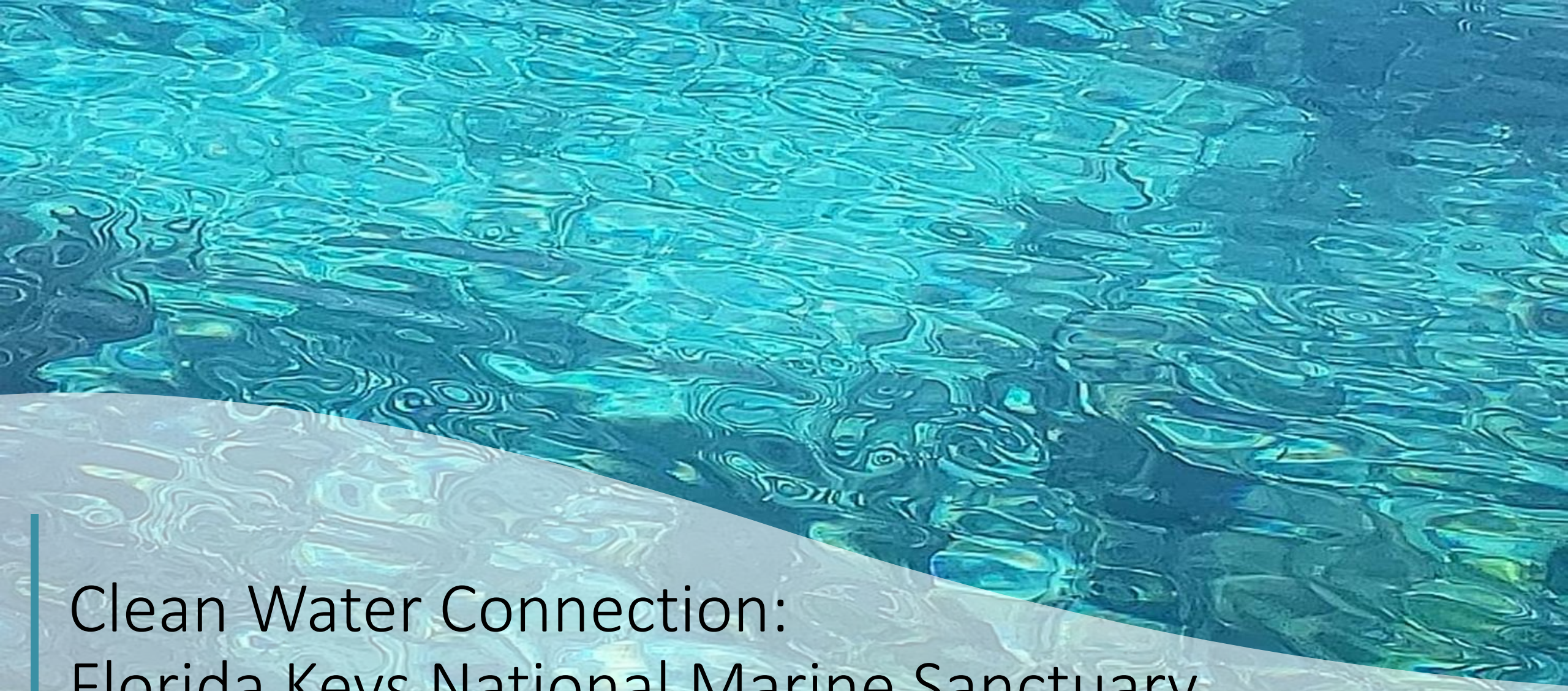


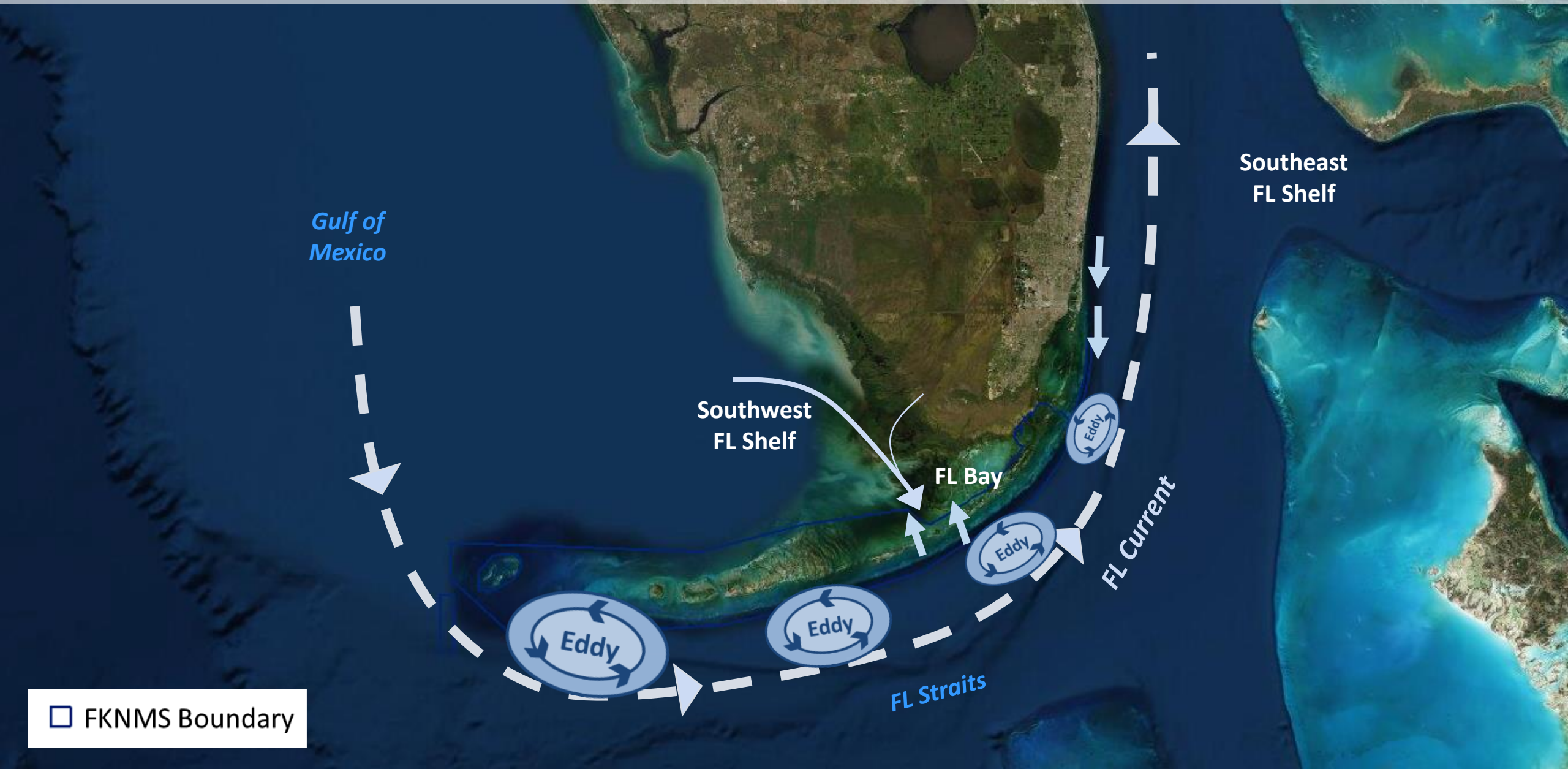
Clean Water Connection: Florida Keys National Marine Sanctuary

