

ALASKA MARICULTURE WORKSHOP SUMMARY

January 21st – 22nd, 2020
Ketchikan, Alaska



NOAA
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Alaska Mariculture Workshop

Workshop Summary NOAA Fisheries Alaska Regional Office

National Marine Fisheries Service and Pacific States Marine Fisheries Commission,
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EXECUTIVE SUMMARY

Mariculture—considered in the State of Alaska to be the enhancement, restoration, and farming of shellfish and seaweed—is a burgeoning industry in this region of the United States. The Alaska Mariculture Task Force (Task Force) established a goal of developing a \$100 million industry in 20 years and outlined recommendations to achieve this goal in the 2018 [Mariculture Development Plan](#) (Development Plan). To help Alaskans advance towards this ambitious goal, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) and Pacific States Marine Fisheries Commission (PSMFC) convened a multi-day workshop with more than 60 mariculture development stakeholders to identify needs and challenges facing the industry, and explore opportunities for coordination and leadership in the areas of research, policy and permitting, and access to capital.

The workshop included a wide range of informational presentations and created a collaborative planning environment for mariculture proponents from across the state. Participants explored challenges in the areas of policy and permitting, brainstormed how to build capacity of hatchery and nursery operations, discussed a research framework, and learned about a new mariculture mapping tool. Several priority action areas emerged over the course of two days, as well as a vision of what research and development of the industry will look like in the years ahead. The workshop concluded with a group discussion of key takeaway messages and emerging considerations that will guide future collaboration across agencies and with industry practitioners and experts.

This workshop summary provides an overview of shared informational presentations and both small and large group discussion outputs. Building on the foundational work of the Development Plan, the outputs described below will inform and help facilitate important steps forward as mariculture continues to develop and expand its reach in Alaskan waters.

This workshop was hosted by the NOAA Fisheries Office of Aquaculture and the Pacific States Marine Fisheries Commission

OFFICE OF AQUACULTURE
NOAA's Office of Aquaculture supports the development of sustainable aquaculture in the United States. Its work focuses on regulation and policy, science and research, outreach and education, and international activities.

ALASKA REGIONAL OFFICE
NOAA Fisheries Alaska Regional Office promotes science-based stewardship of Alaska's marine resources and their habitats in the Gulf of Alaska, eastern Bering Sea, and Arctic oceans.

PACIFIC STATES MARINE FISHERIES COMMISSION
PSMFC promotes and supports policies and actions to conserve, develop, and manage fishery resources in California, Oregon, Washington, Idaho and Alaska.

References:

Alaska Mariculture Development Plan, published March 23, 2018, by Alaska Mariculture Task Force.

Five-Year Action Plan, published January, 20, 2020, by the Alaska Mariculture Task Force.

Sea Grant Association. 2016. NOAA Sea Grant 10-Year Aquaculture Vision. MASGP-16-015.



BACKGROUND

Due to increasing demand for seafood worldwide, growing more seafood domestically in the United States represents a tremendous opportunity. In Alaska, finfish farming is prohibited, but mariculture—seen as the enhancement, restoration, and farming of marine invertebrates (primarily shellfish) and macroalgae (seaweed)—is permissible in state waters. In 2016, Governor Bill Walker established the Task Force through Administrative Order 280 to develop a comprehensive plan to guide 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. The Task Force developed the Mariculture Development Plan, which puts forward an ambitious goal of growing a \$100 million mariculture industry in 20 years.

Published in 2018, the Development Plan identifies challenges and barriers to mariculture development in the areas of hatchery production, investment, regulations, research and development, coordination and leadership, workforce needs, marketing, and public education. The Development Plan includes detailed recommendations for achieving the full potential of the mariculture development opportunities facing Alaska. In order to focus on the near-term priorities, the Task Force completed a Five-Year Action Plan in December, 2019.

Reflecting on the importance of federal support the Development Plan recommended that NOAA Fisheries hire an Aquaculture Coordinator in the Alaska Region to provide leadership, coordination and support at the federal level for mariculture endeavors in the state. NOAA Fisheries addressed this recommendation by hiring a coordinator in November 2019. Shortly after taking this important early step, NOAA Fisheries convened this workshop to better understand how to best support required research, streamline interagency permitting requirements, identify funding opportunities, and provide information to state and federal regulators to inform and support effective decision-making.

WORKSHOP OBJECTIVES

This two-day workshop brought together an array of Alaska mariculture stakeholders—industry, tribes, communities, hatcheries, non-governmental organizations, policy makers, regulators, and researchers—to advance the following objectives:

- Share NOAA's commitment to promoting aquaculture nationally, listen to the needs and desires of the Alaska region, and promote future partnerships
- Discuss and identify needs related to research, policy and permitting, and access to capital
- Explore key elements of the Alaska Mariculture Development Plan to map out and facilitate critical next steps
- Lay a foundation for achieving the statewide goal of building a \$100 million mariculture industry in 20 years

Throughout the workshop, participants learned from a wide range of informational presentations, engaged in collaborative small group discussions, and discussed previously identified and emerging opportunities and challenges. Participants built off the Development Plan, and over the course of two days engaged in conversations focused on improving regional coordination and communication among all stakeholders, enhancing research and capacity, and ultimately advancing development of the Alaska mariculture industry.



WORKSHOP PRESENTATIONS AND INTERACTIVE DISCUSSIONS



Key NOAA Fisheries staff provided introductory remarks. Julie Scheurer, NOAA Fisheries Alaska Regional Office, Protected Resources Division, described the workshop rationale, emphasized the NOAA Fisheries commitment to promoting aquaculture in U.S. waters, and commended the spirit of cooperation among the workshop steering committee and all participants in attendance. She recognized the work of the Task Force and described the Mariculture Development Plan as a foundational document that would inform collaborative discussions on multiple topics held over the course of the workshop.

Jim Balsiger, Regional Administrator, NOAA Fisheries Alaska Regional Office, also emphasized NOAA's interest to support sustainable aquaculture nationally, calling it the “blue economy” of the future. He introduced Alicia Bishop, the new Aquaculture Coordinator for the Alaska Region. During the first presentations, Alicia partnered with Dave O'Brien, Acting Director of the NOAA Fisheries Office of Aquaculture, to highlight the federal government's priorities and growing commitment to support mariculture development in Alaska.

Keolani Booth, a Tsimshian from the Metlakatla Indian Community, gave thanks and an acknowledgment to the indigenous peoples of the land where the workshop was taking place. He offered a description of the Tlingit, Tsimshian, and Haida Nation existing as three separate and distinct indigenous peoples living in this place since time immemorial, recollecting how they kept a balance in nature so that future generations could continue to live with and from the land and sea. This shared history, he noted, should serve as a reminder that together Alaskans can accomplish great things if everyone stands united.

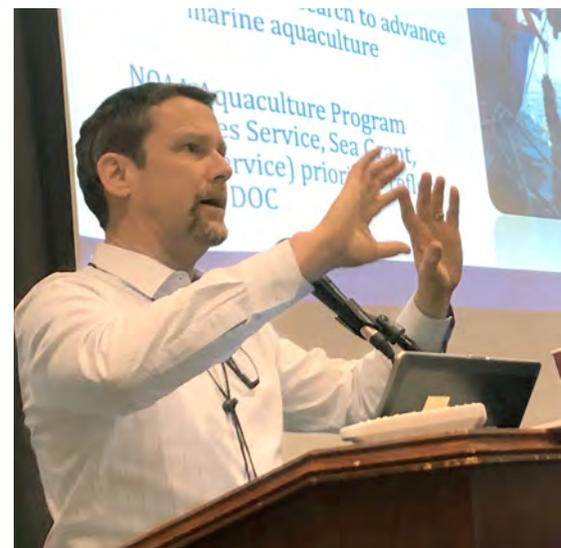
OVERVIEW OF FEDERAL AND STATEWIDE AQUACULTURE

Opening presentations by Dave O'Brien and Alicia Bishop (NOAA Fisheries) and Julie Decker (Mariculture Task Force) focused on national and statewide priorities for aquaculture development with a view towards future prospects in the Alaska region. These presentations laid the foundation for the workshop's subsequent sessions and collaborative discussions.

NOAA's Aquaculture Program

Dave O'Brien, NOAA Fisheries Office of Aquaculture

Mr. O'Brien reviewed Department of Commerce and NOAA Fisheries priorities related to increasing U.S. aquaculture production, including support of research, grant funding to advance initiatives, and streamlining interagency permitting requirements. He introduced the National Science and Technology Council Subcommittee on Aquaculture as the federal interagency coordinating group for research, regulation, technology transfer, and assistance programs. He also described the Advancing Quality and Understanding of American Aquaculture Act, which aims to integrate aquaculture regulations previously embedded in the Magnuson-Stevenson Fishery Conservation and Management Act. Lastly, Mr. O'Brien described the concept of Aquaculture Management Areas, a zoning concept that couples spatial planning with frontloaded environmental analyses to facilitate permit reviews.



Alaska Mariculture Initiative: Phase 2

Julie Decker, Alaska Fisheries Development Foundation/Mariculture Task Force

Ms. Decker presented a brief history of the Alaska Mariculture Initiative, spearheaded by the Alaska Fisheries Development Foundation (AFDF), and the resulting establishment of the Task Force. Per Administrative Order, the Task Force's directive is to make recommendations to present to the Governor by May 1, 2021, along with a report describing progress toward the goal to grow a \$100 million mariculture industry in 20 years. As part of its iterative planning process, the Task Force considered the Alaska Shellfish Farm Size Feasibility Study, and commissioned a set of case studies and economic analyses to inform development of the Mariculture Development Plan. Ms. Decker then introduced a companion document, the Task Force Five-Year Action Plan, completed in December 2019, that describes immediate, near-term action items that the Task Force prioritized for reaching the industry's growth goal. Ms. Decker expressed enthusiasm for the burgeoning mariculture industry, citing recent increases in state aquatic farming lease applications and the number of applicants for seaweed farm training funded by NOAA Fisheries and being offered through a collaboration which includes AFDF, GreenWave, OceansAlaska, Blue Evolution, Alaska Longline Fishermen's Association, Alaska Sea Grant, Alaska Marine Safety Education Association, and state agencies.

National Marine Fisheries Service Regional Priorities

Alicia Bishop, NOAA Fisheries, Alaska Regional Office

NOAA Fisheries recently hired Ms. Bishop as the Alaska Regional Aquaculture Coordinator. As this is a new position, she took the opportunity to introduce herself to workshop participants, provide a brief professional and personal background on her prior work experience, and identified how the Alaska Strategic Plan drew from NOAA Fisheries national aquaculture priorities, thereby providing regional focus. She described several ways in which NOAA Fisheries, and her role specifically, may support the industry, such as:

- Help form state/federal and public/private partnerships
- Act as liaison between the NOAA Fisheries Office of Aquaculture, Alaska Fisheries Science Center, and the Alaska Regional Office
- Support cutting edge research to develop and implement aquaculture strategies
- Develop mapping tools
- Create consultation efficiencies related to the Endangered Species Act (ESA) and Essential Fish Habit (EFH)
- Provide and support mariculture outreach and education
- Disseminate best available science
- Help identify and share information about potential funding opportunities



OVERVIEW OF STATE AND FEDERAL AQUACULTURE PERMITTING PROCESSES

Collectively, the following six presentations provided an overview of various state and federal aquaculture permitting requirements and processes. Agency presenters identified ways they are actively working to improve their respective processes, discussed remaining challenges, and suggested opportunities to further improve permitting processes. At the culmination of this session, lessons learned on this topic were shared from the State of Washington.



Alaska Department of Natural Resources Aquatic Farm Program: Aquatic Farm Site Leases for Commercial Shellfish or Aquatic Plant Farm Sites on State Tide and Submerged Land

Andrew Miller, Alaska Department of Natural Resources

Mr. Miller reviewed leasing requirements and application fees for farm sites in state waters. Requirements include a farm site development plan, Alaska business license, insurance, bonding, and various authorizations from agencies. He next outlined the leasing process and what an applicant can expect to experience from a pre-application meeting with agency staff, through application development, review period, decision-making, public review and appeal periods. Lastly, Mr. Miller described efforts the Alaska Department of Natural Resources is making to improve the policy and leasing process in order to make the experience less onerous for applicants, including taking several actions identified in the Task Force Five-Year Action Plan.

Understanding Aquatic Farming: Alaska Department of Fish and Game Permitting

Sam Rabung, Alaska Department of Fish and Game

The Alaska Department of Fish and Game (ADF&G) permits and regulates aquatic farming in a manner that ensures protection of the environment and natural resources, while aiming to improve Alaska's economy and avoid conflict with existing fisheries uses. Mr. Rabung displayed a chart identifying the major state, federal, and local authorizations required for permitting mariculture operations, and then discussed ADF&G's authorizations including: aquatic farming operations permits, stock transport permits, and stock acquisition permits. Mr. Rabung recognized that the permitting process can be complex and onerous, and noted that ADF&G is implementing improvements to policy and permitting. These improvements include updating forms, online application tools, and providing training presentations and assistance to applicants. He invited workshop participants to provide feedback on additional ways ADF&G can help streamline the permitting process.

