

# EBFM TAP – Where Are We Now?

A Brief Recap on Previous Efforts

# Summary Timeline

- December 2016 – Initial FEP discussions
- 2017 – Cindy Meyer leads the FEP development team
- 2018 – Bill Arnold leads the FEP working group (Ball gets rolling)
- August 2019 – The CFMC declares that the FEP working group does not conform to MSA standards and needs to be formalized
- October 2019 – The CFMC votes to establish the EBFM TAP with its current membership
- February 2020 – EBFM TAP holds initial call & decides to meet in person...
- June 2020 – Here we are

# Mallory Brooks

- Summer 2018 – NOAA Intern
- Fall 2018 – Pew contractor
- Winter 2019 – EBFM liaison to the CFMC
- Worked to:
  - Identify data sets and data gaps
  - Collate data sets and describe basic trends in the data
  - Explore relationships between marine community and habitat
  - Explore opportunities for further data collection and partnerships



# Mallory Brooks

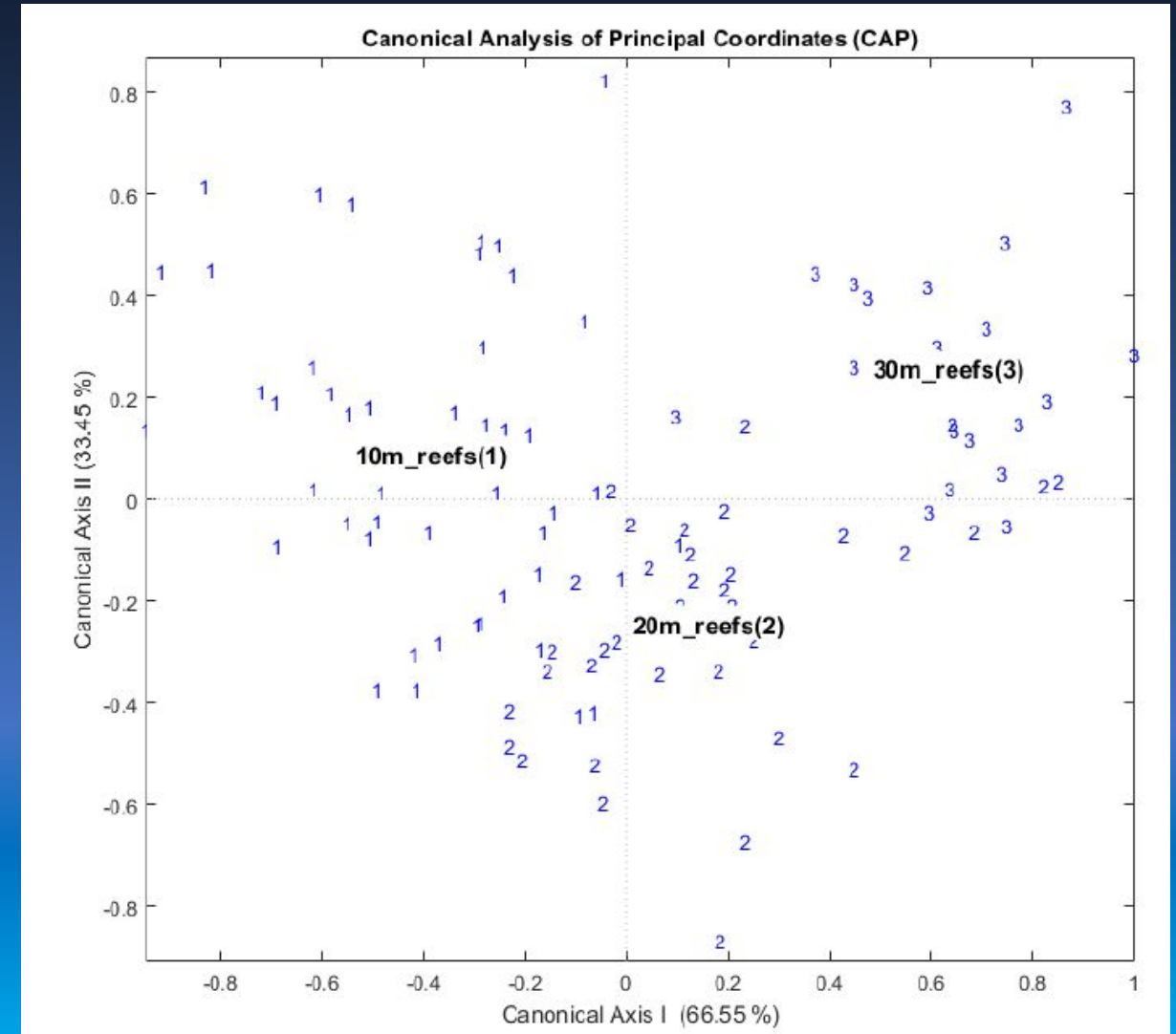
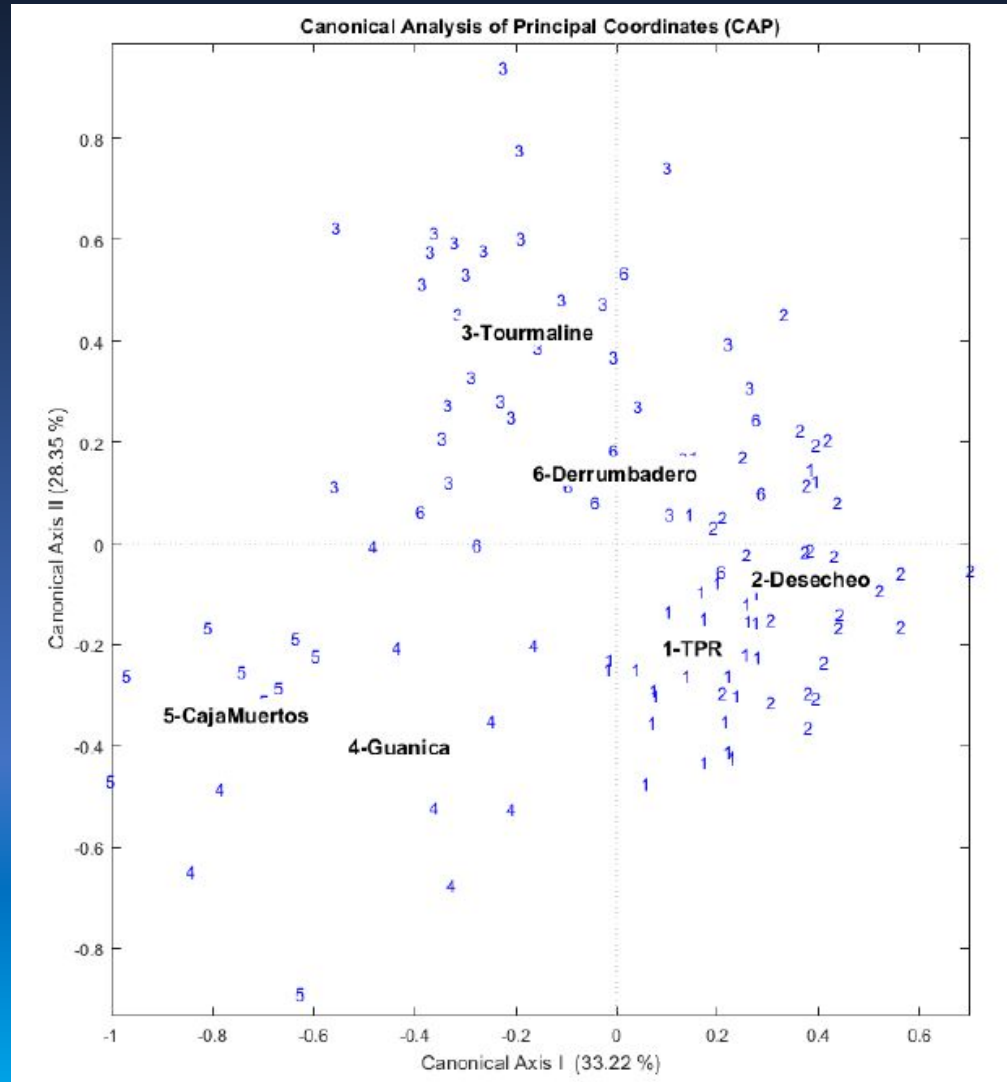
- Data Collection:

