



Florida Department of Environmental Protection
Florida Coastal Office
Coral Reef Conservation Program

Florida Reef Tract Coral Disease Outbreak FAQ

How important are South Florida coral reefs for economic and environmental benefits?

South Florida's economy and our way of life are inextricably linked to our economically and ecologically valuable coral reef ecosystem. Coral reefs provide many goods and services for south Florida such as coastline protection from storms and flooding, including hurricanes, and habitat for many important species of commercial and recreational fisheries. They are also a major driver of tourism, offering aesthetic and recreational opportunities for snorkeling and scuba diving. In south Florida, coral reefs provide the foundation for 71,000 jobs and \$6.3 billion in sales and income (Johns et al. 2001).

How long has the current coral disease outbreak been active?

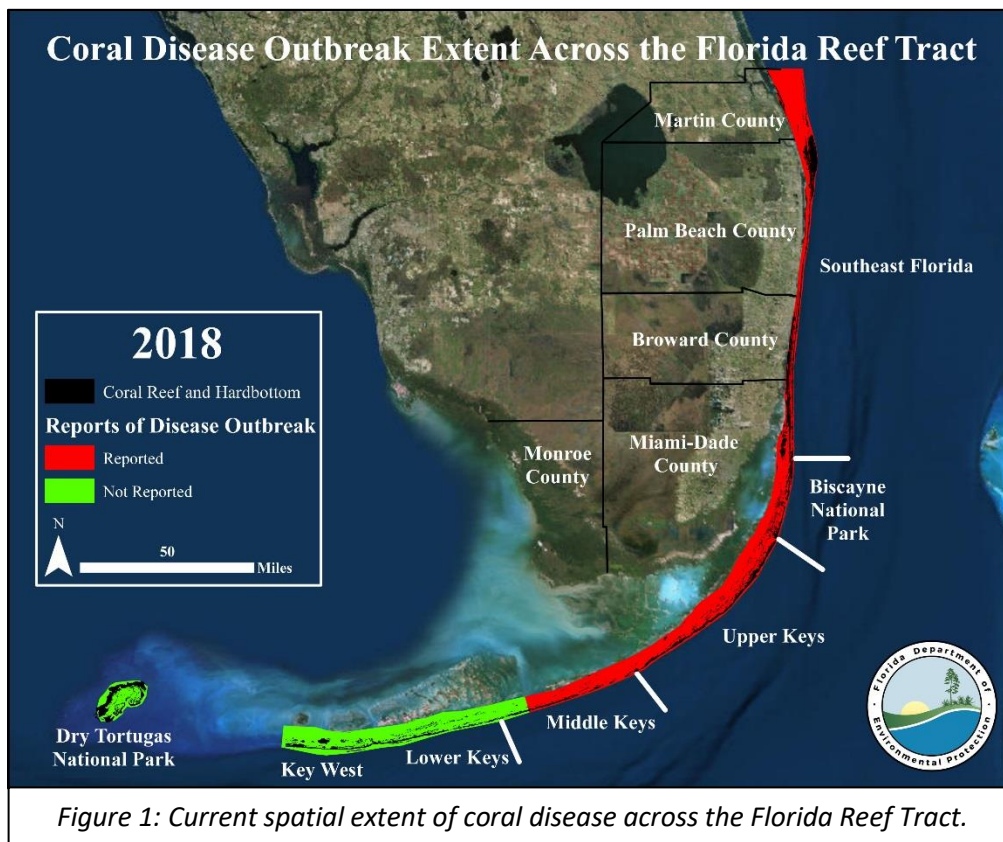
This disease outbreak originated offshore of Miami-Dade County in fall 2014. It has persisted in the original outbreak areas since then and has continued to spread and affect new reefs along the Florida Reef Tract.

What is the geographic extent of this disease outbreak, how many corals are affected?

At this point, the best available information shows that the extent now ranges from the northernmost coral reefs in Martin County, to the area between the middle and lower Florida Keys (Monroe County) (approximately 205 linear miles of reef). Please refer to the figure on page 2 for the most up-to-date map of the spread of the outbreak (Figure 1).

