Effect of Sea Level Rise on Coastal Wetlands

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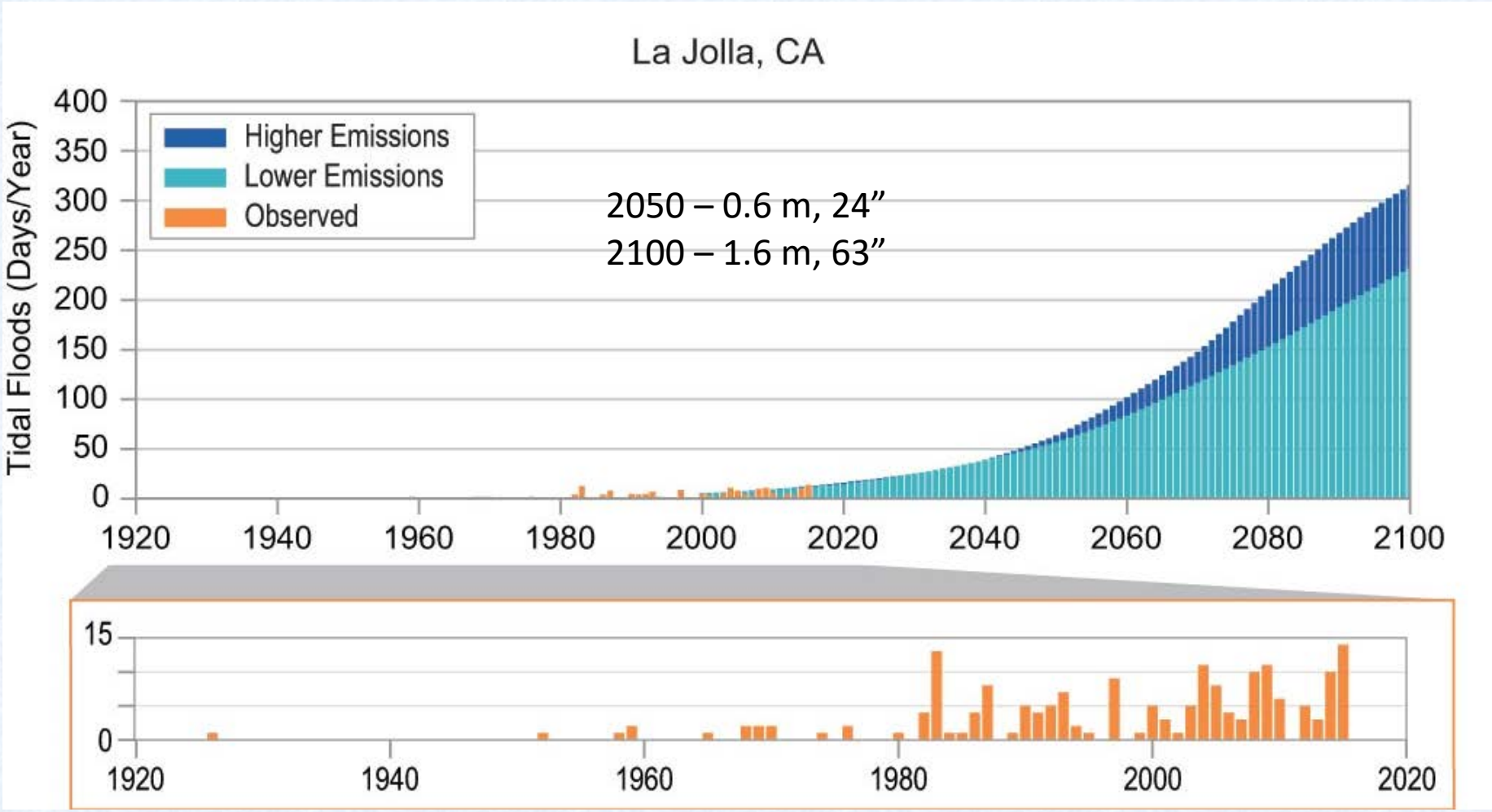
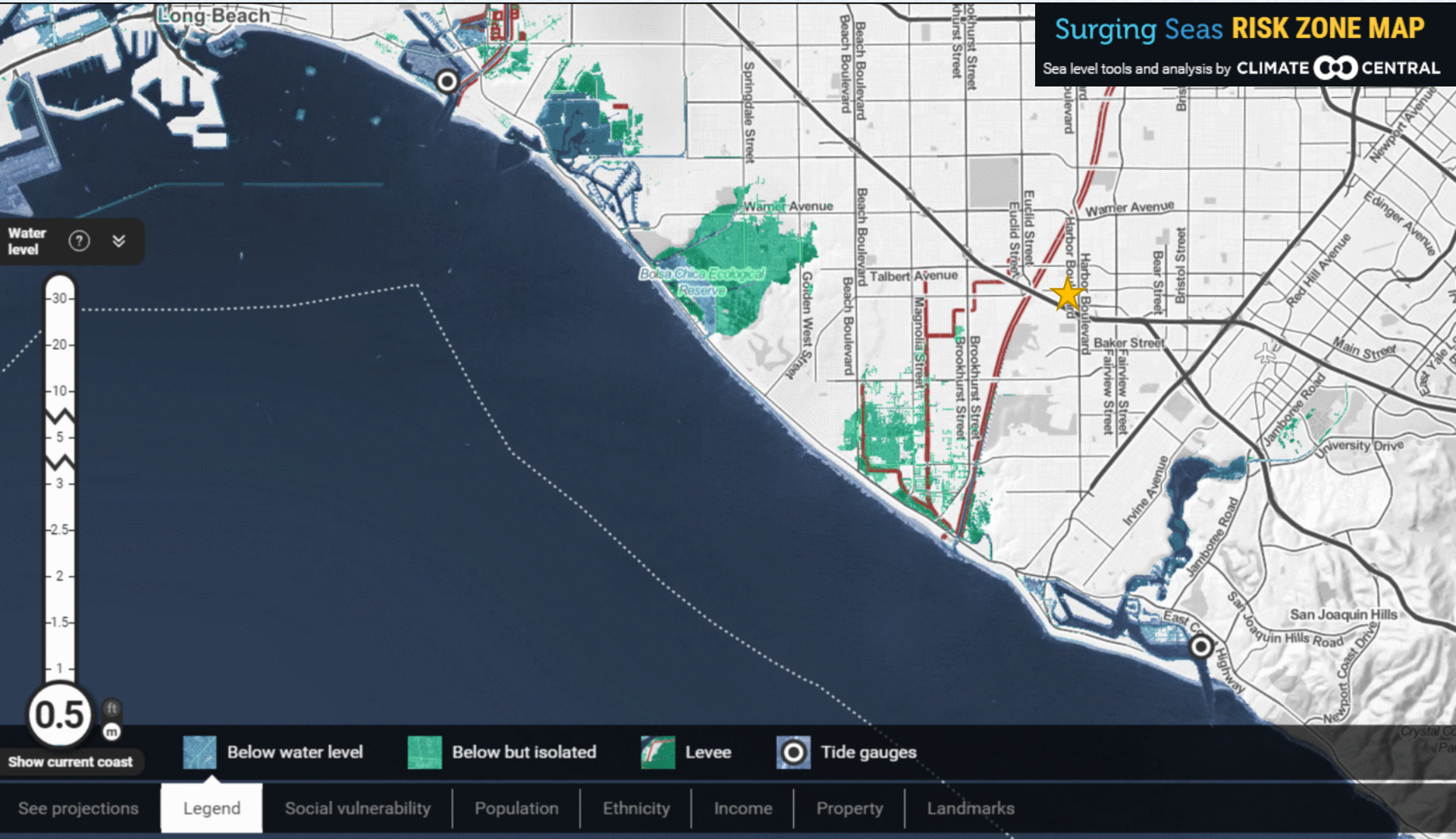
- Sea level rise presents substantial challenges to managing wetlands and other coastal resources
- Several options to accommodate challenges of SLR
- Options vary by wetland type
- There is urgency…. But there is time

