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SAVING ANIMALS FROM EXTINCTION

CORAL

PROGRAM PLAN 2024-2028

Table of Contents

Program Vision and Overview

VISION, GOAL AND MISSION

The long-term (50-year) vision of the SAFE Coral program is ***a world where coral reefs are an abundant, healthy, and genetically-diverse component of a thriving network of interconnected marine ecosystems benefitting human communities.*** Our program goal is for all threatened and endangered corals to begin to recover throughout their natural range to where they experience successful natural reproduction and recruitment. Supporting this vision and goal, the mission of the SAFE Coral program is ***to inspire and mobilize the AZA community to save corals from extinction.***

Our program is restricted to reef-building corals (scleractinia), a highly diverse group of animals, comprising nearly 800 species, with new discoveries every year. They create the scaffolding that supports a myriad of other organisms that live on and around reefs, including more than a billion people who rely upon them for their livelihood. Protecting and restoring threatened corals impacts more than just the corals. Thus, the work of the SAFE Coral program extends beyond the reefs, enhancing a foundation that supports genetic diversity and biodiversity across many interconnected ecosystems: mangrove forests, seagrass beds, sand and rubble zones and others.

Corals are facing a global existential crisis. Although the work described herein is focused primarily on species occurring in the tropical Western Atlantic Ocean and Caribbean Sea, the methods and approaches are globally relevant. In fact, working outside of the tropical Western Atlantic, where decades of disease and thermal-stress events have greatly reduced the health and diversity of coral populations, may provide more opportunities to advance techniques for reef restoration and disease-treatment, further our understanding of coral reproductive biology, and build capacity for handling coral gametes and larvae. Therefore, we provide an opportunity for AZA member institutions to incorporate their expertise associated with corals from other regions.

The five-year program supporting our mission and vision includes a combination of conservation and restoration activities, as well as public engagement and fundraising, organized into eleven strategic objectives that are described in detail in the Program Summary Table. This program plan was developed by the SAFE Coral steering committee with input from program advisors and partners in December 2023. It was submitted to AZA in March 2024, reviewed by the Wildlife Conservation Committee and Public Relations Committee, and published in August 2024.

The SAFE Coral program invites and welcomes all interested AZA accredited zoos and aquariums to become program partners, funders and collaborators.

CONSERVATION TARGETS AND CONSERVATION STATUS

The conservation targets of the SAFE Coral program are all of the scleractinian stony corals that occur in the tropical western Atlantic Ocean, Caribbean Sea and Gulf of Mexico. The following table lists the 22 high-priority species for the SAFE Coral program, along with their ESA and IUCN Red List status. All stony corals are listed under CITES Appendix II. Seven species are currently listed under the United States Endangered Species Act (ESA) and are on the Florida Endangered and Threatened Species List. Twenty species, including six currently assessed by the IUCN as "Least Concern," are impacted by stony coral tissue loss disease (SCTLD) and were prioritized for the AZA Florida Reef Tract Rescue Project (AZA-FRTRP), as indicated below. In support of this project, more than two thousand at-risk corals were removed from Florida's Coral Reef ahead of the progressing disease and placed in human care. These "rescue" corals are now held in 20 facilities in the US, and are a key asset of the program.

Given the overarching programmatic goal of maintaining genetically-diverse populations at several redundant locations, each partner institution will ideally work with a variety of these species.

Scientific name (common name)	ESA Listing	IUCN Red List Status	AZA-FRTRP
Acropora cervicornis (staghorn coral)	Threatened	Critically Endangered	
Acropora palmata (elkhorn coral)	Threatened	Critically Endangered	
Agaricia lamarcki (Lamarck's sheet coral)		Critically Endangered	*
Colpophyllia natans (boulder brain coral)		Vulnerable	*
Dendrogyra cylindrus (pillar coral)	Threatened [1]	Critically Endangered	*
Dichocoenia stokesii (elliptical star coral)		Vulnerable	*
Diploria labyrinthiformis (grooved brain coral)		Critically Endangered	*
Eusmilia fastigiata (smooth flower coral)		Critically Endangered	*
Favia fragum (golfball coral)		Least Concern	*
Madracis auretenra (yellow pencil coral)		Least Concern	*
Meandrina meandrites (maze coral)		Critically Endangered	*
Montastraea cavernosa (large-cup star coral)		Least Concern	*
Mussa angulosa (spiny flower coral)		Near Threatened	*
Mycetophyllia aliciae (knobby cactus coral)		Least Concern	*
Mycetophyllia ferox (rough cactus coral)	Threatened	Critically Endangered	*
Mycetophyllia lamarckiana (cactus coral)		Least Concern	*
Orbicella annularis (lobed star coral)	Threatened	Endangered	*
Orbicella faveolata (mountainous star coral)	Threatened	Endangered	*
Orbicella franksi (boulder star coral)	Threatened	Near Threatened	*
Pseudodiploria clivosa (knobby brain coral)		Near Threatened	*
Pseudodiploria strigosa (symmetrical brain coral)		Critically Endangered	*
Solenastrea bournoni (smooth star coral)		Least Concern	*

[1] In August 2023, NOAA Fisheries proposed a rule to change the ESA status of pillar coral (*Dendrogyra cylindrus*) from Threatened to Endangered. At the time of writing, this is still in the public comment phase.

RECOVERY PLANS

Only three coral species have approved recovery plans. In 2013, the Florida Fish and Wildlife Conservation Commission developed A Species Action Plan for the Pillar Coral *Dendrogyra cylindrus*, prior to its federal listing under the Endangered Species Act (ESA). In 2015, NOAA Fisheries released a Recovery Plan for Elkhorn Coral (*Acropora palmata*) and Staghorn Coral (*Acropora cervicornis*) describing information and activities to provide a roadmap to recovery of wild populations of these two species. This recovery plan establishes goals, objectives and criteria identifying the conditions necessary to delist these two threatened species from the ESA. In 2015, NOAA Fisheries released a Recovery Outline, commencing the recovery planning process for the other five species listed as threatened under the ESA. Part of the NOAA Fisheries recovery outline is to prioritize implementation of actions in the recovery plan for *Acropora* corals that will benefit other threatened species. Finally, as a response to the overall reduction in coral cover across Florida's Coral Reef, NOAA and partners, including Mote Marine Laboratory and Aquarium and The Florida Aquarium, launched *Mission: Iconic Reefs*, with the goal of restoring seven iconic Florida reefs by reintroducing a diversity of stony corals and algae-grazing species, and by building community stewardship around ongoing maintenance and monitoring of the restoration sites. Full citations for the published recovery plans and recovery outline are in the references. NOAA Fisheries and the Florida Fish and Wildlife Conservation Commission are key partners in our work. Representatives from these organizations advised the steering committee during the development of the 2024-2028 SAFE Coral program plan and serve as liaisons to their organizations on an ongoing basis.

In 2022, The Florida Aquarium spawned elkhorn coral in human care for the first time © The Florida Aquarium

THREATS

The population decline in corals across the tropical western Atlantic Ocean is due to a combination of threats at global, regional, and local scales. The NOAA Fisheries *Acropora* Recovery Plan delineates objectives based on two major groupings: (1) *population-based*, and (2) *threat-based* criteria. *Population-based* objectives focus on simultaneously increasing the abundance of large colonies and recruitment rates, while maintaining genetic diversity. *Threat-based* objectives focus on simultaneously reducing the individual and synergistic effects of disease, rising seawater temperature and ocean acidification due to anthropogenic carbon emissions, loss of recruitment habitat, a phase shift from coral-dominated to algae-dominated ecosystems, land-based pollutants (e.g. nutrients, sediments, and contaminants), abrasion and breakage, and predation across the corals' geographic range, as well as recommendations and implementation of protective regulatory mechanisms. Although these objectives were developed with the two *Acropora* species in mind, they are applicable to nearly all stony coral species.

