

A person wearing a wetsuit is shown from the waist down, kneeling on a sandy or silty bottom. They are holding a white bucket and a long vertical pole, likely used for sampling. The background is a bright, clear blue water surface.

Monroe County Canal Remediation Benthic Monitoring Program May 2018 Report

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**Water Quality Protection Program
Canal Subcommittee Meeting
May 23rd, 2018 – Marathon, FL**

Outline

- **Goals for the Monroe County Canal Remediation Benthic Monitoring Program**
- **Canal 28 and Canal 29 (Key Largo- fill)**
- **Canal 132 and Canal 137 (Tavernier- weed curtain)**
- **Canal 263 and Canal 266 (Big Pine Key- dredge)**
- **Canal 476 and Canal 472 (Geiger Key- culvert)**
- **Canal 293 and Canal 290 (Big Pine Key- dredge)**
- **Photos and anecdotal observations from post-Hurricane Irma sampling**
- **Deliverables timeline**

Project Timeline

● Sampling

2014



Spring

Summer

Fall

Winter

137 - Curtain

2015



Spring

Summer

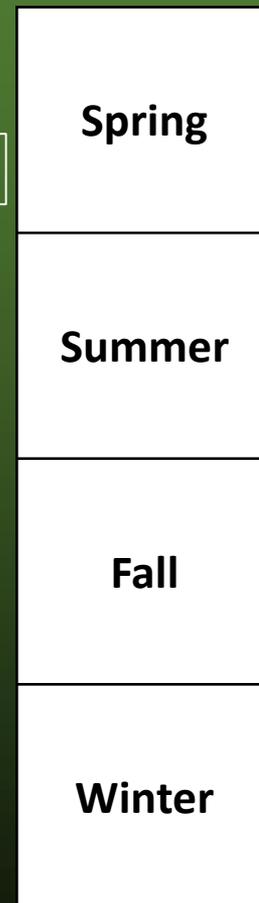
Fall

Winter

472 - Culvert

29 - Fill

2016



Spring

Summer

Fall

Winter

290 - Dredge

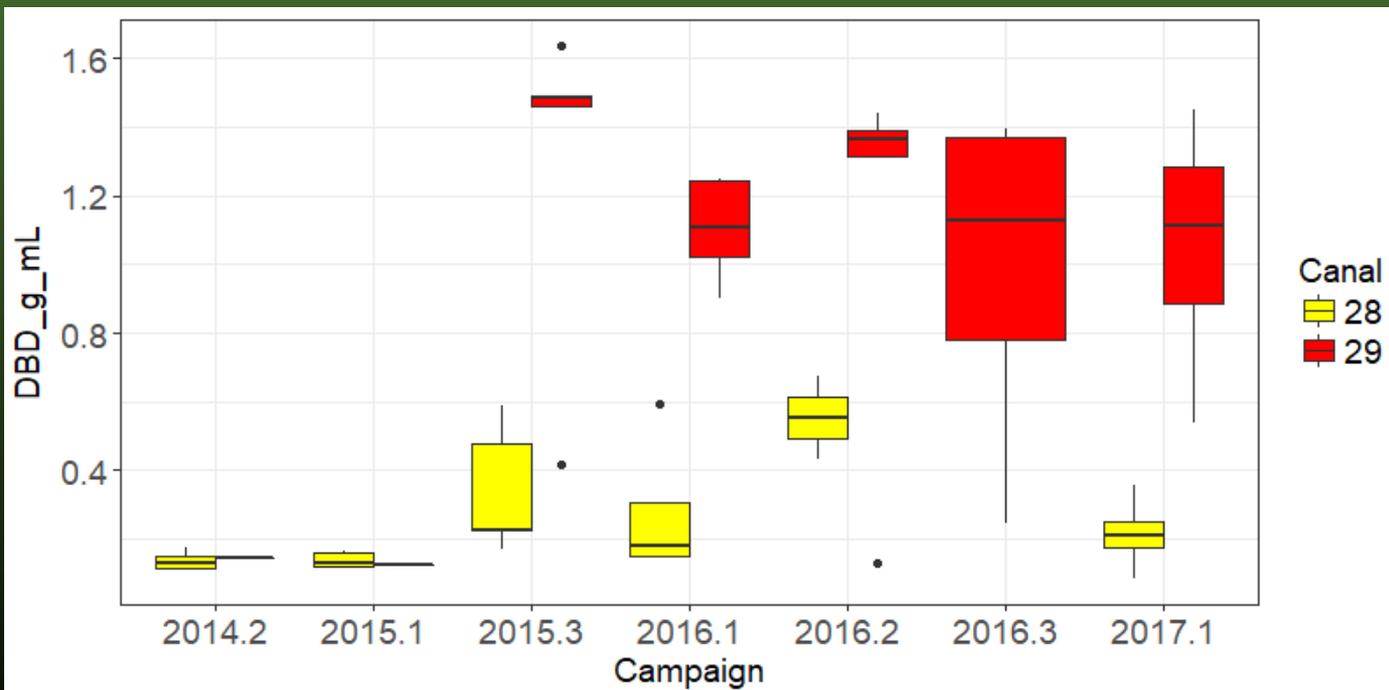
266 - Dredge

Canals 28 and 29 (Key Largo)



CANAL 28 - Control

CANAL 29 – Filled in summer 2015



Sediment dry bulk density (DBD) is the dry weight of the sediment.

Fluffy, fine mud sediment has a low DBD and coarse, sandy sediment has a higher DBD.

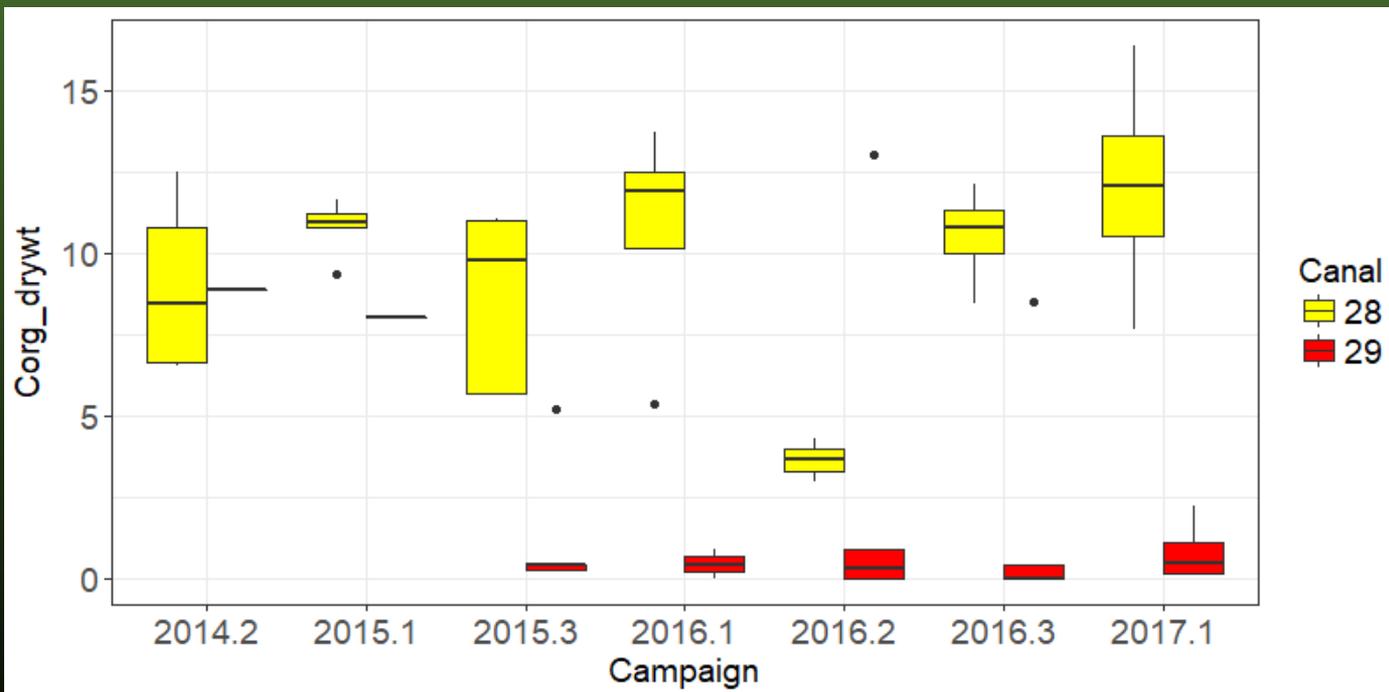
C28 has lower DBD than **C29** ($p < 0.05$).

Canals 28 and 29 (Key Largo)



CANAL 28 - Control

CANAL 29 – Filled in summer 2015



Organic carbon (Corg) is the non-mineral component of sediments.

Fluffy, fine mud sediment has more Corg and coarse, sandy sediment has a less Corg.

C28 has higher sediment Corg than **C29** ($p < 0.05$).

Canals 28 and 29 (Key Largo)



CANAL 28 - Control

CANAL 29 – Filled in summer 2015

We have recorded seagrass within **Canal 29** but not **Canal 28**

During our most recent sampling:

Seagrass and calcareous green macroalgae present 10m from mouth of **Canal 28**

Calcareous green macroalgae noted at mouth of **Canal 29**,
seagrass present 50m from mouth

Nutrient signatures of seagrasses are not significantly different

Canals 28 and 29 (Key Largo)



CANAL 28 - Control

CANAL 29 – Filled in summer 2015

CONCLUSIONS

No pre-fill data for **Canal 29**

No major difference in benthic communities outside canal mouths

However, significant changes in sediment chemistry of **Canal 28** compared to **Canal 29**

