

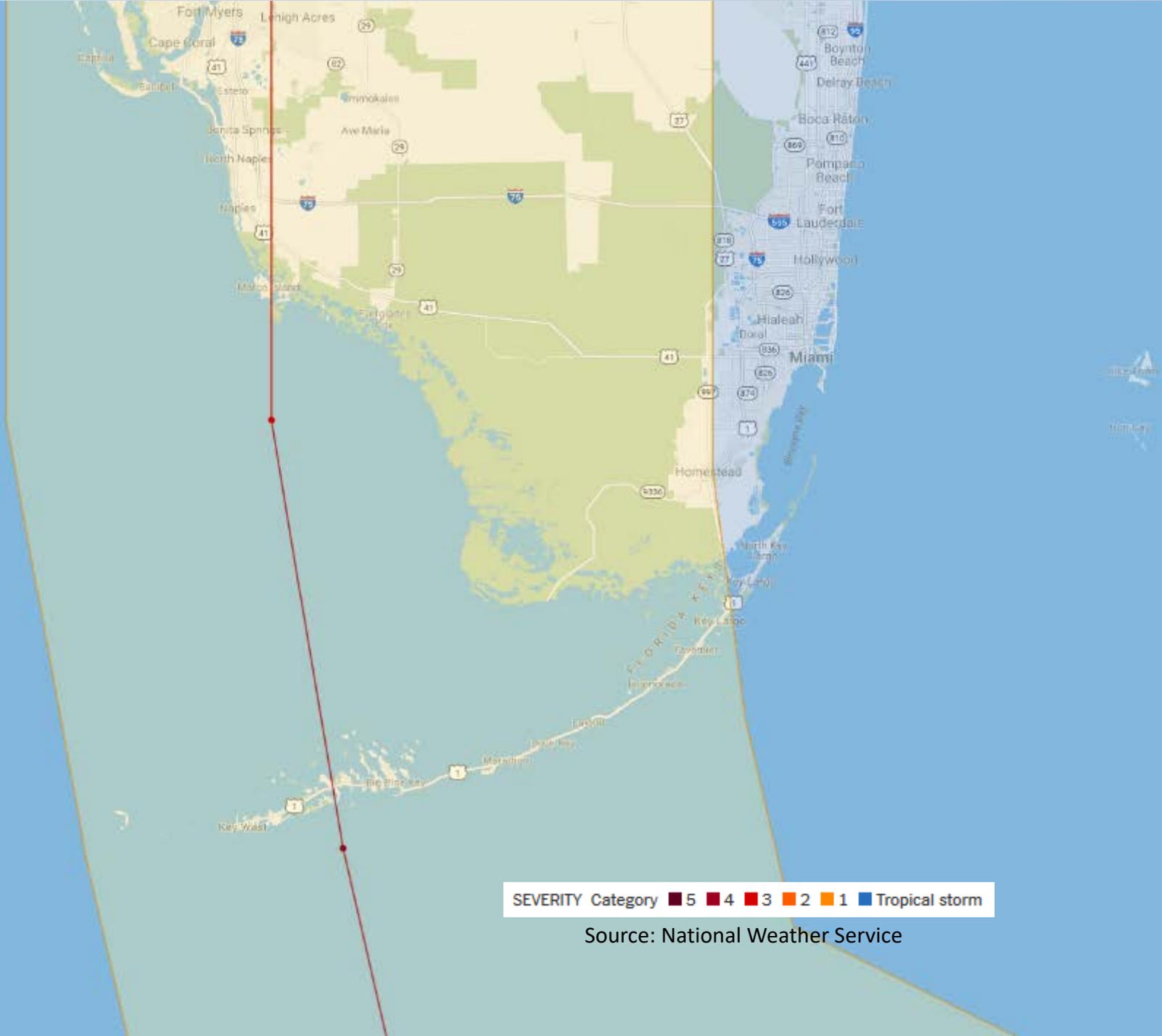
# Hurricane Irma Rapid Response Monitoring

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Jennifer Stein  
South Florida Marine Conservation Coordinator

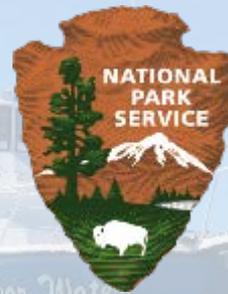




SEVERITY Category 5 4 3 2 1 Tropical storm

Source: National Weather Service

# Partners



# Our Team of Divers

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## DIVERS

Jenni Stein TNC - CS (Benthic Transects) - Chief Scientist

Kurtis Gregg NMFS (Roving / Fish)

Steve Gittings ONMS (Roving / Fish)

Katey Lesneski BU (Benthic Transects / Roving)

### **FIRST LEG**

Katy Cummings FWC (Benthic Transects)

Brian Reckenbeil FWC (Benthic Transects)

Elizabeth Brown FIT (Benthic Transects)

Matt Johnson NMFS (Roving / Fish)

Rob Waara NPS (Roving / Fish)

### **SECOND LEG**

Ananda Ellis FWC (Benthic Transects) – Tender Captain

Keri Oneil FLAQ (Benthic Transects)

Tiffany Boisvert FWC (Benthic Transects)

Jessica Keller FWC (Roving / Fish)

Andy Davis NPS (Roving / Fish)

**14** Total Divers

**2** Legs of the cruise

**10** Days of diving with nine divers per leg

**1** Liveaboard Vessel and **1** Twin-Vee Tender

# Objectives

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To conduct a rapid assessment of “**high value**” sites along the Florida Reef Tract affected by Hurricane Irma

1. Rapid condition **assessment** of reef areas post-Irma
2. Locate areas with **fragmented corals** for subsequent stabilization
3. Assess storm-related **impacts** (e.g. breakage)
4. Assess coral **bleaching** and **disease**
5. Assess **reef fish** community
6. Collect **images** of impacts

**High Value Sites** = Ecologically and Economically Important Sites

High cover of reef building coral species

High coral diversity

Long-term monitoring locations with high coral cover

Sites with high tourism value

# Hurricane Irma Rapid Response Monitoring Methods

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## BELT TRANSECTS

- Coral Demographics (Species, Size)
- Coral Condition (% Mortality, Bleaching, Disease, Hurricane Impacts)

