Situation Assessment of Alaska's Emergent Mariculture Industry

Kayleigh Hamernik
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The Nature Conservancy

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Author

Kayleigh Hamernik, Mariculture Policy Project Lead
The Nature Conservancy
k.hamernik@tnc.org

Contributors and reviewers

Erik O'Brien, Owner
Kodiak Ocean Bounty

Megan Considine, Aquaculture Program Coordinator
The Nature Conservancy

Jason Lessard, Executive Director
Alaska Mariculture Alliance

Caitlin McKinstry, Marine Biologist
Native Village of Eyak

Chloe Ivanoff, Hailey Thompson, and Clifton Ivanoff
Owners at Kelp Island Alaska

Photos

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Abbreviations and acronyms

ADNR	Alaska Department of Natural Resources
AFDF	Alaska Fisheries Development Foundation
AMC	Alaska Mariculture Cluster
AMI	Alaska Mariculture Initiative
AOA	Aquaculture Opportunity Area
ASMI	Alaska Seafood Marketing Institute
BBBRC	Build Back Better Regional Challenge
FAO	Food and Agriculture Organization of the United Nations
NOAA	National Oceanic and Atmospheric Administration
NVE	Native Village of Eyak
FLUPSY	Floating Upweller System
KISS	Kodiak Island Sustainable Seaweed
MTF	Mariculture Task Force
SEC	Southeast Conference
SWAMC	Southwest Alaska Municipal Conference
TNC	The Nature Conservancy
TNC AK	The Nature Conservancy in Alaska
USACE	United States Army Corps of Engineers
EDA	U.S. Economic Development Administration

Key findings

Alaska's Mariculture Industry Holds Significant Economic and Environmental Promise

With its vast coastline, cold nutrient-rich waters, active waterfront communities, and skilled maritime workforce, Alaska is well-positioned to develop a thriving mariculture industry. Mariculture offers significant potential to support coastal economies, advance Indigenous food sovereignty, and provide ecological benefits such as habitat provisioning, nutrient uptake, and carbon mitigation. Localized research is needed to fully understand the scope of environmental benefits and impacts, particularly the carbon sequestration potential of seaweed farming in Alaskan waters.

Market Development Is Critical to Unlocking Growth

Despite growing enthusiasm, Alaska's mariculture industry lacks mature, well-defined markets—particularly for seaweed. Fragmented supply chains, inconsistent product specifications, and limited consumer demand hinder scalability. A recent report by The Nature Conservancy and Bain & Company identifies bioplastics and biostimulants as high-potential market opportunities that could drive demand for seaweed products while contributing to global climate goals over the next 5–10 years.

A Well-Being Framework and Indigenous Leadership Are Central to Long-Term Success

For mariculture to grow sustainably and equitably, it must prioritize the well-being of the communities that depend on it. A holistic framework that centers economic resilience, environmental health, and cultural integrity is essential. Indigenous leadership and sovereignty must be foundational to industry development, ensuring that mariculture supports traditional knowledge systems, community self-determination, and equitable access to resources.

Strategic Public and Private Investment Is Needed Beyond 2026

The $49 million Build Back Better Regional Challenge (BBBRC) grant awarded to the Alaska Mariculture Cluster by the U.S. Economic Development Administration has catalyzed growth, but the funding period ends in 2026. Continued public and private investment will be essential to maintain momentum, expand infrastructure, and ensure long-term industry viability.

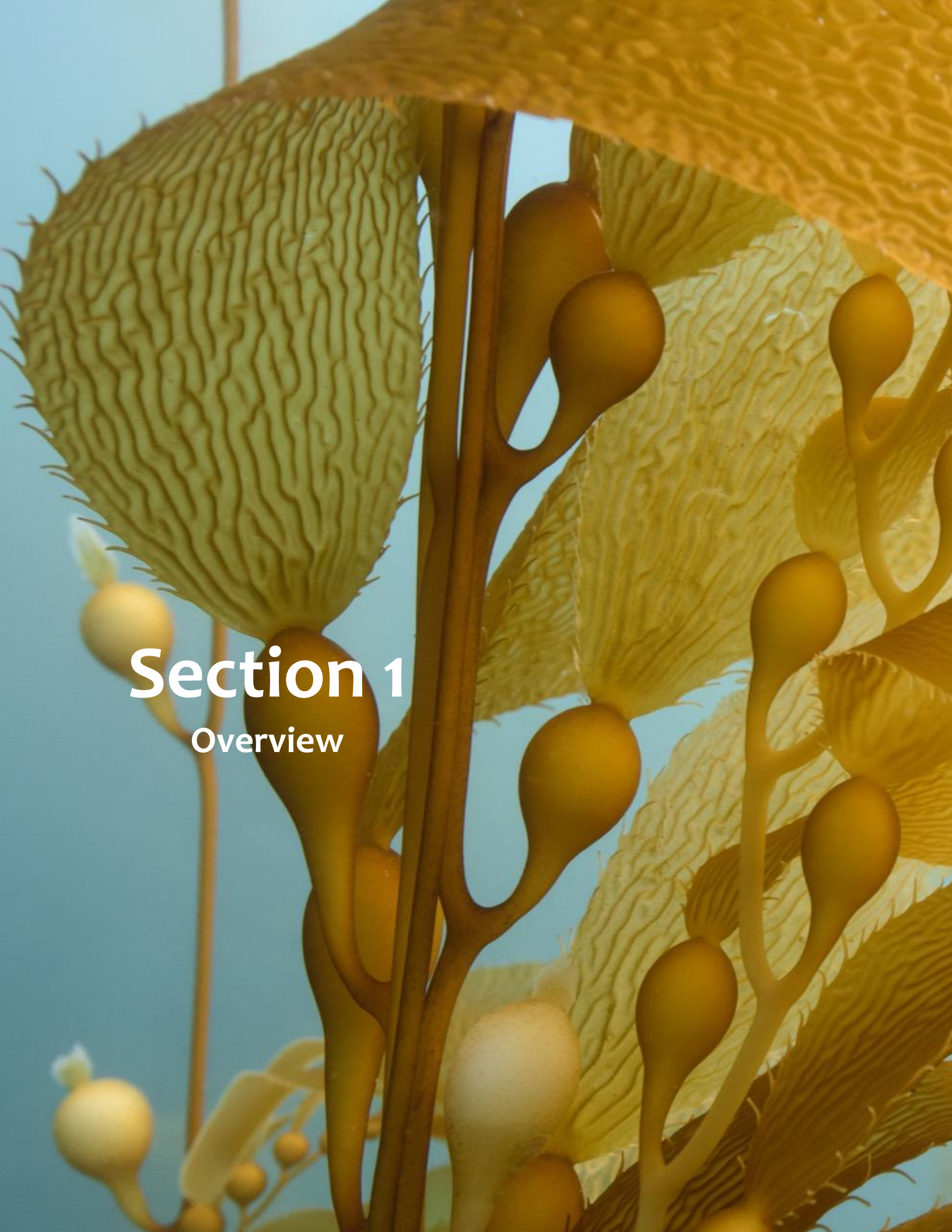
Alaska Has a Pivotal Policy Window to Shape a Sustainable Future

With bipartisan support and strong backing from Governor Dunleavy, the Alaska Legislature has taken proactive steps to streamline regulations and enable mariculture expansion. Now is a critical opportunity to develop a cohesive, equitable, and sustainable policy framework that prioritizes Indigenous leadership, protects ecological integrity, and ensures that the benefits of mariculture remain within Alaska.

The Nature Conservancy and Alaskan mariculture

The Nature Conservancy (TNC) has a 40-year history of operating in Alaska, primarily in Bristol Bay and Southeast Alaska. TNC works around the globe to catalyze the growth of restorative aquaculture and has been working on the ground with farmers in Indonesia, North America, East Africa and Central America since 2016 to promote restorative farming practices that benefit water quality, improve habitat, and reduce carbon emissions, while providing food and high-quality jobs in coastal communities. TNC's Supporting Oyster Aquaculture and Restoration (SOAR) program has supported Alaskan oyster farmers from Kodiak to Southeast and our Shellfish Growers Climate Coalition includes members from across the state.

