This swathe of **NEPTUNE SEAGRASS** (*Posidonia oceanica*) in the Mediterranean could be the oldest known living organism on Earth. Believed to be between 80,000 and 200,000 years old, the meadow spans many kilometres, each blade of seagrass cloned from the same, genetically identical organism.

**Miracle Grass**

IT'S THE WORLD'S ONLY FLOWERING PLANT CAPABLE OF INHABITING SALTWATER, AND ONE OF OUR BEST WEAPONS IN THE FIGHT AGAINST CLIMATE CHANGE — YET SEAGRASS MEADOWS ARE ONE OF THE MOST RAPIDLY DECLINING ECOSYSTEMS ON EARTH. WHAT CAN WE DO TO TURN THE TIDE?
GREEN TURTLES are herbivores in their adult lives. The bulk of their diet is seagrass, which is torn from the seabed with the aid of a serrated (sawlike) beak.
One of the most popular food fishes in the world, ATLANTIC COD (Gadus morhua), depends on eelgrass as a nursery area. Healthy seagrass promotes healthy fish populations.
I lifted up the rock and the keys were gone. Disbelief. It was high noon in July and the Florida Keys heat was oppressive. I was dripping salt water and had seaweed in my hair. The rental car containing my cell phone, wallet, drinking water, hotel key, sunglasses and everything else except my wet board shorts and my underwater camera were sealed in the hot car. I know I put the keys (actually an electronic key FOB that cannot be taken in the water) right there and I kept an eye out from my spot in the water. No one, at least no human, could have taken the keys. Where on Earth could they be?

I had been sitting in a seagrass meadow hoping a shy bonnethead shark would swim in front of my lens. These mini hammerheads were recently proven to be the first omnivorous sharks in the world. It was thought all the vegetation in their bellies was eaten incidentally as a result of hunting crabs hiding in the seagrass, but recent studies show they evolved to absorb nutrients from the plants. In one study lead by Samantha Leigh of the University of California Irvine, bonnethead sharks in captivity were fed a 90% vegetarian diet and the nutrients from the seagrass were traced to the shark’s tissues and sharks gained weight. Plant-eating sharks are just one example of how science is changing our view of seagrass and revealing just how amazing and important it is.

Seagrasses are different from algae and seaweed; they are flowering plants that migrated from the land into the ocean. There are over 60 different species of seagrass found in coastal seas on six of the seven continents (Antarctica being the one without) stretching from the equator to cool and cold areas under ice.

Just a few weeks before I was trapped, keyless, outside my rental car in the Florida heat trying to figure out what my next move was, I found myself wearing a drysuit, shivering uncontrollably in 2°C (35°F) water in Newfoundland, Canada. I joined a small team of scientists from the Department of Fisheries and Ocean’s Canada (DFO) who have been monitoring the eelgrass and fish populations for decades. In the early ’90s one of the world’s largest fisheries collapsed. Severe overfishing of Atlantic cod meant 40,000 jobs in Newfoundland were lost overnight.

A GREEN TURTLE (Chelonia mydas) oversees a researcher with the Center for Ocean Research and Education (CORE) in The Bahamas as they service a predator exclusion array to test the effects of grazers on seagrass health.

“While climate change is a seagrass killer, seagrass is a climate change killer.”
In the nearly 30 years since, the population hasn’t come back to levels where they can be commercially fished, despite a complete moratorium on fishing for most of those years.

Part of the key to bringing back cod numbers is having ample seagrass for the juveniles to hide and feed in. By providing the shelter they need, seagrass meadows improve their odds of survival in the earlier stages of their lifecycle. Therefore, the healthier the seagrass, the healthier the cod population—all else being equal.

Cod aren’t the only commercially fished species to utilize seagrass in this way. The list also includes Alaska pollock, the most landed fish on the planet. This billion-dollar species—the same one found in your McDonald’s Filet-o-Fish Sandwich—also utilizes seagrass as valuable nursery habitat, increasing the likelihood of individuals reaching reproductive maturity.

