



# Nauset Estuary Dredging Stakeholder Meeting



# Agenda

- Nauset Estuary Stakeholder Group (NESG) – Goals & Objectives
- NESG Business Procedures
  - Communications, meetings, chairman, etc.
  - Memorandum of Understanding (MOU)
  - MEPA Special Review Procedure (SRP)
  - Regulatory agencies/personnel for NESG
  - Schedule – driven by Town Meeting vote on whether or not to proceed; drives meeting schedule
- Review of Recent Studies
  - Red tide cyst pilot project
  - Mill Pond channel
- Review of Nauset Estuary Dredging Project
  - Dredging alternatives
  - Disposal alternatives
  - Resource area impacts
- Next Steps & Responsibilities



# Nauset Estuary Stakeholder Group (NESG)

- Goal
  - Decide future of Nauset Estuary Dredging Project
- Objectives
  - Ensure stakeholder interests are represented equally
  - Review project alternatives and environmental impacts
  - Make recommendations on next steps and preferred alternative(s)
  - Meet with regulatory agencies to review project
  - Oversee permitting process
  - Participate in public outreach process



# NESG Business Procedures

- NESG Business Procedures
  - Communications & meetings – MA Open Meeting Law
  - Election of chairman, secretary, etc.
- Memorandum of Understanding (MOU)
  - Executed Feb. 2020
  - Orleans & Eastham Boards of Selectmen
  - Formalized the process to determine scope of Project
  - Prepare & file request for Special Review Procedure (SRP) to MEPA
  - Hold regular meetings
  - Set schedule with specific dates (outdated due to COVID delays)
  - Second MOU to define roles & responsibilities for permitting
- Selection of regulatory agencies/personnel for NESG
- Special Review Procedure discussion
- Schedule



# NESG Schedule - 2019

Task	Week ending																							
	26-Jul	2-Aug	9-Aug	16-Aug	23-Aug	30-Aug	6-Sep	13-Sep	20-Sep	27-Sep	4-Oct	11-Oct	18-Oct	25-Oct	1-Nov	8-Nov	15-Nov	22-Nov	29-Nov	6-Dec	13-Dec	20-Dec	27-Dec	
Contract issue July 18, 2019																								
11.1: Towns send letter to CCNS with project update																								
11.2: Identify details and possible components of MOU and SRP																								
11.3: Schedule joint Orleans, Eastham, CCNS meeting and distribute memo developed in Task 11.2																								
11.4: Attend meeting #1																								
11.5: Prepare minutes of meeting #1																								
11.6: Coordinate with MEPA																								
11.7: Orleans, Eastham and CCNS work internally to draft/edit MOU and SRP components and identify possible CAC members																								
11.8: Prepare Draft Final MOU and Draft Final SRP request																								
11.9: Schedule joint Orleans, Eastham, CCNS meeting #2																								
11.10: Orleans, Eastham, and CCNS work internally to review documents																								
11.11: Attend meeting #2																								
11.12: Prepare minutes of meeting #2, Final MOU, and Final SRP request																								
11.13: Orleans, Eastham and CCNS work to execute/approve documents																								
11.14: File SRP request with MEPA																								
11.15: Coordinate with MEPA on SRP request																								
11.16: Issuance of Secretary's Certificate on SRP																								
11.17: Prepare for and attend four (4) meetings with the CAC																								
11.18: Attend meeting #3																								
12.1: Sediment coring and laboratory analyses																								
12.2: Coordinate with DMF on shellfish survey																								
12.3: Perform shellfish survey																								
12.4: Coordinate with NHESP on dewatering alternatives and designs																								
12.5: Finalize red tide cyst pilot project methodology and implementation schedule																								
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12.7: Prepare Essential Fish Habitat (EFH) assessment and coordinate with DMF, NMFS, and USFWS																								
12.8: Prepare Biological Assessment (BA) and coordinate with NMFS																								
12.9: Prepare Section 106 review and coordinate with appropriate agencies																								

