

**Title:**

**N-117: Improve impact minimization and mitigation activities for unavoidable impacts to resources to reduce and offset lost ecosystem function; including the use of non-traditional mitigation strategies.**

**Background:**

- This recommended management action relates to reef resources statewide.
- This recommended management action is being put forth because the current state statute requires that mitigation replace 100 percent of lost ecosystem function. However, current mitigation practices (boulders) do not recruit like natural reefs nor do they recruit within the monitoring time period. Applications for coastal construction permits frequently include proposals to construct artificial reefs using limestone boulders as compensation for impacts to reef. In instances dealing with a temporary loss or a partial (functional) loss, the use of alternative mitigation strategies may be more appropriate to offset project-related impacts to resources. In some cases, alternative mitigation strategies may also be appropriate to offset permanent or direct impacts. Alternative mitigation strategies would be those that may not directly replace lost ecosystem services but would improve the overall health of the system such as improved water quality. Alternative mitigation strategies may be appropriate where the amount of mitigation required is not feasible. This is not to include the use of mitigation banks.
- Coastal construction projects are required to minimize impacts, but more can be done to minimize potential impacts. In some cases organisms that could be transplanted elsewhere are left within the impact area and are lost due to construction activities. It would be cost prohibitive to require all benthic organisms to be relocated prior to each coastal construction project. Benthic organisms do not always survive transplantation, and the long-term survivorship of organisms after transplantation cannot be guaranteed. However, in situations where a construction activity will result in total mortality of all organisms remaining within the project footprint, transplantation will substantially increase survivorship relative to the no-action scenario.
- Avoidance over minimization is paramount, which is consistent with DEP strategy.

**Objective:**

- One intended outcome of this action is to further avoid and minimize permitted impacts to natural resources due to coastal construction projects. Another objective is to expand and improve mitigation practices where avoidance is not possible. In particular, mandating the relocation of a higher number and diversity of viable benthic organisms (e.g. corals, octocorals, and sponges) from areas of impact and improving the mitigation process (inclusive of permitting, implementation/construction, monitoring and compliance) would better ensure the success of mitigation projects. Additionally, for unavoidable impacts, non-traditional mitigation strategies like outplanting nursery organisms (echinoderms, corals, etc.), hazard removal, and water quality improvements should be encouraged.

**Intended Benefits and/or Potential Adverse Effects:**

- Benefits of implementation include greater minimization of impacts and improved success of mitigation projects which may result in “no net loss of corals” and may achieve a loftier goal of reducing and replacing the loss of ecological functions (not just coral mortality)

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resulting from permitted and unpermitted impacts to hardbottom and coral reefs.

- There will be a reduction in the mortality of benthic organisms within impacted areas. Salvaging organisms from impact areas can improve populations by maintaining genetic diversity and the number of reproductive individuals. Also, transplantation of corals within the project footprint will supply more fragments for coral nurseries, which can be used to repair injury sites. If a permittee ensures that all permit-required transplantation efforts are completed, but is unable to salvage all benthic organisms suitable for transplantation, then it may be advisable to allow trained volunteers to transplant additional organisms prior to construction.
- Corals (and other organisms e.g. octocorals and sponges) transplanted onto bare substrates (e.g., artificial reefs or damaged/barren natural reefs) can also enhance the recruitment (directly or via chemical attraction of larvae) in the areas of transplantation. Reef fish will also be attracted by more complex micro-relief of benthic organisms, which provide them shelter. It is important that more corals, octocorals, and sponges are removed from the area of impact and used to more aptly replicate the lost ecosystem services and function. Therefore, projects should require the removal of hard corals 10 cm and greater, and the transplantation of octocorals and large sponges (*X. muta*). For smaller footprint projects the size requirement may be lowered. If larger benthic organisms (e.g., corals) have higher survivorship, then requiring smaller size classes to be transplanted from impact areas may reduce survivorship of transplanted individuals. It is important to consider that while the proportion of transplanted individuals that survive may be lower than previous projects, the overall number of individuals salvaged from impact areas will be greater.
- Alternative mitigation strategies, such as the transplantation of corals-of-opportunity and nursery-raised corals to unpermitted damaged natural reef sites, can restore the ecological functions of natural hardbottom and reef areas. However, nursery grown corals may hide the black market and would need to be restricted to only be used in mitigation. Currently, nurseries are limited in species reared and size classes offered. Therefore, that industry will need to be developed in order to handle the demand that large-scale projects would generate.
- The financial cost of alternative mitigation and the relative functional gain associated with mitigation activities will need to be compared to boulder reef creation on a project-by-project basis. In some cases, alternative mitigation activities may not be as cost effective as traditional mitigation (e.g., the construction of boulder reefs). Also, there may be increased costs associated with the removal and transplantation of additional benthic organisms from impact areas. Transplantation requires a substantial time commitment to locate organisms, assess their condition (e.g., free from disease), collect, and relocate. It is also necessary to identify suitable transplantation sites for relocated organisms and to prepare the substrate for transplants. Therefore, requiring additional transplantation (e.g., different types of benthic organisms or greater size range of organisms) from impact areas may be cost prohibitive in some circumstances. Potential financial impacts of employing alternative mitigation strategies are expected to be short-term, as methodology and technology improve, the implementation of alternative mitigation is expected to become less expensive. Any additional costs for minimization via transplantation of benthic organisms from the impact area would be incurred on a project-by-project basis, but overall costs are expected to be short-term.

