

CWG Review 1: Spring 2015

Tier 1 Information:

1. Management Action

S-8: Establish coral reef gardens, which are areas for the recovery, restoration, and recruitment of corals and fish, created under strong guidance from scientists and monitored by the community through an educational campaign.

This revised RMA is a combination of the following original RMAs

- S-8: Develop Strategies for coral population enhancement through restocking and larval recruitment to establish recovery zones and recruitment for corals and fish.
- N-115: Restore and enhance coral reef and nearshore hardbottom habitats to maintain and improve ecosystem services, such as fisheries, tourism, and shoreline protection.
- S-7: Construct more scientific-based artificial reefs to rebuild coral reef habitat.
- S-13: Develop plans to restore damaged reefs to create healthy ecosystems where none exist now.
- S-24: Create monitoring system (and reporting system) for existing and new artificial reefs to allow evaluation of success and help develop new artificial reef plans.
- S-15: Assist ESA listed coral species recovery by supporting coral nursery and nursery grown colony outplanting efforts. Outplanting efforts will increase ESA listed coral species populations, engender natural reproductive success, and support reef community restoration.

2. Intended Result (Output/Outcome)

What is the end product/result of this management action?

- Public engagement resulting in the restoration of reef(s) in a scientifically sound way.
- Increase coral propagation and larval recruitment.
- Use diverse/resilient corals from degraded locations with resilient populations to restock to improve natural coral population to regionally appropriate densities, establish recovery zones where impacts are not allowed for restocking populations, and enhance genetic diversity of degraded sites and restored areas.
- The output will be site-level design to incorporate relevant criteria for how to judge successful management practices and strategies (will be based on what the outcome is intended to be). The outcome will be to restore and enhance coral reef and nearshore hardbottom to maintain and improve ecosystem services, such as fisheries, tourism and shoreline protection.
- Nonscientific-based reefs only promote fish aggregation, and artificial reefs, such as wrecks, can be made up of harmful contaminants like asbestos and PCBs. By creating reefs that are based on science, this action should (1) result in not only more reef fish collection, like most artificial reefs, but also produce more fish and (2) produce more reef. Data collected about the productivity of various types of artificial reefs should be used to develop the most effective artificial reefs. No more sunken wrecks and tires should be used as artificial reefs. The ultimate goal is to use artificial reefs for juvenile fish attraction(s) and coral recruitment. In addition to the substance that makes up the artificial reefs, science should be used to determine the most productive location of the artificial reefs (i.e. we should not place artificial reefs deeper than where the corals may grow).
- Create unified monitoring and reporting system for existing and new artificial reefs to allow evaluation of success and help develop new reef plans. Share information between all parties and agencies involved.
- Restoration is an important theme for recommended RMAs (N-115, S-8, S-13, S-15). In general, local reef condition and function are degraded to an extent that active restoration of coral populations and coral reef function are appropriate and can be fruitful in the SEFCRI region. The use of coral population enhancement and artificial structures (S-7) have a role. Additional tools for reef restoration need to be better developed and researched (e.g., S-17).
- Good monitoring and reporting practices should be one component of all existing and new projects in which artificial structures are used for reef mitigation or restoration or could usefully serve that purpose. However, we question the relevance of extending such a program to artificial structures that were deployed to enhance

opportunities for fishing and/or diving. Note that we are calling them artificial structures rather than artificial reefs.

- Promote natural species recovery by enhancing the likelihood of successful sexual reproduction.
- Promote reef community restoration by increasing stony coral abundance and habitat complexity.
- This will need strong scientific oversight (or tracking) for distribution of genetic material.
 - This effort may benefit from a community liaison to relay information between community and agencies (e.g. community garden).

3. Duration of Activity

Is this a discrete action or a recurring activity? Explain.

- Recurring activity. Portions of the reef will be closed to fishing/diving/boating for temporary times based on the quality of the reef in specific areas.
- Recurring activity. Existing artificial reefs need to be reexamined for what is working and what is not. New artificial reef decisions and plans should be based on results from previously created reefs.
- This is a recurring activity. Maintaining and enlarging nurseries is continuous activity. Outplanting from nurseries should be a large, active, continuous component of a nursery effort.

4. Justification

What issue or problem will this management action address? Explain.

- This RMA would help overcome recruitment limitation to degraded sites and improve coral stocks for restoration. Recovery zones could serve ecological functions of natural reefs and enhance and accelerate the recovery of the system in light of increased pressure in the future.
- It will address the degradation of the reef and improve quality over time.
- Artificial reefs at appropriate locations can enhance marine habitat and help control erosion. They can also provide substrate for coral recruitment and habitat for essential fish species. They are also serve as destination dive site locations which helps the diving tourism industry.
- This RMA would address declining populations of endangered coral species, declining reef quality, and a need to restore reef function and overall reef health. ESA listing implies that the species is imperiled and provides a legal mandate to orchestrate 'recovery'.

