# Coral Critical Habitat Consultation Framework
# NOAA Fisheries Southeast Region

Revised August 2022

## Purpose and Scope

In order to inform the Region's consultation activities regarding the designated critical habitat for elkhorn and staghorn corals, this document consolidates and interprets information obtained through collaboration with National Marine Fisheries Service's (NMFS's) Southeast Fisheries Science Center, state, federal, and university partners. This collection of information provides Section 7 assistance, and identifies early conservation/recovery concepts to be considered during consultation. The contents are intended to summarize best available information as well as facilitate integration of conservation/recovery considerations into our routine consultation practices. A large quantity of information was synthesized in the production of this document and as such it should be considered a job aid and used as general guidance only.

## Background Information for Acropora Critical Habitat

This section presents information to help familiarize you with the designated critical habitat to understand the essential features as they specifically relate to Section 7 actions.

### ESA Documentation

On November 26, 2008, NMFS issued a final rule designating critical habitat for elkhorn and staghorn corals (73 FR 72210).

### Habitat Description

Four specific areas are designated: the Florida area (Figure A1), which comprises approximately 1,329 square miles (3,442 sq km) of marine habitat; the Puerto Rico area (Figure A2), which comprises approximately 1,383 square miles (3,582 sq km) of marine habitat; the St. John/St. Thomas area (Figure A3), which comprises approximately 121 square miles (313 sq km) of marine habitat; and the St. Croix area (Figure A4), which comprises approximately 126 square miles (326 sq km) of marine habitat.

As defined in the final rule, critical habitat does not include the following particular areas where they overlap with the areas described above:

1. All areas subject to the 2008 Naval Air Station Key West (NASKW) Integrated Natural Resources Management Plan.

2. All areas containing existing (already constructed) federally authorized or permitted man-made structures such as aids-to-navigation (ATONs), artificial reefs, boat ramps, docks, pilings, maintained channels, or marinas.
3. Twelve federally maintained harbors and channels: (i) Palm Beach Harbor; (ii) Hillsboro Inlet; (iii) Port Everglades; (iv) Miami Harbor; (v) Key West Harbor; (vi) Arecibo Harbor; (vii) San Juan Harbor; (viii) Fajardo Harbor; (ix) Ponce Harbor; (x) Mayaguez Harbor; (xi) St. Thomas Harbor; and (xii) Christiansted Harbor.

And the following area is **excluded** from critical habitat:

4. One military site known as the Dania Restricted Anchorage Area, comprising approximately 5.5 square miles (14.3 sq km), because of national security impacts.

NMFS identified the key conservation objective for elkhorn and staghorn corals as facilitating increased incidence of successful sexual and asexual reproduction. We determined the feature essential to the conservation of the species (also known as essential feature), which supports the identified conservation objective, was substrate of suitable quality and availability, in water depths from the mean high water line to 30 m, to support successful larval settlement, recruitment, and reattachment of fragments. For purposes of this definition, ''substrate of suitable quality and availability'' meant consolidated hardbottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover.

### Threats and Considerations for Essential Features of Elkhorn and Staghorn Designated Critical Habitat

The essential feature of elkhorn and staghorn critical habitat is consolidated hardbottom or dead coral skeleton that is free from fleshy macroalgae cover and sediment cover. Potential impacts include direct removal, burial, or overgrowth of the essential feature.

## Section 7 Considerations for Acropora Critical Habitat

### No Effect Determination

When making a "no effect" determination it is not necessary to mention Acropora critical habitat in the consultation. Identification of locations and common activities that are "no effect" on critical habitat (Table 1):

- Rationale for a "no effect" determination (i.e. essential feature is not present or will be completely avoided)
  - North of the Boynton Inlet in Palm Beach County, outside of critical habitat
  - Deeper than 30 m contour, outside of critical habitat
  - Within the Dania restricted area, NASKW, federally authorized or permitted man-made structure, or one of the named federally maintained channels above, excluded

from or not included in the rule (note: ESA-listed corals may still be present and would need Section 7 consultation for those corals)
    - Substrates within the critical habitat boundaries that do not contain the essential feature are not part of the designation. Note: these areas may appear to be within the boundary of critical habitat in Google Earth; however the text of the rule supersedes the visual depiction. Use the critical habitat boundary on Google Earth with caution.
    - Surveys indicate that the essential feature is not present (e.g., sediment or macroalgae coverage, unconsolidated substrate, etc.)
- Activities that have "no effect" on elkhorn and staghorn critical habitat
    - Noise
    - Increased vessel traffic

## Not Likely to Adversely Affect Determination

The following activities could cause minor sedimentation impacts or temporary removal of critical habitat depending on the size and scope of the project, as well as proximity, to the critical habitat. Identification of common activities that are "not likely to adversely affect" the listed species (Table 1):

