



# RESTORING RESILIENCE

## Update on Florida Reef Tract Coral Disease Outbreak Response Efforts

SOUTH FLORIDA & TREASURE COAST REGIONAL PLANNING COUNCILS

OCTOBER 25, 2019



# OVERVIEW



**The Florida Department of Environmental Protection (DEP) is fully committed to supporting the coral disease response efforts – including co-leading the coordination of a multi-faceted collaborative response effort with numerous partners from federal, state, and local agencies, non-governmental organizations, universities, and members of the community to investigate and solve this problem.**

## **OUR EFFORTS INCLUDE:**

- **monitoring and modelling the disease spread;**
- **documenting the prevalence and severity of the outbreak;**
- **researching causative agents and environmental factors;**
- **developing novel coral disease treatments;**
- **creating a region-wide Reef Ambassador and local reporting programs to facilitate stakeholder engagement through citizen science.**

# STONY CORAL TISSUE LOSS DISEASE





# 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)**



# FLORIDA'S CORAL DISEASE OUTBREAK





# CARIBBEAN CORAL DISEASE OUTBREAK



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## *Exploring Ballast Water as a Coral Disease Vector*



**Ballast Water:** Long-recognized as a global vector for aquatic invasive species and pathogens  
UN International Maritime Organization (IMO) Ballast Water Management Convention (BWM) – adopted in 2004 and entered into force 2017

- Requires active management of ballast water and associated sediment to certain standards
- Includes open-ocean exchange >200 nm offshore and in water >200m deep & eventual installation and use of an approved on-board ballast water treatment system

**US Regulations** largely mirror IMO BWM Convention – include regulations prohibiting discharge in the vicinity of coral reefs

