

Loss of seagrasses 'accelerating'

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Algae smothering seagrasses, the lungs of the ocean (Source: Gary Kendrick)
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Nearly 30% of global seagrass beds have been lost since records began, and the rate of loss is accelerating, according to a new study.

Marine biologist Professor Gary Kendrick, of the [University of Western Australia](#) in Perth, and colleagues report their findings this week in the *Proceedings of the National Academy of Sciences*.

"The losses have been quite substantial," says Kendrick. "Every year we're losing about 110 square kilometres of seagrasses globally."

He and colleagues found that since 1980, 29% of seagrass has disappeared and the overall rate of loss has accelerated from 0.9% a year, before 1940, to 7% a year, since 1990.

In the largest study of its kind, Kendrick and colleagues analysed 215 studies of seagrass beds in shallow coastal waters from around the world.

They found seagrass is being lost from east and west North America, the Caribbean, Mediterranean, Europe, parts of East Asia, Southeast Asia, as well as tropical and temperate Australasia.

Nutrient culprit

Nutrients in sewage and run-off from agriculture and industry are the major cause of seagrass death, says Kendrick.

These nutrients trigger the growth of algae, plants and animals that grow above or on seagrass, and stop it from getting the sunlight it needs.

"In Western Australia, in Cockburn Sound, we've lost 80% of our seagrasses. Over 1200 hectares of seagrasses have been lost in the last four decades," says Kendrick.

"The loss of seagrass there can be tied directly to nutrient input in the form of nitrogen."

Lungs of the ocean

Kendrick says the rate of seagrass loss is comparable to the loss of tropical rainforest.

He says studies have found seagrass fixes as much carbon dioxide as tropical forests, and is also a crucial part of the ocean food chain.

About 75% of seagrass feeds bacteria, which are the bottom of the ocean food chain, says Kendrick: "They actually feed the whole food web."

He says the other 25% of seagrass is eaten directly by animals such as dugongs, green turtles, fish, snails and crustaceans, as well as birds like geese and swans.

Seagrass meadows are also crucial to the survival of fish that live in coral reefs, says Kendrick: "So there's a very close connection between reef systems and seagrass systems in the tropics."

Impacts

The loss of seagrass negatively affects fisheries and human health through degradation of the ecosystem, says Kendrick.

He says seagrass buffers coastal areas from damaging waves, expected to increase with rising seas, and also acts as a filter for toxic materials released into the ocean from industry.

While seagrass beds off undeveloped parts of Australia, such as much of Queensland, remain healthy, most of the seagrass elsewhere in Australia is suffering, says Kendrick.

"Australia wide, seagrass has a problem anywhere there are port developments, harbours and urban development," he says.

But, there are some good news stories.

Kendrick says seagrass between the port of Fremantle and the port of Cockburn in Western Australia has recovered.

"Basically we cleaned up our activities south of Fremantle harbour in the late 1970s," says Kendrick, wondering if it might be a model for future seagrass recovery.

"Can we replicate what's happening there?"

This massive seagrass die-off is the latest sign we're failing to protect the Everglades

By [Chris Mooney](#) April 27, 2016 [Email the author](#)

A massive die off of vital seagrass threatens Florida Bay

EVERGLADES NATIONAL PARK, Florida – The shallow coastal waters of Florida Bay are famed for their crystal clear views of thick green seagrass – part of the largest stretch of these grasses in the world.

But since mid-2015, a massive 40,000-acre die off here has clouded waters and at times coated shores with floating dead grasses. The event, which has coincided with occasional fish kills, recalls a prior die-off from 1987 through the early 1990s, which spurred major momentum for the still incomplete task of Everglades restoration.

“It actually started faster as far as we can tell this year,” said James Fourqurean, a Florida International University marine scientist who studies the system. “In the ’80s, it continued to get worse for 3 years.”

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Fourqurean and government Everglades experts fear they’re witnessing a serious environmental breakdown, one that gravely threatens one of North America’s most fragile and unusual wild places. When most people think of the Everglades, they envision swamps – but seagrass is just as important, if less romanticized.

