Salt pond restoration and breeding birds: enhancing waterbird nest habitat in managed ponds

Alex Hartman, Josh Ackerman, and Mark Herzog
U.S. Geological Survey, Western Ecological Research Center, Dixon Field Station, Dixon, California

U.S. Department of the Interior
U.S. Geological Survey
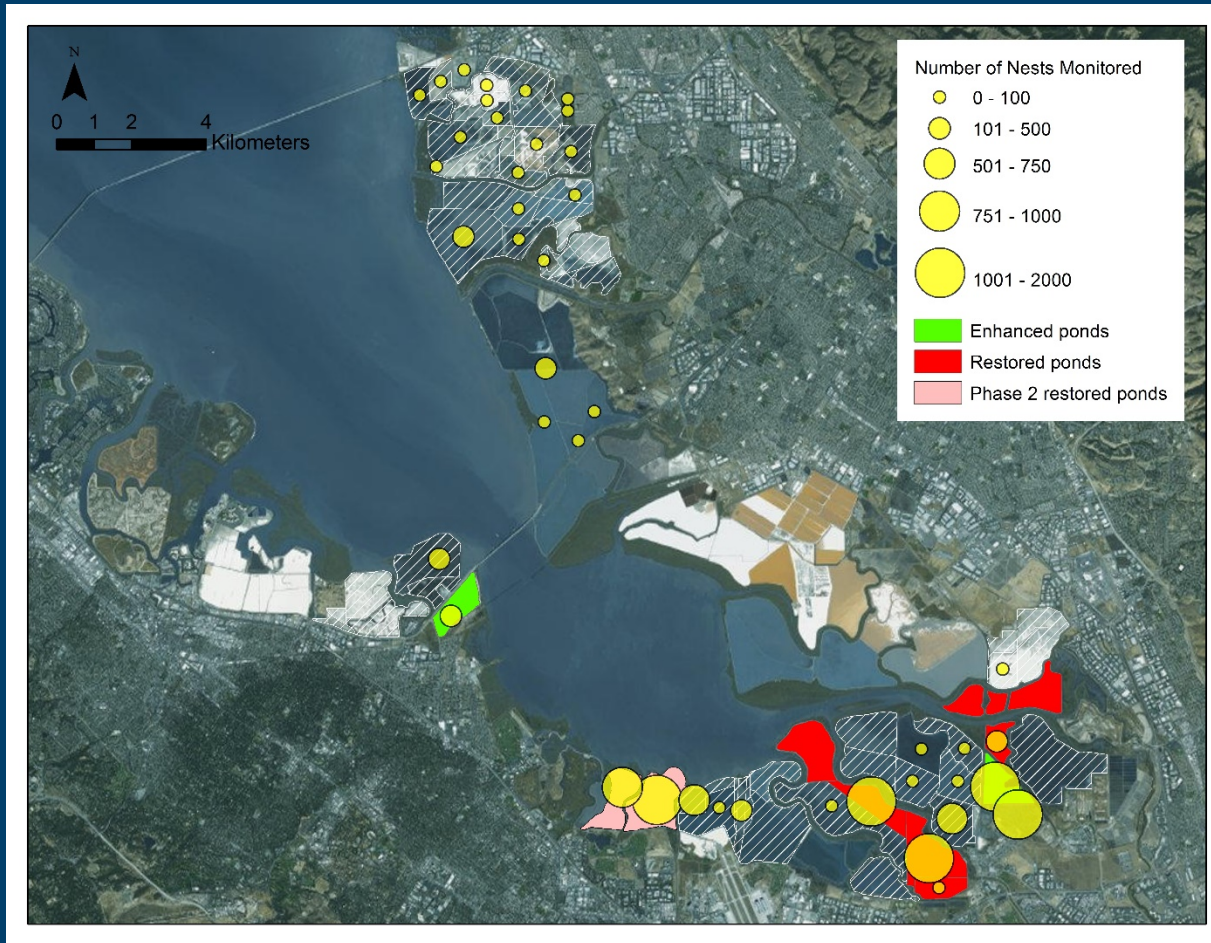
Breeding waterbirds of San Francisco Bay

- **4,000 American Avocets**
- **1,000 Black-necked Stilts**
- **3,000 Forster's Terns**
- **50,000 California Gulls**

Other species:

- **Caspian Terns**
- **Double-crested Cormorants**
- **Black Skimmers**
- **Snowy Plovers**
- **California Least Terns**
- **Waterfowl**
- **Songbirds**
- **Rails**

