

# Connections between the ecological health of Mono Lake & San Francisco Bay

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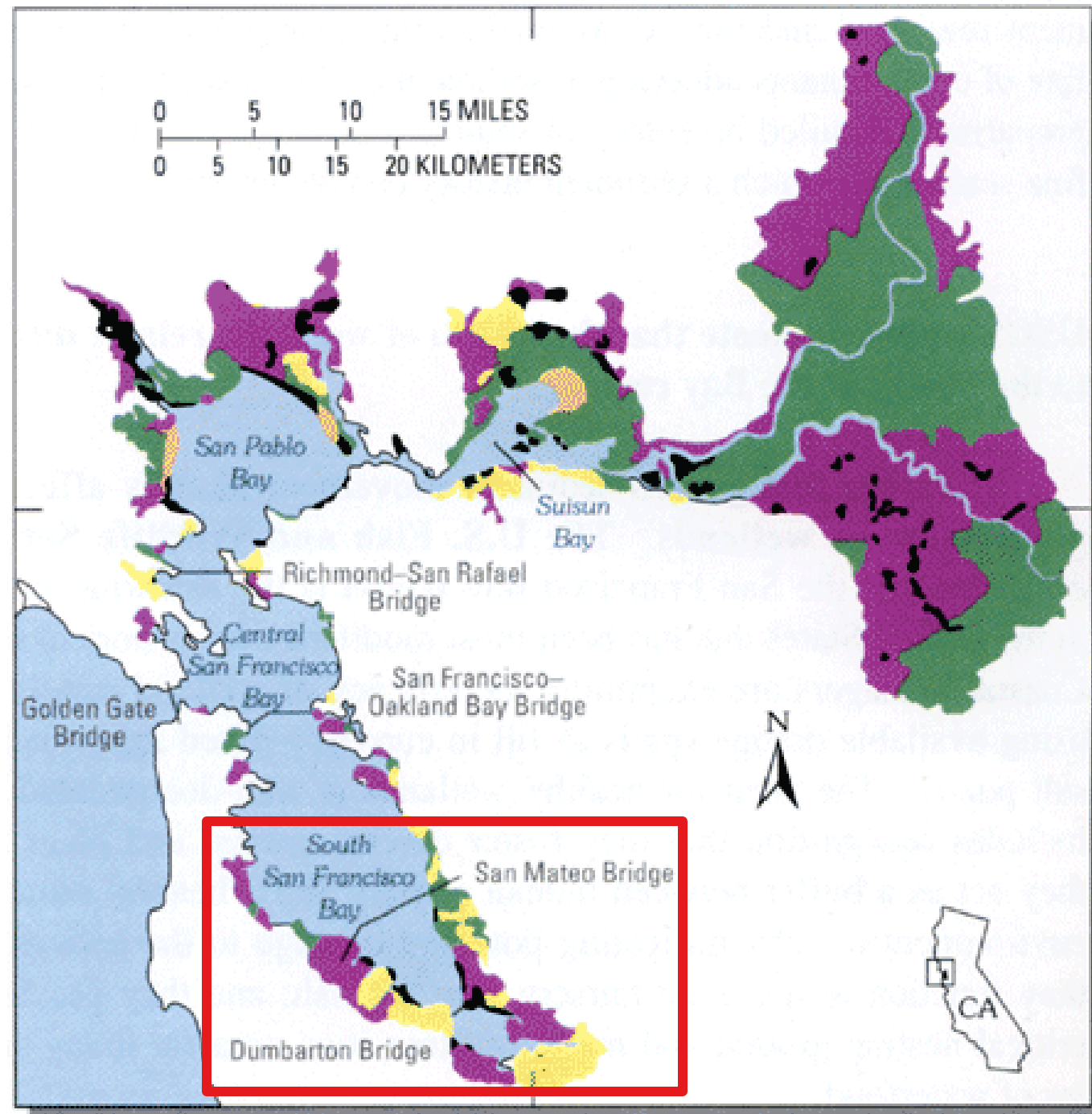
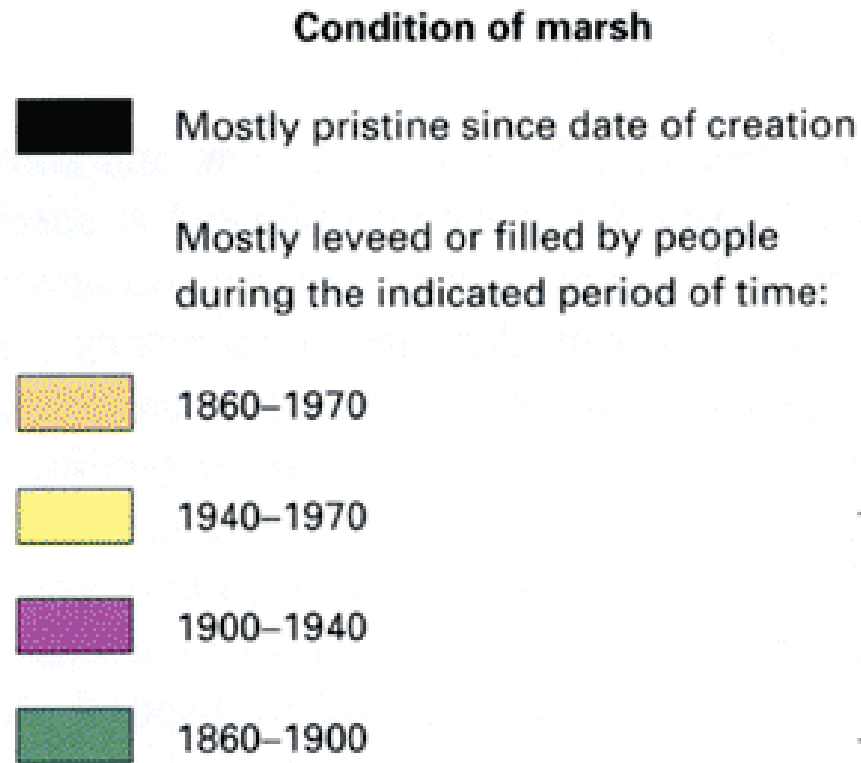


SAN FRANCISCO BAY  
BIRD OBSERVATORY

Photo: KQED



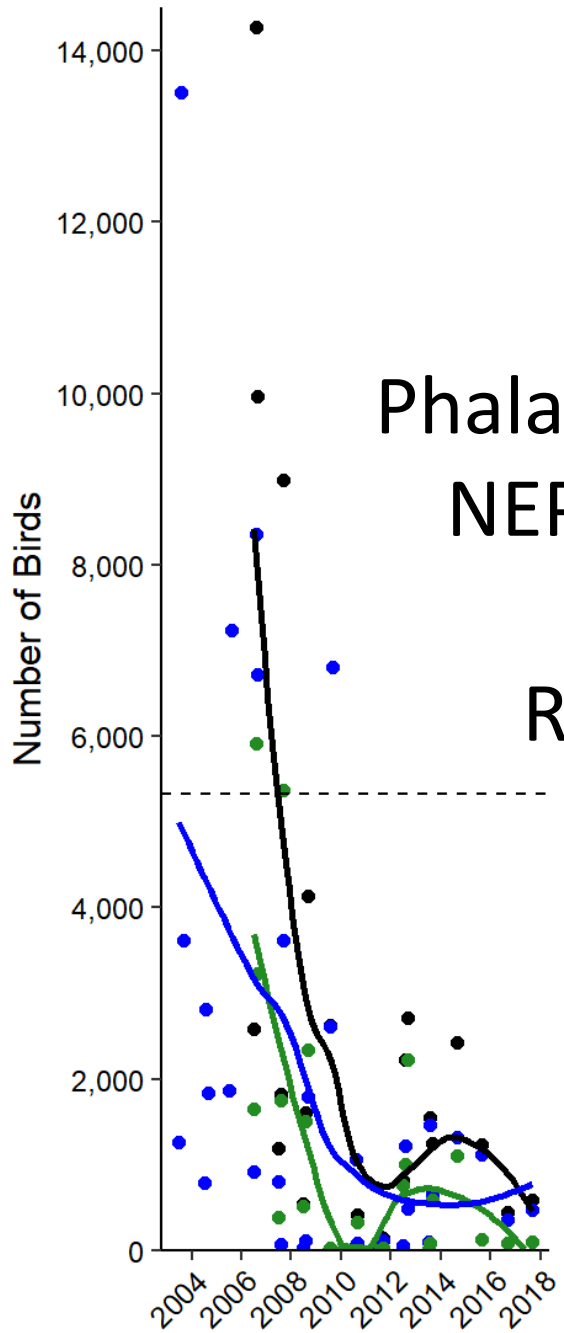
# The San Francisco Estuary



# South Bay Salt Pond Restoration Project

An aerial photograph of the South Bay Salt Pond Restoration Project. The image shows a vast, intricate network of salt ponds and channels. The ponds are color-coded in various shades, including light blue, green, yellow, orange, red, and purple, likely representing different stages of restoration or different types of wetland habitats. The channels are dark and winding, connecting the various ponds. In the background, a cityscape is visible, showing buildings and roads. The overall scene is a complex, multi-colored landscape of water and land.