Source: GloBallast

Source: IMO





# DISEASE RESPONSE PARTNERS

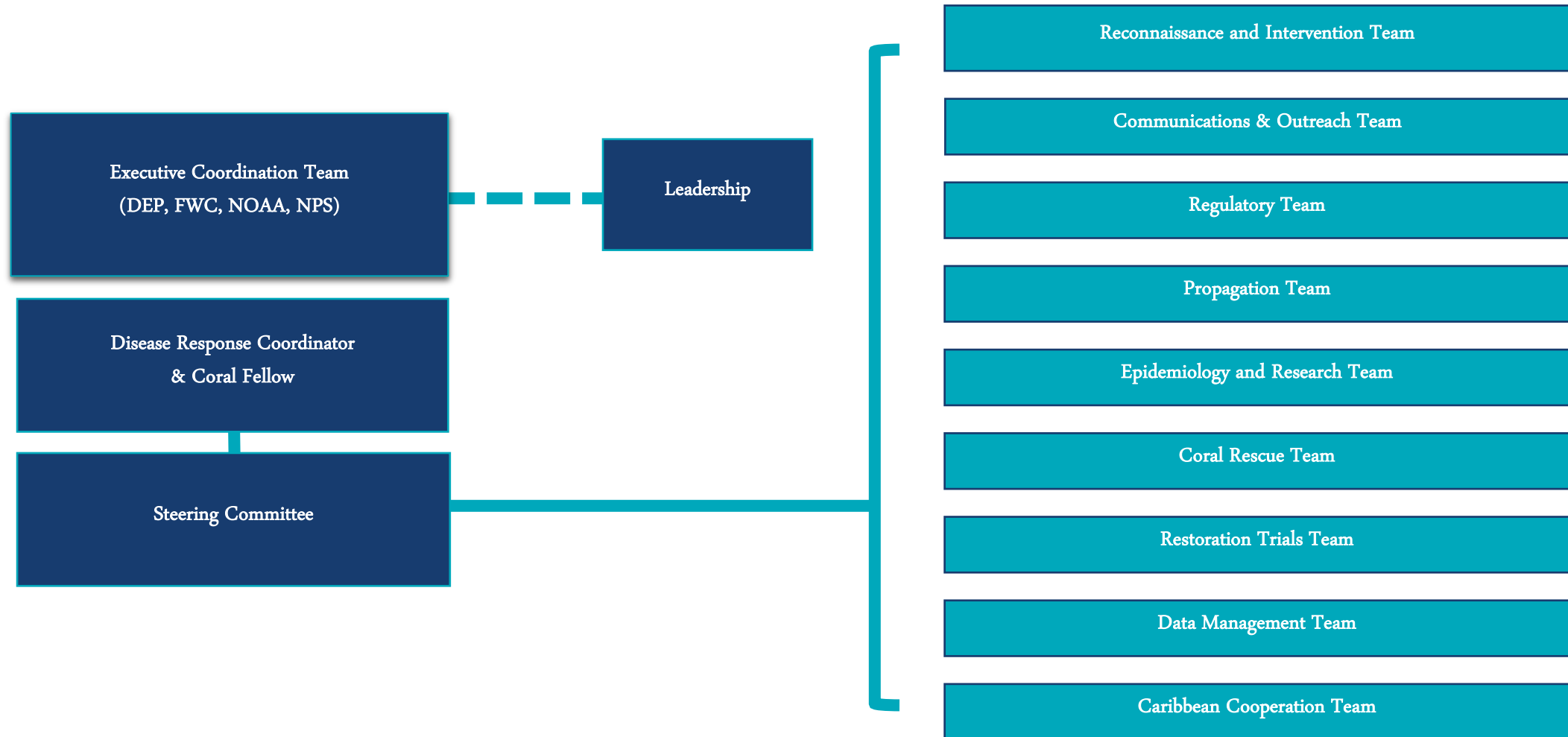


US Army Corps of Engineers®





# DISEASE RESPONSE STRUCTURE *since July 2018*





# TECHNICAL EXPERT WORKSHOPS

November 2017, July 2018, August 2019



## Coral Disease Technical Workshop

- Intervention action framework
- Coral rescue & propagation
- Restoration trials
- Regulatory permitting & project considerations





# RESTORING RESILIENCE



## SHORT TERM

Enhance Disease Response Capacity



## LONG TERM

Reduce Local Stressors & Restore Environmental Conditions to Improve Resiliency Among Reefs



# RESTORING RESILIENCE Path Forward, Short Term



**FY15-18:** mapping, research, lesion intervention, coral rescue

**FY 18-23:** colony intervention, survivor rescue and propagation (including building land-based infrastructure), research and restoration trials

**FY 23+:** site intervention, survivor propagation (maintaining infrastructure), research and ecosystem restoration

# RECONNAISSANCE & INTERVENTION



## TREAT PRIORITY CORALS TO MAINTAIN WILD SPECIES

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



**Laboratory Trials**



**Small-Scale Field Trials**



# CORAL RESCUE



## RESCUE HEALTHY CORALS TO PRESERVE GENETIC STOCK

**Save high priority corals in advance of outbreak margin**

- **Goal of 4,400 corals to capture ~95% of remaining genetic diversity**

**House corals in land-based facilities**

- **Corals housed with expert aquarists across the country**
- **5 facilities in Florida, 10 facilities in other states**

**Genetic Rescue in the 'endemic' region**

- **Determine best management practices to capture genetic information from survivors in disease impacted areas**



# CORAL PROPAGATION



## GROW CORALS FOR LARGE-SCALE REEF RESTORATION

- **Expand existing and develop new land-based infrastructure throughout Florida**
- **Build expertise**
- **Incorporate genetic considerations**
- **Grow hearty corals**



