



Surface Water Improvement and Management Program

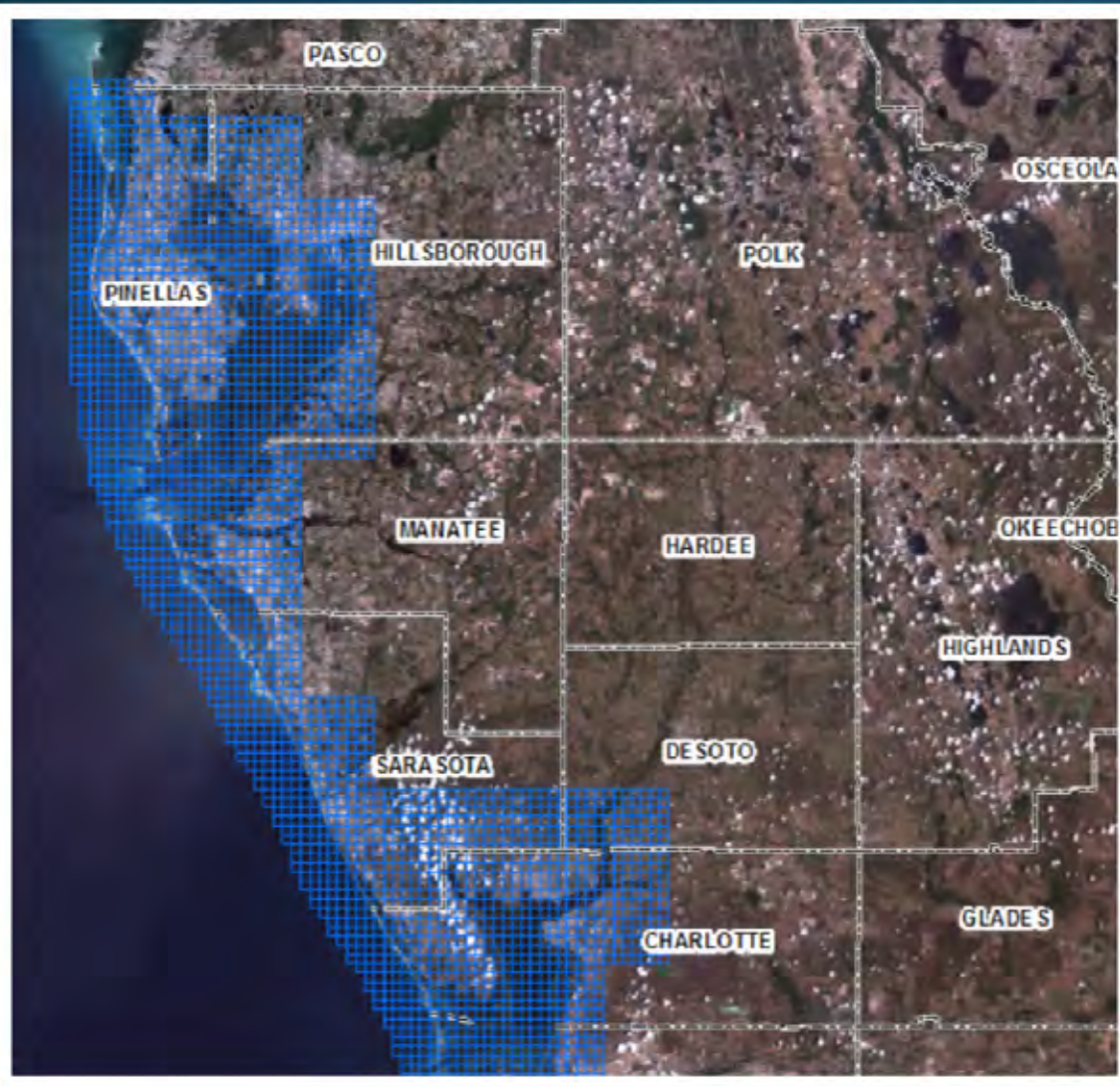
2016 Seagrass Mapping Results

Overview

- SWIM Seagrass Mapping Program
 - 28 year Program (1988 – 2016)
 - Creating 14 GIS-based maps
- Methods
- Environmental Conditions
- 2016 Mapping Highlights



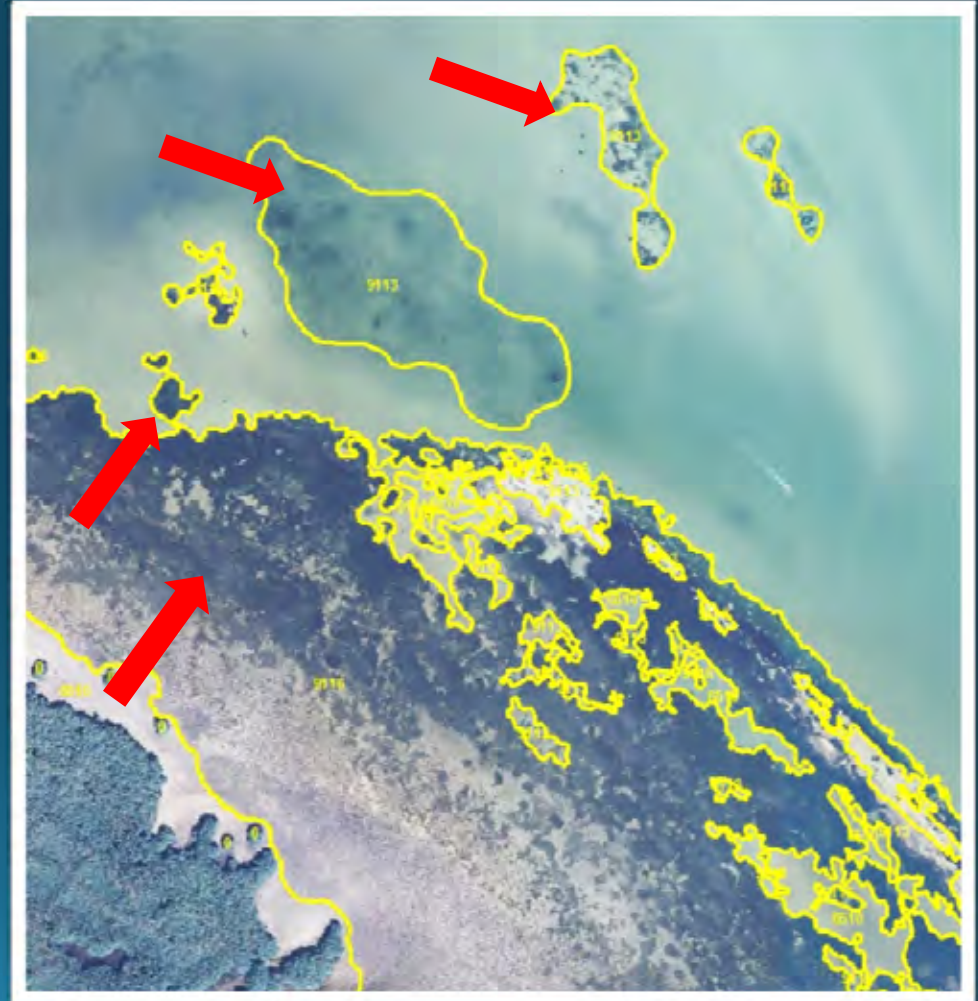
Program Boundaries



Southwest Florida WMD
Approximately 2,539 mi²

2016 Aerial Mapping

- Acquire Imagery :
 - Collect in Winter, Dec '15 – Feb '16
 - 1 ft. digital natural color imagery
 - Leica ADS80 –push-broom digital camera
- Photo-Interpretation :
 - Classify & delineate underwater features
- Field Verification :
 - 1,000+ locations visited, 20 field days
- Accuracy Assessment :
 - Each waterbody achieved 90% or greater



Required Weather Conditions

- **Tidal Condition** : within +/- 2hrs of low tide, no greater than mean tide level, special attention to outgoing slack tides for inlets/passes
- **Wave Height** : less than 2 ft.
- **Water Clarity** : 2 m or greater in each estuary as locations of known low poor clarity
- **Preceding Weather** : wait 72 hr. after a rainfall of 1 inch or greater
- **Cloud Cover** : 0% , District discretion if clouds over land

Weather Conditions: El Nino

- Recognized as the most severe El Nino events:
 - 1997-1998
 - 1982-1983
 - 2015-2016
- Typical El Nino conditions affect the U.S. late fall into early winter
 - September (August 2015) - February

Wet Season (June-September) Rainfall Summary Data by Region				
Year	Northern Region	Central Region	Southern Region	District
1982	38.69	34.86	37.05	37.28
1997	23.55	29.16	28.75	27.09
2015	33.15	36.77	34.69	35.04
Record MEAN	30.06	30.62	31.62	30.93