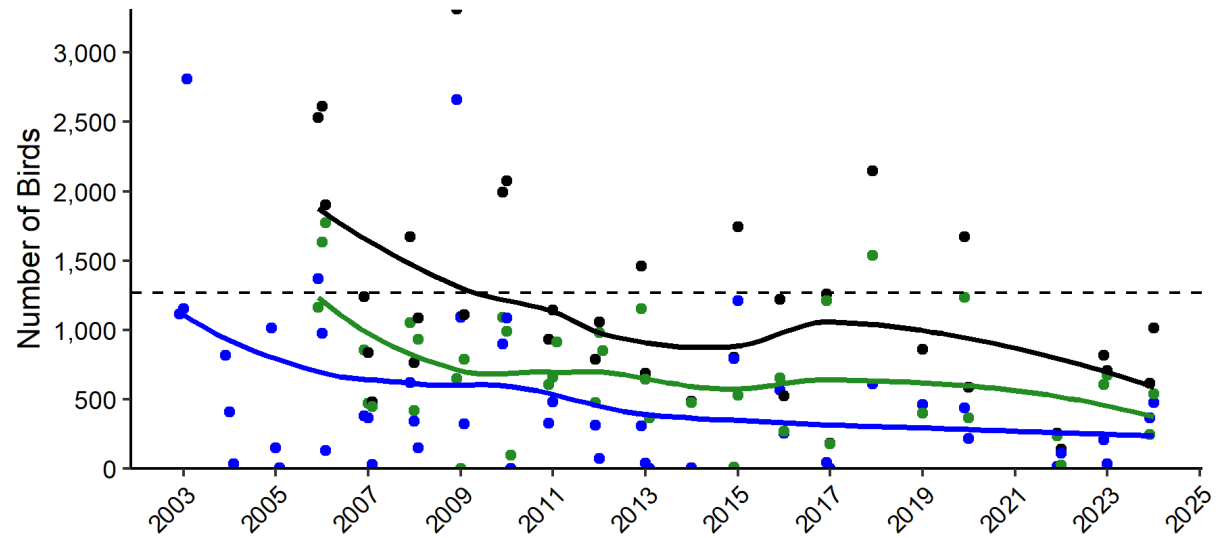
Shifting populations of saline lake species have complicated the largest tidal marsh restoration project on the U.S. Pacific Coast (est. \$1 billion)



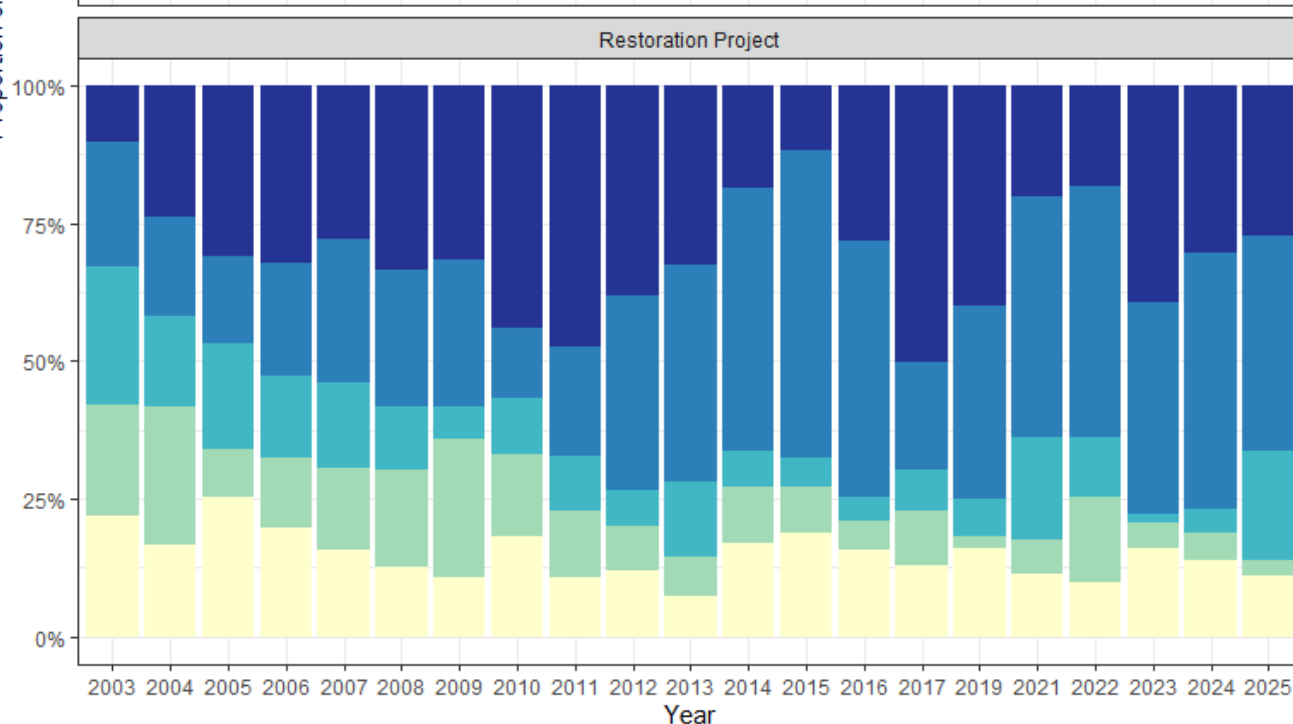
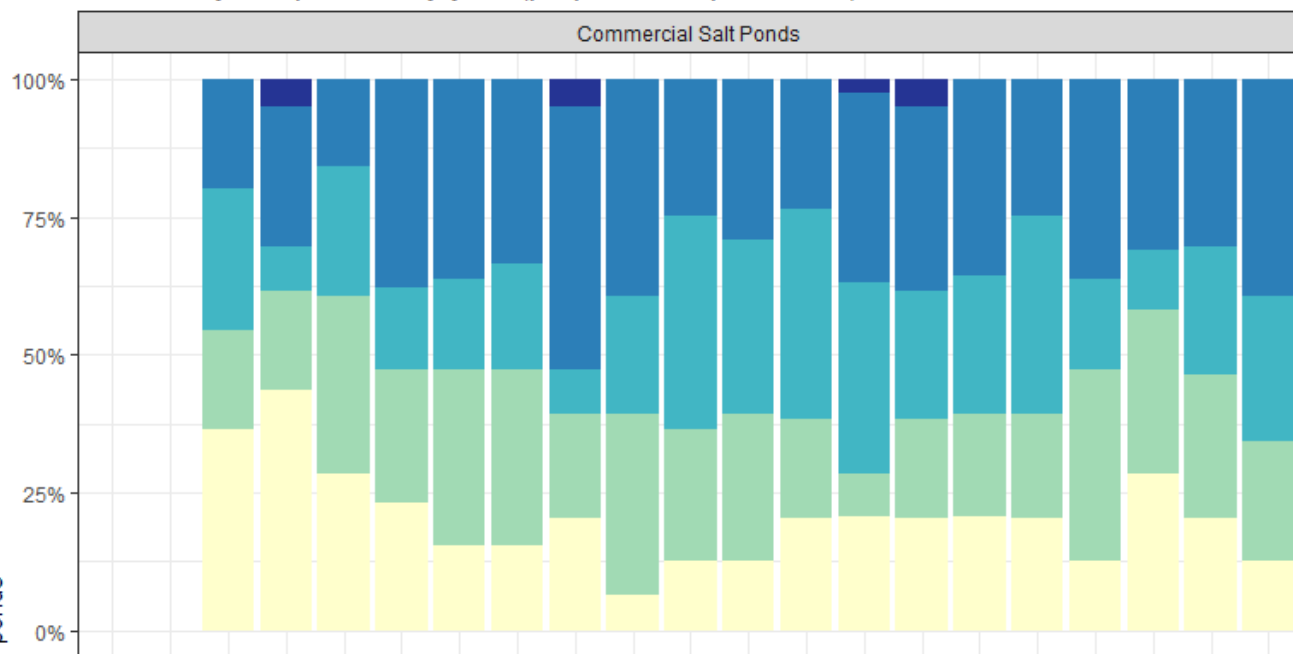
Phalaropes' decline crossed NEPA/CEQA thresholds, complicating the Restoration Project

