Dam Removal to Support Climate Resilience in Coastal Systems

Matilija Dam on the Ventura River

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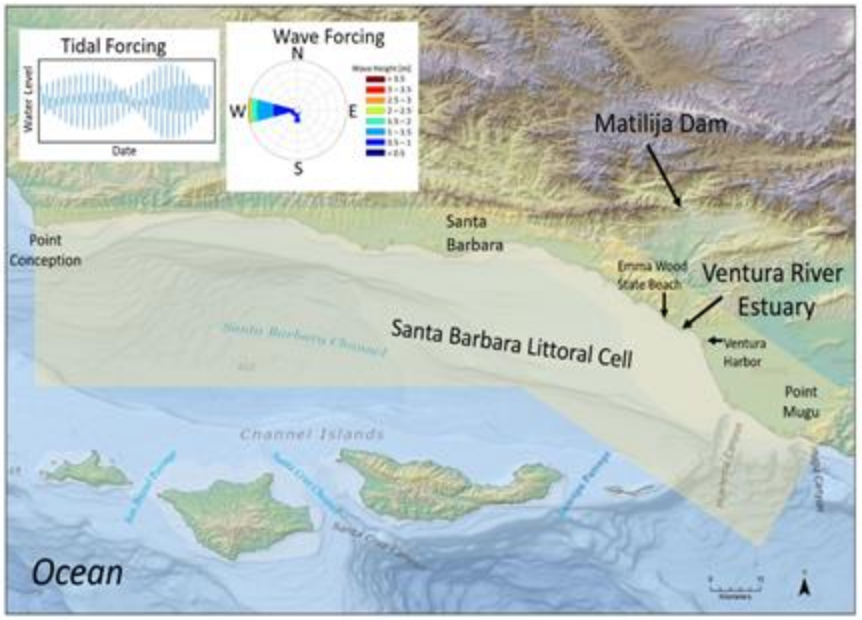
integral consulting inc.

Matilija Dam Ecosystem Restoration

- The Matilija Dam has impounded more than 6 mcy of sediments
- Contracting delta has caused coastal erosion hotspots
- The removal of the Matilija Dam has the potential to provide much-needed sediment to the Ventura River Lagoon and Coast
- Influences of restored sediment on local habitats are beneficial; but, the short- and long-term effects need to be understood



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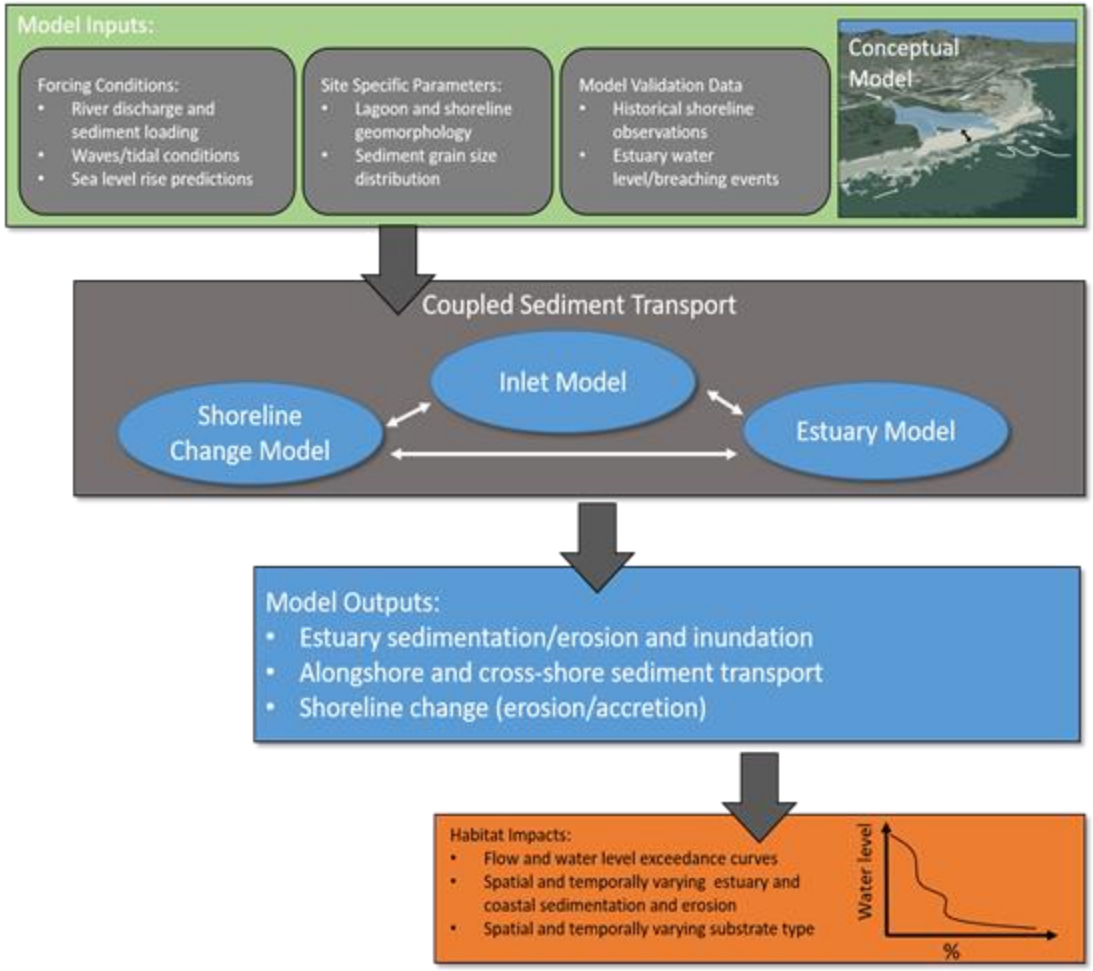
Our Approach

- Focus on relative impact of dam removal compared to current conditions
- Multi-model approach to predict dynamics over range of timescales
- Utilize scenarios to bound range of anticipated dam removal impacts
- Evaluate impact to habitat b characterizing physical stressors



