/23
6/21/23
7/6/23
Samples collected by Sara Faris, ADFG

Why monitoring and communication are so important

AOOS

- *Alexandrium* bloom detected in Northern Bering
- Local communication networks spread the word
- Arctic surf clam sent for testing rather than consumed



The Nome Nugget

Alaska's Oldest Newspaper

Saxitoxin Detected In Regional Clam

By Diana Haecker

A six-inch butter clam harvested on August 28 three miles north of Savoonga tested positive for saxitoxins, or paralytic shellfish poison, Norton Sound Health Corporation Environmental Coordinator Emma Pate said.

What is still needed

AOOS

- More monitoring and sampling
- New technologies – Imaging Flow CytoBot (IFCB)
- Funding for coastal communities

Network Members and HAB Monitors

Sitka Tribe of Alaska/SEATOR
KBNERR
Knik Tribe
Alutiiq Pride Marine Institute
Kodiak Area Native Association
Alaska Sea Grant
Qawalangin Tribe of Unalaska
Aleut Community of St Paul
Norton Sound Health Corporation
Native Village of Kotzebue
North Slope Borough
USGS Alaska Science Center
NCCOS
Alaska Veterinary Pathology Services

Woods Hole Oceanographic Institute
Alaska Dept of Health and Social Services
Alaska Dept of Environmental Conservation
Alaska Dept of Fish and Game
NOAA WARRN-West Lab
Alaska Fisheries Science Center
North Pacific Research Board
US Arctic Research Commission
US Fish and Wildlife Service
US Forest Service
Agency for Toxic Substances and Disease Registry
Alaska Pacific University
Columbia University
University of Alaska Fairbanks

University of Alaska Anchorage
Aleutian Pribilof Islands Association
Chugach Regional Resources Commission
Seldovia Village Tribe
Native Village of Port Graham
Sun'aq Tribe of Kodiak
Community members of Utqiagvik
Alaska Conservation Foundation
Applied Research in Environmental Sciences
Center for Alaskan Coastal Studies
Coastal Observation and Seabird Survey Team
Prince William Sound Stewardship Foundation
Axiom Data Science

Thomas Farrugia farrugia@aoos.org

https://ahab.aoos.org/

Threat to Human Health - PSP

AOOS

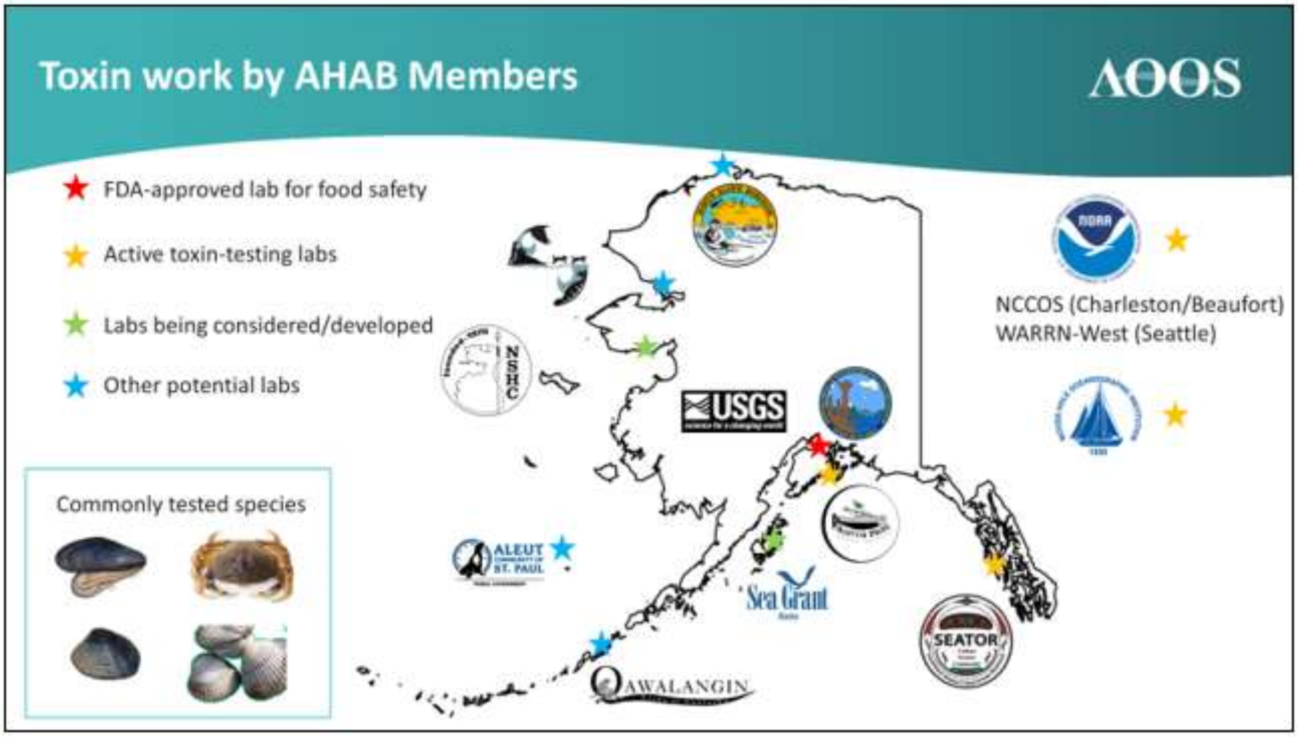
Category of Symptoms	Symptoms
1	Headache
1	Paresthesia (abnormal sensation such as tingling, pricking, numbness)
1	Dizziness (impairment in spatial perception and stability)
1	Nausea, vomiting
1	Vertigo
2	Incoherent speech
2	Nystagmus (involuntary eye movement)
2	Rapid pulse
2	Ataxia (lack of voluntary coordination of muscle movements)
2	Dyspnea (shortness of breath)
2	Backache
3	Dysarthria (motor speech disorder)
3	Dysphagia (difficulty in swallowing)
3	Apnea (suspension of breathing)
3	Weakness of arms and legs
3	Pronounced respiratory difficulties
3	Muscular paralysis
3	Respiratory arrest (without death)
4	Death

Arnich and Thebautl (2018) Dose-response modeling of PSP in humans

When humans consume food with PSP toxin levels above 80µg / 100g of food tissue

IMPORTANT TAKE-HOME POINTS

- Symptoms within minutes to hours.
- Cooking does not remove toxins.
- No antitoxin, supportive care only.
- **SEEK IMMEDIATE MEDICAL CARE!**



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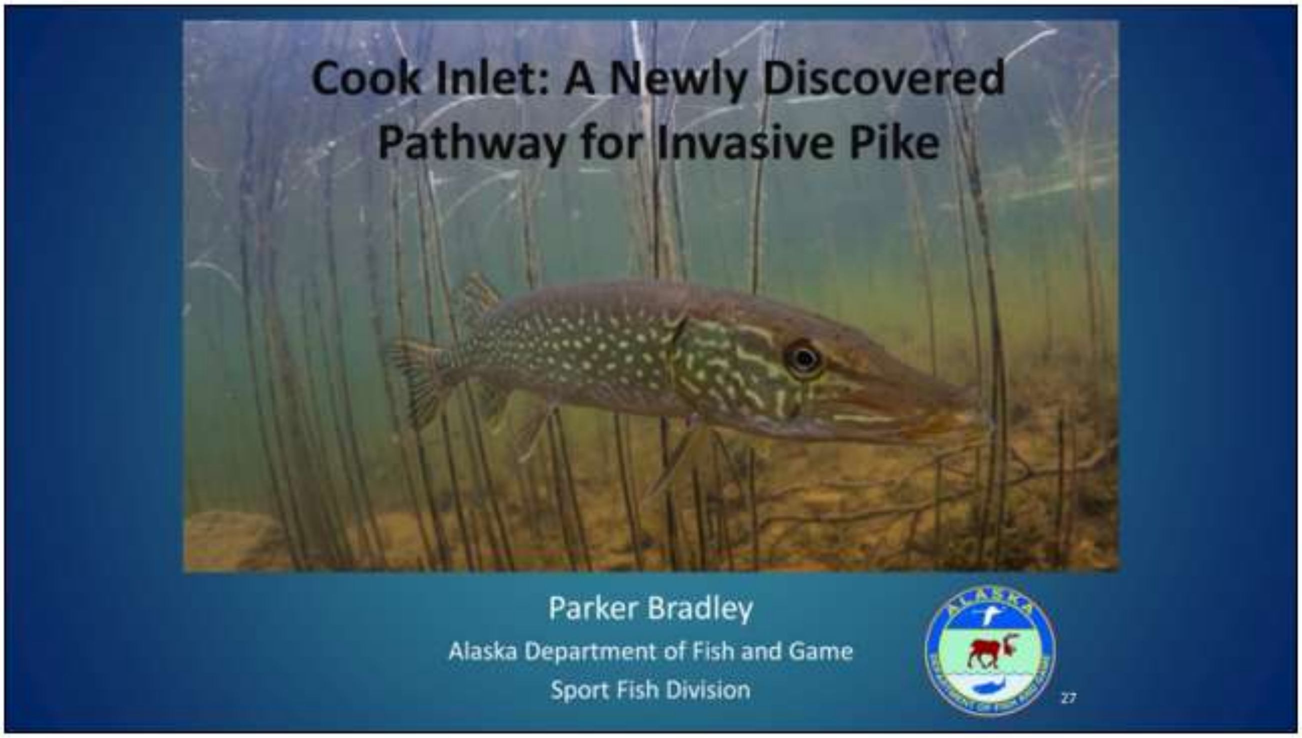


Cook Inlet: A Newly Discovered Pathway for Invasive Pike
Parker Bradley
Alaska Department of Fish and Game
Sport Fish Division
27

Northern Pike Range
Pleistocene Glaciation
Chukchi Sea
Beaufort Sea
Bering Sea
Bristol Bay
Gulf of Alaska
Native Range
Introduced Range
0 125 250 500 Miles
28


Northern Pike Dispersal in Southcentral Alaska
1950s – 1960s
Bulchitna Lake
29


Northern Pike Dispersal in Southcentral Alaska
1970s
30

Northern Pike Dispersal in Southcentral Alaska

1980s

31

Northern Pike Dispersal in Southcentral Alaska

1990s

32

Northern Pike Dispersal in Southcentral Alaska

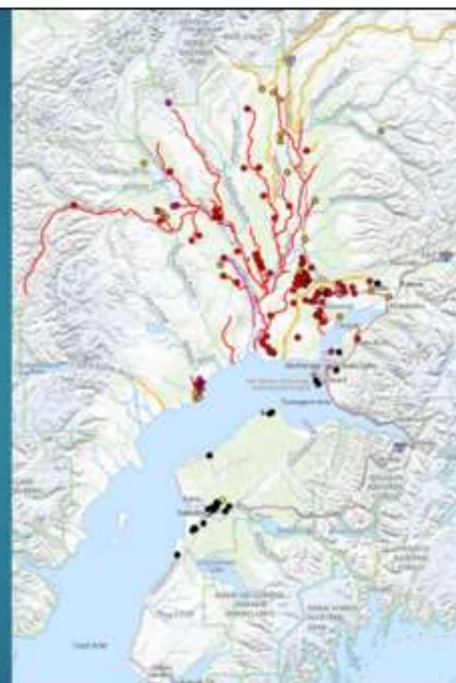
2000s

33

Northern Pike Dispersal in Southcentral Alaska

Today

> 100 water bodies with invasive pike



34

- Where pike have been introduced, juvenile salmonids often rear in the same habitats.
- Impacts tend to be greatest when there is a high degree of habitat overlap with northern pike.
- Habitat variability may mitigate the degree of predation risk.

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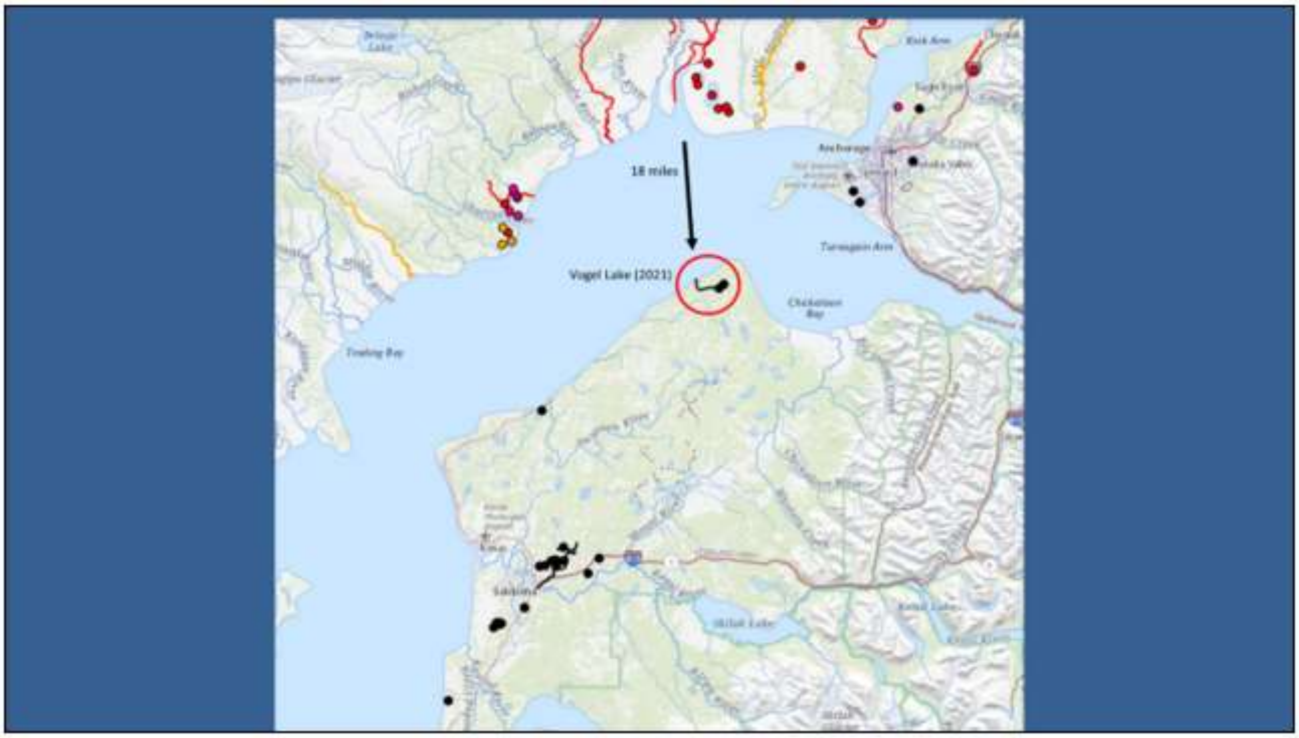
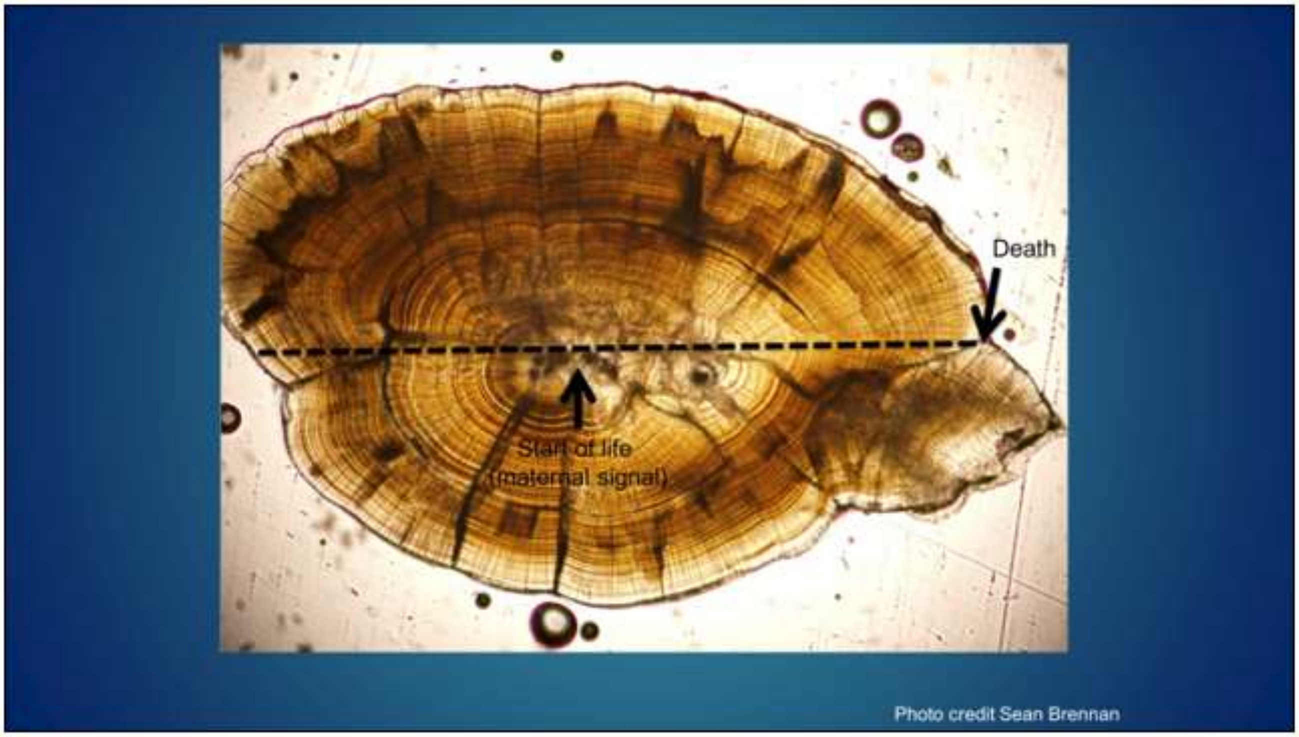
Kenai Peninsula pike eradication
Arc L. 2008
Stormy L. 2012
Hall and Tiny L. 2011
Kenai Peninsula Pike Free!!
We thought…
Scout L. 2009
Soldotna CK Drainage 2014-2017
Tote Road Lakes 2018

