CHUGACH REGIONAL RESOURCES COMMISSION

2024 Chugach Regional Resources Commission Mariculture Workshop and Subsistence Memorial Gathering

March 21st, 2024
Location – Anchorage, Alaska

Document Developed by Briana Murphy, Sean Den Adel, and Raven Cunningham, Chugach Regional Resources Commission

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CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

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CHUGACH REGIONAL RESOURCES COMMISSION

Introduction

Chugach Regional Resources Commission (CRRC) is an inter-Tribal fish and wildlife commission authorized as a Tribal consortium under the Indian Self Determination and Education Assistance Act (ISDEAA). For forty years, CRRC has provided essential government services in natural resource management and food security for the seven Alaska Native villages in the Prince Wiliam Sound and Lower Cook Inlet regions of southcentral Alaska: the Native Villages of Chenega, Eyak, Nanwalek, Port Graham, Tatitlek, Qutekcak Native Tribe, and Valdez Native Tribe. Since 1993, CRRC has been authorized by our member Tribes to carry out natural resource management activities under ISDEAA and act on behalf of our member Tribes in matters related within our traditional use areas encompassing southcentral Alaska, what we call the Chugach region. The Chugach region has been the traditional homeland of our people for over 10,000 years, and includes over 5,000 miles of coastline, over 50 named islands, and over 20,000 square miles of mountains. Today we have over 1,500 Tribal Members living in our seven communities.

CRRC has been hosting the Annual Subsistence Memorial Gathering since 1999. Near the anniversary of the *Exxon Valdez* oil spill, this daylong celebration is meant to honor our resilience and adaptation in the wake of the terrible disaster that drastically changed the Chugach region and its people. Each year the Board of Directors and CRRC staff choose a topic, giving people an opportunity to share traditional knowledge, build relationships, celebrate our lands, habitat, fish and wildlife, and people, while giving us an opportunity to heal from the spill that has continued to impact our lives to this day. We end the day with a candlelight vigil, feast, and dancing that we share in good company. The Subsistence Memorial Gathering provides a safe place to connect our communities where traditional food that has been gifted is cooked and shared. The Gatherings assist in preserving and celebrating culture through food by providing the opportunity to our young people to learn food production and preparation and connecting them to other communities' food. At the Subsistence Memorial Gathering, all food resources are brought together, shared, and traded between villages. CRRC uses this unique gathering to heighten awareness of changing food resources.

2024 Mariculture Workshop

Each year, CRRC hosts a themed workshop and Subsistence Memorial Gathering. The theme of the 2024 one-day workshop was titled: Mariculture: When the Tide is out the Table is Set. This year's Gathering was co-sponsored by the Alaska Conservation Foundation and Native Conservancy and funded in part by the Exxon Valdez Oil Spill Trustee Council. The purpose of this workshop was to encourage Chugach Region Alutiiq/Sugpiaq and Eyak participation in the science and management of mariculture species in the Chugach region and its communities, increase awareness of the work happening at the CRRC Alutiiq Pride Marine Institute (APMI), and promote regional partnerships and coordination throughout the Chugach region and beyond.

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The agenda for the 2024 Mariculture Workshop is provided on the following pages along with short biographies of the presenters. Highlights of the presentations have been summarized. Lastly, if available, the presentations in order given are provided in Appendix A.

LOGO

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Agenda

22ND ANNUAL SUBSISTENCE MEMORIAL GATHERING

09 : 00 AM	**Opening - Prayer**	The Den
09 : 15 AM	**What is Mariculture**	The Den
09 : 30 AM	**KELP** • CRRC + Native Conservancy *EVOS* Project • Native Village of Eyak Mariculture Recon • Commecial Farms and Processing	The Den
11 : 15 AM	**Booth Break**	Student Union Hallways
11 : 30 AM	**Shellfish** • Intro to Monitoring for Paralytic Shellfish Toxins in Resurrection Bay • Restoring Indigenous Clam Gardening from Seldovia to Kake • Assessing Littleneck and Butterclam Populations in the Chugach Region • Happy as a Clam - What Role Does Serotonin Play in Bidarki Reproduction? • Lessons Learned in Spawning and Cultivating Pinto Abalone • Aging Gracefully: Discovering the Secret Age of Sea Cucumbers • Shellfish Panel Discussion from the Alutiiq Pride Marine Institute	The Den
01 : 00 PM	**LUNCH - Provided**	The Den
01 : 30 PM	**Build Back Better Projects** • Chugach Regional Ocean Monitoring Program • Chenega Clam Project • Kelp Cooperative Road Map	The Den
02 : 30 PM	**Booth Break**	Student Union Hallways
02 : 45 PM	**Healthy Land & Sea Planning** • *EVOS* Alaska Conservation Foundation • Healthy Land and Sea Planning	The Den
04 : 45 PM	**Closing**	The Den
06 : 00 PM	**Dinner - NYO Demo - Dancing - Fashion Show**	The Cafeteria

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Workshop Presenters and Biographies

Aaron Poe

Network Program Officer

Alaska Conservation Foundation

Aaron has worked in Alaska for over 20 years specializing in natural resource management, partnership development, and community engagement. Aaron's efforts have focused on helping agencies better understand risks to species and habitats and the value these natural resources have for the communities who depend on them. He is currently the Coordinator for the Aleutian and Bering Sea Islands Landscape Conservation Cooperative and focuses on building partnerships between agencies, tribes, researchers, industry, and communities to address large-scale issues like climate change and marine vessel traffic in the Aleutian Islands and Bering Sea. He is also the program officer for the Sustainable Southeast Partnership and works with several small communities and nonprofit organizations in southeast Alaska to build localized solutions to socioeconomic and environmental challenges.

Allison Carl

Biology Laboratory Manager

Chugach Regional Resources Commission

Allison Carl is responsible for daily operations and procedures in the biology lab that supports CRRC research and monitoring programs at APMI. She manages the laboratory staff and all equipment and supply procurement, sample processing, data quality assurance, quality control and analysis, and generation of final research products.

Allison graduated from the University of Alaska Anchorage with a bachelor's degree in biological sciences. She is currently working on her master's in UAA's Department of Biological Sciences. Through a partnership with CRRC and the Chugach Alaska Corporation, Allison worked as a Research Scientist for two and a half years to support CRRC's Subsistence, Climate Change, and Marine Mammal Programs as well as APMI's research and monitoring initiatives.

Andrew Crow

Executive Director

Alaska Cooperative Development Center, University of Alaska Anchorage

Andrew Crow has been the Director of the Alaska Cooperative Development Center (ACDC) since its founding in 2006. The Center is the only cooperative development technical assistance provider in Alaska. Its goal is to improve economic conditions in rural Alaska by encouraging the establishment of new cooperatives and aiding existing co-ops. It does this by expanding knowledge about the co-op business model, improving cooperative development skills, providing accessible and current information about cooperatives, developing statewide, regional, and national networks, and offering professional assistance.

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Since its inception the ACDC has helped create sixteen co-ops, seven businesses, and several associations in the State.

Before working with cooperatives, Andrew worked in the Far East of Russia as an interpreter for Alaska businesses, and for a series of aid programs. Work in that remote corner of the Russian Federation required solving complex logistical and operational problems. In addition, he has worked as a commercial fisherman in Bristol Bay, served as an AmeriCorps VISTA volunteer for the Lower Yukon Economic Development Council, and acted as staff for the Governor's Commission on Rural Governance. He also has a law degree and worked as an associate at an Anchorage law firm.

Briana Murphy

Mariculture Liaison

Chugach Regional Resources Commission

Briana Murphy is the Mariculture Liaison for CRRC and facilitates mariculture projects throughout the Southcentral region, particularly all things kelp related. She is at the forefront of the commercial kelp farming industry helping push the Southcentral region of Alaska forward by supporting farms through seed string supply and monitoring research grow-out sites to assist farmers with site selection.

Briana grew up commercially fishing with her family in Prince William Sound and has since participated in a variety of different fisheries throughout Alaska. She and her business partner started a commercial seaweed farm outside of Seward and a mobile hatchery in 2021. They have grown over 10,000 feet of seeded string. Briana brings her passion for mariculture and sustainability to APMI.

Caitlin McKinstry

Biologist

Native Village of Eyak

Caitlin McKinstry has lived and worked in the Chugach region for the past 13 years. She moved to Cordova in 2011 after receiving her MSc. in Marine Biology from the University of North Carolina at Wilmington where she studied food web dynamics that affect North Atlantic Right Whales. She spent much of her time in Alaska documenting and monitoring oceanographic changes in the Prince William Sound. Currently, she is the biologist for the Native Village of Eyak in the Department of the Environment and Natural Resources. She has led research efforts into kelp farming best practices and ecosystem impacts of mariculture. As the program manager for NVE's mariculture research program, she has taken an evidenced-based approach to learning more about how kelp farming can benefit NVE tribal members and the traditional waters that they have called home since time immemorial.

Christian Woodard

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Southcentral Alaska Subsistence Resource Specialist 2
Alaska Department of Fish and Game

Christian Woodard is a Subsistence Resource Specialist with the Alaska Department of Fish and Game, Division of Subsistence. He is the lead author on a 2023 paper detailing subsistence salmon fishing and monitoring in Port Graham and Nanwalek. His current projects include life history mapping of traditional moose hunting practices in Port Graham, deer hunting in Port Lions, and the use of kelp and seaweed in communities throughout the Chugach region.

David Guilfoyle

Managing Director
Applied Archeology

Dave is a healthy land and sea program manager with a background in cultural and applied anthropology, heritage preservation, and community-based youth and cultural ranger program design and delivery. He has led several multi-year projects in collaborative heritage planning and management with communities across Australia, Alaska, and the four corners of the USA, with a focus on place and landscape-based assessment methodologies; cultural values mapping; significance assessment of cultural places; working under and working to support cultural and community leadership models in land and sea management programs. His formal qualifications include a Bachelor of Arts degree in Anthropology and Geography (Curtin University and the University of Oregon), a Bachelor of Science degree in Archaeology (University of Western Australia), and a Master of Arts in Archaeology and Heritage (University of Leicester, England). He holds research associations with several institutions and works on active healthy land and sea programs in Australia and Alaska.

Dustin Carl

Tribal Wildlife Biologist
Chugach Regional Resources Commission

Dustin Carl is the Tribal Wildlife Biologist and coordinates CRRC's Invasive Species Program in partnership with the Homer Soil and Water Conservation District, the Wetlands Program funded with CRRC's partners at UAA and the EPA, and the Kachemak Bay Watershed Collaborative with CRRC's Climate Change Coordinator and partners at the Water Policy Council. Dustin has worked on several projects, including updating CRRC's subsistence regulations posters, providing support to the Nanwalek Fisheries Projects, conducting research to update population and composition estimate data for moose in the Lower Cook Inlet with the Port Graham Village Council, and monitoring the spatial distribution of Pacific herring in the Prince William Sound through eDNA analysis with the APMI staff. Dustin attended the University of Alaska Anchorage, where he earned a Bachelor's and a Master's in biological sciences. His thesis is titled "Genomic Variation of Red-faced Cormorants in the Aleutian Archipelago and Bering Sea." He has gained experience working on projects that include different salmon, moose, black and brown bears, seabirds, and marine mammal species throughout Alaska.

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Gayle Neufeld

GIS Analyst 3

Alaska Department of Fish and Game

Gayle is the senior GIS Analyst for the ADF&G Division of Subsistence. Prior to joining the Subsistence Division, Neufeld had lived and worked throughout Alaska for over 25 years, specializing in natural resource management and ecological research in marine ecosystems, GIS, and data management. She holds both B.S. and M.A. degrees in biology, and a post-graduate certificate in GIS. In her spare time, Gayle enjoys hiking, photography, travel, and playing hockey.

Jackie Keating

Southcentral Alaska Subsistence Resource Specialist 3

Alaska Department of Fish and Game

Jackie Keating, Subsistence Resource Specialist 3, is the senior researcher for the ADF&G Division of Subsistence, Southcentral Region. The Division of Subsistence works to scientifically gather, quantify, evaluate, and report information on the customary and traditional uses of Alaska's fish and wildlife resources. Keating has had the privilege of working with communities across the Chugach region since 2017, including a collaborative project on Chenega clams with APMI, and most recently household surveys and ethnographies in Port Graham.

Jacob Cohen

Biology Laboratory Technician

Chugach Regional Resources Commission, APMI

Jacob Cohen is the Biology Laboratory Technician. He supports the various research and monitoring programs at APMI through his laboratory and field work. He analyzes seawater samples from coastal communities and identifies phytoplankton and tests for shellfish toxins in the biology lab. Jacob previously worked as a physical science technician in a paleoclimate lab at the U.S. Geological Survey in Reston, Virginia, before moving to Seward to work for APMI. In this role, he sampled Arctic sediment cores to assist in research on historical changes in ice, and he conducted microscope analyses on ostracod specimens. Jacob has a Bachelor of Science degree from Georgetown University, where he majored in science, technology, and international affairs with a concentration in energy and the environment and a minor in biology.

Jacqueline Ramsay

(Previous) Ocean Acidification & Shellfish Research Lab Manager

Chugach Regional Resources Commission

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Mrs. Ramsay, the Chemistry Laboratory Manager, oversaw the carbonate marine chemistry research and monitoring efforts that began in 2013 at APMI. She collaboratively helped develop the ocean acidification research efforts at APMI and has spawned and raised many different shellfish species, including abalone.

Mrs. Ramsay has over 20 years of research experience in the marine sciences. She holds a bachelor's degree in Zoology from the University of California, Davis and a Master of Science degree in Fisheries Science with an emphasis on crab endocrinology and physiology from the University of Alaska, Fairbanks. In previous positions she managed university laboratories, oversaw graduate students and managed logistics of fieldwork.

Jeff Hetrick

Director of Alutiiq Pride Marine Institute

Chugach Regional Resources Commission

Jeff Hetrick is the Director of APMI and oversees the day-to-day operations and management of the facility, programs, and employees. His responsibilities include staff management, budgeting, financial management, permitting, facility infrastructure management, shellfish culture for aquatic farming and enhancement, and overseeing the mariculture program, the Chugach Regional Ocean Monitoring (CROM) Program, and scientific research preformed at APMI.

Jeff has a Bachelor of Science degree in biology from the University of Maryland and an MBA from Portland State University. He has over 30 years of experience in the Alaska aquaculture industry. He worked 20 years in the salmon enhancement industry working for private nonprofits and the Alaska Department of Fish & Game before becoming Director of the Alutiiq Pride Shellfish Hatchery in 2002. Jeff has operated an oyster farm in Prince William Sound and is a founding member of the Alaskan Shellfish Growers Association.

Dr. Kevin Berry

Professor of Economics, College of Business and Public Policy

University of Alaska Anchorage

Dr. Kevin Berry has been an Associate Professor of Economics at the University of Alaska Anchorage since July 2021. He previously had a joint appointment in the Institute of Social and Economic Research from 2017-2020. Dr. Berry was a postdoctoral associate at Yale University and received his PhD from the University of Wyoming. His children are 4th generation Alaskans. Kevin is an avid hockey player, cyclist, and hiker.

Dr. Maile Branson

Science Director

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Chugach Regional Resources Commission

Dr. Maile Branson is the Science Director and manages the science and research efforts at CRRC and APMI. She works with CRRC staff members and project partners to codevelop and implement research projects; oversees project grant writing, permitting, and data integrity and quality control measures; and works to disseminate project results by publishing the research in scientific journals. Maile leads the development of natural resource projects with the communities served by the CRRC in the Chugach region.

Maile holds a bachelor's degree in biology, a master's in fisheries with an emphasis on aquaculture and fish health, and a PhD in biology focusing on disease ecology and wildlife virology. Maile is passionate about studying OneHealth issues as they relate to the people, animals, and environment of the Chugach region.

Sean Den Adel

Mariculture Liaison Prince William Sound

Chugach Regional Resources Commission

Sean Den Adel is the Mariculture Liaison for the Prince William Sound region at CRRC. He supports the Tribes within the region through outreach, education, and coordination of efforts related to seaweed and shellfish farming. Sean is an active kelp farmer and shares his knowledge with the region while supporting others in regenerative ocean farming. He is responsible for working with the Alaska Mariculture Alliance, while assisting with all mariculture-related projects within the *Exxon Valdez* oil spill area. Sean holds a Bachelor of Science degree in Environmental Science from Western Washington University where he graduated from the Huxley College of the Environment. Sean draws on over a decade of experience as an environmental scientist for Tribes, government agencies, and nonprofit organizations throughout the Pacific Northwest, Alaska, and Japan.

Dr. Tom Thornton

Professor, Environment and Society; University of Alaska Southeast

University of Alaska Southeast

Dr. Thornton is a Professor of Environment and Society at the University of Alaska Southeast. Thornton earned a bachelor's degree in Sociology/Anthropology from Swarthmore College and a master's degree and Ph.D. in Anthropology from the University of Washington. His research interests are in human ecology, adaptation, local and traditional ecological knowledge, conservation, coastal and marine environments, conceptualizations of space and place, and the political ecology of resource management among the indigenous peoples of North America and the circumpolar North.

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Mariculture Workshop Summary and Key Points of Presentations

Prince William Sound Kelp Mariculture Development for Habitat Restoration and Local Economy—Briana Murphy; Mariculture Liaison, Chugach Regional Resources Commission

- Project began in 2021; goal is to establish a sound industry to provide economic development in coastal communities and provide habitat restoration both by limiting stress on natural kelp beds, and by providing a temporary habitat for many marine species affected by the Exxon Valdez Oil Spill.
- Objective 1: scale hatchery infrastructure, both APMI's and Native Conservancy's, to meet industry needs for commercial kelp farmers.

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- Objective 2: develop effective and affordable kelp farming strategies, which include everything from collecting sorus tissue, making seed string affordable and accessible, and refining farming and cultivation strategies to be sustainable for native-owned farms.
- Objective 3: build a database to establish site selection criteria for kelp farms from empirical data, including water quality samples and tissue samples to ascertain how well certain species grow in specific areas and farmer yields.
- To accomplish these objectives, CRRC and Native Conservancy have been operating various kelp research sites throughout Prince William Sound since 2021.

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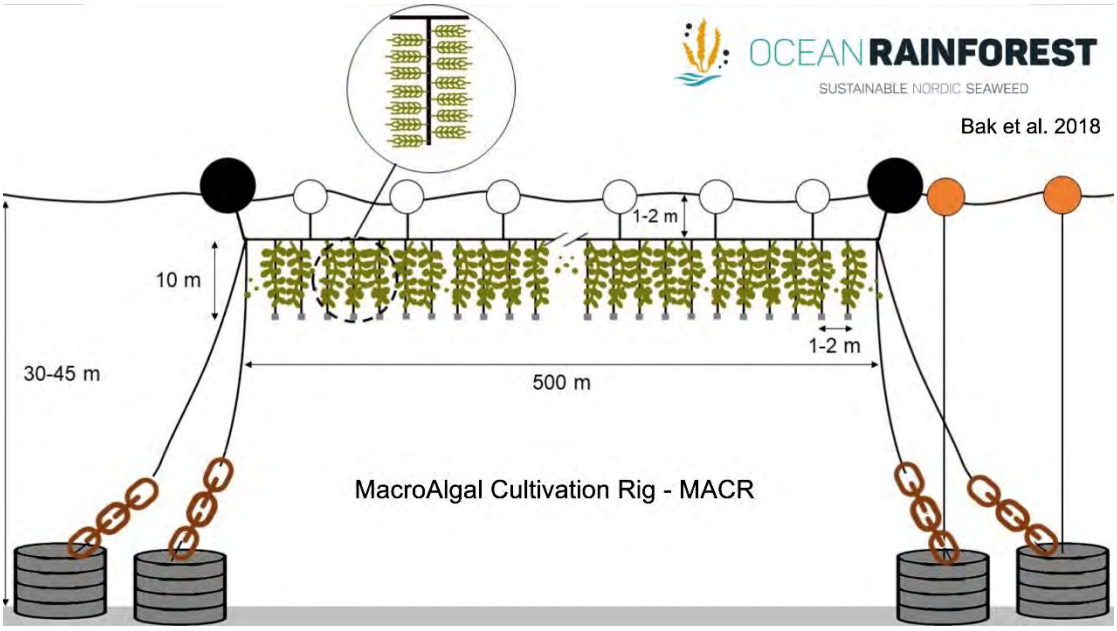
Native Village of Eyak Mariculture Program—Caitlin McKinstry; Biologist, Native Village of Eyak

- NVE's Department of Environmental Resources began looking into kelp mariculture as a tool for carbon sequestration
- The world would need to remove 1 billion tons of Carbon per year to keep up with anthropogenic emissions
- Mariculture ecosystem services include seawater filtration and uptake of nutrients to combat eutrophication; preventing coastal erosion; habitat creation; carbon sequestration and storage
    - NVE's mariculture research program aims to better understand to what extent kelp can help mitigate anthropogenic emissions
- NVE partnered with Ocean Rainforest, based in the Faroe Islands to deploy their MacroAlgal Cultivation Rig (MACR), which grows kelp vertically, producing more kelp biomass in a smaller footprint
- Sugar kelp outplanted in November 2022 grew exceptionally well; kelp required frequent trimming over the summer months or else the weight of the biomass would sink the growlines



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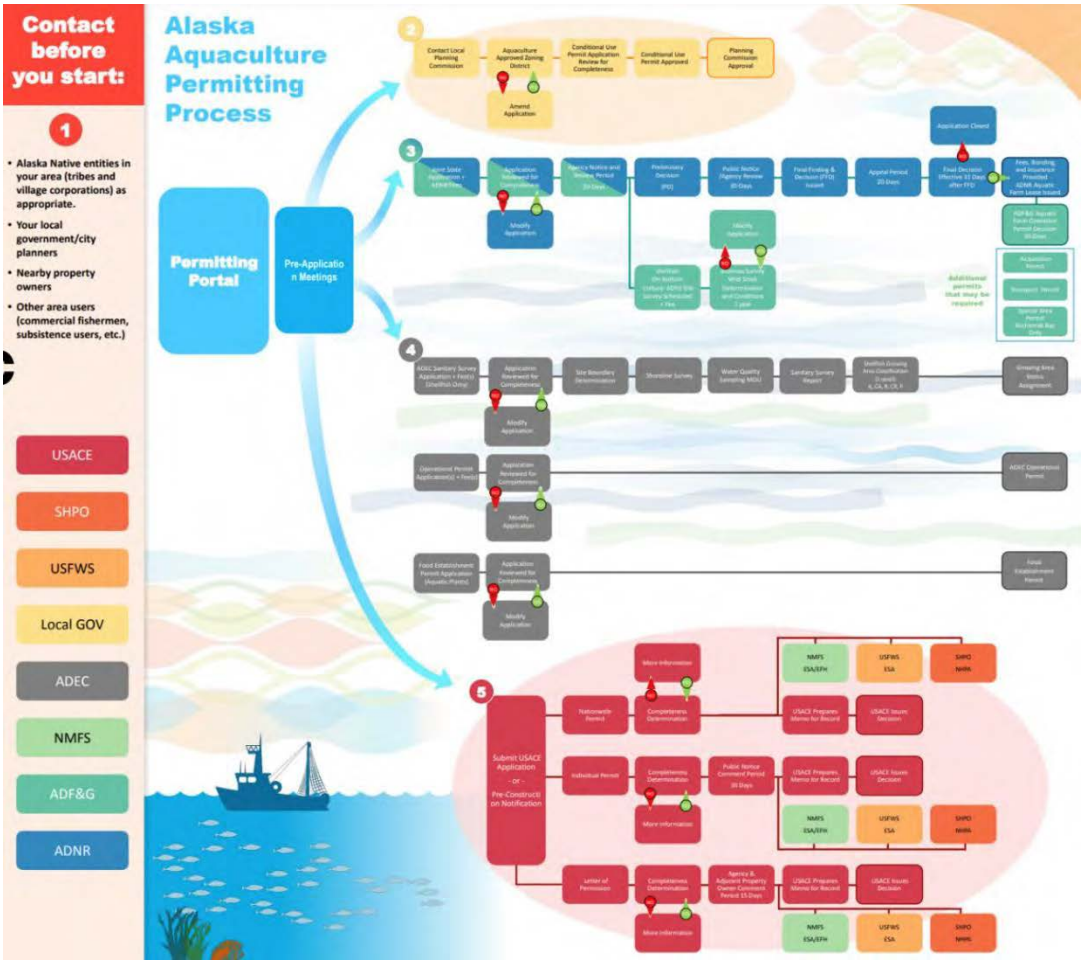
Commercial Farms and Processing at CRRC—Briana Murphy and Sean Den Adel; Mariculture Liaisons; Chugach Regional Resources Commission

- In Spring 2023, CRRC finished the permitting process for three, twenty-acre commercial kelp farms
    - Farms are located in Latouche Passage, Tatitlek Narrows/Boulder Bay in Prince William Sound, and Passage Island in Lower Cook Inlet.
- These farms provide a platform to incorporate community members in the mariculture industry and provide a direct path to involvement for any potentially interested farmers to provide them with a year of farming experience.
- Farms can be used by individuals, Tribal councils, community organizations, however communities might want to be involved.



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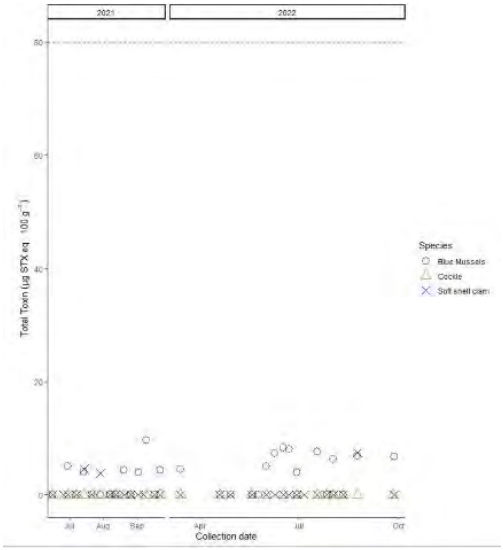
Mariculture Research at the Alutiiq Pride Marine Institute: Paralytic Shellfish Toxin Congener Profiles in Three Species of Bivalves from Resurrection Bay, Alaska during Summer 2021 and 2022—Dr. Maile Branson; Science Director, Alutiiq Pride Marine Institute

- The Alutiiq Pride Marine Institute was established first as a mariculture technical center operated by the City of Seward and what was then the Marathon Native Tribe (now the Qutekcak Native Tribe).
    - CRRC took over operation of the facility in 2004 and continues to operate and manage the facility today to support its broader focus of promoting natural resource management, preserving subsistence lifestyles, and promoting economic development throughout Tribal communities located in the Chugach region.
- APMI's mariculture research focuses on enhancing or improving understanding of marine species important to subsistence lifestyles of Tribal members.
    - Monitoring paralytic shellfish toxin levels in shellfish on beaches throughout the Chugach region is important to gain a better understanding of when and where Tribal members can harvest shellfish.
- Three different species of bivalves that are traditionally collected for subsistence (cockles, blue mussels, and soft shell clams) were tested at a local beach in Seward from July-September 2021 and April-October 2022 for the 12 most toxic PSTs typically found in shellfish.
- No significant toxin levels were detected in any shellfish samples taken during this study.



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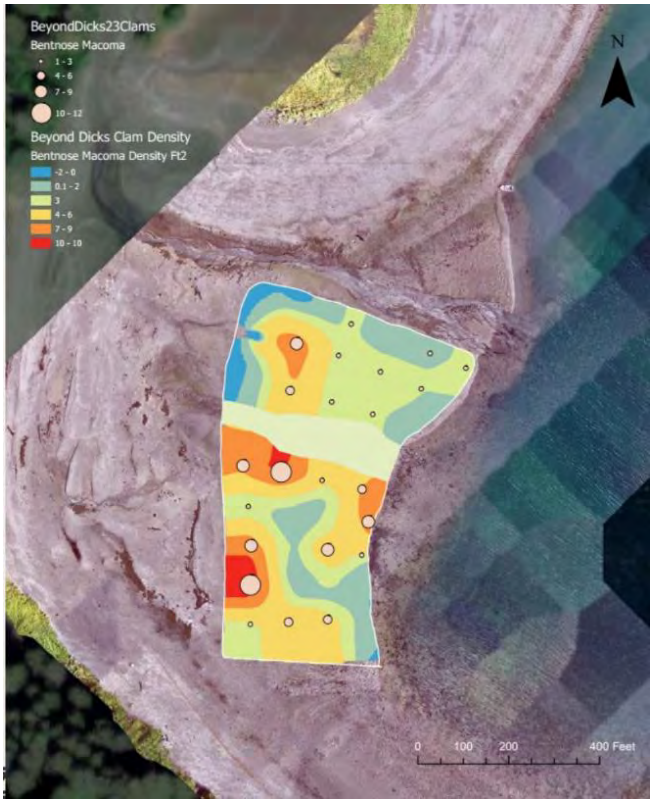
Restoring Indigenous Clam Gardening in Seldovia and Kake—Dustin Carl; Tribal Wildlife Biologist, Alutiiq Pride Marine Institute

- Shellfish populations in the Chugach Region have experienced a significant decline in recent years:
  - Though exact causes are unknown, it is thought overharvest, over predation, the Exxon Valdez Oil Spill, and changes in the climate may all play a role
- To better understand shellfish populations on beaches, CRRC has conducted beach assessment surveys to estimate the populations sizes of various species of shellfish and bivalves.
- In addition to assessing population size, CRRC also collected water and substrate samples to identify the suitability of sites for enhancement areas that can then be provided to nearby communities for any additional clam enhancement or recovery projects.



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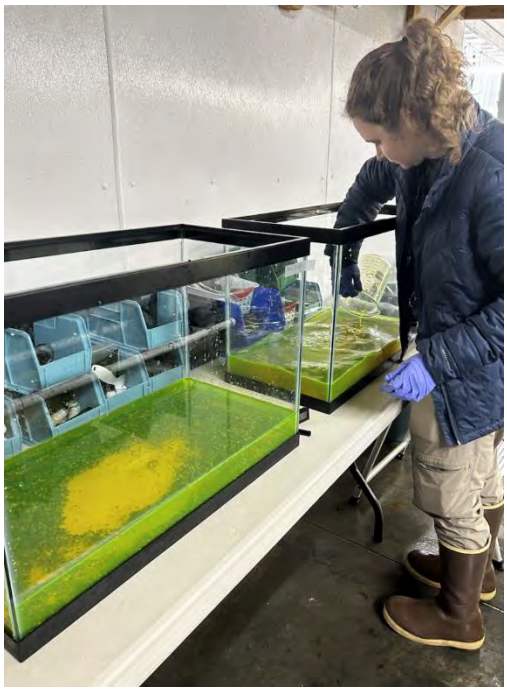
Calcein Marking for Clam Population Monitoring in Southcentral Alaska—Jacob Cohen; CRRC, Biology Lab Technician

- Bivalves have declined in Southcentral Alaska since the Exxon Valdez Oil Spill; continued pressure from changes in regional climate and ecosystem conditions such as heat waves, and predation by rebounding otter populations may all play a role in depressing recovery of these species.
- For over 30 years, CRRC has rehabilitated bivalve populations on beaches throughout the Chugach:
    - Until now, it has been difficult to measure the efficacy of these rehabilitation efforts
- APMI's calcein marking project assesses the recruitment of hatchery-raised clams into beach populations
    - Calcein is a non-toxic, fluorescent dye used to mark the shells of outplanted clams, allowing them to be distinguished from wild populations.
    - The effectiveness of bivalve beach rehabilitation can be better assessed by tracking marked, ouptlanted clams, so hatchery and rehabilitation methods can be tailored to produce more successful management plans.



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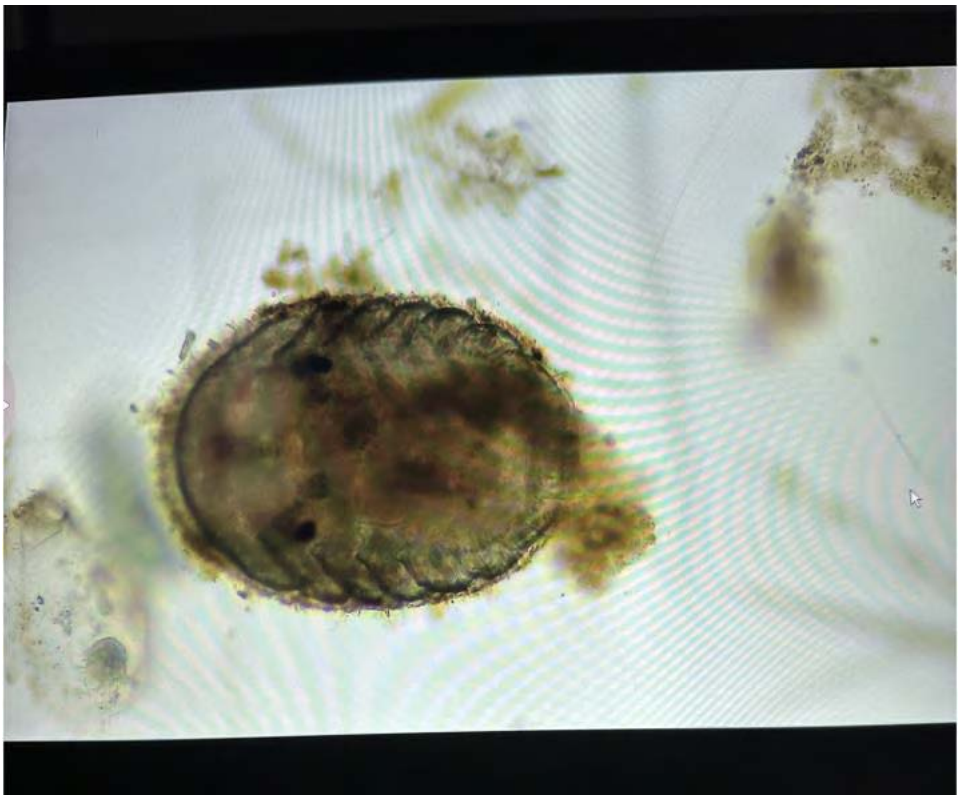
Happy as a Clam: What Role Does Serotonin Play in Bidarki Reproduction?—Jacqueline Ramsey; CRRC, Ocean Acidification Laboratory Manager

- Bidarkis are a valuable food source for subsistence communities in the Chugach region
- Bidarki stocks have been declining in the region for several years
- Little is known about the reproductive cycles of bidarkis, making enhancement plans difficult to design
- Serotonin is a key hormone for reproduction in other invertebrates
    - APMI is looking at serotonin levels in bidarkis throughout the year to better understand the role it plays in reproduction
- Adult bidarkis are collected in Port Graham, Nanwalek, and Seldovia
- Serotonin levels are tested using Enzyme Linked Immunosorbent Assays (ELISA)
- Spawning cycles are observed and both natural spawns and induction attempts are recorded



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Lessons Learned in Spawning and Cultivating Pinto Abalone—Jacqueline Ramsey; CRRC, Ocean Acidification Laboratory Manager

- Pinto abalone are a popular subsistence species used for food and handicrafts
- Native populations of abalone have been declining in Southeast Alaska
- APMI has been striving to better understand reproductive cycles of abalone to create efficient management plans for this species
- Broodstock were obtained from Prince of Wales Island, AK
- Broodstock were held at APMI to observe spawning cycles and gonad ripeness
    - Both natural spawns and inductions were recorded
    - Induction attempts used manipulations of temperature, changes to feed, lighting, and chemical induction (hydrogen peroxide)
- Successful spawning and peak gonadal ripeness was most consistently achieved when adhering to natural circadian rhythms.

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Aging Gracefully: Discovering the Secret Age of Sea Cucumbers— Dustin Carl; Tribal Wildlife Biologist, Alutiiq Pride Marine Institute

- Very little is known about how invertebrates age, particularly through early life stages
- Researchers have used ribosomal DNA (rDNA) to ascertain the age of certain invertebrates, but have never tried it with sea cucumbers
- Adult sea cucumbers were collected in Southeast Alaska and spawned at APMI
- Sea cucumbers are raised to two years old and sampled every 90 days
- RDNA analysis is conducted by the Canadian Department of Fisheries and Oceans
- Project will create a tool to evaluate the age of sea cucumbers randomly sampled in the wild
- Can be used to evaluate population structure to determine fishery stocks in both Canada and Alaska

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Shellfish Panel Discussion from the Alutiiq Pride Marine Institute—Dustin Carl, Jacob Cohen, Jacqueline Ramsey, Jenn Wells. Moderated by Dr. Maile Branson

- Topics discussed included:
  - New species of interest to culture at APMI;
  - Testing for Paralytic Shellfish Toxins (PSTs) for Tribal members;
  - Specification of objectives related to calcein-marking shellfish project;
  - Presence of bidarkis throughout Lower Cook Inlet and discussion of specifics around spawning efforts at APMI;
  - Changing ocean conditions and impacts on incidence of PSTs found in shellfish throughout the Chugach region.

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Evaluating Subsistence Shellfish Beaches for Future Enhancement Projects—Jeff Hetrick; Mariculture Director, Alutiiq Pride Marine Institute

- In Spring 2023, CRRC was awarded funding through the Alaska Fisheries Development Foundation to pursue a Joint Innovation Project to evaluate the viability of subsistence shellfish beaches for future enhancement projects
    - Project is a collaboration with the Pacific Shellfish Institute, based in Olympia, Washington
- This was a continuation of a similar effort originally started in 1996 by CRRC and funded by the Exxon Valdez Oil Spill Trustee Council, where CRRC staff and community members conducted beach survey assessments and clam enhancement strategies, like placing seine web and large rocks on areas of the beach to deter otters
- With the use of drone footage, GIS technology, and transects, PSI and APMI can make clam density predictions of different species

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Hatchery Cultivation of the Pacific Razor Clam (*Siliqua patula*)—Jeff Hetrick; Mariculture Director, APMI

- In Spring 2023, CRRC was awarded funding through the Alaska Fisheries Development Foundation to pursue a Joint Innovation Project to assess hatchery cultivation methods for the Pacific Razor Clam
- Populations of razor clams have been in serious decline in recent years and have been evaluated as unlikely to recover without enhancement plans
- This project aims to better understand optimal aspects of broodstock conditioning, hatchery techniques for rearing larvae at commercial densities, and developing nursery grow-out procedures
- Broodstock was collected and attempts were made to strip spawn clams
    - Managed to fertilize one female, but larvae didn't survive
- This project was awarded in August 2023, after broodstock had already spawned. Project was granted a one-year, no-cost extension to be continued in Spring 2024.