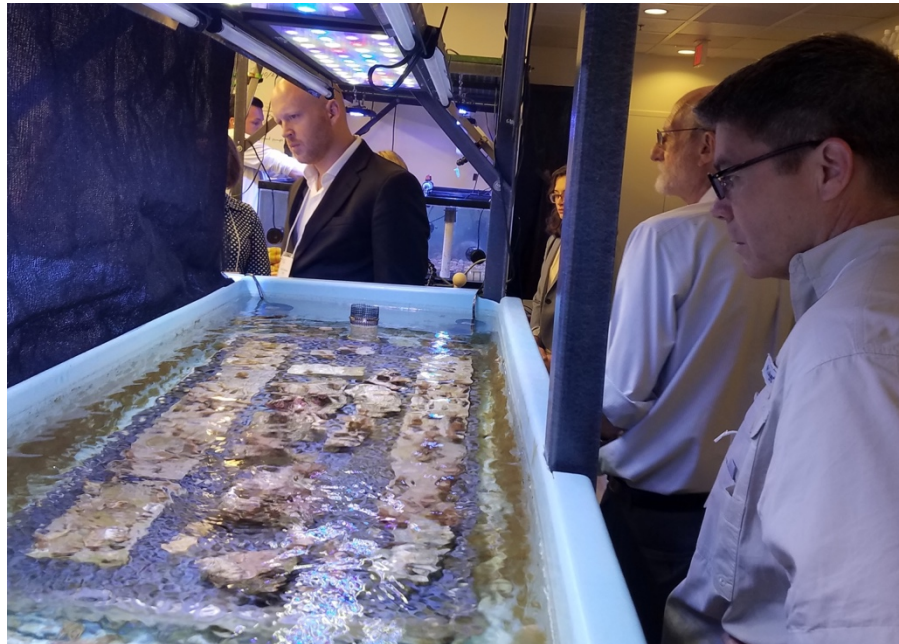


# RESTORATION TRIALS & OUTPLANTING



## DETERMINE WHAT, WHERE, AND WHEN TO RESTORE

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



# RESEARCH & EPIDEMIOLOGY



## IDENTIFY PATHOGEN(S) AND CHARACTERIZE THE DISEASE

### Bacterial and Viral Profiling

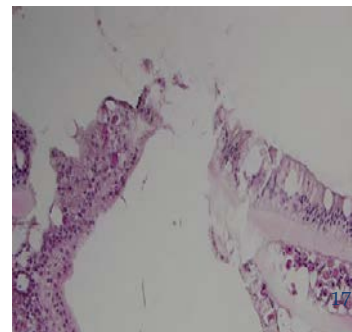
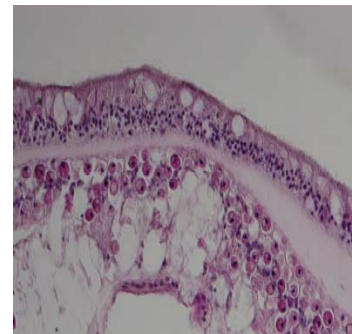
- Determine differences in bacterial and viral communities in healthy vs. diseased corals

### 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





# DATA MANAGEMENT & COMMUNICATION



## SHARING INFORMATION INTERNALLY AND EXTERNALLY

### Information Availability

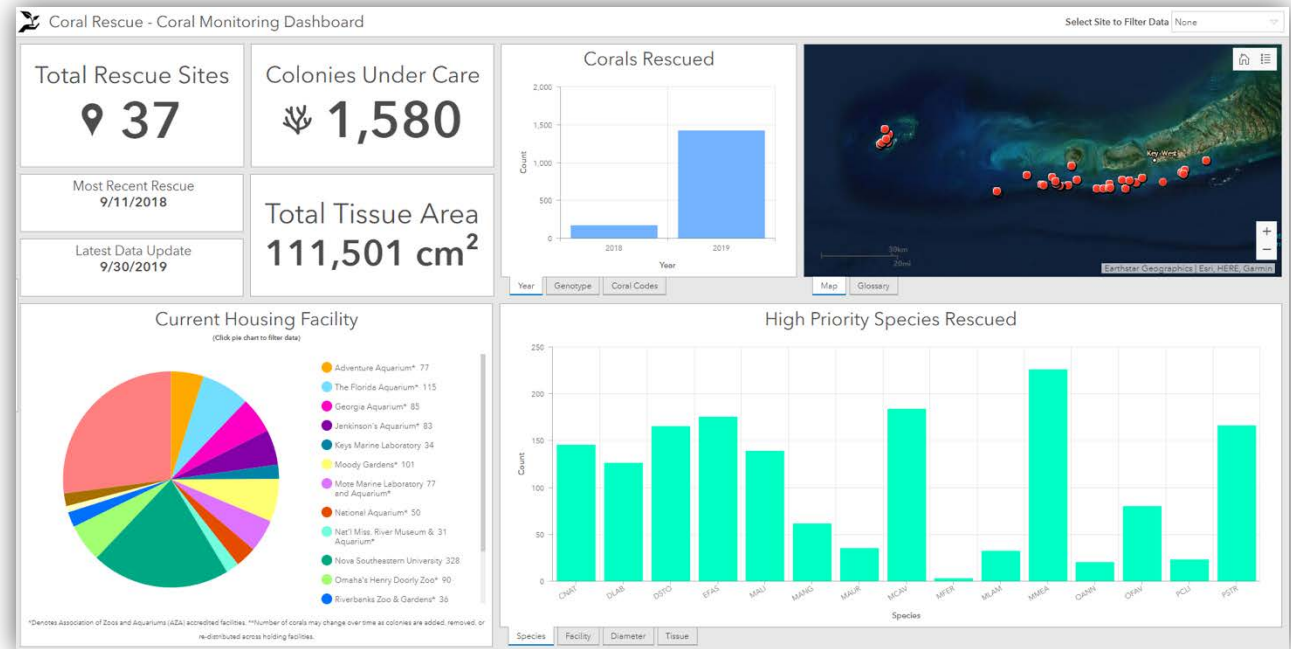
- DEP & FKNMS web portals for Florida-focused information
- NGO partner websites for the wider Caribbean