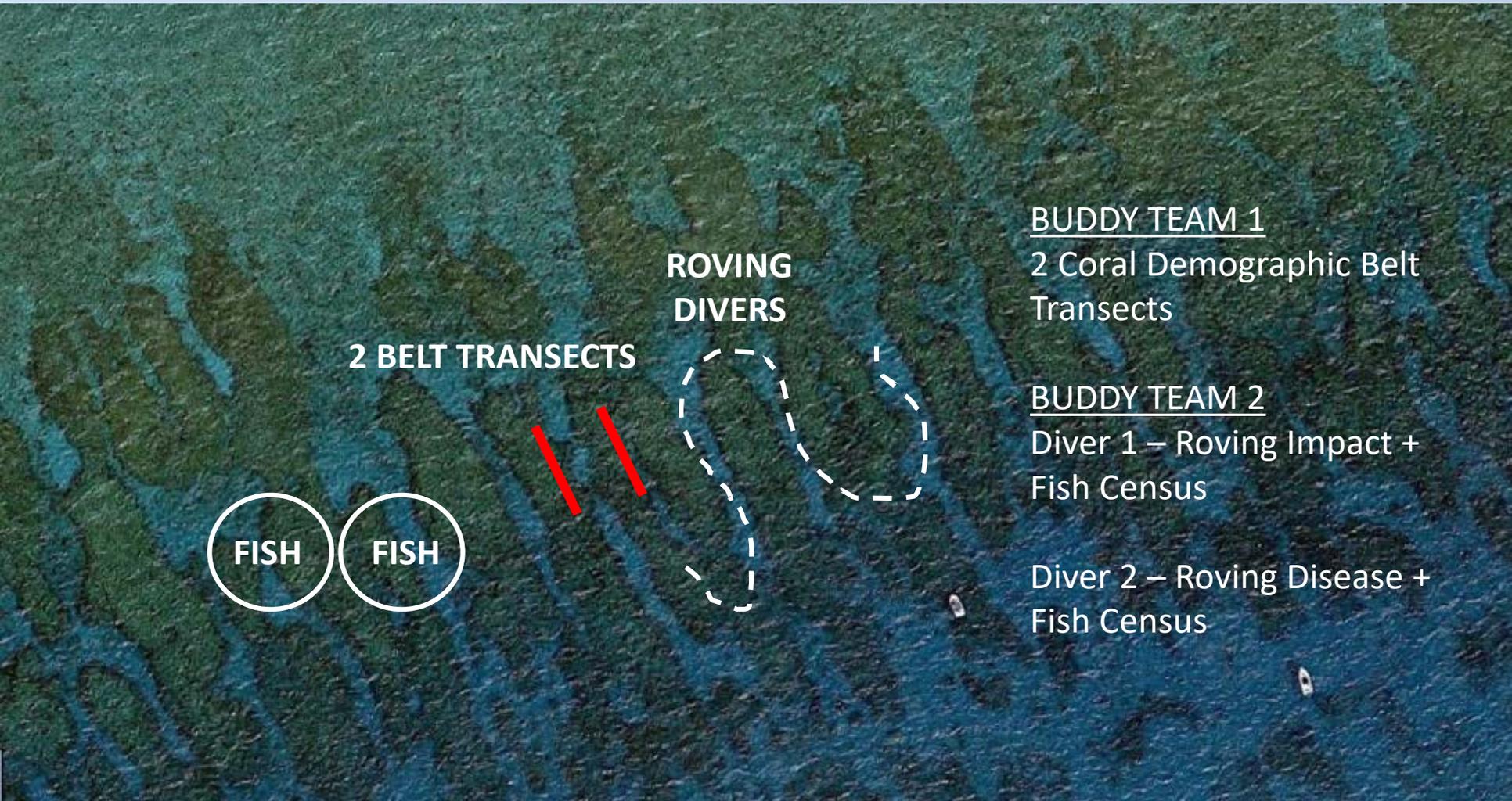
## ROVING DIVER

- Hurricane Impacts per Coral Species (Impact Type, Severity)
- Coral Disease Occurrence per Species

## REEF FISH VISUAL CENSUS (RVC)



# Hurricane Irma Rapid Response Monitoring Methods



FISH FISH

2 BELT TRANSECTS

ROVING  
DIVERS

BUDDY TEAM 1

2 Coral Demographic Belt  
Transects

BUDDY TEAM 2

Diver 1 – Roving Impact +  
Fish Census

Diver 2 – Roving Disease +  
Fish Census

# Post-Dive Debrief

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## POST DIVE QUESTIONS/DISCUSSION

- Area surveyed (total m<sup>2</sup>)
- Injury types observed
- **Triage category.**
  - **Is stabilization recommended?**
- What types of stabilization?
- Number of corals impacted
- Number of corals stabilized
- Size of corals to be stabilized
- Substrate condition
- Does rubble need to be removed?
- Marine debris present?
- Corals disease present?
- Overall condition comments

# Triage Tier Definitions

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**Tier 1**: severe impact/top priority for stabilization/stabilization

**Tier 2**: moderate impact/secondary priority if resources allow after Tier 1

**Tier 3**: minimal impact/not ideal reef community for stabilization

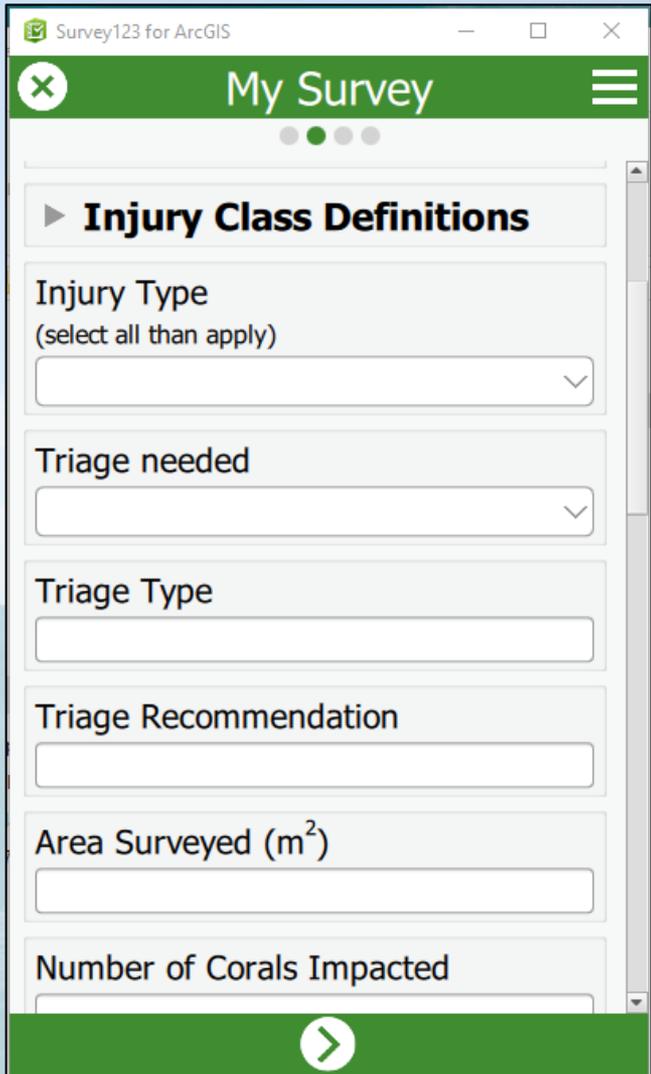
Triage category is a combination of the level of impact and the ability to take responsive action to that impact.

