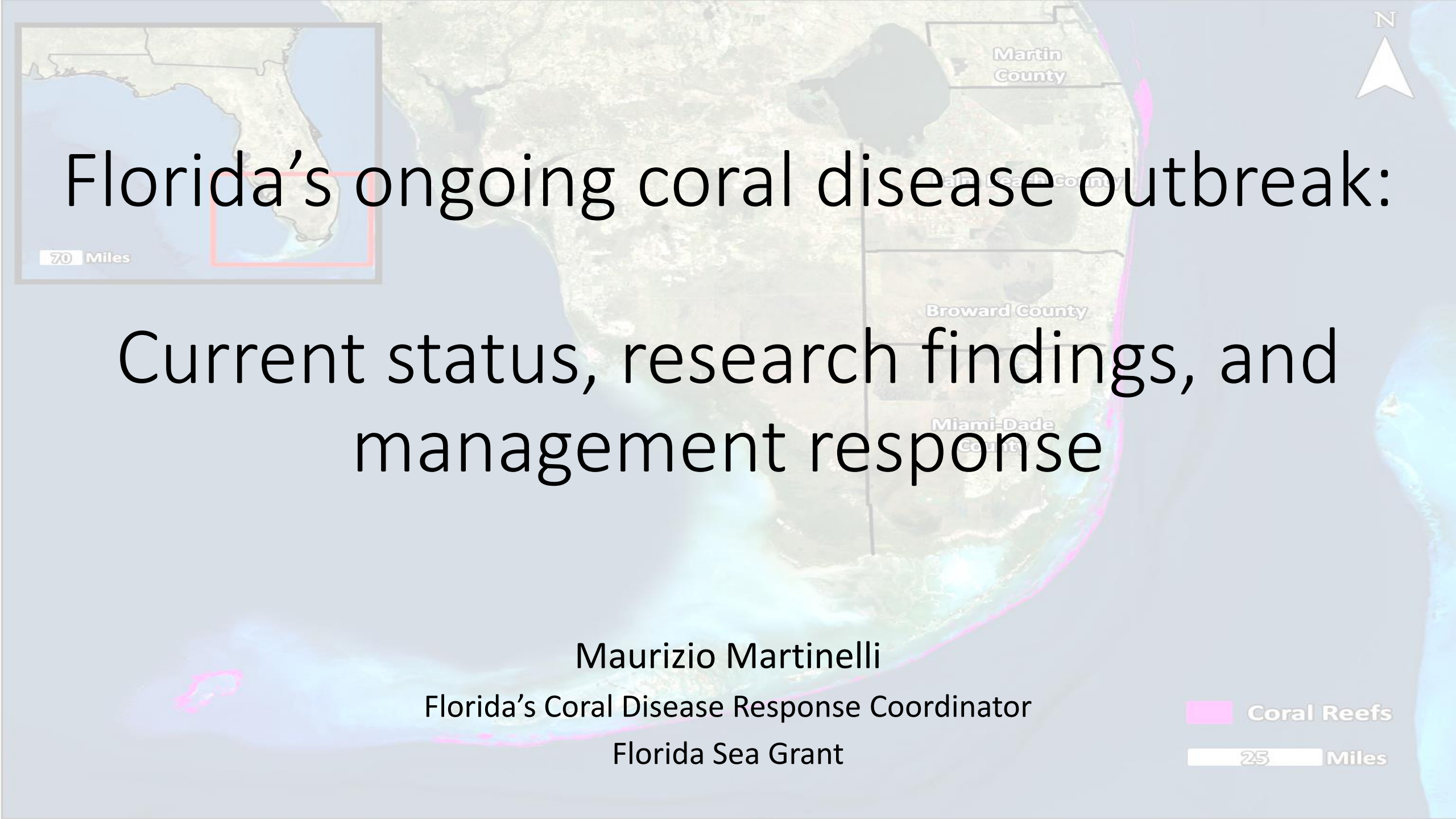
Florida's ongoing coral disease outbreak:

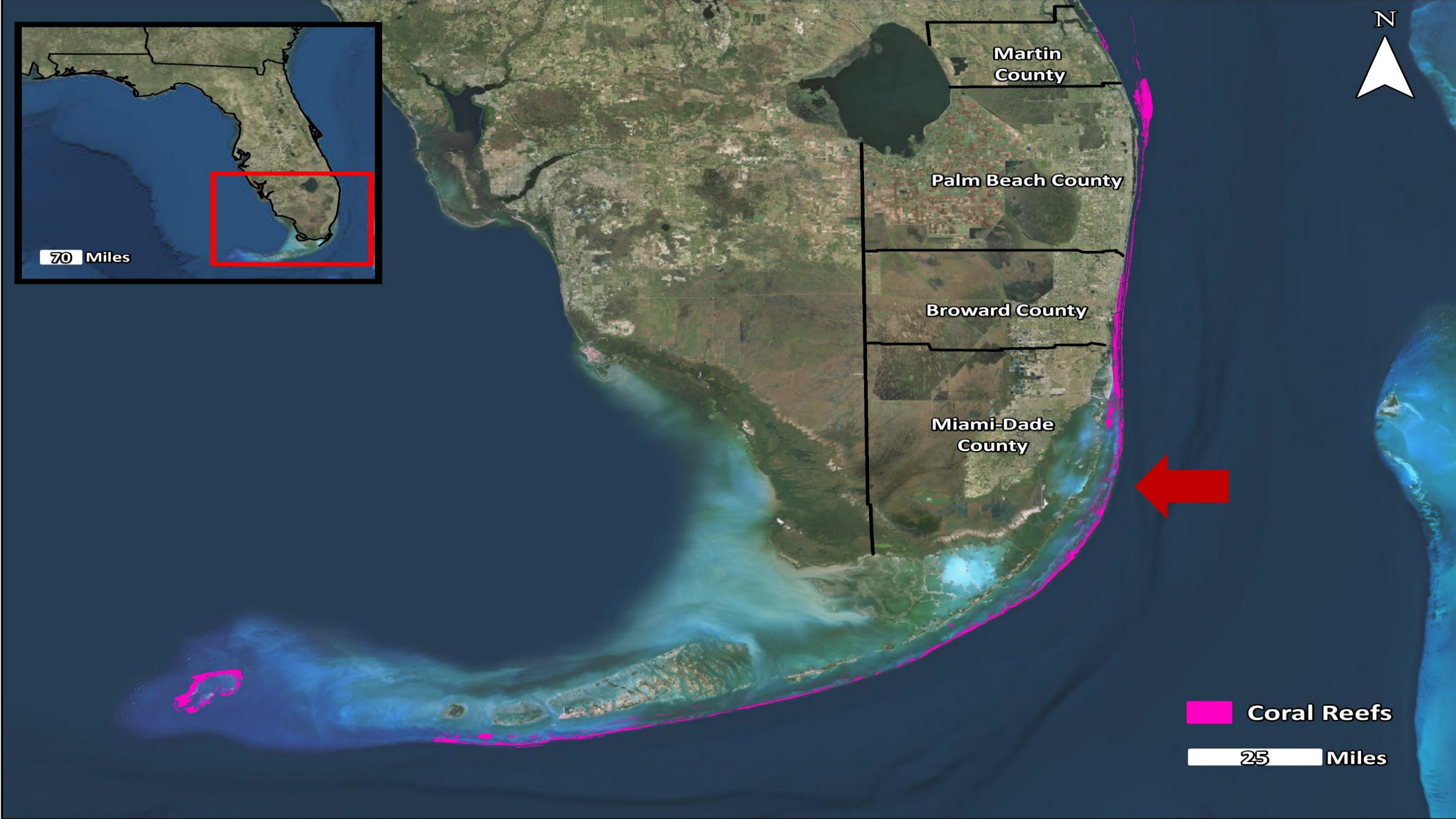
Current status, research findings, and management response

