National Marine Sanctuaries
National Oceanic and Atmospheric Administration

How can you use the spatial information for the Lower Keys?

-natural resources-

- **NOAA – Florida Keys National Marine Sanctuary**
- **Florida Fish and Wildlife Commission**
- **NOAA – National Centers for Coastal Ocean Science**





Photos courtesy of NOAA photo library

Where are locations of ‘special places’?

Natural Resource Info

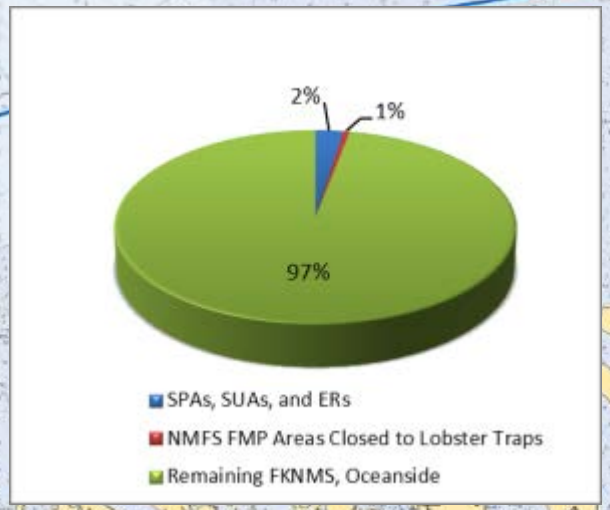
Metrics

- Habitat
  - Habitat types
  - Patch & linear reef
  - High relief reefs
  - Turtle grass density
- Coral
  - Stony coral
  - Soft coral
  - Resilient reefs
- Fish
  - Reef fish surveys
  - Fish aggregations
- Fauna
  - Conch aggregations

Photos courtesy of NOAA photo library

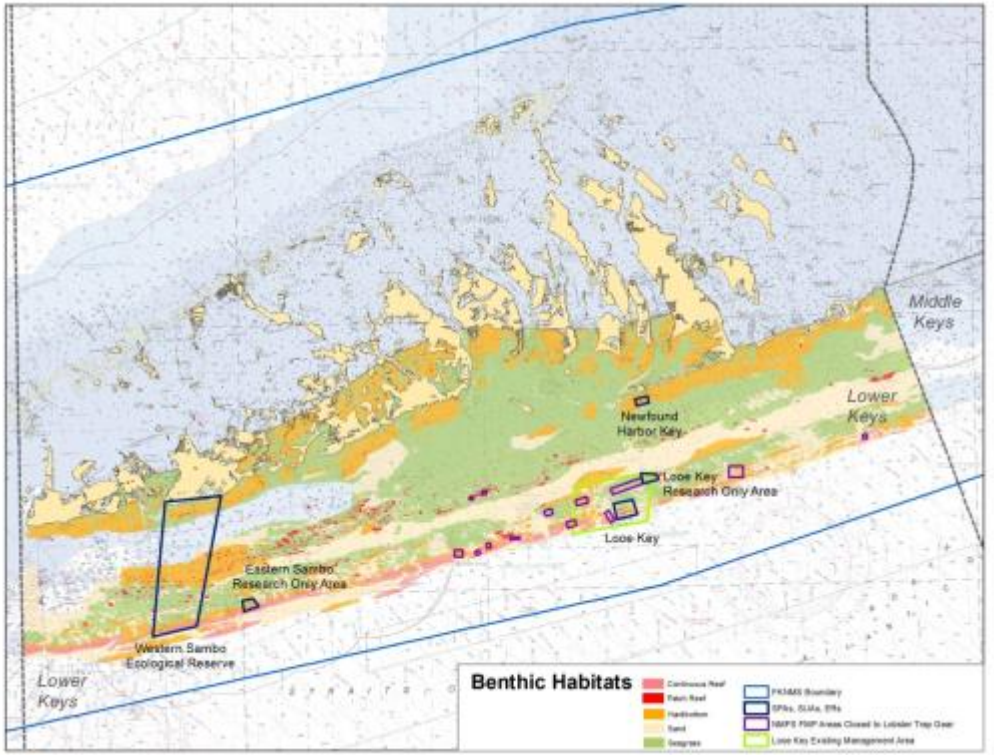
How much area is currently within zones?

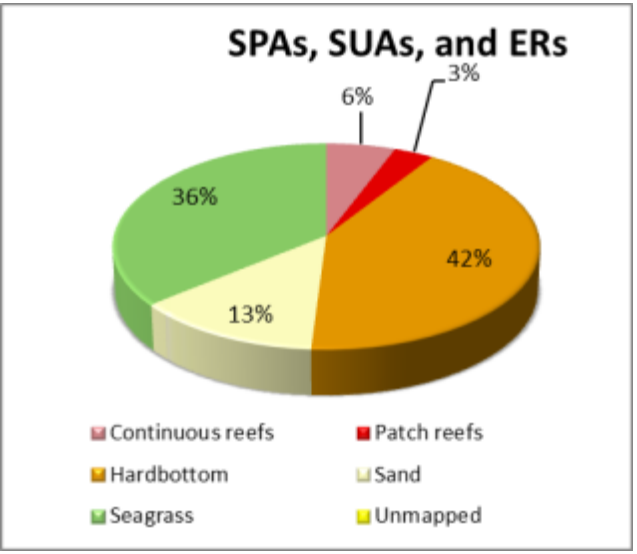
Management Zone	Area (km^2)
SPAs, SUAs, and ERs	34
NMFS FMP Areas Closed to Lobster Traps	8
Remaining FKNMS, Oceanside	1321
Resource Total	1363

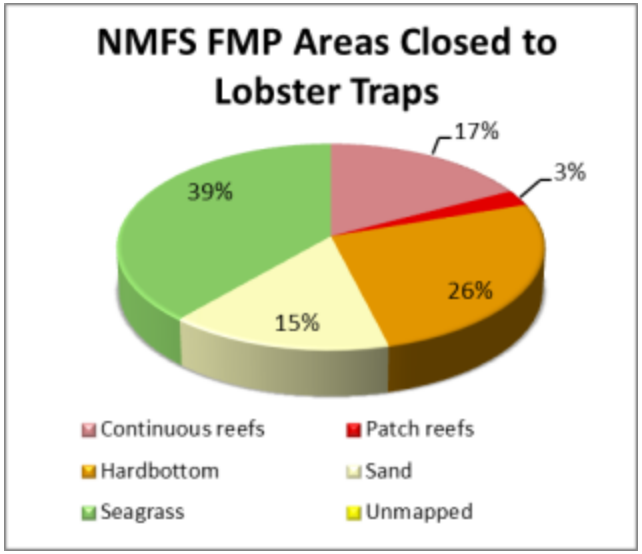


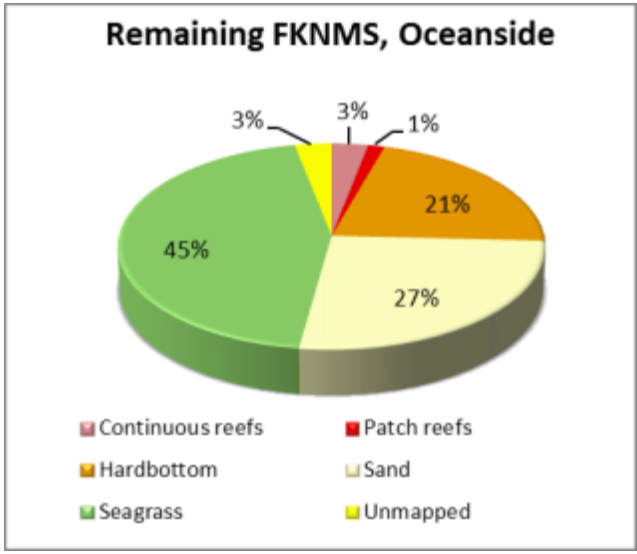
How are habitats distributed?

Habitats	Area (Km^2)		
	SPAs, SUAs, and ERs	NMFS FMP Areas Closed to Lobster Traps	Remaining FKNMS, Oceanside
Continuous reefs	1.4	0.6	19
Patch reefs	0.8	0.1	9
Hardbottom	10.0	0.9	137
Sand	3.1	0.5	169
Seagrass	8.6	1.4	286
Unmapped	0.0	0.0	20









High Relief Reefs

Data source

- NMFS diver surveys

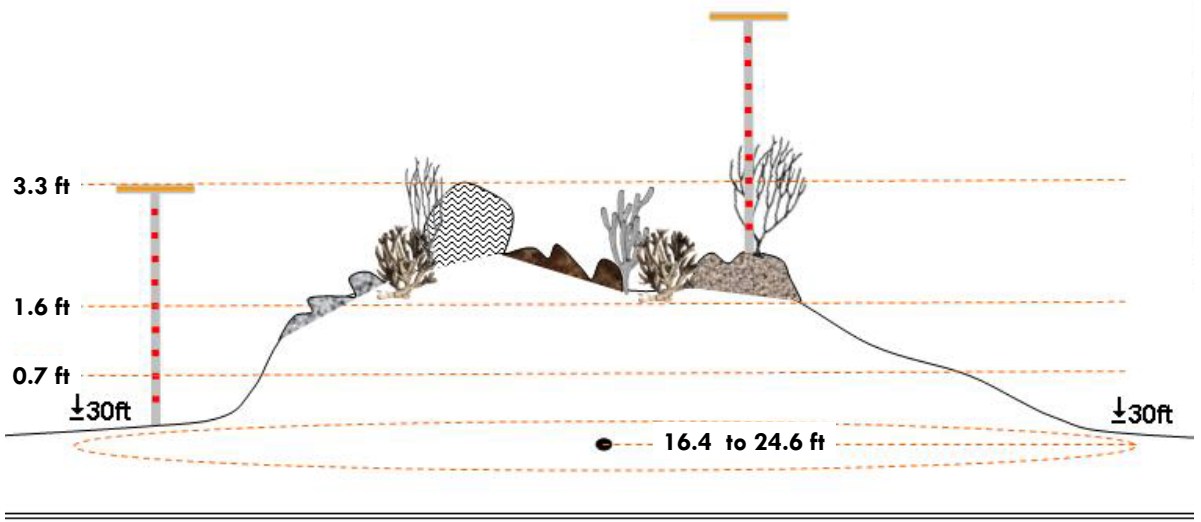
Metric

- **High relief reef**

  Average reef height of 1.6-3.3 ft within a circle 24.6 ft in diameter

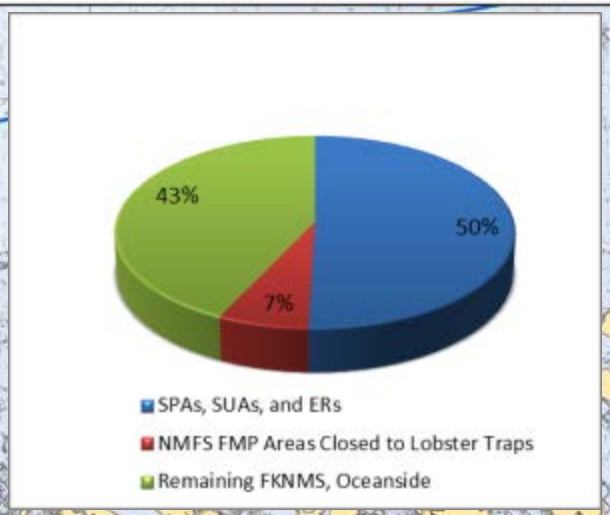
Reference

- Brandt, M. E., N. Zurcher, A. Acosta, J. S. Ault, J. A. Bohnsack, M. W. Feeley, D. E. Harper, J. H. Hunt, T. Kellison, D. B. McClellan, M. E. Patterson, and S. G. Smith. 2009. A cooperative multi-agency reef fish monitoring protocol for the Florida Keys coral reef ecosystem. Natural Resource Report NPS/SFCN/NRR—2009/150. National Park Service, Fort Collins, Colorado.



Where are locations of high relief reefs?

Management Zone	Area (km^2)
SPAs, SUAs, and ERs	1.29
NMFS FMP Areas Closed to Lobster Traps	0.17
Remaining FKNMS, Oceanside	1.10
Resource Total	2.56



Resilient Reefs

Data source

R. Van Woesik analysis of Florida Reef Resilience Program coral surveys, 2005-2010

Study Methods

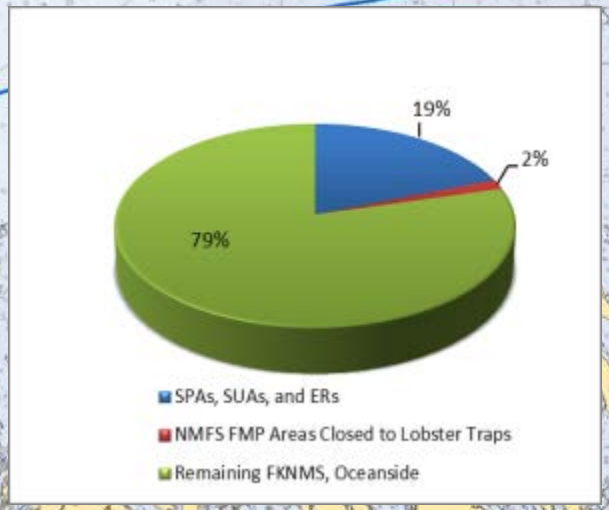
Data selected for high coral colony density, relatively low observations of disease and bleaching

Metrics

- Resilient reefs

Where are locations of resilient reefs?