### Data Visualization

- Dashboards and GIS products

### Data Collation, Organization and Dissemination

- Ensure all data is available to partners for analysis



[FloridaDEP.gov/rcp/CoralDisease](https://FloridaDEP.gov/rcp/CoralDisease)

# MANAGING FOR RESILIENCE Path Forward, Long Term



- 1. Continue Coral Reef Water Quality Monitoring & Coral Propagation Infrastructure Support**
- 2. DEP Triennial Review of Water Quality Standards – Turbidity Criterion to Protect Corals: Nov. 6 - <https://floridadep.gov/dear/water-quality-standards/content/triennial-review-water-quality-standards>**
- 3. \*NEW BMPs\* Low-Impact Development (LID) & Green Infrastructure (GI): Pollution Reduction Guidelines for Water Quality in Southeast Florida <https://floridadep.gov/rcp/coral/documents/low-impact-development-green-infrastructure-pollution-reduction-guidance-water>**
- 4. Southeast Florida Coral Reef Initiative’s Technical Advisory Committee – Oct. 30 & 31  
NSU Oceanographic Center, 8000 N. Ocean Drive, Dania Beach, FL 33004**



# **MANAGING FOR RESILIENCE** Path Forward, Long Term



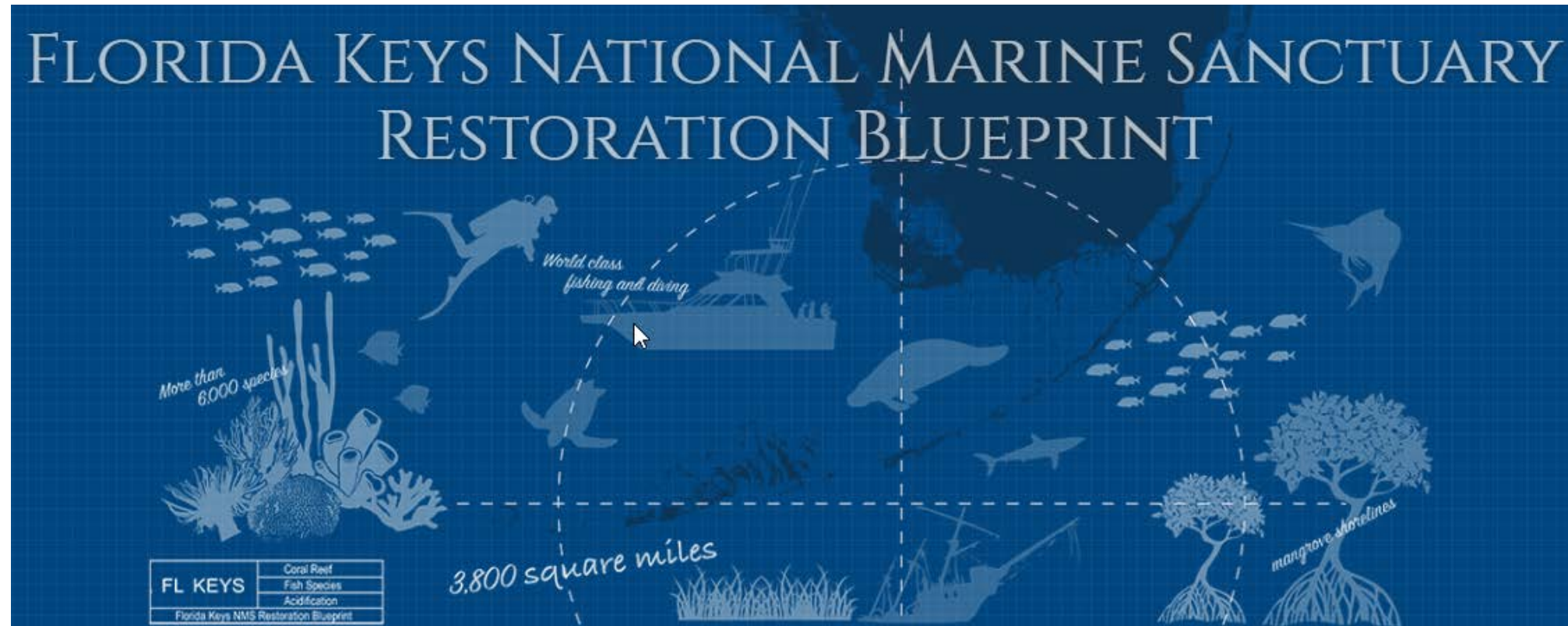
**5. US Coral Reef Task Force – Jurisdictional assistance to determine appropriate coral reef-specific numeric nutrient criteria**

