



ASSESSMENT OF SEAWEED PROCESSING LOCATIONS IN ALASKA

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PREPARED FOR:
Alaska Fisheries Development Foundation



Formerly McDowell Group

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Alaska seaweed farm photography used on this report's cover courtesy of Seagrove Kelp Co. on Prince of Wales Island.

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Executive Summary

Alaska Fisheries Development Foundation contracted with McKinley Research Group to assess the suitability of six coastal Alaska communities as locations for seaweed processing facilities.

This research was conducted to assist companies interested in operating in Alaska. The report provides a broad base of information about the advantages and disadvantages of each community. The public availability of this information is intended to lower the research costs of operating in Alaska, with an understanding that any specific seaweed processor will have additional information needs based on the particulars of their business model.

The six study communities were evaluated based on three broad categories: availability of seaweed supply, costs of doing business, and partnership opportunities.

Summary of Findings

The wide variety of potential types of seaweed processing facilities complicates direct cost comparisons between communities. For example, low-cost energy might be more important to some business models than for others.

The project team was able to make some broad generalizations about advantages and disadvantages of the six study communities within specific categories. These findings are summarized in the table below.

Table 1. Assessment of Seaweed Processing Locations in Alaska, Overview Findings

	Craig	Kodiak	Valdez	Unalaska	Cordova	Ketchikan
Seaweed Supply	++	++	+		+	+
Energy (Cost & Sustainability)	++	++	+		+	++
Water and Sewer (Cost)		+	++	+	+	+
Labor (Worker Residency)		++	+	+		+
Local Property Taxes	++	+		+	++	+
Shipping (Cost & Schedule)	+	+	+	+	+	++

Note: Number of "+" symbols indicates the project team's general assessment of favorability for seaweed processing.

Seaweed Supply

Seaweed supply was assessed at a regional level, rather than a community level. The six study communities and four seaweed supply study regions are identified in the map below.

Figure 1. Study Regions and Communities



Source: McKinley Research Group graphic.

Alaska seaweed farming is in the early stages of development. Modern commercial seaweed farming began in the state in 2017.¹ In the short period since seaweed farming began, the four seaweed-growing regions have taken different trajectories, as seen in the summary table below.

Table 2. Alaska Seaweed Farm Production, Permits, and Sites, by Region

	Past Farmed Seaweed Production, All Years (pounds)	No. of Farm Sites (permitted and proposed)	Total Acreage (permitted and proposed)
Aleutian Islands Region	0	3	132
Kodiak Island Region	743,000	15	573
Prince of Wales Island Region	190,000	10	923
Prince William Sound Region	0	11	307
Other Areas of Coastal Alaska	0	8	79
Alaska Total	933,000	47	2,014

Source: Alaska Department of Natural Resources, Alaska Department of Fish & Game, industry interviews.

¹ Prior to this, some shellfish farmers gathered natural seaweed that grew on their gear but did not actively plant seaweed using seeded line cultivated in a hatchery.

While past production is not a direct indicator of future capacity, the Kodiak Island region's recent history of commercial seaweed farming gives the region an important head start. Successfully growing seaweed requires expertise that takes time to develop, especially when experimenting with new species and techniques.

The Prince of Wales region stands out as having by far the greatest acreage in the permitting pipeline at 922 acres - significantly more than Kodiak (572) and Prince William Sound (351). More than three-quarters of this planned development is applications from a single business: Markos Scheer's Premium Aquatics LLC. (Seagrove Kelp Co.).

Another way to measure potential seaweed production is by proposed linear feet of grow-out line. This measure takes into account farm design to derive a more nuanced estimate of potential farm output. The Prince William Sound region has the largest number of linear feet in the permitting pipeline, largely because many proposed farms in this region use an identical farm design featuring a high ratio of linear feet of line per acre.

The Aleutians Islands region has less immediate potential for seaweed farming than the other study regions. However, the region's industrial seafood infrastructure and remote coastline may help make it a relevant seaweed growing region in the long term.

Operating Costs

Energy

For both cost and environmental sustainability reasons, some companies exploring seaweed processing in Alaska highly favor using renewable energy. The communities of Kodiak, Craig, and Ketchikan stand out as relying almost entirely on renewable energy, mostly hydropower. Utilities in Cordova and Valdez also have substantial hydropower capacity. Unalaska's electricity is generated entirely from diesel combustion, although the city is exploring a substantial geothermal resource located near the community's power grid.

Direct comparisons of energy costs are difficult because of the varying rate structures between utilities. Unalaska stands out as the most expensive, with costs per kilowatt-hour exceeding \$0.20 even when fuel prices are low.

Water and Sewer

With a nominal base rate and a low variable charge of \$0.63 per 1,000 gallons, Valdez has the least expensive water service among the study communities.

Craig has the highest water charges (\$4.13 per 1,000 gallons, dropping to \$3.98 beyond 1 million gallons), although its base rates are low.

Taxes

The City of Craig has the lowest property taxes of study communities, with a tax rate of 6 mills, or \$6 tax per \$1,000 of assessed value. The next-lowest property tax rates are Unalaska (10.5 mills), Cordova (11.06), and the City of Ketchikan (11.8).

Valdez has a tax rate of 20 mills, the highest among the study communities.

In addition to taxing real property (land and buildings), Unalaska, Kodiak, and Ketchikan levy a tax on personal business property, such as machinery and inventory, while the other study communities do not.

Labor

The project team analyzed wage and residency statistics for seafood processing employees based on the assumption that seaweed processors may use a similar workforce. Comparable regional data for seafood processing wages between regions was not available, although the report does analyze seafood processing wages across different job titles.

Worker residency was analyzed because the seafood industry relies heavily on out-of-state workers, including thousands of temporary international workers who require special guest worker visas.

The reliance on nonresident workers varies widely between regions. Kodiak has the largest resident seafood processing labor force, while the Prince William Sound seafood processing sector is particularly reliant on out-of-state workers. In Valdez, (a Prince William Sound community), challenges associated with the seasonal workforce may be moderated by the presence of a skilled technical workforce associated with the Trans Alaska Pipeline System, the oil pipeline that ends in Valdez.

The Prince of Wales region has a particularly small seafood processing labor force, which may be an obstacle to operating in Craig. These challenges may be moderated in Ketchikan, the region's other study community, because of Ketchikan's larger population base.

Shipping

Among study area, Ketchikan has the lowest domestic shipping costs, with frequent inexpensive barge service between the community and Puget Sound. Despite its geographic proximity to Ketchikan, Craig shipping costs are substantially higher because of the added logistics of trucking and ferrying cargo from western Prince of Wales Island to Ketchikan.

Comparing the other five communities is more difficult due to variation in shipping service providers and commodity types. Kodiak has the most frequent ocean freight service, thanks to

twice-weekly port calls from container ship company Matson, in addition to barge service. Ketchikan has the second-greatest frequency of port calls after Kodiak.

Partnership and Social License

The partnership and social license section of this report overviews the 55 entities engaged in or closely tracking mariculture development and research in Alaska, including government agencies, local and tribal governments, Native corporations, nonprofit organizations, and seafood processing businesses.

Introduction and Methodology

Alaska Fisheries Development Foundation contracted with McKinley Research Group to review the suitability of six coastal Alaska communities as locations for seaweed processing facilities.

Alaska is the second largest farmed seaweed producing region in the U.S. (behind Maine), but development of seaweed markets is still in its infancy. This report builds on a previous report produced for AFDF ([Alaska Seaweed Market Assessment](#)). Attracting anchor buyer(s) for Alaska farmed seaweed was identified in the report as a key next step in industry development.

This report provides a guide to current seaweed farming activity in Alaska and costs associated with doing business in six coastal cities located near concentrations of active or proposed seaweed farms: Kodiak, Craig, Valdez, Unalaska, Cordova, and Ketchikan.

Study Regions

This report includes a regional analysis of Alaska's four main seaweed farming regions, followed by an analysis of six communities located within these regions:

- [Kodiak Island region \(including the study community of Kodiak\)](#)
- [Prince of Wales Island region \(including the study communities of Craig and Ketchikan\)](#)
- [Prince William Sound region \(including the study communities of Valdez and Cordova\)](#)
- [Aleutian Islands region \(including the study community of Unalaska\)](#)

Figure 2. Study Regions and Communities



Source: McKinley Research Group graphic.

Selection Rationale - Regions

Kodiak Island and Prince of Wales Island regions were selected for analysis because they have existing commercial seaweed harvest operations. Both regions also contain large clusters of permitted or proposed seaweed farms. More than 900 acres of farm sites have been proposed in the Prince of Wales region and more than 500 acres in the Kodiak region.

The Prince William Sound region is home to the next largest cluster of seaweed farms currently in the permitting pipeline. More than 300 acres of kelp farms have been proposed in this region.

With only three proposed farms totaling 132 acres, the Aleutians Island region is not in a position to produce a large quantity of seaweed in the immediate future. The area was selected for this study to explore potential synergies between seaweed processing farms and the region's large, high-volume seafood processing plants and strong supply chain links with Asia.

Of the 47 seaweed farms currently permitted or proposed in Alaska, 39 are located within the four regional study areas.

Selection Rationale – Communities

In Kodiak and the Aleutian Islands, the primary hub communities were identified as the most likely locations for a seaweed processing plant. In the other two regions, the choice was not as clear and two cities from each region were selected for analysis:

- Prince of Wales Island region: Craig was chosen due to its proximity to permitted and proposed seaweed farm sites. The larger city of Ketchikan was selected due to its larger population base and transportation connections.
- Prince William Sound region: Valdez was chosen due to potential logistical advantages of its location on the Alaska road system. Cordova was chosen based on its proximity to planned seaweed farm sites and for its significant commercial seafood processing facilities, which may become useful partners for seaweed processors.

Methodology

Seaweed Supply

The project team reviewed public documents for 47 permitted or proposed aquatic farms in Alaska that involve seaweed, including mixed shellfish/seaweed farms. Most permit applications were submitted between 2017 and 2021.

Withdrawn applications and farms that have closed were excluded. Mariculture farms that plan to grow only shellfish were also excluded, as were "natural set" farms that foster growth of ambient seaweed without use of hatchery-grown seeded line.

The Alaska Department of Natural Resources provided most aquatic farm permit data. Detailed permit application materials were available for some farm lease applications. For applications in earlier stages of the permitting process, the project team relied on summary information such as location, permitted species, and total farm acreage.

A small number of Alaska aquatic farms do not require a permit from the Department of Natural Resources, including two within this report's study areas. Summary information on these two farms was provided by the Alaska Department of Fish and Game.

Operating Costs and Potential Partners

Public data sources and executive interviews were used to estimate and provide context for costs associated with operating in each prospective seaweed processing hub community and region.

Key data sources include:

- Local electrical utility and municipal water rate sheets and staff interviews
- Alaska Office of the State Assessor and municipal taxing authorities
- Ocean barge and cargo ship tariff sheets and sailing schedules
- Alaska Department of Labor and Workforce Development reports and data sets:
 - Annual 2021 Nonresidents Working in Alaska report
 - List of most common seafood processing occupations

- Occupational Employment and Wage Statistics (OEWS)
- Alaska Department of Environmental Conservation seafood processor waste discharge permit data
- Alaska Department of Fish and Game Intent to Operate data for seafood processors.

Alaska's Seaweed Supply Regions

By volume, Alaska has the second-largest seaweed farming industry in the U.S. behind Maine. The North American seaweed industry in general remains very small compared to major seaweed farming nations in East Asia. The total farm gate value of Alaska's seaweed harvest was \$60,540 in 2019, the most recent year with available data.

Table 3. Alaska Farmed Seaweed Production and Value, 2017-2022 Projected

Harvest Year	No. of Active Farm Sites	Production (wet pounds)	Farm Gate Value
2017	2	18,000	Not available
2018	4	89,000	\$56,167
2019	3	112,000	\$60,540
2020	4	270,000*	Not available
2021	4	440,000**	Not available
2022P	8	570,000+**	-

Source: Alaska Department of Natural Resources and Alaska Department of Fish & Game.

*Based on industry interviews. **Projection.

Most seaweed production has occurred in the Kodiak Island region, with some more recent farming in the Prince of Wales Island region. Alaska has the potential to quickly scale up farmed seaweed production.

As seen in the following table, there are currently 8 active seaweed farms in the state, 16 authorized but not active, and 23 in the permitting pipeline. These numbers fluctuate frequently as new farms are approved, applicants withdraw, and farms close. Alaska's Department of Natural Resources accepts new aquatic lease applications between January 1 and April 31 each year.

Table 4. Alaska Seaweed Farm Permits by Study Region (as of October 2021)

	Total Number of Farm Site Permits	Total Acreage of Farm Site Permits
Aleutian Islands Region		
Active	0	0
Authorized	2	112
Under review	1	20
<i>Aleutian Islands Region Total</i>	<i>3</i>	<i>132</i>
Kodiak Island Region		
Active	4	129
Authorized	4	73
Under review	1	371
<i>Kodiak Island Region Total</i>	<i>15</i>	<i>533</i>
Prince of Wales Island Region		
Active	2	138
Authorized	2	189
Under review	6	596
<i>Prince of Wales Island Region Total</i>	<i>10</i>	<i>923</i>
Prince William Sound Region		
Active	2	25
Authorized	5	103
Under review	4	179
<i>Prince William Sound Region Total</i>	<i>11</i>	<i>307</i>
Outside Study Regions		
Active	0	0
Authorized	3	11
Under review	5	68
<i>Outside Study Regions Total</i>	<i>8</i>	<i>79</i>
Alaska Total	47	2,014

Source: Alaska Department of Natural Resources, Alaska Department of Fish & Game, industry interviews.

Most seaweed harvested to date has been used for food production. The three main varieties of seaweed farmed in Alaska to date are kelps: sugar kelp (*Saccharina latissima*), ribbon/winged kelp (*Alaria marginata*), and bull kelp (*Nereocystis luetkeana*).

Other kelps that have been permitted for farming include three-ribbed kelp (*Cymathae triplicata*) and dragon kelp (*Eualaria fistulosa*). Non-kelp seaweed species that have been proposed for Alaska include red seaweeds such as red ribbon (*Palmaria mollis*) and various species of nori. More farms may come online quickly if a larger market for seaweed develops. A

recent state initiative reduced the average mariculture lease permit application time from 572 to 274 days.²

This section details recent seaweed farming activity, pending permits, and basic socioeconomic conditions in the four seaweed supply study regions:

- 1) [Kodiak Island Region](#)
- 2) [Prince of Wales Island Region](#)
- 3) [Prince William Sound Region](#)
- 4) [Aleutian Islands Region](#)

Kodiak Island Region

Kodiak Island, the second-largest island in the U.S. after the island of Hawaii, is located in the Gulf of Alaska, about 250 miles southwest of Anchorage. Kodiak Island Borough is an archipelago comprised of Kodiak Island, surrounding islands, and a narrow strip of the Alaska mainland.

Figure 3. Kodiak Island Borough Boundaries, Largest Cities, and Seaweed Farm Sites



Source: Alaska DNR and ADF&G data. McKinley Research Group graphic.
Note. Current as of October 2021.

² Alaska Mariculture Taskforce. 2021. [Final Report to Governor Dunleavy](#).

The borough has a relatively high population density compared to other study regions, with a population of 12,611 in 2020. Most borough residents live in the community of Kodiak or along the surrounding roughly 80-mile road system.

Table 5. Population, Kodiak Island Region, 2020

Study Area	2020 Population	% of Borough Population
Kodiak Road System	10,945	86.7%
Kodiak Island Borough	12,611	100.0%

Source: Alaska Department of Labor and Workforce Development.

Kodiak Island Borough has experienced significant outmigration within the last decade, with a net loss of 2,397 individuals (18%) from 2010 to 2020.

Table 6. Population and Net Migration in Kodiak Island Borough, 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	13,592	13,897	13,981	13,823	13,812	13,761	13,549	13,281	13,121	13,009	12,611
Net Migration	24	16	-10	-322	-179	-215	-367	-401	-273	-167	-479

Source: Alaska Department of Labor and Workforce Development.

Note: Net migration does not include natural increases from birth and death rates.

In 2020, the median age in the borough was 35.7, identical to the Alaska statewide median population age that year.

Economy

The borough's primary economic drivers are fishing and fish processing, and the U.S. Coast Guard base. Kodiak consistently ranks as one of the top seafood ports in the nation in terms of both volume and value of seafood landed.³

Employment levels fluctuate annually due to the seasonal nature of commercial fishing and seafood processing. Peak employment occurs in July during the salmon fishing season. In 2020, the most recent year of data available, total borough employment in all industries peaked in July at 6,089, which was 28% higher than December lows.

The borough's unemployment rate exceeded the state's in 2019, and nonresident workers make up a greater share of workers in Kodiak Island Borough than in the state as a whole.

³ NOAA. 2019. [U.S. Commercial Fishing and the Seafood Industry, Top Ports by Volume and Value of Seafood Landed](#).

Table 7. Labor Force Indicators, Kodiak Island Borough, 2019

Study Area	Resident Labor Force	Unemployment Rate	% Nonresident Workers
Kodiak Island Borough	5,968	6.2%	25.7%
Statewide	353,888	5.4%	20.8%

Source: Alaska Department of Labor and Workforce Development.

Per-capita income in the borough is lower than statewide per-capita income, based on five-year average income estimates. However, the borough has a lower percentage of persons in poverty than the state as a whole.

Table 8. Income and Poverty Indicators, Kodiak Island Region, 2015-2019

Study Area	Median Household Income	Per-capita Income	Percentage with Income Below Poverty Levels
Kodiak Island Borough	\$85,839	\$32,876	7.1%
City of Kodiak	\$73,310	\$32,699	8.6%
Statewide	\$77,640	\$36,787	10.1%

Source: US Census Bureau. 2015-2019 American Community Survey.

Seaweed Supply

Seaweed farming is in its infancy in Alaska and in the U.S. in general. However, more than any other region in Alaska, Kodiak has a track record of commercial seaweed farming, with harvests dating back to 2017.

In the spring of 2021, the three active farms in the Kodiak study area produced about 300,000 pounds of seaweed, more than three times the production of the Prince of Wales Island region, the only other active region in Alaska in spring 2021.

PRODUCTION HISTORY

Nearly all past seaweed production in the Kodiak region has been for California-based company Blue Evolution, which makes seaweed food products including frozen and dried whole leaf kelp and kelp puree pouches.

Kelp farming development in the Kodiak Island region has benefited from a share of a \$3.1 million grant from the Advanced Research Projects Agency-Energy (ARPA-E). As part of a series of grants to spur seaweed innovation for the ultimate goal of producing seaweed biofuel, the U.S. government agency funded research in Kodiak and in New England to explore ways to lower seaweed farming costs.⁴

⁴ ARPA-E MARINER Program. [Scalable Coastal and Offshore Macroalgal Farming](#)

Some seaweed farm leaseholders in Kodiak have produced every year, starting with Nick Mangini of Kodiak Island Sustainable Seaweed, followed by the husband-and-wife team of Alf Pryor and Lexa Meyer. Other early Kodiak seaweed farmers (such as Erik Obrien) have not planted seaweed in the years since their initial harvests.

Seaweed harvests have increased steadily over the past five years in Kodiak, though production remains well below the capacity of permitted farms. Farmers report being reluctant to increase the amount of seeded line they outplant due to limited markets for their seaweed.