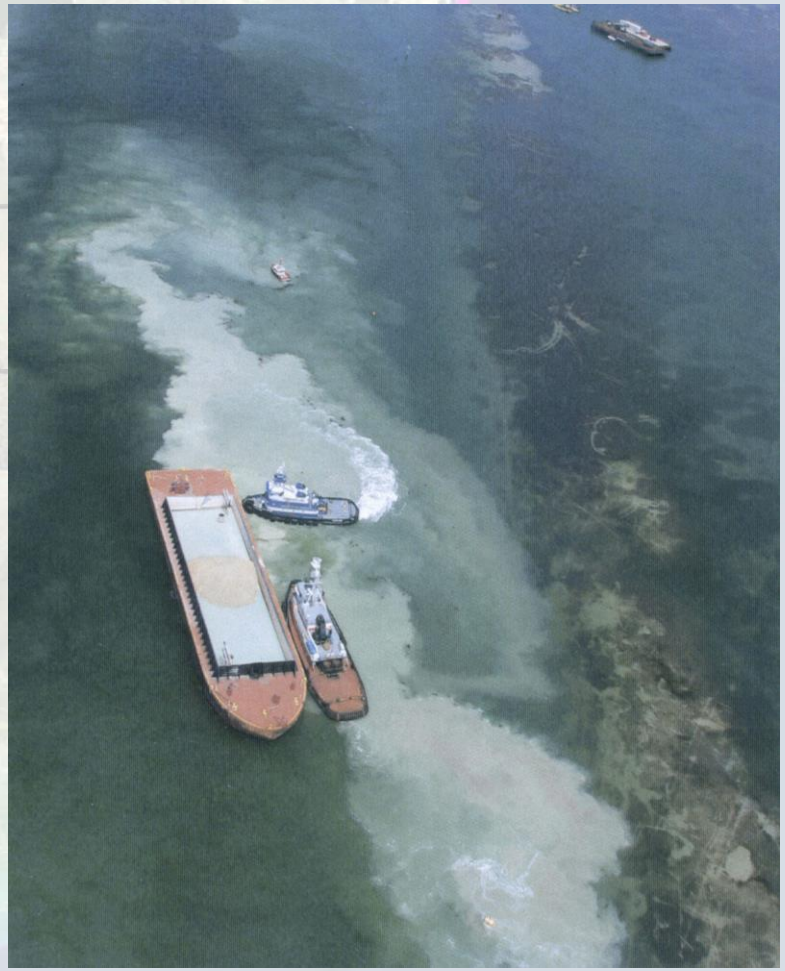
Maurizio Martinelli

Florida's Coral Disease Response Coordinator

Florida Sea Grant




Martin County
Palm Beach County
Broward County
Miami-Dade County
N
70 Miles
Coral Reefs
25 Miles



