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# Coral Reef Restoration overview in the U.S. Virgin Islands

Dinorah Chacin, Ph.D.  
May 30, 2024



# Presentation outline

- USVI Coral Reef Restoration Plan
  - Background
  - Goal Setting
  - Site Selection
  - Coral Targets
  - Next Steps
- Coral restoration efforts beyond the territorial plan



# The US Virgin Islands 2020-2025 Coral Reef Management Priorities

- Restoration Objective 4: Identify areas where restoration efforts will be most successful and beneficial incorporating an assessment of multiple stressors and cumulative impacts considering environmental, ecological, economic and social factors.

## Activities:

- Develop a prioritized restoration plan that identifies potential restoration sites to be used in mitigation of planned impacts and identify areas where previous restoration efforts were implemented.

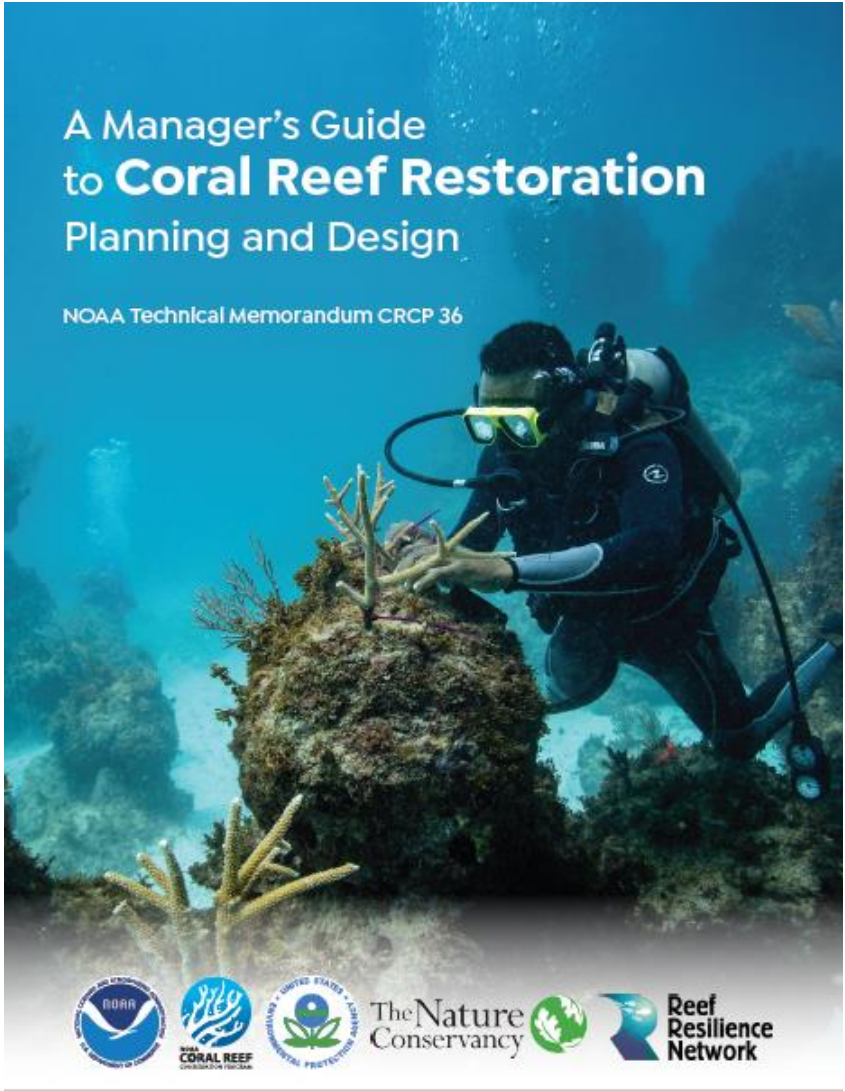


# Virgin Islands Restoration of Coral Squad (VI-RoCS)

Formed end of 2020 to develop a Territorial Coral Restoration Plan to:

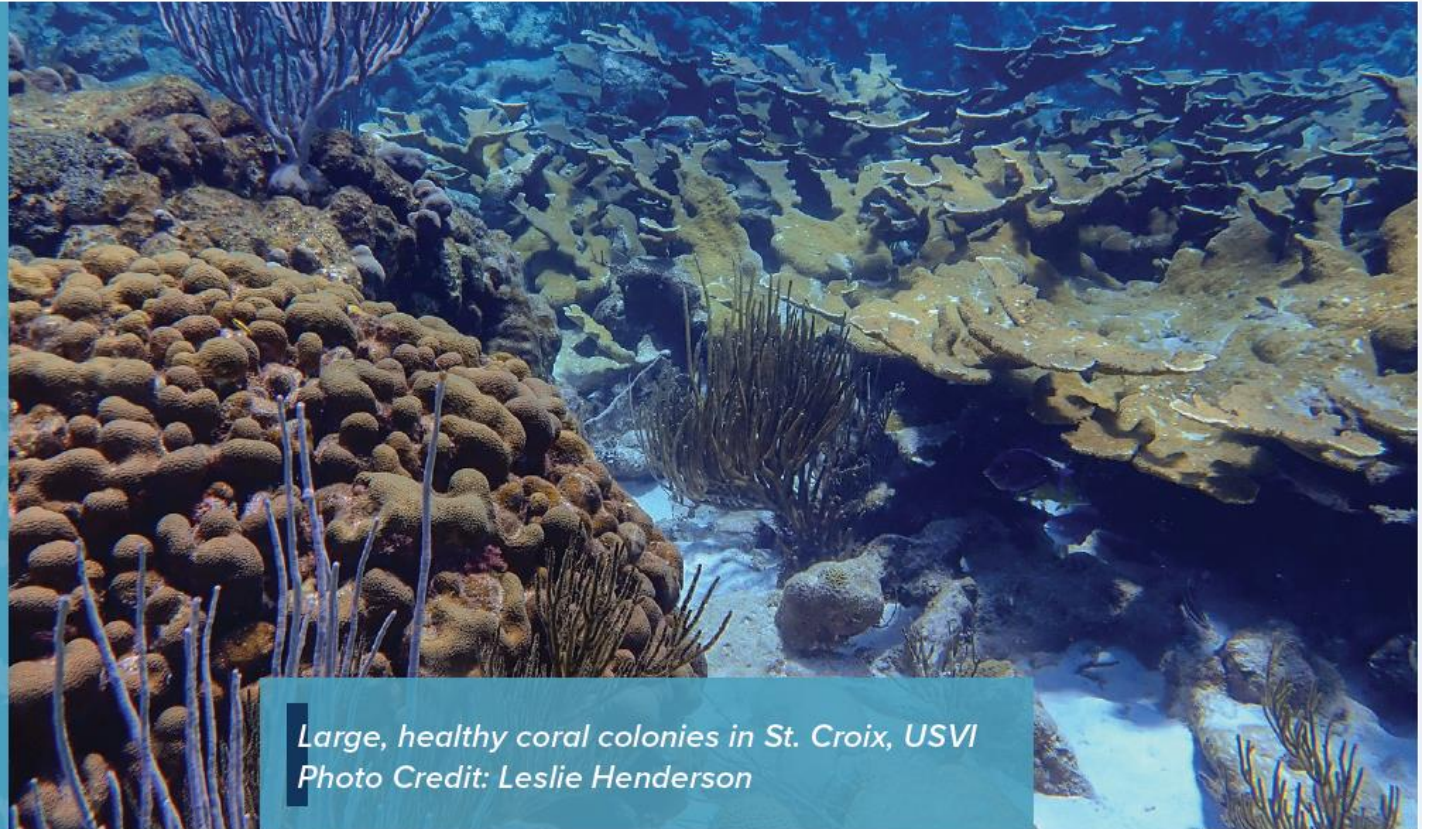
- Allow territorial managers a stronger guiding voice in restoration
- Focus restoration efforts onto specific prioritized reefs
- Coordinate multiple restoration efforts
- Create targets to better track success
- Craft more competitive proposals in some funding opportunities





## Overarching USVI Coral Restoration Goal

To combat coral reef degradation caused by environmental change and human impacts, we will reestablish and/or maintain the ecological function at several (5-10) priority coral reef restoration sites across the territory within the next 10 years.



