Report of the

Oregon & Pacific Northwest Aquaculture Development Conference

Investing in the Future of Seafood

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Oregon Aquaculture Association

Sea Grant Oregon

Oregon State University

Pacific Seafood

Chemeketa Community College

Confederated Tribes of Siletz Indians

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This report reflects the conclusions and recommendations of the organizers and the drafting committee and does not necessarily reflect the positions and/or opinions of the sponsoring institutions.

More information can be obtained from the Oregon Aquaculture Association: oregonaquaculture.org

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“Take calculated risks – that is quite different from being rash.”

General George S. Patton

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Glossary[1]

AQUACULTURE: The husbandry of aquatic plants and animals, synonymous with "aqua farming" and "aquatic farming".

AQUA-BUSINESS: Aquaculture as a business (i.e., an enterprise that has the potential to make financial profit).

AQUA-FEEDS: Formulated feeds given to aquatic farmed animals.

AQUA-PARK: A site designated specifically for aquaculture development and housing a number of aqua-businesses; facilitating support services, delivery of inputs and marketing of products.

AQUACULTURE PRODUCTS: The crops grown by aqua-businesses.

AQUACULTURE SEED: The material "planted" in aqua-businesses; in the case of fish, this generally applies to the fry, fingerlings or juveniles stocked in a production system.

AQUACULTURE STATION: Public sector (Government) infrastructure established to support a national aquaculture program. Typical functions have been for the production of seed and/or food fish as well as feed fabrication and being a training or demonstration site.

AQUACULTURE SUBSECTOR: The component of the broader fisheries and seafood sector devoted to aquaculture.

AQUACULTURE SYSTEM: The combination of structures, technologies and species used to produce a specific product [e.g., tilapia ponds, catfish tanks, etc.].

BIO-CONSERVATION: Protection of the biota.

BIOMASS: The aggregate weight of a population of organism or organisms in a system.

BIOSAFETY: Safety of practices with regard to their impact on humans and the environment.

BIOSECURITY: Protection against the entry and spread of disease in a defined area.

BIOTA: The plants and animals of a particular region.

BREEDING CENTER: An aquaculture station specifically established and managed to undertake stock improvement work.

BROOD STOCK: Parent stock. The organisms used for reproductive purposes by hatcheries.

BUSINESS PLAN: The plan for an aqua-business, including the marketing aspects, that indicates what level of operation is required for the enterprise to achieve a financial profit.

CIVIL SOCIETY: Society considered as a community of citizens linked by common interests and collective activity.

CODE OF CONDUCT for RESPONSIBLE FISHERIES (CCRF): Fisheries (which includes the management, catching, processing, and marketing of fish stocks) and aquaculture (the farming of fish) provide an important source of food, employment, income and recreation for people throughout the world. With this situation in mind, the Code of Conduct for Responsible Fisheries was adopted in 1995. The Code is voluntary and aimed at everyone working in, and involved with, fisheries and aquaculture. The Code of Conduct consists of a collection of principles, goals and elements for action. Governments, in cooperation with their industries and communities, have the responsibility to implement the Code.

CULTURE-BASED FISHERIES: These systems are cropped using capture fishery techniques, but the populations are maintained by stocking hatchery-bred juveniles. The systems are broadly considered as being aquaculture. A typical example would be the stocking of dams [small water bodies] on an annual basis using hatchery reared seed; these waters then being harvested through capture fisheries using hook-and-line, traps, or other fishing technologies.

ECOSYSTEM APPROACH to AQUACULTURE (EAA): This label has recently taken hold to describe the need for holistic approaches to aquaculture development (the corollary being EAF -- the ecosystem approach to fisheries). The concept underscores the need for development efforts to be broad-based: covering social,

[1] Glossary modified from: *Triggers and Drivers for Establishing a Profitable Aquaculture Sub-Sector*, John Moehl, 2013, Food and Agriculture Organization of the United Nations, Regional Office for Africa, Accra, 62 p

cultural, economic, financial, ecological and physical aspects as well as the core bio-technical concerns.

EIA: Environmental impact assessment.

FINFISH: Teleost fish. Generally, categories to contrast culture organisms or aquaculture products; invertebrates (crustaceans, mollusks, etc.), finfish or other vertebrates.

FLOW-THROUGH: Aquaculture systems where water is continuously flowing in and out.

FOOD CONVERSION (FCR): The amount of feed that must be consumed to gain a given amount of weight [e.g., and FCR of 2 means that two kilograms of feed need to be consumed for the organism to gain one kilogram in weight.

GENETIC EXOTIC: Exotic species are those that are of foreign origin -- non-native. From an aquaculture perspective, this has traditionally been a terminology used to identify non-indigenous organisms, taxonomically to the species level, that may be considered for culture, or are being cultured in geographic areas outside their home range. With new high-tech tools, this differentiation can now be intraspecific, looking at genetic variations in different populations of the same species. As most farm-raised organisms are the products of some sort of controlled breeding, their genetic composition is inevitably different from wild stocks, even if they are being raised in their home range. Hence, to some degree all cultured organisms are genetically exotics. The challenge to those crafting best practices is to decide when this level of differentness poses some risk and when it does not.

GMO: Genetically modified organism.

HARVEST CYCLE: The growing period for the crop.

HATCHERY: An aquaculture facility, public or private, whose function is seed multiplication (hatching).

HIGH POTENTIAL ZONE: A site that has an optimum mix of biophysical and socioeconomic attributes that make it very suitable for a given aquaculture system.

MARICULTURE: Culture of marine organisms in salt and brackish water.

MARKET-DRIVEN: Processes that depend on the market; specifically, designing aquaculture systems based on market demand.

NURSERY: An aquaculture facility that procures immature fish seed and raises it to another life stage. Nurseries may raise fry to fingerling or juvenile size. These are links in the seed supply chain.

NOAA: National Oceanic and Atmospheric Administration

ONE-STOP-SHOP: An administrative structure established by Governments to facilitate invest-ment in the aquaculture sub-sector whereby all information and requirements for investing are found in easy-to-use form in one location.

OAA: Oregon Aquaculture Association

ODA: Oregon Department of Agriculture

ODFW: Oregon Department of Fish and Wildlife

OSG: Oregon Sea Grant

PRODUCTION UNIT: The medium or component of a particular aquaculture system (e.g., pond, cage, tank, pen, etc.).

RECIRCULATION: Aquaculture systems that reuse (recirculate) the same water many times, using a variety of filtration and other mechanisms to maintain minimum water quality standards for the species being cultured.

SEA GRANT: Sea Grant is a national network of 34 university-based programs that supports coastal communities through research, extension, and education.

STATIC: Not moving; referring to aquaculture systems that raise organisms in a volume of water that is not significantly changed or replenished during the crop -- most often water added only to replace seepage and evaporation.

STOCK IMPROVEMENT: Selective crossing/breeding of stock to achieve a genetic makeup that has certain pre-subscribed attributes such as faster growth, disease resistance, etc.

STOCKING DENSITY: Number of culture organisms per unit of area or volume depending on the system (e.g., organisms per m2, m3, are, hectare, gallon, litre, etc.).

SWOT: strategic planning technique analyzing strengths, weaknesses, opportunities, and threats.

USACE: U.S. Army Corps of Engineers

VALUE CHAIN: Considered by some to be a group of firms working together to satisfy a specific market demand, it can also be described as the sequential steps required from primary product to value-added consumer product. As it relates to aquaculture, this refers to both the channels that deliver inputs [feed and seed] to producers as well as the conduits that deliver the products from these operators to the ultimate customer or consumer.

WATER BUDGET: The total water requirements for a specific aquaculture system to produce a specified product (e.g., the water needed to grow a crop of fish).

YIELD VS. PRODUCTION: In the context of the present discussions, yields refer to results per crop or harvest (i.e., kg/ha) whilst production refers to the annual cycle (i.e., kg/ha/yr).

PART I: Conference Summary

In this section of the report, we have distilled the principal products from the Conference, synthesizing the information from presentations, panels, and formal/informal discussions. One of the primary advantages of this type of conference is the mixing of diverse ideas and experiences that allows the participants and the authors to extract innovative, realistic results.

Objectives

The principal aim of the Aquaculture Development Conference (Conference) was to promote increased investment in sustainable aquaculture and optimize its positive economic, social, and nutritional contributions in Oregon and the Pacific Northwest (PNW). A parallel objective was to address the considerable lack of aquaculture knowledge that adversely affects the development of the sector in this region.

The underlying principle was that, if aquaculture is to develop and deliver positive benefits in the PNW as it has in many locations in the United States and the world, the status quo is no longer an option—action is required.

Design & Expectations

Given the relatively low level of aquaculture investment in Oregon in particular, and the Pacific Northwest in general, the Conference sought to address key issues affecting public and private investments in aqua farming. The Conference was not meant to be an end unto itself, but the beginning of a process that will encourage greater interest and motivate individuals and firms to raise and eat more farmed seafood.

An immediate expectation from the Conference was to act as a forum for information exchange and networking. A stronger knowledge base leads to greater investment built on an enhanced understanding of the risks and benefits. It is also expected that the Conference will be catalytic, coalescing efforts, prompting action, and expanding horizons.

Major Takeaways & Proposed Action

Aquaculture and the Socioeconomy

Aquaculture is Agriculture

Fundamentally, aquaculture is agriculture. However, to much of the world, including Oregon, aquaculture is considered a new and poorly understood innovation that falls outside the definition of agriculture. Although aquatic and terrestrial farming employ the same general practices and engage with the same institutions, aquatic farming is frequently perceived as being very different. These perceptions can result in concerns about environmental impacts as well as competition for land, water, labor, markets, and other production inputs and outputs. These concerns notwithstanding, aqua farming can and should be synergistic with terrestrial farming when well-planned and implemented.

Culture & Capture Fisheries

Fishermen often view aquaculture as an unwelcome neighbor, with concerns generally including aquaculture's perceived negative impacts on wild fish stocks and competition for space and markets. However, carefully designed and implemented aquaculture investments can coexist with commercial and recreational fisheries; aquaculture can even be complementary. Fishers and aquatic farmers do share a common market, and this market foundation can be inclusive as opposed to exclusive—market channels and processes addressing both cultured and captured products to their mutual advantage. In some instances, these alliances can even support shared processing and marketing facilities.

Aqua Farming & the Environment

There are justifiable environmental and ecological concerns about aquaculture, as there are for most agricultural or industrial activities. Regrettably, there have been cases where negative impacts have occurred, though most of these cases were ultimately transformative, catalyzing significant effort to improve policies and practices. When planned and operated under the guidance of effective environmental regulations and industry best practices, aquatic farms can and do have a very modest ecological footprint, often smaller than other forms of food production.

Aquaculture and Investing

Markets & Marketing

Markets are a critical, if not the most critical, element that should frame any aquaculture investment. Many investors adopt the "if you grow it, they will come" philosophy only to find that this is most often not the case. Markets must be thoroughly researched to identify suitable marketing strategies prior to investing; the costs for these essential

actions should be included as part of the overall preinvestment expenses.

Places & Practices

Aqua farming cannot be practiced anywhere or everywhere. Aquaculture can be complex and involves a wide variety of crops and production technologies. This diversity of the aquaculture sector can provide significant individual and community benefits, but it also imposes many requirements on the siting of production facilities. With this complexity comes the need to determine how to best integrate locations, technologies, and practices. Every farm is site-specific, and every site has a set of practices that are best for the prevailing conditions. Matching the site, technologies, and markets requires specialized knowledge, external support, and detailed preparation.

Business and Farm Planning

Aquaculture is one of many types of agribusinesses undertaken by farmers around the world. In numerous ways, it resembles many other farm enterprises. It requires market development, specialized materials, a trained workforce, regulatory compliance, as well as finely-honed management skills. A comprehensive business and farm plan is an absolute prerequisite for investments that have a significant chance for success.

Aquaculture and Institutions

Government Engagement

The government's role in aquaculture is usually that of policy maker and regulator. In many investors' views, government means convoluted and costly regulations. Nonetheless, there is general agreement that some level of regulation and oversight is necessary. Regulatory processes can be streamlined by involving operators when outlining regulatory procedures, establishing a one-stop-shop to coordinate between and across agencies, and implementing pre-investment meetings for individual investors.

Policy and regulations are not, however, the sole role for governments. Ideally government should be a facilitator of economic development and wise investing. The public sector plays an important part in research and development (R&D), education, outreach, and advocacy. Government support of sector growth is pivotal if aquaculture is to reach its untapped potential in Oregon, the Pacific Northwest and, more broadly, across the country. Additionally, government can serve as a vehicle for increasing the public's understanding of aquaculture through enhanced education and extension systems.

Tribal Aquaculture

Tribal communities have unique circumstances potentially making aquaculture investment easier and allowing them to be prospective early adopters for a nascent[2] program. Conference attendees representing the state of Washington explained that tribal rights can be exercised in ways that allow for faster permitting and startup of aquaculture enterprises. Additionally, tribes can form partnerships with private companies to pair technical ability and aquaculture expertise with tribal organization, funding, and entrepreneurship. For example, the Jamestown Tribe partners with Cooke Aquaculture on developing successful marine aquaculture projects providing the potential to expand tribal economic activity while having downstream impacts on tribal public health, food security, and overall sovereignty. Both from within and outside Tribal Communities, special efforts should be focused on meaningful engagement regarding aquatic farming opportunities and assisting with investment planning incorporated with integrated economic and community development. A dynamic, diversified, and profitable tribal aquaculture program would serve as a strong foundation upon which to expand subsectoral growth and attract additional investment.

Partnerships & Associations

Aquaculture can serve as an important part of the economy, from local to national levels. This requires partnerships with entities covering a range of backgrounds, from markets and technology to civil society. These partnerships can be facilitated through a vibrant aquaculture producer association that is able to add value to the entire aquaculture program. Practically, this means strengthening state and regional aquaculture associations by ensuring they have the necessary breadth to support the overall state industry while building strong relationships with other producer associations (e.g., in the case of Oregon, two important linkages are with the horticulture and viticulture associations).

[2] https://ictnews.org/archive/aquaculture-holds-promise-for-tribal-economies

Knowledge and Education

The lack of a large and diversified aquaculture industry results in limited knowledge which has an impact on industry development. From students to members of civil society to would-be operators, this knowledge gap results in widespread misconceptions that hinder program development and causes farm-level investments that are not technically sound and have high risk of failure. Some of these gaps can be addressed by utilizing available tools and resources while exploring more long-term solutions such as more thoroughly integrating aquaculture into existing educational networks.

Program Development & Strategic Planning

There are certain advantages in having an underdeveloped program. As opposed to retrofitting an expansive existing industry, it is possible to take state-of-the-art solutions and technologies to sculpt a 21st Century sustainable and profitable program. This starts with a comprehensive State Aquaculture Strategic Plan. This plan, in turn, requires naming a lead agency and establishing an ad hoc Planning Committee representing all stakeholder groups. A state strategic aquaculture plan should be considered as an essential component of any responsible and productive state program.

Major Considerations

In the aggregate, Conference discussions can be distilled to highlight an overall investment perspective and a set of high priority actions.

Perspective

Under favorable conditions aquaculture can be a set of food systems and aquatic organism management schemes that can attract positive public and private investment. The corollary is that the absence of this investment can often be attributed to basic principles underpinning the acceptance of aquaculture.

In the case of Oregon, the Pacific Northwest, and many other areas, it can be proffered that the fundamental issues potentially adversely affecting the growth of the aquaculture sector are NOT technical nor even economic. The principal questions affecting the expansion and diversification of aquaculture are political support and social license, or the lack thereof.

Priority Actions

To address concerns coming from this overarching perspective, **the top three areas for concurrent priority action** are:

1. Establish the framework for developing a State Strategic Aquaculture Plan and begin the planning process in 2023, completing the first draft of the comprehensive plan by mid-2024.

2. Pending adoption of the Plan, significantly improve coordination among all stakeholder groups and increase outreach to investors along the seafood value chain while establishing an interim one-stop-shop to interface with regulators and operators.

3. Identify and mobilize ways and means to support aquaculture for those Tribes interested in aquaculture development opportunities.

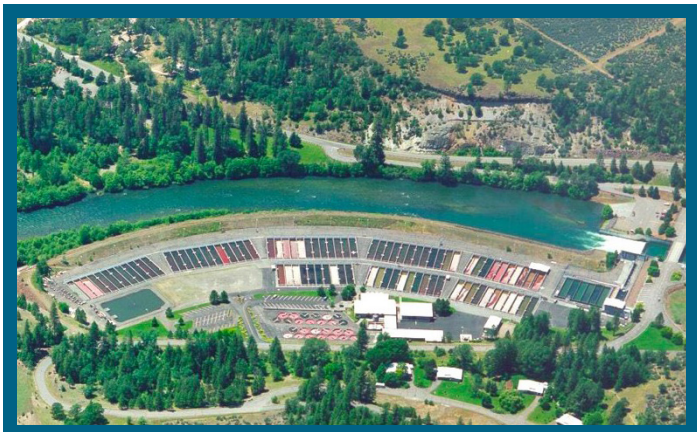
PART II: Conference Actions

Conference Highlights

Aquaculture embraces a diverse set of species, technologies, and issues embodied within its broad definition as "the husbandry of aquatic plants and animals." The Conference reflected this diversity in its structure. The breadth of subject was further mirrored by the two pre-Conference activities: an Aquaculture Technology Short Course (Annex F) and a Forum on Tribal Aquaculture (Annex G). The intent of the present report is to distill the key issues and concerns emphasized in the presentations and discussions rather than recount a detailed proceeding of each session. The report helps identify important commonalities and divergent perspectives. This analysis, including the relevant conclusions and recommendations, is presented in the following sections.

The Story and the Challenge

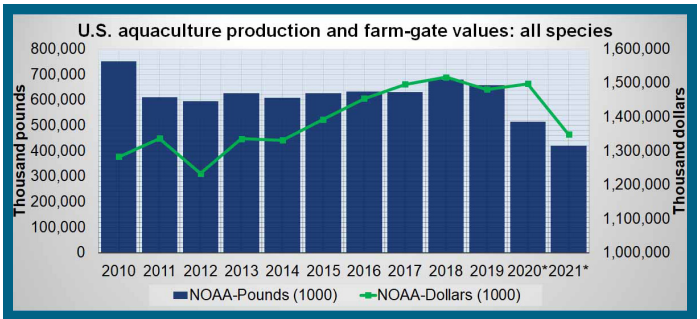
Aquaculture can be considered a wave of the future, a blue revolution, and a blue transformation.
While aquaculture is often considered a relatively new innovation with high potential as an investment in high-quality food, it has frequently failed to meet these expectations in the US. This assessment is particularly true on the West Coast where, overall, aquaculture is not an important component of the local or regional agricultural or seafood sectors.



Cole Rivers Hatchery, ODFW: Public and private hatcheries are an important part of the Pacific Northwest's aquaculture program. https://www.dfw.state.or.us/fish/HGMP/docs/2023/Cole%20Rivers%20HPMP%202023.pdf

With the exception of the shellfish industry, aquaculture's status on the West Coast and especially in Oregon, is largely negligible. Although various forms of shellfish and salmonid culture have deep roots, modern aquaculture technologies have yet to gain a solid foothold. The story in Oregon is told in more detail in Annex D.

In the neighboring states of California, Idaho, and Washington, however, more diversified and higher investment aquaculture programs have been successful. They are able to occupy specific market niches due to concerted efforts of investors and planners. California has enjoyed a profitable, albeit still small, inland aquaculture sector that includes noteworthy production of white sturgeon for caviar. Washington State, as well, when compared to Oregon, has significantly larger and more diversified shellfish and salmonid operations. In spite of these deeper roots, official public interventions since the Conference have dealt a large blow to Washington's marine finfish aquaculture program[3]. Idaho, the largest producer of trout in the US, enjoys arguably the most social license for aquaculture in the Western United States. The modest successes from other states highlight the potential for aquaculture growth in the entire western region, especially in Oregon.



Overall aquaculture production by weight and value in the United States. Declines in recent years are explained mostly by COVID-19 pandemic. (https://coastal.msstate.edu/us-aquaculture-production-farm-gate-values-and-employment)

The challenge is how to optimize assets, including available natural resources, relatively low-cost energy, high-paying markets, a "foody" culture, comparatively high per capita seafood consumption (especially in urban and coastal areas), a skilled high-tech labor force, and a seafood retail economy that is dominated by

[3] https://www.dnr.wa.gov/news/commissioner-franz-ends-net-pen-aquaculture-washington%E2%80%99s-waters https://www.perishablenews.com/seafood/nwaa-launches-grassroots-campaign-spotlighting-damage-done-by-dnr-commissioner-hilary-franzs-political-decision-to-end-commercial-net-pen-fish-farming-in-washington/

imported products. Optimizing these assets will require developing a diversified and expanded aquaculture sector that is economically viable while being socially and environmentally responsible. Another major challenge is how to develop a diversified and expanded aquaculture program that is economically viable while being socially and environmentally responsible.

The Conference

Oregon and other West Coast states possess a unique mix of ecological, societal, and institutional advantages that offer real investment opportunities for aquaculture. The aim of the Conference was to highlight these opportunities while making a realistic assessment of how success can be achieved and what pitfalls often lead to failure. Aquaculture is hard work, and the value chain is complex, but there is considerable potential for profitable businesses.

Conference Design and Aims

The Conference was designed to develop a foundation to facilitate the evaluation of the current aquaculture situation, recognize barriers to growth, and develop strategies to promote sustainable and expanded development. Attendees participated in interactive sessions, providing input that was designed to help chart a path for increased, diversified, and responsible aquaculture investment. The Conference was designed to also facilitate information exchange and help participants gain a broad perspective and appreciation of the realistic promise of aquaculture (in Oregon and throughout the United States) as well as a comprehensive understanding of the necessary challenges in realizing this promise.

U.S. aquaculture offers Americans safe, affordable, and healthy food choices produced with minimal impacts on the environment. Aquaculture is the most efficient form of animal protein production in the world and currently provides more than half of the seafood consumed globally. *A National Strategic Plan for Aquaculture Research, National Sci-ence and Technology Council Subcommittee On Aquaculture, 2022*

Conference Speakers and Participants

From the commercial farm to classroom aquaponics projects, the population of aquaculture stakeholders is expansive and varied. A wide spectrum of these individuals, groups, and agencies attended the two-and-a half-day Conference including: 1) firms operating at every node in the seafood value chain; 2) civil servants, directly or indirectly, engaged in aquaculture-related activities; 3) Tribal Communities, NGO groups and other civic society organizations; 4) students, educators, and researchers; and 5) the public at large. One-hundred-twenty individuals participated in the conference, including ninety-one participants attending in person.

The speakers and facilitators were drawn from this same diversity of stakeholders, representing national and regional aquaculture programs. The Conference offered an exclusive team of exceptional expertise and contrasting but complementary visions of aquaculture's future. Annex A presents the Conference Agenda and Annex B provides a list of speakers and participants.

Conference Themes

I. Markets & Marketing[4]

The conference organizers designed sessions to highlight the importance of market research to help aquaculturists evaluate market opportunities. This emphasis was framed as a "market first" approach, stressing that in a strategic sense, marketing is as important as production in determining aquaculture success and profitability. Panelists reinforced this concept by emphasizing that seafood and aquaculture markets are complex, requiring producers to conduct extensive research to understand market and buyer needs. This information is then used to co-design and integrate marketing and production strategies. Since smaller aquaculture producers will likely be supplying niche markets rather than larger commodity markets, market research is particularly critical. Both these types of markets have a host of specific requirements that include species, product form, product size, product quality (e.g., taste, color, texture, shelf-life), packaging, delivery schedules, pricing, and volume, and also require that harvests be produced in a sustainable manner. While sustainability in aquaculture has multiple interpretations, it typically requires documentation of production practices that meet legal requirements as well as best industry practices. For

[4] The Markets and Marketing theme highlights results from two sessions: 1) *Seafood Market Opportunities* and Challenges featuring Daisy Berg -- Seafood Buyer, New Seasons Markets; and, 2) *Aquaculture Marketing* which featured facilitator David Stone – Director of the Food Innovation Center; and, panelists Erick Garman -- ODA Trade Development Manager, Chuck Toombs – Owner Oregon Dulse, and Jeanne McKnight – Director of the Northwest Aquaculture Alliance.

larger operations sustainability may require third party certification. Evidence of sustainability often involves a narrative conveying dedication to 1) consumer needs, 2) environmental sustainability, and 3) supporting local communities. In turn this information is used in training sales staff, educating consumers, and creating excitement about the product.

Global and national trends

While understanding buyer needs was considered critical to developing marketing strategies, so was the need for recognizing larger global and national trends. Given the world's rapidly growing population, seafood demand is increasing. Given that wild commercial fisheries have plateaued or are expected to show only slow future growth, aquaculture will be the primary method for meeting this demand. The U.S. imports between 60% and 90% of its seafood, much of which are aquaculture products. Consumer attitudes are also changing, namely in their increased demand for local and sustainable foods.

Seafood, both wild and farmed, is vital to our people, economy, and planet. Aquaculture is a key component of our seafood systems and is one of the most climate-friendly and resource-efficient ways to achieve food security, economic, and environmental restoration outcomes.

