Southeast Florida Coral Reef Initiative (SEFCRI)

Technical Advisory Committee (TAC) Biannual Fall Meeting

Report of Proceedings

April 3-4, 2018

Nova Southeastern University Oceanographic Center

8000 North Ocean Drive

Dania Beach, Florida

MEETING ATTENDANCE

Technical Advisory Committee (TAC)		Day 1	Day 2
Erik Ault		X	X
Ken Banks	Broward County	X	X
Don Berhinger	Fisheries and Aquatic Sciences UF/IFAS	X	X
James Byrne	The Nature Conservancy	X	X
Dick Dodge	Nova Southeastern University - Oceanographic Center/ NCRI		
Phil Dustan	COFC	X	X
John Fauth	UCF	X	X
Piero Gardinali	FIU	X	X
Dave Gilliam	NSU-OC/NCRI	X	X
Lew Gramer	UM RSMAS/ Keys Marine Lab	X	X
Kurtis Gregg	NOAA	X	X
Dale Griffin	USGS	X	X
Judy Lang	AGRRA	X	X
Diego Lirman	UM RSMAS		
Jose Lopez	NSU-OC		
Arthur Mariano	UM RSMAS	X	X
Valerie Paul	Smithsonian Marine Station		
Esther Peters	George Mason University	X	X
George Sedberry		X	X
Manoj Shivlani	Center for Independent Experts (CIE)		
Jack Stamates	NOAA	X	X
Brian Walker	NSU-OC		
Dana Wusinich-Mendez	NOAA	X	

Florida Department of Environmental Protection (FDEP) Coral Reef Conservation Program (CRCP) Staff		Day 1	Day 2
Meghan Balling	FDEP CRCP	X	X
David Cox	FDEP CRCP	X	X
Nicole D'Antonio	FDEP CRCP	X	
Kristi Kerrigan	FDEP CRCP	X	X
Maurizio Martinelli	NOAA Coral Reef Management Fellow	X	X

Francisco Pagan	FDEP CRCP	X	X
Alycia Shatters	FDEP CRCP		X
Mollie Sinnoit	FDEP CRCP		
Joanna Walczak	FDEP CRCP	X	
Shelby Wedelich	FDEP CRCP	X	
Aubree Zenone	FDEP CRCP	X	X

Additional Presenters and Observers		**Day 1**	**Day 2**
Kory Enneking	NSU	X	X
Jay Grove	NOAA	X	X
Francesca Toledo	USF CMS	X	X
Dylan Peck	USF CMS	X	X
Eugene Shinn	USF	X	X
Doug Seba	Academy of Marine Science	X	X
Kirk Kilfoyle	NSU	X	
Karen Neely	NSU	X	
Robert Weisberg	USF CMS	X	X
Jennifer Stein	FWRI/FRRP		X

Southeast Florida Coral Reef Initiative (SEFCRI)
Technical Advisory Committee (TAC) Meeting, April 3 & 4, 2018
Nova Southeastern University, Oceanographic Center
Center of Excellence in Coral Reef Ecosystem Science, 3rd Floor Auditorium
8000 N. Ocean Drive, Dania Beach, FL 33330
Phone: 954-262-3600

Agenda

DAY 1, April 3, 2018

8:30 am **Registration**

9:00 am **Welcome, Introduction of TAC Members, New CRCP Focus Area Coordinator**
– David Cox, (FDEP CRCP). Coordinator, Land-Based Sources of Pollution

9:15 am **Meeting Guidelines, Agenda Review & Meeting Purpose** *–David Cox (FDEP CRCP)*

9:30 am **Session I: SEFCRI March 2018 Meeting Update** *– Francisco Pagan (FDEP CRCP)*

10:45 am Break *(15 minutes)*

11:00 am **Session II: SEFCRI LAS Review** *(FDEP CRCP staff)*

12:00 pm Lunch *(1 hr.) Lunch provided courtesy of Nova Southeastern University*

1:00 pm **Session III: Coral Disease**
1. Update on Coral Disease Outbreak *– Maurizio Martinelli (NOAA-FDEP)*
2. Preliminary Disease Intervention Results *– Karen Neely (NSU)*

2:00 pm **Session IV: State of the Corals**
1. National Academy of Sciences Update *– Joanna Walczak (FDEP CRCP)*
2. SECREMP *– Dave Gilliam (NSU)*
3. Reef Visual Census (5 YR Summary) *– Kirk Kilfoyle (NSU)*
4. NCREMP *– Jay Grove (NOAA)*

3:30 pm Break *(15 minutes)*

3:45 pm **Session V: CRCP Project Updates**
1. FRT Water Quality Monitoring *– David Cox (FDEP CRCP)*
2. DEP Turbidity project *– David Cox (FDEP CRCP)*
3. Outfall project *– David Cox (FDEP CRCP)*
4. Boynton ICA WMP *– Kurtis Gregg (NOAA)*

4:30 pm Public Comment *(Three minutes per individual)*

4:45 pm Wrap up & Adjourn

5:00 pm Reception

DAY 2, April 4, 2018

8:30 am	Registration
9:00 am	**Welcome, Agenda Review, Day 1 Recap** – *David Cox (FDEP CRCP)*
9:15 am	**Session I: Disturbance** 1. Hurricane jelly – *Francesca Toledo-Cossu/Dylan Peck (USF)* 2. Post-Irma Turbidity & Coastal Models – *Robert Weisberg (USF)* 3. Disturbance Response Model – *Jennifer Stein (FWC)* 4. Hurricane Irma Impact Assessment – *Kristi Kerrigan (FDEP CRCP)*
11:15 am	Public Comment *(Three minutes per individual)*
11:30 am	**Session II: CRCP 8: Management Data Needs** – *Francisco Pagan, (FDEP CRCP)*
12:30 pm	Lunch *(45 minutes) Lunch provided courtesy of Nova Southeastern University*
1:15 pm	**Session III: CRCP 8: Management Data Needs** *(cont.)* – *Francisco Pagan, (FDEP CRCP)*
2:45 pm	Closing Remarks and Meeting Adjourn – *(David Cox, FDEP CRCP)*

Meeting Available via GoToMeeting

Southeast Florida Coral Reef Initiative's Technical Advisory Committee

Join us for a webinar beginning on Apr 03-04, 2018 at 9:00 AM EDT.

Register now!

A two-day meeting of the Southeast Florida Cora Reef Initiative's Technical Advisory Committee: the TAC will be updated on the recent coral disease outbreak and discuss means of better protecting coral reefs.

After registering, you will receive a confirmation email containing information about joining the webinar. View System Requirements

Meeting Minutes/Summary: Tuesday, April 3rd – Wednesday, April 4th 2018

Welcome, Introduction of TAC Members, New CRCP Focus Area Coordinator

David Cox: Alright, thank you very much. I want to start off with some introductions. We do have some new staff and a new TAC member. He wasn't sure if he could make it here today but he should be here tomorrow if not. We do have a new coral reef conservation program coordinator for the marine industries

Shelby Wedelich: Marine industries coastal construction coordinator.

David Cox: We also have Nicole D'Antonio she is our new RIPPER technician. We have Maurizio Martinelli. He is our NOAA Coral Reef Fellow. Coral reef management fellow. Also today, sitting with us, we have an esteemed college past and present, Jean Shinn, from USF, former TAC member. He helped put together a group working with hurricane jelly with Ken Banks and bringing along a large USF contingent. Alright, with that, our big objective of the weekend is to look at a lot of the monitoring programs and the big objective is to figure out how we can do things better, and that is within the framework of our currently available resources, and also some urgent calls that came in from the All Islands Committee. They put out a call for urgent action as well as convening a working committee to look at resiliency as well as adapted corals, meaning genetic strains of corals that are resilient. Also, we would like you to think about the framework of these management data needs and what we can do better in terms of the National Academy of Sciences-call to convene a committee on intervention on making corals more resilient. Resiliency is going to be a common theme within this discussion of how we can do things better, meaning how can we detect disturbance better, quicker, how can we predict or anticipate outcomes and how can we better respond to things when they do happen. So that is going to be the big goal, and that discussion will take place tomorrow. Today, we've got Kirk Kilfoyle with RVC, Dave will talk about SECREMP, Jay Grove will talk about NCREMP, so we will get a bigger picture than normal by looking at the reef track as a whole. This is especially important in light of the disease outbreak and also with NCREMP moving forward, the changes that are taking place that will affect how the monitoring is done up here. So that is our big picture for the weekend.

Let me walk you quickly through the agenda. Questions? One of the first items today is to revisit the DUNNO [SP] action strategies that you have helped to put together over the past year and a half, and you'll see the final iteration of these, and we are also going to ask you to look at these from your role to as an advisor to the ???? and affiliate yourself, or agree to be an advisor when they actually develop project teams. Aubrey will be leading that session. Project teams are now being formed and they may or may not ask you to be advisors. We are looking to link your expertise with these project teams. The project teams will be in charge of developing these into actual projects.

Following that, we will look into coral disease outbreak and some of the intervention taking place, and some preliminary results of that. After that we will be looking at the monitoring programs. The state of the corals and fish. Day 2, looking at disturbance, mostly we will be looking at what happened after Irma. Preface to the hurricane jellies and historical context. Looking to do coastal and hydrodynamic modeling on the east coast as well as some of the effects of Irma as it moved through the Keys and up the west coast.

Action Item: management data needs.

Session I: SEFCRI March 2018 Meeting Update

(Aubree Zenone) *Morning everybody, welcome back. We just had our most recent SEFCRI meeting in March, some if you were in attendance, some of you were not. It was a pretty simple meeting, the work that you guys have been putting in and the projects that the SEFCRI team has designated as group goals. They were presented to the SEFCRI team and put to a vote to put them into a new public action strategy. If there were minor changes that needed to be made, they were, although most of the projects were approved with little to no content changes. The SEFCRI team did a great job getting to a consensus and had very productive discussion on projects that may have needed more work. They also looked at the charters, that need to be renewed every 5 years. We have met with the SEFCRI vise chairs ahead of time to examine the charter as far as what changes need to be made. It was determined that there were no major content changes that were necessary, however there have been a few situations that have arisen that needed a little more clarification. The wording of the charter may not have been exactly what was needed to answer those problems. So those clarification changes were made and approved in fairly short order at the SEFCRI meeting, so we will have a more final version of the charter at the next SEFCRI meeting in the fall. One thing that we have done since the 27 projects have been approved was to establish project teams. As TAC members, you do have the opportunity to sign up as an advisor to those projects teams. The project teams of SEFCRI volunteer to offer their expertise to help guide the vision of the projects that were approved as well as develop the first steps to implement these projects and go from there. Coordinators from each of the project teams had send out Doodle poles to establish the first meetings. These first meetings are really important. First, they determine the vision of the project and end goal. The pacing of the projects were also discussed in terms of deliverables and an appropriate timeline. This will vary from project to project. Finally, any agreed upon language changes worked together just with people interested in those projects. All of this will happen during the first project team meeting. None of those have happened yet, so as TAC members, today we are going to have a focused area of coordinators and we will go through them. We will read through the finalized versions, then we will give you the opportunity to sign up as advisors on these projects.*

(David Cox) *Into the activity?*

(Aubree Zenone) *Yeah*

(David Cox) *Lets break into groups of four. there is really not anytime to get into the weeds, but do provide your expertise and take notes if needed.*

(Aubree Zenone) *If you do feel like you need to get into the weeds, write it down and bring it to the team meetings, so we will encourage it at that time.*

(Francisco Pagan) *Feel free to ask the coordinators if you have doubts about the project. That is different than getting into the weeds, so if you want to find out more about the project you want to volunteer to sign in on, ask them. The discussion of the project will happen at the project team, just not today. This is in a very specific discussion. You will look at these ideas and you will decide if you want to volunteer to participate in these projects. Participation is not mandatory, so don't feel pressured to sign onto any of the 27, just if you want to. If your area of expertise allows you to contribute is a positive way and your time commitment allows you to take that amount of time from your time to participate, please sign up. So we are separating into groups of 4 and we will*

have a coordinator or co-chair of that particular project team. Participation of the project teams involves the following, participating in the in-person meeting, participate on the meetings as an advisor. The members will discuss connecting science with what they are trying to do. The main goal of the project team it to write the scope of the project forward. Also consider any of the budgetary needs of the project. If it is something that will take half a million dollars to accomplish, the project team will come up with an estimated budget. Once those are done, we will apply for funding if that is the case to make it so.

(Judy Lang) *And the timeline?*

(Francisco Pagan) *The timeline is depending on next meeting and the difficulty and complexity of the project. It will be about 6 months of commitment.*

(Dale Griffin) *So if we are decided on as an advisor, who are we helping steer?*

(Francisco Pagan) *Helping steer the co-chairs of the project team.*

(David Cox) *The rest of the team is SEFCRI members*

(Ken Banks) *Depending on the size of the project, there can be a varying number of advisors. May have 25, may have 3.*

(Aubree Zenone) *We can look that information up if you would like.*

(Francisco Pagan) *Let's get started- feel free to get up and move and needed, don't feel trapped by the sales pitch.*

Session II: SEFCRI LAS Review:
The TAC members are separated into groups and informed about individual LAS projects that SEFCRI recently voted on passing. TAC members are given the opportunity for joining the project as the project advisors.

Session III: Coral Disease
(David Cox) *Alright, lets thank Nova for lunch, this is where we will give you some disease updates. Maurizio Martinelli as our new NOAA coral reef fellow will be giving you an update on the disease outbreak and some of the efforts under way to address it and respond. Then, Karen Neely, a research scientist working on coral disease response efforts will give you some preliminary results of some intervention work being done in the Keys. We will have some time for questions and answers after that. And with that, Maurizio*

1. Update on Coral Disease Outbreak- Maurizio Martinelli
    a. Recap: The disease has occurred for 3 years constantly, over 30 species, and almost 100% mortality.
    b. 2017-2018 FDEP $500k funding for disease research, 2018-2020 $400K funding for disease work and research
    c. Post Irma Survey 2018
        i. Disease prevalence: 5.2-11.4%, Coral Diversity: 1.07+- 0.87 corals/m2, Coral Species Richness: 4.8 +- 2.0 species .This data is based on areas

which were cherry picked for the best remaining sites post the original disease outbreak.

d. Management questions that are being asked
    i. What is causing outbreak
    ii. Where is the boundary and where will it spread next?
    iii. How to control the disease
e. Projects that are answering the research questions
    i. Val Paul and Greta Abey (UH)- Transmission experiment, therapeutic diagnosis and pathogen isolation.
        1. No vector is necessary for transmission, bacterial pathogen most likely (therapeutic diagnostics)
    ii. Derek Manzello (NOAA)- Fixed site monitoring
        1. There are corals that are hit first and more heavily
            a. Sentinel species
        2. How the disease is spreading through the reef
    iii. Bill Sharpe- Sentinel and introgression sites
        1. Speed of progression and experimental intervention sites
    iv. Drs. Erin Muller and Robert Van Woesik are modeling disease spread
    v. Coral Disease workshop
        1. 40 participants looking at sampling and methods for the disease outbreak
            a. Disease intervention
            b. Disease methodology
    vi. Brian Walker (NSU): Large coral monitoring and intervention

<u>Questions: and Comments for Maurizio</u>

1. (John Fauth) *Your sampling methods, are these on the SCFCRI sampling grids?*

→ (Maurizio Martinelli) *This is different, this is in the Keys.*

(John Fauth) *Is it in the SCFP sampling grid?*

→ (Eugene Shinn) *Yeah, this is the CREMP data*

(John Fauth) *So these are the sites that have been occupied since 1996?*

→ (Dave Gilliam) *If they are from Rob, we are assuming that they are the CREMP sites. The previous ones from Brian, I don't know. My questions is that they are listed by site so it may be a little misleading. These are not permanent sites. Just used a GPS point and dropped a buoy.*

→ (Dale Griffin) *So site selection for the post Irma cruise was basically a cherry pick of what are the best coral cover abundance sites from all over the different monitoring programs. This assessment was to go out and see how they did post storm. So the 2018 data, those were our best sites*

(John Fauth) And the species distinct inventories were run the way they always were?

