Variability in Marsh-Estuarine Sediment Exchanges in Back Barrier Systems: Barnegat Bay, NJ, USA

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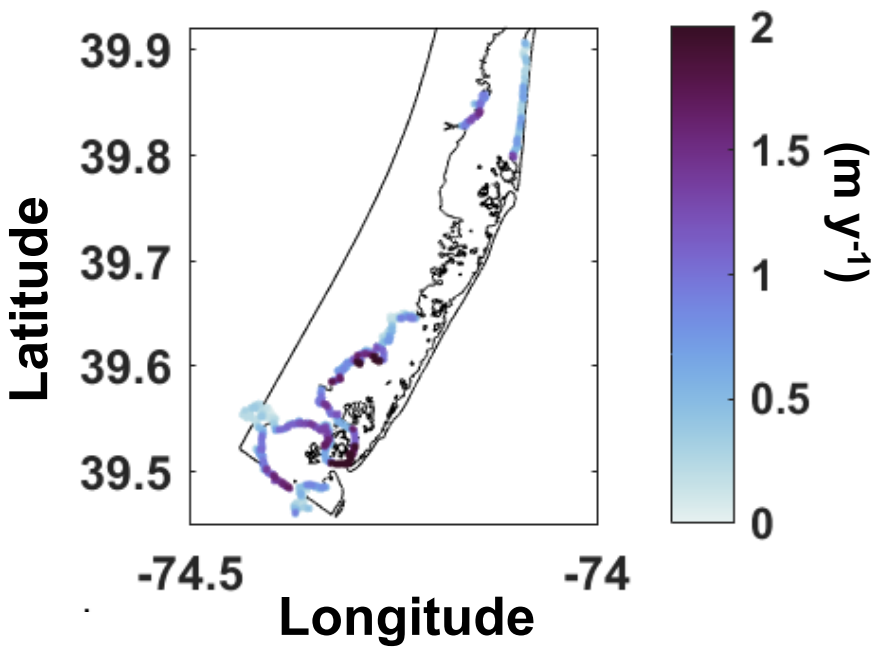
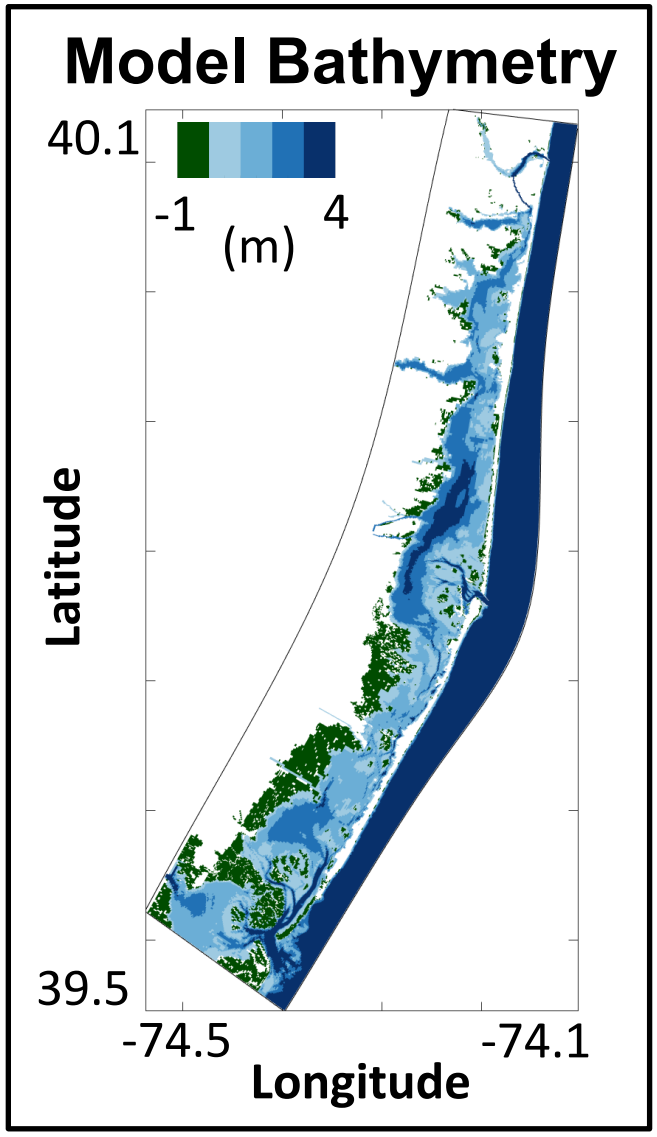
Changes in Marsh Geomorphology Affects Ecosystem Services