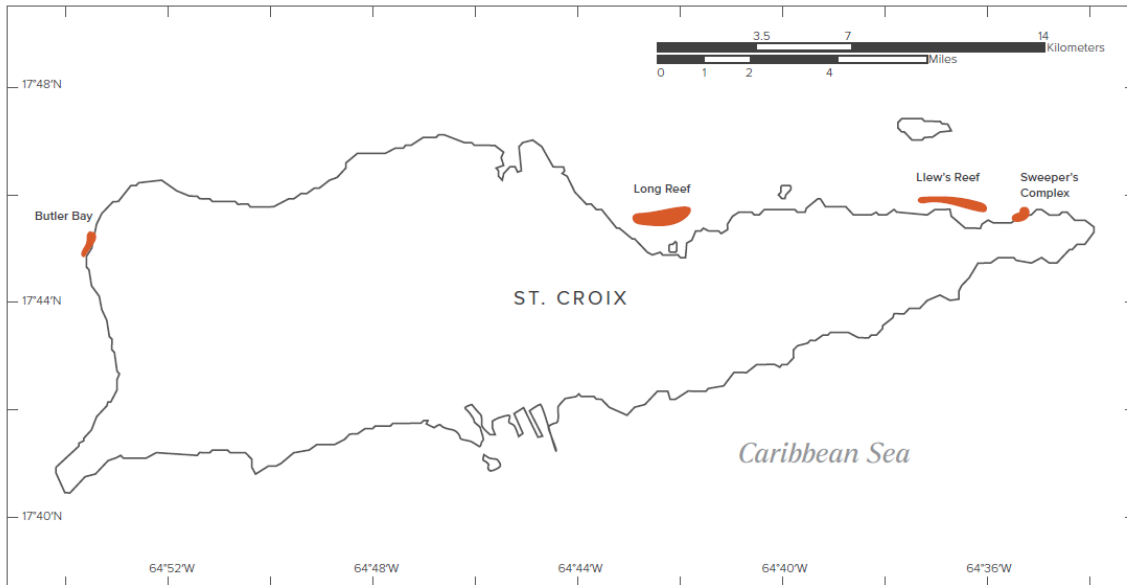
*Large, healthy coral colonies in St. Croix, USVI  
Photo Credit: Leslie Henderson*



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# USVI Priority Restoration Sites

