# Breeding Waterbird Ecology and Management for the South Bay Salt Pond Restoration Project

**Josh Ackerman, Alex Hartman, Mark Herzog, & Carley Schacter**

U.S. Geological Survey, Western Ecological Research Center, Dixon Field Station

jackerman@usgs.gov

(May 11, 2022)

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# Wetland Management for Nesting Waterbirds

1) Nesting waterbird populations are declining
2) Predatory gulls are increasing
3) Construction & management of nesting islands
4) Establishing nesting colonies using social attraction

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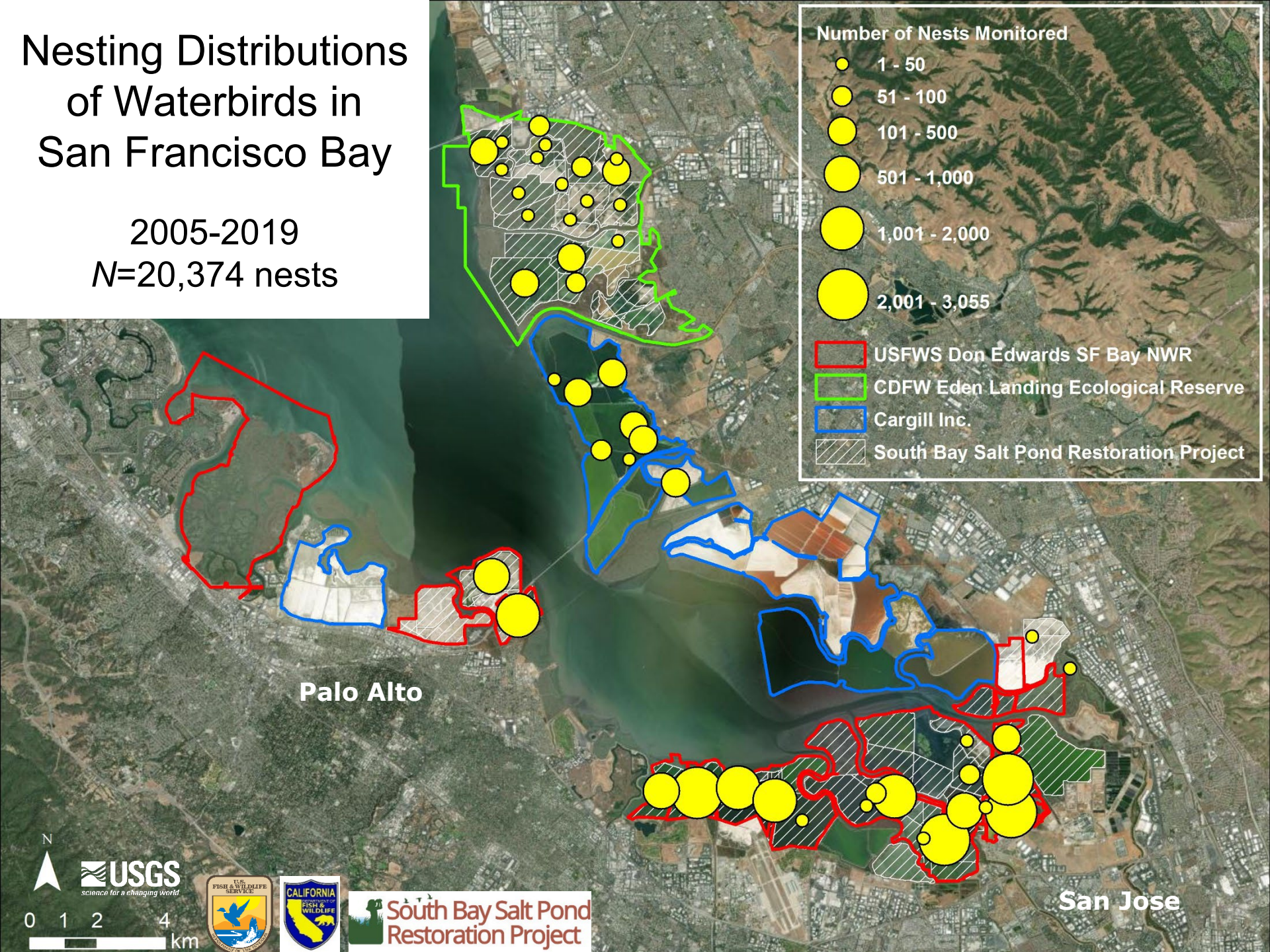
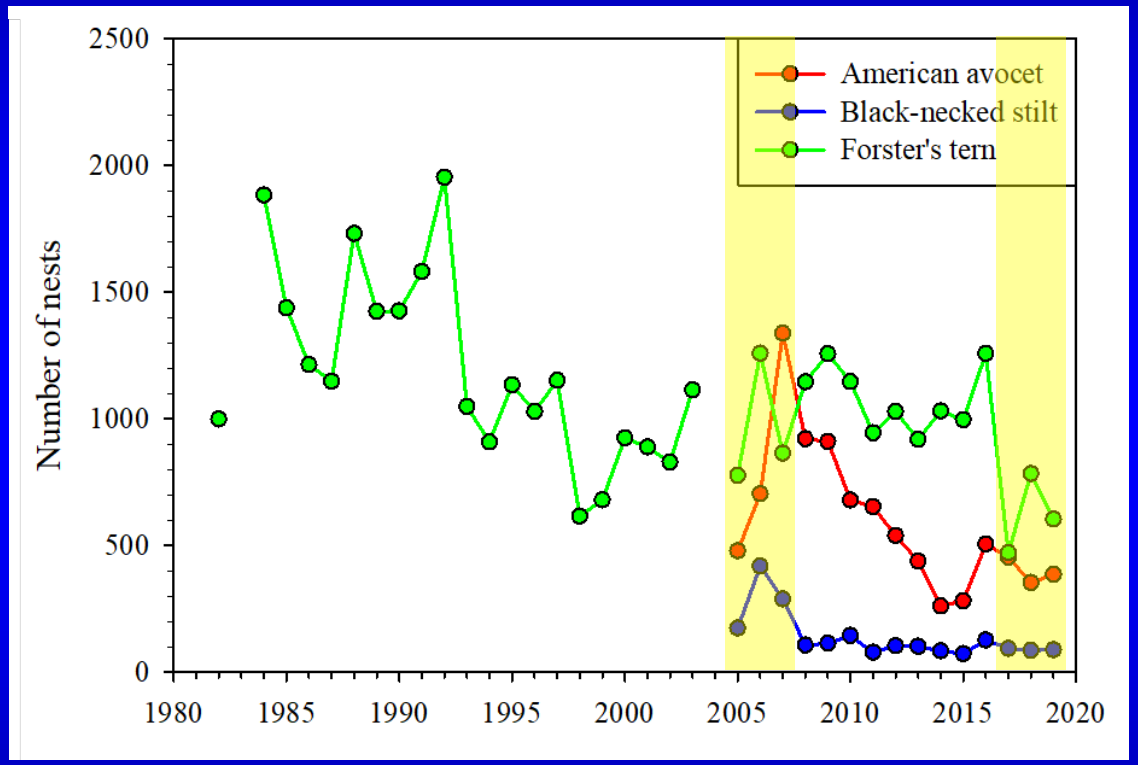
# Nesting Distributions of Waterbirds in San Francisco Bay

2005-2019
*N*=20,374 nests



# Breeding Populations in San Francisco Bay







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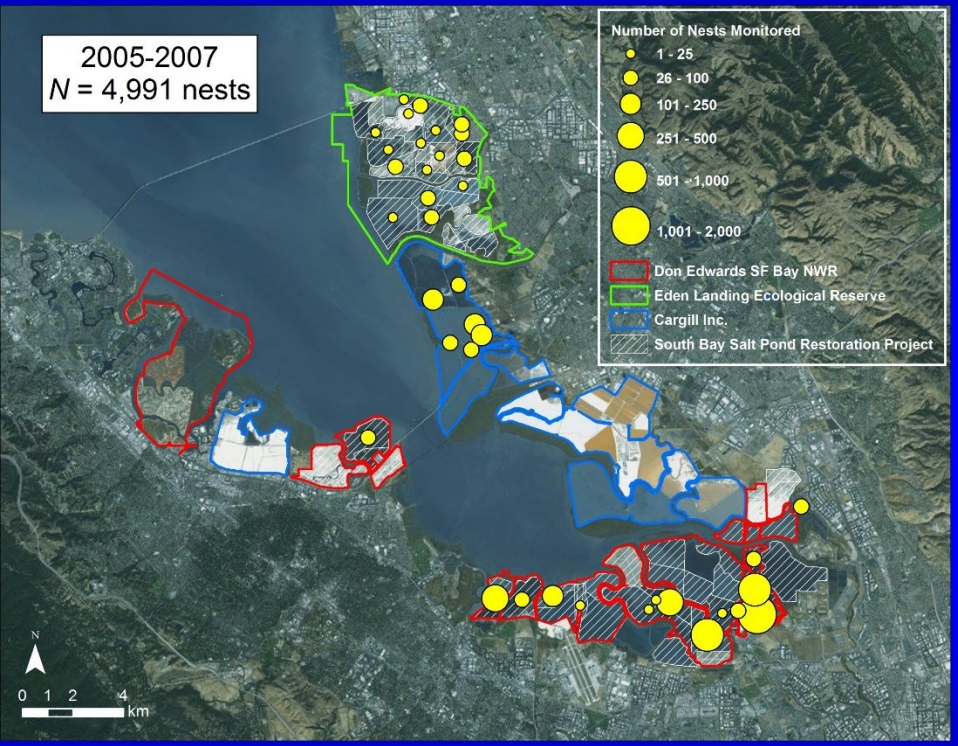
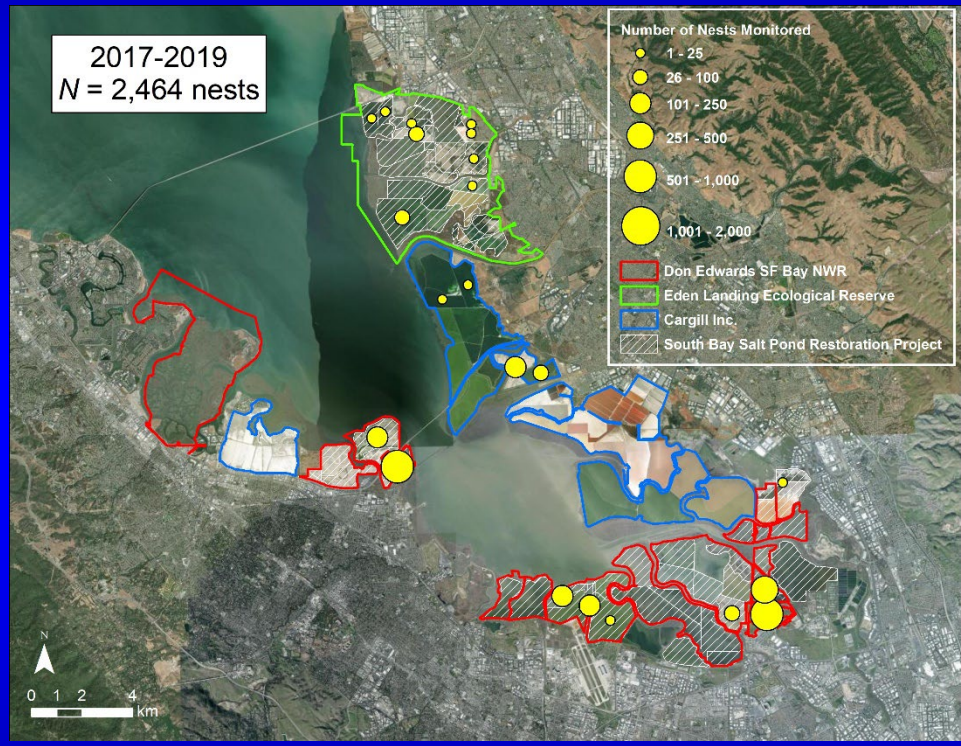
SAN FRANCISCO BAY BIRD OBSERVATORY

