



Florida's Coral Reef & Stony Coral Tissue Loss Disease Information Sheet

SCTLD Communications & Outreach Team

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Table of Contents (click to jump!)

[Significance of Florida's Coral Reef](#)

[Threats to Florida's Coral Reef](#)

[Stony coral tissue loss disease](#)

[Calls to Action](#)

[Frequently Asked \(Tough!\) Questions](#)

PLEASE NOTE this is a product to help Florida SCTLD response partners. Please do not use this as a communication tool, for example to send to reporters or elected officials. Please reach out to the Communications & Outreach Team if you need assistance responding to such requests.

Significance of Florida's Coral Reef

Florida's Coral Reef is a national treasure with enormous **economic, cultural, and intrinsic** value. Florida's coral reef protects our coastlines, supports local fisheries, offers opportunities for recreation and tourism, and is vital to the South Florida way of life.

The Basics

Florida's Coral Reef is the largest bank barrier reef in the continental United States, stretching for over 350 miles. That's equivalent to driving:

- Miami <--> Jacksonville
- Los Angeles <--> Tijuana
- New York City <--> Boston
- Seattle <--> Vancouver

Florida's coral reef is a beautiful, natural treasure. It supports an amazing diversity of marine organisms and offers abundant ecosystem services to millions of residents and visitors. Florida's Coral Reef lies offshore from five heavily populated counties of South Florida (Martin, Palm Beach, Broward, Miami-Dade, and Monroe) and extends past the city of Key West more than 70 miles to the islands of the Dry Tortugas.

Coastal Protection

- **Florida's Coral Reef protects our beaches and coastlines by reducing impacts from direct wave action and flooding. This protects infrastructure and economic activity along our coasts.**
- Healthy coral reefs dissipate 97% of wave energy that would otherwise erode beaches.
- Annually, reefs in Florida protect more than 5,600 people and \$675 million worth of property and economic activity from flooding.
- Losing 3 feet/1-meter of reef height would expose 24,000 more people and \$2.9 billion in property and economic activity to flooding.

Tourism

- **South Florida's economy relies heavily on sharing its reefs and beaches with people from outside the state.**
- Florida's Coral Reef annually supports 71,000 full and part-time jobs and generates \$6.3 billion in combined local sales and income.
- Over 38 million people visit South Florida each year – a number equal to the population of California!

Fishing and Seafood

- **Florida's Coral Reef provides habitat for many marine species that are valuable to commercial and recreational fisheries.**
- Florida has the largest recreational fishery in the country and the 2nd largest seafood

industry. Recreational saltwater fishing trips have an economic impact of \$9.2 billion and support 88,501 jobs. Commercial fishing provides 80 million pounds of commercial food fish landings worth over \$222 million in dockside value ([FWC](#)).

- Florida's marine life fishery has an estimated dockside value more than \$3 million.

Biomedical Research

- **Florida's Coral Reef serves as a frontier for biomedical research – we have a medicine cabinet just offshore.**
- Medicine developed from coral reef organisms are already on the market, including treatments to combat cancer, HIV, pain, and inflammation.

Culture and Aesthetics

- **The futures of millions of people in Florida are tied to the future of coral reefs. Sandy coastlines, made possible in part by coral reefs, are vital to the Floridian way of life.**
- Reefs are intrinsically linked to the cultural identity of many coastal communities and islanders, both here in Florida and beyond.
- The Keys are the southern portion of the reef! In Florida, the Keys have inspired Jimmy Buffett songs, Hemingway novels, the plays of Tennessee Williams, and the poetry of Shel Silverstein.
- Also, it's GORGEOUS!

Threats to Florida's Coral Reef

Florida's Coral Reef is threatened by a combination of global and local stressors that work in concert to degrade the ecosystem. But all hope is not lost! We can and will reduce these stressors to allow the reef to flourish.

The reef is like a big puzzle, with many pieces that need to fit together. After years of stressors, the puzzle is now scrambled, with pieces in the wrong place, flipped over, and a few scattered on the floor! However, we haven't yet lost any pieces. We can help put the puzzle back together through responsible conservation and restoration.

