

ROCKWEED

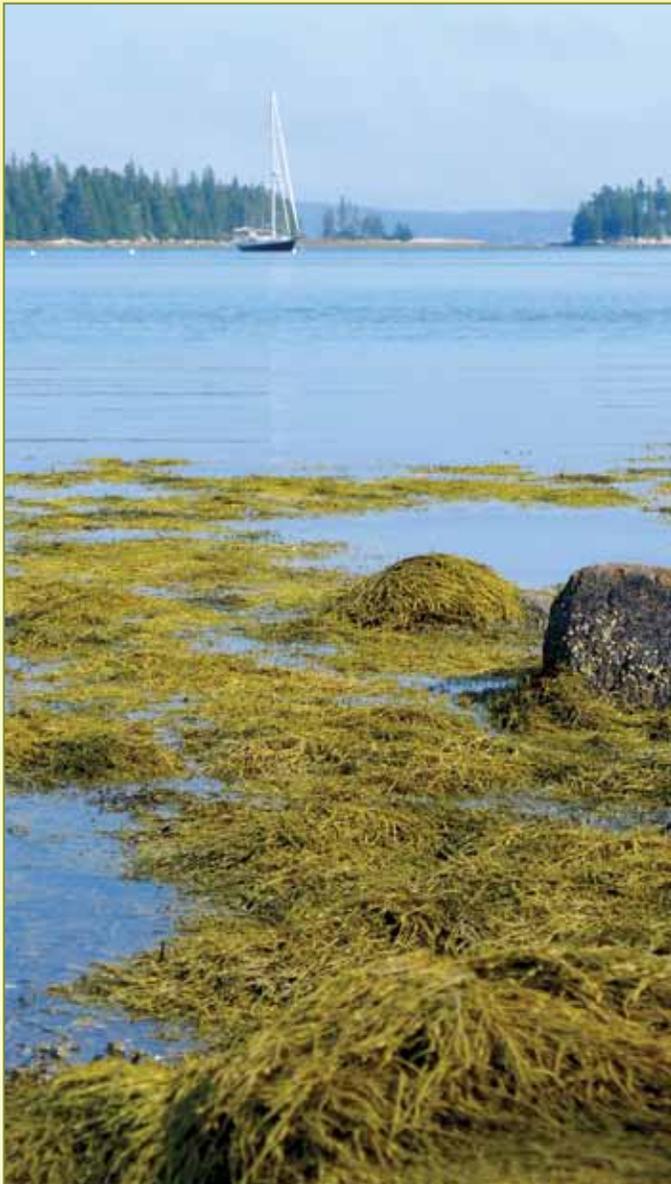
Ecology, Industry & Management

Rockweed or knotted wrack (*Ascophyllum nodosum*) is a type of large marine algae (seaweed or macroalgae) native to the North Atlantic Ocean and the Gulf of Maine. Rockweed is a major component of intertidal habitat along Maine's rocky coastlines.¹

Rockweed ecology

Rockweed is an indicator of good water quality, as it tends to decline in abundance with increasing nutrient pollution. Rockweed provides food, shelter, and spawning habitat for a variety of animals, including small crustaceans, juvenile mussels, snails, whelks, periwinkles, and fish such as rock gunnel and juvenile pollock. These, in turn, attract feeding seabirds and shorebirds including eiders, black ducks, mallards, loons, cormorants, sandpipers, and plovers.²

Rockweed and other macroalgae are very effective at accumulating nutrients and minerals from the surrounding seawater, and this is what makes them a valuable resource for human enterprise. Rockweed is harvested for use in food, fertilizer, soil conditioners, animal feed, and other products.





Rockweed's olive green fronds average 20-30 inches but can grow as long as ten feet on sheltered shores.



Air bladders along the branches help the top of the plant float at high tide.



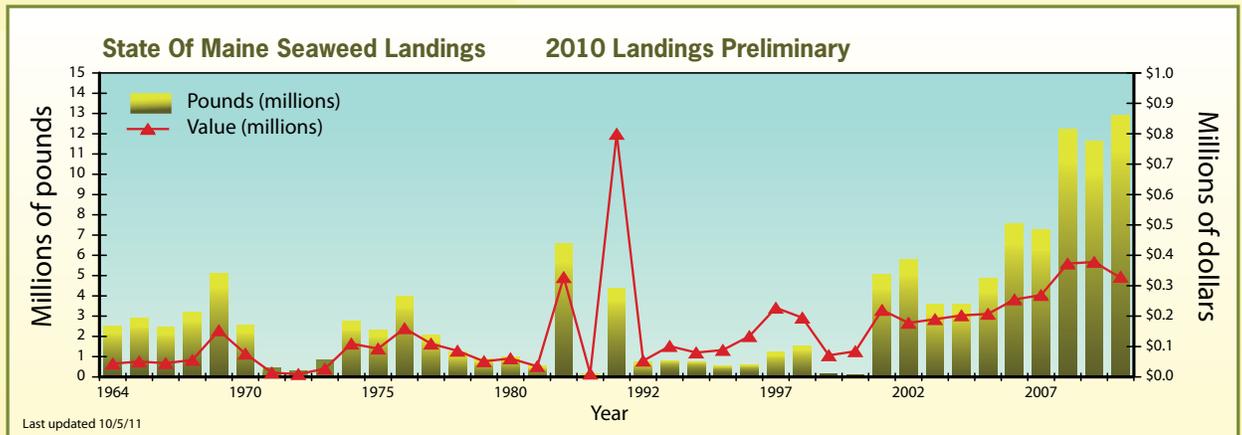
Individuals cling to rocks and other hard surfaces with a holdfast attached to a frond or "thallus."