(1) Population-based Criteria:
   (a) Reduced abundance of large and sexually-mature colonies across the natural range
   (b) Reduced genotypic diversity
   (c) Reduced recruitment rates from both asexual and sexual reproduction

(2) Threat-based Criteria:
   (a) Disease
   (b) Ocean warming and acidification from greenhouse gas accumulation
   (c) Loss of recruitment habitat (including the loss of herbivorous grazers)
   (d) Nutrients, sediments and contaminants (land-based sources of pollution)
   (e) Natural and anthropogenic abrasion and breakage
   (f) Predation
   (g) Lack of adequate regulatory mechanisms (e.g. lack of regulations related to land-based sources of pollution, carbon emissions, and fishing)

The SAFE Coral Program Plan for 2024-2028 work plan directly supports the objectives of the NOAA Fisheries *Acropora* Recovery Plan (2015), the project goals of the AZA Florida Reef Tract Rescue Project (2018), and the project goals of NOAA's Mission: Iconic Reefs (2020). The eleven strategic objectives outlined within this document were designed to address both the population-based (objective 1, criteria 1–3) and threat-based (objective 2, criteria 4–10) recovery objectives of the NOAA Fisheries *Acropora* Recovery Plan, as well as to encourage participation and funding from the AZA community and partners.

Program Operations

PROGRAM OPERATIONAL STRUCTURE

All SAFE Coral program activities are conducted and coordinated by the Program Leader, Vice Program Leader, Steering Committee Members, and Program Partner Representatives. External Advisors, and Government Liaisons are key collaborators, and are periodically consulted for guidance and advice. While the structure will undoubtedly change over time, leadership roles and the list of participants for this 5-year program plan are listed below.

Program Leader and *Vice Program Leader*: The Program Leader provides overall direction to the program, organizes and leads program-wide working meetings, monitors program progress, informs and involves the AZA Wildlife Conservation Committee Liaison as necessary, and submits the annual and mid-year status reports to the program members and AZA. The *Vice Program Leader* assumes responsibility for these tasks in the absence of the Program Leader, and provides additional leadership for the program.

The *Program Manager* supports the implementation of the work plan and facilitates partner engagement. This is a paid position supported by grants and contributions from Program Partners.

The *Steering Committee* consists of representatives from zoos and aquariums that provided program leadership for our two prior Program Plans and the AZA-Florida Reef Tract Rescue Project. The steering committee represents the voting body of the program, and approves the selection of officers, program activities, reports, and plans.

Program Partner Representatives are subject-matter experts on a variety of topics related to coral conservation and management. They provide guidance to program members, and they are invited to collaborate with the program in many aspects including participating in working groups, attending meetings, and providing relevant subject-related information. Partner representatives come from AZA member institutions with signed statements of institutional support for the SAFE Coral program.

External Advisors are primarily representatives from organizations that are key partners working with AZA member organizations to accomplish the goals in the SAFE Coral Program Plan. External advisors are involved in reviewing and providing feedback and direction around the program goals and metrics. This role provides a key relationship that supports the success of the collaborative AZA-Florida Reef Tract Rescue Project.

Government Liaisons provide key points of contact with regulatory agencies overseeing major rescue and restoration projects in the tropical western Atlantic. As with the external advisors, they are involved in reviewing and providing feedback and direction around the program goals and metrics. As with the external advisors, this role is critical to the success of the collaborative AZA-Florida Reef Tract Rescue Project as well as *Mission: Iconic Reefs*.

PROGRAM LEADERSHIP, PROGRAM PARTNERS, AND ADVISORS

Affiliation	Representative	Title	Contact Information
Program Leadership			
Steinhart Aquarium California Academy of Sciences	Bart Shepherd Program Leader	Senior Director	bshepherd@calacademy.org (415) 379-5445
Disney's Animals, Science, and Environment	Dr. M. Andrew Stamper, DVM, Dipl. ACZM Vice Program Leader	Conservation Science Manager/Veterinarian	Andy.M.Stamper@disney.com (321) 229-9376
SAFE Coral Program / AZA	Beth Firchau	SAFE Coral Program Manager	bfirchau@aza.org (757) 434-0745
Steering Committee			
Blank Park Zoo	Jessica Schellhorn	Education Manager	jeschellhorn@blankparkzoo.net (515) 974-2553
Columbus Zoo & Aquarium	Becky Ellsworth	Assistant Curator	Becky.Ellsworth@columbuszoo.org (614) 724-3436
The Florida Aquarium	Keri O'Neil	Director and Senior Scientist, Coral Conservation Program	koneil@flaquairium.org 813-425-1679
Omaha's Henry Doorly Zoo & Aquarium	Mitch Carl	Curator of Aquatics	mitchc@omahazoo.com (402) 738-6933
Mote Marine Laboratory and Aquarium	Erinn Muller, PhD	Science Director, International Center for Coral Reef Research & Restoration	emuller@mote.org (941) 388-4441 x310
The National Aquarium	Brian Nelson	Assistant Curator of Blue Wonders	BNelson@aqua.org (410) 659-4288
The John G. Shedd Aquarium	Ross Cunning, PhD	Research Biologist	rcunning@sheddaquarium.org
The South Carolina Aquarium	Barrett Christie	Director of Animal Care	bchristie@scaquarium.org (843) 579-8589
Program Partner Representatives			
Adventure Aquarium	Nicole Grandinetti	General Curator	ngrandinetti@adventureaquarium.com (856) 365-3300 ext 7369
Blank Park Zoo	Christine Eckles	Chief Engagement Officer	cneckles@blankparkzoo.net (515) 974-2551
Butterfly Pavilion	Sara Stevens	Aquatics Manager	SStevens@butterflies.org (720) 375.9983
Fort Worth Zoo	Robyn Doege	Supervisor of Aquatic Ectotherms	rdoege@fortworthzoo.org (817) 759-7159
Jenkinson's Aquarium	Danni Logue	Animal Welfare Program Coordinator	danni.logue@jenkinsons.com
Georgia Aquarium	Kim Stone	Curator of Fish & Invertebrates	kstone@georgiaaquarium.org (404) 581-4381
Maritime Aquarium at Norwalk	Rachel Stein	Associate Director Interim Director of Animal Husbandry	rstein@maritimeaquarium.org 203-852-0700, x2251
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Nashville Zoo	Dale McGinty	Ectotherm Curator	dmcginnity@nashvillezoo.org (615) 833-1534 x154

National Mississippi River Museum & Aquarium	Andy Allison	Vice President of Living Collections & Education	aallison@rivermuseum.com (563) 557-9545 x239
Riverbanks Zoo & Gardens	Kendra Bottini	Aquarium Curator	kbottini@riverbanks.org (803) 602-0820
Saint Louis Zoo	Ed Spevak, PhD	Curator of Invertebrates	spevak@stlzoo.org (314) 646-4706
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SeaWorld Orlando	Jim Kinsler	Curator of Aquariums	Jim.Kinsler@SeaWorld.com (407) 363-2353
Texas State Aquarium	Jesse Gilbert	Chief Operating Officer	jgilbert@txstateaq.org (361) 881-1215
Virginia Aquarium	M. Evan Culbertson	Assistant Curator	Eculbert@VirginiaAquarium.com (757) 385-0247
External Advisors			
Perry Institute for Marine Science	Craig Dahlgren, PhD	Executive Director	cdahlgren@perryinstitute.org (561) 741-0192 x231
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SEZARC	Linda Penfold, PhD	Director	Linda.penfold@sezarc.com (904) 556-1675
Smithsonian Conservation Biology Institute	Mary Hagedorn, PhD	Research Scientist	Hagedornm@si.edu (808) 520-1368
AZA Wildlife Conservation Committee Liaison			
Maritime Aquarium at Norwalk	Jason Patlis	President and CEO	jpatlis@maritimeaquarium.org (203) 852.0700 x 2212
Government Liaisons			
NOAA Fisheries	Jennifer Moore	Mission: Iconic Reefs Senior Manager, Florida Keys NMS	jennifer.moore@noaa.gov (727) 551-5797
Florida Fish and Wildlife Conservation Commission	Lisa Gregg	Program & Policy Coordinator	lisa.gregg@myfwc.com (850) 617-9621

A small coral bommie in the Bahamas provides critical habitat for a diversity of fishes © California Academy of Sciences

Building on AZA Community Commitments

PROGRAM BACKGROUND AND PROGRESS

The SAFE Coral Program launched in 2018 with eight AZA accredited zoos and aquariums as program partners. The initial conservation targets of the program were two threatened corals, *Acropora palmata* (Caribbean elkhorn coral) and *Acropora cervicornis* (Caribbean staghorn coral). Over the three years from 2018 to 2020, program partners developed multiple nurseries on land and ocean based while simultaneously outplanting nearly 65,000 colonies of *Acropora* corals on reefs in Florida, The Bahamas, and several other Caribbean locations. Tens of thousands more acroporids were also outplanted since that time period. Recent surveys indicate that these efforts likely prevented the local extinction of acroporid corals in Florida during the extreme thermal event during the summer of 2023 (Muller et al., submitted). Program partners developed new techniques to scale the ability to restore coral populations: *microfragmentation*, pioneered at Mote Marine Laboratory; *indirect seeding with artificial substrates*, developed through a partnership between four AZA member institutions and SECORE International; and *aquarium-based spawning systems*, led by The Florida Aquarium and Steinhart Aquarium in partnership with Jamie Craggs from the Horniman Museum in London.