Shellfish Permitting Requirements and Process: Alaska Department of Environmental Conservation

Kimberly Stryker and Carol Brady, Alaska Department of Environmental Conservation

Ms. Stryker and Ms. Brady described the Alaska Department of Environmental Conservation (DEC) role is maintaining food safety and sanitation. The DEC establishes and enforces shellfish sanitation standards, inspects product, investigates illness, provides education and outreach, and issues certain types of shellfish permits (e.g., permits for shellfish dealers, harvesters, and dive vessels). Following Ms. Brady's review of the permitting process and applicable regulations, Ms. Stryker shared information on the National Shellfish Sanitation Program (NSSP) and noted the many state and federal partners in this program. NSSP promotes and improves sanitation of shellfish that move via interstate commerce through cooperation and uniformity of state programs. She explained how the NSSP regularly updates the NSSP Model Ordinance for shellfish sanitation requirements, which Alaska adopts by reference and demonstrates compliance to the Food and Drug Administration. Ms. Stryker outlined associated permitting fees, noting that while fees are currently low, the governor's office has proposed reducing state funding to analyze samples, shifting those costs to industry.

US Army Corps of Engineers Permitting of Aquaculture Projects: Building and Preserving Alaska's Future

Roberta Budnick, U.S. Army Corps of Engineers

Ms. Budnick reviewed the US Army Corps of Engineers (USACE) regulatory jurisdiction for permitting per Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, and reviewed three types of permits the USACE issues. These include Nationwide Permits (NWP), such as NWP 48 for commercial shellfish aquaculture activities, letters of permission, and individual permits. She noted that NWP 48 covers shellfish only, and is not applicable to kelp farming. She also described related legislation, and associated compliance issues, when determining permit issuance. She briefly reviewed compliance associated with the National Historic Preservation Act, Magnuson-Stevens Fishery Conservation and Management Act, and Endangered Species Act. Finally, Ms. Budnick explained how USACE previously issued a general permit for aquaculture in Alaska that is now expired and may not be reissued unless there is a demonstrated need for doing so.

National Marine Fisheries Service: Endangered Species Act and Essential Fish Habitat Consultation Overview

Alicia Bishop, NOAA Fisheries, Alaska Regional Office

Ms. Bishop described common stressors on endangered species from aquatic farming, and Endangered Species Act (ESA) standard mitigation measures. She explained that if a proposed mariculture operation may affect an ESA-listed species or critical habit, the action agency is required to conduct either a formal or informal consultation with NMFS and/or USFWS (ESA Section 7(a)(2)). NMFS has efficiencies in place to streamline their ESA Section 7 consultation processes, including expedited letters of concurrence, batched consultations, and programmatic consultations. Ms. Bishop also described Essential Fish Habitat (EFH) requirements to consult, and reviewed example conservation recommendations to minimize adverse impacts. Online mapping tools for ESA and EFH distribution are available to help applicants meet consultation requirements.

Washington Shellfish Interagency Permitting Team

Laura Hoberecht, NOAA Fisheries, Alaska Fisheries Science Center

Ms. Hoberecht provided perspective, lessons learned, and knowledge-exchange on permitting shellfish operations from the State of Washington, learned through her experience as a member of the Washington Shellfish Interagency Permitting (SIP) Team and former NOAA Fisheries Regional Aquaculture Coordinator for Oregon and Washington. SIP formed in 2011 and includes participants from tribes, local government, state and federal agencies. SIP collaborates in order to develop consistent processes that improve timeliness of permit decisions while simultaneously ensuring regulatory compliance. Ms. Hoberecht described several products developed by the SIP team in support of this goal, including similar examples to those developed by the Alaska Mariculture Task Force. She shared ten recommendations that may help Alaskans improve their permitting processes. Ms. Hoberecht concluded by emphasizing the importance of taking a solutions-oriented approach and continually building trust with all parties involved.



INTERACTIVE SESSION: Assessment of Policy and Permitting Needs, Priorities, and Next Steps for Aquaculture Development in Alaskan Waters



Following the permitting presentations, workshop participants gathered in small groups to further explore policy and permitting needs, priorities, and next steps driving mariculture development in Alaska waters. The groups referenced, and in their discussion built upon, both shared presentation information and prior Task Force work. Excerpts from the Task Force Five-Year Action Plan, particularly recommendations linked to policy and permitting, were provided to each small group for reference. The following priority Task Force actions were highlighted in the reference document: revise the aquatic farm application, reduce the application backlog and provide a web-based information clearing house.

Each small group explored the questions below and then provided brief report backs to the full group. Key outputs included the following (see Appendix III for full small group outputs):

What are the most significant challenges in the state or federal permitting process that would benefit from immediate attention?

- Permit renewal process should be easier
- Need an electronic application system/process wherein applicants can check and receive updates on the status of their application as it undergoes review
- No existing database among all permitting agencies to help streamline application processes and reduce backlog
- Lack of flexibility to account for frequent, necessary lease modifications
- Industry cannot currently explore:
 - Short-term and experimental leases
 - Site-suitability permits
 - Species specific applications
 - Subleasing under existing leases
- Need mapping tools that identify existing operations, tidal upland owners, etc.
- Need to ensure tribal input is incorporated into applications and review processes
- Lack of coordination between permitting agencies

What else may be needed in the area of policy and/or permitting to advance sustainable mariculture in Alaska?

- Pre-approved sites where operations can develop
- Review of certain permit requirements to ensure said requirements are purposeful
- An online portal that enables industry to have all permits, pay fees, track progress etc.
- Flexibility to allow for industry innovation
- Trainings/mentorship programs that help applicants navigate the application process
- Funding for Paralytic Shellfish Poison (PSP) testing
- Better access to water quality and nutrient information
- More research and science to support industry innovation
- Improved sales and marketing of consumer products
- Industry standards with developed best management practices



Do you know of any examples from other places that may offer lessons learned for Alaska?

- Maine: Tiered permitting for experimental leases
- Washington: Provides formal and informal guidance for navigating permit process
- Washington: Online application system
- New Zealand: Great coordination with indigenous tribes
- Iceland: Iceland Ocean Cluster provides leadership in development
- Japan: Aquaculture farming cooperatives

Tribal and Community Engagement

*Markos Scheer, Seagrove Kelp Company, Premium Aquatics
Ed Douville, Shaan Seet (Craig), Mariculture Task Force*

Mr. Scheer and Mr. Douville shared their respective experiences establishing mariculture operations, and discussed best practices for conducting tribal and community engagement. Mr. Douville manages five different businesses for the Shaan-Seet Corporation on Prince of Wales Island. He shared the community's desire to focus on stewardship of the environment while simultaneously providing economic growth for the area. Shaan Seet is interested to provide the infrastructure but not run the business operations. Expansion of mariculture operations in Shaan Seet, later discussed by Mr. Scheer, may provide employment for as many as 40 persons. If proof of concept is demonstrated, many people in the community have expressed interest and see great potential in the future of mariculture. Shaan-Seet envisions support for mariculture through infrastructure development such as providing upland leases, access to roads and access to power.

Mr. Scheer runs a kelp farm, the largest in the state, on Prince of Wales Island, and also leases a nursery facility from OceansAlaska in Ketchikan. He shared his experience navigating the permit application process for operations established approximately six miles south of Craig. Mr. Scheer recommended communicating early and often with local communities. He conducted a significant amount of voluntary outreach to the community, including local municipalities, tribes, village corporations, and the chamber, to provide an opportunity to have authentic dialogue about proposed mariculture operations.

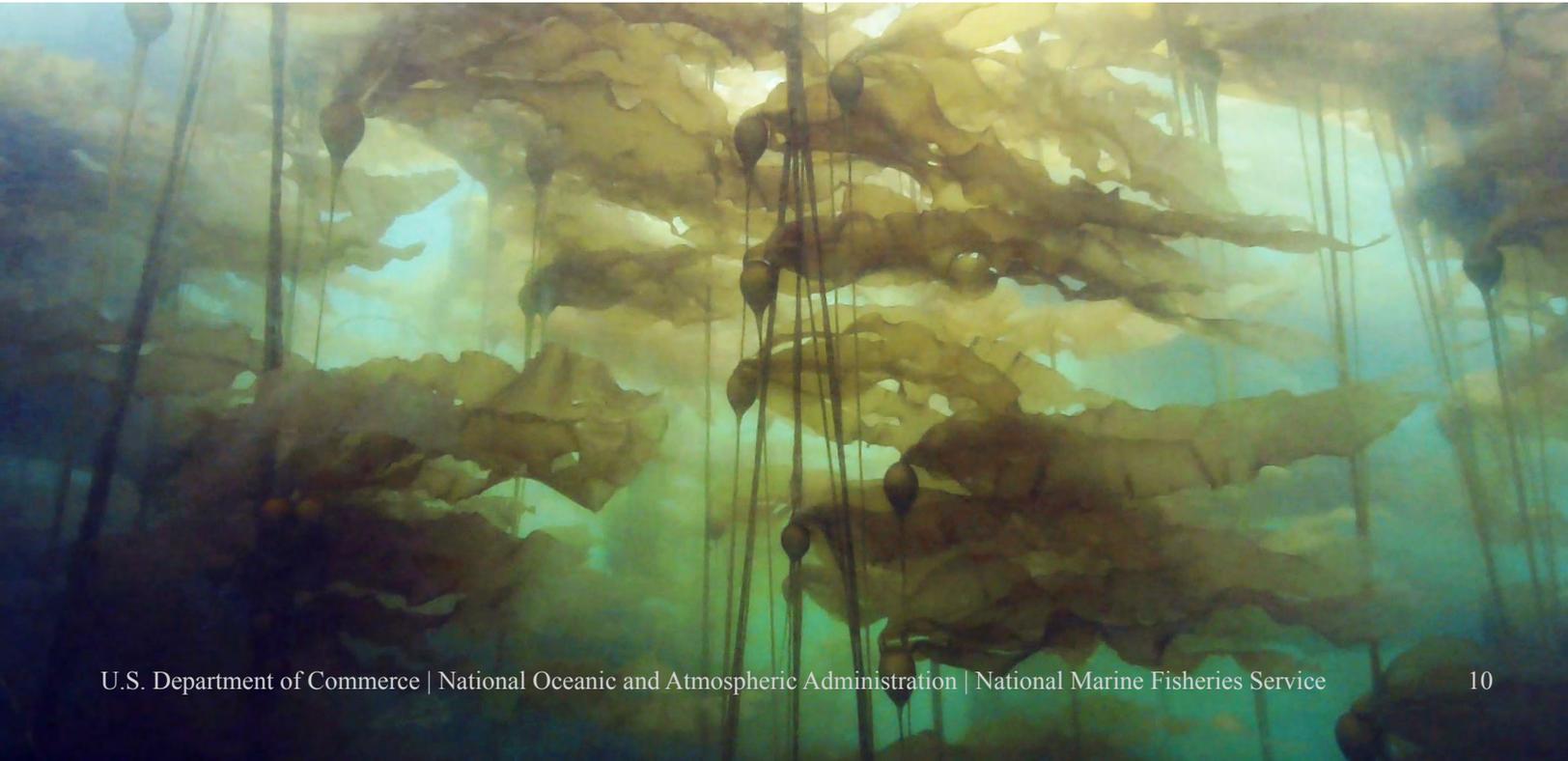
While there is an element of education and information in all outreach, these community meetings provided space for local residents to express concerns, talk about potential conflicts to local uses, and share ideas.

Mr. Scheer emphasized the importance of transparency, particularly as it relates to what a developer hopes to achieve with proposed operations. As a result of his efforts to engage with the local community, no opposition was raised during the public comment period to his farmsite lease application. Additionally, these discussions informed a redrawing of farm configurations to allow them to operate in harmony with existing fishing operations. Both Mr. Scheer and Mr. Douville discussed the importance of permitting agencies demonstrating a willingness to participate in continuous open dialogue with the applicant, which helps, they emphasized, to generate a spirit of cooperation among all parties.

Alaska Mariculture Map [Prototype] *Stacey Buckelew and Trevor Golden, Axiom Data Science*

Ms. Buckelew and Mr. Golden shared how Axiom Data Science generates data products and decision support tools that help mariculture stakeholders make informed decisions related to the siting of new operations. Axiom Data Science is building an online mapping tool and geospatial viewer to inform kelp and shellfish mariculture planning and permitting in Alaska. Ms. Buckelew showed and described to workshop participants the current prototype version of the online Alaska Mariculture Map. The platform is built on the Alaska Ocean Observing System in order to take advantage of existing capabilities and access real-time quality checked data streams. The next phase of project development will involve work to more clearly define the user audience and understand their needs, distill user needs into functional capabilities, access additional data sets to meet these needs, adjust the tool's design and then assign a release date.