Supported by TNC's Global Aquaculture and Emerald Edge programs, The Nature Conservancy in Alaska has conducted this report to better understand the full picture of the mariculture industry in Alaska as it stands today. This report focuses mainly on seaweed and oyster mariculture and explores basic questions concerning Alaska's history and growth in the mariculture space, market opportunities and challenges, environmental benefits, policy landscape, and stories from different groups working in mariculture across Alaska,



Section 1

Overview

Introduction

In light of the world's growing population and compounding environmental challenges, regenerative aquaculture has emerged as a sustainable solution for restoring aquatic ecosystems and achieving global food security. According to the Food and Agriculture Organization of the United Nations (FAO), aquaculture has become one of the world's fastest-growing food production sectors and hit a new high in 2022, with global production of farmed mollusks increasing by 1 million tons from 2020 to 2022 (15.6 percent) and global production of farmed algae increasing from 35.1 million tons in 2020 to 36.5 million tons in 2022, an increase of 1.4 million tons (4.1 percent). However, of that 36.5 million tons, North America only contributed 740 tons (Figure 2). Over 90% of the seaweed produced globally comes from Asia, namely China, Indonesia, Korea, and the Philippines, where there are well-established supply chains and industries.[1]

Alaska has more coastline than the lower 48 states combined, 500 native seaweed species, cold, nutrient-rich waters, active waterfront communities, and a skilled maritime workforce. Despite these advantages, the state's mariculture industry—particularly seaweed production—remains small compared to its potential. A recent assessment by Hatch Blue found that 1,328 acres (about two square miles) are currently permitted for mariculture in Alaska. The industry has developed gradually since the state legislature passed the Aquatic Farm Act (Alaska Statutes 16.40.100-199) in 1988. However, growth has accelerated in recent years, driven by increasing interest and new funding initiatives supporting expansion.

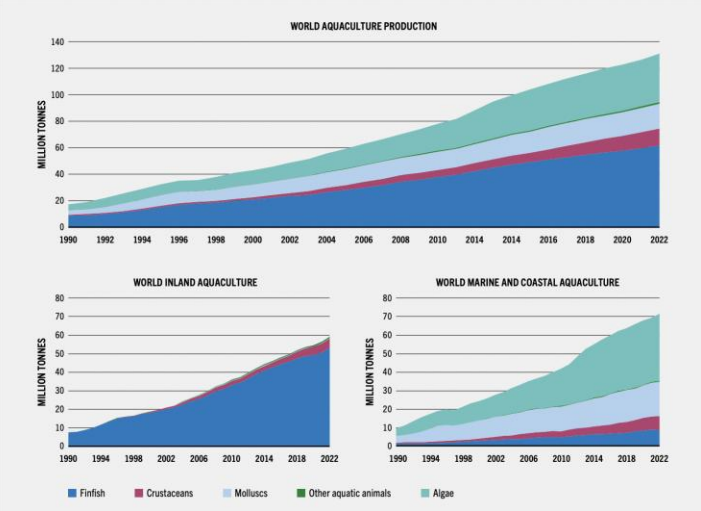


Figure 1. World Aquaculture production by product. Graph Credit: FAO State of World Fisheries and Aquaculture 2024 report.

	Africa	Latin America and the Caribbean	Northern America	Asia	Europe	Oceania	World
Aquatic animal species*							
A. Production 2000 (tonnes)	399 622	838 939	584 495	28 422 489	2 052 889	121 824	32 420 258
B. Production 2022 (tonnes)	2 316 825	4 313 508	644 547	83 399 172	3 503 440	235 231	94 412 723
C. Overall growth 2000–2022 (tonnes)	1 917 203	3 474 569	60 052	54 976 683	1 450 551	113 407	61 992 465
D. Overall growth 2000–2022 (%)	479.8	414.2	10.3	193.4	70.7	93.1	191.2
E. Average annual growth rate 2000–2022 (%)	8.3	7.7	0.4	5.0	2.5	3.0	5.0
Algae**							
A. Production 2000 (tonnes)	51 642	33 582	0	10 487 877	6 040	16 424	10 595 565
B. Production 2022 (tonnes)	188 395	21 241	740	36 252 361	29 988	12 635	36 505 360
C. Overall growth 2000–2022 (tonnes)	136 753	–12 341	740	25 764 484	23 948	–3 789	25 909 795
D. Overall growth 2000–2022 (%)	264.8	–36.8	n/a	245.7	396.5	–23.1	244.5
E. Average annual growth rate 2000–2022 (%)	6.1	–2.1	n/a	5.8	7.6	–1.2	5.8

Figure 2. World Aquaculture production by region. Graph Credit: FAO State of World Fisheries and Aquaculture 2024 report.

[1] (FAO 2024)

Figure 3. Orange dots indicate ADF&G Active Aquatic Farming Operations. Map created using the Alaska Ocean Observing System (AOOS) mariculture mapping tool.

Mariculture in the Alaskan context

Globally, the terms "aquaculture" and "mariculture" are often times used interchangeably to refer to the farming (breeding, rearing, and harvesting) of aquatic plants and animals in the ocean, or on land in tanks and ponds. In Alaska, the term "mariculture" is more commonly used by those in the industry, as exemplified by the naming of Alaskan organizations and industry groups like the Alaska Mariculture Alliance and Alaska Mariculture Cluster, but is sometimes referred to as "aquaculture" by other organizations that work in a national or global context, i.e. TNC's Global Aquaculture program and NOAA's State of Alaska Aquaculture Report. Either of the terms "mariculture" or "aquaculture" used in the Alaskan context refers specifically to the farming of seaweed and bivalves within state waters. Notably, finfish farming is prohibited by Alaskan statute.

42 plant and invertebrate species have been permitted for aquaculture in Alaska. Among these are scallops (purple hinged, rock, pink, spiny), cockles, sea urchins (red, green, and purple), geoducks, and sea cucumbers. However, Pacific oysters, littleneck clams, mussels, and macroalgae (seaweed and kelp) make up the majority of Alaska's aquatic farm products with oysters being the most established and prominent product in the Alaskan mariculture industry today.

"Either of the terms 'mariculture' or 'aquaculture' used in the Alaskan context refer specifically to the farming of seaweed and bivalves within state waters. Notably, finfish farming is prohibited by Alaskan statute."

Seaweed

The three primary seaweed species currently farmed in Alaska are sugar kelp (*Saccharina*

latissima) and ribbon kelp (*Alaria marginata*), which are sinking species that require buoys to keep them near the surface, and bull kelp (*Nereocystis luetkeana*), a floating species that needs weights added to its grow lines. Looking ahead, the 2025 season is expected to mark a significant expansion with wider commercial trials of at least three additional species: split kelp (*Saccharina groenlandica*), dragon kelp (*Eualaria fistulosa*), and three-ribbed kelp (*Cymathaere triplicate*).[2]

The equipment needed for mariculture operations depends on the species being cultivated and the unique conditions at each farm site. Essential components include anchors, ropes, cultivation lines, floats, and buoys. Most farms use single-line arrays, five-line arrays, or catenary arrays. Since the industry is still developing, commercial production of these arrays has not yet been established in Alaska, leaving farmers responsible for designing and building their own farm setups.

Although commercial harvests of farmed seaweed in Alaska have been steadily increasing, production remains well below the capacity of permitted farms. Many farmers report having the ability to grow more kelp each season but are hesitant to expand due to limited buyer demand.

Figure 4. Single-line array illustration by Greenwave.

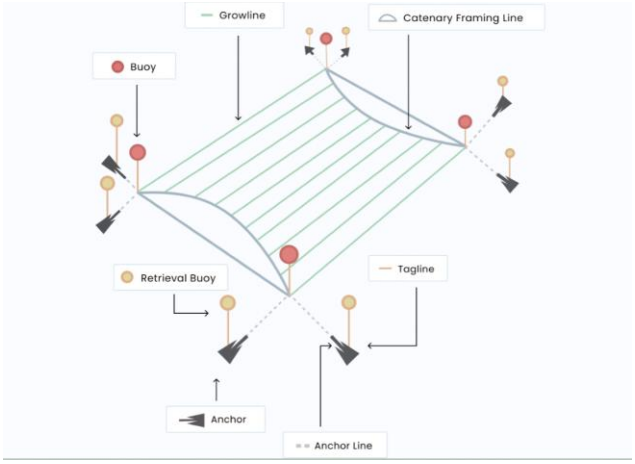


Figure 5. Catenary array illustration by Greenwave.

