

FLORIDA KEYS NATIONAL MARINE SANCTUARY ADVISORY COUNCIL

VIRTUAL MEETING

**Tuesday April 19, 2022
DRAFT NOTES**

Attendees:

Council Members:

Boating Industry: Ken Reda
Conservation and Environment: Chris Bergh (absent)
Conservation and Environment: Ben Daughtry (absent)
Citizen at Large – Lower Keys: Mimi Stafford
Citizen at Large – Middle Keys: George Garrett
Citizen at Large – Upper Keys: Suzy Roebing
Diving – Lower Keys: Joe Weatherby
Diving – Upper Keys: Elena Rodriguez
Education and Outreach: Shelly Krueger
Elected County Official: Holly Raschein
Fishing – Charter Fishing Flats Guide: Will Benson
Fishing – Charter Sports Fishing: Michael Nealis
Fishing – Commercial – Marine/Tropical: Ken Nedimyer (absent)
Fishing – Commercial – Shell/Scale: Justin Bruland (absent)
Fishing – Recreational: Karen Angle
Research and Monitoring: Erinn Muller
South Florida Ecosystem Restoration: Jerry Lorenz
Submerged Cultural Resources: Corey Malcom
Tourism – Lower Keys: *vacant*
Tourism – Upper Keys: Andy Newman (absent)

Council Alternates (present):

Conservation and Environment: Kelly Cox
Citizen at Large – Lower Keys: Stephen Patten
Diving – Lower Keys: Lucja Rice
Fishing – Commercial – Marine/Tropical: Jeff Turner
Fishing – Recreational: Gary Jennings
Research and Monitoring: Patrick Rice
Submerged Cultural Resources: Diane Silvia
Tourism – Upper Keys: Lisa Mongelia

Agency Representatives Non-Voting (present):

Florida DEP: Jamie Monty, Nicolas Parr
Florida FWC - FWRI: CJ Sweetman
National Park Service: Tylan Dean
NOAA Office of Law Enforcement: Jeremy Munkelt
US Coast Guard: Alexandra Hughes

US Fish and Wildlife Service: Christian Eggleston
US Navy: Ed Barham

Municipalities Non-Voting (present):

Islamorada: David Webb
Layton: Cindy Lewis
Key West: Allison Higgins

I. CALL TO ORDER, ROLL CALL, CHAIRPERSONS COMMENTS

Chairperson Garrett welcomed advisory council members and viewers to the meeting and requested a roll call from support staff. The meeting was called to order at 9:03am.

MEETING ADMINISTRATION:

- Motion to approve the agenda made by Mimi Stafford, seconded and approved.
- Motion to approve the December 2021 notes made by Jerry Lorenz, seconded and approved.

COUNCIL BUSINESS AND UPDATES:

- John Armor, Director of the Office of National Marine Sanctuaries, received and acknowledged the resolution passed at the December meeting. He responded by thanking the advisory council for the thoughtful resolution, and saying that he will share with his colleagues at NOS and NOAA OLE.
- Council coordinator Liz Trueblood shared that new members have been selected by the committee and the approval package has been sent to ONMS headquarters for vetting.
- Liz also went over the process for nomination of the council's next chair and vice-chair, and will follow up with an email to members. Members will nominate by email to Liz, and voting will occur at the June council meeting.

II. SAC Florida Keys and South Florida Ecosystem Connectivity Team Update

Jerry Lorenz, Working Group Chair and SAC Member

Cara Capp, Working Group Co-Chair

Cara Capp presented background information that led the working group to this resolution. She reiterated that the health of the Sanctuary is tied in many ways to that of Everglades National Park. The fiscal year 2022 budget saw record funding from the federal government. Biscayne Bay Restoration Project is now fully funded and will help with clean water to the south. Jerry Lorenz introduced the text of the proposed resolution and asked the council if they would like to consider it.

A motion was made to discuss made by: Mimi Stafford, seconded by Holly Raschein.

Discussion:

A member wished to clarify that the previously mentioned underfunding in the past is from the federal level, Florida is currently funding Everglades Restoration at record levels.

Working Group members confirmed that yes, federally, the project has been historically underfunded since its approval.

A council member voiced that the resolution is great, asked if there was a priority project list and if the resolution should include recommendations for project prioritization and implementation.

WG members replied that the U.S. Army Corp is looking at longevity of projects and following the Integrated Delivery Schedule put together by the Corp and South Florida Management District.

