

Interior Mud Flats of Florida Bay Islands: Records of Sea Level Rise, Storm History, and Island Formation

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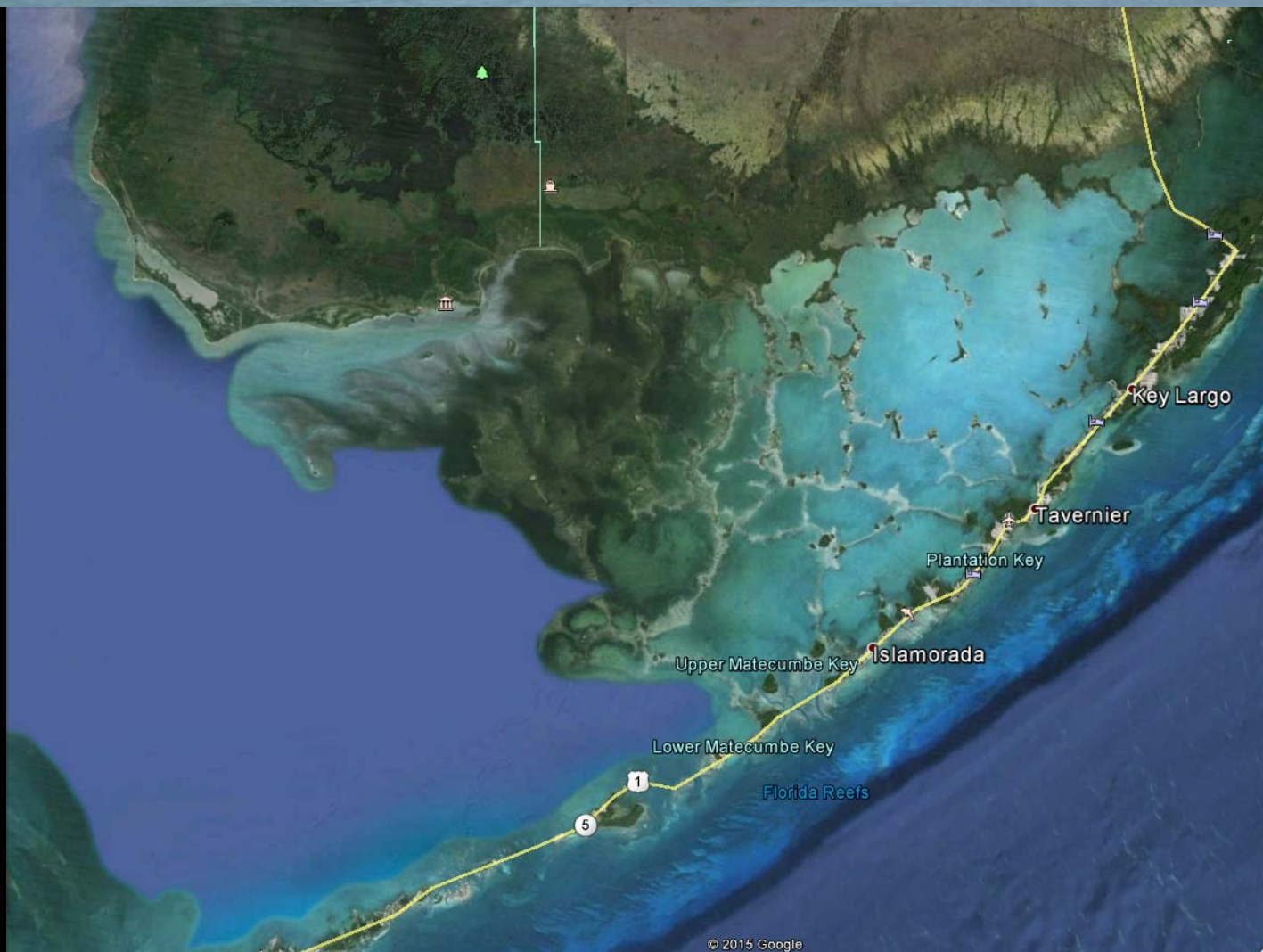
Acknowledgements

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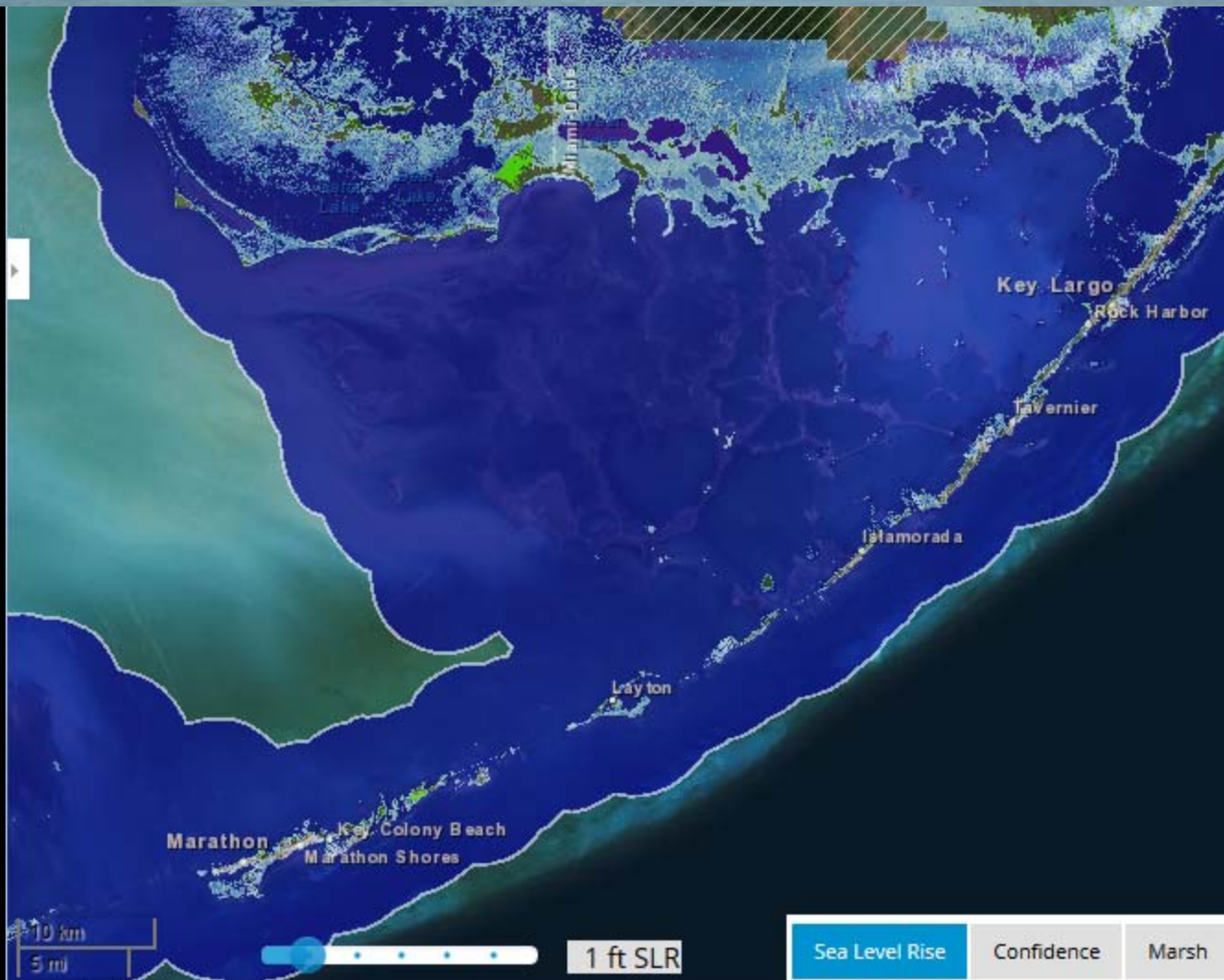
P.J. Walker, NPS for facilitating permits
Keys Marine Lab, for providing our base camp
Terry McCloskey and Jim Murray, USGS for assistance in the field
Staff at Mariners Hospital, Key Largo, for CAT scans