Rockweed reproduction normally occurs in late spring or early summer in Maine, and successful establishment of new plants (zygotes) is facilitated by dense canopy cover along the shore. Because reproduction isn't always successful, rockweed stands are maintained by vegetative growth that occurs at the tips of fronds.

Individual rockweeds have a life span of eight to ten years but can be much older.



Maine Seaweed Landings, 1964–2010



Rockweed makes up at least 90 percent of total seaweed landings in Maine. Other kinds of red, green, and brown algae, such as dulse, nori, Irish sea moss, sea lettuce, and kelp, comprise the remaining 10 percent. Statewide rockweed landings for 2010 were 12.7 million pounds, having a landed value of \$253,525. The 2010 Cobscook Bay rockweed harvest totaled 106,313 pounds out of an estimated bay-wide biomass of 111 million pounds, with a landed value of \$2,126. (Source: DMR. 2010 landings figures are preliminary.)

The landed value of seaweed, or price paid at the dock, is relatively low, but only a small fraction of the harvest is sold fresh or raw. The majority is processed into wholesale and retail products such as fertilizer, soil conditioner, animal feed supplements and nutritional food and health items for human consumption. With a total estimated value of \$20 million per year, rockweed is one of Maine's most valuable marine resources.



Rockweed Management

1970s Commercial-scale harvesting of rockweed begins on the Maine coast. Rockweed industries are well established in western Norway, the British Isles, northern France, Iceland, and eastern Canada.

1980s Maine statutes establish violation fines and harvesting permit fees that support a dedicated Seaweed Management Fund.

1993 Companies, harvesters, researchers, and regulatory officials interested in the promotion and development of the seaweed industry form the Maine Seaweed Council.

1996 Maine Coastal Program initiates a project to evaluate protection and management measures for rockweed, eelgrass, and kelps.²

1999 Global Programme of Action Coalition for the Gulf of Maine holds a workshop on “Gulf of Maine Rockweed: Management in the face of scientific uncertainty.”³

2000 DMR mandates landings reporting and specifies a minimum cutting height for rockweed of 16 inches above the holdfast and above the lowest lateral branches, to allow plants to survive and re-grow.

2009 The Cobscook Bay Rockweed Management Area statute requires pre-harvest plans from harvesters, divides the bay into 36 assigned harvest sectors, caps the harvest for each sector at 17 percent of the biomass, as determined by surveys, and establishes a surcharge of \$1.50 per wet ton landed, to support seaweed research, management, and enforcement.

2010 Maine Department of Marine Resources holds a Rockweed Research Priorities Symposium at the University of Maine to summarize the state of knowledge about rockweed ecology and habitat, the effects of harvesting on the marine environment and other species, and the economic and social benefits and costs of the rockweed industry; and identify and prioritize research needs.⁴

— Maine Department of Marine Resources

Rockweed industry

Four major rockweed companies operate in Maine and, on average, employ 110 local harvesters and 115 waterfront and plant workers, for a total industry employment of 225 people. Companies harvest rockweed in Maine by hand with knives or specially-designed rakes and with mechanical harvesters. In 2010, 48% of landed rockweed was harvested by hand methods and 52% by mechanical means.

The Gulf of Maine contains more than one million tons of rockweed. Research indicates that, based on studies of biomass, productivity, and harvesting, as much as 30 to 40 percent of the total rockweed standing crop could be harvested sustainably on an annual basis. The current level of harvest is less than one percent.⁵⁻⁸

Rockweed growth, survival, and response to harvesting

Rockweed has high powers of growth and regeneration. The biomass of unharvested rockweed beds is completely replaced with new growth every three to 11 years.^{9, 10}

Organisms of the intertidal zone have adapted to large-scale natural breakage and regrowth of rockweed. Rockweed is damaged and dies naturally due to storms, ice scouring, sedimentation, and swift currents. As much as 60 percent of rockweed along the shore of Cobscook Bay becomes detached and moves into the water each year as a result of these processes.¹¹⁻¹⁴

Rockweed harvesting removes physical habitat, causing a temporary decrease in the number of species utilizing cut areas. Few effects persist beyond one year, and many important members of the intertidal community appear unaffected by one-time harvest at a moderate intensity. However, no long-term studies of harvested rockweed beds have been conducted in Maine.¹⁵⁻¹⁶



The re-growth of rockweed following loss or harvest depends on a number of factors, including the age structure of the population, the extent and pattern of branching, and the presence or absence of grazers such as snails and small crustaceans. When cut at least 16 inches above the holdfast and above the lowest lateral branches, harvested rockweed can recover in two to five years. Broken or cut plants may grow back with a different shape or structure (for example, shorter with more branches). In some cases, harvesting can enhance growth rates and reproduction. Regrowth of rockweed is reduced if the holdfast is damaged, or where rockweed is completely removed from large areas. Repeated harvesting in the same location causes declining yields, which is why harvesters rotate sites in order to allow beds to recover.^{5, 15-19}

Sustainable rockweed harvesting depends on the volume of rockweed removed, the size of the area being harvested, harvesting technique, season in which harvesting takes place, and vulnerability of each particular species or habitat to disturbance. If managed well, rockweed beds can sustain repeated biennial and triennial harvests.^{10, 20}





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Written by Pete Thayer and Catherine Schmitt • Designed by Kathlyn Tenga-González • Photos: Cover-rockweed: Kathlyn Tenga-González; shorebirds: Chris Bartlett. Inside-rockweed, bladders, thallus: Kathlyn Tenga-González; measuring rockweed: Source, Inc.; unloading harvest: Maine Department of Marine Resources; seaweed rake: Thomas Trott. Back cover-mechanical harvester: Source, Inc.; shore: Kathlyn Tenga-González.



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