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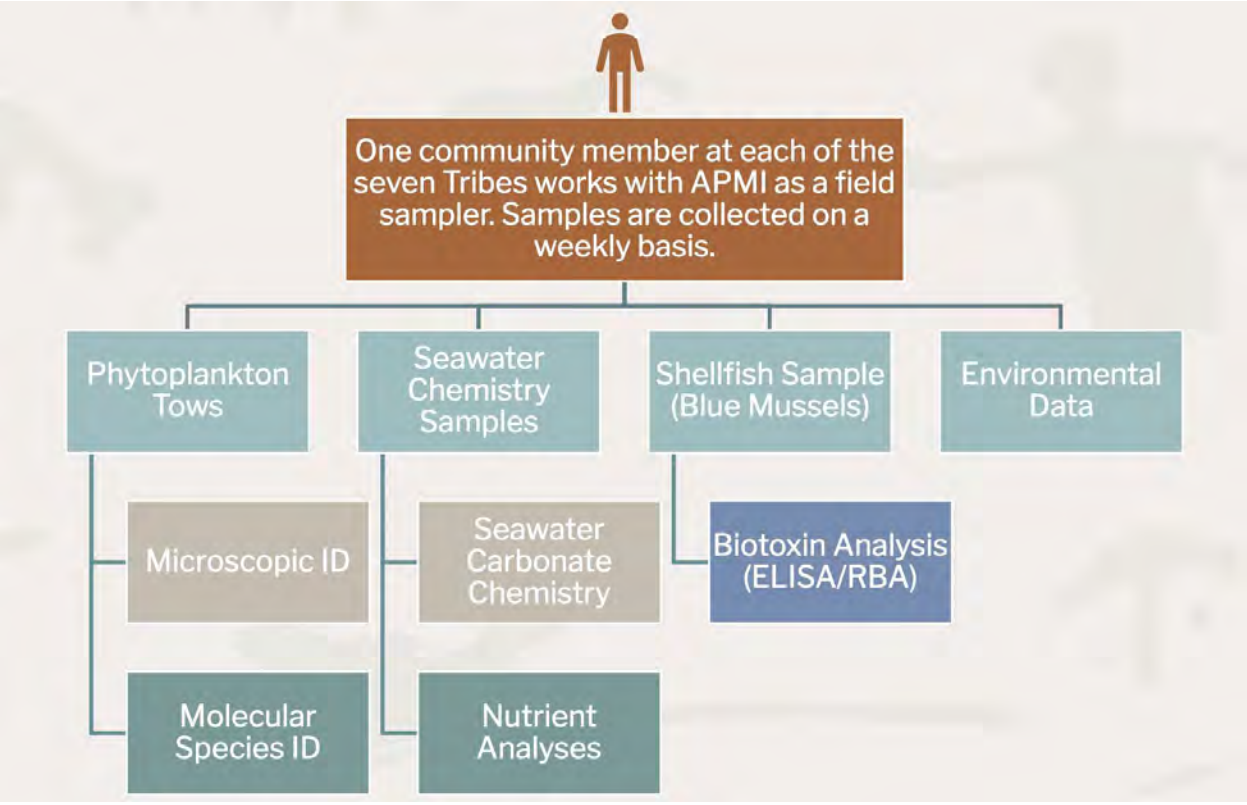
Chugach Regional Ocean Monitoring Program (CROM)—Alli Carl; Biology Lab Manager, Alutiiq Pride Marine Institute

- Program is funded by the Exxon Valdez Oil Spill Trustee Council
- Relies on regional community samplers to collect water samples to monitor changing ocean conditions.
- Samples are tested for presence of biotoxins associated with Harmful Algal Blooms (HABs), general environmental conditions associated with the presence of HABs, and to evaluate coastal marine conditions and changing ocean chemistry
- Objectives include fostering Tribal-led research, supporting informed shellfish harvests for all stakeholders (Tribal members, mariculturists, recreational users), document coastal marine conditions in the Chugach Region, connect with Tribal members, and developing a tool for HAB predictions.



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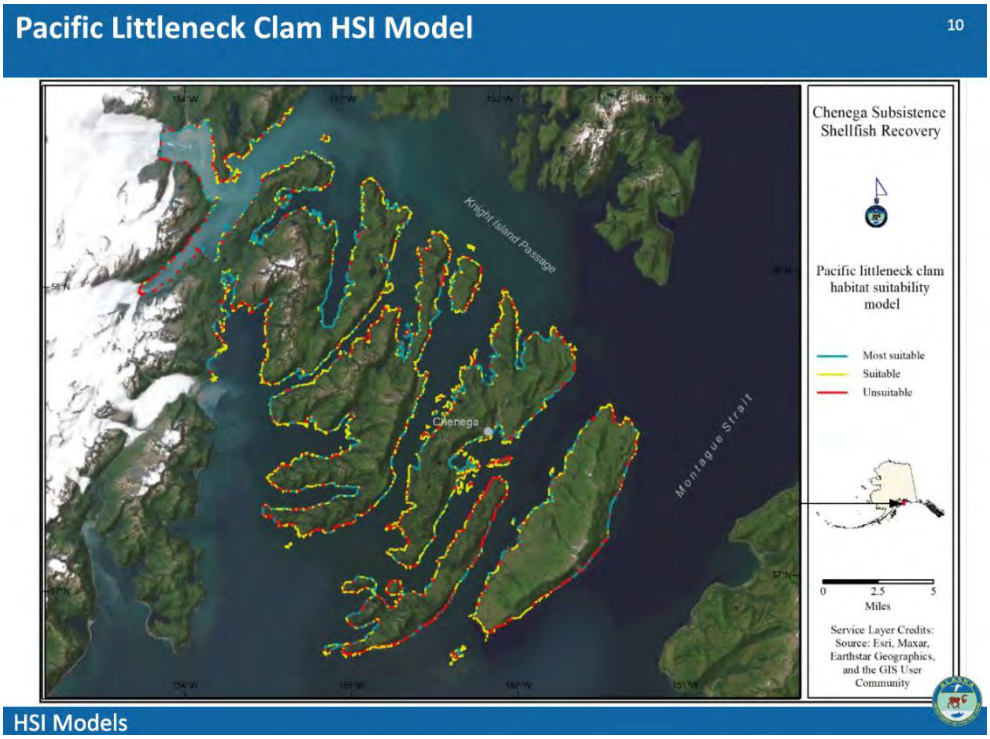
Clam Reintroduction in Chenega: A Mixed Methods Approach to Recovery—Jackie Keating and Gayle Neufeld; Alaska Department of Fish and Game, Division of Subsistence

- ADFG Division of Subsistence's mission is to scientifically gather, quantify, evaluate, and report information about customary and traditional uses of Alaska's fish and wildlife resources.
- This project focuses on developing a habitat suitability index from existing clam harvest data
- Steps included determining and preparing criteria; transforming the values of each criterion to a common suitability scale; weight criteria relative to one another and combine them to create a suitability map; locate the final locations that best meet pre-determined spatial requirements; then validate the model.



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Roadmap for Kelp Producer Cooperative—Andrew Crow; University of Alaska Anchorage

- Benefits of co-ops include spreading costs out over many farms, negotiating with processors, sharing equipment, buildings, and services, and financing.
- Co-ops can be particularly useful for Alaska's emerging kelp mariculture industry, to offset capital-intensive costs of processing and stabilization equipment for biomass.
- If the cooperative is going to process kelp, it needs to evaluate what market it is going after.
- Transportation, and storage can become very complicated: for Alaskan producers, transportation can make or break a business

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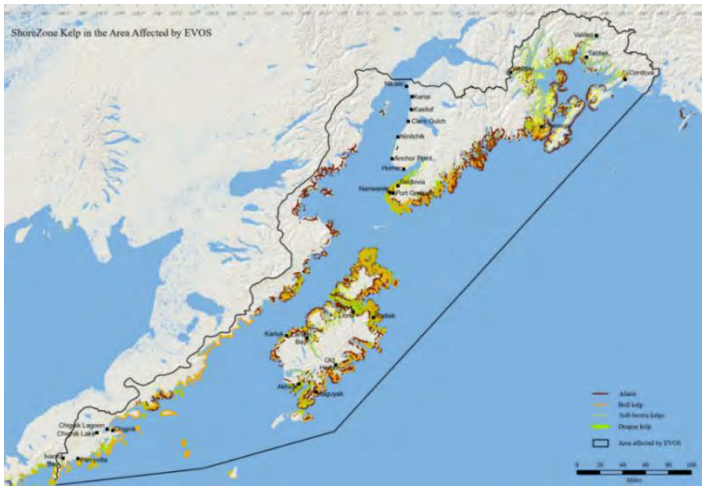
Social, Cultural, and Economic Assessment of Kelp Mariculture Opportunities for Coastal Villages within the EVOS Spill Zone—Aaron Poe; Project Coordinator, Alaska Conservation Foundation; Dr. Tom Thornton, Professor of Environment and Society, UAS; Christian Woodard, ADFG, Division of Subsistence

- ACF became involved in kelp mariculture to sustain rural community connections and the need for healthy and functioning land and waters.
- Project supports indigenous-led conservation and self-determination.
- Aims to understand if kelp as a climate adaptation & mitigation measure is acceptable to Indigenous communities and therefore more viable in Alaska
- Aims to supply data, information, and tools to guide management of public lands and waters as kelp mariculture expands
- Research approach includes:
    - Documenting Indigenous cultural uses (past and present) for kelp and other seaweeds in partnership with spill zone villages
    - Understanding changes in surface kelp distribution since the 1980s with satellite imagery to inform potential future kelp farming siting issues and avoid user conflicts
    - Documenting community perceptions across the spill zone about kelp mariculture relative to other uses
    - Understanding the economic feasibility of the kelp industry in the spill zone
    - Understanding the potential for mariculture operators to be paid for collecting broader monitoring data on ocean conditions



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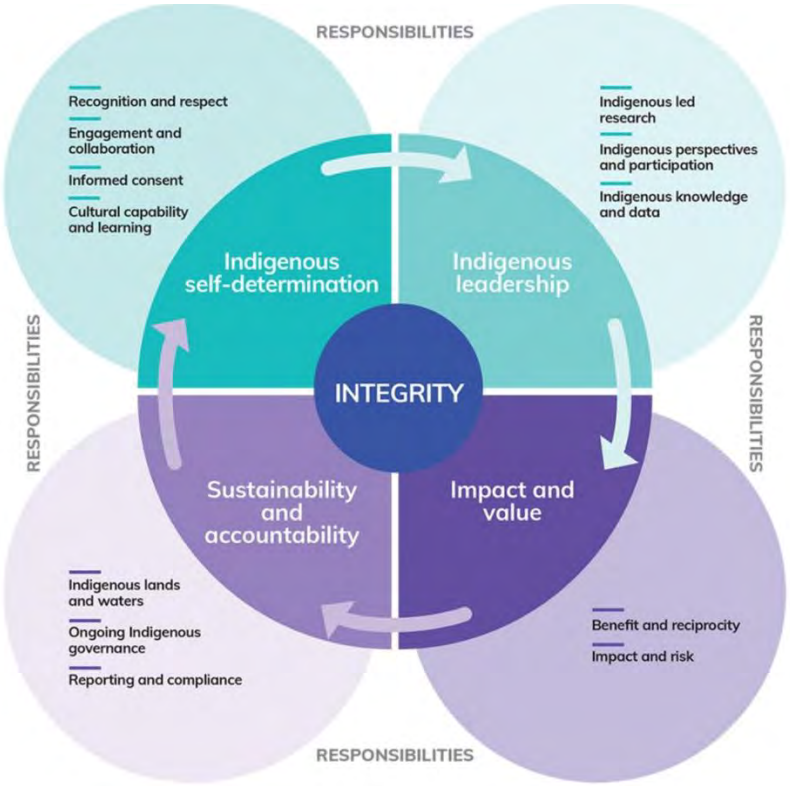
Healthy Land and Sea Planning—David Guilfoyle; Applied Archeology International

- Healthy Land and Sea Planning team is partnering with Native Conservancy to assess if Indigenous kelp mariculture operations within the Exxon Valdez oil spill zone would be compatible with local cultural values of coastal communities, while better understanding the social or economic viability of mariculture.
- This framework situates the role of kelp and other mariculture initiatives in a locally relevant and socially impactful way through collaborative cultural planning.
- Land and Sea Country-based planning works to reinstate the primacy of cultural geographies and networks in governing Country.
- A "country-based plan is simply a plan for the Country of a particular Indigenous group, as defined and selected by that group."
- To manage external pressure, prepare, and respond to change and regain losses, a strategy is to integrate restoration ecology, renewable energy independence, pathways to food sovereignty and heritage preservation as one well-resourced, operational program.



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Exhibitor Booths

Alaska Blue Economy Center

Established in 2019 by Chancellor Dan White at the University of Alaska Fairbanks, the Alaska Blue Economy Center (ABEC) was created to serve as a platform to better connect Alaskans to relevant resources, expertise, and best practices both across and outside of the state. The Alaska blue economy is a cornerstone for Alaskan communities, underscoring the importance of balanced stewardship and sustainable use of marine resources. Through collaborative partnerships, ABEC is focused on sustainability and amplifying community benefits. ABEC actively engages with different sectors in the blue economy to serve and develop opportunities and value adding activities.

Alaska Mariculture Alliance

Alaska Mariculture Alliance is a 501 (c) 3 non-profit organization whose mission is to develop and support a robust and sustainable mariculture industry for the long-term benefit of Alaska's economy, environment, and communities. "Mariculture" means the production, enhancement, utilization and promotion of marine shellfish and aquatic plants cultivated in Alaska.

Chugach Alaska Corporation (CAC)

Chugach Alaska Corporation is one of thirteen Alaska Native Corporations created under the Alaska Native Claims Settlement Act of 1971. Headquartered in Anchorage, Alaska, CAC is a for-profit corporation that has over 2,200 Alaska Native Shareholders of Chugach Alutiiq/Sugpiaq and Eyak descent. The table provided information about shareholder services, business enterprises, information on land, and community development projects.

GreenWave

GreenWave is a bicoastal non-profit organization whose goal is to support farmers, catalyzing the scaled planting of regenerative ocean crops to yield meaningful economic and climate impacts. To scale, GreenWave focuses on two program areas: training and innovation. Their ten-year goal is to provide 10,000 farmers across the U.S. with the training, tools, and support they need. Beyond training and community building engagement, GreenWave also focuses on market development and research.

Kachemak Kelp Hub

The Kachemak Kelp hub is a mission-driven, Alaskan-run initiative established to address two factors limiting the growth of seaweed mariculture in Alaska: a lack of ready and efficient processing, and limited markets. The Hub directly supports regenerative seaweed farms in Kachemak Bay and Cook Inlet by

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testing new approaches to processing, seeking out new markets, and sharing results and information with others. The goal is to foster the development of an Alaskan industry that's healthy for oceans, people, and the planet.

Native Conservancy

Established in 2003 as a 501(c)(3) non-profit organization, the Native Conservancy aims to empower Alaska Native peoples to permanently protect and preserve endangered habitats on their ancestral homelands. Native Conservancy strives to maintain and secure titles to Native lands in conservation trusts to strengthen inherent rights of sovereignty, subsistence, and spirituality. Their vision is to create resilient futures for Indigenous peoples by preserving culture and protecting habitat, and restoring and repatriating ancestral homelands, traditional food sources, and subsistence practices.

Prince William Sound College

Located in Valdez, Alaska, Prince William Sound College (PWSC) is a one-of-a-kind higher education institution. While the main campus is in Valdez, PWSC also has extension sites in the communities of Cordova and Copper Basin. PWSC is accredited by the Northwest Commission on Colleges and Universities through the University of Alaska Anchorage. Besides a general studies degree, PWSC offers associate degrees and occupational certificates not readily available elsewhere, including an Occupation Endorsement Certificate in Millwright and Associate of Applied Science in Outdoor Leadership.

Two Bears Environmental Consulting

The primary goal of Two Bears Consulting LLC. is to reduce risks and increase resilience across impacted facilities, sites and/or environments. They have coordinated and led multidisciplinary teams to develop scientifically based environmental programs that bridge the state-of-knowledge science with applied research and traditional knowledge to answer specific environmental questions. The vision is to increase environmental, economic, social, and cultural climate resilience, empowering communities to move from reactive to proactive climate resilient strategies.

CRRC's climate change program contracted with Two Bears Environmental Consulting to develop a '7 Generations of Climate Change' StoryMap that provides downscaled climate modeling and environmental indices data combined with people's stories of environmental change from around the region to contextualize the data with a human story. The final product can be found here, and is in the process of being linked from CRRC's Climate Change website. CRRC has also been working on a regional climate resilience strategy in conjunction with the Climate Cohort, a group of community members from around the region. The Two Bears Environmental Consulting booth showcased a draft version of the StoryMap and asked for input from Tribal members and staff in attendance. It also asked people to tell their stories and directed them to another room, where an interviewer was on standby to record audio of people's

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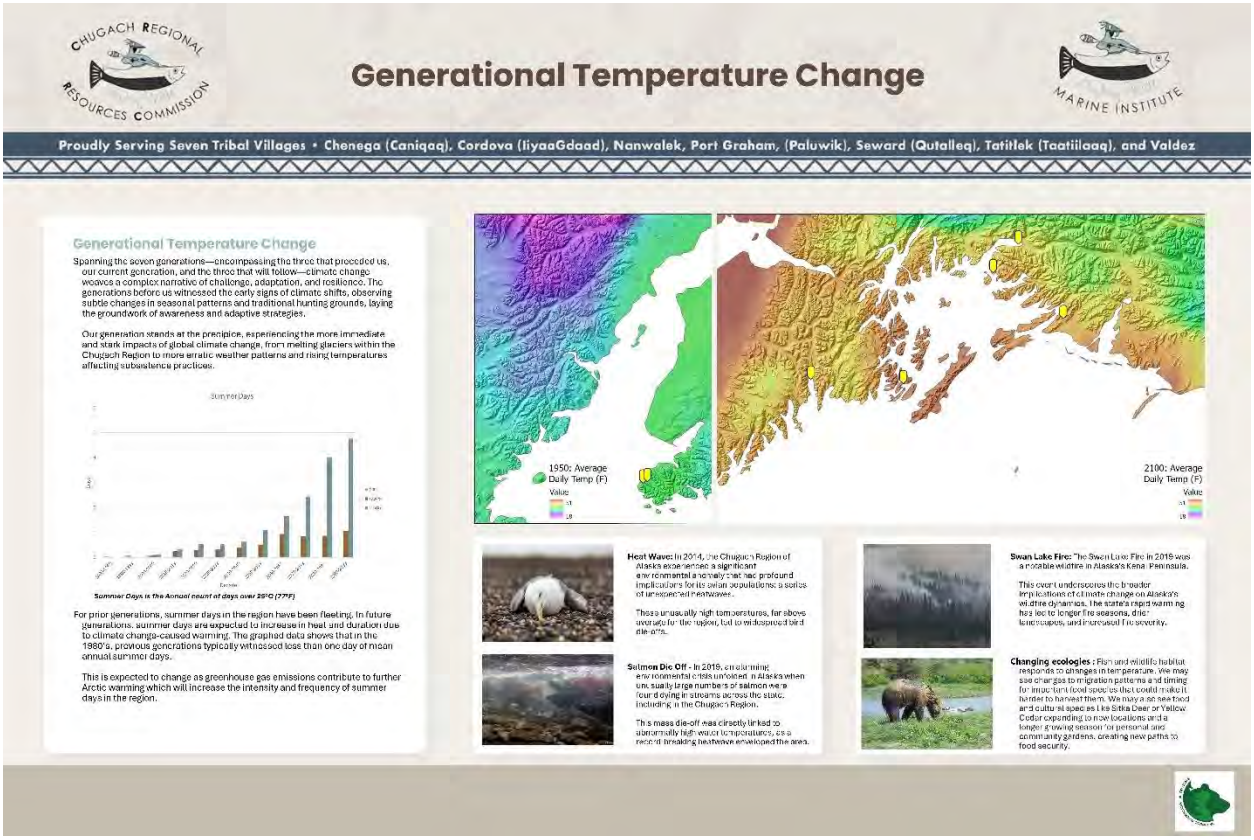
stories of environmental change. The booth had two posters describing some of the climate modeling work and impacts, a computer and monitor so that people could scroll the draft version of the StoryMap at their convenience, a poster that described a broad overview of the strategies and supporting activities included in the resilience strategy, and hard copies of the draft resilience strategy for people to review. Attendees were encouraged to use provided sticky notes to make comments on the resilience strategy and to sign up for a mailing list for future updates on the StoryMap and strategy. Posters that were displayed as part of the booth are included below.



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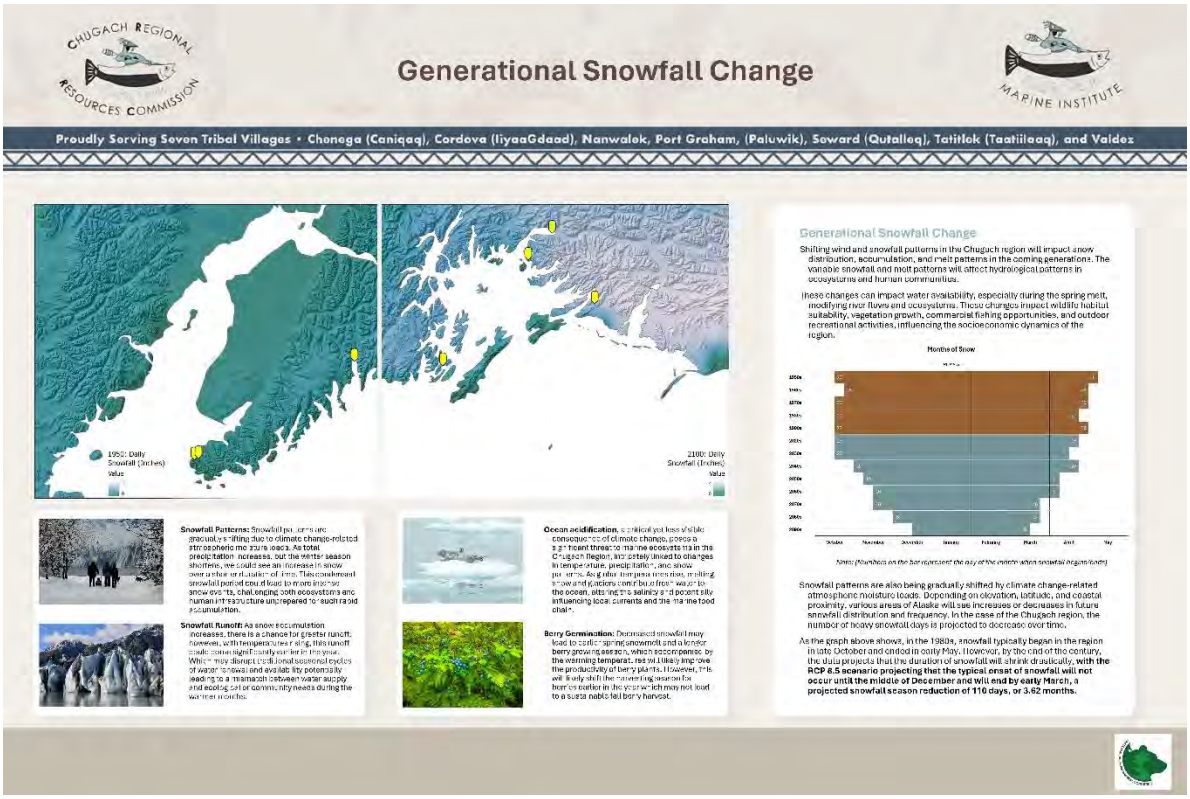

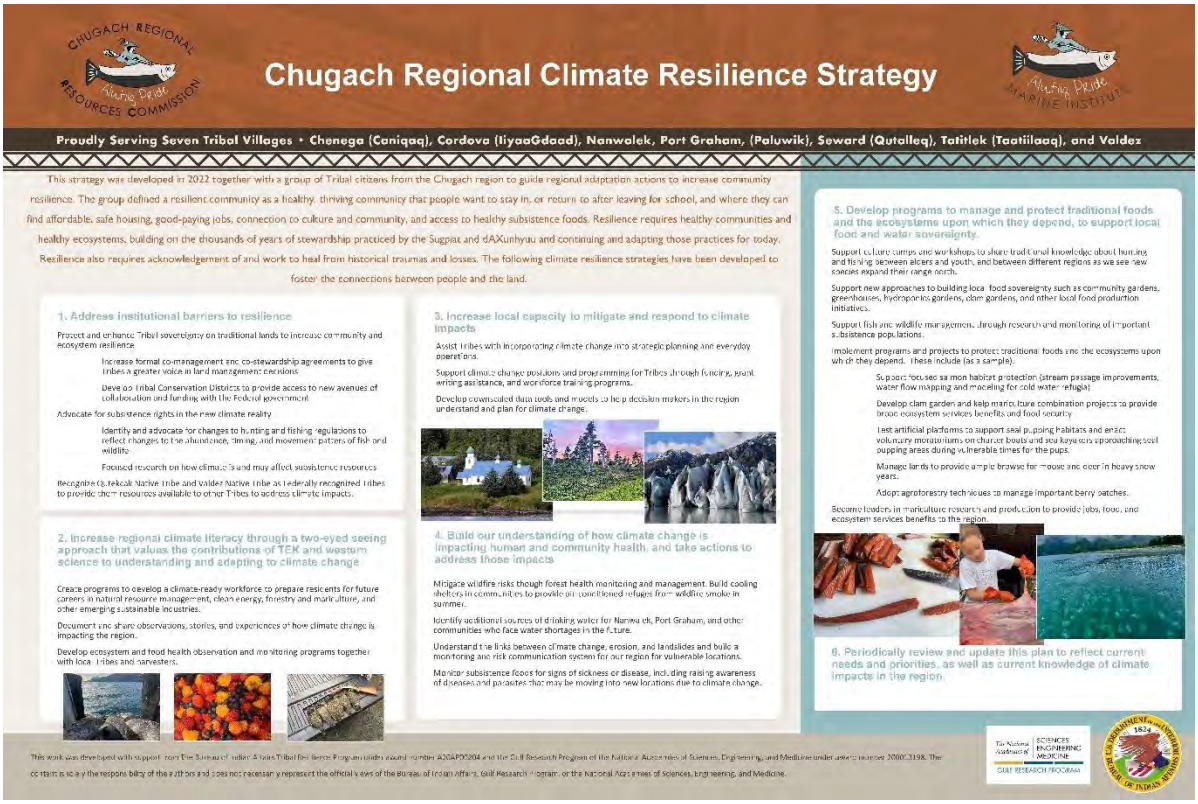

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Sponsors

AWA'AHDAH • QUWANAKCUK • QUYANA • GUNAŁCHÉESH

Chugach Heritage Foundation

Established as a non-profit organization, the Chugach Heritage Foundation (CHF) is determined to support the self-determination of the Chugach Native people through education of original shareholders and descendants, and to utilize, preserve, and promote the tradition and cultural heritage of the Chugach region. CHF promotes three goals: to discover, record, preserve, and promote knowledge and public awareness of native cultures of the Chugach Region; to provide scholarships to encourage educational pursuits of Alaska Native children and adults who are enrolled in the Chugach Region through ANCSA; and to study the needs and aspirations of Native people of the Chugach region as their awareness of Native culture and conflict grows and changes.

Chugachmiut

Chugachmiut is an Alaska Native 501 (c) 3 non-profit agency incorporated in 1974 to serve the seven Native tribes of the Chugach Region. As an organization, Chugachmiut works with all tribes to pursue funding in areas such as economic infrastructure, health care, heritage and language preservation, behavioral health, Information Technology, and Self-Governance. It provides health and social services, education and training, and technical assistance to the Chugach Native people in a way which is acceptable to Native cultural values and tradition in order to enhance the well-being of our people by continuing to strengthen the tribes and increase self-determination opportunities for community operated tribal programs.

Native Village of Eyak

The Native Village of Eyak is a federally recognized self-governing Tribe that provides governmental services within the Tribe's customary and traditional use area: Prince William Sound, the Copper River, and the Gulf of Alaska. The Native Village of Eyak Traditional Council is a tribal government that promotes self-determination to Native Village of Eyak tribal members. Under the guidance of the Council, tribal offices provide health and social services, economic development, natural resource/environmental education, job opportunities and job training to the Native Village of Eyak. The Tribe operates in a way that is acceptable to Alaska Native cultural values and traditions to enhance the wellbeing of our People both physically and spiritually. The Tribal Council seeks ways to enrich tribal living through community-operated tribal programs and self-determination.

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Port Graham Village Council

The Port Graham Village Council is a federally recognized Tribe that serves the community members of Port Graham. The Village Council operates various social, cultural, community, and economic development programs designed to enhance quality of life within Port Graham.

Exxon Valdez Oil Spill Trustee Council

The Trustee Council was formed to oversee restoration of the injured ecosystem through the $900 million civil settlement. The Council consists of three state and three federal trustees (or their designees). The Council is advised by members of the public and by members of the scientific community.

Alaska Conservation Foundation

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 funder and supportive resource for a diverse community of nonprofits working to protect and manage Alaska's natural resources.

Native Conservancy

Established in 2003 as a 501(c)(3) non-profit organization, the Native Conservancy aims to empower Alaska Native peoples to permanently protect and preserve endangered habitats on their ancestral homelands. Native Conservancy strives to maintain and secure titles to Native lands in conservation trusts to strengthen inherent rights of sovereignty, subsistence, and spirituality. Their vision is to create resilient futures for Indigenous peoples by preserving culture and protecting habitat, and restoring and repatriating ancestral homelands, traditional food sources and subsistence practices.

12 Tides

12 Tides is a company dedicated to creating a food system that heals our oceans, starting with the most climate-positive food out there—kelp! 12 Tides believes that kelp will play a key role in turning the tides against climate change and restoring the health of our oceans. Their vision is to create a regenerative food system that heals ocean ecosystems. They produce and sell kelp chips through a variety of retailers nationwide.

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CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Thank you for supporting our 2024 Annual Subsistence Memorial Gathering with your generous donations!

2024 Subsistence Memorial Gathering

The Subsistence Memorial Gathering provides a safe place to connect the Chugach Villages where traditional foods are cooked and shared. For our Alutiiq/Sugpiaq and Eyak communities, traditional foods are a gift. The Gathering assists in preserving and celebrating culture through food and trains young people in food production and preparation, while connecting them to neighboring communities' food. This provides a unique opportunity for different regions to share food and traditional knowledge. At the CRRC Memorial Gathering, all food resources are brought together, shared, and traded between villages. This scenario is true of other terrestrial and marine food resources as well. CRRC utilized this unique gathering to heighten awareness of changing food resources.

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CRAFT BOOTHS

CRRC was excited to have our booths open to the University of Alaska Anchorage student body this year. We were able to host 5 traditional craft booths and 1 traditional tattoo artist booth during our event. There were fur and knit garments, earrings made from fur, fish skin, beads, clay, and fish bones, as well as dream catchers for any of those ravens walking by who saw something shiny that appealed to them. In addition, we were able to host a space for cultural and traditional markings for our regional people to come and gather and support those who wished to add markings of significance to themselves.

Ernersulria and Ilanka
St Michael's Russian Orthodox Church
Frozen Stitches
Quyanaa Nature Based Medicine
Demaris Hudson
Amiah Johnson

TRADITIONAL FEAST

This year we were blessed with many traditional foods and chefs from each of our communities. From salmon to seal to herring eggs and kelp, our cooks brought it all! We are so grateful to the cooks that provided their time, skill, and foods to make this year's dinner truly special: Diane Selanoff and Chelsea Selanoff from Valdez, Nancy Yeaton and Eugenia Moonin from Nanwalek, Kelsey Meganack & Zeth Meganack from Port Graham, Danaya Hoover and Denise Eleshansky from Cordova, and Jen Kiokan and Carol Conant from Seward. Food was also donated by Native Conservancy, Mark King, Raven Cunningham, and Diana Riedel.

Shared Traditional Foods

Herring Roe	Seal Oil	Baked Seal & Sea Lion	Sea Lion Stew	Copper River Coho Salmon	Fry Bread	Salmon Roe
Tumaq - Smoked Red Salmon	Pickled Coho Salmon	Cranberry Jelly	Mixed Seafood Rice	Muktuq - Whale Skin & Blubber	Mixed Seafood Gumbo	Moose Spaghetti
Herring Coleslaw	Mountain Goat	Halibut	Kelp Noodle Salad	Salmon Pie	Baked Fish Heads	Bidarki & Octopus
Blueberry Cheesecake	Baked Red Salmon	Salmon Peroksies	Seafood Chowder	Roasted Moose	Kelp Chips	Blackcod Alfredo

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NYO COMPETITON

CRRC welcomed the Native Youth Olympic Games to our Gathering this year celebrating our student athletes. Our ancestors developed traditional contests to develop abilities crucial to everyday life. Competition with one another honed the abilities needed to be successful in hunting, fishing, and other daily ways of survival in our traditional ways of life. We believe in healthy lifestyles for our young people and this competition reflects the strength and traditional ways of promoting appreciation of our traditions. We would like to thank Dannielle Malchoff for being willing to MC this portion of the evening, educating the audience about the significance of each event, while allowing our regional youth to participate in a friendly exhibition.

MUSIC

The English Bay Band includes John Kvasnikoff, Julius Kvasnikoff, Tikhon Kvasnikoff, and Macky Ukatish is a rock and roll band that was formed in the 1960s in Nanwalek, Alaska. This group performed for our guests during the Traditional Feast and played for the Nanwalek Seal Dancers.

"Best DJ in Anchorage" – 2007 Anchorage Press. Colin Bonfield has been providing sound, lighting and projection for CRRC for a couple years and provides music for our Gathering. Colin also plays for the Fashion Show.

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DANCE GROUPS

Nanwalek Seal Dancers led by Abigail Kvasnikoff & Tikhon Kvasnikoff
Cordova Ikumat Dancers led by Shyla Krukoff
Port Graham Dancers led by Dannielle Malchoff & Ephimia Moonin-Wilson

Each dance group brought 10 dancers to perform at the Gathering. Each dance group shared their distinct songs accompanied by dances. Our traditional dances and music remain the lifeblood of our culture and communities. They sustain and connect us with our rich cultural history. Passed down from generation to generation, our dances ensure we stay connected to our origins.

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FASHION SHOW

To end the night, the fashion show featured eye-catching creations riffing on the year's theme of mariculture. The show featured pieces made by Alaska Native artists; Gloria Cunningham, Amiah Johnson, Reine Pavlik, Raven Cunningham, Britt'Nee Bower, Nikki Corbett, Zoey McCallson, and Kanisha Tiedeman-Lohse. Walking to music from DJ Colin Bonfield, some models wore traditional garments while others showed off looks that featured traditional materials including fur, skins, ivory, bones, and feathers on streetwear. The Alaska Native models who volunteered to be in the show were excited to showcase their cultural history with traditional facial markings. Models featured were Harmony Wayner, Ryen Aavurauq Richards, Amiah Johnson, Angela Peacock, Ashley Brink, Zoey McCallson, Ashley Brankovic, Madison Wilhelm, Tunaqi Blanchett, and Alison Achee. Some of the designer's pieces from the fashion show were sold in the silent auction, with proceeds donated to CRRC as part of the fundraiser.

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Appendix A: Presentations

The 2024 Mariculture Gathering Workshop presentations are shown in the order presented in the agenda.

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NATIVE CONSERVANCY'S OCEANBACK CREW | PHOTOGRAPHED BY DELLA STROH

NATIVE CONSERVANCY

Prince William Sound

KELP MARICULTURE DEVELOPMENT

FOR HABITAT RESTORATION & LOCAL ECONOMY

CHUGACH REGIONAL RESOURCES COMMISSION
Aluutiiq Pride

FUNDED BY THE EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

BRIANA MURPHY

KENAI PENINSULA
MARICULTURE LIAISON
BRIANA@ALUTIIQPRIDEAK.ORG

CHUGACH REGIONAL RESOURCES COMMISSION

Since 1984, our organization's mission is to promote Tribal sovereignty and the protection of our subsistence lifestyle through the development and implementation of Tribal natural resource management programs to assure the conservation, sound economic development, and stewardship of the natural resources in the traditional use areas of the Chugach region.

OUR REASON

WILD BED MAPPING WITH TESIA BOBRYCKI | PHOTOGRAPHED BY DELLA STROH

OUR CONNECTION

PRESERVING CULTURE, PROTECTING HABITAT

Native Conservancy was established in 2003 to empower Alaska Native peoples to permanently protect and preserve endangered habitats on their ancestral homelands. We strive to maintain and secure titles to Native lands in conservation trusts to strengthen our inherent rights of sovereignty, subsistence and spirituality.

Native Conservancy's reason for being is to protect and restore Alaska Native ecosystems for coastal communities.

Native Conservancy is the very first Native-led, Native-owned land conservancy in the United States

OCEANBACK

ENSURING AN EQUITABLE, SUSTAINABLE MARINE INDUSTRY THAT FORWARDS OCEAN RESTORATION, SOVEREIGNTY, ACCESS & CONNECTION.

KELP MARICULTURE DEVELOPMENT FOR HABITAT RESTORATION AND LOCAL ECONOMY

Objective 1

Scale the infrastructure to increase the production capacity of the Alutiiq Pride Marine Institute and Community Kelp Seed Nurseries to meet projected kelp seed string demands of the

Objective 2

Develop effective, affordable, and sustainable practices for Native kelp farming through specific array designs, deployment methods, and seed cultivation strategies that will lead to the long-term restoration of oil-spill impacted areas of PWS.