Table 9. Kodiak Area Farmed Seaweed Production 2017-2021 (wet pounds)

Harvest Year	# of Operating Farm Permits	Production
2017	1	18,190
2018	3	89,276
2019	2	136,140
2020*	3	200,000
2021*	3	300,000+
2022 (planned)	4	300,000+

Source: Alaska Department of Fish & Game, industry interviews.

*2020 and 2021 production are estimates based on industry interviews.

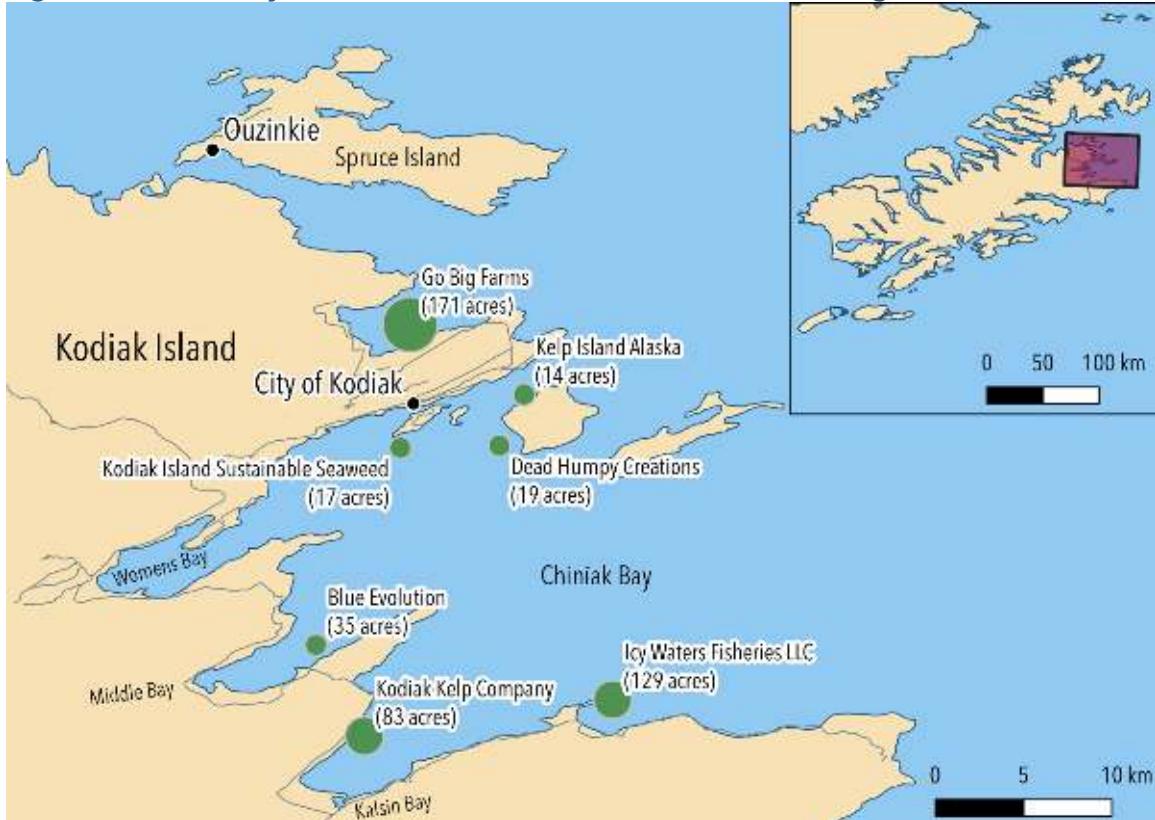
PERMITTED AND PROPOSED AQUATIC FARM SITES

There are currently eight permitted seaweed farms in the Kodiak area, encompassing 201 acres if fully developed. An additional seven are in the permitting process.

About half of the farm sites (both authorized and pending) are clustered within 20 kilometers of the community of Kodiak. Sites near the city include proposals for what would be the two largest seaweed farms in the region: Go Big Farms (171 acres) and Icy Water Fisheries (129 acres). The region's largest operational farm by acreage - the 83-acre Kodiak Kelp Company - is also near the city, although only a small research crop is planned for this farm site this year.

The following figure shows the locations and sizes of permitted and pending kelp farms near the community of Kodiak and along its road system. Roads link the community of Kodiak and its harbor with the region's only major airport, U.S. Coast Guard Base Kodiak, and a few small outlying communities. This road system does not extend beyond the northeast corner of the island.

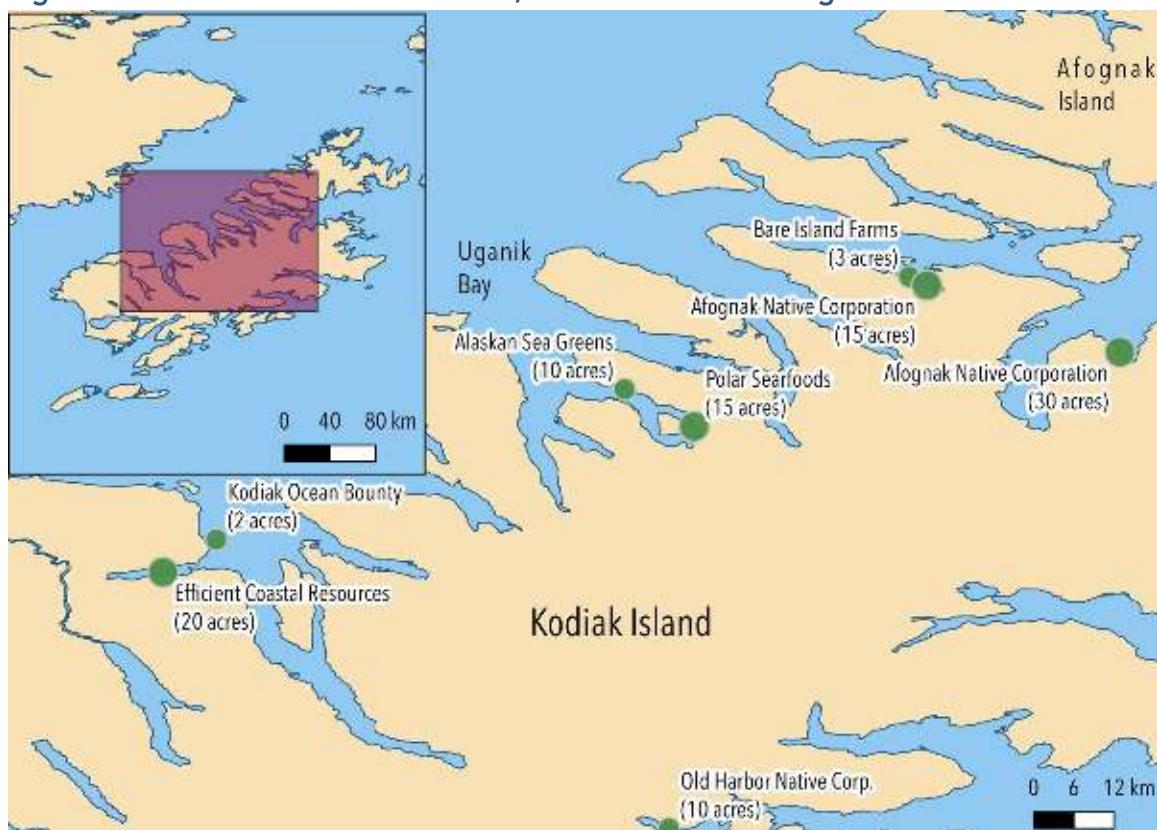
Figure 4. Kodiak City Area Seaweed Farms, Permitted and Pending



Source: Data from Alaska Department of Natural Resources and ADF&G. McKinley Research Group graphic.
Note. Current as of October 2021.

The following figure shows the locations and sizes of permitted and proposed kelp farms outside the Kodiak City area, or off the main road system. Two of these rural commercial farms plan to harvest kelp in the spring of 2022: Alaska Sea Greens on Kodiak Island's west side and Bare Island Farms on Kodiak Island's north side.

Figure 5. Kodiak Rural Seaweed Farms, Permitted and Pending



Source: Alaska DNR and ADF&G data. McKinley Research Group graphic.
Note. Current as of October 2021.

Kodiak is similar to the Prince of Wales Island and Prince William Sound regions with respect to the number and scope of seaweed farms in the permitting pipeline. All three regions have significantly larger proposed seaweed farming footprints than the Aleutian Islands region.

Kodiak farms have been particularly successful at growing sugar kelp and ribbon kelp. The planned 2022 harvest is about half sugar kelp and half ribbon kelp.

The table on the following page provides summary information on the region's permitted and pending kelp farming operations as of October 2021.

Table 10. Permitted and Pending Seaweed Farms in the Kodiak Island Region (as of October 2021)

Business Name	Owner/Contact Name(s)	Application Year	Status	Size (acres)	Size (linear feet of grow line)	Permitted Species			
						Sugar Kelp	Ribbon Kelp	Bull Kelp	Other
Kodiak Kelp Company	Tessa Meyer	2018	Active	83	175,000	X	X	X	Dulse, giant kelp
Dead Humpy Creations	A. Pryor	2017	Active	19	24,000	X	X		Dragon kelp
Kodiak Island Sustainable Seaweed	Nick Mangini	2017	Active	17	40,000	X	X	X	Dulse, nori, dragon kelp, three-ribbed kelp
Aaskar Sea Geers	Adelia Myrick, Tallef Monsen	2019	Active	10	24,700	X	X		
Blue Evolution	Beau Perry	2017	Authorized	35	9,600	X	X		
Hilfier Coastal Resources	Erik OBrier	2017	Authorized	20	19,200	X	X	X	Three-ribbed kelp
Polar Seafoods	Bill Hejes	2017	Authorized	15	Not Available	X	X		Pacific oysters
Bare Island Farms	John Bateman	2019	Authorized	3	800	X	X		
Go Big Farms	Erik OBrien, Nick Mangini, Dylan Bean, Tyler OBrien	2020	Under Review	1/1	Not Available	X	X	X	Dragon kelp
Icy Waters Fisheries LLC	Curtis Avenue Waters	2021	Under Review	129	Not Available	X	X	X	
Alagnak Native Corporation	Natalia Hayden	2020	Under Review	30	30,000	X	X	X	
Alagnak Native Corporation	Natalia Hayden	2021	Under Review	15	Not Available	X	X	X	
Keo's and Alaska	Chloe Irionoff, Haily Thompson, Clifton Ivano T.	2021	Under Review	14	Not Available	X	X		
Old Harbor Native Corp.	Cynthia Berns	2021	Under Review	10	Not Available	X	X		
Kodiak Ocean Bounty	Erik OBrier	2018	Under Review	2	Not Available	X	X		Dragon kelp

Source: Alaska Department of Fish & Game, Alaska Department of Natural Resources, and McKinley Research Group interviews.

Prince of Wales Island Region

The Prince of Wales Island region in Southeast Alaska is part of the Alexander Archipelago. Much of the lands are within the 17-million-acre Tongass National Forest, the largest national forest in the U.S. This region combines two census areas: the Ketchikan Gateway Borough and the Prince of Wales-Hyder Census Area.

Figure 6. Prince of Wales Island Region Boundaries, Largest Cities, and Seaweed Farms



Source: Alaska DNR and ADF&G data. McKinley Research Group graphic.

Note. Current as of October 2021.

The Prince of Wales Island region is home to 19 communities. The largest communities in the region are Ketchikan, Craig, and Metlakatla.

Table 11. Population, Prince of Wales Island Region, 2020

Study Area	2020 Population	Percentage of Regional Population
Ketchikan Gateway Borough	13,677	69.2%
Prince of Wales-Hyder Census Area	6,090	30.8%
Craig	1,065	5.4%
Metlakatla	1,321	6.7%
Prince of Wales Island Region	19,767	100.0%

Source: Alaska Department of Labor and Workforce Development.

The Prince of Wales Island region has seen the smallest amount of outmigration as a percentage of population among study areas. The negative net migration between 2010 and 2020 was 801 individuals or -4% of 2010 population.

Table 12. Population and Net Migration in Prince of Wales Island Region, 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	19,780	20,194	20,355	20,362	20,423	20,359	20,226	20,196	20,082	20,001	19,767
Net Migration*	68	295	28	-124	-39	-170	-221	-75	-191	-120	-266

Source: Alaska Department of Labor and Workforce Development.

*Note: Net migration does not include natural increases from birth and death rates.

The region has a higher median age than Alaska statewide. In 2020, the median age in the Prince of Wales-Hyder Census Area was 41.7, and 40.0 in Ketchikan Gateway Borough.

Economy

The primary private-sector economic drivers in the Prince of Wales Island region are the fishing and visitor industries. The hub community of Ketchikan is the second-largest cruise ship port in Alaska (after Juneau) by visitor volume, with 89% of 2019 Alaska cruise passengers calling there.⁵

Employment fluctuates seasonally due to the nature of the visitor industry. Peak employment occurs in June through September during the cruise ship season. In 2019, employment peaked in the Prince of Wales Island region at 11,101 in August, 32% above January lows.

The Ketchikan Gateway Borough had an unemployment rate of 5.5% in 2019, slightly higher than the statewide unemployment rate. The Prince of Wales-Hyder Census Area had a much higher unemployment rate, at 8.9%. Nonresident workers comprise 26.5% of total workers in the Ketchikan Gateway Borough, and 29.2% of total workers in the Prince of Wales-Hyder Census Area. The proportion of nonresident workers is higher in both regions than statewide averages.

Table 13. Labor Force Indicators, Prince of Wales Island Region, 2019

Study Area	Resident Labor Force	Unemployment Rate	% Nonresident Workers
Ketchikan Gateway Borough	7,022	5.5%	29.2%
Prince of Wales-Hyder Census Area	2,889	8.9%	26.5%
Statewide	353,888	5.4%	20.8%

Source: Alaska Department of Labor and Workforce Development.

Per-capita income in the Prince of Wales Island region is lower than statewide per-capita income, based on five-year average estimates. The Ketchikan Gateway Borough has higher median

⁵ McDowell Group. *Alaska Visitor Volume, Winter 2018-2019 and Summer 2019*.

household income and per-capita income than the Prince of Wales-Hyder Census Area, and also has about half of the percentage living below the poverty level.

Table 14. Income and Poverty Indicators, Prince of Wales Island Region, 2015-2019

	Median Household Income	Per-Capita Income	% of Persons with Income Below Poverty Levels
Ketchikan Gateway Borough	\$27,728	\$37,590	9.4%
Prince of Wales-Hyder Census Area	\$52,379	\$27,080	17.6%
Statewide	\$77,640	\$36,787	10.1%

Source: U.S. Census Bureau. 2015-2019 American Community Survey.

Seaweed Supply

The Prince of Wales Island region produces the second-largest seaweed harvest in Alaska, behind Kodiak Island. The main seaweed producer in this region is Markos Scheer's business, Premium Aquatics, which sells seaweed food products under the name Seagrove Kelp Co.

The geography of Prince of Wales Island is promising for seaweed farming because it has both undeveloped coastline and a robust road system that may facilitate transportation of seaweed grown at remote sites.

PRODUCTION HISTORY

Table 15. Prince of Wales Farmed Seaweed Production, 2017-2022 Projected (pounds)

Harvest Year	No. of Operating Farm Permits	Production (wet pounds)
2017	1	5,000
2018	1	10,000
2019	1	5,000
2020	1	70,000
2021	1	100,000
2022 (Projected)	2	270,000+

Source: Industry interviews.

*2020 and 2021 production are estimates based on industry interviews.

Some small experiments in commercial seaweed farming occurred in this region in 2017, 2018, and 2019 at Trevor Sande's business Marble Seafoods, located north of Ketchikan. Sande's 66-acre farm site is not listed in this report's seaweed farm tables because the business has since shifted moved entirely to shellfish farming.

Larger-scale commercial seaweed production in the Prince of Wales region began in the spring of 2020, with the first harvest from Markos Scheer's 127-acre farm site southeast of Craig.⁶ The farm's harvest has grown each year, and Scheer expects to harvest about 250,000 pounds of kelp in the spring of 2022.

In its first year, Scheer's business outplanted 75% bull kelp and 25% ribbon kelp. The farm has transitioned away from bull kelp temporarily due to challenges using legacy grow-out technology to produce large, marketable bull kelp. The farm currently produces a mix of sugar kelp and ribbon kelp while working to develop better technology for growing bull kelp.

Premium Aquatics has sold seaweed to more than 20 companies, most of them in the food industry. In 2021, the company also began selling ribbon kelp under its own brand, Seagrove Kelp Co.

The first harvest for a new seaweed farmer in this region is expected in the spring of 2022. Megan O'Neil, who has a lease for a small (10-acre) farm north of Prince of Wales Island, plans to farm about a quarter of the 35,000 feet of line in her permit, a mix of bull kelp and winged/ribbon kelp.

PERMITTED AND PROPOSED AQUATIC FARM SITES

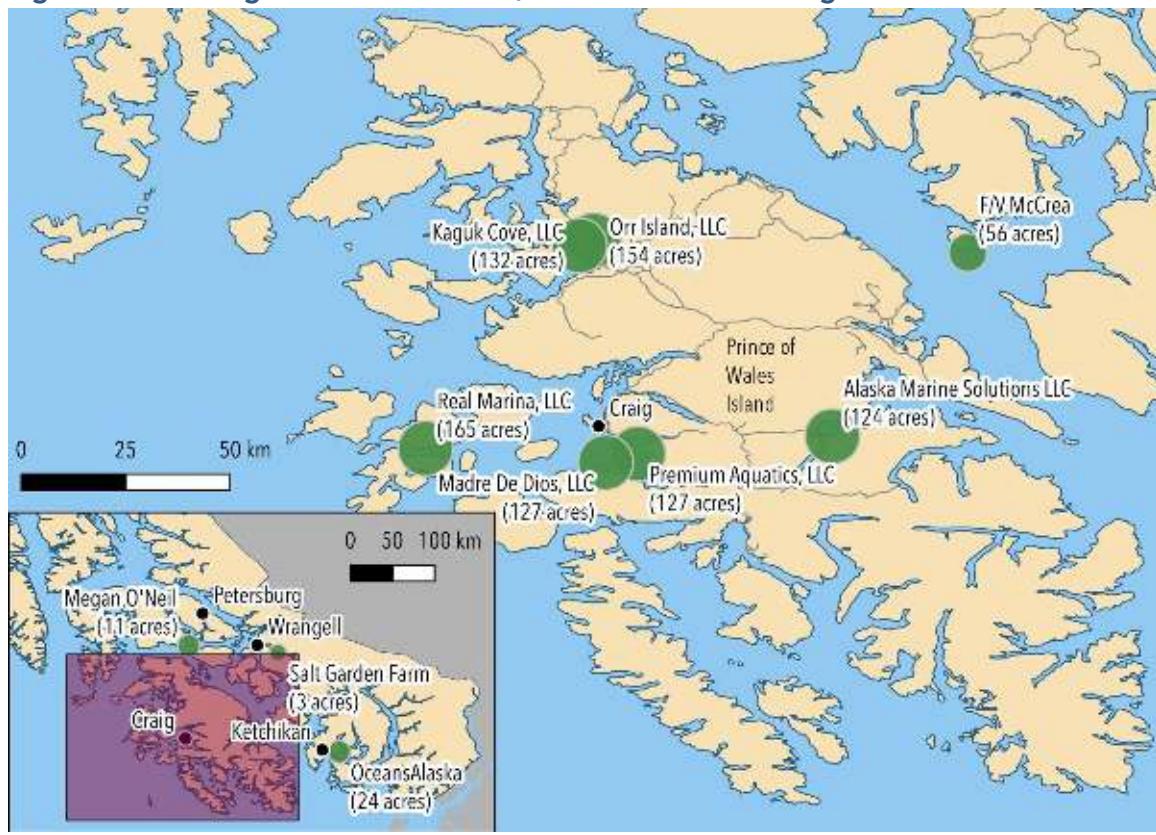
Markos Scheer's Premium Aquatics has three seaweed farm permits pending and one authorized along the west coast of Prince of Wales Island. These are all large farm sites – more than 100 acres – and are the largest concentration of farms of this size in the permitting pipeline in Alaska.