U.S. Department of the Interior
U.S. Geological Survey

Projected Future Change



Projected Future Change



Resource Management Questions

1. What is the fate of the islands and mudbanks as sea level rises and climate changes?
2. Will the character of Florida Bay change completely and become a more open water estuary, similar to Biscayne Bay?
3. Will this mean the loss of the unique habitats on the interior of these islands?

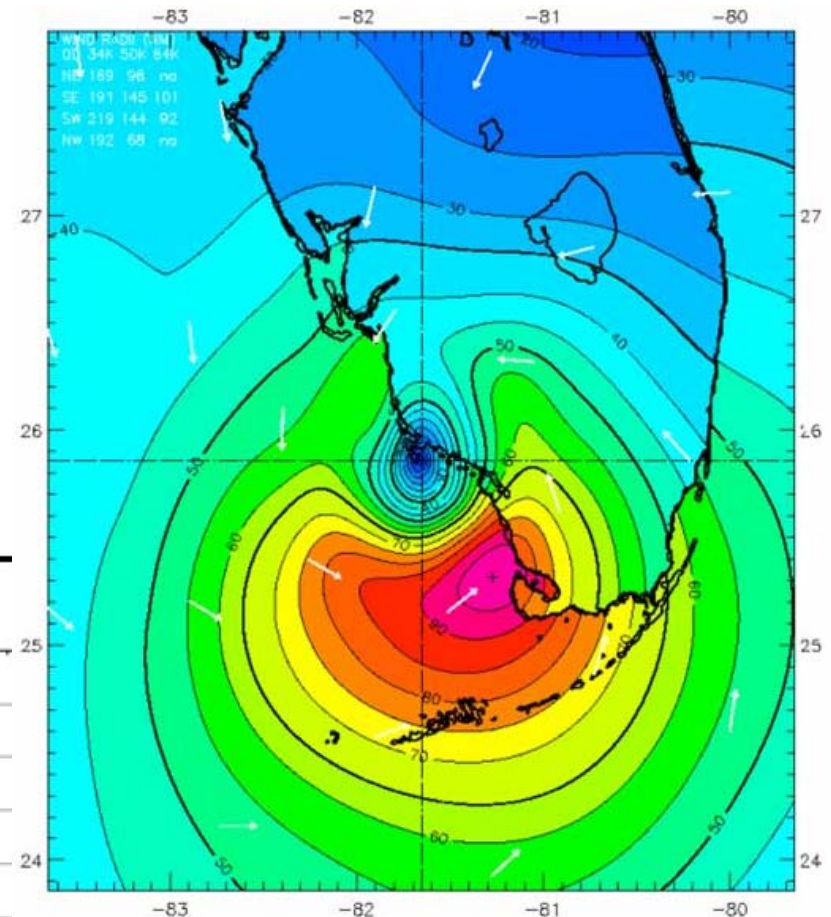
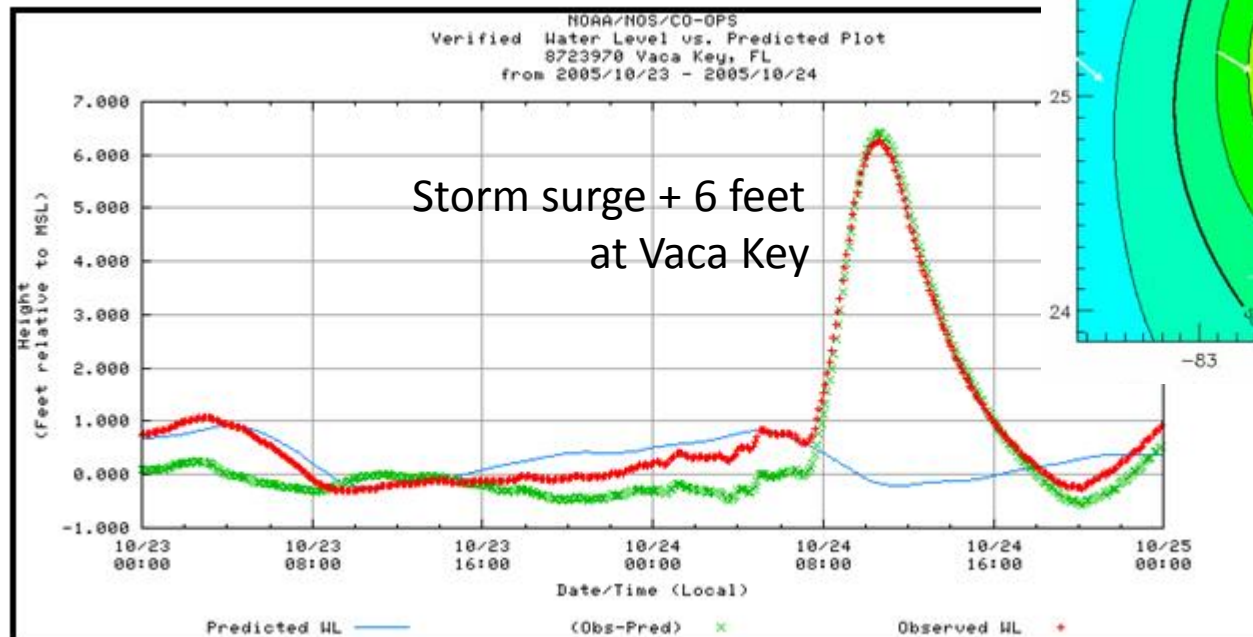
Project Goals

Use the relatively complete sedimentary record preserved in the island interiors to determine:

