

Salinity in Biscayne Bay and the Biscayne Bay Coastal Wetlands

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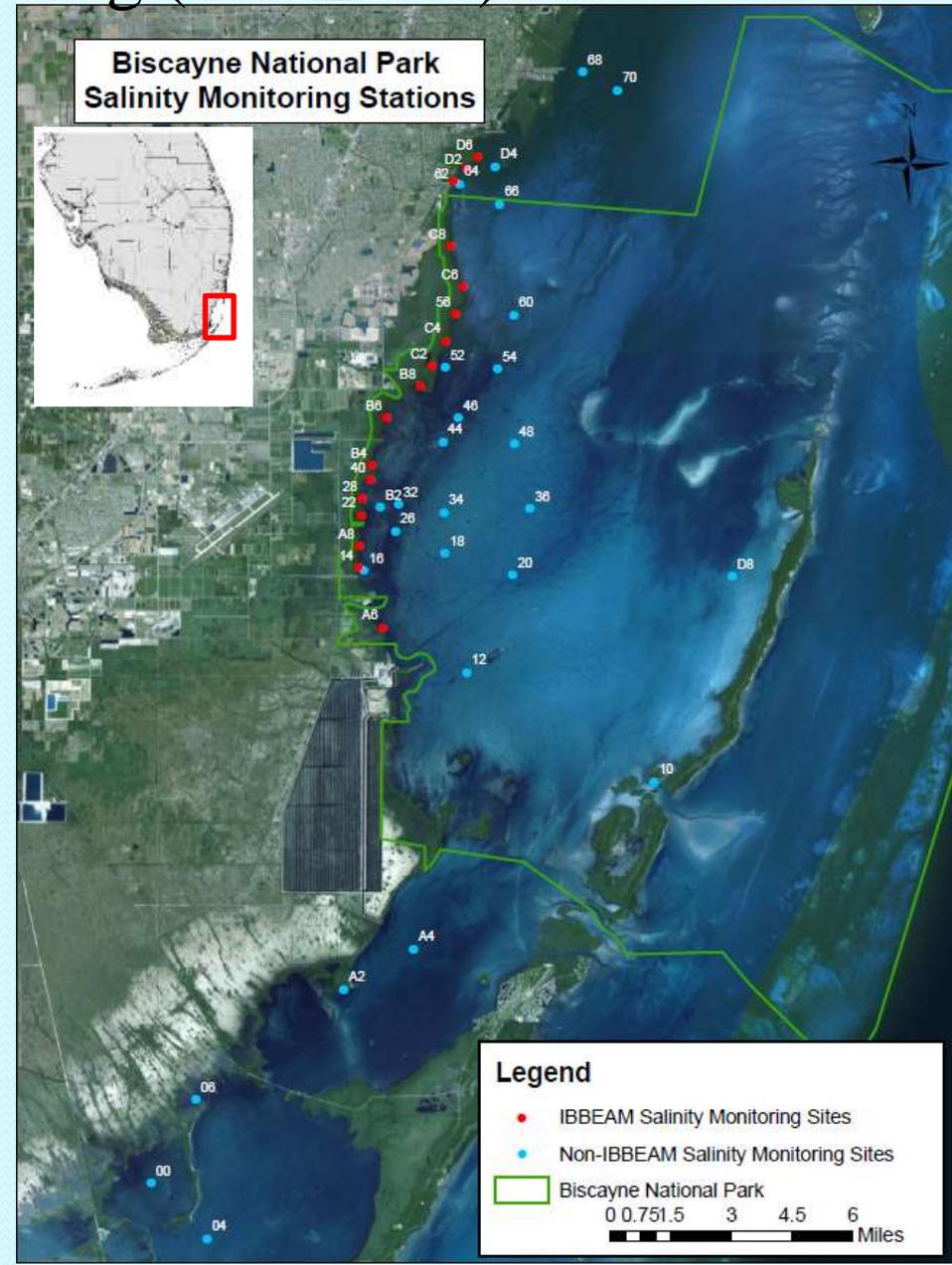
Salinity Network and Integrated Biscayne Bay Ecological Assessment Monitoring (IBBEAM)

- Designed in 2003-2004 by a multi-agency science team
- More sites added in 2010 along the shoreline
- Designed to meet needs of modeling and collecting data as close as possible to the shoreline at specific features

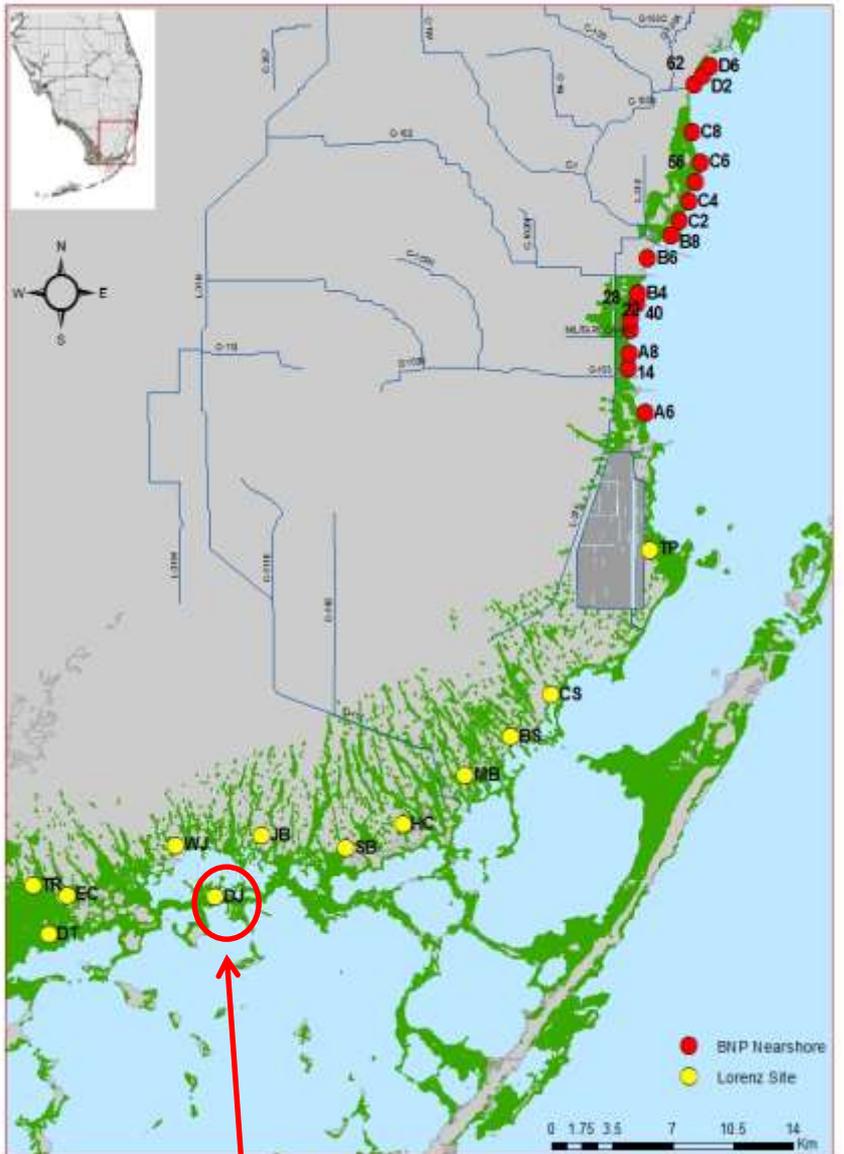


Instrument Deployment

- YSI 6600
- 15min recording – 24hr/365days
- Retrieved, downloaded, lab cleaned, deployed
- Extensive QA-QC



Salinity Regime Metrics



Florida Bay
Reference Site
(DJ, Downstream Joe Bay)

Mesohaline Index (M):

Proportion of salinity observations ≥ 5 and < 18 psu

Hyperhaline Index (H):

Proportion of salinity observations > 40 psu

Variability Index (V):

Proportion of observations where daily salinity range is > 5 psu



Mesohaline Index (M)