**Black** = total counts  
**Blue** = restoration project  
**Green** = active salt ponds

Bonaparte's Gull has also crossed their NEPA/CEQA threshold—in a steady two-decade decline



Fall salinity composition by year (proportion of pond area)



## Initial hypothesis for decline:

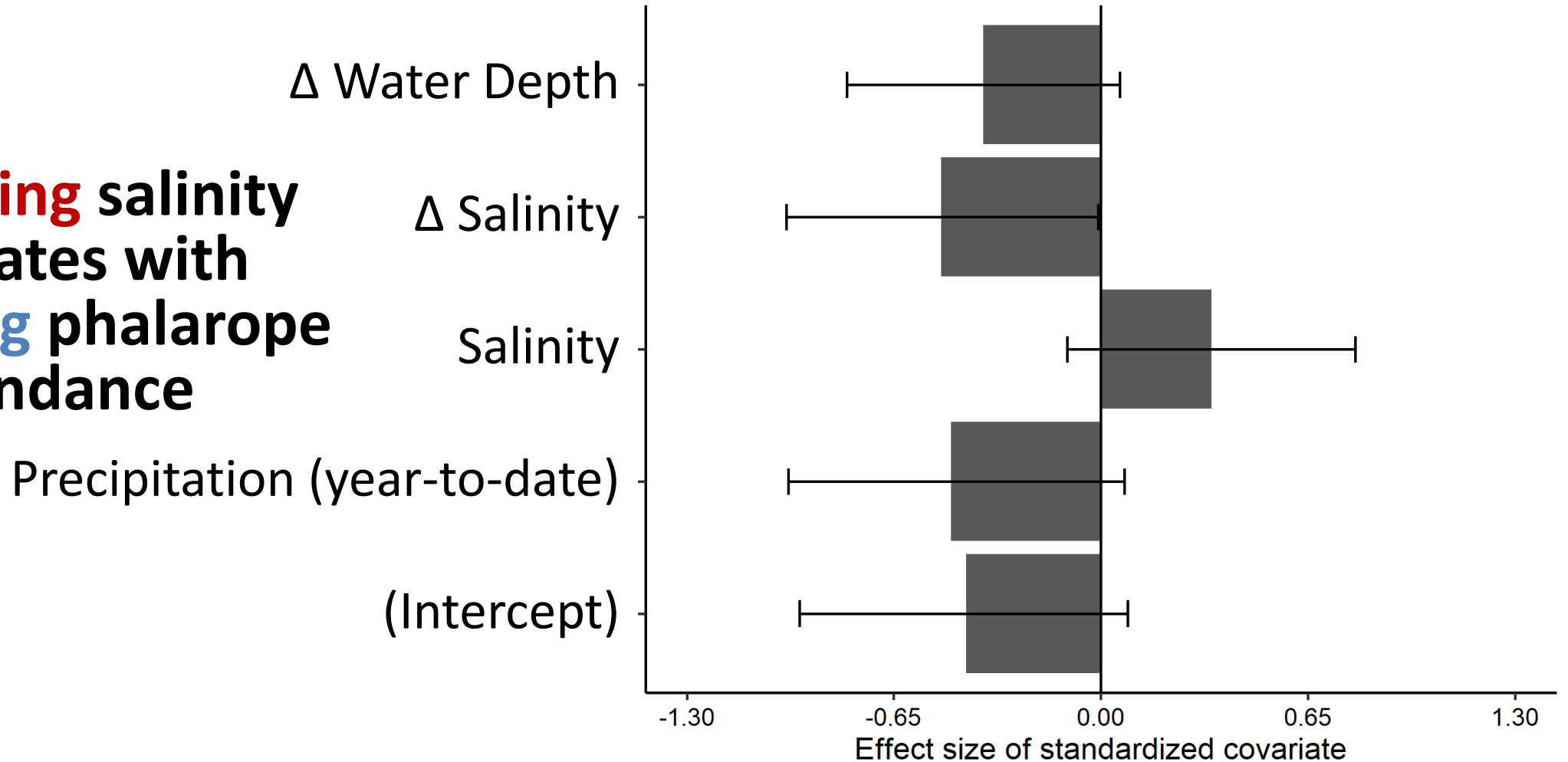
Salinity has decreased in both Restoration Project and commercial salt ponds over the last two decades

### Salinity bin

- Brackish (<30 ppt)
- Marine (30-50 ppt)
- Low hypersaline (50-80 ppt)
- Mid hypersaline (80-150 ppt)
- High hypersaline (>150 ppt)

# Drivers of change in phalarope counts in SF ponds

**decreasing salinity**  
**correlates with**  
**increasing phalarope**  
**abundance**

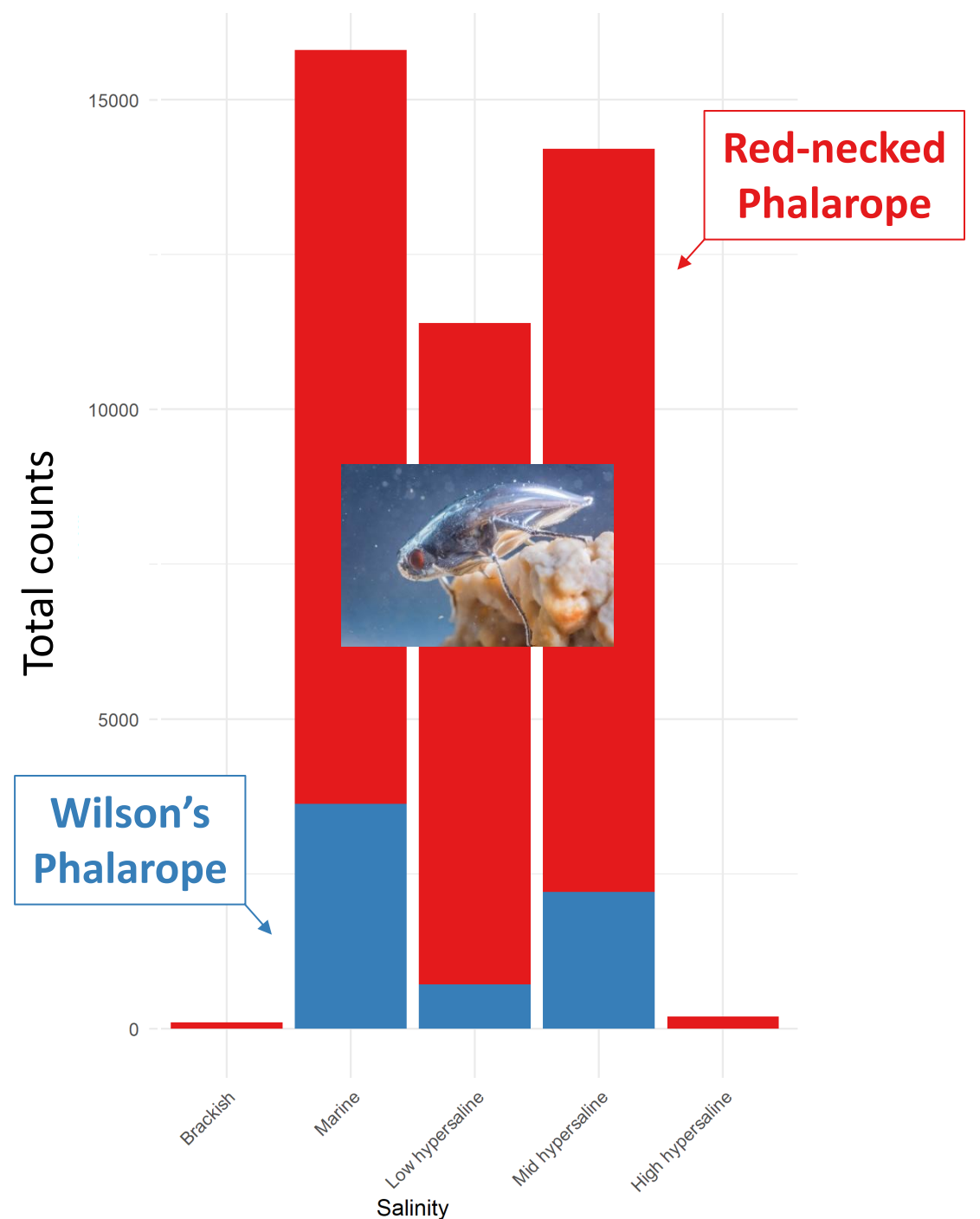
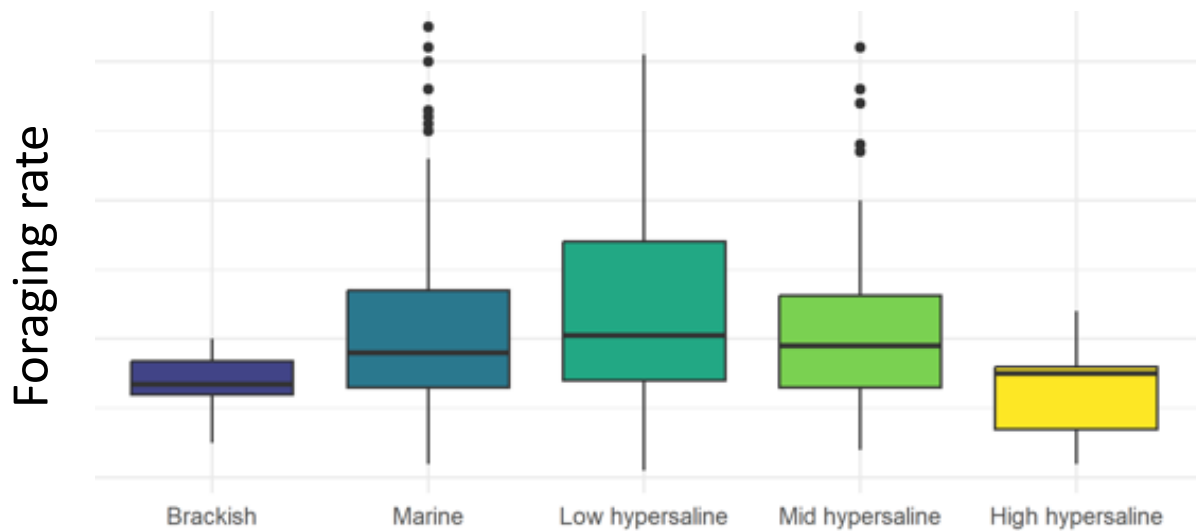