# NESG Schedule - 2020

Contract issue July 18, 2019	Week ending		2020																					
	3-Jan	10-Jan	17-Jan	24-Jan	31-Jan	7-Feb	14-Feb	21-Feb	28-Feb	6-Mar	13-Mar	20-Mar	27-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	8-May	15-May	22-May	29-May		
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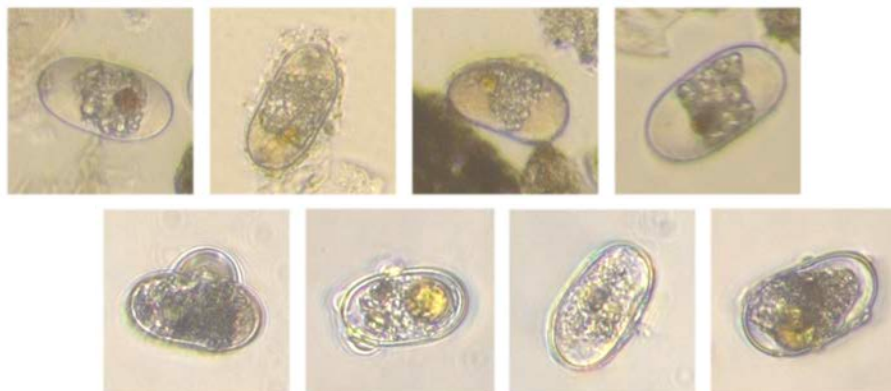
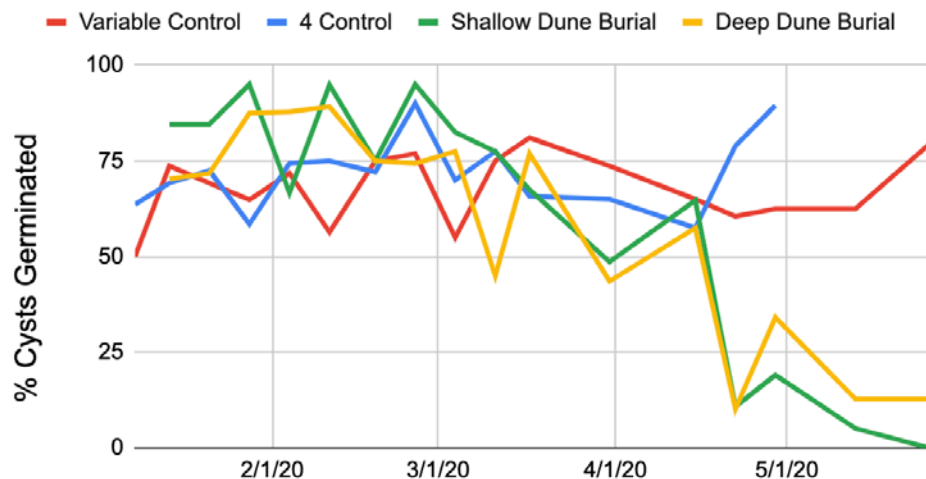
# Red Tide Cyst Pilot Project



# Red Tide Cyst Pilot Project

- Sediment collected from Nauset Estuary in Dec. 2019 and aliquoted into mesh bags
- Bags buried at shallow and deep depths in Nauset dunes
- Bags collected weekly and brought to WHOI laboratory
- Temperature measured in dunes for entire experiment
- Control sediments in lab in anoxic conditions, one at 4 deg. C and another adjusted to mimic field temperatures
- Samples weighed and dried to determine % moisture
- Salinity measured in samples by centrifuging sediment from liquid
- Sediments were sieved to isolate cysts; cysts were checked for germination after two weeks
- Autofluorescence was scored at time of collection
- Total cyst concentrations were determined using primulin stain
- Imagery was used to document changes in cyst morphology over time

