

Mutli-agency response to address Stony Coral Tissue Loss Disease throughout the Florida Reef Tract

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NATIONAL MARINE
SANCTUARIES

FLORIDA KEYS

Objectives

- Overview of SCTLD
 - Epidemiology
 - Etiology
- Response to the disease outbreak
 - Partner involvement
 - Approach
 - Activities



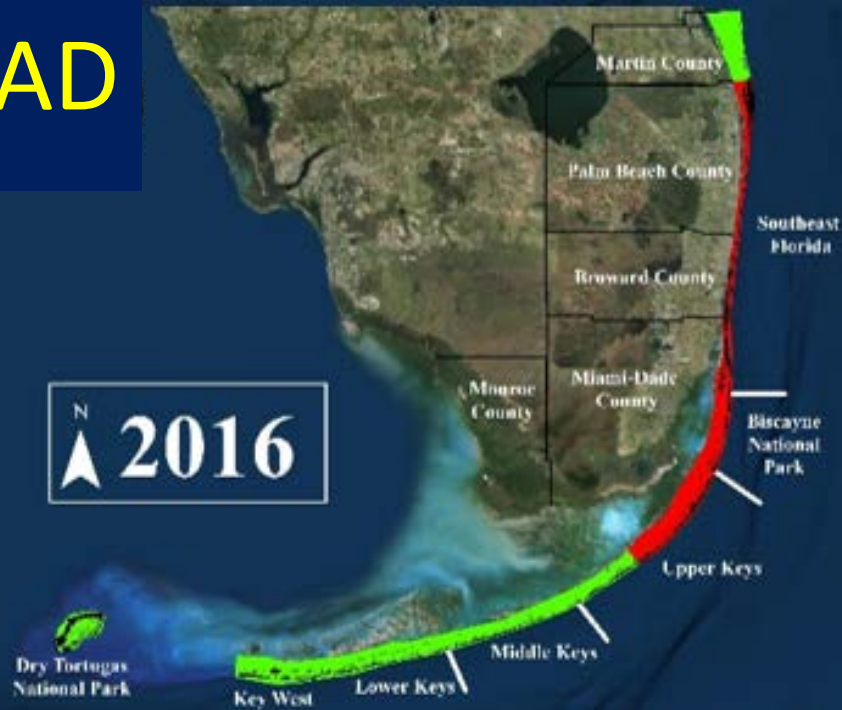


SPREAD

N
▲ 2014



N
▲ 2016



N
▲ 2015



N
▲ 2017



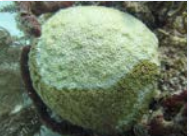









22+ susceptible species



Coral Disease Prevalence: Upper FL Keys

Year	CNAT	DLAB	DSTO	MCAV	MMEA	PSTR	SSID	ORBI	Total
									
2011	0.0	11.1	7.4	0.0	0.0	9.1	6.2	1.2	3.4
2012	0.0	0.0	3.0	1.2	0.0	0.0	6.5	2.5	2.9
2013	0.0	0.0	0.0	3.7	0.0	0.0	3.4	1.4	1.4
2014	0.0	0.0	2.9	3.1	0.0	16.7	13.5	3.2	5.7
2015	0.0	0.0	2.9	1.4	0.0	0.0	14.2	4.1	6.1
2016	0.0	0.0	0.0	6.6	0.0	7.1	4.9	9.7	3.8
2017	50.0	7.1	20.0	10.5	0.0	50.0	22.3	19.7	10.7

