



A REPORT OF

The Oregon Aquaculture Association
&
The Oregon Aquaculture Advisory Group

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Guidelines and References for Aquaculture in Oregon

*Considerations when strategically
developing an innovative aqua farming
program*

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Preface

The outcome of our work is intended to promote the development of a network of profitable and sustainable aqua businesses across Oregon making a positive contribution to the state's economy and to the livelihoods of Oregonians.

Users' Guide

This document is intended to help those crafting the plan for the State of Oregon's aqua farming program.

To assist you in your efforts, it is divided into four parts:

Section I—outlining what some other states have done, summarizing the aquaculture plans from five diverse states;

Section II—laying the groundwork, defining the suggested approach to designing a plan;

Section III—describing possible plan elements starting with major themes and then breaking these down into subunits, many of which are, by their nature, overlapping and crosscutting;

Section IV—presenting selected historical material, references from recent work relating to Oregon aqua farming that may be useful to constructing a plan (N.B.: this is not a comprehensive assemblage of all recent references)

Section I: Before going ahead—what others have done

Not reinventing the wheel

It is useful to see what other states have done. Here are some links to efforts at crafting a strategic pathway for developing a state's aquaculture program:

- Massachusetts (1995) <http://www.mass.gov/eea/docs/czm/publications/aquaculture-white-paper-and-plan.pdf>
- Ohio (2009) http://www.agri.ohio.gov/public_docs/forms/Aquaculture/Ohio%20Aquaculture%20Plan%20Final%2012.10.pdf
- New Jersey (2011) <http://www.nj.gov/agriculture/pdf/aquacultureplanupdate.pdf>
- Michigan (2014) http://michiganaquaculture.org/wp-content/uploads/2015/01/2014-MAA-Strategic-Plan_Final_141215.pdf
- Maine(2015) <https://www.agriculture.gov.ie/media/migration/customerservice/publicconsultation/sustainableaquaculturedevelopment/NatStratPlanSustAquaculDevelopdraftconsult100615.pdf>

There are many sources of information about aquaculture planning¹. These five states represent a subset of states that, beginning in the 1980s, have defined state aquaculture plans. They have been selected because of the completeness of their efforts—some see plans as more limited, synoptic documents, basically an enhanced census of the existing aqua farming program.

A more holistic view is needed.

There is a common group of issues that needs to be addressed by any aquaculture plan if it is to fulfil its needs and meet the expectations of others'. Plans need to embrace the wider spectrum of subjects including not only the technical concerns of what crop to grow and how it should be grown. There are fundamental social, institutional, ecological, economic, and financial components of a plan required if it is to go beyond guiding those directly invested in the sub-sector and accommodate those indirect stakeholders who are concerned about conservation, social impact, and perhaps simply visual pollution.

We believe the five plans referred-to above provide a good balance to both macro and micro issues, serving as examples not only of approaches and methodologies that could be applied to the Oregonian situation, but also perhaps illuminating different aspects of an aquacultural program that have heretofore not been part of Oregon's efforts.

To provide a common platform to review the five reference plans, the following pages provide a brief summary of each. The reader is, however, encourage to follow the above links and examine each plan in its entirety.

¹ Other references of interest might include:

- <http://www.crc.uri.edu/download/FishAquaGuide14Jun13Final.pdf>
- https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiv0tenjdPZAhWkxYMKHYIEA3gQFgqpMAA&url=https%3A%2F%2Fwww.highland.gov.uk%2Fdownload%2Fdownloads%2Fid%2F16929%2Faquaculture_planning_guidance.pdf&usq=AOvVaw2I2PtQweclyb8JcRIT5ZyJ
- <https://vfa.vic.gov.au/aquaculture/aquaculture-planning-guidelines/report-aquaculture-planning-guidelines>
- <https://portals.iucn.org/library/sites/library/files/documents/2009-032.pdf>
- <http://www.fao.org/docrep/012/i1601e/i1601e00.pdf>

Massachusetts Plan

Name of State Aquaculture Strategic Plan: Aquaculture White Paper & Strategic Plan

Year Initiated: September, 1995

Lead Organization: Massachusetts Office of Coastal Zone Management

Background Situation:

The Aquaculture Strategic Plan explained existing aquaculture efforts in Massachusetts and provided both short and long-term recommendations. Is the tool that is needed to form a framework to support aquaculture activity, both private and public, and to encourage the growth of this industry during a critical stage of development. There was not currently a full time staff member in State government responsible for any aspect of aquaculture regulation or economic development.

Goals/Mission/Objectives:

The Aquaculture Strategic Plan includes 68 specific recommendations for the State to implement to overcome existing constraints and take advantage of opportunities in the aquaculture industry.

Recommended Actions (List top 5-8):

- Initiate regulatory streamlining recommendations
 - Establish a broad-based Aquaculture Advisory Group to advise the Aquaculture Coordination Team
 - Work with municipal officials, the Department of Marine Fisheries, and shellfish aquaculturists to improve the prospects for obtaining financing for aquaculture ventures
- Implementing Organization/Budget/Time Frame/Other Key Implementing Issues/:**
- Establish an interagency Aquaculture Coordination Team to oversee implementation of strategic Plan and to guide State aquaculture activities
 - Establish an Aquaculture Coordinator position to serve as a single point of entry for all existing and prospective aquaculturists. The Coordinator is responsible for spearheading the implementation of this plan
 - Direct all aquaculture related bond appropriations toward priorities identified in this plan

Progress to Date (if available):

The Aquaculture Strategic Plan had a five-year horizon, concluding in the year 2000. However, I was unable to locate on line any follow-up report.

Other Key Planning Information:

The plan was developed by three working groups: the Environmental Review Working Group, the Regulatory Reform Working Group and the Economic Development Working Group

Ohio Plan

Name of State Aquaculture Strategic Plan: Ohio Aquaculture Plan

Year Initiated: Published 2009 (took 2 years to develop, formed a task force, did an interim Industry Analysis report)

Lead Organization: Ohio Department of Agriculture

Background Situation:

Status, Identified Needs, and Key Recommendations were developed in these areas: 1) Aquaculture Health, Food Safety and Marketing, 2) Aquaculture Business, 3) Aquaculture Education, and 4) Aquaculture Research.

Excerpts: Aquaculture is poised to expand rapidly in Ohio. Ohio fish farmers reported \$6.6 million in sales for 2007. This is up from \$1.8 million in 1998 and \$3.2 million in 2005, representing an annual sales growth rate of 8 percent. The largest volume of sales belonged to farms selling sportfish and gamefish with 75 farms reporting \$2,455,000 in sales. In 2008, there were a total of 272 aquaculture and baitfish dealer licenses purchased through the Ohio Division of Wildlife (one farm may have multiple permits). Of the 272 permits issued, there were 207 aquaculture, 196 bait dealer and 124 transportation permits. In the North Central Region, Ohio currently ranks 3rd of 12 states for total sales of aquaculture products, up from 7th in 1998. Ohio has the natural resource base (water availability), human capital (labor), proximity to the major consumer markets, and competitive production advantages for specific species (i.e. bluegill, yellow perch and largemouth bass).

Goals/Mission/Objectives: This plan will be used as a guideline to prioritize legislation, initiatives and programs to maximize resources available to the industry.

Recommended Actions (List top 5-8):

- Create a State Aquaculture Coordinator position within the Ohio Department of Agriculture.
- Provide support for the Ohio Department of Agriculture Animal Disease Diagnostic Laboratory.
- Maintain support for the Ohio Aquatic Animal Health Advisory Committee.
- Develop a revolving loan program.
- Conduct a business feasibility study for aquaculture in Ohio.
- Develop enterprise budgets for aquaculture facilities in Ohio.
- Continue to support and promote aquaculture education.
- Finalize the Ohio State University Aquaculture Extension "Triangle Plan."
- Provide on-farm site consultation and training.
- Continue to support funding for applied and basic research.

Implementing Organization/Budget/Time Frame/Other Key Implementing Issues/:

See Funding Matrix

Progress to Date (if available):

Other Key Planning Information:

Plan was developed by a Task Force including: Ohio Department of Agriculture, Ohio Aquaculture Association, Fish Farmers of Ohio, Hocking College, United States Department of Agriculture, Ohio Veterinary Medical Association, Ohio Department of Natural Resources, Ohio Environmental Protection Agency, Ohio Farm Bureau Federation, Ohio Sea Grant College Program, Ohio Agricultural Research & Development Center, OSU South Centers at Piketon, OSU Extension

Funding Matrix:

Funding Matrix for the Ohio Aquaculture Plan

Entity	Identified Need	Annual Cost	Source of Funds	Initial Year Funding
Ohio Department of Agriculture	Aquaculture Coordinator	\$100,000	ODA Budget 1st Year / Legislative Initiative	\$100,000
	Animal Disease Diagnostic Lab Equipment		Legislative Initiative	\$250,000
	Animal Disease Diagnostic Lab Personnel	\$100,000	Legislative Initiative	
	Ohio Aquatic Health Advisory Committee	\$5,000	Legislative Initiative	
	Feasibility Study		Legislature and Aquaculture Associations	\$35,000
	Enterprise Budget Development		Legislature and Aquaculture Associations	\$35,000
	Revolving Loan Program		Agriculture Venture Rural Rehabilitation	\$250,000 - 1 st Year \$250,000 - 2 nd Year
ODA TOTAL		\$205,000		\$955,000
Hocking College	Hocking College Infrastructure Improvements		Legislative Initiative Capital Budget	\$450,000
HC TOTAL				\$450,000
Ohio State University	OSU Extension Personnel	\$100,000	Legislative Initiative	
	OARDC Research	\$200,000	Legislative Initiative	
OSU TOTAL		\$300,000		
COLUMN TOTALS		\$505,000		\$1,400,000
Sources of Funding		Annual Request		Initial Year Funding
ODA				\$600,000
Ohio Legislature	1st Year	\$400,000	Biennial Budget	\$310,000
	Subsequent Years	\$500,000	Capital Budget	\$450,000
Aquaculture Associations				\$30,000

New Jersey Plan

Name of State Aquaculture Strategic Plan:

Opportunities & Potential for Aquaculture in New Jersey, an update of the Aquaculture Development Plan

Year Initiated:

Completed in 2011—update of the 1992 plan

Lead Organization:

Department of Agriculture—serving as chair of an Aquaculture Advisory Council (7 members from public sector and 6 from private—2 each appointed by the Governor, Senate and State Assembly)

Background Situation ((3-5 sentences):

Aquaculture in the state is briefly reviewed, technically and as a business. Aquaculture potential is assessed. Regulations are summarized and analyzed. The document concludes with 10 challenges, providing a strategy for each, that do not require additional funding. It then addresses 9 challenge/strategy couplets that do require additional funding.

