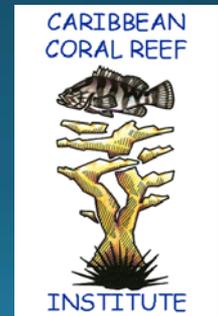


National Coral Reef Monitoring Program (PUERTO RICO V. 1)

May 10, 2016, San Juan, Puerto Rico



National Coral Reef Monitoring Program (NCRMP) - PR

Overview

- NCRMP conducts **nationally coordinated, sustained, and consistent** coastal ocean observations to develop **biological, climate, and socioeconomic status and trends indicators** for priority U.S. coral reef areas
- NCRMP goals include:
 - Collect **geographically comprehensive status and trends data**
 - Develop scientifically sound, **consistent methods through strong partnerships**
 - Deliver **products and tools** as a national context for **localized monitoring & management**.
- NCRMP data provide a **robust picture** of the **status and trends** of U.S. **coral reef ecosystems** and the **human communities** dependent on them.



National Coral Reef Monitoring Program (NCRMP) - PR

Tracking Biological Trends

- Biological indicators to assess the condition of coral reefs and associated reef fish communities:
 - **Coral abundance, size, and condition**
 - **Reef fish abundance and size**
 - **Habitat composition, complexity, and key species**
- Data are collected through **diving surveys** of shallow-water (**0-30 meters**) **hard-bottom** areas.
- **Scientists and coastal managers** can use these data to evaluate coral reef and fish population **management strategies**, document endangered or invasive marine species, and assist with local monitoring efforts.



National Coral Reef Monitoring Program (NCRMP) - PR Atlantic – Caribbean Biological Monitoring



- Co-led by NCCOS and NMFS/SEFSC
- Biennial fish and benthic surveys
- Grid based stratified random design
- Hardbottom habitats to 30 m
- Fish and coral independent survey design

National Coral Reef Monitoring Program (NCRMP) - PR



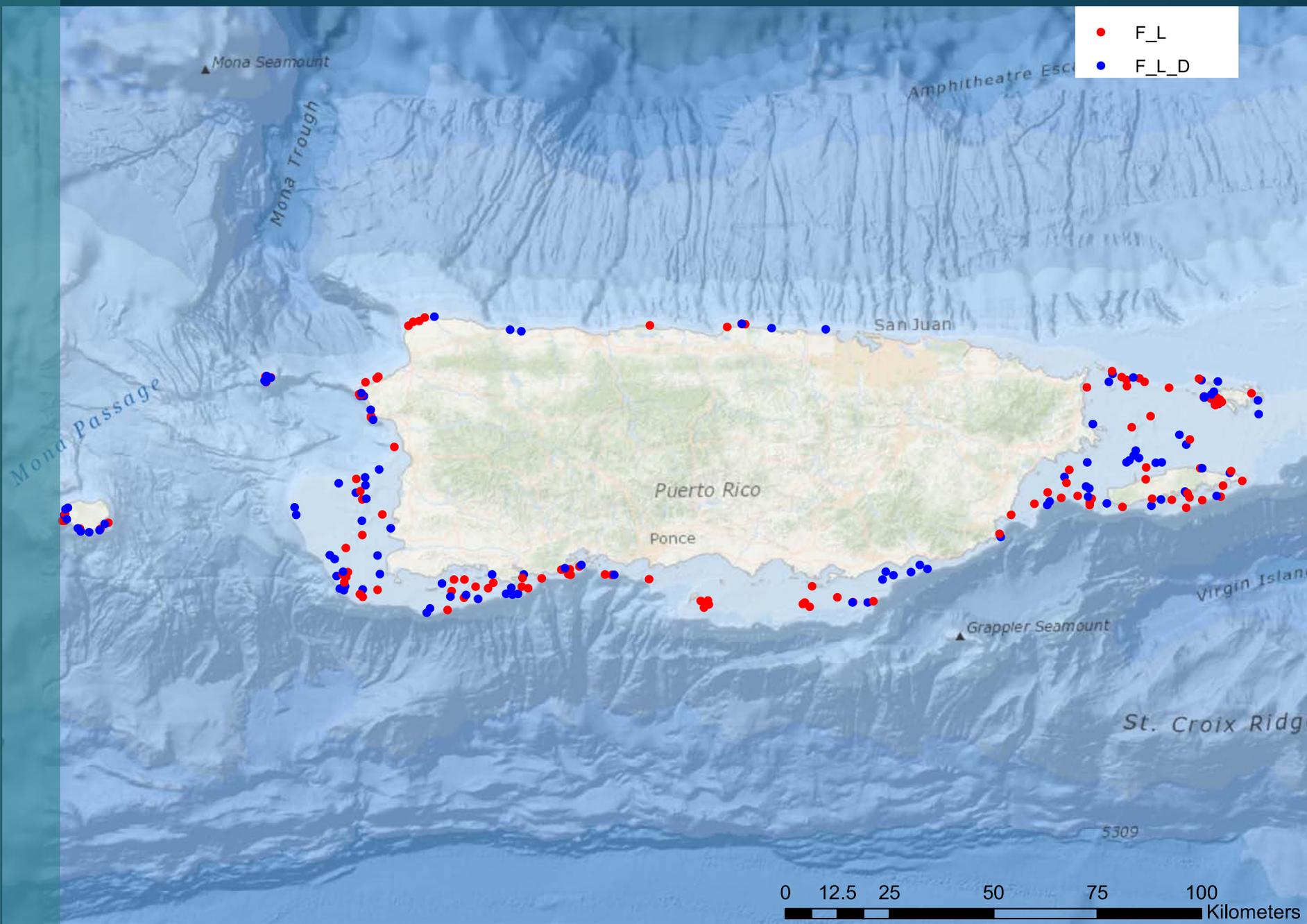
Is **NOT** Monitoring...

- Land-Based Sources of Pollution (LBSP)
- Commercial or recreational fishing effort
- MPA effectiveness

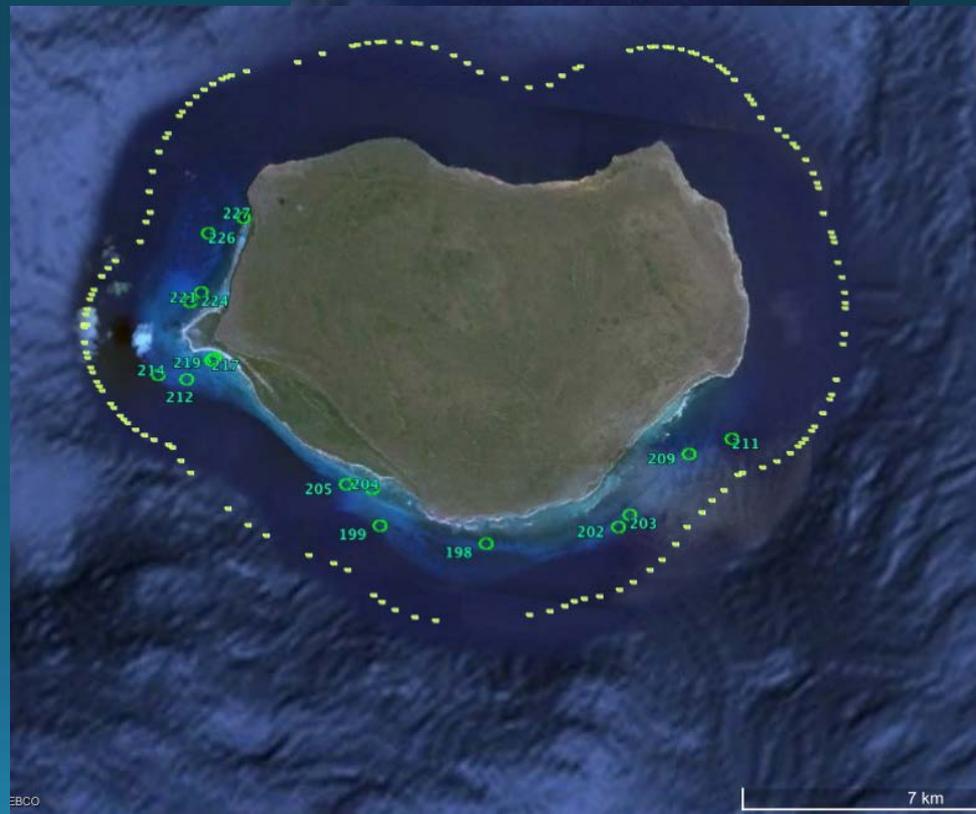
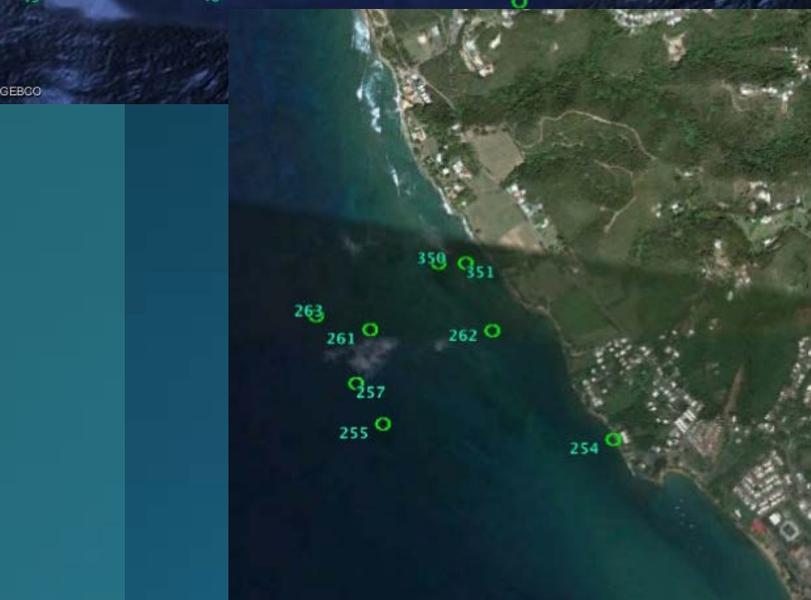
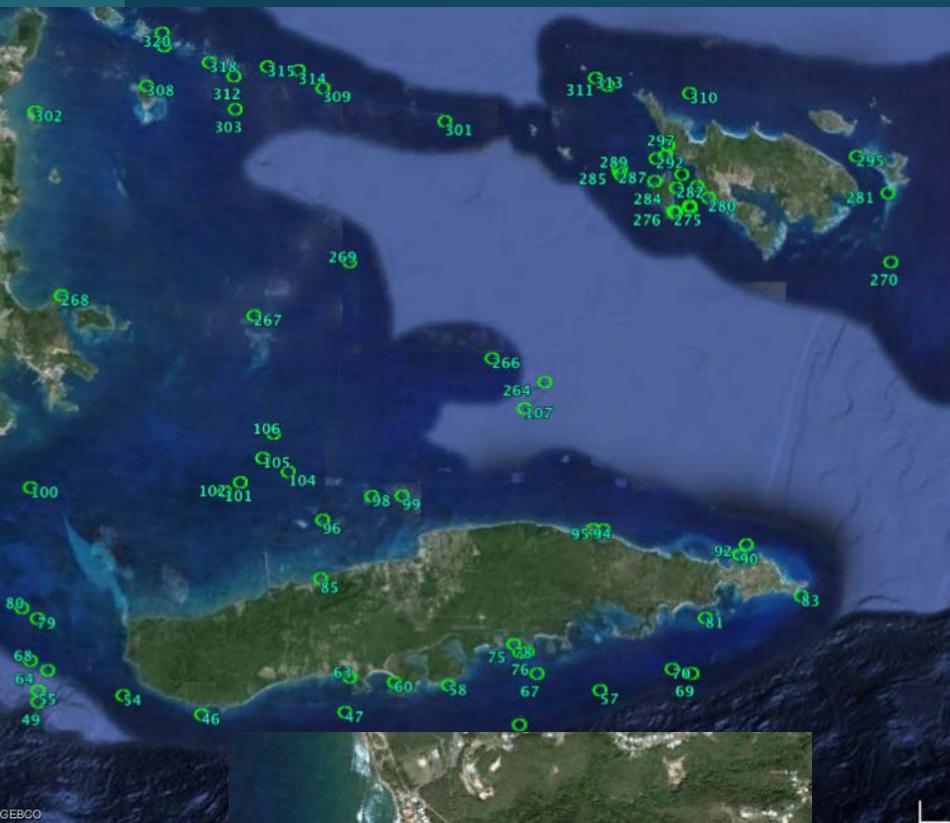
Does **NOT** replace...