- CREMP SURVEYS

- $N = 14$ sites in the Upper Keys; data pooled for all sites

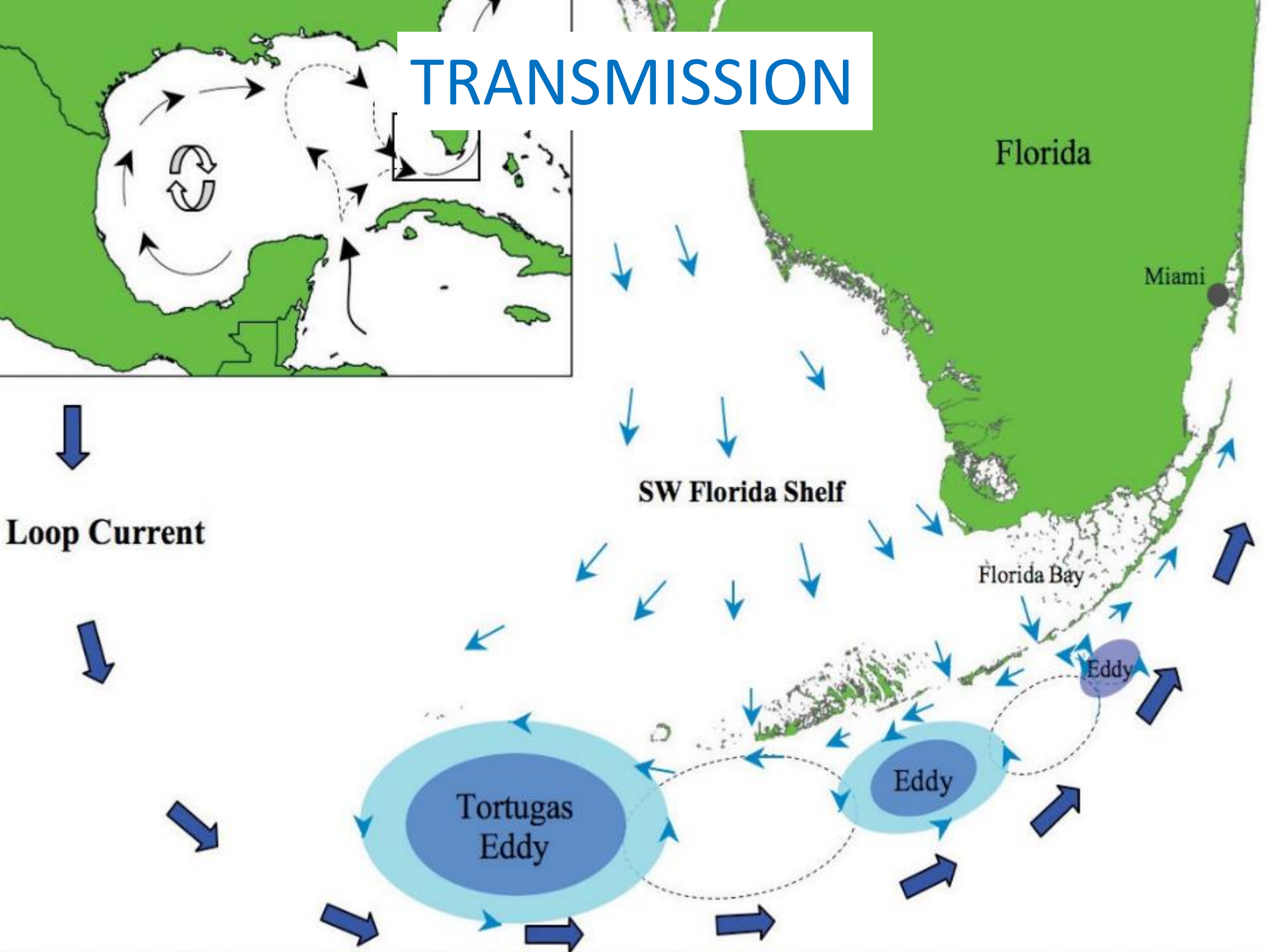


DREDGING



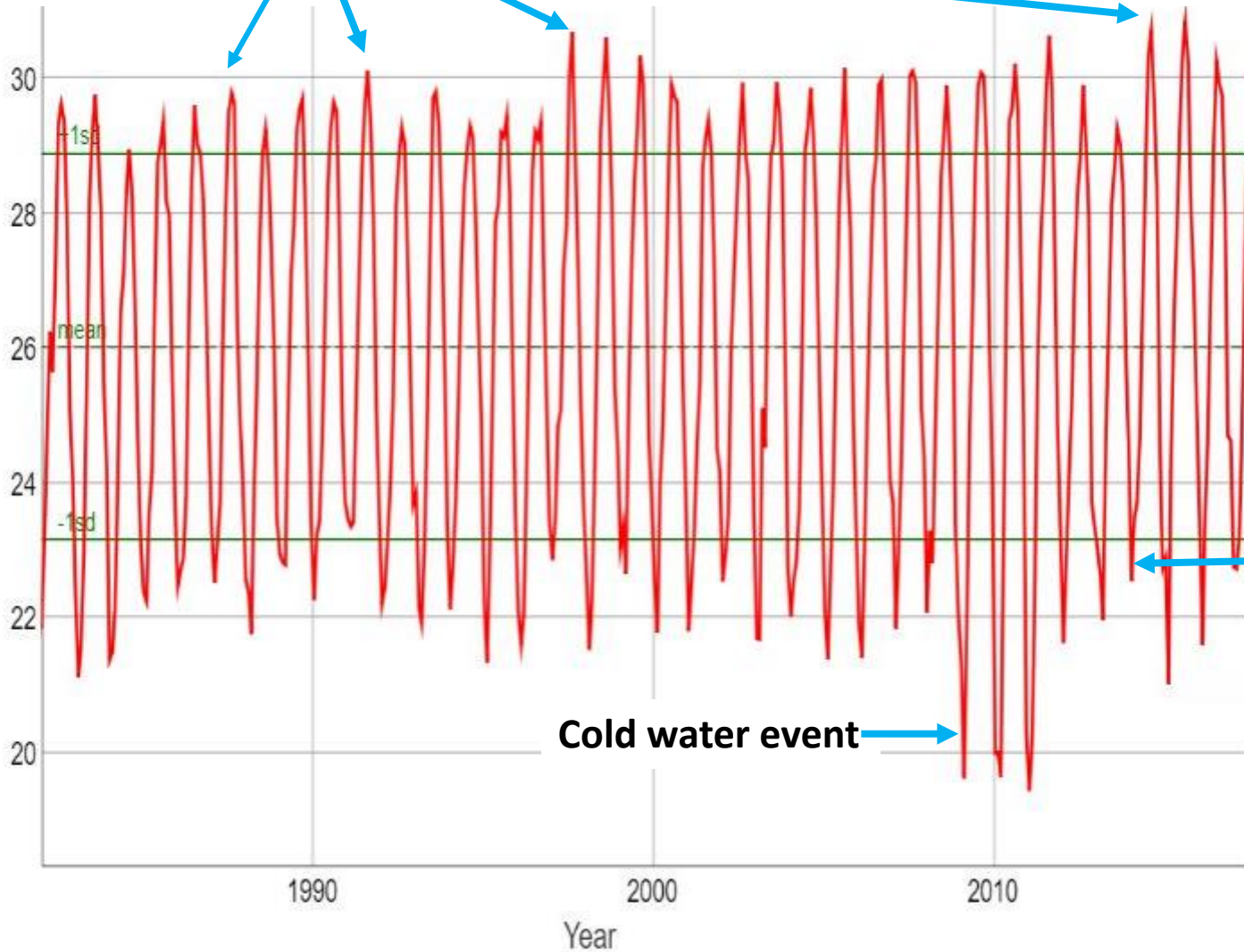