Martin County

N

70 Miles

Coral Reefs

25 Miles

Photos: FDEP

First signs of trouble

Diploria labyrinthiformis

Pseudodiploria strigosa

Dichocoenia stokesii

Meandrina meandrites

Eusmilia fastigiata

Photos: Rob Ruzicka, FWC

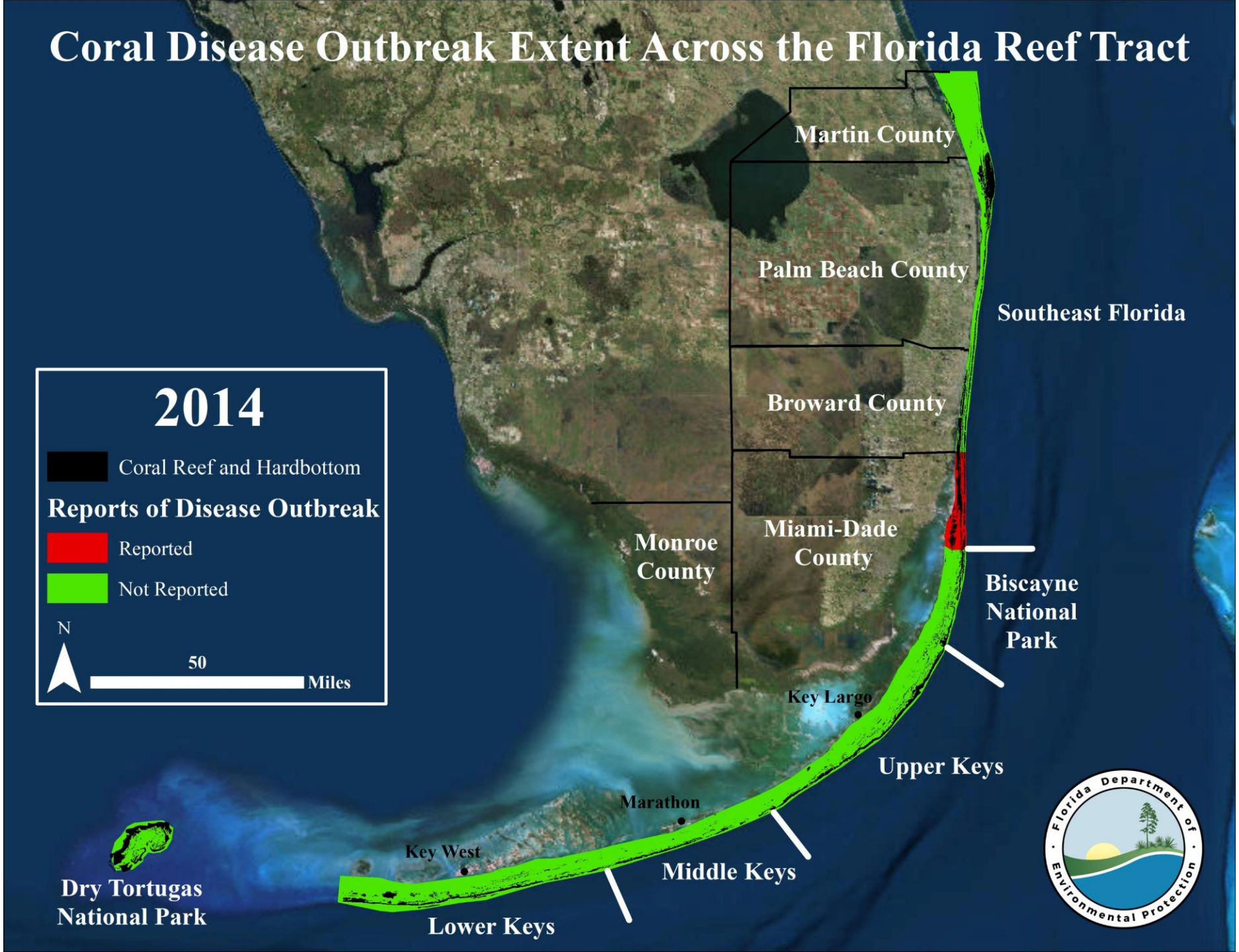
We will cover…

The current extent and impact of the coral disease outbreak

Key research findings and the management response

Resources for you

Coral Disease Outbreak Extent Across the Florida Reef Tract



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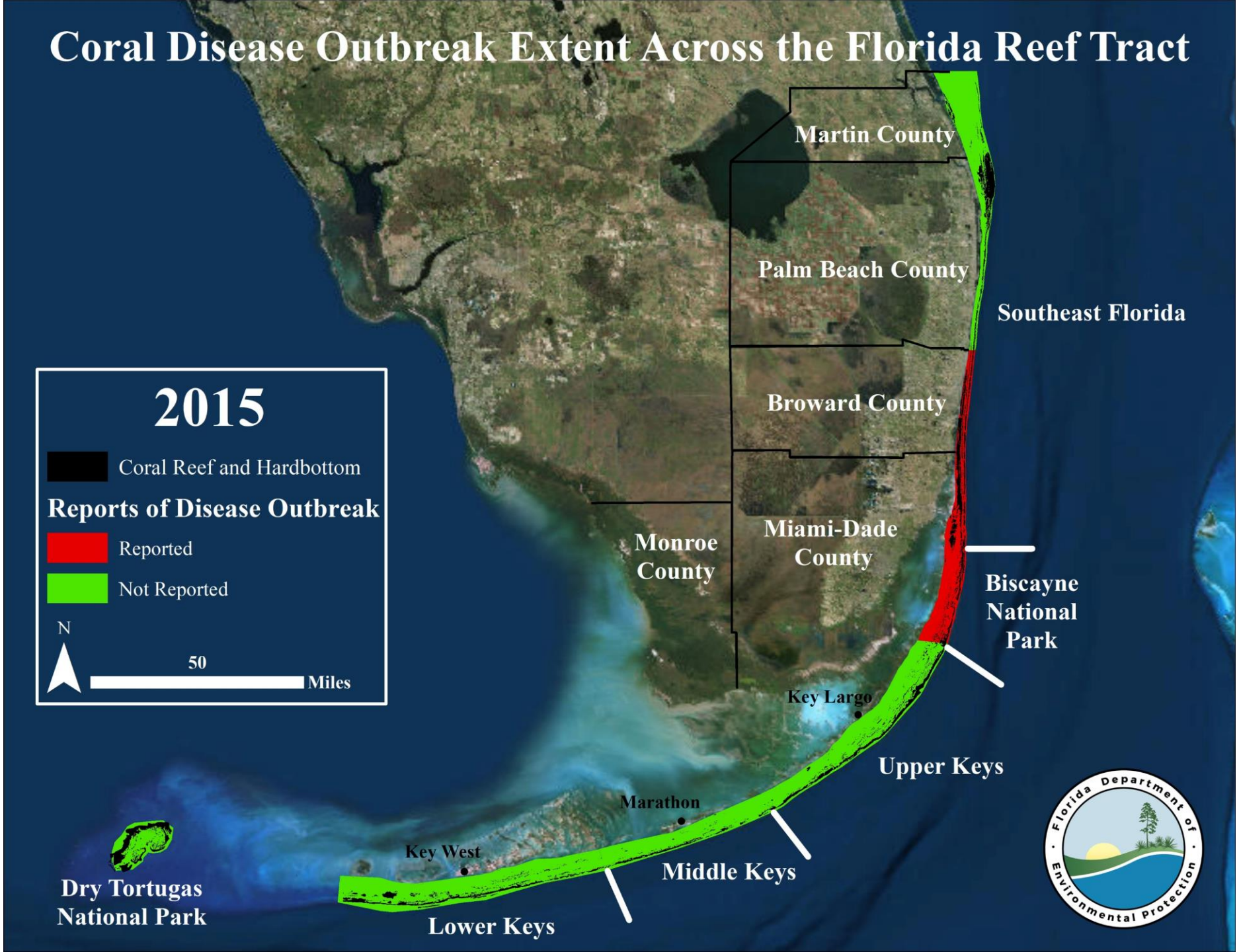

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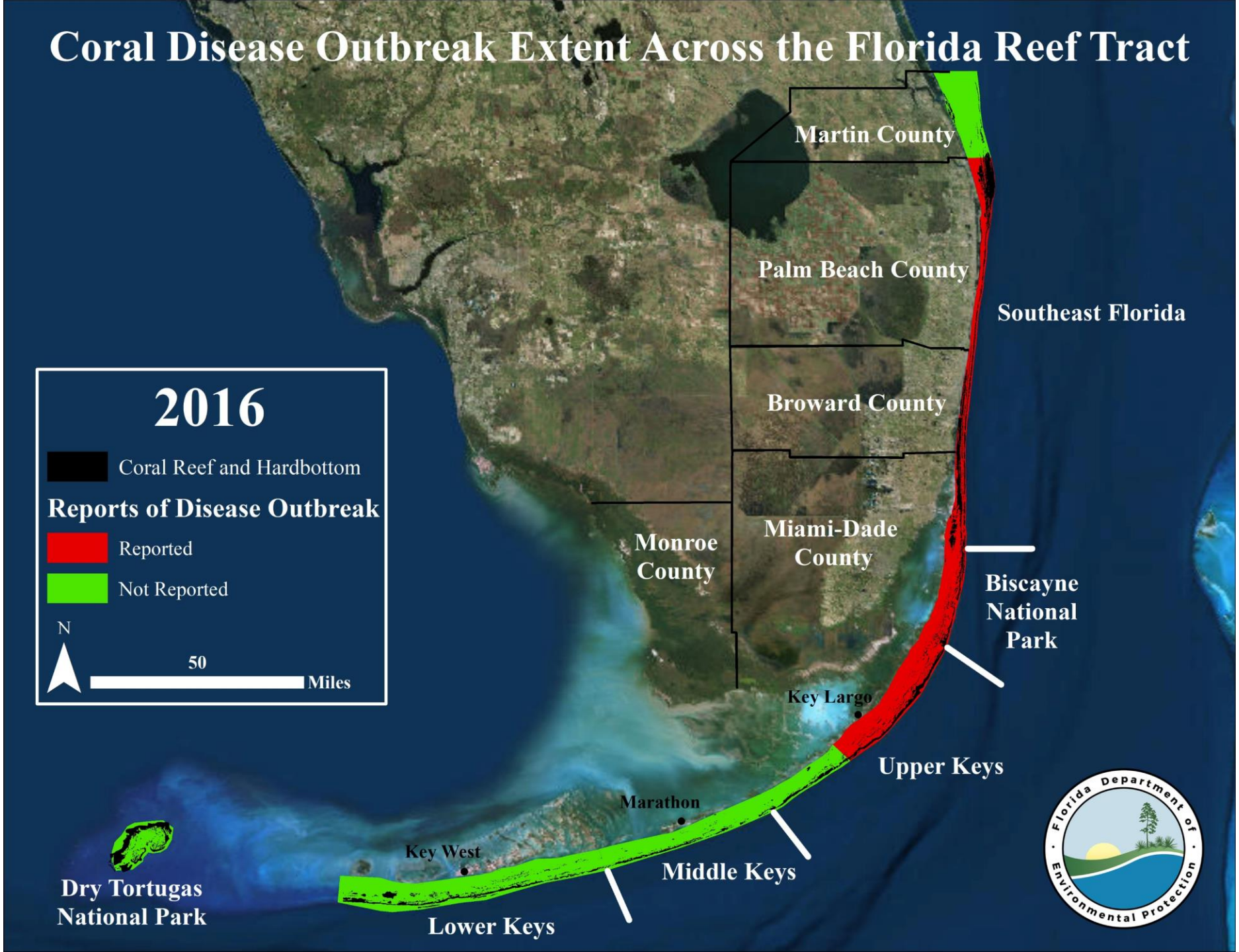