## ST. CROIX CORAL RESTORATION PRIORITY SITES

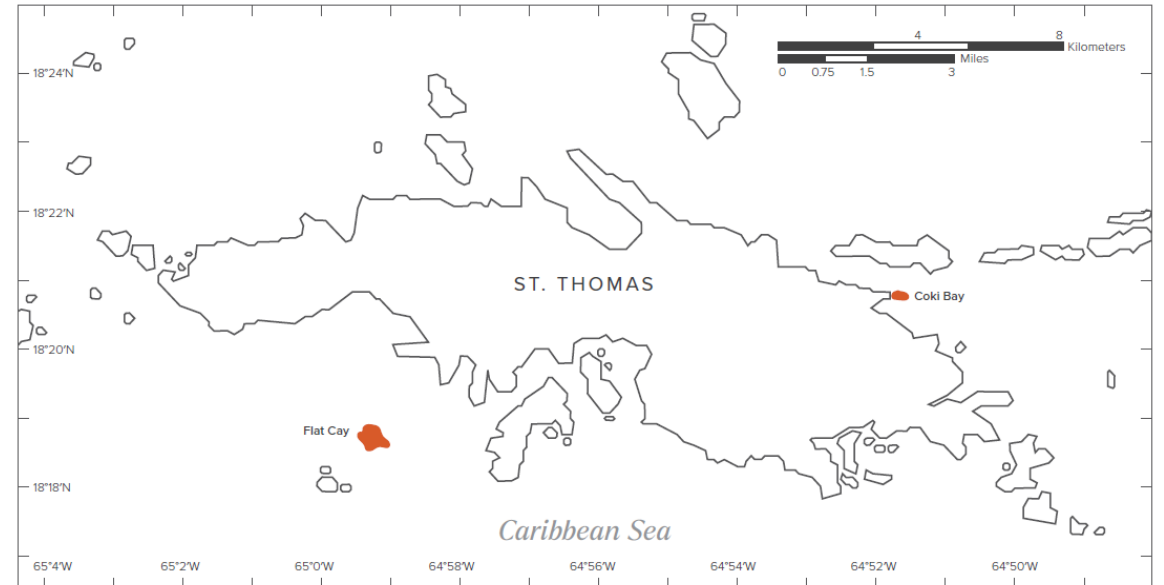


**LEGEND**  
 VI-RoCS Coral Restoration Sites

**OVERVIEW MAP**



## ST. THOMAS CORAL RESTORATION PRIORITY SITES



**LEGEND**  
 VI-RoCS Coral Restoration Sites

**OVERVIEW MAP**



# Mapping and Coral Reef Habitat Classification

Coral Reef Habitat Zone Classification	Description
Reef Crest	Shallow (> 2m [7 ft]) zone of reef laying between back and fore reef zones. Breaking waves can occur with high wave action, but the area is generally workable.
Shallow Reef Crest	Very shallow (< 2m [7 ft]) zone of reef laying between back and fore reef zones. Breaking waves almost always occur. Work in this area is hazardous.
Forereef Terrace	Seaward facing slope feature with shallow angle.
Backreef	This zone lies between the seaward edge of a lagoon floor and the landward edge of the reef crest.
Aggregate Reef - shallow	Hard-bottom continuous or consolidated reef substrate with corals. This zone is usually <i>Orbicella</i> spp. dominated (< 30m [98 ft]) and does not conform to the traditional spur and groove formations.
Aggregate Reef - deep*	Hard-bottom continuous or consolidated reef substrate with corals (> 30m [98 ft]).
Spur and Groove	Made up of ridges of reef formed by coral spurs separated by channels, which may have sediment or rubble.
Patch Reef	Isolated to semi-isolated coral outcrop arising from a sandy-bottomed area. Less than ¼ acre in extent.
Dense <i>A. palmata</i> Framework	Branching reef-building zone of <i>Acropora palmata</i> (Elkhorn coral) (e.g., haystacks at Buck Island Reef). Can exist on reef crest zones.
Scattered Coral and Rock	Made up of corals and rock that are scattered and not aggregated enough to be considered a patch reef.
Unconsolidated Reef/Rubble Zone*	Barren zone of scattered coral fragments (some loose) and sand.
Artificial	Non-biogenic, introduced artificial reef structure. Manmade or placed, non-naturally occurring structure.
Bedrock	Made up of igneous, sedimentary (non-carbonate), or metamorphic rock and can take boulder form or huge slabs. Difficult to nail into.
Pavement/Rhodolith	Made up of flat, low-relief, solid carbonate rock or a rhodolith field.
Sand	Composed of sand substrate.
Seagrass	Composed of seagrass flowering plants.

Notes: Asterisk indicates a classification was not applicable for the priority sites in this Plan, but may be used in additional future site planning.