Public comment:

Kellie Ralston (Bonfish and Tarpon Trust): Love the resolution. Recommend that when looking at the Integrated Delivery System, long term funding sources need to be considered. Propose adding in “sustained financial resources” to make sure we get these projects done.

SAC member discussion after public comment:

Some members voiced a desire to add in language related to sustained funding. Jerry, Cara, and Karen will craft language and present before the break. (See notes after item V.)

III. Restoration Blueprint Draft Rule Update

Beth Dieveney, Policy Analyst, Florida Keys National Marine Sanctuary

We are currently in the “Agency Review & Clearance” phase. Once the draft is cleared, the draft rule and management plan will be released for public comment. Public comment will be open for no less than 90 days, which will include two council meetings. NOAA will also host additional public meetings both in-person and virtually to allow as many people to participate as possible. Comments will be accepted orally at these meetings, in writing, or via [regulations.gov](https://www.regulations.gov). The link will be widely available during this period.

Resources for public engagement are being developed for SAC members and the public to understand and discuss the draft rule, and will include videos, a document library, and an interactive map. Liz will be sending out a Google form soliciting input from council members to let us know how we can help advisory council members prepare for this next phase.

Discussion

Q: A member brought up that some of the part-time Keys residents he has spoken to are worried that they won’t be here for the release. How will they be able to participate from out of town? What can council members tell these people?

A: The timing of public release is dependent on the inter-agency clearance process, we are

currently hoping for a summer release simply because we want to share it with stakeholders as soon as it is ready. Anybody, anywhere, can make a comment on the regulations.gov website, or attend one of the virtual comment sessions. When the draft goes out for public comment, the proposal will not be modified for the duration of the comment period, and comments made at any point during the period will have equal standing. Public and agency comments submitted during the comment period will be used to inform the final rule, management plan, and associated Final Environmental Impact Statement.

IV. Restoration Blueprint Management Plan

Sarah Fangman, Superintendent, Florida Keys National Marine Sanctuary

The management plan is the guiding document for our staff, and includes proposed actions on research, community involvement, and more. This plan is a way for us to advance our goals and objectives. It is worth noting that the President's budget proposes an increase in Sanctuary's budgets, and we are hopeful that an increase in funding will help us accomplish these goals.

The management plan contains six priority themes which were created taking into account public comment. These themes are, in no particular order:

- Management effectiveness/adaptive management,
- Water quality,
- Restoration,
- Visitor use management,
- Enforcement, and
- Stewardship and engagement.

The plan also includes five goals, each of which includes several objectives:

- **Goal 1: Improve our understanding of sanctuary resources, ecosystem services, and their value to the Florida Keys economy.** Activities include: zone-specific monitoring and research, SAC Research Activity working group, update condition report, visitor use data, identify and track ecosystems services value
- **Goal 2: Improve the condition of sanctuary resources and, where possible, restore ecosystem structure and function.** We did not wait until the management plan to come out to start working on the problems we heard. Activities: identify water quality parameters to monitor, continue to engage with partners, facilitate recovery of coral species, coral disease response, investigate and facilitate novel restoration technologies and approaches to coral restoration, Mission: Iconic Reefs
- **Goal 3: Reduce threats to sanctuary resources and manage human uses and associated impacts.** Activities include: response plans for threats, buoy program, Blue Star
- **Goal 4: Increase awareness and support for FKNMS and its resources.** Activities: Eco-Discovery Center, working with SAC, volunteers, Goal: Clean Seas

- **Goal 5: Advance and support collaborative and coordinated management.** Activities: Develop Annual Operating Plan, partnerships,

Discussion:

Q: Is goal 3 looking into commercial impacts?

A: Not specifically, goal 3 seeks to reduce impacts from any and all human activities.

Member comment: This will be a large amount of information coming out and a lot to discuss, we are really hoping for in-person opportunities to comment.

Q: To what extent is the condition report being updated?

A: It has not yet been updated, the intent is to do so as soon as possible.

Member comment: Lots of research and events have occurred since the last condition report. Hopeful that the Management Plan and Draft Rule acknowledges these threats. I applaud the staff for listening to us, and am anxious for release.