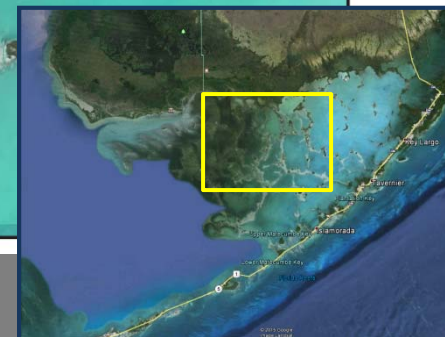
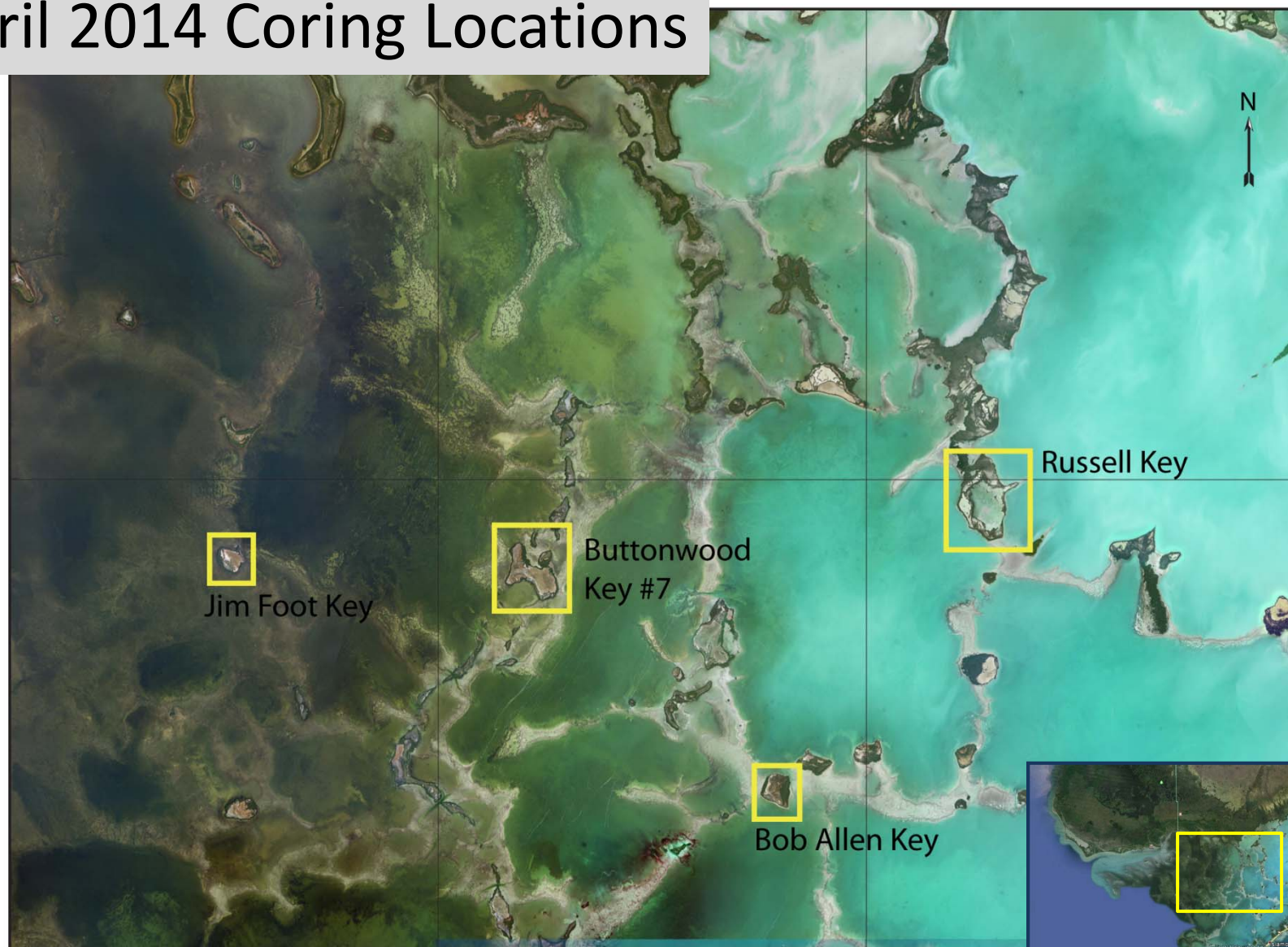
- Sea level rise history
- Storm history
- Role of SLR and storms in the geologic and ecologic history of the islands
- Role of the islands in carbon sequestration

Why core on the islands?

- Interior of the islands are basins that entrap sediment and debris
- Sparse plants and organisms means better preservation of layers
- Most complete record in Florida Bay (Enos, 1989; Swart and Kramer 1997)



April 2014 Coring Locations



Coring Methods: Russian Cores



Coring Methods: Piston Cores



Elevation Data



Collected:

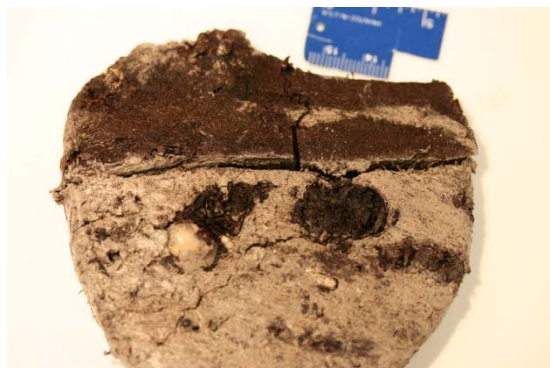
- 2-3 Russian cores/island
- 1 4.5" piston core /island
- 1 2" piston core/island
- Elevation data each site

Planned Analyses



Russian Cores:

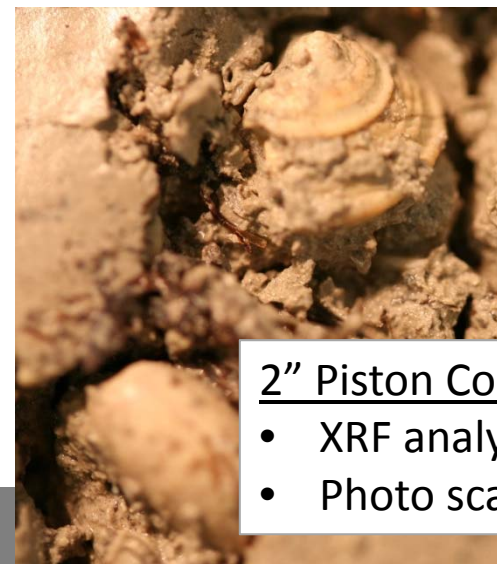
- C accumulation rates
- Peats – macro-plants
- Isotopic ratios
- % Carbon
- % Nitrogen
- C/N



- Stratigraphy and sediment description
- C-14 dating
- Pollen
- Loss on Ignition
- Bulk density

4.5" Piston Cores:

- Grain size
- Pb-210
- Mollusks
- Ostracodes & Forams
- Diatoms
- CAT scans



2" Piston Cores:

