Alaska Aquaculture Opportunity Areas Spatial Planning Workshops

Anchorage Workshop | February 26, 2024
Juneau Workshop | March 26 and 27, 2024

NOAA FISHERIES

NCCOS
NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Alaska Aquaculture Opportunity Areas (AOA) Spatial Planning Workshops

Alaska Region

Summary Report

Anchorage Workshop | February 26, 2024

Juneau Workshop | March 26 and 27, 2024

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Executive Summary

This report presents key outputs from a two-part workshop series focused on Aquaculture Opportunity Area (AOA) spatial planning efforts in Alaska State waters. The workshops were jointly convened by the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS or NOAA Fisheries), National Centers for Coastal Ocean Science (NCCOS), and the State of Alaska. The first workshop took place on February 26, 2024 in Anchorage, followed by the second on March 26 and 27, 2024 in Juneau.

The workshops fostered extensive information sharing and discussion of the ongoing AOA identification process in Alaska. Moreover, each event created an opportunity for a wide range of participants to inform future planning efforts. NOAA anticipates that the workshop outcomes synthesized in this report will assist Alaska Natives, coastal managers, local communities, industry, and other organizations with planning for future aquaculture development in Alaska.

The workshops created a collaborative environment where participants could:

- Learn about NOAA's spatial planning approach and discuss available spatial data within Alaska AOA study areas
- Document data gaps under six ocean sectors, and help identify points of contact for additional data
- Increase transparency, local capacity, and resources to support planning
- Further develop an engaged community to inform NOAA's AOA identification process in Alaska State waters

The agenda and approach for both the Anchorage workshop and day one of the Juneau workshop were the same, in support of the goals above. The Anchorage workshop focused on aquaculture constituents and marine resource managers and coincided with the Alaska Mariculture Conference. The Juneau workshop focused on other ocean user groups such as the fishing industry and subsistence users. That said, all interested parties were invited to both workshops. Moreover, day two in Juneau featured a tribal panel discussion which showcased perspectives of Alaska Natives from the southeast region.

Nearly 100 individuals attended the Anchorage event, and more than 40 people joined in Juneau. Participants across both events included Alaska Native community members, fishermen, aquaculture industry representatives, environmental organizations, scientists, subject matter experts, and state and federal agency personnel.

Participants explored six ocean sectors at each workshop (described below). The *Natural Resources and Cultural and Social Resources* sectors stimulated the most discussion at each event. Many participants were especially concerned about the protection of subsistence harvest and subsistence use areas when identifying optimal farm sites. Some raised questions about how climate change will affect the industry, and how predation, invasive species, and disease may impact farming operations.

A number of questions and comments surfaced about decision-making linked to the protection of threatened, endangered, or otherwise ecologically valuable species. Many cited the need for updated, higher resolution data, particularly, though not exclusively, for natural and cultural resources. Several also questioned how data sets will be kept up to date and accurate after this initial spatial modeling effort is complete.

Participants repeatedly spoke to the value of and need to incorporate Indigenous and other local knowledge into this AOA data gathering exercise. Many suggested that NOAA staff meet directly with Alaska Native communities, build relationships and foster trust in support of information sharing. Indigenous Knowledge (IK), based on evidence acquired through direct experiences and multigenerational observations, lessons, and skills, may significantly improve the validity of the NCCOS marine spatial planning study. Many commented that this type of knowledge could help identify potential AOA options, further reduce user conflicts and conserve natural resources in coastal Alaska waters.

Some emphasized the importance of protecting confidential data and expressed appreciation for NOAA's sensitivity towards data sovereignty, privacy, and security. At each workshop, many emphasized that Alaska Native and local community engagement should occur early and often. This could include informal engagement by agency staff with communities or formal consultations among leadership.

The workshops produced a wide range of data leads and gaps across each ocean sector explored. Detailed outcomes are described below for each sector, including data leads, gaps, and additional questions, concerns and insights put forward by participants. The agenda and attendance list are included as appendices. Participants and interested parties can access the NOAA workshop presentations **here**.

Welcome and Opening Remarks

At each event, Alicia Bishop, NOAA Fisheries Regional Aquaculture Coordinator, and project lead for the AOA identification process in Alaska, welcomed and thanked community members, Alaska Native Tribal representatives, the aquaculture industry, researchers, and state and Federal partners for joining and contributing to a robust spatial planning workshop.

Amilee Wilson, NOAA Fisheries Alaska Region Tribal Relations Coordinator, opened with a land acknowledgement at the Anchorage and Juneau workshops. The acknowledgement included a thank you in the Southeast Alaska Lingít language, Gunalcheesh, to the Alaska Native Tribes for their stewardship of this land and these waterways and for the opportunity to host the workshops on Dena'ina Elenena (Anchorage) and Lingit Aani (Juneau). She emphasized that NOAA and its state partners greatly appreciate tribal engagement on the AOA process and demonstrated patience as contributors learn and build this process together. As NOAA pursues its mission, the agency will strive to listen to and amplify Alaska Native traditions and values through respectful engagement.

Anchorage Workshop
Kate Dufault, Natural Resource Manager, Aquatic Farm Leasing Program, Alaska Department of Natural Resources (ADNR), Division of Mining, Land and Water, followed Alicia Bishop with additional opening remarks. She noted that Alaska has the potential to substantially increase aquaculture in state waters and is working toward a goal of building a $100 million industry by 2040. She emphasized that siting farms must be done thoughtfully and with consideration of all ocean uses and users. The AOA process will lead to development of suitability models that provide future users with valuable data to inform siting. In addition, collaboration between NOAA and Alaska State agencies with aquaculture leasing and permitting responsibilities will help to identify efficiencies in the farm application review process.

Juneau Workshop
Brent Reynolds, Natural Resource Specialist III, Aquatic Farm Program ADNR, provided similar remarks to Kate Dufault. He shared an example of constructive collaboration between NOAA and the State via the effort to integrate ADNR management plans into the AOA spatial suitability models. For example, NCCOS's spatial suitability models will exclude areas identified in ADNR plans that restrict aquaculture so that it is known in advance if sites do or do not comply with an ADNR plan.

Dune Lankard, Native Conservancy Founder and Chief Executive Officer, spoke about the experience of the Eagle clan during the Exxon Valdez oil spill, which resulted in large

dead zones in Prince William Sound (PWS). The area, Dune noted, has recently seen some resurgence of Pacific herring numbers, offering hope for recovery. He emphasized the need to integrate Indigenous Knowledge into the AOA planning process, plan for climate change, and foster collective efforts to restore the ocean and thereby ensure community resilience and the sustainability of the industry.

Approach to Workshop Collaboration

Facilitator Rich Wilson, Seatone Consulting, reviewed the workshop goals, agenda, and proposed an approach to maximize data brainstorming, idea generation, and contributions among participants. Each workshop began with introductory remarks and an overview of NCCOS spatial suitability models for AOAs. The remainder of each workshop was broken down into six discussion topics by key ocean sector:

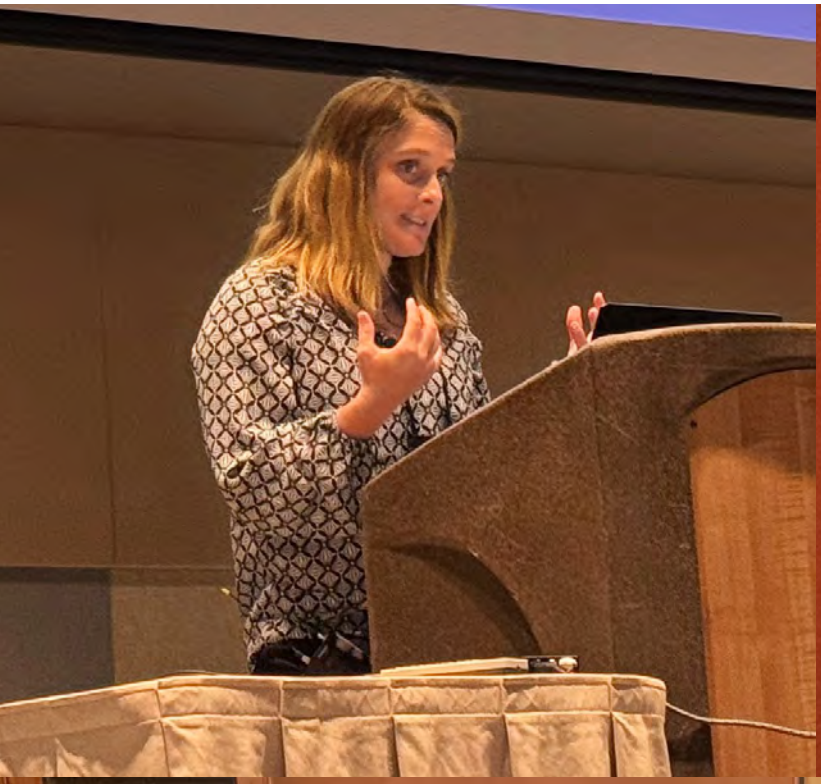
1. *Boundaries*: state and federal boundaries, locations of existing military activities, area management plans, designated parks and refuges, etc.
2. *Oceanographic/Hydrographic Data*: meteorological and oceanographic conditions, water depth, slope (bathymetry), distance from ports, etc.
3. *Natural Resources*: information about protected species and sensitive habitats
4. *Cultural and Social Resources*: cultural, subsistence, personal and traditional/ historical uses of the environment, social vulnerability, demographic data, archaeological sites, etc.
5. *Fisheries*: areas where both commercial and recreational sport fisheries are active, etc.
6. *Industry and Navigation*: locations of vessel traffic, key industrial concerns (shipping lanes, pipelines, submarine cables), buoys and weather forecasting devices, outfalls, etc.

Chris Schillaci, Research Marine Ecologist, NOAA NCCOS, began discussion of each ocean sector by presenting baseline information and the data layers collected to-date by NCCOS for the topic under consideration. Participants then provided feedback on this current data inventory through *Slido* polls (anonymous instant-response polling technology) and small breakout groups. Participants used a simple worksheet and printouts of maps to document ideas put forward during the small group discussion sessions. Large group discussions occurred after each small group breakout.

Three key prompting questions, with related follow-ups, were utilized to stimulate discussion among participants:

1. What are your concerns or questions about the data layers just presented?
2. Are you aware of any data that are missing from the list but are available? If yes, can you provide a point of contact from whom NOAA could acquire the data?
3. What data gaps exist, particularly as related to aquaculture development? For identified data gaps, what stands out as a high priority?

The data development outputs described in this report represent an amalgamation of information collected for each ocean sector via *Slido* polls, from participant worksheets and follow-on facilitated group discussion, and by extensive note taking.



NOAA's AOA Spatial Planning Process

Alicia Bishop, NOAA Fisheries Regional Aquaculture Coordinator, and project lead for identifying AOAs in Alaska, reviewed NOAA's Aquaculture Opportunity Areas planning process. An AOA is a defined geographic area that NOAA has evaluated through both spatial analysis and the National Environmental Policy Act (NEPA) process that may be environmentally, socially, and economically appropriate to support multiple commercial aquaculture operations. A 2020 Executive Order, *Promoting American Seafood Competitiveness and Economic Growth*, launched NOAA's AOA identification process.

The first two regions in the United States to undergo this process were **Southern California Bight** and the **Gulf of Mexico**. To date, these regions have developed AOA Atlases, and are in the process of developing Draft Programmatic Environmental Impact Statements (PEIS) for their respective regions. NOAA initiated the AOA identification process in Alaska in 2023 at the request of the State, and after receiving the most letters of support from the 2020 Request for Information.

