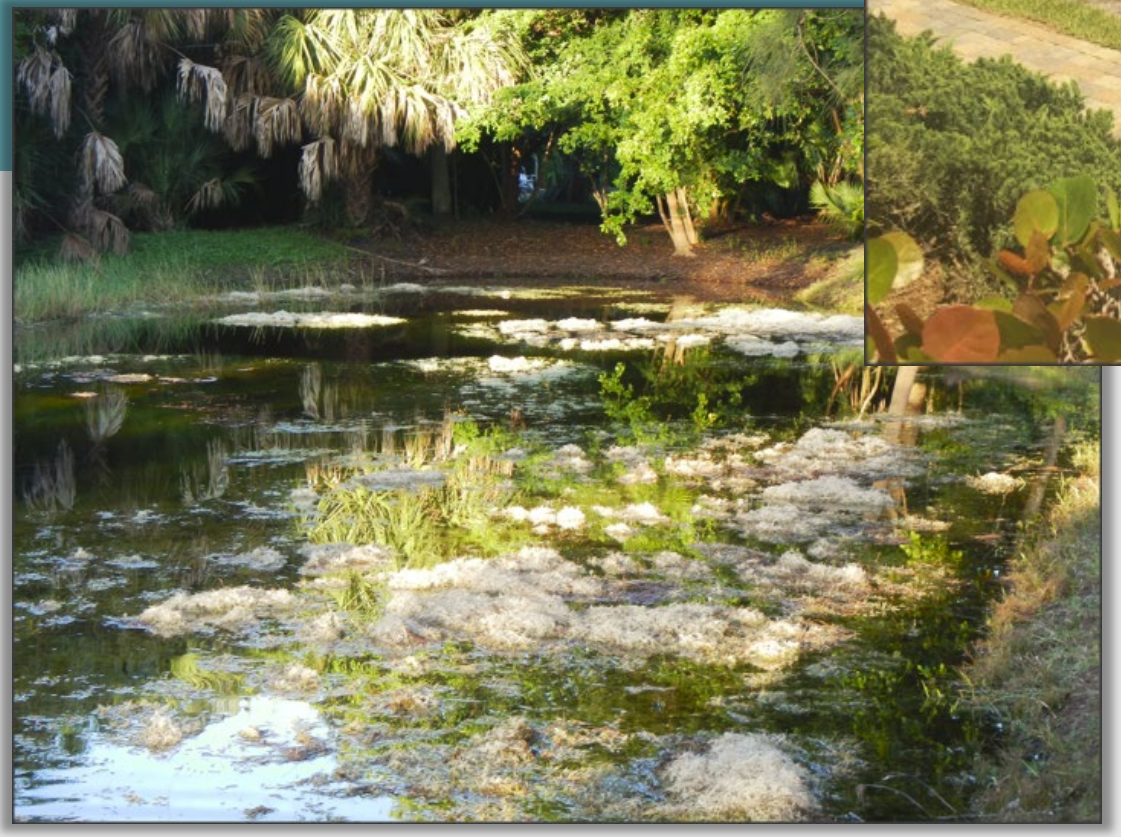
Community Lakes and Groundwater Monitoring 2024 Report



Mark Thompson,

SCCF Marine Laboratory

December 2024

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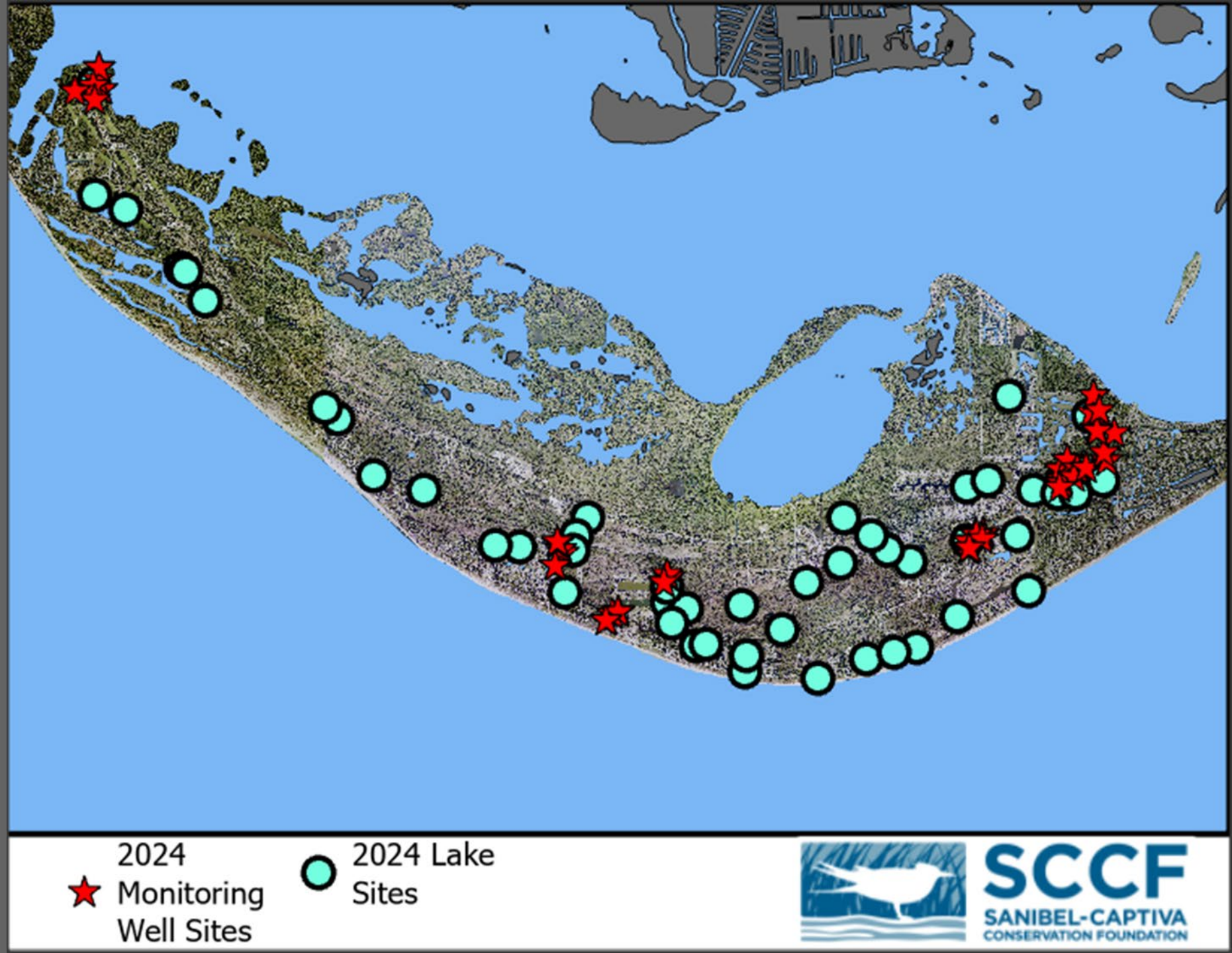
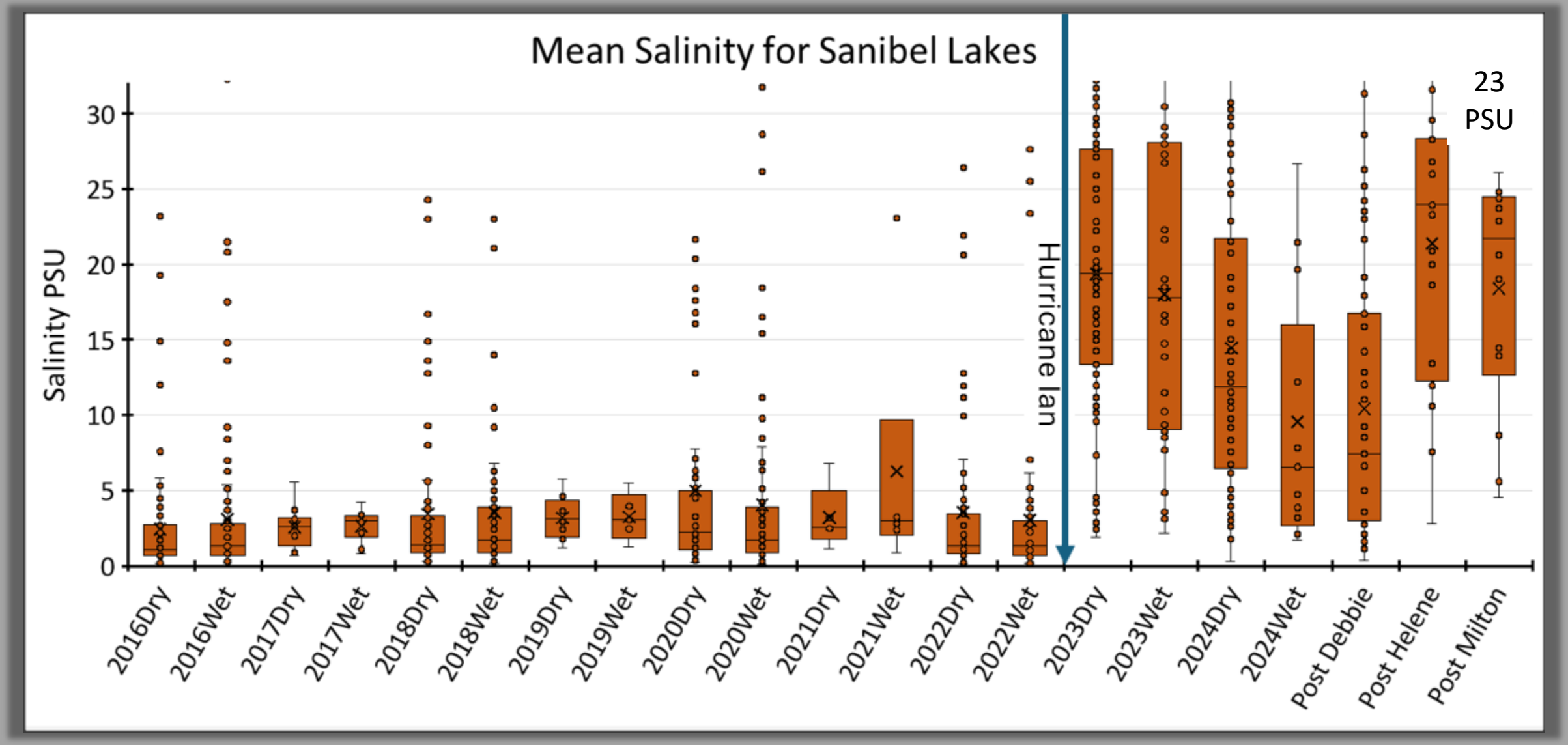
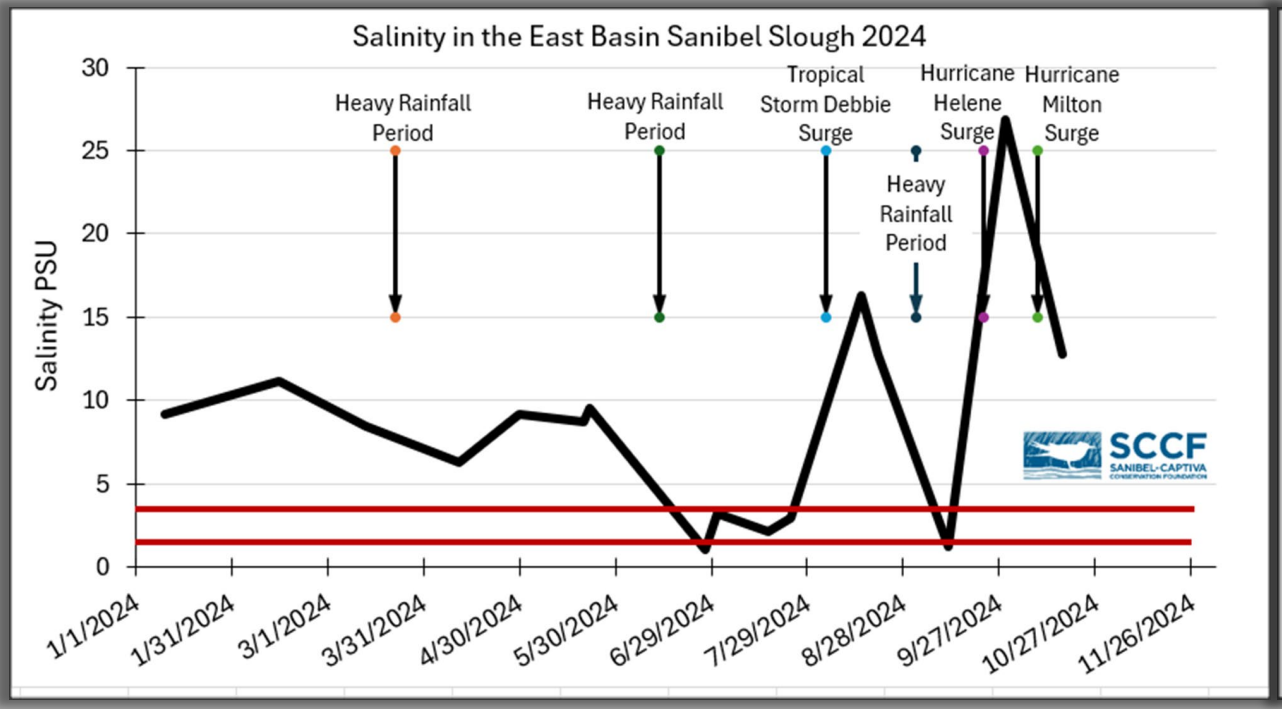
- 50 Lake Sites
- 26 Groundwater Monitoring Wells
- 6 lake groundwater study sites
- Jan – Oct 2025