Observed and Projected Tidal Floods



NOAA National Center for Environnemental Information

What are the Implications of SLR for S. Ca. Coastal Wetlands?



Dozens of leopard sharks died near the mouth of the Tijuana River. (Serge Dedina)

Spread of Spartina into former pickleweed areas at Mugu

Subsidence and inundation at Seal Beach

Pickleweed dieback at Carpinteria

What Are Our Management Options?

Facilitate Migration

- Allow or facilitate passive marsh migration
- Grade areas adjacent to wetlands to increase opportunity for migration
- Relocate or abandon adjacent infrastructure or development

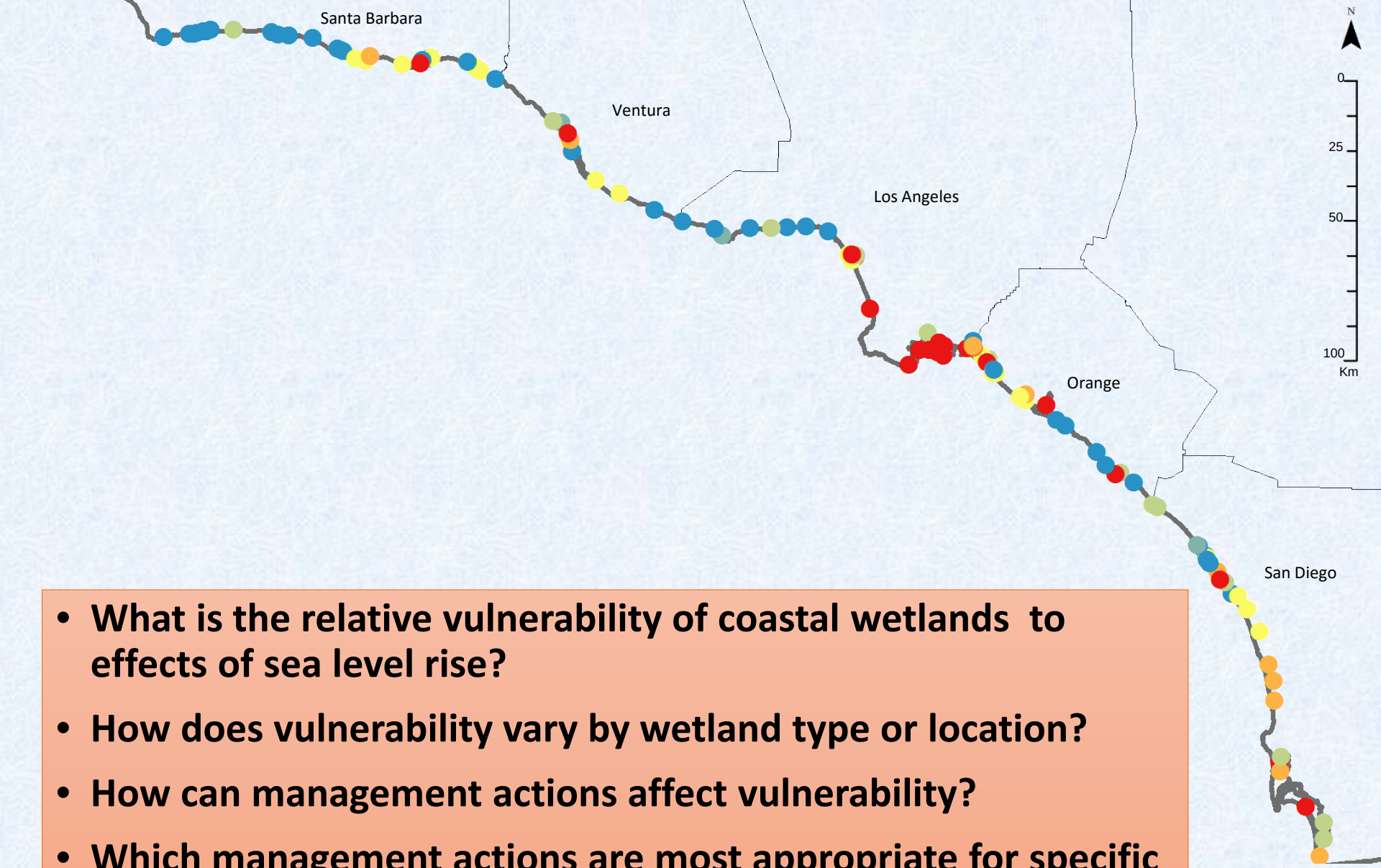
Manage Water Levels

- Alter structure and/or management of “mouth” of lagoons
- Install pumps or tide gates to control water elevations
- Reconnect currently fragmented systems to improve water flow