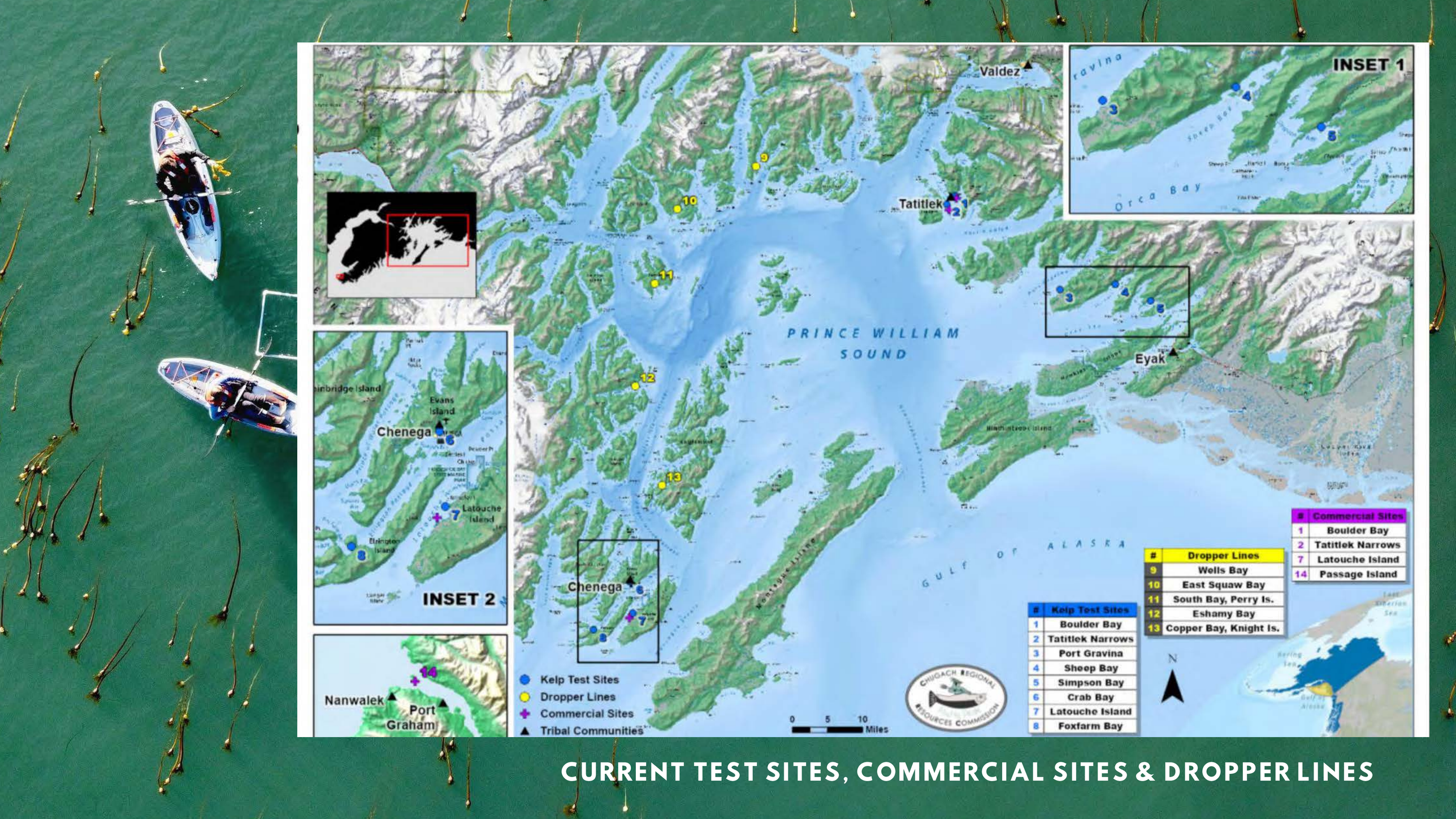
KELP MARICULTURE DEVELOPMENT FOR HABITAT RESTORATION AND LOCAL ECONOMY

Objective 3

Conduct a comprehensive landscape analysis by deploying research kelp sites and kelp dropper lines to develop commercial farm capacity rating per region. Collect, analyze, and share data related to water quality, kelp tissue composition, sea life and other factors that may indicate the viability of a site for commercial kelp farms.

Objective 4

Objective 4: Offer comprehensive, tailored training to prospective Native kelp farmers including supporting site selection, array designs, mapping, permits, and hands on immersive training.



CURRENT TEST SITES, COMMERCIAL SITES & DROPPER LINES

Alutiiq Pride Marine Institute

Seward, AK

NATIVE CONSERVANCY

Community Kelp Seed Nursery

Cordova, AK

Alutiiq Pride Marine Institute

Hatchery Metrics

- APMI GREW JUST UNDER 100,000 FEET OF SEEDED STRING FOR BOTH COMMERCIAL AND RESEARCH FARMS
- CULTIVATING THREE-RIBBED KELP AND WORKING WITH PROCESSORS TO EXPLORE NEW SPECIES
- HAVE ASSISTED WITH TRAINING AND SUPPORT FOR TWO ADDITIONAL HATCHERIES IN THE SOUTHCENTRAL REGION

Community Kelp Seed Nursery

Hatchery Metrics

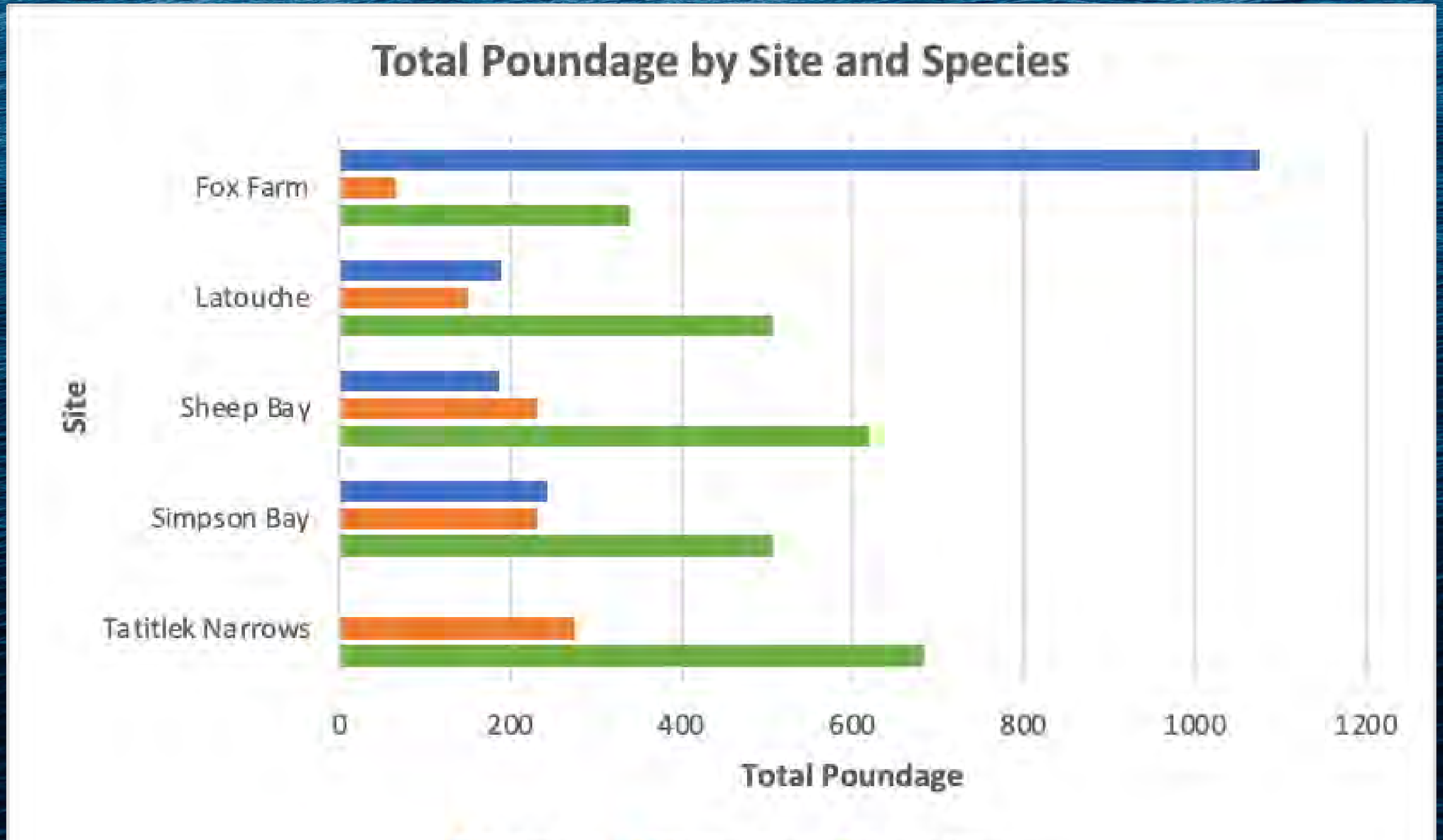
- CKSN GREW OVER 65,000FT OF SEED LINE, DOUBLING OUR OUTPUT UTILIZING THE SAME SPACE WHILE REDUCING ENERGY AND LABOR.

- CULTIVATING THREE SPECIES:
  NEREOCYSTIS LUEKEANA (BULL KELP)
  ALARIA MARGINATA (RIBBON KELP)
  SACCHARINA LATISSIMA (SUGAR KELP)

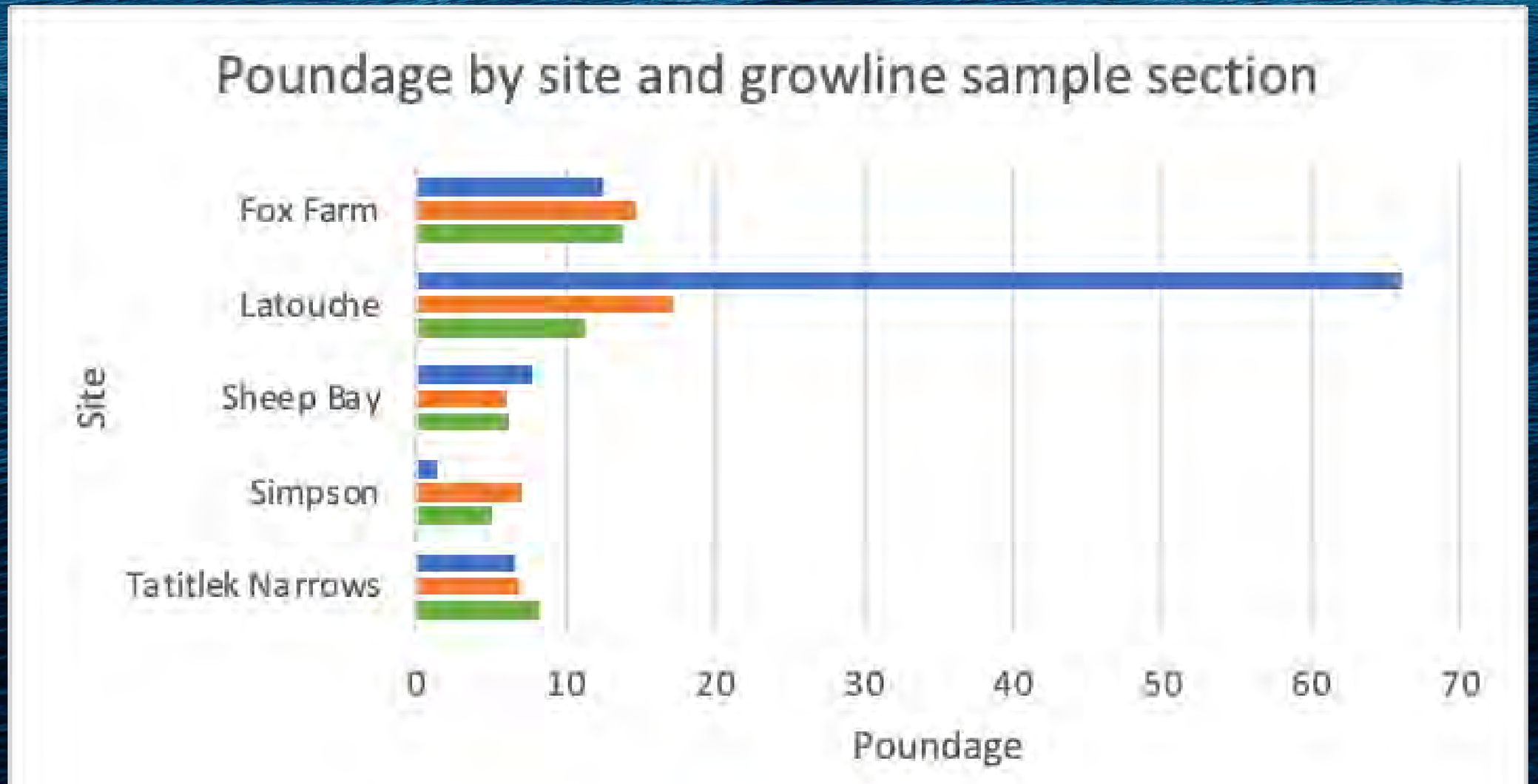
- INSTALLED LED LIGHTS, REBUILT SEAWATER STORAGE AND FILTRATION SYSTEMS, AND EXPERIMENTED WITH REDUCED SEEDING DENSITIES.

- DESIGNED AND PURCHASED EQUIPMENT FOR A SISTER-NURSERY, BUILDING A FLOW-THROUGH SYSTEM TO FURTHER REDUCE LABOR AND INCREASE VITALITY OF SEED PRODUCTION.

Test Site Harvest 2023



Variations in growth per growline (sugar kelp)



SEEDED LINE OUT-PLANTED TO COMMERCIAL & RESEARCH SITES

COMMERCIAL FARMS

BLUE GREEN ENTERPRISE

Owned by Dune Lankard
Alaria Marginata | 10,000ft
Saccharina Latissima | 5,000ft

RESEARCH TEST LINES

ALARIA MARGINATA

1,000ft (Ribbon Kelp)

SACCHARINA LATISSIMA

500ft (Sugar Kelp)

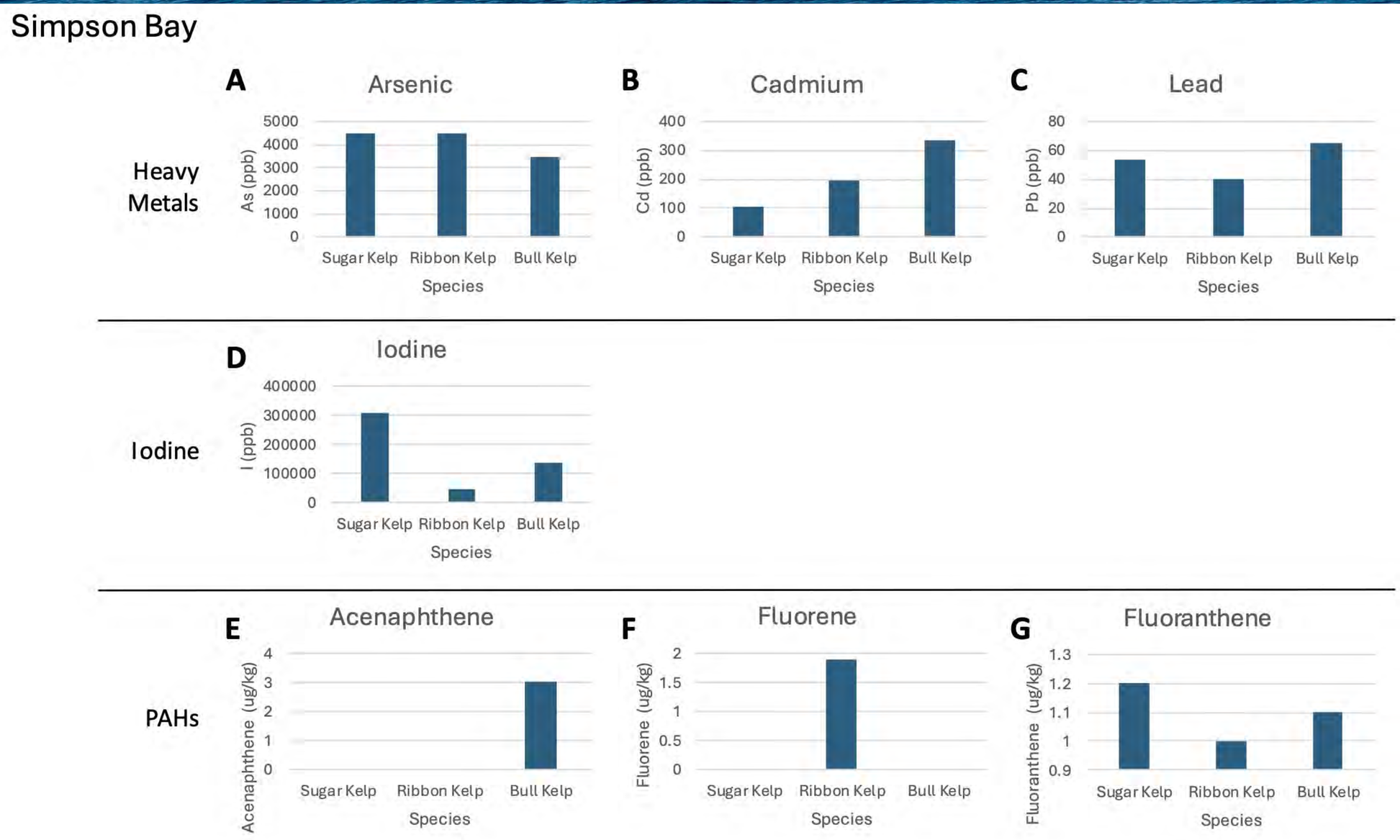
We believe in data sovereignty and will not disclose locations of commercial farms that we have permitted. unless granted by the individual.

What are we looking at in the future?

- Differences between farmed and wild kelp
  - Physical—size and length of frond
  - Chemical—differences in composition of tissue
- Solving harvesting and processing issues at scale
- Increasing mapping efforts for fertile sorus tissue

What else can we do with kelp?

Simpson Bay



NATIVE CONSERVANCY

CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

Q & A

Native Village of Eyak Mariculture Program

Department of the Environment and Natural Resources
Caitlin McKinstry
Biologist
cait@eyak-nsn.gov

Dept. of the Environment and Natural Resources

Our DENR Team:

John Whissel
DENR Director

Ivy Patton
(Former)
Environmental
Coordinator

Jimmy Paley
DENR Engineer

Matt Piché
Natural Resources
Coordinator &
Fish Biologist

DENR

- Programs and Projects:
  - Native American Lands Environmental Mitigation Program (NALEMP)
  - EPA Brownfield Cleanup
  - Recycling programs

DENR

- Programs and Projects:
  - Marine Debris
  - Water quality monitoring
  - Steller Sea Lion dietary monitoring

Chinook Escapement Monitoring

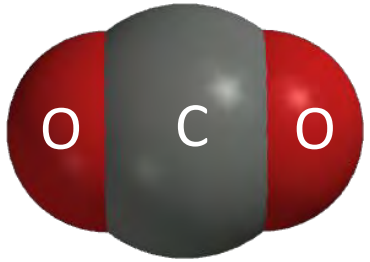
- 20+ yr program monitoring Chinook salmon in the Copper River
- Salmon collection via fish wheels
- Remote field camps in Alaskan backcountry

NVE's Mariculture Program

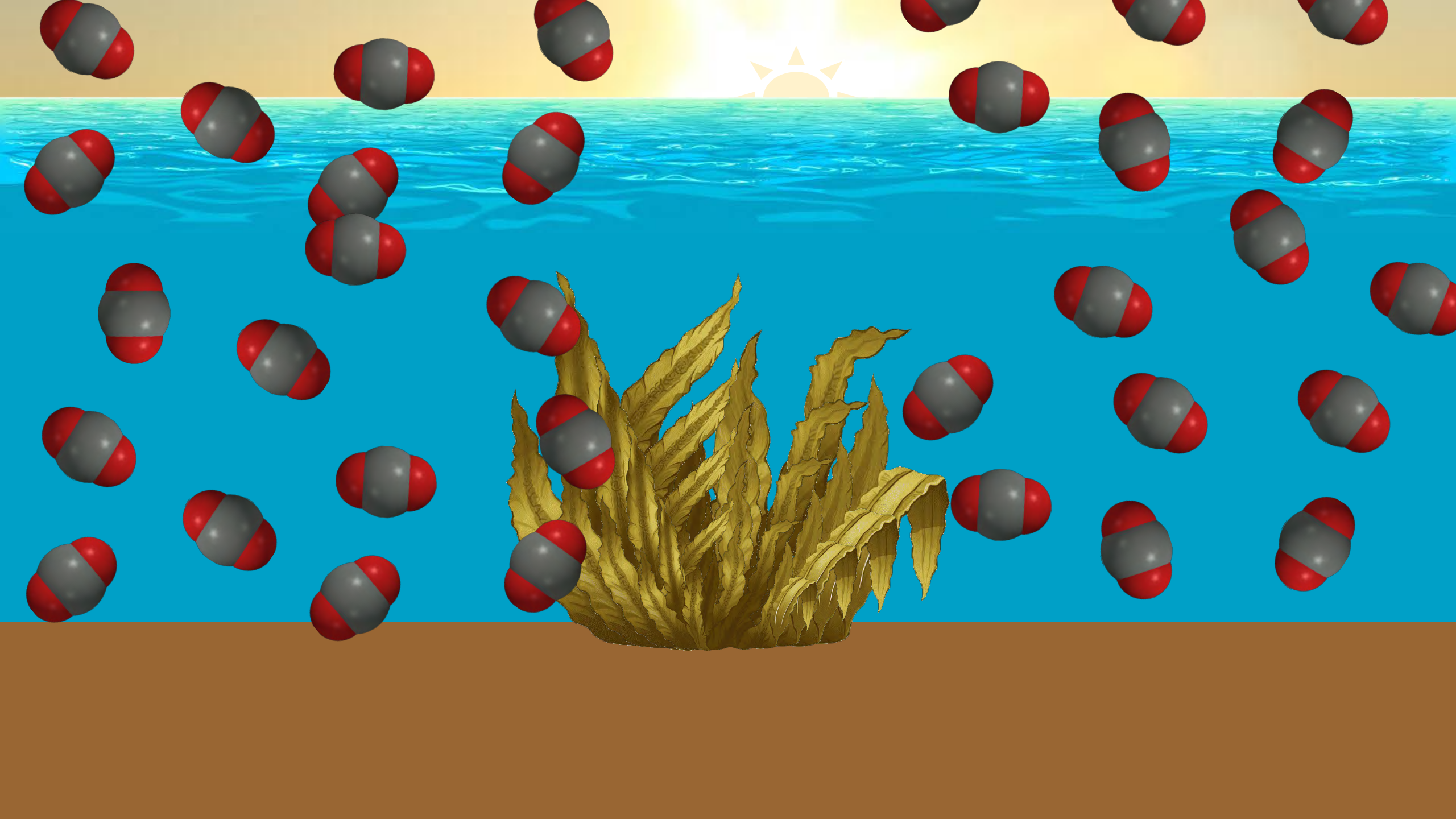
Potential Kelp and Climate Change

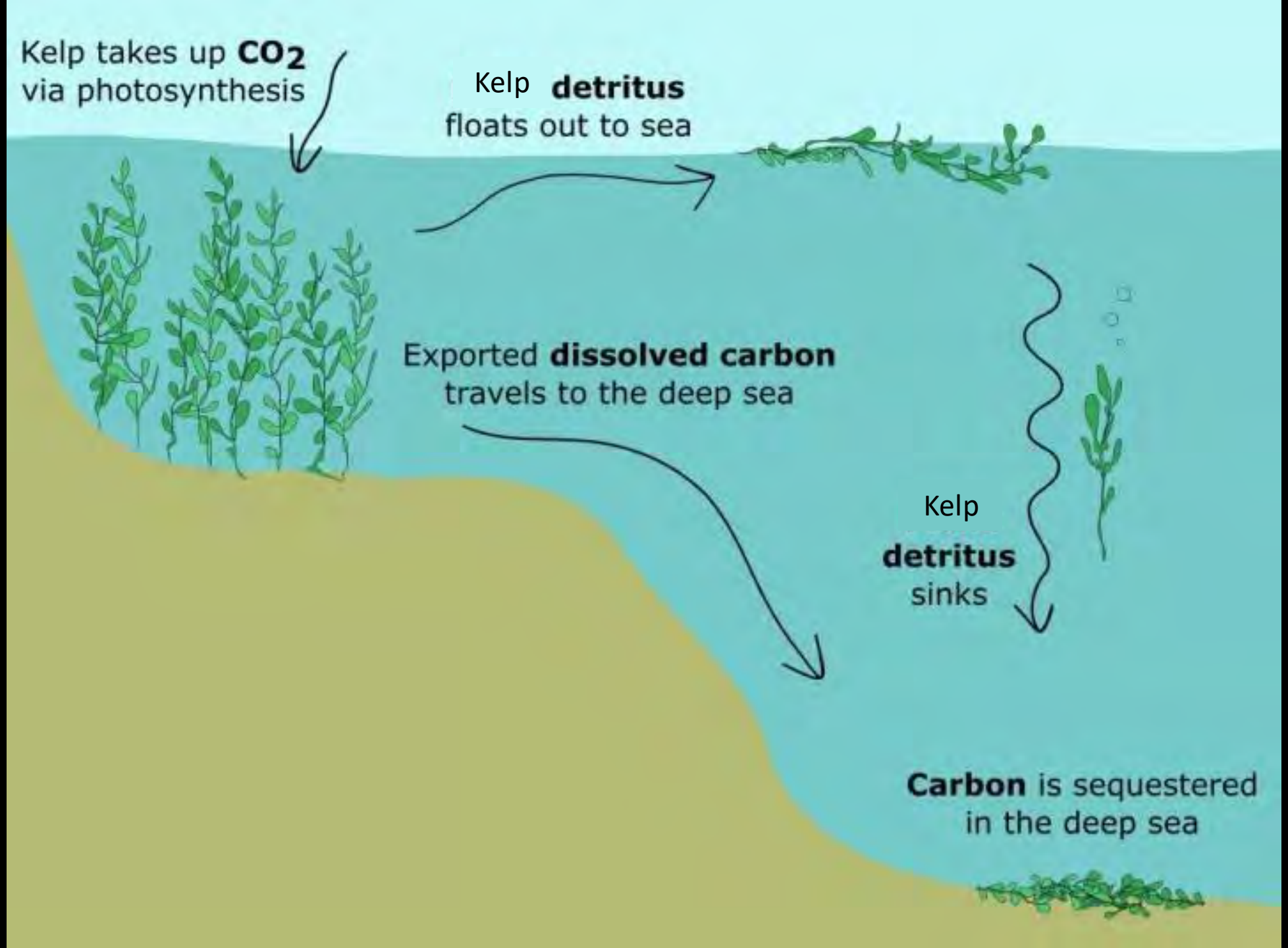
Humans: *mess with climate*
Climate: *messes with humans*
Humans:

- Carbon is the Key!
- Carbon sequestration
- Every living thing is made of carbon



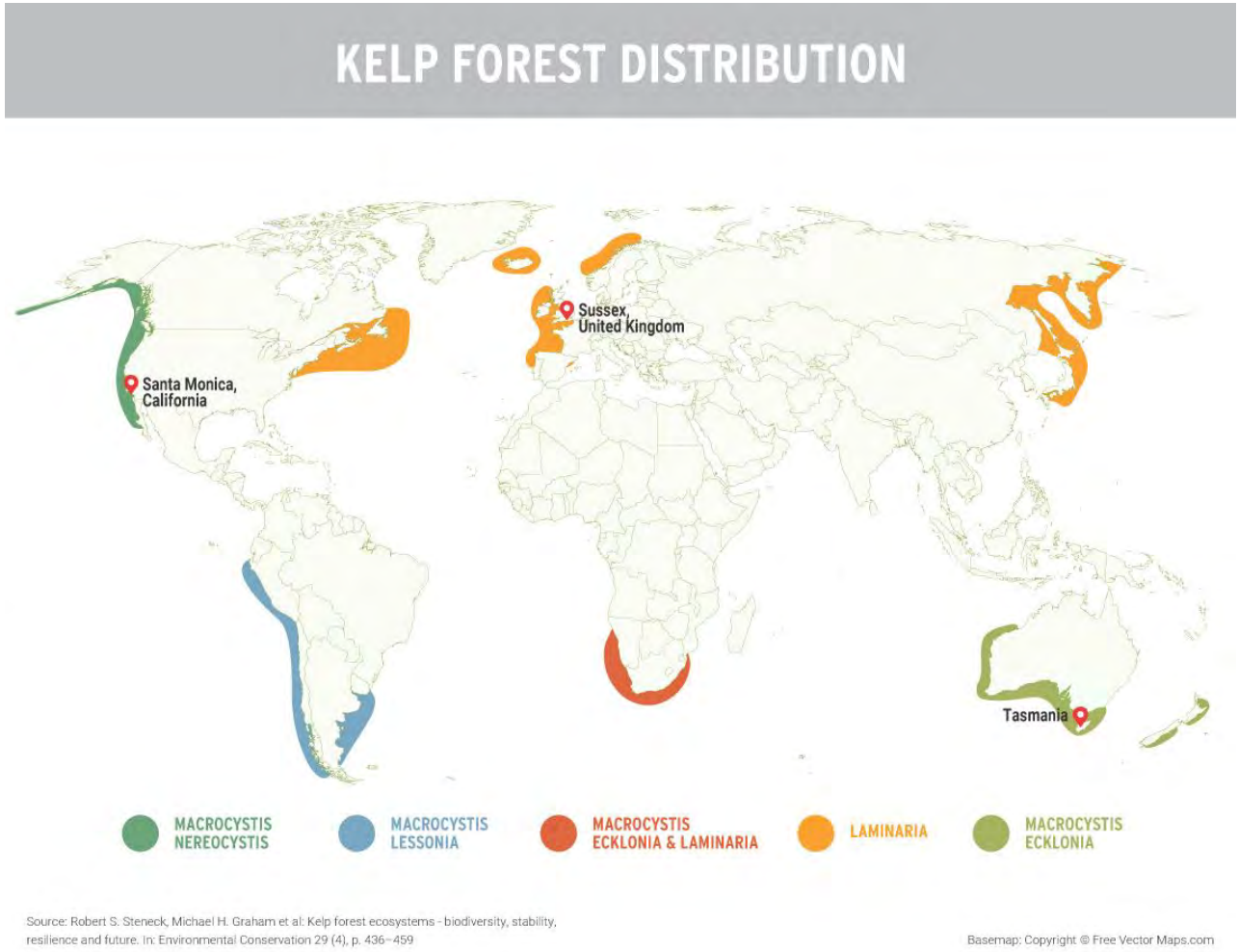
= CO_2
Carbon dioxide




Kelp takes up CO_2 via photosynthesis
Kelp **detritus** floats out to sea
Exported **dissolved carbon** travels to the deep sea
Kelp **detritus** sinks
Carbon is sequestered in the deep sea

Wild Blue Carbon Estimates

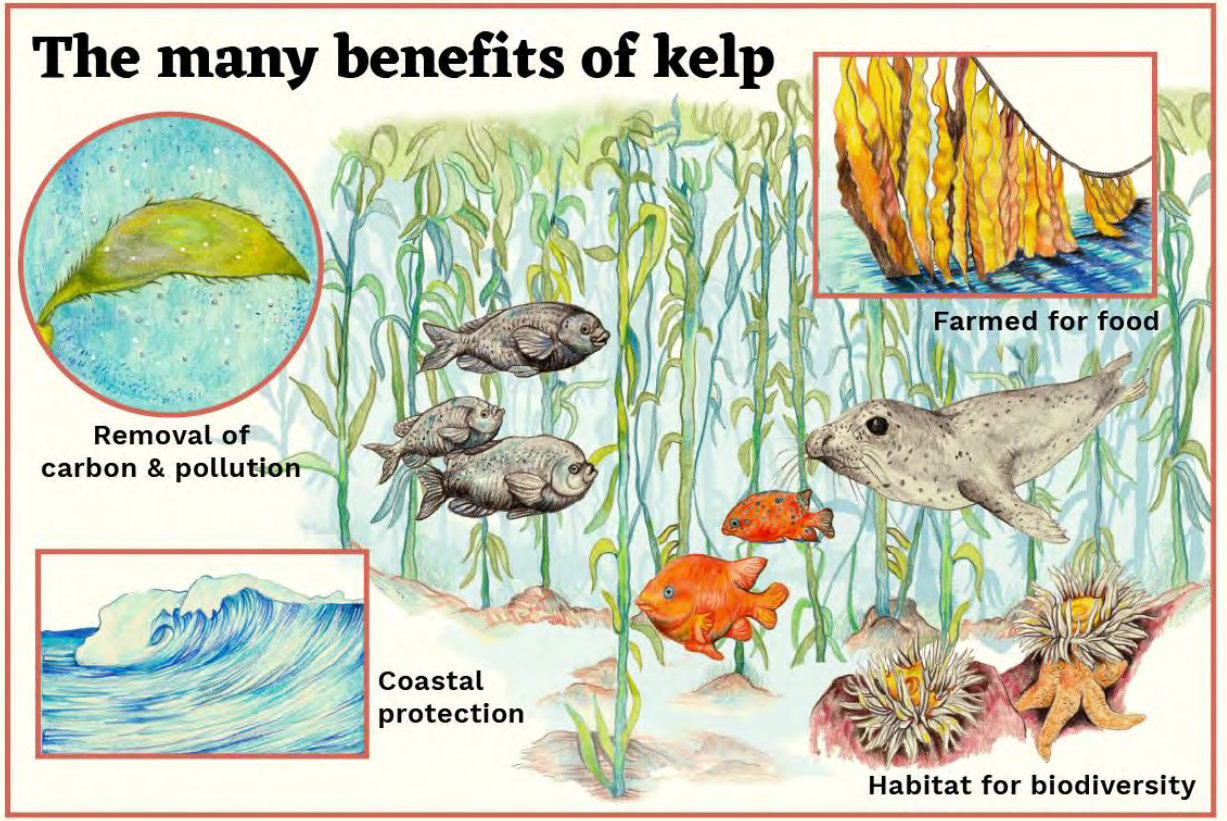
- Wild Kelp Forests, Australia
  - 1.4 – 3.1 million US tons C yr^{-1}
  - 48,000 - 103,000 humpback whales
  - Filbee-Dexter and Wernberg 2020
- Globally–191 million tons C yr^{-1}
  - 6.4 mil humpbacks
  - Krause-Jensen and Duarte 2016
- Need to remove 1 billion tons C yr^{-1}
  - 33.3 mil humpbacks
- Humpback whale = 30 tons

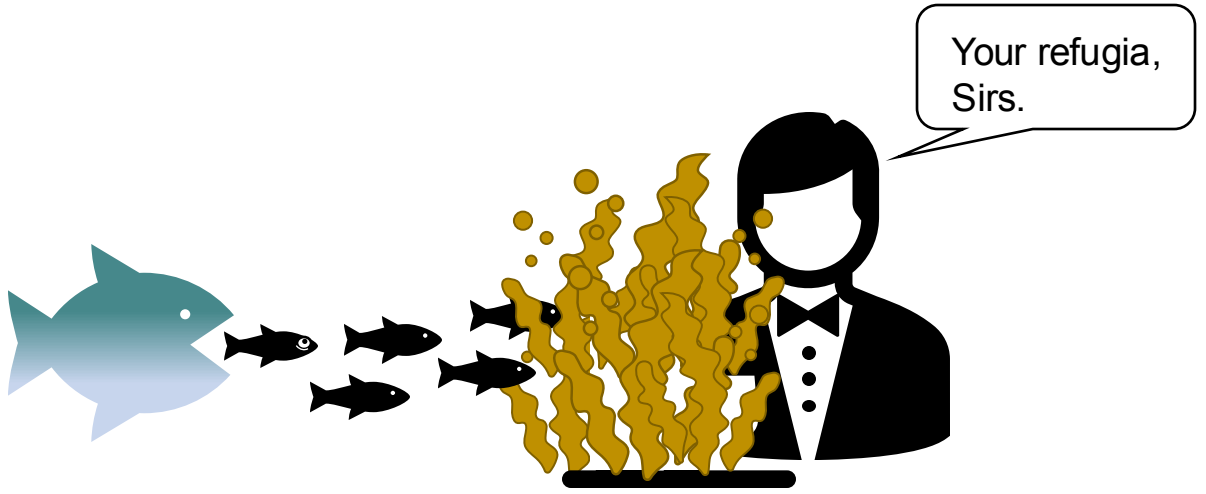


Mariculture Ecosystem Services

- Water filtration and uptake of nutrients to combat eutrophication
- Coastal Protection: Prevent erosion from storm and wave action
- Creates habitat both temporary (kelp) and permanent (shellfish)
- Carbon sequestration and storage
- Restorative or Regenerative Ocean Farming
- Research questions: to what extent?

Alleyway et al. 2019



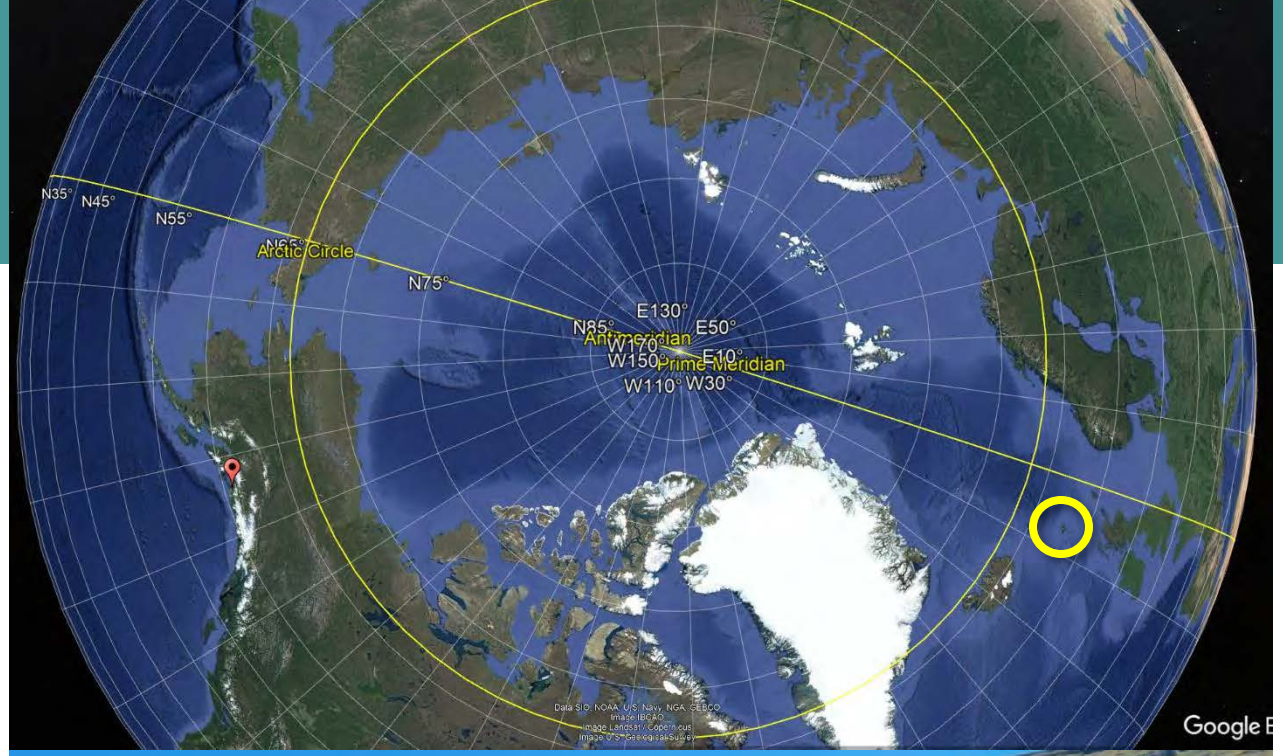



To Anchorage
Valdez
Valdez Arm
Tatitlek
Whittier
Port Gravina
Mariculture Site
Orca Bay
Cordova
Prince William Sound
Hinchinbrook Entrance
Montague Island
Chenega
N
10 miles
Anchorage, AK

Current Eastern PWS leases

Other ways to grow kelp in PWS?