Regional spotlight: The Native Village of Eyak

The Native Village of Eyak (NVE) relies on the ocean as a vital food source, but warming waters and ocean acidification have threatened traditional harvests and the local economy. In response, NVE has turned to mariculture as a way to strengthen food security in the region, diversify the local economy, and build climate resilience.

In partnership with Faroe Islands-based Ocean Rainforest, NVE is testing the Macroalgal Cultivation Rig (MACR), a vertical growing system that, if successful, could significantly increase kelp production in NVE's waters. To advance this initiative, NVE built a research kelp farm using reclaimed materials planting over 15,000 feet of sugar kelp. The harvest not only provides a sustainable food source but could also support climate mitigation efforts by processing excess kelp into agricultural products that may further help to mitigate climate change. Additionally, NVE is collaborating with Prince William Sound College to train students in mariculture and marine resource management, further strengthening the region's blue economy.

NVE's mariculture research program is also studying the changes in bull kelp's buoyancy throughout its growth cycle as well as conducting environmental monitoring at farm sites, tracking biodiversity, water quality, and ocean acidity to evaluate ecosystem impacts and ensure sustainable mariculture practices.

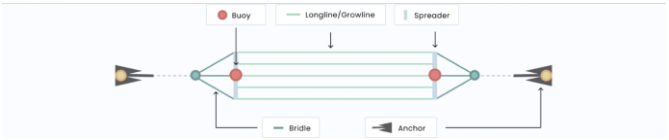


Figure 6. Five-line array illustration by Greenwave.

[2] (McKinley Research Group and Pacific Shellfish Institute 2024)

Oysters and other bivalves

In Alaska only three species of bivalves are being grown to market size and sold to wholesalers or direct to consumers: Pacific oysters (magallana gigas), Blue mussels (mytilus trossulus), and geoduck clams (panopea generosa).[3] The majority of the commercial value of Alaska's mariculture industry is currently related to oyster cultivation, which have a well-established market. $1.5 million in Alaskan-grown Pacific Oysters were sold to the public in 2022, a number that's climbing again after taking a hit during the pandemic.[4]

SOAR: Supporting Oyster Aquaculture and Restoration

In October of 2020, The Nature Conservancy and The Pew Charitable Trusts, in coordination with the shellfish industry, federal, and state partners, launched the Supporting Oyster Aquaculture and Restoration (SOAR) program with the goal of supporting oyster farmers affected by economic slowdowns associated with COVID-19 and rebuilding wild oyster reefs. The Fund was established as part of the SOAR program a year later in 2021 and built upon the principle that a resilient aquaculture industry can advance conservation goals. Responsibly managed shellfish farms can provide vital ecosystem services that benefit ocean health, and, as such, shellfish growers are critical partners in conservation. Recognizing this, the Fund extends grants to shellfish growers and aligned organizations to further collaborative marine conservation efforts and increase economic opportunities for shellfish farming in the U.S. In its first phase, the Fund issued a total of $1 million for 36 innovation awards across 16 states, including Alaska.

"Can I get rich from [oyster farming]?

The industry is fairly new to Alaska and start-up costs are high. So far, most farms are providing some income, but generally not enough to support a family. Some of the challenges in Alaska are that farms are usually in remote areas and have high transportation costs. Shellfish farming is also hard work; to be successful, farms should be operated on a daily basis and worked year round."

-Alaska Department of Fish & Game FAQ page

Oysters do not reproduce naturally in Alaskan waters due to the low temperatures, making hatcheries and nurseries critical components of the industry. Though ongoing collaborations between the industry and the scientific communities are paving the way for a commercial-scale supply of oyster seed produced in Alaskan hatcheries, currently the oyster industry's supply chain is based on oyster seed imported from outside Alaska, with most larvae and seed coming from Hawaiian Shellfish, LLC of Hilo, Hawaii. Alaskan oyster farms range from small-scale family operations with low-tech equipment to larger-scale commercial farms implementing automated modern cultivation practices and state-of-the-art gear designed for accelerated growth and scaled production, such as Floating upwelling systems (FLUPSYs). These systems are highly effective in Alaskan waters and are commonly used by oyster farmers to accelerate the growth of small oyster seeds into sturdy juveniles (7–13 mm) at higher densities than traditional methods (fine mesh bags or lanterns) would allow during this stage of development by providing consistent water movement, taking advantage of the tidal flow and ensures access to oxygen and nutrients.[5] It takes 18-36 months for oysters to grow to market size depending on factors like water temperature, food availability, salinity, and water flow, all of which influence growth rates. Cultivation methods, stocking density, predation,

[3] (Hudson 2023)
[4] (Whitney 2023)
[5] (Hatch Innovation Services 2024)

biofouling, and genetic traits also play a role, contributing to the variation in growth time.

In contrast with the market challenges faced by Alaskan seaweed farmers, oyster farmers consistently sell their harvest and are focusing on technologies and techniques to scale up production, improve farming systems, and reduce losses (e.g., starfish predation, fouling) to improve efficiency and profitability.

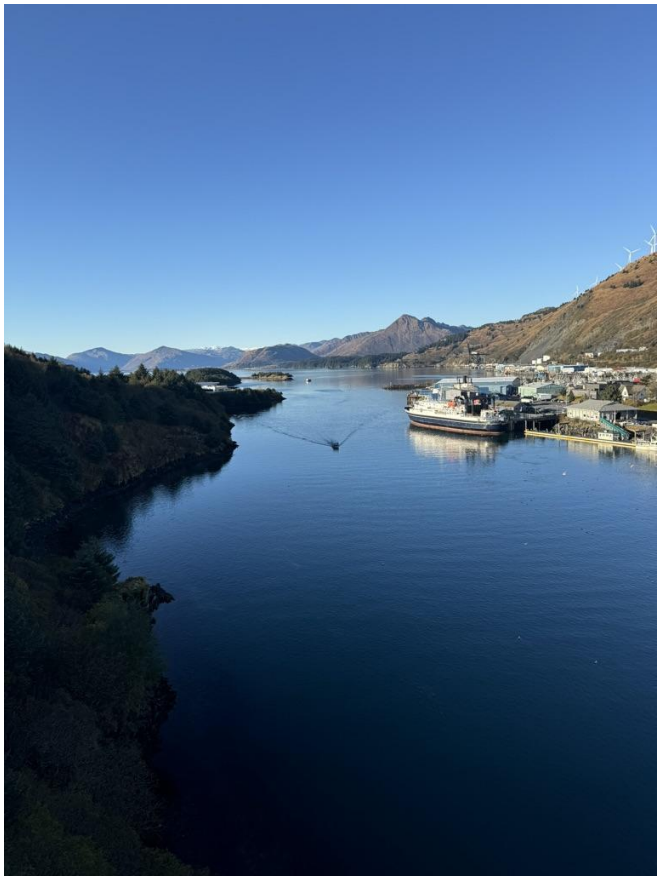


Figure 7. Kodiak Island and Near Island Channel (photo by Kayleigh Hamernik, The Nature Conservancy)

Regional spotlight: Kodiak Island

Kodiak Island, the second-largest island in the U.S. after the island of Hawaii, is located in the Gulf of Alaska, about 250 miles southwest of Anchorage. Kodiak consistently ranks as one of the top seafood ports in the nation in terms of both volume and value of seafood landed, but as fisheries have struggled in the last couple of years, many fishermen have been open to entering adjacent industries. Knowledge of the waters and having access to the necessary equipment (skiffs, etc.) have helped facilitate fishers entering the kelp farming industry. Kodiak currently leads the state in kelp production.[6]

Home to the Alaska Mariculture Research and Training Center (AMRTC), UAF's Kodiak Seafood and Marine Science Center (KSMSC), and the NOAA laboratory within the Kodiak Fisheries Research Center, Kodiak Island is a hub for mariculture research and innovation in Alaska. Kodiak is home to Alaska's first commercial kelp farm, Kodiak Island Sustainable Seaweed (KISS), which in partnership with Blue Evolution pioneered the first commercial seaweed farming supply chain in Alaska. There are three longstanding mariculture farms in Kodiak: KISS, owned by Nick Mangini; Kodiak Ocean Bounty, owned by Erik O'Brien; and Alaska Ocean Farms, owned by Alf Prior and Lexa Meyer. New kelp farms are getting their footing around the island as well, such as Kelp Island Alaska, a farm started by Chloe Ivanoff, Hailey Thompson, and Clifton Ivanoff east of Holiday Island, less than a mile from the city shoreline.