→ (Dave Gilliam) *No, I'll get into that shortly. Hang on. To the afternoon. These are not the same place.*

→ (Maurizio Martinelli) *We will have more information on these sites tomorrow.*

2.(Phil Dustan) *Yea, I just want to add a comment *Inaudible* so we are going to spend half a million dollars a year on a site that is 3 or 4% of what was there 20 years ago. Between 1996 and 2000, we say a very large increase in the spread of coral diseases when we first started the coral disease monitoring programs. We also saw a 400% increase in the geographic location of where disease were found and that has probably been due to where water release is occurring out of the everglades, and high nitrogen coming out of the system after they hyper salinity and the release into the Florida Basin *inaudible* that came through Looe Key that started the epidemics of black band disease and white plague and all kinds of other things, so be careful when you mention that this is the most unprecedented and biggest disease change that we have been seeing, because what happened in the 90's makes this look like tinker toys.*

→ (Eugene Shinn) *So Phil, it was for sure, we did not see 23 species get this level of disease. We have never seen that before. 23 of the 45 of our reef building species *inaudible*.*

→ (Phil Dustan) *I think what happens is the remaining corals went through a series of these episodes*

→ (Eugene Shinn) *Absolutely*

→ (Phil Dustan) *In the 70's, 80's, 90's, and we see this very large spread of disease, and gradually it just chinks down to where the corals have a resistance. And similar to humans, the next wave comes and gets them, and the next wave come and gets them*

→ (Eugene Shinn) *Absolutely*

1. Preliminary Disease Intervention Results- Karen Neely
    f. Dendrogyra is being diseased with the large outbreak
    g. Southern boarder observations in the Florida keys- Grass Key
        i. The disease can jump larger distances
        ii. The sensitive species will be hit first and die off quickly, Montastraea and Orbicella
        iii. Corals extracted of boulder corals that were taken to keys marine lab to treat the corals
            1. Chlorine in z-spar epoxy 60% success
            2. Antibiotic amoxicillin treatments with compounded dental paste 100% success
            3. Bridge rubble in the keys was successful
            4. Works well in still water aquarium
        iv. Chlorine mixed with paste and z-spar was a failure

v. CoreRx looking at leaching rates of antibiotics in the dental paste with up to one day rate for 100% leached
vi. CoreRX is working on a new paste, starch/glue is being developed by DEP, Cement mix and Hoof putty are being examined for future work
vii. Different areas of application on the diseased corals are being examined also

Questions and comments for Karen Neely:

1. (Judy Lang) *So what do the red margins mean?*

→ (Karen Neely) *Those are the ones we have tried, that haven't really been successful. My hope is that there would be greens up here, but that hasn't happened yet.*

2. (Dale Griffin) *So the disease agent, it looks like it is moving south when all of water is going north, and it is baking big leaps in the distance, like miles, heading down south to the Keys. So my question is, what would a quarter inch line of antibiotics do to block an outbreak, when it looks like agent has capability, it looks like it is vector borne, but I heard someone earlier say that they don't think it is vector borne. I don't see how it is not vector borne and make those types of migrations. And so, the quarter inch antibiotic barrier, is don't see how that.*

→ (Karen Neely) *So that is talking at the scale of an individual coral. Trying to protect, for example these big mammas, or a pillar coral that is the only one within miles and miles. If people were super ambitious, maybe you could treat at the scale of a reef, going out and treating the disease. I suspect that there is more pathogen working its way down, so you might treat that reef, but it might easily get re-infected in the future. The antibiotic is the scale of corals… it might easily*

→ (Dale Griffin) *So do you think that the antibiotic within the barrier- is the colony absorbing the antibiotic, and essentially the colony is treated?*

→ (Karen Neely) *So, once they have been cured, for example this antibiotic used in these trials or other ones, they do not get re-infected again. And we are only looking at that- I should rephrase that. So in Cheryl Woodley's work they were never re-infected again, or in this part of the Florida reef track again. What we find is that the ones that don't progress past the barrier, they don't seem to get it again, but we have pretty short term data on that.*

→ (Dale Griffin) *Have you ever tried with the same ointment or whatever the compound 3 is, away from the disease line to see if that would cure it? Instead of making a barrier *inaudible**

→ (Karen Neely) *So Cheryl's initial work was dosing, just putting antibiotics in the tanks and treating the whole colonies at that time, which was moderately successful, but she had better luck with the direct application. So we are not really looking at dosing, because that is not really feasible in the field.*

→ (Dale Griffin) *I am wondering if the antibiotic is getting into the polyp tissue and being distributed around the colony, cause I don't see how a little barrier would stop it. *inaudible* So something has to be happening.*

→ (Karen Neely) *Yea, I don't know*

→ (Dave Gilliam) *Sounds like a good next step*

→ (Francisco Pagan) *Another element is that there are 23 species affected, and how that disease moving, or dose of different species is defiantly different. So, some die faster than others. The bigger the colonies the more resistance is shown. So by applying something like this, we might not secure the recovery and survival of all of the corals out there, but the bigger the coral and the closer to Montestrea are, they have higher the odds that they will still be with us 2, 3 years from now. So it is not a treatment that will apply with all of the same degree of success, but might help some of those corals out there to survive.*

→ (Dale Griffin) *We are trying to get away from antibiotics because of organisms like MRSA, and stuff like that, so when you go and use a treatment like that, the environment you are just promoting antibiotic resistance. So when you go out and try to treat *inaudible* to save it, and coral is there and all of the people that utilize that area. Say someone scrapes against that coral and now they are infected with an antibiotic resistant microorganism that wouldn't have been there if you wouldn't have applied it to the environment. That's a real issue in public health. Now trying to limit the amount of antibiotics that we release into the environment.*

→ (Francisco Pagan) *In the initial permits that we have is to start with chlorine disinfectant. So right now there are no trials at all with antibiotics in the wild. Everything is just happening in the tanks.*

→ (Dale Griffin) *I think it is a great tool to identify what is causing the disease, because if you apply antibiotics and it stops the disease, then it identifies it as a bacteria.*

→ (Karen Neely) *I think it is worth keeping in mind the scale of this too, but the amount of antibiotic that we would apply to a single coral compared to the amount that is coming out of sewage treatment plants in Miami is pretty miniscule. I totally understand your concern, but I think the scale is important.*

→ (Doug Seba) *I think both of those points, in the Keys, they are fighting the tetracycline of mosquitos, not because of that par say, but because of the mosquitos that do say survive, their microbiome may be very resistant to tetracycline and that would have untold effects on the ecosystem if it got out. This is the same point that Dale Griffin is trying to making, and my bigger questions is, you said that chlorine is the only thing that you can look at, but could you try things like silver, or electricity, or UV light, or a lot of other physical things?*

→ (Karen Neely) *Yes, some of those are definitely on the table. UV light for example is basically already under development*

→ (Doug Seba) *Peroxides? *inaudible* That is why I am asking, it wasn't clear for permitting what you can use.*

→ (Karen Neely) *Chlorine has been the one that we have been talking about the most and is permitted to go through. I think that some of the others might be, we just have to but the applications in see what happens.*

3. (Doug Seba) *You have shown one dimension, is there any with depth as far as how the disease is progressing?*

→ (Karen Neely) *So it seems to be, across the reef tract, so we have done some surveys at 60 to 70 feet, and they are infected, the ones on the nearshore patch reefs also very infected. Initially, some of the CREMP data suggested that it moved off shore faster than in moved inshore, but we are absolutely not seeing that in the Marathon area, it is just working its way down pretty evenly.*

4. (Phil Dustan) *So corals have all kinds of creatures that live on their surfaces, their microbiome, and you are talking as though you are assuming that the pathogen is water borne, as opposed to something in the water that is triggering something going on in the microbiome. Very often a coral gets a disease because it has a nick in it, or lesion, and then it starts. So can you distinguish between those?*

→ (Karen Neely) *Well we do see for the most part that it will start on a coral from alive dead margin. It is rare that it will pop up in the middle of healthy tissue. It is definitely coming in from a damaged edge somewhere.*

→ (Phil Dustan) *Is there a trigger coming south? So you are treating a sore on the coral with an antibacterial treatment.*

→ (Karen Neely) *Well I think that some of the other work that took a healthy coral and an unhealthy coral is sterile seawater and showed that transmission suggests that there is a pathogen. I don't doubt that water quality, or other stresses to the coral would dramatically increase their susceptibility to it, but I think that direct transmission through sterile sea water suggests pretty strongly that there is a pathogen there.*

5.(Lew Gramer) *Kind of just a note of caution for everyone in the room. You have shown a nice even progression, I mean it is still extremely rapid, but even progression until you are just about to reach Moser Channel, which is where the 7 mile bridge goes over, there is a well-documented biofurcation [SP] there, and they move rapidly west, and east and north. So you are showing a nice steady progression against the stream until you come to Moser Channel. And then my suspicion if it is a water borne pathogen, or some other water borne trigger, if it is water borne, that rate may increase dramatically.*

→ (Karen Neely) *And we will know in the next month or two really, this has sort of worked its way down. These areas here have disease now, these areas don't. So what happens in here is a big question mark. So sort of thought the same thing about channel 5 bridge, some people thought that would be a barrier*

→ (Lew Gramer) *So it's not a matter of the channel, it's a matter or prevailing winds and the topography. The geology changes anyways. There is an old paper by Tom Lee, and basically water coming out of the bridge, if it happens to come out of the northern side of Mosser [SP], it tends to go north or east, but if it comes out of the southern side, it generally goes west. But again, what every your pathogen is, has been traveling upstream until now.*

→ (Karen Neely) *I agree, I am no oceanography. My understanding is that there is some sort of counter current that comes down and there are eddies that would make those circulation patterns in there.*

→ (Lew Gramer) *Yea, so the prevailing current in terms of the Florida current, in the channel is northerly. Offshore is a different story. The vortex generally the reef as a wall that don't inshore. Other processes may take things out of the vortexes and into the reef system but the vortexes are there.*

→ (Judy Lang) *So what you are suggesting is that it might start moving more rapidly, comparable to how it should move back north?*

→ (Lew Gamer) *Yes, and there are a whole bunch of assumptions built into that.*

→ (Eugene Shinn) *I hate to sound so negative, but black band disease started in 1967, especially in the lower Keys, and Herold Huston started measuring the progression rates on the heads, then he constructed an aspirator. He spent hours down there sucking the black band disease off and putting them in barrels. He didn't want it getting back into the ocean. He took those barrels to shore and buried them. He kept doing that, but in the end, the disease didn't stop, and kept going and as far as I know is still going. I just feel really negative about it all.*

→ (Karen Neely) *Yea, and this is not really a suckable disease, and we have talked about that with black band, trying to save some Dendrogyra, yea but this is a whole different ball game.*

→ (Doug Seba) *On that same note that Jean was asking, have you tried taking 20 harvested buds from the thing and taking an infected coral and seeing if they are more or less susceptible or resistant? And corals that have not yet been infected.*

→ (Karen Neely) *Of different species?*

→ (Doug Seba) *Yea, everyone is trying to grow corals down there to replant, but if you put one infected and a bunch of others around it to see which ones get infected.*

→ (Karen Neely) *Yea, Val and Greta have done that with some species but I don't think they have done it with species that are less susceptible. Our current permit does not allow us to take any that is not disease. The sanctuary seems pretty ok with us taking things that are diseased, but we could ask. I am also not sure if that is our highest priority work right now. It is definitely important but it is not something that we can really manage at his time.*

6.(Francisco Pagan) *So I want to take the opportunity to ask the body a question. One of the things that keeps popping up in these conversations about diseases is the use of antibiotics and the effect that it could have on the wild. Here is southeast Florida, we have contributions from not only the outfalls, but also the inlets and we have spent the last 5 years talking about the outfall and the outfall project. And my questions is if we have any information about how much is being pumped in antibiotics out there that could not only be influencing what is going on out there but inform the conversation about what it can be doing to the corals.*

→ (John Fauth) *I am pretty sure that* Piero *has information on that the outfalls*

→ (Dale Griffin) *I have a little bit of data too.*

→ (Francisco Pagan) *I would like those numbers, so if we can sit down with you later and catch up with that, I would appreciate that.*

→ (Eugene Shinn) *If I can bring up some more negatively, I am sure you are all aware of the controversy around the use of oxibenzone in the sunscreen. I would like to point out that it is not just the sunscreen that contains oxibenzone. If you look at the various cosmetics and what not, you will find that oxibenzone is everywhere. So if you live in the Keys, and take a shower, it washes the sunscreen off, or the other stuff, it all goes into the water and moves east. So this is a big issue that will come to this area pretty soon. I just wanted everyone to be aware of it.*

→ (Judy Lang) *Not just in the medicine cabinet, look under the sink*

→ (Francisco Pagan) *Thank you Jean, and it that spirit I want to continue with the agenda. So now Joanna is going to talk to us briefly about the National Academy of Sciences Initiative.*

Session IV: State of the Corals & Fish

→ National Academy of Sciences Updates- Joanna Walczak
  → Joanna was called on to advise the group on assisted evolution of coral reefs in the short and long term.
  → Actions need to be brought towards the issues necessary to allow the corals to persist and survive
  → The data coming to managers is actionable instead of worrying about the high levels of academic studies and more manageable and plausible studies

Questions and comments for Joanna Walczak

1.(Phil Dustan) *Since the early 1980's, every time we have done something like this, I even helped create the coral reef task force, the thing is that no one wants to take political action to do what is necessary. The science action has been here for a long time. So are you inviting us to give comments on the political action that needs to be done?*

→ (Joanna Walczak) *I am inviting you to actually craft language and statements with our science that actually resonate with those politicals because that is where we have fallen down. The science has been here for decades, but we need to work on communicating it effectively.*

→ (Phil Dustan) *I think that we have been effective at communicating, they just don't want to act.*

→ (Joanna Walczak) *I defiantly think that there is some of that. I will not disagree with you on that for sure.*

→ (Phil Dustan) **inaudible* Look at 99% of our information on the reefs that come from curious people.*

→ (Joanna Walczak) *That is because of the federal policy. There has been a really big disconnect between the scientific community and the management and policy communities. Working on the task force, as a coral reef biologist, I am one of the only ones.*

→ (Judy Lang) *But collectively, we aren't going to change the system.*

→ (Joanna Walczak) *No, absolutely.*

→ (Judy Lang) *But maybe the time has come *inaudible* political disconnect.*

→ (Joanna Walczak) *Yes, I think you are right Judy. I think it is time to engage this. And when I said go to your peers, I meant go to your scientific peers at home, and every person needs to be charged with talking to every other person and getting people educated on these issues. So what we are trying to do is to frame consistent talking points for people so the same messages can get amplified by the broader folks.*

→ (Judy Lang) **inaudible**

→ (Dana Wusinich-Mendez) *To kind of build onto what you are saying, we have provided the information and the politicians and elected officials make their decisions based on amount of people that are behind them. So while we may have provided all of the science and dumbed it down enough for some of these folks to understand it, they aren't going to make those decisions unless they have that*

parade of people behind them. I think that we have fallen short on providing information about the value of the reef system.

