

INSIGHTS INTO AQUATIC FARMING OF SHELLFISH AND AQUATIC PLANTS IN ALASKA



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SUSTAINABLE AG CONFERENCE

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ANCHORAGE, AK

WHAT IS AQUATIC FARMING?

- Growing, farming, or cultivating aquatic farm products in captivity or under positive control by means of
 - managed cultivation for limited or no mobility species (bivalve or aquatic plants) or
 - enclosed within a natural or artificial escape-proof barrier for motile species
- Shellfish and aquatic plants only
- Commercial use only
- Finfish farming is prohibited



ALASKA DEPARTMENT OF FISH AND GAME ROLE IN AQUATIC FARMING



Aquatic Farm Act Implementation (AK Statutes 16.40.100-199; 1988)

The department permits and regulates aquatic farming in the state in a manner that ensures:

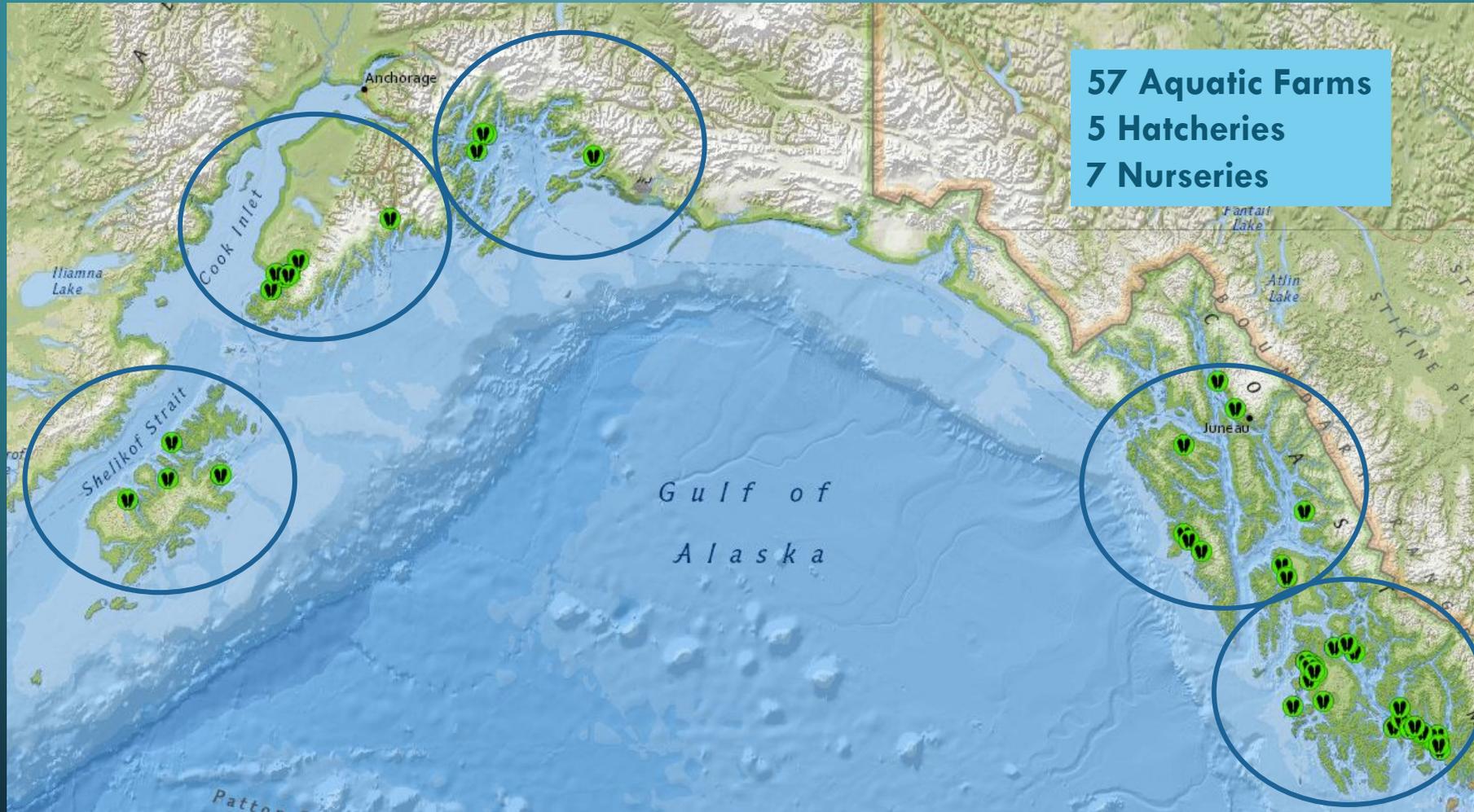
- a. the protection of the state's fish and game resources [and uses of those resources) and
- b. improves the economy, and well being of the citizens of the state.

