

Summary Report for the Florida Keys Region

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Seagrass Integrated Mapping and Monitoring Program

Mapping and Monitoring Report No. 2.0

FWRI Technical Report TR-17 version 2

2016

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Summary Report for the Florida Keys region including the Marquesa Keys and the Dry Tortugas



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General assessment: The Florida Keys region includes the largest expanse of seagrasses in the United States. Mapping data, compiled from imagery collected in 2005, 2006, and 2011, indicated that seagrasses covered 939,487 acres from Key Largo through the Dry Tortugas. An additional 380,680 acres of seagrass were mapped in Florida Bay in 2010–2011. Seagrass beds covered 215,885 acres on the Atlantic side of the Upper Keys and 104,962 acres on the Atlantic side of the Lower Keys. On the Gulf of Mexico side, seagrasses covered 263,247 acres near the Upper Keys, not including Florida Bay, and

305,296 acres near the Lower Keys and the Marquesa Keys; 9,200 acres of seagrasses surrounded the Dry Tortugas in 2010. Five species of seagrass are found in the Florida Keys: turtlegrass (*Thalassia testudinum*) and manateegrass (*Syringodium filiforme*) are the most common; shoalgrass (*Halodule wrightii*), stargrass (*Halophila engelmannii*), and paddlegrass (*Halophila decipiens*) are also observed in the region. Seagrass cover in the Florida Keys is probably stable, but significant changes in seagrass species composition continue in many locations in response to alterations in water quality.

General Status of Seagrasses in the Florida Keys region			
Status and stressors	Status	Trend	Assessment, causes
Seagrass cover	Green	Stable	
Water clarity	Yellow	Locally poor	Phytoplankton blooms
Natural events	Green	Sporadic	Tropical cyclones
Propeller scarring	Yellow	Localized	Near high-use areas

Geographic extent: The Florida Keys region includes the waters adjacent to the Florida Keys from the Card Sound causeway in Key Largo to Key West and out to the Marquesas Keys and the Dry Tortugas. The Florida Keys National Marine Sanctuary is contained within the region.

Mapping and Monitoring Recommendations

- Obtain and photo-interpret imagery of the region every 6–10 years.
- Continue the long-term monitoring program of the Southeast Environmental Research Center at Florida International University.



Figure 1 Seagrass cover in the Florida Keys and the Marquesa Keys. Mapping data are from 2006 and 2011 for the Keys and from 2006 for the Marquesas.

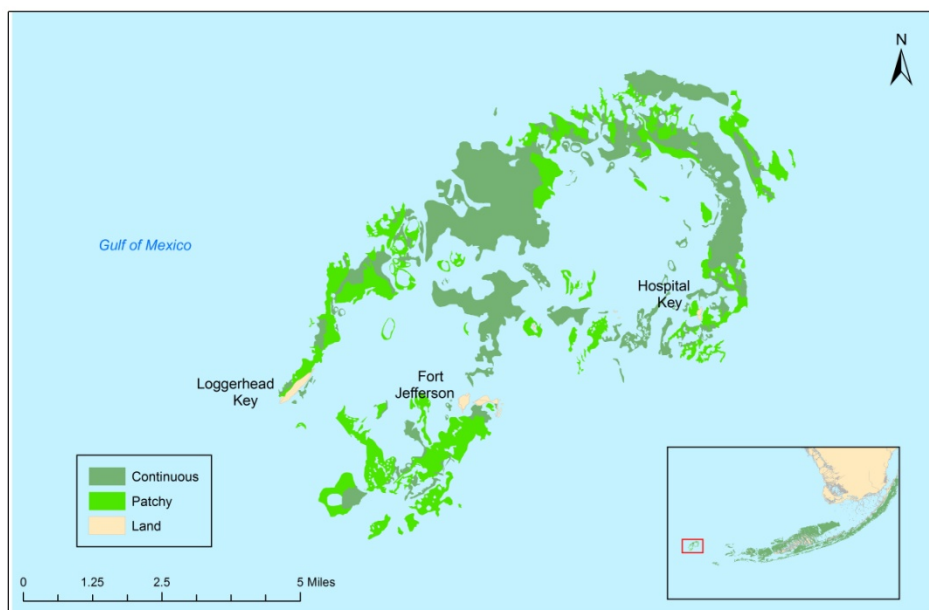


Figure 2 Seagrass cover in the Dry Tortugas, 2010.