→ (Judy Lang) *No one has been successful at that. Since the late 60's*

→ (Dale Griffin) *There have been examples of this in the state of Florida. There are communities and leaders that have taken the necessary steps to create an environment that is resilient. Tallahassee spent 60 million dollars upgrading to quaternary waste water treatment plants because nitrates coming from the facility were infecting the water. The other is the Keys, finally there is an effort to take all of those septic systems out and convert to waste water treatment. If you want to make a change it is going to cost money.*

→ (Erik Ault) *I think what Joanna is talking about is that we need to shift our mental model because we are under the assumption that everyone operates how we do. We get facts, we understand things and we automatically know what we need to do. Education and knowledge is great, but it doesn't change the will to do something unless you target it. If you look at the barriers that are preventing it. It is really changing how were are thinking about things and understanding what is going on to create change and get the action.*

→ (Judy Lang) *And they are representing their community *inaudible**

→ (Erik Ault) *They aren't going to have the stats, they are just going to say that this needs to happen. And that's how you get action, in their terms.*

→ (Phil Dustan) *So what do we need to do?*

→ (Joanna Walczak) *Yea, I think this is just the beginning of the conversation. We are trying to have this conversation across all jurisdictions, all the coral reef community.*

2.(Doug Seba) *I think all scientists understand how to evolve and adapt, but I think *inaudible* so what are three points that would constitute actual data and bringing to a political authority.*

→ (Joanna Walczak) *Yea sure, the first one is why do we have a clear turbidity threshold for coastal construction. We have some information but I don't have a clear statement that say definitively say that a decent level to set your permit standards is X.*

→ (Dale Griffin) *That wasn't needed to change the Florida Keys. The science down there drove that change.*

→ (Joanna Walczak) *Yes, and we are trying to change the conversation. Do you remember what was successful in the conversations down there?*

→ (Dale Griffin) *Yea I think it was a combination between the chemistry and public health department down there. It was the tracer studies and septic studies that John Paul and John Rose did that was a huge thing. And tying it into public health and convince them that there is a risk and create that bond and the tribes change.*

→ (Joanna Walczak) *And we are doing that with the outfalls and the in situ studies.*

→ (Piero Gardinali) *But having said that, we have some examples of the coastal flooding solutions right now where, where flood waters should not be put back into anywhere and the politicians solution is to chop off the head of the scientist.*

→ (Joanna Walczak) *Unless we give them a better solution, because I work on the Biscayne bay issues as well, and the storm water pumps are at the forefront of that conversation.*

→ (Piero Gardinali) *ask for potential solutions before implementing on the back end, so you are asking us to have frank conversation, we need to have a frank conversation at all levels.*

→ (Joanna Walczak) *Absolutely, if we have examples of things that work, definitely bring those to the table and have those conversations. And it is difficult where you have positions changing every four years but it important to repackage the information and work with the economic tie and why it is so important to protect these resources.*

→ (Francisco Pagan) *I would like to add, some of the sinks that we are talking about already were considered years ago. But systems change and there has been change to those social systems. Due to the disease event, the conversations that we are having are different. There are elements that are more open to conversations. And that kind of change means that we need to adapt. That if there is an opportunity to have that conversation again, we should not discard that opportunity because 30-40 years ago we failed to make that connection, as a body.*

→ (Dave Gilliam) *I would like to not stifle, we do have 2 sessions tomorrow to dedicate your comments and questions, but we do have some presentations to give. As we are hearing these, it is important to save that energy and ideas for tomorrow.*

2. SECREMP- Dave Gilliam (NSU)
   → Project History/information-
      i. 2003 no monitoring program in the SEFL region
      ii. Sites began with 10 and now has 22 sites presently
      iii. Fixed belt transect sites looking for stony Corals, long spine urchins, Barrel sponges, octocorals
      iv. Photos taken per transect and point counts created for different reef species
   → There is a hint that the disease is prevent and was moving north in 2015 and 2016 seen in the single time observation SECREMP study

→ Slight increases in coral densities are seen in the brooding "weedy" species acquiring open space from the newly dead corals
→ Dichocoenia and meandrina Live tissue is 99% gone and 50% loss in M. cav tissue over the disease
→ Present/absent values are still the same, but more juveniles than adults now
→ Small species (4-10cm) are higher in abundance and >10cm species are much lower in abundance.
→ Long term monitoring purpose
    i. Identifies long term trends that can be attributed to change
    ii. Adapted for management needs without a funding supply be marine construction
    iii. Ability to maintain history of sites for training and added research questions (recruitment and fate tracking)
    iv. Costs are needed for long term and increase in sites and training
    v. Errors are often present in the long term studies

<u>Questions or comments for Dave Gilliam:</u>

1.(Judy Lang) *I would like to ask where and how you select your sites.*

→ (Dave Gilliam) *Certainly some of that discussion is making the distinction between random sampling and versus where your sites are located.*

2.(Phil Dustan) *The original idea for the monitoring project in the Keys was to detect change and eliminate spatial variability. Many of the things you have put back in as far as demographics *inaudible* if we had that stuff from then we would have a much more complete picture overall.*

→ (Dave Gilliam) *Yea, staring back in 2011, TAC at that time, there was a workshop that Nova put on and there was a number of things that were happening as far as a recognition that we needed to take more of a demographic approach. And we wanted to essentially ask, can you modify your methods to get more demographics.*

→ (Phil Dustan) *We knew that we needed both and had to cut some out *inaudible**

→ (Dave Gilliam) *Yea, and we are doing that this year. Like I said, you know, we have 6 years of demographic data on 5 target species and we are dropping it down to 3, just by choice. We feel that the effort going into capturing more information on these smaller size class populations is worth losing some information on 2 species that are frankly hard to identify in the field.*

→ (Phil Dustan) *A nice way to put it, and as Vlad has said, monitoring should be like how you monitor the weather. So imagine if the weather guy said we are going to forget about some storms but concentrate on hurricanes, so that is the balance.*

3 (Judy Lang) *I am very glad that you will be adding the 4 cm corals.*

→ (Dave Gilliam) *Yea, the first year of any program is learning. Data modification is a bit of a learning curve. When we first added stony coral demographic data, I was gung-ho. We were going to do all 22 m of stony coral, and all of this, and all 22m of octocoral and after the first sites, my students were just ready to strangle me. That is why we needed to modify it. Unfortunately there are not as many colonies to put eye balls on as there used to be.*

→ (John Fauth) *I think that is a good decision, because on of the patterns that I think I am seeing in the data is a pattern of senescence showing through, so the bigger boulder corals are the ones that are getting wacked. We've only done a few studies on that and looked at the general responses of a boulder coral vs a weedy coral. What we are seeing is that the older corals can't seem to be able to respond as strongly to general stressors. They seem respond to specific stress, like thermal but not general ones. It's like the conversation we had back here about how many people got knees replaced, just wear and tear grinding away and that is what these guys are facing out here, and eventually something happens that pushes them over.*

→ (Dave Gilliam) *I think that is the disease vector. *inaudible* You know, no matter what we do with all of the things that we are doing, we still aren't getting at the why and that is always a challenging question to get to.*

→ (John Fauth) *I think that the why is misdirected. If these had clean water, that would take care of how much of the problem, most of it. You just have temperature left, right. The problem is that a lot of the issues that need to be taken care of are not site specific, they are from the everglades, or Florida bay, outfalls, so without having a management plan to go to, who do you go to? And even if you did, those stressors may fall outside of your zone.*

→ (Phil Dustan) *It is a scale issue*

→ (John Fauth) *And I think going down and looking at those younger coral is really going to pay off in the future because if they get up to a certain size and then are gone too, that is going to tell us a completely different story then if the reach a large size. So being able to follow those as they go, and track individual colonies would be really valuable.*

→ (Eugene Shinn) *You have to be careful, and I can send you *inaudible*, the ones that get the size of a basket ball then all die.*

→ (Dave Gilliam) *Terms of size class, yes.*

→ (David Cox) *Going to take an unofficial break, we are a little behind schedule.*

3. Reef Visual Census (5 year summary)- Kirk Kilfoyle (NSU)
   → Data from 2012-2016 examining the abundances and sizes of ecologically important reef fishes on natural habitats only in May-October 0-33m depth

→ 65 divers and 1360 sites using point count observations 347 species observed
→ Red Grouper-8.4% observed to legal size, Mutton Snapper- 24% observed to legal size, Gray Snapper 27.9% observed to legal size, Yellow tail snapper 9.2% observed to legal size, White Grunt 43.5% observed sexual size, Blue stripe Grunt 57.8 observed sexual size, Hogfish 25.1% observed to legal size 2.6% reproductively active males, Gray Triggerfish 8.8% observed to legal size, Red Lionfish- 62% greater than observed sexual size
→ Dry Tortugas and Florida Keys have higher sizes and abundances in most species of fish in comparison to SEFL

Questions and comments for Kirk Kilfoyle:

1 (Eugene Shinn) *Are the Nassau Groupers gone?*

→ (Kirk Kilfoyle) *Nassau grouper we don't really get in our area, there was one report of one but I have never seen one.*

→ (Ken Banks) *I saw my first one after 30 years!*

2. (Doug Seba) *My questions go back to be bigger topic which is the actionable data. You showed what you did about the lion fish and it seems strange to me that it is a perfect example of actionable data. When compared to the hogfish or the yellow tail and everything up to the present has been a sort of ad hoc thing, diver derby. There is a huge resistance to putting out traps because people don't like them. So my questions is, is that actionable data, or more stuff that we are supposed to do with anymore.*

→ (James Byrne) *There have been several EFP's given in both the south Atlantic and the Gulf for lionfish trap testing and I think the one for the Florida Keys National Marine Sanctuary is getting ready, and I think that we actually have some traps and open the doors to let lionfish in that won't let other fish in, so they are working on it.*

→ (Doug Seba) *It has been so apparent for years that the huge problem, like the disease that we were looking at earlier, that the response has been very unique from my perspective. When you see how it looks with these populations.*

3. (Phil Dustan) *Do all of these fish have normal distributions in terms of an Alex function? We are sort of looking at a survival curve, do they all sort of assume a normal distribution?*

→ (Kirk Kilfoyle) *Not all of them, and some of the stats on this are a little more complex that what we are used to dealing with. I might defer that to the experts a little bit.*

→ (Phil Dustan) *It is interesting to think that all fish don't have a normal distribution*

→ (Kurtis Gregg) *On thing that this we are looking at compared to the Dry Tortugas, give us, where does that tail end in Florida. How big do those fish get in Florida and how do they compare with other populations?*

→ (Phil Dustan) *If that is your reference *inaudible**

4. (James Byrne) *I was wondering about the time frame of these species to reach that exploited phase. I know with yellow tail, and their size you might see it in a year or two. Grouper we might be talking 10-15 years before we see the population change. And that is what I was wondering when you talk about them changing size classes, what type of time frame were we looking at to see that population change.* And does that explain why maybe in the Tortugas we don't see the shifting yet.

→ (Kurtis Gregg) *I think that can be informed by the age and length keys that have been collected in the fisheries independent data sets for a long time. We can get that information, but in this work we haven't quantified it yet.*

→ (James Byrne) *It might be useful to get out there to set expectations appropriately. That's what happens a lot of the time, when people think that if you change the size standards of a fishery, you automatically get a response.*

→ (Kirk Kilfoyle) *We are just scratching the surface as far as the analysis that can be done with all of these species. Just a low hanging fruit, so to speak.*

→ (Don Berhinger) *Does this method take in to account reef rugosity at all, or do you set up these sites in such a way that rugosity doesn't play in?*

→ (Kirk Kilfoyle) *When we do allocation they do specify high relief versus low relief, and when the divers go in, they may target more relief as a factor.*

→ (Don Berhinger*) Because I would think that, I don't know of the top of my head, is there a gradient compared to here and the dry Tortugas? Or that decreasing rugosity actually decreases your change of seeing a fish. There might be a greater disparity between say here and the Keys compared to the Dry Tortugas.*

→ (Kirk Kilfoyle) *That is a good point, we should look into that.*

→ (Kurtis Gregg) *I think Brian Walker has to a pretty good extent, and that he has looked at those variations, and that is how he came up with high relief and low relief, because there was not a gradient that he needed to parse into individual pieces.*

→ (Judy Lang) *It is also behavioral because the grouper in the Dry Tortugas don't move because they know there, it is high rugosity but you can also count them really easily.*

→ (Kirk Kilfoyle) *We have a lot of low relief, hard bottom pavement here compared to some other regions, so clearly going to make a difference. So we still have to pair this with the habitat data, so there is a lot here that we can look into.*

5. (Esther Peters) *So the length limits that have been changed. Were they changed based on fishery dependent data?*

→ (Kirk Kilfoyle) *I would say largely so.*

→ (Esther Peters) *I mean, would they consider looking at these data too?*

→ (Kirk Kilfoyle) *I think that the discussion to change the length was made before this data was public.*

→ (Esther Peters) *Do you have any plans to present a sort of educational talk to fisheries groups? Recreational fishing groups?*

→ (Jay Grove) *Stock assessments have used these, particularly for black grouper in the Florida Keys and the yellow tail in the Keys, so they are using this data along with recreational data.*

→ (Esther Peters) *Ok, is there any way to educate the fisheries folks around the area and this is what they data we found is saying. We definitely have some issues here with trying to get our fish populations especially more mature ones that can spawn up another 10cm or so in length, that would help replenish the populations better.*

→ (Jay Grove) *That seems like the common communication breakdown between scientists and management. We are trying to form a report to local managers.*

6. (Piero Gardinali) *Before we move on, can I ask a quick question about that graph? Is it abundance and?*