NOAA Aquaculture Strategic Plan (2023-2028)

Critical components to Developing a Marketing Strategy

Panelists and speakers highlighted import considerations when developing a market strategy. For example, an unfamiliar aquaculture species will not be easily accepted and require considerable marketing efforts to overcome consumer resistance. Given the low profit margins of aquaculture and concerns about sustainability, Conference participants were urged to "monetize" other positive attributes of aquaculture, including carbon sequestration, water reuse, conservation, and efficient use of waste products. Aquaculturists also were encouraged to adopt "Brand Oregon" labeling, taking advantage of Oregon's green image, as well as to seek out third-party certification. Panelists recommended that the aquaculture and wild fisheries industries avoid internecine competition and use "Oregon Way" collaborative approaches for mutual advantage. Aquaculturists were encouraged to embrace concepts including sustainability, humane rearing, and "regenerative" production practices where possible.

Production and Market Opportunities

The marketing panel participants highlighted the following opportunities for Oregon aquaculture:

- Increase trout production for human food given the state's geography and resource base.
- Support opportunities for penaeid shrimp aquaculture given unmet demand for sustainable and local shrimp products.
- Support growth for greater seaweed and shellfish production.
- Adopt ambitious sustainability strategies—for example, "consume the carbon we produce."
- Integrate aquaculture with ecotourism and food tourism—create an Oregon "Aquaculture Trail".
- Develop a custom processing sector targeting aquaculture including mobile processing facilities.

Conference Spotlight: New Seasons Market

A highlight of the Conference was the presentation by Daisy Berg, the Seafood Category Manager at New Seasons Market, a regional highend supermarket focusing on high quality, local, and sustainable products. Until recently, she had limited company purchases of aquaculture products due to sustainability concerns, focusing principally on suppliers using tightly controlled recirculating systems. She has, however, identified sources of quality farmed products that address these concerns and is now willing to look at a wider array of aquaculture products produced in non-recirculating aquaculture systems, such as ponds and marine net pens. She noted that approximately half of the salmon they sell is farmed. She emphasized that many of New Seasons Market customers are relatively new residents of Oregon who are avid consumers of aquaculture products. She explained that once a potential aquaculture supplier's product meets their quality standards, the conversation shifts to discuss sustainability and the "producer's story" – New Seasons' customers want to know more about the foods they consume than just the price. She also discussed the importance of staff training, stressing the key role of producers in providing critical information to help staff tell a compelling story. Conference participants from outside Oregon noted the uniqueness of New Seasons Market and were impressed with the company's willingness to support the aquaculture industry. New Seasons Market's commitment to sustainable aquaculture allows them to take advantage of high-quality products, expand retail sales, and positively influence consumer attitudes.

II. Regulation[5]

The Conference featured two sessions centered upon the aquaculture regulatory environment. The first panel focused on the interactions between regulatory bodies and private sector actors. Representatives from the Oregon Department of Agriculture (ODA), Oregon Department of Fish and Wildlife (ODFW), Pacific Seafood, and Blue Trace Technologies presented various perspectives on the issue of regulations. Panelists participated in productive exchanges about local regulatory frameworks, the conversation centering mainly on the development of shellfish aquaculture in Oregon and the Pacific Northwest—this focus due to the shellfish-centric experiences of panelists as well as the preponderance of shellfish aquaculture in the state relative to finfish and macroalgae cultures. Critically, the costs to the investor associated directly with regulation were highlighted by the panel and throughout the Conference. The public sector representatives indicated permit filing costs are quite low. In a rebuttal, a private sector representative noted that the costs are quite high when considering opportunity cost. The lengthy and convoluted permitting processes of various jurisdictions result in lost revenue to producers. Furthermore, public actors emphasized the importance of due diligence when permitting to avoid greater long-term costs associated with potential environmental degradation. There was some disagreement regarding the environmental costs specific to oyster production. This divergence in opinions regarding these costs and impacts illustrates a difference in point of view among public and private sectors—an issue that should be the subject of future discussions aimed at a more consolidated and user-friendly approach.

Private hatcheries dominate the inland aquaculture space for Oregon. https://www.desertspringstroutfarm.com

The second panel featured presentations by NOAA, the Army Corps of Engineers (USACE), ODA, and ODFW. In contrast with the first panel, these presentations described the steps in the various permitting processes, featuring public entities directly involved in enforcing aquaculture regulations. NOAA, in addition to providing guidance and science support to other agencies, focuses on the Endangered Species Act (ESA) and Essential Fish Habitat (EFH) evaluations when determining permitting. The presenter, NOAA's Oregon and Washington Aquaculture Coordinator, highlighted the agency's efforts to help streamline the permitting process while outlining the entire process for Washington. The USACE representative discussed its regulatory jurisdictions and responsibilities focusing on discharge, protected species, and any aquaculture structures that may occur in navigable waters. ODFW explained its scientific evaluation process and its work in tandem with ODA to monitor for shellfish pathogens. ODA's role in permitting is the approval of state-owned lands for shellfish farming. Additionally, ODA's evaluation and approval would extend to inland aquaculture operations including areas of food safety.

The bulk of discussion after the presentations centered on how permitting could be streamlined, highlighting the following opportunities for expedited approval:

- Higher demand for permits generated by greater investment and more lobbying would increase the priority given to aquaculture by agency staff.
- Regulatory and permitting wait times are often associated with uncertain environmental impacts—NOAA is trying to provide scientific advice to aggregate findings and provide best practice guidance to help state regulators reduce permitting wait times.
- Additional investment in research with public entities and universities can also reduce costs for farmers and improve access to information.
- Online documents, acting as up-to-date roadmaps across regulatory agencies, would help farmers access relevant information for permitting and approval.
- A state aquaculture plan should include strategies to streamline the permitting process.

[5] The Regulation section highlights results from two sessions: 1) *Regulations and Permitting* breakout session featuring facilitator Kellen Parrish – OAA, and panelists Miranda Ries – Pacific Seafood, Steve Rumrill – ODFW, Jim Johnson – ODA, Randy Bentz – OAA and Call Nichols – Blue Trace; and 2) *The Agency Experience* session featuring facilitator Angee Doerr – Oregon Sea Grant and panelists Dan Tonnes – NOAA, Steve Rumrill – ODFW, Jim Johnson – ODA, and Brielle Cummings – USACE.

III. Technology & Production[6]

Production technologies and the harvests they yield are a function of the specific resources and inputs available. During the Conference there were numerous discussions of the essential elements in the aquaculture production process (e.g., water, seed, feed, labor, capital, energy, and equipment). A panel of industry professionals working in aquaponics, trout farming, veterinary services, and private consulting explained the use of different technologies to overcome major challenges in aquaculture. The panel moderator defined technology as "*the application of scientific knowledge to the practical aims of human life, or, as it is sometimes phrased, to the change and manipulation of the human environment*." Developing a successful aquaculture operation requires reliance on existing effective technologies, and development of new technologies, particularly those that reduce costs, increase production efficiency, and contribute to sustainability.

In Oregon, several farmers and other aquaculture businesses are using technology for innovative problem solving. A panelist working in the veterinary field discussed developing vaccines for emerging pathogens and working directly with farms to understand which vaccine route would be most effective. This innovation can lessen the use of antibiotics, a consumer concern, thus helping to increase marketability of aquaculture products. An aquaponics producer discussed how their facility has been able to employ temperature control technologies to optimize their crops. It was emphasized that aquaponics is a well-accepted production system by the public due to its well-publicized utilization of waste to grow plants along with a track record of being food-safe, organic, and sustainable. Lastly, a panelist who owns a trout farm discussed how their operation has used liquid oxygen and a vegetarian diet to increase fish health, reduce feed conversion rates, and eliminate contaminants associated with feeds made from animal byproducts.

Globally, aquaculture consists of hundreds of culture organisms with various production methods. Getting the right match is crucial, and often depends on the availability and quality of inputs, which may be limited in states with small aquaculture industries such as Oregon. Despite the potential lack of resources, several innovative opportunities exist in the region, and these also were discussed during the Aquaculture Technologies panel. Some examples included:

- Neighboring farmers growing different types of crops working together. For example, fish farm effluent from one farm used to irrigate crops at a neighboring farm.
- Diversification of opportunities within a farm. For example, farming fish in a recreational fishing lake with water activities and RV parking.
- Using geothermal springs in cold areas to grow warmwater fish.
- Hybridization and creation of sterile fish.

Innovative new investment options are always being explored, in this case sea urchin and dulse polyculture. https://www.flickr.com/photos/oregonseagrant/52287002692/in/album-72157708197925825/

Looking to the future, many challenges and opportunities exist in the region. One of the major challenges is responding to consumer questions about food safety, contaminants (i.e., antibiotics, microplastics, etc.), and environmental impacts. Research on technologies that address these questions is key to producing a marketable product. As aquaculture becomes more popular, larger companies are developing technologies that increase efficiency on farms and reducing the technological burden on individual farms. Many technologies that are built for one type of operation can be applied to others, which highlights the importance of information sharing. Facilitating conversations among producers, researchers, and other industry members is a critical part of building a modern and sustainable program. It was highly recommended by Conference participants that efforts need to be redoubled to expand and enhance information exchange through a variety of means including formal and informal outreach, workshops, conferences, or other

[6] The Technology and Production theme highlights the *Aquaculture Technologies* breakout session featuring modera-tor Tony Vaught – ProAqua and panelists Thomas Losordo – Pentair Aquatic EcoSystems, Katherine Onofryton – Aquatactics, Joel Kelly – Live Local Organic, and Tom McDonald – Desert Springs Fish Hatchery.

suitable methods. Finally, access to inputs is largely dependent on the existence of a diverse local aquaculture industry. In Oregon and parts of the West Coast region, a diverse industry does not yet exist, and developers may require external assistance to begin their enterprises and build the foundation of a robust aquaculture sector.

IV. Business & Planning Finance[7]

Aquaculture funding and business planning

The Conference had two panels focused on the business operations of aquaculture, one on investment and finance, and another focusing on business planning. During these panels, speakers shared a number of resources available to new and existing aquatic farmers in the region while discussing ways to overcome major challenges.

Obtaining and sustaining funding can be one of the most challenging aspects in establishing and operating an aquaculture business. In general, aquaculture is financially risky and often comes with high startup costs and relatively slow and low returns. It can take multiple years for the "product" to be ready, as many aquatic organisms take years to mature. Scaling up the business to produce more crops can also be difficult due to the costs of land and facilities to produce fish. Additionally, most financial institutions in Oregon and the Pacific Northwest have little understanding of aquaculture, which increases the challenges in obtaining financing. Awareness of, and ability to manage, risks is key to a successful operation.

Types of funding for aquaculture operations

There are different types of financing available for aquaculture operations, and each type may be more appropriate for different phases of startup and production. The Conference's finance panel discussed these options, including traditional loans, non-traditional loans, venture capital, grants, and personal loans or gifts from friends and family. Each type of funding has different requirements and expectations and provides varying levels of support. Traditional loans from commercial banks or financial farm cooperatives typically require that borrowers have several years of relevant business experience, valuable collateral, and that they provide a significant portion of startup and operating costs. Providers of non-traditional loans, such as foundations, are more open to riskier loans with a longer payback period, especially if projects generate environmental benefits (e.g., "restorative aquaculture"). They are willing to work with investors on obtaining grants. Venture capital investors are focused on "entrepreneurship" and are less risk averse while also having a longer time-horizon for the profitability of an investment. They expect the aquaculturist to have a good "pitch" that promises fast growth and long-term value that leads to potential acquisition. There are different classes of venture capital, such as "patient capital," a method that supports longer-term startups and "social capital" that supports riskier longer-term projects if they offer significant social or environmental benefits.

Whisky Creek Shellfish Hatchery is an example of a modern facility with a regional market. (https://www.whiskeycreekshellfishhatchery.com)

Regardless of the funding type, the ability to communicate potential success and impact consistent with the funder's mission is key. An entrepreneur seeking funding must articulate strengths and weaknesses, as well as strategies for addressing weaknesses, to potential investors. Depending on needs and availability of funding, aquaculture businesses may receive funding from different sources throughout the lifetime of the business. Therefore, it makes sense to explore all available options.

[7] The Business Planning and Finance theme highlights results from two sessions: 1) *Investment and Finance* panel moderated by Carole Engle – Engle-Stone Aquatic$, and featuring panelists Joe Bratt – North West Farmers Cooperative, Ryan Anderson -- Steward Foundation, and Alexis Nelson – Gybe; and 2) *Aquaculture Business Planning* panel moderated by Carole Engle – Engle-Stone Aquatic$ and featuring panelists Phil La Vine – Chemeketa Com-munity College, Laura Ferguson – Octant Consulting, and Paul Schuytema, Economic Development Alliance of Lincoln County.

Conference Spotlight: The Cost of Regulation

One of the Conference's featured speakers was Dr. Carole Engle, an aquaculture economist who has spent decades understanding the aquaculture sector. Much of her recent research has focused on the impact that regulation can have in terms of its costs to aquaculture producers. Her analyses suggest that regulations are the largest cost incurred by aquaculture producers across different species and production systems. She contends that these costs are difficult to discern when viewing a standard aquaculture balance sheet, as some direct regulatory costs may appear low. However, when valuing the time and production lost due to the lengthy process of navigating regulations and permitting, one can calculate a significant producer opportunity cost. These costs, according to Engle, can make aquaculture prohibitively expensive, deterring new entrants into the sector and discouraging new investment. Carole's presentation was illuminating, and it opened the door to discussion with representatives from public agencies at the conference. While regulation of aquaculture is inevitable, these insights can emphasize the importance of creative policies that facilitate sector growth while still providing protection for the natural environment and public health. The presentation in the presence of so many stakeholders underscores the Conference's catalytic potential for innovation and growth in the region's aquaculture sector.

Challenges and resources for new growers

The key challenges for new growers are obtaining adequate funding to start a business, demonstrating scientific expertise and business acumen to funders, and developing a successful long-term business plan. When it comes to funding, new growers need to be creative and seek funding from multiple sources (e.g., gifts, grants, loans, venture capital). They also need to show credibility in both science and business. One key recommendation was that new growers need aquaculture experience in order to demonstrate technical and business skills. A second recommendation was that a grower have a downstream business partner (e.g., restaurant) to demonstrate there is viable interest in the product.

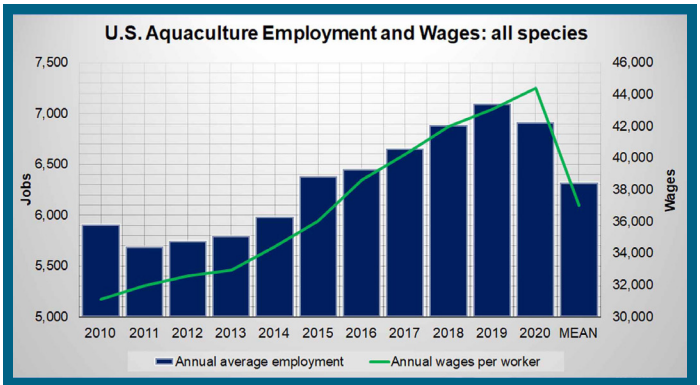
Business planning is essential to a successful aquaculture operation. Being able to produce fish is not enough, and poor business planning often leads to failure. It is important that growers map out how much profit they hope to gain in the short and long-term (1-20 years) and adapt to the changing business environment. The panel highly recommended conducting a Strengths, Weaknesses, Opportunities and Threats (SWOT) business analysis and getting feedback from multiple critical sources. It was emphasized that a new aquaculturist must consider their own personal strengths and weaknesses and create strategies to overcome these. For example, if working directly with customers is not a strength, then hiring someone with this skill would be a good option. There are several resources for business planning assistance, such as community colleges (including Chemeketa Community College where the conference was held), organizations that support entrepreneurship in rural areas (i.e., Oregon RAIN), private consultants that specialize in fisheries and aquaculture, and online business planning resources (i.e., AgPlan: https://agplan.umn.edu)

Decisions for Oregon

During the conference, many attendees and speakers shared their experiences with the financing sector. Many growers have been discouraged by lenders who haven't seen the value in their operation and have turned them away. With such a small aquaculture industry, Oregon lenders often don't have the knowledge base to properly evaluate aquaculture businesses and therefore are likely to view aquaculture as a high-risk investment. There is an opportunity to provide educational resources to growers and lenders to bridge this gap in knowledge. In the past, OSU extension worked with commercial fisheries and lenders to address this type of problem. Working with the Oregon Aquaculture Association and expanding OSU extension to include staff with expertise in aquaculture and business development is essential to support aquaculture expansion in Oregon.

V. Workforce Development[8]

There is a consensus that growing the aquaculture industry in Oregon will require an expanded aquaculture workforce. Aquaculture work, according to the Bureau of Labor Statistics, does provide a comparable wage to other agriculture work in the U.S.[9] Limited opportunities for education, internships, apprenticeships, or practical training for aquaculture currently exist, although a small number of Community Colleges provide aquaculture training for certain species and systems. Accordingly, the Conference organizers invited WorkSource Oregon, Northwest Oregon Works (NOW), and Oregon Sea Grant (OSG) to join a panel discussion about opportunities to increase the aquaculture workforce.



Display of workforce size and mean annual wage for aquaculture in Unit-ed States. (https://coastal.msstate.edu/us-aquaculture-production-farm-gate-values-and-employment)

Workforce Development Organizations

The panel discussed the efforts of three workforce development organizations. WorkSource Oregon[10] is a partnership between the Oregon Employment Department and various agencies, designed to connect employees and employers with opportunities and resources. The overall goal is to provide job-training services to help individuals enter the workforce. WorkSource Oregon is a ready partner for aquaculture businesses.

Northwest Oregon Works (NOW), representing Lincoln, Tillamook, Clatsop, Benton, and Columbia counties, is one of nine local workforce development boards created and funded by the Workforce Innovation and Opportunity Act (WIOA). These boards are designed to merge education, economic development, and workforce investment. They focus on moving people into the local workforce, providing funding for job training, and accommodating diverse training needs.

Through organizations such as WorkSource Oregon and NOW, the Oregon public workforce system helps businesses find skilled workers or upskills new and existing workers. They work with employers to determine their workforce needs and then collaborate with partners, such as community colleges, to develop training and curriculum that reflect those specific needs. While aquaculture education opportunities do exist at some Oregon Communities Colleges (including Oregon Coast Community College and Mt. Hood Community College), the workforce system has yet to focus on training in the fisheries/aquaculture sector.

Oregon Sea Grant (OSG) is involved in efforts to develop aquaculture workforce training. Recent needs assessments showed that a critical need is reliable workers at all levels of an aquaculture business. National Sea Grant has, accordingly, awarded a planning grant to develop aquaculture and fisheries workforce training. Sea Grant has developed an initial implementation plan with a key finding that many people do not even know that aquaculture or commercial fishing exist as career options.

Through the course of discussions, industry partners identified the following specific needs for employability, including both social and technical skills: safety and nautical skills, food safety knowledge, trade skills, teamwork/workplace norms, and management/ leadership skills. Potential programs and resources to develop these skills also were identified, such as community college programs, 4-H, Future Farmers of America, internships or apprenticeships, K-12 STEM, place-based careers and career paths/profiles, and resources for immigrant labor force.

Successfully Putting People to Work

Moving workforce development forward will require effort on the part of industry, as well as partnership with workforce boards and local education providers.

[8]The Workforce Development theme highlights the *Workforce Development breakout* session featuring facilitator Angee Doerr – OSG, and panelists Corey Habiger – WorkSource Oregon and Heather Desart – Northwest Oregon Works.
[9]https://www.bls.gov/oes/current/oes452099.htm
[10]Worksource Oregon has a variety of statewide hiring incentives and programs, including: Work Opportunity Tax Credit (WOTC) – a tax credit for hiring certain groups, Federal Bonding Program, On the Job Training (OJT) program, Self-Employment Assistance (SEA), O*net online: Occupational information network, and Qualityinfo Web-site

The panel identified several opportunities and areas for collaboration. However, the presentations and discussions also raised a number of challenges that are important to consider. Although there is interest on the part of service providers (WorkSource Oregon, Workforce Development Boards) to support the aquaculture, industry leaders will need to work with these groups to develop resources and services, and also take advantage of existing programs. One strategy is to develop a stackable certification program. An important first step is to identify the core requirements for an effective aquaculture employee. Many of these requirements may be met through programs already offered through employment agencies and community colleges; others may be developed for high school career and technical education (CTE) programs. Given that aquaculture is a small industry in Oregon, maintaining a certificate program is potentially challenging (e.g., need to identify and maintain instructors, provide facilities, funding).

A lack of career development may be another limiting factor for recruitment of new growers. It is necessary to make individuals aware of existing jobs by advertising them more widely, including through workforce agencies and announcements sent to community colleges with existing aquaculture programs. Oregon also should consider working with regional programs, which can serve as both a training model and a source of potential employees for Oregon industry. Both Washington and California have schools with aquaculture degrees,

Additionally, it is very expensive to get into aquaculture, so even if the training is provided to potential new entrants, these individuals may not be able to build their own business. Linkages between training, education, and financial planning/investment need to be fostered.

VI. Cross-cutting Issues

There are a number of cross-cutting issues that affect, to a greater or lesser degree, all of the main Conference themes. In many instances, these issues, if not addressed, can significantly impede progress on increasing investment in aquaculture. These elements affect the entire aquaculture value chain, aquaculture support services, and aquaculture education—whether working in the public or private sectors. The cross-cutting themes include the following:

• ***Perceptions***— Aquaculture is often new to many people in the public, and perceptions of its "goodness" vary. Generally speaking, it could be said that the bulk of messaging about aquaculture in the region lacks nuance or scientific credibility, leading to distorted perceptions that influence downstream consumer behavior, business decisions, and legislative activity.

• ***Social License***—Perceptions can affect what is termed "social license." For investments to materialize and profit, they must have the support not only of the official government regulators, but also of society—especially the local community. Communities are concerned about social sustainability, including forewarning about potential negative impacts. Environmental impacts from large-scale aquaculture operations or cumulative effects from smaller operators are a major public concern. Speakers at the conference emphasized that aquaculture in the U.S. is well regulated, sustainable, and environmentally friendly. Engaging with the public directly to change perceptions based on myths is an important step in obtaining social license.

• ***Knowledge gap & weak education and outreach***—Social license and misperceptions are closely tied to a prevailing education gap accompanied by limited outreach. Most individuals and communities are unfamiliar with aquaculture, and many would-be investors have incomplete knowledge upon which to base their decisions. Education, both formal and informal, is necessary for the sector to develop. Specifically, outreach efforts should include two-way communication between farmers and researchers (i.e., extension), experience sharing between well-established and emerging farmers, and a focus on realistic conditions and expectations for running an aquaculture operation. There is also a need to provide information to legislators from industry leaders on the importance of supporting aquaculture as a part of the blue economy.

• ***Political champions & policy support***—All of the above influence the fact that there are currently incomplete or poorly designed aquaculture policies and few political champions to support the development of the sector. Aquaculture can only reach its potential when it is recognized as an important part of the state's agriculture and economic strategy. Policies that support other agriculture industries, when applied to aquaculture, also signal to investors that a jurisdiction supports a sector and would like to see it grow. This will require an increased demand for space, products, and resources from industry and the public.

• ***Natural resource constraints***—Aquaculture ventures touch both sides of the resource equation. They require inputs of high-quality resources such as land, water, and energy and compete with other sectors when these are in short supply. They also produce byproducts and effluents/outflows that could have negative (or positive) impacts. These input-output relationships require

careful evaluation and management as one develops an aquaculture enterprise. While Oregon has vast natural resources, obtaining land with adequate water access and other required inputs has been a challenge for prospective aquaculturists.

• ***Import substitution & consumer sovereignty***—Farmed seafood is a major contributor to broader seafood supply chains. At present, the vast majority of the seafood supply in the US is imported and includes several aquaculture products coming from countries with lower costs and fewer environmental regulations. New investments must be able to compete with these imports or target other market opportunities that are un- or under-supplied. As the variety of seafood products increases to accommodate, among others, specialized local products, this must be done in concert with efforts to expand consumer preferences. Additionally, outreach efforts should center on the idea that consumers need exposure to and education about new products alongside assurance that existing choices are not socially or environmentally harmful.

• ***Producer associations and collaboration***—A critical mass of advocates is needed to advance industry and create positive inertia. While individual farms may be able to operate and even thrive, substantive programmatic advancement requires that many operations and operators work collaboratively. These energies are best harnessed through strong producer associations that link closely to other agriculture associations to gain maximum traction and political support. Strong producer associations have active and engaged members, producer representation, leadership development, succession training, and value creation. In addition to OAA, several regional and national aquaculture producer associations are available for Oregon farmers, such as the Northwest Aquaculture Alliance, Pacific Coast Shellfish Growers Association, U.S. Trout Farmers Association, and the National Aquaculture Association.

• ***Strategic planning***—All of the above issues highlight the need for comprehensive strategic planning. Currently most states and regions lack strategic plans, and many activities happen on an ad hoc basis. A flexible and broad-based strategic plan, with its related policies and regulatory measures, is necessary to optimally guide sector investments and the hoped-for sector expansion. State and federal agencies at the conference agreed that an Oregon state aquaculture plan would be a valuable next step.