- XRF analysis
- Photo scans

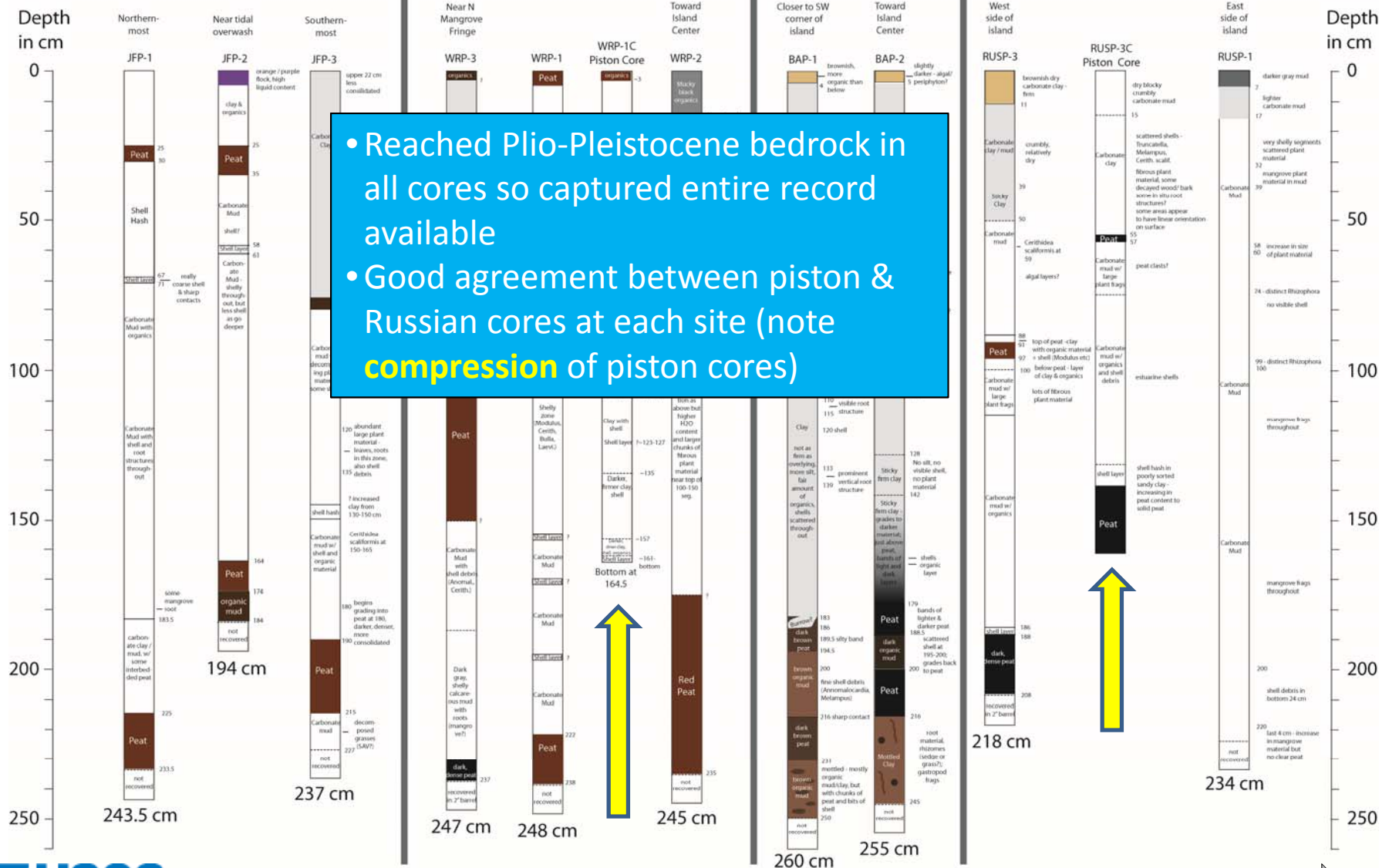
Overview

Jim Foot

Buttonwood #7

Bob Allen

Russell



west

east

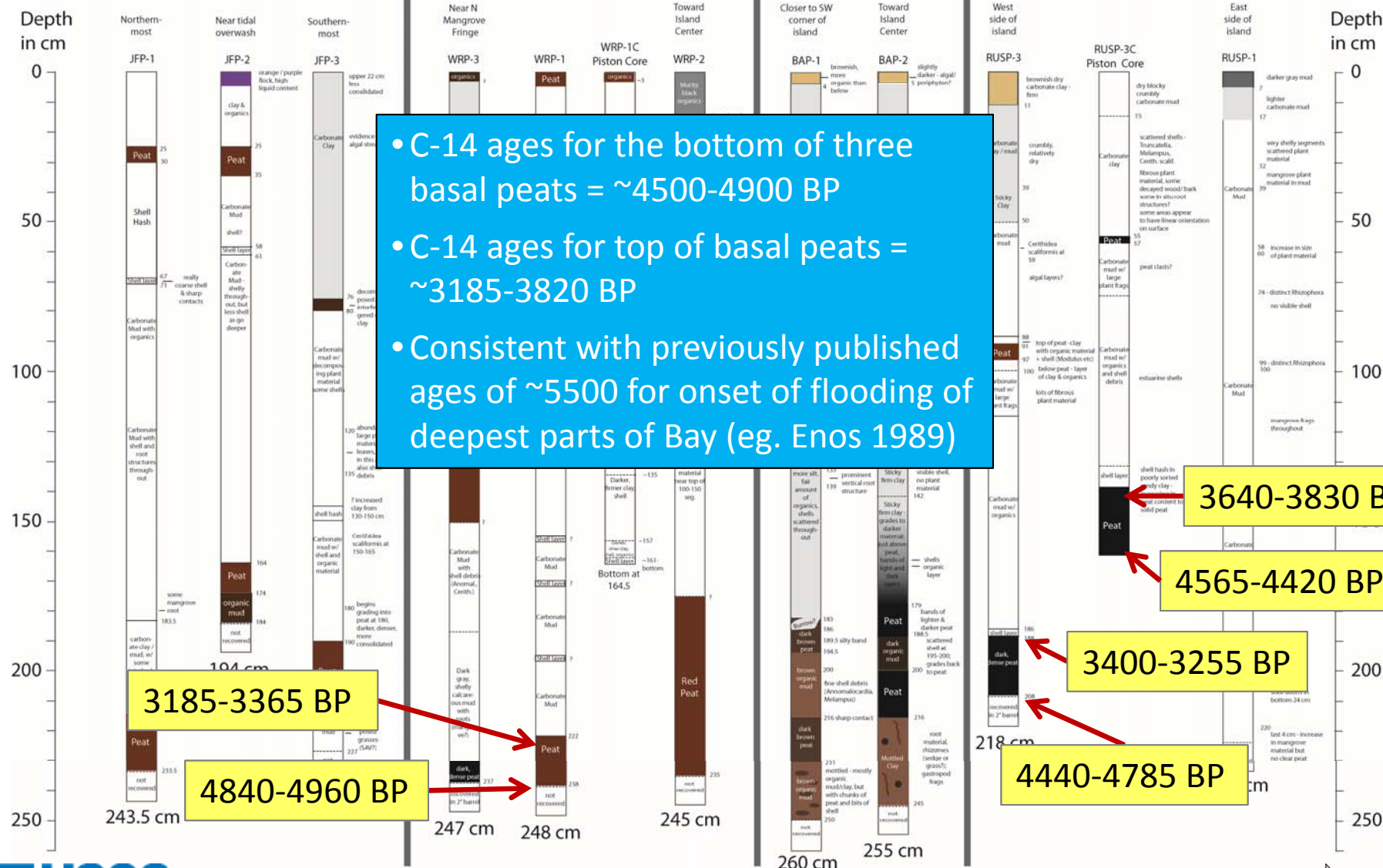
Overview

Jim Foot

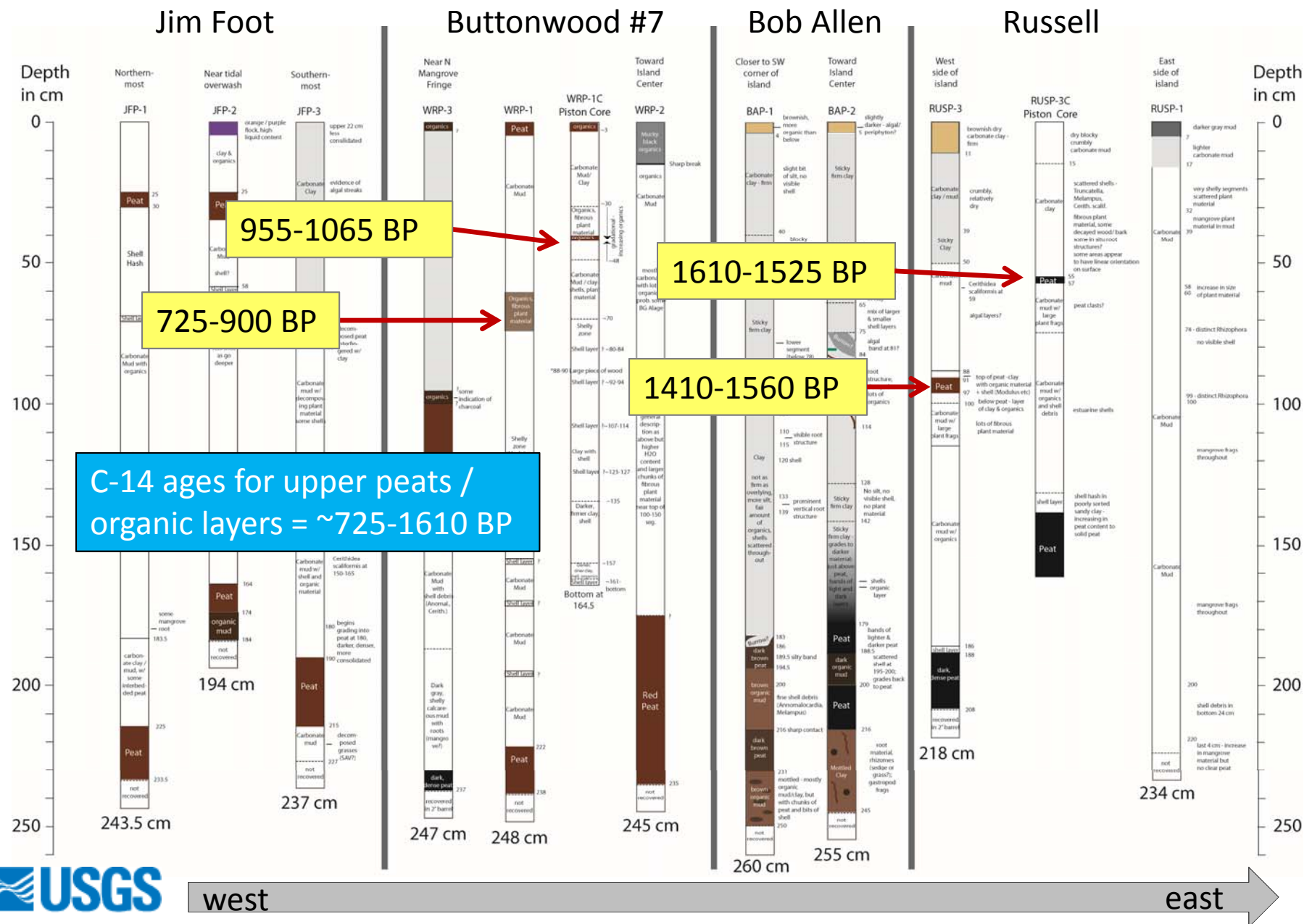
Buttonwood #7

Bob Allen

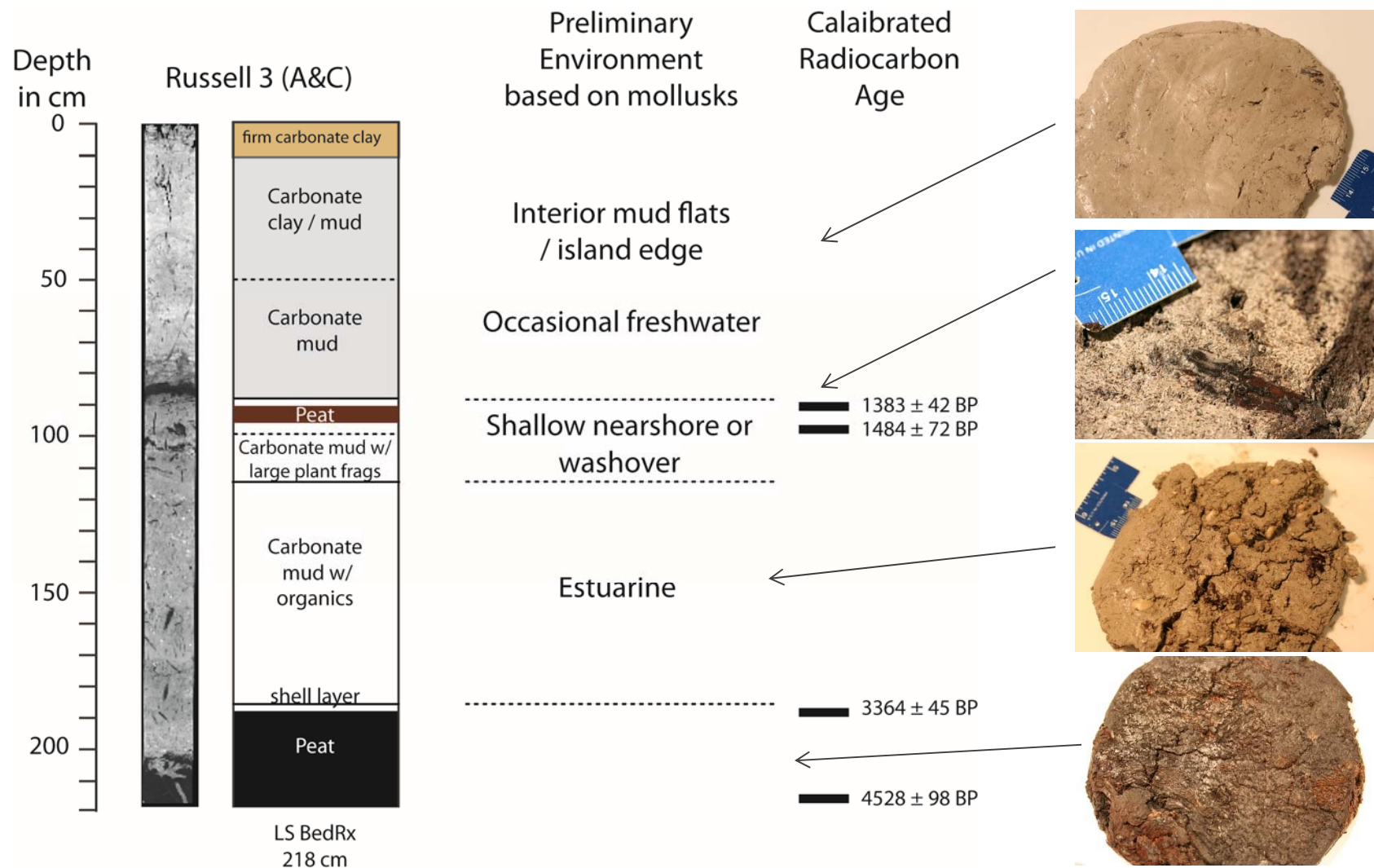