**6. Support for Restoring Resilient Reefs Act**

**7. DEP Coral Reef Conservation Program’s SE FL Coral Reef Ecosystem Conservation Area Management Planning Process**

**8. Florida Keys National Marine Sanctuary’s “Restoration Blueprint”**

# MANAGING FOR RESILIENCE

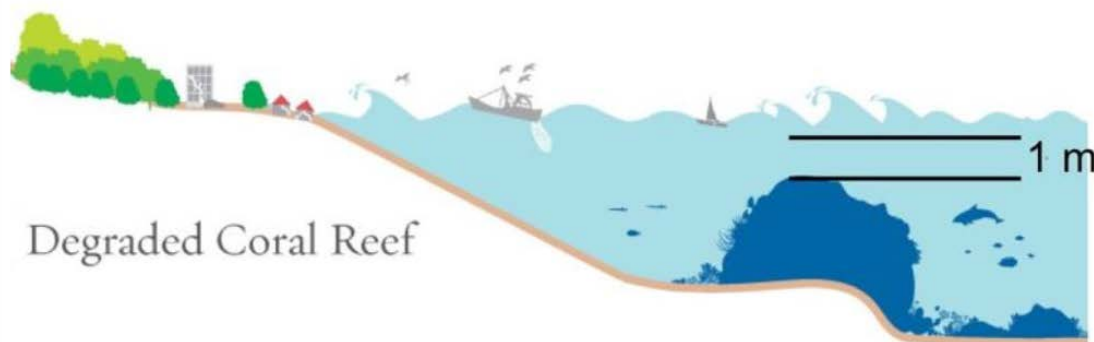
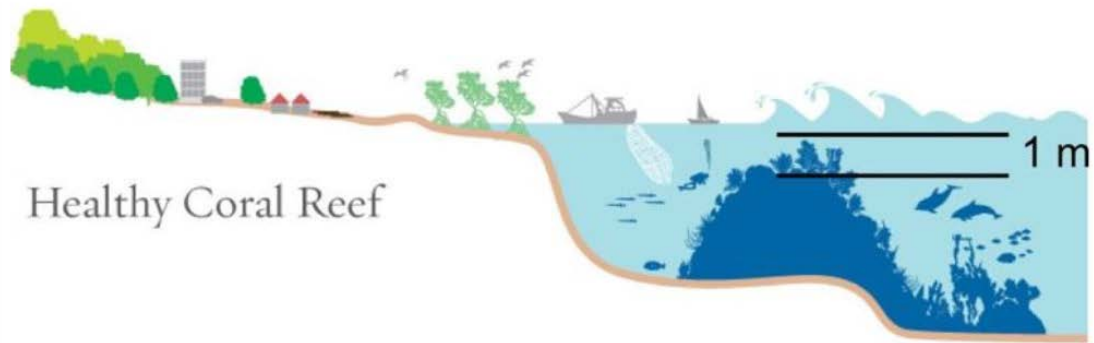


[FloridaKeys.noaa.gov/blueprint](https://FloridaKeys.noaa.gov/blueprint)