- Stock Assessments
- Local state/jurisdictional monitoring

National Coral Reef Monitoring Program (NCRMP) – PR



National Coral Reef Monitoring Program (NCRMP) – PR



GEBCO

GEBCO

7 km

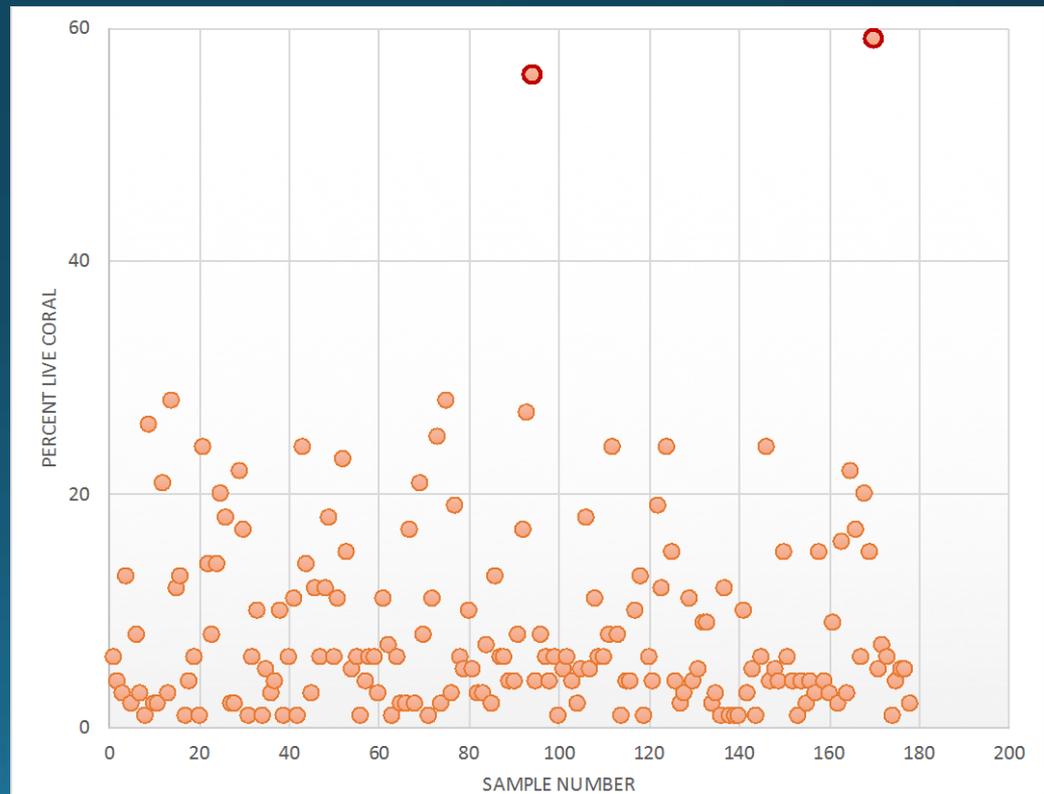
National Coral Reef Monitoring Program (NCRMP) - PR



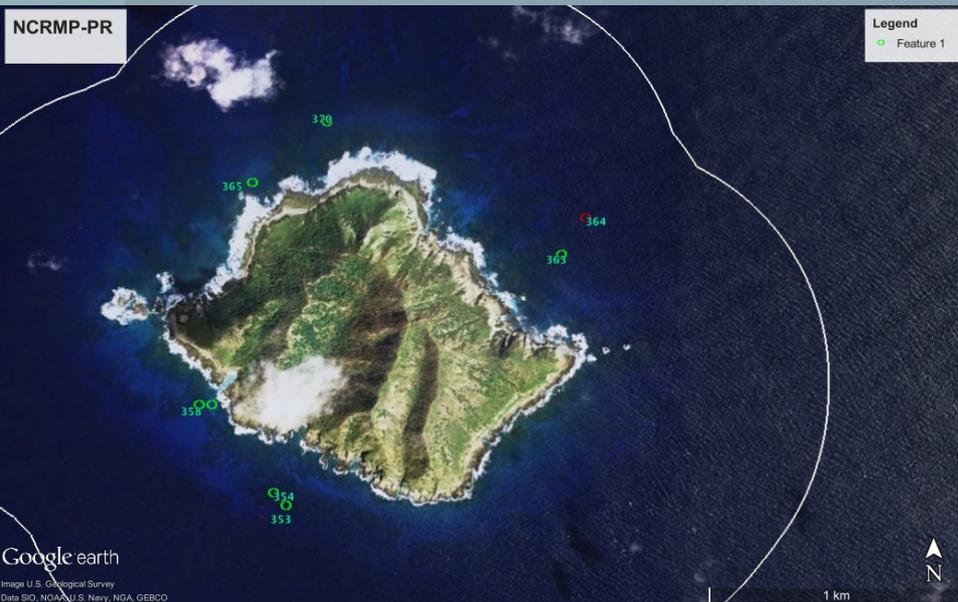
PRELIMINARY RESULTS 2014

LINE POINT INTERCEPT (LPI) = 230 surveys

- 8.6 % Live Coral (all reef habitats included)

