The Washington Post
Democracy Dies in Darkness

Golf thrives on the ocean's edge. What happens when the oceans rise?

By Dave Sheinin

May 20, 2021 at 4:00 a.m. EDT

KIAWAH ISLAND, S.C. — To walk along the 18th hole at the Ocean Course at Kiawah Island is to stand outside the lion's cage. Nature's awesome power is implied and understood, but from the safety of your perch, it is only there for you to gawk and marvel at. The Atlantic Ocean, visible from your raised ground just beyond the dunes, a mere gap wedge away at high tide, laps at the shore.

The grass you traverse is an impossibly vivid shade of green, but everything else — dunes, seagrass, shrubs — is varying shades of brown, a landscape forged by the whims of time and nature, except where it was been mowed, rolled and watered to verdant perfection.

The Ocean Course, which hosts the PGA Championship this week, was born from nature at its most destructive, its construction in 1989 halted when Hurricane Hugo flattened Kiawah Island and set construction on the course back to square one. There was a hard deadline: The PGA of America had announced the island's Ocean Course as the host of the 1991 Ryder Cup two years before the course actually existed.

"The golf course changed entirely," said Troy Miller, a Charleston native and golf course architect who apprenticed under the legendary Pete Dye when the latter was building the Ocean Course. "The hurricane happened, and everyone came back, and it was all gone. Where the ponds were, there were dunes. And where the salt marshes were, there was water."

Figuring Hugo wouldn't be the last storm to strike this coast, Dye, who died in 2020 at age 94, once said he doubted the course would still be around in another 50 years. That figure may be too conservative, given the greater frequency and strength of Atlantic hurricanes in the age of global warming.

"If a Category 3 or 4 came in just south of here, there probably wouldn't be much left," said George Frye, the former superintendent of the Ocean Course. "It would be devastating."

Hurricanes, though, are unpredictable. The other existential threat facing the Ocean Course — as well as other coastal golf courses around the world and, for that matter, houses and developments and entire cities — is more immediate, measurable and insidious: sea-level rise. It is hardly news that our oceans are rising at an accelerating rate — nearly a foot in the past 100 years, with predictions of two to six more feet by the end of this century. But it seems to have taken golf courses a while to catch on.

"There's no simple solution to this," said William Austin, professor of geography and sustainable development at St. Andrews University in Scotland. After the U.K.-based Climate Coalition released a study in 2018 saying the Old Course at St. Andrews, the famed "birthplace of golf," and other storied U.K. courses were in danger of being wiped out by sea-level rise, the Royal and Ancient Golf Club asked Austin to head up its own study, currently underway.

"The Old Course just now is fine," Austin said. "But it's a case where we're holding the line. … If I were in the golf business, I would be nervous about the future."

On Kiawah Island, 17 miles southwest of Charleston and home to some of the most expensive real estate in the American South, nuisance flooding was beginning to affect some low-lying areas following heavy rains. Then, in 2018, a report by the Union of Concerned Scientists, a nonprofit science advocacy group, confirmed the worst fears: Things were only going to get worse. By 2045, the report said, more than 1,500 homes on Kiawah, worth a collective $1.3 billion, were at risk of becoming chronically inundated by

flooding. The year before that report's release, Tropical Storm Irma flooded an estimated 73 percent of the island.

The Town of Kiawah Island quickly formed a subcommittee to study the issue and find solutions. Committee members consulted scientists. They made site visits to vulnerable areas. And on Sept. 4, 2018, they published their sobering findings in a report that clocked in at 123 pages.

"We must unite to address the risks of increased flooding and future sea-level rise," the report read.

Although the report made specific recommendations for improving roads and storm-water management, it also made clear what a lack of action would mean: A series of maps showed the island under different potential levels of storm surge or sea-level rise, based on projections ranging from conservative to worst case. At one foot, 14 percent of the island's land was inundated. At six feet, the figure was 90 percent.