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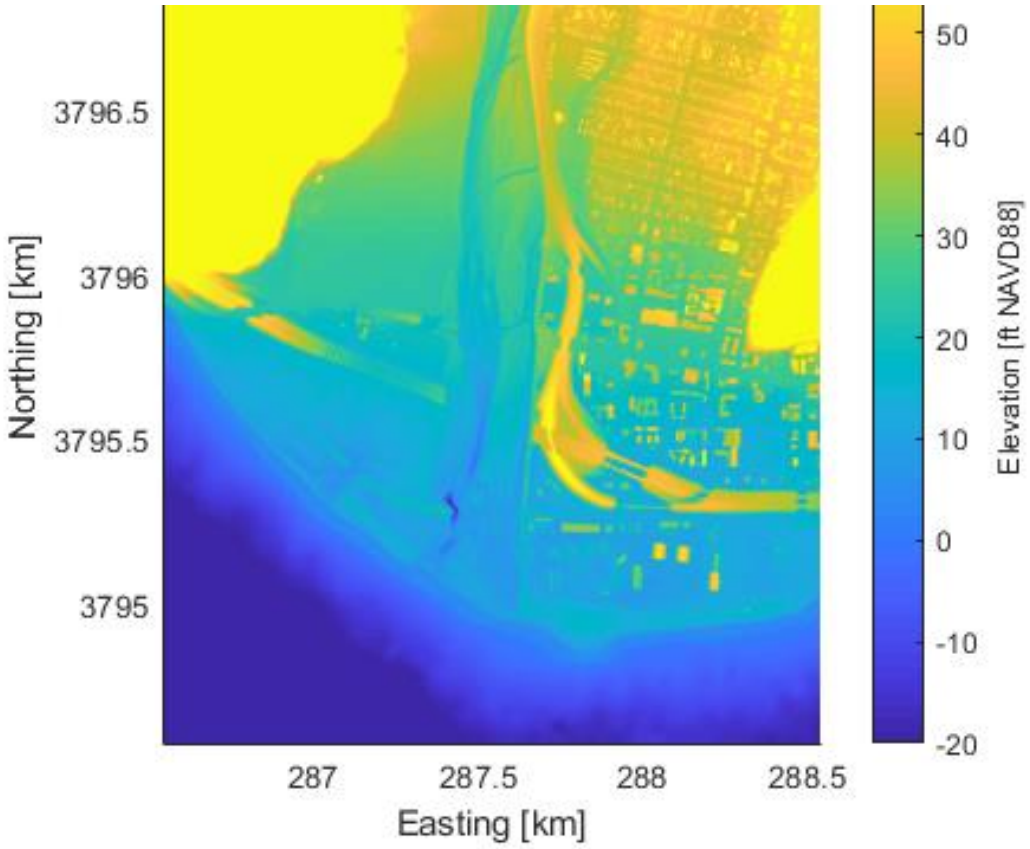
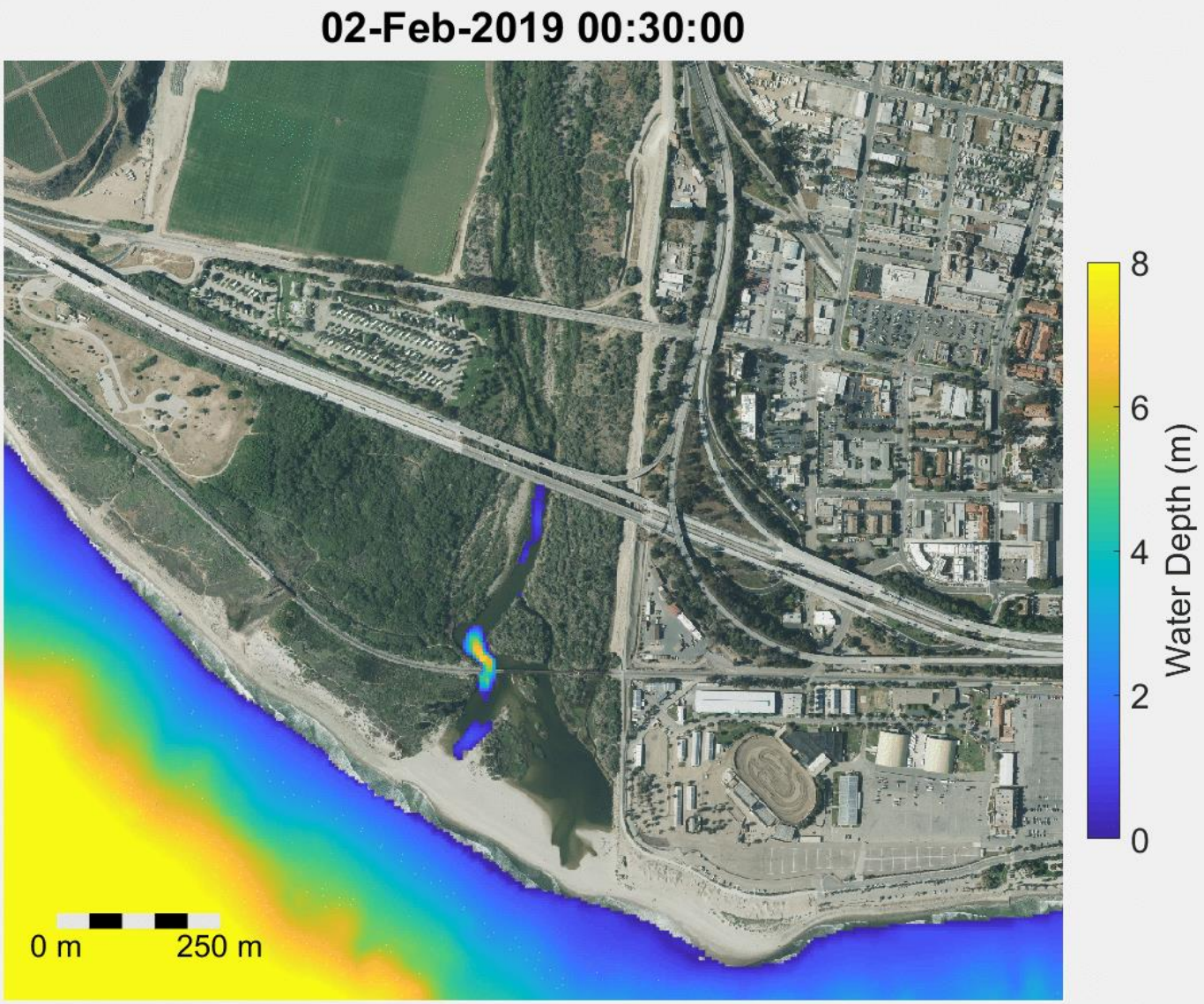
Estuary Modeling

