Coastal Measurements

Moderator: Scott Graves

Presenters: John McLaughlin, Jim Tait, Scott Graves

Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Panel Discussion: Coastal Resilience

Moderator: Scott Graves

Presenters: *John McLaughlin, Jim Tait*

– panel questions/discussion points to include … how GLOBE protocols can be used to monitor coastal environments more broadly; new tools and established techniques; how to contribute to local/ regional stakeholders; expand student investigations of this important and dynamic interface between land, sea and sky; with considerations of possible future opportunities.

Presenter: *John McLaughlin*

Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Coastal Measurements Discussion: Citizen Science Resources from NOAA

GLOBE Annual Meeting

JOHN MCLAUGHLIN
NOAA CITIZEN SCIENCE COORDINATOR
OFFICE OF EDUCATION

AUGUST 1, 2017

Southern Connecticut State University

Coastal Measurements Discussion: Citizen Science Resources from NOAA

GLOBE Annual Meeting

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AUGUST 1, 2017

Citizen Science Can…

5

- Enhance scientific research
  - volunteers can collect data
  - volunteers provide unique perspectives and local expertise
  - human brain is good at image recognition
- Address societal needs
  - leverages the skills, dedication, and ingenuity of the American people
  - can facilitate diverse participation by all parts of society
  - Contributes to a conservation ethic
- Provide hands-on learning and increase STEM literacy
  - work on real-world problems
  - exposure to and involvement in scientific process
  - Reduces barrier to doing science

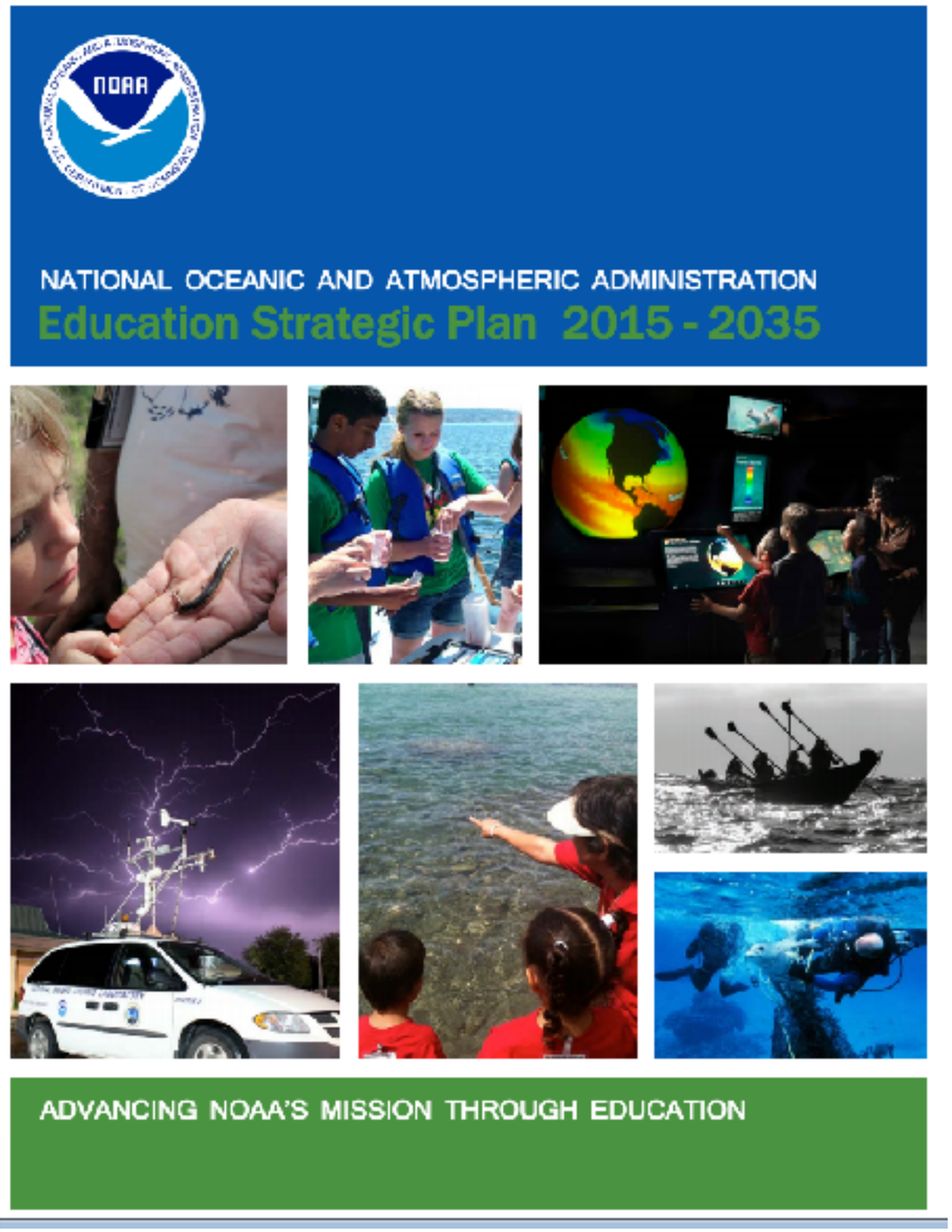
Increasing Relevance to Science Education

- A Framework for K-12 Science Education calls for students to engage in Scientific and Engineering Practices
- There is “limited but growing evidence that citizen science projects achieve participant gains in knowledge about science knowledge and process…” (1)
- Merging of citizen with Science Education “may make education more responsive to current global challenges” (2)

Therefore…

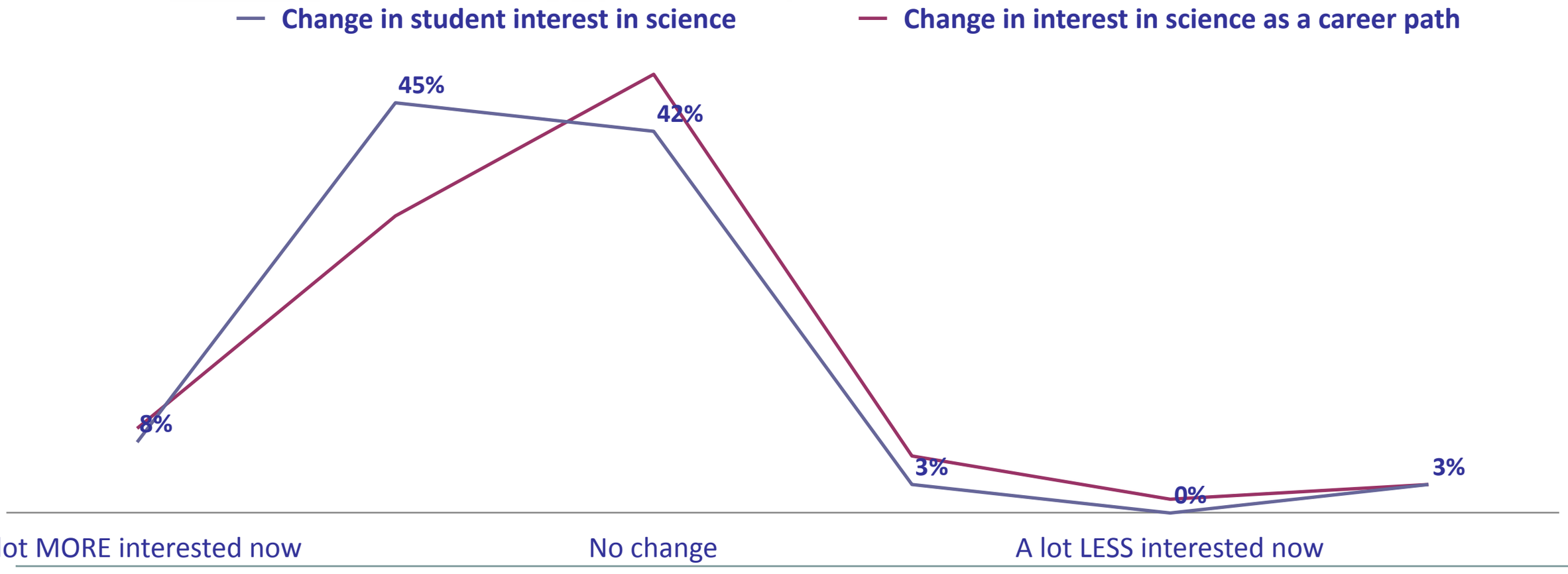
NOAA Education adopted a strategy to:

"Promote and coordinate citizen science opportunities"



The LiMPETS Program

~6,000 teachers and students collect rocky intertidal and sandy beach data at National Marine Sanctuaries along the coast of California



A Myth…

The scientific usefulness of a project needs to be "watered down" to get students to participate.