“One fifth of the world’s biggest fisheries are reliant on healthy seagrass meadows”

The same is true for tiger prawns, conch and other species of commercial value. In fact, according to research published in 2018, one fifth of the world’s biggest fisheries are reliant on healthy seagrass meadows.

Diving along Newfoundland’s seagrass beds you’d think there are no juvenile cod at all. It wasn’t until I kept still that they would reveal themselves. I set my underwater camera rig on a tripod in front of a lush patch of seagrass and backed away, remote trigger in my freezing hand. The more still I was, the more fish flitted about. Every once in a while, a tiny 2–6inch Atlantic cod would flit in front of my lens and I’d snap a picture. After an hour my assistant and I couldn’t take it anymore and, leaving the camera behind marked by a buoy, would head back to shore for some hot chocolate. I joked with the team between dives how I was on my way to sunny Spain after this, attempting to simultaneously warm them up and make them jealous.

In Spain’s Mediterranean Sea I swam among the oldest and largest living organism on the planet - a type of seagrass called Posidonia oceanica. The plant’s root system is connected beneath the sea floor and stretches for over 9 miles of coastline. A study by Carlos Duarte of the University of Western Australia estimates this organism to be between 80,000 to 200,000 years old! Can this historically robust plant survive humanity? The Mediterranean Sea is warming three times faster than the world average and, so far, P. oceanica is declining 5% per year. “They have never experienced the speed of climate that the Mediterranean is currently experiencing,” Duarte says.
Most seagrass the world over is on the decline. Best estimates suggest almost 30 per cent of known seagrass area across the globe has been lost since the late 19th century. Since 1990, the destruction has continued at an alarming 7% per year. Moreover, at least 22 of the world’s 72 seagrass species are currently in decline. Pollution, coastal development, poor fishing and boating practices, reduced water clarity and, of course, climate change, are all contributing factors.

But while climate change is a seagrass killer, seagrass is a climate change killer. The wonder plant is a highly efficient carbon sink, removing CO2 from the atmosphere at a rate 35 times faster than tropical rainforests. Incredibly, despite covering just 0.1% of the seafloor, seagrass stores up to 18% of the world’s oceanic carbon. It can also help with some of the symptoms of climate change. A recent study led by Jeremy Testa, of the University of Maryland, found that restored seagrass in the Chesapeake Bay area helped lower the severity of ocean acidification caused by climate change and agricultural runoff. The growing acidification of the oceans has become a serious problem for the production of shellfish around the world, as it limits their ability to build and maintain calcium carbonate shells. Everything from clams, mussels, and oysters to corals, crabs and urchins are affected. But Testa and his colleagues found that seagrasses in the bay are capable of performing a magnificent chemical trick: as they photosynthesize in the sunshine, they produce a carbon-based mineral that acts like a miniature antacid tablet, helping to neutralise the corrosive waters.

In the early 1930s, Chesapeake Bay was the United State’s leading oyster fishery. Seagrasses crowded the bay’s shallows, providing a home for the oysters, as well as fish, crabs and other species. However, a combination of factors—including increased trawling, and nitrogen pollution from land—reduced the seagrass cover, creating dead zones and killing off the oyster fishery. Today, after two decades of restoration efforts, seagrass cover has expanded again in Chesapeake Bay. The water is cleaner, and the oysters are starting to mount a comeback.

“A BILOBED GHOST GOBY (Pleurosicya bilobata) uses transparent skin to blend in to a seagrass blade in Indonesia. Over 30 times more animals live within seagrass compared to adjacent sandy habitats.

“Healthy seagrass means a healthy ocean.”
[ABOVE] Horseshoe crabs (*Limulus polyphemus*) mate in a shallow seagrass bed in Florida. Their blue blood is used in the medical industry to prevent contamination of vaccines, and help fight disease, including COVID-19.