Estuary/Lagoon Model Overview

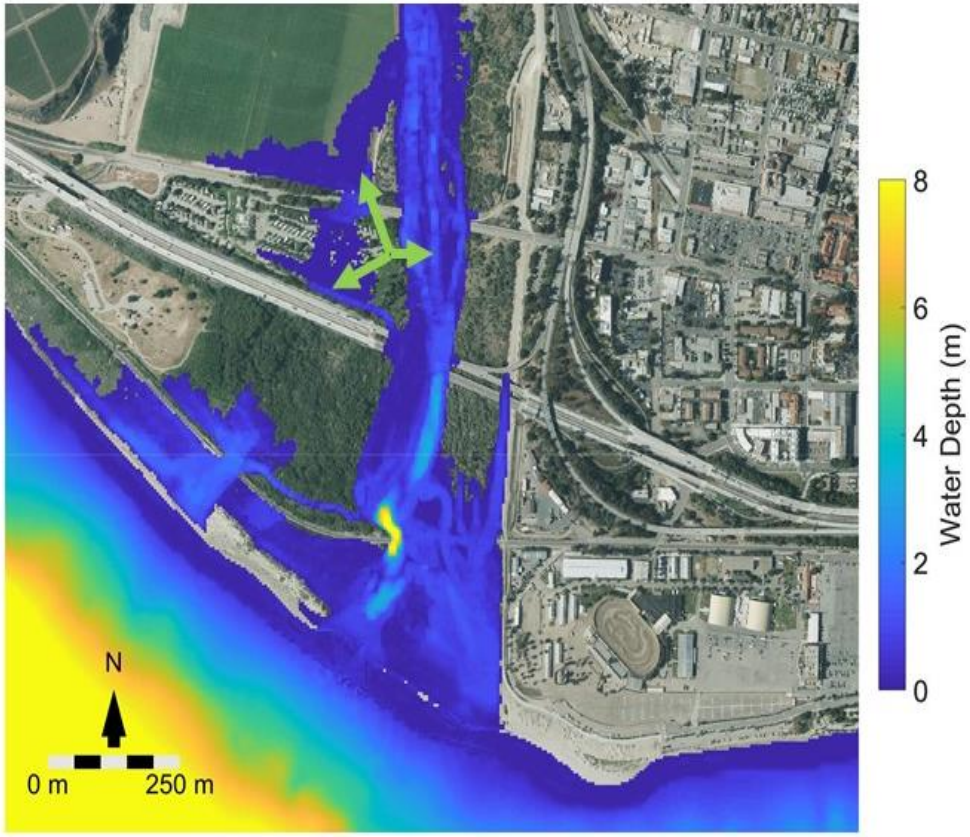
- Delft3D hydrodynamic and sediment transport model
  - Morphological model
  - Wetting and drying
- Boundary conditions
  - Offshore water level
  - Upstream loadings
- Validated with observed flood events