Karen Bohnsack

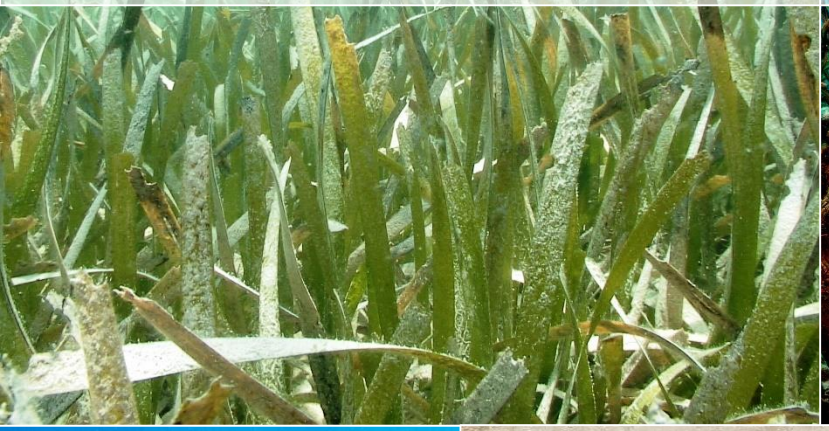
35th Everglades Coalition Conference

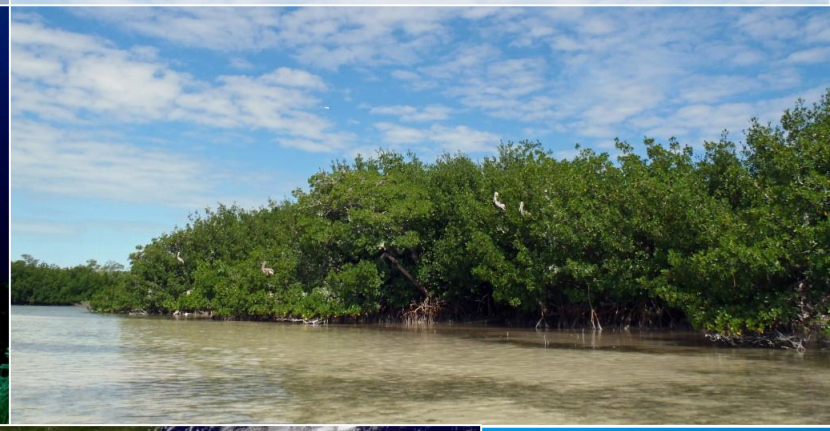
Florida Keys Connectivity

Florida Keys Connectivity

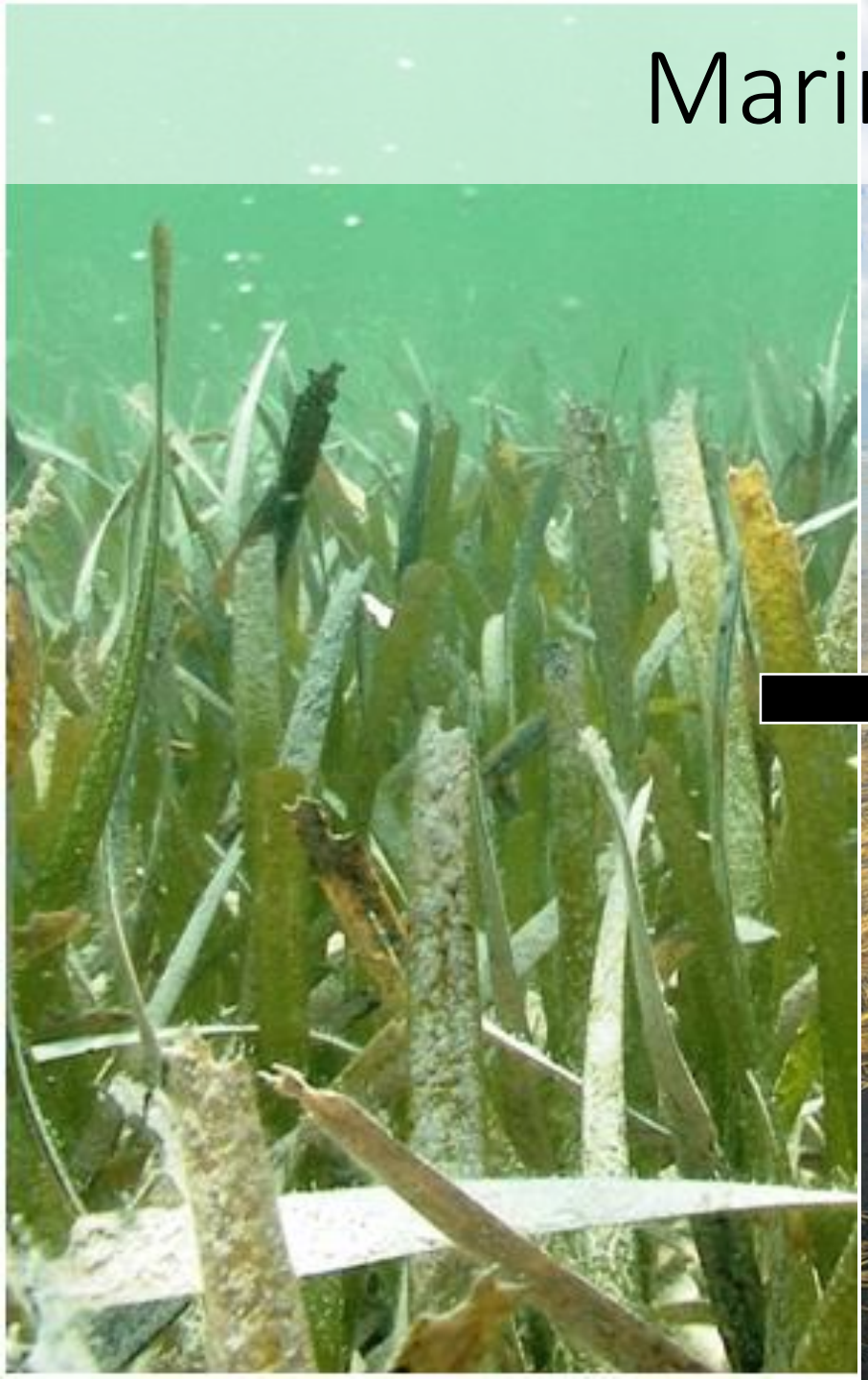


Nationally Significant Marine Resources





Marine Resource Declines



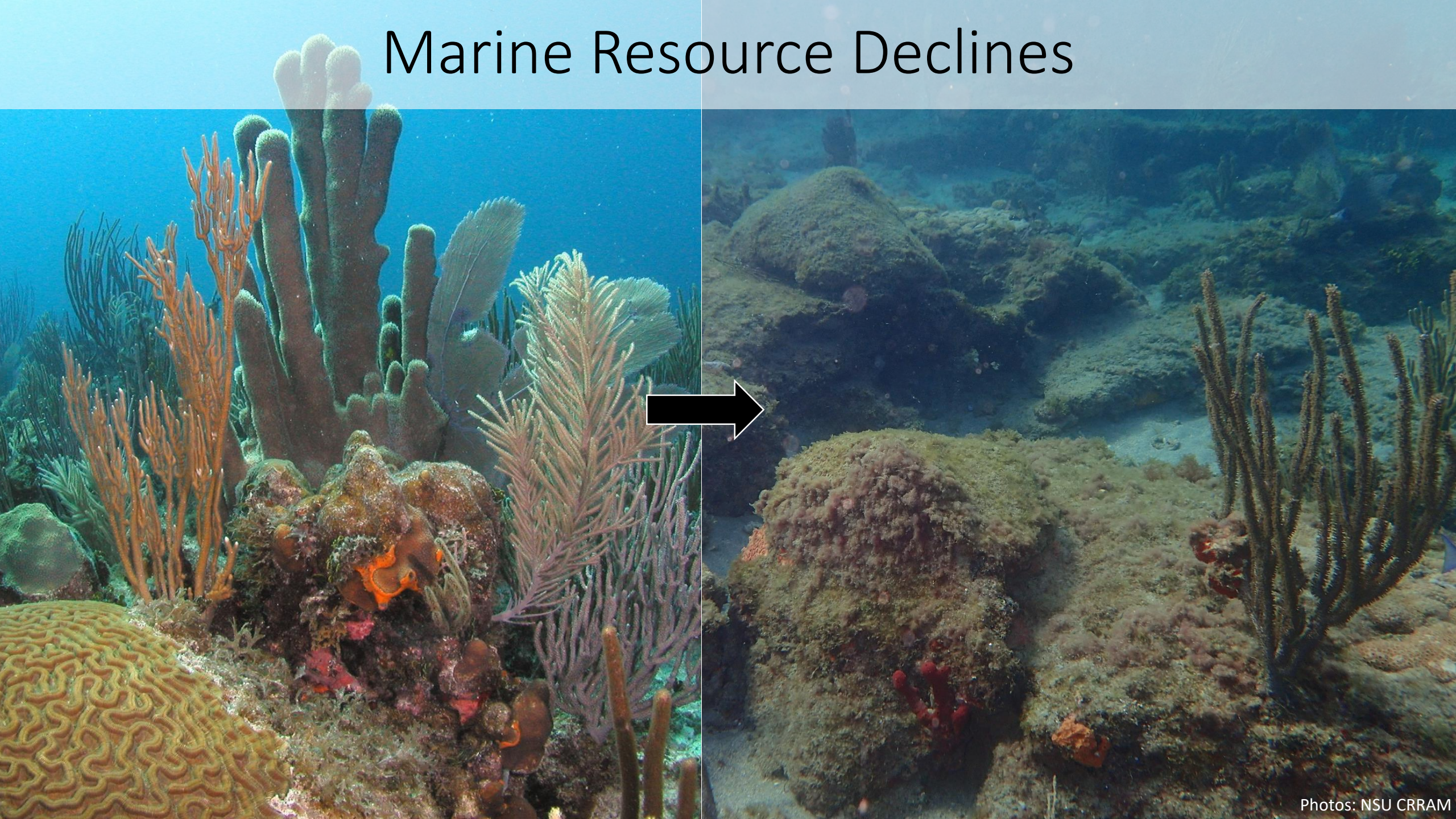
Importance of Everglades Restoration: Florida Bay