5. Potential Pros

What are the potential advantages associated with this management action?

- More coral larvae and fragments would be available for restoration activities as well as increased resilience/sustainability of resources.
- There is the potential for the northern expansion of corals, re-establishing populations of coral communities, increased resilience and continuation of services provided by the habitat. The ecosystem as a whole will be restored and enhanced, and innovation of new ideas will proliferate.
- Artificial reefs will take pressure off of the system, and propagation (fisheries and corals) will enhance existing system. This will bolster resilience to climate change and sea level rise.
- Artificial reefs take pressure off of the natural reef and provide more areas that attract more divers, which increases economic prosperity.
- Improvement of the reef with respect to increased coral coverage, invertebrate inhabitants, and fish populations.
- There will be an evaluation of success of artificial reef projects and planning of future projects. The more agencies and academia involved, the better.
- Monitoring and reporting of the artificial structures would only assess their success, but in itself provide no guarantee than corrective action would follow any delinquencies, and it would provide no information directly benefiting the natural reefs. We suggest relocating the excellent observation that uniform monitoring and reporting of artificial structures should be required into all MAs that propose using them for either mitigation or restoration.

6. Potential Cons

What are the potential disadvantages associated with this management action?

- Associated cost, infrastructure and expertise needed to set up facilities, and recovery zones may be off limit to certain activities.
- Costs of this action will be high, and must be in conjunction with threat abatement (must address what caused the threat). Other factors may negatively affect the ecosystem despite management efforts. For example, Lake Okeechobee discharge could negatively affect the area independent of restoration efforts.
- Inadvertent depletion of fishery resources from the natural resources could result because there is a location that is established where people may fish more aggressively.
- Diversion of management resources away from efforts to more directly improve the condition of natural reefs. (Efforts should be spend on natural reef resources).
- Action to restore these species must include identifying and addressing the reasons for decline. Without addressing broader issues such as water quality, success is unlikely. Additionally, since declines are not completely understood, the action would need significant research to produce the intended results.

7. Location

County/Counties: Miami-Dade, Broward, Palm Beach, Martin, Other?

- Reef habitat in all four SEFCRI counties.

Relevant Habitats: Coral reef, seagrass, watershed, etc.?

- Coral Reefs, Sandy Bottom, and nearshore Hardbottom would be targeted.

Specific Location: City, site name, coordinates, etc.?

- The most suitable habitat within the SEFCRI Region based on research would be chosen.
- Existing artificial reef project sites.

8. Extent

Area, number, etc.

- We must determine site selection criteria.
- We must ensure that there are not too many artificial reefs that they interfere with natural ocean environments.
- The entire SEFCRI Reef tract could benefit from this effort.
- An area of minimal deleterious influence would need to be identified to re-plant nursery corals.

9. Is this action spatial in nature?

- Yes. Artificial structures have a spatial component and are mapped.

Do you believe this management action could be informed by the Our Florida Reefs Marine Planner Decision Support Tool?

If yes, you will proceed to the next section on Marine Planner Information.

- Yes.

Marine Planer Information:

Marine Planner Information

The Decision Support function of the OFR Marine Planner assists in providing spatial options for management recommendations. If the management action is spatial in nature, and it is believed that data layers in the OFR Marine Planner can be used to help provide spatial options for that management recommendation, please fill out the following to help us develop the tool to address your needs.

The Decision Support Tool provides spatial options based on features in the OFR Marine Planner that you select as being

relevant. The critical information you need to provide for your recommendation are:

Feature - These are the data layers in the marine planner relevant to your management recommendation. For example:

- Depth
- Habitat types to avoid or target
- Proximity to other features (inlets, outfalls, artificial reefs)
- Types of reef-use to include or exclude
- Intensity of use
- Fish/coral density
- Fish/coral diversity
- Etc.

(Feature) Value - How much? This will be a unit of measure, e.g. #, %, distance, area, amount. If you are unsure you can state “high, medium, low” and allow input from advisors on how much is high, medium or low for our region. Also, you can make a statement like “far enough away to allow for ___” or “has enough of x to accomplish y,” again allowing reviewers to help provide necessary input.