Management Zone	Area (km^2)
SPAs, SUAs, and ERs	3.54
NMFS FMP Areas Closed to Lobster Traps	0.28
Remaining FKNMS, Oceanside	14.61
Resource Total	18.43



Middle Keys

Lower Keys

Newfound Harbor Key

Looe Key Research Only Area

Looe Key

Eastern Sambo Research Only Area

Western Sambo Ecological Reserve

Lower Keys

STRAITS OF

Resilient Reefs

Resilient Reefs

Coral Reef and Hardbottom

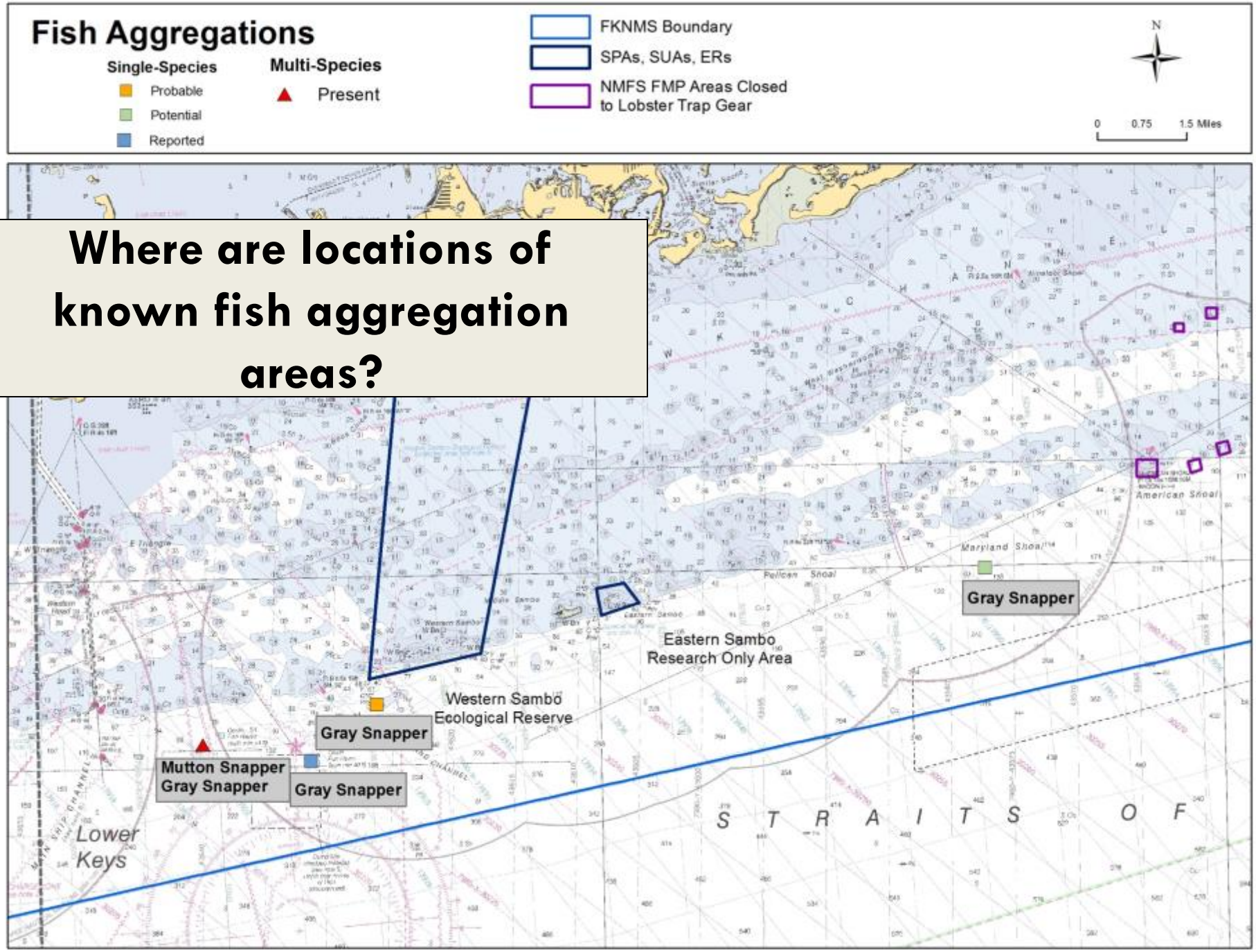
FKNMS Boundary

SPAs, SUAs, ERs

NMFS FMP Areas Closed to Lobster Trap Gear

Looe Key Existing Management Area

Lower Keys: Ocean Side


Fish Aggregations
Single-Species
Probable
Potential
Reported
Multi-Species
Present
FKNMS Boundary
SPAs, SUAs, ERs
NMFS FMP Areas Closed to Lobster Trap Gear
N
0 0.75 1.5 Miles
Where are locations of known fish aggregation areas?
Gray Snapper
Eastern Sambo Research Only Area
Western Sambo Ecological Reserve
Gray Snapper
Mutton Snapper
Gray Snapper
Gray Snapper
Lower Keys
STRAITS OF
American Shoal
Maryland Shoal
Pelican Shoal

Coral current and candidate ESA species

Data sources

- Sanctuary Coral Reef Ecosystem Assessment & Monitoring (SCREAM), Nova Southeastern University
- Florida Reef Resilience Program (FRRP)
- Coral Reef Ecosystem Monitoring Program (CREMP), FWC
- NOAA NMFS Protected Resources & FWC ESA monitoring

Species

- ESA Threatened: elkhorn *(Acropora palmata)*, staghorn *(Acropora cervicornis)*
- State of FL Threatened: pillar (*Dendrogyra cylindrus*)
- Candidate ESA Endangered: elkhorn, staghorn, pillar, boulder star *(Montastraea annularis)*, mountainous star *(M. faveolata)*, star (*M. franksii)*
- Candidate ESA Threatened: sheet coral (*Agaricia lamarcki*), elliptical star coral (*Dichocoenia stokesii*)

Metrics

- presence

What proportions of sites with ESA coral species are present in current zones?

Threatened Coral Species

+ Staghorn Coral
O Elkhorn Coral
▲ Pillar Coral

Continuous Reef
Patch Reef
Hardbottom
Seagrass
Sand

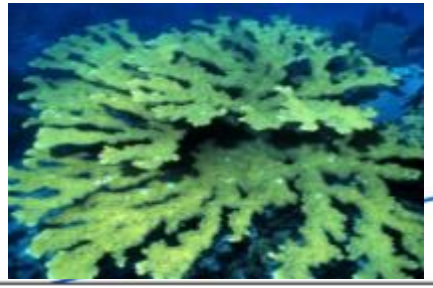
SPAs, SUAs, ERs

N

0 0.5 1 Miles

Western Sambo Ecological Reserve

Eastern Sambo Research Only Area

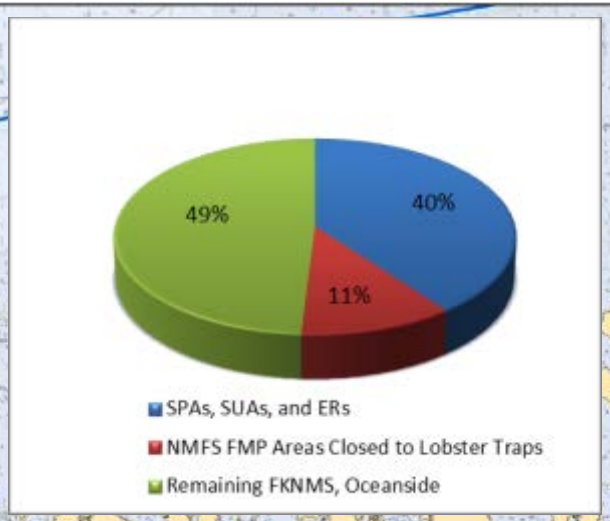


What proportion of sites with Threatened Staghorn corals are present in current zones?

Greatest colony densities and sizes in mid-channel & offshore patch reefs.
Source: http://floridakeys.noaa.gov/scisummaries/elkhornstaghorn2013.pdf

What proportion of sites with Threatened Staghorn corals are present in current zones?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	260
NMFS FMP Areas Closed to Lobster Traps	74
Remaining FKNMS, Oceanside	321
Resource Total	655

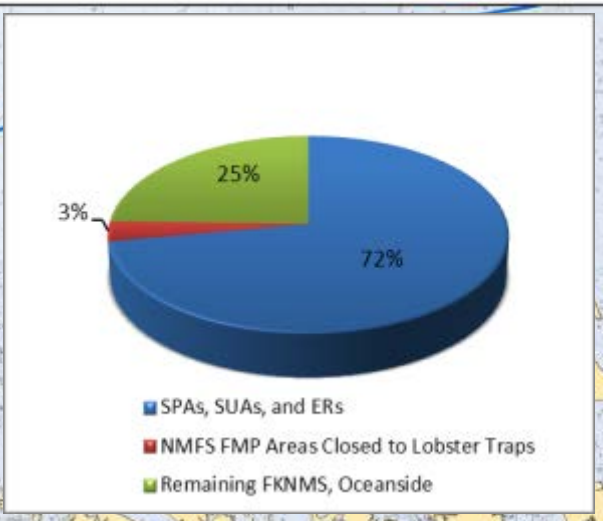


What proportion of sites with Threatened Elkhorn corals are present in current zones?

In 2012, nearly 80% of colonies were found in high-relief spur & groove reefs and offshore patch reefs. Coral density, size and occurrence were higher inside SPAs.
Source: http://floridakeys.noaa.gov/scisummaries/elkhornstaghorn2013.pdf

What proportion of sites with Threatened Elkhorn corals are present in current zones?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	376
NMFS FMP Areas Closed to Lobster Traps	17
Remaining FKNMS, Oceanside	128
Resource Total	521

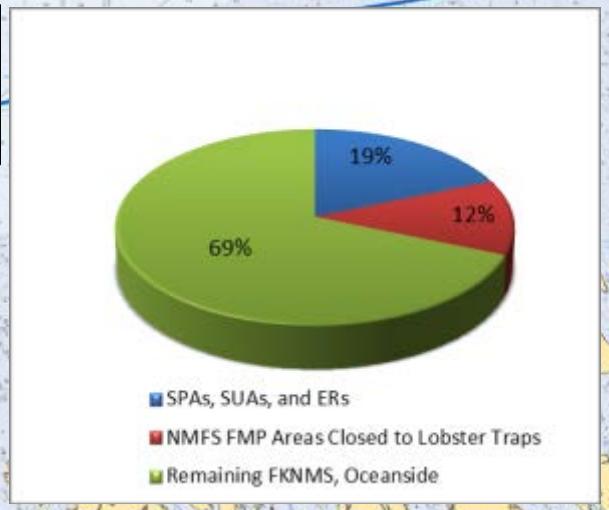


What proportion of sites with Threatened Pillar corals are present in current zones?

Threatened status – State of FL; ESA candidate Endangered species
81 known sites with pillar coral present in the Florida Coral Reef Tract.
6 known locations are in the middle Keys region.

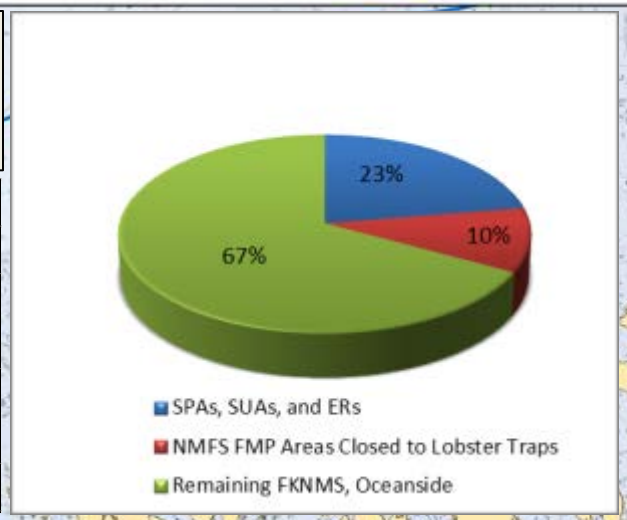
What proportion of Threatened Pillar corals are present in current zones?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	3
NMFS FMP Areas Closed to Lobster Traps	2
Remaining FKNMS, Oceanside	11
Resource Total	16



What proportions of sites with Candidate ESA coral species are in current zones?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	170
NMFS FMP Areas Closed to Lobster Traps	79
Remaining FKNMS, Oceanside	507
Resource Total	756



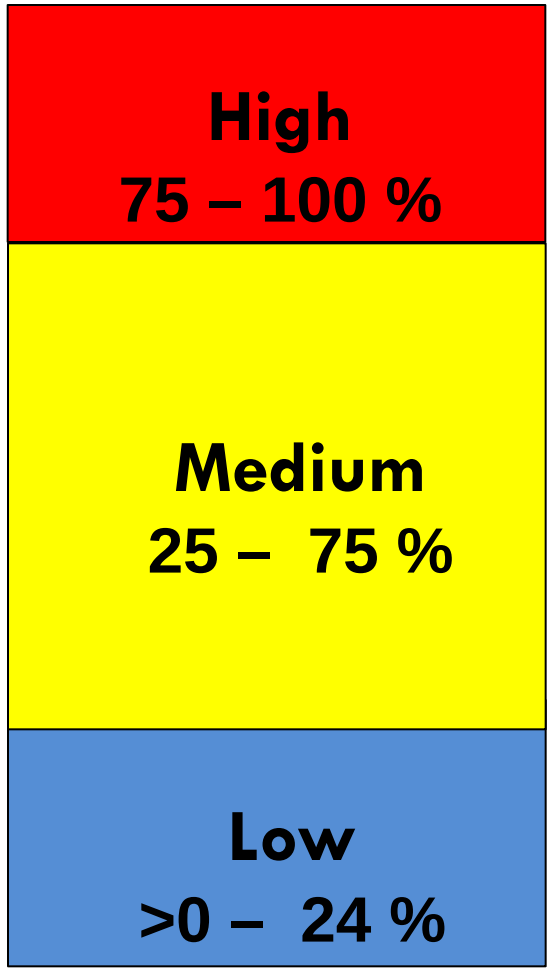
Other ecosystem metrics

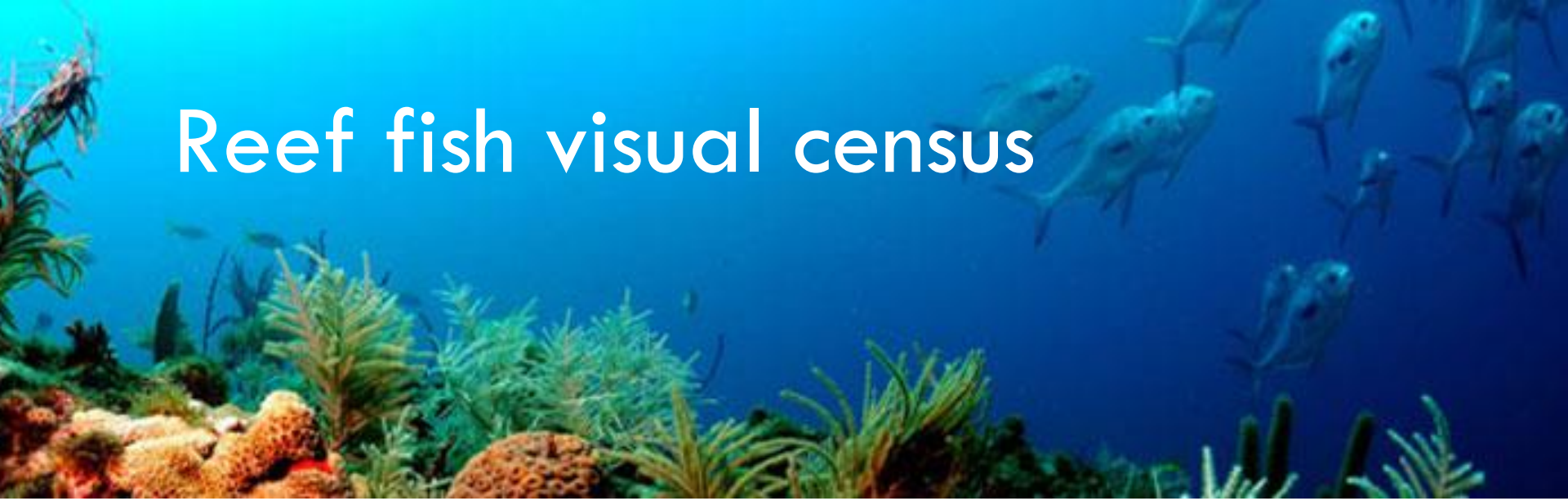
- **Fish abundance**
- **Fish species richness**
- **Stony Coral cover**
- **Stony Coral species richness**
- **Soft Coral cover**
- **Soft Coral species richness**

How can we tell what areas are good?