Can the impacts observed be stabilized or are the impacts irreversible?



# Daily Triage Recommendations

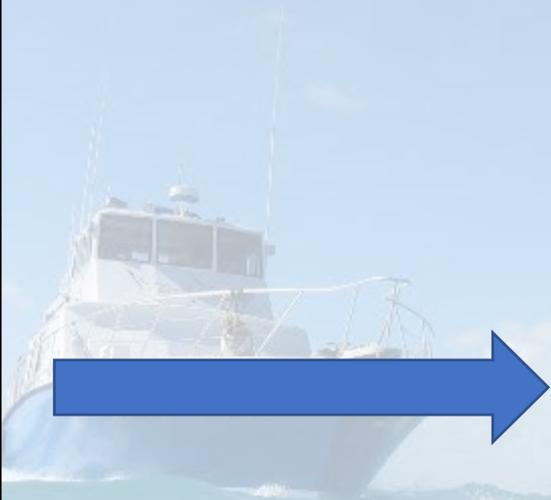
## Recommendations



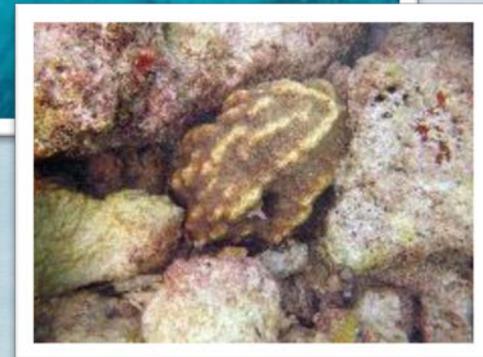
The screenshot shows a mobile application window titled "Survey123 for ArcGIS" with a sub-header "My Survey". The interface includes several input fields for data collection:

- Injury Class Definitions** (Section Header)
- Injury Type** (select all that apply) with a dropdown menu.
- Triage needed** with a dropdown menu.
- Triage Type** with a text input field.
- Triage Recommendation** with a text input field.
- Area Surveyed (m<sup>2</sup>)** with a text input field.
- Number of Corals Impacted** with a text input field.

A green navigation bar at the bottom contains a white right-pointing arrow icon.



## Triage Team Action



# Observations and Recommendations

## Injury Types

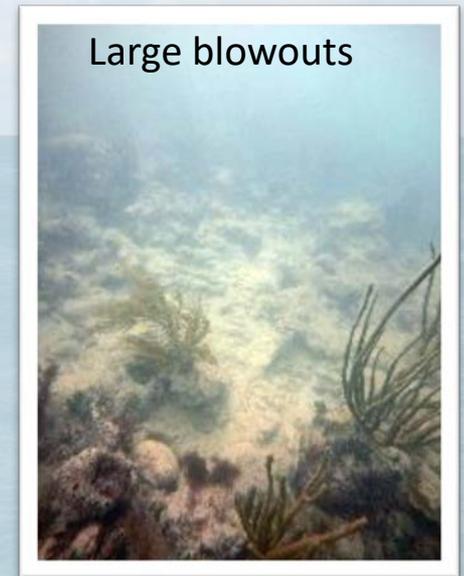
- Dislodged corals
- Broken and fractured corals
- Burial of stony corals and octocorals
- Heavy sedimentation
- Displaced rubble and sand
- Abrasion on stony corals and octocorals
- Clogged and damaged sponges

## Examples of Diver Recommendations

- Use cement for large coral stabilization
- Use epoxy for smaller dislodged corals
- Possibly use shovel and crowbar for leverage in digging corals out of the sand
- Move corals out of sand