→ (Kirk Kilfoyle) *It is abundance and length*

→ (Piero Gardinali) *I am assuming that all of the areas are normalized to some spatial constrain.*

→ (Kirk Kilfoyle) *Amount of habitat is a factor as well. You compare the amount of real estate here compare to the keys and Dry Tortugas. Even though it is a smaller size, there is a larger population.*

(David Cox) *Just a quick note before we move on… we will check then and we will continue*

(David Cox) *Does anyone want to make a public comment?*

***No Public Comments**

4.NCRMP-Jay Grove (NOAA)

- → NCRMP- national coral reef monitoring program- monitoring reefs in all united states and territories coral reefs
- → Goals: collect scientifically sound data, develop consistent protocols, deliver data
- → Data sets are available for researchers, reports for management, and high level documentation for reports to congress
- → Florida reef sampling will begin to occur every other year
- → DRM and NCRMP will co-allocate sampling and get good coverage of Florida, NCRMP will begin tissue cover for disease work and DRM will begin rugosity sampling
- → 1060 sites sampled, 360 sites in Dry Tortugas, 400 sites in Florida Keys and 300 sites in SEFCRI all for fish
- → 420 sites sampled 140 sites in Dry Tortugas, 150 sites in Florida Keys and 130 sites in SEFCRI all for benthos
- → Exploited species generally increased with reserve and decreased with hurricanes, Non-target species indifferent with everything except cold snaps (increased), Moratorium species indifferent in events
- → Protected areas were too small and ineffective for all species

<u>Questions and comments for Jay Grove:</u>

1.(George Sedberry) *The exploited species that you mentioned have been the subject of other management plans. They have minimal sizes, bag limits, spawning season closures, a lot of different regulations. I wonder if you have had a chance to look at when those regulations came into place, they had any effect on what you are seeing, and the effects of hurricanes or cold snaps, or things like that.*

- → (Jay Grove) *The ones that I am presenting to you, we looked up the regulations and they had not changes, except for the black grouper.*

- → (George Sedberry) *In state waters, the federal regulations affect them as well I am sure?*

- → (Jay Grove) *Yea, it's possible, but these state waters extend, the reefs are pretty close to shore.*

2.(Joanna Walczak) *I just want to caution your slides specific to the zones, potentially because those zones were not created for fish.*

- → (Jay Grove) *No, they were not.*

- → (Joanna Walczak) *I think it is important for people to really understand that, they didn't fail because they were not designed for that specific need. So it would be interesting to look into the data that was designed for that specific purpose.*

→ (Jay Grove) *Yea, that is a great point, I never know how much to say because people expect them to change for fish, so yes, you have to put it in context. They were not designed for fish, but people still expect a response from fish.*

3.(John Fauth) *So sort of piggy backing on that comment, going back to Kirks previous talk, where he had a lot of the slide are numbers of fish per density. That can lead to some of these expectations due to scale reasons*.

→ (Jay Grove) *It is per square meter, 177 meters squared.*

→ (John Fauth) *The previous talk was not, so it should be scaled up so*

→ (Kirk Kilfoyle) *What she is saying is correct, they are both based off.*

→ (John Fauth) *If you have these small reserves that are meant for benthos and not fish, if you increase the length, it might affect if you go from 0.2 to 0.4, it a doubling from basically 0 to 0.*

→ (Jay Grove) *We get good statistical power from the sites that we have. We run the CV, coefficient variations as we are targeting a value of 20. If we can get below that point, it is great. But I should mention, that we target from those the exploited species trying to get really good representation from then, we end up getting a really good representation of all of the other species. We do have the capacity to add additional sites.*

→ (John Fauth) *It would be better to go spatially and habitat then add another site.*

→ (Jay Grove) *Exactly, and that is what those numbers are based on.*

4.(Phil Dustan) *Just out of curiosity, in the pacific, we have 3 50m transects that we work off for fish, and they are linked together. It has been criticized if you don't have the transects linked together because fish roam, but the data is reported as per 100m squared as opposed to per meter squared.*

→ (John Fauth) *That makes sense, that is correct.*

→ (David Cox) *Thank you very much. I am going to give you a quick update on the CRCP projects*

Session V: CRCP Project Updates

1. FRT Water Quality Monitoring- David Cox (FDEP CRCP)
    a. 88 sites have been added in 2017 to total 115 sites
    b. There seems to be no difference in depth and the trends may hold true
    c. More data to be analyzed soon
    d. Monitoring sites may be decreased or changed due to less money
2. DEP Turbidity Project- David Cox (FDEP CRCP)

a. Turbidity readings will be taken at areas of construction from a non-bias area to create a metric to measure sedimentation in the future

3. Outfall Project- David Cox (FDEP CRCP)
    a. 32 samples per season at Hollywood and ocean outfall and 3 samples per season from Broward North WWTP and Miami North WWTP
    b. Samples done by Dale

Questions and comments for David:

1.(Phil Dustan) *One aspect about the measured PAR in shallow waters because the dominant effect in the reduction of red light in the first 10m.*

→ (David Cox) *And that is something that we are really looking into.*

→ (Phil Dustan) *Need to do it spectrally as well. PAR is an easy measurement to make, but it doesn't mean anything because of the loss of red light so quickly.*

2.(Lew Gramer) *Yea, along the lines of PAR and the wafer fraction, your sampling time, and how long you are actually sampling is important.*

→ (David Cox) *Yea, so the data analysis is going to be key in the field to document any compounding factors.*

3.(John Fauth) *I am still a little nervous that those samples are too close. I'd be happier if we had a couple more that were on the far side.*

→ (David Cox) *Well, maybe we could have some topic later on with*

→ (Dale Griffin) *I think we have the control sites built into it*

→ (David Cox) *I thought the 400, 800 meters are the control*

4.(Dale Griffin) *There are 15 antibiotic resistant targets. Ken has sent me water sample, influences from the waste water treatment plant. 11 of the 15 targets lit up from extracting the DNA.*

→ (David Cox) *That's it. 11 of the 15. The initial objective this is phase 2 of the project, this is what everyone agreed what best of our budget and goals it is coming to fruition. We have a tentative dive team set up and should have some results by the next TAC meeting.*

5.(Jack Stamates) *If you don't mind I just want to throw out something, I was looking at the Miami waste water plan for after 2025, interesting stat came up, they are able to dispose 5% of the average flow through outfalls, however, they are anticipating at the northern most outfall 161 days and the central area, there will be 190 days until it flows out of the outfall. So even though there is only going to be 5%, of the mean flow from the outfall, in some cases half the days of the year.*

→ (David Cox) *It is interesting of the wording, as we are talking about hundreds of millions of gallons a day.*

→ (Dale Griffin) *I am just surprised they have not decided to upgrade their facilities. Tallahassee is a city of 200 million people and they spent 60 million dollars upgrading the system to protect the environment, and rather than replacing the pipes or rerouting, you would be better served upgrading your systems and the pumping offshore.*

→ (Kurtis Gregg) *To jump in on this Dale, the point of closing the outfall wasn't for conservation of the coral reefs, it was to increase conservation of freshwater on land. That is why they were connected in the statute to begin with. … The folks in Tallahassee saw that we were running out of fresh water here, said stop pumping water off shore.*

→ (Jack Stamates) *They estimate that the need is no longer present, and by 2035, our water goals with using the Floridian aquifer*.

6.(Piero Gardinali) *Does anyone have any knowledge or why, we are on the north campus and we lost all of the reclaimed water, we were told that we were not allowed to use reclaimed water anymore. Does anyone know why?*

→ (David Cox) *Is this the North Campus, might have something to do with the proximity to Aleta [SP], but I don't know.*

→ (Piero Gardinali) *But it is going to be something in the water itself.*

→ (Judy Lang) *They are having problems *inaudible**

→ (Piero Gardinali) *All I know is a conversation between FDEP.*

7.(Francisco Pagan) *Thanks group for being there and updates.*

4. Boynton ICA WMP- Kurtis Gregg (NOAA)
    a. Point sources in SEFL include inlets, septic systems, and watersheds
    b. Inlet pollution estimates were created based off the land slopes and other factors
    c. Inlets weighted for priorities- Jupiter, Boynton, Government Cut, Lake Worth Inlet and St Lucie
    d. Boynton inlet analyzed to try management strategies
    e. Based on the analysis, management plans are being drafted to make a successful management plan to reduce pollution on the reefs off Boynton inlet in the end of May

<u>Questions for Kurtis Gregg:</u>

1.(Dale Griffin) *What are the plans to deal with these big releases out of Okeechobee that cause these?*

→ (Kurtis Gregg) *So the Saint Lucie watershed has a management program, South Florida watershed district and the army corps of engineers, so that mitigation has to happen through that regulatory releases, flood protection comes first for those lands, the environment comes later.*

→ (Dale Griffin) *Is there a reason that the release can't go south, and not due east?*

→ (Kurtis Gregg) *Yea, that comes from a court case, the 10 ppb, the water can't have more than 10 ppb of phosphorus into the everglades, the issue is that rain water has 10 ppb phosphorus. So the natural system cleans that water into the river, than to Lake O, and out of there, it got it down to 10ppb but our engineered system doesn't work that well.*

→ (David Cox) *And another one that was just permitted is south of Lake O also, that will be 20 feet deep*

→ (Kurtis Gregg) *That is a flow equalization basin, that will hold it over time and bleed out over time.*

→ (Dale Griffin) *You have these nice plans, then an event happens and you have to open the gates.*

→ (Kurtis Gregg) *These features will help prevent that in the future. I mean, oysters can only take fresh water for so long, 14 or 15 days before they start dying and they are gone. There was some data collected that they were below that mortality threshold for 56 days. So to even have those oysters in that estuary is, but when we have some dry cycles, dryer years or dryer wet seasons, those oysters will come back over time.*

2.(Lew Gramer)I heard that you were sending this to me?

→ (Kurtis Gregg) *Yea, I thought this might be of interest to you. (chuckles)*

3.(John Fauth) *Are there plans to pick another watershed after this one?*

→ (Kurtis Gregg) *That's going to be up to the guidance from the SEFCRI team, TAC, and the other programs.*

→ (John Fauth) *This happened amazingly fast, from the selection to the first report coming out. It was 3 years, not even. That was amazingly quick work.*

→ (Kurtis Gregg) *This was done with the intent to make the templet that other water sheds or ICUs that could be plugged into but I don't know of any plans to make another ICU*

→ (Dana Wusinich-Mendez) *The next step after the plan is finalized is to try and start to implement some of the goal of the plan and understand the impact.*

→ (Kurtis Gregg) *I do know the next steps that is in the works, and it is something that David is working on, and is basically a best management practices manual for municipality scale practitioners who are designing the specs for retrofit projects. We can compile the information through that manual that they can set up their specs for.*

→ (David Cox) *That brings us to the conclusion. Thank you very much.*

DAY 2 FALL 2018 TAC MEETING

Welcome, Meeting Guidelines/ Agenda Review/ Overview Day 1 Discussions

→ (David Cox) *Just so we are on the same page, each of the TAC meetings has been done with way, with a live webinar. These are microphones, they don't pick up more than a murmur in the groups, just so they don't get upset that they can't hear anything, but they are defiantly can hear the presentations.*

→ (Phil Dustan) *Is there anyone out there? Is there anyone listening in?*

→ (David Cox) *Yea, there were about 5 yesterday, I think 12 signed up today. Just wanted to let you know also that we switched around the presentations this morning. We are going to move Hurricane Irma impact down to the third spot, we are going to start off with the hurricane jelly and Jean Shin is going to preface that with a little history also. Lou Gramer had also asked that we slip him in also, so he is going to kick off the day with some upwelling results and couple of things. I did get a chance to introduce Erik Ault, he said we was going to be here both days, so I was reticent on that. If you didn't know, he is our newest TAC member. We do have 3 seats open so if you know anyone who might be interested, please come speak with Francisco, Aubree or myself. We do have another CRCP employee, Alisha Shatters. She comes from FIU and Harbor Branch as an assistance coordinator. Last but not least, I would live to take a moment of silent for our friend.*

→ (Francisco Pagan) *I want to thank Meghan Balling, this is her last TAC meeting with us, she is moving on with her career. She is still with us until the end of April, but I wanted to thank her for all of her contributions to SEFCRI and TAC. Thank you.*

→ (David Cox) *With that we will kick off the days' festivities with Lou.*

Session I: Disturbance

1. Upwelling on Southeast Florida Shelf- Lew Gramer (UM RSMAS/ Keys Marine Lab)
    a. Cool water events occur deeper the further north on the FRT
    b. Sea surface temperatures is in relation with the nutrient levels

<u>Questions and comments for Lew:</u>

1. (Phil Dustan) *You talk about nitrate, what about phosphate?*

→ (Lew Gramer) *Yes, interestingly, the ratio in the casts between nitrate and phosphate is 10:1. There is a robust relation relationship between them, again in am not a chemist,*

→ (Phil Dustan) *So 10 nitrogen to 1*

→ (Lew Gramer) *Yea, we estimating both based on sea surface temperatures and I am using a linear relationship.*

2.(John Fauth) *This is more question for the group that dives here, during these cold water events, does anybody notice any freshwater occurrence?*

→ (Dave Gilliam) *I think generally you are so in shock that you are expecting warm and you get in a hit 70 degree.*

→ (Erik Ault) *Are you talking about the fuzzy, unclear water?*

→ (Lew Gramer) *Not the unclear water, but the differences is density and refraction, I didn't look at salinity in particular, but do have data on density. If it was submarine ground water discharge, and not a mix, which I don't know, you would expect an inversion, that we don't see.*

2. Hurricane jelly – Franscesca Toledo-Cossu/Dylan Peck (USF)
    a. Jean Shinn introduced hurricane jelly being discovered as a mud layer by the reefs
    b. Corals and Xesto sponges were damaged and diseased possibly by sediment
    c. Stable isotope analysis on inorganic and organic compositions of the jelly and surrounding environments
    d. Isotopes of the organic compounds suggests everglades origination
    e. Isotopes of inorganic compounds are quite different than whiting and shellfish compounds
    f. X-ray Diffraction analysis and increased spatial resolution of samples will be later implemented

<u>Questions for Franscesca Toledo-Cossu and Dylan Peck</u>

1.(Kurtis Gregg) *What is the time getting the XRD fixed? Because, that is really the information that is going to inform*

→ (Francesca Toledo) *Yea, they said by the end of the semester, I hope soon.*

→ (Dylan Peck) *We have also been discussing with the academy at USF, they have one that is running, but there were some flaws in communication, because they are right down the road and the timeline on getting it fixed was much shorter in the beginning but hopefully sooner than later.*

→ (Kurtis Gregg) *The reason that I ask is because we have access to Dr. Schwartz lab, NOAA fisheries has access to Dr. Schwartz lab for some other work that we are doing. If the repair was the impediment to getting this answer, I was [SP?] when he collected the samples from Looe Key and others sites, so that is a burning question of mine, having seen the mud from down there on the reef. Down there we first thought it might be Florida bay origin, and then on the cruise using google saw some of Dr. Shins publications and reevaluated our thoughts.*