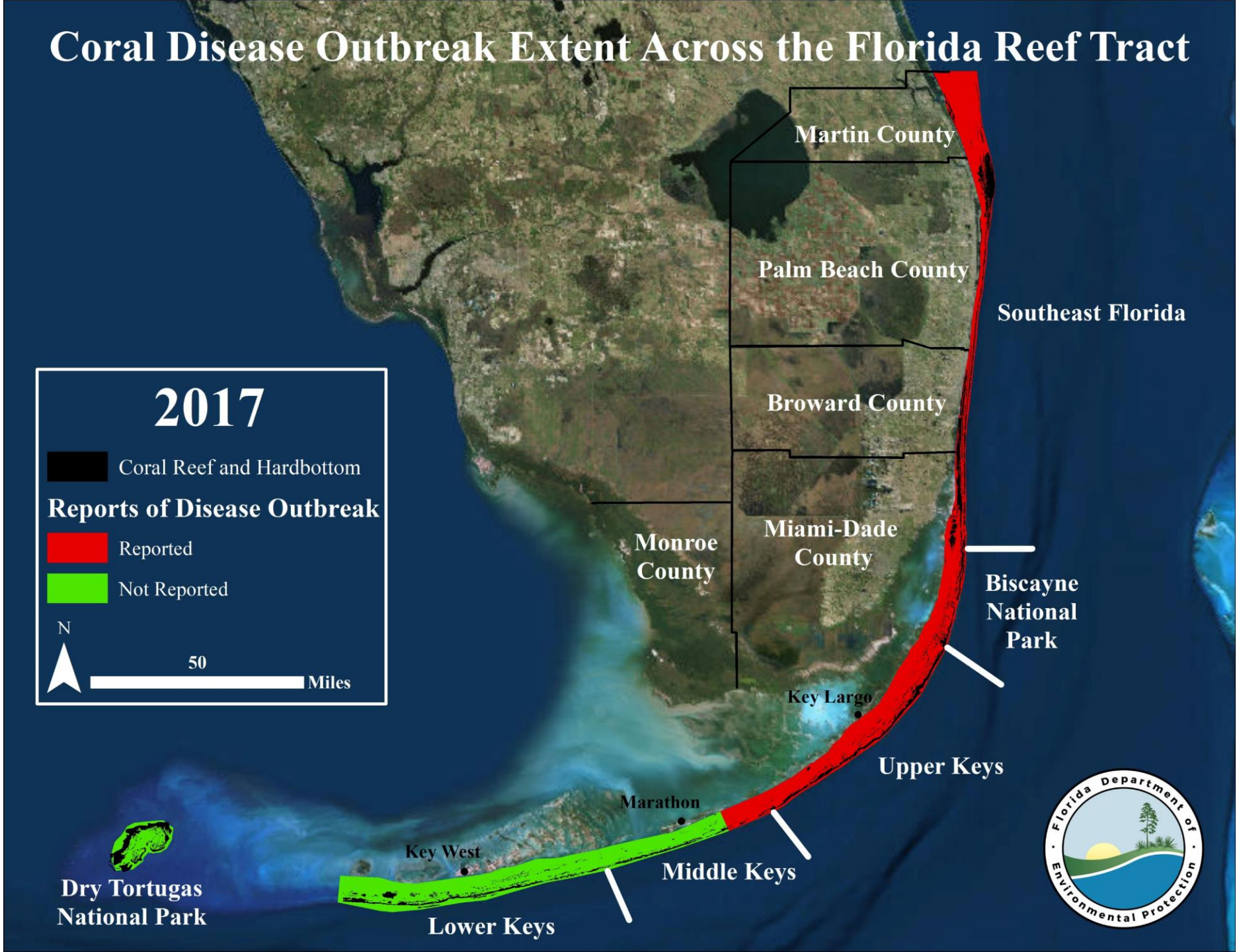
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Biscayne National Park
Key Largo
Upper Keys
Marathon
Middle Keys
Key West
Lower Keys
Dry Tortugas National Park
2017
Coral Reef and Hardbottom
Reports of Disease Outbreak
Reported
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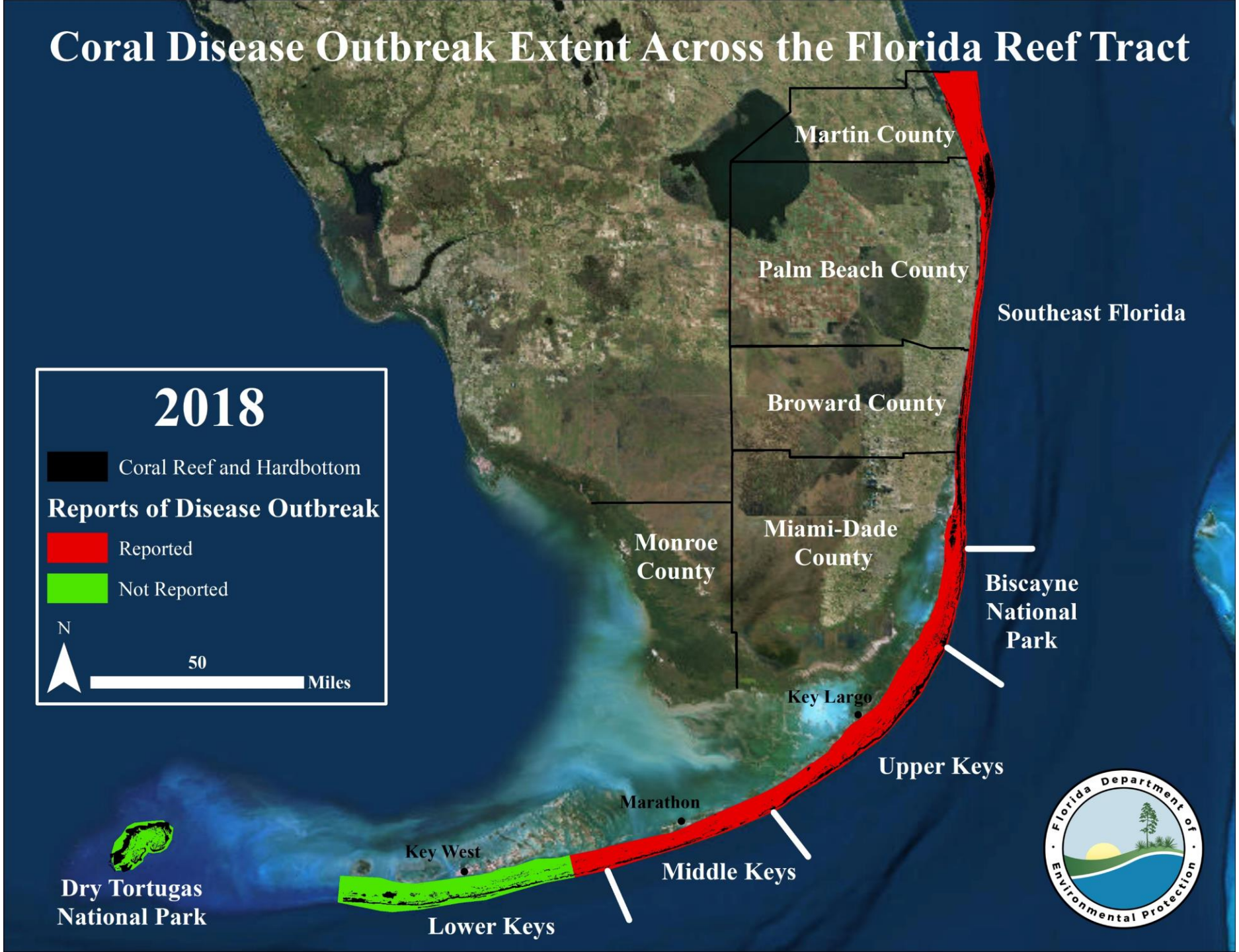
50
Miles
Florida Department of Environmental Protection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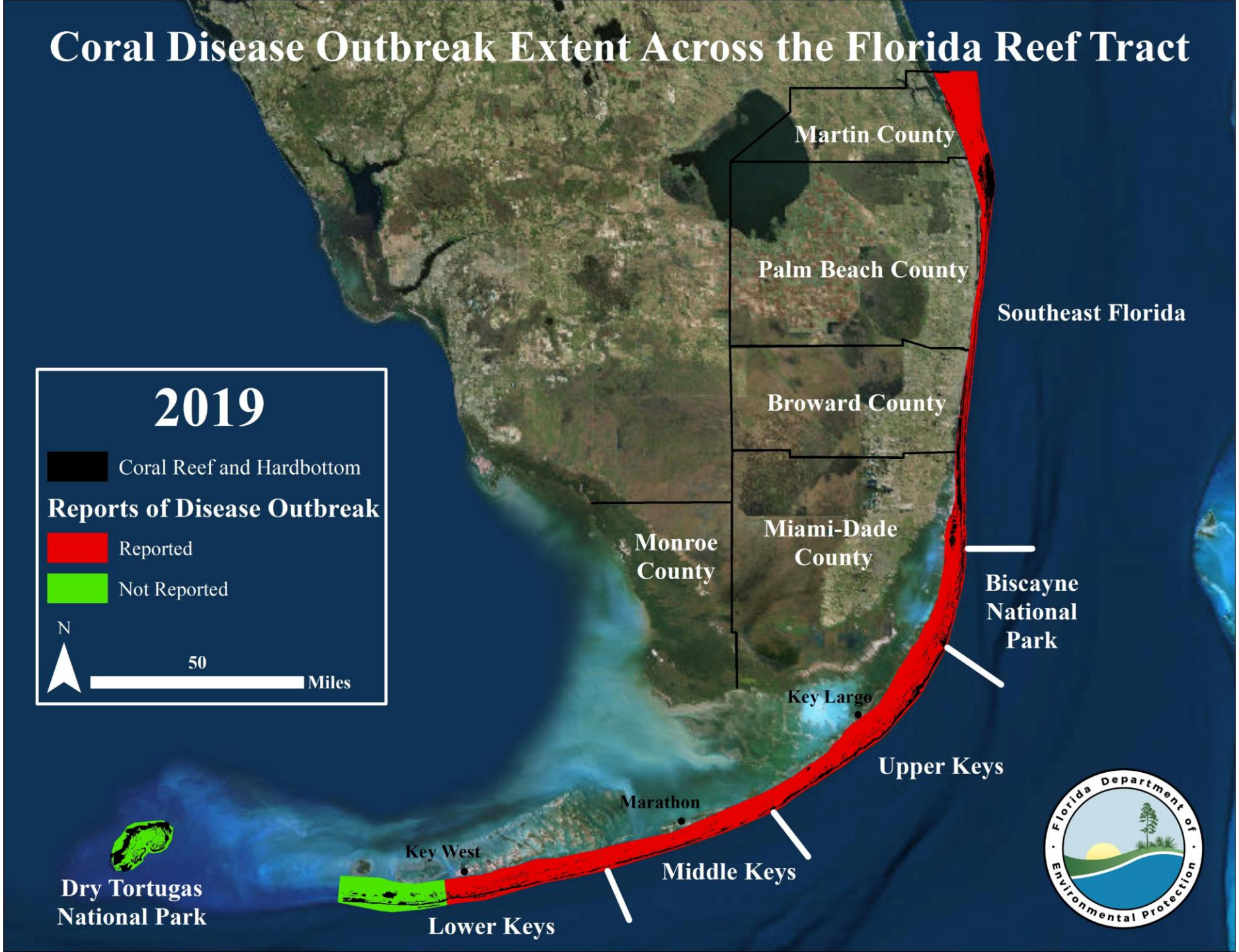
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★ = Potential signs of SCTLD
FLORIDA
Gulf of Mexico
The Bahamas
Cuba
Turks and Caicos Islands
YUCATAN
CAMPECHE
QUINTANA ROO
Cayman Islands
Jamaica
Haiti
Dominican Republic
Puerto Rico
British Virgin Islands
Antigua and Barbuda
Montserrat
Dominica
St Lucia
Barbados
Grenada
Belize
Guatemala
Honduras
El Salvador
Caribbean Sea
Google