Coral buried in rubble



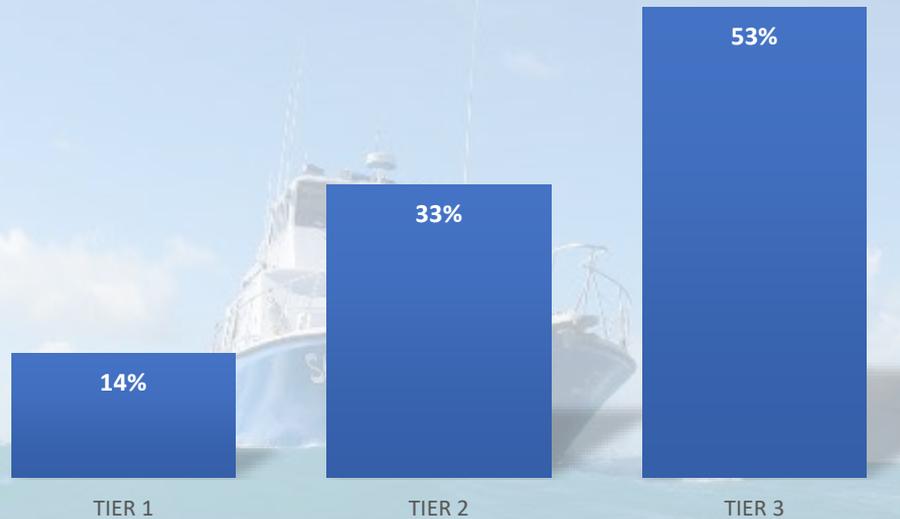
# Triage Tier Results

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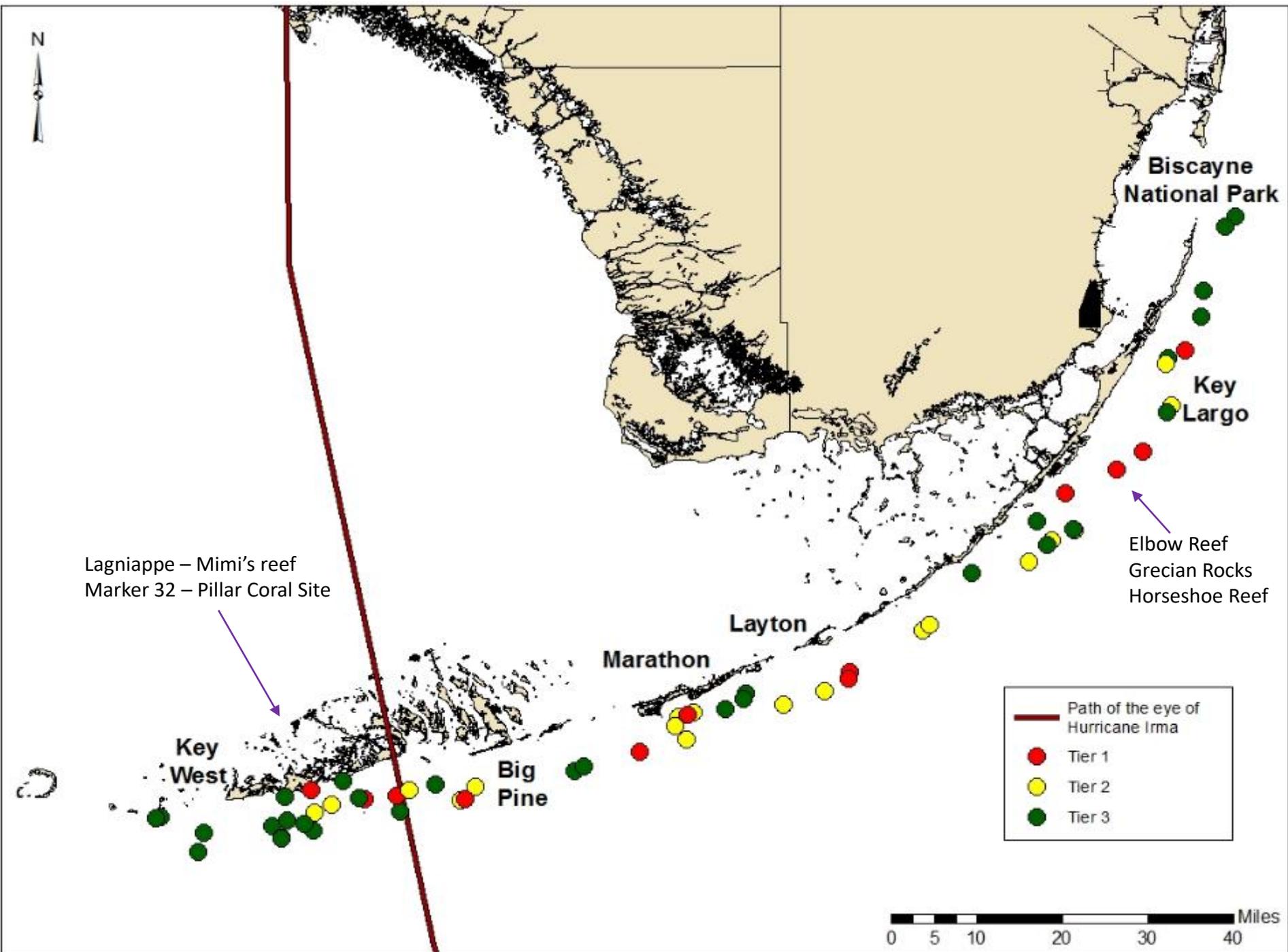
A total of 57 sites were surveyed during over 10 days of diving

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Percent of Total Sites Surveyed



At the Tier 3 sites the most common impact was sedimentation.



