

Seagrass and Seagrass Beds

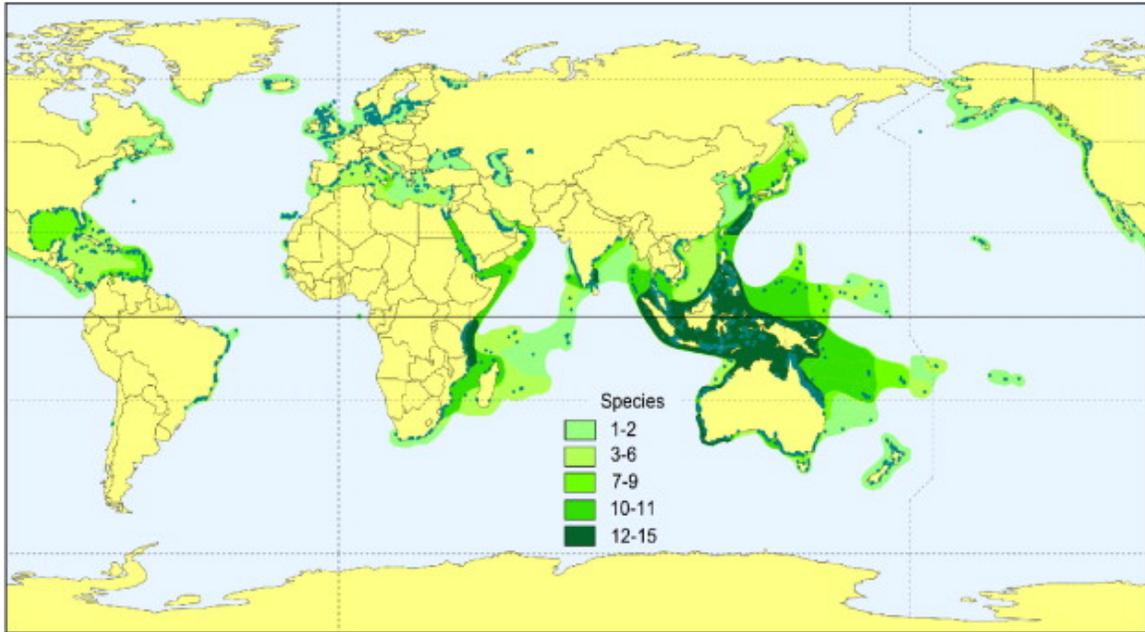
by the Smithsonian Ocean Portal

Online at <http://ocean.si.edu/seagrass-and-seagrass-beds>



An Australian Giant Cuttlefish (*Sepia apama*) crosses a seagrass bed. Credit: Richard Ling

Around 100 million years ago, grass from land adapted to live and reproduce while submerged in seawater—the modern-day seagrasses. This sea invasion by land plants happened four separate times, resulting in four unrelated families of 50-60 total seagrass species, which can be found on the coast of every continent except Antarctica. Just like grasses on land, seagrasses form vast meadows, produce flowers and seeds, and are home to an incredibly diverse community of organisms.



Seagrasses are found around the world, in tropical and colder regions. Shades of green indicate numbers of species reported for an area. (from 2005 UNEP-WCMC).

Growth and Lifecycle

Seagrasses get their energy from photosynthesis—converting sunlight into energy—and so must live in shallow water touched by the sun. There they grow into lush meadows not just by reaching blades upwards, but also stretching their roots down and sideways. Many stems in a meadow are a single plant, connected underground by their roots in what's known as a rhizome root system. In some

seagrass species, a meadow can spring up from a single plant in less than a year; in slow-growing species, it can take hundreds of years.



Seagrass meadows, such as this one composed of turtle grass (*Thalassia testudinum* and manatee grass (*Syringodium filiforme*), are an important shallow water habitat. Credit: Heather Dine, Florida Keys National Marine Sanctuary

Since they are true flowering plants (angiosperms), seagrasses reproduce by pollinating flowers and sending out seeds. Male flowers release pollen into the water that often collects into stringy clumps and, moved by the waves, runs into and fertilizes female flowers. Just like land plants, these flowers develop into seeds, which can float many miles before they settle onto soft seafloor (a few species can settle on rock) and germinate into a new plant.

Biodiversity



Seagrasses don't just provide shelter for free-swimming animals, but also are a habitat for non-moving organisms, such as these sea anemones. Credit: Ria Tan, Wild Singapore

A Unique Habitat

Seagrass serves as its own unique habitat. The meadows provide canopy cover that shelters small organisms such as invertebrates and juvenile fish, including commercial fish species. Many species of algae, bacteria and plankton grow directly on the living and dead leaves. Some of these bacteria can extract nutrients (e.g. nitrogen) from the environment and make it available to bigger animals. And seagrass plants themselves help with creating a nutrient-rich environment: they take up nutrients from the soil and release them into the water through their leaves, acting as a nutrient pump.