Conference Spotlight:
The importance of aquaculture associations

Dr. Carole Engle and Paul Zacijeck spoke of the importance of aquaculture associations in the United States. Paul is the President of the National Aquaculture Association, the primary body representing the interests of aquaculture producers in the country. Through Zacijeck's and Engle's research, they demonstrated that strong producer associations help create a critical mass of voices to amplify the voice of the industry, advocate for beneficial policy, and provide mutual support across regions. As an example, the COVID-19 pandemic relief funds initially did not include aquaculture producers even though they were experiencing significant economic losses during the outbreak. Efforts on the part of NAA and other aquaculture associations opened funds to protect farms while the economy slowly recovered from the pandemic downturn.

In addition, producer associations can collaborate to protect their markets. Catfish production is a long-running practice and is one of the largest aquaculture sectors in the United States. However, catfish from Asia at a lower price point eventually made its way into U.S. markets. With collaboration to market their products strategically, U.S. producers have been able to survive and thrive in the midst of increased international competition. These two examples highlight the importance of aquaculture producers' associations, and their ability to galvanize collective action.

Conclusions and Recommendations: The Way Forward

Summing Up—Immediate Concerns

As with any investment, there are many challenges and risks associated with aqua farming. However, unlike more traditional investments, aquaculture is new. On many fronts there is a notable knowledge gap. This is exacerbated in many situations by ill-founded perceptions of aqua farming that result in weak political support and even community antagonism toward these food-producing systems. It is in this frame of reference
that immediate action is needed to address concerns and facilitate investment, allowing aquatic farming to make contributions to food security and environmental integrity. It is in this context that, as underscored throughout the Conference, the necessary perspective for advancement is to concentrate on garnering political acceptance and social license.

Needed Action

1. Establish the framework for developing a State Strategic Aquaculture Plan. Begin the planning process in 2023, completing the first draft of the comprehensive plan by mid-2024.

2. Pending adoption of the Plan, significantly improve coordination among all stakeholder groups and increase/improve outreach to investors along the seafood value chain. Establish an interim one-stop-shop to interface with regulators and operators.

3. Identify and mobilize ways and means to support aquaculture for those Tribes interested in aquaculture development opportunities.

4. Enhance formal aquaculture education at all levels, including developing specific curricula at secondary and tertiary levels to help grow the needed workforce for expanded statewide and regional aqua farming.

5. Expand informal education and outreach to address critical shortfalls in aquaculture knowledge.

6. Strengthen the Oregon Aquaculture Association and other state producer groups. Reinforce links with “sister” associations and groups.

7. Continue and expand work on the Oregon Aquaculture Explorer Platform and the PAMIC project to support inter- and intra-state program growth.

PART III: Annexes

Oregon and Pacific Northwest Aquaculture Development Conference
"Investing in the Future of Seafood"

October 3-6, 2022

Chemeketa Community College
4000 Lancaster Dr NE,
Salem, OR 97305

Monday, October 3rd *Pre-Conference*		**Presenter(s)**	**Room/Link**
1:00-5:00	**Recirculating Aquaculture Technology Workshop—Part I**	Thomas Losordo, Principal Scientist & Chief Engineer for Pentair Aquatic Eco-Systems	Room 106 - Lab
Tuesday, October 4th *Pre-Conference*			
8:00-12:00	**Recirculating Aquaculture Technology Workshop—Part II**	Thomas Losordo, Principal Scientist & Chief Engineer for Pentair Aquatic Eco-Systems	Room 106 - Lab
9:30-11:00	**Forum on Strategic Tribal Aquaculture & Food Security**	Stan van de Wetering, Siletz Tribe	Room 100

Conference

12:00-1:00	Lunch (provided)		
1:00-1:15	**Welcome Remarks**	Randy Bentz, OAA Karina Nielsen, Oregon Sea Grant	Room 102/104
1:15-2:00	**The Case for US Aquaculture** *What are the opportunities and the challenges for those wanting to invest in aquaculture in Oregon and other Western States?*	Paul Zajicek, NAA	Room 102/104

2:00-2:45	**Investing in Aquaculture** *How does one prepare for starting an aquaculture business? What are the essentials to start and what are the subsequent keys to success?*	Carole Engle, Engle-Stone Aquatic$ LLC	Room 102/104
2:45-3:00	Coffee Break		
3:00-4:15	**Seafood Market Opportunities and Challenges**: *Some would say that the market is the single most import factor when planning on investing in aquaculture. If demand is expected to increase, how do small- and medium-scale producers meet these demands?*	Daisy Berg, New Seasons	Room 102/104
4:15-5:15	**Tools for Investment: Oregon Aquaculture Explorer & Innovation Centers**	Megan Judge, OAA Tony Vaught, ProAqua	Room 102/104
5:15-6:30	Networking over farmed seafood	Food by Chef Luis Cabañas	Pavilion
Wednesday, October 5th			
8:00-8:30	Coffee and Networking		
8:30-10:00	**The Investment Experience** *Successfully starting and operating an aquaculture business can be difficult. Why did you invest in aquaculture and what are the biggest challenges?*	*Moderator*: Tony Vaught, ProAqua *Panel*: - Missy Bird, The Mermaid's Garden - Wally Pereyra, Arctic Storm Management Group - Kellen Parrish, OAA/NOAA	Room 102/104
10:00-10:15	Coffee Break		
10:15-12:15	Breakout Sessions		

	Regulations and Permitting *Reviewing the challenges in unravelling the regulatory knots and procedures for both small and larger operations*	*Moderator:* Kellen Parrish, OAA/NOAA *Panel*: - Miranda Ries, Pacific Sea Food - Steve Rumrill, ODFW - Jim Johnson, ODA - Randy Bentz, OAA - Call Nichols, Blue-Trace	Room 104
	Investment and Finance *Examining critical factors constituting good aquaculture investments from the perspective of financial institutions*	*Moderator*: Carole Engle, Engle-Stone Aquatic$ *Panel*: - Joe Bratt, NWFC - Ryan Anderson, Steward Foundation - Alexis Nelson, Gybe	Rm 100
	Aquaculture Technologies *A general overview of the key elements of the most likely production methodologies, discussing the real-life problems in bringing these systems on-line*	*Moderator*: Tony Vaught, ProAqua *Panel*: - Thomas Losordo, Pentair Aquatic Eco-Systems - Katherine Onofryton, Aquatactics - Joel Kelly, Live Local Organic - Tom McDonald, Desert Springs Fish Hatchery	Room 102
12:15-1:15	Lunch (provided)		

1:15-2:45	**The Agency Experience** *Aquaculture is often perceived as an over-regulated activity with little political support and few champions from the public sector. What is the role of public agencies in the evolution of the aquaculture program?*	*Moderator:* Angee Doerr, Oregon Sea Grant *Panel*: - Dan Tonnes, NOAA - Steve Rumrill, ODFW - Jim Johnson, ODA - Brielle Cummings, USACE	Room 102/104
2:45-3:00	Coffee Break		
3:00-5:00	<u>Breakout Sessions</u>		
	Marketing *Assessing a market-first approach and how a new investor (or someone expanding operations) goes about evaluating different potential market pathways*	*Moderator/panelist*: Dave Stone, FIC *Panel*: - Erick Garman, ODA - Chuck Toombs, Oregon Seaweed/Oregon Dulse - Jeanne McKnight, NWAA	Room 100
	Aquaculture Business Planning *Reviewing the components of a good business plan and how to prepare one, highlighting critical initial pre-investment considerations*	*Moderator:* Carole Engle, Engle-Stone Aquatic$ *Panel*: - Phil La Vine, CCC - Laura Ferguson, Octant Consulting - Paul Schuytema, Economic Development Alliance of Lincoln County	Room 102
	Work Force Development *Reviewing the spectrum of skills required for aqua businesses and how*	*Moderator:* Angee Doerr, Oregon Sea Grant	Room 104

	these skills can be attained/learned including how to address high labor costs affecting US producers' ability to compete on the international stage	*Panel*: - Angee Doerr, Oregon Sea Grant - Heather Desart, Northwest Oregon Works - Corey Habiger, Worksource Oregon	
5:00-7:00	Networking and Farmed Seafood Cuisine	Food by Chef Luis Cabañas	Pavilion
Thursday, October 6th			
8:00-8:30	Coffee and Networking Time		
8:30-9:00	**Role of Aquaculture Associations** *Aquaculture organizations regrouping the wide spectrum of stakeholders in state and national programs can be important actors in facilitating investment and promoting seafood consumption*	Carole Engle, Engle-Stone Aquatic$	Room 102/104
9:00-10:15	**Presentation of investment strategies** *Each of the six breakout sessions summarizing the groups conclusions and recommendations*	Moderator Presentations - Kellen Parrish: Regulations and Permitting - Carole Engle: Investment and Finance; Aquaculture Business Planning - Tony Vaught: Aquaculture Technologies - Dave Stone: Marketing - Angee Doerr: Workforce Development	Room 102/104

10:15-10:30	Coffee Break		
10:30-11:45	**Investing in Aquaculture: Opportunities and challenges for the farmer** *What are the major takeaways for the investor/operator that can facilitate growth of the industry and related markets?*	Facilitator: Jane Barth	Room 102/104
11:45-1:00	**Investing in Aquaculture: Opportunities and challenges for government** *With a growing need for more seafood, how can agencies address this need, support their constituencies, and promote 21st Century aquaculture development?*	Facilitator: Jane Barth	Room 102/104
1:00-1:15	**Concluding remarks**	Randy Bentz, OAA	Room 102/104
1:15-2:15	Networking Lunch (provided)		

Post-Conference			
2:15-5:30	**Post Conference Roundtable on Aquaculture Perceptions** *An examination of "good" versus "bad" aquaculture and how these perceptions affect the growth of the sector*	By invitation Facilitator: Jane Barth	Room 102/104

Annex B. List of Participants

First Name	Last Name	Entity Representing
Brad	Bailey	Aquaculture Producer
Adrian	Barnes	Aquaculture Producer
Jane	Barth	Aquaculture Scientist and Moderator
Randy	Bentz	Oregon Aquaculture Association/Blue Den Ranch Trout Farm
Daisy	Berg	New Seasons Market
Melissa	Bird	Mermaids Garden
Rick	Boatner	Oregon Department of Fish and Wildlife
Jon	Bonkoski	Ecotrust
Kathy	Bridges	Oregon Aquaculture Association
Mark	Buettner	Klamath Tribe
Samuel	Chan	Oregon State University
Marcus	Chatfield	Oregon Department of Land Conservation and Development
Megan	Considine	The Nature Conservancy
Brielle	Cummings	U.S. Army Corps of Engineers
Heather	DeSart	NW Oregon Works
Christina	DeWitt	Oregon State University
Kelly	Dirksen	Grand Ronde Tribe
Angee	Doerr	Oregon Sea Grant
Shawn	Donkin	Oregon State University
Ken	Dunder	Participant
Hillary	Egna	Oregon State University
Amy	Ehrhart	Oregon Sea Grant
Glenn	Eisenach	
Carole	Engle	ENGLE-STONE AQUATIC$ LLC
Daniel	Epple	Structural Armor
Ford	Evans	Oregon State University
Laura	Ferguson	Octant Consulting
Nicole	Fernandes	NOAA
Henry	Fleener	Oregon State University
Colby	Gonzales	Cow Creek Band of Umpqua Tribe of Indians
Jeff	Griffin	Port of Bandon
Corey	Habiger	Employ Oregon
Louis	Hans	Producer
Christina	Higby	Oregon Department of Agriculture
Jim	Johnson	Oregon Department of Agriculture

Colby	Johnson	Aquabiomics
Meg	Judge	Professional Aquaculture Services/Oregon Aquaculture Association
Brian	Katz	Cascadia Visualizations
Joel	Kelly	Live Local Organic
Alana	Kiefer	Oregon Seaweed Company
Stephanie	King	Oregon State University
Gway	Kirchner	The Nature Conservancy
Phil	La Vine	Chemeketa Community College
Chris	Langdon	Oregon State University
Michael	Lee	Oregon and California Aquaculture Associations
Xin	Liu	Oregon Oyster Farms
Thomas	Losordo	Professor Emeritus: North Carolina State University
Tom	MacDonald	Desert Springs Trout Farm
Alexis	Manderson	Oregon Department of Agriculture
Jon	Maroney	Oregon Venture Fund
Sarah	Masoni	Oregon State University
Catherine	Mays	SLR Consulting
Robert	McGorrin	Oregon State University
Brenda	Meade	Coquille Tribe
Julianne	Merrill	Oregon State University
Eric	Miller	
Damon	Miller	
Ruth	Milston-Clements	Oregon State University
John	Moehl	Oregon Aquaculture Association
Michael	Morrissey	Oregon State University
Paul	Nagel	
Alexis	Nelson	Gybe
Call	Nichols	Blue Trace Technologies
Karina	Nielsen	Oregon State University
Janet	Niessner	CTCLUSI
Connor	Nolan	Oregon RAIN
Katharine	Onofryton	Bimedia
Alisha	Papazian	ONYM Bookkeeping
Kellen	Parrish	Oregon Aquaculture Association
Mateusz	Perkowski	Capital Press
Hailey	Quigley	Oregon State University
Miranda	Ries	Pacific Seafood
Anja	Robinson	Oregon Oyster Farms
Martin	Rosenthal	

Steve	Rumrill	Oregon Department of Fish and Wildlife
Kira	Sabin	Oregon State University
Paul	Schuytema	Economic Development Alliance of Lincoln County
Tania	Siemens	Oregon State University
Chandler	Smith	Aquasend
David	Stone	Oregon State University
LaDon	Swann	National Sea Grant
Stan	Swerdloff	Klamath Tribe
Gilbert	Sylvia	Oregon State University
Robin	Terry	
Dan	Tonnes	NOAA
Chuck	Toombs	Oregon Seaweed Company
Nicholas	Trejo	Wilbur Ellis
Tony	Vaught	Professional Aquaculture Services
Luguang	Wang	Oregon State University
Jennifer	Wells	Lateral Systems
Paul	Zajicek	National Aquaculture Association

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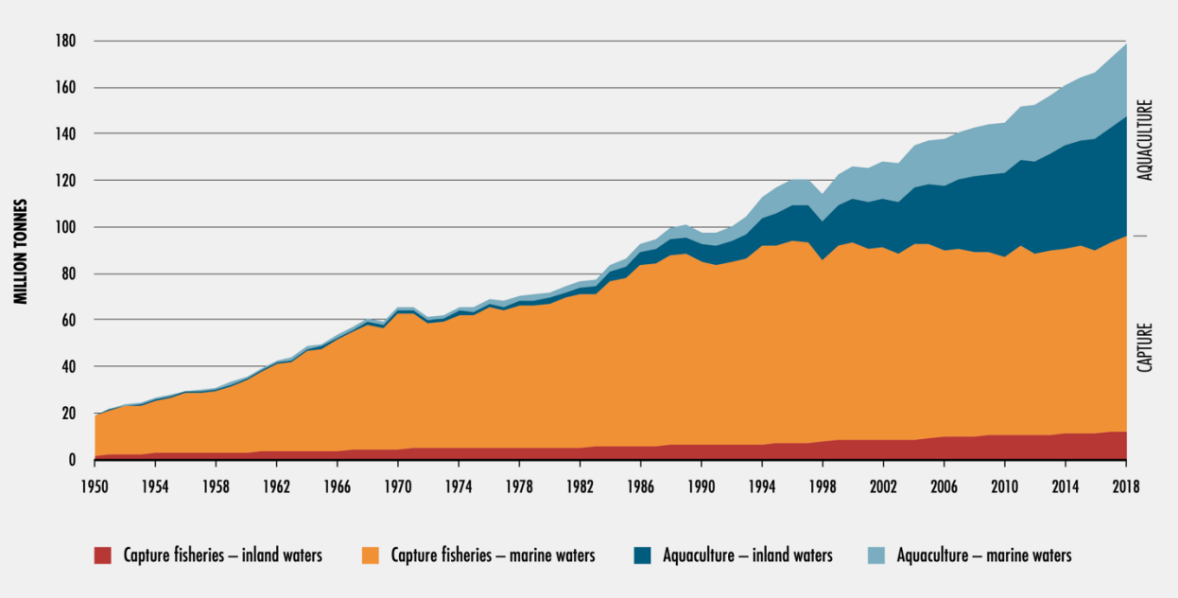
PROBLEM STATEMENT

Globally, as aquaculture increases its market share, the subsector is reaching critical mass—transforming from an esoteric, almost sideline conglomeration of activities into a structured body of specialized businesses and an important part of many economies and significant food production schemes. Through this transition to becoming a major actor, the technologies, economics, and impacts of aqua farming are evolving. But this transfiguration is not being applied equally across the globe. The United States still relies heavily on imported seafood and is not among the top aquaculture producers. Within the US, the Pacific states of California, Oregon, and Washington have relatively modest and uniform programs. There are efforts to enhance investment in the three states while, at the same time, diversifying farm-raised products to attract varied markets. The market is, moreover, a principal driver of the expansion of Pacific programs. And during what should otherwise be a period of growth, the worldwide surge of aquaculture has been curtailed by the impacts of COVID. Overall, the hoped-for expansion often relies on the introduction of products, technologies, and/or methodologies that are being produced or practiced in other parts of the country or the world—the adoption of these products, technologies, and methodologies often ecosystem based, following more ecological than political boundaries. With this backdrop, a designated center for aquaculture development, marketing, and program expansion in the three states is seen as the best mechanism to facilitate timely programmatic growth while ensuring access by small- and medium-size operators who otherwise may be marginalized in regard to accessing costly technical, financial, and market assistance. The center would improve coordination, market access, input supply, investment, links to the public sector while serving as a valued source of science-based knowledge about aqua farming—covering the value chain from the hatchery to the restaurant and fish counter of the local grocery store. Concurrently, the center would be an incubator for startups and an acknowledged partner with state education programs for both practical learning as well as applied R&D.

BACKGROUND & CONTEXT

Globally, aquaculture is one of the fastest growing food-producing subsectors, providing high-quality products to markets around the world. In the United States, in 2017, the aquaculture industry produced 313,000 tons valued at $1.5 billion and generating 1.7 million jobs—in 2017, the US was seventeenth in the world in terms of production (NOAA https://coast.noaa.gov/states/fast-facts/aquaculture.html). China, the number one producer, harvested 17,461,000 tons (FAO 2020). Figure 1 highlights the major trend in the share of seafood production from aquaculture versus wild harvests.

Figure 1 : Seafood supply from capture fisheries versus aquaculture (Source: SOFIA 2020 (FAO))



According to FAO (2020), 52% of the seafood consumed by humans comes from farms. The World Bank (2013) estimates that aquaculture will provide over 60% of the world's seafood by 2030. The expanding importance of aquaculture has been foreshadowed for some time. In 1980, Congress declared "*... that aquaculture has the potential for reducing the United States trade deficit in fisheries products, for augmenting existing commercial and recreational fisheries, and for producing other renewable resources, thereby assisting the United States in meeting its future food needs and contributing to the solution of world resource problems. It is, therefore, in the national interest, and it is the national policy, to encourage the development of aquaculture in the United States."* (https://www.usda.gov/topics/farming/aquaculture).

US consumption is not only low, it is relatively homogenous, not representing the variety of products available on the world market (https://www.seafoodsource.com/news/supply-trade/us-seafood-consumption-rises-to-the-highest-level-seen-since-2007-but-falls-short-of-usda-recommendations). The Seafood Nutrition Partnership(https://www.seafoodnutrition.org) works to both increase political support for increased seafood consumption as well as to educate the population about the value of an improved seafood diet11.

Seafood overall supply is not only affected by consumer preferences and consumption. Between 2000 and 2018 commercial fisheries landings fell by 15% (NMFS 2001, 2020). Moreover, since the onset of the COVID pandemic, seafood processors have lost many of their markets. Seafood sales to restaurants make up 60-80% of the sales from some processors—the impacts of COVID reducing or even closing these channels (West Coast Processors Association 2021). Increasing aquaculture production could, therefore, benefit processors as well as consumers12.

However, given the volatility of both supply and demand as well as the costs inherent with farmed versus wild-caught items, effective marketing and market planning are essential for a successful operation. Identifying markets can be tricky and the necessary prerequisites of a suitable market plan can be a challenge for many would-be operators. There are guidelines available[13,14], but often the best choice is often an individualized approach that can address the nuances of each situation—a choice requiring access to such a service.

While international aquaculture development efforts in the 1970s and 80s focused on crafting and tailoring production technologies, there was a tipping point in the 1990s when the critical role of biotechnology was overtaken by economics—operations, large or small, needed to be sustainable and this generally meant profitable. Concurrently there was increasing awareness that the subsector would not achieve needed levels of adoption without social license. The developmental pathway led to present paradigm where aquaculture must be technically, economically, and socially sound while recognizing the fact that most often successful operations are market-driven. Unsurprisingly, it is now understood that aquaculture is multidimensional—all aspects requiring attention if viable programs are to be sculpted[15].

Through recent actions including but not limited to the NOAA Blue Economy Strategic Plan 2021-2025, the US government has increased support to the aquaculture sub-sector. Yet, according to some sources, the US still imports 90% of its seafood (National Fisherman 2018) and per capita consumption is roughly sixteen pounds per person compared to the global average of 45 pounds/person (Stastista).

As an acknowledgement of the complexities in developing a viable multifaceted program, in 2019 the State of Oregon funded the project: Development of the Oregon Explorer Platform. This set of activities elaborated an open-access on-line toolbox to assist investors during the pre-investment stage in financial and spatial planning. These tools are based on aquaculture system options (a system being the combination of the organism and the production technology)—highlighting areas with suitable ecologies, economies, and regulatory frameworks to support a designated system and then outlining the requirements for such an operation such as land area, water availability, production inputs, and capital while making rough estimates of profit or loss. Phase I State support ends in 2021 and a Phase II through 2023 has been funded by NOAA/ Seagrant (The Aquaculture Explorer Platform: Integrated Spatial-Financial Tools to Catalyze Aquaculture Investment).