In addition to Scheer's five sites, two more farms have been proposed in the Prince of Wales Island region:

- The 124-acre Alaska Marine Solutions LLC farm site on the east side of Prince of Wales Island. Scheer's former employee Kevin Sund is the lease applicant.
- The 56-acre F/V McCrea farm site is 10 miles east of Prince of Wales Island. Lease co-applicant Julie Decker serves as executive director of the Alaska Fisheries Development Foundation.

⁶ Scheer is the current board president of the Alaska Fisheries Development Foundation.

Figure 7. POW Region Seaweed Farms, Permitted and Pending



Source: Alaska DNR and ADF&G data. McKinley Research Group graphic.
Note. Current as of October 2021.

In the wider Southern Southeast Alaska region, three additional seaweed farms have been proposed or permitted:

- OceansAlaska, a nonprofit organization, has a permit for a 24-acre farm site near Ketchikan but has not yet harvested any seaweed commercially.
- Two small farms have been proposed north of Prince of Wales Island near the communities of Wrangell and Petersburg: Megan O'Neil's Level Island Kelp farm, which plans to outplant its first crop in fall 2021, and Salt Garden Farm, a 3-acre farm still in the permitting process.

Interest in Seaweed Farming in Metlakatla Indian Community

Metlakatla Indian Community, Alaska's only Indian Reserve, is located south of Ketchikan in this region. Mariculture permitting for Metlakatla falls under the jurisdiction of the tribal government rather than the State of Alaska. No seaweed farms are currently operating in the Metlakatla area, but the community is exploring development of five small (half-acre) farm sites as of fall 2021.

The table on the following page provides summary information on the Prince of Wales region's permitted and pending kelp farming operations as of October 2021.

Table 16. Permitted and Pending Seaweed Farms in Prince of Wales Island Region (as of October 2021)

Business Name	Owner/Contact Name(s)	Application Year	Status	Size (acres)	Size (linear feet of grow line)	Permitted Species			
						Sugar Kelp	Ribbon Kelp	Bull Kelp	Other
Premium Aquatics, LLC	Markos Scheer	2017	Active	127*	145,800*	X	X	X	Pacific Oyster
Megan O'Neil	Megan O'Neil	2020	Active	11	35,000		X	X	
Real Marina, LLC	Markos Scheer	2018	Authorized	165	264,000	X	X	X	
OceansAlaska	Ioni Marsh	2017	Authorized	24		X	X	X	
On Island, LLC	Markos Scheer	2019	Under Review	154		X	X	X	Pacific Oyster
Kaguk Cove, LLC	Markos Scheer	2019	Under Review	132		X	X	X	Pacific Oyster
Madre De Dios, LLC	Markos Scheer	2018	Under Review	127		X			
Alaska Marine Solutions LLC	Kevin Sund	2020	Under Review	124		X	X	X	Giant Kelp
HV McCrea	Julie & Greg Decke	2020	Under Review	56		X	X	X	
Salt Garden Farm	Robert Lemke	2020	Under Review	3			X		

Source: Alaska Department of Fish & Game, Alaska Department of Natural Resources, McKinley Research Group interviews.

Prince William Sound Region

The Prince William Sound region is located in the Gulf of Alaska, east of Anchorage. The region encompasses more than 10,000 square miles, and is home to numerous waterways, islands, fjords, and glaciers. Cruise ships visit the area in the summer months, stopping primarily in Whittier and Seward, and to a lesser extent Valdez.

The region is home to five small communities. The largest are Cordova, Valdez, and Whittier, all of which serve as access points to the Sound.

Figure 8. Prince William Sound Region, Largest Cities, and Seaweed Farm Sites



Source: Alaska DNR and ADF&G data. McKinley Research Group graphic.

Note. Current as of October 2021.

This study defines the Prince William Sound Area as the Chugach Census Area, which is a subset of the area known until 2020 as the Valdez-Cordova Census Area.

Table 17. Population, Prince William Sound Region, 2020

Study Area	2020 Population	% of Borough Population
Cordova	2,366	35.0%
Valdez	3,855	57.1%
Whittier	298	4.4%
Prince William Sound Region	6,751	100.0%

Source: Alaska Department of Labor and Workforce Development.

The Prince William Sound region has seen negative net migration over the last ten years. The net outmigration between 2010 and 2020 was 442 individuals or -7% of 2010 population.

Table 18. Population and Net Migration in Prince William Sound Region, 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	6,684	6,805	6,907	6,849	6,789	6,818	6,807	6,719	6,718	6,750	6,751
Net Migration*	23	33	56	-133	-101	-20	-65	-136	-55	-3	-41

Source: Alaska Department of Labor and Workforce Development.

*Note: Net migration does not include natural increases from birth and death rates.

In 2020, the median age in the Chugach Census was 37.3, slightly higher than the statewide median age of 35.7.

Economy

Similar to other study areas, the primary economic drivers in the Prince William Sound region are the fishing and visitor industries. Salmon is the primary target species in the region, with harvests significantly dependent on hatchery production.

Employment levels fluctuate seasonally due to the nature of fishing and tourism. Monthly employment numbers in 2020 peaked at 4,538 in August, 61% above January lows of 2,826.

The Valdez/Cordova Census Area had a higher unemployment rate than statewide averages in 2019, and a much higher percentage of nonresident workers. Nonresident workers make up 41.7% of total workers in the Valdez/Cordova Census Area.

Table 19. Labor Force Indicators, Prince William Sound Region, 2019

Study Area	Resident Labor Force	Unemployment Rate	% Nonresident Workers
Valdez/Cordova Census Area*	4,817	6.7%	41.7%
State of Alaska	353,888	5.4%	20.7%

Source: Alaska Department of Labor and Workforce Development.

*The Valdez/Cordova Census Area is a previously defined census area that includes the current Chugach Census Area and neighboring Copper River Census Area.

Per-capita income in the Prince William Sound region is higher than statewide, based on five-year average estimates. The Prince William Sound region also has a lower poverty rate than the state as a whole.

Table 20. Income and Poverty Indicators, Prince William Sound Region, 2015-2019

Study Area	Median Household Income	Per-capita Income	Percentage with Income Below Poverty Levels
Valdez/Cordova Census Area*	\$9,867	\$36,907	7.8%
State of Alaska	\$77,640	\$36,787	10.1%

Source: United States Census Bureau. 2015-2019 American Community Survey.

*The Valdez/Cordova Census Area is a previous census area that includes the current Chugach Census Area and neighboring Copper River Census Area.

Seaweed Supply

The Prince William Sound region has not produced commercial farmed seaweed to date. However, this region has potentially to rapidly scale up seaweed production at several recently approved farm sites.

PRODUCTION HISTORY

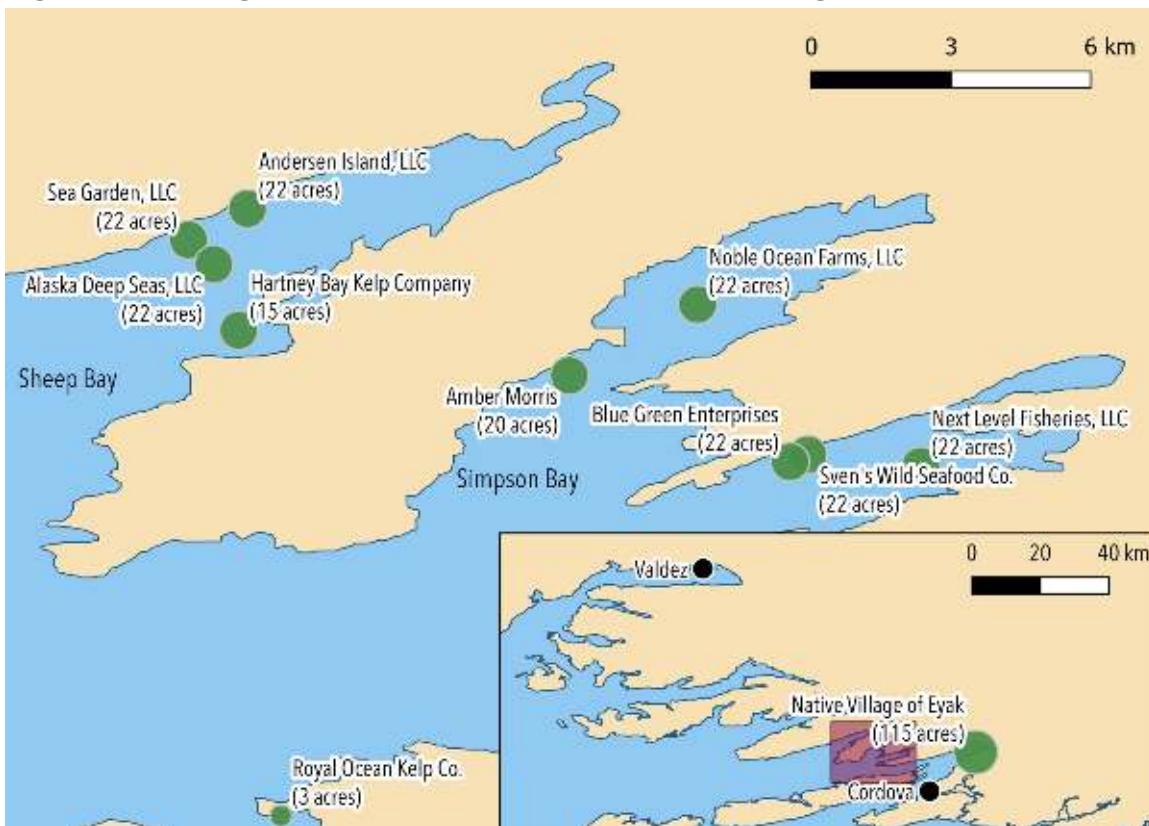
The first seaweed farm sites in the Prince William Sound Region were developed by The Native Conservancy in the fall of 2020 and harvested in spring 2021. These sites were developed as research sites only, where commercial harvest is not allowed. The region's first two commercial farms outplanted for the first time in fall 2021.

PERMITTED AND PROPOSED AQUATIC FARM SITES

The 11 proposed and permitted farms in the Prince William Sound region are closely clustered, with nine farm sites located in three small bays near the City of Cordova. All the farm sites are within 50 kilometers (ocean distance) of Cordova and within 250 kilometers of Valdez, across the relatively protected waters of Prince William Sound.

The region's largest proposed farm is the Native Village of Eyak farm site near Cordova.

Figure 9. PWS Region Seaweed Farms, Permitted and Pending



Source: Alaska DNR and ADF&G data. McKinley Research Group graphic.

Note. Current as of October 2021.

Proposed seaweed farms in the region have more linear feet of grow-out line than any other region in Alaska, despite the region's relatively small number of acres in the permitting pipeline. This is because many Prince William Sound farm applications share an identical farm design that features a more ambitious ratio of grow-out line to acreage than most Alaska farms.

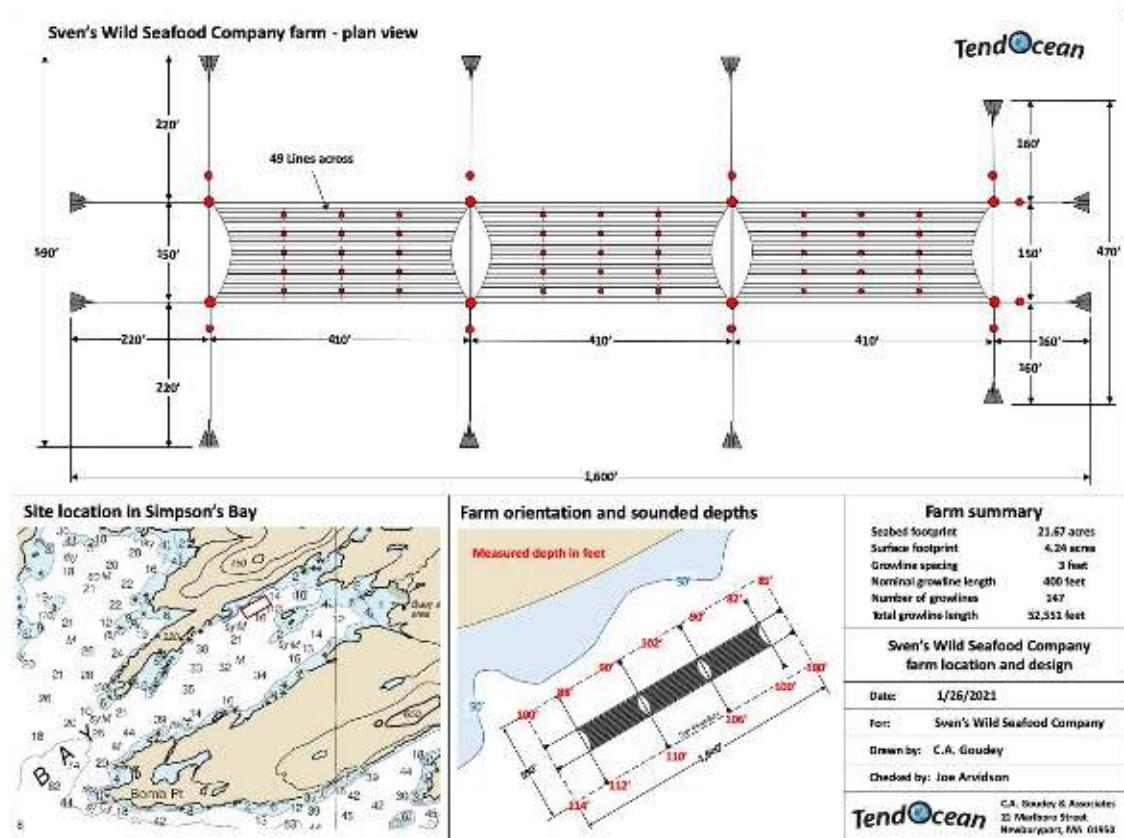
Seven of the 11 proposed farms in the Prince William Sound area were proposed using the same design for a 22-acre sugar and ribbon kelp farm with nine arrays each with 16 400-foot grow-out lines. The farm design's grow-out line to acreage ratio is 2,613 ft/acre, well above the state average of 1,848 ft/acre.

The seven farms with this modular design have moved quickly through the permitting process. All seven applications were filed in 2020, and as of October 2021, five had been approved. The first two Prince William Sound commercial seaweed farms were outplanted in fall 2021 –Nobel Ocean Farms and Royal Ocean Kelp Co.

The use of a common design in the region contrasts with other regions, where each farm has a unique design. With time each farm's design may change from the original permit application

drawings. For instance, Joe Arvidson's latest aquatic plant farm drawing depict a similarly dense farm design on 22 acres, but with a different layout.⁷

Figure 10. Sven's Wild Alaska Seafood Company Kelp Farm Design



Source: Joe Arvidson.

⁷ Joe Arvidson helped compile most of the seaweed farm applications to date in the Prince William Sound region.

Table 21. Permitted and Pending Seaweed Farms in Prince William Sound Region (as of October 2021)

Business Name	Owner Name(s)	Application Year	Status	Size (acres)	Size (linearfeet of grow line)	Permitted Varieties			
						Sugar Kelp	Ribbon Kelp	Bull Kelp	Other
Noble Ocean Farms, LLC	Sean Adel	2020	Active	22	57,600	X	X		
Royal Ocean Kelp Co.	Irene Thomas	2019	Active	3	9,000	X	X		
Svens Wild Seafood Co.	Joe Arvieson	2020	Authorized	22	57,600	X	X		
Next Level Fisheries, LLC	Bret Bradford	2020	Authorized	22	57,600	X	X		
Blue Green Enterprises	Dune Lankard	2020	Authorized	22	57,600	X	X		
Sea Garden, LLC	Rion Schmidt	2020	Authorized	22	57,600	X	X		
Harbor Bay Kelp Company	Michael Mahoney, Tara Kreyling	2020	Authorized	15	42,000	X	X		
Native Village of Hoonah	John Wissel	2019	Under Review	115*				X	Pacific cyste-
Andersen Island, LLC	Mall Andersen	2020	Under Review	22	57,600	X	X		
Alaska Deep Seas, LLC	Ruth Reuter	2020	Under Review	22	57,600	X	X		
Amber Morris	Amber Morris	2021	Under Review	20					Kelp (species unspecified)

Source: Alaska Department of Fish & Game, Alaska Department of Natural Resources, McKinley Research Group interviews.

*Note: In addition to seaweed, these farm permits include area planned for shellfish farming.

Aleutian Islands Region

The Aleutian Islands region in Southwest Alaska lies between the Bering Sea and the Pacific Ocean. The island chain extends more than 1,700 kilometers toward Russia and the Kamchatka Peninsula. Similar to other regions in the study, the Aleutian Islands are only accessible via plane or boat. This region is farther from the hub communities of Anchorage and Seattle. It takes approximately three hours to fly to Anchorage from Unalaska by jet.

This study area combines two geographic regions, the Aleutians West Census Area, which includes the communities of Unalaska and Adak, and the Aleutians East Borough, which includes the community of Sand Point.

Figure 11. Aleutian Islands Region, Largest Cities, and Seaweed Farm Sites



There are 14 communities in the Aleutian Islands, most of which have a population under 500. The largest communities in the region are Adak, Akutan, King Cove, Sand Point, and Unalaska. Unalaska is by far the largest, with more than half of the region's population.

Table 22. Population, Aleutian Islands Region, 2020

Study Area	2020 Population	% of Borough Population
Aleutians East Borough	2,925	34.5%
Akutan	995	11.5%
King Cove	900	10.4%
Sand Point	880	10.2%
Aleutians West Census Area	5,544	65.5%
Adak	290	3.3%
Unalaska	4,567	52.7%
Aleutian Islands Region	8,649	100.0%

Source: Alaska Department of Labor and Workforce Development.

Net outmigration between 2010 and 2020 in the Aleutian Islands region was 513 individuals or -6% of 2010 population.

Table 23. Population and Net Migration in Aleutian Islands Region, 2010-2020

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Population	8,702	8,670	8,758	8,775	8,695	8,570	8,475	8,337	8,283	8,526	8,469
Net Migration*	6	-65	61	-9	-119	-136	-112	-160	-88	222	-65

Source: Alaska Department of Labor and Workforce Development.

*Note: Net migration does not include natural increases from birth and death rates.

The Aleutian Islands region has a higher median age than Alaska statewide. In 2020, the median age in Aleutians East Borough was 44.5, and 40.0 in Aleutians West Census Area.