	FEATURE	VALUE
1.	coral diversity	number of species
2.	historical vessel grounding locations	number location
3.	coral cover	%cover
4.	benthic maps	location habitat and substrate type
5.	proximity to inlets and outfalls	distance location depth
6.	current and historic restoration	location type size
7.	Use	type number of user frequency intensity historical anecdotal
8.	Depth	number
9.	coastal construction projects	location recurring projects historical projects frequency duration
10.	historical and cultural resources	location type footprint
11.	a) Areas that have few fish // b) Identify degraded areas	a) Increase fish population if fishing is restricted for a temporary period of time. // b) Storm degraded areas anthropogenically degraded areas (buried coral reefs)
12.	a) Areas that have 0.01-2 corals per square meter //	a) Will help repopulated corals if not used for
13.	• //Chronic TURBIDITY and poor water quality areas	//Highly turbid or nutrient high areas
14.	• //Identify number of factors affecting area (WHY is the area degraded)	//# and type of factors affecting reef
15.	• //Identify user areas that are degrading	//WHAT is causing decline? (ship groundings, fishing pressure, diving pressure, water quality, disease)
16.	• //Identify areas that would benefit from propagation and coral transplanting	//source of damage must not be in areas of chronic degradation due to factors beyond control
17.	• //Identify factors that limit the success of transplants	//

- Tier 1 Marine Planner: Project-specific goals need to be stated in order to determine appropriate siting. Many of the features listed would indeed be helpful but likely not known.
- Generally, restoration effort should be focused at locations far from current and anticipated impacts.

Tier 2 Information: (No Tier 2 Info from S-8, N-115, S-7, S-24- Info below from S-13 and TAC comments)

WHY?

1. Strategic Goals & Objectives to be Achieved

Refer to the [SEFCRI Coral Reef Management Goals and Objectives Reference Guide](#).

- Shockingly, I am not sure that any of the items in the attached Management Goals and Objectives guide refer to coral population enhancement.
- Repopulate the reef with regionally appropriate coral densities and fish populations.

2. Current Status

Is this activity currently underway, or are there planned actions related to this recommendation in southeast Florida? If so, what are they, and what is their status.

- There are ongoing culture and some outplanting of staghorn coral. There is little capacity with other species in Florida. We could examine nursery areas in other Caribbean waters that have success stories with other species.
- Mooring buoys are installed on portions of the reef which help to eliminate anchoring, but the reef is still damaged by divers and/or spearfishing.
- Yes, there are coral nurseries in our region (Broward and Miami-Dade Counties), both of which are very successful at growing Staghorn coral, however, outplanting methods and the broader ecological benefit need to be further evaluated. Funding for these programs are also very limited and recently turning towards private sponsors. The Miami-Dade and Broward County has outplanted Staghorn corals to many locations.
- In situ Staghorn nurseries and outplanting are ongoing in Miami-Dade and Broward. These Staghorn nurseries are currently not actively propagating other ESA listed coral species.

3. Intended Benefits (Outcomes)

What potential environmental benefits or positive impacts might this management action have?

- If populations (along with maintaining a hospitable environment) can be brought to a self-sustainable level, the benefits are self-perpetuating. *A. cervicornis* outplants most often have high survivorship over the short term (few years); and probably lower than natural survivorship over long term.
- Environmental benefits only occur if the fishes and corals that naturally recruit to the artificial structures release larvae that recruit to the natural reefs... but are not likely to be of a scale that's large enough to have much effect; however, this is one important component of any mitigation or restoration project involving artificial structures fishing and diving industry, and the public who participate in these activities, would benefit from the new recreational sites.
- It would give time for corals to spawn and repopulate and for fish to increase in population here, which will spill over to other parts of the reef tract.
- Increased community awareness would result from this RMA.
- Intended benefits include contributing to recovery of ESA listed coral species, enhancing structure and reef systems, as well as increased fish habitat. If restocked corals are successful on the long term, these benefits will be perpetual.

What potential social/economic benefits or positive impacts might this management action have?

- Greater area of reef and numbers of fish.
- Additional benefits of coral nurseries include outreach and educational opportunities as well as economic benefits generally associated with healthy coral reefs.
- The SEFCRI region, specifically Broward County, appears to have fairly large populations of the ESA listed and

nursery coral, *A. cervicornis*, however, there is no protection for these large populations of ESA species or the locations where the nursery colonies are being outplanted.

What is the likely duration of these benefits - short term or long-lasting? Explain.

- Long lasting. If this area is observed as to becoming degraded, it can be closed off again to replenish the damaged areas.
- Long-term. Outplanted colonies will provide all the services naturally recruited colonies provide. These colonies will grow, create habitat, and reproduce supporting natural recruitment.

4. Indirect Costs (Outcomes)

What potential negative environmental impacts might this action have?

