

**Endangered Species Act
Listed Coral Species
Survey Study Plan
Port Everglades
Navigation Improvements Project**

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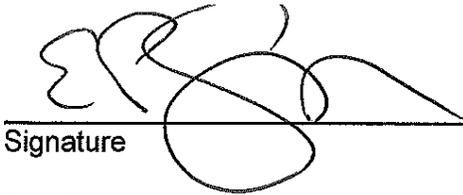
The following signatories approve this Endangered Species Act Listed Coral Species Survey Study Plan for the Port Everglades Harbor Deepening and Widening Project with the following caveat. If in the future additional information is received that shows a change in the expected extent of potential impacts to ESA-listed coral and elkhorn and staghorn coral critical habitat that effect the ESA action area as defined by this Plan and shown in Figure 1, the parties agree to reevaluate and appropriately address the boundaries of the Action Area.



Signature

3/17/2017
Date

Mark Lamb
Chief, Coral Program Branch
Protected Resources Division
NOAA Fisheries Service



Signature

27 MAR 2017
Date

Eric Summa
Chief, Planning Division
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Signature

3/14/17
Date

David Anderton
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1.0 SURVEY OBJECTIVES

The objectives of the Endangered Species Act (ESA) Listed Coral Species Survey Study Plan are to outline a method of survey to quantitatively estimate the population of ESA-listed coral species on coral reef and hardbottom habitats¹ both adjacent to and as far away as 1050 m to the north and 1020 m to the south of the Port Everglades entrance channel as shown in Figure 1. This area includes the anticipated direct and indirect impact areas of the Port Everglades Navigation Improvement Project (PENIP). The estimates of ESA-listed coral species gathered from this survey will provide the necessary information required for the National Marine Fisheries Service (NMFS) to complete an updated Biological Opinion (Biop) on the PENIP.

1.1 Background - Corals listed under the Endangered Species Act

In the Caribbean and western Atlantic there are a total of seven (7) coral species listed as threatened under the ESA (NOAA 2014). These are:

- *Acropora palmata* - Elkhorn coral
- *Acropora cervicornis* - Staghorn coral
- *Dendrogyra cylindrus* - Pillar coral
- *Mycetophyllia ferox* - Rough cactus coral
- *Orbicella annularis* - Lobed star coral
- *Orbicella faveolata* - Mountainous star coral
- *Orbicella franksi* - Boulder star coral

Based on previous field efforts performed during the Feasibility process for the PENIP, some of the recently listed coral species (2014) are known to occur within the project impact areas. Surveys performed by Dial Cordy and Associates (DC&A 2009), identified that at least two of the three sibling species of the *Orbicella annularis* species complex and *Mycetophyllia ferox* occurred in the project area in 2006. To allow NMFS to complete their updated Biop under Section 7 it is necessary to conduct a new survey to estimate the populations of ESA-listed corals species within the project area (1050 m north and 1020 m south).

2.0 SURVEY METHODS

All Atlantic coral species presently listed under the ESA will be identified and surveyed within predicted direct and indirect impact areas as shown in Figure 1. The following areas will not be surveyed: the existing channel (channel bottom and walls), the area south of the channel where previous ESA coral surveys have been conducted (NSUOC 2011); and in the nearshore hardbottom (artificial habitat type), north of the channel where data from the Broward County Sand Bypass project ESA survey will be incorporated.

¹ These habitats include the following Southeast Florida Habitat Types and Modifiers: *Acropora cervicornis*, Aggregated Patch Reef-Shallow, Artificial*, Colonized Pavement-Deep, Colonized Pavement-Shallow, Linear Reef-Inner, Linear Reef-Middle, Linear Reef-Outer, Patch Reef, Ridge-Shallow, Scattered Coral/Rock in Sand, Spur and Groove, Aggregated Patch Reef Ridge-Deep

2.1 ESA Listed Coral Species Surveys

This survey method is based upon the “Recommended Survey Protocol for *Acropora* spp. In Support of Section 7 Consultation (Revised October 2007);” as well as NMFS specific recommendation for this project (NMFS 2007). A total of 163 survey sites predetermined in ArcView GIS, are overlaid on the benthic habitat maps developed by Walker and Klug (2014). As shown in Figure 1, a grid pattern comprised of 100 x 100 m (10,000 m²) survey sites, will be sampled using a clover leaf pattern by one or more pairs of scientific divers, as suggested by NMFS.