*Strong et al. 2004 Waterbirds 27:411-423*

*Hartman et al. 2021 San Francisco Estuary and Watershed Science 19:3:4*

# Fewer Nests in Fewer Places

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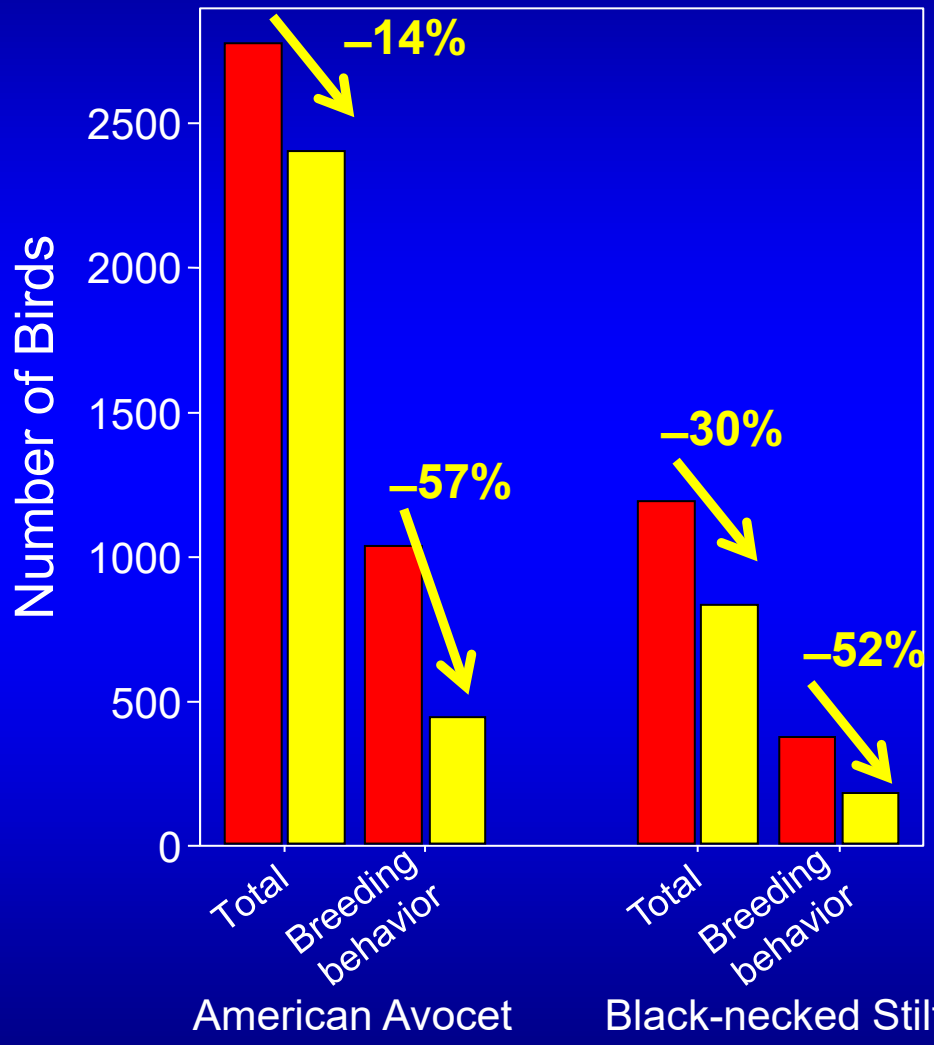
*Hartman et al. 2021 San Francisco Estuary and Watershed Science 19:3:4*

# Breeding Population Decline

(2001 vs 2019 South Bay Surveys)

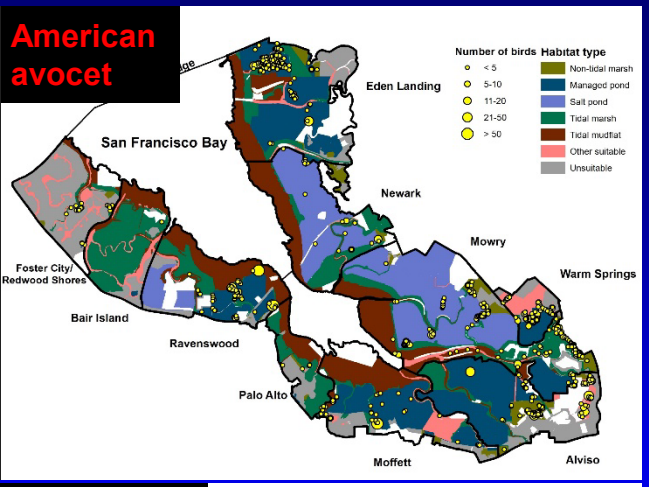



*Hartman et al. 2021 San Francisco Estuary and Watershed Science 19:3:4*

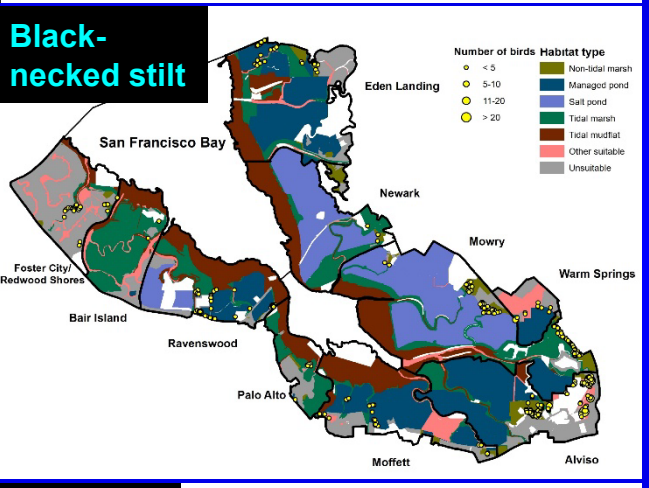
# Habitat Use vs Availability

(2019 South Bay Survey)

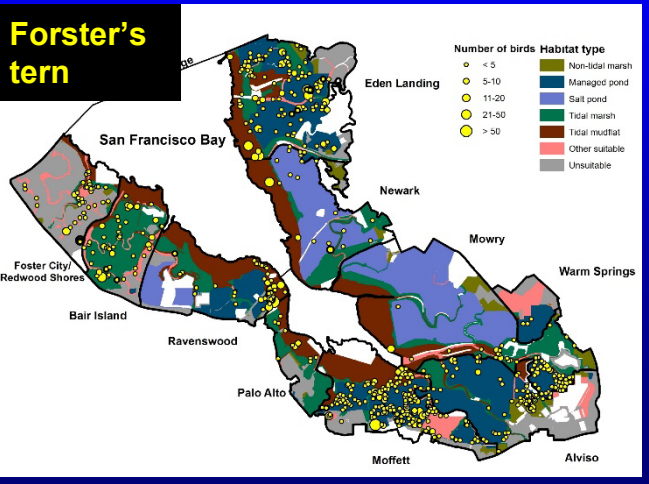
American avocet

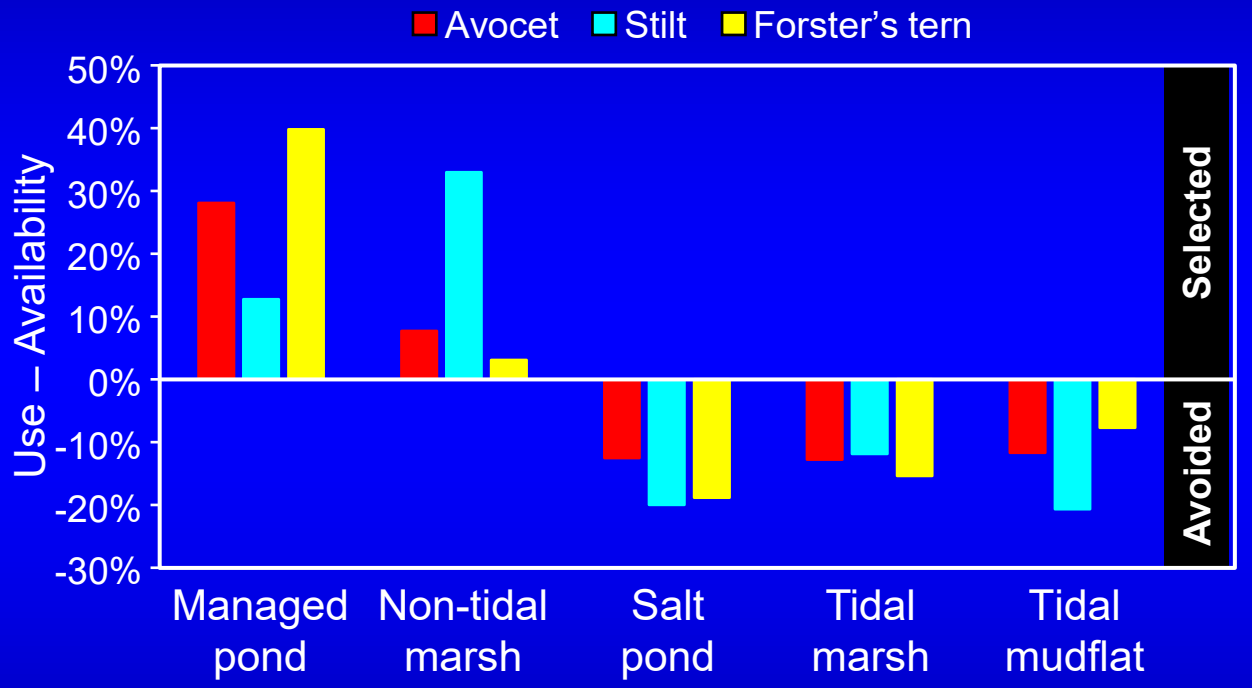



Black-necked stilt




Forster's tern

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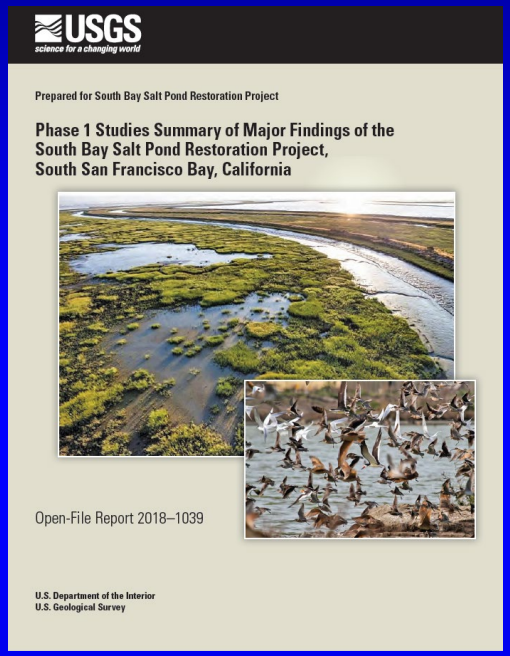
*Hartman et al. 2021 San Francisco Estuary and Watershed Science 19:3:4*

