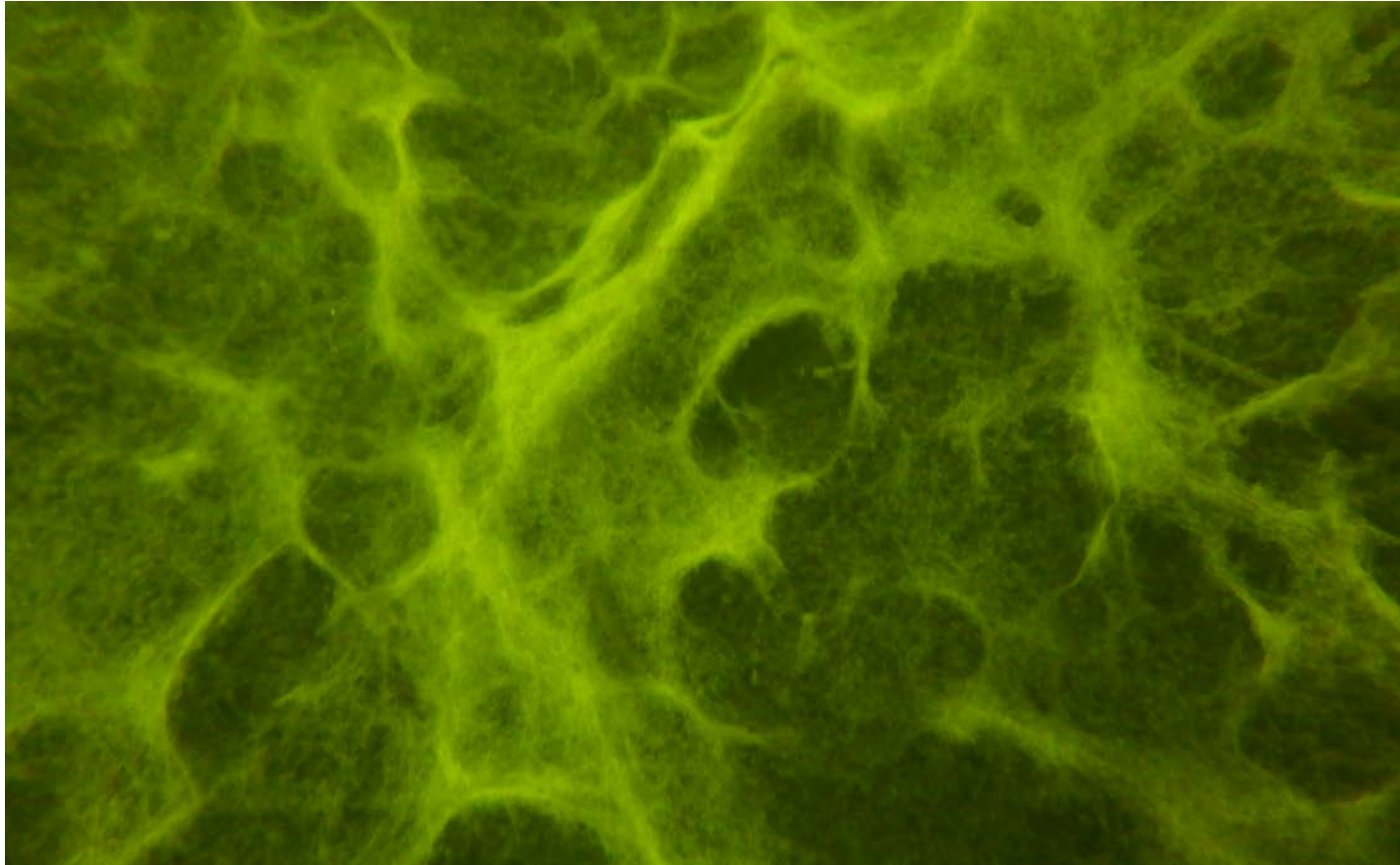


Canal Restoration in Monroe County Benthic Monitoring Report



Jason Howard and James Fourqurean
Seagrass Ecosystems Research Lab
Florida International University

FKNMS Steering Committee Meeting
September 7th, 2016

Made possible by



Christian Lopes
MSc student



Sara Wilson
SERL Lab Manager

Made possible by



Townships
Homeowner Organizations
Individuals



**Seagrass Ecosystems
Research Lab**
Florida International University



About Us

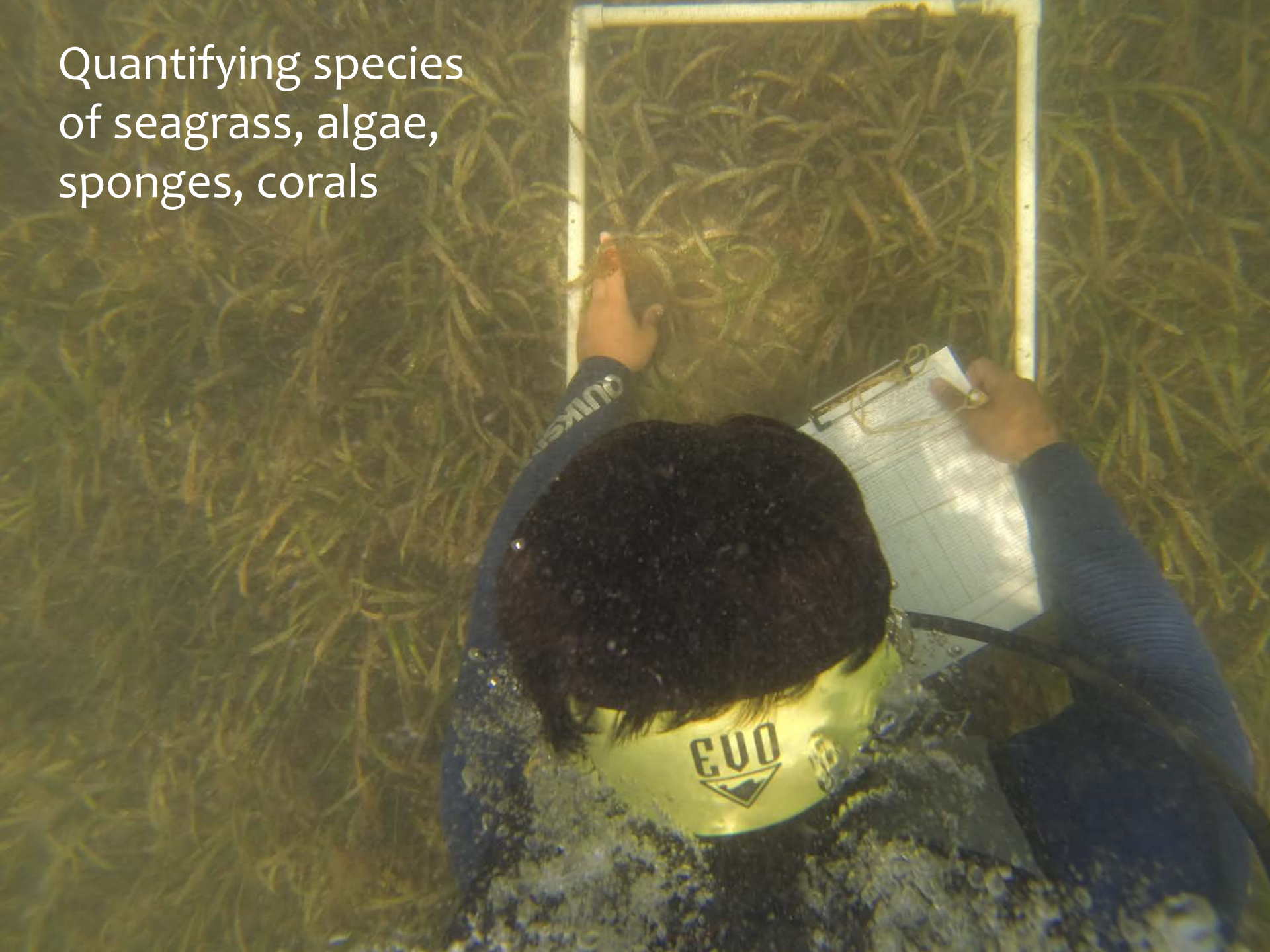


<http://seagrass.fiu.edu>
jhowa033@fiu.edu



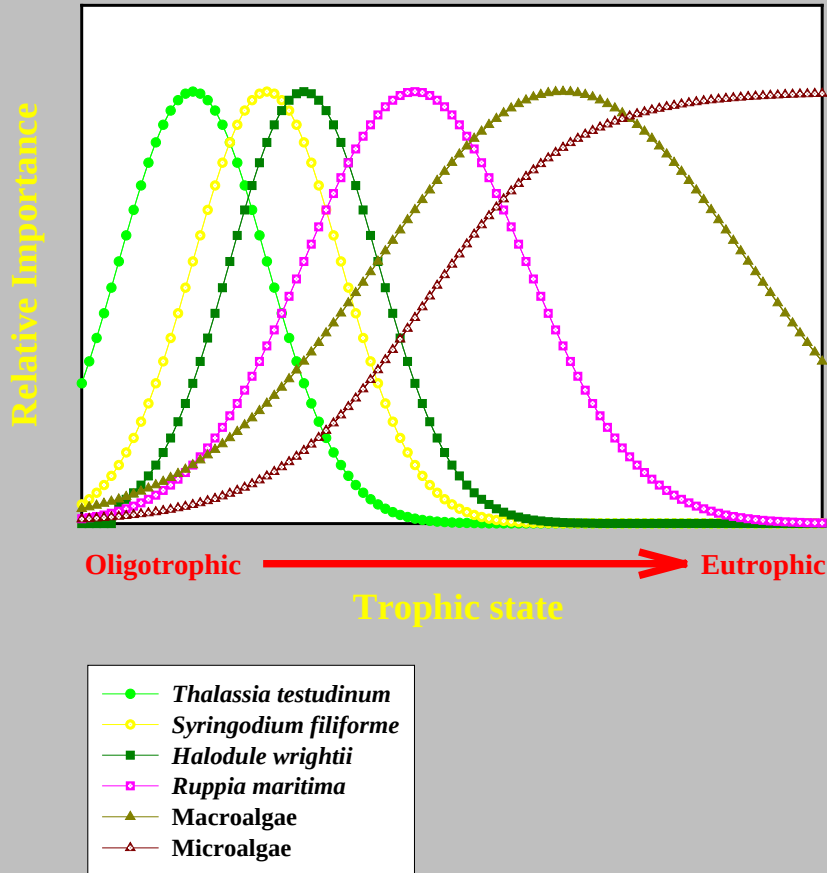


Quantifying species
of seagrass, algae,
sponges, corals



Benthic Monitoring for Water Quality

Eutrophication model



Explicit model of ecosystem behavior #1

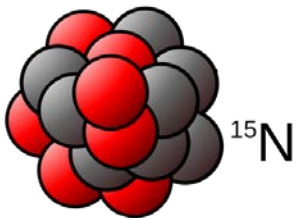
Nutrient pollution will lead to changes in relative abundances of primary producers in a predictable way.