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[11] https://www.forbes.com/sites/margotwilsterman/2020/05/15/eat-seafood-america-a-campaign-to-increase-seafood-consumption-amid-a-national-meat-shortage/?sh=1796154262cd

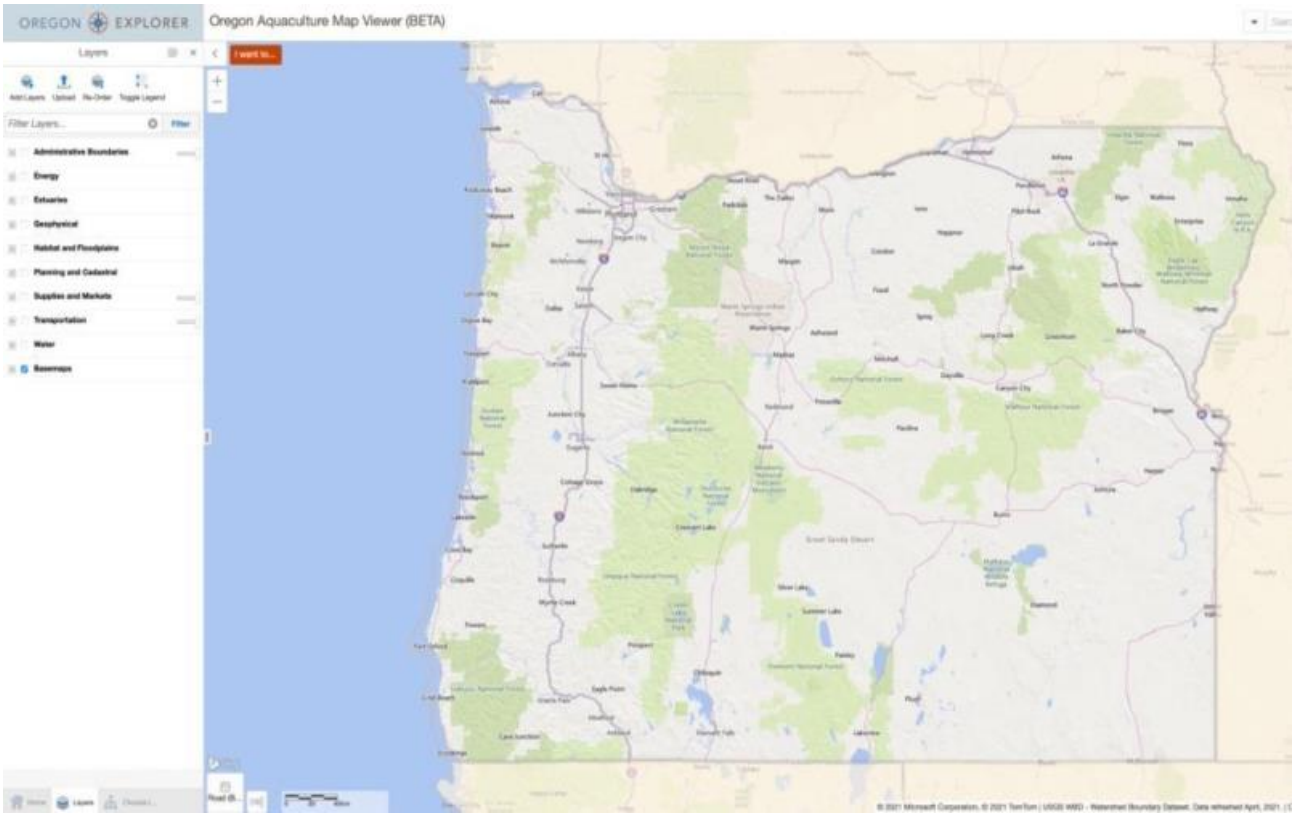
[12] https://www.googleadservices.com/pagead/aclk?sa=L&ai=DChcSEwi_3vyYnvLwAhV0CecKHSi_AHMYABABGgJwdg&ae=2&ohost=www.google.com&cid=CAESQOD23fR-tXfNCTZUNpkiTDo8NBRC6Wyvg9hfqJNSZBuToTx1d3EUWD2KUe94cZ4DTogNg8Rxsu14ru75XtE1UZg&sig=AOD64_0JSm8dh8i-nvnA9k7grtZAddy2gg&q&adurl&ved=2ahUKEwiYqfOYnvLwAhXFi54KHfjxDjoQ0Qx6BAgDEAE&dct=1

[13] https://aquaculture.ca.uky.edu/sites/aquaculture.ca.uky.edu/files/srac_350_small_scale_marketing_of_aquaculture_products.pdf

[14] https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1012&context=ncrac_techbulletins

[15] http://www.fao.org/3/i3363e/i3363e.pdf

The Explorer Platform hopes to guide investors while reducing the aquaculture education gap—this rift having been identified as a major impediment to a better understanding of and expanded investment in aqua farming[16]. However, to use the platform effectively, some basic information is needed. This is encapsulated in the questions, "What can I sell and how do I raise it?" The relatively monolithic nature of many of the aquaculture programs in the Pacific Region means that the answer to this

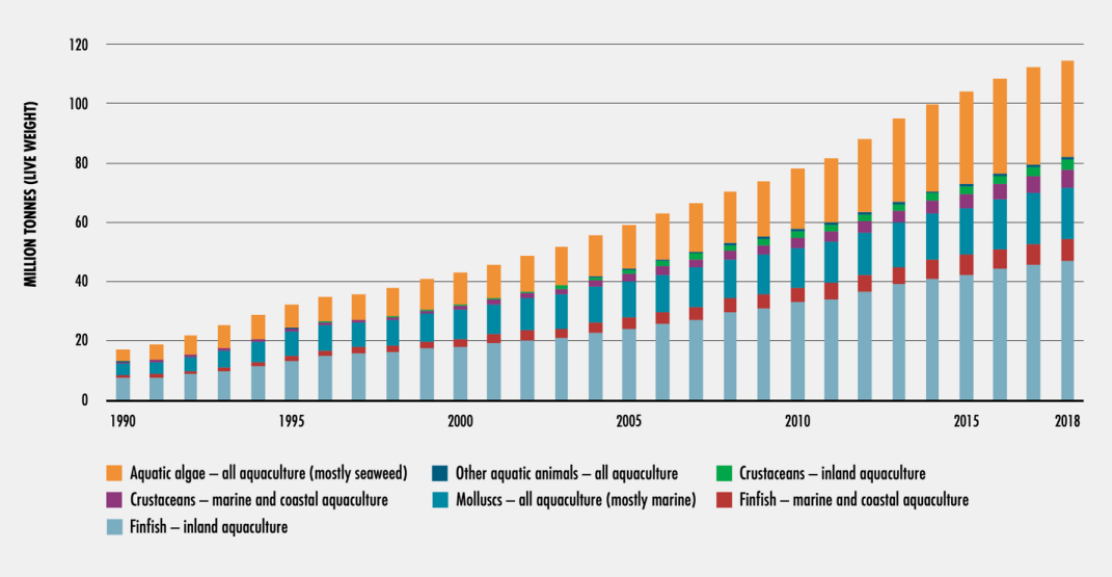


question is currently not readily available. There are many choices with only a subset being highly applicable to the markets and environments of the Region.

More than 600 aquatic species are cultivated around the world (UN 2016)—these fall into several general categories, Figure below. However, the Pacific states have been focusing on deep-rooted practices and crops. Traditional husbandry by native peoples goes back centuries while more structured propagation dates to the 1800s. The object of this attention has typically been and continues to be salmonids and oysters (USDA/APHIS 1995).

[16] https://www.oregon.gov/ODA/shared/Documents/Publications/MarketAccess/AquacultureInvestment.pdf

Figure 2 : Composition of crops constituting the global aquaculture program



Source: SOFIA 2020 (FAO)

A subgroup of the broader population of aquaculture crops is appropriate for the Pacific Region. The table below reflects some of the important farmed crops in the US and indicates a possible sample of those crops for consideration in the Region—others still to be identified.

Table 1 : Number of farms raising specific crops

Crop/organism	US	California	Oregon	Washington
Hybrid Striped Bass	62	4	0	0
Catfish	531	35	3	0
Yellow Perch	65	0	0	0
Sturgeon	18	7	0	0
Tilapia	137	9	0	0
Trout	334	15	15	9
Large Mouth Bass	195	17	4	0
Walleye	42	0	0	0
Freshwater Shrimp	13	0	0	0
Marine Shrimp	39	0	0	0
Clams	312	0	2	79
Mussels	33	7	0	6
Oysters	701	17	15	86
Algae	189	1	0	0
Value of total harvest ($)	1,515,680,000	106,031,000	23,668,000	207,685,000
Total number of farms	2,932	91	38	121

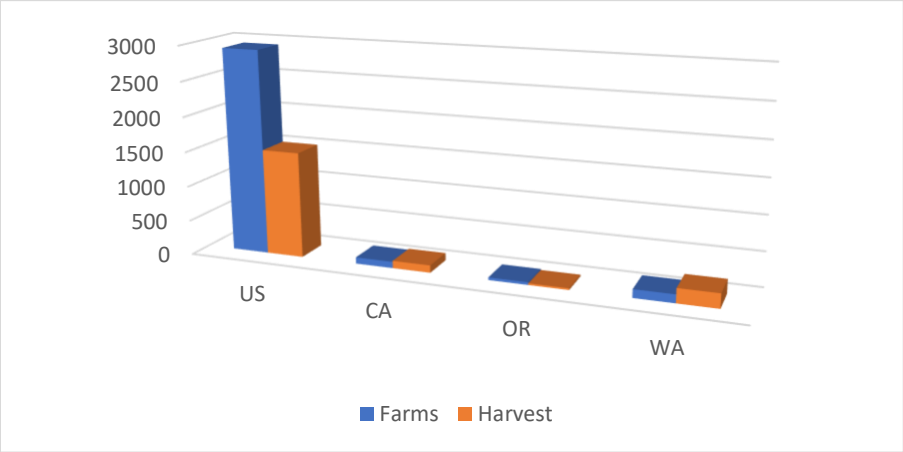
Source: USDA 2018 Census of Aquaculture (2019)

The crops/organisms above are grown in a collection of production systems with many shared methodologies. In general, aquaculture involves retaining a volume of water in which the crop is raised. The main variable is the degree of control—the water can be static or flowing, the medium can be that of the ambient environment or manipulated, the organisms can be fed or rely on natural nutrition. Regardless of the specifics, most water farming takes place in earthen

ponds, concrete raceways, fiberglass (or similar) tanks, on longlines, or in cages. Thus, with a large number of crops and relatively few production methodologies, there are numerous commonalities between crop production systems.

Aquaculture has a few other unique aspects. Fish are efficient feed converters (https://www.aquaculturealliance.org/what-we-do/why-it-matters/). Aquaculture can be good for the environment (https://blog.nature.org/science/2019/01/21/aquaculture-could-be-conservations-secret-weapon/) and even facilitate water and land conservation (https://www.theguardian.com/sustainable-business/2016/may/31/california-drought-fish-farming-water-crops-agriculture-southwest, https://www.pnas.org/content/pnas/115/20/5295.full.pdf , https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.666.4320&rep=rep1&type=pdf, http://www.fao.org/3/AB412E/ab412e07.htm).

Figure 3 : Size in terms of value of harvest ($ 000,000) and number of farms for the three Pacific states versus the national program



Source: USDA 2018 Census of Aquaculture (2019)

Figure above indicates the magnitude of the Pacific Regional programs by state vis-à-vis the national program with regard to the number of farms and the total value of the harvest. In the aggregated, the three Pacific states contribute 22% of the value of the national harvest and only nine percent of the total number of aqua farms across the country—two-thirds of the farms in the three-state area devoted to the long-time crops of oysters and trout.

Distilling the trends:

- Worldwide, aquaculture is a high-growth sub-sector with potentially positive economic, ecological, and health impacts;
- However, US production and consumption are low and there is a trade deficit due to a significant reliance on imports;

- The Pacific Region, with many markets and probable comparative advantages, appears to be under-investing in aqua farming—a much more diversified and integrated program appropriate for many areas;
- With increased aquaculture investment, as hopefully the pandemic lessens, there are opportunities to resuscitate supply channels, possibly with more varied products, while increasing per capita consumption and reducing the trade deficit; and
- To optimize the impact of the sub-sector, there is a need for coordination, education, and adjusting existing technologies and methodologies for the Pacific Region.

In light of the above, there is a need to plan/develop a structure that will:

- Filter and fine-tune existing data to determine the aquaculture systems best suited for the Pacific States Region while underscoring holes or inconsistencies in the data that need to be tempered to Northwest conditions;
- Using these data and others, educate stakeholders about aquaculture issues and investments with a focus on small- and medium-scale farmers who do not have access to more costly information sources;
- To introduce, test, and inform about a wider diversity of farmed products and aqua-farm-based cuisine;
- To provide an incubator for aquaculture start-ups as well as a suitable site for the co-location of key aquaculture input suppliers;
- To serve as a portal linking public services and agencies with private operators;
- To serve as an outreach hub;
- To provide shared premises for stakeholders and researchers to ensure appropriate applied research and development are being undertaken in line with operators' needs and resources;
- To link to both input and product markets—domestic and international/export;
- To link with other centers and related institutions including the National Aquaculture Association and other national groups; and
- To cover a suitably large geographic area that regroups an adequate number of stakeholders where the costs are offset by the benefits.

Indicative List of Innovation Centers

- https://www.maineaquaculture.org
- https://dmc.umaine.edu/aquaculture-business-incubator/
- https://aic.rutgers.edu
- https://www.tp.edu.sg/research-and-industry/centres-of-excellence/aquaculture-innovation-centre-aic.html
- https://www.cargill.com/animal-nutrition/aquaculture/aquaculture-innovation
- https://www.sustainableaquaculture.com
- https://aquatechcenter.com
- https://www.salmoneye.no/?gclid=CjwKCAjwzMeFBhBwEiwAzwS8zPETmZ_wGj5WZjD5LN3WIxHIN0uh57wqd9JBZLbkvbyw7_719SAEpxoCRicQAvD_BwE

The centers listed above are typically linked to tertiary education institutions or are private enterprises. While these institutional settings provide some benefits, our view is that **public-**

private partnerships driven by producer associations will provide the most dynamic institutional structure.

PAMIC is unique because:

- It involves three states;
- It focuses on transplanting existing knowledge and technologies to the Region through an adaptation and localization of available data and methodologies;
- It champions small- and medium-size operators, providing a link between the farm and the market accompanied by a reliable source of science-based and localized information; and,
- It focuses on the market, planning to cover the whole value chain from seed to table including methods of preparation.

N.B.: FAO, The World Fish Center and others have worked to establish regional aquaculture networks—sometimes only on-line and sometimes only "information" networks; but other times more substantive. These have met with varying degrees of success but there could be some models since our federal structure makes states like countries in this context….
https://enaca.org/?id=42&title=participating-research-centres
https://thefishsite.com/articles/network-of-aquaculture-in-americas-begins-to-spread
http://www.raisaquaculture.net
https://www.sarnissa.stir.ac.uk/?page_id=4
https://www.unescap.org/sites/default/files/Session%20A%20NACA%20Strengthening%20networking%20to%20promote%20sustainable%20aquaculture%20in%20Asia-Pacific.pdf
https://www.innovationnewsnetwork.com/aquaculture/

In view of the above scenario, it can be concluded that private investors and other stakeholders would pragmatically benefit from a regional marketing and innovation center as a practical way to address many of their currently **unmet needs**. These would include but are not limited to the following:

1. Easy access to easily understandable and *relevant general aquaculture-related information*—at present, interested parties have few if any way to filter information that is specifically applicable to the Pacific region—the center would provide this localized information;
2. Aquaculture is, for many, a learning curve—if the best available information indicates aquaculture could be a good fit for an individual farmer, there is then a need for *pre-investment guidance* that will orientate the potential investor as to what are the physical and financial requirements for entering into the industry—the center will provide this guidance;
3. Most would-be operators have a difficult time maneuvering through the *regulatory environment*—the center would facilitate and understanding of the relevant regulations and indicate top potential operators the best pathways to address the necessary approvals and licensing;

4. In parallel, aqua farming activities can and often do have requirements for routine *monitoring* of various aspects of the operations from food safety to water quality—the center would assist stakeholders in understanding the monitoring requirements;
5. Aqua farming operations are market-driven, yet investors are often challenged by accessing *market analyses* that are essential for directing their businesses—the center would undertake and maintain regular market data sets that will be accessible to new as well as established operators and any others along the value chain;
6. Market analyses address items for which there is currently a measurable demand—with the wide variety of potential aquatic crops, there are a number of possible food items that have not yet made it to store shelves or consumers' plates—the center would work with partners to assess and promote *new aquatic food stuff*s;
7. Individual operators, especially small- and medium-scale operators have difficulties *"pulling-down" services* with the result that they often pay excessively high prices for production inputs such as feed and seed—the center would link operators with reliable and lower-costs input providers where economies of scale can be used to reduce operating costs;
8. Operators are also challenged in finding the right technical advice and technical tools and/or equipment—the center would assist in maintaining verified lists of *consultants, equipment suppliers,* and others necessary to support the small- and medium-size operation;
9. Individually, operators will lack a critical mass to be able to have a *public voice* in evolving policies and practices that affect aqua farming—in collaboration with participating producer associations, the center would serve as an efficient lobbying tool for the regional industry;
10. Operators are at a disadvantage with regards to aqua farming as the general level of *public education* on this discipline is modest at best—the center would improve aquaculture public education in both formal and informal venues;
11. *Public services* (e.g., extension, animal health, consumer protection, etc.) can provide uneven support to disparate operators—the center will provide a hub for such services where beneficiaries can assemble for cost-effective public support;
12. *Enhanced resource use*—natural and/or infrastructural resources may be available for aquaculture use but potential investors are unaware of these opportunities—the center would maintain current inventories of such opportunities;
13. Aquaculture can require significant investments in *energy*, yet the region possess a variety of alternative energy sources including unique resources such as geothermal energy—the center will keep in close contact with the wide spectrum of energy-related agencies and institutions such that aqua investors will be able to avail themselves of the best possible choices in designing their farms;
14. As the regional aquaculture program expands, there will be an expanding need for *skilled labor*—the center will link closely to secondary and tertiary educational institutions as well as offer specific educational opportunities in-house to assist in both the formal education of aquaculture professionals as well as the fine-tuning of practical skills by current agricultural and food processing/servicing workers; and,
15. *Research and development* is best when farmer-orientated—to date, given the disaggregation of the aquaculture production subsector, there have not been strong linkages between a wide variety of private operations along the entire value chain and the

design of research and development programs—the center would serve as an intermediary between researchers and extensions and operators to help ensure that research and outreach activities address the priorities as seen by those active in the aquaculture value chain.

Oregon and Pacific Northwest Aquaculture Development Conference*

Productive Neighborhood

Aquaculture is growing across the West. However, Oregon's program lags behind; the value of Washington's program is nearly twenty times larger with California and Idaho seven and four times larger, respectively.

Positive Footprint

In spite of its current small contribution to the state's economy, DEQ concluded that land-based fish farming systems have comparatively small footprints compared to other farming systems producing animal protein.

Large Menu

National and global trends are for diversified aquaculture programs that offer a variety of products suitable to different environments and markets. The world menu includes more than 600 choices

Investing in the future

OREGON AQUACULTURE ASSOCIATION

Oregon State University

Aquaculture is not new to Oregon. It has been around for generations. However, most of the state's relatively limited aquaculture investments to date have focused on shellfish, principally oysters, and salmonids. According to recent USDA data, by value, 87% of the Oregon aquaculture private sector harvest is shellfish. Of the remaining 13% of the harvest attributed to finfish, 98% reportedly comes from trout. Trout and oysters have been the staples of Oregon aquaculture for decades — this not considering the large network of public sector salmonid hatcheries and nurseries across the state.

Addressing the needs of Today

As we all know, the world's population is growing rapidly. There is increasingly frequent competition for resources and growing food insecurity — even in more affluent parts of the globe. The World Bank predicts aquaculture will assume a greater and greater role worldwide in attracting investment and producing much needed food — contributing an estimated 60% of global seafood supply by 2030.

The Aquaculture Development Conference

There is an immediate need for Oregon to take the necessary strategic steps to establish a conducive and productive environment for investing in aquaculture. The state possesses a unique mix of natural, human, market, and technological resources that offer real investment opportunities. The aim of the **Conference** is to highlight these opportunities while making a realistic assessment of how success can be achieved and what pitfalls often lead to failure. Aquaculture is hard work and the value chain complex, but these can lead to many profitable businesses.

➢➢➢ *(*) Chemeketa Community College, Salem OR: October 3-6, 2022*

https://www.eventbrite.com/e/oregon-and-pacific-northwest-aquaculture-development-conference-tickets-345703457347

RECIRCULATING AQUACULTURE TECHNOLOGY

Presented by: Dr. Thomas Losordo
Dates: October 3, 1-5 PM & 4, 8 AM to 12 noon, 2022
Venue:

Chemeketa Community College

4000 Lancaster Dr NE, Salem, OR 97305.

Registration: Registration is free and is limited to the first 35 registrations.
SHOW REGISTRATION LINK HERE

About the Workshop:

Recirculating aquaculture technologies (systems that recondition and reuse water) continue to attract attention and are the subject of considerable capital investment worldwide. This workshop is designed for a broad audience and seeks to provide participants with non-biased, research-based information about the design and management of recirculating aquaculture fish production systems. The information presented comes either from the first-hand research results, findings from the global research community, or the experiences of the presenter with commercial scale producers. Workshop registration includes a technical workbook containing the prints of the slide presentations (electronic PDF copies of the presentations are not available for distribution).

About the Presenter: Dr. Tom Losordo retired in 2017 as Principal Scientist & Chief Engineer for Pentair Aquatic Eco-Systems, a global provider of water technology. Dr. Losordo is an Emeritus Professor in the Department of Biological & Agricultural Engineering at North Carolina State University in the United States. Dr. Losordo has a bachelor's degree in biology and an M.S. and Ph.D. in Biological and Agricultural Engineering. Involved in aquaculture for more than 45 years, at NC State University, Dr. Losordo lead a program of applied research and public service in the area of recirculating aquaculture production systems and the treatment of freshwater and marine aquaculture effluents. Known as the North Carolina Fish Barn program, the program developed evaluated and demonstrated new technology for intensive fish farming at the commercial scale. While focusing on tilapia, hybrid striped bass, and sturgeon, the Fish Barn program also investigated the production of rainbow trout, yellow perch, southern flounder, ornamental fish, and koi carp in recirculating aquaculture systems. Dr. Losordo has provided workshops, lectures, and design services worldwide in recirculating and water re-use technologies since 1990.

AGENDA

PRE-CONFERENCE SHORT COURSE: Basics of Recirculating Aquaculture Systems (RAS)

Monday Oct. 3rd, 1:00 PM – 5 PM
Lecture Topics
Critical Considerations in RAS
Tank Hydraulics and Settleable Solids Removal
Suspended Solids Removal Technologies
Nitrification Processes and Biofilter Components

Tuesday Oct. 4th, 8:00 AM – 12:00 Noon
Lecture Topics
Aeration and Oxygenation Processes in RAS
Fine and Dissolved Solids Removal
Advancements in Solid Waste Capture and Treatment
Management and Operation of RAS Systems
Considerations in RAS Design

Forum on Strategic Tribal Aquaculture & Food Security

Co-Hosted by the Confederated Tribes of Siletz Indians

Across the US, aquaculture, the husbandry of aquatic plants and animals, has been adopted and adapted by a variety of Tribal Communities for a variety of reasons (https://www.fishfarmingexpert.com/article/native-american-tribes-moving-on-aquaculture/). Aquaculture plays a critical role in maintaining populations for sports and commercial fishers. Aquaculture can be a keystone in restoration programs. And, notably, aquaculture can make productive use of available Tribal resources to produce high-quality foods for the marketplace and for community tables—contributing to Tribal food security and economic development. Several Oregon Tribes have expressed interest in investing in one or another form of aquaculture. However, there is not a concerted nor coordinated program to promote and support Tribal aqua farming—this although there are numerous economies of scale that would benefit individual communities if they worked and collaborated in concert and in partnership with the wider seafood and natural resource value chains. The aim of the *Forum on Strategic Tribal Aquaculture & Food Security* is to lay the groundwork for an integrated and synergistic program facilitating aqua farming among Tribal Communities.

TUESDAY, OCTOBER 4TH, 2022, FROM 09:30-11:00 AM AT THE CHEMEKETA SALEM CAMPUS (4000 LANCASTER DR NE) OR JOIN ON-LINE

More information: kellen@oregonaquaculture.org

Part of the

OREGON AND PACIFIC NORTHWEST AQUACULTURE DEVELOPMENT CONFERENCE

"Investing in the Future of Seafood"

https://www.eventbrite.com/e/oregon-and-pacific-northwest-aquaculture-development-conference-tickets-345703457347

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Forum on Strategic Tribal Aquaculture & Food Security

09:30-11:00 AM October 4, 2022
Chemeketa Salem Campus

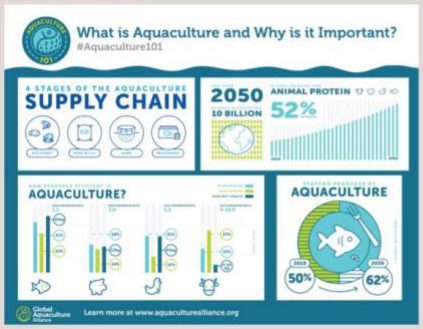
Co-Hosted by the Confederated Tribes of Siletz Indians

Tentative Agenda

- Introduction of the participants and the process (5 min)
- A developmental approach—the illustration of the Confederated Tribes of Siletz Indians (10 min)
- Support and coordinating mechanisms (10 min)
- An investment in communities (10 min)
- Coffee Break (10 min)
- Milestones on the way forward (5 min)
- Discussion (25 min/*2 min per intervention SVP*)
- Conclusions and recommendations (15 min)

Oregon and Pacific Northwest Aquaculture Development Conference
"Investing in the Future of Seafood"

Forum on Strategic Tribal Aquaculture & Food Security



Aquaculture is a relatively new & fast-growing innovation that can benefit Tribal Communities

With a variety of partners, the **Confederated Tribes of Siletz Indians** are planning a three-pronged aquaculture project that includes:

* a modernized *hatchery*
* an integrated fish & vegetable *farm*
* a community outreach & knowledge *center*

Benefits from aquaculture are diverse:

Employment & food production

Nutrition & health

Learning & skills development

Aquaculture actions are also diverse:

They generally fall into three baskets with several common denominators

(1) *Restoration*

(2) *Stocking*

(3) *Farm-to-plate*

Addressing common challenges with interlinked strategies benefits communities—delivering economic development and improved food security

Our aim is community-based action increasing impacts of sustainable aquaculture—elaborating synergistic programs optimizing profits from state-of-the-art aqua farming

We look forward to your inputs…..

Annex H. Session Highlights and Summaries *(digital version only)*

The following are notes taken during the various conference panel sessions by various members of the conference planning team. These are unedited notes taken by the recording team:

Forum on Tribal Aquaculture:
Attendance: Dan Tonnes (NOAA), Carole Engle, Stan van de Wetering, Nicole Fernandes, (NOAA Office of Aquaculture Acting Deputy Director), Angee Doerr (OSG), Amy Ehrhart (OSG), Paul (work w/Yakima tribes), Gway Kirchner (TNC), Colby Gonzalez - Cowl Creek Tribe - Fish biologist, Paul Zajicek (NAA), Jon Bonkoski (Ecotrust), John Moehl (OAA), Gil Sylvia (OSU, Zoom), Megan Considine (TNC; Zoom), Doug Hatch (Columbia River Intertribal fish commission; Zoom), Paul (Ghana), Tom Macdonald (Desert Springs Trout Farm)

Notes
Presentation by Stan on tribal aquaculture opportunities

- OAA approached tribe about Oregon Explorer project
    - Case study using these new tools w/the Tribe
    - Aquaculture is fast growing sector - come up with a product
    - Three goals of project
        - Modernizing old ODFW hatchery that had been abandoned - incubate and hatch eggs and produce juveniles
        - Integrated fish and vegetable farm
            - Bought 30 acres and planning/building right now
            - Currently do not have a fish product to provide for tribal members consistently
            - Charter school

Benefits from aquaculture

- Economic, educational, social
- Employment and food production
- Nutrition and health
    - Tribal members experience issues w/nutrition and related diseases like diabetes

Learning and skills development
Biology, math, ecology, engineering at a minimum

- Aquaculture actions are diverse - generally fall into 3 baskets
    - Restoration
    - Stocking
    - Farm-to-plate

Idea is for the tribe to support all three of these with the same system - one aquaculture system could meet all of these needs
Critical to develop a comprehensive strategy with all communities involved
Tribe is just beginning this work and it's moving along slowly - but there is momentum
Difference between Columbia River tribes (who have treaties) and other tribes who don't have recognized treaty rights (some of the coastal tribes)
Questions

- Why is there not much seafood included in the USDA tribal program for school lunch?
    - Probably based on national priorities
    - Up to the clients to say what types of foods they want - need to express to the program lead
    - Needs to be the right quantity - not able to inventory food
    - NY School system sells a beet product and they express the need, and get the product directly to the school system
- Tribes in the U.S. represent a smaller group
    - Does NAA have a relationship with the Seafood Nutrition Partnership/Marketing seafood to children/ Opportunities to partner with them?