Historic Flow

Current Flow

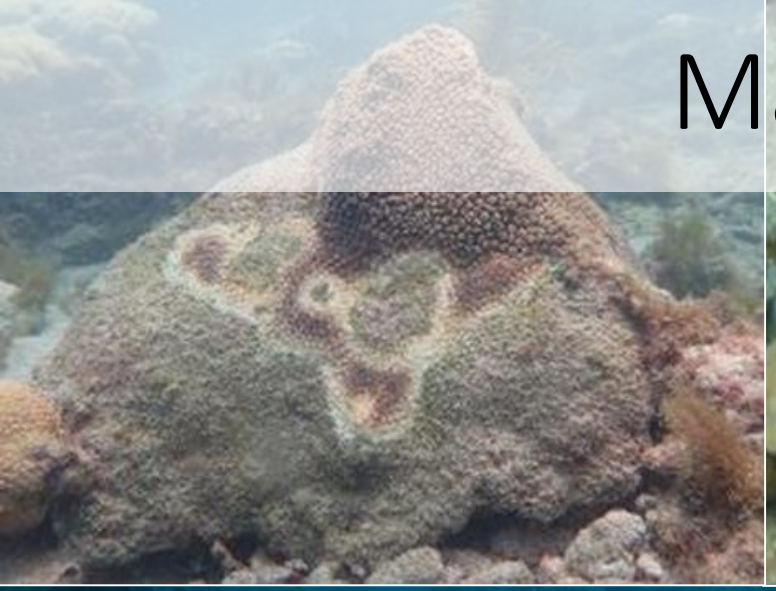
Restored Flow

Marine Resource Declines

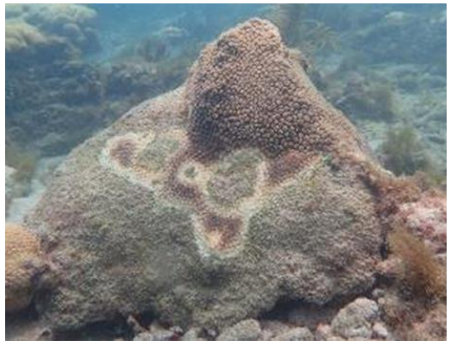


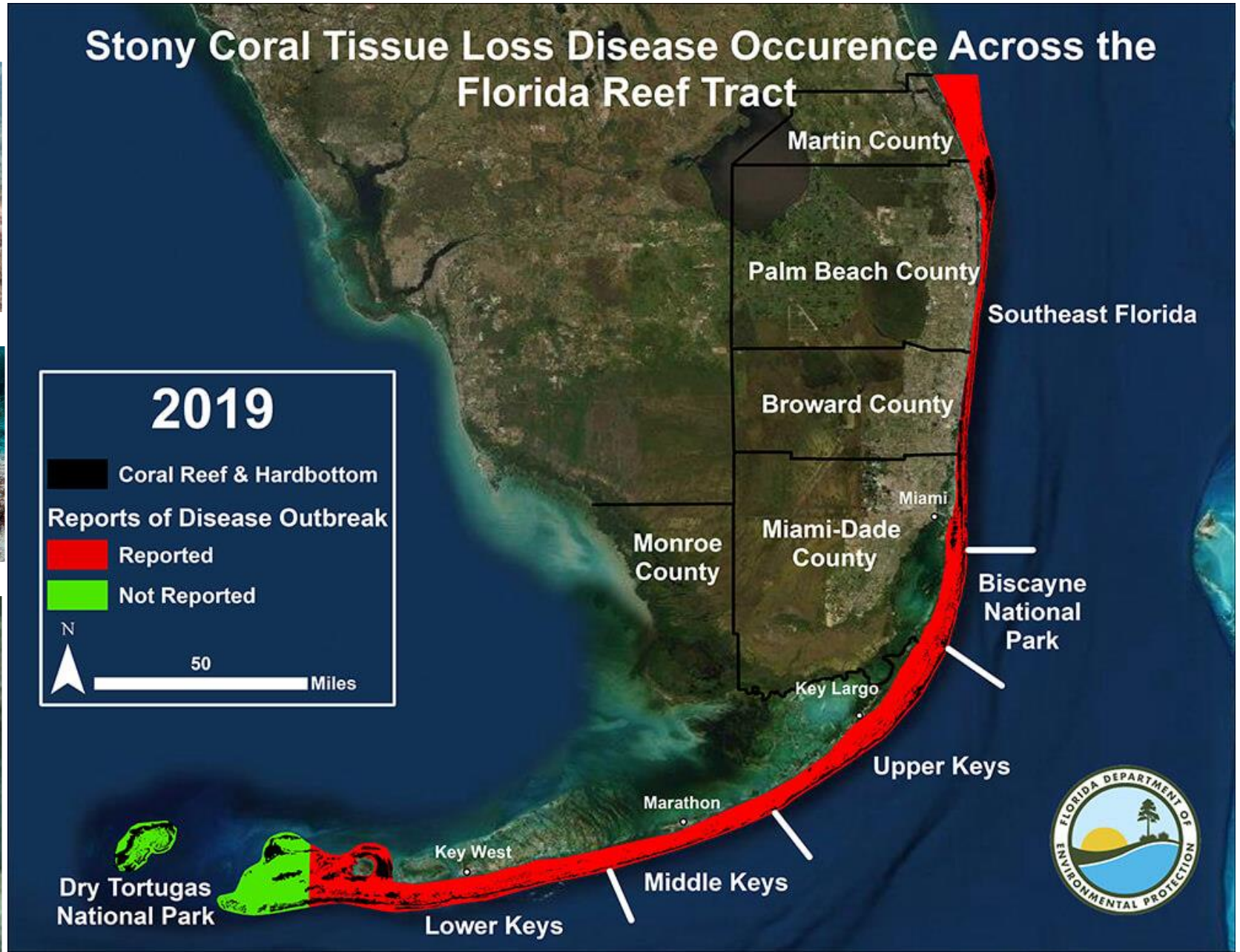
Photos: NSU CRRAM

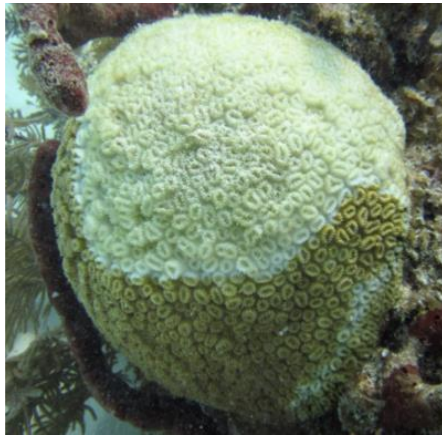
Marine Resource Declines



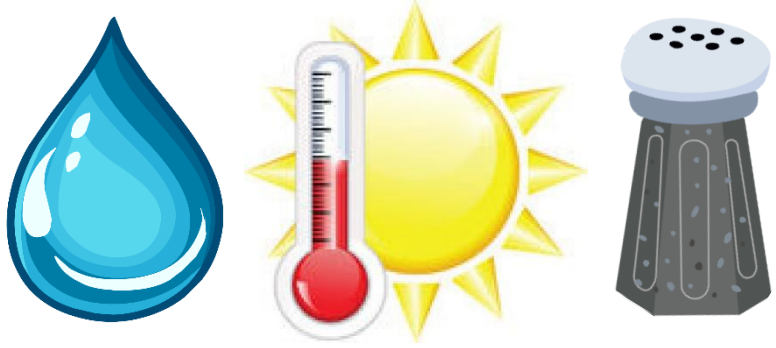
Marine Resource Declines

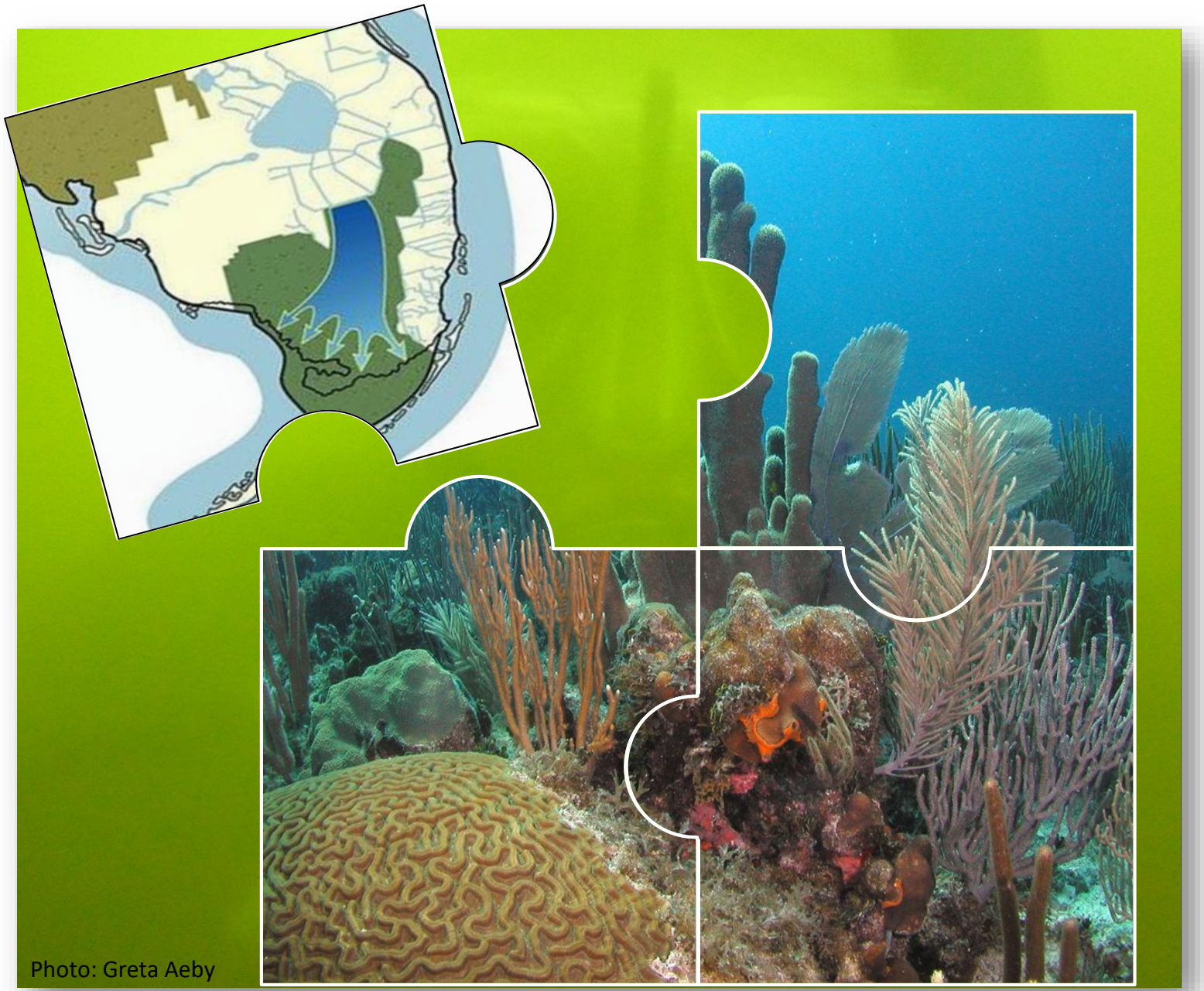




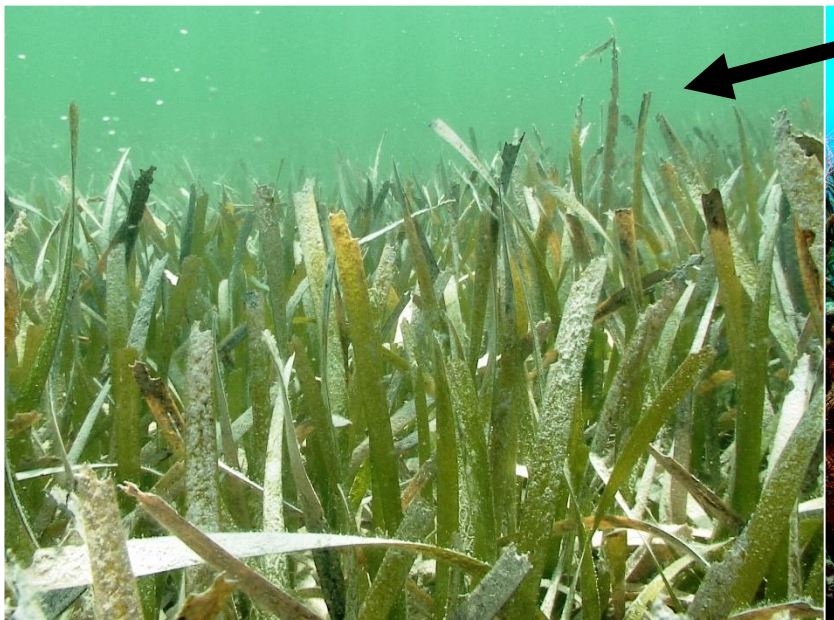


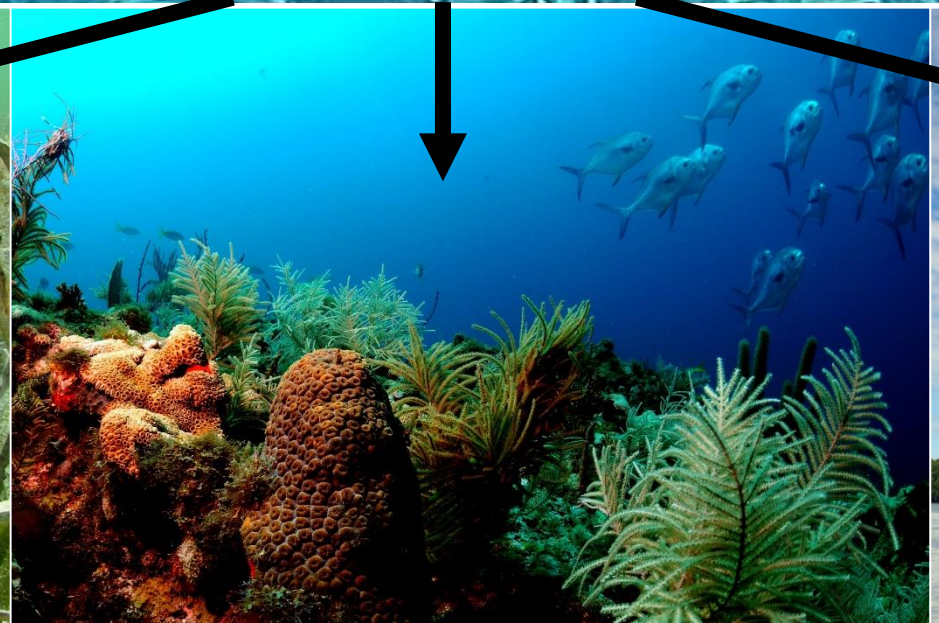
Importance of Everglades Restoration: Coral Reefs





Importance of Everglades Restoration





Local Restoration Efforts

Water Quality Protection Program

Restoration Blueprint

Coral Rescue

Mission: Iconic Reefs

The Clean Water Connection

Thank You

Clean Water Connection:
Reefs in Peril & Impacts on the Community

Madeline Kaufman | Everglades Coalition Conference 2020

Acropora palmata

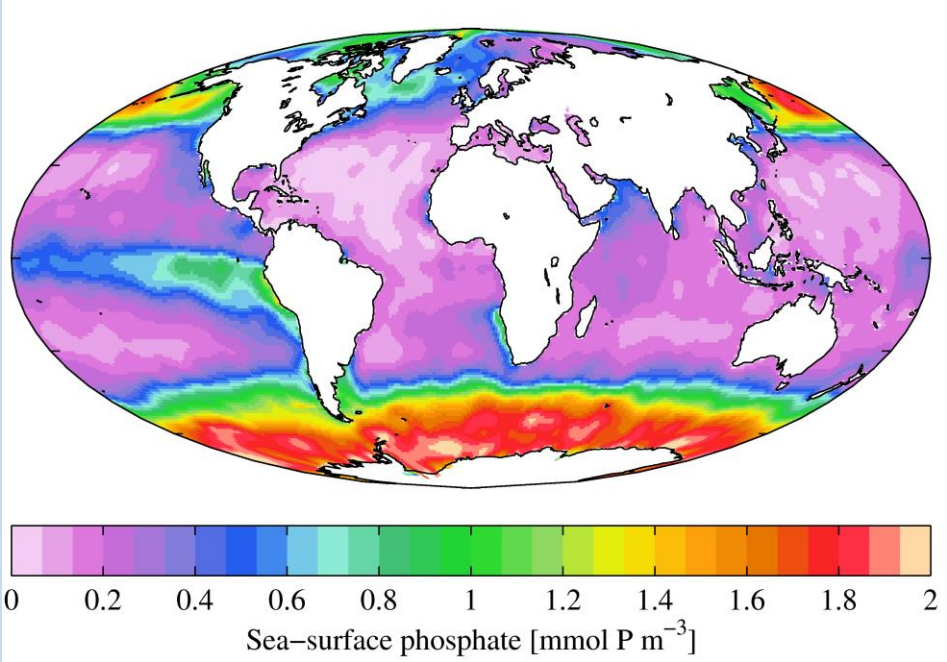
Acropora cervicornis

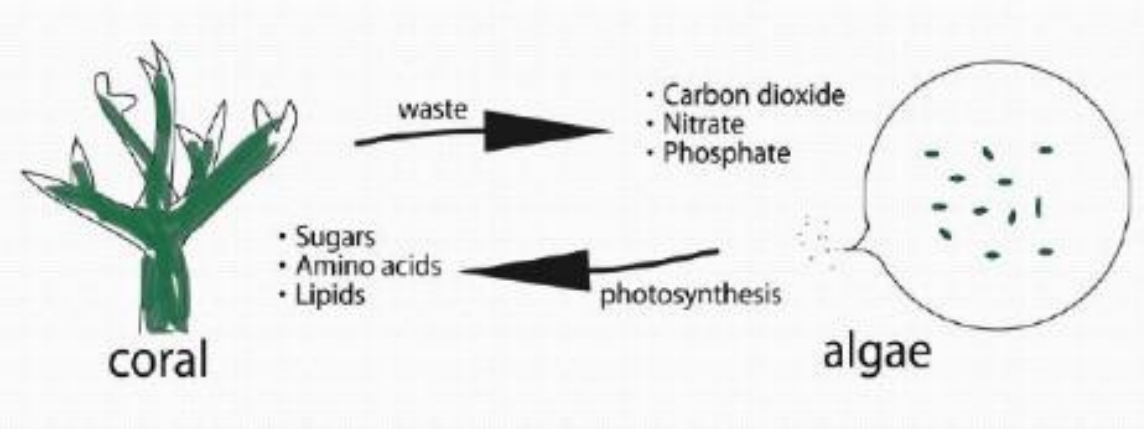
Orbicella faveolata

Diploria labyrinthiformis

- **Buffer up to 97% of wave energy**
- **Support 4,000 species of fish**
- **Asset value of $8.5 billion in Florida ALONE (NOAA)**

The evolution of the most biodiverse ecosystems in the nutrient deserts of the ocean…





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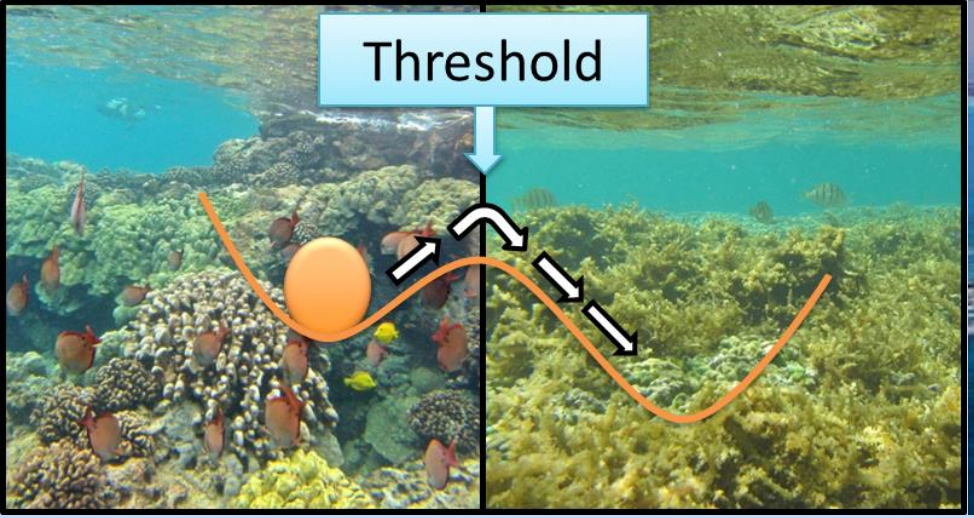
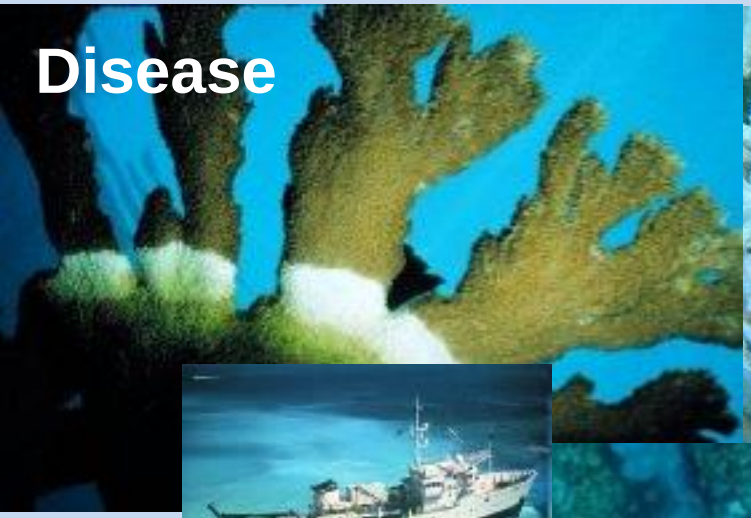

Threshold

Coastal Development

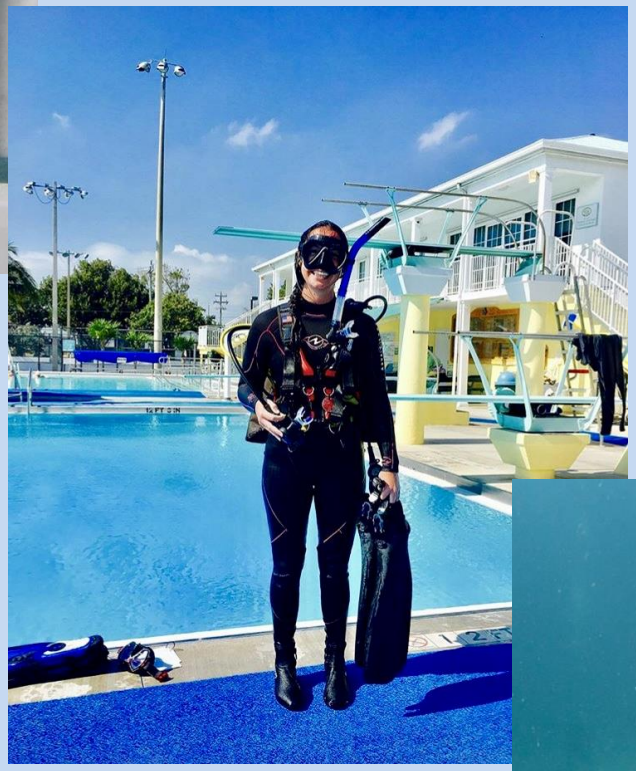

Disease

Climate Change and
Coral Bleaching

Bill Keogh

Ship Groundings
Florida Keys National Marine Sanctuary

Overfishing



Rescue
a Reef

RIVERS TO REEFS

How Water Links the Everglades to the Florida Reef Tract & Coral Disease Outbreak Response Efforts

35TH EVERGLADES COALITION CONFERENCE

January 10, 2020

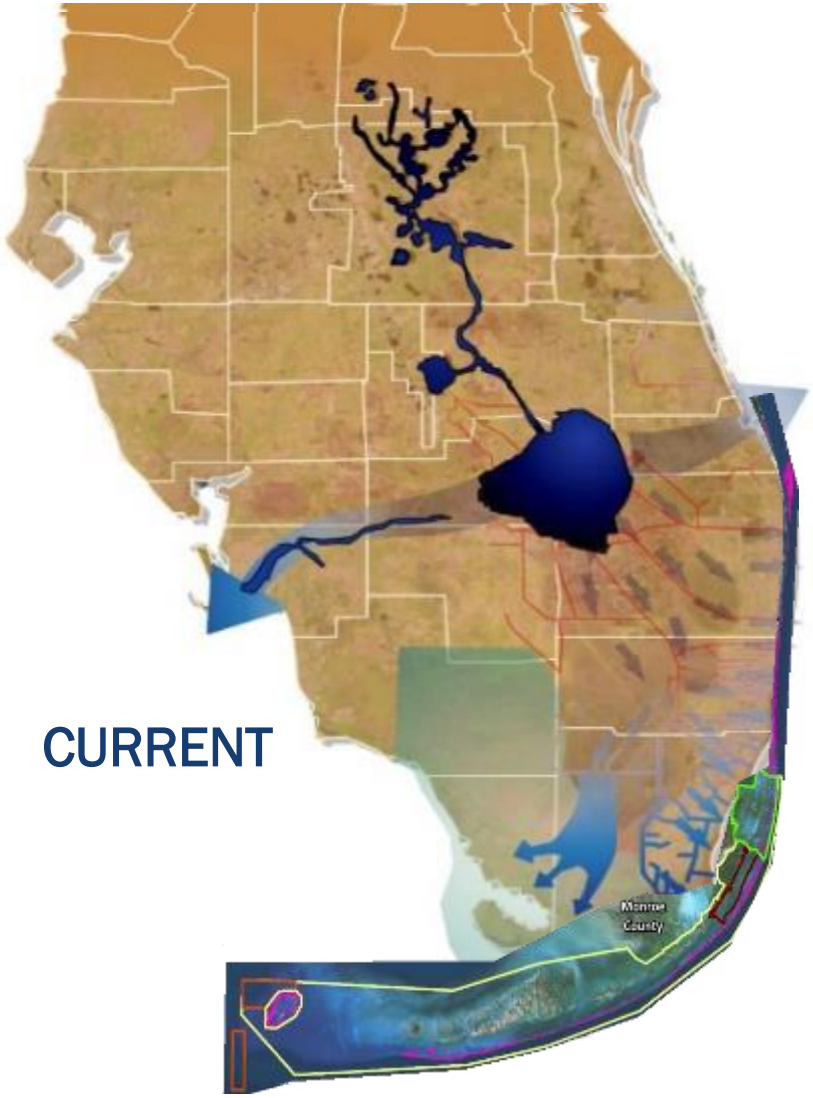
Michelle Graulty, Awareness & Appreciation Coordinator
FDEP Coral Reef Conservation Program &
Southeast Florida Coral Reef Ecosystem Conservation Area

