Summary Report for Western Pinellas County Coastal Waters

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in

Seagrass Integrated Mapping and Monitoring Program
Mapping and Monitoring Report No. 3

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Technical Report 17, Version 3 • 2018
DOI10.13140/RG.2.2.12366.05445

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General assessment

In 2016, 26,317 acres of seagrass were mapped in Boca Ciega Bay, Clearwater Harbor, and St. Joseph Sound; St. Joseph Sound accounted for nearly 50% of the mapped acreage. Between 2014 and 2016, seagrass acreage increased 103 acres (0.4%) for the region, but seagrass area in the northern Clearwater subregion and St. Joseph Sound decreased by 44 and 75 acres, respectively. Shoalgrass (*Halodule wrightii*) and turtlegrass (*Thalassia testudinum*) are the most common seagrasses in the region; manateegrass (*Syringodium filiforme*) is occasionally present. Many seagrass beds in this urban county are greatly affected by storm runoff. In addition, propeller scarring affects seagrass beds in some areas. Water quality is affected by storm runoff, harmful algal blooms, and large-scale events such as El Niños.

Geographic extent

This region includes Boca Ciega Bay, Clearwater Harbor, and St. Joseph Sound in Pinellas County. The watersheds of these bays are densely populated and almost entirely urban. Boca Ciega Bay (BCB), in central and southern Pinellas County, is the largest of the three water bodies, covering 35 square miles. Its watershed is almost entirely urban (95%) and covers 113 square miles. Almost 5% of this watershed is covered by forests and wetlands. The water areas of Clearwater Harbor and St. Joseph Sound, in northern Pinellas County, are much smaller, covering 0.4 and 2.1 square miles, respectively. The water areas of these two bays are also much smaller (3–5%) compared with their watersheds than the ratio of water area to watershed for BCB (31%). The watershed of Clearwater Harbor covers 14 square miles and land use is 98% urban. St. Joseph Sound's watershed is 3 times as large as the Clearwater Harbor watershed, covering 41 square miles. Land use in the St. Joseph Sound watershed is 78% urban and 19% forested and wetlands. More information on these watersheds can be found in the Pinellas Wateratlas http://www.pinellas.wateratlas.usf.edu/watershed/waterquality.asp?wshedid=1&wbodyatlas=watershed). Freshwater sources for the 3 bays are small streams and drainage ditches. The primary pollutant is nitrogen in stormwater runoff (Tampa Bay Estuary Program State of the Bay, https://www.tbep.org/about_the_tampa_bay_estuary_program-state_of_the_bay.html). Releases of both treated and untreated sewage have occurred sporadically since 2015. The Florida Department of Environmental Protection (FDEP) has listed BCB as impaired due to levels of nutrients and fecal coliform bacteria in bay waters. The U.S. Environmental Protection Agency has also listed BCB, Clearwater Harbor, and St. Joseph Sound as impaired due to the levels of mercury in fish tissue.

Mapping and monitoring recommendations

- Continue the fall monitoring program managed by the Tampa Bay Estuary Program.
- Continue biennial acquisition of imagery and photo-interpretation by the Southwest Florida Water Management District.

Management and restoration recommendations

- Continue efforts to reduce storm-water runoff and nutrient loading to coastal waters, especially BCB.
- Monitor the impact of propeller scarring and develop a strategy for reducing impacts. Restore scarred seagrass beds as funding becomes available.

1. General status of seagrasses in Western Pinellas County

Status and stressors	Status	Trend	Assessment, causes
Seagrass acreage	Green	Stable	Urban runoff a concern
Water clarity	Yellow	Poor in Boca Ciega Bay	Urban runoff; wastewater releases
Natural events	Yellow	Sporadic	El Niños, tropical cyclones
Propeller scarring	Yellow	Regional	Near high-use areas