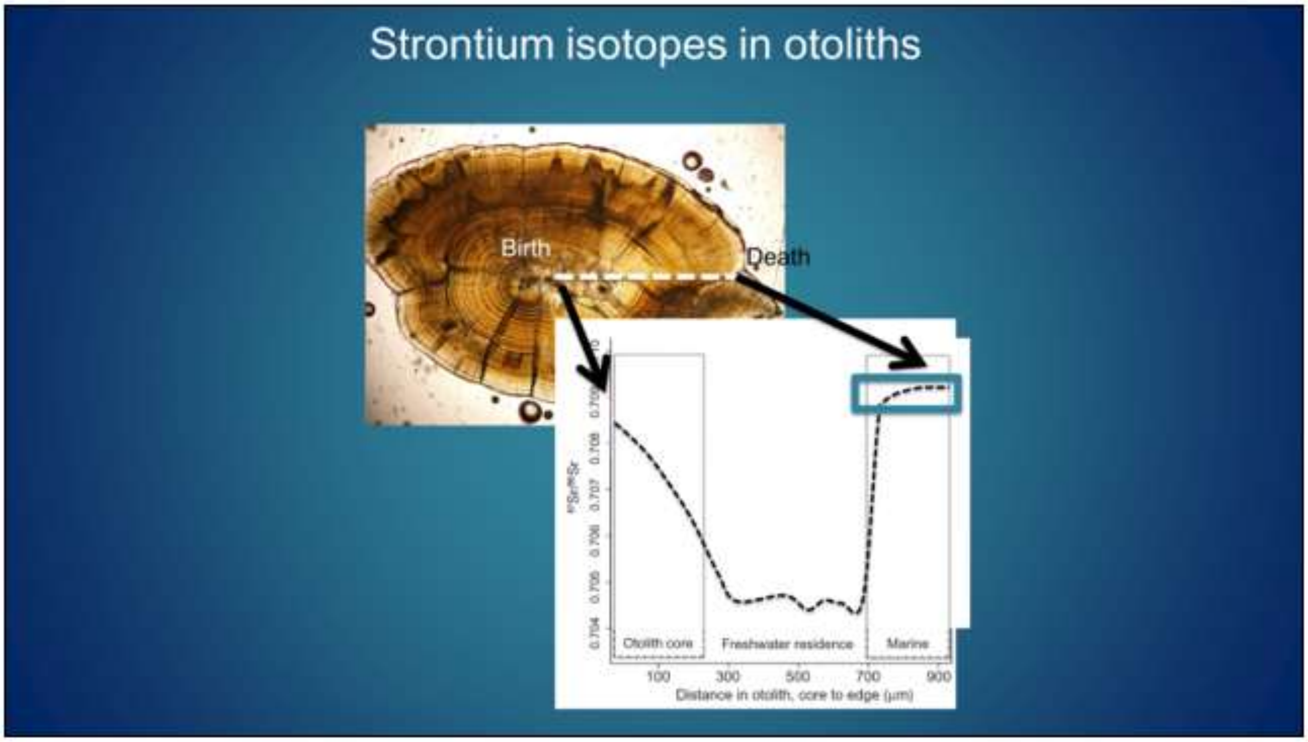


18 miles
Vogel Lake (2021)
Anchorage

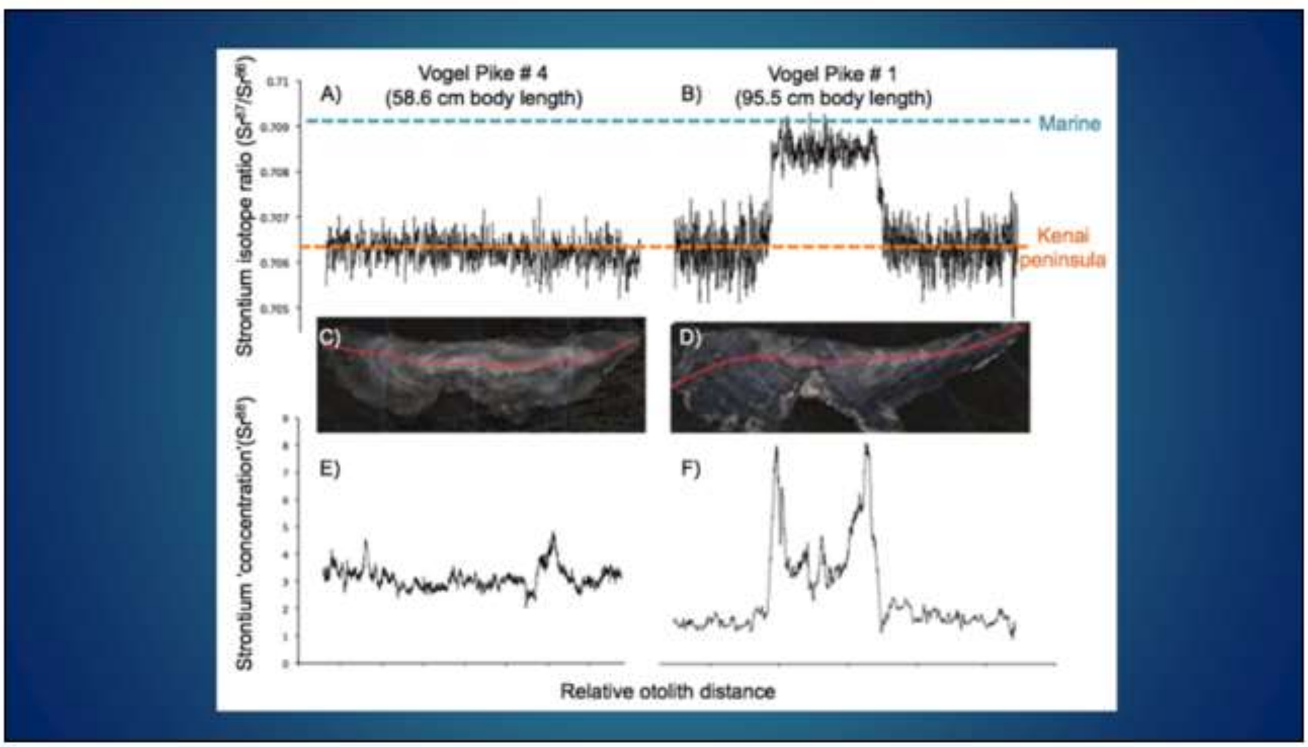
38


Death
Start of life
(maternal signal)
Photo credit Sean Brennan


Alaska Stable Isotope Facility, UAF

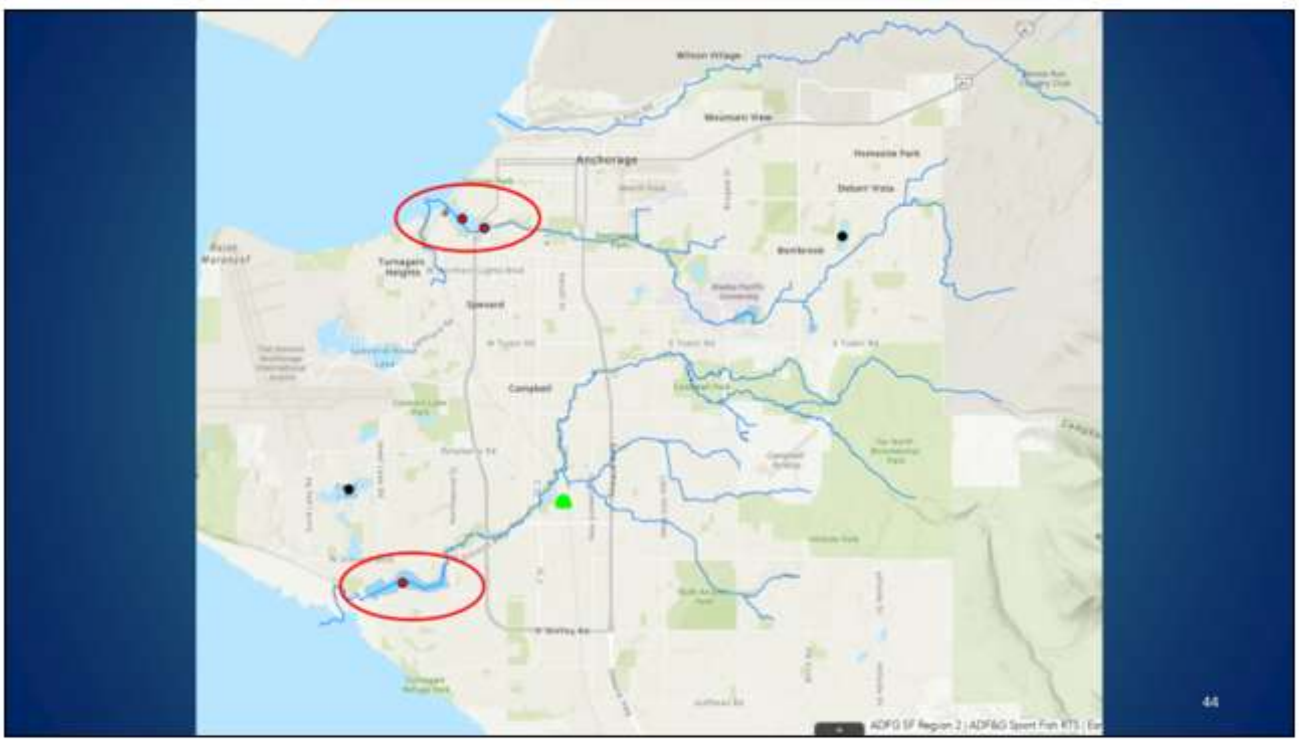


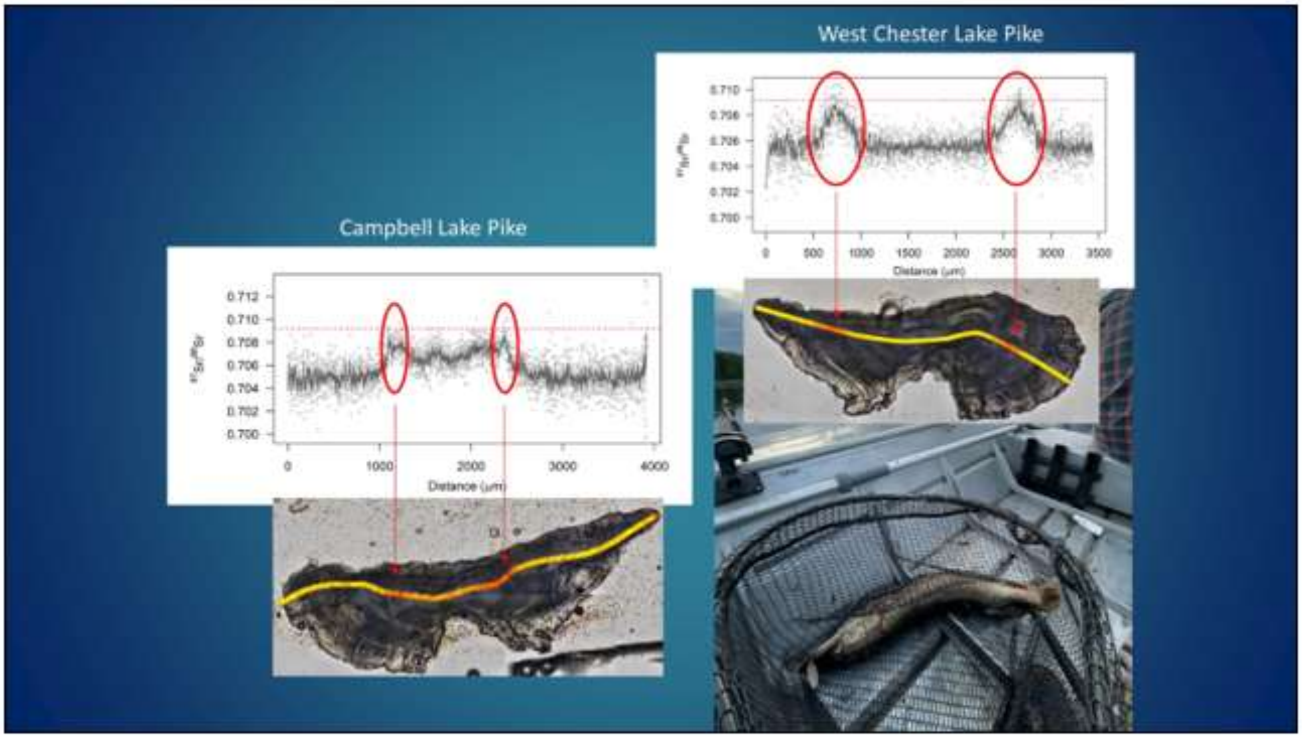
Strontium isotopes in otoliths
Birth
Death
Otolith core
Freshwater residence
Marine
0.704
0.705
0.706
0.707
0.708
100
300
500
700
900
Distance in otolith, core to edge (μm)



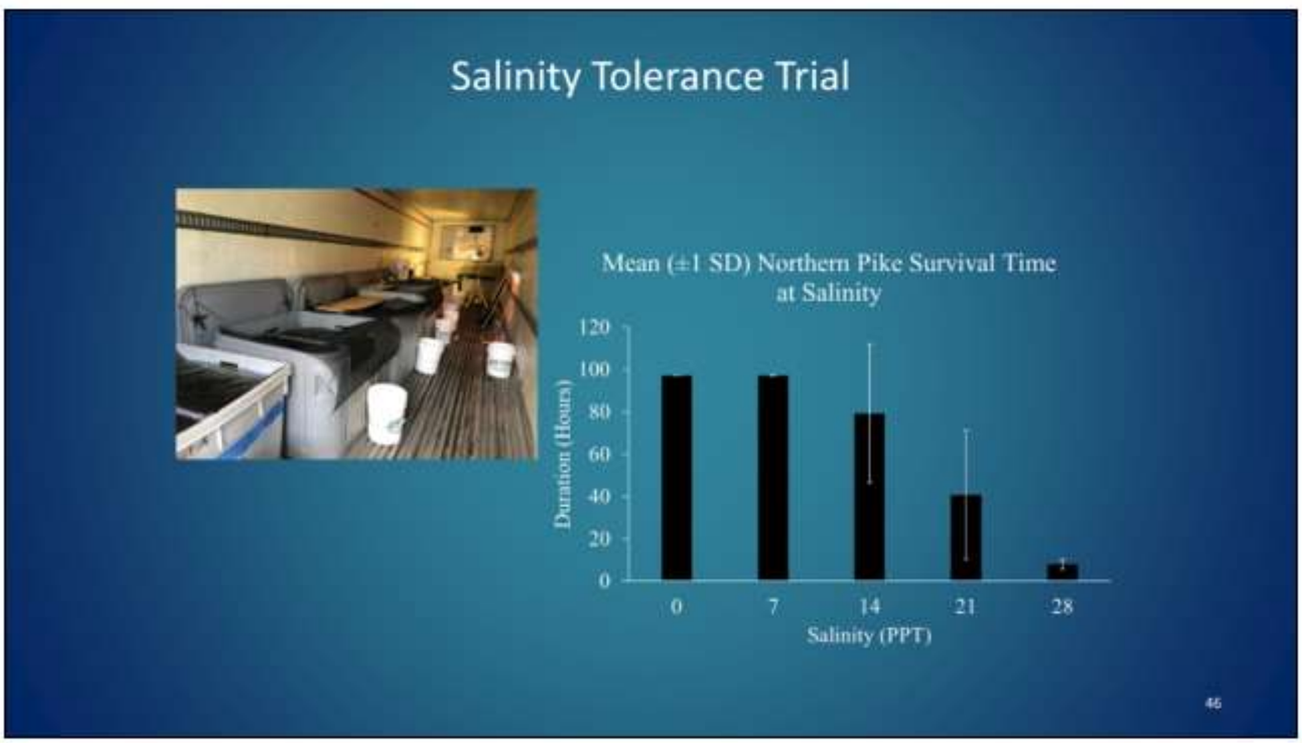
Vogel Pike # 4
A)
(58.6 cm body length)
Vogel Pike # 1
B)
(95.5 cm body length)
Marine
Kenai
peninsula
Strontium isotope ratio (Sr87/Sr86)
C)
D)
E)
F)
Strontium 'concentration' (Sr88)
Relative otolith distance


Anchorage Bowl pike eradication
Cheney Lake (2008)
Lower Fire Lake (2022)
Otter Lake (2015)
Anchorage finally pike free??
Sand Lake (2009)
Sixmile Lake (2022)