V. Restoration Blueprint Mooring Buoy Operations (potential action item)

Sarah Fangman, Superintendent, Florida Keys National Marine Sanctuary

As we approach the draft rule, we need to consider the need for new or relocated marker and mooring buoys within some of our zones. Sarah gave an overview of the existing buoys and showed photos of what the anchors look like on the seabed. She explained that repeated stern tying of large boats to mooring buoys is pulling out these anchors, and asked council members to please help spread the word of using them properly.

With regard to the draft rule release, we will need to discuss new buoys if zone changes take place. We would like to invite the council members to participate in a working group to discuss installation and priorities for potential new buoys. Sarah asked for volunteers to participate in this working group, and several members voiced their interest. Will Benson and Lisa Mongelia discussed volunteering to co-chair together. Once formed, the working group should consist of 10-15 members including both council members and community members, and meetings will be open to the public.

Sarah asked council members to please let staff know if they have suggestions for membership in this group, and to plan to revisit this proposed working group at the next council meeting.

Florida Keys and South Florida Ecosystem Connectivity Team: draft resolution revisited:

Florida Keys and South Florida Ecosystem Connectivity Team members shared the updated draft language. A motion was made to accept the edit, seconded, and brought to a vote. All council members present voted in favor, for a total of 14 in favor, 0 opposed.

VI. National Marine Sanctuary Foundation Local Chapter Update

Sara Rankin, Director, Florida Keys Chapter National Marine Sanctuary Foundation

Sara gave the council an overview of recent projects supported by the Foundation which includes Goal Clean Seas, which has removed over 35,000 pounds of debris from the ocean floor so far. In addition, the Foundation helps raise funds for three major goals: restoration, infrastructure (including buoys), and community engagement.

As part of the sanctuary system's 50th anniversary, the Foundation will be hosting a gala November 12th in Key West which will include dinner, entertainment, and a live auction. Please visit the Foundation's website to learn more: <https://floridakeysfoundation.org/save-spectacular-gala-2022/>

The Foundation will be printing a commemorative magazine highlighting recent sanctuary programs. Ads for magazine are available for purchase, please contact Sara Rankin for details at sara@marinesanctuary.org, or 941-228-0048.

VII. Sanctuary Explorer App Release

Scott Atwell, Communications and Outreach Manager, FKNMS

Marlies Tumolo, Education and Outreach Program Coordinator, FKNMS

Scott and Marlies gave a presentation on the Marine Sanctuary Explorer app which is coming soon to both Apple and Android. The app features information about sanctuary species, regulations, zones, and recreational activities in addition to a GPS enabled interactive map. The app can be updated easily by sanctuary staff to reflect any zoning changes, or to add new educational content. After this meeting, we will send all council members a link to a tutorial that shows app features in greater depth.

Discussion:

Q: Is it currently available?

A: Yes, council members with an Apple device may download it now if you'd like to participate in our "soft launch," we are still waiting for the Android version. Please submit any information on bugs, or needs/wants on the Google form to be sent out with the video tutorial.

VIII. AGENCY REPORTS

Superintendent's Report: Sarah Fangman

FKNMS Updates:

- Sanctuary staff will begin the transition back to being in the office full time on April 25. Staff are excited to collaborate in person again.
- We are hiring a vessels operations coordinator, please email Sarah with questions
- Updates from the EcoDiscovery Center: fabrication of the next phase has begun, and will be installed once complete. Sarah expressed appreciation for council members who have been fielding questions from the public on this topic. We are excited to see the center reopen later this year.

Florida Department of Environmental Protection: Jamie Monty

Resilience and Coastal Protection:

- Lignumvitae Key Aquatic Preserve
 - We held our public meeting to review the draft Lignumvitae Key Aquatic Preserve Management Plan on January 25th. Thank you to the Keys History & Discovery Center for providing the space for the meeting, and to anyone who showed up and provided comments.
 - We had 13 attendees, and received thoughtful reviews, many of which have been incorporated into the plan, which will be presented to the state's Acquisition and Restoration Council on June 10th in the Marjory Stoneman Douglas Building in Tallahassee at 8a.
- Coupon Bight Aquatic Preserve
 - We now have the necessary permits to install a fourth "Caution: Shallow Seagrass Area" sign at the mouth of Newfound Harbor Channel to help better direct boat traffic away from the flat there and protect that resource. There will now be four caution signs, evenly spaced between Little Palm Island and channel marker 2.
 - AP staff held a public scoping meeting for the Coupon Bight Aquatic Preserve Management Plan on April 15th. Thank you to the Lower Keys Chamber of Commerce for providing the space for the meeting and to the approximately 20 attendees, including engaged residents and stakeholders to providing very helpful guidance.
 - We are soliciting additional comments through April 30th. These comments can be on any part of the old management plan (<http://publicfiles.dep.state.fl.us/CAMA/plans/Coupon-Bight-AP-MP.pdf>) that you would like to see updated. Please direct any comments to Nick Parr, Nicholas.Parr@FloridaDEP.gov.
 - We will try to incorporate as many of the suggestions as possible while drafting the new management plan.
 - We hope to release the new draft of the management plan to an advisory committee in the Fall or Winter, after the Restoration Blueprint comment period has concluded.