Lagniappe – Mimi's reef  
Marker 32 – Pillar Coral Site

Biscayne  
National Park

Key  
Largo

Elbow Reef  
Grecian Rocks  
Horseshoe Reef

Layton

Marathon

Key  
West

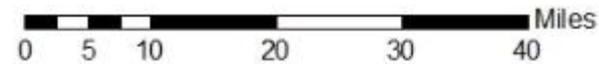
Big  
Pine

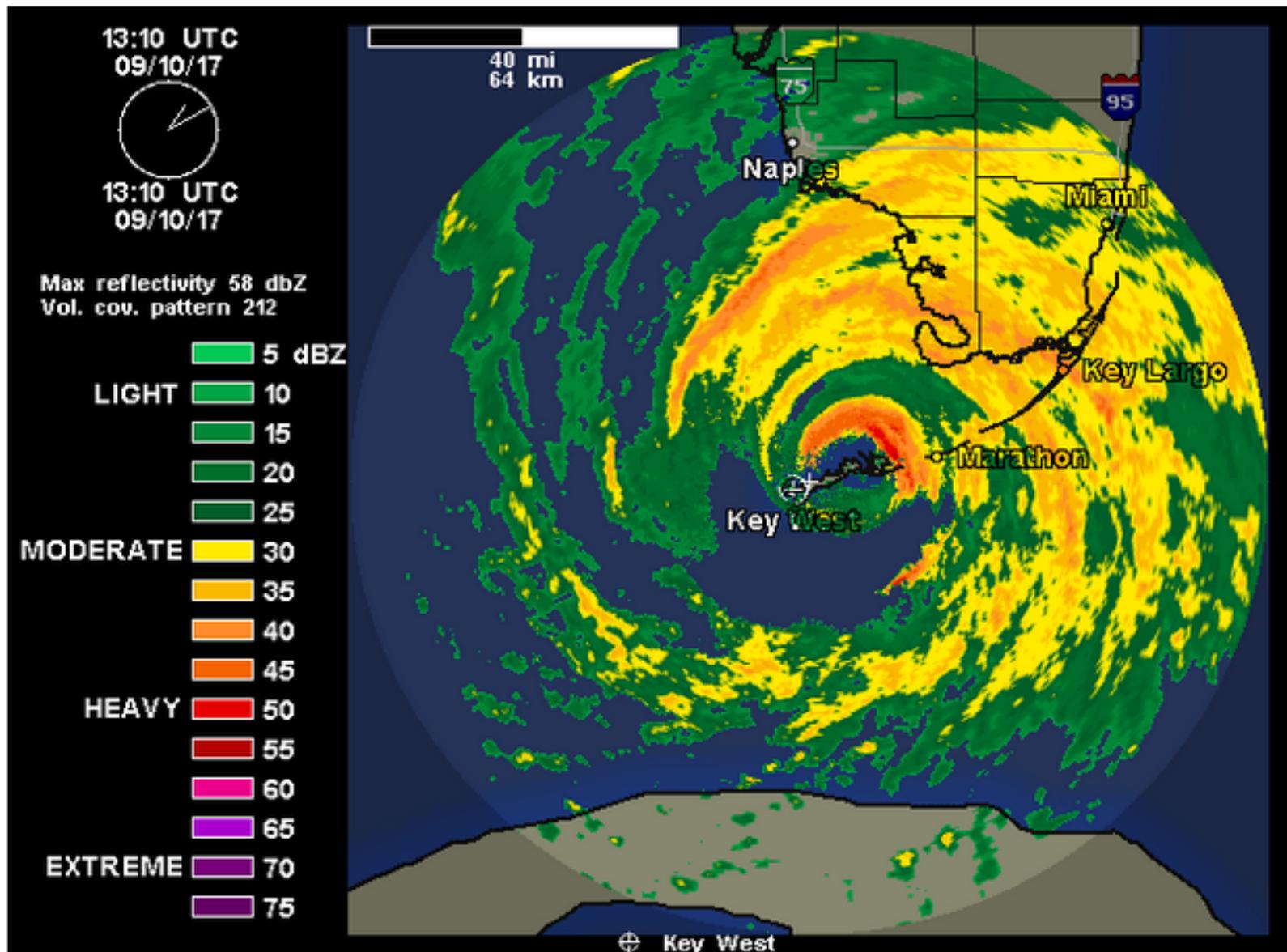
— Path of the eye of Hurricane Irma

● Tier 1

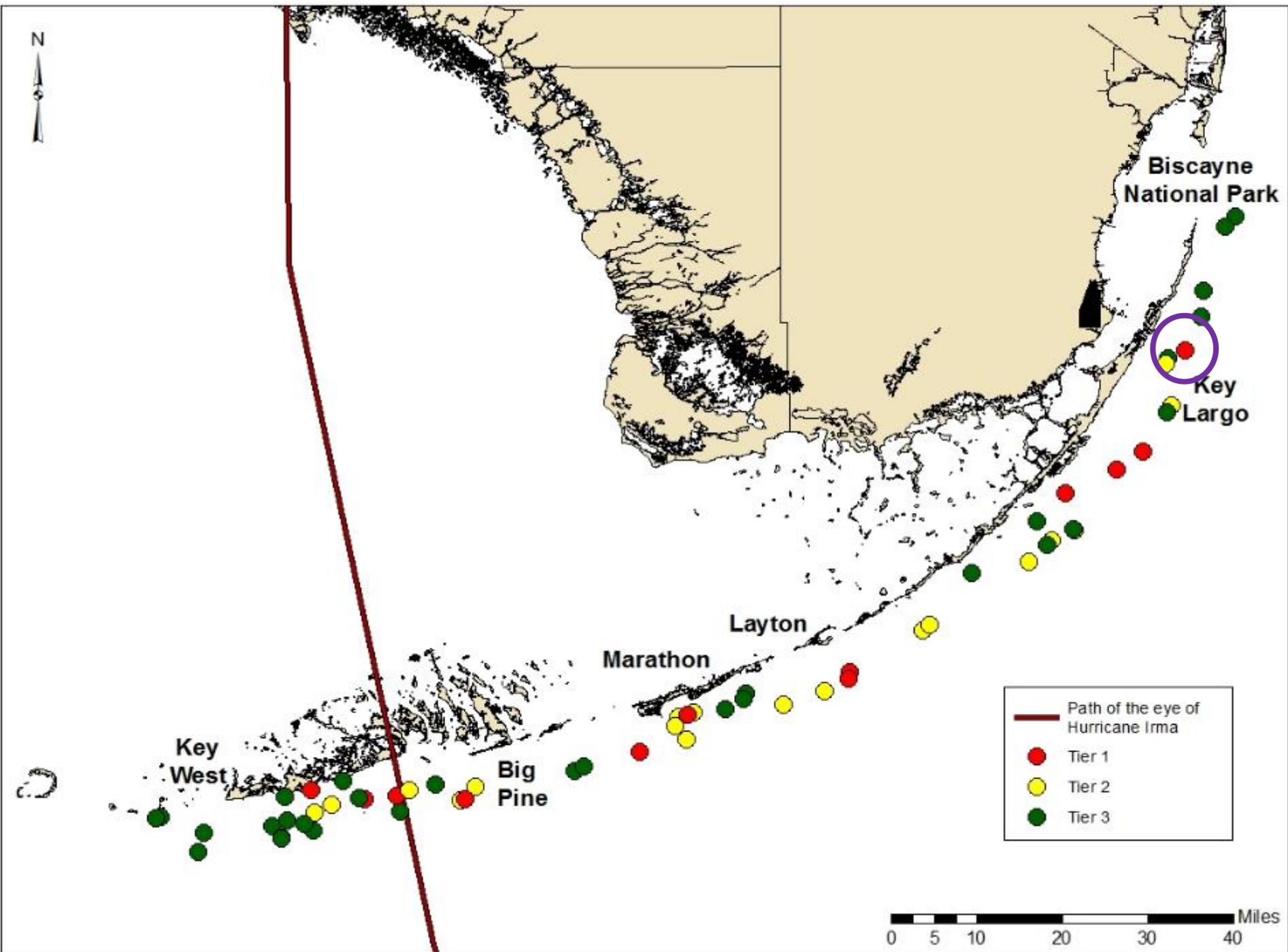
● Tier 2

● Tier 3





**Figure 1.** Radar image of Hurricane Irma taken at the time of landfall in the Florida Keys, 9:10 am EDT September 10, 2017. Note the eyewall on the south side, but very intense echoes on the north side.