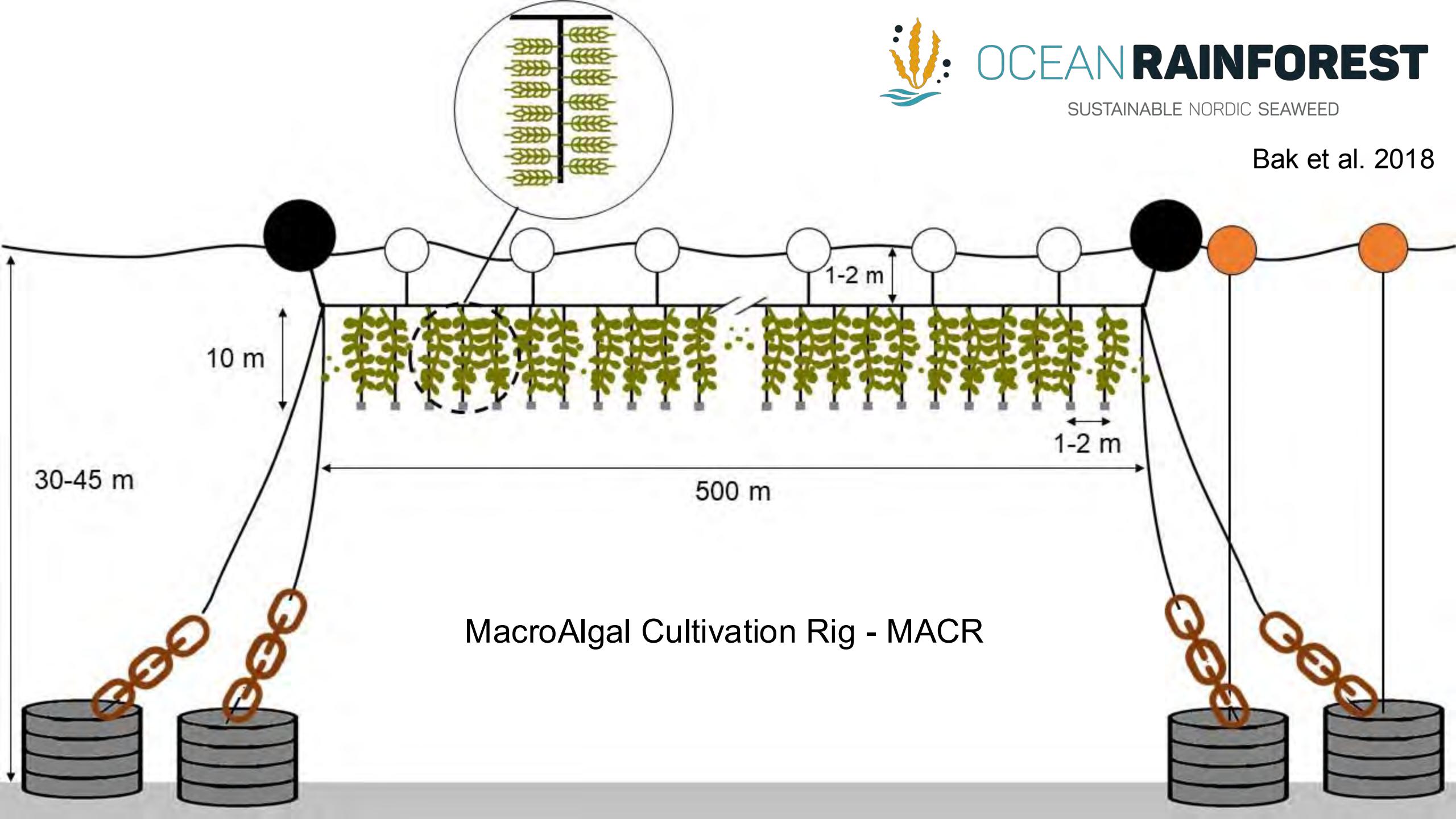
- OCEAN RAINFOREST – Faroe Islands
  SUSTAINABLE NORDIC SEAWEED
  - growing kelp since 2013
- Similar latitude
- Same daylength cycles
- North Sea storms like Gulf of Alaska storms



OCEAN RAINFOREST

SUSTAINABLE NORDIC SEAWEED

Bak et al. 2018

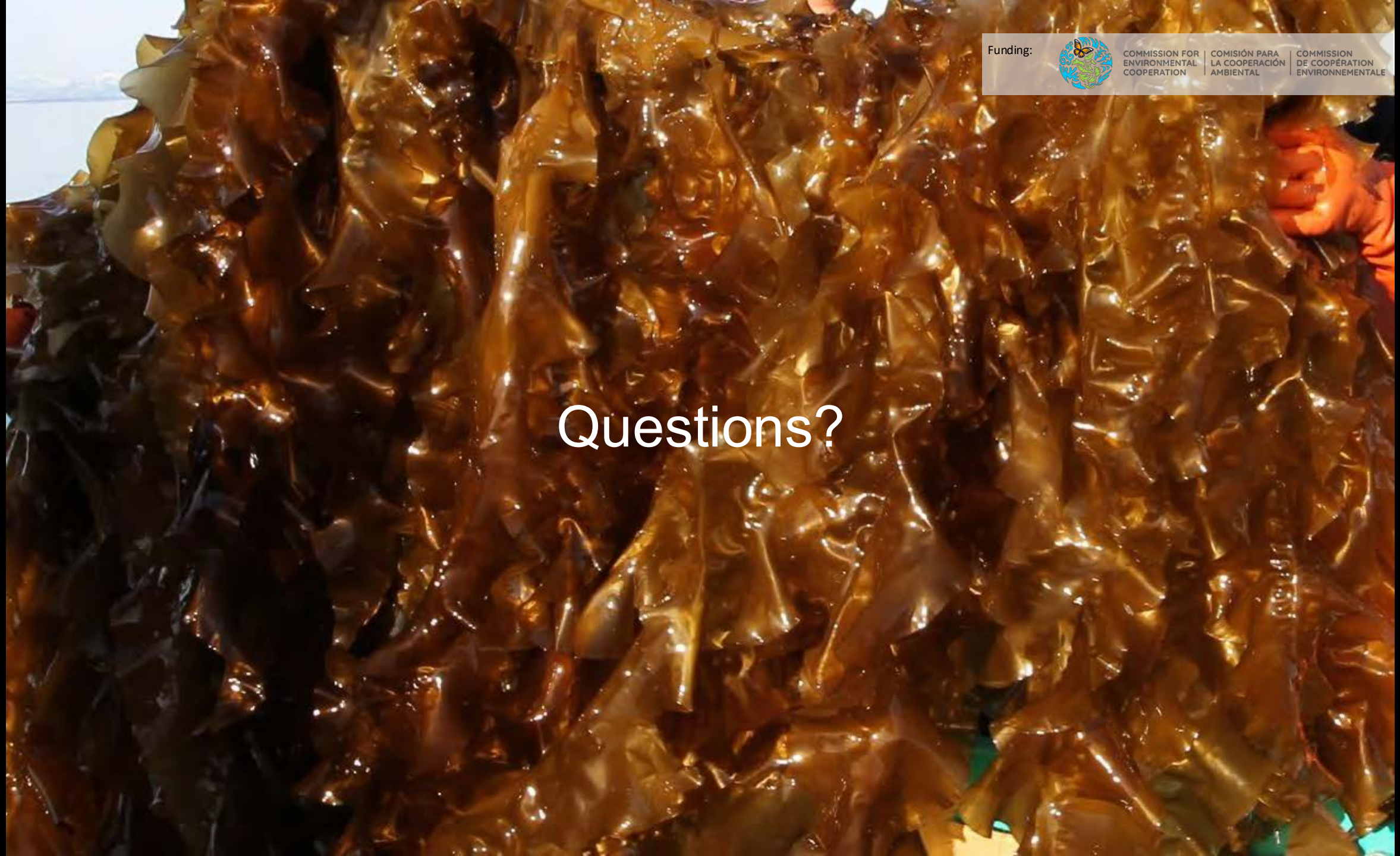


MacroAlgal Cultivation Rig - MACR


22Nov22


19Apr23


01Jun23



Funding:

COMMISSION FOR ENVIRONMENTAL COOPERATION | COMISIÓN PARA LA COOPERACIÓN AMBIENTAL | COMMISSION DE COOPÉRATION ENVIRONNEMENTALE

Questions?

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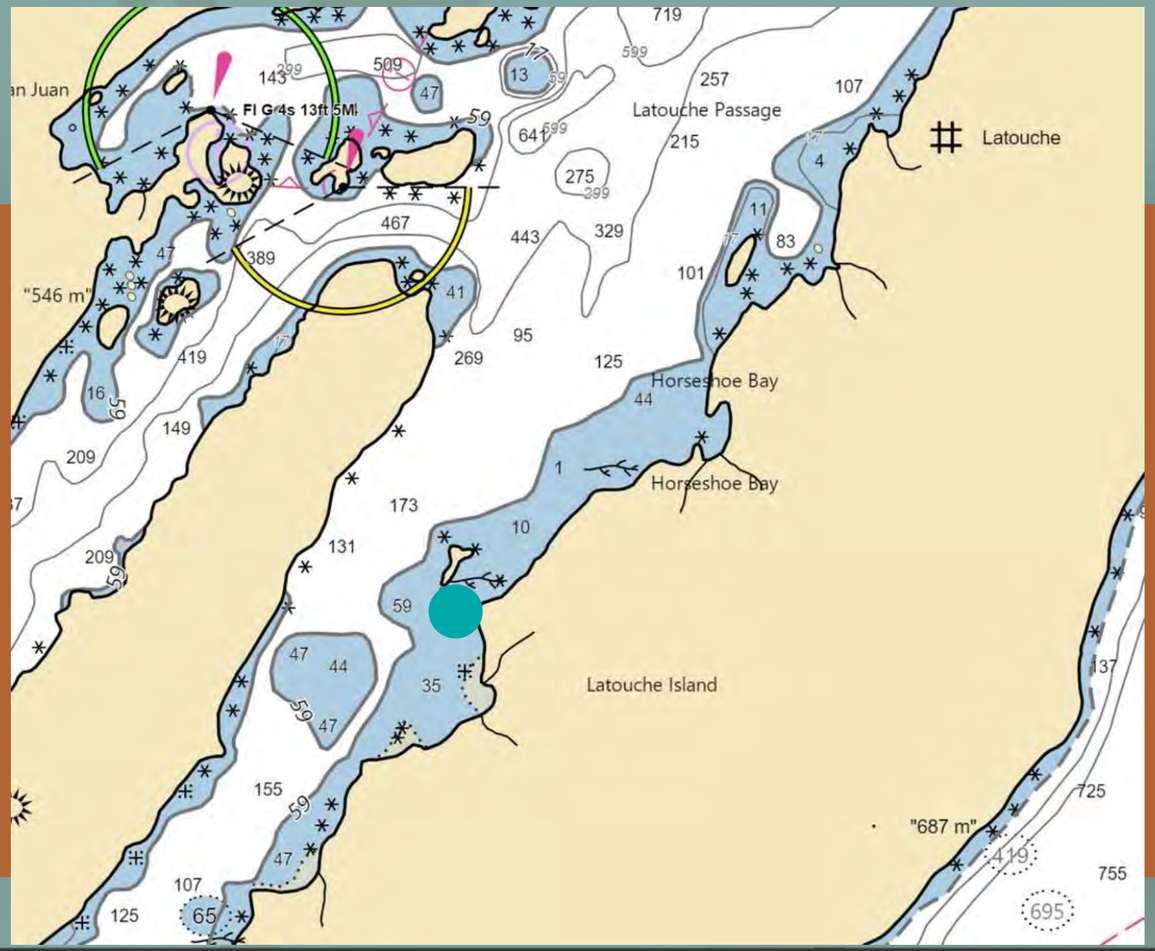
Alutiiq Pride

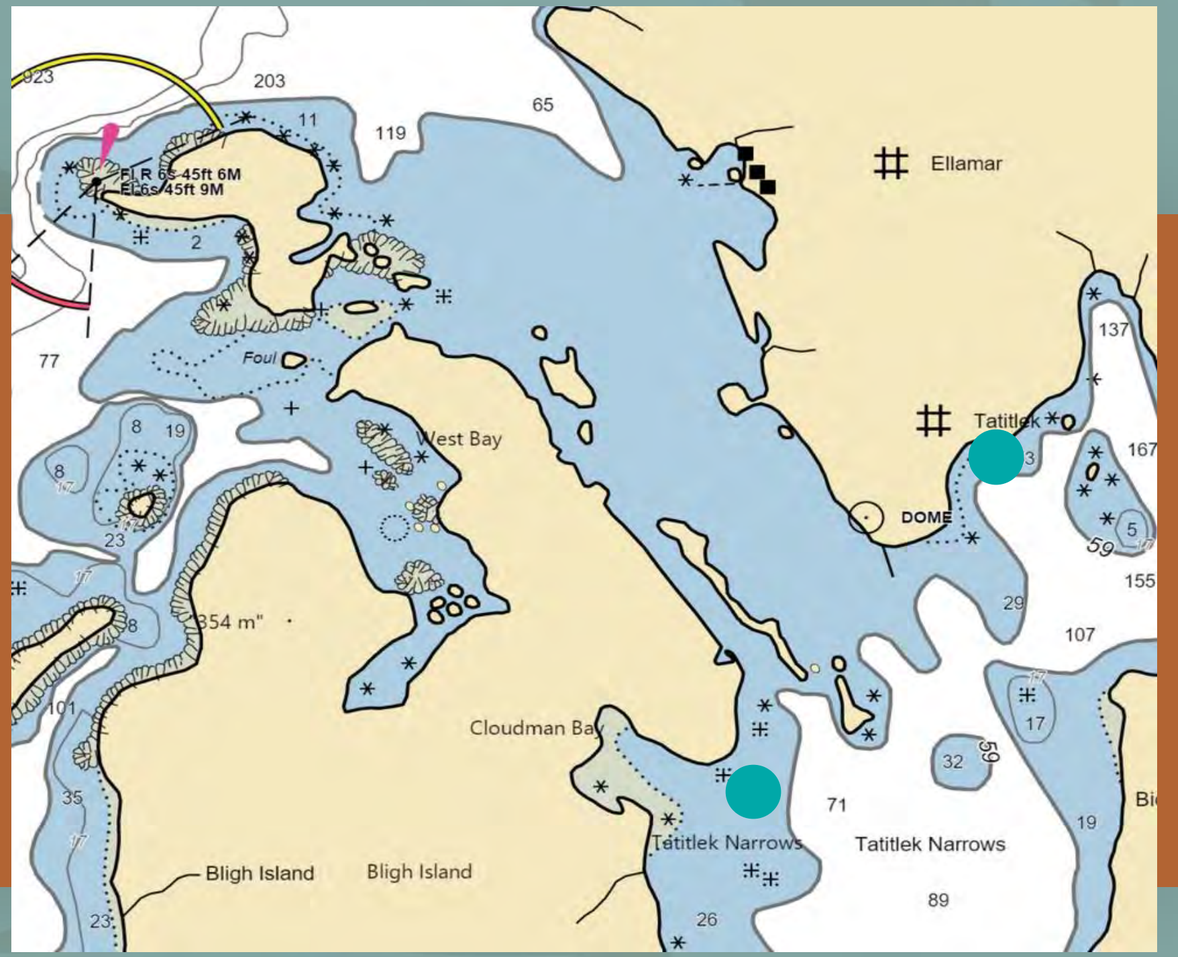
CHUGACH REGIONAL RESOURCES COMMISSION

Commercial sites in Prince William Sound:

20-acre farm site in Latouche Passage



10-acre farm site parcels in Tatitlek Narrows and Boulder Bay



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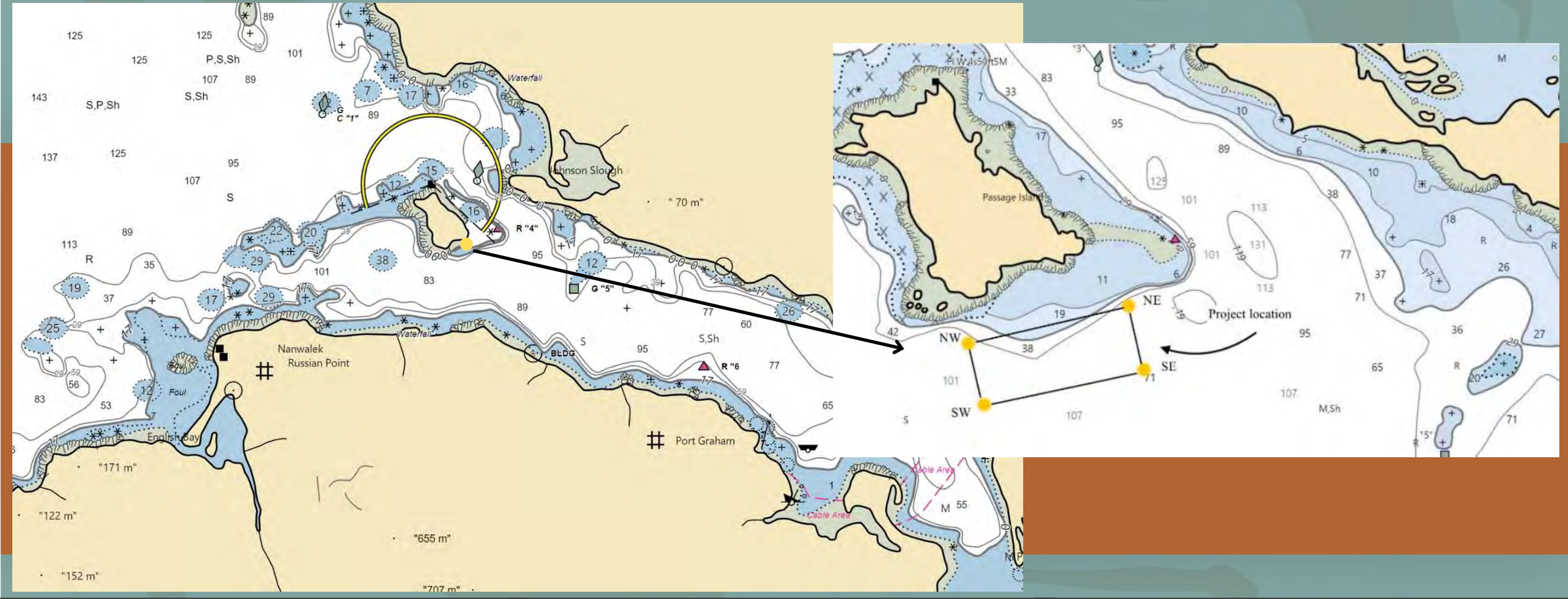
Commercial site in Lower Cook Inlet:

20-acre farmsite near Passage Island



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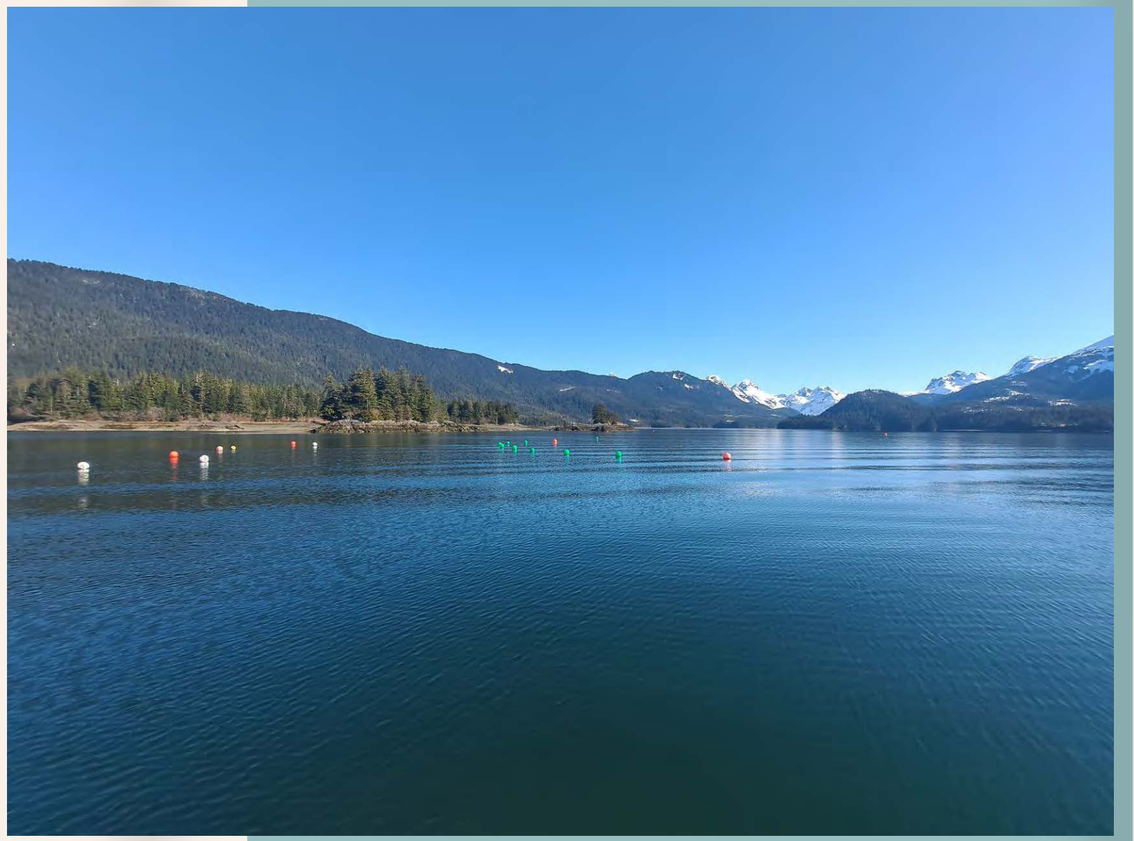
Commercial aquatic farm permitting overview

Operation permits needed:

- Department of Natural Resources
- Department of Fish and Game
- U.S. Army Corps of Engineers



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Commercial aquatic farm permitting overview

Contact before you start:

1

- Alaska Native entities in your area (tribes and village corporations) as appropriate.
- Your local government/city planners
- Nearby property owners
- Other area users (commercial fishermen, subsistence users, etc.)

USACE

SHPO

USFWS

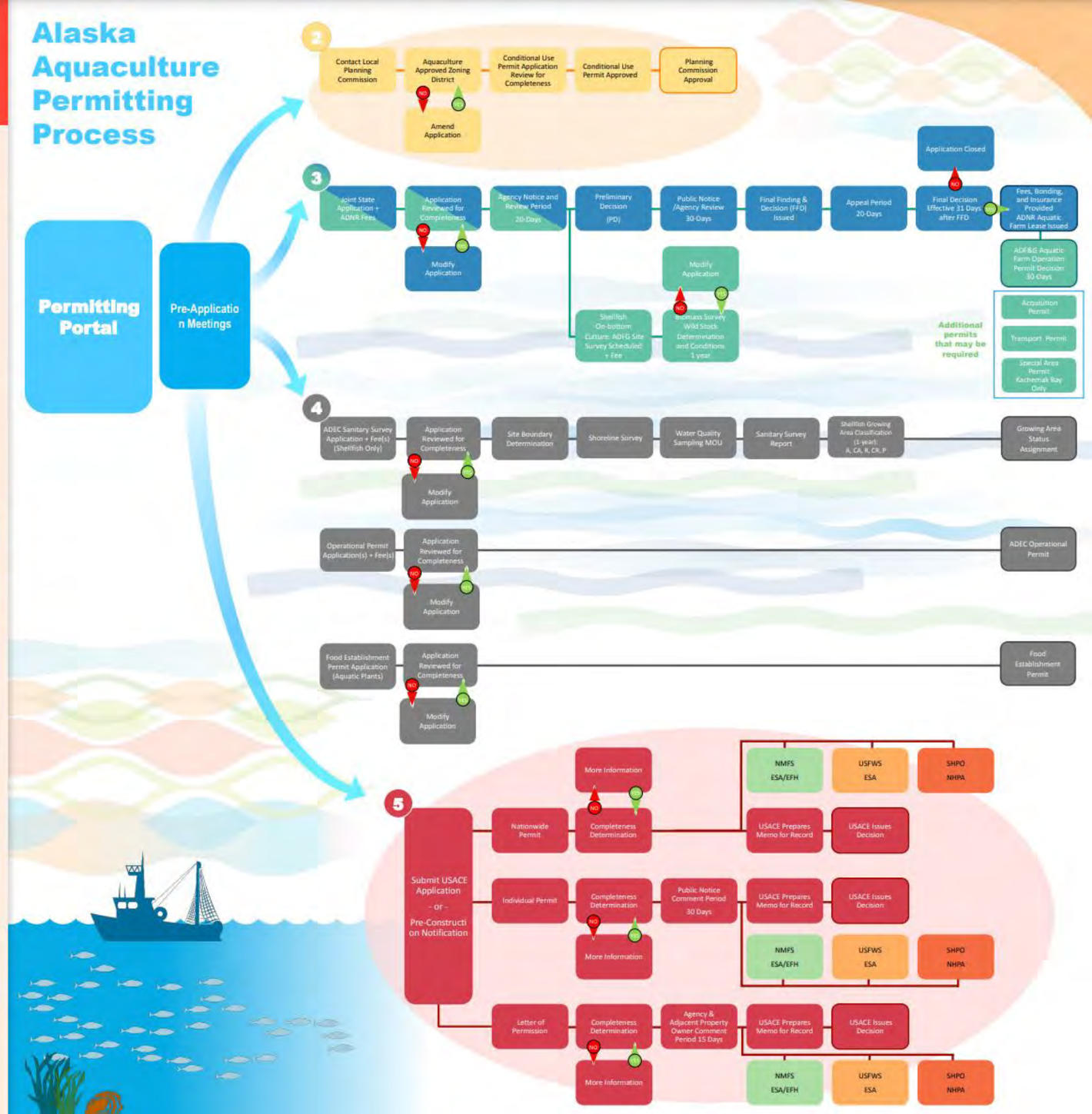
Local GOV

ADEC

NMFS

ADF&G

ADNR



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Commercial aquatic farm permitting overview

- Aquatic farm permits take at least a year to process
- Applications are only received between January 1st and April 30th of each year
- Fees:
  - Application fee—$2,000 for a 20-acre farm
  - Annual lease fee—$2,950 for a 20-acre farm
  - Insurance fee—varies, $550
  - Performance bond—$2,500

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Aquatic farm permit fee structure

Type of Fee	Type of Operation and Size (Acres)					When Fees Required to be Paid to Agency
	Suspended Shellfish		On Bottom, Intertidal	On Bottom, Subtidal	Suspended - Aquatic Plant	
	(1 acre) Example	(50 acres) Example	(1 acre) Example	(3 acres) Example	(10 acres) Example	
Year 1						
Application Fee[2]	$600	$2,000	$600	$1,200	$2,000	Application submittal
Annual Lease Fee[3]	$450	$6,575	$450	$700	$1,575	According to lease agreement
Security Bond[4]	$2,500	$2,500	$2,500	$2,500	$2,500	With signed lease submittal
Annual Liability Insurance with third party[5]	Based on quote from insurance company or broker	Based on quote from insurance company or broker	Based on quote from insurance company or broker	Based on quote from insurance company or broker	Based on quote from insurance company or broker	According to insurance agreement
Wild Stock Survey Fee[6]	$0	$0	$2,000	$5,000	$0	Application submitted
Sanitary Survey Initial Fee, Water Classification[7]	$500	$500	$500	$500	$0	When water classification requested
Initial Fees 1st Year (Minimum)	**$4,050**	**$11,575**	**$6,050**	**$9,900**	**$6,075**	As indicated above
Years 2 - 10						
Fees for Years 2 - 10	**$1,735**	**$7,860**	**$1,735**	**$1,985**	**$1,725**	As indicated above
All Years 1 - 10 Combined						
Total Fees for All 10 Years[9]	**$19,665**	**$82,315**	**$21,665**	**$27,765**	**$21,600**	As indicated above

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CRRC's Processing Feasibility Study:

- Economic Assessment of Harvesting, Processing, and Primary Stabilization Methods for Commercially Grown Kelp
  - Primarily looking at harvesting, processing, and transportation costs for large-scale kelp harvest
  - Aims to provide a full cost-assessment and labor analysis for harvesting and processing approximately 20,000 pounds of kelp
- Partnership with Mothers of Millions and Pacific Seafood in Seward

Pacific Seafood

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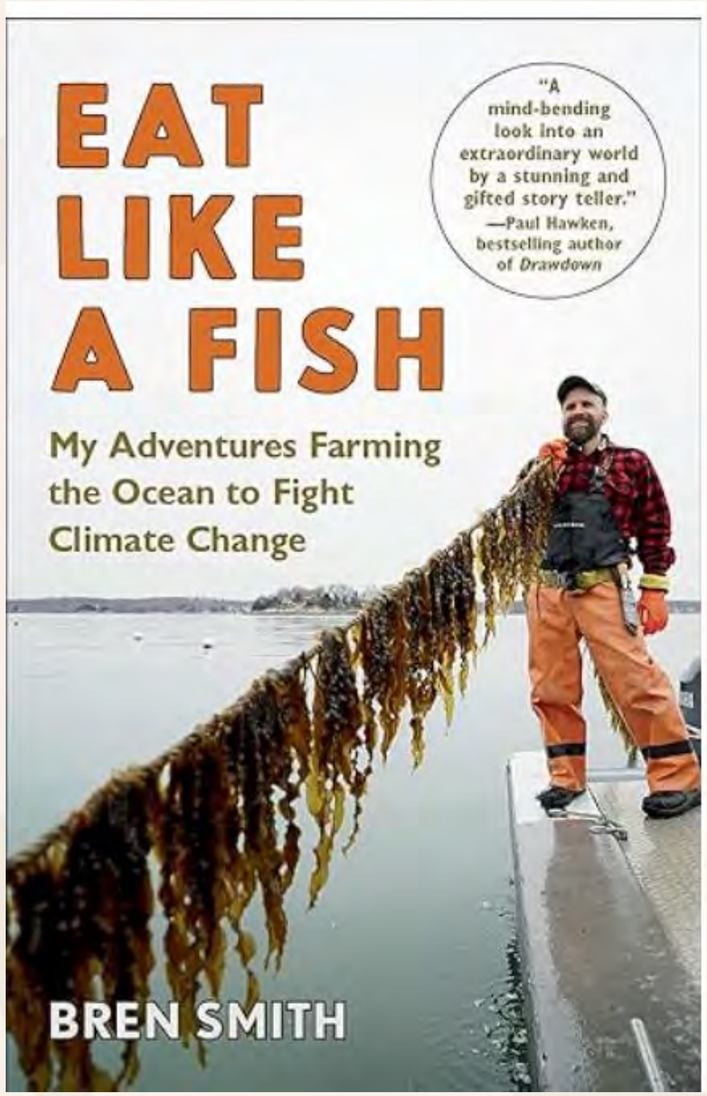
Spring 2024 Processing Opportunities:

- Kelp Processing Workshop in Homer
  - Led by Saltwater Inc. and ReGeneration North
  - Testing four different approaches to seaweed stabilization
    - Solar drying
    - Infrared drying
    - Fermentation
    - Salting
- Check out the Saltwater Inc. booth to sign up!

ReGENERATION NoRTH

KACHEMAK KELP

Saltwater Inc.



Eat Like A Fish, By Bren Smith

A captivating story about a Canadian fisherman who transitioned to ocean farming in response to climate change and our societal need to develop more global regenerative food systems.

Advantages of Ocean Farming relative to Terrestrial Farming:

- **No Freshwater Inputs**
- **No Fertilizer**
- **No Feed**

Health Benefits Of Eating Kelp

What nutrients does kelp contain?
Potassium, Magnesium, Calcium, Iodine, Iron, Selenium, Zinc, Fucoidan, Vitamins A, B1, B2, C, D and E, Omega-3 fatty acids, and fiber.

What can kelp do for your body?
Kelp helps with detoxification and purifies the blood by drawing out waste, toxins, and heavy metals. Kelp can also help reduce inflammation and lower the risk of chronic disease. The Iodine in kelp can also help your body maintain a healthy thyroid.


12tid
ORGANIC KELP SNACKS
PUFFED KELP CHIPS
vegan cheddar
12tid
ORGANIC KELP SNACKS
PUFFED KELP CHIPS
chili pepper
12tides
ORGANIC KELP SNACKS
PUFFED KELP CHIPS
sea salt
NET WT. 2 OZ (57g)
COMPOSTABLE PACKAGING

Contact:

Kenai Peninsula:

Briana Murphy at

briana@alutiiqprideak.org

Prince William Sound:

Sean Den Adel at

sean@alutiiqprideak.org

crrcalaska.org @crrc_alaska

Mariculture Research at the Alutiiq Pride Marine Institute

Maile Branson PhD
Science Director

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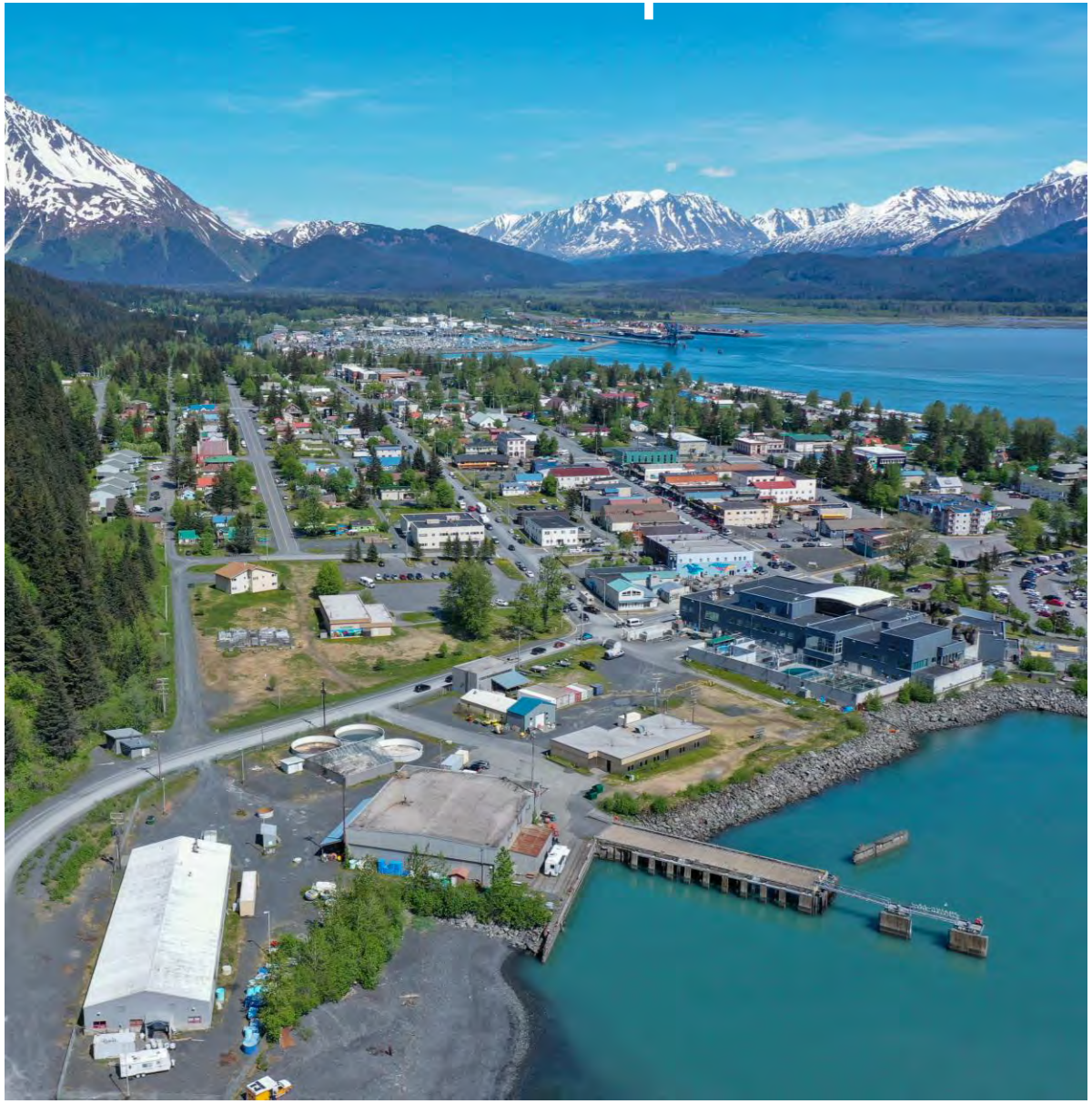