AOA identification is a multi-year planning process which combines spatial analysis, scientific review, and Alaska Native and public input to help identify appropriate locations that minimize user conflict with other ocean uses and optimize conditions for the growth of selected species, all while maintaining commitment to ocean stewardship. A central goal in Alaska is to identify areas that can accommodate multiple seaweed and invertebrate (e.g., shellfish, sea cucumber) aquaculture operations. The AOA process is anticipated to take approximately four years to complete. This timeframe is split into two phases:

- Phase 1 is focused on the aquaculture spatial suitability analysis
    - Will take approximately two years
    - Will produce an *AOA Atlas Report*
- Phase 2 is focused on the NEPA analysis
    - Will also take approximately two years
    - Concludes in a PEIS
    - Final identification of AOAs occurs at the end of the NEPA process with the Record of Decision (ROD)

State and Federal regulatory agencies involved in the leasing and permitting of aquaculture in Alaska formed an *AOA Interagency Working Group* to guide the process in Alaska. Participants include: NOAA Fisheries, United States Army Corps of Engineers (USACE), Alaska Department of Fish and Game (ADF&G), Alaska Department of Environmental Conservation (ADEC), and ADNR.

AOAs in Alaska have not yet been identified. This workshop series is part of the Phase 1 spatial analysis planning process, designed to gather the best available information to help farmers and regulators make informed decisions about where to site farms. It is important to note that AOAs are not pre-permitted sites. Aquaculture farms can be sited both inside and outside of AOAs. Future aquatic farms will require the operator to undergo the same state and Federal leasing and permitting processes. However, siting operations within AOAs may help frontload the leasing and permitting process for potential farms by identifying areas with reduced use conflict, optimal biological and physical features that may support the invertebrate and seaweed species they want to grow, and environmental analysis.

All AOAs in Alaska will be sited within State waters and could support multiple farms for seaweed, shellfish, and other invertebrate species. AOA identification in Alaska will not consider finfish farming as it is prohibited by State law.

AOA Study Areas in Alaska

Throughout fall and winter of 2023, NOAA met with interested parties to gather ideas on important siting considerations and study area parameters with the aim of narrowing down possible options of AOA study areas in Alaska State waters. NOAA Fisheries published a **Request for Information** (RFI) in the Federal Register in October 2023 seeking data and other information to support the identification of AOAs in Alaska including feedback on two proposed parameters to identify study areas:

1. State waters within 25 miles of coastal population centers in Alaska (as a proxy for infrastructure).
2. Waters that do not regularly experience significant sea ice cover.

These two parameters resulted in 16 proposed study areas across Southeast, Southcentral, and Southwest Alaska.

NOAA Fisheries and the AOA Interagency Working Group reviewed public comments submitted through the 60-day RFI and applied best available data in finalizing ten Alaska AOA study areas.

The final study areas for the *Southeast* region include: Juneau, Sitka, Petersburg, Wrangell, Craig, and Ketchikan. For *Southcentral* Alaska, the final study areas include: Seward, Valdez, and Cordova. And for *Southwest* Alaska the final study area includes an expansion of the Kodiak study area.

NOAA is in conversation with Metlakatla Tribal Leadership regarding the possible inclusion of Metlakatla (Southeast region) as a study area. Annette Island and the surrounding Tribal waters are the only Indian Reservation in all of Alaska. NOAA will only proceed with this study area at the invitation of the Metlakatla Indian Community.

A Public-Driven Process

Alicia Bishop concluded her overview by emphasizing that the AOA planning process is driven by public input and review. NOAA Fisheries provides multiple opportunities for both formal and informal public input throughout this multi-year planning process. The October 2023 RFI provided the public an opportunity to share information and feedback on draft study areas and relevant data to support the identification of AOAs in Alaska State waters. Input received helped NOAA finalize the study areas and begin to fill in some data gaps.

The spatial planning workshops described in this report represent another opportunity for engagement in the process. Participants reviewed data gathered to date by NOAA, helped identify data gaps, offered insights on the best ways to fill those gaps, and shared what types of data are most important to consider during the AOA process.

Following this spatial analysis phase, the environmental review phase will provide a formal comment period via the Notice of Intent (NOI) to prepare the NEPA analysis, and via public scoping and listening sessions. Finally, NOAA will request public input on the draft NEPA analysis. Public and tribal engagement is occurring throughout the process, and tribal consultation is anticipated to occur at the beginning of the NEPA process.

Development Of Spatial Suitability Models

Chris Schillaci, Research Marine Ecologist, NOAA NCCOS, presented a brief overview of NOAA's marine spatial planning and modeling process in order to set the stage for data development across the six ocean sectors. Workshop participants and interested parties may view his presentation **here**.

NCCOS conducts marine spatial planning in order to understand how ocean industries such as aquaculture impact communities and the environment, and to support sustainable coastal development by informing permitting agencies and resource managers.

Over the last decade, NCCOS has developed a robust marine spatial planning framework. Approximately 60 spatial analyses have been completed. These include two published Atlases which compile the best available science to inform the identification of AOAs in the **Gulf of Mexico** and **Southern California Bight**, as well as work in state waters of Florida, California, and Massachusetts.

NCCOS collaborates with local partners across the United States to advance marine spatial planning. Spatial suitability models are a tool that allows planners and interested parties to:

- Analyze the whole ecosystem through defensible and transparent methods
- Identify both hotspots of conflict as well as areas of opportunity
- Conduct scenario planning and support comprehensive environmental review

Spatial planning is about improving ocean intelligence and digital infrastructure. Alaska Native and public engagement – building, for example, on the knowledge and data already possessed by many individuals, organizations, Alaska Native entities, and agencies in the Alaska region – is a key element of the marine spatial planning process. In time, a spatial suitability analysis provides a holistic view across multiple ocean sectors. These workshops will help enable local partners in Alaska to move in this direction.

Species/Gear Based Suitability Models for Alaska Aquaculture Opportunity Areas

In addition to considering basic needs to help support successful aquaculture siting – such as siting close to coastal population centers (as a proxy for infrastructure), and avoiding areas that experience significant ice build-up in winter months – other factors are also considered when determining potential suitability. Important parameters to help inform siting of AOAs in Alaska State waters include identification of areas most appropriate for common culture species and common gear types. The study areas will be refined via spatial modeling, which will narrow down areas by environmental thresholds tailored to common gear types for common culture species. For each species, applicable environmental thresholds (e.g., salinity, water temperature, pH, turbidity, etc.) can be identified and areas narrowed to locations within those environmental thresholds. Additional environmental thresholds (e.g., depth, current speed, max wave height, etc.) for common gear types in Alaska can also be identified and utilized to further narrow down the study areas.

As a first step to evaluate an area for species/gear specific suitability, regional study areas are narrowed down based on bathymetry and a set maximum depth for species and gear type under consideration. Chris Schillaci noted it can be challenging to define depth thresholds. Sometimes thresholds are determined by gear manufacturers. Thresholds can also be based on economic or logistical considerations about what is practical for the farmer. Shallow and intertidal gear types have different thresholds (e.g., minimum depth) than floating gear and longlines. Across Alaska, most existing aquatic farms are within 200 feet of water. Wave height is also important for suitability of exposure for certain gear types. NOAA is working in collaboration with the Pacific Shellfish Institute to understand different gear thresholds beyond depth (such as wave exposure and current speed), along with environmental data.

Opportunities exist, Chris noted, for grouping across gear types. Many species/gear combinations may have similar physical and biological thresholds. For instance, the thresholds for floating bags, cages, and baskets used for abalone are consistent with suspended oyster aquaculture gear. In Alaska, hundreds of acres are available for evaluation with overlapping species/gear suitable areas.

Following Chris's presentation, participants were invited to participate in an informal polling exercise using instant response *Slido* technology. Polling questions focused on likely cultured species in Alaska, important factors for determining suitable gear types, and practical depth for limiting analysis. The facilitator noted that participation was voluntary, anonymous, and that no responses would commit any individual or organization to a position regarding prospective aquaculture development in Alaska.

Responses for both the Anchorage and Juneau workshops are shared below. Juneau did not realize as large attendance as Anchorage, thus the smaller response numbers.

Poll 1: Beyond oysters and seaweeds, what are the most likely culture species for Alaska? (choose all that apply)

Poll type: Multiple choice

Anchorage

Response rate: 51 participants

- Mussels – 41 votes (**80%**)
- Abalone – 28 votes (**55%**)
- Sea cucumbers – 27 votes (**53%**)
- Geoduck clams – 19 votes (**37%**)
- Other clam species – 14 votes (**27%**)
- Something else – 5 votes (**10%**)

Juneau

Response rate: 17 participants

- Abalone – 12 votes (**71%**)
- Geoduck clams – 10 votes (**59%**)
- Mussels – 9 votes (**53%**)
- Sea cucumbers – 9 votes (**53%**)
- Other clam species – 5 votes (**29%**)
- Something else – 3 votes (**18%**)

Poll 2: What are the most important factors for determining if an area is suitable for a particular aquaculture gear type? (choose all that apply)

Poll type: Multiple choice

Anchorage

Response rate: 52 participants

- Current velocity – 38 votes (**73%**)
- Depth – 35 votes (**67%**)
- Wave height – 27 votes (**52%**)
- Substrate – 23 votes (**44%**)
- Something else – 14 votes (**27%**)

Juneau

Response rate: 19 participants

- Depth – 13 votes (**68%**)
- Current velocity – 12 votes (**63%**)
- Substrate – 8 votes (**42%**)

- Something else – 7 votes (**37%**)
- Wave height – 6 votes (**32%**)

Poll 3: For suspended gear types (e.g., hanging baskets, kelp longlines etc.), what is the practical depth to limit the analysis to?

Poll type: Single choice

Anchorage

Response rate: 35 participants

- 100 feet – 1 vote (**3%**)
- 150 feet – 6 votes (**17%**)
- 200 feet – 21 votes (**60%**)
- 250 feet – 3 votes (**9%**)
- 300 feet – 1 vote (**3%**)
- No maximum depth – 2 votes (**6%**)
- Something else – 1 vote (**3%**)

Juneau

Response rate: 8 participants

- 100 feet – 1 vote (**13%**)
- 150 feet – 1 vote (**13%**)
- 200 feet – 2 votes (**25%**)
- 250 feet – 0 votes (**0%**)
- 300 feet – 0 votes (**0%**)
- No maximum depth – 1 votes (**13%**)
- Something else – 3 votes (**38%**)

Immediately following each poll, results were displayed on screen in real-time at the front of the room. This afforded participants the opportunity to reflect on the results, then share additional comments and feedback. Several commented on the opportunities for polyculture with mussels and sea cucumbers, abalone and oyster, and abalone and seaweeds. When considering important factors for determining if an area is suitable, mooring conditions, chlorophyll nutrient levels, freshwater input, and the depth of salinity and freshwater lens, frequency of wave height, frequency of harmful algal blooms (HABs), and wind conditions were all noted as other critical factors.

Data Development Across Key Ocean Sectors

Throughout the course of the workshops, participants engaged in rapid data brainstorming across each of the six ocean sectors. Following the opening NOAA presentation for each sector, participants initially asked questions, shared concerns or offered insights or reflections on the information displayed. The group then worked to identify any missing but available data not included in the presentation, the leads to acquire said data, and key data gaps that need to be addressed.

Data development outcomes for each session are summarized below. NOAA's available database is initially presented for each ocean sector. Subsequent text and associated tables and bulleted lists show information collected from the group for the sector under consideration. Given the early stages of AOA marine spatial planning in Alaska, combined with the rapid pace of brainstorming and group discussion, some redundancy of text in this workshop summary is expected.

Workshop participants and interested parties may access the NOAA presentations and Alaska AOA study area maps **here**.

Session 1: Boundaries and Oceanographic/ Hydrographic Data

The *Boundaries* sector includes data layers on state and federal boundaries, locations of existing military activities and national security areas, ports and harbors, area plan management units, USACE Civil Works project areas, and designated parks and refuges.

NCCOS shared the *Boundaries* data layers of which the agency is aware, noting if said layer was a **constraint**, versus a **consideration**.