# Red Tide Cyst Pilot Project

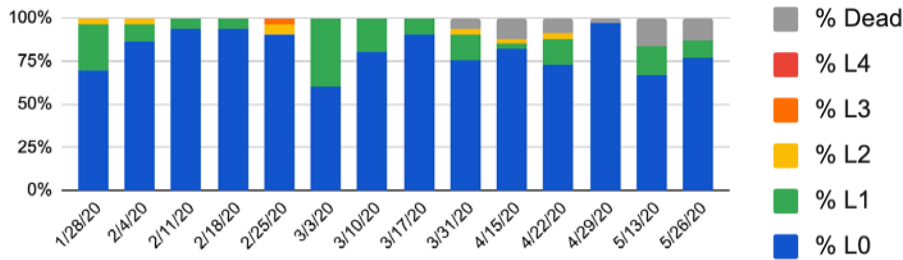


- Top Row: Healthy cysts, imaged 2/25
- Bottom Row: Dead/dying cysts imaged 5/26

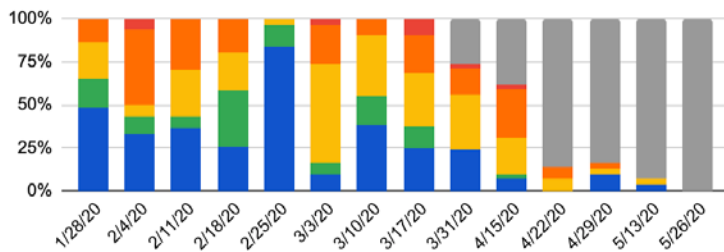
- Cysts remained viable throughout winter months
- At times displayed more successful germination than laboratory controls in anoxic conditions
- Cyst mortality rates increased to 70% in spring (week 15)
- Cyst mortality rates were 100% at shallow treatment in mid May (0% germination, 100% dead cysts)

# Red Tide Cyst Pilot Project

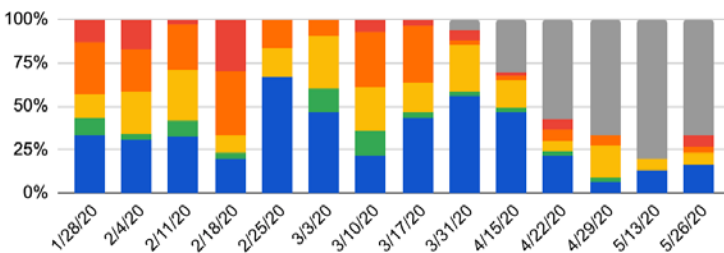
Variable Control



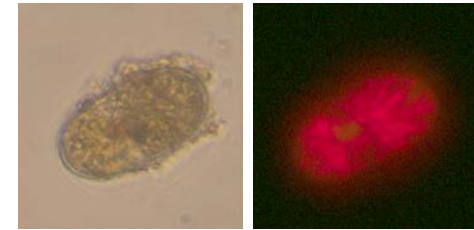
Shallow Treatment



Deep Treatment



- Proportional cyst fluorescence data from the variable control, shallow, and deep treatments.

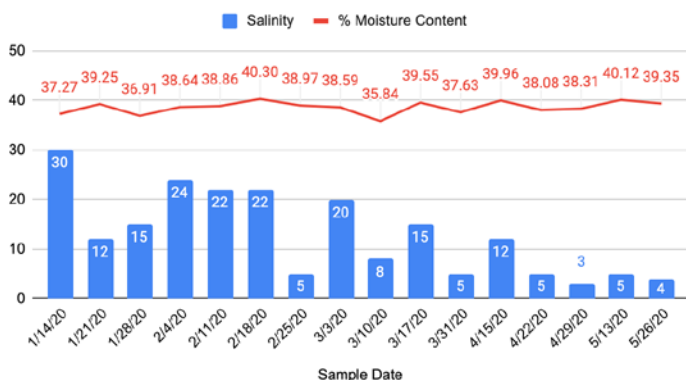


L4 Autofluorescent Cyst

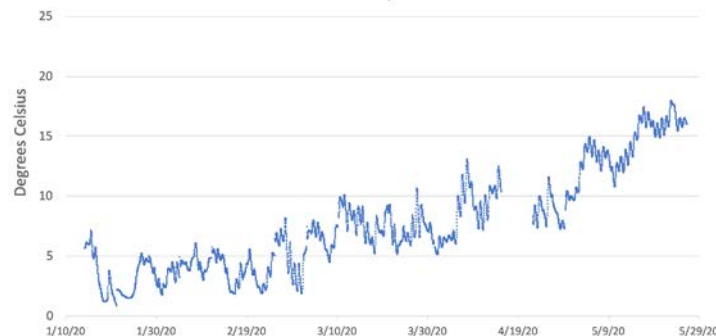
- Prior to germination cysts synthesize chlorophyll which leads to emission of red autofluorescence
- Germination was determined by checking for autofluorescence and gradings on a scale of 0 to 4
- Dune samples displayed high levels of autofluorescence throughout the study – indicating cysts were preparing to germinate