Mr. Golden conducted a live demonstration of the prototype version of the online tool by walking through an interactive exercise worksheet with participants. Some back and forth discussion of current or anticipated advanced functionalities occurred. Participants then considered the four primary user types of this tool. These included mariculture permit applicants, mariculture operators, resource managers/permit regulators, and researchers/program managers. Feedback from workshop attendees on how mariculture developers and other interested parties will use the tool, as well as desired functionality and capability, is listed in Appendix III.





WATER COVE LODGE

NORTH RIVER

CURY

OVERVIEW OF FEDERAL AND STATE LOAN AND GRANT PROGRAMS



This collection of presentations provided an overview of available federal and state loan and grant programs, as well as private equity alternatives, for industry proponents and researchers.

National Sea Grant Aquaculture Portfolio Update

Chuck Weirich, National Sea Grant

Mr. Weirich provided background information on the National Sea Grant program, whose mission is to enhance practical use and conservation of coastal, marine, and Great Lakes resources in order to create a sustainable economy and environment. Sustainable fisheries and aquaculture, he noted, is one of Sea Grant's focus areas. Sea Grant's 10-year vision for aquaculture, published in 2015, outlines several funding mechanisms offered through the network. Moreover, Sea Grant has been supporting aquaculture research and funding for more than 50 years. Mr. Weirich described several examples of projects funded last year, including three based in Alaska.

Federal Funding Opportunities

Jen Hall-Brown, NOAA Fisheries Alaska Region

Ms. Hall-Brown gave a brief description of financial assistance programs run out of NOAA Fisheries, including the Saltonstall-Kennedy Grant Program, Small Business Innovation Research, and the Fisheries Finance Program. For each program she outlined proposal requirements, eligibility, funding announcement schedules, and provided examples of previously funded projects. Federal funding opportunities are available online at www.grants.gov.

Mariculture Revolving Loan Fund

Jim Andersen, Alaska Department of Commerce, Community and Economic Development

The [Mariculture Revolving Loan Fund](#) provides loans for the planning, construction and operation of a mariculture business. Mr. Andersen reviewed general requirements of the loan, loan terms and conditions, application requirements, associated fees and costs. As of December 2019, 10 loans, valued in total at nearly \$1 million, have been awarded, with an \$86,300 average loan size. Mr. Andersen reviewed recent state legislation (HB76) which allows consideration of shellfish or seaweed hatcheries as eligible applicants, and pending legislation authorizing wild shellfish fishery enhancement (HB41/SB22). If HB41/SB22 passes, regulations to implement amendments to the loan fund will be released.

Raising Private Equity: The Seagrove Kelp Company Experience

Markos Sheer, Seagrove Kelp Company

Mr. Scheer related his experience in securing capital for shellfish farming operations in Craig and kelp farm operations in Ketchikan. He has not yet met his \$8 million goal, but has raised several million dollars as of the time of the workshop. He described the challenges of securing loans for a startup company, due in part to the inability to show previous experience in a new industry and to meet in-state resident employee requirements, as well as the need to produce collateral. Eventually he secured private equity start-up funds, which took about two years. He emphasized that raising funds as expeditiously as possible is a critical element of successful mariculture development.



BUILDING HATCHERY AND NURSERY CAPACITY IN ALASKA

Jeff Hetrick, Eric Wyatt, and Beau Perry each gave presentations describing three different hatchery and nursery operations in Alaska. Each explored existing capacity at their respective facilities, and briefly touched on what is needed to support projected growth in demand over the next 10 years.

Alutiiq Pride Shellfish Hatchery, Seward, Alaska

Jeff Hetrick, Alutiiq Pride

Mr. Hetrick oriented attendees to the Alutiiq Pride Shellfish Hatchery by first providing a floor plan of the ~13,000 square foot hatchery, then describing room size and use specifications. The facility has water filtration, sterilization, heating and effluent treatment systems. This enables cultivation of algae, larvae, broodstock of various species of bivalve and crustacean. The facility cultivates red giant sea cucumber (*Apostichopus californicus*), and pinto abalone (*Haliotis kamtschatkana*). Alutiiq Pride has been instrumental in developing and documenting new culture techniques for red king crab (*Paralithodes camtschaticus*), blue king crab (*Paralithodes platypus*), sea cucumber, and geoduck (*Panopea generosa*) in Alaska. The King crab juveniles have been used to complete research related into the effects of ocean acidification on juvenile crab stocks. The hatchery also partnered to restore clam beds important to subsistence users in Southcentral Alaska. Finally, Mr. Hetrick noted, the hatchery conducts water quality monitoring, including ocean acidification testing, and implements other programs on climate change, migratory birds, and food security.

OceansAlaska: Marine Science Center and Shellfish Hatchery, Ketchikan, Alaska

Eric Wyatt, OceansAlaska

Mr. Wyatt shared the story of how OceansAlaska, initially a floating aquarium project, evolved to become a hatchery, demonstration kelp farm, and marine science center. OceansAlaska is now a non-profit organization dedicated to promoting mariculture as an economic driver for Southeast Alaska. The organization's goal is to support wild stock enhancement for geoducks and sea cucumbers, as well as aquatic farming of oysters and kelp by making commercial quantities of seed available to growers. Mr. Wyatt discussed operational challenges and emphasized the importance of having comprehensive protocols and competent, knowledgeable staff in order for operations to be successful.

Blue Evolution, Kodiak, Alaska

Beau Perry, Blue Evolution

Blue Evolution is a full cycle commercial seaweed farm and food products business with locations in Kodiak, Alaska, and Ensenada, Baja California. Mr. Perry discussed the history of Blue Evolution's hatchery, farm and food processing operations in Alaska, and explained their vertical integration business model, and how all operations are conducted in-house. He reviewed various elements of these operations, including research and development, hatchery/seed production, onshore and offshore farms, processing, production of dried and frozen products, food service, consumer products, and sales and marketing. Mr. Perry highlighted what he saw as challenges for hatchery operations, specifically those linked to permitting and regulations, monitoring and data collection, establishment of best practices, and forecasting supply and demand. He encouraged innovation around consumer product development and mariculture technology solutions.



Photo Credit: Jennifer Nu

INTERACTIVE SESSION: Identifying Hatchery and Nursery Capacity Limitations and Exploring Growth Opportunities



Building on the above presentations, participants collaborated in small groups to further identify and explore capacity limitations, needed infrastructure, and growth opportunities facing hatchery and nursery operations. Many ideas that emerged in small group conversations were then shared with the full group (see Appendix III for a comprehensive list of small group outputs).

Challenges or Barriers to Expanding Hatchery and Nursery Operations

- High costs of infrastructure and operations
- Inefficiencies in the organization and workflow between operations and management
- Difficulties acquiring seed stock
- High labor costs and difficulties recruiting talented workers
- Low financial return on investment for hatchery operations
- Lack of space/infrastructure
- Inconsistent demand for seed during early industry development (“chicken or egg”)
- Lack of adequate capital to support operations during early industry development
- Inefficiencies in operating technologies
- Arbitrary or conservative permit requirements
- Gaps in genetic research

Ideas or Opportunities for Overcoming Identified Challenges or Barriers

- Establish seed cooperatives
- Develop operating manuals and best management practice (BMP) documents
- Provide trainings, mentorship programs, and apprenticeships for staff
- Expand Fish Tech program at University of Alaska Southeast to include more topics related to shellfish and seaweed culture
- Diversify seed sources
- Develop an on-call or seasonal labor pool
- Design and establish a “post-hatchery/pre-nursery facility”
- Revise regulations to allow for cultivation of additional species
- Develop portable hatcheries and nurseries
- Funnel public funding to hatchery infrastructure investment and short-term operational support
- Generate positive public relations and marketing for the industry
- Fund research that will inform operational decision making
- Promote research and development
- Establish stronger partnerships between state and federal agencies, industry, non-governmental organizations, academic researchers, tribes and end-product consumers



ADVANCING MARICULTURE RESEARCH IN ALASKA

This suite of presentations explored mariculture research priorities, statewide research programs, collaborative research opportunities, and recent advancements in mariculture research in Alaska.

Alaska National Science View

Mike Rust, NOAA Fisheries Office of Aquaculture

Mr. Rust shared how NOAA will continue to invest in science that supports better decision-making for industry professionals and the regulatory community, including state-led science efforts that commonly also address federal interests. He described the evolving nature of research science, requirements for conducting research (e.g., infrastructure, expertise and funding), and the subsequent challenges of operationalizing information for end-users. NOAA prefers to hire career-term scientists with locally relevant expertise, and the ability to coordinate and communicate with others outside their region.

Alaska Fisheries Science Center Mariculture Research Mission

Bob Foy, NOAA Fisheries, Alaska Fisheries Science Center

Mr. Foy presented on current and future mariculture research at the Alaska Fisheries Science Center (AFSC) and described AFSC facilities and programs. AFSC conducts science associated with sustainable fisheries and could leverage assets at its laboratories in Kodiak, Juneau, and Newport, as well as research sites in Little Port Walter and Auke Creek, to further advance mariculture research. Existing laboratories have temperature and ocean acidification control, and the focus on mariculture, Mr. Foy noted, could be expanded. Current mariculture projects include salmon aquaculture, red and blue king crab culturing, macroalgae seeding, and environmental monitoring. He provided an outline of a draft mariculture strategic plan currently in preparation at AFSC, outlined research initiatives, described AFSC's capacity challenges, and suggested ideas for addressing capacity needs. He emphasized that for research facilities, the question should define the experiment, and not vice versa. Finally, Mr. Foy noted AFSC will be hiring a macroalgae researcher to coordinate their mariculture research and mariculture working group.

Mariculture Task Force Research Priorities and Progress to Date

Mike Stekoll, University of Alaska Southeast

Mr. Stekoll drew attention to the research recommendations in the Mariculture Development Plan. A Research and Development Advisory Committee to the Task Force developed these recommendations, including the priority recommendation to establish a Mariculture Research Center (MRC) at the University of Alaska. The committee recommends modeling the MRC after the Alaska Coastal Rainforest Center and Maine Aquaculture Innovation Center.

A central MRC activity would be to host an annual Research and Development Forum. The MRC could subsequently seek funding to advance research priorities which emerge from this forum and could be carried forward by other entities. Mr. Stekoll pointed to a list of near-term research priorities extracted from Appendix H of the Mariculture Development Plan.

Building Academic Mariculture Research Potential

Ginny Eckert, University of Alaska Fairbanks and Alaska Sea Grant

Alaska Sea Grant, one of 33 Sea Grant programs nationwide, is a state program headquartered at the University of Alaska Fairbanks (UAF). The UAF's College of Fisheries and Ocean Sciences works with Alaska Sea Grant (ASG) to provide education, research, training, and technical assistance for Alaska's seafood industry. Ms. Eckert noted that ASG sponsors many of the workshops offered by the college (e.g., seafood processing, harmful algal blooms), and explained how these events play a key role in recruiting aquaculture talent to Alaska. It is essential, she noted, for ASG to provide services that are responsive to ongoing industry needs.

West Coast Collaborative Research Opportunities

Bobbi Hudson, Pacific Shellfish Institute

The Pacific Shellfish Institute (PSI) is a Washington-based NGO established in 1995 with strong links to the Pacific Coast Shellfish Growers Association. PSI's research and educational activities support sustainable shellfish production and restoration, protect marine ecosystems, reduce user conflicts, and inform coastal planning decisions. Ms. Hudson provided a regional perspective on aquaculture research opportunities and shared several examples of collaborative PSI projects. She attributed the organization's success in part to a high level of industry cooperation, partnerships, and in-kind support.



INTERACTIVE SESSION: Developing a Vision and Future Roadmap for Mariculture Research in Alaska



Participants engaged in a brief exercise to envision what a successful Alaska mariculture industry, supported by a robust research and monitoring program, would look like in 10 years.