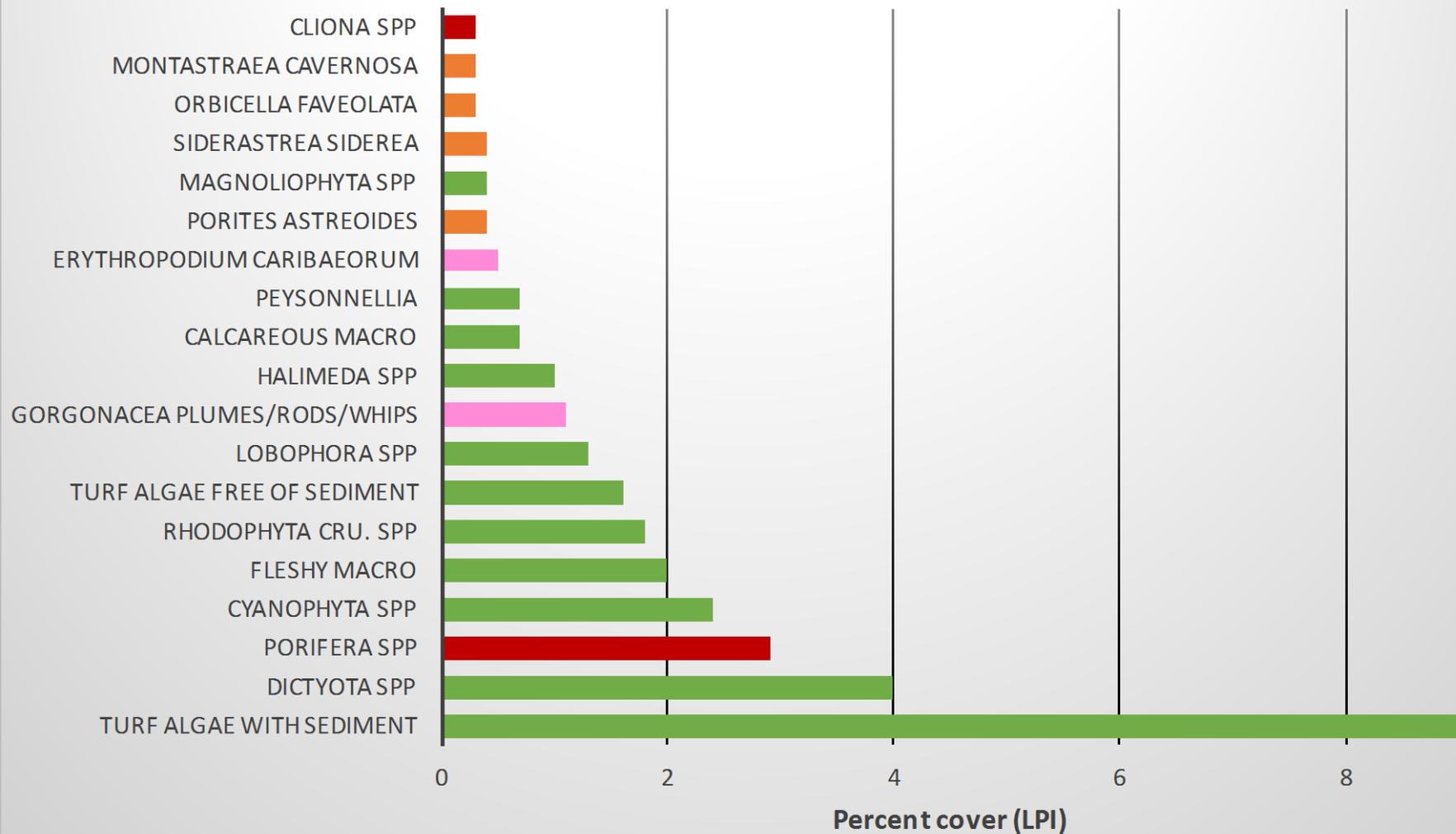


National Coral Reef Monitoring Program (NCRMP) - PR



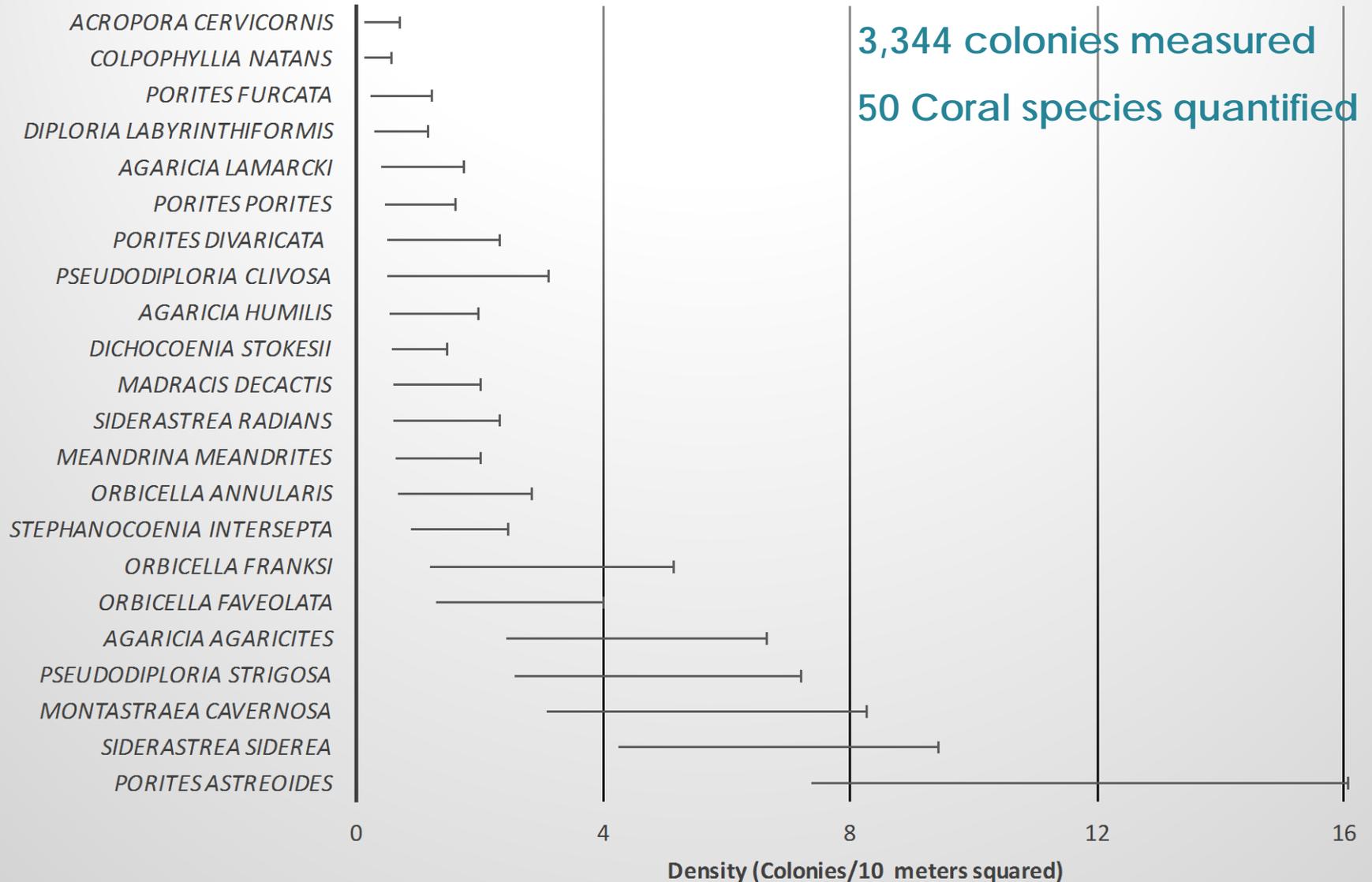
National Coral Reef Monitoring Program (NCRMP) - PR

LINE POINT INTERCEPT RESULTS (N=230)



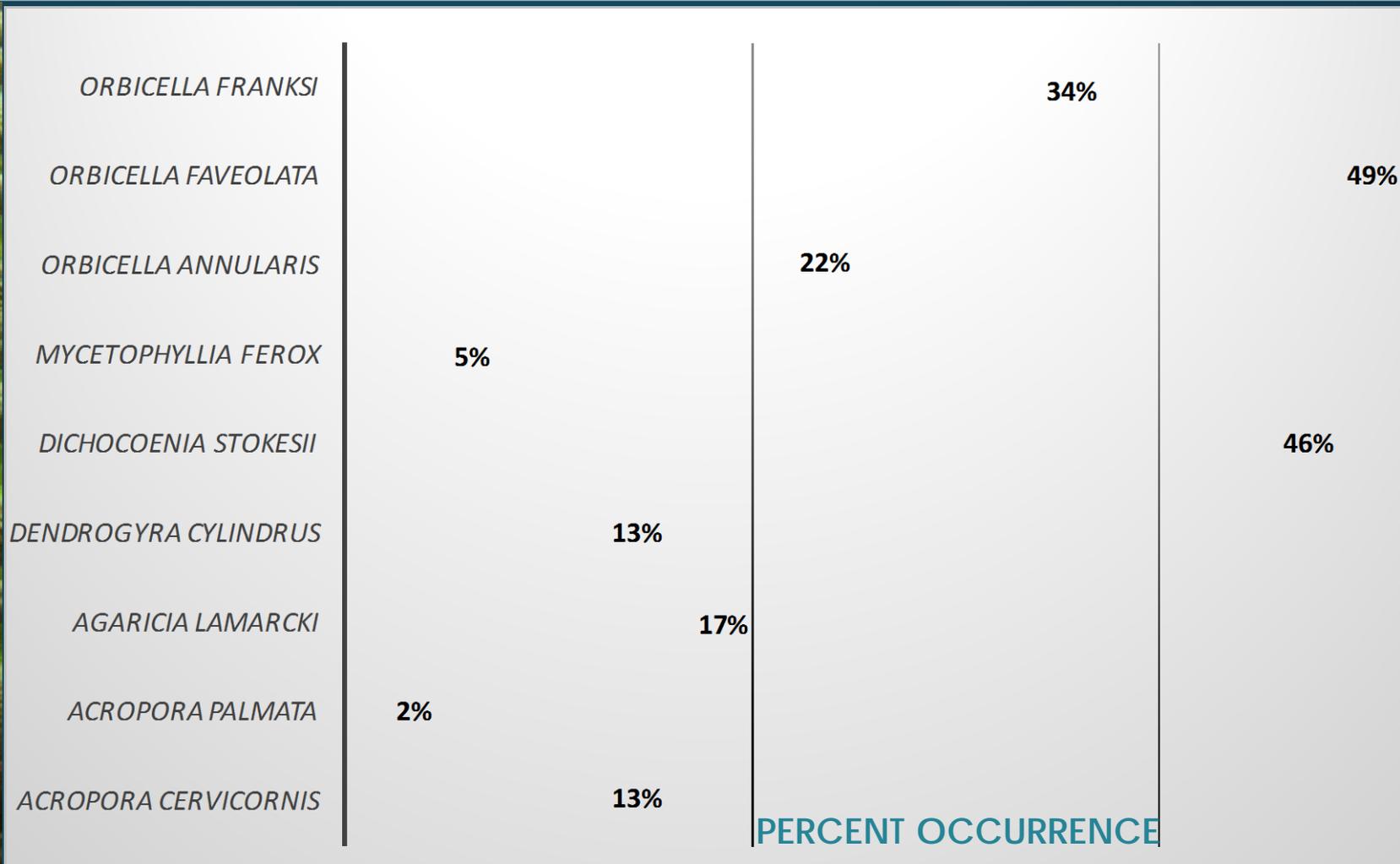
National Coral Reef Monitoring Program (NCRMP) - PR

CORAL DEMOGRAPHIC RESULTS (N=110)

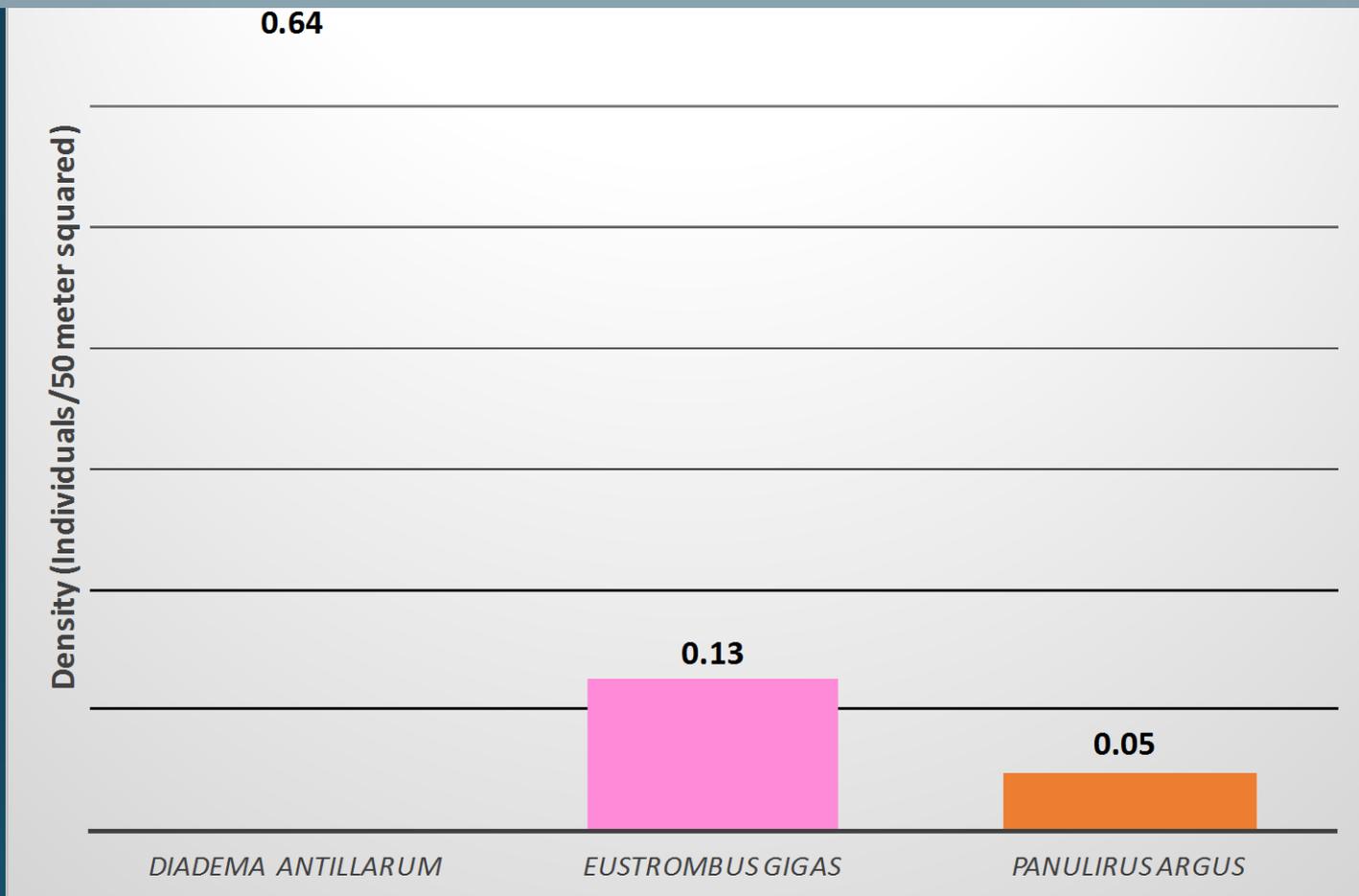


National Coral Reef Monitoring Program (NCRMP) - PR

CANDIDATE CORALS FOR ESA (N=230)