Dan Tonnes - Presentation on Federal Tribal Relationships

- WA has about 20 tribes

- Change in the past few decades
    - Previous racism towards tribes, but being reduced
    - Diversified their economic gains
        - Shellfish aquaculture in the sound
- Commercial and restorative (Olympia oysters)
- Casinos
- Focus on working waterfronts
- Interest in seaweed
- Conflicts w/tribal fisheries, so non-tribal folks have to work with them to get their support - less of a hurdle for tribal members

NIMBY mentality for new development in coastal areas from non-tribal members, but tribes have reservations with waterfronts (sometimes 5-6 miles) and this is less of a concern (less NIMBY from tribal members and they don't care about attitude from non-tribal folks)

A lot of opportunities, but they need more support and funding

- Federal funding just for tribes for fisheries, but not for aquaculture - they have to compete w/everyone
- Funding sources on the NOAA page
- Continue to communicate to the federal government that they need a funding source just for tribes
- Could diversify the industry (new species that are shipped from overseas) and provide economic/food security benefits for the tribes
- Starry flounder in closed systems

Social Benefits

- Social license is really important and aquaculture is heavily refuted
- NAA made a myths and facts document and it helps to have real conversations with people about their concerns
- Foundation w/funding available for aquaculture education that the tribes could take advantage of
- Critics that are willing to learn become believers - education should be focused on the next generation
- Labor is a huge issue
- Maine - occupational standards to develop programs to meet actual workforce needs
    - Tribal people have been hearing for decades that the fish produced in aquaculture look and taste bad, and they have great fish right from the river - why would they do aquaculture? - Need to address these perceptions.

Discussion

- What do the tribal leaders want? What are the priorities? Is this important to them? Why aren't they here?
    - Often the process doesn't start at the leadership level - it can start at the grassroots level to garner interest to take up to the leadership level. This is just a starting point and conversation, and we're trying to move things forward.
    - Important to identify common issues among multiple communities and bring them together and look for public support
    - WA Sea Grant has indigineous aquaculture working group - encouraged to email Melissa Poe to get more information
    - In WA, tribes are more integrated with the industry and outside groups, not necessarily among each other
    - National Sea Grant has funding opportunities for tribes to apply for and partner with Oregon Sea Grant, or OSG can apply for funding to lead something
    - If there is interest from multiple Oregon tribal communities, get a critical mass of people to work together on a program
- How do we move forward after this meeting to work on this? How can we look at our existing resources and use them with a wide lens?
    - NOAA set up grant w/Pacific Shellfish Institute - move federal money to a non-federal entity
    - Money from this went to Puget Sound Restoration Fund to help tribes who are interested in seaweed farming and co-culture - pays for technical expertise through staff time.
    - If there's interest in Oregon, what is a similar model?
    - Could go to a non-profit organization - OAA
    - SBIR - Small Business Innovation Research Program - NOAA has one
    - Trying to form a working group w/non-treaty recognized tribes with Oregon Aquaculture Association and industry (Stan)
    - Try to get some grant money to start some production partnerships with current businesses (like Desert Springs) to get things rolling. Get outreach going and develop the market.
    - Important to show that we are doing something
    - There will be a distinct difference between the treaty-tribes and non-treaty tribes and they will have different priorities

- Non-treaty tribes don't have good relationships with ODFW right now and they might be more responsive
- Don't depend on state agencies to get in touch with any of them - instead contact the program managers for the tribes
- Focus should be on getting funding from federal government
- Need to make sure some of the leadership/influencers are at the table (Carole)
- Needs assessment - what each tribe is doing, what they are interested in, how they want to move forward (Angee)

- Goal: Work with OAA to develop a network, and then look for priorities/commonalities with different communities (John)
- Tribes are more likely to develop partnerships with private industry than with public agencies
- Building trust among tribes and organizations - working at the speed of trust (this should be the focus)
- Nature Conservancy in WA - hired a tribal consultant from a tribe that knew the leadership, and they could get that communication going
- The Whitener Group
- Big gap w/aquaculture products - people need to eat more fish produced on farms so they can see that the product is good
- Needs to be affordable - coastal communities can't afford fish right at the boat
- Tribal council - typically have other jobs and very limited time; even staff barely get time to to interact with them; influx of NGOs and other wanting to engage with the tribes, and they can't keep up with it
- Almost zero chance that they will attend a meeting like this - it will take time and engagement on other levels
- Last thoughts
- We will be putting together a report on this event
- Organize a follow up meeting with this group
- Lead to a series of activities, including conference in 2024

Notes from Gil Sylvia on Tribal Roundtable:
John gave introduction. Participants introduced themselves. Stan gave presentation of Siletz project and tribal interests to kick off meeting.
Question on the school lunch program and whether west coast aquaculture is part:
Paul explained there are aquaculture companies selling into the program but there are very specific requirements including large volumes and standardized approaches – conversation on whether this would be an opportunity for West coast tribes. There is also a Seafood Nutrition Partnership program supported by the feds that may be an opportunity
Dan Tonnes noted that Washington state has 20 tribes and many are "waterfront" tribes – he noted that relationships with tribes have improved—tribes are better off economically and have diversified economically and desire a working waterfront including especially shellfish activities as well as restoration. They have an interest in seaweed aquaculture as well. Tribes are well positioned for the sector compared to non-tribal sectors because they have legal rights – seaweed by non-tribes need consent of tribes --- not always easy. Cook
Aquaculture and the Jamestown Tribe are working together (net pens for steelhead and black cod). Tribes have an easier regulatory pathway, and have reservation with up to 5-6 miles of waterfront. The sector needs more support – need federal support and funding for tribal aquaculture—tribes have funding available including under ESA—but no priority for aquaculture for tribes –they have to compete with non tribes for funds—funding sources available on NOAA-NWFSC pages. **Would be great for tribes to communicate to D.C. a specialized stream of funds.**
There is not enough funding to support tribal projects – e.g. Starry Flounder project – Starry flounder flown to Seattle from Asia—can we raise them in PNW. Tribes want to get into this in Puget Sound but need funding.
Tom McDonald discussed his work with tribes and opportunities for disease free production – also mentioned challenges with ODF&W. Clean secure water is critical.
Paul Z.—discussed the social license problem and the critical importance to educate— **tribes have a huge advantage to talk to the public and address misunderstandings.** Education is critical given misunderstandings [about aquaculture]. He noted that the Kurt Grinnell scholarships are around but there is not a good applicant pool. There are aquaculture critics but once people learn [more about aquaculture] they become supporters—including students—they can be key drivers [of growth]. Tribes move slowly…but the education part is tough. Maine has occupational standards – these standards are needed to get jobs. [Tribes] need to support students and keep them on the reservation with good education and skills.
Carole – difficult to do development—Arkansas loves its fish farmers (unlike Oregon). Need to focus on communities – bottom line must determine what tribes really want – disappointed that tribal leaders weren't present at roundtable. Need to find out who the influencers are… What do tribal leaders really want .. Shame they aren't here—how do tribal leaders view aquaculture?
John—Ideas need unpacking to move forward. Look at common denominators between three baskets of production…land water, environmental issues…look for common denominators.
Dan Tonnes…WA aquaculture has an organized group to work with tribes…email Elissa Poe for Indigenous Aquaculture Hub -- contact them. Tribes in Puget Sound work with other tribes and other organizations for restoration. WA Sea Grant was funded by a Sea Grant HUB – another direction to move forward.

[NOAA] NMFS set up grant with Pacific Shellfish Institute—moved NOAA money to set up tribal aquaculture specific to seaweed and there is staff time to support projects to provide technical support. If interest in Oregon—are their tracks to pursue—not a ton of money about $100K per year.
Small Business Innovation Research (SBIR) opportunities with different agencies
NAA has a variety of information to help advance aquaculture – [we] don't need to start from scratch.
Stan would like to set up working group with other tribes to advance aquaculture – Siletz like to work with other tribes rather than a federal agency initially. Bring tribes into OAA and let OAA lead and collaborate.
Angee Doerr indicated she is willing to help.
Tom McDonald willing to help set up smokers etc and partner with tribes.
Stan: Cow Creek, Lower Grand Ronde, Siletz, etc. would have common interests
Carole: Need to step back and do a scoping effort with the tribes – the influencers.
Tom McDonald: A different approach -- work with a single tribe and get a success and word will spread. Stan supports that. Influencers is a longer pathway—Carole responded that meeting needs of leaders is the best approach. Angee would like to determine their needs as well. John suggests a dual approach to reach tribal communities and work with individual tribes on early projects.
Ecotrust: Work at "speed of trust" – Trust is key. TNC in WA hired a tribal consulting firm that knew the elders—could get phone calls returned—could meet with tribal members. Ecotrust works with "catalysts" to work with tribes. Jon believes that model could be replicated here in Oregon. Could include trout from Tom's farm. Need to grow and taste farmed seafood and change attitudes. Alaskan consultant that works with tribes called the Whitner (sp?) Group.
Key issue: determine strategy to successfully work with tribes – a challenging issue – complex—need a good fit and trust.
Key Issue: Work on individual tribal projects and collective projects at the same time. Opening Remarks:
Opening Remarks:

Gil's Notes Tues, Oct 4 1:00-1:30 Opening Remarks

Randy OAA: Introduced OAA and its history. Aquaculture is an unexplored territory, need to know the challenges, regulatory issues, and must deliver product—tough challenge--"raising cows underwater". Need practical skills.
Karina SG: Important goals of SG is to support aquaculture and be a trusted source of information. Hope to be a model for other states. Fastest growing animal protein industry in the world. Healthy and efficient food production. SG supports development including extension. Listed six aquaculture projects SG is supporting.

The Case for U.S. Aquaculture

- U.S. imports a lot of aquaculture products from countries with less strict regulations - our costs are higher because of regulations to protect env.
- Addressing social license issues head on by making connections with the public in opposition - many don't realize the regulations involved in keeping the environment intact (gave a good example of talking to a protester about permits from the EPA for discharge permits)
- At least 20 federal acts that govern aquaculture
    - 50 years celebration of the Clean Water Act this year
- "EPA doesn't know aquaculture" - wouldn't work to have a federal agency for every commercial industry -
- 15 federal agencies involved in the process
    - What are the Oregon agencies out there to regulate? Who are the people working there? What do they want for the state?
- Mismatch between how natural resources are regulated (land, water, etc.) and where aquaculture takes place (FL was able to make a case to change the approach for their state)
- Regulatory burden is significantly higher for small farms - Engle
    - $3.31/pound for Salmon - not possible to deal with that cost on small farm
- There is hope
    - 35+ aquaculture associations
    - 3,000+ farms
        - A significant number don't report to the census - don't want to shine light on what they're doing, but #'s are really important for congress (very difficult problem to solve)
    - 33 Sea Grant colleges and universities, but a huge decline in extension agents
        - Online fact sheets aren't adequate - needs extension agents onsite at the farms

Subcommittee on aquaculture

- National Aquaculture Development Plan
    - Economic Development
    - Research
    - Regulatory Efficiency

Opening Remarks:

NAA is science oriented.
[We] must move the needle for aquaculture
76% more meat protein needed in coming years
Reviewed global trends in aquaculture
Emphasized trade deficit of $17B dollars
Target to move from 19 pounds per capita to 26 pounds
Americans don't spend much on food – complacent population—need to work on message of human health—importing more and more cheap seafood a problem
Concerned about env impact from imported seafoods—no standards for imported product
Challenges—social license and regulations
Social license – lots of misunderstandings – need education – farmers must embrace the role for education
Regulation—embrace working with regulators
Emphasis on understanding commerce clause which is supported by FDA, Clean Air and Water Act
Significant federal regulation (20 major acts), and states can have own regulations on top federal level.
Federal Regulatory Agencies (15 so far)
Oregon—has accepted delegation of Clean Water Act and usually have stricter regulations than feds
Additional Complexity: land, water, species, human health, animal health – agencies become siloed and duplication and lack of communication
Florida has one stop shop for aquaculture permit but there are tradeoffs
Complexity of ecoregions and hydrologic units
1600 species and varieties in U.S. including plants – huge array of possibilities for producers—60% of aquaculture facilities make less than $100K – they find niche markets and pay higher costs. This 60% produces only 24% of value
Human Health: Food Safety Modernization Act – more regulations – but not much progress
Federal Food Drug and Cosmetic Act—FDA sets regulations for therapeutants—tough challenge given small size of industry
Lacey Act-USF&WS-need health certificate but what are the risks—recommendation is to manage for real risks.
Given high regulatory costs how to help small farmers without forcing them to fly under the radar 35 plus national, state, and regional associations
Aquaculture Statistics underreported by 50% or more due to staying under the radar Decreasing number of extension agents- a major problem Congress working on new National Aquaculture Development Plan (last plan 1983)
National Economic Dev Plan
National Strategic Plan for Aquaculture Research
Strategic Plan to Enhance Regulatory Efficiency in Aquaculture

Investing in Aquaculture

- Oregon is #16 nationally in sales [of aquaculture products]
    - Oregon's sales doubled on census since 2013 - mostly shellfish
- #20 nationally in terms of number of farms
- What will it take to grow aquaculture in Oregon?
- Financial, research, extension, education, human resources, public policy/regulation, aquaculture literacy
- AgPlan - free business planning tools, helpful and easy to use for business planning
- Doesn't help new businesses plan for the startup phase, which is longer for aquaculture than other industries (building facilities, get crop going, move up the learning curve, develop markets)
- Common mistakes in startup planning
- Overly optimistic estimates of sales revenue
- Using existing infrastructure and expecting it to transfer
- 85% of U.S. aquaculture farms are classified as small businesses
    - Myth that aquaculture in the U.S. consists of factory farms - not true
- Catfish is Life videos
- Need more production research - optimal stocking rate, fish size, etc.

Extension

- Two-way communication cannel
- Farm problems to researchers
- Researchers to farmers
- Not enough to just share the results - may not apply universally to their farm
- Get science-based information to farmers, policy-makers, and agency staff
- Informal Education
- Oyster gardening programs
- Citizen science oyster restoration

Aquaculture is not for everyone

- Fish need care around the clock 24 hours a day, 7 days a week

- If you're trying to get rich, you probably won't be successful

Workforce development

- Programs must be driven by farmers - ones that work have this model

Regulations

- 8.5-22% of total operating costs attributable to regulatory costs and are mainly related to environmental permits
- Paths forward examples:
- Reduce frequency of testing effluents where farms have long-term data showing compliance
- Risk-based approach
- Many suggestions to streamline the process without sacrificing the environment

Aquaculture literacy

- General public is very poorly informed about aquaculture which leads to a lot of misinformation/opposition
  - U.S. aquaculture is on the Seafood Watch Best Choices and none are on the avoid list - because farms will be shut down if they don't meet regulatory requirements
  - **By opposing U.S. aquaculture, groups/public must take some responsibility for pollution in other countries from imported seafood that isn't farmed w/regulations**

Look at what the state of Maine has done - Maine Aquaculture Association - Focus Maine

- Developed a brand with environmental quality wrapped in (Maine is known for having clean and beautiful environments)

Gil Sylvia Notes: Investing in Aquaculture

- Oregon sales 2018—$23.7M
- In top half of states but no substantial growth
- There is aquaculture in Oregon
- Diverse ecosystems in state
- OR Farmers raise a variety of crops—have great farm expertise
- What will it take to grow industry – presentation topics:
  - Financial
  - Research
  - Extension
  - Education
  - Human resources
  - Public Policy/regulation—need to streamline
  - Aquaculture literacy

- Financial: Build facilities, operate farm, process product, distribute products,
- Business Planning—very critical—"ag-plan" free https://agplan.umn.edu
  - Lots of details and sub categories
  - Weakness it doesn't build in start-up phase -- aquaculture has a long start-up phase—build facilities, get crop going, move up the learning curve
  - Develop markets
  - Startup mistakes: Overly optimistic estimate of sales revenue, under-estimation of costs, Insufficient capital, underestimating water requirements, assuming exiting facilities can be used as is.
- Research: Investment critical given small size of farms—most are family operations multiple generations, and 85% are classified as small businesses, there is inadequate investment in production research and a variety of other disciplines
- Extension: Two-way communication—not outreach (one way); and need Farm R&D – communicate with researchers Need Farm R&D, Verification of research needed on the farm, diagnostics, marketing, business planning, need science based info
  - Need investment in formal education for future researchers, extensions, etc. Also need –restorative aquaculture citizen science
- Fish farming 24 hour job (like dairy) – only do it if you love it.
- Lots of decisions farmers must make…management, markets, etc. Need a good manager. But also need entrepreneurs – need both and of course need workforce—labor scarce, more automation developing, workforce development must be driven by farmers
- Lonoke Business Academy, Arkansas does a great job at training workers—run by farmers

- Policy and Regulation Investment: 8.5% to 22% of total operating costs are regulation. - - - Proportional costs decrease for larger farms per pound. Most costs related to protecting environment.

- Solutions—reduce frequency of testing, use risk-based testing to reduce costs. Sequential permitting and permitting delays in WA—Severe delays—we need to get smarter—need streamlining – simultaneous -- not sequential. Researchers need thorough review of reg trends and anticipate—get ahead of the curve.

- Aquaculture Literacy: Public poorly informed. Myths --Aquaculture use up all the water. Intensive ponds least amount of water per kg ; another myth is aquaculture is not sustainable –opposite is true given all our regulation; imported product is polluting environment – U.S. increases pollution by importing; RAS more sustainable than other systems – not true. Sustainability does not require profitability – wrong.

- What will it take in Oregon to be sustainable:

- Look at Maine—Maine Aquaculture Association—wrapped environmental quality into its brand (Oregon has done that)—sales doubled in ten years

Seafood Markets' Opportunities and Challenges

- Sourcing and Marketing Sustainable Agriculture - Daisy Berg
- "One of the great things about New Seasons is that I could do new things as I moved my way up"
- "What my job entails, basically everything seafood related"
- Came into one location to give the seafood counter some "sparkle"
- Moved up in the company - office manager, etc.
- Now is the Seafood Program Coordinator (something like that)
- "We've chosen only to carry green and yellow eco rated seafood…We really choose the phrase, *vote with your fork,* and they definitely chose that they did not want red rated seafood."
- Wild Salmon is King
- We chose not to carry any farm salmon or shrimp because of the environmental concerns that happen because of these farms. We will only carry wild caught.
- 5 months, 5 kinds.
- "I never saw the need to bring in farm salmon…we don't need farm salmon…It doesn't fit our profile, it doesn't fit our position on sustainability."
- New management of the company wanted Atlantic farm salmon (even though I didn't see the need for it), so I went to the expo to find a farm that could meet our company's desires
- Seafood expo north america 2017
- Atlantic Sapphire had RAS-fed, large farm - "This is the fish we need." - but they could not bring their fish to Portland. Later on, they contacted me because they found a way to make it work.
- Staff education
- Meat and seafood staff education with representatives from Atlantic sapphire in Denmark
- Webinar for all new season market employees
- Social media campaign reaching over 100k followers
- Instagram
- Facebook
- Twitter
- Weekly email reaching over 230k

- Weekly print ad reaching nearly 200k homes: Awesome Aquaculture
- Some changes we have to introduce the consumer to new products that we are excited about.
- Even though aquaculture has been practiced for over a century, only recently has a sustainable farming method for salmon emerged that meets our high standards
    - I expected to have lots of angry customers about the farm salmon, but once the process was explained, most customers were willing to try the salmon
    - One lady was very upset and refuses to eat the salmon, but we have many good discussions about aquaculture to this day
- In-store signage
- Catch the new atlantic sapphire salmon
- The only farmed atlantic salmon rated green "Best Choice" by MBA Seafood Watch
- No antibiotics, no pesticides & no growth hormones
- Sustainability farmed on land with no impact on native species or the environment
- "I didn't want to hide the farm salmon, I wanted to shout that we had it"
- I planned on not purchasing farm salmon during wild salmon season, but the customers wanted the farm salmon year round, so we have kept it at all times now (we still supply wild salmon in season)
- We have since switched to a new company that does not use rass (Ice crush from Iceland)
- Talk about aquaculture to customers and explain that farming is not all bad, and it can be a way to feed a growing population

- Wild is usually more expensive than farm
- Salmon sales have grown now that we offer farm salmon
- Seafood displays
- Suppliers of wild salmon were not upset about the choice to use farm salmon, they were happy with our choice of using a RAS fish
- I don't want cost to the main factor. I want to focus on if the product is a direct fir, and then cost will come later
- Amazon: has cut into our market because of their large discounts and many customers are price savvy.
- COVID really increased their direct consumer sales because people started to realize that they could cook seafood at home. Pre COVID we used sampling for customers often, but since COVID shut that down, we really have been trying to rethink the way we demo our products. I think that educated staff will help sell fish to consumers more than sampling ever will. Our philosophy is that no customer is to leave without something in their hand, even if it ended up being free.
- Because of inflation, our prices are up insanely, so we are selling less pounds, but making more in sales
- We are okay with testing something. We definitely can work with small farmers who can only supply during certain seasons, or a few weeks out of the year.
- "Innovation is key…If there's science behind it, I want to know"
- Small farmers really need people who can communicate their story because they may not have the resources to reach customers. Customers want more storytelling about the farmers and ranchers. "Who's better than the farmer to tell their own story." People want to see the farmer directly at the market, telling their story
- We are partnered with fish flies and seafood watch. The color ratings are based on scientific data, the fisheries are very thoroughly evaluated and given a rating. Green is the most sustainable, and the best you could possibly get. Yellow is considered somewhat sustainable, but there are some issues with the farm. Red is considered not sustainable. This is a pretty standard system, but there are always downfalls.
- Consumers get so confused by all the different sustainability labels, so having them directed to the Seafood watch can make it a little easier for the customers to understand.
- USDA is now trying to create certified verification for aquaculture claims. EX) if a farmer does not use antibiotics, they can find a way to show their process to prove that they do not use antibiotics. After sending this to USDA, USDA will go into the farm and verify this, and then allow the farmer to use their stamp of approval.

We hold training classes virtually every month to train employees. Each program has a farmer talk about their product.

Notes from Gil Sylvia on Seafood Markets and Challenges
New Seasons supporting local food
Only carry green and yellow rated seafood (Monterey Bay) or the equivalent (no red rated)
Wild salmon is king…in early days never saw a need for farmed salmon—sell wild frozen in winter
But as time passed, company leadership wondered why they weren't selling farmed salmon—she was convinced she wouldn't find good farmed product
Found yellow rated farmed salmon – found high quality farmed salmon.
Met Atlantic Sapphire based on RAS – finally found a fish she loved—needed to educate the staff—did webinars with staff—trained up to 4,000 staff – hardest part of project was educating staff
Needed a marketing plan including using social media "Tides are Changing" –only one farming method (RAS) meets our standards. She feared that customers would complain but they didn't once they heard the story. It has been five years. Initial growth was slow. Also brought in product from NZ . Assumed when they moved into wild season they would not doe farm—now moved to an Icelandic salmon—1,200 pounds a week was target, but now 1,700 lbs/week. They need to tell the story. Sales of farmed and wild salmon are now equal – 40% of all seafood sales are salmon.
Question from audience—what about price?—kept price low initially – mark up only 25% instead of 45% -- mark ups about the same. We sell a variety of aquaculture product. Will help to sell product with name of producer.
People who live in Portland not native Oregonians and expect to see farmed products.
Cost doesn't lead the conversation—sustainable attributes lead -- cost is last. Whole Foods is major competitor but sells at lower price point.
Pre-covid robust demo strategies. Post covid has to restart demoing. Educated staff will sell fish better than any other strate-gy—if you trust fishmonger then can sell fish. Send home free piece of farmed salmon. Pre-covid robust demo strategies. Post covid has to restart demoing. Educated staff will sell fish better than any other strate-gy—if you trust fishmonger then can sell fish. Send home free piece of farmed salmon.
New Seasons can do tests—nimble enough to do infrequent supplies and tests of product. Adaptable.
She is open to innovation—can change positions and is willing to consider net-pen fish.
Market wants to hear the story—they want to see the farmer at the farm—tell stories to connect farm to consumers.
They partner with FishWise and Monterey Bay Aquarium (Seafood Watch).
Consumers are confused by all the labels and certifications. Get one good certification.
Question—USDA "verified process" will verify claims (such as no antibiotics).