Attributes of a Successful Mariculture Industry in 10 Years

- A well-established mariculture research center
- Partnerships, networking among all stakeholders, and collaboration towards a common goal
- Research and development have led to an order of magnitude increase in hatchery production
- Full-time, stable funding for a mariculture specialist staff position at Alaska Sea Grant
- Two-way communication regularly occurs between growers and researchers
- Existing brand recognition for Alaska mariculture products
- Robust research and development program
- Ability to forecast harmful algal blooms and inform industry decisions
- Established pharmaceutical industry partnerships based on kelp's health benefits
- Novel freezing technique for oysters enables barge shipment of product
- Improvements in supply-chain logistics realized
- Species diversification of products allows for year-round market
- On-site monitoring stations exist at every farm
- Efficient regulatory processes
- New product development and successful global marketing
- System to track permit application status in place
- Increase in farm operation efficiencies and lower equipment costs
- Use of alternative energy sources on farms
- Establishment of Alaska oyster broodstock that suits local conditions
- Availability of affordable remote monitoring technologies
- University of Alaska and NOAA provide education and workforce development trainings and other support for industry technicians

With this vision of future success in mind, participants broke into small groups and explored industry growth opportunities across a range of identified capacity development issues and needs. Groups identified next steps in moving topics forward including (see Appendix III for full small group outputs). Next steps include:

Finances/Marketing/Advocacy

- Expand use of Mariculture Revolving Loan Fund and increase corpus fund
- Create new bond pool and insurance pool
- Expand marketing of mariculture products in connection with the tourism industry
- Sponsor ecotourism at farm sites to help fund overhead operational expenses
- Provide financing for mariculture investments via the Alaska Industrial Development and Export Authority

Infrastructure

- Develop in-state seed/juvenile supply
- Establish a Mariculture Research Center
- Mobilize hatchery/nursery facilities (i.e., mobile units) and build shipping container kelp labs
- Develop micro-hatcheries on individual farms
- Support new research and development (e.g., labs, methods, new species)
- Develop regional hatchery production
- Have Fisheries NOAA operate hatcheries and nurseries
- Increase capacity of existing facilities
- Provide support to scale-up beyond small-scale farms
- Build post-hatchery facility
- Build pre-nursery facility

Training and Education

- Expand formal education (i.e., industry training in high schools and universities)
- Host training workshops for hatchery technicians
- Develop mentorship programs for succession planning and transfer of knowledge
- Develop nursery operations training programs at the University of Alaska

Business Models and Partnerships

- Foster cooperative business models with labor pools
- Expand the role of Alaska Sea Grant
- Increase operational efficiencies
- Vertically integrated hatcheries
- Partnerships with NOAA Fisheries, industry, university, and private entities
- Provide more resources for small business
- Technology transfer and access to improved designs



Looking towards the future of the mariculture industry in Alaska, and considering two days of workshop discussions, participants conducted a simple prioritization exercise after which the following top industry growth opportunities emerged (1 = highest priority; 9 = lower but still high priority):

Future Priorities of the Alaska Mariculture Industry

1. Establish a Mariculture Research Center
2. Develop in-state seed and juvenile supply
3. Expand formal education
4. Technology transfer access to improved designs
5. Draft and advocate for supportive state legislation
6. Provide ability for industry to forecast harmful algal blooms (HABs)
7. Develop brand recognition and marketing strategy for products
8. Develop cooperative farm structure and labor pools
9. Hire a full-time, stable funding for a mariculture specialist staff position at Alaska Sea Grant

Following this prioritization exercise, small groups had a brief amount of time to begin action planning centered on the aforementioned priorities. These discussions will no doubt continue and evolve following the workshop (see Appendix III for summary of initial action plan ideas).



KEY TAKE-AWAYS, INSIGHTS AND CONCLUDING REMARKS



At the culmination of the workshop, participants gathered again as a full group to share personal takeaways and insights gained from participating in this event. Individuals from around the room put forward a number of perspectives which inform likely collaborative work ahead.

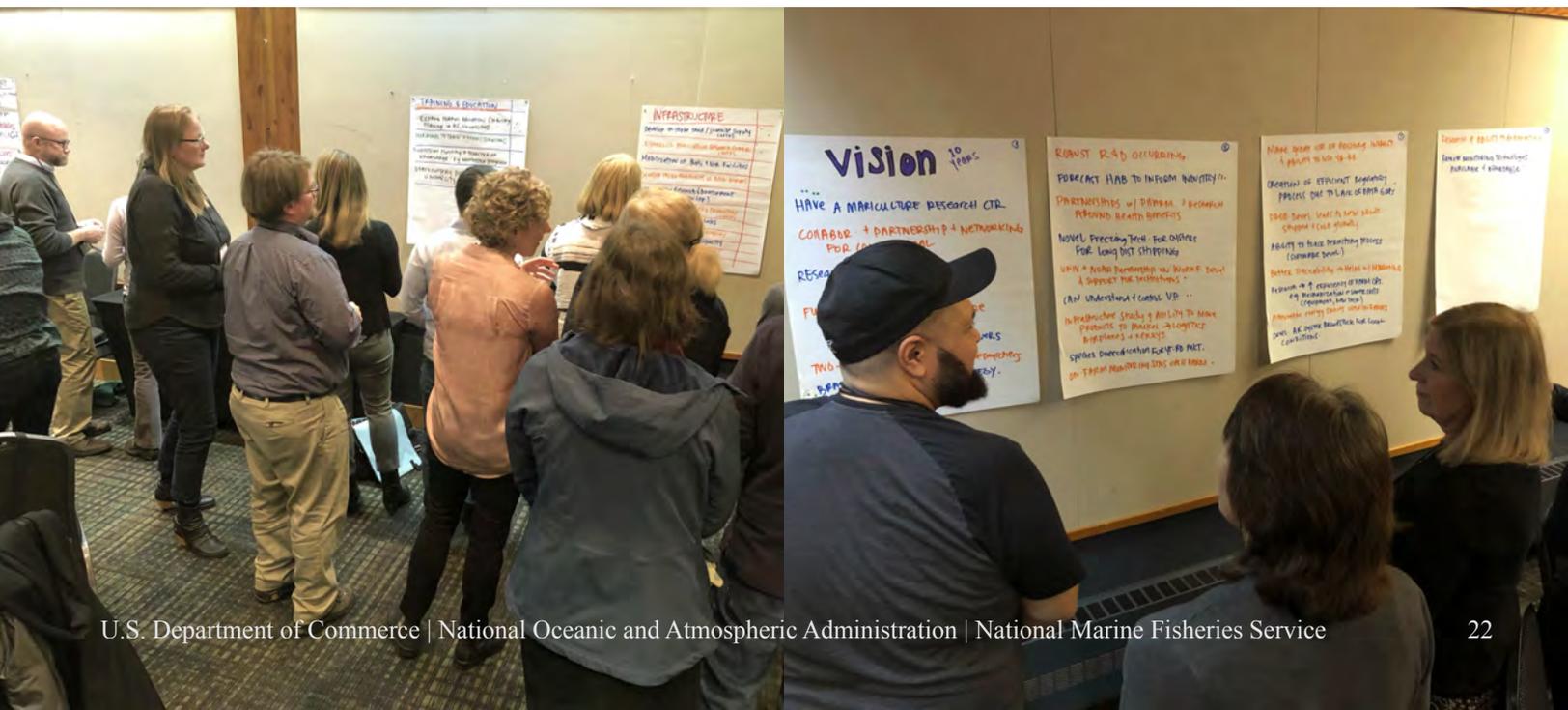
- The workshop enabled critically important stakeholder collaboration, cross-sectoral education and networking opportunities
- Collaboration and leveraging resources will lead to industry success
- Formal training is essential to develop seed supply due to a limited labor pool
- Limited opportunity exists for research facilities or laboratories to hold or conduct needed research on live oysters due to current regulatory environment
- Individuals from all aspects of industry are working diligently to ensure success of sustainable mariculture in Alaska – workshop demonstrated how many folks are involved
- The Mariculture Development Plan, and the companion Five-Year Action Plan, needs wider distribution to cultivate greater public awareness about its goals and purpose
- Future workshops should expand participation to include interested parties from across different regions of the state
- Greater outreach is needed to share work products, industry technologies and opportunities for expansion or collaboration with others
- Challenges remain to incorporating the feedback and needs of farmers into research, technology innovation, facilities and operations improvements
- Alaska can proactively address challenges and barriers to the success of its own burgeoning industry by learning lessons from other areas, nationally and internationally
- Transparency among and between growers will support industry development – “grow together, not alone”
- Although a focus tends to be on industry growth, the need to support existing industry and address current hurdles, such as reduced state funding for PSP testing of shellfish, must not be lost in the action planning process
- Increased engagement and support from NOAA Fisheries is a significant and positive change
- Evolving work from the Task Force is both desired and necessary



Alicia Bishop and Julie Scheurer provided closing comments. Ms. Bishop thanked participants for the valuable exchange of knowledge and perspectives, and for welcoming her as the new Alaska Aquaculture Coordinator for NOAA Fisheries. She told the group she was both inspired and encouraged by the number of people working together to build a successful industry. Ms. Scheurer expressed hope that the workshop outputs will bolster support for advancing priority action items identified by the Task Force. She remains excited for future development of the industry in Alaska.

NEXT STEPS AND CONCLUSION

This workshop convened mariculture industry representatives, tribes, communities, hatcheries, non-governmental organizations, policy makers, regulators, and researchers to advance knowledge sharing and promotion of the Alaska mariculture industry. Participants gained a better understanding of federal and state permitting processes, statewide hatchery and nursery capacity, access to capital and other funding opportunities, lessons learned from different regions, and current mariculture research priorities. Participants discussed challenges associated with these topics, identified knowledge gaps and research needs, articulated growth opportunities, and mapped out priorities. Building on the foundational work of the Mariculture Development Plan, workshop outputs are expected to inform and facilitate important next steps toward the ambitious goal of building a \$100 million mariculture industry in 20 years.



APPENDIX I. WORKSHOP AGENDA

January 21st – 22nd, 2020, Ketchikan, Alaska

ALASKA MARICULTURE WORKSHOP

Workshop Purpose

NOAA Fisheries will convene a multi-day workshop that brings together an array of Alaska mariculture development stakeholders—industry representatives, tribal representatives, policy makers and regulators, and researchers—to advance the following objectives:

- Share NOAA's commitment to promoting aquaculture nationally, listen to the needs and desires of the Alaska region, and promote future partnerships;
- Discuss and identify needs related to research, policy and permitting, coordination and leadership, and access to capital;
- Explore key elements of the Alaska Mariculture Development Plan to map out and facilitate critical next steps;
- Lay a foundation for achieving the Mariculture Task Force goal of building a \$100 million industry in 20 years.

DAY 1 – Tuesday, January 21st

9.30	Opening Welcome and Land Acknowledgement <ul style="list-style-type: none"> • <i>Keo Booth, Metlakatla Indian Community</i>
9.35	NOAA Fisheries Welcome, Agenda Review and Workshop Ground Rules <ul style="list-style-type: none"> • <i>Julie Scheurer, NMFS Alaska Region</i> • <i>Rich Wilson and Meagan Wylie, Seatone Consulting</i>
9.50	Overview of Federal and Statewide Aquaculture Initiatives <ul style="list-style-type: none"> • <i>Dave O'Brien, NMFS Office of Aquaculture</i> • <i>Julie Decker, Alaska Fisheries Development Foundation/Mariculture Task Force</i> • <i>Alicia Bishop, NMFS Alaska Aquaculture Coordinator</i> <p><u>Session objective:</u> Set the stage for collaborative workshop discussions by presenting both national and statewide priorities for aquaculture development, with a view towards future prospects in the Alaska region.</p>
10.50	BREAK
11.00	Overview of State and Federal Aquaculture Permitting Processes <ul style="list-style-type: none"> • <i>Andrew Miller, Alaska Department of Natural Resources</i> • <i>Sam Rabung, Alaska Department of Fish and Game</i> • <i>Kim Stryker, Alaska Department of Environmental Conservation</i> • <i>Roberta Budnick, U.S. Army Corps of Engineers (remote presentation)</i> • <i>Alicia Bishop, National Marine Fisheries Service</i> • <i>Laura Hoberecht, NMFS Alaska Fisheries Science Center</i>

DAY 1 – Continued

	<p><u>Session objective:</u> Provide an overview of state and federal aquaculture permitting requirements, identify what agencies are currently doing to improve the process and what challenges remain, share lessons learned from the state of Washington, then engage in group discussion regarding opportunities to further improve the process.</p>
12.30	LUNCH
1.30	<p>Interactive Session: Assessment of Policy and Permitting Needs, Priorities, and Next Steps for Aquaculture Development in Alaskan Waters</p> <ul style="list-style-type: none">• <i>All workshop participants</i> <p><u>Session objective:</u> Utilize the work of the Mariculture Task Force as a foundation to further explore policy and permitting needs, priorities and the next steps driving aquaculture development in Alaskan waters.</p>
3.00	<p>Discussion of Tribal/Community Engagement</p> <ul style="list-style-type: none">• <i>Markos Scheer, Seagrove Kelp Company, Premium Aquatics</i>• <i>Ed Douville, Shaan Seet (Craig), Mariculture Task Force</i> <p><u>Session objective:</u> Identify and discuss best practices for conducting tribal and community engagement.</p>
3.30	BREAK
3.45	<p>Interactive Demonstration/Feedback: Alaska Mariculture Map</p> <ul style="list-style-type: none">• <i>Stacey Buckelew, Axiom Data Science</i>• <i>Trevor Golden, Axiom Data Science</i> <p><u>Session objective:</u> Workshop participants gain familiarity and some ability to use this tool, and developers receive feedback from users on content and usability.</p>
4.45	Summarize Day 1 Discussion/Preview Day 2
5.00	Workshop Day 1 Adjourns

