

# Introduction: Use of Videos

Eliza Moore – Narragansett Bay Commission



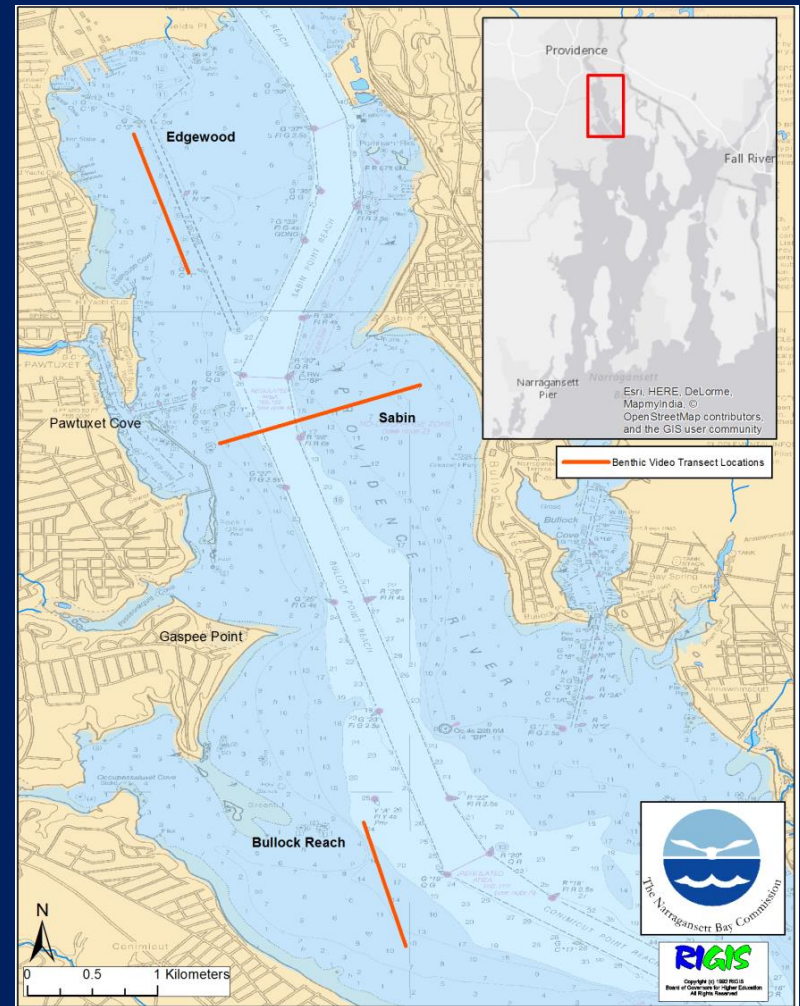
# What....

- Benthic video surveys to track benthic community, habitat structure, and general observations over time.
- Started in 2014



# Where ....

- Providence River Estuary – the headwaters of Narragansett Bay – Rhode Island
- Three permanent transects





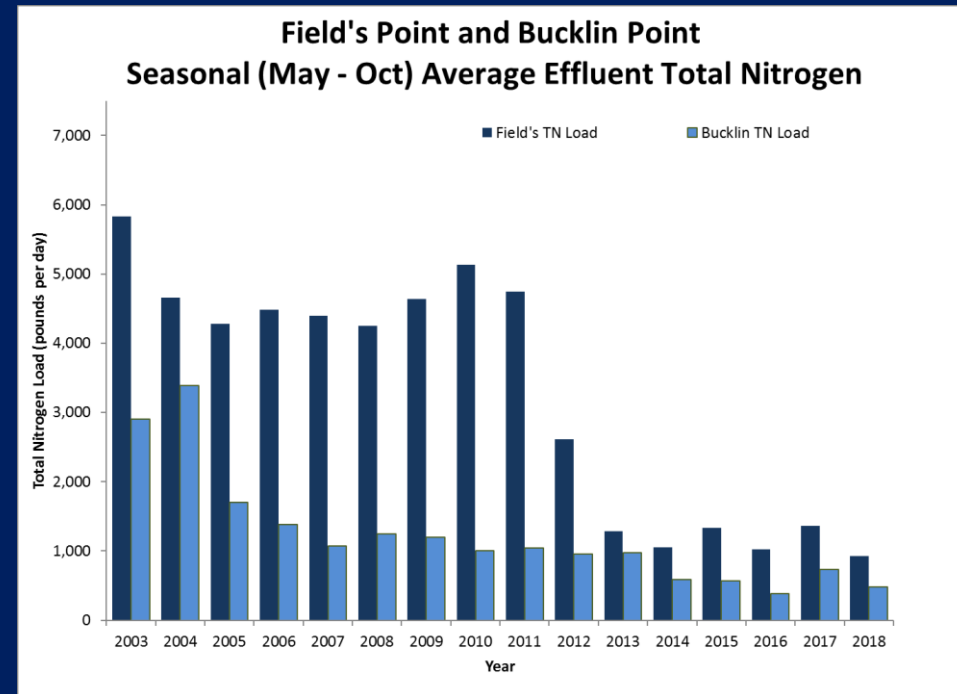
# Why ....

