# Monroe County Canal Remediation Benthic Monitoring Program May 2018 Report

### Sara Wilson, Dr. Jason Howard, and Dr. Jim Fourqurean

Water Quality Protection Program Canal Subcommittee Meeting May 23<sup>rd</sup>, 2018 – Marathon, FL

## Outline

- Sampling Design and Criteria
- Results from Canal 28 and Canal 29 (Key Largo- fill)
- Results from Canal 132 and Canal 137 (Tavernier- weed curtain)
- Results from Canal 263 and Canal 266 (Big Pine Key- dredge)
- Results from Canal 293 and Canal 290 (Big Pine Key- dredge)
- Results from Canal 476 and Canal 472 (Geiger Key- culvert)
- Post-Irma updates
- Deliverables timeline

# Sampling Design

19 canals (7 treatment) 5 Islamorada canals



# **Sampling Design**

19 canals (7 treatment) 5 Islamorada canals







Treatment

 $\mathbb{X}$ 

25cm x 25cm randomly placed for benthic coverage

25cm x 25cm set sites for benthic coverage

××

10cm x 10cm randomly placed for canal wall coverage

# **Sampling Criteria**

- Benthic community assessment
  - Vegetation coverage
    - In general, SAV presence should indicate better canal health
  - Seagrass tissue nutrients
    - Tissue nutrients tell a story of the conditions that the plant has experienced recently
  - Fish surveys
    - In general, we expect more fish in healthier canals
  - Seawall assessments
    - Community composition could reflect canal health

Quantifying species of seagrass, algae, sponges, corals

### Animal surveys



### Sea wall

# **Sampling Criteria**

Sediment or 'Muck' measurements

### Muck depth

Quick and dirty estimate of muck layer thickness

Sediment dry bulk density (DBD)

- Bulk density is the weight of a standardized sediment sample after the water has been evaporated out
- Fluffy, muddy sediments have a lower DBD than coarse, sandy sediments or fill material

### Sediment nutrients

- Indicator of how much N and P in the sediments
- Corg generally higher in muck than sandy sediment



# Sediment Characteristics



# **Project Timeline**





#### CANAL 29 – Filled in summer 2015

#### **CANAL 28 - Control**



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

**C28** has lower DBD than **C29**.



#### CANAL 29 – Filled in summer 2015

**CANAL 28 - Control** 



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

C28 has higher sediment Corg than C29.



#### 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



#### **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)



**CANAL 132 - Control** 

#### CANAL 137 – Curtain in fall 2014



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.



**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.



CANAL 132 - Control

#### CANAL 137 – Curtain in fall 2014



Corg\_drywt

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

C137 has higher sediment Corg than C132.



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

CANAL 132 - Control

CANAL 137 – Curtain in fall 2014

### CONCLUSIONS

Not enough pre-curtain data for Canal 137

No<sup>137</sup> 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.



**CANAL 263 - Control** 

#### CANAL 266 – Dredge in spring 2016



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

C266 has higher DBD than C263.



#### **CANAL 263 - Control**

#### CANAL 266 – Dredge in spring 2016



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

C263 has higher sediment Corg than C266.



**CANAL 263 - Control** 

#### CANAL 266 – Dredge in spring 2016







**CANAL 263 - Control** 

CANAL 266 – Dredge in spring 2016



![](_page_26_Figure_1.jpeg)

#### **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

![](_page_27_Figure_1.jpeg)

### 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 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.

![](_page_28_Picture_1.jpeg)

#### **CANAL 293 - Control**

#### CANAL 290 Dredged in spring 2016

![](_page_28_Figure_4.jpeg)

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

C290 has significantly higher DBD than C293.

![](_page_29_Picture_1.jpeg)

#### CANAL 293 - Control

#### CANAL 290 Dredged in spring 2016

![](_page_29_Figure_4.jpeg)

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

C293 has higher sediment Corg than C290

![](_page_30_Picture_1.jpeg)

#### **CANAL 293 - Control**

#### CANAL 290 Dredged in spring 2016

![](_page_30_Figure_4.jpeg)

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

C293 has a greater muck depth than C290.

![](_page_31_Figure_1.jpeg)

#### **CANAL 293 - Control**

#### CANAL 290 Dredged in spring 2016

![](_page_31_Figure_4.jpeg)

![](_page_31_Figure_5.jpeg)

![](_page_31_Figure_6.jpeg)

![](_page_32_Picture_1.jpeg)

#### **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 <sup>13</sup>C enriched seagrasses outside Canal 290 may be indicative of greater light availability, but need more samples to confirm

![](_page_33_Picture_1.jpeg)

**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

![](_page_34_Picture_1.jpeg)

**CANAL 476 - Control** 

CANAL 472 Culvert in spring 2015

![](_page_34_Figure_4.jpeg)

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

C472 has significantly higher DBD than C476.

![](_page_35_Picture_1.jpeg)

**CANAL 476 - Control** 

CANAL 472 Culvert in spring 2015

![](_page_35_Figure_4.jpeg)

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

C476 has higher Corg than C472.

![](_page_36_Picture_1.jpeg)

**CANAL 476 - Control** 

CANAL 472 Culvert in spring 2015

![](_page_36_Figure_4.jpeg)

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

C476 has a greater muck depth than C472.

![](_page_37_Picture_1.jpeg)

**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

**CANAL 476 - Control** 

CANAL 472 Culvert in spring 2015

### CONCLUSIONS

c476 5

Pre-/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

### **Brief Post-Irma Observations**

Middle Keys oceanside canals had notable sediment deposits at the mouth and near their entrances

![](_page_39_Picture_2.jpeg)

### **Brief Post-Irma Observations**

Most lower Keys canals not dive-able (safety reasons).

For these canals, no collections of muck depth were made, but sediment samples were collected by dropping a grab sampler off the side of the boat

![](_page_40_Picture_3.jpeg)

## **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 monitoringwill 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