ADF&G PERMITS

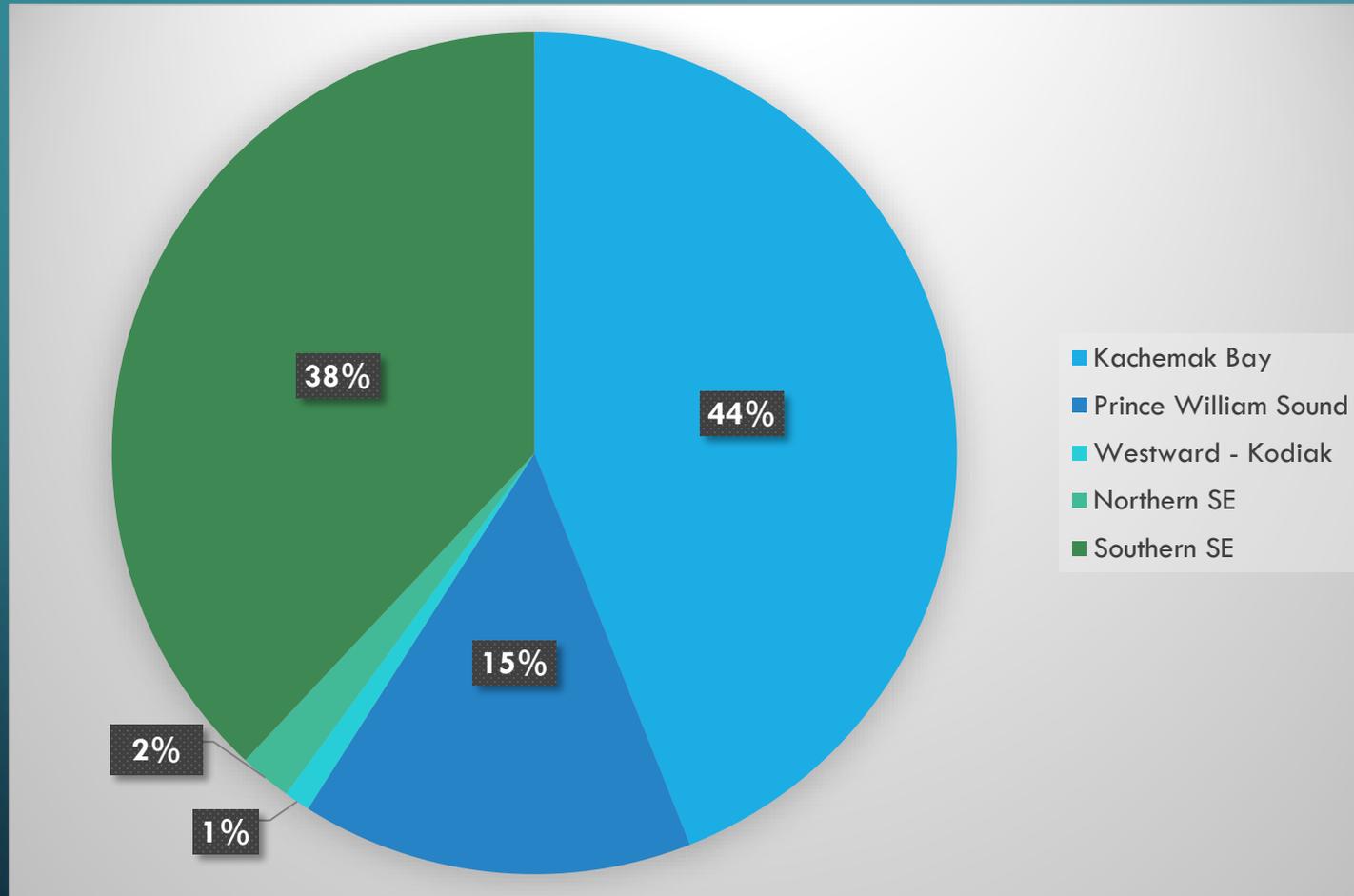
- Aquatic Farming Operation Permit - 10 yrs.
 - To operate an aquatic farm or hatchery
- Stock Transport Permit - 1 yr.
 - To transfer stock to, from, or between an aquatic farm, hatchery, or stock acquisition site (waters of the state)
- Stock Acquisition Permit - 1 yr.
 - To collect wild stock from outside of an aquatic farm site, for the purposes of providing broodstock or seedstock to a farm or hatchery
- Seedstock Supplier:
 - Shellfish Import Certification (Hatchery) – 1 yr.
 - Instate Seed Distributor Approval (Hatchery / Nursery) – 1 to 3 yrs.