# Restoration Project's Phase 1 Assessment




| | **Key Uncertainties:** *Can the existing number and diversity of migratory and breeding shorebirds and waterfowl in the Project area be supported with reductions in salt pond acreage?* | **Score** |
|---|---|---|
| 1 | Is the number of **diving ducks** maintained? | |
| 2 | Is the number of **ruddy ducks** maintained? | |
| 3 | Will managed ponds provide foraging and roosting habitat for **migratory shorebirds**? | |
| 4 | Will managed ponds provide breeding habitat to support sustainable densities of **snowy plovers**? | |
| 5 | To what extent will the creation of large isolated pond **islands** maintain numbers and reproductive success of **terns, avocet, and stilts**? | |
| 6 | Will reconfigured and managed ponds significantly increase the prey base for, and pond use by, **waterfowl, shorebirds, and phalaropes/grebes**? | |
| 7 | Is the number of **California least terns** in the Project area maintained? | |

Meets/exceeds expectations | Uncertain, trending positive | Uncertain | Uncertain, trending negative | Not meeting expectations

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*Valoppi 2018 Open File Report 2018-1039*

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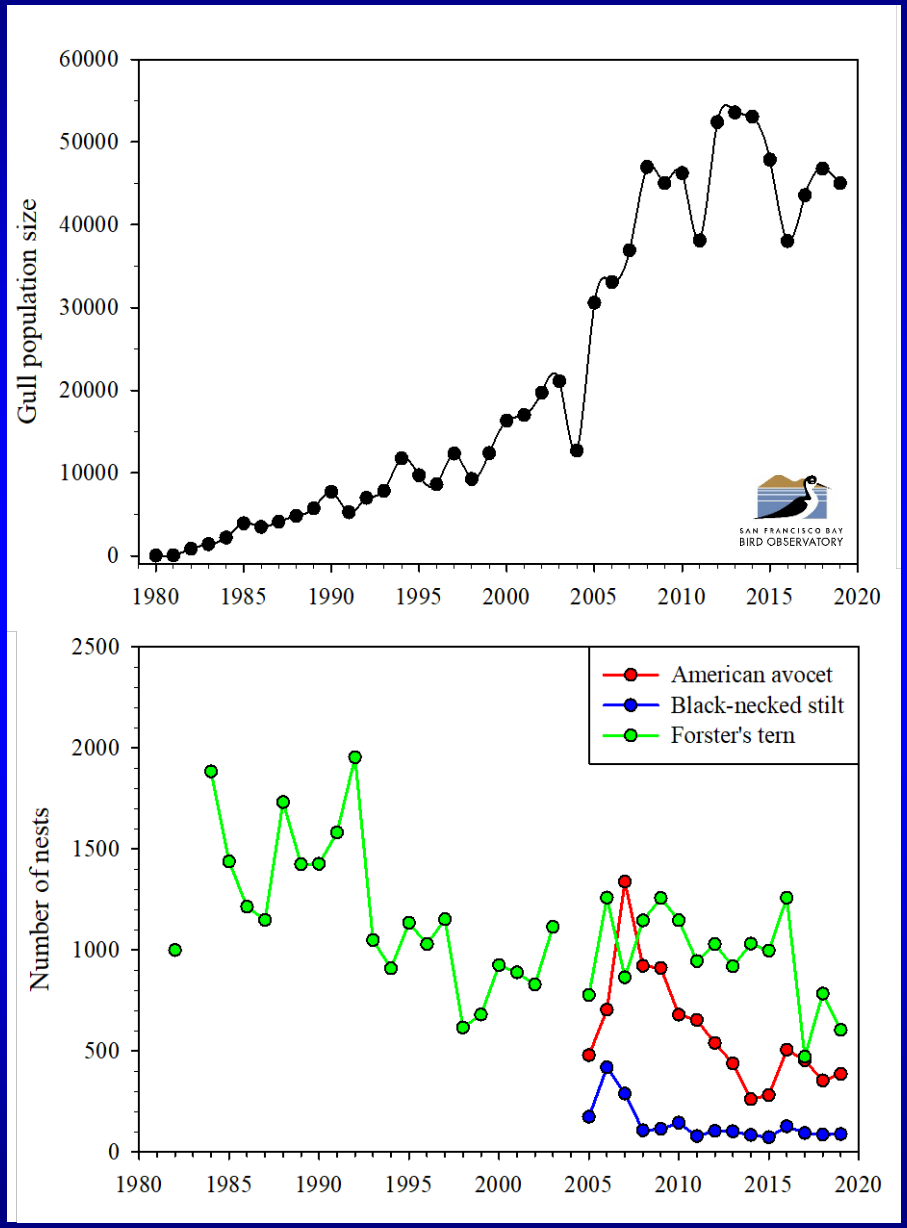
# Breeding Populations in San Francisco Bay









*Strong et al. 2004 Waterbirds 27:411-423*

*Burns et al. 2018 Studies of Western Birds 3:180-189*

*Hartman et al. 2021 San Francisco Estuary and Watershed Science 19:3:4*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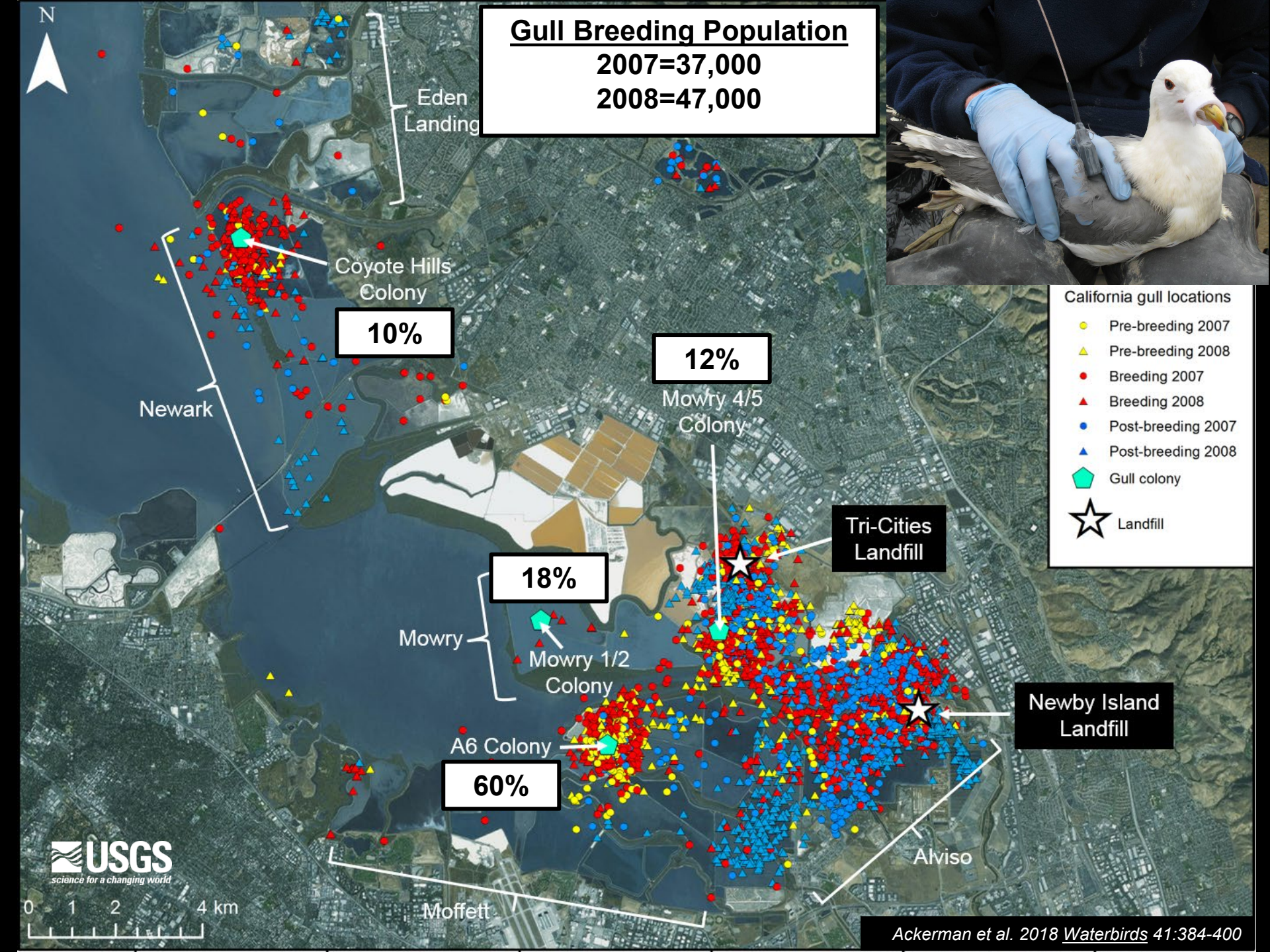
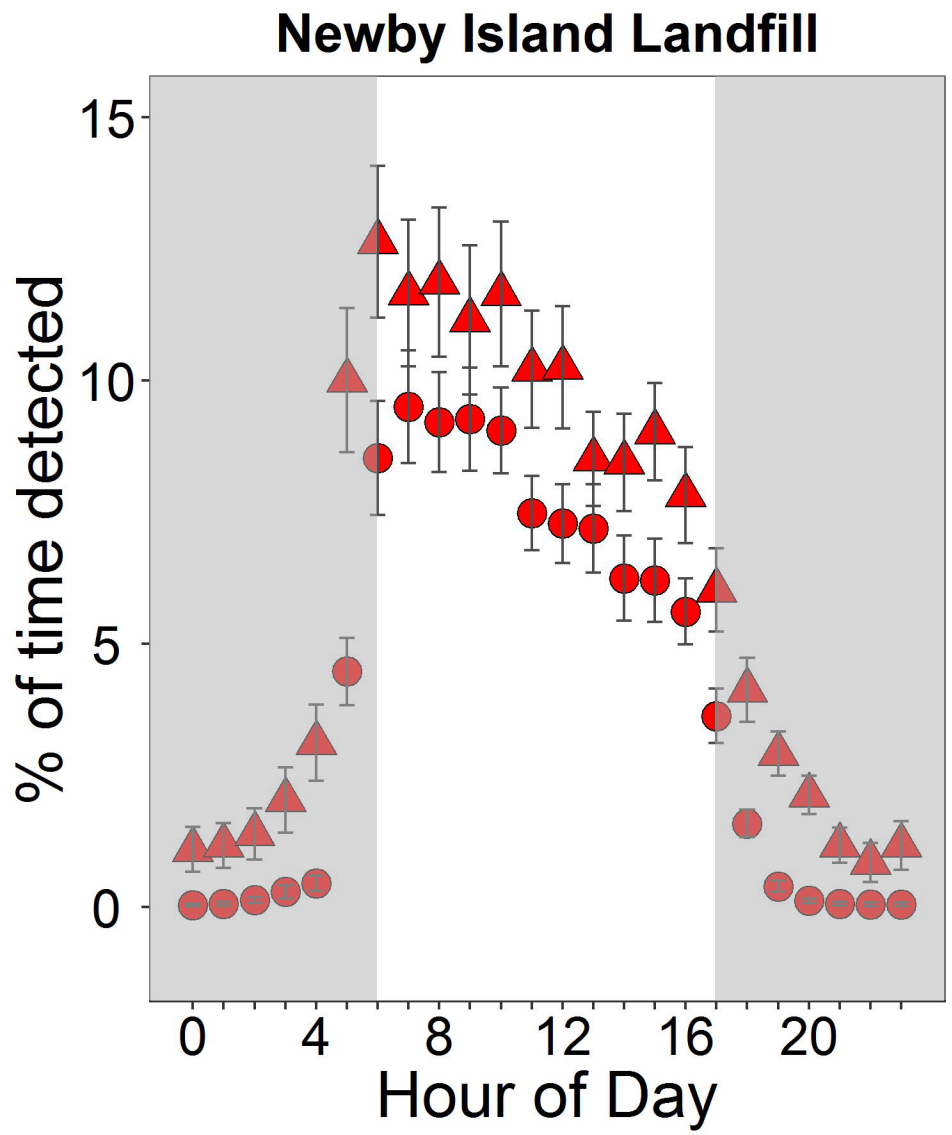
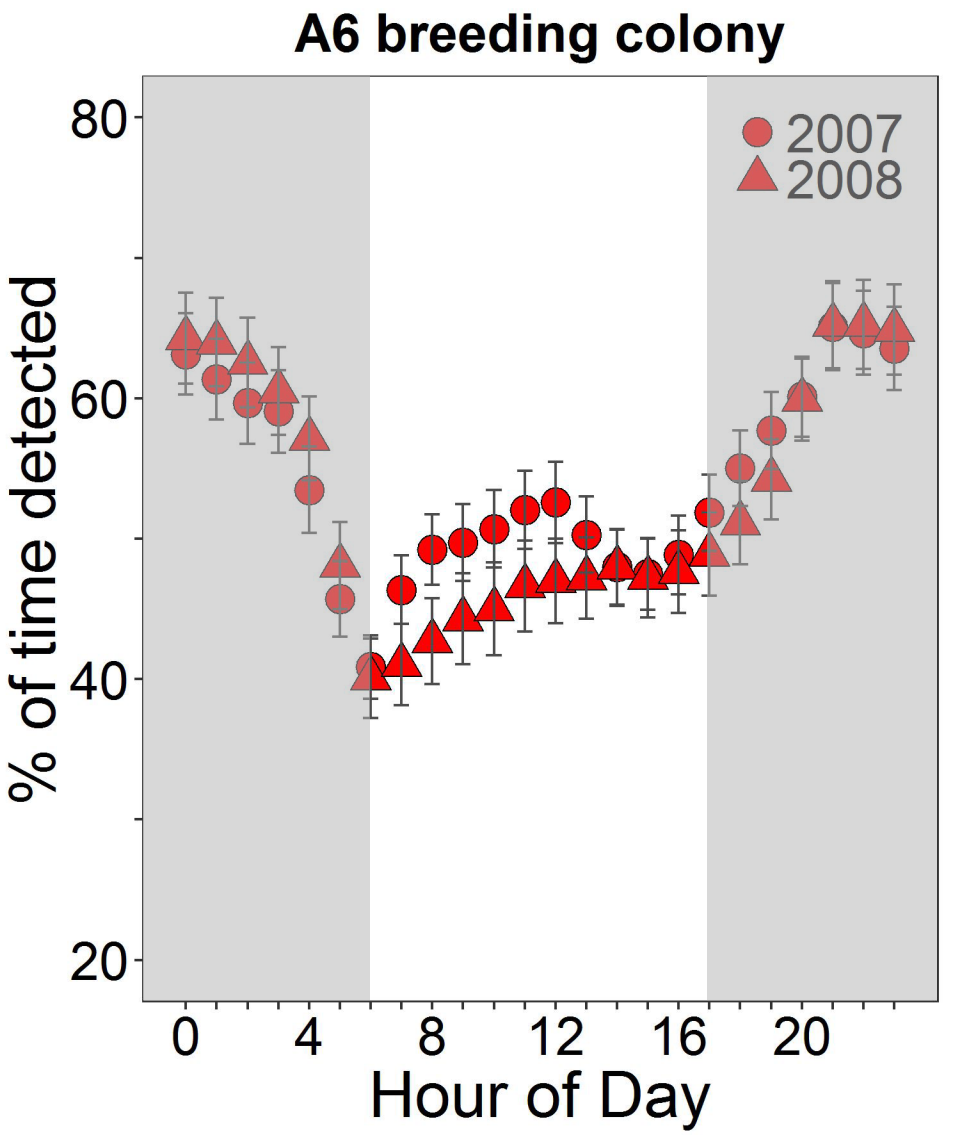