Rank survey site relative other sites in Lower Keys

High	Top 25%
Medium	Middle
Low	Bottom 25%





Reef fish visual census

Data sources
NOAA NMFS and partners including University of Miami, FWC, etc

Study Methods
Diver-based stationary surveys on hardbottom reef

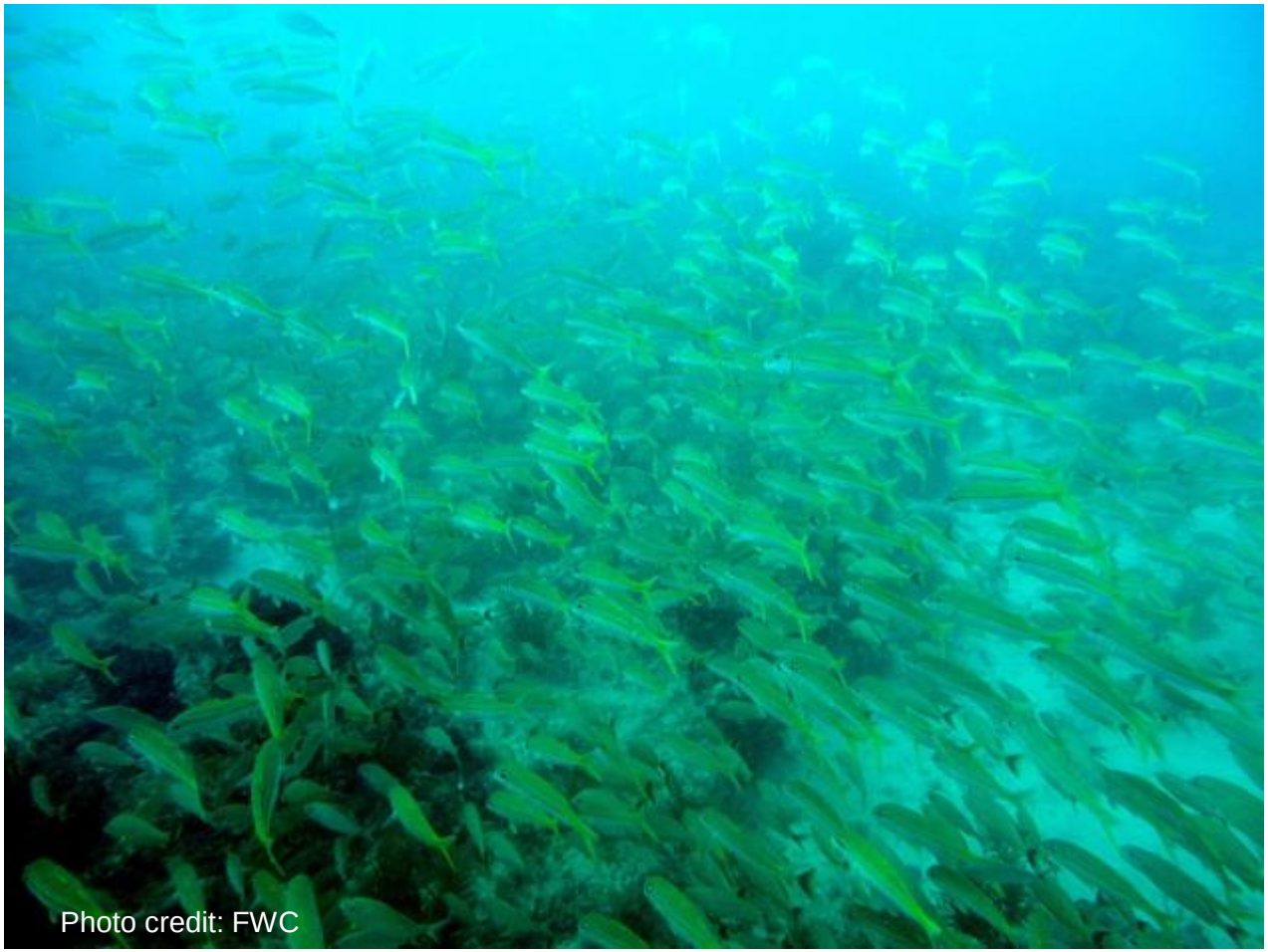
Metrics

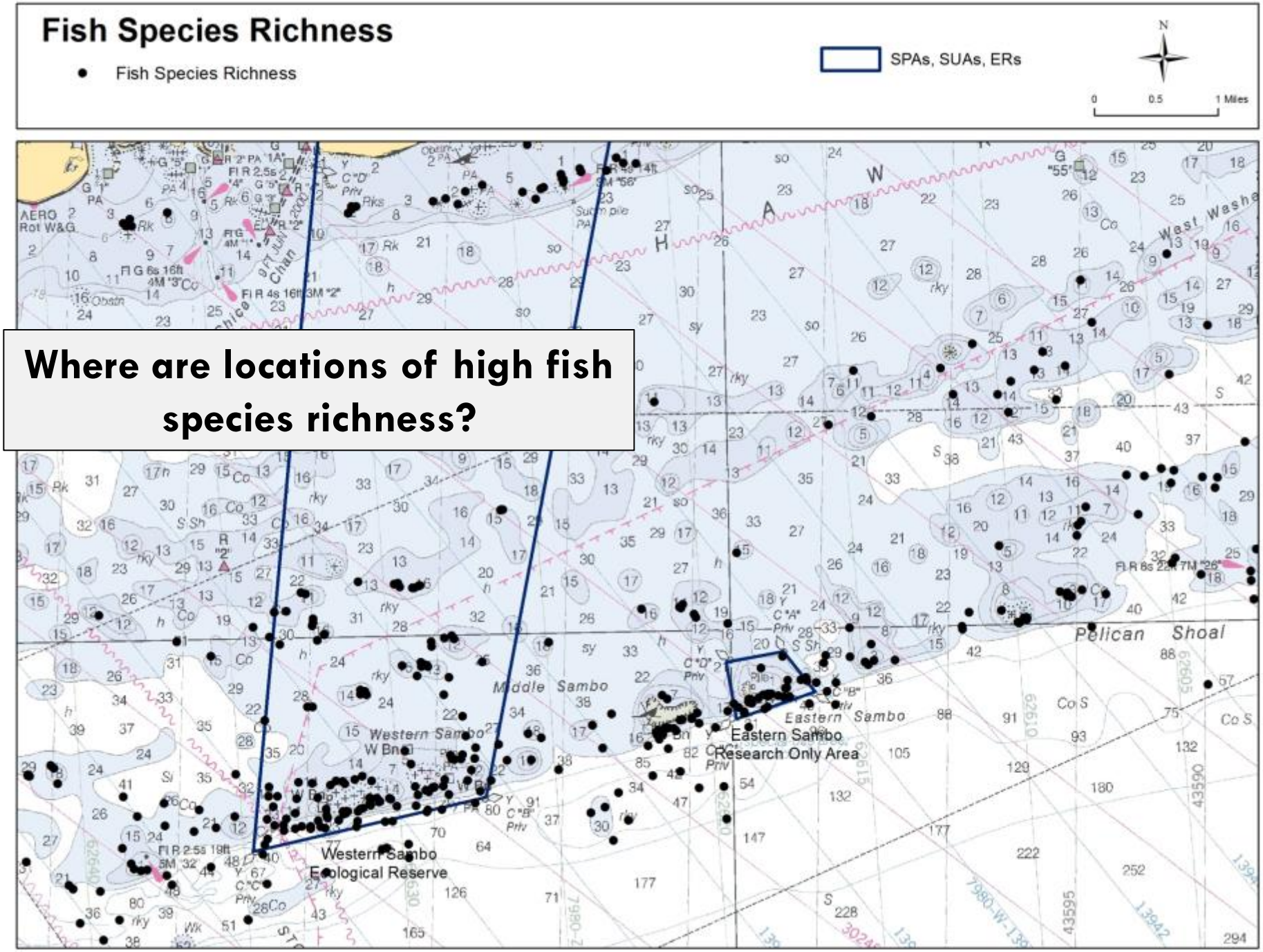
- **Fish abundance**
- **Fish species richness**
- Grouper-snapper complex abundance
- Nassau-Goliath grouper abundance
- Marine life fishery fish species abundance
- Top 10 marine life fishery fish species abundance
- Parrotfish abundance
- Barracuda abundance
- Permit abundance

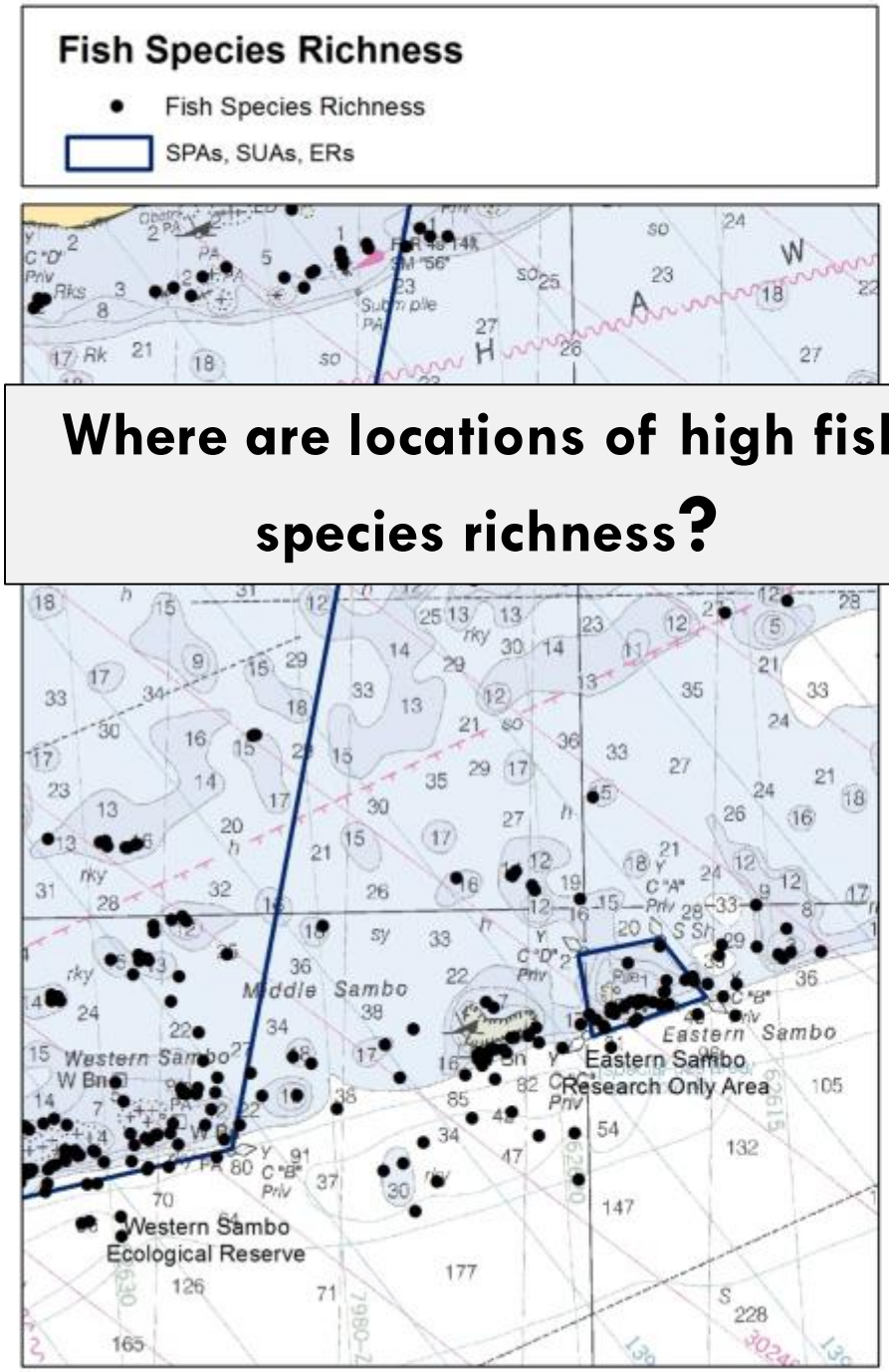
Photo courtesy of FKNMS

Fish Metrics

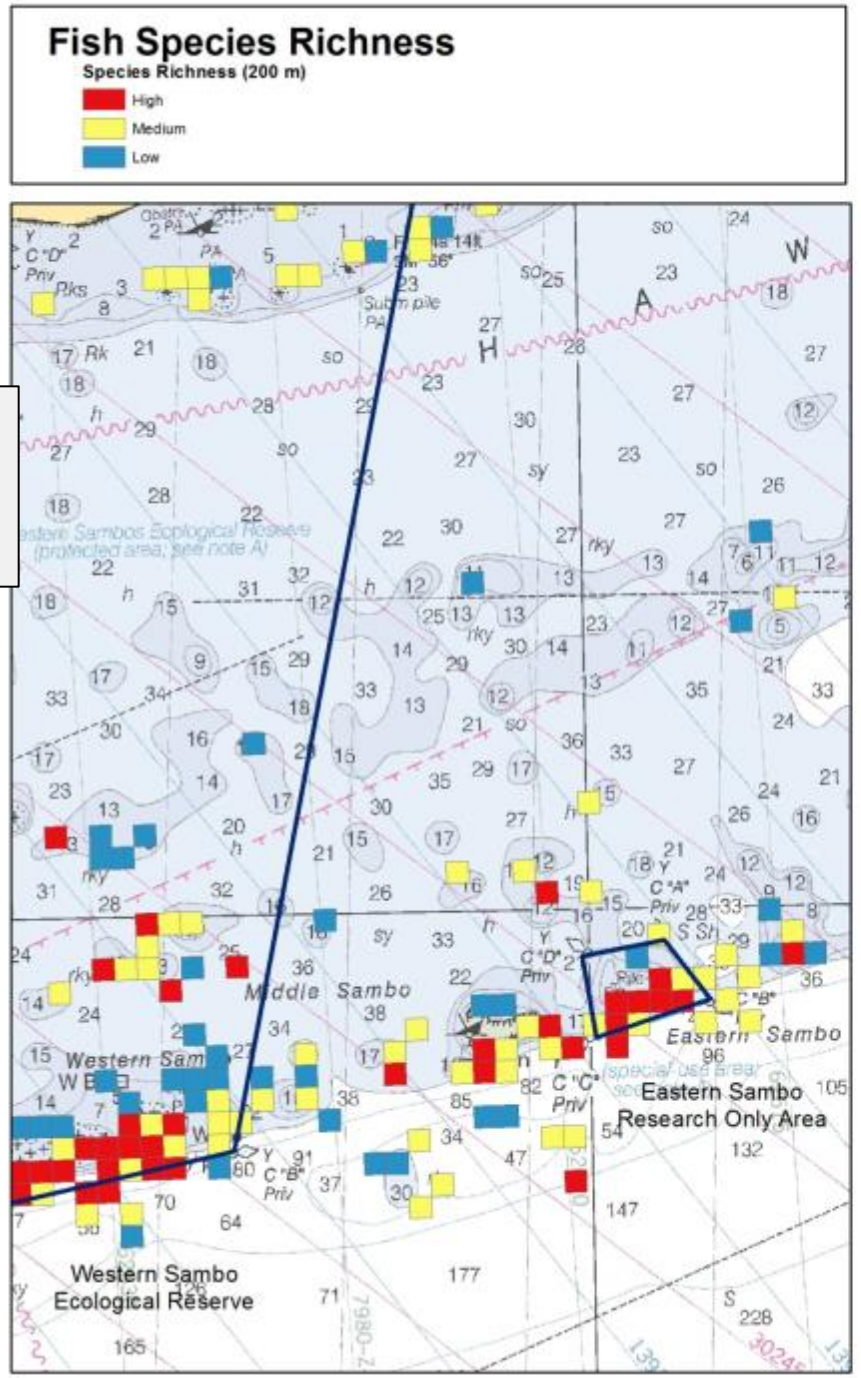
- **Fish abundance: How many fish?**
- **Fish species richness: How many species of fish?**