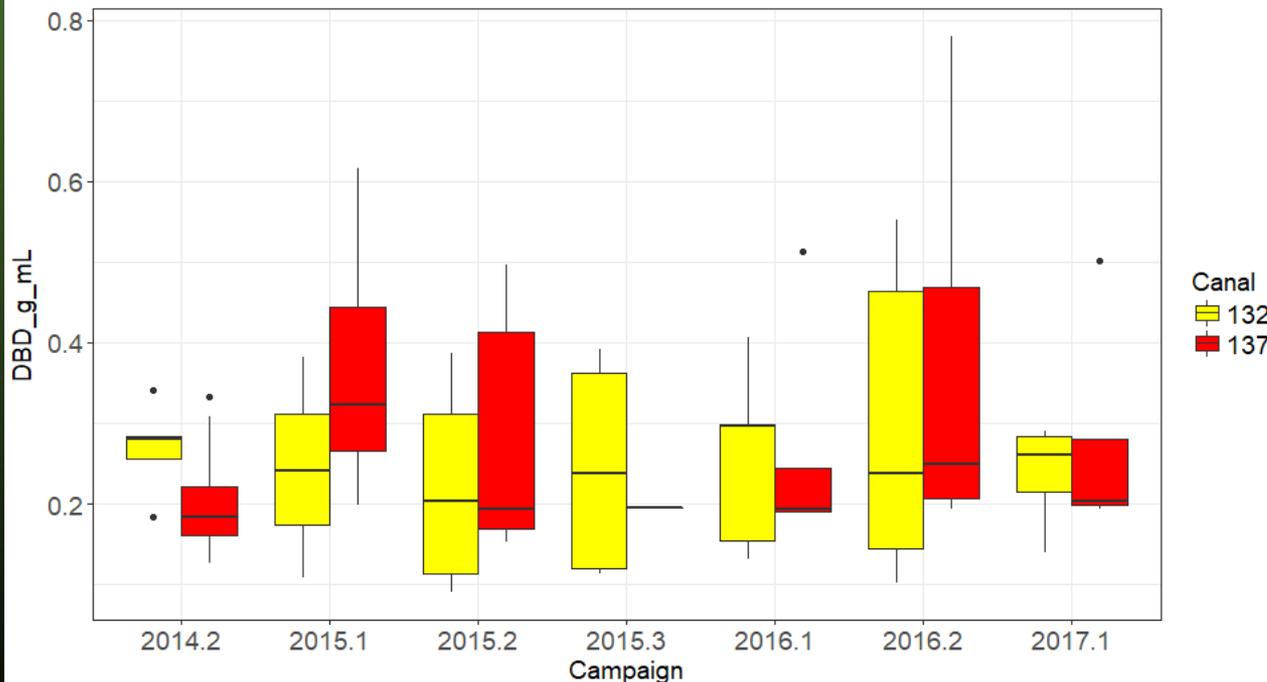
Increased water quality/clarity in **Canal 29** compared to **Canal 28**
(anecdotal observation, need to confirm with Briceño data)

Canals 132 and 137 (Tavernier)



CANAL 132 - Control

**CANAL 137 –
Curtain in fall 2014**



Sediment dry bulk density (DBD) is the dry weight of the sediment.

Fluffy, fine mud sediment has a low DBD and coarse, sandy sediment has a higher DBD.

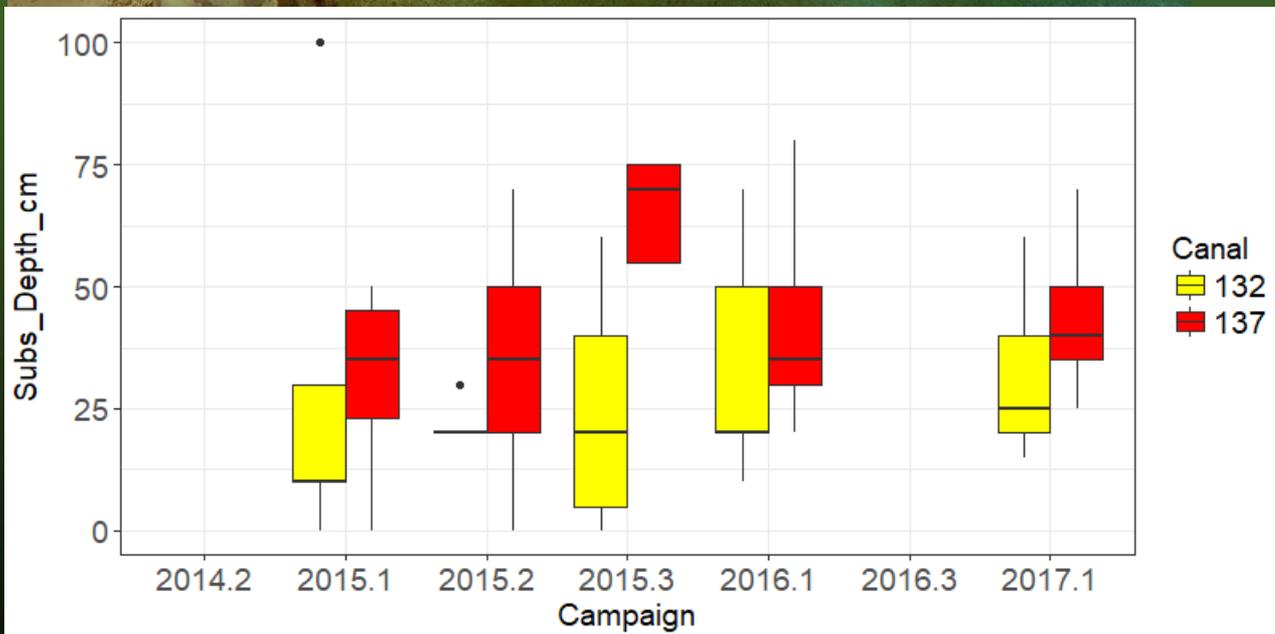
C132 and **C137** show no differences in sediment DBD.

Canals 132 and 137 (Tavernier)



CANAL 132 - Control

**CANAL 137 –
Curtain in fall 2014**



We infer that a greater substrate ('muck') depth indicates greater Corg loading from wrack deposits.

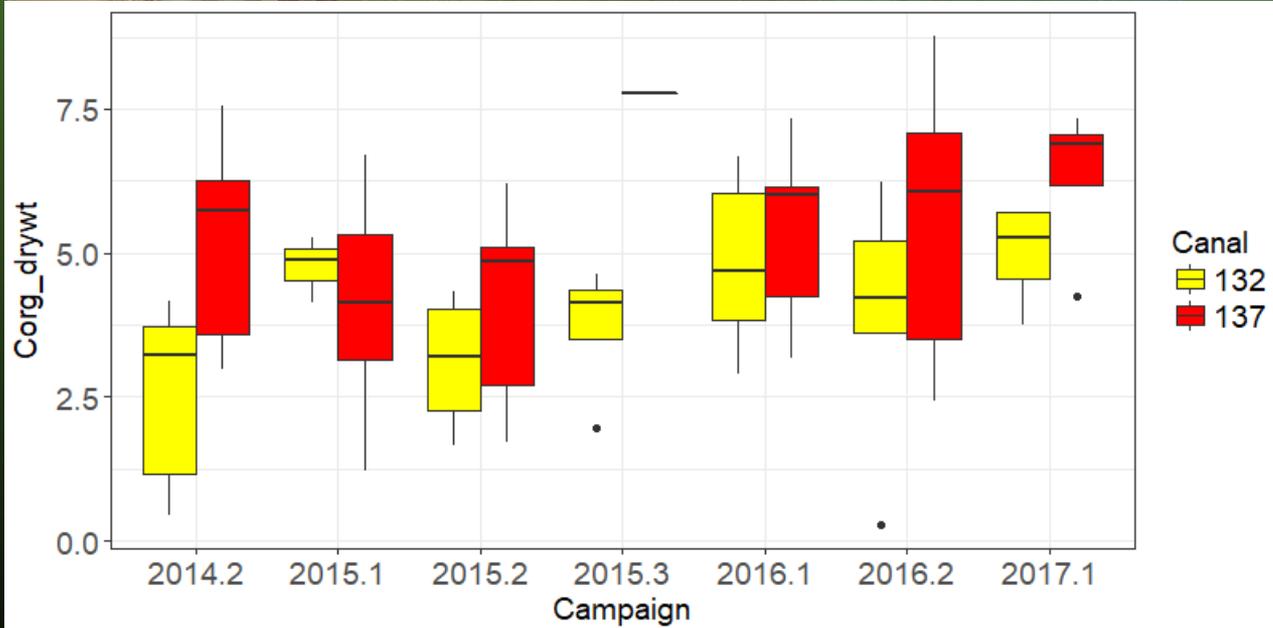
C137 has a greater muck depth than **C132** ($p < 0.05$).

Canals 132 and 137 (Tavernier)



CANAL 132 - Control

**CANAL 137 –
Curtain in fall 2014**



Organic carbon (Corg) is the non-mineral component of sediments.

Fluffy, fine mud sediment has more Corg and coarse, sandy sediment has a less Corg.

C137 has higher sediment Corg than **C132** ($p < 0.05$).

Canals 132 and 137 (Tavernier)



CANAL 132 - Control

**CANAL 137 –
Curtain in fall 2014**

No seagrass recorded within Canal 132 or Canal 137

During our most recent sampling:

Calcareous green macroalgae present 100m from mouth of Canal 132, seagrass not present until 100m from the mouth

Calcareous green macroalgae and seagrass present 50m from mouth of Canal 137

Nutrient signatures of seagrasses are not significantly different

Canals 132 and 137 (Tavernier)



CANAL 132 - Control

**CANAL 137 –
Curtain in fall 2014**

CONCLUSIONS

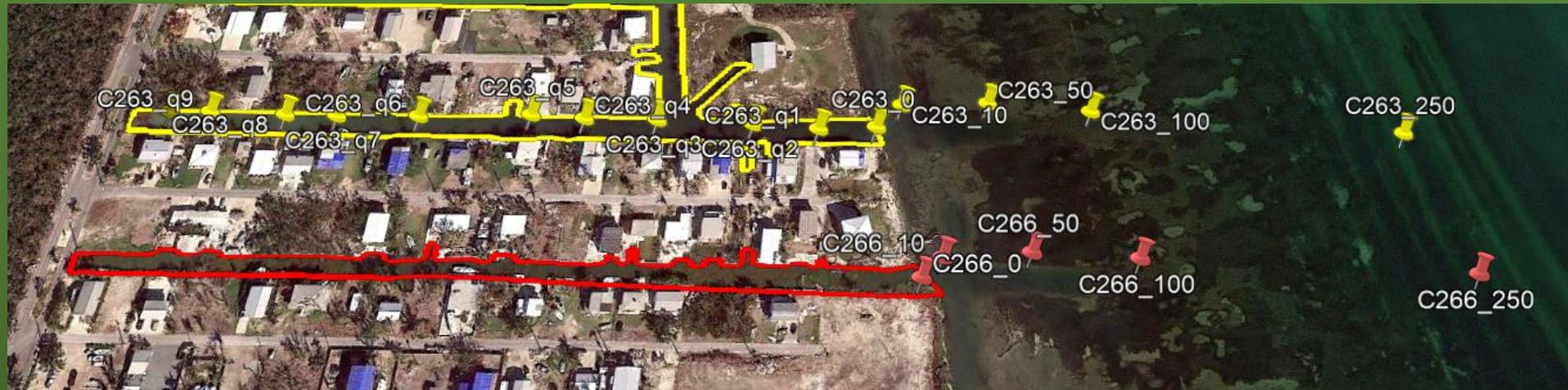
Not enough pre-curtain data for **Canal 137**

No major difference in benthic communities outside canal mouths

No major difference in sediment DBD between canals, but there are significant differences in sediment chemistry of **Canal 132** compared to **Canal 137**