Promote Accretion

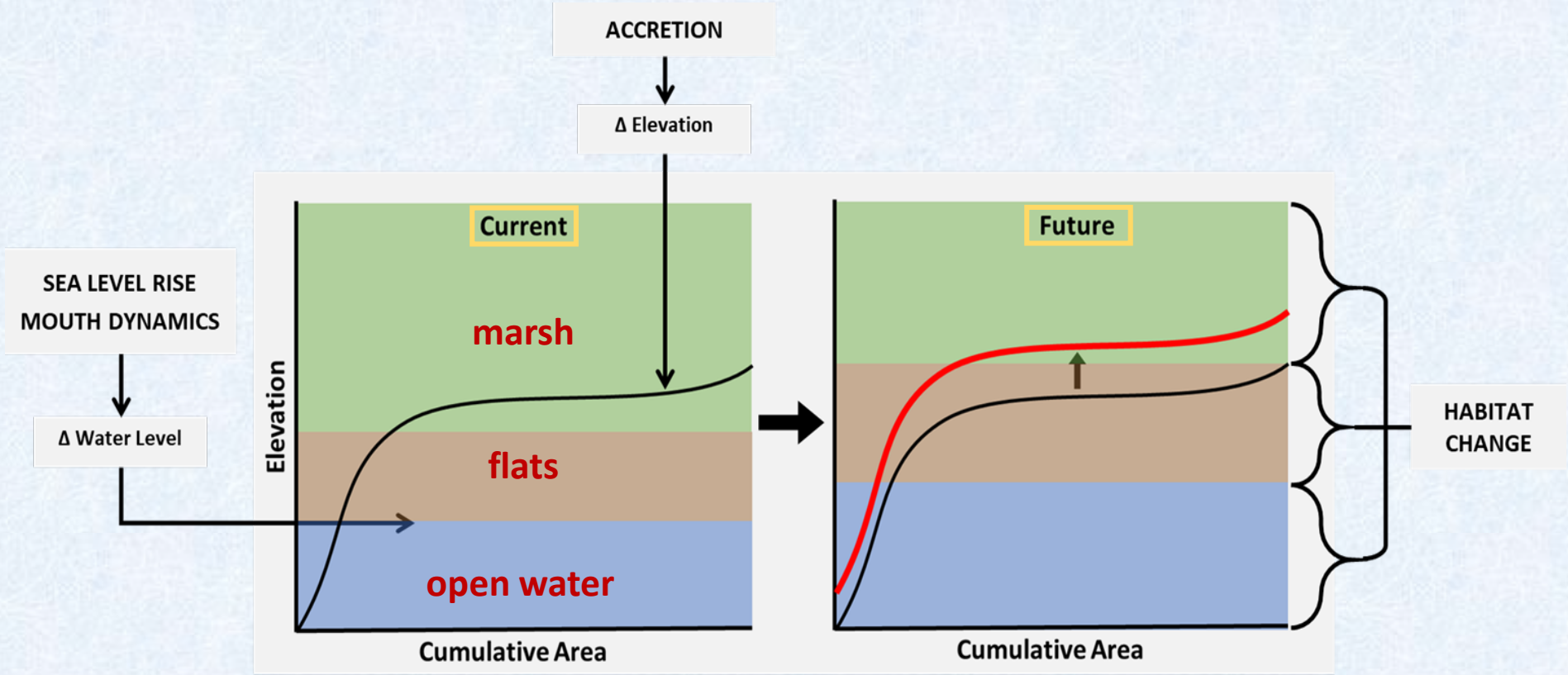
- Thin layer sediment augmentation
- Sediment trapping
- Sediment re-use to raise marsh elevations

Allow Conversion to Deepwater Habitat



- **What is the relative vulnerability of coastal wetlands to effects of sea level rise?**
- **How does vulnerability vary by wetland type or location?**
- **How can management actions affect vulnerability?**
- **Which management actions are most appropriate for specific wetland types?**

