State of the States Focus

- Farms & Landings

- Permitting & Regulations
  - Note: Seaweed farmers will need to obtain multiple permits and authorizations to get their farms up and running. Only the lead regulatory agency is listed in each state.

- Post Harvest and Primary market
EAST COAST

Maine
New Hampshire
Massachusetts
Rhode Island
Connecticut
New York

WEST COAST

Alaska
Washington
Oregon
California
Hawaii
East Coast States

Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York
30+
Active commercial farms, with 100+ sites permitted to grow seaweed or seaweed alongside shellfish.

>1 million lbs harvested in 2022
Expected 2023 landings >1.2 million lbs
Landings reported by the state

Maine has 4 commercial seaweed nurseries.

Primary species under cultivation: Sugar Kelp (*Saccharina latissima*), Skinny Kelp (*Saccharina angustissima*), Winged Kelp (*Alaria esculenta*).

Maine also has a wild harvest seaweed industry, which harvested ~15 million lbs in 2022 (mostly rockweed).
PERMITTING & REGULATIONS

Lead Agency:
**Maine Department of Marine Resources (DMR)**
https://www.maine.gov/dmr/aquaculture/

Maine DMR issues licenses and leases for conducting shellfish, seaweed, and finfish aquaculture.
- Licenses have a low barrier to entry but are limited in size and need to be renewed annually. Sites are limited to 400 sq. ft. and need to be renewed annually.
- Leases are larger and are granted for up to 20 years. Farms can be up to 100 acres. Fees are $500 for first acre, $50 for each additional acres.

Seaweed cultivated in Maine must be sourced from/native to Maine waters.
The primary market for Maine seaweed is value-added, consumer-ready food products.

Maine has both first-stage processing (ex. drying, blanching, freezing, etc.) and second-stage processing (creation of consumer-ready products)

Increases in processing capacity, product development, and marketing have allowed for stabilization and growth in Maine’s kelp farming industry.

Examples of products produced in Maine include seaweed salads, kimchi, teas, smoothie cubes, snack bars, beverages, and spice blends, as well as dried whole leaf, flakes, powders.
NEW HAMPSHIRE

IMTA Site - Integrated Multi-Trophic Aquaculture
5 Commercial Farms.
2 commercial farms (UNH) deployed and sold sugar kelp
3 commercial farms that did not deploy

2 Experimental Farms.
These farms are submerged longlines, with 3 lines per farm.
One farm is located 9 miles offshore as part of a project funded
by the Department of Energy

Primary species under cultivation: Sugar Kelp
(Saccharina latissima)

Landing not reported

There is no commercial wild harvest industry
**NEW HAMPSHIRE**

**PERMITTING & REGULATIONS**

Lead Regulator:

**New Hampshire Fish and Game (F&G)**

https://www.wildlife.state.nh.us/

New Hampshire F&G issues leases for shellfish, seaweed, and finfish aquaculture.

- The fee for conducting aquaculture in NH is $500/submerged acre/year.
- Size of seaweed leases: No minimum size limit on leases for seaweed
The primary market for New Hampshire seaweed is **culinary uses and food products**.

Seaweed is sold to local restaurants and breweries as well as processors in Maine.

Seaweed is seasonally available in fresh/raw forms.

Examples of products produced include kelp beer and fresh kelp in restaurant dishes, as well as value-added products produced in Maine.
MASSACHUSETTS
5 Commercial Farms
Two of these farms are standalone kelp farms and three farms are within an existing shellfish farm. These are all commercial sites.

< 10,000 lbs
Harvested in 2021 for both human consumption and use in fertilizer products.
Official landings are not reported by the state (farmer reported)

Primary species under cultivation:
Sugar Kelp (*Saccharina latissima*)

There is no commercial wild harvest industry, though there was historically.
MASSACHUSETTS

PERMITTING & REGULATIONS

Lead Regulator:
Massachusetts Division of Marine Fisheries (DMF)
https://www.mass.gov/service-details/aquaculture

Massachusetts DMF works directly with the municipalities and issues a Class 4, Type 2 Commercial Aquaculture Permit for seaweed. ACOE is lead agency at federal level.