[6] (McKinley Research Group 2022)

Starting a Kelp Farm: Kelp Island Alaska

After attending a Sea Grant workshop in Kodiak on starting a kelp farm, Chloe Ivanoff, Hailey Thompson, and Clifton Ivanoff were inspired to combine their knowledge of the ocean and experience in commercial fishing to launch their own operation. Their farm, Kelp Island Alaska, spans 14 acres with 25,000 feet of seeded lines growing sugar kelp, ribbon kelp, and bull kelp this year.

However, the journey to starting Kelp Island Alaska was far from easy.

"The permit application process was challenging to navigate," said Thompson. "The established kelp farmers in town who had gone through the process themselves helped us out a lot."

The timing of their lease approval added to their startup costs. After submitting their application, it took 18 months for approval, which came in October 2023—months after preparations would have needed to start for the season. The Ivanoffs and Thompson agreed that if leases can't be approved by the start of the growing season, it would be helpful if the fees could be waived until the first harvest to ease the financial burden on new farmers.

Last year, the farm struggled with low-quality seed, but the team is optimistic about the new hatchery on the island, which promises to deliver consistent, high-quality seed to local growers. Despite these improvements, the team is concerned about the undeveloped market for kelp.

"We need someone to invest in all steps of the kelp market," Thompson explained. "We need processing infrastructure, startup kits for new farms, and better planning tools. It's incredibly difficult to figure out everything, from applying for permits to building infrastructure, processing, marketing, and applying for grants."

Although they received $23,000 in matching funds from AMA MIGP grants, these funds come with limitations: they cannot be used to buy equipment like skiffs or to pay themselves for their time, which creates significant barriers for small-scale operations. The team believes a centralized resource outlining all available grants and funding opportunities would significantly help prospective kelp farmers navigate the industry and lower the barriers to entry.

Despite these challenges, Kelp Island Alaska remains determined to grow their farm and contribute to the growing mariculture movement in Alaska.

Key groups involved in guiding the growth of Alaska's mariculture industry

The Alaska Mariculture Task Force and Alaska Mariculture Alliance

The Governor's Mariculture Task Force (MTF) was formed in 2016 by Governor Walker and set out to create "a comprehensive plan for the development of a viable and sustainable mariculture industry that produces shellfish and aquatic plants for the long-term benefit of Alaska's economy, environment, and communities." A part of the comprehensive planning process included dozens of public meetings of not only the Task Force, but also five additional Advisory Committees in the topic areas of Investment and Infrastructure, Research and Development, Regulatory Issues, Public Education and Marketing, and Workforce Development. In 2018 the Task Force published an 82-page Mariculture Development Plan outlining a strategy for developing the industry, including contracted economic reports by McDowell Group and Northern Economics.

The broad goals of the AK Mariculture Development Plan, as outlined by Fong et. Al, are as follows:

1. Secure Seed Supply Through Hatcheries
2. Establish an Alaska Mariculture Development Council
3. Maximize Innovation and Growth through Research
4. Align Laws, Regulations and Agency Practices with Stakeholder Needs
5. Secure and Promote Investment in Mariculture
6. Promote Success through Alaska Native participation
7. Grow and Develop the Mariculture Workforce
8. Develop New Mariculture Markets and Products
9. A Summary of Research Needs (55)[7]

The Mariculture Task Force was re-authorized by Governor Walker in 2018 by Administrative Order No. 297 to work on implementation of the Development Plan. Governor Dunleavy continued to support the work and mission of the MTF upon his election in 2018. In 2019 the Task Force approved a 5-Year Action Plan, which further broke down the goals identified in the Development Plan into 41 key actionable items with objectives, steps to take, timelines, and responsible entities needed. The action items are broken down into the three categories of Industry (16 actions), Government (22 actions), and Research (2 actions).

In the industry category, key actions are centered around developing mariculture infrastructure ("develop in-state seed/juvenile supply" and "Expand Mariculture Revolving Loan Fund"), exploring different business models for the industry ("consider cooperative structures" and "consider community-based structures"), meeting industry information needs ("Develop and maintain GIS map tool in-state waters"), training, marketing

Alaska Mariculture Task Force Members:

Jim Andersen, Division of Economic Development, Alaska Dept. of Commerce, Community and Economic Development (ADCCED)

Julie Decker, Alaska Fisheries Development Foundation (AFDF)

Ed Douville, Shaan Seet Corporation

Angel Drobnica, Aleutian Pribilof Island Community Development Association (APICDA)

Dr. Ginny Eckert, Alaska Sea Grant (ASG)

Jeff Hetrick, Alutiiq Pride Shellfish Hatchery (APSH)

Heather McCarty, Central Bering Sea Fishermen's Association (CBSFA) and Alaska King Crab Research, Rehabilitation and Biology (AKCRRAB) program

Sam Rabung, Division of Commercial Fisheries, Alaska Dept. of Fish and Game (ADFG)

Dr. Michael Stekoll, University of Alaska Southeast (UAS), University of Alaska Fairbanks (UAF)

Kate Sullivan, Southeast Alaska Regional Dive Fisheries Association (SARDFA)

Eric Wyatt, Alaska Shellfish Growers Association (ASGA), OceansAlaska (OA), and Blue Starr Oyster Company

[7] (C.R. Fong 2024)

("build on ASMI programs [to include mariculture]"), and public outreach. The government category is broken down into desired state regulatory changes, statutory changes, and policy issues, with many of the actions to simplify or otherwise amend aquatic farm leasing terms or application processes (Pass legislation to simplify ADNR lease renewal process" and Amend commercial use requirement [and enforce]). A couple of federal government engagements are also outlined, mainly regarding hiring Alaska-based mariculture positions within NOAA and Sea Grant. The research category outlines the need for the Mariculture Research Center and acquiring funding.

The final report was presented to Governor Dunleavy in 2021, updating on the goals and actions completed (Figure 8) from the initial Report and the 5-Year Action Plan. In 2021 the MTF sunsetted and was replaced by the Alaska Mariculture Alliance (AMA), which continued working towards the goals outlined in the MTF reports. As of 2025, many of the key actions from the 5-Year Action Plan are still in progress, with the group still actively working towards the outstanding goals.

Figure 8. Priority actions completed from the MTF Final Report to Governor Dunleavy.

The Alaska Mariculture Cluster

In September 2022, Southeast Conference (SEC) leveraged the outcomes from the Task Force Report to secure a $49 million U.S. Economic Development Administration (EDA) Build Back Better Regional Challenge (BBBRC) grant to catalyze a viable and sustainable mariculture industry in Alaska. The Alaska Mariculture Cluster (AMC), administered by SEC, is a comprehensive project spanning four regions across Alaska with a goal of creating a viable mariculture industry that can excel past the lifespan of the Build Back Better funding that ends in 2026.

The coalition includes members of Alaska's mariculture industry, tribal organizations, regulatory agencies, academics, Economic Development Districts, trade organizations, and other groups. A Governance Body, composed of AMC coalition leaders and tribal representatives from each of the project's regions, guides the grant's work and equity goals. The 2024 State of Alaska Aquaculture Report describes the cluster as creating "a holistic approach for building the industry, reducing the cost structure for farmers and processors, enhancing workforce development plans, attracting private sector investments, increasing demand via product development and marketing and engaging a governance body with representation from around the state to ensure equitable growth."

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Figure 9. Wild kelp in Sitka, AK (photo by Alaina Plauche).