FLORIDA'S NATIONAL TREASURES

The Everglades and Florida's Coral Reef

FLORIDA'S NATIONAL TREASURES

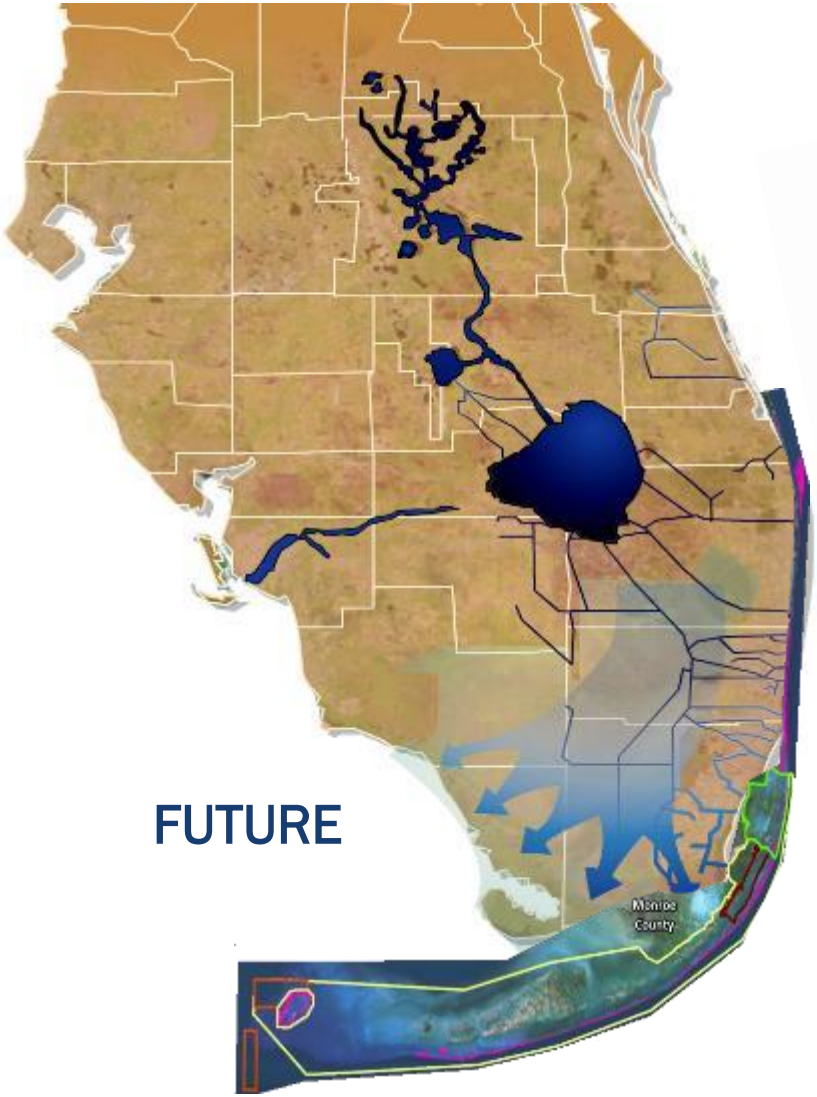
The Everglades and Florida's Coral Reef

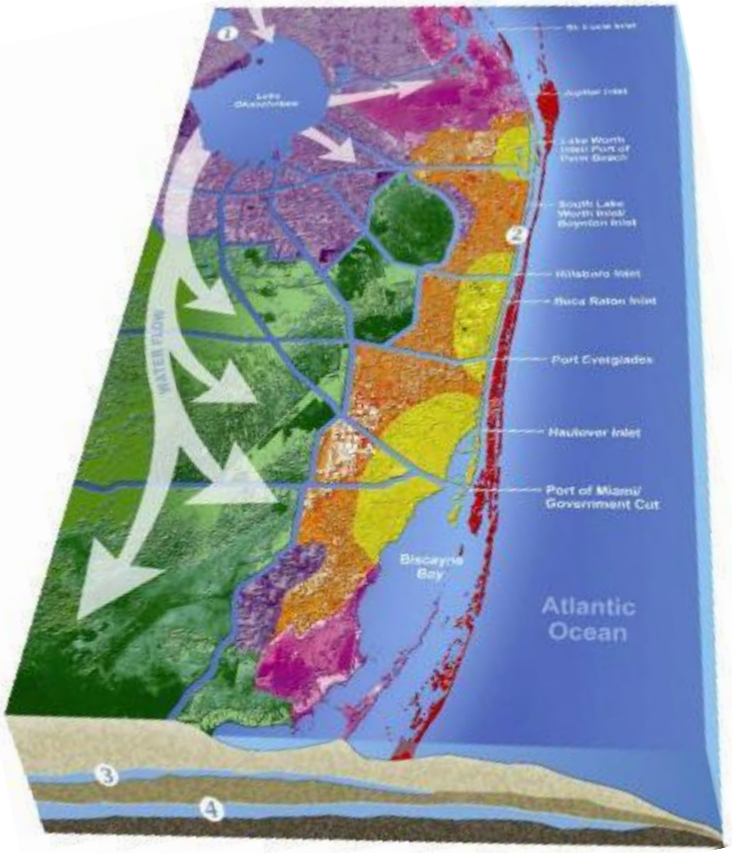


CURRENT

FLORIDA'S NATIONAL TREASURES

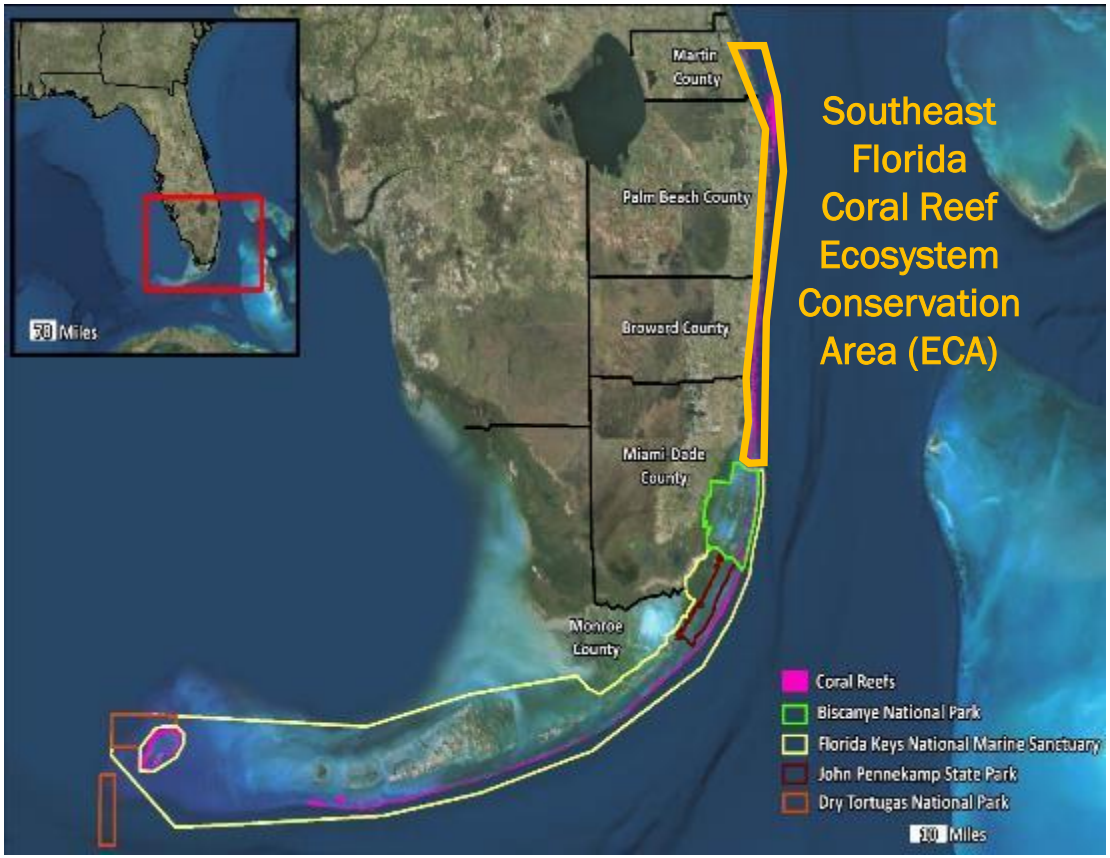
The Everglades and Florida's Coral Reef

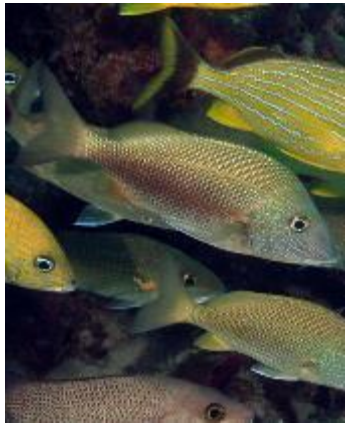




FLORIDA'S CORAL REEF

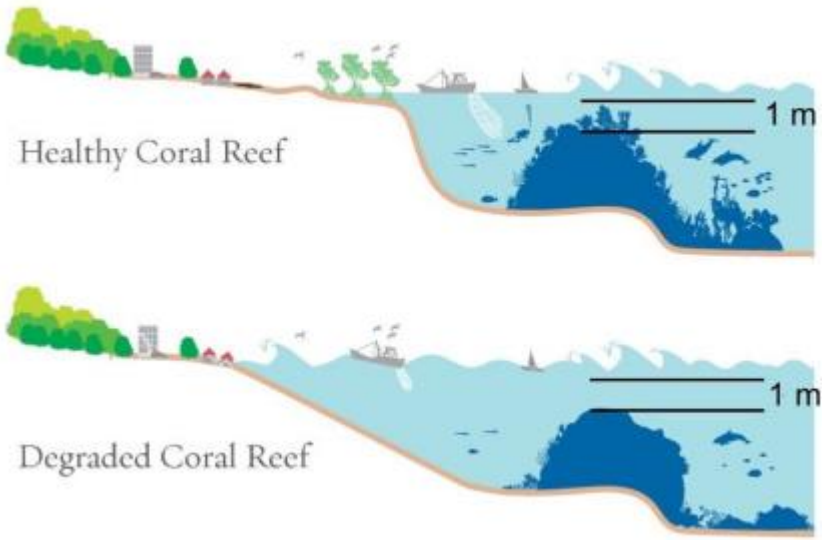
Florida Reef Tract





ECONOMICALLY ESSENTIAL

Coastal Protection, Fishing, Tourism

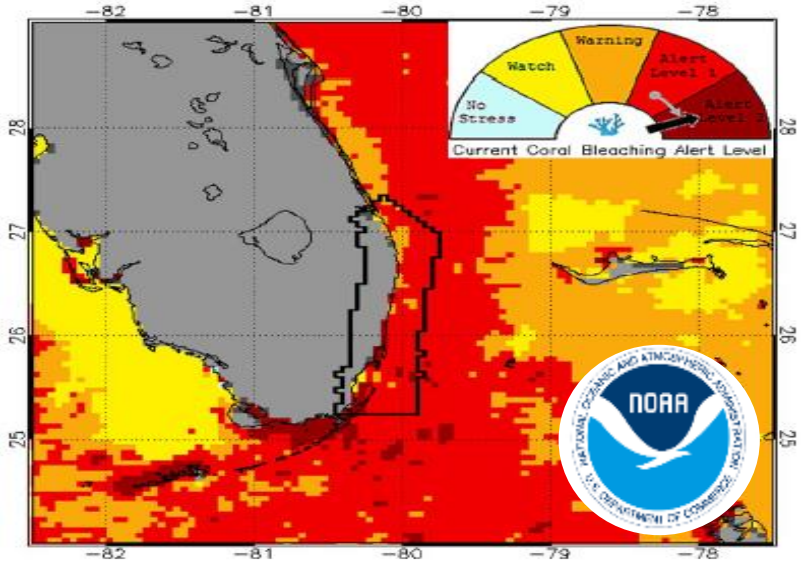


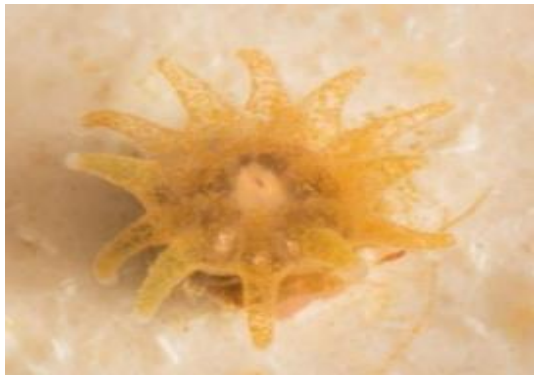
Images from: Mapping Ocean Wealth

GLOBAL STRESSORS

Increased frequency & severity of extreme thermal events

(hot & cold)