Hypsometric Curves



area under the curve ≈ area of different habitat types

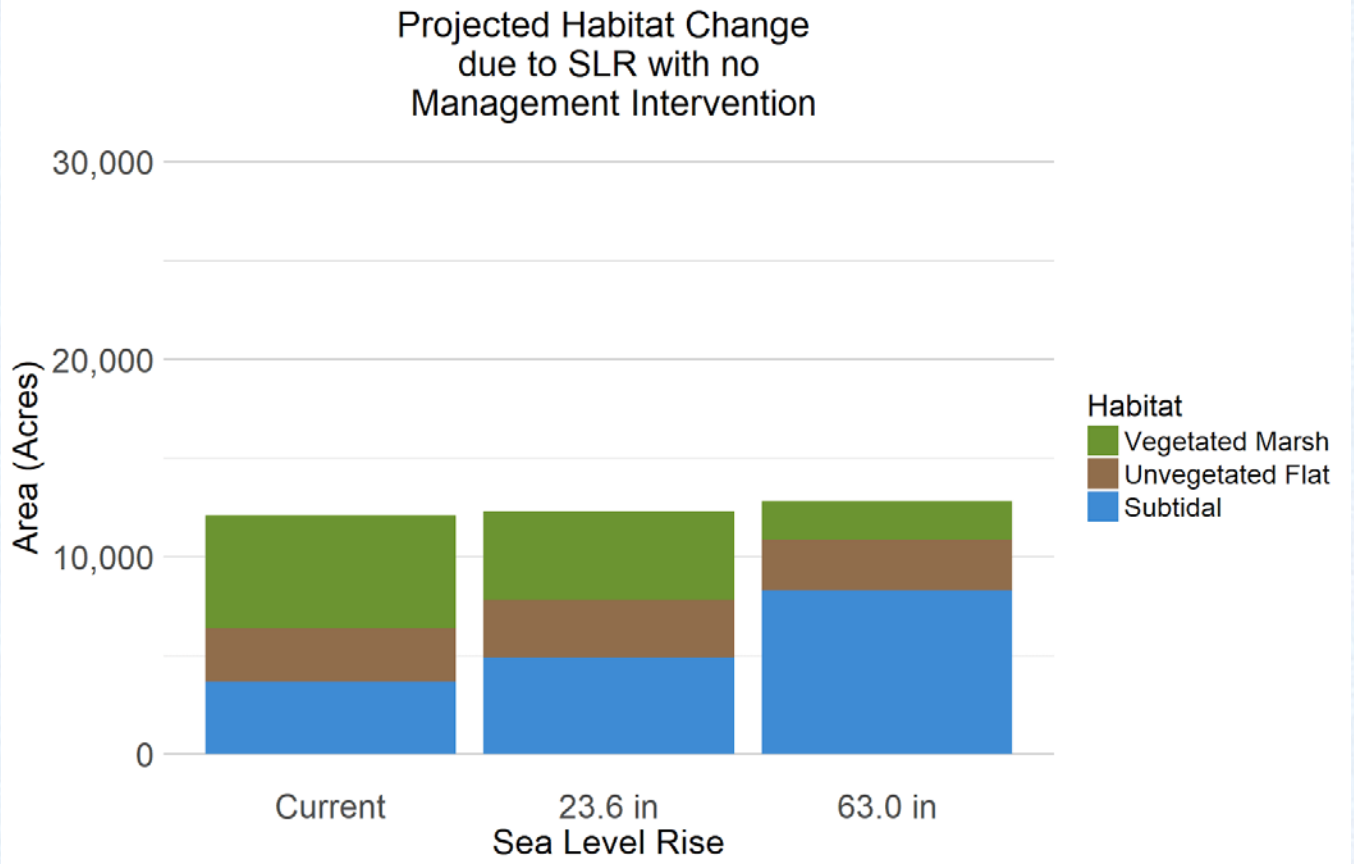
We Evaluated Different Scenarios

- Two sea level rise projections
  - 0.6 m (23.6”) SLR by 2050