Our first Program Plan was marked by several major achievements. Program partners conducted the first assisted gene flow for *A. palmata*, using cryopreservation to cross gametes from three locations in Florida and the Caribbean and create novel genotypes. In 2019, The Florida Aquarium spawned two species of threatened corals in a specially-designed breeding aquarium, generating offspring to be used for restoration of wild populations, and microfragmented corals outplanted by Mote Marine Laboratory spawned in synchrony with their wild counterparts, validating that corals restored through this technique can indeed introduce reproductive functionality back onto damaged reefs (Henry et al., 2021; Koch et al., 2021; O'Neil et al., 2021). In addition to these major accomplishments, program partners deepened relationships with government agencies, particularly with the National Oceanographic and Atmospheric Administration (NOAA) and the Florida Wildlife Conservation Commission (FWC). These enhanced partnerships led to what was a critical second phase for the SAFE program for corals, one that incorporated a massive rescue response to stony coral tissue loss disease (the AZA-Florida Reef Tract Rescue Project, or AZA-FRTRP), and an expansion of the conservation target to twenty priority species.

The 2021-2023 Program Plan built on the successes of the 2018-2020 program and the AZA membership's growing role in coral rescue, research, and restoration, expanding the SAFE Coral Program to include additional taxa and several newly developed programs and techniques. Scientific publications from the prior program plan are listed in Appendix 2. The Florida Aquarium, Mote Marine Laboratory and Aquarium, and Steinhart Aquarium/California Academy of Sciences, are now actively spawning corals in specially-designed aquarium systems, producing unique new individuals for restoration and research. Sixteen species of corals have now been spawned in human care by program partners. The Florida Aquarium and Mote Marine Laboratory and Aquarium are exploring cryopreservation to biobank genetic material and for assisted gene-flow. Today, the AZA-FRTRP's network consists of 19 facilities, managed by 20 partners in 13 states with seven AZA members on the Pathway to Rescue process for FWC approval as coral-holding facilities. The network partners care for 1,831 of the 2,341 total rescued corals (78%). A Coral Aquarists Program was developed by AZA

members and launched in 2023 as an official AZA Course offering. The first cohort of 7 aquarists completed the program, and a call for participation in early 2024 secured another 8 participants.

This, our third Program Plan, builds on our prior successes, focuses our work, and creates opportunities for more AZA member institutions to get involved. While our primary target continues to be the reef-building stony corals in the tropical western Atlantic, we provide a structure whereby work with other species can be endorsed. In recent years, high temperatures from global climate change have threatened corals on reefs and in nurseries being grown for restoration purposes, including the extraordinary event in the summer of 2023. This region-wide heat event recalibrates our restoration efforts, and highlights the importance of integrating *resilience* into restoration strategies. Research on methods to increase resilience, ensuring redundancy of key genotypes in our nurseries, and increasing the public's empathy for corals and the political will to address the root causes of climate change feature prominently in our 2024-2028 Program Plan.

We aim to increase the number of AZA accredited member institutions directly participating in and contributing to coral conservation, and raise awareness of the important work being conducted by AZA member institutions through engagement with university and research institutions, government agencies, conservation working groups, media and other partners. We will increase awareness of the global coral reef crisis and empathy for corals through our collective public engagement activities and outreach, both within our institutions and in the communities where we work. Through the conservation and engagement approaches described in this document, AZA accredited institutions and project partners will have a measurable positive impact on wild coral populations, on our scientific understanding of how we can restore them, on public awareness of the global coral reef crisis, the important role corals play in the oceans and in supporting local economies and infrastructure, and the connection between carbon emissions and the global decline of coral reefs.

This work plan was developed by a steering committee consisting of leaders from ten AZA member institutions (Blank Park Zoo; Columbus Zoo and Aquarium; Disney's Animals, Science, and Environment; The Florida Aquarium; Mote Marine Laboratory and Aquarium; The National Aquarium; Omaha's Henry Doorly Zoo and Aquarium; The John G. Shedd Aquarium; The South Carolina Aquarium; and the California Academy of Sciences' Steinhart Aquarium), along with AZA staff, project partners, external advisors, and leadership of the Aquatic Invertebrate Taxon Advisory Group. This plan supports the following restoration and recovery strategies: *A Species Action Plan for the Pillar Coral Dendrogyra cylindrus* (FWC, 2013); *NOAA Recovery Plan for Elkhorn (Acropora palmata) and Staghorn (A. cervicornis) Corals* (2015), *Restoring Seven Iconic Reefs: A Mission to Recover the Coral Reefs of the Florida Keys* (NOAA 2020); *NOAA Action Plan on Coral Interventions* (2020); and the goals of the *AZA-Florida Reef Tract Rescue Project* (AZA-FRTRP), a partnership between the AZA membership, The Florida Fish and Wildlife Conservation Commission (FWC), NOAA Fisheries, and other regulatory agencies and universities, initiated in 2018.

STATUS OF TAXA WITHIN THE AZA COMMUNITY

Although there are no Species Survival Plans for corals, they fall within the purview of the Aquatic Invertebrate Taxon Advisory Group (AITAG). The AITAG supports the SAFE Coral Program Plan, and the SAFE Coral steering committee includes AITAG leadership.

Many AZA member organizations manage habitats representing coral reefs within their facilities. These exhibits are vibrant, colorful, and popular ways to engage our members and guests on the topics of coral reef decline and raise awareness of the need for restoration and the important work conducted by accredited zoos and aquariums. Through associated formal and informal educational activities, public-facing exhibits offer opportunities for AZA member institutions to support the goals of the SAFE Coral Program Plan. Staff members at AZA accredited institutions often have specialized expertise in corals, which are delicate and difficult to manage in human care. These same staff are in many cases actively engaged in coral reef conservation and research.

In addition, as a result of the coordinated efforts of the AZA-FRTRP, 19 accredited organizations now serve as coral holding facilities: living *ex-situ* gene banks. These institutions collaborate with each other on animal care and welfare challenges, and provide necessary redundancy for key species and genotypes.

AZA community coral reef conservation activities and public engagement/awareness activities typically fall within the following categories.

Conservation Activities	**Public Engagement / Awareness Activities**
Propagating and outplanting corals	Animal habitats and associated exhibitry
Managing *in-situ* and *ex-situ* nurseries	Public programs (informal education)
Caring for corals rescued from disease and other threats	Student and teacher programs (formal education)
Spawning corals in aquariums for research and restoration	Community outreach and conservation education
Capacity-building through training and workshops	Video, media and other assets shared online for free
Live-banking and cryopreservation of tissue and gametes	Workshops and other in-person training
Research on restoration, life-history, and threat-mitigation	Advocacy campaigns
Webinars and other online training	Scientific publications
	Youth engagement and mentoring

AZA CONSERVATION ACTIVITIES

Numerous institutions and partners conduct restoration by outplanting corals to repopulate reefs in southern Florida and at locations across the Caribbean region. Although some member institutions have developed and are conducting their own restoration programs (e.g. Disney, The Florida Aquarium and Mote), AZA members located outside of Florida generally participate in coral conservation by: (1) outplanting in partnership with organizations in Florida and elsewhere in the Caribbean; (2) by providing care and housing for corals rescued from the Florida Reef Tract and held *ex-situ* at member institutions as a collaborative response to SCTLD; or (3) conducting scientific research related to disease, reproduction, resilience, or improving restoration practices.