2.(Dave Gilliam) *We did see it after Wilma as well if that means anything. It was a much different hurricane story from Irma, and in the same locations that we saw it after Wilma.*

→ (Ken Banks) *In 2005 it was a complicated, it wasn't a simple hurricane, it was a field of hurricanes that didn't hit us, so it is complicated*

→ (Francesca Toledo) *Yea, it seems to occur after every storm.*

3.(Lew Gramer) *In that regard, have you gathered any data that might give you some clues to transport mechanism?*

→ (Francesca Toledo) *Not yet, which is why we are here also. Any clues to that would be great.*

→ (Lew Gramer) *I would love to talk to you about it.*

4.(Arthur Mariano) *I just wanted to comment, in that image, it looks like a large plume coming off the bank, it didn't look like in this event it affected anything. Other events that might be a large possible source.*

→ (Francesca Toledo) *Yea you can see that there. It seems to be going into the channel and not so much*

→ (Arthur Mariano) *It is quite an impressive plume.*

→ (Eugene Shinn) *There is defiantly mud coming off the Bahama bank, and this has been a problem for years because we measured how much was coming from whitings and knew how much was coming off shore. Now Greg Everyly [SP] used a Johnson Selink [SP] and was diving out in the straights and that is where the mud was. He found a pile of it 100 m high, it was aragonite. The stuff on this side, it just has to be more of a mixture. I can tell you from watching the effects of a few hurricanes that mud gets deposited on places of the reef track that it shouldn't be there, so every time the wind gets above 15mph, it stirs up and you can't see anything, and it still goes off the slope for quite a while, and that lasts for 2 to 3 weeks.*

→ (Ken Banks) *I noticed that after hurricane Sandy, just as it came up from behind the Bahamas before it hit new York, we didn't a helicopter ride to check the beaches, the coastal waters looked like café con leche. It was just way off shore, and made me think that we are agitating much more deeply, that only occurs in a hurricane, so that particles that generally are not suspended are. So I thought that a lot of this could come from deep within the sediment.*

→ (Eugene Shinn) *I can comment on those, one of the mysteries that we have had for years, was the Miami oolite, which is a cross-bedded sand with layers of mud and thought that it shouldn't be there, it was current deposit that shouldn't be there, and then we started seeing it in channels where there were big dunes with layers of mud. So when Hurricane Andrew came by, we hopped in the boat to places I knew pretty*

well in the keys and sure enough, there were fresh layers of mud. So that mystery was solved. So I think you get a thick slurry and if it sits and compacts, you can break it with your hand.

5.(Lew Gramer) *Just one quick additional comment, someone mentioned in 2005 when there was a Category 1 storm, it was kind of a direct hit, in remote effects here in terms of hurricanes and there is a lot of evidence that hurricanes affect the temperature of the reef line when they are 300 km away, so have you put and thought into these sediment plumes when there are not direct impacts, but indirect ones. Might be worth looking into.*

→ (Dylan Peck) *I think that transport is definitely one of the next steps. Hopefully with collaboration with others, we can get a grip on that.*

3. Post-Irma Turbidity & Costal Models- Robert Weisberg (USF)
    a. Based on the dispersant of water in the Florida bay, then later the water filled back in causing water to move over the Florida Keys
    b. Modeling of the storm was overestimated based off wrong wind speeds
    c. The model suggested that transport of sediment was transported across the cuts in the keys and are moved east and up the coast
    d. Sediment only close to the Florida Bay goes through the keys while sediment further off the coast resides in the bay
    e. USF has trajectory, current, and *K. brevis* tracking models
    f. High Resolution TBCOM was excellently simulated in the Tampa bay area during the hurricane
    g. WFCOM is portable to anywhere in Florida based off of nesting in HYCOM and FVCOM

<u>Questions and comments for Robert Weisbert:</u>

1.(Phil Dustan) *I was fascinated by you showing the change in sea level as the hurricane progresses north. And what strikes me is it pulls the water from in front of it and pulls that into the storm surge, is that correct?*

→ (Robert Weisberg) *So how a storm surge actually works is, if you are in really deep water, basic Ekman theory, the transport is to the right of the winds. But as you get into shallow water and friction becomes a component with the Coriolis force, transport is down wind. So what happens, you have probably heard the term 'forerunner' but a forerunner is a rise is sea level or set down deepening on the winds only to the Ekman transport, then as it get shallow it is downwind transport. So it all has to do with the transport of the wind relative to the land. On the west coast of Florida, if Irma had tracked a little farther to the west, so it is now going parallel to the coast, the sea level would have been put down due to transport away from the coast and as the storm went by it would be set up. It really has to do with the orientating of the track relative tot the land.*

→ (Phil Dustan) *But that set down is 100 of miles from the storm*

→ (Robert Weisberg) *Yea, cause these storms are big. It's not really how far from the eye, but how string the winds are as it is approaching.*

2.(Ken Banks) *The 05 year when we had the jelly and hurricane, Those storms were coming into the Gulf more, and Wilma came across the state.*

→ (Robert Weisberg) *Wilma is a character in Jellystone National Park, it came from the east.*

→ (Ken Banks) *Yea, and that further suggests that stuff came just like you said*.

→ (Robert Weisberg) *Yea, and Wilma came ashore near Naples, but it came west to east, so behind Wilma, the winds were blowing strongly to the south. So that would have transported stuff in the same way. When Andrew came across, you would have northerly winds in advance, same with Katrina. All of those, in 2005 you would have transport from Jelly Stone from a few of those storms.*

→ (Don Berhinger) *You basically you are going to get it each time, it is just whether you are going to get it initiated in front or behind.*

→ (Robert Weisberg) *The other thing that happens every winter, is we get all these fronts and strong northerly winds, and I think that they stir the sediment to transport it, and you get sediment events at least once a winter, even if it is not a large storm.*

→ (Doug Seba) *I have a comment and then a question. In 1948, on Anna Maria Island, I saw Tampa bay completely empty, and when our talk with Jean that is some kids story. And I say honest to god, except for the channel, I could have walked across and when I saw on your model the huge changes, that confirmed that. But my questions, is there a sort of integrative function, cause living in Key West, post Irma was the dirties water I've seen in my entire life down there and you are showing what happened on this day, but what is the cumulative transport of all of this stuff and fronts?*

→ (Robert Weisberg) *Yea, that would be something really interesting to investigate, but any time you have strong winds you will stir things up.*

→ (Doug Seba) *But the transport and nutrient might be much more significant than these episodic events.*

→ (Robert Weisberg) *It would be something that we would have to do. And it brings up the health of the reef in the Keys also. Temperatures rising and everything is dying, and there is a lot more going on and we can explore those hypothesis looking at models. We can explore those in the future.*

3.(Lew Gramer) *Just one last quick question, thinking in terms of extending your domain, to the south east Florida shelf? have you looked at coupling and have you looked at two-way nesting?*

→ (Robert Weisberg) *So we do one way nesting, so we are getting and being influence by the HICOMP. That does have a profound effect on the coastal ocean. The 2-way nesting would be like the tail wagging a dog. I have never felt compelled to engage in 2 way nesting from a practical point.*

→ (Lew Gramer) *The difference you face is the west Florida shelf vs SE Florida shelf.*

→ (Robert Weisberg) *I get your point, we have found that 1 way nesting is that if you do it right, it tends to work really well. And so there is enough room in there to nest the models and not screw up the shallow models. You can also go right into the intercostal water way with this model and have all of the regions with nutrition flux.*

→ (Lew Gramer) *The other question is the wave modeling*

→ (Robert Weisberg) *So we have done that too, and the model we are using has a built in wave component, and we have done that. There are certain things of interest for some, and certainty things it is not. The model also has an ecological component, and every time you add something you need more computer power. So there are some practical limitations. If you do not get the circulation right, then forget about everything else.*

→ (Arthur Mariano) *Beautiful tirade.*

4. Disturbance Response Model - Jennifer Stein (FWC)
    a. Florida Reef Resilience Action Plan is being created and will be initiated in 2018
    b. Disturbance response Monitoring 2005-2016 looked at bleaching and 2016-present is monitoring hurricane and disease impact
    c. Irma Rapid Response Survey occurred in the summer of 2017 following DRM protocols and still looked at coral bleaching and disease
    d. The DRM is being transitioned from TNC to FWC
    e. FWRI is developing a new DRM website
    f. DRM protocols are being updated to better track disease, Topography will be observed and recorded, ROV diver is added, Millepora abundance and condition excluded, Comments are standardized to conditions

<u>Questions for Jennifer Stein:</u>

1.(Robert Weisberg) *Is there some quantitate measure of how this coral reef system has done throughout the period of time that you have been looking at it? A graph?*

→ (Jennifer Stein) *There has been some publication produced on the FRP data that loos specifically at coral bleaching and where the hot spots are essentially, where they bleach continuously, or only once and a while. I haven't seen a whole lot of use of the disease data and I am hoping that will change soon, but yes, there have been publications.*

→ (Kurtis Gregg) *I think that is the question that NCRMP is trying to answer for public decision makers and different levels of interested parties. That is what those 4 prongs are trying to get at in CRMP.*

→ (Jennifer Stein) *Yes.*

2. (Lew Gramer) *Thanks, that was a great presentation, as someone who has used the FRP data in the past, I am very glad to hear that it is being used and hopefully into the future. And very happy to hear that incomparability across inter-annual timescale is a priority still, even if we are doing the new stuff and physical and chemical effects, if you were changing protocols you are losing information, so thank you for that. Essentially volunteer collaborations, volunteer participants and it sounds like you will continue that, so I urge you,*

→ (Jennifer Stein) *Yes, despite the transition of coordinating responsibilities, the program will function the same way it always has. It is a volunteer effort among all of the patterns allows us to get more from the data. You are the ones collecting and using the data. We have to be responsive to that and comparable to be able to use it in the future.*

→ (Lew Gramer) *And there is precedent for responsive, adaptive, disturbance response monitoring. In the 2010 cold snap data from some of the surveys that we did, so I guess we are going to be gaining useful information from that also.*

→ (Jennifer Stein) *Yea, and even with the new terminology that we are using, we are setting up those that are actually looking further into this and the geographic range of disease and how it is spreading. Understanding how it manifests and spreads is more important that we calling it white plague, but at the same time, I can use those descriptors to decide if I would have called it white plague in the past. It is still comparable, but we are just looking at it through a different lens.*

3.(Phil Dustan) *So I want to throw some lime juice out into the system, so we have started monitoring corals in the mid 70s, we know the basic stories, and how to monitor, but nothings has really changed. The number of monitoring surveys increase almost exponentially with the decrease in corals, and now that we are at the last 2-3 % of corals, and it is always to inform management, and I would like to know 2 things, number 1 is what has management done to ever stop what is going on, and number 2, is there ever a point at which you say the monitoring is over because there is nothing left?*

→ (Jennifer Stein) *Good point, right now-*

→ (Francisco Pagan) *I'll take this one, we are going to have an session that starts at 1130 to deal with those two points Phil, so we are going to talk about those points, are good.*

→ (Jennifer Stein*) I should give you a little explanation, we have a somewhat target survey, which is a specific time of year, however, the traditional monitoring outside 2017 is a stratified random sampling design to target the whole population and not*

a certain area. So we do randomly select the sites every year to get a subset. However, in 2017 after Irma, the main goal of that cruise was to look for areas to find the best sites for restoration.

4.(Esther Peters) *Jenny lets chat because I have a concern about terminology.*

→ (Jennifer Stein) *Yes, I thought I might have some concern about that.*

5. Hurricane Irma Impact Assessment- Kristi Kerrigan (FDEP CRCP)
    a. Purpose was to identify the state of the coral reefs and identify current areas of high impact and the gradient of disease
    b. 62 sites monitored and 29 of them were selected with high coral cover
    c. Pseudodiploria clivosa, Siderastrea siderea, and Orbicella faveolata was high disease abundance across sites
    d. North and South regions had very different disease prevalence make-ups
    e. 57% decrease in mean coral density in the sites from previous densities (sampled 2005-2014) to 2018 density
    f. 30% decline in the north sites and 50% decline in the south on coral richness
    g. Impacts were most often recorded as dislodged, sediment stressed, and buried coral colonies
    h. Survey only covered stony corals, therefore overall reef health is not fully observed
    i. The FRT is being more dominated by relative homogeneous coral populations

<u>Questions for Kristi Kerrigan:</u>

1.(Robert Weisberg) *If you were to engage in a restoration where you were to remove those rocks, what would that cost?*

→ (Kurtis Gregg) *The NOAA restoration center in St. Pete was involve in putting together the rapid assessment in the Florida Keys and they were getting the reports from the field folk and mobilizing the crews who were going out with the equipment to do that. None of the levels that we saw in the Keys approached that level of deviation and we saw some pretty severe stuff down there with large 2-3 m diameter colonies that slumped in Hawk's channel, but in terms of splitting those slabs you are talking about hydraulic power that is used in major equipment. But in terms of breaking those slabs, you are taking multiple days of field operations with heavy construction equipment or having diver sling them with a crane, but probably in the scale of 10,000-100,000.*

→ (Dale Griffin) *That is just incidental, but the heart of the problem with the coral reefs in our state are not in the storms, you know.*

→ (Kurtis Gregg) *I use to take that ecological approach in my own personal perspective, until talking with colleague in the restoration center that have pointed out that the one thing that we are lose rapidly is live coral tissue. So if we can go out and flip some of these colonies back over, and use some of the tool and expertise to reattach then, we are doing something directly to maintain some live coral tissue.*

→ (Dale Griffin) *I would look for successful historical mitigation. Look at what the citrus industry did in Florida when climate change affected all of our grooves that were along I4 from Orlando to Tampa, not one exists now. What we did was an active breeding program, so you have to look at what is current. I don't seen a big effort in breeding resistant strains of species or things like that, which may ultimately serve us better.*

→ (David Cox) *it is interesting that you mention that because you will hear a little but about that in a talk coming up and regarding intervention and mitigation.*

2.(David Cox) *Is there anyone in the room have a public comment?*

No public comments

Session II: CRCP 8: Management Data Needs – Francisco Pagan (FDEP CRCP)

(Francisco Pagan) *Welcome back to these sessions on management and data needs. I want to start by adapting to most of the questions and comments that have been shown on the floor, so although I have notes, most of it is mental. Addressing questions from maybe half of an hour ago, these has been work on corals for probably before I can even recall. I am an explorer and am probably a descendent of the generation that was influenced by Jacques Cousteau and other marine explorers jumping into the sea, and here I am. So government entered the work through marine conservation or marine resource management, has happened for a long time. But it happens at two different levels. The federal level which tries to include all of the states and the different jurisdictions including the Pacific and Atlantic ones, so when we are talking about coral reefs, we are talking about a pretty big effort. It also happens at the state level, to the state of Florida, the territories, Puerto Rico, the Virgin Islands, Pacific state of Hawaii ect, and it also happens through NGO that have been involved in these kinds of events for decades. One of the questions was what work has been done in the past that have some kind of effect on this. Monitoring of coral reefs among other things, lead to the creation of the 1998 coral reef task force as a consequence of the red flags that were raised from the big bleaching events that happened before that, particularly. So monitoring, or observations of the marine resources have lead us to some successful conversations and lead to action throughout the years. Not only that, but it led to how we have conversations about funding. So science, through monitoring has contributed to the conversation of continuing science funding through the years. So these things are never happening in vacuum and are always interconnected. Monitoring outside of the area here in Florida has been going on for a long time and we have funded different monitoring efforts throughout the years and communicated the results of those have allowed us to, among other things, prove the need to keep looking into these resources toward a better management of them. Because we are talking about different levels of governance involved, the communication tools are different. Management is different. Most of the areas in Florida are divided. You have the Florida Keys National Marine Sanctuary, the Biscayne National Park, and those are different elements that are managed in different ways. So there is not a unified management structure. Neither Florida, or any of the other jurisdictions. So it is not a simple communication, just having a point of contact with allow for things to evolve in a speedy manner. Then you have scientists like yourself joining us today, which have different interests, all of them are important, but the number of managers and personnel that are dedicated to the management of the resources can only follow so many ideas. Right now I have, depending on the*

time of the day, 20 of you contributing with very useful ideas but there is only 6 of us here with us today. We cannot follow 20 ideas with the same degree of energy. And we have 2 meetings a year, and we also listen to a big number of stake holders, represented through the general populations that one way or another are affected by any kind of management actions that are taken. So not because we are only trying to improve the management, we also need to use and the conservation of our marine resources. And uses are an important word here, the general stakeholders depend on the use of these resources to move forward. That is a very important element. Having said that, thank you. What can we measure as a success, how many conversations can we have at the same time, what are we monitoring and what resources are available, our essential concepts. I once again apologize, I have been trying to adapt to the conversations that we have been having for the last 36 hours, so these slides are more or less things that have been happening in the background.