WHERE ARE PERMITTED AQUATIC FARMS IN ALASKA? OPERATION LOCATIONS

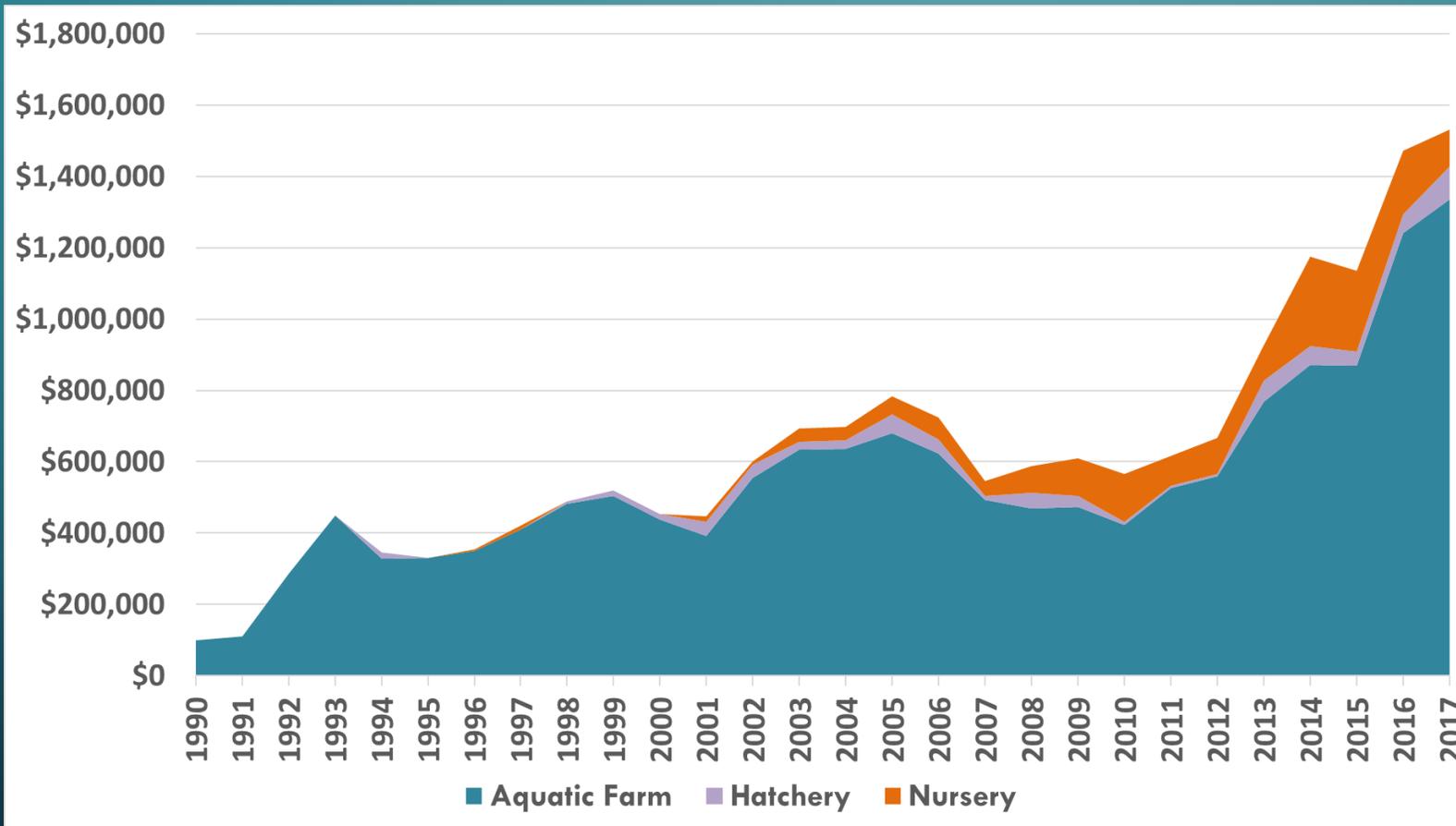


AQUATIC FARM PRODUCTION REGIONAL DISTRIBUTION



* Based on 2017 Annual Reports from Permitted Operators

AQUATIC FARMING INDUSTRY SALES PRODUCTION (1990 TO 2017)



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In 2017:
41 operations with sales*
Aquatic Farms = \$1.34 Million
Hatchery = \$91,519
Nursery = \$104,448
Total Sales = \$1.53 Million

* Farm gate value

AQUATIC FARM SHELLFISH PRODUCTS CULTURED AND SOLD



PACIFIC OYSTER

(*Magallana gigas*)

2- 4 years to market size

Seedstock from hatchery and
/ or nursery



BLUE MUSSEL

(*Mytilus trossulus*)

3-4 years to market size

Natural set collection onsite
or opportunistic on gear



PACIFIC GEODUCK

(*Panopea generosa*)

9-10 + years

Seedstock from hatchery and
/or nursery

AQUATIC FARM SHELLFISH PRODUCTS CULTURED AND SOLD



PACIFIC OYSTER

(*Magallana gigas*)

2- 4 years to market size

Seedstock from hatchery and
/ or nursery

~1.8 million produced (2017)



BLUE MUSSEL

(*Mytilus trossulus*)