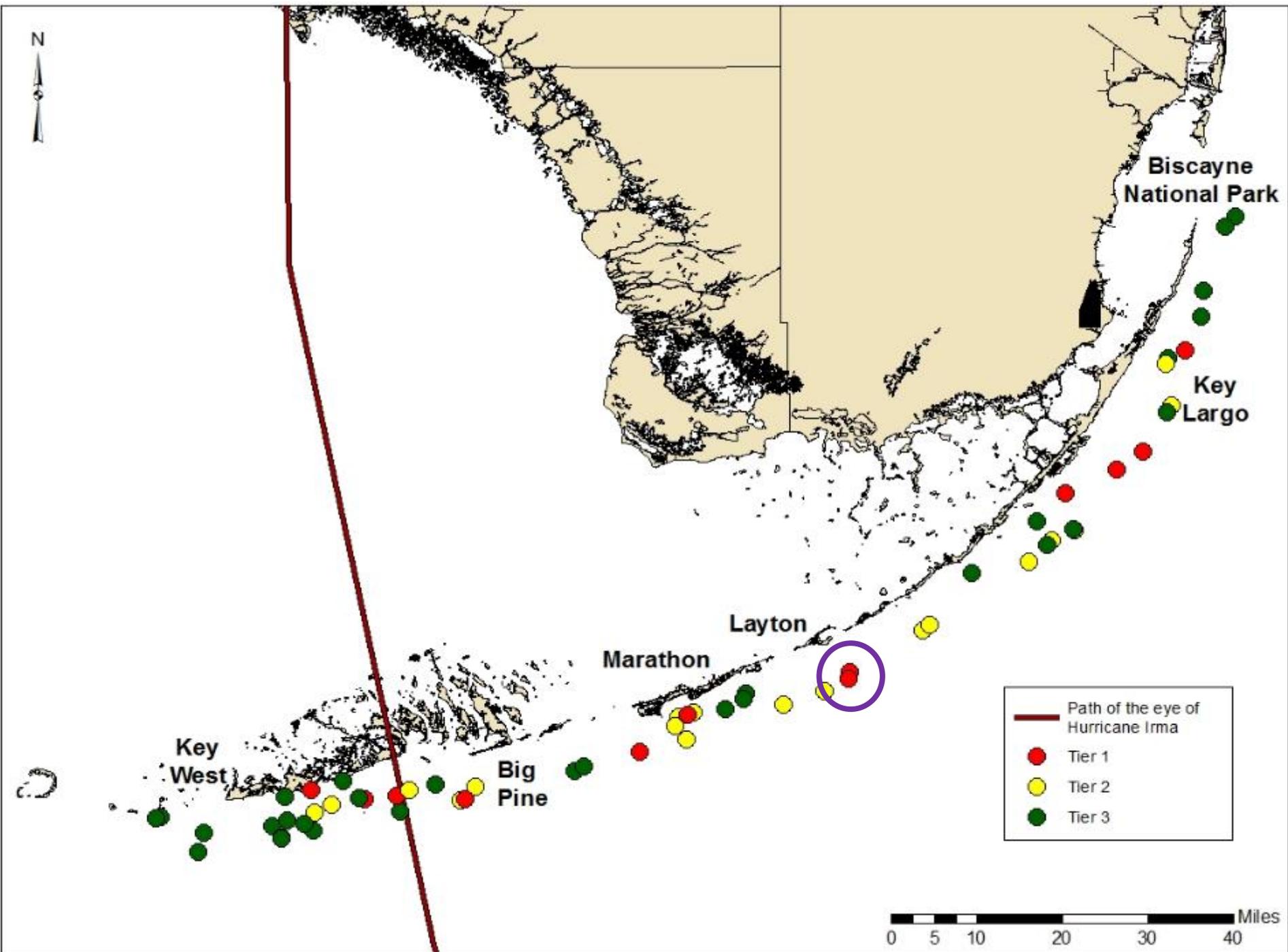




**Irma 103** – Long-term Elkhorn (*Acropora palmata*) monitoring site in Biscayne National Park called Ball Buoy.

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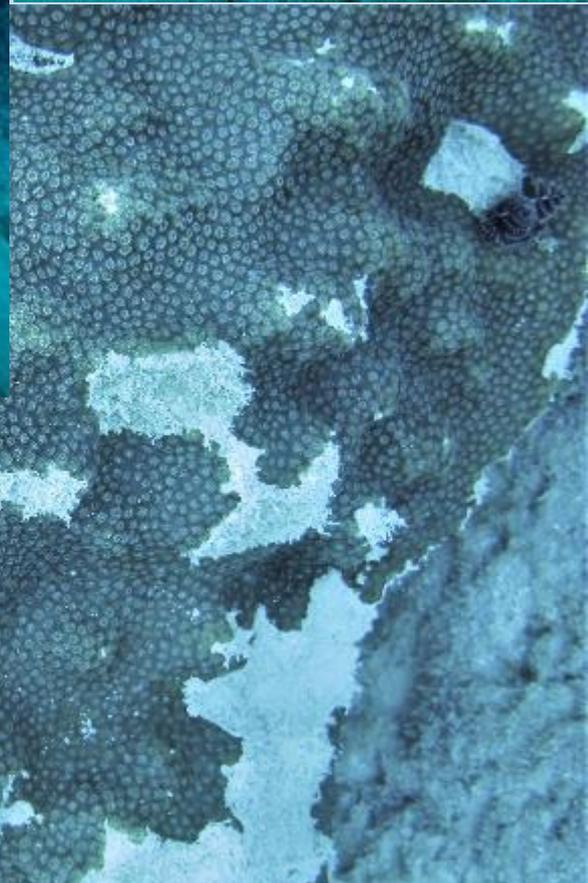
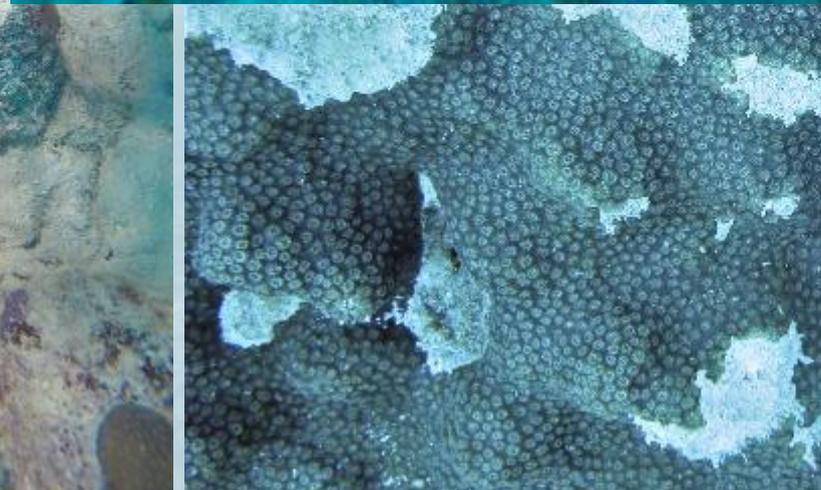