- A **constraint** is a variable that means aquaculture cannot be conducted in the area
- A **consideration** is a non-constraint parameter that may influence a site's overall suitability score for aquaculture

Table 1. Boundaries, Study Area Overlap and Data Layer Type

Data	Overlap	Type
State/Federal Line	N/A	Constraint
Southeast Alaska Study Areas	Juneau, Craig, Sitka, Petersburg, Wrangell, Ketchikan	Constraint
Southcentral Alaska Study Areas	Valdez, Cordova, Seward	Constraint
Kodiak Study Areas	Kodiak	Constraint
Munitions and Explosives of Concern	Juneau, Kodiak	Consideration
Danger Zones and Restricted Areas	Ketchikan	Consideration
State Parks (with submerged lands)	Southeast, Southcentral, Kodiak	Constraint
National Wildlife Refuges (with submerged lands)	Kodiak	Consideration
National Park System (with submerged lands)	Seward	Consideration
USACE Civil Works Projects	Southeast, Southcentral, Kodiak	Constraint
Area Plan Management Units	Southeast, Southcentral, Kodiak	Consideration

The *Oceanographic/Hydrographic* sector includes a range of meteorological and oceanographic information needed to inform planning and decision-making. This includes meteorological and oceanographic conditions, water depth, temperature, salinity, water quality, sea ice aggregate, slope (bathymetry), and HABs. *Oceanographic/ Hydrographic* data layers which NCCOS is aware of include:

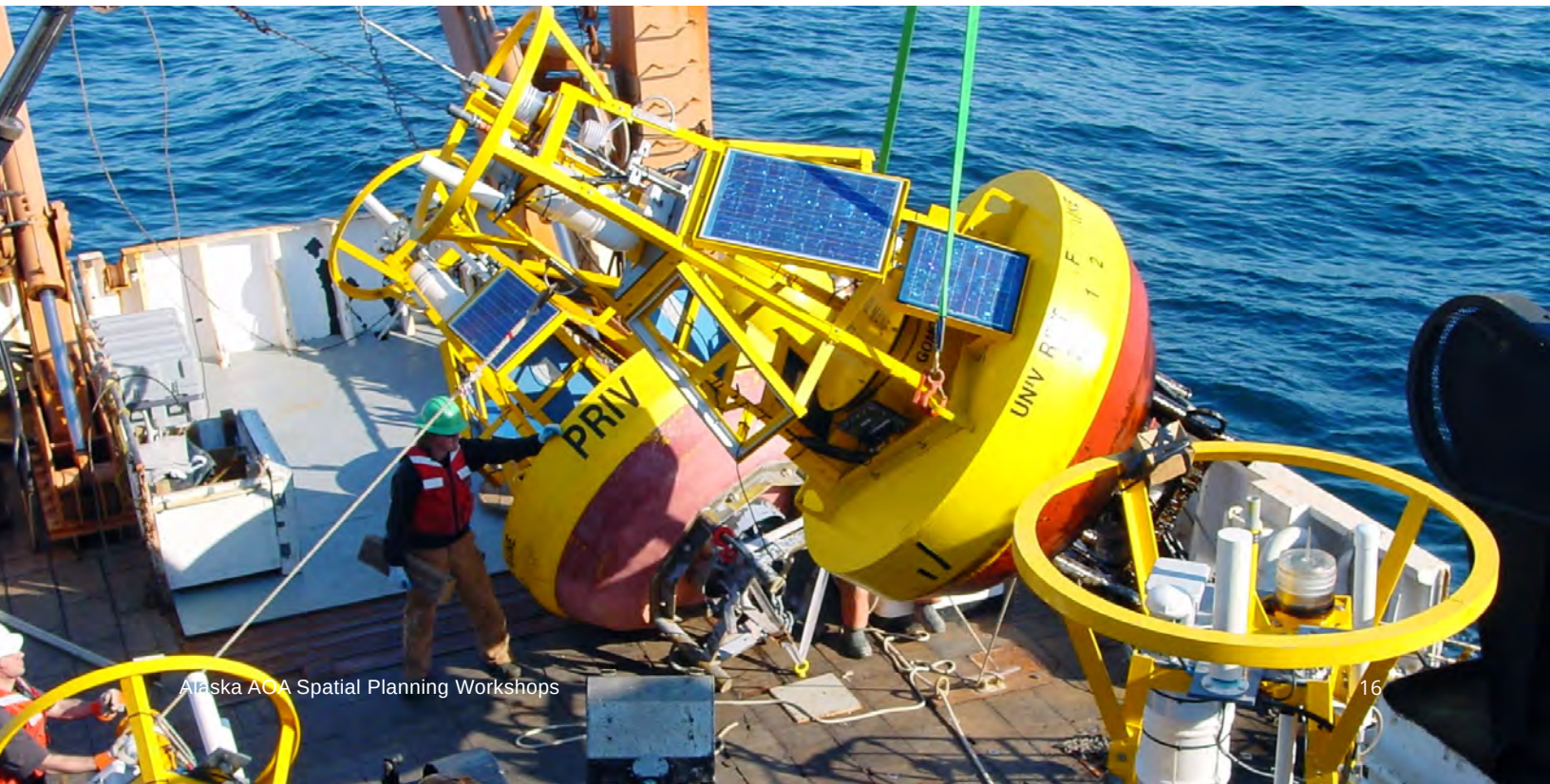
Table 2. Oceanographic/Hydrographic Data, Study Area Overlap and Data Layer Type

Data	Overlap	Type
Bathymetry	Southeast, Southcentral, Kodiak	Constraint
Maximum Aggregate Sea Ice	Cordova, Seward	Constraint
Environmental Sensors and Buoys	Southeast, Southcentral, Kodiak	Constraint
Ecological Marine Units	Southeast, Southcentral, Kodiak	Consideration
Larval Drift Zones	Southeast, Southcentral, Kodiak	Constraint

Other data sources NCCOS will consult for this sector include:

- Navy Coastal Ocean Model Current Speed and Direction
- National Weather Service (NWS) Coastal Waters Forecast (CWF)
- Alaska Harmful Algal Bloom Network
- Satellite data
- Sediment texture data
- Department of Defense Siting Clearinghouse

Following the NOAA presentations on *Boundaries* and *Oceanographic/Hydrographic* data, participants used *Slido* to identify missing but available data, as well as associated leads or points of contact to acquire this data. As poll results were displayed real-time on screen, the facilitator opened discussion to the full group and suggested that participants expand on initial ideas put forward. A summary of poll responses for this ocean sector, along with associated follow-on discussion is compiled below. Except for minor editing for readability, compiled outputs in the tables and bulleted lists in this and subsequent sessions reflect direct transcription from poll responses and participant worksheets.



Anchorage Workshop

Participants at the Anchorage workshop emphasized the importance of including freshwater influx and nutrient data. Chris reflected on the list of missing but possibly available data and noted that additional data layers to inform sanitary surveys of prospective AOA sites is desired. Discussions with ADEC and other partners about dynamic areas, especially related to toxins and HABs, will be critical to assignment of suitability scores. He also noted that the United States Coast Guard (USCG) has offered to conduct an informal navigation safety assessment of the study areas.

Juneau Workshop

Participants at the Juneau workshop mentioned kelp beds around sacred sites in Southeast Alaska that Alaska Native Tribes will want protected from the impacts of farming operations. NOAA acknowledged confidentiality issues around sacred sites, and noted that these data are not being requested during this public forum. Rather, if Alaska Native Tribes are willing to articulate general locations of sacred areas on maps, these areas may then be considered less suitable while maintaining data sensitivity. A number of participants noted that Alaska Native Tribal resources are not yet adequately represented in the various sectors and data layers. NOAA responded that discussion of these kinds of resources and associated data will be provided during the *Cultural and Social Resources* sector, and available information on kelp beds will be provided in the *Natural Resources* sector discussions later in the day.

Table 3. Available Data and Leads for the Boundaries and Oceanographic/ Hydrographic Sector

Available Data	Lead to Acquire
Nearshore data layers	• United States Forest Service (USFS) (Kim Homan)
Nearshore hydrographic data	• Navionic
Sea level change	• None provided
Sediment types and subsurface	• None provided
Substrate mapping	• Shorezone • Department of Defense (DOD)
Dissolved metals/heavy metal concentrations	• None provided
Ocean acidification (OA)	• Alaska Ocean Acidification Network (Darcy Dugan) • Chugach Regional Resources Commission (CRRC)
Climate modeling/climate change impacts	• None provided
Bathymetry	• NOAA Depth Team
Freshwater influx into Gulf of Alaska	• National Aeronautics and Space Administration (NASA)

Available Data	Lead to Acquire
Potential landslide zones and land shifting areas that affect coastlines	• United States Geological Survey (USGS) • Ground truth trekking
Sea surface temperature, temperature, pH in southeast Alaska from the ferries	• Wiley Evans
Data in the Exxon Valdez Oil Spill (EVOS) affected region (PWS, Lower Cook Inlet (LCI), Kodiak)	• Prince William Sound Science Center (PWSSC) https://pwssc.org/
HABs/OA data	• Southeast Alaska Tribal Ocean Research • Knik Tribe (Jackie McConnell)
HABs monitoring	• Southeast Alaska Tribal Ocean Research (SEATOR) • Alutiiq Pride Marine Institute (APMI)
Past log staging sites, which can have wood and other debris that can affect mooring and water quality considerations	• None provided
Southeast Alaska Fish Habitat Partnership spatial data viewer for this region	• www.seakfhp.org (Deborah Hart)
Fisheries Rehabilitation, Enhancement, and Development (FRED)	• Southeast Alaska Fish Habitat Partnership (Deborah Hart)
Alaska Coastal Rainforest Center data collaboration in southeast Alaska intercoastal water climate/sea data with the state - Alaska Marine Highway	• None provided
PWS specific oceanographic data	• EVOS Trustee Council Reports (Shiway Wang) https://evostc.state.ak.us/ • Gulf Watch Alaska, organized by Alaska Ocean Observing System (AOOS) and Axiom (Adrienne) • Sound Ecosystem Assessment Program • Regional Citizens Advisory Council
Temperature	• None provided
Freshwater intrusion/freshwater lens	• None provided
Organic sediment loading for intertidal mudflats	• None provided
Longevity pollutants from previous industry	• None provided

Available Data	Lead to Acquire
Sediment or pH factors in water	• None provided
Areas that have tested positive for paralytic shellfish toxins (PSTs)	• None provided
Aggregated marine weather, buoys, gliders, ship transects, HFR, water level, acidification, etc.	• AOOS data portal
Suspended particulate, glacial influence	• None provided
Total coliform counts in harbors	• National Shellfish Sanitation Program (NSSP) dataset
Mariculture Recon program funded by EVOS Trustee Council	• Ginny Eckert
Conductivity, temperature, and depth (CTD) data going back to the 1960s	• Campbell. 2018. Hydrographic trends in PWS 1960-2016. Deep Sea II – Rob Campbell
Oceanographic data from the entire Gulf, especially from Kodiak in the 1970s from oil exploitation	• Department of Commerce (Caitlin McKinstry)
Kachemak Bay data	• Gulf Watch AIS • Kachemak Bay National Estuarine Research Reserve (KBNERR) (Kris Holderied)
Oil spill response data	• Exxon Valdez • Cook Inlet Regional Advisory Council
Water productivity including phytoplankton, nutrients, oxygen (O2), nitrogen (N), light, etc.	• None provided
Ice flow	• None provided
Iceberg calving events and ice float movement	• USGS • Park Service (Kenai Fjords) • USCG/navigation information
Alaska Native Claims Settlement Act (ANCSA) 14(h)(1) sites	• Bureau of Indian Affairs https://www.bia.gov/regional-offices/alaska/ancsa-program
Seawater intake measurement logs	• Marine labs • Aquariums • Hatcheries
None provided	• Regional Citizens Advisory Council (Donna Schantz)
None provided	• Oil Spill Recovery Institute (Scott Pegau)

Data gaps for the *Boundaries and Oceanographic/Hydrographic* sector:

Environmental Factors:

- Bottom substrate type, distribution, and depth of substrate
- Haloclines/thermoclines
- Turbidity and glacial silting effect
- Sunlight availability
- Sunlight penetration depth and sunlight hours by time of year
- pH, trends in pH
- Water column parameters
- Water quality data
- Nutrients
- Nitrogen by depth by time by location
- Total coliform counts in harbors
- Rare earth elements (REEs) critical to produce electric motors and generators, and high-value Platinum Group Metals (PGMs)

