



# Sedimentological Characterization of the Higbee Beach Wildlife Management Area



Dr. Susanne Moskalski, PI  
Coastal Sedimentology Lab

## Introduction

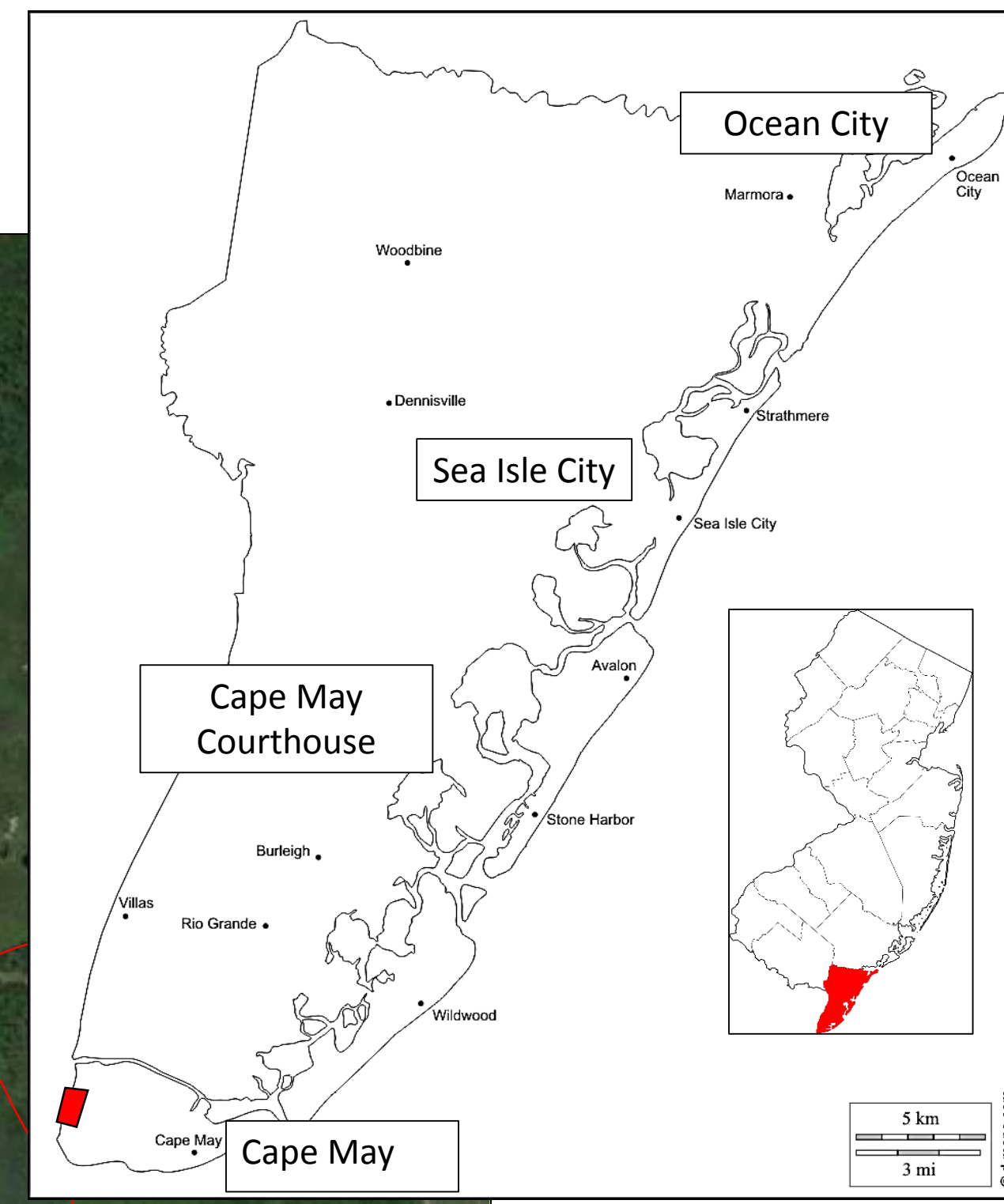