- The Narragansett Bay Commission owns and operates two major wastewater treatment facilities in Rhode Island.



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- The Narragansett Bay Commission owns and operates two major wastewater treatment facilities in Rhode Island.
- Nitrogen reduction required ~\$41 million in upgrades to facilities.
- Monitoring to demonstrate the water quality impacts of investment



# Why ....

- Monitoring benthic conditions for observable impacts of nitrogen reduction.
  - Indicator species
  - Evidence of biological activity



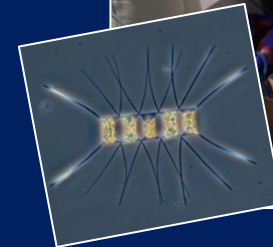
**Amphipod tube mats** – indicative of excess organic matter, adequate DO levels



**Tunneling megafauna** – adequate DO levels

# Why ....

- Benthic video monitoring is part of a comprehensive water quality monitoring program:
  - Fixed-site (buoy and dock station) Monitoring
  - Water Column Profiles
  - Surface Mapping
  - River & Bay Bacteria
  - River & Bay Nutrient Monitoring
  - Water Clarity
  - Phytoplankton Monitoring
- Sound science to support management decisions
- Stimulate further research





# Sampling Design and Execution

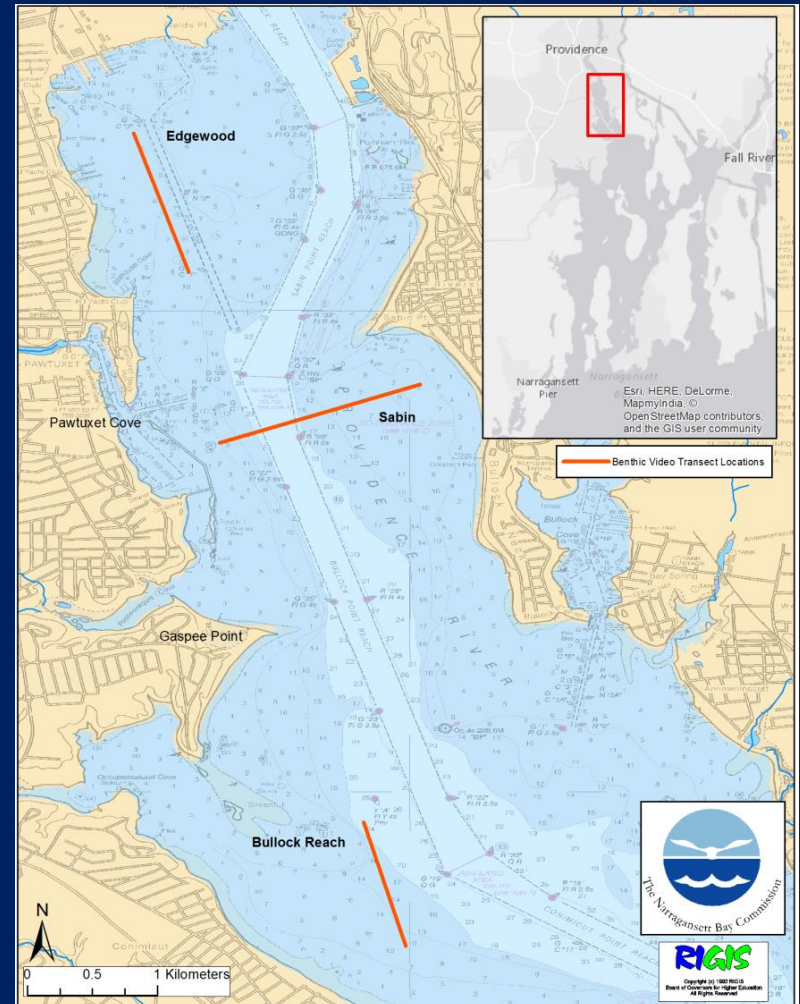
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# Preparation