Biological Factors:

- HAB cyst seed beds distribution
- Invasive species mapping

Natural Phenomena:

- Effects of king tides on log movement
- Floating log movement/prevalence/flood zones and active logging areas

Data and Mapping:

- Landowner data
- Updated/aged out data from DOD, cable areas, etc.
- Water classification areas for shellfish farms
- Localized current and bathymetry data

Participant worksheets showed additional questions, concerns, and insights:

- Remote sensing data and existing data layers are relied on too much. Substantial data collected in the Gulf of Alaska and Prince William Sound has not yet been processed into easily usable layers or other resources. How can such data be incorporated into this process?
- More granularity for all existing layers would be helpful, especially for nutrient availability, sunlight penetration, and substrate.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Session 2: Natural Resources

The *Natural Resources* sector includes data layers on critical habitat, threatened and endangered species, essential fish habitat, and protected areas. *Natural Resources* data layers which NCCOS is aware of include:

Table 4. Natural Resources Data, Study Area Overlap and Data Layer Type

Data	Overlap	Type
NMFS Endangered Species Act (ESA) Critical Habitat	Southeast, Southcentral, Kodiak	Consideration
Whale Biologically Important Areas (BIAs)	Southeast, Southcentral, Kodiak	Consideration
Pinniped Haulout Locations	Southeast, Southcentral, Kodiak	Consideration
Sea Otter Concentration Areas	Southeast, Southcentral, Kodiak	Consideration
United States Fish and Wildlife Service (USFWS) ESA Critical Habitat	Kodiak	Consideration
NMFS Essential Fish Habitat	Southeast, Southcentral, Kodiak	Consideration
Kelp and Eelgrass Shore	Southeast, Southcentral, Kodiak	Consideration
Seagrass BioBand	Southeast, Southcentral, Kodiak	Consideration
Kelp BioBand Shore Zone	Southeast, Southcentral, Kodiak	Consideration
Anadromous Stream	Southeast, Southcentral, Kodiak	Constraint
Audubon Bird Important Bird Areas (IBA)	Southeast, Southcentral, Kodiak	Consideration
Herring Spawning	Southeast, Southcentral, Kodiak	Consideration
Deep Sea Corals	Southeast, Southcentral, Kodiak	Consideration

Following the NOAA presentation, participants moved into small breakout groups to discuss and identify missing but available data, data gaps, and any concerns or questions about the data layers presented. Each group utilized a simple worksheet and printouts of maps to collect ideas. Feedback from both workshops is compiled below.

Participants at the Anchorage workshop shared concerns about the robustness of the data layers for this sector, specifically for sea otter populations and seal haulouts. Some asked how data layers will be harmonized to produce suitability maps. Others noted that climate change may shift feeding patterns and distribution of marine mammals and other species, and asked how the model will reflect this and how the data will be maintained over time. Several spoke about how Indigenous Knowledge can provide more accurate data than is collected by some of the agencies.

NOAA staff acknowledged that incorporation of climate models is a challenge.

However, Chris Schillaci reminded the group that the spatial suitability modeling process aims to prioritize siting using the best available spatial data and avoid areas which are most vulnerable to near-term change. He again explained that the various data layers do not directly interact with each other. Rather, each layer is incorporated into sub-models. Suitability scores are then applied to each 10-acre grid cell. This enables production of heat maps, which illustrate suitability, or lack of suitability, for particular areas within an overall study area.

In the breakout group worksheets, participants identified where additional data might be acquired and identified potential points of contact.

Table 5. Available Data and Leads for the Natural Resources Sector

Available Data	Lead to Acquire
Environmental changes related to EVOS	• PWS Science Center (Kaitlin McKinstry) • Gulf Watch Alaska https://gulfwatchalaska.org • Axiom
Tracking invasive species in Alaska waters (green crab, tunicates)	• USGS
Kelp mapping: subtidal and kelp beds outside of BioBands	• Kelp Watch • High resolution satellite data
Genetic data with location	• ADF&G
Aquaculture near nesting eagles	• ADF&G
Abalone abundance and locations in southeast Alaska	• Taylor White
Red tide events (Kodiak in spring)	• None provided
Paralytic Shellfish Poison (PSP) prevalence	• AOOS monitoring
Community data efforts	• HABs network • Seator (recreational shellfish)
ESA species data and range	• None provided
Invasive species	• Alaska Invasive Species Partnership (AKISP) • Alaska Fisheries Development Foundation (AFDF)
Migration patterns of some animals	• None provided
Herring distribution/spawning sites	• Tom Thorton • Traditional Knowledge at Doyle Bay
Invasive species data (e.g., green crab, tunicates)	• Anecdotal data from small communities
Key habitat sites	• Seaduck Joint Venture https://seaduckjv.org
Eider duck concentration (causes predation issue for mussel farms)	• USFWS
Sunflower sea star distribution	• None provided
2023 BIAs map should be used in lieu of the 2016 data	• NMFS
Walrus data (include in the pinniped layer)	• None provided
ESA candidate species	• None provided

Available Data	Lead to Acquire
Herring fisheries and spawning data	• Scott Pegau • Southeast Alaska Region Subsistence Regional Advisory Council and Craig Tribe (Michael Douville) • ADF&G • Tribes • Anecdotal data from small communities
Herring spawning data – Metlakatla	• Metlakatla Indian Community/Ecotrust (Keolani Booth)
Better sea otter data is available	• USFWS
Hooligan fisheries	• None provided
EVOS area/lingering presence	• None provided
Abundance and distribution of wild kelp species	• None provided
Estuary classification and map units	• The Nature Conservancy (TNC)
Ecological Atlas for Southeast Alaska	• TNC • Alaska Audubon Society
1990s Sound Ecosystem Assessment Program	• AOOS
Sea otter impact on productive areas over time	• Household survey data
Wild kelp beds	• Barnacle drone footage
European Green Crab (*Carcinus maenas*) database	• None provided
Ferry data	• None provided
Shorezone	• None provided
SEATOR datasets (PSP, OA monitoring)	• None provided
NASA data	• NASA
Traditional Ecological Knowledge (TEK) of natural resources	• None provided
Southeast coastal monitoring surveys (via NOAA)	• NOAA
Nearshore Fish Atlas of Alaska (NFA)	• None provided
North Pacific Research Board Gulf of Alaska Research Project (GOARP) https://nprb.org/gulf-of-alaska-project/	• None provided
Local knowledge	• None provided
No specific data provided, just lead	• Alaska Fisheries Science Center (AFSC)

Available Data	Lead to Acquire
No specific data provided, just lead	• Oceans Alaska
No specific data provided, just lead	• Pacific States Marine Fisheries Commission (PSMFC)
No specific data provided, just lead	• PWS Science Center (Rob Campbell)
No specific data provided, just lead	• Skipper science
No specific data provided, just lead	• Smithsonian Environmental Plate Watch Program
No specific data provided, just lead	• Smithsonian Environmental Research Center's (SERC) National Estuarine and Marine Exotic Species Information System (NEMESIS)
No specific data provided, just lead	• USGS

Data gaps for the *Natural Resources* sector:

Aquaculture Impact Assessment:

- Buffer zones for aquaculture near eagle nesting sites
- Impact of mariculture activity near harbor seal haulouts
- Predation of sea otters/sea birds off gear
- Aquaculture impact on other wildlife (including terrestrial)
- Severity of biofouling
- Change of behavior
- Invasive species distributions
- Factors that might contribute to oyster naturalization
- Critical habitat risk of Pacific oyster naturalization
- Shading impacts on eelgrass

Environmental Factors and Modeling:

- Nutrient availability
- Nutrients, scale, and satellite data accuracy
- Water productivity
- Climate modeling and site prediction
- How data layers could be impacted by climate change
- Habitat changes over time
- Environmental impact of past oil spills
- Spatial maps of PSPs and their impact on new kelp or oyster beds
- Projected species distributions under various climate scenarios

Species and Habitats:

- Potential ESA species (e.g., sunflower seastar)
- Locations of harbor seal haulouts
- Bear prevalence in shoreside farms
- Bird mapping
- Corals
- Abundance and distribution of wild kelp species
- Subtidal seagrass locations
- Eelgrass encroachment on farms
- Underwater geology and sediments
- Sea asparagus and geoduck natural distribution
- Sunflower starfish distribution
- Historical (pre-1966) kelp distribution and kelp farming operations
- Traditional hunting areas
- Other fisheries spawning areas beyond herring
- Eelgrass and other species preservation considerations
- Projected species distributions relevant to Tribal subsistence futures

- Steller Sea Lion (*Eumetopias jubatus*) rookeries
- Walrus population distribution
- Deer crossing areas (swimming)

Data and Mapping:

- Water classification data for shellfish farms
- Subtidal kelps - data availability
- Kelp bands outside currently mapped Shorezone BioBands
- Data on historic extent and range of other fish species (non-herring)
- Spatial maps of PSPs and their impact on new kelp or oyster beds
- Invasive species mapping
- Genetic data
- Total chloroform counts within harbors
- Granularity of data (e.g., nutrients, sunlight penetration, substrate)
- Localized, site-specific oceanographic data compared to buoy data
- Remote sites excluded in the 25-mile radius

Specific Concerns and Considerations:

- Per- and Polyfluorinated Substances (PFAS)
- Potential allergens for seaweed farms in proximity to shellfish
- Prevalence and distribution of parasitic Tanner crab disease (and other parasites, diseases), especially in Lynn Canal
- How to map logs and icebergs that could float through farms
- TEK/sub use areas

Participant worksheets collected at the conclusion of this session revealed additional questions, concerns, and insights for the *Natural Resources* sector.

Data Harmonization and Quality:

- How quickly does data become out of date? Can it be more predictive?
- How will data be updated and maintained over time? Will data remain relevant?
- How are fluctuations in data layers and changes over time (dynamic data sets) accounted for?
- Updates to older datasets will be needed
- Data formats from multiple species/sources are hard to harmonize as data layers
- Concerns about data harmonization: all datasets currently that are disparate should be interactable with each other
- There are inconsistencies in data collection
- Responsible agencies should make reporting a requirement to improve data over time and understand spatiotemporal change
- Important to utilize local knowledge to fill data gaps, as many of the data layers shown are state or federally funded, and sometimes funding streams run out

- Aging of data and relevancy of data is a concern

Impact of Aquaculture:

- What are the environmental impacts of aquaculture development? How does a farm impact natural resources over time?
- Is there an effect of aquaculture on harbor seal haulouts specific to Alaska?
- Will farms become essential fish habitat or marine mammal attractants?
- Some gear types have certain risks of entanglement

Species and Habitat Concerns:

- The marine mammal layers are extensively mapped. How do they coexist within a polygon?
- How will farming change the habitat/behavior of mapped species?
- How do models account for populations that change and move, such as sea otters?
- How is seasonality of data reflected in the model?
- Traditional Knowledge suggests that sea otter populations may be higher than USFWS counts. A better mapping of species, not just concentrations, is needed. How is the data collected? Is the population growing or shrinking?
- Key subsistence food and culturally important areas are missing
- Herring spawning areas should be viewed as a constraint, not a consideration
- Rapid ecological change is not reflected in the data
- Species distributions need a temporal component
- Not all herring spawning locations were presented on the maps, so this information needs to be updated.

Data Collection and Usage:

- What does each layer represent with respect to the timing of data collection and history of the site? What is the temporal relevance of the layers and data collected over time versus a discrete measurement?
- Are the data layers clear and useful to non-scientists? How will the data be used beyond the AOA process?
- How are the data sourced for these NOAA compiled datasets? Who owns and updates the datasets?
- How robust is the current data?
- Can models leverage EVOS/Science Center work in Kodiak?
- How far back in history do the data layers go?

Other Questions and Considerations:

- Can herring spawning events on kelp farms be a positive for farmers?