How fast are corals being affected? Are we running out of time? Do corals that are affected ever show signs of recovery?

DEP and our partners continue to work to address this disease event with urgency to this unique disease event. While past disease outbreaks have subsided during the cooler winter months, this disease has continued unabated with no indication of seasonality and without any interruption from Hurricane Irma. Once a coral becomes affected or shows signs of the disease, we are seeing mortality (loss of all tissue) within a range of weeks to months.



What species are affected? Are some more at-risk than others? Have any been lost?

Nearly half of Florida's 45 reef-building coral species have reportedly been affected, including (* indicates a species listed under the Endangered Species Act):

Agaricia agaricites (Lettuce coral)	Orbicella annularis (Lobed star coral)*
Agaricia fragilis (Fragile saucer coral)	Orbicella faveolata (Mountainous star coral)*
Colpophyllia natans (Boulder brain coral)	Orbicella franksi (Boulder star coral)*
Dendrogyra cylindrus (Pillar coral)*	Porites astreoides (Mustard hill coral)
Dichocoenia stokesii (Elliptical star coral)	Porites porites (Clubtip Finger Coral)
Diploria labyrinthiformis (Grooved brain coral)	Pseudodiploria strigosa (Symmetrical brain coral)
Eusmilia fastigiata (Smooth flower coral)	Pseudodiploria clivosa (Knobby brain coral)
Meandrina meandrites (Maze coral)	Siderastrea radians (Lesser starlet coral)
Montastraea cavernosa (Great star coral)	Siderastrea siderea (Massive starlet coral)
Madracis decactis (Ten-ray star coral)	Solenastrea bournoni (Smooth star coral)
Mycetophyllia spp. (Cactus coral)*	Stephanocoenia intersepta (Blushing star coral)

Some of the most susceptible species have disappeared from certain long-term monitoring sites, however there are still surviving colonies of those species across the Florida Reef Tract. There has been a decline in the population of some species.

Among the most susceptible species are *Dendrogyra cylindrus* (pillar coral) which is listed as threatened under the Endangered Species Act, *Dichocoenia stokesii* (elliptical star coral), and *Meandrina meandrites* (maze coral). Some of the most important reef-building species have also been affected, including *Colpophyllia natans* (boulder brain coral), *Montastraea cavernosa* (great star coral) and *Siderastrea siderea* (massive starlet coral), among others.

What is the difference between this disease and coral bleaching? Is this disease related to the global coral bleaching event that occurred between 2014 and 2015?

This disease is not the same as bleaching. Bleaching is a stress response that occurs when corals lose the colorful symbiotic algae that usually live in coral cells, causing the white skeleton to show through their translucent tissue. Corals rely on these algae as their primary source of nutrition and energy, and without them, corals are severely weakened and at a greater risk of disease and death. Although many factors can cause a coral to bleach, mass coral bleaching is generally associated with thermal stress from exposure to elevated temperatures. While both bleaching and disease can turn corals white, there are distinguishing features between the two. Bleached corals retain live tissue covering their skeletons, and if water temperatures return to normal soon enough, bleached corals may recover their colorful algae. In contrast, this disease kills the coral tissue, leaving a bare skeleton behind. For this reason, we are referring to this outbreak as a tissue-loss disease.

We don't know for certain to what extent bleaching may have contributed to this outbreak. While the onset of the disease outbreak coincided with bleaching in 2014 and 2015, the disease has persisted beyond that. Those back-to-back years of increased thermal stress and extensive bleaching could have weakened the corals' resilience potential and allowed for naturally occurring viruses and bacteria in the water column to become lethal, but the actual causes of this (or any) disease event are difficult to determine and, at this time, are not yet very well understood. World-class scientists continue to study tissue samples to try and identify potential pathogens or other sources of disease.

Has the disease agent affecting South Florida coral reefs been identified? What are the causes of this epidemic?