ENABLING FACTORS

TRANSMISSION



Keys-Wide Bleaching

2014-2015 Warmest Summers on record

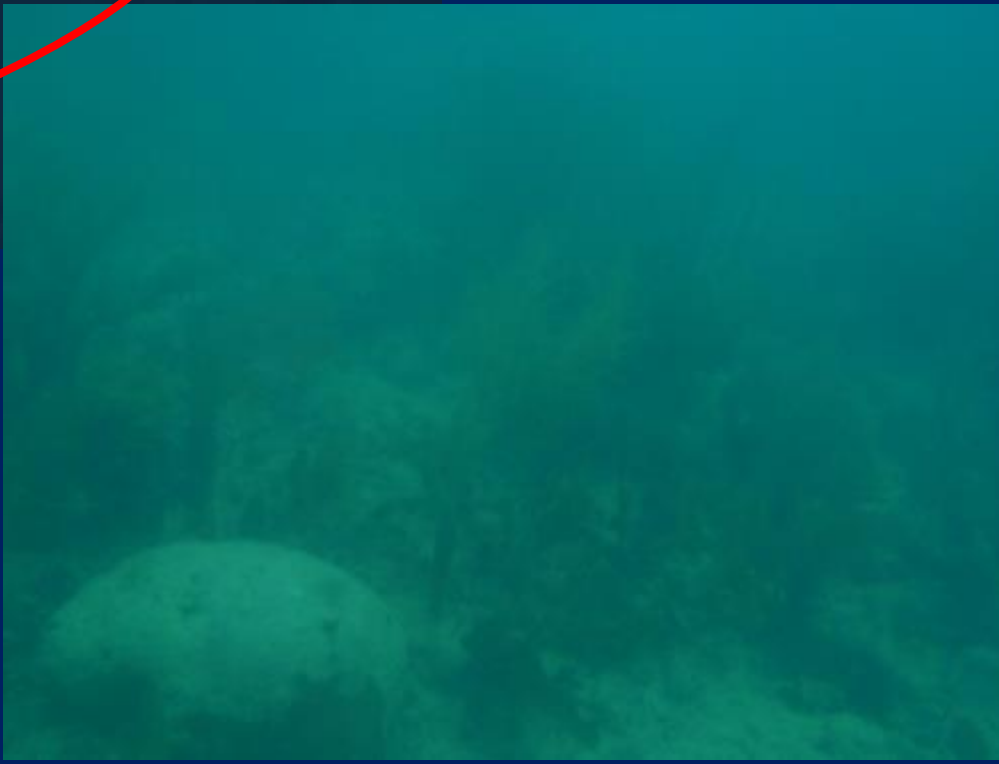
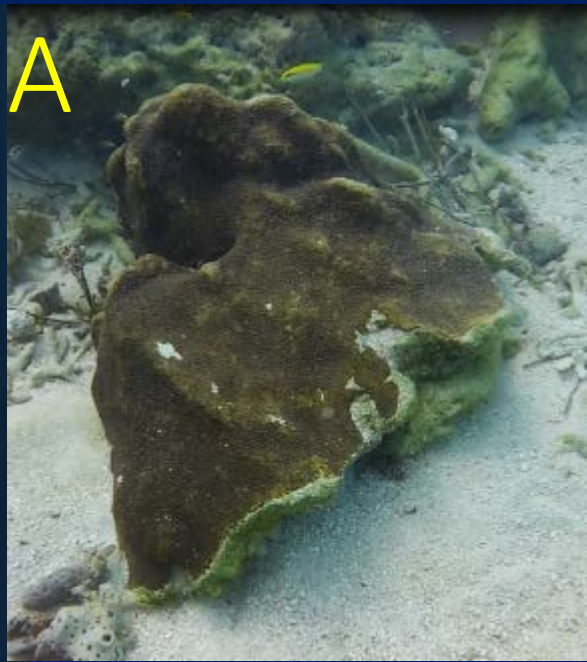


