Fighting to save Caribbean coral reefs to sustain life underwater and on land

_Coral reefs are the heart of the ocean, radiating vitality and life into the waters that make up over 70 percent of our planet._ Hidden beneath the surface, they are complex ecosystems that support countless plant and animal species and are essential for maintaining a healthy ocean. They also supply millions of people worldwide with food, livelihoods and protection against environmental threats.

As a region made up of over 2.5 million square kilometers of ocean and hundreds of islands, the Caribbean is especially dependent on coral reefs. The fishing and tourism industries are the major driving forces behind economies across the region, and these industries cannot survive without healthy and thriving coral reefs. A recent study led by The Nature Conservancy (TNC) revealed that reef-associated tourism generates over $7.9 billion for Caribbean economies annually. In addition, reefs help protect vulnerable Caribbean communities against the devastating impacts of climate change, including erosion, flooding and extreme weather events—like 2017’s Hurricanes Irma and Maria, which took hundreds of lives and caused mass destruction across multiple islands.

Today, however, climate change and other threats are degrading the very ecosystems, like coral reefs, that provide natural coastal protection. Increasing ocean temperatures, pollution and overfishing have pushed many coral species around the globe to the verge of extinction, and the world is witnessing a dramatic loss of coral reefs that will continue to escalate at a dangerous pace unless action is taken. Partnering with some of the world’s best coral science organizations, TNC is scaling up coral reef protection, restoration and monitoring efforts in the Caribbean to levels that are relevant to today’s coral crisis. By pioneering advanced techniques and technologies, TNC strives to ensure that Caribbean coral reefs not only survive today’s threats but thrive for generations to come.
In response to this crisis, TNC is using the latest science and technology to pursue proactive coral reef restoration in the Caribbean on a scale large enough to compete with global threats like climate change. In addition, TNC is advancing protection and monitoring initiatives that help safeguard coral reefs from local stressors, like overfishing and sediment runoff, to directly benefit surrounding marine environments and the communities that depend on them. A leader in coral conservation for decades, TNC combines these initiatives to form our comprehensive, three-pronged approach:

These three cornerstones of our coral conservation work are built on a foundation of community engagement and empowerment. TNC is committed to providing education, tools and opportunities that support communities in local efforts to protect their coral reefs. This commitment includes, and often focuses on, the younger generation, as they will inherit the responsibility of conserving reefs in the future.
Restoration

The dramatic decline of coral reefs worldwide has prompted scientists to assist reef recovery and restore ecosystem function by transplanting corals raised in nurseries onto degraded reefs. However, the scale of degraded reefs today is of a magnitude far greater than the ability to restore them using traditional methods. TNC and partners are pioneering emerging techniques that have the potential to bridge this gap in scale between restoration needs and current capacity, while promoting collaboration and knowledge-sharing to disseminate these innovative techniques as widely as possible.

TNC is partnering with leading coral scientists and organizations like Mote Marine Laboratory and SECORE International to advance and scale up two cutting-edge coral restoration techniques—microfragmentation and facilitated sexual reproduction.

By employing advanced modeling techniques, TNC and partners are able to identify priority areas for restoration where reefs provide the greatest benefit to coastal communities.

Protection

Overfishing, land-based pollution, sediment runoff, and ocean warming and acidification have created marine environments in which degraded reefs are unable to rebound on their own. These underlying drivers of reef degradation must be addressed not only to protect existing reefs, but also for restoration efforts to have the greatest long-term impact. TNC is joining stakeholders together and leading regional initiatives that promote effective marine protection and management.