Field conservation activities have consistently increased in scale and frequency over the past five years. During this time, multiple project partners have conducted spawning workshops for a variety of species, and hundreds of thousands of corals have been outplanted at restoration sites in Florida, The Bahamas, Curaçao and other locations. In addition, as participation in the FRTRP has expanded across our professional community, nearly 2,000 corals have been relocated from the reef to land-based nurseries at 19 facilities in 13 states. Additionally, technological advances in inducing spawning in corals held in human care have led to significant achievements in the ability of zoos and aquariums to contribute to coral reef restoration across several strategic fronts: serving as genetic arks, producing corals for scientific research, and restoring native populations of imperiled corals across the wider tropical western Atlantic Ocean bioregion. A list of these approaches can be found in the table on the previous page, and more detailed information on the specific projects of each program partner is located below, in the section “Funding Commitments to Date.”

Outplanting fragments of staghorn coral, *Acropora cervicornis*, in Florida © Mote Marine Laboratory and Aquarium

AZA PUBLIC AWARENESS ACTIVITIES

Public awareness activities conducted by the SAFE program partners are varied and encompass many different ways of delivering programming related to coral reef decline, Atlantic coral reefs, and the global coral reef crisis.

Guest-facing (in our facilities)

- Aquarium displays of live coral with messaging related to the coral reef crisis
- Public programs about coral reefs (e.g. dive shows, feedings)
- Films, movies, planetarium shows, other media related to coral reefs
- Behind-the-scenes tours or similar programming related to coral reefs
- Interpretive public floor activities

Students and Learning

- Coral-themed activities or materials for school field trips to our facilities
- Coral-themed activities or materials for off-site (classroom) use
- Intensive learning experiences (e.g. camps, fieldwork, internships)
- Formal science curriculum development in partnership with schools
- Virtual classroom visits or programming

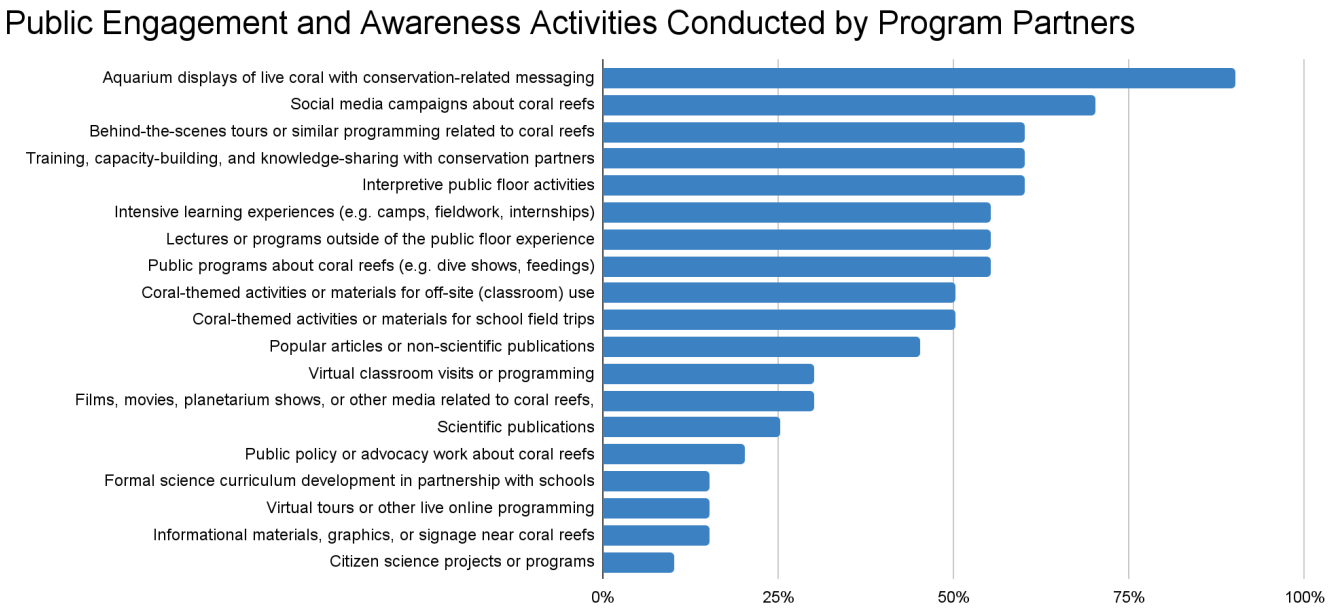
Community Engagement

- Public policy or advocacy work about coral reefs
- Training, capacity-building, and knowledge-sharing with conservation partners
- Citizen science projects or programs
- Lectures or programs outside of the public floor experience

Media/Publications

- Scientific publications
- Popular articles or non-scientific publications
- Informational materials, graphics, or signage deployed outside of our facilities near coral reefs
- Social media campaigns about coral reefs
- Virtual tours or other live online programming

Twenty-five SAFE Coral Program Partners were queried as to the types of public awareness and education programs conducted by their organizations. The data from 20 responses (80%) is summarized below.



This education program at Steinhart Aquarium connects visitors with the coral reef crisis through the use of a trusted messenger, an aquarium diver, who discusses ways that everyone can help address the coral reef crisis © California Academy of Sciences

FUNDING COMMITMENTS TO DATE

From 2018-2022, AZA member institutions contributed a total of more than $22 million for conservation activities related to corals. The following table lists AZA zoo and aquarium members' contributions toward coral reef conservation for 2018-2023, summarized from the AZA's Annual Research and Conservation Spending (ARCS) surveys, including the number of institutions reporting and the total dollars spent for each year. The narrative that follows includes examples of research and restoration performed by program partners over the past several years. This is summarized in table form in Appendix 2.

Coral Conservation and Research							
Year	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Reporting Institutions	32	42	31	39	38	42	
Total Dollars	$2,451,000	$3,502,000	$3,580,000	$5,700,000	$3,200,000	$3,926,000	$22,359,000

The Florida Coral Rescue Center houses hundreds of corals rescued from an ongoing disease threat © SeaWorld

The California Academy of Sciences' *Hope For Reefs* initiative was a five-year, $15 million effort to save coral reefs through advances in science, education and sustainability. *Hope for Reefs* directly funded SECORE International from 2017-2021 to further develop the indirect-seeding approach for coral restoration. Funds were also allocated for direct costs associated with Steinhart Aquarium staff participation in the partnership with SECORE, and in-kind support (staff time). Direct and in-kind support from Autodesk Foundation facilitated collaboration on seeding unit designs. Through a partnership with coral reef scientist Dr. Rebecca Albright and Dr. Jamie Craggs at the Horniman Museum and Gardens (London, UK), Steinhart Aquarium staff constructed a coral spawning laboratory to achieve off-cycle spawning in scleractinian corals. Although this work is with Indo-Pacific species, the research supports and informs reef restoration and fundamental aspects of corals' early life-history, including training and capacity-building for staff from a Caribbean partner, Roatan Marine Park. A four-year grant from Kingfisher Foundation supported this project from 2018-2021. The project is now supported by a three-year grant from CORDAP to Dr. Albright (2023-2026). Phase II of *Hope for Reefs*

will support research, restoration, and public engagement activities through three main channels of activity around coral reefs: protection, regeneration, and advocacy. The fundraising goal for *Hope for Reefs* phase II is $40M across five years (2021-2025) supporting a diverse portfolio of research, conservation, and education projects, including dedicated funding for the SAFE Coral program, operational support of our coral spawning facility and associated research, and continued partnership with SECORE.

The Columbus Zoo and Aquarium (CZA) has supported coral aquaculture and conservation since 2005, when it gave a home to SECORE International in the United States. CZA provided funding and staff support that helped develop the SECORE program and lead to its independent nonprofit status. Direct funding supported SECORE coral restoration efforts in Guam, Curaçao, the wider Caribbean, and Mexico. CZA displays live corals propagated through methods developed by SECORE. In 2010, an episode of Jack Hanna's *Into the Wild* featured SECORE coral conservation efforts. In 2016, the Columbus Zoo held a fundraiser for SECORE, which generated more than $55,000 towards coral conservation. Additional projects have included developing head-starting strategies for restoration of spiny sea urchin (*Diadema antillarum*, a key herbivore that creates habitat for coral recruits) and expanding Caribbean coral species targets for larval restoration. In 2019, CZA focused its coral conservation efforts on assisting the AZA-FRTRP by establishing a facility to maintain disease-free corals with the possibility of propagation.