# ECONOMICALLY ESSENTIAL

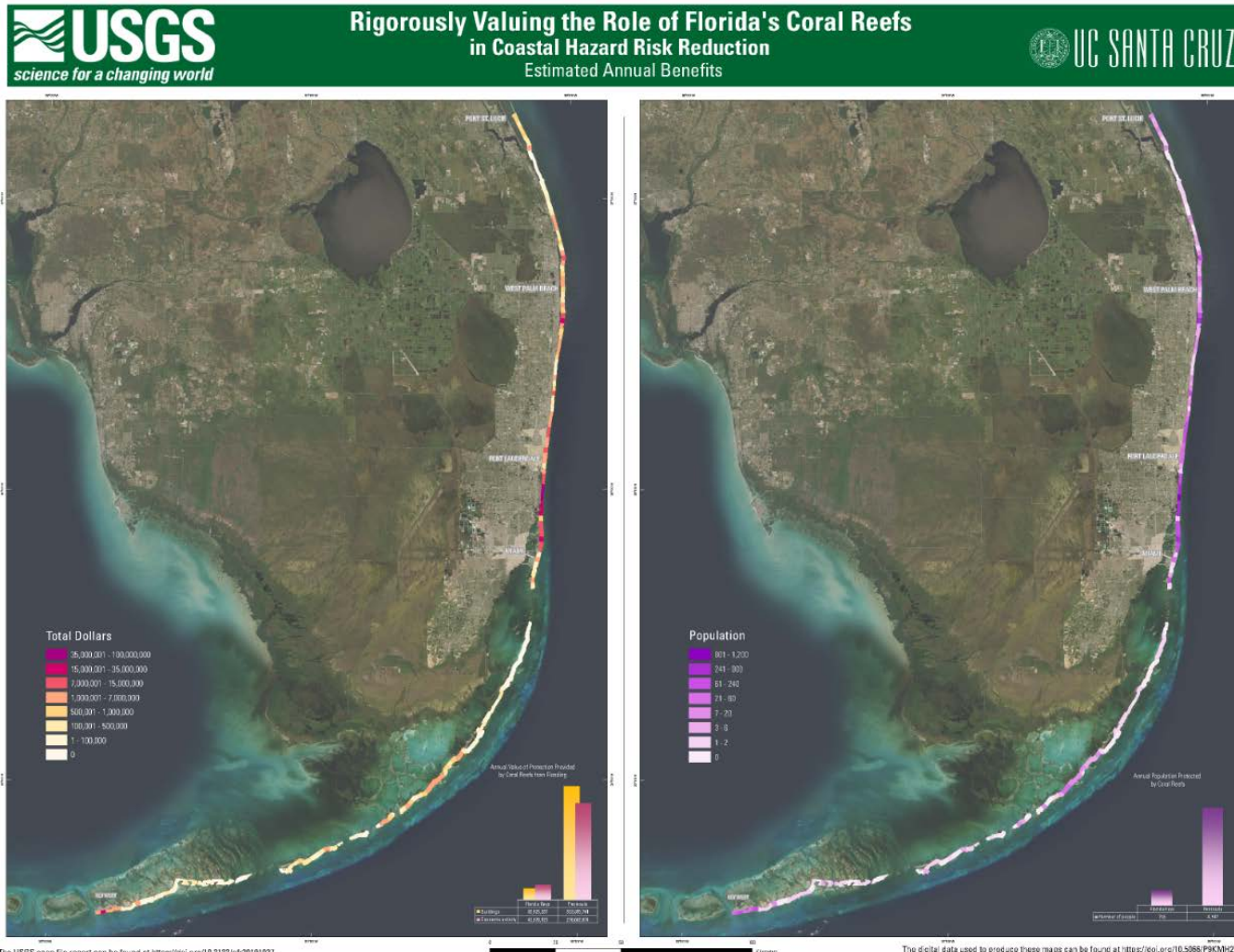
*Coastal Protection, Fishing, Tourism*



Images from: Mapping Ocean Wealth

# ECONOMICALLY ESSENTIAL

*Rigorously Valuing the Role of Florida's Coral Reefs in Coastal Hazard Risk Reduction*



**Florida's Reefs annually provide \$355 million in flood protection benefits to buildings and protect nearly \$320 million in economic activity.**

**Over \$1 billion in protection during extreme storm events**



# ECONOMICALLY ESSENTIAL



## **Coral and Artificial Reef Socioeconomic Study (Partial) Update**

- Funding provided by DEP, NOAA, Martin County, and FWC

**Phase 1: Economic Impact = Goods and Services associated with dive, snorkel, and fishing trips in SE FL (Results Coming Soon!)**

**Phase 2: Economic Valuation = Willingness to Pay**

**What would you like to know?**



# THANK YOU!



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