Largest site permitted currently is 27 acres.
The primary market for Massachusetts seaweed is **Food products, and fertilizers**

Seaweed is sold: raw and fresh. Though has been dried and examined for use in food additives and skin care products.

In Massachusetts, sugar kelp must be sold directly to a wholesale seafood dealer to be a food product per Department of Public Health (DPH) food protection and DMF regulations.
RHODE ISLAND

Juvenile Kelp

Photo: Humphries, 2017 / University of Rhode Island
10 Permitted Farms
10 farms are permitted in Rhode Island, but only 3 are growing kelp this year.
2 new permits currently under review.

14,500 lbs
Sugar kelp landings for 2022
Official landings are not reported by the state (farmer reported)

Primary species under cultivation:
Sugar Kelp (*Saccharina latissima*)

There is no commercial wild harvest industry.

Seed source: self-propagated, private supplier, and university
Rhode Island CRMC issues shellfish and seaweed leases on state submerged land.

- Leases can be for 15 years, with yearly lease fees.

Due to growth in shellfish aquaculture, the state caps the acreage of aquaculture activities in coastal ponds at 5% of the total open water surface area.

Size of permitted farms: 2.0 to 9.6 acres
Farmed seaweed in Rhode Island primarily goes to:

**Processors**

Seaweed is sold: freshly harvested / raw to processors, chefs, and consumers

In Rhode Island, kelp processors ability to purchase fresh product is the limiting factor for kelp farms.
Sugar kelp (left); *Gracilaria* research (right). Photo credit: CT Sea Grant
15 Permitted Sites. Of these sites, 10 farms deployed sugar kelp seed-string in 2022. Connecticut has 1 nursery.

2022 Landings: 3,800 lbs
Landings reported by the state

Species under cultivation: **Sugar Kelp** (*Saccharina latissima*) and **Gracilaria** (*Gracilaria tikvahaie*), in tank cultures only.

There is no commercial wild harvest industry.
CONNECTICUT

PERMITTING & REGULATIONS

Lead Regulator:
Connecticut Department of Agriculture, Bureau of Aquaculture
https://portal.ct.gov/DOAG/Aquaculture1/Aquaculture/Seaweed/Seaweed

Kelp-only licenses are issued and are good for 5 years.
• Cultivation for seaweed is based on the Connecticut shellfish model and can only occur in approved or conditionally-approved waters.
• Size of permitted farms: 2-9 acres
The primary market for CT seaweed is **Food and food products**.

Seaweed is sold: raw, blanched, dried and cut

Seaweed in Connecticut is sold as a Raw Agricultural Commodity. Some of the product is sold as fertilizer.

Connecticut is investigating **kelp powder** for use as an additive in food and in skin care.
Blanched Kelp Stipes
NEW YORK

Research Farm Site

Photo: Michael Doall, Stony Brook University
New York does not have any permitted commercial seaweed farms, but does have three research sites at Stony Brook University’s School of Marine and Atmospheric Sciences.

~1000 lbs

Of sugar kelp was cultivated at 3 oyster farm sites
Official landings are not reported by the state (farmer reported)

Major species under cultivation: Sugar Kelp (*Saccharina latissima*) and *Gracilaria* (*Gracilaria tikvahaie*).

New York’s first kelp hatchery is located at SBU’s Southampton Marine Station. In 2019, the hatchery produced over 40 spools.
Southampton Marine Station Hatchery Spools

Photo: Michael Doall, Stony Brook University
New York does not currently permit seaweed farms.

Prospective Lead Regulator:
New York State Department of Environmental Conservation
https://www.dec.ny.gov/63.html

Commercial seaweed cultivation in New York *requires a change* to the state Environmental Conservation Law (ECL).
West Coast States
Alaska, Washington, Oregon, California and Hawaii
Kelp Nursery
2022 Sales: 871,911 lbs of seaweed
Up from 591,711 in 2021

Landings reported by the state

Active Farms in 2022

- Seaweed only: 24 issued permits, 11 active
- Seaweed/Shellfish: 26 issued permits, 22 active
- Seaweed nurseries: 6 active (4 land-based; two floating)

New applications under review:

- Shellfish only, Seaweed only, Seaweed/Shellfish: 40
- Seaweed only: 16

Primary species under cultivation: Sugar Kelp (*Saccharina latissima*) and Ribbon Kelp (*Alaria marginata*), and Bull Kelp (*Nereocystic leutkeana*) to a lesser degree.
A L A S K A

Bull Kelp Farm

Photo: Gary Freitag
PERMITTING & REGULATIONS

Lead Regulator:
Alaska Department of Natural Resources (DNR)
http://dnr.alaska.gov/mlw/aquatic/

Alaska DNR issues leases for aquatic farm sites in the state, including sites for aquatic plants.
- The lease terms is 10 years.
- Lease fee is $450 for the first acre, $125 for each additional acre.

Alaska Department of Fish and Game issues permits for commercial wild harvest of seaweeds.
Food-use
The primary market for Alaska seaweed is for human consumption.

Companies produce
**Value-added food products**
like seaweed salsa, hot sauce, and dried kelp seasonings.

Seaweed is sold: dried, blanched, and frozen
WASHINGTON

Blue Dot Sea Farms, Hood Canal, WA

Photo: John Mickett
Open Water: Blue Dot Sea Farms

In 2021, Blue Dot Sea Farms (formerly Hood Canal Mariculture) transitioned to become Washington’s first open water commercial seaweed farm in 30 years.

Primary species under cultivation: Sugar Kelp (*Saccharina latissima*) (marketed through Baywater Shellfish Farm).

Sugar Kelp landings: 14,000 lbs (2017); 15,000 lbs (2020); and 10,000 (2021)

Official landings are not reported by the state (farmer reported)
WASHINGTON

SolSea LTD Tank Cultured Red Algae
Tank Culture: SolSea LTD

Combined propagation/research facility at NOAA’s Manchester Research Station.

Primary species under cultivation: *Chondracanthus* (Turkish towel), Dulse, and *Ulva*. Research incubators recently dedicated to continuous seasonal culture of Sugar Kelp and Bull Whip (aka Bull Kelp).

Annual production capacity: 28 metric tons (*not verified*) of *Chondracanthus* and Dulse (reduced during pandemic). Over 2000 lbs (multiple species) harvested for NOAA research.
WASHINGTON

Lummi Island Sea Greens

Photo: Larry Mellum / Lummi Island Sea Greens
Open Water: Lummi Island Sea Greens

Newly-permitted sugar kelp farm in Legoe Bay, WA. Operators granted an experimental 1-year lease to cultivate kelp on the site of an existing salmon reef-net fishing operation during the off-season.

Primary species under cultivation: Sugar Kelp (*Saccharina latissima*).

Inaugural harvest April 16, 2023.
Joint Aquatic Resources Permit Application (JARPA) - Permit applications are funneled to the various agencies and stakeholders through the state JARPA process. Permits are ultimately granted by the US Army Corps of Engineers.
www.ep ermitting.wa.gov/site/jarpa/9983/jarpa.aspx

Washington Department of Natural Resources - WDNR leases are required for all farms on state-owned aquatic lands. Leases may be granted for up to 30 years. Note that ~50% of Washington tidelands belong to Treaty Tribes or private landowners; prospective growers are advised to consult with local county planning offices about tideland ownership.
Blue Dot Sea Farms - 100% of Blue Dot’ Sea Farms’ sugar kelp harvest is currently utilized for *Seacharrones*, a new kelp snack produced by Blue Dot Kitchens (available through retail outlets in March 2022).

SolSea LTD - tank system produces seaweed for:

- **High-end skincare** - proprietary face and body bars, gels and serums, moisturizer (SEAME brand)

- **Upmarket restaurant-quality food** - including value-added products and snacks (limited to product development due to pandemic)

- **Research** - fish feeds, high-end fertilizers, abalone and oyster cultivation.
OREGON

West Coast Dulse

Photo: Stephen Ward / Oregon State University
Currently, there are no ocean-based seaweed farms permitted in Oregon.

3 Land-Based Farms
Since 2016, there has been significant growth in land-based dulse farming in Oregon.

Access to a consistent supply of high-quality seawater is the main limiting factor for these land-based systems.

