Title:

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.

Background:

- This recommended management action relates to all four Southeast Florida Coral Reef Initiative (SEFCRI) counties, including coral reefs, sandy bottom, and nearshore hardbottom habitats.
- This recommended management action is being put forth because it will address the degradation of the reef and improve quality, health and function over time by increasing coral propagation and larval recruitment.
- This recommended management action would use diverse/resilient corals from degraded locations with resilient populations to restock and 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 of this recommended management action will be site-level design to incorporate relevant criteria for how to judge successful management practices and strategies (which 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.

Objective:

- The intended outcome of this action is to 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.
- This recommended management action would address declining populations of endangered coral species, declining reef quality, and a need to restore reef function and overall reef health. An Endangered Species Act (ESA) listing implies that the species is imperiled and provides a legal mandate to orchestrate 'recovery'.
- Finally, this recommended management action will create a 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.
- **This RMA is not intended to prohibit extractive use. There would be no fishing or diving restrictions associated with this RMA.**

Intended Benefits and/or Potential Adverse Effects:

- Benefits of implementation of this recommended management action would 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 in the long term, these benefits will be perpetual.
- Some anticipated negative impacts associated with this recommended management action include the potential for spreading disease upon transplanting propagated colonies in close proximity to natural colonies.

- The duration of the benefits of this recommended management action are recurring. Maintaining and enlarging nurseries is continuous activity. Outplanting from nurseries should be a large, active, continuous component of a nursery effort.
- If this recommended management action is not implemented, there will be continued degradation of the reef tract. Seven Atlantic/Caribbean corals are already listed as threatened under the ESA, and 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.

Agencies/ Organizations:

- The lead agencies for implementation of this recommended management action would be local coastal governments, Florida Department of Environmental Protection, non-governmental organizations, and the Florida Fish and Wildlife Conservation Commission (FWC) through special activities licenses.
- Other potential agencies or organizations who could be involved include the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service, United States Army Core of Engineers (USACE), and the academic institutions already involved in coral culture/restocking (e.g., University of Miami, Nova Southeastern University, Florida International University, etc.).
- The key stakeholders for this recommended management action would be any entity involved in reef preservation, restoration or mitigation, as well as the recreational boating and fishing industries. Dive charters would likely support it.
- This could be a stakeholder initiative.
- Legislative action is required to appropriate funding if alternative funding sources are not available, but legislative or Board of Trustees action is not required.
- This recommended management action is supported by the NOAA Recovery Plan and the Recovery Plan for elkhorn (*Acropora palmata*) and staghorn coral (*Acropora cervicornis*).

Permitting/ Enforcement Requirements of RMA:

- There will be lots of permitting considerations but FWC, and USACE are the primary players in the SEFCRI region.
- Enforcement would be required to ensure regulations for this recommended management action are followed.
- A measurable way to show success with this recommended management action is monitoring the restoration areas, as well as nearby natural reefs, for any changes in fish and coral 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. Data/photos would be taken at the start and end of the off-limits period (e.g. 6 months - 2 years) to determine if the intended result is achieved.

Cost:

- The estimated direct cost of implementing this recommended management action depends on the scale and scope, but would likely be between $100,000 and $250,000.
- Potential funding could be acquired through taxes on boat purchases or fishing licenses. Note: Refer also to recommended management action proposals regarding creative mitigation (banking, no-net-loss, etc.) to help fund ESA restocking activities.

Time Frame & Extent:

- The anticipated timeframe for implementation of this recommended management action would vary depending on the scope and scale of the project. Implementation would be immediate for the support of existing nurseries, and could be several years for support for new or enlarged nurseries. Individual projects could be implemented in a two year time frame, but ongoing projects may take 5 - 10 years.

Miscellaneous Info:

- Some uncertainties or gaps with this recommended management action include long-term survivability of outplanted corals, the potential for disease transfer with outplanted corals, and the need to identify ecological, environmental and physical factors which define a "good" outplant sites. In order to gain support and funding for this action, it may be necessary to demonstrate linkages between increasing corals on natural reefs and the benefits seen in coral and fisheries populations on surrounding reefs.
- Supporting and relevant data include the following:
    - There is a rapidly developing science that supports coral culture/restocking. See case studies in:
        - Johnson, M. E., Lustic, C., & Bartels, E., Baums, I.B., Gilliam, D.S., Lirman, D., Miller, M.L., 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. R., Baria, M. V., Gomez, E. D., Heyward, A. J., & Edwards, A. J. (2014). Closing the circle: is it feasible to rehabilitate reefs with sexually propagated corals? *Coral Reefs*, 33(1), 45-55.
    - MICCI 2 gives guidance on restoration after a grounding, which may or not be a useful resource, in parts, depending on the direction this action takes. http://www.dep.state.fl.us/coastal/programs/coral/reports/MICCI/MICCI_Project2_Guidelin es.pdf
    - NOAA Acropora Recovery Plan: (http://sero.nmfs.noaa.gov/protected_resources/coral/documents/acropora_recovery_plan.pdf
- Currently in situ staghorn coral nurseries and outplanting are ongoing in Miami-Dade and Broward counties. These staghorn nurseries are currently not actively propagating other ESA listed coral species.

Goals/ Objectives to be achieved:

Refer to the SEFCRI Coral Reef Management Goals and Objectives Reference Guide

- Goals and Objectives were not identified within this recommended management action.