Organization spotlight: Native Conservancy

Native Conservancy has made regenerative kelp farming one of their top priorities. Dune Lankard, an Eyak Elder and President and Founder of the Native Conservancy, has been driving the organization towards kelp mariculture as a means of returning to the Eyak traditional ecological knowledge and relationship to kelp. They promote regenerative kelp not just as food security but as an economic driver for Indigenous coastal communities. Native Conservancy's kelp mariculture research spans all stages and processes related to kelp farming and their OceanBack Initiative empowers Native farmers with tools and trainings on how to grow kelp and start their own kelp farms. Native Conservancy wants to ensure that oceans are permitted fairly and managed properly with honor and respect for Alaska's Native communities. As the Alaskan mariculture industry grows, it must reflect Indigenous sovereignty and leadership as demonstrated by the Native Conservancy.

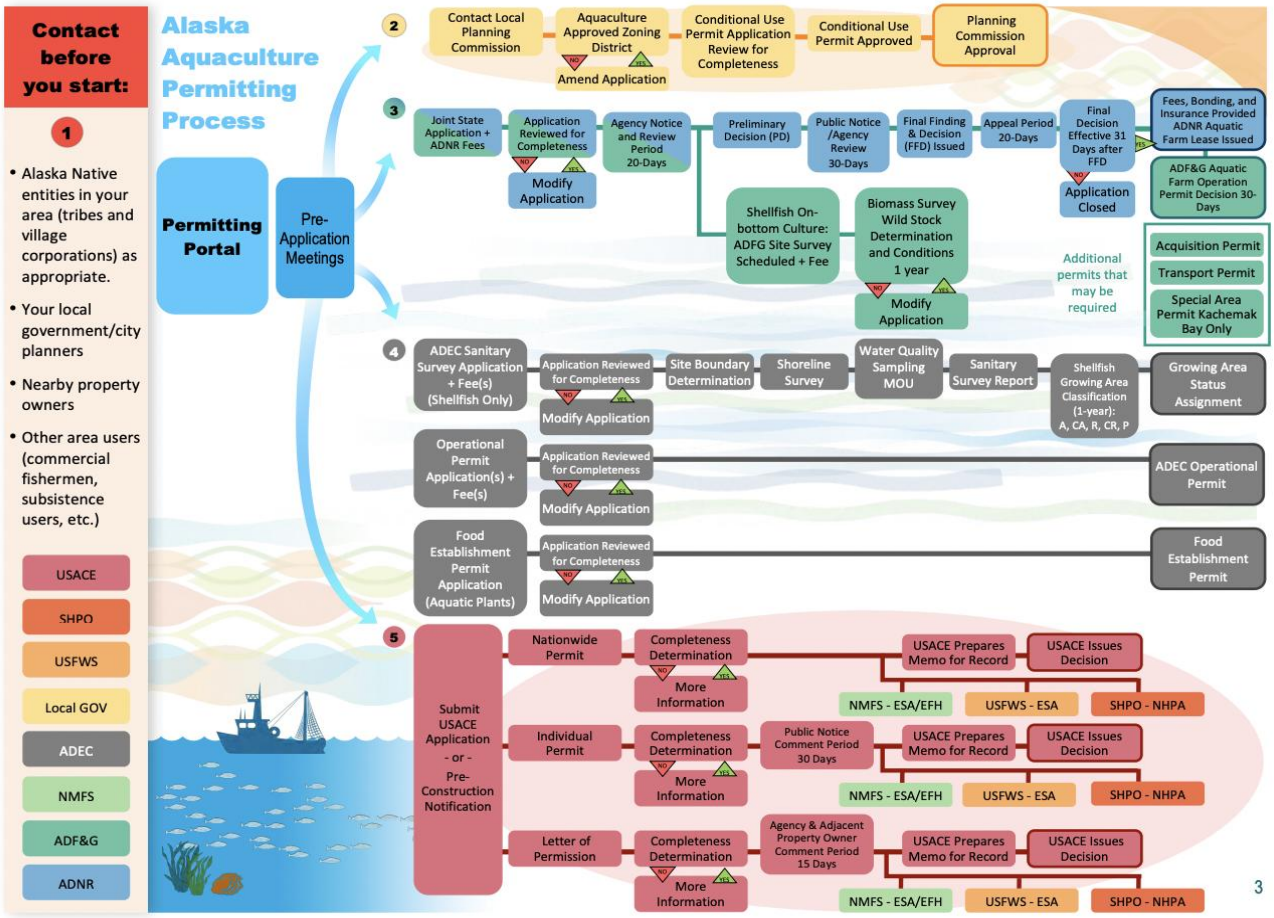

Figure 10. Alaska aquaculture permitting process flow chart. Source: NOAA Fisheries Alaska aquaculture permitting guide (https://media.fisheries.noaa.gov/2021-11/Alaska-Aquaculture-Permitting-Guide.pdf).

Government entities

Starting an aquatic farm in Alaska requires multiple permits and involvement of multiple state and federal agencies (Figure 10). The Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Environmental Conservation (ADEC) jointly oversee the permitting process for aquatic activities. See Alaska Aquaculture Permitting Guide (2021). Applications for operation permits can be submitted annually on the ADF&G website from January 1 to April 30. Additional permits from ADF&G are needed to transport species between nurseries and farms and to collect wild stock for seed production. Farms located on state tidelands or submerged lands require a lease from the Alaska Department of Natural Resources (ADNR). Additionally, the U.S. Army Corps of Engineers (USACE) must approve the placement of farm equipment in the water. To streamline the permitting process, ADF&G introduced an online platform called My Farm in late 2022. This portal allows permit holders to manage their operation permits, apply for additional permits, and submit annual reports through a user-friendly system.

NOAA Aquaculture Opportunity Areas

WHAT ARE AOAs?

"Aquaculture Opportunity Areas (AOAs) are areas that have been evaluated through spatial analysis and National Environmental Policy Act (NEPA) review, and have been determined to be environmentally, socially, and economically appropriate to support multiple commercial aquaculture operations."

-National Oceanic and Atmospheric Administration (NOAA)

In June 2023, NOAA Fisheries and the state of Alaska jointly announced a multi-year process to identify Aquaculture Opportunity Areas for the state of Alaska to support the advancement of sustainable mariculture throughout the state. Aquaculture Opportunity Areas (AOAs) are areas that have been evaluated through spatial analysis and National Environmental Policy Act (NEPA) review, and have been determined to be environmentally, socially, and economically appropriate to support multiple commercial aquaculture operations. As per NOAA, the size and location for AOAs will be determined through spatial analysis, local and Indigenous knowledge, and public engagement. In Alaska, this process will only consider invertebrate and seaweed aquaculture within state waters. The identification of AOAs is a planning process bringing in the best available information to help new farmers and managers make informed decisions on where projects should occur.

The AOA process does not involve creating pre-permitted sites but instead seeks to reduce permitting challenges by identifying low-use, low-conflict areas. Federal and state leasing and permitting requirements remain unchanged. The process is expected to span approximately four years, with two years dedicated to suitability analysis and another two years for environmental review under NEPA.

Final AOA Study Areas in Alaska will be chosen using suitability models based on factors like minimal ice coverage and the avoidance of critical habitats for other species. The results of these evaluations will be published in a regional "Atlas," though the release date for the Alaska version is not yet known. Alaska will be the third region to undergo the NOAA AOA process, following the Gulf of Mexico and Southern California. The process is designed to be transparent and participatory, incorporating multiple opportunities for public engagement and feedback, including two spatial planning workshops. The first workshop took place on February 26, 2024 in Anchorage and the second on March 26 and 27, 2024 in Juneau. The summary from these workshops reports that how to both acquire and safeguard local and indigenous data was perhaps the main topic of concern across attendees from both workshops.

Section 2

Policy Landscape

Overview

Having passed the temporal halfway mark of the $49 million BBBRC EDA grant (2022–2026) and with significant momentum and funding currently flowing into the industry, the rapid expansion of mariculture farming in Alaska has spurred increased lobbying efforts from stakeholders and the passage of several supportive bills in recent years. With bipartisan support for sustainable economic development and strong backing from Governor Dunleavy, the Legislature has generally championed the growth of the mariculture industry. Lawmakers should be proactive about creating an equitable mariculture policy framework that prioritizes keeping the potential profits of the industry in Alaskan communities.