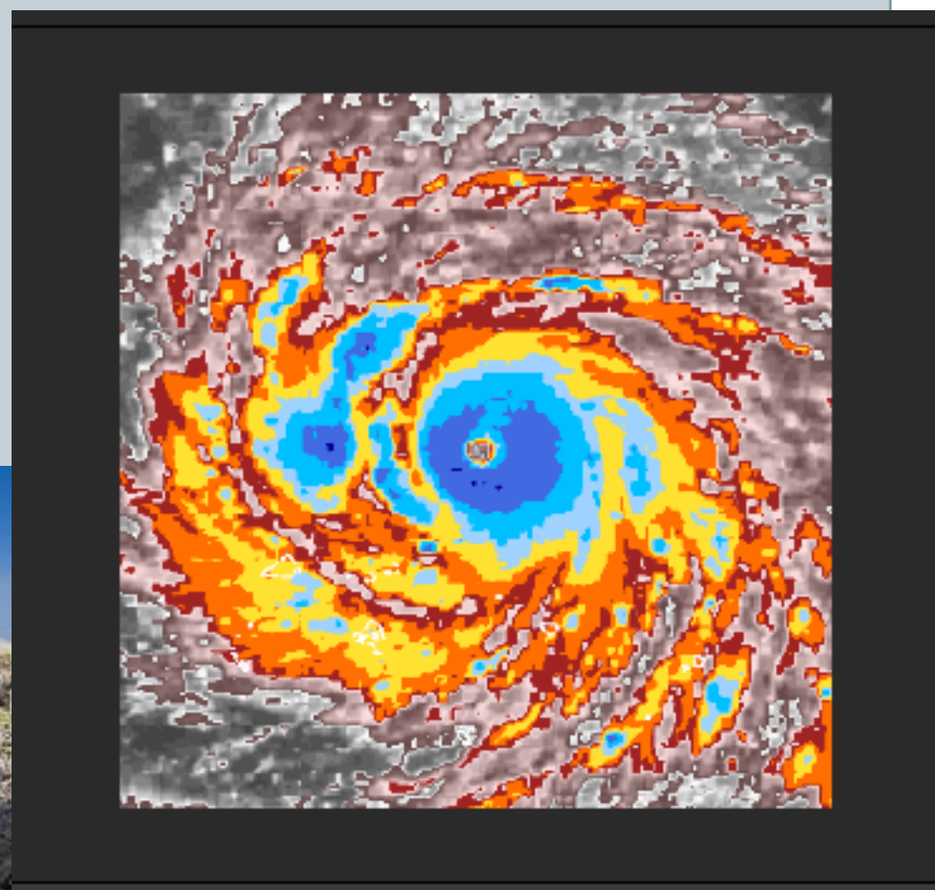
…to Throw a Bucket of Cold Water On

Research shows that children in early grades are capable of surprisingly sophisticated scientific thinking (National Research Council, 2007).

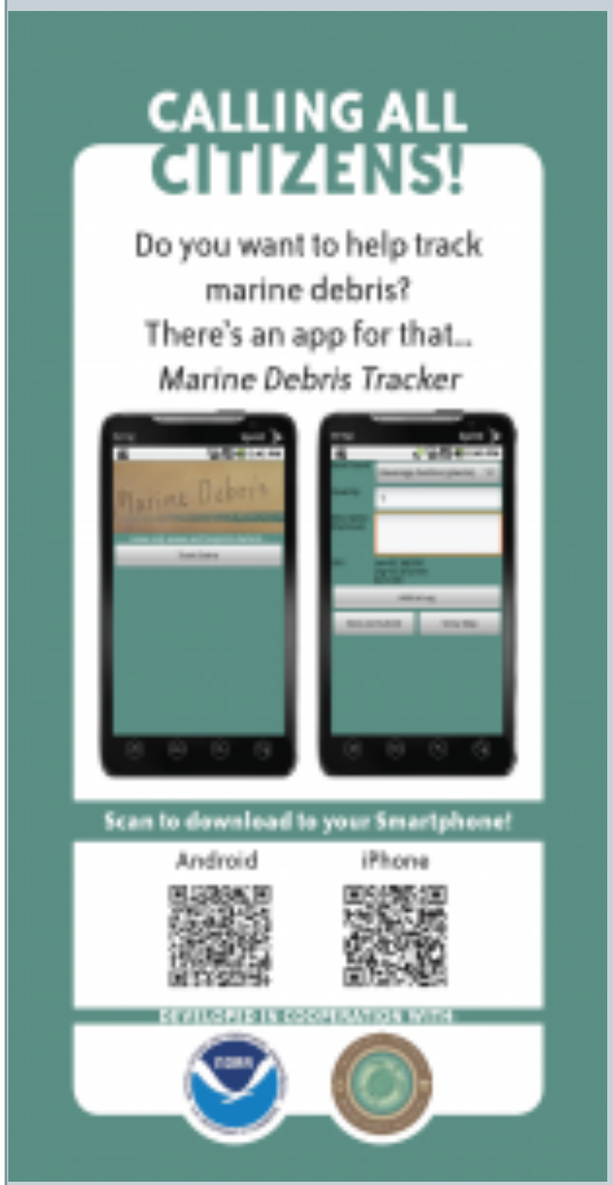
Specific Areas to Highlight

NOAA marine-related citizen science projects that can complement GLOBE measurements in:

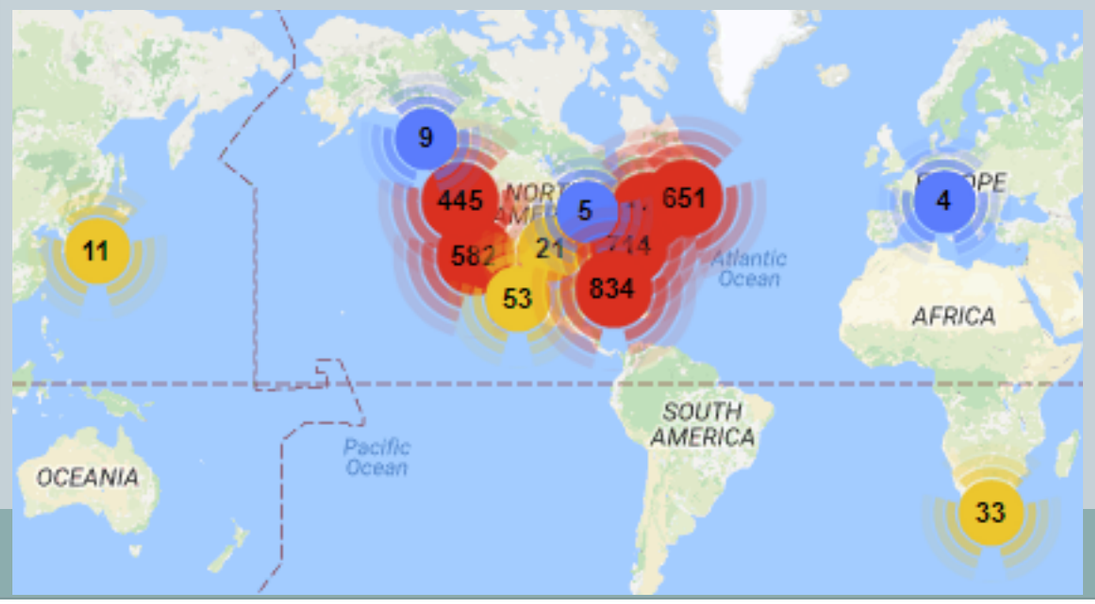
- Marine debris
- Image recognition
- Species tracking