Marsh-Edge Erosion Rate: Barnegat Bay (1930 – 2007)



Leonardi et al., 2016

Barnegat Bay COAWST Model Implementation



Hydrodynamics (Defne et al., 2015)

- Tides, Winds, Waves, River Input
- Resolution: ~40-200 m

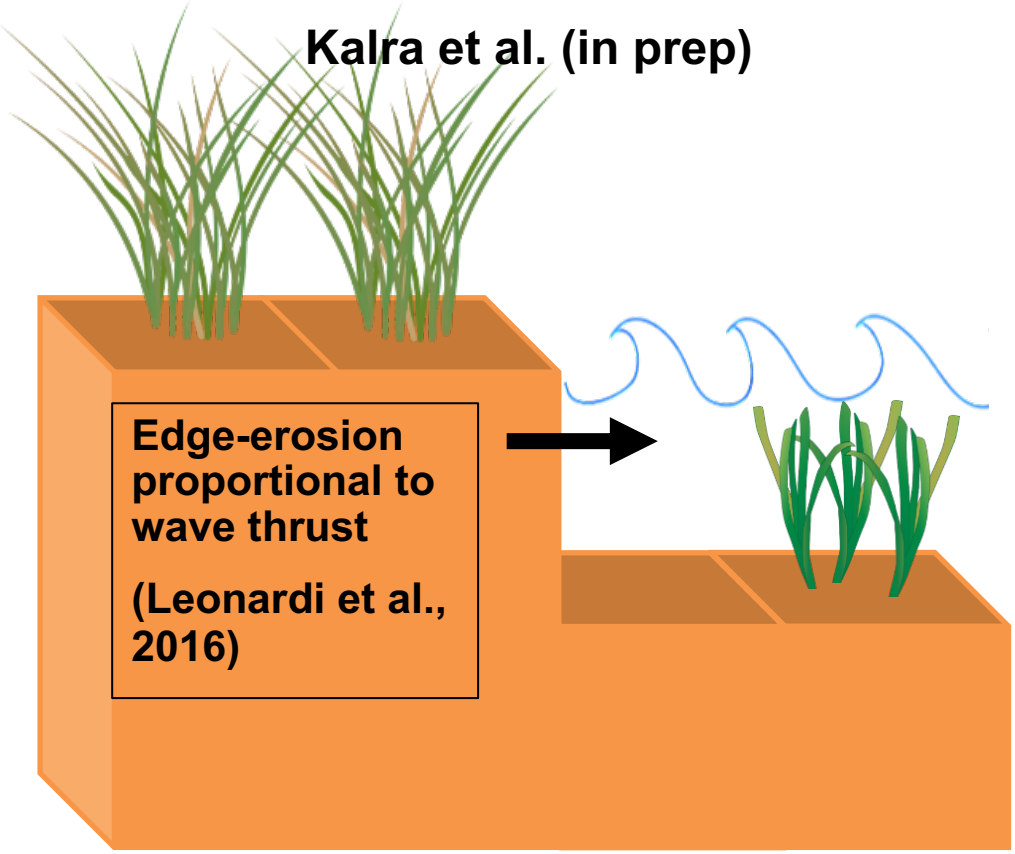
Sediment

- 3 estuarine sediment classes (Defne et al., 2019)
- 3 marsh sediment classes

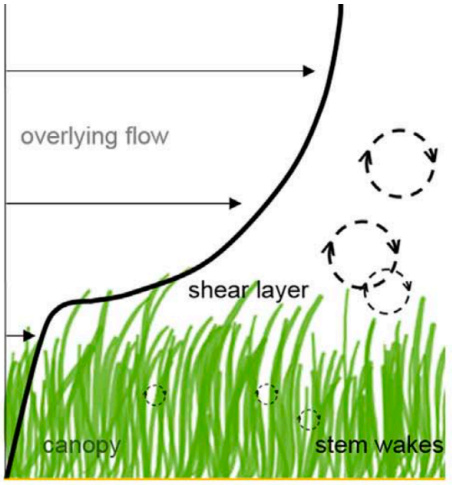
Time Period: March – June 2012

Incorporation of Vegetation-Sediment Transport Processes in COAWST

Marsh Edge Erosion based on Kalra et al. (in prep)