National Coral Reef Monitoring Program (NCRMP) - PR MACRO INVERTEBRATE RESULTS (N=230)



National Coral Reef Monitoring Program (NCRMP) - PR

RESULTS 2014

FISH BELT TRANSECTS = 230 surveys

- Biomass 5.9 kg/100 m²
- 169 Reef fish species quantified
 - Top 25 = 4 parrotfishes, 1 snapper, 1 grouper, 1 jack, 1 triggerfish, 1 grunt
 - *Stegastes partitus* Bicolor damselfish



Species	% Occurrence
<i>Stegastes partitus</i>	80
<i>Sparisoma aurofrenatum</i>	77
<i>Acanthurus bahianus</i>	76
<i>Thalassoma bifasciatum</i>	75
<i>Acanthurus coeruleus</i>	69
<i>Halichoeres garnoti</i>	67
<i>Scarus iseri</i>	49
<i>Sparisoma viride</i>	48
<i>Scarus taeniopterus</i>	47
<i>Ocyurus chrysurus</i>	46
<i>Halichoeres bivittatus</i>	44
<i>Chaetodon capistratus</i>	43
<i>Holocentrus adscensionis</i>	41
<i>Cephalopholis fulva</i>	38
<i>Holocentrus rufus</i>	35
<i>Acanthurus chirurgus</i>	31
<i>Chromis cyanea</i>	31
<i>Pseudupeneus maculatus</i>	27
<i>Halichoeres maculipinna</i>	27
<i>Carangoides ruber</i>	27
<i>Canthigaster rostrata</i>	26
<i>Serranus tigrinus</i>	24
<i>Balistes vetula</i>	23
<i>Haemulon flavolineatum</i>	23
<i>Stegastes leucostictus</i>	22

National Coral Reef Monitoring Program (NCRMP) - PR

Species	Common	#/230
<i>Cephalopholis cruentata</i>	graysby	<u>61</u>
<i>Cephalopholis fulva</i>	coney	<u>429</u>
<i>Dermatolepis inermis</i>	marbled grouper	
<i>Epinephelus adscensionis</i>	rock hind	<u>2</u>
<i>Epinephelus guttatus</i>	red hind	<u>36</u>
<i>Epinephelus morio</i>	red grouper	<u>0</u>
<i>Epinephelus striatus</i>	Nassau grouper	<u>0</u>
<i>Lutjanus analis</i>	mutton snapper	<u>32</u>
<i>Lutjanus apodus</i>	schoolmaster	<u>21</u>
<i>Lutjanus buccanella</i>	blackfin snapper	
<i>Lutjanus cyanopterus</i>	cupera snapper	<u>2</u>
<i>Lutjanus griseus</i>	gray snapper	<u>3</u>
<i>Lutjanus jocu</i>	dog snapper	<u>1</u>
<i>Lutjanus mahogoni</i>	mahogany snapper	<u>17</u>
<i>Lutjanus synagris</i>	lane snapper	<u>35</u>
<i>Mycteroperca bonaci</i>	black grouper	<u>0</u>
<i>Mycteroperca interstitialis</i>	yellowmouth grouper	<u>0</u>
<i>Mycteroperca tigris</i>	tiger grouper	<u>0</u>
<i>Mycteroperca venenosa</i>	yellowfin grouper	<u>0</u>
<i>Mycteroperca phenax</i>	scamp	
<i>Ocyurus chrysurus</i>	yellowtail snapper	<u>535</u>
<i>Lachnolaimus maximus</i>	hogfish	<u>9</u>
<i>Pterois volitans</i>	red lionfish	<u>13</u>



National Coral Reef Monitoring Program (NCRMP) - PR

PARTNERSHIPS

Diver's effort (# surveys)

- NOAA (166)
 - Biogeography (166)
 - Office of Restoration (105)
- HJR Reefscaping (160)
- US Fish and Wildlife Service (3)
- Univ. of Virgin Islands (32)



National Coral Reef Monitoring Program (NCRMP) - PR



Local In-Kind Match

- NOAA Office of Restoration (22 diver days)
- PR-Department of Natural and Environmental Resources (Mona Island lodging)
- US Fish and Wildlife Service (2 diver days)
- Eco Eléctrica LNG (4 vessel & captain days)
- AECIMA (student org.) AAUS divers (8)
- Department of Marine Sciences, U. Puerto Rico
- Isla Mar Research Expeditions (6 diver days)
- Volunteer divers and photographers (HJR, JPZ)

National Coral Reef Monitoring Program (NCRMP) - PR



Lessons Learned

Human resources

- Trained personnel is key
- Continued education necessary
- Diver Reciprocity

Partner's Engagement

- Interested personnel is key
- Continued communication necessary
- Provide results for their collaboration

National Coral Reef Monitoring Program (NCRMP) - PR

2016 NCRMP V. 2

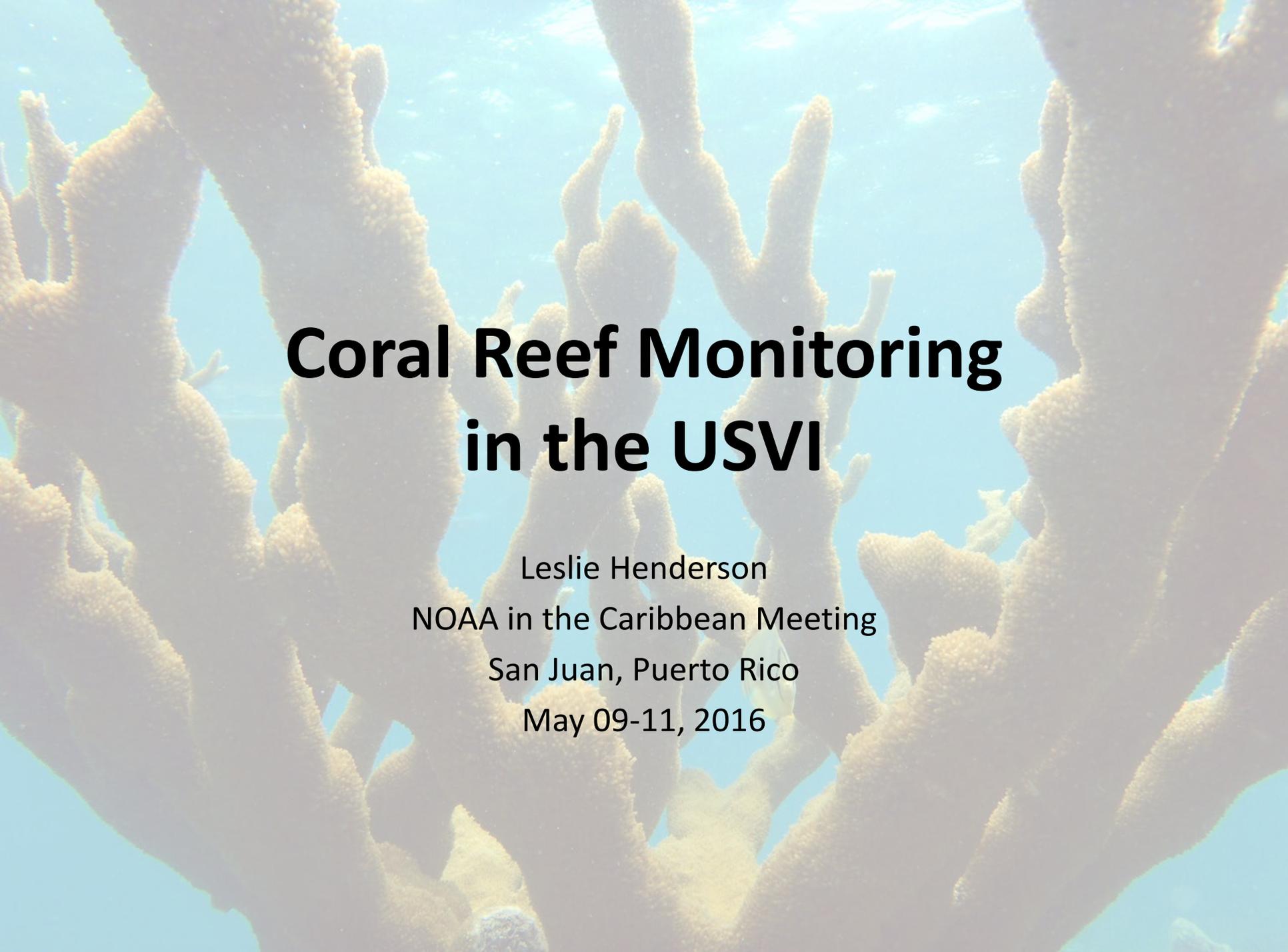
Lead Teams

- HJR Reefscaping
- CSS- Coastal Surveys Solutions

Partnerships with

- US Fish and Wildlife Service
- Eco Eléctrica (LNG)
- PR- DNER
- NOAA Restoration (PR)
- AECIMA, ISLAMAR
- Amigos de Tres Palmas
- Sea Grant College Program





Coral Reef Monitoring in the USVI

Leslie Henderson
NOAA in the Caribbean Meeting
San Juan, Puerto Rico
May 09-11, 2016