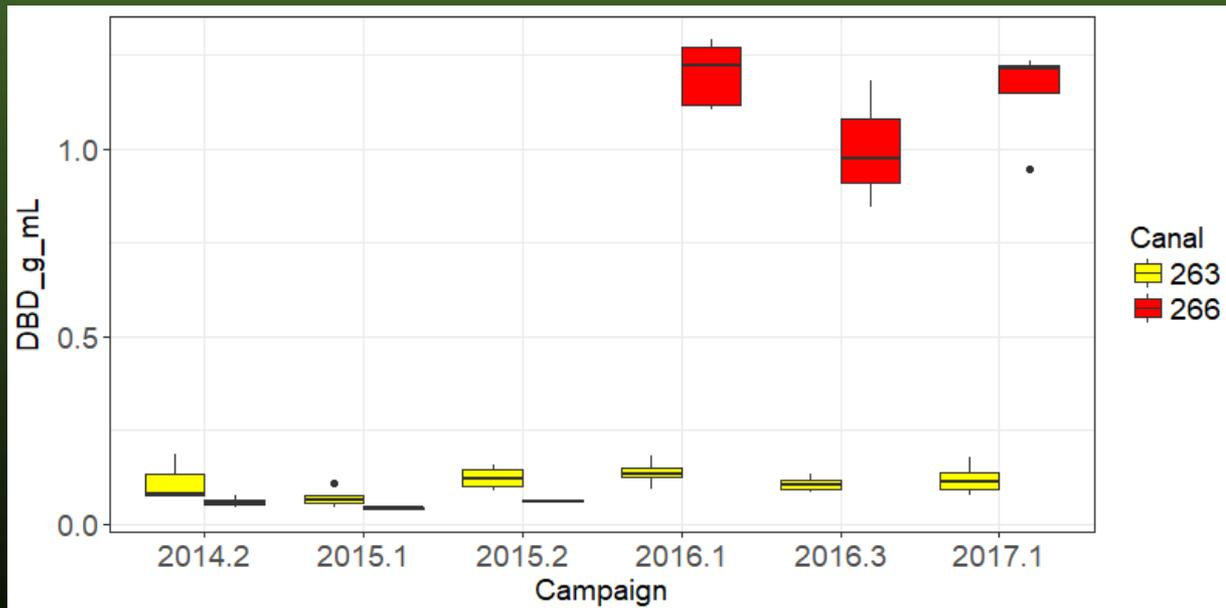
Surprisingly, **Canal 137** has greater muck depth and higher sediment Corg than **Canal 132**. This data does not demonstrate that the weed curtain has helped **Canal 137**.

Canals 263 and 266 (Big Pine Key)



CANAL 263 - Control

CANAL 266 – Dredge in spring 2016

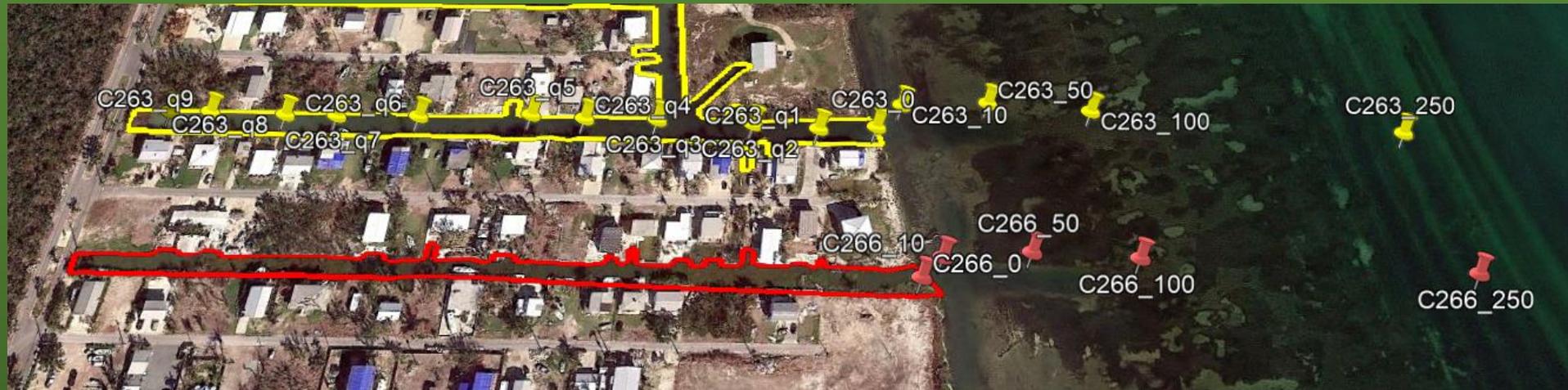


Sediment dry bulk density (DBD) is the dry weight of the sediment.

Fluffy, fine mud sediment has a low DBD and coarse, sandy sediment has a higher DBD.

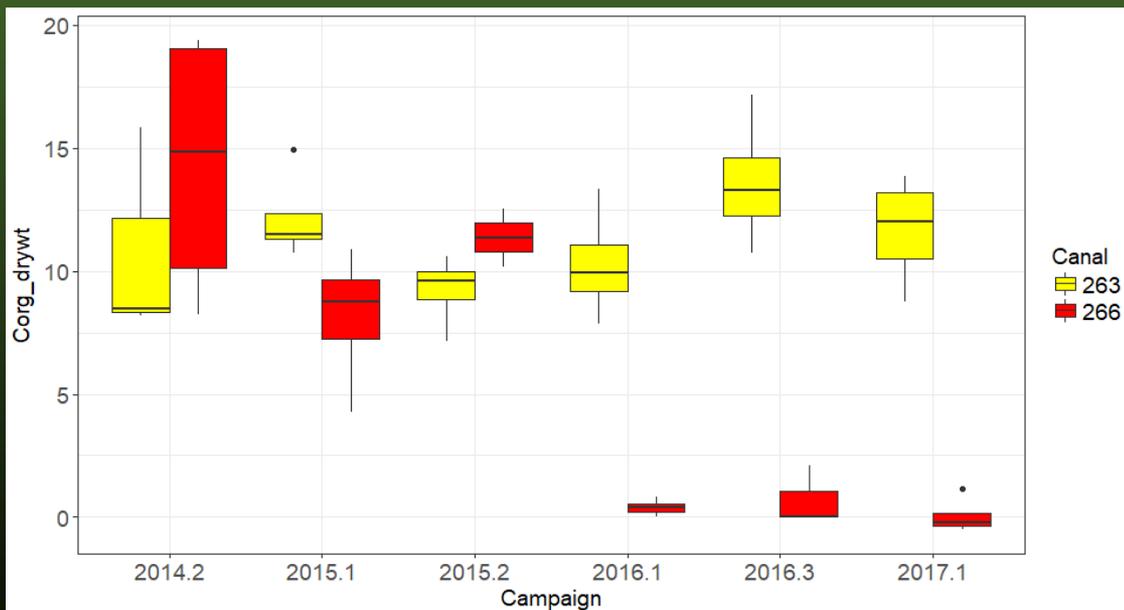
C266 has significantly higher DBD than **C263**.

Canals 263 and 266 (Big Pine Key)



CANAL 263 - Control

CANAL 266 – Dredge in spring 2016

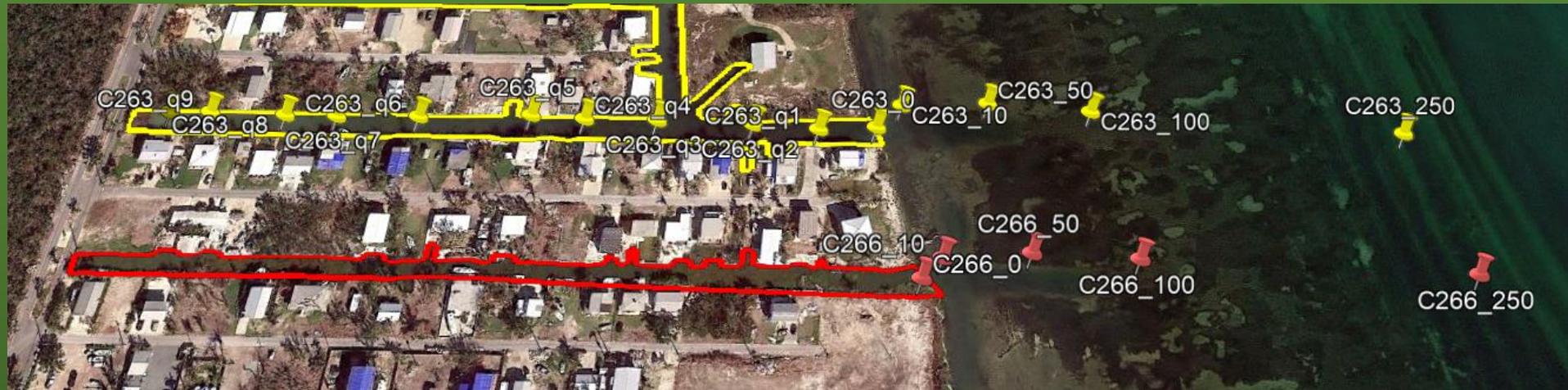


Organic carbon (Corg) is the non-mineral component of sediments.

Fluffy, fine mud sediment has more Corg and coarse, sandy sediment has a less Corg.

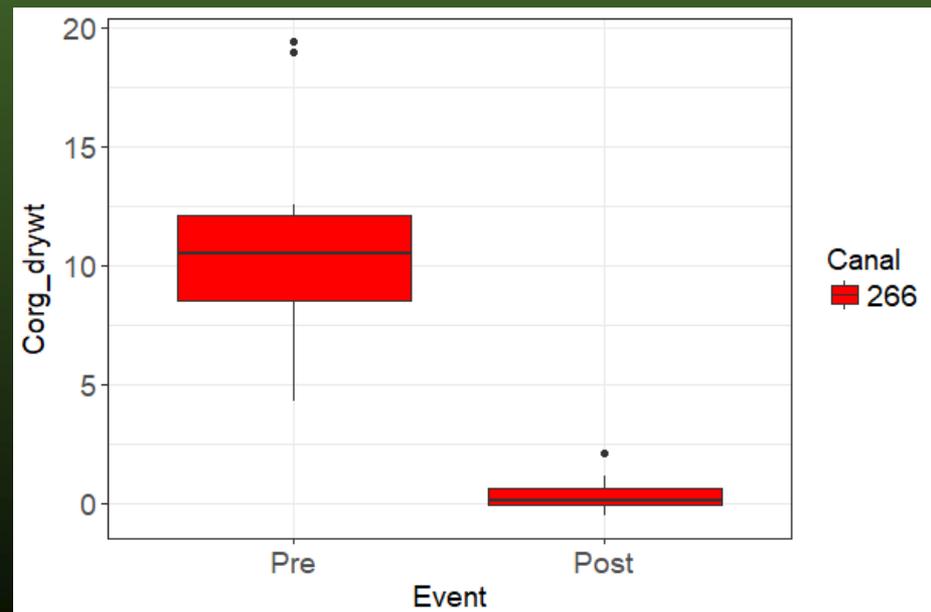
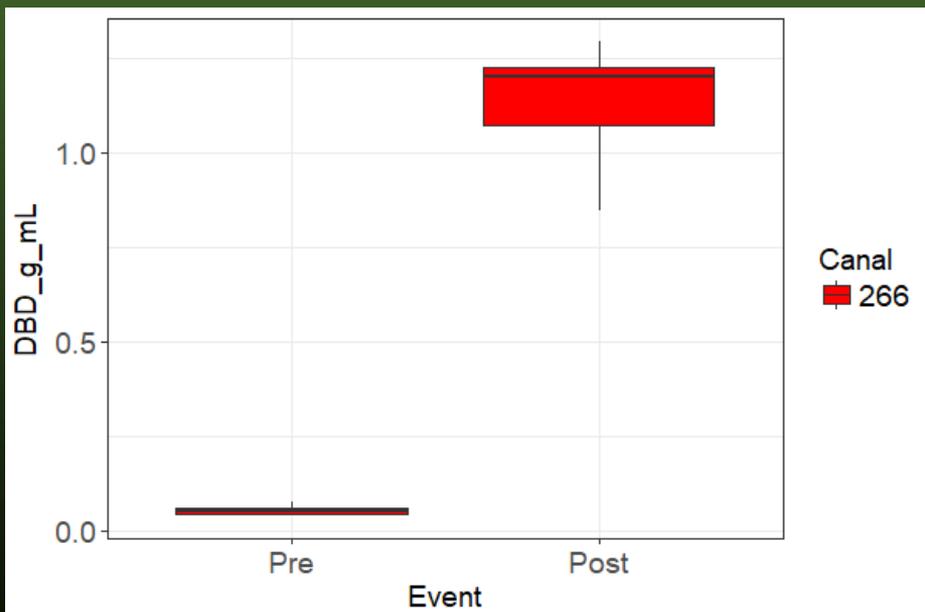
C263 has higher sediment Corg than **C266** ($p < 0.05$).