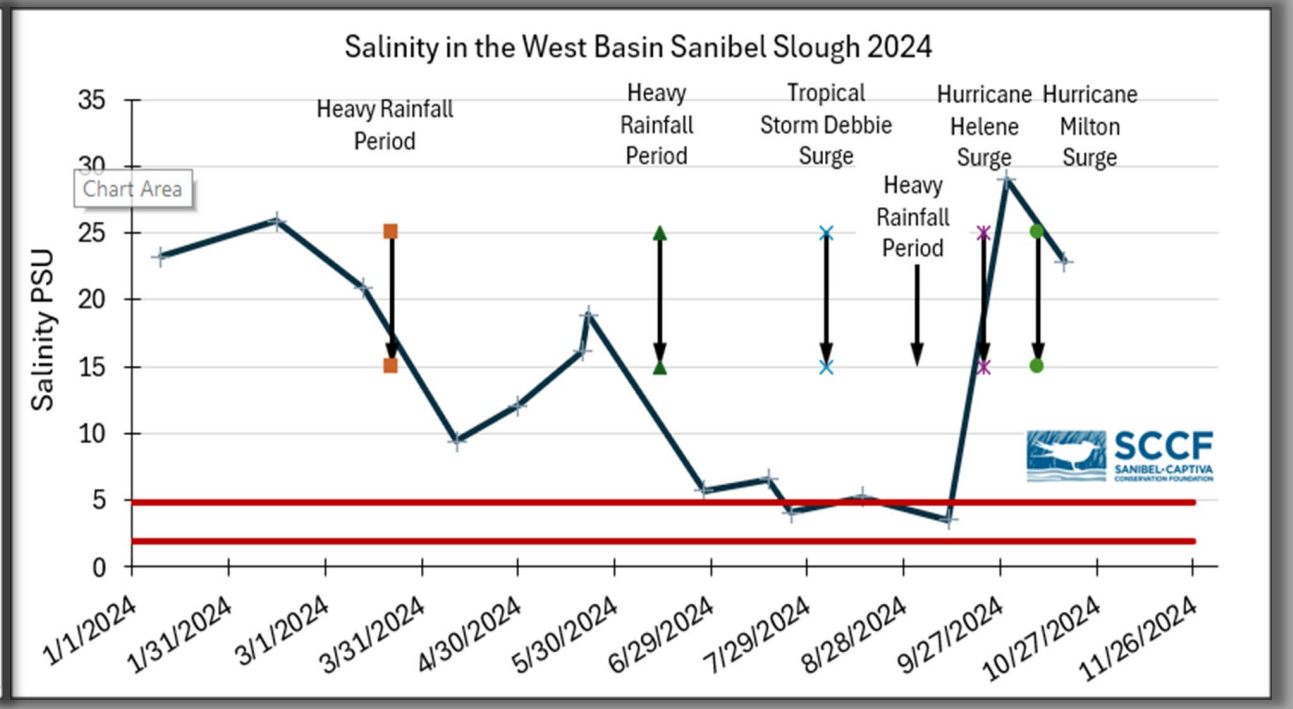


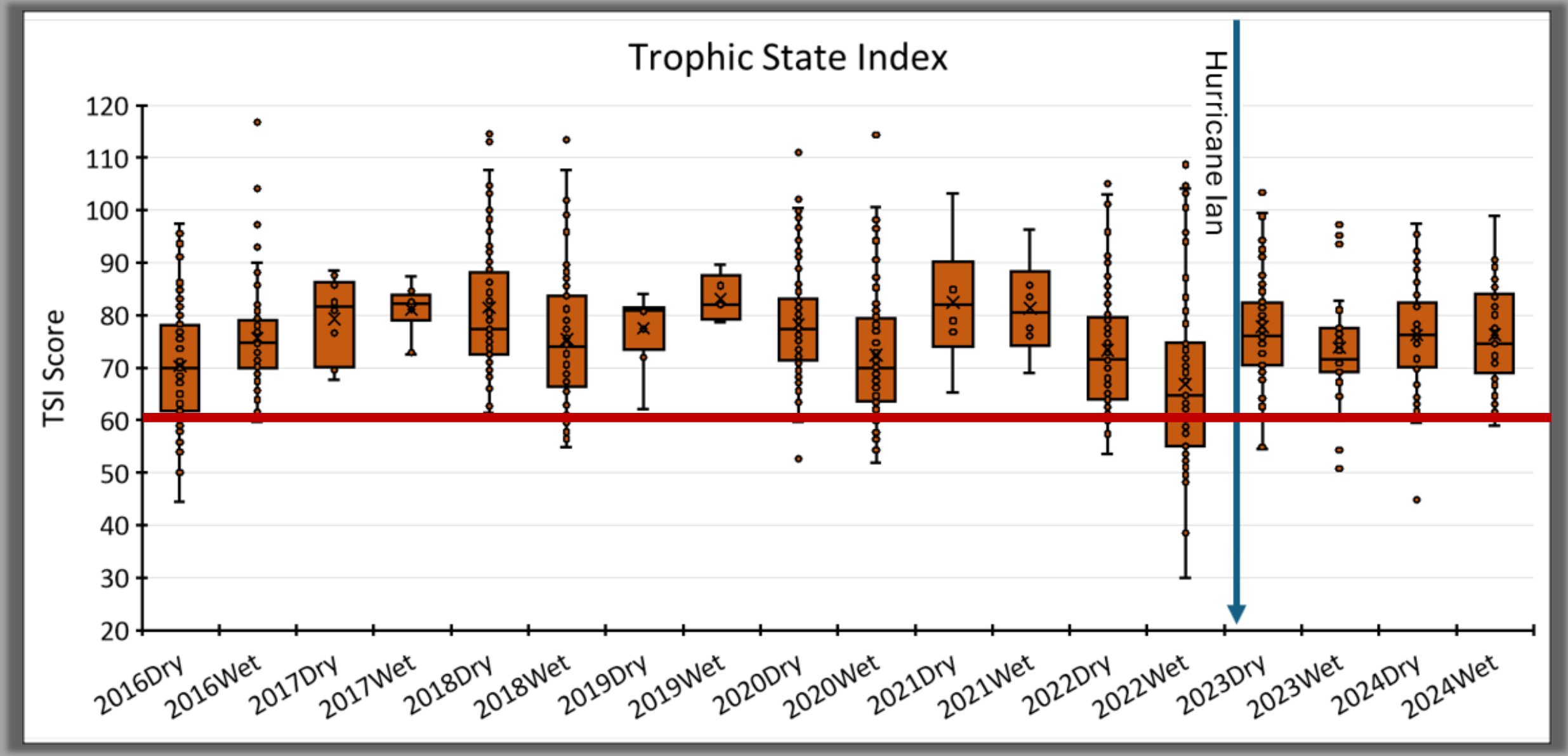
Average Salinity In Lakes on Sanibel through 2024