M = proportion of salinity observations where salinity ≥ 5 and < 18 psu

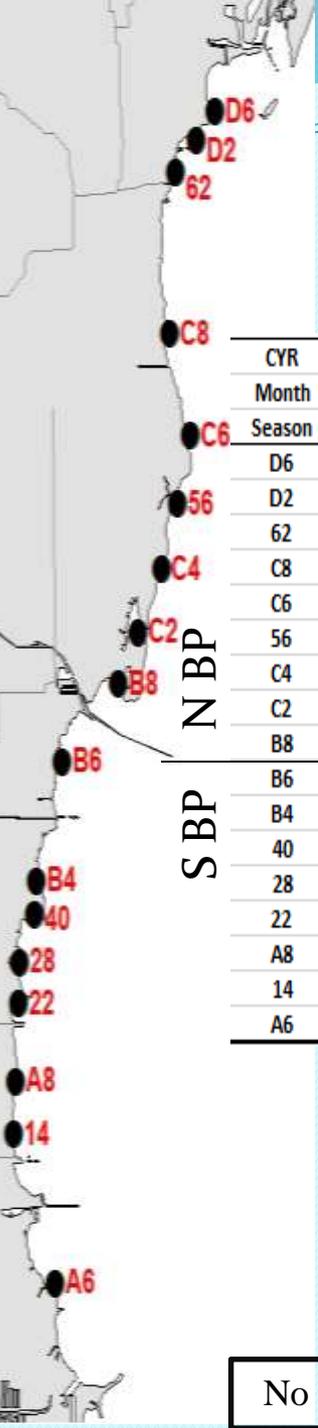
Cyr	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Mean	
	Month	May-Oct	Nov-Apr																			
	Season	Wet	Dry																			
D6							0.00	0.00	0.01	0.00	0.08	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.06	0.01	0.03	0.01
D2							0.00	0.00	0.01	0.01	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07	0.01	0.03	0.01
62	0.09	0.00	0.11	0.00	0.01	0.00	0.10	0.00	0.02	0.02	0.25	0.00	0.22	0.00	0.00	0.00	0.01	0.15	0.06	0.09	0.03	
C8							0.11	0.00	0.02	0.03	0.34	0.00	0.22	0.01	0.00	0.00	0.01	0.27	0.08	0.11	0.05	
C6							0.11	0.00	0.03	0.04	0.58	0.00	0.38	0.00	0.00	0.00	0.00	0.31	0.21	0.20	0.06	
56	0.35	0.01	0.21	0.00	0.05	0.01	0.14	0.00	0.07	0.04	0.65	0.00	0.45	0.01	0.01	0.00	0.00	0.38	0.31	0.25	0.07	
C4							0.22	0.00	0.09	0.05	0.65	0.00	0.50	0.01	0.07	0.00	0.00	0.51	0.43	0.29	0.10	
C2							0.34	0.04	0.19	0.09	0.69	0.01	0.42	0.11	0.08	0.00	0.02	0.60	0.50	0.31	0.14	
B8							0.29	0.05	0.06	0.14	0.78	0.01	0.72	0.17	0.05	0.08	0.00	0.66	0.49	0.35	0.18	
B6							0.65	0.14	0.37	0.40	0.67	0.44	0.53	0.43	0.33	0.13	0.16	0.75	0.67	0.45	0.38	
B4							0.46	0.14	0.28	0.54	0.74	0.19	0.56	0.42	0.19	0.34	0.14	0.87	0.61	0.42	0.42	
40	0.40	0.19	0.42	0.26	0.29	0.22	0.49	0.14	0.37	0.53	0.83	0.17	0.73	0.40	0.14	0.12	0.10	0.91	0.61	0.46	0.38	
28	0.35	0.16	0.39	0.20	0.16	0.17	0.52	0.11	0.23	0.43	0.78	0.11	0.59	0.33	0.11	0.13	0.07	0.88	0.46	0.37	0.33	
22	0.35	0.17	0.49	0.15	0.24	0.16	0.60	0.12	0.25	0.45	0.72	0.11	0.60	0.29	0.11	0.07	0.05	0.84	0.46	0.37	0.31	
A8							0.44	0.12	0.19	0.42	0.60	0.14	0.51	0.24	0.09	0.14	0.06	0.70	0.42	0.31	0.29	
14	0.42	0.28	0.38	0.26	0.24	0.23	0.44	0.13	0.21	0.57	0.57	0.22	0.53	0.13	0.11	0.18	0.09	0.68	0.46	0.33	0.32	
A6							0.09	0.04	0.06	0.18	0.22	0.01	0.09	0.03	0.02	0.01	0.04	0.30	0.06	0.08	0.09	



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Hyperhaline Index (H)

H = proportion of salinity observations > 40 psu



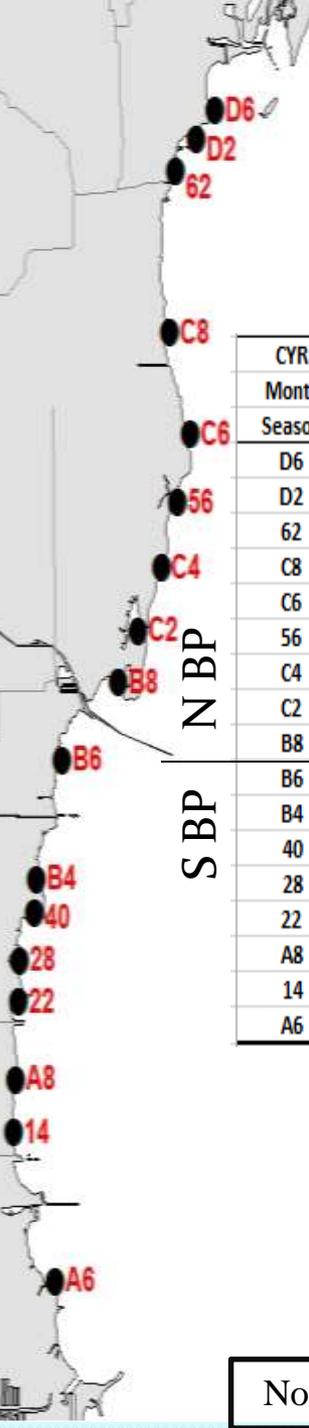
Cyr	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Mean	
	Month	May-Oct	Nov-Apr																			
	Season	Wet	Dry																			
D6							0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.02	0.00	
D2							0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.04	0.00	
62	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.02	0.00	
C8							0.00	0.02	0.14	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.13	0.00	0.00	0.05	0.00	
C6							0.00	0.03	0.19	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.18	0.00	0.00	0.08	0.01	
56	0.00	0.00	0.00	0.02	0.09	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.15	0.00	0.00	0.07	0.00	
C4							0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.16	0.00	0.00	0.06	0.00	
C2							0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.06	0.00	0.00	0.04	0.00	
B8							0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.04	0.00	
B6							0.00	0.01	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.04	0.00	
B4							0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.06	0.00	
40	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.08	0.00	0.00	0.04	0.00	
28	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.06	0.00	
22	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.10	0.00	0.00	0.06	0.00	
A8							0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.15	0.00	0.00	0.07	0.00	
14	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.16	0.00	0.00	0.08	0.00	
A6							0.00	0.02	0.36	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.34	0.00	0.00	0.14	0.00	

No color insufficient data



Variability Index (V)

