Alaska Seaweed Industry Expansion Scenarios

PREPARED FOR:

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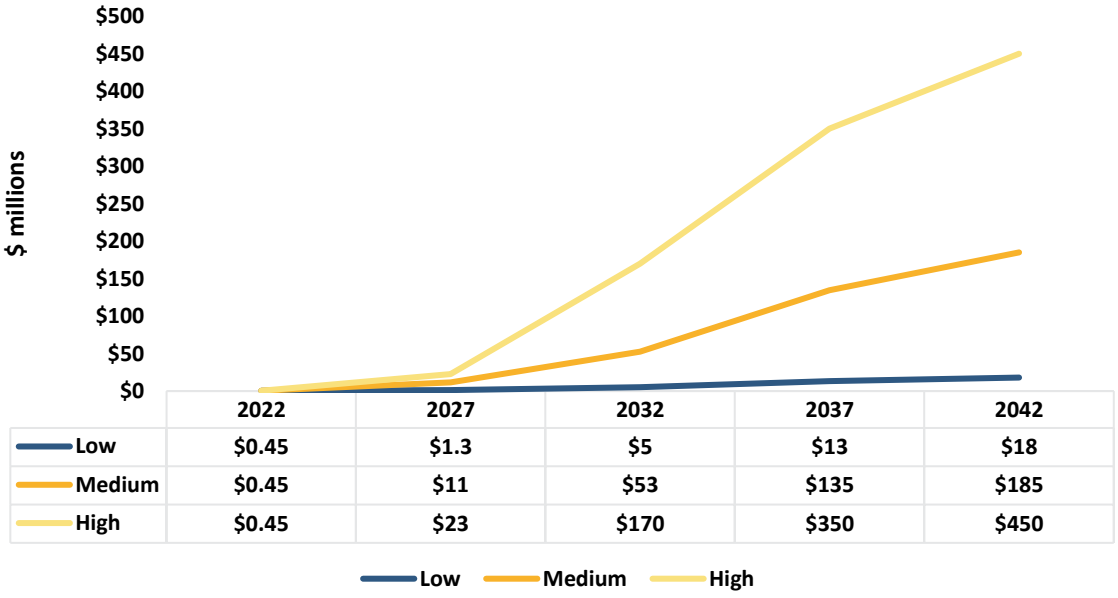
Executive Summary

In a 2017 report commissioned by the Alaska Mariculture Task Force, McKinley Research Group developed projections for the potential economic scale of Alaska's mariculture industry. Alaska Fisheries Development Foundation, with grant support from the Denali Commission, commissioned McKinley Research Group to update these projections for the seaweed sector.

Three scenarios (low, medium, and high) are described below with projections at Year 5, 10, and 20 for the size of the seaweed mariculture industry in Alaska in terms of acres under cultivation, seaweed farm production volume, and the revenue and jobs associated with both the seaweed farming and seaweed processing sectors.

As shown in the chart below, the annual revenue of the Alaska seaweed industry (farming plus processing) is projected to range, in 20 years, between $18 million in the low growth scenario and $450 million in the high growth scenario.

Figure 1. Projections of Alaska Seaweed Mariculture Industry Annual Revenue (Low, Medium, and High Growth Scenarios)



	2022	2027	2032	2037	2042
Low	$0.45	$1.3	$5	$13	$18
Medium	$0.45	$11	$53	$135	$185
High	$0.45	$23	$170	$350	$450

Source: McKinley Research Group projections.

The large (25-fold) gap between the low and high growth scenarios at year 20 can be attributed primarily to uncertainty in the viability of new technologies and markets for Alaska seaweed. The low growth model is based on modest but steady expansion of low-volume but high-value products like the specialty food products currently produced with Alaska seaweed. The medium and high growth scenarios are based on aggressive public sector industry support and the successful deployment (at various levels) of one or more of the high-volume seaweed markets that have been proposed for Alaska.

The proposed high-volume seaweed markets include animal feeds, biostimulants, fertilizers, seaweed-derived nutritional products, and bioplastics. The economic viability of these markets for Alaska seaweed remains untested. However, companies in these industries (including companies currently planning operations in Alaska) have made significant progress in raising capital since the last Alaska seaweed market projections were produced.[1] In addition, these companies report very strong interest from prospective buyers and promising results of new processing technologies at the bench (and in some cases, pilot) scale.

Progress on Alaska Mariculture Goals Set in 2017

In 2017, the Alaska Mariculture Task Force commissioned research that included setting production and revenue goals for the Alaska mariculture industry looking out 5, 10, and 20 years. McDowell Group (now McKinley Research Group) completed this research, which led to the seaweed goals shown below. The year 20 total revenue goal was set at $15.7 million in seaweed sales.