3-4 years to market size

Natural set collection onsite
or opportunistic on gear

1,678 lbs. produced (2017)



PACIFIC GEODUCK

(*Panopea generosa*)

9-10 + years

Seedstock from hatchery and
/or nursery

11,456 lbs. produced (2017)

AQUATIC FARM AQUATIC PLANT PRODUCTS CULTURED AND SOLD



**In 2016, 1st farm
operations permitted in
Alaska for kelp.**



SUGAR KELP (*Saccharina latissima*)

4 – 6 months to market size - plant
in winter and harvest in spring

Seedstock (seeded lines) from
hatchery

RIBBON KELP (*Alaria marginata*)

4 – 6 months to market size - plant in
winter and harvest in spring

Seedstock (seeded lines) from
hatchery

AQUATIC FARM AQUATIC PLANT PRODUCTS CULTURED AND SOLD



In 2016, 1st farm operations permitted in Alaska for kelp.

SUGAR KELP (*Saccharina latissima*)

4 – 6 months to market size - plant in winter and harvest in spring

Seedstock (seeded lines) from hatchery

By 2017, farms produced 16,180 lbs. of kelp.



RIBBON KELP (*Alaria marginata*)

4 – 6 months to market size - plant in winter and harvest in spring

Seedstock (seeded lines) from hatchery

FARMING PHASES FROM CRADLE TO MARKET GATE

1st PHASE
SEED / SPAT
or
SEEDSTARTS

Hatchery and / or
Nursery Operation

Aquatic Farm Operation

2nd PHASE
JUVENILE to
ADULT

Nursery Operation

3rd PHASE
ADULT TO
MARKETABLE SIZE

SEED DEVELOPMENT HATCHERY PRODUCTION



Shellfish

Broodstock conditioned and spawned

Production of Algae for feed

Eyed-larvae to seed reared to 3–4 mm

Seaweed - Kelp

Fertile Mature Blades with Sorus

Spore Release / Inoculate Solution

Light and Nutrient Solutions

Sporophyte on string wrapped PVC



SEED DEVELOPMENT NURSERY PRODUCTION

REMOTE SETTING NURSERY

Eyed-larvae settles out and becomes spat

Feed Phytoplankton and Diatoms

Downwellers (200 μ) / Upwellers (240 – 400 μ)

Seedstock reared up to 3-4 mm



INWATER NURSERY

Seedstock cultured in marine waters

Fluid Upwelling System (FLUPSY) with
paddle wheel

Brings in plenty of food phytoplankton

Seedstock reared from 3 – 15+ mm



WILD STOCK NATURAL SET - ONSITE



Kelp on oyster longline

Mussels on oyster gear



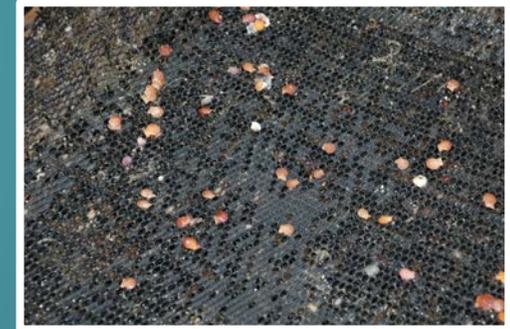
Blue mussel fouling
on stacked culture trays



Blue Mussel culture socks



Blue Mussel natural set lines



By catch in oyster tray
culture gear (scallops)



Scallop culture gear - small
scale

SHELLFISH AND AQUATIC PLANTS APPROVED TO CULTURE

Shellfish	Total Permits	Seed Source
Bivalves		
Pacific Oyster*	34	Hatchery-produced
Geoduck	18	"
Blue Mussel	10	Natural set
Littleneck Clam	5	Natural set and Hatchery-produced
Cockle	2	"
Scallop – Purple-hinged rock, pink, & spiny	1- 3	Natural set
Other Invertebrates		
Sea Urchin – green, red, and purple	1 - 4	'
Sea Cucumber	1	"

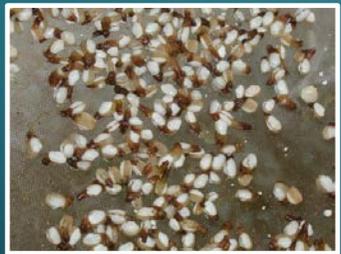
* Pacific oysters are a non-native species – allowed to be imported into the state from the Pacific Northwest broodstock.