# Red Tide Cyst Pilot Project – Preliminary Results

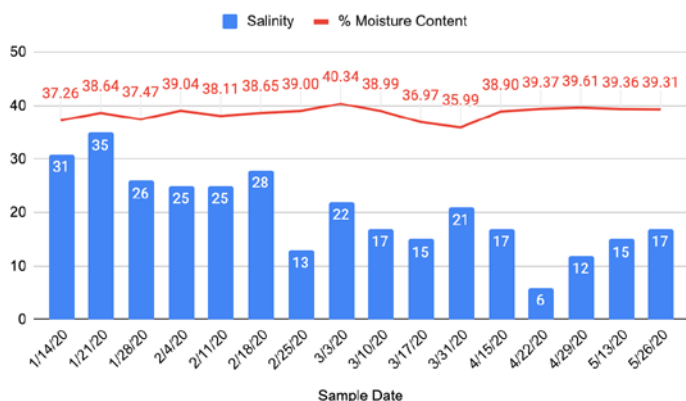
Shallow Treatment



Surface Temperature



Deep Treatment



Bottom Temperature



- Warm winter; freezing conditions not measured in dunes which explains why germination was high throughout winter

- Extended spring rainy season caused salinity levels to drop resulting in cyst mortality

# Mill Pond Dredging & Red Tide Cyst

- Highest cyst concentrations in Nauset Estuary are in bottom sediments of Mill Pond, Town Cove and Salt Pond
- Cysts germinate into the water column & grow as vegetative cells into a bloom
- Hydrodynamic model used to evaluate impacts of dredging entire project with spur channel into Mill Pond
- Model included sediment transport component to represent how cysts associated with sediment are transported via currents
- Estuary is flood dominant – shorter duration and faster current velocities than on ebbing tide
- Net sediment transport is in the flood direction to terminal ponds
- Dredging causes increase in tide range and current velocities, with enhanced sediment transport/cysts into terminal ponds, such as Mill Pond
- Dredging also causes enhanced flushing of terminal ponds, which reduces settling/accumulation rates
- No adverse impacts on cyst distributions with Mill Pond dredging