- PRCRMP
- NCRMP/NCCOS
- CARICOOS
- CREWS
- STEER\*\*\*
- La Parguera Water Quality\*\*\*
- Habitat maps (NOAA – BioGeo; DNER; DPNR)
- Other minor data sets

- Prelim Analyses:

- PRCRMP
- NCRMP/NCCOS
- CARICOOS
- CREWS
- STEER\*\*\*
- La Parguera Water Quality\*\*\*
- Fish species heat maps
- Fish species expected abundances

# PRCRMP - Benthos



# NCRMP/NCCOS – Benthos

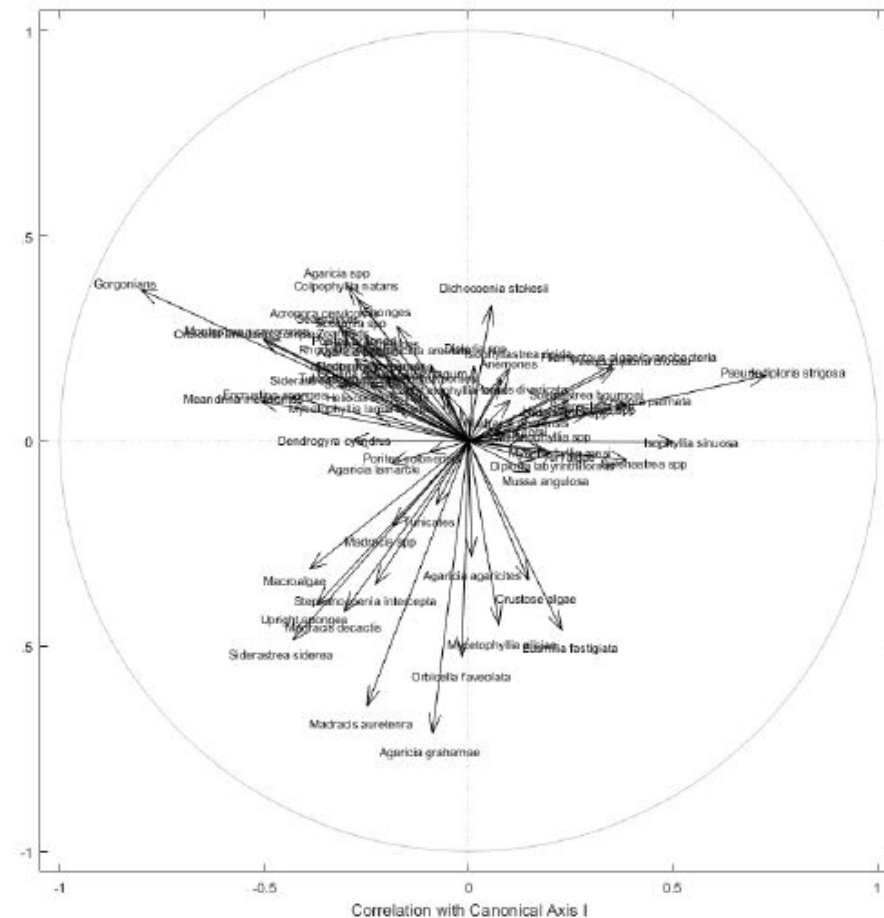
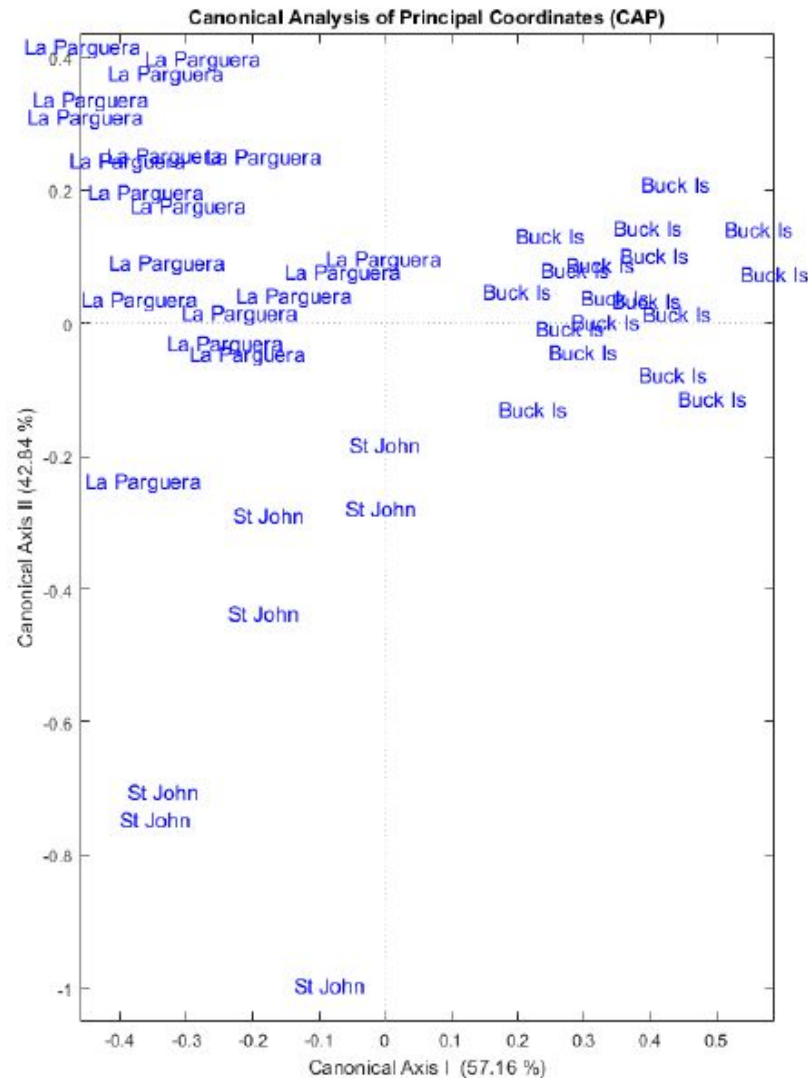
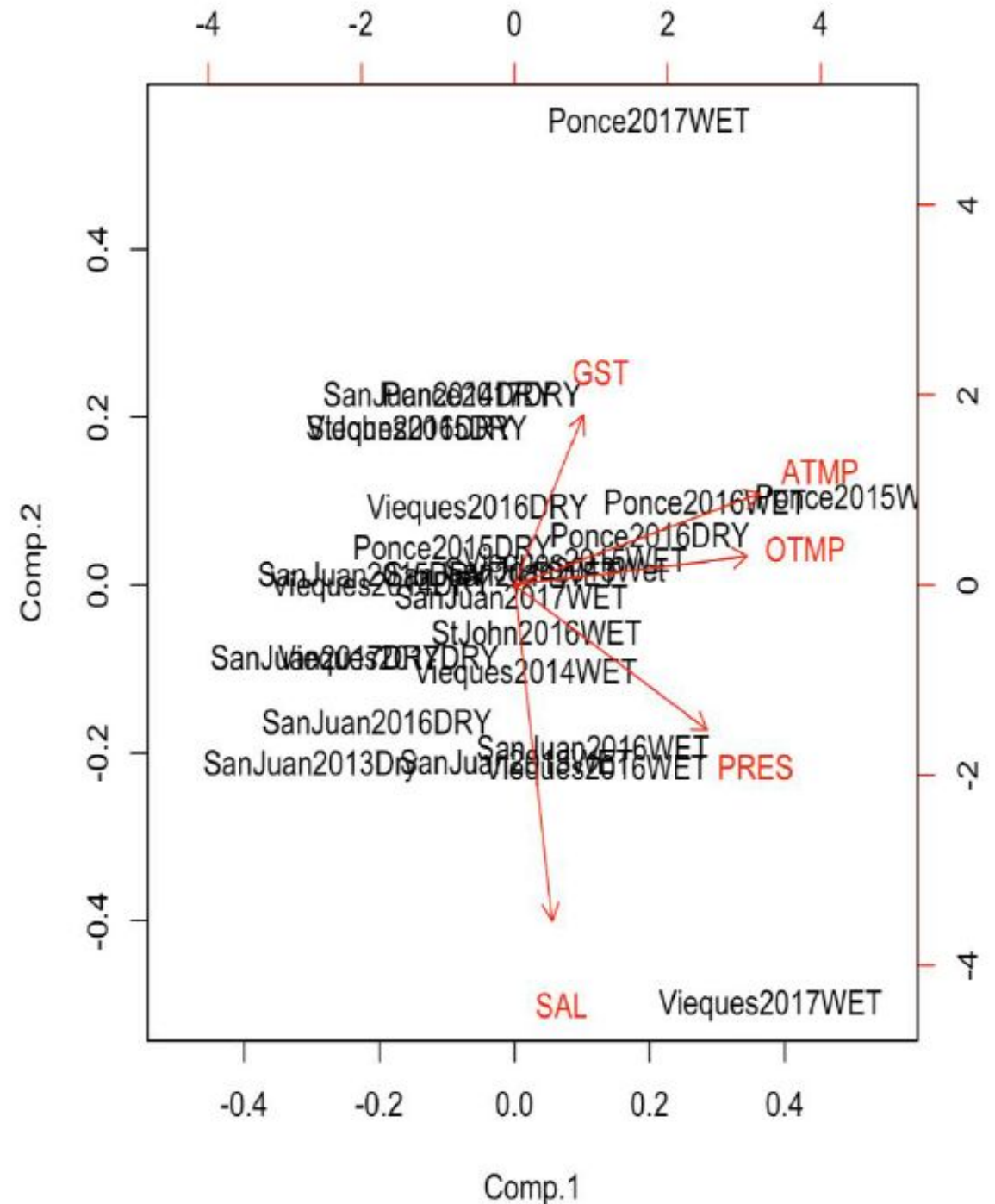