**2014
warmest
winter on
record**



Sea Surface Temperature

HURRICANE IRMA



Coral Disease Response Teams

1. Research and Epidemiology
2. Interventions
3. Coral Rescue
4. Restoration Trials
5. Citizen Engagement
6. Communications
7. International
8. Data Management
9. Management

Coral Disease Response



1. Research and Epidemiology

- Tracking the spread
- Understanding the impacts
- Identifying potential causes

Stony Coral Tissue Loss Disease Condition Report

Legend

-  Coral Reef and Hardbottom
- Endemic**
 -  Duration of Disease Exposure: 1 year – 4 years
- Epidemic**
 -  Duration of Exposure: 6 months – 1 year
- Invasion/Disease Front**
 -  Duration of Exposure: 1 – 6 months
- Pre-Invasion**
 -  Duration of Exposure: None

*Disease boundaries are not exact as this is an evolving event.

Dry Tortugas National Park

Key West

Lower Keys

Middle Keys

Upper Keys

Biscayne National Park

Southeast Florida

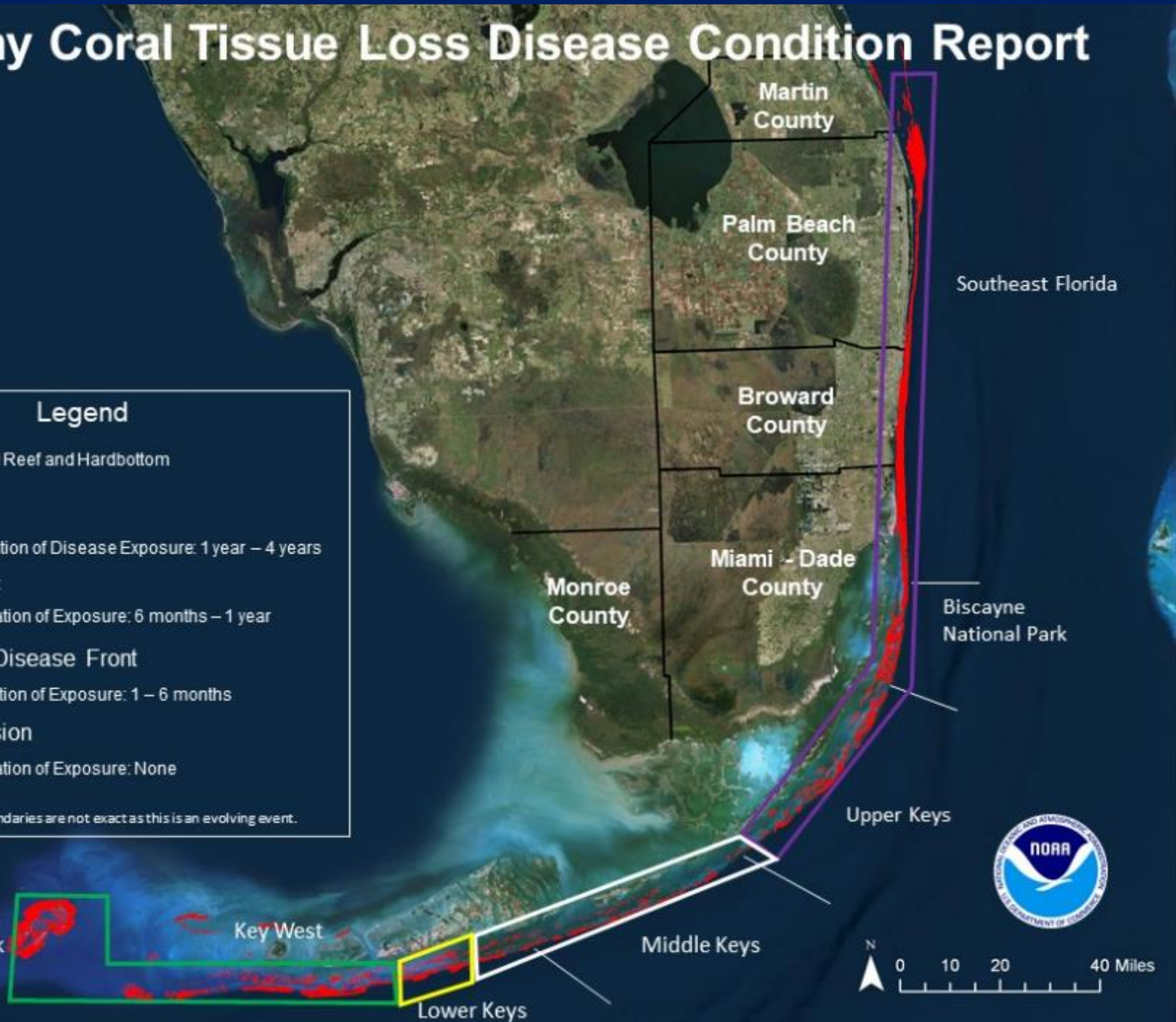
Martin County

Palm Beach County

Broward County

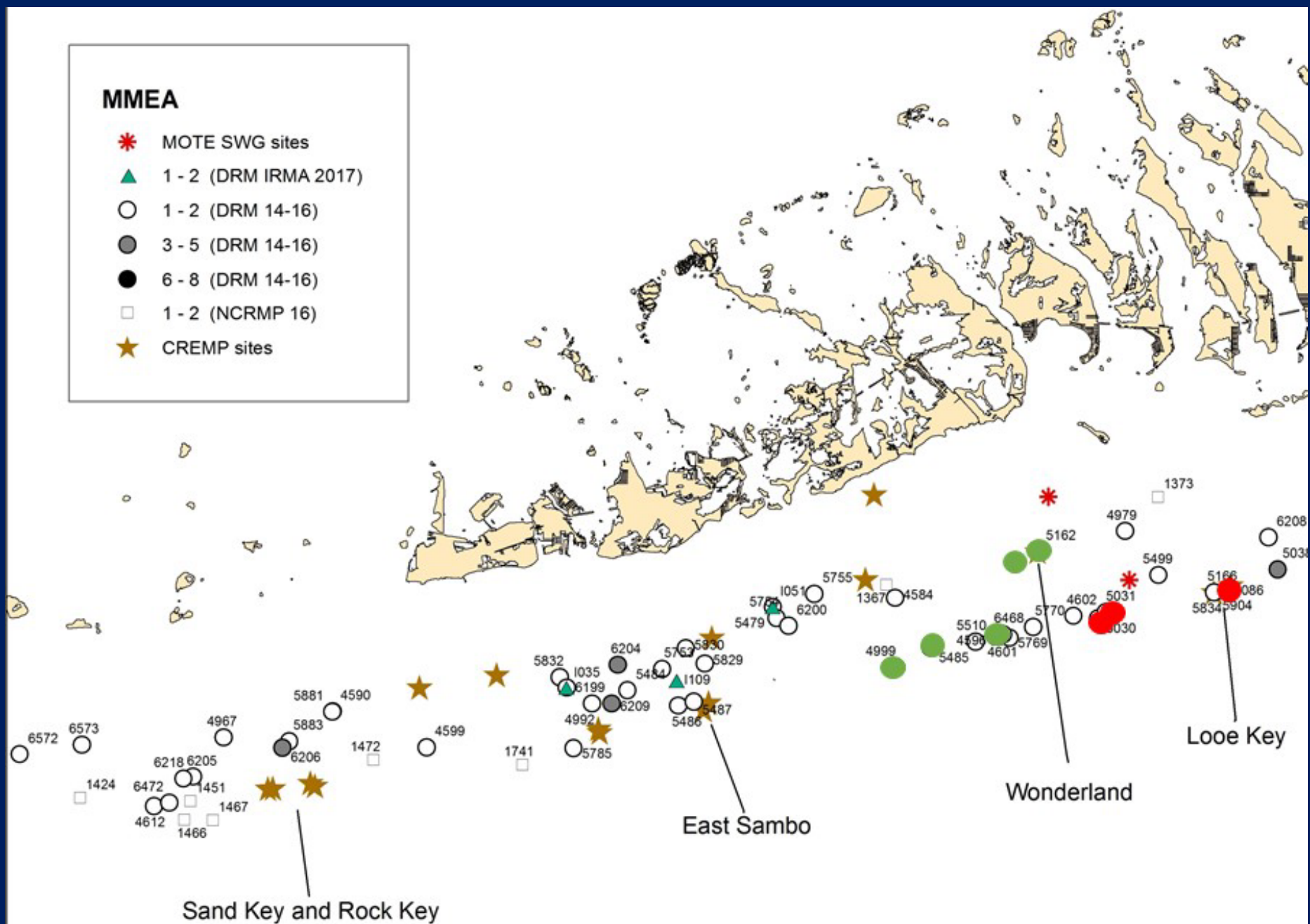
Miami - Dade County

Monroe County



MMEA

- ★ MOTE SWG sites
- ▲ 1 - 2 (DRM IRMA 2017)
- 1 - 2 (DRM 14-16)
- 3 - 5 (DRM 14-16)
- 6 - 8 (DRM 14-16)
- 1 - 2 (NCRMP 16)
- ★ CREMP sites



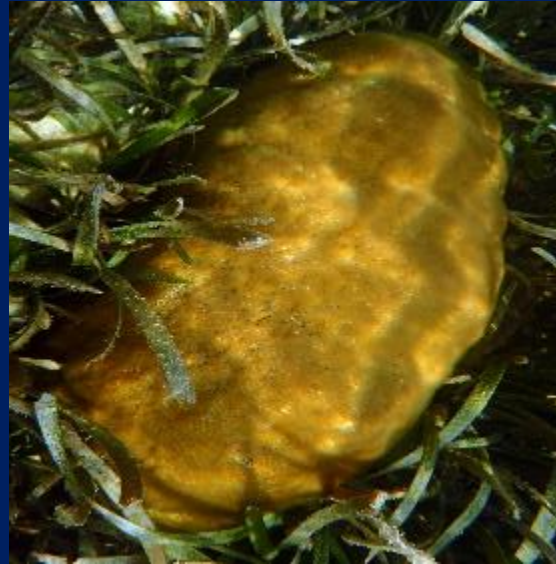
CREMP surveys: 1.5 miles from eastern end of American Shoal