**Relationship:**

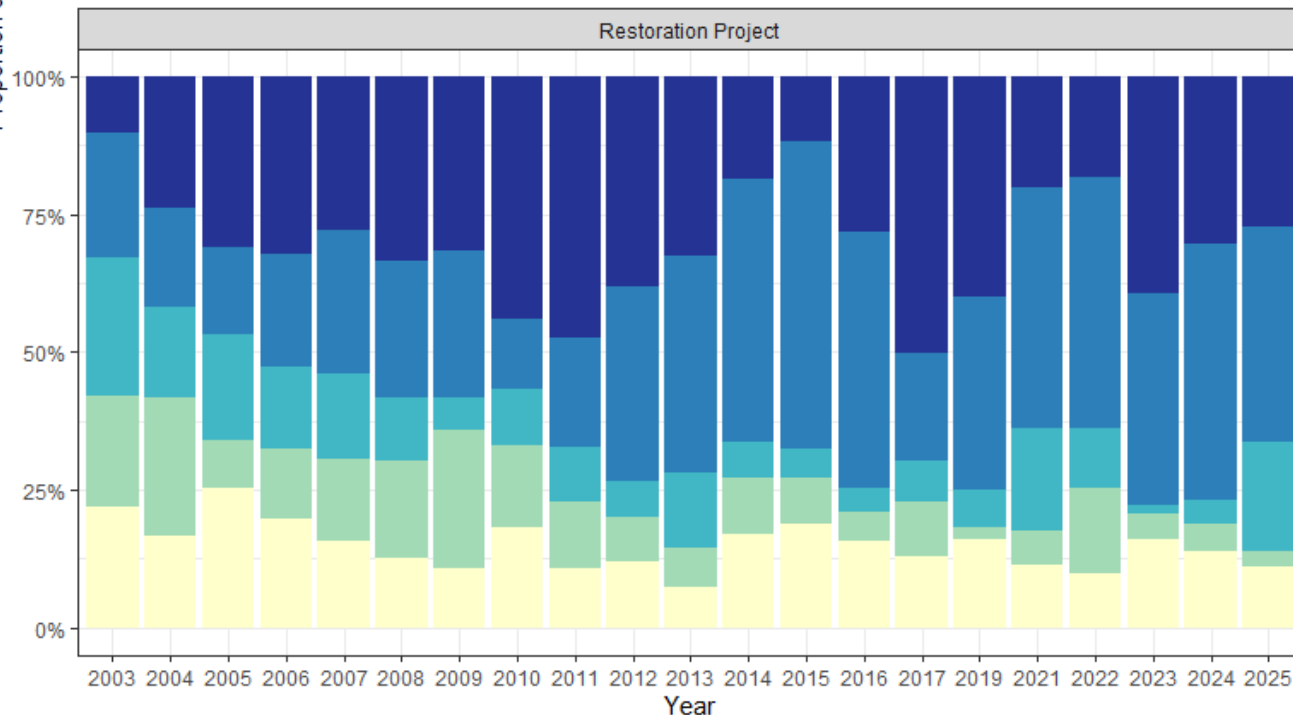
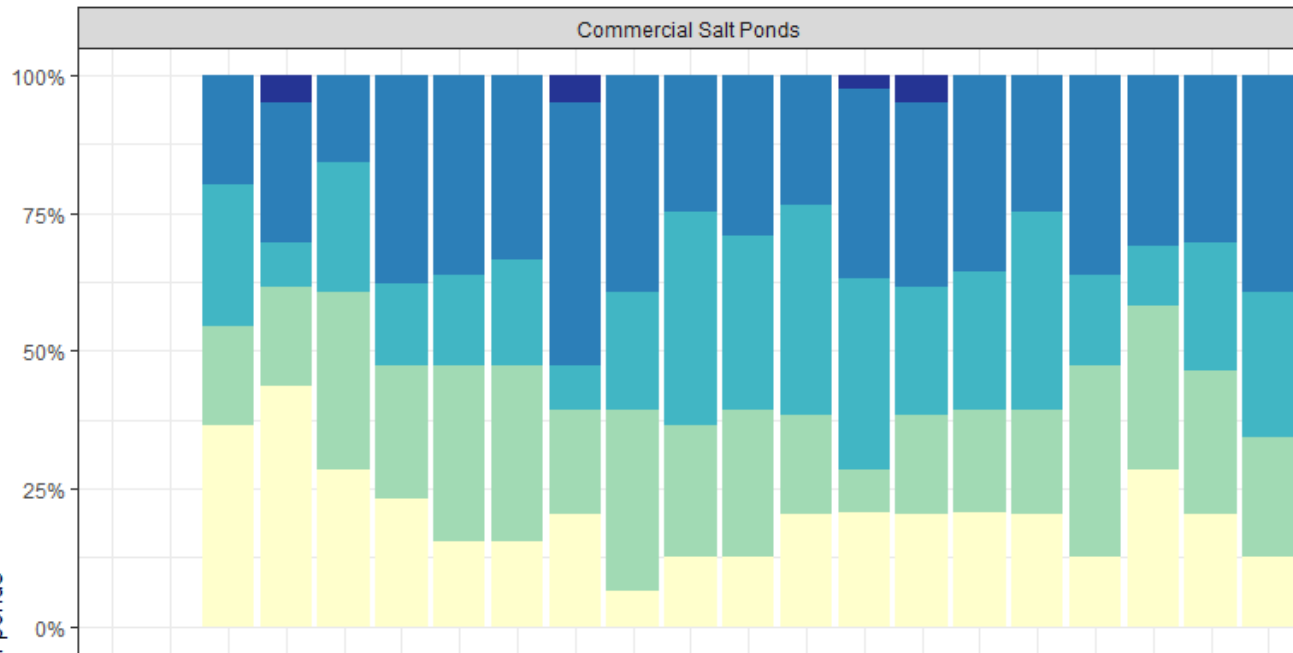


Phalarope abundance and foraging is highest in marine to moderately hypersaline ponds (30 – 150 ppt saltiness)