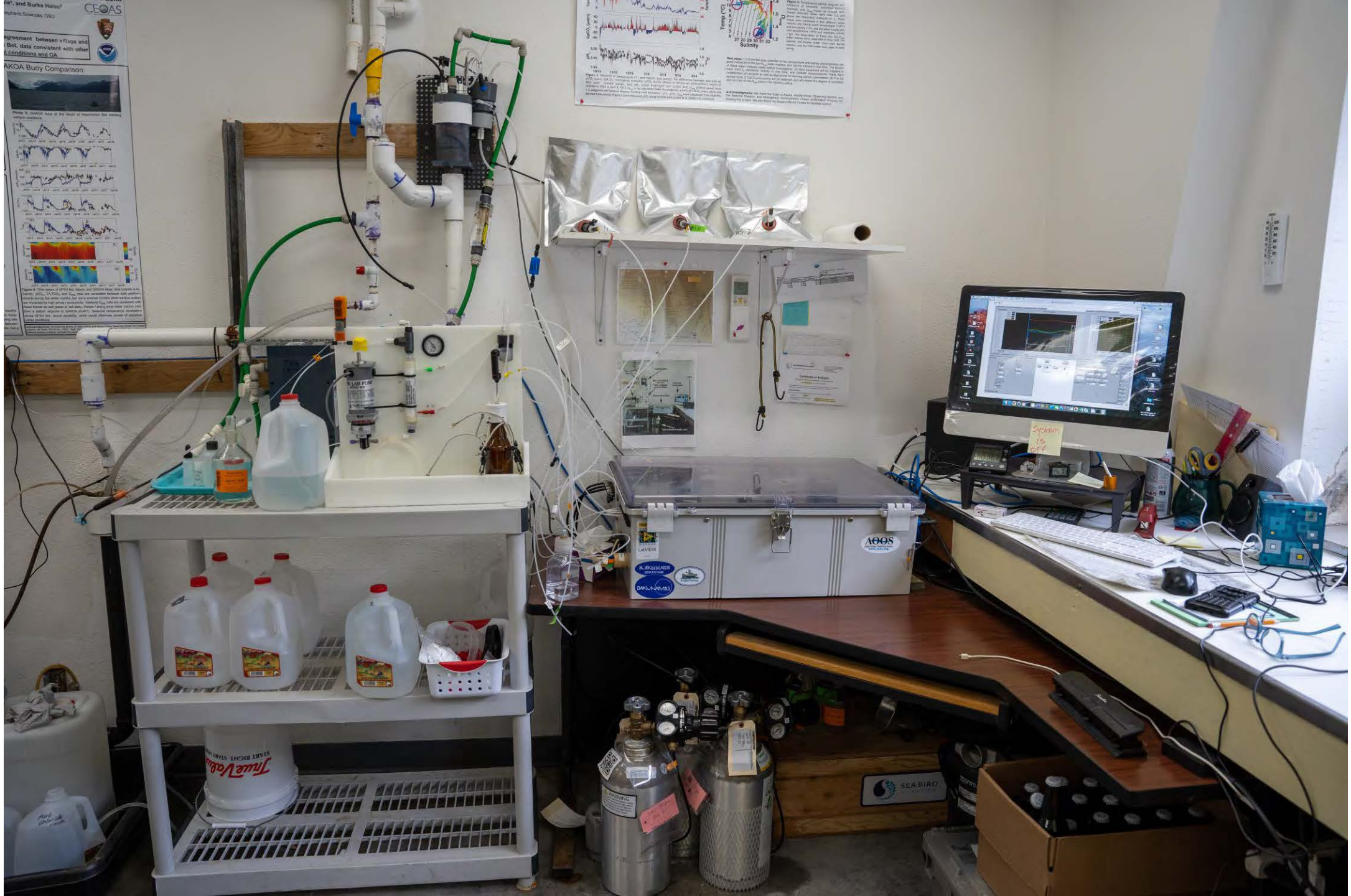
CEOAS
AKOA Buoy Comparison:
AOOS
SEA-BIRD

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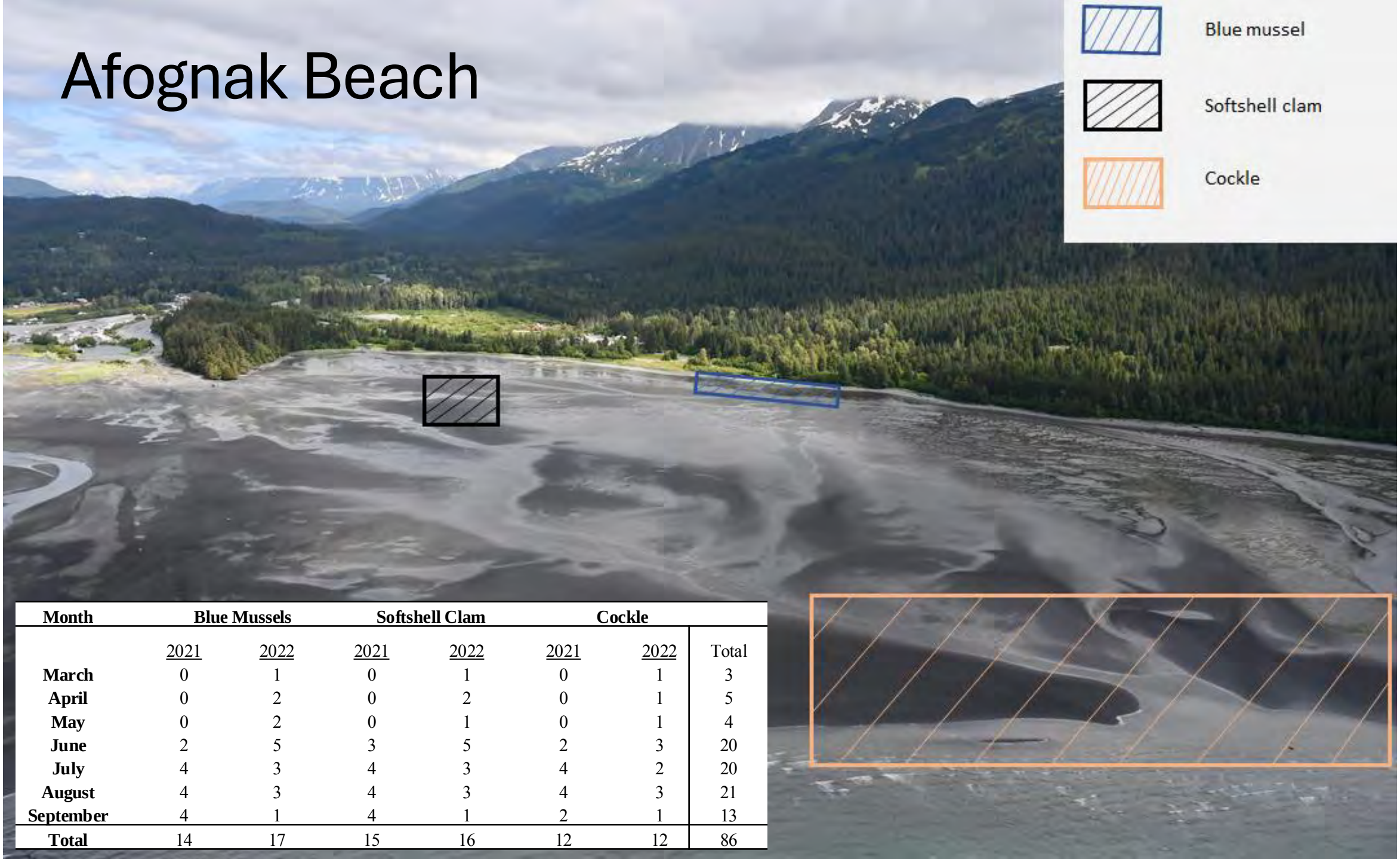
Paralytic shellfish toxin congener profiles in three species of bivalves from Resurrection Bay, Alaska, during the summer of 2021 and 2022

Annette Jarosz, MS student UAF

Biologist, Alutiiq Pride Marine Institute

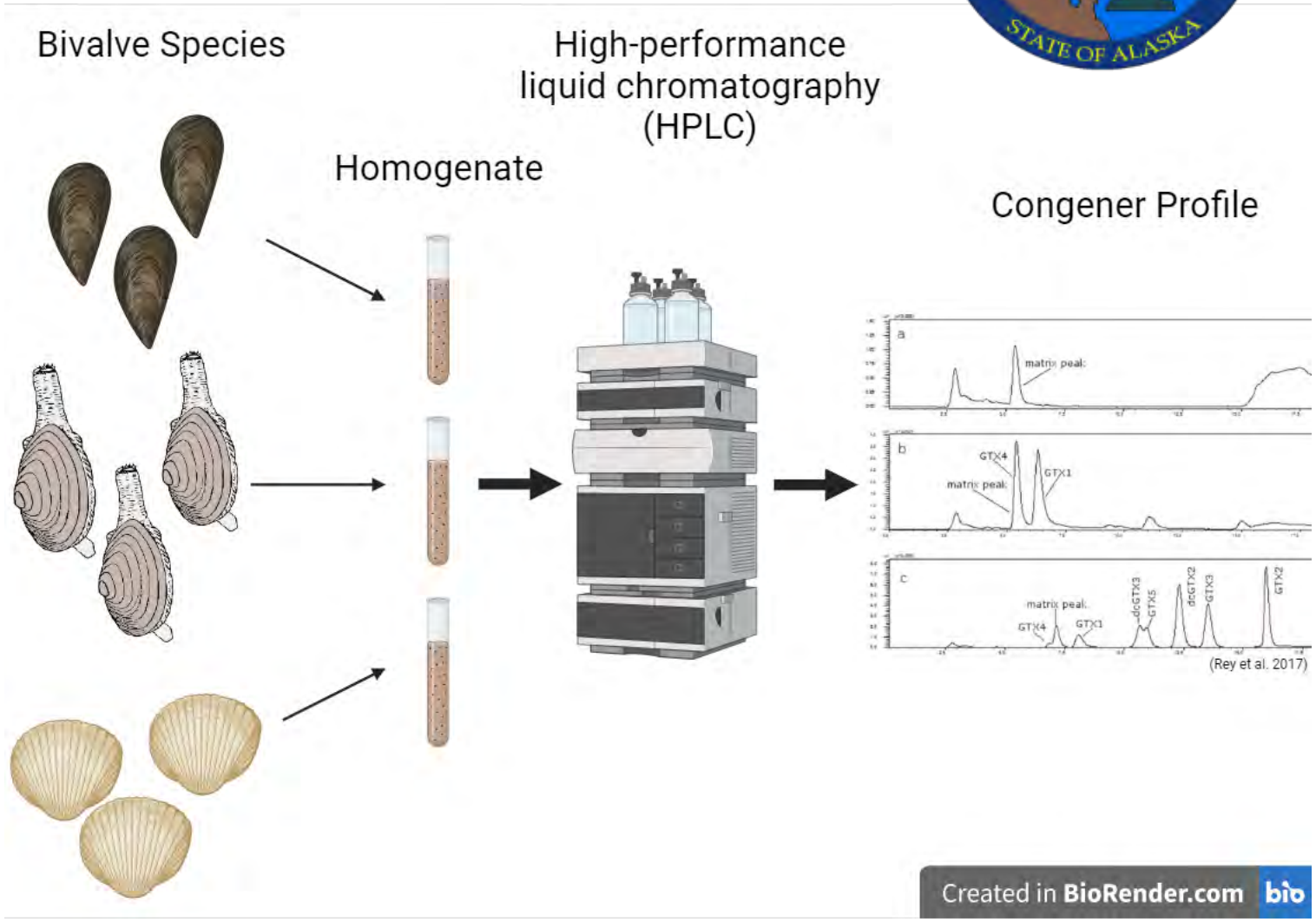
Afognak Beach



Month	Blue Mussels		Softshell Clam		Cockle		
	2021	2022	2021	2022	2021	2022	Total
March	0	1	0	1	0	1	3
April	0	2	0	2	0	1	5
May	0	2	0	1	0	1	4
June	2	5	3	5	2	3	20
July	4	3	4	3	4	2	20
August	4	3	4	3	4	3	21
September	4	1	4	1	2	1	13
Total	14	17	15	16	12	12	86

Laboratory Analysis

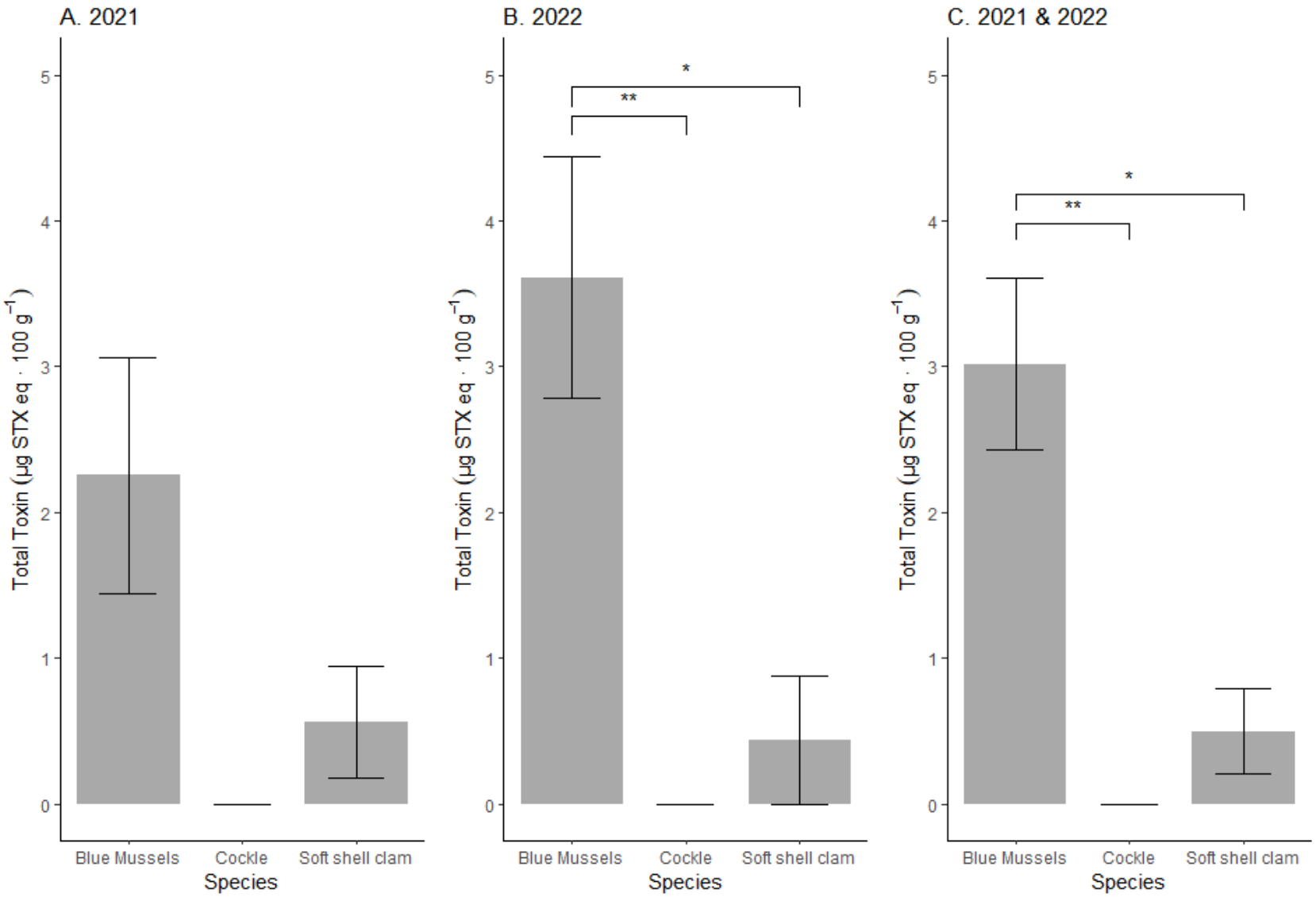
- All samples (n=86) were sent to the ADEC
- HPLC method for identification of PSTs in Shellfish
- This method only identifies 12 most toxic PSTs

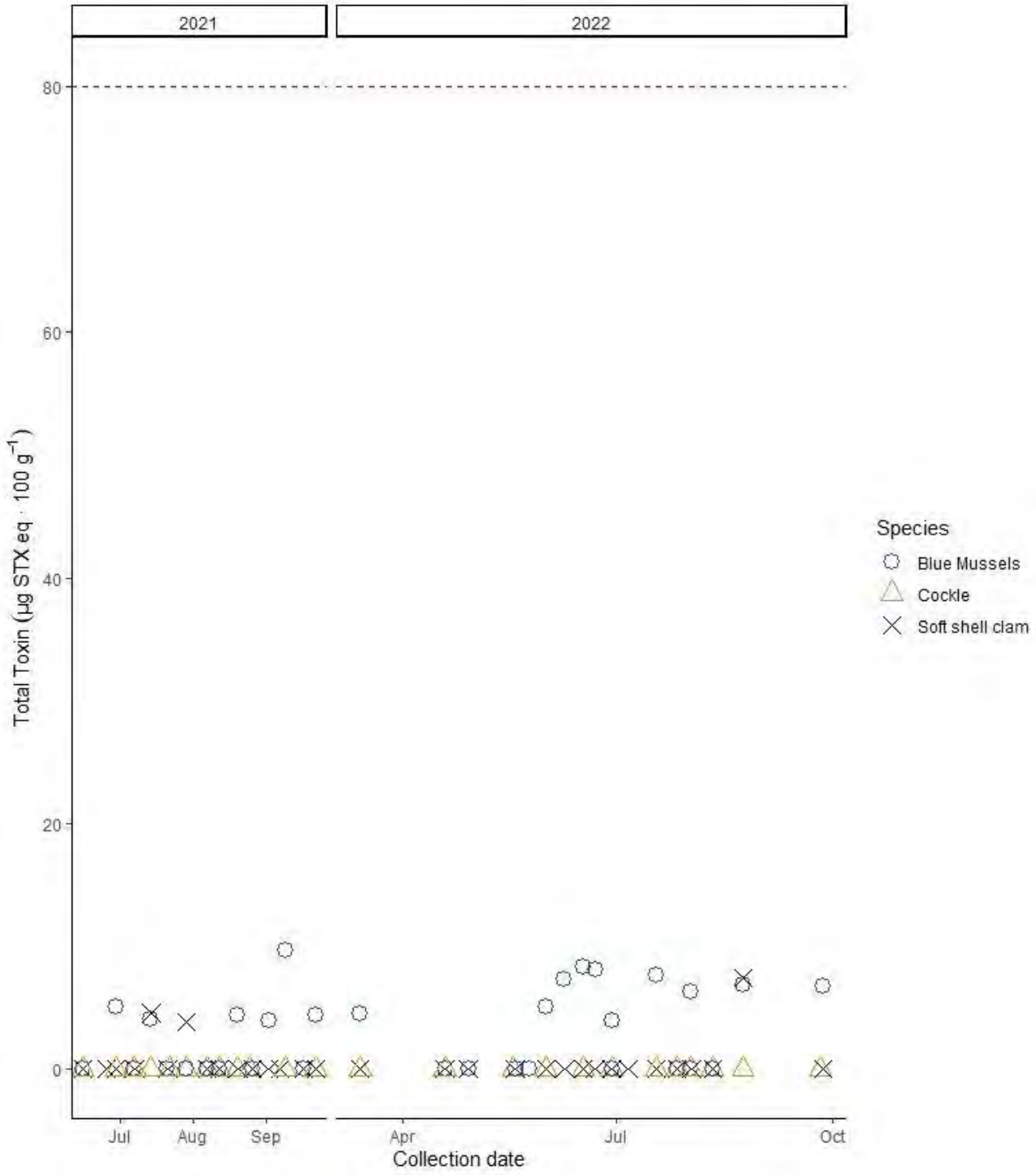


(Created by BioRender, 2023)

Total

Toxicity




2021
2022
80
60
40
20
0
Total Toxin (µg STX eq · 100 g^{-1})
Jul
Aug
Sep
Apr
Jul
Oct
Collection date
Species
Blue Mussels
Cockle
Soft shell clam

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Restoring Indigenous Clam Gardening in Seldovia and Kake

Dustin Carl, MS
CRRC Tribal Wildlife Biologist

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Native Species Restoration

- Invertebrates species experienced significant decline
- Causes are unknown,
  - Oil spill
  - Overpredation
  - Overharvest
  - changing climate
- Modern aquaculture and indigenous clam gardening methods to restore

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Restoration Research Process

- Collected as adults
- Spawn-research spawning methods
- Raise-research rearing methods
- Outplant-research outplanting, growth, and success rates

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Habitat Surveys

- Drones and GIS tools
- Clam size classes, population densities, and substrates
- Clam density predictions and habitat suitability maps

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Calcein Marking for Clam Population Monitoring in Southcentral Alaska

Jacob Cohen
Biology Lab Technician, APMI

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Context

- **Bivalves have declined in Southcentral Alaska since the Exxon Valdez Oil Spill**
  - **Continued pressure from changes in regional climate and ecosystem conditions (e.g., marine heat waves, predation by rebounding otter populations)**

- **For over 30 years, CRRC has rehabilitated bivalve populations on beaches throughout the Chugach region**

How can we measure the effectiveness of rehabilitation?

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Calcein Project

- Mark and recapture study to assess the recruitment of hatchery-raised clams into beach populations

- Calcein, a non-toxin, fluorescent dye, is used to mark the shells of out-planted clams, allowing them to be distinguished in the lab from wild populations

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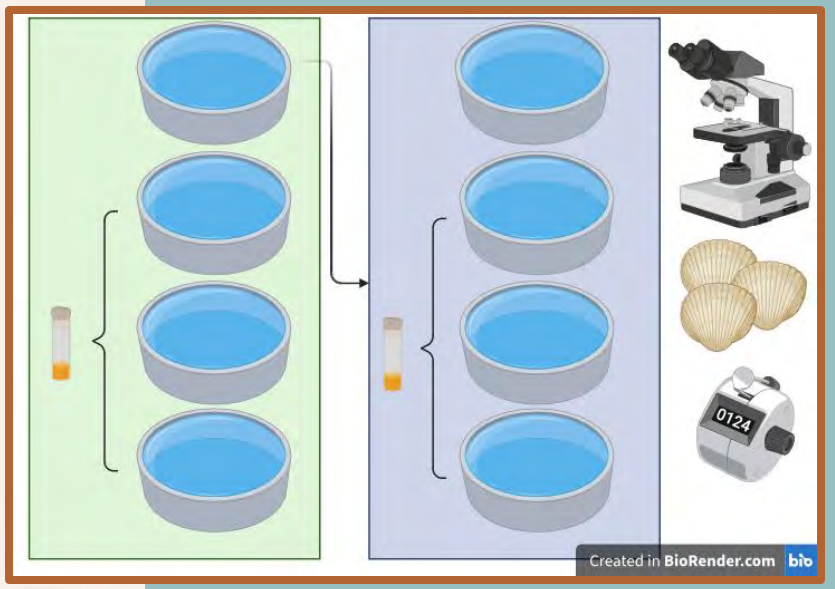
Experimental Method

- **Shellfish are immersed in a calcein solution, which is taken up by the growing shell as calcium carbonate is deposited. This results in a distinct fluorescent mark on the shell, which can be visualized under a fluorescence microscope.**

- **This project aims to establish methods for calcein marking in two native Alaskan species: the littleneck clam (*Leukoma staminea*) and the butter clam (*Saxidomus gigantea*).**

- **In May of 2023, adult broodstock clams were collected in Prince William Sound and lower Cook Inlet. They were spawned in July at the Alutiiq Pride Marine Institute.**



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Progress and Implications

- Calcein exposures have been completed on littleneck and butter clam spawn from Tatitlek as well as cockle spawn from Seldovia
- Calcein marks should be able to be identified within the next two months
- Once outplanted, we can better assess the effectiveness of bivalve beach rehabilitation and adapt these efforts to be most successful

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Happy as a Clam—What Role Does Serotonin Play in Bidarki Reproduction?

Jacqueline Ramsay, MS
Biologist

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Chitons (Bidarkis) in the Chugach Region

- Bidarkis are a valuable food source for the People of the Chugach region
- Bidarkis have been declining in the region
- Mariculture may help to bring them back
- Little is known about reproductive cycles of Bidarkis

Reproduction

- Little is known about reproductive cycles of Bidarkis

- Serotonin is a key hormone in invertebrate reproduction

- APMI is:

1. looking at serotonin levels in wild Bidarkis throughout the year
2. Attempting to spawn Bidarkis to understand reproductive cycles

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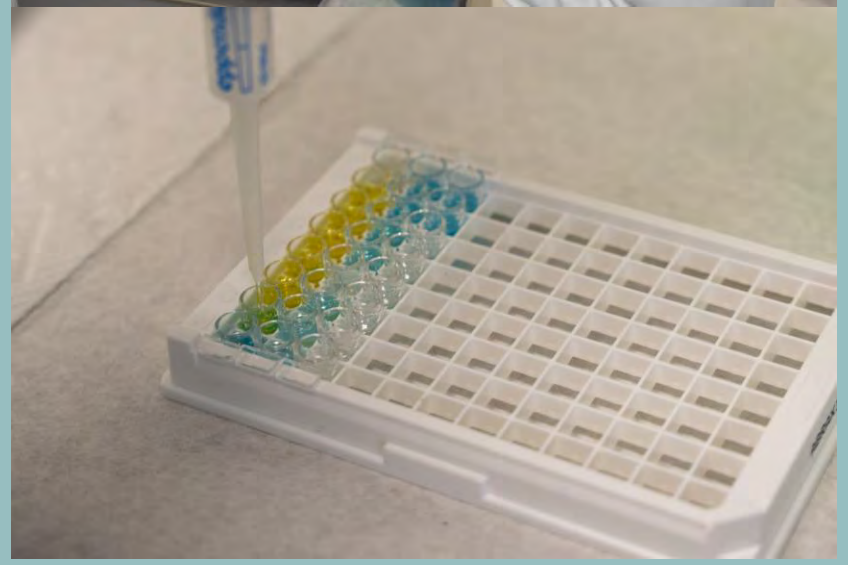
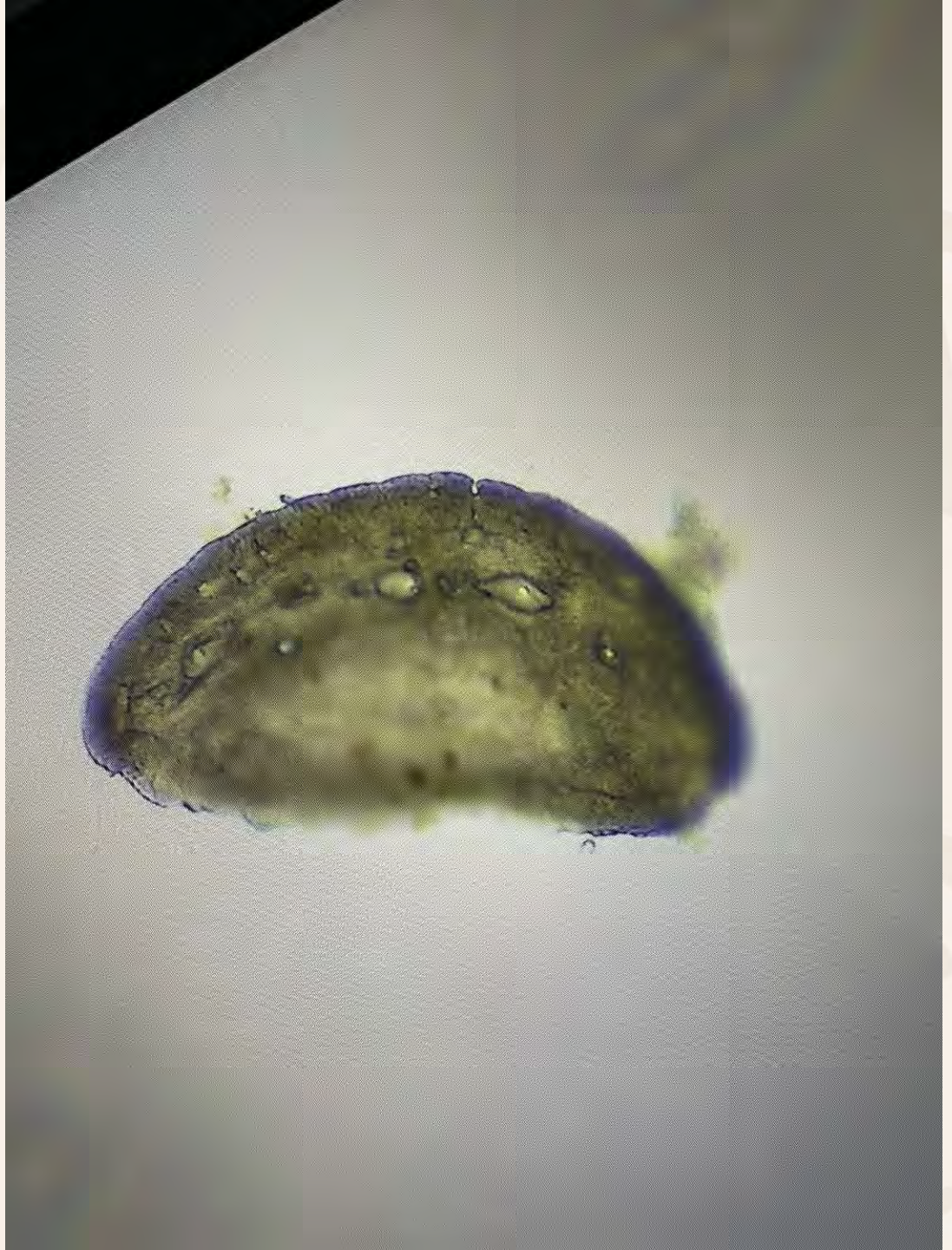


Methods

- Bidarkis are collected as adults in Port Graham, Nanwalek, and Seldovia
- Some are harvested for laboratory testing
- The rest are spawned at APMI
- Staff at APMI:

1. Test serotonin levels using Enzyme Linked Immunosorbent Assay (ELISA)
2. Observe spawning cycles, and record both natural spawns and induction attempts



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Outcomes

- Better understanding of reproduction overall
- Can be used as tool to assess spawn feasibility
- Can be used to create mariculture models for chiton species

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Lessons Learned in Spawning and Cultivating Pinto Abalone

Jacqueline Ramsay, MS
Biologist

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COMMISSION

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Pinto Abalone (*Haliotis kamtschatkana*)

- Pinto abalone are a popular species, used for food and handicrafts
- These abalone have been declining in their native southeast AK
- Mariculture may help to bring them back
- Little is known about reproductive cycles of these abalone

CHUGACH REGIONAL RESOURCES COMMISSION

Methods

- Broodstock were obtained from Prince of Wales Island, AK
- Held at APMI to observe spawning cycles, gonad ripeness, and record both natural spawns and induction attempts
- Induction attempts utilized manipulations of temperature, feed, lighting, and chemical induction (H_2O_2)
- Settlement manipulation was also attempted using y-Aminobutyric Acid (GABA)


Instant Algae® – Algae When You Need It.™
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(Concentrated)
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Outcomes

- Successful spawning and peak gonadal ripeness was most consistently achieved when adhering to the natural circadian rhythms
- Better understanding of reproduction overall
- Can be used to augment mariculture models for pinto abalone, a species of ecological and economical importance

CHUGACH REGIONAL RESOURCES COMMISSION

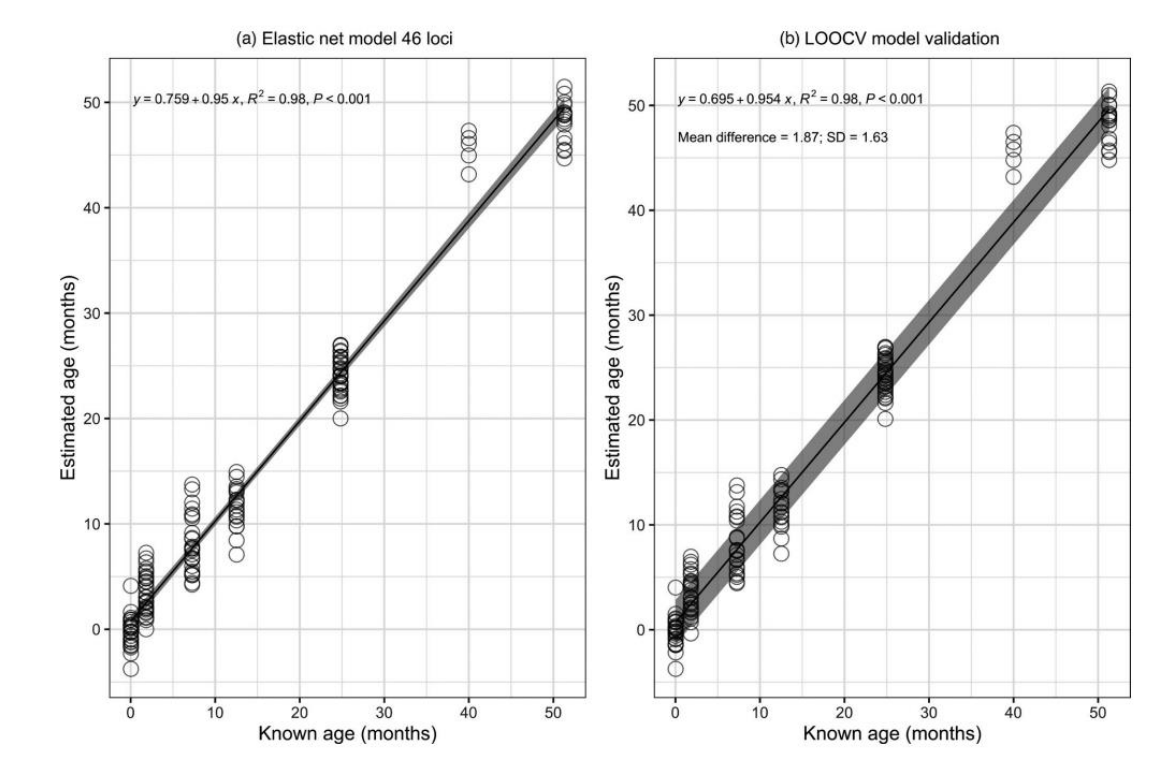
Alutiiq Pride

Aging Sea Cucumbers Using rDNA

Michael Mahmood
Production Manager

CHUGACH
REGIONAL
RESOURCES
COMMISSION

Aging in Invertebrates



- Little is known about how invertebrates age, particularly though early life stages
- Researchers have used ribosomal DNA (rDNA) to find the age of animals, including invertebrates (Fairfield et al., 2021), but have never tried it with sea cucumbers

CHUGACH REGIONAL RESOURCES COMMISSION

Cucumber Rearing and Sampling

- Collected as adults in Southeast AK
- Spawned at APMI
- Raise to two years old-sampling every 90 days
- rDNA analysis conducted by Canadian Department of Fisheries and Oceans (DFO)

CHUGACH REGIONAL RESOURCES COMMISSION

(SARDFA, 2024)

Outcomes

- Will create a tool to evaluate age of individuals randomly sampled in the wild
- Can be used to evaluate population structure to determine fishery stocks in both Canada and Alaska

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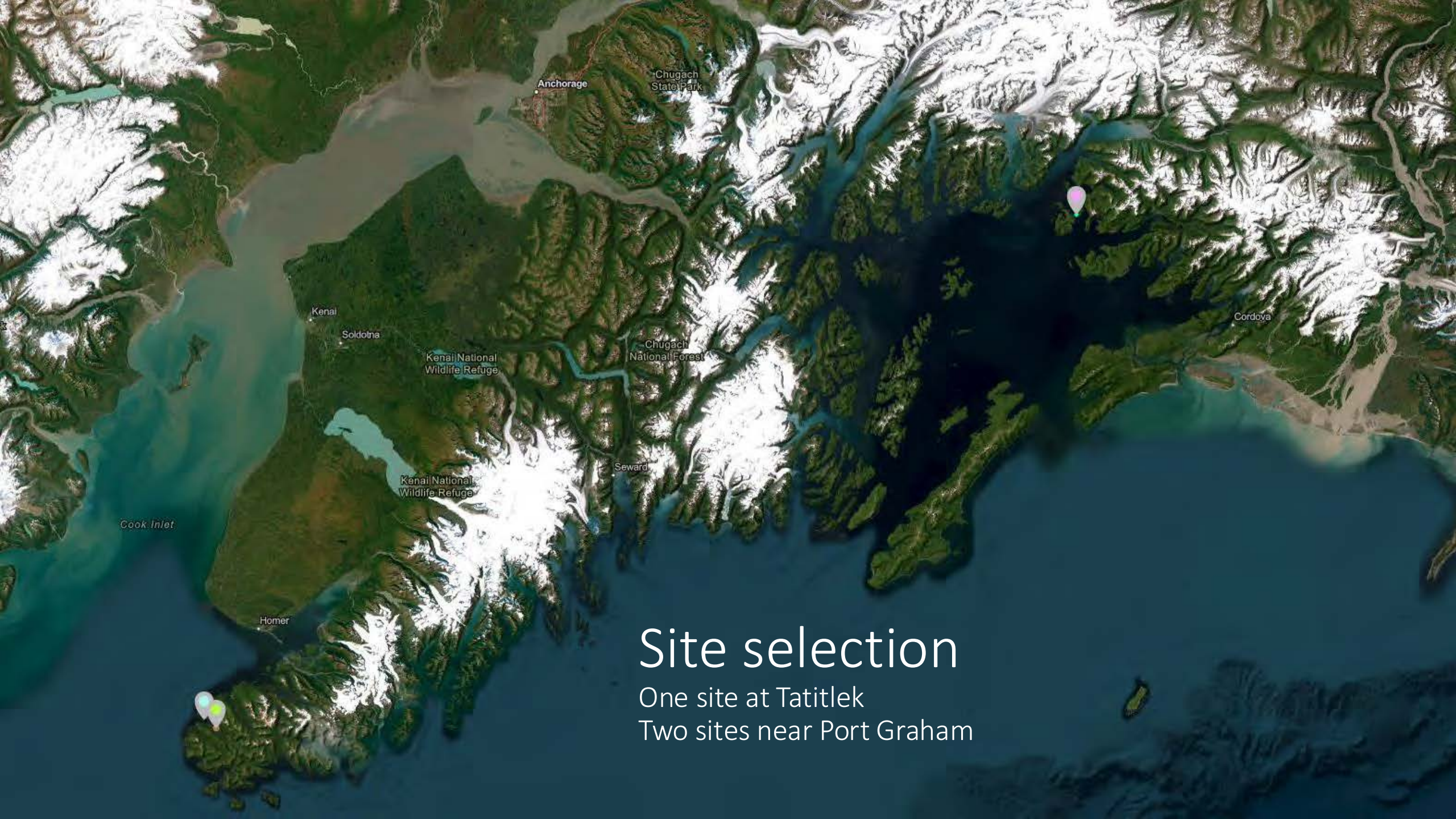
Evaluating Subsistence Shellfish Beaches for Future Enhancement Projects

