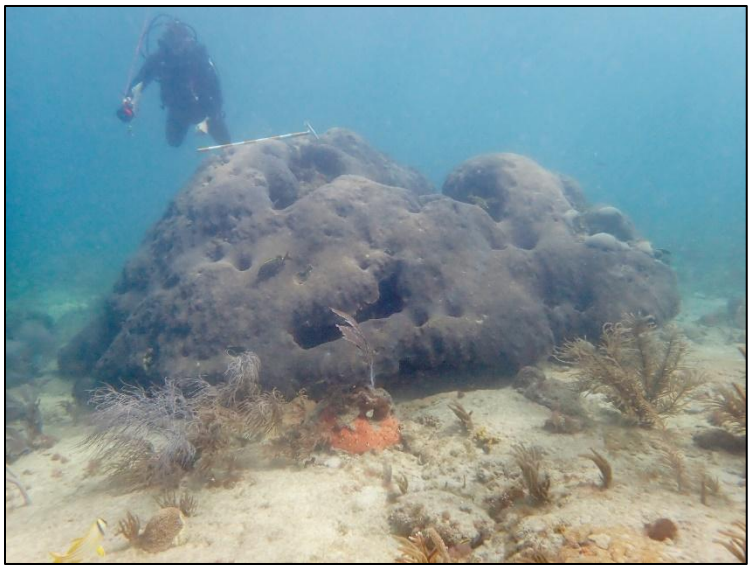
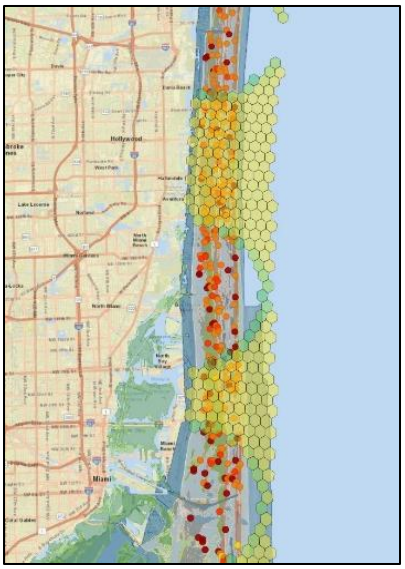
2025-2026 FCR Coral Restoration DSS support and KJCAP Reef-building-coral Disease Interventions

Final Report





Florida Department of Environmental Protection
Coral Protection and Restoration Program

2025-2026 FCR Coral Restoration DSS support and KJCAP Reef-building-coral Disease Interventions

Final Report

Prepared By:

Brian K. Walker, Hunter Noren, Reagan Sharkey, Samantha Buckley, and Maya Becker

Nova Southeastern University
Halmos College of Arts and Sciences
8000 N. Ocean Drive
Dania Beach, FL 33004-3078

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Florida Department of Environmental Protection
Coral Protection and Restoration Program
8000 N Ocean Dr.
Dania Beach, FL 33004

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List of Acronyms

CRCP	Coral Reef Protection Program
CPR	Coral Protection and Restoration Program
DEP	Florida Department of Environmental Protection
DMT	Data Management Team
DSS	Decision Support System
FCR	Florida's Coral Reef
FCRRP	Florida's Coral Reef Resilience Program
FWC	Florida Fish and Wildlife Conservation Commission
GIS	Geographic Information System
KJCAP	Kristin Jacobs Coral Aquatic Preserve
NOAA	National Oceanic and Atmospheric Administration
NSU	Nova Southeastern University
RRC	SCTLD Resistance Research Consortium
SCTLD	stony coral tissue loss disease

Acknowledgements
Thank you to the Florida Department of Environmental Protection's Coral Protection and Restoration Program (DEP CPR) and NOAA CRCP for supporting these efforts. We thank the Florida Coral Disease Advisory Committee for the large number of volunteers assisting in the meeting and planning of coral disease efforts. We thank Lisa Gregg for assisting with permitting. Thank you to Sasha Wheeler, Robby Spekis, Whitney Schwab, Tristan Buckell, Zachary Niedermaier, Kate Heffner and Harry Smith at the NSU GIS and Spatial Ecology lab for field assistance.

Management Summary (300 words or less)

Coral diseases have caused enormous impacts to coral populations globally perpetuating the rapid need for large-scale coral reef restoration. Stony Coral Tissue Loss Disease (SCTLD) exemplifies that coral diseases are more devastating than ever before. However, implementing recent disease intervention techniques from the restoration toolbox reduces the necessity for costly and time-consuming post hoc restoration techniques.

Our work shows that SCTLD is still prevalent in the region, interventions are still needed, and these efforts are saving corals, preempting post hoc restoration. This year, interventions helped maintain species diversity and ecosystem services within the Kristin Jacobs Coral Aquatic Preserve (KJCAP) and kept alive some of the largest and oldest animals in Florida. Monthly monitoring and treatments have reduced the loss of live tissue area allowing these corals to maintain their reproductive capacity. They have also provided valuable information on the temporal and spatial epidemiological patterns of disease. The monthly large coral monitoring data have been invaluable in linking environmental drivers to disease dynamics. Higher water temperatures, amounts of water following out of the inlets, and rainfall account for 66.2% of the temporal variability in the number of diseased colonies. Understanding these dynamics helps with water management strategies.

The FCR Decision Support System (DSS) is functional and being used by many stakeholders. Over the last six months of use as of May 19, 2026, the site received 1,100 visitors, 46 forum posts, 310 sketches, and 206 downloads. The number of visitors has increased substantially since January as well as the frequency of visits. Through separately funded efforts, the DSS was used to assist site selection of coral restoration conducted for the NOAA-funded Florida Resilient Reef Research, Rescue and Restoration (RE5) Hub. We continue to work with all partners to incorporate the latest datasets and stakeholder needs.