- Three permanent transect areas designated non-randomly
  - Edgewood - low flushing, poor water quality
  - Bullock Reach - fixed-site monitoring buoy collecting water quality data
  - Sabin - in between, includes a shoal area on opposite side of channel
- Limited potential to extrapolate over larger region, but targets key areas of interest


















# Execution

- SeaViewer camera on custom in-house built-sled
- Scale lasers added at the end of 2017
- No lights, but possible in the future
- Transects each approximately 1 km long
- Depth varies ~ 2-6 meters
- Aim for monthly surveys, achieve ~ quarterly



# Data Management

- Folders to organize videos by year, labeled with date and transect name
- Video overlay also saves time, location, and date details
- Screenshots saved with date and transect name
  - Keyword tagging???
- Data in Excel
  - Analysis using R in development

Name	Date modified	T
 BR_060817_00224.PNG	4/3/2018 1:09 PM	P
 BR_060817_00724.PNG	4/3/2018 1:11 PM	P
 BR_060817_01224.PNG	4/4/2018 8:07 AM	P
 BR_060817_01724.PNG	4/4/2018 8:07 AM	P
 BR_060817_02224.PNG	4/4/2018 8:08 AM	P
 BR_060817_02724.PNG	4/4/2018 8:10 AM	P
 BR_060817_03224.PNG	4/4/2018 8:11 AM	P
 BR_060817_03724.PNG	4/4/2018 8:12 AM	P
 BR_060817_04224.PNG	4/4/2018 8:14 AM	P
 BR_060817_04724.PNG	4/4/2018 8:16 AM	P
 BR_060817_05224.PNG	4/4/2018 8:17 AM	P
 BR_060817_05724.PNG	4/4/2018 8:18 AM	P
 BR_060817_10224.PNG	4/4/2018 8:19 AM	P
 BR_060817_10724.PNG	4/4/2018 8:20 AM	P
 BR_060817_11224.PNG	4/4/2018 8:22 AM	P

# What worked well, and what didn't ...

- Establishing permanent transects was essential!
  - Structured approach >> haphazard exploration
- Shorter, replicated transects would have been a good idea...
  - Regional inference
- Stimulated further research!
  - NBC has limited resources for this work
  - Many partners now doing similar or complimentary monitoring in the area
  - Spurred conversation and greater attention



# Data Analysis

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# Quick Reminder...

- Purpose
  - Monitor for ecological response to nitrogen reduction efforts of wastewater treatment facilities
    - Improved dissolved oxygen conditions?
    - Reduced organic loading?
- Approach
  - SeaViewer camera on sled, towed along three permanent transects monthly to quarterly

The logo for the Narragansett Bay Commission is displayed within a rectangular frame. The background of the frame is a dark blue, textured image of water ripples. The text is centered and white. The main text reads "Narragansett Bay Commission" in a large, bold, sans-serif font. Below it, in a smaller, regular sans-serif font, is the tagline "Working For A Clean Bay Today!".

**Narragansett Bay Commission**

Working For A Clean Bay Today!