Economy

The primary economic driver in the Aleutian Island region is the fishing industry, and particularly the fish processing industry. The City of Unalaska has been the top seafood port by volume in the nation every year for more than two decades. The Aleutians East Borough, which includes Akutan, False Pass, Sand Point, and King Cove, ranked second in the nation in 2019.⁸ The primary Aleutian Islands commercial fisheries are groundfish, including pollock and cod.

Employment levels in the region fluctuate over the course of the year due to the seasonal nature of the fishing industry. In 2020, monthly employment peaked at 7,782 in February during the pollock season. The lowest employment levels occurred in December, 46% below February peaks.

⁸ National Oceanic and Atmospheric Administration. *U.S. Commercial Fishing and the Seafood Industry, Top Ports by Volume and Value of Seafood Landed*. 2019.

The Aleutians East Borough and Aleutians West Census Area both had lower unemployment rates in 2019 than statewide averages. In both regions, nonresidents make up a majority of workers, at 77.2% of the workforce in the Aleutians East Borough and 52.5% in the Aleutians West Census Area. The proportion of nonresident employment is significantly higher in both regions than the state as a whole.

Table 24. Labor Force Indicators, Aleutian Islands Region, 2019

Study Area	Resident Labor Force	Unemployment Rate	% Nonresident Workers
Aleutians East Borough	2,560	2.3%	77.2%
Aleutians West Census Area	3,657	3.1%	52.5%
State of Alaska	353,888	5.4%	20.8%

Source: Alaska Department of Labor and Workforce Development.

The Aleutians East Borough has lower average income levels than statewide averages, while the Aleutians West Census Area exceeds statewide average income levels. The percentage of people with incomes below the poverty line in the Aleutians West Census Area is approximately half of that in the Aleutians East Borough.

Table 25. Income and Poverty Indicators, Aleutian Islands Region, 2015-2019

Study Area	Median Household Income	Per-Capita Income	% with Income Below Poverty Levels
Aleutians East Borough	\$69,250	\$33,939	14.8%
Aleutians West Census Area	\$87,466	\$39,647	7.6%
State of Alaska	\$77,640	\$36,787	10.1%

Source: United States Census Bureau. 2015-2019 American Community Survey.

Seaweed Supply

Among the four study regions, the Aleutians Islands has by far the fewest seaweed farms operating or in the permitting process. However, regional attributes could make it a prime seaweed growing and processing location in the future. These attributes include the significant Bering Sea seafood processing infrastructure and an existing seafood supply chain that sends large volumes of seafood products to Asia from the region.

This remote region also has large areas of undeveloped coastline that may hold potential for seaweed farming. However, the relative scarcity of protected bays may present a challenge for this industry given the region's notorious wind and waves.

PRODUCTION HISTORY

Seaweed has not yet been farmed commercially in the Aleutian Islands region. In fall 2021, the region's first two kelp farm leases were authorized: Trident Seafoods' 102-acre farm near Sand

Point and a 10-acre farm site near Sand Point leased to the Aleutians East Borough government. Outplanting at the Aleutians East Borough site has been impacted by COVID-related travel issues and will likely not occur until fall 2022. Trident Seafoods' lease application was approved late in the season and no immediate activity is planned.

PERMITTED AND PROPOSED AQUATIC FARM SITES

The Aleutians East Borough farm site proposal includes plans to grow sugar kelp, ribbon kelp, bull kelp, and giant kelp. This farm features a novel design that combines two species on each growout longline, with one species lower in the water column and one floating on the surface.

While the borough government owns and plans to initially operate the aquatic farm, the borough's intent is to catalyze additional development, not to operate the farm indefinitely. The borough plans to eventually sell the farm or use it as a seaweed farming training site.

A much larger farm site was recently approved in the Sand Point area. The leaseholder for this 102-acre farm is Trident Seafoods, a major vertically-integrated commercial fishing and seafood processing company. Trident's lease permit application was filed in 2019.

Seven hundred miles away from Sand Point in the far western Aleutians, another seaweed farm has been proposed near the community of Adak. This lease application proposes raising geoducks in addition to kelp.

Table 26. Permitted and Pending Seaweed Farms in Aleutian Islands (as of Oct. 2021)⁹

Business Name	Appl. Year	Status	Nearest Community	Size (acres)	Size (linear feet grow line)	Permitted Varieties
Aleutians East Borough	2019	Authorized	Sand Point	10	24,080	Sugar, Ribbon, Bull, and Giant Kelp
Trident Seafoods Corporation	2019	Authorized	Sand Point	102	111,600	Sugar, Ribbon, and Bull Kelp
Golden Harvest Alaska	2020	License Review	Adak	20*	Not available	Sugar, Ribbon, Bull, Dragon Kelp, Geoducks

Source: Alaska Department of Fish & Game, Alaska Department of Natural Resources, McKinley Research Group interviews. *Note: This acreage includes area planned for shellfish farming.

⁹ While kelp farming applications have been limited so far in the Aleutians region, there has been a great deal of interest from communities in the area, according to Melissa Good, the statewide mariculture specialist for Alaska Sea Grant, who previously worked as a Sea Grant Marine Advisory Program agent in Unalaska.

Processor Operating Costs Comparison

This section evaluates the six study communities based on the following business input costs: utilities, labor, taxes, and shipping costs.

Energy

Due to Alaska's geography, each of the study communities draws power from separate electrical grids. None of the communities are connected to the "Alaska Railbelt" road and rail system that links Alaska's largest cities of Anchorage and Fairbanks as well as the Kenai Peninsula and Matanuska-Susitna Valley.

Small power cooperatives or municipal utilities own the power systems in all study communities except Craig. Craig is served by Alaska Power & Telephone, a corporation that provides power and communications services in several parts of rural Alaska.

The geography and climate of coastal Alaska support renewable energy production, especially hydroelectric power. Use of renewable energy ranges from nearly 100% in Craig, Kodiak, and Ketchikan to zero in Unalaska, which is powered exclusively by diesel.

Hydroelectric power plants in coastal Alaska primarily involve penstocks connected to alpine lakes which serve as reservoirs. In some places run-of-river plants also used, though these systems are not able to store energy for when it is in demand.

Where present, fossil fuel power plants in coastal Alaska are generally powered by diesel fuel rather than natural gas or coal, due to the easier logistics of transporting liquid fuel in small quantities, among other reasons.

In addition to regular posted rates, the tables for each community below include estimates provided by utilities of variable customer charges generally known as cost of power adjustments (COPA). In coastal Alaska, these variable charges are often highest in the winter months (as high as 20 cents per kilowatt hour) when less hydroelectric power is available, and utilities are more likely to rely on supplemental diesel generators.

Craig

Hydroelectric plants power a grid that supplies electricity throughout Prince of Wales Island, including Craig and Klawock. The utility is owned by Alaska Power and Telephone (AP&T), a Washington-based utility company that provides electricity and communication services for several areas of rural Alaska.

AP&T's Prince of Wales hydroelectric power capacity nearly doubled with the completion of the 5-megawatt Hiilangaay project in 2021. The company also draws power from two other hydro projects on the island: the 4.5-megawatt Black Bear Lake project and the 2-megawatt run-of-river South Fork project. The utility has an additional 17 megawatts of diesel power capacity on Prince of Wales Island that is available as backup.

Table 27. Relevant Alaska Power & Telephone Electricity Rates for Prince of Wales Island

	Bulk Power (>7,500 kWh per month or peak demand >20kW)	Large Customer (annual energy usage >250,000 kWh)
Customer Charge (per month)	\$103.37	\$172.27
Demand Charge (per kW)	\$8.44	\$8.24
Energy Charge (per kWh)	\$0.10	\$0.10
Cost of Power Adjustment (per kWh)*	\$0.07- \$0.11	\$0.07- \$0.11

Source: AP&T.

*Minimum and maximum COPA charge over previous two years.

Note: Energy rates rounded to the nearest cent.

Kodiak

Kodiak Electric Association (KEA) produces about 80% of its energy from the 33-megawatt Terror Lake hydroelectric plant. An additional 19% of the borough's energy comes from other renewable sources: six wind turbines (total power of 9 megawatts), two flywheels, and a battery storage system. About 1% comes from a backup diesel power plant. Because Kodiak uses very little diesel, its Cost of Power Adjustment is particularly low and varies little month-to-month.

Kodiak has a special rate for seafood processors. Qualifying for the seafood processor rate class requires approval of the Kodiak Electric Association board. Two customers currently qualify for the seafood rate.

Table 28. Relevant Kodiak Electric Association Rates

	Commercial	Large Power (> 50 kW peak)	Seafood Processor (requires board approval)
Customer Charge (per month)	\$15	\$50	\$50
Demand Charge (per kW)	None	\$5.67	None
Energy Charge (per kWh)	\$0.15 (first 300 kWh) \$0.13 (over 300 kWh)	\$0.13 (0-20K kWh) \$0.13 (> 20K kWh)	\$0.13
Cost of Power Adjustment (per kWh)*	\$0.02- \$0.03	\$0.02- \$0.03	\$0.02- \$0.03

Source: Kodiak Electric Association.

*Minimum and maximum COPA charge over previous two years. Energy rates rounded to the nearest cent.

Valdez

Copper Valley Electric Association (CVEA) provides electric service to Valdez and a large area of inland Alaska along the Richardson Highway. In the summer, the utility produces about 70% of its power from a pair of hydroelectric facilities with a combined nameplate capacity of 19 megawatts.

The cooperative also has two diesel plants with a combined capacity of 16 megawatts, and a 5.2-megawatt cogeneration plant at the Petro Star oil refinery in Valdez. The cogeneration plant burns a naphtha-type petroleum product to produce electricity for CVEA members. The plant also produces exhaust heat that is sold to the refinery and generates income for the cooperative.

Variable cost-of-power-related-fees in Valdez can be nearly twice as high in the winter because limited seasonal hydroelectric power production (especially from the run-of-river Allison Creek facility) necessities more diesel fuel use.

Table 29. Relevant Copper Valley Electric Association Rates

Large Commercial Rate (50-1,500 kW)	
Customer Charge (per month)	\$100
Demand Charge (per kW)	\$12
Energy Charge (per kWh)	
Tier I: 0 to 25,000 kWh	50.06
Tier II: >25,000 kWh	50.02
Cos. of Power Adjustment (per kWh)*	\$0.12 (summer)- 50.22 (winter)

Source: Copper Valley Electric Association.

*Two-year range for cost of power fees including fuel charge and G&T (generation and transmission) charge.

Note: Energy rates rounded to the nearest cent.

Unalaska

Unalaska provides electricity service from two city-owned diesel power plants with a total capacity of 17.6 megawatts. The city generates additional power from waste heat recovery generators at the main power plant.

Several attempts have been made to develop a geothermal power plant at the Makushin Volcano 14 miles from the city's grid. The current project developers describe plans to build a 36-megawatt plant at the volcano, with commercial operation starting in 2024.¹⁰

Some seafood processing plants in the city have their own power generation systems.

¹⁰ Makushin Geothermal Project. "[August 2021 Schedule](#)."

Because of Unalaska's reliance on diesel fuel for power generation, Cost of Power Adjustment in Unalaska tracks fuel prices and can be a major part of power bills when oil prices are high.

Table 30. City of Unalaska Electricity Rates for Large Commercial and Industrial Service

	Large General Service (20-60 kW demand)	Industrial Service (>100 kW demand for 6+ months)
Customer Charge (\$/inTar.h)	\$53.07	\$106.13
Demand Charge (kW)	\$7.11	\$8.49
Energy Charge (kWh)	\$0.18	\$0.15
Cos. of Power Adjustment (kWh)*	\$0.06- \$0.19	\$0.06- \$0.19

Source: City of Unalaska.

*Minimum and maximum COPA charge over previous two years.

Note: Energy rates rounded to the nearest cent.

Cordova

The Cordova Electric Cooperative (CEC) produces power through a 10.8-megawatt diesel plant and two hydroelectric plants with a total capacity of 7.25 megawatts. In 2019, the cooperative installed a 1-megawatt battery system to increase use of run-of-river hydropower and reduce diesel consumption.

CEC delivers power to its 1,500 customers entirely with underground distribution lines to avoid outages from snow, ice, and windstorms.

Cordova is 100% hydro-powered in summer months, and as little as 10% in the winter. The community's all-time peak for annual hydro power as a percentage of total kWh delivered was 78%. Drought conditions in the last two years led to higher-than-usual diesel usage and cost of power adjustment charges.

Published rates below do not reflect a pending Cordova Electric Cooperative rate revision meant to re-balance costs across rate classes and reduce month-to-month fluctuations in COPA charges. Of note, seafood processor rates are expected to go up 20%.

Table 31. Cordova Electric Cooperative Rates for Seafood Processors

	General (small non- residential)	Large Power*	Seafood Processors**	
			April-September	October-March
Customer Cos. per month	\$23.50	\$60.00	\$120.00	\$120.00
Demand Charge (per kW at peak)	None	\$8.57	\$13.18	\$13.18
Energy Charge				
Tier I (per kWh)	\$0.26 (0-500 kWh)	\$0.20 (0-50K kWh)	\$0.19 (0-20K kWh)	\$0.17
Tier II (per kWh)	\$0.22 (500+ kWh)	\$0.16 (5-25K kWh)	\$0.16 (20-40K kWh)	\$0.15
Tier III (per kWh)		\$0.16 (25K+ kWh)	\$0.16 (40-400K kWh)	\$0.14
Tier IV (per kWh)			\$0.11 (400K+ kWh)	\$0.11
COPA (per kWh)***	\$0.01-\$0.12	\$0.01-\$0.12	\$0.01-\$0.05	\$0.05-\$0.12

Source: Cordova Electric Cooperative.

Note: Energy rates rounded to the nearest cent.

*Large power is defined as three-phase users and single phase with demand > 500 kW.

**Available to three-phase seafood processors whose demand exceeds 500kW at any point in the year. These customers provide their own transformers, primary metering equipment, service wires, and disconnects.

***Lowest and highest COPA value over previous three years.

Ketchikan

Ketchikan Public Utilities is owned by the City of Ketchikan and provides power to Ketchikan and the nearby city of Saxman. Ketchikan's grid is powered mostly by hydroelectricity. About half the power comes from plants owned by the public utility on Revillagigedo Island, where Ketchikan is located. Ketchikan gets most of its remaining power from two other dams north of Ketchikan owned by the Southeast Alaska Power Agency (SEAPA). SEAPA also provides wholesale electricity to the Southeast Alaska communities of Wrangell and Petersburg. Ketchikan has two diesel power plants that are used as backups when hydropower is not available.

Table 32. Ketchikan Public Utilities Electric Rates

	Commercial Service	Industrial Service (demand > 100kW)
Customer Charge (per month)	\$42	\$61.75
Demand Charge (per kW in excess of 25kW)	3.37	3.37
Energy Charge (per kWh)	\$0.10	\$0.10
Cos. of Power Adjustment (per kWh)*	Up to \$0.06	Up to \$0.06

Source: Ketchikan Public Utilities.

Note: Energy rates rounded to the nearest cent. *Highest COPA charged in past two years.

Water and Sewer Service

Seafood processors are major consumers of municipal water in coastal Alaska. Seafood processors use municipal sewer systems less than they use water systems. This is because most medium and large processors generally discharge processing waste into the ocean rather than into the municipal sewer system.

This section deals only with waste and wastewater utility costs. More information about ocean discharge permits, which may be relevant to some seaweed processors, is available through the Alaska Department of Environmental Conservation.¹¹ In many cases special municipal sewer charges for seafood processors are based on the assumption that processing wastewater is being discharged into the ocean and that city sewer service is only needed for auxiliary parts of seafood processing facilities such as offices and bunkhouses.

Water and sewer rates in coastal Alaska use a combination of volume-based charges and more complex charges for unmetered systems. The latter are estimates of consumption of various types of businesses compared to a typical home. In study communities, this unmetered billing unit is known variously as an equivalent unit, equivalent residential unit, or equivalent dwelling unit.

Craig

The City of Craig uses an equivalent dwelling unit system rather than a meter to determine wastewater charges for industrial customers, including seafood (and presumably seaweed) processors. Customers are charged \$66.40 per equivalent dwelling unit. The number of equivalent dwelling units is determined on a case-by-case basis and must be approved by the city council.

Table 33. City of Craig Water/Wastewater Rates for Industrial Customers

Charge Type	Water	Wastewater
Base Rate Per Month	\$29.57 (varies by meter size)	\$66.40 Per Equivalent Dwelling Unit
Per 1,000 gallons	\$4.13 (up to a million gallons) \$3.98 (over a million gallons)	None

Source: City of Craig.

Note: Water base rates rounded to the nearest dollar.

¹¹ Alaska Department of Environmental Conservation. ["APDES Permitting for Wastewater Discharges from Seafood Processing and Hatchery Facilities in Alaska."](#)

Kodiak

Like Craig, Kodiak uses an equivalent unit system to determine sewage fees. Kodiak's fees for processors are based on the number of employees.

Table 34. City of Kodiak Water/Wastewater Rates for Industrial Customers

Charge Type	Water	Wastewater
Base Rate Per Month	\$68.57/46 (varies by meter size)	\$96.37 Per 6 Employees
Per 1,000 gallons	\$2.90	None

Source: City of Kodiak.

Note: Water base rates rounded to the nearest dollar.

Valdez

Valdez stands out as having by far the lowest water and sewer rates among the six study communities.

Table 35. City of Valdez Water/Wastewater Rates for Metered Customers

Charge Type	Water	Wastewater
Base Rate Per Month	\$10	\$14
Per 1,000 gallons	\$0.63	\$0.89

Source: City of Valdez.

Note: Base rates rounded to the nearest dollar.

Unalaska

The wastewater charge for commercial users in Unalaska is \$18.97 per 1,000 gallons, compared to \$2.26 for seafood processing customers. Seafood processing customers must have permits to discharge wastewater into the ocean to qualify for the rate.

The City of Unalaska has published anticipated sewer service fee increases through the year 2024. By July 2024 the industrial wastewater fee is scheduled to increase to \$5.65 per 1,000 gallons of metered water consumption, an increase of more than 100% from the 2021 rate.

Table 36. City of Unalaska Water/Wastewater Rates for Industrial Customers

Charge Type	Water	Wastewater
Base Rate Per Month	\$3.5103 (varies by meter size)	\$42
Per 1,000 gallons	\$2.60	\$2.26

Source: City of Unalaska.

Note: Base rates rounded to the nearest dollar.

Cordova

The City of Cordova charges customers for water using a metered service and uses an equivalent unit system to determine wastewater service charges. Some seafood processing facilities such

as bunkhouses are charged at the commercial \$67.81 rate (in the case of bunkhouses the number of units is 0.3 times the number of bunks). Processing plants are charged at the industrial rate of \$119.22 for each office or structure present.

Table 37. City of Cordova Water/Wastewater Rates for Heavy Industrial Customers

Charge Type	Water	Wastewater
Base Rate Per Month	\$34,523.2 (varies by meter size)	\$67.81 (commercial) - \$119.22 (industrial) Per Equivalent Unit
Per 1,000 gallons	\$1.85	None

Source: City of Cordova.

Note: Water base rates rounded to the nearest dollar.