Susceptible species (★ = ESA listed species) (□ = major framework builders)

Highly susceptible

Colpophyllia natans (Boulder brain coral)

Dendrogyra cylindrus (Pillar coral) ★

Dichocoenia stokesii (Elliptical star coral)

Diploria labyrinthiformis (Grooved brain coral)

Eusmilia fastigiata (Smooth flower coral)

Meandrina meandrites (Maze coral)

Pseudodiploria strigosa (Symmetrical brain coral)

Pseudodiploria clivosa (Knobby brain coral)

Intermediately susceptible

Montastraea cavernosa (Great star coral)

Orbicella annularis (Lobed star coral) ★

Orbicella faveolata (Mountainous star coral) ★

Orbicella franksi (Boulder star coral) ★

Siderastrea radians (Lesser starlet coral)

Siderastrea siderea (Massive starlet coral)

Solenastrea bournoni (Smooth star coral)

Stephanocoenia intersepta (Blushing star coral)

Unknown susceptibility

Agaricia agaricites (Lettuce coral)

Agaricia fragilis (Fragile saucer coral)

Favia fragum (Golfball coral)

Helioseris cucullata (Sunray lettuce)

Isophyllia rigida (Rough star coral)

Isophyllia sinuosa (Sinuous cactus)

Madracis arenterna (Pencil coral)

Mussa angulosa (Spiny flower coral)

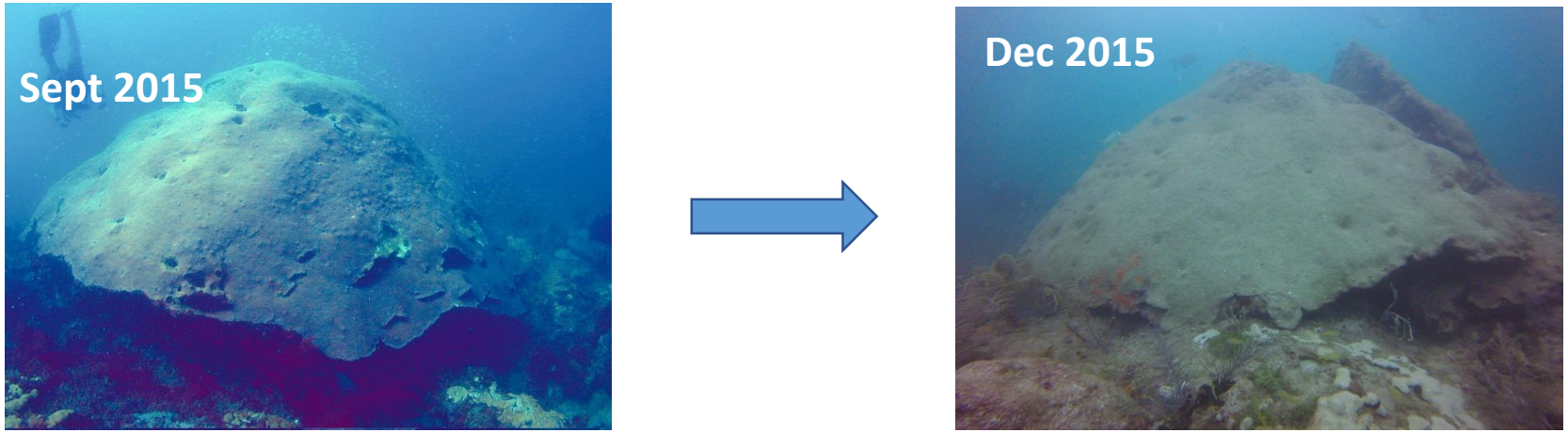
Mycetophyllia spp. (Cactus corals) ★

Scolymia spp. (Disk corals)

Rate of tissue loss

Highly susceptible species: Tissue loss of 20-40 cm^2 per day

Intermediately susceptible: Tissue loss of 5-10 cm^2 per day



Top: Rob Ruzicka, FWC; Bot: FDEP & NSU

Species-specific prevalence rate

66-100% prevalence of SCTLD on susceptible species

Mortality rate

Historically, ~100% mortality rate of colonies showing disease signs

Top: FDEP; Bot: Sharp & Maxwell, FWC

An unprecedented event?