- How is predation on farms (e.g., otters, terns, Eider ducks) and other threats to farming practices accounted for?
- How are gear interactions with species considered or accounted for?
- Is PSP an issue for oysters and/or mussels in the water column, as it is for clams?
- What is the BioBand data layer?
- Why are we creating new “beds”?
- How is herring spawning recorded? Only via aerial observations or with ground truthing?
- Will USFWS critical habitat information be available for other regions?
- May be onerous to trudge through large collections of data as a user looking for “green-light” areas
- Consider the weightings of each layer (e.g., predation on farms, sea otter interaction, protected mammals)
- Would be useful to know the gear types that most successfully prevent sea otter predation on cultured products

Session 3: Cultural and Social Resources

The *Cultural and Social Resources* sector includes data layers on cultural uses, personal use and subsistence fisheries, traditional/ceremonial or important recreational uses of marine or coastal areas (e.g., dive sites, sandbars, transit routes to those areas, etc.), social vulnerability, demographic data, coastal infrastructure/working waterfronts, and underwater and/or actual or possible archeological sites in coastal areas. Cultural and social resource data layers NCCOS is aware of include:

Table 6. Cultural and Social Resources Data, Study Area Overlap and Data Layer Type

Data	Overlap	Type
Community Subsistence Information System Data	Southeast, Southcentral, Kodiak	Consideration
Subsistence Fisheries Revenues	Southeast, Southcentral, Kodiak	Consideration
Subsistence Use Communities	Southeast, Southcentral, Kodiak	Consideration
Subsistence Harvest Non-Fisheries Resources	Southeast, Southcentral, Kodiak	Consideration
Subsistence Harvest Fisheries Resources	Southeast, Southcentral, Kodiak	Consideration
Community Culture and History	Southeast, Southcentral, Kodiak	Consideration
Federally Recognized Tribes	Southeast, Southcentral, Kodiak	Consideration
Coastal Infrastructure and Working Waterfronts	Southeast, Southcentral, Kodiak	Consideration

Chris Schillaci emphasized that ADF&G has conducted significant data collection on subsistence fishing. This information will be incorporated into the model. He also noted that additional subsistence use beyond fisheries, such as use of terrestrial subsistence resources, still requires consideration for siting. In addition, it is essential to consider high use areas as well as a myriad of tribal uses. NOAA will engage with Alaska Native Tribes to collect Indigenous Knowledge throughout the multi-year AOA planning process, and will conduct formal tribal consultation as part of the NEPA analysis. NOAA is communicating with several Alaska Native Tribes to share information and seek opportunities for partnerships and participatory mapping.

Similar to the earlier sessions, participants moved into small breakout groups after the NOAA presentation in order to discuss and identify missing but available data, leads to acquire, and any data gaps. Participants also considered cultural and social uses not discussed by NOAA that may present conflicts with aquaculture. Feedback from the small breakout group worksheets from both the Anchorage and Juneau workshops is compiled below.

During report backs, participants at both the Anchorage and Juneau workshops highlighted the value and importance of NOAA visiting communities as a way to ensure accurate and useful data collection. Many emphasized that this is particularly important when working with Alaska Native Tribes. Outreach and engagement should occur early in the process to foster trust-building, development of relationships and, in time, sharing of additional information.

Table 7. Available Data and Leads for the Cultural and Social Resources Sector

Available Data	Lead to Acquire
Recreational activities	• Special use permits • USFS
Tourism uses	• Data from cruise ship companies
Special use permits for hiking and kayaking in local bays	• USFS
Wildlife refuges	• USFS
Hunting data	• ADF&G
Regional specific experts in use of ocean and coastal resources	• Local chambers of commerce • Public social media • Facebook generally
Shore side infrastructure	• None provided
Boat ramps/marinas	• None provided
Social vulnerabilities data	• None provided
Natural hazard risk data	• None provided
Ceremonial locations throughout the year	• None provided
Ocean economy data	• NCCOS

Available Data	Lead to Acquire
Historical sites	• State Historic Preservation Office (SHPO)
Traditional sites, archeological dig sites	• East Kodiak dig sites: Tanganak site (Ben Fitzer) • Refuge Rock: University of Washington (UW)
Archeological data	• Chugachmiut • USFS
Traditional historical use data (e.g., clam gardens, black seaweed beds, historical fishing weirs, etc.)	• Discuss with tribal elders and culture bearers • Interviews (qualitative research) • The book *Haa Aani, Our Land* has historical knowledge of shellfish sites by bay (1940s) • USFS
Archaeological information on PWS	• Chugach National Forest
Herring spawning locations in traditional use areas	• Southeast Alaska Subsistence Regulatory Advisory Council and Craig Tribe (Michael Douville)
Shipwreck database	• Mike Burwell
Environmental justice mapping	• EPA EJScreen
TEK	• None provided
Socio-economic index of communities in proposed areas	• None provided
No specific data provided, just lead	• ADF&G Department of Subsistence
No specific data provided, just lead	• ADF&G game management units
No specific data provided, just lead	• ADF&G public comment logs
No specific data provided, just lead	• ADNR area plans
No specific data provided, just lead	• ADNR Office of History and Archaeology database
No specific data provided, just lead	• ADNR Alaska Heritage Resource Survey Forms (link here)
No specific data provided, just lead	• Alaska Division of Wildlife permits
No specific data provided, just lead	• Alaska State Library
No specific data provided, just lead	• Chugach Regional Resources Commission (Willow Hetrick)
No specific data provided, just lead	• Community Organized Restoration and Learning (CORaL) Network
No specific data provided, just lead	• Cordova District Fisherman United (CDFU) (Jess Rude)

Available Data	Lead to Acquire
No specific data provided, just lead	• CRRC Subsistence Alliance meetings (Daven Holland)
No specific data provided, just lead	• EVOS region for community contacts (ask CRRC or Robin McKnight)
No specific data provided, just lead	• Hakai Institute (Wiley Evans)
No specific data provided, just lead	• Indigenous Sentinels Network
No specific data provided, just lead	• International Pacific Halibut Commission (IPHC)
No specific data provided, just lead	• Kelp Kodiak (Annie Brewster)
No specific data provided, just lead	• Kodiak Native Association
No specific data provided, just lead	• Kodiak Seiners Association
No specific data provided, just lead	• Mariculture liaisons network
No specific data provided, just lead	• Museums/archival records for Anchorage, Alutiiq, Juneau etc.
No specific data provided, just lead	• National Park Service “Navigating Troubled Waters”
No specific data provided, just lead	• Native Conservancy
No specific data provided, just lead	• Nearshore Fish Atlas of Alaska
No specific data provided, just lead	• North Pacific Fishery Management Council (NPFMC)
No specific data provided, just lead	• Office of History and Archaeology (Judith Bittner)
No specific data provided, just lead	• Port Etches
No specific data provided, just lead	• Regional Advisory Councils
No specific data provided, just lead	• Sealaska Heritage Institute (SHI)
No specific data provided, just lead	• SeaSketch at University of California Santa Barbara (UCSB) (Will McClintock)
No specific data provided, just lead	• Skipper Science
No specific data provided, just lead	• Survey of locals about aquaculture
No specific data provided, just lead	• The Office History and Archaeology
No specific data provided, just lead	• Tom Thorton’s Southeast Alaska Herring aggregation thesis
No specific data provided, just lead	• Tribes
No specific data provided, just lead	• University of Alaska Fairbanks (UAF) (Courtney Carothers, Jessica Black, Professor Forest Haven)

Data gaps for the *Cultural and Social Resources* sector:

Hunting and Cultural Uses:

- Bear and duck hunting locations
- Hunting access on farms
- Sport and personal use hunting
- Cultural uses of clams and other foods
- Locations of traditional burial grounds in proximity to potential farm operations
- Clam garden and traditional fish trap areas/sites
- Sea asparagus and other foods
- Wild harvest sites
- Canoe runs for hauling traditional canoes from heads of bays
- Hoonah Tlingit Cultural Landscape in Glacier Bay
- Points of contact for each tribe

Community Mapping:

- Locations of orphan/derelict properties
- Demographics of working waterfronts
- Subsistence communities

Economic and Asset Mapping:

- Environmental justice mapping
- Ocean economy data
- Equipment asset mapping for community, sector, and business
- Value mapping of “big-boat” and “small boat” waters for farm size and ownership structure
- Jobs data for communities from aquaculture

Subsistence Data and Seasonality:

- Seasonality in subsistence data use, granularity on use interactions
- Subsistence use data layers

Additional *Cultural and Social* uses that may present conflicts with aquaculture:

Cultural and Traditional Uses:

- Tribal uses, especially black seaweed
- Sacred sites
- Native American Graves Protection and Repatriation Act (NAGPRA)
- Access to burial sites
- Traditional hunting and trapping access
- Location of cultural camps
- Historical routes navigated to get to ceremonial sites
- Traditional canoe haulouts
- Subsistence harvesting
- Subsistence egg collecting from seabirds
- Non-native subsistence (e.g., halibut longlines)
- Clam beds
- Herring harvest sites
- Intertidal gathering of greens/beach asparagus, shellfish
- Sea asparagus
- Abalone harvest areas

Recreational and Tourism Uses:

- Tourism
- Tourism/recreation hotspots

- Pleasure boating
- Sport fishing/recreational fishing
- Anchorage sites for recreation
- Proximity to public use cabins
- Yacht club race routes
- Recreational uses of areas, including hunting and sportfishing
- Beach camping
- Hiking trailhead access

Industrial and Infrastructure Considerations:

- Logging
- Wastewater plants
- Near-shore industry
- Float plane docks/landings
- Lodges/private cabins – many will have plane landings
- Proximity to processing facilities via boat
- Polluted areas
- Hatchery outflows
- Munitions dump sites (e.g., some near Metlakatla)

Participant worksheets collected at the conclusion of this session showed additional questions, concerns, and insights for the *Cultural and Social Resources* sector.

Data Collection and Management:

- A current data limit is the ability to verify the source of data that is already informing these models, making it possible to comment on what is missing
- Incorporation of cultural maps will be important to communities
- How information is distributed and compartmentalized is a concern
- Some communities do not want their information shared; but if it is not mapped, then important information is left off – how can this gap be bridged?
- Not everyone will want to share where they fish; how will these important areas be incorporated into a data layer on subsistence use?
- Incentives and education will be needed to ensure locals share information to inform data layers
- How will NOAA handle sensitive data?
- Too much information may exist for staff to document and process given the allotted time and resources to complete this effort

Alaska Native Tribal Engagement and Concerns:

- Government-to-government consultation with tribes should be prioritized early in this process
- Corporate and tribal entities do not always communicate
- To what end does this process allow tribes food sovereignty?
- Some tribal members wonder why specific tribal authorization is not part of the state leasing process
- Unresolved tribal water rights are a concern
- The AOA interagency team does not include tribes
- Making black seaweed a commodity devalues the cultural aspect of this species

Community Engagement and Participation:

- Community culture varies – some are pro-development while others are anti-development
- Community differences exist when it comes to granting social license for aquaculture – some may be more accepting than others
- Lack of dedicated resources limits participation in data collection exercises
- People have a lot of fatigue around these types of topics
- Concerns with NOAA's efforts to collect data in person – important to build relationships and conduct public outreach to communities early in the process
- Takes time and effort for relationship building with organizations and tribes
- "Not in my backyard" or what is known as NIMBYism
- Host community open houses to engage non-traditional participants and inform locals about what data is collected and how it is shared

- Science and marketing have not caught up with community information needs
- More community engagement is needed concerning recreational and subsistence uses to understand where, when, and much fishing occurs
- NOAA and state agency investment in community, research, and environment is needed
- Are there efforts to assist and/or promote engagement in the NEPA public comment process for TEK sites, fisheries, etc?