Tools for Investment: Oregon Aquaculture Explorer Platform:
There was a lot of knowledge gaps about aquaculture.
The aquaculture explorer platform facilitates the site selection and pre-investment process for potential aquaculture ventures in Oregon
Stakeholders
landowners/producers
Potential investors
Tools
Map viewer
Site report
Financial planning tool
Results
Business planning
Education and resources
Informed stakeholders
Permit efficiencies
Oregon Aquaculture Map Viewer/ Oregon Aquaculture Financial Planning Tool - allows farmers and investors to know costs of potential projects.
Start here
Location
Select system
Production
Startup
Transportation
Operating
Financing
Financial summary
Summary - you can download all data found into a PDF to compare different scenarios, or you can download into an Excel spreadsheet and play with the data on your own

- Oregon Explorer
- Intro
- https://oregonexplorer.info/topics/aquaculture?ptopic=62
- Aquaculture in Oregon
- Aquaculture investment tools
- Estuary shellfish mariculture tool
    - Articles and stories
    - Maps and tools
    - Reports and publications - from many databases about anything having to do with aquaculture
    - Data
    - Photos and videos
- Project activities resulted in three complementary sources of funding for aquaculture development
- Pacific Aquaculture Marketing and Innovation Center
- Cooperativeerators
- USDA local food promotion program
- Steward foundation
- California aquaculture association
- Oregon aquaculture association
- Northwest aquaculture alliance
- Supporters
- Oregon state University College of Agricultural Sciences
- Klamath Tribes aquatic resources department
- Pacific seafood
- Business Oregon - oregon innovation council
- Variety of innovation drives success
- You have to be creative, innovation is a very important concept
- Aquaculture component
- To investigate the establishment of a regional aquaculture innovation center
- Key elements: As a planning grant, the implementation study is charting the necessary actions and measures for the center to become reality. Specific activities will include:
- Identify stakeholders and catalog priorities and challenges that can be addressed by the center

- Identifying the physical infrastructure requirements for center functions
- Elaborating business and marketing plans for the launching of the center
- Charting long term financial requirements

- The process
- Interviews with stakeholders
- Review existing innovation centers
- Virtual vs brick and mortar
- Development funding solutions
- Long term operational funding

- Final Product
- Prepare a comprehensive way to:
    - Determine purpose and functionality of a western aquaculture innovation center

- Demand for local seafood on the rise
- Working on making seafood markets a more common occurrence across the west coast

- Where to now?
- Inland marine hatcheries
- Offshore opportunities
- Inland freshwater production
- Seaweed culture
- Recirculating aquaculture systems
- Aquaponics and resource sharing farms
- Water delivery production systems
- Technology and modernization

- What we need
- Input
    - If you are involved in aquaculture, what are your challenges? Grower, supplier, educator, investor
    - If you are looking at aquaculture as a business, what are your needs? Financing, technical assistance
- The team
    - The steward foundation (Ryan Anderson and Luke Knowles)
    - Oregon state university (Gil Sylvia)
    - Oregon Aquaculture Association (John Moehl and Kellen Parrish)
    - Northwest Aquaculture Alliance (Jeanne McKnight)
    - California Aquacultue Association (Tony Vaught)
- Contact information
    - Oregon aquaculture association
    - https://www.oregonaquaculture.org/
    - Northwest aquaculture alliance
    - https://www.nwaquaculturealliance.org/
    - California aquaculture association
    - https://caaquaculture.org/

The Investment Experience:

Panel: Tony Vaught, Missy Bird, Wally Peyrera, Kellen Parrish

Missy:

- Obtaining land is a major barrier to new aquaculture businesses in Oregon
    - Been told aquaculture is too innovative
    - People receiving capital are maintaining the status quo
    - Regenerative and sustainable models are not rewarded
- Average age of farmers in Oregon is 73, and heirs are not interested in taking over the farm
- Veterans need 3 years of experience in farming to qualify for a loan, and there are no opportunities to get this experience in Oregon
- Aquaculture business is not just about making money, is about creating community, providing jobs for marginalized individuals,
- Had to get really creative about getting funding and finding land - sent letters to 200 land owners in the target area and found 1 person to sell them
- Barriers to entry for young people are significant - funding, land, understanding of the science, but not the business side
- Need to give people a realistic idea about what it's like to do aquaculture - outreach/extension

    - Don't need to go to the university to get this experience, but the extension side is important
    - Provide mentorship - and seek mentors if you're trying to get into the business
- Big corporations are coming in and buying small parcels of land, which is taking it away from the smaller businesses

Gil Sylvia Notes on Investment Experience

Tony Vaught:

- Emphasis on the "pathway" of investment and "stories"
- Three things to focus on—financial structure, where was success and failures and why did that happen, entrepreneurial spirit
- Talked about his start on Chico Fish farms raising catfish as manager
- Then started raising sturgeon on another farm and partnering with University—closing the loop starting with wild fish—emphasizing different type of investors and business styles
- Eventually started his own consulting company

Wally Pereyra

Story of investing in a catcher processor vessel—great story of politics, subsidies, and working with a variety of partners, Norwegian subsidies, Korean equity, adapting to rapid change. But saw limits on wild catch, and he suggested to his son to invest in tilapia in Central America. Formed a partnership with Guatemalan family. Israeli company showed it could be a profitable venture and were partners to get funding. Wally provided the original financing due to lack of $$ from the bank and family. A long journey – started with raceways and then went into net pens in the lake – need ingenuity on the financing side. Developing a financial plan -- must meet special Guatemalan (sp?) labor laws. Financial plan gets extensive – must plan ahead, revenue takes time to accumulate and get a ROI. Back up generators failed in storm and fish died. Example of unintended disasters and risks.

Missy -- Melissa Byrd

Three years of planning developed first plan in 2020. Spent many years and hours developing plans with experts but can't find land. Small businesses need capital – crowd funding $200K. Spoke to 37 different banks and credit unions and federal agencies. Considered too ambitious and risky compared to traditional farming. Believes that we need a new way to farm to regenerate the land. Can't get a veteran's loan because don't have 3 years experience. We checked every box state wants but no access to funding. She is aggressive—500 letters to landowners – one landowner-- 5 versions of the contract – beautiful property but no funds.

Kellen Parish:

Tilapia farming in Guatemala as Peace Corps volunteer. Cold call to U.S. sturgeon farmer after graduate school and Guatemala fellowships (cold calls to start employment critical). Then got job in international aquaculture extension – different countries but similar problems. Market development is critical. Working with NOAA and OAA but doing volunteer consulting with young entrepreneurs—start-up costs for his "generation" very difficult.

Q&A

Panel indicated small R&D for start-up a challenge. Investors don't understand the time for return. Oregon RAIN not set up to help. Need land for investment (AquaSpark wouldn't support without the land first). PNEL Panel cited importance of markets and working with good niche marketers. Wally said need a good financial analysis and ROI that works. Investors need to understand ROI's are lower than other industries.

Investment and Finance

Panelists

- Carole Engle
- Alexis Nelson - Head of finance at Gybe (Water Quality Management Company - Venture backed and NASA/DOE backed) - Also a Venture Partner w/Oregon Venture fund and Portland State Impact Venture fund; Founding team members of aquaculture explorer program w/Gil, helped secure funding and work on investment models
    - On investing and receiving end of venture capital
- Joe Bratt - Senior Vice President for Western WA region Farm Credit Services
- Ryan Anderson - President of Steward Lending LLC

What types of financing and credit do you offer?

- Ryan
    - Two grant programs for the benefit of local producers - applicable to aquaculture
    - Local food promotion and value added product grant programs

Joe

- Very similar to a traditional bank on the lending side
- In house appraiser group for specialized equipment related to aquaculture
- In WA, take tidelands as collateral
- Long and short term options

Alexis

- Variety of Venture Capital
- Traditional - Oregon Venture Fund - expecting equity in your company and high returns
- Impact Venture Fund - still looking for returns, but on a smaller scale; not a donation/grant, but there is a larger range of returns
- Should see the VC as a partner

What is the view of your agency on aquaculture, generally, and then more specifically species, scale, etc. that would be more feasible in Oregon?

- Ryan
- Potential of projects to be regenerative is really important - sustain and rebuild the environmental quality
- Would rely on other experts in aquaculture for technical expertise
- Joe
- View of aquaculture has changed over time w/so many oyster farms in WA
- Also have smaller scale clam and mussel
- Primarily finance wild capture operations
- Starting to see aquaculture ramp up as wild capture fisheries are plateauing
- Perception that Salmon farms are bad - starting to see the industry accept and understand that aquaculture is a significant part of our food system and is an industry of the future
- Preparing to be more supportive in the future - needs to be more established to feel comfortable investing in new technologies, but remaining open/optimistic
- Products: native to Oregon in areas w/access to good water and environmental conditions
- "Bullish on aquaculture"

Alexis

- Not directly working with fund actively investing in aquaculture, but know of a lot
- Gybe is not a traditional company, it is a resilience company that measures success in environmental resilience, not as much profit, but still received a lot of funding
- If you can find a creative way to make money and have an impact, you should be able to pitch your company - doing things the same way it's always been done won't work
- More private money available than what it is in the public market

What do you view as the ideal type of client for your funding programs?

- Ryan
- Someone w/clear impact - evidence that they can make a profit and pay back the loan, but also have a good impact
- B Corp organization
- More risk tolerance than farm credit
- Projects that have a couple of years of profitability, or a very strong leadership team
- Aquaculture will often be new leaders, so need to demonstration both scientific expertise and business acumen
- Lowest level of lending is $100,000, so probably too low for most aquaculture
- Very comfortable with the $1-3 millions range with other significant support/funding

Joe

- Similar to Ryan w/needs for experience and leadership
- More conservative - not the best lender for folks that haven't already gotten started and have the profitability
- Once they can demonstrate performance, they are more likely to get funding
- Ideal client is an established business
- Current investments range from $50,000 (very small) to very large seafood companies

Alexis

- Venture capital can come in earlier - you have an idea, a pitch deck, and a leadership team; willing to put in higher risk for future high reward
- $10,000-$250,000 angel funds and then can get multiple investors
- Once you get this, it makes you more attractive to get grant money
- Gybe got VC money before DOE and NASA grants

What are you looking for when you evaluate loan proposals? Marketing skills, equity, etc.

- Ryan
- Lenders won't provide 100% of the financing - need to also talk with VC's
- Alexis
- VCs aren't planning to be paid back, they want to know how you'll 3x-5x their investment in a reasonable time. Looking at revenue growth, not whether or not you are profitable. Coming in for you to accelerate your growth.
- Want to know where the potential exit points are (e.g., acquisition)
- Marketing skills - if you know your industry and your product, and know your weaknesses and where to attract talent to make up for it, that is more realistic.
- Identify your skillset and who you need to bring on (hiring more talent)
- Rising interest rates is giving some leverage to offer less for land, but it makes payments higher

Where do people starting small businesses

- Aquaculture Associations need to build relationships with VCs, so that they can go there to learn about funding - but this hasn't really been the case in reality, more focused on regulatory challenges
- Extension services have played a larger role in the past in helping new farmers search for loans

As an investor, what do you tell new entrepreneurs who are too focused on finding the funding?

- Go find some customers, even if you know there is a market - proving that you've done your research and know where you're selling the product
  - Demonstrate repeatable sales where you can quantify the sale really quickly
- Importance of having experience - if you're thinking about starting up a business, go work at an established business first

When getting funding, you would typically start w/local lenders, but local financial institutions don't understand aquaculture lending, even if you have brilliant materials.

- There are investors in other states that do get it, but it is challenging for new businesses to go to those other states. Oregon is hostile towards innovative aquaculture businesses.
- Are there people in the Oregon Land Grant farming extension community that can help build relationships with the lenders?

Aquaculture has continuous innovation and development - how to fund and incentivize this?

- Oregon doesn't have a lot of incentives (e.g., tax, etc.)
- Really tied to job creation
- Economic development can be a framing to help get funding - jobs, connecting people back to the land and food systems
  - Translating multiple products in a complex system onto paper is really difficult and lenders don't understand it

Mitigating Risks - Aquaculture businesses established 40-50 years ago started small and grew slowly, and many didn't make it - the risks are real

- The ones that have made it have a family farm with their own money, and they work around the clock to keep it going - businesses with outside funding have been less successful
- Learning to manage these risks is key - NAA and other orgs are working on support for risk management
- Having a customer who is also a partner - like a seafood restaurant or any restaurant who wants to source locally - can demonstrate reliability

State of Oregon is starting to do surveys on industries that are growing - one of these is the blue economy

- Goals are to evaluate opportunities in Oregon and educate the legislature on potential industries.
- Aquaculture is part of the blue economy

Technology Association of Oregon works in all industries at the intersection of agriculture and technology, and aquaculture is on their radar. They have a lobbyist - could be a way to get these issues to the legislature.

OSU had 6-7 extension agents working in commercial fisheries as the industry was developing that really helped on the ground with identifying funding, etc. This is not really needed in that industry, but it is for aquaculture. OSU doesn't really have these resources anymore and aquaculture is going through its development stage.

- Extension in the marine sector doesn't have this expertise in Oregon because the industry is so small.
- Integrating aquaculture with traditional farms is a frequent conversation among aquaculture group at OSU/OAA to expand farming portfolio for folks who already have land available and farming experience

Gil Sylvia's notes on investment and finance

Q1: Ask each institution to describe financial services

Steward: Most popular are a loan from participating loans from $100K to $1M – this is a true debt model, Also have short term loans. Also help to facilitate connection to USDA and federal agencies --particularly value added products

Joe Blatt—NWFC—a cooperative bank – on the lending side similar to banks—the firm is use to financing specialty type of operations. Willing to take unique farm properties as collateral

Alexis: There is a variety of venture capital. Traditional investment expects high risk and high returns in a short period of time – 5-7 years. There is also "patient" funds willing to wait longer. There is also impact capital that requires social impact – can be lower returns at a lower rates but still expect a positive return. Where to find funds they are connected to foundations or other larger venture funds. Need funds that will be a true partner and understand your industry

Q2: What is the view of agency for types and scale of aquaculture?

Steward: "Regenerative" is the key word—must sustain and rebuild the environment plus equity and fairness standards. We are a private lender and are flexible—no specs on species or methods—do shellfish and finfish, kelp etc., —must show regenerative possibilities

NWFC: We have financed many oyster farms, shellfish, but have $1B total in loans for commercial fisheries. Aqua loans are much smaller but see a lot of potential for aquaculture. Becoming comfortable with more innovative aquaculture. More traditional species (shellfish, salmonids) more comfortable.
Alexis: Developing sustainable resilient watersheds. Sustainability is key for finance—find innovative way to make money and support climate resilience and restoration. Lots of private money.

Q3: Ideal type of client:

Steward: Want regenerative impact client, but must see clear pathway to profit. Have a bit more risk tolerance than traditional bank. Are willing to help with incubating and can then transition to traditional finance from lets say NWFC. Help folks get proven track record. Lowest level of funding $100K --$1-3M more typical. Also can go up to $10M-$30M.
NWFC Has clients to refer to Steward. We are more conservative and unwilling to help in early life cycle – too risky -- refer to Steward. But cost of capital a bit lower because taking less risk. We support an established business – not typically start ups. Have a Goeduck farm loan at $50K up to many millions for traditional farms—part of our Congressional mandate.
Alexis: venture capital requires only a "pitch deck" and team—attract angel investors from $10K upwards. Can pool angel investors together to create an LLC. Need to attract capital and then more attractive to a lender. Need to attract someone who believes in your company – the key.

Q4: What business client investment/experience do you require?

Steward: we don't provide 100% of capital. Expect the company to put in some equity. We can put up to 80% for land and buildings. 50% for equipment. In total 60-70% depts and the rest to come from other sources (equity, tax credits, etc.). No absolute expectations for experience of lender depends on quality of business proposal and your team and expectations to service debt—does the business plan show ability to make loan payments from cash flow. We are financing land infrastructure and equipment. Looking at highly securable assets.
NWFC: We require 40-50% of equity for the loan. 50% target of loan to value typical. The three legs of stool, production, processing, marketing—looking for strong performance in all three legs. But depends on company and how their business model is structured. Most important financial metrics—we take collateral but cash flow critical—does cash flow from the business support the loan payments. We want to see working capital—is there money set aside for emergencies and unforeseen events. We finance working capital and look at inventory as potential assets.
Alexis: The difference with us—three legs of stool important but investor not looking as dept instrument—need to show 3X to 5X of investment revenue in five years time. Don't care if profitable or not. They want to accelerate your growth and what exit plans are—e.g., acquisition (bigger company will absorb you). Must scale and grow fast because of competitive advantage. Must show how to attract marketing talent rather than it preexist—focus more on entrepreneurs and valuable plans and ability to higher needed talent.

Q5: What will interest rates be in 2023?

NWFC: Did not think long term rates would go up this fast—Powell says federal rates will continue to go up—shorter term rates will go up—longer term rates and bond rates and creating more uncertainty—what we are telling customers is to lock in a fixed rate for a shorter period of time.
Alexis: Venture capital will expect more equity due to higher rates—everything may take longer. Uncertainty makes it more difficult. She heard there is still plenty of money around. Plenty of dollars for early stage start ups. 3.8% VA loans now 5.6% rate. Need an investor's guide for aquaculture and associations need to build those relationships. Carole pointing out that Land Grant Extension helps farmers get finance – not associations (which focus on regulatory)
NWFC: for start ups – recommendation is to get experience working for another company.
Missy: People don't understand aquaculture—so makes it hard. Need investment from other states that have experience. Alexis noted that CA has more willingness to invest in aquaculture. OAA should work with OSU Extension to train lenders and take them out to the farm.
They did a conversation rather than the planned exercise.
Focus: R&D needs
Carole: Most aquaculture businesses started slow and built up. But in Arkansas lots of federal $$ and all the farms failed. But when somebody else's money then not the same dedication. Risks are big and real. Must manage the risks – insurance strategies but aquaculture doesn't fit well. Big move to work on insurance plans. Joe's view (NWFC) Risks are very real—a "higher risk" sector and return on assets, 2.5% low return—must be a low risk return. There are a lot of options for funding as the panel showed—need strategies to mitigate risk (grants for example). Alexis loves closed loop systems and a lot of startups have a customer who is a partner. For example a seafood restaurant or retailer—could they be a partner? Partner with casinos? Find a customer who is also a partner. State legislature is doing a survey of six sectors including the "Blue Sector".

Aquaculture Technologies:

Tom Losordo -
Some definitions

- Technology - Technology is the application of scientific knowledge to the practical aims of human life, or, as it is sometimes phrased, to the change and manipulation of the human environment.
- Aquaculture - Aquaculture is the husbandry of aquatic organisms, and aquaculture is agriculture.

Progression of aquaculture in California:

- Started with stocking fish in ponds via - transported via railcars, up to high mountains lakes. To create recreational opportunities. Oysters as well, have been around for a long time, in the Bay area - growing, harvesting, and selling oysters to the booming town of San Francisco.
- Many species are grown in California throughout the year, in recent times offshore aquaculture and plans to diversify species (Steelhead).
- Many avenues for production - Recreation, seed stock, resource enhancement, live fish markets, white tablecloth demand, filling the seafood deficit.
- Recreation: large business for stocking in private and public waters. Many of the stocked fish from private aquaculture. Important for fishing license sales, provide recreational opportunities to many people (Inner City pond stocking).
- "Restorative Aquaculture" to enhance fisheries that may be depleted
- Fish Markets - markets oftentimes include live fish.

Aquaculture opportunities and important topics for the future – Tom

- Neighbors helping neighbors- Tom brings up an example of fish farm where effluent is used to irrigate crops.
- Diversification - Water skis pond along with fish farming with the recreational fishing lake, and rice farm! Tom shows a picture of the farm overview. Folks with RVs can also stay at the site, diversifying income
- Heat - Growing Tilapia in a very cold area of Northern California where geothermal springs can be used.
- Resource rehab - Rice farms with marshland to produce salmonids. Newer technology to help prevent predators
- Fish Greens, Dates - Combination of greenhouses and outdoor ponds for growing dates and fish
- Wetland Mitigation - Wetland area, farm supplying nutrients and water to a wetland area.
- New Technology in the Nutrition field - New technology, and recent advances made
- Genetics - hybridization, creation of sterile fish
- Fit the site with appropriate technology or fit the technology within the appropriate site?
- Aquaculture is becoming a household name, and familiarity with existing large companies with existing technology increases our efficiency.

Panel discussion and further introductions start –

- Ono - Aquatactics - Introduction to Ono's company, providing vet services, creating vaccine technology. Provide diagnostics and recommend treatments.

Questions/ Discussion with Ono at the front

- Existing vaccines?
- Help with pathogen regulation/reporting to ODFW? Yes, they can help with existing agencies
- Recording requirements: Work within state regulations if the pathogen is required to be reported.
- Work with Ich/Columnaris - They can help use vaccines and manage disease risk
- Developlment of vaccines? - Send isolate to Ono, look at pathogen, work with disease and farm to understand which vaccine route (immersion/injection) is proper.
- What timeline? Depends on the pathogen, if they have worked with it before, ~2-3 months and maybe longer.
- A recent disease that the state of California is experiencing? - They are working on a vaccine, and are aware of the disease. Disease management is multifaceted, opportunities for disease management beyond vaccines
- % of business that they work on the most? - Salmonids mainly, lots of vaccine work, work with many pathogens. Oftentimes they are in the field working with farms/hatcheries. Have a lab component to the company. Working to lessen antibiotic use, both because toolbox is limited and to provide farms with a more marketable product. Customers care a lot about what is put on the packaging but know very little about the technical components of disease management and fish production.

Joel – Aquaponics

- History of aquaponics - Aztecs grew vegetables on rafts in lakes, then to now, aquaponics regained popularity with the cannabis industry.
- Now can grow low-margin items like vegetables successfully.
- Many new opportunities out there
- Live Local Organic started in 2013, relatively new. Joel started the company with his uncle. Was new to aquaponics. Started aquaponics in the backyard. Grew tilapia, and many vegetables. Produce inside of a warehouse, producing mainly plants, fish production is smaller but
- Aquaponics vs hydroponics - Aquaponics uses aquaculture where hydroponics does not. Hydroponics has issues with excess sodium production, whereas no sodium is produced in aquaponics.
- Tilapia in the farm seem to be happy in the system, thinking about other opportunities like catfish.
- Markets - live fish markets, and grocery stores. In Fred Meyers, Safeway, New Seasons, other smaller grocery stores.
- Overall, public has positive outlook on aquaponics, can be food safe, organic selling fish to asian markets in portland area.

Questions:

- How to keep tilapia warm? Use industrial gas heaters, pump in the heat for the majority of the winter. A bit on the colder side, they grow a bit less and eat less but still are healthy.
- Indoor vertical farms providing competition? Maybe not the future of all farms, but aquaponics provides increased food security, not to compete with normal local farms. They want to compete with farmers that are out of state.
- Annual production of fish? It's daily low, 200 fish per 1,000 gallons. Fairly low. About 1 year to 1lb, which is sellable weight. In the middle of transition at current time. On average, producing around 10K - 15K lbs per year.
- Where to get fingerlings? Permitting for them? Fingerlings from Americulture in NM. From DutchBoy farms, no longer. Seller takes on fish transport permit. Needed through ODFW, ODFW inspects site. Also, fish propagation license. No disease certifications or import permits. Live fish markets are very easy, no processing, get quite a bit more per fish ~$3 per lb.
- Permit for greens? They choose to get a 3rd party, but their product needs to pass ODS/FDA inspection. If the product is cut once or less, then it does not need to be inspected. They became certified organic, less so for food safety but they check on chemical. They have GAP certification, some customers require it.
- Light source? All LED lights
- Tank shape? Round tanks.

Tom Losordo:

- Appropriate technologies for Oregon. Working with local Oregon Tribes to get the technology to Oregon. Hybrid split pond technology has proved itself, in older industries (Mississippi) the technology is tough to prove as older farms are unwilling to change. That is why Oregon/Willamette Valley may be a great place to start.
- Split ponds can increase production relative to standard pond culture. Hybrid striped bass may work well. Nice fish, fit well in markets, go to an iced market. Issue with hybrid striped bass is that they need to be managed well.
- Thinks aquaponics has a lot to offer to OR. Also, RAS may work well, or a combination of these.

Questions for Tom:

- When was the split pond technology created? ~10 years ago, many publications since
- How are these designed? Use gravity with ponds just inches below each other.
- Co-culture? In marine? The idea of co-culture has been around for many years. A lot of the work has been done overseas. Some more interest in it in the US. The hard part is to become good enough at it to make money.

Tom McDonald:

Discussion of using liquid oxygen. Used to strip the oxygen out. Much healthier fish. Very expensive. ~100K.year for liquid fish. The fish haul better with them. They are more robust. Eat a lot better, and digest food better. Great investment. Run liquid oxygen 24hrs per day. Very expensive to buy liquid oxygen tanks. All tanks are computer controlled and they automatically refill the tanks. They use meters on each raceway that monitor how much oxygen is being used.