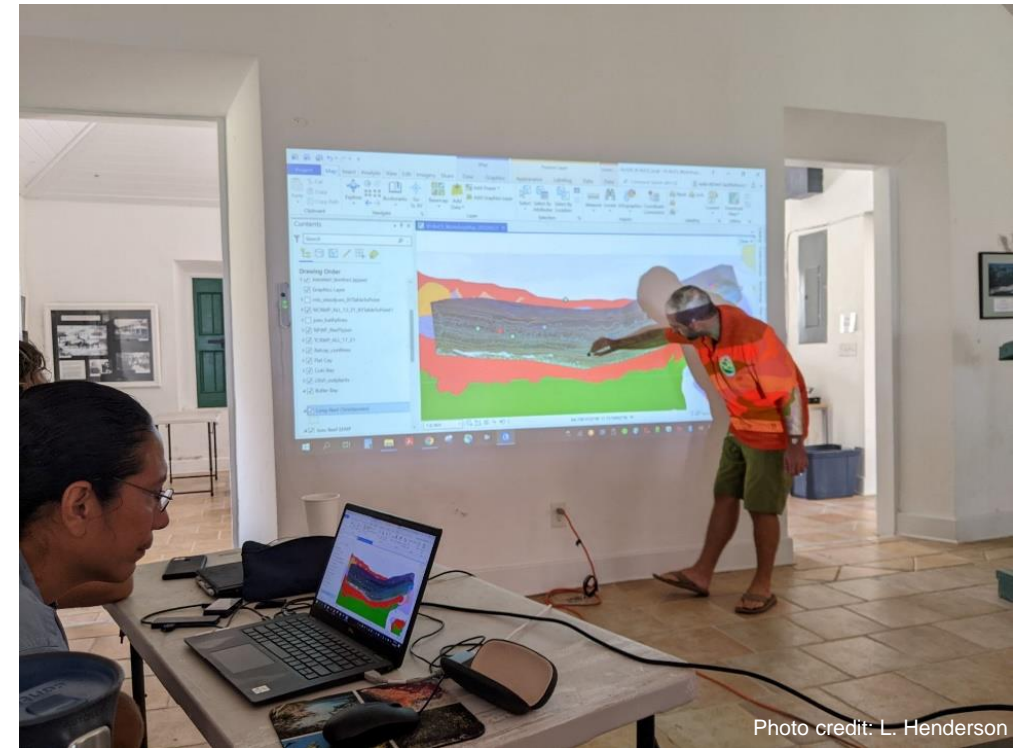


Photo credit: L. Henderson



## VI-ROCS CORAL RESTORATION SITE: Flat Cay, St. Thomas

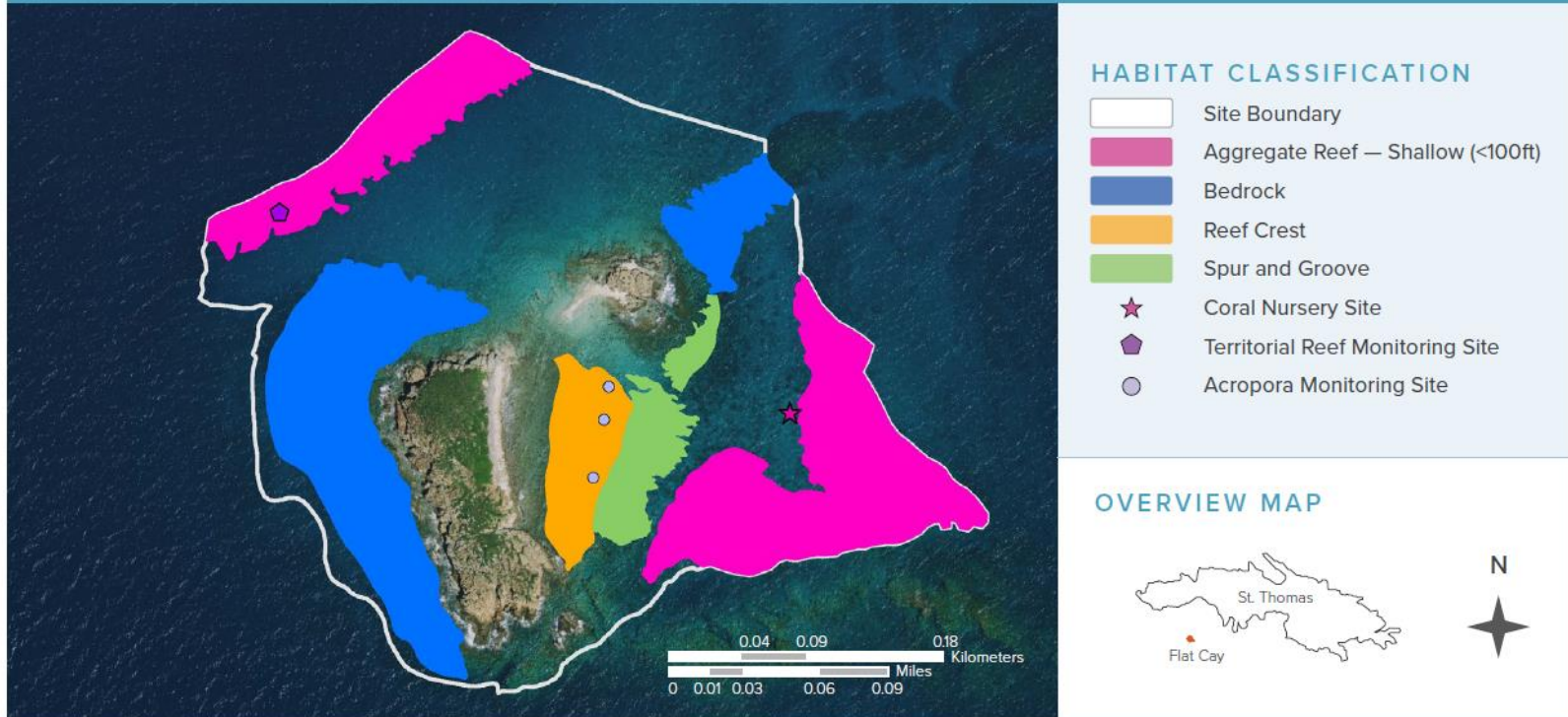


Table 6. Flat Cay 10-Year Restoration Targets

Flat Cay Site Totals	
Total Mapped Area (m <sup>2</sup> )	56,374
Restorable Area of Reef (m <sup>2</sup> )	42,352
Number of Coral Outplants Needed	
Coral Restoration Components	Total
Elkhorn Coral	2,535
Staghorn Coral	2,256
Star Coral	27,040
Brain Coral	6,359
Pillar Coral	133
Other Small Stony Coral	18,256
<b>Totals</b>	<b>56,578</b>

*Table 4.* Number of Coral Outplants Needed to Reach 10-Year Targets



Island	Site	Elkhorn Coral	Staghorn Coral	Star Coral	Brain Coral	Pillar Coral	Small Stony Coral	Total
 St. Thomas	Flat Cay	2,535	2,256	27,040	6,359	133	18,256	56,578
	Coki	725	76	3,120	3,537	0	0	8,879
 St. Croix	Llew's Reef	6,018	2,720	2,779	2,779	0	941	15,237
	Long Reef	5,039	0	57,164	16,259	0	109,768	188,230
	Butler Bay	6,154	0	528	826	0	1,734	9,243
	Sweeper's Complex	1,314	17	870	2,655	0	1,355	6,212
<b>Total</b>		<b>21,786</b>	<b>5,068</b>	<b>91,502</b>	<b>32,416</b>	<b>133</b>	<b>133,475</b>	<b>284,380</b>

# Result: USVI Coral Reef Restoration Plan!

<https://dpmr.vi.gov/coastal-zone-management/what-we-do/coral-reef-initiative/>



# Next Steps

- Online ESRI mapping tool with local coral reef data
- Meet periodically to evaluate progress