Fish Species Richness
Fish Species Richness
SPAs, SUAs, ERs
N
0
0.5
1 Miles
Where are locations of high fish species richness?
Western Sambo Ecological Reserve
Eastern Sambo Research Only Area
Middle Sambo
Western Sambo
Eastern Sambo
Pelican Shoal

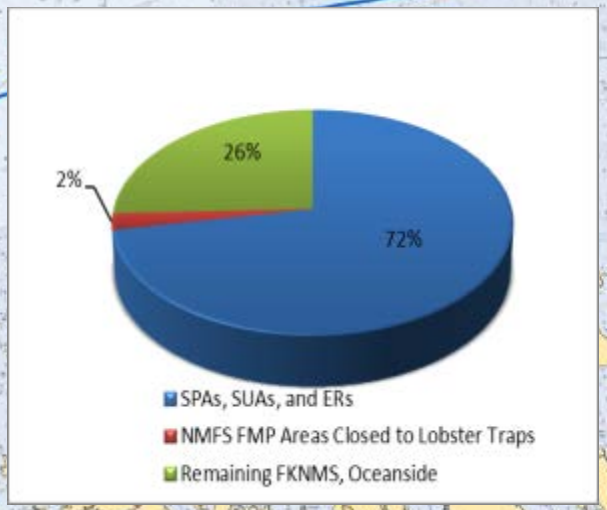


Where are locations of high fish species richness?



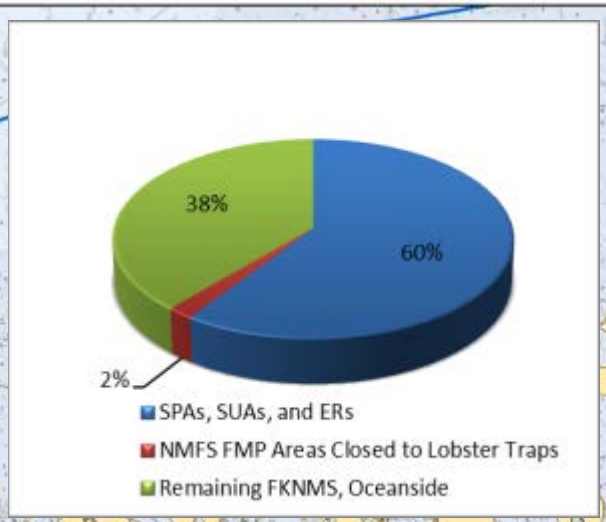
Where are locations of high fish species richness?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	183
NMFS FMP Areas Closed to Lobster Traps	6
Remaining FKNMS, Oceanside	65
Resource Total	254

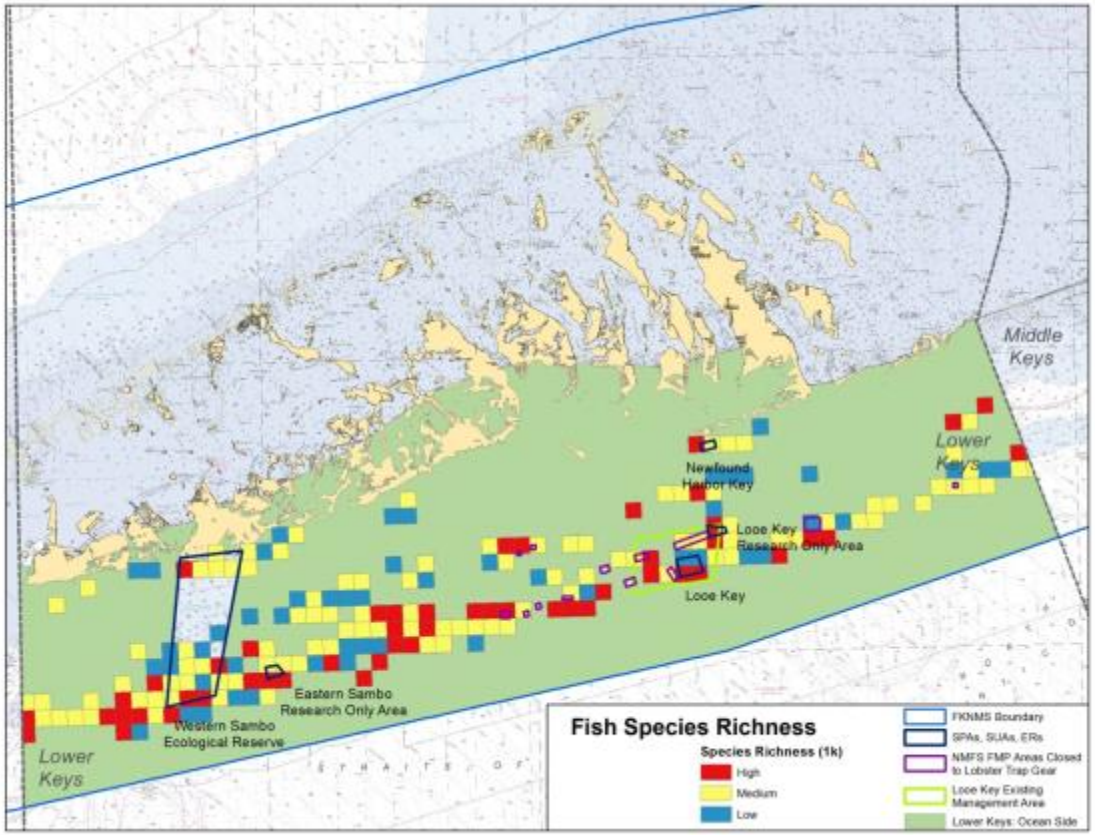


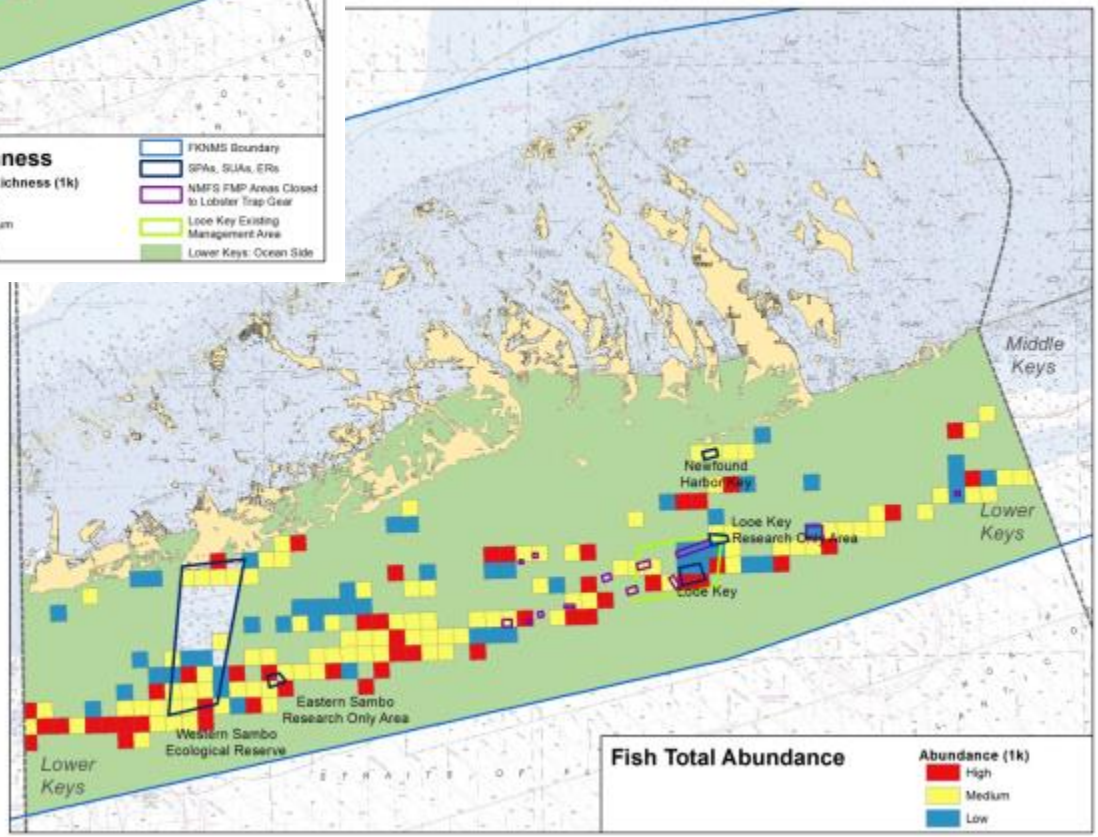
Where are locations of high fish abundance?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	153
NMFS FMP Areas Closed to Lobster Traps	5
Remaining FKNMS, Oceanside	99
Resource Total	257