So what is success, that depends more or less on the person that is doing the evaluation. If you are a member of the general public, you want the resource there for you and your descendants. There are multiple uses so, there is not only one use. As a scientist, you want to answer all of these scientific questions that you could have that are a derivative of the physics, the geology, the biology of the system, and further the knowledge of the human kind through history. What are the resources? They are never limited to money, resources are number of bodies that we have available. When we have an event like Irma, and we have to have people jump in the water to do evaluations, they could be doing impact assessments, or they could be doing DRM, or they can be looking for diseases. We can try to mix and match and be very efficient and do as many of those same things at the same time as we can, but that lowers the amount of the people resource that we have available in the system, so that means that we can have a very intensive cruise in the Dry Tortugas, have a couple of cruises in the Keys, have people who were involved in those cruses doing something here so the number of people resource available are limited.

*That takes us to monitoring, but it sounds like I am jumping, and I am. So what is monitoring. We only have 1 or 2 very simple objectives. You are either documenting changes through time that allow you to have more informed conversations later for time, and for that you need data sets that go through time. *Inaudible* So monitoring could have multiple objectives. So for today, and because one of the things that is normal, is that when you come up to somebody, my father used to say, don't bring me problems, bring me solutions. As he was not trying to have me solve the problem by myself, he was trying to help by having me sit down and thing about the problem before had and figure out how we can solve this problem together. So on that philosophy, I decided to come up with a structured way to have a conversation today. What could be the questions that management has for you, so you can help us move forward. So for today's exercise, I am going to say that the detection and communication for our results should be priorities. Why? *Inaudible* when you find something, and communicate those to the managers, the managers need to take that message in to somebody who can take action. They can come back to the managers with what funds were allocated, what funds were allocated. Acknowledgement of a problem occurs and a conversation happens as a result of that, to move forward. But it is never a linear 1-1 function. In the last 2 days or so, you have seen a preview of everything that is going on around here, and the Florida reef tract. We don't have, for today's conversations, extra resources. We have what we have now, as far as what we have seen for the last day and a half. Same amount of people, same amount of money, same size of the Florida reef tract. So given the recent events and impacts on the FRT, and in particular the SEFCRI, there have been significant changes in densities of specific species that affect the ecosystem functions. So how can we detect, not only document, but detect on time, potentially harmful events with the resources that we currently have available, and how can we communicate those findings in a way that we can take action. We, generally, Florida has the coral reef protection act, so if there is a grounding, there are mechanisms that we can enact.*

*Thank you, so quick objectives for the rest of the day, the exercise. We are trying to develop a set of relevant parameters that can be used as indicators to detect potentially harmful effects. I don't know if the next event will be another disease outbreak. It could be algae, it could be something that we cannot imagine here, so how can we detect, into the future when something happens. We are trying to move from being reactive to more proactive. You can never be completely proactive. You need to invest a lot of effort and resources to be able to be completely proactive. So because of that, we are going to look into a matrix of methods for detecting such parameters. We will use them as a menu, so *inaudible* today we are going to be creating a menu of things that you can decide, this is the appetizer, this is the dessert, this is the salad, the main entrée. So we are creating those different items people in management can create their own meal. This is the kick start of the conversation. Do not see or perceive anything that we are doing today as the end of the conversation. This is a paradigm shift, and as much, it takes a lot of time and conversations. We are trying to have a very direct conversation today. Today we will brainstorm those methods that we can use to decrease the timing between monitoring and action and results. That means that if we are doing monitoring and the results come back 2 years after, by the time that I receive a report telling me that action is needed, the event already happened. So we need to find way to monitor and advice those that are taking action in a timely manner. So what are we considering? The critical parameters, can we improve or modify existing protocols. That doesn't mean that we are starting from scratch, we are doing stuff, there are things going around in the background. Should we select size, should we have sentinel size, do we look for some particular stressors, and what methods can we use to increase the efficiency between doing some monitoring and informing those people who could take action. This is something that we came up with for some ideas. This is what it could look like. We are going to start with a call or action from the All island committee and will consider these options. We are trying to explore all of the permutations and we will separate into 4 groups and pick from the matrix and elaborate to how that applies for actionable items. Again, this is the kick-start of the conversation. We are trying to enhance the monitoring program, so that when this started in 2004 of observations of the disease, to the interventions that we are trying to work on today, we are trying to improve. Any questions?*

Questions:

1.(Robert Weisberg) *So let me give you the comment through the eyes of the child. I have always contended that you cannot manage something that you don't understand. The reason why we have a temperature gauge on the engine block is because there was some medal done, and it was found out that if the temperature exceeds this amount, the block is going to crack. So we know to monitor the temperatures of the engine so the block does not crack. I don't know if we know what to monitor about the coral, so it doesn't crack. And so I'd like to see a much broader set of tools, because I don't think that it is inclusive enough. I have read a lot about coral bleaching, and I don't know what really causes coral bleaching and there are some subjective ideas about that. We have heard a lot about disease today, and what disease is and I don't know, what the hypothesis or diseases are. So, what are they hypothesis so that we can manage it better and that to me goes beyond what is in the matrix.*

→ (Francisco Pagan) *The matrix is not complete. It is actually there for you for the first exercise, trying to expand this particular list. These are just examples. It is not all of it, and I agree with you as a scientist, that it is difficult, but sometimes you need to take a leap of faith to manage evens like this, particularly with a disease*

outbreak. Corals take hundreds of years of growth. Maybe science will develop a method of rapid growth, but I cannot predict the future, but I understand your point, thank you.

→ (Lew Gramer) *On that point, they say that predicting anything is hard, but especially the future. So bringing some perspective I guess from observing system simulation experiments, what are the available models, how can they improve, it is a back in forth. These vortexes have feedback loops with components, as an ecologist would say, above the hydrodynamics. So using slightly less than a wild ass guess to figure out where in the water to swim, so that you can produce even a less wild ass guess, so that you know better, seems like it might be a useful tool to do what you are describing.*

→ (James Byrne) *I don't know if I should throw this out there, but I am not sure you are going to get the result you want out of this, and the reason that I say that is because how you describe it, I look at is as an example fire in the western US. You look for a short-term fix, which is to fight the fires. We did it yay! We did it, next year there is another fire, and we got to put that out, and every time that we do that, it diverts the resources from addressing the root cause, which is the fuel load, because we are too busy hitting the disturbance. Until we actually shift out of the firefighting mode to address the actual causes, it will be a continuous loop and will get harder and harder each time, and that is what we are seeing management stuck in this loop and break this cycle completely, and not looking at the new disturbance that comes in this year. We have done a great job of documenting the decline while still putting out each of the fires and characterizing the disturbance, it needs to shift from breaking that cycle.*

→ (Erik Ault) *I think in the theory of the brainstorming, there is no such thing as a bad idea and I am absorbing this as my first TAC meeting and one way that I manage things is through reverse engineering, what are the actionable items, what are the things that you can do to make a difference, and then have tiers, there might be stuff that is real simple, like putting out a fire, or big long term plans as far as that goes. So I would look at what the actionable items are as then what can we do as far as monitoring to get to that spot. But that you have plans so if a fire does pop up you aren't ignoring it, but also looking to fix the overall problem*

→ (Francisco Pagan) *And that is the intent of the groups today, you have over 200 years of experience right now, at the tables. I cannot sit down at my desk with my less than 30 and try to figure this one out by myself. I tried to frame this as a very objective way, and my thoughts were very similar to James. There are limits to what are actionable items. There are something happens at the federal, some by the state some at this level. We need to identify what those are and to be proactive, as well as reactive, like he mentioned in the fires, but we need to shift a little bit, but sometimes you need to start taking small action and move before you understand the system completely.*

→ (Dale Griffin) *To Bob's point earlier, it kind of helps to understand the disease, if you didn't identify that polio was caused by the polio virus, you wouldn't have never been able to stop it. I thin Jean will tell you to this day that we have no clue what is causing all of this stress and all of the loss. We assume that it is anthropogenic but the actual cause has yet to be understood. So we are monitoring. So we are in this monitoring loop watching it happen because you are not supporting basic science. That is what needs to be supported.*

→ (Francisco Pagan) *I need to take items to have conversations that will move us forward. Unfortunately, the way that science works, not h having some degree of certainty does not sit well with other people in the decision-making chain.*

→ (Dale Griffin) *Then the management chain is flawed*

→ (Francisco Pagan) *And I am not defending or trying to prove throughout the years how management changes, I am trying to stay that it is, it is what we are working on right now. And I am trying to determine what elements, and you can't say that monitoring isn't necessary because it doesn't allow the conversation to happen*.

→ (Dale Griffin) *I do not think that monitoring is not necessary, I just think that it should be a piece of what we are doing, not the main thing.*

→ (Francisco Pagan) *You cannot conclude that, there are different levels, there is communication happening at the government level, at different stakeholders, at the NGO, at the scientist level, but that communication need to happen for balanced use of the resources. If we are worried about the resources that we have outside, we need to change the way that, and seems like from the comments that we have heard today, has not been producing the results since the 60s that have been the been doing the same thing. I can hear his frustration when he says that we have been doing the same thing since the 60s and 70s. There is no change, well we need something to change the way we do things to promote change.*

2.(Phil Dustan) *What I wanted to say though, was that monitoring has, from my experience, has three functions, it is required by law, when you go to a community and tell them that we have a monitoring program, they feel comfortable. The third thing is that there is money for scientists and it shuts them up. Monitoring is not science, it is technology. Most of what we have done, the science is what invested the monitoring. We have had this conversation many many many times about monitoring and if you go back and look at the conservation you want to know how many species is are there to begin with. If you lose the fundament genetics of the system, you've lost the system. In coral reefs it is about the coral cover and the algae, and the fish, so we have this formula. And 25 years ago, Clive Wilkinson [SP] said that you really can't manage the reef, you have to manage the people. You have to manage the way that people feel on land, and you have to manage how they feel about the ocean. We have not done any of that that, and I think that we really need to change the attitudes of the people, so they want live on a planet that is alive. There is a line in chasing coral that 'do we need forests, do we need trees, to we need corals or do we just want to live in the ashes of all of that' and I think that tis a line that resonates with a lot of people. And if you want to monitor change, we have created the best, most precise monitoring program on the planet, and once we did it and shows change had occurred, changed the stats and the people doing*

it rather than doing something about it. So what we need to do is change the attitude so people demand that we do something, it needs to come from the bottom up. I think we need to monitor like we need to monitor the weather. I think the money that we are spending could be far better done putting into an advertising agency like the group that stopped the war in Columbia. A really creative advertising agency to change the way that we see it. Kids these day are doing this with gun control, and I think that we need to change.

→ (Judy Lang) *Can I follow up on you? On March 16, New Zealand parliament accorded a river, fulfilling requests originally made 140 years ago by the local minority people that have been requesting that ever since. Three days later, a court in northern India recorded the Ganges and its tributaries as a state of living and told the government to resume their legal government duties. Unfortunately, the Indian high court reversed that order. I thought that the Victoria in Australia was give the same legal status as a person but actually it was a parliamentary act, which when translated back into English, says keep the air alive, combined the traditional knowledge of the owners with modern knowledge to create a protection act that has the communities working together to address the economic, social and all of the other environmental societal reasons that have caused the rive to be stressed to create an non-governmental solution. I would propose that we go beyond that and extend the watershed to the inlet and get the local communities to care about their water resources in a way that would lead to improvements in water quality, which is so necessary for the little coral this is left.*

→ (Phil Dustan) *And to suggest that the coral reef is a living community rather than a resource, in some respects when we talk about reefs as a resource, we do them an incredible disservice. That means that we just go out and exploit, but that's not it. The reef is a living functioning part of the planet that we need to keep humans healthy.*

→ (Judy Lang) *And in this country, where we can afford to give corporations the status on an individual, I don't see why this state can't afford rivers and inlets the same legal status.*

→ (Francisco Pagan) *Those are on the notes. Phil, what you are proposing is also important to today's conversations. But I want to add that because the conversation I wanted to frame it on resources, which include people. Your suggestion that we need to go bottom up implies that some of the resources need to go to that. You also mentioned monetary need to keep happen, if I want to do both things, I need to reassign how to do bottom up. The resources are limited, why should I five priority and reallocate resources on the monitoring that is going on right now, no matter, I am keeping it general, it doesn't have to be CRCP, I can stop monitory if we decide we want bottom up.*

→ (James Byrne) *I want to build on that just a little bit, what Phil and Judy mentioned, and what I don't see up there and hasn't been mentioned in the last 2 days, is that management affects people and changes behavior. Weather that is a direct campaign to change behavior or a marketing campaign to change behavior, we need change. And yet we haven't had a single presentation about behavioral*

change and an actual response to the management, and the social response. I propose that we look at and consider adding that in some of this. I know that Crag does some social monitoring and you guys do that with some others, but that needs to be included in some of the concepts that we are talking about. I think that is the missing piece here.