  - 1.7 m (63.0”) SLR by 2100
- Three wetland migration scenarios

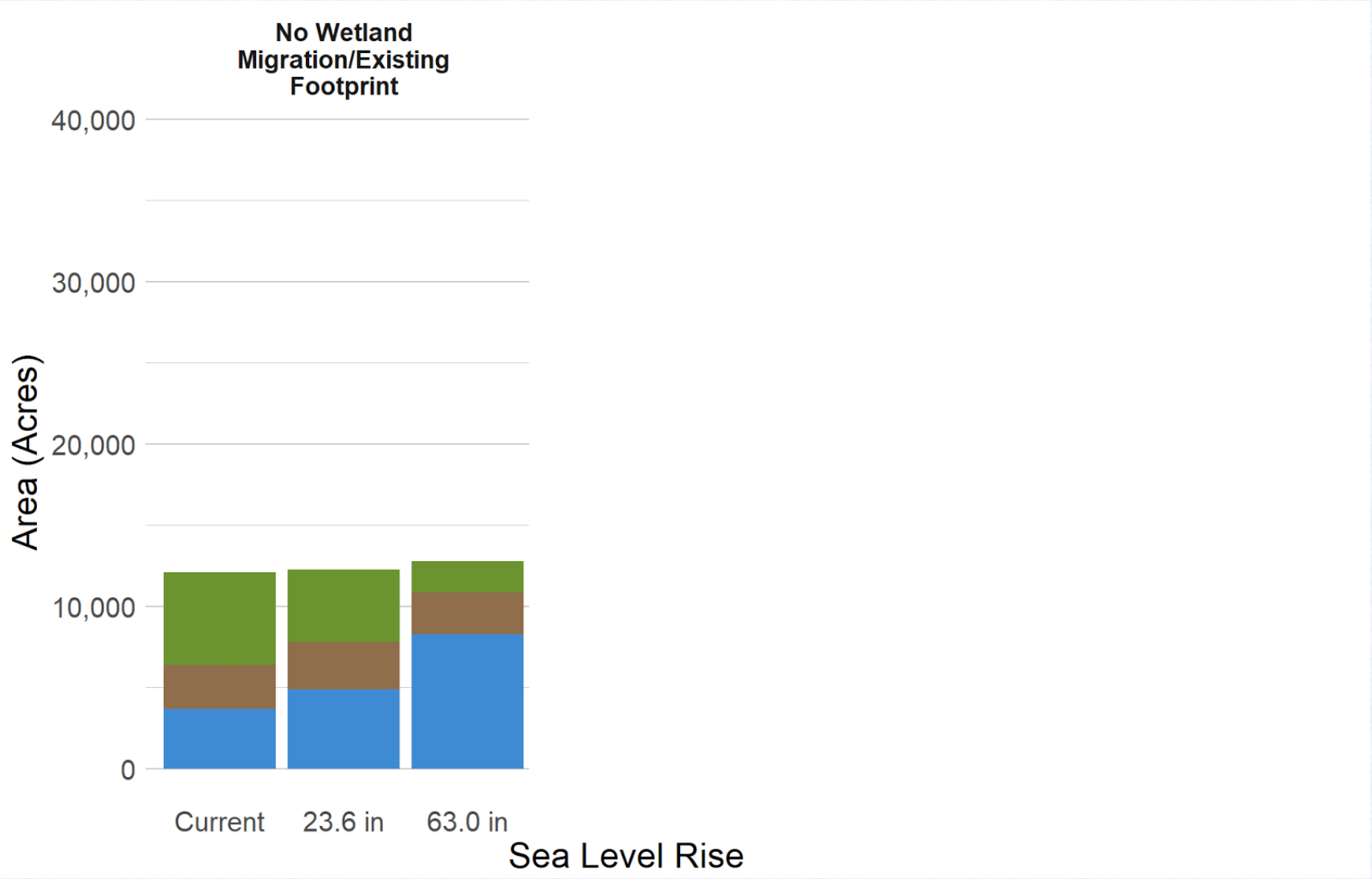
No wetland migration (existing wetland extent)	Wetland migration (avoid developed areas)	Wetland migration (all areas)