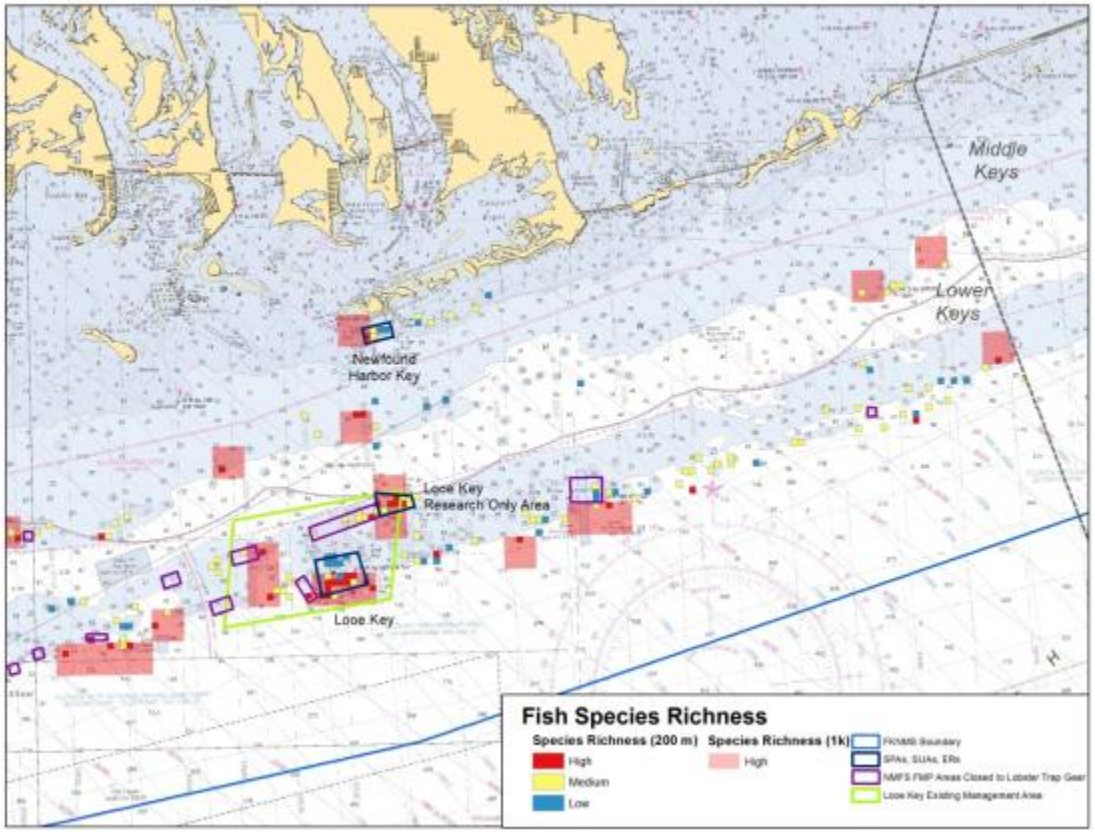


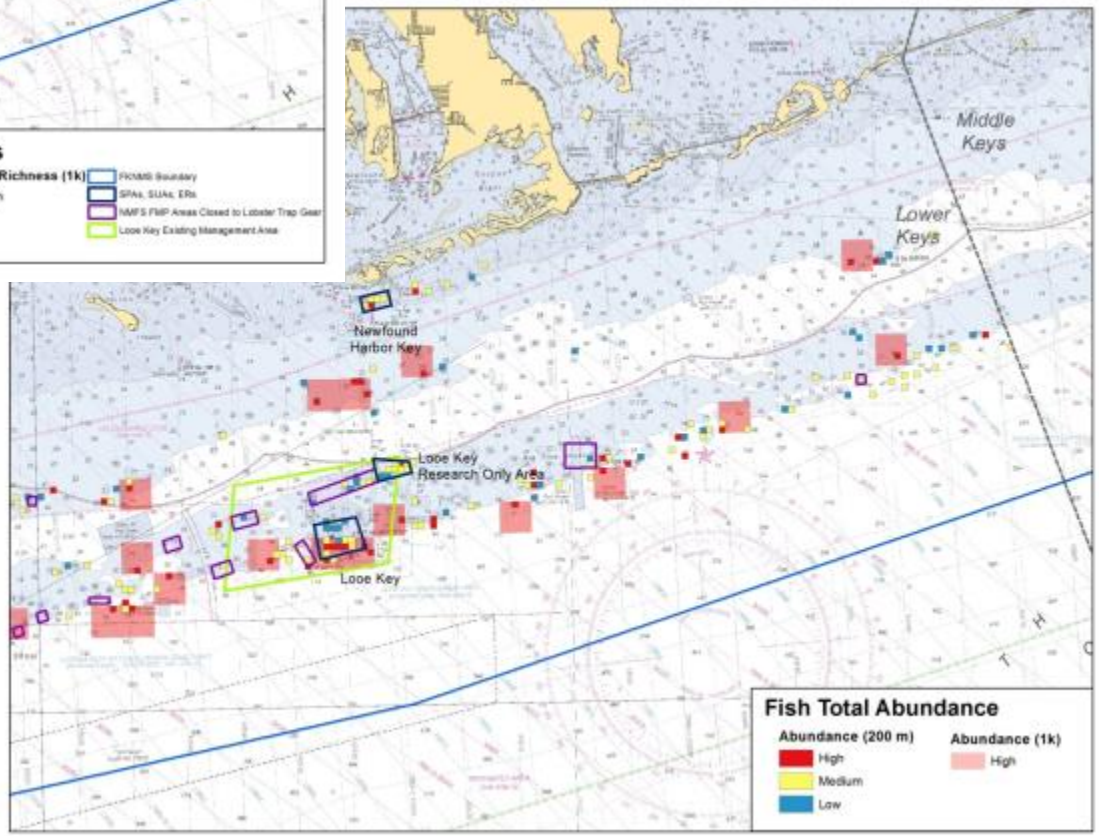
entire
Lower Keys region



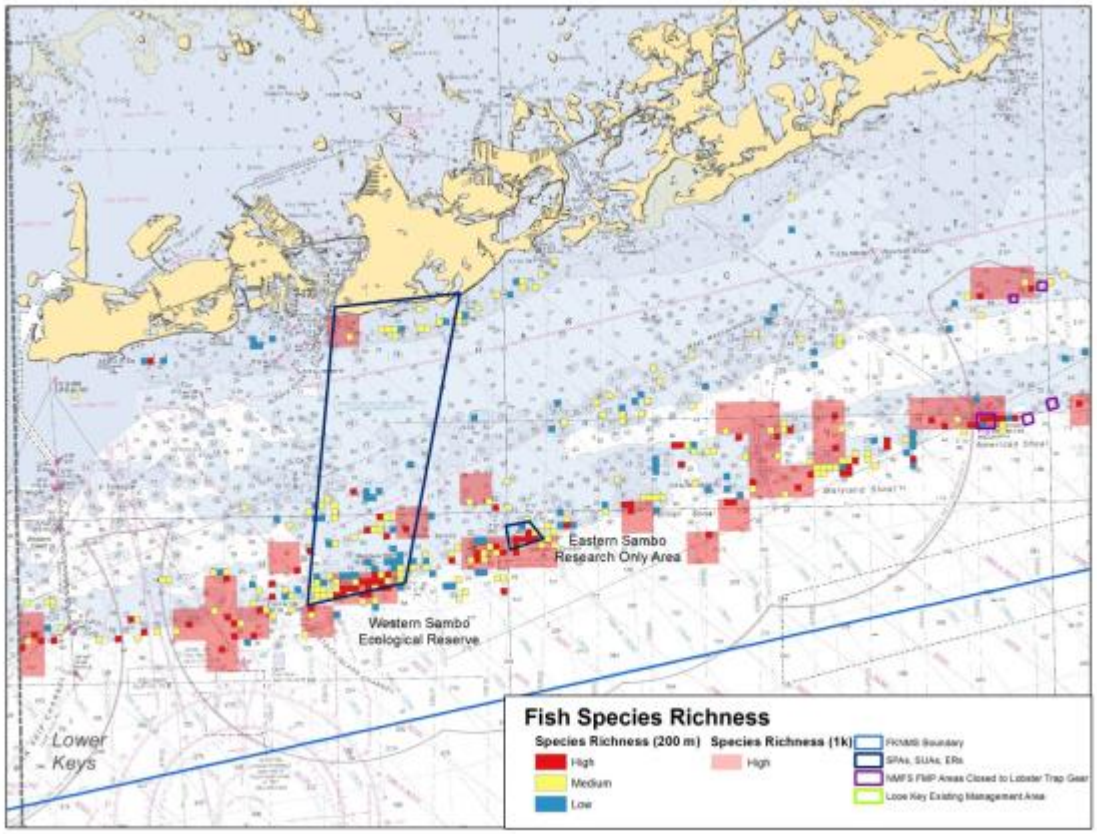


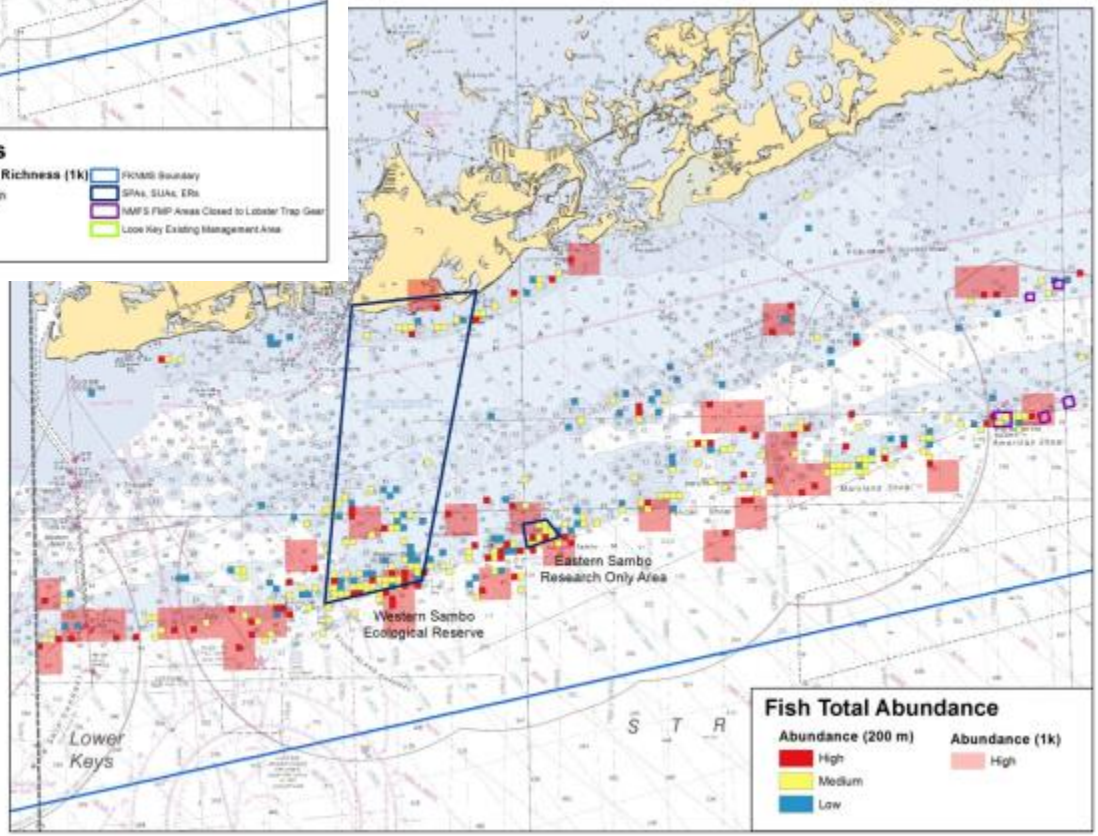
eastern 1/2 of
Lower Keys region





western 1/2 of
Lower Keys region





Coral

Data sources

- Nova Southeastern University (SCREAM)
- Florida Reef Resilience Program (FRRP)
- Coral Reef Ecosystem Monitoring Program (CREMP), FWC

Metrics

- Stony coral
    - **Benthic cover (%)**
    - Density
    - **Species richness**
- Soft Coral (Octocoral)
    - **Benthic cover (%)**
    - Density
    - **Species richness**

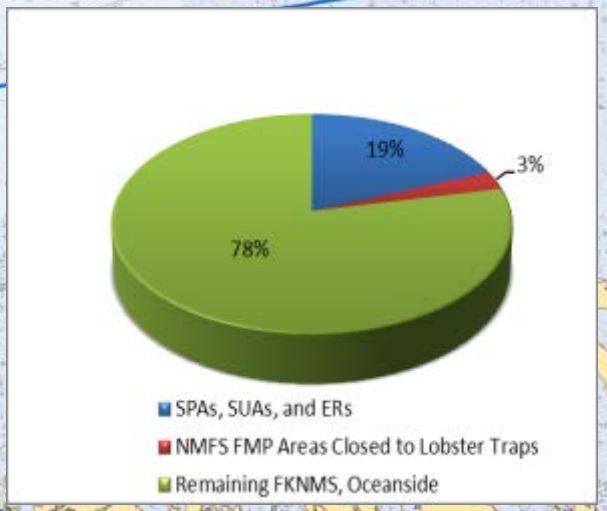
Photo courtesy of TNC

Hard Corals

- **Stony Coral cover: How much of the hard bottom is covered in coral?**
- **Stony Coral species richness: How many species?**

Where are locations of high coral cover?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	14
NMFS FMP Areas Closed to Lobster Traps	2
Remaining FKNMS, Oceanside	58
Resource Total	74



Middle Keys

Lower Keys

Newfound Harbor Key

Looe Key Research Only Area

Looe Key

Eastern Sambo Research Only Area

Western Sambo Ecological Reserve

Lower Keys

STRAITS OF FL

Stony Coral Cover

Stony Coral Cover

High

FKNMS Boundary

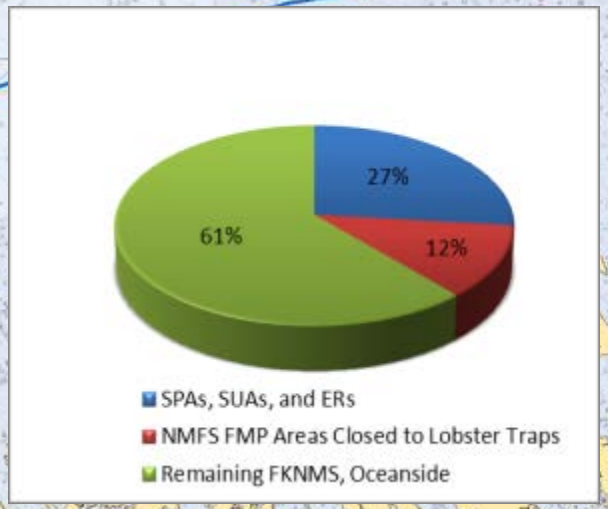
SPAs, SUAs, ERs

NMFS FMP Areas Closed to Lobster Trap Gear

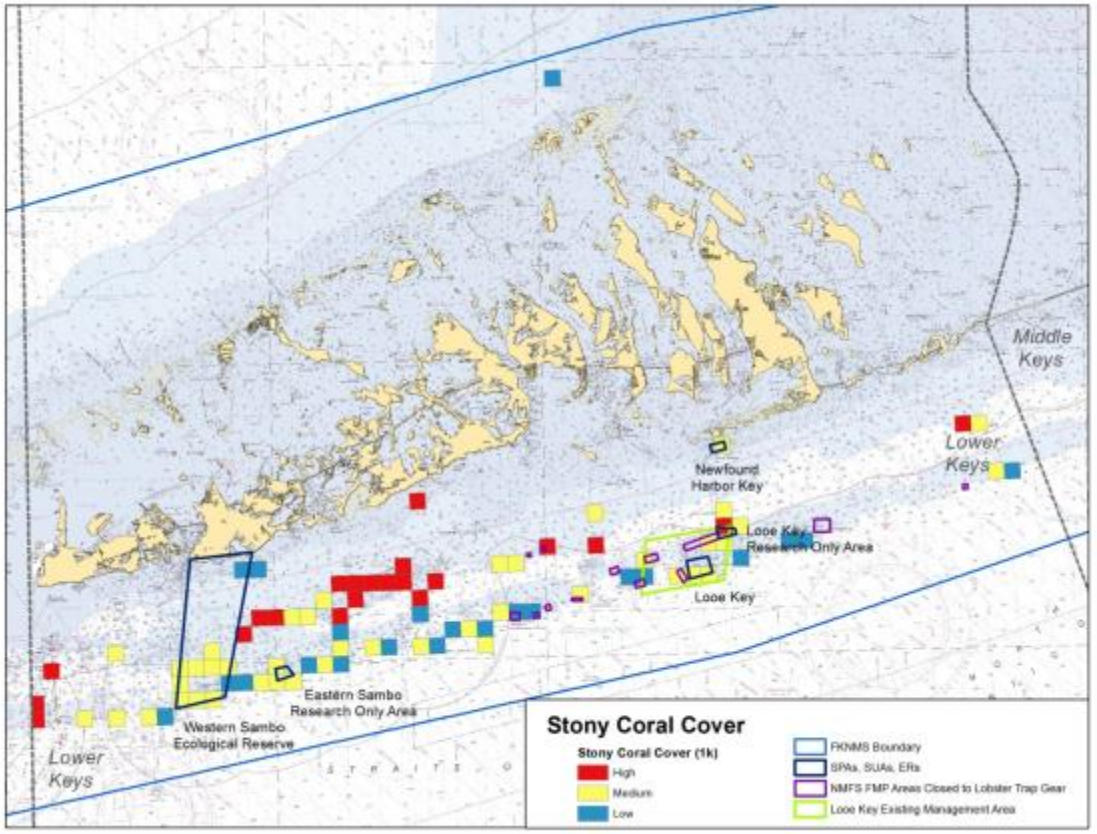
Looe Key Existing Management Area

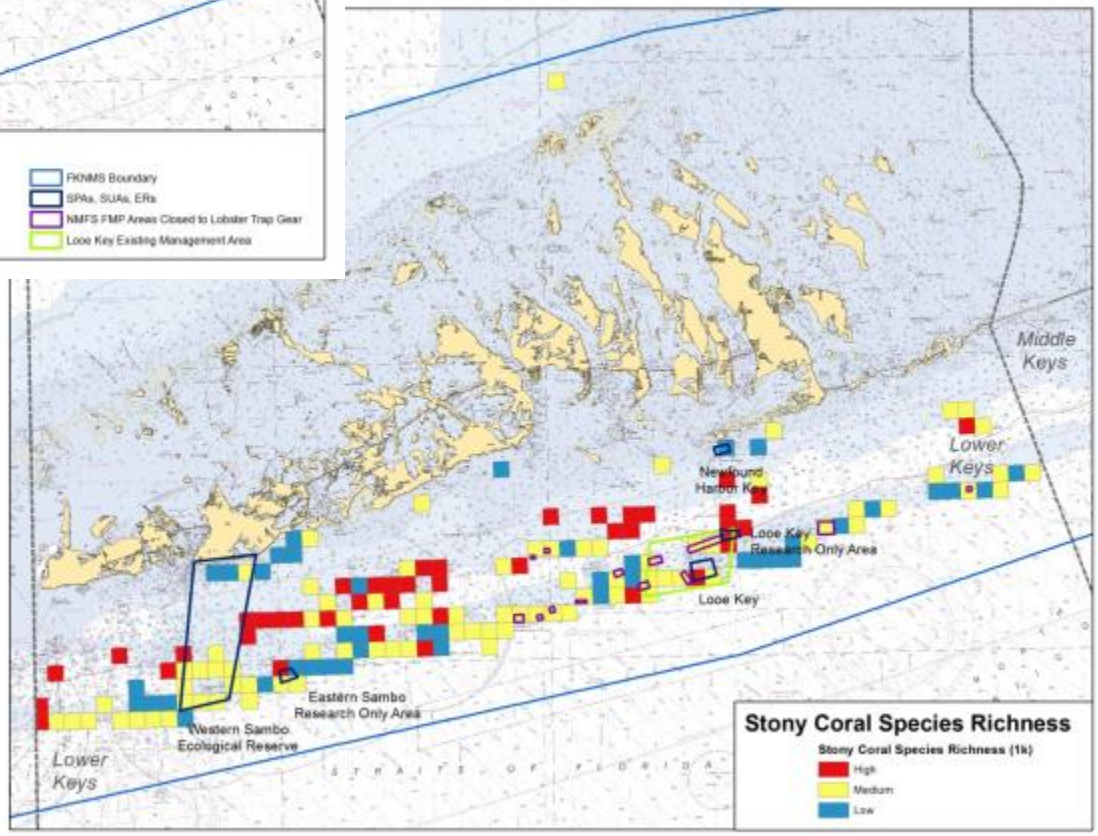
Where are locations of high coral species richness?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	43
NMFS FMP Areas Closed to Lobster Traps	19
Remaining FKNMS, Oceanside	99
Resource Total	161