Annette Jarosz, Andy Suhrbier, and Jeff Hetrick

PACIFIC SHELLFISH INSTITUTE

CHUGACH REGIONAL RESOURCES COMMISSION



Site selection

One site at Tatitlek

Two sites near Port Graham

Tatitlek Beach

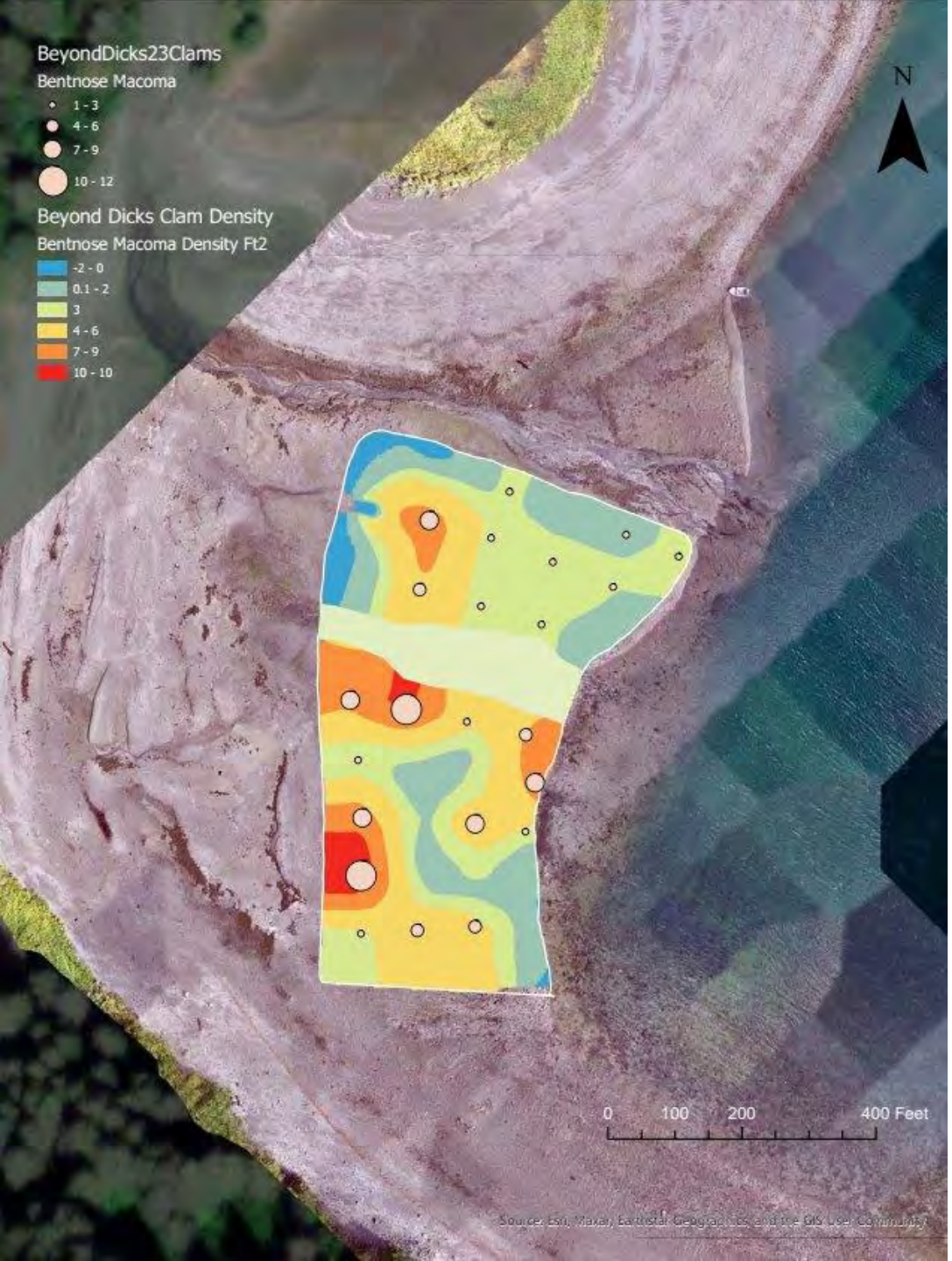

Legend
TatitlekClams23
Cockle
4
3
2
1
Tatitlek
Clam Band
Hard Pan
Old Nets
others
Skiff Ln

Passage Island


Legend
PassageIslandClams23
Butter
3
2
1
Passage Island

Beyond Dick's Beach


Legend
BeyondDicks23Clams
Bentnose Macoma
> 12
9
6
3
< 0
Beyond Dicks
Clam Band
Stream
others



Clam density Maps

- With the use of a drone, GIS, and transects, PSI and APMI can make clam density predictions on different species
- Transects also included substrate samples and these data can also be integrated into GIS to map substrate suitability

Hatchery cultivation of the Pacific razor clam (Siliqua patula)

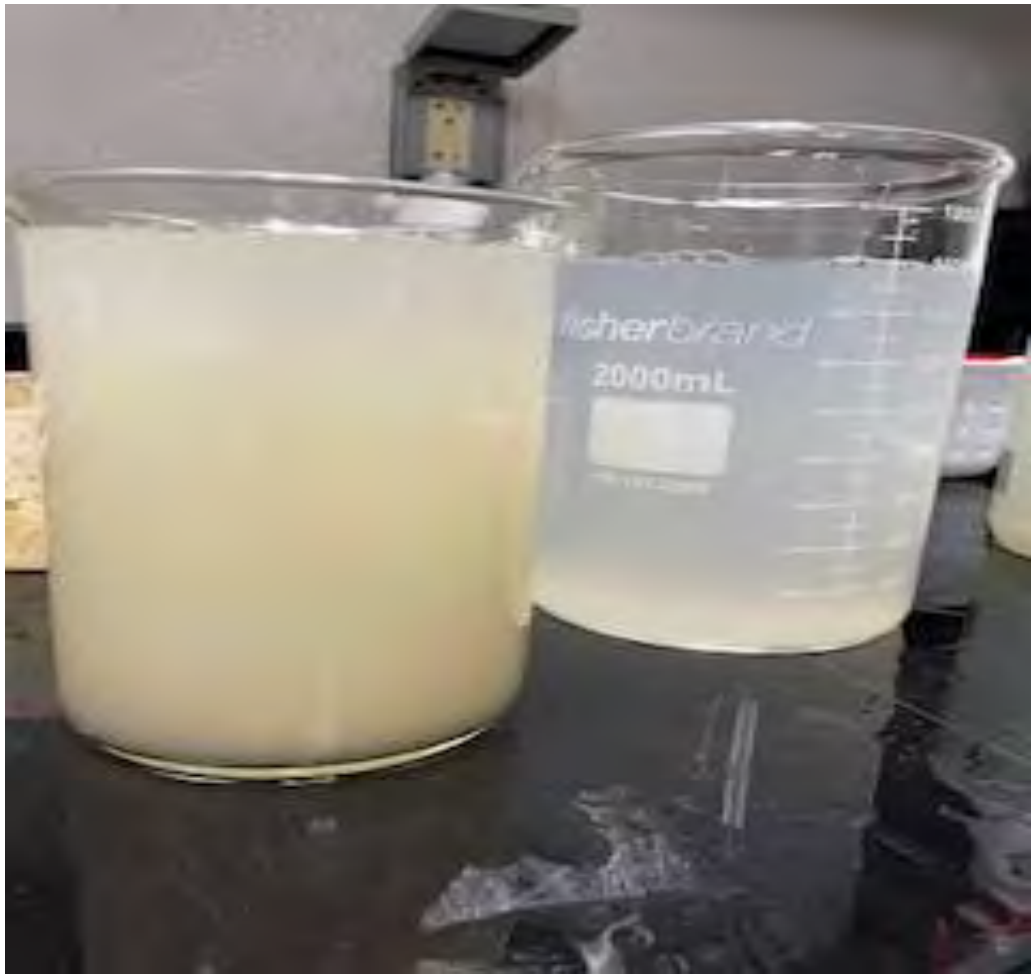
Joint Innovations Project

2023-08-03

2023 Summary

- No Cost Extension, project delayed as funding was received in August after clams had naturally spawned.
- Received permits for brood collection and attempted to try strip spawn.
- Managed to fertilize 1 female but larvae didn’t survive.

Strip spawned eggs and sperm



Bucket of mixed sperm and eggs

2024 Plans

- Prepared to initiate project in 2024.
- In discussions with University of Alaska Fairbanks about participating in the project.
- Developing an outplanting component to the project near Cordova if juveniles are produced.

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Chugach Regional Ocean Monitoring (CROM) Program

Allison Carl
Alutiiq Pride Marine Institute
Biology Lab Manager

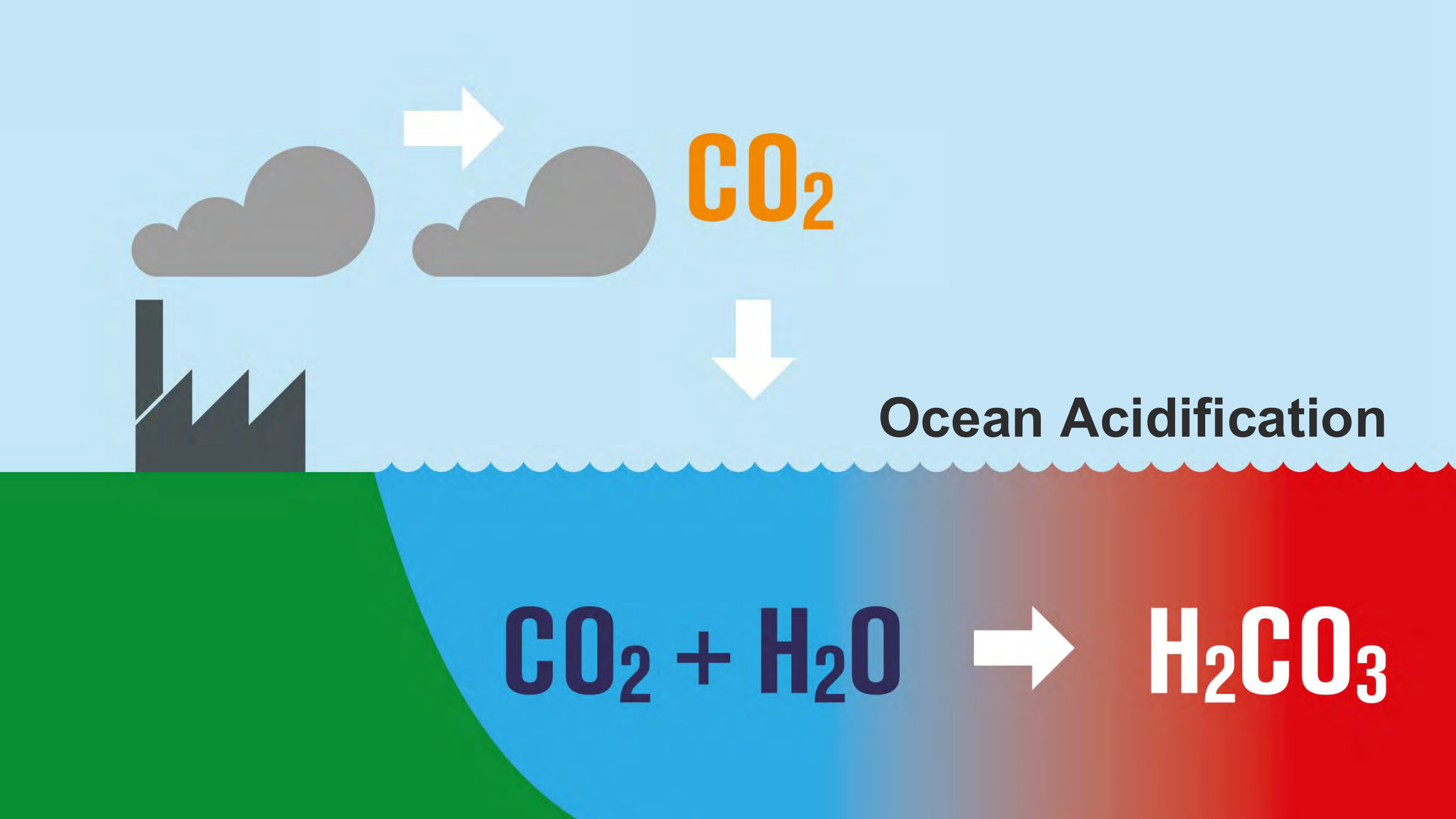
CHUGACH REGIONAL RESOURCES COMMISSION

Alutiiq Pride

CROM Program

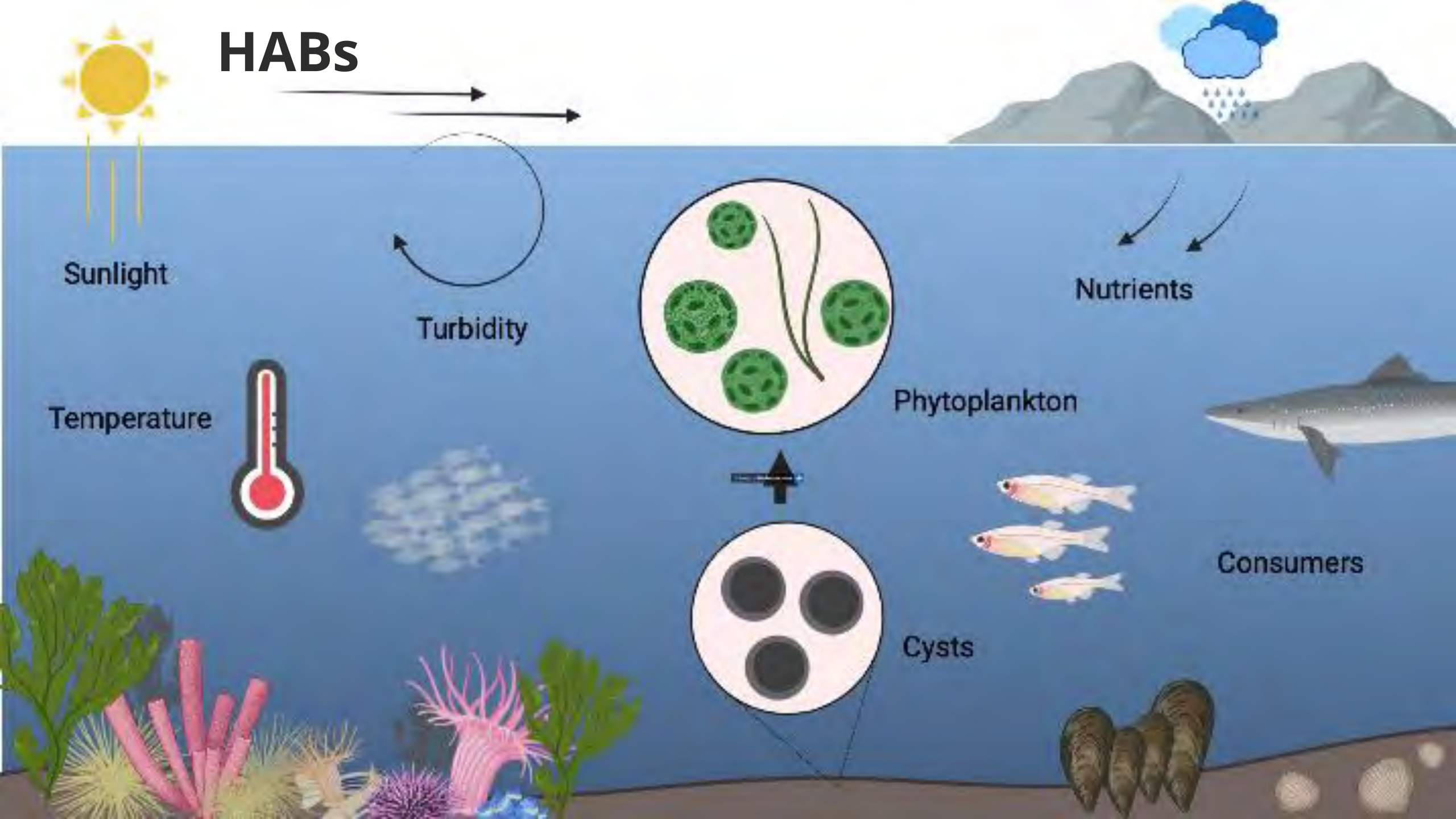
What are we monitoring for?

- ❑ Coastal marine conditions and ocean chemistry
- ❑ Presence of algae with the potential to form harmful algal blooms (HABs)
- ❑ Presence of biotoxins associated with those HABs (e.g. paralytic shelf poison (PSP))
- ❑ General environmental conditions and how they related to HAB presence


CO_2
Ocean Acidification
$CO_2 + H_2O \rightarrow H_2CO_3$

Ocean Acidification Research (OAR) Lab

HABs


Sunlight
Turbidity
Nutrients
Temperature
Phytoplankton
Consumers
Cysts

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Aluutiiq Pride

HABs Lab

COMMUNITY SAMPLING

Regional CROM Samplers

Tasks:

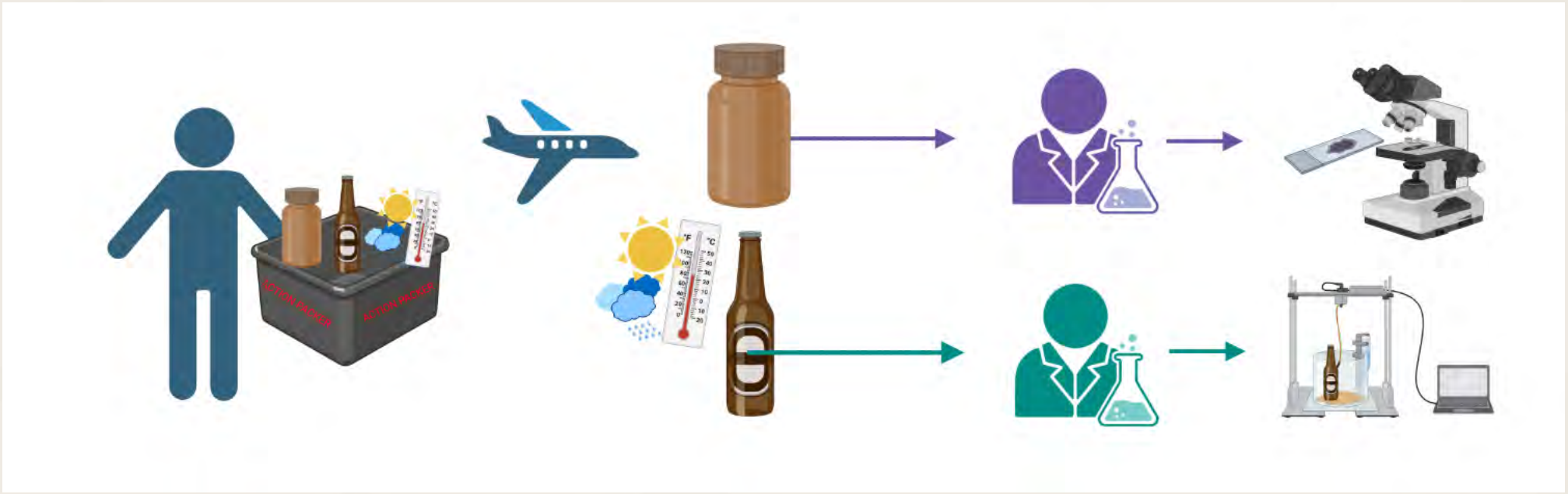
- ❑ Attend trainings & meetings
- ❑ Take weekly water samples and phytoplankton tows
- ❑ Record environmental data

Samplers work to Support:

- ❑ Long-term environmental monitoring
- ❑ Document coastal environmental conditions
- ❑ Support informed subsistence harvest

One community member at each of the seven Tribes works with APMI as a field sampler. Samples are collected on a weekly basis.

- Phytoplankton Tows
  - Microscopic ID
  - Molecular Species ID
- Seawater Chemistry Samples
  - Seawater Carbonate Chemistry
  - Nutrient Analyses
- Shellfish Sample (Blue Mussels)
  - Biotoxin Analysis (ELISA/RBA)
- Environmental Data


ACTION PACKER
ACTION PACKER

CHUGACH REGIONAL RESOURCES COMMISSION

Objective & Outcomes

- ❑ Foster Tribally-led research
- ❑ Support informed shellfish harvests for all stakeholders (Tribal, mariculture, and recreational users)
- ❑ Document coastal marine conditions in the Chugach Region
- ❑ Connect with Tribal members
- ❑ Develop tool for HAB predictions

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Building Partnerships

Expansion to monitoring include Utqiagvik, Kotzebue, Nome, Unalaska, Kodiak, & some research cruises.

Longest running sampling program in Alaska!

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Information Sharing

With Tribes:

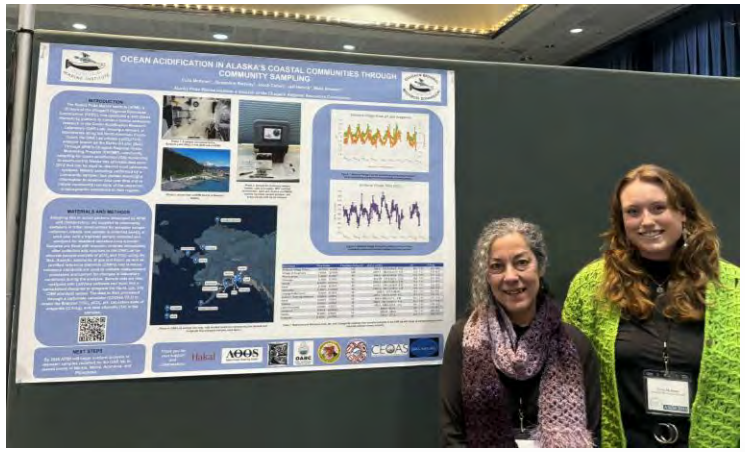
- ❑ Monthly sampler meetings and trainings
- ❑ Facebook updates
- ❑ Quarterly (or as needed) digital newsletters
- ❑ Community visit

With the public:

- ❑ Facebook updates
- ❑ Presentations
- ❑ Website

With the scientific community:

- ❑ Conferences
- ❑ Presentations
- ❑ Posters
- ❑ Publications



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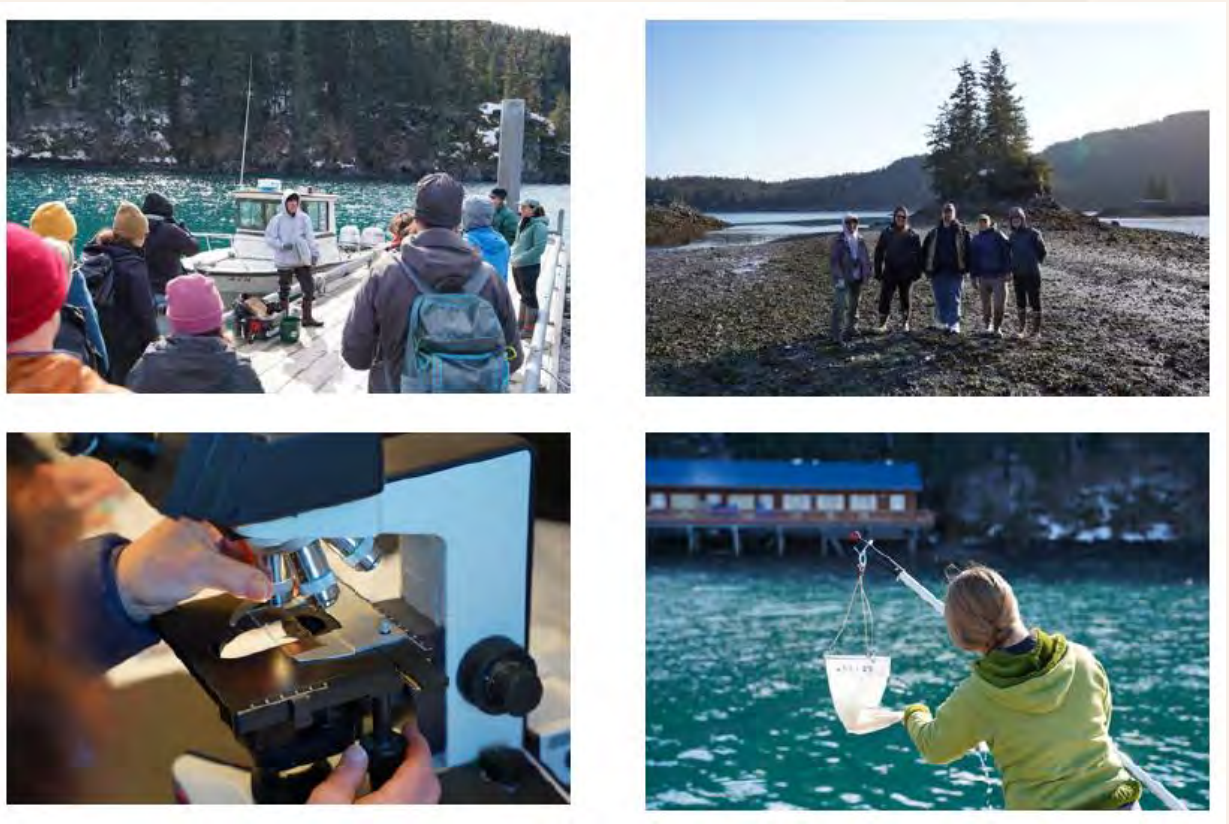
Communication

- Building lasting community relationships
- Be respectful of community boundaries
- Engage youth!
- Informal is always better
- Knowledge exchange is a two-way street



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We're looking for Tribal samplers!!

$75 Per sample event

4 Sampling events per month

Possible high school and/or college credit

Trainings and events

Exxon Valdez Oil Spill Trustee Council

THE OCEAN FOUNDATION

THE BAUM FOUNDATION
SERVING THE ARTS EDUCATION AND THE ENVIRONMENT

Ocean & Earth
ENVIRONMENTAL SERVICES

Alaska
Harmful Algal Bloom Network

Quyana

Allison Carl
CRRC/APMI Biology Lab Manager
Seward, AK
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General CRRC Info
admin@crrcalaska.org

Websites
www.crrcalaska.org

www.alutiiqprideak.org

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Clam Reintroduction in Chenega: A Mixed-Methods Approach to Recovery

CRRC Annual Gathering
Anchorage, Alaska - March 21, 2024

Jackie Keating and Gayle Neufeld (ADF&G)
Co-authors: Annette Jarosz and Jeff Hetrick (APMI)

ADF&G Subsistence Overview

Our mission is to scientifically gather, quantify, evaluate, and report information about customary and traditional uses of Alaska's fish and wildlife resources. AS 16.05.094

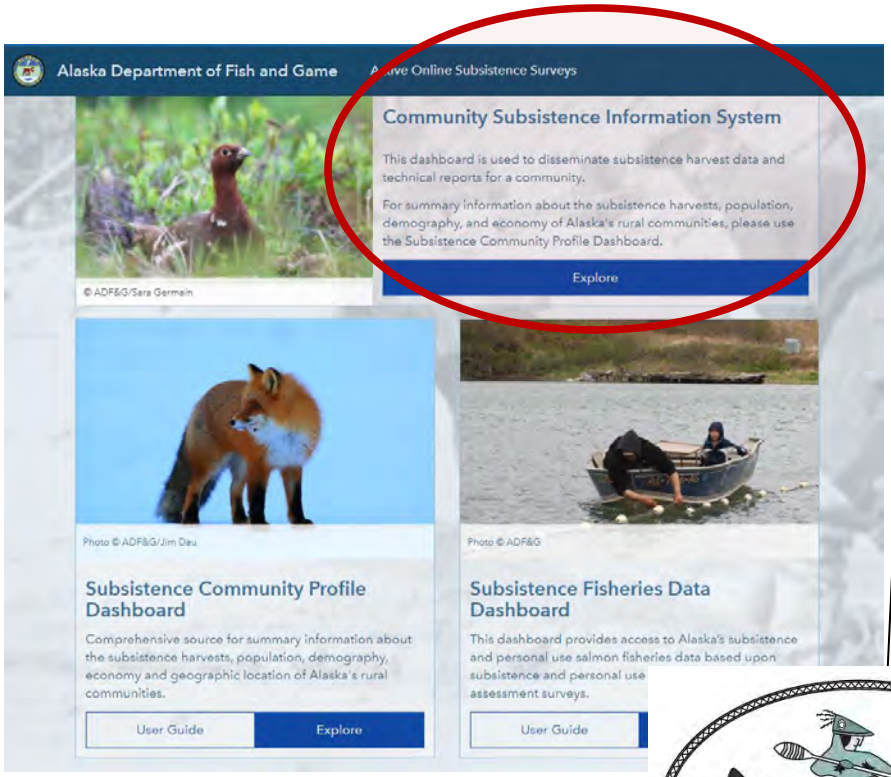
- Quantitative and qualitative research
- Most projects are partnerships
- Research is voluntary and confidential

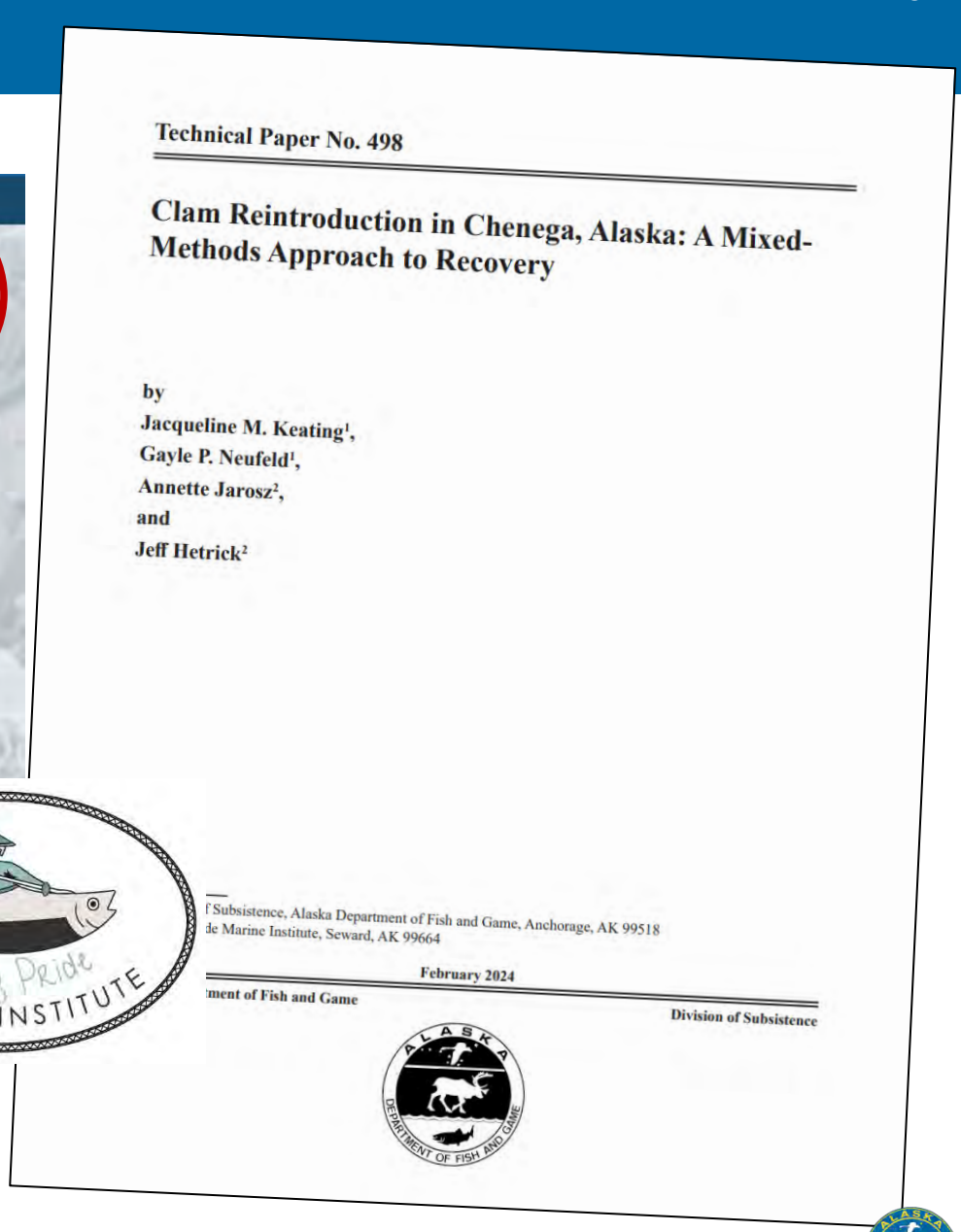
Photo captions:

CRRC and ADF&G with Chenega Corp Captain

Key respondent mapping in Chenega

Finding Subsistence Data





Technical Paper No. 498

Clam Reintroduction in Chenega, Alaska: A Mixed-Methods Approach to Recovery

by
Jacqueline M. Keating[1],
Gayle P. Neufeld[1],
Annette Jarosz[2],
and
Jeff Hetrick[2]

[1] Subsistence, Alaska Department of Fish and Game, Anchorage, AK 99518
[2] de Marine Institute, Seward, AK 99664

February 2024

tment of Fish and Game — Division of Subsistence

http://www.adfg.alaska.gov/sb/CSIS/

http://www.adfg.alaska.gov/sf/publications/

Study Methods

Subsistence Data

- Compile existing clam harvest data
- Ethnographic key respondent interviews
- Clam harvest area mapping
- Habitat Suitability Index modeling

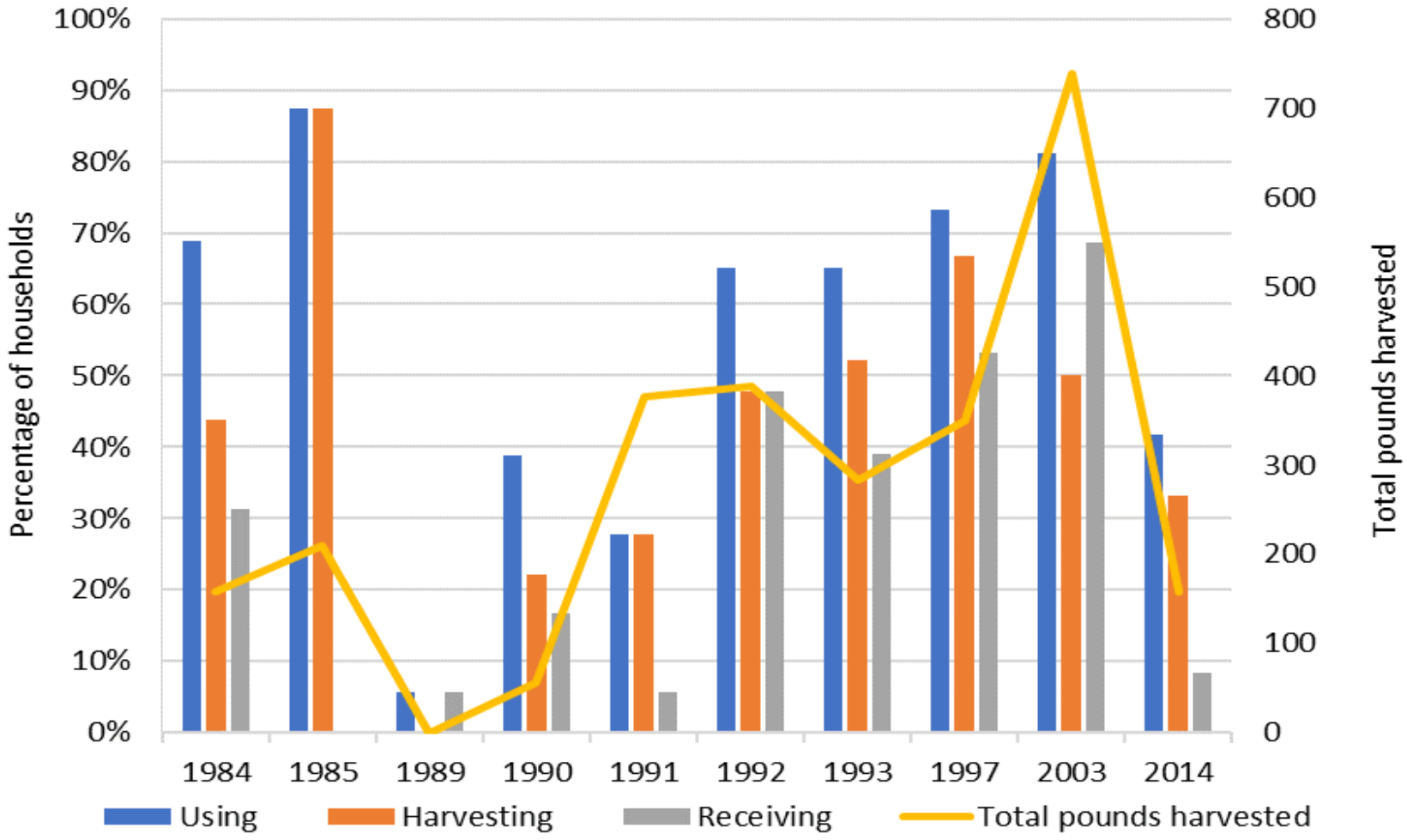
Establishing a Shellfish Sanctuary

- Site selection and biological data
- Seed production and hatchery rearing
- Seeding and monitoring

Top photo: Willow Hetrick and Jackie Keating conduct a key respondent interview in Chenega, August 2021

Bottom photo: Jeff Hetrick plants clam in PVC pipes on Airport Beach, August 2021

Clam Harvest Data, Chenega 1984 – 2014



Local Knowledge on Harvesting and Processing Clams

Clam Preparation Methods

- I also like to eat them raw. (NCN09b)
- If they're a little small, make a broth. Kids love the broth. (NCN013)
- Steam them, fry 'em, make soup. (NCN03)
- I think I'd have to go with fried. The local guys here use bread batter. (NCN09)
- Probably in pasta, like a linguini. Butter, water, garlic. Try to share a bunch. (NCN10)
- Steamed. Get a mess of them, put them in a pot, and steam it up. A little tabasco sauce, some salt. Big pile for everybody. (NCN08)

Jeff Hetrick measures a littleneck clam, August 2021

Local Values around Clams

Social activity with families and friends

Accessible to most people

No special gear required

Fun to share with others

" We also give to elders. Because either they can't go themselves, or they don't want to ask younger members to go. So, it's always nice just to check in – 'Do you need something? Got you these."