Post 97-98 El Nino Mapping 1996 to 1999 Percent Change

Tampa Bay

-8%

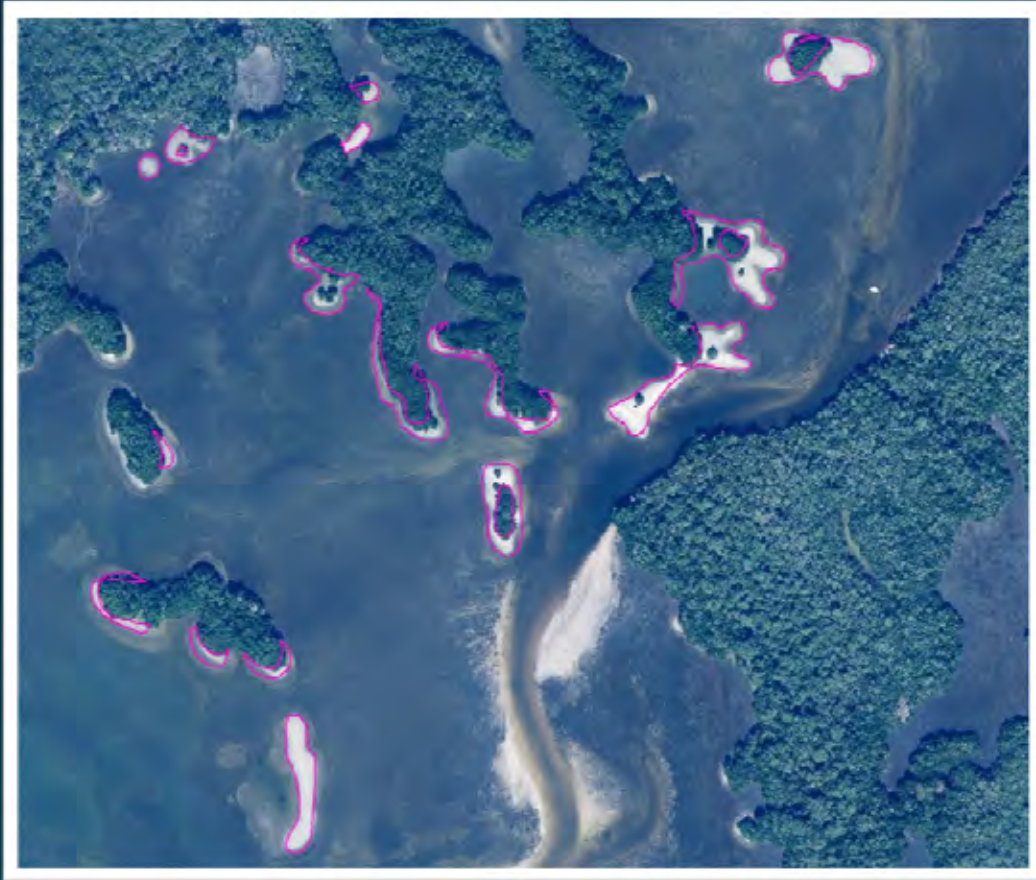
Sarasota Bay

-11%

Charlotte
Harbor

-7%

2014 Updates – Oyster Mapping

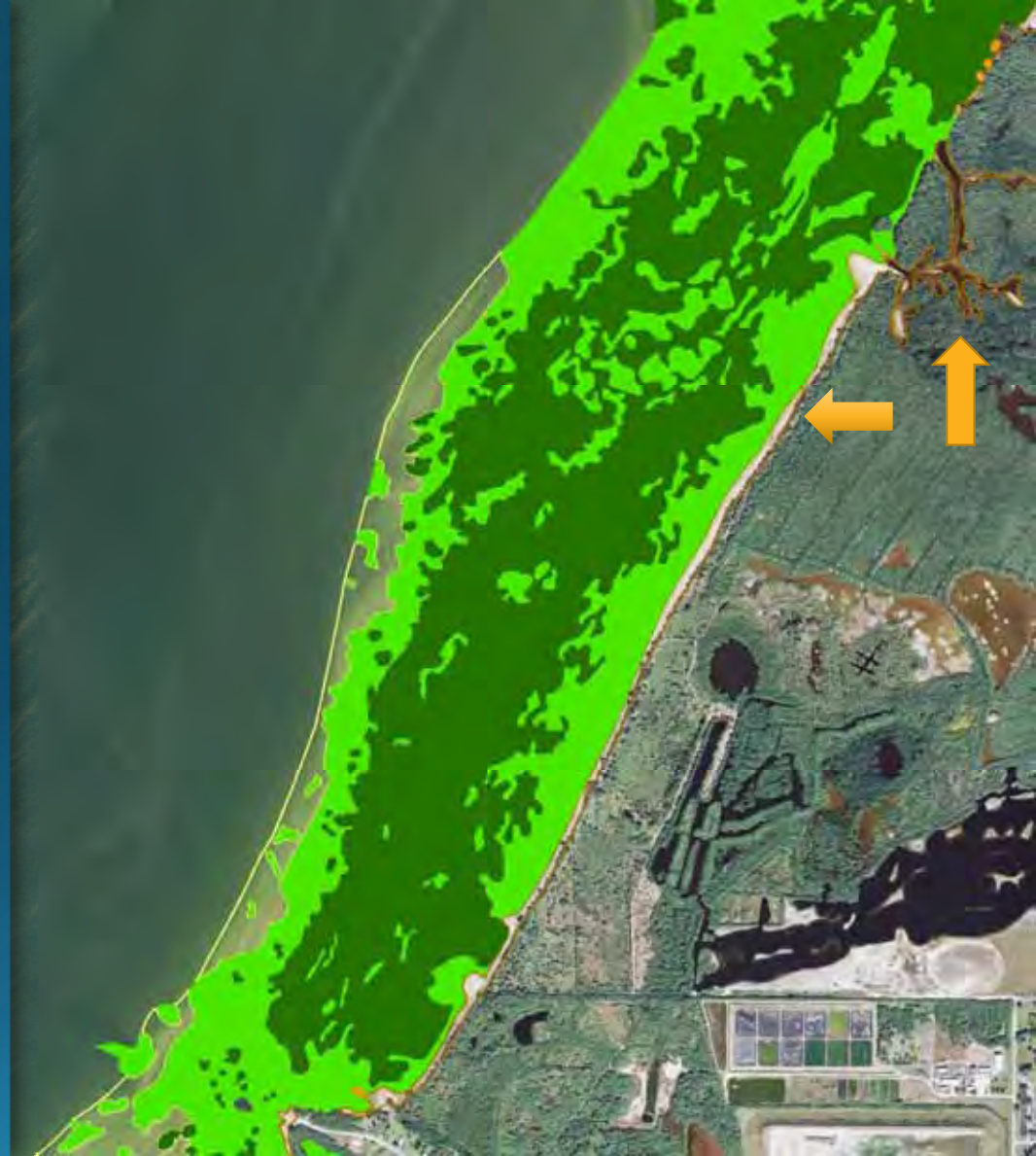


Oysters were added as a new class in 2014.

Oyster Bars (6540) – Dense collection of sessile mollusks found as linear or oval shaped substrates. Hash or dead oyster shell is not differentiated from live oysters and can be included in this class.

2014 Updates – Tidal Flat Definition

Tidal Flats (6510) – Non-vegetated, intertidal shallow-water habitats. These are unconsolidated sediments located in low energy environments and are capable of supporting seagrass if able to establish. A characteristic of this class is its alternating cycle of submergence and exposure to the atmosphere.



2016 Updates – Sand Other Than Beaches

Sand Other Than Beaches – Submerged (7210) – Subtidal, non-vegetated sands, visible bright submerged bottoms. In some nearshore and backwater conditions non-vegetated muddy sands can be dark brown or grey in color and can utilize this code. This is a District added level 3 code. The standard Sand Other Than Beaches (7200) code is usually in reference to dune sands however it is not restricted to dune sands as bare sands exist in other forms. These areas are capable of supporting seagrass if able to establish.

Water Body	Bay Segment	Authoritative Data Comparison to Map Polygons - Did they agree?			
		No - Misclassified	Yes	Total Field Stations Reported	% Correct
Charlotte Harbor		5	145	150	96.7%
	EASTERN CHARLOTTE NO	1	24	25	96.0%
	MYAKKA RIVER		25	25	100.0%
	PEACE RIVER	1	24	25	96.0%
	PLACIDA	2	23	25	92.0%
	TURTLE BAY BULL BAY	1	24	25	96.0%
	WESTERN CHARLOTTE		25	25	100.0%
Lemon Bay	LEMON BAY	1	24	25	96.0%
Sarasota Bay		4	120	124	96.8%
	BLACKBURN BAY	2	23	25	92.0%
	LITTLE SARASOTA BAY	1	24	25	96.0%
	ROBERTS BAY		24	24	100.0%
	UPPER SARASOTA BAY-M	1	24	25	96.0%
	UPPER SARASOTA BAY-S		25	25	100.0%
SJS/CWH		3	65	68	95.6%
	CLEARWATER NORTH	2	16	18	88.9%
	CLEARWATER SOUTH	1	24	25	96.0%
	ST JOSEPH SOUND		25	25	100.0%
Tampa Bay		10	139	149	93.3%
	HILLSBOROUGH BAY	2	23	25	92.0%
	LOWER TAMPA BAY	2	23	25	92.0%
	MANATEE RIVER	3	22	25	88.0%
	MIDDLE TAMPA BAY	1	24	25	96.0%
	OLD TAMPA BAY	1	24	25	96.0%
	TERRA CIEA BAY	1	23	24	95.8%
	BOCA CIEGA BAY	2	22	24	91.7%
Overall Map		25	515	540	95.4%

Thematic Accuracy Assessment Results

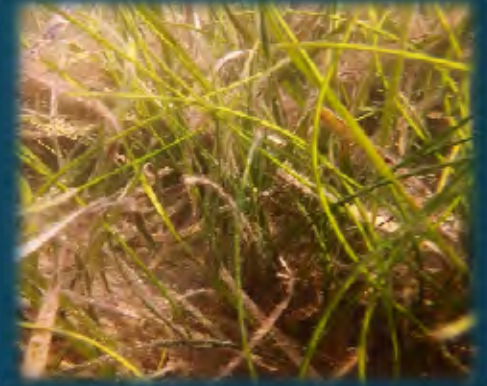
Misclassifications can often occur within patchy seagrass beds.

SWIM Seagrass Mapping

2016 Results



2016 Results by Waterbody

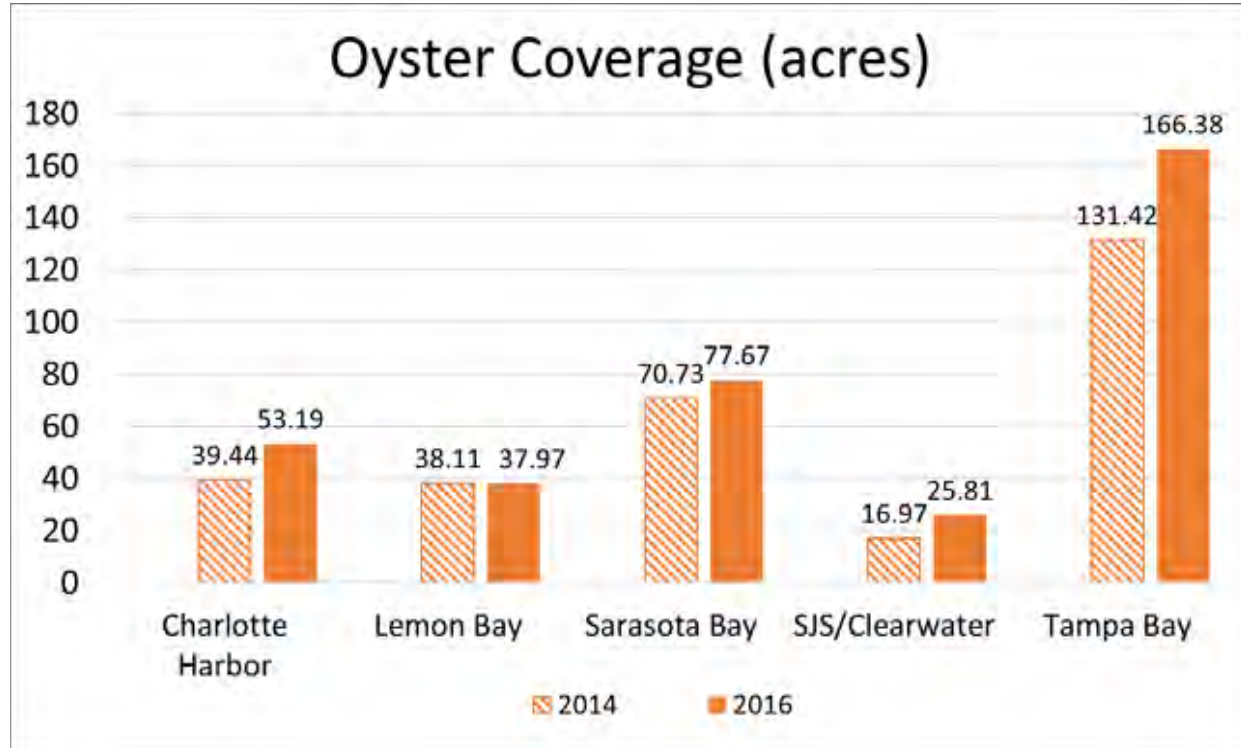


	2014 (acres)	2016 (acres)	Change from 2014 to 2016	% Change
<i>Charlotte Harbor Total:</i>	19,895.86	20,279.67	384	1.9%
<i>Lemon Bay:</i>	3,271.97	3,224.74	-47	-1.4%
<i>Sarasota Bay Total:</i>	13,288.71	13,468.65	180	1.4%
<i>Clearwater/St. Joseph Sound Total:</i>	17,333.63	17,247.94	-86	-0.5%
<i>Tampa Bay Total:</i>	40,294.87	41,655.16	1,360.29	3.4%

Oyster Cover (6540) Overtime

Hypothesize increases likely due to:

- Additional effort interpreting
- Additional fieldwork
- Clarity of images and different tide stages in 2016 data capture