[ABOVE] A lumpfish (*Cyclopterus lumpus*) hides in a seagrass meadow in Newfoundland, Canada. Lumpfish are hunted for their eggs and are Vulnerable to extinction.

[BELOW] A school of striped catfish (*Plotosus lineatus*) move through seagrass in Indonesia, eating the algae growing on the blades.
A mother and son collect sea urchins among the seagrass beds in Indonesia. Millions of people in developing nations rely on nutrition supported by seagrasses.
Seagrass supports a diversity of organisms rich enough to rival tropical rainforest. Here, a single blade of Neptune grass in Spain plays host to two species bryozoans: the white, spoked colonies of *Lichenopora radiata*, and the ‘chain-link’ colonies of *Electra posidoniae*, a species which grows exclusively on seagrass.

A baby sea star eats algae growing on seagrass in Newfoundland, Canada.

A comparison of clean seagrass vs. seagrass covered in sediments kicked up by passing boat traffic. The more sediment, the less sunlight seagrass blades can absorb for photosynthesis.

One of the by-products of photosynthesis is oxygen. One square meter of seagrass can produce 10 litres of oxygen per day.
Seagrass meadows commonly occupy sheltered bays - locations that are also attractive for boating activities.

[RIGHT] Propeller scars, pictured here in the Florida Keys, are a result of careless boating in shallow seagrass beds. The Florida coast is particularly vulnerable, due to a large human population possessing a large number of boats.

[LEFT] Boat propellers and mooring chains can cut past the roots of seagrass and inflict long-term damage on the meadow. Boat-damaged seagrass beds recover slowly, resulting in new damage that often outpaces recovery of existing damage.
In May 2019, I joined a team of volunteers and researchers from the Virginia Institute of Marine Science (VIMS), who are undertaking a twenty-year seagrass restoration effort. Under the guidance of Professor Robert “JJ” Orth, VIMS researchers helped pioneer tools and techniques used to gather, preserve, and deploy seeds for restoring seagrass. It basically works like this: in springtime, volunteers collect as many seed-bearing seagrass shoots as possible and store them in large vats. After the seeds have fallen out and sunk to the bottom of the vats, they are dried and strategically dispersed the following September. The system is incredibly effective. Since sowing began in 1999, VIMS has transformed over 9,000 acres of barren bays into lush eelgrass meadows—the largest and most successful example of seagrass restoration in the world.

Professor Orth has been hailed as the ‘Johnny Appleseed’ of seagrass, but the big question is: can his method be replicated elsewhere? The answer, at least in some cases, is yes. VIMS’ success has led to collaborations with restoration scientists and resource managers in both northern Europe and Australia. In the United Kingdom, millions of pounds have recently been invested into restoring seagrass meadows that were severely damaged by trawl fishing using the tried-and-tested seeding method. However, in other parts of the world, with different species of seagrass, this method is far less likely to succeed. Seagrass conservation, on a global scale, clearly requires a more multifaceted approach.

So far, attempts to slow this decline have included the aforementioned restoration efforts, as well as legislative protection of habitat. For example, In July 2020, fisherman, scientists and conservationists came to agreement that saw the protection of 40,000 acres of seagrass in Florida—the first such protection declaration for the state in over forty years. However, critical gaps in seagrass protection remain. They are among the least protected coastal habitats, with only 26 per cent of recorded seagrass meadows falling within Marine Protected Areas, compared with 40 per cent of coral reefs and 43 per cent of mangroves. A growing perception of the massive extent to which seagrass habitats have been decimated, and a better recognition of their outsized role in combating the climate crisis and protecting food chains, provides a compelling case for stepping up our efforts.
How do you restore 9,000 acres of seagrass? One handful at a time. A volunteer with The Nature Conservancy grabs a handful of eelgrass (*Zostera marina*) with seed-bearing shoots.