- A primary focus on artificial structures would divert funds from more direct measures to conserve and restore natural reefs.
- People will not abide by these rules. There will be confusion on the part of boaters, divers, and fishermen.
- A primary focus on artificial structures would divert funds from more direct measures to conserve and restore natural reefs.
- There is little evidence showing any negative impacts from this process or RMA. There is some concern that outplanting colonies grown in high density nurseries adjacent to naturally recruited colonies may increase the risk of disease.

What potential negative social/economic impacts might this action have?

- There may be difficulty in informing the public and monitoring it. There will always be those that don't abide by the rules.
- Economic – Currently, outplanting nursery grown colonies within areas which may be in the future permitted maritime and coastal construction projects is not supported.

What is the likely duration of these negative impacts - short term or long-lasting? Explain.

- Short term. As more and more areas are temporarily opened and closed, the public will be educated and FWC or DEP can put out notices like the fishing season notices already in place.

5. Risk

What is the threat of adverse environmental, social, or economic effects arising from not implementing this action?

- Seven Atlantic/Caribbean corals are already listed as threatened under the Endangered Species Act.
- The risk is that if the causes of the initial decline are not managed or removed from the system before restoration or enhancement begins, then the restoration or enhancement could fail to achieve its goals and objectives. We agree that artificial structures used for mitigation or restoration should be based on the best available science in order to provide maximum environmental, and long-term economic, benefits.
- Continued degradation of the reef would occur if the RMA is not implemented.
- We agree that, in order to provide maximum environmental, and long-term economic, benefits, good monitoring and reporting are important component of programs in which artificial structures are used for mitigation or restoration.
- Very little risk, however, some considerations should be taken. For instance, showing the ability to restore a location may provide groups to use that as leverage to obtain permits and mitigate damaged areas. Another potential risk could be placing money in to a program without considering other point factors that may negate the efforts and waste resources. As ESA threatened, target species are already 'likely to become in danger of extinction in the foreseeable future'.

6. Relevant Supporting Data

What existing science supports this recommendation? (Provide citations)

- There is a rapidly developing science that supports coral culture/restocking. See case studies in: Johnson ME,

Lustic C, Bartels E, Baums IB, Gilliam DS, Larson L, Lirman D, Miller MW, Nedimyer K, Schopmeyer S (2011) Caribbean *Acropora* Restoration Guide: Best Practices for Propagation and Population Enhancement The Nature Conservancy, Arlington, VA.

- For larval recruitment/enhancement, see: Guest J, Baria M, Gomez E, Heyward A, Edwards A (2014) Closing the circle: is it feasible to rehabilitate reefs with sexually propagated corals? Coral Reefs 33:45-55.
- MICCI 2 gives guidance on restoration after a grounding, this may or not be a useful resource, in parts, depending on the direction this action goes.
http://www.dep.state.fl.us/coastal/programs/coral/reports/MICCI/MICCI_Project2_Guidelines.pdf
- The large literature on adaptive management supports the utility of sound monitoring.
- NOAA Acropora Recovery Plan:
http://sero.nmfs.noaa.gov/protected_resources/coral/documents/acropora_recovery_plan.pdf

7. Information Gaps

What uncertainties or information gaps still exist?

- There is also a lot of science yet to be done to improve the implementation, extend to more species, and ensure long term viability of out planted populations. Short term success of *A.cervicornis* (i.e. few years) is very clear. Long term viability is less clear.
- Outplanted corals are shown to be successful (surviving and with high growth rates) in the short term (i.e. few years). There is more uncertainty regarding their long-term viability (decadal scale).
- Potential risk of increased disease events associated with nursery grown colonies and outplant densities adjacent to naturally recruited colonies.
- Identifying ecological, environmental and physical factors which define a "good" outplant site is ongoing.
- Need demonstrable linkages between increasing fishes or corals on artificial structures and benefits to natural reefs tend to be pretty weak at best. The benefits would seem to be primarily economic and societal.

WHEN?

8. Anticipated Timeframe for Implementation

How long will this recommendation take to implement?

- This is probably a long term endeavor, though individual projects could be implemented in a two year time scale.
- 5-10 years is anticipated for implementation.
- Implementation would vary with scale of any particular project.
- Implementation would be immediate for support of existing nurseries, and could be several years for support for new or enlarged nurseries.

9. Linkage to Other Proposed Management Actions

Is this activity linked to other proposed management recommendations?

- There is a clear linkage to e.g., S-13, S-15, possibly also S-12 and N-115.
- There are linkages to the "scientifically based artificial reef" MA (S-7) and all MAs with a mitigation and/or restoration component, especially those that mention use of artificial structures.

If so, which ones, and how are they linked? (e.g., is this activity a necessary step for other management actions to be completed?)

- N-146: Establish an MPA zoning framework.

Does this activity conflict with other existing or proposed management actions?

- No.

WHO?