V = proportion of observations where daily salinity > 5 psu

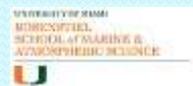
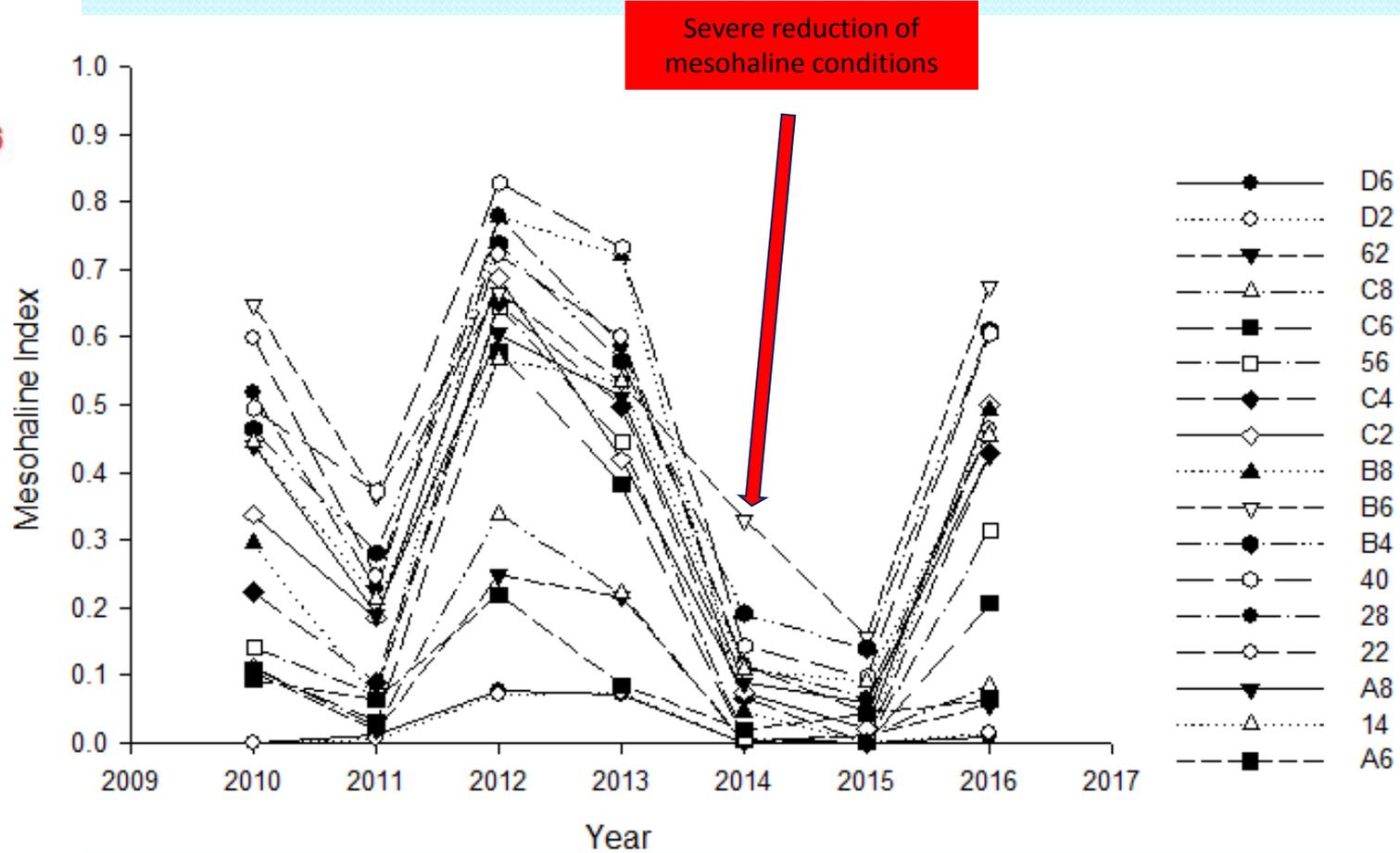
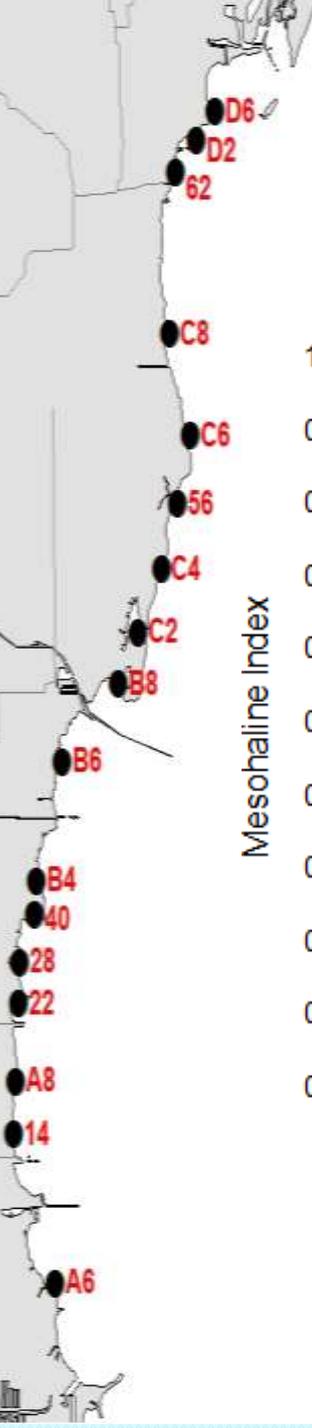


CYR	2007		2008		2009		2010		2011		2012		2013		2014		2015		2016		Mean			
	Month	May-Oct	Nov-Apr	Wet	Dry																			
Season	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
D6								0.00	0.01	0.04	0.06	0.16	0.07	0.10	0.03	0.00	0.00	0.04	0.03	0.02		0.06	0.03	
D2								0.00	0.01	0.03	0.05	0.12	0.03	0.06	0.08	0.04	0.01	0.01	0.03	0.04		0.05	0.03	
62	0.27	0.03	0.17	0.10	0.23	0.13	0.41	0.18	0.13	0.08	0.36	0.03	0.19	0.04	0.09	0.03	0.13	0.08	0.09		0.17	0.07		
C8								0.12	0.00	0.05	0.09	0.17	0.01	0.09	0.02	0.01	0.00	0.02	0.08	0.09		0.07	0.03	
C6								0.14	0.08	0.10	0.07	0.38	0.02	0.18	0.06	0.04	0.01	0.01	0.10	0.15		0.15	0.06	
56	0.18	0.02	0.18	0.03	0.02	0.07	0.16	0.06	0.13	0.07	0.24	0.03	0.10	0.12	0.07	0.02	0.07	0.10	0.04		0.11	0.07		
C4								0.07	0.00	0.09	0.04	0.08	0.01	0.03	0.03	0.05	0.02	0.04	0.13	0.02		0.05	0.04	
C2								0.53	0.19	0.40	0.25	0.43	0.13	0.26	0.18	0.32	0.13	0.28	0.36	0.19		0.31	0.21	
B8								0.17	0.24	0.21	0.23	0.29	0.23	0.09	0.05	0.04	0.01	0.02	0.08	0.11		0.13	0.14	
B6								0.29	0.03	0.24	0.17	0.35	0.07	0.32	0.14	0.40	0.08	0.23	0.24	0.39		0.32	0.12	
B4								0.29	0.08	0.21	0.21	0.21	0.10	0.29	0.25	0.18	0.14	0.15	0.19	0.42		0.24	0.16	
40	0.05	0.02	0.11	0.02	0.08	0.03	0.08	0.02	0.10	0.18	0.08	0.13	0.09	0.10	0.06	0.01	0.03	0.05	0.08		0.07	0.08		
28	0.08	0.04	0.14	0.06	0.04	0.09	0.21	0.39	0.48	0.08	0.10	0.06	0.14	0.12	0.03	0.01	0.03	0.02	0.08		0.14	0.11		
22	0.10	0.09	0.23	0.06	0.13	0.07	0.47	0.19	0.19	0.12	0.21	0.10	0.16	0.02	0.10	0.01	0.03	0.04	0.09		0.13	0.08		
A8								0.27	0.07	0.23	0.21	0.30	0.18	0.28	0.18	0.28	0.14	0.28	0.28	0.37		0.29	0.18	
14	0.57	0.61	0.54	0.34	0.47	0.44	0.57	0.23	0.41	0.41	0.62	0.56	0.59	0.38	0.48	0.29	0.31	0.55	0.52		0.49	0.40		
A6								0.12	0.08	0.10	0.05	0.19	0.10	0.27	0.06	0.18	0.01	0.03	0.10	0.15		0.15	0.07	