- Development of restoration a monitoring protocol
- Development of a genetic management plan



Photo credit: Michael Aw / Ocean Image Bank

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# The Nature Conservancy (TNC)

- Restoring Llews Reef, St. Croix
- Conducting restoration in the USVI since 2009 focusing on fast growing branching species
- Field-based nurseries in Cane Bay, Little Princess, Channel Rock, BUIS, and land-based nursery at the Coral Innovation Hub
- Incorporating slower-growing species of boulder, brain, and star corals using microfragmented corals outplanted in arrays
- Assisted sexual reproduction of brain corals to increase genetic diversity
- Questions? [Jessica.ward@tnc.org](mailto:Jessica.ward@tnc.org)



Photo credit: M. Davies



Photo credits: THE NATURE CONSERVANCY | CARIBBEAN

# The University of the Virgin Islands (UVI)

- Restoring in
  - St. Thomas: Flat Cay, Coki Point, Peterborg Point, Hull Bay, Brewers Bay, Perseverance Bay, Stumpy Bay, Fortuna Bay
  - St. John: Lovango Cay, Mary's Creek, Leinster 3 buoys, Watermelon Cay
- Several field-based nurseries and 1 land-based nursery at the Center for Marine and Environmental Studies
- Microfragment arrays on substrates or to cement domes
- Focusing on branching, star, brain, and pillar corals
- New building to expand land-based and coral rescue capacity
- Questions? [mbrandt@uvi.edu](mailto:mbrandt@uvi.edu)