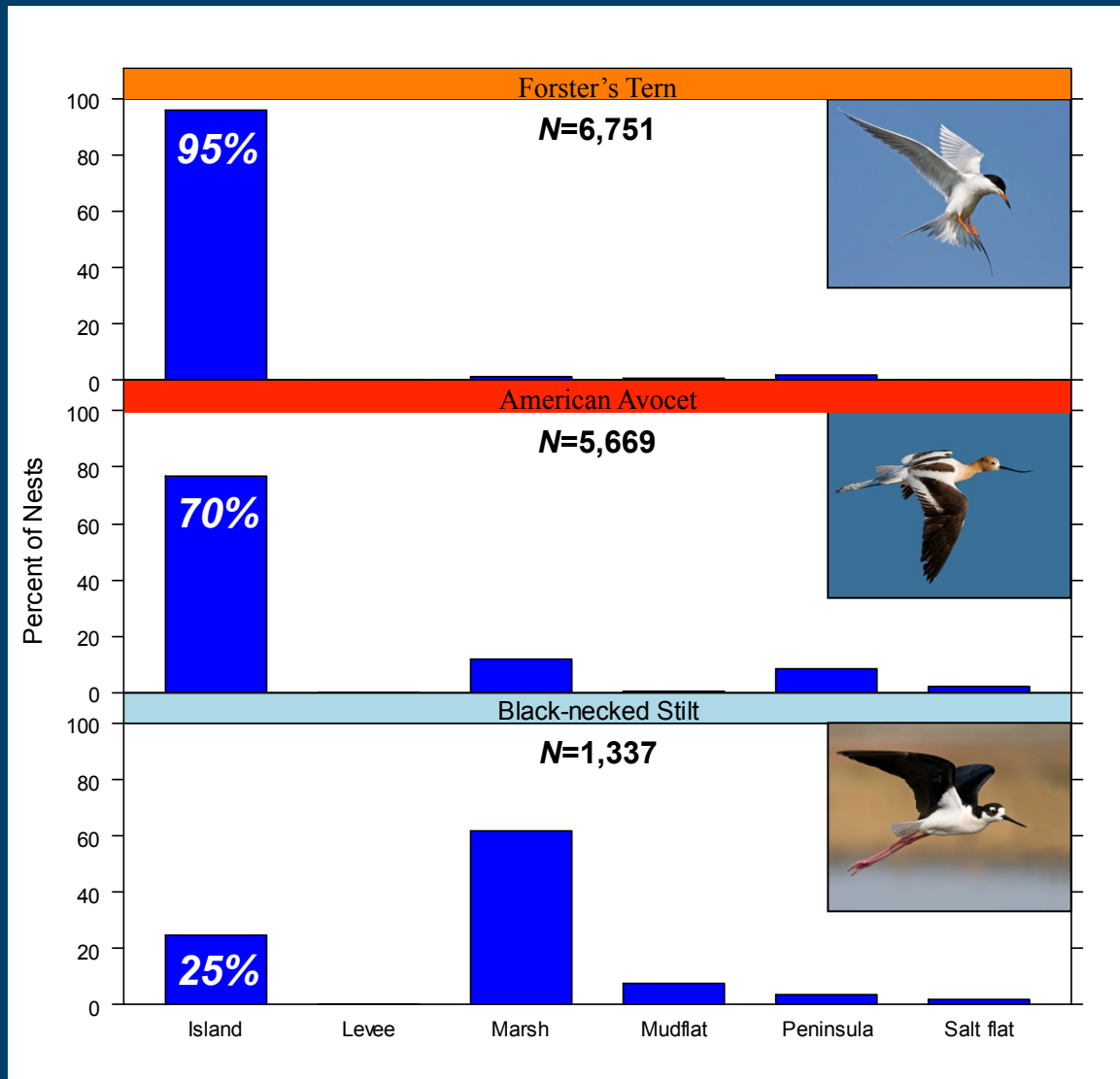

USGS

Former salt ponds important for nesting

Will breeding birds be affected by the restoration?

