

Coral Reef Restoration

A DOI Nature-Based Solutions Roadmap Fact Sheet



Coral reefs are the skeletons of marine invertebrates called coral, which form large underwater structures comprised of colonies. Coral reefs are built by hard corals that extract calcium carbonate from the ocean to create an exoskeleton.¹ Coral polyps, which are individual corals, begin building reefs by attaching themselves to submerged rocks or hard surfaces near the ocean floor (CRA 2018). In the United States, corals are concentrated in the Pacific Islands, the Caribbean, and the Gulf Coast, with a few isolated deep-sea corals off the Pacific and Carolina coasts.²

TECHNICAL APPROACH

Coral restoration techniques are often used in conjunction with each other and none of the methods are mutually exclusive:

- Removing stressors, such as removing coral predators, algae, or invasive species as well as managing coral diseases^{3,4,5,6}
- Enhancing reef structure using artificial reefs that add hard substrates for coral polyps to attach to⁷
- Supplementing the coral population using coral transplantation, coral gardening in nurseries, micro-fragmentation (to enhance growth), or larval enhancement (raising harvested embryo corals in a protected environment before releasing them at a reef)^{8,9,10,11}

BENEFITS

Climate Threat Reduction

- Storm protection
- Reduced flooding
- Sea level rise adaptation and resilience
- Carbon storage and sequestration

Social and Economic

- Reduced erosion
- Property and infrastructure protection
- Recreational opportunities
- Tourism
- Food security
- Resilient fisheries
- Jobs
- Mental health and wellbeing
- Cultural values
- Scientific research

Ecological

- Enhanced biodiversity
- Supports wildlife
- Increased primary productivity
- Improved water quality

SITE SUITABILITY FACTORS

- ✓ Room to accommodate colony expansion
- ✓ Close to existing wild coral populations
- ✓ Ample sunlight
- ✓ Hard and stable substrate
- ✓ Historical presence of coral reefs
- ✗ High temperature variability
- ✗ High human impact on the site
- ✗ High levels of coral predation
- ✗ High water movement
- ✗ High sediment or nutrient pollution

EXAMPLE PROJECT

The Carysfort Reef Restoration off Key Largo Florida is one of seven distinct coral restoration projects within the Florida Keys National Marine Sanctuary. The 31-acre site was historically a vibrant reef that supported endangered elkhorn and staghorn corals, but was severely degraded by coral disease. The restoration efforts involved installation of artificial reef structures and coral out-planting of over 200,000 corals.



Corals on site. Photo credit: [Coral Restoration Foundation](#)

KEY RESOURCES

Title and Link	Site Suitability	Design and Construction	Monitoring Guidance	Example Projects
Coral Reef Restoration: A Guide to Coral Restoration Method	✓	–	✓	✓
A Manager's Guide to Coral Reef Restoration, Planning and Design	✓	✓	✓	–

LEARN MORE

Visit the DOI Nature-Based Solutions Roadmap for more information on coral reef restoration, other nature-based solutions, and principles and considerations broadly relevant for nature-based solutions projects. The coral reef restoration summary includes additional details on each section included in this fact sheet, plus information on operations and maintenance, common barriers, and more resources and example projects.

Explore the Roadmap



Full Roadmap Document



Coral Reef Restoration Section

www.nicholasinstitute.duke.edu/roadmap

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