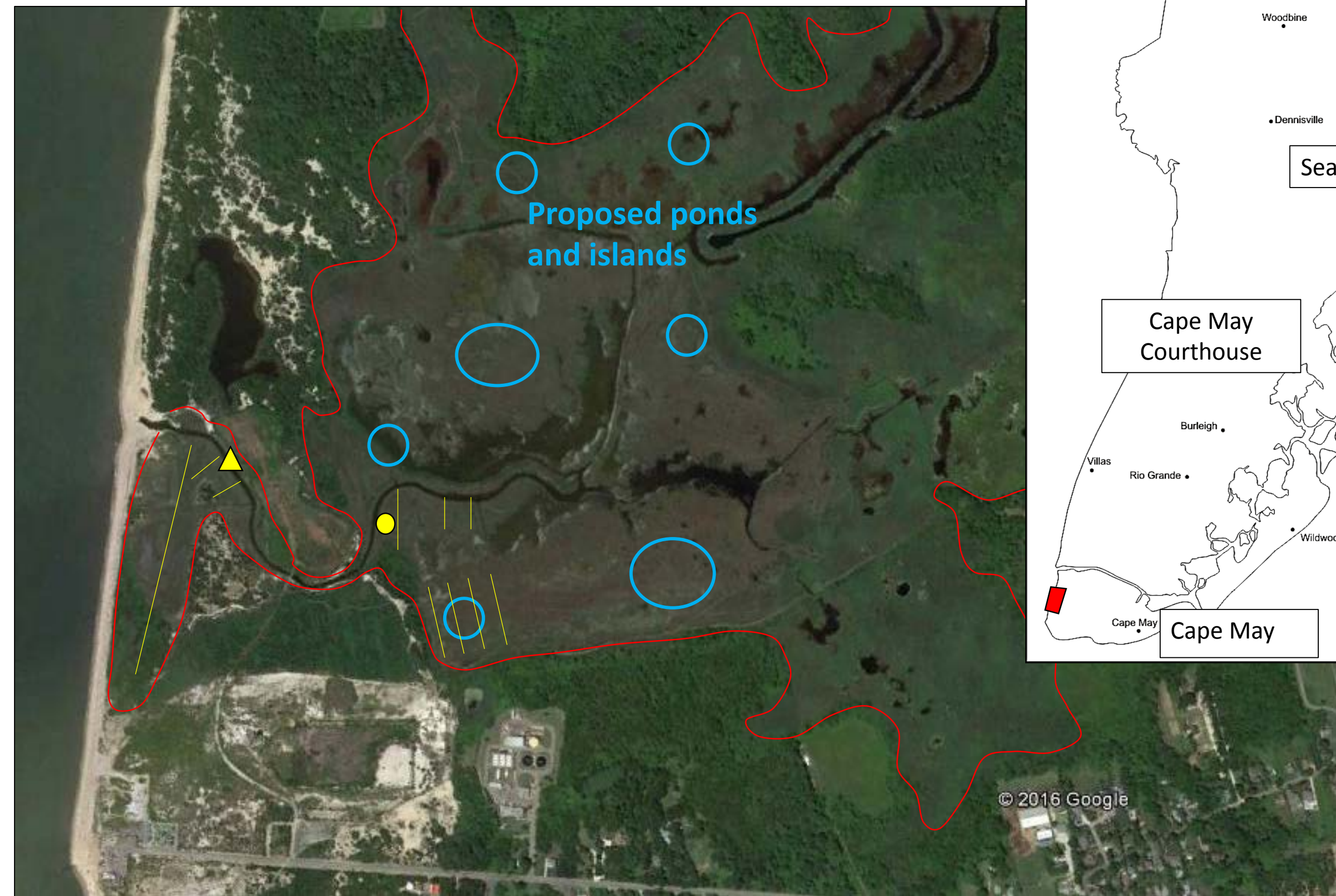
The Higbee Beach Wildlife Management Area is a 1,100 acre region of dune, scrubland, and salt marsh on the Cape May peninsula in New Jersey. It is a critical stopover habitat for migratory birds.