Food Security, Sovereignty, and Subsistence Use:

- Why is cultural and subsistence use only a consideration and not a constraint?
- How can operators support subsistence or cultural/social connections to species and with communities?
- Subsistence needs such as food security and food sovereignty should be prioritized
- There is a difference in national food security versus local, community-based food sovereignty – this process must support both
- It is difficult to quantify “subsistence economy” – value is more than just the profit/ dollar amount provided via socioeconomic “datasets”

Specific Concerns and Considerations:

- How does the State of Alaska engage in a way so there is no conflict associated with every application?
- How do farmers complete their requirements for permitting near private property?
- Specialized skills are needed to run farming operations
- Limited availability of workers and support infrastructure may inhibit successful farming operations
- Outside companies competing with local use/access is a concern
- AOAs and optimal sites will change over time with changes in use over time

Session 4: Fisheries

The *Fisheries* sector is divided into commercial, sport, and recreational fishing data. Subsistence fishing data was previously discussed under the *Cultural and Social Resources* sector. Fisheries play a pivotal role in the socio-economic fabric of Alaska, providing employment, sustenance, and recreational opportunities. Accurate spatial data are essential for effective fisheries management, sustainable and productive harvest, and conservation of marine species and ecosystems. NOAA is still in the earlier stages of data collection for the *Fisheries* sector, and noted that the data are not currently compiled in layer or map format. That said, NCCOS staff provided key areas for future data layer development which include:

- *Commercial fisheries*: fish ticket data for salmon, herring, shellfish, groundfish, dive fisheries; commercial fisheries revenues
- *Sport/recreational fisheries*: charter, fishing tournaments, public comments, and input on past proposed leases
- *Fishery independent survey data*

Participants worked in small breakout groups to identify the primary fisheries that may potentially conflict with aquaculture. Like other sessions, breakout groups discussed missing but available data, leads to acquire, and data gaps. Worksheets also prompted consideration of fisheries that may conflict with aquaculture. Feedback collected on the small breakout group worksheets from both workshops is compiled below.

Primary fisheries which may conflict with aquaculture:

- Dive fisheries
- Dive fisheries – Hookah
- Subsistence fisheries
  - Crab
  - Groundfish (halibut)
  - Herring
  - Herring/roe
  - Longline
  - Yelloweye rockfish
  - Salmon fisheries (e.g., troll and purse seine)
  - Shrimp
- Charter boat and recreational fishing
- Commercial diving (e.g., geoduck, sea cucumber, and urchin)
- Commercial fisheries
- Shallower Dungeness crabs around Kodiak
- Dungeness crabs
- Experimental fisheries (e.g., seine fishing for sablefish)
- Geoduck clam, especially seasonal use areas
- Gillnetting

- Groundfish
- Herring fisheries
- Herring seiner
- Longline in deeper water
- Pot fisheries
- Salmon (all gear types)
- Salmon seining
- Salmon sport fishing
- Sea cucumbers
- Seining
- Setnetting
- Shrimp
- Sport crab and shrimping
- Trolling
- Trolling and most shorelines

Table 8. Available Data and Leads for the Fisheries Resources Sector

Available Data	Lead to Acquire
Transit areas	• None provided
Gear storage sites	• None provided
Hatchery sites Tribes/set-aside	• None provided
Marine debris clean-up sites	• None provided
Stream temperature data	• None provided
Geoduck and sea cucumber tract surveys	• ADF&G
Salmon hatchery data	• UAF (Tonny Sheridan)
Tourism data	• None provided
Tanner Crab fishery information (Kodiak)	• None provided
Timing of salmon runs	• None provided
Seaquester	• Jon Antoni
Sea cucumber dive sites	• ADF&G (Kelly Drummond)
Sport fishing data/hunting data	• ADF&G
Submerged fish weirs	• None provided
Smaller fishing vessel traffic/routes	• None provided
Commercial fish harvest areas	• None provided
Eastern PWS “Salmon Harvest Task Force” areas	• ADF&G (link here)
Anecdotal information on fishing “hot spots”	• Commercial fishermen
Fishing data	• Processing plants
Water monitoring data	• SALT (local company that processes salt from water)
No specific data provided, just lead	• ADF&G surveys
No specific data provided, just lead	• ADF&G sportfish creel surveys
No specific data provided, just lead	• Alaska Longline Fishermen's Association (Linda Behnken)
No specific data provided, just lead	• Alaska Trollers Association
No specific data provided, just lead	• Atmosphere Absolute (ATA) – new study on water column conditions
No specific data provided, just lead	• Catcher/processors (discard)
No specific data provided, just lead	• Cordova District Fishermen United (CDFU)
No specific data provided, just lead	• Charter boat logbook information
No specific data provided, just lead	• Charter companies
No specific data provided, just lead	• Commercial seaweed harvest data
No specific data provided, just lead	• Drone-assisted surveys

Available Data	Lead to Acquire
No specific data provided, just lead	• Fisherman unions in the Cordova District
No specific data provided, just lead	• Hatcheries may have anecdotal/ observation information
No specific data provided, just lead	• International Pacific Halibut Commission (IPHC)
No specific data provided, just lead	• Kodiak Seiners Association
No specific data provided, just lead	• Local groups/cooperatives
No specific data provided, just lead	• National wildlife refuges special use fishery permits
No specific data provided, just lead	• PWS Aquaculture Association (Geoff Clark)
No specific data provided, just lead	• Rotational maps of dive fisheries
No specific data provided, just lead	• Southeast Alaska Regional Dive Fisheries Association (SARDFA)
No specific data provided, just lead	• Southeast Alaska Indigenous Guardians Network for PSP information
No specific data provided, just lead	• SEATOR/Southeast Alaska Tribal Toxins (SEATT)
No specific data provided, just lead	• Skipper Science/Indigenous Sentinels Network
No specific data provided, just lead	• Southeast Fisherman's Association
No specific data provided, just lead	• Stock assessment reports
No specific data provided, just lead	• Subsistence permit data
No specific data provided, just lead	• Subsistence regional advisory councils
No specific data provided, just lead	• TEK
No specific data provided, just lead	• Traditional Knowledge holders
No specific data provided, just lead	• United Cook Inlet Drift Association (UCIDA)

Data gaps for the *Fisheries* sector:

Fishing Activities:

- Locations of actual commercial fisheries activity
- Sportfishing, crabbing and shrimping locations
- Crab and shrimp fisheries
- Herring, often in most places
- Salmon escapements
- Dive fisheries data
- Location of recreational crab pot gear
- Sport fishing data, reporting not required by ADF&G
- Experimental fisheries
- Recreational dive sites

Data and Information Sources:

- Automatic Identification System (AIS) data
- ADF&G data that is confidential due to small number of landings/operators related to fishery
- Knik Tribe study on PSTs and salmon pollution factors
- Alaska designated and pre-approved aquaculture sites in the 1990s and early 2000s
- Activeness of sites
- Seasonality of fishing activity
- Small vessel traffic
- Refinement of data areas (poor resolution for spatial data)

Infrastructure and Historical Data:

- Old native village sites
- Locations of processing plants in high use areas
- Salmon hatchery mapping
- Locations of historical aquaculture areas (e.g., oyster farms south of Ketchikan starting in 1910 through the 1960s, plus other areas where operations started then ceased operation); these were previously valuable, why did they stop?
- Fish processing plants and associated outflow
- Kelp farm restrictions for Juneau (not in channel/Auke Bay)

Environmental Factors and Habitat:

- Commercial fishing gear storage in the ocean
- Personal use tracking or access to data (as a spatial area zone) is limited
- Gear classification: activities that could occur in an area based on gear in that area

- Area uses that could be symbiotic
- Fishing ground location changes with climate change
- Farms as habitat for bait fish
- Geoducks/sea asparagus natural distribution
- Sediment transport
- Competition with other wild species

Participant worksheets collected at the conclusion of this session showed additional questions, concerns, and insights for the *Fisheries* sector.

Prioritization of Data Layers in Suitability Models:

- How are the different industries, fishers, and users being prioritized?
- How are user groups weighted within and outside the commercial use layers?
- Are the various fishing types weighted equally in the sub-models?

Interactions and Impact:

- Potential beneficial interactions exist between aquaculture and other fisheries
  - Structures can create habitat or nursery grounds for certain species
  - Can or how will such benefits be accounted for in the model?
- What does aquaculture do to enhance/impact existing fisheries?
- How do the various types of fishing impact site suitability?
- One could consider the history of commercial fishing use of an area, and whether mariculture will offer the same chance to establish a livelihood
- Intersections exist between aquaculture farms and commercial/recreational fishing activities (i.e., fishing alongside farms), is this considered?
- Dive harvesters cannot access fishing areas with aquaculture farms
- More appropriate to have gear in the water during specific months of the year in some areas

Data Collection and Information Gathering:

- NOAA should poll the fishing industry to capture non-published information that informs data layers

Session 5: Industry and Navigation

The *Industry and Navigation* sector includes locations of vessel traffic, key industrial concerns (shipping lanes, pipelines, submarine cables), buoys and weather forecasting devices, outfalls, and similar. Data layers NCCOS is aware of include:

Table 9. Industry and Navigation Data, Study Area Overlap and Data Layer Type

Data	Overlap	Type
AIS vessel traffic	Southeast, Southcentral, Kodiak	Consideration
Active aquatic farming operations (aquatic farm permits only)	Cordova, Kodiak, Ketchikan, Craig, Sitka, Petersburg, Wrangell	Constraint
Aids to navigation	Southeast, Southcentral, Kodiak	Constraint
Cook Inlet fiber optic network	Kodiak	Constraint
Alaska harbors	Valdez, Cordova, Kodiak, Ketchikan, Juneau, Craig, Sitka, Petersburg, Wrangell	Constraint
NOAA charted submarine cables	Valdez, Cordova, Kodiak, Ketchikan, Juneau, Sitka, Petersburg, Wrangell	Constraint
Permitted carcass disposal sites	Valdez, Kodiak, Sitka, Wrangell	Consideration
Alaska marine highway	Kodiak, Ketchikan, Juneau, Sitka	Constraint
Shipwrecks and obstructions	Southeast, Southcentral, Kodiak	Constraint
ADEC water quality monitoring stations	Southeast, Southcentral, Kodiak	Consideration
ADEC impaired waters	Southeast, Southcentral, Kodiak	Consideration
ADEC wastewater outfall mixing zones	Southeast, Southcentral, Kodiak	Constraint
Log transfer facilities	Southeast	Constraint
Seafood processing facilities	Southeast, Southcentral, Kodiak	Constraint
Airports	Southeast, Southcentral, Kodiak	Constraint

Other data sources NCCOS will consult for this sector include:

- USFS Special Use Permits
- Seaplane navigation logs
- Buoys and High Frequency (HR) Radar Stations

Participants at the Anchorage workshop commented on the limitations associated with utilizing AIS to accurately capture vessel traffic data. Many noted that AIS is only

required for larger vessels and many salmon fishing boats and whale watching vessels do not use this technology.

Similar to prior sessions, participants moved into small breakout groups following the NOAA presentation in order to discuss and identify missing data, leads to acquire, and/or data gaps.