Global Stressors

- **Warming ocean temperatures** - rising temperatures can kill some corals (e.g., through coral bleaching) and make survivors more susceptible to diseases.
- **Extreme weather events** - hurricanes and other storms are becoming stronger and slower, causing physical damage to reefs.
- **Ocean acidification** - the ocean is becoming more acidic as it draws carbon dioxide pollution from the air. This makes it difficult for corals to build and maintain their skeletons and erodes existing reef structure.

Local Stressors

- **Physical damage – corals can be harmed through contact**
 - Vessel groundings and anchoring on coral reefs damage and kill coral.
 - Swimmers and divers can harm coral by touching or standing on them.
 - Marine debris like old lobster traps can get pushed around by water and waves, knocking into corals.
- **Land-based Sources of Pollution – remember: all drains lead to the ocean**
 - Trash becomes marine debris, harming coral through physical contact and leaching pollutants.
 - Sedimentation starves corals of light and, in extreme circumstances, can bury corals.
 - Nutrient enrichment leads to extensive growth of both macroalgae (like seaweeds) and microalgae (like red tides), which can in turn smother corals. Nutrient sources include fertilizer used in agriculture and landscaping, septic systems, and more.
 - Harmful substances like pesticides and toxins that are improperly used or disposed of on land make their way into the ocean, harming many organisms including corals.
 - Certain chemicals in sunscreen have been shown to harm corals. Sunscreen should be used responsibly – you can use mineral-based sunscreens or choose non-chemical sun protection like rash guards and hats.

- **Non-native and invasive species – new animals tipping the eco-balance**
 - Invasive species such as lionfish are able to outcompete local species, disrupting the delicate balance of the reef ecosystem.
- **Overfishing**
 - Healthy fish and invertebrate populations are crucial for healthy reefs. Herbivores like parrotfish and queen conch are important for keeping algae at bay. ‘Detritovores’ – animals that eat dead organic matter – like lobsters act like the janitors of the reef. Top predators like sharks and groupers are also incredibly important to balancing the entire ecosystem – just look at what happened to Yellowstone when they removed the wolves!
- **Coastal Construction**
 - Coastal construction is a necessary part of living near the ocean. However, these activities can have many detrimental effects to natural systems including direct habitat destruction and sedimentation.
- **Disease**
 - Diseases are natural to every population and ecosystem. However, the more humans impact the natural world, the worse these diseases are getting. With corals, for example, increasing ocean temperatures are simultaneously making corals less able to fight off disease while also making pathogens like certain bacteria more virulent.

Stony coral tissue loss disease

The latest threat to Florida's Coral Reef is a disease called 'stony coral tissue loss disease.' This new disease has had very severe impacts to corals throughout the Caribbean, but there is an immense amount of work being done to combat the disease and recover from its impacts.

Terminology

Please note that "stony coral tissue loss disease" should not be capitalized when fully spelled out. The initialism (SCTLD) should be used only when necessary. Do not pronounce the initialism as "Skittle-D," "Skittled," or "Scuttled" and instead use the full name, "S.C.T.L.D.," or phrases like "the disease."

Outbreak Basics

- **While the situation is urgent, it is not too late to preserve and support the recovery of this incredibly important ecosystem.**
- **It covers a large geographic area:** the entirety of Florida's Coral Reef has been affected. As of June 2021, at least [17 countries and territories](#) in the wider Caribbean have been impacted.
- **It has lasted a long time:** the disease has been spreading consistently since 2014. Areas first impacted by the outbreak still show signs of active disease 6 years later.
- **Many coral species are affected:** approximately half of the 45 species of stony coral in Florida are susceptible. This includes five species listed as Threatened under the US Endangered Species Act, all major framework builders, and other iconic Caribbean corals.
- **There is very high disease prevalence:** within certain species, disease is seen in 66-100% of colonies surveyed on affected reefs.
- **There is very high mortality:** once a coral begins to lose living tissue, most colonies will die within weeks to months without intervention. There are few cases of partial mortality.