Using Seagrasses Tissue

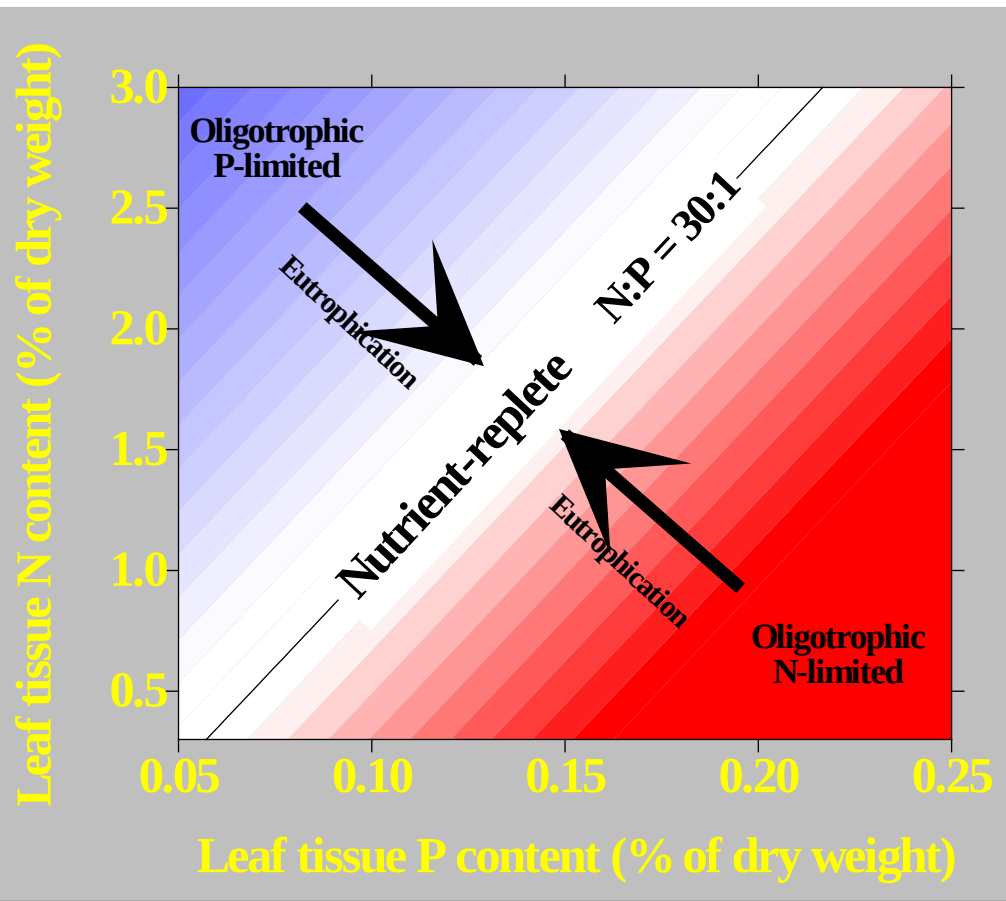
C:N:P

$^{13}\text{C}/^{12}\text{C}$

$^{15}\text{N}/^{14}\text{N}$



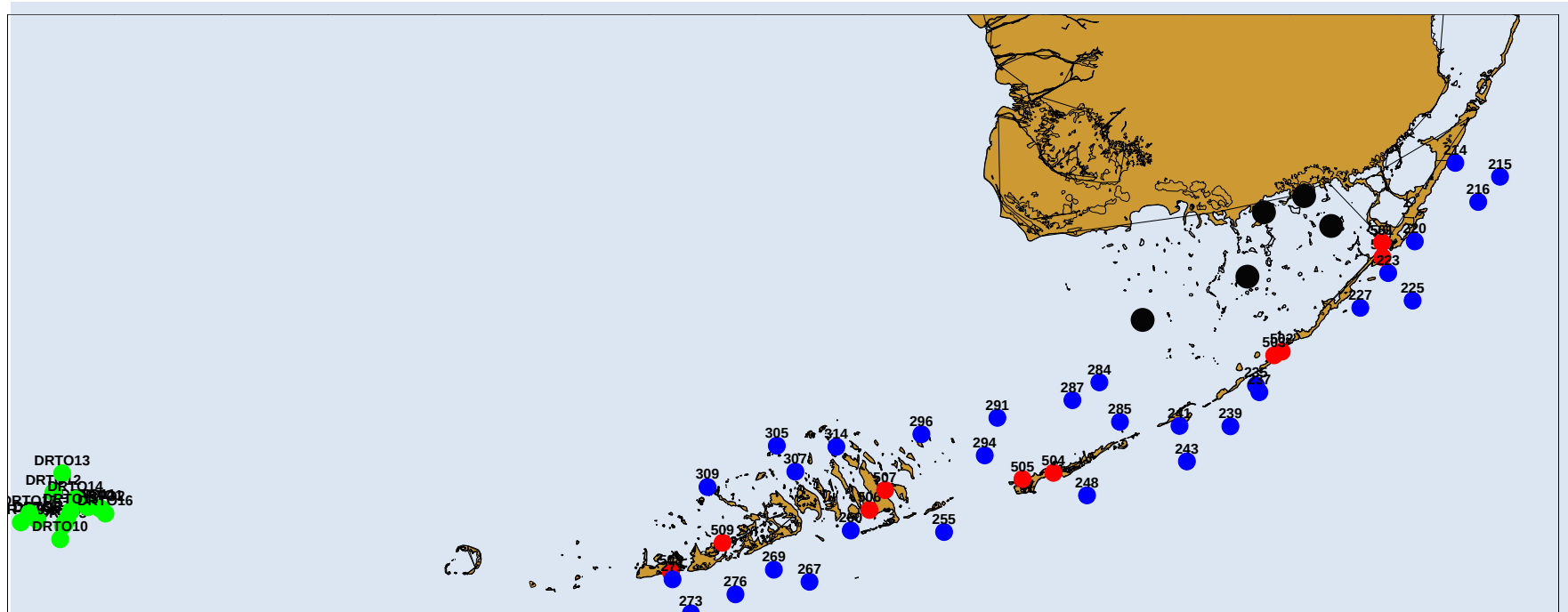
Benthic Monitoring for Water Quality



Explicit model of ecosystem behavior #2

Nutrient pollution will shift N:P ratios of primary producers towards a taxon-specific “Redfield ratio”

Benthic Monitoring for Water Quality



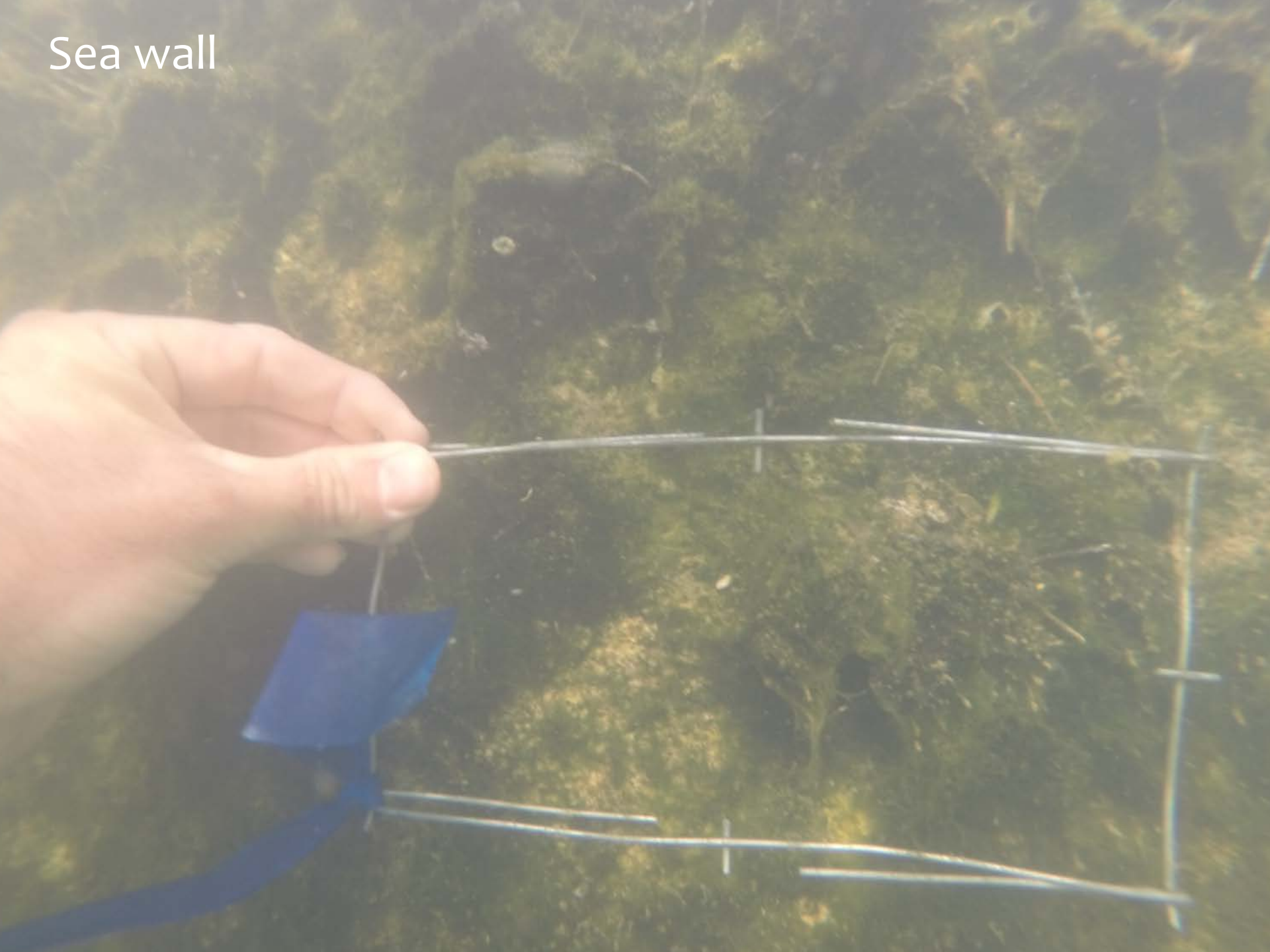
Original 30 sites (1995)

17 sites in Dry Tortugas (2011)

10 sites for nearshore emphasis (2012)

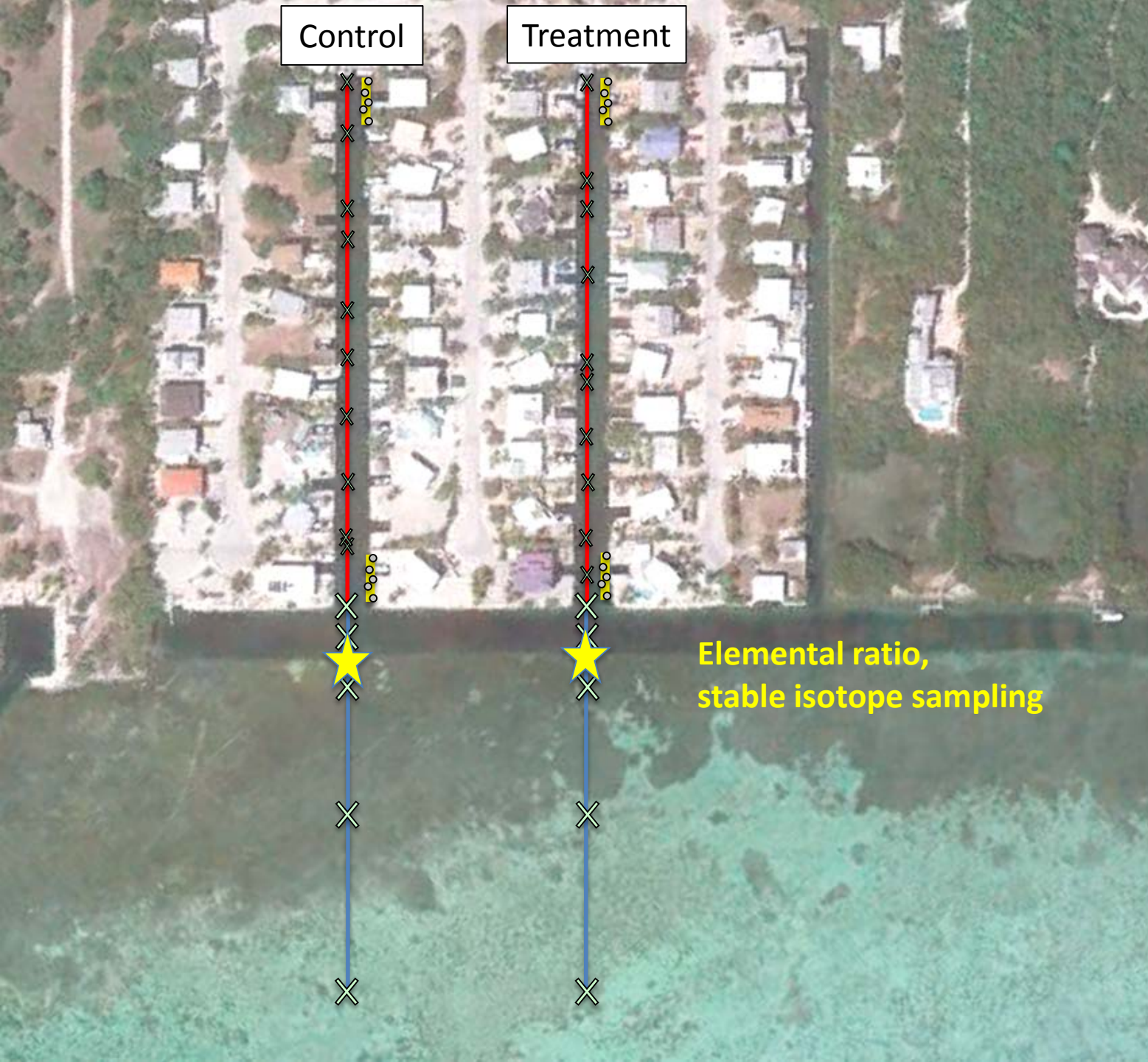
5 sites for Everglades LTER (2000)