A Diverse Food Web

Seagrass beds are important feeding grounds for thousands of species around the world, and they support this diverse food web in three different ways. Some organisms eat the living leaves directly, such as the ecosystem's large grazers, including manatees and green sea turtles (*Chelonia mydas*). Many of these large grazers are now endangered, in large part because of habitat destruction, but once they were very common. It's estimated that before Europeans settled America in the 1400's, the [number of green turtles supported by seagrass meadows was 15 to 20 times](#) the number and biomass of large hooved animals in the Serengeti Desert alive today!



Adult green sea turtles spend most of their time grazing in seagrass meadows. Credit: Clifton Beard

Seagrass beds support far more than grazers, however. When the leaves die, they decay on the ground below, supporting organisms that thrive on rotting material. And, lastly, some of these living and dead seagrass blades are washed away to other areas of the ocean, [feeding organisms in ecosystems as far as the deep sea](#).

The collection of smaller animals hiding amongst the seagrass blades and feeding on decaying seagrass attracts bigger animals, accumulating thousands of species in this single habitat. The ecosystem may be home to many types of fish, octopuses, squids,

cuttlefish, snails, oysters, sponges, shrimps, sea fleas, worms, urchins, anemones, microalgae, crabs, polychaetes, clams, diatoms, dinoflagellates, copepods—the list goes on. Some of these organisms are permanent residents, while others just pass through.

Conservation



Broad-leaf seagrass (*Posidonia australis*) with algae epiphytes grows at Corner Inlet Marine National Park in Australia. Credit: Mark Rodriguez

Ecosystem Role

Although they get little attention, seagrass meadows are one of the most productive ecosystems in the biosphere. They're known as the "lungs of the sea" because one square meter of seagrass can generate 10 liters of oxygen every day! Seagrass meadows also improve water quality by absorbing nutrients and attracting particles to their blades. Their roots stabilize the sediment below them and protect coastlines by scattering wave energy.

Vast seagrass meadows also capture and store a huge amount of carbon from the atmosphere—even more than the world's forests per hectare. Trees take carbon from the air to build their trunks, for example, storing that carbon there as long as the tree stands. Similarly, seagrasses use carbon to build their grassy blades. As their carbon-rich leaves die and decay, they collect on the seafloor and are buried in the soil below, trapped in sediments. It's estimated that [the world's seagrass meadows capture 27.4 million tons of carbon each year!](#) The carbon stored in sediments from coastal ecosystems, including seagrass meadows, [mangrove forests](#), and salt marshes, is known as [blue carbon](#).

Human Impacts

Unfortunately, seagrasses are in trouble: it's estimated that 29% of the world's seagrass meadows have died off in the past century, with 1.5% more disappearing each year. The main culprit is runoff from land into the ocean. Nutrients, such as those from fertilizers and pollution, wash into the water and can cause algal blooms, which block the necessary sunlight from reaching the seafloor. Sediment washing into the water can also block sunlight and cause similar effects.

When people remove fish from seagrass beds, it can lead to seagrass death. Algae and other epiphytes grow on seagrass blades and are regulated by grazing fish. Some of these algae-grazing fish are targeted by fisheries, and their disappearance allows the algae to grow out of control and to choke the seagrass. However, more commonly fisheries catch bigger fish species a couple of steps up the food web from algae-grazers. When these larger fish are removed from the ecosystem, their prey—the predators of algae-grazers—thrive, and they can quickly decimate algae-grazer populations. So overfishing of large fish indirectly causes algae to grow out of control and kill seagrass.



Neptune grass (*Posidonia oceanica*) is a slow-growing and long-lived seagrass native to the Mediterranean. Credit: Gaynor Rosier

Don't forget invasive species: introduced seaweeds can displace seagrass beds. One potent example is the invasion of *Caulerpa taxifolia*, an aquarium seaweed later nicknamed "the killer algae". [Released into the Mediterranean in the 1980s](#), by 2000 it covered more than 50 square miles (131 square kilometers) of Mediterranean Sea coastline, overgrowing and replacing the seagrass neptune grass (*Posidonia oceanica*) and reducing the ecosystem's biodiversity. Since then, *Caulerpa* has also been released off the coast of California and Sydney, Australia.

Some fast-growing seagrass species are able to rebound—but many species (including *Posidonia oceanica*) grow over the course of centuries and could be slow to recover from the impact. [People attempt to rebuild and restore seagrass beds](#), often by planting seeds or seedlings grown in aquaria, or transplanting adult seagrasses from other healthy meadows.