

DRAFT

**Endangered Species Act
Listed Coral Species
Survey Study Plan
Port Everglades**

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1.0 SURVEY OBJECTIVES

The objectives of the Endangered Species Act (ESA) Listed Coral Species 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. This area includes the proposed direct and indirect impact areas of the Port Everglades deepening and widening project. 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 on the Port Everglades expansion project.

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 include the following species:

- *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 EIS process for the Port Everglades expansion project, some of the recently listed coral species (2014) are known to occur within the project impact areas. For instance, surveys performed by Dial Cordy and Associates (DC&A 2009), showed 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. Thus, per the Section 7 consultation it is necessary that an up-to-date survey be completed to estimate the populations of ESA-listed corals species within the project area (1050 m north and 1020 m south).

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

*Note for Artificial, based on surveys performed by Nova Southeastern University for the Broward County Sand Bypassing project and other efforts (e.g., D'Antonio et al. under review), it appears the westernmost edge of the artificial habitat located north of the channel (and west of the Colonized Pavement-Shallow to the north and south) may not be suitable for coral recruitment and growth, however the habitat classified as Artificial located to the east and into deeper waters is suitable for coral recruitment and growth and therefore should be included in the ESA survey.

2.0 SURVEY METHODS

As part of the ESA listed coral surveys, all protected coral species presently listed by NMFS will be identified and surveyed within the presently proposed direct and indirect impact areas as shown in Figure 1. Some areas will not be surveyed, and those include: the existing channel, the area south of the channel where existing data provide listed coral species information (NSUOC 2011); and in the nearshore hardbottom, north of the channel where data from the Broward County Sand Bypass project is expected to provide listed species information. Any listed corals in the Sand Bypass project area will be relocated by Broward County prior to construction of the sand bypass, which is expected to begin during the summer of 2017 (Chris Creed, pers. comm.).

Diver surveys will be conducted for all listed coral species potentially found in the project area in support of Section 7 consultation. Based on GIS analysis of Walker and Klug's (2014) reef map and the study area limits, including hardbottom and reef resources within 1050 m north and 1020 m south of the existing channel, all listed corals observed will be numbered and the species and colony size measured and a photograph recorded. The location where the colonies are observed will be denoted using a Shark Marine Navigator or other suitable underwater navigation tool.

2.1 Perform ESA Listed Coral Species Surveys

A total of 162 survey sites were predetermined using ArcView GIS, using benthic habitat maps developed by Walker and Klug (2014). The proposed survey area is within 1050 m north and 1020 m south of the existing entrance channel. A grid pattern comprised of 100 x 100 m (10,000 m²) survey sites has been superimposed over the coral reef and hardbottom habitat areas within the survey area (Figure 1). At each sampling site, a clover leaf pattern will be surveyed by one or more diver pairs 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. 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. Each belt transect will measure 4 m x 50 m, for a total of 800 m² sampled per site, where hardbottom or reef are present. For 162 sites 12.29 hectares (approximately 8%) of listed species habitat will be surveyed (hardbottom and reef area only within 100 by 100 m survey sites). The following information will be collected for each individual coral encountered.

- a. Species;
- b. Dimensions of the colony length, height, and width (units = mm) ;
- c. Percentage live tissue (recorded in 10% increments);
- d. GPS coordinate of each colony (if 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. 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 area of ESA listed corals species critical habitat essential feature within area mapped (acres or square meters) within direct and indirect impact area(s)
- Total area of ESA listed coral species critical habitat essential feature that will be impacted by project (acres or square meters) within direct and indirect impact area(s)
- Total acres of hardbottom habitat within the direct and indirect impact areas.
- 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)

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 2002. Recommendations for sampling *Halophila johnsonii* at a project site. In Final Recovery Plan for Johnson's Seagrass (*Halophila johnsonii* Eiseman). <http://www.nmfs.noaa.gov/pr/pdfs/recovery/johnsonsseagrass.pdf>

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.