- **Will sufficient nesting habitat remain?**

- **What is suitable nesting habitat?**
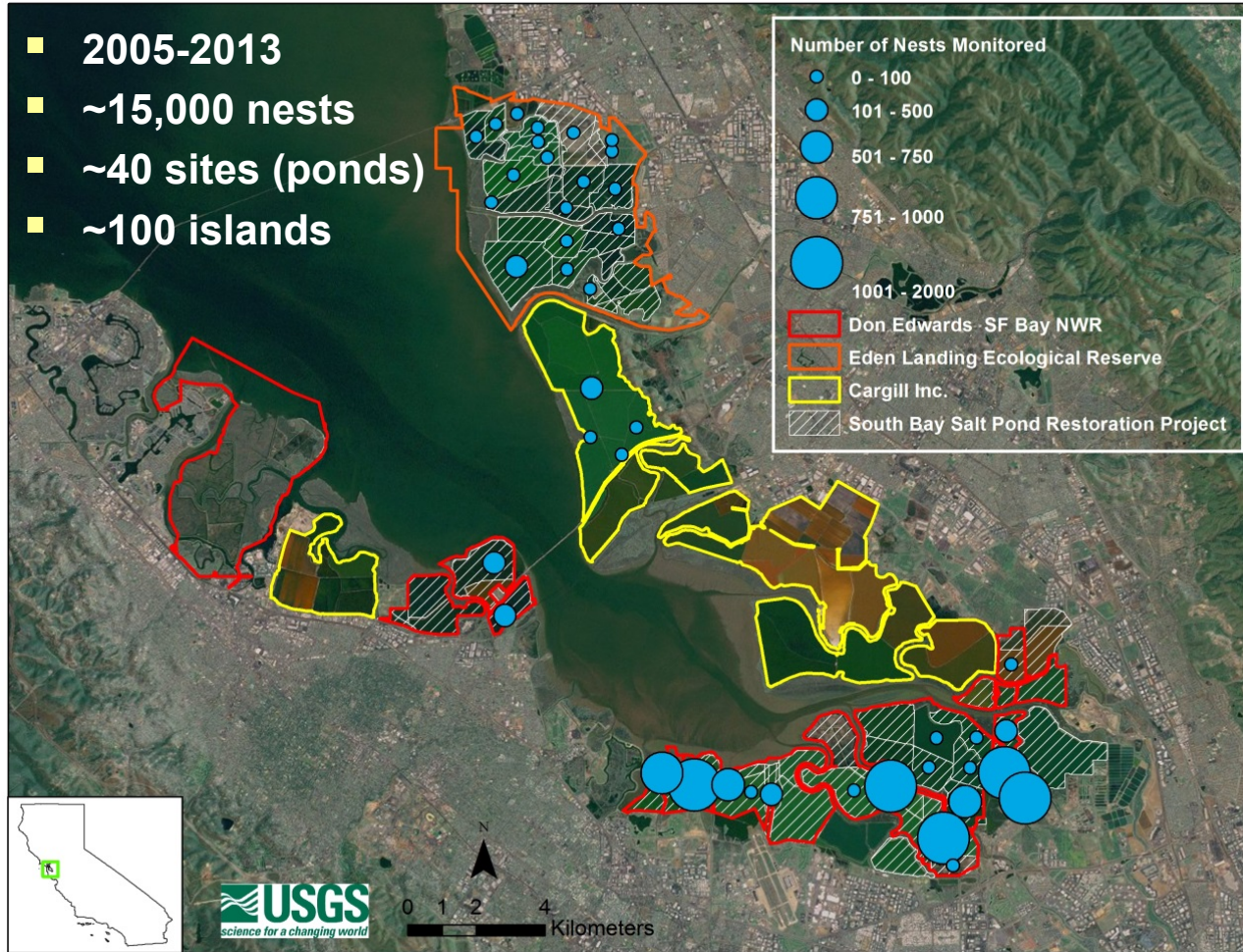
USGS

Most Nests Are On Islands

What Makes Good Island Nesting Habitat?