Figure 10. CAP biplot displaying influence vectors from the benthic data.

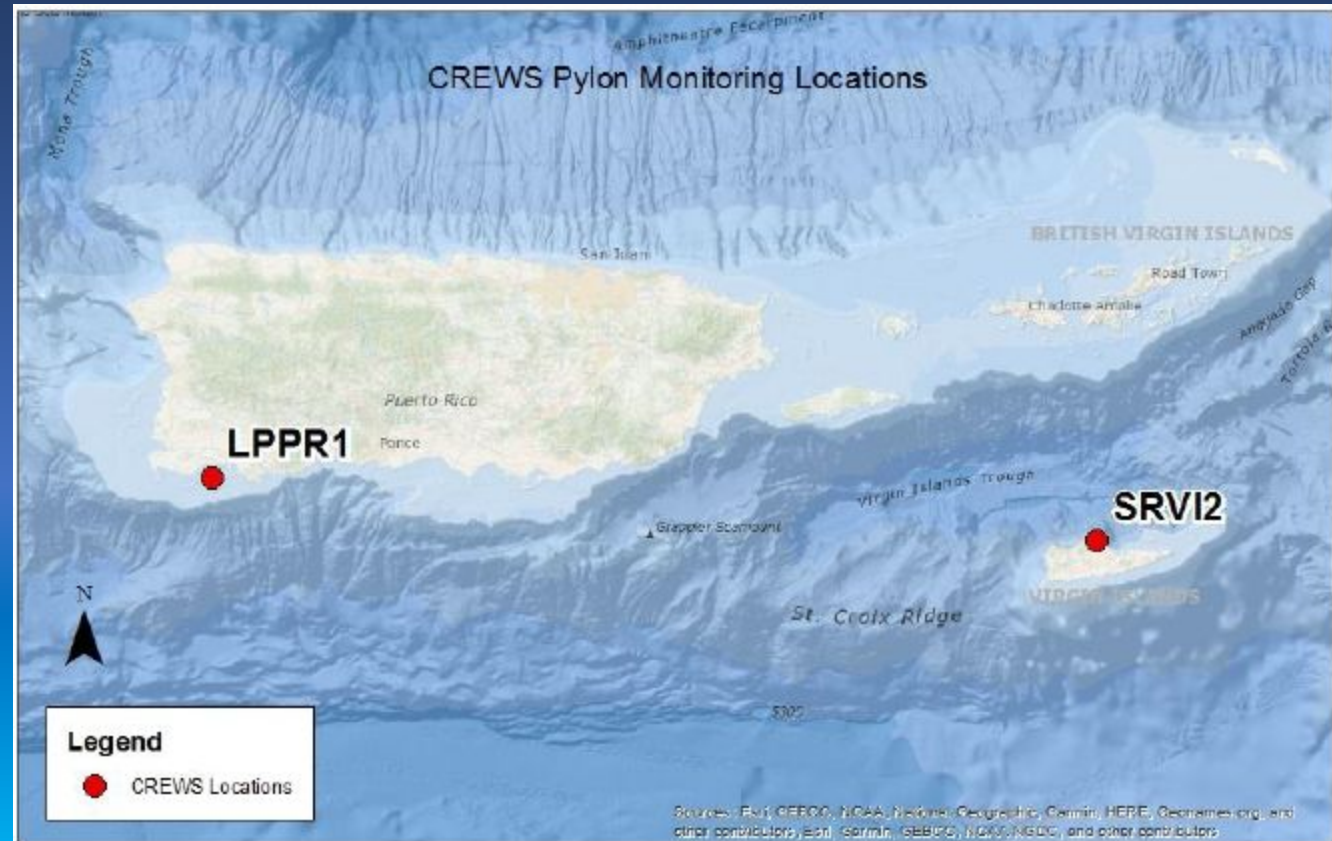
# CARICOOS

- Wet vs Dry Seasons



# CREWS

| Site          | DF  | Pillai  | F Number | DF den | P Value |
|---------------|-----|---------|----------|--------|---------|
| Factor (Year) | 7   | 0.32868 | 1.6627   | 28     | 0.01877 |
| Residuals     | 130 |         |          |        |         |



# STEER H<sub>2</sub>O Quality

*Table 1. Average nutrient data for the six sampling locations in the St. Thomas East End Reserves.*

| Site               | NO <sub>3</sub> - | HPO <sub>4</sub> - | HSIO <sub>3</sub> - | NH <sub>4</sub> + | NO <sub>2</sub> - |
|--------------------|-------------------|--------------------|---------------------|-------------------|-------------------|
| Benner Bay         | 0.010             | 0.006              | 0.266               | 0.016             | 0.002             |
| Cowpet Bay         | 0.006             | 0.005              | 0.062               | 0.006             | 0.001             |
| Little Saint James | 0.006             | 0.005              | 0.037               | 0.005             | 0.000             |
| Saint James        | 0.008             | 0.006              | 0.098               | 0.005             | 0.001             |
| Mangrove Lagoon    | 0.039             | 0.005              | 0.518               | 0.019             | 0.001             |
| Rotto Cay          | 0.005             | 0.004              | 0.047               | 0.006             | 0.000             |