Divers will conduct four belt transects from the referenced center point to the north, south, east and west of the center point, forming a “+” from the center point. A diver pair will swim away from the center point with a transect tape marked in meter increments and swim to 50 m in one direction. The second diver of the pair will carry a clipboard, ruler, and camera in order to record observations of any of the listed species on the swim away from the center point and on the return swim to the center point. Divers will swim one meter above the bottom and all ESA listed species that are visible will be recorded within a 4 m wide belt transect, with the transect as the center line. For sites with an entire cross, each belt transect will measure 4 m x 50 m, for a total of 800 m² sampled per site. Due to absence of habitat, some sites do not have four 50 m transects. For the 163 sites 12.34 hectares (30.51 acres and approximately 8%) of listed species habitat will be surveyed. Presence of ESA species (densities) in areas not surveyed by scientific divers will be accounted for by using adjacent habitat values. The following information will be collected for each individual coral encountered.

All listed corals observed will be documented, the species and colony size measured as stated in b below, and photographed. Percent live tissue will be estimated for each documented colony, in 10% increments. The location (decimal degrees) for each colony will be recorded in one of two ways: 1. using a Shark Marine Navigator. 2. A colony may be located based on transect distance, bearing, and distance from the transect. Since this information is tied to a known center point, a colony location (decimal/degrees) may be estimated using this method.

- a. Species;
- b. Dimensions of the colony length, height, and width (units = mm) ;
- c. Visual estimate of percent live tissue for colony (10% increments)
- d. GPS coordinate of each colony (as close as possible) or each survey site (unit = decimal degrees and state datum);
- e. Site map with locations of each colony. If actual GPS coordinates of each colony were not collected, approximate location, based on direction and distance from center point, shall be mapped.

3.0 REPORTING AND LOGISTICS

All data including photos, videos, and spreadsheets will be shared via the internet or via external hard drive within 30 days after data collection is completed. A draft report will be

submitted 60 days after data collection is completed to Port Everglades, USACE and NMFS. Agencies are expected to return comments within 15 days of receipt. A final report will be issued within 10 days of the receipt of all draft report comments.

3.1 Products

- Georeferenced map (ArcGIS files) and GPS coordinates for all sites
- Report summarizing field-data collection
- Output files from statistical analyses software programs used to analyze datasets
- All photos
- Map of location of ESA listed coral species critical habitat essential feature [Only required within the boundaries of ESA listed species critical habitat] within direct and indirect impact area(s)
- Total acres of hardbottom habitat that were directly surveyed by this protocol.
- Total number of ESA listed species per acre surveyed (by species).
- Any other data products (i.e. data collected in items 2. a-e above) should be made available to agencies in a usable electronic format (e.g., spreadsheets provided in excel and not in pdf format).
- Electronic copies of any reports/other datasets utilized to estimate colony densities in areas not surveyed by the survey team.
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4.0 REFERENCES

DC&A 2009. Benthic and Fish Community Assessment at Port Everglades Harbor Entrance Channel. Prepared for Corps of Engineers. 143 pages.

NMFS 2007. Recommended Survey Protocol for *Acropora* species in Support of Section 7 Consultation. <http://sero.nmfs.noaa.gov/pr/pdf/RecommendedSurveyProtocolforAcropora.pdf>

[NOAA 2014. Endangered and Threatened Wildlife and Plants: Final Listing Determination on Proposal to list 66 reef-building coral species and to reclassify Elkhorn and Staghorn Corals. 79 FR 53851 Pages 53851-54123.](#)

Walker, B.K. and Klug, K. 2014. Southeast Florida Shallow-Water Habitat Mapping & Coral Reef Community Characterization. Florida DEP Coral Reef Conservation Program report : 1 - 71. http://nsuworks.nova.edu/occ_facreports/87.

NSUOC. 2011. Benthic Habitat Characterization for the South Florida Ocean Measurement Facility (SFOMF) Protected Stony Coral Species Assessment. Prepared for Seaward Services. 54 pages.