Sanibel Slough Salinity Time Series





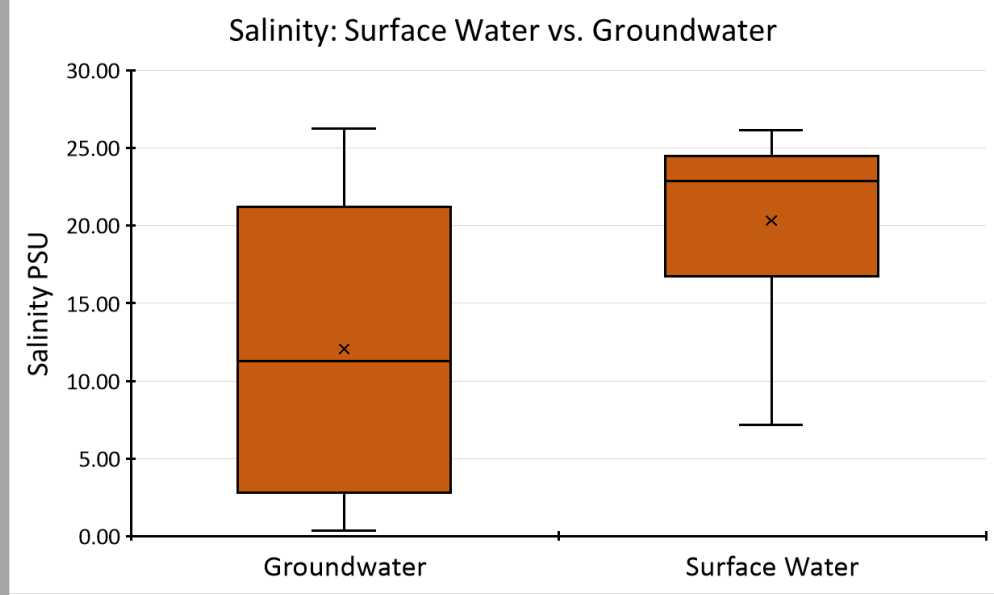

Trophic State Index
TSI Score
120
110
100
90
80
70
60
50
40
30
20
Hurricane Ian
2016Dry
2016Wet
2017Dry
2017Wet
2018Dry
2018Wet
2019Dry
2019Wet
2020Dry
2020Wet
2021Dry
2021Wet
2022Dry
2022Wet
2023Dry
2023Wet
2024Dry
2024Wet

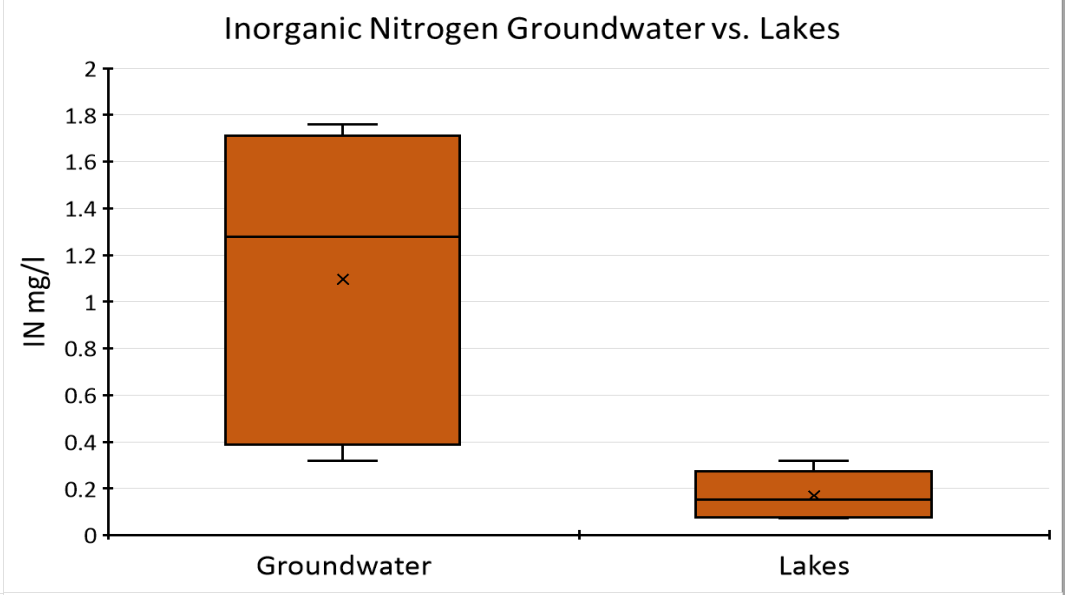
Prority Rank	Station	Description	2024 WQ Grade	WQ Trend
1	SCL74	Herons Landing Lake	F	Better
2	SCL13	SanGolfReclmPnd	F	No Change
3	SCL60	WhiteIbisGulfPines	F	Worse
4	SCL80	East Hollys Pond	F	No Change
5	SCL07	DunesLa		
6	SCL57	GulfPines Near T		
7	SCL26	CasaY		
8	SanSlou	West Basin Sanibel Sl		
9	SCL19	GulfsidePark_1 O		
10	SCL05	CityReclaim		
11	SCL69	Sanctuary		
12	SCL41	HurricaneLan		
13	SCL08	DunesLa		
14	SCL45	NPoincianaPond Poinc		
15	SCL71	Sanctuary		
16	Devitt01	Pond at SCCF Homestead	F	Worse
17	SCL15	PanamaCanal	D	No Change
18	SCL32	AniPondBailyTract	F	No Change
19	SanSlou	East Basin Sanibel Slough monthly data	D	No Change
20	SCL35	SeagullEstates - Daniel Lane _ western small lake	D	No Change
21	SCL62	ChateauSurMerLake	D	Worse
22	SCL43	PalmLake	D	No Change
23	SCL82	Pond Behind Jacaranda	D	No Change
24	SCL27	CityHall	D	No Change

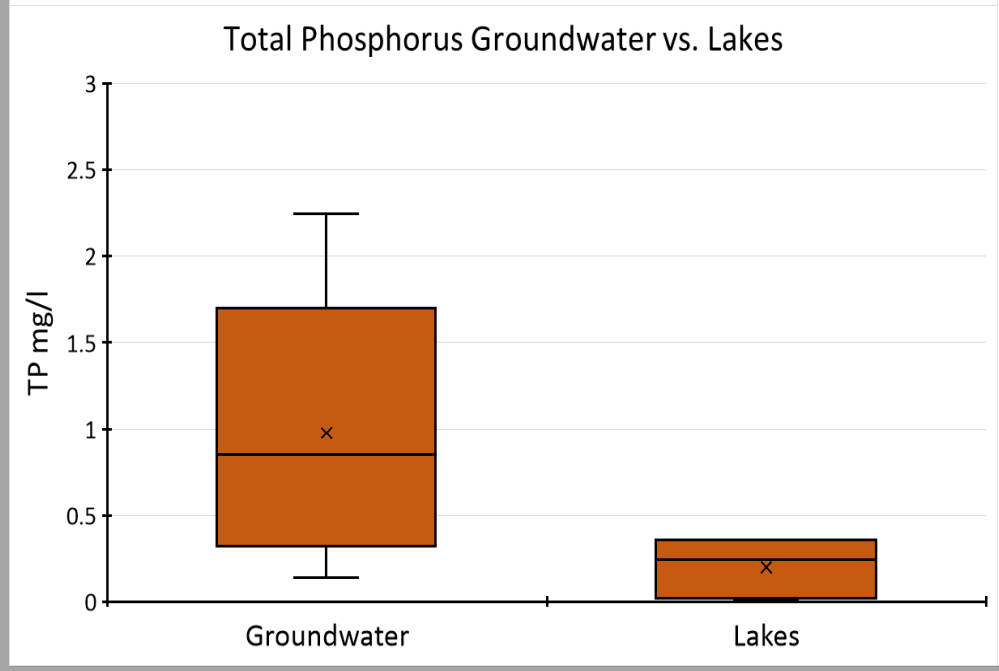
Prority Rank	Station	Description	2024 WQ Grade	WQ Trend
25	SCL02	BeachRdVillasPnd	D	Worse
26	SCL70	BluCrabLake	D	No Change
27	SCL48	SLakeMurex	D	Worse
28	SCL56	WRockEastEndCoquina	D	Worse
29	SCL21	OceansReachCondo	D	No Change
			D	No Change
			D	No Change
			C	No Change
			D	No Change
		ComHouse	D	Worse
			D	No Change
			C	No Change
		Roseate	C	No Change
			C	No Change
			C	No Change
			D	Worse
41	SCL55	ERockWestEndCoquina	C	No Change
42	SCL11	GumboLimboEast	C	Better
43	SCL31	BaileysPond	D	No Change
44	SCL36	SandPointe	D	Better
45	JM02	Jordan Marsh Effluent	C	No Change
46	SCL52	SBikePathLake	C	No Change
47	SCL64	TradewindsNLake	C	Better
48	SCL47	NlakeMurex	C	Better
49	SCL25	PeriwinklePinesSW	C	No Change
50	SCL16	SundialEast	B	Better

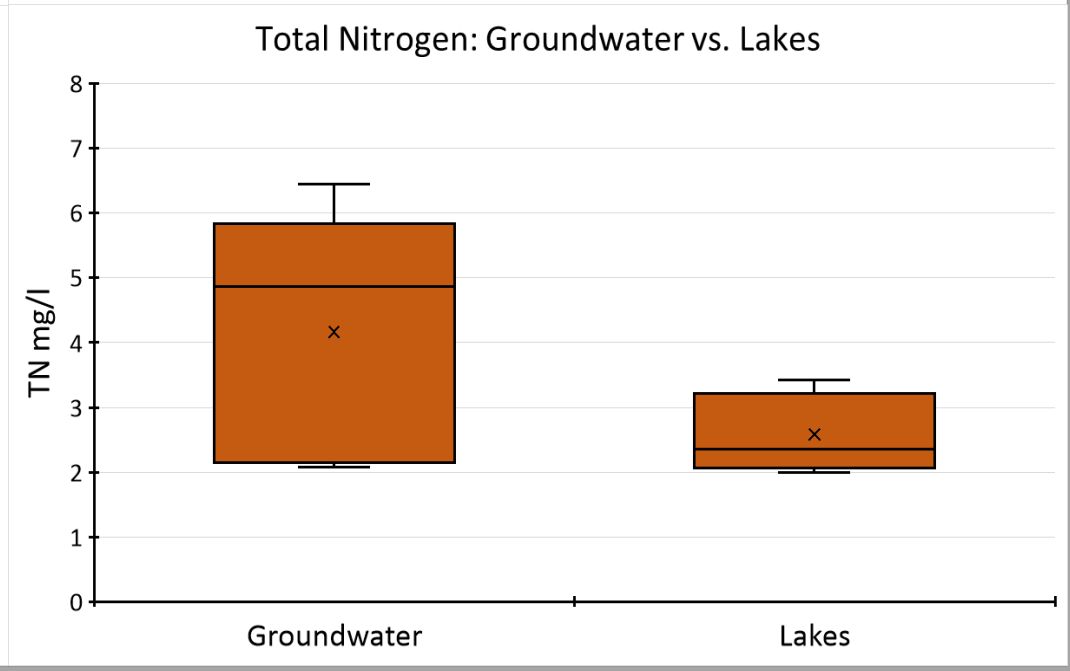
- **1/50 (2%) B Grade**
- **12/50 (24%) C**
- **37/50 (74%) D or F**
- **6/50 (13%) Trending Better**