Russell



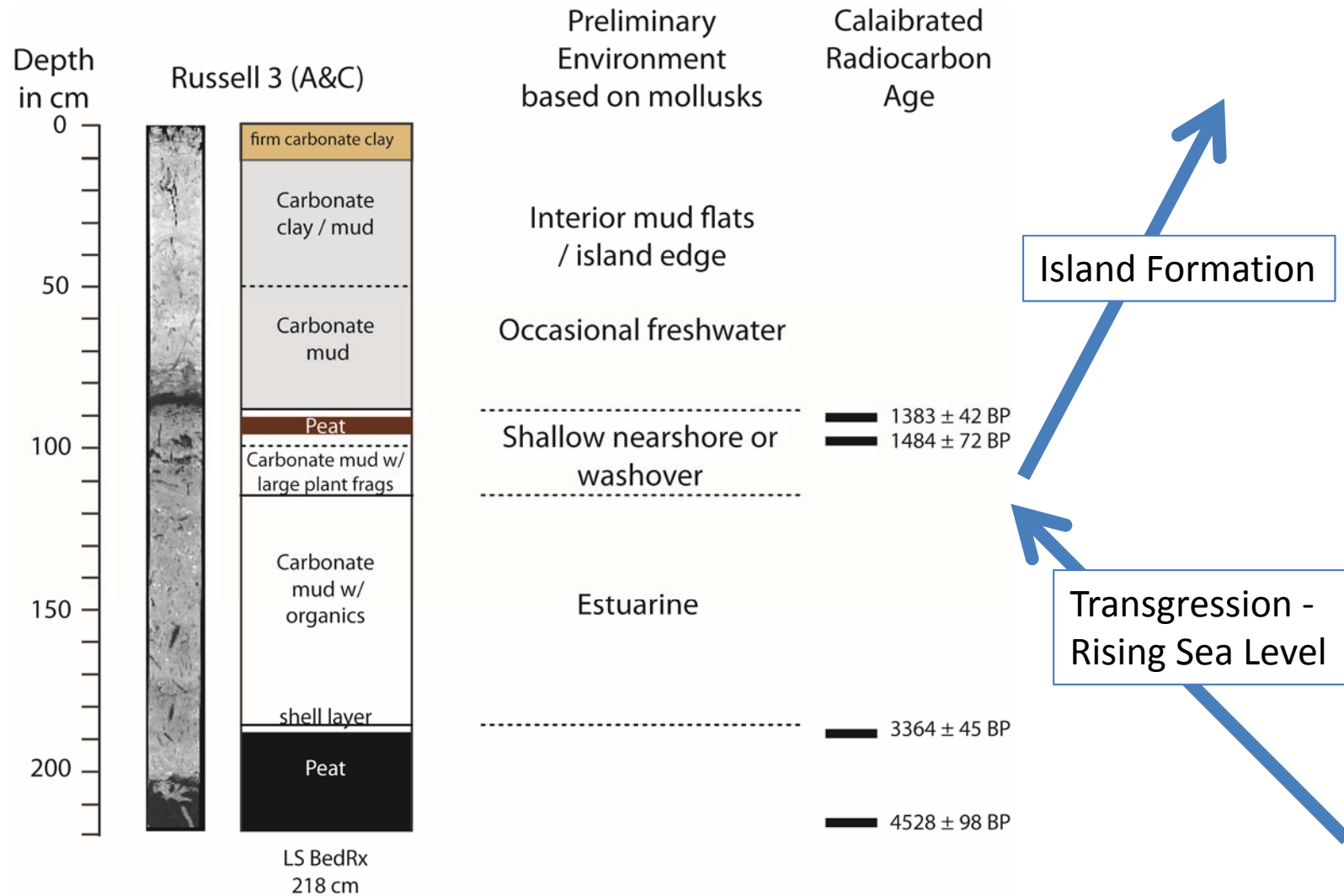
Overview



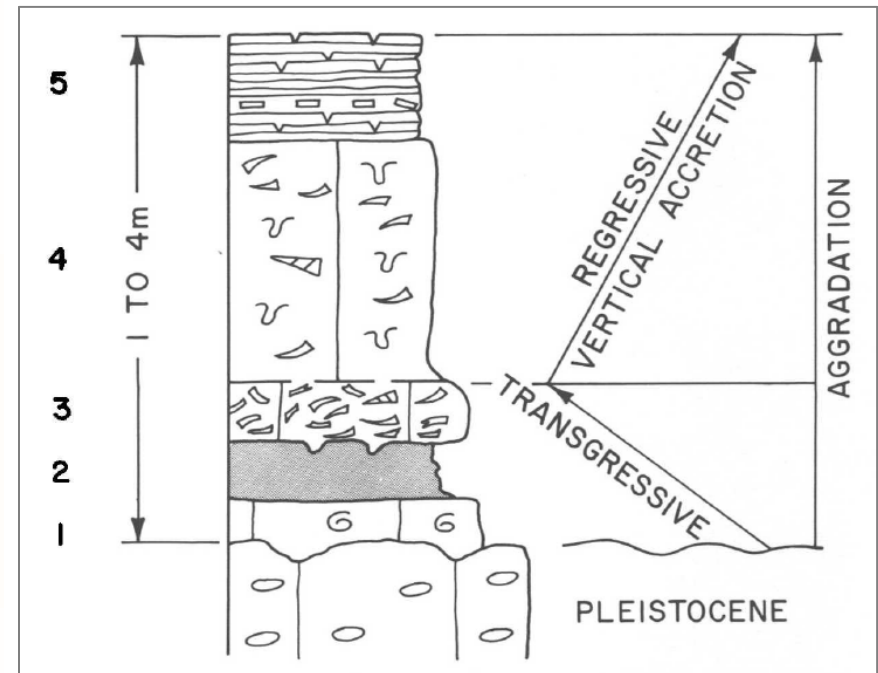
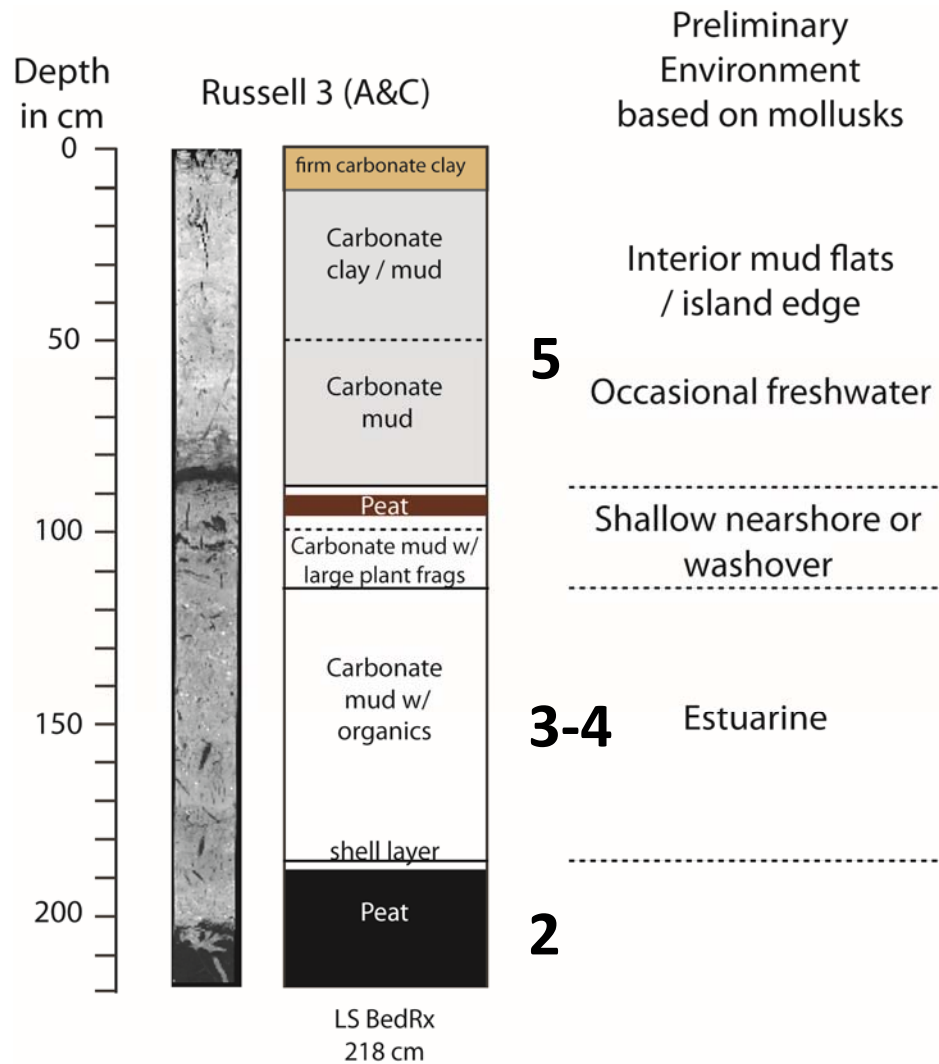
Preliminary Interpretation



Preliminary Interpretation



Preliminary Interpretation