- Water Quality Monitoring
 - We continue to monitor a network of 18 water quality sites strategically located throughout the Keys as well as 3 new sites located in the Dry Tortugas. Additionally, we currently have 2 continuous water quality monitoring stations with plans for 2 more to be installed in the coming months.
 - DEP has funded FIU to install 4 continuous water quality monitoring stations along Florida's Coral Reef in the sanctuary. Sites will be paired with historic atmospheric and water temperature monitoring sites at Sand Key, Sombrero Key, Molasses Reef, and Fowley Rocks.
 - We are coordinating this work with the Sanctuary's Water Quality Protection Program, and data will be available on a website, which we will provide a link to when it is up and running.
- Biscayne Bay Commission
 - This is a new advisory group to DEP, created by the Florida Legislature, that meets quarterly for 4 years to develop two plans for Biscayne Bay – one on projects and one financial. They also submit a biennial plan to the Governor on their progress.
 - There are 9 Commission members – DEP, FWC, SFWMD, 3 MDC Commissioners, League of Cities, FIND, and a Governor appointee.
 - Meeting progress to date includes obtaining an understanding of water quality and impairments by Bay basin, understanding the regulatory processes to address impairments, hearing from Tampa Bay about their Reasonable Assurance Plan (RAP), discussing member agency's priority project types for the Bay and financial resources they can bring to bear on projects, and supporting MDC's selection of a Bay basin to conduct their RAP.
 - I bring this up because, as alluded to earlier in the meeting during the Everglades discussion, everything that happens upstream of the Sanctuary affects the Sanctuary, especially with the Commission's focus on water quality.

Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute:
CJ Sweetman

Our next Commission meeting will be an in-person meeting held on May 3-4, 2022, in Gainesville. Relative to marine fisheries items, staff will be providing a proposed final rule for cobia in state waters, following recent action taken at both the Gulf and South Atlantic Fishery Management councils in federal waters to address overfishing in the fishery. We will provide a final rule proposal to modify size, bag, and vessel limits for commercial and recreational harvest and these proposed rules are consistent with pending federal regulations that are aimed at helping to end overfishing.

For redfish, staff will present proposed rules that include new management regions and regulation changes based on an evaluation of the redfish fishery in each of the proposed regions using new management metrics. These new management metrics incorporate habitat into the management of redfish fishery.

Staff will also be providing several reports to the Commission. These include the Division of Marine Fisheries Management's Annual Workplan, where staff will review new and ongoing marine fisheries programs and management issues that we anticipate to be actively

worked on during the 2022/2023 cycle and items completed during the 2021/2022 cycle. Staff will also provide council reports from the most recent Gulf of Mexico and South Atlantic Fishery Management Council meetings. Relative to the South Atlantic, staff will discuss a potential Executive Order to temporarily modify the blueline tilefish recreational season in state waters to be consistent with actions recently taken by NOAA Fisheries. These actions modified the blueline tilefish recreational fishing season to be open May 1 – July 25 instead of the typical May 1 – August 31 season based on projections for when the quota is expected to be met. The agenda for the May 2022 FWC Commission meeting can be accessed on our Commission meeting website at the following link: <https://myfwc.com/about/commission/commission-meetings/may-2022/>

NOAA Office of General Council: Loren Remsberg

The NOAA Office of General Counsel Enforcement Section posts information about charged cases on its website: <https://www.gc.noaa.gov/enforce-office7.html>. The site is updated every 4 months. It is current for Notices of Violation and Assessment issued through April 2021, and will be updated again at the end of August. Cases involving the Florida Keys National Marine Sanctuary regulations are in the section titled "Southeast."