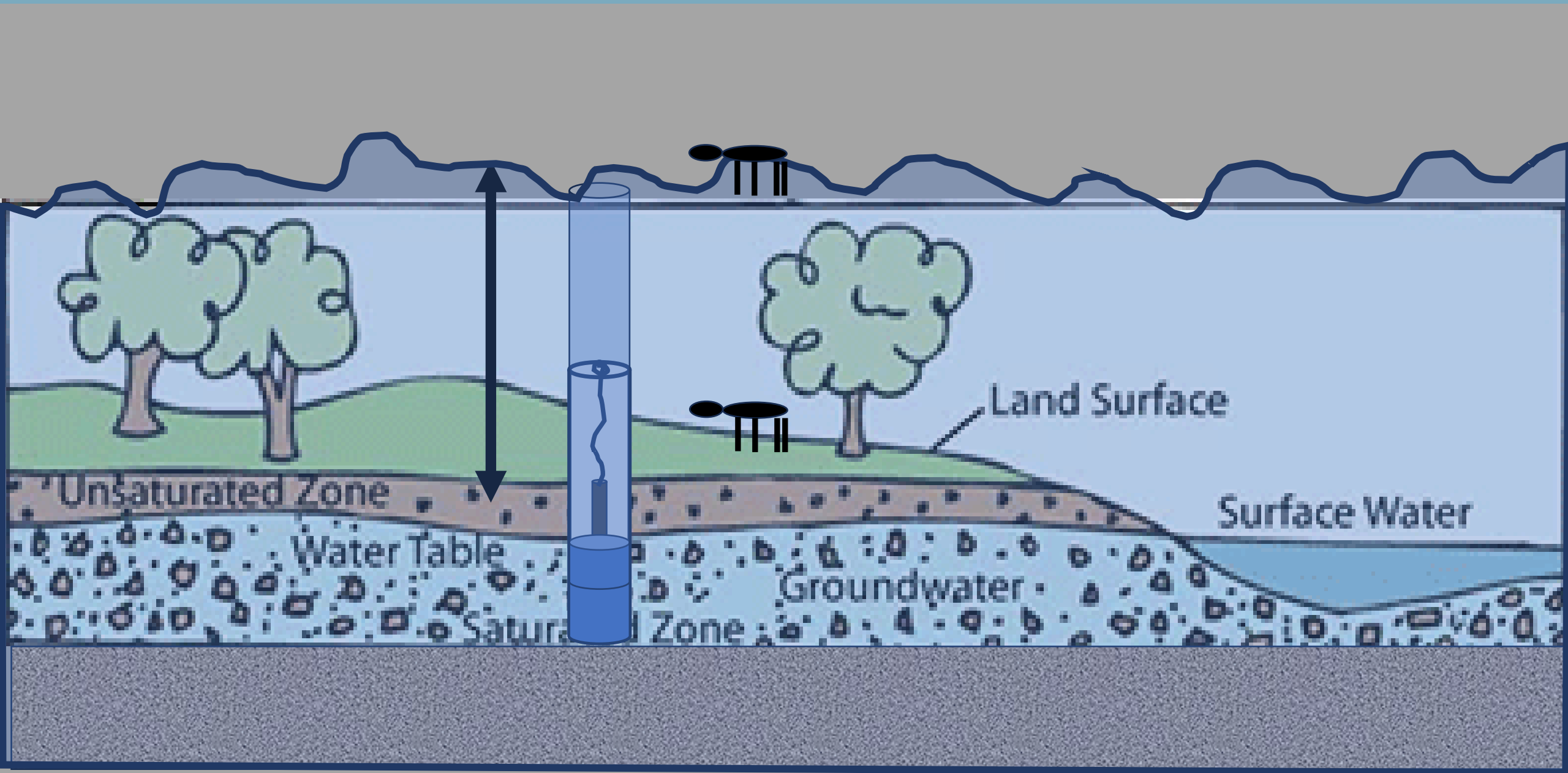
Lakes Vs. Groundwater



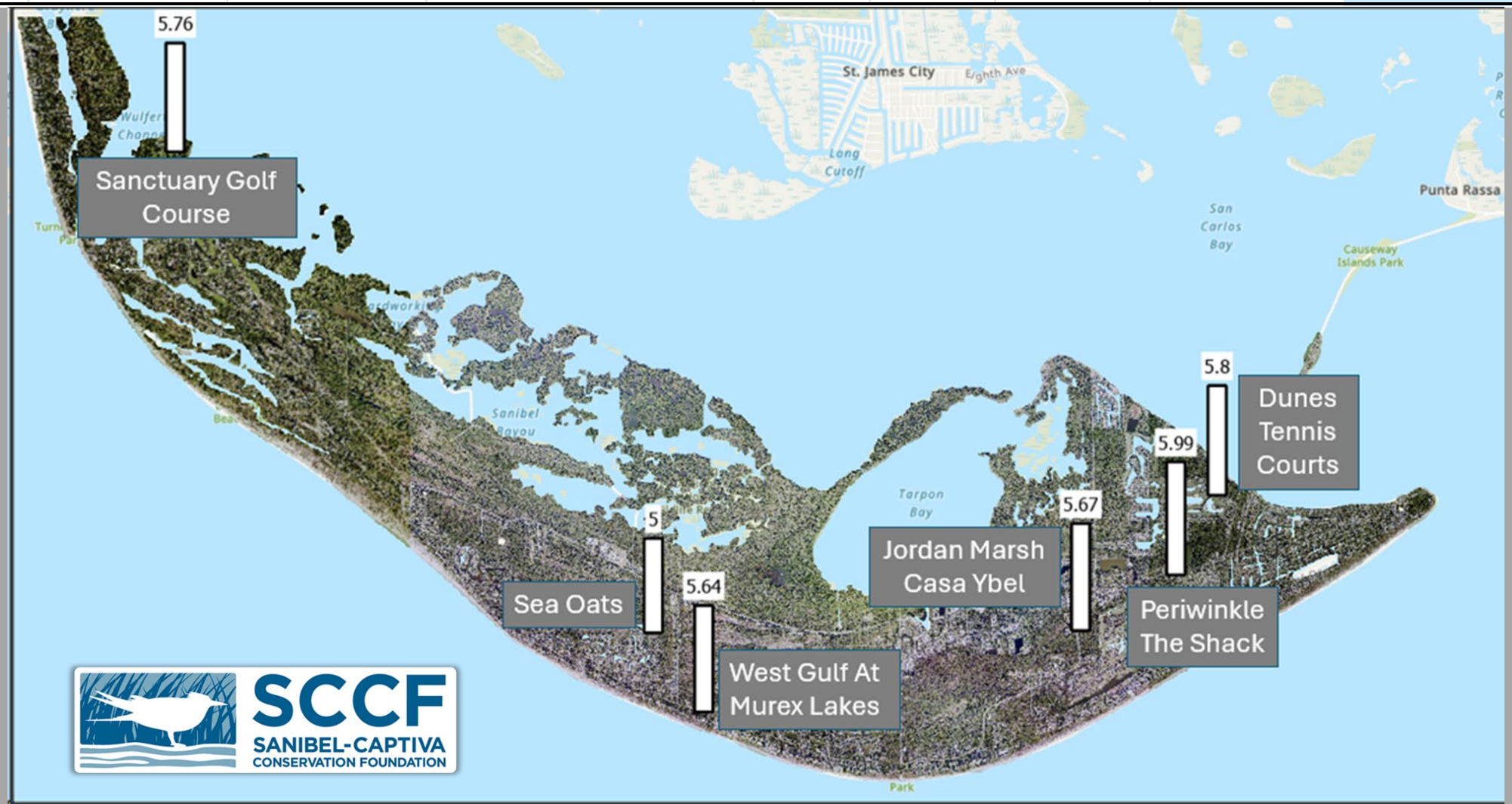






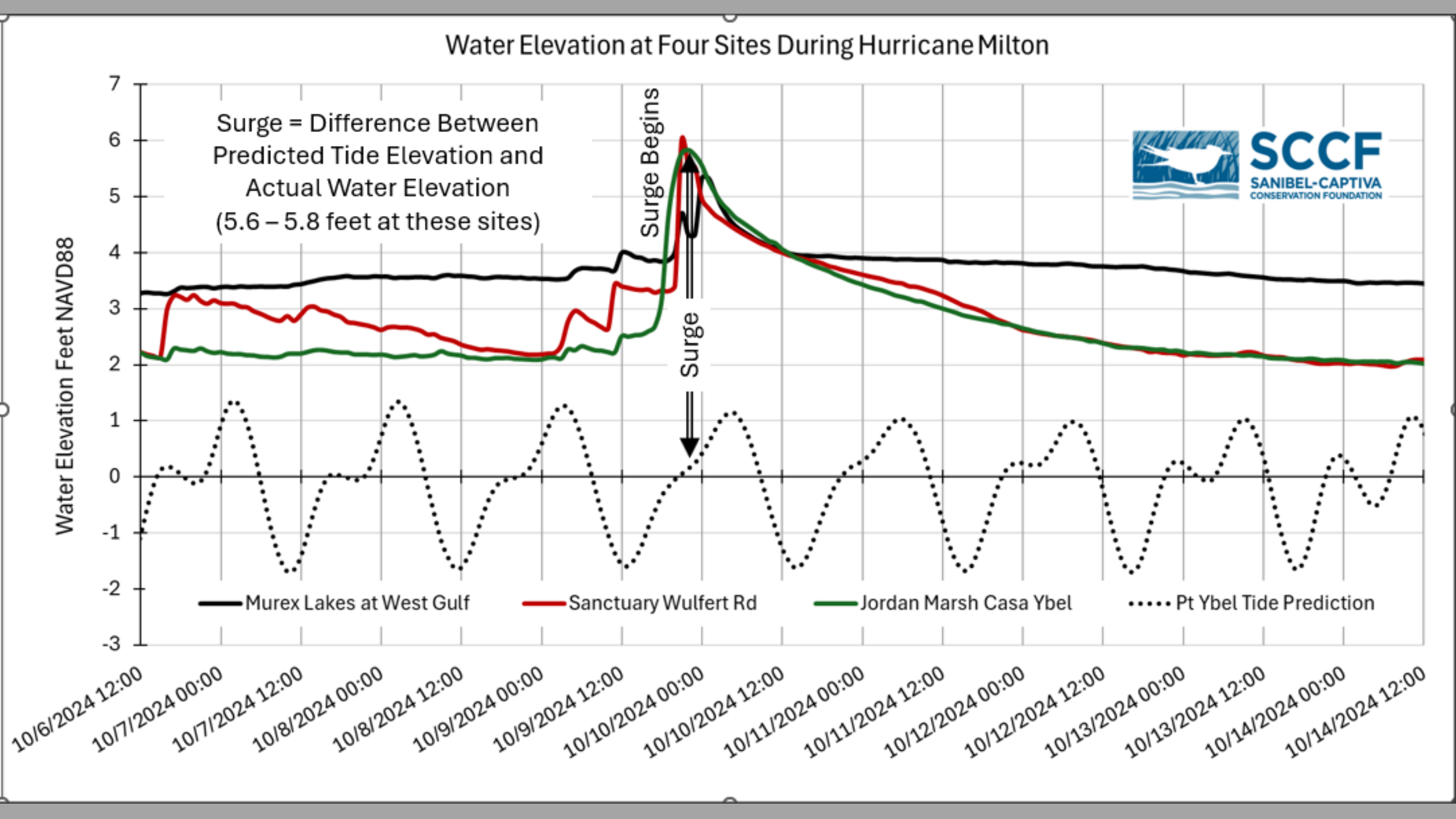

Land Surface
Unsaturated Zone
Surface Water
Water Table
Groundwater
Zone

Site	Date	Time	Milton Max Water Elevation (m) NAVD88	Milton Max Water Elevation (m) MLLW	Description	Lat	Long	Predicted Tide m MLLW	Estimated Depth Above Predicted Tide at Location m	Estimated Depth above Predicted Tide at Location ft	Water Depth above Ground Level ft
GW26	10/9/2024	23:00	1.61	2.193	Sea Oats	26.438274	-82.110956	0.67	1.52	5.00	2.5
GW10	10/9/2024	22:00	1.76	2.368	Jordan Marsh	26.438558	-82.057874	0.64	1.73	5.67	3.82
GW20	10/9/2024	21:00	1.813	2.377	Dunes Tennis Courts	26.453699	-82.040941	0.61	1.77	5.80	2.12
GW09	10/9/2024	21:00	1.742	2.328	West Gulf Road Murex Lakes	26.429453	-82.104676	0.61	1.72	5.64	-0.39
GW23	10/9/2024	21:00	1.8333	2.365	Sanctuary GC Path at Wulfertt Rd.	26.491958	-82.170398	0.61	1.76	5.76	4.01
GW17	10/9/2024	21:00	1.837	2.437	Periwinkle Drive At "The Shack"	26.444776	-82.046063	0.61	1.827	5.99	1.4



Volume Estimate	Water Surface Area Acres	SqFt	Depth ft	Volume ft3	Surge Volume MG
East Basin	64.4	2,805,242	4	11,220,968	84.2
West Basin	66.9	2,914,141	4	11,656,564	87.4

Event	Basin	Basin Area Acres	Basin Area Sq Ft	Water Level Average Feet Above Ground	Water Volume Ft3	WaterVolume MG	Capacity of Empty Sanibel Slough MG	Dry Slough Volume Compared to Surge Volume %	Time to Inundate To Max Surge (hrs)	Average Rate of Inudation (cfs)	Max Dioscharge Rate at Weirs (cfs)	At Max Discharge Time to Drain (hours)
Milton	East Basin	1,255	54,667,380	2.24	122,454,931	918.4	84.2	9.163	5	6,803	500	68