Goals/Mission/Objectives:

Purpose: objectively discuss issues that have impacted aquaculture development in New Jersey, both negatively and positively. Recommended will be future opportunities and actions to advance aquaculture in New Jersey, as an activity that is both environmentally sustainable and economically successful.

Recommended Actions (List top 5-8):

No funding: Governor office provide interagency oversight, coalesce aquaculture regulations, maintain aquaculture advisory council

Funding required: Develop marketing initiative, develop high potential areas, develop industry-based funding mechanism

Implementing Organization/Budget/Time Frame/Other Key Implementing Issues/:

Ag Dept (Office of Aquaculture Coordination) issues “Aquatic Farmer License” and responsible for development, marketing, promotion and advocacy. Many other agencies involved. A CC designated as Aquaculture Technology Information Center. University also designated as Aquaculture Technology Transfer Center with ties to Sea Grant.

Progress to Date (if available):

Under implementation as this is an update (N.B.: original '92 Plan not available)

Other Key Planning Information:

As an update, there is a change in focus from aquaculture as a fisheries activity to it being an agricultural pursuit. Proximity to markets is stressed. A robust aquaculture industry is seen as enhancing the image of the state’s core economic asset of shore tourism.

Michigan Plan

Name of State Aquaculture Strategic Plan:

“A Strategic Plan for a Thriving & Sustainable Michigan Aquaculture”
Michigan Sea Grant Integrated Assessment – Project Report

Year Initiated: 2014

Lead Organization: Michigan Sea Grant; Michigan State University; Originz LLC

Background Situation (3-5 sentences): Michigan saw a growing trend in the desire to have locally produced, healthy seafood as bigger part of our diets. At the same time, they recognized a need to grow their aquaculture industry. To do that Sea Grant assessed four scenarios for growth by the year 2025. The assessment included a base scenario that looked at minimal growth of the sector, contributing little if any to the global or local food demand, to a thriving sector scenario with Michigan contributing \$1 billion or more of farm gate product.

Goals/Mission/Objectives: Grow aquaculture into a major industry sector by 2025 that complements our natural resource conservation and recreation uses of water

Objectives:

1. Social acceptance and political will
2. Achieving trust: branding, regulation, & certification
3. Invest: research, education, & extension
4. Design for sustainability: RAS/Cage/flow through systems
5. Leadership: a sector champion
6. Improved business plans
7. Financing: attract new investors

Recommended Actions (List top 5-8): see page 8 for details

1. Expand and establish aquaculture enterprises along the supply chain
2. Open for business: aquaculture endorsed in the MI great lakes water strategy as needed economic activity
3. Engage tribal leadership and state regulators in great lakes water usage
4. Simplify permitting and regulation
5. Drive RAS operations cost reduction
6. Funding sector leadership
7. Attracting investors and financing growth

Implementing Organization/Budget/Time Frame/Other Key Implementing Issues/:

Core values: sustainability, economic success as key to funding natural resource stewardship investment, trust – stakeholder support

Time frame: by 2025

Progress to Date (if available): N/A

Other Key Planning Information:

Appendix 2 lays out how they developed the strategic plan

Section II: Beginning—the overall approach

Introduction: why a strategic plan

Aquaculture is an increasingly important sub-sector; both around the world and across the United States. As the US seafood trade deficit soars, there is growing pressure to expand aquacultural production. This increase should lead to many benefits, including augmenting local food supply and generating employment. Unfortunately, aqua farming operations have not always proven to be good stewards of the resources upon which they rely—nor reliable suppliers of high quality products upon which the public relies. These missteps need to be understood in order to create the right framework for Oregon and guide today’s investments. This strategic plan will provide such guidance. In creating it, we aim to propose the best and most sustainable use of natural, human, and financial resources to achieve the expected outcomes of expanded local seafood supply and improve overall economic development while safeguarding the ecosystems that make this possible.

Background & Setting

Oregon has a very modest aquaculture program consisting mostly of oyster producers and trout farms for stocking private lakes and ponds. Past analysis² of this program has concluded that the Oregon aquaculture program is “under sized” given the existing natural and economic resources. There is room for the program to be significantly larger and more diversified. With noteworthy local and external markets, generous aquatic assets covering a spectrum of environments, and ever-improving technologies, there is potential for a considerably larger aqua farming program in Oregon. Failure to capture these opportunities has often been attributed to a sizeable knowledge gap regarding aqua farming in the state. This shortfall in awareness covers a wide range of areas from a lack of academic instruction on aquaculture to a scarcity of science-based facts to counter a negative legacy to an insufficiency of data to demonstrate the bankability of investing in aqua farming in Oregon.

This strategic plan sets forth actions to address constraints and optimize opportunities.

Strategic Structure/Core Requirements

Strategies describe the ways and means to reach targets or objectives. They also describe the roles and responsibilities of the various stakeholder groups comprising the sub-sector such as the public and private sectors as well as civil society. Strategies answer the questions “*who*” and “*how*”? Plans are more detailed than strategies; answering the questions of “*where*” and “*when*”. This strategic plan draws on both strategic and planning aspects.

To be successful, we need a common program to encompass Oregon aqua farming; and although aquaculture is undertaken in a broad mix of environments and with an

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<http://www.oregon.gov/ODA/shared/Documents/Publications/MarketAccess/AquacultureUsersGuide.pdf>

<http://www.oregon.gov/ODA/shared/Documents/Publications/MarketAccess/AquacultureInvestment.pdf>

assortment of organisms, there are many common denominators. For economies of scale and uniformity of action, it is important this strategic plan cover the entire Oregon program. This will undoubtedly require crossing institutional, political, and traditional borders. Thus, an integrated approach is needed, and our strategic plan will facilitate this methodology³.

Central Issues

Through reviewing similar strategic documents from established programs, we recognized four central issues or **themes** to consider when building a resilient program:

- 1) Strong institutions;
- 2) Suitable legal and regulatory framework;
- 3) An enabling environment; and,
- 4) An educated citizenry

These themes form the structure of our strategic plan. Each theme is subdivided into a group of factors that, in the aggregate, contribute to the theme's impacts.

Crosscutting Elements

In addition to the themes, there are crosscutting matters. While most of the components of an aqua farming program are to some extent intersecting, the chief subject for the current discussion is education. Education enters into all dimensions of the program—including formal education, extension, media, and other conduits.

Crosscutting elements may well affect many of the factors composing each theme.

Organizational Framework

For each of the levels of this strategic plan, a common framework is applied. Each theme will be assessed from two vantage points:

- Context and guiding principles, and
- Strategic approach

Proposed Goal

The aim of this strategic plan is to identify the pathway for expanding and diversifying the Oregon aquaculture program. Specifically, the target is to expand the program by fivefold, reaching to total statewide value of the aquacultural harvest of \$60M⁴. At this magnitude of economic activity, aqua farming would be roughly at a par with the crab fishery—enough of a contribution to the state's economy to pull-down services and bring-in investment.

³ Additional reading: <https://onstrategyhq.com/resources/how-to-write-a-strategic-plan/> , <https://www.thebalance.com/strategic-plan-elements-2276139> , <http://www.balancedscorecard.org/BSC-Basics/Strategic-Planning-Basics> , <http://www.dummies.com/business/strategic-planning-kit-for-dummies-cheat-sheet/>

⁴ USDA (2013) cites the value of aquaculture sales for Oregon as being \$12M (Idaho \$48M, California \$83M, and Washington \$233M). ODA (2017) indicates the value of the state's hops harvest as \$65M, crab harvest is \$56M, and pear harvest \$33M. The proposed level of \$60M is in the range of mid-sized agricultural activities.

Section III: Thematic approach

Theme 1: Strong Institutions

CONTEXT & GUIDING PRINCIPLES

Institutions including public and private organizations and agencies that have both direct and indirect impacts on the state’s aquaculture activities are key to building a program. Yet, it is the activity itself that must achieve a certain level of relevance for these institutions to invest their time and energy into support efforts. In other words, there is a production threshold the aquaculture must be capable of reaching before the institutional actors judge that their intervention is warranted.

The Goal of this Strategic Plan is to create the conditions where statewide aquaculture production will increase to a level suitable to attract the necessary institutional support.

Evaluations of the current status of aquaculture in the state have noted a lack of coordination. This is attributed to both the large number of actors and the relative marginalization of the program due to current low levels of production.

STRATEGIC APPROACH

*Given many institutions have a stake in a statewide aquaculture program, it is necessary to formally designate a lead institution. Similarly, in view of the quantity of actors, processes need to be established where operators can have a designated **exclusive entry point** initiate contact with the state program. Throughout, it is essential to build processes that reinforce **private-public partnerships**—ensuring participation and inputs from all stakeholders. Taken together, these steps should improve the program’s **coordination** and accountability.*

State Agencies

CONTEXT & GUIDING PRINCIPLES

A number of state agencies are directly involved in the aqua farming program (Appendix 4). Many of these have a regulatory or monitoring role (Theme 2). In Oregon, aquaculture is agriculture. This is the core principle. It is also important to cater to the clients’ needs (Theme 2)—i.e., state agencies need to provide services and not solely be overseers.

STRATEGIC APPROACH

As **aquaculture is agriculture**, Oregon Department of Agriculture (ODA) should be the lead agency. Inter-agency structures are needed, revolving around this nucleus and organized to provide the investor with a clear path to developing aqua businesses. A state level “**pre-investment conference**” or similar mechanism, regrouping the investor(s) and agencies, has been used both previously in Oregon and elsewhere to align all the actors and spotlight the pathway ahead. Outreach and extension (Themes 3 and 4) are key functions at state level. Moreover, state agencies need a common platform and tools to address the needs of the program in a uniform, coordinated, and efficient manner.