DAY 2 – Wednesday, January 22nd

8.30	<p>Review Day 1 Outputs and Introduce Day 2 Agenda <i>Workshop Facilitation Team</i></p>
8.45	<p>Overview of Federal and State Loan and Grant Programs</p> <ul style="list-style-type: none"> • <i>Chuck Weirich, National Sea Grant (remote presentation)</i> • <i>Jen Hall-Brown, NMFS Alaska Region</i> • <i>Jim Andersen, Alaska Department of Commerce, Community and Economic Development</i> • <i>Markos Scheer, Seagrove Kelp Company</i> <p><u>Session objective:</u> Provide an overview of available federal and state loan and grant programs, as well as private equity alternatives, for mariculture industry growers, farmers, and researchers.</p>
9.45	<p>BREAK</p>
10.00	<p>Building Hatchery and Nursery Capacity in Alaska</p> <ul style="list-style-type: none"> • <i>Jeff Hetrick, Alutiiq Pride</i> • <i>Eric Wyatt, Oceans Alaska</i> • <i>Beau Perry, Blue Evolution</i> <p><u>Session objective:</u> Explore existing hatchery and nursery capacity in Alaska, what is projected demand over the next 10 years, and what is needed to reach that projected demand.</p>
10.50	<p>Interactive Session: Identifying Hatchery and Nursery Capacity Limitations and Exploring Growth Opportunities</p> <ul style="list-style-type: none"> • <i>All workshop participants</i> <p><u>Session objective:</u> Further identify and explore capacity limitations, challenges and ways to overcome, needed infrastructure, and growth opportunities for building out mariculture hatchery and nursery operations in Alaska.</p>
12.00	<p>LUNCH</p>
1.00	<p>Advancing Mariculture Research in Alaska</p> <ul style="list-style-type: none"> • <i>Mike Rust, NMFS Office of Aquaculture and Bob Foy, NMFS Alaska Fisheries Science Center: NMFS mariculture research mission</i> • <i>Mike Stekoll, University of Alaska Southeast: Mariculture Task Force priorities and progress to date</i> • <i>Ginny Eckert, University of Alaska Fairbanks and Alaska Sea Grant: Academic mariculture research potential</i> • <i>Bobbi Hudson, Pacific Shellfish Institute: Collaborative research opportunities</i> <p><u>Session objective:</u> Build on the previous interactive session by describing the priorities, progress to date, and future potential of mariculture research in Alaska.</p>

<i>DAY 2 – Continued</i>	
2.00	BREAK
2.15	<p>Interactive Session: Developing a Vision and Future Roadmap for Mariculture Research and Development in Alaska</p> <ul style="list-style-type: none"> • <i>All workshop participants</i> <p><u>Session objective:</u> Foster a collaborative vision, needed actions, and partner roles/responsibilities for building capacity and advancing mariculture research in Alaska.</p>
4.15	<p>Summarize Workshop Outputs and Look Towards Next Steps</p> <p><i>Workshop Facilitation Team and Alicia Bishop, NMFS Office of Aquaculture</i></p>
4.30	Workshop Adjourns

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APPENDIX III. TRANSCRIBED SMALL GROUP WORKSHEETS



DAY 1: Assessment of Policy and Permitting Needs, Priorities, and Next Steps for Aquaculture Development in Alaskan Waters

The notes below have been directly transcribed from small breakout groups which worked together at different tables at the workshop. The lists are formatted with either bullet points or numbers, reflecting how to each group organized its information. No attempt has been made to edit or improve the outputs which emerged from each of these tables.

1. What are the most significant challenges in the state or federal permitting process that would benefit from immediate attention? (Please consider and document all perspectives at your table (e.g. industry, tribes, regulators, scientists, policymakers, others etc.)

TABLE 1

- The existing permit system is too broad. A single application is currently used for all marine aquaculture (shellfish and algae) and all farm sizes.
- There is limited coordination between agencies. Conflicting information may, and has been, distributed to applicants.
- Metrics for reporting/recording algae are not compatible on current applications. Individual plants is not a viable metric. Establish a standard for sale of seeded line and harvest.
- The chain of custody on the application is unclear to applicant; no clear understanding of where/who is currently handling the application, or where is the bottleneck.
- There is no current way to verify if submitted applications are complete. The agencies are left to communicate directly with the applicant, in a very time consuming manner.
- There is a strong need to allow for subleasing, allowing younger/first time farmers/ tribes the ability to enter the industry. A process to identify how to sublease is needed.

TABLE 2

- Portal: An online mechanism for applicants to work with agencies and have all the permits in one place, pay fees, track progress, etc.
- Uplands owner of properties integrated in to mariculture map so applicants know who is upland. Include tide lands.
- We need to throw a life ring to our currently struggling shellfish industry by assuring funding for shellfish testing before we start spending money on research and design, portals, new opportunities, etc.
- Alaska Department of Fish and Game differentiate between kelp and shellfish in permits.
- Alleviate some of the burden on farmers with multiagency permits. It's difficult for farmers to find time to farm with all of the time spent pushing pen/ permitting
- Tiered permitting for experimental leases.

TABLE 3

- Definitions are important what needs to be modified to better meet our needs.
 - Under current regulations for permitting – researchers cannot hold live oysters if they aren't in a farm (don't have farm permits).
- Site Suitability Permit – Private citizens can no longer do research to check out viability of a site or feasibility studies to see if species can grow.

- It took the state a year and a half to simply determine the application was inadequate.
- No central coordination of information needed for aquaculture permitting. Like no clearing house of information. Need for state mariculture coordinator. Division of government coordination, or aquaculture coordinator.
- Open access to up-to-date data.
- Ability to address customer service needs.
- Potentially pulling in federal agencies too late in the process. Would be good to clearly know timing, needs, standard mitigation – allowing us to front load process.
- Prioritizing sites for mariculture development. Why is it the lowest priority?
- In comparison to other areas, our regulatory process is fairly straightforward with lots of sites and limited conflict.
- Training help for new applicants.

TABLE 4

- Shellfish Authority (Department of Environmental Conservation). Funding issue, facing loss of certification could affect growers ability to distribute and crush industry; regulations require testing, but testing agency not supported by State.
- Siting. Permitting process drives aquaculture into less desirable locations. Water quality surveys needed, revisiting pre-approved aquaculture areas (Department of Natural Resources) might be useful.
- Marine Mammal Policy. Previous applications denied, policy changed, haul out use also changes, need updated surveys.
- Cultural significance needs to be better considered, tribes not included in agency review period, concerns ignored. Tribes must submit comments during public comment period.
- Streamlining process, add staff, reduce backlog.
- Funding agencies need to know applicants have permits in hand.
- Change regulations to allow longer leases and streamline renewal process.
- Untested mitigation measures.
- Subsistence overlap.
- Long appeals process (Department of Natural Resources), one person handles all and can take two years.

TABLE 5

- Alaska Department of Fish and Game. Funding for permitting mission critical.
- Alaska Department of Environmental Conservation. streamlining permitting process; support staff; central website.
- Research. State coordinator to help applicant through process.
- Industry. Finding a way to offset the DEC cost of testing (private and local government), not just current capacity but growing.
- Communities. Outreach/education to help comm. Tribal entities to pursue.

TABLE 6

- More people necessary to process permits. Applications are incomplete but Alaska staff don't have enough time to assist with the applications which contributes to more delays.
- Suggest a portal to check on permit timelines or see if when additional data is necessary. Need a permit tracking system. Need more electronic permitting. Rural applicants don't have access to quick communication which creates answering questions more difficult and time consuming. Bigger permits don't necessarily make it longer or harder. Goal post i.e. permit requirements seem to be continuously changing.

TABLE 7

- Review and revision of the application to define the information necessary for review and approval/consideration and refine application to limit duplication of required information
- Agencies have specific statutory and regulatory requirements and obligations that must be adhered to.
- Consider collaborative dialogue with agency and industry to revise application (like 2003 program).
- Application is oyster-centric. With new species coming online, the application process doesn't necessarily fit these other species.
- The prospective operations and plan will often change after the application is submitted, since much of the development reflects the diversity of ideas as to what is the right plan
- Templates for applications? That would be for certain farm culture techniques.

TABLE 8

- Timelines → (1) During the application process there are sometimes stalls because of N number of reasons (e.g. vacation, ball dropped). People need to be told better estimates of how long it will take to have application processed. (2) longer allocated time for farm permit – 10+ year option, please.
- Redundancy → The same information is often required across multiple agencies or even within agencies. When information on one is changed it requires changing a lot of other paperwork. Streamline! Clarify intent in why some information is needed.
- Application input are too rigid/detailed. They do not allow for fluidity in farming practices, e.g. changing between gear, changing approaches, etc. Private information can be shared with the public via these applications and companies may not want this.
- “Customer Service” → sometimes difficult for applicants to know how to respond to specific comments during the application process (e.g. who made the comment?) and then it is difficult for applicant to appropriately respond in a timely manner.

TABLE 9

- Testing facilities. Need for more affordable options.
- Site selection. Is there an existing list of “dormant” pre-approved locations? A consolidated list of pre-approved (or likely to be approved) sites would streamline site selection, especially for new entrants.
 - Site sizes in Alaska are so much different than other areas, like Washington (size, grow method, etc.) – this is a challenge.
 - This could reduce backlog.
- Learning curve issue: The processes are not horrible but there is not enough communication and guidance yet to help promote development of responsible aquatic farms (we don't want it too easy to start farming but new entrants need support); need for something like a real estate broker/mentor to guide new entrants through the site selection/ permit process (private or public).

2. How would the following recommended actions from the Mariculture Development Plan (Plan) help address the challenges your group just identified?

Numbers below signify tables which focused on particular topics as they answered this question. Not all tables responded to every topic.

Recommended Action (actions below are from the Plan)	Tbl #	Challenges the Action Addresses (insert here whatever challenges from Q#1 above you feel the action addresses)	Additional Discussion Notes (highlight how or why the recommended action addresses the challenges)
Revise Aquatic Farm Application	1	1. Creating electronic application. 2. Make species-specific applications.	This will change metrics.
	2	Still need farmer/applicant advocate to help get farmers through the process.	Creating a portal would improve the process and provide clarity in processing paperwork.
	3	If they create different levels of requirement, it could help with providing site suitability permits.	
	5	<ul style="list-style-type: none"> • Alaska Department of Fish and Game adjustment/ clarification on Operations Plan requirements/review for renewals. • Additional materials: Department of Environmental Conservation water quality test. 	<ul style="list-style-type: none"> • Produce manuals, training materials for applicants.
	6	Alaska Department of Fish and Game has a lot of detailed information required that may not be necessary. This is very time consuming to applicants. Streamlining this between Alaska Department of Fish and Game and Department of Fish and Game will really free up time for application and revises.	Need standards for industry folks to use as a basis of the applications to assist them.
	7	<ul style="list-style-type: none"> • Collaboration with industry to develop/ modify applications. • Templates for farm techniques. 	

	8	<ul style="list-style-type: none"> • Reduce redundancy of information on paperwork across agencies and within agencies. • Timeliness, allow for more than 10 years per form if can prove active. • Reduce level of detail that restricts fluidity in farm methods. 	
	9	<ul style="list-style-type: none"> • Site selection. 	<ul style="list-style-type: none"> • Pre-approved sites could make this process simpler, faster. • Could help promote more species.
Reduce Application Backlog	1	<ol style="list-style-type: none"> 1. Creating electronic application. 2. Make species-specific applications. 	<ul style="list-style-type: none"> • Expedite transfer. • Verify completion of form. • Workflow management. • Species can help streamline application processing.
	2	Two new Department of Natural Resources staff for reviewing applications.	
	3		<ul style="list-style-type: none"> • It's taking too long to get feedback. • Need better examples of what a good application looks like.
	6	More people will definitely help speed up the backlog. Investors are not willing to put up money when permit process takes so long. Shorten the timeline so investors can have more certainty.	
	7	<ul style="list-style-type: none"> • It appears that the Department of Natural Resources backlog, including staffing, have been addressed. • Applicants need a reply more often. 	
	8	<ul style="list-style-type: none"> • Reduce redundancy. • Better “customer service” and communications through application process will lower response and troubleshooting times. • Increase in 10-year time limit for permit would reduce review/issue of permits. 	