→ (Francisco Pagan) *Just to add on what you are saying right now, the socioeconomic study was not ready to be presented today, so I thought about it.*

→ (James Byrne) *The socioeconomic is a certain aspect of is, but it is stopping a piece short of what Phil and Judy is talking about. What that was doing is similar to what we are doing. We are characterizing the reefs, characterizing what is happening and where, that us the same that has been done with those studies, and that is missing the piece that are going to direct us or are respond to action, so we can see the* change. *And those are kind of the two things that we need to pull out, and something that we need to consider and add in.*

→ (Francisco Pagan) *I think that we do have the right people, because of the direction and it is an option and I hope that the notes reflect that. The resource needs to be redistributed, and that is the main objective today when I bring this over to you. Resources are not changing,*

→ (Judy Lang) *Your resources are not changing, but other entities resources, or just the science and the monitoring, are they changing?*

→ (Francisco Pagan) *To the best of my knowledge, the amount of resources available to work on the balance of resources and use of protection in the state of Florida for the next fiscal year are not changing, that doesn't mean that they can't change. We do have the same resources for the next year. So that is not an assumption of the model, it is a statement of the conversations. So take the message, I am not the one who needs to change the resources, or go have a conversation with someone to redistribute resources, I can do that if that is the recommendation. But we have the same resources, we were lucky and again thank the governor and legislature for having an increase in line budget items to work on water quality and disease, and that does not mean that we will have a third year. The current conversation is that the coral reef conservation program has, when signed, will have a level of funding that is similar to the last 10 years.*

→ (Aubree Zenone) *Just to address this problem, AA project 39, that is exactly what we are looking for here. The first study is the views of the local residents, tourist and resource users in the region. That hasn't been done for about 10 years, so the idea to re-up with a new resource study, with guidance from SECRI to TAC to help guide that is important. I urge you, if you are considering those types if things to let me know, and I would be happy to work with you.*

→ (Robert Weisberg) *So I am a little confused, the reef system is part of a system that supports fisheries from every form, it supports recreation use of every form and it supports life as we have been hearing. The state of Florida got 319 million of*

NIFWIF [SP] money through DEP. The state of Florida got through its various counties and directly though the governor got who knows how much money from the restoration act, and the state of Florida through the feds are getting god knows how much money through NERTA [SP], and everything we are talking about is part of a system. Why is it that none of these monies are being spoken about and engaged here? So if the understanding of that this is a system, we need to manage that system, and if more resources than anybody would have dreamed about have come to the state of Florida, through the Deep Water Horizon and what not, why aren't we discussing that?

→ (Dave Gilliam) *I am just sitting here stuck on some words that I have been writing down. I think you mentioned earlier thinking outside the box, the new paradigm, why are we putting ourselves into a monitoring box, we need to think broader, what do we need to be doing differently at the broader scale, not if we need to measure corals at fixed sites, or random sites, or coral point count, or transects, looking at your examples, that has been done to death, we are really good at counting corals. What we need to be good at is saving the corals. What do we need to do in a broader sense than we are not doing now, I guess that is thinking outside of the box, other than monitoring? What are we not doing.*

→ (Phil Dustan) *I would totally agree with you and start with the assumption that reefs are very conservative ecosystems, and various adaptations have allowed them to survive. And sort of look at that a as general model. There is land based models, and people taking and breaking, and crazy thing to that system. And a lot of that is because people do not know how to behave, and only look at it as a resource, and we know how to monitor it, the thing that we don't know how to do is change people's attitudes. We don't know how to sell the number one toilet paper on the planet. That is in the realm of people that know how to do the social stuff, to start a new paradigm and the kids know how to do that with gun control.*

→ (Judy Lang) *And the kids have shown that you don't need to have some expensive advertising agency working to sell a message if the message is correct and the time is right. We are all frustrated because the time is right. We need to do something proactive about this.*

→ (Francisco Pagan) *I have two comments that I will try to address also. The one from Mr. Seba's and the one from Kathy Fitzpatrick from the webinar. I'll try to answer Dave's question after that.*

→ (Doug Seba) *I think that the kids are getting so much traction is now looking back, they had a boat load of actionable data and for whatever reasons, it didn't work. That is part of their anger, and part of our anger because for 50-60 years, we have been giving actionable data and nothing happened. So I would be thrilled to see some social science to come in and tell me to reformat what I know about actionable data. Judy what you were saying about voting districts being based on water sheds, and the gerrymandering that we have now. That is an example of how we might get the message out, by watershed. I think we need someone from outside of here that can market what we are doing with people who can make a difference.*

→ (Francisco Pagan) *Ok, Lew, hold that thought.*

→ (Mauricio) *Ok we have Kathy Fitzpatrick from Martin County, this is from 15 minutes ago, so the corals right now are totally stressed, what is the most cost effective measure we am managers that we can take now. We need doable measures that are backed by science and can be taken to the public.*

→ (Jack Stamates) *I would like to comment on that as far as what actions we can actually take. Gun control has obvious actions, our actions are limited. Temperatures I think is a little outside the scope, nutrients, turbidity is perhaps something that we can act on. What can we act on? We are working backwards, what can we actually do and how can we do something?*

→ (Francisco Pagan) *What can I do, and this is an answer for today, why I brought this the TAC meeting, is that I do have some resources that from time to time I need to realign or redistribute according to a plan. Everybody had a plan and a budget. I am asking you for feed that would allow the managers to create better plans, we do have the same limited resources. Should we apply them to a soft-shell study in the upcoming year, if we decide to do that, I cannot support the same amount of monetary fund that we have had in the past. What monetary level is essential for us to reallocate resources to something else. That is what I have been try to restrain with the resources concepts. Because we can have the these conversations, and like July was mentioning about the nomination of a particular area, that is not in our preview. I understand the recommendation, it is in the notes, but it is not something that we will be involved in the near future. If I need to reallocate resources, this is the conversation that I submitted to the TAC. Should I do things as usual. Everyone here is giving me feedback from their point of view that it is not leading to a better relationship between use and balance with the resource and something needs to the change and for something to change, the resources need to be redistributed. As far as the monetary, how often does it need to happen to open resource to be reallocated to other objectives.*

3.(Doug Seba) *You keep saying that here is one pie, but if you really get the message out, resources always follow, at least that has been my experience.*

→ (Francisco Pagan) *Usually people that work in management, area will say something similar too, when we make plans we cannot count on resource that are not available to us.*

4.(James Byrne) *So I wanted to refer to something that Bill said earlier and you just said it and technical-we are the technical advisory committee. Technology is the applied application of science. We are bot about the science so much as how that science is applied. I think this is something that we keep getting hung up on, because we want to keep doing real science, cause that is what most of us are. But what we really need to advice is the application of that science. You are trying to make a resource allocation decision, and where does it make the most sense. Where can you apply that resource so that it is still most beneficial to the reef. For ideas that we are really good about, because we have years and year of data on, we don't need more of that, we*

actually know that because we have the data that is there. What would be better is action based on models, or assumption from data that we have and might need more monitoring around that. We need to inform that management going forward. What do we know that we have, because we have 30, 40, 50 years of data that shows us that the reefs are dying. Do we need to keep showing that? Or do we need to look at other things.

→ (Francisco Pagan*) I have Arthur, Kurtis and Lou from earlier, sorry for skipping. And the I will readdress the room if you want to go to lunch or want to continue. So Arthur?*

5.(Arthur Mariano) *If I look at it, I would say that one goal we should really think about is having coral reefs around for our grandchildren, and I think the biggest impedance to that is the ocean environment, temperature, alkalinity, pH are changing. There is also no way that this small group of people is going to stop decades long of pollution, sediment stress, water qualities and others. I really think that the only hope for our coral reefs is not thinking about how to save our present reefs, but to put our use our scientific knowledge to reengineer a new reef, because the reef that we have now is not going to be able to survive 20, 30 years in the future and that is what the best science is telling us. We could either talk about saving the reefs that are out here now in the short term, which is good, but the long term is really going to be a reengineering problem.*

→ (Francisco Pagan) *Thank you*

6.(Ken Banks) *Is your real question, I got a million dollars next year, how do I spend it.*

→ (Francisco Pagan) *No*

→ (Ken Banks) *You got money. You have water quality monitoring with your funding, Jenny talked about their program for monitoring, SCRMP, that's not coming out of your budget, the water quality is, and you also have disease money coming in. shouldn't you be asking us how to send that, not how to measure coral stress?*

→ (Francisco Pagan) *The paradigm shift that I am trying to approach here with resources is, once again it is not only about money, I put resources. Person resources, or diseases work. We have a limited number of divers in Florida, and probably if someone wants to find out we can ask Jenny how many teams of divers we have in the water for DERM at any given time, so that is a limited number of resources. We do have comparative agreements that have 2 year iteration and some priorities of the project needs to happen,*

→ (Ken Banks) *But they just did that, they have a committee that is doing what you are asking us to do. And they come up with some new ideas to make it a more effective program.*

→ (Francisco Pagan) *SEFCRI is asking the TAC to provide feedback so the coral reef conservation program for Florida can determine what resource allocation can happen. Should we keep contributing people for the RN? Should I be doing something different?*

→ (Ken Banks) *That is a bargain-based program, we all volunteer to do it.*

→ (Francisco Pagan) *Yes, and at this moment in time we have to stop and ask ourselves if the whole program is getting what it needs out of it. This is the questions, I don't have a premade answer, I am not here with 'I already made up my mind, I need you to provide me the information to justify it'. Otherwise I would have framed this completely different.*

→ (Dave Gilliam) *That seems like a different question that what we are asking on the excel sheet though.*

→ (Francisco Pagan) *The excel sheet is just an example to kick off some conversations, like we are having right now, and I think from that point of view has ben very successful. And once again I mention, I have 20 people, and Mauricio and I sit down for a couple of hours trying to brainstorm what needed to be up there. So we have over 200 years of experience added together, so you are going to win from the get go. I mean I am not look at this you know.*

→ (Phil Dustan) *So if you want an actionable item, there are 2 very simple things. Grow diadema, figure out how to out that down. Because in places like Jamaica, where the reefs are fubar, where there is diadema the reef is coming back like gangbusters. There are colonies 6 feet across, Acropora palmata, the whole reef is going through succession because of the diadema, in spite of the fishing and pollution, in spite of everything. The second thing is to stop taking fish out of the ocean. So stop fishing, grow diadema and stop pollution. Those are the three actionable items. I doubt if you could do, or anyone could make it politically viable in this state, but those are three thigs that you can take the oil money and out hundreds of millions of dollars.*

→ (Francisco Pagan) *Yea, I promised Lou and then lunch, Lou?*

7.(Lew Gramer) *On that topic, is the afternoon session that is a continuation, because I don't want to get in the way of anybody's lunch.*

→ (Francisco Pagan) *When we return from lunch, we will have a quick recap of restoration all island community request, which actually ties to, it was Dale, no Arthur, who mentioned that idea of reengineering and restoring our reefs for the years to come. And I will separate you into 4 groups after that and you can write your ideas on paper and I will carry them over.*

→ (Lew Gramer) *So to further what Arthur saying, I think it is ultimately about restoration. In response to some of the comments that were made, and some of the reasons why we are seeing change in a very different area of policy is because there is anger, several people voiced that, anger is a response to a perceived threat. And saying that we have been swimming around watching the corals for the last 60 years does not necessarily mean that we have the answers as to what the people*

over there, across the water way, perceive as threats. Don't treat it as a resource, but I have also heard that good ethics is based on good biology, that doesn't just mean coral biology, I think that also means human biology. So how as scientists in the TAC best help with that.

→ (Francisco Pagan) *I think that it ties to James comment with the social part of this, and the interest in finding more and connecting and getting that information out there. So unless there is anything else, I see James.*

→ (James Byrne) *I can just answer the funding question about the oil. So the reason that we cannot use any of that here is because it was actually part of the settlement. It had to go to places that were directly impacted by the oil spill and they didn't have a direct impact on this coast. It did influence the Keys a little, so they did get a small piece of the pie, but because we did not have the direct physical or economic impact in this region that is why we are not eligible.*

→ (Francisco Pagan) *Thank you James. So I have Kurtis, and John, the we got to lunch.*

8. (Kurtis Gregg) *So it sounds like what you are asking for is a scaled view of a threat assessment and response to those threats and there is not going to be one answer and one program approach to that. You are going to have to look at disease threats and developed responses to that. What are the human impacts and anthropogenic impacts. The focus of the program has been for 15 years, these threats. But what we don't have is ok, what are the threshold, triggers for action and the actions. It might be a human capacity effort but put together the action plans for those threat areas. You start implementing those actions for that. Rather than the ad hoc approach that we have been struggling with, the funding resource and human impacts to address the problem and what are the solutions. This group is probably the best to come up with actions that could be done with the technology that is available, not just there. I think that is the role of TAC. Going back to Dales point earlier about management being broke, so is science. Science, the biggest outcome is more questions. We don't need more questions, we need answers, so we need to balance these broken paradigms if we want to conserve this resource for our grandkids.*

→ (Dave Gilliam) *I mean voters need to get people in decision making positions to make a move.*

→ (Eugene Shinn) *Not to be cynical but if you come up with a great action plan, and you sell that to management, management will use that as an excuse to hire more management. That is what I have observed in my time.*

9. (John Fauth) *So I am going to bring some expertise from working in fresh water and terrestrial and being negotiator for a faculty where were butted head with the administrating and got nowhere. One of the things that I learned was that you get these little windows of opportunity and when they open, you have to get the bus through here as fast as you can with the biggest bus you can fit. I think that we have a real opportunity with the legislation that was passed to form a manage unit that covers his part of the reef. And my experience in fresh water, is that the more contained and small the unit is, and the more independent the mangers can be, the faster you can get solutions. At least within that box we can be effective. Now part of the challenges that part of*

the stressors are out of that box. But we have had some successes. We didn't know a lot about the reef at all when I first started, and we learned a lot. I think you are absolutely right that we need that paradigm shift and we need it now. We need to decide if this is a threat that we need to solve now is it within the box, can we get partners from outside of the box to start to contribute and we need to start working on knocking these off one by one. It sounds like the outfalls are going to stop, and that is a huge success, and all of these other things, going from septic to sewage, that is something that we need to accelerate. So, I think that the monitoring is important but what are the actionable items, and how do we get the linkage between the management, science and people. When you get the folks involved we can get some action done. I think folks are getting more aware and that is important because they can go to legislature, and then start supporting you, because that is was it takes.