Officials from the Kiawah Island Golf Resort, which owns the Ocean Course, declined to be interviewed for this story. In a statement, a spokesperson said the resort "is grateful for and has a high level of confidence in the work being conducted by the Town of Kiawah Island to proactively address the issue of sea-level rise." Those officials also declined to meet with a reporter on a recent visit for a tour of the course.

The resort's stance is easy enough to understand: Golfers playing the Ocean Course — whether amateurs who pay $463 for the privilege or the top professionals competing there this week — aren't supposed to be bothered with such pesky matters as climate change and sea-level rise. The course boasts the most oceanfront holes, 10, of any in the northern hemisphere, and if you stood and gazed out at the ocean, you would find it hard to imagine it overtaking the Ocean Course.

You wouldn't be wrong. It was Alice Dye, Pete's wife and partner, who had the idea to build the course at such a height that the Atlantic would be visible on every hole. It also keeps the course dry. Between its height, up to 20 feet above sea level in some places, and a dune system that is as robust as any on the South Carolina coast — the beach at the eastern tip of the barrier island tends to add sand over time, through accretion, rather

than lose it to erosion — there is little chance of the Ocean Course being swallowed by the ocean.

The bigger problem comes from the inland side, in the form of the tidal marshes that you probably don't even notice unless your golf ball lands in one. If you're looking out at the ocean and wondering where the threat is, it turns out you're looking in the wrong direction.

The lion is out of its cage. And it's prowling around right behind you.

A threat from behind

On a projection screen in a classroom at the College of Charleston's downtown campus, Norman S. Levine, professor of geology and environmental geosciences, pulls up maps from the National Oceanic and Atmospheric Administration showing the Ocean Course and all of Kiawah Island in future years under various sea-level rise projections. The first shows the landscape in 2030 during a "king" tide — scientific name: perigean spring tide

— the exceptionally high tides when the moon is nearest the earth, occurring roughly monthly.

“The course is still fine,” Levine says, pointing to the Ocean Course. “The marsh is filled. There’s more water around. And that will last for a few more days. All the homes are still dry, as are most of the roads.”

In Charleston, king tides cause enough nuisance flooding that the roadblocks used to block off inundated streets are strewn around the side of the road when not in use rather than stored elsewhere. Easier that way to haul them out the next time. Though Kiawah Island hasn’t seen the same effect from king tides, the NOAA maps indicate it soon will.

“On Kiawah, you’ve got some time,” Levine says.

The next map is 2040. On the island, small areas of green have been overtaken by blue. But the Ocean Course, with its raised playing surfaces, remains green. “We’re starting to see they’re going to need to raise some of their cart paths,” he says. “But in general, in 2040, the course is still really good. The houses are mostly fine, but you can see how their lots are starting to be affected.”

Levine is the godfather of the environmental sciences community around Charleston, his name and research sprinkled throughout the Kiawah Island sea-level-rise mitigation report. One recent product of his graduate program works for the nonprofit Kiawah Conservancy and another as the environmental specialist for the homeowners’ association.

“The main concern here is what’s happening to our marshes,” said Lee Bundrick, the Levine protege at the conservancy. "[Some] are showing acres and acres of loss. … A few more feet of sea-level rise in 50 years [would] mean drastic changes to this area. I don’t think the marshes can sustain that.”

When Levine, who lives in Charleston, sets the date on the NOAA sea-level-rise viewer to 2080, he briefly shifts the map to the northeast, then zooms in and circles a house near the northern tip of the Charleston peninsula, where blue has now overtaken green.

“That’s my house,” he says. “This is why my wife is mad at me. She wants to move right

"That's my house," he says. "This is why my wife is mad at me. She wants to move right now."

He moves the map back to Kiawah, and there's the Ocean Course, some 60 years out in the future, its raised fairways and greens represented as small slivers of green amid large swaths of blue.

"The Ocean Course is still there," Levine says. "The roads getting to it are not. We've lost most of the houses. The infrastructure is in trouble."

But it's clear the water isn't coming from the ocean — at least not directly. It's coming from the inland marshes.