Disease Basics

- **Disease is a natural part of any ecosystem, but SCTLD is worse than any other recorded coral disease due to the factors described above.**
- There is a lot of ongoing research to understand this new disease, including investigating its causes, how it spreads, and the role of local environmental conditions.
- The origin and cause of the disease is unknown, but research into potential pathogens and environmental drivers is ongoing.
- This disease is different from coral bleaching. Coral bleaching is the breakdown in symbiosis between coral and the algae that lives in its tissue, often due to changes in environmental

conditions; when a coral is bleached, it is still alive and can recover if conditions return to normal. SCTLD, however, is the death of the animal tissue itself.

Response Effort

- **Partners in Florida were not content simply documenting this disease progressing and decided – for the first time anywhere – to mount a response to this coral disease outbreak. The response is highly collaborative and addresses the disease and its impacts on multiple fronts.**
- The response is HUGE! It is composed of two leadership bodies, eight working groups, and over 60 partner organizations.
- The response is led by four government agencies: Florida Department of Environmental Protection (FDEP), Florida Fish and Wildlife Conservation Commission (FWC), National Oceanic and Atmospheric Administration (NOAA), and National Park Service (NPS).
- **Below are details on specific areas of response.**

Research & Monitoring

- To date, over 100 research projects have been funded and nearly 100 researchers are involved in the response in Florida alone. Researchers and partners (including citizen scientists) are working to document the outbreak, identify the causes, and understand how the disease spreads.
- The study of coral diseases is a relatively young field – partners have likely learned more about this disease in a shorter amount of time than any other coral disease.
- This work is *highly* collaborative -- researchers are sharing their results faster than ever, allowing partners to rapidly build on each other's work.

Intervention (aka Treatments)

- Treatment for SCTLD is very personal – the approach involves scientists on scuba applying treatment to one important coral colony at a time. Our intervention teams focus on the biggest, largest corals – some of which were alive when the Declaration of Independence was signed. To date, >4,000 important, reef-building corals in Florida have been saved via intervention efforts.
- Many different treatments have been trialed. Partners began with laboratory trials to assess efficacy and safety before moving into small-scale field experiments. Treatments trialed include chlorine, essential oils, probiotics, and antibiotics.
- Currently, antibiotics are the most effective treatment. The treatment delivers amoxicillin via a specialized paste (developed by pharmaceutical partners Ocean Alchemists/CoreRx). The paste is designed to limit leaching of antibiotics into the surrounding environment.
- **Want to learn more?** Check out the [intervention dashboard](#) or jump to the tough question below!

Coral Rescue & Propagation

- Coral Rescue partners collect colonies of susceptible species and place them in land-based facilities to preserve genetic diversity and serve as parent colonies for the next generation of restoration corals.
- This project is made possible by an amazing partnership with the Association of Zoos & Aquariums. There are Florida corals being held in Texas, Michigan, New Jersey, Colorado, Nebraska, and beyond!
- Over 2,000 corals have been rescued in Florida. Many of these coral species have never been kept in human care before, teaching us a lot about coral biology in the process!
- **Want to learn more?** Check out the [rescue dashboard](#) or jump to the tough question below!

Restoration

- The goal of restoration is to put mother nature back in the driver's seat. Bold, aggressive restoration efforts are needed to achieve this: we need to outplant enough resilient corals to the reefs so that they can rebuild their own populations in the future.
- Given that the disease remains in affected areas for years, our Restoration Team is conducting targeted research to understand when and where restoration of disease-affected species can occur.
- Restoration of the most resilient corals is key to the future for Florida's Coral Reef and reefs around the world. However, restoration must be combined with efforts to mitigate stress on the ecosystem, which involves every resident and visitor in Florida.
- **Want to learn more?** Check out the tough questions below!