Ackerman et al. 2018 Waterbirds 41:384-400

# Gulls Use Landfills During Day Operations & Colonies at Night

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Ackerman et al. 2018 Waterbirds 41:384-400

# Gull Predation on Waterbird Eggs and Chicks

## Eggs

11% of depredation on avocet & stilt

## Chicks

55% of avocet, 15% of stilt, 54% of tern chick deaths


*Ackerman et al. 2014 Journal of Wildlife Management 78:818-829*

*Ackerman et al. 2014 Journal of Avian Biology 45:609-623*

*Herring et al. 2011 Southwestern Naturalist 56:35-43*


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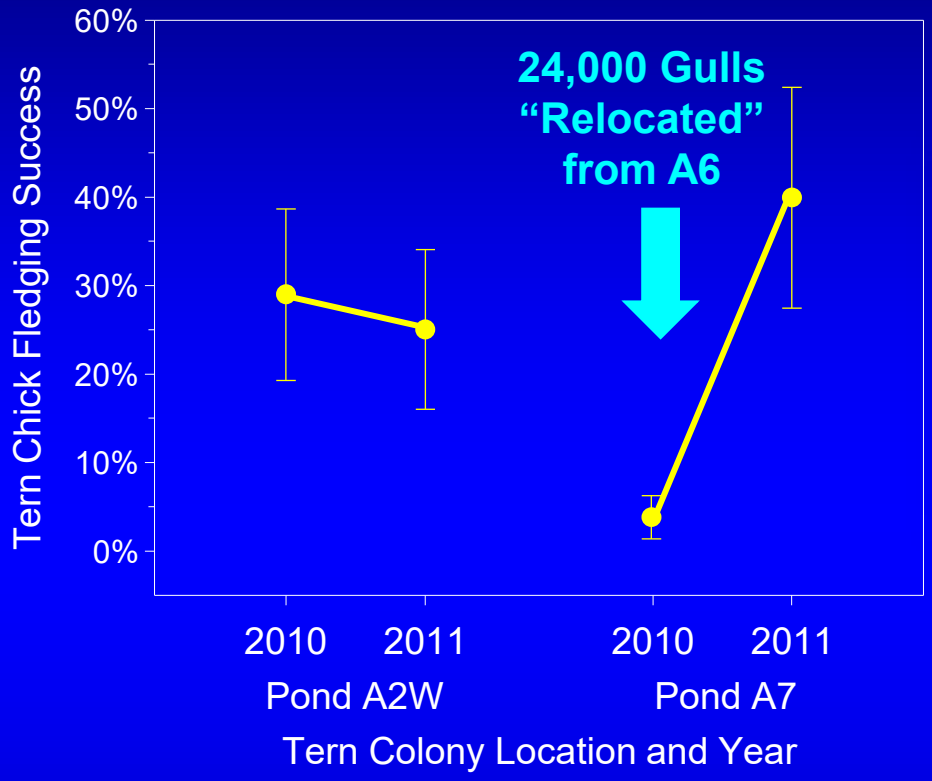
# 900% Increase in Tern Chick Survival After Gull Colony Relocation





Ackerman et al. 2014 Journal of Wildlife Management 78:818-829

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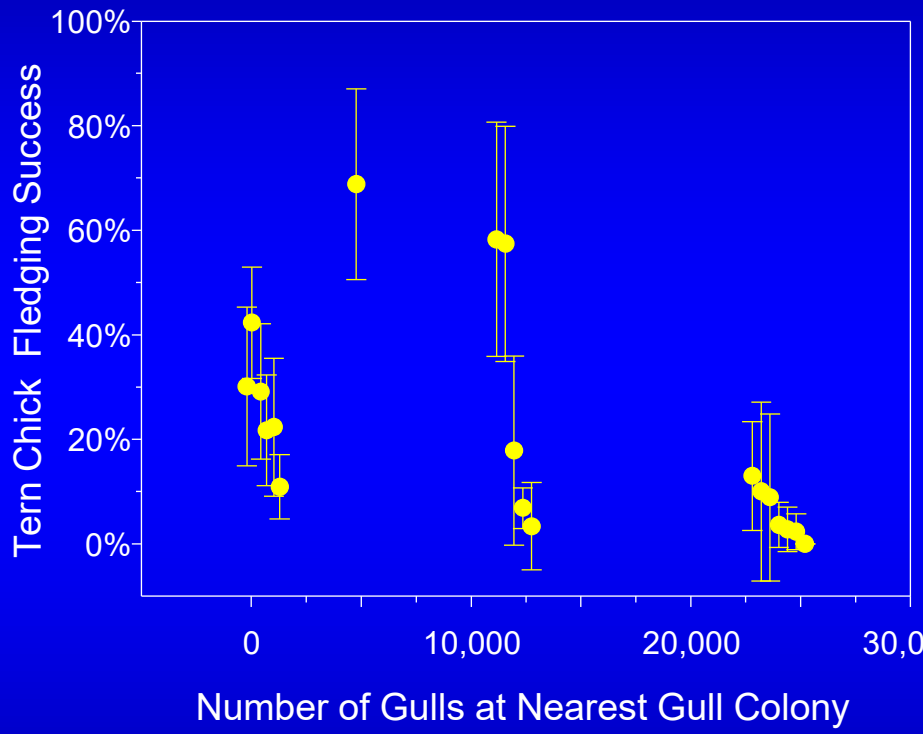
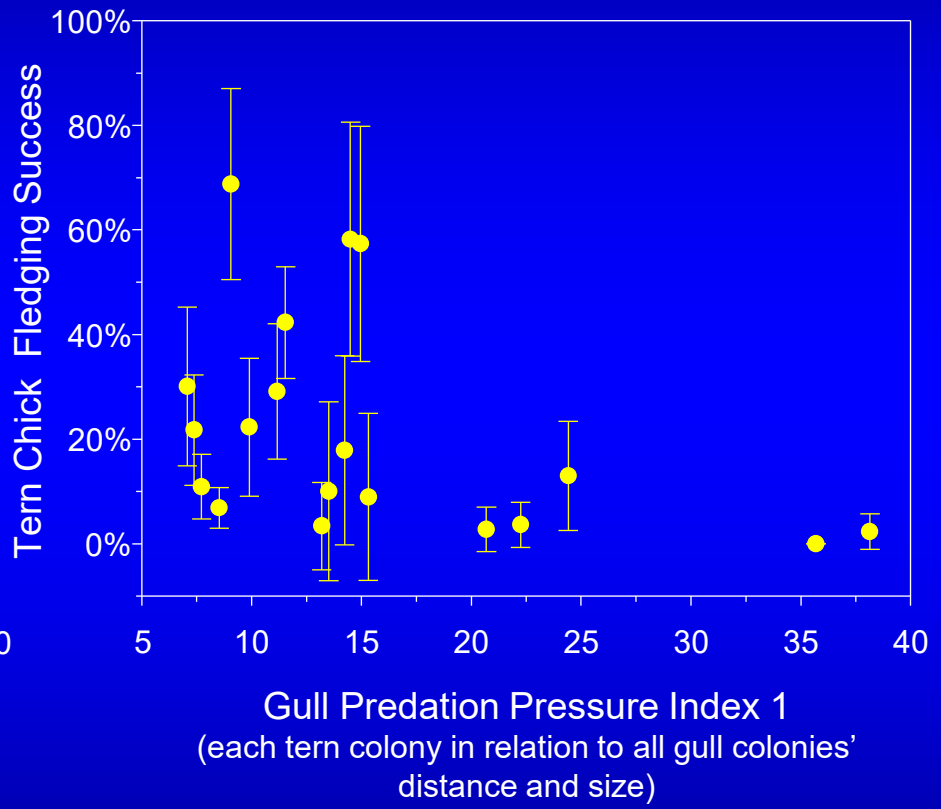
# Tern Chick Fledging Success vs. Gull Colony Size & Location