Canals 263 and 266 (Big Pine Key)

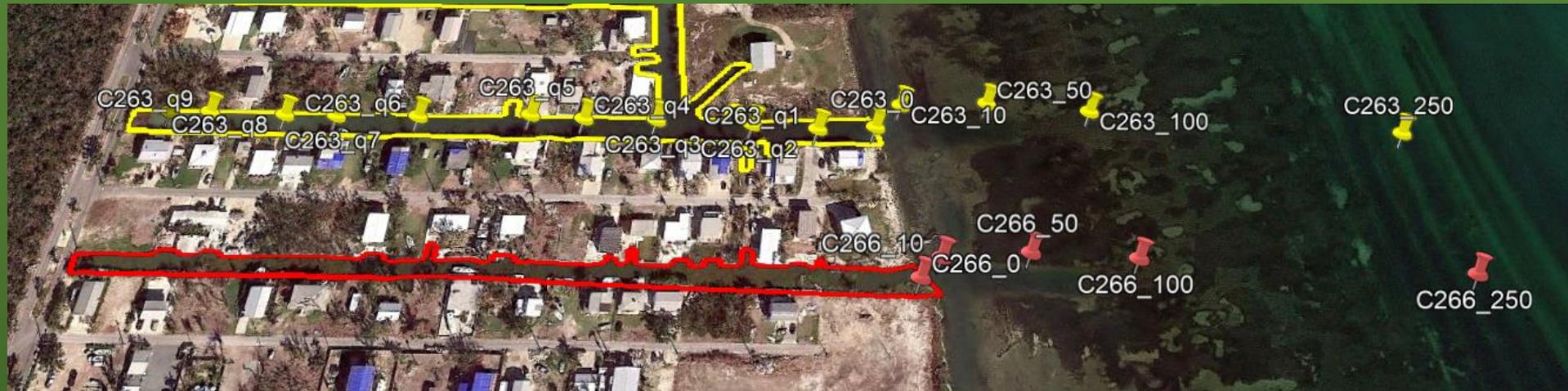


CANAL 263 - Control

CANAL 266 – Dredge in spring 2016

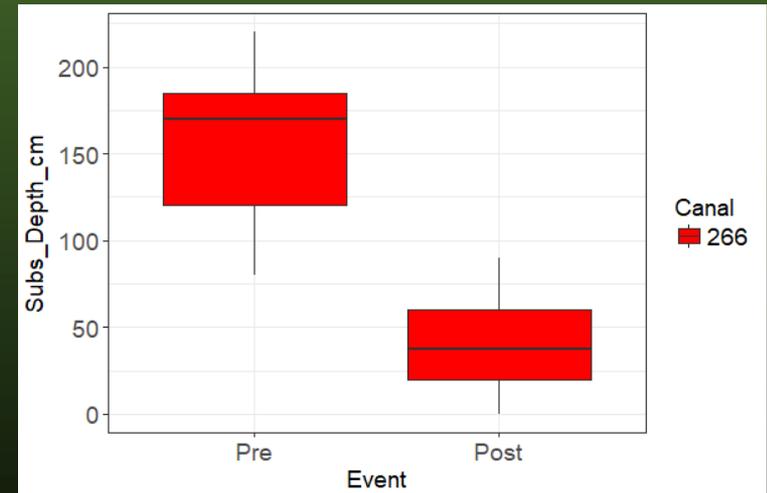
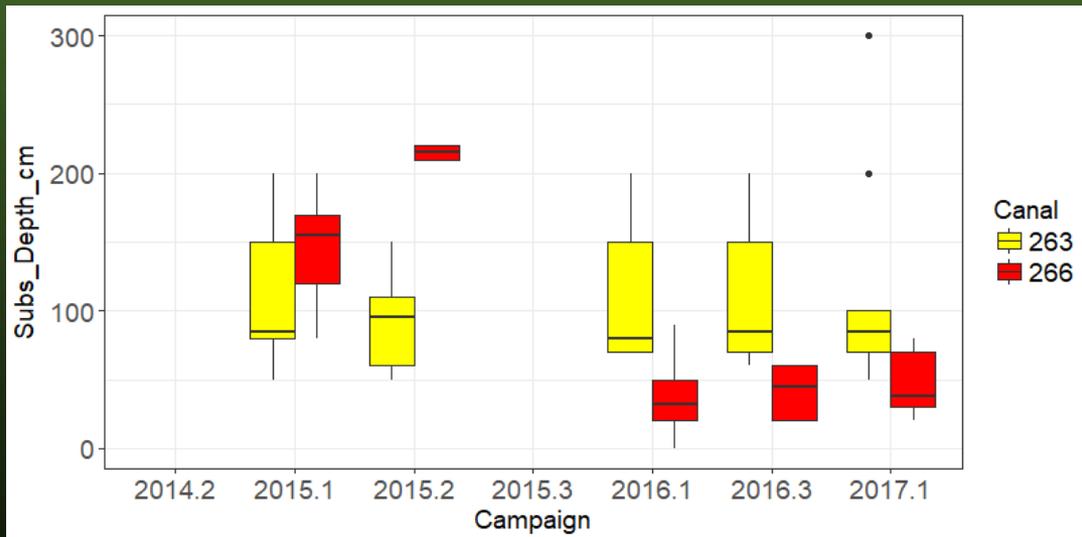


Canals 263 and 266 (Big Pine Key)

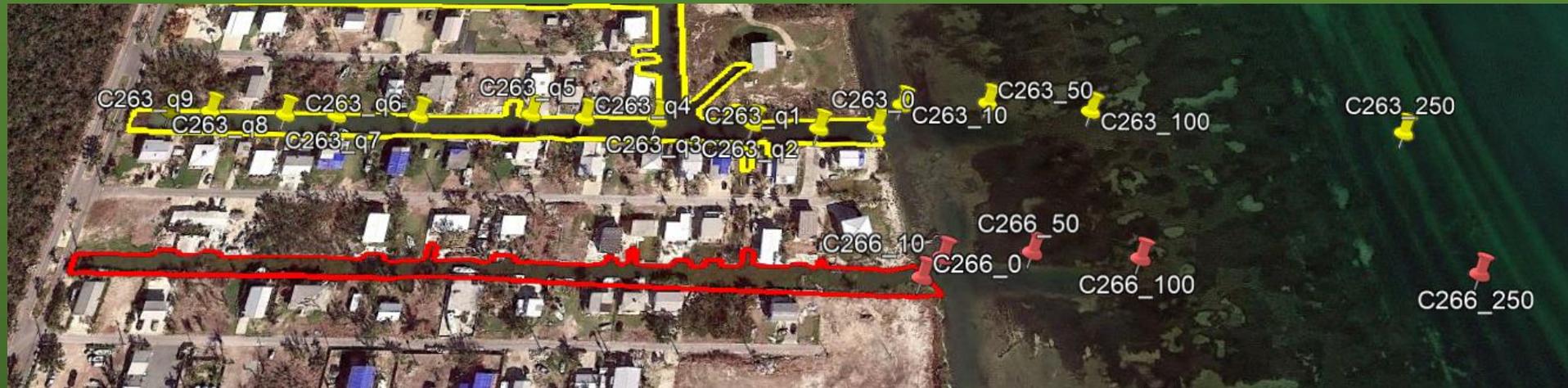


CANAL 263 - Control

CANAL 266 – Dredge in spring 2016



Canals 263 and 266 (Big Pine Key)



CANAL 263 - Control

CANAL 266 – Dredge in spring 2016

No seagrass recorded within **Canal 263** or **Canal 266**

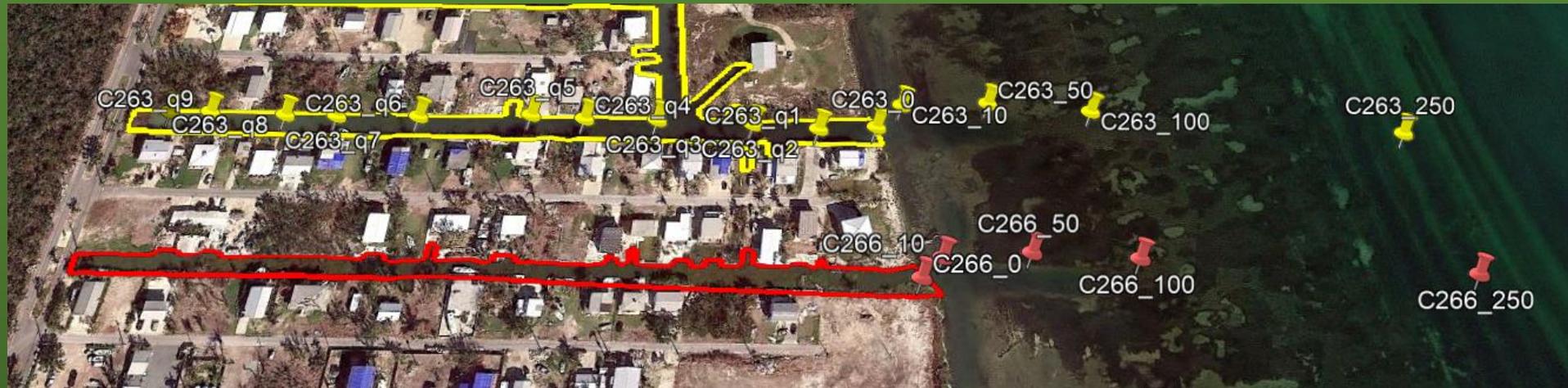
During our most recent sampling:

Seagrass present 50m from mouth of **Canal 263**, calcareous green algae not present until 100m from the mouth

Seagrass and calcareous green macroalgae present 10m from mouth of **Canal 266**

Nutrient signatures of seagrasses are not significantly different

Canals 263 and 266 (Big Pine Key)



CANAL 263 - Control

CANAL 266 – Dredge in spring 2016

CONCLUSIONS

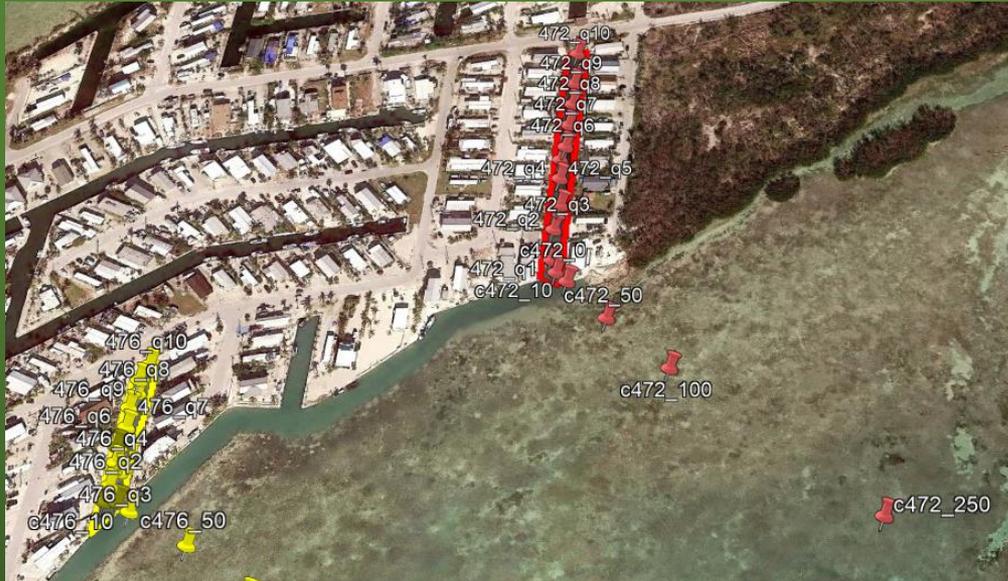
Excellent pre-dredge data for **Canal 266**

Benthic communities 10m from mouth of **Canal 266** but 50m from mouth of **Canal 263**
(However, no major benthic community differences)

Significant difference in sediment DBD, muck depth, and sediment Corg between canals,
also significant pre-dredge and post-dredge differences in **Canal 266**

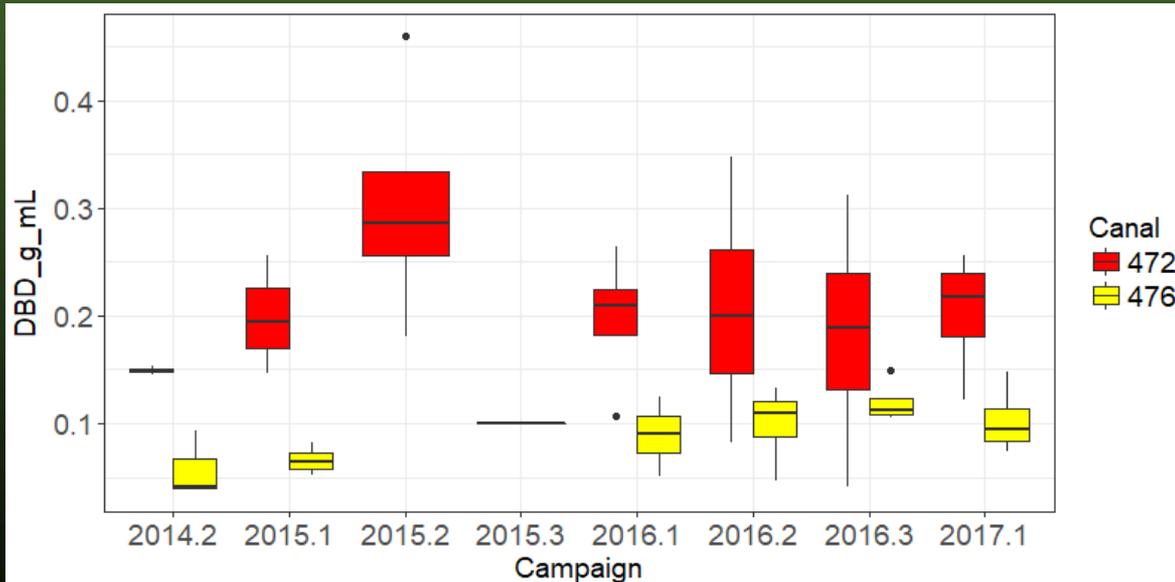
All data from **Canal 266** and control **Canal 263** demonstrate less muck and significant
impacts from drege/weed barrier installation.

Canals 476 and 472 (Geiger Key)



CANAL 476 - Control

**CANAL 472
Culvert in spring 2015**

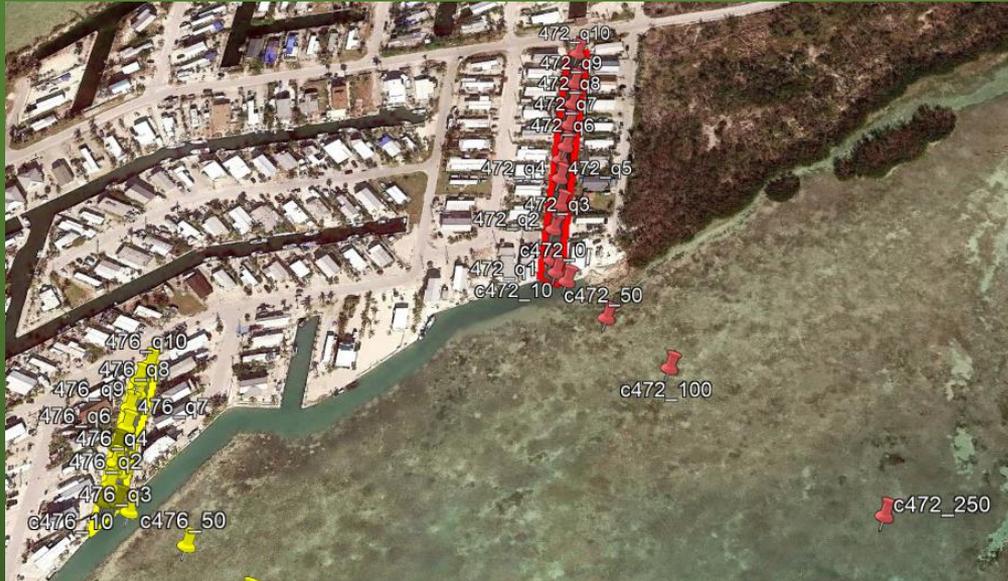


Sediment dry bulk density (DBD) is the dry weight of the sediment.

Fluffy, fine mud sediment has a low DBD and coarse, sandy sediment has a higher DBD.

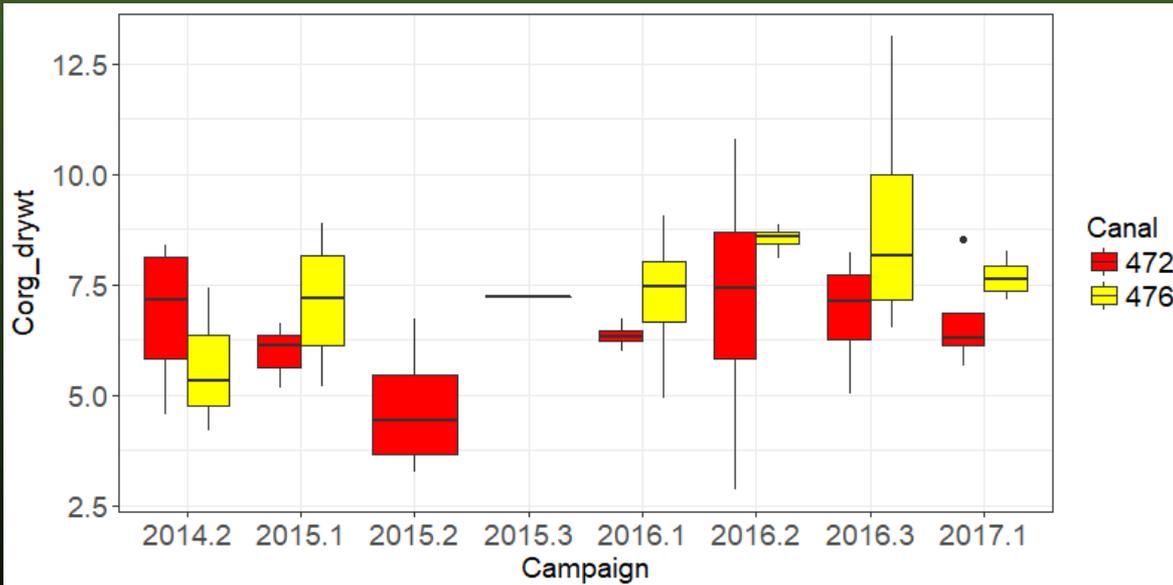
C472 has significantly higher DBD than **C476**.

Canals 476 and 472 (Geiger Key)



CANAL 476 - Control

CANAL 472
Culvert in spring 2015

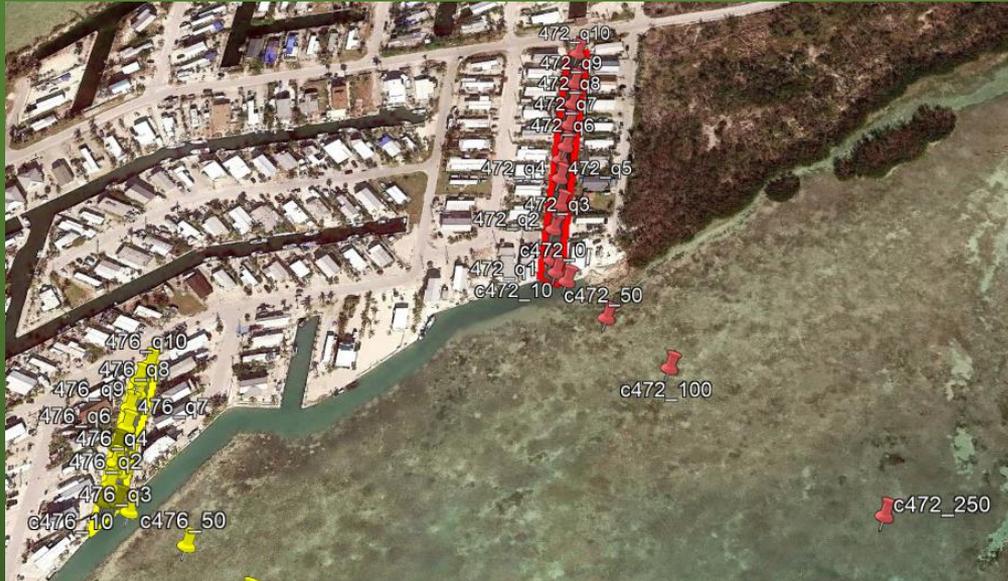


Organic carbon (Corg) is the non-mineral component of sediments.