	9	<ul style="list-style-type: none"> • Site selection. • Learning curve. 	<ul style="list-style-type: none"> • Pre-approved sites would reduce staff capacity needs. • Mentor/broker model.
Provide Web-based Information Clearing-House	1	<ol style="list-style-type: none"> 1. Creating electronic application. 2. Make species-specific applications. 	<ul style="list-style-type: none"> • Consolidates all information/ maps/ etc. and standardizes. • Can link in to multiple state and federal agencies.
	2	Reduce duplicative requirements for farmers; improve efficiencies and communication in agencies.	
	5	Yes, but not state/federal – run site. Dysfunctional. Run by Alaska SeaGrant.	
	6	This will be very hard to pull off because there is so much data to include. But if there was a portal this would be a tremendous tool for applicants.	Should have commercial and sport fishery data or cultural site data (broad based data). Who will own this and who will update this?
	7	<ul style="list-style-type: none"> • The volumes of information available make access and refining search parameters complicated. • Need funding to manage. 	<ul style="list-style-type: none"> • SeaGrant could assemble information. • Assembly by region/state – Alaska to focus that information. • Find funding/agency to manage the information.
	8	<ul style="list-style-type: none"> • Redundancy across applicants for similar regional information necessary, for example, if applying for a farm in location B, link to water quality or environmental data of other farm applications in the same region. 	
	9	<ul style="list-style-type: none"> • Site selection. • Learning curve. 	<ul style="list-style-type: none"> • Single website for site selection mapping. • Broker/mentor information. • SeaGrant/Washington Regional Aquaculture Coordinator would be good to carry this out.

3. What else may be needed in the area of policy and/or permitting to support the advancement of sustainable mariculture in Alaska?

TABLE 1

- Regulations need to address farm size; large farms may have impacts on fish stocks, etc.
- Science is needed to address brood stock requirements/ policy (genetics, oceanography).

TABLE 2

- State funding for Department of Environmental Conservation programs.
- Federal funding for federally regulated food and drug.
- SeaGrant Farmer advocate/liaison to help walk farmers through the process.
- Support for House Bill 116 to allow for lease renewals.

TABLE 3

- Look at what we can fix through regulatory process versus legislation.
- Alaska Department of Fish and Game has shown a lot of support within their authority.
- Pass legislation to allow shellfish enhancement.
- Pass legislation to allow for shellfish gardening.
- Industry has to show they are willing to pay for the services they receive.

TABLE 4

- Funding for testing (Department of Environmental Conservation) and full operation of shellfish authority.
- Mapping tool will help with siting decisions and local knowledge.
- Need for research permit/ experimental permit (conditional short-term), 'limited production aquaculture permit' (see Maine model).
- Need better fine scale distribution information, incorporate local knowledge.
- Incorporation of local knowledge came up repeatedly.
- Clearer process of tribal engagement.
- Revision to policies regarding marine mammal siting conditions and larger issue of allowable native uses for marine mammal parts.
- All applications online to view, plus status.

TABLE 5

- Money.
- Coordinator positions.
- Marketing.
- Sales/production.

TABLE 6

- Industry standards with suggested best management practices (BMPs).
- Front end help on permit prior to submittals to streamline applications to ensure in right format.
- Mariculture revolving loan fund needs to allow more risky investment (i.e. allow farm assets to be to use equipment as collateral but could only get a seven year note instead of 20 year if real estate used as collateral).
- Better support for genetic research to hopefully create an argument for regional seed supply like hunting or sports fishing supported by testing.
- Regulations need to be modified to allow pacific oyster research. Now law prohibits this. Change the importing regulation to include the word "research."

TABLE 7

- Coordination to training for applications.
- Online renewals.
- STP and acquisition applications at the same time to coordinate the transportation of materials.

TABLE 8

- Monitoring of how product strains grown on a farm “leak” into surrounding wild populations → when a farm begins to use optimized and selected strains it risks that the surrounding populations convert into a monoculture.
- State/federal research on genetic stocks (nuclear DNA) across regions.

TABLE 9

- Mentors/Brokers: to work as guides.
- Micro-permits: as key for research and development, including research and development on nutritional values of kelp and other species (Alaska Seafood Marketing Initiative).
- Mentor Programs: before, during and/or after application process (“smaller grower networks” in Washington, example).

4. Do you know of any examples from other places that may offer lessons learned for Alaska?

Stay focused on the issue of policy and permitting.

TABLE 1

- Maine: test permit/ learning permit for prospective farmers.
- New Zealand: Intersection with Maori, government supported.
- Japan: Co-op run hatcheries/ processors.
- Ireland: a good lesson → don't privatize wild harvest.

TABLE 2

- Maine: Differentiation between micro and macro farms. Online portal.

TABLE 3

- Some states have more onerous processes.
- Japan divided marine environment in to zones.
- New Zealand no government subsidizing for permitting.

TABLE 4

- Maine tiered permitting structure that allows experimental and limited production leases.
- Washington presents some good models.

TABLE 5

- Iceland: Clustering ocean centers.
- Japan: Cooperatives.

TABLE 7

- See powerpoint presentation from Laura Hoberecht - best ideas summary.

TABLE 8

- Maine tier system.

TABLE 9

- Washington: “Small Grower Networks” (like Young Fishermen's Summit)
- Washington: Formal/informal guidance through growers' association
- East Coast: Import/export regulations to keep diseases controlled
- France: Aquaculture school.

DAY 1: Mariculture Map – Participant Feedback

The notes below have been directly transcribed from small breakout groups which worked together at the workshop. No attempt has been made to edit or improve the outputs which emerged from the discussion about the Mariculture Map tool.

How will you use this tool?

Aquaculture Permit Applicant

- Application completion.
- Permit application siting tool.
- Spatial planning.
- Compare with other mapping tools during application process.

Aquaculture Operator

- Direct applicants to this tool for determining site coordinates, size, site suitability, etc.

Researcher/Program Manager

- Advocate for state programs using data.
- Comparing seaweed beds over time.
- Locating seaweed beds by species.
- See what other projects are already occurring in this area.
- To determine location of active farms. “Gear in the water.”
- To determine sites for mariculture research.
- Provide co-variants for research on effects of mariculture on ocean chemistry and vice versa.
- Community entity information source for federal and state grant applications.

Resource Manager/Permit Regulator

- To make appropriate public/agency comments (support, oppose, etc.).
- View farm locations relative to ESA-listed species distributions.
- Help prospective applicants identify conflicts/tings to avoid.
- Identify and define boundaries for shellfish growing areas.

What functionalities and capabilities would you like to see?

Aquaculture Permit Applicant

- 50 kilometer radius circle.
- Need meta data and source information (incl. dates).
- Measuring tools.

- Farm application.
- Haul outs every 2 years.
- Add ability to draw 3 nm circle around a point.
- Print to PDF.
- Pop-up with coordinates of corners of site.
- Site plan map ability to draw longlines, buoys, anchor systems, rafts, insert text, legend, north arrow.
- Major shipping routes.
- Measure distances.
- Calculate square footage.
- When generating parcels, provide parcel size + parcel coordinates.
- Export customized maps as PDFs.
- Resource assessment.
- Know environmental issues (physical, biological, chemical).
- Integrate the tool into electronic application so that the application outputs the appropriate map.
- Draw farm plots with annotations and distances between corners.
- PWSAC hatcheries in the wrong spots.
- Add data layers for Endangered Species Act critical habitat and Endangered Species Act – Essential Fish Habitat.
- Be able to gauge distance.
- Print feature with legend of all data layers on map.
- Be able to search for a specific location by name.
- Feature to print out (save a pdf) a bibliography of data sources used on the map created.
- Needs to function on lower bandwidth.
- Dominant weather patterns (wave + wind info).
- Show preexisting but not active aquatic farm sites and what they grew.
- Show farm info (what they are growing, size, etc.).
- Commercial fisheries use/permits.
- List the date that the data was updated.
- Upland information (ownership, quads, etc.).
- PDF export with map resolution (similar to NOAA Raster Navigational Chart maps).
- Adjustable distance/radius (not just one size/measurement).
- Be able to input coordinates/set points, provide acreage, perimeter, etc.

Aquaculture Operator

- Wind rose (seasonal peaks and averages).
- Ability to measure distances.
- Increased availability of fine-scale, site-specific data (e.g. currents, temp, chlorophyll).
- Add stations (salinity, turbidity, water and air temps) to all farms (not a SW thing but would be nice to include farms as source data).
- Department of Environmental Conservation toxin and water quality test results (historic and real time).
- Other permitted uses.
- Add ability (mechanism) for aquaculture farmers to contribute data (temp, salinity, phytoplankton, etc.).
- Add ability to upload site specific data to validate data on map.
- Current charts.
- Bathymetry (where available) and ability to calculate tidal exchange in a polygon.
- Water temperature weekly/bi-weekly
- Tide and current data.
- Historical weather.
- Freshwater inputs.

- To help with identification of appropriate locations to collect broodstock, it would be helpful to have a polygon tool that identifies the total water surface area that is within a user-set distance from a global positioning system (GPS) point. Distance by water, not by bird's eye.

Researcher/Program Manager

- Nutrients in water column with biweekly updates.
- Salinity biweekly.
- Automatically generate corner coordinates and area for polygons.
- Data for this tool would need to be updated quarterly.
- Ability to draw 3 nm circle for planning.
- Information on when source data last updated.

Resource Manager/Permit Regulator

- Incorporate paralytic shellfish poisoning data, fecal coliform (water quality), pollution sources.
- Share maps with troopers.
- Mapping from Alaska Department of Fish and Game re: geoduck surveys and rotation of area opening.
- Arsenic data from NOAA Seafood Inspection Program.
- Share maps of classified waters with harvesters.
- To enter coordinates to create polygon on map for application (coordinates already known from site visit.)
- Wind data weather.
- Bird migration patterns pathways.
- Resident wildlife populations.
- Name of company that owns each farm polygon should be included, with websites and/or contact details.
- Endangered Species Act, Essential Fish Habitat, critical habitat layers.
- Add data from NMFS Alaska Essential Fish Habitat mapper.
- Who has completed Endangered Species Act/Essential Fish Habitat consultation.
- Who has infrastructure in the water.
- To see if current lease corner coordinates are accurately found on map.
- Hydrodynamic studies.
- Quick cut and paste of screen images to paste into consultations.
- Time and depth series for my site, for: temperature, nox, salinity, current, waves, turbidity.
- Uplands and tideland ownership information for my site and near my site.
- Locations of aquatic farms, species, and productivity volume.
- Measurement tool to measure distances to nearest critical habitat, harbor seal haul out, harbor, etc.

DAY 2: Identifying Hatchery and Nursery Capacity Limitations and Exploring Growth Opportunities

The notes below have been directly transcribed from small breakout groups which worked together at different tables at the workshop. No attempt has been made to edit or improve the outputs which emerged from each of these tables.

Facilitation guidance at workshop: Remember to consider and document all perspectives at your table (e.g. industry, tribes, regulators, scientists, policymakers, others etc).

1. Considering *hatchery* operations in Alaska:

- a. Using the table below, identify and list the most significant challenges or barriers to expanding hatchery operations in Alaska.
- b. Brainstorm and suggest at least one idea or opportunity for overcoming each challenge or barrier your group identified

Tbl	Challenges or Barriers to Expanding Hatchery Operations	Idea or Opportunity for Overcoming Identified Challenges or Barriers
1	Hatcheries available close to operations.	“Farmer seed” hatchery in a box/ connect.
	Cost of setup/operation.	Increase efficiency of output, co-op owned/ operated facility.
	Inefficiencies in the organization, workflow, operations, management → distinguishing between kelp and shellfish workforce = appropriate expectations, shifting mentality from fishing to “growing”, recruitment.	<ul style="list-style-type: none"> • Operating manuals, cost-effective/appropriate staffing (full time v contract). • Identify financial bottlenecks. • Distinguishing the needs. • Alaska Fisheries Development Foundation trainings, mentorship programs, subleasing (Alaska Department of Fish and Game). • Openness/communication between hatcheries (keeping info close to vest).
	Space/infrastructure.	Unused facilities, premade hatcheries, connex hatcheries.
	Seed stock acquisition.	AK subsidizing. How does industry pay for it? Diversify seed source?
	Labor cost / recruitment.	Labor pool, on-call/seasonal labor pool.
2	Funding people with skillset to live in community and manage money and permitting.	For seaweed, have large co-pay to buy product from local farms.
	Hatcheries don’t typically make money.	Expansion of fish tech program.
	Need local infrastructure in place to take unstable product quickly and process and freeze, or process here and create plant here to produce food. Like Barnacle Seafoods (if there were enough demand).	Need infrastructure in place to process.