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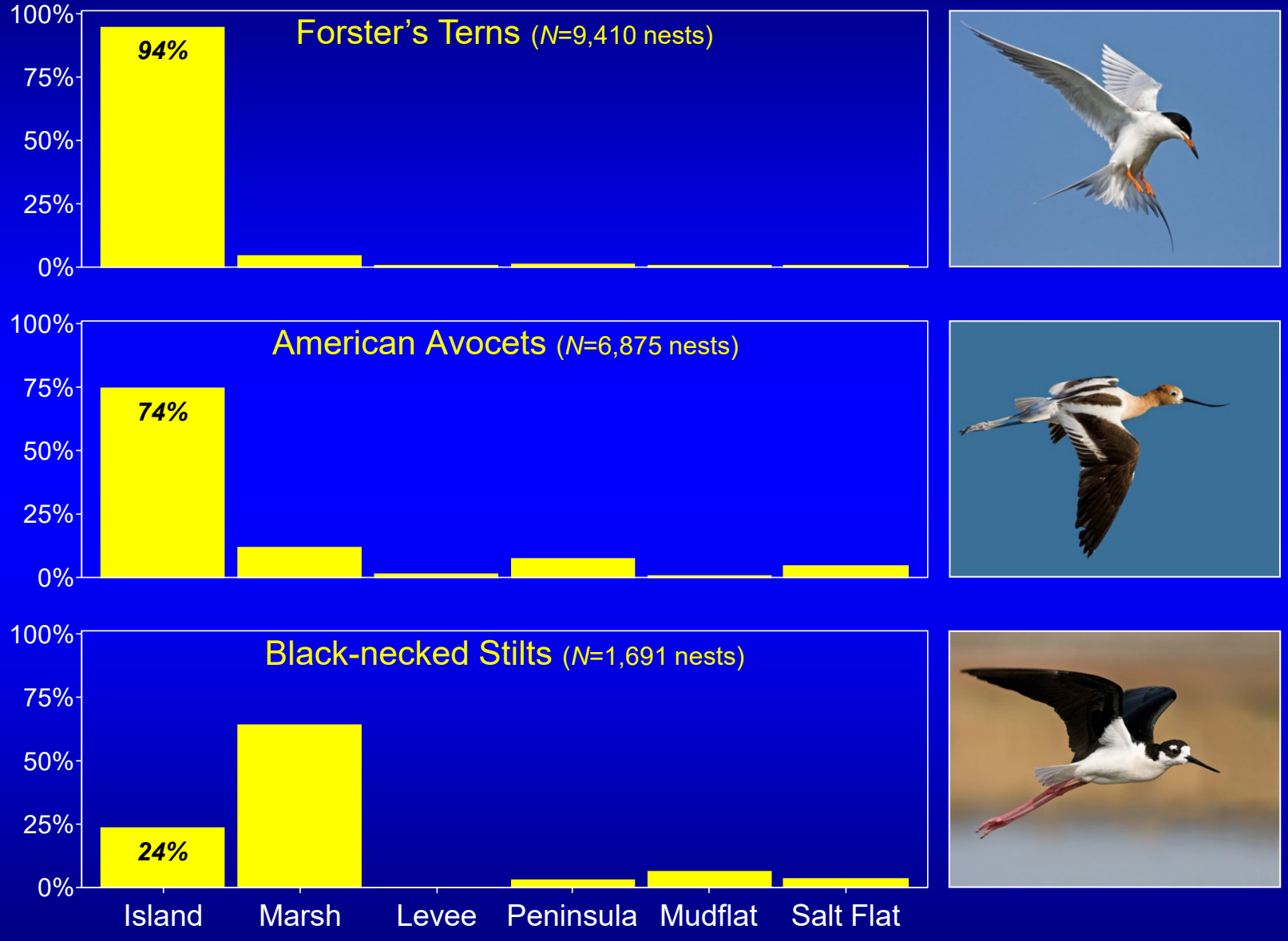
# Nests Are On Islands In Managed Ponds







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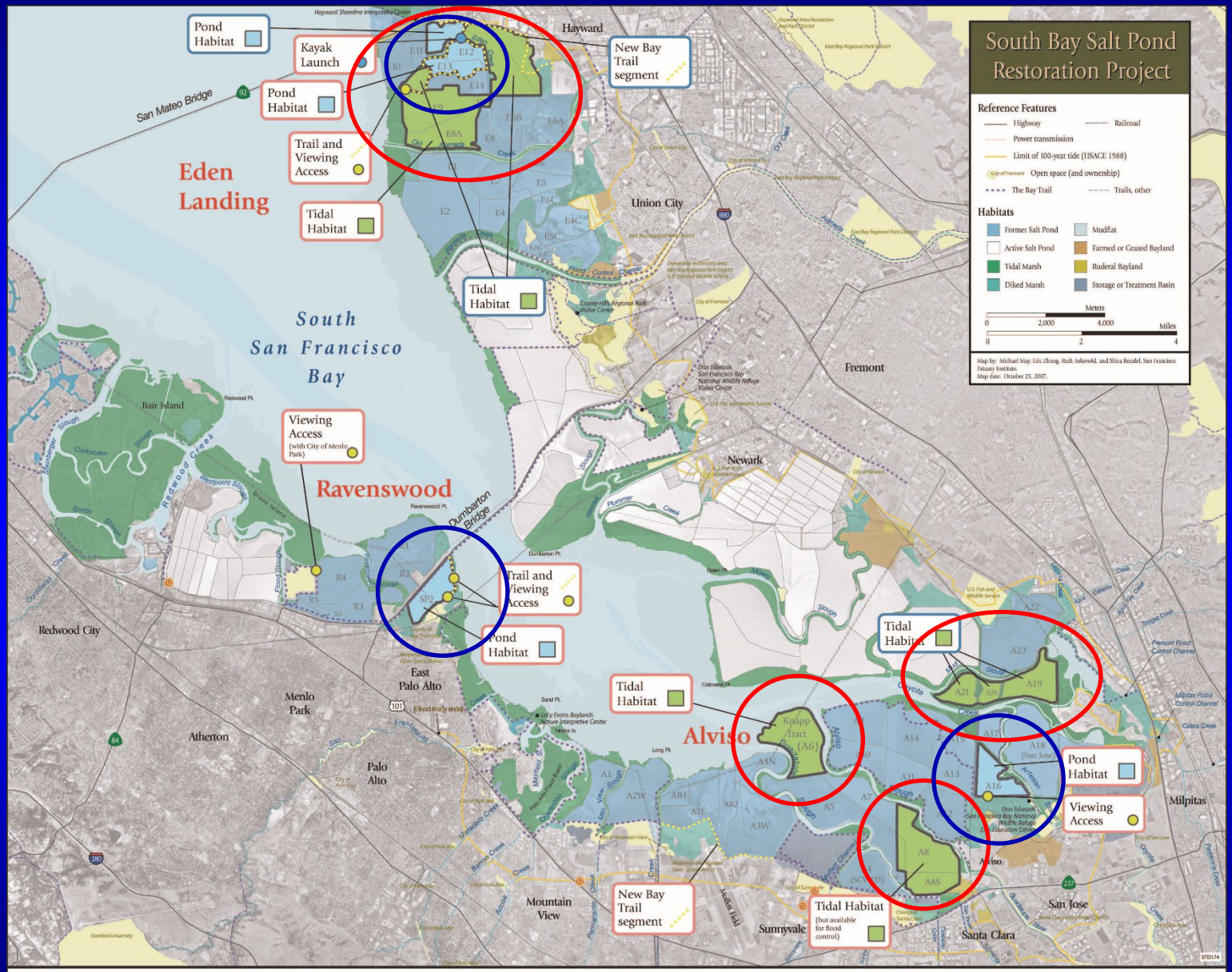
# South Bay Salt Pond Restoration Project




## Initial Restoration Actions

South Bay Salt Pond Restoration Project

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# South Bay Salt Pond Restoration Project




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South Bay Salt Pond Restoration Project

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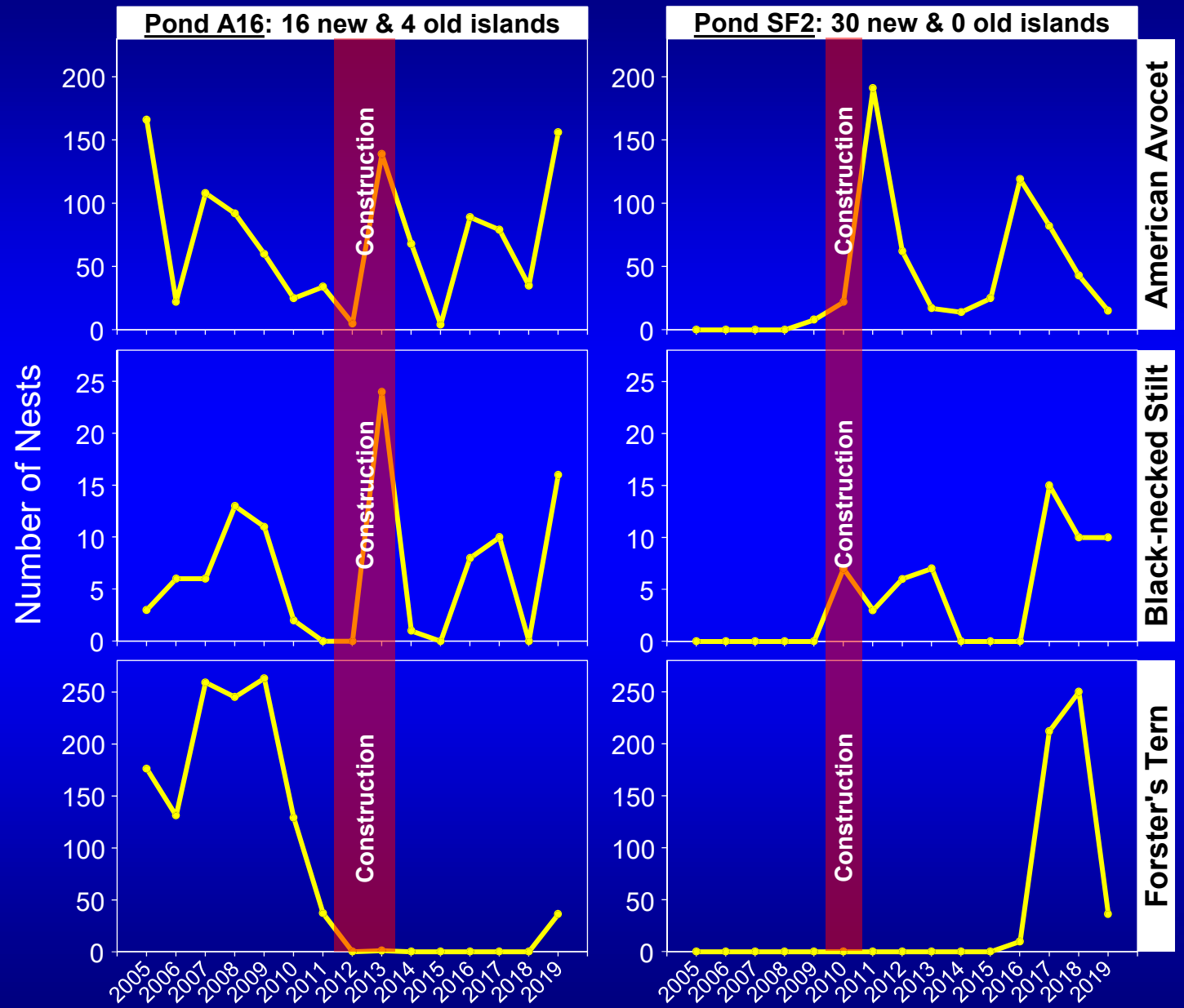
# Nesting Islands Constructed in Managed Ponds

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# Constructing Island Nesting Habitat

1) How many islands to put in a wetland?
2) Location of island within wetland?
3) Size and shape of island?
4) Topography of island?