Communications & Outreach

- Informing partners and the interested public about the disease and response is crucial! Partners have been hosting webinars, sharing presentations, and training local citizens to identify and report presence (or not!) of the disease. These training courses have been adapted for use throughout the Caribbean.
- There are lots of places to get information! These include:
 - [FKNMS webportal](#) for general information.
 - [DEP website](#) for technical information (e.g., project reports, meeting summaries, etc.)
 - [AGRRA website](#), for regional information (e.g., map of affected Caribbean jurisdictions).
 - [AZA page](#) for information on the Florida Reef Tract Rescue Project.
 - [NPS page](#) for information relevant to Dry Tortugas National Park.

Regulatory

- Regulatory partners are coordinating on permitting SCTL-related activities and the development of guidance documents so that all the different permitting authorities are in agreement on permissible activities.
- Many coastal construction projects include activities to offset their environmental impacts. Partners are working to incorporate activities related to rescue, propagation, restoration, intervention, and more into these plans. This is the first time that many of these activities are included in these projects!

Data Management

- Information makes the world go 'round! With so many projects and activities, we generate a *lot* of data. Our Data Management Team helps partners collate, synthesize, and display their data.
- Many of the dashboards and datasets you may see related to this effort were generated in collaboration with this small but mighty team.
- **Want to learn more?** Check out the data management products [here](#).

Caribbean Cooperation

- This is not just an issue faced by Floridians – the disease has spread to the greater Caribbean. As the disease continues to spread, a regional network has been developed to share information, expertise, new ideas, challenges and opportunities, and more in hopes of minimizing the impact of the disease.
- Partners at the EPA, US Coast Guard, US Navy, and NOAA are investigating ballast water from large ships as a potential vector for the spread of the disease.
- **Want to learn more?** Check out the [Caribbean SCTL dashboard](#) and the [AGRRA webpage](#).

Calls to Action

There's a lot each and every one of us can do to support healthy coral and coral reefs! If you're in Florida, be sure to **recreate responsibly** and **get involved with your local community**. Anyone anywhere can help by **reducing carbon emissions, using fertilizers and pesticides wisely, and investing in coral conservation**.

Just like a coral colony requires all of its polyps to work together, we all have the ability to help coral reefs if we work together - even if you don't live near the ocean! You can sign a pledge to [help corals worldwide](#) and [help corals in Florida](#)!

How to help if you're spending time on Florida's Coral Reef!

Recreate responsibly!

- Are you **boating**?
 - Practice [clean boating](#).
 - Consult your GPS before boating to ensure you don't run aground on shallow reef areas.
 - Make sure you know if your destination is in a no-take or no-anchor area.
 - Don't anchor on reefs - always anchor in the sand. Always check nautical charts or GPS before anchoring. If you're in the Keys, check out the [Florida Keys National Marine Sanctuary buoy program](#) to find mooring buoys.
- Are you **hiring a charter boat** for fishing or diving?
 - Check out the Florida Keys National Marine Sanctuary's Blue Star Operators, who have taken pledges to practice responsible diving, fishing, and business practices - including educating their customers on becoming better environmental stewards. Find a Blue Star Operator [here](#).
- Are you **fishing**?
 - Stay up-to-date with the [best practices for being a responsible fisher](#).
- Are you **swimming, diving, or just enjoying the beach**?
 - Avoid touching the coral - remember, they're alive too!
 - Check your sunscreen! Some chemicals commonly found in popular sunscreens have been shown to negatively impact marine life. The best option is to avoid these products by opting for long sleeve Ultraviolet Protection Factor (UPF) clothing, sunglasses, and hats, or by using zinc oxide or titanium-dioxide-based sunscreens. Extra perk: they're better for YOU too!

Be a Citizen Scientist

- **Report any bleaching or other damage to reefs** via the [SEAFAN network](#).
- If you see a coral with a **bright yellow cattle tag** nearby, please **snap a picture** and submit it via the instructions on the tag. That coral has been treated for SCTLD, and we'd love to know how it's doing!

Be a marine debris crusader

- Volunteering to **clean your local beach, reef, or waterway** is a great way to act locally and make an impact globally. Find a local cleanup [here](#).