*Table 2. Average nutrient data for the six sampling locations in the St. Thomas East End Reserves (continued).*

| Site               | Urea  | NO <sub>3</sub> -+NO <sub>2</sub> - | Total N | Total P |
|--------------------|-------|-------------------------------------|---------|---------|
| Benner Bay         | 0.009 | 0.912                               | 0.296   | 0.011   |
| Cowpet Bay         | 0.002 | 0.565                               | 0.266   | 0.015   |
| Little Saint James | 0.002 | 0.498                               | 0.300   | 0.011   |
| Saint James        | 0.003 | 0.660                               | 0.267   | 0.013   |
| Mangrove Lagoon    | 0.004 | 2.895                               | 0.368   | 0.012   |
| Rotto Cay          | 0.002 | 0.481                               | 0.279   | 0.018   |

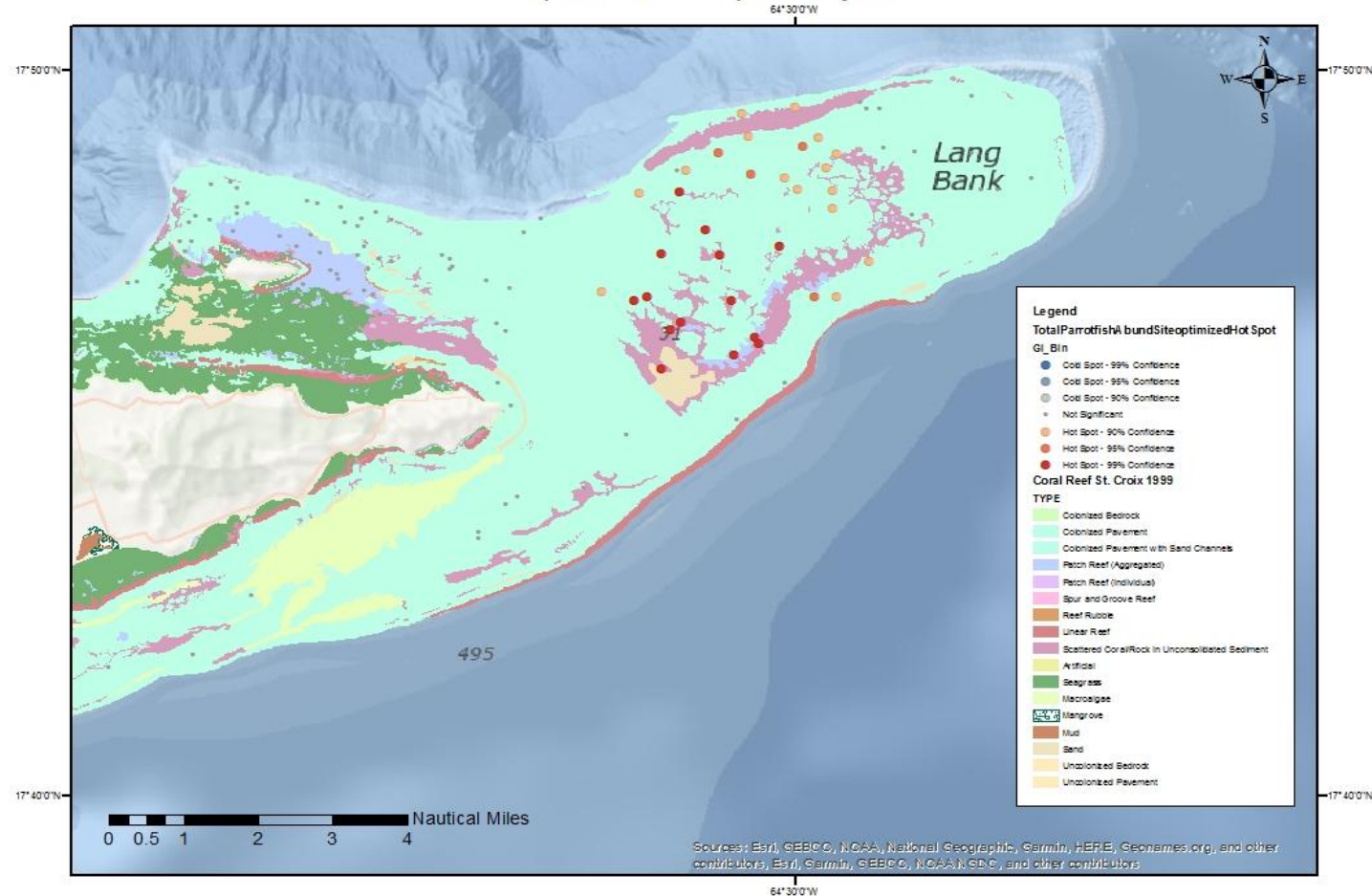
# La Parguera H<sub>2</sub>O Quality

*Table 3. Yearly averages for temperature, salinity, chlorophyll-a, and turbidity at La Parguera survey sites.*

| <b>Year</b> | <b>Temperature</b> | <b>Salinity</b> | <b>Chlorophyll-a</b> | <b>Turbidity</b> |
|-------------|--------------------|-----------------|----------------------|------------------|
| 2003        | 28.60              | 54.74           | 0.06                 | 25.99            |
| 2004        | 28.52              | 53.56           | 0.01                 | 7.51             |
| 2005        | 30.04              | 52.49           | 0.00                 | 17.19            |