Anchorage
44

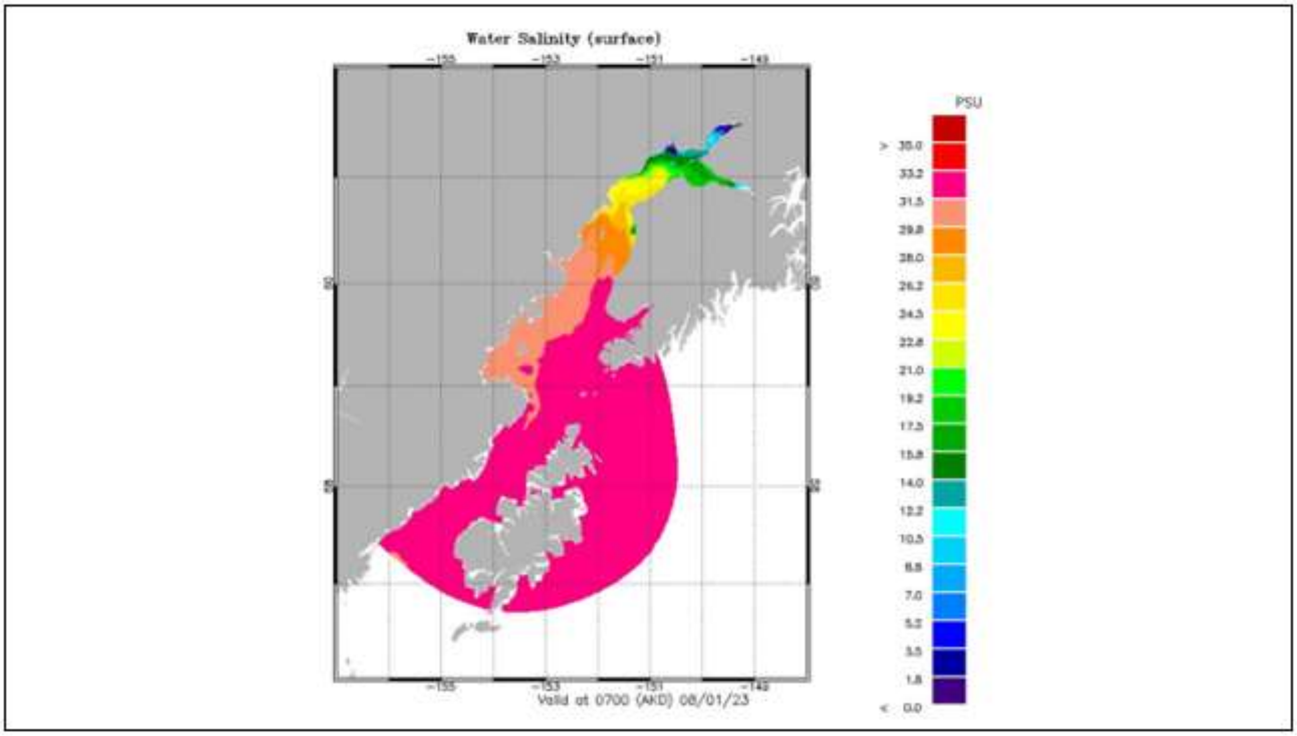


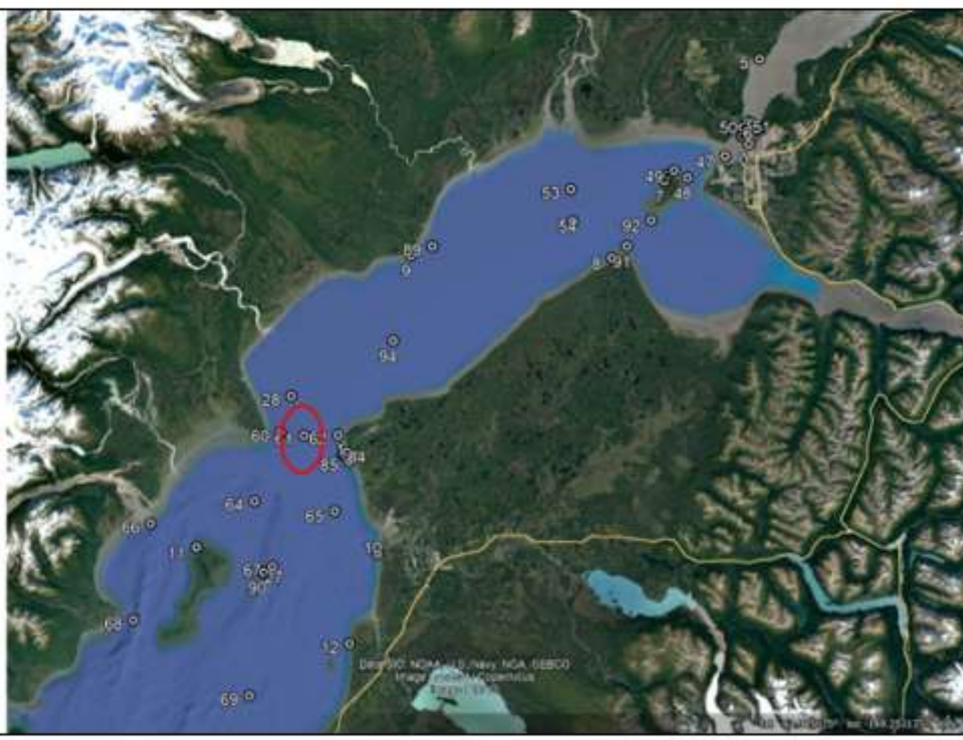
West Chester Lake Pike
Campbell Lake Pike
Distance (μm)



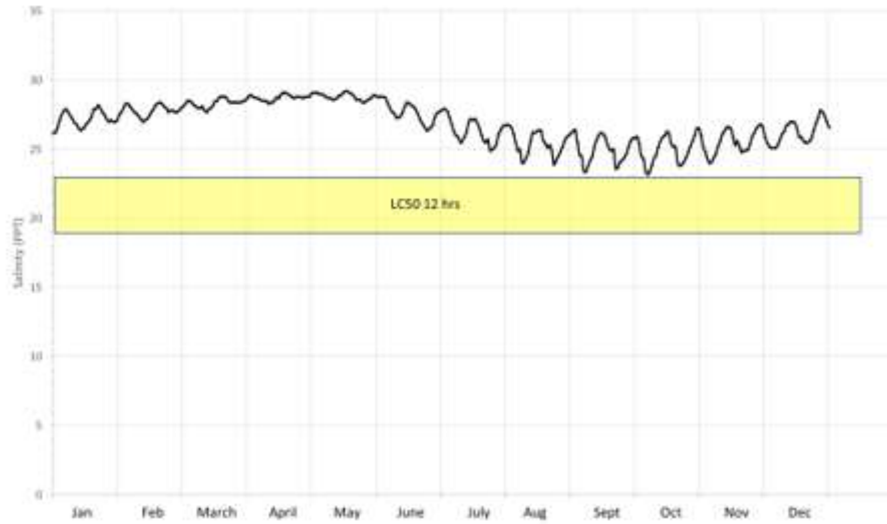
Salinity Tolerance Trial
Mean (±1 SD) Northern Pike Survival Time at Salinity
Duration (Hours)
Salinity (PPT)
46

	Salinity in ppt		
Exposure Period	LC50 estimate	Lower 95% C.I.	Upper 95% C.I.
12-hour	21.16	19.22	23.09
24-hour	20.18	17.589	22.48
48-hour	17.5	15.25	19.74
72-hour	15.98	14.06	17.9
96-hour	15.98	14.06	17.9

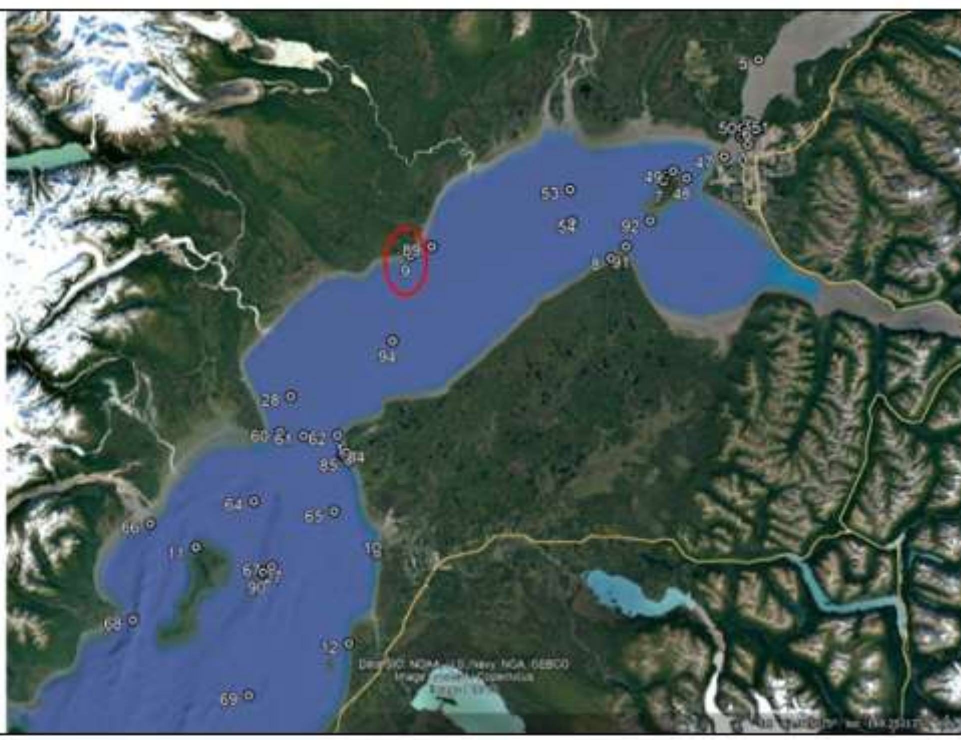

Water Salinity (surface)
Valid at 0700 (AKD) 08/01/23
PSU
> 35.0
33.2
31.5
29.8
28.0
26.2
24.5
22.8
21.0
19.2
17.5
15.8
14.0
12.2
10.5
8.8
7.0
5.2
3.5
1.8
< 0.0



Station 61



35
30
25
20
15
10
5
0
Salinity (PPT)
LC50 12 hrs
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec



5
50
47
49
53
54
92
8
91
9
94
28
60
61
62
85
84
64
65
66
11
10
67
90
68
12
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WCI Station 9

Pt. Possession Station 8

5
50
47
49
93
48
7
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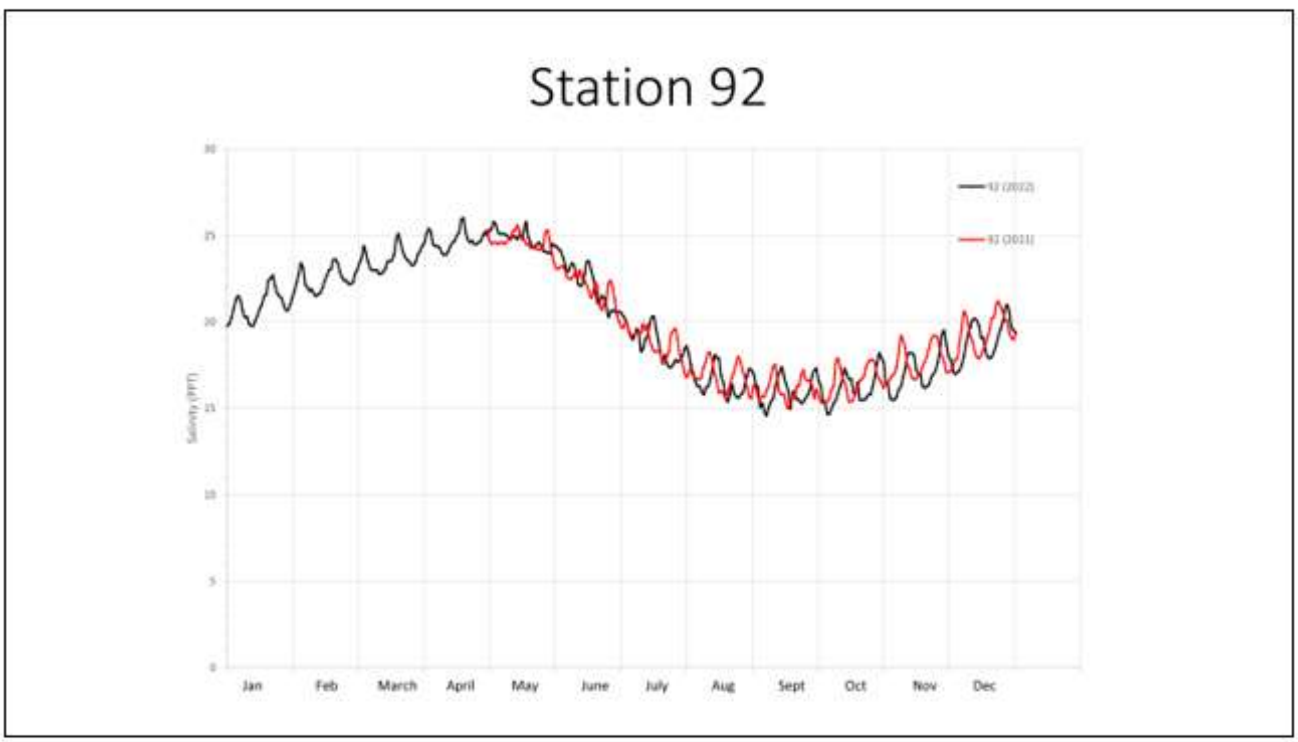
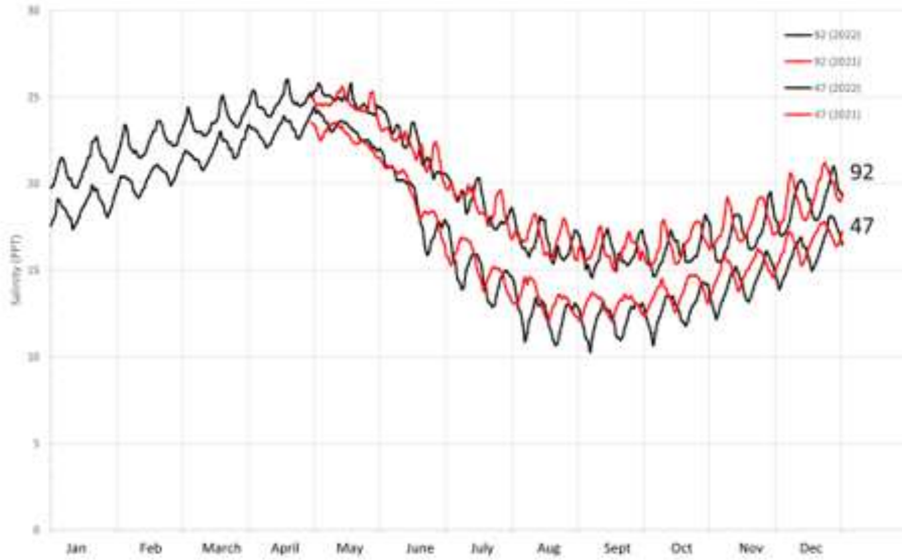
54
92
91
8

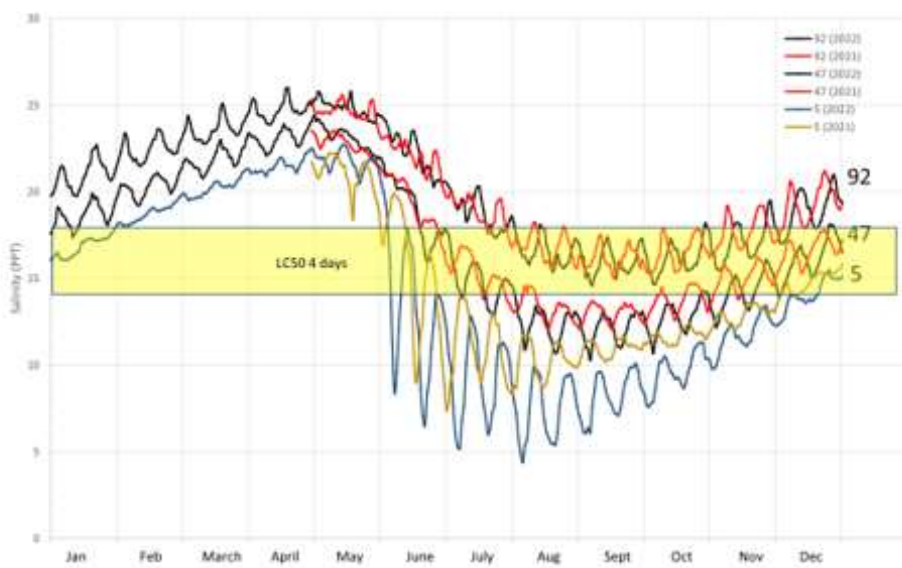


Station 92
30
25
20
15
10
5
0
Jan
Feb
March
April
May
June
July
Aug
Sept
Oct
Nov
Dec

Station 92 vs 47



Station 92 vs 47 vs 5



Research Needs

- Ground truth NOAA forecast salinities
- Dial in places at risk
- Otolith microche
  known exposure
- Pike exclusion st

61

Thank You
Any
Questions?

parker.bradley@alaska.gov
907-746-6328

New pike management plan!!!

Cook Inlet Aquaculture Association

Tyonek Tribal Conservation District

UAF University of Alaska Fairbanks

U.S. Fish & Wildlife Service


Session 3: Status of Fish & Wildlife
9:10 It Takes a Village: Meeting the Complex Challenges Presented by HABs in Cook Inlet Through the Alaska Harmful Algal Bloom Network - Thomas Farrugia, Alaska Ocean Observing System
9:30 Cook Inlet: A Newly Discovered Pathway for Invasive Pike - Parker Bradley, Alaska Department of Fish and Game
9:50 The Status of the Endangered Cook Inlet Beluga Whales - Mandy Migura, Alaska Wildlife Alliance
10:10 Break
10:30 European Green Crab a Marine Invader Threatening AK Fisheries and Coastal Habitats - Katherine Schake, Kachemak Bay National Estuarine Research Reserve
10:50 Q&A with Session 3 Speakers

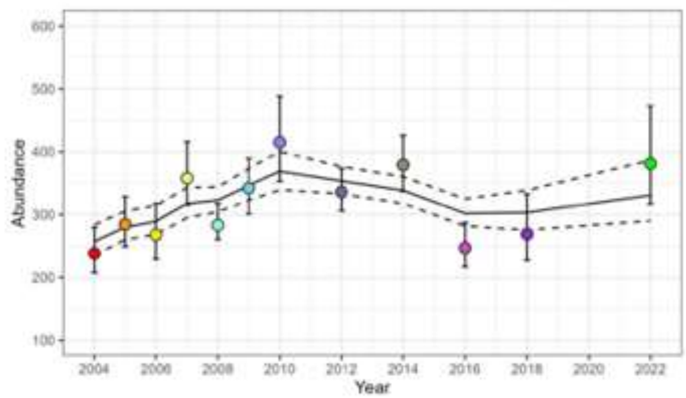

The Status of the Endangered Cook Inlet Beluga Whales
Cook Inlet Water Quality Summit
Mandy Migura, Alaska Wildlife Alliance
© Environmental Investigation Agency

CIBW Population Size Changes

- **Historical Anecdotal Population Size**
  - So many whales you could walk across them (to include areas of lower CI)
- **Earliest Scientific Abundance Estimate**
  - 1979 ADF&G conducted surveys of portions of CI, excluding the areas of greatest beluga concentration today
  - Using a correction factor, population was estimated at 1,297 whales
- **Best current Abundance Estimate ~300 Belugas**
  - 2016 NOAA aerial survey estimated 328 whales → 2023 model changed it to 302
  - 2018 NOAA aerial survey estimated 279 whales → 2023 model changed it to 303
  - 2022 NOAA aerial survey estimated 331 whales* (very large error bars)

* Goetz, K. T., Shelden, K. E. W., Sims, C. L., Waite, J. M., and Wade, P. R. 2023. Abundance of belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2021 and June 2022. AFSC Processed Rep. 2023-03, 47 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

CIBW Population Size Changes



From Goetz et al. 2023, Figure 15: Annual Cook Inlet beluga abundance estimates (circles) and 95% probability intervals (error bars) for the survey period 2004-2022. The moving average is also plotted (solid line), with 95% probability intervals (dashed lines).