Local Government

CONTEXT & GUIDING PRINCIPLES

In the current context, aquaculture is considered as agriculture but, when new investments are accorded at the state level, these are “conditional” on the corroborative approval from local governments (e.g., county, city, etc.). It is reported that most often the local authorities do not have the expertise to review proposals and revert to their state colleagues—this process adding to the time required to evaluate a new project.

STRATEGIC APPROACH

Local inputs should be sought without delaying processing and without relying on expertise that is not available at local levels.

Other Public-Sector Actors

CONTEXT & GUIDING PRINCIPLES

There is a variable group of other government actors that interface with aqua businesses ranging from federal to Tribal, and in some cases regional. These participants need to be identified, their roles clearly spelled-out, and their processes articulated.

STRATEGIC APPROACH

The nomination of a lead agency would cover the full array of public-sector actors—the non-state component needing to be folded-into the expedited **one-stop-shop** and their key parameters including in any monitoring systems.

Private Investors

CONTEXT & GUIDING PRINCIPLES

Given the current exiguous state aqua farming program—both in terms of overall production and diversity of products—attracting private investment is major aim. This need notwithstanding, it is a basic principle that aqua farming operations need to be responsible and sustainable. While economic and financial viability are fundamental, symbiosis with the ecosystem is equally basic—this covering social and ecological compatibility within the operational environment.

STRATEGIC APPROACH

Investors require **science-based knowledge** and, once this knowledge has been used to make a positive decision, **user-friendly processes** to follow that do not overly burden the would-be operator. Additionally, investors need to be partners in the monitoring of any operation. It is not realistic to rely totally on public agencies to collect data and monitor events—a part of the investment approval process needs to be stipulations as to **reporting responsibilities** for investors.

Civil Society/Sharing the Commons

CONTEXT & GUIDING PRINCIPLES

Aquatic and many terrestrial resources are part of the commons. This reality much the taken into account when planning and implementing aqua farming operations. Stakeholders—real and perceived—need to have avenues to review actions, receiving adequate assurance that the resources of the commons are secure.

STRATEGIC APPROACH

Transparency and **knowledge** are the key to satisfactorily sharing the commons: shared responsibilities and shared benefits. Stakeholder groups need to be identified, quantified, and brought into the discussions.

Civil Society/Organizations

CONTEXT & GUIDING PRINCIPLES

The aquaculture program engages directly and indirectly a number of civil society organizations. The leaders in direct involvement are operator associations. In the case of Oregon, this presently includes the *Pacific Shellfish Growers Association* (PSGA), the *Oregon Aquaculture Association* (OAA), and the *National Aquaculture Association* (NAA). These groups have indispensable functions in supporting operators technically (e.g., chiefly by facilitating access to appropriate information) and politically (e.g., lobbying for favorable policies and regulations). PSGA and OAA have been essential to supporting the program to date and their efforts need to be bolstered and structures so as to optimize impact and sustainability. There are also a number of other organizations which may have a vested role in specific operations at a specific site—these needed to be incorporated into planning and operations as suitable.

STRATEGIC APPROACH

Many core functions of a program can be facilitated by, or even overseen by OAA and/or PSGA—these **functions** need to be **formalized** and necessary **tools** put at the disposal of the associations. These directly-engaged groups need to have a **seat at the table** whenever aquaculture is under discussion—indirectly-involved groups also having a seat when warranted.

Education/Research/Extension-Outreach

CONTEXT & GUIDING PRINCIPLES

The trio of actions—education, research, extension—is typically a traditional role of Sea Grant and Land Grant institutions—in the case of Oregon: Oregon State University. At present, there are considerable research actions, albeit these undertaken with limited human and financial resources. Extension, on the other hand, is nearly absent— aqua farming outreach totally absent from all but some limited coastal areas. The current *Marine Studies Initiative* should strengthen these functions as they relate to aquaculture.

STRATEGIC APPROACH

These traditional functions need to be **reinforced** and **linked** to the needs of the Oregon aqua farmer. This will likely entail joining hands with other institutions—both public/educational and private/operational.

Theme 2: Suitable Legal & Regulatory Framework

CONTEXT & GUIDING PRINCIPLES

Appropriate legal and regulatory frameworks are necessary. Given the small and relatively monolithic structure of the Oregon program, the current regulatory arrangements do not accommodate optimally many current scenarios. Moreover, a number of the legal and regulatory issues were drafted years ago—in the interim, many concerns have arisen including shortages of what once were abundant resources (e.g., water and land).

Realistic regulatory and legal “packages” would, by necessity, involve a number of local, state, and federal agencies; probably as well as civil society. This array of actors and actions needs effective coordination.

STRATEGIC APPROACH

*New rules are needed to fit new circumstances and new situations. Additionally, as indicated for Theme 1, an **exclusive entry point** should be built into the program to facilitate upstream and downstream flow of information as well as minimize difficulties for investors.*

*Oregon is not operating in isolation—many states have been supporting large aquaculture programs for years. Furthermore, many national and international organizations provide oversight, identifying **best practices** as well as practical tools for promoting and following these practices. Existing elements should be folded into the present work.*

*Monitoring of the application of rules requires comprehensive and current **data sets**. Present data collection, collating, and analysis is incomplete and inefficient—better approaches are needed. Moreover, defining rules is an iterative process that changes with a rapidly changing program. Those engaged in these processes need mechanisms to update and revise elements as need be.*

Responsible Action

CONTEXT & GUIDING PRINCIPLES

Aquaculture must be done responsibly. It is understood this obligation is a moving target—aquaculture technologies are changing rapidly, often negative sides of otherwise positive innovations only visible after a considerable gap. It is frequently not possible to act preemptively. Nonetheless, it is possible to try to include best practices in all operations.

STRATEGIC APPROACH

Incorporation of **best practices**, appropriate and holistic **oversight** including good record keeping, combined with prerequisite monitoring **tools** are all needed to be promote and follow responsible action.

Conservation & Development—the “Oregon Way”

CONTEXT & GUIDING PRINCIPLES

What may be considered as the “Oregon Way”, may also be seen as wanting the best of both worlds. While conservation of resources in as close to a natural form as possible is

a high priority, using these resources to launch economic growth is also a high priority. This teeter-totter requires careful balance on the part of all actors; facilitating responsible investment while maintaining the resource base.

STRATEGIC APPROACH

Achieving a program that is acceptable to the citizenry requires identifying strategic action that maintains the delicate **equilibrium between growth and conservation**. **Science-based knowledge** is the best starting point. Effective and expeditious **channels of communications** (feed-forward and feedback) are essential—these operating over the medium- and long-term.

Legislation

CONTEXT & GUIDING PRINCIPLES

Aqua farming engages a multiplicity of legal “zones”—federal, state and local. As a program develops, the roles of various levels of legal authority become more apparent; the direct and indirect impacts (positive and negative) more visible. However, in the present case with no substantive program, much of the consideration as to the roles of various levels of government is purely speculative—often based on incomplete information.

Other more advanced and diversified programs may serve as models, but ultimately the links between different levels is an arrangement that needs to be specific to the state and her unique agencies, with established mandates.

STRATEGIC APPROACH

A **one-stop-shop approach** should be highlighted as the aim. This will formally link those agencies, at all levels, that are involved in aquaculture oversight. The entry point should be at the state level through ODA given aquaculture is agriculture. This would likely require an iterative process starting with a formally established **pre-application conference** for each operation. Steps need to be planned for this relatively generic conference to evolve into a more multifaceted one-stop-shop.

As **process** is addressed, **content** also needs to be upgraded to meet the current needs of major stakeholder groups. This regards formal legislature-passed legislation as well as prevailing rules and standards. This can be challenging sine once size does not fit all—we are dealing with a large number of possible production systems and operating environments. Legislative and regulatory measures need to be flexible enough to adapt and adopt to this business model.

Protocols & Best Practices

CONTEXT & GUIDING PRINCIPLES

While aquaculture is new, it is no longer in its infancy—producing roughly half the aquatic products eaten by people around the world. Over the past five decades, many ventures and adventures have been tried. There is now a growing body of solid information about what works and what does not—what is responsible and what is not. A number of

organizations⁵ have been funded to identify and assist with implementing best practices. There is also data available as to prevailing protocols and regulations⁶.

STRATEGIC APPROACH

It is incumbent on planners in the current exercise to review existing **science-based information** to incorporate a foundation that incorporates **relevant best practices and policies**.

Food Safety/Consumer Protection

CONTEXT & GUIDING PRINCIPLES

This subject is of growing importance, with considerable effort invested in traceability and, eventually organic aquaculture products (USDA does not currently recognize organic aquaculture). Oregon through ODA has a good base with the on-going investment in food safety for shellfish products. It could be assumed (verification required) that this base could be expanded to include the full range of aquatic produce grown in the state.

STRATEGIC APPROACH

As with best practices, the relatively low level of current aquacultural development facilitates the incorporation of **state-of-the-art tools** with a **shared responsibility** between operator and oversight agent.

Monitoring & Oversight/Personnel

CONTEXT & GUIDING PRINCIPLES

Assistance and surveillance are important parts of an aquaculture program—assisting in identifying the best way to raise and market a crop while overseeing the process to ensure it is applied responsibly. Typically, these functions fall on the government aquaculture extension service—something that does not exist in Oregon. Present dedicated personnel are limited to food safety.