At The Florida Aquarium Center for Conservation (TFA), over 3,000 square feet of coral holding, spawning, and rearing space was constructed between 2016 and 2020 with $1.2 million in funding from the State of Florida in collaboration with the Florida Fish and Wildlife Conservation Commission (FWC). An additional 1,500 square foot coral greenhouse was constructed in 2021, and a $3 million, 4,200 square foot Coral Care Complex was completed in 2023, with funding secured from federal Irma Disaster Relief and FWC. The Coral Conservation Program at TFA focuses entirely on western Atlantic coral species. TFA hosts numerous visiting scientists and partner facilities during annual spawning events to train them in coral assisted fertilization techniques and to provide access to coral larvae for research.. Through partnership with the Horniman Museum and Gardens, TFA became the first location to successfully induce Atlantic coral species to spawn in the laboratory after extended holding ex situ in 2019. Additionally, TFA was the first facility to sexually reproduce corals collected as part of the AZA-FRTRP and return sexually produced offspring of rescue corals to the wild, in collaboration with the University of Miami in 2020. A total of fourteen species of Atlantic coral have successfully spawned at TFA, many of which have spawned repeatedly over multiple years. Over $1.5 million in external funding for coral conservation operations from a combination of state, federal, and private sources has been secured, focusing on increased capacity for spawning and rearing sexual recruits for release back onto Florida's coral reefs.

Since 1995, Disney's Animals, Science, and Environment has provided more than $4.4 million to nonprofit organizations working with communities to lead more than 40 coral conservation projects around the world. In 2014, this effort was expanded in The Bahamas, led by the Perry Institute of Marine Science with support from the Disney Conservation Fund. To date, the Perry Institute and Disney are working with over 30 community groups with a common goal of increasing *Acropora* spp. numbers in The Bahamas within ten years. Since 2019, these efforts have expanded to understanding SCTLD in The Bahamas as well as preventative measures to limit or eliminate the spread. In addition, in 2021, Disney made a financial contribution of $500,000 to support three years of Florida Coral

Rescue Center facility operations, and an additional $500,000 for a coral rescue facility at Atlantis, in The Bahamas. In 2024, Disney directly supported SAFE Coral program management with $147,960.

Omaha's Henry Doorly Zoo formalized a partnership with SECORE International in 2017, supporting these efforts with $12,500 of direct funding. In 2018, HDZ increased this to $30,000 and entered into a five-year agreement to provide SECORE with at least $30,000 per year. HDZ also provides in-kind support, including a staff member who acts in the capacity of the SECORE Diving Safety Officer.

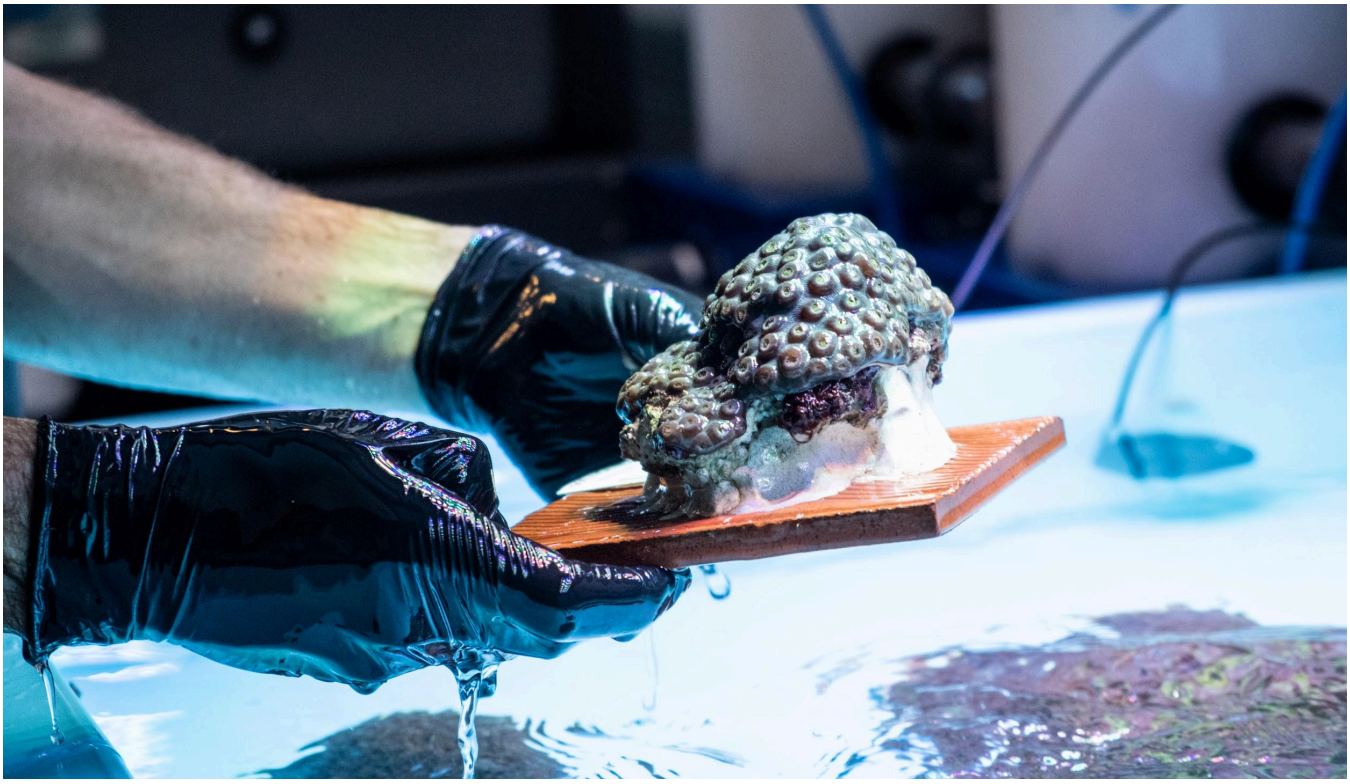
Since 2019, The Maritime Aquarium at Norwalk has been in a partnership with the Ocenario Islas del Rosario in Colombia, South America as well as local universities, and national parks authorities to conduct restoration activities in the Parque Nacional Natural Los Corales del Rosario y de San Bernardo MPA. Preliminary surveys have also been conducted for assessing the future potential for restoration work at other sites in the Caribbean. To date the aquarium has dedicated $84,032 in direct costs and in-kind expenses to *in situ* coral restoration efforts in South America and the Caribbean. The aquarium has also participated in the Florida Reef Tract Rescue Project within AZA dedicating a total of $55,939 to the effort in husbandry and veterinary expenses.

Mote Marine Laboratory's *Elizabeth Moore International Center for Coral Reef Research & Restoration* (IC2R3), on its Summerland Key campus in the Florida Keys, serves as the base of operation for its restoration initiatives. In the past decade, Mote scientists have planted more than 200,000 corals onto Florida's reefs, working with multiple partners to achieve effective restoration. In 2023 alone, Mote outplanted over 34,000 corals. Over the past several years Mote has opened two additional land based nurseries, one in Key Largo and one in Islamorada along with paired in water coral nurseries within those regions. Additionally, staff at Mote's International Coral Gene Bank were trained on integrating cryopreservation into sexual reproduction efforts of coral. Mote's Coral Reef Restoration Research Crab Hatchery was opened at Mote Aquaculture Research Park, which will produce grazers suitable for seeding reefs with to reduce macroalgae within outplant sites. Funding to cover the approximately $4M annual operation budget to execute Mote's Coral Reef Research and Restoration Initiative comes from federal (NOAA, NFWF, NSF), state (FWC, FL DEP), and local agencies (Monroe County) as well as through philanthropic sources. Finally, Mote is a core partner in NOAA's *Mission: Iconic Reefs* Initiative, and has secured funding from NFWF NCRF and NOAA Transformational Habitat Restoration and Coastal Resilience Grant supported by the Bipartisan Infrastructure Law and Inflation Reduction Act to outplant tens of thousands of corals to *Mission: Iconic Reef* sites.