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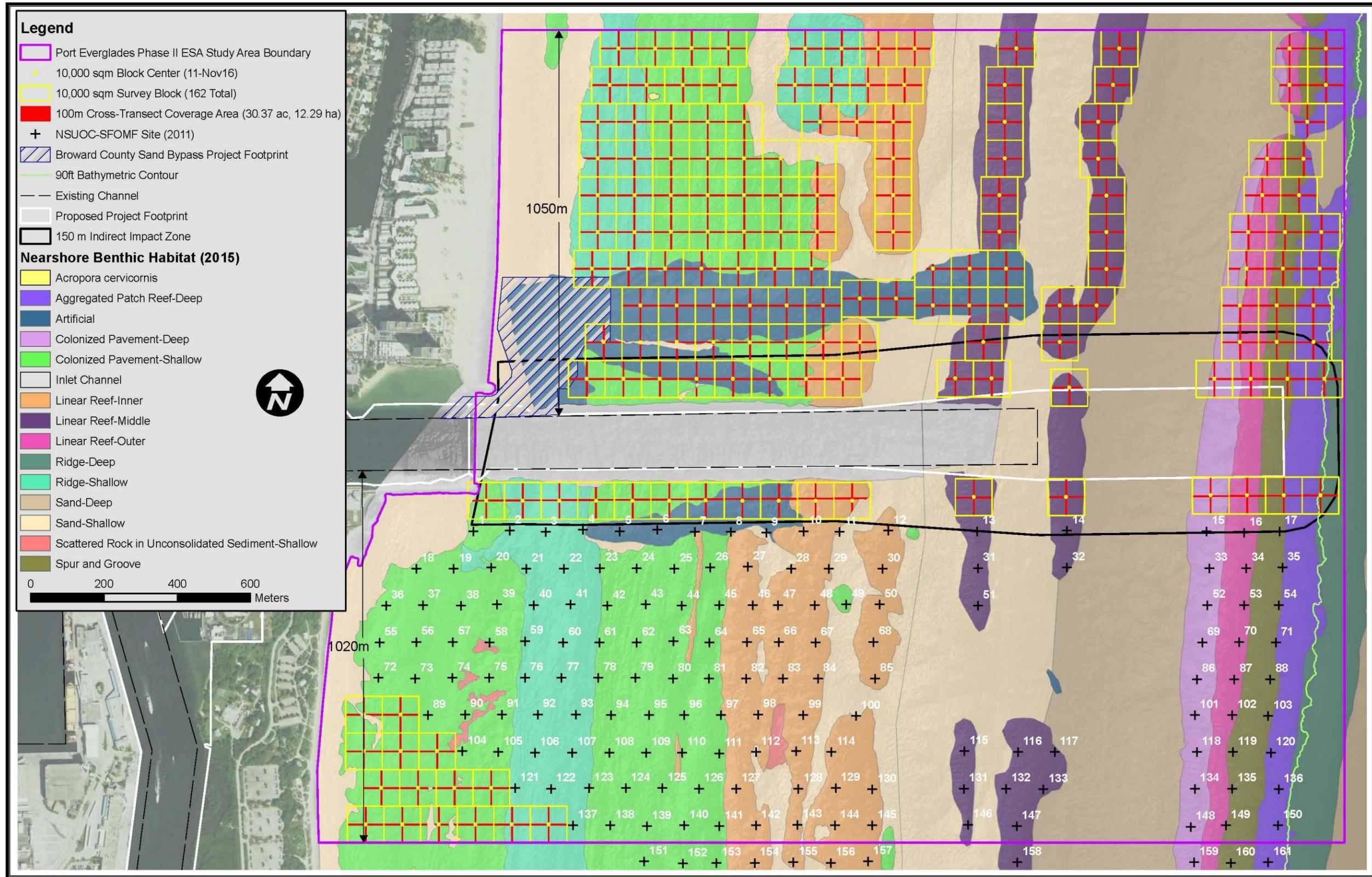


Figure 1. Design of ESA Listed Coral Species Survey sites for Port Everglades. The survey area spans 1050 m north and 1020 m south of the Port Everglades Entrance Channel.