9/15/2018

Early susceptible species

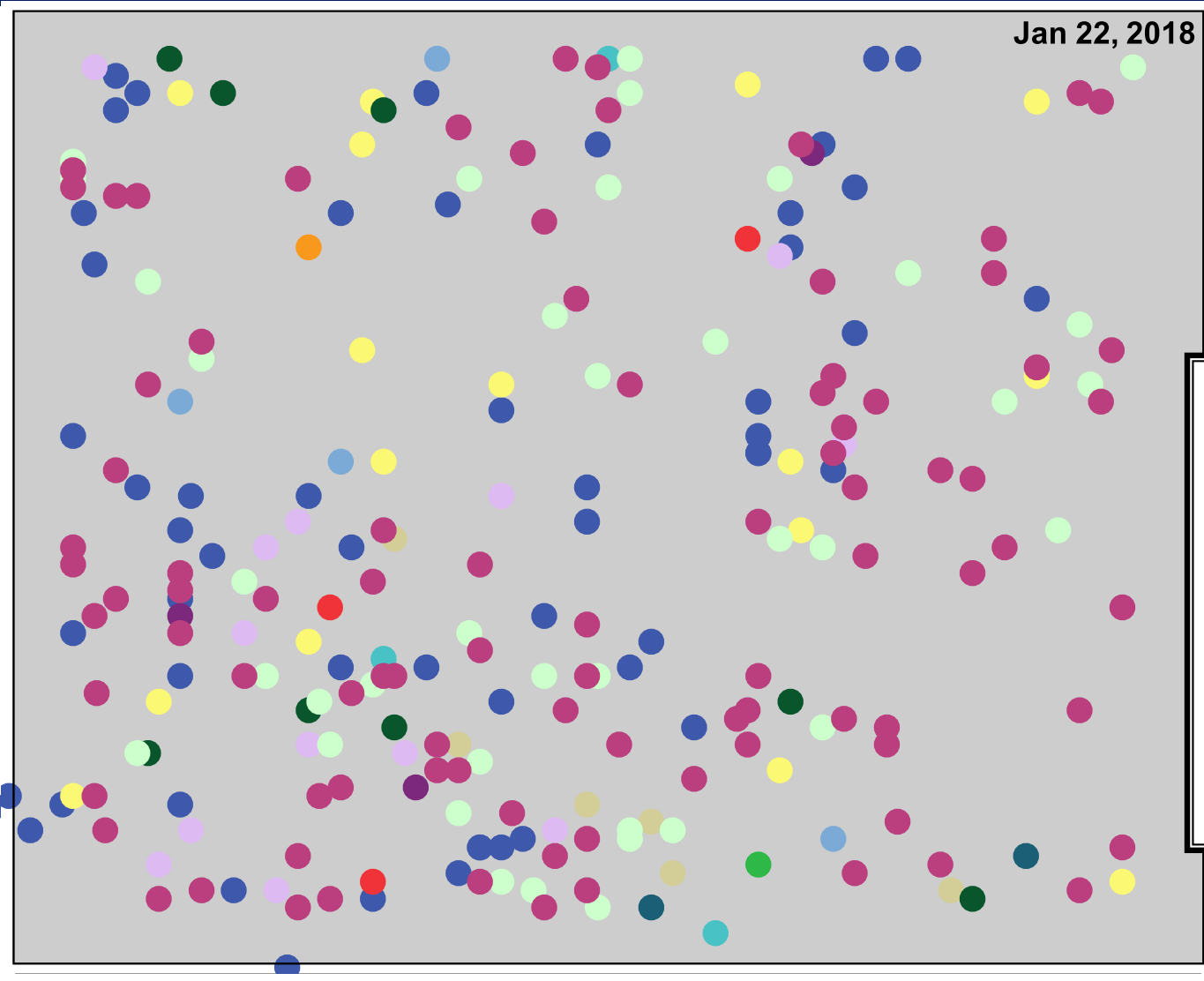


Intermediate susceptible species





Disease Progression: Boot Key Patch Reef



● Diseased Colony
● Dead Colony

● <i>Colpophyllia natans</i>	0%
● <i>Diploria labyrinthiformis</i>	0%
● <i>Dichocoenia stokesii</i>	0%
● <i>Eusmilia fastigiata</i>	0%
● <i>Montastrea cavernosa</i>	0%
● <i>Meandrina meandrites</i>	0%
● <i>Mycetophyllia aliciae</i>	0%
● <i>Oculina diffusa</i>	0%
● <i>Orbicella faveolata</i>	0%
● <i>Porites astreoides</i>	0%
● <i>Pseudodiploria clivosa</i>	0%
● <i>Pseudodiploria strigosa</i>	0%
● <i>Solenastrea bournoni</i>	0%
● <i>Stephanocoenia intersepta</i>	0%
● <i>Siderastrea siderea</i>	0%

Sentinel site, Middle Keys, Jan-Aug 2018

FWC: Bill Sharp



Jan 5, 2017

Tissue Loss

Feb 1, 2017

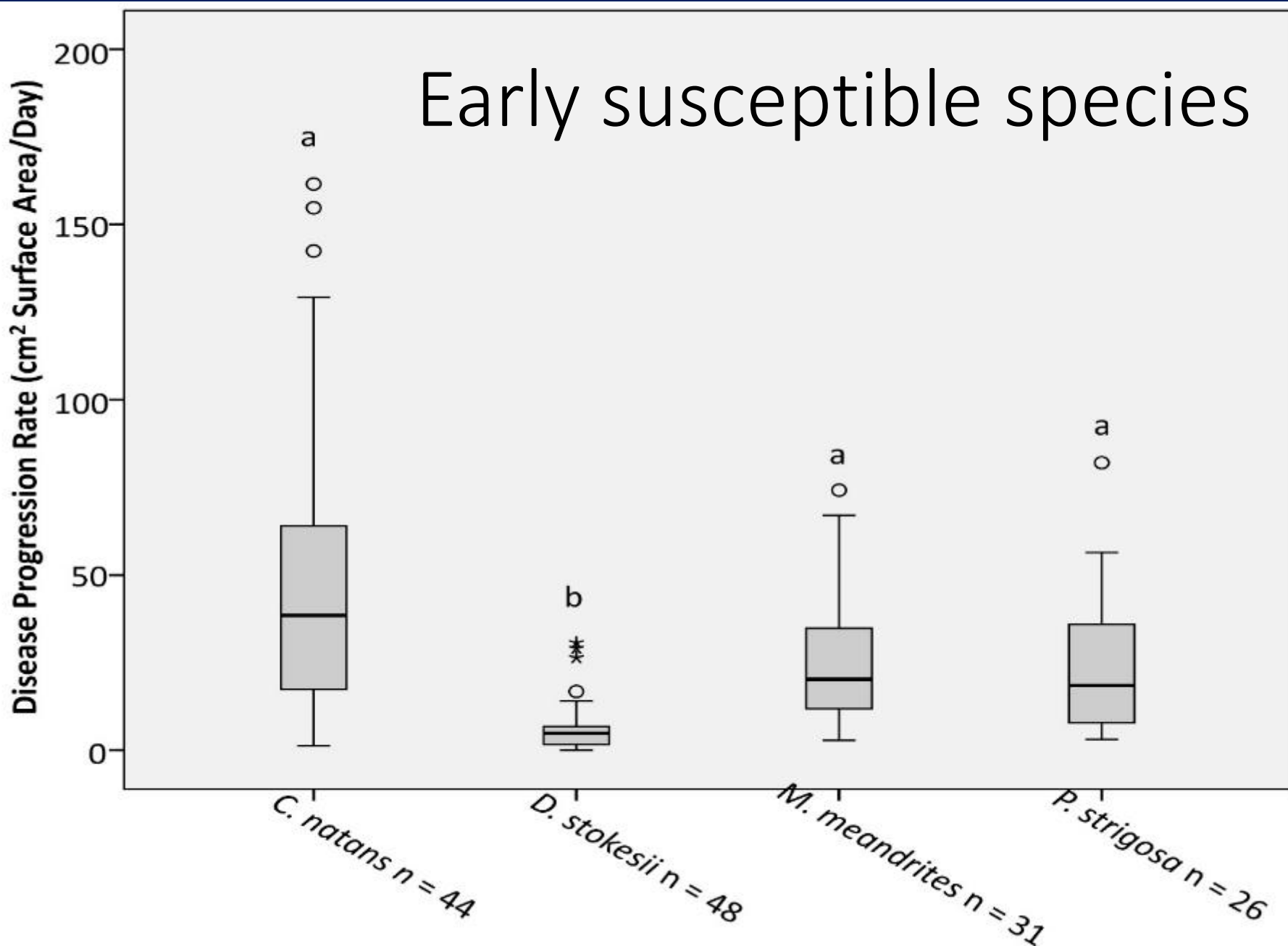


Jan 19, 2017



3-4 cm per
day linear
spread

Early susceptible species



3 sentinel sites, Middle Keys, Jan-Aug 2018

FWC: Bill Sharp

Impacts

Species	N	No Disease		Disease		Complete Colony Mortality	
		N	%	N	%	N	%
<i>C. natans</i>	97	12	12%	85	88%	29	30%
<i>D. stokesii</i>	86	12	14%	74	86%	31	36%
<i>D. labyrinthiformis</i>	10	5	50%	5	50%	2	20%
<i>M. meandrites</i>	24	0	0%	24	100%	12	50%
<i>P. strigosa</i>	48	7	15%	41	85%	14	29%
<i>P. clivosa</i>	3	0	0%	3	100%	2	67%
<i>M. cavernosa</i>	107	60	56%	47	44%	9	8%
<i>O. faveolata</i>	29	13	45%	16	55%	0	0%
<i>S. intersepta</i>	258	131	51%	127	49%	2	1%