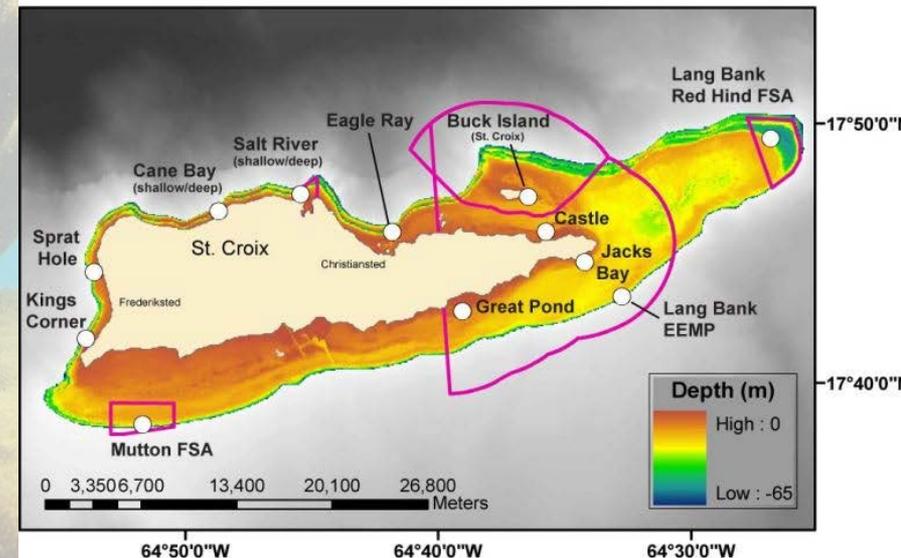
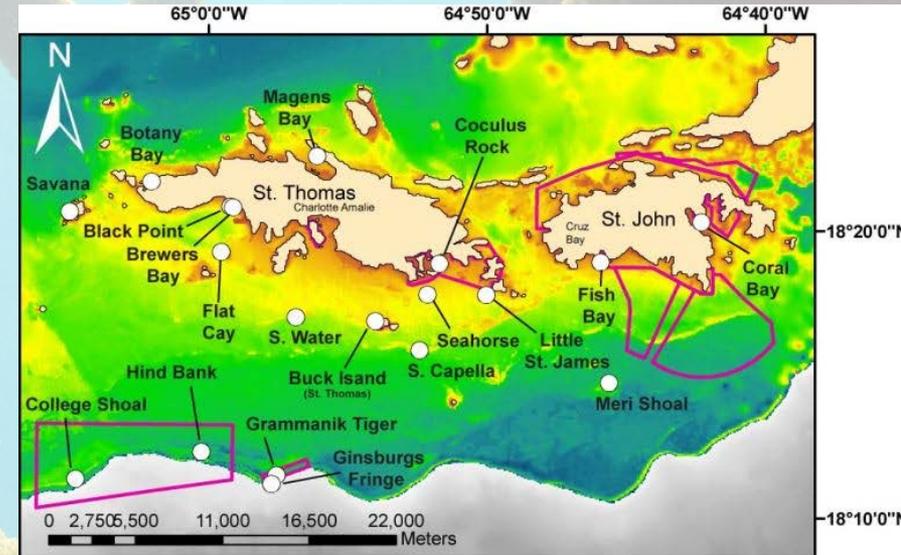
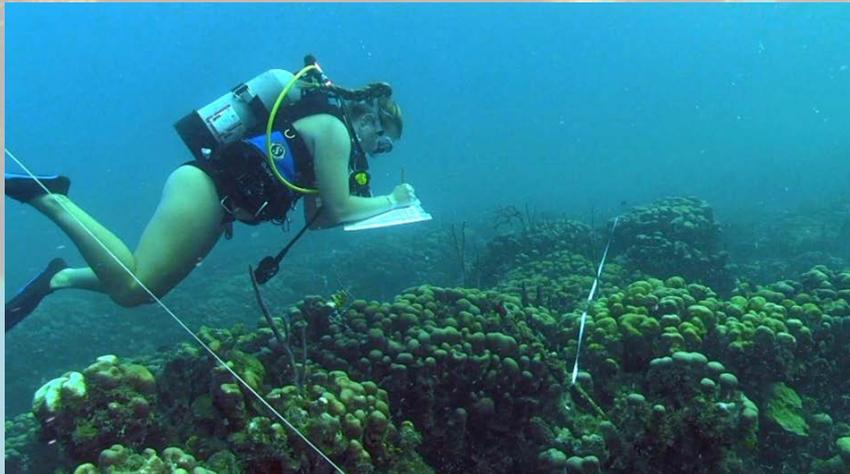
TCRMP

Territorial Coral Reef Monitoring Program



TCRMP

- Once a year surveys at 33 permanent sites
 - Corals
 - Fish
 - Algae
 - Diadema
 - Temperature



TCRMP

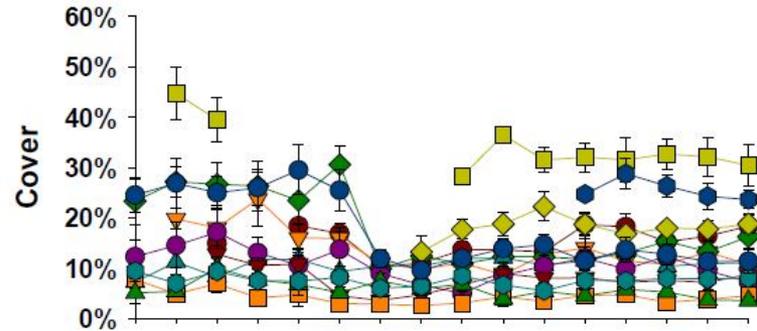
Coral Cover

(Example video frame)



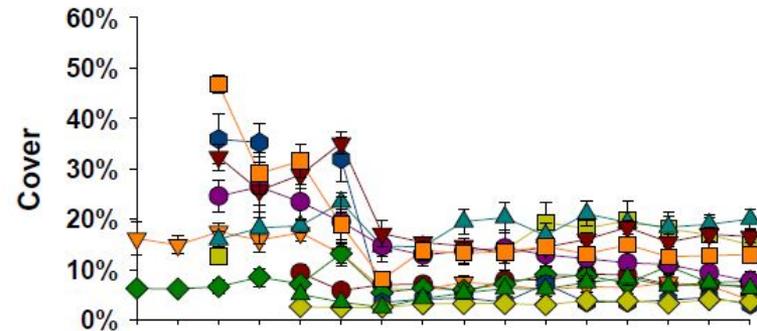
Nearshore

- Black Point
- ▼ Botany Bay
- Brewers Bay
- ◆ Cane Bay
- ▲ Cocus Rock
- Coral Bay
- Fish Bay
- ▼ Great Pond
- Jacks Bay
- ◆ Kings Corner
- ▲ Magens Bay
- Salt River West
- Sprat Hole



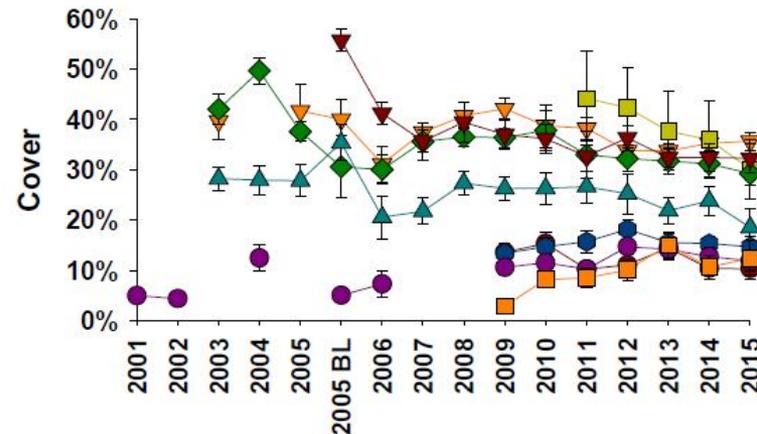
Offshore

- Buck Island STT
- ▼ Buck Island STX
- Castle
- ◆ Eagle Ray
- ▲ Flat Cay
- Mutton Snapper
- Savana Island
- ▼ Seahorse
- South Capella
- ◆ South Water
- ▲ St. James



Mesophotic

- Cane Bay Deep
- ▼ College Shoal
- Ginsburgs Fringe
- ◆ Grammanik Tiger
- ▲ Hind Bank FSA
- Lang Bank EEMP
- Lang Bank FSA
- ▼ Meri Shoal
- Salt River Deep



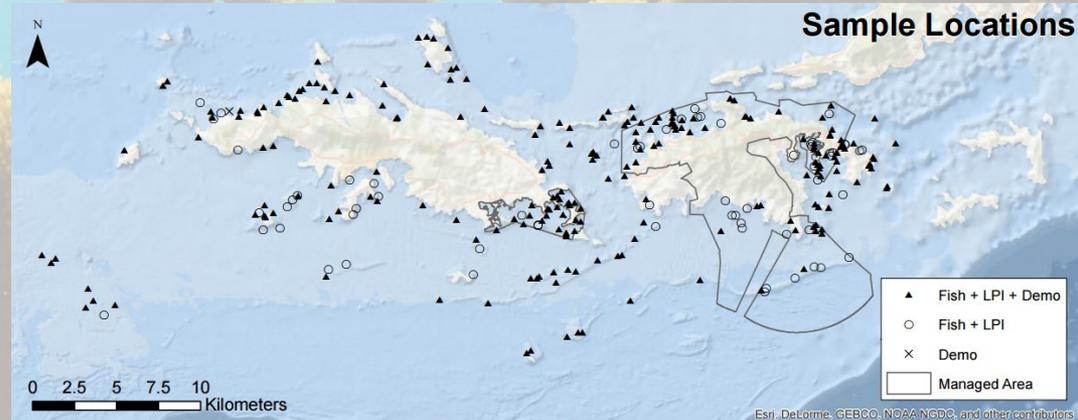
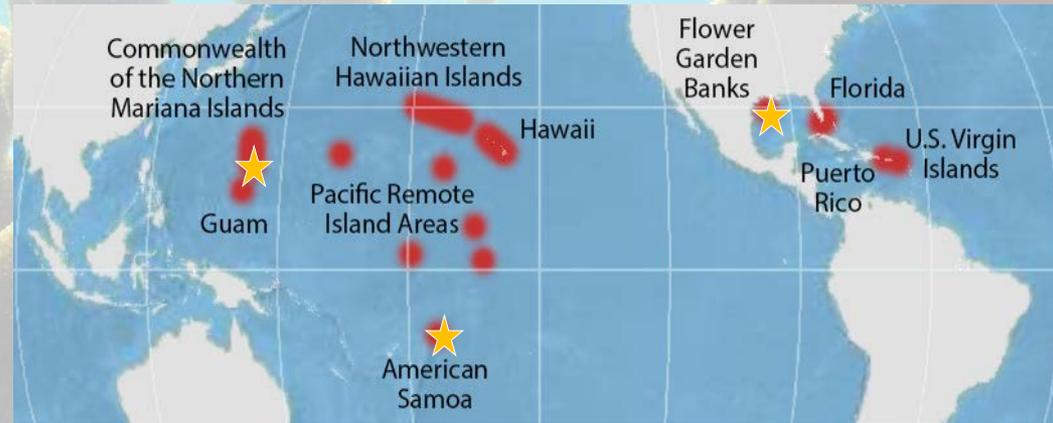
NCRMP

National Coral Reef Monitoring Program



NCRMP

- Every other year surveys ~ 500 sites
 - Benthic
 - LPI + Demo
 - Fish
 - Inverts
 - Diadema, conch, lobster