Ketchikan

The City of Ketchikan currently has an unmetered water system but plans to begin using meters for large customers in late 2022 or early 2023. The per-1,000-gallon charge of \$1.30 listed below is an estimate provided by the municipality based on the average rates paid by the city's three main seafood processors in 2020. Ketchikan is the only study city that currently uses an unmetered water system for large customers.

Like several other cities, Ketchikan uses an equivalent unit system to determine sewage charges. Charges are \$56.16 per equivalent residential unit.

Table 38. City of Ketchikan Water/Sewer Rates for Seafood Processors

Water	Wastewater
\$1.30 Per 1,000 Gallons*	\$56 Per Equivalent Residential Unit

Source: City of Ketchikan.

*City estimate based on water usage and fees paid by seafood processors in 2021.

Labor

Alaska's seafood processing workforce has been identified as a potential labor force for seaweed processing businesses.

Alaska's seafood processing sector employs around 25,000 people each year. Statewide, about three-quarters of processing workers are non-Alaska residents. Most seafood processing workers are seasonally employed; about 20% work in the industry year-round.

About 60% of the workforce has experience in seafood processing from the prior year, and few (usually less than a third of the workforce) have five or more years of seafood processing experience.

About 66% of workers are male, and workers' average age is about 40 years.¹²

Seafood Processing Labor Force Across Regions

The nature of the seafood processing workforce varies across Alaska based on factors including seasonality of fisheries and remoteness.

For example, the Kodiak Island seafood processing workforce is large (1,970 workers) and primarily consists of residents. In 2019, 66% of workers were residents. While seasonal fluctuations occur, the variety of fisheries accessible from this Gulf of Alaska island make seafood processing a relatively steady year-round occupation there.

By contrast, in the Valdez-Cordova Census Area, processing activity is centered around the summer salmon season and relies more on a seasonal non-resident workforce: in 2019, 86% of processing workers were nonresidents. Many nonresident workers are foreign nationals who come to Alaska for seasonal work with H-2B visas.

Nonresident workers are even more important in the Bristol Bay Borough and the Aleutians East Borough. At peak employment these boroughs each attract more than 3,000 workers (more than 90% non-resident) to process Bristol Bay salmon and Bering Sea groundfish harvests.

The southern half of Southeast Alaska (Ketchikan Gateway Borough and the Prince of Wales Island area) has the smallest seafood processing workforce of the areas considered in this analysis. The Prince of Wales-Hyder Census Area has a particularly small seafood processing workforce: 161 workers in 2019.

Table 39. Seafood Processing Workforce by Region, 2019

Borough / Census Area	Workers	Wages (\$millions)	Non-Alaska Residents (%)	Non-resident Wages (%)
Aleutians West Census Area (Unalaska)	2,485	573	67%	58%
Ketchikan Gateway Borough	157	513	80%	68%
Kodiak Island Borough	1,970	547	44%	30%
Prince of Wales-Hyder CA (Craig)	161	53	70%	71%
Valdez-Cordova Census Area (PWS)	2,175	532	86%	73%

Source: Alaska Department of Labor and Workforce Development.

*Census area split into the Chugach Census Area and Copper River Census Area (inland area) starting in 2020.

¹² Alaska Department of Labor. [Worker Demographics in the Seafood Processing Industry](#).

Seafood Processing Wages and Job Types

The Alaska Department of Labor and Workforce Development identifies jobs associated with the seafood processing industry by occupational code. The nine most common codes are listed below.

In May 2020, the mean wage for the main seafood processing worker category (Meat, Poultry, and Fish Cutters and Trimmers) was \$16.05/hour. Hourly wages averaged \$19.26 for Food Batchmakers, a category of higher-skilled seafood processing workers that includes fish roe and surimi technicians. Wages averaged \$36.68 for first-line supervisors of production and operating workers.

Table 40. Alaska Seafood Processing Occupations Worker Count, Wage, and Residency

Occupation Code	Occupational Title	# of Workers (2018)	% Non-Resident (2018)	Mean Hourly Wage (2020)
513022	Meat, Poultry, and Fish Cutters and Trimmers	18,891	17%	\$16
511011	First-Line Supervisors of Production and Operating Workers	800	70%	\$37
439061	Office Clerks, General	519	46%	\$21
531199	Material Moving Workers, All Other	504	82%	\$24
513092	Food Batchmakers (including Fish Roe Technicians)	486	68%	\$19
352012	Cooks, Institution and Canteen	255	55%	\$20
352021	Food Preparation Workers	224	65%	\$15
499011	Maintenance and Repair Workers, General	221	47%	\$26
514041	Machinists	214	71%	\$31

Source: Alaska Department of Labor and Workforce Development.

Taxes

The State of Alaska does not currently impose an individual income tax or sales tax. The taxes most relevant to potential seaweed processors are the state corporate income tax and local property taxes.

Alaska Corporate Income Tax

Alaska levies a tax on corporate income above \$25,000. The tax rate increases over 10 brackets, up to a maximum rate of 9.4% for taxable income of \$222,000 and above.¹³

¹³ <http://tax.alaska.gov/programs/programs/index.aspx?60380>

Local Property Taxes

Local governments in all study areas impose real property taxes on land and structures. Real property tax rates range between 5.2 mills and 20 mills across study jurisdictions and also vary within jurisdictions.

In addition to real property taxes, some governments impose personal property taxes based on the value of non-real estate property such as machinery, office equipment, and inventory.

In Alaska, boroughs are local governments similar to counties, but boroughs do not exist in all parts of the state. Areas that have both city and borough governments (such as Ketchikan and Kodiak) often have lower property taxes in parts of the borough outside city boundaries.

In Kodiak, the total tax rate in the City of Kodiak, where much of the waterfront infrastructure is located, is 12.75 mills.¹⁴ In Ketchikan, the city rate is 11.8 mills, the highest rate in the borough.¹⁵

Other cities in this study, including Craig and Cordova, are not located within a borough.

Table 41. 2021 Property Tax Rates Across Study Jurisdictions

Jurisdiction	Real Property Tax Rate (mills*)	Personal Property Tax**	Notes
Cities Outside Organized Boroughs			
Craig	6	No	
Cordova	11.06	No	
Unalaska	10.5	Yes	Exemptions for boats and first \$30,000
Valdez	20	No	
Boroughs (rate varies by location)			
Kodiak Island Borough	10.75-14.5 (12.75 city)	Yes	Exemptions for boats, fishing gear, inventories, and first \$20,000
Ketchikan Gateway Borough	5.2-11.8 (11.8 city)	Yes	No personal property tax outside City of Ketchikan; exemptions for first \$25,000

Source: Alaska Office of the State Assessor, Alaska Taxable Supplemental Report, municipal websites.

*One mill is a \$1 tax on each \$1,000 of a property's assessed value.

**Where taxed, personal property is taxed at the same rate as real property.

Other Taxes

The State of Alaska and local governments collect several other taxes not directly applicable to most farming or processing businesses, including sales taxes and taxes on seafood landings.

¹⁴ Kodiak Island Borough. 2021. [Borough Mill Rates](#).

¹⁵ Ketchikan Gateway Borough. 2021. [Taxing Jurisdictions](#).

Of the cities and boroughs listed above, the cities of Kodiak, Cordova, and Craig have the highest sales tax rates at 7%, 6%, and 5%, respectively. The Ketchikan Gateway Borough levies a 2.5% sales tax and Unalaska levies a 3% sales tax. Neither the Kodiak Island Borough nor the City of Valdez have a sales tax.

Seaweed farms and processing businesses do not pay the 0.5% seafood industry tax used to finance the Alaska Seafood Marketing Institute. A bill was introduced in the Alaska Legislature in 2021 that would apply the levy to certain seaweed businesses and expand the state seafood marketing organization's mission to mariculture.

Shipping Costs

This report focuses on shipping costs to the contiguous United States, especially ocean freight shipping to the Puget Sound region of Washington, a major logistics hub for Alaska and the U.S. West Coast. Where possible, this section also addresses opportunities for international shipping.

Ocean Freight

Two main styles of ocean freight vessels serve Alaska coastal communities: barges and container ships. Container ships are ocean-capable vessels that carry large quantities of cargo. Container ships require deep water ports and usually require cranes for loading and unloading. Cargo company TOTE Maritime in Alaska is an exception, with roll-on/roll-off capacity.

Barges are flat-bottomed vessels that move more slowly than container ships and are less suited for rough seas. Barge shipping rates are often lower than container shipping rates. Barge service is especially important along the protected waters that connect Southeast Alaska and Puget Sound, as well as for Prince William Sound, where no container ship service is available. Barges also serve Western Alaska and are an essential resource for coastal communities not served by container ships.

Like container ships, barges often carry cargo in shipping containers. Shipping companies charge a premium for less-than-container-load shipping loads.

Domestic cargo ships differ from international cargo ships due to the Jones Act. This federal law requires ships that carry goods between American ports to be built, owned, and operated by U.S. citizens or permanent residents. Foreign-flagged ships can transport goods to or from Alaska from other countries, but Jones Act-compliant vessels, which have higher costs associated with them than the foreign fleet, must be used to transport goods from Alaska to other U.S. states.

In addition to the scheduled sailings described below, coastal Alaska is served by unscheduled charter or occasional service. A startup company, Washington-based Open Tug, is attempting to develop a shipping marketplace matching non-time-sensitive shipping needs with available space on barges already transiting to or from Alaska.

Alaska Marine Lines (AML) and Samson Tug and Barge are key barge service providers, while Matson operates container ships. Coastal Transportation, which serves Unalaska, operates another type of vessel, a coastal breakbulk carrier, which transports non-containerized freight on pallets, and can serve small ports in Western Alaska. The following table summarizes the ocean shipping services from barges and container ships in the six study communities.

Table 42. Ocean Freight Service to Puget Sound Across Study Communities

Port	Kilometers to Puget Sound*	Scheduled Port Calls/Month**	Main Service Providers	Notes
Ketchikan	1,500	8	Alaska Marine Lines (AML), Samson	Samson service via AML vessel share
Craig	1,700	4	AML, Samson	Samson service via AML vessel share
Cordova	3,100	6	Samson, AML	AML service on small barge via Whittier
Valdez	3,300	6	Samson, AML	AML service on small barge via Whittier
Kodiak	3,600	10	Matson, Samson	AML provides unscheduled service
Unalaska	5,000	10	Matson, Coastal Transportation, AML, Samson	Reduced sailing in winter and pollock off seasons

Source: Published sailing schedules, McKinley Research Group interviews.

*Estimated seaway distance.

**Approximation based on periods when service is most frequent (usually summers).

The specific types of ocean freight service vary between communities.

KETCHIKAN/CRAIG

Because of geographic proximity, Southern Southeast Alaska enjoys the fastest and lowest-cost barge service to Puget Sound from Alaska.

Alaska Marine Lines (AML) provides twice-weekly service from Ketchikan to Seattle, a trip that takes approximately three travel days.

Craig has access to this Ketchikan-Seattle service, but shipping takes longer and costs more because the west coast of Prince of Wales Island is not on the AML barge's main shipping route. AML moves freight by truck from Craig across the island to Throne Bay, where it is loaded onto a small barge, operated weekly, for transport to Ketchikan and on to the mainline barge.

A second shipping company - Samson Tug and Barge - offers shipping service to Ketchikan and Craig on the AML barge through a vessel-sharing agreement.

VALDEZ/CORDOVA

The Prince William Sound region is served by a combination of waterborne service directly from Puget Sound, and service through Anchorage and Whittier.

Samson Tug and Barge provides direct service to Seattle from both Valdez and Cordova on a once-every-two-week schedule, changing to once every three weeks in winter.

AML mainline Prince William Sound service is through the Port of Whittier, with service to Valdez and Cordova via a smaller barge that ferries across Prince William Sound once a week.

Whittier is connected to Anchorage by both rail and road. Several companies provide service between Anchorage and Puget Sound. Goods arrive at Anchorage's Port of Alaska on board container or roll-on/roll-off ships operated by Matson Navigation Company (Matson) and Tote Maritime. Both operators deliver to Anchorage twice weekly. AML also offers seasonal barge service between Anchorage and Seattle.

Another freight service through Whittier is the Canadian National Railway Company's "Aquatrain" barge. This barge serves Whittier from Prince Rupert, a British Columbia port linked to the North American road system, two to three times a month, year-round.

KODIAK

Kodiak's most frequent ocean freight service link to Puget Sound is Matson Navigation Company (Matson), which provides twice-weekly sailings on an itinerary that includes Tacoma (a major Seattle-area port), Anchorage, Kodiak, and on some sailings Dutch Harbor (Unalaska). The southbound service can be as short as three days on itineraries that do not include Dutch Harbor, and six days on itineraries that include Dutch Harbor. Matson also operates international service between Kodiak, Unalaska, and ports in Asia.

Barge service provider Samson Tug and Barge provides every-other-week service to Kodiak.

AML does not have scheduled service, but makes frequent stops in Kodiak, especially on southbound trips of its every-other-week Western Alaska run during the summer fishing season.

UNALASKA (DUTCH HARBOR)

Dutch Harbor is a body of water outside the city of Unalaska and the name is often used synonymously with Unalaska, particularly in the contexts of shipping and aviation.¹⁶

Dutch Harbor receives international container ship service not available to the other study communities due to its central Pacific Ocean location and the region's high-volume Bering Sea and Gulf of Alaska groundfish fisheries. Major international shipping companies that serve Dutch Harbor include American President Lines (APL), Matson, Maersk, and CMA CGM.

For domestic shipping, Dutch Harbor is served by all the companies mentioned above in this report, as well as Coastal Transportation, a Western Alaska breakbulk (noncontainerized) shipper that transports palletized cargo. Coastal Transportation provides service to Dutch Harbor every week during the peak of pollock seasons (Jan.-March and June-Aug.) and every other week in the off-seasons.

Matson serves Dutch Harbor once a week year-round. Samson sails to Dutch Harbor every other week in summer and every three weeks in winter. AML calls on the port approximately every-other-week, in summer only.

APPROXIMATE FREIGHT RATES

Shipping companies are required to publish tariff books, documents that outline charges associated with shipping different types of products.

These documents provide a rough estimate for ocean shipping costs to and from Alaska. However, in interviews shipping company leaders said the prices in tariff books are only a benchmark. They encouraged potential shipping customers to reach out and get a rate quote, emphasizing that shipping contracts with regular customers - especially large-volume customers - can be significantly lower than published prices.

Tariff books are also of limited use for comparing costs across shipping companies and port cities because specifications for commodity rate classes vary between companies and routes.

The table of sample tariff rates below provides a sense of magnitude of shipping costs to various communities. Because tariff rates for seaweed products do not yet exist, tariffs for other shelf-stable and frozen seafood products are provided. Example commodities were chosen based on similarities to potential seaweed products in terms of value or other characteristics, with an effort to choose shipping rates for products that are frequently shipped.

¹⁶ City of Unalaska. [The Story of a Name - Unalaska or Dutch Harbor?](#)

Factors that influence shipping rates include cargo value (more valuable cargo costs more, reflecting higher liability associated with shipping it) and the ratio of cargos weight to volume (denser cargos cost less because they require less volume aboard ships).

In addition to the rates listed below, shipping companies apply fuel surcharges, calculated as a percentage of a shipping bill. The fuel surcharge is higher for longer-distance trips. For example, as of October 2021, AML's shipping surcharge was 10% for Ketchikan and Craig, 16% for Valdez/Cordova, and 22.5% for Kodiak and Dutch Harbor. Fuel surcharges are relatively high at the time of this report's publication due to high fuel prices.

Table 43. Select Shipping Rates to Puget Sound by Community (\$/100 pounds)*

Commodity(item number)	KTN	CRG	COV	VAL	KOD	DTH
Alaska Marine Lines (AML) Tariffs						
Salmon, canned(3000)	\$7.79	\$14.46	\$14.24	\$19.44		
Salmon, canned(6500-001)					\$16.68	
Fish meal(6900-001)					\$12.98	\$13.15
Fish bait or animal feed, frozen(8000)	\$6.57	\$9.24	\$7.42	\$8.35		
Po ^l lock fillet, frozen(6400-002)					\$14.65	\$14.84
Salmon, pink or chum, frozen(8010.13)	\$7.50	\$10.14	\$12.50	\$10.07		
F ^o rster pink salmon(6500-006)					\$12.83	
Samson Tariffs						
Salmon, canned(3025)	\$7.79	\$14.46				
Fish, canned(2110)			\$12.75	\$15.99	\$17.96	
Salmon, pink or chum, frozen(3063)	\$7.50	\$10.14				
Salmon, frozen(2140)			\$30.98	\$24.24	\$27.13	
Matson Tariffs						
Fish oil in drums(3140-03-4801-0001)					\$12.50	
Fish, N.O.S., frozen(3140-01-3350-0001)					\$22.75	
Coastal Transportation Tariffs						
Fish, canned(1545-00-0002)					\$14.10	
Fish oil in drums(1547-80-0002)					\$10.55	
Fish meal, f ^o rster in bags(1547-90-0002)					\$15.35	
Fish, f ^o rster in blocks(1547-35-0002)					\$17.12	
Matson Tariffs						
Fish meal, Fish Powder				\$5.731*		\$8,385*

Source: Published tariff books for each company.

Note: All prices are the lowest rate for each product category (usually for 40-foot containers with cargo weighing 44,000 pounds or more).

*Except as noted. Matson prices are per 40-foot container.

Road Access

Valdez is the only study community connected to the North American road system. Driving distance between Valdez and Seattle is 2,200 miles, most of it through Canada.

All other study communities have a link to the road system through the Alaska Marine Highway System, a state-operated ferry system. Ferries connect communities not on the road system with each other and with the following continental road system-connected cities: Homer, Whittier, Haines, Skagway, Prince Rupert (British Columbia), and Bellingham (Washington). The ferry system can accommodate cargo trailers and vans up to 48 feet in length.

Partnership and Social License

The presence of community support and partnership opportunities will likely be key to the success of future seaweed processing in Alaska. The absence of sufficient community support (also known as social license) is cited as one reason for the failure of an earlier generation of seaweed farming in Washington State in the 1990s.¹⁷ Partnerships build community support and can foster access to labor, infrastructure, funding, and other resources.

This chapter briefly describes potential partners or sources of support, in three main categories. While efforts have been made to identify significant potential players, the list should not be considered exhaustive.

- [State and National Support](#)
- [Local, Regional, Native Corp, and Tribal Partners](#)
- [Potential Seafood Processing Partners](#)

State and National Support

Statewide and national organizations have been key sponsors of the emerging Alaska seaweed farming industry and will likely play a role in any future scaled-up seaweed processing efforts.

Below is a listing of organizations that support or may have the potential to support Alaska seaweed farming, production, research, product development, and marketing.

State of Alaska

Alaska Mariculture Task Force - Statewide support for the budding Alaska mariculture industry is rooted in the work of the Mariculture Task Force, formed in 2016 by an executive order from Alaska's governor. The Mariculture Task Force explored and documented priority needs in the areas of farming technique, applied research, siting, permitting, marketing, and other mariculture support. Task force members also worked to help the industry address policy and legislative barriers. In 2021, the Task Force dissolved and morphed into the Alaska Mariculture Alliance. See the non-profit section below for more on this Alliance.

¹⁷ Kim, JangKyun; Michael Stekoll; and Charles Yarish. 2019. [Opportunities, challenges and future directions of open-water seaweed aquaculture in the United States](#). Phycologia.