Scientists use their bodies to stir the harvested eelgrass in large tanks. Since 1999, VIMS has sown over 70 million eelgrass seeds in mid-western Atlantic coastal lagoons, leading to recovery of 3612 ha (8,925 acres). Well-developed meadows now foster diverse animal communities, and have prompted a parallel restoration for bay scallops.
DUGONGS (Dugong dugon), like this one in Egypt, are a species Vulnerable to Extinction and feed exclusively on seagrass. One of the largest threats to the species is declining seagrass habitats.
AMERICAN CROCODILES, like this one in Cuba, feed on fish and small mammals among seagrass and mangroves. The two habitats are connected and needed for life at all levels from small grazing animals all the way to top predators.
SEAGRASS


A RED LIONFISH (*Pterois volitans*) hunts a school of Moluccan cardinals (*Apogon moluccensis*) in a tapegrass bed in Indonesia. Seagrass meadows provide habitat, food and shelter for a myriad of species, be it predator or prey.

BONNETHEAD SHARKS (*Sphyrna tiburo*) are the first shark species discovered to be omnivorous. In addition to feeding on crabs, they ingest copious amounts of seagrass and are able to retain nutrients from the plants.

Why then, with so much going for it, is seagrass so overlooked and underappreciated? Perhaps part of the problem is it’s just not sexy like coral reefs or even mangoes. You don’t have dive tourists flocking to explore seagrass meadows. You don’t see it disappearing like the rainforests ablaze on the evening news. Yet, in my travels with seagrass, I’ve encountered toothy sharks and crocodiles, loveable dugongs and turtles, amazing seahorses and octopus, strange lumpfish and horseshoe crabs. Not to mention the species that people enjoy, and—in some cases—depend on for food: lobster, cod, urchins and oysters, to name a few.

I did eventually meet a bonnethead shark. You know, the one I was hoping to see before my key mysteriously disappeared? A single shark swam up to my camera, took a quick look and disappeared. I had one usable photograph after 9 days of patience. So, what happened to my key? I still don’t know. My best guess is that a crab grabbed it like treasure and dragged it down one of the many holes I saw in the immediate area. I was lucky a park ranger eventually came by and let me borrow his phone to call a tow truck. I don’t know what I would have done otherwise. Perhaps nature got a bit of revenge on me that hot day. If we are not careful, if we let ourselves destroy too much of nature, I fear I will not be the only recipient of her wrath. So, let’s protect our seagrass, let’s not lose that key.

The benefits of protecting seagrass cannot be overstated. While in Indonesia, I met a mother and son who would go out almost every day during low tide to collect sea urchins from the local seagrass beds to feed their family. The story is not rare—in developing nations, seagrass habitat provides 50% of the animal protein that 400 million people eat. Seagrass nurtures fish populations, provides food and livelihoods to hundreds of millions of people, and alleviates poverty. It stabilises sediments, weakens storm surges, and protects against coastal erosion. It can purify the water by filtering pathogens, bacteria, and pollution out of seawater. Not only is this habitat home to endangered and charismatic species such as dugongs, seahorses, and sea turtles, but it also constitutes one of the planet’s most efficient stores of carbon, representing a powerful nature-based solution to the climate challenge. In short, healthy seagrass means a healthy ocean.

Shane Gross is a Canadian marine conservation photojournalist who specializes in underwater stories. He has shot assignments for Greenpeace, The Nature Conservancy and more. Shane’s first book, *Bahamas Underwater*, takes a deep dive into the beauty and challenges of the island-nation and is available in virtually every school in The Bahamas, with sales proceeds helping to teach Bahamian children about the ocean, in the ocean. By his own admission, Shane is desperate for Instagram followers.
[CLOCKWISE FROM RIGHT] Cunner pair in eelgrass, Canada; Banded sea krait (Laticauda colubrina) hunting in seagrass bed, Indonesia; Common sea star juvenile on eelgrass blade, Canada; Neptune seagrass meadow in Spain.