Fluffy, fine mud sediment has more Corg and coarse, sandy sediment has a less Corg.

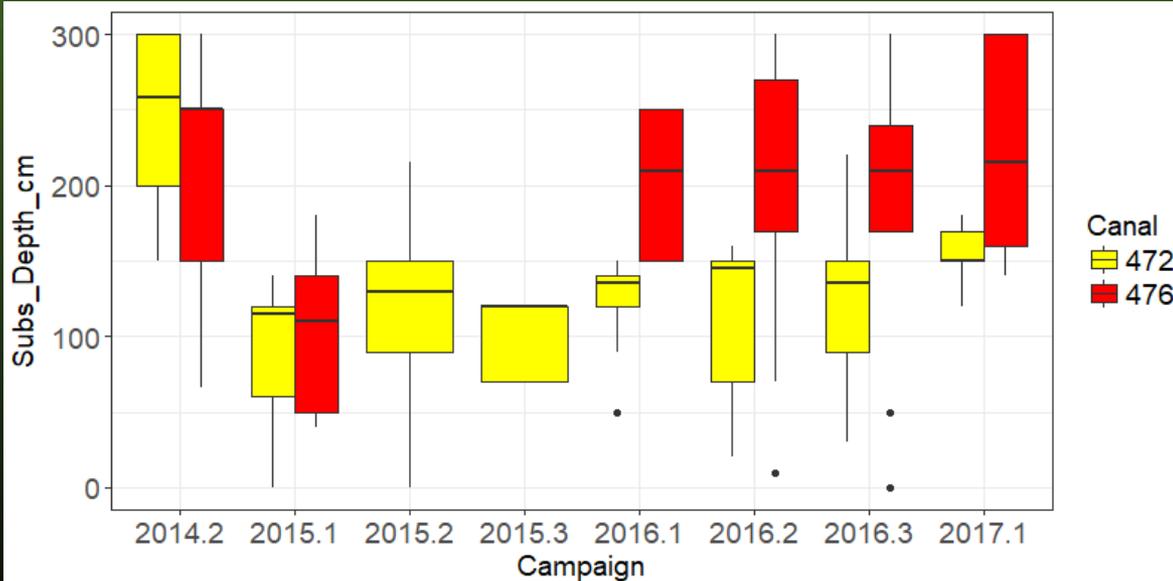
C476 has higher sediment Corg than **C472** ($p < 0.05$).

Canals 476 and 472 (Geiger Key)



CANAL 476 - Control

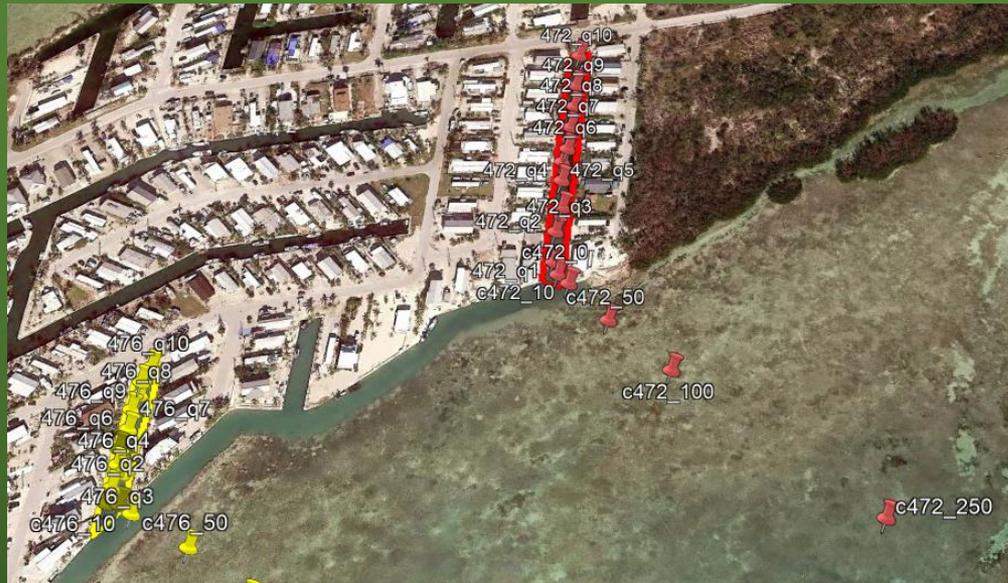
**CANAL 472
Culvert in spring 2015**



We infer that a greater substrate ('muck') depth indicates greater Corg loading from wrack deposits.

C476 has a greater muck depth than **C472** ($p < 0.05$).

Canals 476 and 472 (Geiger Key)

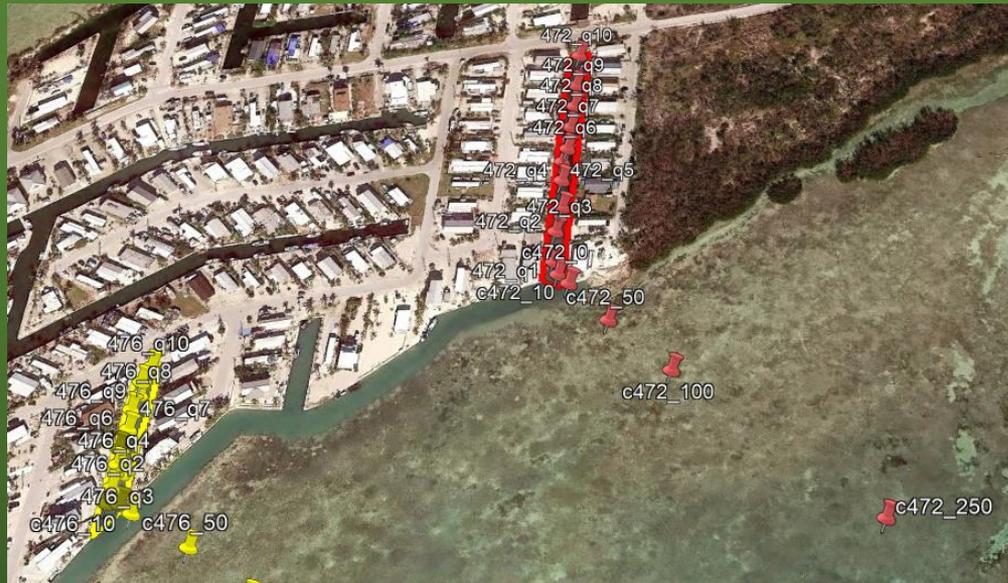


CANAL 476 - Control

**CANAL 472
Culvert in spring 2015**

We do not sample the mouths of these canals. The channel between the canals and the shallow bank strongly affects nutrient transport / legacies to the surrounding area

Canals 476 and 472 (Geiger Key)



CANAL 476 - Control

**CANAL 472
Culvert in spring 2015**

CONCLUSIONS

Pre-culvert and post-culvert data from directly after it's installation seem to demonstrate greater sediment DBD and lower Corg for **Canal 472**

However, this trend quickly reversed and now **Canal 472** sediments more closely resemble those of pre-culvert

Significant difference in sediment DBD, muck depth, and sediment Corg between canals, but these differences don't appear to be driven by culvert installation

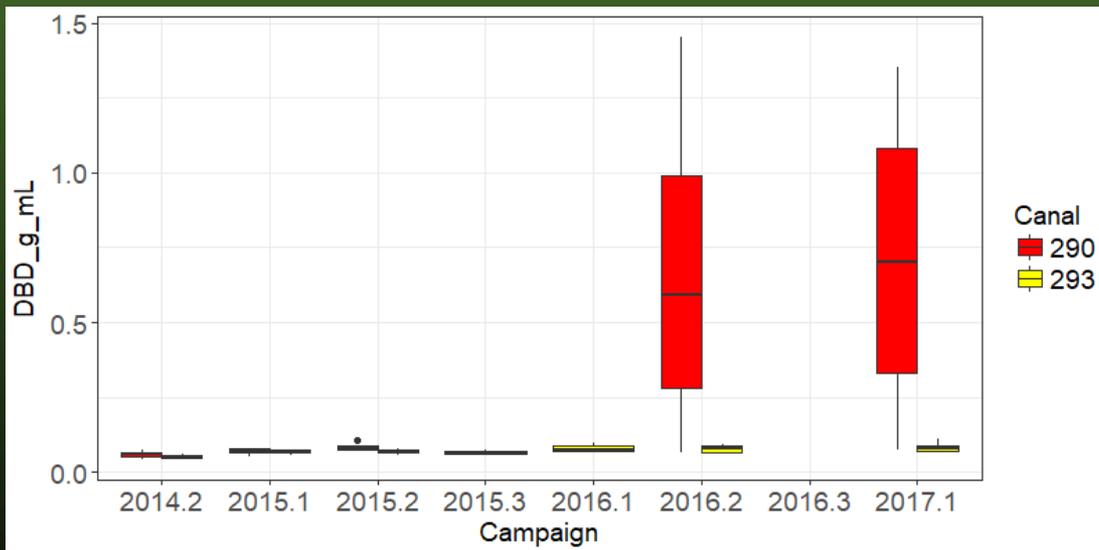
Our data does not demonstrate a lasting impact from culvert installation in **Canal 472**

Canals 293 and 290 (Big Pine Key)



CANAL 293 - Control

CANAL 290
Dredged in spring 2016



Sediment dry bulk density (DBD) is the dry weight of the sediment.

Fluffy, fine mud sediment has a low DBD and coarse, sandy sediment has a higher DBD.

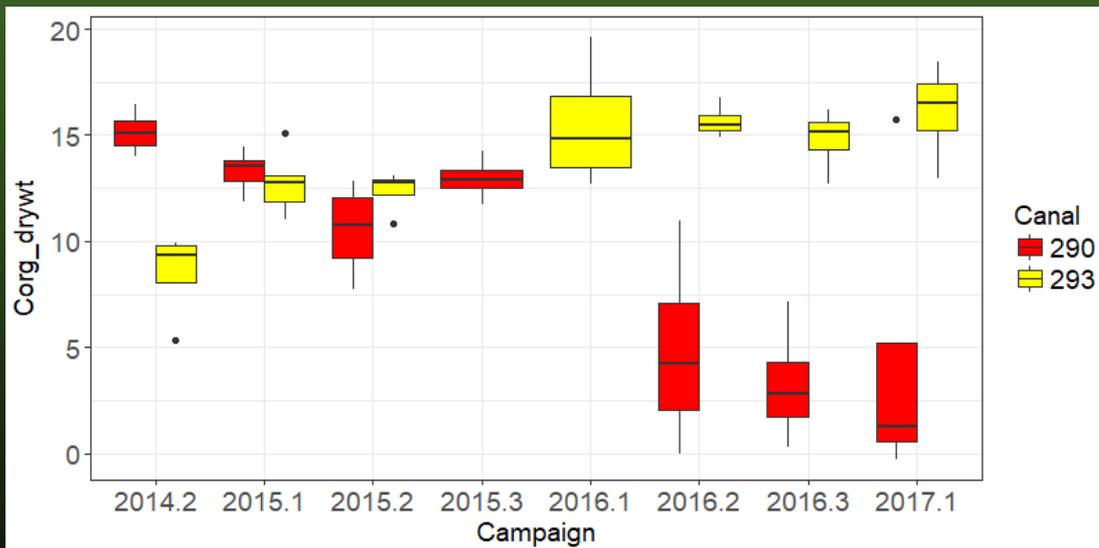
C290 has significantly higher DBD than **C293**.