Patterns very similar to Enos & Perkins (1979) idealized sequence.

Incorporating Historical Data

Whipray /
Buttonwood #7 -
1870

GLW0414 WRP-1
- Russian core
- 2.0" piston core
- 4.5" piston core

GLW0414 WRP-3
- Russian core

GLW0414 WRP-2
- Russian core



US Coast & Geodetic Survey 1870 Map

Incorporating Historical Data



Incorporating Historical Data

Whipray /
Buttonwood #7 -
Today

GLW0414 WRP-1
- Russian core
- 2.0" piston core
- 4.5" piston core

GLW0414 WRP-3
- Russian core

GLW0414 WRP-2
- Russian core

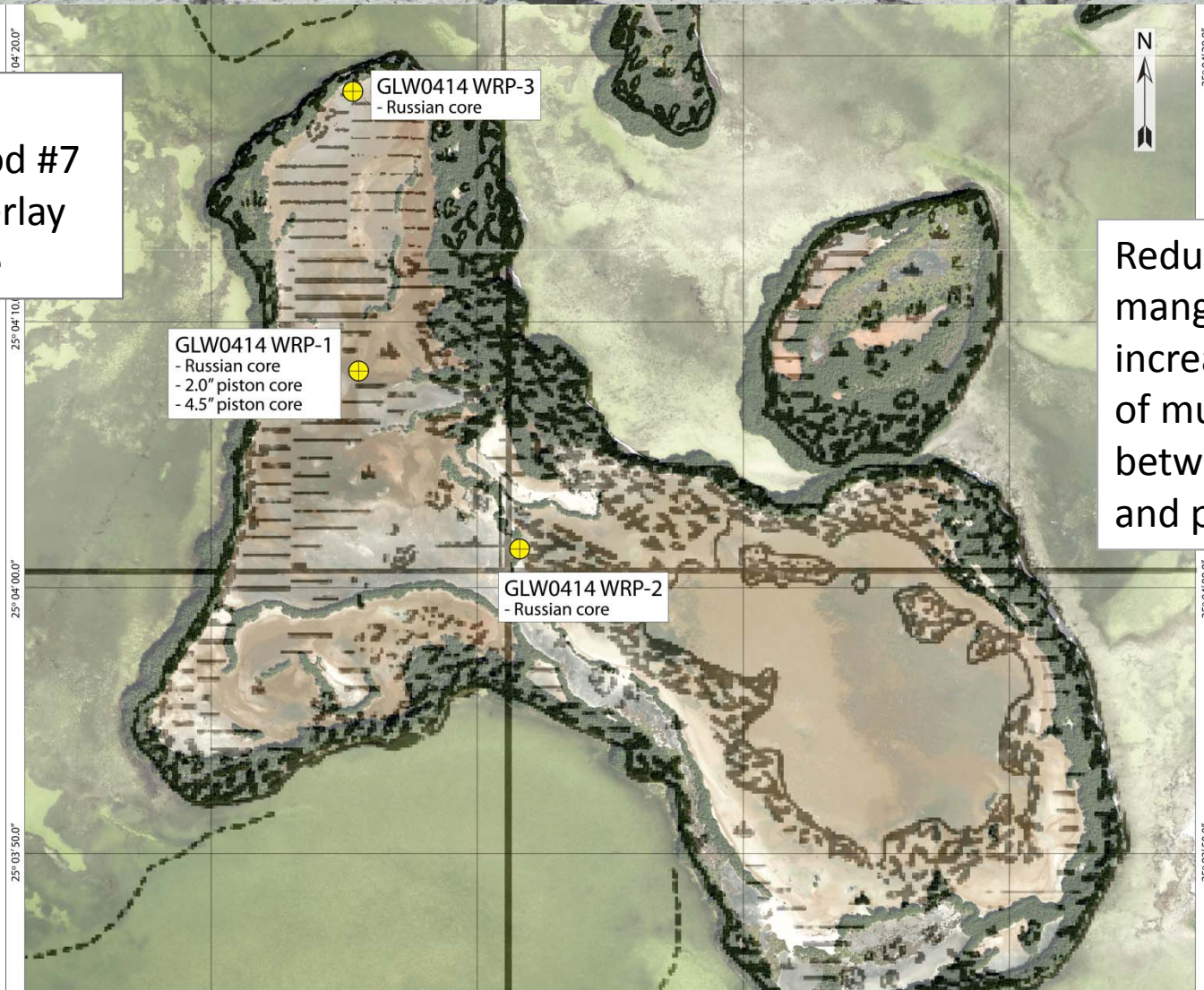
Elevation at
center of island
= -0.17 m MSL