3 sentinel sites, Middle Keys, Jan-Aug 2018

FWC: Bill Sharp



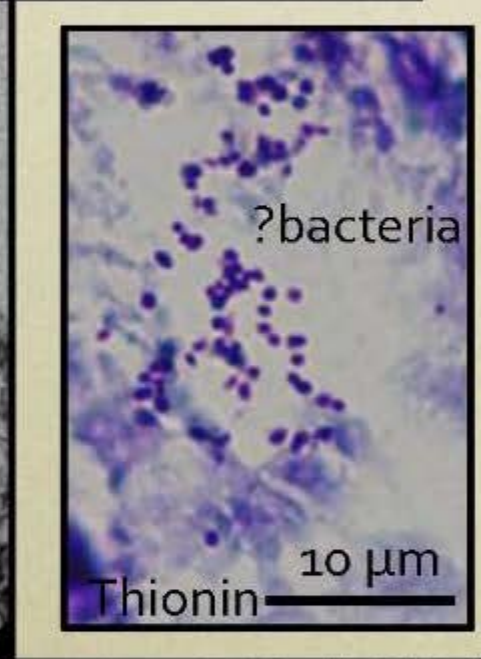
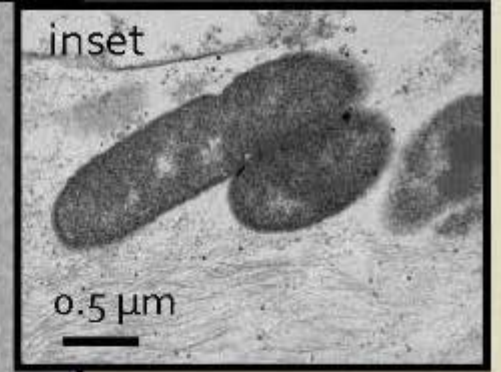
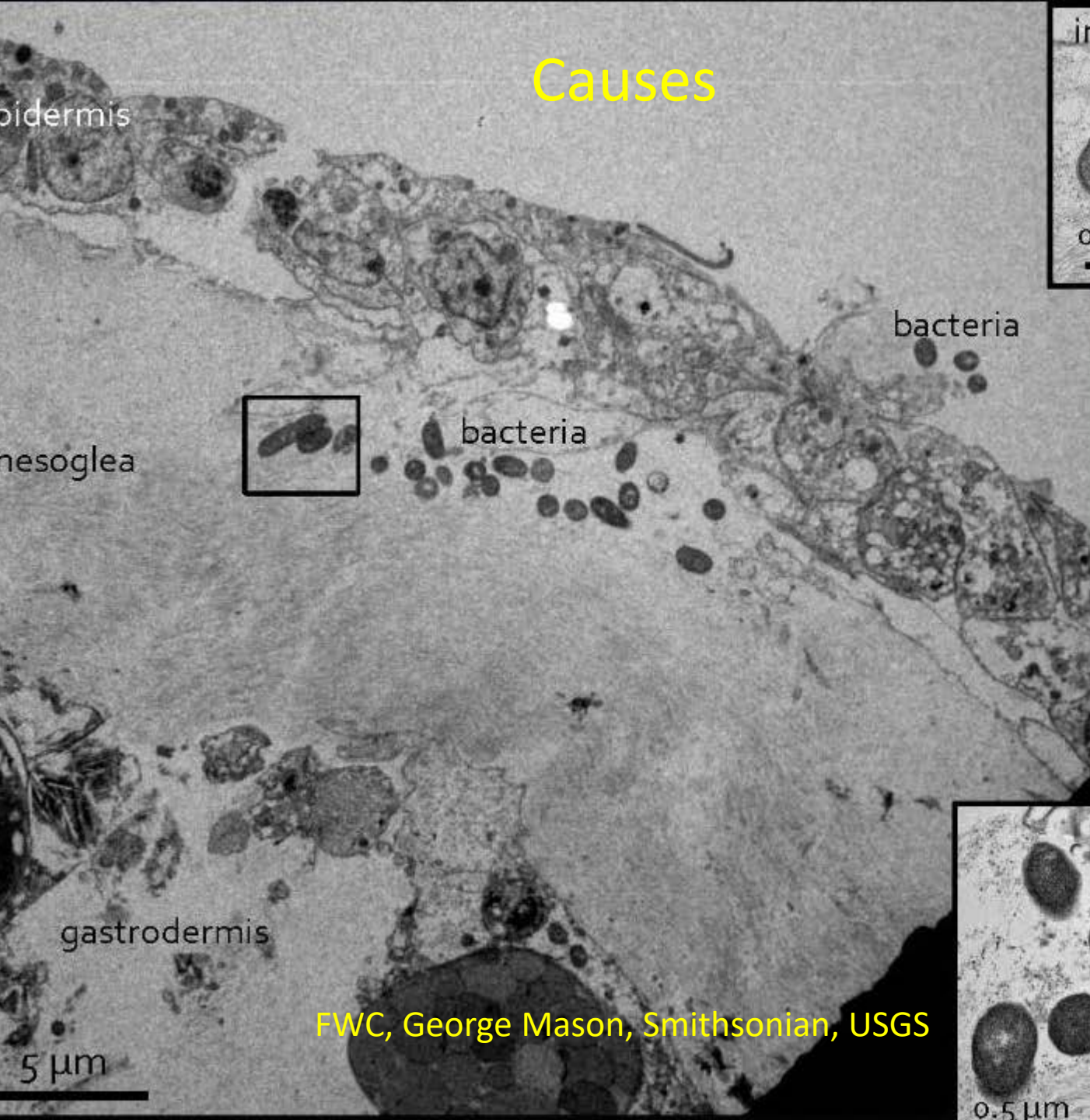
Resistant genotypes
Resilient habitats
Non-susceptible species



HOPE SPOTS

white bank 082018

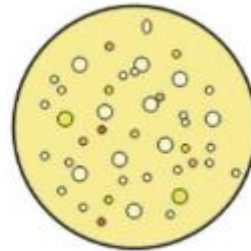
Causes



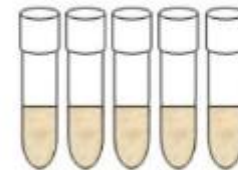
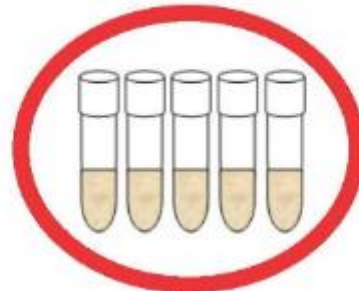
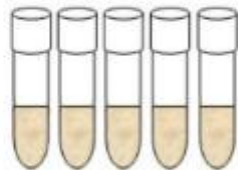
FWC, George Mason, Smithsonian, USGS

Isolation of Putative Pathogens

1) Mucus bacteria from diseased coral isolated



2) Pools of five isolates tested simultaneously



3) Determine which pools cause disease



2. Interventions

- Can you effectively treat diseased corals?
- Can you change the trajectory of the disease?
- Can you reduce the spread of the disease?