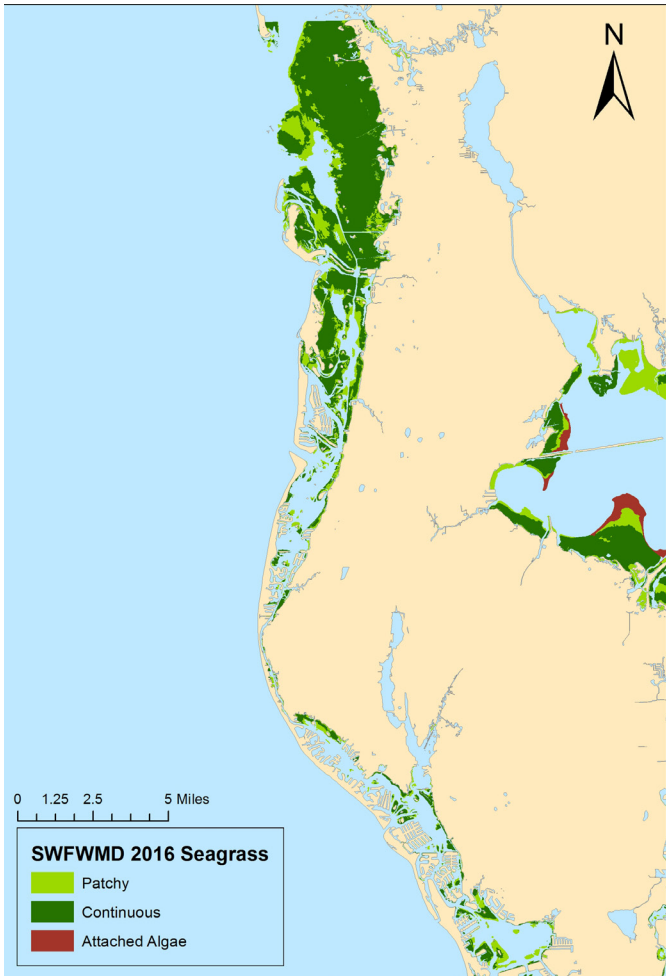

Figure 1. Seagrass beds in Boca Ciega Bay, Clearwater Harbor, and St. Joseph Sound, 2016.

- Use the boating and angling guide for waters in the region to improve boater education and awareness of seagrass beds and to reduce propeller scarring.

Summary assessment

Seagrass beds in western Pinellas County are stable or slightly increasing in size (Table 1). From 2014 through 2016, the region gained 103 acres of seagrass, an increase of 0.4%. Shoalgrass and turtlegrass are the most common seagrasses in BCB, and occurrence of both species has remained stable since monitoring began in 1998. Manateegrass occurs much less frequently and is more variable than shoalgrass and turtlegrass. In Clearwater Harbor, monitoring data from 2010 through 2012 show that shoalgrass and turtlegrass occurred at similar frequencies, while manateegrass was less common. The percentage of bare quadrats along monitoring transects in BCB has remained low over the 18-year period (mean = 16%; Table 2), but a much greater proportion of quadrats (49%) was bare in Clearwater Harbor during monitoring in 2010–2012. All coastal waters receive storm-water runoff from the urban Pinellas peninsula, and this might diminish water clarity and quality. Propeller scarring, especially in areas of greatest boat use near the Intracoastal Waterway, continues to fragment seagrass beds.

Seagrass mapping assessment

Seagrass beds covered 26,317 acres in the coastal waters of western Pinellas County in 2016, and nearly half of the beds were found in St. Joseph Sound in the northwestern part of this region (Figure 1). From 2006 to 2016, seagrass cover in the entire region expanded by 2,374 acres or 10%. Since 2006, most of the gains in seagrass have occurred in St. Joseph Sound where acreage increased by 2,447 acres. Between 2014 and 2016, seagrass acreage increased in BCB by 190 acres or 2%. St. Joseph Sound lost 75 acres during the same period, Clearwater North lost 44 acres, and Clearwater South gained 32 acres.

Monitoring assessment

Field monitoring data from quadrats located on fixed transects suggest that seagrass beds in BCB were stable from 1998 through 2015 and that most quadrats contained seagrass (84%, on average). The most common seagrass species were shoalgrass and turtlegrass with FO varying between 37% and 65% (Table 2). Manateegrass was observed much less frequently in BCB. Some transects showed a temporary decrease in density from 2004 to 2005, most likely an effect of tropical storms during that time (Meyer and Hammer Levy 2008). In Clearwater Harbor, data from 2010–2012 show that about half of all quadrats were bare of seagrass and that, as in BCB, shoalgrass and turtlegrass were most common. The FO for all seagrass species in BCB increased significantly between 1998 and 2015 (Table 3; Johansson 2016)