- Which ponds support nesting waterbirds
- How many islands within a pond
- Location of islands within a pond
- Island size and shape
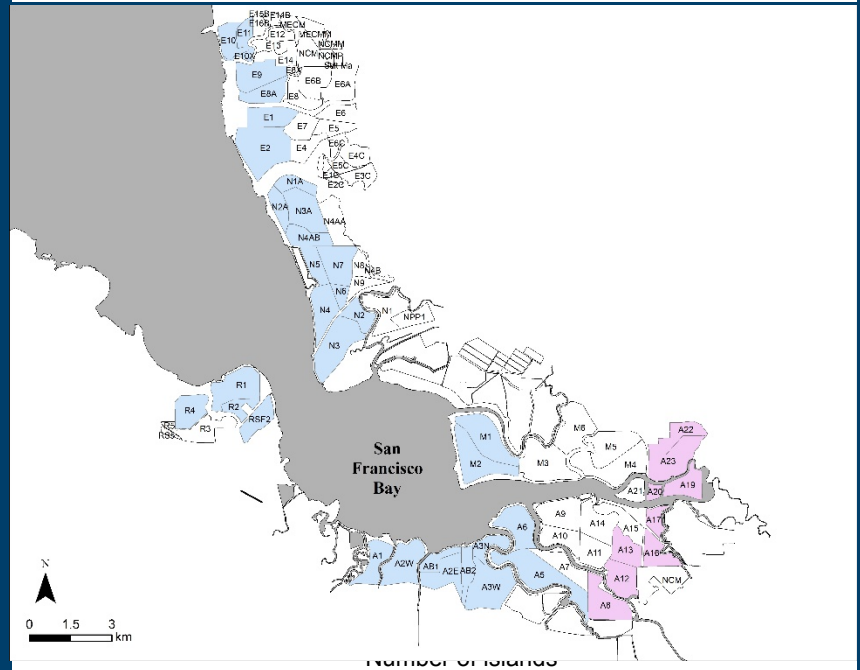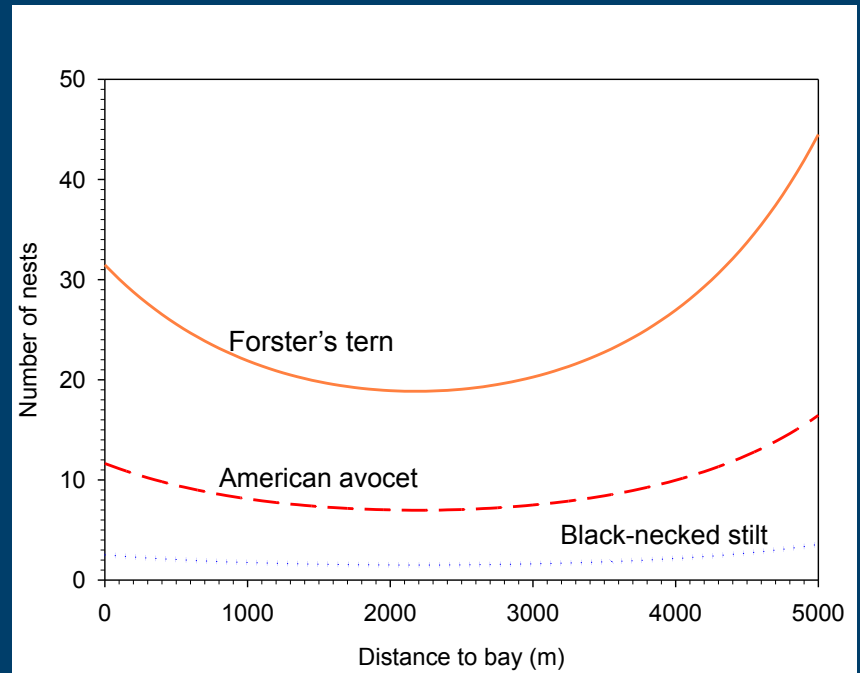- Topography
- Elevation
- Vegetation