Besides being the home to majestic sea turtles, dolphins, and manatees, Florida Bay also hosts pink shrimp, spiny lobsters, spotted seatrout, and much more – sport fishing alone here is worth \$ 1.2 billion per year, according to the Everglades Foundation.

And although there is at least some scientific dissent, Fourqurean and fellow scientists think they know the cause of the die-off. It’s just the latest manifestation, they say, of the core problem that has bedeviled this system for many decades: Construction of homes, roads, and cities has choked off the flow of fresh water. Without fast moves to make the park far more resilient to climate change and rising, salty seas, the problem will steadily worsen.

The Everglades ecosystem “being out of balance at a time of climate change is really going to have a huge impact on South Florida, if we don’t do something about it,” said Interior Secretary Sally Jewell, who surveyed the seagrass die-off last week during an Everglades Trip.

Holding dead grasses in her hand in a National Park Service boat in the more than half-a-million-acre estuary, Jewell told a group of staff and reporters, “This is what we get when we don’t take care of Florida Bay.”



FLORIDA CITY, FLORIDA – APRIL 22, 2016

Sally Jewell, United States Secretary of the Interior, along with Pedro Ramos, superintendent of Everglades and Dry Tortugas National Parks in Florida, looks at grass that was floating in the waters of the Everglades National Park during a trip to look at dying sea grass.

(Photo by Angel Valentin)

Florida Bay encompasses roughly one-third of Everglades National Park. And like the park’s mangroves and sawgrass prairies, it relies on the same broad water system. Both need fresh water to flow southward from

Florida's Lake Okeechobee, and the central part of the state, to preserve their unique characteristics. And both have suffered from highway and water management projects that have blocked or diverted much of this water away.

"It's basically a permanent manmade drought, created by the drainage and development patterns to the north in the Everglades," said Robert Johnson, director of the National Park Service's South Florida Natural Resources Center, on the boat trip with Jewell.

The seagrass die off, according to Johnson, was caused when this perennial problem was further exacerbated by a 2014-2015 South Florida drought.

Flows through Shark River Slough, which feeds water to the Everglades and eventually Florida Bay, plunged to just 200,000 acre-feet in 2015. That's just a quarter of standard annual flows, which themselves are less than half of historic flows of 2 million acre-feet per year before major projects blocked and redirected the Everglades' water.

The center of the bay then heated up last summer, saw considerable evaporation, and became quite salty – for some parts of the bay, twice as salty as normal sea water.



"It's a really delicate balance between how much freshwater comes in each year, how much rainfall falls, and then how much evaporation occurs," Johnson said. "In the absence of rainfall, salinity takes off in the bay, and we get a lot of harmful impacts of that."

In very salty conditions, waters hold little of the oxygen that seagrasses need to live. At the same time, other marine organisms turn to a different "anoxic" process – one that goes forward without oxygen – that has a nasty by-product: hydrogen sulfide.

The chemical "is a notorious toxin," said Donald Boesch, president of the University of Maryland Center for Environmental Science. "It kills life, including human."

And that's just the beginning. Once the seagrass dies off, it becomes a feedback – the water becomes filled with dead grasses that release nutrients, and those can stoke huge algal blooms (which happened the last time around, but so far have not appeared en masse). That clouds the water and prevents light from reaching remaining seagrasses, which then also die, because they need the light for photosynthesis.



FLORIDA CITY, FLORIDA – APRIL 22, 2016 A sample of algae covering dead sea grass that was picked up in the waters of the Everglades National Park during a trip to look at dying sea grass. (Photo by Angel Valentin)

"You have this water that's notoriously gin clear water, because the seagrasses and the biology kept the light penetrating, and then all of a sudden it changes pretty dramatically to a system without grass, and very turbid waters," Boesch said.

Granted, there are some dissenters. Brian LaPointe, a researcher with Florida Atlantic University, contends that Florida Bay seagrass die-offs are caused by the runoff of too many nutrients, like nitrogen, into the Bay's waters, which in turn stoke algal blooms. "There really isn't a correlation over time of high salinity and problems in the Bay," LaPointe said.