Executive Summary

SCTLD continues to be prevalent in the KJCAP, therefore management efforts have focused on proactive intervention techniques to save remaining corals at priority sites. Of the 108 monitored corals between July 1 and May 15, 2026, a total of 140 antibiotic ointment treatments were conducted on 28 colonies. In other words, 25.9% of the large corals monitored had at least one lesion over 10.5 months. Twenty-nine treatments failed, equating to 79.3% effectiveness on lesions. The number of new infections varied throughout the period. Prevalence ranged from 0.9% in March 2026 to 10.8% in August 2025 with an average of 3.7%. Historically, disease was highest in 2022 and 2023. The average prevalence has declined from 9.4% in 2022 to 3.7% in 2026, however without regular visiting and treatments, prevalence would be higher and much more live tissue, and perhaps entire genotypes would be lost (Kozachuk et al 2026).

The DSS usage dashboard shows increasing use over time. Over the last six months of use as of May 19, 2026, the site received 1,100 visitors, 46 forum posts, 310 sketches, and 206 downloads. The number of visitors has increased substantially since January as well as the frequency of visits. Through separately funded efforts, the DSS was used to assist site selection of coral restoration conducted for the NOAA-funded Florida Resilient Reef Research, Rescue and Restoration (RE5) Hub.

1. BACKGROUND

Florida's Coral Reef is currently experiencing a multi-year disease-related mortality event, that has resulted in massive die-offs in multiple coral species. Approximately 21 species of coral, including both Endangered Species Act-listed and the primary reef-building species, have displayed tissue loss lesions which often result in whole colony mortality. First observed in late 2014, the disease spread to the entire extent of Florida's Coral Reef. The best available information indicates that the disease is continuing to spread throughout the Caribbean. Given the large temporal and geographic range of this Stony Coral Tissue Loss Disease (SCTLD), the virulence of the still-unidentified pathogen(s), and its likely continued rate of progression, management efforts have focused on proactive intervention techniques to save remaining corals at targeted sites.

This project is a continuation of NSU KJCAP monitoring and coral disease interventions of 100 priority large corals ongoing since 2018 (DEP PO# B2A150, B48140, B46AD7, B3C3AD, B558F2, B7B6F3, B96800, C00BAE, C20F00, C2003, C229F7, C3D4C8). Information from this previously funded activity has provided data on treatment effectiveness, saved the largest large colonies from extreme tissue loss, and facilitated testing of antibiotic alternatives. It also provided data on tissue loss rates, survivor sites, new infection rates through time, and classifying large corals into categories based on infection rates setting up the study design for the SCTLD Resistance Research Consortium (RRC).

Additionally, recent state initiatives have focused coral reef management efforts on restoration site selection to improve shoreline protection and flood mitigation. Building from information on priorities gathered during the previous funding period, Florida’s Coral Reef Resilience Program (FCRRP) Data Management Team (DMT) will oversee the development of a decision support system (DSS) for coral reef conservation. The first iteration of the DSS will assist managers and practitioners in site selection specifically for coral reef restoration. The effort will build upon data aggregation and analysis work completed by Brian Walker in the Kristin Jacobs Coral Aquatic Preserve.

NSU GIS & Spatial Ecology lab retains the previously trained and knowledgeable disease intervention personnel and additional new personnel to carry on the institutional knowledge and history of the corals as well as the original Marine Planner development and implementation.

2. PROJECT DESCRIPTION

One goal of this project is to perform disease interventions on the remaining reef-building coral species with active disease in the KJCAP. These are direct management activities essential to saving the remaining corals in SE FL affected by disease that have the potential of recovering and building new reef structure. Coral disease intervention treatments shall include smothering diseased tissue, creating a disease-break to arrest disease progression and covering the newly exposed skeleton with amoxicillin while testing antibiotic alternatives. The objective is to apply these interventions to the 100 priority large corals as necessary to maintain their health and continue monthly monitoring.

The second goal of this project is to support the continued development of FCR DSS. The DSS is being developed and overseen by the FCRRP DMT. It is intended to assist managers and practitioners in site selection for coral reef restoration using the most recent scientific data available.

3. METHODOLOGY

The antibiotic paste treatments were conducted under the State of Florida Special Activity License Permit SAL-25-2022-SRP and SAL-26-2022-SRP which authorized the cutting of disease-breaks and the application of disease treatments containing amoxicillin and chlorine.

3.1. Monthly Interventions to 100 Large Corals (Task 2)

The largest known corals in the region were prioritized for monitoring and disease interventions. From September 2018 – June 2019, approximately 60 corals began being monitored and treated on a monthly basis. This increased to 90 colonies in July 2019, but it took several periods to establish all 90. As of October 2021, there were a total of 107 corals in the priority database. All priority corals were photographed monthly and visually assessed by a diver estimating the percentage of live tissue, diseased tissue, bleached tissue, recent mortality, and old mortality. If SCTLD was found, the lesion was treated with antibiotic paste. All margins were treated with the Ocean Alchemists antibiotic ointment CoreRx B2B with amoxicillin (1:8 ratio by weight). Photographs were taken of all areas before treatment at both the 0.5 m standard distance and wider scenes. The length of each treatment was estimated using a standardized scale in the photographs. Lesion treatments were determined failures if the active disease continued progressing past the treatment line. Treatment success was calculated as the reciprocal of the percentage of treatment failures. All prioritized colonies were tagged with a yellow tag with a unique number and instructions to photograph the coral and submit the photo to www.SEAFAN.net/tags (Figure 1).