Long tenure. After four years, the disease is still active in endemic areas and advancing through unaffected reefs.

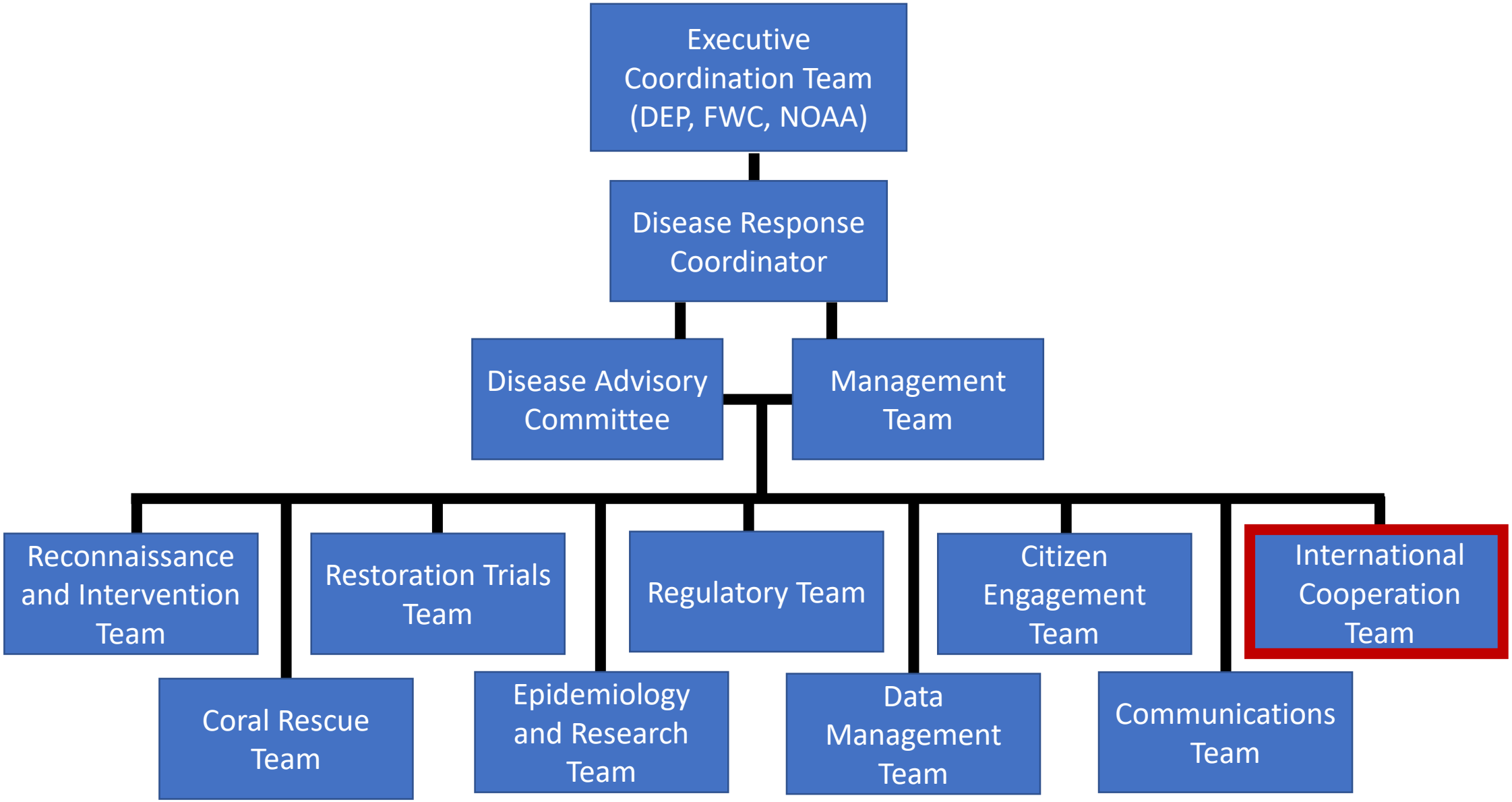
Large spatial scale. The outbreak covers most of the reef tract, with no signs of stopping.

High number of species affected. Roughly half of Florida's 45 stony corals are susceptible.

High frequency of whole colony mortality. If a colony becomes infected, it will likely suffer complete mortality.

Response Partners

Response Structure



Key research findings

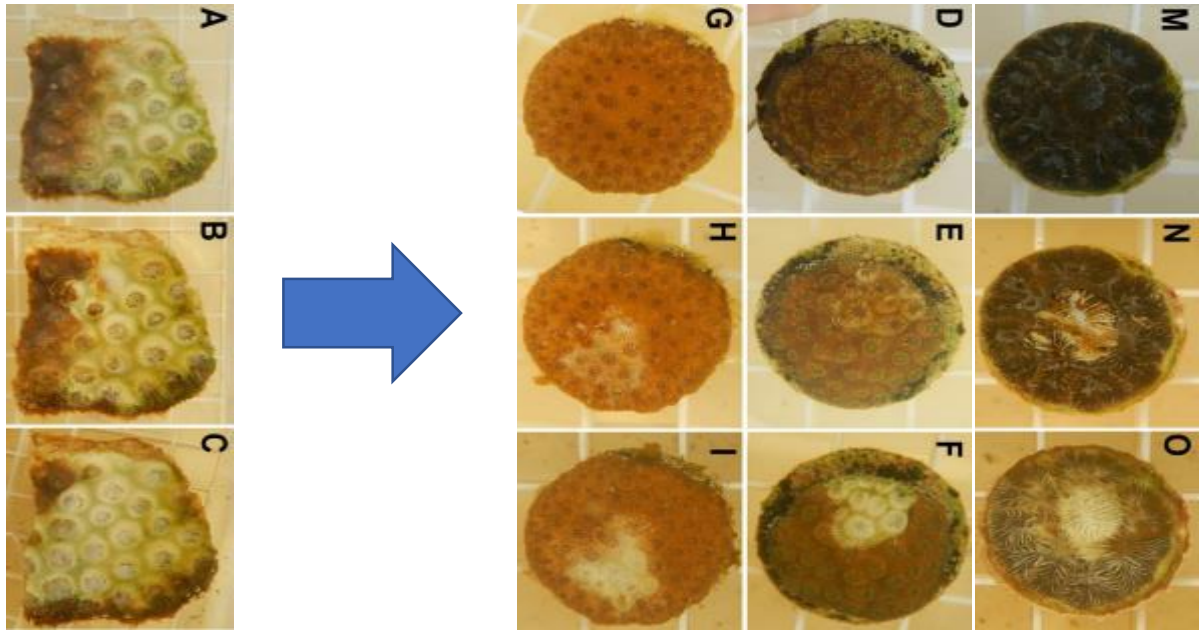
Transmission experiments demonstrate this is infectious

Therapeutic diagnoses suggest bacterial pathogen(s) are involved

Pathogen isolation experimentation has identified pathogenic bacteria

Histology suggests that lesions begin in the gastrodermis

Temporal progression across species



Day 0

Day 3

Day 8

Transmission via direct contact and through sterile seawater

Source: Ushijima & Paul, Smithsonian. Unpublished.