NOAA OLE: Jeremy Munkelt

- 1) Since last meeting in December, OLE has generated **25** incidents within the Sanctuary including 13 ATBA violations, 2 boardings of recreational vessels, 9 fishing in SPA/ERs, 1 grounding
- 2) OLE Quarter 1 (Oct-Dec 2021) Council Report provided to Sanctuaries and Councils-covers all three councils, **specific to Keys Area:**
 - a) 7 SSOs issued in the Keys area consisted of fishing activity and improper operation of vessels, including 2 unpermitted charter operations (open access), 3 TED/BRD requirements within the Florida Keys National Marine Sanctuary.
 - b) 1 case sent to GCES-VMS Program Requirements
- 3) Ops/major patrols conducted
 - a) Operation SPA Hopper- 1 week patrol in Jan, Upper Keys: Hens and Chicken, Davis and Conch Reefs some of the targeted SPAs ii) Poor weather, difficult to patrol reef line; ended up looking for grounded vessels nearshore. Couple vessel stops on Pickles and Molasses Reef (no violations)
 - b) Joint patrols w/FWC, CBP
 - c) Regular patrols conducted throughout area by EOs as well
- 4) GCES Charging Info released (Oct-Dec 2021) -**Link provided for more details** <https://www.gc.noaa.gov/enforce-office7.html> **2 ATBAs, total of \$11,250**

NPS: Tylan Dean

I am Tylan Dean, Biological Resources Branch Chief for Everglades and Dry Tortugas National Parks. Christopher Kavanagh, our previous representative on the SAC has moved on, and I will be covering in the interim while we bring on new staff. I'll also mention our other natural resources leads for the 3 marine South Florida Parks. Clayton Pollock is our lead

Fisheries Biologist at Dry Tortugas National Park, though he is away on a detail through May, and Morgan Elmer is the NPS Natural Resources Chief at Biscayne National Park.

NPS staff continue to work in conjunction with restoration partners to advance Everglades Restoration, both participating on the many CERP projects, but also several other efforts to restore hydrology and water quality, including the Taylor Slough Flow improvements project, work to complete elevation Tamiami Trail in conjunction with FDOT, and plugging the Raulerson canal on Cape Sable in conjunction with many partners.

In Everglades National Park, we're monitoring an algae bloom in central Florida Bay that appears to be declining in intensity. This bloom formed in December, which is later than the seasonal algae blooms that have occurred each year since the 2015 seagrass die-off. This year's bloom was less extensive and lower intensity than in most previous years. Overall, conditions have been pretty good with salinities generally lower than previous years and improving water quality, though we are seeing hypersalinity now in a few areas.

I'm also happy to share that as I speak, the first comprehensive Fisheries Independent Monitoring effort throughout Florida Bay and the Park's marine waters is ongoing in partnership with FWC. This information will complement our ongoing creel surveys and provide valuable information for fishery management, but also document the benefits. We also initiated an assessment of sponges in FL Bay in conjunction with FIU.

At Dry Tortugas National Park, we're working to address SCTLD. Since it's arrival at DRTO in 2021, it has continued to spread, and now occurs on corals throughout the park. NPS staff and partners have continued interventions to limit the impacts across the Park, and have treated around 10,000 corals.

We're beginning planning to relocate a potentially large number of corals from the Fort's Counterscarp as we repair the damage caused by Hurricane Irma. Staff are early in our efforts to develop a coral restoration plan over the next year(s) that we hope will improve coral reef communities and align with and complement the FKNMS Mission Iconic Reef.

Dry Tortugas has also embarked on a long-range strategic facility planning process that will look out to 2050 and alternatives on how we might operate and maintain the park in the context of climate change.

At Biscayne National Park, staff are continuing coral restoration activities including maintaining coral nurseries, treatment of SCTLD, outplanting and physical protection of corals through marine debris removal, mooring buoys and marker installation. In addition there are upcoming seagrass restoration projects planned this summer at Biscayne National Park.

U.S. Coast Guard: Alexandra Hughes

- The USCG has most available assets focusing on the AMIO mission. On Saturday April 16th, 2022 USCG assets interdicted 204 total migrants (Cuban/Haitian) Those migrants were all located in the straits of Florida in our backyard and in Cay Sal Banks area. Due to the uptick in migrants trying to illegally enter the United States through the Florida Keys the USCG has been unable to complete Living Marine Resources missions.
- The last two months our Stations have assisted with rescuing 3 injured Sea Turtles.
- USCG Sector Key West law enforcement division and Prevention department have provided training to all of the USCG members in the Florida Keys on illegal charters and bareboat charters. We are targeting their illegal operations and working with FWC and MCSO to do so. If mariners want to know what the USCG is doing to combat Bareboat Charters/ Illegal Charters, please have them reach out to me directly at 305-304-8306.