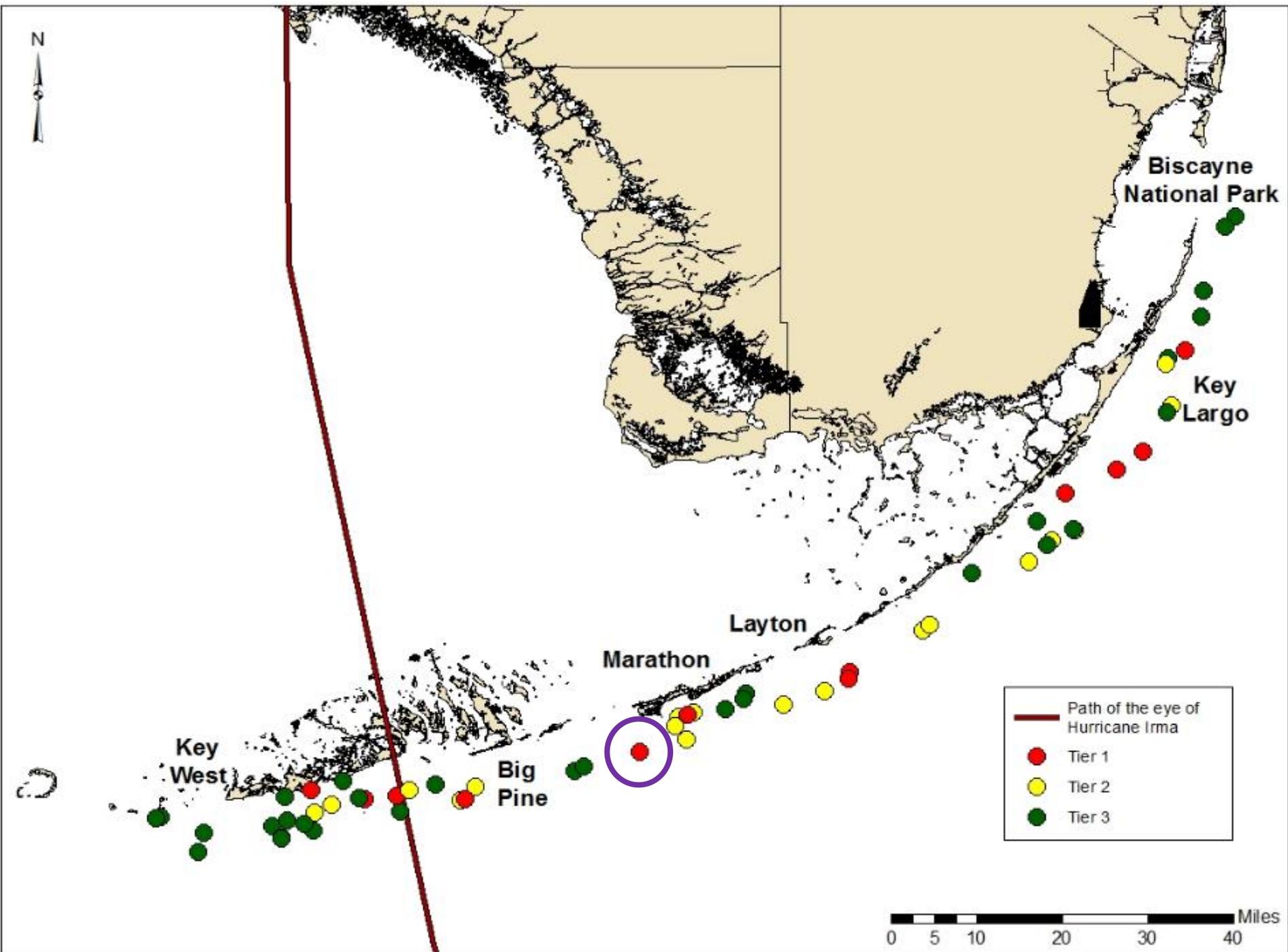


Irma 95 – Tennessee Reef at about 45 ft of water.  
Broken and dislodged corals and heavy sedimentation.

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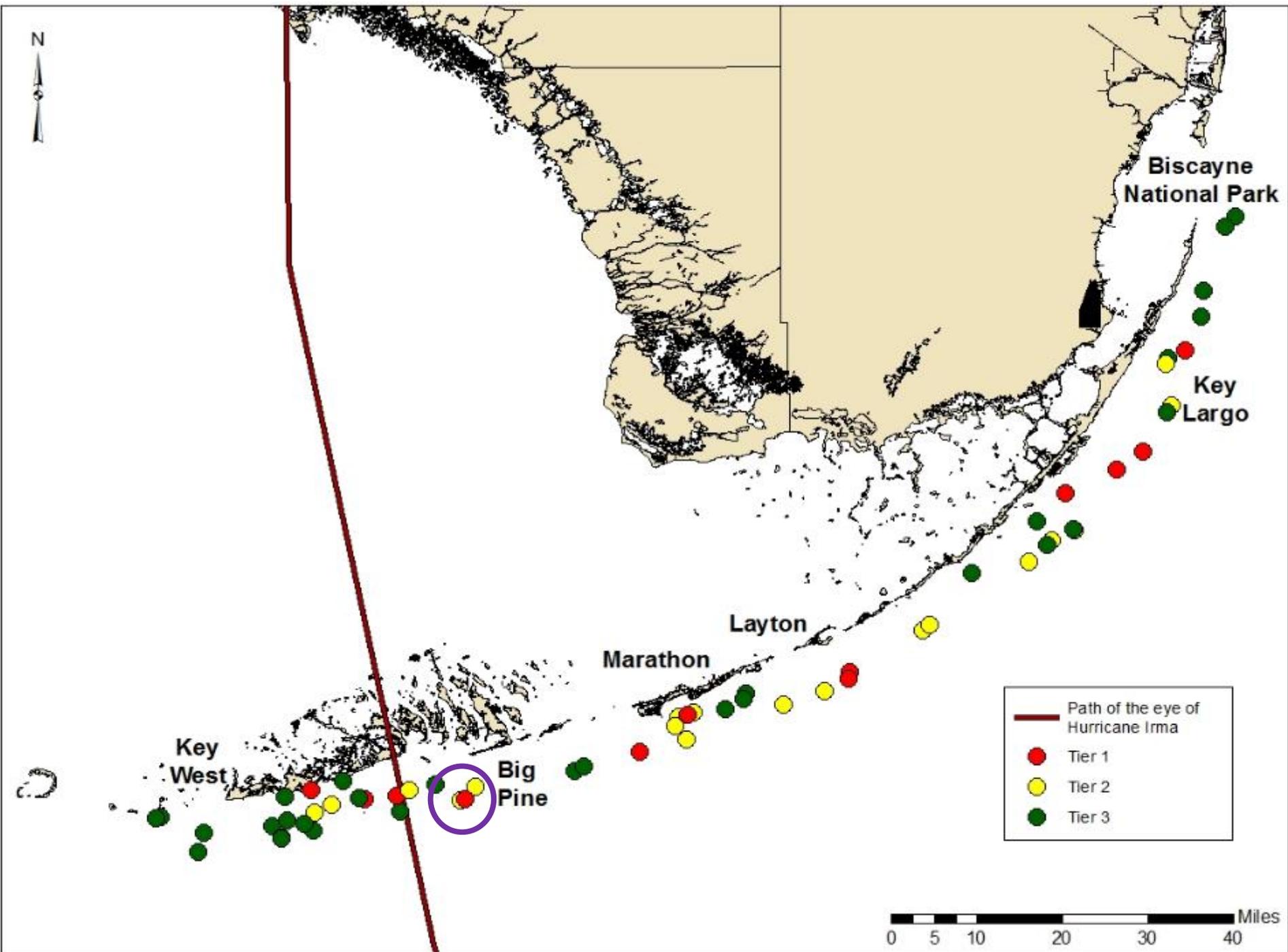


Irma 96 – Sombrero Reef in 10-15 feet of water  
Fractured reef framework and toppled corals