"If it's going to flood, it's going to flood from the back," confirmed Doug Marcy, coastal hazards specialist for NOAA's Office for Coastal Management in Charleston, who helped conceive and build out the online sea-level-rise viewer. "The beachside is where all the elevation is. So the golf course [along the beach] is fine. But it's the back side [that is key]. As sea levels rise, if there's not enough room for the marshes to migrate, they will migrate naturally." By overtaking developed land, in other words.

What does this all mean for Kiawah?

"It means they have to start looking at changes to infrastructure," Levine says. "Raising the roads. [Building] a channel underneath them to move water. They're starting to do this. It's a design that has to go in. But it's [going to cost] billions of dollars."

He pauses. "It's either that or abandoning the land — retreating."

Build or bail

That's the basic choice for coastal golf courses in the era of sea-level rise: spend billions of dollars or retreat. Retreating is the choice more often than you might think.

Just up the coast from Kiawah Island, in Isle of Palms, S.C., the seaside Links Course at Wild Dunes lost about half of its par-5 18th hole to erosion. After multiple attempts at restoring the hole failed, it now plays as a 185-yard par-3.

At Montrose Golf Links in Scotland, which dates from 1562 and touts itself as the world's fifth-oldest course, the course has lost some 70 meters of land and parts of several holes to the North Sea in recent years. "As the sea rises and the coast falls away, we're left with nowhere to go," Chris Curnin, Montrose's director of golf, said in research published by the University of Dundee.

In Doonbeg, Ireland, Trump International Golf Links Ireland, owned by the former president's Trump Organization, made news when the company petitioned government officials for permission to construct a sea wall around the course, located on Ireland's southwestern coast, to help stop the erosion that has eaten away roughly a meter per year and washed away several greens.

"Any course that is already experiencing some of these effects are going to need to take action," said Miller, the Charleston native and golf course architect. "You're going to need to do something to prepare for the next 50 to 100 years."

The job Miller recently completed at Charleston Municipal Golf Course, a historic facility

widely credited as being the first in the southeast United States to integrate, may be a model for what that action looks like. For decades, the Stono River, which runs alongside the course, would flood the course at high tide, frequently forcing the closure of the back nine. The city hired Miller, who grew up playing the course, to save it. It closed for 10 months in 2020, and Miller added as much as six feet of elevation to some fairways and greens, digging new ponds to hold the water.

“I absolutely think this is going to be a more common occurrence, where you’re going to have to make some modification to the golf course,” he said.

On a recent April afternoon that happened to coincide with a king tide for Charleston, Miller pointed to a stretch of fairway along the river. “We used to have big problems with a seven-foot tide,” he said, a level that NOAA designates as minor flood stage for Charleston. “That oak tree over there would be sitting in salt water. But this morning, we were at eight feet, and we’re dry. We’ve got it high enough now where those king tides stay back.”

In other parts of Charleston, where many homeowners have shelled out hundreds of thousands of dollars to raise their houses off the ground, the roadblocks were stretched across flooded streets again.

On Kiawah Island, the marshes swelled. The work of protecting the land from the rising seas went on. And the Ocean Course, with its unfettered views of the Atlantic, was booked from dawn to dusk on one of the last available days before it was shut down in preparation for the PGA Championship.

According to the tide charts, the next king tide arrives Monday, the day after the tournament.

Updated May 10, 2021

Read more about sports and social issues:

Perspectives:

• Blackistone: Northwestern's athletic director hiring is an insulting and embarrassing step back for everybody

• Jenkins: The athletes are the only thing saving college sports from the NCAA

• Brewer: The difference between a plantation and college sports: A plantation didn't pretend

• Svrluga: Baseball needs a culture change, or more women will be hurt

Features:

• After the violence in 'Football City, USA'

• Bomani Jones thrives where race and sports collide. Can he be a star at ESPN?

• Fifty years ago, Curt Flood walked away from the Senators. He left baseball forever changed.

• 'The Eyes of Texas' is here to stay, UT says. So is the fight over its roots.

• Shawn Kemp is lighting up Seattle again