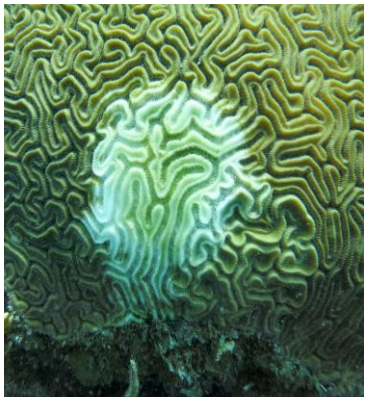


Ocean (& coastal) acidification

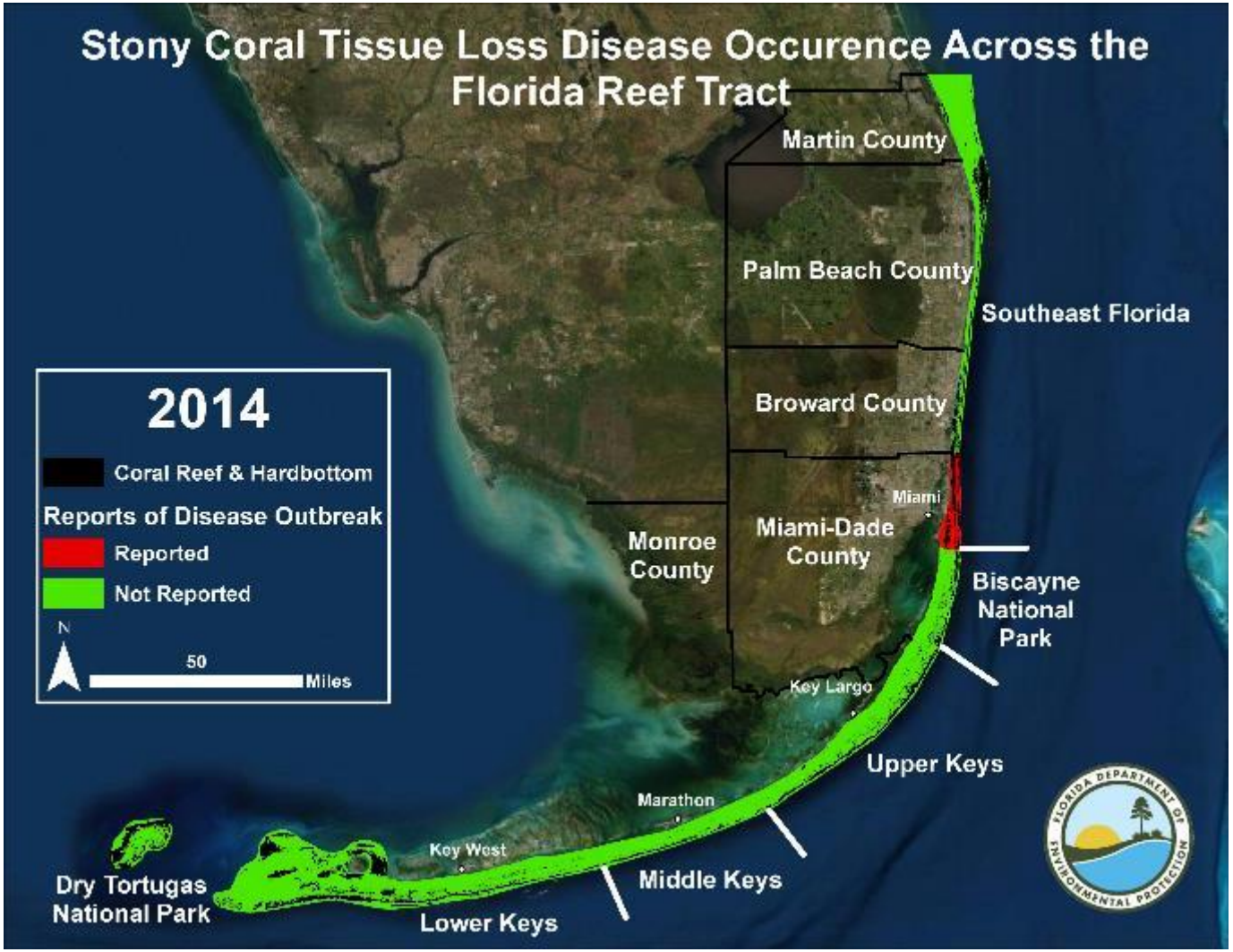
LOCAL STRESSORS

GLOBAL & LOCAL DECLINE

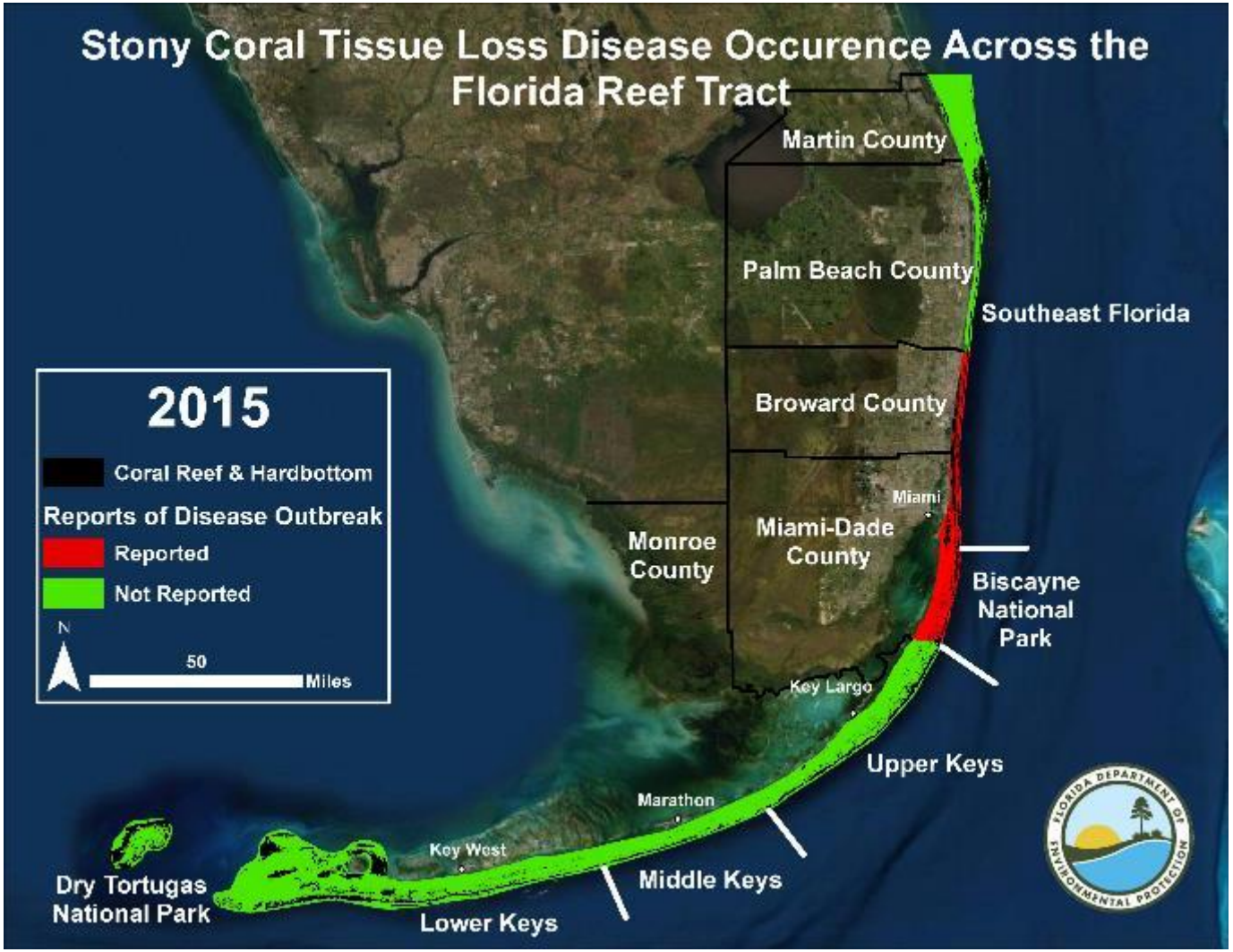
STONY CORAL TISSUE LOSS DISEASE



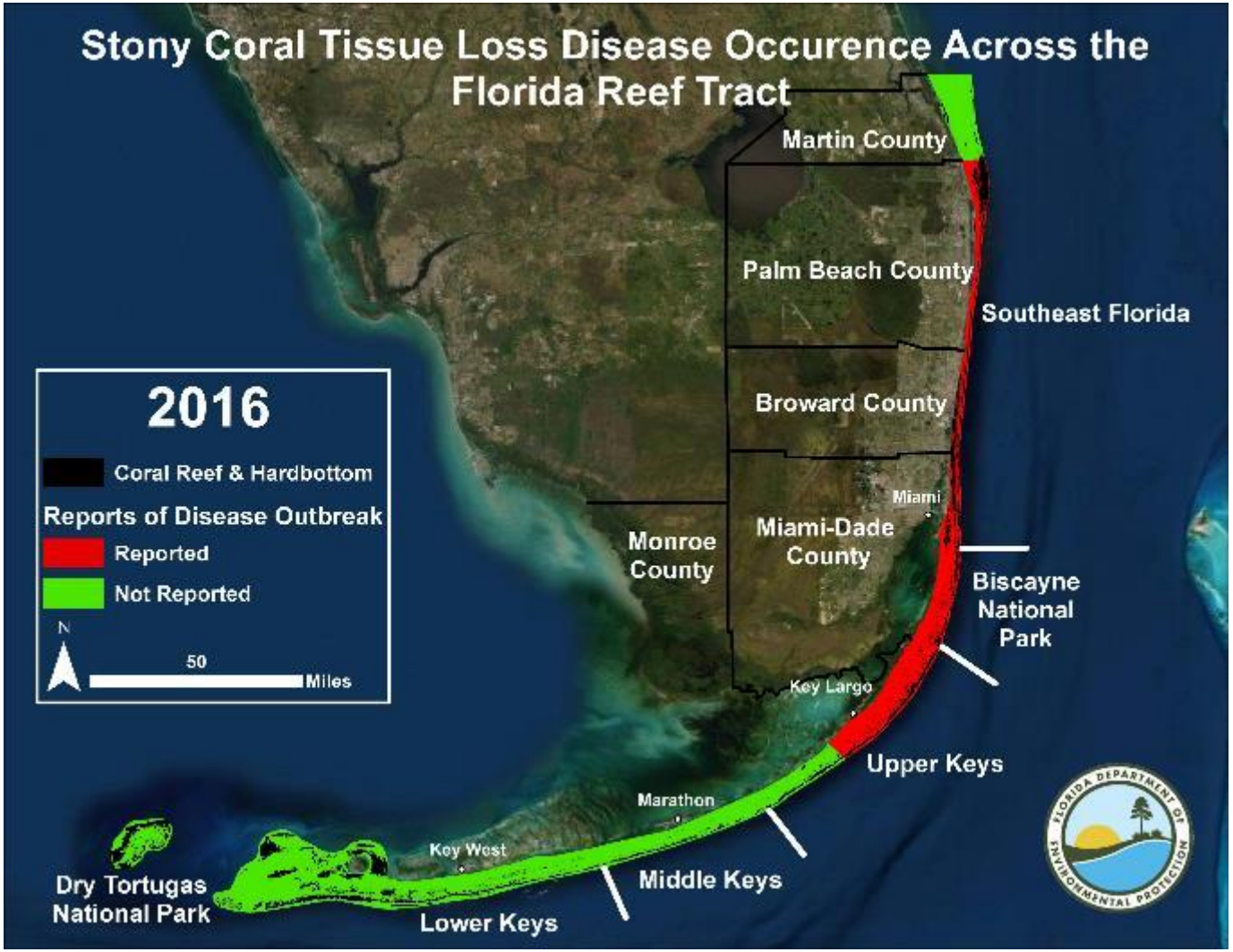
FLORIDA'S CORAL DISEASE OUTBREAK



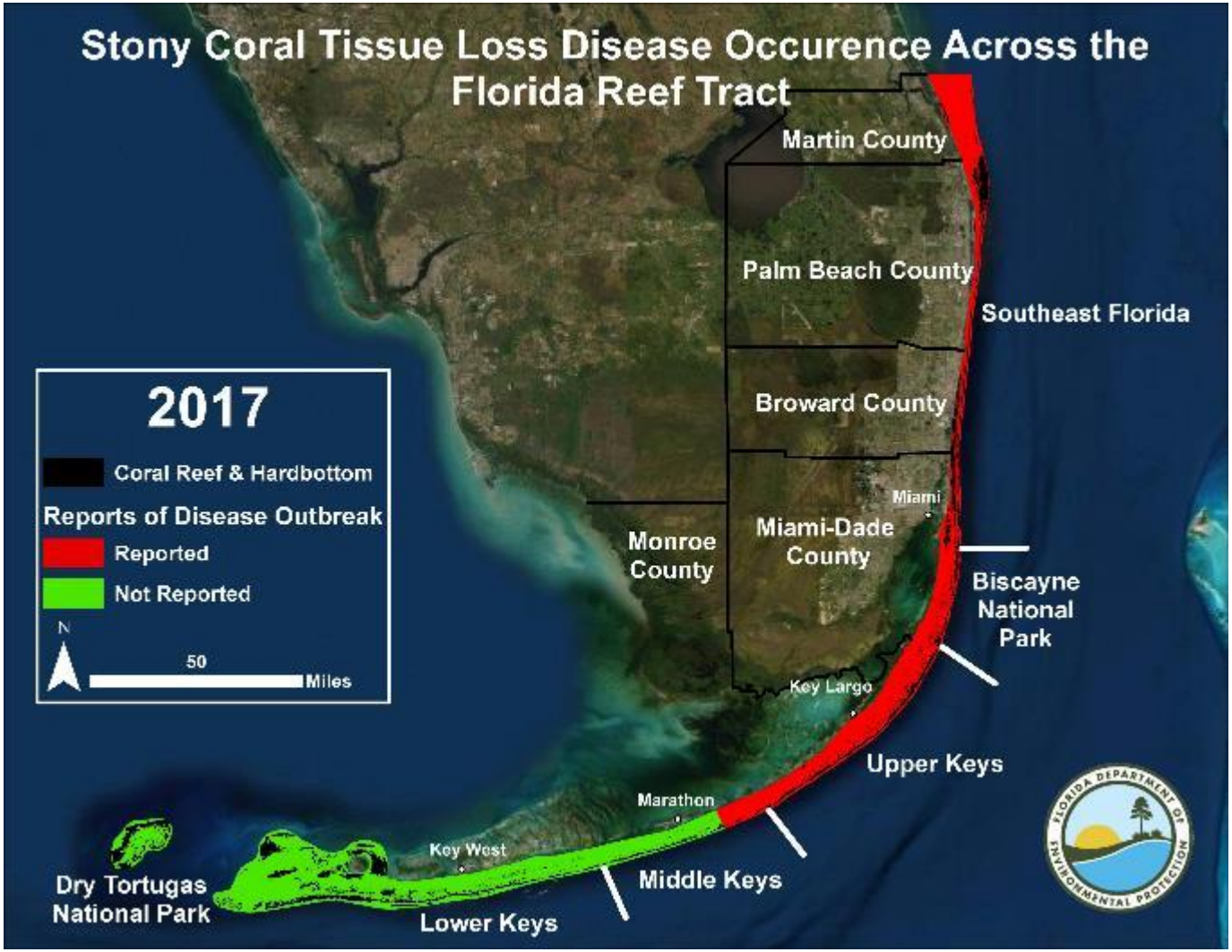
FLORIDA'S CORAL DISEASE OUTBREAK



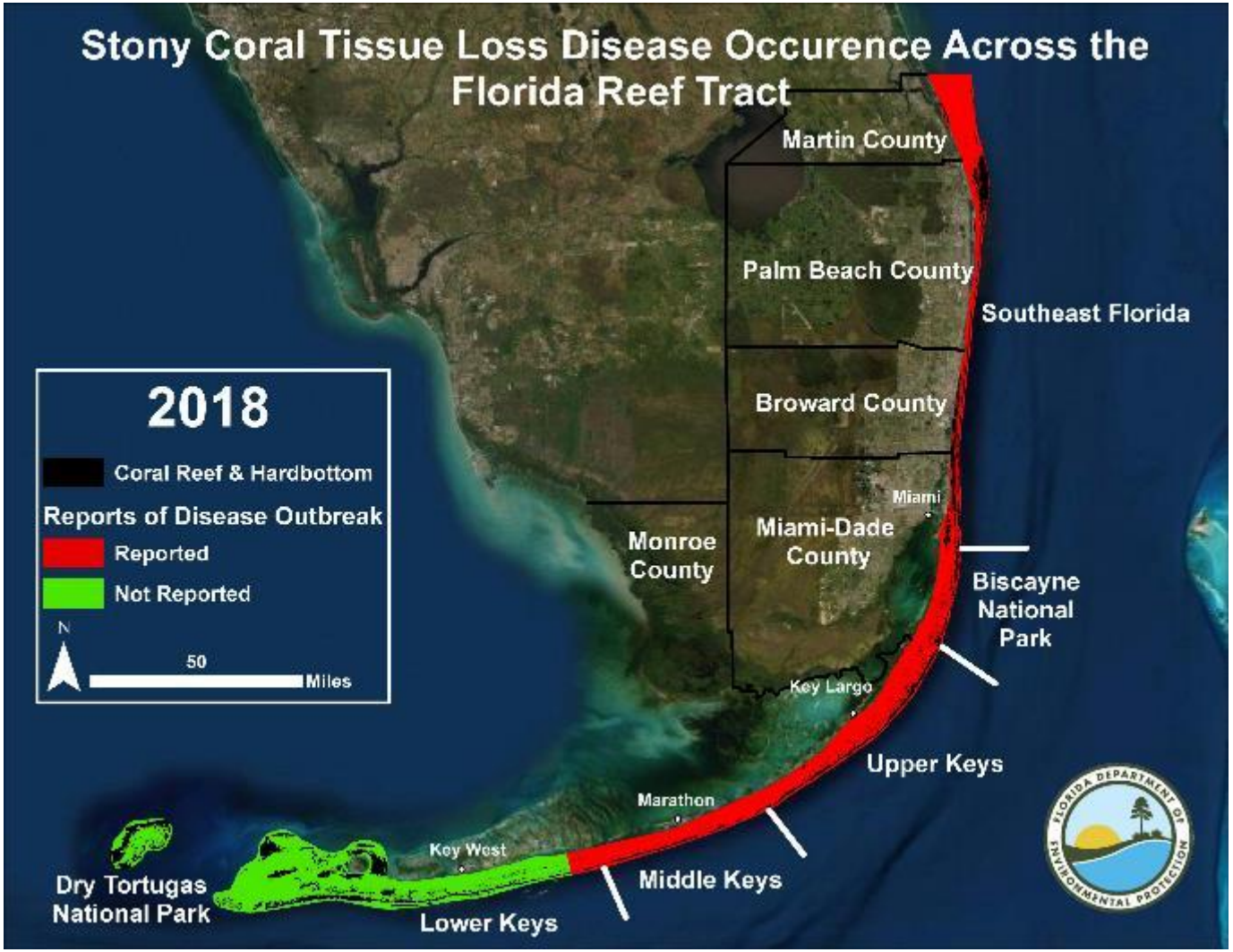
FLORIDA'S CORAL DISEASE OUTBREAK



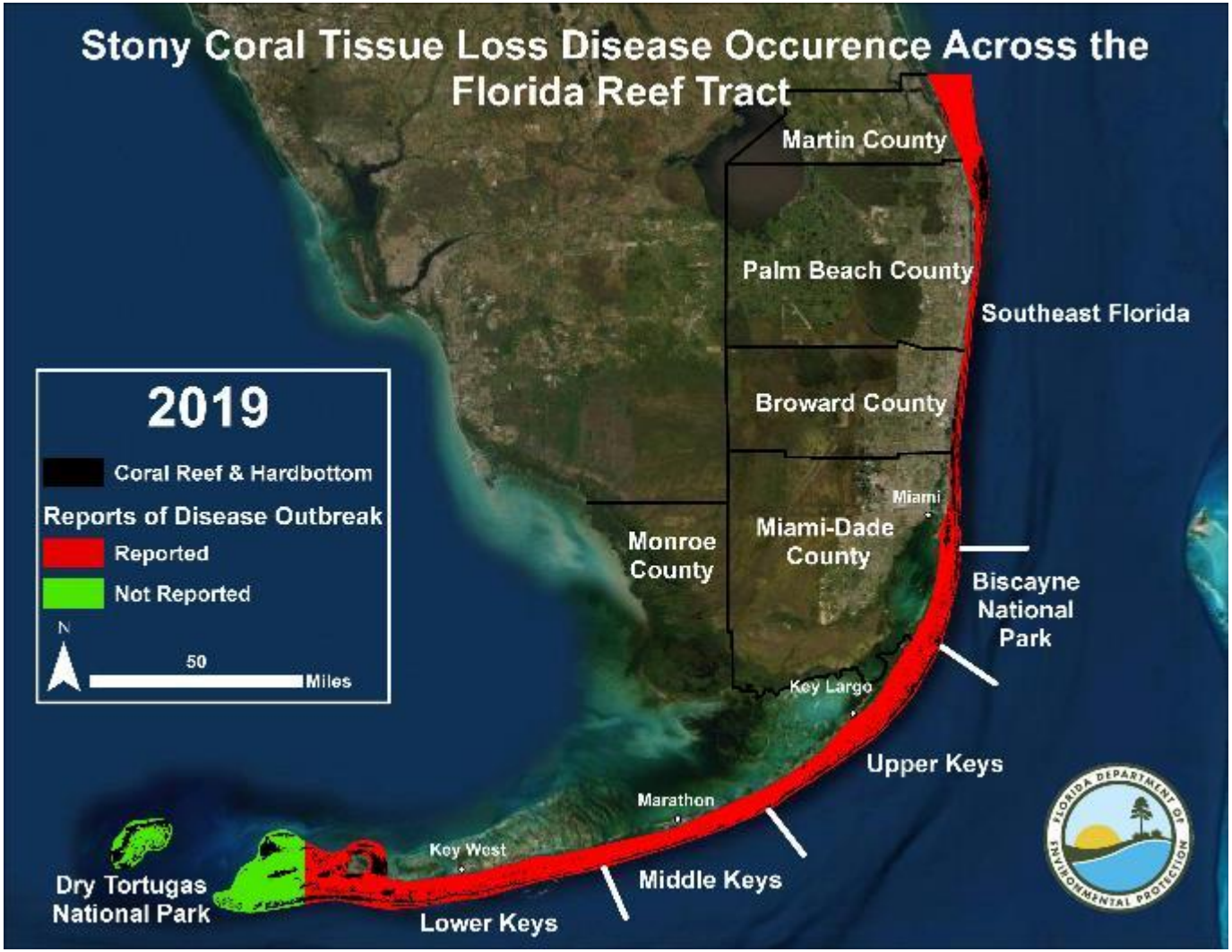
FLORIDA'S CORAL DISEASE OUTBREAK



FLORIDA'S CORAL DISEASE OUTBREAK



FLORIDA'S CORAL DISEASE OUTBREAK



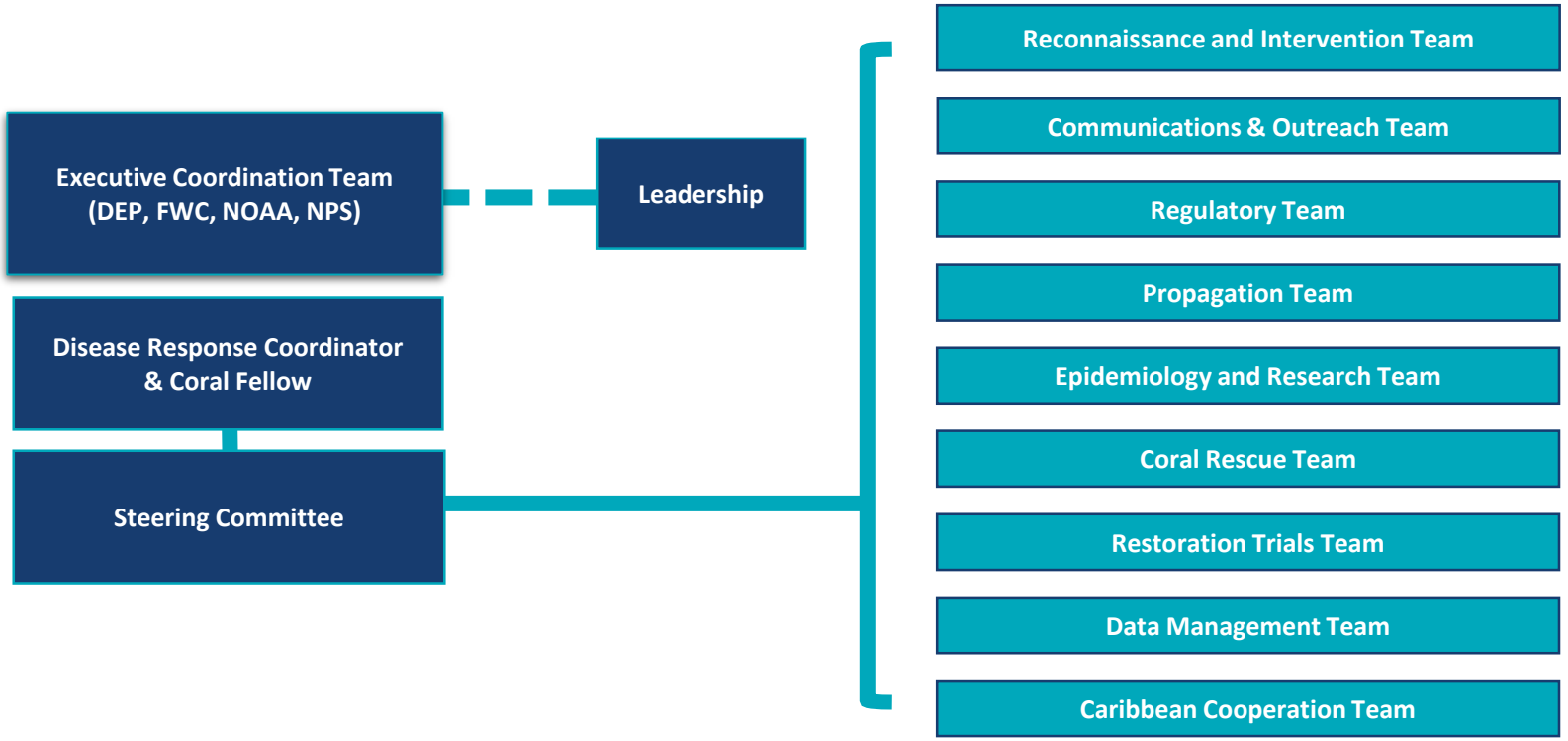
CARIBBEAN CORAL DISEASE OUTBREAK

STONY CORAL TISSUE LOSS DISEASE

- Highly infectious, waterborne disease
- Long residence time of pathogen(s) – 5+ years
- Affects 22+ species of stony coral – more than 50% of primary reef builders
- Prevalence rates of 66%-95% in some susceptible species
- Mortality rates of nearly 100% of affected colonies – including oldest known colonies (330+ years)

DISEASE RESPONSE PARTNERS

DISEASE RESPONSE STRUCTURE *since July 2018*