Interventions



Karen Neely, Nova Southeastern Univ

April 5, 2018- First Visit



April 27, 2018- Treatment



June 1, 2018 – Monitor- Progressed passed covered margin



June 11, 2018- Monitor



Antibiotic treatment

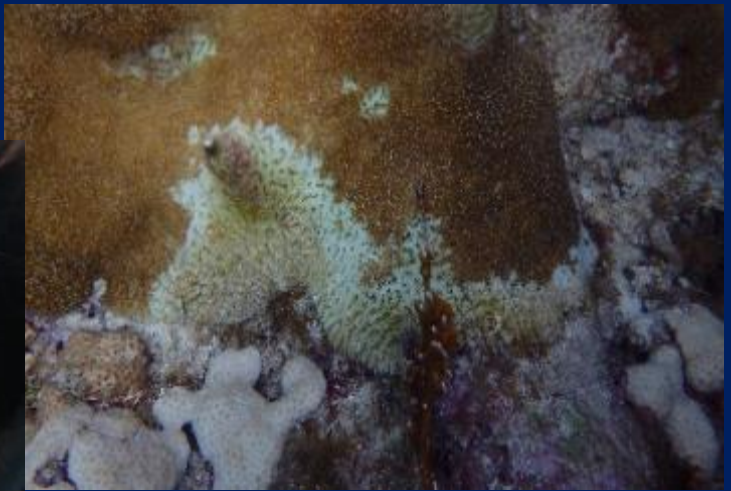


Woodley, NOAA/NCCOS

Field Trials

May 18

May 23



June 1

June 13

Cindy Lewis, KML; Karen Neely, NOVA Southeastern

Antibiotic field trials



Dlab: n=1 100% success



Cnat: n=7 100% success



Pstr: n=1 100% success



Mcav n=2 100% success



Dcyl n=43 88% success



Ofav n=6 100% success

Karen Neely: Florida DEP/Nova

Scaling up interventions

- 10 m X 10 m plots within reefs
- Entire patch reefs (Invasion zone)
- High value corals (Endemic/Epidemic zone)



3. Coral Rescue

- Preserve the species diversity and genetic diversity of corals found in Florida
- Establish gene banks
- Propagate corals for restoration

Pilot Collection Sites



Coral Rescue



4. Restoration Trials

- When do you start restoring a reef?
- Where do you restore?
- How do you minimize risks?

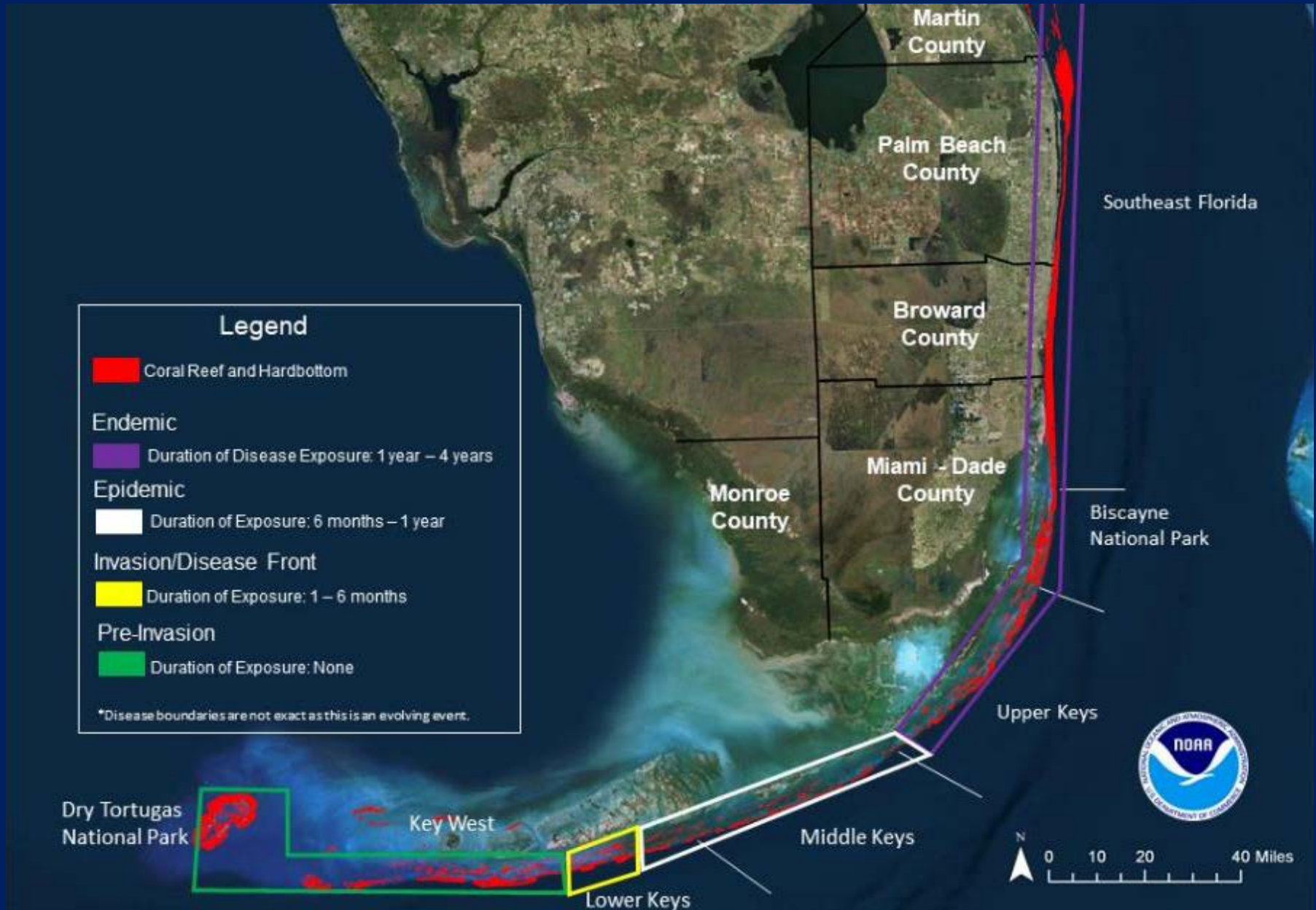
Restoration Trials

Partners:

- Mote
- CRF
- FWC
- Reef Renewal



Where and what do you outplant?