Marine Debris Tracker App

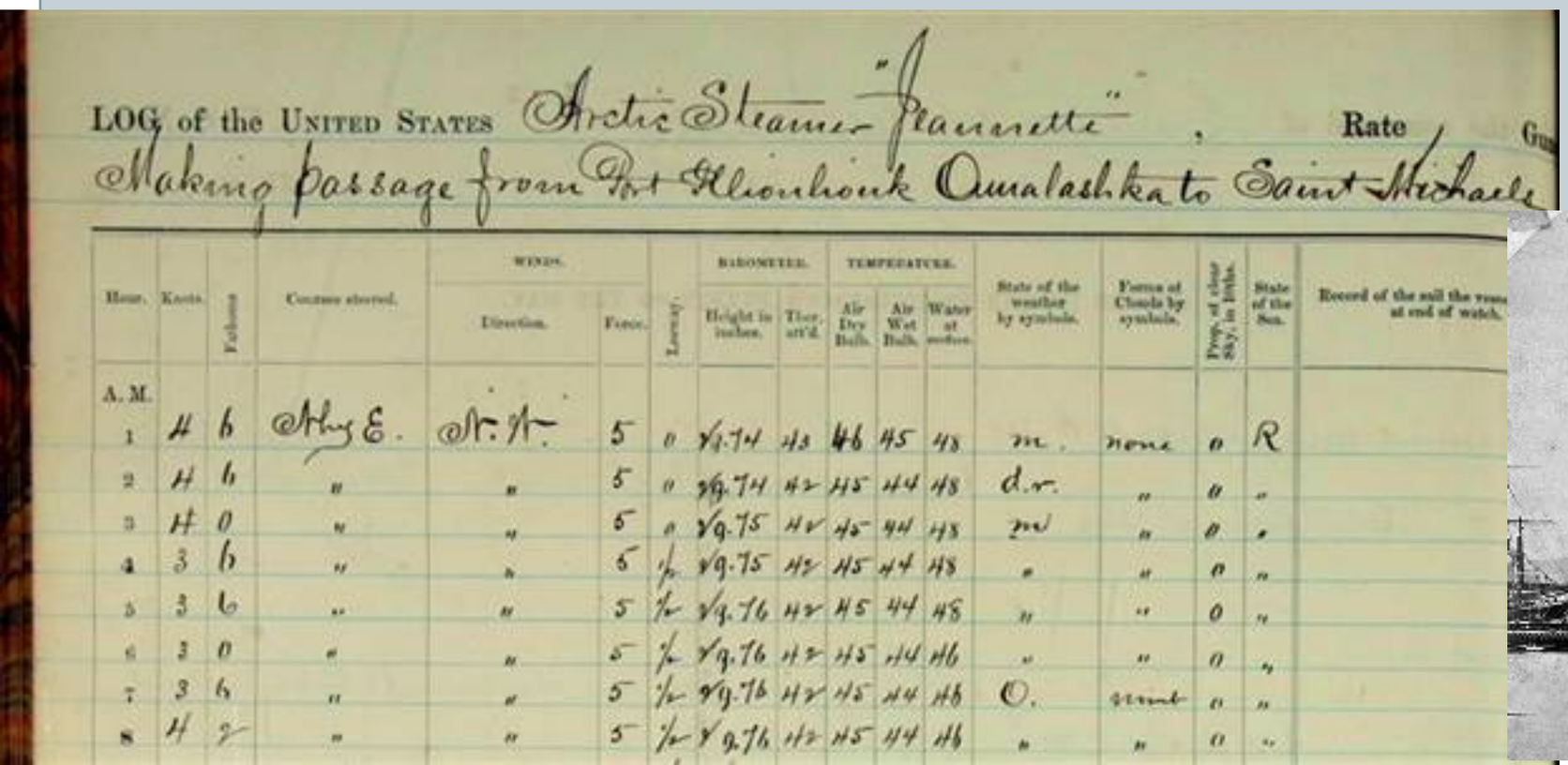


- Freely available app to report type, location and photos of marine debris
- Thousands of people have logged and removed over 750K pieces of litter and debris all over the world!



Old Weather

- Help digitize and recover Arctic and worldwide weather observations made by United States ships since the mid-19th century by transcribing ships' logs
- Also, work with logbooks from Arctic whaling ships
- Great way to involve language arts



LOG of the UNITED STATES Arctic Steamer "Jeannette", Rate Gu

Making passage from Port Kliouhouk Oumalashka to Saint Michaels

Hour.	Knots.	Fathoms	Courses steered.	WINDS. Direction.	Force.	Leeway.	BAROMETER. Height in inches.	Temp. att'd.	TEMPERATURE. Air Dry Bulb.	Air Wet Bulb.	Water at surface.	State of the weather by symbols.	Forms of Clouds by symbols.	Prop. of clear sky, in tenths.	State of the Sea.	Record of the sail the vess at end of watch.
A. M.																
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2	4	6	"	"	5	0	29.74	42	45	44	48	d.r.	"	0	"	
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5	3	6	"	"	5	½	29.76	42	45	44	48	"	"	0	"	
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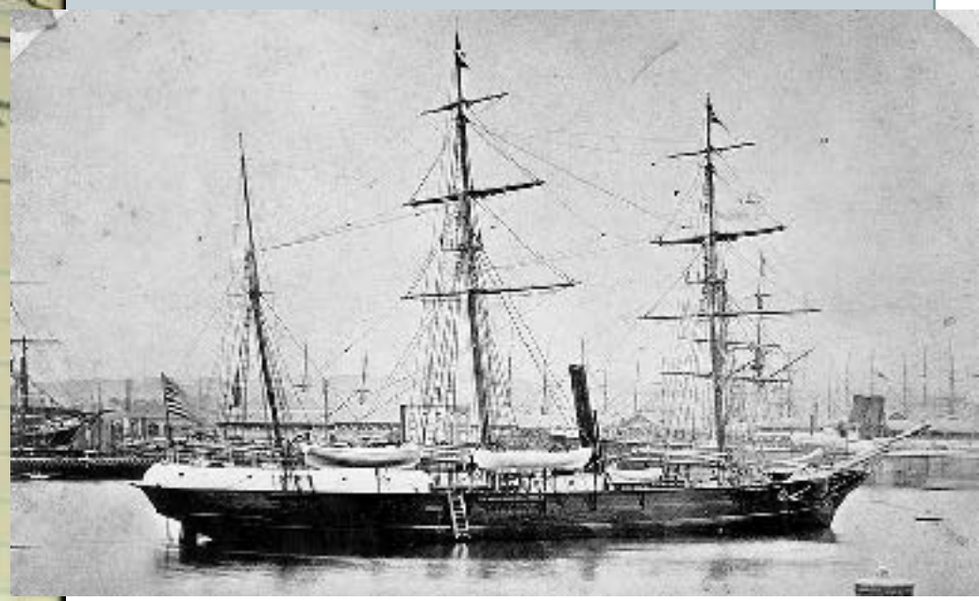
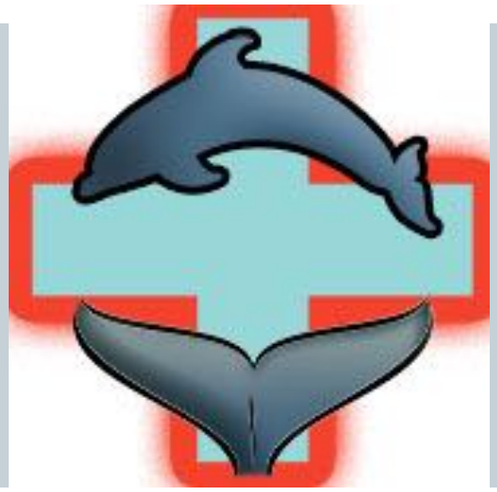
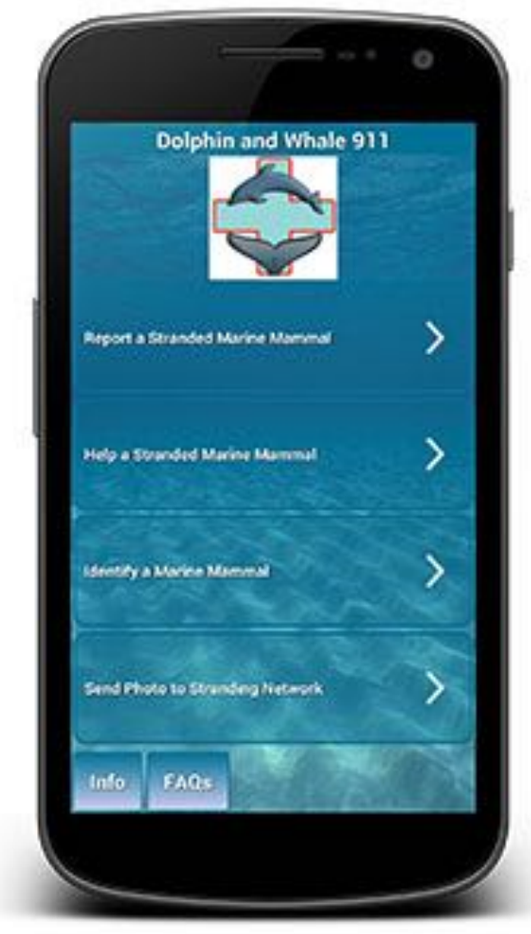


Dolphin & Whale 911

- Report dead, injured or entangled marine mammals
- App only works in Southeastern US- stay tuned for expansion to additional geographic areas
- Send a photo of the marine mammal along with GPS coordinates
- Identify the kind of animal by providing an electronic field guide of marine mammals found in the Southeastern U.S.
- Help live and dead stranded marine mammals by providing you with a list of “do’s and don’ts” or tips on what to do when you find a live or dead stranded dolphin, whale, or seal.