- Docks and marinas using turbidity curtains
- Seawalls using turbidity curtains
- Artificial reefs
- Coral nursery structures constructed in accordance with the Project Design Criteria under the programmatic consultation, *U.S. Army Corps of Engineers (USACE) Regional General Permit SAJ-112 for Coral Propagation/Nursery Structures off the Coasts of Florida, Puerto Rico, and U.S. Virgin Islands* (SER-2014-15282, permit pending)
- ATONS if following the PDCs of the programmatic, *USCG - Southern Aids to Navigation (ATON) Servicing in the Aids to Navigation Team (ANT) CG 7th District - Sectors Miami, San Juan, and Key West (*SER-2011-3196)
- Core borings if limited in size and scope and the holes are back filled
- Dredging where certain project parameters or specific minimization measures make the effect insignificant or discountable

Factors to consider when making an insignificant or discountable determination:

- Distance from the critical habitat to minimize impacts
- Turbidity curtains used to minimize sediment from depositing on the critical habitat
- Monitoring to include turbidity less than 7 NTU (Nephelometric Turbidity Units) and/or sediment depth measurements of less than 0.5 cm on the reef to ensure no sediment impacts (time, duration, location, and spatial extent of monitoring to be determined based on project specifics) (Fourney and Figueiredo 2017; NMFS 2015)
- Sediment type and hydrodynamics of the area minimize sediment from travelling and depositing on the critical habitat

- Backfilling small core boring holes returns critical habitat to pre-project functionality

## Likely to Affect Determination

The following activities could cause long term sedimentation impacts or permanent removal of critical habitat. Identification of activities that are "likely to adversely affect" the listed species (Table 1):

- Sediment Manipulation
    - Dredging and the transportation and disposal of dredged material
        - physical removal, sedimentation
    - Fill/Beach Nourishment
        - burial, sedimentation
    - Sand bypass construction and operation
        - physical removal, sedimentation, burial at the output site
- Cables, gas lines, pipelines,, etc., crossing the bottom or installed below the surface (e.g., horizontal directional drilling)
    - physical impacts from direct contact of lines or movement of cables after placement can unconsolidate the substrate, possible sedimentation from pipeline leaks, or potential frac-outs which result when drilling muds escape to the surface of the seafloor due to fissures in the substrate
- Aids to Navigation (ATONs) installation and removal
    - direct removal, sedimentation
- Anchoring and anchors from vessels and other structures (e.g., buoys, etc.)
    - anchors can unconsolidate substrate
- Artificial Reef installation: Guidance being developed for effects determinations and standard language used for artificial reef analyses
    - direct removal, sedimentation during placement, damage to critical habitat from shifting reef materials
- Outfalls/Discharge/Stormwater Runoff
    - water quality changes including increased nutrients which can lead to increased macroalgal growth and sedimentation

## Conservation and recovery considerations

Biologists should consider the following conservation or recovery actions when engaging with action agencies and applicants throughout the entire the consultation process. In many cases, the process of avoidance, minimization, and mitigation can be incorporated into the proposed action. If not, and take or adverse effects to critical habitat are anticipated, these consideration actions can be added as Terms and Conditions and Conservation Recommendations to reduce the impacts.

- Avoidance
    - Avoiding impacts completely by not taking a certain action, or parts of an action, or redesigning the action to avoid adverse impacts to reefs

- Minimization
    - Environmental windows to avoid dredge/beach nourishment during coral spawning (to allow for coral recruitment and larval settlement)
    - Monitoring to maintain turbidity of less than 7 NTU (absolute) in areas of critical habitat (Fourney and Figueiredo 2017)
    - Buffers designed using the sediment types, dredge types, and hydrodynamics of the project area. Sediment transport modeling may be helpful
    - Sediment depth measurements on essential feature not to exceed 0.5 cm (in lieu of sediment traps, which are a less accurate measure of sedimentation)
    - Limiting or prohibiting allowable overflow during scow loading and scow transportation
    - Moving or stopping the dredge if turbidity is equal to or greater than 7 NTU or sediment depth measurements equal 0.5 cm or more until levels recede to an acceptable level

- Mitigation
    - If impacts to Acropora critical habitat are expected, mitigation should be sought.
        - If Acropora critical habitat is never expected to recover (e.g., substrate removed or broken up, permanently covered with structures or sand), the loss is considered permanent. Additionally, sediment depths greater than or equal to 0.5 cm is considered a permanent loss of habitat when fine grain sediment is present. Mitigation should be sought to compensate for loss of future adults due to the preclusion of settlement. The abundance criterion in the Acropora Recovery Plan should be used in a Resource Equivalency Analysis to calculate the number of corals that should be outplanted from a nursery to compensate for the loss. For *A. cervicornis*, the abundance criterion is colonies at least 0.5 m in diameter at a density of 1 colony per $m^2$ occupying 5% of the habitat in 5-20 m water depth. For *A. palmata*, the abundance criterion is colonies at least 1 m in diameter at a density of 1 colony per 4 $m^2$ occupying 10% of the habitat in 1-5 m water depth.
        - If Acropora critical habitat is expected to recover, the loss is considered a temporary loss of coral recruitment. Average recruitment rates can be used in a Resource Equivalency Analysis to determine the number of outplants needed to compensate for loss of recruitment. Contact Alison Moulding regarding REA (Appendix B).