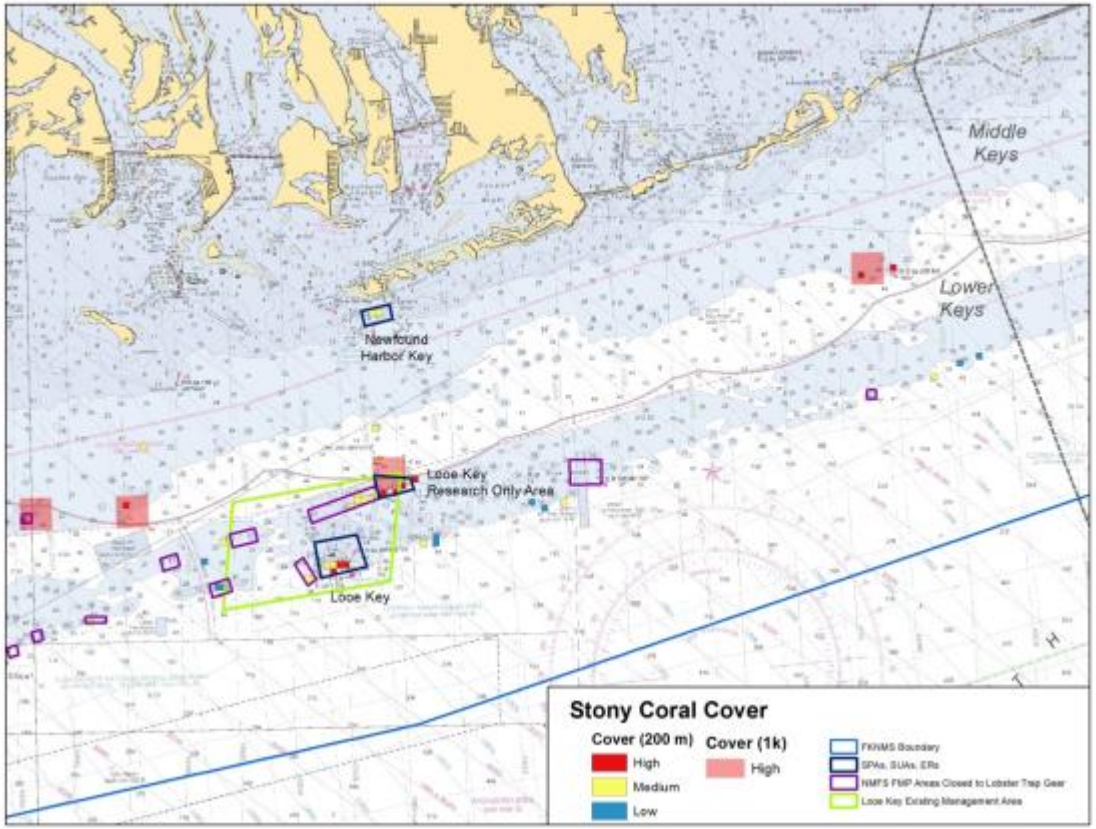


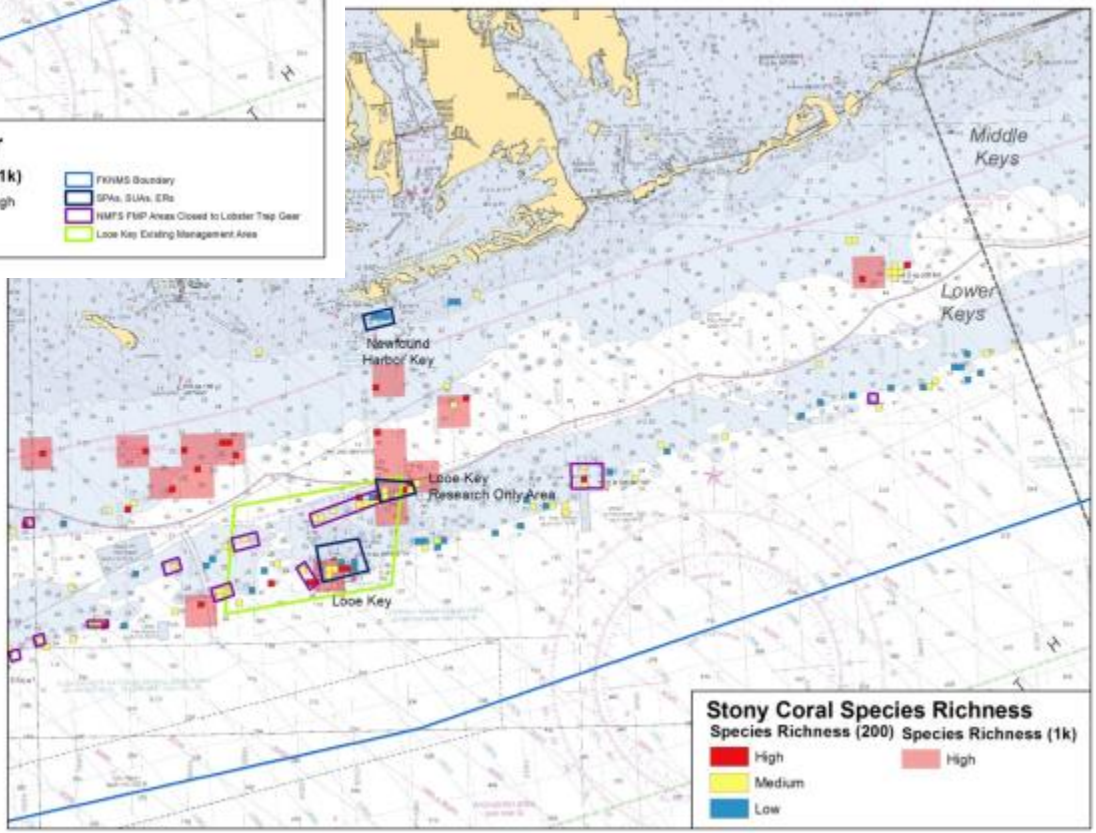
entire
Lower Keys region



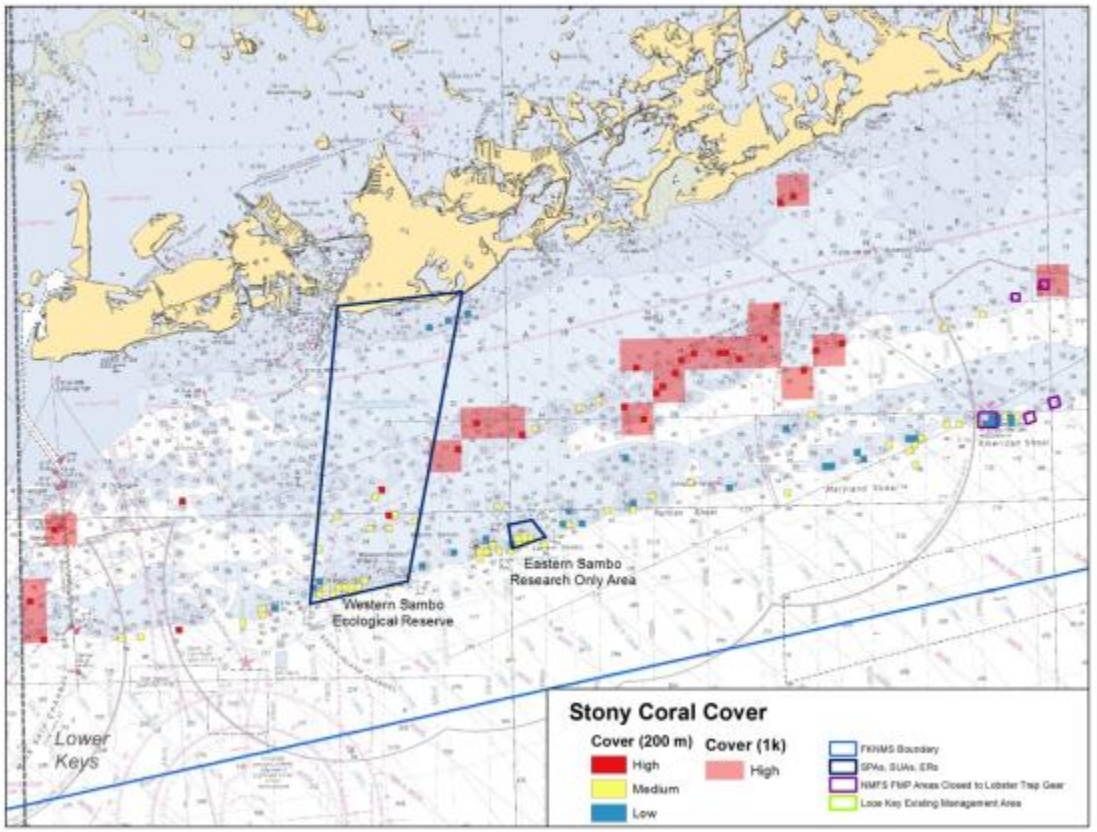


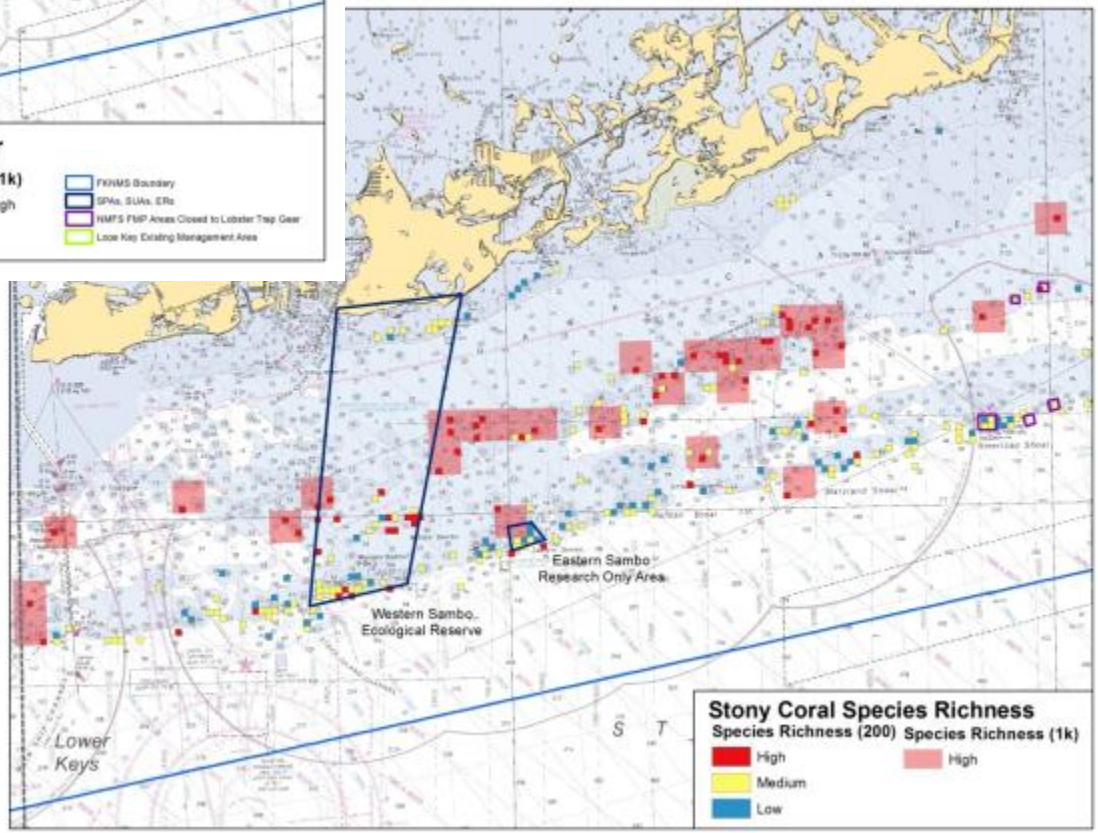
eastern 1/2 of
Lower Keys region





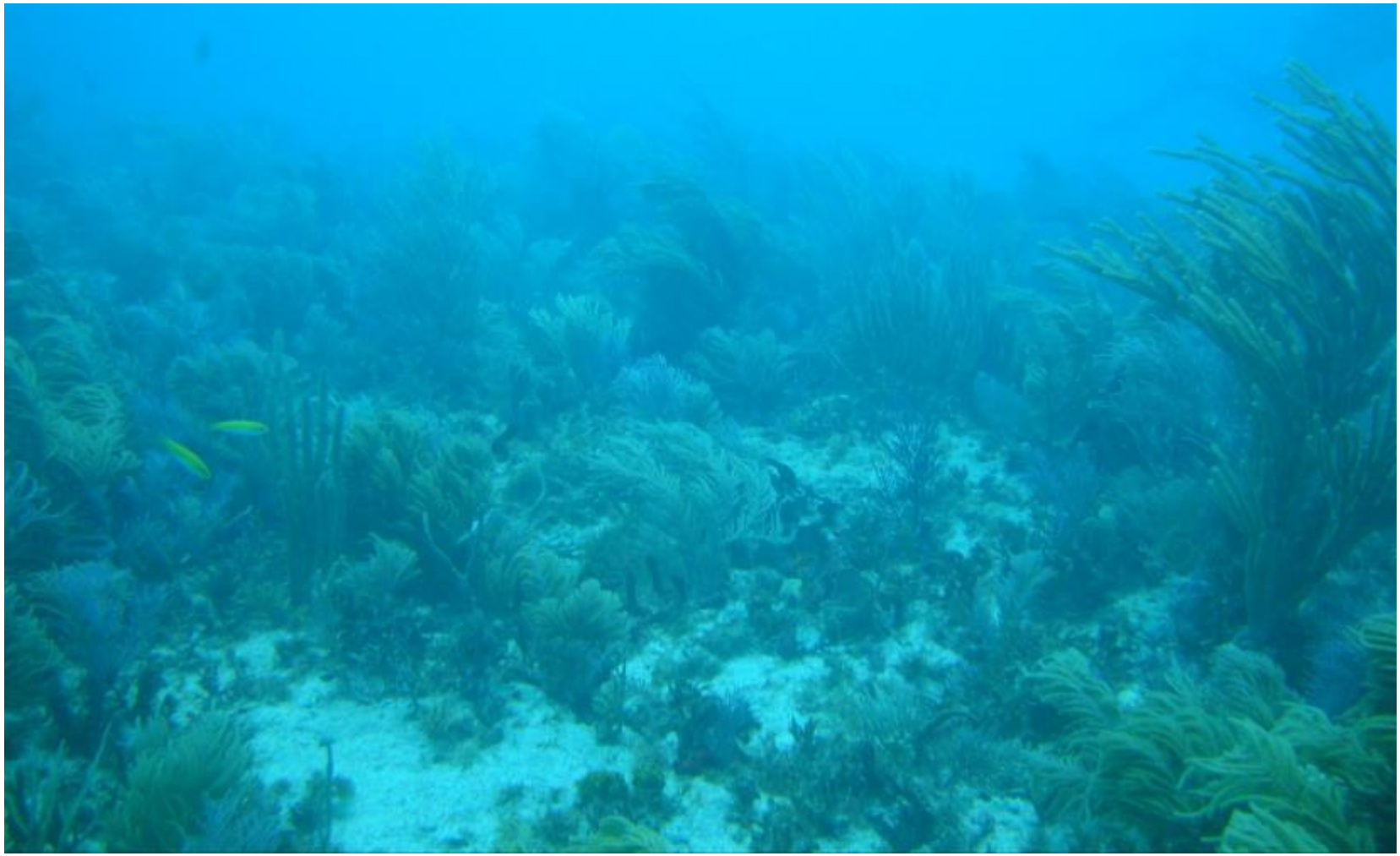
western 1/2 of
Lower Keys region





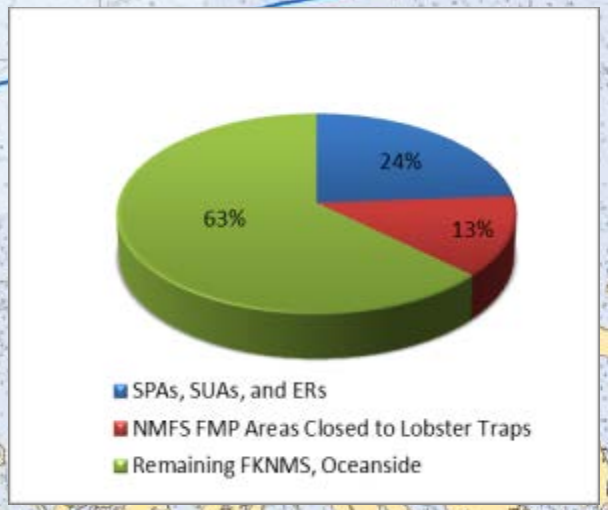
Soft Coral

- **Soft Coral cover: How much of the hard bottom is covered in soft coral?**
- **Soft Coral species richness: How many species?**



