

Florida Seagrass Integrated Mapping and Monitoring

Program

Summary Report for Lake Worth Lagoon

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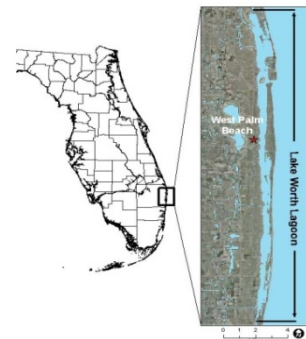


Figure 1: Location of Lake Worth Lagoon, Palm Beach County, Florida

General Assessment: Based on interpretation of aerial photographs, seagrass cover in Lake Worth Lagoon (LWL) between 2001 and 2007 was generally stable, with a slight increase in 2007. Approximately 1,688 acres of seagrass were mapped in the lagoon in 2007. Most of the increase can be attributed to greater areas of patchy seagrass beds throughout the lagoon. Most of the seagrass (65%) is found in North LWL near Singer Island in Riviera Beach. The dominant species in North LWL are manatee grass (*Syringodium filiforme*), turtle grass (*Thalassia testudinum*), and shoal grass (*Halodule wrightii*). The least coverage by seagrasses occurs in the central (12%) and southern (23%) portions of the lagoon; dominant species are Johnson’s seagrass (*Halophila johnsonii*), paddle grass (*H. decipiens*), and shoal grass. Seagrass species composition also appears to be stable in all sections of the lagoon. Annual transect monitoring indicated decreases in cover and density after the 2004, 2005, and 2006 hurricanes. Record high levels of seagrass cover and density were noted in 2007, but slight decreases were observed in 2008 and 2009. Stressors include nutrients, suspended sediments, and turbidity associated with stormwater discharges from three major canals (C-51, West Palm Beach Canal; C-16, Boynton Canal; and C-17, Earman River). Freshwater discharge was elevated after the 2004, 2005, and 2006 hurricanes, but they have returned to background levels. Minor propeller scarring is evident around South Lake Worth (Boynton) Inlet and Lake Worth (Palm Beach) Inlet but is minimal elsewhere.

Seagrass Status and Stresses	Status	Trend	Assessment, Causes
Seagrass cover	Yellow	Stable?	Little change, 2001–07
Water clarity	Red	Declining	Affected by runoff, storms
Nutrients, turbidity	Yellow	Increasing	Affected by runoff, storms

Mapping and Monitoring Recommendations

- Map and monitor seagrasses in areas where conventional aerial photography is not effective (where water is too deep, visibility through the water column is poor, and diminutive species such as paddle grass and Johnson's seagrass are dominant).
- Collect aerial photography for the entire region again in 2011–12.
- Continue annual fixed-transect monitoring.
- Evaluate the effectiveness of patch scale monitoring and continue if effective.

Management and Restoration Recommendations

- Assess proposed changes in freshwater discharges, nutrient loads, and sediment loads from the canals that empty into LWL.
- Evaluate nutrient and suspended sediment loading from the agricultural areas (L8 basin) and identify the most cost-effective management options.

Summary Assessment: Seagrass acreage in Lake Worth Lagoon remained relatively stable between 2001 and 2007, although some increases in patchy cover were observed (Table 1). From 1990 to 2001, 484 acres of seagrass, or 23%, were apparently lost, but different mapping methods were used in the 1990 assessment, which may account for some of this difference. Annual fixed transect monitoring has shown fluctuations in seagrass cover over the nine years of the project: years of poor water quality due to increased freshwater releases (2004, 2005, and 2006) coincided with