- Corals, coral reef, and hardbottom are designated Essential Fish Habitat (EFH) by Caribbean and South Atlantic Fishery Management Councils under the EFH provisions of the Magnuson-Stevens Fishery Conservation and Management Act. Coordinate early and often with peers within the Habitat Conservation Division (HCD) for projects that

require both Section 7 ESA and EFH consultations. In particular, habitat characterization surveys, monitoring plans, and compensatory mitigation planning should reflect input by both PRD and HCD for projects. Best practices include coordinating draft Reasonable and Prudent Measures, Terms and Conditions, and EFH Conservation Recommendations to ensure thoroughness and consistency prior to review by General Counsel, especially for controversial or high profile projects.

## Determining buffer distances between construction activities and designated critical habitat

There is no one-size-fits-all buffer distance between a construction activity and designated critical habitat. The buffer distance applied should ensure the nearest edge of resource is outside the influence of all direct and indirect impacts (e.g., sedimentation and turbidity generated from dredging). Factors to consider in determining a buffer distance include:

- Type of activity and construction methodology being employed
- Duration, frequency, and concentration of the activity
- Time of day of the activity (e.g., nighttime dredging may make it difficult to see and maintain appropriate buffer distances)
- Known hydrographic conditions (e.g., tidal phase, current speeds and direction
- Characterization of the suspended benthic materials causing turbidity and sedimentation including geophysical composition (e.g., type and concentration of sediment grain sizes [fine material is more problematic than natural reef sediment grain sizes]) and chemical composition (e.g., type and concentration of chemical constituents)
- Type of equipment to be used for the work and ancillary activities (e.g., dredge type, anchoring or spudding of dredge support vessels)
- Sediment transport modeling may be useful in predicting appropriate buffer distances
- Can best management practices be implemented? (e.g., can turbidity curtains be used to limit sediment dispersal and protect water quality?)

In general, the more uncertainty surrounding the information available on the items above, could justify requiring a larger buffer distance.

**Table 1.** Activity, Effect Determination, Route of Effect, and Considerations for *Acropora* critical habitat.

| Activity | Potential Effect Determination | Potential Route of Effects to Designated Critical Habitat | Considerations Which Could Lead to NLAA |
|---|---|---|---|
| **Dredging** | LAA | Direct removal | |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls, turbidity and sedimentation monitoring to ensure turbidity does not exceed 7 NTU (due to correlation between turbidity and sediment deposition) and sedimentation does not exceed 0.5 cm. Use of environmental windows. |
| **Fill/Beach Nourishment** | LAA | Direct burial | |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls, turbidity and sedimentation monitoring to ensure turbidity does not exceed 7 NTU (due to correlation between turbidity and sediment deposition) and sedimentation does not exceed 0.5 cm. Use of environmental windows. |
| **Sand bypass** | LAA | Direct removal via dredge, relocation, burial at placement site | |
| | LAA | Sedimentation from dredging and placement | |
| | NLAA | Sedimentation from dredging and placement | Distance from critical habitat, use of turbidity controls, turbidity and sedimentation monitoring to ensure turbidity does not exceed 7 NTU (due to correlation between turbidity and sediment deposition) and sedimentation does not exceed 0.5 cm. Use of environmental windows. |
| | LAA | Direct removal | |
| | LAA | Sedimentation | |

| Activity | Potential Effect Determination | Potential Route of Effects to Designated Critical Habitat | Considerations Which Could Lead to NLAA |
|---|---|---|---|
| **Cables, Gas lines, Pipelines** | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls, turbidity and sedimentation monitoring to ensure turbidity does not exceed 7 NTU (due to correlation between turbidity and sediment deposition) and sedimentation does not exceed 0.5 cm. |
| **Removal of seawalls / riprap** | No Effect | | |
| **New seawall / riprap** | LAA | Direct removal | |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls to ensure sediments do not deposit onto the critical habitat |
| **ATONs** | LAA | Direct removal | |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls to ensure sediment does not deposit onto the critical habitat |
| | NLAA | Following PDC's of programmatic | SER-2011-3196 |
| **Outfalls** | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls to ensure sediment does not deposit onto the critical habitat |