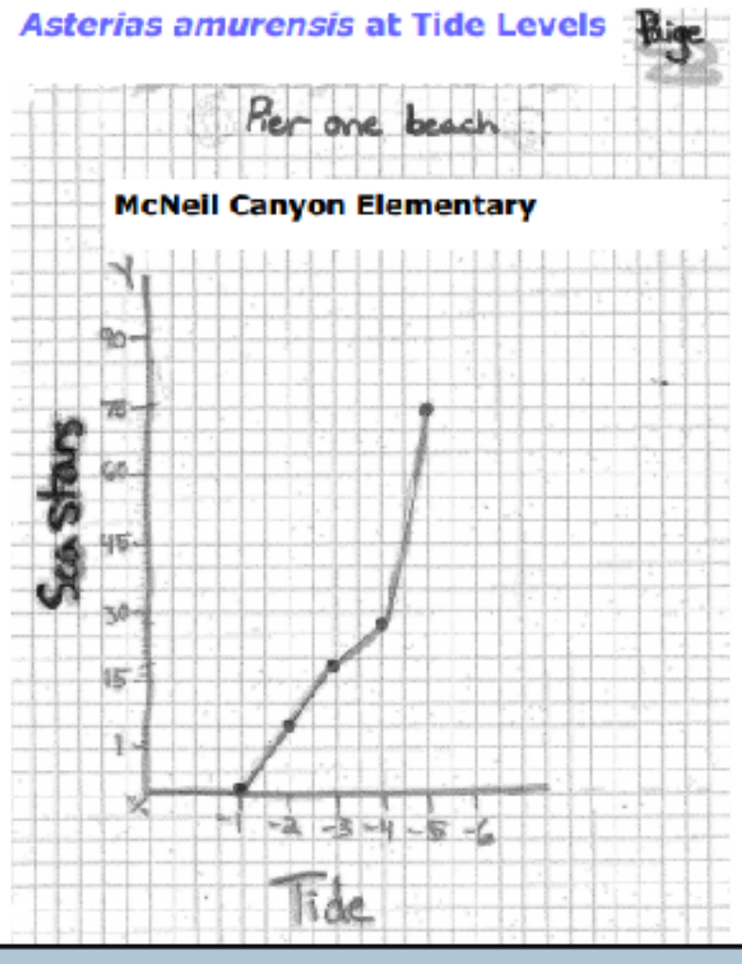


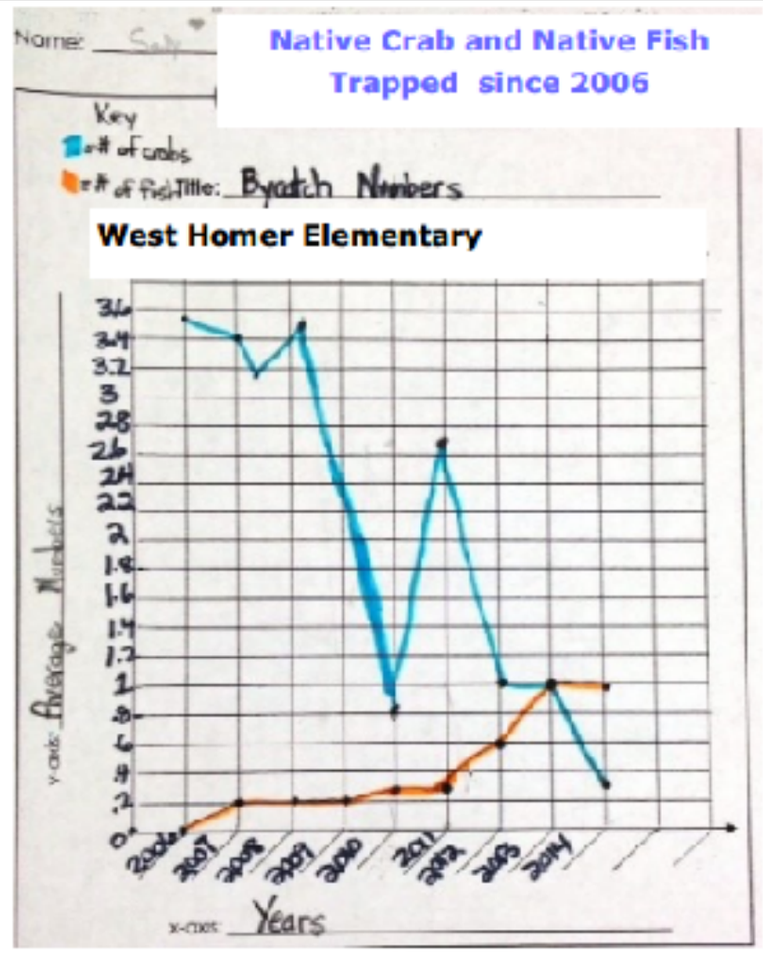
Also at a Local Level

KACHEMAK BAY RESEARCH RESERVE

European Green Crab student graphs

2014 Progress Report





Does the low tide level affect sea stars?

EGC detection trapping events are all held at minus tides. *Asterias amurensis* sea stars are counted in a 10 meter circle around each trap. The students noticed that some trap-

Are we catching as many native crab in our traps as we have in the past?

The West Homer Elementary 4th grade monitors created this graph of bycatch crab caught throughout the history of our program. They

Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Presenter: Jim Tait

Dr. Tait received a Ph.D. is Earth Sciences, with a specialty in coastal oceanography, from the University of California at Santa Cruz. His current research focuses on the coastal impacts of large storms such as Irene and Sandy. He is co-founder and co-coordinator of the Werth Center for Coastal and Marine Studies at SCSU. He has worked with coastal communities to develop resilience in the face of rising sea level and storm intensification. One of his most cherished accomplishments is being included in the surfing movie Beyond Monster Mavericks.

Presenter: *Jim Tait*

21st Annual GLOBE Meeting

Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Working with fellow faculty and students on detailed beach and inland transects - surveying with Total Station.

Southern Connecticut State University

Presenter: *Jim Tait*

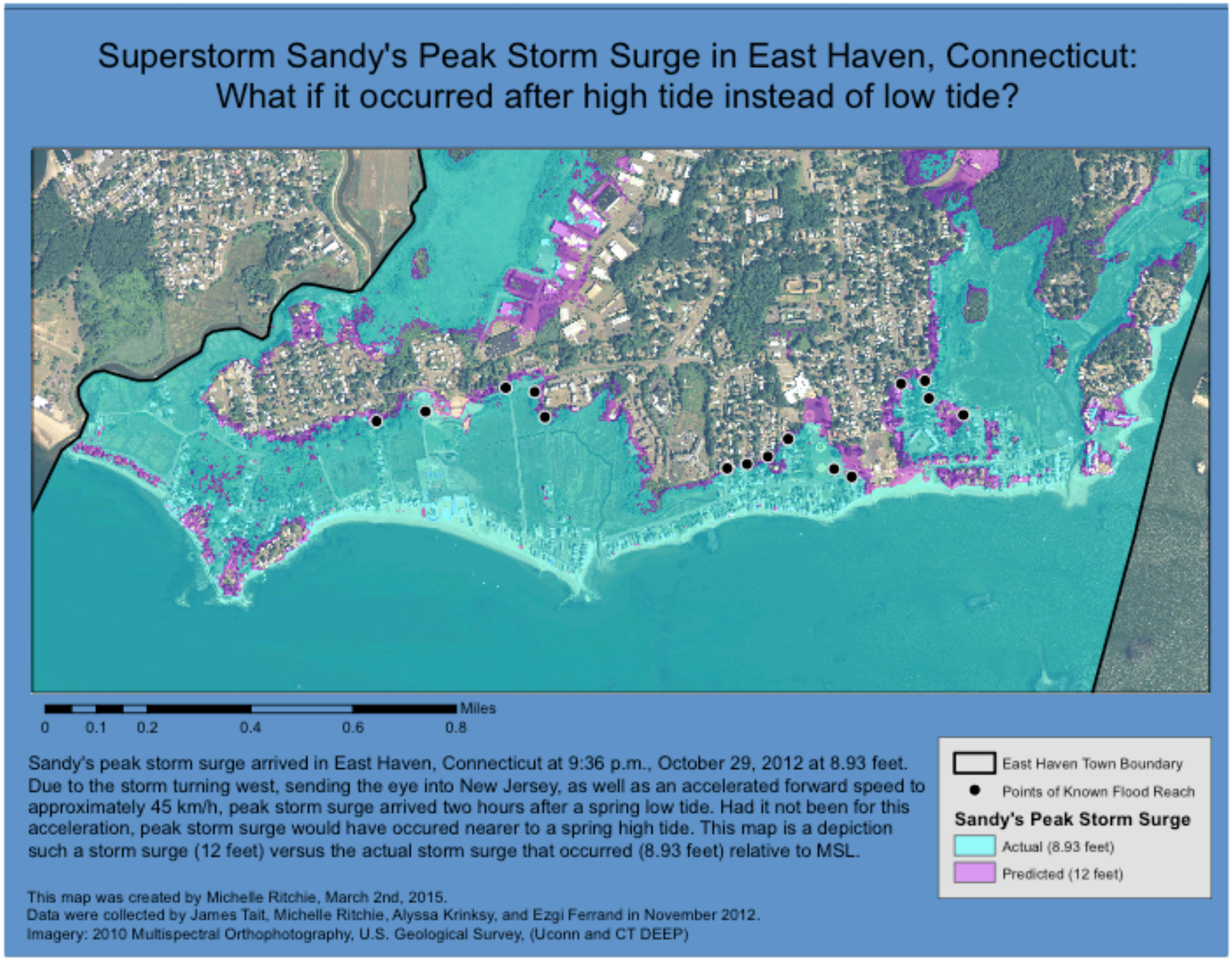
Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