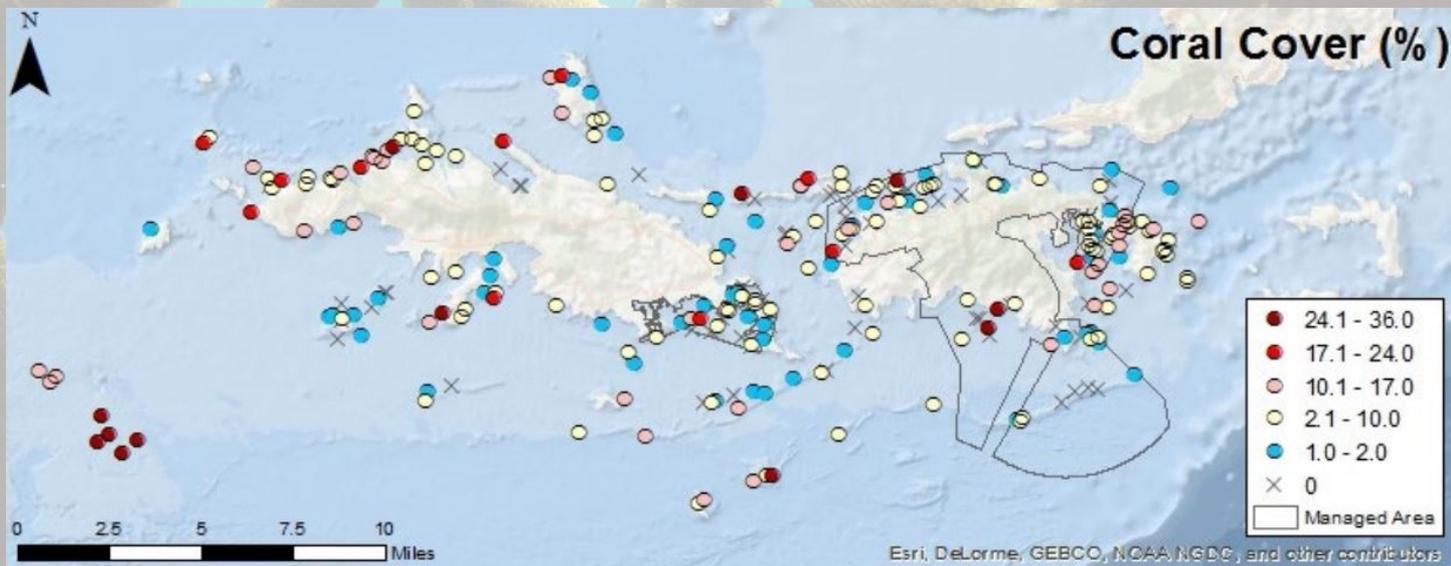
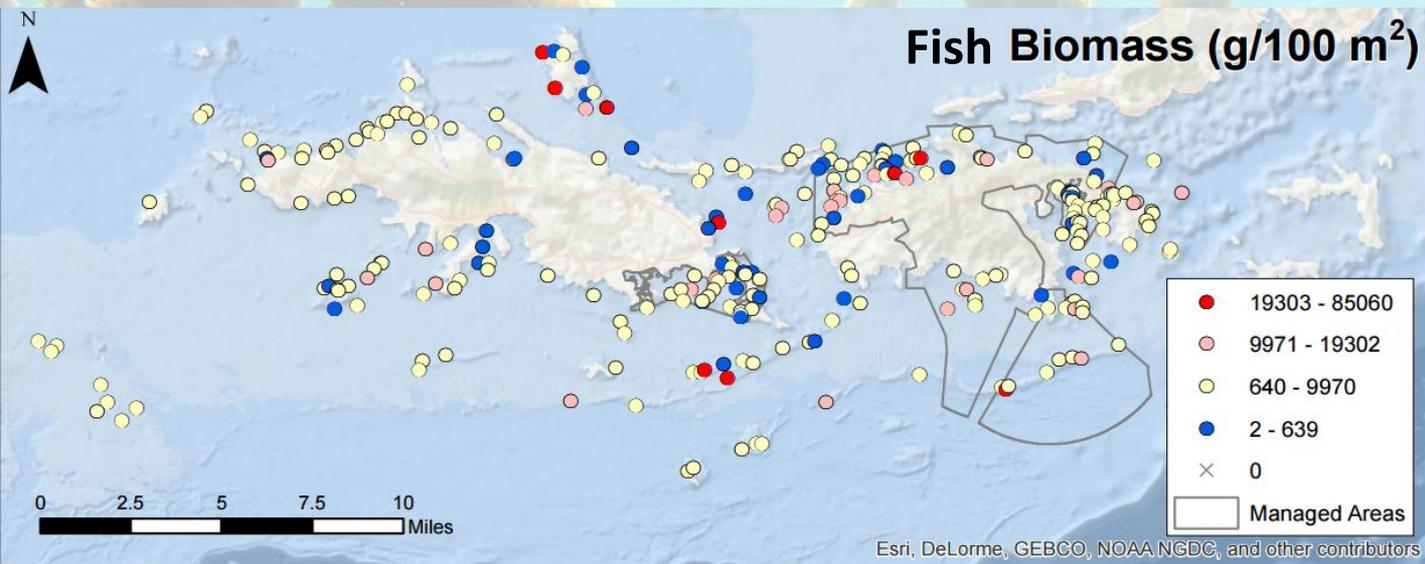


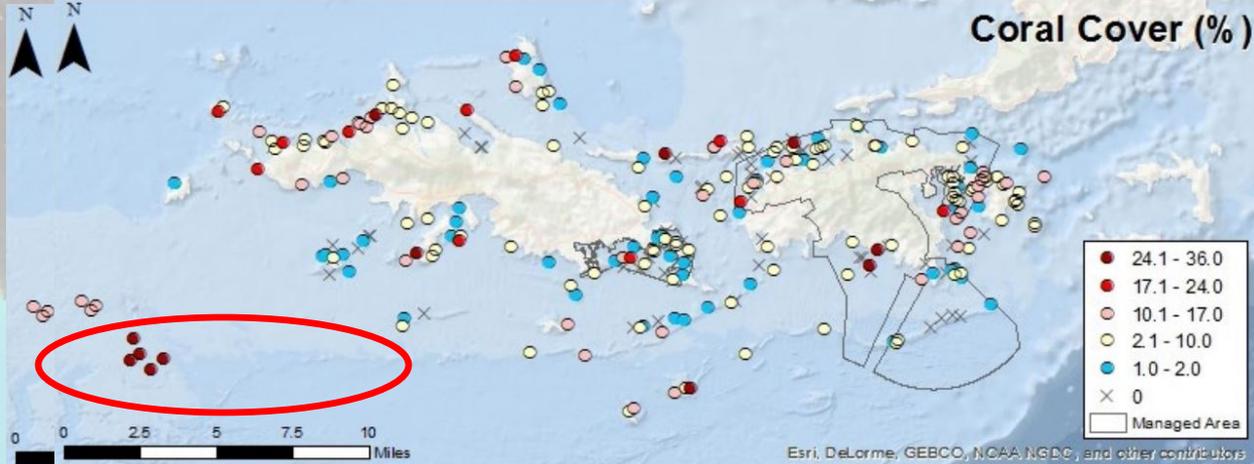
NCRMP

- USVI Partners
 - DPNR, TNC, UVI, EPA, NPS, NOAA
- USVI Surveys
 - St. Croix 2012 – 276 fish surveys
 - St. John/Thomas 2013 - 282 fish surveys; 221 coral surveys
 - St. Croix/John/Thomas 2015 - ~450 fish surveys; 250 coral surveys



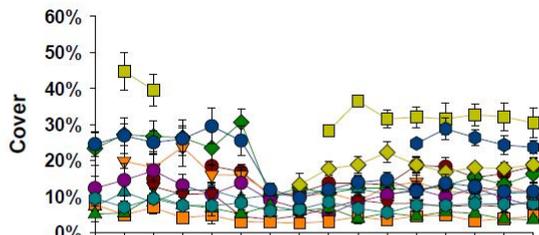
NCRMP





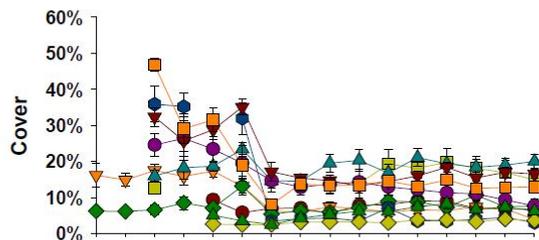
Nearshore

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- ▲ Cocalus Rock
- Coral Bay
- Fish Bay
- ▼ Great Pond
- Jacks Bay
- ▲ Kings Corner
- ▲ Magens Bay
- ▲ Salt River West
- Sprat Hole



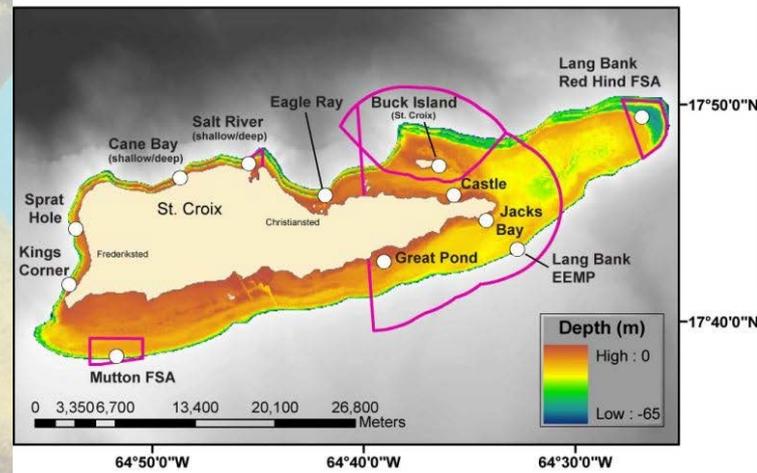
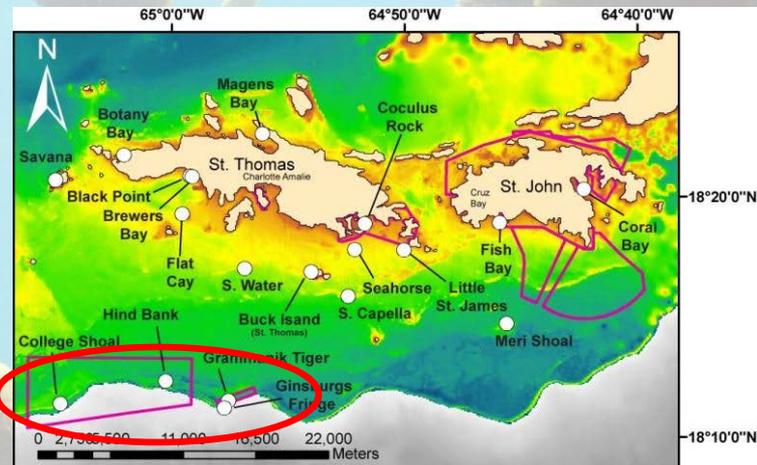
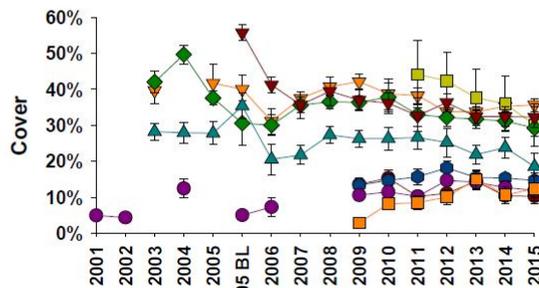
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Mesophotic

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- ▲ Hind Bank FSA
- Lang Bank EEMP
- Lang Bank FSA
- ▼ Meri Shoal
- Salt River Deep



TCRMP

- Territorial
- Started 2001
- Annual
- Permanent transects
- Reef focused
- Detailed coral health
- Video transects
- 33 sites
 - 6 coral transects
 - 10 fish transects
- 60-75 minutes per site x 6 divers
- 9 sites > 30m depth
- Fish transect