Goetz, K. T., Shelden, K. E. W., Sims, C. L., Waite, J. M., and Wade, P. R. 2023. Abundance of belugas (*Delphinapterus leucas*) in Cook Inlet, Alaska, June 2021 and June 2022. AFSC Processed Rep. 2023-03, 47 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Endangered Species Act Status

- **Listed as an Endangered Species in 2008**
- **Critical Habitat Designated in 2011**
  - one of the primary constituent elements (PCE), now referred to as essential physical and biological features:

Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.

CIBW Recovery Plan

- Finalized December 2016
- Summarizes information about Cook Inlet beluga whales
- Reviews and ranks threats
- Identifies criteria, actions, timeline, and cost for recovery

Recovery Plan
for the
Cook Inlet Beluga Whale
(Delphinapterus leucas)

National Marine Fisheries Service
National Oceanic and Atmospheric Administration

December 2016

NOAA FISHERIES

CIBW Recovery Plan Threats Ranking

THREAT	LEVEL OF CONCERN
Catastrophic Events (e.g., natural disasters; spills; mass strandings)	High
Cumulative Effects of Multiple Stressors	High
Noise	High
Disease Agents (e.g., pathogens, parasites, harmful algal blooms)	Medium
Habitat Loss or Degradation	Medium
Reduction in Prey	Medium
Unauthorized Take	Medium
Pollution	Low
Predation	Low
Subsistence Hunting	Low

No Recovery Actions Identified in Recovery Plan

"Given the increases in the human population and development of Cook Inlet, it is likely that the level of pollution entering Cook Inlet is increasing and will continue to increase in the future."

- CIBW Recovery Plan (NMFS 2016) at page III-34

"The ***PCB*** values for CI belugas were at levels associated with endocrine disruption…close to levels that disrupted immune function in free ranging harbor seals…"

"CI belugas had higher concentrations of most ***PFCs*** compared to belugas from the eastern Chukchi…"

"CI belugas have much higher ***PAH*** levels than do subsistence-harvested belugas from MacKenzie River Delta…"

"…***copper*** levels in livers of CI belugas were two to three times higher than in Arctic Alaska belugas…"

"…CI belugas have significantly higher total levels of the brominated flame retardant ***Hexabromocyclododecane*** than the Eastern Chukchi Sea belugas from Point Lay…"

– CIBW Recovery Plan (NMFS 2016) at pages IX-55, IX-59, and IX-60, emphasis added

NOAA Fisheries Study of Contaminants of Emerging Concern in CIBW Prey & Habitat

- In 2017, NOAA Fisheries collected six species of fish (eulachon, coho salmon, longfin smelt, saffron cod, starry flounder, staghorn sculpin) known to be consumed by CIBWs, from four sites in upper Cook Inlet (Eagle River; Ship Creek; Susitna River; and Twentymile River).
- Eight water samples were also collected from each of these four sites.
- The fish were tested for the presence of 119 contaminants of emerging concern and the water samples were tested for 126 contaminants of emerging concern.
- Contaminants of emerging concern include pharmaceuticals and personal care products; antibiotics and antihistamines; neurological medicines (antidepressants, stimulants, and illegal drugs); metabolic medicines; heart medicines; flame retardants; bisphenol; alkylphenols; phthalate; and perflurinated organic compounds.

Preliminary Results for Contaminants of Emerging Concern in Fish

- 21 of the 119 analytes tested for were detected, with several detected at high levels.
- Several of the tested contaminants categories (antibiotics; hydrocortisone; nonyphenols) were found in fish from all sampled locations

Table created by NOAA Fisheries as part of a slide presentation. A copy was obtained through a Freedom of Information Act records request submitted by Environmental Investigation Agency. These data are not published.

Analyte	Description	Location	Level
Antibiotics	Virginiamycin M1, Azithromycin, Cefotaxime, Ciprofloxacin, Roxithromycin, Sulfamerazine	All locations	Low-high
Amphetamine	A potent CNS stimulant	Eagle River, 20Mile	High
Caffeine	World's most widely consumed psychoactive drug	Eagle River, Ship Creek	High
Fluticasone propionate	Corticosteroids used to treat asthma, allergies	Eagle River	Low
Hydrocodone	Narcotic analgesic, usually cough suppressant	Eagle River, Ship Creek	Low
Hydrocortisone	Cortisol as a medication	All locations	High
2-Hydroxy-ibuprofen	Metabolite of ibuprofen	Eagle River and Ship Creek	High
Nonylphenols	Used in manufacturing antioxidants, lubricating oil additives, laundry & dish detergents, emulsifiers, and solubilizers	All locations	High
PFCs	PFOA, PFNA, PFHxS, PFOS; perfluorochemicals-used in teflon, water resistant textiles, paper & furniture, & fire-fighting foam	Eagle River and Ship Creek	High
Sertraline	Antidepressant, Zoloft generic name	Ship Creek	Low
Trenbolone acetate	Powerful androgen & anabolic steroid used in livestock farming	Susitna	High

21 of 119 analytes tested for were detected

Preliminary Results for Contaminants of Emerging Concern in Water Samples

- Benzoylecgonine (a compound excreted in the urine of cocaine users) was detected at high levels in both Eagle River and Ship Creek
- High levels of caffeine were present in waters from all locations except Eagle River
- Low levels of acetaminophen were found in water from the Susitna River
- Low levels of sulfamethoxazole (an antibiotic) were found in Ship Creek

Analyte	Description	Location	Level
Acetaminophen	Active ingredient in hundreds of OTC and prescription medicines	Susitna	Low
Benzoylecgonine	Excreted in the urine of cocaine users after processing in the liver	Eagle River and Ship Creek	High
Caffeine	World's most widely consumed psychoactive drug	All except Eagle River	High
Sulfamethoxazole	Antibiotic	Ship Creek	Low

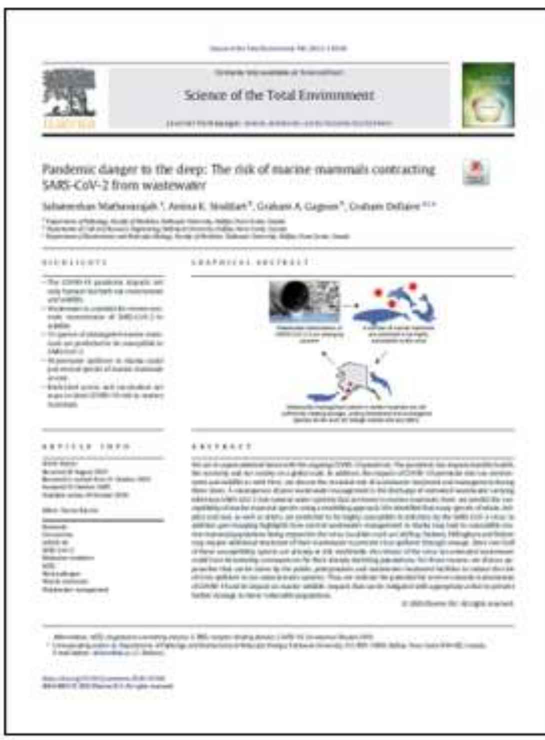
*4 of 126 analytes tested for were detected above the reporting limit

Table created by NOAA Fisheries as part of a slide presentation. A copy was obtained through a Freedom of Information Act records request submitted by Environmental Investigation Agency. These data are not published.

“Intestinal Polycyclic Aromatic Hydrocarbon-DNA Adducts in a Population of Beluga Whales with High Levels of Gastrointestinal Cancers”

MY SUMMARY

Poirer et al. (2019) evaluated polycyclic aromatic hydrocarbon (PAH)-DNA adduct formation in beluga intestines, comparing whales living in areas with low or no PAH contamination (Arctic and aquaria), and those living in known PAH-contaminated St. Lawrence Estuary (SLE) and Cook Inlet. They found SLE belugas’ intestines had significantly higher PAH-DNA damage than the intestines of low PAH areas, and environmental PAH contamination leading to PAH-DNA adduct formation plays an important role in SLE beluga gastrointestinal cancer. Similar to the SLE beluga population, CIBWs had high PAH-DNA adduct staining, and scored significantly higher than the Arctic/Aquaria group of belugas, although cancer has not been documented in CIBW.


Science of the Total Environment

Pandemic danger to the deep: The risk of marine mammals contracting SARS-CoV-2 from wastewater

“Pandemic danger to the deep: The risk of marine mammals contracting SARS-CoV-2 from wastewater”

MY SUMMARY

Mathavarajah et al. (2021) analyzed wastewater management practices in Alaska and identified locations of primary treatment facilities adjacent to marine mammals as high-risk locations, including Palmer and Anchorage for CIBWs. They concluded additional treatment of wastewater may be necessary “to prevent virus spillover through sewage” because a “potential virus spillover into the Cook Inlet population of highly social and susceptible beluga whales may have devastating consequences for the success of their population moving forward.” The concern analyzed was in context of potential for marine mammals to be exposed to the COVID-19 virus, but has broader implications regarding limited treatment of wastewater discharged into Cook Inlet.

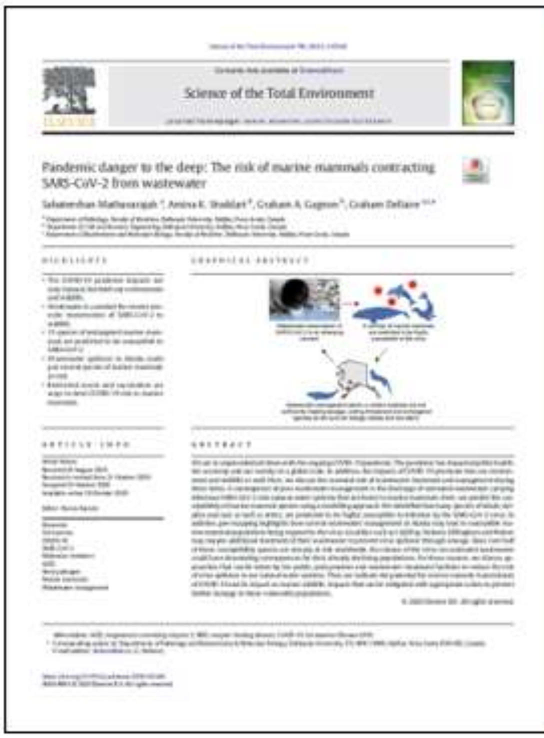
"Congenital defects and herpesvirus infection in beluga whale *Delphinapterus leucas* calves from the critically endangered Cook Inlet population"

ABSTRACT

Cook Inlet beluga whales (CIBs) *Delphinapterus leucas* are Critically Endangered and genetically distinct from other beluga populations in Alaska. CIBs are exposed to numerous natural and anthropogenic sources of mortality and morbidity. This study describes congenital defects observed in 2 CIB calves. The first case, an aborted fetus, was characterized by lack of a peduncle and flukes, anorectal and genitourinary dysgenesis, and probable biliary dysplasia. The second case, a male calf, had a perineal groove defect and suspected secondary peritonitis; it also had a systemic herpesvirus infection. Further studies are needed to determine if such defects are due to genetic mutation, infectious diseases, nutritional imbalances, or contaminant exposure.

NOTE

Congenital defects and herpesvirus infection in beluga whale *Delphinapterus leucas* calves from the Critically Endangered Cook Inlet population



Science of the Total Environment

Pandemic danger to the deep: The risk of marine mammals contracting SARS-CoV-2 from wastewater

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Congenital defects and herpesvirus infection in beluga whale *Delphinapterus leucas* calves from the Critically Endangered Cook Inlet population

Kathleen A. Burek-Huntington, Kim E. W. Shelden, Colleen Guilfoyle, J. G. M. Thewissen, Mandy Migura, Aníbal G. Armién, Carlos H. Romero

CIBW Recovery Plan Threats Ranking

THREAT	LEVEL OF CONCERN
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Cumulative Effects of Multiple Stressors	High
Noise	High
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Reduction in Prey	Medium
Unauthorized Take	Medium
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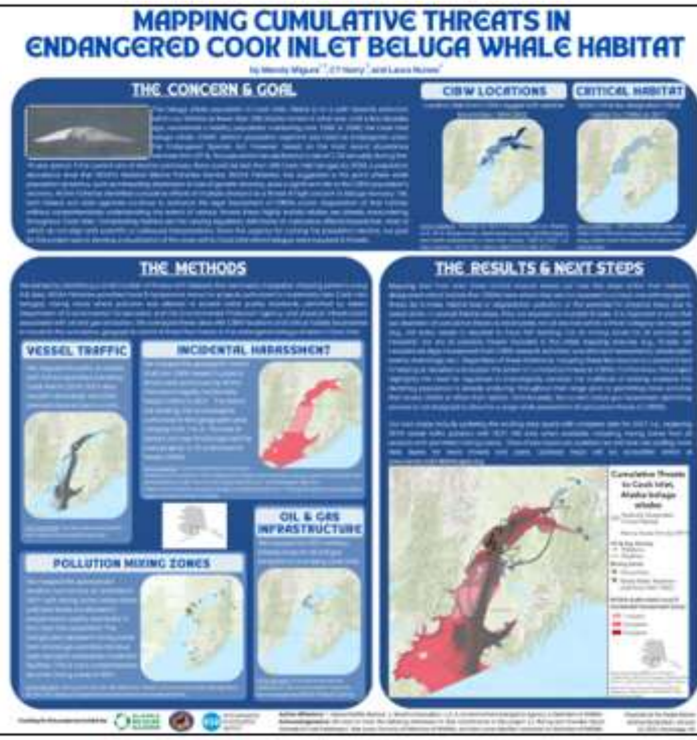
Predation	Low
Subsistence Hunting	Low



Poster visualizing some of the individual threats CIBWs encounter in their habitat, and then overlaying them to see cumulative threats.

This is NOT inclusive of all the threats CIBWs encounter

Migura, M., C.T. Harry, and L. Nunes. 2023. *Mapping Cumulative Threats in Endangered Cook Inlet Beluga Whale Habitat.* Poster presented at Alaska Marine Science Symposium, 2023, Anchorage, AK.

CIBW LOCATIONS

Location data from CIBWs tagged with satellite transmitters 1999-2002

DATA SOURCE: Provided by NOAA Fisheries based on "Shelden et al. 2018. Beluga whale, *Delphinapterus leucas*, satellite-tagging and health assessments in Cook Inlet, Alaska, 1999 to 2002. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-369, 227 p."

CRITICAL HABITAT

NOAA Fisheries designated critical habitat for CIBWs in 2011

DATA SOURCE: CIBW critical habitat data from https://www.fisheries.noaa.gov/resource/map/beluga-whale-cook-inlet-dps-critical-habitat-map-and-gis-data

VESSEL TRAFFIC

We mapped the paths of vessels with AIS transponders transiting Cook Inlet in 2019 (2021 data wouldn't download, and 2020 deemed atypical due to covid).

DATA SOURCE: AIS data were downloaded from https://marinecadastre.gov/ais/

OIL & GAS INFRASTRUCTURE

We mapped the 2021 existing infrastructure for oil and gas extraction in and along Cook Inlet.

DATA SOURCE: A full list of sources we explored can be found at https://www.one-tab.com/page/wgH8SE2kTReNydXv3j4Ojw

POLLUTION MIXING ZONES

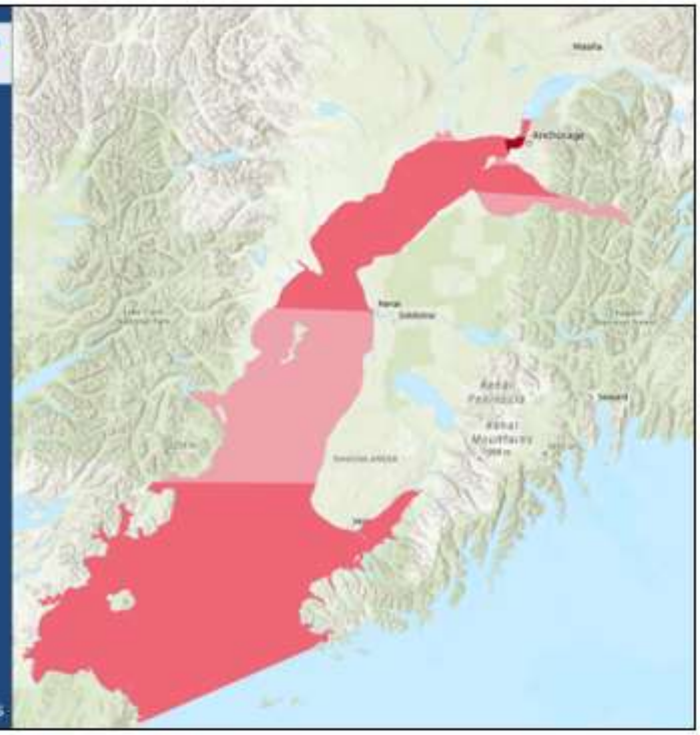
We mapped the approximate location, but not size, of activities in 2021 with mixing zones (areas where pollution levels are allowed to exceed water quality standards) in the Cook Inlet watershed. The orange stars represent mixing zones from oil and gas activities; the blue stars represent wastewater treatment facilities. This is not a comprehensive list of all mixing zones in 2021.