Sea wall

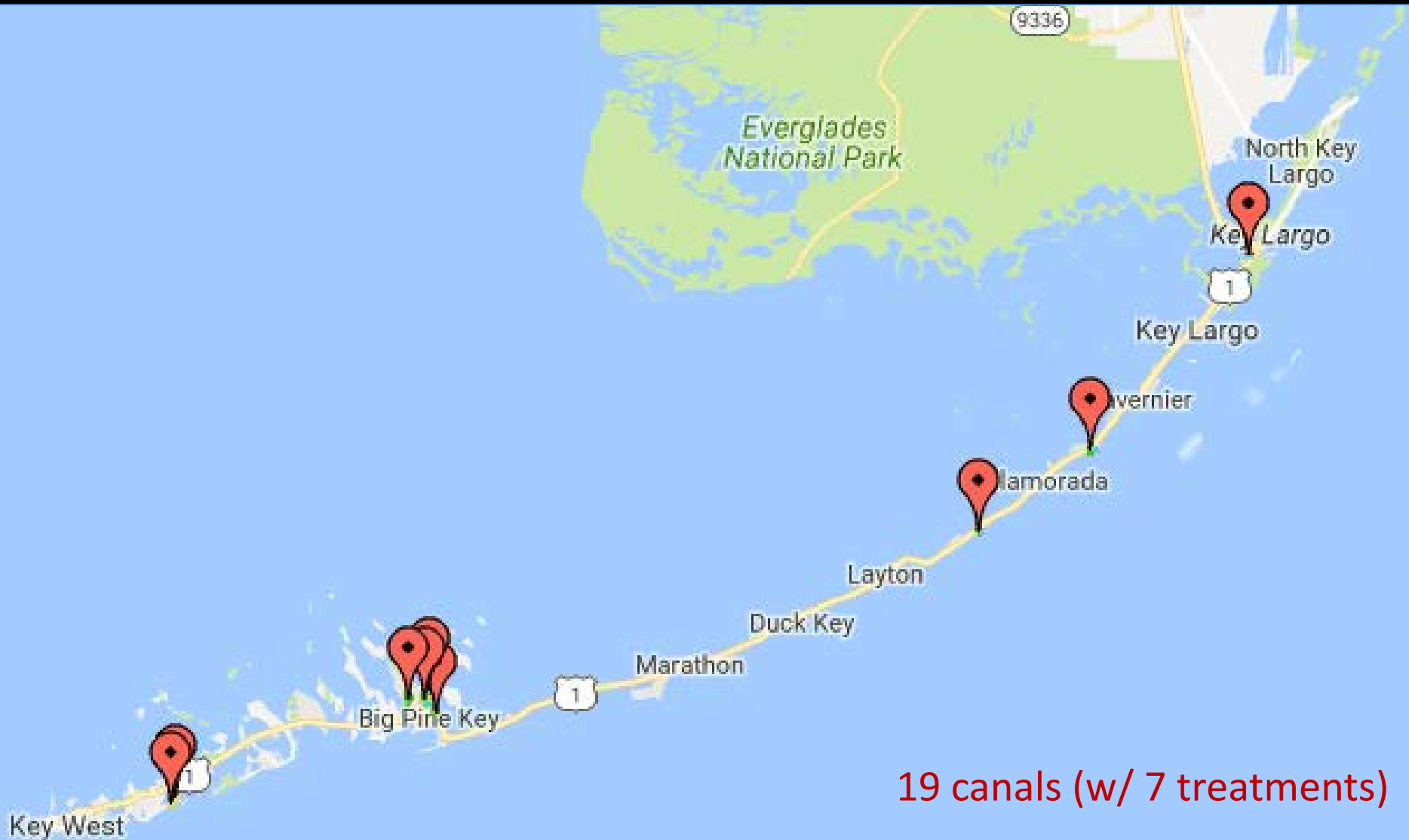


Sediment Characteristics





Monitoring Canals



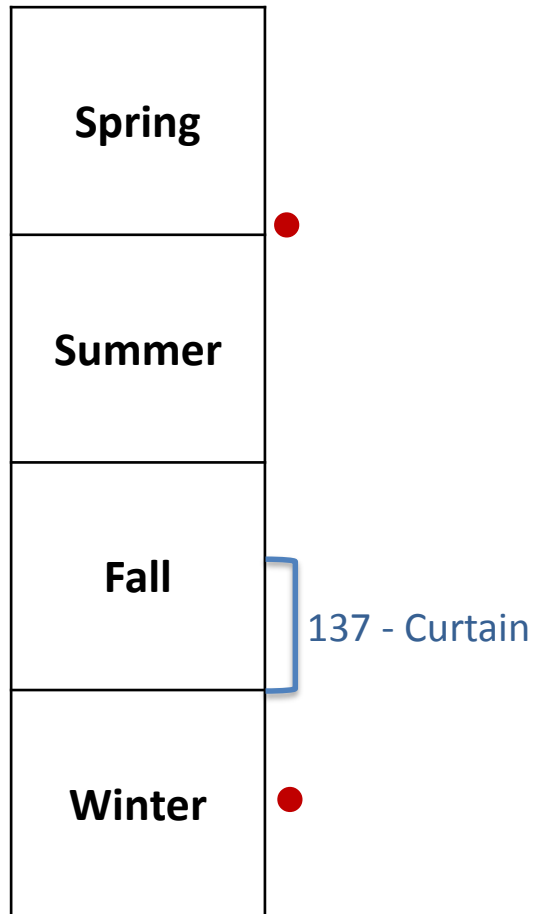
19 canals (w/ 7 treatments)

5 Islamorada canals

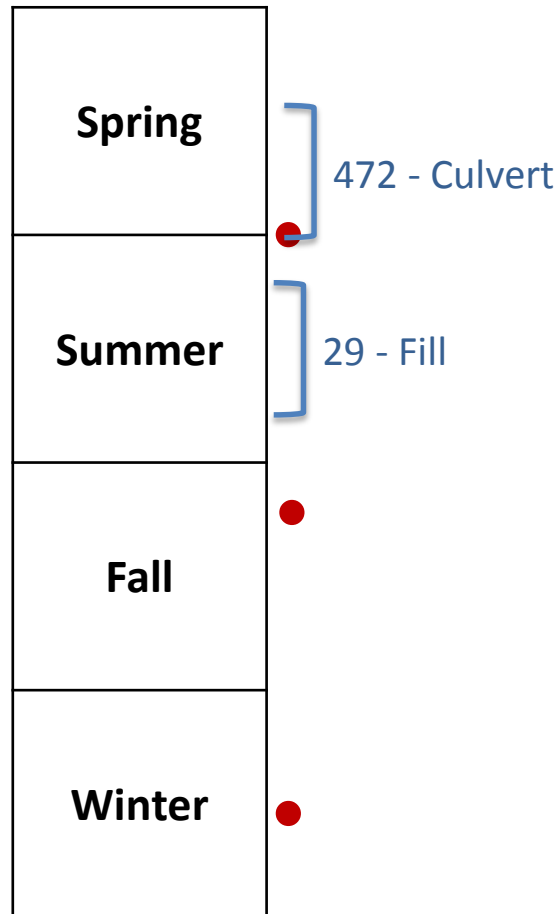
Monitoring Canals

● Sampling

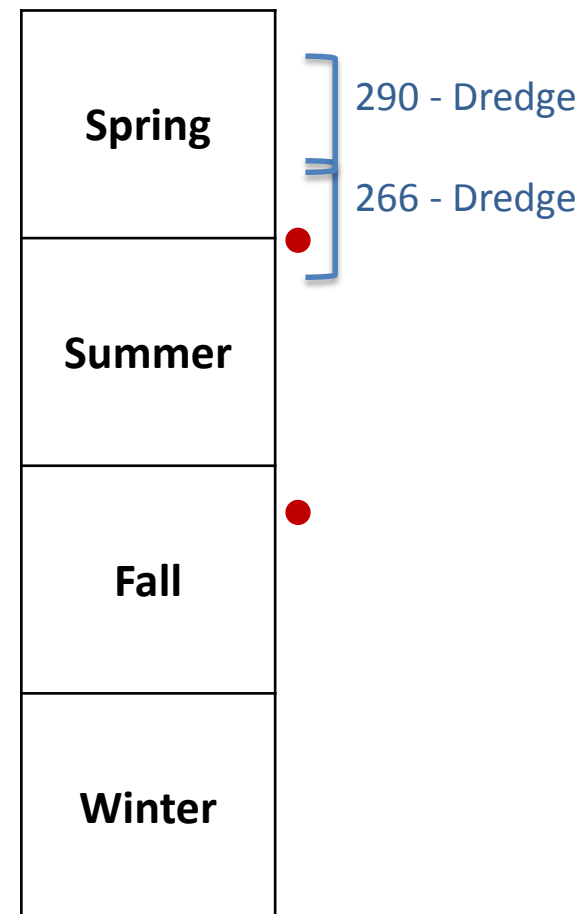
2014



2015



2016



Effect on Seagrasses

Canal	Distance from Canal Mouth (m)				
	0	10	50	100	250

Thalassia testudinum

28	0	4	2	4	1
29	2	4	5	4	0
132	0	0	1	0	1
137	0	0	2	0	5
147	0	0	0	2	2
148	0	0	0	5	0
263	0	0	5	5	0
266	0	3	4	4	0
277	1	2	2	0	3
278	1	0	0.5	0	3
282	0	0	0	5	5
287	0	0	0	0	4
288	0	0	0	0	5
290	0	0	3	4	1
293	0	0	0	0	4
472	0	0	2	1	4
476	0	0	1	5	2



Canal	Distance from Canal Mouth (m)				
	0	10	50	100	250

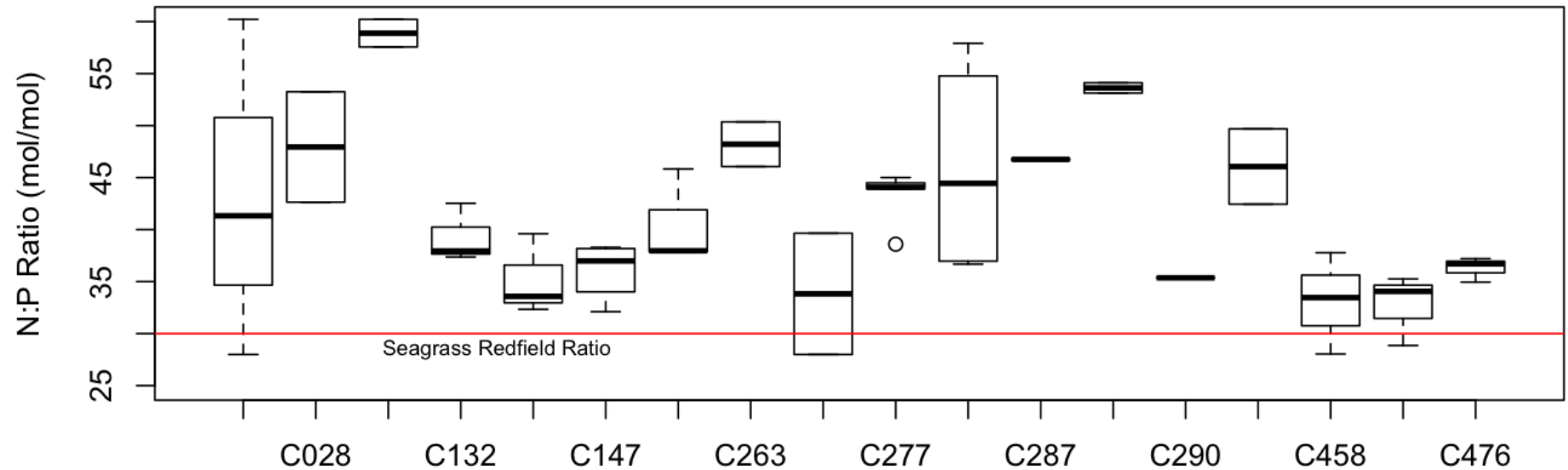
Halodule wrightii

28	2	2	2	0	0
29	0	0	0	0	2
132	0	0	0	0	0
137	0	0	0	1	0
147	1	0	4	3	3
148	2	0	0	0	0
263	0	0	0	0	0
266	0	3	0	0	0
277	2	3	2	4	0
278	5	3	5	4	0
282	0	0	3	2	0
287	0	0	0	0	0
288	0	0	0	0	0
290	0	0	0	0	0
293	0	0	0	0	0
472	0	2	2	1	0
476	0	0	1	0	0