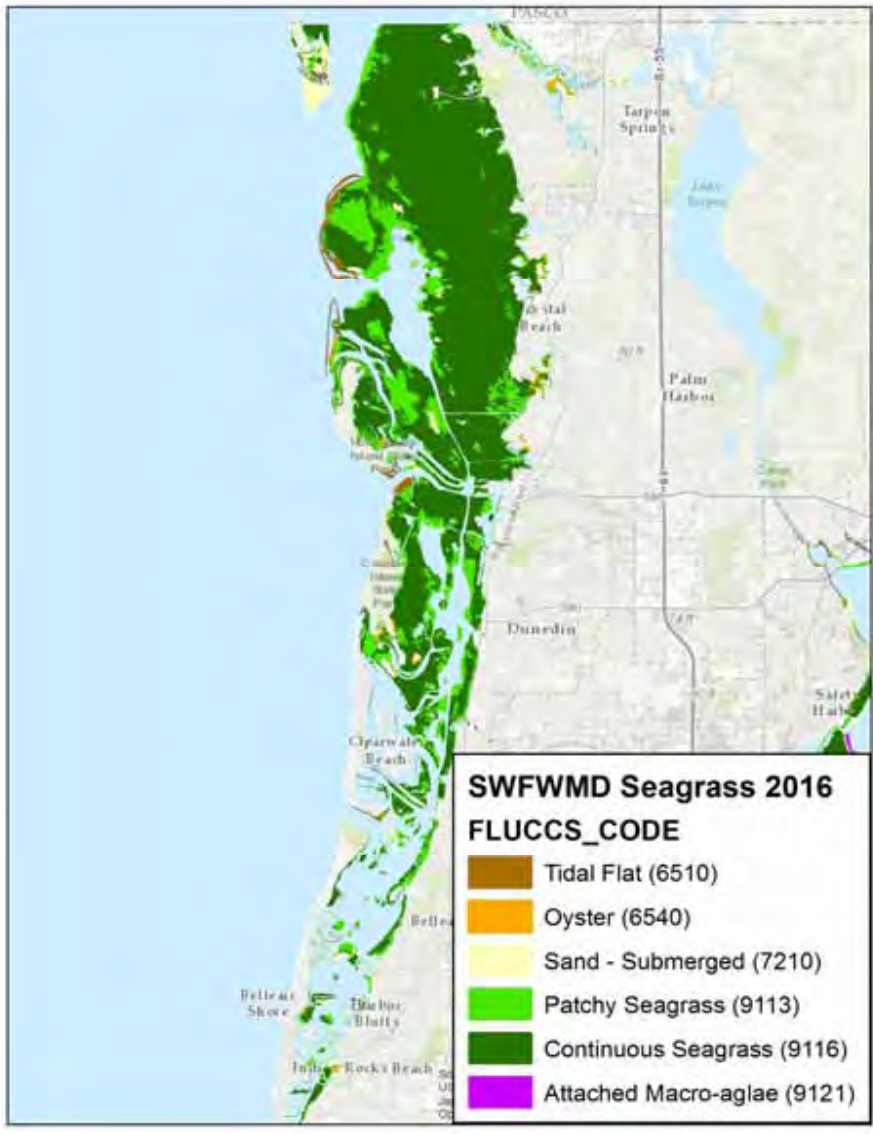
Attached Macro-algae (9121) Overtime

City of Tampa Bay Study Group work was noted in a Department of Maryland report as having a bay-wide macroalgae coverage as:

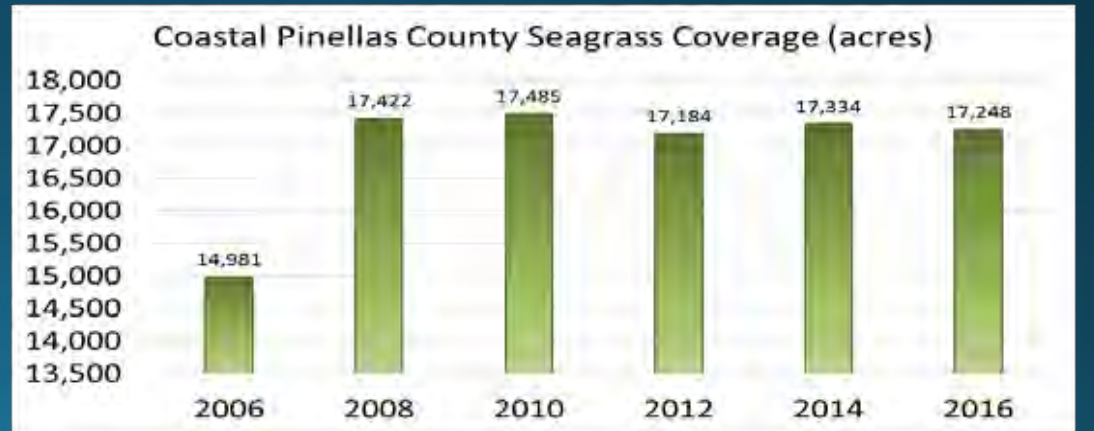
- 741 acres in the late 1980s
- 74 acres in 1997
- This study reported on more than attached algae, major genera included: Ulva, Graciliara, Spyridia, Caulerpa
- HB currently has 37% of the coverage
- OTB 30%

Tampa Bay Segments	2014	2016	Change in Acreage 2014 to 2016
Boca Ciega Bay			
Hillsborough Bay	245.46	921.20	675.74
Lower Tampa Bay	480.84	500.37	19.53
Manatee River			
Middle Tampa Bay	101.56	279.59	178.03
Old Tampa Bay	117.77	763.83	646.07
Terra Ceia Bay	41.17	40.10	-1.08
Tampa Bay Total:	986.79	2,505.09	1,518.29

St. Joseph Sound & Clearwater Harbor



Clearwater/St. Joseph Sound	2014	2016	Change in Acreage 2014 to 2016	% Change
Clearwater North	3,496.01	3,452.24	-44	-1.3%
Clearwater South	769.62	802.16	33	4.2%
St. Joseph's Sound	13,068.00	12,993.54	-74	-0.6%
Clearwater/SJS Total:	17,333.63	17,247.94	-86	-0.5%



**To visualize oysters at this scale, polygons were enhanced using a 1 pt. outline

St. Joseph Sound

Gains & Losses

Three Rooker Bar

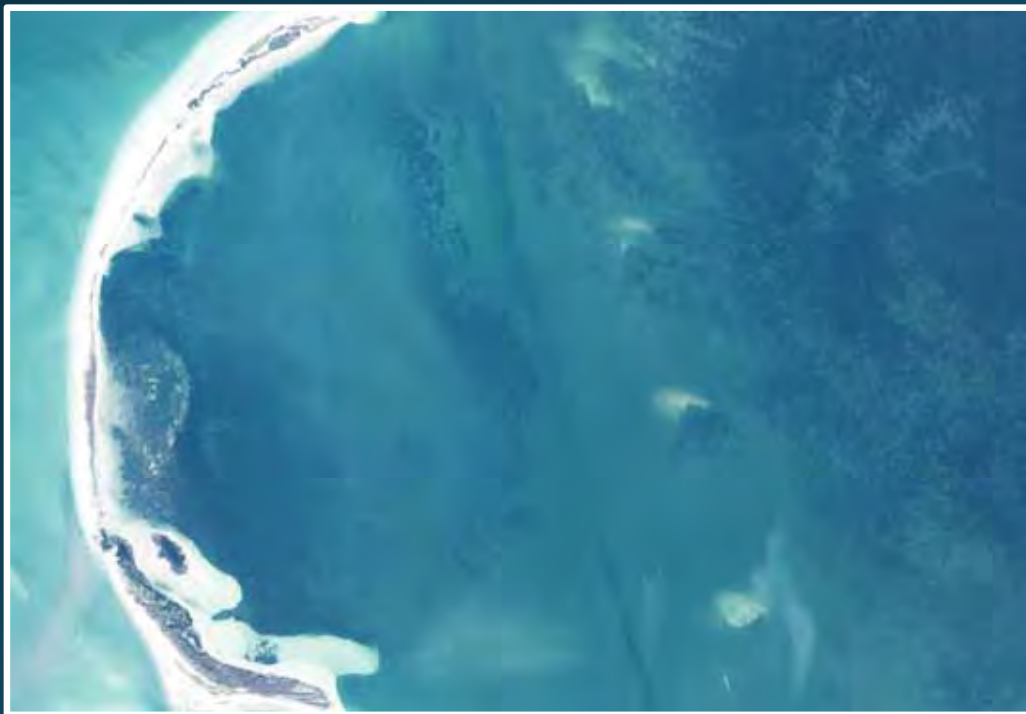


Ground truthing Points:
no species identified = no
seagrass present



Accuracy Assessment Points

2014



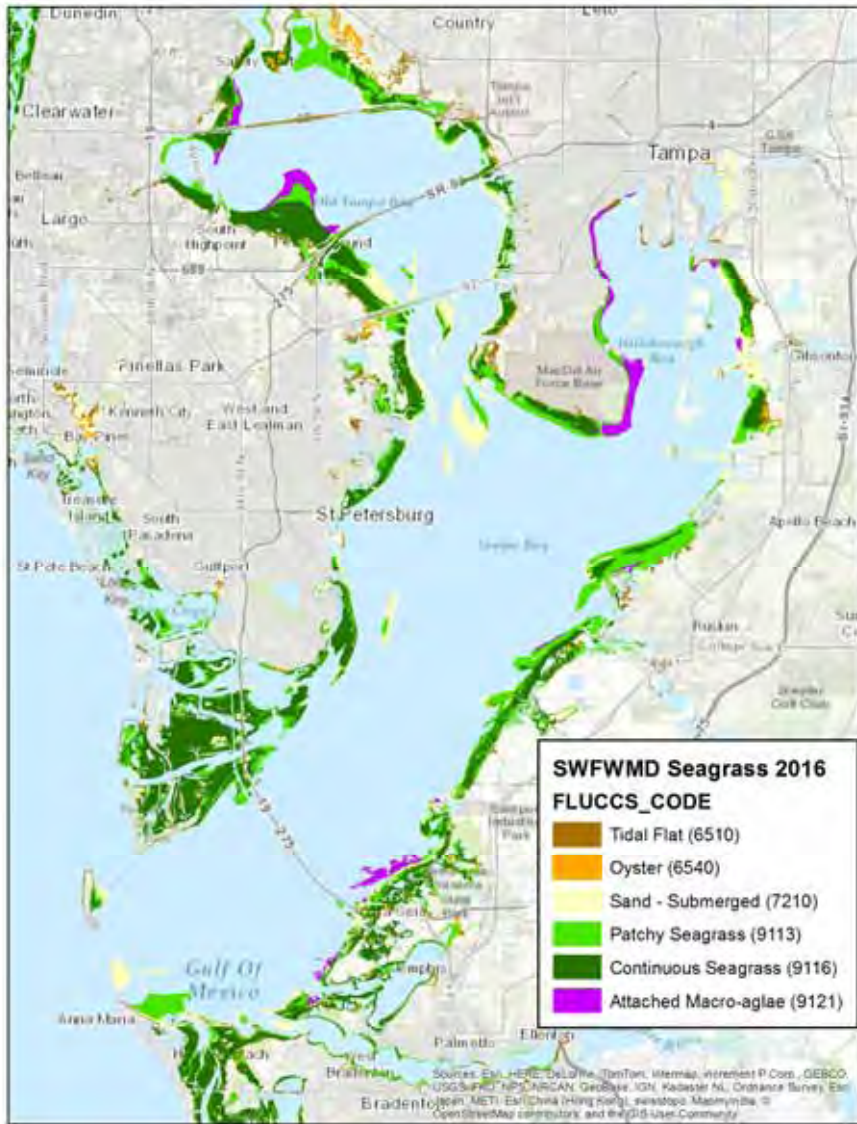
2016



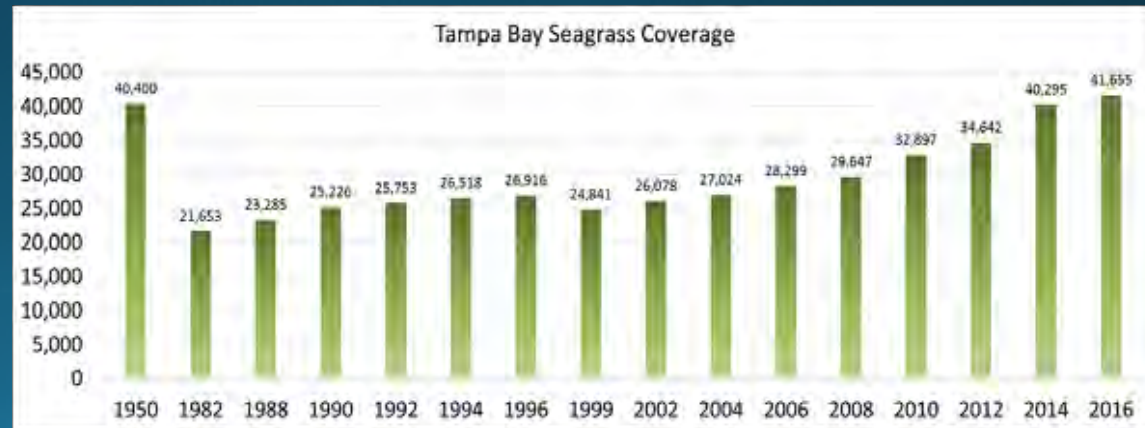
Clearwater Gains & Losses



Tampa Bay



Tampa Bay Segments	2014	2016	Change in Acreage 2014 to 2016	% Change
Boca Ciega Bay	8,880.43	9,070.29	190	2.1%
Hillsborough Bay	1,973.41	2,007.18	34	1.7%
Lower Tampa Bay	7,637.67	7,796.92	159	2.1%
Manatee River	656.31	723.35	67	10.2%
Middle Tampa Bay	9,694.21	9,652.45	-42	-0.4%
Old Tampa Bay	10,272.53	11,146.64	874	8.5%
Terra Ceia Bay	1,180.31	1,258.33	78	6.6%
Tampa Bay Total:	40,294.87	41,655.16	1,360.29	3.4%