Table 10. Available Data and Leads for the Industry and Navigation Sector

Available Data	Lead to Acquire
Seawater intakes	• None provided
Floatplane traffic and landing zones	• None provided
Small vessel traffic	• AIS • Local knowledge
Oil seeps	• None provided
Cruise ship dump sites	• None provided
Geothermal activity	• None provided
Harbors that are safe from stormy weather	• None provided
Harbors that are traditionally known	• None provided
Shipwreck locations	• Facebook pages
Ferry, cruise ship routes	• Alaskan Coastal Rainforest
Water taxi pick up and drop off points	• None provided
Docks, floats, float planes	• Remote personal property records
Recreational use cabin locations	• None provided
Access trails	• None provided
Previously abandoned sites	• None provided
Mining data	• None provided
Special use permits for tourism	• USFS
Historic cannery and mining locations	• None provided
Taku Harbor	• None provided
Superfund sites	• None provided
Water quality monitoring	• ADEC (Carol)
Fiber optic plans	• Alaska Power & Telephone (AP&T)
Lynden Freight locations/refrigeration	• None provided
Land use for tour operators (beach access)	• USFS
Air transport/logistics	• Alaska Air routes/stops • Local air lines/services (float and wheeled planes)
Small vessel tourism (whale watch and charter fishing)	• None provided

Available Data	Lead to Acquire
Industrial outputs and sewer discharge sites	• None provided
Underwater cables	• None provided
Minimum distance requirement for siting aquaculture farms near airports due to bird attraction	• Federal Aviation Administration (FAA)
Navigation markers	• None provided
Navy sonar testing sites	• United States Navy
Inactive aquatic farm permits	• None provided
Rural Community Assistance Corporation transportation data	• None provided
Tourism/special use permits	• None provided

Data gaps for the *Industry and Navigation* sector:

Marine Transportation and Traffic:

- Floatplane traffic
- Tugs, tows, and research vessels
- Charter boat radio tracking signals
- Oil tanker tracks
- Marine safety sites/locations where vessels hide from bad weather
- Boat launch areas (heavy use and traffic)

Environmental Concerns:

- Cruise ship dump sites
- Invasive species and ballast dumping
- Outfall maps/sewage lines and water quality data
- Gray water/black release areas and effect on habitats
- Residential versus industrial pollution
- Current versus historical contamination sites
- Oil spill data
- Solid waste/chemical run-off from war-related activities conducted in the Peninsula/Aleutian areas
- Areas previously used for mining

Energy Generation and Infrastructure:

- Seawater intakes
- Wind generation permitting
- Tidal energy generation
- Fish/kelp processing facilities, especially the smaller ones
- Cold storage facilities
- Future plans for infrastructure
- Working waterfront inventory (e.g., seafood processors, boat ramps and marinas, seafood retail, gear manufacturer, etc.)
- Coastline assets and infrastructure

Industry and Economic Development:

- Overlap with other developing industries
- Social/economic profiles of local communities (e.g., jobs, supplies, parts)
- Points of contact for fisheries associations
- Previously permitted aquaculture sites
- Visitor traffic
- Tourism

Participant worksheets collected at the conclusion of this session showed additional questions, concerns, and insights for the *Industry and Navigation* sector.

Data Collection and Quality:

- AIS data difficult to work with in Alaska
- Smaller, nearshore boats (under 60 feet) not logged or tracked via AIS – relying solely on vessels with AIS to determine busy areas is a concern
- Limited ability to collect unbiased data is a concern
- Age of data is a concern (e.g., cables marked but not present/pulled)
- NOAA should remove airport data layer for accuracy

Environmental Concerns:

- Detailed bathymetric data that affect navigation and siting needed
- Concern in fishing community that sharing fishing locations leads to decreased opportunity
- Some chemical spills not documented
- Potential overlap of marine safety sites, such as protected bays, with proposed aquaculture sites
- What is industry's/Alaska's plan to protect farmers in the event of an oil spill?

Industry and Economic Impact:

- Need comprehensive inventory of processing facilities and transportation corridors
- Concerns exist in fishing community concerns that sharing fishing locations leads to decreased opportunity
- With increased complexity and perception that aquaculture is lowest priority, some farmers concerned that permitting with become onerous
- Expense of assessing and maintaining water quality in areas classified as shellfish growing areas is a concern

Tribal Engagement

NOAA, with support from the non-governmental organization Ecotrust, dedicated the second day of the Juneau workshop to a tribal panel discussion to help elevate Alaska Native voices as part of the AOA identification process in Alaska. The day began with a brief synopsis of presentations and discussion from the first day of the workshop. Alicia Bishop again reviewed the AOA process and timeline, then Chris Schillaci revisited the process for developing the AOA spatial suitability model. Amilee Wilson shared updates and recent advances in NOAA's tribal consultation process to further set the stage for discussing Alaska Native Tribal engagement in the AOA process.

Dr. Rosita Worl, whose Tlingit names are Yeidiklas'akw and Kaaháni, serves as President of the Sealaska Heritage Institute. Dr. Worl provided the keynote address. She emphasized that this workshop presents an important opportunity for tribal members to share their perspectives on the prospects of aquaculture in Alaska State waters. She highlighted the critical importance of black seaweed as a traditional resource for tribes, and described alarming abnormalities in shape, color, and taste observed by harvesters of this resource over the last two years. Recent efforts by SHI and others to address these issues brought to light concerns that aquaculture may have an impact on traditional subsistence harvest areas and associated activities in Alaska. She expressed skepticism towards the NOAA AOA process and timeline, and advocated for consultation with tribes and traditional harvesters before the State of Alaska grants aquaculture permits. She further stressed the need for assessments that incorporate Indigenous Knowledge to safeguard subsistence areas, sacred sites, and cultural practices. Dr. Worl concluded by underscoring the importance of preserving cultural diversity and ancient practices which are integral to Alaska's Tribal communities.

Juneau Tribal Panel Discussion

Kara Briggs, Vice President of Ecotrust, served as panel moderator. She introduced three panelists:

- Keolani Booth, Ecotrust Mariculture Specialist and elected member of the Metlakatla Tribal Council
- Barbara Cadiente-Nelson, Council Secretary for the Douglas Indian Association
- Clinton Cook, President of the Craig Tribal Association

Panelists were first asked to share what catalyzed their interest in aquaculture and desire to participate in this discussion. Each indivudual shared short personal stories about his or her history and connection to the sea and the land, and subsequently spoke to the urgent need to safeguard traditional uses and ways of life. All panelists emphasized the need to ensure tribal voices are heard and considered as part of this effort and therefore requested that NOAA meet directly with tribal communities. Face-to-face communication and consultation was identified as the best mechanism to build trust and community among tribes and agencies. Panelists feel that the AOA identification process in Alaska may one day lead to decisions that could impact many tribal communities. They noted that tribes who work together with NOAA to merge Indigenous Knowledge with modern science could help to guide aquaculture projects away from sensitive areas and protect important resources, thus ensuring the sustainability of tribal communities. Panelists also underscored the need for tribes to engage in difficult,

yet honest, conversations with agencies and farmers in order to support the best possible outcomes.

Panelists next shared concerns and hopes related to the potential of aquaculture development in Alaska State waters. Panel members expressed broad skepticism about the AOA process to date, particularly the speed at which the process is moving, but at times also put forward cautious optimism. Again, a central concern expressed is the potential impact that aquaculture may have on tribal subsistence use. One panelist offered hope that, if done correctly, aquaculture could create jobs for the next generation and bring stability back to changing coastal ecosystems, particularly given that fishing opportunities are changing in some areas. Although panelists noted that they only speak for themselves, generally a broad and strong desire was put forward for consultation, collaboration and listening to the needs and interests of tribes. Panelists suggested that NOAA incorporate Indigenous Knowledge into the aquaculture siting process, along with the knowledge that comes from science and industry. Clinton Cook described the close collaboration between his community and Kelp Blue as an example of successful communication that is leading to positive outcomes for all parties, and helping the company pick appropriate areas to farm. He would like that level of conversation with NOAA on the AOA process.

When asked to consider the future of aquaculture in Alaska, panelists stressed the importance of thorough research into the potential impacts of aquaculture on both the marine ecosystem and local communities. They emphasized the need to earn social acceptance as a critical step to achieving success, noting that different tribal communities will have varying perspectives on aquaculture. Panelists also advocated for agency coordination with individuals who possess deep knowledge of the local environment, and inclusive engagement with all potentially impacted tribal communities. They acknowledged the complexities of this topic, highlighted the need for knowledge-sharing and skills development, and underscored the importance of considering tribal ways of life in the AOA planning process. Panelists discussed how AOAs could aid tribes in their ability and desire to bring traditional knowledge forward to talk to the State and live in harmony.

As the discussion concluded, panelists offered NOAA advice on how to be more effective with tribal outreach and engagement. The state permitting process, it was noted, is different from the NOAA AOA planning process. That said, panelists encouraged NOAA staff who are leading the AOA process to travel to their communities and meet directly with tribal members in order to build trust. Co-management of natural resources across the broader landscape should be considered. Panelists encouraged fellow tribal members to be bold and ask difficult questions of agency staff. In turn, they requested that NOAA be transparent about both the risks and benefits of aquaculture, and for all agency personnel and members of tribal communities involved in these discussions to commit to honest dialogue. Finally, towards the end of the session panelists noted that tribes are involved in many issues related to the protection of terrestrial and marine resources, so it may take time to properly engage on this topic.

Key Takeaways and Next Steps

At the conclusion of each workshop, participants shared key takeaways and developing insights to support AOA planning in Alaska State waters. Comments from both the Anchorage and Juneau workshops are summarized below. Generally, the bullets below reflect comments from individual participants. Similar or related comments are grouped together, yet some redundancy is to be expected. Given the focus of the workshop – initial brainstorming of data develop ideas and associated leads to acquire – no attempt was made to either assess or build consensus on any particular comment.

- Alaska is home to many native communities.
  - Coordination with Alaska Native Tribes requires special engagement.
  - Knowledge and information collected and retained by Alaska Native Tribes is their property.
  - Data sharing and data sovereignty standards and/or agreements are needed prior to collection of information.
- NOAA should meet with Alaska Native Tribes in person, for face-to-face discussions. This kind of approach is invaluable and can build trust.
- It is important for agencies to engage both tribal and non-tribal communities about this process before attempting to collect Indigenous Knowledge and other local knowledge that informs data layers.
  - Early engagement helps develop relationships and establish trust.
  - Resources and time should be dedicated to making community connections.
  - A great deal of valuable information may surface from such an effort.
- Uncertainty and lack of clarity about the AOA process persist among many communities.
  - Sharing information about aquaculture – what it is, potential benefits, and possible impacts – needs to occur with local communities in order to advance productive dialogue.
  - Agencies should emphasize and clearly communicate to communities how the AOA process will give back and add value to those communities.
- A significant amount of useful information will be generated from this modeling effort. This information will be useful to more ocean related issues and challenges than just its application to future aquaculture siting.
- It is important to engage communities as soon as possible as time to complete this AOA process seems short.
  - NOAA should consider slowing down this process to allow more time to connect with communities.
- Agencies should involve individuals from the commercial fishing industry, cruise ship industry, ferry operators, and small passenger vessel operators.

- Some have concerns regarding the State's ability to properly monitor and enforce operating conditions at existing aquaculture farms. This may be problematic for future farms unless additional funding is secured for this purpose.
- A significant concern is that a great deal of effort and resources will be expended to complete the AOA Atlas for Alaska, and yet this resource will become outdated in a short period of time.
    - Establish points of contact for key data layers and provide funding to maintain those data layers
    - Make this information sharing and mapping effort stay relevant over time
- Agencies should establish and maintain clear lines of communication with Alaska Native Tribes. In turn, Alaska Native Tribes and agencies could set a roadmap for collaboration via this process that future generations could follow.
- Individual consultation is needed with each Alaska Native Tribe which desires to engage in affected areas. In addition, greater thought should be given to ways in which federal funding can enable Alaska Native Tribes and individuals to purchase permits and start aquaculture businesses.
- NOAA and other agencies can learn from the past efforts of ADF&G's Fisheries Rehabilitation, Enhancement, and Development Program on how to better engage and work with Alaska Native Tribes.
- NOAA has done a respectable job of compiling data layers so far, however, a lot of data is still missing or incomplete.
- The hope is NOAA has enough funding to fill all gaps that were identified during these workshops.
- This AOA planning effort is positive in the sense that it seeks to avoid infringing upon established fisheries and cultural subsistence data.
    - Many appreciate NOAA's acknowledgment and efforts to protect data sensitivity and confidentiality, especially as it relates to cultural and sacred use of resources.

As each event concluded, Chris Schillaci and Alicia Bishop thanked everyone for their hard work and contributions shared during the course of the workshop. Both acknowledged and agreed on the value of meeting with Alaska Native Tribes directly, as suggested by numerous workshop participants, and confirmed that NOAA intends to do so as part of this process. NOAA will also continue its engagement with the wider set of relevant parties who are interested in, or may be affected by, aquaculture development in Alaska State waters. The NOAA team will begin to follow up on identified data leads in the weeks and months ahead.