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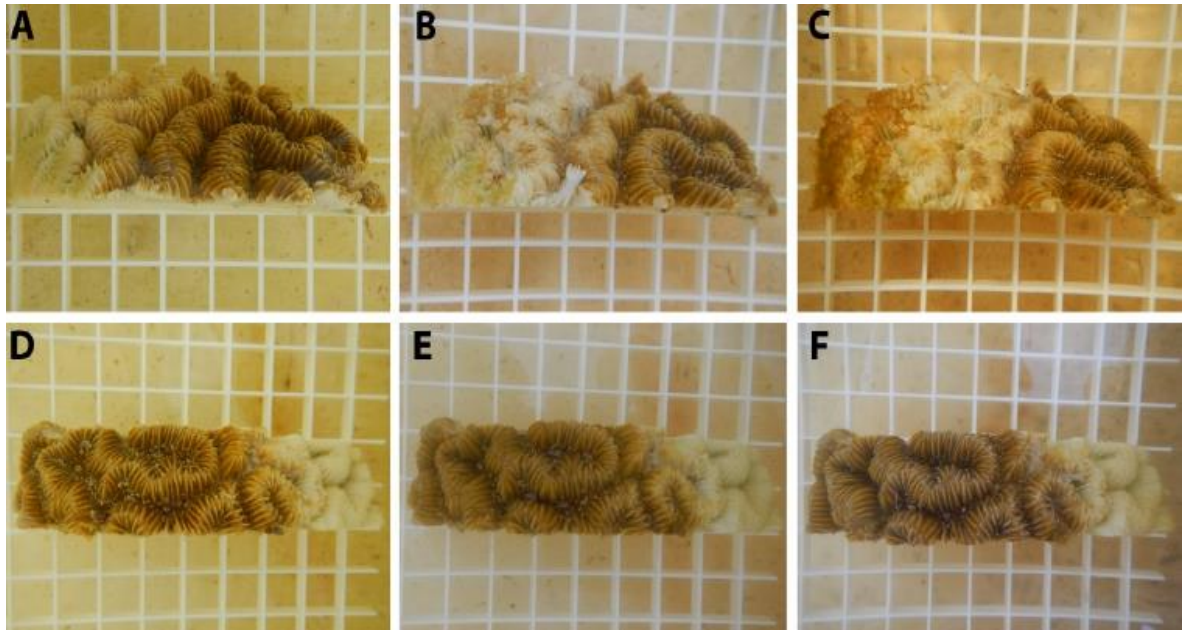

No treatment

Treated w/ amoxicillin & kanamycin

Source: Ushijima & Paul, Smithsonian. Unpublished.

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2017

1) Of-T6#17 – *Vibrio coralliilyticus*
2) Of-T6#21– *Vibrio coralliilyticus*
3) Of-T7#21 – *Vibrio coralliilyticus*
4) Mc-T4 #15 – *Alteromonas* sp.
5) Mc-T4#42 – *Leisingera* sp.
6) Mc-T4#56 – *Leisingera* sp.

2018

1) Mm-McT2 #1 – *Vibrio* sp.
2) Mm-McT2 #2 – *Alteromonas* sp.
3) Mm-McT2 #3 – *Alteromonas* sp.
4) Mm-McT2 #4 – *Vibrio* sp.
5) Mm-McT2 #5 – *Alteromonas* sp.
6) CNT1 #3 – Pending ID (non-*Vibrio*)
7) CNT1 #13 – Pending ID (non-*Vibrio*)
8) CNT1 #28 – Pending ID (non-*Vibrio*)

Source: Ushijima et al., Smithsonian. Unpublished.

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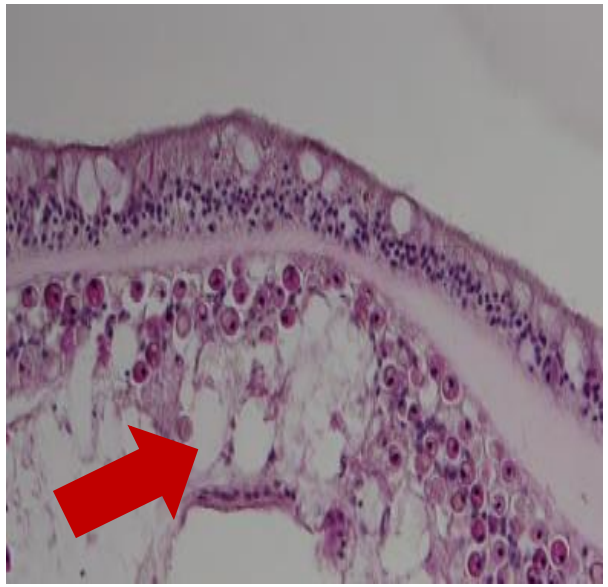

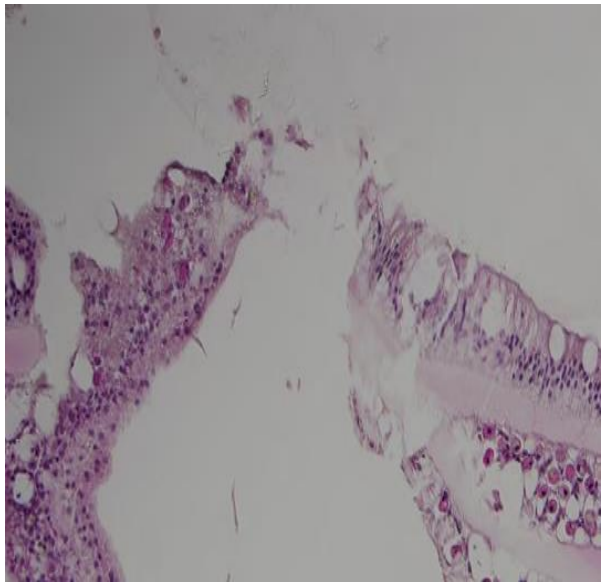

Source: Landsberg et al., FWC. Unpublished.

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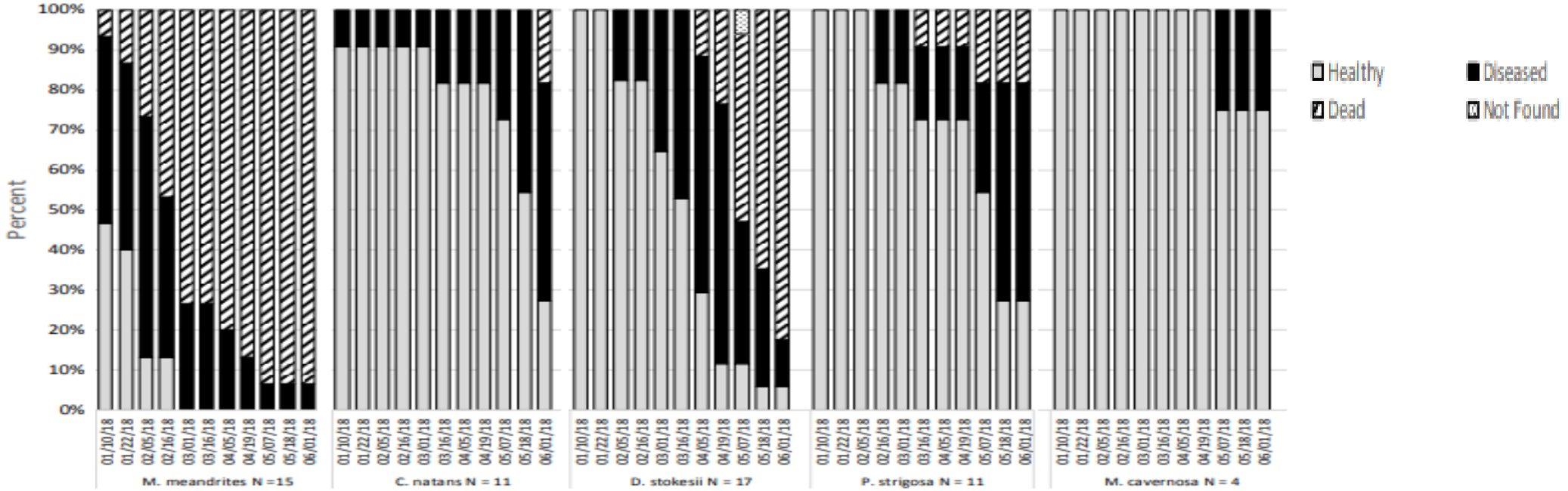


Source: Sharp & Maxwell, FWC. Unpublished.