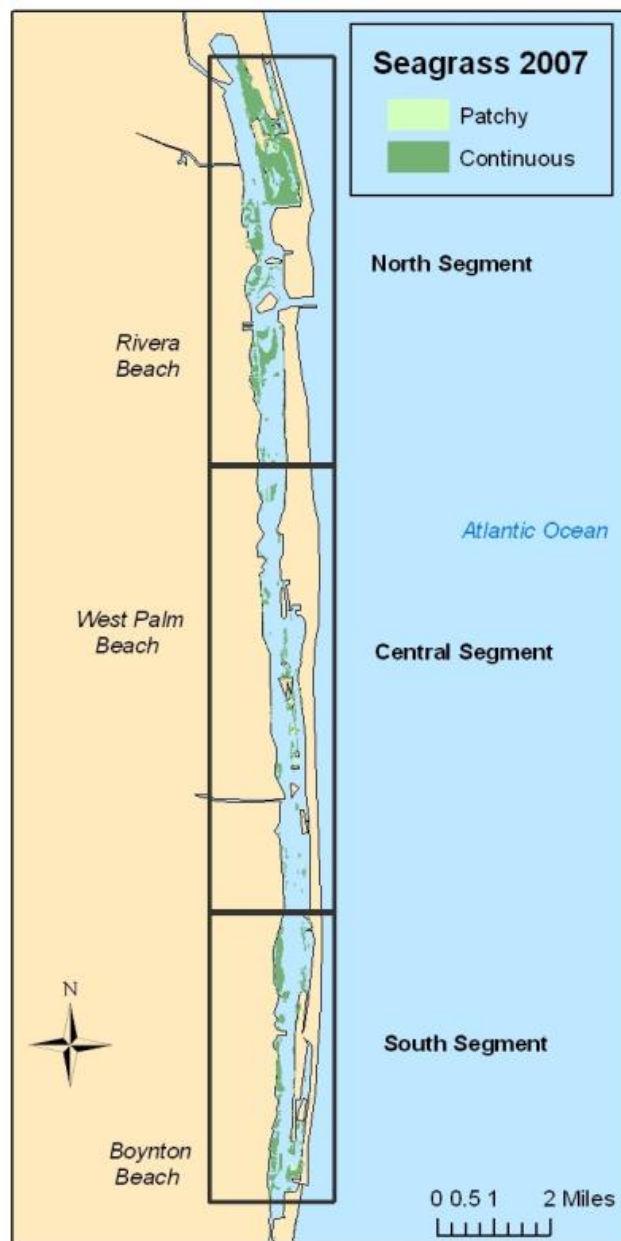


Figure 2. Seagrass beds in Lake Worth Lagoon, 2007.

widespread reductions in seagrass cover. Monitoring programs documented increases in seagrasses in 2001, 2002, 2007, 2008, and 2009, when water quality was better.

However, it is very difficult to provide an accurate estimate of seagrass habitat within the lagoon because of poor water quality, limited visibility through the water column, and the very small size and limited optical signature of Johnson’s seagrass and paddle grass. Stressors include increased freshwater inputs to the lagoon, nutrients, sedimentation, turbidity, and phytoplankton blooms associated with runoff from urban stormwater and the regional canal discharges. Impacts of regional canal discharges extend throughout the Lagoon but are most severe in the central portions adjacent to the C-51 canal. The hurricanes of 2004, 2005, and 2006 also affected seagrass beds.

Seagrass Mapping Assessment: Between 2001 and 2007, total seagrass cover for the LWL region increased from 1,647 acres to 1,688 acres, or 2.5% (Table 1). The majority of the increase resulted from a greater area of patchy seagrass beds throughout the lagoon. Seagrass cover varies throughout the lagoon, with the most seagrass found in the northern end (65%), compared with 12% in the central segment and 23% in the southern segment. Comparing the 2001 maps to the 2007 maps revealed a 59-acre decrease in seagrass cover in the northern segment, a 9-acre increase in the central segment, and a 91-acre increase in the southern segment. The results are considered an underestimate of seagrass cover because areas of the lagoon have poor visibility and the tiny and thus difficult to assess Johnson’s seagrass and paddle grass are dominant. As a result, mapping efforts may not have accurately identified seagrass cover. Mapping efforts identified only seagrass beds that were 0.25 acre or more in size and were designed to detect large-scale changes.