Table 1. Alaska Mariculture Seaweed Production and Revenue Goals Set in 2017

	Year 5	Year 10	Year 20
Annual Production			
Seaweed (lbs. wet)	1,200,000	4,800,000	19,200,000
Seaweed farm acreage	150	300	600
Annual Revenue			
Seaweed farms	$600,000	$2,400,000	$9,600,000
Seaweed value-added	$381,000	$1,524,000	$6,096,000
Total Seaweed Revenue	*$981,000*	*$3,924,000*	*$15,696,000*

Source: McDowell Group, 2017. *Alaska Mariculture Initiative, Phase II: Economic Analysis to Inform a Comprehensive Plan*, prepared for the Alaska Mariculture Task Force.

[1] For more information about investment in seaweed technology businesses, see the Phyconomy Database of Seaweed Organizations. For more information on Alaska applications for high-volume seaweed production technologies, see Alaska Fisheries Development Foundation, 2021/2022. Alaska Seaweed Market Assessment and Assessment of Seaweed Processing Locations in Alaska.

Comparing Alaska's anticipated production in 2022 to the 5-year goals produced in 2017 shows that none of Alaska's mariculture goals are on track, including seaweed. In 2021, an estimated 440,000 pounds of seaweed worth $210,000 at the farm-gate level was harvested at Alaska seaweed farms. Based on interviews with aquatic farmers and a review of seaweed seed string deployment in fall 2021, McKinley Research Group expects roughly 570,000 wet pounds of seaweed will be harvested in 2022, worth approximately $300,000. These harvest volumes and value would be roughly half those projected for 2022 in 2018. The shortfall is primarily a function of lower than forecasted production volume per acre, as total acreage actively farmed has exceeded the 5-year goal set in 2017. In addition to having 175 acres estimated to be in production as of late 2021, there another roughly 1,825 acres either permitted or in the permitting pipeline.

Table 2. Estimated Alaska Mariculture Farm Seaweed Production and Revenue (2017-2021) and 5-Year Goal Set for 2022 in 2017

	2017	2018	2019	2020	2021	2022P	2022 Goal Set in 2017
Annual Production							
Seaweed (lbs. wet)	18,000	89,000	112,000	270,000*	440,000*	570,000*	1,200,000
Seaweed farm acreage (active)	~50	~50	~140	~125	~140	~175	150
Annual Revenue							
Seaweed farms	n/a	$58,167	$60,540	n/a	$210,000*	$300,000	$600,000

Source: ADF&G; DNR; and McKinley Research Group estimates. Prior goals from McDowell Group, 2017. *Alaska Mariculture Initiative, Phase II: Economic Analysis to Inform a Comprehensive Plan*, prepared for the Alaska Mariculture Task Force. * based on industry interviews.

There is ample evidence that one factor in this shortfall was COVID, which curtailed cashflow, focused companies and individuals on their core existing businesses, led to supply chain disruptions, strained labor markets, and drastically modified food markets, among other impacts. New aquatic seaweed farm applications in Alaska, for example, dropped 62% from 2020 to 2021 (the application period runs from January through April, so was largely completed when COVID hit in 2020).

Projected Gross Revenues at Years 5, 10, and 20

The annual revenue of the Alaska seaweed industry (farming plus processing) is projected to range, in 20 years, between $18 million in the low growth scenario and $450 million in the high growth scenario.

The growth model projects processor revenues will start smaller than farm revenues, but that they will rise to equal farm revenues in 10 years and exceed them in 20 years.

Table 3. Projected Annual Seaweed Farming and Processing Industry Revenue

	2022 (estimated)	Year 5	Year 10	Year 20
Farm Gate				
Scenario 1: Low Growth	$300,000	$800,000	$2,500,000	$6,000,000
Scenario 2: Medium Growth	$300,000	$3,800,000	$18,000,000	$45,000,000
Scenario 3: High Growth	$300,000	$7,500,000	$42,500,000	$110,000,000
Processor Value Added				
Scenario 1: Low Growth	$150,000	$500,000	$2,500,000	$12,000,000
Scenario 2: Medium Growth	$150,000	$7,500,000	$35,000,000	$140,000,000
Scenario 3: High Growth	$150,000	$15,000,000	$127,500,000	$340,000,000
Total Industry				
Scenario 1: Low Growth	$450,000	$1,300,000	$5,000,000	$18,000,000
Scenario 2: Medium Growth	$450,000	$11,300,000	$53,000,000	$185,000,000
Scenario 3: High Growth	$450,000	$22,500,000	$170,000,000	$450,000,000

Description of Growth Scenarios

The low, medium, and high scenarios differ in the assumptions applied with regard to key external factors likely to shape the overall industry over the next 20 years, including the extent of public sector investment in the industry and the success of processing technologies and associated companies that could drive large-volume markets for Alaska-grown seaweed.