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Tampa Bay: 2014 Highlights



- **16.3%** increase from 2012 – 2014
- More than **3,000** of the **5,652 acre** increase occurred in **Old Tampa Bay and Hillsborough Bay**

Old Tampa Bay Gains & Losses

NE Side of the Courtney
Campbell Causeway



Old Tampa Bay Gains & Losses

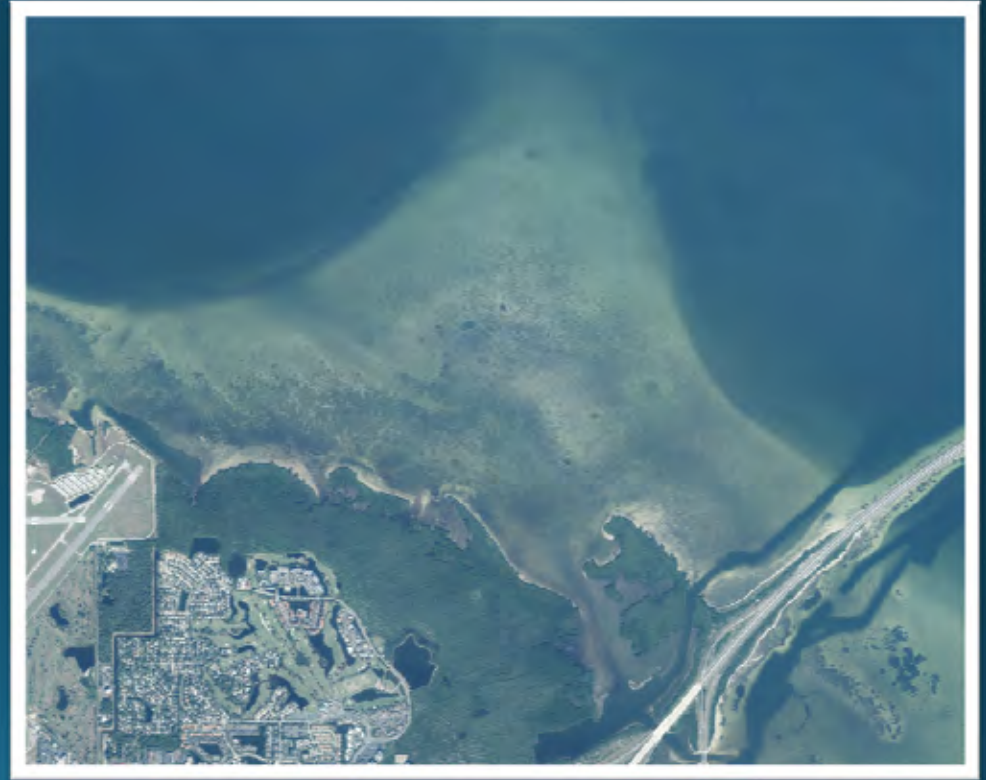


Feather Sound

Tampa Bay Gains



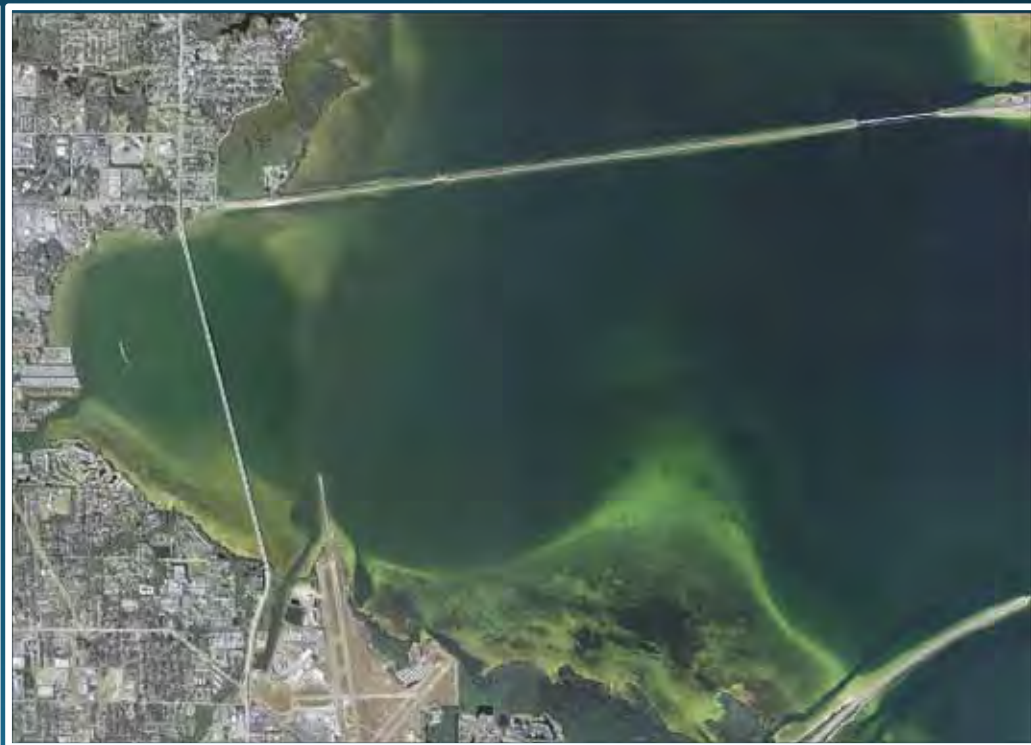
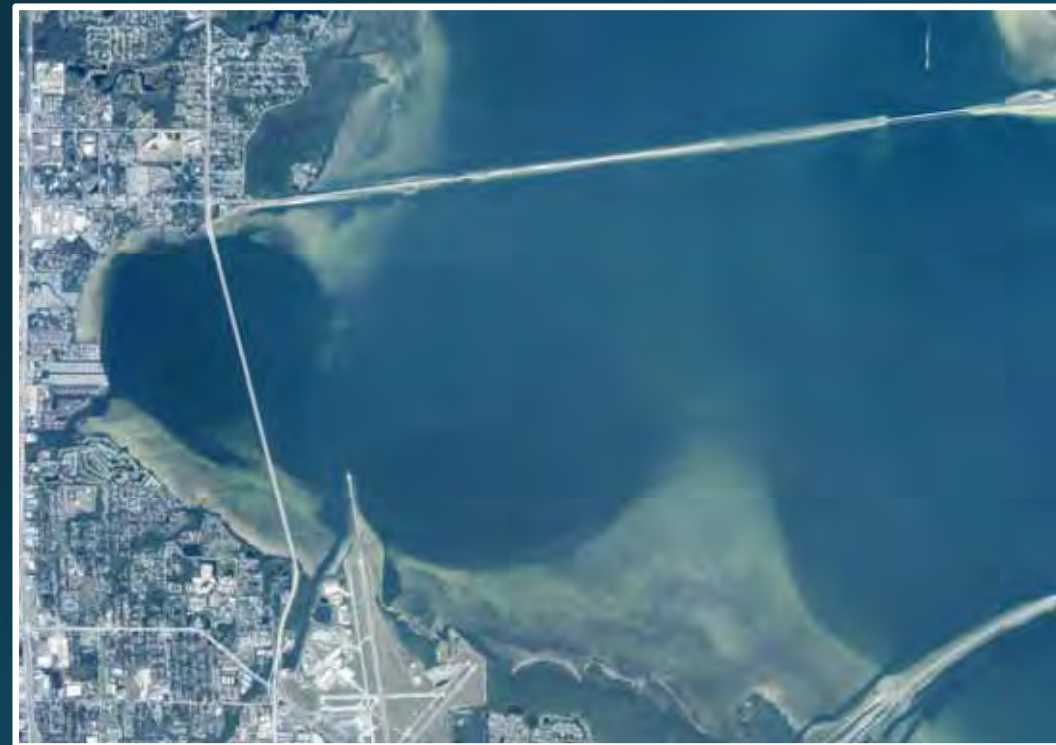
2012



2014

2014

2016



Hillsborough Bay Gains & Losses

MacDill AFB

Gain in this graphic only is for
Attached Macro-algae (9121)

Yellow is stable seagrass

Red is seagrass loss to 9121



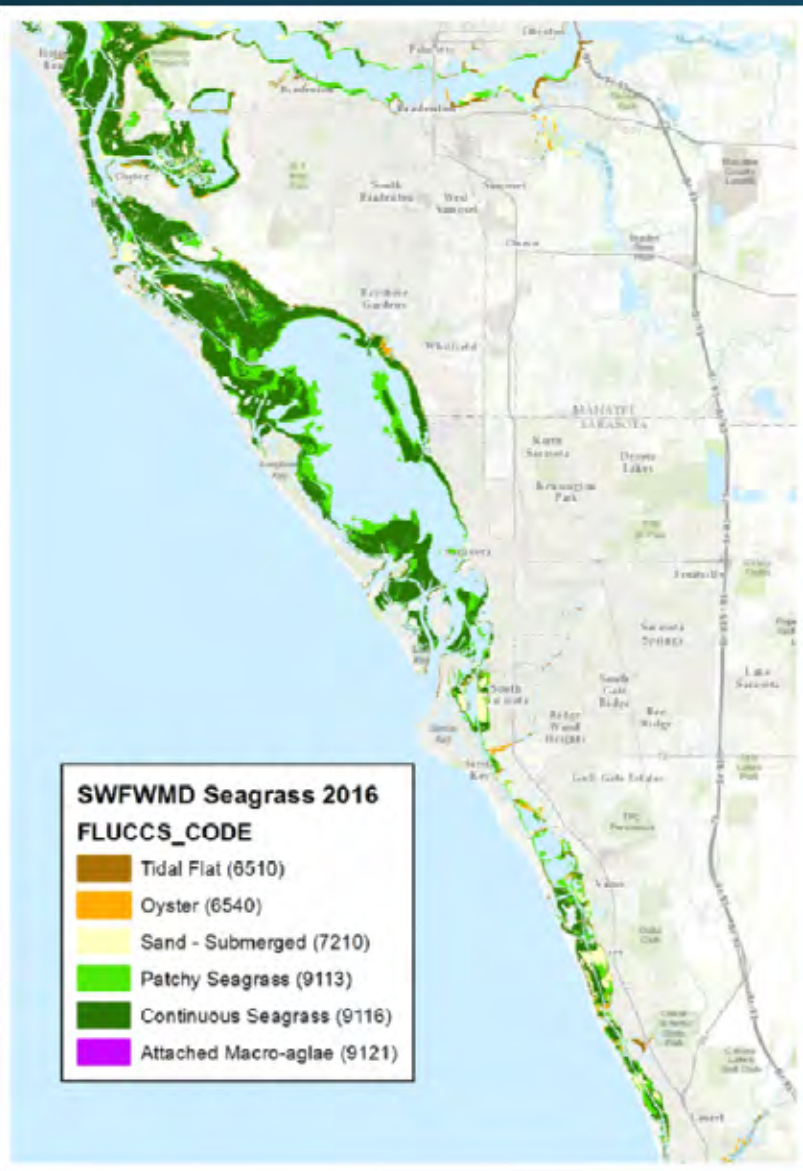
2014



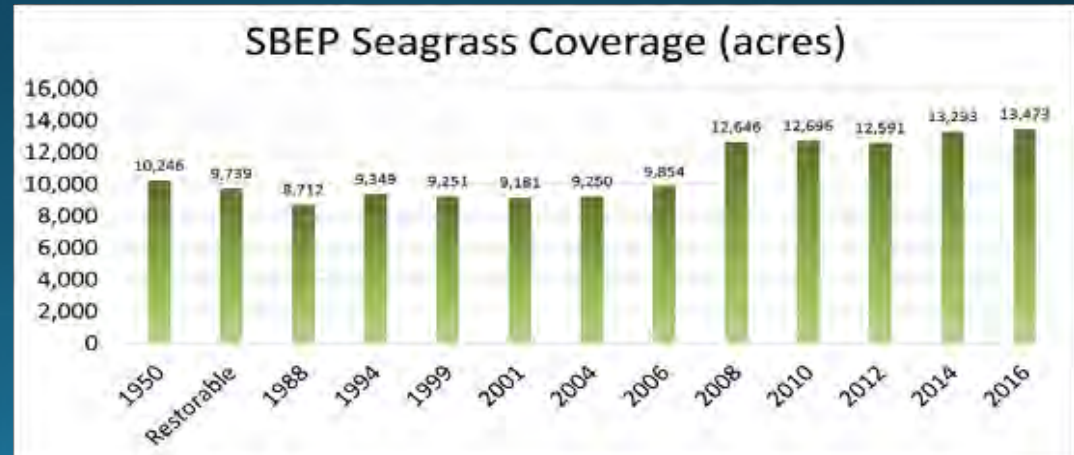
2016



Sarasota Bay



Sarasota Bay Segments	2014	2016	Change in Acreage 2014 to 2016	% Change
Blackburn Bay	420.57	388.72	-32	-7.6%
Little Sarasota Bay	928.81	805.08	-124	-13.3%
Roberts Bay	324.81	359.57	35	10.7%
Upper Sarasota Bay N	8,160.67	8,219.69	59	0.7%
Upper Sarasota Bay S	3,453.85	3,695.59	242	7.0%
Sarasota Bay Total:	13,288.71	13,468.65	180	1.4%