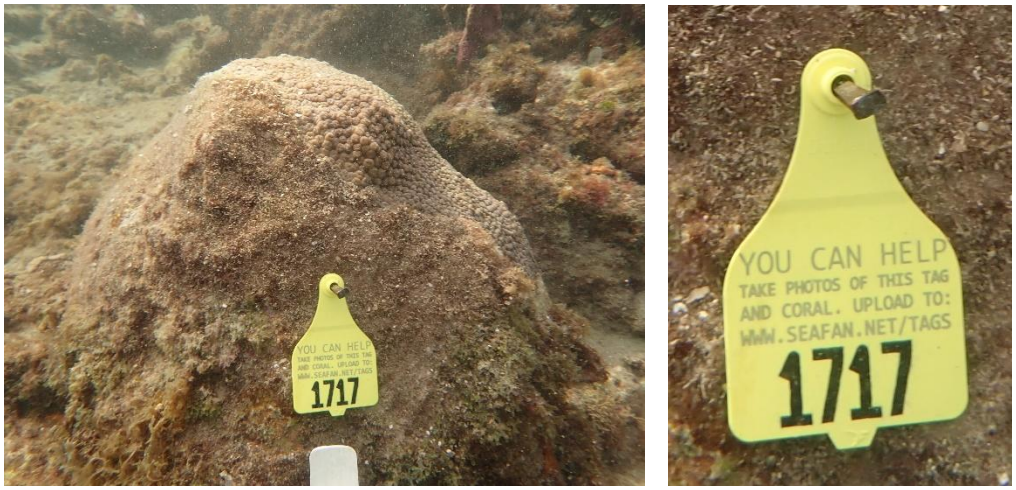

Figure 1. Example of coral tag placed on or next to each treated coral.

3.2. Florida's Coral Reef Decision Support System (DSS) (Task 3)

NSU's GIS & Spatial Ecology Lab inventoried, reviewed, and updated existing data layers encompassing Florida's Coral Reef (FCR) that were previously aggregated by the DMT. We also identified and incorporated new and missing relevant data layers and assessed all data layers for relevance to restoration site selection.

4. RESULTS

4.1. Monthly Interventions to 100 Large Corals (Task 2)

a. Treatment Success

Figure 2 illustrates the locations of all 108 priority corals. Not all monitored corals required treatments this period; 28 corals (25.9%) were treated, and 80 corals (74.1%) did not show active lesions (Figure 3 and Table 1). The proportion of colonies requiring treatment varied between species, with 23 out of the 85 (27.1%) monitored *Orbicella* spp., and 3 of the 14 *M. cavernosa* (21.4%) requiring treatment.

Over the project period (July 2025 to May 2026), a total of 140 antibiotic ointment treatments were conducted on 28 large colonies. 29 treatments failed, equating to 79.3% effectiveness on lesions. One colony, LC-122, required 28 treatments with 13 new treatments and 15 retreatments, accounting for 20% of the total treatments.

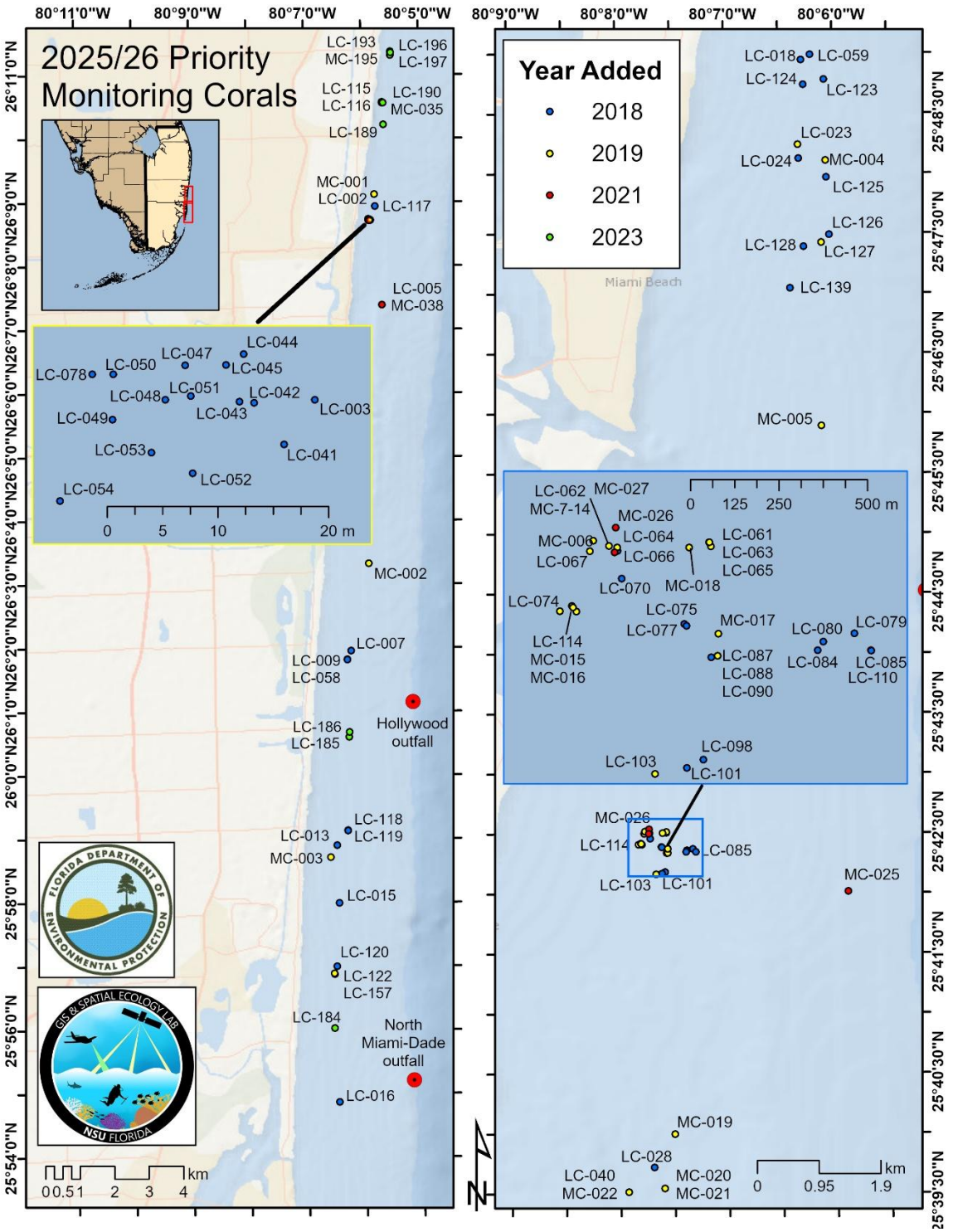

Figure 2. Map of the large priority monitoring corals colored by the year they were added to the monitoring.