For example, TNC and partners launched the Caribbean Challenge Initiative, which unites governments across the region in a commitment to protect and effectively manage at least 20 percent of their marine environment and has resulted, to date, in the protection of nearly 11 million acres of marine area in the region. Through other collaborative initiatives, TNC and partners:

- provide data that allows governments to prioritize areas for protection and complete marine spatial planning to maximize protection benefits and sustainable use of resources
- support the effective, long-term management and financial sustainability of marine protected areas
- educate fisher communities and the larger fishing industry on best practices and gear to prevent overfishing and destruction of coral reefs
- raise awareness among local communities, tourists and tourism-based businesses about the role they can play in reducing harm to coral reefs
- implement ecosystem-based solutions, including coral restoration, as a core part of coastal and climate resilience efforts

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MICROFRAGMENTATION is a process of cutting corals into tiny fragments which causes a dramatic increase in their growth rates. After growing in land-based or in-water nurseries, they are outplanted onto damaged reefs where they can fuse together to form new, healthy coral colonies. This technique is used for treating targeted, severely degraded reefs.

FACILITATED SEXUAL REPRODUCTION involves the collection of coral reproductive cells, or gametes, during natural spawning events, fertilizing them in a lab and growing the embryos in land-based or in-water nurseries. Millions of coral embryos can be created from a single dive mission, which makes this technique ideal for large-scale restoration. It also promotes genetic diversity—as sexual reproduction is the natural process by which genetic diversity is created—which is important for preserving the natural resilience of corals to environmental threats.

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Monitoring
Partnering with leading specialists in remote sensing technologies, including Planet and the Carnegie Institution for Science, TNC is using groundbreaking technologies to map and monitor coral reefs throughout the Caribbean in order to inform conservation strategy and policymaking. Working from outer space to the ocean floor, our multilayered process involves a “constellation” of over 200 satellites, a high-tech aircraft equipped with a hyperspectral sensor, aerial and marine drones, and scuba divers—providing a level of detail and accuracy never before possible.

Merging data from all these sources, TNC and partners are creating the first high-resolution map to reveal the location and extent of coral reefs and seagrasses across the entire Caribbean, which will serve as one of the most powerful tools developed to date for large-scale coral conservation. This game-changing map will allow individual Caribbean islands to implement conservation solutions and national policies that are uniquely tailored to their specific reef systems. The multilayered data can be used to:

- identify changes to coral reef health over time and evaluate the impact of extreme weather events, like hurricanes
- catalyze marine protections and marine spatial planning, including identifying post-hurricane priority areas
- quantify the benefits of coral reefs, including the economic values associated with tourism and fishing and the coastal protection benefits, to advocate for greater investment in reef conservation
- monitor the effectiveness of coral protection and restoration efforts to inform ongoing strategy and policymaking
- support other TNC analysis tools like Mapping Ocean Wealth, which uses predictive models to reveal global ecosystem benefits and help ensure that policy decisions and economic development investments are designed to sustain, not misuse, ocean benefits

Mobilizing Global Action with Coral Innovation Hubs
Because the loss of coral reefs impacts biodiversity and human wellbeing everywhere, TNC aims to mobilize large-scale protection, restoration and monitoring initiatives throughout and beyond the Caribbean. Meaningful action for coral reefs requires organizations, governments and communities everywhere to collaborate, share knowledge, combine resources and build on one another’s achievements. To this end, TNC and partners have launched three Coral Innovation Hubs in key geographies across the Caribbean—The Bahamas, Dominican Republic and U.S. Virgin Islands—to proactively share expertise and promote rapid deployment of our three-pronged coral strategy.

Created to host interdisciplinary networks of coral scientists, conservation organizations, local stakeholders, students and educators, the Hubs serve as incubators for ideas on scalable coral conservation. As centers of innovation, they advance the development, implementation and dissemination of techniques like microfragmentation and facilitated sexual reproduction to promote restoration at a scale that can compete with today’s rate of reef degradation. As vehicles for education and training, they offer learning and advocacy pathways for stakeholders (such as fishers or dive operators) and students who want to learn how they can help protect reefs.
Each of the three Coral Innovation Hubs is a partnership between TNC and trusted local partners. Through collaboration among the Hubs, the latest in coral protection, restoration and monitoring techniques can be trialed and deployed synchronously across geographies. Much of the work and testing that has gone into innovative restoration techniques has been at a small scale in solitary locations, which limits the ability to learn what consistently works, where it works and why. By gathering comprehensive results through the interconnected Coral Innovation Hubs, TNC and partners can advance these techniques forward and into the locations, in the Caribbean and around the world, where they are needed most urgently.