Disease treatments

Antiseptic treatment: chlorinated epoxy

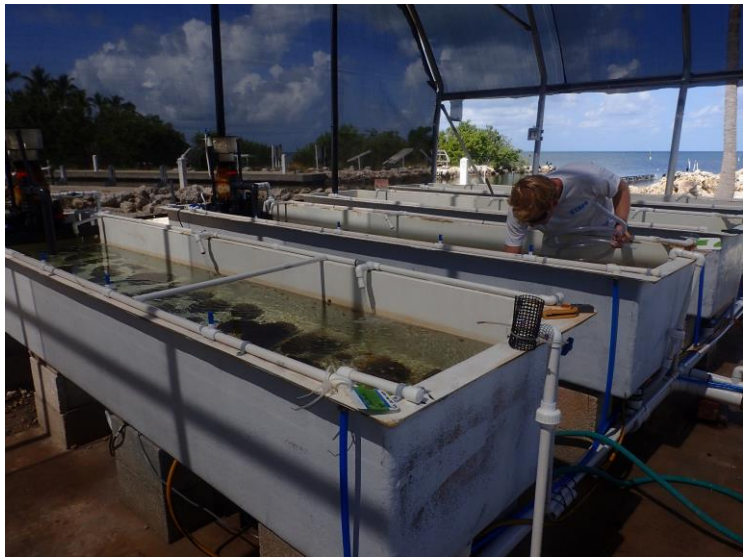



Antibiotic treatment: amoxicillin via ‘Base2’ or shea butter

Top: Brian Walker, NSU; Bot: Karen Neely, NSU

Coral Rescue

Collection efforts are underway to “rescue” colonies of priority species ahead of the disease front to be kept in on-land facilities for future restoration efforts



Photos: Stephanie Schopmeyer, FWC

What to look for on your reefs

A tissue loss disease presenting on multiple species



Sequential disease signs by species

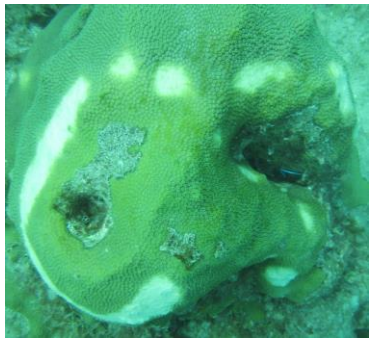
(1) *M. meandrites*, *C. natans*, *D. cylindrus*

(2) Other brain corals

(3) Boulder corals

Lesions sometimes starting in apparently healthy tissue





Resources

Stony Coral Tissue Loss Disease Case Definition

Field Identification Guide

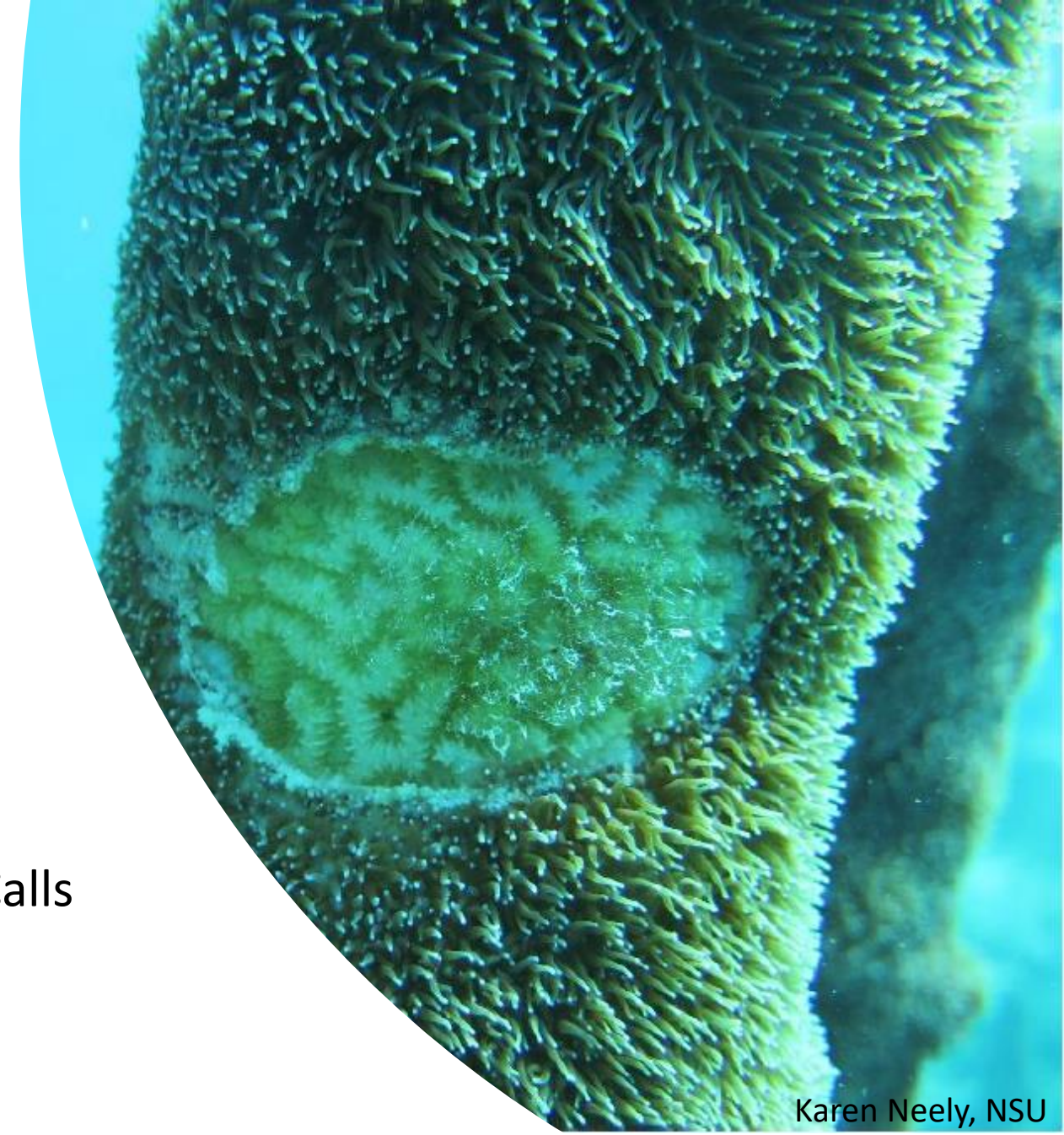
Coral Disease Treatment SOPs

Diver Decontamination Protocol

International Coordination Team

Florida Reef Tract Coral Disease Coordination Calls

Available at:
https://floridakeys.noaa.gov/coral-disease/
https://floridadep.gov/fco/coral/content/florida-reef-tract-coral-disease-outbreak



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https://floridadep.gov/fco/coral/content/florida-reef-tract-coral-disease-outbreak