→ (Francisco Pagan) *Thank you, we will head to lunch and return to separate into groups.*

Session III: CRCP 8: Management Data (Cont.) – Francisco Pagan (FDEP CRCP)

(Francisco Pagan) *As I promised, we will have a presentation from Kristi from the all island request and I have a coordinator in each group documenting your suggestions and what needs to be done. Please don't felt he need to follow that particular matrix, because it seems like you may already have a way better idea of what needs to be written down. We will have 4 different groups and once again thank you for everything.*

(Kristi Kerrigan) *To introduce you into this urgent call that has happened, and Joanna kind of introduced you to it yesterday, that we are playing around with the idea of there being a functional extinction by 2030 or 2050 or so that has really sparked (comment from audience that they were having trouble hearing) so this functional extinction of our reefs, what does that mean, it is really freaking people out but this is really about what we need to do. We need to be more proactive, rather than reactive and we have heard that being said multiple times today. And so this one idea, this one thing that has arisen is that the US All Islands Committee has send an urgent call to action to be more proactive and getting into the realm of restoration. We have had areas of research in genetic selection, human manipulation, hybridizations, but we are very far from getting that out into the field and there are a lot of regulatory hurdles that we need to jump over in order to get anywhere. But what we do have, and what we do know is that corals are living right here in the ports and with all this pollution that is going on, there are already under so much stress, and thriving, so what we need to do is cultivate these corals, these stress hardened corals either in field-based nurseries, lab based nurseries, and grow and out plant them to help build this resistance. And so the call to action is basically, there is going to be the creation of this national working group that is going to focus on its effort, and it will be representative of all of the US jurisdictions, and then we are going to stand up local working groups in each of the jurisdictions to tackle this issue, develop methodologies, develop an action plan, and implement on the group. So this very quick, we are doing this right now, we are hoping to have the rest of this set up by the next Coral Reef Task Force Meeting in the fall. So we don't really yet what it is going to look like, we are still having these very initial conversations, but just wanted to give you at least some insight into what is going on right now.*

<u>Questions for Kristi:</u>

1.(Phil Dustan) *Is this working with coral morphologic?*

→ (Kristi Kerrigan) *I don't know*

→ (Phil Dustan) *They made a movie a couple years ago about corals that live in Miami harbor. They made an incredible movie about coral living in the worst possible conditions. And they have an amazing aquarium facilities.*

→ (Kristi Kerrigan) *Ok great, I will write that down.*

2. (Dale Griffin) *There is a real lack of understanding in coral genetics. Like if you have strains that grow in the port that are similar to strains out there on the shelf that are not doing well, we need to know the difference genetically between the two. The citrus thing earlier, they look a bacterial gene that was resistant to freezing and made it into the strain of that orange tree. So, these are genetic modifications that can be made, but first we need an understanding of the genome of these organisms.*

→ (Kristi Kerrigan) *Yea, absolutely, and there is some work being done simultaneously, but again, that kind of science does take time.*

→ (Dale Griffin) *Well not really, you can sequence the genome quick now. It's not like the human genome project that look many years*

2.(John Fauth) *Part of what is going to happen with these corals, with antibiotic resistance, the corals that can do that upregulate their protective enzymes quickly and at in orders of magnitude, but that comes at a cost. And so when you are in an environment without those costs means that it is not selected for. When they are in those really crappy waters, they are consistently crappy. But when they are out fluctuating, they are not going to win all of the time.*

→ (Kristi Kerrigan) *Yea, all of this is important to know.*

3. (Phil Dustan) *When thinking about this entire effort, I have had long discussions about it, out planting and creating a super coral, unless you get the habitat right, diadema are probably more important to get out there than the coral. If you have a place the settle, that is important.*

→ (Kristi Kerrigan) *Yea, going at this with an ecosystem approach, not just focusing on corals. I think that these are all things that we need to consider. All good points, thank you.*

The TAC members are split into 4 small groups for discussion of the management needs as discussed prior in session II

Report out:

(Francisco Pagan) *So they way that this is going to move forward, each coordinator is going to mention who was a part of the group for the notes, and they are going to give a recap of the recommendations, and those will be on the minutes. You will receive those eventually, in an email as they do every time. Having said that, take it away Bree.*

Group 1: (Aubree Zenone, John Fauth, Ken Banks, Eugene Shinn, and Erik Ault) *Some of the immediate action items that came out of here was including timing as any part of a management plan. This includes timing on construction projects, discharges, ect to coincide with the important time dependent life history stages of a coral, so coral spawning and reproduction. It was suggested that we need more modeling, there have been studies out there that if you use models to predict how management action might actually affect the coral reef in the real world, it can make it easier to prioritize different management actions. So, a few examples of that around the world. You can also model the effects of construction projects themselves, in the long run, how may corals do they actually affect. Sunscreen reduction is a big actionable item or provide education about sunscreen reduction. Continued monitoring as a suggestion to show that management actions are having an effect through before and after a management action. This can then be used to justify more, or less of that action. Diadema out planning and reproduction onto the reefs was considered as an actionable item. Could have the reef designated with human rights, or some sort of special protection of the area. This can include any kind of management as far as how the reef is used. Should not just be a DEP management plan, should be a joint FWC and DEP management plan as its habitat and animals cannot regulate along. It would be easier to get by on any sort of plan if there can be a link between the reef and the fish, so that is an actionable item to show that link. Potentially more artificial reefs, not just for recreation but to take the pressure off natural reefs, and having a coordinated artificial reef was suggested as an actionable item. Working more closely with the south Florida water management district on items such as septic and water diversion, and the timing of discharges in terms of the lift cycle of corals*.

Group 2: (Meghan Balling, Dale Griffin, George Sedberry, Arthur Mariano, and Jennifer Stein) *We had a conversation about what can be done in our own backyard. Most of what we talked about details with water quality issues. Fertilizer bans in the summer should happen everywhere. As it happens right now, it is currently on a local municipality scale, nothing state wide. Potentially provide alternative for agriculture, at least on a private or small scale. If they can't be banned, at least restricted. Switching over from septic in the Keys which is happening already, and to include that up here. Statewide setback to inundated wetlands is only 15 feet, it should be much more than that. Canals reclassified as drainage so you are not allowed to dump a lot of things. This needs to stop. Tallahassee spent a lot of money and converting to quandary system and this could be our model system if we transitioned to a treatment section where they have 100% reuse of water where all the nutrients are scrubbed, of course that was on a much smaller scale in a much smaller city. Potentially that could be expanded to a large area where a coast population makes sense to have, of course because the population is much higher it would be more difficult. Coming back to the ban on not just fertilizers but pesticides and herbicides. Restrictions as far as what can be put into pesticides, herbicides and fertilizers so they are more ecofriendly. Limiting access to these pesticides, herbicides and fertilizers to only agriculture or a certain set of people that might need them. George mentioned Audubon certified golf courses that catch run off and install the retention ponds. You have to offer alternatives that are affordable, natural and sustainable. We also talked about things that happen in stressed situations. We had a lot of spray fly overs with the zika outbreak, those were supposed to be ecofriendly solutions that were not going to harm vertebrates, but I am sure that is not the whole case. That ends the water quality. Practice solutions, I think we*

need an outreach awareness campaign that we need to allocate resources to. Potential a mascot logo for this, basically a Smokey the bear for coral reefs. Online resources for kids, especially would go a long way. We have to present the information in a way that will stick with people, potentially involving an actual curriculum. They are all taught not to drink or smoke, maybe we could add a marine component to that. Possibly the best idea, by Dale. Education for reef resources, and the curriculum involving DARE, does everyone remember Dare? How about CARE? The coral abuse resistance education and possibly this is your brain coral on drugs. Right? Novel solutions. Other suggestions involved no more dredging, not possible to do this because there is too much power and money behind it and based on shipping industry, or do it right rather than medication. Generally, a suggestion agreed upon by the group was to slow population grown both locally and globally. Education about decreasing our rate of expansion to address climate issues. Licenses for boater, before you can buy or rent a boat. Educate places that rent out boats, and jet skis or any other water fare. Money from these licenses can be put back for enforcement for marine resources. Finally, out last issue was lobster and stone fishing industry, unnecessary physical damage to the reef due to commercial lobster fishing industry. How much money is brought in by this versus the monetary damage that is actually being done. For those that are not aware, there is a lot of thievery that occurs in the commercial lobster and stone crab industry, and in order to alleviate that, the owners of these traps string them together and grapple hook them, and often times they are dragged along the benthos and cause damage. Traps for commercial industry only. Recreational should use hand nets, this will help it be more of a sport rather than doing extra damage and reduce the amount of ghost traps.

Group 3 (Kristi Kerrigan, Jay Grove, Jack Stamates, Dave Gilliam , Robert Weisberg) *We didn't have quite the extensive list as that other group but our first idea was to fund Bob to do his study here. We need to model our coast and it has a lot of ecological applications that could be made. By having the tools and diagnosis, we could really start to learn what is controlling the system and this could be updated every year. Highly applicable. The other ideas involved turbidity standards need to be updated. This had definitely been an ongoing issue. The turbidity standard was originally used as a proxy for sedimentation, but of course, these two things need to be measured independently of each other. Particularly everything that we have seen in the Port of Miami. Need to broaden partnerships beyond coral and fisheries groups. Need to include modelers and satellite imagery which could be particularly helpful in the disease outbreaks. The terms that we use to describe what we observe needs to be standardized. There has been some misinterpretation of some observations and we need to make sure that everyone is on the same page. For example, even the slightest but of tissue, the coral would still be considered alive, so making sure that we are consistent in our monitoring. We definitely had talks to incorporating the social sciences and it could be improved. Monitoring, to continue that because ultimately if we are going to implement a management action, we need the monitoring programs to see how these decisions are affecting the reef. We have all this data from consecutive years, but perhaps we are not seeing the right message, we need to dedicate more time to synthesizing data and sending it to the right people and in the right way. For the habitat connection to fish, that is important and there might be a disconnect and we need to make that more apparent. How can we send those message is a better way.*

Group 4 (Maurizio Martinelli, Judy Lang, Ester, Lew Gramer, Phil Dustan, and James Byrne) *I am thinking that we now have this discrete area that we can manage, this long term monitoring is going to be important because this is what we have to compare anything else to, and it is changing. But we need it as sort of a background to detect any outliers that we are going to call the changes.*

We can potentially shift long term monitoring sites in order to target to what we really want to monitor. We discussed the incorporation of citizen science into the detection. So, when you have these long-term monitoring programs, you can have these to detect the changes that can be compared to these long-term data sets. Some of the interesting ideas that were brought up were this sort of set photo sites, where you can set up a discrete area where you citizen scientists can go and take a discrete picture. If we have all of these pictures from the same site, you can have these digital programs that detect change for you. Once that detection is made, it can be sent to managers or, to scientist to see if there is actually a change underway. Another interesting one was a digital fish tournament that is where folk can talk a picture of the fish that they catch and that can be aggregated into a single place to look at thinks like size classes, or diversity and it can turn into a sort of game people can play to get engaged. Two important aspects of the citizen scientist is that the state needs to recognize data collected by citizen science as legitimate. That this is a huge area that we need to be able to take advantage of and have to respect it as such. The state also need to report back on some of the data that has been collected, to those that are collecting it. We can use the word 'reward' but just so the folks that are collecting the citizen science data know that it is being used and can see the results of that. Looped into that is the power of photography as so there can be this push to document changeover time that way. In addition, as these long term monitoring programs continue, perhaps we can incorporate some first look data. As for example, if you are going down in a team and the first member goes down to set the transect, the other can be doing some roving nearby to check for changes that might otherwise be missed by this. That can allow for some faster turnaround of the data along with potential changes. Additionally, there was a suggestion that we can supplement the existing ecological data with some physical data. For example, following the deep ocean nutrients that we have heard about this morning. This is data that can be collected with perhaps not as much man power, but with money, but can provide some important aspects that we may not understand yet. We also discussed a lot about outreach and education, and how to actually get change underway. That can be done by engaging the public and engaging decision makers that are higher than us. We discussed out the commissioner for Martin County pushed a lot for water quality monitoring, as a human health issue. So we were thinking, is there a way that we can take a 50% loss in coral and translate that into a sort of human health issue or a human danger somehow, how is it affecting us in a way that might bring some fear. It was suggested, well what are you doing during hurricanes, but in addition we really need to focus our efforts to outreach and education to get citizen and political action. That might involve CRCP staff members, instead of dedicating how many days a month to these survey efforts, perhaps that time can be allocated specifically for outreach and education. In addition, we discussed engaging the coral aquarium crowd, to for example reintroduce diadema, we can do this by incorporating some monitoring, so for example, you can monitor a site and release a whole bunch of diadema at a site and see if you have any actual recover. We also had a suggestion regarding the remediating of fish nursery habitats. Did I miss anything?

→ (Lew Gamer) *You already mentioned it, but we have spent a large amount of effort on understanding response variables and intermediate forcing variables, or independent variables if you will, we have very little data on and that is the biophysical project kind of habitat. Of course, the ultimate, as many people made the point beautifully here, the ultimate variables would be inshore but there are more approximate forcing variables which we have almost no data on.*

→ (Phil Dustan) *I just want to reinforce the idea of the aquarium trade. This is a multimillion dollar business. And if you could do one thing out there, it would be*

to put diadema back out there. If we could populate that place at a couple meters squared, it is a long way from solving that algae problem and creating surface area for settlement. There are people at the Tampa Bay Aquarium looking at it and a few people in the Keys looking at it, but the guys that know how to grow coral, get them hooked on that it would be a break through. As I mentioned it is a huge part of the economy and so we might invite them to get involved.

Closing remarks:

(David Cox) *You know what that is the sound of? Us finishing! Thank you very much everybody. A few comments, thank you for all of your comments as always, yesterday and today. It was very interesting and great to see lots of engaged faces and conversations. Thanks to Friends of Our Florida Reefs for breakfast both days. Thanks to Nova for snacks, lunch and the reception. A couple of housekeeping items, if you haven't filled out an evaluation form, please do so. It is very helpful for us. And leave your name tags.*

→ (Dave Gilliam) *The process for populating the TAC, if I remember is an application to the vice chair, and the vice chair is*

→ (David Cox) *Yea, so you have three seats to fill*

→ (Dave Gilliam) *Right, so is that process going to be initiated prior to October, because I think that we need to, I don't know what the long term process as terms as TAC membership.*

→ (David Cox) *So the nominations do go to the vice chairs and we have asked you as afar as which niches we want to fill, for example I think we lost some coral biologists.*

→ (Dave Gilliam) *I brought it up in our group, but I think that the largest niche that needs to be filled is participation. It is nice to look for a specific need or science, but if they don't come, it is a butt in a seat with one here. That is the niche that I think we need to fill.*

→ (David Cox) *I can look at the attendance and see who is participating really. We can also look at scheduling, we generally hold these in late September/ October and April or late march. Some of the people who teach have had a hard time has to beg out, that was one of the reasons that we lost Diego. Maybe we go to a weekend schedule, I guess that is a good discussion for us to have. I will get the instruction for nominating the TAC members, and I think the vice chairs meet once a month. There are three seats open.*

→ (Dave Gilliam) *Maybe the attendance should be based on the number of people we want in a meeting. So maybe the 25 can be bumped up so if people can't make it.*

→ (David Cox) *Yea, optimum level. That will have to be a discussion as well as funding how much capacity Nova can handle with the contract, but please share these thoughts in an email. We can also give you more time, so you have it in your plans. You don't have to leave, we have the room till 5. Thanks again, it was nice seeing you, we will be in touch.*