Scenario 1: Low Growth

The low growth scenario is based on continued incremental growth of existing markets for Alaska seaweed, specifically specialty food and cosmetic products. This model assumes annual growth of 10% per year, slowing to 8% after 10 years. This growth rate is based on modeling developed for Maine's edible seaweed market, where the seaweed mariculture industry is in a similar stage as Alaska.[2]

With respect to industry revenue, the low growth scenario roughly matches the industry trajectory mapped out in 2017 for Alaska seaweed ($15.7 million in revenue by 2038, compared to the low growth estimate of $18 million in revenue by 2042).

[2] Island Institute, 2020. Edible Seaweed Market Analysis.

Scenario 2: Medium Growth

The medium growth scenario is based around the market growth envisioned in the low growth scenario as well as the successful development of at least one large-scale seaweed processing plant/company (such as a biorefinery or large animal feed producer) within 10 years. Such a processor is anticipated to purchase roughly 60-70 million wet pounds of seaweed annually when fully operational. This scale is based on industry interviews and business models developed by seaweed processors currently scoping investments in Alaska.

This scenario depends on continued aggressive public sector support for the Alaska seaweed industry. Examples of such support include the following:

- EDA statewide planning grant funds that the State of Alaska allocated to implementing recommendations in the Alaska Mariculture Task Force's report to the governor
- $32 million in mariculture research funds awarded in 2021 through the Exxon Valdez Oil Spill Fund
- $49 million Phase II grant application submitted in March 2022 to EDA's Build Back Better Regional Challenge grant program
- $20 million grant application to USDA Climate-Smart Commodities program submitted in April 2022
- $25 million mariculture matching grant program under consideration by Alaska Legislature.

Scenario 3: High Growth

This is a supply-constricted model for the five-year projection that shows how large the industry could become if all farms in the permitting process were permitted and used to their full capacity within five years. This model assumes heavy demand for Alaska seaweed from multiple large processors, making seaweed supply the limiting factor for industry growth, rather than demand.

Beyond five years this model assumes that total farm acreage will grow at an aggressive annual rate to meet demand. While aggressive, it should be noted that the high growth scenario results in an Alaska seaweed industry size that is still well below the project team's understanding of the combined business models of major seaweed processors currently scoping investments or expansions in Alaska, such as Kelp Blue, Oceanium, Ocean Rainforest, Macro Oceans, Blue Evolution, Premium Aquatics, and others.

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Other Assumptions

All model scenarios assume seaweed farms will become more efficient over time, growing more pounds of seaweed for each foot of seeded line, and using more feet of line in each acre of aquatic farm. The models also assume the farm-gate price of seaweed will drop as the industry achieves economies of scale.

Other Metrics Projected

In the process of developing the models underlying the revenue projections described above, a variety of other metrics were developed and projected. These include the acres under cultivation for seaweed farms in Alaska, production volume at these farms, and industry employment.

Areas Under Cultivation

Projections for the number of acres under cultivation in 20 years range from 1,000 to 15,000 acres between the low growth and high growth scenarios. This is the difference between 10 100-acre farms and 150 100-acre farms.

Table 4. Projected Acres Under Cultivation at Alaska Seaweed Farms

	2022 (estimated)	Year 5	Year 10	Year 20
Seaweed Farm Acreage				
Scenario 1: Low Growth	175	225	300	1,000
Scenario 2: Medium Growth	175	1,000	3,000	6,000
Scenario 3: High Growth	175	2,000	6,000	15,000

Aquatic Farm Seaweed Production Volume

Projections for annual seaweed production at Alaska seaweed farms range from 30 million wet pounds under the lower growth scenario to almost 600 million wet pounds under the high growth scenario. The nearly twenty-fold difference between scenarios is based on both the

greater numbers of acres outlined in Table 4 as well as assumptions of greater productivity (seaweed growth per foot of line) gains in the high growth scenario.

Table 5. Projected Annual Seaweed Production at Alaska Farms (wet pounds)

	2022 (estimated)	Year 5	Year 10	Year 20
Seaweed Farm Production (wet lbs.)				
Scenario 1: Low Growth	570,000	2,000,000	10,000,000	30,000,000
Scenario 2: Medium Growth	570,000	10,000,000	70,000,000	230,000,000
Scenario 3: High Growth	570,000	20,000,000	170,000,000	570,000,000

Industry Employment

In the low growth scenario, we predict that the industry in Alaska will require a total workforce of 100 full time-equivalent (FTE) workers. At medium and high growth levels, the industry would need roughly 1,000 and 2,500 FTE workers, respectively. It is estimated that these FTE workers would be about even between farming and processing workforces. With both sectors experiencing seasonality, the total people employed in the industry could be double or more the FTE worker numbers.

Table 6. Projected Annual Alaska Seaweed Industry Employment (FTE workers)

	2022 (estimated)	Year 5	Year 10	Year 20
Total Industry (FTE workers)				
Scenario 1: Low Growth	20	20	40	100
Scenario 2: Medium Growth	20	90	400	1,000
Scenario 3: High Growth	20	160	900	2,500