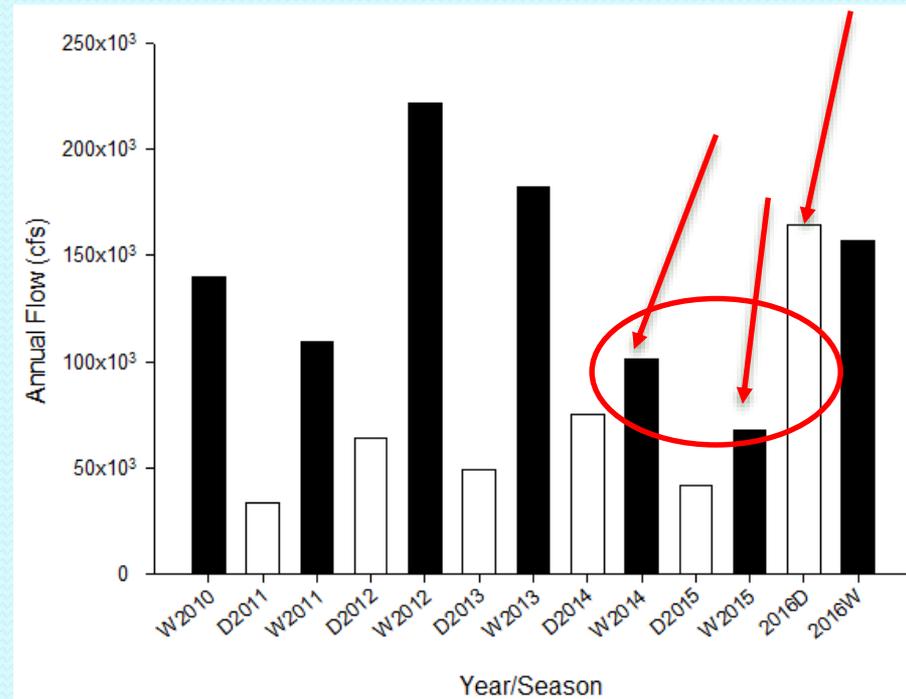
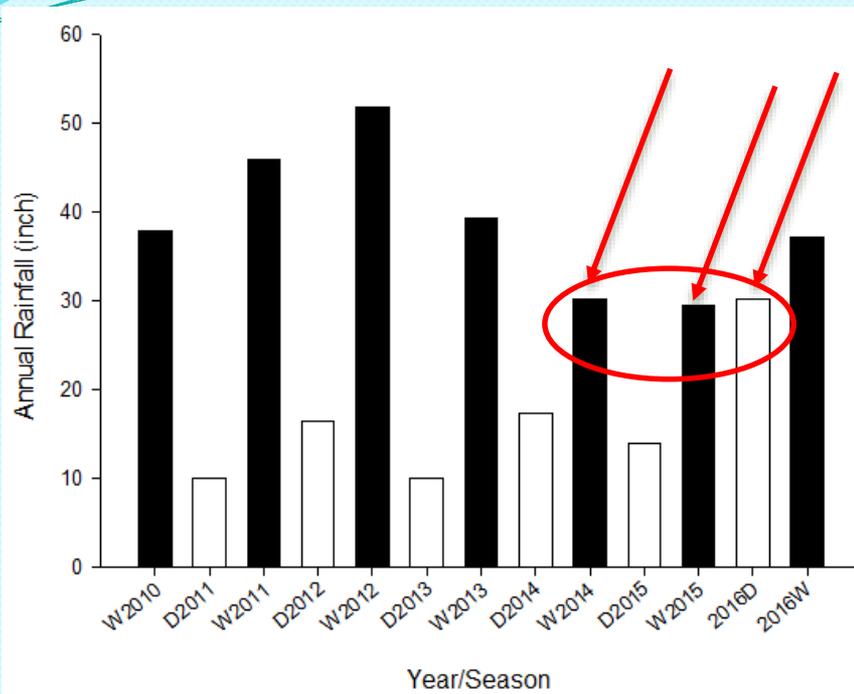
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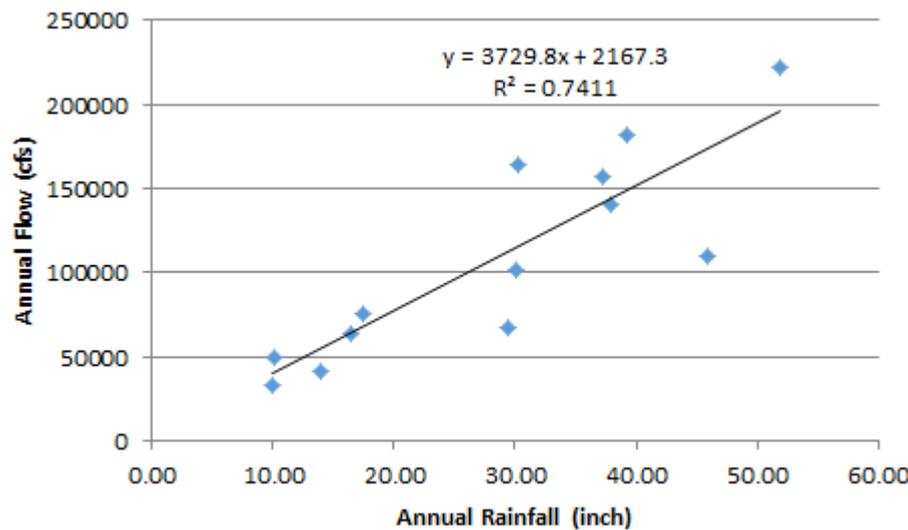
Mesohaline Condition Wet Season



Rainfall and Flow



Total annual rainfall data

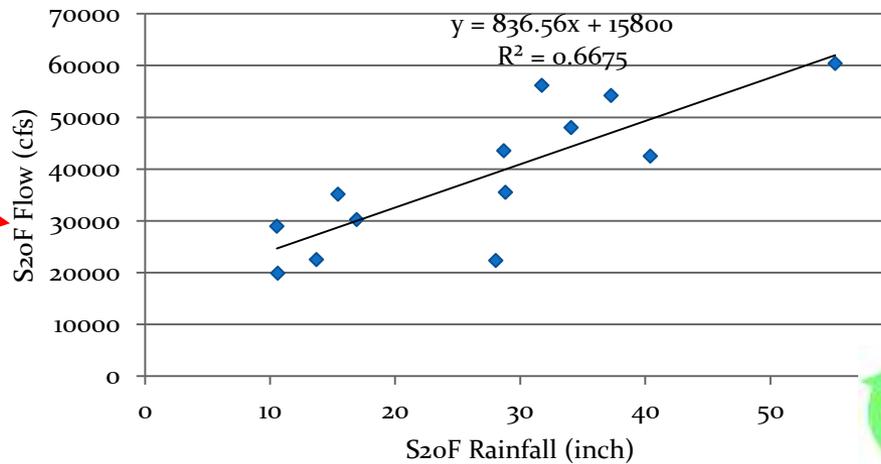
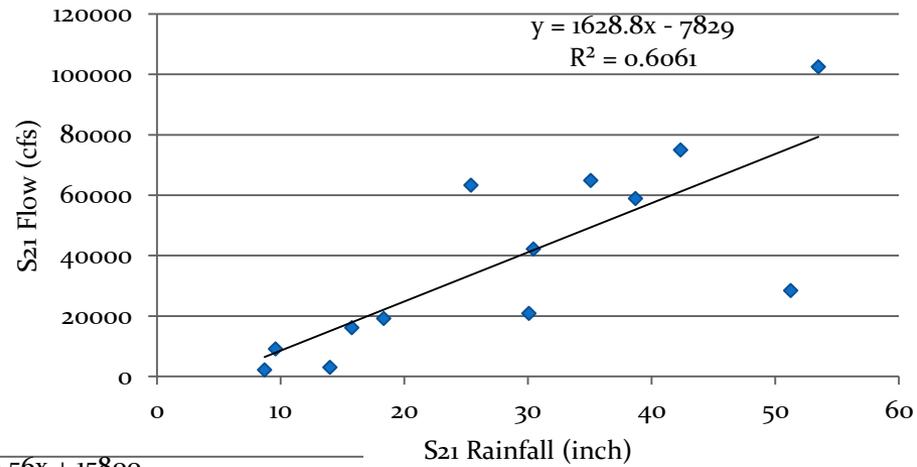
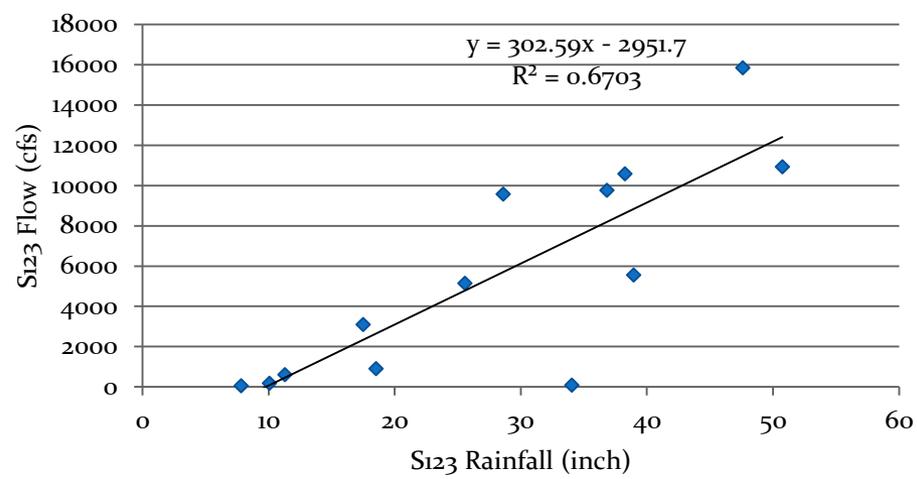
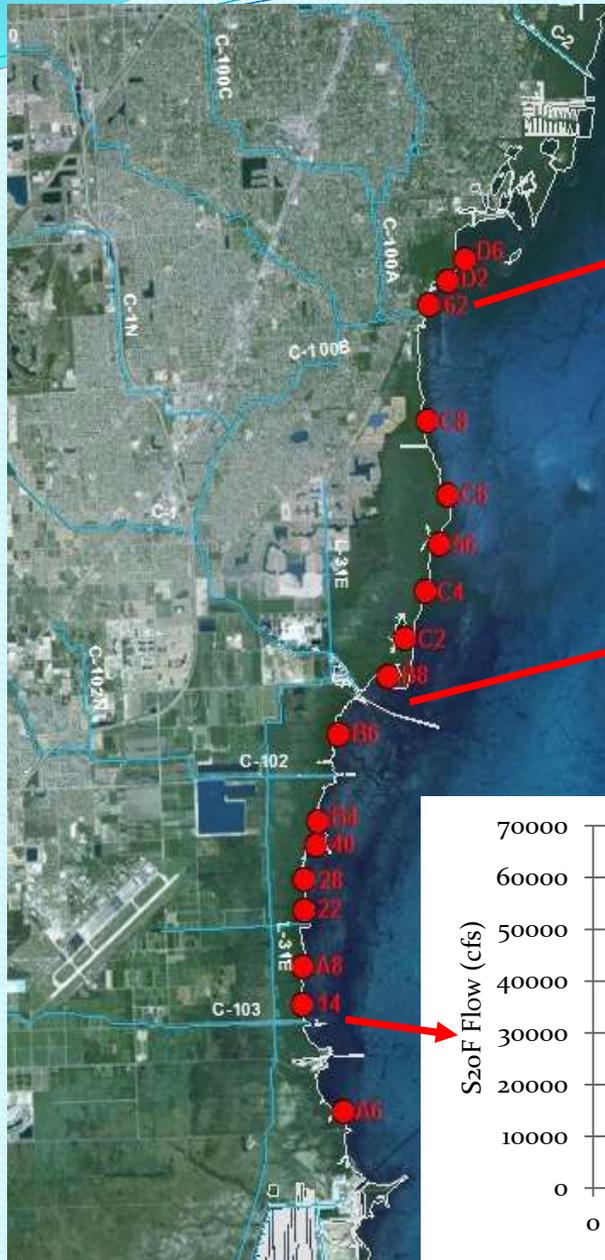