Seagrass Status Indicators	Status	Trend	Assessment, Causes
Seagrass abundance		Stable	Slight increase, 2001–07
Seagrass species composition		Poor	
Overall seagrass trends		Stable	Stormwater runoff impacts
Seagrass Stressors	Intensity	Impact	Explanation
Water clarity		Poor	Affected by runoff, storms
Nutrients		Relatively high	Affected by runoff, storms
Phytoplankton		Relatively high	Affected by runoff, storms
Natural events		Serious impacts	2004-06 hurricanes
Propeller scarring		Localized	Near inlets

TABLE 1. SEAGRASS ACREAGE IN LAKE WORTH LAGOON

Habitat type	Regions of Lagoon			Total
	North	Central	South	
2001				
Patchy	13	1	0	14
Continuous	1,136	195	302	1,633
All seagrass	1,149	196	302	1,647
2007				
Patchy	21	21	10	52
Continuous	1,069	184	383	1,636
All seagrass	1,090	205	393	1,688
Change 2001-2007				
Patchy	8	20	10	38
Continuous	-67	-11	81	3
All seagrass	-59	9	91	41
Percent change	-5.1%	4.6%	30.1%	2.5%

Monitoring Assessment: In 2000, the Palm Beach County Department of Environmental Resource Management (PBC DERM) initiated a long-term seagrass monitoring program that included the establishment and annual assessment of nine fixed transects throughout LWL (Figure 3). With improving water quality and clarity, seagrasses are expected to grow at greater depths or to increase in density and diversity. To test this hypothesis, transects were located in areas where the lagoon bottom increased in depth by 1–2 ft. within 50–100 ft. of the edge of an existing seagrass bed. The first five years of surveys showed fluctuations in seagrass cover with no obvious pattern of increase or decrease—until the hurricanes of 2004. The survey conducted in June 2005 and 2006 showed a major decrease in seagrass cover in most areas of the lagoon. This loss is believed to be the result of increased turbidity and suspended sediments caused by runoff from the hurricanes and discharges from Lake Okeechobee, as well as burial and scour from wave action. Areas suffering the least severe impact were shallow sites and sites closer to inlets, where water quality was least affected. The 2007 survey reported record highs in terms of total number of sampling locations at which seagrass was observed and of percentage cover at the sampling locations. The 2007, 2008, and 2009 surveys documented not only increases in seagrass cover but also the expansion of beds into deeper water.

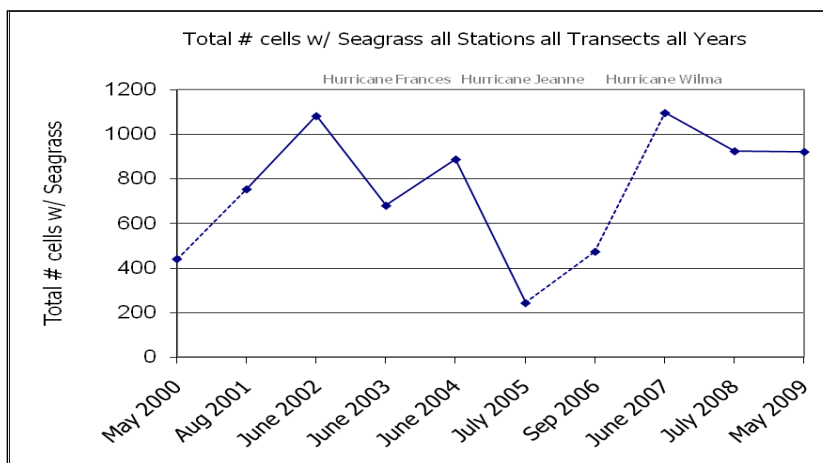


Figure 3. Seagrass occurrence along monitoring transects, 2000–09. In 2000, the project consisted of only five transects (15 stations). In 2001–05 and 2007–09, it consisted of nine transects (27 stations). In 2006, poor water clarity allowed for the monitoring of only 4 transects (12 stations). In 2006, the number shown is the average of 2005 and 2007 values.

Management and Restoration Recommendations

- Assess proposed changes in freshwater discharges, nutrient loads, and sediment loads from the canals that empty into LWL.
- Evaluate nutrient and suspended sediment loading from the agricultural areas (L8 basin), and identify the most cost-effective management options.