Recent state legislation

HB 115

Passed in 2021, **HB 115** expedites the lease renewal process by making it consistent with other renewal processes for Department of Natural Resources leases, shortening the process from 200 days to around 90 days, removing a layer of bureaucracy for mariculture farmers and reducing administrative overhead.

HB 42

Passed in 2022, **HB 42** legalized shellfish hatcheries in the state. The original bill had a provision to include farmed products in Alaska Seafood Marketing Institute (ASMI), Alaska's official seafood marketing arm. Despite unanimous support from ASMI's board of directors, the clause was dropped before passage and mariculture remains excluded by the state's main seafood marketing initiative.

HB 329

Passed in 2024, **HB 329** simplified the mariculture farm lease process and extends lease durations to 10-year terms for first leases and up to 20-year terms for lease renewals. included Geoduck transfer now includes the Aleutian Chain. Lease appraisals are subject to the commissioner and are no longer required every five years. Lessee preference to be given during time of full reapplication period. This bill also extended geoduck farming to the Aleutian Islands.

Looking ahead

The 50/50 rule

The 50/50 rule requires collecting 50 genetically unrelated fertile parent plants (sorus tissue) from different sites within 50 kilometers of the out-planting location, with all plants harvested from longlines before becoming fertile. Additionally, selecting for specific traits is prohibited. This regulation, established by ADF&G, aims to preserve the genetic diversity of seaweeds in Alaskan waters.

While Alaska's precautionary approach is ecologically important, it is costly and labor intensive for each farm to source seed each year. Without adjustments, the state risks falling behind others advancing in plant husbandry and genetic selection, potentially hindering mariculture innovation and competitiveness. To address this, ongoing research and tissue analysis projects are exploring best avenues to balance genetic diversity preservation with reduced constraints for farmers, such as gametophyte cultivation and seedbanking. As new science emerges, stakeholders can advocate for policies that protect ecosystems while supporting industry growth.

Alaska Seafood Marketing Institute (ASMI)

Removing the prohibition of farmed aquatic products in ASMI marketing has been a long-standing goal of the Mariculture Task Force and ASMI. This provision was included in HB 41 originally but was removed before the bill passed. Further efforts to change the provision excluding mariculture from the Alaska Seafood Marketing Institute are likely forthcoming.

Joint Innovation Projects (JIPs) and further research

Ongoing Joint Innovation Projects and other RFPs are generating a wide array of research and scientific findings. As results from these projects and studies are published, JIP recipients, the scientific community, and policy advocacy groups should form a cohesive strategy to translate these insights into meaningful, science-based policy advancements. Scientists contribute data-driven analyses and evidence-based recommendations, while advocacy groups bridge the gap between research and policymakers, ensuring that findings are effectively communicated and integrated into legislative and regulatory decisions.

Proactive policy to prioritize Alaskans

Alaskan policymakers are at a pivotal juncture. With the State's goal to scale up the mariculture industry to $100 million mariculture industry by 2040, there is huge potential for Alaskans to benefit. This is an opportune moment to develop a cohesive, sustainable, and equitable policy framework for Alaskan mariculture that allows for necessary private investment in the industry while still prioritizing Alaskan farmers, businesses, and communities. Such a plan is crucial to ensure that the benefits of mariculture remain within the state and do not follow the same trajectory as the outmigration of commercial fishing permits from rural and Alaska Native communities.

Section 3

Opportunities and challenges in Alaska

Overview

While oyster and seaweed farming share certain challenges—such as supply chain and transportation difficulties due to Alaska's remote coastal geography—as well as opportunities, like the region's ideal cold, nutrient-rich waters and influx of available grant opportunities, these two main sectors of Alaska's mariculture industry are at different stages of development and face distinct market conditions.

Opportunities

Economic growth for Alaska's coastal communities

Alaska's mariculture industry presents significant opportunities to support resilient coastal communities, particularly due to its compatibility with the existing fishing industry. With the largest seafood processing infrastructure in the U.S., Alaska boasts approximately 9,000 vessels registered for commercial fishing, many of which have excess capacity during fishing off-seasons. This presents a unique opportunity for integrating seaweed cultivation, which is typically planted in the fall and harvested in the late spring, aligning with the seasonal low periods for both processors and fishermen. Alaska also benefits from having the largest expanse of state and federal waters, with relatively few conflicting uses, further enhancing its potential for mariculture development. Additionally, businesses like Hump Island Oyster Co. in Ketchikan have successfully incorporated farm tours into their operations, creating new revenue streams by tapping into Alaska's tourism industry. Economic models, including those highlighted in the Sea Grant Workforce Development Plan, suggest that mariculture can be a sustainable and profitable avenue for Alaska's coastal communities.

Indigenous sovereignty and food security

For thousands of years, Alaska Native communities have harvested seaweeds and bivalves as part of their traditional diets, and this tradition continues today. However, food security throughout Alaska is an increasing concern, and reduced access to marine harvests have put strain on many communities who depend upon subsistence harvests and local food availability. Mariculture presents an opportunity for Indigenous communities to strengthen food sovereignty and security, support local economies, and maintain their cultural connection to the ocean. There are many organizations championing and investing in Indigenous-led mariculture throughout Alaska, including: EcoTrust (Kake), Native Conservancy (Eyak-Cordova), Metlakatla Indian Community, and Aluutiq Pride Marine Institute (South Central).

The importance of Alaska Native involvement in developing Alaska's burgeoning mariculture industry is supported by the 2018 Alaska Mariculture Development Plan, which establishes Alaska Native participation and leadership as one its founding principles.

"The Plan promotes mariculture success through Alaska Native participation. Mariculture development will benefit from the participation of Alaska Natives in every element of the process, utilizing local and traditional knowledge in the siting of farms, accessing programs and funding sources geared towards economic and workforce development, and supporting appropriate development on Native owned lands."

-Alaska Mariculture Development Plan, 2018

TNC SOAR grantee: Kodiak Ocean Bounty

Erik O'Brien, raised in the village of Larsen Bay 60 miles southwest of Kodiak, understands the challenges of sustaining small marine economies and creating job opportunities in rural communities. Building on the family fishing business and a career in community development, O'Brien founded Kodiak Ocean Bounty to generate sustainable local, year-round jobs and infrastructure by anchoring farming resources in the village. In 2023, Kodiak Ocean Bounty planted four million oysters, marketing them as a premium, sustainable product through a shellfish cooperative based in Homer, Alaska.

With support from a TNC SOAR grant, O'Brien is expanding his vision for Larsen Bay by focusing on cultivating lower-trophic aquatic species, such as algae, oysters, and kelp, in a laboratory setting. These efforts aim to restore and enhance habitats vital to both subsistence and commercial species. This project leverages the development of an algae lab and oyster hatchery in the Tribal Building, the old school which closed due to low attendance, supplying the tribally-owned FLUPSY nursery in the City Harbor with millions of locally-grown oysters, anchoring the seed supply and reducing risks to new businesses to ensure value stays in the village.

The proposed activities will enhance tribal capacity to lead habitat restoration and ecosystem management. By integrating mariculture into a tribally owned laboratory and deploying it at a local farm site, the project will create sustainable jobs for the community while fostering environmental stewardship. As one of Larsen Bay's few year-round employers, Kodiak Ocean Bounty plays a critical role in the local economy, providing meaningful work for part-time farmers and laboratory staff. Through infrastructure investment and a commitment to aquaculture, O'Brien envisions not only strengthening the village's economic foundation but also encouraging displaced residents to return and rebuild their connection to Larsen Bay.

Community wellbeing

A thriving mariculture industry in Alaska must be built on principles that prioritize community well-being, food sovereignty, and cultural sustainability. Dr. Rachel Donkersloot's well-being framework, originally developed for Alaska salmon fisheries, emphasizes that well-being is multidimensional and encompasses not just economic success but also ecological health, cultural practices, and a self-defined quality of life for individuals and communities.[8] Similarly, Sugaq Harmony Jade Wayner's research extends this framework to Indigenous food systems, highlighting the intrinsic connection between food sovereignty and well-being.[9]

As the mariculture industry rapidly expands, Alaska's public agencies and lawmakers have the opportunity and responsibility to integrate these principles from the outset. Ensuring that mariculture permits remain in the hands of local residents, particularly Indigenous communities, will help maintain equitable access to resources and support long-term sustainability. Additionally, adopting a holistic well-being framework that considers metrics beyond market value to include cultural and ecological priorities, Alaska can develop a mariculture industry that truly benefits its coastal communities for generations to come.