Get involved in your local community and local politics

- There are many local initiatives to protect our reefs, and they would love your help! The best way to learn about these is to **engage with local community groups**.
- Educate yourself on the local issues and **get out to vote!**

What anyone, anywhere can do to help!

Reduce your carbon emissions

- Where possible, **drive less**: walk, take public transportation, carpool, rideshare, or bike.
- **In your home**, there are many things that you can do to **reduce your impact and lower your electric bill**. Using energy efficient light bulbs and appliances, setting your thermostat conservatively (lower in the winter and higher in the summer), and ensuring your house is properly insulated and sealed are all good options. Consider installing solar panels on your house - the cost has come down significantly in the past decade, and if you opt for a loan, your payments will often be the same as your average pre-solar electricity bill.
- Purchase **carbon offset** credits when flying.
- Your eating habits can help, too! **Eat low on the food chain** – increasing your intake of fruits, vegetables, grains, nuts, and beans in place of meat. A great place to start is Meatless Mondays. Also, **eat local!** Purchasing or procuring local foods cuts down the need to ship your food across the globe – get to know your local farmers and support them.

Choose sustainable seafood

- Eating responsibly can also be delicious! Consult a **sustainable seafood guide**:
 - [Monterey Bay Sustainable Seafood Guide](#)
 - [Aquarium of the Pacific's Seafood for the Future](#)
 - [Georgia Aquarium's Seafood Savvy](#)
 - [Virginia Aquarium's Sensible Seafood](#)
 - [Vancouver Aquarium's OceanWise](#)
- Learn about the effects of overfishing on coral reefs and how to reduce the threat [here](#).
- Consider your consumer choices, beyond seafood too!

Refuse, Reduce, Reuse, Recycle

- **Refuse single use plastics**. Many common items are now offered in plastic-free containers, including drinking water, laundry detergent, toothpaste, shampoo, and cleaning supplies.
- **Reduce single-use plastic consumption** and **check your local recycling regulations** to be sure you are recycling items properly. Disposing other waste properly helps minimize the amount of marine debris in our oceans.

Conserve water and use fertilizers and pesticides wisely

- **Conserving water in your home** minimizes the wastewater that eventually finds its way back to our oceans. Strategies include using low flow showerheads, turning off the sink while you are brushing your teeth, and setting up a rainwater system to water your plants.
- **Reduce the use of fertilizers and pesticides**, and ensure you are properly applying them. Polluted runoff from fertilizers and pesticides can have many negative impacts, including leading to harmful algal blooms.
- **Plant native foliage in your yard** – this can reduce your need to use fertilizers and pesticides, reduce your water use, and remove the environmental impacts of producing and shipping non-native species.

Invest in coral conservation and restoration

- There are many opportunities to support coral conservation in Florida and beyond! Below are just a few examples.
 - Donate to our pharmaceutical partners, [Ocean Alchemists](#), to **donate materials for SCTL D intervention** across the Caribbean.
 - **Support your local AZA accredited zoos and aquariums!** Ticket sales and memberships directly support rescue corals. Rescued Florida corals are being cared for at AZA facilities across the country – learn more [here](#).
 - **Upgrade your Florida tag** to a [Protect Our Reefs licence plate](#) to support research and conservation.
 - **Get in the water with coral restoration practitioners** like [Coral Restoration Foundation](#) (CRF) and [Islamorada Conservation and Restoration Education](#).
 - **Donate to management friend groups**, including [Fish & Wildlife Foundation of Florida](#), [Friends of Our Florida Reefs](#), [Florida Keys National Marine Sanctuary Foundation](#), and [National Park Foundation](#).

Don't release your pets! Use native plants in your gardens!

- Releasing your pets into the environment can have severe consequences for local ecosystems! If you have a pet that you can no longer care for, **put it up for adoption** or **take advantage of [FWC's Exotic Pet Amnesty Program](#)**. Released pets can become invasive species, outcompeting local animals and endangering the balance of the ecosystem. In Florida, invasive populations of lionfish, burmese pythons, and iguanas are all thought to have come from released pets.
- Plants can become invasive species, too. **Utilize [native plants](#)** in your gardens to avoid the possibility of exotic plants spreading into the surrounding environment.