**To visualize oysters at this scale, polygons were enhanced using a 1 pt. outline

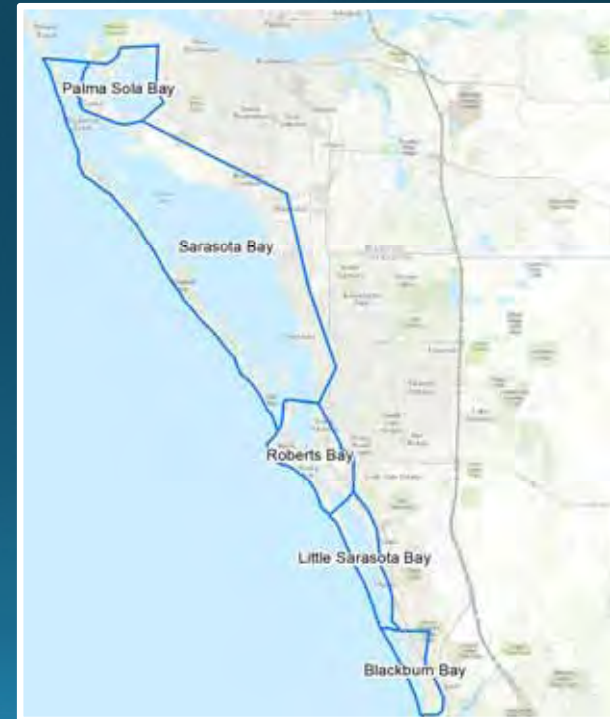
Different Reporting Units

Visually cannot see the differences but the boundaries do not line up exactly and the slight offset is creating an approximate 1 – 2 acre difference in the comparable segments.

District Seagrass Segments



SBEP Seagrass Segments

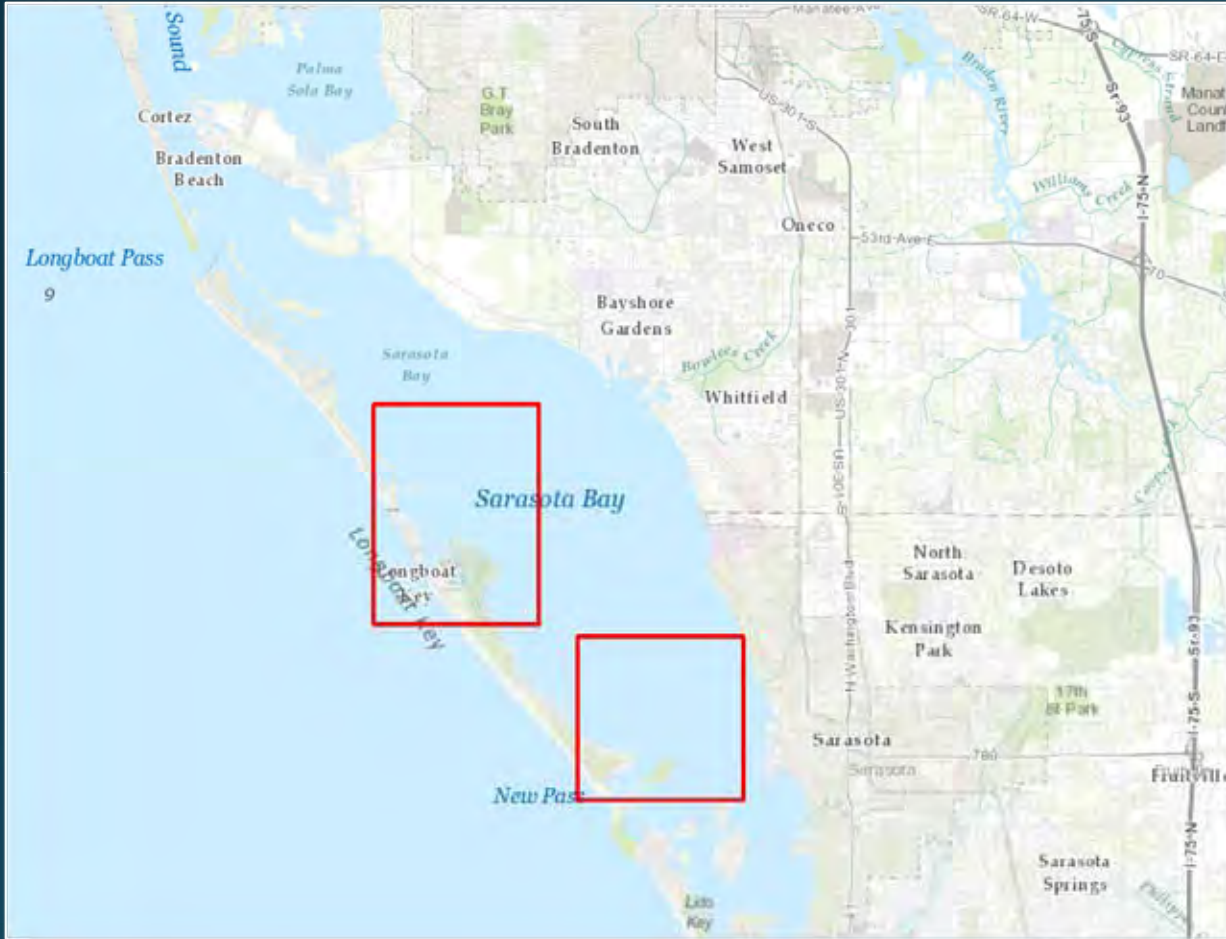


SBEP Seagrass Target Tracking

Annual seagrass coverage (acres) in the SBEP.

Bay Segment	1950	Restorable	1988	1994	1999	2001	2004	2006	2008	2010	2012	2014	2016
Palma Sola	1,087	1,031	1,111	1,089	1,025	1,046	1,002	1,028	1,164	1,177	1,185	1,238	1,258
Sarasota Bay	7,557	7,269	6,323	6,910	6,750	6,862	6,646	7,436	9,997	9,917	9,798	10,378	10,659
Roberts Bay	342	282	334	347	332	273	371	325	302	329	307	326	361
Little Sarasota	958	883	533	592	770	699	763	640	837	891	902	929	806
Blackburn	302	273	411	411	374	301	468	425	346	382	399	422	390
<i>Total</i>	10,246	9,739	8,712	9,349	9,251	9,181	9,250	9,854	12,646	12,696	12,591	13,293	13,473

Sarasota Bay: 2014 Highlights



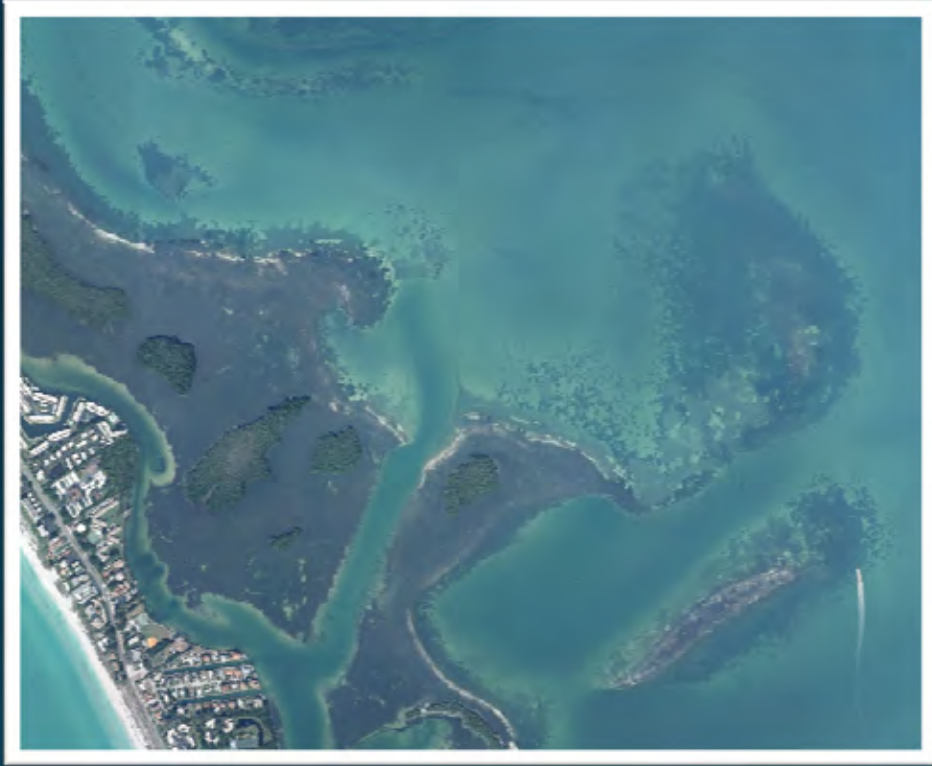
- **5.6%** increase from 2012 – 2014
- More than **600** of the **701 acre** increase occurred in Sarasota Bay:
 - **403 acres** in Sarasota Co.
 - **230 acres** in Manatee Co.