Aquatic Plants (Macroalgae)	Total Permits
Brown – Sugar Kelp	15
– Bull Kelp	8
– Ribbon Kelp	6
– Three Ribbed Kelp	6
– Ribbon Kelp	3
– Giant Kelp	3
– Dragon Kelp	1
Red – <i>Pyropia sp. and Palmaria sp.</i>	3

Hatchery-cultivated and reared

KEY STEPS FOR AQUATIC FARMING OPERATIONS - CULTURE METHODS /MANAGED CULTIVATION

**Acquire Quality
Seedstock**



Cleaning/Sorting



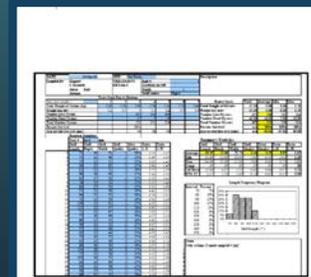
**Predator
Removal /
Defouling**



**Dividing /
Density
Manipulation**



Recordkeeping



**Monitor /
Maintenance**



Predator Exclusion



KEY STEPS FOR AQUATIC FARMING OPERATIONS - STANDARD CULTURE GEAR AND EQUIPMENT

Raft & Trays



Longlines & Lantern Nets



Longlines & Trays



Floating Bags



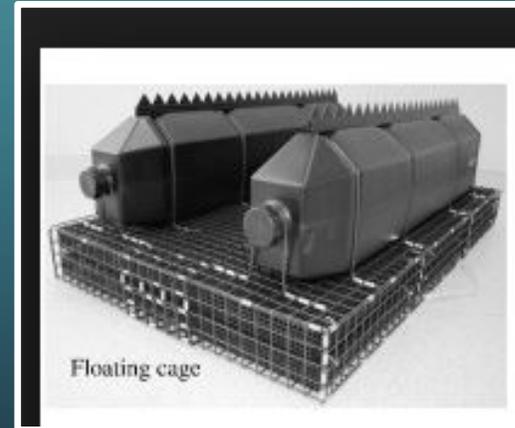
Flip-flop Bags



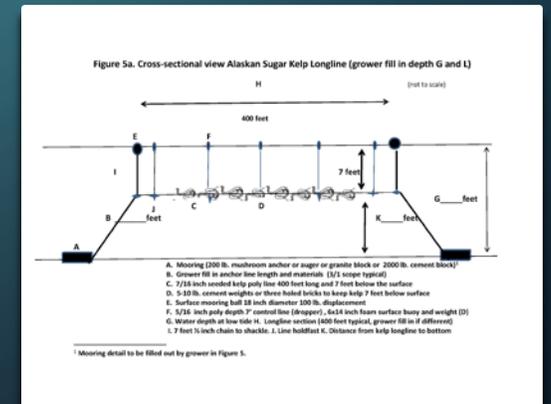
PVC Tubes / predator netting



Floating cages



Submerged longlines



Longlines – large, more exposed areas or less current; Rafts for small sites with sufficient current

KEY STEPS FOR AQUATIC FARMING OPERATIONS

HARVEST METHOD, PROCESSING, & SALES

- Cleaning, hardening, processing, packaging, logistics, marketing, transport, etc.



KEY TO SUCCESSFUL SALES

- a consistent aquatic farm product available in quality and quantity and when the buyers want it in the form that they want



AQUATIC FARM SITE SUITABILITY / SITE SELECTION

MUST BE SUITABLE FOR THE FARMING OR THE SHELLFISH OR AQUATIC PLANT

Physical and Biological Characteristics

- ✓ Protected
- ✓ Exchange rates, water temps, currents, salinity, food availability, light, and suspended sediments
- ✓ Suspended - Water depth (40-60 ft or greater)
- ✓ On bottom - Substrate composition, Intertidal exposure