[8] (Donkersloot 2020)
[9] (Wayner 2022)

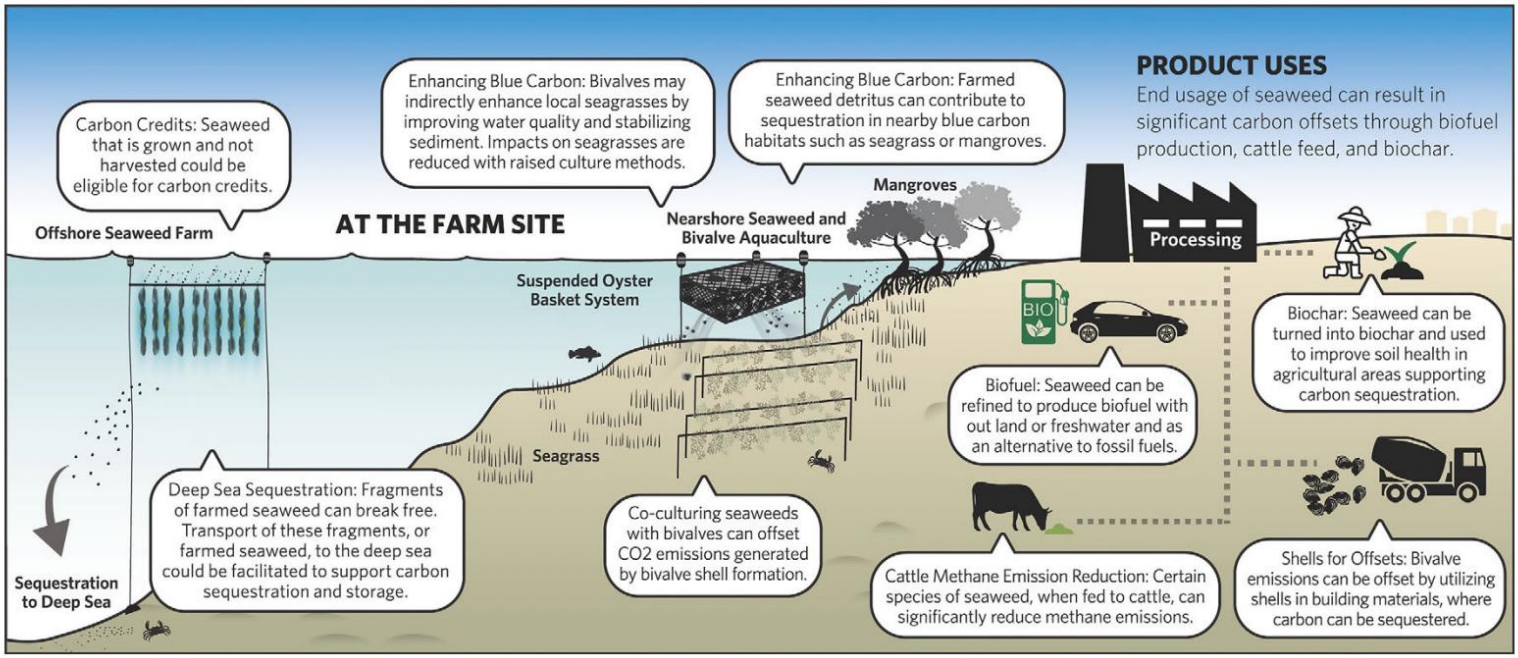

Figure 11. Potential pathways for greenhouse gas offsets, carbon storage, and sequestration from seaweed and bivalve mariculture (Jones et al. 2022).

Environmental benefits

There are multiple potential pathways via mariculture that can contribute to greenhouse gas offsets, carbon storage, and carbon sequestration (Figure 11). As a food source, seaweed and bivalve farming requires no land or freshwater to grow and emits negligible greenhouse gases in the growing stages. While global food production accounts for 80% of land degradation, 70% of freshwater use, and 33% of greenhouse gas emissions, mariculture offers a low-impact alternative to traditionally farmed foods. Seaweed aquaculture in particular presents opportunities for environmental benefits including carbon mitigation, but the amount of carbon sequestration varies based on context-dependent factors such as species, sediment type under the farm, and location.[10] Farmed seaweed's sequestration potential also depends on biomass fate—whether it sinks to deep-sea sediments or is used as a replacement for a high-emission product (such as cattle feed, bioplastics, or

Carbon crediting

The Nature Conservancy and Bain recently conducted an analysis of carbon crediting as an economic pathway to grow the global seaweed farming industry and support farmer livelihoods. While data indicates that seaweed farms do sequester some carbon in many cases, carbon crediting is unlikely to increase industry development and farmer incomes under current market conditions at this time as sequestration rates and credit prices are too low to incentivize growth, especially after factoring in additionality and discounts. It is worth noting that Alaska State Senate Bill 48, passed May 2023, allows the State of Alaska to establish a carbon offset program, which does include a potential carbon credit mechanism for kelp farming.

[10] (Fujita 2022)

biostimulants). To calculate for these variables, TNC and Scitech Environmental Consulting released a regional blue carbon seaweed services model, the first of its kind, that allows users to enter seaweed farm and product information to estimate kelp production, associated farm emissions, the potential for in-water marine carbon sequestration and nutrient removal, and the amount of carbon emissions avoided through chosen seaweed replacement products. The model shows how farming seaweed can help with carbon emissions reductions goals when used as a replacement for more carbon-intensive products, depending on market prices and demand.

A report recently published by TNC and Bain & Company identifies bioplastics and biostimulants as two of the most promising markets to drive demand over the next five to ten years while simultaneously reducing greenhouse gas emissions. Several projects have recently been funded across Alaska to develop biostimulant studies, and The Nature Conservancy is working with partners across the globe to better understand the potential mechanisms of a seaweed biostimulant market.

Water quality benefits

It is well documented that both oysters and seaweeds can remove significant amounts of nitrogen and phosphorous from the marine environment,[11][12] which can assist with decreasing nutrient loading in eutrophic areas. While seaweed's ability to buffer against ocean acidification is site-specific, co-culturing seaweed with shellfish could help counteract localized acidification impacts (Figure 11).