	For oysters, seed comes from outside Alaska.	As long as business stays up speed on certification OK.
3	Operational costs high. Small orders not cost effective. Need big operation to support smaller operators. <ul style="list-style-type: none"> How to get from 3 mm to 20 mm critical size? 	<ul style="list-style-type: none"> Need investment from larger operator. Helps offset cost for smaller orders (0.5 mm range). Need post-hatchery pre-nursery facility. There needs to be an in-between setup. E.g. and Upland Nursery.
	Currently most hatcheries are tied with a farm. <ul style="list-style-type: none"> Guaranteed deed. Integrated operations. 	<ul style="list-style-type: none"> We need the state to attract multiple size farms. Large farms are needed to integrate hatchery operations.
	Under current regulation can't get seed from outside AK for other species. Can't expand to other species like on bottom limited produce.	<ul style="list-style-type: none"> Change regulations to allow for input of other species (clams, seaweed, etc). Change regulations on bottom clam farming.
4	People/ Workforce. Lack of trained personnel and difficulties with retention.	<ul style="list-style-type: none"> Get youth involved, trained, educated, invested (to improve retention). Make them owners. Invest staff in success of organizations.
	Overhead/costs.	Pop-up nurseries/cheap.
	Space/ Infrastructure.	Pop-up nurseries/cheap.
	US & European hatcheries are overthinking ops – need to keep it simple (kelp).	Learn from cultures with longer history.
	Seed availability.	<ul style="list-style-type: none"> Vertical integration of operations. Control hatcheries and nurseries in Alaska. Industry strains best for Alaska.
	Funding.	USDA, NOAA, State endowment.
	Strain selection.	Public funding of breeding program.
5	Accessing seed (from Washington and Hawaii).	Find other agencies to access seed.
	Providing enough nutrients for seed.	Infrastructure (funding).
	Trained operators (personnel, managers, techs).	Provide training, outreach, fellowships in labs, hatcheries.
	Great variation in species. Different needs, space, feeding, survival rates, etc.	Focused attention on desired products (supply + demand).
6	Inadequate consistent demand to justify developing hatchery capacity in-state.	Develop capacity anyway to make “seed” available broadly for research and development use beyond commercial productions.

	Regulations prohibiting on-site research on seed.	<ul style="list-style-type: none"> • Change regulations to allow on-site research and development for efficiency. • Partnerships with off-site research and development entities.
	Limited in-State transportation infrastructure.	More ferry service.
7	Legislation for shellfish enhancement.	Positive public relations for this topic.
	Training for technicians (not PhDs) – labor force issues.	<ul style="list-style-type: none"> • Funding for training. • Fellowships to work in labs/ @ hatcheries. • Bellingham Technical College model in Alaska. [See Task Force 5 yr Plan pg. 5] • Community outreach and education with farms. • Ecotourism. • Primary education, vocational programs week (add mariculture).
	Funding.	
	Keep Alaska kids in the community (challenge and opportunity with aquaculture).	<ul style="list-style-type: none"> • Workforce development group for fisheries. • Scholarships for vocational.
	All oyster seed is imported (from Hawaii and Washington).	Public/private partnership for a regional hatchery that supplies regional needs (coop structure) → needs to include the retail/market side of things. Need some big players to help (Trident and Silver Bay?).
8	<ul style="list-style-type: none"> • Economies of scale and diversity of sources • Competition with Washington (also a strength – push for better seed and variety of seed sources). 	<ul style="list-style-type: none"> • Identify size of a business before they can afford their own hatchery. • Convert state ferries into hatcheries.
	Less inconsistent demand (inconsistent staffing quality state gov, big companies not interested given gov. budget instability).	40 years of this question – zero champions – we all start over every legislative session.
	Cove issues → instability → unpredictability.	
	No funding for operating costs/ funding for new staff.	Look at FSA Reimbursement Transportation Cost Payment programs as potential for granting/ paying farmers as they produce seed.
9	Workforce – need for available, competent workforce – need for housing, etc.	<ul style="list-style-type: none"> • Create trade training programs/ program networks in Alaska at schools. • Department of labor trainings.
	Research and development – need for better understanding of genetics.	<ul style="list-style-type: none"> • Fund research on genetic profiles of stocks; improved fitness models to understand thresholds/opportunity for selective breeding.

<p>Lack of trade training programs – need for science/ labor interface for workers.</p>	<ul style="list-style-type: none"> • Partnering with salmon hatcheries and salmon hatchery. training models – Washington (Sitka example) facilities used for vocational training – partner with vocational training.
<p>Need for more efficiencies in basic technology.</p>	<ul style="list-style-type: none"> • More science! • Funding mechanisms (SARDFA?) for purchasing technology from other regions of the world. • Partnering with foreign investors? • Exchange programs with regions or scientists. • More friendly competition <ul style="list-style-type: none"> ▶ Otis; Ocean Tuesday; Symphony of Seafood. • University of Alaska (Established Program to Stimulate Competitive Research) and University of Maine mariculture partners. • Knowledge exchange with salmon hatcheries. • Bellingham Technical College.

2. Considering *nursery* operations in Alaska:

- a. Using the table below, identify and list the most significant challenges or barriers to expanding nursery operations in Alaska.
- b. Brainstorm and suggest at least one idea or opportunity for overcoming each challenge or barrier your group identified.

Tbl	Challenges or Barriers to Expanding Nursery Operations	Idea or Opportunity for Overcoming Identified Challenges or Barriers
1	Labor in remote locations.	Outreach, education.
	Cost of operation.	Subsidizing.
2	Management needs enough staff to manage and also do the specialty work of propagation and seed.	Getting qualified individuals to run hatcheries and nurseries willing to live in communities.
4	Arbitrary/ conservative permit requirements (Alaska is the only place in the world that requires permits for seaweed nurseries).	Expand distances for collecting.
	Gaps in genetic research.	Fund and initiate studies.
	Funding.	USDA < NOAA, State Endowment.
5	Technology transfer.	Make tech.
	Trained personnel. Not enough labor.	Provide training, access information. Tech schools.
	Approved seed sources.	
	Labor/ workforce.	Mentorship program.
	Supply + demand. Propagating focused on wanted products.	
6	Timing/scale.	Set up regional cooperatives.
7	<i>Most of the hatchery challenges and opportunities apply to nurseries too. See above.</i>	
		Apprenticeship program with Alaska Department of Labor to increase # of technicians.
	Improve genetic information to improve conditions placed on farmers for “broodstock”, starts, etc.	
8	<i>See responses in above table.</i>	
9	Best practices.	Create inter-agency and university best practices.

3. What type and scale of infrastructure is needed to address the projected demand you heard about during the presentations, and the challenges your group just identified?

TABLE 1

- Training, area-specific manual/guide/operating procedures.
- Labor pool with training paid through taxes (e.g. construction industry).
- Strain selection research → policy regulation.
- Seeding technologies (research and development).
- Government buy-in / backing/ funding.
- An organization (Co-Op, Associations, etc.) building trust, how to integrate larger independent company (e.g. Blue Evolution).
- Standardized/comp/continued research and development and monitoring.

TABLE 2

- Expansion and development of existing facilities and operational funding to buffer the gap between current market and potential market capacity over the next 5 years.

TABLE 3

- Need mix of small scale and large-scale farms to offset costs.
- Broader product mix → need subsidy for non-traditional species.

TABLE 4

- More hatcheries and nurseries (building and equipment) in Alaska.
- Hatcheries, nurseries, farms need to be in closer proximity to one another.
- Vertical integration.
- Setup nursery in University?

TABLE 5

- Regional infrastructure: cooperative extensions.
- Ten times more demand for shellfish/ kelp in ten years.
 - Capacity.
 - Processing capabilities.
 - Hazard Analysis Critical Control Point controls, safety and sanitation of product.
 - Storage and shipping capacities.

TABLE 6

- Demand for small scale farms/ but economic reality of large-scale feasibility requires partnership.

TABLE 7

- Need regional: cooperatives or associations/hatcheries/nurseries/research capacity.
- Leverage existing assets / infrastructure that supports seafood industry.
 - Would be helpful to have an assessment of what is available.
- Existing assets that could be further developed (i.e. Blue Ocean).
- Utilize packing facilities.
- Need to think and plan and build for where we expect to be in 10 years.

TABLE 8

- We don't know that scale would work.
- Flexible infrastructure.
- Variety of sizes – text out.
- KMBC and Jim Aguiar (small individual in-state seed).

TABLE 9

- Kelp vs. shellfish (not the same models).
- We wonder whether Alaska needs shellfish hatcheries at all, until the industry grows. Kelp hatcheries at current scale are relatively easy and feasible, until scale increases such that selective breeding becomes necessary.

4. Based on your responses to questions 1, 2 and 3 above, identify 2 – 4 growth opportunities for building out mariculture hatchery and nursery operations over the next 5-10 years.

For each growth opportunity identified, please mark with an X if it supports capacity development of hatcheries, nurseries or both.

Tbl	Growth opportunity (please describe)	Supports Hatcheries	Supports Nurseries	Supports Both
1	Organization Structure (co-ops, labor pools, etc).			X
	Public-private partnership subsidizing /taxation: <ul style="list-style-type: none"> • Voluntary assessment industry. • Government backing. 			X
	Operations efficiencies (how to capture institutional knowledge; manuals; operating protocols).			X
	Hatcheries in proximity to operations (modular hatcheries).			X
	R&D: <ul style="list-style-type: none"> • Strain selection. • Quality/consistent monitoring and protocols. 			X
2	Industry partnerships with NOAA (like partnerships with Blue Evolution and NOAA). <ul style="list-style-type: none"> • Little Port Walter. 			X
	Shipping container kelp labs/hatcheries in each community so individual communities can seed their own lines.			X
	Workshops to train hatchery techs: <ul style="list-style-type: none"> • Univ. fisheries tech program expansion to include shellfish and kelp. • AVTEC: Alaska vocational and technical education. 			X
	Partnerships between Feds, Univ., and industry (RPE grant, Blue Evolution).			X
	Vertically integrated hatcheries: Seed → grow → harvest → produce product → repeat.			X
	Pairing hatcheries with ecotourism to help fund overhead operational expenses.			X
3	Need for post-hatchery, pre-nursery facility. Creating upland nursery.			X
	Succession planning, transfer knowledge. Training to operate facilities.			X
4	Start nursery programs in University. Training programs.			X
	NOAA run hatchery/nursery for training & production.			X
	Expand funding sources (USDA).			X
	Subsidies/ seed funds/endowment instead of loans to build infrastructure needed to launch industry.			X

Tbl	Growth opportunity (please describe)	Supports Hatcheries	Supports Nurseries	Supports Both
	Partnerships!			X
5	Develop Training.			X
	Technology Transfer.			X
	Labor/workforce (mentorship program).			X
	Facility Capacity.			X
	Access to improved designs (Farm size growth).			X
6	Buy-in from UA in training/workforce development. Expand SeaGrant.			X
	Make available history/fate of all aquatic farms in-state going back 20 years. Success/failure analyses by region.			X
	Expansive support industry to alleviate the demand for small-scale farms.			X
	ANSEP/AVTEC workforce development.			X
	Look at using resources for small business.			X
	Support for applications/ permitting.			X
7	AIEDA (AK Industrial Economic Development) (i.e. shipyard).			
	Maritime history preservation.			
	Vertical integration? (maybe not one player that does all but a loop that connects the pieces).			
	R&D for new species or improving current practices – self assessment to support?			
	Market for products.			
	Tax shelter.			
8	Micro hatcheries. Micro flupsies.			X
	Bring FSA into the conversation (big difference between fishing and farming culturally and business model). Dept. of Agriculture.			X
9	High school trainings on kelp/ seaweed nurseries (lab projects).			X
	Pushing marking with the tourist industry – cruises paying for this – for hatcheries, nurseries, trainings in mariculture.			X

DAY 2: Developing a Road Map for Building Capacity and Advancing Mariculture Research in Alaska

The notes below have been directly transcribed from small breakout groups which worked together at different tables at the workshop. The lists below are formatted with either bullet points or numbers, reflecting how to each group organized its information. No attempt has been made to edit or improve the outputs which emerged from each of these tables.

A. Establish a Mariculture Research Center

Near-term Action Steps (next 3-12 months)

- Change name to Mariculture Research Network.
 - Partners get agreement on name change.
- Identify funding to support Executive Director position.
 - Partners are people who can lobby do so. Others apply for funding. Work on ways to make funding permanent.
- Identify leads and key players; Develop terms of reference (operations plan); Establish Steering Committee with one representative from each of the following: State Agency, Federal Agency, Academia, Shellfish Grower, Kelp Grower, others.
 - Partners have teleconferences; circulate drafts.
- Improve list of research priorities for 1) Industry and 2) regulators (annual research and development forum). *May be longer term, after establishment of steering committee.
 - Partners participate in priority setting.

Long-term Action Steps

- Disseminate information and be a resource (clearing house) of relevant information and research results. Identify research to support hatchery capacity (oysters and kelp). Change rules to allow research to occur on oysters. Select strains that grow fast in early life stages.
- Generate a web presence with relevant portals: construction technology, growing technology, ecosystem services, environmental interactions, etc.