Helene	East Basin	1,255	54,667,380	1.63	89,107,829	668.3	84.2	12.593	3	8,251	500	50
Milton	West Basin	1,978	86,161,010	2.24	193,000,662	1447.5	87.4	6.040	5	10,722	666	80
Helene	West Basin	1,978	86,161,010	1.63	140,442,446	1053.3	87.4	8.3	3	13,004	666	59
June 2024 Rain Events	East Basin	1,255	54,667,380	0.58	31,707,080	238	84.2	35.4	168	52	500	18
June 2024 Rain Events	West Basin	1,978	86,161,010	0.58	49,973,386	375	87.4	23.3	168	83	666	21


Water Elevation at Four Sites During Hurricane Milton
Surge = Difference Between Predicted Tide Elevation and Actual Water Elevation (5.6 – 5.8 feet at these sites)
Surge Begins
Surge
SCCF
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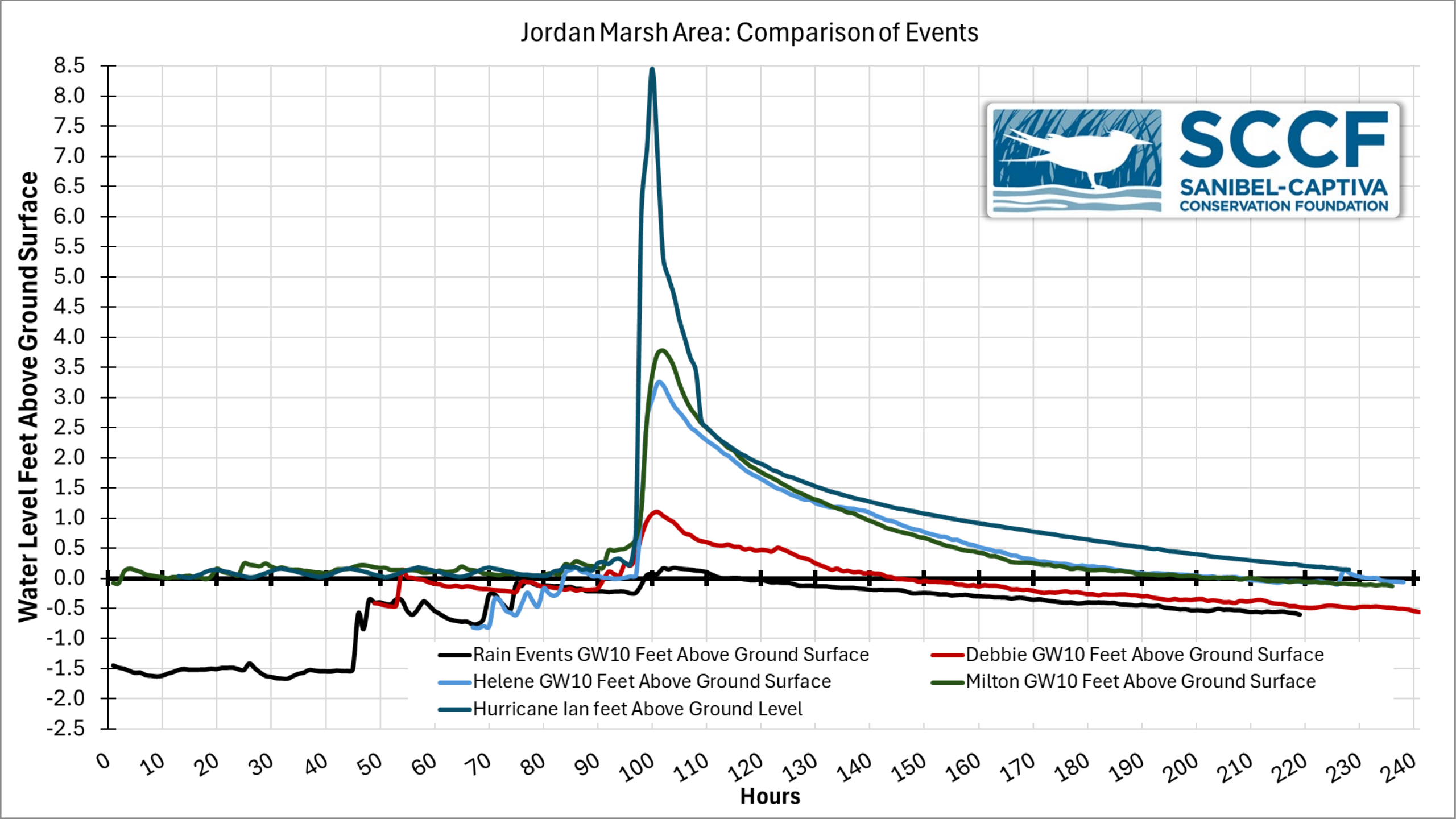
Water Elevation Feet NAVD88
7
6
5
4
3
2
1
0
-1
-2
-3
Murex Lakes at West Gulf
Sanctuary Wulfert Rd
Jordan Marsh Casa Ybel
Pt Ybel Tide Prediction
10/6/2024 12:00
10/7/2024 00:00
10/7/2024 12:00
10/8/2024 00:00
10/8/2024 12:00
10/9/2024 00:00
10/9/2024 12:00
10/10/2024 00:00
10/10/2024 12:00
10/11/2024 00:00
10/11/2024 12:00
10/12/2024 00:00
10/12/2024 12:00
10/13/2024 00:00
10/13/2024 12:00
10/14/2024 00:00
10/14/2024 12:00


Jordan Marsh Area: Comparison of Events
Water Level Feet Above Ground Surface
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
Hours
Rain Events GW10 Feet Above Ground Surface
Debbie GW10 Feet Above Ground Surface
Helene GW10 Feet Above Ground Surface
Milton GW10 Feet Above Ground Surface
Hurricane Ian feet Above Ground Level
SCCF
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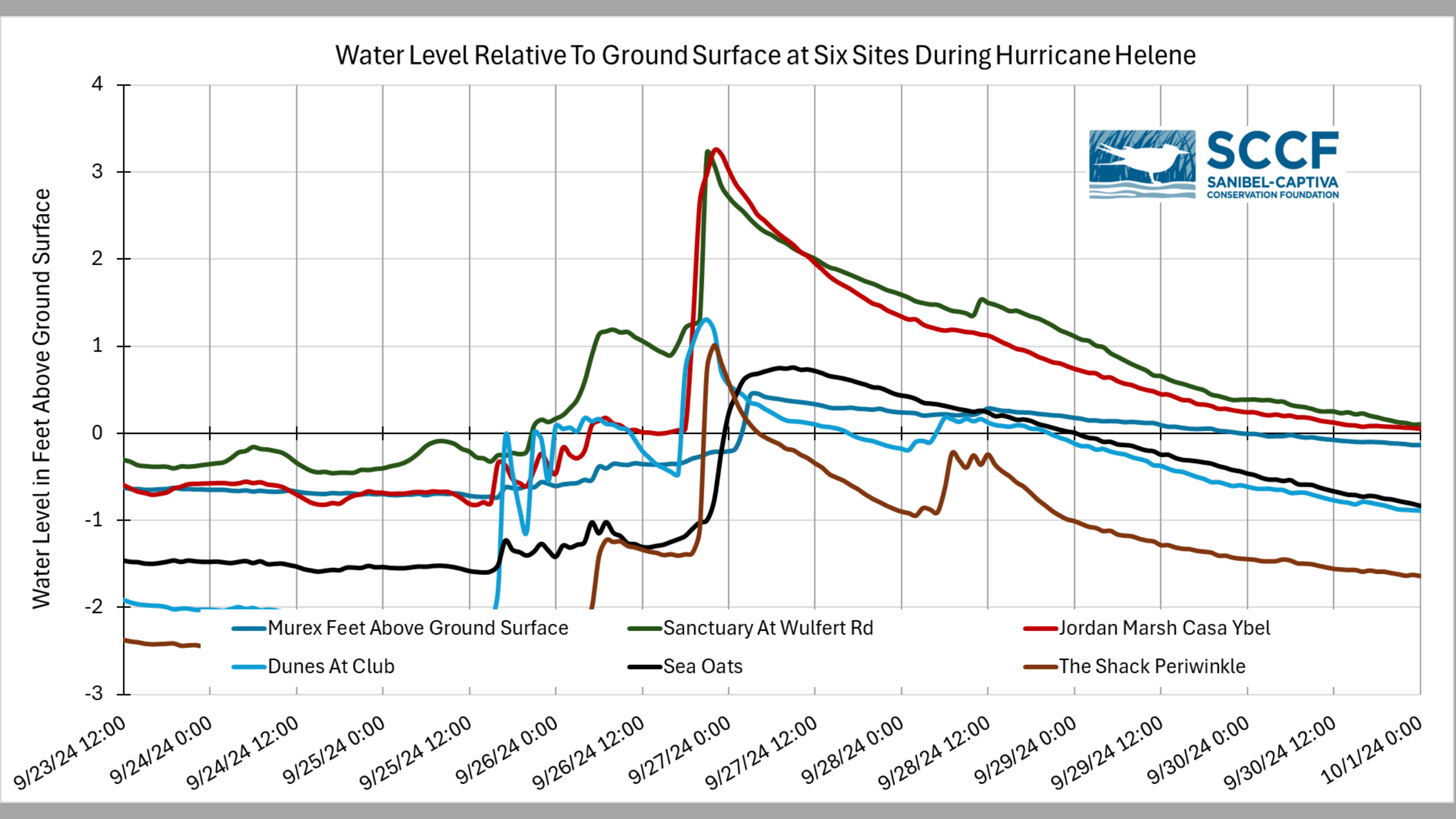
CONSERVATION FOUNDATION