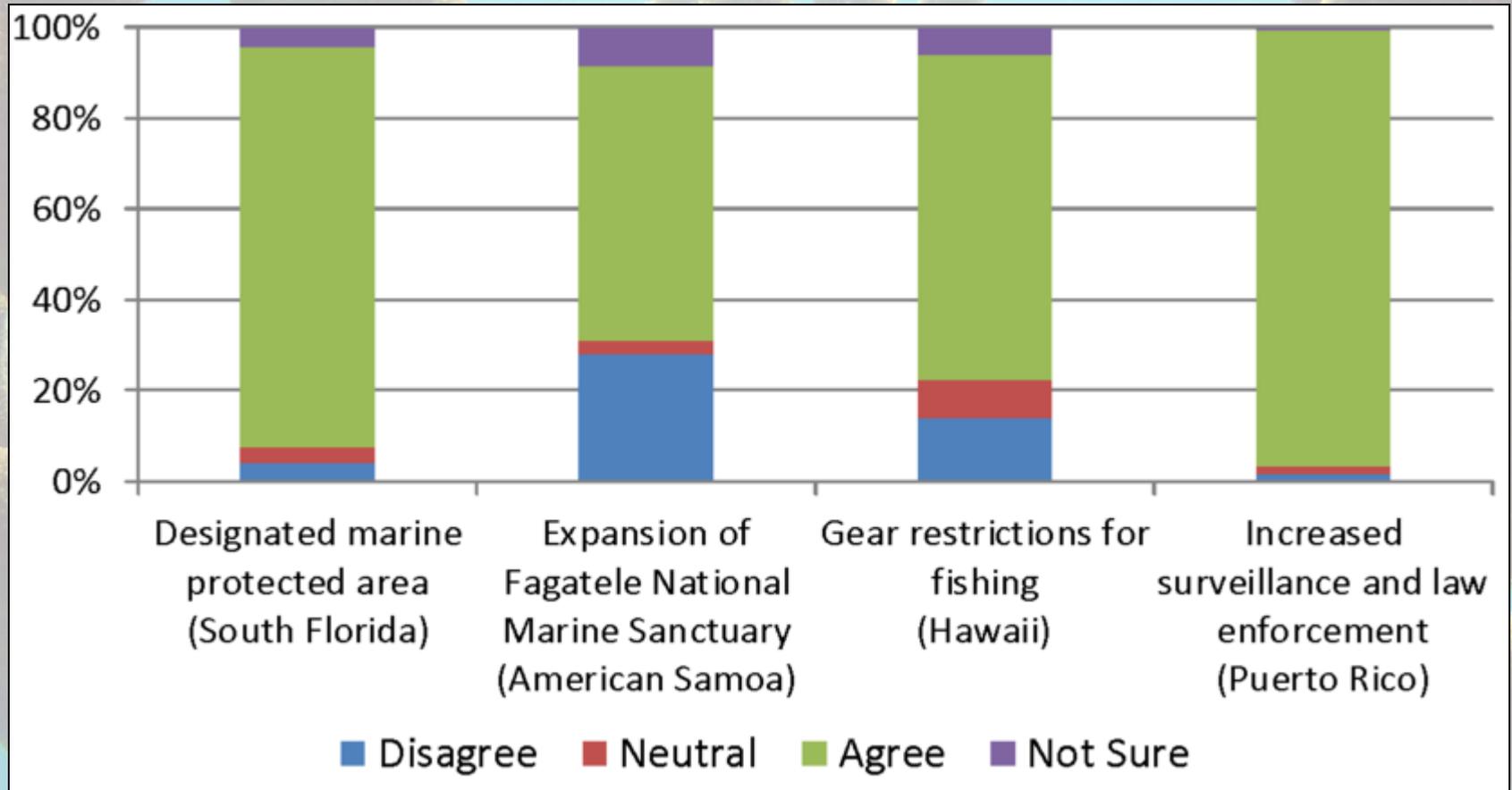
NCRMP

- National
- Started 2013
- Biennial
- Random transects
- Hardbottom focused
- General coral health
- Diver transects only
- ~500 sites
 - 1 benthic transect
 - 1 fish transect
- 20-40 minutes per site x 3 divers
- 0 sites > 30m depth
- RVC

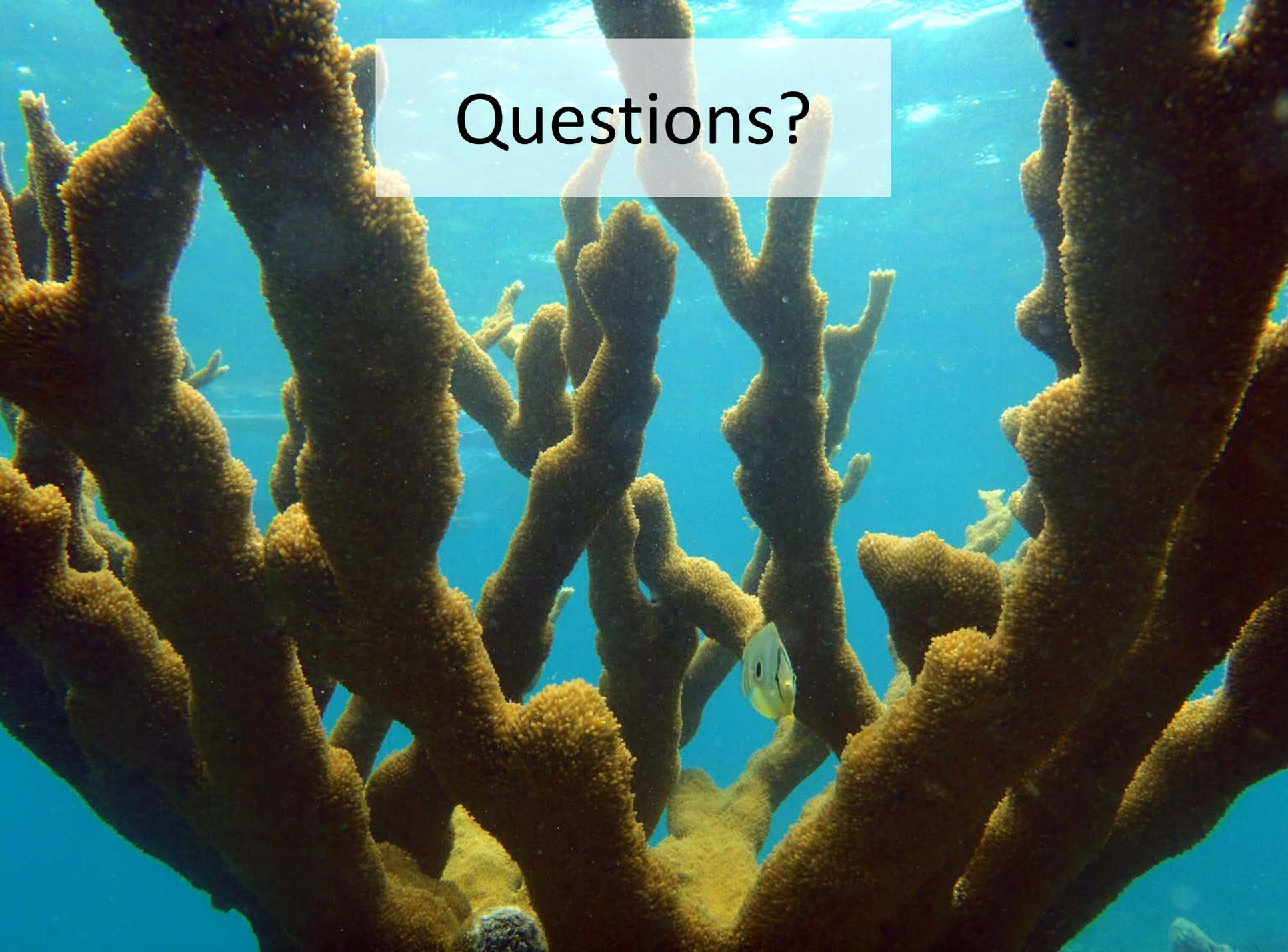
NCRMP – Social Science



NCRMP – Social Science



(coming soon to USVI: 2016-2017)

An underwater photograph of a coral reef. The coral is a branching, yellowish-brown color. A small, white fish with a black stripe is swimming near the bottom center. The water is clear and blue. A semi-transparent white box is overlaid on the top center of the image, containing the text "Questions?".

Questions?

DPNR-CZM & Its Partners Striving for Healthier Coastal Zones in the US Virgin Islands

NOAA in the Caribbean 2016 Partners Meeting
“Enhancing Community and Ecosystem Resiliency in the Caribbean”

Inter-American University of Puerto Rico School of Law
San Juan, Puerto Rico



Department of Planning & Natural Resources
Division of Coastal Zone Management

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Frederiksted, VI 00841

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Email: anita.nibbs@dpr.vi.gov

Anita E. Nibbs

Environmental Planner III/Watershed Coordinator

Department of Planning & Natural Resources

Division of Coastal Zone Management

- * Authority from the VI Coastal Zone Management Act enacted in 1978
- * VICZM's Goal: To protect , preserve & where feasible, enhance & restore the overall quality of the environment in the coastal zone.
- * VICZMP works, coordinates & partners with various local/ national government agencies to develop and implement a variety of projects/programs, including reviewing, processing and enforcement of minor and major development permits in the first tier of the coastal zone.

Coral Bay Watershed Plan

- * Population – Approx. 1200
- * About 900 homes (400 vacation/seasonal homes)
- * Extremely hilly area
- * Partners: CBCC, DPNR, NOAA, EPA, USDA-NRCS & Horsley Witten Group



- * **How partnership worked:**

- * Public Meetings
- * Engaged stakeholders

- * **Strong Aspects:**

- * CBCC
- * Detailed list of projects

- * **Accomplishments:** Plan completed gives recommendations for projects throughout the watersheds

- * Several roadway projects
- * Plan is being updated
- * Growth of new associations

- * **Challenges:**

- * Ecosystem vs “abandoned” roads

- * **What’s next?**

- * Implementing projects recommended
- * Establishing/engaging watershed groups
- * Obtain additional funding



CBCC's Coral Bay Watershed Mgt Project – to 2012:

EPA –CARE funded Planning and Design, and Partnership Relations:
Minimizing Environmental Toxins

NOAA Recovery Act funds through VI RC&D to implement construction of
BMPS to *minimize main toxin: Sedimentation into Shoreline and Marine
ecosystems.*

Numerous small grants to
implement projects, and local
govt. participation

Volunteers and HOA funding
and donations

Also Investigating : Air Quality, Drinking Water, Solid Waste, Waste Water,
and Land Use Planning parameters

St. Croix East End Watershed Plan

- * Project covered 6 subwatersheds:
 - * Great Pond Bay, Southgate, Solitude, Madam Carty, Teague Bay & Turner Hole
- * **Partners:** DPNR (DEP, CZM & BP), USDA-NRCS, The Nature Conservancy, Horsley Witten Group, St. Croix Environmental Assoc., & NOAA



- * **How partnership worked:**

- * Public Meetings
- * Engaged stakeholders
- * Demonstration projects installed

- * **Strong Aspects:**

- * Detailed list of projects

- * **Accomplishments:** Plan completed gives recommendations for projects throughout the watersheds

- * **Challenges:**

- * **What's next?**

- * Implementing projects recommended
- * CZM provided CBCC funding to establish a rain garden



St. Croix East End Watersheds Management Plan
U.S. Virgin Islands
FINAL November 2011

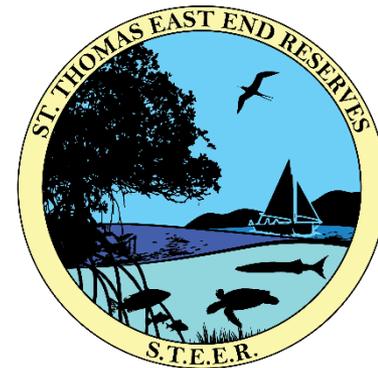
Prepared for:
St. Croix East End Marine Park
USVI Department of Planning and Natural Resources
NOAA Coral Reef Conservation Program
USDA-NRCS, St. Croix Field Office

Prepared by:
Horsley Witten Group, Inc
90 Route 6A, Sandwich, MA, 02563
www.horsleywitten.com

The cover of the report includes a map of St. Croix with the East End watersheds highlighted in pink. It also features three photographs: a person standing in a garden bed, a road construction site, and a person standing in a garden bed.