Flow data (sum of S20F, S20G, S21A, S21, S123)

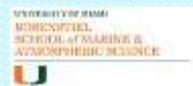
S123	C100
S21	C1
S21A	C102
S20G	Military
S20F	C103



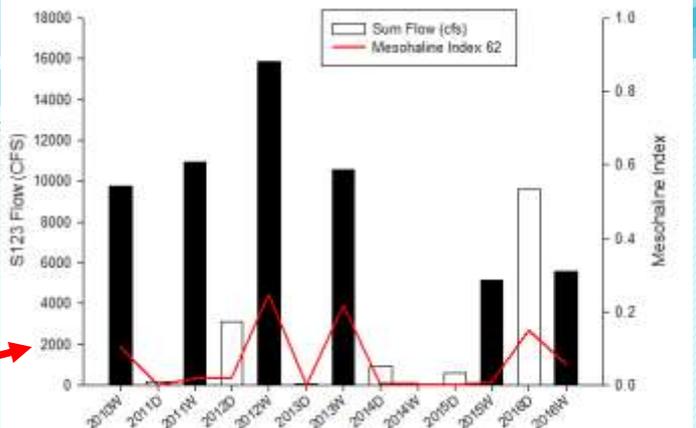
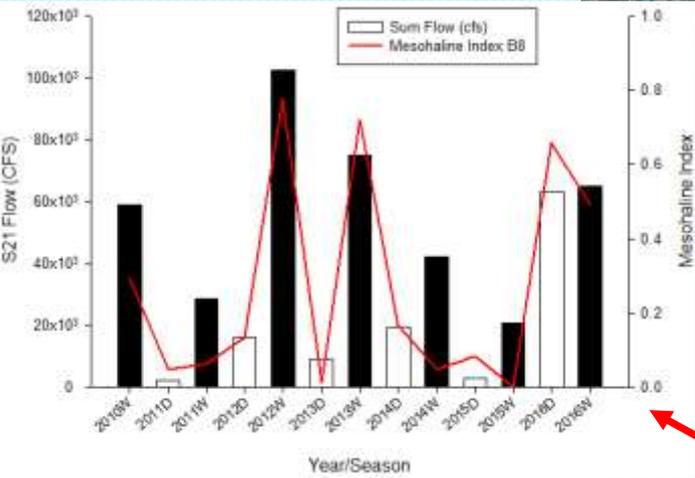
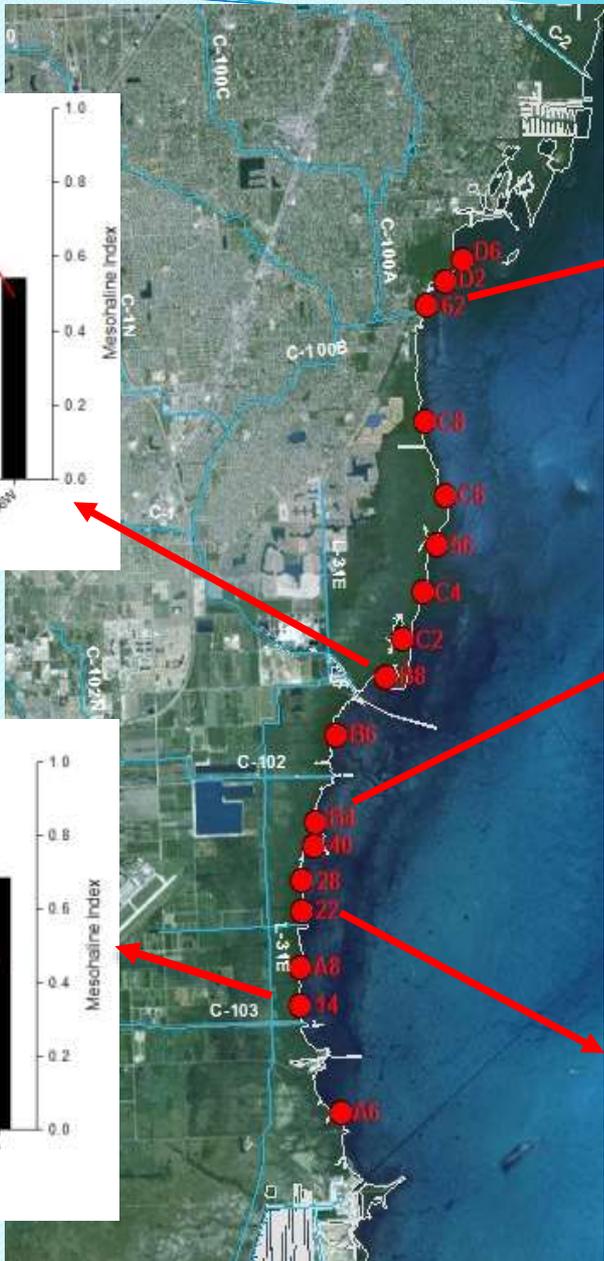
Rainfall vs. Flow