Effect on Seagrasses

N:P



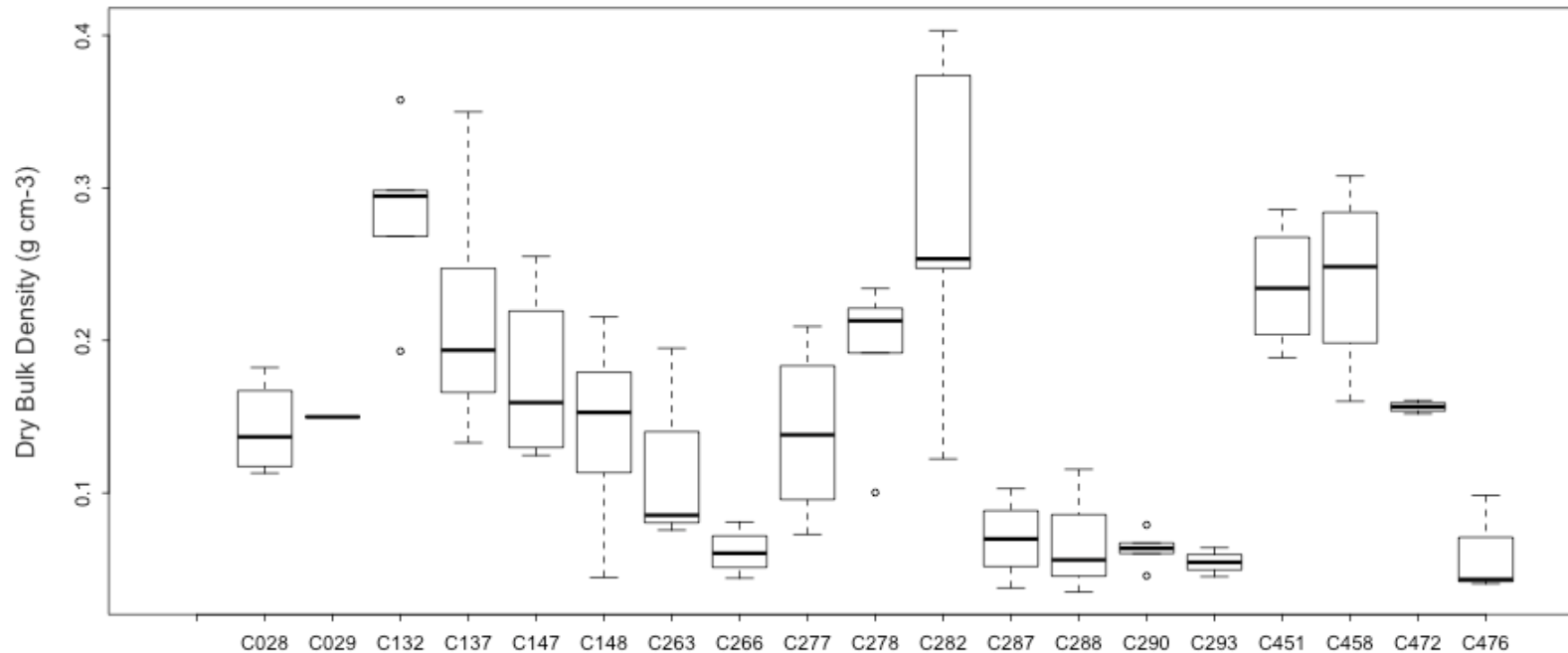
Effect on Seagrasses

^{15}N

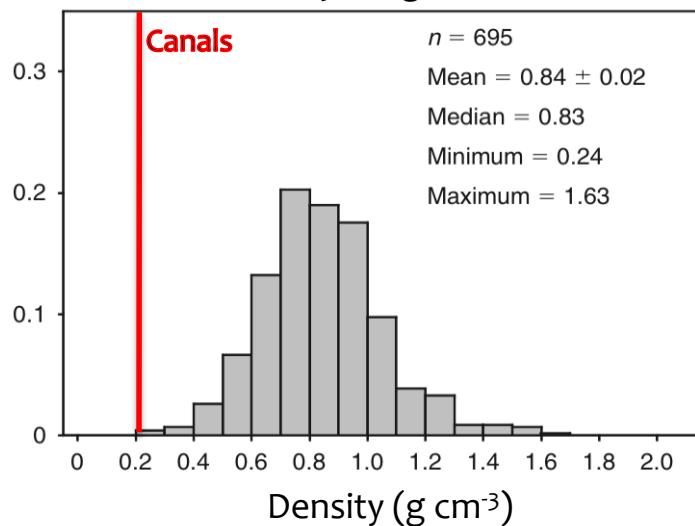
Higher $^{15}\text{N}/^{14}\text{N} \rightarrow$ More anthropogenic influence

	$\delta^{15}\text{N}$	
	South FL	Canals
Mean	2.0	2.1
n	78.0	45.0
SE	0.2	0.3
Median	1.8	2.4
Minimum	-2.2	-2.6
Maximum	5.4	7.2