C. Benton

≋ USGS
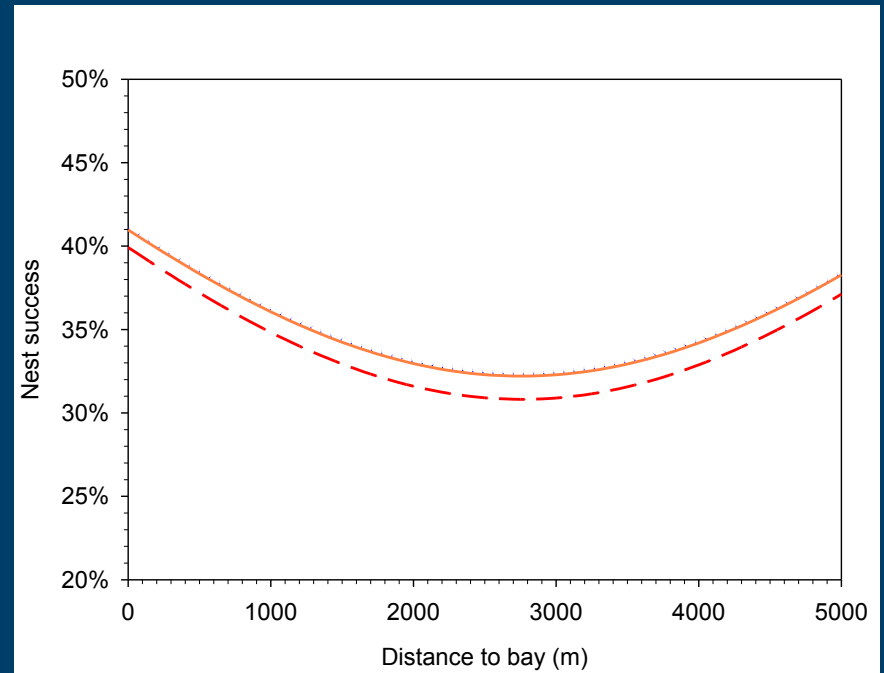
Historic Nest Monitoring Dataset

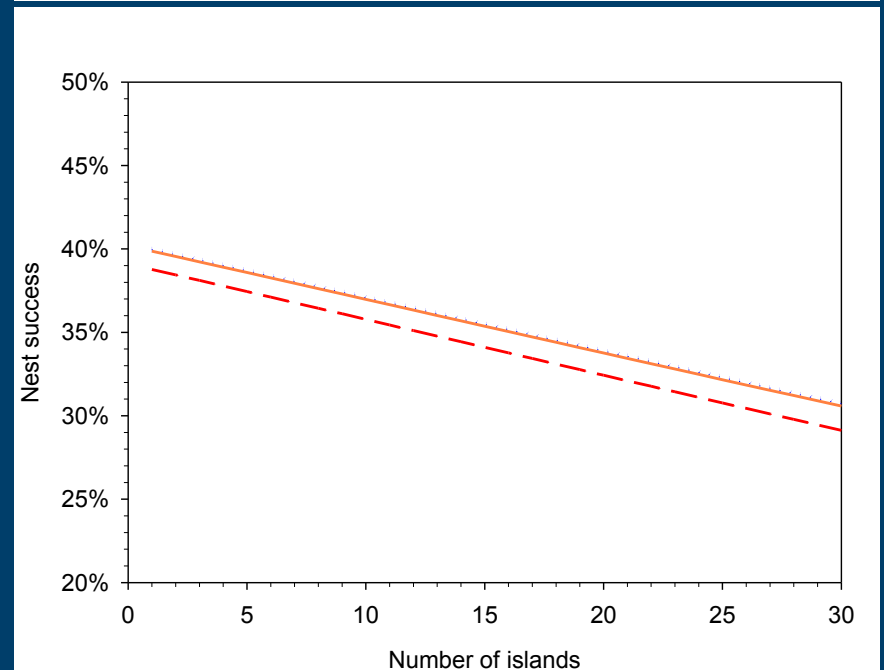- Ponds less than 1 km and 4-5 km from SF Bay had the most nests