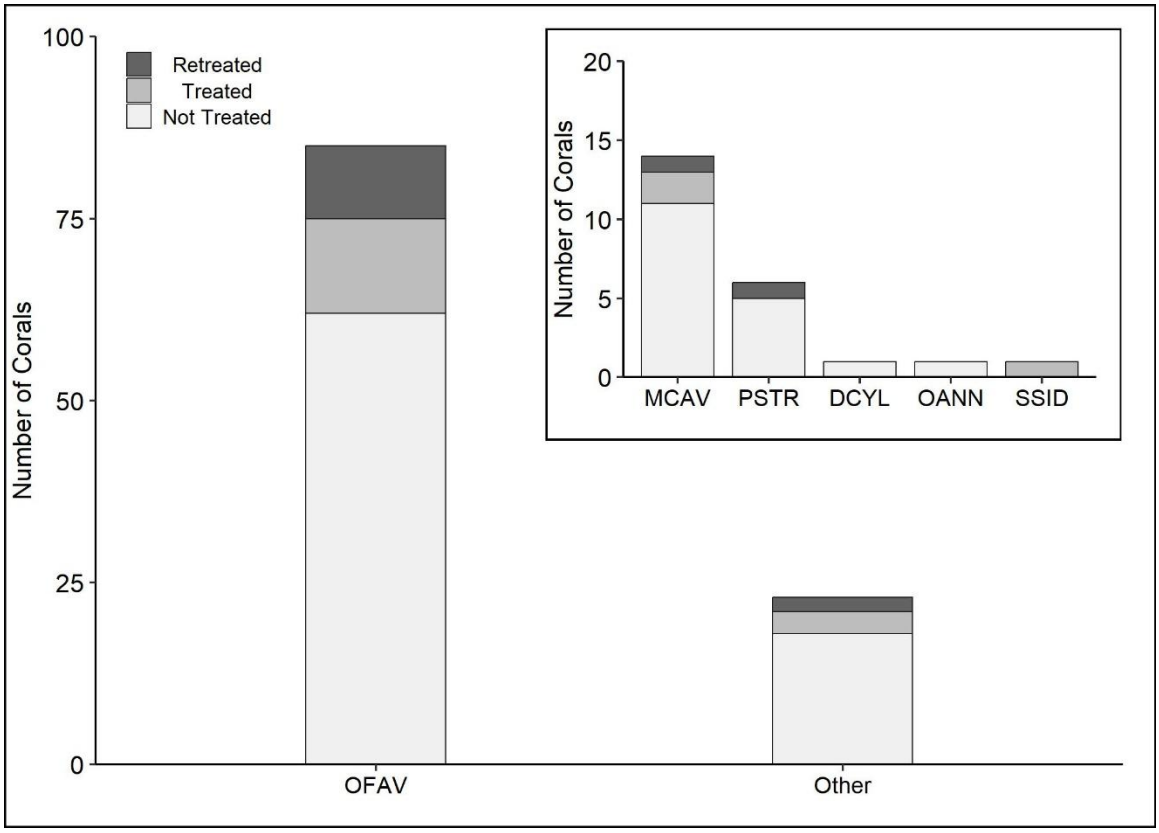

Figure 3. Total number of corals monitored and Not Treated (no disease), Treated (once), and Retreated for each species from July 2025 to May 2026. "Other" has been enlarged to show the number of treatments for the less abundant species.

Table 1. Total antibiotic ointment treatments by species from July 2025 – May 2026.

	MCAV	OFAV	PSTR	ALL SPECIES
Total Colonies	14	85	6	108
Total Treated Colonies	3	23	1	28
% Treated	21.4%	27.1%	16.6%	25.9%

a. Temporal Infection Patterns

All disease lesions were treated at each monitoring period, thus the total number of new treatments indicates the amount of new disease found on the monitored corals over time after their initial visit. Figure 4 summarizes the number of new treatments required (light gray) and percentage of diseased corals (black) per monitoring period for all corals during the project period. The number of new infections and corals with disease varied through time with relatively low numbers of treatments and disease prevalence. Figure 5 summarizes the amount of treatment required in each period. Over the project period, the KJCAP experienced relatively low temperature and rainfall compared to previous years, which could suggest why treatments and percentage of colonies diseased decreased (Figure 6).