Water Level Relative To Ground Surface at Six Sites During Hurricane Helene
Water Level in Feet Above Ground Surface
4
3
2
1
0
-1
-2
-3
9/23/24 12:00
9/24/24 0:00
9/24/24 12:00
9/25/24 0:00
9/25/24 12:00
9/26/24 0:00
9/26/24 12:00
9/27/24 0:00
9/27/24 12:00
9/28/24 0:00
9/28/24 12:00
9/29/24 0:00
9/29/24 12:00
9/30/24 0:00
9/30/24 12:00
10/1/24 0:00
Murex Feet Above Ground Surface
Sanctuary At Wulfert Rd
Jordan Marsh Casa Ybel
Dunes At Club
Sea Oats
The Shack Periwinkle
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2. Data Collection

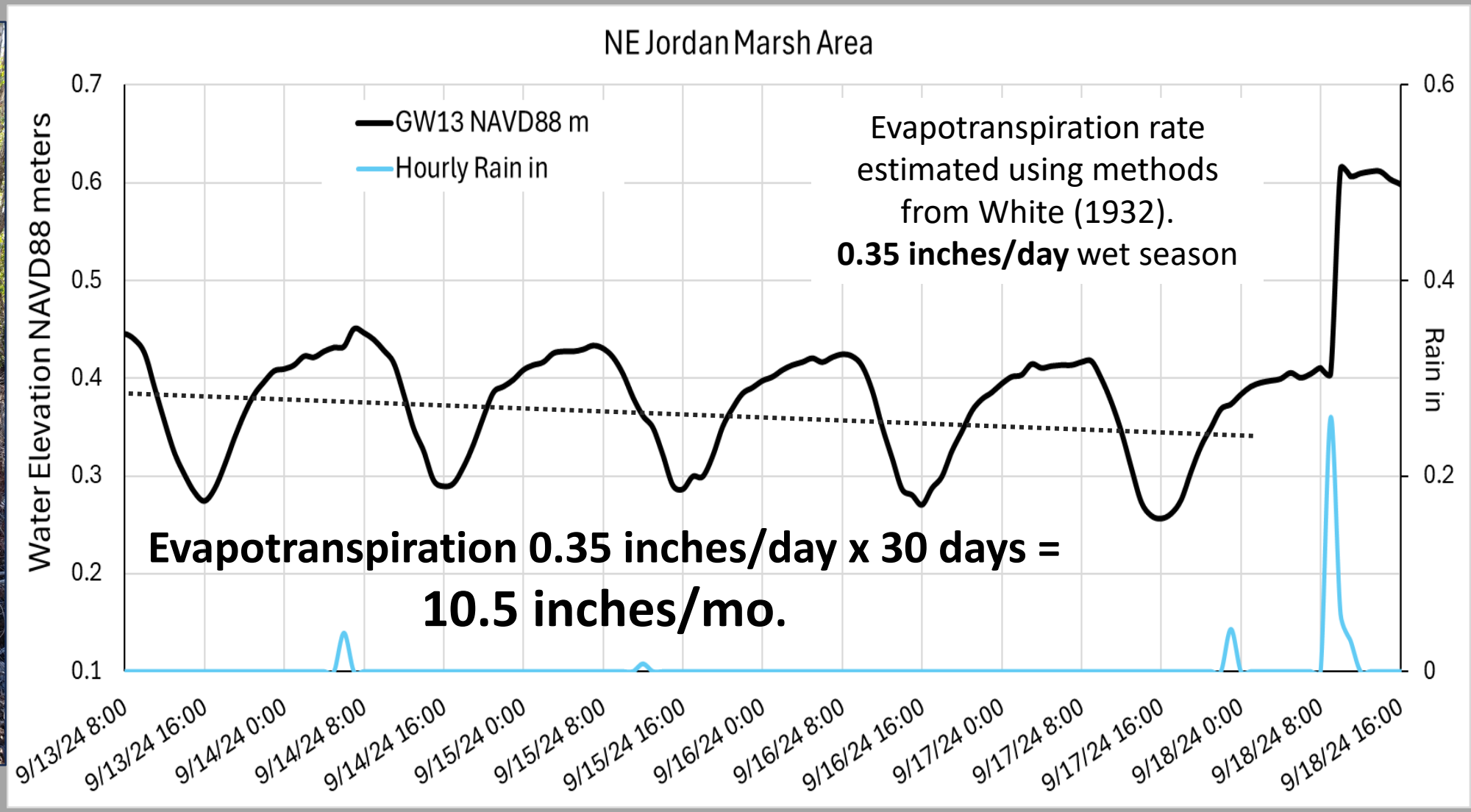
- Hydrologic Budget: Precipitation and Evapotranspiration (ET)
- Normalized Difference Vegetation Index (NDVI)
  - › Ratio Between Red and Near Infrared Satellite Bands (Landsat USGS/NASA)
  - › Useful in Analyzing Plant Health Over Time & Predictor of ET

Courtesy Johnson Engineering and City of Sanibel

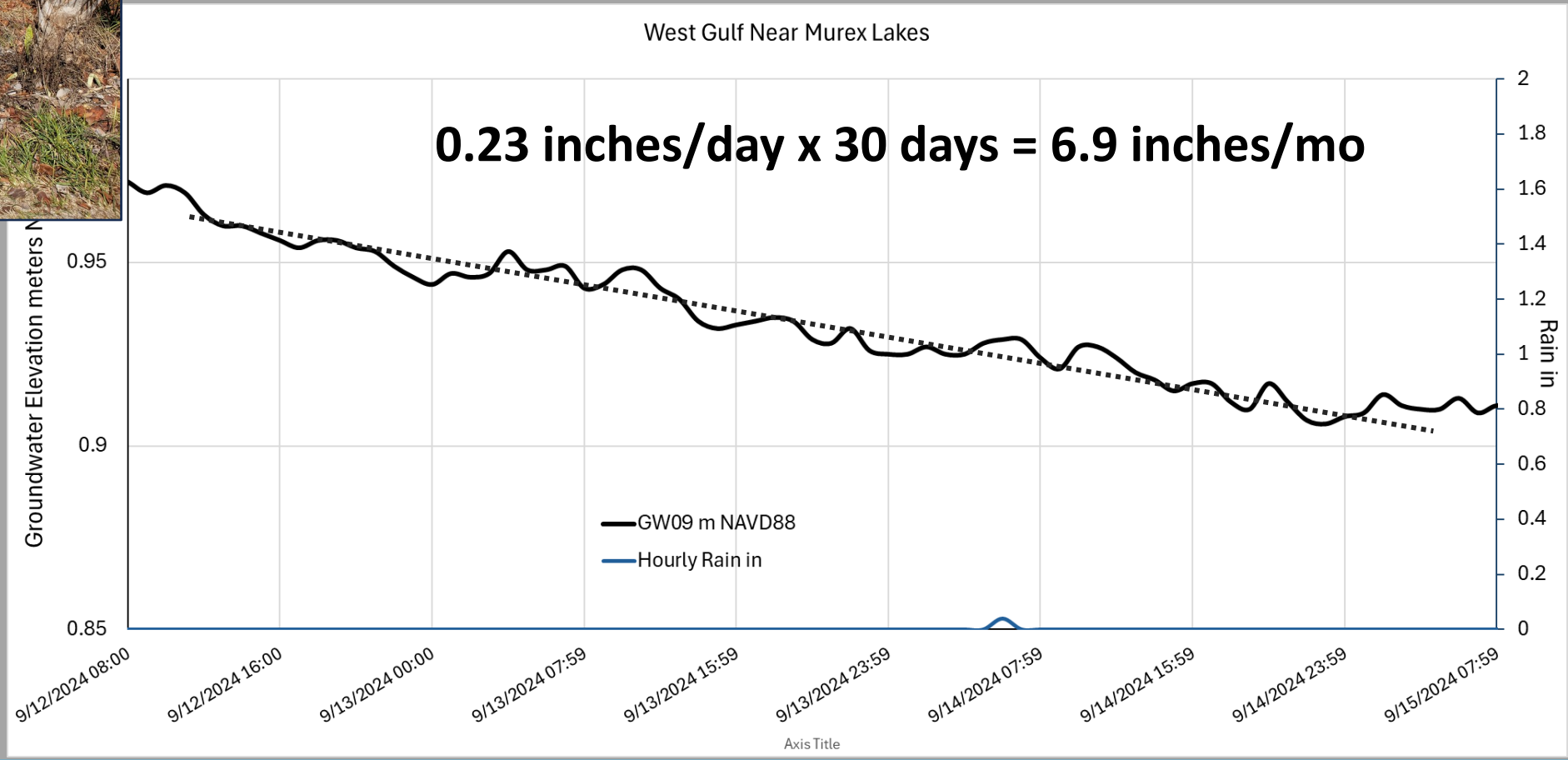
NDVI Before Hurricane Ian (2013-22)