10. Lead Agency or Organization for Implementation

What agency or organization currently has/would have authority? Refer to the [Agencies and Actions Reference](#)

Guide.

- Several organizations are already greatly involved in coral culture/restocking (e.g., FWC, UM, NSU, etc). NMFS probably has interest in restocking ESA-listed species. Not clear what agency might lead this as a coordinated effort. It currently occurs on a case/project basis.
- FWC: Local coastal governments; FWC, DEP, NGOs.
- FWC: 'permits' the activity through Special Activities Licenses.
- NOAA NMFS supports these activities through Biological Opinions.
- USACOE 'permits' the use of the nursery sites and structures within the nurseries.

11. Other Agencies or Organizations

Are there any other agencies or organizations that may also support implementation? Explain.

- FWC: FWC, DEP, NOAA, USACE; local coastal governments, NGOs, and academic institutions.
- Broward County, Miami-Dade County, Palm Beach and Martin counties could be involved too.

12. Key Stakeholders

Identify those stakeholders most greatly impacted by this management action, including those from whom you might expect a high level of support or opposition. Explain.

- This could be anyone who uses or has an interest in the water, nearshore hardbottom, reef, inlets, and water column, etc.
- FWC: This could be a stakeholder initiative.
- Professional fishermen, lobster fisherman, fish collectors for aquariums may oppose it. Dive charters may support it.
- Any entity involved reef preservation, restoration or mitigation; plus recreational industry and recreationists would be affected.

HOW?

13. Feasibility

Is there appropriate political will to support this? Explain.

- Rapid implementation relative to staghorn coral is underway. Techniques for other species are less developed.
- Yes, if the state and cities want to continue tourism in our offshore waters, they should support it. It has worked in the Keys.
- This is feasible for *A. cervicornis*, which had exhibited high survivorship/success over the short term (few years following outplant). Currently less known and less capacity for other ESA listed species.

What are the potential technical challenges to implementing this action? Has it been done elsewhere?

- It has only been done in the islands, namely Bonaire, where the entire reef tract is a protected marine park. They do close off some buoys periodically if they are becoming damaged by divers for a temporary time and then reopen them. Other islands have made off limit areas to fishing and/or diving and it has enhanced the reef and fish populations.
- This should be feasible, even though it is not recommended as a stand-alone management action.
- The main technical challenge is learning to be better efficient with limited funding. It is important to be more successful growing more colonies and outplanting more colonies with limited budgets.

14. Legislative Considerations

Does the recommendation conflict with or actively support existing local, state, or federal laws or regulations? Explain.

- This RMA supports the Recovery Plan for Elkhorn and Staghorn coral.
- FWC: Legislative or Board of Trustees action is not required.
- FWC: Legislative action is required to appropriate funding.
- Legislative action is required to appropriate funding if alternative funding sources are not available. This RMA is supported by the NAOO Recovery Plan.

15. Permitting Requirements

Will any permits be required to implement this action? Explain.

- Lots of permitting considerations but FWC, and USACE are the primary players in the SEFCRI region.
- Can we involve some changes in legislation relating to permitting artificial structures for mitigation?

16. Estimated Direct Costs

Approximately how much will this action likely cost? (Consider one-time direct costs, annual costs, and staff time, including enforcement.)

- Cost depends on specific actions and scope.
- \$100,000 - \$250,000

Will costs associated with this activity be one-time or recurring?

- Recurring.

If recurring, approximately how long will staff time and annual costs be necessary to implement the management action?

- This project would be full time to monitor the areas for success and poaching (if off limits).
- Likely re-occurring. Costs should be all encompassing including not only the restoration but other associated issues impacting ESA species. Costs should also consider using the nurseries as an outreach and PR tool.

17. Enforcement

Does this require enforcement effort?

- Yes.

Provide an explanation if available.

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18. Potential Funding Sources

Identify potential funding organizations/grant opportunities, etc.

- Taxes on boat purchases or fishing licenses.
- Depends on the purpose of the artificial structure.
- Some other related MA proposals regarding creative mitigation (banking, no-net-loss, etc...) could help fund ESA restocking activities.

19. Measurable Outcomes/Success Criteria/Milestones

How will the success of this recommendation be measured? How will you know when the intended result is achieved?

- Monitoring the artificial structures, or perhaps nearby natural reefs, for any changes in fish populations. Long-term benefits to coral populations on natural reefs are unlikely to be measurable on a reasonable time frame, however increased recruitment could be monitored.
- There should be data/photos taken at the start and end of the off limits period (e.g. 6 months - 2 years) to see if the intended result is achieved.
- Outcomes depend on the intended result, which needs clarifying. Any benefits to coral populations on natural reefs are unlikely to be measurable on a reasonable time frame.
- The outcome would be more corals on the reef.