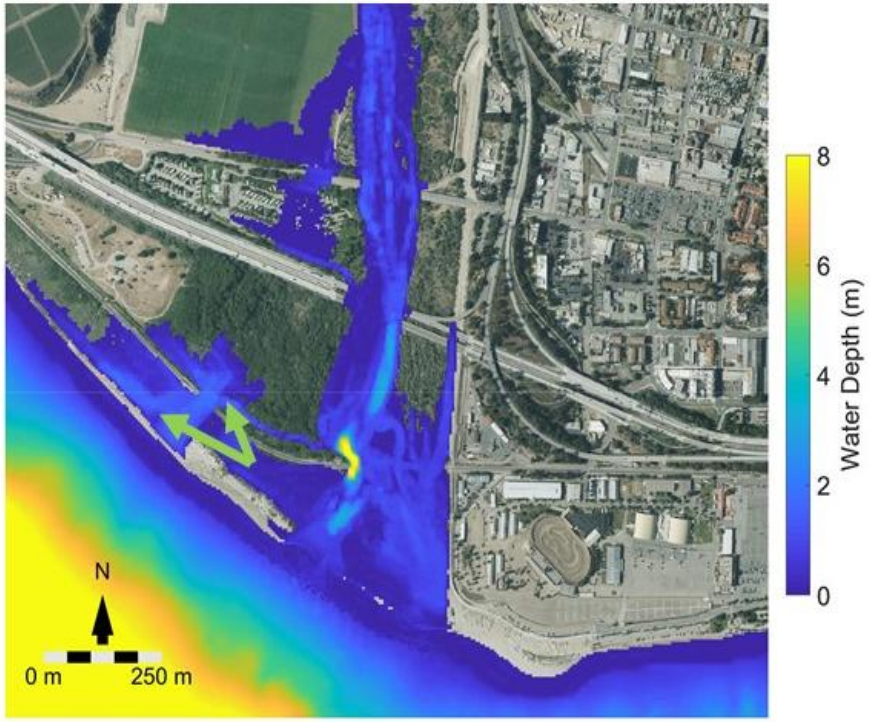
February 2019 Event



Lagoon Modeling Results



Lagoon Modeling Results



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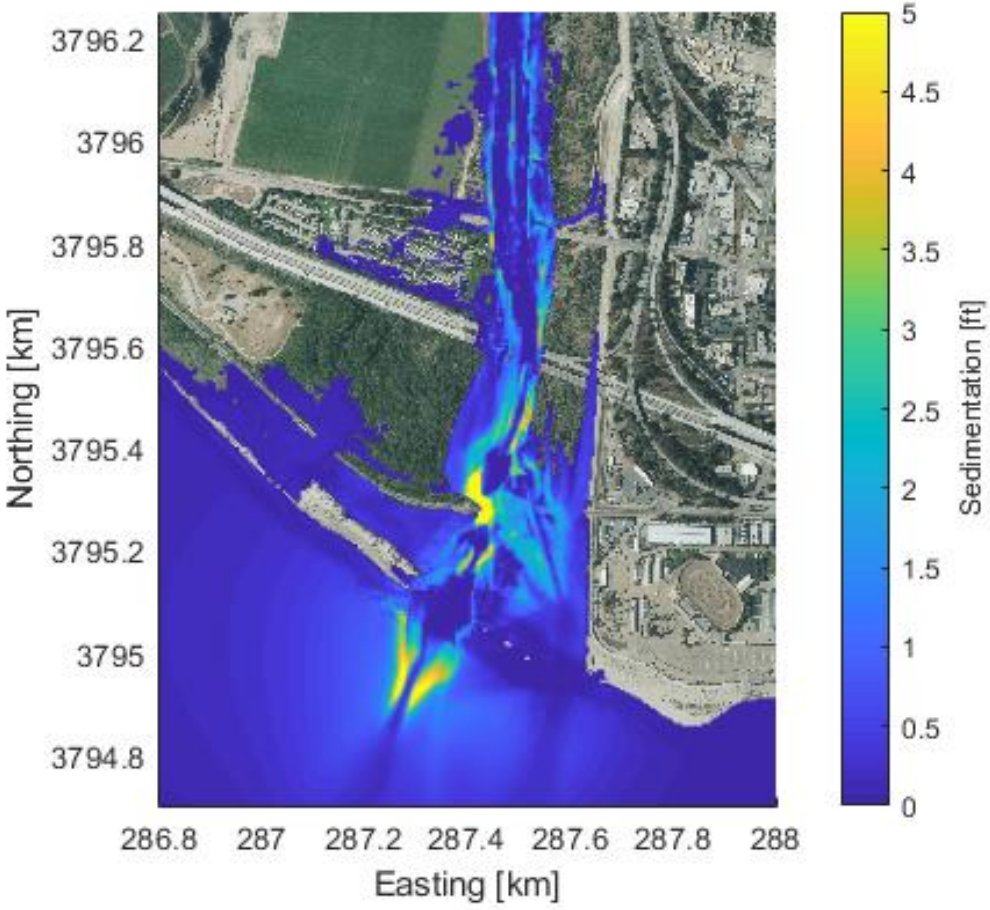
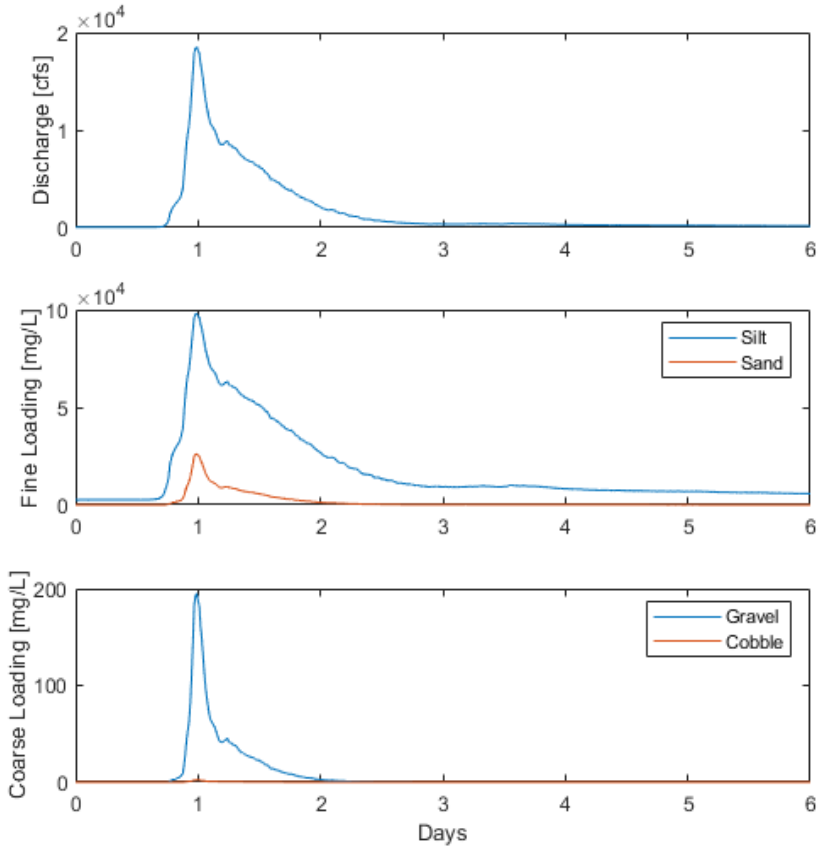
High Loading Scenario





- Approximately 50-90 percent of the total sediment load is due to initial dam release

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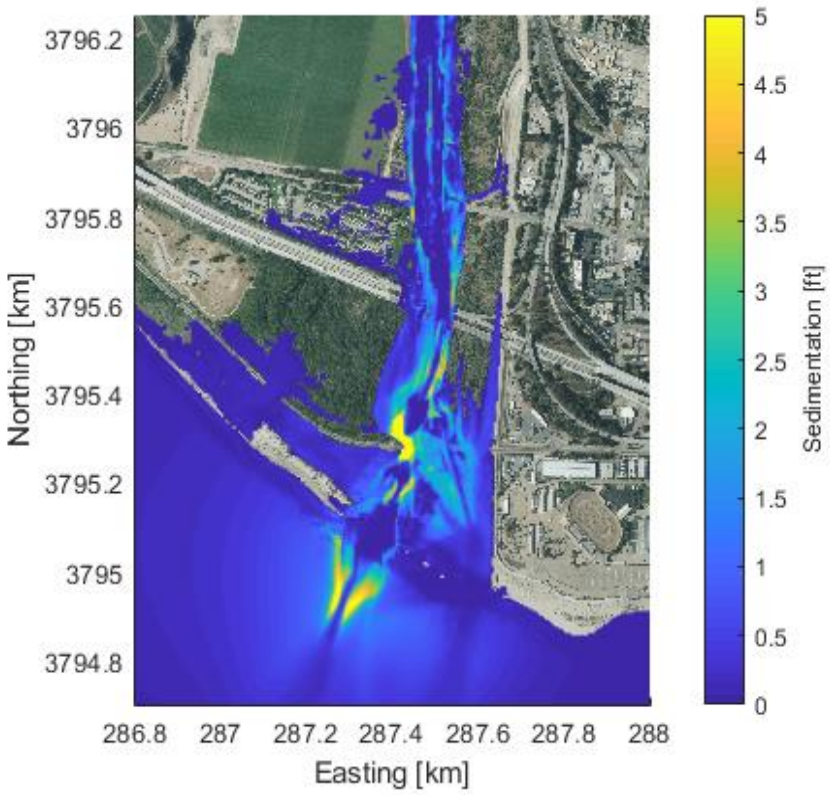
Estuary Trapping Efficiency