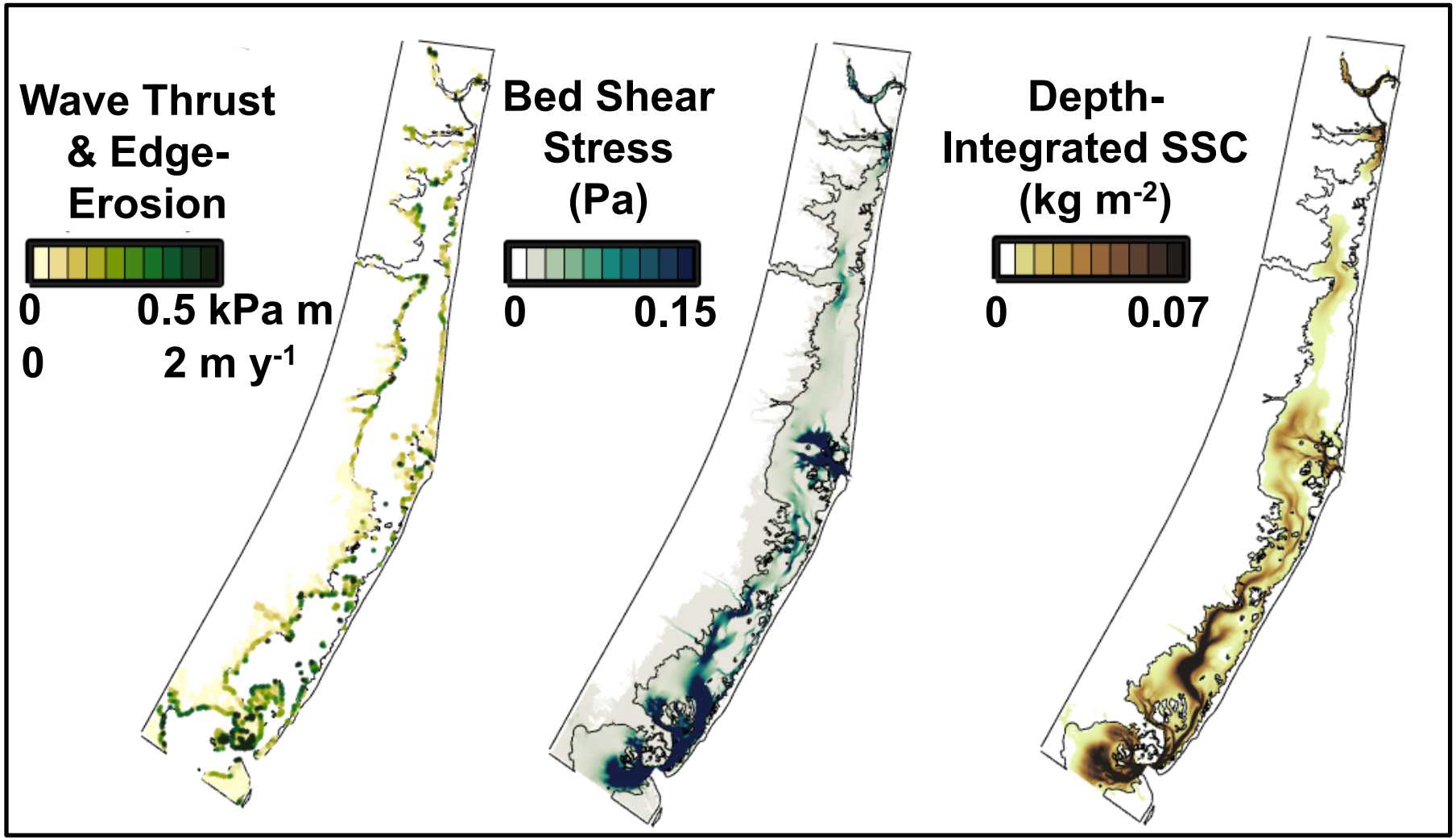


Veg-Hydro Feedbacks based on Beudin et al. (2017)