The NJ Department of Fish and Wildlife plans to alter the 417 acre marsh for migratory bird habitat in 2018. Restoration goals are to encourage native vegetation and discourage invasives by restoring tidal flow to Pond Creek, and to build islands and ponds for migrating and nesting birds.

This study records sedimentary processes and sediment accumulation rates prior to the construction.

## Land use history

- Up to 1905 Higbee family land.
- 1905 – 1942 Sand mining.
- 1917 Tidal flow blocked for mosquito control.
- 1942 – 1983 Harbison Walker magnesite plant.
- 2001 Initial restoration efforts.



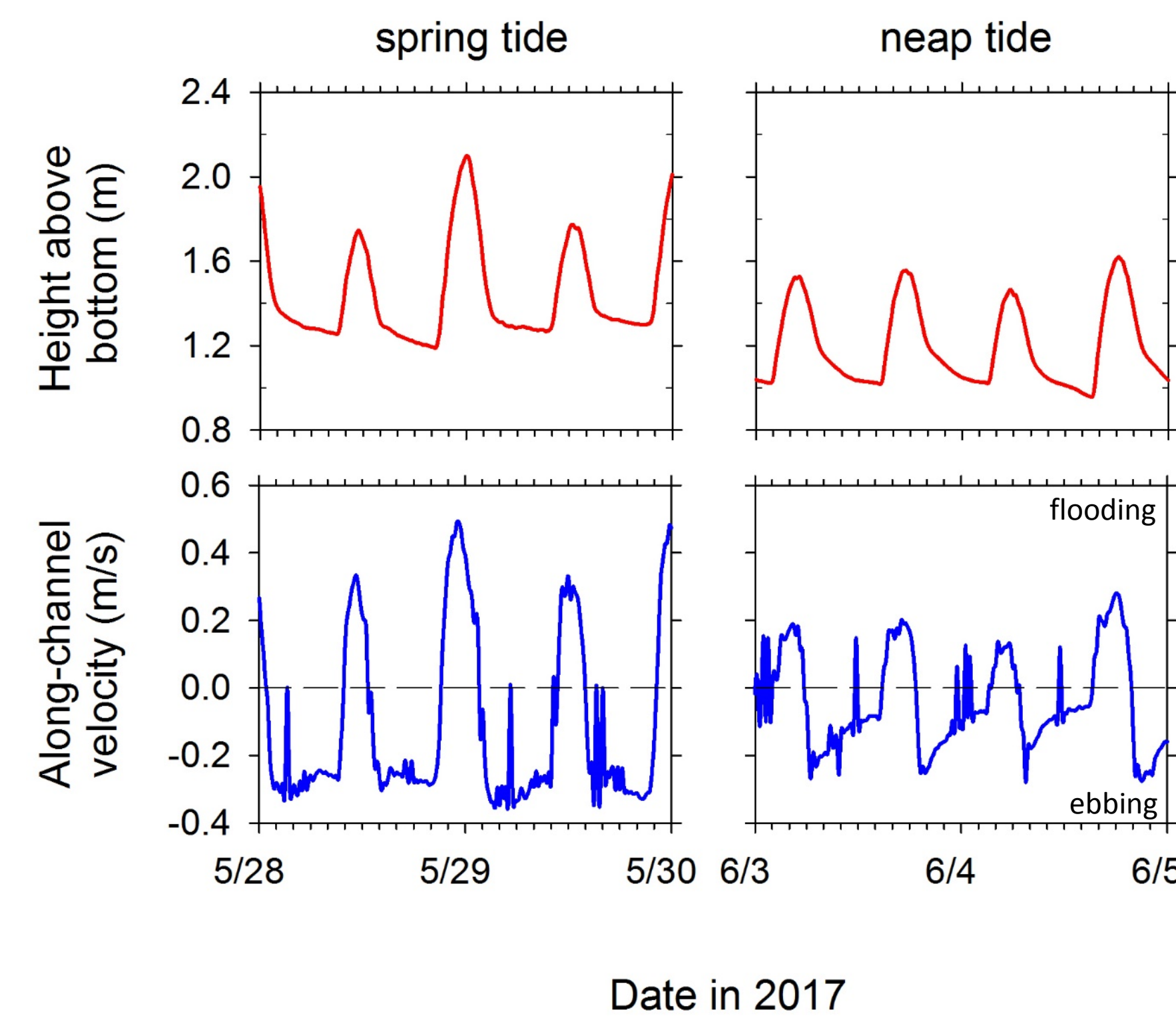
Locations of sediment trap and water level transects (yellow lines), velocimeter (yellow triangle), and a sediment core (yellow circle). Proposed locations for new ponds and islands (blue) within the study area. Marsh areas outlined in red.

## Methods

- Sediment traps.
- HOBO water level sensors.
- Acoustic Doppler Velocimeter
- Piston-assisted push cores.
- Bulk density and LOI.
- <sup>210</sup>Pb and <sup>137</sup>Cs analysis.