Canals 293 and 290 (Big Pine Key)



CANAL 293 - Control

CANAL 290 Dredged in spring 2016



Organic carbon (Corg) is the non-mineral component of sediments.

Fluffy, fine mud sediment has more Corg and coarse, sandy sediment has a less Corg.

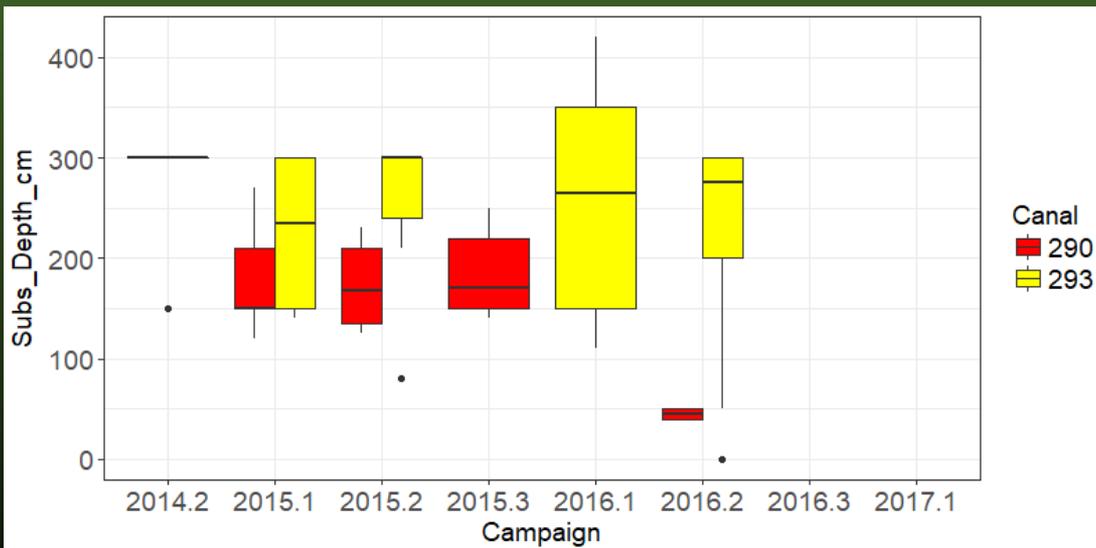
C293 has higher sediment Corg than **C290** ($p < 0.05$).

Canals 293 and 290 (Big Pine Key)



CANAL 293 - Control

CANAL 290
Dredged in spring 2016



We infer that a greater substrate ('muck') depth indicates greater Corg loading from wrack deposits.

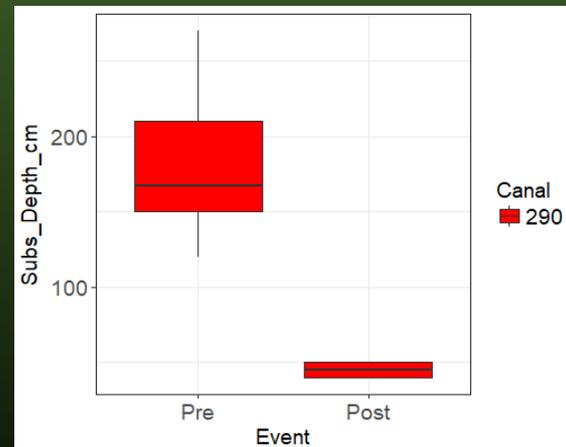
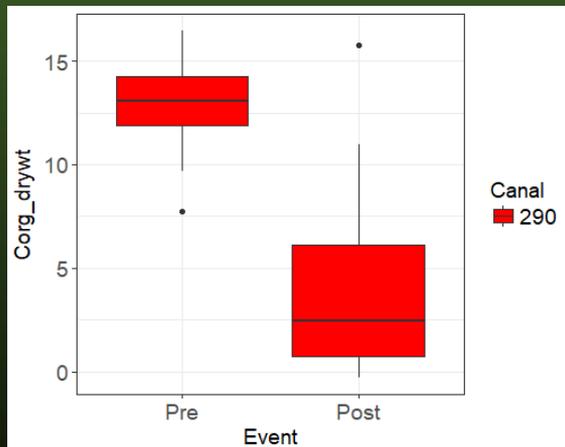
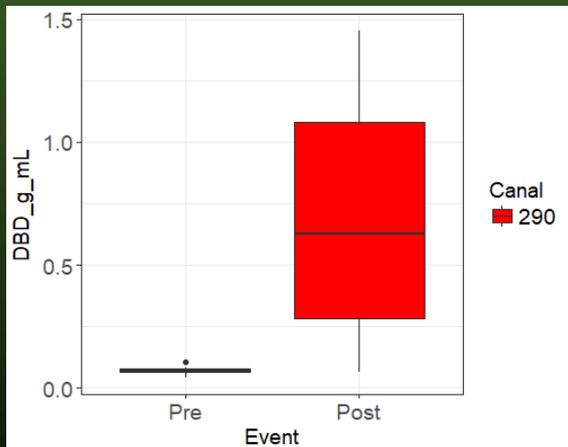
C293 has a greater muck depth than **C290** ($p < 0.05$).

Canals 293 and 290 (Big Pine Key)



CANAL 293 - Control

**CANAL 290
Dredged in spring 2016**



Canals 293 and 290 (Big Pine Key)



CANAL 293 - Control

CANAL 290
Dredged in spring 2016

No seagrass recorded within **Canal 293** or **Canal 290**

During our most recent sampling:

Seagrass and calcareous green macroalgae present 50m from mouth of **Canal 293**

Seagrass and calcareous green macroalgae present 50m from mouth of **Canal 290**

Marginally ^{13}C enriched seagrasses outside **Canal 290** may be indicative of greater light availability, but need more samples to confirm

Canals 293 and 290 (Big Pine Key)



CANAL 293 - Control

CANAL 290
Dredged in spring 2016

CONCLUSIONS

Excellent pre-dredge and post-dredge results from **Canal 290** indicative of higher sediment DBD and lower sediment Corg and muck depth

We are close to seeing significantly different elemental content of seagrasses outside **Canal 290** compared to **Canal 293**, with greater light available to seagrasses adjacent to **Canal 290**, but need more data to confirm this

Benthic Habitat Monitoring - Canals

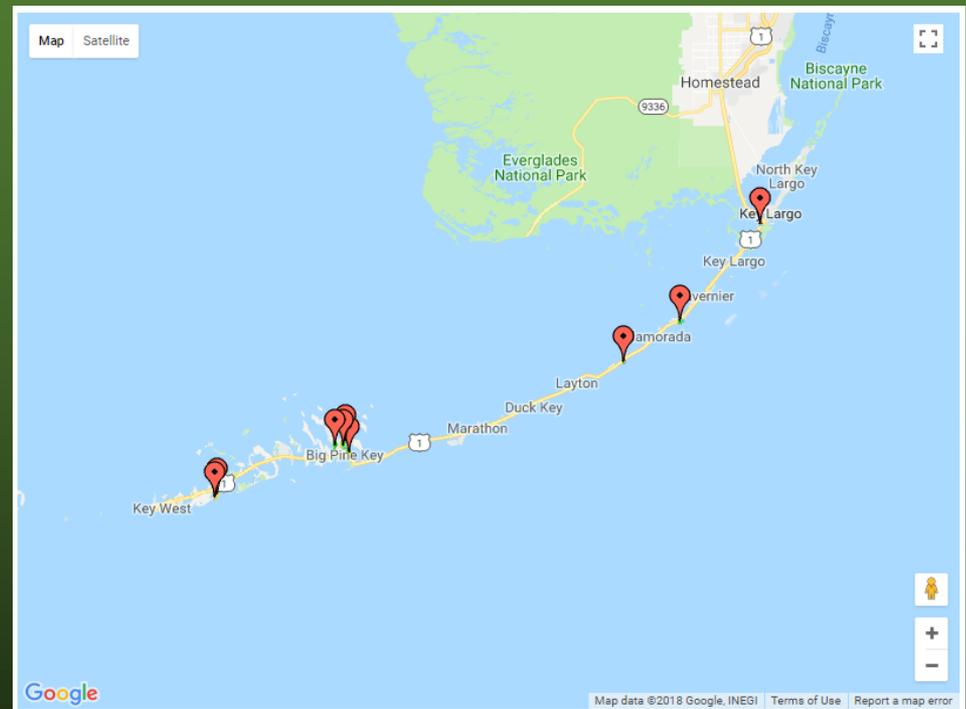
- **19 canals (7 treatments)**
 - 5 Islamorada canals