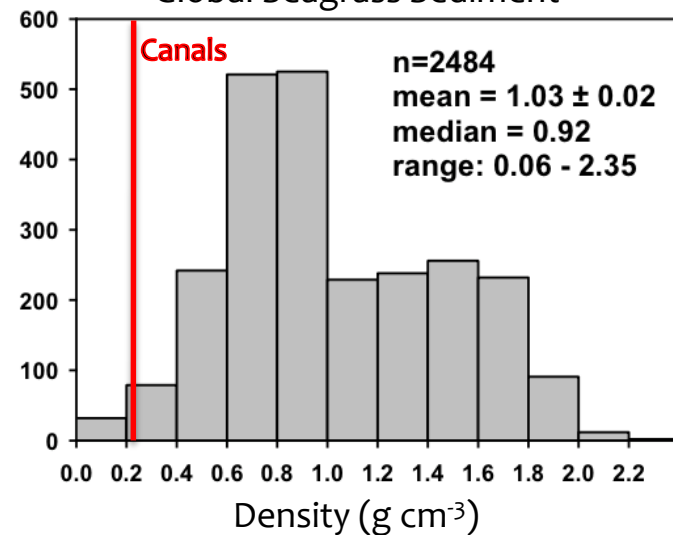
Sediment Density



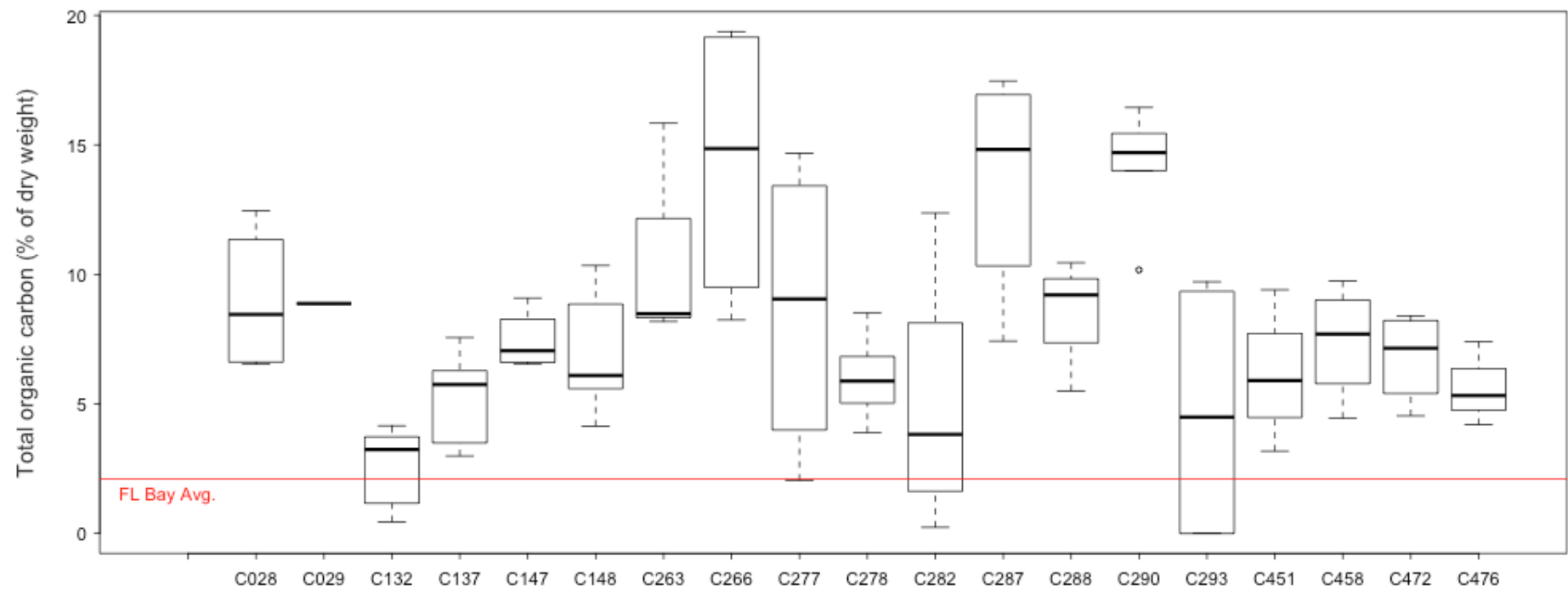
Florida Bay Seagrass Sediment



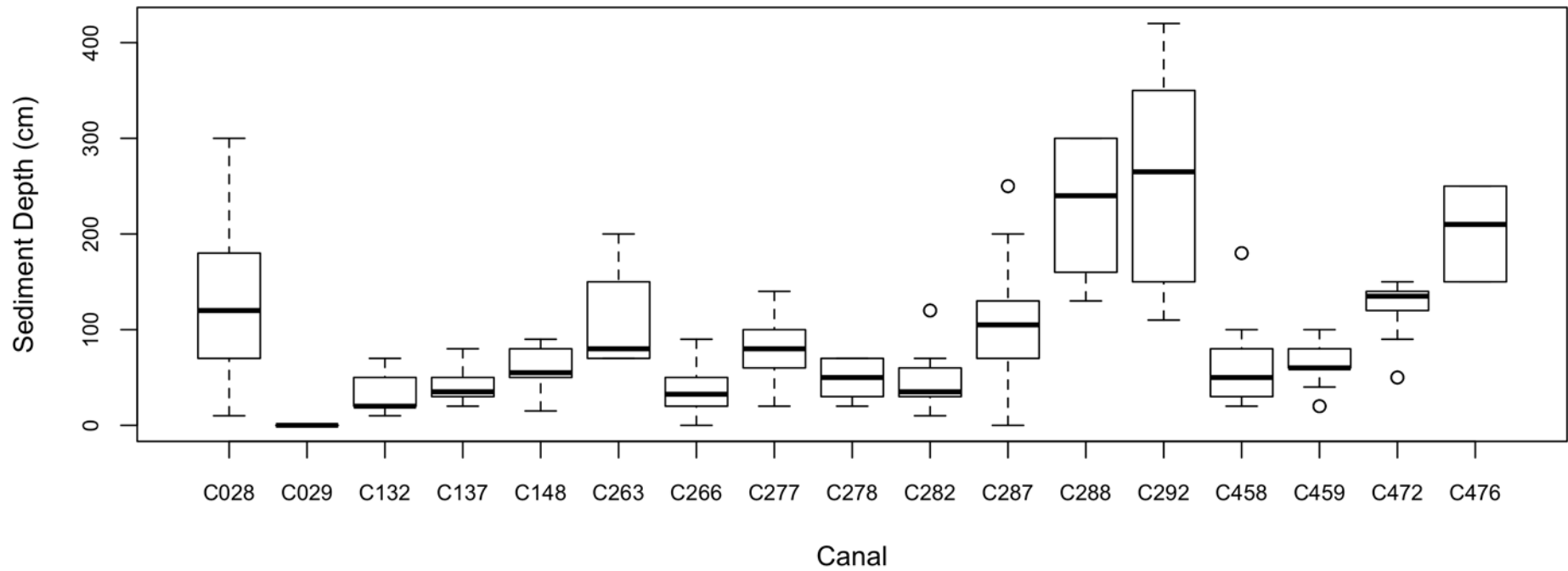
Global Seagrass Sediment

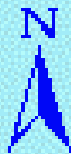


Sediment Organic Carbon



Sediment Depth





THE FLORIDA KEYS

GULF
OF
MEXICO

Miami

1

Homestead

Everglades
Natl. Park

Florida
City

Key
Largo

Tavernier

Islamorada

Long Key

Marathon

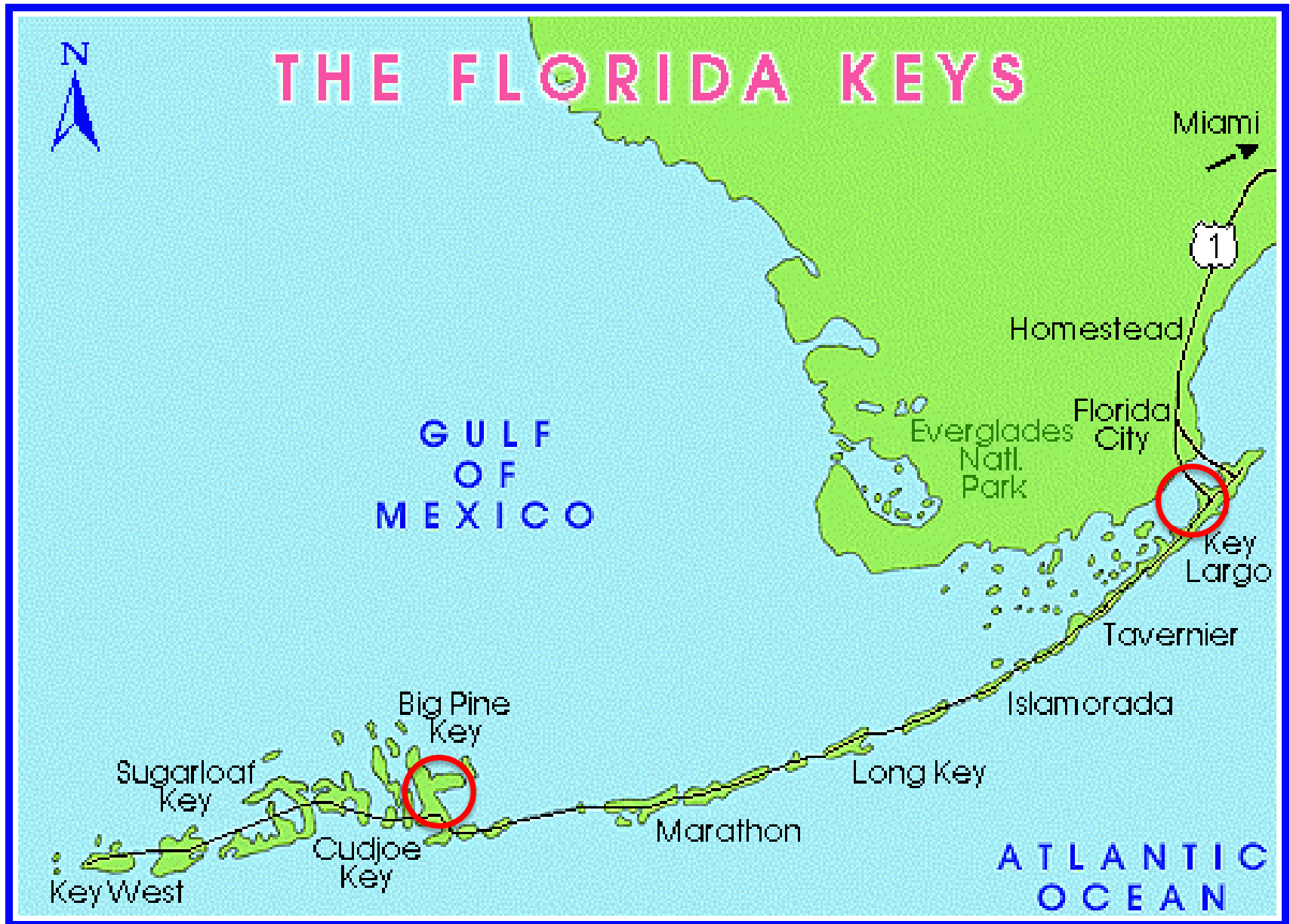