Management and Restoration

Recommendations

- Continue to assess changes in seagrass beds associated with changing nutrient conditions in the water column.
- Inventory the locations of propeller scarring and develop a strategy for reducing impacts. Restore scarred seagrass beds as funding becomes available.
- Establish a framework for detecting the effects of climate change and ocean acidification on coastal marine resources in the region.

Summary assessment: Seagrass cover in the Florida Keys, Marquesa Keys, and Dry Tortugas is likely stable. Data from imagery collected in 2005, 2006, and 2011 found 939,488 acres of seagrass in the region. Mapping of imagery collected in 1992 found 856,355 acres of seagrass. The increase in acreage observed in the most recent mapping efforts (83,133 acres, or 10%) may reflect real increases in seagrass area, or the difference might be due to small differences in imagery (footprint, resolution) and methodology. Despite generally stable acreage, the texture and species composition of seagrass beds continue to change in response to changing water quality. Nutrient content in seagrass tissues indicates that available nutrients in the water are increasing. Increased nutrient availability in the past 20 years is altering the relative abundance and dominance of

seagrasses and macroalgae. Where nutrients have been elevated for some time, long-term increases in phytoplankton populations have been observed, which increase light attenuation in the water column and thus harm seagrass beds.

Seagrass mapping assessment: Photo-interpretation of aerial imagery collected in 2005, 2006, and 2011 showed that 939,488 acres of seagrasses covered the shallow bottom from the Upper Keys to the Dry Tortugas (Table 1). To obtain this estimate, photo-interpretation was carried out on non-overlapping imagery acquired in 2004 (primarily for Florida Bay), 2005 and 2006 (the Gulf side of the lower Keys and the Marquesas), and 2011 (portions of the entire region). Mapping data for the Dry Tortugas were interpreted from imagery collected in 2010. Seagrass beds on the Gulf side of the Keys (463,900 acres) accounted for 49% of the total acreage in the region. Seagrasses on the Atlantic side of the Keys covered 320,847 acres, and seagrasses near the Marquesa Keys covered 145,540 acres. In 2010, 9,201 acres were mapped around the Dry Tortugas. When seagrass cover for the Florida Keys and Florida Bay (380,681 acres) are summed, approximately 1.3 million acres of seagrass were mapped for the area south of the Everglades from Key Largo through the Dry Tortugas. This number might actually be greater, because almost 42,000 acres of Florida Bay were not mapped in 2010–2011, because the bottom cover could not be interpreted.

Seagrass Status and Potential Stressors in the Florida Keys region			
Status indicator	Status	Trend	Assessment, causes
Seagrass cover	Green	Stable	
Seagrass meadow texture	Yellow	Some changes	Species changes
Seagrass species composition	Orange	Changing	Changes in water quality
Overall seagrass trends	Yellow	Changing	Altered water quality
Seagrass stressor	Intensity	Impact	Explanation
Water clarity	Yellow	Locally poor	Phytoplankton blooms
Nutrients	Yellow	Increasing?	Northeastern region
Phytoplankton	Yellow	Increasing?	Northeastern region
Natural events	Green	Sporadic	Tropical cyclones
Propeller scarring	Yellow	Localized	Near high-use areas

Table 1 Seagrass acreage in the Florida Keys region. This includes the Dry Tortugas, the Marquesa Keys, and Florida Bay. A: Acreage by mapping data source (non-overlapping); B: Acreage totals using mapping data from 2006–2011; C: Acreage of continuous and patchy beds in Florida Bay and the Marquesa Keys.

		Lower Keys (including the Marquesas)		Upper Keys (including Florida Bay)		
				Atlantic		
A.	Mapping data source	Dry Tortugas	Atlantic side	Gulf side	side	Gulf side
	Marquesa Keys 2006		40,896	104,644		
	Florida Keys 2006–2011		104,962	200,653	215,885	263,247
	Florida Bay 2010–2011					380,681
	Tortugas 2010	9,201				
	Total	9,201	145,858	305,296	215,885	643,928
B.	Total seagrass acreage					
	Atlantic side	Gulf side	Total Florida Keys	Dry Tortugas	Florida Bay	Total for region
	361,743	568,544	930,287	9,201	380,681	1,320,169
C.	Acreage of continuous and patchy seagrass beds					
			Continuous	Patchy	Sparse	Total
	Marquesa Keys 2006		10,223	13,271	17,401	40,896
	Florida Bay 2010–2011		377,158	3,522		380,680