Desert springs uses a vegetarian diet. The fish really like this, and grow well with the feed. Food conversion ratio, down to 1.3-1.4. Plant based diet are more expensive. Ingredients to replace fish meals are very expensive to produce. . Their diet uses algae, pistachio nuts/oil, and other products. StarMilling from San Diego produces it. No animal bi-products in it. Lessens mercury/no microplastics. It could be very important for the future of Desert Spring. Fish seem to love it and eat it very well, just a very expensive upfront cost. Have done trials with it, but have no public. Most people are looking for a fish meal-free feed, Desert Spring has come up with it.

The Agency Experience

Brielle Cummings, USACE

- Regulatory authorities for mariculture
  - Section 10 of Rivers and Harbors
  - SEction 4 of CWA
- Additional environmental reviews - ESA MSFCMA, MMPA, NHPA, Tribal Treaties, CZMA, Water Quality Cert (DEQ)
- USACE can't issue a permit until they can verify that the permit meets ALL of these requirements - a lot of time delays waiting on responses
- Joint form w/DSL

Dan Tonnes, NOAA

- Science for management, production and technology transfer
- Aquaculture library - fact sheets on aquaculture topics (helping to dispel myths)
- Reg role is related to ESA and Endangered Fish Habitat (EFH)
- Online permitting guidance for WA - hopefully available in the spring
  - Report on Improving Shellfish Aquaculture Permitting Efficiency - using as a blueprint
- Oregon - NOAA has a programmatic agreement w/USACE for shellfish - if the permit meets certain standards, USACE can just use the general permit and they don't have to apply for anything additional (example of streamlining)

Steve Rumrill, ODFW

- A lot goes into evaluating and maintaining shellfish lands, much of this is done by ODFW
- ODFW has very little direct regulatory authority for shellfish mariculture
    - Receive notice from ODA of new lease application - assemble relevant information and make a yes/no recommendation
    - SEACOR gathers data
    - Makes sure that fish (including shellfish) that are transported are free from diseases - shellfish health certificate
    - Works w/ODA to monitor for pathogens
- Role of agencies in aquaculture growth
    - Enable the growth of the program
    - Conduct science-based research for decision-making
    - Conduct characterization of the habitat
    - Monitoring of water quality
    - Monitor essential driving forces of change
    - Policy development, regulation review, updating - open and transparent process
    - Conservation enhancement of sensitive species (e.g., Olympia oysters)

Jim Johnson, ODA

- Approve shellfish on state-owned lands for commercial operations (not research - this would be through DSL)
- Aquaculture protected under right to farm use
- Local government is supposed to give compatibility information, but they often say they can't do it, so ODA ends up doing the analysis
- 1 shellfish app every 3-4 years
- Involved in terrestrial aquaculture w/management of fish waste (will work with ODEQ)
- Local governments can't regulate farming in a farm use zone, but they can regulate aquaculture
- Need to think about aquaculture as agriculture

Questions

If you want to farm fish on your existing farm, where do you start?

- Local government - county planning dept. - zoning and water rights

- How do we make permitting easier for new growers (barrier to entry)?
    - Shellfish permitting flow chart
    - Land-based doesn't need a flow chart, pretty straightforward
    - Availability of land is a larger barrier

Should OR contribute to a state aquaculture plan?

- Yes, it would be helpful for NOAA

- Pre-certify areas for aquaculture use? But if it's not done, there's a huge barrier to a novice.
    - ODA won't certify new areas for water quality because it takes a lot of funding and the agency operates on 2 yr budget cycles
    - Need the demand to be there first - have some lobbying to do
    - Estuaries are zoned, so you can see which areas would allow or not allow for aquaculture, but these estuary plans are 30 years old
- How to reduce regulatory costs (time spent, not actual costs of permits) on farms?
    - Often related to uncertain environmental impacts
    - NOAA has taken several actions
    - Investing in research projects that will eliminate farmers having to assess individually
    - Streamlining permits w/web info so new farmers don't have to go to several websites
    - AOAs - "pre-permitting" for offshore aquaculture \
    - Oregon governor said they weren't interested in having AOA's in Oregon
- Can streamline all we want, but when dealing with public lands, public use doctrine, and weighing against other public uses (i.e., recreation), aquaculture is rarely prioritized
    - Dealing w/general public which you don't do on private lands

Gil Sylvia's Notes on the Agency Experience Panel

Lauren from ODA—Acting Director

- Noted that ODA welcomes aquaculture and aquaculture is agriculture
- Need a legislative champion, need a customers etc. to advance

- Aquaculture development doesn't happen overnight

Panelists:

· **Brielle Cummings Army Corps of Engineers**
· **Dan Tonnes-NMFS**
· **Steve Rumrill – ODF&W**
· **Jim Johnson – ODA**

Dan Tonnes: His first trip to Oregon. Aquaculture program small footprint in NOAA—30 staff in DC and regional coordinators. We work to expand aquaculture but also regulate—three parts: NOAA Fisheries, Sea Grant, National Centers for Coastal Ocean Science (neat GIS tools on line). Mission: increase domestic product of aquaculture – get site reports from NMFS sites-great aquaculture library at NOAA; Regulatory role—ESA and Habitat responsibilities (Sec 7 work consultation is half the staff and aquaculture is an action). There is an aquaculture permitting guide. Permitting process is complex. Creating new flow chart to support on-line enhanced permitting guidance—copying Alaska's online guidance. Permitting environment is complex. NMFS working with State. In Oregon there is an ESA/EFH consultation for a broad state wide industry permit—don't need to see an individual permit. Also in Washington state

Brielle Cummings- Army Corps: Regulatory authorities Sec 10 of the Rives and Harbors Act—provides permits for any structures in navigable waters. Army reviews permit application but must also consider applicable laws are adhered to; at least 7 major laws including ESA—so complex and comprehensive. Can be long time lags to meet all legal requirements and get required information. Forms are on-line—same form jointly with Oregon DSL. Three classes of permits—national effects, letters of permission, and standard form. 3 national permits (finfish, shellfish, seaweeds). We do pre-application meetings to expedite and get questions answered

Steve Rumrill: Oyster production is an agricultural commodity in Oregon. Must show plats are appropriate for oyster production. Only eight areas in Oregon are allowed for shellfish growing/harvest. To certify new areas must meet fed guidelines and do a hydrographic study – lots of expensive requirements—extraordinary expense to start up a new area. Very few private areas for shellfish aquaculture (unlike WA). ODF&W has a conservation mandate and has set up rules for production. They assemble info when they get request from ODA for new permit and must give their ok (approve, deny, conditions). Require transport permit and safety review of broodstock. Role of the agency should allow for the evolutionary growth: science-based research with universities and NGO's; conduct characterization of habitats (e.g., eelgrass beds); monitoring of water quality and env monitoring; review existing regulations for improvement; provide transparent access to info; conduct conservation aquaculture for enhancement.

Jim Johnson: ODA—shellfish program has authority for oyster leases on state owned land for only commercial production only; ODA required to make a suitability determination case by case—there is a public comment period—major concern protecting other resources and compatibility uses (right to farm laws which includes aquaculture). Must get a Land Use Compatibility agreement from local gov. Some local govs don't have resources so ODA does it with a temporary permit certificate. Get only one new shellfish permit application every four years. Food safety people of ODA do a lot of the work and also involved with zoning. ODA also gets involved with EDQ to control effluent (e.g., new sturgeon farm in Klamath). Land Use regulations complex including terrestrial aquaculture as well. It is a farm use but can be allowed in non farm areas – must get a local gov conditional use permit.

Question from audience—farmer wants to know where to start: Panel answer—investigate local zoning—e.g., if exclusive farm use. Start with local planning; Water Resources to determine water rights—even pumping including storage rights must be approved.

ODA has a flow chart for shellfish aquaculture—preconference meeting led by ODA—that is only required for shellfish. Land-based process less complex.

John Moehl asked panel whether there should be a state aquaculture plan. NMFS says yes, Johnson/ODA says yes—can improve efficiency and certainty. Steve Rumrill also in favor of an overall plan for goals and including best practices. Army Corps also agrees. A consensus.

- Note that estuarine bays are zoned for shellfish increasing certification—food safety

Gil asked question about regulatory costs and Carole provided more explanation—8-22% annual cost. Lost time biggest issue.

Dan Tonnes: Uncertainties with respect to environmental impacts is the biggest issue. Oregon notes low applicant fees which do not cover research costs absorbed by agency. There is an Executive Order to develop Economic Opportunity Areas to pre-permit aquaculture in areas in the ocean. Oregon not interested in this right now (I missed the second point Dan made). Jim Johnson pointed out that public use doctrine is complex by nature. Public demands are complex. Streamlining is critical. . (which states have done a good job in streamlining?).

Question about wells and storage: Water rights include the well right and the pond storage permit as well.

Question about permitting aquaculture with wind energy. Complex and requires tradeoffs. The quality of the site is critical. Major tradeoffs.

- Comment that aquaculture does generate ecosystem services.

Marketing Panel

Jeanne McKnight

- How to market seafood in a TikTok world. We need to market to Gen Z and Millennials, but how do we do that?

- Why aren't people in Chile eating fish? Mothers do not want to feed their babies fish with bones

Daisy

- Owner of New Seasons market
- Often gets put into a marketing role through store advertising

Chuck

- Challenged students to make a marketing plan on how to make seaweed the new kale
- Oregon state discovered a variety of seaweed that tastes like bacon. It went viral and he went on the today show, flew to japan. He now has contacts with portugal, chile, malaysia, etc who are all trying to help the adoption of seaweed

Erick

- Helps small to midsize agribusinesses grow their businesses to extend them to buyers, suppliers, wholesalers, etc.
- Has not had that much experience with aquaculture, but works with Chuck and his seaweed

Question 1)

- Daisy: Bringing a fish that has no name and no recognition into a place where it would not typically be is quite difficult. We used tasting, give it away for free, etc. Eventually, the project failed because the product ended up becoming a red rating, and because people just couldn't understand what the fish was because of the name. "The consumer is used to the things they are used to."
- Chuck : On a podcast with Bruce (a guy who threw blood on models who wore fur outfits, and the queen). We came to the conclusion that trying to shame someone into changing a behavior is a very small percentage. Most people, if you tell them they need to stop eating something because it's bad for the environment, will turn around, flip you off, and then start eating double of that product.
- Jeanne: Shrimp is high in cholesterol. Focus on what people's eating patterns are, and find a way to introduce products without scaring them. The younger generations are more concerned about the carbon footprint of foods.
- Erick: know your audience. We have a competitive advantage just from being from Oregon, "clean air, clean water." We may not be the cheapest or most widely available option, but we are the best because we are from oregon.

Question 2) Market 1st approach:

- Chuck: Our seaweed is very pretty and high in protein, and we wanted to convey that freshness. When covid hit, all the restaurants shut down, and we were wondering how we were going to pay our rent. With Covid, there were all the issues with meat. increasing meat demands, and people were turning to alternative proteins. Someone asked, don't you think that there will be a race to the best protein with the smallest carbon footprint? So we tried to come up with a carbon negative protein that can compete with soy. That will revolutionize the entire food supply chain in the world.

- Jeanne: If you are thinking about starting an aquaculture anything, it can't be just because you think it's cool. It needs to be because there is a market or need for it. Market 1st means really understanding your audience. If you don't know your customer or who your market channels are, then you're going to be in big trouble.
- Erick: You can't sell sardines to an elementary school, so you have to know who your market is to know where you can push your product. 3rd party certification is very important for a sustainable product that consumers want.
- Daisy: Look at a younger shopper, they are very educated and know what they want. They generally are conscious, and are purchasing proteins in smaller quantities and are less likely to have protein in every meal. Finding ways to sell only the quantity that the consumer needs to reduce food waste, which they are also concerned about.

Question 3)

- Erickk: "Clean water, clean air" The advantage we have is that we have a community and a general public who cares. This could be a positive and negative because you have to prove that you are a viable option for them. Work with government agencies.
- Jeanne: Professor at Lewis and Clark, lived in Oregon for 9 years. Oregon is almost its own brand. Consumers trust the brand of their retailer, probably more than anything else. Consumers may not know anything about the product and may be wary about it, but if they trust the store brand they may try it anyway.
- Chuck: There's a real advantage to trying to sell Oregon and seaweed because of the way we live out here, it is not abnormal to have that pairing. Scale is an issue that comes up a lot

- Daisy: Buying locally is very important to oregonians. Oregon is also a very self efficient state, pretty much any product you may want can be (or already is) in Oregon. We all need to stop fighting each other, and work together to get the US to eat more seafood. The US is way behind the rest of the world in their seafood consumption.

Question 4)

- Daisy: protein content is very important. Consumers want to trust the market they are purchasing from. Bringing to light, regenerative ocean aquaculture.

- Chuck: All these rich guys like Zuckerberg are used to creating a new market, but they have no idea how complex the food supply chain system is. There's so much in agriculture like distributors, regulations, suppliers, etc that they just don't understand.
- Jeanne: Consumers still want to feed their kids. Will my kids eat it, will my kids like it? An emerging issue is whether the animals are being treated well. Is pain worth your porkchop? We need to think about all of those things and attach a brand to these attributes. Many consumers are becoming overwhelmed by certification fatigue, so we need to be aware of that as well.
- Erick: If you want to sell to institutional locations like schools, there is a lot of opportunity, but kids won't eat something if it's stinky. Try to find ways to make your product attractive.

Question 5) What should new investors ask?

- Chuck: What I am doing is new, pretty much in the world. The only way seaweed will work, as a business is to do it on land in a controlled environment. Our first investment had to come from Norway because in the US the investors were more interested in the new hot sauce. They want to know exactly how much carbon you are pulling into the atmosphere. There is a company called brilliant planet in Africa that is growing something just for carbon credits. I don't think monetizing carbon credits is a fad, I think this is a trend that will continue to increase in popularity.
- Jeanne: There is money to be given to encourage new thoughts and ideas into aquaculture, but you have to have a business plan before they even consider funding you.
- Erick: Talk to your local elected officials and get them excited about it because they will ultimately be the ones who will help push this along. There was a legislative champion that was able to allow the DOA to help find the meat packaging issue.
- Gil: If we had had this conversation 25 years ago, we would have focused on product attributes regarding color, smell, taste etc. But now we talk about sustainability, carbon footprint, animal cruelty etc. Is the market changing so much that we are changing direction, or are the previous attributes still important?
    - Daisy: At the end of the day, it has to taste good. So they definitely go hand in hand.
    - Jeanne: The newer consumer cares about sustainability
    - Chuck: Looking at this from a marketing and sales perspective, I'm looking at using sustainability as a feature to add on to the other important attributes.

Question 6) What is an example that you think would be great to adopt for Oregon

- Jeanne: I think Oregon could become an amazing trout producer, shrimp too

- Chuck: If we grew 20 square miles of seaweed in the desert, we could make Oregon a carbon neutral state. Getting more people to eat seaweed as a snack, which is already starting to get popular.

- Daisy: I'd love to see shrimp here. There is a group that started in Vietnam, Thailand, Belize, etc. and worked with small producers and brought them into a cooperative. I think we could get small mom and pop shrimp producers in Oregon that could definitely be viable here.
- Erick: Seafood jerky. It's an innovative product, it's interesting, it can be a low cost product that could be a value added product.

Open questions:

What new innovative products do you have going on?

- Chuck: My new innovative products are extracting different proteins from the seaweed. We would like to get more resources to get more involved with seaweed chips and snacks.

What demographics and how immigration is moving ideas around the US and the world? We definitely want to focus on the hispanic demographic. Ethnic markets that are fresh are growing in popularity. Aquaculture is a niche market and not that big, so finding processing is difficult.

- Erick: Cost sensitivity will definitely come into play. You can have some certifications that are irrelevant if you are trying to grow to the mass public. Knowing your audience, and how that will work in the future.

- Daisy: A retailer won't take live fish and don't really like whole fish because we don't have the time to cut and serve the fish. Round is when the fish is exactly how it came out of the water, but customers usually want a boneless skinless filet.

- Erick: Fresh vs frozen is a missed opportunity. Frozen is more sustainable and often safer, but there are a lot of misconceptions about frozen. Luckily that is starting to change and more and more restaurants are starting to use frozen because they realize it is easier.

In seafood, there is a lack of traceability that makes people nervous about purchasing it. Does this affect aquaculturists?

- Daisy: In retail or to the restaurant, the fish has to be labeled with the last country of origin where it was processed. You can put more information on there, but that education piece has to be important to the restaurant in order to make that known to the customers. There are some traceability programs that have come about over the years, such as one that traced from catch to consumer and the consumer could read it with a QR code. There are many companies that are starting to use blockchain technology, which will allow that traceability without disruption or mistakes. In aquaculture, there is so much trading that goes on between the fisherman, multiple processors, wholesalers, distributors, etc. Oregon needs a processing facility that is donated to aquaculture. The processors here are mostly owned by distributors, so they would not take farm raised competition over their own product.
- Gilbert: With the QR code traceability, we were too early. The QR code is too expensive and too much of a hassle for the small audience that wants the QR code. That's why it isn't working yet because the consumer isn't demanding it enough.

Gil Sylvia's notes on Marketing breakout session
Panelists:
Erick Garman, ODA
Chuck Toombs, Oregon Seaweed/Oregon Dulse
Jeanne McKnight, NWAA
Daisy Berg New Seasons

- Jeanne: Described Northwest Aquaculture Alliance—taking the pinbones out of Chilean farmed salmon were critical to entering the U.S. market—based on consumer surveys
- Daisy: Introducing new items—educate the consumer through their staff
- Chuck: Oregon Seaweed—have an equity investor with seaweeds. Member of a seaweed accelerator.
- Erick: Trade manager at ODA. Help introduce Oregon producers to buyers tradeshows, export markets.

Q1: **What are critical components to marketing strategy for aquaculture.**
Daisy: Tried bringing cobia into Portland market—tough! New species. The program failed and could not get acceptance -- and was also red-rated by Seafood Watch. Bringing in a new species is difficult. Coming up with the right name is critical. Odd names are tough.
Chuck noted that markets are monetizing carbon. Don't shame people into changing behavior –doesn't work. Provide incen-tives

- Jeanne: The shrimp industry NFI did consumer research on shrimp due to NGO's – what was stopping consumers was the high level of cholesterol. But different attitudes from different generations.
- Erik: Oregon has a competitive advantage—clean air and water—"green". We will not be the cheapest, or the first, but the best. "Brand Oregon"

Q2**: When you hear the phrase market first approach—what does that mean to you?**

- Chuck: we have a pretty product, fresh good tasting and could sell the fresh product – but then covid hit. Beyond Meat when public, race for the lowest carbon protein – dulse was best because extracted from fresh seaweed and proteins not denatured. We have come up with a carbon negative protein—The world will need 360 mmt of protein—we can grow on 10% of the land the equivalent product.
- Jeanne: Market first means starting with markets. And what they want—understand what you are aiming at. Markets are grounded in research.
- Erick: State needs to market itself first to support aquaculture products. Believe in certifications consistent with Ore-gon's brand.
- Daisy: Younger shoppers – can pull in younger shopper and purchases guided by consciousness—old marketing ap-proaches won't work—they also eat less protein. And work to reduce waste.

Q3**: What are Oregon's advantages and disadvantages to marketing aquaculture?**

- Erik: Environmentally friendly industry—critical. Growers must work together – ODA and FIC are good partners.v
- Jeanne: "Made in Oregon" great opportunity. Brand of supermarket a critical factor in acceptance.
- Chuck: Because I am growing seaweed I get better acceptance—associating seaweed and Oregon is a great marriage.
- Oregon may not let us scale in the state so will need to move if we grow big. Oregon has lots of food products •
- Daisy: Seafood fights each other and we need to work together.

Q4: What are critical product attributes?

- Daisy: Sustainability is most important; creeping up is humanely raised, high protein content ; shelflife not as critical for consumers because they eat it same day. Regenerative aquaculture is a great trend.
- Chuck: Seafood -- extremely complex and mature markets – with lots of regulations.
- Jeanne: Will my children eat the product. Animal welfare is a growing issue. Too many certifications is fatiguing
- Erick: Knowing your audience is key. Kids don't like smelly seafood

Q5: What is critical to develop market pathways?

- Chuck: Move from a batch process to a continuing process at scale on land. Must know precisely what the carbon cap-ture is. A serious issue and monetizing greenhouse gasses.

Q6: Is there something you have seen in travels—what could Oregon adopt

- Jeanne: Oregon could be a great fresh water trout producer for food.
- Chuck: Oregon should have a strategy to eat all the carbon it produces
- Daisy: Would love to see shrimp here produced here—vanedii, black tiger, small mom and pop working in a coopera-tive here in Oregon
- Erick: Seafood jerky is fantastic idea—value added product
- Should focus on changing demographics. New ideas for Chuck's business—focused on extracting proteins
- Tony noted that most aquaculture products are sold live in CA—quite incredible for Asian market—higher price for ethnic market—knows its fresh
- Daisy notes we don't want live fish or round fish. Want it processed—for example boneless skinless fillets.
- Erick noted that we have processors and assuming aquaculture could work with wild caught processors. Also noted greater acceptance of frozen product.

Why not more traceability?

- Daisy said that U.S. law only has to have country of Origin.
- Daisy doesn't think processors will support processing aquacultured product – need a custom aquaculture processor

Breakout Group reports

Shellfish

- Tours to farm, product attributes, certification for improving water quality, ecosystem services, increased biodiversity
- Daisy likes the idea of bringing tourists to the shellfish farm and buy the experience. Direct connection to the farmer

Salmon

- Take over empty shopping malls 500,000 pounds, supply regionally, restaurants and farmers markets, let people pick the live fish, sustainability, local, use pink shrimp pellets from crab processing.
- Panel like the feed solution and malls – also sanitation training for retailers so product smells like strawberries.
-

Seaweed—selected 100,000 pounds—start smaller given not sure of markets—have 3 grade of seweeds. Liked the carbon offset markets to get value for the product.

Aquaculture Business Planning

Panelists

Carole Engle

Phil La Vine, CCC

Laura Ferguson, Octant Consulting

- Market research; consulting w/businesses when they need to pivot/change

Paul Schuytema, EDALC

- Financed HI aquaculture farms - mostly prawns and a tilapia farm

Notes

- A lot of good fisherman can raise fish really successfully, but lacking a good business plan leads to a lot of failures
- SWOT Analysis
    - Strengths (internal), weaknesses (internal), opportunities (external), and threats (external)
    - Do one for the tech operation, and the business plan
    - Your friends are going to love the idea - need to reach out to potential opposers to get feedback. Think of threats as opportunities for feedback
    - Also think about your personal strengths and weaknesses - are you good at working w/customers? Or are you better at farming?
- Shorter term VCs might not be the best fit for aquaculture - expect quick returns
    - VCs want an exit strategy
- What do they really want out of their farm business? How much profit do they want? Long-term and short-term. Really important to map out where you want to be in 1, 2 3, 5, 10 years, and 20 years
- What options are there for small investments that will take a long time (8-10 years) for returns? Really common for new aquaculture businesses to not want to take out loans. Often they have personal loans from friends and family.
    - 5 C's of credit - character and integrity are really important in getting funding
    - Passion project investors
    - Grants - SBIR from NSF/USDA
    - Talk to the markets you will sell to and see if they have support
    - Funding to keep food local

- Investors know there are going to be losses and they understand the risks - it's okay that they lose money because they also make money in other investments

Work Force Development

Panelists:
Corey Habiger-Worksource Oregon
Heather Desart-Northwest Oregon Works

Corey H:

- Worksource Oregon works with State to provide job training services for various industries to help individuals enter the workforce.
- Each county has resources available to help support employer/employee development
- Goals: Produce high-functioning teams with business service analysts for various counties
- Targeted job seeking
- Pivoted to online job fairs during pandemic, more people than expected willing to relocate
- Worksource helps businesses focus on core business functions and reduces the costs associated with hiring.
  - They provide staff-assisted recruitment to help reduce hiring costs and find the right candidate
- Variety of statewide hiring incentives and programs, including:
  - Work Opportunity Tax Credit (WOTC) – a tax credit for hiring certain groups
  - Federal Bonding Program
  - On the Job Training (OHT) program
  - Self Employment Assistance (SEA)
- O*net online: Occupational information network: https://www.onetonline.org/
- Qualityinfo.org
- Encourage WOTC program to help find people to alleviate a heavy tax burden
- Veteran Readiness and Employment Programs
- 60% of training is CDL and Heavy equipment, less experience with agricultural industries
- Recommends going in and meeting with staff one-on-one

Heather D- Northwest Oregon Works

- Northwest Oregon Works (NOW) is the local workforce development board, representing Lincoln, Tillamook, Clatsop, Benton, and Columbia counties
- Funded/created by WIOA - Workforce Innovation and Opportunity Act
  - WIOA designed to get education, economic development, and workforce investment to work together
  - Labor department sends money to states
  - There is a state board that determines county-level allocation, then it flows through local groups like Worksource, NOW
- Oregon has 9 local workforce areas to support locally-driven decisions and programs
  - Boards members are 51% business, 1 locally elected official, reps from community colleges
- Goal to move people into workforce, funds activities for job training for job readiness, and is flexible in terms of ability to accommodate diverse training needs.
- Passthrough funds from state to counties and communities to address needs in an acute way
- Non-profit (501c3)
- Public Workforce System:
  - Help businesses find skilled workers, or upskills new workers
  - Work with employers to find what they need in workers
  - Working with community colleges for skills training, and finds curriculum that is working well to train students for given professions
- Aquaculture Educational Opportunities:
  - Oregon Coast Community College
- Currently don't offer much in terms of fisheries/aquaculture, although there is Aquaculture Online farmhand training: uri.edu
- Youth Work Experience (WEX) for 16-24 year olds to learn OJT
- Paused for discussion on issues with recruitment for aquaculture workforce and finding jobs + appropriate training for aquaculture.
- Helps with On the Job training and paid internships (site someone in environment where they can gain experience where Worksource actually pays the salaries)

- Can help to create occupational skills training – skill certificate training (stackable programs work best)
- Will provide slide deck for the powerpoint to access local workforce boards

Angee Doerr-NextGen PNW Seafood

- Large project of SeaGrant is workforce development
- We know what the industry needs, but not sure how to fill those needs
- Sea Grant "Food from the sea" careers program: Young Fisherman's Development Act and Aquaculture Program
- Charged with developing opportunities for young people to enter the various areas of the seafood industry (processing, aquaculture, fishing, etc, etc.)
- Planning Grant:
  - Cultivate Invested Stakeholders
  - Program Development
  - Implementation Plan and Budget
- Many people don't know commercial aquaculture or fishing exists as a career
  - "Everyone knows you can be an astronaut, but not everyone knows you can farm fish"
- Completed Fisheries Needs Assessment for employability with potential training design format:
  - First Aid
  - Team work and leadership skills
  - Financial skills
  - Technical fishing skills (budgeting for streaky income due to fisheries)

Training format:
- 1-2 day groups
- 5-10 per cohort
- Captain's school/Cohort

Aquaculture workforce needs assessment for employability:
- Safety and Nautical skills
- Food safety knowledge
- Trade skills
- Teamwork, workplace norms
- management/ leadership skills

Potential Programs/Resources:
- Internships/Apprenticeships
- 4-H school programs
- CC Programs
- STEM programs
- Place-based careers
- paths/profiles
- Resources for immigrant labor force
- Future Farmers of America, CDE (career development exercises) for aquaculture for competition. Now have regional competitions

Thursday, Oct. 6th

Role of Aquaculture Associations

Dr. Carole Engle:
- Example: During COVID, there was significant uncertainty in the aquaculture industry, CARES act was administered to farmers by USDA CFAP program.
- USDA didn't have data to declare aquaculture eligible. NAA, ECSGA, PCSGA, CFA, mobilized effort to provide reliable data to USDA to get CARES Act funding to aquaculture.
- A number of farms in the US say they would have gone under without the relief funding from the CARES Act.