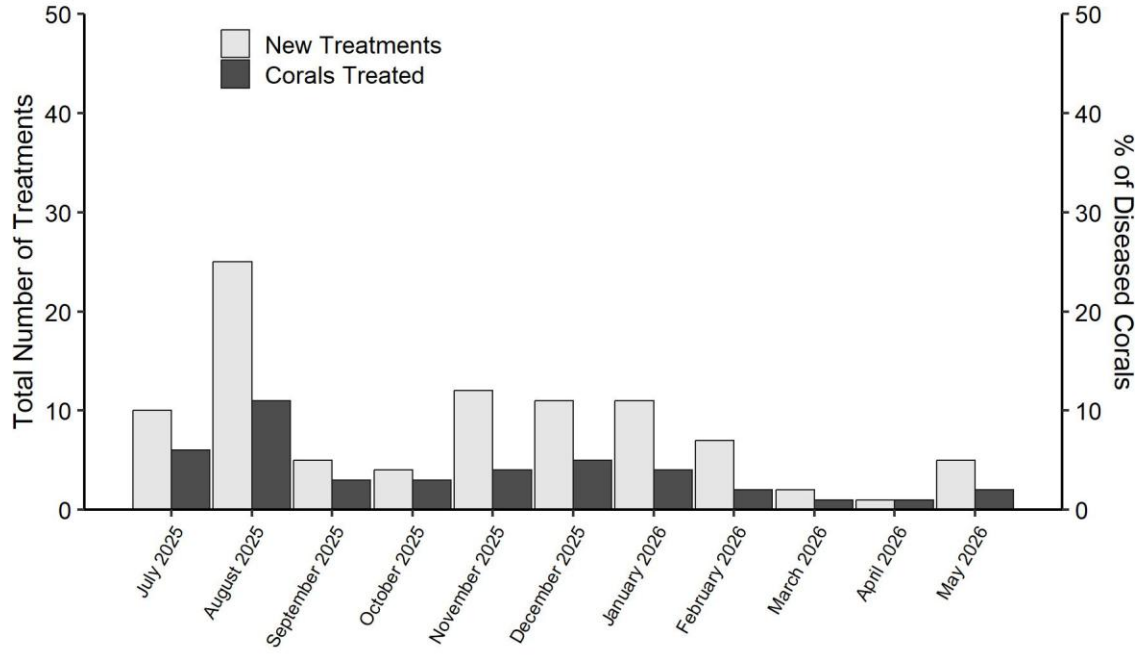

Figure 4. The number of new treatments (light gray) on all corals used as a proxy for new infections and the percentage of diseased corals (black) by treatment period.

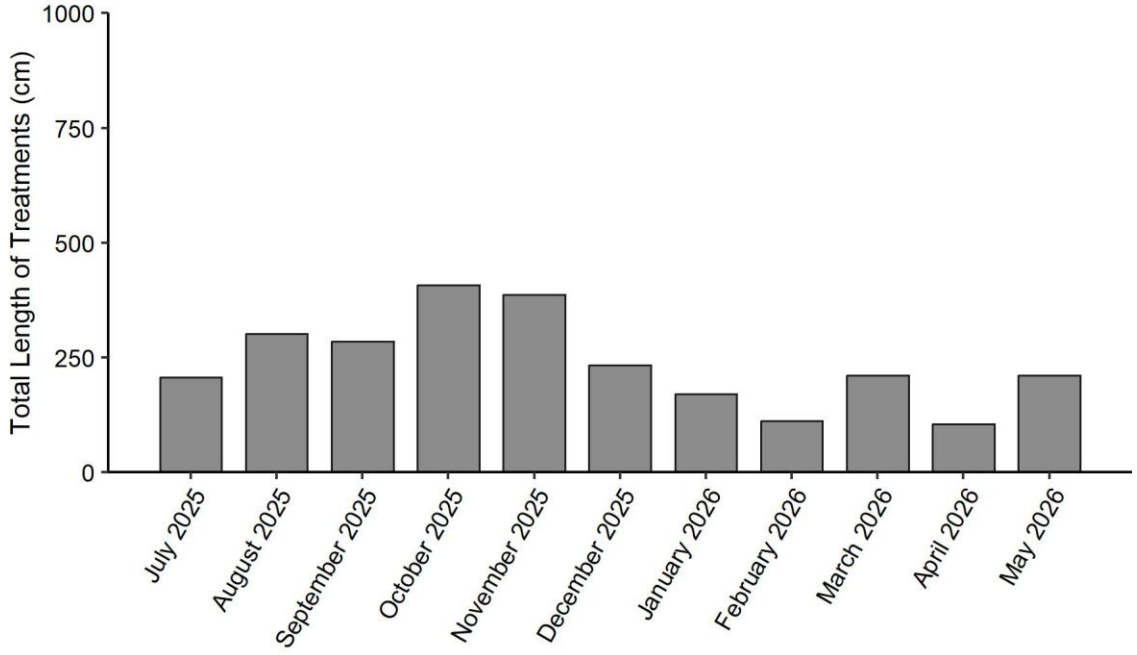

Figure 5**.** The total treatment length (cm) on all corals by monitoring period. Shaded area indicates antibiotic ointment treatments.