Frequently Asked (Tough!) Questions

Below is information to help answer some of the tough questions we often get. These questions are:

1. How did the response develop?
2. What are the major successes of the response?
3. Why don't we know more about SCTLD?
4. Why conduct intervention? Why are you using antibiotics?
5. Why conduct coral restoration now?
6. What are 'you' doing to address poor water quality, climate change, etc.?

How did the response develop?

- The response started as a **grassroots effort**, and there was a lot being done those early years!
 - There is no mechanism to declare a 'coral reef emergency' to get folks organized, so activities had to be organized from the ground up. **Reports and monitoring for the first few years were entirely opportunistic** – shared by researchers, managers, and citizen scientists when they were out on the reef doing other things.
 - From Day 1, **inclusion and collaboration was central** – anyone who could help was welcome to the table. This has allowed us to be agile and creative. **We recognized in 2018 that the grassroots effort had grown so large that we needed to be more strategic and organized.** So while the 'official' response – the big machine we see today – was created in 2018, there was a lot of work being done before then to understand the disease and figure out just how bad the outbreak was.
- **This coral disease is new and weird!** We had to learn about what we were seeing while also trying to limit the impact.
 - We didn't know what we were dealing with when the disease first emerged – and it has turned out to be quite the puzzle! A few unique characteristics of this disease:
 - Most coral diseases are seasonal, emerging during the summer and subsiding in the winter – but **this disease has been seen progressing year round.**
 - This is the **first coral disease to start at an epicenter and progress linearly through the reef tract**, in the way that you would expect an infectious/communicable disease to spread. Most coral diseases emerge in a spatial area but do not spread colony-to-colony like we see with this disease.
 - There was **nothing at this scale seen before** – this was initially treated as we would any other coral disease. Once we understood just how bad it could be, we began organizing.
- One reason we had to be organized is because it's not easy to tell what's going on out on our reefs. Unlike a forest fire or a sewage leak or even a terrestrial disease, **you can't just walk to the beach and see what is happening.** You need to get out onto the reef (and breathe underwater!) to see, study, and monitor the disease. This is why opportunistic reports were so

crucial to helping us gather information on this disease outbreak.

- However, **this is in our ‘backyard’ and is affecting a national treasure!** We can and will continue doing what we can to preserve and restore Florida's amazing coral reefs.

What are the major successes of the response?

- **Unprecedented collaboration on a marine conservation effort!**
 - Partners throughout the United States and the Caribbean have mobilized and collaborated to combat a major, ecological issue.
 - This is a **public-private partnership** on a huge scale! This is a multi-pronged conservation endeavor: research, rescue, intervention, etc. all occurring simultaneously.
 - This is similar in scale to the conservation of condors in California.
- **First-of-its-kind mobilization of field intervention efforts!**
 - Our “intervention” is scientists on scuba, treating one important coral colony at a time. It is a very personal approach. As of mid-2021, **over 4,000 corals across 16 species have been saved.** The corals saved include some of the largest, oldest animals in Florida – some of which were alive when the Declaration of Independence was signed.
 - The amount of coral preserved through intervention to date is roughly equivalent to 900,000 restoration plugs.
 - By keeping these corals alive, we are **preserving ‘ecosystem services’ like coastal protection and fish habitat, and providing new opportunities for cutting edge research.**
- **Coral rescue is preserving genetics and setting us up for successful restoration!**
 - Coral Rescue has contributed to the preservation of over 20 coral species of Florida's Coral Reef by collecting a genetically diverse population of corals, some of which have already been successful in producing offspring to restore the reef.
 - **Over 2,000 corals - each about the size of a loaf of bread - are under care at 29 public aquariums and universities in 14 states.** This means there are corals in Texas, Michigan, New Jersey, Colorado, Nebraska, and beyond!
 - The largest of these facilities, the Florida Coral Rescue Center in Orlando, Florida, is a partnership between SeaWorld, Disney Conservation, the Fish & Wildlife Foundation of Florida, and the Association of Zoos and Aquariums (AZA). They are holding over 800 corals!
 - Coral Rescue is a **large-scale, groundbreaking public-private partnership** with the Association of Zoos and Aquariums (AZA) and has provided a model for future collaborative marine species conservation efforts. This effort has enhanced our understanding of coral biology, most of which have never been kept in human care before.
 - **AZA facilities have contributed over \$14M** to the rescue of Florida corals since July 2018.
- **Florida remains a global leader in restoration research!**
 - Restoration partners are collaborating on answering key restoration questions, including through a **cooperative, large-scale outplanting study** led by the Florida Fish and Wildlife Conservation Commission to determine whether susceptible species can be outplanted with acceptable survival rates to warrant attempting coral restoration efforts on a larger scale. As with many things in the response, nothing of this scale has been done before!