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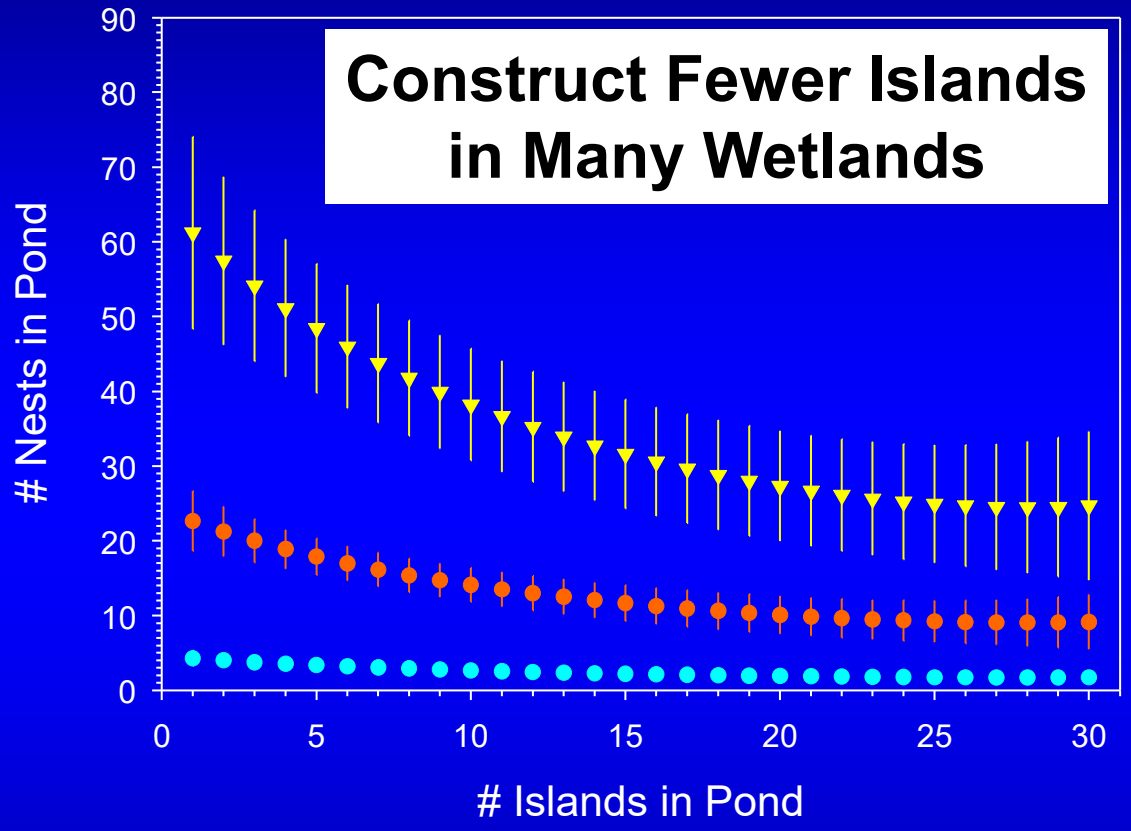
# Number of Nesting Islands Within Wetlands




**Forster's Terns**
**Avocets**
**Stilts**

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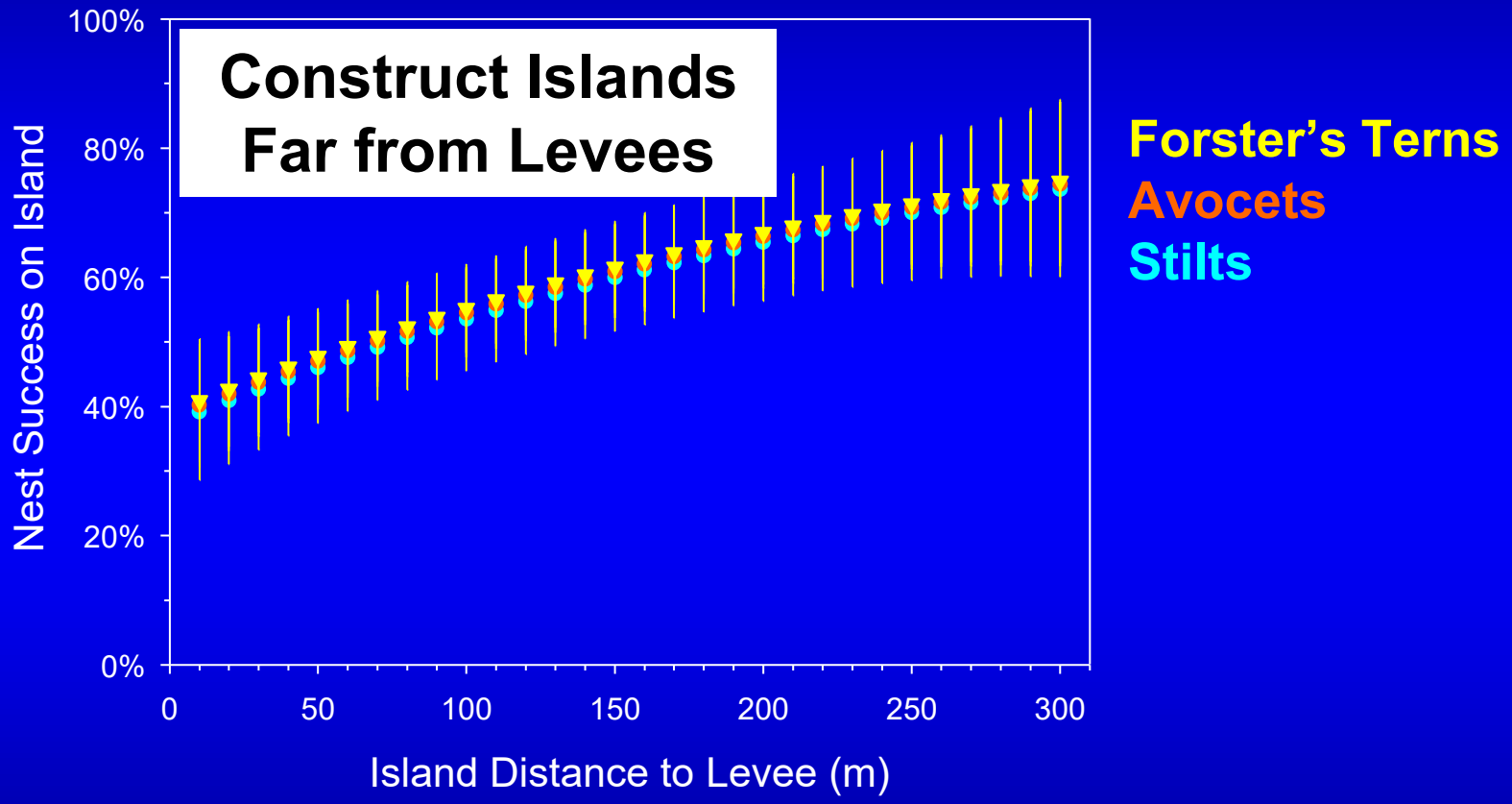
*Hartman et al. 2016 Journal of Wildlife Management 80:1177-1188*

# Nesting Island Location Within Wetlands

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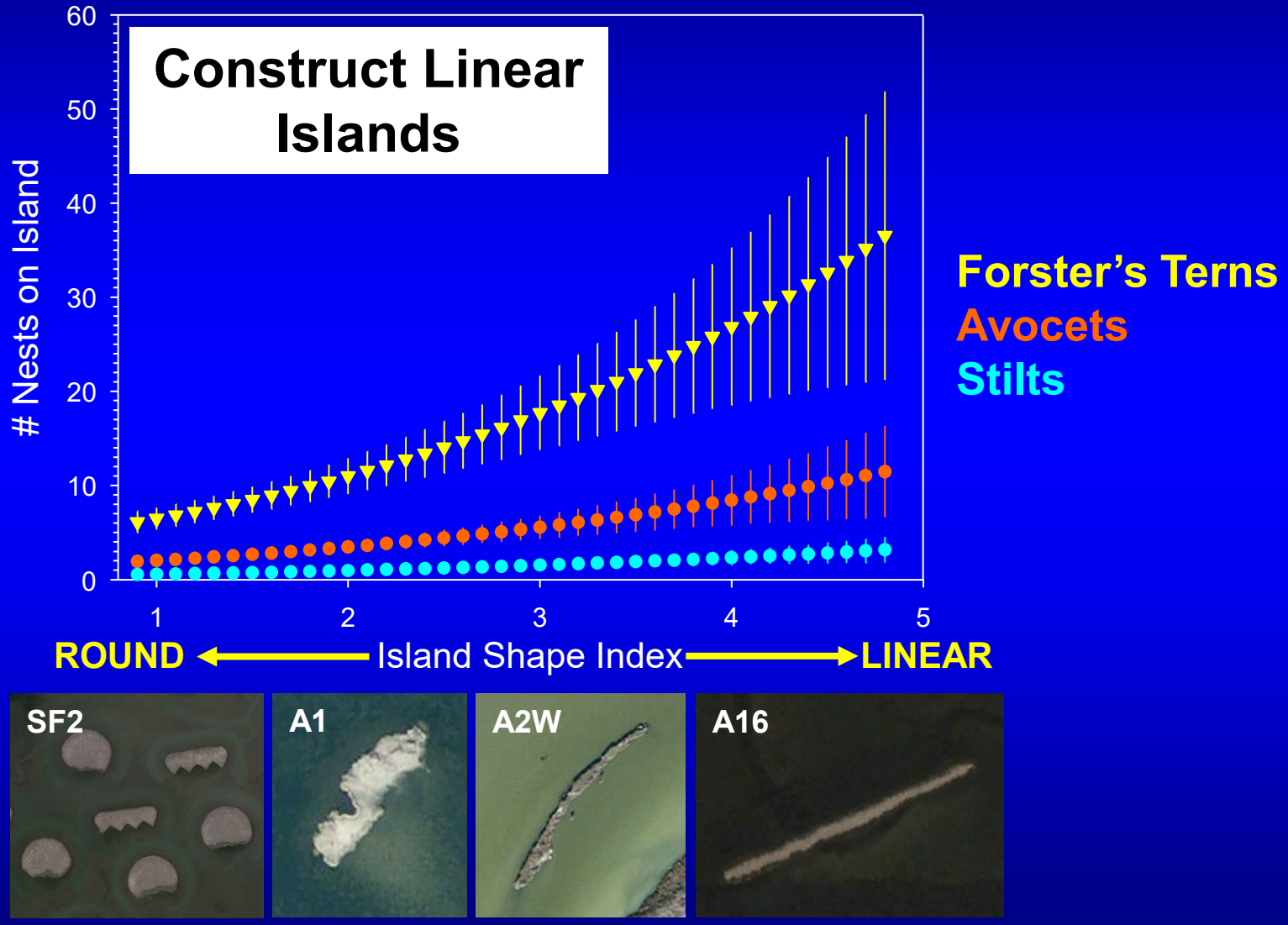
*Hartman et al. 2016 Journal of Wildlife Management 80:1177-1188*