CT Shore Profile Locations

Coastal Measurements

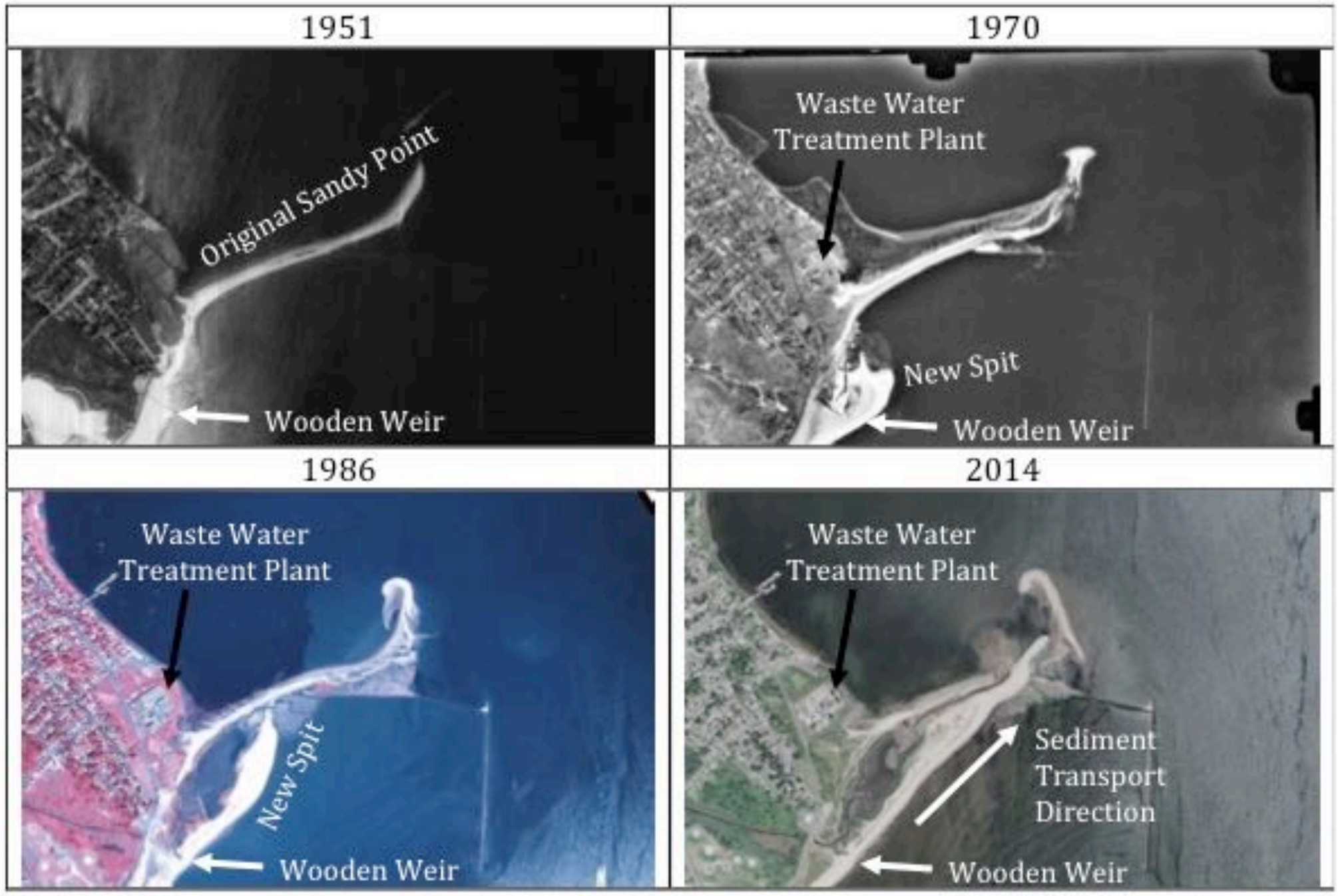
Tuesday 1 August, 2017 @ 3:15 – 4:45pm



Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

West Haven Along-shore sediment transport.



Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Presenter: *Mark Paine*

Coastal Measurements

Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Coastal Measurements

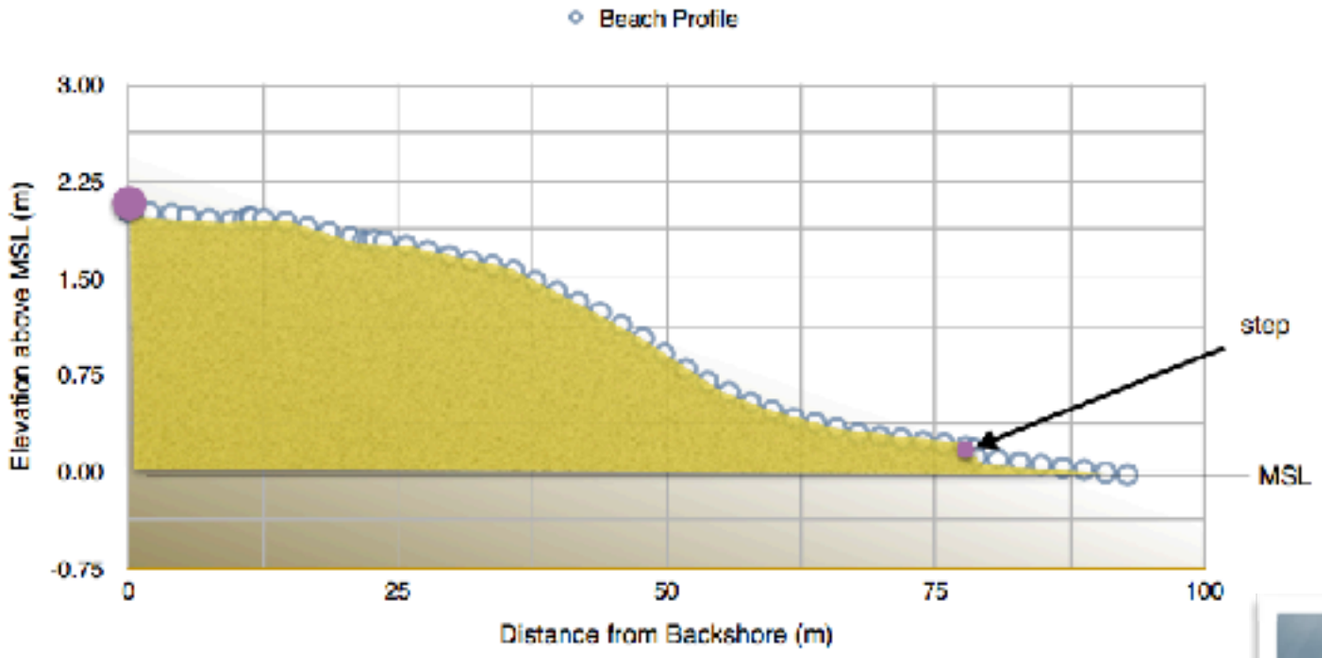
Tuesday 1 August, 2017 @ 3:15 – 4:45pm

Moderator: Scott Graves

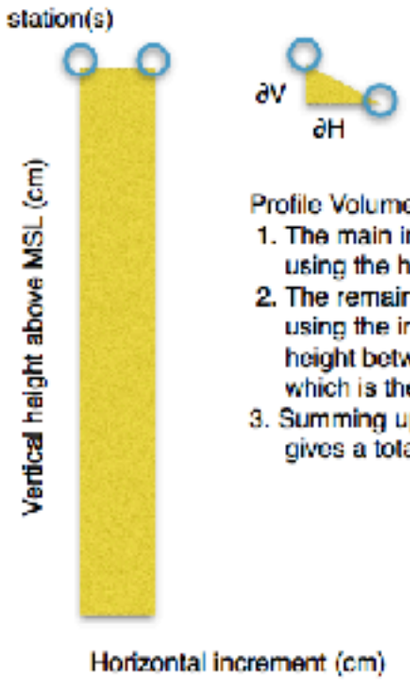
The importance of ongoing environmental monitoring; the value of Citizen Science and GLOBE; How local GLOBE students can connect their data collection to the needs of a local stakeholder/municipality. Examples of Cove River, West Haven City, WH High School, SCSU ENV classes.

Emery Method

Transit/Theodolite/Total Station



For each Profile location, a backshore reference must be established (hopefuly tied to a surveyed benchmark).
If no backshore reference is available, the profile can be tied to the "hydraulic step" which should be at or near the MLW mark.