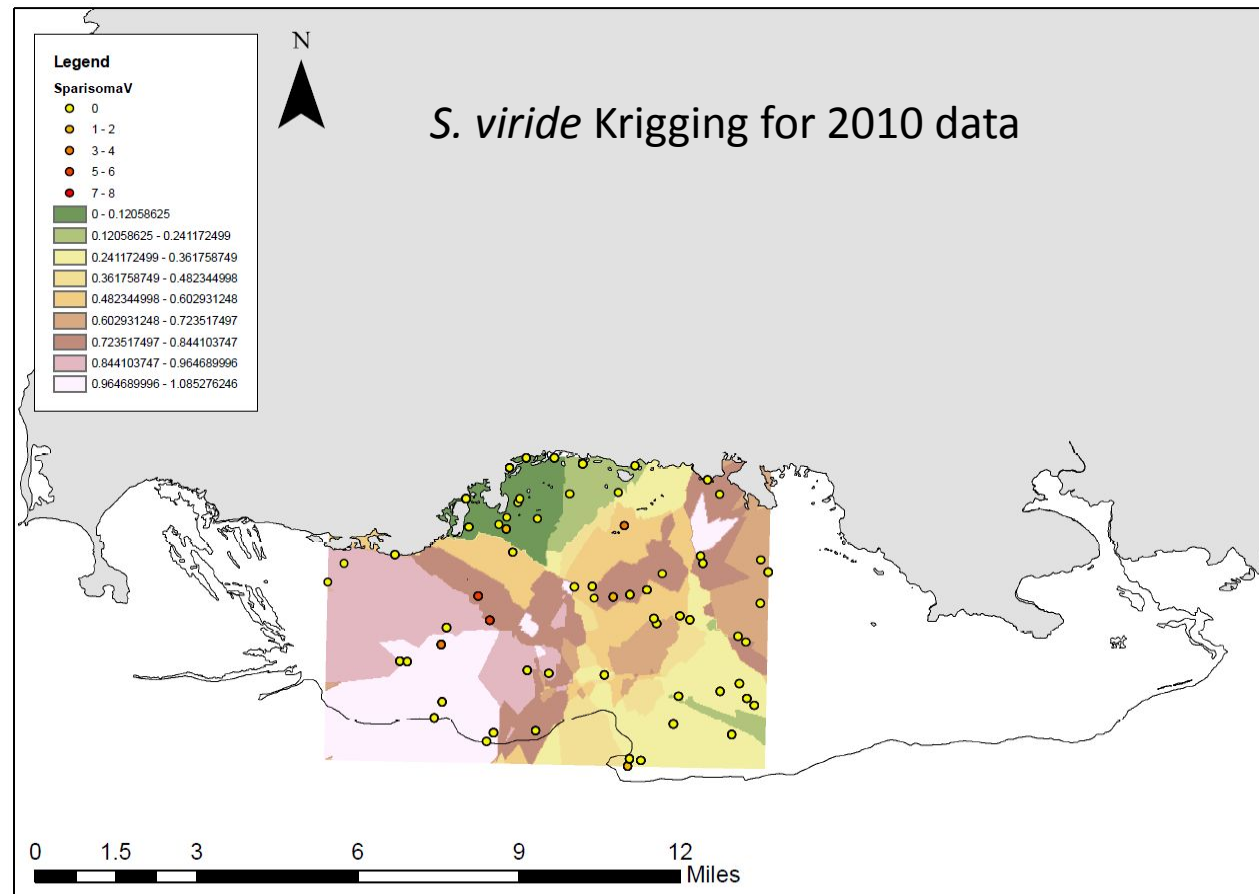
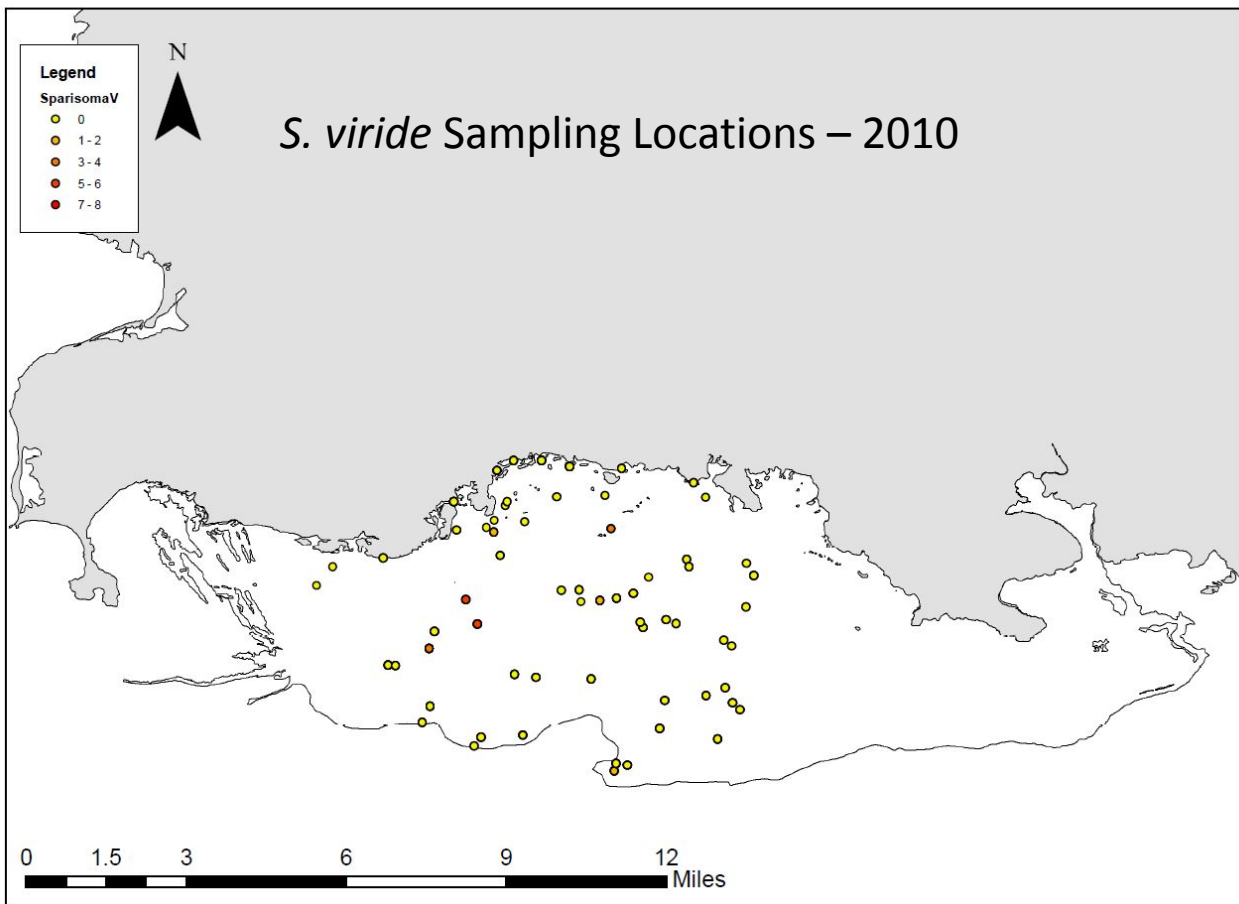
# Fish Species Heat Maps