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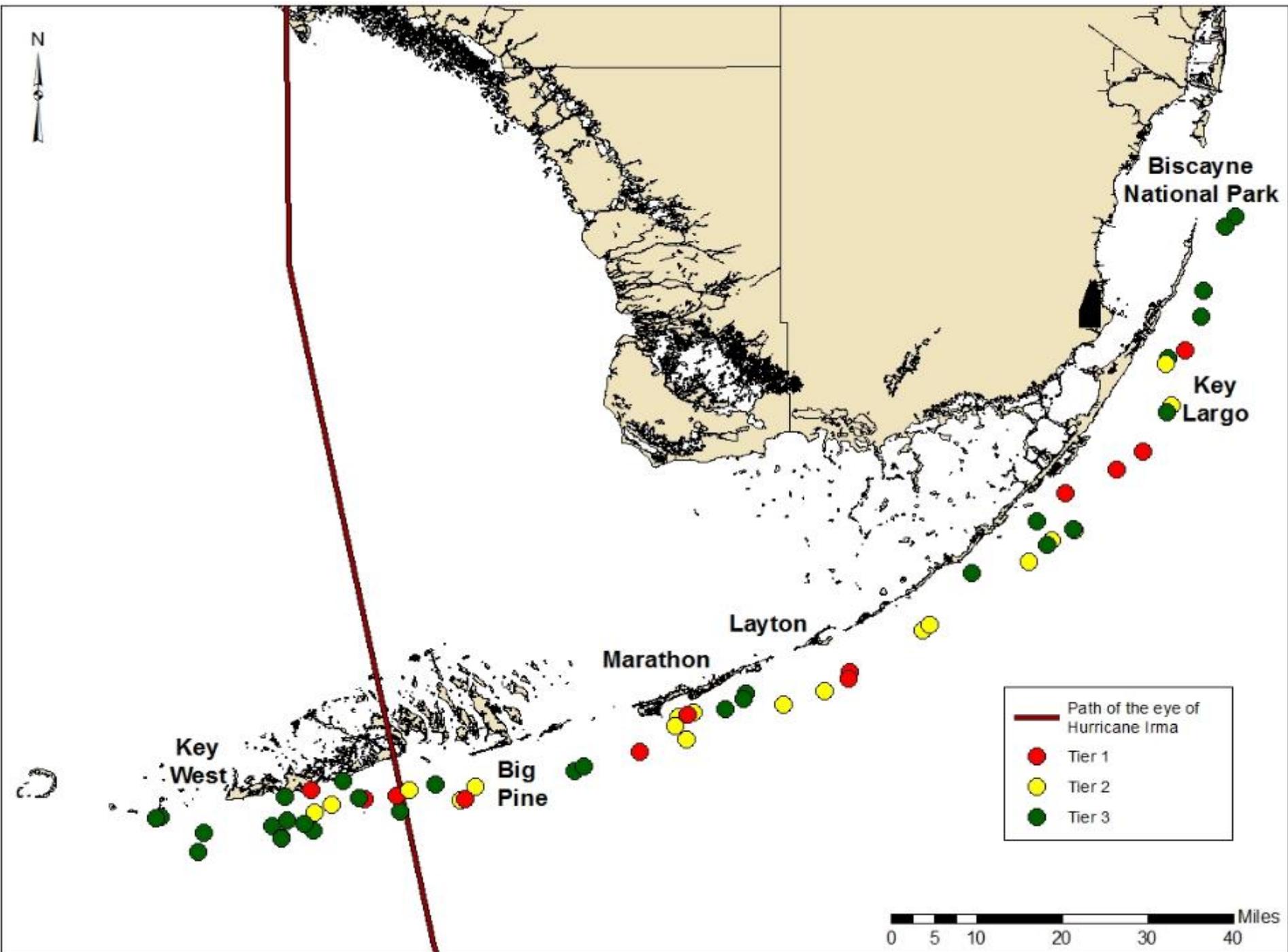






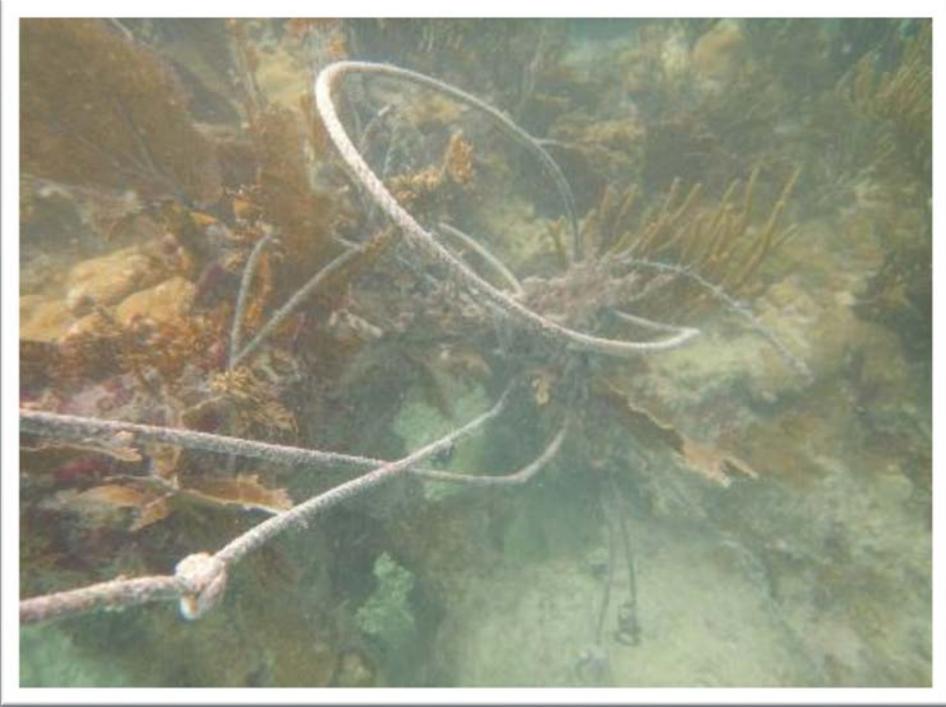
Irma 86 – Looe Key Reef in 15-25 feet of water.  
Toppled and dislodged corals

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# Marine Debris

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# Rapid Assessment Outcomes

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## WHAT WE DID/ARE DOING

57 Total sites surveyed

Stabilization and restorative action were recommended at 14 sites.

- 1 BNP
- 13 FKNMS

Focusing on large corals

Each reef site (e.g. Looe Key, Dustan Rocks) could have weeks of work

However, time is of the essence...

## WHAT DID WE LEARN

Injury types:

- Coral
- Octocorals
- Hardbottom substrate

Impacts are variable both at a landscape and site level.

How to prepare:

Planning, logistics, operations and equipment, etc.

What works best

Timing of efforts



# Questions?

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