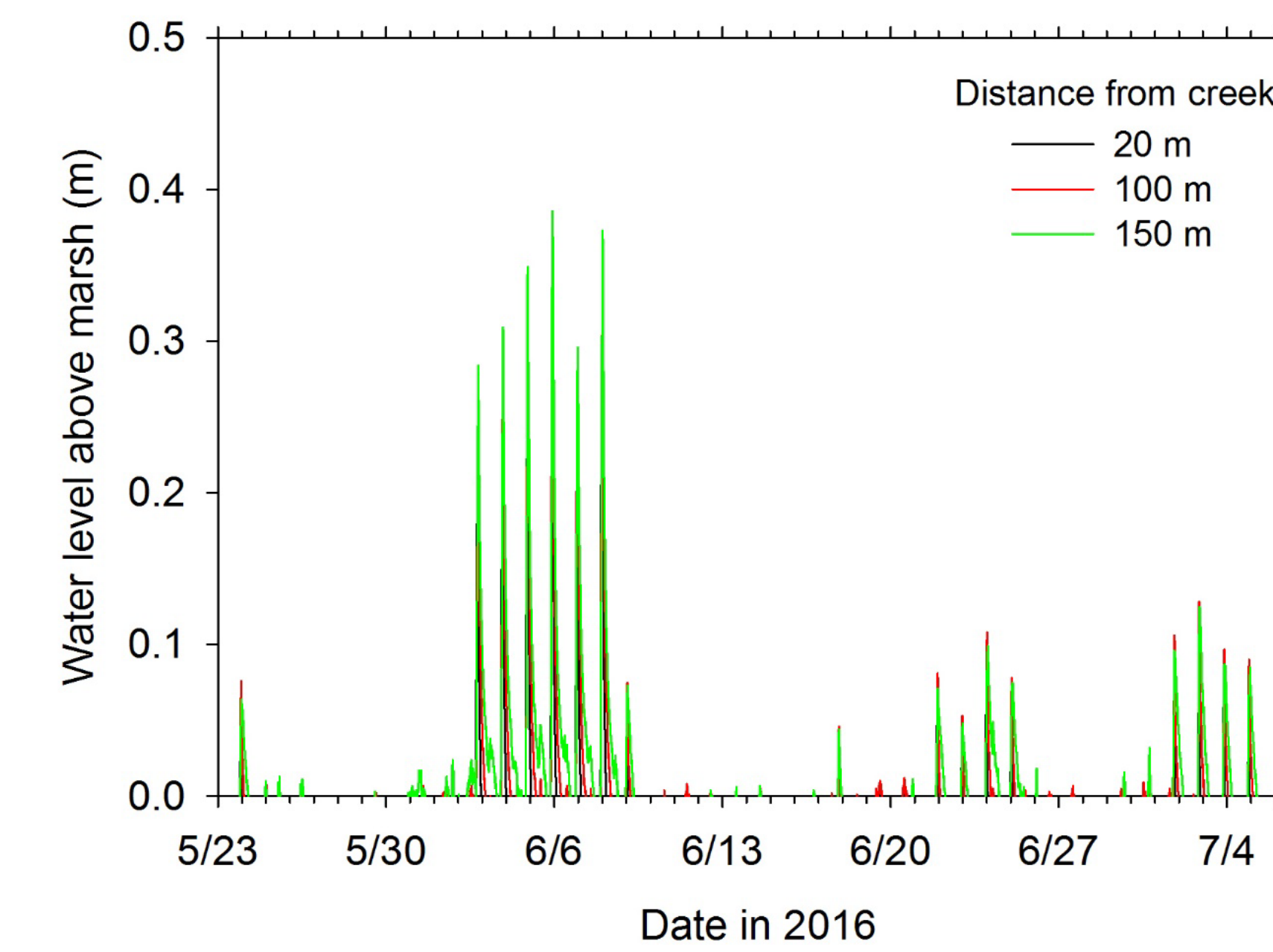
6-week Instrument deployments.  
Sediment trap collection every 2 weeks.