Profile Volume is calculated in increments:

1. The main incremental volume is calculated using the horizontal increment X height aboveMSL
2. The remainder incremental volume is calculated using the incremental horizontal value x the difference in height between successive stations. This gives a small "rectangle" which is then divided in half... (∂H x ∂V / 2)
3. Summing up all incremental "main volumes" and "remainder volumes" gives a total profile volume above MSL

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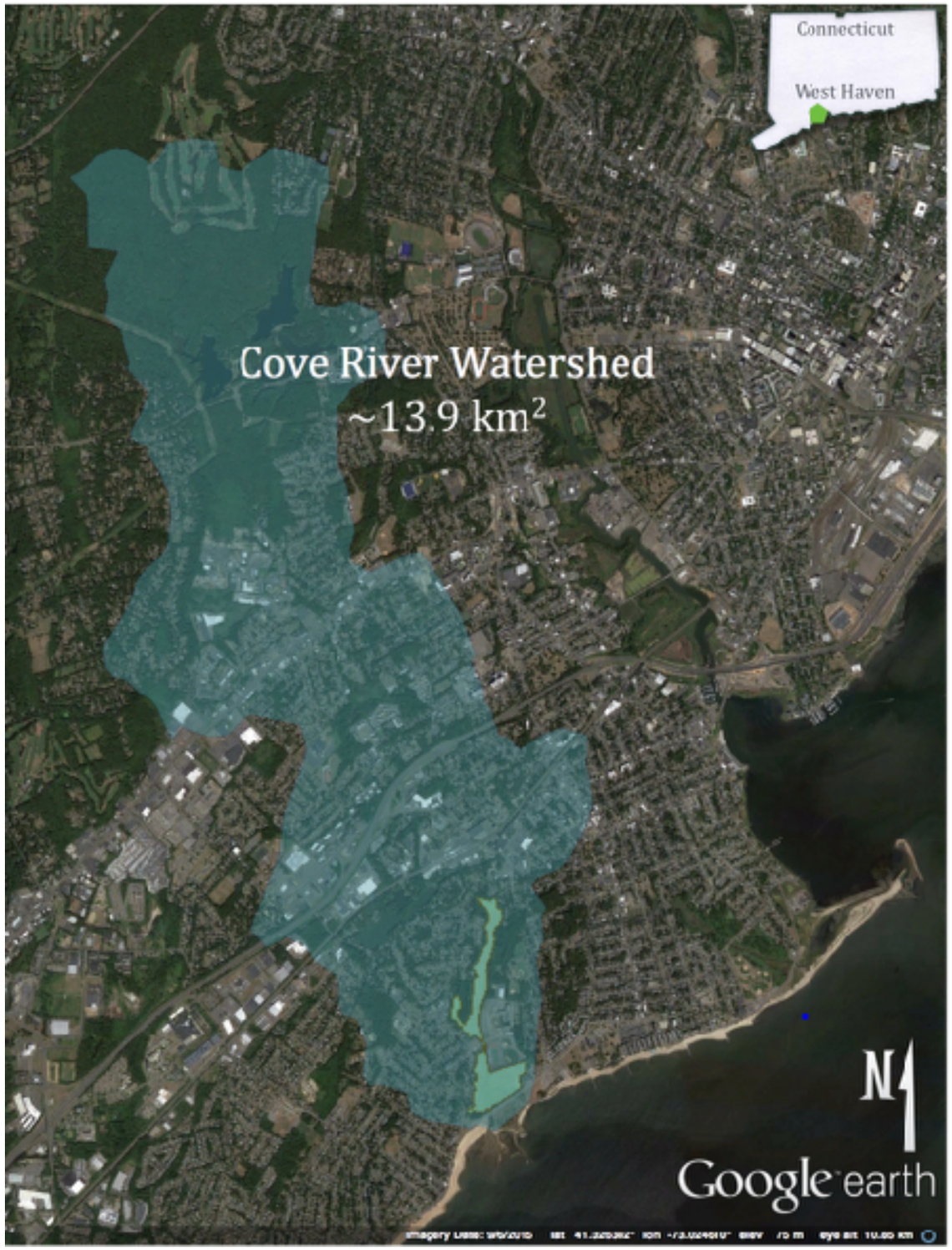
9/2015
1991
2016
Old Field Creek
Cove River
805 m
Tour Guide
1991
Google earth
lat 41.263107° lon -72.950976° elev 10 m eye alt 3.75 km

Watershed and location map of Cove River Historical Site and field study site



INVASIVE SPECIES

- Non-native species – those species that are alien to the ecosystem that they have been introduced into, and whose introduction causes or is likely to cause harm to the environment or human health.

- Invasive species - some non-native species exhibit an aggressive growth habit and can out-compete and displace native species, and they are a serious problem in Connecticut and elsewhere.

- CT DEP – works to protect native species and the habitats in which they occur.
  - control & removal
  - assist landowners

~2010 Invasive marsh grasses dominate

~2016 Native marsh grasses returning

ACTIONS / REMEDIATION

- Herbicide treatment:
  - Imazapyr & Glyphosate spraying
- Mulch Mowing:
  - “Marshmaster”
- Spot application of herbicide and weed pulling
- Native marsh grass planing & tending
- Continuous monitoring

EDUCATION / COLLABORATION

- SCSU Undergraduates
  - ENV350 class field studies
- SCSU Graduates
  - SCE575 class field studies
- WHHS Biology / Environmental Science
  - class field studies

Students help gather climate data

Ground-based photography - ground-

fall 2012

spring 2013

Ground-based photography - ground-

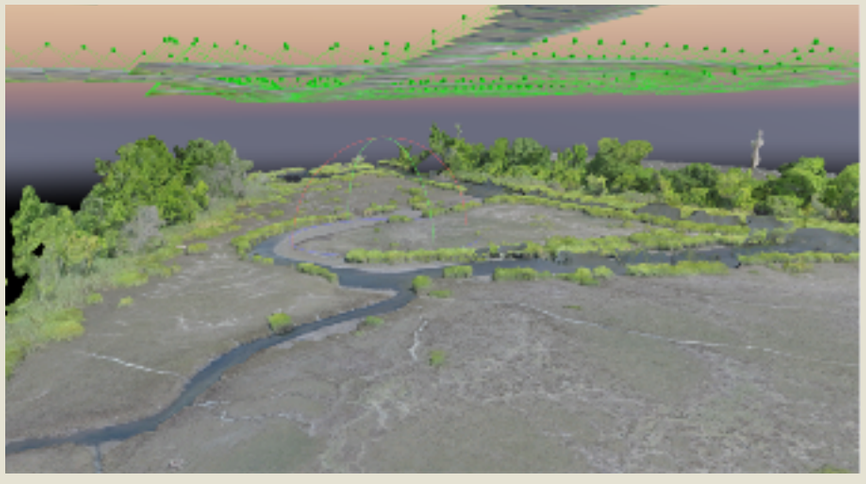
Panorama Views of Lower-Mid Cover River Estuary/Marsh,

Coastal Measurements

Osprey's View of Coastal Resilience in Urban Environments
µUAS: New Tools for Monitoring Coastal Resilience

Structure from Motion (SfM): software applications for Ecological Mapping with µUAS/drones