- Ponds with fewer than 10 islands had the most nests

USGS

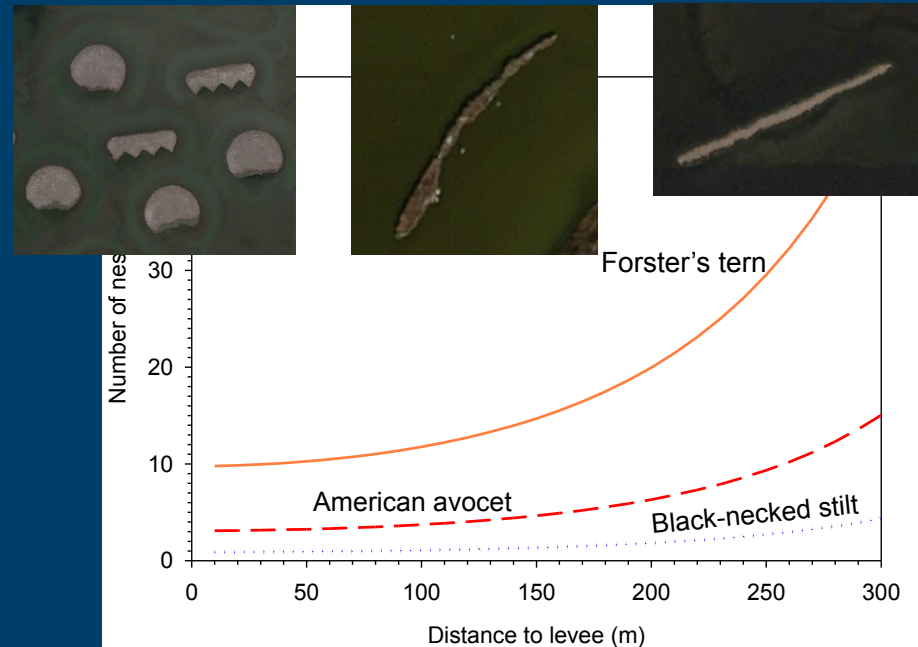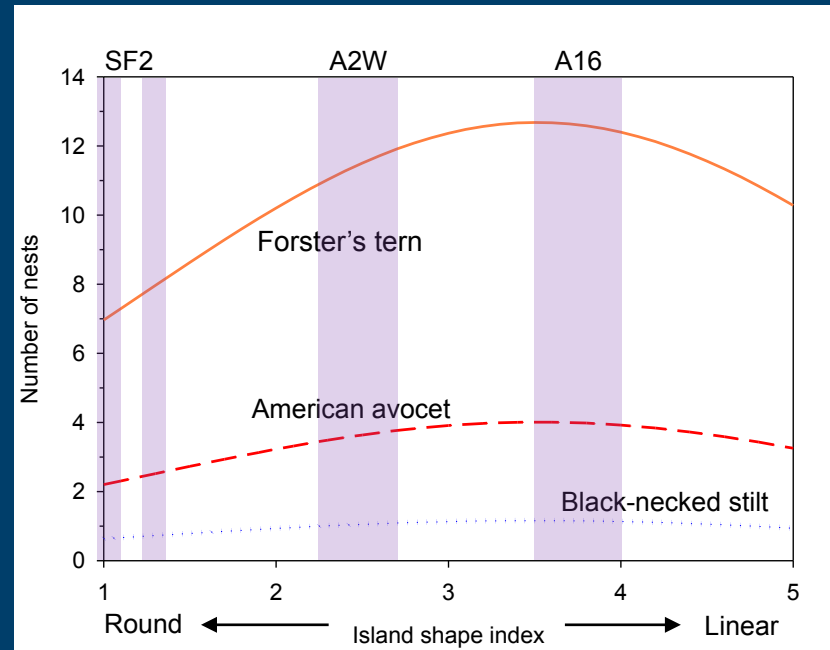- Ponds less than 1 km and 4-5 km from SF Bay had the highest nest success

- Nest success declined with number of nests within a pond

- Elongated, linear islands had the most nests

- Islands further from pond levees had more nests

USGS

Recipe for Island Nesting Habitat

- Target ponds close to or far from SF Bay
- Spread out islands among <u>more</u> ponds: 3-5 islands per pond, 30 built in SF2
- Linear islands better than round islands
- Place islands away from levee boundaries
- Small- to medium-sized islands (<2 ha)

Island Topography 2011-2012

- Real-time kinematic (RTK) GPS (~3cm accuracy)
- Resource Selection Probability Functions: Logistic Regression
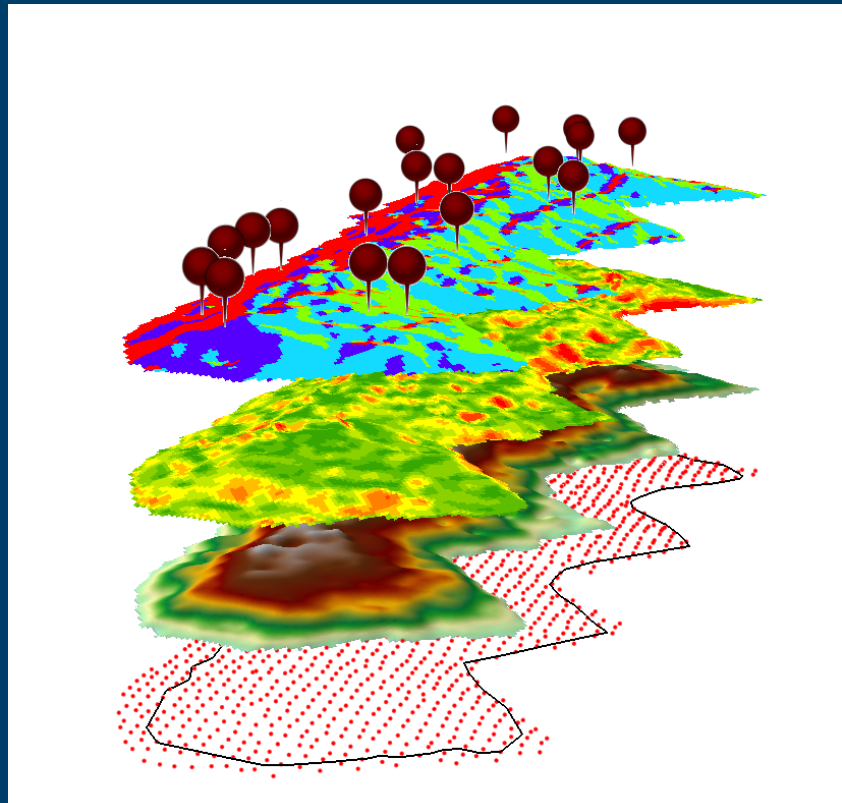
Nest locations