Parrotfish Abundance by Site (2015) and Benthic Habitat (1999) - Lang Bank, St. Croix  
Optimized Hot Spot Analysis



# Fish Species Expected Abundances

- Across NCCOS & NCRMP



# Meaghan Faletti

- Summer 2019 – EBFM Liaison to the CFMC
- Worked to:
  - Identify data gaps
  - Identify key stakeholders for qualitative data collection
  - Conceptual model data gathering and formatting
  - Initial conceptual model analyses

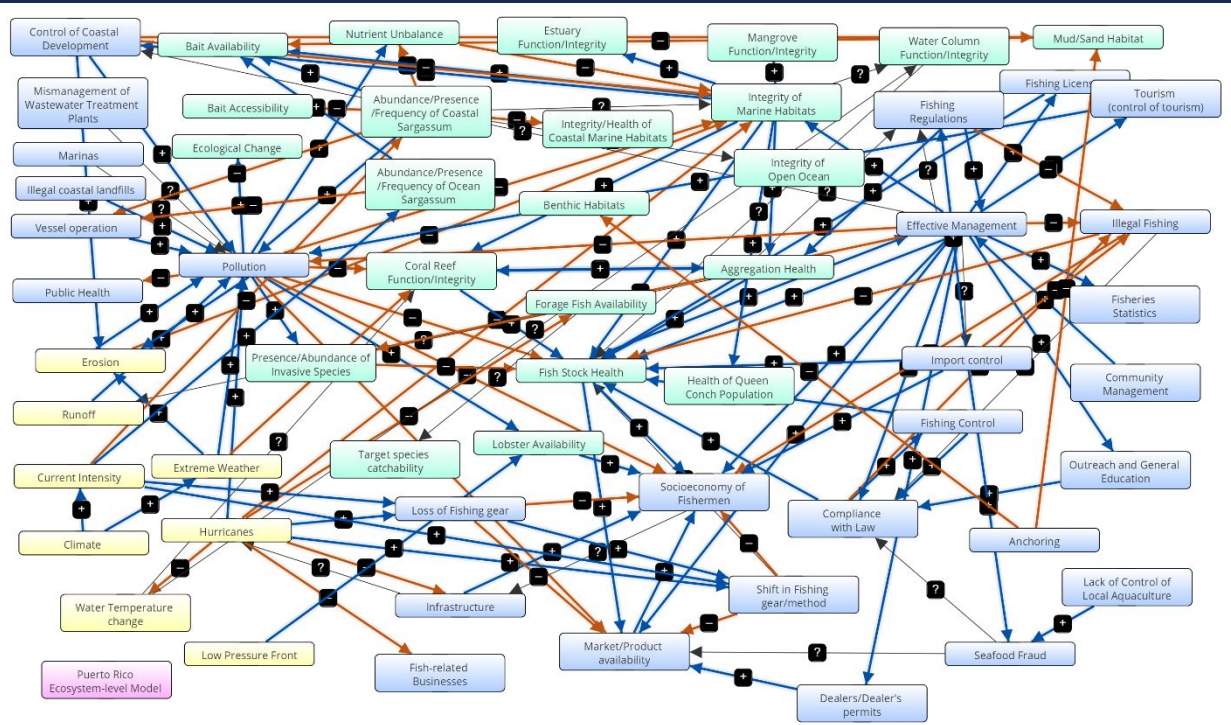


# Meaghan Faletti

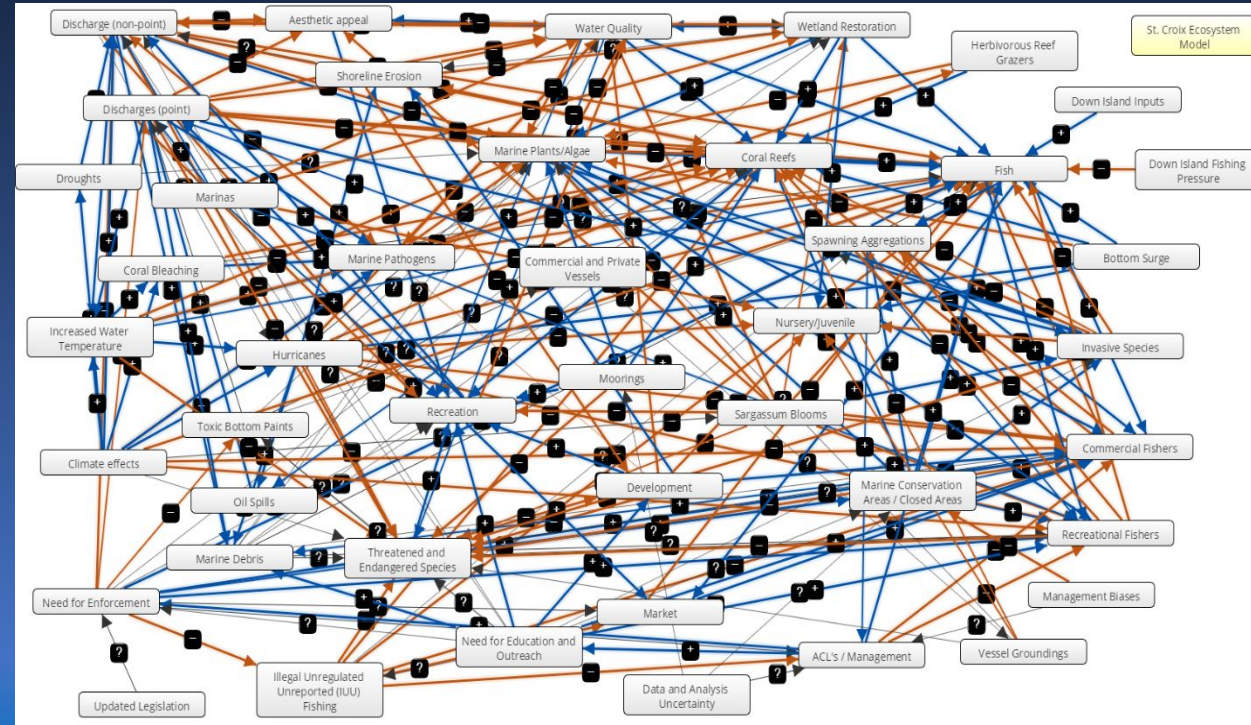
- Prelim Analyses:
  - DAP Conceptual Models
  - Data availability and utility
  - FEP development structure (regional comparisons)