Absent Intervention, SLR Will Result in Substantial Loss of Coastal Wetlands

405 ha (1,000 acres) of vegetated marsh and unvegetated flats will be lost regionwide with 0.6 m (23.6”) SLR and 1,620 ha (4,000 acres) with 1.7 m(63.0”) SLR



Maintaining Wetlands in the Future Depends on Wetland Expansion



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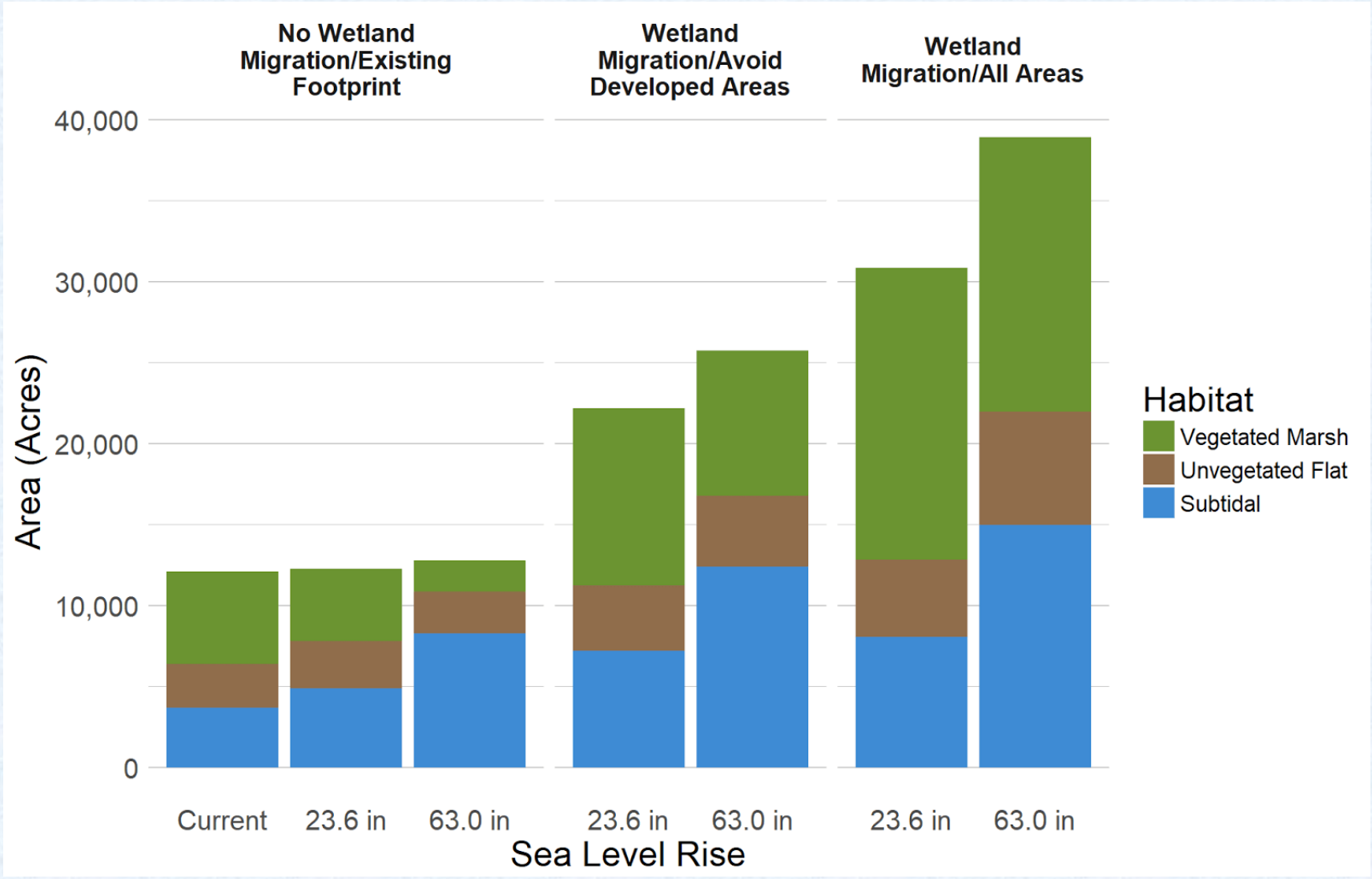