Aspect

Slope

Elevation

GPS points

Island outline

USGS

Recipe for Island Nesting Habitat

- Target ponds close to or far from SF Bay
- Spread out islands among <u>more</u> ponds: 3-5 islands per pond, 30 built in SF2
- Linear islands better than round islands
- Place islands away from levee boundaries
- Small- to medium-sized islands (<2 ha)
- Abundant area 0.5 – 1.5 m above water surface
- Abundant area close to water's edge–Linear islands
- Mosaic of slopes—flat to moderate slope (15°)
- Sparse to dense, low vegetation

Caspian Tern Nesting Islands

- 5 islands (2 in Pond A16, 3 in Pond SF2)
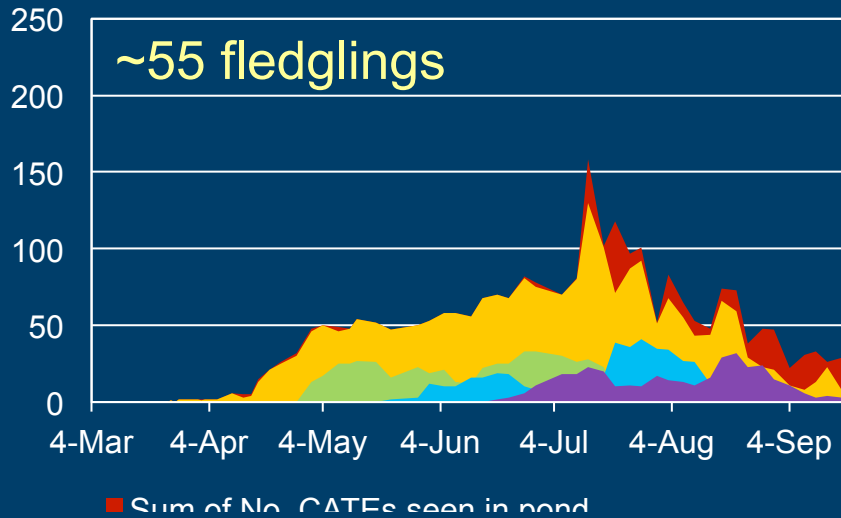- 10,000 yards^3 of pea-gravel