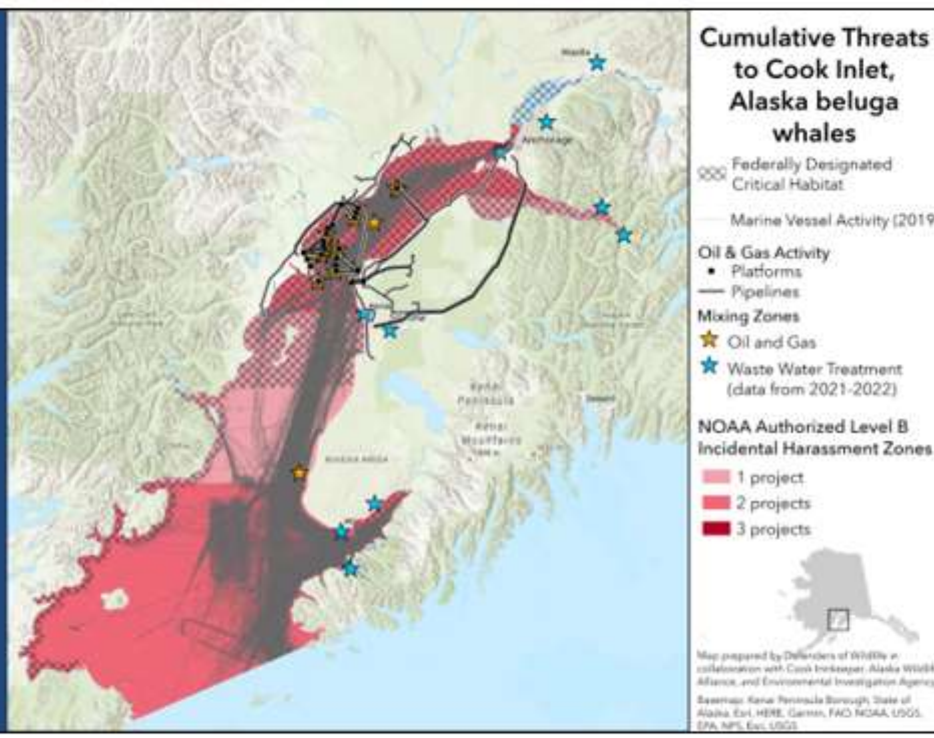
DATA SOURCE: Mixing zone permits identified from Alaska's Environmental Data Management System (dec.alaska.gov/applications/water/edms/ncore/external/home)

INCIDENTAL HARASSMENT

We mapped the geographic extent of all non-CIBW research projects which were authorized by NOAA Fisheries to legally, incidentally harass CIBWs in 2021. The darker the shading, the more projects authorized in that geographic area (ranging from 1 to 3). The area in darkest red near Anchorage had the most projects (n=3) authorized to harass CIBWs.

DATA SOURCE: Level B harassment zones were obtained from Incidental Take Statements (https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act) and Biological Opinions (https://www.fisheries.noaa.gov/alaska/consultations/section-7-biological-opinions-issued-alaska-region) issued by NOAA Fisheries





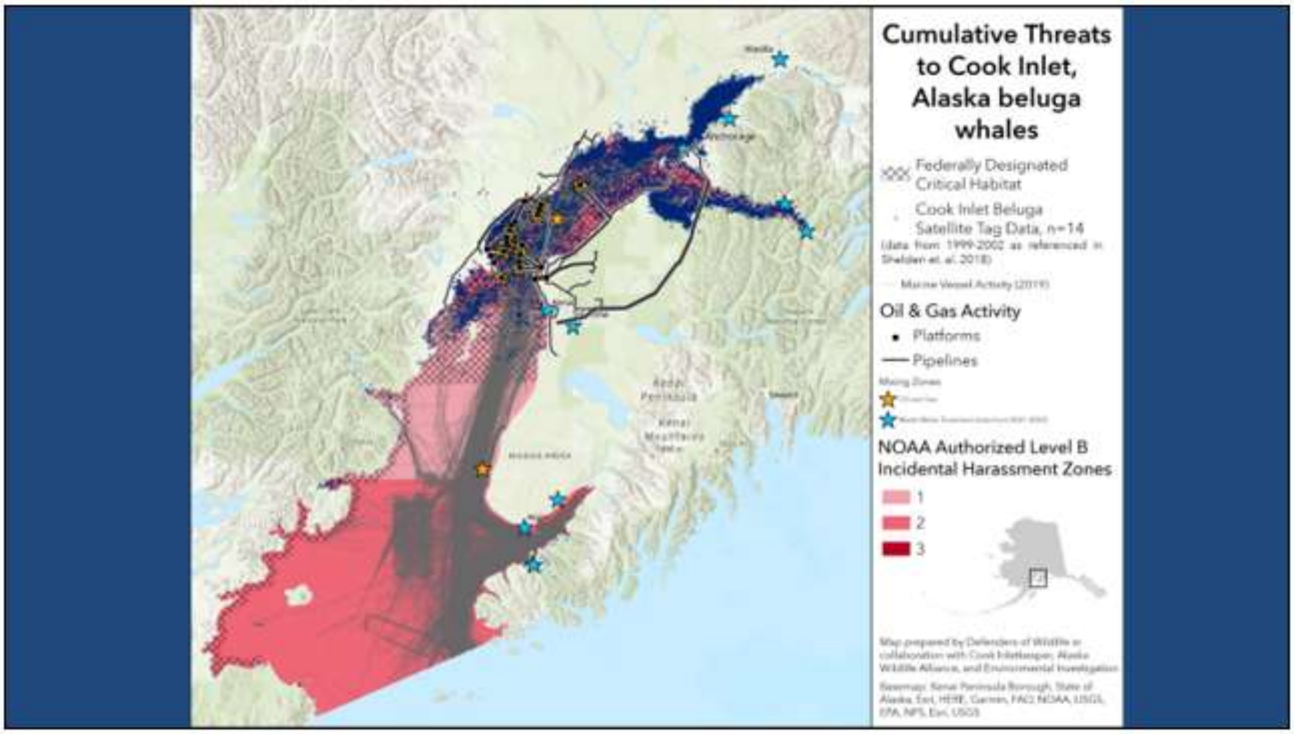

Cumulative Threats to Cook Inlet, Alaska beluga whales
Federally Designated Critical Habitat
Cook Inlet Beluga Satellite Tag Data, n=14
(data from 1999-2002 as referenced in Shelden et al. 2018)
Oil & Gas Activity
Platforms
Pipelines
NOAA Authorized Level B Incidental Harassment Zones
1
2
3


image from NOAA Fisheries website

Session 3: Status of Fish & Wildlife

9:10	*It Takes a Village: Meeting the Complex Challenges Presented by HABs in Cook Inlet Through the Alaska Harmful Algal Bloom Network* - Thomas Farrugia, Alaska Ocean Observing System
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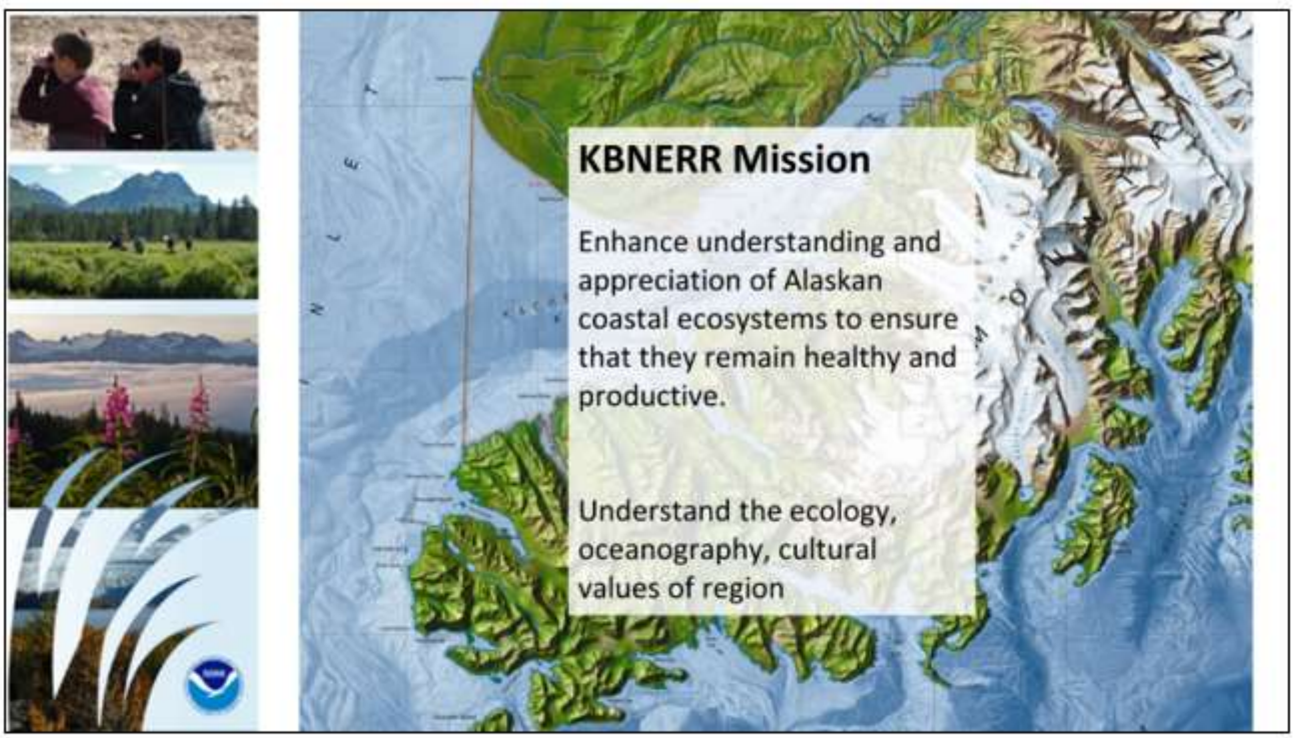
10:10	Break
10:30	***European Green Crab a Marine Invader Threatening AK Fisheries and Coastal Habitats* - Katherine Schake, Kachemak Bay National Estuarine Research Reserve**
10:50	Q&A with Session 3 Speakers

What is something you love about coastal Alaska?

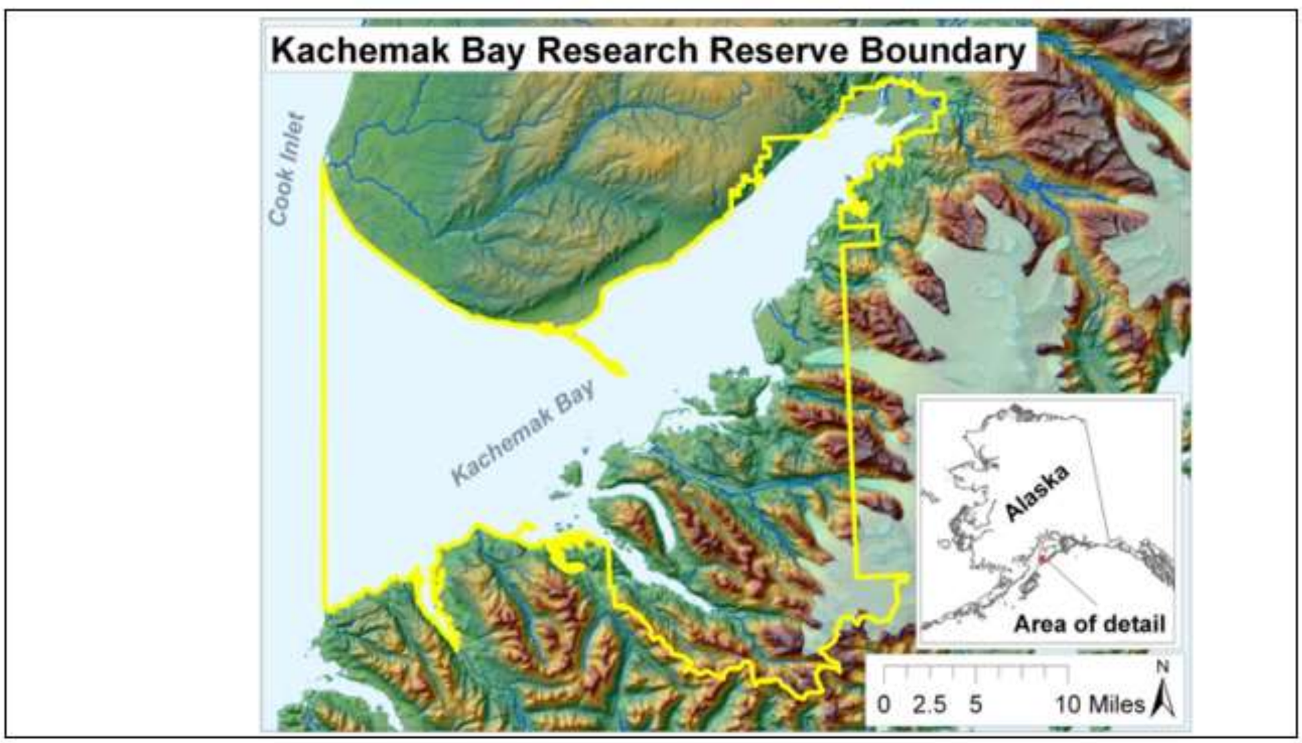
- Introduction to KBNERR
- European green crab impacts and biology
- Early detection and response
- Responding Together

Kachemak Bay National Estuarine Research Reserve


KACHEMAK BAY
UAA
Kachemak Bay National Estuarine Research Reserve
Alaska Center for Conservation Science
UNIVERSITY of ALASKA ANCHORAGE


KBNERR Mission
Enhance understanding and appreciation of Alaskan coastal ecosystems to ensure that they remain healthy and productive.
Understand the ecology, oceanography, cultural values of region


NOAA
NATIONAL
ESTUARINE
RESEARCH
RESERVE
SYSTEM


Kachemak Bay Research Reserve Boundary
Cook Inlet
Kachemak Bay
Alaska
Area of detail
0 2.5 5 10 Miles
N

Enhance understanding and appreciation of Alaskan coastal ecosystems to ensure that they remain healthy and productive.

Monitoring

Research

Education

Training

KBNERR Harmful Species Program

What is an invasive species?

What is an invasive species?

A species that is **introduced by human activity** and **causes harm** to

- **the ecosystem**
- **the economy** or
- **human health**

Examples of introduction pathways for marine invasive species.

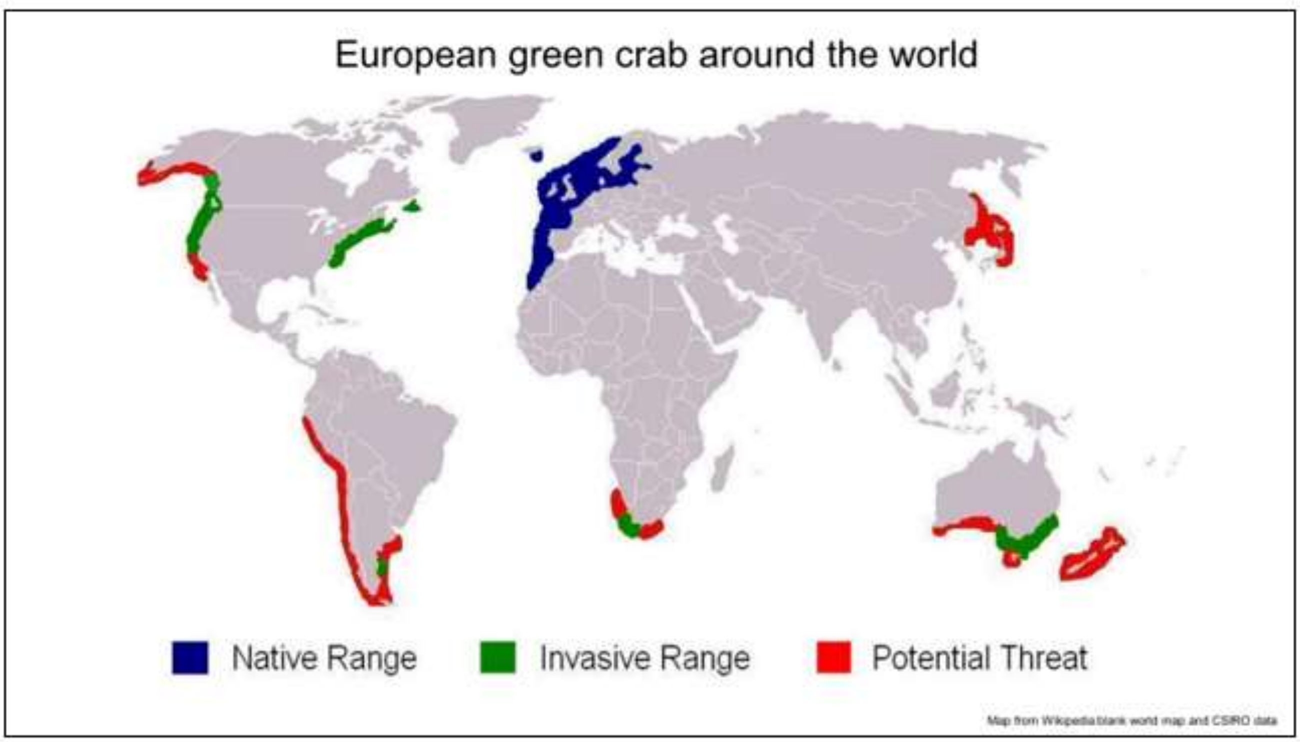
https://uopbioinformatics.github.io/project/2017-08-17_anti-fouling-marine-biofilms/

https://www.ukpandi.com/news-and-resources/articles/2020/us-ballast-water-management-regulations-new-nbic-ballast-water-management-reporting-form/

Photo from Parks Canada

Stephens et al. 2014


Rostral Bumps
1 2 3
Marginal Tee
1 2 3 4 5
Up to 4"
Wide to Narrow
Somewhat Flattened


European green crab around the world
Native Range
Invasive Range
Potential Threat
Map from Wikipedia blank world map and CSIRO data