Monitoring assessment: Florida Keys seagrass beds are monitored twice annually by the Florida International University (FIU) Southeastern Environmental Research Center (SERC). Using data from 2013 and 2014 from the FIU database, we calculated the percentage frequency of occurrence of seagrasses in six subregions of the Florida Keys National Marine Sanctuary (FKNMS; Figure 3). The subregions were 1) Atlantic Card Sound, the area northeast of the U.S. Highway 1 causeway; 2) Atlantic Upper Keys, coastal waters on the Atlantic Ocean side of the upper Keys; 3) Atlantic Middle Keys, coastal waters on the Atlantic Ocean side of the middle Keys; 4) Atlantic Lower Keys, coastal waters on the Atlantic Ocean side of the lower Keys; 5) Gulf Middle Keys, Sanctuary waters on the Gulf side of the middle Keys; and 6) Gulf Lower Keys, Sanctuary waters on the Gulf side of the

lower Keys. The most common submersed vegetation was manateegrass, turtlegrass, and calcareous green macroalgae. Shoalgrass was scarce and was observed only in the Atlantic Card Sound and Gulf Lower Keys subregions. Turtlegrass was the most common seagrass species, except in the Gulf Middle Keys, and its mean frequency of occurrence ranged from nearly 95% in the Atlantic Upper Keys to 49% in the Gulf Lower Keys. Manateegrass was the most common seagrass observed in the Gulf Middle Keys, and its mean frequency of occurrence ranged from 79% in the Gulf Middle Keys to 19% in the Atlantic Upper Keys. Calcareous green macroalgae were abundant in all subregions, ranging from a frequency of occurrence of 79–80% in the Atlantic Card Sound and Gulf Middle Keys to 44% in the Gulf Lower Keys.