Big Pine
Key

Sugarloaf
Key

Cudjoe
Key

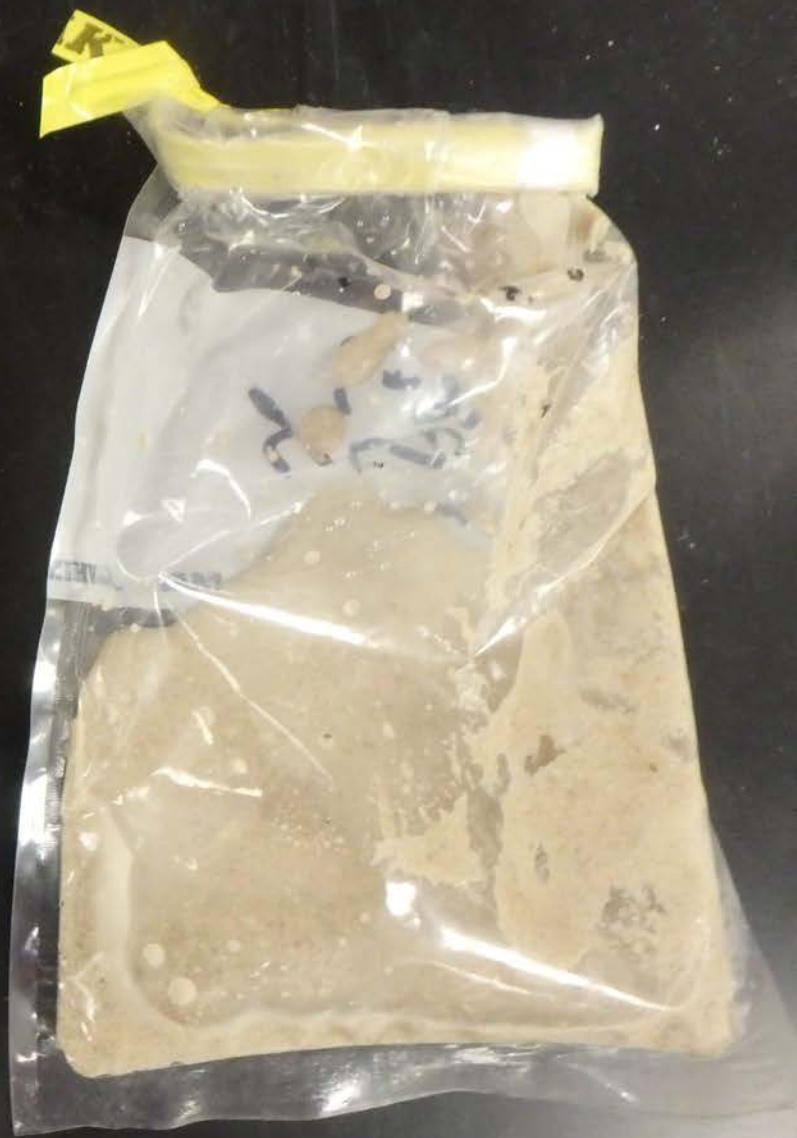
Key West

ATLANTIC
OCEAN



Canal 29 – Key Largo

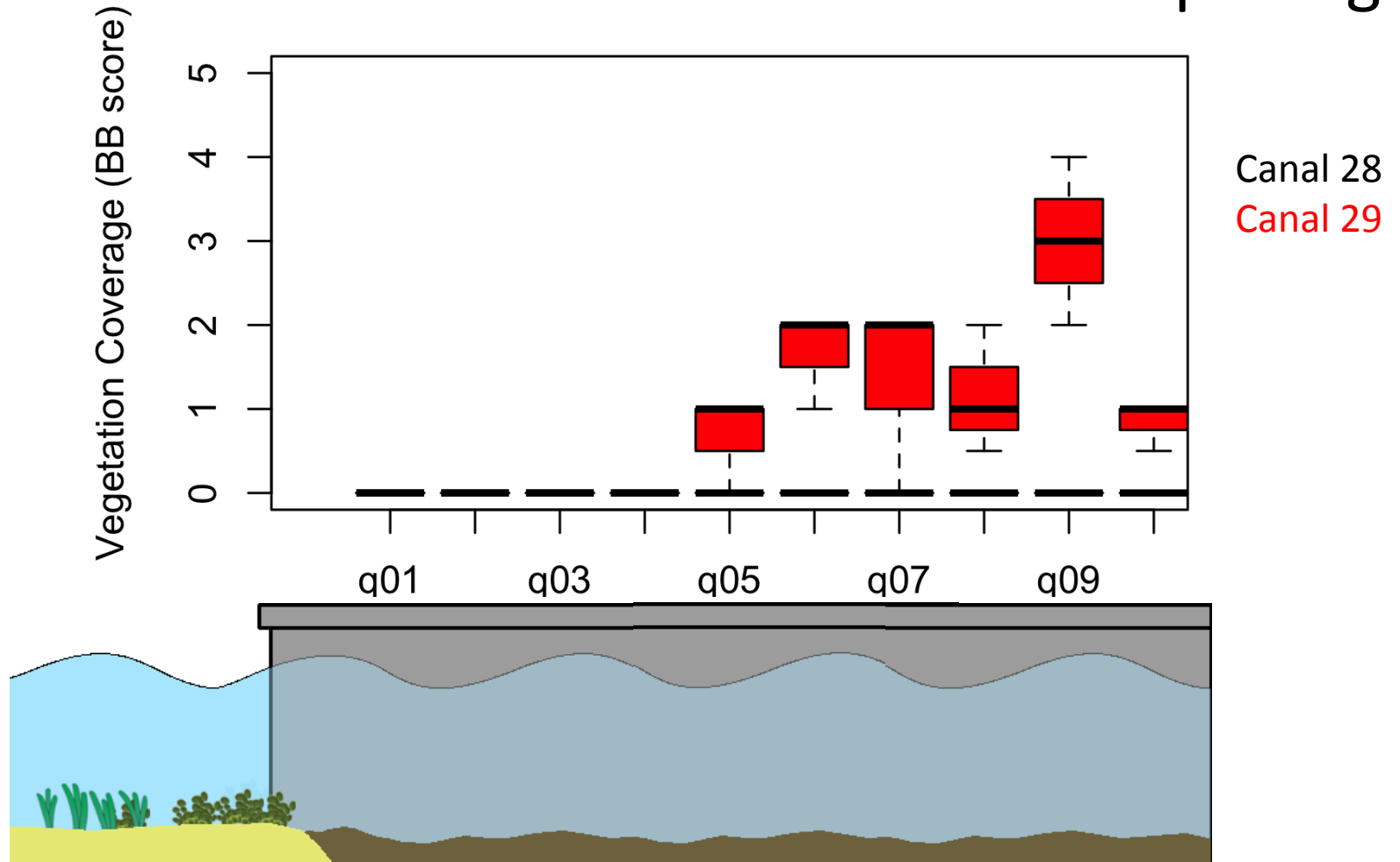




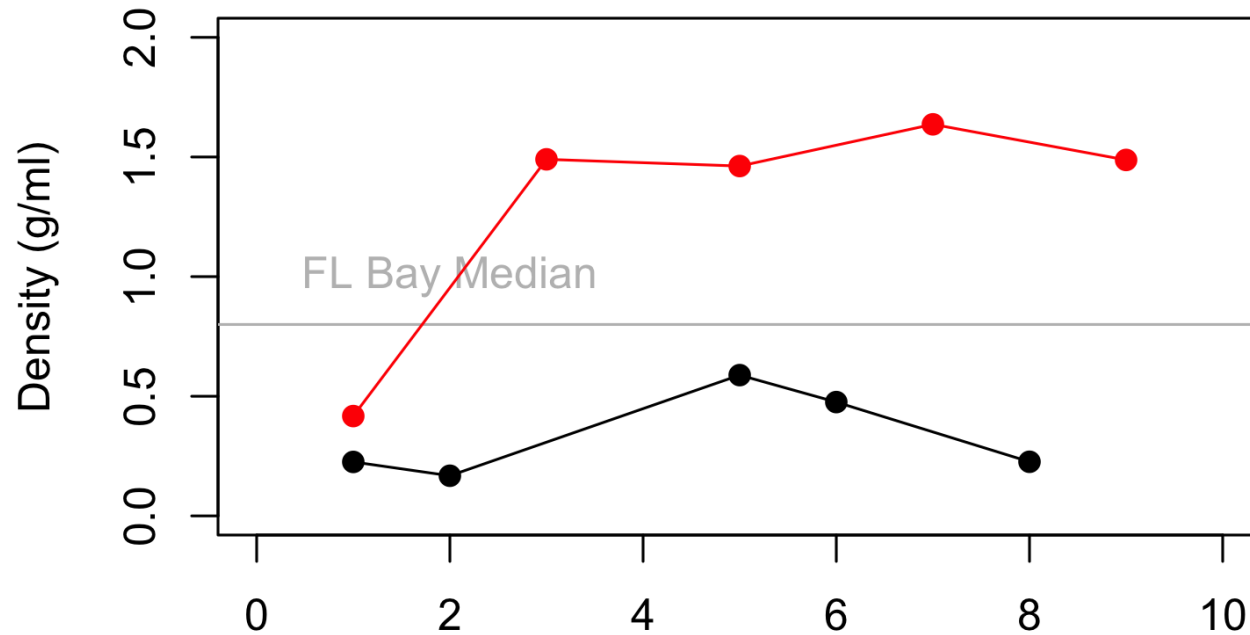


Canals 28 and 29

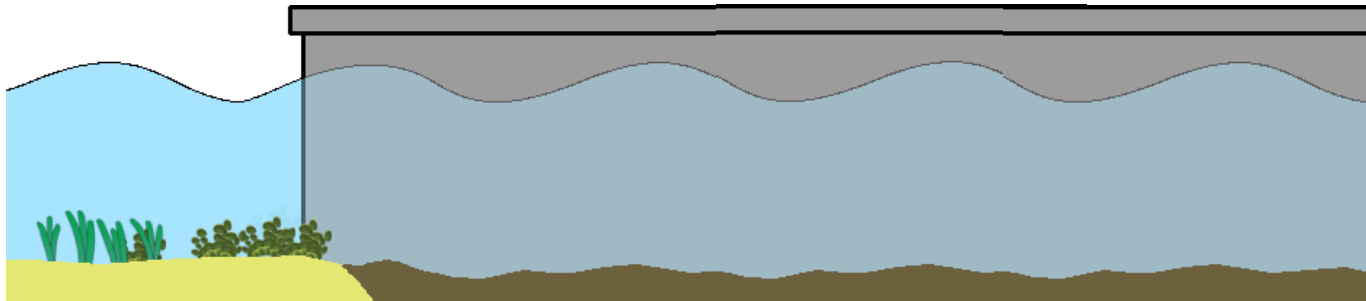
Two months after Opening



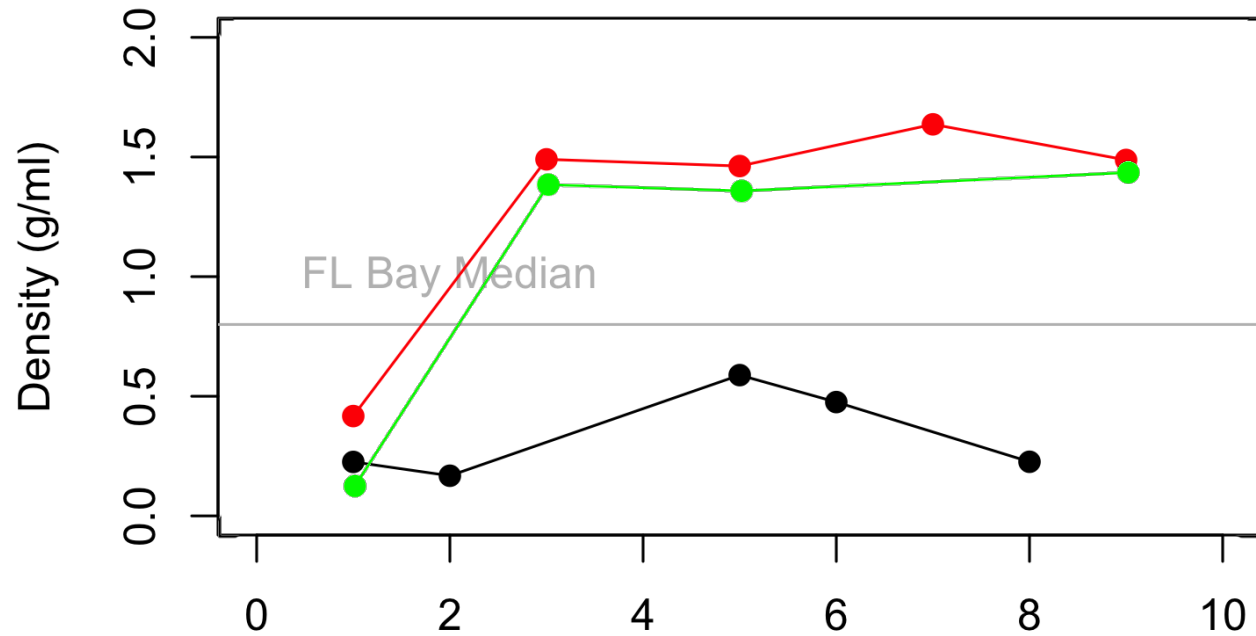
Canals 28 and 29



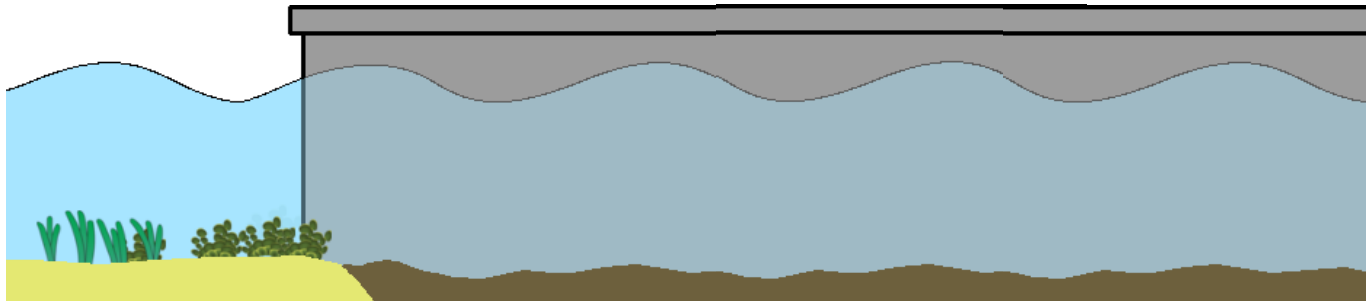
Canal 28
Canal 29
3 mo. after