ESRI World Imagery - April 2015 from <http://www.arcgis.com>

Incorporating Historical Data

Whipray /
Buttonwood #7
– 1935 overlay
on satellite



Reduction of
mangroves, and
increase in size
of mudflats
between 1935
and present

Incorporating Historical Data

Jim Foot - Today

Today - Jim Foot has open tidal exchange in SE section of island

Elevation on edge of island =
-0.47 m MSL -
lowest recorded

GLW0414 JFP-1
- Russian core
- 2.0" piston core
- 4.5" piston core

GLW0414 JFP-2
- Russian core

GLW0414 JFP-3
- Russian core



ESRI World Imagery - April 2015 from <http://www.arcgis.com>

Incorporating Historical Data

Jim Foot - 1935 overlay on satellite

Today - Jim Foot has open tidal exchange in SE section of island.

Mangroves shown in 1935 map - dead stumps present today.



Incorporating Historical Data

Russell Key -
Today

Elevation on NE
side of island =
-0.35 m MSL

GLW0414 RUSP-1
- Russian core

Today – Russell
has open tidal
exchange in SE
section of island

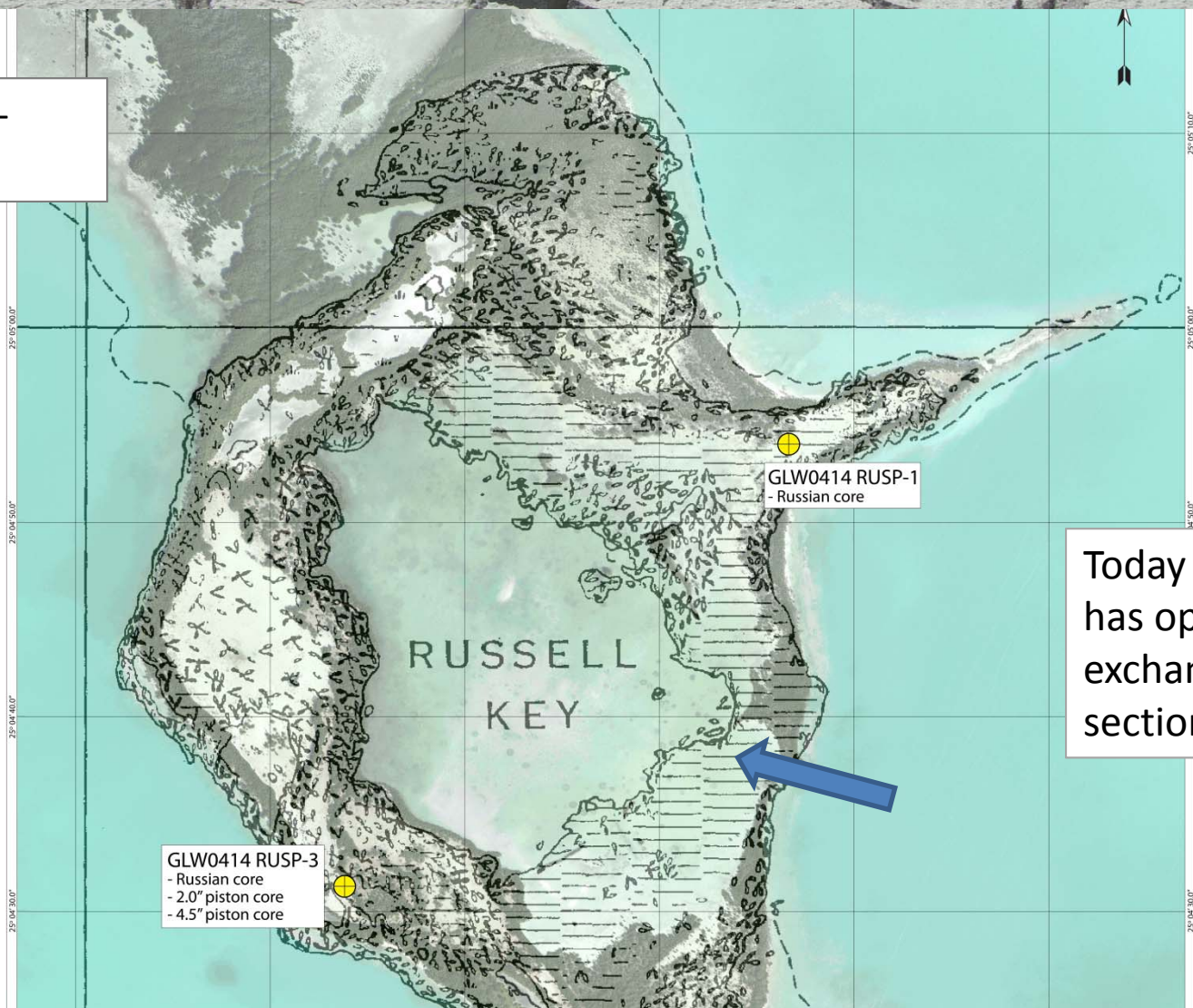
GLW0414 RUSP-3
- Russian core
- 2.0" piston core
- 4.5" piston core



ESRI World Imagery - April 2015 from <http://www.arcgis.com>

Incorporating Historical Data

Russell Key -
Today



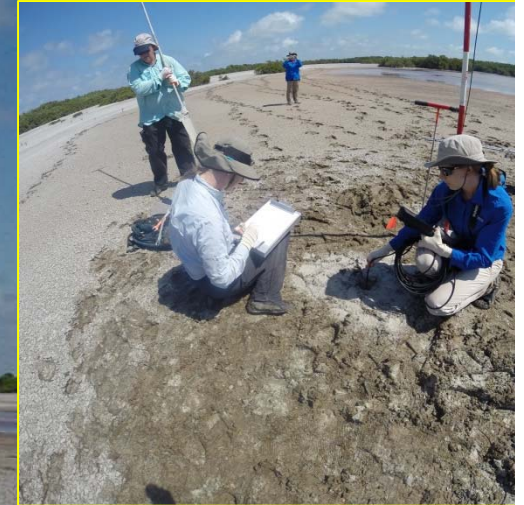
Today – Russell
has open tidal
exchange in SE
section of island

What we know so far . . .

- Ages of basal peats are consistent with initial flooding of Florida Bay approximately 5500 years ago
- Similar sequences of basal peat, followed by estuarine sediments and island formation in all the cores
- Elevation of basins is below sea level
- Indication from examination of historical imagery that sea level rise is already affecting islands

Stay tuned for more as we continue with our analyses!

For more information on research visit:
<http://sofia.usgs.gov/>



Related Presentations:

B. Stackhouse – Wed. Poster Session # 76 –
Extreme Environments

M. Jones – Thurs. 3:30, Great Cypress Room –
Patterns of Change & Carbon Storage

Thank you!