Habitat

Intertidal to maximum known depth of 55 m

Dominate in saltmarsh, eelgrass beds, protected bays

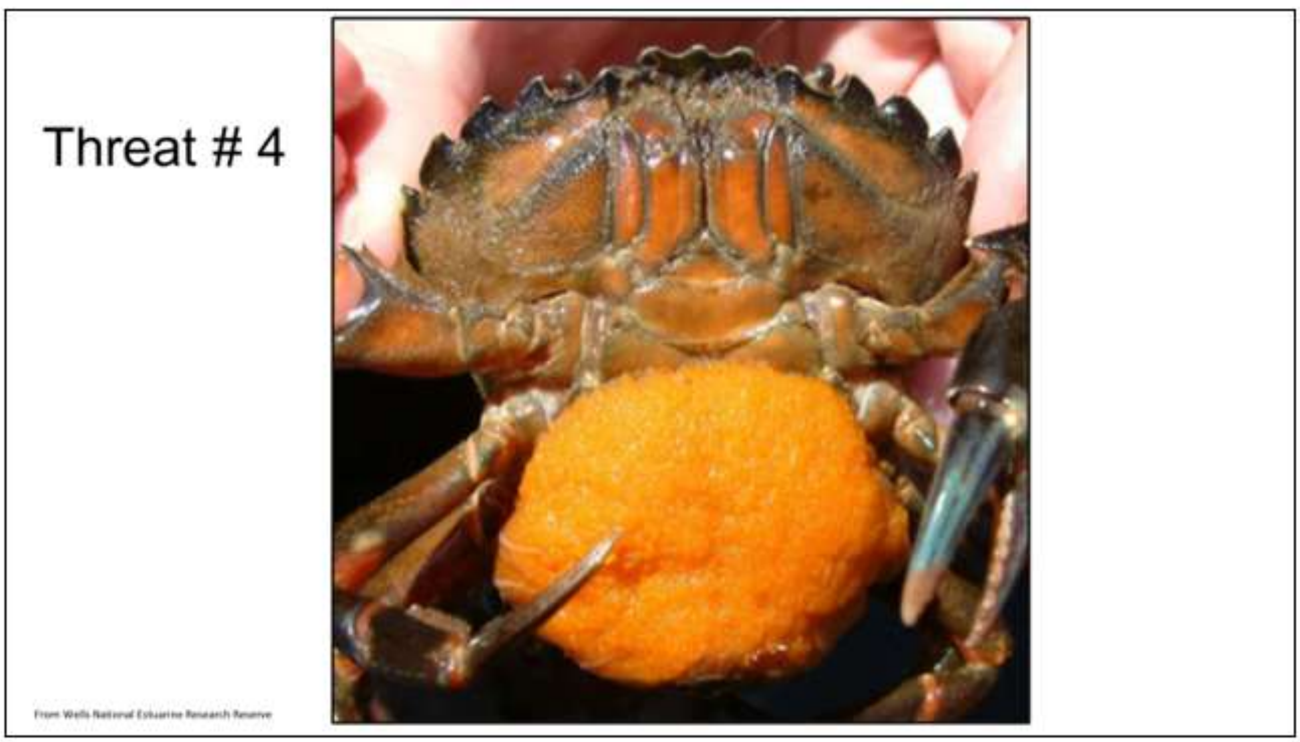
On NE Pacific Coasts less common in rocky intertidal

Threat # 1

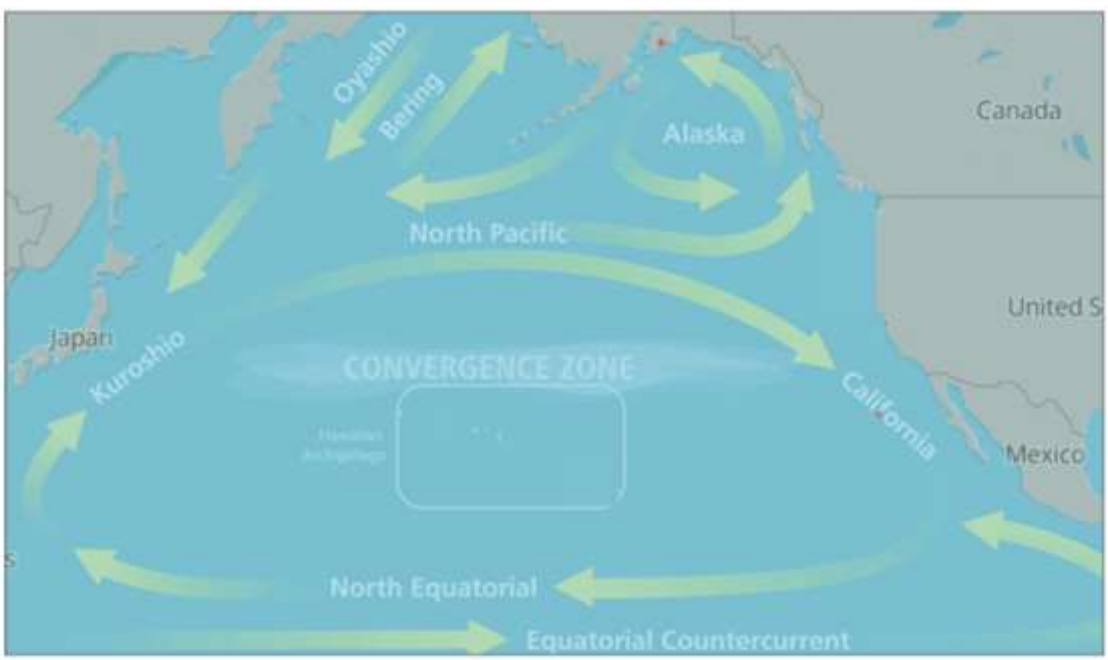
https://www.theseashore.org.uk/

scotdir.com


Threat # 3


Threat # 4
From Wells National Estuarine Research Reserve

Crab Larvae
aka Zoea



https://www.geographyrealm.com/debris-2011-japanese-tsunami-carried-almost-300-species-marine-across-pacific-ocean/

European green crab invasion of NE Pacific

- San Francisco 1989
- Oregon 1995/1996
- Washington 1998
- Salish Sea 1999
- British Columbia 1999
- British Columbia Mainland Coast 2011
- Southern Haida Gwaii Island, BC 2020
- **Annette Island, Alaska 2022**

Animation by Pacific States Marine Fisheries Commission

Invasive green crab status in Alaska

Invasive European green crab found on Annette Island July 2022 by Metlakatla Indian Community's EGC Early Detection Program.

Tamgas Harbor, Annette Island

Photo Courtesy of Linda Shaw

Since July 2022

- > 3,000 live invasive green crabs
- Gravid females found April 2023
- ADF&G trapped in "nearby" suitable habitat, 2022 and 2023, no additional detections.

Photo courtesy of Linda Shaw

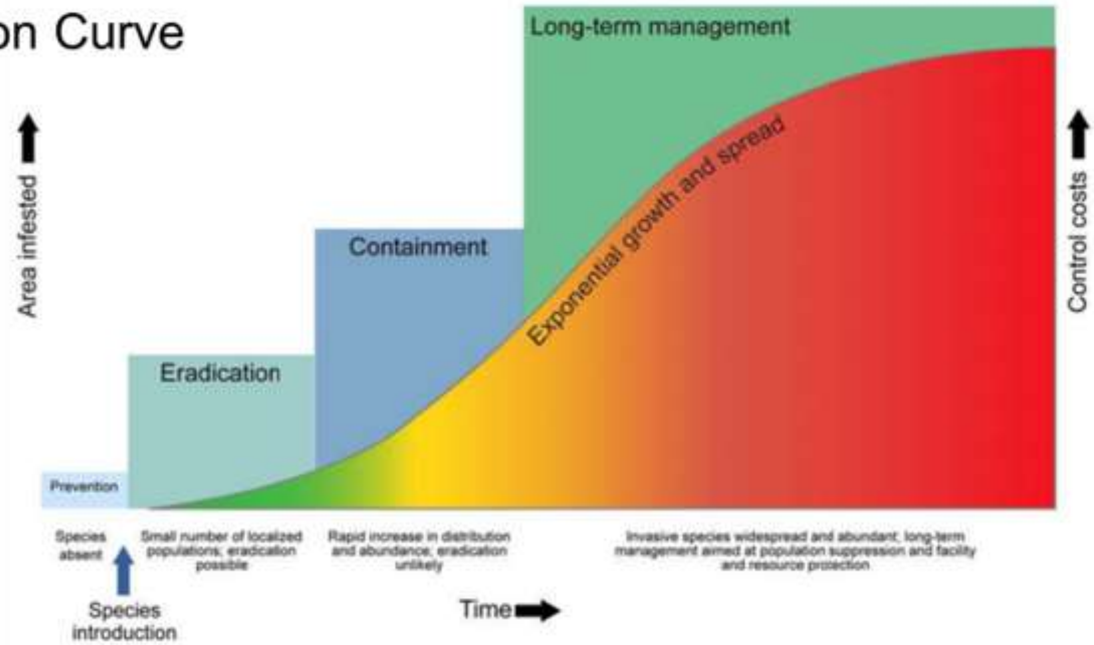
Responding Together

Invasive green crab

Early Detection

Statewide efforts

Invasion Curve



Sources: National Invasive Species Council; U.S. Department of Agriculture; National Park Service; U.S. Fish and Wildlife Service; Rodgers, L. South Florida Water Management District; Department of Primary Industries, State of Victoria, Australia; and GAO. | GAO-16-49

AKISP
ALASKA INVASIVE SPECIES PARTNERSHIP

Current Monitoring & Early Detection Efforts

- Metlakatla Indian Community
- PWSRCAC
- National Parks
- USGS
- USFWS
- Seldovia Village Tribe
- ADFG
- KBNERR
- NOAA
- Alaska Sea Grant
- Alaska Sea Life Center
- Citizen Scientists
- SEATOR

Trap Types

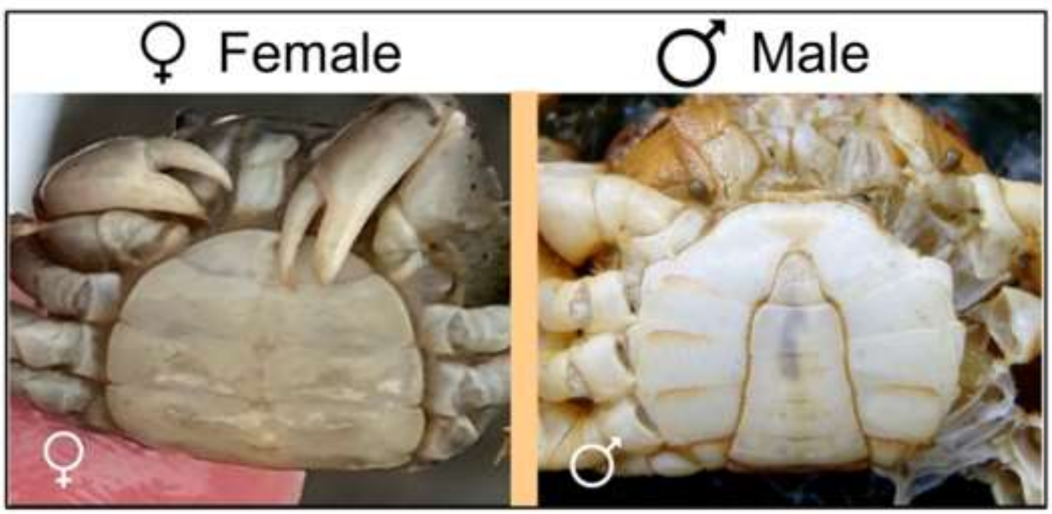
- Folding Fukui traps
- Shrimp traps
- Minnow traps

5

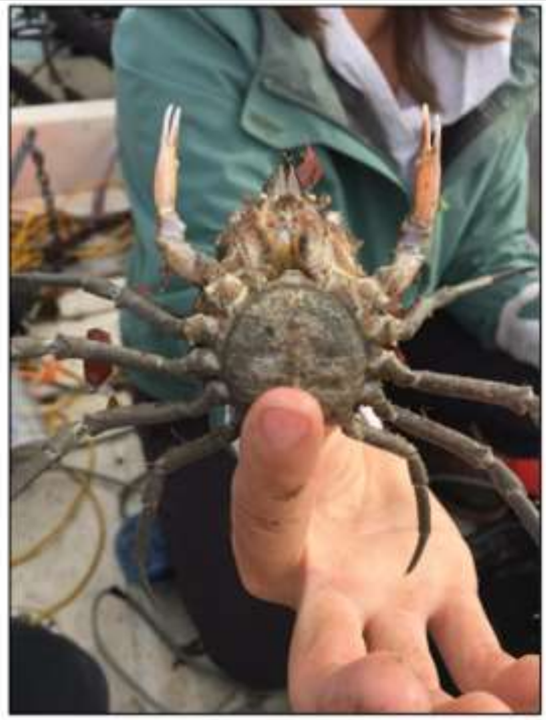
baited

traps

Determine if crabs are



Is this a female or male crab?



Female

EGC Early Detection

- Community Monitors
- Tribal Partners
- State and Federal Agencies
- School Groups

Invasive European Green Crab (EGC) Beach Walk Crab Molt Monitoring 2023

For each crab molt seen use tally marks under the carapace shape to count up to 16 per shape, then circle the total in the table on the back.

Observer(s): ______________________ Date: ____________

Location started (description or GPS): ______________________

Location ended: (description or GPS): ______________________

Distance walked: ________ Beach Habitat (wrack line, driftwood etc.): ____________

Time started: ____________ Time ended: ____________

Invasive EGC (five spines): ____________

Red Rock: ________ Helmet: ________ Dungeness: ________ Pygmy rock: ________

Decorator: ________ Shore: ________ Tanner: ________ Kelp: ________

You can share additional observations on the back as needed. Take pictures of any carapace you can't identify, take pictures of any suspected EGC.

Please return data sheet to:

Scan the QR code or call 1-877-INVASIV to report observations of any invasive, non-native species or unusual plants or animals.

I think I found an invasive green crab!!!!

Now what?

- Photograph
- Detailed location
- Report

- Photograph
- Detailed location
- Report

Reports of suspected invasive green crab will be investigated and confirmed.

Report Invasive Species

1-877-INVASIV (1-877-468-2748)

Report Invasive Species

1-877-INVASIV (1-877-468-2748)

Alaska is the most recent state to experience EGC invasion

- Extensive coastline
- Prevention
  Clean. Drain. Dry.
- Early detection
- Coordinated response across organizations and regions.

Responding Together to Invasive green crab in Alaska

Increase awareness and monitoring efforts

Support new monitoring programs
- Training in methods
  - Carapace Beach Surveys
  - Trapping

Responding Together to Invasive green crab in Alaska

Increase awareness and monitoring efforts

Support new monitoring programs
- Training in methods
  - Carapace Beach Surveys
  - Trapping

Determine areas of importance
- Cultural
- Ecological
- Economical

Maintain AK European green crab Rapid Response Plan and conduct regular exercises

Kachemak Bay National Estuarine Research Reserve
Alaska Center for Conservation Science
UNIVERSITY of ALASKA ANCHORAGE

Kachemak Bay National Estuarine Research Reserve

Katherine Schake, kschake@alaska.edu
Jasmine Maurer, jrmaurer@alaska.edu

Session 4: Regulatory Landscape

11:10	***An Introduction to the Clean Water Act*** **- Matthew LaCroix, U.S. Environmental Protection Agency**
11:40	Lunch Break (on your own)
1:00	*USACE Regulatory 101* - Andrew Gregory and Jennifer Mercer, U.S. Army Corps of Engineers, Pacific Ocean Division
1:30	*Cook Inlet Fish Consumption and Regional Tribal Environmental Programs* - Michael Opheim, Chugach Regional Resources Commission & Stephen Payton, Seldovia Village Tribe
2:00	Break
2:20	Panel Discussion

An introduction to the Clean Water Act

October 25, 2023

Matthew LaCroix
Wetlands & Oceans Section

Organization of the Clean Water Act

Things EPA does
Things EPA supports others to do

Overarching themes

Clean water is a work in progress.

Shared responsibility between federal government, states, tribes, local governments, NGOs & others.

Clean water is everyone's job.

The Clean Water Act was ______ in 1972.

a. passed

b. vetoed

c. Both a. and b.

d. The Clean Water Act was passed in 1977.

What do we mean by the "Clean Water Act"?

Federal Water Pollution Control Act amendments of 1972 and subsequent amendments (1977, 1981, 1987, 1988, 1990, 1994, 2000, 2002, 2008, 2017, 2018, 2019)

33 USC § 1251-1387

Federal Water Pollution Control Act

Originally passed in 1948 and amended in 1956, 1961, 1965, 1966, and 1970.

Current organization established in 1972.

Cooperative federalism

EPA collaborates in research & provides funding, consistency, & technical support.

Implementation led by states, tribes, local governments & others.

EPA created administratively in 1970.

EPA did/does not have the capacity to achieve CWA objectives.

Clean water is a national issue, but a local problem best addressed by local action.

The condition of surface waters reflects the cumulative influence of watershed activities.

Our individual choices affect water quality.

No one agency or entity can "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

Statute organization by the numbers

6 subchapters/titles

5 grant programs (Administrator provided broad authority to issue grants)

2 permit programs

1 revolving loan program

Subchapter I Research & Related Programs

1251. Congressional declaration of goals & policy

1254. Research, investigations, training, & information

1256. Grants for pollution control programs (Section 106)

1263a. AK Native village & rural communities water grants (1996)

1267-1275. Chesapeake Bay, Great Lakes, etc.

Cook Inlet Water Quality Summit 11

Declaration of goals and policy

Objective: restore & maintain chemical, physical, & biological integrity of Nation's waters.

Goal: eliminate discharges by 1985.

Goal: water be fishable & swimmable by 1983.

Cook Inlet Water Quality Summit 12

Declaration of goals and policy

Policies:

- **no discharge of toxic pollutants in toxic amounts**
- **federal funding for POTW construction**
- **waste treatment management planning**
- **research and demonstration of technology**
- **nonpoint source programs be developed**

Section 101/ 1251

- **States have primary responsibility & right to prevent, reduce, & eliminate pollution & plan the development & use of land & water.**
- **States have the authority to allocate water.**
- **Implementation of the Act should involve public participation, minimize paperwork, & avoid unnecessary delays.**

Subchapter I Research & Related Programs

1256. Grants for pollution control programs (Section 106):

- Grants to states, territories, interstate agencies, & tribes for water quality programs.
- Can fund monitoring & assessment, WQS & TMDL development, NPDES permit programs, enforcement, watershed planning, outreach & education.

https://www.epa.gov/water-pollution-control-section-106-grants

Cook Inlet Water Quality Summit 15

Subchapter II Grants for Construction of Treatment Works

- $94B appropriated to support construction of publicly owned treatment works (POTW).
- Federal share typically 55% of project costs.
- 1987 amendments phased out program, replaced it with Clean Water State Revolving Fund.

Cook Inlet Water Quality Summit 16

Subchapter III Standards and Enforcement

1311. Effluent limitations

1312. Water quality related effluent limitations

1313. Water quality standards & implementation plans

1316. National standards of performance

1317. Toxic & pretreatment effluent standards

Subchapter III Standards and Enforcement

1311a. Effluent limitations: "The discharge of any pollutant by any person shall be unlawful" except in compliance with 1311, 1312, 1316, 1317 (effluent limitations), 1328, 1342, & 1344 (permit programs).