Alaska Grown - The Alaska Grown program is housed in the Alaska Department of Natural Resources' Division of Agriculture. The program created an Alaska Grown logo that can be applied to products and maintains a list of farmers and producers for buyers. Alaska Grown guidelines list mariculture products as eligible to use the logo upon applicant approval. The Division of Agriculture offers technical assistance, specialty block grants, and micro-grant opportunities for specialty crop growers (\$5,000/individual or \$10,000/organization).¹⁸ In theory, Alaska Grown could conduct marketing functions and familiarization trips for Alaska sea-farmed products, similar to ASMI's marketing for Alaska seafood, though Alaska Grown is not as well funded.



Alaska Seafood Marketing Institute (ASMI) - ASMI is a public-private partnership between the seafood industry and the State of Alaska, with a mission of increasing the economic value of the Alaska seafood resource. Although ASMI is not currently charged with supporting marketing of Alaska seaweed products, potential for that support exists. ASMI's implementing legislation would have to be amended to include seaweed products to allow ASMI authority to market Alaska-origin seaweed/kelp. The seaweed industry would ultimately be expected to contribute a portion of revenue to fund ASMI marketing work.

University of Alaska

The University of Alaska (UA) has three main campuses and multiple small community campuses. This diffuse system of campuses can be challenging to navigate. The three main campuses are: The University of Alaska Fairbanks (UAF), the University of Alaska Anchorage (UAA), and the University of Alaska Southeast (UAS). The following UA seaweed-processing-relevant programs are identified along with their parent University of Alaska campus.



Alaska Sea Grant (UAF) - The Sea Grant program is a partnership between National Oceanic and Atmospheric Administration (NOAA) and universities that offers extension services to marine-related industries, such as harvesting, processing, and aquaculture farming. Alaska Sea Grant extension agent Melissa Good, located in Kodiak, is

the program's designated mariculture specialist. Alaska Sea Grant hosted an Alaska Shellfish and Seaweed Festival in May 2021.¹⁹ Additionally, there are two Sea Grant agents also located in Kodiak who specialize in marine product research, development, and manufacturing - Quentin Fong and Chris Sannito. Also in Kodiak is a Seafood Processing Workforce

¹⁸ Alaska Department of Natural Resources, Division of Agriculture. 2021. [Grants](#).

¹⁹ Alaska Sea Grant. May 2021. [Alaska Shellfish and Seaweed Festival](#).

Development Coordinator, Lexa Meyer, who also works for the seaweed company Blue Evolution.

Each Sea Grant program is required to allocate a large percentage of its budget to grants for research that supports the wise use of marine resources. Alaska Sea Grant issues small grants every two years, mostly to faculty researchers in the UA system. Small grant proposals with Alaska industry partners or that help answer industry questions can score strongly. Through this small grant program, it may be possible for the Alaska seaweed industry to help shape the direction of applied research conducted in Alaska on seaweed.

Alaska Sea Grant currently has several aquaculture-related grants from National Sea Grant. One was received in partnership with the Aleutians East Borough to set up a pilot seaweed farm in Sand Point. A second grant is for Alaska Sea Grant to participate in a cross-Pacific Ocean collaboration with other state Sea Grants. Alaska Sea Grant is part of a National Seaweed Hub.

Manufacturing Extension Partnership (MEP) (UAA) - Housed in UAA's Business Enterprise Institute, the Alaska MEP Center is funded as part of a national network of centers operating under the National Institute of Standards and Technology.²⁰ The MEP serves small and medium-sized manufacturers to improve production processes, upgrade technological capabilities, and facilitate product innovation and growth. The Alaska MEP Center recognizes that seafood processing is a major area of manufacturing in Alaska and offers business development support to processors and all other manufacturing industries in Alaska including seaweed processing.



Cooperative Extension Service (UAF) - Extension programs were traditionally established at state land-grant universities in partnership with the U.S. Department of Agriculture to advance and innovate farming practices through applied research. That agricultural mission has been expanded in Alaska to include any research-based knowledge generated at the university that can be applied to problems and challenges in Alaska, including food safety at home, natural disaster preparedness, invasive species prevention, and development of alternate heating sources. Because seaweed mariculture is a form of agriculture, supporting research and development of the mariculture industry in Alaska is a logical fit for the UAF Cooperative Extension Service (CES) as it is in other states.²¹ However, UAF CES has largely reassigned that role to Alaska Sea Grant. CES receives funding from USDA and Alaska Sea Grant receives funding from NOAA, which means both entities could support mariculture in Alaska and tap into two federal funding sources.

²⁰ Manufacturing Extension Partnership. 2020. [Alaska MEP Manufacturing Solutions](#).

²¹ North Carolina State. [Cooperative Extension Service](#).

CES could become more engaged in supporting seaweed farming in Alaska because the USDA has said “aquaculture is agriculture,” and that supporting aquatic plant farming is within the agency’s purview.²² CES has a larger budget and far more extension agents and staff throughout Alaska than Alaska Sea Grant.



College of Fisheries and Ocean Sciences (UAF) - The research and teaching faculty within the College of Fisheries and Ocean Sciences (CFOS) are located at the inland Fairbanks main campus as well as in the coastal towns of Juneau and Kodiak. In 2020, CFOS hired Assistant Professor Schery Umanzor located in Juneau who specializes in kelp ecology.

University of Alaska Southeast (UAS) - UAS is headquartered in the Auke Bay area of Juneau, with affiliate campuses in Sitka and Ketchikan. UAS offers a variety of degrees ranging from 12-week occupational endorsements to bachelors and masters degrees. A number of UAS classes and degree programs help prepare students for careers in fisheries and mariculture, particularly the Fisheries Technology program based out of UAS Sitka. The Fish Tech program offers occupational endorsement opportunities with Alaskan Aquaculture, Scientific Diving, and Fisheries Management emphases, as well as an Associate of Applied Science degree. Fish Tech courses include Introduction to Mariculture, beginning and advanced scuba diving classes, Freshwater Ecology, Fisheries Management, and a variety of lab and internship opportunities. Many courses are offered in a flexible online or self-paced format. UAS Juneau Campus hosts its own Marine Biology degree programs and additional specialized diving and marine safety courses, as well as partnering with UAF's College of Fisheries and Ocean Sciences. UAS Ketchikan is home to a Maritime Training Center that offers a 12-week program (the Maritime & Multi-Skilled Worker program) leading to a United States Coast Guard Marine Oiler credential.



Federal Government

ARPA-E (U.S. Department of Energy) - In 2018, Professor Mike Stekoll (now emeritus) with UAS in Juneau won a Department of Energy, Advanced Research Projects Agency-Energy (ARPA-E)²³ grant to investigate scalable kelp farming for biofuel in Alaska and New England. Partners involved in the grant are Alaska Fisheries Development Foundation and Woods Hole Oceanographic Institution.²⁴ The grant will conclude in 2023.



²² U.S. Department of Agriculture. [Aquaculture](#).

²³ U.S. Department of Energy. 2017. [Macroalgae Research Inspiring Novel Energy Resources](#).

²⁴ U.S. Department of Energy. 2018. [Scalable Coastal and Offshore Macroalgal Farming](#).

NOAA Fisheries Alaska Regional Office - Each region of the U.S. now has a regional aquaculture coordinator housed at the National Marine Fisheries Service (NMFS, also called NOAA Fisheries) regional office. Coordinators are supported by the Office of Aquaculture at NOAA headquarters in Silver Spring, Maryland. Alaska's regional NMFS office in Juneau added an aquaculture coordinator, Alicia Bishop, in 2019. Securing an aquaculture coordinator position in the Alaska Regional Office was among the top recommendations of the Alaska Mariculture Task Force.



Alaska Fisheries Science Center - In October 2020, the Alaska Fisheries Science Center (a research-focused agency within NOAA) hired a new Mariculture Research Lead based in Juneau, Dr. Jordan Hollarsmith. She is expected to develop a mariculture research program, including research on macroalgae biology and ecology, shellfish culture, life cycle analysis, and habitat impacts of mariculture. Prior to this hire, the Alaska Fisheries Science Center conducted research on scallops, oysters, and abalone in Juneau and on crab and macroalgae in Kodiak.

Federal grant opportunities - NOAA opens several grant funding mechanisms to aquaculturists, through most funding is primarily aimed at fishing and processing operations. The National Sea Grant Marine Aquaculture Grant Program has three grant streams: Advanced Aquaculture Collaborative Programs; Exploring New Aquaculture Opportunities; and Social, Behavioral, and Economic Research Needs. In 2019, the state-level Sea Grant programs were the primary applicant in the first two categories, and academic institutions were the primary applicant in the third category. Industry applicants are unlikely to have a proposal funded by National Sea Grant unless they partner with a state Sea Grant program or university. For example, Alaska Sea Grant was a successful applicant along with Aleutians East Borough to the Exploring New Aquaculture Opportunities grant in 2019. The partners were awarded \$99,751 to establish a pilot seaweed farm in the Alaska Peninsula. A 50% match was required.

NOAA grant opportunities for which private industry or organization can be the primary applicant are the NOAA Small Business Innovation Research (SBIR) Program, Saltonstall-Kennedy Grant Program, and the Marine Aquaculture Pilot Projects operated through the Pacific States Marine Fisheries Commission. Since its inception in 2018, a number of grants have gone to projects in Alaska from the Marine Aquaculture Pilot Project grant, including one to Seagrove Kelp Company in 2021 on the topic of black seaweed cultivation in Alaska.

The 2021 Guide to Federal Aquaculture Grant and Financial Assistance Services²⁵ was prepared by NOAA and includes opportunities from other federal agencies for grants, loans and loan guarantees, education and training, cooperative research, market development support,

²⁵ National Oceanic and Atmospheric Administration Fisheries, Office of Aquaculture. 2021. [Guide to Federal Aquaculture Grant and Financial Assistance Services 2021](#).

research and development support, and small business support. Many federal grant programs require non-federal matching funds or in-kind contributions.

Statewide Non-profit Organizations



Alaska Fisheries Development Foundation, Inc. (AFDF) - Based in Wrangell, Alaska, AFDF has facilitated development of the mariculture industry in Alaska over the past decade by supporting industry and government communication, high-level planning by the state, identification of research priorities and industry needs, and conceiving of and receiving grant funding for mariculture capacity development and market research for the industry's benefit. AFDF offered mariculture training courses to Alaskans in 2020 and 2021 with East Coast seaweed non-profit organization Greenwave. AFDF received grant funding to launch the Alaska Mariculture Initiative, was a founding member of the Alaska Mariculture Task Force, released the Alaska Mariculture Development Plan, and helped found the Alaska Mariculture Alliance.

AFDF commissioned this report.

Alaska Mariculture Alliance (AMA) - At the conclusion of the Alaska Mariculture Task Force's work, the Alaska Mariculture Alliance was established by AFDF as a non-profit in June 2021. The AMA's mission is to "develop and support a robust and sustainable mariculture industry, producing shellfish and aquatic plants for the long-term benefit of Alaska's economy, environment and communities."²⁶ Anyone with an interest in Alaska mariculture can apply to be a member of AMA, which requires annual membership dues.

Alaska Ocean Cluster - Started within the Bering Sea Fishermen's Association, the Alaska Ocean Cluster's mission is to promote and enhance the "blue economy" in Alaska. Seaweed farming is part of the blue economy and could potentially be supported by the Alaska Ocean Cluster.



²⁶ Alaska Fisheries Development Foundation. 2021. [Alaska Mariculture Alliance](#).

Local and Regional Partners

Each region has ongoing partnerships and varying levels of engagement and support among local and statewide entities. Below are current partnerships and opportunities in each region with respect to mariculture development.

A Note on Native Corporations, Tribal Governments, and Related Entities

A basic understanding of the unique economic and governance structures of Alaska's indigenous people is important for doing business in the state. In 1971, the Alaska Native Claims Settlement Act (ANCSA) was passed by U.S. Congress to settle indigenous land claims. ANCSA established for-profit Native business corporations, not reservations, for 12 regions of the state plus a thirteenth regional corporation for Alaska Native people living outside the state. Each region includes additional village corporations also established by ANCSA. Alaska Native individuals can be shareholders of both regional and village corporations.

In parallel to Alaska Native regional and village corporations are village tribal councils, which are the governing body of a tribe. Tribal councils may deliver government services to tribal members and community residents. Services may include housing, social services, and judicial services. In addition to land allocations made through ANCSA, most village tribal councils own developable land. Village tribal councils are formally recognized by the U.S. federal government and are eligible for funding and services from the Bureau of Indian Affairs. Alaska has 229 federally recognized tribes.

Kodiak



Koniag - Koniag is the Regional Native Corporation for the Kodiak Archipelago. Koniag makes investments in energy and water, real estate, government services, technology and commercial IT, and in-region operations that support culture and community-generated products and services. Examples of investments on Kodiak Island include the Kodiak Granite Quarry and the Kodiak Brown Bear Center. Koniag has expressed an interest in supporting local community-based mariculture. Koniag holds title to 145,000 acres of surface land and submerged land. A land use or commercial use permit must be obtained from Koniag prior to accessing these lands.

KALI - The Kodiak Archipelago Leadership Institute (KALI) is supportive of small and community-based farming, mariculture, and hydroponics in the Kodiak region. Since 2005, KALI has convened an annual forum for Kodiak's rural communities to discuss and develop the rural regional agenda. Since 2015, KALI has been awarded grant funding for pilot land-based farms

in villages and for agriculture and business training for all Kodiak communities. In 2019, KALI organized a Regional Mariculture Conference and secured technical assistance from former Blue Evolution employee Tamsen Peeples. Peeples has assisted four rural communities - Larsen Bay, Old Harbor, Ouzinkie and Port Lions - in the Kodiak region with site selection, permit application, and business planning.²⁷

Afognak Native Corporation - Afognak Native Corporation is a village corporation that serves about 1,000 shareholders from the villages of Afognak and Port Lions. Afognak is large for a village corporation. The corporation employs 4,000 people nationally through its subsidiaries and could be a potential investor in seaweed farms as a form of local economic development.²⁸



Sun'aq Tribe of Kodiak - Of the many village corporations and tribes in the Kodiak region, one of the most pro-active in the seaweed industry has been the Sun'aq Tribe of Kodiak, which owns and operates Kodiak Island WildSource seafood company. Blue Evolution has partnered with the Sun'aq tribe to process kelp grown on farms in the area.²⁹

Kodiak Seafood and Marine Science Center (KSMSC) - A University of Alaska Fairbanks satellite campus, the Center houses faculty and staff offices, laboratories, and classrooms. Several extension agents (also called Marine Advisory Program agents) and staff of Alaska Sea Grant are involved in seaweed, including Quentin Fong (marketing and product development), Chris Sannito (processing techniques, testing and food safety) and Lexa Meyer. Meyer is also a PhD candidate on the topic of seaweed and a seaweed farm owner, and she provides technical support, grant writing assistance and training to communities interested in seaweed farming. She also works for Blue Evolution.

KSMSC contains a small processing space that can be rented for small-scale testing of processing techniques, product forms, and health and safety processes. It has been used to test seaweed processing by Blue Evolution.

Kodiak Fisheries Research Center - This city-owned facility houses fisheries research labs and scientists from NOAA Fisheries, Alaska Department of Fish & Game, and the Kodiak Regional

²⁷ Alaska Sustainable Agriculture Conference. 2020. [Developing a Network of Small, Community-Based Farms in the Kodiak Archipelago- Successes and Challenges](#).

²⁸ Native Business. 2020. [Afognak Native Corp. Acquires Retail Chain With \\$80M in Annual Revenue](#).

²⁹ VegWorld Magazine. 2021. [Making Waves for a Thriving Future with Seaweed](#).

Aquaculture Association. This facility is located adjacent to KSMSC. This proximity of researchers and facilities offers potential for collaboration on mariculture.

Kodiak Regional Aquaculture Association (KRAA) - This non-profit salmon hatchery association enhances salmon runs in the Kodiak area for the benefit of harvester groups. Salmon hatcheries could be potential partners in seaweed due to remote hatchery infrastructure that may be available for alternative uses such as seaweed farming in the non-fishing season.

 **Kodiak Economic Development Corporation** - This organization is new to Kodiak and has recently partnered with the Kodiak Chamber of Commerce to survey residents about the business climate in Kodiak. KEDC may have a future interest in seaweed mariculture or be a channel for economic development grant funds.

Southwest Alaska Municipal Conference (SWAMC) - A non-profit economic development organization for a large swath of Alaska, SWAMC is designated as the Alaska Regional Development Organization (ARDOR) for the Kodiak region and the federal Economic Development District for the southwest region. SWAMC serves as a liaison between regional leaders and government by communicating priorities and advocating for rural economic development. SWAMC received CARES Act funding from the U.S. Economic Development Administration to accelerate development of mariculture in the southwest region of Alaska.³⁰ The project will expand product development by informing processors about seaweed markets and products, as well as increasing private investment.



Prince William Sound



Valdez Fisheries Development Association (VFDA) - This private non-profit organization operates a salmon hatchery, a small seafood processing plant, and a cold storage facility for seafood products.

City of Valdez - The City of Valdez is supportive of waterfront industrial development, operates a dock for shipping vessels, and has provided the Valdez Fisheries Development Association (VFDA) with a 25-year land lease for its cold storage and processing facilities. The City of Valdez has a mariculture consultant on contract.



³⁰ Alaska Regional Development Organizations. 2020. [Fiscal Year 2020 Annual Report](#) (pg. 56).

Since 1977, the City of Valdez has managed and grown a multi-million-dollar fund seeded with a 1% fee on a Trans-Alaska pipeline bond. Valdez Permanent Fund earnings are to be used for the benefit of present and future generations, rather than for city operations or capital budgets. Fund earnings can be invested in local economic development, such as mariculture infrastructure.

Valdez Native Tribe - Valdez Native Tribe is pursuing opportunities to get more involved in mariculture in Alaska with a particular focus on job creation and workforce development. In the seaweed space, the tribe has pursued potential opportunities related to setting up a seaweed nursery as well as seaweed farming opportunities.

Tatitlek Native Entities - The Tatitlek Corporation and the Native Village of Tatitlek invested in shellfish farming 30 years ago and have a history with mariculture. Alaska village corporations in the area - Tatitlek and Chenega Corporations - have financial and leadership capabilities that could be invested in mariculture development.



Prince William Sound Science Center - Formed following the 1989 Exxon Valdez oil spill, the Prince William Sound Science Center was a research hub for species recovery and ecosystem function. The Science Center has potential to engage on seaweed research, product development, and hatchery/seed stock services. The Science Center recently formed a Mariculture Committee comprised of community members, aquatic farmers, and Science Center staff and scientists to explore how best to engage on mariculture.

The Science Center's future new site in Cordova will be a state-of-the-art research facility that is anticipated to have a running seawater system. This system would allow the Science Center to grow seaweed seed stock and sell to farmers or hatcheries, which would generate funding for Science Center operations while fulfilling mariculture industry needs. The Prince William Sound Science Center anticipates a future ability to conduct mariculture-related research such as factors that influence seedstock, seaweed's role as habitat and refugia for juvenile fish, and seaweed use in ocean acidification mitigation.