Watershed and bay management

In 1987, the Florida Legislature passed the Surface Water Improvement and Management (SWIM) Act to protect, restore, and maintain Florida's highly threatened surface water bodies. Western Pinellas estuaries are included in the Tampa Bay SWIM plan of the SWFWMD (SWFWMD 1999; https://www.swfwmd.state.fl.us/sites/default/files/medias/documents/tampabay-swim.pdf). The Tampa Bay SWIM plan included the following goals, taken from the Comprehensive Conservation and Management Plan (CCMP) of the Tampa Bay Estuary Program (TBEP)

- Limit loading of nitrogen to Tampa Bay to average levels measured in 1992–1994 to increase seagrass cover to 38,000 acres.
- Protect clean parts of the bay from contamination by toxins, and minimize risks to marine life and humans from contaminants already impacting other areas.
- Increase and preserve seagrass communities in the bay,
- Restore and protect low-salinity tidal marshes, mangroves, salt marshes, and salt barrens.

The Pinellas County/Boca Ciega Bay Aquatic Preserves will publish a management plan in 2019 (http://publicfiles.dep.state.fl.us/CAMA/plans/Pinellas-County-Boca-Ciega-Bay-AP-Management-Plan.pdf). Management priorities for seagrasses include reducing mechanical damage to seagrasses by boats, mainly by propeller scarring, encouraging and assisting with inventories and research, and providing regulatory review of projects that might impact seagrasses.

2. Seagrass status and potential stressors in Western Pinellas County			
Status indicator	**Status**	**Trend**	**Assessment, causes**
Seagrass cover	Green	Stable	Losses in St. Joseph Sound, northern Clearwater Harbor
Seagrass meadow texture	Green	Stable	
Seagrass species composition	Green	Stable	
Overall seagrass trends	Green	Stable	
Seagrass stressor	**Intensity**	**Impact**	**Explanation**
Water clarity	Yellow	Poor in Boca Ciega Bay	Storm runoff; wastewater releases
Nutrients	Orange	Increasing	
Phytoplankton	Yellow	Variable	Responsive to nutrients in storm runoff
Natural events	Yellow	Low and sporadic	El Niños, tropical cyclones
Propeller scarring	Yellow	Regional	Near high-use areas

Table 1. Seagrass acreage in western Pinellas County, 2006–2016 (data source: PhotoScience Inc. and SWFWMD 2017).

							Change, 2014–2016	
Bay segment	2006	2008	2010	2012	2014	2016	Acres	%
Clearwater North	3,522	3,784	3,759	3,526	3,496	3,452	−44	−1.2%
Clearwater South	914	1,000	907	743.2	769.6	802	32	4.2%
St. Joseph Sound	10,546	12,639	12,819	12,914	13,068	12,993	−75	−0.57%
Boca Ciega Bay	8,961	8,457	8,554	8,544	8,880	9,070	190	2.1%
Total	23,943	25,880	26,039	25,727	26,214	26,317	103	0.4%

Table 2. Percentage frequency of occurrence (FO) of seagrass species and bare quadrats in Boca Ciega Bay, 1998–2015, and Clearwater Harbor, 2010–2012. Data collected in fall were extracted from the Tampa Bay Estuary Program database. Blanks indicate that a species was not observed.

Year	# of quadrats	Shoal-grass	Manatee-grass	Turtle-grass	Bare
Boca Ciega Bay					
1998	106	60.4	0.94	50.9	5.66
1999	183	47.0	0.55	39.9	25.1
2000	162	45.7	4.32	37.0	29.0
2001	157	48.4	3.82	42.7	19.7
2002	169	52.1	6.51	40.8	17.2
2003	174	51.7	7.47	39.7	21.8
2004	183	59.6	6.56	38.3	15.8
2005	159	65.4	6.92	39.0	9.43
2006	130	48.5	10.8	50.0	13.8
2007	117	62.4		48.7	9.40
2008	73	61.6	13.7	42.5	12.3
2009	95	45.3		43.2	24.2
2010	68	52.9	14.7	41.2	16.2
2011	77	46.8		49.4	16.9
2012	77	53.2	16.9	42.9	13.0
2013	67	49.3		58.2	10.4
2014	70	64.3	12.9	41.4	10.0
2015	80	52.5		58.8	10.0
Clearwater Harbor					
2010	26	23.1	15.4	34.6	53.8
2011	22	27.3	13.6	36.4	50.0
2012	27	40.7	14.8	29.6	44.4