- A potential negative environmental impacts would be the risk of transmitting diseases by transplanting nursery raised corals to natural sites. To minimize the potential transmission of disease, it is typically recommended that organisms with visible signs of disease not be transplanted.
- This recommended management action will be a recurring activity because coastal development, and by extension the maintenance of coastal developments, is ongoing and the best suited minimization or mitigation method will need to be determined on a project by project basis. Similarly, the permitting process, as well as developing alternative mitigation methods, for mitigation projects should be continually adapted and improved upon based on lessons-learned.
- If this recommended management action were not implemented then ecosystem function will not be replaced 100 percent and therefore lost. There will continue to be a loss in the natural range of population age and size class structure. This can result in economic and social losses due to lack of resources for public users, including divers and fisherman.

**Agencies/ Organizations:**

- The lead agency for implementation of this recommended management action would be the Florida Department of Environmental Protection (FDEP).
- Other potential agencies or organizations who could be involved include the United States Army Corps of Engineers (USACE), Florida Fish and Wildlife, National Oceanic and Atmospheric Administration, and the National Marine Fisheries Service.
- The key stakeholders for this recommended management action would be coastal construction entities including permittees and regulatory agencies, as well as organizations with expertise in mitigation reefs, nurseries, and transplantation.
- This regulation does not conflict with any laws or regulations. State laws currently require minimization and mitigation for unavoidable impacts to resources. This recommended management action would provide applicants additional options for mitigation.

**Permitting/ Enforcement Requirements of RMA:**

- There are no permits required to implement this recommendation. However, requirements in permits should include that the removal of organisms to be transplanted is a minimization effort and could be counted on the front end of assessment equations and would not also count on the backend of the mitigation equation.
- There are no enforcement requirements with this recommended management action.
- A measurable way to show success with this recommended management action is through counting the number of projects using alternative mitigation. The status/success of specific projects using alternative mitigation methods can be quantified using the number of transplanted organisms, their growth and survival. Also, the number of organisms salvaged from impacted areas and their survival post-transplantation could be measured. The success of mitigation is defined as the replacement of ecological functions provided by natural resources/communities that were lost or degraded due to anthropogenic impacts.

**Cost:**

- Promotion of alternative mitigation by regulatory agencies will not require a substantial amount of money. There will be one-time cost to develop and implement new mitigation standards.

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- Potential funding for the start-up would come from the FDEP and possibly USACE Research Division, but permittees would be responsible for funding the minimization and mitigation activities.

#### **Time Frame & Extent:**

- The anticipated timeframe for implementation of this recommended management action is 0 - 2 years.

#### **Miscellaneous Info:**

- Some uncertainties or gaps with this recommended management action include:
  - Additional studies on the methods for transplanting corals could improve protocols and best practices.
  - Best management practices for minimization (i.e., removing and transplanting organisms) will need to be developed; specifically, information on the appropriate size and types of taxa that are to be removed should be refined – this is currently being addressed by Florida Fish and Wildlife Conservation Commission and a workgroup of experts.
- The use of alternative mitigation strategies (e.g., coral transplantation) is supported by literature, including:
  - Abelson, A. (2006). Artificial reefs vs coral transplantation as restoration tools for mitigating coral reef deterioration: benefits, concerns, and proposed guidelines. *Bulletin of marine Science*, 78(1), 151-159.
  - Monty, J. A., Gilliam, D. S., Banks, K., Stout, D. K., & Dodge, R. E. (2006). “Coral of opportunity survivorship and the use of coral nurseries in coral reef restoration”. Oceanography Faculty Proceedings, Presentations, Speeches, Lectures. Paper 31.
  - Forrester, G. E., Ferguson, M. A., O'Connell-Rodwell, C. E., & Jarecki, L. L. (2014). Long-term survival and colony growth of *Acropora palmata* fragments transplanted by volunteers for restoration. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 24(1), 81-91.
  - Rinkevich, B. (2008). Management of coral reefs: We have gone wrong when neglecting active reef restoration. *Marine pollution bulletin*, 56(11), 1821-1824.
  - Yap, H. T. (2009). Local changes in community diversity after coral transplantation. *Mar. Ecol. Prog. Ser.*, 374(3).
- Alternative mitigation strategies, such as the transplantation of corals-of-opportunity and nursery-raised corals, have begun to be incorporated into FDEP coastal construction permits, when applicable.

#### **Goals/ Objectives to be achieved:**

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

- FL Priorities Goal A1 / FL Priorities Goal A4 Obj. 3
- SEFCRI LAS LBSP FL Priorities Goal C4 Obj. 4 / SEFCRI LAS MICCI Issue 1 Goal / SEFCRI LAS MICCI Issue 1 Obj. 1 / SEFCRI LAS MICCI Issue 1 Obj. 2 / SEFCRI LAS MICCI Issue 2 Goal / SEFCRI LAS MICCI Issue 2 Obj. 1 / SEFCRI LAS MICCI Issue 3 Goal / SEFCRI LAS MICCI Issue 3 Obj. 3 / SEFCRI LAS MICCI Conservation Goal C.