# Nesting Island Shape

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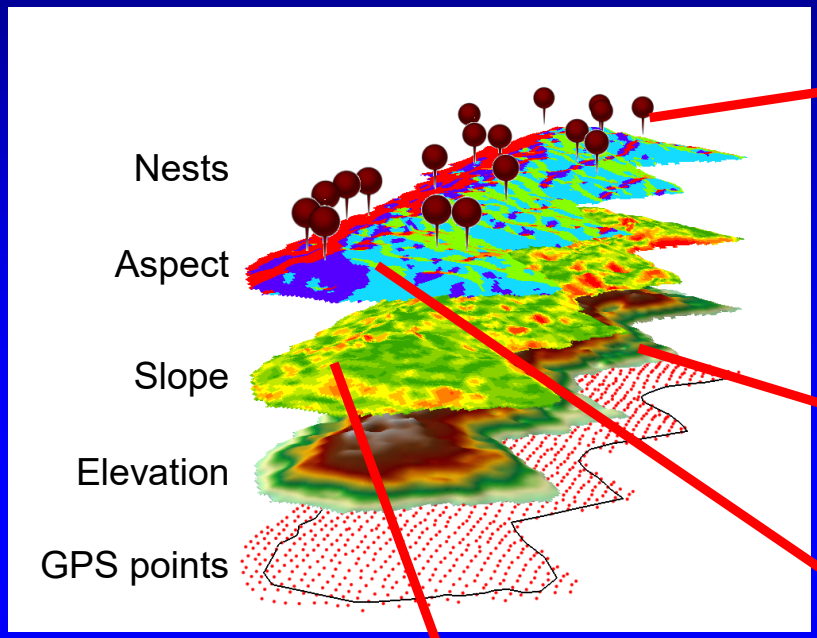
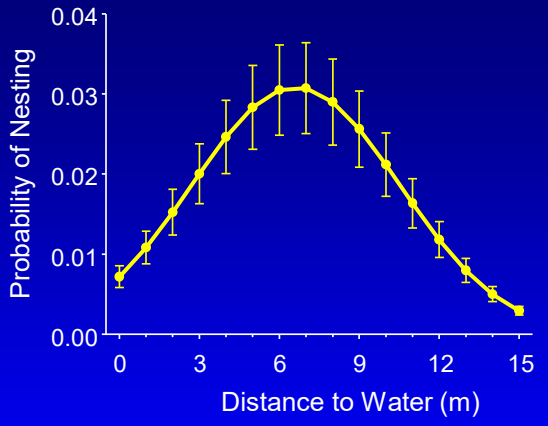
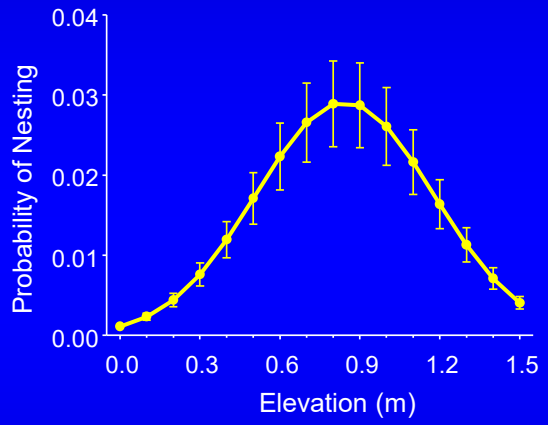
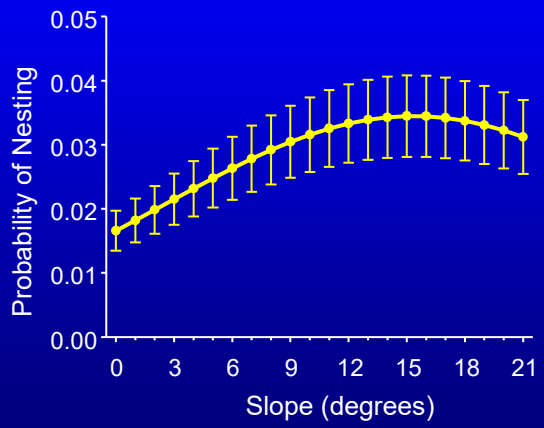
Hartman et al. 2016 Journal of Wildlife Management 80:1177-1188

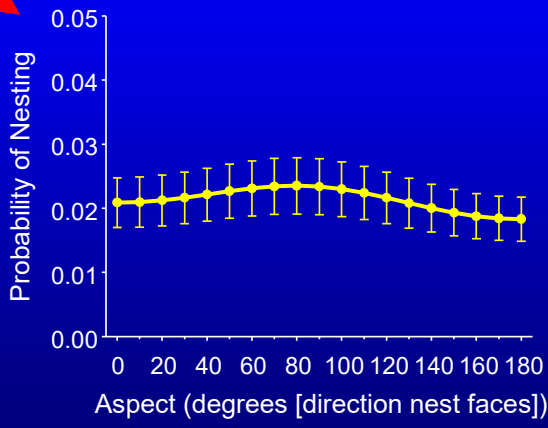
# Nest Site Location on Islands

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*Hartman et al. 2016 Journal of Wildlife Management 80:1267-1279*

# Recipe for Constructing Island Nesting Habitat

**Where should nesting islands be built?**

- Near (<1km) SF Bay
- >100m from pond levees

**How many islands should be built in a wetland?**

- 3-5 islands within many different wetlands

**How big and what shape should islands be?**

- Small (0.05-0.10 ha)
- Linear (e.g., 50m×10m or 100m×10m)

**Island topography?**

- Elevation: 0.5–1.5m above the water surface
- Distance to water: ≤10m of the water's edge
- Slope: Both steep (avocets) and flat (terns)
- Aspect: South-facing, East-West linear islands

**Vegetation?**

- Include patches of 1) dense and short vegetation and 2) bare ground

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Ackerman et al. 2014 USGS OFR 2014-1263

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# Establishing New Bird Colonies Using Social Attraction

Decoys and electronic broadcasting of bird calls


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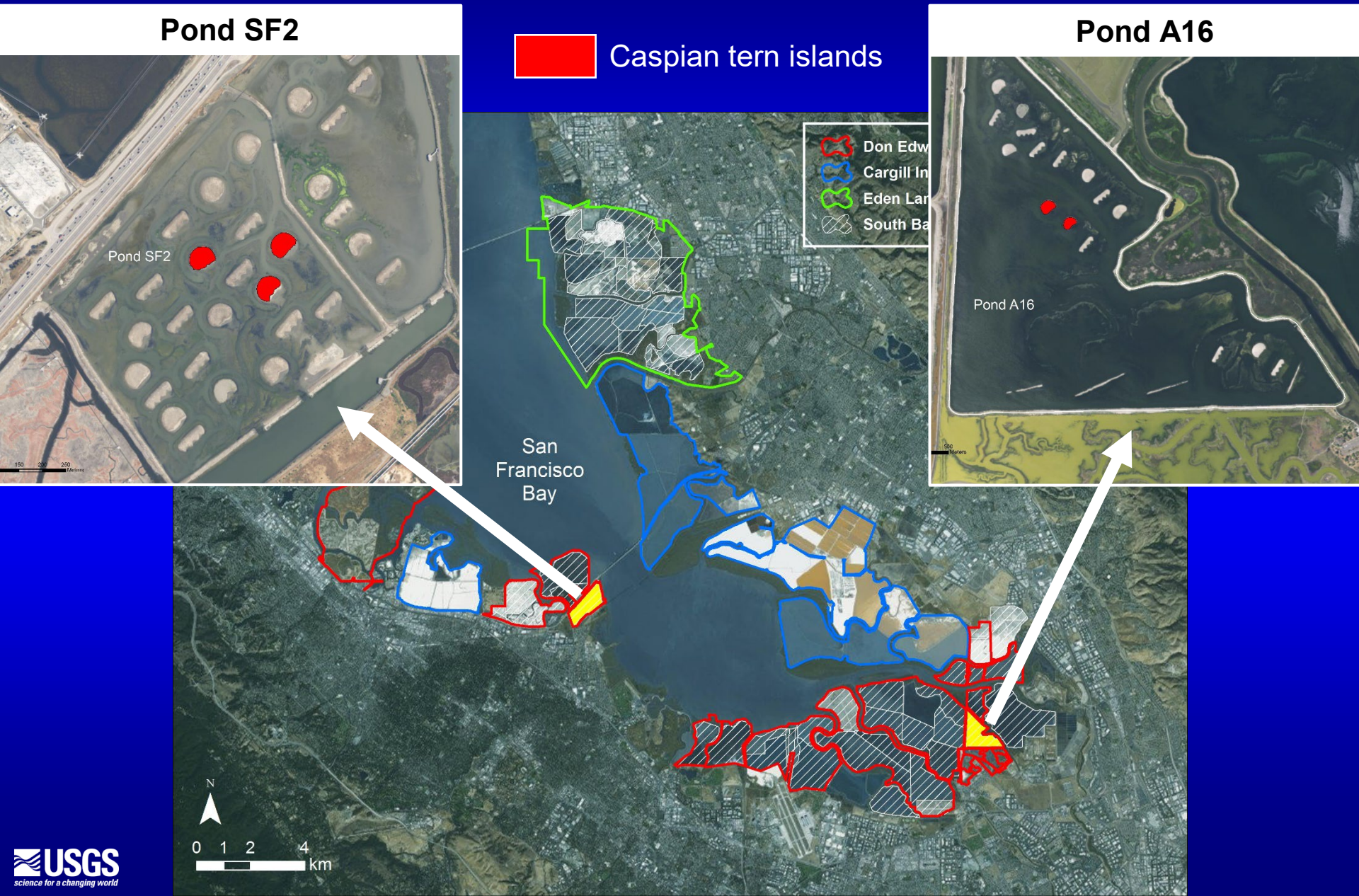
# Caspian Tern Social Attraction Islands

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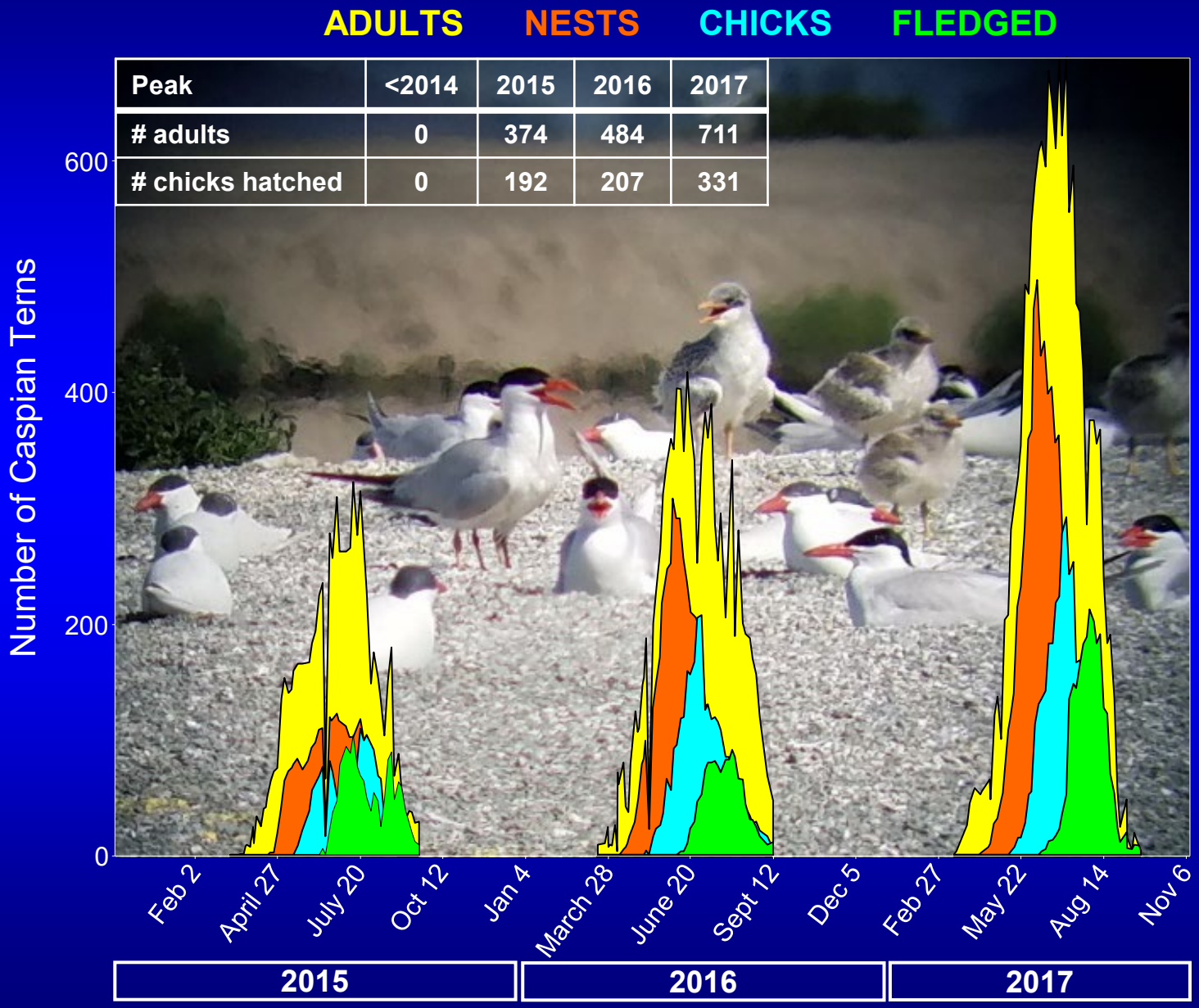
# New Caspian Tern Colonies Established on Refuge