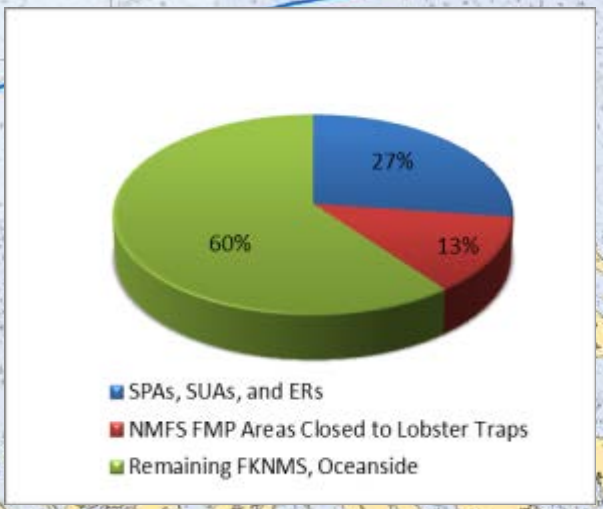
Where are locations of high soft coral cover?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	11
NMFS FMP Areas Closed to Lobster Traps	6
Remaining FKNMS, Oceanside	29
Resource Total	46

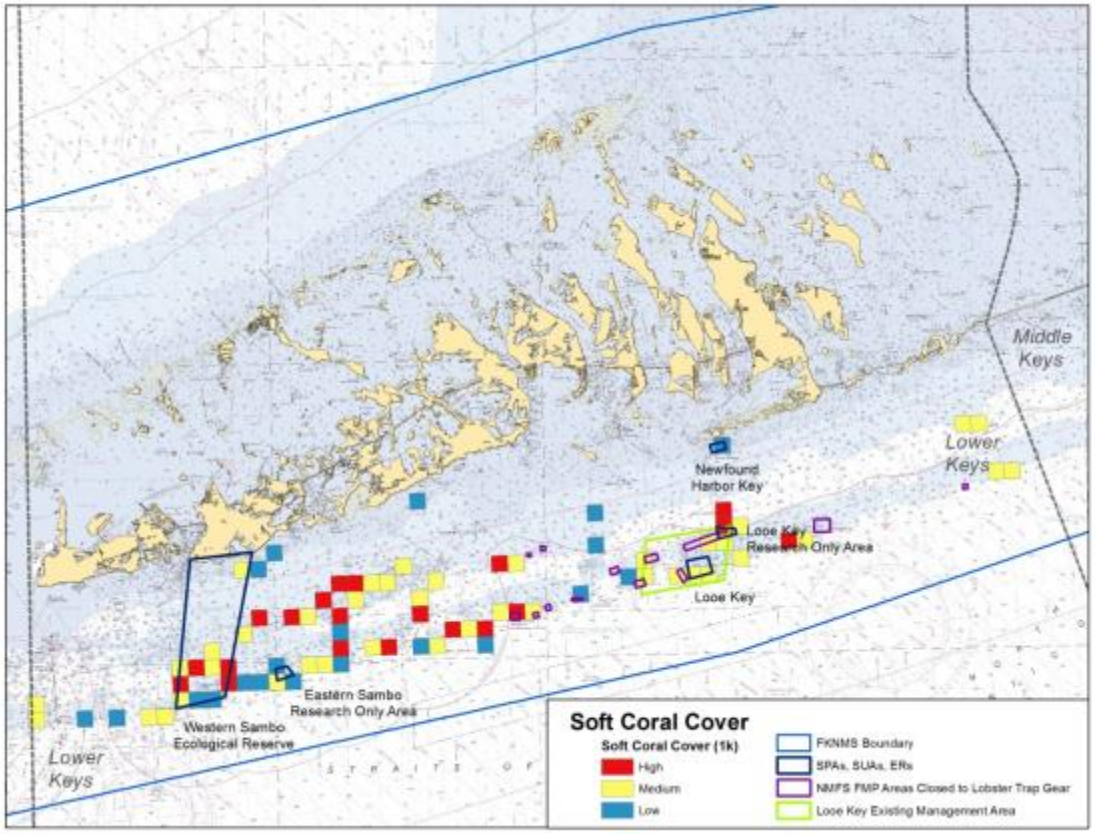


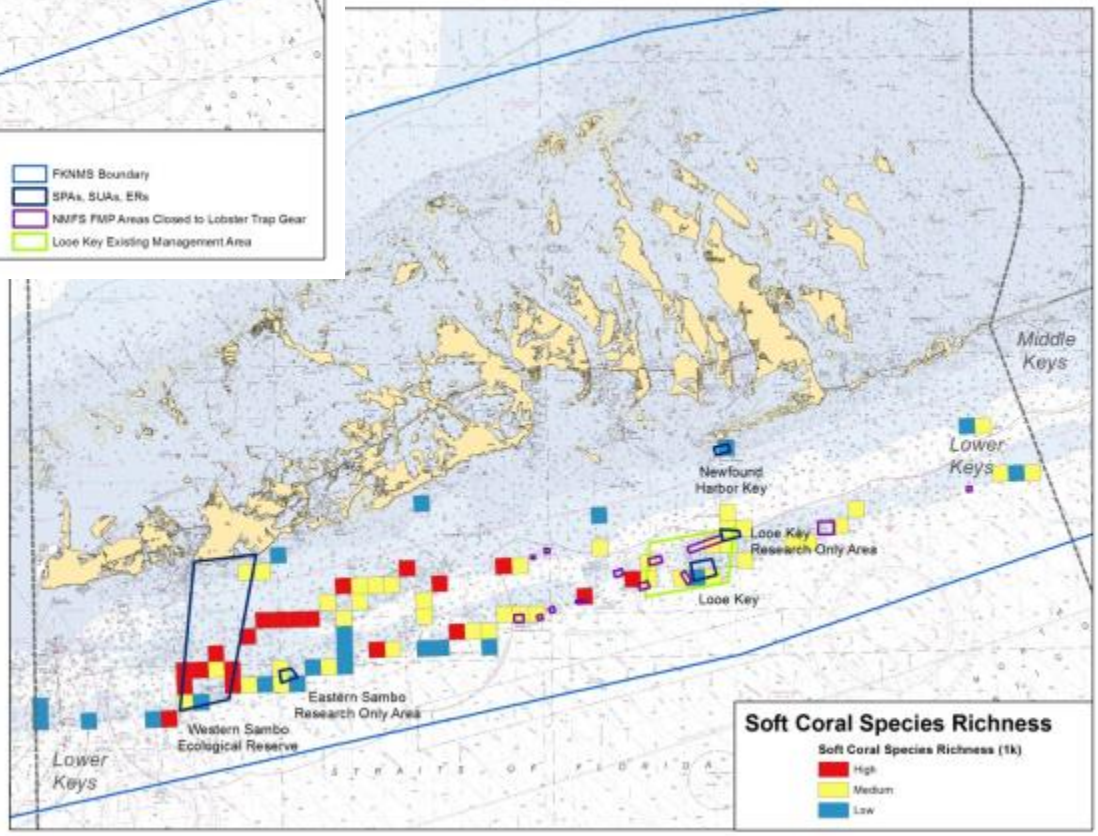
Where are locations of high soft coral species richness?

Management Zone	Locations (#)
SPAs, SUAs, and ERs	13
NMFS FMP Areas Closed to Lobster Traps	6
Remaining FKNMS, Oceanside	29
Resource Total	48