Other considerations

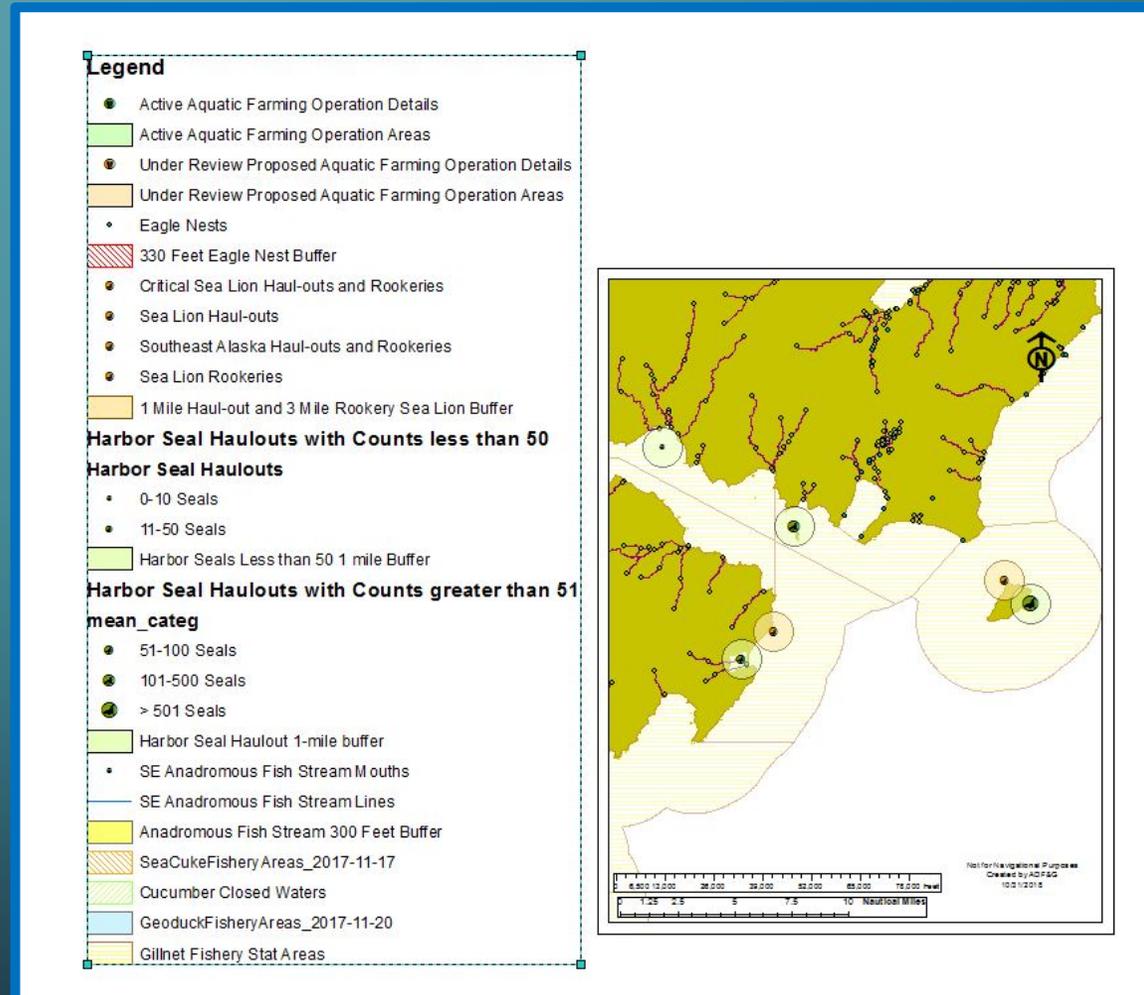
- ✓ Fouling organisms
- ✓ Predation
- ✓ Pollution
- ✓ Paralytic Shellfish Poisoning (PSP)
- ✓ Distance from labor pool and market
- ✓ Vicinity to other farms

AQUATIC FARM SITE SUITABILITY / SITE SELECTION

MAY NOT SIGNIFICANTLY AFFECT FISH, WILDLIFE, OR THEIR HABITATS IN AN ADVERSE MANNER

PROXIMITY TO SENSITIVE AREAS:

- Anadromous Fish Streams
- Herring Areas
- Kelp and Eelgrass beds
- Shorebirds, water fowl, harbor seals, seal lion, walrus concentrations