Role of Associations:
- Take care of aquaculture producers during times of regulatory consideration.
- Easier for legislators to pass laws and regulations on behalf of an association rather than an individual
- Garner support and build partnerships with other agencies
- In Oregon, should engage with the Oregon Farm Bureau (grassroots, starts at the county level)

- ODA
- NAA (National Aquaculture Association)
- USTFA
- PCSGA

Good to join national, species-based, and state organizations.

National policies are best addressed by NAA

- Cares Act
- Lacey Act
- ESA

- **OR Shellfish farmers should be members of PCSGA**
- **All trout farmers should be members of USTFA**
    - Both associations hold annual meetings, engage industry, and discuss regional and national issues. Farmers should be included in these discussions.
- **State associations are best equipped to deal with state regulations, the largest cost to farmers.**
    - Active, engaged members, travel to represent association, and producer representation, leadership development and succession training, value creation, all make for strong associations.

Weak Associations:

- Focused on things not relevant to producers
- Little communication from association
- Failure to add value to business
- Factions develop in association
- Poor policies
- Conflict among members
- No Young Farmers programs

Who does work of strong association?

- **Elected officers, with paid executive directors**
- **Smaller associations have part-time paid directors**

- In Oregon, recommend: NAA, PCSGA, USTFA, and **OAA.**
- Coalition-building can help states take an interest in helping other states, and strengthen advocacy efforts (Arkansas example)
- Jeanne McKnight asks Oregon aquaculture folks to add NWAA to their lists of associations to join. NWAA's mission is to push back on the incipient regulatory forces that are forcing the industry to contract.

Gil Sylvia's notes on Role of Aquaculture Associations

- Address disasters like Covid for members—coordinated with federal agencies for relief; producer associations had to get data so USDA could get relief and stay in business—without associations farmers may not have gotten relief
- Address regulatory agencies and address new regulations
- Networking opportunities – business and social
- Get agency and other association support
- Oregon Farm Bureau – a good organization to work with that has lobbying power
- Coordinate with other associations (including PCSGA)
- There are 40 national associations – 22 are NAA members
- Call to quick action with other associations
    - But membership requires responsibility: contact elected officials, voice in D.C.
    - Join multiple associations—local, regional, national: State Association, Species Association, National Association
    - Work on major laws and legislation
    - Disseminate alerts and news to members; organize meeting sessions etc.
    - Address species-specific issues; example catfish folks; need young farmer associations; research forums, service awards etc.
- In the region join PCSGA (shellfish)or USTFA (trout) (species specific)
- Hold annual meetings—membership must be active—for example dealing with state regulations
- For example Arkansas Baitfish got 3rd party certification and created brand and local starting with transportation problem
- For example, Catfish Industry created check off promotion Board

- Strong Associations have active engaged members –producer driven—focused on general good—supports leadership development etc.
- Weak Associations: activities not relevant, little communication, poor policies, too cliquish; can't resolve conflicts; no young farmers association

- Who does the work: elected officers yes—but need a paid exec director
- Funds: checkoff programs, charge suppliers at conferences, own property rights, auctions, fees

Additional Comments:

- Paul of NAA argued how much work they did with USDA -- got contentious – but dogged working with USDA; he noted the importance of networking – amending Jones Act—working cooperativeeratively with other associations to help them even though no direct benefit –
- Tony: Cost of joining the associations is relatively low; need to rebrand and bring in young farmers to develop leadership;
- Michael Lee: Getting folks to run for the Board is critical; is OAA a member of PSGA?
- Jeanne: critical part of their mission is to change public perception
- Michael Lee: there are members who don't want to expand the industry but the industry will shrink if members aren't active

Randy Bentz (OAA):

- OAA has had a rough couple years due to multiple reasons
- Time to give the officers a break, call for elections for a new president of OAA
- Great idea to have a strategic plan for aquaculture in the state of Oregon.
    - Multi-agency, multi-stakeholder effort, articulate desired state of aquaculture in Oregon
    - New officers and new strategic plan for this next year, as well as a new board of directors

Gil's Notes: **9:15 Randy Concluding Remarks**

- OAA has not been active the last few years and needs to be re-energized.
- Randy will dedicate the next year to determining strategic direction and actions
- Need to elect new officers (old officers need a break)
- Work on state-wide strategic plan; rationalize and streamline agency plan—governor will sign the plan

Presentation of Investment Strategies

Regulations and Permitting:

- Opportunities:
- Aquaculture Associations are important
- Facilitate dialogue, collective voice of the industry
- Transparent regulators
- Direct conversations w/regulators about what is required
- Updated regulations: state regulations are being updated - the process is starting

Challenges:

- Public opinion and politics
- This really guides what the regulators/agencies can do. We need to do outreach
- Loss of momentum - need more of us to come forward and provide support
- Personnel changes and transfer of issues - many are retiring

Takeaway:

- Better understanding of the regulatory concerns for OR and are positioned for productive conversations
- Legislative actions via aquaculture associations is necessary to fund the research/support that facilitates permitting
- Regulators are aware of the updates needed and many of these are in progress

Recommendations

- Hash out the discussion on dredging oysters and eelgrass
- Organize OAA members around the issues we'd like to focus on
- Organize regular dialogues with state and relevant federal agencies

Gil Sylvia's Notes on Regulations and Permitting:

- Civil discussion
- Slides (see slides)
- Update regulations – folks aware of what needs to change

- Public opinion and politics drive what regulators do
- Personnel issues and changing of folks
- Need research to fund the science to facilitate permitting

Investment and Finance

- Opportunities
  - Foundation that works with folks to acquire land
  - Venture Capital in Oregon - more willing to take a chance and help people work
  - Panelists connected so they can refer new growers to each other when a different type of funding might be more appropriate
- Challenges
  - Requirements for getting a loan include experience in business management, which is really challenging for new farmers
  - Lenders don't understand aquaculture
- Recommendations
  - Need to make information about resources available to new farmers
  - Mobilize extension in the state to pull in trained extension people that have training/experience in this kind of lending

Gil Sylvia's notes of the Financing and Business planning review sessions

- NWFC; Steward Foundation (Grants for land acquisition) and a variety of loans; Venture capital—Alexis Nelson—there is impact financing as well as traditional: "Patient capital"
- Traditional lenders – experience is critical requirement; venture capital willing to take more risk (slide deck) Different types of funding in life cycle of operation.
- Lenders don't understand aquaculture – need to educate lenders

<u>Business Planning</u>

- Challenges
  - Financing is really challenging
  - Lack of resources
- Opportunities
  - Really good panel of folks with experience that could provide resources to future growers
    - Phil LaVine - teaches courses at CCC and really has good knowledge about business planning - knows the right questions to ask
    - Laura Ferguson - consults on business planning and marketing and has a lot of good experience that would be helpful to new growers
  - SWOT Analysis
  -

Carole:

- Finance was a big issue
- Great group of panelists-lots of experience—Phil offers courses— people need to take his class! Phil is a great resource
- Need for extension resources

Aquaculture Technologies review sesión:

- Technology is the application of scientific knowledge to the practical aims of human life
- Recognize that technology built for one type of operation can be applied to other types as well
- Challenges
- Answering the consumer when they ask hard questions about impacts (e.g., do you use antibiotics? Are there microplastics in the fish?)
- Opportunities
  - Research to answer consumer questions to have data on major concerns
  - Water quality - cleaning water and waste management
  - Feed - total vegetarian diet (reduces mercury)

Recommendations

- Get together more to share information about technologies

Technology Session Review:

- Older technology can be applied to new species
- Applying new technology to other problems from what it was directed
- Challenges—must answer questions from consumers (e.g., safety, antibiotics; are there microplastics in fish feed; address hurdles; water quality (RAS), nutrition (Toms veg feed), feed fish 7x week to pregnant women; new vaccines development and communication to public; the conference helps to really meet folks

Workforce Development Review:

- Opportunities
    - A lot of programs in Oregon that we weren't aware of - Angee can provide information on all of these
    - Worksource Oregon
    - Work Opportunity Tax Credit
    - On the Job Training program
    - Northwest Oregon Works
    - Occupational Skills Training
    - Youth Work Experience
    - Get youth out on the farms to see what it's like to work there
    - Just a few examples of like 20 that they have available
    - Collaborations with local school can introduce aquaculture as a career through K-12 programs

Challenges

- Small industry can make maintaining a certificate program potentially challenging (instructors, facilities, cost, demand)
- Need to connect Service Providers (Worksource, Workforce Development boards) with Industry Leaders (aquaculture groups not on their radar, websites)
- It's very expensive to get into aquaculture, so even if you give all the training, they might not be able to build their own business

Takeaways

- There are a lot more programs available than we needed
- Industry support will be necessary
- Demand will drive opportunities, but opportunities may also drive demand

Recommendations

- ID the core requirements to have someone be effective on a farm
- ID existing opportunities to learn these skills at the highschool/community college/vocational level
- Very little aquaculture related education in Oregon at the CC level and no direct certificate programs
- Send job announcements to current CC programs - Mount Hood, Oregon Coast

Other Comments

- CA has two aquaculture programs - Redwoods Community College
- OSU leadership needs to hear from industry leaders - coming from the inside it will keep getting rejected
- Starting a named aquaculture program in a college is really hard - might not be its own department, but will have aquaculture faculty
    - E.g., Degree in biological engineering, but focus is actually on aquaculture engineering
- Other good aquaculture programs:
    - Bellingham Technical College has a good aquaculture
    - Virginia Institute for Marine Science
- Linn-Benton Community College

Marketing Review Session:

What is the critical component to marketing and strategy to aquaculture?

- Trying to bring a new species to OR is extremely difficult - they've actually failed at New Seasons
- Monetizing carbon as part of his strategy
- OR has a competitive advantage w/clean air and water - not the cheapest, but the best (brand Oregon is a key strategy)

What does market first really mean?

- Need to pull in younger shoppers - old marketing approaches won't work (they eat less animal protein)

- Advantages/Disadvantages
    - Aquaculture needs to point out that they are a environmentally friendly industry
    - Industry needs to work w/agencies together

- Oregon is not about scaling up to large size - they want to keep businesses small
- Aquaculture needs to work *with* commercial fisheries, not against them
- Humanely raised high quality protein branding is not enough - without the sustainability attributes, you won't be successful in marketing in Oregon - loved the idea of regenerative aquaculture
- If shrimp could be produced in Oregon, New Seasons could easily market that to customers
- Value-added products like seafood jerky would be great
- Breakout groups
    - Shellfish - Farm tours that merge wine w/shellfish tasting
    - Salmon - use shrimp from farms to produce pink color
    - Seaweed - create carbon offset markets

Investing in Aquaculture Review: Opportunities and challenges for the farmer/government

What opportunity did you learn/hear about during the workshop that you are most excited about?

- Workforce development
- Marketing aquaculture, not just the products
- Things that keep driving new growers are consistent
- The need to reach younger audiences; factoring in best management practices - new and different messages
- New technologies coming into play - applications beyond their initial purpose - how can they be applied in different ways
- Desire to learn about aquaculture - co-learning is really important
- Great people here in Oregon - this is important
- Opportunities can come out of hurdles - market differently
- Brand associated with clean water and Oregon being green
- People and the passion - so hard to get into aquaculture, but people are doing it because they have the passion
- OAA made a commitment to work on a strategic plan for Oregon, and elect new officials
- **Use of smartphone technology in the farms - could have applications for permitting/planning and monitoring**
- **Oregon Aquaculture Trail - tasting tour - partner w/Travel Oregon**
- Desire for young/new/freshpeople to get into the industry - very welcoming
- Current admin just made $$$ available to create fertilizer - opportunity to use fertilizer as a way to connect with farmers and have another income generating product

What aspects of Oregon's aquaculture industry do you now have increased confidence about and what has caused that shift?

- Opportunities for carbon offsets - come from the on the ground impacts (e.g., ocean acidification impacts on hatcheries led to a lot of legislative action in Oregon)
- Confidence in the workforce development aspect - aquaculture is a good opportunity - welcoming
- **Recent shifts in nearshore ocean conditions - decline in kelp, boom in purple sea urchins - led to aquaculture operations that weren't on the radar ten years ago**
- **People are going to come together to approach the legislature to get more funding and support for the industry - really educating on what the barriers to entry are**
- **Opportunity for OAA to start drafting letters for the legislature, but not sure this is really in the plan**
- **OAA could have a tradeshow with displays to educate them about the aquaculture industry**
    - **Need to feed them (over lunch)**
    - **Need to keep the messages concise (just 1 or 2 asks)**
    - **Talk to the lobbyists**

Who are the key supporters/partners in increasing investment in Oregon's aquaculture industry?

- **It would be nice to have a bank in Oregon at this meeting and to fund aquaculture more readily**
    - **Unlikely that they would show up to a meeting - need to do more targeted outreach by talking to the lenders and having the farmers work with them - connect them with extension**
    - **Banks that work w/ag and fisheries, and shellfish industry - good start**
- Small farmers are a key partner - needs to be proactive on the side of associations, agencies, etc. - hard to connect with these voices and it takes going to them
    - Key is to understand why people aren't coming to meetings
    - Growers might just be really busy (working at 4:00 am six days a week)
    - What is really important to them? How can you work with their schedule? How can you meet them in a location that works for them?
    - Important to make connections and build trust with these groups
- Oregon Farm Bureau
    - Outreach to get them involved - find the barriers
    - Work with the counties

- Are any aquaculturists members of the farm bureau?
- Oregon has Commodity Commissions for fisheries, beef, wheat, and hemp, but none for aquaculture - could be an opportunity to create one

- **Action Item: approach and ask for an aquaculture group to be created; don't need a plan, just need to talk to them - will bring more members so they might be interested**
- **Seafood Oregon Brand - include aquaculture in this group**
  - Fishermen - How do we bridge the connection between wild fisheries and aquaculture producers?
  - Opposition mainly stems from offshore operations and concerns for conflict
  - Consciously address this issue - companies like Pacific are embracing both - and work with commercial fishing industry as a partner
  - Fishermen also concerned about price - imported products are cheaper - send the message that issues are common for both groups (costs are higher to produce in the U.S.) - help to bridge the gap here
  - Commercial farmers and fishermen work together well as they experience common problems - natural allies with aquaculture as well if they can avoid the pitfalls
    - General public - we have a publicly owned coastline, public wants locally grown foods - they need to be a part of the conversation and we need to get the right messages out to them
    - **Seafood processing infrastructure** - someone that can cut and the fish after it's produced
    - How insurmountable are the costs of U.S. farming compared to imports?
- **Need to tell the story about imported fish not meeting the environmental standards we have in the U.S. - legislators, public, etc.**
  - Important to do marketing and outreach
  - Seafood needs to be affordable for the majority of people, and there are products you can get locally at an affordable price (SNAPed and other programs)
  - Farm co-ops can support each other

Who do you consider the key detractors/barriers to increasing investment?

- Land with water in Oregon and rules/regulations related to water access (virtually unavailable)

How does this issue relate to seawater? - Free to bring in seawater at the dock for tank-based and discharge as long as it doesn't impact water quality (dulse tanks)

- Bringing the seawater inland would probably be too expensive, and inefficient; makes more sense to make the seawater
- **Phil has contacts for Natural Resource Lawyers that are great at explaining water rights issues in lay terms**

Water quality/discharge regulations - standards are increasing in Oregon

- Very costly for small businesses
- The way DEQ implements the law is the same across all ecosystems which is really challenging for aquaculture

Environmentally-minded non-profits that spread out-dated information (and individuals that have the time to call their senators)

Bring them to the farm and personally show them that the issues have been addressed on the farm - it is sustainable

- Farmers are reluctant to have the public on their farm - important for associations/organizations to help with this messaging

- Groups like PETA are more difficult because their goal is for people to be vegan, it's not about good treatment
  - Lewis and Clark Law Schools is one of the leaders in animal rights and drafted a bill to control the slaughter of fish in aquaculture - didn't go through
  - OAA helped bring this down - most products are sold live, not slaughtered at the farm

On the agency side - what will you be taking home to work on with your agency? Last thoughts on the actions?

Developing best management practices - ODFW is moving forward with making best management practices

- Think about the terminology - don't make them regulations
  - Survey on grower perspectives of co-management of aquaculture - spatial differences (Brian Katz)
  - **Extension agents are a huge need - we only have Sea Grant extension, on a limited basis and focused on coastal issues, but we need a terrestrial aquaculture extension person at OSU**
    - Need legislative support - in competition with other needs/positions
    - Difficult to get new positions at the university level; need to make a case at the legislative level
  - Online courses/Community Ed w/a focus on aquaculture
    - There is an online aquaculture course at OSU, taught by Ford Evans

Opportunity to partner w/nurseries that have freshwater ponds on their property not in use (Phil asked a couple and they would be open to the idea)

- If you had a crystal ball, how do you see aquaculture in Oregon and the PNW in 50 years?

- Shift to include restorative aquaculture by the private sector (e.g., switching to Olympia oysters)
  - Federal funding coming to support carbon sequestration - oyster and seaweed might apply to this (NRCS)

- Model to connect people to the land, their bodies and food and to support black and indigenous students that don't have access to these opportunities - aquaculture can be a leader in creating opportunities
- **People who are interested in aquaculture coming together and sharing ideas - more of this in the future**
- **Phenomenon of backyard aquaculture - similar to chickens and composting trends right now**
- Return of Olympia oysters as a flourishing species in the estuaries to the point where public harvest is possible - driven by conservation mariculture
- Cooperative of oyster hatcheries and diversified locations - one die-off event doesn't create a crisis
- Lead agency figured out - ODFW or ODA; streamlined permitting process to remove barriers
- Trust re-established between the farmers and the regulatory agencies
- Develop policies to address invasive species on farms - ODFW requirement
- Increase access to pathologists
- Get extension agents to work directly with farmers
- Have the foresight, but be nimble enough to move with changing times, to create a secure industry that is providing food security and income
- New growing methods available with more interest from the public and younger people
- Increased adoption of technology in this space to help with major issues like waste management and water quality
- New emerging sectors that have commercial viability in the state
- In Oregon, thinking about a post-cascadia event - rebuilding of coastal access and the infrastructure to support shore-based aquaculture
- Global middle class expansion - demand for seafood is going up - Oregon needs to set itself up to be part of this market and meet the demands.
- More public-private partnerships working together into a warmer world with more people
- **Integrating "The Oregon Way" into the industry (enjoying aquaculture products onsite w/wine) - farm to table**
- **Statewide strategic plan and strong OAA**
- **Need for an aquaculture innovation center**

Gil Sylvia Review of Marketing:

What opportunities you are excited about:

- Workforce development opportunities
- Need to market aquaculture to a younger group—building in best management practices to demonstrate that
- New technologies like RAS – shifting marine species inland -- create new opportunities and choices
- Co-learning given diversity of aquaculture in Oregon—like agriculture
- Social Networking
- Diversity of aquaculture, clean water,
- Addressing Barriers to aquaculture requires passion –good to see that
- Develop strategic plan for Oregon—value of the plan is getting everyone together to work together—value of the planning process
- Use of smart phone technology –inteactive planning tools on line agencies and business using these
- Need an Oregon Aquaculture Trail
- Work with Travel Oregon
- Need for young people to get involved – very welcoming from the established

What actions moving forward?

- Carbon offsets for aquaculture—adopt/mitigate to climate changes
- Workforce discussions is great – knowing there are opportunities for young people
- Changes in ocean conditions creates opportunities for restorative and ranching aquaculture (kelp, urchins)
- (Missed some comments)
- Connect with politicians

Who are the partners?

- Need finance and banks -- but must be proactive with training banking sector—great comment by Carole
- Small farmers are important – how to connect with them—lean about their needs—go to them in their areas—they will turn out if you address their needs
- Where is the Oregon Farm Bureau??? You have to make them involved? Needs authentic communication. Concept for strategic plan—core partners and get them involved.
- Can fishermen work together with aquaculturists? — advantages if cooperativeeration
- General public needs to be brought in
- Cooperativeerative needs – seafood processing, feed, --CA has live fish no place to process fish—path dependency
- Lack of processing a big constraint—is this a business opportunity (mobile processing???)

Barriers: How to address costs—U.S. not competitive – Carole ran the costs for VietNam – the key is not labor but regulation—do we require imported fish to be held to same standards.

- Farms can cooperativeerate to buy feed to save money – alligator farm example
- Barrier is land with available quantity and quality of water
- Water rights issue for seawater-no charge taking seawater

- Barriers are the NGO groups and their anti-aquaculture narrative
- Tell the farmer stories
- Amy and Angee pointed out the Sea Grant report -- website—barriers to aquaculture—how are other states addressing these –broad recommendations
- Steve developing "Best Management Practices" for aquaculture—QR codes on the table—Carole emphasized need for follow up
- Steve—need to go their farms to have discussions
- Need to develop best practices in conversations with industry
- Must be positive and productive
- How do we ramp up students—chicken versus the egg.
- There is a House Aquaculture Caucus in Washington D.C.

A look into the future:

- Steve Rumrill wants conservation Mariculture to grow—private industry (native oysters)
- State-by-State Nature Conservancy and state will share some of the costs – but fully prescribed
- Small farms for aquaculture to train students (all types) to be a connect to the land
- Cooperativeeration of hatcheries in case of disaster
- Get the lead agency figured out—one permit process needed—get trust reestablished – get security to minimize invasive species issues—need access to a pathologist for fish disease—need extension agents
- The agency must be nimble. Have adaptive 5 year plans.
- Increase in new technologies, agencies work collaboratively with other agencies.
- Improve feed conversions diversify
- Turn effluent into valuable products
- Carole: double production in five years in all sectors
- Seafood demand will grow and Oregon can be part of that

Annex I. Conference Presentations *(digital version only)*

Oregon and Pacific Northwest Aquaculture Development Conference "Investing in the Future of Seafood" - Forum on Strategic Tribal Aquaculture & Food Security

Sourcing and Marketing Sustainable Aquaculture - Daisy Berg

Investing in Aquaculture - Carole R. Engle, Ph.D.

The Case for Aquaculture - Paul Zajicek

Portland District Regulatory Branch Authorities Pertaining to the Regulation of Mariculture Activities - Brielle Cummings

Overview NOAA's Role in Aquaculture - Dan Tonnes

Breakout Session: Regulations and Permitting - Kellen Parrish

Breakout Session: Workforce Development - Angee Doerr

Investing in Aquaculture: Opportunities and Challenges for the Farmer?

Role of Aquaculture Associations - Carole R. Engle, Ph.D.