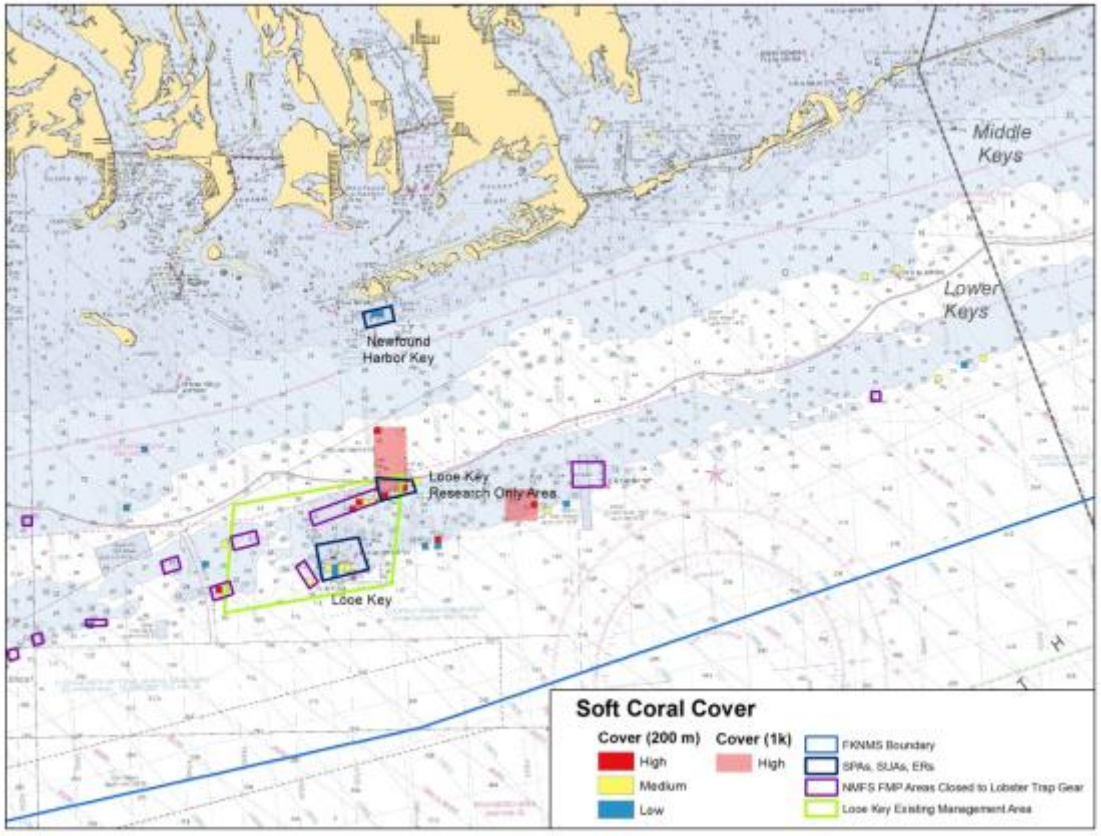


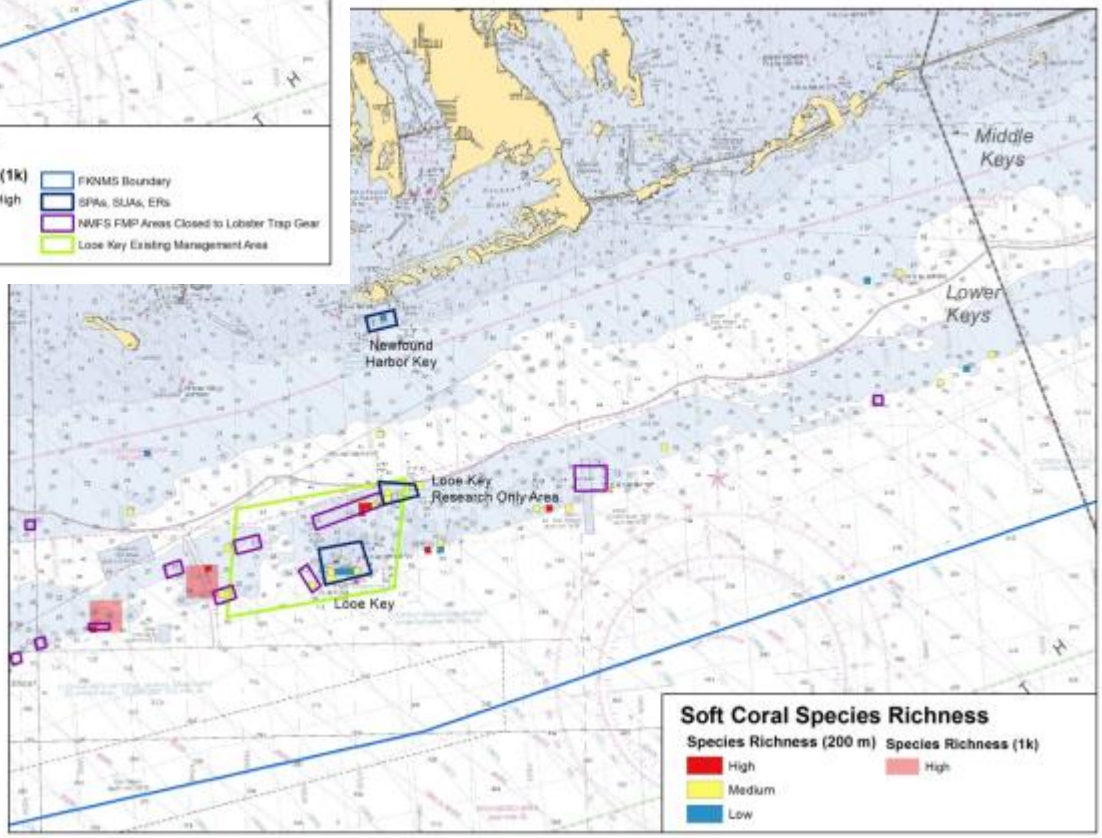
entire
Lower Keys region



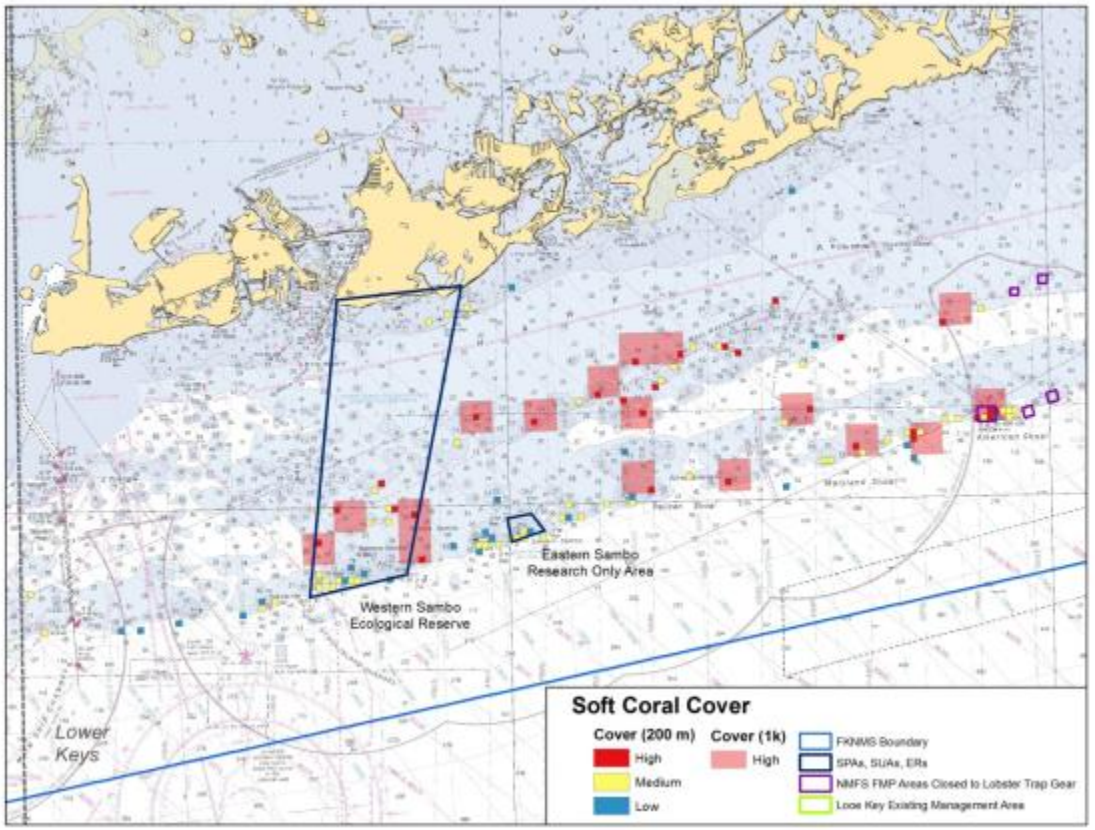


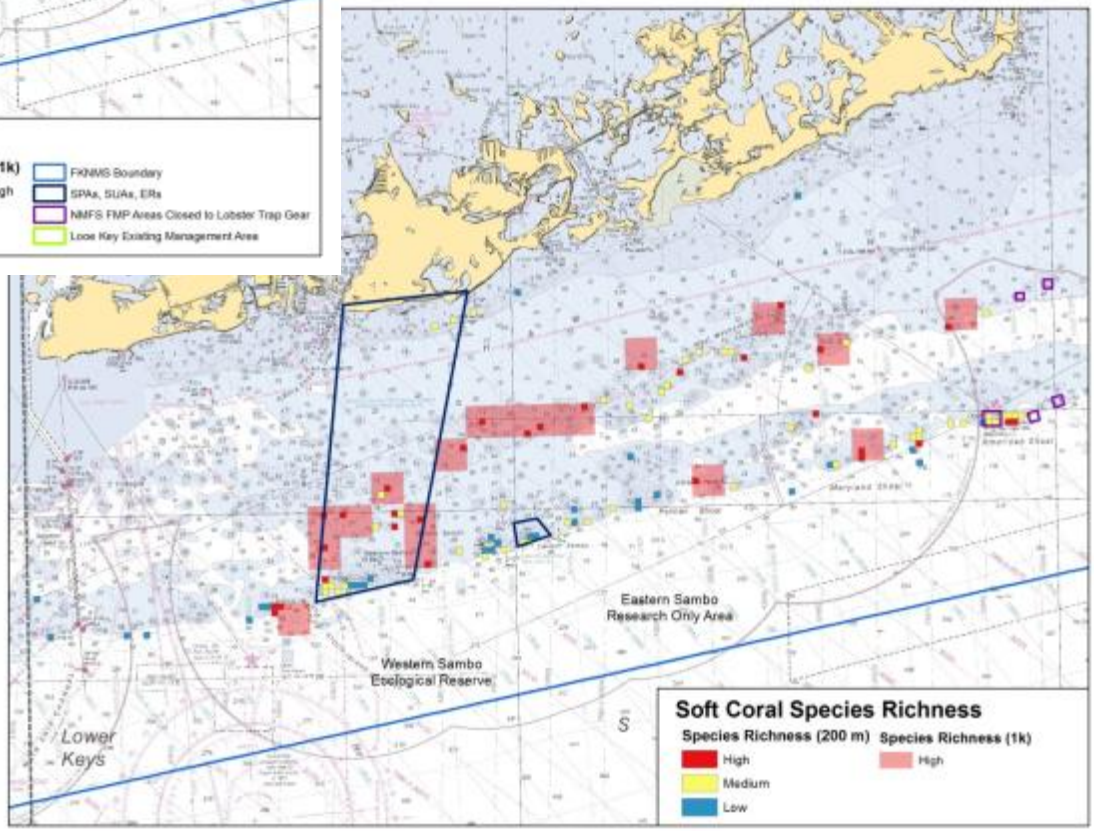
eastern 1/2 of
Lower Keys region



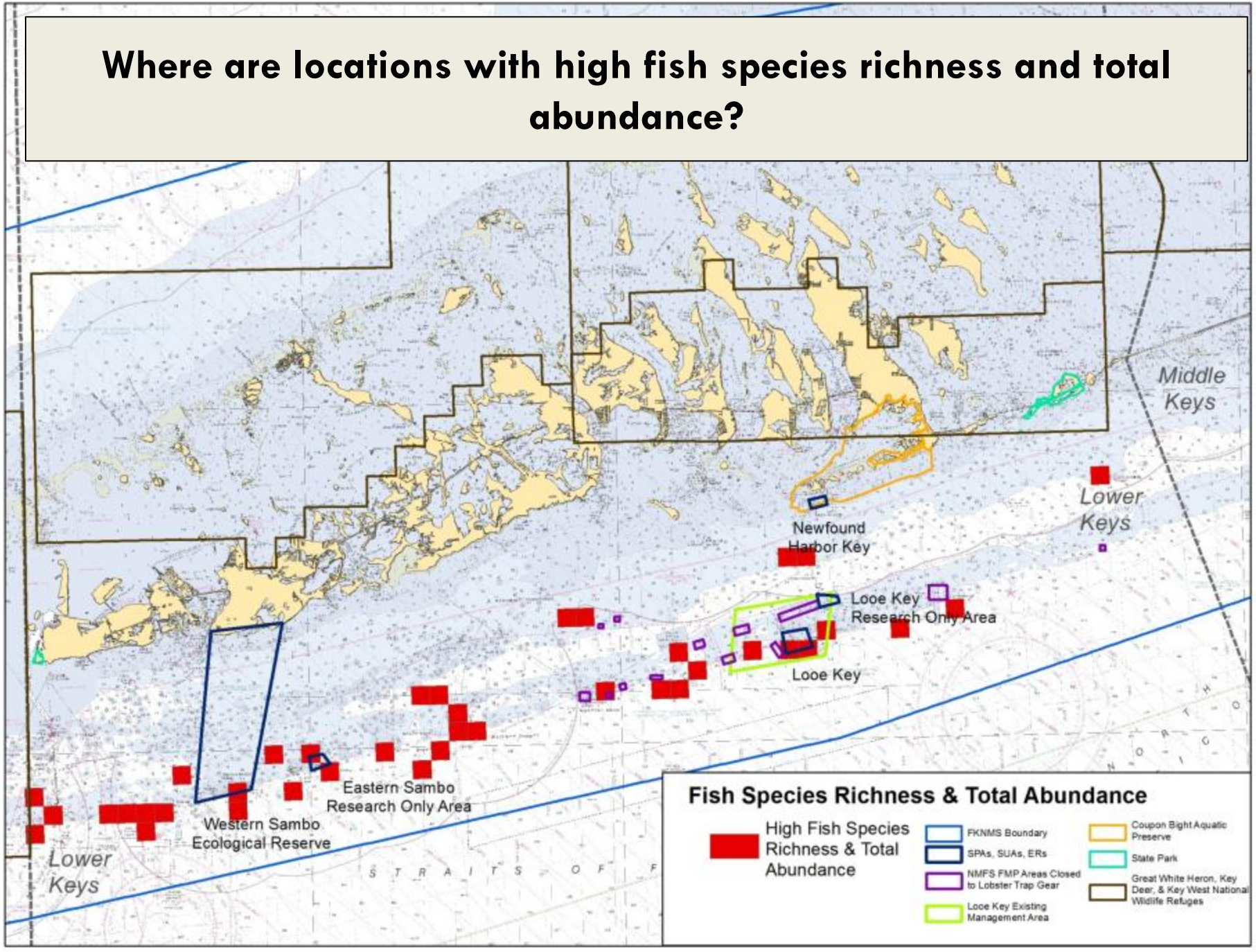


western 1/2 of
Lower Keys region

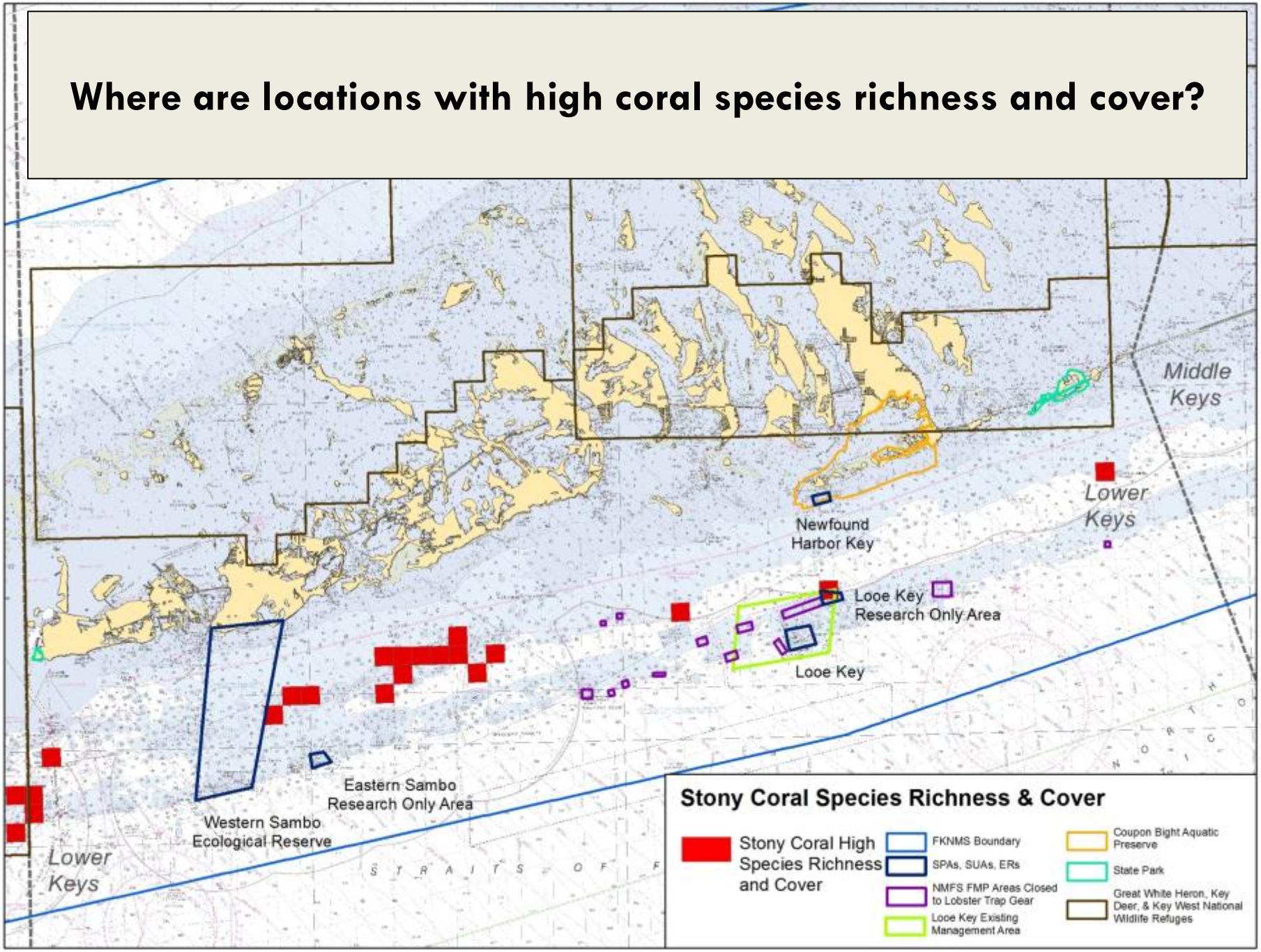




Where are locations with high fish species richness and total abundance?



Where are locations with high coral species richness and cover?



Where are locations with high fish species richness, fish total abundance, stony coral species richness and stony coral cover?