Unfortunately, the disease agent has not yet been identified. World-class scientists are studying tissue samples to try and identify potential pathogens or other sources of disease. Generally, multiple factors ultimately contribute to coral disease rather than a distinct agent, and the definitive causes of this outbreak remain unknown. Identifying causes and sources of coral disease is a worldwide issue and the subject of global study. Investigation into the potential causes of the South Florida coral disease outbreak is ongoing.

After three years, why are there no answers to the types of disease, or a possible solution for the outbreak? Is it a limitation of resources, personnel or otherwise?

Coral disease investigations are tremendously complicated. While human health and disease management have advanced rapidly in recent years, knowledge about coral diseases and control options are not as advanced. World-class scientists continue to conduct studies and research to improve our understanding of the causes of disease, which is critical for determining what management interventions we can take to remediate impacts and prevent future outbreaks.

Is there still hope for our corals?

Absolutely. An amazing group of incredibly dedicated scientists, resource managers, policy makers, veterinarians, and everyday citizens have come together to help respond to this disease outbreak.

The efforts undertaken in Florida are at the forefront of global disease research and response, and the knowledge gained through this collaborative effort will not only help save Florida's coral reefs but will be instrumental against future coral disease outbreaks around the world.

*We also have to note that while nearly half of our coral species are impacted by this disease, half are not – and some of those species not impacted have even increased in prevalence on our reefs. Two species of great import to the entire Caribbean basin – staghorn coral (*Acropora cervicornis*) and elkhorn coral (*Acropora palmata*) – are not impacted and are still the focus of the groundbreaking propagation and outplanting efforts that make Florida a leader in coral reef restoration. Furthermore, even on reefs that have been within the disease outbreak area for years, there are still survivors, including colonies of some of the most impacted species. Given their incredible resilience and survival against multiple stressors of the years, these corals just may be among the most important corals in the world for improving future restoration efforts.*

In addition to the stony corals, Florida's coral reefs are home to an amazing diversity of sponges, soft corals, fish, lobster, sharks and other reef creatures that together make up the larger coral reef ecosystem.

Who is working towards ending this disease outbreak? What organizations are involved?

The Florida Department of Environmental Protection is working with dozens of partners from federal, state, and local agencies, non-governmental organizations, universities, and members of the community to investigate and solve this problem.

Our partners currently include but are not limited to:

- Broward County
- Coral Restoration Foundation
- Cry of the Water
- Florida Aquarium
- Florida Atlantic University
- Florida Department of Environmental Protection
- Florida Coastal Office
- Florida Parks Service
- Florida Fish and Wildlife Conservation Commission
- Fish and Wildlife Research Institute
- Florida International University
- Florida Institute of Technology
- George Mason University
- Keys Marine Laboratory
- Martin County
- Miami-Dade County
- Mote Marine Laboratory
- National Oceanic and Atmospheric Administration
- Coral Reef Conservation Program
- Coral Disease and Health Consortium
- Florida Keys National Marine Sanctuary
- National Park Service
- Biscayne National Park
- Dry Tortugas National Park
- Environmental Protection Agency
- South Florida/Caribbean Network
- Nova Southeastern University/National Coral Reef Institute
- Oregon State University
- Palm Beach County
- Palm Beach County Reef Rescue
- Southeast Florida Coral Reef Initiative
- Smithsonian Institution
- The Nature Conservancy
- United States Geological Survey

- National Wildlife Health Center
- University of Florida
- University of Hawaii
- University of South Florida
- University of Miami Rosenstiel School of Marine and Atmospheric Science

What specific response efforts have been undertaken thus far?

The Florida Department of Environmental Protection has been undertaking a multi-faceted response effort in coordination with the above partners. This effort has included monitoring and modelling the disease spread, documenting the prevalence and severity of the outbreak, researching causative agents and environmental factors, and developing novel coral disease treatments. In addition, the Florida Department of Environmental Protection has created a region-wide Reef Ambassador and SEAFAN program to facilitate stakeholder assistance.