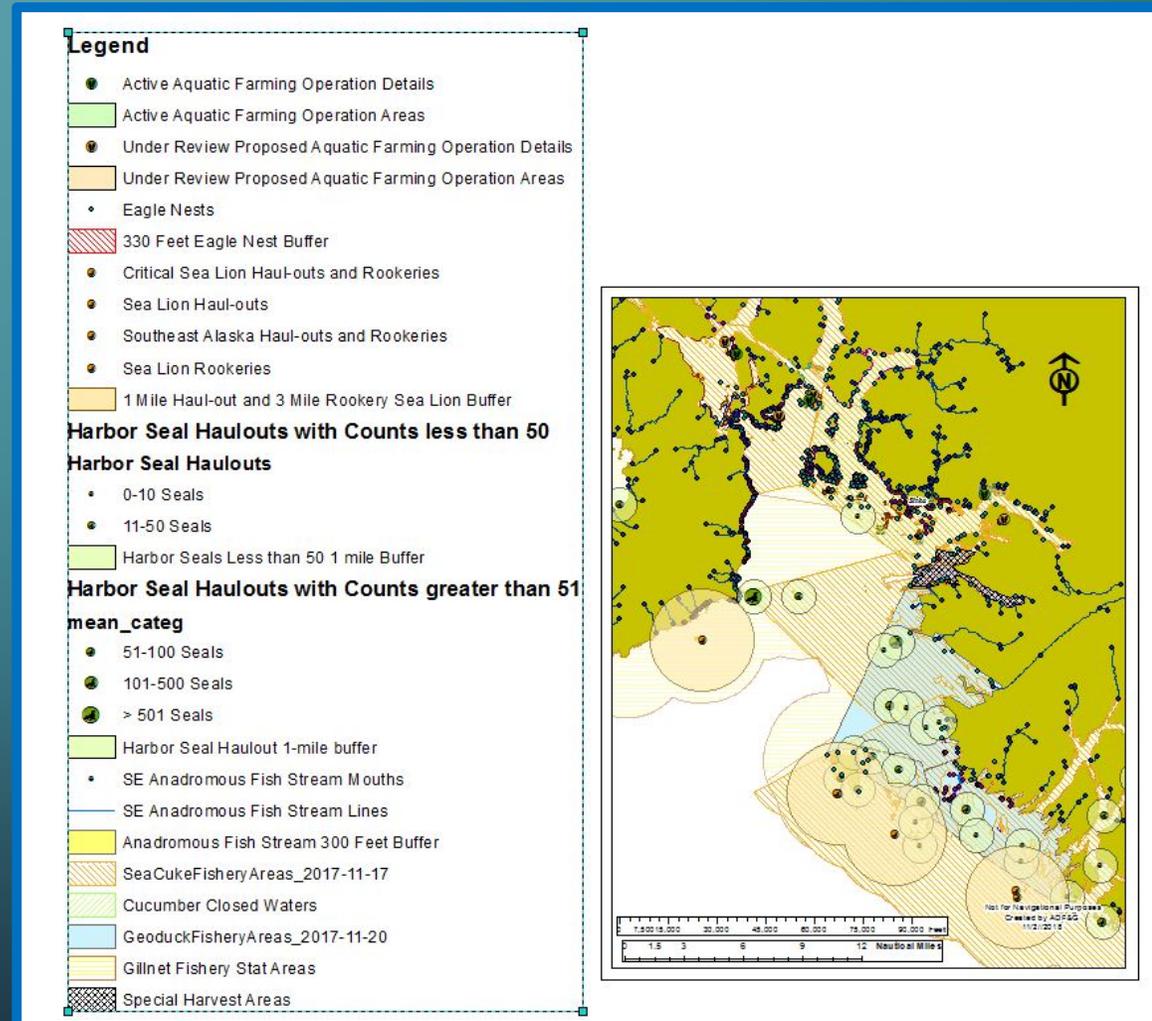


AQUATIC FARM SITE SUITABILITY / SITE SELECTION

MAY NOT REQUIRE SIGNIFICANT ALTERATIONS IN TRADITIONAL FISHERIES OR OTHER EXISTING USES OF FISH AND WILDLIFE RESOURCES

PROXIMITY TO EXISTING USE AREAS

- Existing commercial, subsistence, sport, or personal use areas for fish, shellfish, or aquatic plants
- Salmon Hatchery - special harvest areas or terminal harvest areas
- Major anchorages and floatplane access