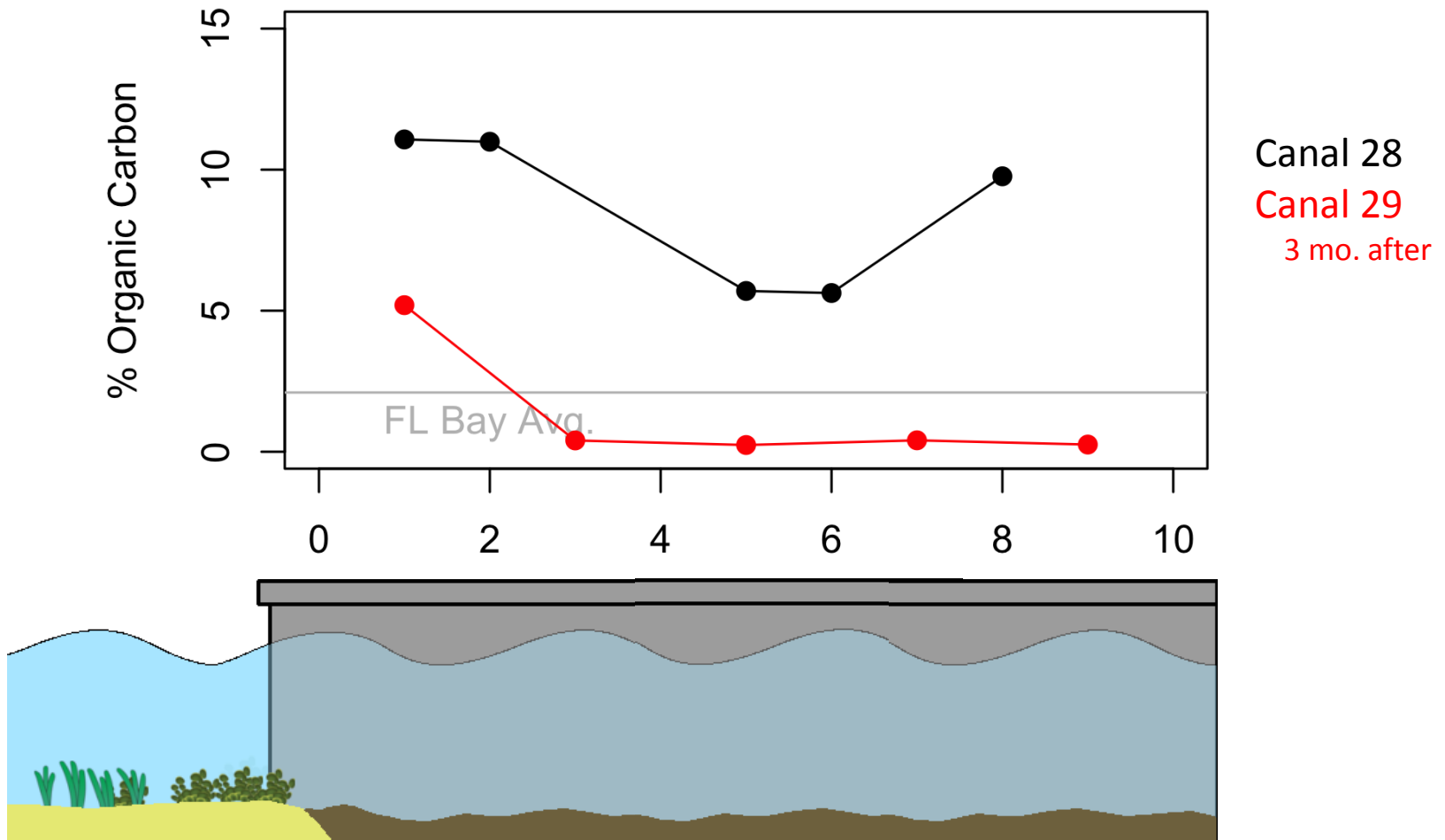
Canals 28 and 29



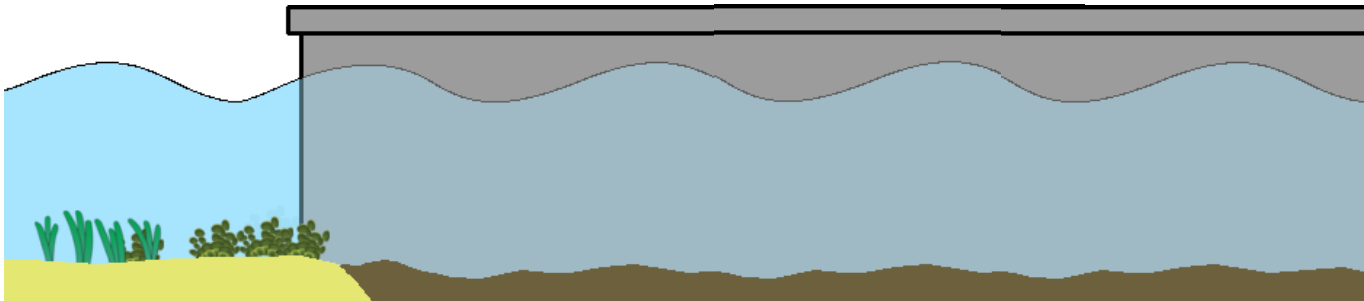
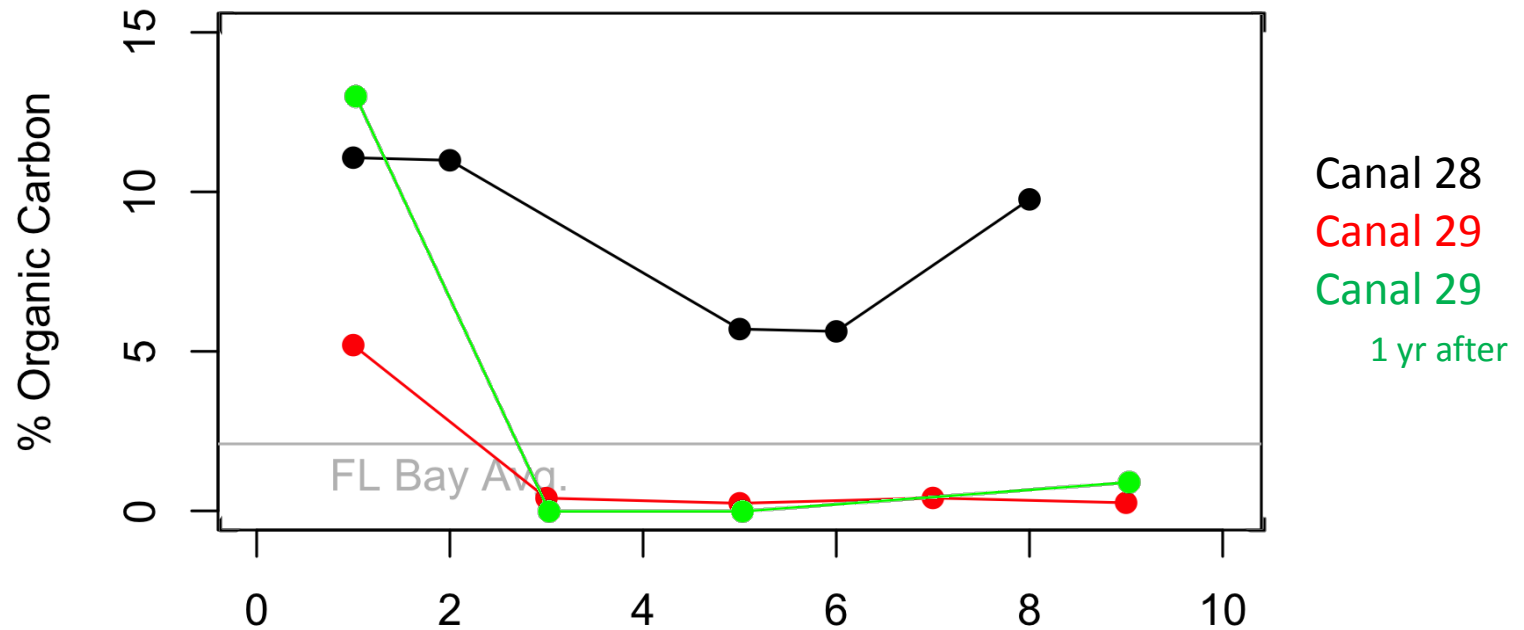
Canal 28
Canal 29
Canal 29
1 yr after



Canals 28 and 29



Canals 28 and 29



One year after Opening



Canal 266 – Big Pine



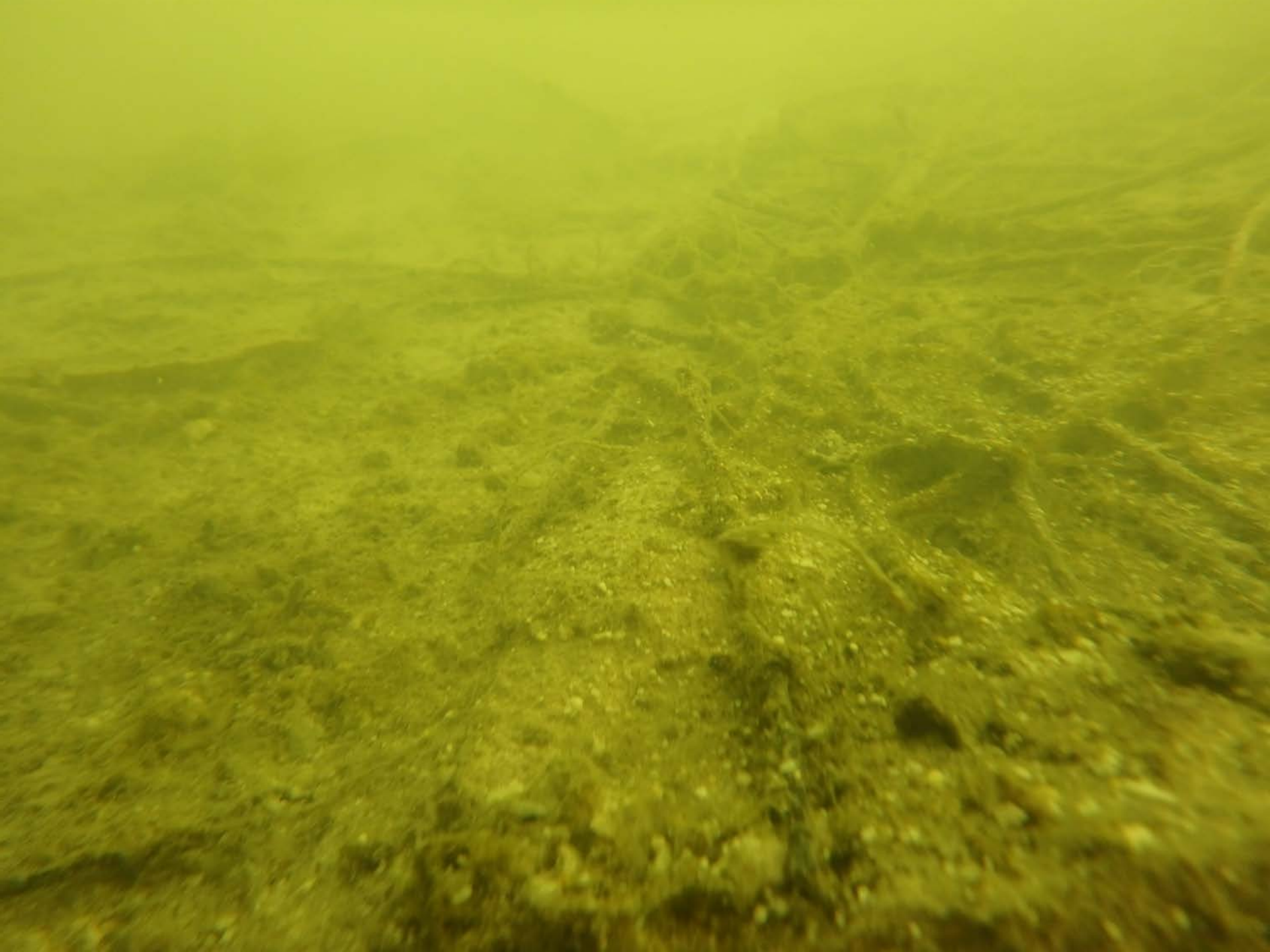
Canal 266- Before Dredging





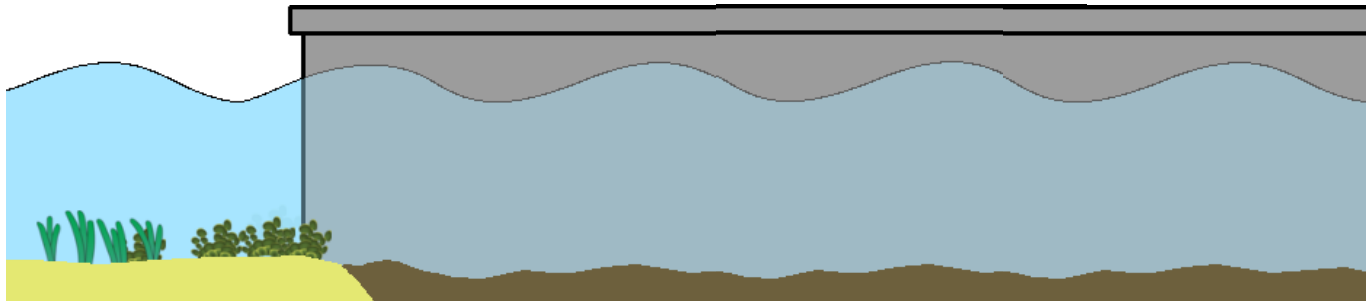
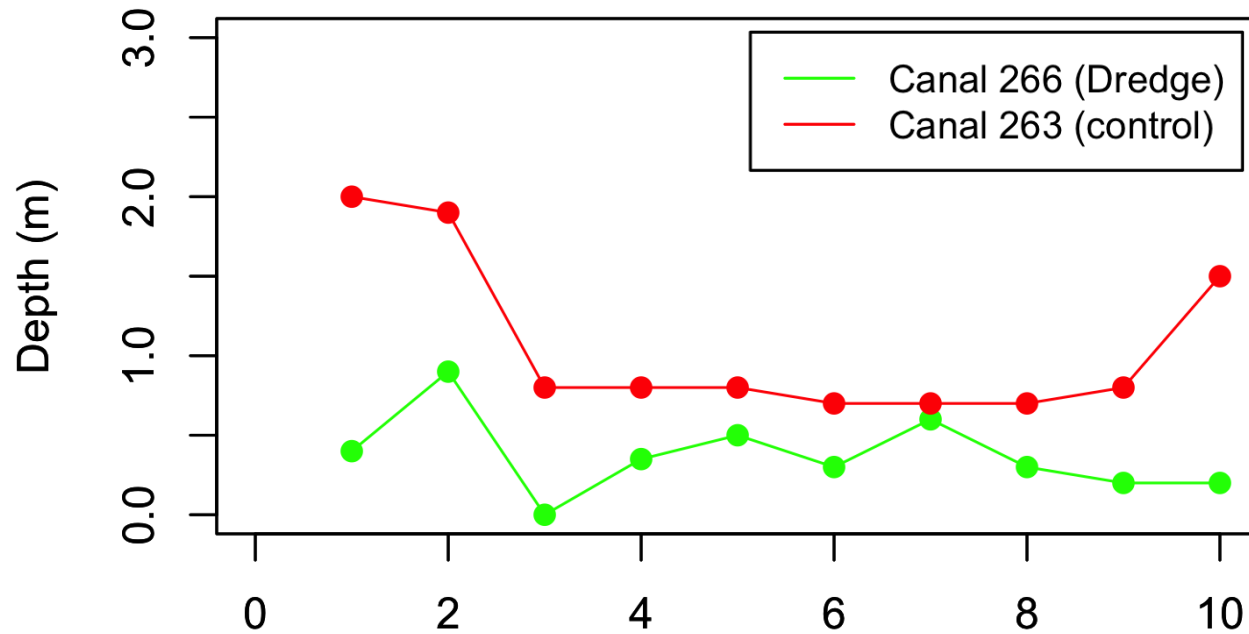
Canal 266- After Dredging