NDVI After Hurricane Ian (2022-23)

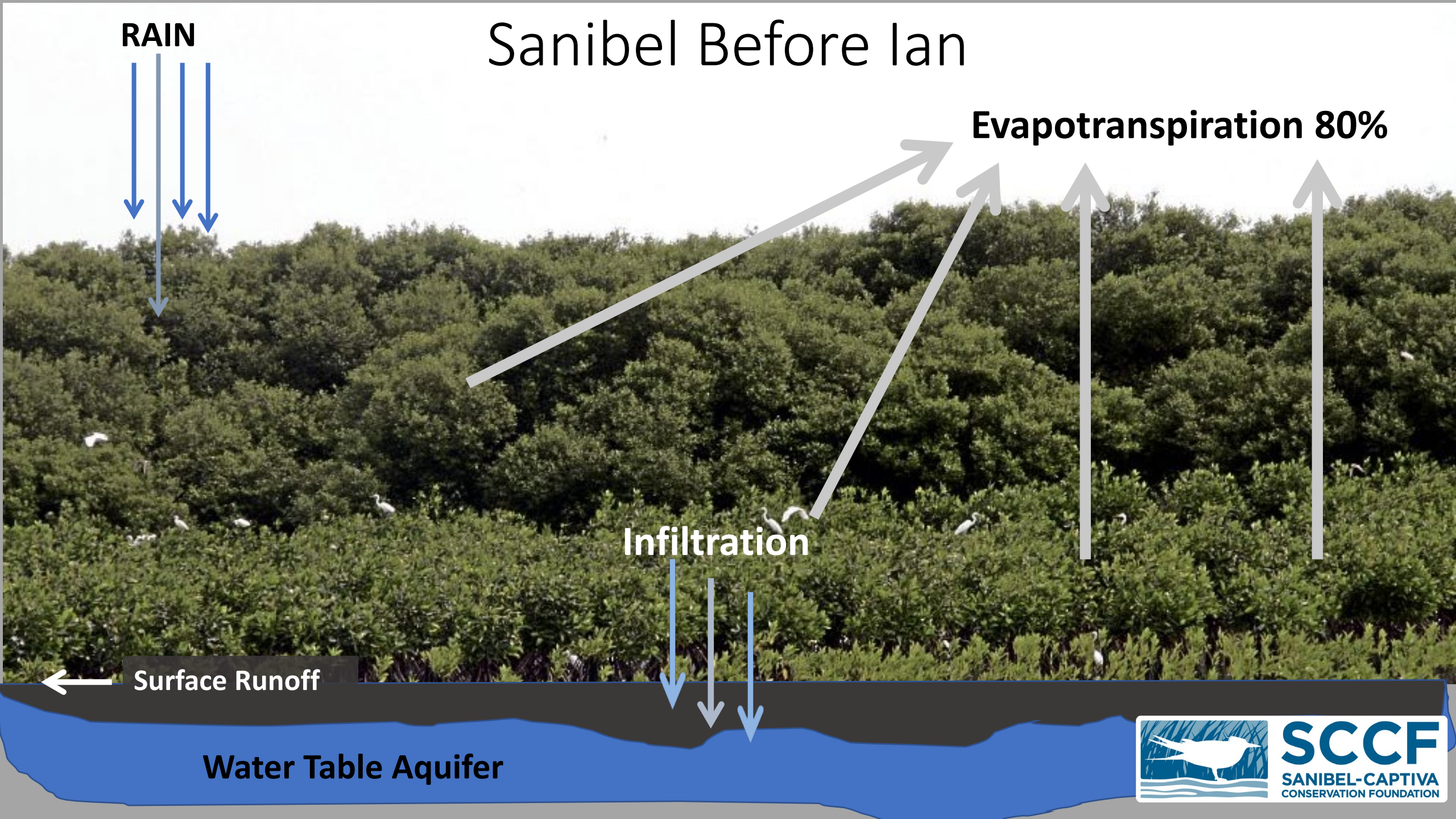
Young Buttonwood Forest

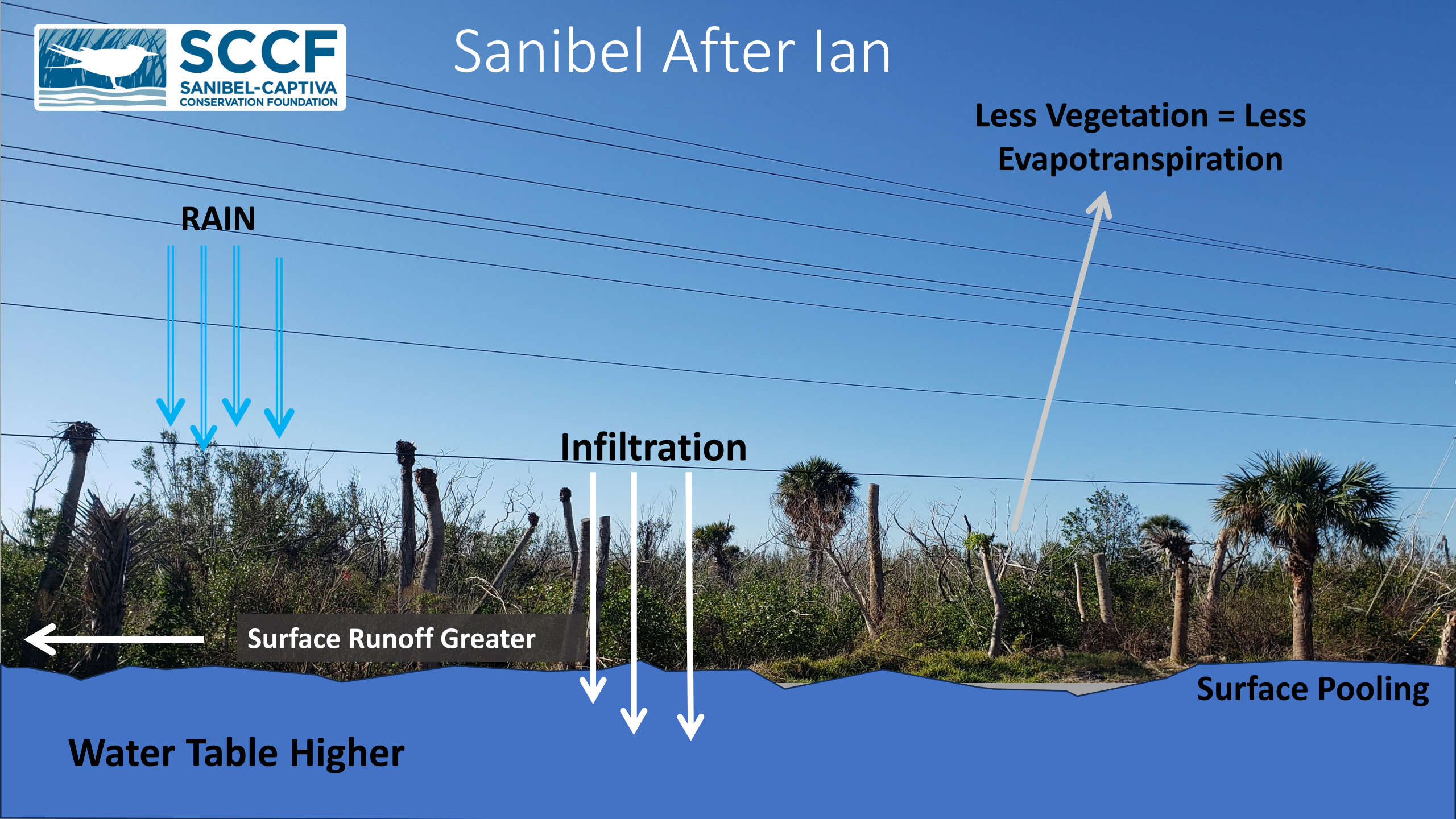


Recently Cleared Lot Near Roadway



Sanibel Before Ian

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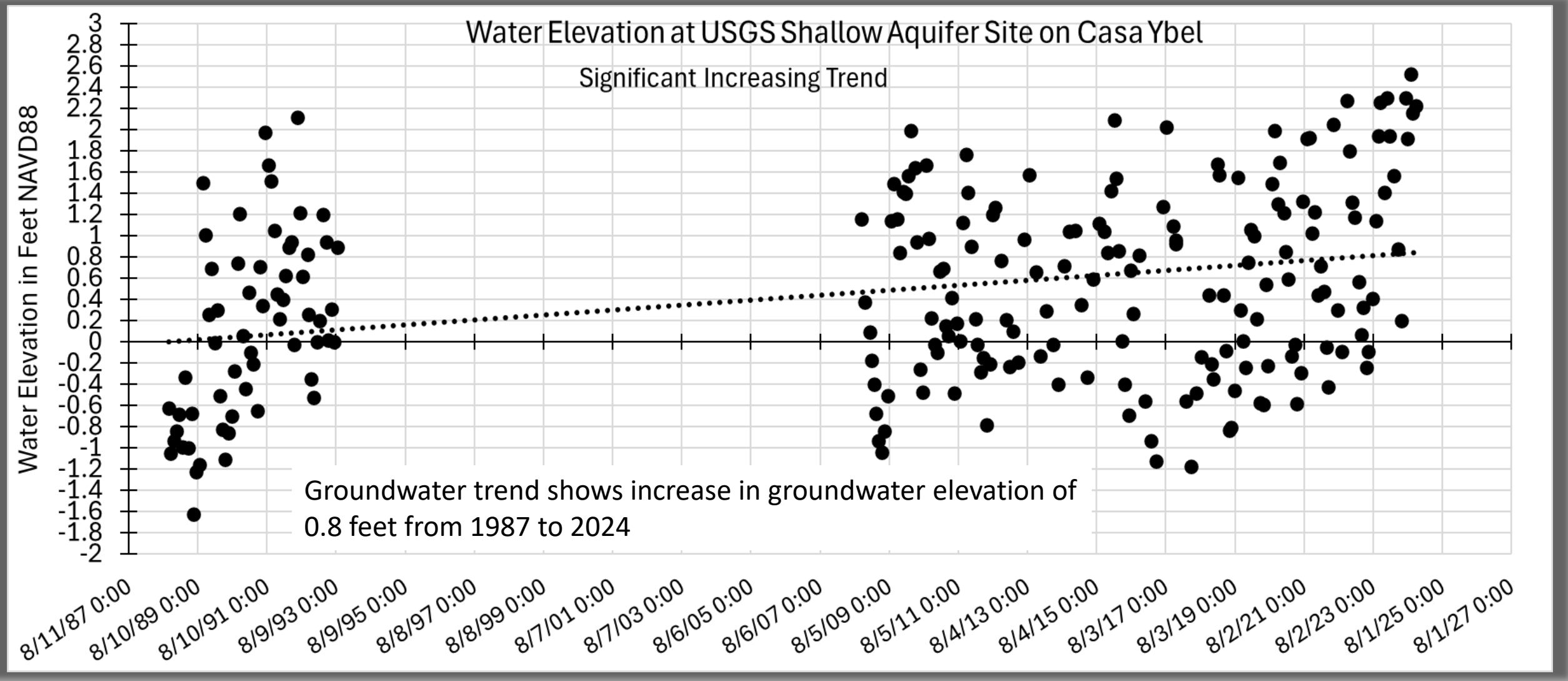
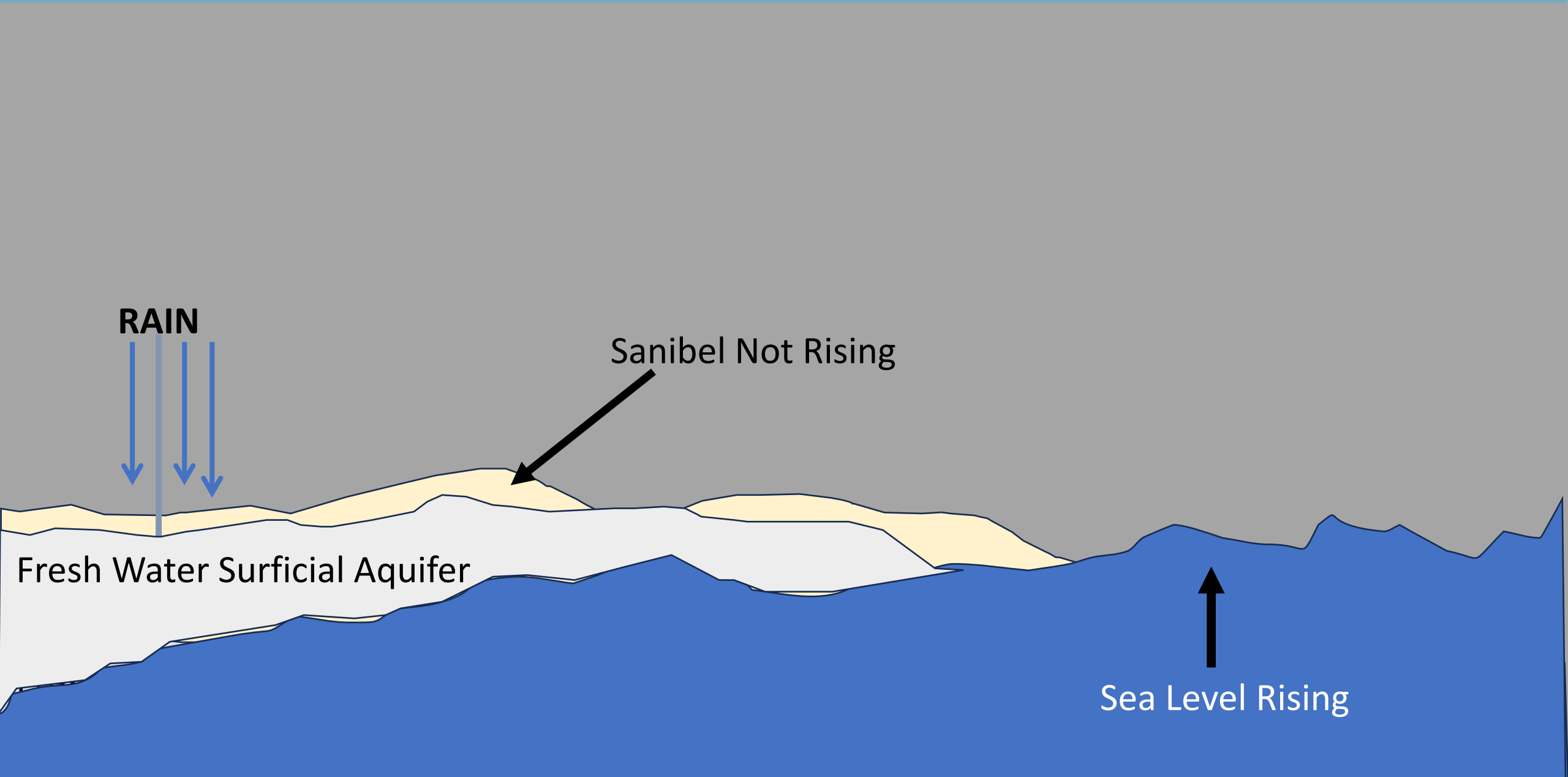
Sanibel After Ian
Less Vegetation = Less Evapotranspiration
RAIN
Infiltration
Surface Runoff Greater
Surface Pooling
Water Table Higher


Water Elevation at USGS Shallow Aquifer Site on Casa Ybel
Significant Increasing Trend
Water Elevation in Feet NAVD88
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
-2
8/11/87 0:00
8/10/89 0:00
8/10/91 0:00
8/9/93 0:00
8/9/95 0:00
8/8/97 0:00
8/8/99 0:00
8/7/01 0:00
8/7/03 0:00
8/6/05 0:00
8/6/07 0:00
8/5/09 0:00
8/5/11 0:00
8/4/13 0:00
8/4/15 0:00
8/3/17 0:00
8/3/19 0:00
8/2/21 0:00
8/2/23 0:00
8/1/25 0:00
8/1/27 0:00
Groundwater trend shows increase in groundwater elevation of
0.8 feet from 1987 to 2024


RAIN
Sanibel Not Rising
Fresh Water Surficial Aquifer
Sea Level Rising

Findings

- Vegetation removes (evapotranspiration) and stores water – can equal annual precipitation – single greatest water mover (Missimer 1976, Bogess 1974, Thompson 2025).
  - Trees remove nutrients (Many studies since 70s).
  - Keep soil porous – better infiltration, More infiltration, less runoff more microbes to remove nutrients.
  - Woody vegetation resists surge overwash and reduces upland to wetland conversion on barrier islands (Zinnert et al. 2020).