| Activity | Potential Effect Determination | Potential Route of Effects to Designated Critical Habitat | Considerations Which Could Lead to NLAA |
|---|---|---|---|
| **Anchoring** | LAA | Direct removal | |
| **Docks / Marinas** | LAA | Direct removal | |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls to ensure sediment does not deposit onto the critical habitat |
| **Core borings** | NLAA | Direct removal | Backfilling boring holes |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls to ensure sediment does not deposit onto the critical habitat |
| **Artificial Reef** | LAA | Direct removal | |
| | LAA | Sedimentation | |
| | NLAA | Sedimentation | Distance from critical habitat, use of turbidity controls to ensure sediment does not deposit onto the critical habitat |
| | NLAA | Direct physical effects | Must follow artificial reef guidelines: http://sero.nmfs.noaa.gov/protected_resources/section_7/guidance_docs/documents/noaa_artificial_reef_guidelines.pdf |
| **3R's: Coral Research, Restoration, and Relocation (which can include Coral Nurseries)** | NLAA | | Covered under programmatic |

| Activity | Potential Effect Determination | Potential Route of Effects to Designated Critical Habitat | Considerations Which Could Lead to NLAA |
|---|---|---|---|
| **Location** | No Effect | | Below 30 m depth contour |
| | No Effect | | North of Palm Beach County |
| | No Effect | | Lacks essential feature (e.g., unconsolidated, covered with sediment or macroalgae) |
| | No Effect | | In one of the areas excluded by rule (see list of maintained harbors, channels, restricted area) |

## Literature Cited

Fourney, F., and J. Figueiredo. 2017. Additive negative effects of anthropogenic sedimentation and warming on the survival of coral recruits. Sci Rep 7(1):12380.

Moulding, A. L., V. N. Kosmynin, and D. S. Gilliam. 2012. Coral recruitment to two vessel grounding sites off southeast Florida, USA. Revista de Biologia Tropical 60(4):99-108.

NMFS. 2015. Examination of Sedimentation Impacts to Coral Reef along the Port of Miami Entrance Channel, December 2015. National Marine Fisheries Service, St. Petersburg, Florida.