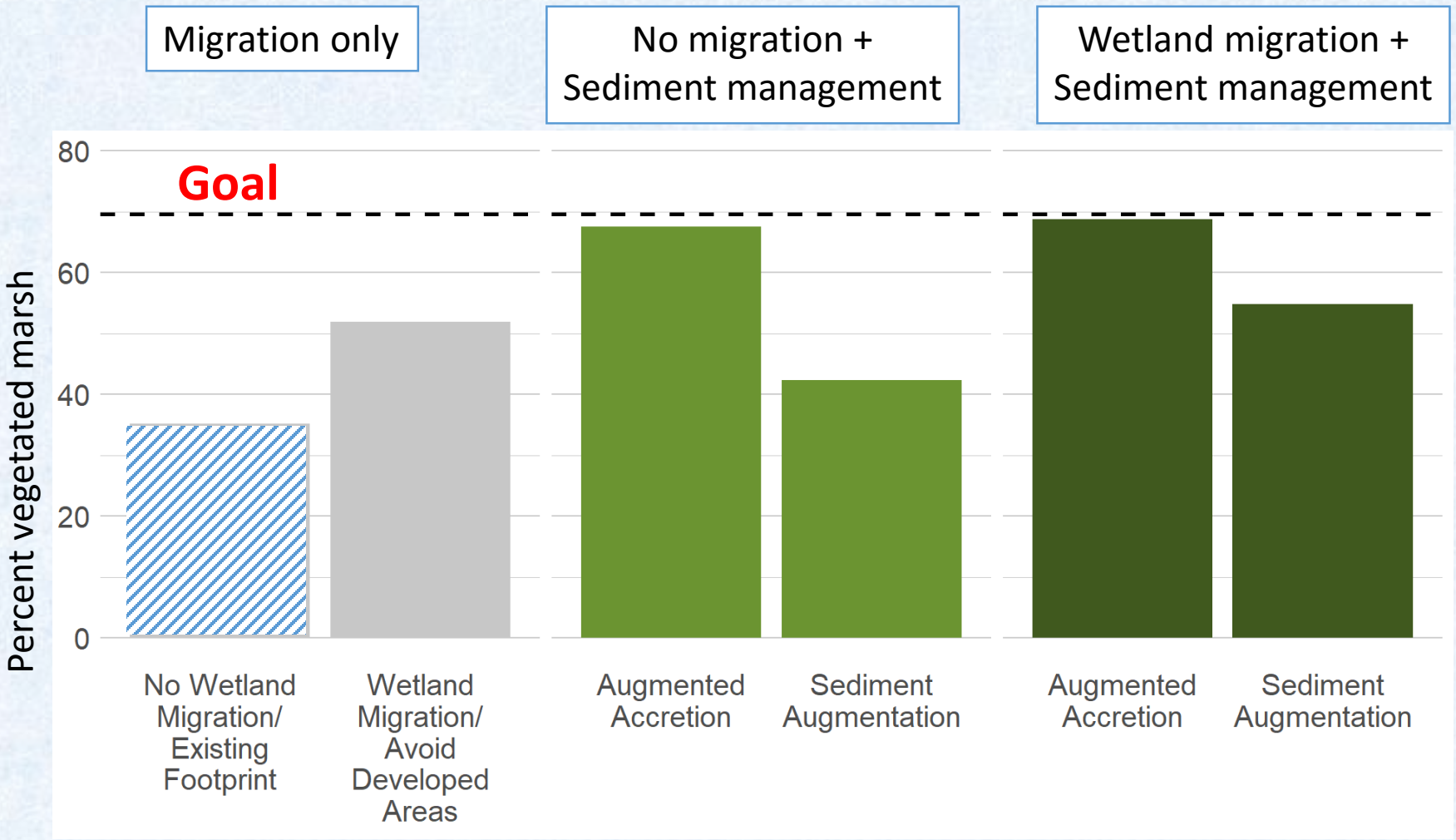
Management Options

Goal = maintain 70% of total estuary area as vegetated marsh

- Facilitate wetland migration
- One-time up front sediment augmentation
- Ongoing enhanced accretion

(Rick Nye/USFWS)