- Hurricanes and clearing can destroy and reduce vegetation capability of removing water from landscape.
- Ian and post Ian clearing destroyed and damaged vegetation water moving capability.
- Less evapotranspiration + more rain = higher water table and standing water.

Recommendations

- Replant residential and commercial landscapes to ordinance specifications.
- Promote revegetation of storm impacted preserve lands.
- Incorporate vegetation as part of stormwater infrastructure, when appropriate.
- Employ tools to help calculate value and impact of planting vegetation on stormwater quality and quantity. (iTree USDA; Stormwater Trees Guide EPA).
- Future planning for Sea Level Rise
  - The Sanibel Plan Update
  - Stormwater Master Plan Update
  - Vulnerability Assessment

- Surge events change freshwater ecosystems for years.
- Surface water and groundwater interact.
- Water quality is poor in most lakes.
- It may be years until deep lakes become fresh again.
- Shallow lakes will become fresh more quickly.
- Loss of vegetation = reduction in stormwater removal.

Questions

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Photo Credit: Sanibel Island Golf Club


Photo Credit: The Dunes

Golf Course Report Card Program: Post-Storm Recovery

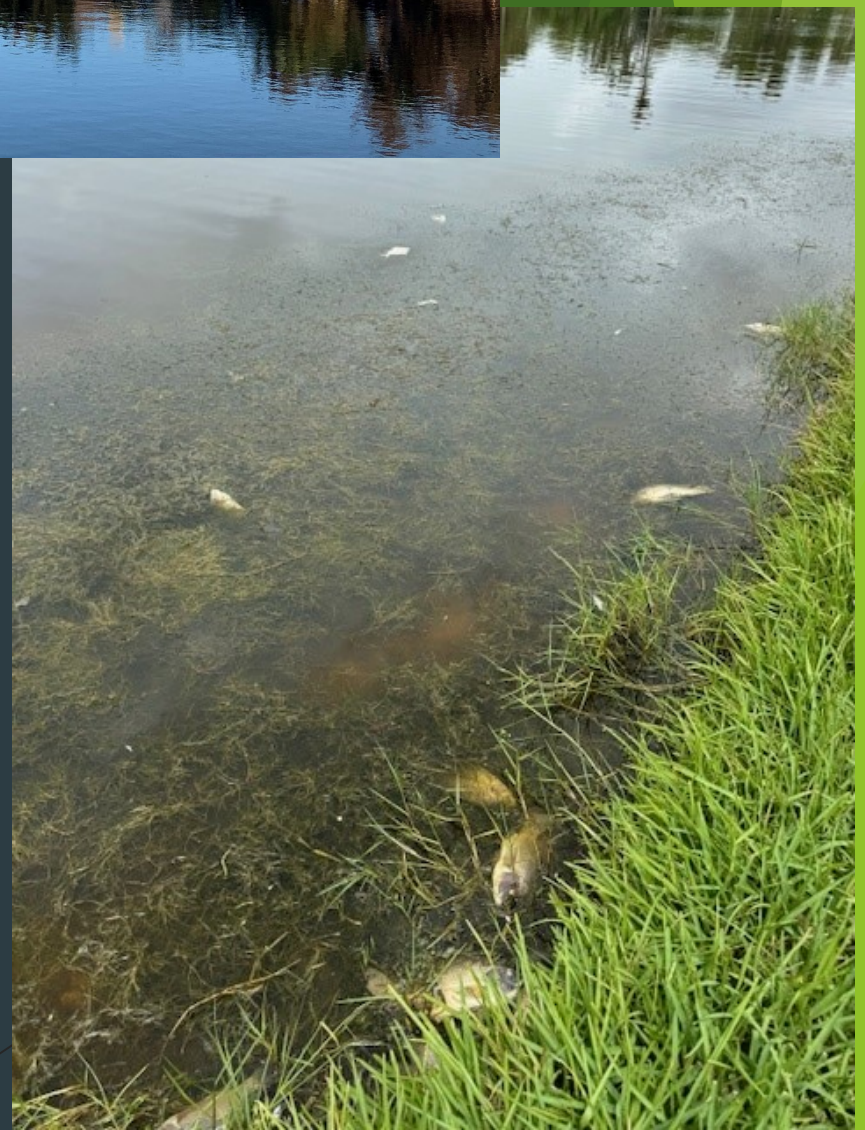
Environmental Biologist, Dana Dettmar

The Dunes Golf & Tennis Club

The Dunes Golf & Tennis Club

The Sanctuary Golf Club

The Sanctuary Golf Club



Sanibel Island Golf Club

Questions?