Table 3. Trends of percent frequency of occurrence (FO) for all seagrass species in Boca Ciega Bay, 1997–2015. Yellow blocks = seagrass reported in 51–75% of 1-m^2 quadrats; green blocks = >75% of quadrats; white block no data collected. A significant upward trend, derived from Mann-Kendall statistics ($p \leq 0.05$), is shown in boldface type. Table modified from Johansson 2016.

Year	All species
1997	
1998	85
1999	72
2000	74
2001	74
2002	81
2003	77
2004	89
2005	93
2006	85
2007	94
2008	95
2009	76
2010	86
2011	83
2012	92
2013	88
2014	100
2015	81
Kendall tau statistic	0.39

Legend: 51–75%; >75%; no data

The TBEP recently revised its Charting the Course Management Plan (TBEP 2017), which includes BCB and its watershed. The revised plan for the region set the following goals and priorities:

- Reduce or eliminate nutrient inputs to the bay to meet water quality targets and to maintain at least 38,000 acres of seagrass bay wide.
- Reduce the frequency and duration of harmful algal blooms.
- Reduce the levels of toxic chemicals in bay sediments that are already contaminated and maintain areas that have clean sediments.
- Reduce pollution due to microplastics and other contaminants of recent interest.
- Reduce bacterial contamination originating in the watershed to ensure that fishing and swimming in the bay can continue.

A comprehensive conservation and management plan for Clearwater Harbor and St. Joseph Sound was prepared for the Pinellas County Department of Environment and Infrastructure (now called the Environmental Management Division) by Janicki Environmental Inc. in December 2011 (Janicki Environmental Inc. 2011). This plan includes goals and priorities for bay and watershed habitats, water quality, sediment management, and public education. The goals with respect to supporting seagrass success were:

- to ensure adequate water quality.
- to reduce the impact of boaters on seagrass beds.

Mapping methods, data, and imagery

Every two years since 1988, the Southwest Florida Water Management District (SWFWMD) has acquired aerial imagery of submerged aquatic vegetation along the Gulf Coast from Pinellas County south through northern Charlotte Harbor. The most recent set of imagery was acquired in December 2017 and January 2018. Mapping data from this effort will be released in spring 2019. Imagery was photo-interpreted from natural color photographs taken at 1:24,000 scale and classified using the SWFWMD modified Florida Land Use Cover and Forms Classification System (Florida Department of Transportation 1999). The minimum mapping unit for classification was 0.5 acre. Data are available from SWFWMD or the Marine Resources Geographic Information System (MRGIS) website of the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute.

Monitoring methods and data

Seagrass beds are monitored as part of a regional program administered by the TBEP. From 1998 through 2012, seagrass cover was evaluated by the Braun-Blanquet method in 1-m^2 quadrats located along fixed transects. There were 11 fixed transects in BCB and 14 transects in Clearwater Harbor and St. Joseph Sound. Beginning in 2006, the fixed-transect design was replaced with a stratified-random transect design (Burnes et al. 2011). Sixty-three sites were visited in 2006, 65 sites in 2007, and 67 sites in 2008–2010. Generally, transects begin at the shoreline and end at the water depth adopted by TBEP as the target depth for seagrass growth in each respective bay region (Avery and Johansson 2001). In BCB, the longest transect extended 600 m into the bay, and in Clearwater Harbor the longest transect was 100 m. Field monitoring was completed in the fall by personnel of the Pinellas County Environmental Management Division. Data are reported to the TBEP. In addition to assessing seagrass cover, divers determine shoot density and canopy height for each species present. Field staff also measure water quality (pH, temperature, salinity, dissolved oxygen concentration) and water clarity (transmissivity, light attenuation).

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Document citation

Raulerson G, Johansson JOR, Burnes R, Brown A. 2019. Summary report for Western Pinellas County coastal waters. pp. xx-xx, in Yarbro L, Carlson PR Jr. (eds.). Seagrass Integrated Mapping and Monitoring Report No. 3. Technical Report TR-17, version 3. Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, St. Petersburg.