Shedd Aquarium supports in-situ and ex-situ work on Caribbean corals through two full-time resident researchers, Dr. Ross Cunning and Dr. Shayle Matsuda. Since 2018, over $1M in funding has been directed to research on Caribbean corals focusing on thermal tolerance and resilience, genomics, microbiomes, and reproduction. Shedd Aquarium operates the research vessel, R/V *Coral Reef II*, out of Miami, Florida, which serves as a platform for coral research, conservation, education, and public engagement. Shedd Aquarium has also been an active partner with SECORE since 2006, supplying financial and personnel support for in-situ coral spawning work and ex-situ holding space and research assistance. Since 2015 over $40,000 has been appropriated to support SECORE research on improving the design of in-situ coral holding units and providing staff and materials to support restoration work in Curaçao, Mexico and The Bahamas.

In late 2018, as part of the stony coral tissue loss disease (SCTLD) response effort, and at the invitation of the Florida Fish and Wildlife Conservation Commission (FWC), AZA joined with state, federal and

private partners to mount the largest coral rescue effort in US history, the AZA-Florida Reef Tract Rescue Project (FRTRP). The goals of the rescue effort focused on preventing corals most susceptible to SCTLD from being infected, preserving genetic diversity of those same corals species, and eventually propagating them for future restoration. For its part, AZA created a centrally administered network of AZA accredited coral holding facilities across the country. As of early 2021, 20 facilities in 13 states are holding nearly 2,000 rescued corals. To date, these facilities have invested over $14.1 million towards the FRTRP. Funds contributed have supported the creation, maintenance, and in some cases, the expansion of holding facilities compliant with FWC requirements, coral health initiatives to enhance the care and welfare of corals at holding facilities, and the development of a coral aquarist training program for building capacity. Additionally, funds have allowed AZA to provide husbandry expertise and experience to the wider Florida coral rescue effort, as well as public outreach and engagement to build awareness of coral conservation and the impacts of SCTLD on corals in Florida and the Caribbean. Future funding is being identified and current estimates of funding already secured or in process exceed $2 million. This includes more than $1,200,000 from the Florida Department of Environmental Protection, the National Fish and Wildlife Foundation, and the Fish and Wildlife Foundation of Florida to maintain and expand coral holding within the AZA network, provide vital health diagnostics tools, facilitate essential instructor training to enhance the coral aquarist training program, and ensure continued coordination of the project into the future.



One of several thousand corals rescued from the Florida Reef Tract in human care at AZA-accredited facilities © Georgia Aquarium

SAFE Coral Work Plan

Work plan objectives have been developed for three categories: (1) population-based objectives; (2) threat-based objectives; and (3) funding and participation objectives. These directly align with the approved NOAA recovery plans and the goals of the AZA-FRTRP. Objectives are generally described below; timelines, actions, and metrics are found in the program summary table at the end of this section.

Population-based Objectives

1. Increase the abundance and genetic diversity of high-priority coral species at targeted locations, leading to an increase in natural reproduction and recruitment.
2. Manage a network of coral gene banks to increase long-term population viability and save coral species from extinction.
3. Expand our collective capacity for controlled aquarium spawning to support the program goals.

Threat-based Objectives

4. Support agencies' calls to action to rapidly mobilize support for emerging threats such as temperature-stress events, disease outbreaks, etc as well as incident-response at land-based nurseries.
5. Increase capacity for coral research, prioritizing research on animal care, diseases, the impacts of climate change and ocean acidification, scaling up the efficiency of restoration (reducing costs), and increasing climate change resilience in corals grown in nurseries and aquaria.
6. Train and develop the next generation of coral aquarists and restoration practitioners and leaders.
7. Support public awareness and education campaigns that connect carbon emissions to the coral reef crisis, with an ultimate goal of building empathy for reefs and increasing political will to address the root cause of climate change.

Funding and Participation Objectives

8. Develop and implement a proposal for a SAFE Coral coordinator position
9. Facilitate onboarding new program partners by developing and distributing a SAFE Coral new partner starter kit.
10. Establish a SAFE Coral Advancement Team and develop a 5-year funding strategy.
11. Develop a process for incorporating Pacific species into our work plan.

SAFE Coral 2024-2028 Program Plan Summary Table

The long-term (50-year) vision of the SAFE Coral program is ***a world where coral reefs are an abundant, healthy, and genetically-diverse component of a thriving network of interconnected marine ecosystems benefitting human communities.*** Our program goal is for all threatened and endangered coral species to begin to recover throughout their natural range to where they experience successful natural reproduction and recruitment. Supporting this vision, the mission of the SAFE Coral program is ***to inspire and mobilize the AZA community to save corals from extinction.***

Population-based Objectives: A priority of the NOAA recovery plan for corals is to simultaneously increase the abundance of large corals and recruitment of new coral juveniles, while maintaining genetic diversity. The following group of strategic objectives for the SAFE Coral program directly support these priorities (NOAA 2015 *Acropora* recovery plan: Objective 1, Criteria 1–3).

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
Strategic Objective 1: Increase the abundance and genetic diversity of priority coral species at targeted locations, leading to an increase in natural reproduction and recruitment.					
• AZA institutions • Restoration partners • Research partners • Government partners	(a) Produce more than 20,000 coral outplants each year on targeted reefs, supporting the implementation of NOAA's *Mission: Iconic Reefs*, Florida state restoration plans, and restoration plans in The Bahamas, Honduras, and other priority locations. (b) Incorporate climate-resilience into our production and outplanting strategy by implementing approaches that increase heat-tolerance, such as conditioning larvae and cross-breeding of select genotypes. (c) Reduce cost per outplant, allowing economies of scale for restoration	(a) ≥20,000 coral outplants per year planted on to targeted reefs (b) Within 5 years, project leads and research and restoration partners identify 3 ways to promote resilience and long-term survival within outplant strategies (c) Cost per coral is reduced by 10% over a 5-year timeframe	(a) Annually (b) Within 5 years (c) Within 5 years	Disney Florida Aquarium Mote NOAA FWC Other restoration partners	≥$1,250,000 per year • $600,000 (Mote) • $600,000 (FLAQ) • $50,000 (Disney)
Strategic Objective 2: Manage a network of coral gene-banks to increase long-term population viability and save coral species from extinction.					
• AZA institutions • Restoration partners • Research partners • Government partners	(a) Care for thousands of genetically-diverse corals in *in-situ* and *ex-situ* nurseries and living gene banks. (b) Ensure redundancy for key genotypes across a network of land-based facilities. (c) Utilize nursery stock to produce corals for restoration and research. (d) Partner with industrial design and manufacturing companies to increase efficiency in nursery-management and reduce costs per coral. (e) Improve knowledge of coral genetics of populations within AZA institutions to better inform population management strategies. Coordinate and share this data with the Global Coral Biobank. (f) Create a restoration pathway of networked facilities that connects coral production facilities with outplanting entities.	(a) ≥20,000 coral colonies held in nurseries across partners (b) Integrate ≥20 genotypes of all conservation targets within land based facilities. (c) Produce >20,000 corals asexually and sexually from existing broodstock. (d) Reduce the cost per coral by 10% over 5 years. (e) Collate all existing provenance data of Florida source coral held within US institutions. (f) Within 5 years create a partnership with AZA facilities and Florida based NGOs to facilitate the relocation of corals from production facilities to Florida-based facilities responsible for outplanting.	(a) Annually (b) Within 3 years (c) Within 2 years (d) Within 5 years (e) Within 2 years (f) WIthin 5 years	Disney Florida Aquarium Mote AZA-FRTRP Coral-holders SAFE Coral Program Manager Global Coral Biobank Restoration Partners	$50,000 to ≥$500,000 per year for each land-based gene-bank, depending upon scope and scale

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
Strategic Objective 3: Expand our collective capacity for controlled aquarium spawning to support the program goals.					
• AZA institutions • Restoration partners • Research partners • Government partners	(a) For corals that are part of the AZA-FRTRP, work with the FWC to determine goals and priorities for spawning of rescued corals through development of a broodstock management and propagation plan. (b) Increase the number of corals spawning in our aquaria to increase overall genetic diversity of the offspring produced through cross-fertilization. (c) Successfully spawn all high-priority species, including those outside of the AZA-FRTRP (d) Increase the number of facilities conducting spawning work (e) Increase the genetic diversity of our broodstock (f) Increase collaboration and coordination between spawning facilities to better advance our goals	(a) Develop broodstock management and propagation plan with FWC (b) Increase # of individuals synchronously spawning (c) Increase # of species spawning to include all high-priority species (d) Add 1-2 facilities with spawning capabilities (either brooders or broadcasters) (e) Conduct a collaborative collection-planning workshop to identify areas where genetic diversity of broodstock is low, and develop a plan to mitigate this through transfers and, if necessary, wild-collection (f) Hold at least 3 collaborative sharing sessions to discuss spawning among facilities	(a) Within 2 years (b) Annually (c) Within 3 years (d) Within 5 years (e) Within 3 years (f) Within 5 years	Florida Aquarium Mote Steinhart Aquarium AZA-FRTRP coral-holders	$75,000 to $100,000 or more per facility per year, depending upon the scope and scale of the work at each institution.