Appendix A:
Acronyms and Abbreviations

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
AFDF	Alaska Fisheries Development Foundation
AFSC	Alaska Fisheries Science Center
AIS	Automatic Identification System
AK	Alaska
AKISP	Alaska Invasive Species Partnership
ANCSA	Alaska Native Claims Settlement Act
AOA	Aquaculture Opportunity Area
AOOS	Alaska Ocean Observing System
AP&T	Alaska Power and Telephone
APMI	Alutiiq Pride Marine Institute
ATA	Atmosphere Absolute
BIAs	Biologically Important Areas
CDFU	Cordova District Fishermen United
CORaL	Community Organized Restoration and Learning
CRRC	Chugach Regional Resources Commission
CTD	Conductivity, temperature, and depth
CWF	Coastal Waters Forecast
DOD	Department of Defense
EPA	Environmental Protection Agency
ESA	Endangered Species Act
EVOS	Exxon Valdez Oil Spill
FAA	Federal Aviation Administration
FONSI	Finding of no significant impact
FRED	Fisheries Rehabilitation, Enhancement, and Development
GOARP	Gulf of Alaska Research Project
HABs	Harmful algal blooms
HF	High frequency
HFR	High frequency radar
IBA	Important Bird Area
IK	Indigenous knowledge
IPHC	International Pacific Halibut Commission
KBNERR	Kachemak Bay National Estuarine Research Reserve
LCI	Lower Cook Inlet
N	Nitrogen
NAGPRA	Native American Graves Protection and Repatriation

NASA	National Aeronautics and Space Administration
NCCOS	National Centers for Coastal Ocean Science
NEMISIS	National Estuarine and Marine Exotic Species Information System
NEPA	National Environmental Policy Act
NFA	Nearshore Fish Atlas of Alaska
NIMBY	"Not in my backyard"
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPFMC	North Pacific Fishery Management Council
NSSP	National Shellfish Sanitation Program
NWS	National Weather Service
O2	Oxygen
OA	Ocean Acidification
PEIS	Programmatic Environmental Impact Statement
PFAS	Per- and Polyfluorinated Substances
PGMs	Platinum Group Metals
PSMFC	Pacific States Marine Fisheries Commission
PSP	Paralytic Shellfish Poison
PSTs	Paralytic shellfish toxins
PWS	Prince William Sound
PWSSC	Prince William Sound Science Center
REEs	Rare Earth Elements
RFI	Request for Information
ROD	Record of Decision
SARDFA	Southeast Alaska Regional Dive Fisheries Association
SE	Southeast
SEAR	Southeast Alaska Region
SEATOR	Southeast Alaska Tribal Ocean Research
SEATT	Southeast Alaska Tribal Toxins
SERC	Smithsonian Environmental Research Center
SHI	Sealaska Heritage Institute
SHPO	State Historic Preservation Office
TEK	Traditional Ecological Knowledge
TNC	The Nature Conservancy
UAF	University of Alaska Fairbanks
UCIDA	United Cook Inlet Drift Association
UCSB	University of California Santa Barbara
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UW	University of Washington

Appendix B:
Workshop Agendas

Day 1 Agenda | Anchorage: February 26, 2024, Juneau: March 26, 2024

Time	Topic
8:30	Registration + Enhanced Continental Breakfast + Coffee
9:00	Welcome and Opening Remarks
9:30	NOAA Presentation: Overview and Purpose of Workshop
10:10	Break (Icebreaker – Meet your neighbors!)
10:20	NOAA Presentation: Development of Spatial Suitability Models ● Constraints versus considerations ● Interactive session: species/gear thresholds
11:20	Interactive Session: Data Development Across Key Ocean Sectors ● Boundaries • Military activities • Area management plans • Parks and refuges ● Hydrographic data
12:00	Lunch (Catered onsite)
1:00	Interactive Session: Data Development Across Key Ocean Sectors ● Natural resources • Protected resources • Habitat ● Cultural and social resources • Subsistence • Personal use • Traditional/historical use
2:45	Break
3:00	Interactive Session: Data Development Across Key Ocean Sectors ● Fisheries • Commercial • Sport ● Industry and navigation • Vessel traffic • Oil and gas • Outfalls

Time	Topic
4:30	Key Takeaways and Mapping to Focus Next Steps
4:50	Closing Comments
5:00	Day 1 Adjourns

Day 2 Agenda | Juneau: March 27, 2024

Time	Topic
8:30	Registration + Enhanced Continental Breakfast + Coffee
9:00	Welcome and Recap of Day 1
9:30	Tribal Engagement and the AOA process	Panel Discussion
12:00	Day 2 Adjourns

Appendix C: Workshop Participants

Anchorage Workshop

Name	Affiliation
Jonathan Antoni	Seaquester Farms
David Bailey	GreenWave
Martha Barberio	City of Valdez
Gretchen Bath	CSS, Inc. on contract to NOAA NCCOS
Skylar Bayer	NOAA Fisheries
Kristy Beard	NOAA Fisheries
Alicia Bishop	NOAA Fisheries
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Carol Brady	Alaska Department of Environmental Conservation
Annie Brewster	Alaska Department of Fish and Game
Kara Briggs	Ecotrust
Andrew Brosier	United States Department of Agriculture National Agricultural Statistics Service
Cassidi Cameron	Kenai Peninsula Economic Development District
Adreienne Canino	Axiom Data Science
Kristin Carpenter	PWS Economic Development District
Rebecca Cates	NOAA Alaska Fisheries Science Center
Wei Cheng	Alaska Department of Fish and Game
Cyde Colin	Southeast Conference
Karen Cougan	ADNR Aquatic Farm Leasing Program
James Crimp	University of Alaska
James Currie	NOAA Alaska Sea Grant Fellow
Rusty Dame	Alaska Fisheries Science Center
Sean Den Adel	Noble Ocean Farms/Chugach Regional Resources Commission
Muriel Dittrich	University of Alaska Fairbanks

Name	Affiliation
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Kelly Drummond	Alaska Fisheries Development Foundation/Alaska Sea Grant Fellow
Kate Dufault	Alaska Department of Natural Resources
Darcy Dugan	Alaska Ocean Observing System
Sara Ebersole	University of Alaska Southeast, Sitka Campus
Ginny Eckert	Alaska Sea Grant
Alicia Ellington	University of Alaska Southeast, Sitka Campus
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Alisha Falberg	NOAA Fisheries
Thomas Farrugia	Alaska Ocean Observing System
Henry Fleener	NOAA Alaska Fisheries Science Center
Seawan Gehlbach	Alaska Shellfish Growers Association
Calvin George	PWSSC and CRRC
Trevor Golden	Axiom Data Science
Melissa Good	Alaska Sea Grant
Lindsey Hammer	PWS Economic Development District
Deborah Hart	Southeast Alaska Fish Habitat Partnership
Joa Hok	Nautical Marine Alaska, LLC
Jordan Hollarsmith	NOAA Alaska Fisheries Science Center
Amy Kirkham	US Fish and Wildlife Service
Megan Koch	Alaska Center for Innovation, Commercialization, and Entrepreneurship
Angela Korabik	NOAA Kodiak Lab/Alaska Sea Grant Fellow
Alix Laferriere	NOAA Alaska Fisheries Science Center
Juliana Leggitt	Southeast Conference
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Anne Li	World Wildlife Fund
Carol Mahara	US Fish and Wildlife Service
Nick Mangini	SWAMC
Tomi Marsh	Oceans Alaska
Caitlin McKinstry	Native Village of Eyak

Name	Affiliation
Robin McKnight	Chugach Regional Resources Commission
Lexa Meyer	Alaska Ocean Forum
Adriane Michaelis	Virginia Institute of Marine Sciences
Michelle Morris	Alaska Dept. of Fish and Game
Briana Murphy	Alutiiq Pride Marine Institute
Dain Myers	Shinaku Shellfish Company
Mackenzie Nelson	Seatone Consulting (facilitation support)
Dave Nisbet	Nisbet Oyster Co.
Erik O'Brien	Kodiak Ocean Bounty LLC
Stephen Phillips	Pacific States Marine Fisheries Commission
Alf Pryor	Alaska Ocean Forum
Jenny Renee	Alaska Sea Grant
Drew Resnick	CSS Inc. in support of NCCOS
Brent Reynolds	ADNR Aquatic Farm Leasing Program
Micahel Riederer	Hydraswell
Tom Rudolph	The Pew Charitable Trusts
Katherine Schatz	Maryland Sea Grant
Markos Scheer	Premium Aquatics, LLC/Seagrove
Christ Schillaci	NOAA NCCOS
Maura Scudero	Premium Aquatics, LLC. dba Seagrove
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Nicholas Stern	Pacific Kelp Co. Inc.
Annika Sullivan	University of Alaska Southeast, Sitka Campus
Haley Terpenny	Southeast Conference
Thea Thomas	Royal Ocean Co.
Adam Turner	Chenega Regional Development Group, LLC
Karli Tyance Hassell	Central Council of Tlingit & Haida Indian Tribes of Alaska
Jessica Whitney	University of Alaska Fairbanks

Name	Affiliation
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Sadie Wright	NOAA Fisheries
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Juneau Workshop

Name	Affiliation
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Allison Bidlack	University of Alaska Fairbanks
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Keolani Booth	Ecotrust/Southeast Sustainable Partnership
Carol Brady	Alaska Department of Environmental Conservation
Kara Briggs	Ecotrust
Barbara Cadiente-Nelson	Douglas Indian Association
Clinton Cook	Central Council Tlingit & Haida Indian Tribes of Alaska
James Currie	NOAA Alaska Sea Grant
Michael Douville	Southeast AK Subsistence Regional Advisory Council
Olivia Duner	Sea Quester Farms
Heather Evoy	Southeast Alaska Conservation Council
Teresa Fairchild	Pacific States Marine Fisheries Commission
Alisha Falberg	NOAA Fisheries
Karen Grosskreutz	Alaska resident
Kristen Gruenthal	Alaska Department of Fish and Game
Arielle Halpern	Sealaska
Deborah Hart	Southeast Alaska Fish Habitat Partnership
Mike Jones	Organized Village of Kasaan
John Kiser	Rocky Bay Oysters
Dune Lankard	Native Conservancy
Jeremy Leighton	Southeast Conference

Name	Affiliation
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Chris Schillaci	NOAA NCCOS
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Kate Sullivan	Southeast Alaska Regional Dive Fisheries Association
Jill Weitz	Tlingit & Haida
Tracy Welch	United Fishermen of Alaska
Steve Wiechmann	Douglas Island Pink and Chum (DIPAC)
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Meagan Wylie	Seatone Consulting (facilitation support)

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NOAA Fisheries	Cover (coastal seaweed)
NOAA Fisheries	Page iii (Alaska sunset)
Rich Wilson	Page 2 (small groups – Anchorage and Juneau)
NOAA Fisheries	Page 3 (harvester)
Rich Wilson	Page 6 (Alicia, Chris, small group breakouts)
NOAA Fisheries	Page 9 (farm visit)
NOAA Fisheries	Page 10 (farm buoys)
NOAA Fisheries	Page 13 (farm)
Rich Wilson	Page 14 (Chris and attendees)
Personnel of NOAA Ship DELAWARE II	Page 16 (GoMOOS buoy)
NCCOS	Page 21 (Cordova harbor)
NOAA Fisheries	Page 23 (kelp and shellfish)
NOAA Fisheries	Page 26 (mussels)
NOAA Fisheries	Page 30 (harvesting seaweed)
NCCOS	Page 31 (docked vessels)
Seagrove Kelp Co.	Page 35 (herring eggs)
Keolani Booth	Page 37 (black seaweed)
NOAA Fisheries	Page 39 (farm infrastructure)
Dennis MacDonald	Page 41 (Seward fish catch): ID 2380259093
Karenfoleyphotography	Page 43 (fishing vessel): ID 2337796787
Iryna Makukha	Page 45 (docked vessels): ID 2261667207
FloridaStock	Page 48 (cruise ships and seaplane): ID 65586727
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