# Coral World Ocean and Reef Initiative



- Restoring Coki Point, St. Thomas
- Field-based nursery and land-based nursery at Coral World
- Methods evolved with two-part epoxy then to coral clips, to a Portland cement silica fume
- Focusing on branching, star, finger corals
- Coral genetic rescue and propagation Ark
  - Targeted corals: pillar, brain, boulder, star, and maze corals
  - Spawning induction system
  - Coral gene bank
  - Treatment system

Questions? [educationandresearch@coralworldvi.com](mailto:educationandresearch@coralworldvi.com)



Photo Credits: L. Williams and L. Henderson

# The National Park Service

- Restoring in:
  - St. John: Virgin Islands National Park – Leinster Bay 3 sites
  - St. Croix: Buck island Reef National Monument – 2 sites
- Goals to increase coral cover by 10% over 10 years
- Field-based nursery and land-based nursery
- Partnering with TNC in STX and UVI, CWORI, CORE in STJ
- Focusing on branching corals, but finger, boulder, brain, star and pillar corals are included in their plan
- Fragments attached with epoxy or cement and use of pucks from fragmented pieces
- Questions? Catherine\_toline@nps.gov

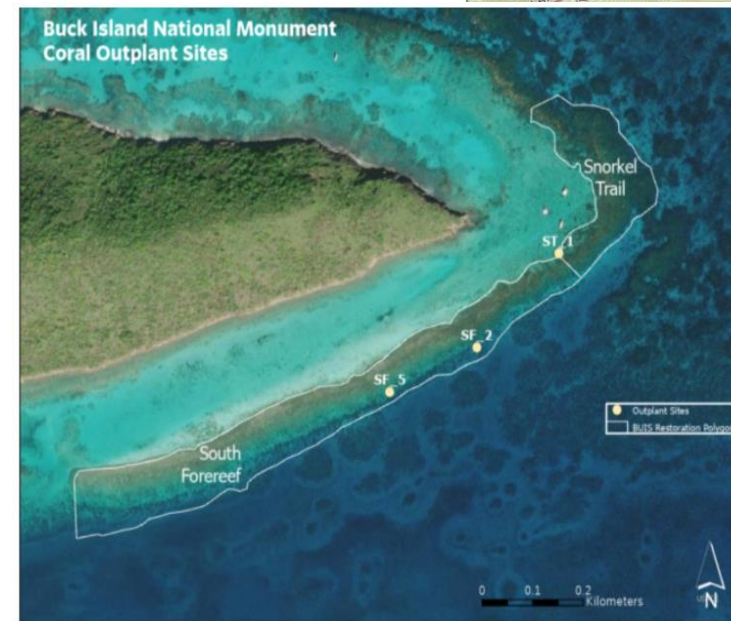
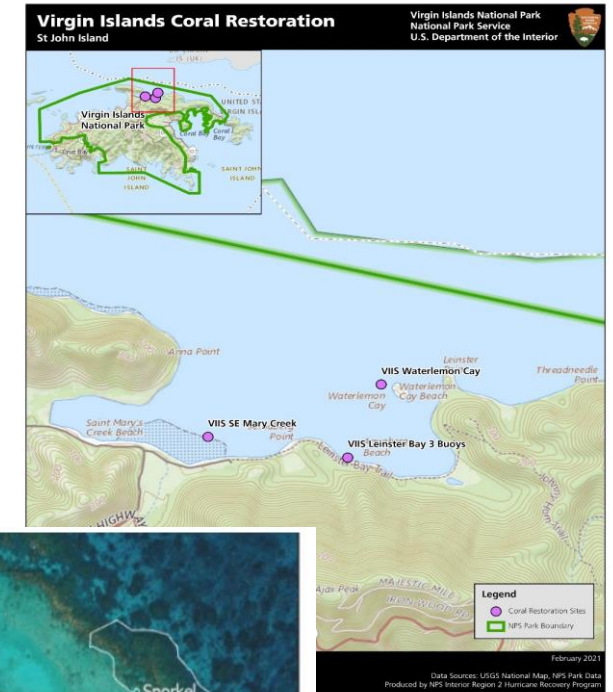
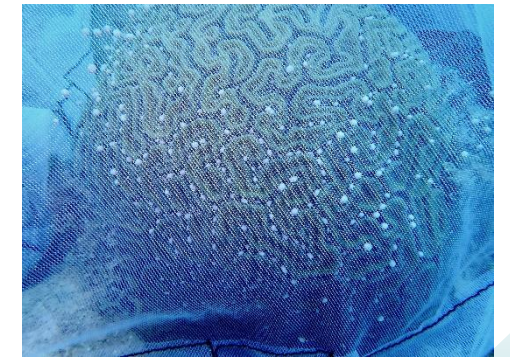
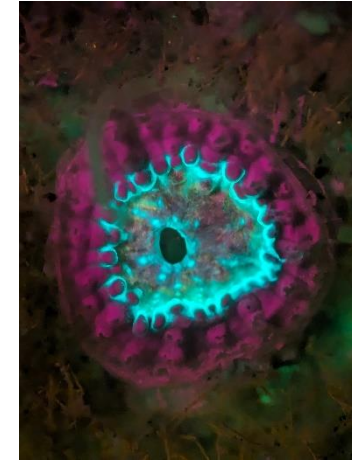