Threat-based Objectives: A priority of the NOAA recovery plan for corals is to simultaneously reduce local, regional and global threats for endangered coral species across their geographic ranges. The following group of strategic objectives for the SAFE Coral program directly support this priority (NOAA 2015 *Acropora* recovery plan: Objective 2, Criteria 4–10).

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
Strategic Objective 4: Rapid response: support agencies' calls to action to rapidly mobilize support for emerging threats such as temperature-stress events, disease outbreaks, etc. as well as incident-response at land-based nurseries and gene-banks.					
• AZA institutions • Restoration partners • Research partners • Government partners	(a) Develop a rapid-response process and communication-plan targeted to the tropical Western Atlantic region. (b) Communicate the existence of this team and plan to key government and regulatory partners. (c) Develop a funding strategy for likely response scenarios and identify funding partners	(a) Draft and distribute a response plan for review and comments (b) Present the plan to at least three existing and relevant working groups (c) Partner with Fish & Wildlife Foundation of Florida for funding	(a) Within 1 year (b) Within 1 year (c) Within 1 year	SAFE Coral Program Manager Program Leadership Steering Committee	Funding for response depends heavily on the type of crisis we are responding to. Approximately $15,000 per week of support, based on prior work (6 people/week).
Strategic Objective 5: Increase capacity for coral research, prioritizing research on animal care, diseases, the impacts of climate change and ocean acidification, scaling up the efficiency of restoration (reducing costs), and increasing climate-change resilience in corals grown in nurseries and aquaria.					
• AZA institutions • Restoration partners • Research partners • Government partners	(a) Form long-term strategic research partnerships between AZA member institutions and scientists studying coral biology, restoration techniques, disease, and reproduction.	(a) Form at least two partnerships between program partners and research institutions	(a) Annually (b) Annually (c) Within 2 years	SAFE Coral Program Manager Florida Aquarium Mote Marine	$75,000 to $150,000 per year per institution, depending on research focus

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
	(b) Produce corals for research projects. (c) Create a recommended form/process for research proposals including those detrimental to animal wellbeing. Standardize reporting requirements, and serve as intermediary to connect researchers that need corals to AZA institutions that could provide them.	(b) Provide 1,000 corals to address critical research / provide corals for at least 5 research projects (c) Draft and distribute a recommendations paper for guidelines and expectations related to corals in research		Shedd Steinhart Aquarium	
Strategic Objective 6: Train and develop the next generation of coral aquarists and restoration practitioners and leaders.					
• AZA institutions • Restoration partners	(a) Support and integrate the work of AZA member institutions into conservation networks and resources, active leadership of restoration working groups, and representation at major conferences. (b) Produce training materials and conduct training and capacity-building through online and in-person workshops. (c) Support the successful continuation of the Coral Aquarist Program as a part of AZA's professional development tract.	(a) Ensure at least 10 AZA members participate within existing conservation and restoration working groups; Two presentations are given at conferences each year (b) At least one in-person workshop and one online workshop each year. (c) Recruit and administer the Coral Aquarist Program for at least 8 coral restoration practitioners each year.	(a) Annually (b) Annually (c) Annually	Florida Aquarium Mote Marine AZA SAFE Coral Program Manager	N/A (in-kind support) The cost of the Coral Aquarist Program is $90,000 per year
Strategic Objective 7: Support public awareness and engagement campaigns that connect carbon emissions to the coral reef crisis in a bipartisan manner, with an ultimate goal of building empathy for reefs and increasing political will to address the root cause of climate change.					
• AZA institutions • Restoration partners • Government partners	(a) Work with NNOCCI and ACE for Wildlife to develop stories tailored for regional US zoo and aquarium audiences that focus on empathy for coral and specific actions to fight climate change. Conduct evaluation to measure the impact of this effort. (b) Work with the Aquarium Conservation Partnership to link our CO2/GHG pledges with storytelling about the coral reef crisis. (c) Social media: work with AZA and SAFE Coral program partners on a social media messaging toolkit (d) Media: each year, secure media articles, television spots or online videos highlighting the work that AZA members are doing to help address the coral reef crisis. (e) Public display: encourage coral-holders to move rescued corals on to public display to increase awareness of the project and AZA response (f) SAFE Seascapes: employ the partnership to amplify our messaging through the other aquatic programs (g) Education: each year, develop program ready curriculum and activities for educators to use across and outside of AZA facilities.	(a) Develop strategy with NNOCCI. Have training with interested partners.10 partner institution representatives to take the course. If not taking it then indicate how they are participating in their local area (e.g. write a local story). (b) Meet with ACP to determine interest and action items. Report out and execute on findings. (c) Create a tool kit with approved messaging. Use behavioral evaluation of messaging impact to direct messaging. (d) >30 media articles, television spots or online videos. (e) 5 institutions convert their display space to SAFE Coral	(a) Within 2 years (b) Within 1 year (c) Within 1 year (d) Per year (e) Within 5 years (f) Within 1 year (g) Annually (h) Within 2 years	(a) Ed Working Group (b) Ed Working Group (c) Ed Working Group + steering committee (d) Ed Working Group + Program Leadership, Program Manager, and steering committee. (e) Ed Working Group + Program Leadership, Program Manager, and steering committee. (f) Ed Working Group + Program Manager. (g) Ed Working Group (h) Steering Committee, Ed Working Group and Program Manager	(a-b) $7,500 per year for travel expenses related to attending AZA conferences and other meetings. (h) Approximately $5,000 to construct and $2,000/year to maintain.

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
	(h) SAFE Coral Website: Develop a website for improved awareness of the program and to promote potential opportunities for collaboration and fundraising.	display animals with messaging. Produce a toolbox to provide consistent effective messaging based on evaluation. (f) SAFE Coral representative serves on Seascapes messaging committee. (g) Create an education repository/toolkit that includes 3 new lessons for school programs and/or floor activities for use with facility visitors. (h) Define/obtain domain name and construct website.			

Funding and Participation Objectives: In order to scale our impact and allow more AZA member institutions to actively participate in and support the SAFE Coral program, we have developed the following objectives:

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
Strategic Objective 8: Develop and implement a proposal for a SAFE Coral Program Manager position.					
• AZA institutions • Government partners	(a) Write job description, delineate role and priorities, and identify a "host" organization/entity for the position. (b) Develop a budget for salary, travel, etc (c) Develop a plan for fundraising, and identify revenue streams (d) Require an annual program commitment for program partners?	(a) Create position (b) Ensure adequate funding is acquired each year, ideally on a 3-year cycle. (c) Hire Program Manager (d) Draft and circulate funding request to program partners	(a) Within 3 months (b) Within 3 months (c) Within 1 year (d) Within 1.5 years	Disney Florida Aquarium Mote SeaWorld Orlando Steinhart Aquarium FWC FWFF NOAA Fisheries AZA	$180,000 to $200,000 per year, including salary and travel expenses
Strategic Objective 9: Facilitate onboarding new program partners by developing and distributing a "SAFE Coral new partner starter kit."					
• AZA institutions: specifically coral-holding facilities that are not program partners	(a) Form working group (b) Model kit on SAFE African Penguin starter kit (c) Identify candidate partners using the 2023 AITAG space survey (d) Send kit to all coral-holding facilities who are currently not signed on as formal program partners	(a) Established Working Group (b) Starter Kit Established (c) Develop list of coral-holding institutions that are not current program partners (d) Kits sent to all potential partners	(a) Within 1 year (b) Within 1 year (c) Within 2 years (d) Within 2 years	(a) Ed Working Group, Program Manager and Steering Committee (b) Ed Working Group + Program Manager and Steering Committee (c) Steering Committee (d) Program Manager	$2,500 for printing and distribution