3DR SOLO



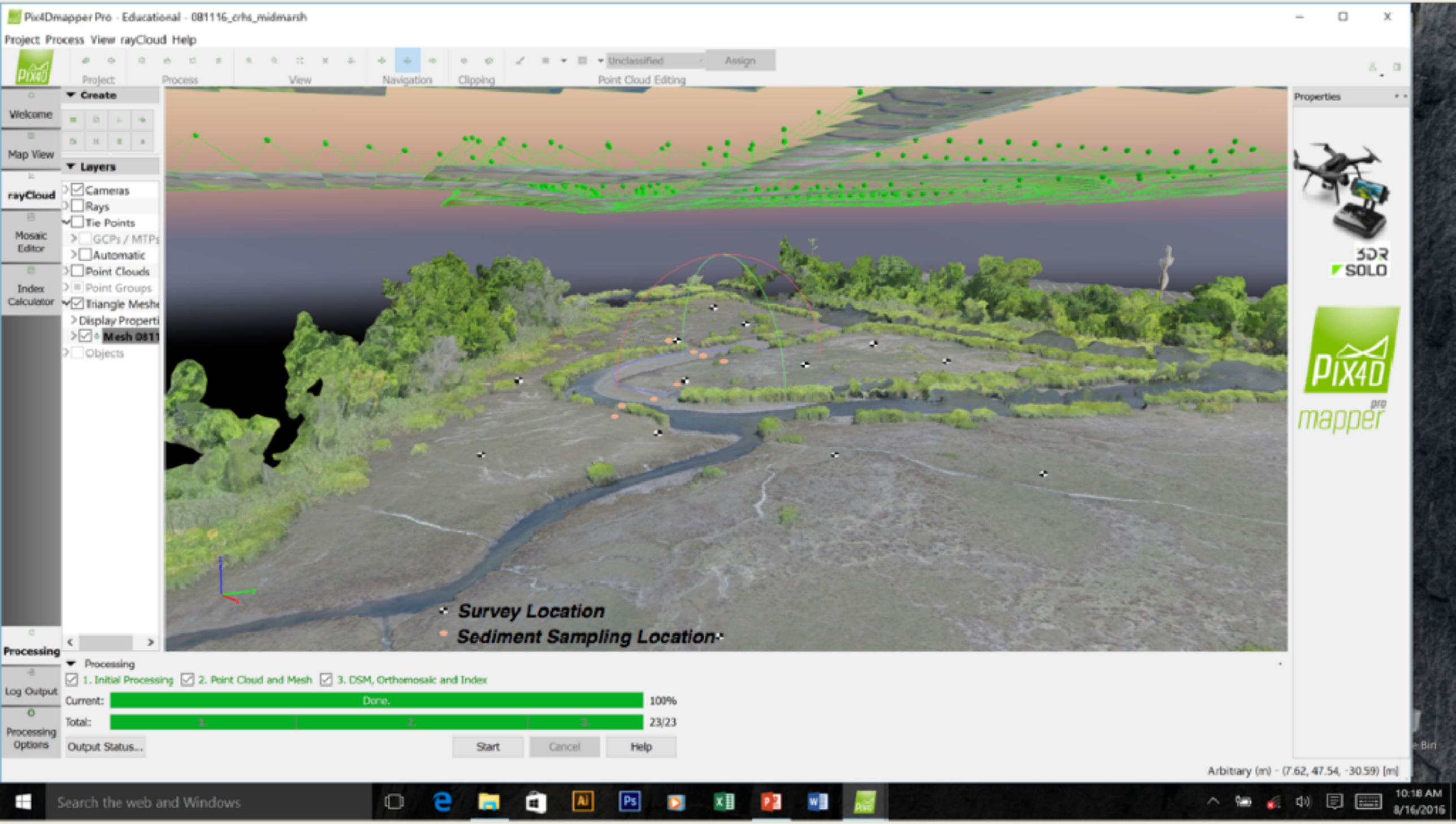
Pix4D map/model rendering with µUAS flight path and camera locations above terrain

processed with Pix4D Mapper Pro

µUAS Piloting
Peter Broadbridge

Ground Station App for Mission Planning

Dr. Scott M. Graves, Associate Professor
Department of the Environment,
Geography and Marine Sciences
Southern Connecticut State University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View
Navigation
Clipping
Point Cloud Editing
Unclassified
Assign
Welcome
Map View
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Mosaic Editor
Index Calculator
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Processing Options
Create
Layers
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Rays
Tie Points
GCPs / MTPs
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Survey Location
Sediment Sampling Location
Processing
1. Initial Processing
2. Point Cloud and Mesh
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Done.
100%
Total:
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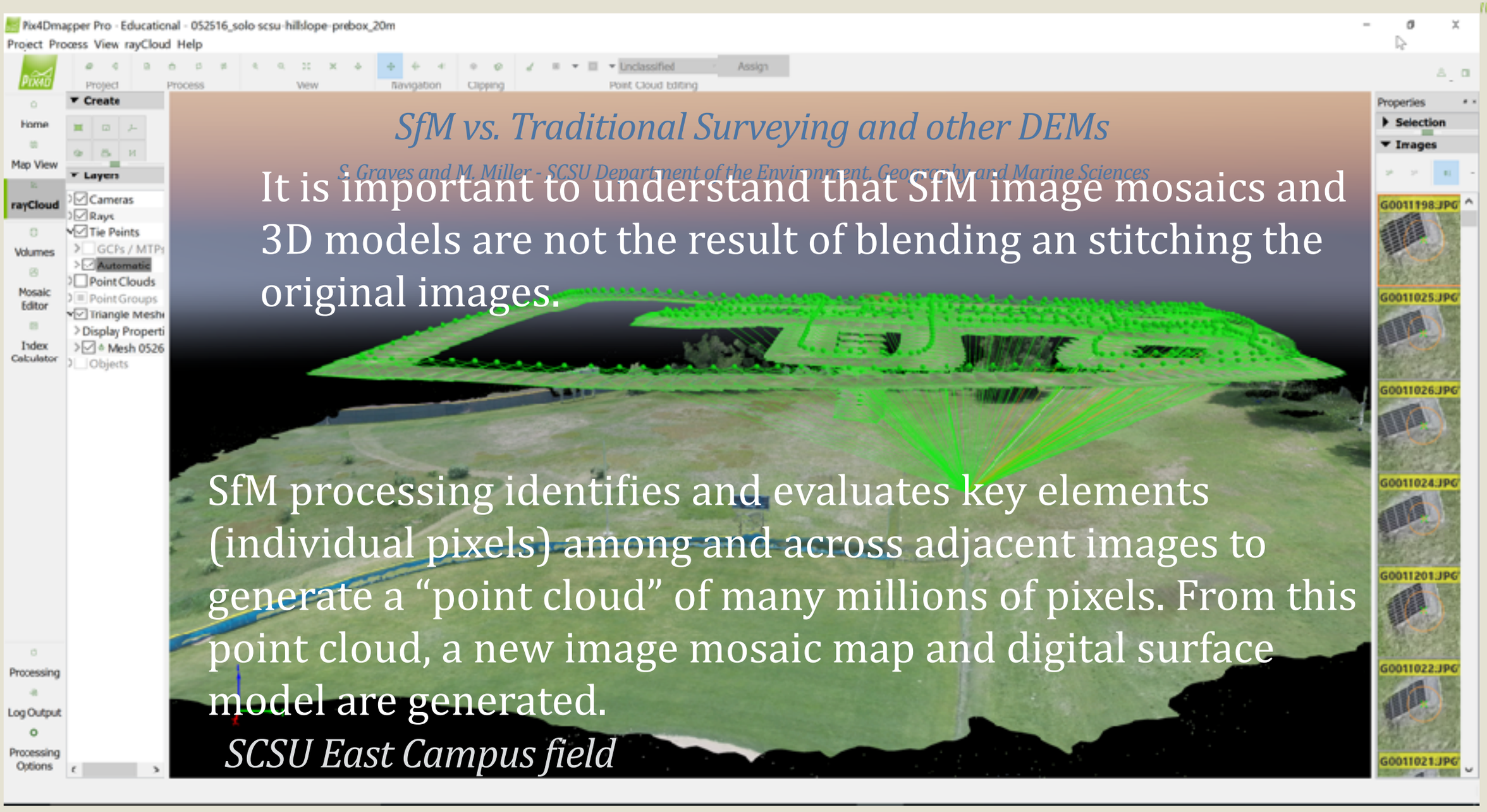
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Project
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Mosaic Editor
Index Calculator
Layers
Cameras
Rays
Tie Points
GCPs / MTPs
Automatic
Point Clouds
Point Groups
Triangle Mesh
Display Properti
Mesh 0526
Objects
Processing
Log Output
Processing Options
Properties
Selection
Images
G0011198.JPG
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G0011026.JPG
G0011024.JPG
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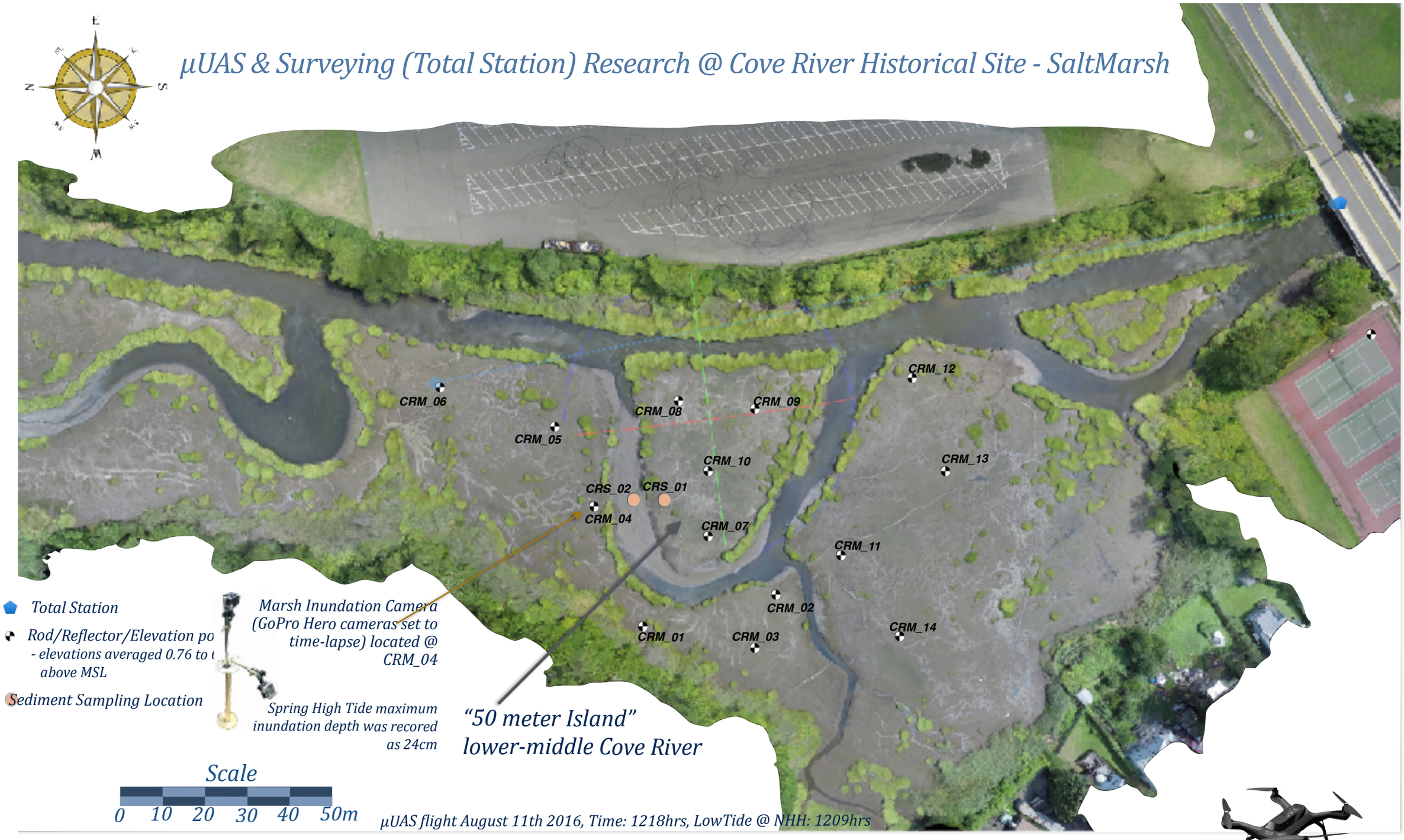
G0011022.JPG
G0011021.JPG
SfM vs. Traditional Surveying and other DEMs
S. Graves and M. Miller - SCSU Department of the Environment, Geography and Marine Sciences
It is important to understand that SfM image mosaics and 3D models are not the result of blending an stitching the original images.
SfM processing identifies and evaluates key elements (individual pixels) among and across adjacent images to generate a “point cloud” of many millions of pixels. From this point cloud, a new image mosaic map and digital surface model are generated.
SCSU East Campus field