- **Benthic community assessment**

- Vegetation coverage
- Seagrass nutrients
- Fish surveys
- Seawall assessments

- **Sediment (“muck”) measurements**

- Muck depth
- Sediment bulk density
- Sediment nutrients



Canal # 282 Post-Irma

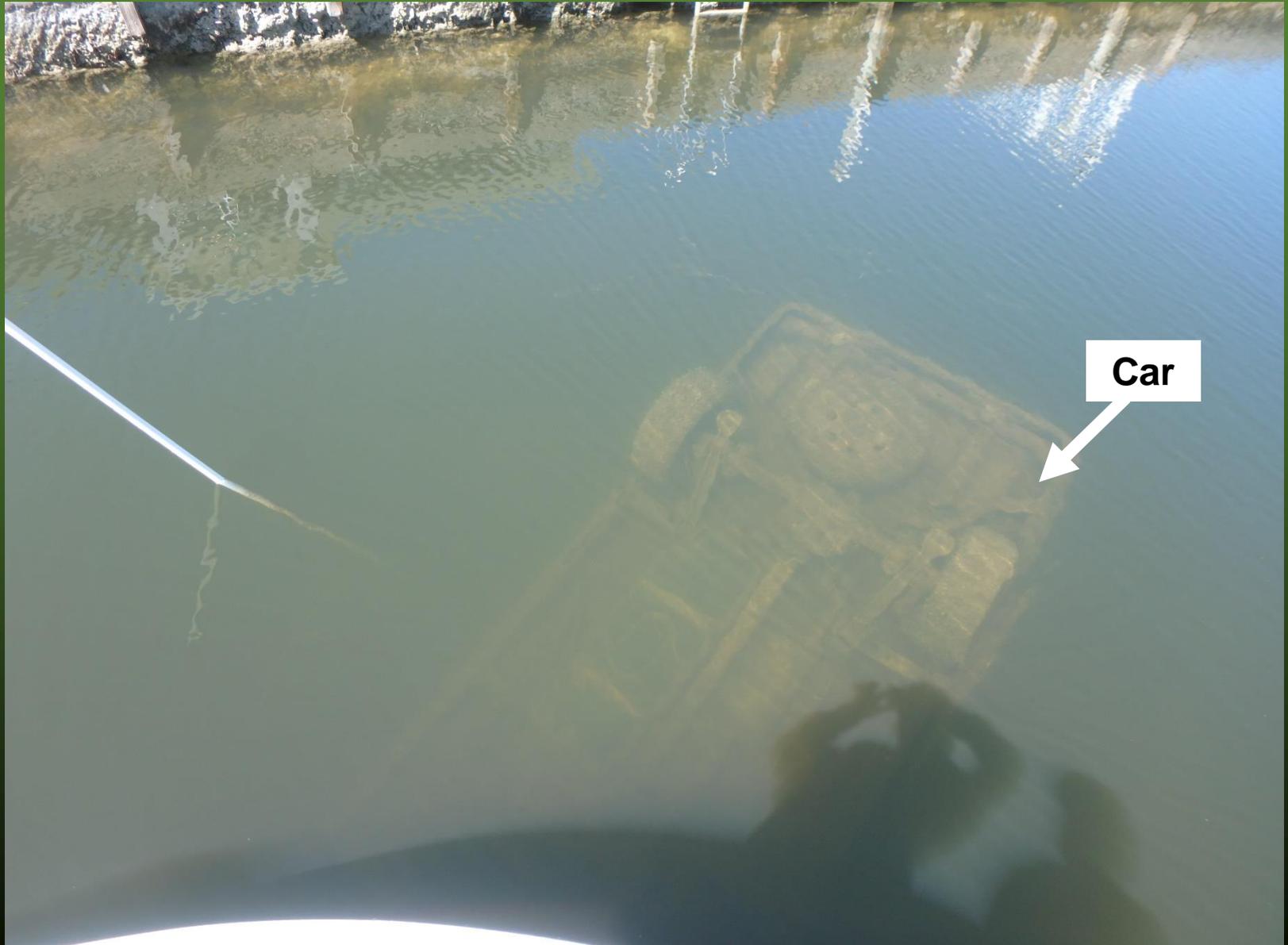


**Unknown
large debris**

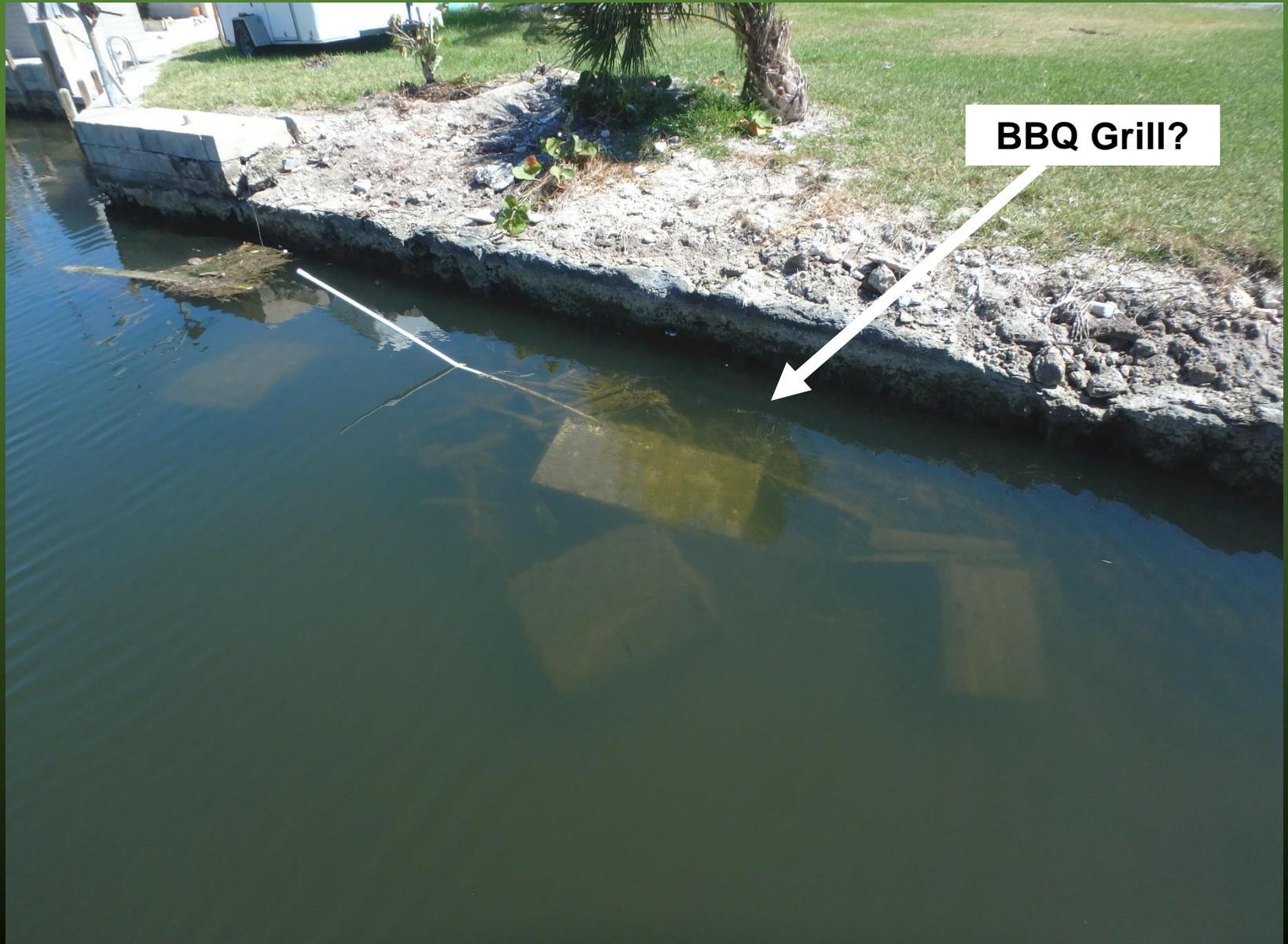
Couch

**Mat of floating
wrack and
garbage**

Canal # 282 Post-Irma



Canal # 282 Post-Irma



BBQ Grill?

Canal # 282 Post-Irma



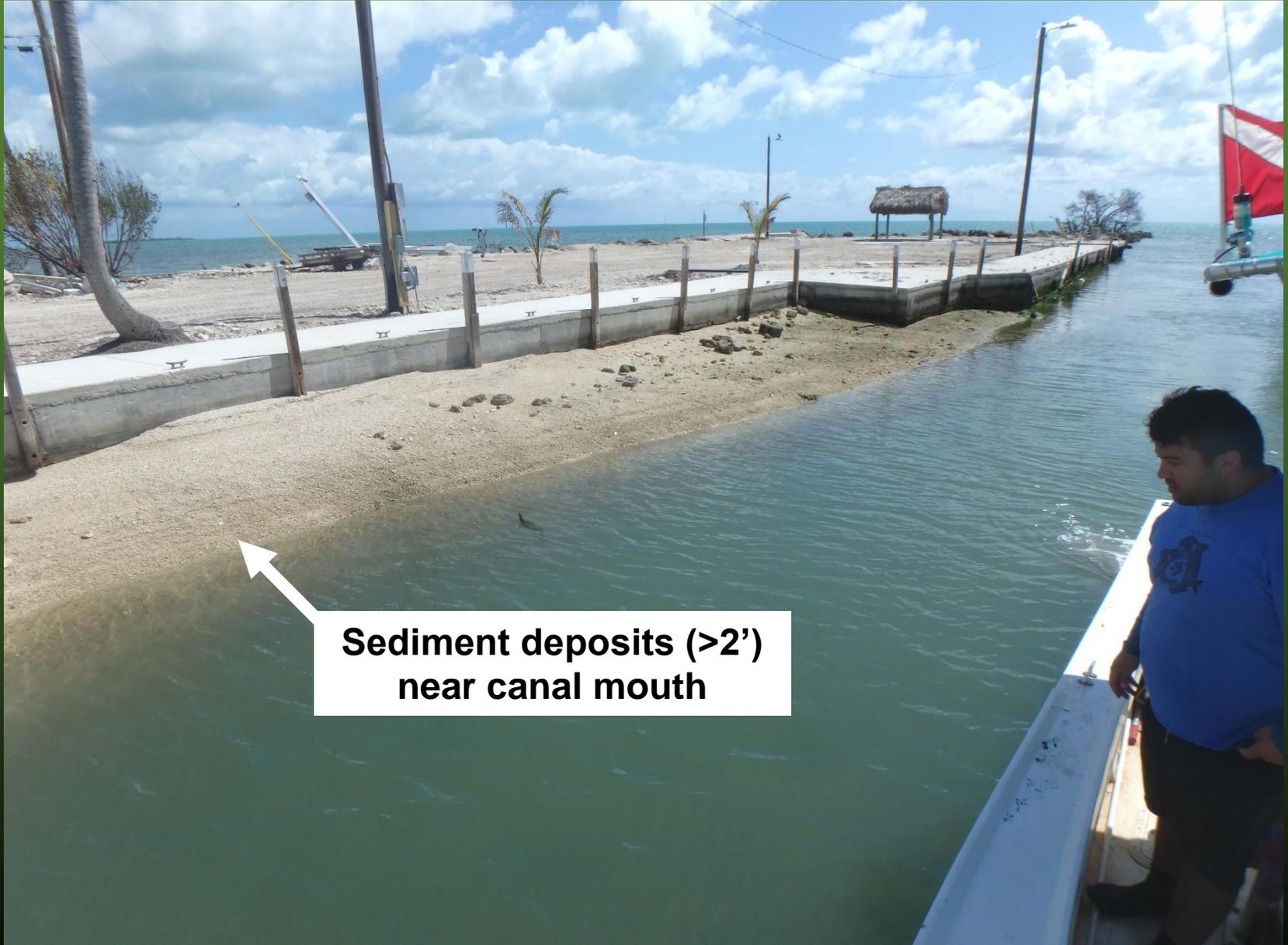
**Unknown
large debris**

Canal # 282 Post-Irma



Tree

Canal # 148 Post-Irma



**Sediment deposits (>2')
near canal mouth**

Deliverables Timeline

- 2017 “Fall” sampling (usu. Sep/Oct) pushed back, occurred February 2018
- Sample processing during March and April 2018
- Currently analyzing data
- We estimate completion of the Final Project Report by end of June 2018
- Funded through Village of Islamorada to continue our monitoring- will conduct fall/summer sampling beginning fall 2018
- We will continue to update the website and provide data as it is generated
 - <http://seagrass.fiu.edu/canals.htm>