Stakeholders Engaged	Activity	Metrics	Timeframe	Responsible Party	Budget
Strategic Objective 10: Establish a SAFE Coral Advancement Team, and develop a 5-year funding strategy.					
• AZA institutions • Government partners	(a) Develop SAFE Coral Advancement Committee (AC). (b) Launch development strategy for internal (AZA) partners. (c) Launch development strategy for external partners. (d) Create an endowment fund to financially support SAFE Coral annually. (e) Launch an endowment campaign.	(a) Recruit 5-7 member fundraising team; conduct brainstorming workshop; draft and implement strategy. (b) Provide options and opportunities for membership to support SAFE Coral through direct funding (c) Identify partners (private, corporate, etc); create engagement process/plan; request funding. (d) Identify potential funding sources; establish a dedicated account at an AZA partner institution; Review and determine funding needs; Develop strategy and launch campaign	(a) Year 1 (b) Year 2 (c) Year 3 (d) Year 4	(a) SAFE Coral Steering Committee and Program Manager (b) Advancement Committee (c) Advancement Committee (d) Leadership and Advancement Committee (e) Program Partners	$30,000 for travel and in-person meetings
Strategic Objective 11: Develop a process for incorporating Pacific species into our work plan. The target species for the SAFE Coral program are 22 priority species from the Caribbean Sea, Gulf of Mexico and tropical Western Atlantic Ocean. However, the program will begin endorsing projects that are working with species in other regions, including the tropical Indo-Pacific, Indian Ocean and Red Sea.					
• AZA institutions • Restoration partners • Research partners • Government partners	(a) Conduct listening sessions with members working in the Pacific (b) Form a working group to lead the process (c) WG develops the criteria for endorsement, the timeline, and the review process (d) WG makes recommendations to Steering Committee (e) Steering Committee reviews/approves (f) Roll out process to endorse Pacific projects	(a) Implement three listening sessions (b) Form working group (c) Develop criteria (d) Provide recommendations (e) Review and approve recommendations (f) Roll out process	(a) Within 1 year (b) Within 2 years (c) Within 2 years (d) Within 3 years (e) Within 3 years (f) Within 3 year	SAFE Coral Steering Committee, Program Manager, Partners and Advisors	N/A (in-kind support)

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Appendix 1:
SELECT PRESS AND MEDIA

2023

SAFE under the sea AZA Connect, 18 January 2023
Scientists work to save Florida's reef CBS News, 2 February 2023
Omaha's zoo saves coral reefs in the middle of the heartland KETV7, 15 February 2023
Probiotics may help corals fight a dangerous disease off Florida's coast Smithsonian, 6 April 2023
Driving coral recovery: the coral bus 26 April 2023
The Florida Aquarium successfully spawns grooved brain coral Ecomagazine, 18 May 2023
Baby king crabs find new home at Mote SNN News 18 May 2023
Atlantis to create The Bahamas' first coral gene bank Travelpulse 8 June 2023
SeaWorld to open first and all-new coral rescue center to guests Cision 9 June 2023
Opal Resorts Partnership with Mote Marine Lab Keys News 17 July 2023
Scientists at Florida Aquarium working to restore declining reefs Fox13 Tampa Bay 17 July 2023
Strikingly warm ocean heat wave could decimate corals ABC News 20 July 2023
Florida Keys coral reefs are already bleaching Heromag 21 July 2023
Wounded US veterans accept new mission: healing coral reefs Raw Story 24 July 2023
As Florida ocean temperatures spar, a race to salvage imperiled corals Washington Post 26 July 2023
Scientists race to rescue corals from deadly ocean temperatures Yahoo Finance 26 July 2023
Florida's record hot ocean temperatures cause early coral bleaching USNews & World Report 26 July 2023
Apocalyptic: Scientists rush to rescue corals withering in Florida's hot waters Miami Herald 27 July 2023
Georgia Aquarium works to help restore coral reefs FOX5 Atlanta 28 July 2023
Florida's coral is in hot water. Scientists are diving in before it's too late Merced Sun-Star 3 August 2023
Can a scientific Noah's Ark save Florida's coral reef from warming? Fox13 News, 7 August 2023
20 new coral colonies added to Florida Aquarium breeding program Tampa Bay News 10, 10 August 2023
Florida's coral reef is in danger. Rescued corals may aid recovery New York Times Post, 16 August 2023
Mote Marine Lab responds to ongoing coral bleaching crisis Fox 4 News, 17 August 2023
America's most iconic coral reef is dying; only one thing will save it Vox 18 September 2023
Wounded army veterans are working to save coral reefs TCD 18 September 2023
Why I'm worried about Florida's mass coral bleaching, and you should be too Her Campus 19 Sept 2023
Scientists will unleash an army of crabs to help save Florida's dying reef Vox 27 September 2023
The Florida Aquarium helps rescue 5,000 corals in the Florida Keys Tampa Bay 10, 29 September 2023
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Chicago biologists from Shedd Aquarium return from coral reef expedition CBS 2 Chicago, 4 October 2023
A Caribbean king crab swarm to be released in Florida Keys Press News Agency, 12 October 2023
Florida's corals rescued from one of the worst bleaching events are back to the ocean WUFT, 15 Nov. 2023
Heat tolerant coral may trade fast growth for resilience Science Daily, 17 November 2023
New hope for Puerto Rico's coral reefs NOAA Fisheries News, 4 December 2023
Mote Coral Restoration Experts Return Evacuated Corals to Nurseries AZA news, 12 Dec 2023
The Florida Barrier Reef's Last Stand Reason, 19 Dec 2023
Our HeaRTs Go Out To Help Hot Corals AZA Connect, December 2023

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Florida sea urchins to the reefs' rescue Axios Tampa Bay 5 January 2022
Florida Aquarium project seeks to regenerate state's reef tract Fox13 3 February 2022
Metro Detroit aquarium an ark for Florida corals Spartan Newsroom 11 February 2022
Zoopalooza: coral restoration at Nashville Zoo CBS 19 News 28 February 2022
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A deadly disease is wiping out corals in Florida National Geographic 15 November 2021

Appendix 2:

SELECT RESEARCH AND RESTORATION ACTIVITIES

Organization	Activity	Timeframe
AZA-Florida Reef Tract Rescue Project (20 facilities in 13 states)	Coral rescue Aquarium spawning systems Capacity-building in Florida Emergency response (HeART)	2018–present 2023
California Academy of Sciences Steinhart Aquarium	*Hope for Reefs* initiative SECORE partnership Aquarium spawning system Capacity-building in Roatan, Honduras	2016–present 2016–present 2018–present 2023–present
Columbus Zoo and Aquarium	SECORE partnership AZA-FRTRP coral-holding facility *Diadema* sea urchin restoration techniques	2005–present 2019–present
The Florida Aquarium	Center for Conservation construction Aquarium spawning systems AZA-FRTRP coral-holding facility Production of corals for restoration partners *Diadema* sea urchin restoration techniques	2016–2024 2019–present 2018–present 2017–present 2016–present
Disney's Animals, Science and Environment	Capacity-building in The Bahamas Florida Coral Rescue Center	2007–present 2021–present
Henry Doorly Zoo	SECORE Partnership AZA-FRTRP coral-holding facility	2017–present 2019–present
Maritime Aquarium at Norwalk	Capacity-building in Colombia AZA-FRTRP support	2019–present 2019–present
Mote Marine Laboratory and Aquarium	Direct restoration of Florida coral reefs Land-based gene banks and nurseries Herbivorous crab restoration techniques Aquarium spawning systems	2012–present 2012–present 2022–present 2020–present
Shedd Aquarium	Research on coral resilience and restoration SECORE partnership	2018–present 2006–present

RELATED SCIENTIFIC PUBLICATIONS: 2021-2023

(Program Partners Representatives in bold)

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