Native Conservancy - Established in 2003, The Native Conservancy supports habitat restoration, subsistence rights, language revitalization, and other programs. Founder and CEO Dune Lankard is Eyak Athabaskan, a seaweed farmer, and has partnered with GreenWave to develop regenerative ocean farming in Alaska. The Native Conservancy worked with a variety of partners to permit and set up seven research-only seaweed farms in Prince William Sound that saw their first harvest in the spring of 2021. A portion of the harvest was processed locally in Cordova, though none of the production is allowed to be sold under the terms of a research permit.

Native Village of Eyak - The Native Village of Eyak is a federally recognized tribe that has members, a tribal council, and provides government services to its members, such as health care, social services, economic development, job training, education, and natural resource management. The Native Village of Eyak is in the permitting process for a kelp and oyster farm site near Cordova.



Chugach Regional Resources Commission - The seven Tribes of the lower Cook Inlet and Prince William Sound region – including the Native Village of Tatitlek, Native Village of Eyak, Native Village of Port Graham, Native Village of Nanwalek, Native Village of Chenega, Qutekcak Native Tribe, and the Valdez Native Tribe – formed the Chugach Regional Resources Commission (CRRC) in 1984. The tribal consortium conducts a variety of programs related to management and advocacy in the preservation of natural resources and subsistence opportunities.



Alutiiq Pride Marine Institute - Located in Seward, the Alutiiq Pride Marine Institute is operated by the Chugach Regional Resources Commission. The institute was formerly known as the Alutiiq Pride Shellfish Hatchery and includes a grow-out facility for a variety of molluscs (oysters, clams, scallops, and others) as well as king crab, sea cucumbers, and kelps. The institute also serves as a science facility for aquaculture and ocean chemistry research. Supported by grant funding, Alutiiq Pride developed a containerized seaweed hatchery that provided seed to all active seaweed farms in the Prince William Sound region in 2020 and 2021.

City of Cordova - Cordova's mayor, Clay Koplin, is a supporter of innovative rural economic development, including mariculture. The City's fisheries development committee also supports mariculture development in the Cordova area.



Prince William Sound Economic Development District (PWSEDD) - Executive Director Kristin Carpenter leads the Prince William Sound Economic Development District, which includes Valdez, Cordova, Whittier, Chenega, and Tatitlek. This organization has a mission to foster economic growth and has organized an informational meeting about kelp farming and processing for fall 2021. The organization co-funded a Cordova cold storage and public processing feasibility study completed by McKinley Research Group in Summer 2021. The study found that the Cordova area offers significant cold storage and processing facility potential, though a second phase of this research has not yet been triggered.





Exxon Valdez Oil Spill Trustee Council (EVOS TC) - After the 1989 oil spill from the oil tanker *Exxon Valdez*, a government Trustee Council consisting of three state and three federal members was assembled to restore and recover the spill-affected area using settlement funds. Though funds have been spent down in the past 30 years, some funds remain. The EVOS TC recently issued an invitation for proposals that included development of mariculture as a focus area. Several seaweed proposals have been submitted to the EVOS TC from coalitions.

Successful proposals will be funded for five or 10 years.



Prince William Sound Aquaculture Corporation - This private, non-profit hatchery association was formed in 1974 with a mission of enhancing salmon runs in Prince William Sound for all user groups – commercial, recreational, personal, and subsistence. Prince William Sound Aquaculture Corporation (PWSAC, locally pronounced PIZ-whack) operates four remote hatcheries with infrastructure on Prince William Sound, as well as one in-river hatchery. The organization's operations are directed by a General Manager (Geoff Clark is interim GM), who is guided by a six-member Executive Committee as well as the larger Board. PWSAC is funded through a 2% commercial salmon harvest tax and by selling a portion of the returning hatchery salmon (cost recovery sales).

Depending on the interest of the leadership of this organization, there is potential for PWSAC to experiment with growing seaweed at hatchery sites for juvenile salmon refugia from predators or for other purposes, such as absorbing excess nutrients, regulating localized ocean acidification, or to harvest and sell. The four Prince William Sound remote hatchery sites are on waterfront and have structures for fish incubation and rearing, staff housing, and seawater circulation equipment. This infrastructure could potentially be used for seaweed farming; however, no site assessments have been done for these locations and seaweed farming is not a current priority for PWSAC.



Blue Wave Futures, LLC - A for-profit seaweed farm collective led in part by Joe Arvidson, Blue Wave Futures has an office in Cordova and the founding members are seaweed farmers in the Prince William Sound region. The Blue Wave Future vision statement states, "by growing kelp we can help local economies while saving our oceans."³¹ As of summer 2021, the collective has three members with permitted seaweed farm sites in the Cordova area. The farms have not been set up or outplanted, pending market development and grant funding.

³¹ Blue Wave Futures. [Social Purpose](#).

Prince of Wales Island Region

Shaan Seet Incorporated - Shaan Seet is the ANCSA village corporation in Craig. President Ed Douville was a member of the state's Mariculture Task Force. Shaan Seet does not have an interest currently in seaweed farming or processing; however, the corporation is carefully tracking the progress of the industry as it grows. Shaan Seet has the capacity to support and facilitate the mariculture industry in the future using existing corporate assets, such as its construction company, hotel, dock, property management and leasing business, and shipyard at False Island.



Other Tribal Entities - The village corporations and tribal councils for four Prince of Wales communities - Craig, Klawock, Kasaan, and Hydaburg - formed a mariculture group that meets approximately quarterly. Klawock Cooperative Association (KCA), a tribal government, operates an oyster farm near Naukati, a road-accessible town. Klawock Heenya Corporation and Shaan Seet, both ANCSA village corporations, own land that could be developed, leased, or managed for use by the mariculture industry.



Sustainable Southeast Partnership and Spruce Root - Focused on sustainable economic development in rural, Native communities in Southeast Alaska, the Sustainable Southeast Partnership is active in supporting Klawock and other Prince of Wales communities and tribes. Spruce Root, an Alaska Native-led community development non-profit, provides backbone support and coordination for Sustainable Southeast Partnership. Spruce Root aids local entrepreneurs with business coaching and financial training. Recently, the Seacoast Trust pledged to expand Sustainable Southeast Partnership programs by leveraging \$17 million from Sealaska regional corporation and The Nature Conservancy. Spruce Root's Board of Directors will have oversight and fiduciary responsibility for the Seacoast Trust.



Sealaska - The ANCSA regional corporation Sealaska has 23,000 shareholders and invests in business ventures that protect the environment and create economic opportunity and growth. Sealaska has invested in several sustainable foods companies, one of which is Barnacle Foods, a kelp food manufacturer based in Juneau, Alaska. As noted above, Sealaska pledged \$10 million in matching funds to establish the Seacoast Trust, which will expand Sustainable Southeast Partnership's work.

Naukati Bay Shellfish Nursery - A community-owned oyster grow out facility in the town of Naukati supplies oyster farmers in Alaska with seed oysters. Naukati is on the Prince of Wales Road system and has a floating dock and boat launch.

Southeast Alaska Sustainability Strategy - The U.S. Department of Agriculture (USDA) launched a Southeast Alaska Sustainability Strategy to support and diversify economies in Southeast

Alaska. Fisheries and mariculture are among the key opportunities that this federal agency identified in the region. The initial \$25 million federal investment from the USDA may increase capacity within the Tongass National Forest office to support the agency and local priorities. Investments may be made in infrastructure, renewable resource development, local capacity building, and supporting indigenous interests.



Southeast Conference - Southeast Conference is the state and federally designated regional economic development organization for Southeast Alaska and is directed by Robert Venables. Mariculture development is one of the key priorities identified through the organization's Comprehensive Economic Development Strategy (CEDS) planning process. Southeast Conference strongly supported the state's Alaska Mariculture Task Force and has recently worked to pursue grant opportunities to further support the region's mariculture industry. In fall 2021, Southeast Conference led the submission of a successful mariculture-focused grant proposal through the U.S. Economic Development Agency's Build Back Better program. As a Phase I grantee, the statewide coalition led by Southeast Conference was awarded \$500,000 in funds for planning and research, with a key deliverable a grant application for Phase II BBB funds, which can be up to \$100 million to support implementation of identified mariculture development projects.

OceansAlaska - A shellfish hatchery and marine science center, OceansAlaska operates a permitted 24-acre farm site near Ketchikan. The farm site began in 2018 as the Ketchikan Community Demonstration Seaweed Farm with a grant from the Pacific States Marine Fisheries Commission aquaculture program. Tomi Marsh, long-time Alaska seafood harvester and OceansAlaska board member, is associated with GreenWave and is on the Alaska Seafood Marketing Institute board.



Metlakatla Indian Community – Mariculture activity in Metlakatla, a community of about 1,400 located southeast of Ketchikan, is regulated by the Metlakatla Indian Community rather than the State of Alaska. Metlakatla is the only Indian reservation in Alaska because the tribe chose to opt out of the Alaska Native Claims Settlement Act. The tribe governs reservation land like tribes in the contiguous United States and did not form a Native corporation.

Dustin Winters is program director of the tribe's Department of Fish and Wildlife. According to Winters, as of fall 2021 no seaweed farming was taking place in Metlakatla, but there is interest in farming sugar kelp, bull kelp, and nori, known locally as black seaweed. Like other seaweed farms in Alaska, seaweed farms in Metlakatla require authorization from the U.S. Army Corps of Engineers in addition to state - or in this case tribal - permits.

Prince of Wales Vocational and Technical Education Center (POW VocTEC) – Built in 2014, the POW VocTEC facility in Klawock includes small and large conference rooms, a large wood shop,

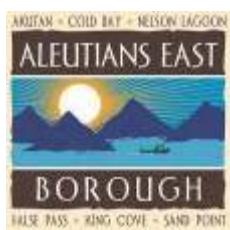


a wet lab, and welding room. These spaces are available for rent for meetings, workshops, trainings, classes, and other uses. The wet lab is rented at times by biologists doing field work on Prince of Wales. The facility is currently underutilized and seeking opportunities to grow their impact.

Aleutian Islands (Dutch Harbor)

Aleutian Pribilof Islands Community Development Association (APICDA)

The Aleutian Pribilof Islands Community Development Association is a Community Development Quota (CDQ) entity based in Juneau that supports economies, infrastructure, and education in six remote Aleut villages. Although Dutch Harbor/Unalaska is not among the six communities expressly supported by APICDA, the organization partners with agencies, organizations, and Native and conventional corporations to offer services to Aleutian residents. For example, APICDA and partners offered an Aleutian Marketplace workshop in 2020 that included a webinar on the small-business fundamentals of a mariculture farm.³² APICDA also runs for-profit operations including Atka Pride Seafoods, Aleutian Adventures, Alaska Adventure Travel, and Nelson Lagoon Storage.



Aleutians East Borough - Aleutians East Borough partnered with Alaska Sea Grant in 2019 and received grant funding to establish a pilot seaweed farm in Sand Point. The pilot farm is intended to provide a learning platform for the Borough and other interested kelp farmers regarding mariculture decisions, such as species types, siting, and anchoring mechanisms appropriate for the stormy weather in that area.

Potential Seafood Processing and Related Partners

Alaska's seafood processing infrastructure is extensive. Large-scale processing happens throughout coastal Alaska, including in many small, remote communities. Existing investments in seafood processing buildings, equipment, and workforce could potentially be used for seaweed processing depending on the interest of seafood processors.

In general, the timing of seaweed processing, which is anticipated to occur in April, May, and June, fits well with the typical summer salmon processing season of June to August or September. Many plants process species other than salmon, however, resulting in extended seasons or year-round operations. Seafood will likely take precedence over seaweed because it

³² Aleutian Pribilof Island Community Development Association. 2020. Aleutian Market Place, [Mariculture Small Business Fundamentals](#).

is a more valuable product with a more developed market. In some locations, a spring seaweed harvest will fit well in the two months before a summer salmon harvesting season, such as in particularly salmon-dependent communities of Valdez, Craig, Ketchikan, and Cordova.

Most seafood processors in Alaska maintain housing facilities (such as bunkhouses) for non-resident workers. These facilities could presumably be used for additional months if seaweed processing extended the operating season. In other locations, notably Kodiak, seafood processing occurs year-round, and the labor force contains a higher percentage of local residents who furnish their own housing.

Other seafood processing infrastructure potentially relevant to seaweed processing includes docks, cranes, totes, and vacuums for unloading raw products; processing and freezing space and machinery; water systems; packaging capabilities; outbound shipping routes; and fleets of tender (transport) vessels that move raw product to shore-based processing facilities.

Attributes the various seaweed processing regions bring to bear on potential seaweed operations are discussed below.

Kodiak

Kodiak is home to multiple major seafood processing plants, though the year-round nature of the fish processing business in this region may constrain options for seaweed businesses to partner with seafood processors.

One partnership is already in effect: Kodiak WildSource, a seafood processing facility owned by the Sun'aq Tribe of Kodiak, has provided seaweed processing services to Blue Evolution for the past two seasons. Kodiak WildSource CEO Chris Sannito, also a seafood technology specialist for Sea Grant, said in an interview that the business has taken on seaweed processing as an experiment in order to develop a new industry. However, the seaweed harvest comes at the "worst possible time" for his small high-value fish processing business, arriving at the same time as valuable seafood products caught with jigging gear, including cod and black rockfish. The Kodiak WildSource facility must be completely cleaned and reset between uses as a seafood and seaweed processing plant. Kodiak WildSource's small (3,600 foot) facility is located along the waterfront adjacent to larger seafood processing plants on Shelikof Street.

Kodiak's largest processor is Trident Seafoods, which has two main processing footprints in Kodiak: the larger Star of Kodiak facility (which includes a landlocked WW2 Liberty Ship), and smaller pier and freezer facility on Shelikof Street. Trident is one of a handful of major Alaska seafood businesses that has applied for a seaweed farming lease. Trident's proposed farm site is near Sand Point, about halfway between Kodiak and Unalaska. Previously, Trident applied for a seaweed farm lease near the community of Kodiak, though the application was not approved.

Kodiak has three other large processors, two of which have changed names in the last year: OBI (known as Ocean Beauty before the 2020 merger of Icicle Seafoods and Ocean Beauty); Alaska Pacific Seafoods (the local name for the processing plant owned by North Pacific Seafoods); and Silver Bay Seafoods (which purchased the plant owned by International Seafoods in 2020).

A consortium of large seafood processing companies in Kodiak own Kodiak Fishmeal Co., a dedicated fishmeal plant.

Kodiak also has a small plant owned by Pacific Seafoods. In addition to commercial fish processing, the Pacific Seafoods plant does sport fish processing and operates a retail store under the Island Seafoods name. Kodiak has at least two additional businesses that do small-volume fish processing work in addition to operating retail shops: Kodiak Fresh Seafood and Kodiak Island Smokehouse.

Several parcels of developable land on the Kodiak road system may lend themselves to future infrastructure development. One is at Gibson Cove, near downtown Kodiak, where an old seafood processing facility (now owned by the City of Kodiak) is slated for demolition in summer 2021. There is existing, though deteriorated, dock infrastructure at Gibson Cove. The City of Kodiak will be looking for redevelopment opportunities for the Gibson Cove site in the future.

Another potential processing location is land in Women's Bay, approximately 12 miles by road from city center. The land is owned by Koniag, Inc., the regional Alaska Native Corporation for the Kodiak area. Koniag leadership have expressed curiosity about the potential for the corporation to become more involved in seaweed development in their region.

Table 44. Kodiak Seafood Processors

	Square Feet Processing Space	Operation Dates	Notes
Ident Seafoods Kodiak	63,185	Year round	The Seal of Kodiak plant
Ident Seafoods Kodiak	42,192	Year round	Shelikof Street ("Pillar Mountain") plant
OBI Kodiak	45,775	Year round	OBI formed by 2020 merger of Ocean Beauty and Icicle Seafoods
Alaska Pacific Seafoods (North Pacific Seafoods) Kodiak	48,536	Yearround	
Silver Bay Seafoods Kodiak	38,000	Year round	Previously owned by International Seafoods
Kodiak Fishmeal Plant	18,906	Year round	
Pacific Seafoods Kodiak (Island Seafoods)	8,934	Year round	
Kodiak Wild Scource (Subsidiary of OBI)	3,600	Year round	Currently processes seaweed for Bio Evolution
Kodiak Fresh Seafood	Small	Year round	

Kodiak Island Smokehouse	Small	Year round
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Source: Alaska Department of Environmental Conservation Discharge Permit data, Kodiak Island Borough property records, and interviews.

Valdez

Valdez has two major seafood processors, Peter Pan³³ and Silver Bay. Silver Bay's Valdez plant, built in 2015, has high-volume freezers with large capacity and is one of the largest salmon processing plants in the state. Peter Pan's Valdez plant is smaller, but it is a large processing plant by statewide standards. Neither plant currently operates year-round or processes species besides salmon. Both processors have bunkhouse facilities that house hundreds of workers during the salmon processing season.

Valdez Fisheries Development Association (VFDA) is a non-profit corporation that operates salmon hatcheries. VFDA also manages a small seafood processing plant and cold storage. VFDA does custom processing and provides access for direct marketers to process their fish. The processing building has plate freezers and blast freezers with racks, while the cold storage has a large holding freezer that was designed for expansion. VFDA is the anchor tenant for the cold storage, and other space in the facility is leased by local businesses and community members. VFDA has a small bunkhouse for up to four hatchery workers.

Valdez has at least two additional business that do custom fish processing and shipping primarily for charters and other recreational harvesters: Easy Freeze, Inc and Fish Central.

Table 45. Valdez Seafood Processors

	Square Feet Processing Space	Operation Dates	Notes
Silver Bay Seafoods Valdez	54,000	June-Sept	
Pete Pan Seafoods Valdez	31,344	Aug-Sept	
Valdez Fisheries Development Association	Medium	Year round	Space available for local businesses to lease
Easy Freeze, Inc.	Small		Has blast freezers
Fish Central	Small		

Source: Alaska Department of Environmental Conservation Discharge Permit data, City of Valdez property records, and interviews.

³³ Peter Pan is partially owned by McKinley Research Group's parent company, McKinley Management LLC.

Cordova

Cordova has a variety of seafood processor sizes and types, but not all have potential to easily reconfigure to process seaweed. Seafood processors that primarily thermally process seafood (canning, foil pack) typically have less flexibility to reconfigure the plant layout and machinery.

Cordova does not currently have a cold storage and processing facility available for public use, and rates for custom processing through local processors are described as high. A public cold-storage facility and a central multi-user handling and processing facility in Cordova have potential to support local seaweed business development.

Large seafood processors that operate on large volumes, such as the Trident North facility used for pink salmon processing, are expensive to start up and maintain. Therefore, it may be less likely to be used for seaweed processing unless the volume of seaweed is high.

Other large processors in Cordova, such as Trident South, Ocean Beauty, and Copper River Seafood, focus on lower volumes and higher value products. Each of these facilities and companies have aspects that could lend themselves to potentially processing seaweed.

The smaller custom processors in Cordova – Alaska Wild Seafood Partners (aka Camtu's) and Sixty Degrees North – have potential to focus on seaweed processing as a low-volume specialty product. Sixty Degrees North has been approached by seaweed farmers and is interested in partnerships but the timing overlaps with sablefish processing. There are two micro-processing trailers in Cordova. One is owned by Simpson Bay Oyster Company, which intends to farm kelp.