Sarasota Bay Gains & Losses

Upper Sarasota Bay South



Sarasota Bay Gains

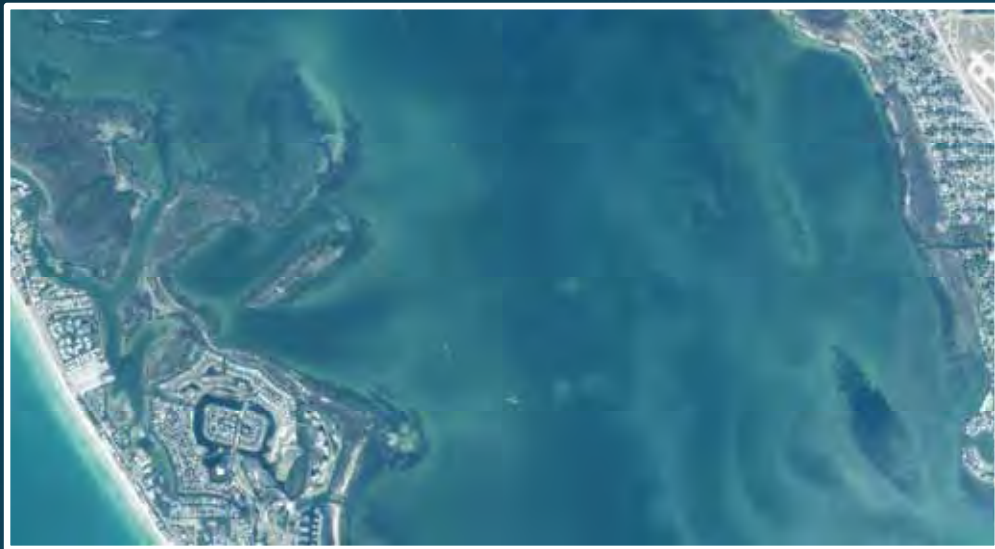


2012



2014

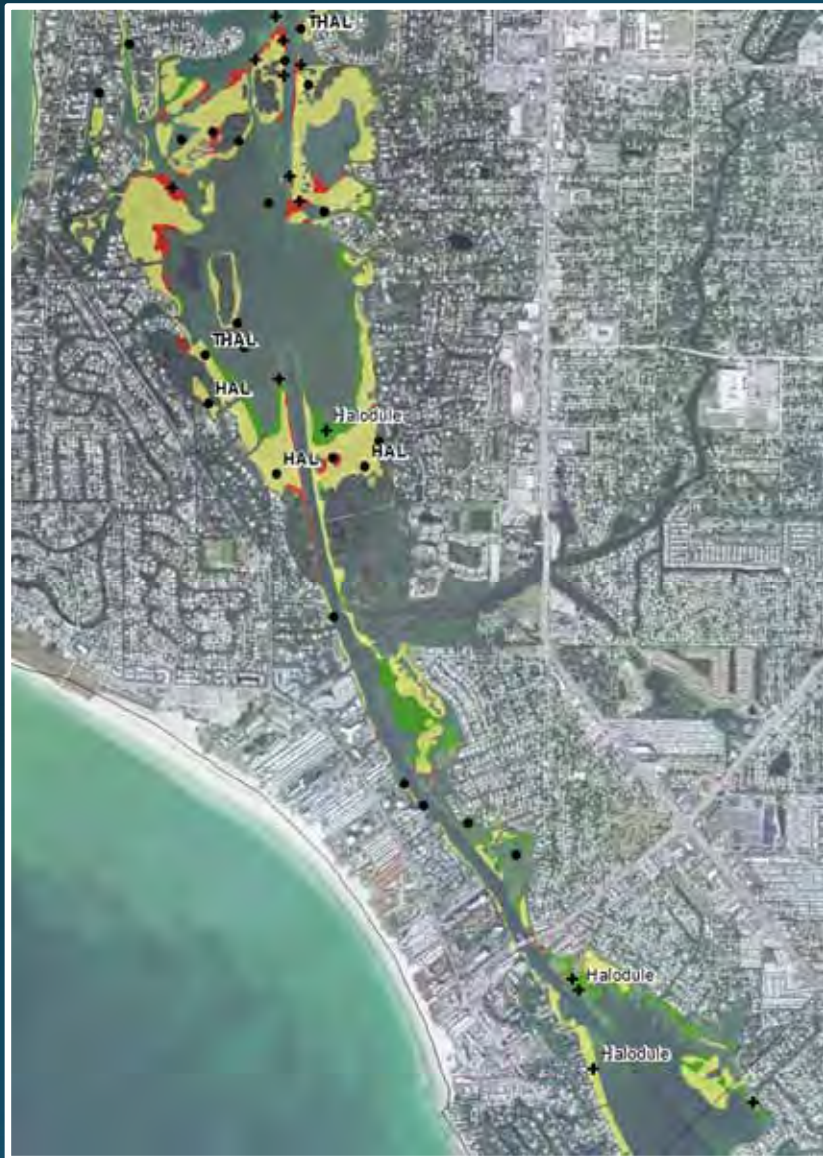
2014



2016



Sarasota Bay Gains & Losses



Roberts Bay

2014



2016



Sarasota Bay Gains & Losses

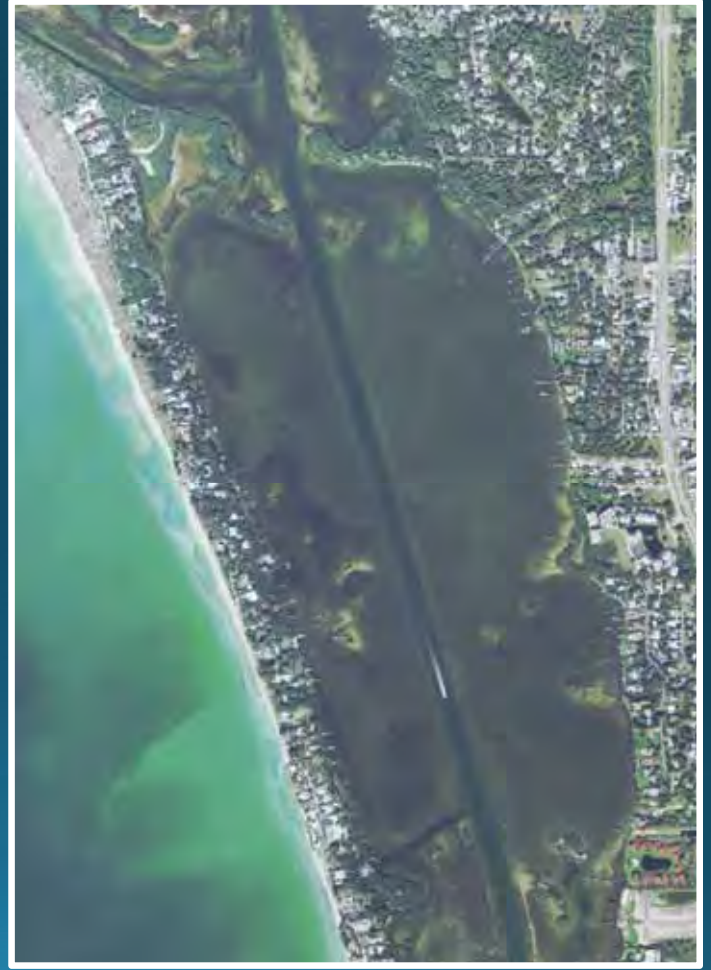
Little Sarasota Bay



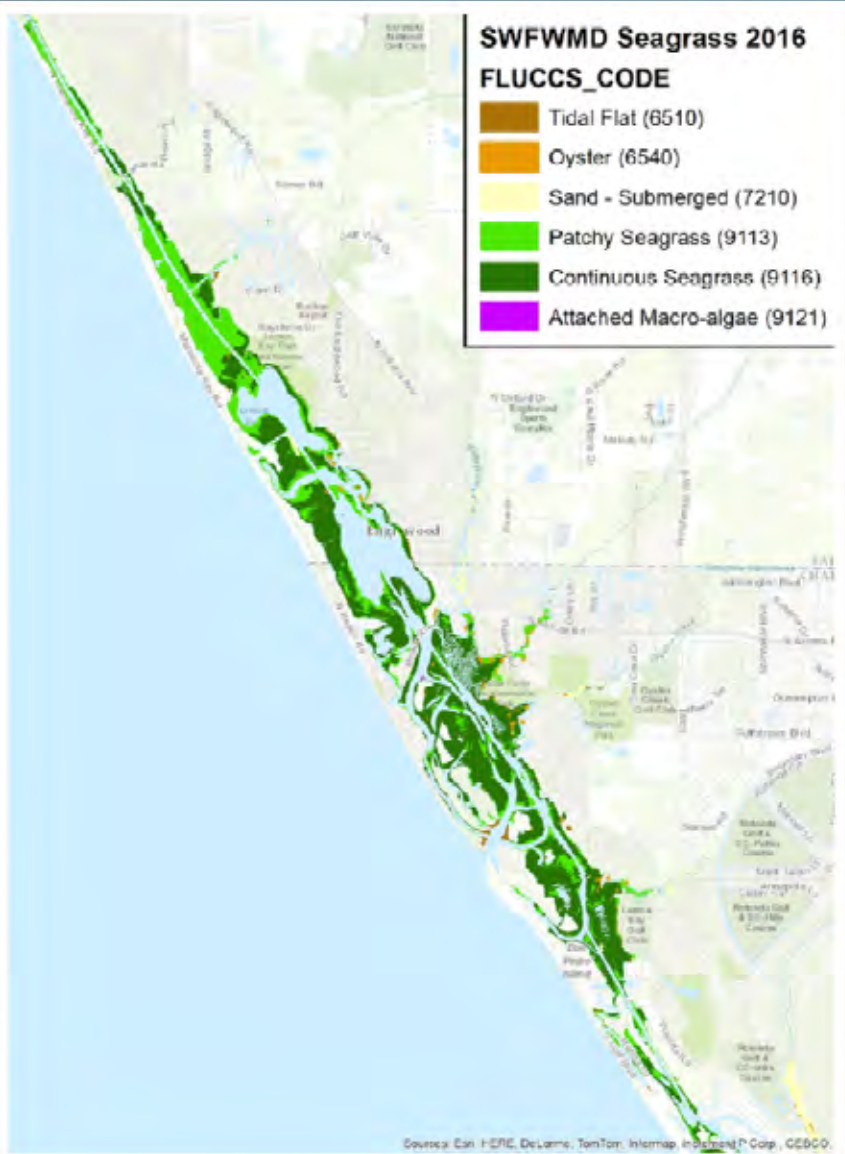
2010



2016



Lemon Bay



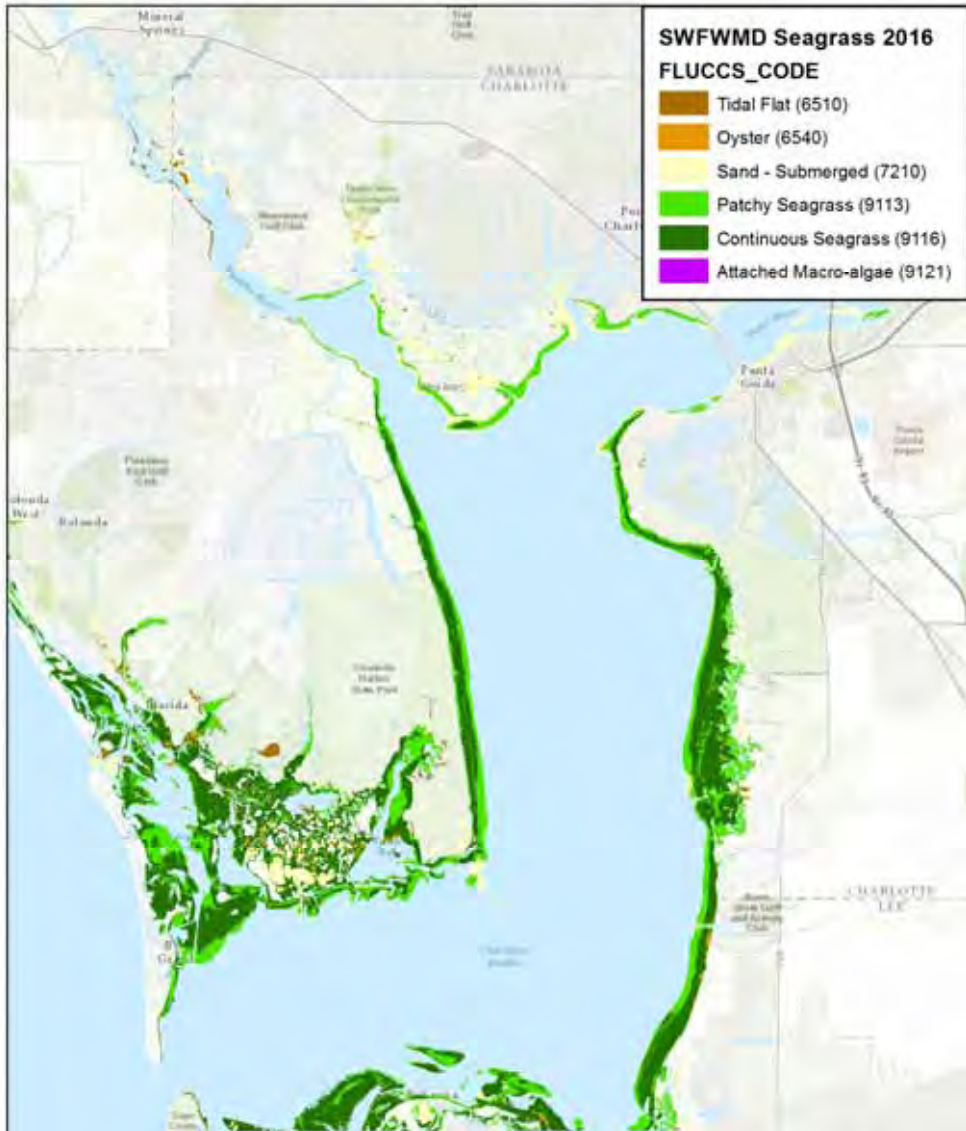
Lemon Bay	2012	2014	2016	Change in Acreage 2014 to 2016	% Change
Lemon Bay Total:	3,106	3,271.97	3,224.74	-47	-1.4%