Primary species under cultivation:

**Dulse** (*Palmaria mollis*)

The Land-based farms consist of anywhere between 5 and 10,000 liter tanks.

Official landings are not reported
Lead Regulator:
Oregon Department of State Lands (DSL)
https://www.oregon.gov/dsl/WW/Pages/Waterways.aspx

Oregon DSL issues special use leases or licenses.
• Leases can be from 1-30 years.
• Licenses grant non-exclusive use of state lands. A license can only be granted for less than 3 years.
Seaweed grown in tank systems goes to primarily to
Local restaurants
And is shipped out of state.

Seaweed is sold: fresh/raw and dried

The seaweed is used as ingredients in restaurant dishes
and in health food supplements.
CALIFORNIA

Red Ogo Produced in Tank System
4 Farms/Businesses
California has mostly tank culture operations, like Monterey Bay Seaweeds. There are 2 pilot-scale open water farms.

Primary species under cultivation: Red Ogo (*Gracilaria pacifica*), Sea Lettuce (*Ulva spp.*), Dulse (*Palmaria mollis*)

Giant Kelp:
Commercial wild kelp harvest exists for Giant Kelp (*Macrosystis pyrifera*). 25 metric tons of edible algae were wild harvested in 2015.
C A L I F O R N I A

Bull kelp line from HSU-ProvidenSea. Photo credit: Rafael Cuevas Uribe, Cal Poly Humboldt
Lead Regulator:
California Department of Fish and Wildlife (DFW)
http://wildlife.ca.gov/aquaculture

California DFW coordinates permits/approvals for farms in state waters. They work with the California Fish and Game Commission who issues bottom leases in most areas. In some cases, the harbor/port districts may administer leases.
- Maximum lease term is 25 years (10 for marine finfish aquaculture).
- Lease process triggers an environmental review under CA law.

California requires an Aquaculture Registration through the DFW for all aquaculture businesses. California DFW also regulates the harvest of kelp and other aquatic plants.
Seaweed in California is a niche market; sold to restaurants and direct to consumers.

Seaweed sold for food purposes is mostly fresh/raw.

Some of California’s wild harvest kelp is not used for food purpose/non-edible.
HAWAIʻI

Gracilaria coronofifolia

Asparagopsis taxiformis

Halymenia formosa
**HAWAIʻI**

**FARMS & LANDINGS**

**7 Farms/Businesses**
Hawaiʻi has tank culture operations, including Royal Hawaiian Sea Farms, Olakai Hawaii, Blue Ocean Barns, OceanEra, and Symbrosia. No ocean farmed seaweed is available.

Primary species under cultivation: Limu Manauea (*Gracilaria* spp.), Dulse (*Palmaria mollis*), Limu Kohu (*Asparagopsis taxiformis*), and Lepeʻulaʻula (*Halymenia formosa*)

**Production:**
Estimated production for *Gracilaria*, “ogo”: ~5,000 pounds per week, or ~260,000 pounds per year mostly for human consumption. Official landings are not reported by the state (farmer estimates)

State Division of Aquatic Resources production includes seed for industry and as feedstock for urchin stock enhancement program: ~1,500 pounds per year

Estimated production ~500-600MT (500,000 -600,000kg) or 1.1-1.3 million pounds of red macroalgae per annum for animal feed.
HAWAIʻI

Tank Culture System
Lead Regulator:
Hawai‘i Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR)
https://dlnr.hawaii.gov/dar/

Hawai‘i DAR coordinates permits/approvals for farms and collection permits for aquatic plants in state waters.

Hawai‘i requires an Aquaculture Facility License through the DLNR for all aquaculture businesses (https://dlnr.hawaii.gov/dar/licenses-and-permits/aquaculture-facility-license/)
Edible seaweed in Hawai‘i is a niche market; sold to restaurants and direct to consumers.

Seaweed sold for food purposes is mostly fresh/raw.

Mālama Maunalua removes ~ 70,000 pounds of invasive algae (*Avrainvillea lacerata*, *Gracilaria salicornia*, and *Acanthophora spicifera*) from Maunalua Bay on the island of Oahu each year. 100% of the algae removed is converted into soil amendment and compost at local farms, schools, and nursing homes.