Partners

- NOAA Fisheries
- SeaGrant
- National Ocean Service
- University of Alaska Fairbanks
- Alaska Shellfish Growers Association
- Other Industry Representatives
- Hatcheries
- Shellfish Farmers
- Pacific Shellfish Institute
- State Agencies

B. Develop in state seed and juvenile supply

Near-term Action Steps (next 3-12 months)

OYSTERS

- Establish one facility within Alaska to spawn oysters (potentially Alutiiq Pride or NOAA's Lena Point).
 - Partners: Alutiiq Pride, NOAA Fisheries – Alaska Fisheries Science Center.
- Partner with NOAA, Universities and SeaGrant to utilize their facilities.
 - Partners: NOAA, Universities, SeaGrant.
- Expand Capacity of existing regional setting facilities (Four: Alutiiq Pride, Oceans Alaska, Kachemack Bay, Jim Aguiar).
 - Partners: Alutiiq Pride, Oceans Alaska, Kachemack Bay Mariculture Association/Coop, Industry, Government Grant.
- Develop cooperative agreements between industry (multiple companies, potentially companies outside of AK) and government for guiding management of facilities.
- Secure funds for facilities.
 - Partners: NOAA, SeaGrant.
- Develop workforce development program (longer term)
 - Partners: University, NOAA, Alaska Vocational Technical Center, Fisheries Tech Program at University of Alaska Southeast.

SEAWEED

- Add and expand seaweed hatcheries near communities which are hubs of farms
 - Partners: Blue Evolution, Sea Grove Kelp, NOAA.
- Partner with NOAA, Universities and SeaGrant to utilize their facilities.
 - Partners: NOAA, Universities, SeaGrant.
- Develop cooperative agreements between industry (multiple companies, potentially companies outside of AK) and government for guiding management of facilities.
 - Partners: Industry, NOAA, University.
- Secure funds for facilities.
 - Partners: NOAA, SeaGrant.
- Develop workforce development program (longer term).
 - Partners: University, NOAA, Alaska Vocational Technical Center, Fisheries Tech Program at University of Alaska Southeast.

C. Expand formal education

Near-term Action Steps (next 3-12 months)

- Alaska young fisherman's' summit for Mariculture. Workshop planning and curriculum.
 - Partner: Alaska SeaGrant. Role: Host/planner.
 - Partner: National SeaGrant. Role: Funding, participant, planning.
 - Partner: Alaska Shellfish Growers Association. Role: Planning.
 - Partner: Industry.
- Develop High School Curriculum. Curriculum needs to meet educational standards (NES). Part of Alaska *Seas and Watershed Curriculum*.
 - Partners: School districts/ teachers. Role: Curriculum development and implementation.
 - Partner: University of Alaska Southwest. Role: Curriculum development.

- Development of introductory training for shellfish. Develop of curriculum, brainstorming funding sources, industry needs assessment.
 - Partner: Shellfish industry. Role: Feedback on curriculum.
 - Partner: SeaGrant, Alaska Governor's Mariculture Taskforce, Mariculture Research Center/University of Alaska. Role: Develop curriculum, facilitate funding
 - Partner: Agencies. Role: Develop curriculum.
- Development of introductory training for seaweed. Alaska Fisheries Development Foundation (seaweed farming); continuation plan for trainings; improving curriculum/adjusting; expansion.
 - Partners: Alaska SeaGrant, Alaska Department of Fish and Game, Agencies, Industry, State of Alaska, Oil and Gas Industry. Various roles: Participation, feedback, funding.

Long-term Action Steps

- Establish mentorships for new entrants to the partnered with established farmers
 - Partner: Eric Wyatt. Role: Mentor.
 - Partner: Industry. Role: Mentor.
- Development of a program/curriculum (Graduate Degree Program). Internship/ study abroad programs.
 - Partner: University of Alaska.
- Development of advanced vocational training for farming. Creating cluster of information from various vocational organizations – relationship building, curriculum development. Fish tech.
 - Partners in developing curriculum: Alaska Vocational Technical Center, King Career Center, best practices nationwide, workaway.

D. Draft and Advocate for Supportive State Legislation

Near-term Action Steps (next 3-12 months)

- Change regulation to add “and research” [SAAC.41.070A].
 - Partner: Alaska Department of Fish and Game. Role: Will submit this to the Alaska Board of Fisheries next cycle.
- Generate better awareness within the industry of legislative actions/ideas that affect them.
 - Partner: Heather McCarty. Role: collecting list of people who want to stay in touch.
 - Partner: Liz Harpold. Role: Help keep people informed.

Long-term Action Steps

- Revise Jones Act HR 5061. Requiring aquaculture to meet standards in Jones Act is a burden/hurdle.
 - Partners: Murkowski and Sullivan Young, Ann Robertson, Chere Klein.
- Show support for the following by submitting public testimony to Senate and House Finance Committees: HB 116, HB 41, Department of Environmental Conservation Budget – paralytic shellfish poisoning funding.
 - Partner: Everyone! Role: Be advocates.
 - Partner: Heather McCarty. Role: Collecting list of people who want to be updated/informed.
 - Partner: Liz Harpold. Role: Help keep people informed.
- Chip away at other Mariculture Taskforce Legislative Priorities.

E. Industry has Ability to Forecast Harmful Algal Bloom

Near-term & Long-term Action Steps (next 3-12 months and beyond)

- **Step 1:** Identify environmental antecedents and spatial variations to harmful algal bloom events.
 - Partner: Southeast Alaska Tribal Ocean Research and University of Alaska Southeast (John Harley). Role: Data analysis.
 - Partner: Alaska Harmful Algal Bloom Network. Role: Communicating results.
 - Partner: Farmers. Role: Field verifications.
- **Step 2:** Set up continuous remote monitoring of environmental water quality parameters identified in Step 1 at farm sites. Install image flow CytoBot for harmful algal bloom monitoring and auto data uploads.

Partners: Alaska Ocean Observing System, Southeast Alaska Tribal Ocean Research, University of Alaska Fairbanks, University of San Diego (Scripps). Roles: Grant writers, principal investigators, partners.
- **Step 3:** Combine Department of Environmental Conservation + Alaska Ocean Observing Commission data into Mariculture Map when Department of Environmental Conservation completes quality control.
 - Partners: Department of Environmental Conservation, Alaska Ocean Observing System, Axiom. Role: Data holders.
- **Step 4:** Create Regional Ocean Modeling Station model for each region where there are farms, run models and analyze for farm areas.
 - Partners: Department of Environmental Conservation, WN, SPAR, Researcher (possibly University Alaska Fairbanks), oceanographer. Role: Possible model source.
- **Step 5:** Combine environmental data, harmful algal bloom data, Regional Ocean Modeling Station model, PST data (Steps 1-4). Run hindcast model and feed information to farmers.
 - Partners: Modeling people (university, state, federal agency). Role: run model.

F. Expanding Brand Recognition and Marketing Strategy for Products

Near-term Action Steps (next 3-12 months)

- Secure legislation to amend ASMI by-laws.
 - Partner: Alaska Seafood Marketing Institute. Role: Markets.
 - Partner: Government. Role: Legislation.
 - Partner: Community. Role: Advocate.
 - Partner: Trust Force (?). Role: Advocate.
 - Partner: Fishing organizations (?). Role: Advocate.
- Source funding for nutritional opportunities (working with aquaculture corporations).
 - Partner: Saltonstall/Kennedy grant program and Fisheries Innovation Fund. Role: Funding source for nutritional studies and marketing.
- Marketing the products of mariculture to Alaskans and consumers outside of Alaska through outreach and education.

Long-term Action Steps

- Execute marketing strategy to build brand recognition of Alaska mariculture with buy-in from Alaskans.
 - Partner: Alaska Seafood Marketing Institute. Role: Build the Alaska brand.
 - Partner: Alaska Seafood Marketing Institute/Alaska Fisheries Development Foundation /Innovation Summit. Role: Explore side-stream product innovations and development.

- Partner: Rasmuson Foundation. Role: Cultural and community outreach.
- Partner: RIM Mariculture. Role: Help mariculture explore certification.
- Partner: SeaGrant. Role: Growers' Summit and Young Growers' Summit.
- Partner: Regional Seafood Development Associations. Role: Engage regional marketing groups.
- Partner: Alaska Fisheries Development Foundation (various innovation summits).
Role: Promote people to innovate. Alternative opportunities for benefits re: climate change erosion, ocean acidification, pairing with aquaculture corps., etc.
- Partner with community marketing groups.
- Obtain global certifications (e.g. Marine Stewardship Council).
- Expand in to Alaska Seafood Marketing Institute's existing programs.
- Explore side-stream product innovations and development.
- Promote the mariculture idea.

G. Full Time and Stably Funded Mariculture Specialist at SeaGrant

Near-term Action Steps (next 3-12 months)

- Washington SeaGrant and Alaska SeaGrant develop a memorandum of understanding to share extension agent or Western Regional Aquaculture Consortium/United States Department of Agriculture.
 - Partners: Washington SeaGrant and Alaska SeaGrant Directors, National SeaGrant, United States Department of Agriculture, Western Regional Aquaculture Consortium
- Restore budget to University of SeaGrant for position.
 - Partner: Industry. Role: Lobby.
 - Partner: SeaGrant Director. Role: Educate National SeaGrant on needs and opportunities.
 - Partner: NOAA Fisheries Office of Aquaculture/Alaska Fisheries Science Center.
- Use existing funds from OA to hire a fellow. Identify a project.
 - Partner: Alaska SeaGrant Director. Role: Make the hire.
 - Partner: Alaska Fisheries Science Center Director. Role: Explore co-funding options.

Long-term Action Steps

- Align University of Alaska priorities with SeaGrant and industry to support marine advisory agents.
 - Partners: University of Alaska Southeast, University of Alaska Fairbanks, Alaska SeaGrant, National SeaGrant, NOAA.
- Assess fees on industry to support position (details to be determined).
 - Partner: Industry. Role: Assess and pay fees.
 - Partner: State of Alaska. Role: Collect fees.
 - Partner: Trade associations. Role: Assess and pay fees.

APPENDIX IV: REFERENCES

PUBLICATIONS

Alaska Mariculture Development Plan

<https://www.afdf.org/wp-content/uploads/Alaska-Mariculture-Development-Plan-v2018-03-23-small-single-pg-view.pdf>

Alaska Mariculture Development Plan *[In Brief]*:

<https://www.afdf.org/wp-content/uploads/In-Brief-Alaska-Mariculture-Development-Plan-FINAL-ONLINE.pdf>

Alaska Mariculture Task Force 5-Year Action Plan

https://www.adfg.alaska.gov/Static/fishing/pdfs/mariculture/12.13.19_5yr_action_plan_draft.pdf

Economic Analysis to Inform the Alaska Mariculture Initiative: PHASE 1 Case Studies

<https://www.afdf.org/wp-content/uploads/1c-Economic-Analysis-to-Inform-AMI-Phase-I-Case-Studies.pdf>

Alaska Mariculture Initiative Economic Analysis to Inform a Comprehensive Plan PHASE II

<https://www.afdf.org/wp-content/uploads/AMI-Phase-II-Final-Nov2017.pdf>

Alaska Shellfish Farm Size Feasibility Study

<https://www.afdf.org/wp-content/uploads/2b-Alaska-Shellfish-Farm-Size-Feasibility-Study.pdf>

SeaGrant Aquaculture 10-year Vision

http://masgc.org/assets/uploads/publications/1216/10-year_sg_aquaculture_plan_final_with_hyperlinks.pdf

AGENCIES

Alaska Department of Fish and Game (ADFG):

<https://www.adfg.alaska.gov/index.cfm?adfg=fishingaquaticfarming.main>

Alaska Department of Natural Resources (DNR):

<http://dnr.alaska.gov/mlw/aquatic/>

Alaska Fisheries Development Foundation (AFDF):

<https://www.afdf.org/projects/current-projects/>

Alaska Department of Commerce, Community and Economic Development:

<https://www.commerce.alaska.gov/web/>

Alaska Department of Environmental Conservation (DEC):

<https://dec.alaska.gov/eh/fss/shellfish/>

NOAA Fisheries Office of Aquaculture:

<https://www.fisheries.noaa.gov/topic/aquaculture>

SeaGrant Alaska Aquaculture:

<http://aquaculture.seagrant.uaf.edu>

NMFS Alaska Regional Office:

<https://www.fisheries.noaa.gov/about/alaska-regional-office>

NMFS Alaska Fisheries Science Center:

<https://www.fisheries.noaa.gov/about/alaska-fisheries-science-center>

US Army Corps of Engineers (USACE) Alaska District:

<https://www.poa.usace.army.mil>

US Fish and Wildlife Service:

<https://www.fws.gov>



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