The Bahamas Coral Innovation Hub is based at Cape Eleuthera Institute in close collaboration with Perry Institute for Marine Science. Here, TNC and partners are advancing coral restoration by increasing the efficiency and effectiveness of novel coral propagation and outplanting techniques. Hands-on education is offered to local students through experiential field trips that include snorkeling, coral restoration activities and visits to the Institute's research facility.

The Dominican Republic Coral Innovation Hub is jointly based at Grupo Puntacana Foundation’s Center for Marine Innovation and FUNDEMAR (Fundación Dominicana de Estudios Marinos), in close collaboration with RAD (Red Arrecifal Dominicana). Here, TNC and partners are introducing new coral colonies onto reefs in the 8,000-square-kilometer Southeast Marine Sanctuary, where TNC, after helping to establish this protected area, is leading the marine spatial planning process using aerial hyperspectral imaging data. In addition, TNC and partners at this Hub are making significant gains in the efficiency of propagation, fragmentation and outplanting techniques. Local students participate in field trips to the Coral Innovation Hub facilities, where they explore coral nurseries and take part in hands-on activities.

The U.S. Virgin Islands Coral Innovation Hub is based at Estate Little Princess, TNC’s nature preserve on St. Croix. At this Hub, TNC and partners are establishing a new land-based coral nursery designed to be modular, customizable and easily replicated at other Hubs or global locations. Here, TNC and partners will introduce new coral colonies within the St. Croix East End Marine Park, a protected area TNC supports and home to coral reefs that are vital to the island’s reef ecosystems.

A Future for Coral Reefs
By pooling our resources, science and expertise, TNC and partners are a powerful force with the potential to implement revolutionary solutions to one of the greatest conservation challenges of our time. At no other time in history has the need been greater to take action for coral reefs in the Caribbean and around the world.

The opportunity to interrupt the coral reef crisis and prevent the extinction of these life-giving ecosystems is here and within our reach today. Through collaboration, innovation and the very best science, we can bring back the robust, resilient coral reefs that once flourished throughout the Caribbean and around the world, before these unique and imperative ecosystems are lost forever.
We have a responsibility to future generations whose wellbeing, like ours today, is directly connected to the health of coral reefs. These ecosystems have helped sustain life on Earth for millions of years. Their drastic decline in just the past few decades calls for our urgent response, working together across the globe to apply the most advanced science, technology and policy available.

— Dr. Joseph Pollock, Director of Coral Strategy for The Nature Conservancy in the Caribbean

Key Partners

- Asner Lab
- Bahamas National Trust
- Bahamas Reef Environment Educational Foundation
- California Academy of Sciences
- Cape Eleuthera Institute
- Carnegie Institution for Science
- Center for the Conservation and Eco-Development of Samaná Bay
- Coral Reef Alliance
- Coral Restoration Consortium
- FUNDEMAR (Fundación Dominicana de Estudios Marinos)
- Dominican Republic Ministry of Environment and Natural Resources
- Grupo Puntacana Foundation
- Mote Marine Laboratory
- National Oceanic and Atmospheric Administration
- Perry Institute for Marine Science
- Plant a Million Corals
- Propagas Foundation
- RAD (Red Arrecifal Dominicana)
- SECORE International, Inc.
- Shedd Aquarium
- St. Croix East End Marine Park
- USVI Coastal Zone Management Program
- USVI Department of Planning and Natural Resources

OUR MISSION: TO CONSERVE THE LANDS AND WATERS ON WHICH ALL LIFE DEPENDS

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