# Conceptual Models

## Puerto Rico – DAP



## St Croix – DAP



# Conceptual Model Components

| Ranked Driving Components                         |                                         |                                              |                                       |
|---------------------------------------------------|-----------------------------------------|----------------------------------------------|---------------------------------------|
| Puerto Rico DAP                                   | St. Thomas / St. John DAP               | St. Croix DAP                                | SSC General Model                     |
| 45 Components                                     | 47 Components                           | 43 Components                                | 65 Components                         |
| 58 Total Components                               | 69 Total Components                     | 44 Total Components                          | 100 Total Components                  |
| 128 Relationships                                 | 120 Relationships                       | 237 Relationships                            | 199 Relationships                     |
| Effective Management                              | Education and Outreach                  | Hurricanes                                   | Large Vessel/Shipping Activity        |
| Pollution                                         | Sargassum                               | Discharge (non-point)                        | Coastal Development                   |
| Integrity of Marine Habitats                      | Management (Fisheries/Coastal?)         | Need for Education and Outreach              | Water Temperature                     |
| Hurricanes                                        | Large Vessel Impacts                    | Need for Enforcement                         | Major Disturbances (e.g., Hurricanes) |
| Abundance/Presence/Frequency of Coastal Sargassum | Lithium Ion Batteries                   | Climate effects                              | Algal Blooms                          |
| Import control                                    | Law Enforcement                         | Discharges (point)                           | Pelagic Habitat                       |
| Aggregation Health                                | Live aboard house boats/Private vessels | Sargassum Blooms                             | Fishing Gear                          |
| Control of Coastal Development                    | Communication                           | Marine Debris                                | Inshore Forage Fishes                 |
| Current Intensity                                 | Coastal Runoff                          | Marine Conservation Areas / Closed Areas     | Marine Development                    |
| Shift in Fishing gear/method                      | Ballast Water                           | Water Quality                                | Corals                                |
| Fish Stock Health                                 | Anchoring                               | Illegal Unregulated Unreported (IUU) Fishing | OTHER HABITATS*                       |
| Compliance with Law                               | Closed Areas                            | Increased Water Temperature                  | Ocean Acidification                   |
| Illegal Fishing                                   | Tourism Visitors                        | Marinas                                      | Periodic Oceanographic Phenomena      |
| Fishing Regulations                               | Lost Gear                               | Development                                  | Offshore Forage Fishes                |
| Loss of Fishing gear                              | Landfills                               | Wetland Restoration                          | Seagrass                              |
| Extreme Weather                                   | Round Up/ Pesticides                    | Invasive Species                             | Mangroves                             |
| Erosion                                           | Lack of Recycling                       | Toxic Bottom Paints                          | Exotic/Invasive Species               |
| Infrastructure                                    | Sewage Outfalls                         | Commercial and Private Vessels               | Ciguatera                             |
| Coral Reef Function/Integrity                     | Lack of Pump-Out Stations               | Commercial Fishers                           | Sargassum                             |
| Seafood Fraud                                     | Mangroves                               | Marine Plants/Algae                          | Water Toxicity                        |
| Fishing Control                                   | Tax Dollars                             | ACL's / Management                           | Suspended Sediments                   |
| Anchoring                                         | Strong Currents                         | Marine Pathogens                             | Bathymetry                            |
| Water Temperature change                          | Land-Based Sources of Pollution         | Threatened and Endangered Species            | Fishing Mortality                     |
| Climate                                           | Dredging                                | Bottom Surge                                 | Reef Fishes                           |
| Abundance/Presence/Frequency of Ocean Sargassum   | Water Quality                           | Mooring's                                    | Tourism                               |
| Runoff                                            | Heritage and Culture                    | Spawning Aggregations                        | Fishing Grounds                       |
| Mismanagement of Wastewater Treatment Plants      | Natural Disaster Response?              | Fish                                         | Regulatory Structure                  |
| Dealers/Dealer's permits                          | Sunscreen                               | Recreation                                   | Eutrophication                        |
| Presence/Abundance of Invasive Species            | Oil Disposal                            | Recreational Fishers                         | Commercial Fishing Landings           |
| Nutrient Unbalance                                | Restoration                             | Vessel Groundings                            | Recreational Fishing Landings         |
| Water Column Function/Integrity                   | WWTP - Treatment Type                   | Coral Bleaching                              | Light Penetration                     |
| Fishing Licenses                                  | Fisher Cooperation                      | Shoreline Erosion                            | Agricultural Runoff                   |
| Outreach and General Education                    | Marine Debris                           | Corals                                       | Noise Generation                      |
| Socioeconomy of Fishermen                         | Compliance                              | Data and Analysis Uncertainty                | Turtles                               |
| Tourism (control of tourism)                      | Derelict Vessels                        | Droughts                                     | IUU Fishing                           |
| Community Management                              | Lagoons/Benner Bay                      | Market                                       | Urban Runoff                          |
| Lack of Control of Local Aquaculture              | Invasive Species                        | Herbivorous Reef Grazers                     | Market Demand                         |
| Market/Product availability                       | Coral Diseases                          | Management Biases                            | Infectious Diseases                   |
| Illegal coastal landfills                         | Essential Fish Habitats                 | Oil Spills                                   | Fishery Infrastructure                |
| Vessel operation                                  | Seagrass Beds                           | Aesthetic appeal                             | Coral Bleaching                       |
| Mud/Sand Habitat                                  | Coastal Development                     | Down Island Inputs                           | Coastal Community Resilience          |
| Forage Fish Availability                          | Merchant Vessels                        | Down Island Fishing Pressure                 | Cultural Preferences/ Norms           |
| Marinas                                           | Strong Storms                           | Updated Legislation                          | Public Health                         |
| Low Pressure Front                                | Inshore Reefs                           |                                              | 4. Fishing                            |
| Lobster Availability                              | Off-shore Reefs                         |                                              | Education & Outreach                  |
|                                                   | Nassau Grouper                          |                                              | Population Size                       |
|                                                   | Sedimentation                           |                                              | Fishing Seasonality                   |
|                                                   |                                         |                                              | Erosion                               |
|                                                   |                                         |                                              | Local Economy                         |
|                                                   |                                         |                                              | Sewage Outfalls                       |
|                                                   |                                         |                                              | Circulation                           |
|                                                   |                                         |                                              | Fisher Income/Revenue                 |
|                                                   |                                         |                                              | Compliance                            |
|                                                   |                                         |                                              | Fishing Community Well-Being          |
|                                                   |                                         |                                              | Ecosystem Services                    |