Warner et al., 2010, 2019; Beudin et al., 2017; Kalra et al., 2017, in prep; Moriarty et al., in prep

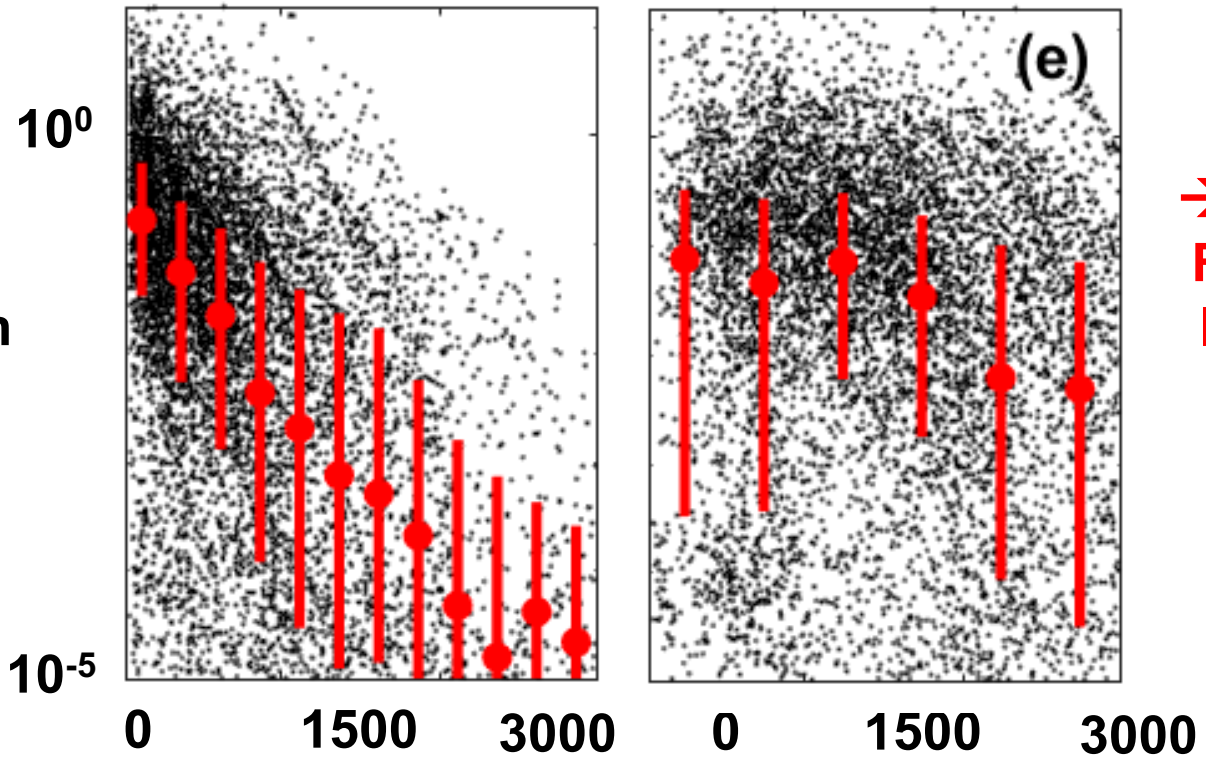
Marsh-Edge Erosion, Sediment Concentrations, Highest Near Inlets



Marsh Deposition is Largest Near High-Thrust, Near-Channel Regions

Modeled Deposition Rate on Marsh Platform

(kg m^{-2} y^{-1})



→ Deposition Fastest near Inlets, high-turbidity regions

Conclusions

1. **A hydrodynamic-wave-sediment transport model accounting for marsh-edge erosion and the presence of vegetation was implemented for a back-barrier estuary, Barnegat Bay, NJ, for March-June 2012.**