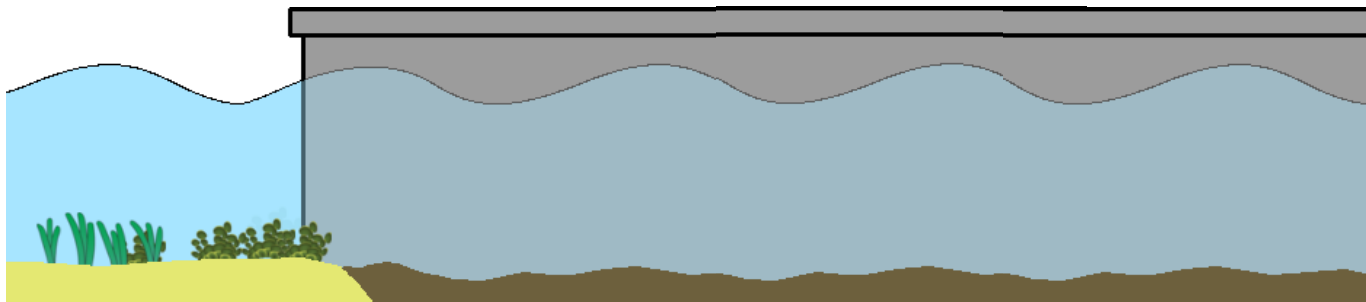
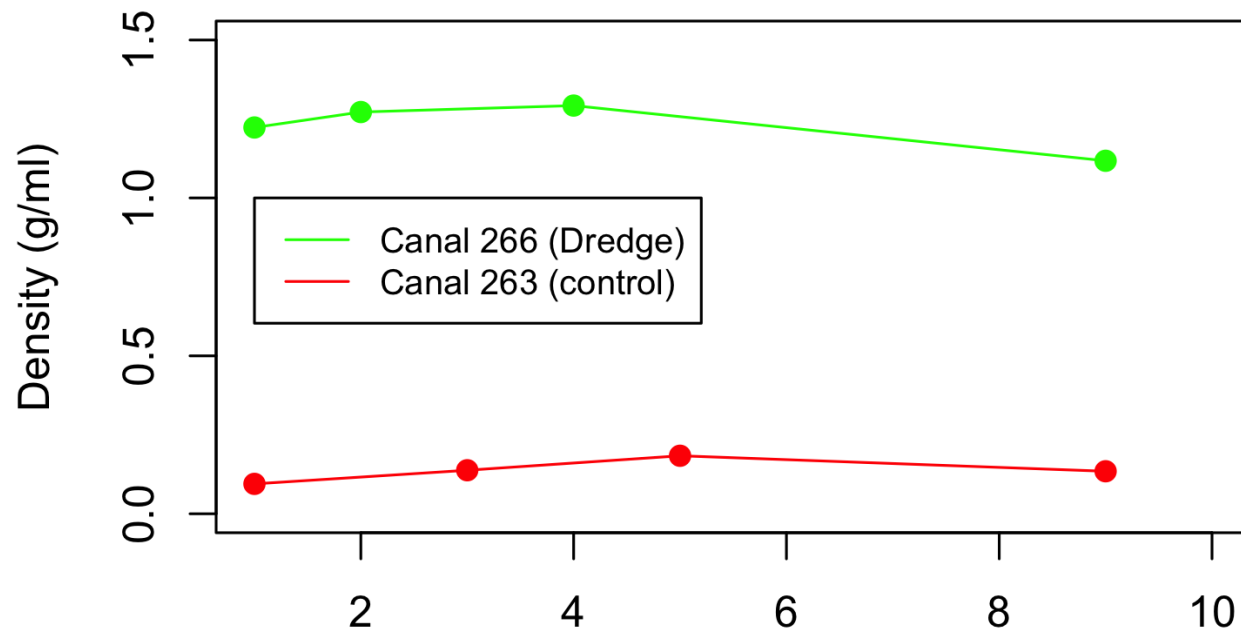




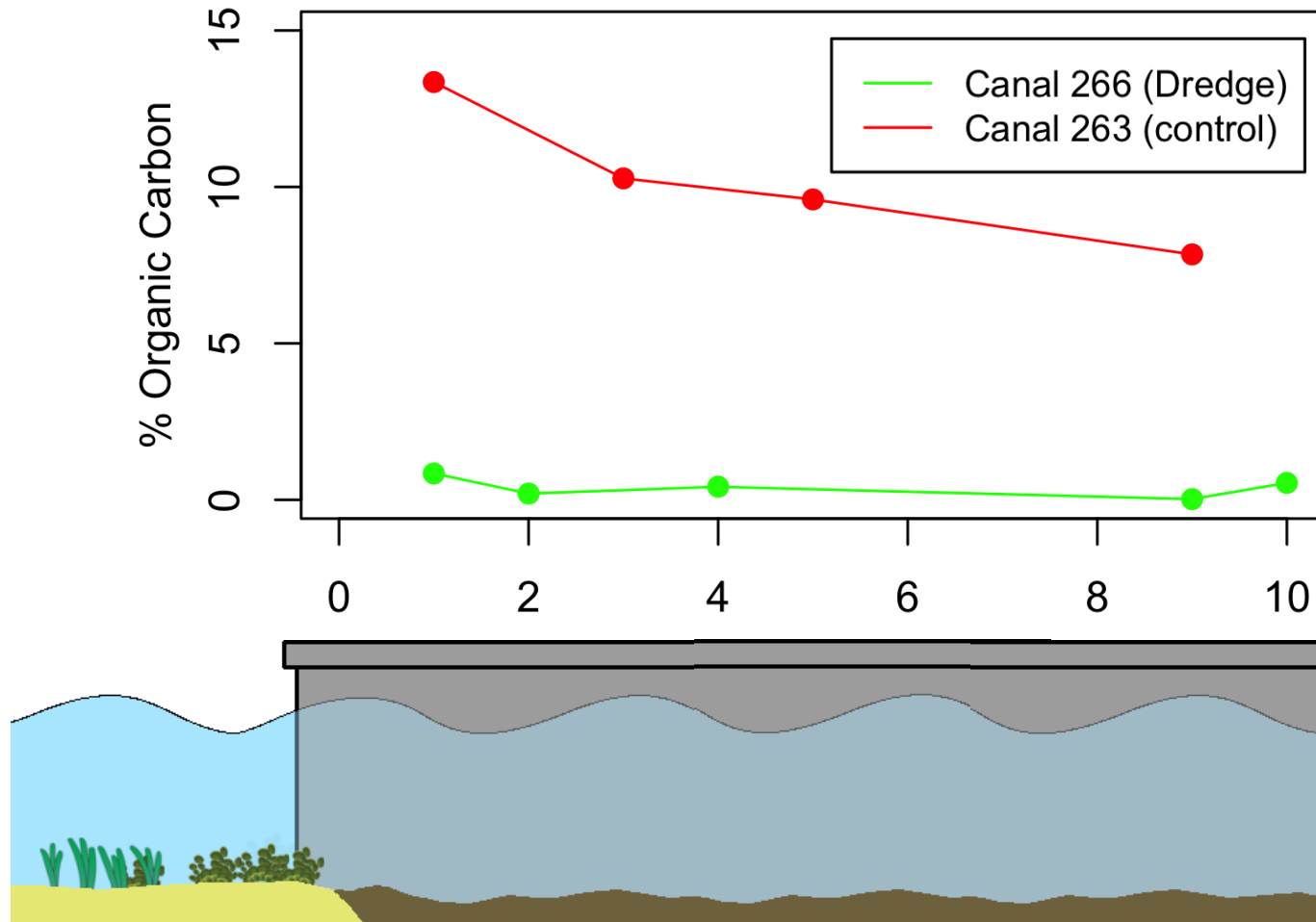
Canal 266



Canal 266



Canal 266

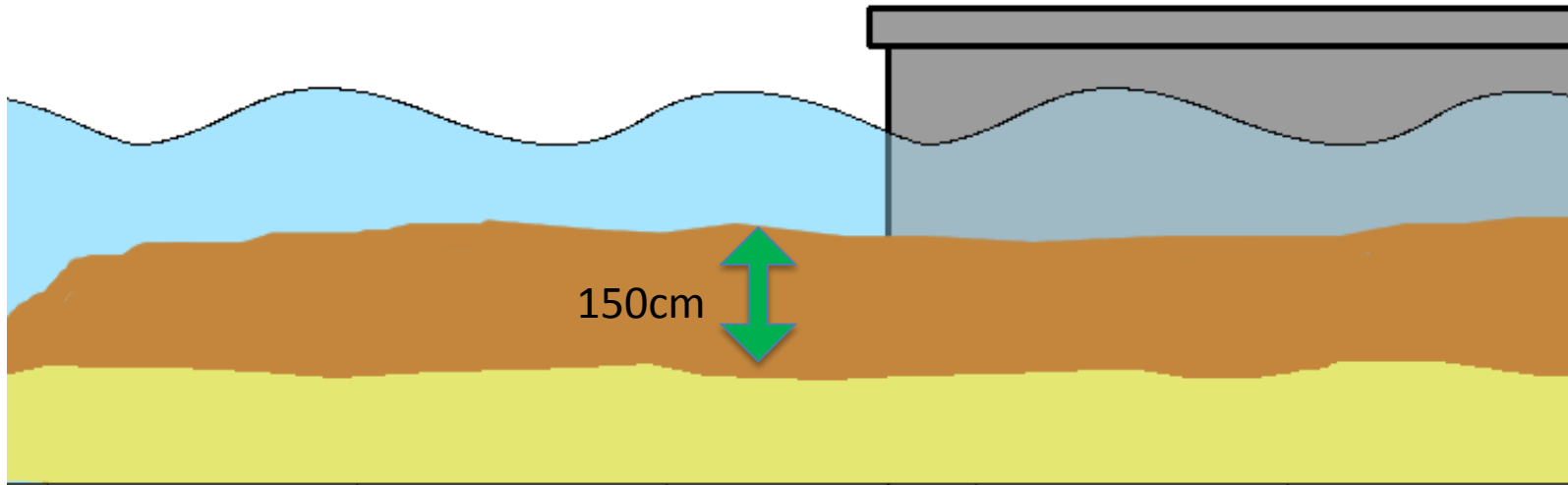




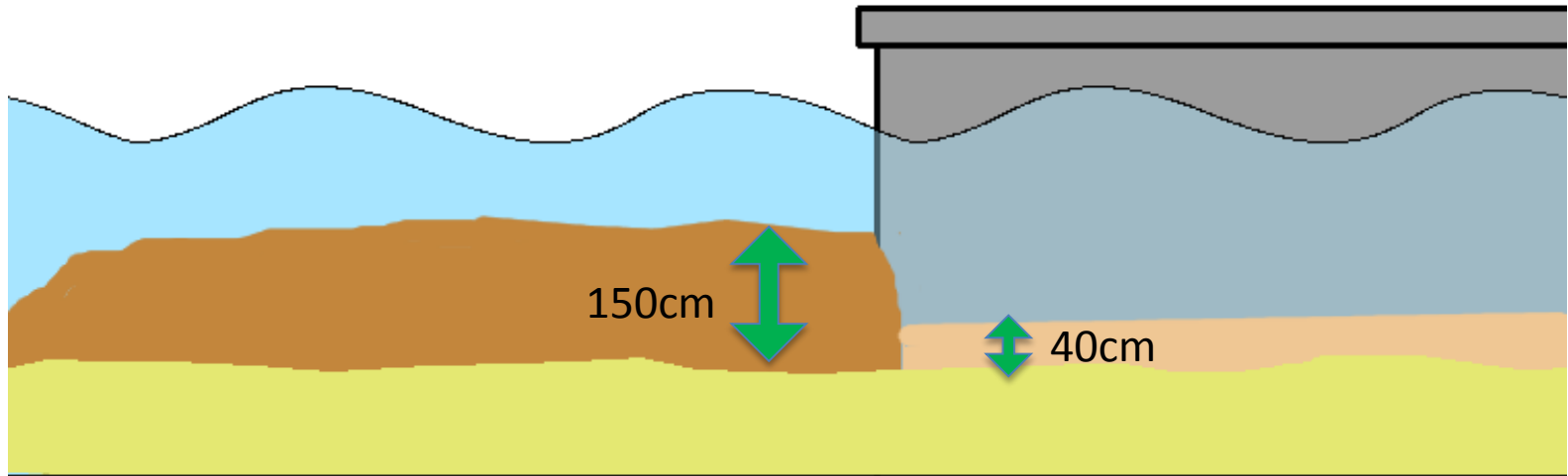


Canal 266

Before
Dredging



After
Dredging



Conclusions

- Most remediation Techniques are showing positive results on sediments
 - some on seagrass, algae and animals
- Care must be taken to preserve remediated canals
- Canals are affecting adjacent waters
 - Further sampling required to assess the effects of remediation on adjacent waters



<http://seagrass.fiu.edu>
jhowa033@fiu.edu