# Nauset Estuary Dredging Alternatives

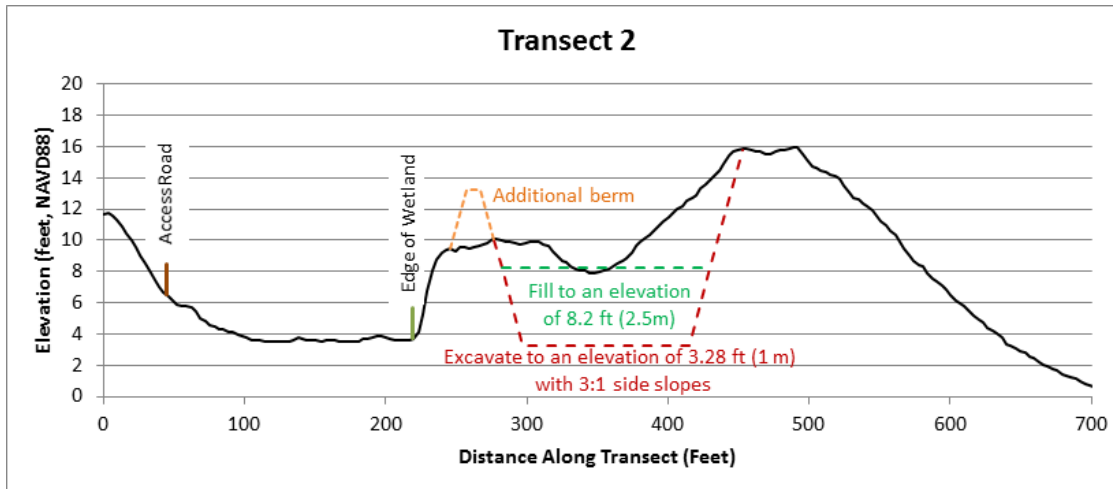


# Nauset Estuary Dredging Alternatives

	Length (ft)	Width (ft)	Permitted Depth (ft MLW)	Depth w. overdraft (ft MLW)	Depth used in Volume Calc	Dredge Volume (cy)	Sand Volume (cy)	Fines Volume (cy)	Material
<b>Nauset Estuary</b>									
Town Cove	9,100	100	-5	-6	-6	14,406	11,010	3,396	Silty sand
	9,100	50	-5	-6	-6	10,622	8,046	2,576	Silty sand
Central Main Channel	2,200	100	-5	-6	-6	8,046	897	7,149	Sandy silt
	2,200	50	-5	-6	-6	6,206	748	5,459	Sandy silt
Eastern Main Channel	3,500	100	-5	-6	-6	2,660	2,660	0	Sand
	3,500	50	-5	-6	-6	2,131	2,131	0	Sand
Priscilla Spur	4,500	50	-5	-6	-6	16,278	0	16,278	Sandy silt
Behind Barrier	5,900	100	-5	-6	-6	122,164	122,164	0	Sand
	5,900	50	-5	-6	-6	102,547	102,547	0	Sand
<b>Total (100 ft Alternative)</b>	25,200	100	-5	-6	-6	<b>163,554</b>	<b>136,731</b>	<b>26,822</b>	
<b>Total (50 ft Alternative)</b>	25,200	50	5	-6	-6	<b>137,784</b>	<b>113,472</b>	<b>24,312</b>	

- Current Nauset Estuary Dredge Project permitting assumes a 50' wide channel, not 100'.
- Volumes for 100' wide channel included at the request of the Orleans Dredge Committee.
- Important to remember permitting for dredging behind the barrier will be challenging.
- Dredged channel behind the barrier beach will require frequent maintenance dredging.
- Not all material (fines, silty sand) are suitable for beneficial reuse.

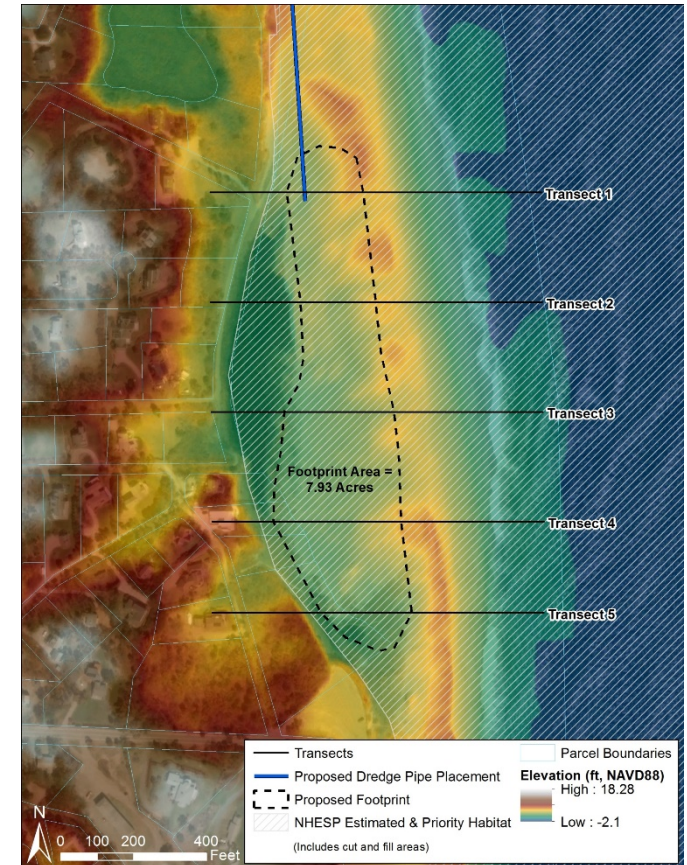
# Nauset Estuary Disposal



Aug. 13, 2019 – Request for pre-application consultation with NHESP

MESA filing will be required w/ 3 outcomes:

- No Take
- Implement conditions to avoid Take
- Take will occur and CMP will be required



Continued consultation:

- Disposal alternatives, minimize size of basin, frequency of use, details on pipe, overall area of impact

# Resource Area Impacts

Sediments

Eelgrass

Shellfish

Fisheries

State-listed Species

Essential Fish Habitat

## Construction Equipment

## Next Steps & Responsibilities