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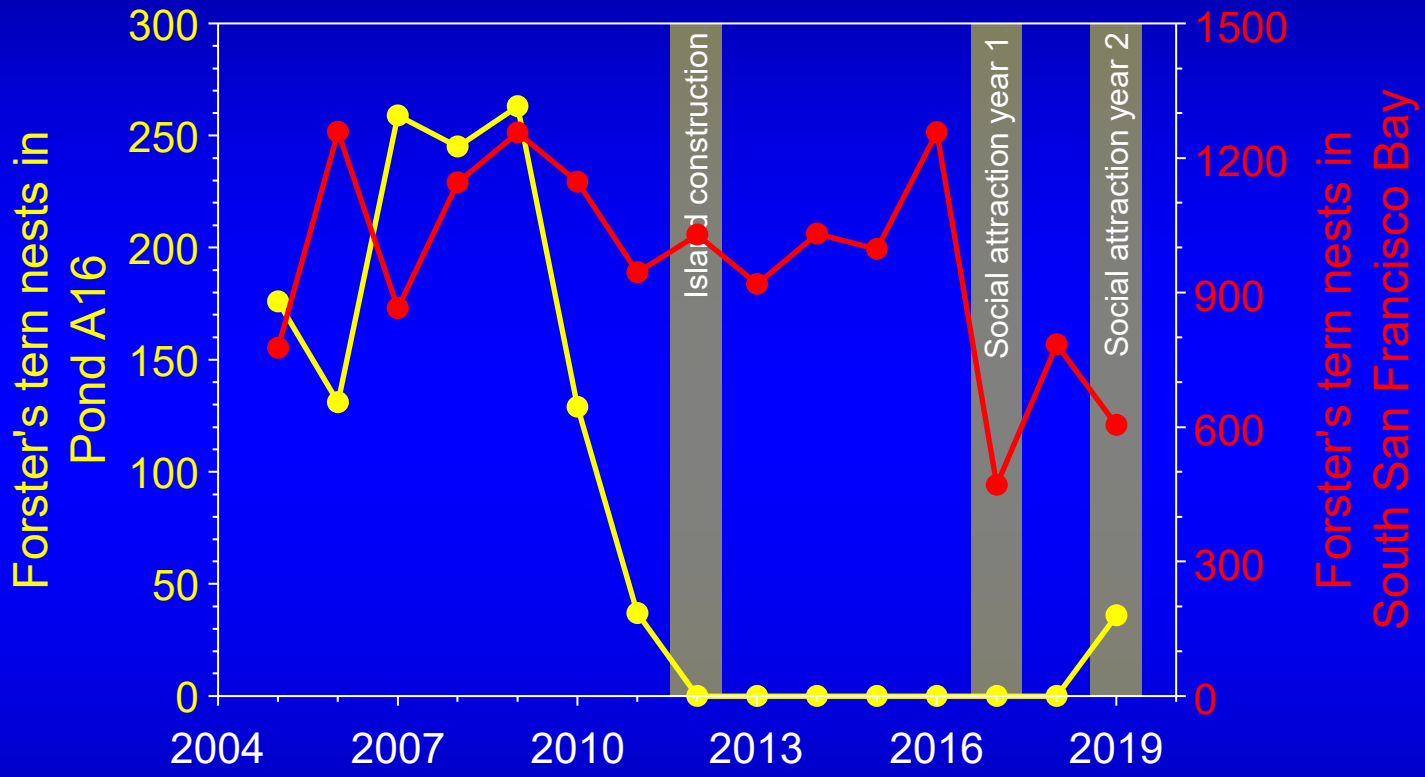
Hartman et al. 2019. Global Ecology and Conservation 20:e00757

# Forster's Tern Social Attraction in Pond A16

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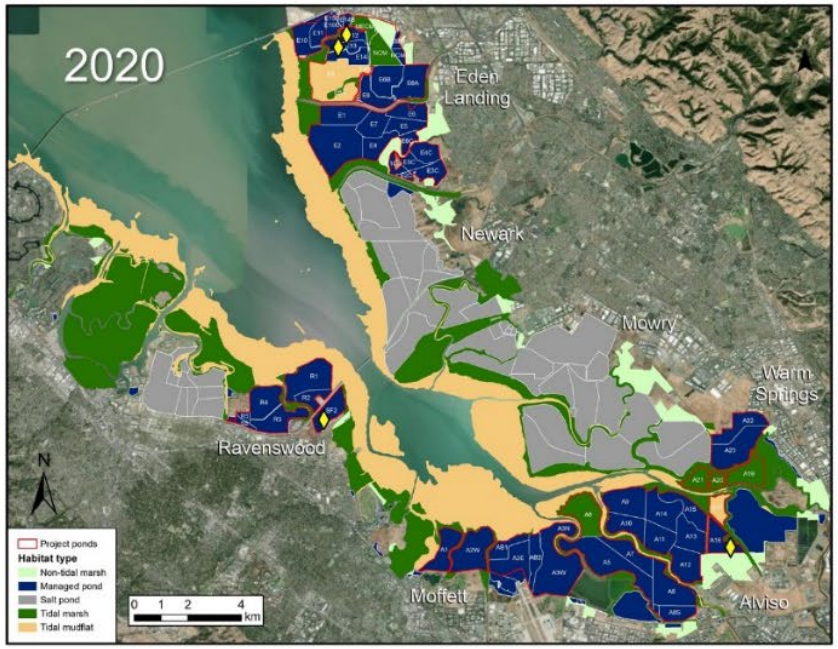
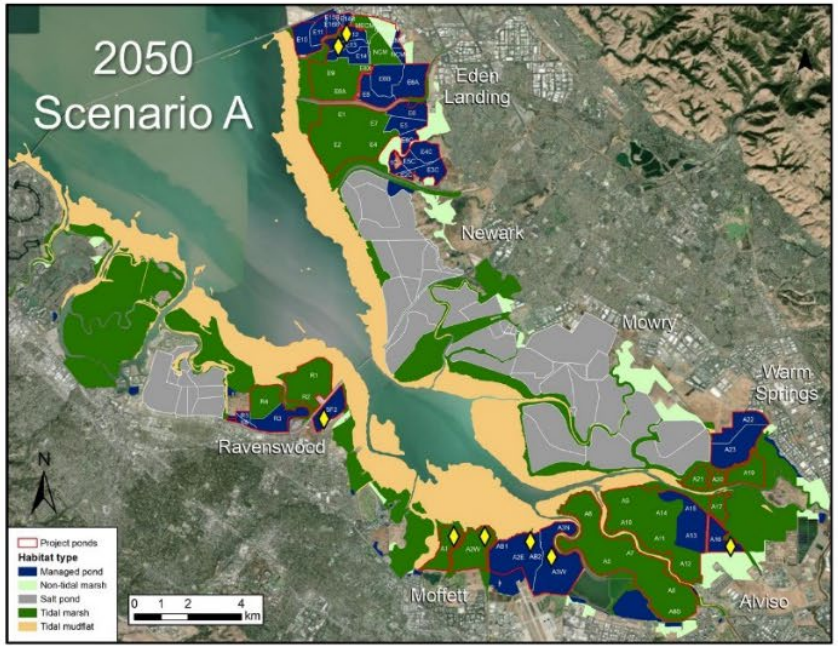
Valley Water
SAN FRANCISCO BAY BIRD OBSERVATORY

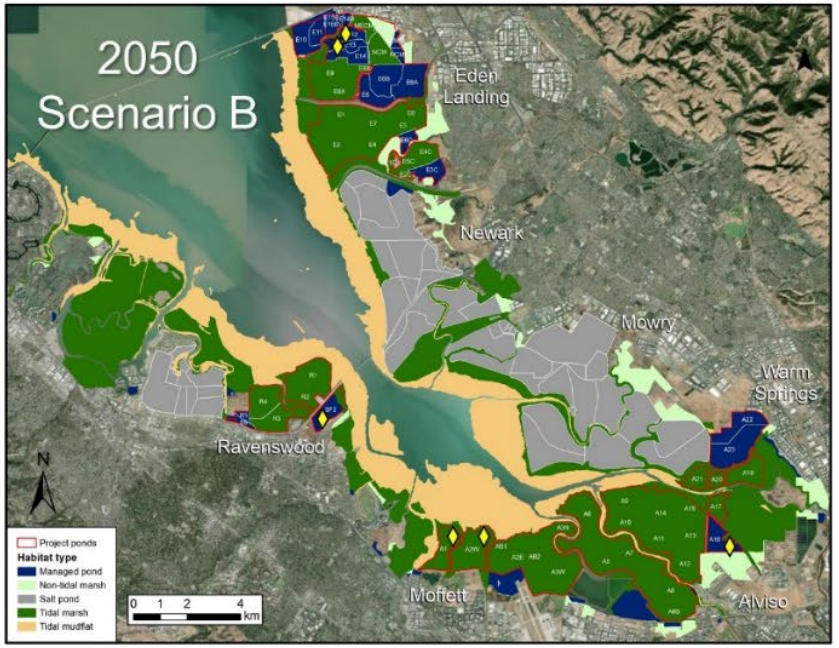
# Landscape Scenario Planning for the South Bay Salt Pond Restoration Project

**49% of managed ponds to tidal marsh?**




**71% of managed ponds to tidal marsh?**



# Thank You Partners!

Support & Funding:

- South Bay Salt Pond Restoration Project
- Don Edwards San Francisco Bay National Wildlife Refuge
- Eden Landing Ecological Reserve
- Napa-Sonoma Marshes Wildlife Area
- U.S. Fish and Wildlife Service
- California Department of Fish and Wildlife
- San Francisco Bay Bird Observatory
- The San Francisco Bay Restoration Authority
- California Wildlife Foundation
- California Coastal Conservancy
- Resources Legacy Fund
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- Valley Water
- San Francisco Estuary Institute
- San Francisco Bay Regional Monitoring Program
- CALFED Ecosystem Restoration Program
- Ducks Unlimited
- USGS Ecosystems Mission Area & Environmental Health Program

Photos by:

- Ken Phenicie, Michael Kern, Abe Borker, and USGS

Contact:

- jackerman@usgs.gov