Management Options



1.6 m, 63” SLR

Management Recommendations

- Where you have room → facilitate migration

- For larger systems → augment accretion

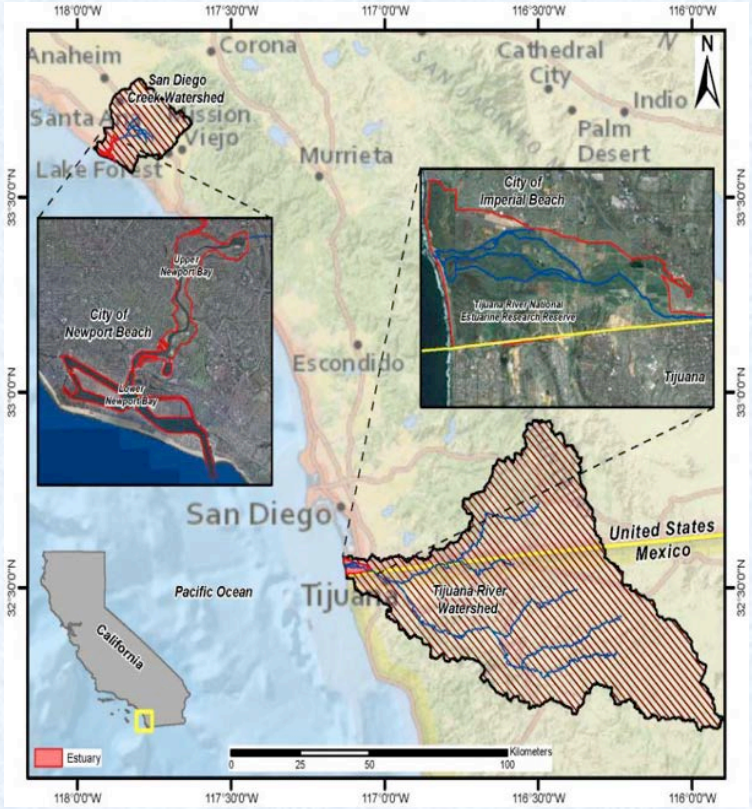
- Some small or constrained systems → allow conversion to deep water

Future Research Directions

- Build on this initial **screening level analysis**
- Increase sophistication and confidence in models
  - Better prediction of mouth dynamics
  - Improved consideration of migration into transition zones
  - Expanded consideration of watershed inputs
- Better understanding of response of biological communities
- Investigate implications of management actions
  - Explore different trajectories of response based on management

Current Efforts

- Quantify the “Ridges to Reefs” movement of sediment
- Identify innovative, integrated strategies to manage sediment
  - Focus on long-term strategies
- Include influence of social drivers
- Focus on two end-member systems
  - **Newport Beach**
  - **Tijuana River Valley**



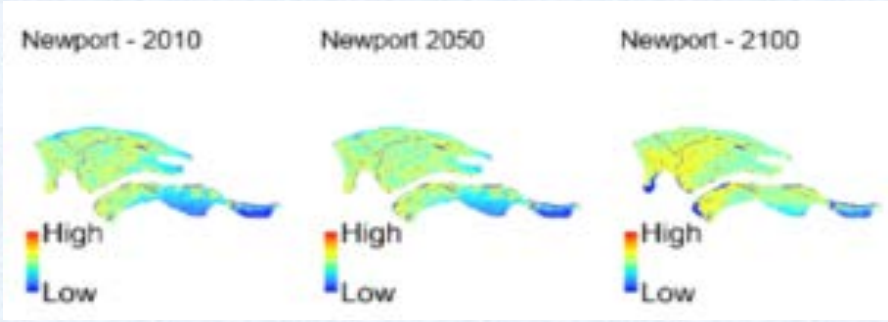
General Approach and Products

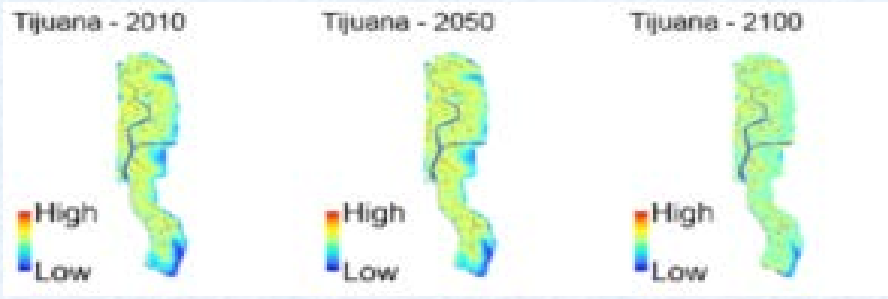
Physical models
- GSSHA
- Sediment mass balance
- DELFT 3D

Marsh Response models
- WARMER
- SCCWRP

Biological response models
- MaxEnt
- GAM
- CART

- Social drivers
- Management actions





Questions

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