Ted Grosholz
Dept of Env. Science and Policy

- Intersection of ecological processes in coastal ecosystems with human impacts
- Consequences of biological invasions and climate change in coastal estuaries
- Using science to inform and guide habitat restoration
- Populations, communities, ecosystems
- Freshwater floodplains to subtidal marine
- Microalgae to shorebirds
Grosholz Lab

- Students and postdocs
- Pamela Reynolds
- Brian Cheng
- Megan Kelso
- Christine Sur
- Rachel Wigginton
- Jason Sadowski
- Jordan Hollarsmith
REMOVAL AND RESTORATION: SOCIAL, ECONOMIC AND ECOLOGICAL DYNAMICS OF INVASIVE SPARTINA IN SAN FRANCISCO BAY

Edwin Grosholz, Jim Sanchirico, Mark Lubell, Carmia Feldman, Alan Hastings

Funded by National Science Foundation
Selected Questions

- How do benthic communities respond to the eradication of the invasive hybrid *Spartina*
- What are the legacy effects of invasive *Spartina*?
- How are legacy effects likely to affect recovery to pre-invasion conditions

Native & Exotic Infauna & Epifauna
SITE WITH WHERE HYBRID SPARTINA WAS ERADICATED

- Above ground structure: Dowels (flow and shade), Shade (shade)
- Below ground structure: Litter (enhance BG litter), Aeration (reduce BG litter)
Hybrid *Spartina* and California Clapper Rails in San Francisco Bay

Hybrid *Spartina (foliosa x alterniflora)* invading SF Bay with >90% eradication

California Clapper Rail
*Rallus longirostris obsoletus*
Investigating estuarine acidification in northern California and its impact on native oysters (*Ostrea lurida*)

Co-P.I. Ann Russell

Project members: Manon Picard, Brian S. Cheng, Jason Sadowski

Funded by CA Sea Grant
pH and alkalinity **before** rain event

- pH and alkalinity **after** rain event

**Sta#on**
- Channel (Bottom)
- Channel (Surface)
- Shore

**Station**
Channel
3 Stations
5 Tiles per station
~20 oysters per tile

Shore
3 Stations
5 Tiles per station
~20 oysters per tile
Overcompensation Following Eradication of an Invasive Predator
Collaborators and Funding

Smithsonian Environmental Research Center
Dr. Gregory Ruiz, Andy Chang, Linda McCann

Portland State University
Dr. Catherine de Rivera

Gulf of the Farallones National Marine Sanctuary
Kate Bimrose

Seadrift Homeowners Association

Pacific States Marine Fisheries Commission

National Science Foundation
Eradication Trapping of Green Crabs
Green Crab Population Reduction

![Bar chart showing the comparison between the estimated population and total number of green crabs removed from 2009 to 2014.](chart1.png)

- **Estimated Population**
- **Total # Removed**

![Bar chart showing the mean number of crabs per trap per day (CPUE) for green crabs by year from 2009 to 2014.](chart2.png)

- Mean # Crabs/Trap/Day

**Green Crab Population Reduction**

**Green Crab CPUE by Year**
Living Shorelines: Restoring Oysters and Eelgrass in San Francisco Bay

We are very grateful to our funding and landowner partners:

www.sfbaylivingshoreslines.org

Construction support – Dixon Marine Services, Drake’s Bay Oyster Company, CA Wildlife Foundation
<table>
<thead>
<tr>
<th>Ecosystem Functions</th>
<th>Ecosystem Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>enhance habitat for fish and wildlife</td>
<td>sediment accretion</td>
</tr>
<tr>
<td>increase food resources</td>
<td>wave attenuation</td>
</tr>
<tr>
<td>rearing/nesting support</td>
<td>minimize shoreline erosion</td>
</tr>
<tr>
<td>improve linkages and connectivity between habitat types</td>
<td>promote potential physical synergistic effects between habitats</td>
</tr>
<tr>
<td>assess interactions between habitat types that influence restoration success</td>
<td>test alternatives to traditional shoreline armoring</td>
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</tbody>
</table>
• In one year, >2 million new oysters present on shell mounds
• Eelgrass successfully established
• Increased abundances of juvenile Dungeness crabs, bay shrimp, rock crabs, bay pipefish
• Extended visits by white sturgeon and steelhead
• Increases in numbers of wading birds and oystercatchers

Photos, S. Kiriakopolos