- NCN09

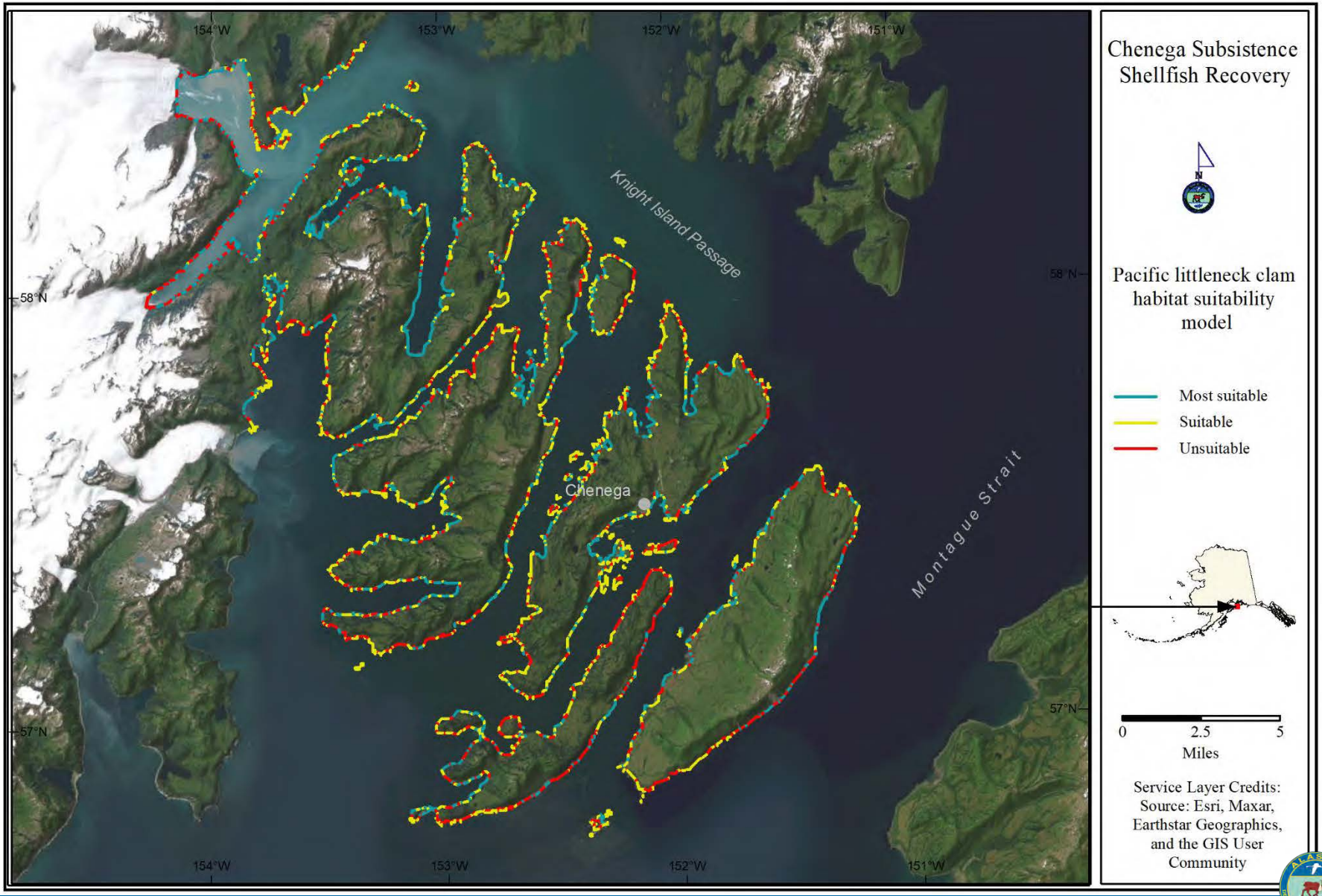
Chenega residents Terri and Charles Michener proudly display map of beaches around Chenega

Mapping of Harvest Areas

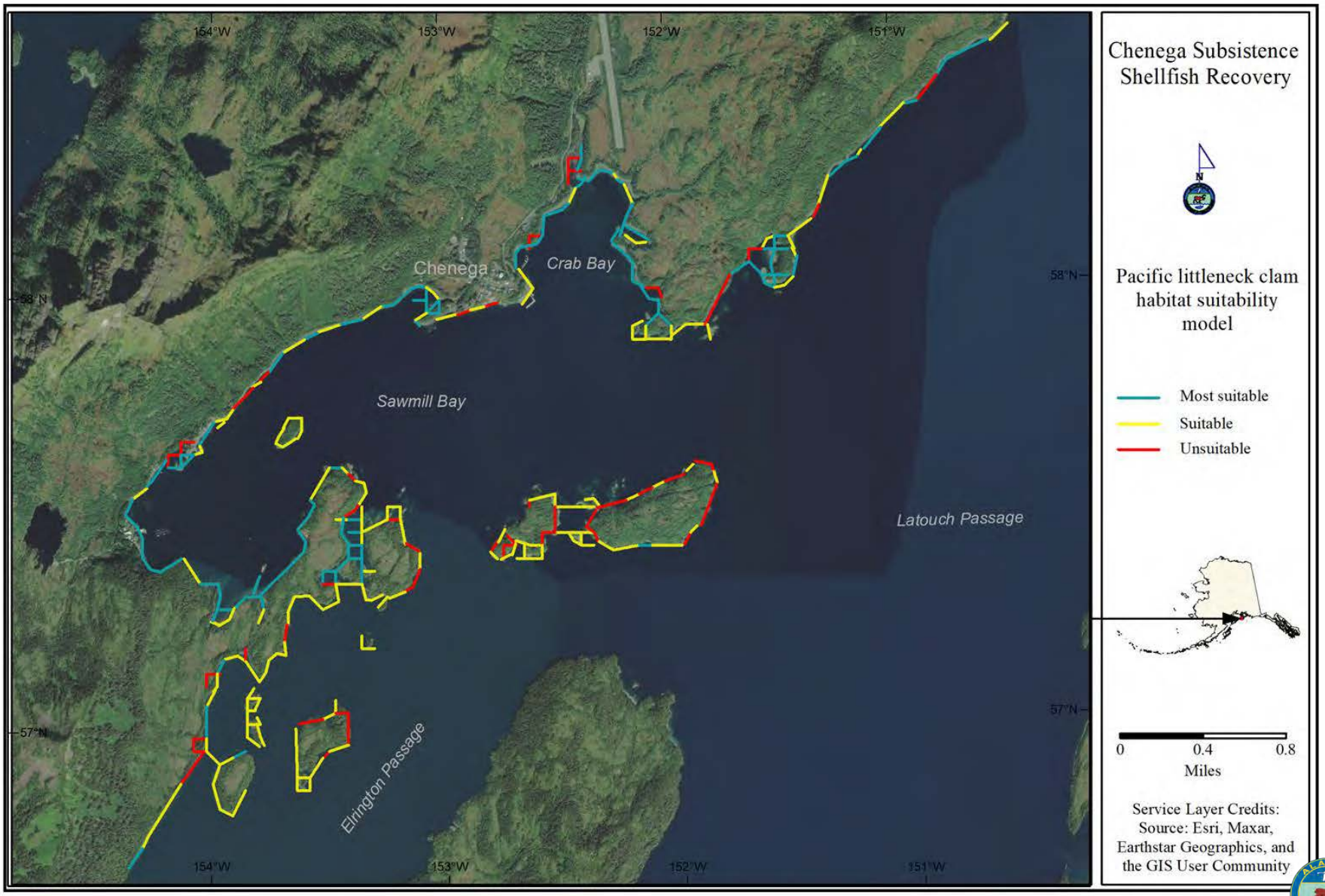
Habitat Suitability Index Modeling

1. Determine and prepare criteria
2. Transform the values of each criterion to a common suitability scale
3. Weight criteria relative to one another and combine them to create a suitability map
4. Locate the final locations that best meet pre-determined spatial requirements
5. Validate the model

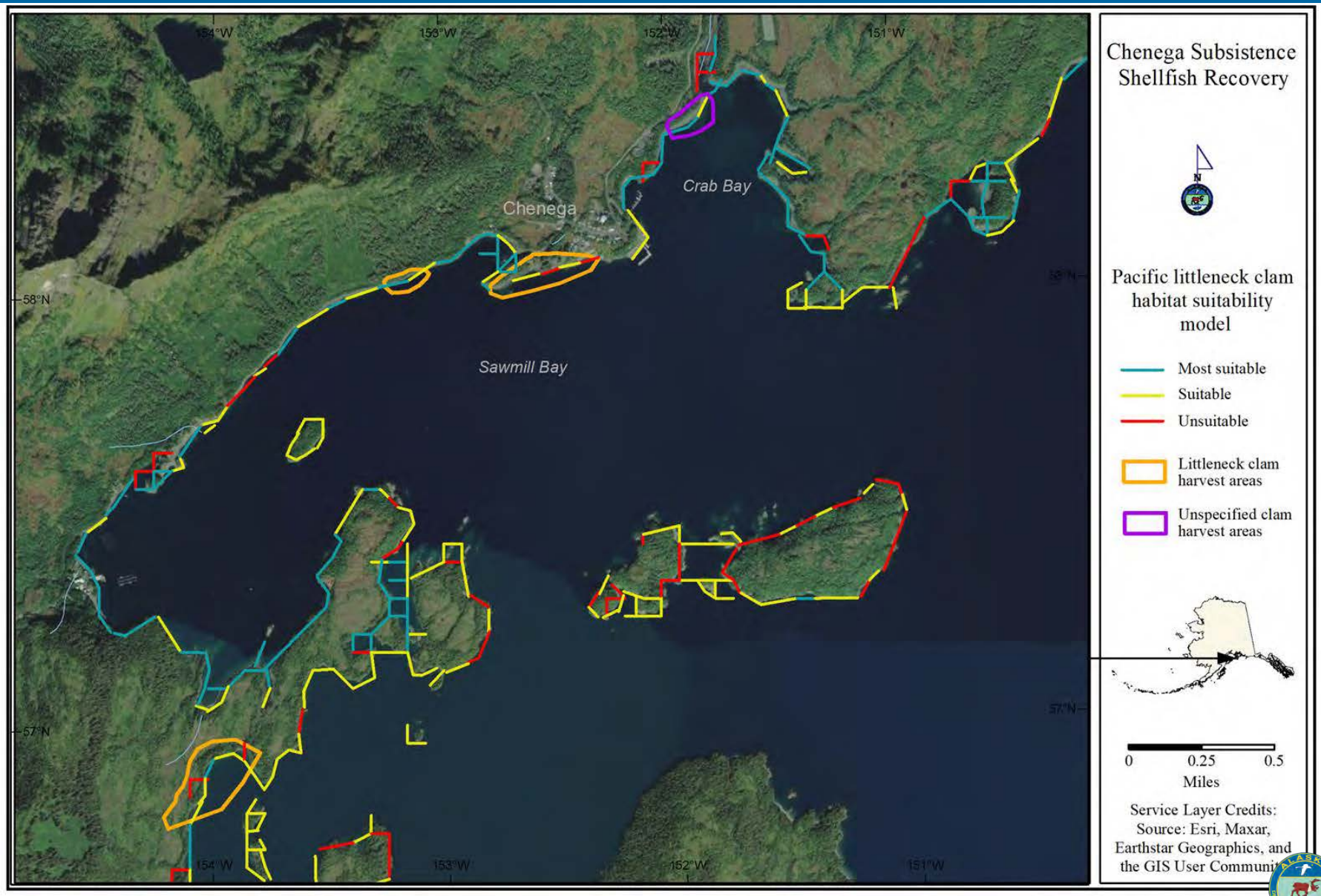
Pacific Littleneck Clam HSI Model



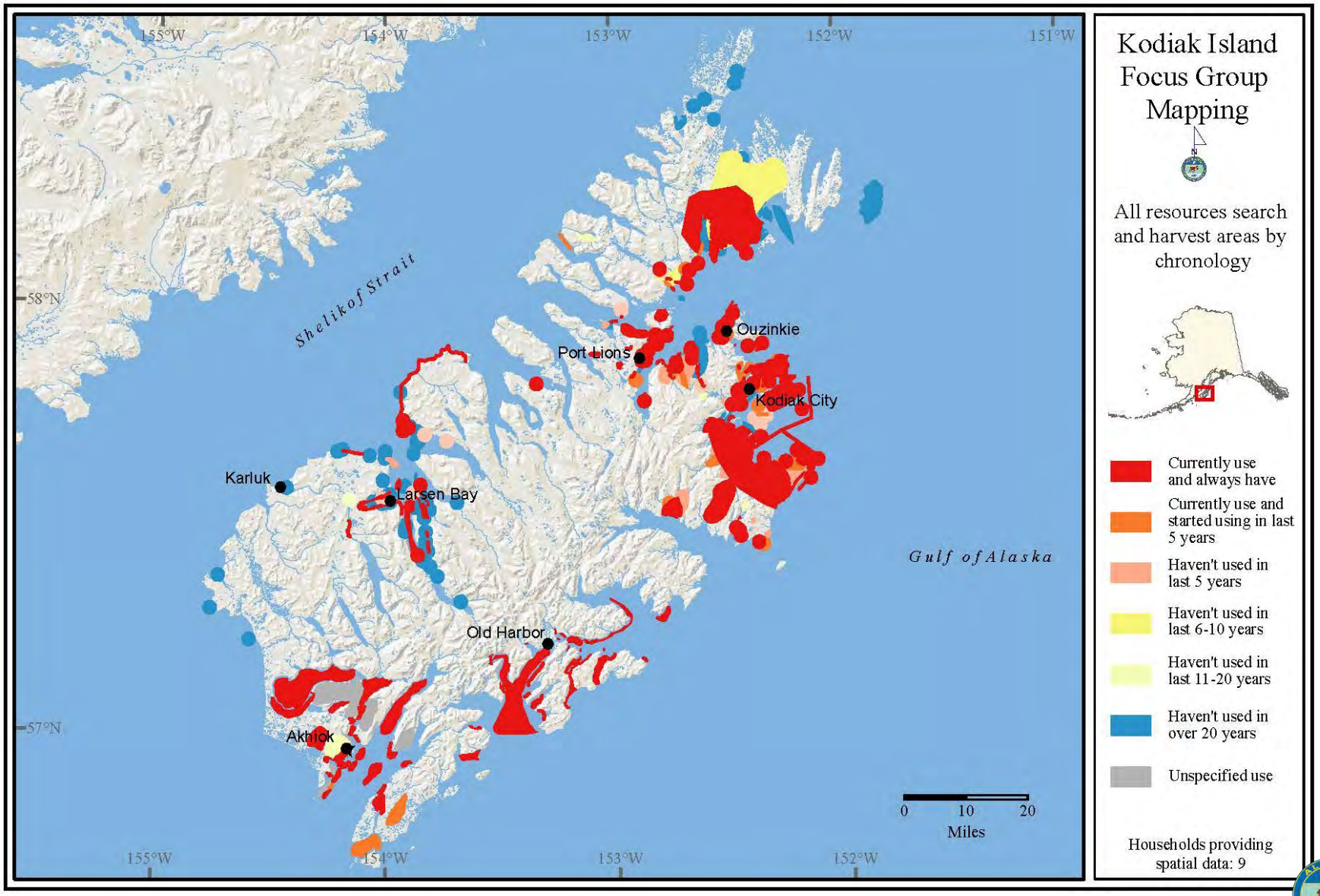
Pacific Littleneck Clam HSI Model



HSI Models and Documented Harvest Areas



Other Mapping Projects: Life History Mapping



Thank you!

Contact Us:

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(907) 267-2368

Gayle Neufeld
GIS Analyst
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(907) 267-2317

Community Subsistence Harvest Information System
http://www.adfg.alaska.gov/sb/CSIS/

Division Technical Paper Series
http://www.adfg.alaska.gov/sf/publications

For more Information, see TP 498

https://www.adfg.alaska.gov/techpap/TP498.pdf

Jeff Hetrick prepares clams at Airport Beach

Business Enterprise Institute
University of Alaska Anchorage

Roadmap for Kelp Producer Cooperative

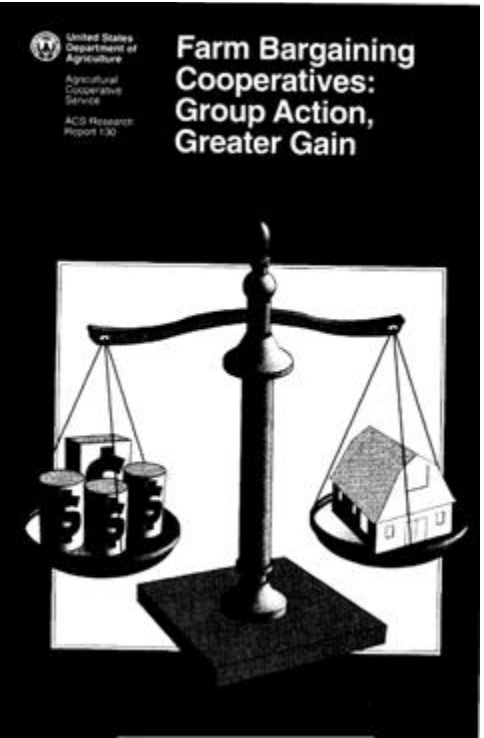
Andrew Crow
March 2024

USDA United States Department of Agriculture

Alaska Cooperative Development Center

Co-ops can do a lot of things

- Spread costs out over many farms
- Negotiate with processors
- Share equipment/buildings/services
- Financing



Cooperatives are businesses

- Solve problems for their customers
- Solve problems for their owners

They are businesses and need income to be sustainable

Match product to your production

Members need to understand their industry beyond just production for a coop to be successful.

Why do salmon fillets cost so much when I only get $2/lb?

		Cost per lbs
Paid to Fishermen	**$2.00**	$2.00
Lost to H&G	70%	$6.67
Airfreight	$0.70	$7.37

Marketing and Sales

Distribution

Advantages of Forming a Cooperative

Producers have control

Roadmap

- What problem will it solve?
- Who will be members?
- What will it cost to build?
- What will it cost to operate?
- How will all this be paid for?

What a cooperative needs to be successful

Things to keep in mind

- It’s a process - you may not end up where you thought you wo
- Communication is important
- Not everyone has to join

Resources

- Alaska Coop Development Center, alaskacoops.com, accrow@alaska.edu
- BC Coop Association https://bcca.coop/
- Cooperative Development Institute https://cdi.coop/
- USDA https://www.rd.usda.gov/resources/publications
- University of Wisconsin https://uwcc.wisc.edu

BCCOOP

COOPERATIVE DEVELOPMENT INSTITUTE

Social, cultural, and economic assessment of kelp mariculture opportunities for coastal villages within the EVOS spill zone

Or: the "*Kelp Values Project*"

Project Coordinator: Aaron Poe
Alaska Conservation Foundation &
Northern Latitudes Partnerships
apoe@alaskaconservation.org

Tom Thornton
University of Alaska, Southeast
tthornto@alaska.edu

Christian Woodard
ADF&G Division of Subsistence
christian.woodard@alaska.gov

More at: KelpValues.org

Alaska Conservation Foundation

- Established as a 501c3 in 1980 to protect public lands and waters
- Works through Alaska, western Canada, and collaborates nationally and internationally
- A focus on conservation and climate adaptation
- A focus on building networks of diverse collaborators and co-stewardship with Indigenous communities
- Has granted over $50M in private funding in 40+ years
- Currently managing $10M in federal & state funding
- Full time staff of 16 in Anchorage, Juneau, Fairbanks, Kodiak and Eugene, OR

Alaska
CONSERVATION
FOUNDATION

The Northern Latitudes Partnerships

- **Led by 3 diverse Steering Committees** of federal and state agencies, Tribes/First Nations, Indigenous organizations, nonprofits and universities
- **A 'collective impact' approach with 200+ partners** in Alaska and Canada
- **Building on 14 years of trust & collaboration** starting with Landscape Conservation Cooperatives (LCCs)
- **Mission:** *Collaborate across geographic and disciplinary boundaries to help decision makers understand and adapt to a rapidly changing North*

Aleutian & Bering Sea Initiative

Northwest Boreal PARTNERSHIP

Western Alaska Partnership

www.northernlatitudes.org

40 Partners Lead Our 3 Steering Committees

Environment and Climate Change Canada

Canada
Natural Resources Canada
Canadian Forest Service

AK CASC
Alaska Climate Adaptation Science Center

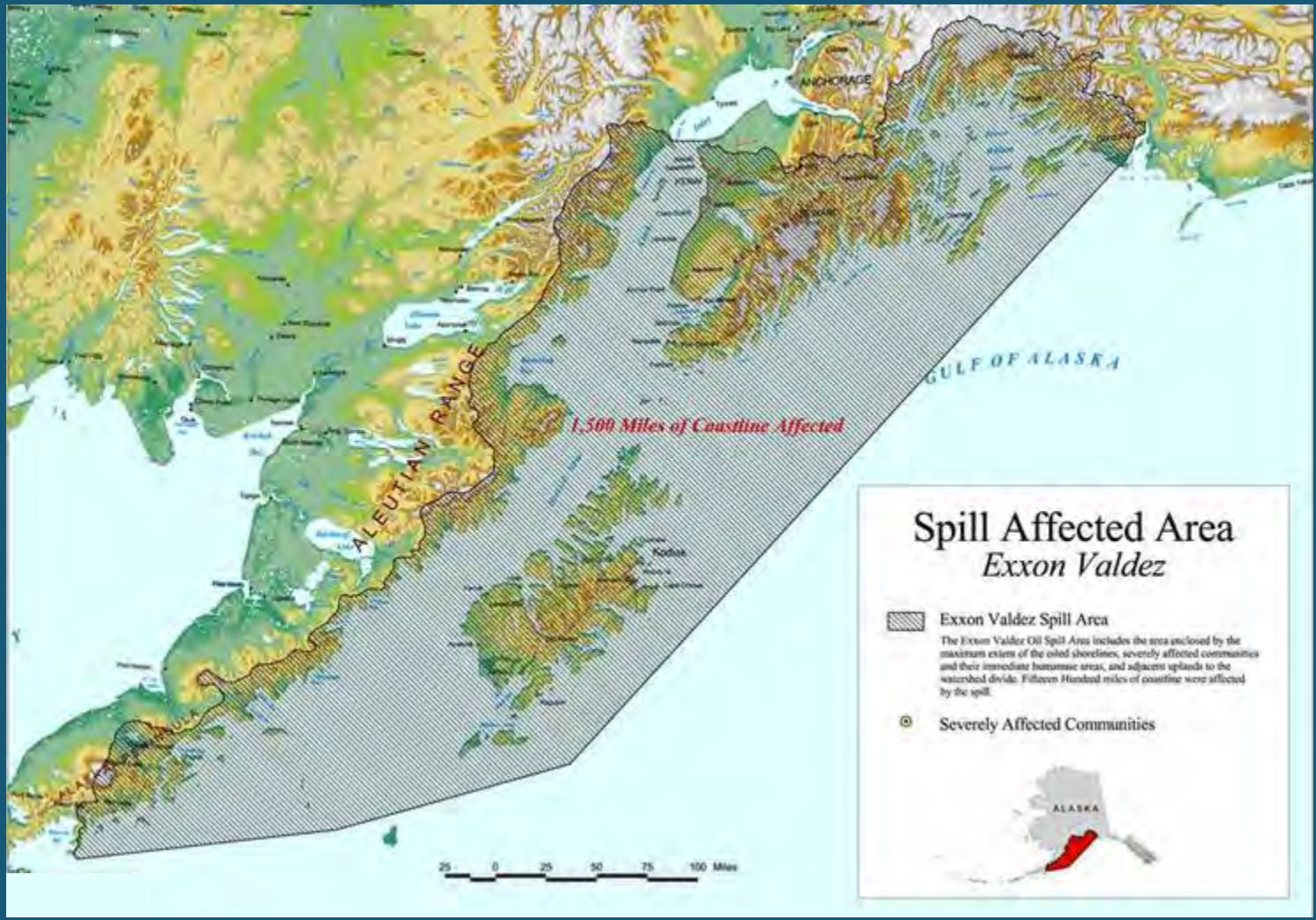
NLP Focus Areas:

- Indigenous-led stewardship
- Food security & traditional foods stewardship
- Environmental observations
- Climate change adaptation

How we do our work:

- Bringing government & private funds together for new programs and initiatives
- Creating community-based, tribally-led positions
- Shaping policy and creating transformative, institutional change
- Bridging science and Indigenous Knowledge
- Creating learning opportunities for professionals
- Networking and building meaningful relationships
- Hosting dialogues, workshops, forums, gatherings
- Transboundary collaborations
- Breaking down silos among groups and regions
- Creating and sharing new tools and datasets

Kelp Values Study Area & 10 Villages



Why Kelp Mariculture is Expanding in Alaska?

Economic Diversification

Fishing harvests are increasingly unreliable due to growing impacts of changing climates, fishery depletion.

Economic diversification strengthens communities in uncertain times.

Demand for sustainable and nutritious foods from equitably managed companies.

Climate Adaptation and Mitigation

Some indications that mariculture development is an method for reducing localized climate change effects and that it *could* be used to reduce greenhouse gases and ocean acidification…

Indigenous Sovereignty

Indigenous communities fear ‘the next big land grab’ will be in ocean in front of their communities and on their traditional homelands.

Why ACF & Northern Latitudes Partnerships are involved…

WHY: Sustaining rural community connections and need for healthy and functioning land and waters

NATIVE CONSERVANCY

CHUGACH REGIONAL RESOURCES COMMISSION

- Supporting Indigenous led conservation and self determination
- Understanding *if* kelp as a climate adaptation & mitigation measure is acceptable to Indigenous communities and therefore more viable in Alaska
- Supplying data, information and tools to guide management of public lands and waters as kelp mariculture expands
- We were asked to help by Native Conservancy and Chugach Regional Resources

Key partners leading the effort include…

- **Native Conservancy**
  - Dune Lankard, Della Stroh, & David Guilfoyle
  - Supported by Kodiak Archipelago Leadership Institute (KALI)

- **Chugach Regional Resources Commission**
  - Willow Hetrick & Briana Murphy
- **University of Alaska Southeast**
  - Dr. Tom Thornton, Dr. Tom Bell, Karen Grosskreutz, and Michaela Korodimou
- **University of Alaska Anchorage**
  - Dr. Kevin Berry, Barbara Johnson, & students
- **University of Alaska Fairbanks**
  - Dr. Mike Stekoll
- **ADF&G Division of Subsistence**
  - Jacqueline Keating, Gayle Neufeld, and Christian Woodard

Summary of Our Research Approach

- Documenting Indigenous cultural uses (past and present) for kelp and other seaweeds in partnership with spill zone villages
- Understanding changes in surface kelp distribution since the 1980s with satellite imagery to inform potential future kelp farm siting issues & avoid user conflicts; synthesizing kelp/seaweeds data
- Documenting community perceptions across the spill zone about kelp mariculture relative to other uses
- Understanding the economic feasibility of kelp industry in the spill region giving markets and processing capacity limitations
- Understanding the potential for mariculture operators to be paid for collecting broader monitoring data on ocean conditions
- Connecting our results with those of ecology/oceanography efforts around kelp also funded by EVOS for 2022

Our Charge

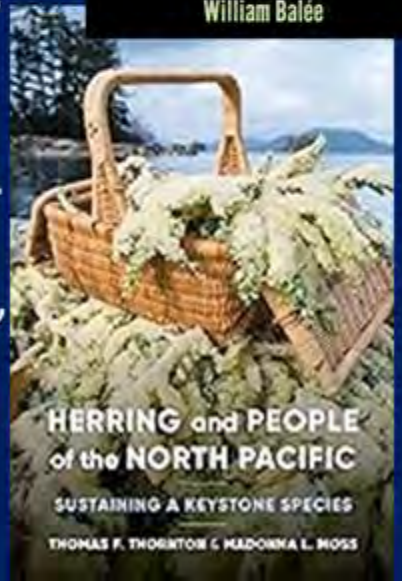
- Social science investigations of historical ecology and ethnoecology of culturally important kelp/seaweed species and habitats within the study area:
- H1: Evaluate the historical abundance, distribution, and specific practices pertaining to traditional Indigenous kelp/seaweed production to inform effective siting and management of potential future mariculture sites;
- H2: Assist with assessment of the potential for Indigenous-led kelp mariculture permitted enterprises in the EVOS spill zone that would provide economic benefits to area communities as well as co-benefits for the subsistence harvest and commercial fishing activities at the local scale.
- Relevant linkages to other Gulf of Alaska regions (e.g., Southeast).

Historical Ecology Approach

Tracing the evolution of landscapes/ seascapes over long time scales. Three assumptions:

1. Humans have had effect on nearly all environments on earth → co-produced land/seascapes
2. Different types of societies influence their land/seascapes in different ways;
3. Co-evolutionary relationships between people & land/seascapes should be examined holistically over time.

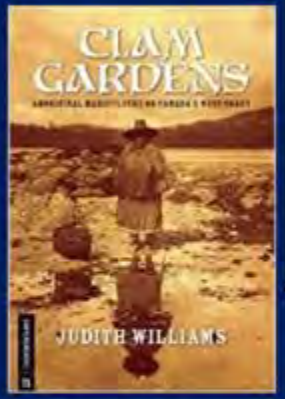
Sources of data: Oral histories, Indigenous and Local Knowledge, historical maps/archives, biological, ecological, archaeological, ethnographic and other data.



Example: “Clam Gardens”

Indigenous Innovation of clam gardens
(Coastal British Columbia and Gulf of Alaska)

- Build and maintain rock walls to optimize beaches for shellfish production
- Increase productivity (size and number), reliability, and harvestable area of shellfish
- Transplantation of clams/cockles.



Grosbeck, et al 2016: https://www.eopugetsound.org/articles/ancient-clam-gardens-northwest-coast-north-america

Kake, AK: “[Simon] Friday said the garden will help make local shellfish more resilient to climate change … [F]irst: by helping them weather the storms that tend to tear up the coastline…something … likely to occur [more frequently] with climate change.’
[S]econd ..: clam gardens increase the number of shell fragments in the area, boosting the minerals baby clams need to create their shells. ‘We’re hoping that will help out with the ocean acidification, due to the calcium in the shells,’ said Friday.
[Third]: the rock fortress could help trap food for the clams.”

Kake’s northern shore, close to where volunteers laid the foundation of the community clam garden. (Shelby Herbert/KFSK)

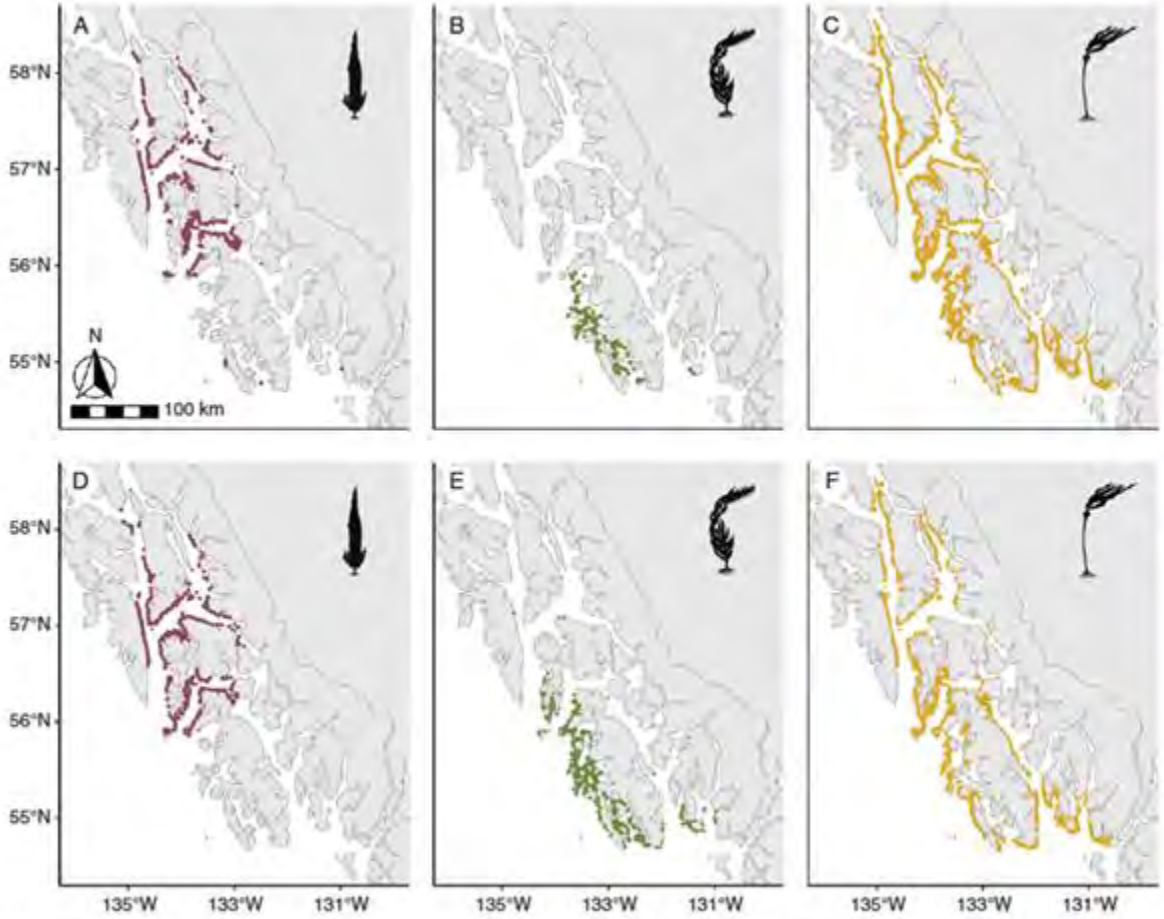


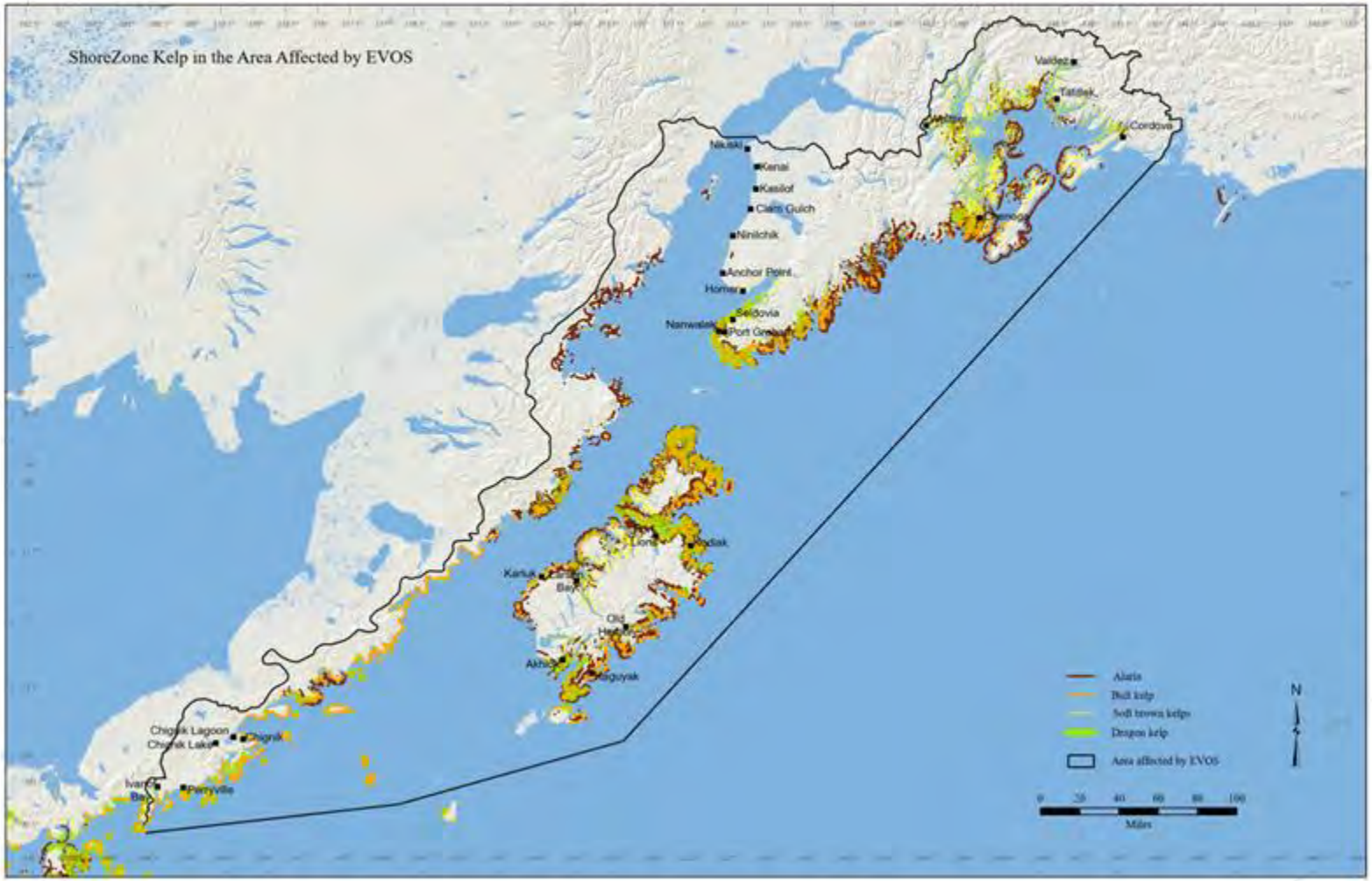
FIG. 3. Kelp extent broken up by survey and species in Southeast Alaska. (A–C) Cameron surveys in 1913. (D–F) ShoreZone surveys in 2004–2013. The extent of dragon kelp (*Eualaria fistulosa*) is indicated by maroon lines in panels A and D; giant kelp (*Macrocystis pyrifera*) is indicated by green lines in panels B and E; and bull kelp (*Nereocystis luetkeana*) is indicated by gold lines in panels C and F.

Historical (1913, Top)

vs.

Contemporary (2004-13, bottom)

Mapping



Kelp

&

Community Values

&

Events (EVOS)

ADFG Subsistence Surveys and Mapping

• Work with up to 10 villages to understand potential impacts and co-benefits to the subsistence harvest and commercial fishing activities at the local scale.

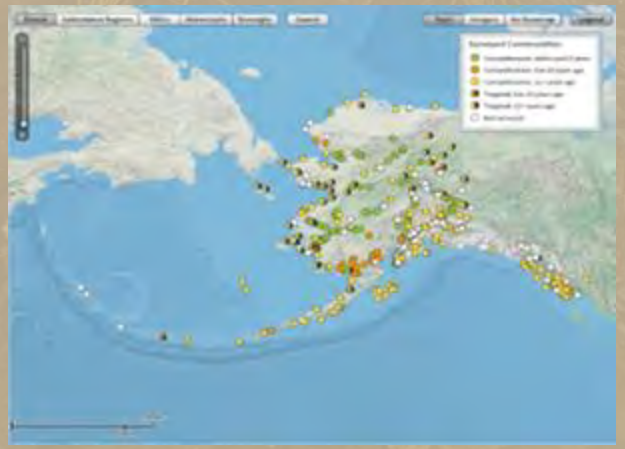
- Subsistence data and mariculture permitting.

- Research can be directed toward different questions, including intensivity of use, critical habitat areas, and interactions between commercial and subsistence activities.

- Core data about when and where different resources have been used, with additional identifiers possible (place names, cultural sites, etc.) depending on community goals.

Subsistence Household Surveys

- Single year “snapshots” of community use of wild resources.
- Completed about every 10 years for every community in the state.
- Data available through the Community Subsistence Information System and through Technical Paper series.