How do the local reefs help protect against hurricane damage?

Coral reef structures reduce wave energy, which helps protect our coastlines and valuable infrastructure from big waves and storm surge. A similar effect can be found with mangroves, as seen in [this video](#)¹. Coral reefs aid in natural resiliency and serve as a first line of defense for Florida's coastline.

As someone who is concerned and wishes to help protect Florida's coral reefs, what can I do?

The Florida Department of Environmental Protection is working with the five counties in South Florida that have coral and are affected by this disease to provide tips and tricks to help the reefs. For more information, read their recommendations below to become a Coral Champion!

Boating

- *Avoid dropping an anchor on the reef. This is illegal under Florida's Coral Reef Protection Act (CRPA) and could be associated with heavy fines. Find sandy bottom, drop your anchor, and float out back across the reef. If you are having trouble locating sandy bottom, check out our free [phone application](#)².*
- *If you cannot find sand, you may also make use of free public mooring buoys all over the southeast region. For buoy location information, you may use our free phone application².*
- *Boats can be disease vectors and transplant potentially harmful exotic species. Wash your boat as thoroughly as possible after use, including the bilge, before moving from one area to the next.*
- *Fuel up and add oil in calm areas to avoid spills. Avoid overflowing your fuel tanks and oil receptacles.*
- *Keep a sharp eye out for manatees and sunning sea turtles.*

Diving

- You can reduce the risk of harming coral by taking a more “reef friendly” approach to sun protection.
 - *CHECK THE LABELS:* While no sunscreen has been proven to be completely ‘reef-friendly,’ those with titanium oxide or zinc oxide, which are natural mineral ingredients, have been to be safer for corals.
 - *COVER UP:* You can protect yourself as well as the reef by ‘covering-up’ before you enter the water. Long-sleeved shirts or rash guards will help prevent sunburn when in the water, and hats, sunglasses and light, long-sleeved clothing will protect you on shore or on boat.
 - Learn more at https://cdhc.noaa.gov/docs/Site%20Bulletin_Sunscreen_final.pdf
- To prevent the spread of coral disease, it is **essential** to clean your gear when moving between dive sites. While on board your vessel, disinfect your gear in a water bath rinse, using any non-ionic detergent or soap. Once returning to shore, use a diluted bleach wash to quickly and effectively remove any disease trace.
- Buoyancy is key. Practice floating off the bottom in a shallow area first and determine your exact weighting needs. With the correct buoyancy, you can avoid sinking and damaging reef habitat.
- Clip your alternate second stage regulator (octopus) to your Buoyancy Control Device (BCD) to prevent it from dragging across the reef.

Fishing

- Use circle hooks whenever possible, as fish have a hard time swallowing them. When fish that are caught are successfully and safely released, there will be more fish to catch later.
- When bottom fishing, use braided line and a leader lighter than the breaking strength of the braid. In this way, you can leave minimal amounts of line on the reef if you are snagged.
- Only take what you need, rather than what you're allowed. More fish in the water leads to more successful reproduction, which in turns means more sustainable fishing for the future.

If you don't boat, fish or dive, you can still be a Coral Champion!

- Participate in any and all beach cleanups that you can attend.
- Recycle as much as possible, and deposit trash into receptacles for proper disposal. Millions of tons of trash winds up in the ocean that would otherwise be properly disposed of.
- Conserve water. Water purification takes a lot of energy, and it is good to conserve energy.
- Shut out the lights when you leave the house, and turn your AC to a higher temperature to conserve even more energy. This is just as good for your electric bill as it is for your reefs.

For questions or clarifications on how to be a **Coral Champion**, please email coral@dep.state.fl.us. We'd like to thank the Broward, Martin, Miami-Dade, Monroe, and Palm Beach Counties for partnering with the DEP and CRCP in this effort.

1. <https://www.youtube.com/watch?v=aoMrLYJOdA4>
2. <https://floridadep.gov/files/house-graphics-coral-reef-conservation-programesri-app-instructionsjpg>