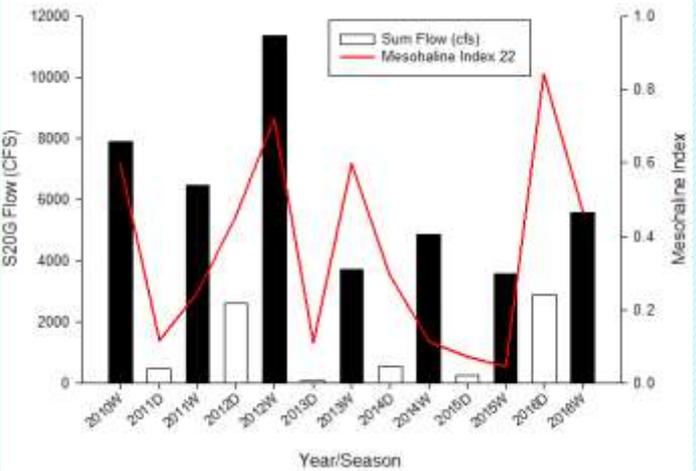
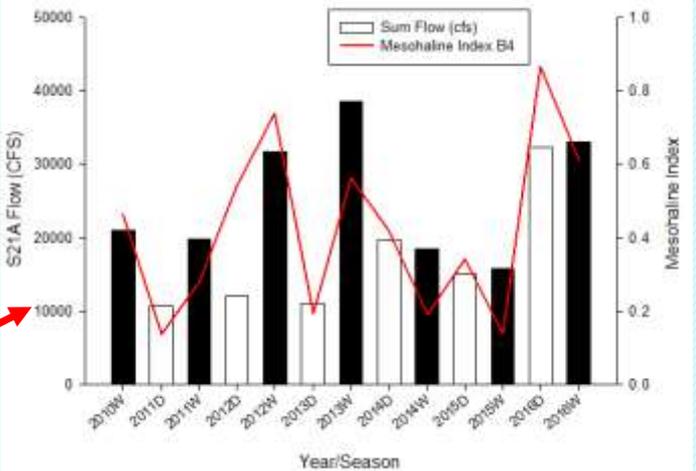
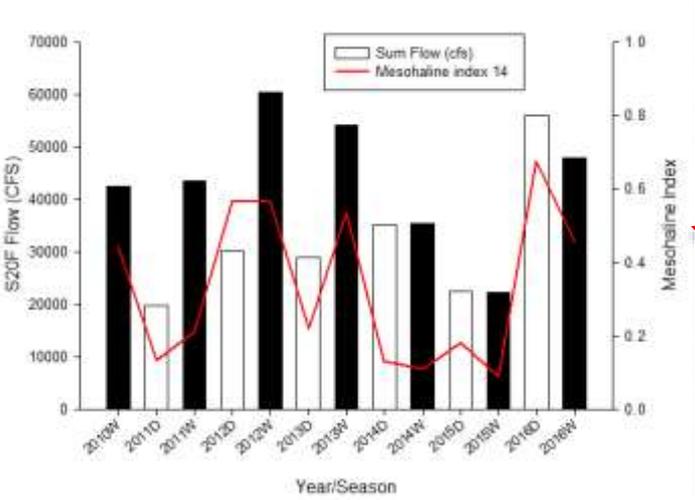
S123	C100
S21	C1
S21A	C102
S2oG	Military
S2oF	C103



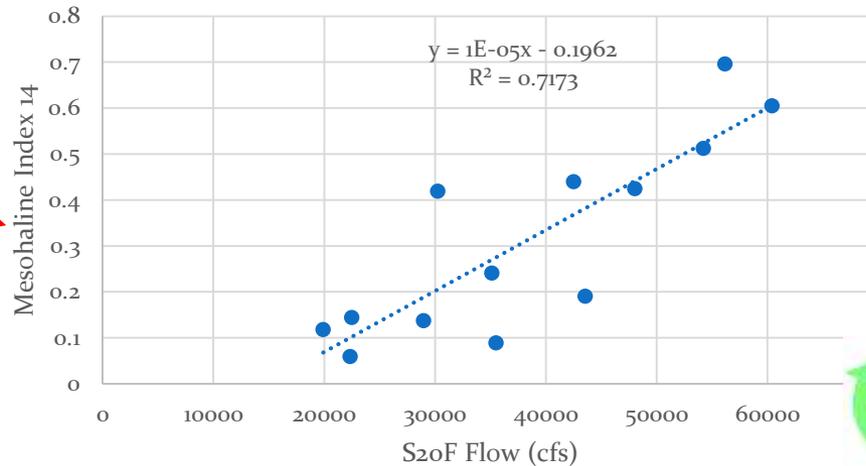
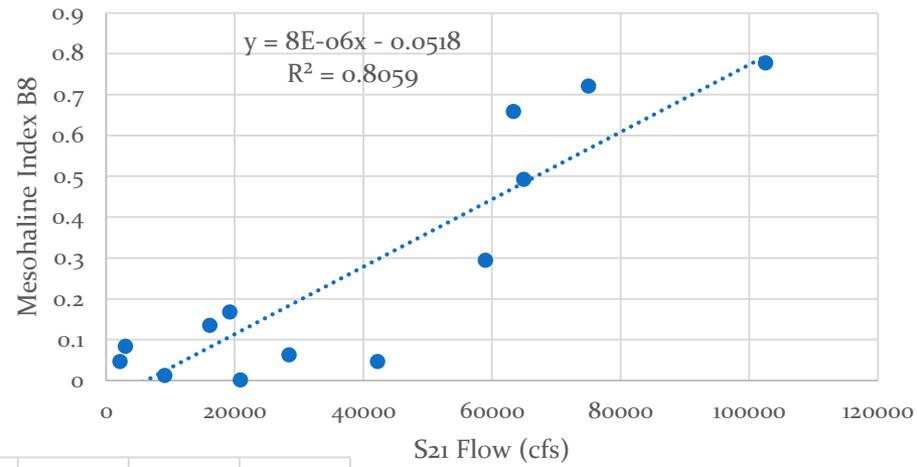
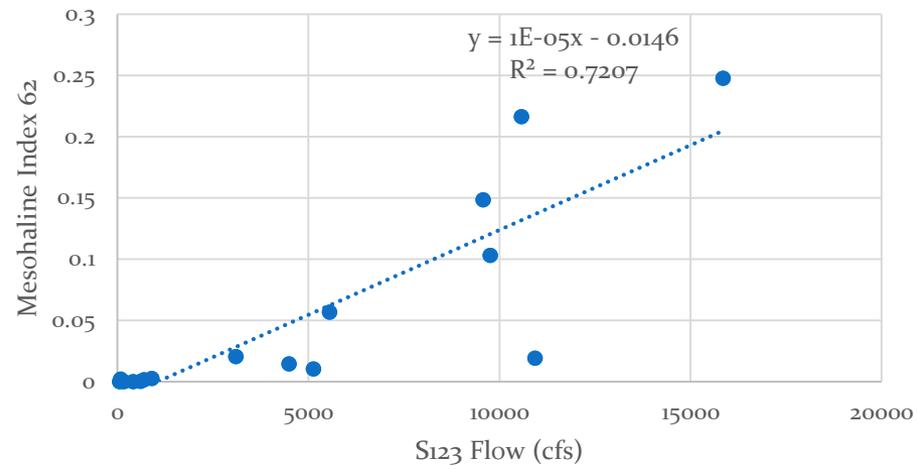
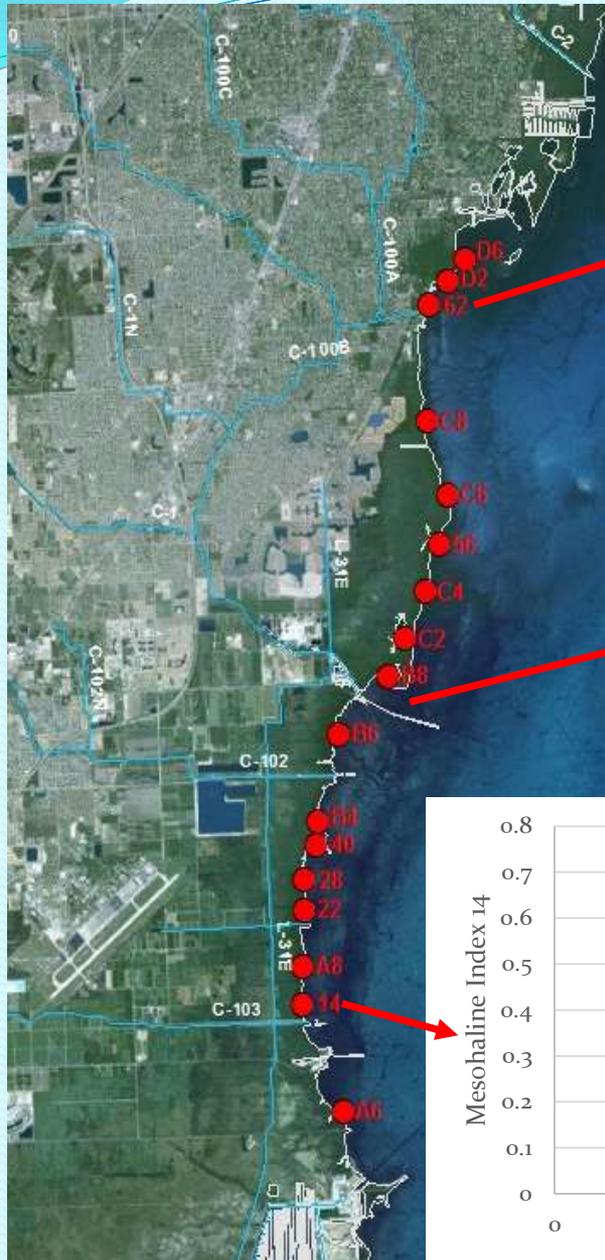
Flow vs. Mesohaline Index