**To visualize oysters at this scale, polygons were enhanced using a 1 pt. outline

Lemon Bay Gains & Losses



Charlotte Harbor

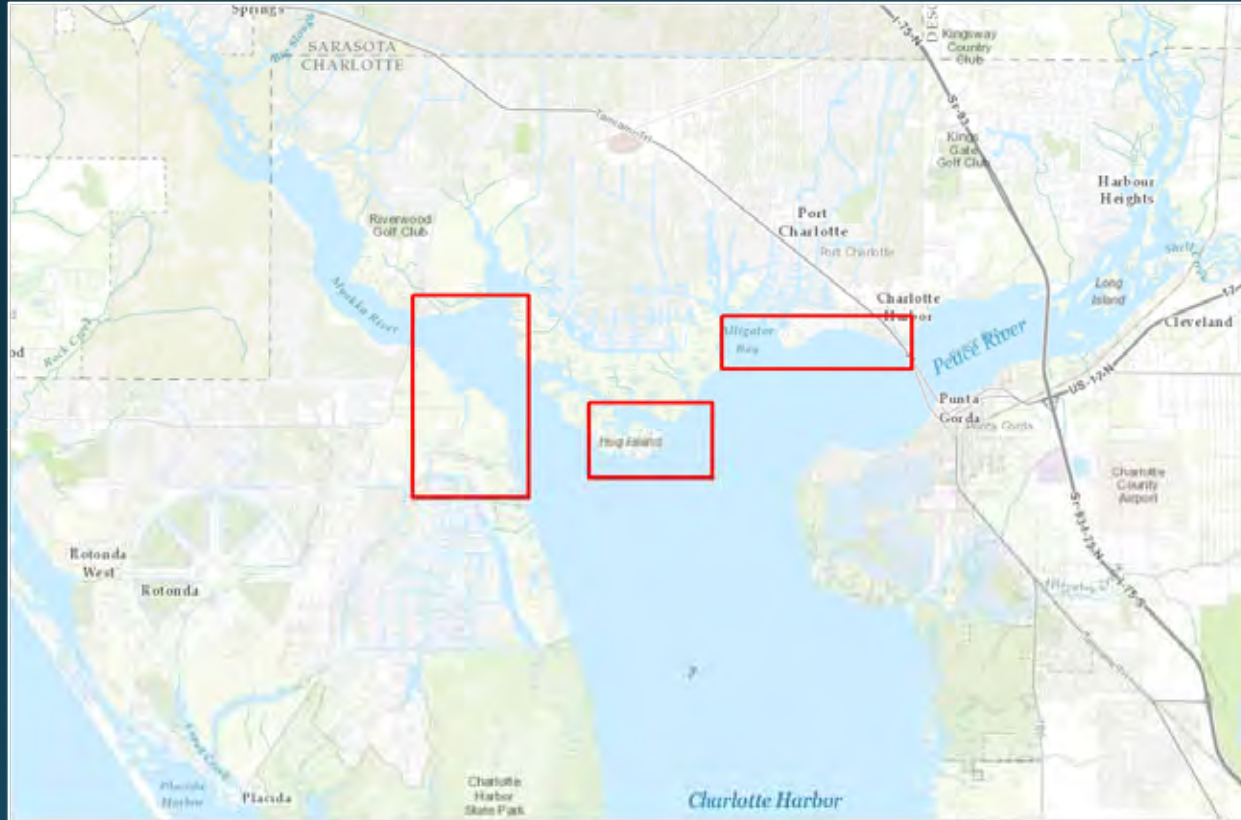


Charlotte Harbor Segments	2014	2016	Change in Acreage 2014 to 2016	% Change
Eastern Charlotte N	3,638.36	3,684.33	46	1.3%
Eastern Charlotte S	1,428.48	1,481.68	53	3.7%
Myakka River	369.53	402.98	33	9.1%
Peace River	637.15	677.85	41	6.4%
Placida Harbor	4,711.93	4,670.68	-41	-0.9%
Southern Charlotte	2,489.37	2,551.76	62	2.5%
Cape Haze (Turtle/Bull Bays)	4,532.76	4,775.93	243	5.4%
Western Charlotte	2,088.28	2,034.46	-54	-2.6%
Charlotte Harbor Total:	19,895.86	20,279.67	384	1.9%



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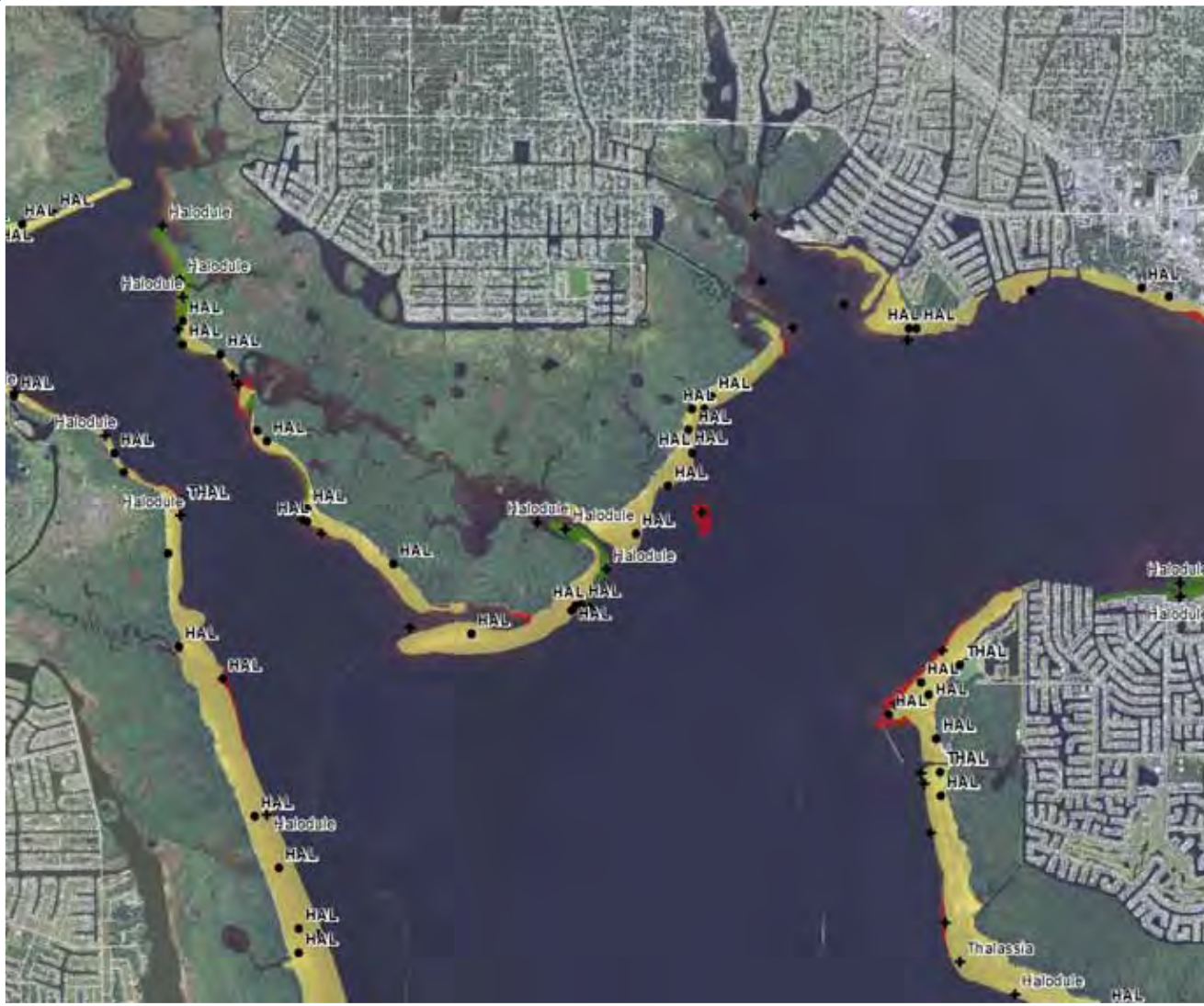
Charlotte Harbor: 2014 Highlights



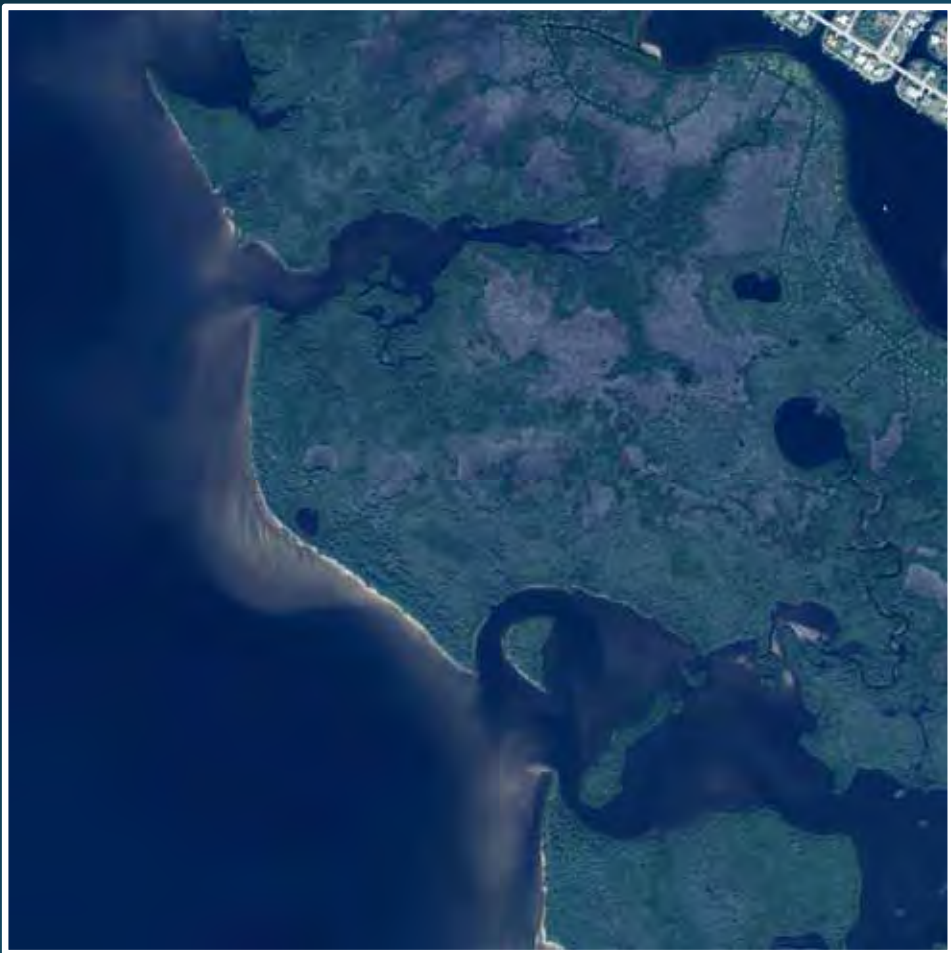
- **5.2%** increase from 2012 – 2014
- Each of the 8 segments **gained 50-250 acres** of grass. **Myakka & Peace River** had the largest percent increases **45 & 67%** respectively