STRATEGIC APPROACH

It seems unlikely in the near-term, and improbable in the longer term, that a fully-staffed state extension service will be established. These functions will likely require well defined **public-private partnerships** engaging not only public agent and private operators, but also civil society organizations such as the Oregon Aquaculture Association and other structures regrouping stakeholders (e.g., watershed councils⁷, STEP volunteers⁸, FFA Oregon⁹, ports¹⁰, etc.). Strategically, it is necessary to craft multifocal **surveillance**

⁵ <https://www.bapcertification.org>, <https://www.aquaculturealliance.org/what-we-do/bap-certification/>, <http://www.seafoodwatch.org>

⁶ <http://www.fao.org/fishery/collection/nalo/en>, <https://www.epa.gov/npdes/npdes-aquaculture-permitting>, <http://nationalaglawcenter.org/research-by-topic/aquaculture/>, <https://fishculture.fisheries.org/resources/federal-aquaculture-regulations/>, <https://www.fisheries.noaa.gov/topic/aquaculture/regulation-policy>

⁷ <http://www.oregonwatersheds.org>

⁸ <http://www.dfw.state.or.us/fish/step/>

⁹ <http://www.oregonffa.com>

¹⁰ <http://www.oregonports.com>

mechanisms that provide the needed data and feedback without hampering operations. It is unclear if these arrangements can be applied to technical assistance?

Monitoring & Oversight/Tools & Record Keeping

CONTEXT & GUIDING PRINCIPLES

Monitoring and oversight are not only about collecting needed verifiable data and promoting responsible farming; these are also key components of an aqua farming program that wants to benefit optimally from high-value markets. Issues such as certification and eco-labeling become important economic questions that require substantiating data and oversight. Current record keeping, however, is woefully incomplete. Composite figures for the Oregon program can only be found from USDA—these with an uncertain margin of error.

STRATEGIC APPROACH

Public-private partnerships are probably the avenue needed to apply many of the available monitoring tools including **spatial analyses** and **significantly expedited access** to existing information sources. Yet, there is need for a focal point, a common repository. Logically this would fit within the mandate of ODA—practical measures needed to be able to achieve this aim.

The Investor as the Client

CONTEXT & GUIDING PRINCIPLES

While a plan needs to promote responsible operations and safeguard resources, it needs to also attract investment—the investor is a client of those agencies and groups supporting aqua farming across the state. This, in some cases, may require a change in approach. Investors proposing aquaculture ventures have often been vilified. To obtain our goals, we need to work with investors, fostering high levels of interest while channeling these energies in ways that are best suited to local conditions.

STRATEGIC APPROACH

Oregon needs to attract investors. This means a user-friendly plan that provides the needed buffers and guardrails while still offering the needed economic stimuli.

Theme 3: Enabling Environment

CONTEXT & GUIDING PRINCIPLES

Aqua farming is an innovation in Oregon. At this embryonic stage of programmatic development¹¹, it is crucial to foster an enabling environment that promotes responsible aquaculture across the state.

Investment opportunities exist at the nexus of a variety of components that make up this supportive environment. Chief among these are markets (of several forms), technologies, knowledge, and capital¹². Experience has shown that in many cases, markets are of paramount importance.

Oregon may be categorized as a state with sub-optimal natural conditions for growing a variety of aquatic crops; frequently judged as being too cold for warm-water culture and too warm for cold-water. However, rapidly advancing technologies allow for considerable buffering against unsuitable prevailing climates—these technologies at times also offering buffers against undesirable impacts on the natural ecosystem. The choice of systems to employ in Oregon is of the utmost importance.

STRATEGIC APPROACH

*A positive environment enables investment and investment is **market-oriented**—thus, activities need to be market-driven. In addition to prerequisite markets for aqua products, among the inputs (e.g., land, labor, water, seed, feed, equipment & supplies, etc.), labor at various skill levels is necessary to build a viable program. Oregon, through **Measure 98** offers an opportune political environment to craft academic pathways to train people in aqua farming.*

*As with other themes, good **record keeping** combined with easy access **science-based information** are fundamental.*

Markets/Demand & Supply

CONTEXT & GUIDING PRINCIPLES

Historically, developing aqua farming is often seen as finding the right production system to fit the prevailing physical environment. We have now learned that while the physical environment is important, the critical component for success is to find the right fit within the targeted market. Production needs to be market-driven—supplying an identified demand (often through import substitution). Identifying the market to target is a one of the first paramount steps. We need to develop a program that can supply a spectrum of markets from high-end specialty products to high-volume institutional foods.

Many aqua farming ventures have failed in spite of good technical operations. These have often, knowingly or unknowingly, had a philosophy that, “it you grow it, they’ll buy it”. Not true. Operations need to be based on a well-documented and quantified demand.

¹¹ While global aquaculture is maturing—no longer in its infancy—Oregon is still far behind the world-wide growth curve.

¹² This follows the trajectory of many aquaculture programs around the globe where there are often reports of the “Big 5” key requirements for investors: (a) access to high-paying markets; (b) access to good quality and affordable feed; (c) access to good quality and affordable seed; (d) access to affordable capital; and, (e) access to high quality and current information.

STRATEGIC APPROACH

A **market-first approach** is employed. This requires current and factual **market data**. This also requires **skills and tools** to be able to analyze existing demand and forecast growth. Oregon has unique niche markets, access to profitable international markets, and a diverse populace providing opportunities for several of the nearly 600 aquatic crops grown around the world¹³.

Markets/Inputs & Logistics

CONTEXT & GUIDING PRINCIPLES

Inputs—chiefly feed and seed but also a wide variety of other specialized aquacultural items—are obviously necessary for any operation. Feed is typically up to two-thirds of variable costs. Bio-Oregon¹⁴ is a “local” aqua feed provider specializing in salmonid diets. It is similar to other feed millers in neighboring states¹⁵ whereby Oregon is currently not a major client and diets are prepared for crops that may not be the best for Oregonian aqua farming. Seed supplies (hatcheries/nurseries) follow a similar pattern as feed: in-state providers are few beyond the time-honored crops of salmonids and oysters. Other specific aquaculture supplies and materials are considered esoteric by most and largely unavailable locally.

Logistics are critical for both inputs and outputs. High transport costs dictate an economic zone within which products can be profitably moved—outside this area, profitability is challenging at best.

STRATEGIC APPROACH

A market-first approach means that (see above) the demand for the food item is the key driver. Accordingly, while logistics relating to this market are part of the early analyses, availability of needed inputs is examined later in the process—frequently leading to scenarios where needed inputs are **not** currently **available locally**. Thus, **attracting** needed **suppliers** is critical. A bit tangentially, if there are choices in which crops to grow, the principle is to row an organism low on the food chain where diets require less protein. Specialty crops may require **specialty diets** that are hard to find. The same difficulties could apply to seed and other inputs.

Markets/Quality Control & Branding

CONTEXT & GUIDING PRINCIPLES

Competition is keen. Often the aim may be import substitution. Concurrently, standards for aquatic crops are increasing and the industry is always under scrutiny. Oregon growers are new entries into the market place and will need specific comparative advantage if they are to be successful.

¹³ <http://www.fao.org/aquaculture/en/>

¹⁴ Headquartered in Washington State: <https://www.bio-oregon.com>

¹⁵ <https://www.starmilling.com/products-fish.php>, <http://www.rangen.com> and <https://www.skretting.com/en-ca/>

STRATEGIC APPROACH

Initially, when the state program is still small, Oregon producers will need to prove **exceptionalism**—through quality, transparency, or novelty. This will require innovative **market strategies** to increase the market share for made-in-Oregon products. This will also require greatly improved **record keeping** including **access** to these data in a variety of formats.

Markets/Processing

CONTEXT & GUIDING PRINCIPLES

At the early stages of program development, it may be opportune to think of products that require minimal processing—e.g., whole or even live products. However, as the program grows, it will require considerable diversification of products—supplying processed products in a variety of forms. In some cases, under capacity in fish processing plants may be addressed by initiating processing of farmed products as long as they fit within the requirements of the specific plant. Longer value chains will have greater economic impact but require the ability to produce the prime product at a relatively low competitive price.

STRATEGIC APPROACH

Stand-alone aquacultural **processing infrastructure** will require a certain minimum **economic program size** before it can be justified. The Oregon program has probably not yet met this threshold. In the interim, options include dovetailing with existing commercial fisheries processing, repurposing existing infrastructures, and/or using out-of-state facilities.

Technological Innovation/Systems & Species

CONTEXT & GUIDING PRINCIPLES

Aqua farming crops are dynamic. The choice of crops and methods for raising them is changing rapidly—new organisms domesticated, current crops able to be grown under increasing intensification, new technologies being identified, and old technologies being refined. A strategic plan is not a census of current operations nor solely a trends analysis predicting options for new products. Given the inherent volatility in addressing specific production systems, plans need to be generic, at time prescriptive—able to be interpreted and applied to a wide variety of systems and species.

STRATEGIC APPROACH

Categories of systems are probably most useful (e.g., ponds, raceways, cages, recirculating, etc.)—the nexus for strategic action being the combination of a given crop, grown using specific methods, in a specified environment. However, given the number of permutations, this much be addressed in a more **generic** way where different general categories of combinations can be prioritized and assessed. The plan is expected to provide **guidance** as to the best choices in terms of systems and species for Oregonian situations—not provide detailed information as to which crops and systems can be used where and how.

High Potential Zones

CONTEXT & GUIDING PRINCIPLES

Siting operations is important¹⁶. While water of varying qualities is a common denominator, different crops have different requirements—often developing sites to provide the needed requirements a costly process. There are, therefore, economies of scale in developing aqua farming operations. To attain the minimum threshold, it may be necessary to cluster operations around a common resource or set of resources (e.g., an aquaculture “park”¹⁷)—effectively establishing an aquaculture zone based on ecological conditions.

Zones may also be a development option when non-ecological factors are prominent in the decision-making process. Sites may cluster around a large market. Sites may, for regulatory and monitoring purposes, be clustered. Sites could be clustered in one watershed while excluded from others.

STRATEGIC APPROACH

Concentrating effort (“aquaculture parks”) may have advantages. **Targeting** zones of concentration requires thorough analyses including **tools** (e.g., spatial analyses) to delineate the zones and monitor their operations.

Information Management

CONTEXT & GUIDING PRINCIPLES

Knowledge is crucial to development. A significant knowledge gap has been attributed to the slow growth of the program. This knowledge needs to be enhanced by access to validated, science-based information. There is a wide variety of aquaculture information available today to the consumer. Unfortunately, as aquaculture may be seen by some as a “sex” topic, there is a large body of misinformation intertwined with the larger body of data and material available. There are a number of reliable sources¹⁸. Nonetheless, it is often difficult to filter out the “good” from the “bad”.