## Results



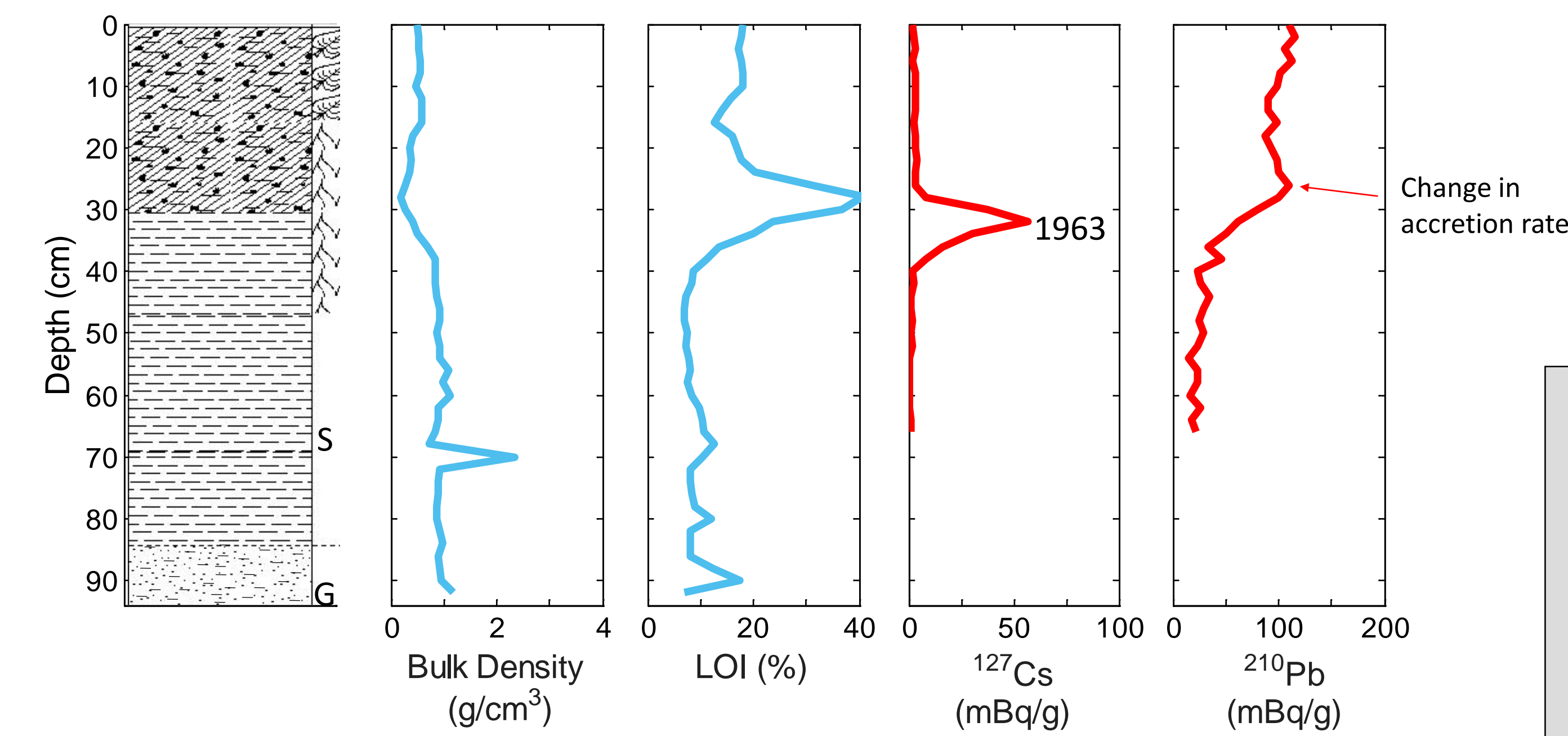
### Pond Creek tides

- Short flooding and high tide.
- Extended ebbing and low tide.
- Tide range 0.5 m (neap tides) to 1 m (spring tides).
- Velocity is flood dominant during spring tide, and slightly ebb dominant during neap tide.