SEFCRI/TAC Targeted Questions:

1. **TAC** - Is the recommendation likely to achieve the intended result? Explain.

Tier 1 – #2 (Intended Result - Output/Outcome)

- Certain types of actions can achieve enhanced coral populations for some species (namely *A.cervicornis*).
- Too broad of a MA with no specific restoration or enhancement action described so it is difficult to evaluate.
- Team 4: we request clarification, or restatement, of the intended result (see Tier 1 comments).
- There are absolutely no specifics are provided for this MA. Impossible to judge.
- Yes if the information gathered for artificial structures is relevant to the goal of improving the condition of natural reefs.

2. TAC - Is the recommendation sufficient to address the identified issue or problem? Explain.

Tier 1 – #4 (Justification)

- It is unclear if our current practice of planting corals (in the range of hundreds of colonies per project) by itself is adequate to restore populations to self-sustainability.
- No, too vague to assess.
- That depends on what the identified issue or problem really is (better diving/fishing opportunities or improved reef condition).
- Absolutely no specifics are provided for this MA. Impossible to judge.
- Demonstrable linkages between Increasing fishes or corals on artificial structures and benefits to natural reefs tend to be pretty weak at best.

3. TAC - Is the recommendation technically achievable from a science or management perspective? Explain.

Tier 2 – #8 (Anticipated Timeframe for Implementation) and Tier 2 - #13 (Feasibility)

- Yes for fragment out planting of *A.cerv.* Less clear for other species/methods.
- ****See discussion (PDF version)**
- All great intentions, but there is limited detail.
- We need a hypothesis, targets and goals to give better TAC input.
- Cost analysis needed.
- Tools/methods: coral nurseries as a tool to restore reefs (enhance pop. Abundance).
- Recovery zones restore natural reefs to recover
- Using larvae to enhance degraded ecosystems (not specific).
- Transplant resilient corals w/o nursery.
- Building artificial reefs.
- restore, create, and enhance estuarine nursery habitats (done through water management)
- There's very little we can do w/out more specifics.
- Certain methods more feasible than others; larval enhancement needs more development.
- Absolutely no specifics are provided for this MA. Impossible to judge.
- Coral nurseries to restore reef.
- Could try urchin restocking, must think about *Xesto* sponges and coral species.
- Yes, in theory.

4. SEFCRI Team, PPT & Other Advisors - Has this been done (by SEFCRI, other agencies or organizations in the SEFCRI region)? Explain.

Tier 2 – #2 (Current Status)

- There have been many coral transplantation efforts and there on current *Acer* nursery and out plant activities.
- Some restoration activities have been completed.
- FWC: This is partially already occurring.
- See discussion of Tier 2, Q#3.

5. SEFCRI Team, PPT & Other Advisors - Is this recommendation a research or monitoring project? (Recommendations should be turn-dirt management actions, not the step you take before a management action). Explain.

- Both.

- Depends on the goal of the effort.
- See discussion of Tier 2, Q#3.

6. SEFCRI Team, PPT & Other Advisors - If either of the following applies to this management action, provide feedback on which information submitted by the Community Working Groups may be more appropriate, or if entries should be merged. Explain.

- There are different viewpoints for an individual management action (i.e. two working group members provided separate information, as indicated by a "//" marking between them).**
- Information submitted for this and other draft management actions is sufficiently similar that they might be considered the same.**

- None to directly merge but plenty that are associated with enhancing coral populations.
- FWC: Combine with S-15.
- Could possibly be merged with S13.
- FWC: Combine with N-128, N-129, N-70, S-23.
- FWC: Combine with N-115.
- **See discussion for S-13**

7. SEFCRI Team, PPT & Other Advisors - Non-agency Question: Is the recommendation technically achievable from your stakeholder perspective? If not, do you have suggestions that would allow this to become technically achievable from your stakeholder perspective? Explain.

Tier 1 - #5 (Potential Pros), Tier 1 - #6 (Potential Cons), Tier 2 - #3 (Intended Benefits), Tier 2 - #4 (Indirect Costs) and Tier 2 - #12 (Key Stakeholders)

- We can transplants many corals but as stated above "It is unclear if our current practice of planting corals (in the range of hundreds of colonies per project) by itself is adequate to restore populations to self-sustainability."
- ****See discussion**
- Too broad of an RMA with no specific restoration or enhancement action described so it is difficult to evaluate....
- Potentially limited by cost.
- Local reef condition and function are degraded so that active restoration is necessary.
- Reef restoration RMAs – need to develop plans for restoration; improved science base for artificial reefs/structures; improve data collection for monitoring and evaluating success.
- There is a role for artificial structures, but there are other tools for restoration that need to be developed.