RESEARCH & EPIDEMIOLOGY

IDENTIFY PATHOGEN(S) AND CHARACTERIZE THE DISEASE(S)

Bacterial and Viral Profiling

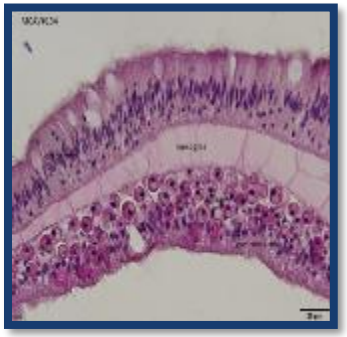
- Determine differences in bacterial and viral communities in healthy vs. diseased corals

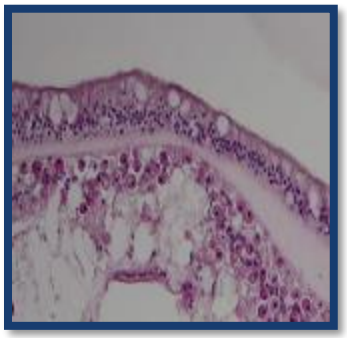
Histopathology & '-omics'

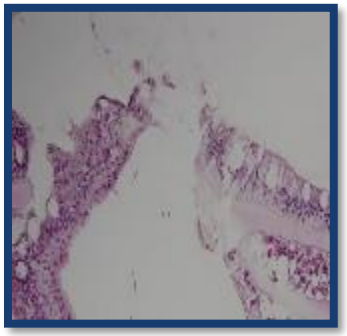
- Look at changes in tissue caused by disease
- Study the genes, proteins and certain molecules related to disease progression

Environmental Factors

- Identify any environmental factors (nutrients, temperature, salinity, etc.) that may drive disease







RECONNAISSANCE & INTERVENTION

TREAT PRIORITY CORALS TO MAINTAIN WILD POPULATION

- Track extent of disease, locate survivors
- Apply whole colony treatments to priority corals
- Develop and trial new treatments

Laboratory Trials

Small-Scale Field Trials

CORAL RESCUE & PROPAGATION

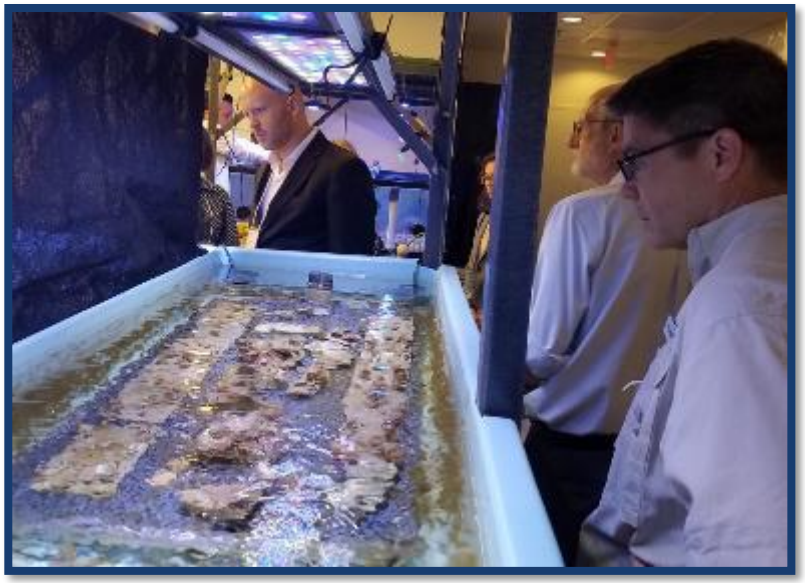
GROW CORALS FOR LARGE-SCALE REEF RESTORATION

- Expand existing & develop new infrastructure throughout Florida
- Build expertise
- Incorporate genetic considerations
- Innovate new ways to grow hearty corals