Figure 1. Location of outplant sites within restoration polygons at Buck Island Reef National Monument.

# Thriving Islands and Ceiba Strategies

- Restoring Butler Bay, St. Croix
- Pop-up coral propagation lab at Feather Leaf Inn in May and June incubation chambers for brain corals on an artificial structure
- Outplanted more than 700 arrays of elkhorn in 2023 and 2024 and 27 brain corals in 2023
- Asexual coral propagation - elkhorn coral
- Assisted sexual reproduction of brain corals
- Reattaching corals of opportunity
- Questions? [Corina.marks@gmail.com](mailto:Corina.marks@gmail.com) and [Jordan@ceibastrategies.com](mailto:Jordan@ceibastrategies.com)



# Coral Restoration Foundation

- Restoring in
  - St. Croix: Long Reef
    - Targets: in situ nursery establishment, **~7,000** multi-species outplant
  - St. Thomas: Coki Beach
    - Targets: staffing support, **~2,000-3,000** multi-species outplant
- Goals: enhancing nursery capacity and, genetic sequencing of Elkhorn coral
- Field-based nursery and plans to add more nurseries near Long reef
- Branching, brain, boulder, and star corals
- Outplanting using coral clips and direct attachment with marine epoxy
- Questions? [bailey@coralrestoration.org](mailto:bailey@coralrestoration.org)

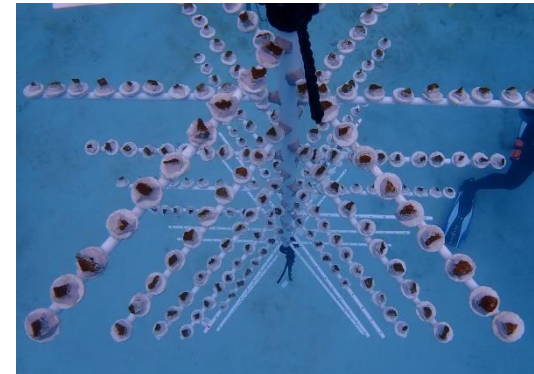
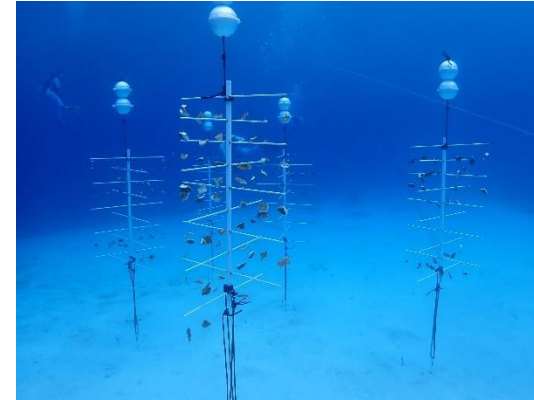


Photo Credits: J. Levy



# The ocean is hot!

## *Orbicella franksi* (boulder star coral), St. Croix, U.S. Virgin Islands

May 2023 - Healthy



October 2023 - Bleached



March 2024 - Recovered



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Thank you!  
dinorah.chacin@noaa.gov



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The Nature  
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