Wet Season
 Dry Season



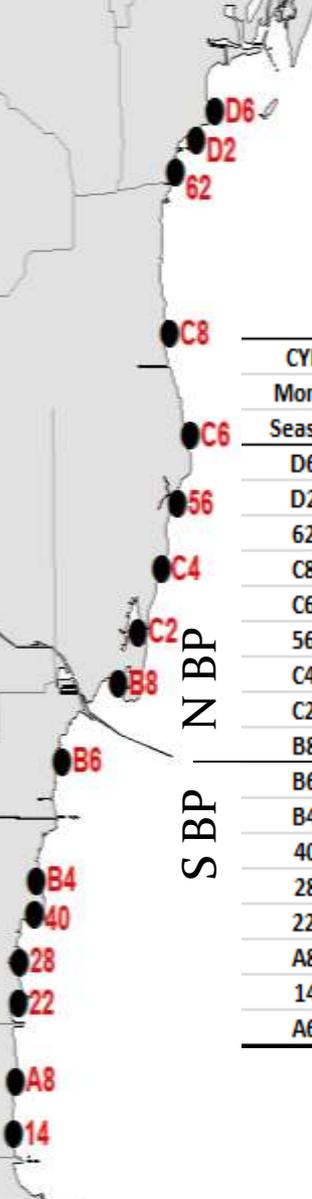
Flow vs. Mesohaline Index



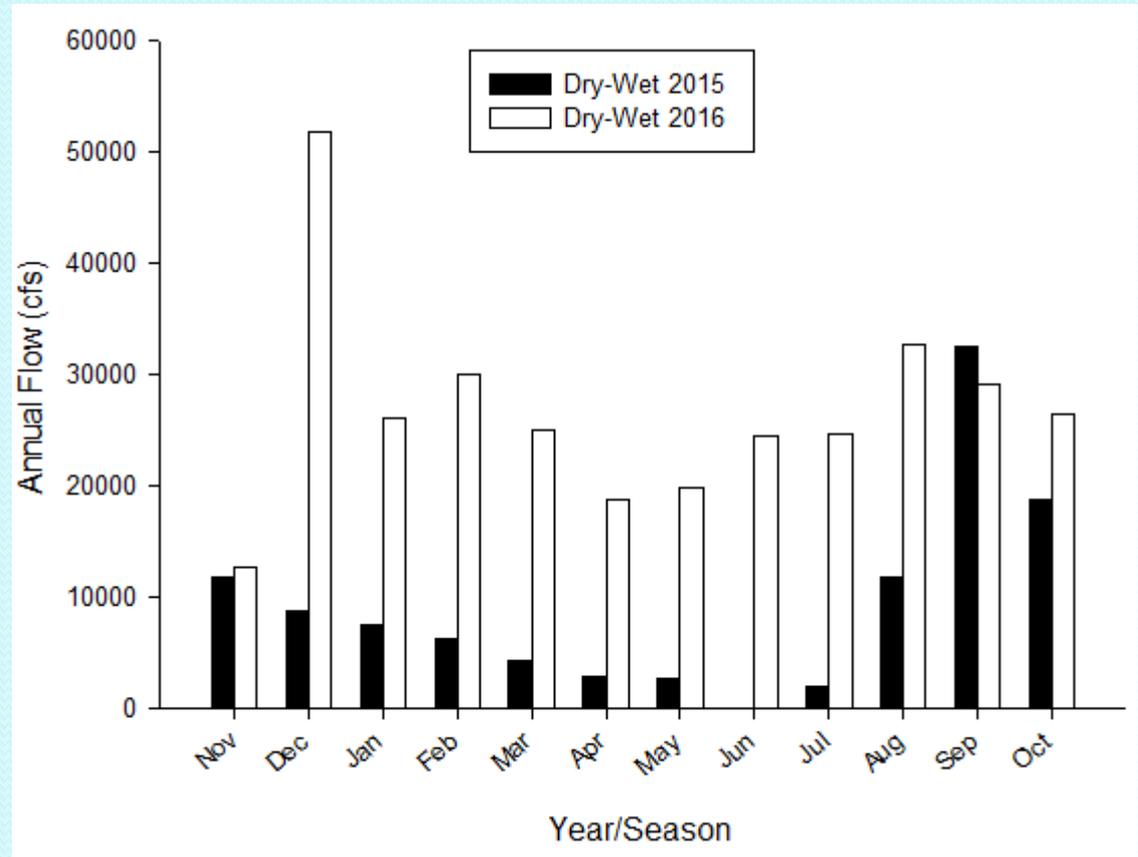
S123	C100
S21	C1
S21A	C102
S2oG	Military
S2oF	C103