Extremely hypersaline and brackish ponds are avoided

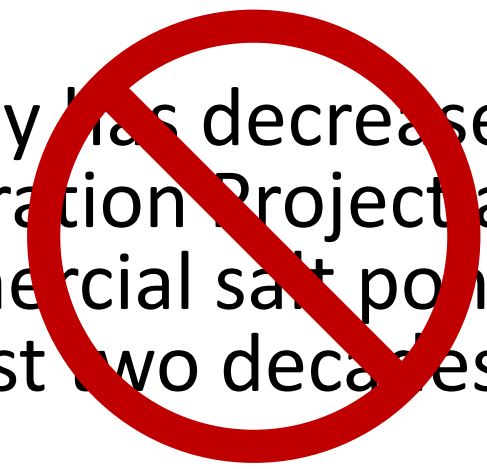


Fall salinity composition by year (proportion of pond area)



## Initial hypothesis for decline:

Salinity has decreased in both Restoration Project and commercial salt ponds over the last two decades



- Salinity bin
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Suitable range for phalaropes has been steady or even increased

# Shared Species between Mono Lake and SF Bay

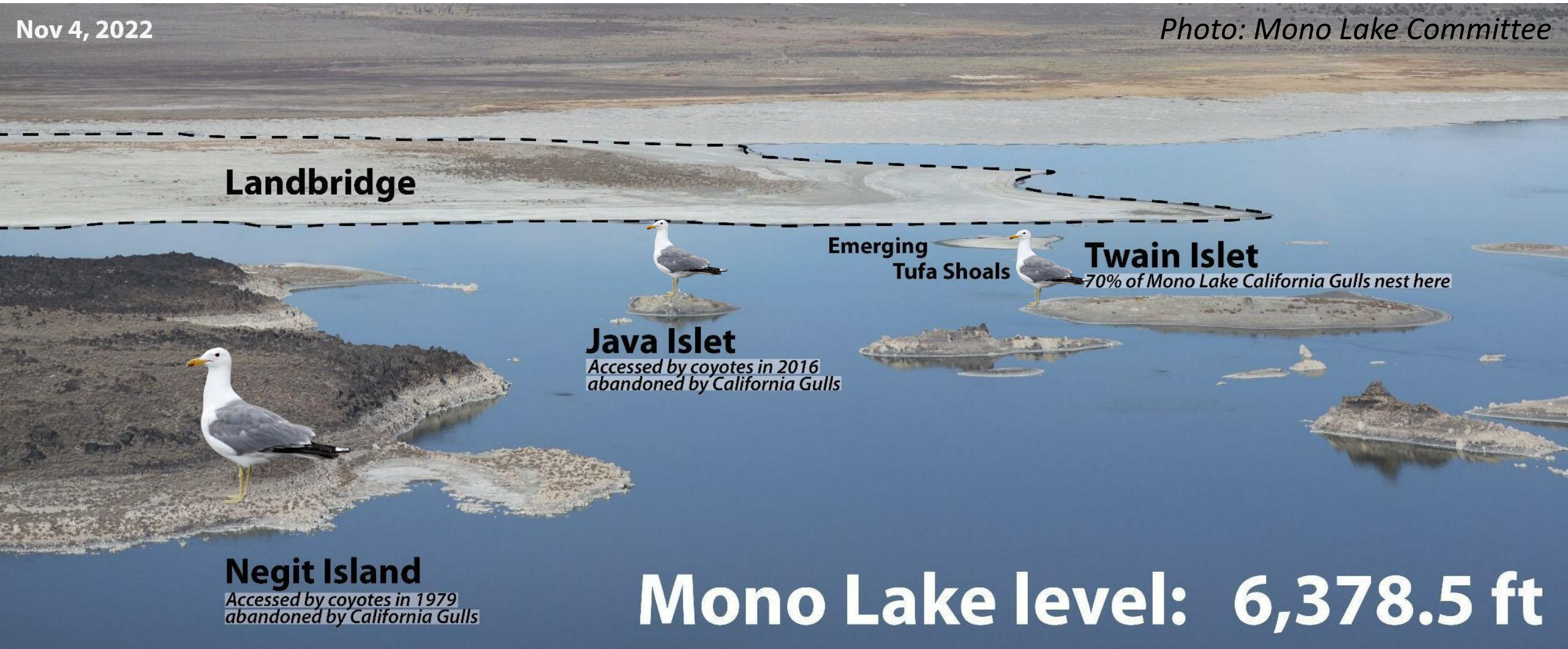
- Studies all show an apparent improvement in habitat quality  
→ Apparently SF Bay decline is driven by non-local factors
- Ongoing tidal marsh restoration will reduce Wilson's Phalarope and Bonaparte's Gull habitat → increasingly important to provide reliable habitat at Mono Lake to maintain these species' California populations