USGS
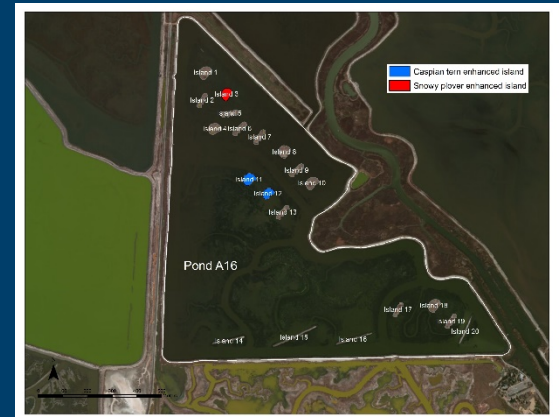
Caspian Tern Social Attraction

- 50-150 tern decoys on each island
- Sound system
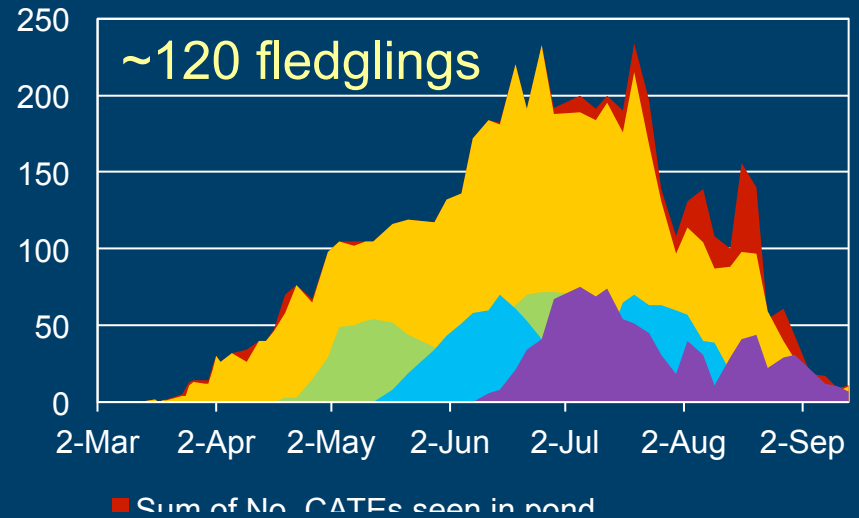- Broadcast Caspian tern colony sounds March-September

USGS

Caspian Tern Social Attraction


Pond A16

~55 fledglings

Pond SF2

~120 fledglings

Legend:
- Number of terns in pond
- Number of terns on modified islands
- Number of tern nests
- Number of tern chicks
- Number of tern fledglings

USGS

Will breeding birds be affected by the restoration?

- Depend on the quantity and quality of breeding habitat
  - Island designs that promote high nest abundance and nest success
- <u>Monitoring and adaptive management critical</u>
  - Nesting response to island creation, enhancements
  - Population surveys

USGS
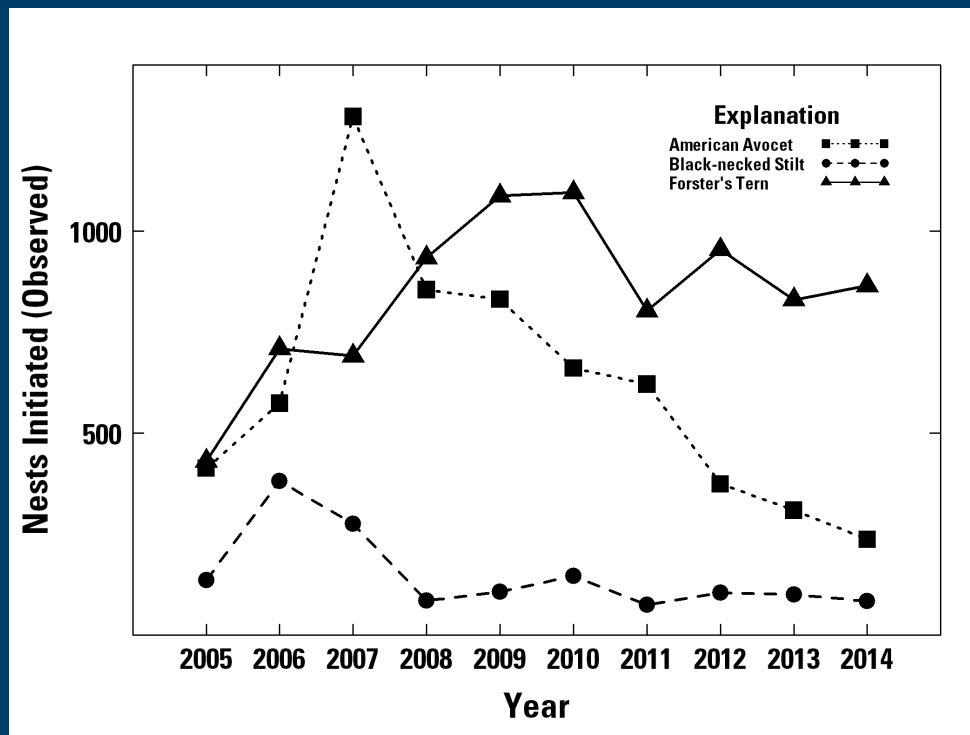
Acknowledgments

Funding

- US Army Corps of Engineers
- Resources Legacy Fund
- Coastal Conservancy
- CALFED Ecosystem Restoration Program
- US Geological Survey
- South Bay Salt Pond Restoration Project

Support

- Don Edwards San Francisco Bay National Wildlife Refuge
- South Bay Salt Pond Restoration Project
- Eden Landing Ecological Reserve
- San Francisco Bay Bird Observatory

Fieldwork

- Many, many technicians

Contact: chartman@usgs.gov

≋ USGS