STRATEGIC APPROACH

Reliable and verifiable information is needed. Yet, there is an acknowledged shortage of information specific to **Oregon conditions**. In the short-term, wider access to that portion of the large body of information that is relevant to Oregonian investment could

¹⁶ <http://www2.ca.uky.edu/wkrec/AquacultureSiteSelection.PDF>,
<http://www.fao.org/docrep/field/003/AC170E/AC170E00.htm>,

¹⁷ https://digitalcommons.lsu.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=3923&context=gradschool_dissertations,
<https://thefishsite.com/articles/government-receives-environmental-license-for-aquaculture-parks>,
<https://www.africaportal.org/publications/national-investment-policy-for-aquaculture-parks-in-uganda/>

¹⁸ For example: <http://www.fao.org/fishery/factsheets/en>,
<https://fishculture.fisheries.org/resources/regional-aquaculture-centers/>,
<https://www.worldfishcenter.org/publications-resources>, <http://sfaas.auburn.edu/international-work/publications/>, <http://aquafishcsp.oregonstate.edu/publications>

perhaps be best provided via the efforts of the **OAA** and its partners—posting the most appropriate material on-line. The information needs include **spatial information** tools¹⁹ and oversight. Data from the broader global pool needs to be complemented with Oregon-specific information which, in turn, requires improved **record keeping**, collation, and analyses.

Finance & Credit

CONTEXT & GUIDING PRINCIPLES

Finance and credit are necessary for most enterprises. Aqua farming, as a new activity, is often challenged when seeking funding—the rate of failed investments higher than successes. Funding requires good market and business plans for the firm requesting the financing. The raw data to prepare such necessary documents is often lacking.

STRATEGIC APPROACH

“Real-life” case studies of **bankable aquaculture investments** in Oregon along with verifiable Oregon-specific data sets are needed. These will be required to justify lending necessary for capital investment in the state program. These will also serve not only as needed **templates** for use by would-be investors, but also set benchmarks for what should be a growing population of potentially profitable aquacultural operations.

Infrastructure

CONTEXT & GUIDING PRINCIPLES

Infrastructure—both general public and specific aquacultural—is another requirement for a viable aqua farming program. Farm-to-market transport is of the utmost importance for perishable aqua products. The network of public and private hatcheries, currently focusing on salmonids, could possibly be diversified to produce seed for other crops.

STRATEGIC APPROACH

Oregon’s infrastructure may be considered as above average. However, it is necessary to review investment options in light of **infrastructure pros and cons**. Infrastructure, therefore, needs to be built into **spatial planning analyses**.

Governance

CONTEXT & GUIDING PRINCIPLES

Good governance implies an openness to all stakeholder groups and a decision-making process that is built on verifiable science-based information. It requires educated actors at all levels and the needed instruments within which to operate.

¹⁹ <https://www.uwsp.edu/cols-ap/GIS/Pages/Research/wisconsinAquacultureAssessment.aspx>, <http://www.seagrant.wisc.edu/Home/AboutUsSection/PressRoom/Details.aspx?PostID=1657>, <https://dnr.wi.gov/maps/GetGISData.html>

STRATEGIC APPROACH

The current **strategic plan** is the first of several steps to reinforce good governance. **Information dissemination** and **education** are key partners in these processes. Effective governance requires considerably improved **coordination** between all the various actors in the state program.

Theme 4: Educated Citizenry

CONTEXT & GUIDING PRINCIPLES

Education and overcoming the knowledge gap are major issues for the aquaculture program. These cover the gamut, as has been stated, of formal and informal education. These also incorporate information systems which are part of education, but also integral to many other segments of the overall Oregon program.

Oregon has a chain of high quality institutions from secondary through tertiary levels that have assets to add value to a state aquaculture program. Measure 98 offers some momentum to use these new interventions to develop a cadre of skilled entry level aquaculturists.

STRATEGIC APPROACH

*There is a negative legacy for aqua farming that must be addressed with **science-based education**, shining a light on the most current and best practices.*

*Tangible **links** need to be forged between all education levels from primary school through graduate studies, including other partners active in supporting these scholastic actions. **Land and Sea Grant** tripartite structures linking university studies, research, and extension are important parts to shape and meld into the state strategic plan.*

Formal Education/Primary & Secondary

CONTEXT & GUIDING PRINCIPLES

Aquaculture is not a component of many primary or secondary curricula. The ODF&W egg to fry program²⁰ is the major entry point for a good number of schools. A few secondary schools have more comprehensive aquaculture or aquaponics instruction²¹.

STRATEGIC APPROACH

Existing programs and curricula provide a good base, formulated within the overall context of **Measure 98**, to develop appropriate learning tools for primary and secondary levels and ultimately to develop career paths (high school diploma) for skilled labor to support the hoped-for growing Oregonian aqua farming program. Other avenues and **strategic partnerships** may include FFA²², 4-H²³, and importantly the Agriculture in the Classroom Foundation²⁴, as well as others.

Formal Education/Tertiary & Beyond

CONTEXT & GUIDING PRINCIPLES

The major actor for tertiary education is Oregon State University—increasing its role through the recent *Marine Studies Initiative*. Eastern Oregon University has expressed

²⁰ <http://www.dfw.state.or.us/fish/STEP/resources-education.asp>

²¹ BTI is an example of a school with specialized courses/instruction
<https://webspm.com/articles/2015/11/01/aquaponic-teaching-tools-examples.aspx>

²² <http://www.oregonffa.com>

²³ <http://oregon.4h.oregonstate.edu>

²⁴ <https://oregonaitc.org>

interest in aqua farming. Mount Hood Community College has a program focusing on salmonid hatchery operations. Other community colleges (e.g., Chemeketa, Clackamas) have had some aquaculture-related activities. The Oregon Institute of Marine Biology (University of Oregon) is engaged in some aquaculture-related work, as well.

STRATEGIC APPROACH

Networking is important. The base of existing local knowledge is limited with inadequate exchange of information and **coordination** of efforts. A **network** linking all educational institutions from primary to graduate would be beneficial both to the institutions, the students, and the wider populace.

Extension

CONTEXT & GUIDING PRINCIPLES

Oregon has had aquaculture extensionists. However, at present, there is no full-time extension support albeit there are fulltime staff working on the food safety portion of the value chain. Yet, extension support, offering technical production advice to current and new operators, is effectively lacking.

STRATEGIC APPROACH

Technical guidance and support are necessary for investors. This requires extension. Extension is expensive. **Land** and **Sea Grant** programs offer a framework for extension. Nonetheless, even if fulltime staff are available, looking at programs in other states, it is unlikely direct **on-site support** would be available for the majority of Oregon investors. Extension services, if established, are going to need to rely on **information tools** (including spatial analysis to target effort) and **partnerships** to get the job done.

Informal Education & Outreach

CONTEXT & GUIDING PRINCIPLES

Today's citizenry has access to a multitude of information sources. The need for verifiable information is unquestionable. The risks of supporting and/or disseminating unsubstantiated/unscientific messages are real—leading at the very least to financial losses for those following erroneous pathways.

STRATEGIC APPROACH

Vetting information entails highlighting messages and messengers providing **verifiable and traceable data**. This will demand a **coordinated effort** from public and private actors as well as channels to publicize these data in a **user-friendly**, and if possible, **interactive** way. A **common portal** may be the most useful for the investor.

Media

CONTEXT & GUIDING PRINCIPLES

Media is awash with aquacultural information. The media is both a benefit and a bane. At times, it seems for every piece of solid bankable data there are five pieces of miraculous

empty wishes. The challenge is to find ways and means to filter the available information and then make that that if found to be of value available to operators on an open-access forum that is will publicized, supported, and controlled.

STRATEGIC APPROACH

Open-access media will be an important tool in **closing the knowledge gap**. **Quality control** and maintaining **current material** is the difficult challenge.

Information Tools & Feedback

CONTEXT & GUIDING PRINCIPLES

Efficient and vetted information flow up and down the value chain is critical. The tools and media constituting these channels are rapidly changing. Among the most important are spatial analyses.

STRATEGIC APPROACH

It is incumbent on planners to identify the **latest information technologies**, building the use of these into their works. These will most probably require pathways that **cut across** public and private networks and data management systems. **Common standards, definitions, and tools** are important.

Section IV: Appendices

Appendix 1: Opportunities & Constraints—Working Group results

TECHNOLOGICAL OPPORTUNITIES WORKING GROUP

Oregon Strengths:

- Broad range of environments - from coastal sites to inland high desert sites offers opportunities to culture a wide range of aquaculture species
- Geothermal water resources in southern Oregon
- High levels of solar irradiation in the high desert
- Marine coastal environment has a moderate temperate climate with limited seasonal variation, allowing maintenance of consistent temperature conditions for culture systems
- Land and freshwater resources are not expensive compared with California
- Universities, community colleges, extension programs and funding agencies with a research interest in aquaculture
- Long history (30+ years) in oyster and salmon (hatcheries and ranching) aquaculture
- Economically important state and federal salmon hatchery program
- Columbia river and dam system offers potential for freshwater aquaculture for both food production and restoration

Oregon Weaknesses:

- Limited resources for research and extension agencies
- Lack of potential investors (venture capitalists etc.) in aquaculture
- Oregon's strong environmental interests often oppose aquaculture development
- Poor reputation among environmental groups for salmon hatcheries and ranching in Oregon
- Changing marine environmental conditions are impacting oyster and clam aquaculture through increasing ocean acidification and blooms of harmful toxic algae
- Limited number of aquaculture companies based in Oregon resulting in limited sharing of technological knowledge.

Opportunities:

- Develop energy efficient aquaculture systems using plentiful solar (high desert), wind and wave power (coastal) and hydrothermal power (southern Oregon)
- "Clean" environment can result in high-quality products.
- Little concern about man-made pollution in most of Oregon (but not the Columbia River)
- Development of restoration aquaculture for endangered species with support from environmental interests.