| Ranked Affected Components                         |                                         |                                              |                                       |
|----------------------------------------------------|-----------------------------------------|----------------------------------------------|---------------------------------------|
| Puerto Rico DAP                                    | St. Thomas / St. John DAP               | St. Croix DAP                                | SSC General Model                     |
| 50 Components                                      | 45 Components                           | 36 Components                                | 58 Components                         |
| 58 Total Components                                | 69 Total Components                     | 44 Total Components                          | 100 Total Components                  |
| 128 Relationships                                  | 120 Relationships                       | 237 Relationships                            | 199 Relationships                     |
| Fish Stock Health                                  | Water Quality                           | Fish                                         | Corals                                |
| Pollution                                          | Inshore Reefs                           | Coral Reefs                                  | Seagrass                              |
| Socioeconomy of Fishermen                          | Invasive Species                        | Threatened and Endangered Species            | OTHER HABITATS*                       |
| Integrity of Marine Habitats                       | Essential Fish Habitats                 | Marine Plants/Algae                          | Mangroves                             |
| Market/Product availability                        | Mangroves                               | Commercial Fishers                           | Pelagic Habitat                       |
| Coral Reef Function/Integrity                      | Lagoons/Benner Bay                      | Recreation                                   | Fishing Mortality                     |
| Compliance with Law                                | Coral Diseases                          | Recreational Fishers                         | Commercial Fishing Landings           |
| Bait Availability                                  | Land-Based Sources of Pollution         | Water Quality                                | Recreational Fishing Landings         |
| Illegal Fishing                                    | Marine Debris                           | Discharge (non-point)                        | 2. Habitat                            |
| Erosion                                            | Compliance                              | Discharges (point)                           | Light Penetration                     |
| Shift in Fishing gear/method                       | Fisheries                               | Wetland Restoration                          | Reef Fishes                           |
| Aggregation Health                                 | Coastal Runoff                          | Spawning Aggregations                        | Market Demand                         |
| Effective Management                               | Off-shore Reefs                         | Nursery/Juvenile Habitat                     | Coastal Community Resilience          |
| Fishing Regulations                                | Fisher Cooperation                      | Marine Pathogens                             | Eutrophication                        |
| Infrastructure                                     | Law Enforcement                         | Marine Debris                                | 1. Marine Ecosystem Components        |
| Presence/Abundance of Invasive Species             | Seagrass Beds                           | ACL's / Management                           | Compliance                            |
| Nutrient Unbalance                                 | Invasive Species                        | Aesthetic appeal                             | Public Health                         |
| Control of Coastal Development                     | Live aboard house boats/Private vessels | Shoreline Erosion                            | Water Toxicity                        |
| Water Column Function/Integrity                    | Fishermen                               | Marine Conservation Areas / Closed Areas     | Cetaceans                             |
| Seafood Fraud                                      | Nursery Hatchery                        | Market                                       | Discards & Bycatch                    |
| Loss of Fishing gear                               | Ballast Water                           | Hurricanes                                   | Tourism                               |
| Vessel operation                                   | Sargassum                               | Need for Enforcement                         | Infectious Diseases                   |
| Mud/Sand Habitat                                   | Sedimentation                           | Increased Water Temperature                  | Fishing Community Well-Being          |
| Lobster Availability                               | Round Up/ Pesticides                    | Development                                  | Turbidity                             |
| Ecological Change                                  | Sunscreen                               | Oil Spills                                   | Algal Blooms                          |
| Runoff                                             | WWTP - Treatment Type                   | Coral Bleaching                              | HMS                                   |
| Dealers/Dealer's permits                           | Tourism Visitors                        | Toxic Bottom Paints                          | Bathymetry                            |
| Hurricanes                                         | Lost Gear                               | Illegal Unregulated Unreported (IUU) Fishing | Salinity                              |
| Abundance/Presence /Frequency of Coastal Sargassum | Education and Outreach                  | Droughts                                     | Circulation                           |
| Fishing Licenses                                   | Policy Makers                           | Sargassum Blooms                             | Fisher Income/Revenue                 |
| Outreach and General Education                     | Public                                  | Regulatory Structure                         | Regulatory Structure                  |
| Mangrove Function/Integrity                        | Recruitment                             | Commercial and Private Vessels               | Cultural Preferences/ Norms           |
| Estuary Function/Integrity                         | Endangered Species                      | Bottom Surge                                 | 4. Fishing                            |
| Tourism (control of tourism)                       | Outdated Regulations                    | Mooring's                                    | Major Disturbances (e.g., Hurricanes) |
| Fisheries Statistics                               | State Government/DPNR                   | Herbivorous Reef Grazers                     | Water Temperature                     |
| Import control                                     | Shoreline Erosion                       | Need for Education and Outreach              | Education & Outreach                  |
| Fishing Control                                    | Strong Storms                           |                                              | Erosion                               |
| Fish-related Businesses                            | Large Vessel Impacts                    |                                              | Inshore Forage Fishes                 |
| Public Health                                      | Anchoring                               |                                              | Coastal Pelagics                      |
| Water Temperature change                           | Air Quality                             |                                              | Offshore Birds                        |
| Extreme Weather                                    | Council Authority                       |                                              | Coastal Birds                         |
| Benthic Habitats                                   | Halophila                               |                                              | Suspended Sediments                   |
| Current Intensity                                  | Closed Areas                            |                                              | Coastal Development                   |
| Forage Fish Availability                           | Landfills                               |                                              | Urban Runoff                          |
| Target species catchability                        | Nassau Grouper                          |                                              | Sewage Outfalls                       |
| Health of Queen Conch Population                   |                                         |                                              | Large Vessel/Shipping Activity        |
| Bait Accessibility                                 |                                         |                                              | Offshore Forage Fishes                |
| Integrity/Health of Coastal Marine Habitats        |                                         |                                              | Coral Bleaching                       |
| Integrity of Open Ocean                            |                                         |                                              | Fishing Gear                          |
| Abundance/Presence /Frequency of Ocean Sargassum   |                                         |                                              | Noise Generation                      |
|                                                    |                                         |                                              | Sargassum                             |
|                                                    |                                         |                                              | Septic Seepage                        |
|                                                    |                                         |                                              | Power Plant Effluents                 |

# Where are we now, and where are we going?

- All previous work on google drives
  - Need to streamline the drive(s)
  - Identify the status of current data sets and future needs
- Conceptual Models
  - Model melding
  - SSC model – to meld or not to meld?
- Start thinking about future products
  - G&O's
  - Ecosystem Indicators
  - Risk Assessment

# Where are we now, and where are we going?

- Use the momentum
  - Increased buy in from NOAA
  - Increased buy in from the CFMC
  - Ecosystem status report
  - Interested local stakeholders
  - Setting a precedent moving forward