# Mono Lake landbridge forms to Negit Island in 1979

Nov 4, 2022

Photo: Mono Lake Committee



**Landbridge**

Emerging  
Tufa Shoals

**Twain Islet**

*70% of Mono Lake California Gulls nest here*

**Java Islet**

*Accessed by coyotes in 2016  
abandoned by California Gulls*

**Negit Island**

*Accessed by coyotes in 1979  
abandoned by California Gulls*

**Mono Lake level: 6,378.5 ft**

# Exponential Growth in California Gull Counts

Total nests over time

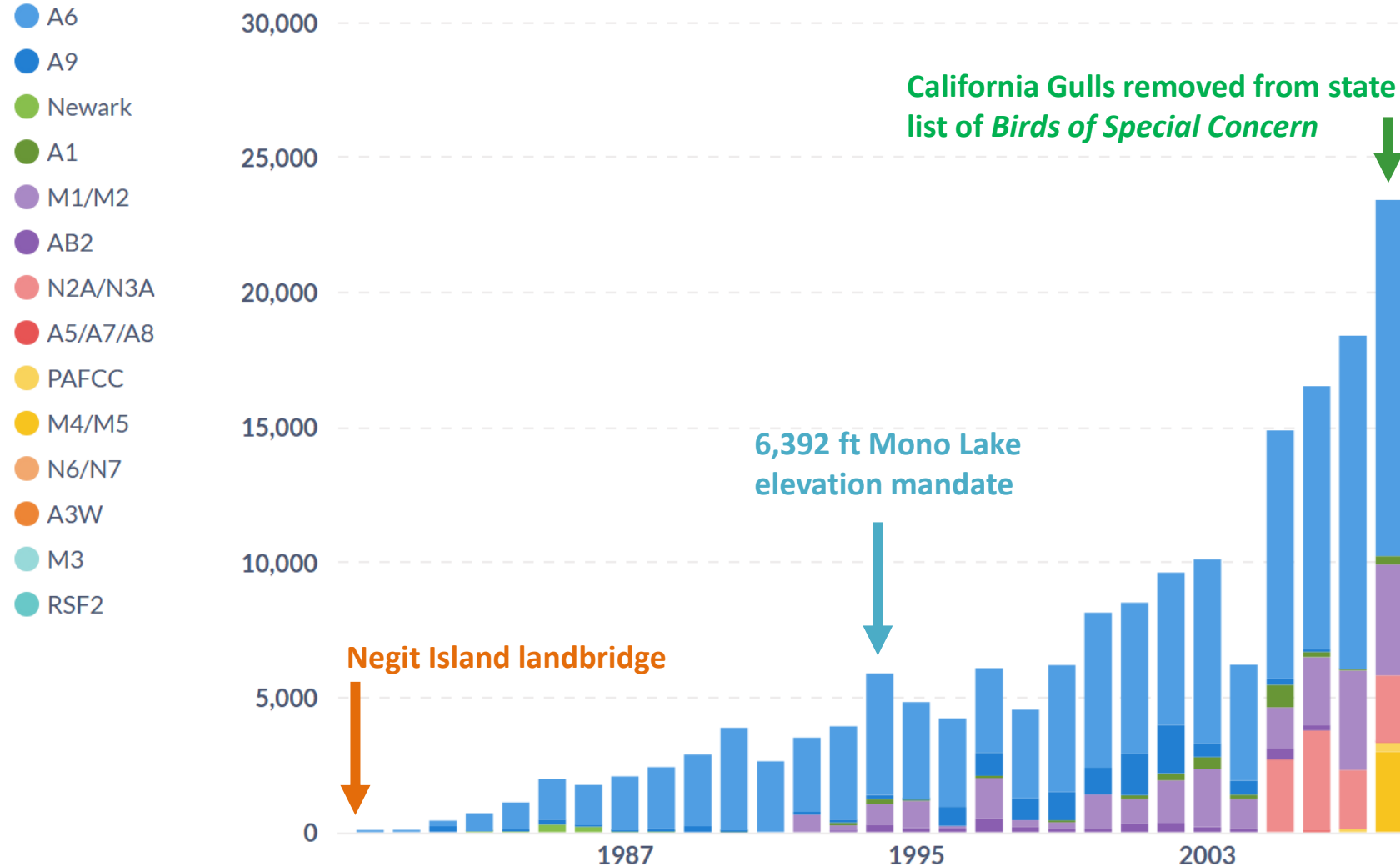
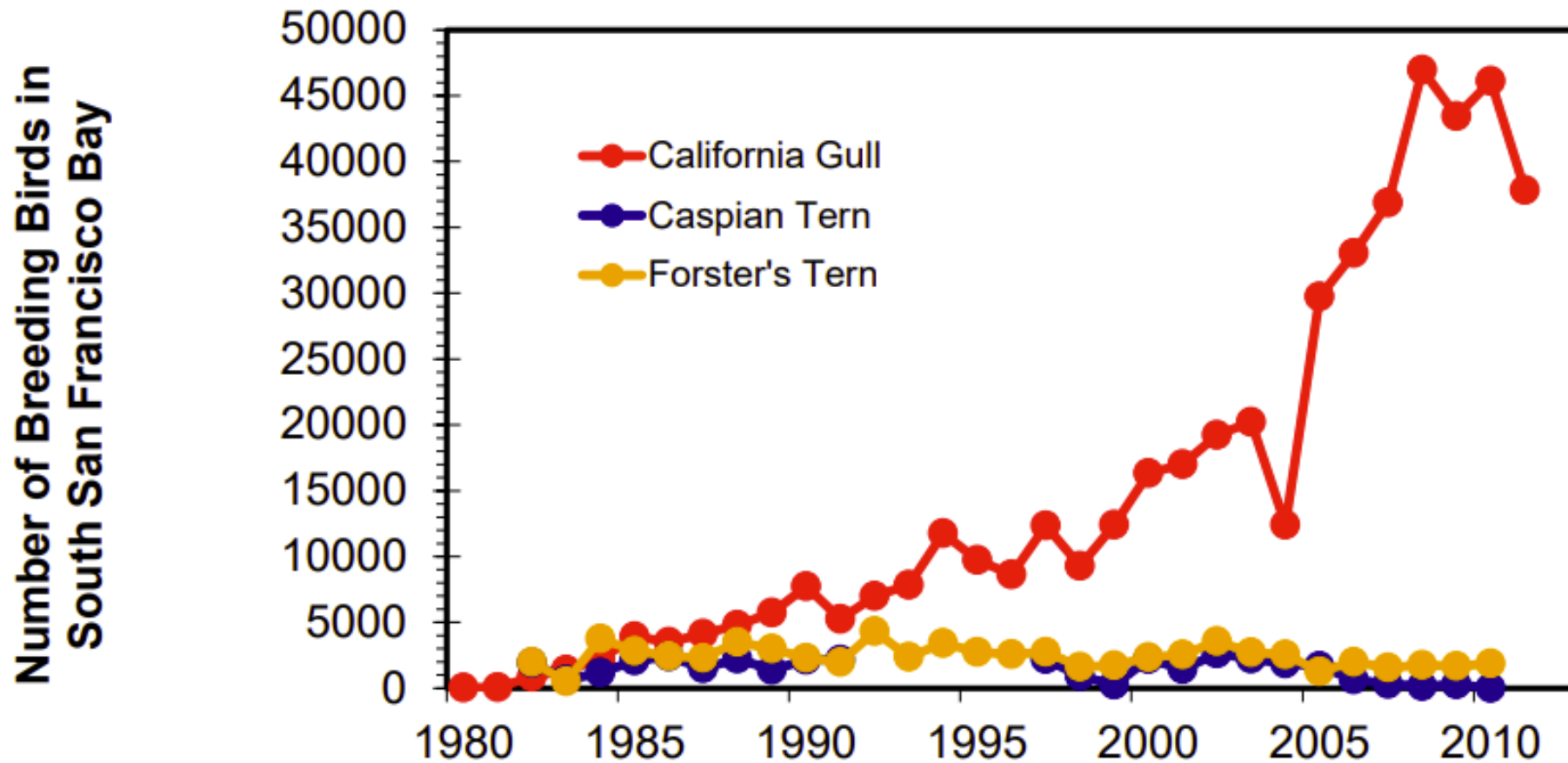


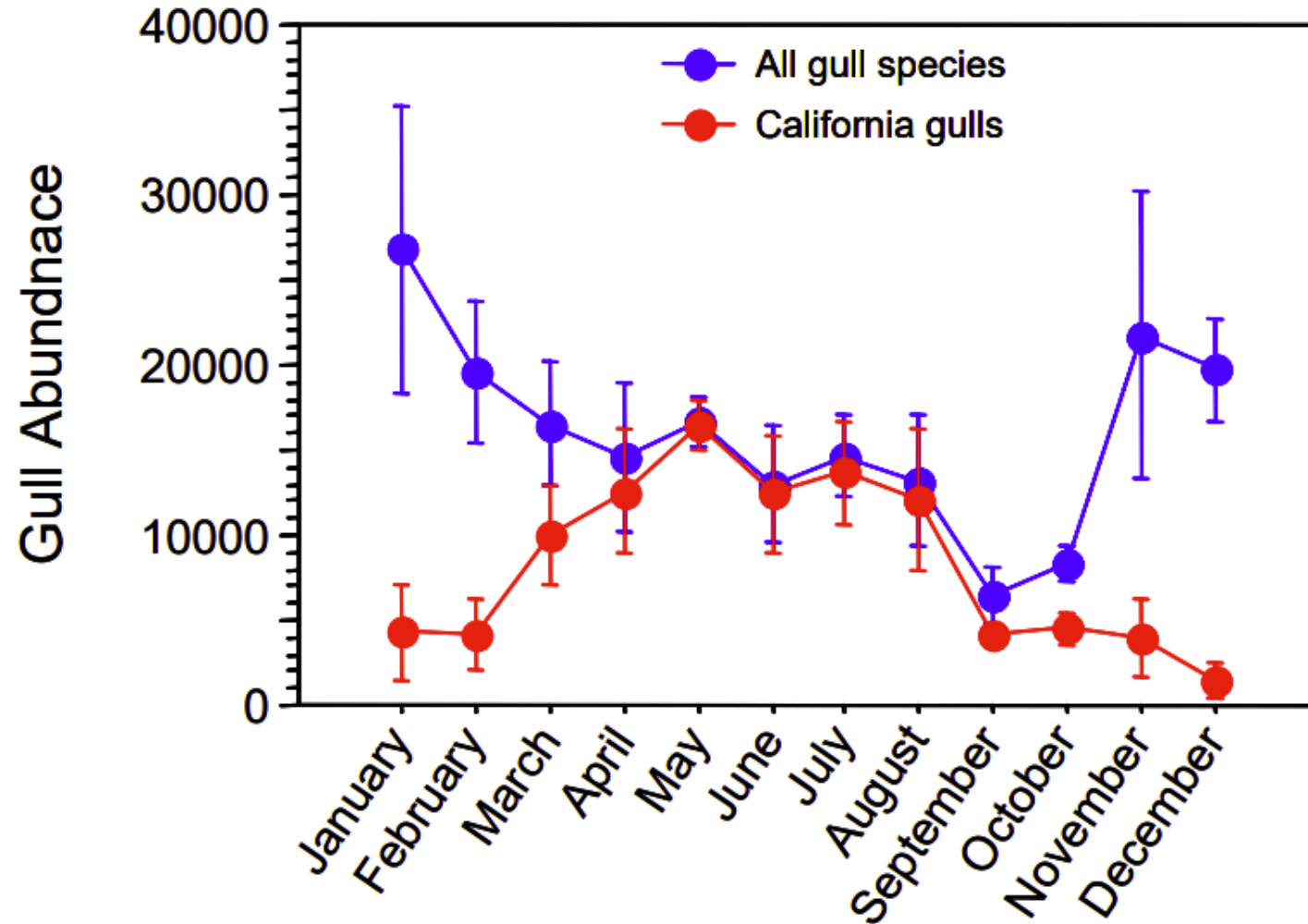
Photo: Santa Clara Valley Bird Alliance

Parsons & Van Schmidt (in prep)

# California Gull's explosive growth has swamped native local breeding waterbirds



# Unlike locally native gulls, California Gulls are present in the breeding season



(Ackerman et al. 2006)

# San Francisco has key breeding sites for many birds that are endangered, threatened, or of conservation concern



American Avocet - CAGU depredate 61% of chicks (Ackerman et al. 2006)



Black-necked Stilt - CAGU depredate 23% of chicks (Ackerman et al. 2006)



Forster's Tern - CAGU depredate 32% of chicks (Ackerman et al. 2014)

