

Florida Trustee Implementation Group

# Refining Suncoast Seagrass Maps to Identify Oyster Reefs 2024



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## Overview

The [Deepwater Horizon Natural Resource Damage Assessment](#) Florida Trustee Implementation Group awarded the Florida Fish & Wildlife Conservation Commission (FWC) funds to conduct habitat suitability analyses to identify optimal locations for oyster restoration along the Gulf coast of Florida. Six estuaries of interest were selected for habitat analyses: Pensacola Bay, St. Andrew Bay, Suwannee Sound, Withlacoochee River, Crystal River, Tampa Bay, and Charlotte Harbor. Mapping was divided into subtidal or intertidal efforts due to differing methodologies. This report encompasses intertidal oyster habitat mapping within the Suncoast region (including Tampa Bay, Sarasota Bay, and northern Charlotte Harbor) of the Southwest Florida Water Management District (SWFWMD), from Tarpon Springs to Boca Grande Pass. This mapping effort was designed to refine published SWFWMD (2023) seagrass maps that also delineated areas of oyster reef, rubble, and shell to improve oyster reef mapping for the statewide compilation of live oyster reefs, [Oyster Beds in Florida](#). Maps will also be used to help create regional oyster habitat suitability analyses.

## Methods

Seagrasses within the Suncoast region of SWFWMD have been mapped biennially since 2004 to provide an indicator of estuarine health. In 2022, polygons were manually digitized in ArcGIS Pro (ESRI; Redlands, CA) from six-inch orthophotographs using a minimum mapping unit of 0.25 acres (NV5 Geospatial 2023a, SWFWMD 2023). Each polygon was classified as continuous or patchy seagrass, attached macroalgae, oyster bars, tidal flats, submerged other than seagrass, composite colonized algae, or bays and estuaries following a modified Florida Land Use, Cover and Forms Classification System (FLUCCS) definition for each class (FDOT 1999, NV5 Geospatial 2023a). A photointerpretation key was also developed as part of this mapping effort (NV5 Geospatial 2023b). As part of the original mapping, a random subset of polygons from each class strata were selected for accuracy assessments via ground-truthing resulting in a final map accuracy of 93% (NV5 Geospatial 2023a). The ‘Oyster Bars’ FLUCCS code 6540 used in SWFWMD (2023) maps included “oyster reef, clump, rubble, or shell hash” (NV5 Geospatial 2023a). The mapping effort described here isolated those polygons in the SWFWMD (2023) layer that were live oyster reef only and removed all other substrate types. The isolation of live reefs was necessary for 1) incorporation into the statewide Oyster Beds in Florida, which is a compilation of live oyster reef maps and 2) generation of regional oyster habitat suitability indices, which are informed by live reef extent.

Map revisions were conducted in ArcGIS Pro (ESRI; Redlands, CA), where SWFWMD (2023) polygons were interpreted using imagery basemaps (Imagery sources: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community) and Google Earth Pro 7.3.6 (Google LLC; Mountain View, CA). All polygons with a FLUCCS code 6540 (oyster bars) designation were extracted from SWFWMD (2023), then visually analyzed with consideration of color, shape, texture, and location and classified as either 1) a high-confidence oyster reef, 2) a low-confidence oyster reef or 3) unlikely to be oyster reef and therefore recommended for removal from the map. A subset of polygons from each category were targeted for ground-truthing. Ground-truthing efforts were

conducted by FWC personnel in February, March, and April of 2024. Not all sites selected for ground-truthing could be evaluated due to site access, tides, or time constraints. The substrate of each ground-truthed reef was visually inspected or probed with a pole and classified as oyster reef, sand/mud, oyster shell/shell hash, scattered live oyster, rip rap, or mangrove. To account for variation in oyster reef extent between mapping (2022) and ground-truthing (2024), reefs were defined by a minimum 20% live oyster coverage (estimated visually); sites with less than 20% cover were classified as scattered, live oyster. Polygons with 'mangrove' substrate were dominated by the presence of mature and juvenile mangroves and had < 20% live oyster coverage.

## Results and Conclusions

Through this mapping revision, 2,618 oyster reefs were reviewed and 183 were ground-truthed. Following reclassification based upon remote imagery and ground-truthing, the final map consisted of 1,356 live oyster reefs for the region (Fig. 1). Only polygons that were confirmed reef or had a high confidence of being a live oyster reef (based on their appearance in aerial images) were included in updated maps. Ground-truthing data determined that 77% and 47% of high- and low-confidence reefs were confirmed oyster reefs, respectively (Table 1). Of the 88 ground-truthed polygons that were unlikely to be reefs and recommended for removal, 88% were confirmed not to be oyster reef (Fig. 2, Table 1). Separating potential reefs into high-confidence and low-confidence strata for ground-truthing enabled focus on areas that have the potential to be reefs, but lack the distinctive visual cues of oyster reefs, enhancing ground-truthing efficiency and improving overall accuracy of oyster maps. Because ground-truthing focused on including many low-confidence reefs with ambiguous appearance and those recommended for removal, overall ground-truthing accuracy was 74.9%. Potential reefs that were determined during ground-truthing to be misclassified were most commonly composed of scattered, live oyster and sand/mud (both representing 26.3% of polygons ground-truthed) followed by oyster shell/shell hash (7.4%; Table 1).