Threats:

- Regulations are not developed for new aquaculture approaches
- Opposition from traditional fishing communities and some environmentalists
- Conservationists often don't understand aquaculture technologies that reduce or eliminate real or perceived aquaculture threats.

POLICY AND REGULATIONS WORKING GROUP

Strengths

- Agencies work well together
- Educational infrastructure in place to ramp up
- Industry is excited, wealth of knowledge
- Oregon farmers do not perceive regulations as negative as other systems
- Manageable size with focused scope
- Long-term investment by small group of individuals
- Growers see potential to growth
- 2015 Passed HB2209
- Mapping of the estuaries has been conducted
- Coastal Atlas in management units and is online
- Commercial shellfish is politically organized

Weaknesses

- Small number of growers with limited income
- 2015 Passed HB2209 but limited resources to obtain
- 6 out of 34 recommendations have been acted on
- don't have this policy with the rest of aquaculture in Oregon
- no free water limited supply
- NOAA inspector required export of live crab
- ODA and DSL need to codify their relationship on state owned tidal lands as it relates to Removal-Fill permitting
- Legal fill permits and clean water
- Awareness of zoning plans – few certified growing areas due to water quality
- Army Corps of Engineers
- Comprehensive County plans and zones need to be updated
- Value of ecosystem services not measured
- Negative public perception of aquaculture esp. finfish culture
- Oversight of processing infrastructure

Opportunities

- OAA taking lead organizing policy for
- Nearby vets could be utilized for inspections
- Oregon vets have cat. 2 with USDA (MOU with NOAA)
- Incorporate the biology data sets into new zoning plans
- Promote zoning maps to potential farmers
- Coos Bay and Netarts estuary plans will be simplified
- ODA process could help with county estuary plan maps

- Agencies should model shellfish growers policies for promoting finfish aquaculture – outreach and media coverage

Threats

- Operational permits – oversight of state and federal regulations
- Civil Suits
- Population growth and competing uses
- Regulatory process
- Biotoxins impact on public perception of safe seafood

Priority Areas

- Existing aquaculture regulatory process reports reviewed, revised and disseminated – files are attached
- Prioritizing recommendations from HB2209 –
- Best Management Practices including industry, agencies and stakeholder input and how they can be applied – files are attached

BUSINESS OPPORTUNITIES WORKING GROUP

Oregon Strengths:

- Political Environment
 - Agencies seem supportive
 - Legislators and Representatives appear supportive – Open to ideas if not yet funding
 - Coastal Caucus has been very supportive
- Oyster Process – appears to be the best developed process in Oregon, even if not completely documented
- Education Infrastructure to provide employees
 - School of Fisheries and Wildlife at Oregon State
 - Sea Grant and Marine Science Center
 - Aquaculture Tech Programs
 - Mount Hood Community College
 - Chemeketa Community College
- Environment – Oregon has a wide variety of environments from the coast to Eastern Oregon, offering opportunity for a wide variety of species and culture methods

Oregon Weaknesses:

- Non-oyster Process
 - There is a small presence of other finfish, shrimp and other aquaculture
 - Development process is not well defined
 - Each player will have to feel out their own process
 - Allowable species is not defined
 - Permitting is not defined
 - Geographic permissions/limitations are not defined
- Availability of processing
 - Processing is available for certain species but will be limited for other species

- Available processing is geographically concentrated in the west and limited or not available in the east
- Freight out limitations
 - No container shipping in Portland which requires shipping to Seattle, San Francisco or Vancouver, adding cost
 - Limited air freight options out of Portland requiring shipment to Seattle

Scope of Opportunities:

- Infrastructure development guidelines – a “Guide Book”
- Permitting – Who, How, What
- Logistics – Getting product to market
- Local Market Development – Larger communities along the West Coast offer chefs interested in local, sustainable, environmental, etc.
 - Supports newer operations that are likely to start out with smaller production

Constraints/Threats:

- Agency time and commitment to support the development of a State “Guide Book”
- Time required to obtain the permit
 - Agency person power limitations
- Cost – significant up-front investment with a long time lag on generating return
- Availability of water – water that can be used for a project
- Power infrastructure in more remote areas

Focus Areas:

- Developing the “Guide Book”
 - What agencies are involved
 - What permits are required
 - What species can be permitted
 - What can be grown within which geographies
- Exploring markets for new products – work jointly with Markets work group

Appendix 2: Advisory Group Mission & Vision

Mission, Vision and Action Statements *March 2014*

Following the Groups regular meeting of 27 March 2014, the following principles and activities have been agreed upon to guide the Group's work:

OAAG Vision

A progressive, safe and resilient aquaculture community that positions Oregon as globally competitive in the culture of fish, shellfish, and other farmed aquatic products.

OAAG Mission

To promote and facilitate an innovative state-wide program to develop aquaculture as an agriculture sector in Oregon that is economically beneficial, environmentally friendly, and socially responsible.

OAAG General Goals

- * Foster economic development through sustainable aquaculture farming and best management practices.
- * Promote safe, local food production through aquaculture.
- * Protect and enhance environmental and social quality.
- * Educate consumers, communities, and policy makers about the benefits, opportunities and challenges of aquaculture.
- * Support innovative research to foster beneficial aquaculture production and decision-making.
- * Clarify and streamline regulatory and legislative processes governing aquaculture.
- * Support agency, university and institutional capacity for fostering sound aquaculture development.
- * Identify waters, lands and tidelands most suitable for aquaculture development through collaborative planning processes.
- * Compliment and grow existing agricultural and fisheries infrastructures and businesses in concert with aquaculture.

() Membership in OAAG includes: Relevant ODA services; Oregon Department of Fish and Wildlife; Oregon Department of Environmental Quality; Oregon State University; Oregon Sea Grant; US Department of Agriculture; Oregon Aquaculture Association; Ecotrust Citizen's Group; Fish and shellfish processors; and, Fish and shellfish growers.*

OAAG Outputs & Actions

It is anticipated the OAAG will develop, review and endorse the following key elements guiding the State aquaculture program's development:

- ◆ Mission, vision, goals, and output statements
- ◆ Strategy document for the way forward;
- ◆ “White Paper” reviewing the *status quo*, opportunities and constraints as well as elaborating developmental options including target species and systems;
- ◆ Recommendations for immediate adjustments to constraints as highlighted by the White Paper;
- ◆ Prioritizing opportunities as identified by the White Paper;
- ◆ Synthesis of optimal relationships between stakeholder groups;
- ◆ Recommendations for updated regulations, policies, and legislation, including enhanced monitoring;
- ◆ Recommendations for expanded marketing and branding of Oregon Aqua Products;
- ◆ Suggestions and models for strengthening the State Producer Organization(s);
- ◆ Suggestions for relevant capacity, research and outreach development and support;
- ◆ A draft *Oregon Aquaculture Development Plan* including components of all of the elements above;

In addition, OAAG is expected to take the following actions:

- ❖ Seek funding for specific work and projects as needed through intramural and extramural sources;
- ❖ Communicate OAAG progress and outputs using appropriate methods to targeted stakeholder groups;
- ❖ Create Annual Action Plans to address current and emerging aquaculture issues with specific goals and outputs;
- ❖ Form specific task forces as necessary to create draft documents for OAAG review and submission to ODA.

Appendix 3: Advisory Group Recommendations

Group Recommendations for the Oregon Aqua Farming Program

May 2015

The Oregon Shellfish and Inland Aquaculture Advisory Group (OSIAAG), in line with its mission, “*to promote and facilitate an innovative state-wide program to develop aquaculture as an agriculture sector in Oregon that is economically beneficial, environmentally friendly, and socially responsible*”, and referring to the recent overview of the State’s aqua farming program presented to the Group [*Developing Additional Investment in Aqua Farming in Oregon: a roadmap for sustainable development*]:

A. **Endorses** the conclusions that:

1. sustainable aqua farming is a responsible agricultural practice for Oregon;
2. the Oregon aqua farming program must expand and diversify to ensure greater economic, social and nutritional benefits;
3. a higher level of collaboration among all stakeholders is needed to achieve the aim of an expanded and diversified program;
4. a state aqua farming plan [including one-stop-shop and strengthened producer associations] is necessary; and,
5. more human and financial resources are required from both the public and private sectors.

B. **Recommends** that:

1. ODA should be the lead agency in this program that encompasses a variety of other state and federal agencies as well as civil society;
2. OSIAAG should guide the expansion and diversification of the program;
3. the core of the Oregon aqua farming program should be producing foods for local consumption as well as export;
4. efforts should be taken to educate people as to the realities of aqua farming as well as how to undertake the practice in a bankable and responsible way; and,
5. action should be taken immediately [see below].

C. Proposes and **prioritizes** actions for the immediate- and short-term:

1. ODA nominate/appoint someone as the focal point for aqua farming;
2. Institute pre-application conferences for aqua farms;

3. Secure means to undertake the elaboration of a state aqua farming plan;
4. Identify ways and means to increase investment in aqua farming across the state;
5. Establish pathway for increased OSIAAG action including the support to sub-groups on inland, marine/shellfish and aquatic plant/algal farming as well as regulatory and monitoring mechanisms [i.e., four sub-groups];
6. Design and implement a set of activities to educate Oregonians about aqua farming, addressing both pros and cons in a science-based and objective way;
7. Design and implement a curriculum to train aqua farmers and would-be aqua farmers in market and business planning;
8. Prepare and circulate a quarterly aqua farming newsletter;
9. Undertake a comprehensive assessments of, and research and development on the market, resource base, production options and regulatory environment; and,
10. Put in place mechanisms to ensure more accurate and comprehensive statistics for the program.

Appendix 4: Outreach

Wendy Culverwell: Oregon's seafood gap

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The Oregon Department of Agriculture has hired a contractor to explore ways to promote inland aquaculture and help the state play a role in closing the nation's \$10.4 billion seafood-related trade deficit.

While Americans debate farmed salmon versus wild, the entire country has fallen behind in producing its own fish. Oregon is one of the worst culprits.