8. SEFCRI Team, PPT & Other Advisors - Agency Question: Is the recommendation technically achievable from a management perspective? If not, do you have suggestions that would allow this to become technically achievable from your agency's management perspective? Explain.

Tier 2 – #10 (Lead Agency or Organization for Implementation) and Tier 2 - #11 (Other Agencies or Organizations)

- FWC is likely to support this. Barriers include: Genetic and health data gaps; funding.
- FWC: This is already being done with Acroporids. Scientific gaps exist in moving genotypes of other listed species across regions, and potential spread of disease through restoration activities. Research on potential genetic and health impacts from such activities is crucial in advance of implementing or increasing restoration efforts to avoid posing unnecessary risks to the wild stock. Such research has been/is being conducted for Acroporids and supports broader restoration efforts for that species.
- Yes, it's feasible but limited by cost. Perhaps the most likely means to implement a restoration/enhancement project may be as a mitigation requirement.
- FWC: General Comments - Recommend defining what is meant by "enhance" (for example, enhance for fishing opportunity and enhance to improve fish growth rate are two, sometimes competing objectives). Also, there are multiple components under the "ecosystem services", each component of which will identify unique objectives. More science-based information will be required to support decision making for specific objectives. This recommendation is very vague. This is being done with artificial reef deployments. FDEP is currently in the process of developing a semi-experimental reef restoration project in Ft. Lauderdale at the Spar Orion and

Clipper Lasco grounding sites using EMRTF funding. These projects will further knowledge of reef restoration methods. Restoration and enhancement techniques (eg, stabilization of rubble) for hardbottom communities continue to be refined with some lessons learned from projects in Florida and elsewhere. Projects involving the outplanting of nursery-reared stock (stony and gorgonian corals) are ongoing to refine techniques to increase survivorship of stock and outplants. FWC supports the collection of “corals of opportunity” (ie those dislodged by natural events or from groundings or salvaged from construction projects) for nursery broodstock, but does not otherwise support the collection of wild stock unless there is no other alternative available. FWC supports restoration efforts which responsibly account for region and species-specific genetic requirements and potential disease transmission.

- FWC: Barriers include - Need more science based information to support decision making for specific objectives. Achieving certain objectives may require management action, or other actions to minimize influencing variables to maximize the primary intended benefits.
- FWC: General comments - "More information is needed on what exactly is meant by the “science-based” component this action and how it specifically relates to rebuilding coral reef habitat. The Tier 1 ‘intended result’ states: “Nonscientific-based reefs only promote fish aggregation, and artificial reefs, such as wrecks, can be made up of harmful contaminants like asbestos and PCBs. By creating reefs that are based on science, this action should (1) result in not only more reef fish collection, like most artificial reefs, but also produce more fish and (2) produce more reef. Data collected about the productivity of various types of artificial reefs should be used to develop the most effective artificial reefs. No more sunken wrecks and tires should be used as artificial reefs. The ultimate goal is to use artificial reefs for juvenile fish attraction and coral recruitment. In addition to the substance that makes up the artificial reefs, science should be used to determine the most productive location of the artificial reefs (i.e. we should not place artificial reefs deeper than where the corals may grow).”
- The ‘intended result’ sentences imply many different separate aspects of artificial reefs such as: fishing pressure, fish growth and mortality rates, fisheries life history bottlenecks, coral recruitment, fish consumption (toxicology), etc. The FWC supports the concept of improved data collection to provide more scientific-based decision making, but the ‘intended results’ are not nearly comprehensive enough to capture all artificial reef objectives and the variables associated with each. It is not realistic to presume there is ‘one-size fits all’ artificial reef design, or location. Multiple locations, material types and management strategies will be necessary to achieve multiple objectives. If the strategy is intended to be coral-specific, the expected ‘intended results’ should be coral specific. As currently stated ‘to rebuild coral reef habitat’, implies construction of mitigation reefs to repair anchor or ship grounding sites to “rebuild” coral reef habitat, but that is not is what is described in the ‘intended result’. The recommendation should be revised to be more specific, perhaps divided into multiple different recommendations (one on use of man- made materials as mitigation for ship groundings, another for coral nursery areas, etc?)."
- FWC: Barriers include - Funding - need legislative support; reaching consensus as to what defines "success"; prioritizing monitoring efforts using limited funding, resources and manpower.
- FWC: General comments - In order to identify the specific parameters to monitor, expectations of "success" should first be identified, from which respective monitoring parameters would be developed. This recommendation should then be expanded to include development of monitoring strategies consistent with monitoring efforts at natural habitats, such that performance can be considered across the entire marine landscape (manmade and natural habitats combined).