1319. Enforcement: By EPA and permitting authority (state, Corps, or tribe).

Subchapter III Standards and Enforcement

1321. Oil & hazardous substance liability: Oil Pollution Act of 1990

1321a. Prevention of small oil spills: spill prevention & education program for small vessels, NOAA & Coast Guard (2010).

1322. Marine sanitation devices; discharges incidental to the normal operation of vessels

Subchapter III Standards and Enforcement

1329. Nonpoint source management programs:

- Grants to states, territories and tribes added in 1987.
- Funding for technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring.

Nonpoint Source Water Pollution Section 319 Grants
https://www.epa.gov/nps/319-grant-program-states-and-territories

Subchapter IV Permits and Licenses

1341. Certification:

- State authority (tribes may seek TAS).
- EPA issues for areas of exclusive federal jurisdiction.
- Certify, deny, or waive that discharges comply with effluent limitations, WQS, & national performance standards.

Subchapter IV Permits and Licenses

1342. National pollutant discharge elimination system:

- Permits for point source aqueous discharges.
- States intended to implement.
- EPA issues for areas of exclusive federal jurisdiction (e.g., Metlakatla, Denali NPP), & facilities with § 301(h) waivers (e.g., AWWU).

Subchapter IV Permits and Licenses

1343. Ocean discharge criteria: EPA issues NPDES permits in territorial seas, contiguous zone, & oceans.

1345. Disposal or use of sewage sludge: EPA issues NPDES permits if states do not assume.

1346. Coastal recreation water quality monitoring & notification: BEACH Act (2000) grants to local governments.
https://www.epa.gov/beach-tech/beach-grants

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Subchapter IV Permits and Licenses

1344. Permits for dredged or fill material:

- Permits for point source solid discharges.
- Compliance with § 404(b)(1) Guidelines required.
- States intended to implement except where Corps has non-CWA authority (e.g., Rivers & Harbors Act).

- Wetland Program Development Grants. RFA open until November 15, 2023.
https://www.epa.gov/wetlands/federal-funding-wetlands

Cook Inlet Water Quality Summit 24

Subchapter V General Provisions

Definitions: "navigable waters" means the waters of the U.S., including the territorial seas. See https://www.epa.gov/wotus for additional information.

Citizen suits: "any citizen may commence a civil action" against any person or the EPA Administrator.

State authority: federal standards do not affect state jurisdiction; states may adopt higher standards.

Green Infrastructure promotion: outreach, training, & information-sharing. (added in 2019)

Subchapter VI State Water Pollution Control Revolving Funds

1383. Clean Water State Revolving Fund (CWSRF):

- Replaced Title II construction grant program.
- Capitalized by EPA, operated by states.
- Can finance wastewater facilities, nonpoint source pollution control, estuary protection, & water reuse.

Subchapter VI State Water Pollution Control Revolving Funds

Clean Water State Revolving Fund (CWSRF)

Bipartisan Infrastructure Law
$11.7B, $1B for emerging contaminants

https://www.epa.gov/cwsrf

An introduction to the Clean Water Act

Questions?

Matthew LaCroix
Wetlands & Oceans Section
LaCroix.Matthew@epa.gov

Session 4: Regulatory Landscape

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U.S. ARMY CORPS OF ENGINEERS ALASKA DISTRICT, REGULATORY PROGRAM

Cook Inlet Water Quality Summit

Andrew Gregory
Jenn Mercer

Regulatory Division
Alaska District, USACE

25 October 2023

PRESENTATION OUTLINE

Regulatory Division

- Authorities
- Jurisdiction / WOTUS
- Wetlands
- Permits
- Corps NEPA Process
- Compliance and Enforcement

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MAJOR PROGRAMS

F-22 Squad Operations Hangar

MILITARY/INTERAGENCY & INTERNATIONAL SERVICES

Harbor in Aleutian Islands

CIVIL WORKS

Wetlands Determination

REGULATORY

Rapid Optical Screening Tool (ROST)

ENVIRONMENTAL ENGINEERING

EMERGENCY MANAGEMENT

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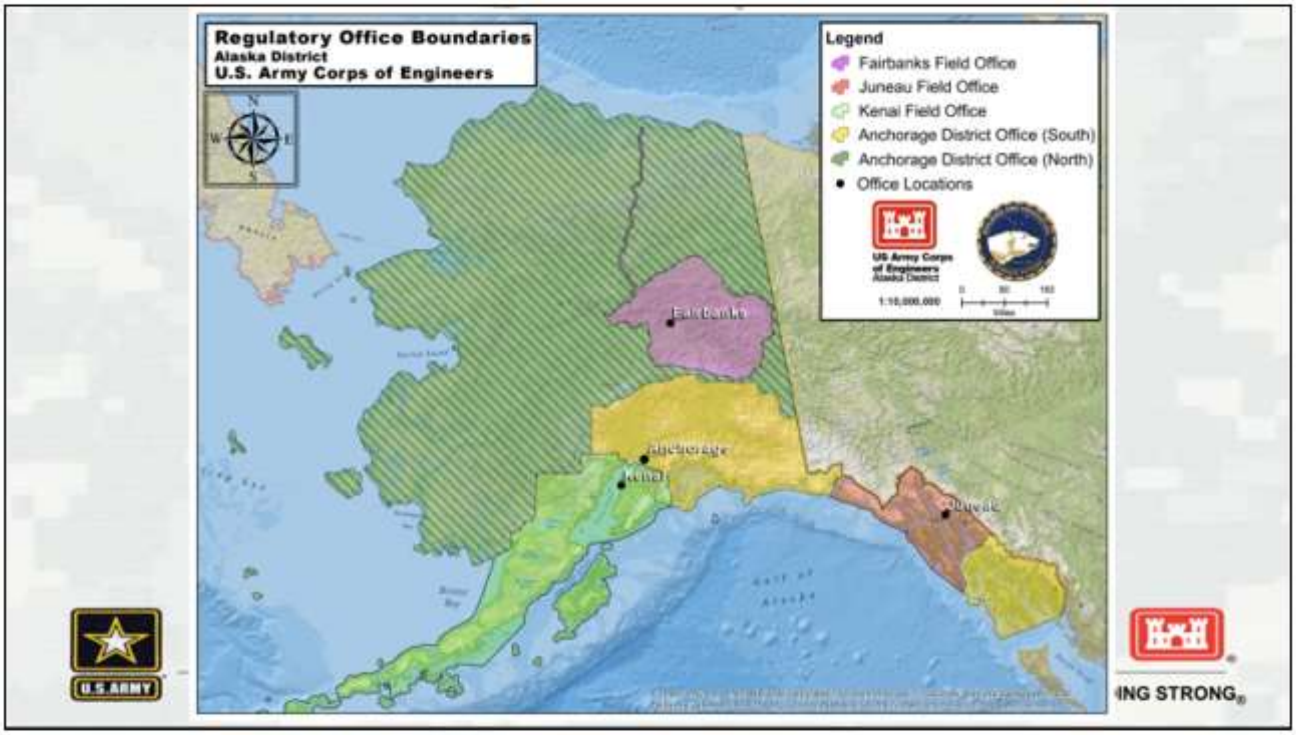

AUTHORITY

RIVERS AND HARBORS ACT OF 1899
SECTION 10: NAVIGABLE WATERS

Authorizes the U.S. Army Corps of Engineers to issue permits for structures or work in or affecting the navigable waters of the United States

PRIMARY GOAL:
MAINTAIN NAVIGATION

AUTHORITY: RIVERS AND HARBORS ACT OF 1899
SECTION 10
NAVIGABLE WATERS OF THE UNITED STATES

- Waters subject to tidal ebb and flow, and/or
- Those waters that are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce

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AUTHORITY: RIVERS AND HARBORS ACT OF 1899
SECTION 10
NAVIGABLE WATERS INCLUDE:

- Tidal waters landward to the Mean High Water Mark (MHWM)
- Non-tidal waters below the Ordinary High Water Mark (OHWM)
- Waters identified as a result of navigability studies, listed on the web at http://www.poa.usace.army.mil/Portals/34/docs/regulatory/NavWat.pdf

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AUTHORITY: RIVERS AND HARBORS ACT OF 1899 SECTION 10

REGULATED (JURISDICTIONAL) ACTIVITIES

Any work affecting the course, condition, location or capacity of the navigable waterbody:

Examples:


Structures and/or Work


Dredging/Fill


Excavation

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AUTHORITY: CLEAN WATER ACT SECTION 404: WATERS OF THE UNITED STATES (WOTUS)

- **The U.S. Army Corps of Engineers is authorized to issue permits for the discharge/placement of dredged or fill material into waters of the United States (WOTUS)**

PRIMARY GOAL CWA:
RESTORE AND MAINTAIN THE PHYSICAL, CHEMICAL, AND BIOLOGICAL INTEGRITY OF THE NATION'S WATERS

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AUTHORITY: CLEAN WATER ACT SECTION 404

REGULATED (JURISDICTIONAL) ACTIVITIES

- Discharge/placement of dredged or fill material into waters of the U.S.
- Includes mechanized land clearing/leveling

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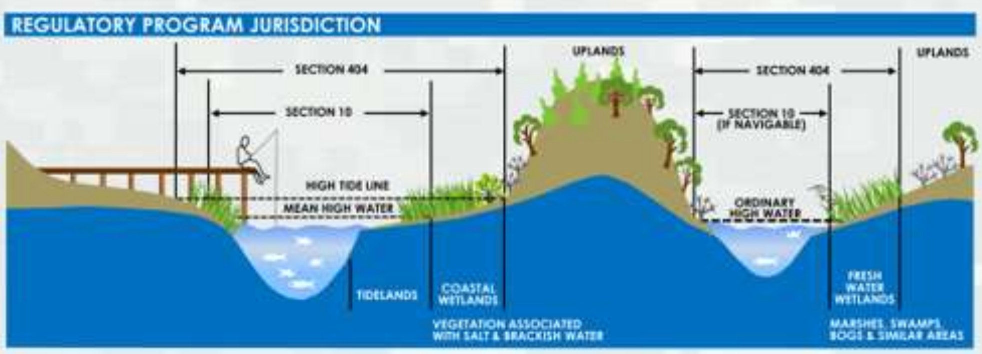
AUTHORITIES: CLEAN WATER ACT SECTION 404 RIVERS & HARBOR ACT OF 1899 SECTION 10

JURISDICTIONAL AREAS



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AUTHORITY: SECTION 404 CLEAN WATER ACT

JURISDICTIONAL WOTUS

Includes:

- All Section 10 waters
- Rivers, tributaries, lakes, ponds, adjacent wetlands

Boundaries:

- Tidal waters landward to the High Tide Line (HTL)
- Non-tidal waters below the Ordinary High Water Mark (OHWM)
- Wetlands: limit of wetlands

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AUTHORITY: CLEAN WATER ACT SECTION 404

WETLANDS – WHAT ARE THEY?

USACE & EPA JOINT DEFINITION:

"Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

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AUTHORITY: CLEAN WATER ACT SECTION 404

WETLANDS CRITERIA

- Hydrophytic vegetation
- Hydric soils
- Hydrology

*** ALL THREE MUST BE PRESENT!!**

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AUTHORITY: SECTION 404 CLEAN WATER ACT

NON-JURISDICTIONAL WATERS

Not Regulated Under Section 404 of the CWA

- Groundwater
- Swales and Erosional Features
- Diffuse stormwater run-off & sheet flow
- Ditches (excavated wholly in and draining only dry land and that do not carry a relatively permanent flow of water)
- Artificially irrigated areas
- Artificial lakes and ponds, including detention, retention, and infiltration basins
- Water filled depressions
- Stormwater control features
- Waste treatment systems
- Prior converted cropland designated by the Secretary of Agriculture. The exclusion would cease upon a change of use, which means that the area is no longer available for the production of agricultural commodities.

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AUTHORITY: CLEAN WATER ACT SECTION 404

WHEN IS A SECTION 404 PERMIT <u>NOT</u> REQUIRED?

- One step excavation – upland disposal
- Pilings / structures in Section 404 only WOTUS or above MHW in Section 10 navigable waters (unless pilings would have the effect of fill)
- Directional Boring under Section 404 waters with upland entry points
- Certain agricultural, logging, ranching activities – 404(f) exemptions

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AUTHORITY

1972 MARINE, PROTECTION, RESEARCH & SANCTUARIES ACT – SECTION 103

- Ocean waters outside of territorial seas
- Transportation of dredged material for the purpose of disposal into ocean waters

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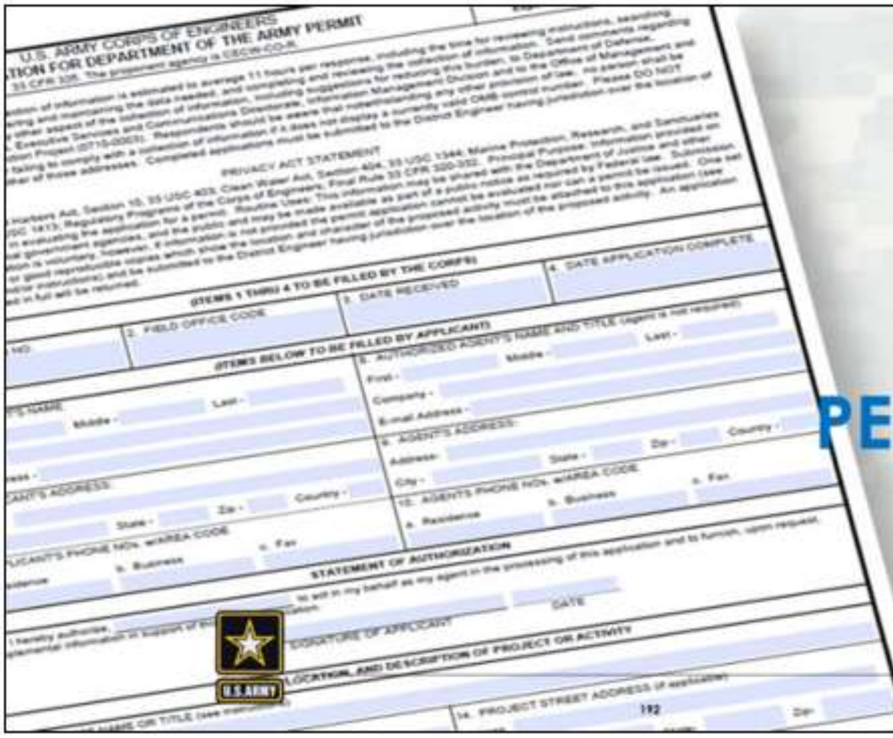

PERMITS

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OTHER LEGAL REQUIREMENTS

ENDANGERED SPECIES ACT

FISH & WILDLIFE COORDINATION ACT

COASTAL ZONE MANAGEMENT ACT

MAGNUSON-STEVENS FISHERY CONSERVATION & MANAGEMENT ACT

NATIONAL HISTORIC PRESERVATION ACT

NATIONAL ENVIRONMENTAL POLICY ACT

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TYPES OF PERMITS

1. Nationwide General Permits (NWPs)- EA
2. Regional General Permits (RGPs)- EA
3. Letters of Permission (LOPs) - Cat Ex.
4. Standard/Individual Permits – EIS or EA

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MITIGATION SEQUENCING

1. Avoidance – avoid impacts to Waters of the United States, including wetlands, whenever possible
2. Minimization – minimize impacts that can't be avoided
3. Compensation – may be required to compensate for any impacts that remain ***AFTER*** avoidance and minimization
   - This is through the purchase of credits from a Mitigation Bank or an In-Lieu Fee (ILF) Provider or offset impacts through a Permittee-Responsible Project

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RESTRICTIONS ON DISCHARGES CWA 404(b)(1) GUIDELINES

Discharges shall not be permitted if there is a practicable alternative with less adverse impacts on aquatic ecosystem

- **Practicable –** "available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose"
- **Alternative** - does not have to be owned by applicant to be considered practicable
- **Burden of proof** - always on applicant to demonstrate no available practicable alternatives
- **Alternative Analysis** – An analysis that identifies the least environmental damaging practicable alternative that meets the overall project purpose (LEDPA). Unlike a FONSI determination, mitigation is not taken into account when determining the LEDPA.

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NEPA?

Pearls Before Swine by Stephan Pastis for August 06, 2016

US Army Corps of Engineers®

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NEPA vs. CWA

NEPA	CWA
✓ Procedural law	➢ Substantive law
✓ Does not regulate decisions agencies make only procedures	➢ Specific requirements must be met or specific actions must be taken (compliance with 404(b)(1) guidelines; LEDPA & mitigation)
✓ Disclosure of Impacts	➢ Failure to comply (violation) can include civil and criminal penalties
✓ Agencies free to select any alternative regardless of impact	
✓ Failure to comply results in injunction until agency complies	

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CORPS NEPA PROCEDURES

33 CFR Part 325 Appendix B of Corps Regulations implements the NEPA procedures found in 40 CFR Parts 1500 – 1508

- Corps can be Lead Federal Agency or Cooperating Agency
  - Jurisdiction by law or special expertise
- Scope of Analysis – Federal Action
  - Control & responsibility for portions of project beyond limit of Corps jurisdiction if larger action is a product of Corps permit action
  - Extent to which entire project within Corps jurisdiction
- Contracting
  - Information required for EIS may be furnished by applicant's consultant
  - Corps approves applicant consultant selection, applicant pays cost
  - Corps responsible for independent evaluation and accuracy of information
- Purpose and Need
  - Exercise independent judgement in defining the purpose and need for project from both applicant and public perspective

Recent changes to NEPA require agencies to revise implementing regulations (currently in process)

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CORPS NEPA PROCEDURES

Alternatives

- Corps neither an opponent nor a proponent of proposed project
  - Applicant's final proposal identified as the "*applicant's preferred alternative*"
  - Corps can only permit the LEDPA
- NEPA (reasonable) vs. CWA (practicable)
  - *Reasonable alternatives means a reasonable range of alternatives that are technically and economically feasible, and meet the purpose and need for the proposed action.*
  - Practicable - available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose.
- Alternative Analysis for NEPA
  - Must also be thorough enough for Corps to use for both the public interest review and 404(b)(1) guidelines

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ENFORCEMENT & COMPLIANCE

Unauthorized Activity

- Referral to the U.S. Environmental Protection Agency (EPA)
- Order corrective measures
- Voluntary restoration
- ATF Permit
- Legal action

Permitted Activities

- Compliance inspections
- Voluntary compliance
- Compliance Orders
- Suspend/revoke permit
- Administrative penalties
- Legal action

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Questions?
Andrew Gregory
907-753-2791
andrew.w.gregory@usace.army.mil
Jenn Mercer
907-753-2779
jennifer.a.mercer@usace.army.mil
U.S. ARMY
http://www.poa.usace.army.mil/Missions/Regulatory.aspx
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COOK INLET SUBSISTENCE CONSUMPTION ASSESSMENT AND SOCKEYE SALMON TISSUE SAMPLING PROJECT

Michael Opheim – Chugach Regional Resources Commission
Stephen Payton - Seldovia Village Tribe

HISTORY/BACKGROUND:

Communities/villages of Seldovia, Port Graham, Nanwalek, and Tyonek are all within the Cook Inlet region of Alaska – all are only accessible by boat or plane and all are small (populations range from 171 to 420); fishing communities

Between 2011 and 2012, SVT staff conducted an assessment (i.e. survey) of Tribal Members from these 4 villages

HISTORY/BACKGROUND:

Assessment funded by Indian General Assistance Program (IGAP or GAP) unmet needs grant.

