Science, experimentation, and workforce development in nature-based adaptation

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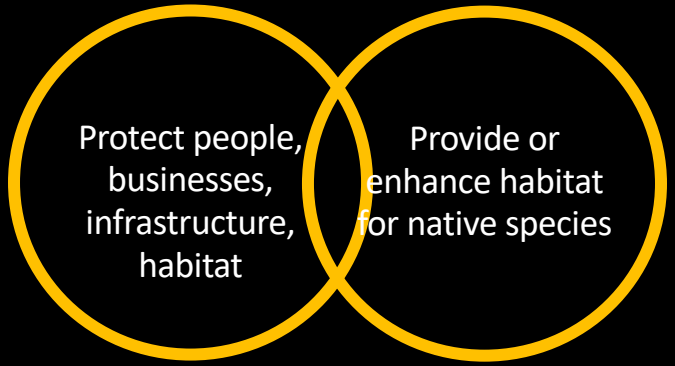
Smithsonian Environmental Research Center & San Francisco State University, Estuary & Ocean Science Center

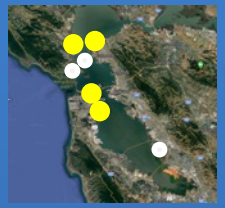
Smithsonian Environmental Research Center

State of the Estuary May 29 2024, Oakland CA

NB solutions challenge us!

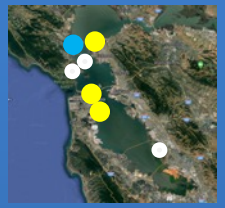


A range of projects

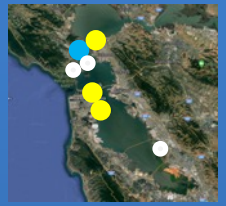


- Science-based approach
- Development of methods
- Knowledge transfer
- Workforce

SF Bay Living Shorelines Project, San Rafael



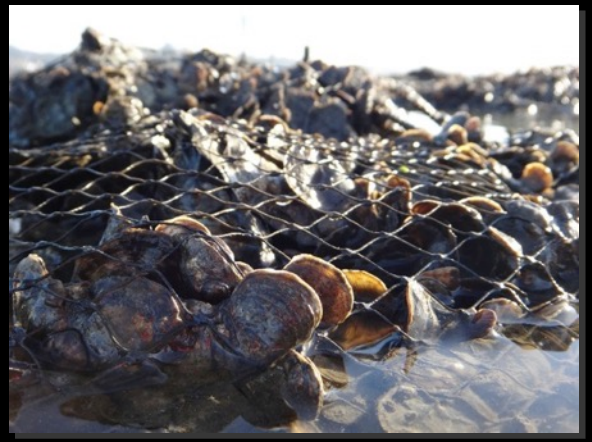
- Enhance native oysters, eelgrass
- Refine restoration methods
- Test shoreline protection



San Francisco Bay Living Shorelines Project

- Extensive monitoring plan
- BACI approach
- Biological, physical goals

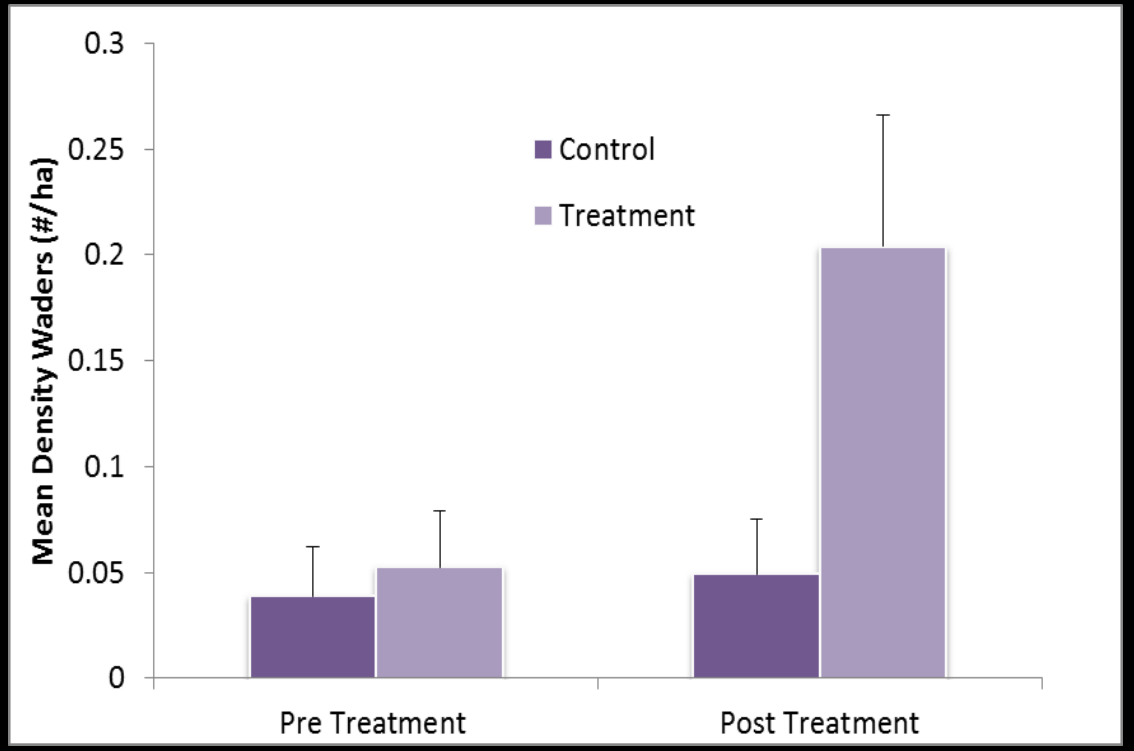
Oysters & eelgrass = greater diversity



Photos: S. Kiriakopolos

Benefits up the food chain

- Infaunal invertebrates increased in abundance, diversity
- Wading birds increased