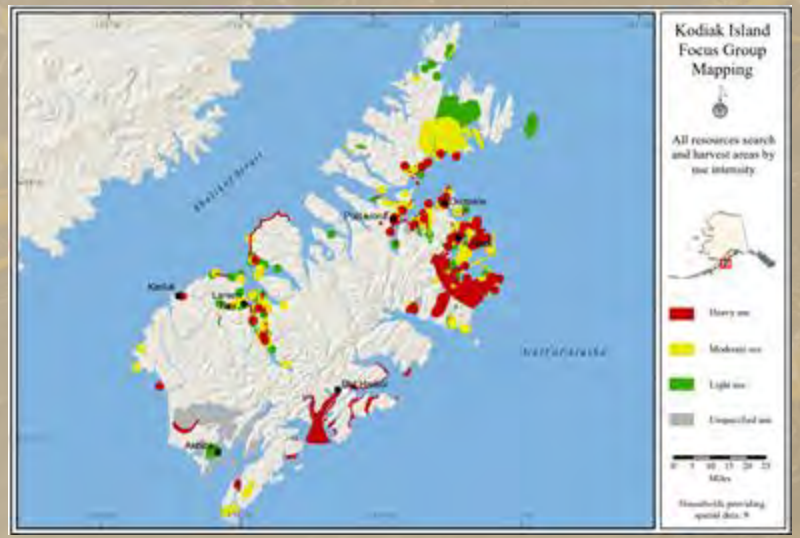


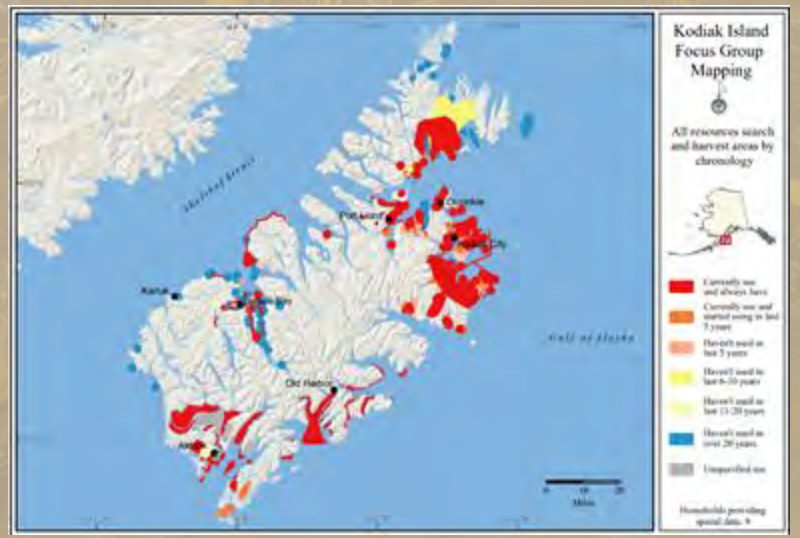
Subsistence Life History Mapping

- Long-term use patterns.
- Locations that have been or remain important to the community over time.
- Resource-specific maps showing change over time

Subsistence Life History Mapping

- Long form interviews with knowledgeable harvesters.
- Spatial context for harvest data.
- All data reported at the community level.





Life History Mapping

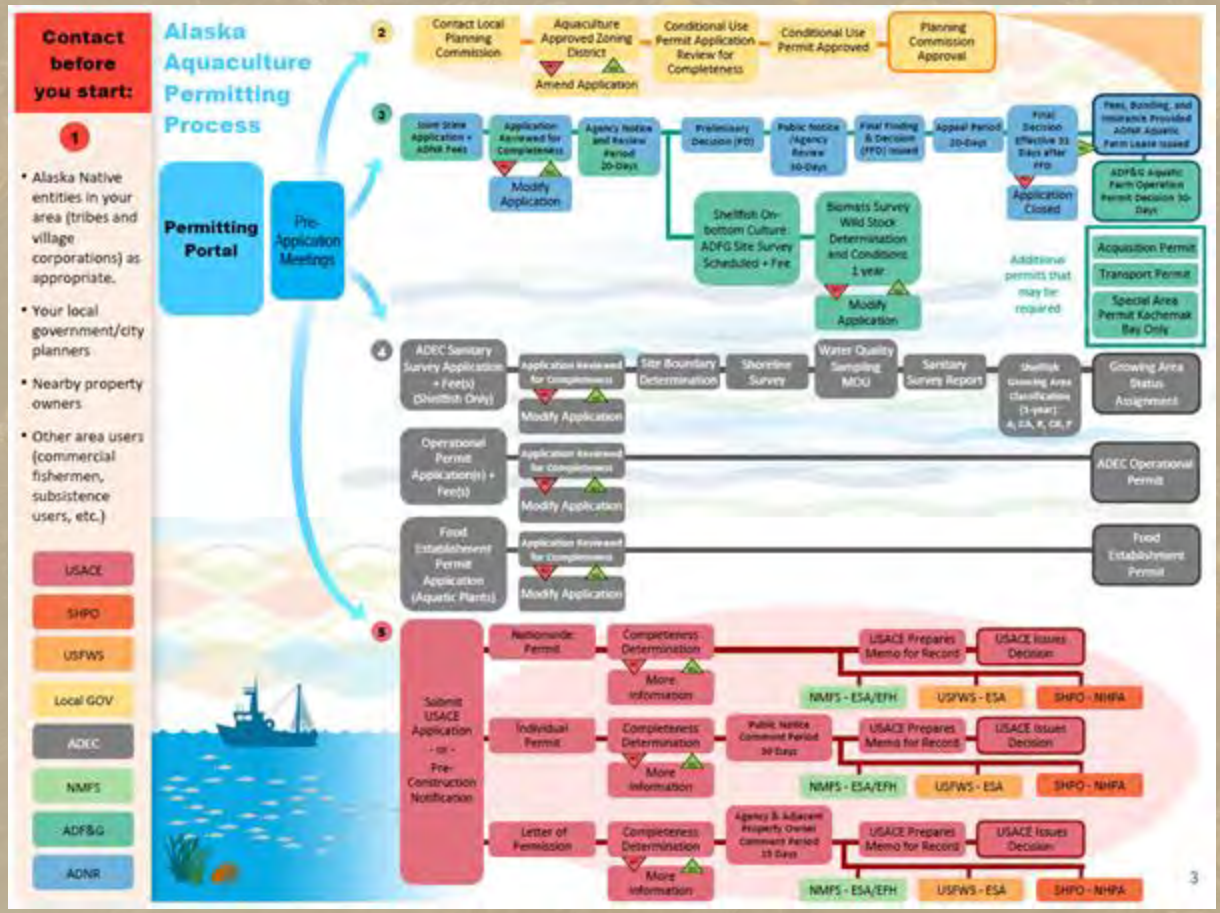
- Allows unique approaches for different community needs.

- Can documents changes in:

- Harvest Locations
- Intensivity of Use
- Critical Habitat Areas
- Important Cultural Locations
- Commercial Sites
- Other community-defined categories

- Data available for communities to characterize their use of local resources.

- Supports Subsistence Division comments on proposed mariculture permits.


Contact before you start:
1
• Alaska Native entities in your area (tribes and village corporations) as appropriate.
• Your local government/city planners
• Nearby property owners
• Other area users (commercial fishermen, subsistence users, etc.)
USACE
SHPO
USFWS
Local GOV
ADEC
NMFS
ADF&G
ADNR
Alaska Aquaculture Permitting Process
Permitting Portal
Pre-Application Meetings
2
Contact Local Planning Commission
Aquaculture Approved Zoning District
Amend Application
Conditional Use Permit Application Review for Completeness
Conditional Use Permit Approved
Planning Commission Approval
3
Modify Application
Preliminary Decision (PD)
Public Notice /Agency Review 30-Days
Final Finding & Decision (FFD) issued
Appeal Period 20-Days
Final Decision Effective 31 Days after FFD
Application Closed
Bond, Bonding, and Insurance Provided ADNR Aquatic Farm Lease Issued
ADF&G Aquatic Farm Operation Permit Decision 30-Days
Shellfish On-bottom Culture ADFG Site Survey Scheduled + Fee
Biomass Survey Wild Stock Determination and Conditions 1 year
Modify Application
Additional permits that may be required
Acquisition Permit
Transport Permit
Special Area Permit Kachemak Bay Only
4
ADEC Sanitary Survey Application + Fee(s) (Shellfish Only)
Modify Application
Site Boundary Determination
Shoreline Survey
Water Quality Sampling MOU
Sanitary Survey Report
Growing Area Status Assignment
Operational Permit Application(s) + Fee(s)
Modify Application
ADEC Operational Permit
Food Establishment Permit Application (Aquatic Plants)
Modify Application
Food Establishment Permit
5
Submit USACE Application - or - Pre-Construction Notification
Nationwide Permit
Individual Permit
Letter of Permission
Completeness Determination
More Information
Public Notice Comment Period 30 Days
Agency & Adjacent Property Owner Comment Period 15 Days
USACE Prepares Memo for Record
USACE Issues Decision
NMFS - ESA/EFH
USFWS - ESA
SHPO - NHPA

H3 Economic Valuation

- Discrete Choice Experiment to measure willingness to pay a premium for products from south coast of Alaska via qualtrics surveys of west coast consumers
- Focus groups and meetings with kelp distributors to understand barriers facing producers and the products and markets they want to participate in
- **Decoding Consumer Preferences:** Understanding what drives consumer choices for kelp
- **Marketing Strategies:** Tailoring marketing efforts based on DCE outcomes
- **Product Development:** Using insights to innovate or modify kelp product offerings
- **Future Market Opportunities:** Identifying potential areas for growth and expansion
- Focus groups/surveys of agencies and researchers to understand ocean data gaps that could be filled by farmers and their willingness to pay for that information; same for farmers to understand their willingness to collect data and expected compensation

Cultural Values Mapping
and
Healthy Land & Sea Planning

Questions? Connections?

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More at: KelpValues.org

David Guilfoyle, Applied Archaeology International

Healthy Land & Sea Planning

NATIVE CONSERVANCY

APPLIED ARCHAEOLOGY INTERNATIONAL

Presentation Overview

This presentation provides an international insight into Healthy Land and Sea Planning in relation to Cultural Values Mapping, Cultural Ranger Programs, and Cultural Leadership models related to climate change response and food sovereignty initiatives.

- Begin with an overview of the **Rise of Healthy Land and Sea Planning**
- Discuss **examples and videos** from the Tjaltjraak Healthy Land and Sea Program in Australia
- Outline the HLSP program related to the EVOS-**mariculture** program and insights into the methodologies
- Finish with a brief snapshot into the **Ouzinkie HLSP** project underway
- Invitation to continue **yarning** about this program and opportunities to work together – at the open meeting **tomorrow**

Project Background

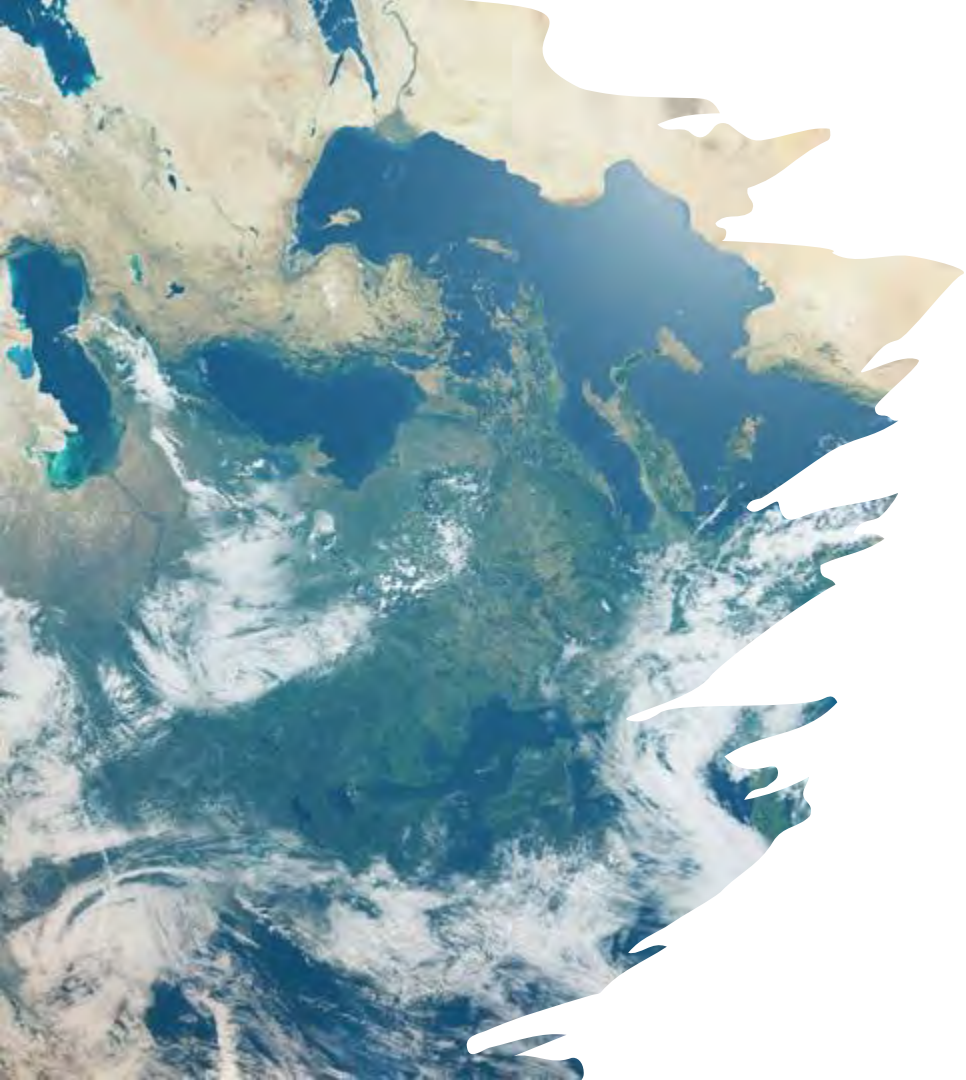
This work is part of a 5-year project sponsored by the Exxon Valdez Oil Spill Trustee Council (EVOSTC) and organized by the Alaska Conservation Foundation (ACF) and Native Conservancy (NC) to assess if Indigenous kelp mariculture operations within the Exxon Valdez oil spill zone would be compatible with the local cultural values of coastal communities while better understanding the social or economic viability of Mariculture.

Native Conservancy partners with Applied Archaeology International (AAI) to assess this via NC's Cultural Values Mapping project and the workshopping of Healthy Land and Sea Plans related to mariculture; with interested communities.

NC and AAI's shared vision of uplifting the voice of the community aligns us in this work as we center lived experiences and community vision and voice in a planning framework. This framework situates the role of kelp and other mariculture initiatives in a locally relevant and socially impactful way through collaborative cultural planning.

Acknowledgements….

Intro Video: We Are Salt Water People



The Rise of Healthy Land and Sea Planning

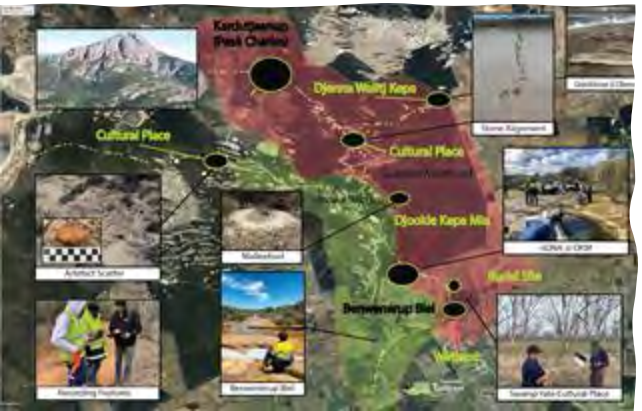
Land and Sea Country-based planning works to reinstate the primacy of cultural geographies and networks in governing Country.

Land and Sea Country-based planning has been '**out-competing, or at least coexisting with, the introduced governance and management scales** that have dominated the Australian landscape and seascape for the last two centuries'

Community-defined Scale and Scope

A ‘Country-based plan is simply a plan for the Country of a particular Indigenous group, **as defined and selected by that group**’ (Smyth, 2015, p. 77).

These plans have increasingly become central resources for governing Country in contemporary settings. Communities may scale-up plans to cover a larger area by incorporating several family or language groups, or create a plan focused on a single smaller landholding group or area (Smyth, 2015).



Cultural Geographies

- Country-based plans are a critical governing tool for documenting community vision, relationships with Country, and **culturally legitimate management pathways**. In this way, these plans can shift power to Indigenous people and enable governance grounded in cultural geographies and networks.

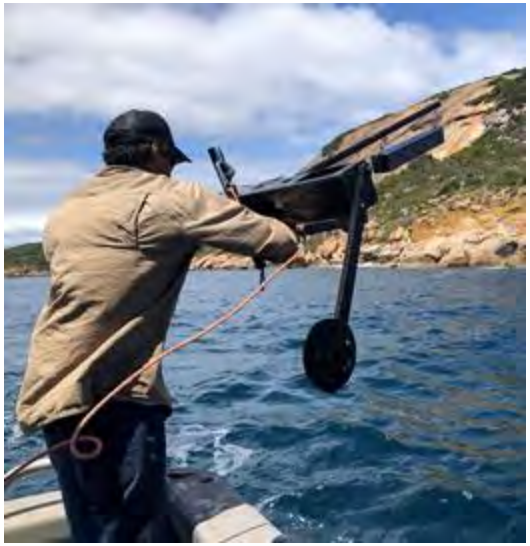
- Country-based planning is embedded pathways for Cultural Ranger programs that seek to achieve sustainable Country management through **Healthy Land and Sea Planning**; along with other mechanisms such as two-way science and partnerships.

Bedrock – Cultural Rangers

Country-based planning has become a bedrock and is used by many Cultural Rangers groups.

When these programs commenced, only land legally held under exclusive Indigenous tenure was eligible for inclusion.

Today these programs have transformed to encompass land subject to **various tenures; including Sea Country**.



Video Snapshot 2:
"*Week in the Life of a Tjaltjraak Ranger*"

Change the Status Quo

By virtue of encompassing multiple tenures, Country-based plans provide a platform for collaboration on the terms of communities.

As Bock et al. suggest, Country-based planning essentially: **flips the status quo and avoids Traditional Owner aspirations being squeezed into someone else's plan or led by a single partner**.

Traditional Owners invite prospective partners to sign on to their aspirations opening up more diverse partnerships and economic options (2021, Joordingyoor, para. 18).

Cultural Governance – Cultural Authority

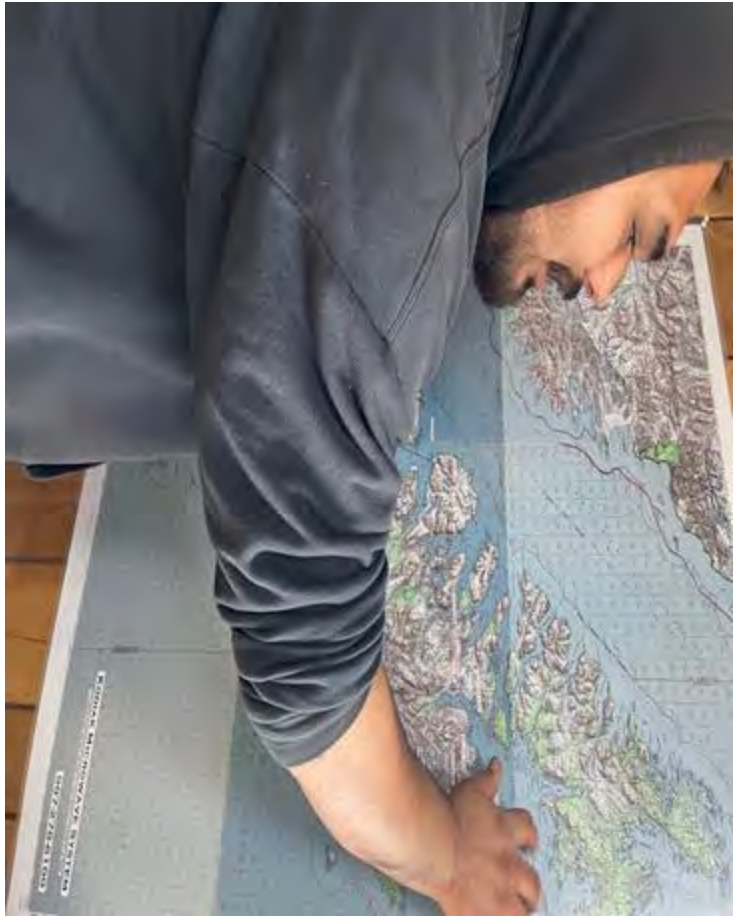
The importance of using cultural categories of Country as a governance – it de-emphasises non-Indigenous interests and validates the enduring status of cultural ways of being and ancestral estates.

The strength of such plans is that they **do not rely on the colonial nation-state for authority (e.g. Chumash)**, but stem from the authority of the relationships of People to place - and each other.

Healthy Land Sea Plans & Mariculture

The voice of community in land and sea management.

'Culturalise' & 'contextualise' mariculture initiatives. Keeping it real…



Threats and Gaps

In developing HLSPs, initial sessions aim to identify core values as well as immediate threats to Country and knowledge gaps.

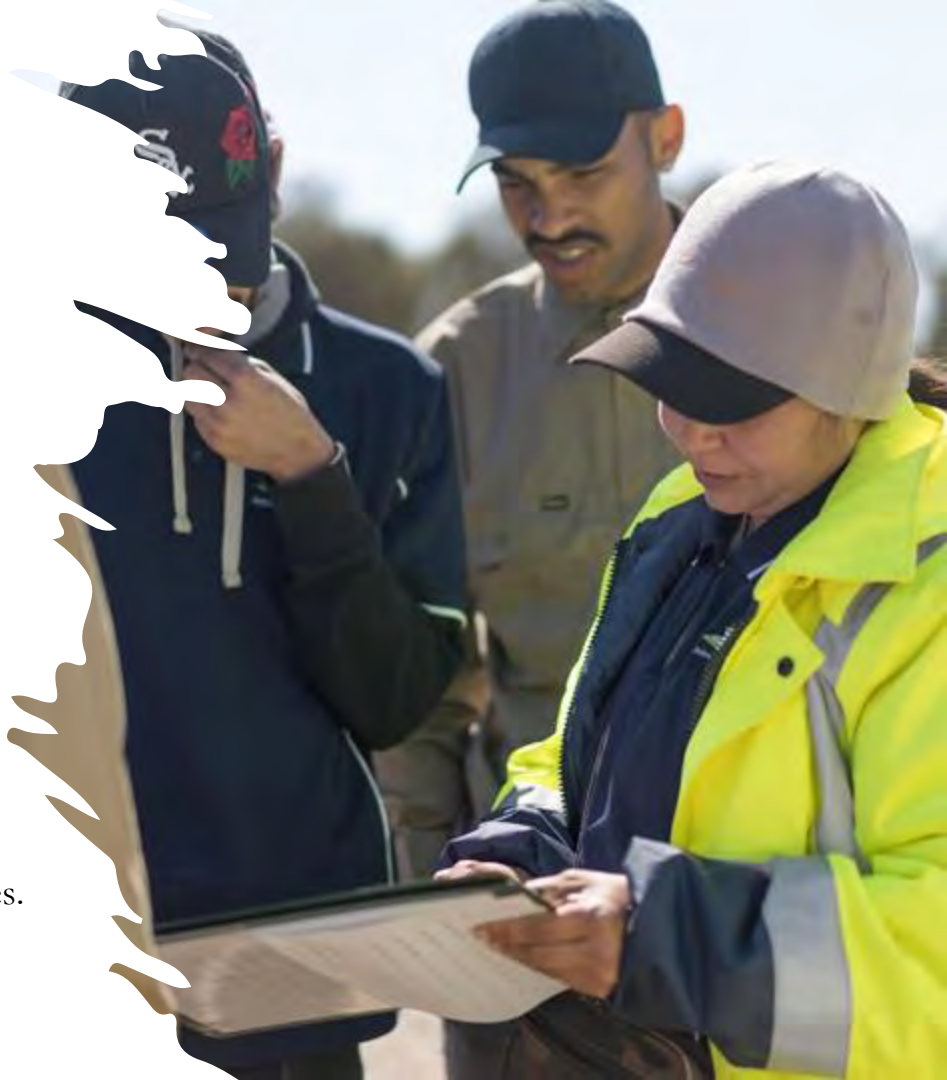
To manage external pressure, prepare and respond to change, and regain losses, a strategy is to integrate restoration ecology, renewable energy independence, pathways to food sovereignty and heritage preservation as one well-resourced, operational program.

Local Planning, Global Movement

In so doing, HLSPs align broader initiatives with local conditions, gaps, and opportunities - defined by cultural values.

More broadly, the Plans stem from the global movement to support Community Sovereignty to ensure

1) the security of rights to cultural land and resources;
2) meaningful representation in decision-making; and
3) access to capital to support conservation and sustainable development. A ground-up, locally relevant community HLSP is one small step toward creating a strategic context for these global initiatives.



Mariculture, CVM and HLSP

A core goal of our program is to engage with communities in the EVOS zone in relation to mariculture initiatives at the local or region-wide scale; through Elders and Youth based projects.

This includes:

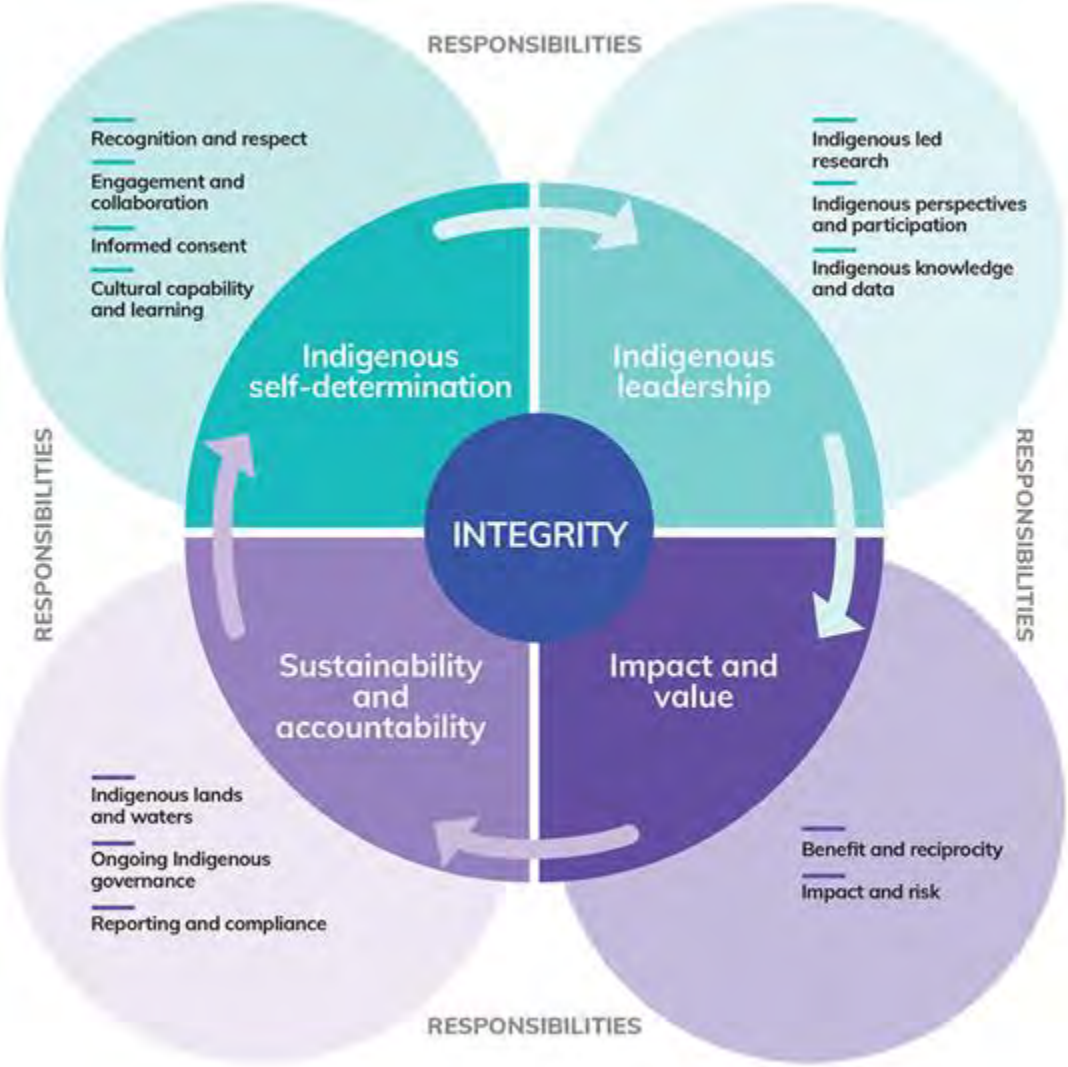
- Documenting the cultural landscape and place-based setting of a farming operation(s), and
- Identifying the methods for community-based cultural and environmental management and monitoring programs - that directly support a mariculture initiative operation.
- Capturing the voice of community with regard to their interests and priorities

Community Engagement via Projects

Begins with targeted community engagement and workshop sessions.

- Elders
- Facilitators
- Advisors
- Operators
- Youth Team
- Local Knowledge Holders/Specialists

Our final plan is to engage at various levels and deliver a formal report on learnings, common themes, and recommendations for community-based mariculture in the EVOS region; while delivering useful outcomes for local community that have invited us in.


RESPONSIBILITIES
Recognition and respect
Engagement and collaboration
Informed consent
Cultural capability and learning
Indigenous led research
Indigenous perspectives and participation
Indigenous knowledge and data
Indigenous self-determination
Indigenous leadership
INTEGRITY
Sustainability and accountability
Impact and value
RESPONSIBILITIES
RESPONSIBILITIES
Indigenous lands and waters
Ongoing Indigenous governance
Reporting and compliance
Benefit and reciprocity
Impact and risk
RESPONSIBILITIES

Healthy Land & Sea Planning – Kelp Farms

Field projects situate a kelp farm within their broader cultural landscape -

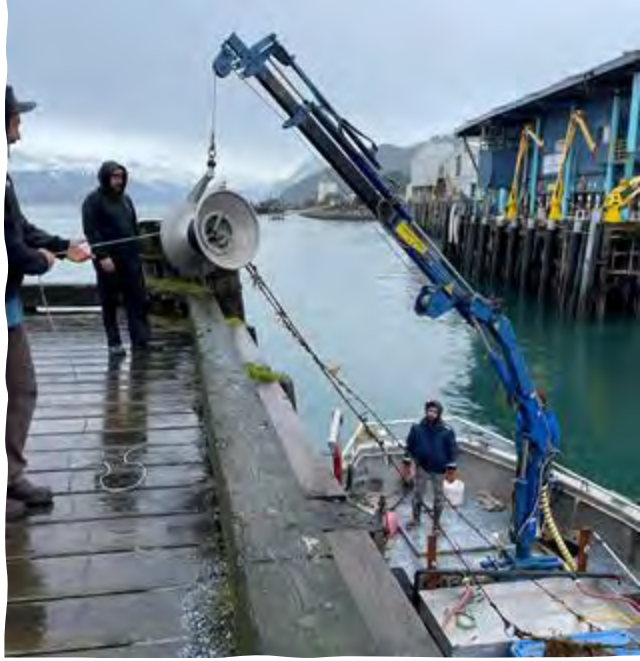
Assess the impacts, threats and risks to these values.

A component includes registering areas/farms as heritage places/landscapes.

Traditional Cultural District (TCD) nomination – to encompass the kelp farms/operations.

Integrating **Species Distribution Modelling** – as a method of cultural zoning/mapping.

A Cultural Ranger Employment/Training Model (Field School) - to serve the monitoring and support of a local kelp farm operation.



Cultural Ranger Program & Plan

A pilot field school or project - delivers an operational management plan - to be delivered by local communities.

The community, action-oriented approach is presented as a report and associated Cultural Plan. This Plan outlines the **management directives** to support a kelp and shellfish operation – whether at the individual, collective, and regional scale.

Each plan serves as a guide for implementation that adds values and support to the larger program, as well as serving as a model for sharing to other cultural regions/networks.

Protecting Cultural Knowledge & Information

Healthy Country Planning is **co-designed.**

The intent is to capture information on what the community wants to do for the long-term management and support of a mariculture farm or operation.

This **does not** require documenting culturally sensitive information, and it does not involve extracting information on subsistence or household information.

We place this into legally mandated frameworks where pre-existing knowledge remains the IP of the individual or community; and cannot be used by collaborators for any purpose unless agreed through formal processes.

We also add in ***Breach of Trust*** legal frameworks.

Karragurning - Healthy Land and Sea Plan - Abalone Farm

Core Programs

Youth/Elder Cultural Place Surveys & Mapping

Heritage Place and Landscape Protection

Fish Ecology Studies

Water Quality Monitoring

Invasive Species Control

Marine Debris and Microplastics Monitoring

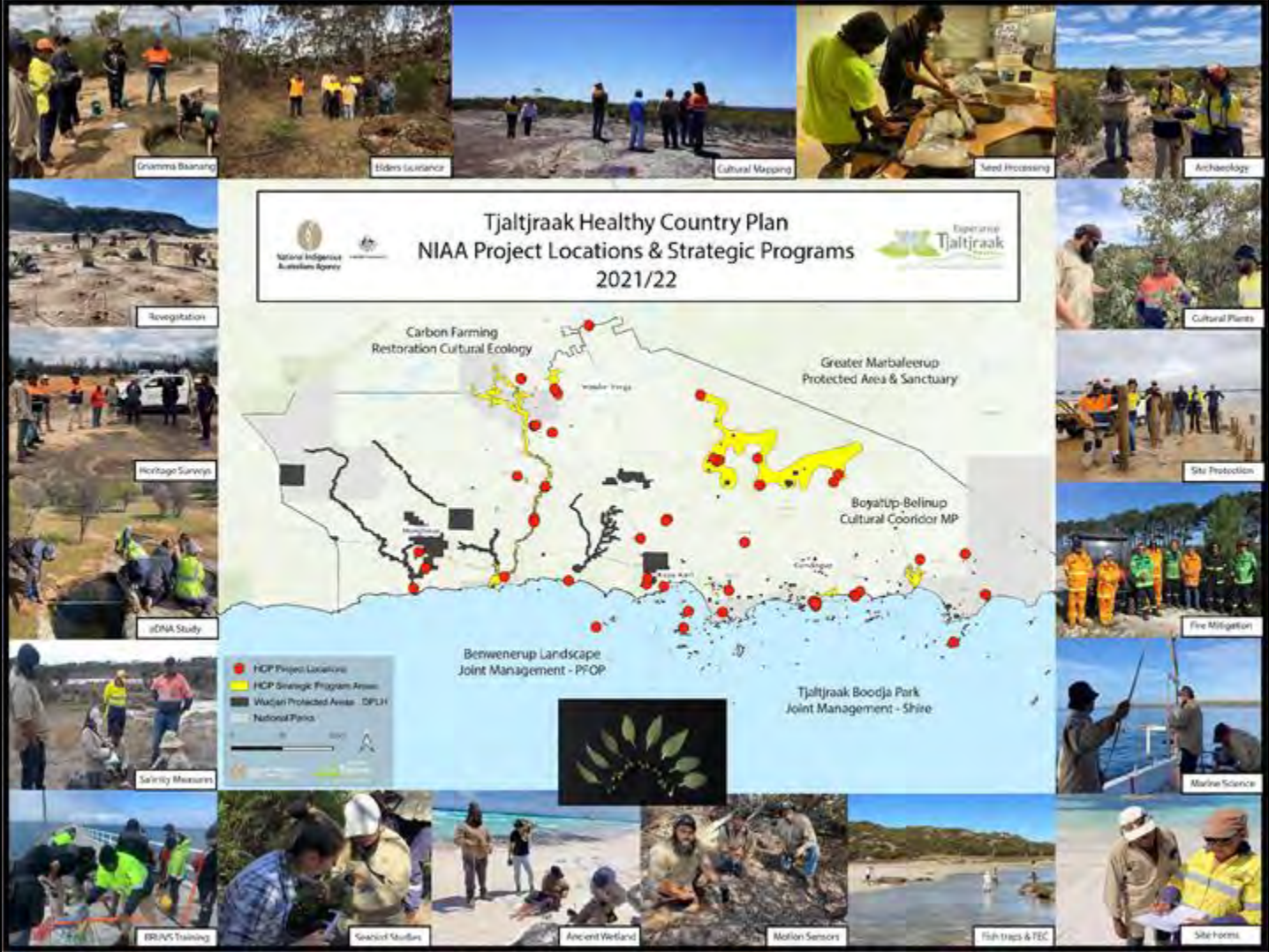
Marine Habitat Mapping

Abalone Farming - Science & Operations

Knowledge Exchange - Youth Camps

Employment and Training Strategy

Integrate within a Healthy Country Program


Tjaltjraak Healthy Country Plan
NIAA Project Locations & Strategic Programs
2021/22
Esperance Tjaltjraak
Carbon Farming
Restoration Cultural Ecology
Greater Marbaleerup
Protected Area & Sanctuary
Boyatup-Belinup
Cultural Coorridor MP
Beriwenerup Landscape
Joint Management - PFOP
Tjaltjraak Boodja Park
Joint Management - Shire
HCP Project Locations
HCP Strategic Program Areas
Wadjari Protected Areas - DPLH
National Parks
Gnamma Baanang
Elders Guidance
Cultural Mapping
Seed Processing
Archaeology
Revegetation
Cultural Plants
Heritage Surveys
Site Protection
eDNA Study
Fire Mitigation
Salinity Measures
Marine Science
BRUVS Training
Seagrass Studies
Ancient Wetland
Motion Sensors
Fish traps & FEC
Site forms

Strategic Management

Country Maintenance: A cultural plan for a large UCL parcel that demonstrates a process for delivering and expanding HCP (NIAA) targets focused on heritage protection, threatened species recovery, and biodiversity management.

Strategic Management Plan

Collaborative Regional & Regenerative Farming: Case studies, property-level plans and actions focused on integrating cultural mapping, fire management, soil health, streambank restoration and regenerative farming - Tjaltjraak properties within the Kepwari (RAMSAR) wetlands/catchment.

Strategic Management

Karnta/Garawa Bereavement Cultural Corridor: Develop a program to inform landscape models of restoration ecology and cultural leadership embedded in adaptive management, monitoring, and on-ground actions/HCP projects.

Strategic Management Plan

Tjaltjraak Boodja Park: A co-management project to develop a cultural plan for a Shire Reserve while undertaking cultural and geo-archaeological studies, coastal dune stabilisation projects, Dieback control measures, and visitor education and public art experiences.

Strategic Management

Western Sea Country Program: Sea Country Plan with 148 management directives linked to the establishment and development of a sea country ranger and marine science program, seafloor and habitat mapping, seabird research, and marine debris studies.

Conclusion: Benwenerup Cultural Corridor HLSP

Ouzinkie HLSP

To finish, here is a brief presentation on the first HLSP project we have commenced in Alaska for this larger EVOS program related to Mariculture.