Connectic
Cove River
Google Earth Image of Cove River Historical Site wetland and forest habitats.
CRHS Estuarine salt marsh and mudflat
CRHS newly regrown closed canopy forest. 50-60 yrs of forest regrowth have converted what was an open meadow with just a few fringing trees, to a fully closed canopy forest.
CRHS Fresh water marsh
Scale
0 5 10 15 20 25
Tour Guide
1991
41°15'45.20" N 72°57'39.28" W elev 4 ft eye alt 1483 ft
Google earth

Osprey

µUAS & Surveying (Total Station) Research @ Cove River Historical Site - SaltMarsh



Total Station

Rod/Reflector/Elevation po
- elevations averaged 0.76 to
above MSL

Sediment Sampling Location

Marsh Inundation Camera (GoPro Hero cameras set to time-lapse) located @ CRM_04

Spring High Tide maximum inundation depth was recored as 24cm

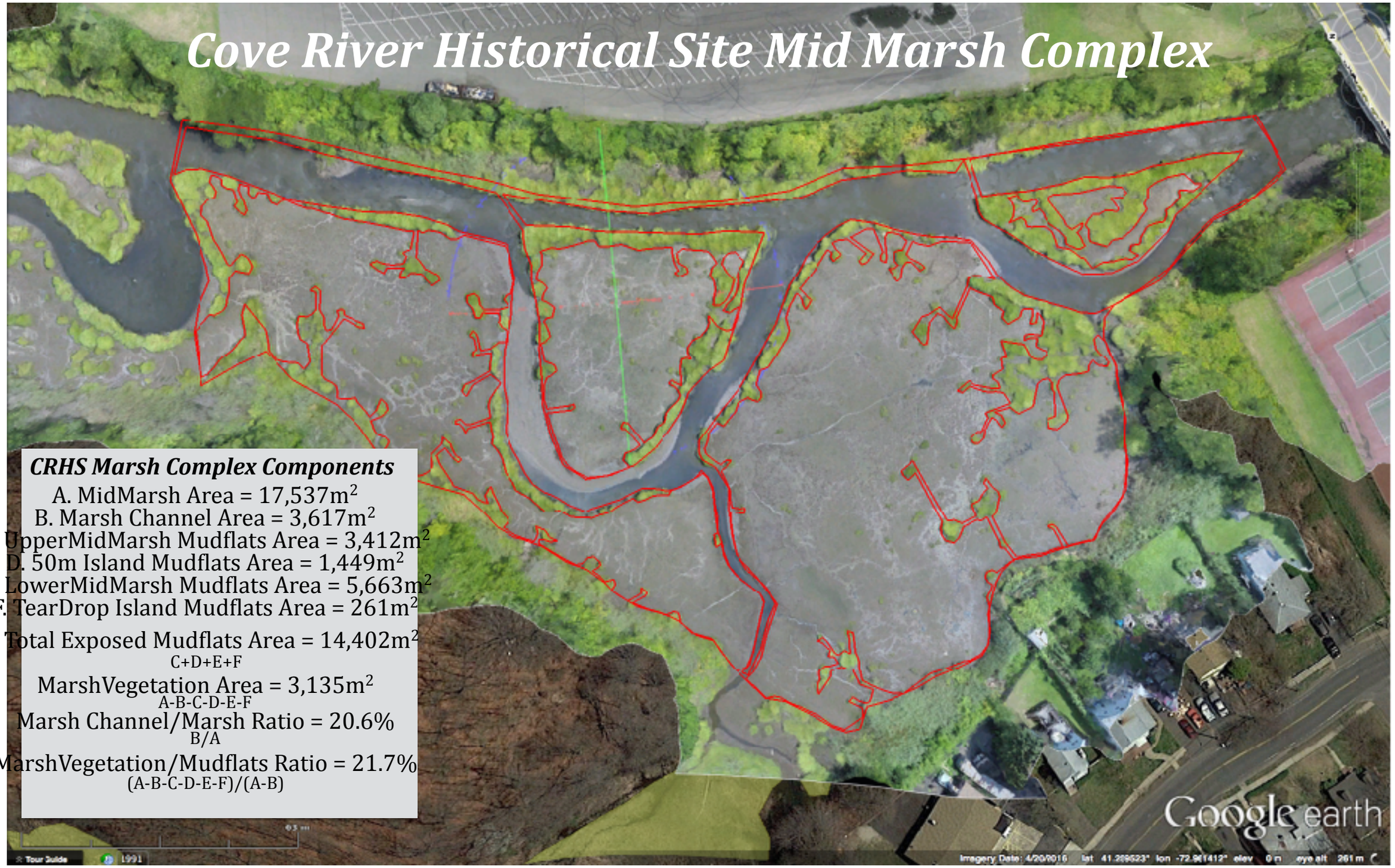
"50 meter Island" lower-middle Cove River

Scale

0 10 20 30 40 50m

µUAS flight August 11th 2016, Time: 1218hrs, LowTide @ NHH: 1209hrs

Cove River Historical Site Mid Marsh Complex



CRHS Marsh Complex Components

A. MidMarsh Area = 17,537m^2

B. Marsh Channel Area = 3,617m^2

C. UpperMidMarsh Mudflats Area = 3,412m^2

D. 50m Island Mudflats Area = 1,449m^2

E. LowerMidMarsh Mudflats Area = 5,663m^2

F. TearDrop Island Mudflats Area = 261m^2

Total Exposed Mudflats Area = 14,402m^2
C+D+E+F

MarshVegetation Area = 3,135m^2
A-B-C-D-E-F

Marsh Channel/Marsh Ratio = 20.6%
B/A

MarshVegetation/Mudflats Ratio = 21.7%
(A-B-C-D-E-F)/(A-B)

October 31st 2015 @ CRHS, mid tide stage

Acknowledgements: many thanks to the following persons for their invaluable help and assistance in conducting field surveys and in the μUAS aerial mapping endeavors:

• μUAS field team – graduate students Peter Broadbridge, Scott Thibault, Darryl Nicholson; •Marsh top surveying team – undergraduates Shannon Bronson, Matthew Connors, and Dr. J. Tait

– all from Southern Connecticut State University Department of the Environment, Geography and Marine Sciences