## Appendix A. Critical Habitat Range Maps for Elkhorn and Staghorn Corals

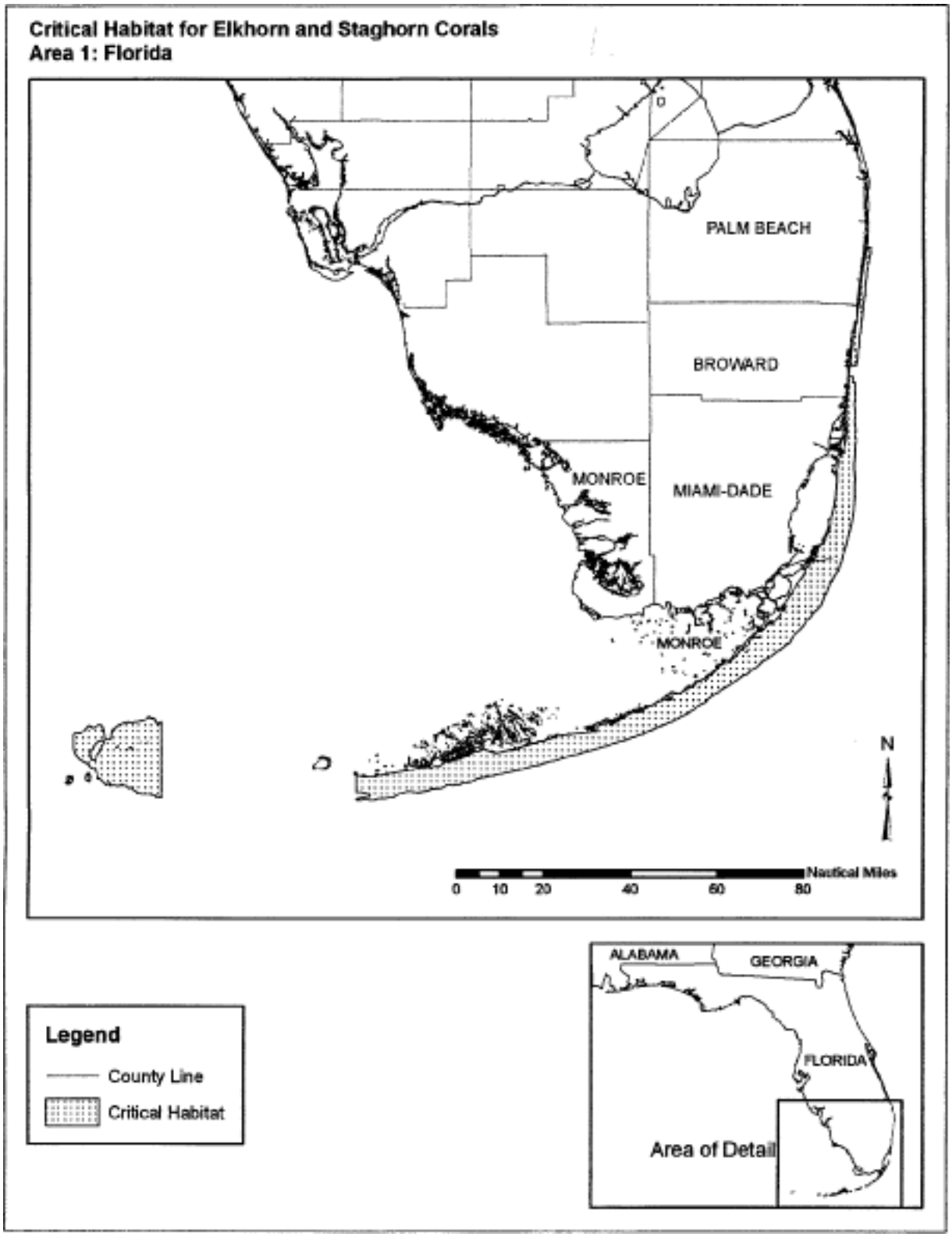


**Figure A1.** Florida Unit

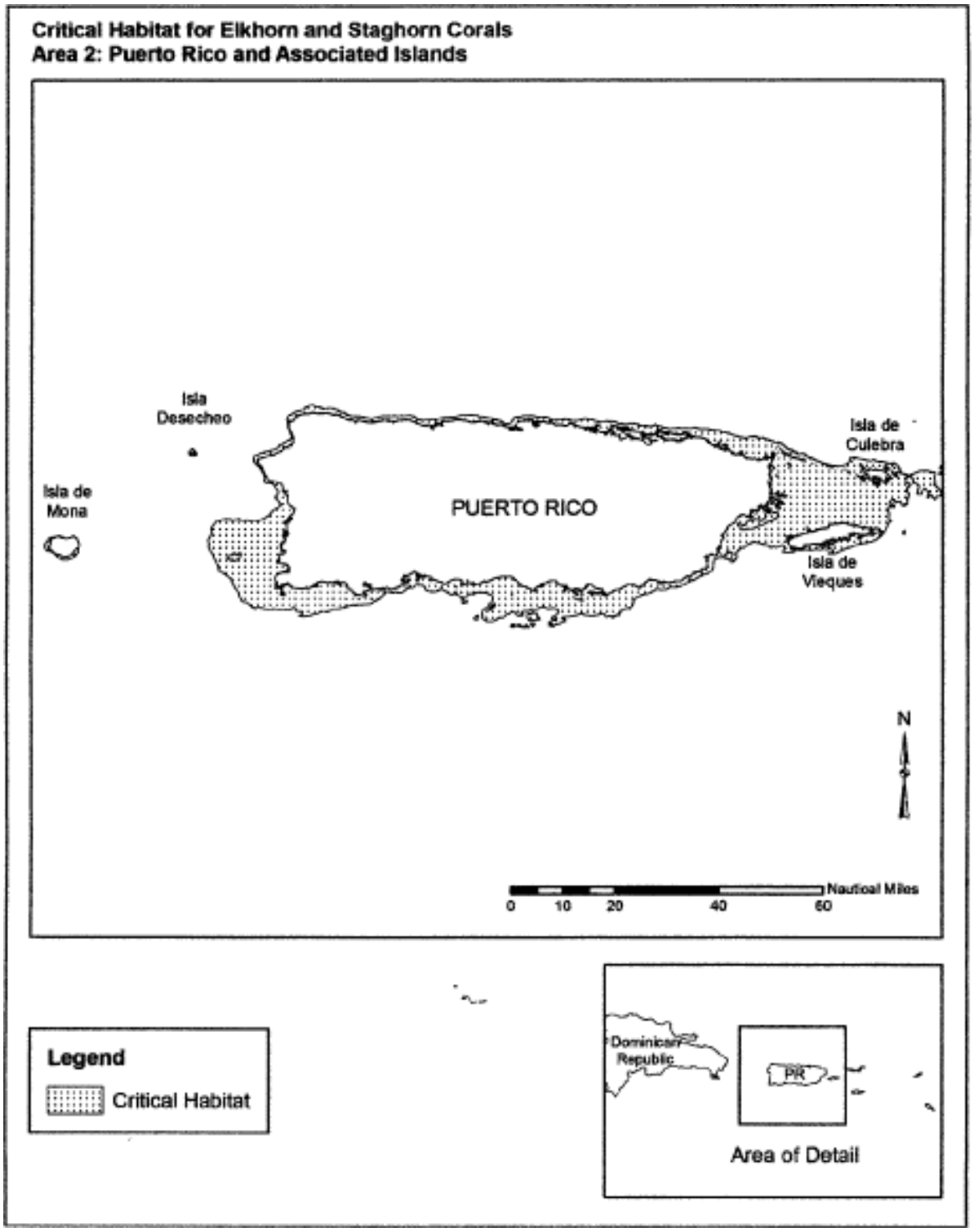


**Figure A2.** Puerto Rico Unit

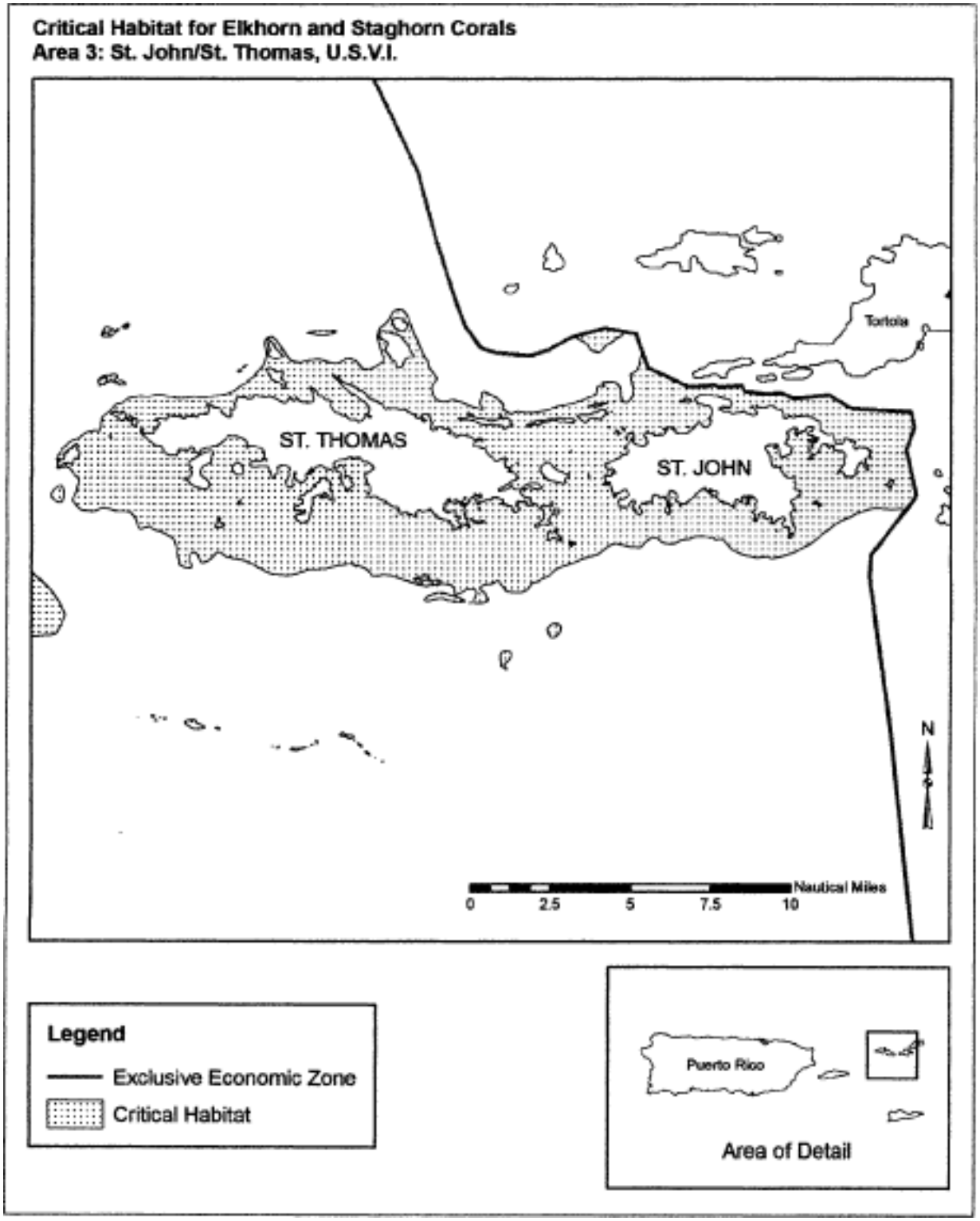


**Figure A3.** St. Thomas/St John, USVI Unit

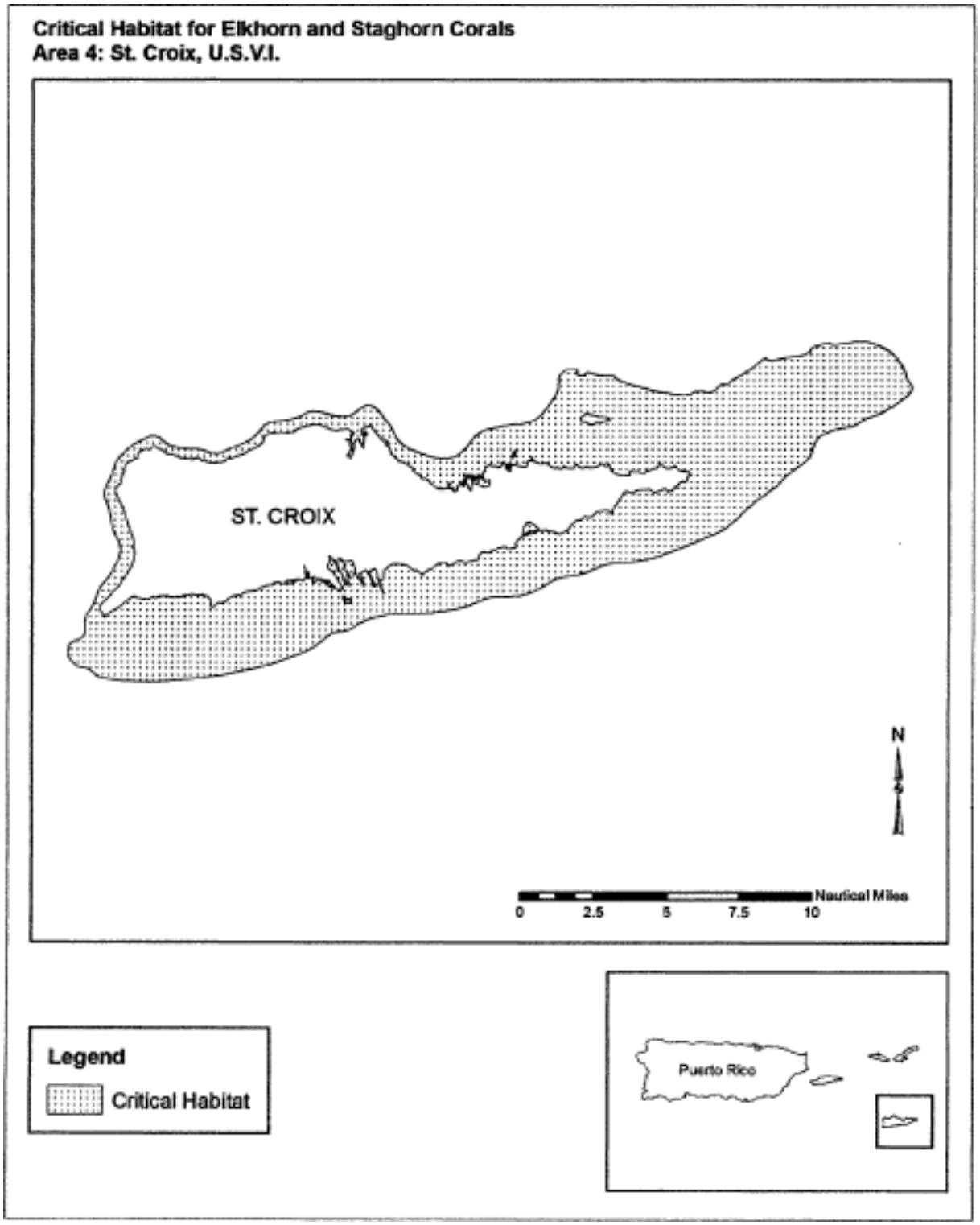


**Figure A4.** St. Croix, USVI Unit

## Appendix B. Resource Equivalency Analysis (REA) Inputs for Critical Habitat

A Resource Equivalency Analysis (REA) can be used to calculate the amount of compensatory mitigation to offset losses of *Acropora* critical habitat that would result in reduced coral recruitment. The Restoration Center has developed an REA spreadsheet that is periodically updated with improvements. Data are entered in the "Injury_Inputs" and "Credit_Inputs" tabs to calculate the losses through injury and gains through outplanting nursery-propagated corals for compensatory mitigation.
The spreadsheet groups species by life history characteristics to calculate losses and compensation. Table A shows the life history classification, species group id, and service weighting factor already in the spreadsheet for *Acropora* species corals.

**Table A.** ESA-listed coral species life history classification, species group id, and service weighting factor entered on the REA spreadsheet.

| Species | Life History | Group | Service Weighting Factor |
|---|---|---|---|
| ***Acropora cervicornis*** | Acropora | C | 0.719 |
| ***Acropora palmata*** | Acropora | C | 0.816 |

To calculate the debits for loss of Acropora Critical Habitat, enter values into the REA spreadsheet in the yellow cells on the "Injury_Inputs" tab. Some are pre-filled but can be changed if needed. Some inputs will be different depending on whether the loss of habitat is temporary or permanent. Permanent impacts occur if the habitat is expected to permanently lose its function as coral recruitment habitat (e.g., removed through dredging, covered by structures or sediment). Temporary impacts occur if the habitat is expected to recover its function as coral recruitment habitat after project construction. The species to use in the REA will be determined by which species is present in the project area or in the vicinity if no colonies are in the project area.