The following characteristics were notable for the SWFWMD (2023) revision:

- Many potential oyster reefs were coupled with mangrove habitat - either through an oyster reef fringing mangroves (Fig. 3) or, in some cases, an entire polygon was colonized by a mature mangrove stand (Fig. 4).
- More than half of ground-truthed polygons had substrate characterized as scattered, live oyster or sand/mud (Fig. 5). A moderate number of scattered, live oyster polygons were expected due to the inclusive nature of the 6540 'oyster bar' designation used in FLUCCS classification (NV5 Geospatial 2023a). While these areas support some scattered live oyster clusters, they fall below this study's threshold of a live oyster reef and are less likely to sustain a biogenic oyster reef into the future relative to their higher-density counterparts. Sand/mud polygons did not contain oysters or shell; while they mimicked the color and shape of typical patch oyster reefs, they lacked the texture seen on oyster reefs or shell substrate and were frequently surrounded by macroalgae and seagrass (Fig. 5).



**Figure 1.** Areas classified as 6540 ‘oyster bars’ in SWFWMD (2023) maps (blue), and those that were confirmed as live oyster reefs in this study (red). Oyster reefs are not represented to scale.



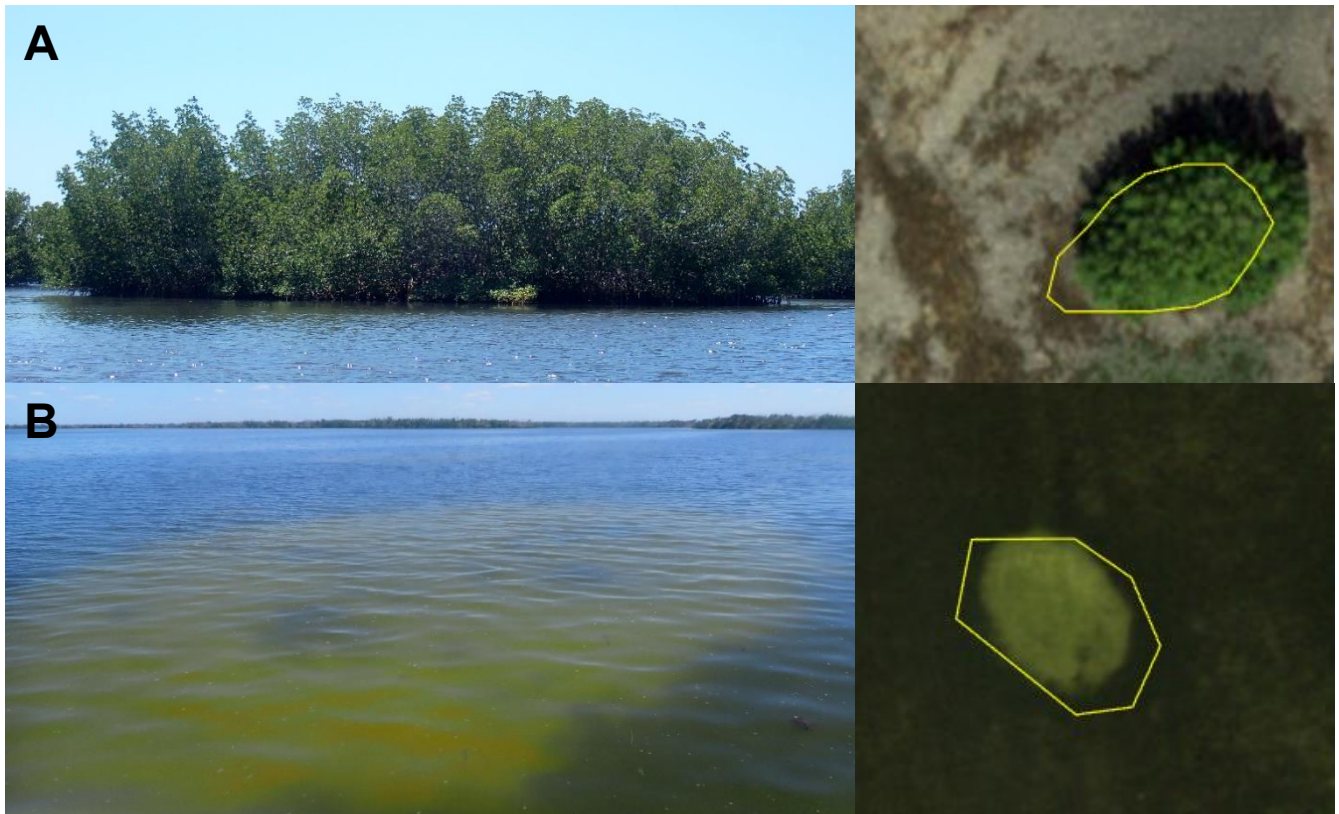
**Figure 2.** Map of ground-truthed locations used to refine SWFWMD (2023) maps.

**Table 1.** Error matrix of ground-truthing results from field assessments. Highlighted cells indicate confirmation of correct classification for this mapping revision.

Ground-truthed substrate	High-confidence potential reefs	Low-confidence potential reefs	Reefs to remove	All ground-truthed 6540 'oyster bars' polygons
Oyster reef	34	20	11	65
Sand/mud	1	4	41	46
Oyster shell/shell hash	1	3	9	13
Scattered live oyster, non-reef	7	15	24	46
Rip rap	1	0	1	2
Mangrove	0	1	2	3
Total classified correctly	34	20	77	131
Total sites	44	43	88	175
Accuracy	77.3%	46.5%	87.5%	74.9%



**Figure 3.** An oyster reef fringing a mangrove stand in Cape Haze, FL.



**Figure 4.** Two misclassified substrate types were mangrove (A) and sand/mud (B), as seen in-person (left) and in imagery (right). Note many mangrove islands were former oyster reefs that had been colonized by mangroves in recent years.



**Figure 5.** Scattered, live oyster with less than 20% live oyster extent.

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