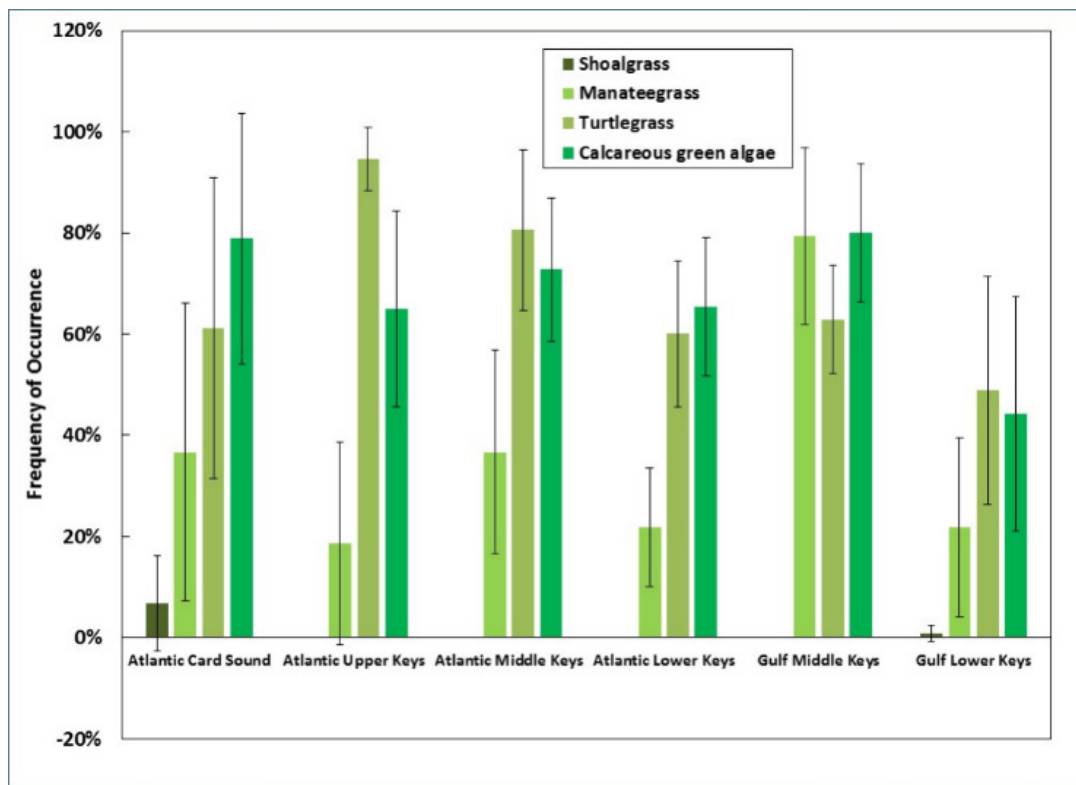


Figure 3 Mean (± 2 standard error) frequency of occurrence of seagrasses in the FKNMS in 2013 and 2014 (data from FKNMS/FIU database).

**Mapping and Monitoring
Recommendations**

- Acquire and interpret new imagery in 2016–2018.
- Continue the long-term monitoring program of Florida International University.

**Management and Restoration
Recommendations**

- Continue assessment of the effects of nutrient enrichment on seagrass ecosystems.
- Inventory the locations of propeller scarring and develop a strategy for reducing impacts. Restore scarred seagrass beds as funding becomes available.
- Use boating and angling guides produced by the Florida Fish and Wildlife Conservation Commission for waters in the region to improve boater education and awareness of seagrass beds and to reduce propeller scarring.
- Establish a framework for detecting effects of climate change and ocean acidification on coastal marine resources in the region.

Mapping methods, data, and imagery: The most recent mapping data (2005–2011) were produced by the National Oceanic and Atmospheric Administration (NOAA) as part of the project called Benthic Habitat Mapping of Florida Coral Reef Ecosystems to Support Reef Conservation and Management (<http://coastalscience.noaa.gov/projects/detail?key=209>.) Imagery was acquired by tasking the Ikonos and GeoEye satellites, and acquisition dates extended from May 2005 through 2011. Image interpretation

and bottom-feature classification followed NOAA National Centers for Coastal Ocean Science (NCCOS) methodology, and an accuracy assessment at selected areas in the region was completed by Walker *et al.* (2013). In 2004, color aerial imagery was collected primarily for Florida Bay but included some locations adjacent to the Florida Keys. Photo-interpretation was completed by Photoscience Inc. (St. Petersburg, Florida). Imagery collected in 1992 is part of the South Florida Geographic Information System benthic habitat data set. Areal extent of seagrass beds was interpreted from 1:48,000-scale natural-color aerial photography. The photography was digitized by a photogrammetrist and stereo analytical plotters made available by NOAA.

Monitoring methods and data: Seagrasses and water quality are monitored by SERC, and this program began in 1996. Seagrass abundance, productivity, and nutrient availability are sampled quarterly at permanent stations throughout the Florida Keys National Marine Sanctuary. Sampling sites are located at sites where water quality is assessed as well. Two other sets of randomly chosen sampling locations are evaluated annually for seagrass abundance and nutrient availability. Data collected include Braun-Blanquet evaluation of bottom macrophyte communities, measurements of seagrass tissue nutrient concentrations, stable carbon and nitrogen isotope composition of seagrass leaves, and water quality data. Summary reports and monitoring data are available on the Florida Keys National Marine Sanctuary Water Quality Protection Program website (http://ocean.floridamarine.org/FKNMS_WQPP/pages/sgmp.html.)

Pertinent Reports and Scientific Publications

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General References and Additional Information

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Florida Keys National Marine Sanctuary:

<http://floridakeys.noaa.gov/plants/seagrass.html>. Accessed June 2014.

Seagrass Monitoring Project (WQMP) of the Florida Keys National Marine Sanctuary Water Quality Protection Program:

http://ocean.floridamarine.org/FKNMS_WQPP/pages/sgmp.html. Accessed November 2014.

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Document Citation:

Carlson, P. R. Jr., and J. W. Fourqurean. 2016. Summary report for the Florida Keys National Marine Sanctuary. pp. 214-221, *in* L. A. Yarbro and P. R. Carlson Jr., eds. Seagrass Integrated Mapping and Monitoring Report No. 2. Fish and Wildlife Research Institute Technical Report TR-17, version 2. Florida Fish and Wildlife Conservation Commission, St. Petersburg. 281 p. DOI: 10.13140/RG.2.2.12366.05445.