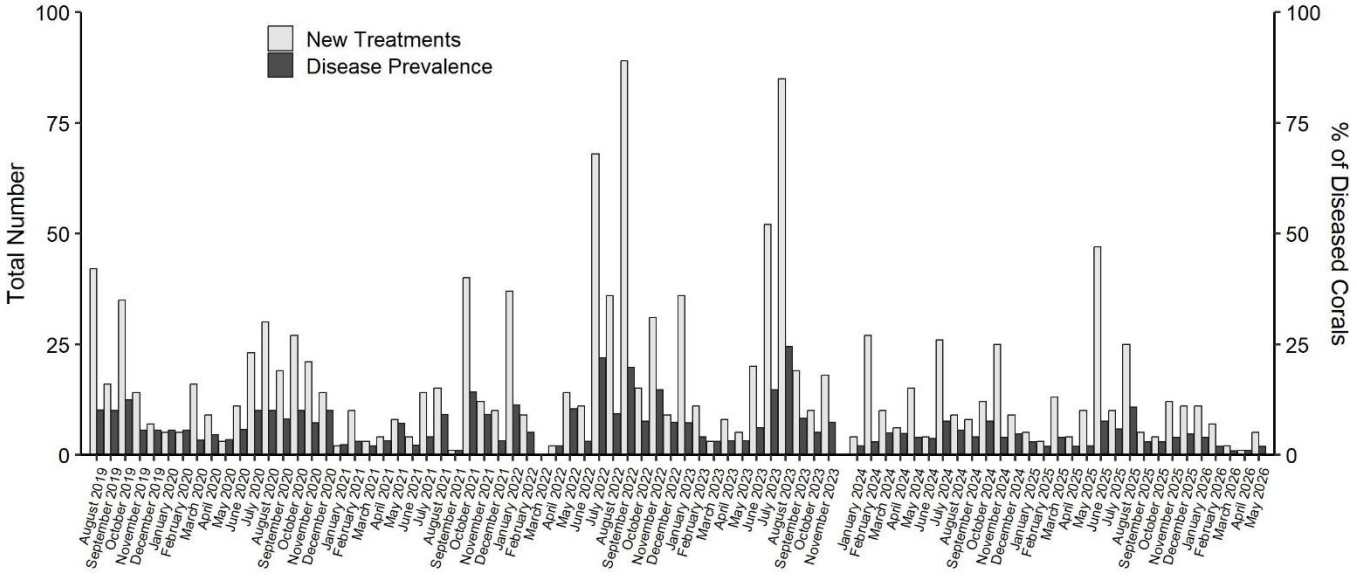

Figure 6. The number of new treatments (light gray) on all corals used as a proxy for new infections and the percentage of diseased corals (black) by treatment period since 2019.

4.1. **Florida's Coral Reef Decision Support System (DSS) (Task 3)**

We have continued to compile relevant data layers and confirm we have the most up to date layers in the DSS. Metadata for all layers have been updated to show all layer information in a consistent layout. There have been discussions and updates with the SeaSketch team to improve the site report tool to give more detailed information about proposed sites with information including min/max depth, relief, and more detailed coral and fish data. Also, reports of filters selected for grid cells have been added (Figure 7).

A second beta testing round occurred April 2026 to test the latest DSS tool features and data layers. A host of coral practitioners and managers attended and tested the tool during a webinar meeting in collaboration with NSU, FWC, and SeaSketch. We are looking forward to receiving comments and general feedback on the latest DSS to ensure these updates are still relevant for coral out-planting and restoration efforts.

Datasets that have been recently added or updated relating to DSS include (Figure 8):

- NOAA's Acropora cervicornis Data Coordination hub (AcDC) layers:
  - Nurseries
  - Observations
  - Genet Source Locations
- Large Coral Database ECA
- APAL Status post 2023 Heatwave
- TNC Tier 2 scenarios:
  - Martin County_Tier_2
  - Palm Beach, Broward, Miami-Date_Tier_2
- Inlet Contributing Areas
- Restoration Modeling Scenarios:

        - *Replaced* – Degraded 50 yr Erosion
        - *Replaced* – Degraded 50 yr Elevation
        - *Replaced* – Degraded 50 yr Base
    - *Updated* - BCG Scores (updated the scores with the latest years of 2022-2024 data)
    - *Updated* – Commercial anchorage area
    - *Updated* – BCG_22_24_Scores
    - *Updated* – Historic Acropora Locations
    - *Updated* – ACER Observations
    - *Updated* – DCYL Locations
    - CRW SST 5 km
    - MUR SST 1 km

Datasets currently being QA/QC'd for the DSS

- *In progress* – Quantified_Metals_Since_2010

Hex Grid Coded Layer Updates:

- DCYL_Status
- NationalPark
- State Park
- AquaticPres
- BCG_Min_Score and BCG_Max_Score
- ECA_LargeCoral:
    - ECA_LC_OFAV
    - ECA_LC_OANN
    - ECA_LC_OFRA
    - ECA_LC_MCAV
    - ECA_LC_CNAT
    - ECA_LC_PSTR
    - ECA_LC_SSID
- APAL_Mortality_2023
- OutplantSite

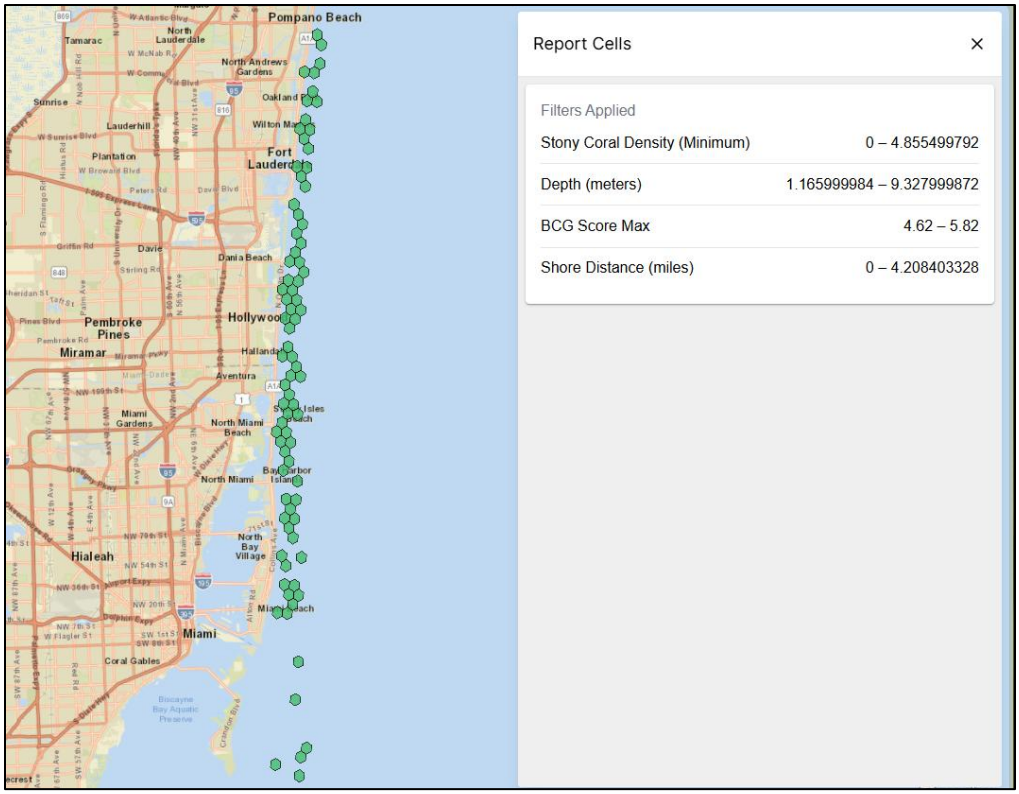

Figure 7. Filtered hex grid cells and report showing what selections were used.