RESTORATION TRIALS & OUTPLANTING

DETERMINE WHAT, WHERE, AND WHEN TO RESTORE

- **Conduct Outplanting Trials**
- **Identify Restoration Sites**
- **Conduct Meaningful Ecosystem Restoration**



DATA MANAGEMENT & COMMUNICATION

SHARING INFORMATION INTERNALLY AND EXTERNALLY

Information Availability

- DEP & FKNMS web portals for Florida-focused information
- NGO partner websites for the wider Caribbean

Data Visualization

- Dashboards and GIS products

Data Collation, Organization and Dissemination

- Ensure all data is available to partners for analysis

FloridaDEP.Gov/RCP/CoralDisease

FloridaKeys.Noaa.Gov/Coral-Disease

RESTORING RESILIENCE

SHORT TERM

Enhance Disease Response Capacity

LONG TERM

Reduce Local Stressors & Restore Environmental Conditions to Improve Reef Resilience

Thank you!
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Michelle Graulty
Michelle.Graulty@FloridaDEP.gov

SCCF

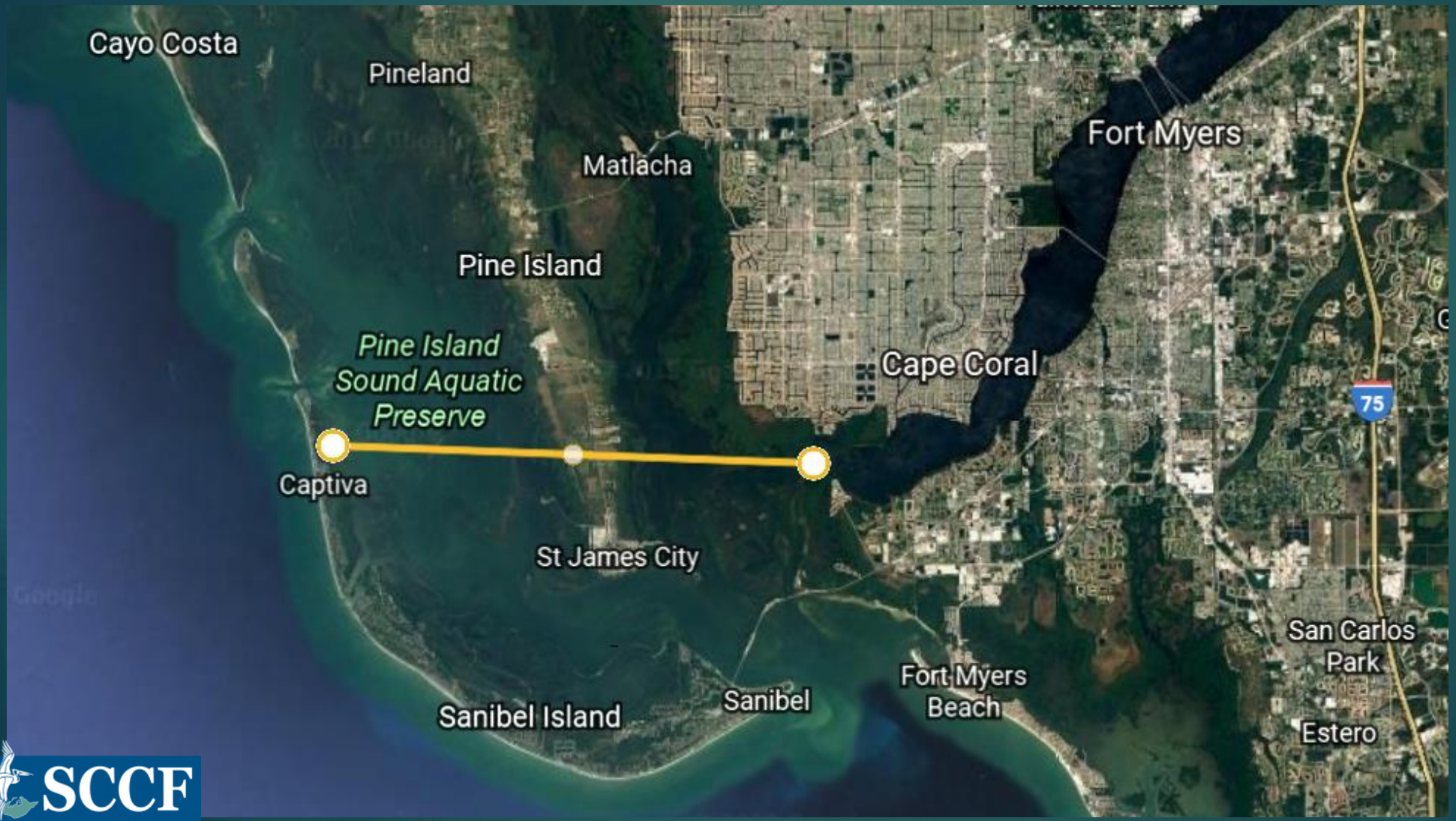
Sanibel-Captiva Conservation Foundation

Clean Water Connection: Everglades Restoration and Marine Health

35th Annual Everglades Coalition Conference
Captiva, Florida

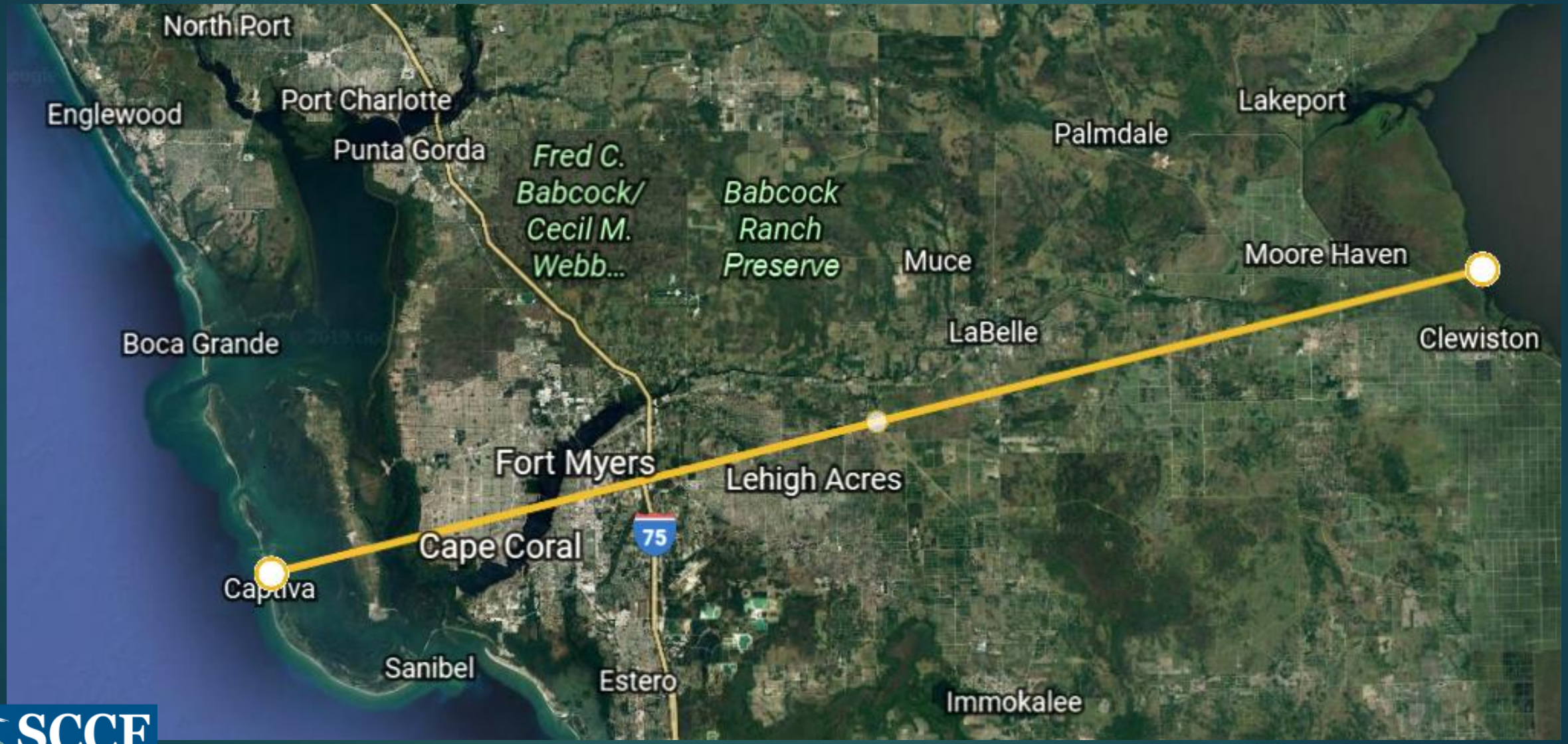
Ryan Orgera, Ph.D.
Chief Executive Officer
Sanibel Captiva Conservation Foundation

11 miles



SCCF
Sanibel-Captiva Conservation Foundation

80 miles



SCCF
Sanibel-Captiva Conservation Foundation

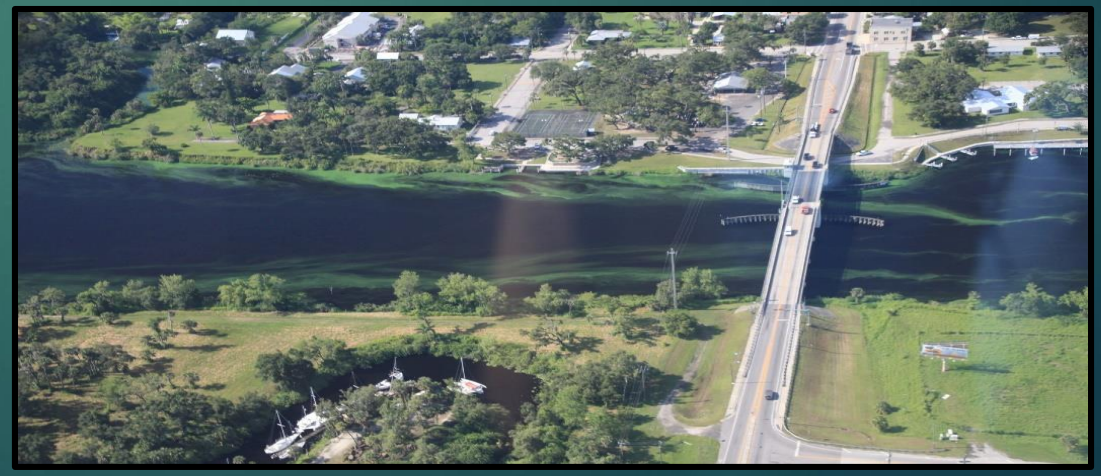
Two Harmful Algal Blooms Continue

Increased return frequency and duration

SCCF
Sanibel-Captiva Conservation Foundation

SCCF
Marine Laboratory

Cyanobacteria bloom began in Lake O June 2018



SCCF
Sanibel-Captiva Conservation Foundation

Red Tide in Southwest Florida

- Blooms of the toxic dinoflagellate *Karenia brevis* occur almost annually off the coast of Southwest Florida
- Produce a group of neurotoxins collectively termed brevetoxins
- Linked to high mortality of fish, marine mammals, sea birds, and sea turtles

Dead wildlife: Caloosahatchee, estuary, canals, back bays, Sanibel, Fort Myers beaches & Islands **Lee County has removed 2,200 tons of dead marine life. Sanibel = 425 tons** *Ongoing list not comprehensive* *Endangered/Threatened Species*		
American eels	Grunt sp.	Red snapper
American oystercatcher	Hardhead catfish	Remora
Anchovies	Horseshoe crabs	Reticulate moray
Angel fish	Jack fish sp.	Royal tern
Anhinga	Kemps ridley sea turtle	Sand dollar
Atlantic needlefish	Kingfish	Sanderling
Atlantic spadefish	Lane snapper	Sand Trout
Batfish	Laughing gull	Scaled sardine
Black drum	Lesser scaup	Sheepshead
Black scoter	Loggerhead sea turtle	Seahorses
Black tip shark	Lookdown fish	Shame- faced crab
Blenny	Mackerel	Snook
Blue crabs	Manatees	Snowy plover
Bottlenose dolphin	Mallard ducks	Starfish
Brown pelican	Mangrove snapper	Southern puffer
Bull shark	Mantis shrimp	Southern stargazer
Calico crab	Menhaden	Spanish mackerel
Catfish sp.	Minnows	Spotted eels
Cobia	Moray Eel	Spotted seatrout
Common tern	Muscovy duck	Sting rays sp
Coquina	Mullet sp.	Stone crab
Cowfish	Ornate diamondback terrapin	Striped burr fish
Crevalle jack	Osprey	Threadfin herring
Double crested cormorant	Pale spotted eels	Tarpon
Flounder	Parchment worms	Toadfish
Gafftopsail catfish	Permit	Tri-colored Heron
Goby	Pig fish	Tripletail
Goliath grouper	Pinfish	Whale shark
Green sea turtle	Florida Pompano	Whiting
Grey triggerfish	Red drum/ Redfish	Yellow snake eel
Grouper sp.	Red knot	

Red Tide Bloom

Severe and prolonged bloom Oct. 2017-2018

- *Karenia* concentrations as high as 200 million c/L
- Aerosolized toxins detected up to 1 mile inland
- 2,200 tons of dead marine wildlife removed from Lee Co.
- 425 tons of dead marine wildlife removed from Sanibel