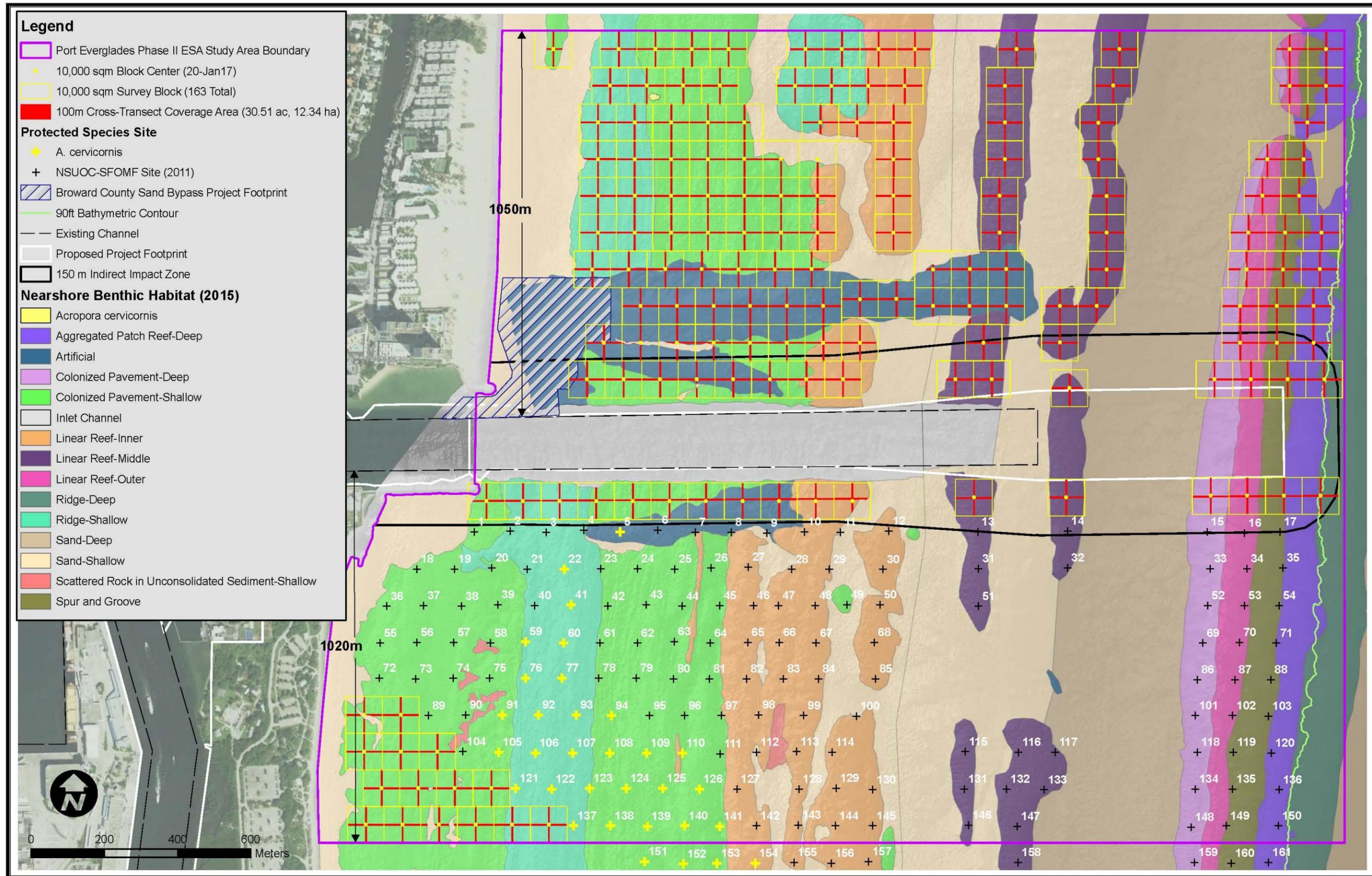


Figure 1. Design of ESA Listed Coral Species Survey sites for Port Everglades. The survey area spans 1050 m north and 1020 m south of the Port Everglades Entrance Channel.