Benefits up the food chain

- Birds spent more time feeding, resting
- More Forster's terns and black oystercatchers
- Data suggest greater fish foraging

Photos: S. Kiriakopolos

Physical benefits

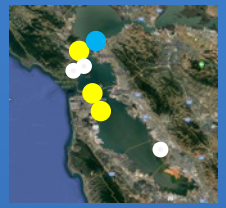
15 cm along reefs

Sediment accretion

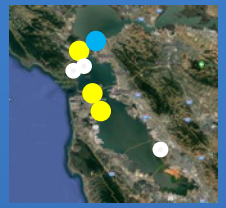
Wave energy

30-50% decrease at MSL water levels

Living Shoreline Project at Giant Marsh



Living Shoreline Project at Giant Marsh



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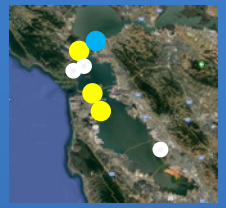
Workforce development: structure manufacturing

Living Shoreline Project at Giant Marsh



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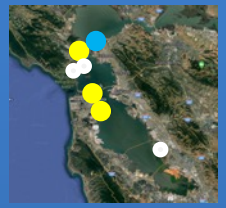
Best restoration techniques

Living Shoreline Project at Giant Marsh



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Intertidal oyster substrates with *Fucus*

Chela Zabin, SERC

Oyster structures for marsh protection, habitat

Chela Zabin, SERC

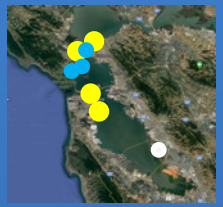
Marsh and upland plantings, SLR adaptation

Photos: Invasive Spartina Project, SFSU

How will we scale up?

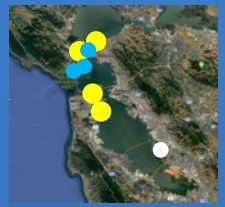
- Less expensive, lighter materials
- Bigger workforce needed

Reef Design Innovations



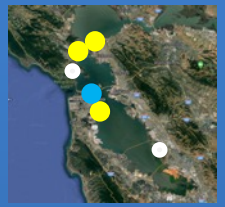
- Improved design ideas
- Educational opportunities
- Workforce development

Reef Design Innovations



- Deployed three locations
- 5-year monitoring plan
- Oysters, other species

SF Living Seawall Pilot Study



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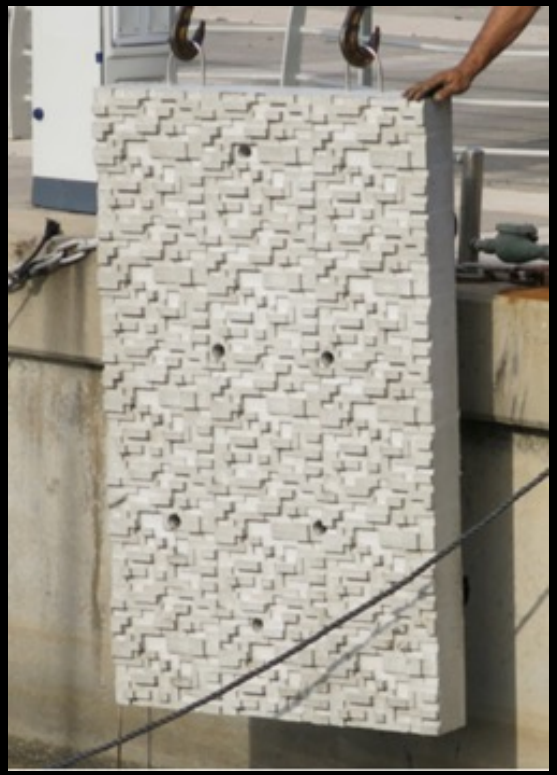
Andy Chang, SERC

Greening a gray structure

Addition of texture to benefit native species



Three sites along gradient estuarine

3 tidal elevations, 3 tile types, 2 sizes

Two years of data collection on biodiversity are planned

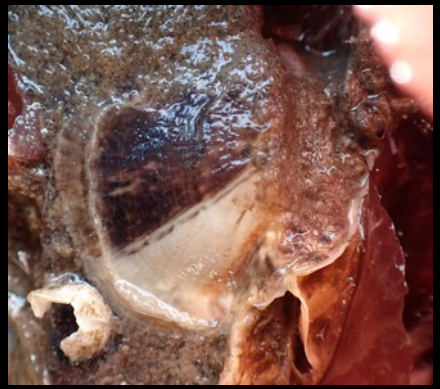
Findings will inform design of new seawall

Andy Chang, SERC

Rapid recruitment of native seaweeds

Jessika de Jesus, SERC

Diverse assemblage of animals



Andy Chang and Jessika de Jesus, SERC

Diverse assemblage of animals

Jessika de Jesus, SERC

Initial takeaways Year 1

- Location matters
- More species in low intertidal
- More native than non-native species
- More species on textured tiles
- More native oysters on textured tiles

NB solutions challenge us!