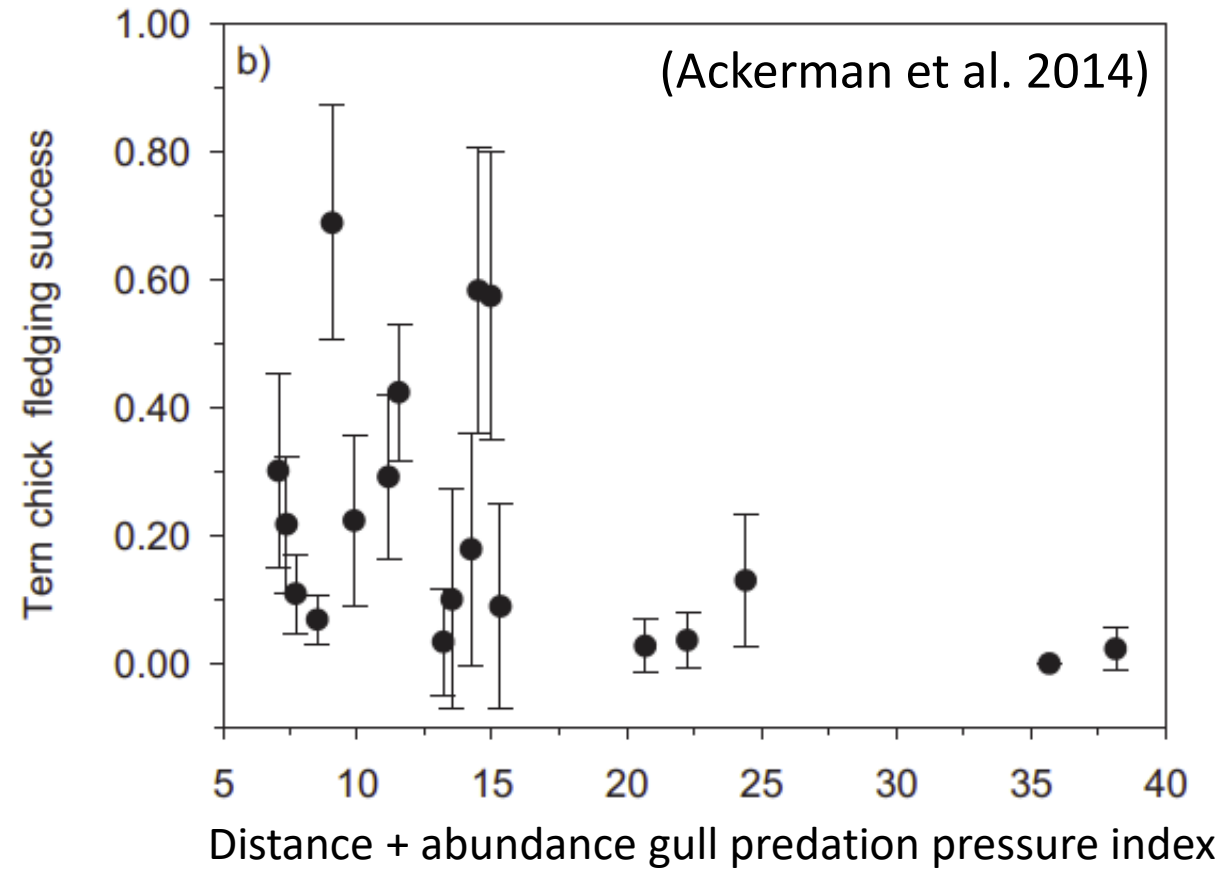


California Least Tern - after gull control, nest success increased 30% → 78% and # of fledglings/pair 0.17 → 1.07 (Riensch et al. 2013)



Western Snowy Plover- CAGU are the most common nest predator - 38% of predation events (Robinson-Nilesen & Strong 2009, Ackerman et al. 2014)

# Abundance of nearby California Gulls and distance to colony predict tern breeding success



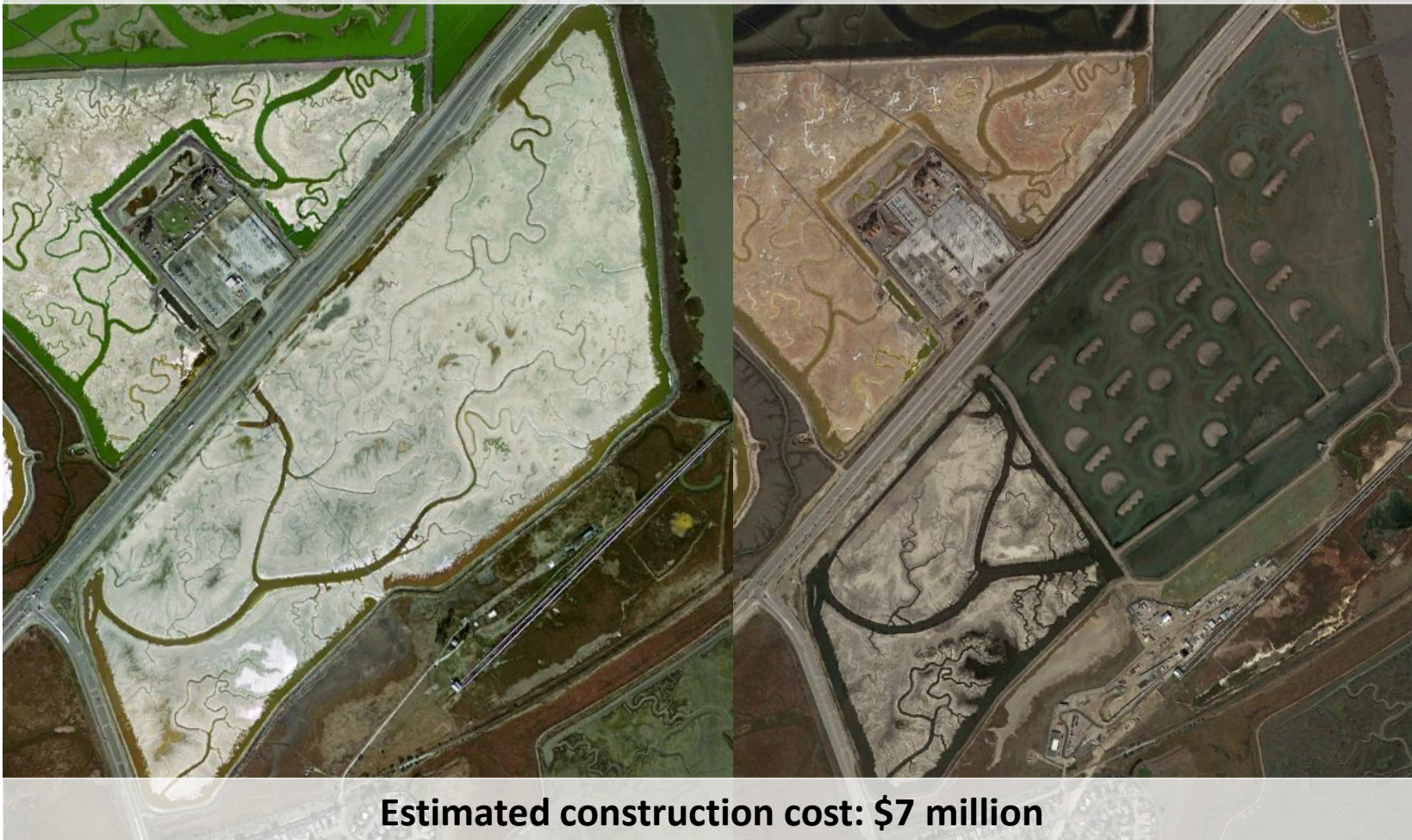
Relocation of a 24,000-adult colony increased nearby tern chick survival by 900%

# Nest hazing at sensitive nesting sites on Don Edwards National Wildlife Refuge

2004 (start of project)

Ravenswood SF2 Complex

2011 (post-construction)