St. Thomas East End Reserve Watershed Plan

- * One of the largest & most heavily impacted
- * Located on the east end of St. Thomas
- * Joined MPA System in 2012
- * **Partners:** DPNR, EPA, NOAA, UVI, TNC, Horsley Witten Group & STEER Committee (DPNR, UVI, TNC, Friends of Christmas Cove)



- * **How partnership worked:**

- * Public Meetings
- * Engaged stakeholders
- * Demonstration projects installed

- * **Strong Aspects:**

- * Detailed list of projects
- * 2013 STEER Watershed Existing Conditions Report
- * Buy-in from business community

- * **Accomplishments:** Plan completed gives recommendations for projects throughout the watersheds

- * Watershed Coordinator

- * **Challenges:**

- * Leveraging funding for more demo projects
- * 3rd highest level of TBT ever found by NOAA
- * Aged watershed/neighborhood with failing traditional septic systems

- * **What's next?**

- * Implementing projects recommended
- * Establishing/engaging watershed groups

Habitat Restoration in PR and USVI

*National Fisheries Service
Office of Habitat Conservation
Restoration Center*

Michael Nemeth, Sean Griffin, Lisa Vandiver, Tom Moore
Aguadilla, PR

Partners

NGOs: Protectores de Cuencas, Sociedad Ambiente Marino, UPR, Reefscaping, TNC

Government: PR-DNER, USVI-DPNR, USCG, NRCS, USEPA, PR-EQB

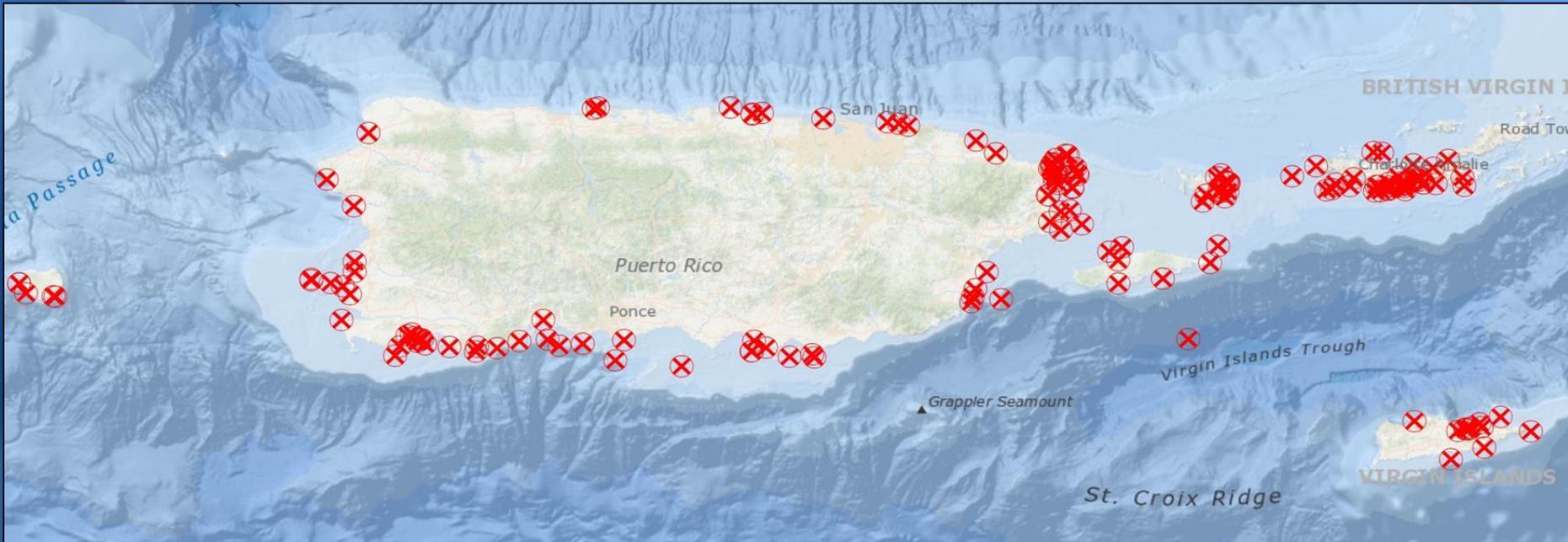
NOAA: CRCP, PRD, OR&R, RC



Restoration Center Goals

- Minimizing long-term impacts from physical impacts like vessel groundings, anchor damage, storm damage, and oil spills
- Curtailing land-based sources of pollution (LBSP) for habitat restoration
- Recovering endangered species populations and coral reef restoration

Reported Groundings in Puerto Rico and the USVI (2009-2015)



Summary Groundings

Year	Reported Groundings	Restoration Implemented	Corals Reattached	Corals Impacted
2009	51	7	9,074	80,190
2010	32	3	1,045	1,399
2011	54	6	915	3,381
2012	36	4	2,835	7,707
2013	32	3	214	214
2014	42	12	2,132	2,202
2015	51	3	1,919	8,505
2016	26	3	110	110
Total	324	41	18,244	103,708



T/V Margara 900' (April, 2006)

- Approximately 7,500m² of reef were damaged.
- 11,000 corals were reattached during Emergency Restoration
- Approximately 150,000 corals lost during the grounding.
- 1,600m² of rubble fields that inhibit recovery at the site.
- Trustees will likely have to go to NPFC to fund Primary Restoration

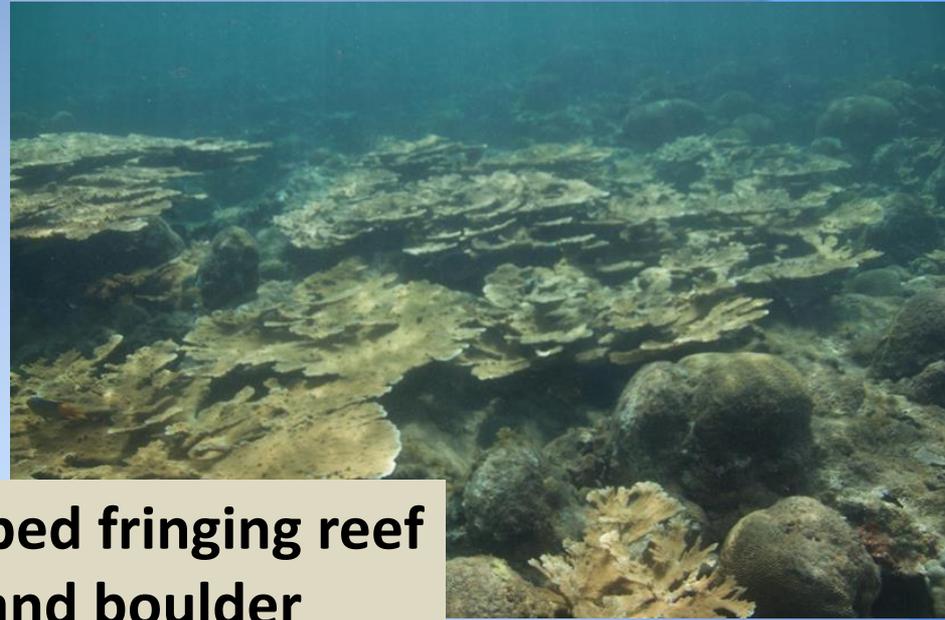


The M/V Aubi, a 49' powered catamaran, ran aground on a coral reef on 14 May 2015 near La Cueva del Indio, Arecibo, Puerto Rico within a newly established Marine Reserve.





Caribbean Reef Life Conservation



- Well developed fringing reef
- Large brain and boulder corals
- ESA listed Elkhorn coral



©Miguel A. Mercado Santiago



©Miguel A. Mercado Santiago

NOAA IN THE CARIBBEAN

CONNECTING NOAA & PARTNERS ACROSS THE CARIBBEAN



NOAA and community respond to major ship grounding Successful collaboration to rescue corals

The M/V Aubi, a 49' powered catamaran, ran aground on a coral reef on 14 May 2015 near La Cueva del Indio, Arecibo, Puerto Rico, within a newly established Marine Reserve. The hulls of the vessel contained integrated fuel tanks, and the USCG (in coordination with NOAA's National Ocean Service Emergency Response Division & Assessment and Restoration Division and NOAA NMFS Southeast Regional Office & Restoration Center) ordered the fuel removed prior to moving the vessel to minimize the risk of an oil spill.



MV Aubi aground on *Acropora* reefs near Arecibo

While an oil spill was prevented, the grounding resulted in significant impacts to coral reef resources, flattening almost 400 m² of reef and creating two large berms of coral and rubble. The rubble posed an immediate risk since it buried many live corals and, when mobilized by swells, would impact areas containing healthy colonies of ESA listed elkhorn coral (*Acropora palmata*) and other species. "The damage at this site is on par with damage seen at some tanker grounding sites and certainly the worst coral damage from a recreational vessel seen in many years" said Tom Moore of NOAA Restoration Center. Immediately following the removal of the vessel, 20 people worked together for two days to collect detached live corals and remove rubble before the swells increased. The group included personnel from NOAA Restoration Center, Puerto Rico's Department of Natural and Environmental Resources, Sea Ventures Inc.,

NGO volunteers from Caribbean Reef Life Conservation, VIDAs (Vegabajeños Impulsando Desarrollo Ambiental Sustentable) and Yo Amo el Tinglar (I Love Turtles), and members of the local community. Using buckets and their hands, the team filled kayaks with corals and rubble to transport them offshore into deeper water. Once the seas improved, the Restoration Center mobilized a restoration crew led by Sea Ventures using an emergency response fund set up with support from the NOAA NMFS Southeast Regional Office, Coral Reef Conservation Program, and Assessment and Restoration Division. Approximately 1,500 corals, including 100 fragments of *Acropora palmata*, were reattached and 10 m³ of material were removed from the site during the restoration. Thanks to the efforts of everyone involved, impacts to coral resources were minimized after the grounding. ■

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LBSP Activities

- Erosion and runoff from unpaved roads and bare soil sites
- WMP Development
- Unpaved road stabilization (waterbars, rain gardens, check dams, etc.)
- Hydro-seeding bare soil



- Habitat restoration and recovering endangered species populations
- *Acropora cervicornis* grown in coral nurseries from fragments
- Multiple projects throughout PR and USVI
- DNER leadership



Photo 2006



Photo 2015