Seagrasses, he said, "can handle pretty high salinities." During the last dieoff, a large scientific debate erupted over whether changes in salinity were indeed the cause.

But Boesch, who led a scientific review of the last die-off during the Clinton administration (which failed to reach a conclusion at the time), said that the high-salinity explanation "has now become kind of the mainstream scientific explanation," although that now encompasses other related processes involving oxygen content of waters and buildup of hydrogen sulfide.

It's not just Florida Bay: Seagrasses the world over are threatened. In a 2009 study, scientists found that seagrass extent had declined globally by 29 percent since the late 19th century. They concluded that seagrasses were just as threatened as their companion coastal ecosystem, coral reefs, though the latter tend to get far more attention.

The Obama administration, in collaboration with Florida state agencies and local leaders, has been moving lately to simultaneously restore historic Everglades water flows and to try to safeguard the park against climate change.

President Obama visited last year, telling his audience that "You do not have time to deny the effects of climate change...nowhere will it have a bigger impact than here in South Florida."

And this year Jewell visited the Everglades on Earth Day to announce a \$ 144 million "bridging" project that will elevate 2.5 miles of Highway 41, more popularly known as the Tamiami Trail, which connects Miami to Tampa and runs through the Everglades. Constructed in the 1920s, the highway impairs water flow southward, from Lake Okeechobee, into the Everglades (and, eventually, the Bay). It's like a dam across the famed "river of grass." Lifting it could restore a substantial part of historic freshwater flow levels.

But that will take years – the project should be completed in 2020 – too long to stop the current seagrass die off from running its course and perhaps having many cascading effects, scientists fear.

And it's not just nature that needs this fresh water: It's people.

South Florida, the home to 6 million people now and growing steadily, relies on the Biscayne aquifer, which is refilled by the Everglades, for drinking water. The aquifer's water flows through limestone that is quite porous, which means that saltwater and freshwater can both penetrate it.

In effect, two walls of water abut one another, facing off – and for the sake of nature and people alike, freshwater needs to hold its ground. If inadequate freshwater flows southward in Florida, then Florida Bay can get too salty even as the seas also creep into the Everglades, potentially causing land to subside and sink – but also penetrating the aquifer and threatening drinking water.

In short, it's bad news across the whole system.

And even as governments at the local, state, and national level move faster to send the Everglades and the Bay more fresh water, the question remains just how much climate change will worsen problems like the seagrass die-off. After all, it will raise seas, increase air and water temperatures, and perhaps drive more droughts as well.



FLORIDA CITY, FLORIDA – APRIL 22, 2016 A look of a vast bed of healthy seagrass in the waters of the Everglades National Park during a trip to look at dying seagrass with staff from the park and the Secretary of the Interior. (Photo by Angel Valentin)

“The questions I would ask, from a climate perspective, going forward, is first of all, are we going to have more conditions of really high temperature, due to, you know, the atmospheric warming, coupled with these extended periods of still water?” Boesch said. “Are we going to have longer periods of drought in the Everglades?”

Boesch said that while higher temperatures are a given, precipitation patterns are difficult to predict, but notes that there is some reason to fear South Florida could get drier in the future.

“What happened to the Bay is very much a climate change issue,” Jewell said in an interview during her Everglades tour. “It’s tied in to a drought. Now, is the drought tied to climate change? None of us could tie any single hurricane or storm event or drought to climate change, but we do know that the weather here is getting more extreme. And we do know that those extreme weather patterns are having a dramatic impact on our ecosystems, as we saw today on Florida Bay.”

Still, much of Florida Bay remains unaffected – for now. That includes an area of lush seagrass meadow near a small island named Johnson Key. A trio of bottlenosed dolphins approached the National Park Service skiff there, and as the boat trolled slowly through the clear, only 3- to 4-foot-deep water, started to lead the way ahead of it.

Nonetheless, the second major seagrass die off in three decades certainly suggests that something has changed recently in the system. “The really disturbing thing is, this unprecedented event has now happened twice in my career,” Fourqurean said.