Estimated construction cost: \$7 million



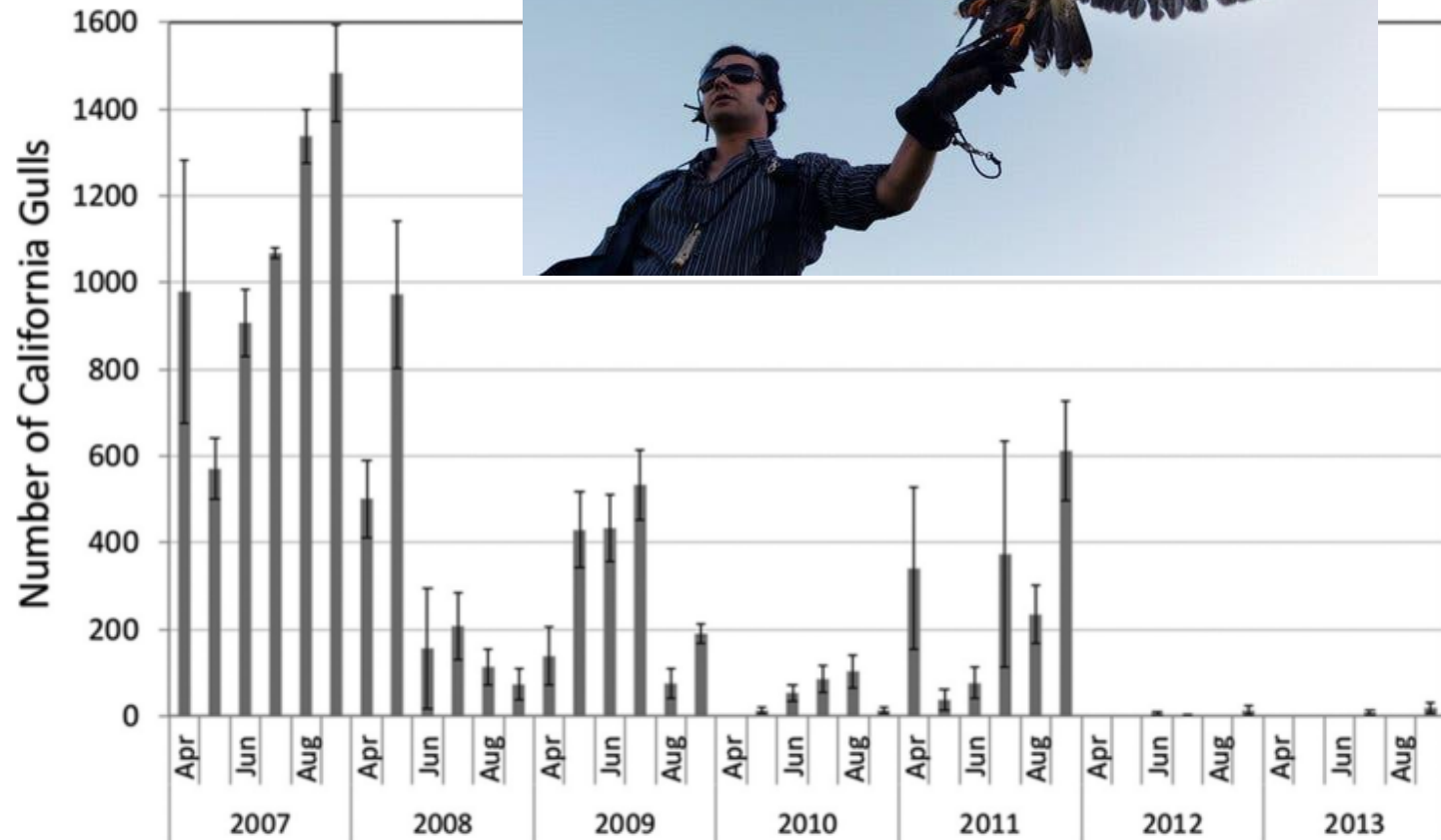
# What Caused the Population Boom?

- Has not been determined if decades-long California Gull population growth was driven by Mono Lake immigration or local reproduction (Ackerman et al. 2013)
- Availability of anthropogenic food sources from landfills are believed to be a factor in gulls' extreme growth (Burns et al. 2018)



# Gull Abatement on Landfills

- Landfills begin falconry gull abatement in 2007
- 10 active landfills in Bay Area (4 with confirmed falconry programs)
- Estimated total expenses of \$800,000 per year (potentially up to \$2 million)

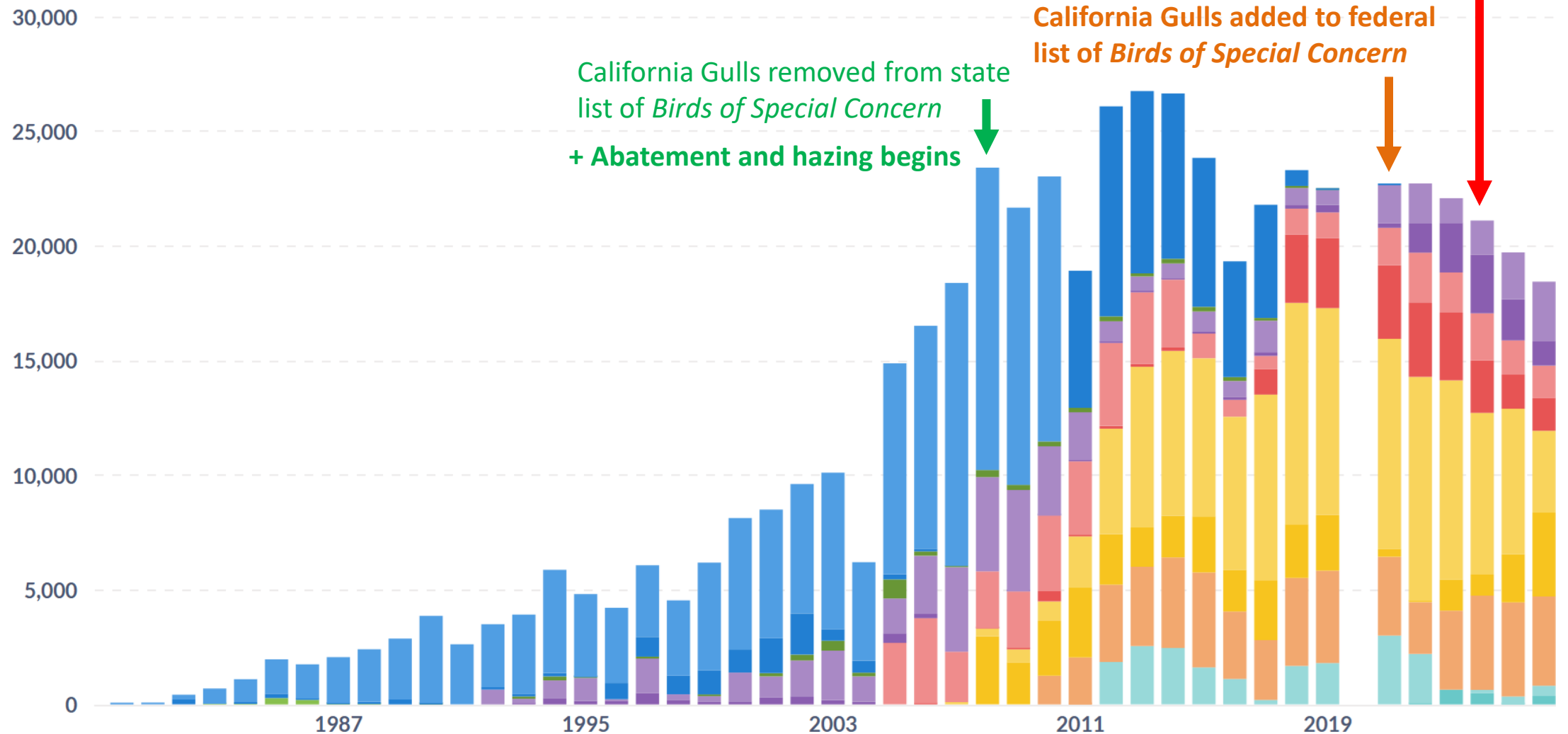


(Burns et al. 2018)

# California Gull Counts Leveled off Post-Abatement

Total nests over time

- A6
- A9
- Newark
- A1
- M1/M2
- AB2
- N2A/N3A
- A5/A7/A8
- PAFCC
- M4/M5
- N6/N7
- A3W
- M3
- RSF2



# A Conservation Conundrum

- SF Bay now has >60% of the total California Gull population
  - 39,400 breeding in SF in 2025 - nearly double Mono Lake's 21,100  
(Van Schmidt & Parsons 2025, Burnett et al. 2026)
  - Approximately 10% of the global population of ~330,000 (Doster & Shuford 2018)
- Species has now been federally listed as Of Conservation Concern
- Neither condition that led to the state removing California Gulls from their Species of Conservation Concern list is now met
  - Mono Lake water levels have still not recovered
  - Exponential growth has ended in San Francisco Bay

If SF Bay remains essential to the California population, we face a “wicked problem” addressing mutually incompatible conservation needs

# Citations:



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# Funding