Idaho has 300 times more aquaculture, or inland farm fishing, than Oregon. And Washington? Probably more.

"Oregon is behind its neighbors," said Jerry Gardner, the blunt-speaking business development manager for the Oregon Department of Agriculture's Food Innovation Center. The state is developing a catchup plan that could turn fish farming into a key economic development initiative with special ramifications for job-strapped rural communities. This summer, the department hired Dr. John Moehl, a Klamath Falls native and retired United Nations aquaculture specialist, to lead its efforts to promote inland fish farming.

Oregon's efforts reflect the U.S. Department of Agriculture's campaign to encourage American aquaculture and reduce its dependency on foreign fish. Imported seafood accounts for more than \$10 billion of the U.S. trade deficit.

Gardner calls aquaculture an enormous opportunity with the earth's population expected to hit 9 billion by 2050. Fish and seafood will be a major protein source.

Katy Coda, Oregon's director of agriculture, convened an advisory group to evaluate possible strategies to augment the state's limited oyster and shellfish farming last year, culminating in the decision to hire Moehl in August. Aquaculture could be a promising strategy for rural communities to raise a wide-variety of species.

Salmon, though, is not one of them.

Dr. Gil Sylvia of Oregon State University's marine center in Newport said the state's coast lacks the large bays that support healthy salmon farms. Gardner characterizes Oregon's approach as highly cautious. The agriculture department is collaborating with the Department of Environmental Quality and the Department of Fish and Wildlife to pursue a sustainable approach that doesn't compromise the environment.

"We certainly don't want to do anything that's harmful to the environment and we don't want invasive species," he said.

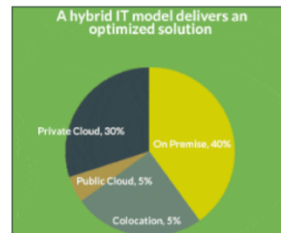
Nevertheless, Oregon is well positioned to produce trout, striped bass, tilapia, abalone, sturgeon and other species to feed the world.

"We think there's going to be a big demand for this. We need to line our ducks up," Gardner said.

Wendy Culverwell covers sustainable business, manufacturing and law.

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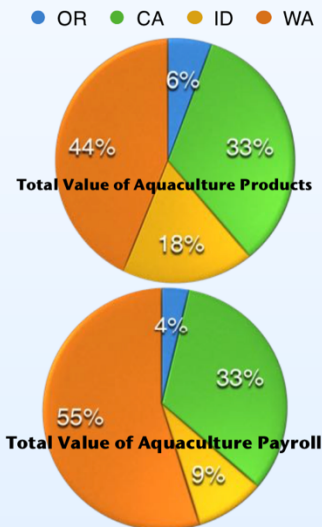


ODA launches the Oregon Aquaculture Advisory Group

Oregon Department of Agriculture (ODA) Targets Greater Aquaculture Investment

Aquaculture is the fastest growing animal protein industry in the world. In contrast, Oregon's aquaculture industry has yet to achieve its considerable economic potential, ranking fourth in production and value relative to its neighboring western states. However, as a complement to finite wild harvests from important fisheries, aquaculture can significantly help to meet growing demand for seafood products. Energizing this sector will require a thoughtful and focused effort addressing economic, environmental, and policy issues. To achieve the industry's potential, the state will be required to address specific needs. **Need for coordination:** There are diverse interests affected by aquaculture development. State leaders will need to coordinate their activities to develop the state's aquaculture potential while ensuring inclusion of all stakeholders. **Need for baselines and benchmarks:** Existing information on the state's aquaculture industry is inadequate and fails to represent basic economic value or future potential as an agricultural sector. Baseline data are needed to justify investment, identify opportunities, establish best practices, and serve as benchmarks for future growth. **Need for innovation:** Aquaculture offers many potential crops, production systems and markets. But aquaculture also poses major challenges that require economic, technical and policy innovations that match opportunity with Oregon's environment and geography. **Need for education:** Aquaculture remains an enigma to many Oregonians. As a rapidly growing natural resource industry, it has generated numerous misconceptions as well as realistic concerns. Education is needed to help citizens and stakeholders undertake and support responsible and science-based development. **Need for responsible, balanced development:** Aquaculture provides healthy foods and useful agricultural products. It creates jobs, supports direct and indirect economic benefits in rural and urban communities, complementing other natural resource industries. Plans are needed to develop and support investment opportunities that will produce high quality products, meet consumer expectations, and ensure responsible and sustainable business operations. Aquaculture practices must be consistent with sustaining Oregon's natural resources, supporting the state's economic, social and environmental goals, and meeting the public's present and future needs.

Pacific Northwest Aquaculture
 Although Oregon embraces a variety of water resources – fresh, brackish and saltwater – including a 363-mile coastline with 22 major estuaries along with an estimated 1,400 named lakes, 1,300 main-stream reservoirs, 10,000 small dams and 111,610 stream miles (State of Oregon Water Resource Department, 2007), according to USDA (2005 data from the Census of Aquaculture), Oregon occupies the last place in terms of tapping the state's aquaculture potential. The graphs below compare the four states in regard to total production and employment generation.



Oregon Aquaculture Advisory Group: OAAG

To build consensus and address the sector's specific needs, in 2013 the Oregon Department of Agriculture (ODA), as the state agency leading aquaculture development, established the **Oregon Aquaculture Advisory Group (OAAG)** to guide and reinvigorate the state's aquaculture industry. The ultimate aim is to elaborate and implement an *Oregon Aquaculture Development Plan* that achieves the state's policy objectives as these relate to the farming of Oregon's fresh, salt and brackish waters. OAAG has been established to advise on this process, to ensure the process and its results are responsible, equitable, transparent and productive.

OAAG Vision

An innovative, entrepreneurial and sustainable aquaculture community that positions Oregon as a globally competitive industry in the culture of fish, shellfish, and other farmed aquatic products.

OAAG Mission

To develop and facilitate an innovative program to develop aquaculture as an agriculture sector in Oregon that is economically beneficial, environmentally friendly, and socially responsible.

OAAG General Goals

- * Foster economic development through sustainable aquaculture farming and best management practices.
- * Promote safe, local food production through aquaculture.
- * Protect and enhance the quality of the environment as well as the quality of Oregonians' livelihoods throughout the value chain.
- * Educate consumers, communities, and policy makers about the benefits, opportunities and challenges of aquaculture.

- * Support innovative research to foster beneficial aquaculture production and decision-making.
- * Clarify and streamline regulatory and legislative processes governing aquaculture.
- * Support agency, university and institutional capacity for fostering sound aquaculture development.
- * Identify waters, lands and tidelands most suitable for aquaculture development through collaborative planning processes.
- * Complement and grow existing agricultural and fisheries infrastructures and businesses in concert with aquaculture.

OAAG Membership

OAAG is composed of a responsible experienced and diverse cross-section of neutral stakeholders representing the private and public sectors as well as other interested parties. While participation adapts to needs, the group has established representation from:

- ★ relevant ODA services,
- ★ Oregon Department of Fish and Wildlife,
- ★ Oregon Department of Environmental Quality,
- ★ Oregon State University,
- ★ Oregon Sea Grant,
- ★ US Department of Agriculture,
- ★ Oregon Aquaculture Association,
- ★ fish and shellfish processors,
- ★ fish and shellfish growers.

OAAG Outputs & Actions

It is anticipated the OAAG will develop, review and endorse the following key elements guiding the State aquaculture program's development:

- ◆ mission, vision, goals, and output statements,
- ◆ strategy document for the way forward,
- ◆ "White Paper" reviewing the *status quo*,

status quo, opportunities and constraints as well as identifying developmental options including target species and systems,

- ◆ recommendations for addressing constraints as highlighted by the White Paper,
- ◆ prioritizing opportunities as identified by the White Paper,
- ◆ recommendations for improving relationships between stakeholder groups,
- ◆ recommendations for updated regulations, policies, legislation and monitoring,
- ◆ recommendations for expanded marketing and branding of Oregon's aquacultural products,
- ◆ suggestions and models for strengthening the State Producer Organization(s),
- ◆ suggestions for relevant capacity, research and outreach development and support,
- ◆ a draft *Oregon Aquaculture Development Plan* including components of all of the above elements,

In addition, OAAG is expected to take the following actions:

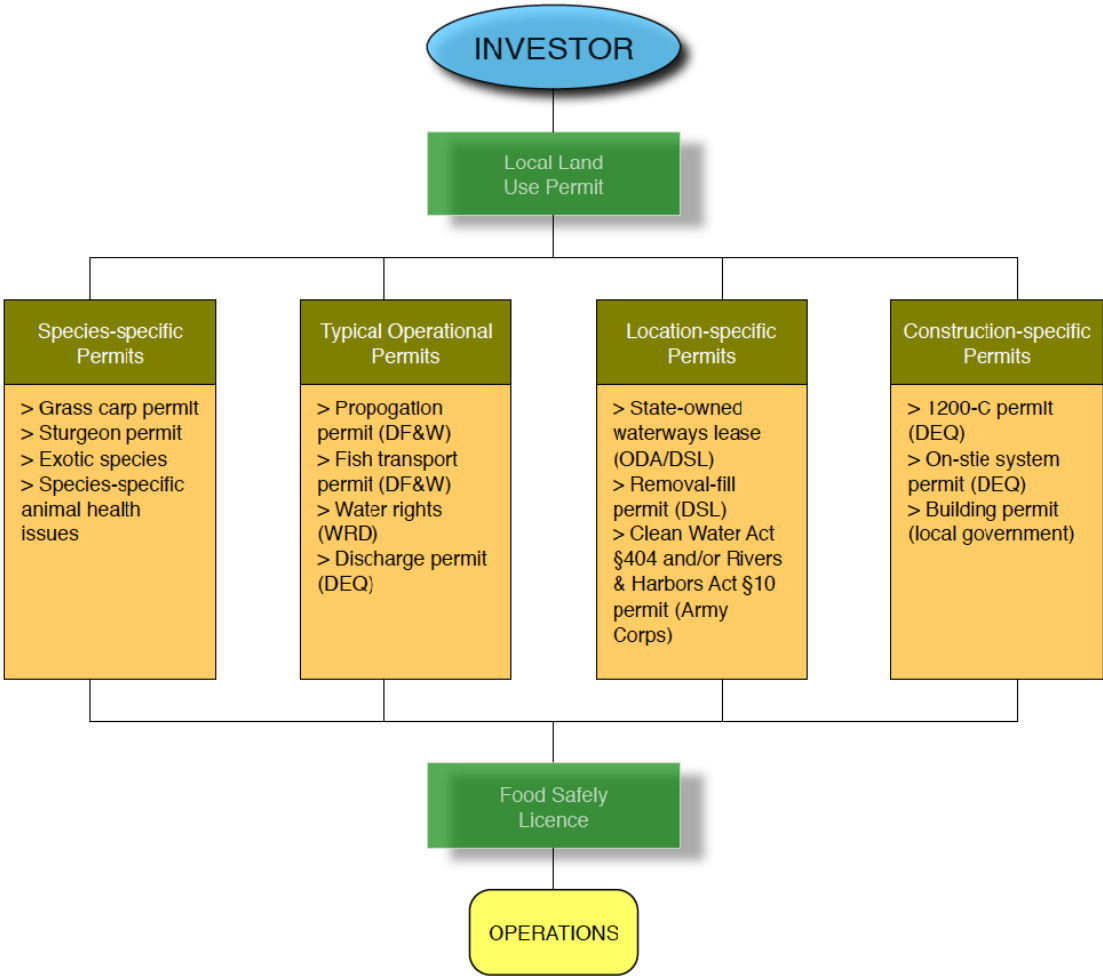
- ❖ seek funding for specific work and projects as needed through intramural and extramural sources,
- ❖ communicate OAAG progress and outputs using appropriate methods and channels,
- ❖ create annual action plans to address current and emerging aquaculture issues with specific goals and outputs,
- ❖ Form specific task forces as necessary to create draft documents for OAAG review and submission to ODA.

For more information, contact:
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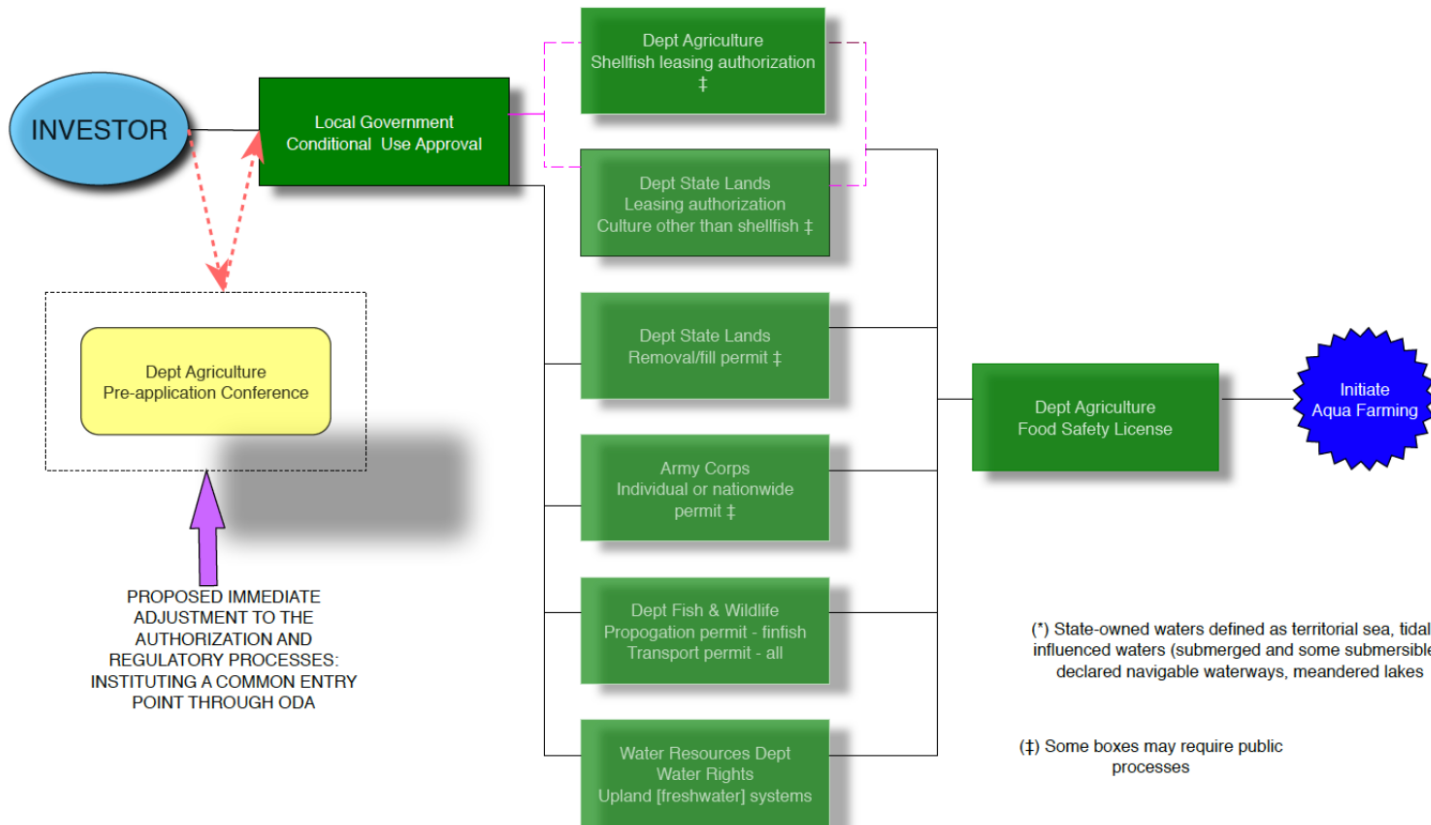
Appendix 5: Flow Charts for Regulatory Processes

(A) Aqua Farming Permitting

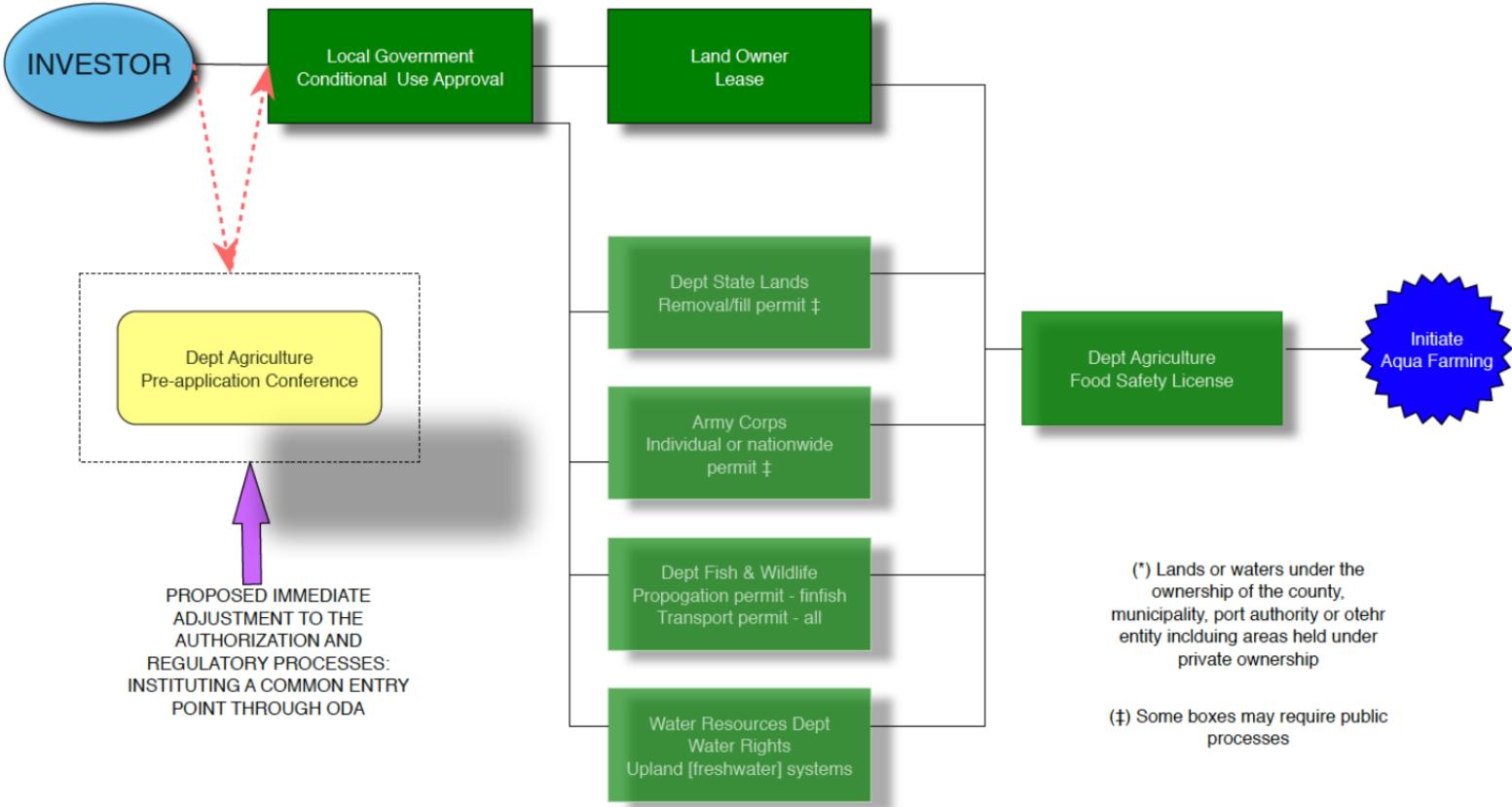
Major categories and indicative samples of permits requiring consideration by the new aqua farmer



(B) Aqua Farming on State-owned Waters*



(C) Aqua Farming on Non State-Owned Waters(*)



(D) Upland/Inland Aqua Farming

Land-based systems

Not in wetlands or ESH and no significant alteration of beds or banks of state waters*