Charlotte Harbor Gains & Losses

Peace & Myakka Rivers
& Coral Creek



2014



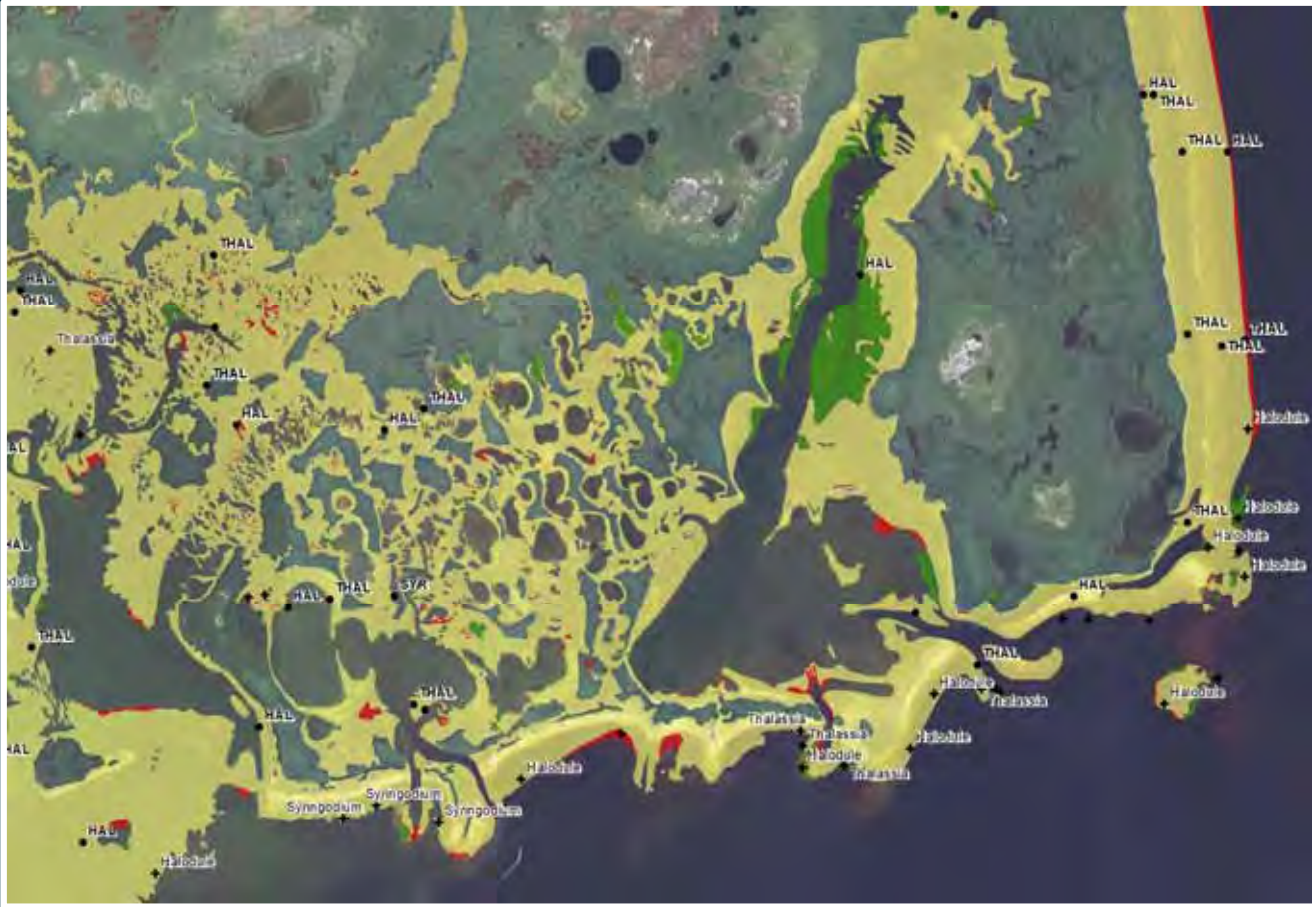
2016



Charlotte Harbor

Gains & Losses

Turtle Bay & Bull Bay



2014



2016

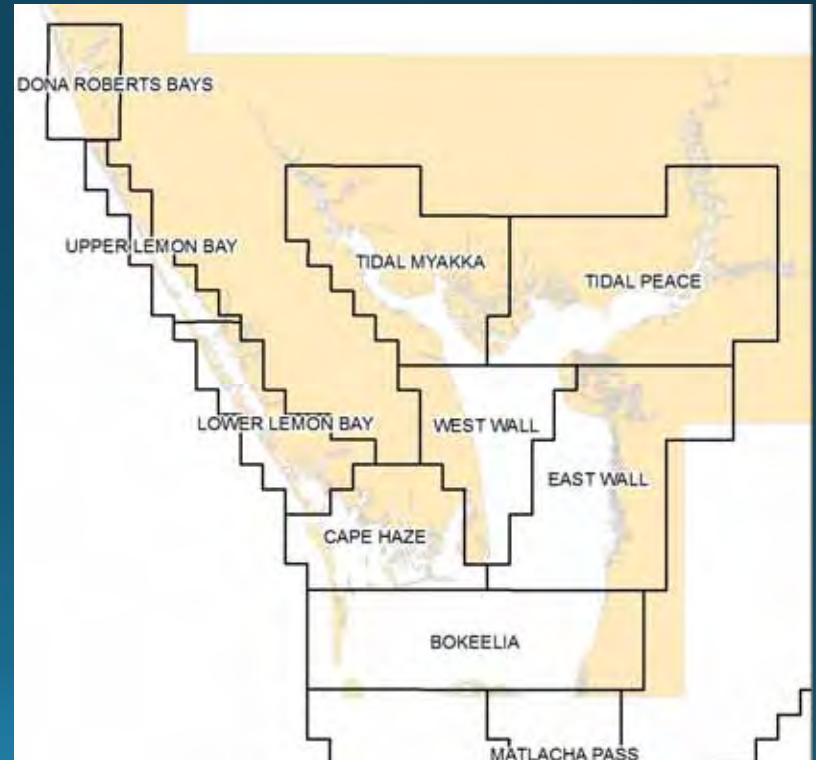


Reporting Unit Differences

District Bay Segments



CHNEP Seagrass Stratum



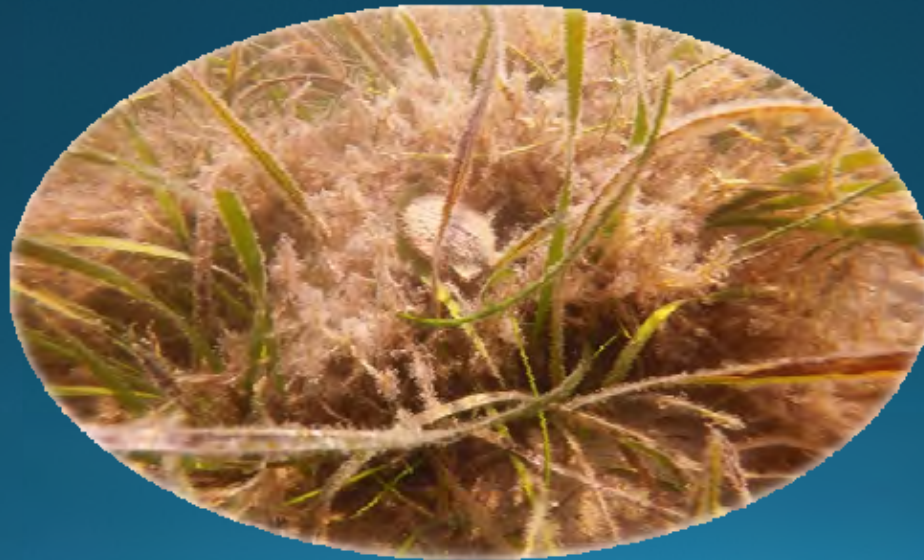
CHNEP Seagrass Target Tracking

Segment	Restoration Target	Total Seagrass Target Acres	2008 Acres	2012 Acres	2014 Acres	2016 Acres	% Target
Dona and Roberts Bay	21	112	187	181	203	197.53	176%
Upper Lemon Bay		1,009	1,148	1,276	1,357	1,342.59	133%
Lower Lemon Bay	380	2,882	2,607	2,785	2,893	2,829.57	98%
Tidal Myakka		456	311	287	419	452.23	99%
Tidal Peace	591	975	247	389	648	701.43	72%
West Wall	199	2,106	2,049	2,150	2,222	2,158.04	102%
East Wall	433	3,898	2,691	3,499	3,652	3,703.71	95%
Cape Haze		6,998	6,672	6,849	6,977	7,187.80	103%
Bookelia		3,342	3,689	3,941	4,086	4,168.85	125%
Pine Island Sound		26,837	27,084		29,114	496.84	108%
Matlacha Pass	1,733	9,315	7,704		8,272	352.25	89%
San Carlos Bay		4,372	6,482		7,167		164%
Tidal Caloosahatchee*	6	93	293		411		442%
Estero Bay	591	3,662	3,590		3,683		101%
Total	3,954	66,057	64,754	21,357	71,104	23,591	136%

* Note: Dona and Roberts Bay and Lemon Bay are the difference in the District and CHNEP totals

Fantastic work by:
Woolpert, Inc.

Richard Eastlake, Quantum Spatial
Capt. Brad Young, Scheda Ecological Inc.



Thank you to our volunteers!

Ed Sherwood, TBEP

Melissa Harrison, Pinellas Co.

Mark Flock, Pinellas Co.

Ashley Melton, Sarasota Co.

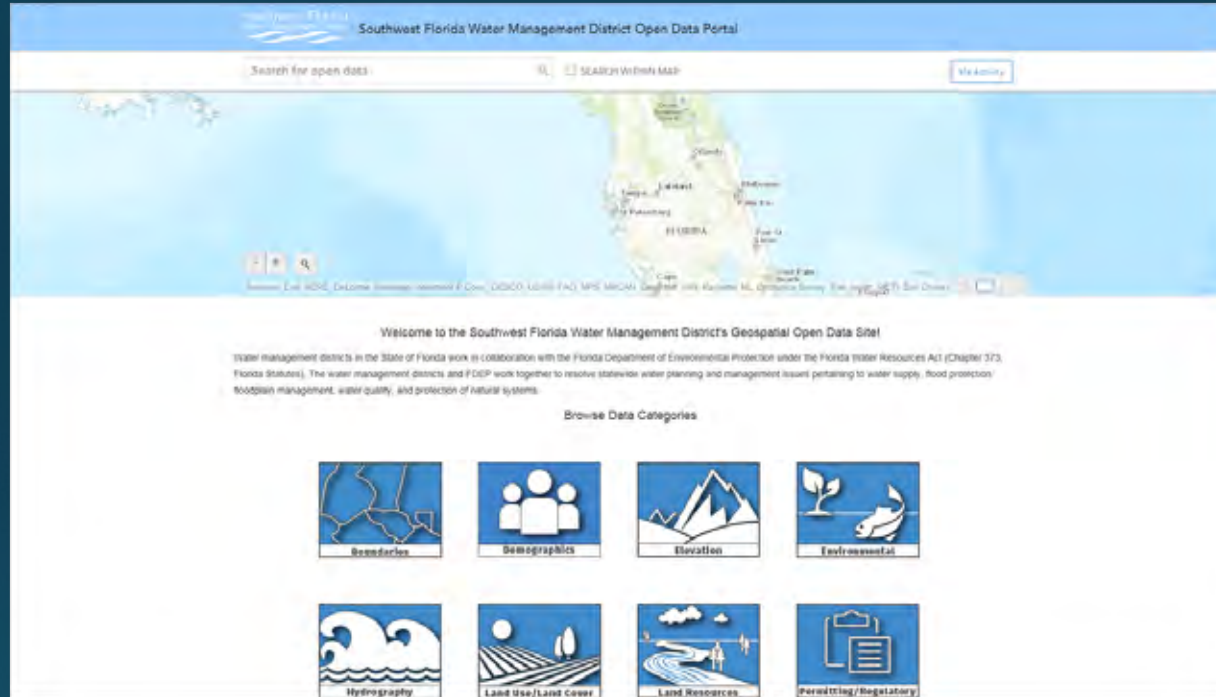
Judy Ott, CHNEP

Melynda Brown, CH Aquatic Preserve



Data Inquiries – GIS Layers

<http://data.swfwmd.opendata.arcgis.com/>



Imagery Requests: Brooksville MGIS Section

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