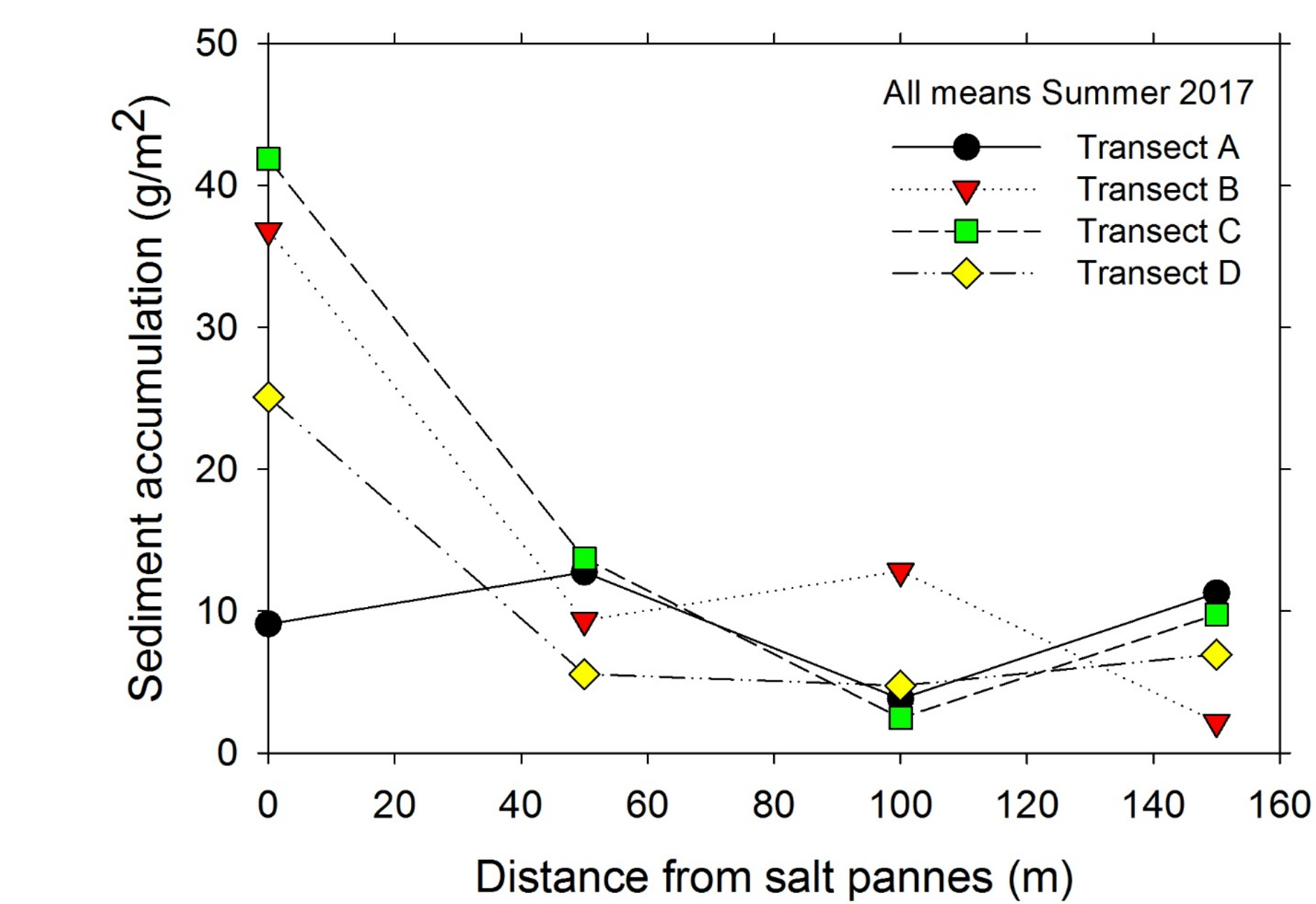
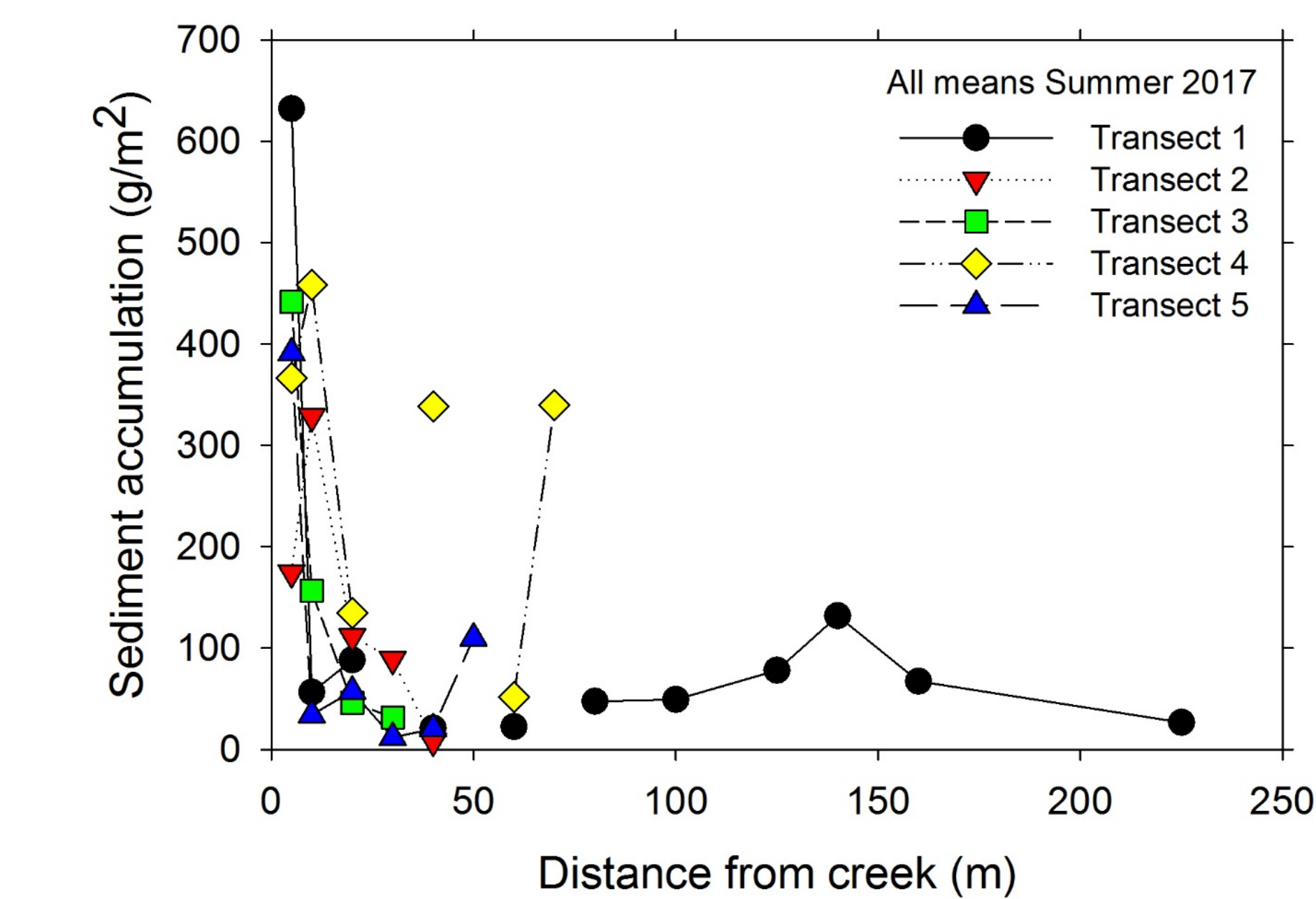