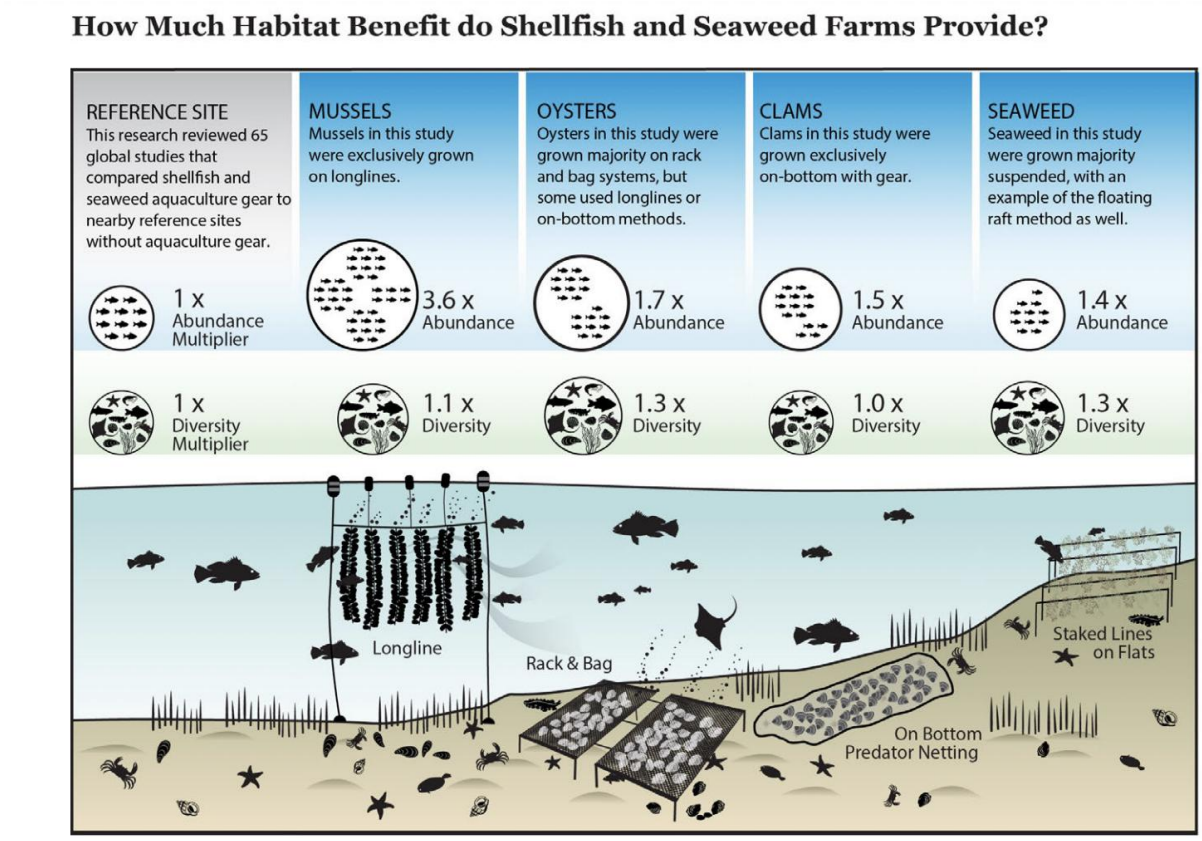

Figure 12. An illustration of the habitat benefits offered by shellfish and seaweed farms. Adapted from Theuerkauf et al. (2021).

[11] (M. Lisa Kellogg 2018)
[12] (Phoebe Racine 2021)

A key principle of restorative aquaculture is to strategically locate farms in areas where they can provide the greatest environmental benefits—for example, siting them in coastal bays and estuaries with high nutrient pollution to help improve water quality.

Habitat benefits and wild species

A global review led by The Nature Conservancy, in collaboration with multiple universities, analyzed 65 studies and found that farms cultivating mussels, oysters, clams, and seaweed generally support greater abundance of fish and invertebrates compared to nearby non-farmed sites. This suggests that restorative aquaculture can enhance local biodiversity when thoughtfully implemented (supported by Figure 12). Localized studies can help identify specific impacts of mariculture sites and wild species.

In Alaska, NOAA scientist Dr. Alix Laferriere recently launched a research project to investigate whether seaweed farms can serve as habitat for native fish species. Her team is comparing fish populations found within a kelp farm to those in natural kelp beds to better understand potential ecological benefits. Notably, Alaska Sea Grant fellow Emily Reynolds recently conducted a study examining the effects of oyster farming on sea otters and found no significant differences in their activity or foraging behavior in areas with farms compared to those without.[13]

Alaskan Kelp Beds

According to NOAA, unlike the declining kelp forests observed at lower latitudes, the kelp ecosystems fringing the Gulf of Alaska have remained relatively stable—and in some cases, have even expanded—over the past century. However, these patterns vary by species and location. The potential for kelp bed restoration in Alaska remains uncertain, as ecological, legal, and financial conditions differ significantly from regions where restoration is more immediately needed. Understanding these regional differences is essential to determining whether restoration efforts in Alaska are necessary or feasible.

[13] (Reynolds 2024)

Challenges

Fragmented markets

The seaweed industry in Alaska faces considerable hurdles, primarily due to the absence of strong consumer demand and a cohesive market strategy. Although kelp is often promoted for its vast ecological and economic potential, this potential remains largely unrealized in Alaska as the industry is still in its early stages.

One of the primary obstacles to growth is the lack of mature domestic markets. Without established processing infrastructure or a consistent customer base, producers struggle to scale operations efficiently. Market fragmentation further compounds this issue. There is little agreement on product specifications, end-use formats, or quality standards, making it difficult to streamline production or secure long-term buyers. This creates a classic "chicken-and-egg" problem: processors and consumers hesitate to invest without consistent supply, while farmers are hesitant to expand production without guaranteed demand.

To overcome these barriers, a consolidated effort is required to clearly define product types, target markets, and value-added opportunities. Organizations such as the Alaska Mariculture Alliance (AMA), the Alaska Mariculture Cluster (AMC), and The Nature Conservancy (TNC) are actively working to address these foundational gaps by supporting workforce training, conducting market research, and developing infrastructure and business planning resources.

Without this strategic alignment, Alaska's seaweed industry risks remaining stuck in its pilot phase—rich in potential but constrained by fragmented supply chains and unclear market signals. However, with coordinated investment and policy support, the state could carve out a meaningful role in the expanding global seaweed economy.

Alaska's size: processing and transport

Alaska's vast and remote geography presents significant challenges for farmers, particularly in transportation and processing. With over 70% of Alaska's population living along the coastline, yet fewer than 10% of coastal communities connected by road, most rely on boats or planes for access. This remoteness leads to high costs for power and transportation, making it difficult for mariculture business ventures to scale efficiently.

Processing infrastructure is another major bottleneck. Most existing seafood processing facilities are designed for fish, not seaweed, and many are hesitant to accommodate kelp due to concerns about contamination or production conflicts. In Cordova, for example, early kelp farmers had to process by hand because salmon plants were unwilling to risk contamination before the fishing season.

However, recent innovations are beginning to address this issue. Among other creative solutions currently in pilot phases, a $380,000 grant from the Environmental Protection Agency is funding a pilot seaweed-drying project in Cordova that repurposes waste heat from the Cordova Electric Cooperative's diesel generators to power dehydrators. This system could significantly reduce energy costs and, if successful, serve as a replicable model for other remote communities facing similar processing limitations.[14]

High barriers to entry

Despite the growing interest in kelp farming, aspiring producers face substantial barriers to entry. Challenging regulatory hurdles and high permitting fees, combined with the logistical and financial challenges of securing farm infrastructure and acquiring boats, as well as the time needed for locating, harvesting, and transporting wild kelp seed to comply with the 50-50 rule, further complicate the startup process. Another critical constraint is the inconsistent availability of reliable seed (both kelp and oyster) creating supply bottlenecks that can slow the growth of new farms. As the demand for local seed increases, the need for investment in nursery capacity becomes more urgent.

While Alaska currently has a relatively favorable grant landscape for mariculture, many farmers report difficulty identifying and navigating complex application processes. In general, it's widely documented that there are barriers to getting federal dollars to rural communities—limited administrative capacity can make it challenging to take full advantage of available funding opportunities. In this context, nonprofit organizations can play a vital role in bridging capacity gaps, partnering with communities to provide technical assistance, helping farmers apply for grants, and advocating for more accessible funding mechanisms, and translating existing resources into practical, on-the-ground support for Alaska's mariculture sector.

[14] Note: See AFDF report (McKinley Research Group 2022) for full processing location suitability analysis.

Conclusion

Alaska's mariculture industry holds immense potential to drive economic growth in Alaska's coastal communities, support Indigenous food sovereignty, and deliver environmental benefits. Yet, realizing this potential requires overcoming persistent challenges. As the BBBRC EDA grant period draws to a close next year, continued public and private investment in infrastructure and a cohesive market strategy will be essential for building a resilient and scalable industry.

Indigenous leadership and community-based approaches are central to ensuring that growth is both equitable and sustainable. A well-being framework that prioritizes economic stability, environmental health, and community resilience can guide the industry toward long-term success. By investing in workforce development, supporting local capacity, and ensuring fair access to resources, Alaska can cultivate a mariculture sector that strengthens coastal communities while safeguarding ecosystems.

The policy landscape will be pivotal in shaping the industry's future. With bipartisan legislative support and backing from Governor Dunleavy, recent state-level reforms have streamlined permitting, legalized hatcheries, and expanded farming opportunities, laying a solid foundation for future growth. As the industry expands, ongoing collaboration among policymakers, Indigenous leaders, researchers, and industry stakeholders will be critical to refining regulations that balance ecological responsibility with economic viability.

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