U.S. Fish and Wildlife Service: Christian Eggleston

U.S. Navy: Edward Barham

- We celebrated Earth Day on April 9 with a clean-up on the Overseas Highway Right-of-Way on Boca Chica, removing approx. 1000 pounds of trash. On April 16 we participated in the Bahia Honda State Park Earth Day festival. We highlighted our natural resource conservation efforts, interacted and engaged with over 200 visitors from all parts of the country including some foreign tourists visiting from countries such as England, Poland and Austria.
- In April we started our sea turtle nesting surveys on Truman Annex and Boca Chica beaches and monitoring for Least and Roseate tern nesting on our nesting platforms on Geiger and Big Coppitt Keys, and building rooftops throughout the installation.
- In February and March we completed an annual survey of crocodiles and a comprehensive marine resource survey of our operational areas.

IX. CLOSING REMARKS

Chairperson Garrett thanked council members and the public for tuning in to this virtual meeting, and for a robust discussion.

Meeting adjourned 12:20.

X. PUBLIC COMMENT RECEIVED VIA EMAIL

One email received from Tim Birthesiel, see attached.

The Terra Sub Aqua Project: suggested practice to consider

My family and I, with the help of volunteers, operate a live rock aquaculture farm located in the EEZ about 6 mi. offshore of the FL keys, in the desert-like sand flats (50-70' depth) just outside the shallow reef line (~40' depth on the outside). We have developed a robust and economical system to suspend the rocks above the sand bottom, evolving to resist storms over 25+ years.

Simple linear, rebar-supported stacks of drilled substrate rock worked great for 15+ years prior to Irma's "direct hit" in our area. These stacks are supported by iron rebars which are buried up to 4-5' depth into the coarse sand in the area. Irma was a very powerful storm, I was told the waves were 35' in the zone, and that the natural reef base was cracked in a couple places nearby. Our site saw the rocks being stripped off, leaving the rebar supports in place. Since that storm, we have redesigned the rock supports into a series of tripod stacks secured by a stainless closure at the apex, using a banding system used by the US Navy. Now we have a much more robust structure, and it appears we have created a sustainable method of operation. I suggest the method could form the basis of an economical way to create local reef habitat as we have seen, perhaps connecting biodiversity "hot spots" like the MPA's and higher profile reefs in the Keys. These could conceivably be located to enable better gene flow to enhance the overall health of the reef biome, and may help protect areas inshore by resisting some of the wave and current energy.

As a zoologist I see beneficial effect of live rock substrate stacking, not just on the live rock, but on fish populations, which serve as "algae police," grazing on overgrowth that competes with hard and soft corals. We have observed cycles of reproduction at the operating site, including fish eggs on the substrate rocks, clouds of fish fry, schools of fingerlings sheltering at the aquaculture structures, diverse fish and shrimp interactions including parasite cleaning stations, the eventual maturation of fish that migrate away from the installations, and large schools of adults that gather at the site for spawning aggregations. We have observed over 100 fish species as well as many invertebrates, including turtles, squid, sharks, grouper, etc. that use the farm habitat. We only harvest small amounts of live rock, generally planting more than we harvest, so we have effectively created new habitat in the area.

The collapse of the Elkhorn, Staghorn, and Mountainous Star corals (now listed as endangered species) that used to dominate the hard bottom reefs in the Keys is biologically profound. The historically high relief reefscape is more flattened now, covered more by sponges and algae, and the space provides poorer fish habitat. That the endangered coral species persist in some places at all, visible mostly as small colonies, is largely due to the heroic efforts at out-planting shore-raised coral fragments. Due to the slow growth rate of the planted colonies, the return of the actual widespread functional habitat, described as geologically "rugose," will require something on the order of a century or so, assuming the starter colonies can thrive over time in locations they used to occupy. I believe the method we have developed has potential to help in the effort and recommend your consideration. I am happy to provide details, and hopeful that it might complement other work. See the links below, and please contact me directly as needed.

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