Outplanting Susceptible Species



Concerns

- Increase pathogen load
- Reinvigorate outbreak
- Enhance spread
- Mortality of outplants

Carriers/Vectors



Are acroporids susceptible to SCTLD?

Are acroporids carriers and can they transfer disease to new areas



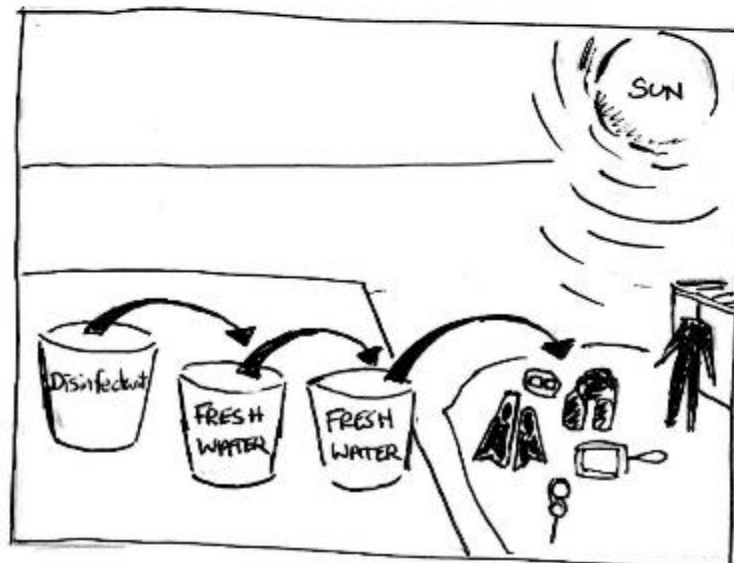
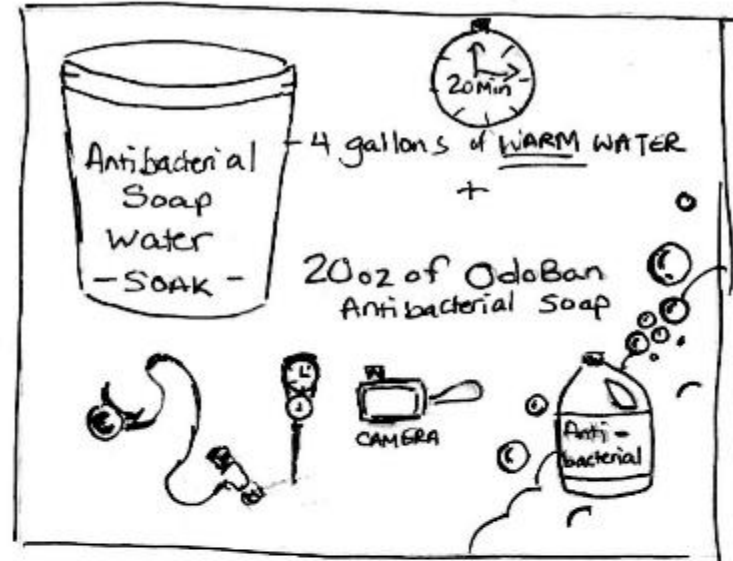
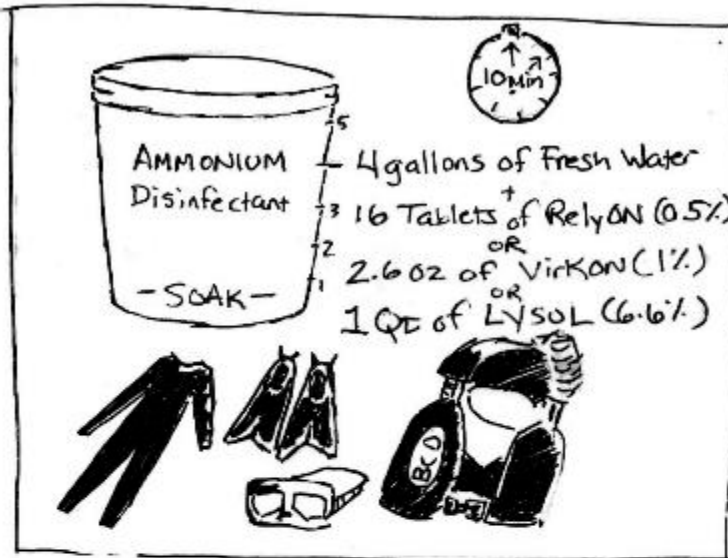
5. Citizen Engagement/Communications/International

- Improve understanding
- Share lessons learned
- Get involved

The disease is now in Mexico!



Decontamination Protocol



Citizen Engagement: Phase I

Florida Reef Tract Stony Coral Tissue Loss Disease

TODAY'S AGENDA:

- POWERPOINT PRESENTATION
- GROUP CORAL AND DISEASE IDENTIFICATION
- TEST - CORAL IDENTIFICATION

SHELLY KRUEGER and ANA ZANGRONIZ
FLORIDA SEA GRANT

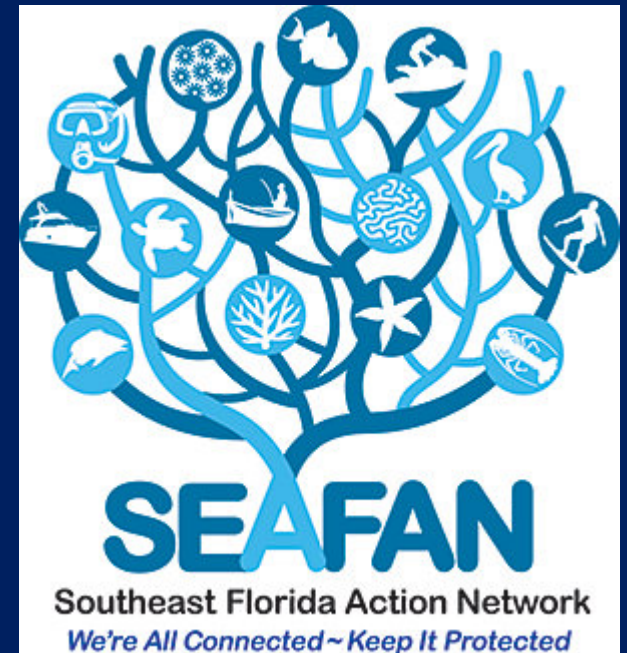
OCTOBER 5, 2018

Training Sessions

- FKCC
- Blue Star Dive Operators
- REEF Lionfish Workshops

More information

<https://floridakeys.noaa.gov/coral-disease/>



Report observations

Get involved

Andy.Bruckner@noaa.gov