- Silt is largely transported through estuary and out to the coastal ocean (7-15% trapping)
- Gravel and cobble remains upstream of estuary mouth across all scenarios for decades
- Sand comprises largest mass of sediment deposited in the estuary (>70%)
- **Total trapping ranged from 11-17%**



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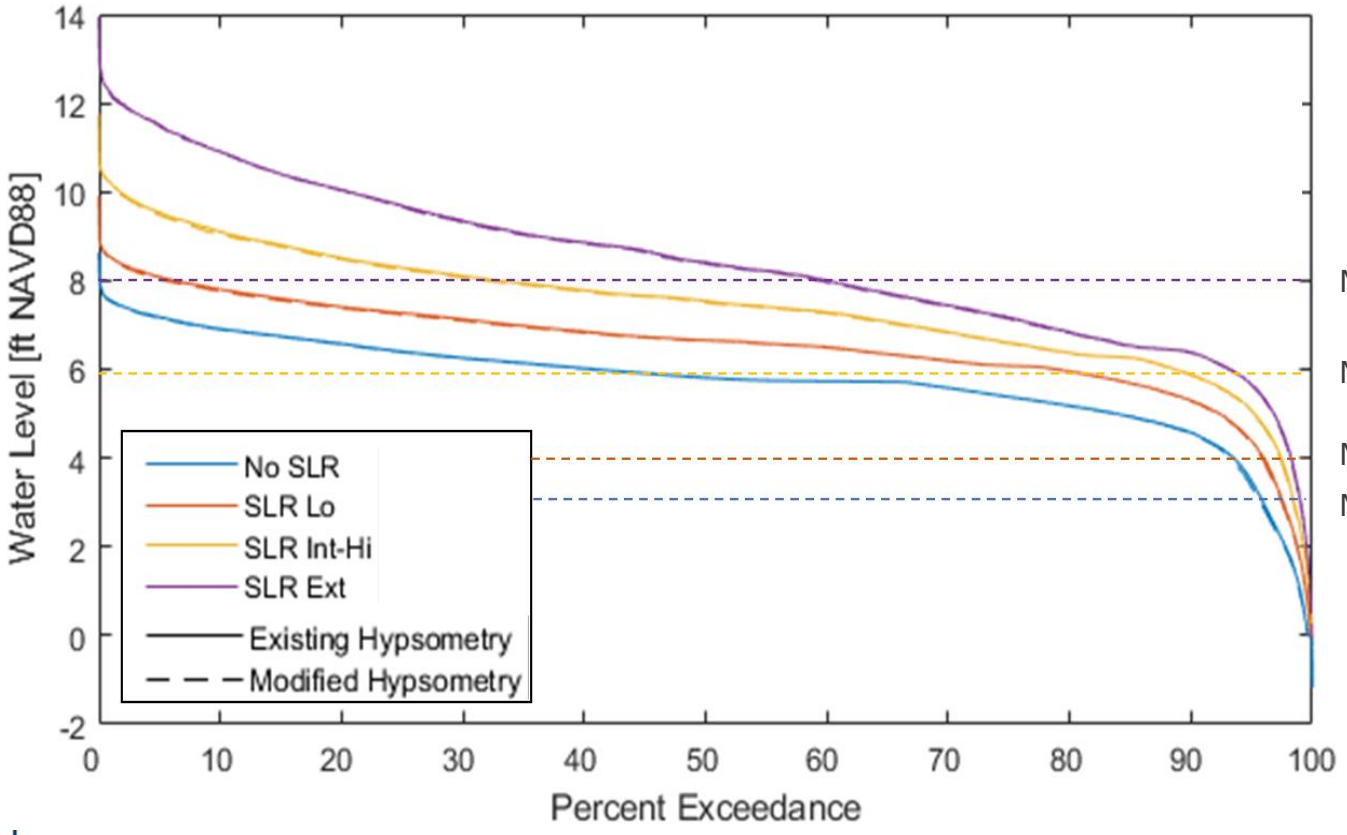
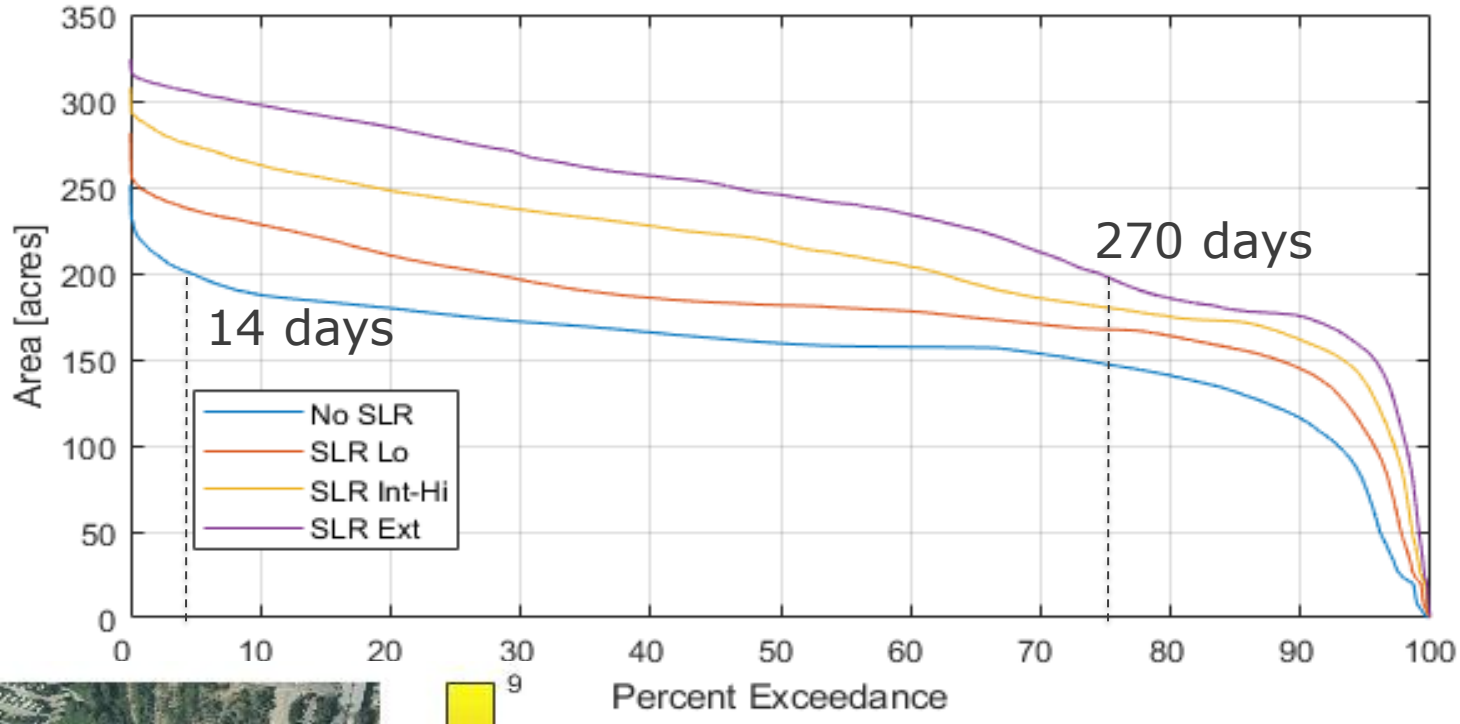
Water Level Exceedance