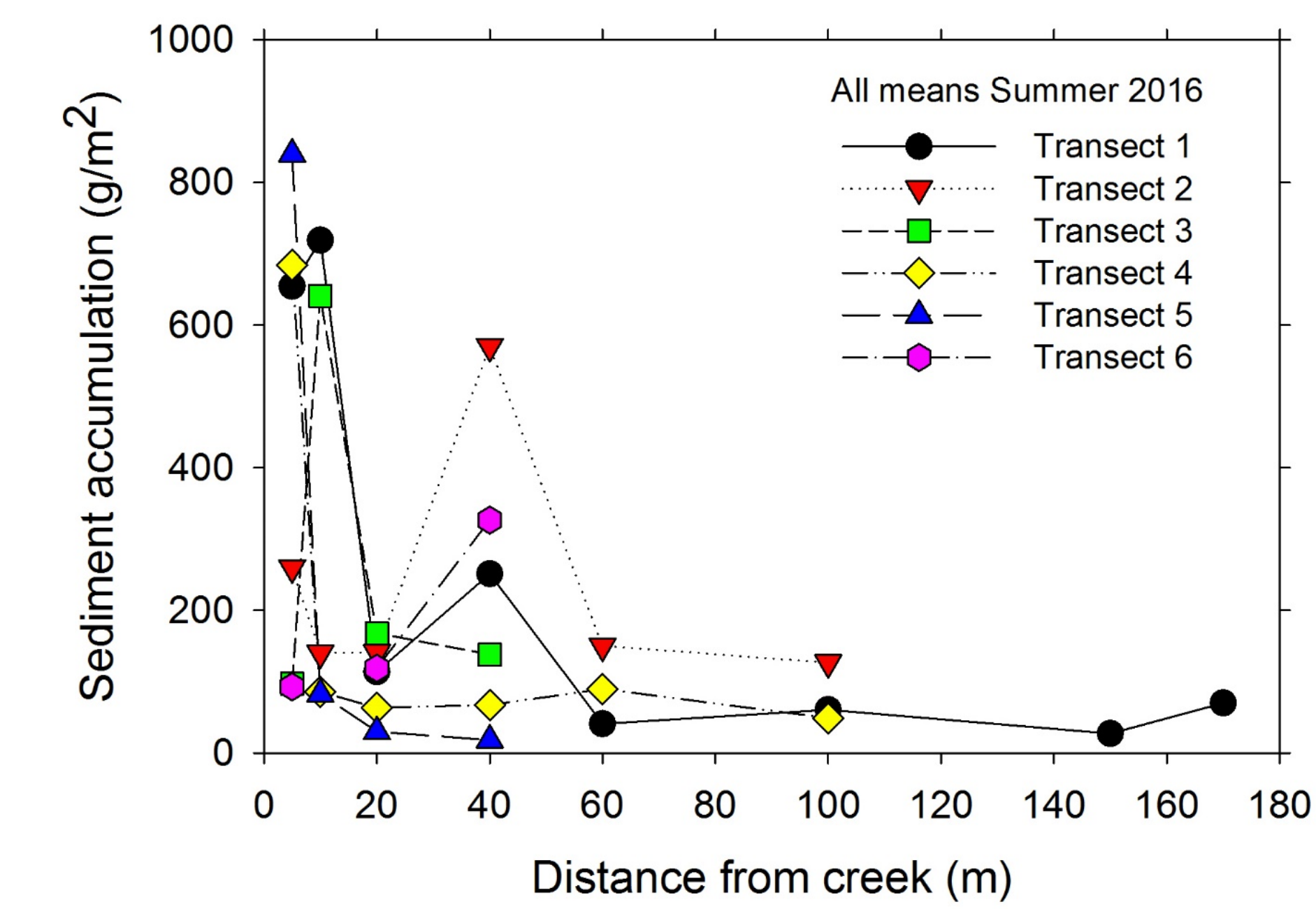
### Marsh flooding