- **Impact Area**: If the impacts are temporary, the total area of impact should be entered in square meters. If the impacts are permanent, multiply the total impact area by 0.1 for *A. palmata* and by 0.05 for *A. cervicornis*.
- **Impact Year**: Year in which the project will start.
- **Discount rate**: 3% is the standard rate.
- **Standard coral size**: 45 is prefilled. The value for this cell does not matter since it is the same on the debit and credit sides of the calculations.
- **% Service Loss at Injury**: Generally, 100%.
- **Loss into Perpetuity**: True for permanent impacts, and false for temporary impacts.
- **Annual Growth Rate**: This value only needs to be entered for a temporary impact. For Acropora, it is 10 cm.
- **Recovery Delay**: This value only needs to be entered for a temporary impact and will generally be 1 year unless the project will be ongoing for more than a year.

- **% Addressed by ER**: 0% since emergency restoration does not occur for planned projects.
- **Average Recruitment Delay**: This value only needs to be entered for a temporary impact. For Acropora, it is 10 years.
- **% Relative Value at Recovery**: This value indicates the expected functional services relative to baseline at the injury site at the end of the recovery period. It only needs to be entered for a temporary impact and will generally be 100%.

Finally, density of species by size class should be entered on the spreadsheet. The values will be dependent on the species affected and whether it is a permanent or temporary impact. For permanent impacts, use the density and size classes from Criteria 1 in the *Acropora* Recovery Plan (Table B). If the impacts are temporary, use average recruitment rates of these species specific to the area of the project, if known. If species-specific recruitment rates are not known, use a value one order of magnitude lower than the low end of the reported recruitment range for corals. For instance, the coral recruitment range is 0.2 to 7 recruits per $m^2$ on natural substrate in Broward County (Moulding et al. 2012). Thus, we assume a value of 0.02 recruits $m^2$ for *Acropora* (Table B).
The spreadsheet has size classes in 10 cm increments, but these may be adjusted. For impacts to Critical Habitat, the following changes should be made:

- The 0-5 cm size class should be changed to ≤1, and the average size should be changed to 1.
- The 50-60 cm size class should be changed to ≥ 50 cm, and the average size should be changed to 50.
- The 100-110 cm size class should be changed to ≥ 100 cm, and the average size class should be changed to 100.

There are service weighting factors on the spreadsheet specific to each species that should not be changed (Table A). After all this information is entered, the spreadsheet will calculate the coral losses and convert them into debits in the column labeled "Outstanding DWCCYL."

**Table B**. REA input values for density and species size class for temporary and permanent impacts to Critical Habitat.

| Species | Impact type | Size Class | Density |
|---|---|---|---|
| ***A. palmata*** | Permanent | ≥ 100 cm | 0.25 |
| ***A. cervicornis*** | Permanent | ≥ 50 cm | 1 |
| ***A. palmata*** | Temporary | ≤ 1 cm | One order of magnitude lower than the low end of coral recruitment range reported in the project area (0.02 for Broward County, FL) |
| ***A. cervicornis*** | Temporary | ≤ 1 cm | One order of magnitude lower than the low end of coral recruitment range reported in the project area (0.02 for Broward County, FL) |

To calculate the credits produced from outplanting corals from a nursery, enter values into the REA spreadsheet in the yellow cells on the "Credit_Inputs" tab. Some are pre-filled but can be changed if needed.

- **Service weighting factor:** Values are specific to each species (Table A) and should not be changed.
- **Target Outplant size:** This number should be the typical size of outplants in the region, which can be ascertained by talking to local coral nursery operators. Typical outplant size is usually between 15 and 20 cm in diameter for *Acropora*.
- **Full Function after Outplanting:** This value is the number of years it will take for the outplanted colonies to reach full function. For *Acropora*, it is generally 3 years.
- **Outplant lifespan:** This is how long outplants are expected to provide functional services. For *Acropora*, the value is about 15 years.
- **% Relative Service Function:** This value represents the functional service level of outplants at the end of the recovery period. Most likely, this value will be 100%.

The number of coral outplants expected per year should be entered in the column labeled "Number of Surviving Coral Outplanted Annually." To get a ballpark idea of the numbers to put in this column, you can enter 1 into the cell for the year of first outplant. The value that appears in the column labeled "WCCYG Annually" is the number of credits applied per outplant and can then be divided into the number under the column "CCYL Requiring Offset." The resulting number is close to the total number of outplants needed to offset losses and can then be entered in the column "Number of Surviving Coral Outplanted Annually." Values can be adjusted up or down until the number in the "Balance" column is zero or slightly negative.

Because there is some expected mortality associated with outplanting, the number of corals actually outplanted will need to be higher than the values indicated in the column "Number of Surviving Coral Outplanted Annually." For *Acropora*, we expect a 15% mortality rate, so the total number of surviving outplants should be multiplied by 1.15 to determine the total number of corals that actually need to be outplanted to compensate for this expected mortality. The spreadsheet has a column for calculating the number of outplants actually needed for a 25% mortality rate, so the formula should be adjusted by changing 1.25 to 1.15.