- Modified estuary hypsometry has negligible effect of estuary dynamics relative to sea level rise



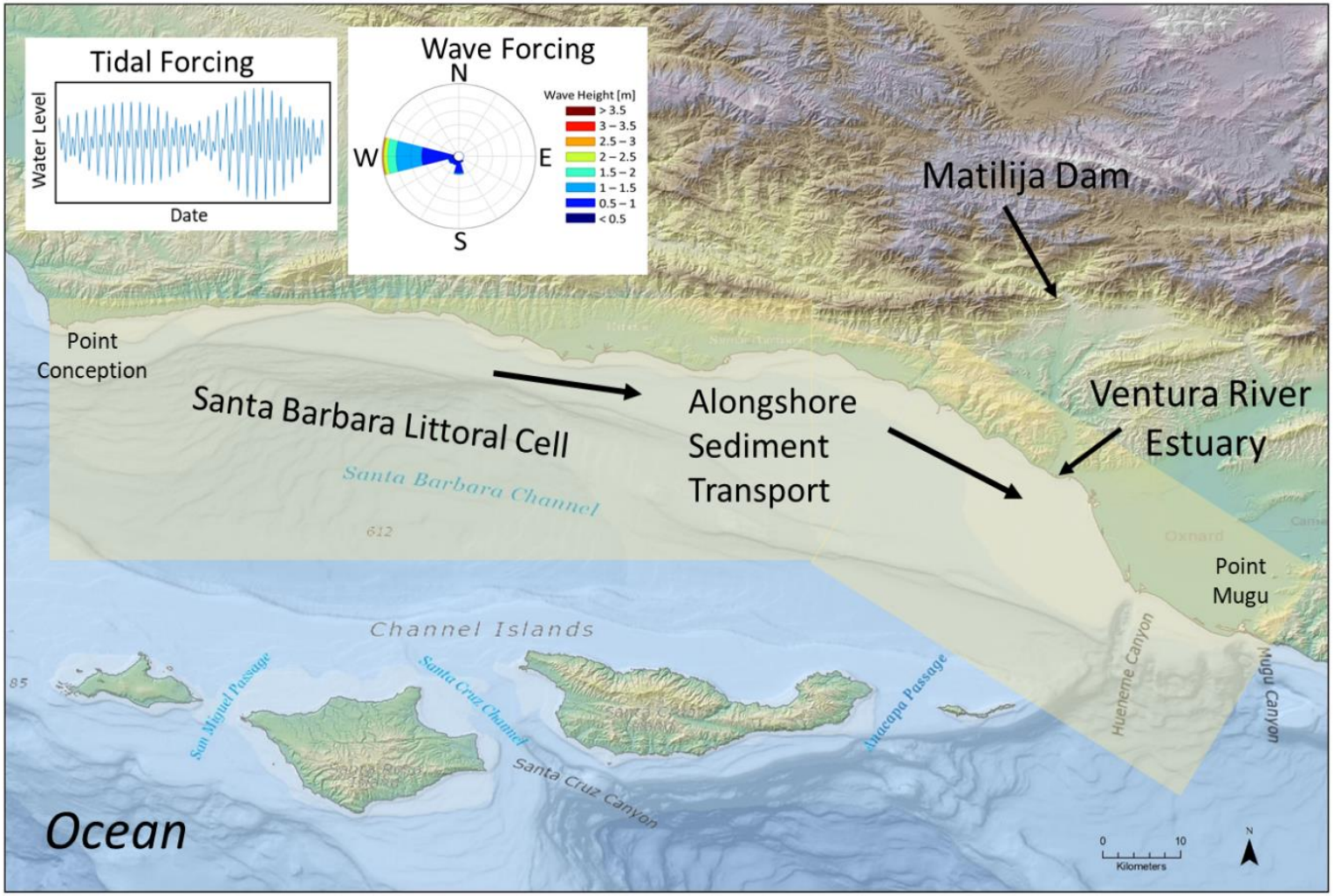
Habitat Impact



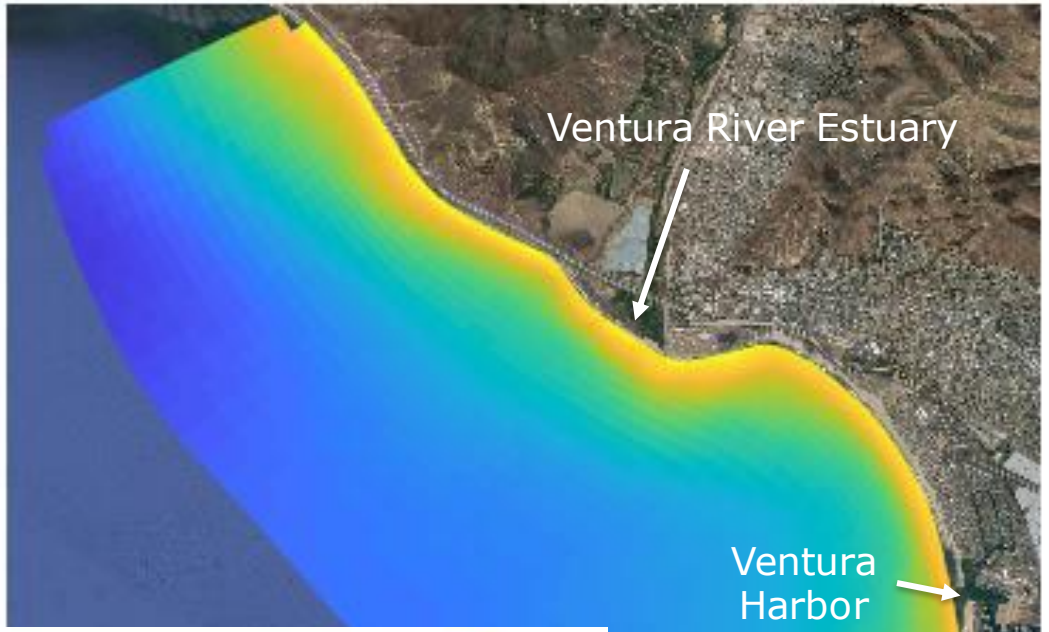
- SLR increases the area and duration of habitat that is inundated
- Contours indicate 50% inundation areas