Why did we want to do it?

Concern about contaminants in the traditional foods our Tribal members eat (especially fish!) and exposure to these contaminants

Believe there is an underestimation of fish consumption rates used to currently calculate ambient water quality criteria for human health

- EPA = recommends 17.5 g/d = 0.62 oz (Powell 2011)

  DEC = uses 6.5 g/d = 0.23 oz (Powell 2011)

HISTORY/BACKGROUND

Last study (before this one) to look at fish consumption rates of Cook Inlet Tribal members was done by the Agency for Toxic Substances and Disease Registry (ATSDR 2009) - came up with a much higher average daily rate of fish consumption based on Port Graham Tribal members: 202 g/d = 7.1 oz

Traditional foods comprise 40 % - 90 % of rural Alaskan diets (ATSDR 2009)

No previous studies for Cook Inlet tribes examined consumption of particular fish parts, or how the frequency and process of particular cooking methods or breastfeeding influenced exposure to contaminants

ASSESSMENT ACTIVITIES:

Modeled project design on survey done by Columbia Inter-Tribal fish commission- 1994

Coordinated with all the participating tribes

Developed lots of documents

Hired and trained two interviewers from each village

Randomly interviewed 19 adult Tribal members (18 years old and up) from each village – SVT staff acted as monitors

Use food models and recorders

Adults were asked to give fish consumption information for the youngest child (under 18) in their households

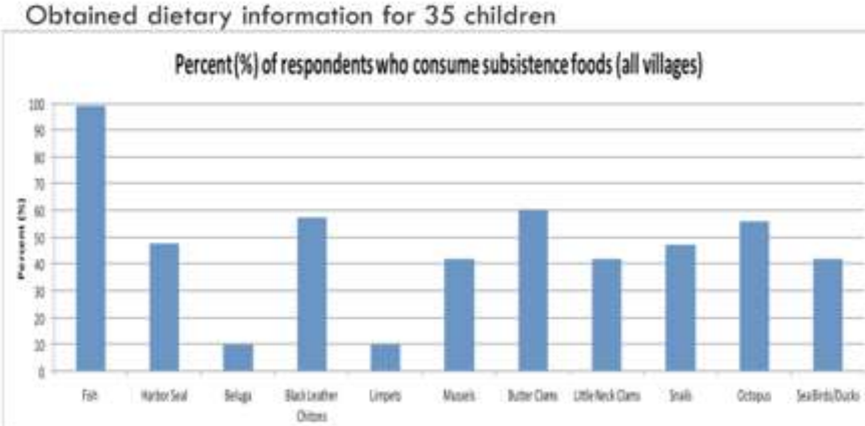
Final report and a summary report was written up

FINDINGS:

Total of 76 interviews

Even number of female and male participants (38)

Obtained dietary information for 35 children



Percent (%) of respondents (n=76) who consume subsistence foods. Weighted data. Seldovia data not included for beluga (n=57) or snails (n=57).

Cook Inlet Tribes (values for fish and non-fish consumers combined). Weighted.

Total Fish			
	Average ± SE	Median	95%
All respondents (n=76)	94.8 ± 23.5	46.5	247.1
Males (n=38)	109.5 ± 39.2	54.1	290.8
Females (n=38)	79.8 ± 26.3	42.6	175.7
Fishers (n=68)	99.0 ± 26.1	48.6	253.2
Non-Fishers (n=8)	45.8 ± 19.4	25.0	110.8
18-39 years old (n=24)	99.4 ± 41.6	43.5	232.9
40-59 years old (n=30)	109.6 ± 48.9	48.6	316.7
60+years old (n=22)	62.5 ± 13.6	44.2	151.5
Shellfish (snails not included for Seldovia)			
	Average ± SE	Median	95%
All respondents (n=76)	12.0 ± 3.4	3.3	36.7
Males (n=38)	9.4 ± 3.5	2.1	29.7
Females (n=38)	14.7 ± 5.8	4.1	63.2
Fishers (n=68)	11.9 ± 3.6	2.9	34.5
Non-Fishers (n=8)	13.7 ± 8.9	3.5	50.2
18-39 years old (n=24)	8.4 ± 3.0	3.6	29.3
40-59 years old (n=30)	11.7 ± 4.5	1.2	47.3
60+years old (n=22)	18.3 ± 8.3	6.1	84.0
Total Seafood (snails not included for Seldovia)			
	Average ± SE	Median	95%
All respondents (n=76)	106.8 ± 23.9	55.3	267.1
Males (n=38)	118.9 ± 39.3	61.0	291.0
Females (n=38)	94.5 ± 27.7	50.2	241.1
Fishers (n=68)	110.9 ± 26.6	54.1	271.8
Non-Fishers (n=8)	59.5 ± 19.5	55.0	118.3
18-39 years old (n=24)	107.8 ± 42.7	51.5	242.2
40-59 years old (n=30)	121.2 ± 49.0	50.3	328.0
60+years old (n=22)	80.8 ± 17.8	60.8	259.1

Cook Inlet Tribes (all children). One outlier excluded. Weighted.

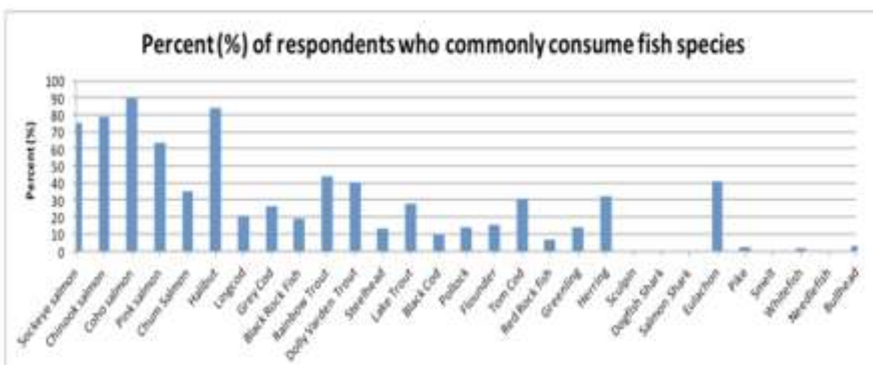
	Average ± SE	Median	95%
All (n=34)	58.0 ± 16.3	40.5	177.8
5 yrs old and younger (n=17)	34.9 ± 17.4	12.8	134.1
6 to 17 yrs old (n=17)	83.3 ± 25.8	67.3	203.7

Cook Inlet Tribes (only children who eat fish). One outlier excluded. Weighted.

	Average ± SE	Median	95%
All (n=30)	67.0 ± 17.5	40.5	186.6
5 yrs old and younger (n=13)	47.1 ± 20.9	31.8	151.8
6 to 17 yrs old (n=17)	83.3 ± 25.8	67.3	203.7

Tribe(s)	Average age children (who ate fish) started eating fish (months)	Percentage of women that have given birth	Percentage of women who have given birth who currently are breast-feeding or have breast-fed	Average age children (who were breast-fed) stopped being breast-fed (months)	Reference
Cook Inlet Tribes	11.8 (± 2.6 SE)	96.3%	68%	11.5 (± 2.3 SE)	This current assessment
Suquamish Indian Tribe	12				Suquamish 2000
Tulalip and Squaxin Island Tribes	39		43% and 75% of children had been breast-fed (respectively)	8 to 9	Toy et al. 1996
Columbia River Basin Tribes	13.1 (± 0.7 SE)	88%	42%	7.6 (± 0.6 SE)	CRITFC 1994

Women who breast-fed, consumed on average, 100.1 (± 38.5 SE) g/d of fish per day which is higher than the mean fish consumption rate found, in general, for women (79.8 (± 26.3 SE) g/d) within the tribal population.



Percent (%) of respondents (n=75) who commonly consume fish species. Weighted data. Seldovia data not included in this graph for the following species: pike, smelt, whitefish, needlefish, and bullhead

Table 3. Consumption of anadromous fish species by percent of total fish consumption per month. Percents are based on consumption of only listed fish species identified in questionnaire (based upon number of times fish species are eaten in a month and average fish portion sizes as indicated by respondents). Unweighted data. One outlier excluded from Port Graham's data.

Village	Fish Species										
	Sockeye salmon	Chinook salmon	Coho salmon	Pink salmon	Chum salmon	Dolly varden trout	Steelhead	Eulachon	Rainbow trout	Lake trout	Smelt
Seldovia (n=19)	24.7	10.3	14.0	8.8	4.1	0.6	0.0	1.4	0.7	0.4	N/A
Port Graham (n=18)	17.7	9.4	17.9	7.6	6.8	3.0	1.2	2.2	3.1	1.0	0.0
Nanwalek (n=19)	14.2	1.8	20.7	16.5	2.5	6.3	0.4	5.2	4.2	2.6	0.0
Tyonek (n=18)	9.2	40.6	24.2	0.9	0.9	1.3	2.3	9.2	2.7	1.6	0.0

Table 4. Consumption of non-anadromous fish species by percent of total fish consumption per month. Percents are based on consumption of only listed fish species identified in questionnaire (based upon number of times fish species are eaten in a month and average fish portion sizes as indicated by respondents). Unweighted data. One outlier excluded from Port Graham's data.

Village	Fish Species										
	Halibut	Lingcod	Grey cod	Black rockfish	Black cod	Pollock	Flounder	Tomcod	Red rockfish	Greenling	Herring
Seldovia (n=19)	19.8	1.9	4.6	0.7	1.0	2.9	0.0	1.0	0.7	0.8	1.7
Port Graham (n=18)	10.1	1.9	1.3	1.5	1.4	6.6	2.0	1.3	0.9	0.9	1.3
Nanwalek (n=19)	11.3	0.5	1.0	1.4	0.1	1.7	0.6	4.2	0.0	1.6	2.8
Tyonek (n=18)	5.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	1.1

The results obtained from this assessment indicate that the average daily fish consumption rate of Cook Inlet tribal members is approximately five times greater than the consumption rate recommended by EPA (17.5 g/d) and 15 times greater than the rate used by ADEC (6.5 g/d) in determining human health based ambient water quality criteria and standards for toxins. Current rates clearly underestimate tribal fish consumption, suggesting water quality criteria based on these rates could endanger Native Alaskan health in Cook Inlet. Based on the 95 percentile fish consumption rate value obtained for all respondents of this assessment, we would suggest the use of 247 g/d.

Development and oil and gas activities occurring in upper Cook Inlet have raised concerns over contaminants in traditional foods harvested within Cook Inlet, and the risk these contaminants pose to human health.

Treated wastewaters and drilling mud are the main sources through which contaminants generated from these operations enter Cook Inlet (ATSDR 2009). Some of these contaminants include oil, grease, mercury, cadmium, barium sulfite, and chemical additives such as flocculants, oxygen scavengers, biocides, cleansers, and scale corrosion inhibitors. It is estimated that 253 tons of oil are discharged into Cook Inlet from treated wastewaters each year (MMS 2003, as cited in ATSDR 2009).

SAMPLE COLLECTION

Sockeye salmon were caught using set nets

Dolly Varden were caught using nets and/or rod and reel (this varied by community and by sampling personnel)

MEAN VALUES OF METALS IN SOCKEYE AND DOLLY VARDEN

Location	Species	n	Length	Age	Tissue	Hg	As	Cu	Pb	Se
NANWALEK	DOLLY VARDEN	10	30.6	7.5	Fillet	0.0316	1.0330	0.6967	ND	0.5822
					Whole	0.0273	0.9857	1.0026	ND	0.8766
PORT GRAHAM	DOLLY VARDEN	11	31.1	8.0	Fillet	0.0195	0.8366	0.7407	ND	0.5478
					Whole	0.0186	0.8629	0.9795	ND	0.8028
SELDOVIA	DOLLY VARDEN	10	18.9	9.3	Fillet	0.0332	0.4100	0.5319	ND	0.5098
					Whole	0.0301	0.4828	1.1764	0.03169*	0.7547
TYONEK	DOLLY VARDEN	4	29.8	9.0	Fillet	0.0267	1.2860	0.7875	ND	0.5438
					Whole	0.0244	1.3628	1.1925	ND	0.7868
NANWALEK	RED SALMON	9	57.7	NA	Fillet	0.0390	0.5094	0.6689	ND	0.5208
					Whole	0.0334	0.5858	6.1422	ND	1.0554
PORT GRAHAM	RED SALMON	9	58.3	NA	Fillet	0.0351	0.4493	0.5782	ND	0.5013
					Whole	0.0303	0.5426	5.2011	ND	1.0101
SELDOVIA	RED SALMON	9	56.0	NA	Fillet	0.0374	0.4002	0.6067	ND	0.4674
					Whole	0.0310	0.4929	7.2378	ND	1.1550
TYONEK	RED SALMON	9	55.3	NA	Fillet	0.0444	0.3711	0.7703	ND	0.5179
					Whole	0.0383	0.3486	5.0756	ND	0.8536

*The reporting limit (RL) for Pb is 0.01 mg/Kg. Two whole body dolly samples from Seldovia were at or above the RL, the other 8 were below the RL with the average reported in the table above. Results less than the RL but greater than the detection limit are considered an estimate.

MEAN (SD) (NG/G WET WEIGHT) FOR COMPOSITE WHOLE-BODY SAMPLES SUBMITTED FOR SELECT ORGANOHALOGEN CONTAMINANTS

Location	Species	# Fish	% Lipid	Total PCBs	Total PBDEs	Sum Chlordanes	Sum DDT	Sum HCH	Hexachlorobenzene	Mirex	Sum Nonachlor	Dieldrin	Toxaphene
NANWALEK	DOLLY VARDEN	10	2.7	3.26	0.220	0.167	1.787	1.078	0.583	NA	0.398	NA	NA
PORT GRAHAM	DOLLY VARDEN	11	6.14	7.47	0.182	0.195	1.379	0.541	0.819	NA	0.326	0.171	NA
SELDOVIA	DOLLY VARDEN	10	2.63	11.3	0.145	1.10	0.693	0.066	0.474	NA	0.188	0.089	NA
TYONEK	DOLLY VARDEN	4	8.85	11.4	0.547	0.384	1.863	1.487	1.33	NA	0.731	0.249	NA
NANWALEK	RED SALMON	9*	7.05 (0.81)	10.3 (2.40)	0.147 (0.027)	1.057 (0.183)	11.04 (2.72)	1.536 (0.221)	1.62 (0.398)	0.07 (0.013)	1.621 (0.352)	0.377 (0.097)	21.4 (4.03)
PORT GRAHAM	RED SALMON	9*	6.12 (0.85)	6.89 (2.23)	0.152 (0.026)	0.838 (0.149)	6.83 (2.52)	0.770 (0.141)	1.27 (0.21)	0.075 (0.021)	1.135 (0.386)	0.327 (0.056)	14.33 (3.52)
SELDOVIA	RED SALMON	9*	6.49 (0.89)	5.81 (4.43)	0.141 (0.022)	1.02 (0.075)	8.61 (3.30)	1.047 (0.085)	1.40 (0.094)	0.918 1.44	1.240 (0.336)	0.383 (0.019)	15.33 (3.31)
TYONEK	RED SALMON	9*	5.73 (0.84)	5.81 (1.86)	0.152 (0.012)	1.398 (0.285)	10.82 (3.03)	0.597 (0.108)	1.70 (0.132)	0.090 (0.016)	1.582 (0.356)	0.440 (0.051)	17.98 (8.15)

*Three whole body composites of three fish each

RESULTS

Although there were both sockeye and Dolly Varden samples with higher than average ADEC FMP amounts of contaminants, no individual or composite sample of sockeye showed amounts exceeding FDA action levels or EPA chronic consumption threshold values for heavy metals or PCB congeners, PBDEs, or organochlorine pesticides.

There is no apparent correlation between the length or weight of the sockeye salmon sampled and the amount of metals accumulated. Neither was there an apparent correlation between length and weight and the amount of PCB congeners, PBDEs, or organochlorine pesticides accumulated.

THE SOCKEYE SALMON COLLECTED FOR THIS STUDY THAT HAD THE HIGHEST AMOUNTS OF METALS IN ADEC'S FISH MONITORING PROGRAM WERE:

- a whole-body sample from Seldovia with 0.12 mg/kg of cadmium;
- a whole-body sample from Seldovia with 25.5 mg/kg of copper;
- a whole-body sample from Tyonek with 0.0552 mg/kg of mercury;
- a fillet sample from Tyonek with 0.554 mg/kg of selenium;
- a whole-body from Seldovia with 3.0 mg/kg of selenium.

CRRC/APMI are working on programs in Port Graham and Nanwalek in Lower Cook Inlet that will help those communities continue to have their subsistence resources. In Port Graham Bay APMI has been working on planting clams for many years. Planting Steamers and Butter clams in several areas with some success in seeing clams grow to mature sizes. APMI is working on a kelp farm in Port Graham Bay to help the community to have a possible source of work for locals. CRRC is working on planting King Salmon in Port Graham and Nanwalek to give community members another resource to harvest. CRRC has been helping Nanwalek with the fish weir and salmon counts for red salmon for several years. APMI is working on breeding and growing Bidarkis in the hatchery in Seward to later be able to return those to Port Graham and Nanwalek.

CRRC PROGRAMS