# Approach

- Windows Media Player – Video playback
- CMECS Details
  - Data entry in Excel
  - Substrate Component and Biotic Component focus
  - Modifiers:
    - Co-Occurring Elements



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  - Modifiers:
    - Co-Occurring Elements
    - Associated Taxa
    - Percent Cover
    - Community Successional Stage (Infaunal Status)

AL	AI	AO	AP	AS	AV	AW	AX	AY	AZ	BA	BB	BC	BD										
Biotic Subclass	Biotic Group	Biotic Community	Percent Cover Modifier	Infaunal Status (SS)	Crepidula	Algae Raft (sp Unknown)	Attached Algae (sp Unknown)	Ulva Raft	Attached Ulva	Gracilaria Raft	Attached Gracilaria	Grateloupia Raft	Attached Grateloupia	Chaetopterus	Small Burrowing Fauna (2 mm)	Larger Burrowing Fauna	Tunneling Megafauna	Diatom Felt	Tracks and Trails	Small Tube-building Fauna	Larger Tube-building Fauna		
Soft Sediment Fauna	Mobile Mollusks on Soft Sediment	Nassariid Bed	Sparse	2				T		T						T			T				

# Approach

- CMECS Modifications
  - Visibility score



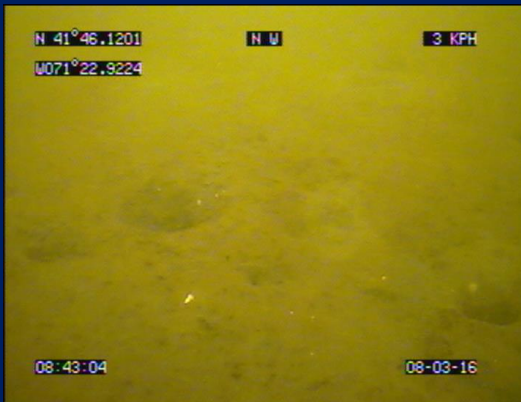
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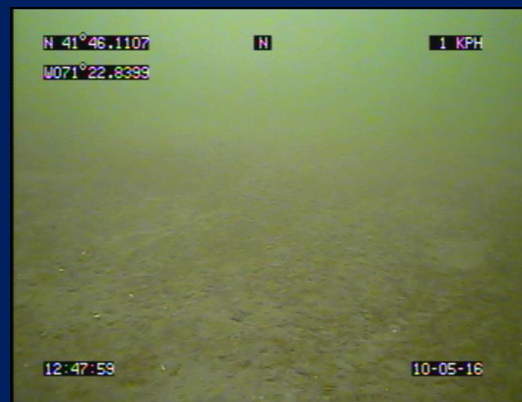
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2



3



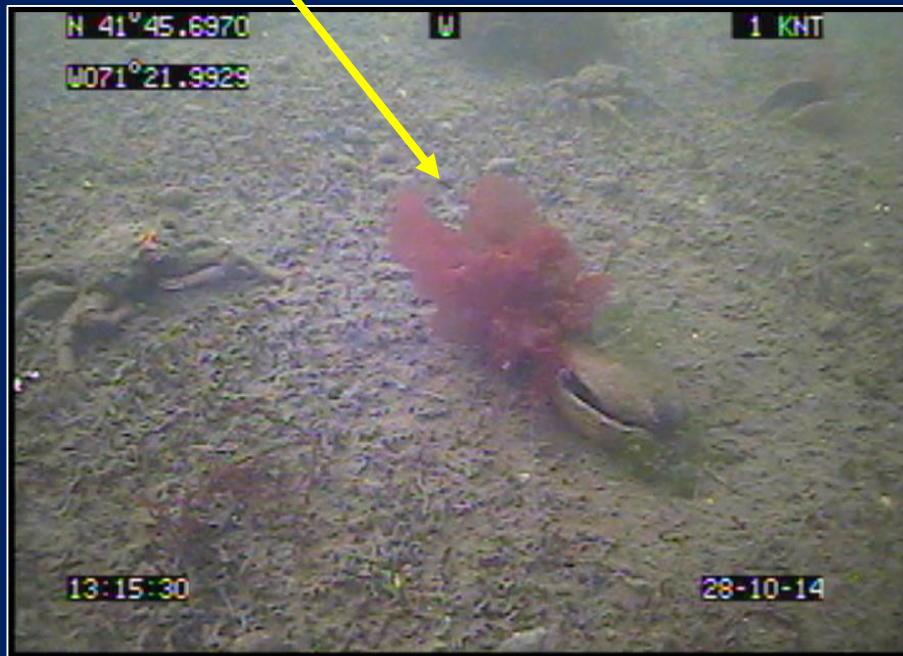
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5