Strandings

Sea Turtles: 1,296*

Manatee: 211

Dolphin: 127

* FWC attributes 589 sea turtle strandings to red tide

SCCF
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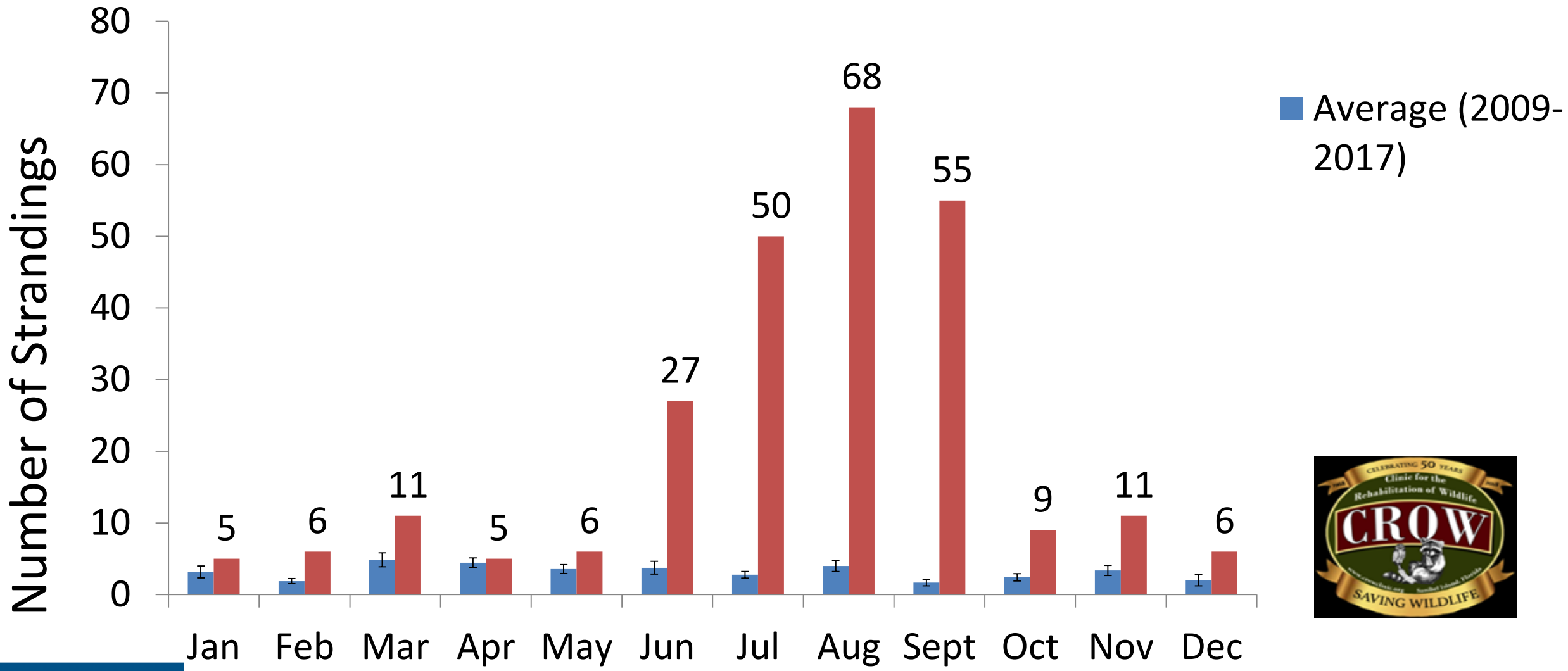
Total Strandings on Sanibel and Captiva

Total 2018 Strandings: 256

51 Live, 205 Dead



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CROW
Clinic for the Rehabilitation of Wildlife
SAVING WILDLIFE

Red Tide Effects on Shorebirds & Seabirds

Ruddy turnstone rescued from south seas 2018

Ruddy turnstone foraging on viscera of larger fish during a fish kill - 2018

- Symptoms:
  - Ataxia- loss of control of nervous system. Appear to be drunk, stumbling, unable to fly
- Causes of Morbidity & Mortality
  - Ingestion of contaminated prey
  - Consumption of fishes, contaminated marine invertebrates: worms, crustaceans, coquina, or crabs.
  - Starvation from lack of suitable prey
  - Some species are prey specialists, and if unable to eat preferred food- more likely to starve

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sanibel® sea school

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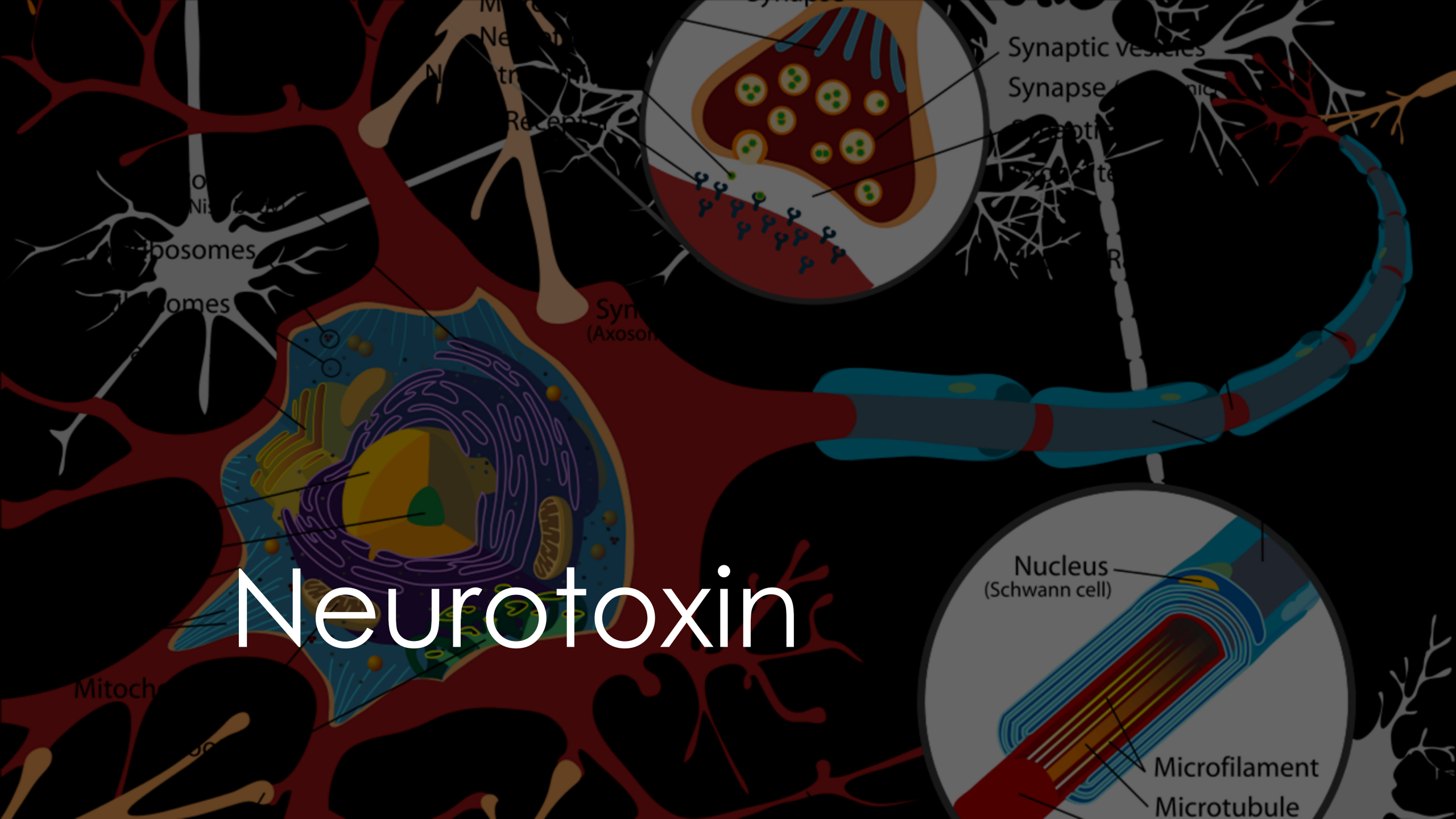
Synaptic vesicles
Synapse
Nucleus
(Schwann cell)
Microfilament
Microtubule

Neurotoxin

Compounding & Confounding Issues

Too little Lake O water hurts our islands

The Goldilocks Condition™

Getting it just right.

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Too Little Flow = Salinity Too High

Loss of > 1000 ac of Tapegrass
Need Flows 800 – 1000 cfs

Too much water Flushes Aquatic Nursery Out to Gulf

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Totals Sanibel Captiva July – December 2018

Lost Revenue Combined : $46,814,419

Avg 2,128,155 weekly

Jobs Represented: 4,278

Year Over Year Decrease: 38.7%

78% Accommodations Cancellation Rate

The Islands of SANIBEL CAPTIVA CHAMBER OF COMMERCE

SCCF Sanibel-Captiva Conservation Foundation

Economic Impacts

FL Fishing $5 billion = $8.6 billion trickle down

Tarpon Fishing $108 million

Lee County's artificial reefs $104 million

Lee County Boating Activity - $3 billion/yr

$1.9 billion Real Estate property taxes Lee /Collier

$400 million bed tax, sales & local taxes Lee /Collier

49,000 jobs in Lee County

2005 Economic Impact $40 million

Lee County Tourism employs 1 of 5 people

Generates $3 billion economic impact

Visitor Survey = 94% came for beaches

74% Clean Unspoiled Environment

58% cited swimming

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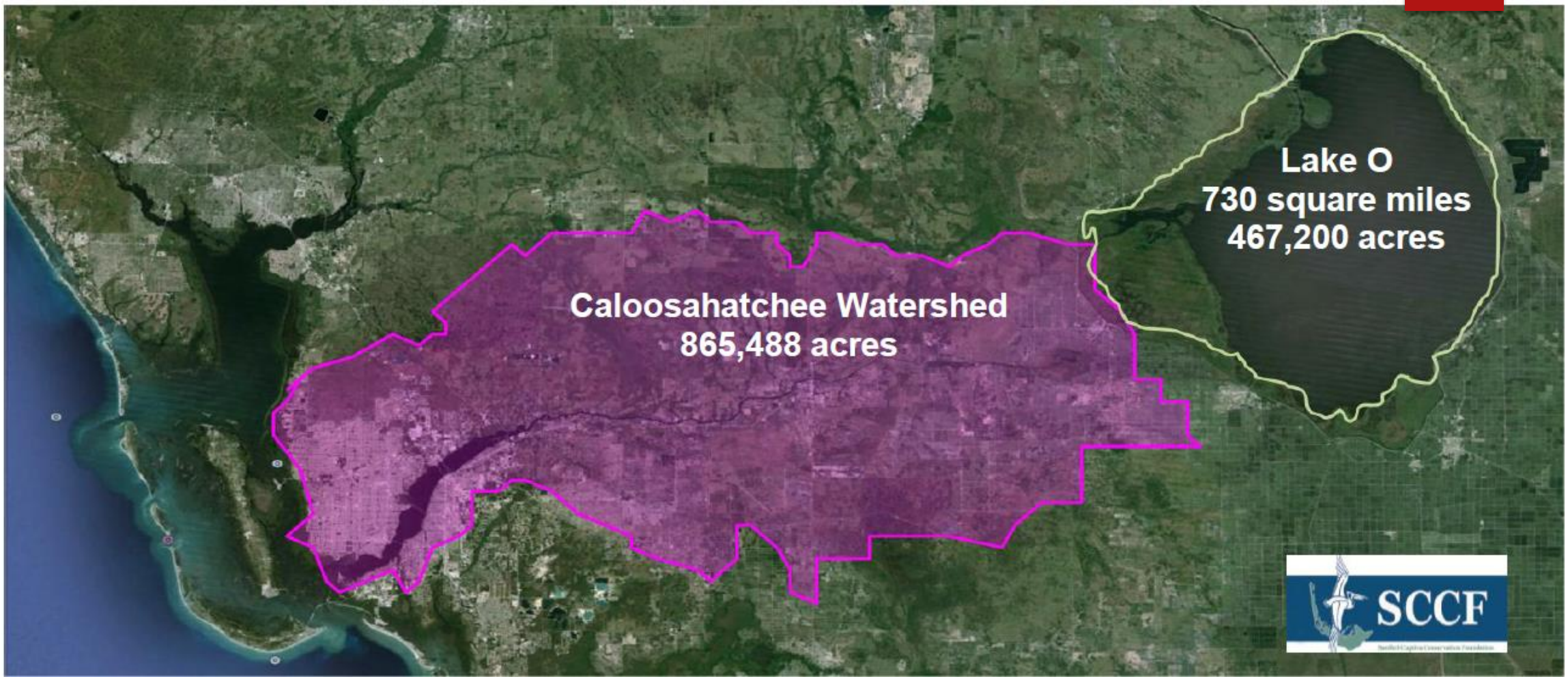
The Islands of SANIBEL CAPTIVA
CHAMBER OF COMMERCE

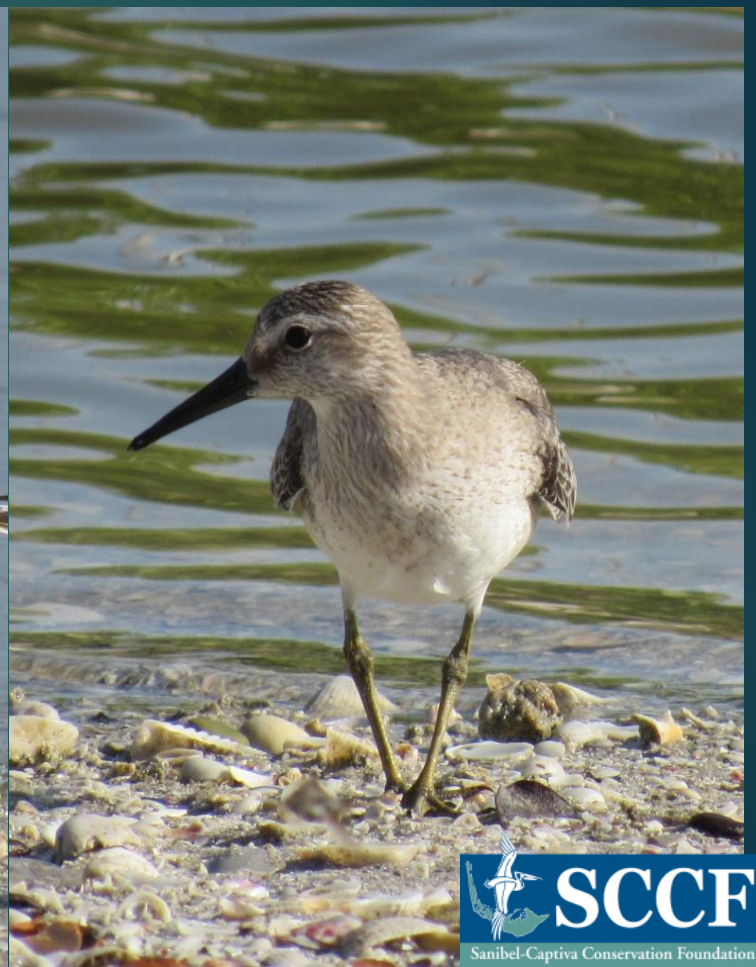
Thank you


Lake O
730 square miles
467,200 acres
Caloosahatchee Watershed
865,488 acres
SCCF

Specific example: Red Knots

Dead coquina washed up by the thousands - July 2018 ->

- Arctic Migrants
- Survival depends on available food along migratory route
- When they return in autumn they are exhausted from long flight and need food!
- Preferred food here is coquina, but also eat other marine invertebrates
- When coquina are all dead or dying during red tide- many red knots starve or become ill from other contaminated food sources



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