Mesohaline Index and Flow

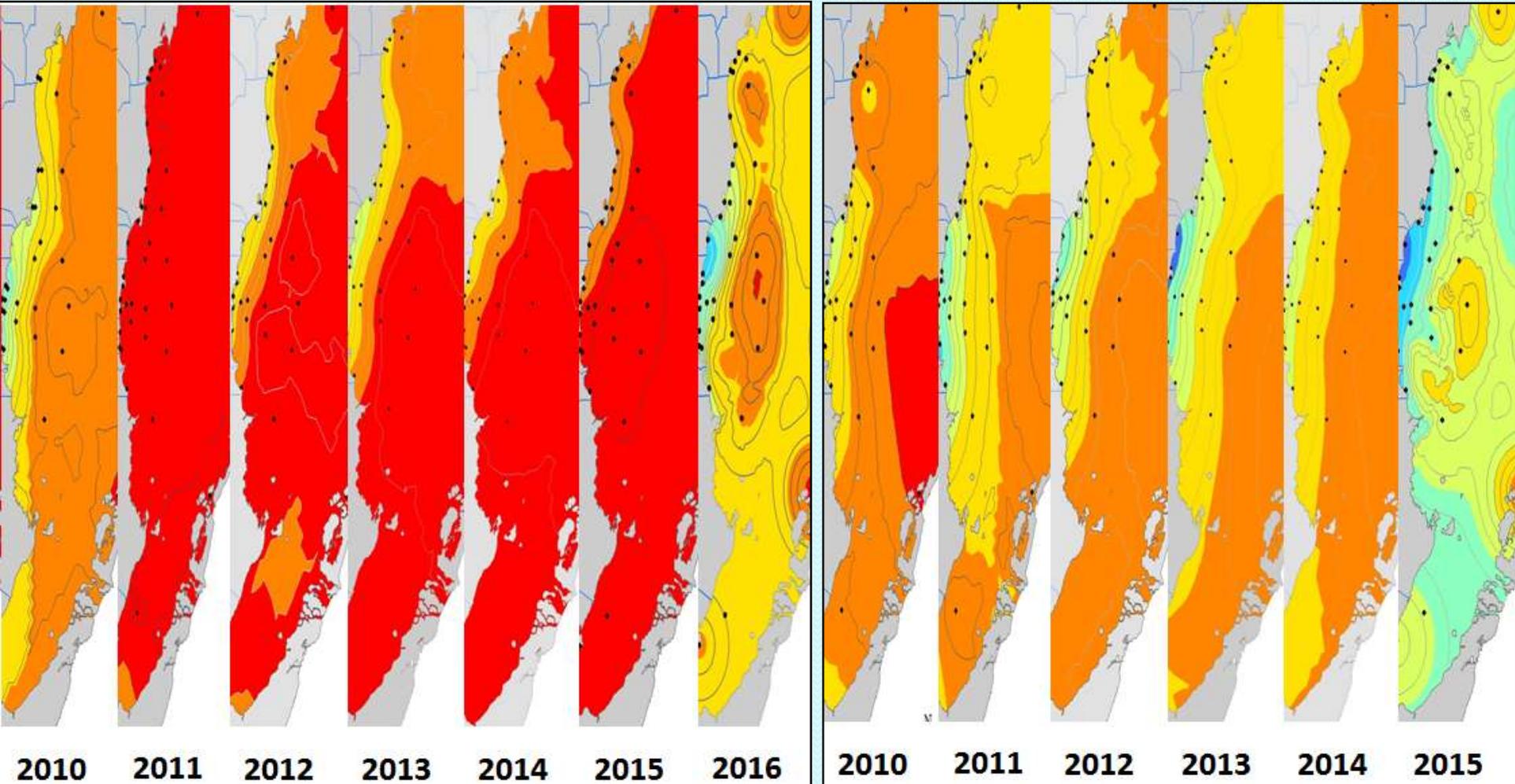


CYR	2015		2016	
	Nov-Apr	May-Oct	Nov-Apr	May-Oct
	Dry	Wet	Dry	Wet
D6	0.00	0.00	0.06	0.01
D2	0.00	0.00	0.07	0.01
62	0.00	0.01	0.15	0.06
C8	0.00	0.01	0.27	0.08
C6	0.00	0.00	0.31	0.21
56	0.00	0.00	0.38	0.31
C4	0.00	0.00	0.51	0.43
C2	0.00	0.02	0.60	0.50
B8	0.08	0.00	0.66	0.49
NBP				
B6	0.13	0.16	0.75	0.67
B4	0.34	0.14	0.87	0.61
40	0.12	0.10	0.91	0.61
28	0.13	0.07	0.88	0.46
22	0.07	0.05	0.84	0.46
A8	0.14	0.06	0.70	0.42
14	0.18	0.09	0.68	0.46
A6	0.01	0.04	0.30	0.06
SBP				



Dry 2015 Flow (summed S2oF, S2oG, S21A, S21, S123)	Dry 2016 Flow (summed S2oF, S2oG, S21A, S21, S123)	Flow Increase	% Dry Flow Increase	Wet 2015 Flow (summed S2oF, S2oG, S21A, S21, S123)	Wet 2016 Flow (summed S2oF, S2oG, S21A, S21, S123)	Flow Increase	% Wet Flow Increase
41,356	164,314	122,958	297	67,654	157,171	89,517	132

Average Monthly Salinity Maps



April

Salinity (psu)



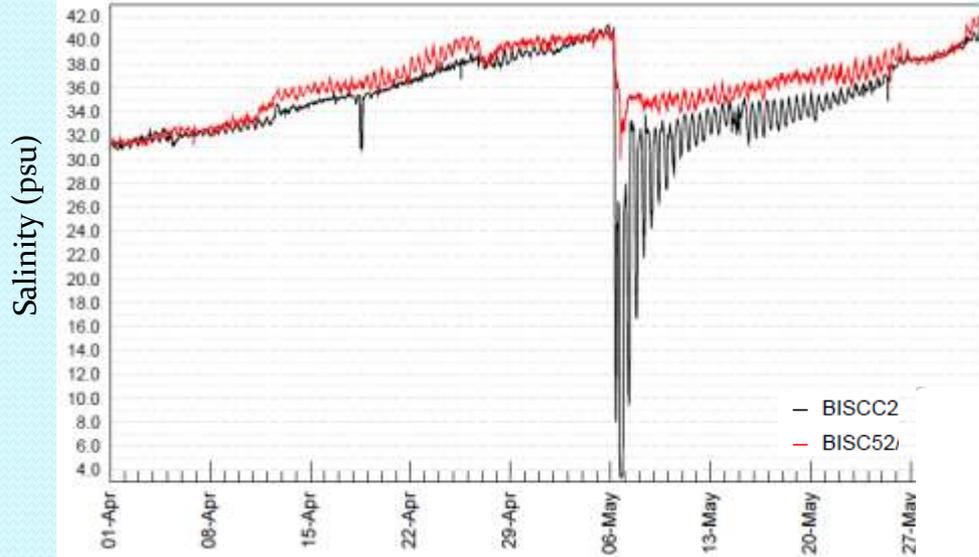
December



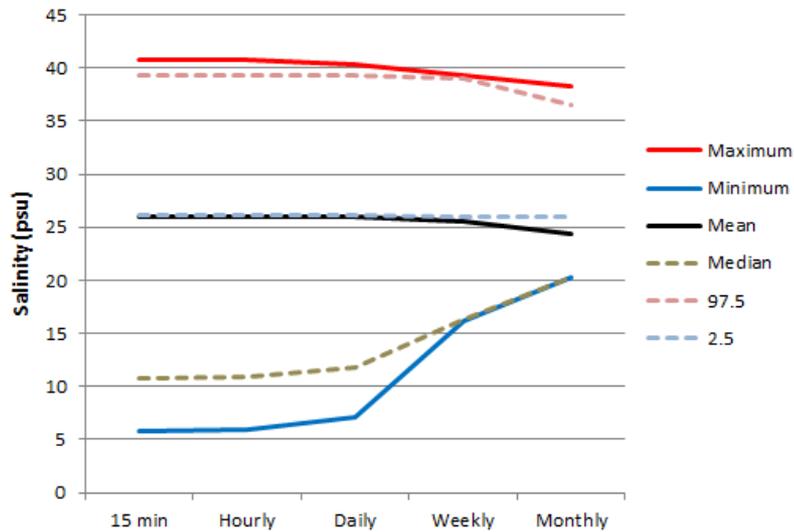
UNIVERSITY OF MIAMI
ROSENSTIEL SCHOOL OF MARINE &
ATMOSPHERIC SCIENCE



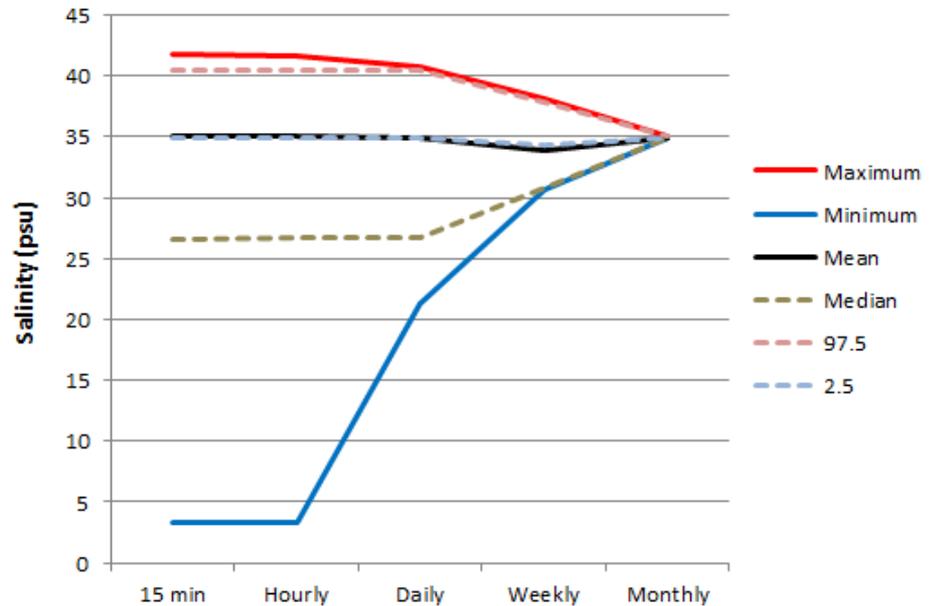
Comparison of sampling frequency



Site 14 (2014)



Site C2 (April 1 May 31 2011)



Summary

- Described the spatial and temporal domain of the salinity network and the resolution of measurements
- Demonstrated how the data streams are used to generate salinity regime metrics
- Revealed relationships between rainfall, flow and the mesohaline metrics
- Results allow assessment of CERP performance against natural variation
- Data results emphasize the need to collect data at high resolution so that we can record rare, but important events.
- In progress are tools to investigate relationships between biota and antecedent salinity and temperature conditions (i.e., frequency of mesohaline conditions 30 days prior to biota sampling).



Thank you