# Approach

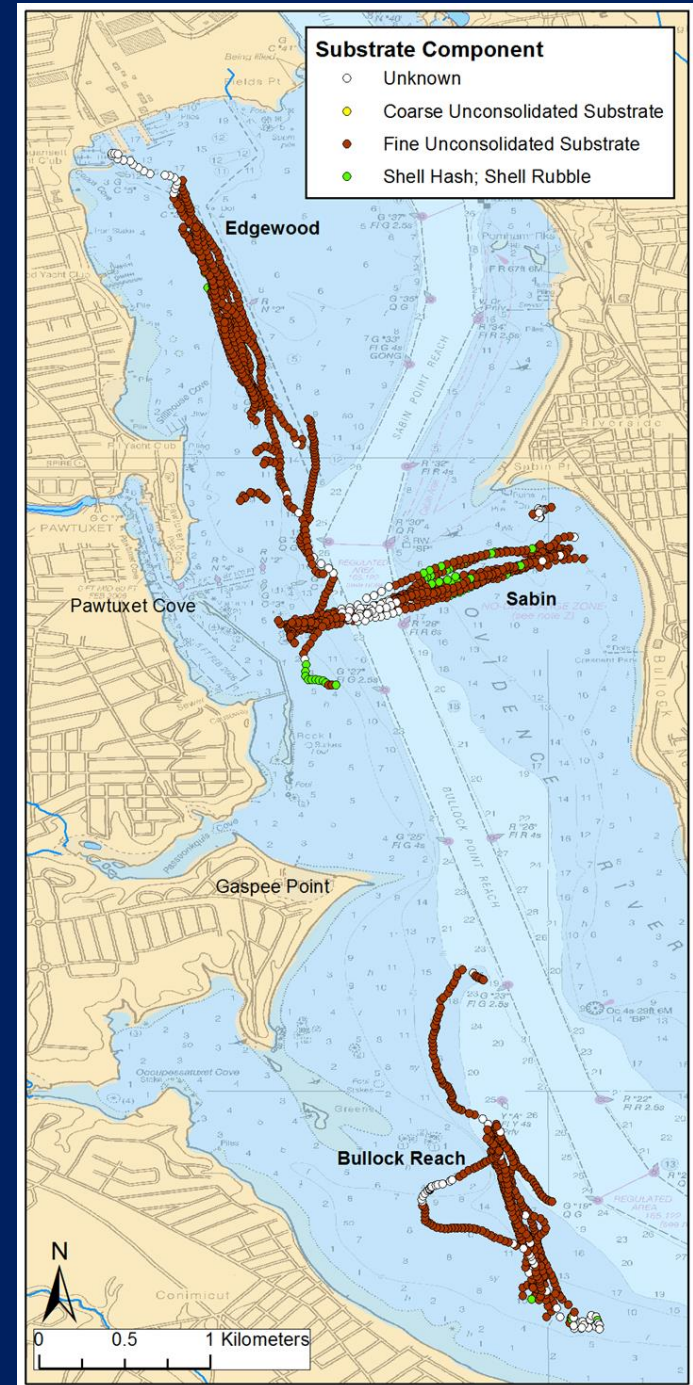
- CMECS Modifications
  - Visibility score
  - New elements as needed (e.g.)
    - Leaf Debris
    - *Grateloupia* Rafts, Attached





# Results

- Analysis in R and Excel
- Repeat transect sampling
  - Successfully building a long-term monitoring dataset
- Few, long transects
  - Difficult to separate temporal change from spatial variability
  - More, shorter transects (randomized?) would be ideal





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- Difficult to determine “biotopes”
  - Too much detail captured?
  - Need to whittle down to meaningful groups

**“Small-med surface burrowers/tube builders occasionally with algae rafts/beds, boring sponge, diatom felt, epifauna (*Crepidula*, mudsnails, crabs), small tube-building fauna, small-med surface burrowers/tube builders, sponges on sandy mud/muddy sand”**

**13 LONG biotopes?**

# What worked, and what didn't ...

- Data Entry
  - What to do with images with no clear dominant?
  - Finding CMECS surprisingly subjective...
- Data Analysis
  - Visibility score – limit analysis to comparable footage
- Overall – Videos are excellent outreach tools, regardless of data analysis!

