

## Satellites show Florida beaches becoming darker, and that's good for sea turtles

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The 368 one-kilometer sections of Florida beach studied by researchers are shown in red. Credit: University of Central Florida



Newly published research that started as a high school science project confirms that the density of sea turtle nests on Florida beaches is reduced where artificial lights along the coast deter nesting females.

But the data also show that the network of sea turtle-friendly lighting ordinances along Florida's coast seems to be working.

"It's a success story. Florida's coastlines are getting darker, and that's a good thing not just for <u>sea turtles</u> but for other organisms," said UCF biology professor John Weishampel, co-author of the study published last week in the journal *Remote Sensing in Ecology and Conservation*. "It shows we affect turtles' nesting, but at the same time we've been successful at reducing that effect."

The research started last year with Weishampel's son Zachary. The <u>high</u> <u>school</u> student had experience analyzing satellite imagery from an earlier project. He was looking for an idea for the science fair that would let him use that skill when his father suggested exploring how sea turtle nests have fared since cities began adopting restrictions on coastal lighting that can disorient nesting mothers.

First, they gathered data on the intensity of artificial light at night that was collected by the Defense Meteorological Satellite Program from 1992 to 2012. Then they compared it to the extensive data on nesting sea turtles collected by the Florida Fish and Wildlife Conservation Commission for the same period.







Image A shows average nighttime light levels in Florida from 1992-2012. Image B shows decreasing light levels over time, denoted by a lower slope value, in many nesting areas. Credit: University of Central Florida

Because Florida's human population increased by more than 40 percent during that period - adding about 5.5 million people - researchers expected to find that artificial light levels had increased, too. But, assisted by UCF graduate student Wan-Hwa Cheng, they found that nighttime light levels had decreased for more than two-thirds of the 368 one-kilometer (.62-mile) sections of Florida beach that were examined. Some 14 percent had increased, and the rest hadn't changed.

"Sea turtle populations are doing pretty well in Florida, and it may be due in part to our coastal management," Weishampel said. "The satellite serves as a kind of policeman in the sky to see what's going on with these lighting ordinances."

About 90 percent of sea turtle nesting in the continental United States occurs in Florida, led by three main species: loggerheads, green turtles and leatherbacks. The U.S. Fish and Wildlife Service classifies green turtles and leatherbacks as endangered, and loggerheads as threatened.

Previous research has shown that sea turtles are impacted by artificial light. And because sea turtles are so long-lived and spend only a fraction of their lives ashore, they had little time to adapt to manmade lights. That's prompted regulations meant to reduce the amount of light near nesting beaches by mandating the type of bulbs used and requiring fixtures to be shielded and directed downward.

In some areas - such as around Kennedy Space Center, Merritt Island and Sanibel Island - the researchers found that light levels had decreased



dramatically since 1992. Others, including Wabasso Beach and Jupiter Island, had increased.

The density of turtle nests is reduced where artificial light is brightest, and higher where it's dark, researchers found. They also concluded that turtles aren't impacted by beach lighting alone. Data showed that light from distant urban areas, known as "skyglow" - even from cities as far as 60 miles away - can influence a female turtle's nesting location.

An earlier study in Israel used satellite data to gauge artificial light's impact on loggerhead and green turtle nesting in the Mediterranean Sea. But the data on which it relied were not as robust as Florida's vast nesting database. At most, the density of nests in the Israeli study was fewer than 10 per kilometer of beach. By comparison, several monitored Florida beaches have more than 700 loggerhead, 100 green and 10 leatherback nests per kilometer.

In Florida, sea turtle nesting has been increasing for all three species. The UCF research suggests that <u>artificial lighting</u> may not be critically impairing those turtle populations, and light mitigation policies are working.

At the same time, the adult females are only half the equation. Turtle hatchlings are lured away from the sea by artificial light, and that impact on nesting may not be felt for decades.

Even so, Weishampel said the research shows satellite-derived data can be used to determine what areas need more effective management of artificial light. It's also a useful tool to monitor more remote areas for conservation purposes.

Provided by University of Central Florida



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