Mapping Data and Imagery: In 2001 and 2007, natural color aerial photography of the Lake Worth Lagoon region was flown at 1:10,000 scale for Palm Beach County by U.S. Imaging (Bartow, FL). The original negatives and copies of diapositives are housed at PBC DERM. Benthic habitats were classified and mapped from this dataset by Avineon Inc. (Clearwater, FL) using the Florida Land Use Cover Classification System. ArcMap shape files of benthic habitats are available on the Fish and Wildlife Research Institute Marine Resources Geographic Information System (MRGIS) website (<http://ocean.floridamarine.org/mrgis/>) or by contacting PBC DERM.

Monitoring Data: A variety of groups and agencies monitors seagrass in the Lake Worth Lagoon (Table 2). Since 2000, PBC DERM has been monitoring seagrass annually along nine transects (27 stations) throughout LWL with the Fixed Transect Monitoring Project (FTMP). Since 2006 the Fish and Wildlife Research Institute (FWRI) and the National Oceanic and Atmospheric Administration (NOAA) have been monitoring Johnson’s seagrass (*H. johnsonii*) at 8 locations and 33 stations in the lagoon for the *H. johnsonii* Recover Team. And in 2009, the

South Florida Water Management District (SFWMD) and the U.S. Army Corps of Engineers (USACOE) began bimonthly monitoring at five locations (with 30 stations at each) for the Comprehensive Everglades Restoration Plan (CERP)/Restoration, Coordination and Verification (RECOVER) Seagrass Monitoring Section.

TABLE 2. MONITORING PROGRAMS IN LAKE WORTH LAGOON

Program	Agency	Frequency	Number of locations	Number of stations per location	Annual total of stations
LWL FTMP	PBC DERM	Annually	9	3	27
Johnson's Recovery	FWRI/NOAA	Annually	9	33	297
CERP/RECOVER	SFWMD/USACOE	Bimonthly	5	30	900

Pertinent Reports and Scientific Publications

CRIGGER, D. K., G. A. GRAVES, and D. L. FIKE. 2005. Lake Worth Lagoon conceptual ecological model. *Wetlands* 25: 943–954.

PALM BEACH COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT IN CONJUNCTION WITH DAMES AND MOORE. 1990. Lake Worth Lagoon natural resources inventory and resource enhancement study, West Palm Beach, Florida. 226 p.

PALM BEACH COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT AND STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION, SOUTHEAST DISTRICT. 1998. Lake Worth Lagoon management plan, West Palm Beach, Florida. 257 p.

PALM BEACH COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT. 2008. Palm Beach County Mangrove and Seagrass Mapping Project. Final report prepared by Avineon Inc., West Palm Beach, Florida. 18 p.

PALM BEACH COUNTY DEPARTMENT OF ENVIRONMENTAL RESOURCES MANAGEMENT. 2009. Lake Worth Lagoon: fixed transect seagrass monitoring cumulative report 2000–2008. Final report prepared by Applied Technology and Management Inc., West Palm Beach, Florida.

REstoration COordination and VERification. 2007. Final 2007 system status report. Section 5 Northern Estuaries Module, Comprehensive Everglades Restoration Plan. 11 p.

REstoration COordination and VERification. 2010. 2009 system status report draft. Section 4 Northern Estuaries Module, Comprehensive Everglades Restoration Plan. 91 p., see also: http://www.evergladesplan.org/pm/ssr_2009/hc_ne_sav_results_lake_worth.aspx; accessed March 2011.

General References and Additional Information

KING, JOE. 2010. Numerical nutrient criteria for the Lake Worth Lagoon. Palm Beach County Department of Environmental Resources Management, March 2010: http://www.dep.state.fl.us/water/wqssp/nutrients/docs/estuarine/ftpierce/lake_worth_lagoon.pdf; accessed March 2010.

Palm Beach County: <http://www.pbcgov.com/erm/lakes/seagrasses/>.

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