There is potential for unused structures at Orca Adventure Lodge to be renovated for use as processing facilities. Orca Adventure Lodge has waterfront property, though existing dock structures are not functional.

Table 46. Cordova Seafood Processors

	Square Feet Processing Space	Operation Dates	Notes
Trident Seafoods North	101,973	Feb.-Sept.	Canning equipment.
Alaska Wild Seafood Partners (Camtu)	38,659	May-Sept.	Larval freezing capacity
Sixty Degrees North Seafoods, LLC	24,000	April-Oct.	Larval freezing capacity
Trident Seafoods South	21,750	May-Sept.	
Ocean Beauty Seafoods	16,035	April-Sept.	
Copper River Seafoods	13,787	May-Sept.	
Webber Wise	Smalls		Micro-processor/trailer
Simpson Bay Oyster Company	Smalls		Micro-processor/trailer

Source: Alaska Department of Environmental Conservation Discharge Permit data, City of Cordova property records, and interviews.

Craig

The largest processor in Craig, Silver Bay Seafoods, has a bunkhouse for a seasonal workforce of about 150 laborers. Craig also has a resident processing labor force.

Under the same ownership, Seaborn and Noyes Island Smoke House are housed in two adjacent buildings on property leased from the City of Craig. Premium Aquatics has partnered with Seaborn to process, package, and freeze seaweed. Also in Craig, the Chop Shop processes and freezes fish for recreational harvesters. The Chop Shop leases its facility from Shaan Seet, the ANCSA village corporation for Craig.

In the nearby community of Klawock, the Klawock tribe (Klawock Cooperative Association) owns the Klawock Oceanside Inc. building, currently used only for storage. This building is on pilings over water and would be well situated for processing if it is renovated. Also in Klawock, Wildfish Cannery is a small cannery and smokery of finfish, shellfish, and squid/octopus.

Roughly an hour drive south from Craig is the community of Hydaburg, which is home to a small specialty seafood processing plant that is currently unused. The Hydaburg tribal government purchased processing equipment via a federal grant and set up the plant in a building owned by the City of Hydaburg. The plant operated for one season in 2019 before shutting down.

Table 47. Craig and Klawock Seafood Processors

	Square Feet Processing Space	Operation Dates	Notes
Silver Bay Seafoods Craig Plant	31,273	June - Oct.	Largest processor in Craig
E.C. Phillips CBA Craig Fisheries	~10,000		
Noyes Island Smoke House LLC/Seaborn Seafood	1,703		Season currently processes seaweed for Seagrove
Historic Klawock Cannery (Klawock Oceanside Inc. building)	75,000 (building total)	Closed	Historic cannery, no longer operational, located in Klawock
Wild Fish Cannery	Smaller		Located in Klawock
Chep Shop	Smaller		Charter fish processing

Source: Alaska Department of Environmental Conservation Discharge Permit data, City of Craig property records, and interviews.

Ketchikan

Ketchikan's waterfront contains three main processing plants. Alaska General Seafoods and Trident facilities are seasonal summer plants geared towards processing salmon into frozen and canned products. The Trident plant can employ as many as 500 people and produces salmon roe and oil in addition to frozen and canned salmon.³⁴

The E.C. Phillips plant operates year-round but adds as many as 190 employees in the summer as it grows to a total staff size of 200-250.³⁵ The E.C. Phillips plant produces products including salmon, herring, shrimp, rockfish, geoduck, and sea cucumber.

Table 48. Ketchikan Seafood Processors

	Square Feet of Building Space	Operation Dates	Notes
E.C. Phillips Ketchikan Plant	101,041	Year round	
Alaska General Seafoods Ketchikan Plant	65,611	May-September	Mostly salmon plant
Trident Seafoods Ketchikan Cannery Plant	56,933	May-September	Mostly salmon plant
Gateway Smokehouse	Smaller		

Source: Alaska Department of Environmental Conservation Discharge Permit data, Ketchikan Gateway Borough property records, and interviews.

³⁴ Trident Seafoods. [Our Plants](#).

³⁵ E.C. Phillips & Son Inc. [Employment](#).

Dutch Harbor

The Port of Dutch Harbor in Unalaska consistently lands the highest volume of seafood in the U.S. (763 million pounds in 2019).³⁶ The Unalaska economy is inextricably linked to commercial fishing and processing. Maritime services are available for maintaining vessels and gear, such as mechanical and electrical repair, diesel sales and service, and construction.

Unalaska has three large shore-based processors and one active floating processor. The floating processor is a vessel that can move under its own power and is typically set up for processing a single product at a time. It can be reconfigured although it is costly to do so. The Northern Victor, a floating processor vessel owned by OBI, could in theory be moved to a kelp farming area and set up to process kelp. Floating processors that are not in current use in Dutch Harbor could potentially be used for seaweed processing.

The three shore-based processors in Dutch Harbor are Japanese owned and have large waterfront campuses with processing buildings, worker housing, administrative offices, worker recreation centers and galleys. All have freezing capacity and loading docks. Nearly all the processing labor is brought in to work in the plants on months-long contracts.

These processors are set up to process pollock into various products, and that equipment is rarely reconfigured or removed because of the long processing season for pollock. The Bering Sea pollock A and B seasons are approximately January to April and June to September, respectively. It is unlikely that a pollock processing building in Dutch Harbor would have enough down time to convert to seaweed processing. Cod and crab harvests have been low in recent years; those processing areas would have more potential for processing new products.

Shore-based processors in Dutch Harbor may be more inclined to innovate with seaweed, depending on the market, due to company background and culture in the production of diverse marine food items. Further, these companies have substantial sunk costs in their large facilities and may need to find other high-volume products to process in the future. However, large plants may be unlikely early adopters of untested processing methods or seaweed markets.

The Port of Dutch Harbor has city-owned facilities that could provide useful infrastructure if vessels are used to deliver seaweed product. The Unalaska Marine Center has cargo dock space with a crane and rail system for cargo containers, a fuel facility, upland storage, warehouse space, sewage pump-out and potable water. Boat slips and moorage are available at two boat harbors, a spit dock, and a cargo dock. The docks have shore power, potable water, and waste removal services. However, Unalaska has no small custom processors, community processing facilities, or community cold storage that could serve as a small-scale processing venue.

³⁶ NOAA Fisheries. 2019. [Fisheries of the United States](#).

Table 49. Dutch Harbor Seafood Processors

Name	Sq. Feet Processing Space	Operation Dates	Notes
UniSea Dutch Harbor Seafood Plant	152,802	Year round	Large, processor in study coming online
Westward Seafoods Captains Bay Plant	86,250	Year round	
Icicle Seafoods (OBI) PVC Northern Victor	Not Available	Year Round	Floating processor
Ayeska Seafoods Unalaska Plant	37,684	Year Round	Oldest processor in port.

Source: Alaska Department of Environmental Conservation discharge permit data, City of Unalaska, and interviews.

Tenders and Other Vessels

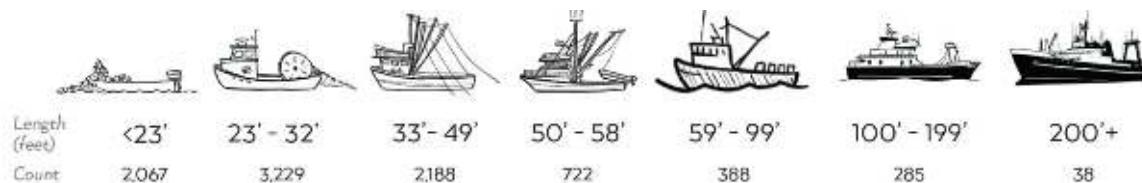
In addition to the community-specific seafood processing assets described above, each region of the state is home to an extensive array of vessels used to harvest and transport seafood. In 2019, a total of 8,900 vessels were involved in Alaska's seafood harvesting and processing industries – according to data from the Alaska Commercial Fisheries Entry Commission (CFEC). Of these, nearly three-quarters (74%) were owned by Alaska residents, with Southeast Alaska home to more vessels than any other region of the state (see table below).

Table 50. Alaska Commercial Fishing, Processing, and Related Vessels, 2019

Vessels Owned by Regional Residents	% of Total
Bering Sea and Aleutian Islands	2%
Kodiak	7%
Southeast Alaska	30%
Prince William Sound	6%
Other Alaska Regions	28%
Outside Alaska	27%
Total Fishing and Related Vessels	8,917

Source: Alaska Commercial Fisheries Entry Commission (CFEC).

Most of the vessels described above are under 50 feet in length, largely in the 23-32 foot (36%) or 33-49 foot (25%) ranges. But 16% of the total, or 1,433 vessels, are larger in size.

Figure 12. Alaska Fishing and Related Vessels, Count by Size, 2019

Source: Economic Impacts of Alaska's Seafood Industry, Alaska Seafood Marketing Institute.

Besides the smallest vessels, nearly all of these vessels have significant fish holds and spaces to store seafood fresh, chilled, live, or frozen until delivery to a processor or market.³⁷ In certain fisheries – especially high-volume, highly seasonal salmon fisheries – it is common for seafood processors to hire or operate large “tender” vessels which anchor near fishing grounds and receive deliveries from harvesting vessels. This arrangement helps keep fishing vessels fishing (in addition to reducing transportation times, tenders also often provide groceries, spare parts, and meet other needs) and can improve seafood quality by providing ice to fishing fleets and standardizing refrigeration/chilling of fish during transport to shoreside or floating processors.

Tender vessels present a significant asset relevant to potential seaweed processing in Alaska. A total of 1,103 vessels – according to CFEC data – registered as providing tendering or packing services in 2019.³⁸ The average length of these tender vessels was 68-feet, double that of vessels in the CFEC database that did not serve as tenders. For tender vessels that provided data, the average hold capacity was 9,400 cubic feet and the average gross tonnage was 120 tons.

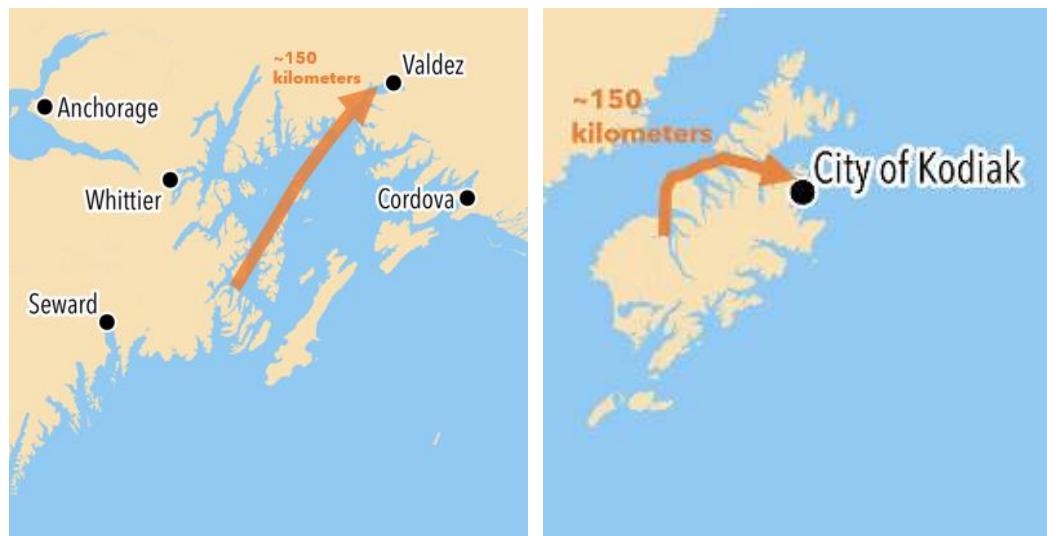
Reliable data is not available on the number of tender vessels operating in different regions of Alaska. However, all of the potential seaweed processing regions studied in this report (with the exception of parts of the BSAI region) are major salmon-harvesting regions home to a wide variety of tender vessels that could be used to transport freshly harvested seaweed to a regional processing facility (provided the economics of such transportation were favorable).

The graphics on the following page provide examples of regular tendering routes used extensively each summer in Prince William Sound and Kodiak Island. The relatively small size and protected waters of Prince William Sound make tendering fish (and seaweed) practical from one side of the sound to another. In the Kodiak region, it is also common for tender vessels to transport fish from outlying parts of the island (and parts of the Alaska Peninsula) to the City of Kodiak. The tender route illustrated from Larsen Bay to Kodiak takes about 10 hours to travel. To reiterate, these routes are provided as examples – multiple other similar routes are used as often or more often along with the routes shown. In addition to regularly used tendering routes, in years with especially large salmon harvests, tendering can be commonplace over even larger distances, such as from Prince William Sound to processing plants in the town of Kodiak.

³⁷ Commercial fishing vessels under 23-feet in length are mostly open boats such as set net, seine, and other skiffs.

³⁸ These data are based on self-reported categorizations provided while registering a vessel with CFEC. More accurate and detailed data is expected to be available on tendering in 2022 and future years through new practices related to fish ticket data collected by the Alaska Department of Fish & Game.

Figure 13. Examples of Tendering Routes in Prince William Sound and Kodiak Regions



The protected waters of Southeast Alaska and abundance of seafood processing locations lead numerous regularly used tendering routes. Two moderately long routes (225-250 kilometers) are illustrated below. On big years, tenders sometimes travel even longer distances to take fish to facilities that have the capacity to process them. One such route would be from Lynn Canal (the location northwest of Juneau where the top tendering route below begins) to Ketchikan - a distance of nearly 500 kilometers. The region's geography and available tendering capacity makes it possible to reliably cover these distances while carrying fresh fish.

Figure 14. Examples of Tendering Routes in Southeast Alaska



Appendix A: Permitted & Pending Seaweed Farms in Alaska (as of October 2021)

Business Name	Owner/Contact Name(s)	Appl. Year	Status	Size (Acres)	Size (Linear Feet)	Permitted Species			
						Sugar Kelp	Ribbon Kelp	Bull Kelp	Other
Aleutian Islands Region									
Aleutians East Borough	Charlotte Levy	2019	Authorized	10	24,080	X	X	X	Giant Kelp
Trident Seafoods Corporation	Shannen Carlile	2019	Authorized	102	111,600	X	X	X	
Golden Harvest Alaska	Steve Mino	2020	Under review	20		X	X	X	Codduck, Dragon Kelp
Kodiak Island Region									
Kodiak Kelp Company	Tessa Meyer	2018	Active	63	175,000	X	X	X	Dragon Kelp, Giant Kelp, Red Ribbon
Dead Humpy Creations	A. Pyor	2017	Active	19	24,000	X	X		Dragon Kelp
Kodiak Island Sustainable Seaweed	Nicholas Mangini	2017	Active	17	40,000	X	X	X	Dragon Kelp, Dulse, Nori, Three-Ribbed Kelp
Aaskar Sea Geers	Adelia Myrick, Iallef Manson	2019	Active	10	24,700	X	X		
Blue Evolution	Beau Perry	2017	Authorized	35	9,600	X	X		
Hilcier Coastal Resources	Erik OBrien	2017	Authorized	20	19,200	X	X	X	Three-Ribbed Kelp
Polar Seafoods	Bill Hejes	2017	Authorized	15*		X	X		Pacific Oyster
Bare's and Farms	John Baremar	2019	Authorized	3	800	X	X		
Go Big Farms	Erik OBrien, Nick Margini, Dylan Bean, Iyle OBrien	2020	Under review	1/1	Not Available	X	X	X	
Icy Waters Fisheries LLC	Curt and Avenue Waters	2021	Under review	129	Not Available	X	X	X	
Alagnak Native Corporation	Natalsha Hayden	2020	Under review	30	30,000	X	X	X	
Alagnak Native Corporation	Natalsha Hayden	2021	Under review	15	Not Available	X	X	X	
Kealooa and Alaska	Chloe Bennett, Daily Thompson, Clifton Ivanoff	2021	Under review	14	Not Available	X	X		
Old Harbor Native Corp.	Cynthia Berns	2021	Under review	10	Not Available	X	X		
Kodiak Ocean Bounty	Erik OBrien	2018	Under review	2	Not Available	X	X		Dragon Kelp

Prince of Wales Region									
Premium Aquatics, LLC	Markos Scheer	2017	Active	121*	145,800*	X	X	X	Pacific Oyster
Megan O'Keefe	Megan O'Keefe	2020	Active	11	35,000	X	X	X	
OceansAlaska Aquaculture, LLC	Iomi Marsh	2017	Authorized	24		X	X	X	
Real Marina, LLC	Markos Scheer	2018	Authorized	165	264,000	X	X	X	
HV McCrea	Julie & Greg Decker	2020	Under review	56		X	X	X	
Salt Garden Farm	Robert Lemke	2020	Under review	3			X		
Orca Island, LLC	Markos Scheer	2019	Under review	154*		X	X	X	Pacific Oyster
Kaguk Cove, LLC	Markos Scheer	2019	Under review	132*		X	X	X	Pacific Oyster
Madre De Dios, LLC	Markos Scheer	2018	Under review	127		X			
Alaska Marine Solutions LLC	Kevin Sund	2020	Under review	124		X	X	X	Giard, Kelp
Prince William Sound Region									
Royal Ocean Kelp Co.	Irene Thomas	2019	Active	3	9,000	X	X		
Noble Ocean Farms, LLC	Sean Adel	2020	Active	22	57,600	X	X		
Svens Wild Seafood Co.	Joe Arvidson	2020	Authorized	22	57,600	X	X		
Next Level Fisheries, LLC	Bret Bradford	2020	Authorized	22	57,600	X	X		
Blue Green Enterprises	Dure Lankard	2020	Authorized	22	57,600	X	X		
Sea Garden, LLC	Rion Schmidt	2020	Authorized	22	57,600	X	X		
Harbor Bay Kelp Company	Michael Mahoney, Leia Kreyling	2020	Authorized	15	42,000	X	X		
Native Village of Hoonah	John Wissel	2019	Under Review	115*				X	Pacific oysters
Andersen Island, LLC	Mal Andersen	2020	Under Review	22	57,600	X	X		
Alaska Deep Seas, LLC	Ruth Reuter	2020	Under Review	22	57,600	X	X		
Amber Morris	Amber Morris	2021	Under Review	20					Keiki (species unspecified)
Outside Study Regions (nearest community)									
Rainy Dawn Fisheries (Gustavus)	Brian Delay	2018	Authorized	7	1,200	X		X	Dragon Kelp
Rainy Dawn Fisheries (Juneau)	Brian Delay	2019	Authorized	3		X	X	X	
Kealakistic (Sitka)	Hilom' Maash	2018	Authorized	1	1,600	X	X		Giard, Kelp

Fisherman Fresh (Seward)	Briana Murphy, Kristen Smith	2020	Under review	29	36,000	X	X	
Silke Sound Aquatic Farm	Stanley G. Johnson	2018	Under review	15	40,700	X		
Maraspina Sea Farms (Yakutat)	Luce Purdy	2021	Under review	11		X	X	X
Blue Acres Alaska (Juneau)	Kevin Siwickie	2018	Under review	10*	12,000*	X		Pacific Oyster, Blue Mussel
Alaska Salty Greens (Haines)	Aaini D. Epfernesnil	2019	Under review	3	3,200	X	X	Red Ribbon, Nori

Source: Alaska Department of Natural Resources and Alaska Department of Fish & Game. Industry interviews.

*Indicates some of farm acreage is planned for shellfish farming, in addition to seaweed farming.