Comments from the Reviewers:

- More clarification/specificity is needed to hone this as a 'management action'. For example, it is not clear what is meant by 'recovery zones'. Does this mean some sort of spatial closures would be used in conjunction with restocking-type action? Or does it just refer to anticipated downstream replenishment function or restored areas/populations? The specific action and its citing are crucial.
- Also, as with many descriptions, the intended result here is seemingly in IMPLEMENTING the population enhancement, not simply developing the strategy!
- Note that genetic diversity is not often a clear major bottleneck in extant coral populations, but is certainly a

major concern in 'designing' new (restocked) populations.

- Team 4: Enhancing coral populations would go far to improve reef ecosystem function, fish habitat, and recover ESA listed species, etc.
- SEFCRI TAC and Team fully supports restoration, just more detail needed
- See discussion on restoration techniques (urchins, etc... Tier 2, TAC Question 3)
- Local reef condition and function are degraded so that active restoration is necessary.
- Reef restoration MAs – need to develop plans for restoration; improved science base for artificial reefs/structures; improve data collection for monitoring and evaluating success.
- There is a role for artificial structures, but there are other tools for restoration that need to be developed.
- Project idea: Set aside an area of reef similar to a community garden to conduct restoration. Raise awareness and generate community buy-in.
- ". If there is an underlying reason that the reefs in a particular area are declining (ocean temperatures, runoff etc...). Then local stressors may need to be addressed first, otherwise risk the chance that the restoration and enchantment activities will not "survive".
- *****In general, The CWG did not provide and comment or information to review. The RMA is too broad and no specific actions are described. In general reef restoration would have many goals and objectives.**
- Divers and fishers are probably not the major reasons for the decline of the SEFCRI reefs, with the possible exception of the immediate vicinity of any very heavily dived sites. Potential pros needs to include reasons that clearly benefit the natural reefs. We suggest relocating the excellent observation that any emplacement of artificial structures should be based on sound science into all MAs that propose using them for either mitigation or restoration purposes.
- Tier 2, Q7: we are unsure of how, as proposed, this MA is intended to benefit natural reef systems.

Questions from the Reviewers:

Questions/Information Needs Highlighted by the Reviewers	Addressed by CWG:	Not Addressed by CWG Because:
1. What is meant by "recovery zones"? Does this mean some sort of spatial closures would be used in conjunction with restocking-type action? Or does it just refer to anticipated downstream replenishment function or restored areas/populations?	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
2. Update intended result to include developing a strategy- not merely implementing the strategy.	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
3. Is there more coral in the enhancement areas? This would make a good case to get a program funded.	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
4. need hypothesis, targets and goals to give better TAC input	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
5. cost analysis needed	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
6. Where does the policy and science cross?	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
7. Restoration and enhancement actions are not specified . . . Presumably artificial reefs and propagation/out planting would be involved??	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
8. Project-specific goals need to be stated in order to determine appropriate siting.	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
9. Clarify intended result	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.

10.	What do the CWGs mean by “better” or “enhance”? What standards will be used to assess success	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
11.	Must identify multiple components under the "ecosystem services", and for each component identify unique objectives	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
12.	More information is needed on what exactly is meant by the “science-based” component this action and how it specifically relates to rebuilding coral reef habitat (intended result).	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
13.	Does this apply to closures?	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.
14.	Must demonstrate linkages between Increasing fishes or corals on artificial structures and benefits to natural reefs tend to be pretty weak at best. The benefits would seem to be primarily economic and societal.	<input type="checkbox"/>	<input type="checkbox"/> This does not apply. <input type="checkbox"/> Need help addressing it.

Questions from the CWGs back to the Reviewers:

Additional information by SEFCRI Team and/or Technical Advisory Committee

The SEFCRI Team/TAC have concerns this is research and not enough is known to develop strategies/zones, additionally without those zones being protected, how will they ensure spawning, growth, restocking. **This zone would need to exist within an MPA as there otherwise would not be assurance the area would not be impacted. Consider combining this with another place-based action.** However, the appropriate zones to do this are unknown and scientists to not fully understand larval recruitment at this time. Recovery of these areas without improvements to the bio-physical environment – recovery will not occur. Things to consider: Genetic diversity is low within coral species; Adaptive management would be needed: administer “community garden” instead of zones.

Jocelyn is the POC (for S-8) and Jocelyn thinks the RMA has been sufficiently modified to address the above concerns.

Additional information by SEFCRI Team and/or Technical Advisory Committee

- Review the ESA *Acropora* recovery plan.

Dave Gilliam is POC (for S-15) - combined into S-8 on the second round of SEFCRI Review.