- Flooding up to 0.5 m over marsh surface.
- Only during spring tides and storms.
- Higher flooding close to feeder creeks.



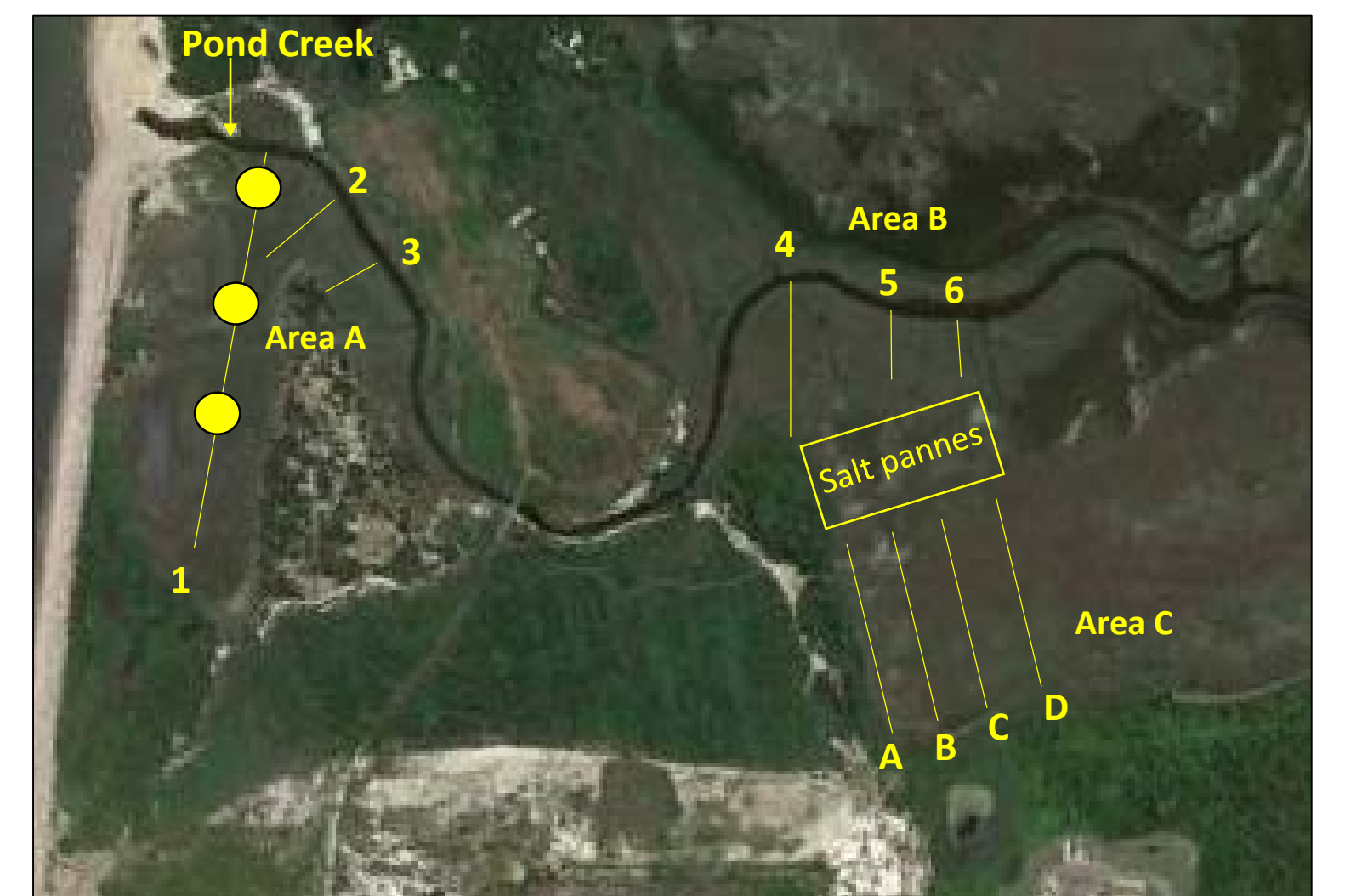
### Sediment Core

- Muddy peat and peaty mud over stiff mud.
- High LOI at 28 cm right above <sup>137</sup>Cs peak.
- Sediment accumulation rate 0.62 cm/yr (Cs).
- <sup>210</sup>Pb inventory indicates <sup>210</sup>Pb<sub>xs</sub> delivery from tidal flooding in addition to atmospheric deposition.
- Change in sediment delivery after 1963.
- Non-steady-state accumulation.



### Sediment accumulation

- Greatest sediment accumulation on bank of main creek.
- Exponential decrease with distance away.
- Slightly higher deposition near feeder creeks.
- Similar accumulation rates and patterns in both years.
- 350 – 820 g/m<sup>2</sup>/fortnight near creek.
- 5 – 45 g/m<sup>2</sup>/fortnight in backmarsh.
- Accumulation rates are lower during fortnights containing rain.



Transect designations and other named places in the study area. HOBO sites are marked by yellow circles.

## Discussion & Conclusions

- Marsh surface deposition opportunity only during spring tides and storms.
- Extended ebb tide may allow Pond Creek to export sediment.
- Sediment accumulation rates are variable in time and across the marsh.
- Sediment can be reworked after deposition.
- The <sup>137</sup>Cs accumulation rates are consistent with other Delaware Bay marshes.

## Future work

- Wait for construction to take place.
- Perform post-construction studies 1 year and 5 years later.