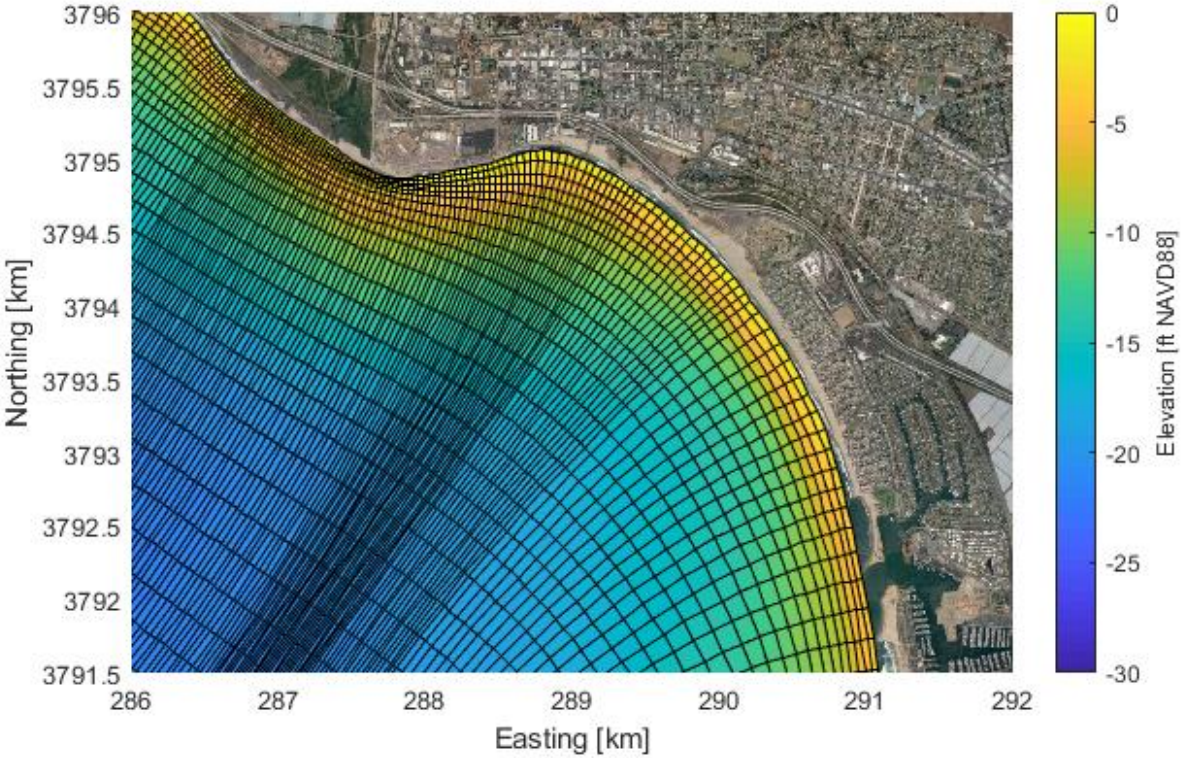
Coastal Modeling

Coastal Dynamics



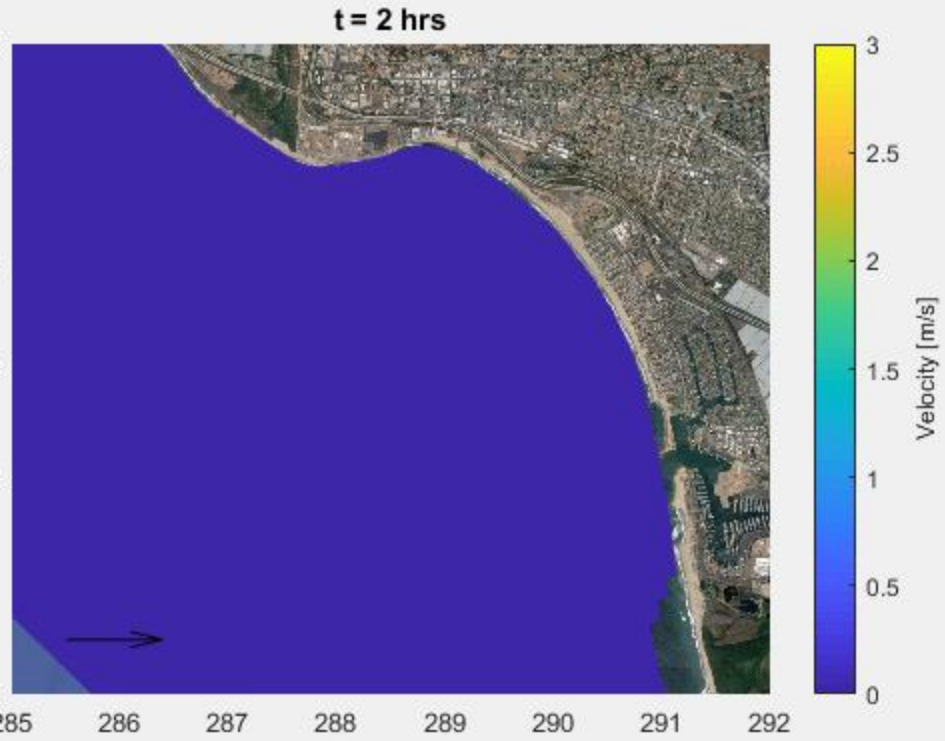
Coastal Model Domain



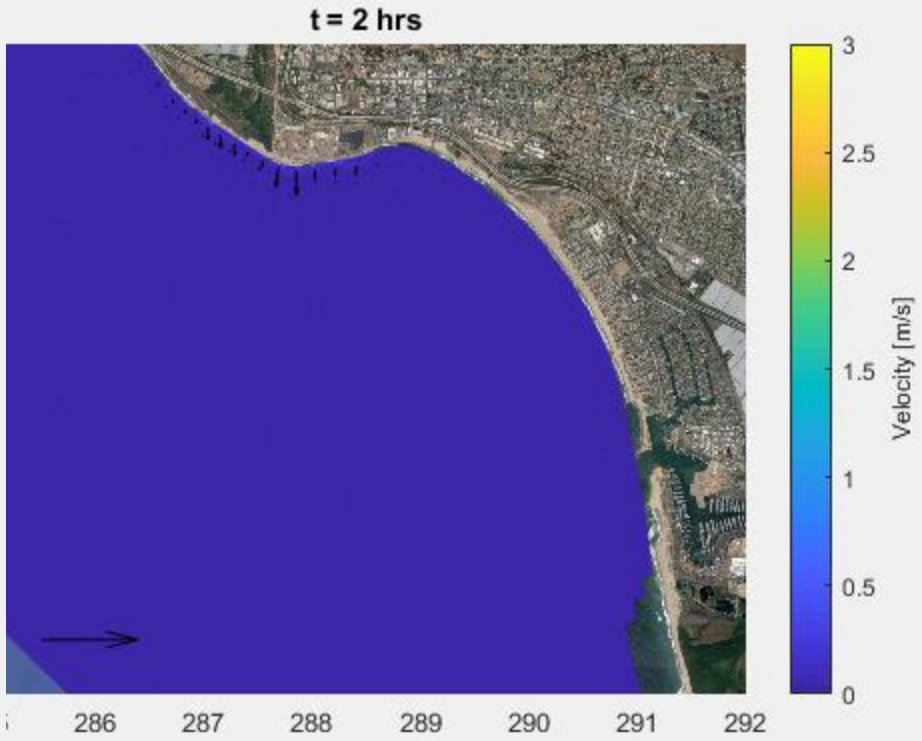


Wave Conditions

Large winter storm (4 m w swell)



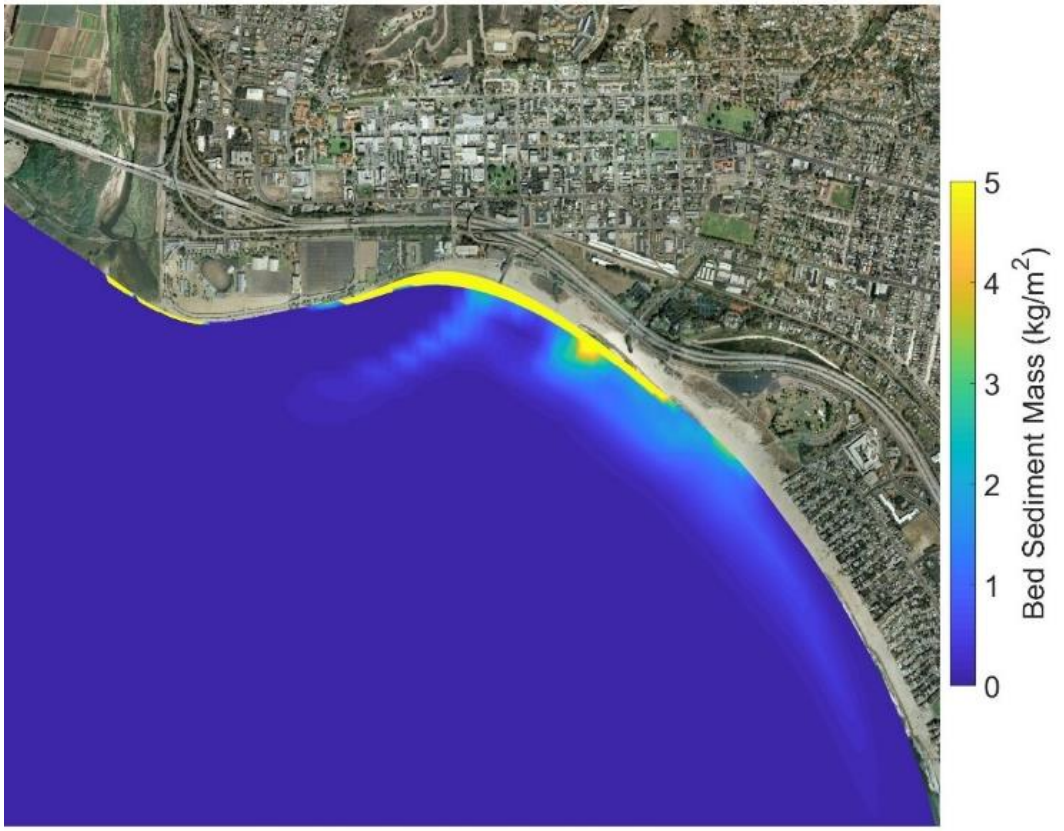
Average summer/fall (~1 m s swell)



Particle Size

- Sand particle size affects transport patterns
- Large winter storm with maximum sediment loading

- Fine sand is transported offshore
- Medium and coarse grain sediment deposits along the shoreline



Key Findings

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- Restored sediment loads results in different timing of downstream and downcoast effects
- No significant changes in lagoon hypsometry, breaching dynamics, or habitat due to dam removal
- Sea level rise is anticipated to have significant effect on the estuary habitats and shoreline dynamics in the long-term
- Dam removal does not significantly impact downcoast regions
- Coarser grained sediments provide higher natural coastal protection

Questions?

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Acknowledgments

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AECOM

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