Why don't we know more about SCTLD?

- Actually, **we have learned a lot about SCTLD** in a relatively short period of time! While over 40 coral diseases have been described and at least partially described, SCTLD had never been seen anywhere before 2014. In just six-seven years, we have made huge strides in

understanding SCTL D – what it is, what might be causing it, how it could be spreading, and more!

- To date, we have worked with over 100 researchers who have conducted nearly 100 experiments on SCTL D. **Partners have likely learned more about this disease in a shorter amount of time than any other coral disease.** And the tools and strategies being developed to study SCTL D can benefit other coral/marine disease research, too!
- Even though we have made great strides, we need to recognize that coral disease research is difficult for a number of reasons:

We had to design the research approaches

- The study of corals - and particularly of coral diseases - is a relatively new effort. There have been very few studies to date that have successfully identified the cause(s) of coral disease. **We had to develop many of the methods and tools to study this disease.**

Coral diseases are poorly understood and complex

- Corals are super complex creatures! Marine diseases can be caused by a consortium of microorganisms working together or normally benign microorganisms that go haywire. Marine diseases can even be driven entirely by changes in the environment. **Untangling the intertwined roles of bacteria, viruses, fungi and environmental factors is quite the challenge!**

Marine research presents an ocean of challenges

- Doing research in the ocean means hopping on a boat with all your equipment, finding your research subjects, and breathing underwater. Marine field research is expensive, complicated, and time consuming.
- We try to do a lot of this work on land, but most marine organisms are not designed to live outside of the ocean, so bringing animals and microbes into the laboratory (and then keeping them alive) can be very difficult. Unfortunately, we can't just grow bacteria the way we do with human pathogens.

Why conduct intervention? Why are you using antibiotics?

- **Intervention is a rapid, effective, and rigorously tested method for preventing the death of corals from SCTL D.** Imagine you cut yourself – very likely, you will wash the cut with soap and water and apply an antibiotic cream to prevent infection. That's what our Intervention teams are doing - scientists on scuba, treating one important coral colony at a time.
- **We know what happens if we do nothing** - so rather than just monitoring these corals as they died, we had to try to do something to try to save them.
 - Our intervention teams focus on big corals; the redwoods of the ocean. These big corals are some of the oldest animals in Florida and maybe even the world! This approach is saving the 'elders of the reef.'
 - We focus on large colonies because they contribute much more to the ecosystem than small fragments: they are able to stop waves more effectively, provide more habitat for fish and invertebrates, and can produce the most coral babies.
 - To date, these efforts have saved over 4,000 important corals!
- **There is no silver bullet to dealing with SCTL D;** to be successful, we have to approach the problem from many different angles. One very important piece of the puzzle is maintaining adult corals out on the reef to support natural recovery and research. Intervention is the tool that allows us to do that.
- **Antibiotics are by far the most effective treatment option that we have.** However, we are actively exploring other intervention options and evaluating any unanticipated effects of our treatments.