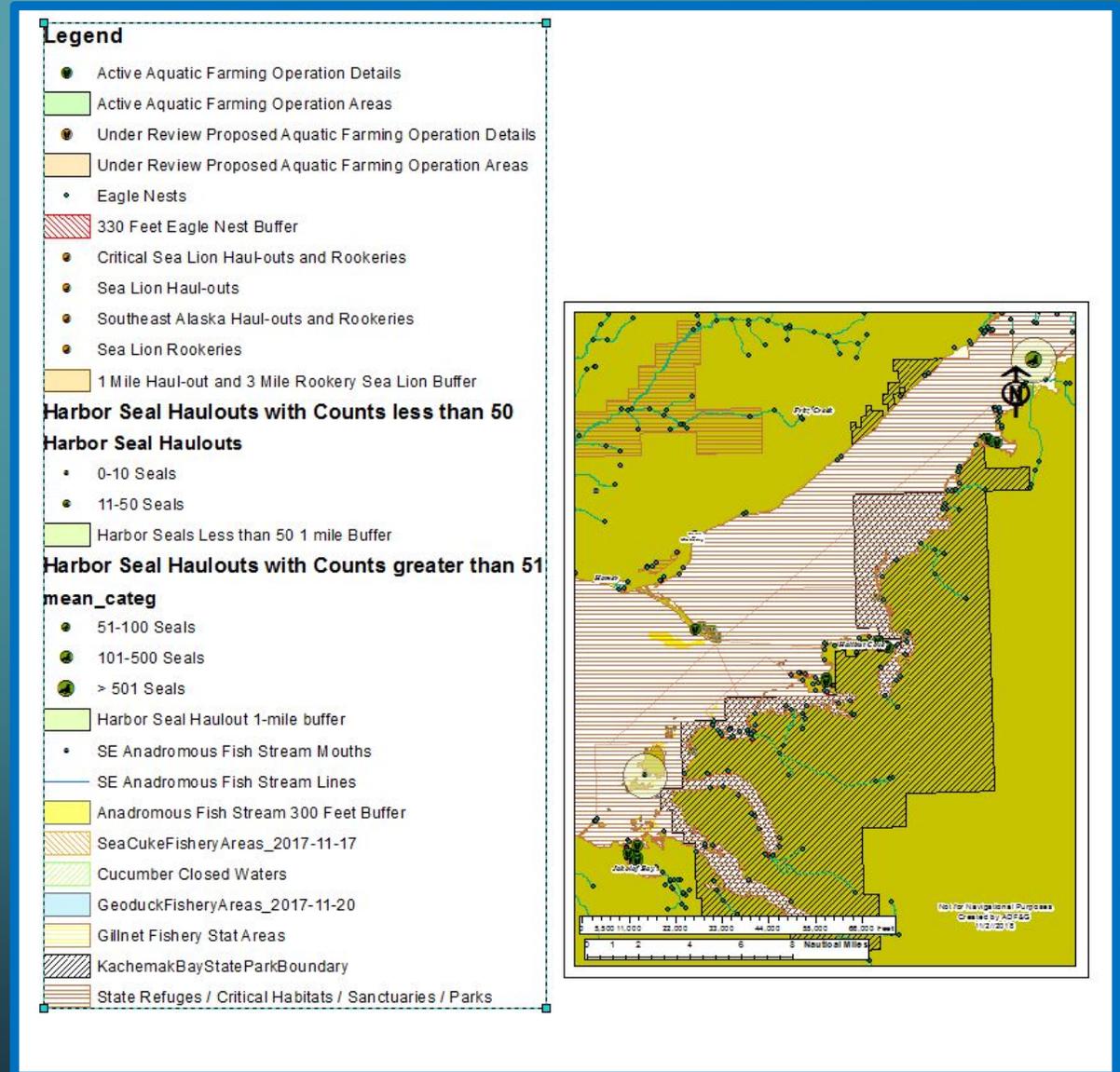
AQUATIC FARM SITE SUITABILITY / SITE SELECTION

PROXIMITY TO RESTRICTED AREAS



Designated Areas:

- State refuge and sanctuaries
- State parks and marine parks
- State critical habitat areas (CHA) except Fox River / Kachemak Bay



AQUATIC FARMING OPERATION PERMIT

OPERATION, DEVELOPMENT, AND STAFFING PLANS MUST DEMONSTRATE TECHNICAL AND OPERATIONAL FEASIBILITY

1. One operation and development plan for each species intended to be cultured
2. Demonstrates technical and operational feasibility – improving productivity of the organism above what would occur in natural conditions
3. Summarizes installation and maintenance of support facilities / culture gear/ anchoring systems
4. Schedule is consistent with life history of species intended to be cultured



***Complete one operation and development plan for each species**

AQUATIC FARM OPERATION AND DEVELOPMENT PLAN – PART A

Part A includes questions regarding your proposed operation. Your proposed aquatic farm or hatchery plans must demonstrate technical and operational feasibility (AS 16.40.105(4)). Please provide any additional information that you consider pertinent to your operating plan on additional sheets of paper as necessary.

Name _____ Species _____
 ADNR Lease ADL No.: _____ ADF&G Permit No. ____ - ____ -AF - ____

1. Provide an estimate of the total days and number of people (including yourself) that will be needed to operate your farm site for each year:

Year 1:	Number of Days _____	Number of People _____
Year 2:	Number of Days _____	Number of People _____
Year 3:	Number of Days _____	Number of People _____
Year 4:	Number of Days _____	Number of People _____
Year 5:	Number of Days _____	Number of People _____

Name _____ ADL Number _____ ADF&G Permit No. ____ -AF- ____ Species _____								
Calendar Year	Installation Schedule			# of Hatchery-Produced Seed	# of Seed Collected Onsite <small>(Only applies to indigenous sp.)</small>	Aquatic Farm Production Projected Harvest and Sales		
	Support Facilities ¹	Equipment/ Gear Types And Numbers ²	Anchoring Systems			Projected Sales ³ (\$)	# of Animals	# of Pounds
(Year 1) 20__						\$		
(Year 2) 20__						\$		
(Year 3) 20__						\$		
(Year 4) 20__						\$		
(Year 5) 20__						⁴ \$		

WHY DO AQUATIC FARMING?



BENEFITS

1. Sustainable
2. Economic opportunity
3. Opportunity to innovate
4. Opportunity to transfer technology
5. Opportunity to educate
6. Quality of life
7. Heritage
8. Food Security
9. Habitat for other species

1. Committed Coordinators
2. Mariculture Loan Program
3. Alaska Shellfish Growers Association
4. Alaska Fisheries Development Foundation
5. MTF goal of \$100 M /20 yrs.
6. College of Fisheries and Ocean Sciences - University (UAF) - Mariculture Professor & Specialist
7. NOAA Sea Grant Services & NOAA Aquaculture Coordinator

State and Industry Commitment

1. Seed supply
2. Workforce
3. Cost of doing business
4. No single point of contact
5. Limited state resources
6. Public perception
7. Public submerged and intertidal lands vs private lands

Limitations

QUESTIONS

For additional assistance, please contact:
Aquaculture Section/Commercial Fisheries Division
Alaska Department of Fish and Game
P.O. Box 115526, Juneau, AK 99811-5526
(907) 465-6150 - cynthia.pring-ham@alaska.gov
(907) 465-4325 - sam.rabung@alaska.gov
Fax: (907) 465-4168



General Aquatic Farming email: dfg.dcf.aquaticfarming@alaska.gov

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