Figure 8: Examples of added visual data layers including inlet contributing areas, AcDC database layers, NSU large coral database, and *A. palmata* status post 2023 heatwave.

The DSS usage dashboard shows increasing use over time. Over the last six months of use as of May 19, 2026, the site received 1,100 visitors, 46 forum posts, 310 sketches, and 206 downloads (Figure 9). The number of visitors has increased substantially since January as well as the frequency of visits. Through separately funded efforts, the DSS was used to assist site selection of coral restoration conducted for the NOAA-funded Florida Resilient Reef Research, Rescue and Restoration (RE5) Hub (Figure 10).

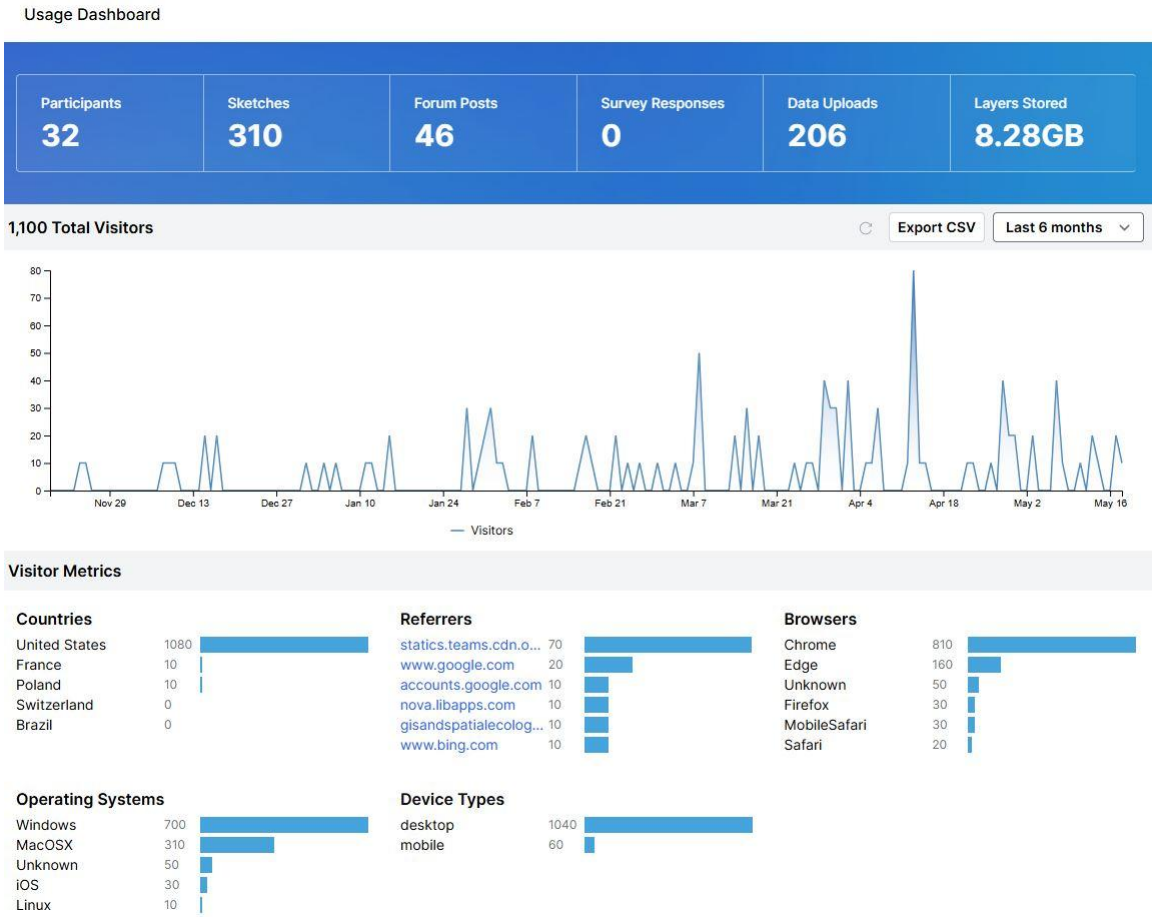

Figure 9. Image of the DSS usage dashboard summarizing the last six months of use as of May 19, 2026. In that time, the site received 1,100 visitors, 46 forum posts, 310 sketches, and 206 downloads.