2. **Regions near inlets were characterized by energetic waves, experienced faster rates of marsh-edge erosion, and had faster deposition rates on the marsh platform, compared to other regions.**

Acknowledgements: Neil Ganju, Taran Kalra, Zafer Defne, John Warner, Alfredo Aretxabaleta, Nicoletta Leonardi

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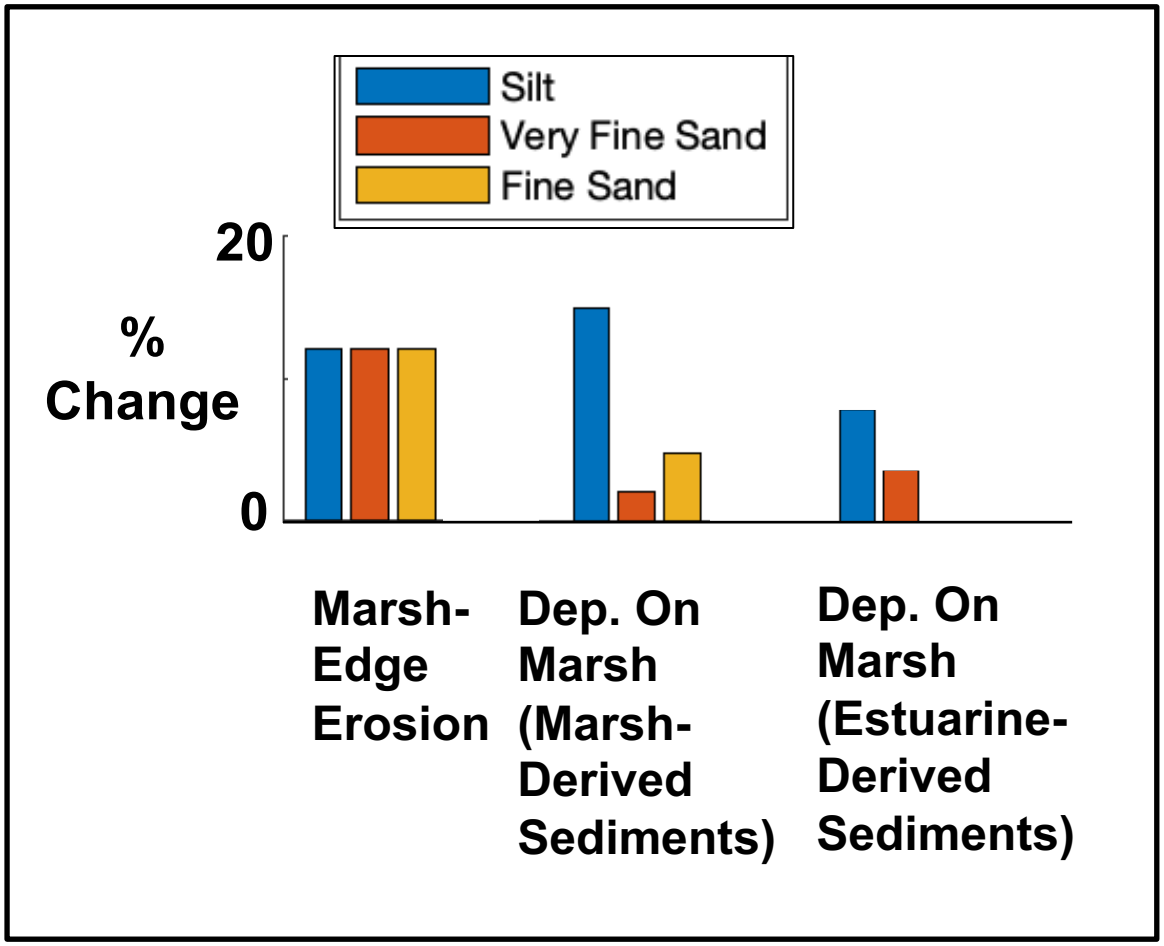
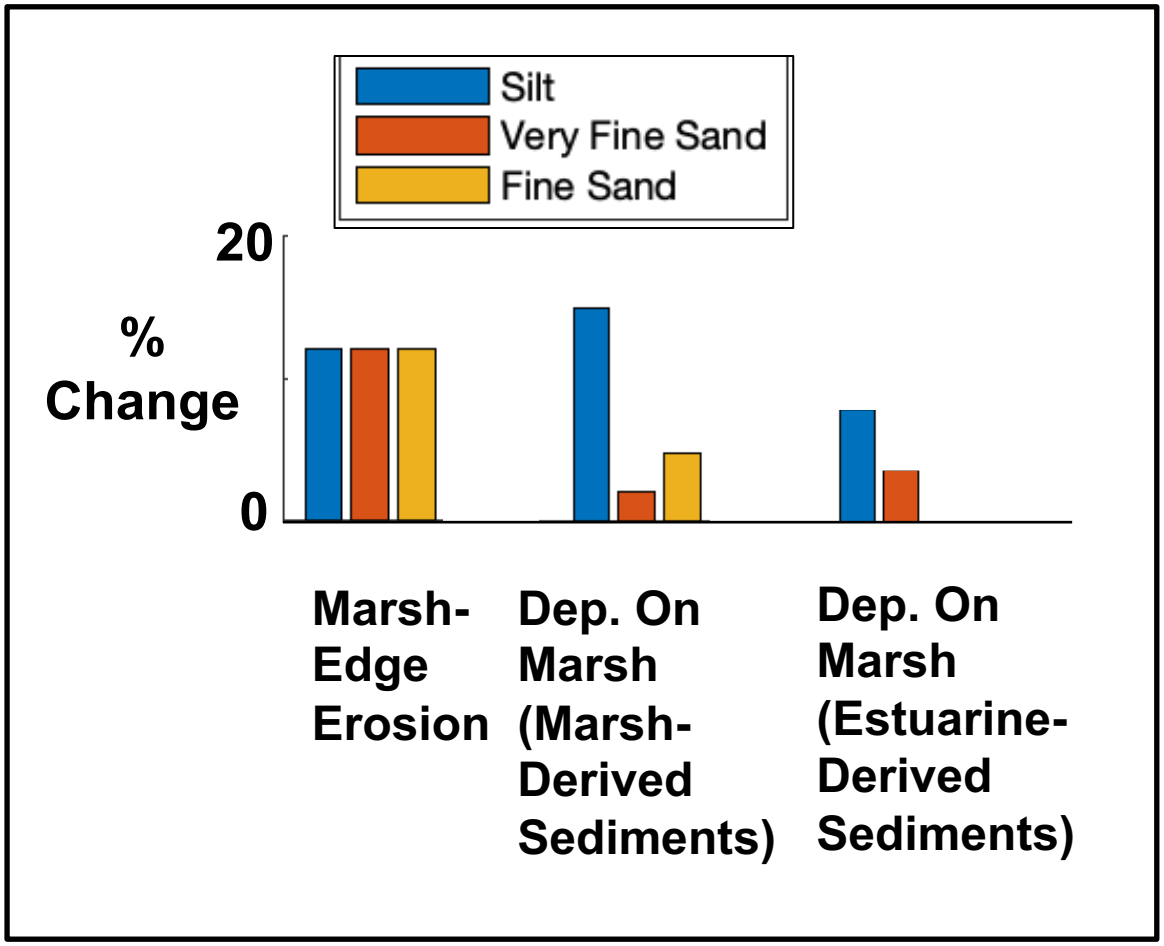
50% SAV Density Reduction Increased Marsh Edge-Erosion & Deposition on Marsh



- Marsh-edge erosion increased by 10+%
  - Directly proportional to wave thrust
  - Assumed no differences due to sediment classes
- Deposition on marsh increased up to 15%
  - Due to increased resuspension in subtidal estuary & sediment supply from marsh edge-erosion

50% SAV Density Reduction Increased Marsh Edge-Erosion & Deposition on Marsh



- Marsh-edge erosion increased by 10+%
- resuspension in subtidal estuary & sediment supply from marsh edge-erosion

Decreasing SAV density by 50% similar to Removing 10-15% of SAV from estuary based on Donatelli et al. (2018)