- It's important to remember that **the amount of antibiotics we are applying is very small** (especially compared to what is introduced from land-based sources of pollution) and **the paste they are mixed in is specifically designed to prevent release into the water.**
- Many response partners feel that while humans have caused so many problems on our reefs, we have the ability and obligation to fix them!

Why conduct coral restoration now?

- **The goal of restoration is to put nature in the driver's seat.** Mother nature is resilient, but we are throwing a lot of stressors at her simultaneously – like death by a thousand cuts. Restoration is trying to get enough resilient corals out on the reefs so that they can rebuild their own populations in the future.
- **Time is of the essence!** While we work to reduce those 'thousand cuts', we also need to be advancing our restoration techniques and keeping viable coral populations out on our reefs. **Many coral conservation activities need to occur simultaneously** – if we wait to 'solve' climate change and water quality before starting restoration, it will be far too late.
 - Similarly, **we can't wait until the disease is 'gone' because likely, it never will be.** SCTLD is now "endemic" (i.e., part of the ecosystem) to Florida, so we need to learn how to do restoration with the disease around.
- **Restoration can be successful!** We are beginning many of Florida's coral restoration efforts with species that are not susceptible to SCTLD. Further, there are some genotypes (i.e., genetic individuals) of susceptible species that are resilient to the disease and continue to thrive. **We've been having a lot of success with restoration even during the outbreak** and researchers are studying how to make corals more resilient.
- **There is A LOT to do!**
 - Restoration in Florida is an enormous undertaking, so **we need to start refining our restoration techniques now.** Most of these corals have never been raised or bred in human care.
 - We are focusing on breeding corals that are **more resilient to environmental stressors and disease.** We need to have corals out on the reef to teach us how they can adapt, to maintain habitat for other organisms, and even to reproduce on their own. Many corals only spawn one time per year, so we can't waste a single opportunity!
- **Florida is a world leader in coral restoration** and the techniques developed here are used all over the world! We're developing a whole new science that benefits corals far beyond our reefs.
- Many response partners feel that while humans have caused so many problems on our reefs, we have the ability and obligation to fix them!

What are 'you' doing to address poor water quality, climate change, etc.?

- We recognize that the reef is not only impacted by coral disease. The disease response is thinking holistically to the issue of reef decline and focuses on mitigating local threats to allow for the system to build resilience to global threats. A number of groups are tasked with addressing these issues, including:
 - **The Florida Reef Resilience Program** is working to bring together managers across Florida to coordinate on wider coral reef conservation threats/stressors.
 - **The Florida Keys National Marine Sanctuary Water Quality Protection Program** brings together managers, scientists, and policy-makers to improve the water quality of the Florida Keys, to the benefit of the natural resources and people living and recreating in the Keys.
 - **The Southeast Florida Coral Reef Initiative (SEFCRI)** is a venue for collaborative action among government and non-governmental partners to identify and implement priority

actions needed to reduce key threats to coral reef resources in southeast Florida (Miami-Dade, Broward, Palm Beach and Martin counties).

- **We know some things are going well!** NOAA conducted a status report of all US coral reefs, and found Florida coral reef fisheries are doing very well. In addition, the Keys have been successfully transitioning from septic systems to central waste management to reduce local water quality impacts. Also, corals and coral disease are being considered in the planning of the large-scale coastal construction projects.
- **Everglades restoration is in full swing!** All the south Florida ecosystems are connected, and healthy Everglades are crucial for healthy reefs.
 - The freshwater that runs through the Everglades is vital for nearshore ecosystems like seagrass beds and mangrove forests, both of which contribute to reducing harmful nutrients in the water and sequestering carbon pollution.
 - The Everglades have the largest continuous seagrass beds in the world and the largest mangrove ecosystem in the Western Hemisphere!
 - Detail things being done as part of CERP and other Everglades projects - improving flow to Shark River Slough, building more bridges on the Tamiami Trail to improve water flow, creating new stormwater treatment areas and water storage areas, restoring the upper Everglades watershed along the Kissimmee River, plugging canals, removing roads, and more. See [this Story Map](#) for more information.