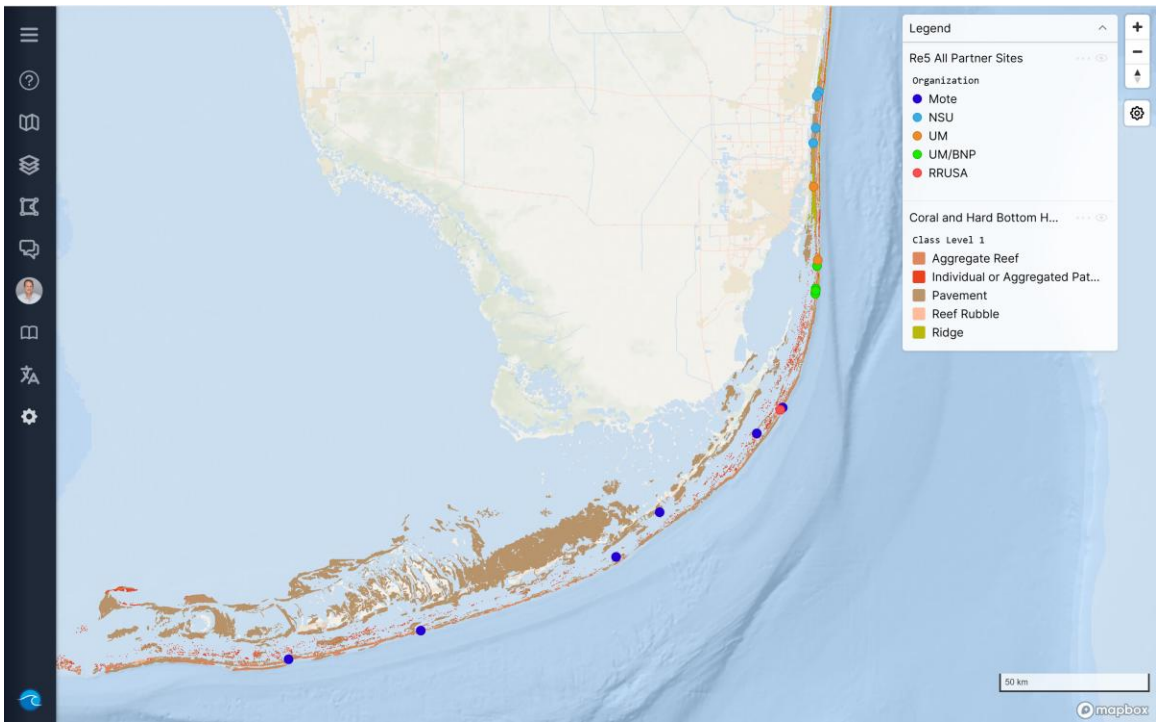

Figure 10. Restoration sites chosen using the DSS through separately funded efforts to assist site selection of coral restoration conducted for the NOAA-funded Florida Resilient Reef Research, Rescue and Restoration (RE5) Hub

5. DISCUSSION

Coral diseases have caused enormous impacts to coral populations globally perpetuating the rapid need for large-scale coral reef restoration. SCTLD exemplifies that coral diseases are more devastating than ever before. When a virulent disease like SCTLD ravages a coral ecosystem, it significantly alters the population's demographics and causes local extinctions. However, recent disease intervention techniques are over 85% effective at stopping lesions. Implementing these in the restoration toolbox reduces the necessity for costly and time-consuming post hoc restoration techniques (e.g. microfragmentation, coral husbandry, and outplanting).

Our work shows that SCTLD is still prevalent in the KJCAP nearshore habitats, that interventions are still needed, and that these efforts are worthwhile. This past year, interventions helped maintain species diversity and ecosystem services and kept alive some of the largest and oldest animals in Florida. Although disease interventions are very effective at stopping disease lesions, they do not provide protection against reinfection. This requires regular visits to ensure colony survival. Saving the remaining corals susceptible to SCTLD preserves genetic diversity and maintains the population's reproductive capacity. This allows post hoc restoration to be focused on the species more susceptible to SCTLD that are now functionally extinct.

Prioritizing the largest, oldest colonies of reef-building species is imperative to preserve the high fecundity, ecological function, and genetic diversity of the most resilient corals.

Large corals have a higher reproductive potential, thereby increasing the natural ability to replenish the reef as well as harness the potential for assisted reproduction through gamete collection. Their size also preserves ecological functions, such as existing reef structures and habitats. As a proxy for age, coral size is an indicator of their resistance to previous perturbations which may indicate higher fitness.

Monthly monitoring and treatments have reduced the loss of live tissue area and provided valuable information on the temporal and spatial variations of colonies with lesions. Corals not regularly treated with disease interventions have had drastic declines in live tissue area. Regular disease intervention is restoring colony health and saving the large priority corals from SCTLD and is an efficient method to save live tissue area preempting slower, more costly post hoc restoration efforts.

By stopping disease lesions, *in situ* disease interventions can save a higher magnitude of live tissue in comparison to the amount that can be generated from years of microfragmentation. Our intervention activities have saved species and size classes that would take decades to achieve through asexual restoration at a fraction of the cost that equivalent restoration would require to achieve similar coral cover. There is also the considerable advantage that the saved corals are already reproductive, and the largest ones have the most reproductive potential. Disease interventions have the added benefit of reducing disease loads as well, but the use of antibiotics poses an unknown risk in the environment.

6. RECOMMENDATIONS

Continue monthly monitoring and treatment of large priority corals – Monitoring these colonies has saved many from extinction. Monthly monitoring and treatment have facilitated the classification of corals based on differing infection rates which has informed the design of the SCTLD Resistance Research Consortium.

Initiate broad-scale strike team efforts – Start conducting strike team efforts again to reduce the active SCTLD prevalence and save the genetic diversity remaining on the reef.

Continue use of antibiotic ointment CoreRx B2B and amoxicillin until an alternative is found (1:8 weight ratio) – Perform margin treatment and appropriate disease-break interventions using antibiotic paste on SCTLD lesions.

Investigate use of nonantibiotic treatments – Evaluate the efficacy of the following recent Ocean Alchemist non-antibiotic disease interventions through field trials in the KJCAP: CoralCure Black Band Disease Formulation K (CCBBD-K) and CoralCure Universal Putty combined with chlorine (CCUP-C).

Avoid areas prone to increased coral disease when choosing restoration sites.

FCR DSS support – Continue supporting the development of the FCR DSS to support coral reef restoration activities in Florida.