

Waterbird Nesting Ecology and Management in San Francisco Bay



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U.S. Geological Survey

(October 11, 2017)

Outline

Wetland Management for Nesting Waterbirds

- 1) Some nesting waterbird populations are declining
- 2) High use of islands as nesting habitat
- 3) Construction and management of island nesting habitat
- 4) Social attraction techniques to establish nesting colonies
- 5) Predatory gull populations are increasing and gulls depredate eggs and chicks

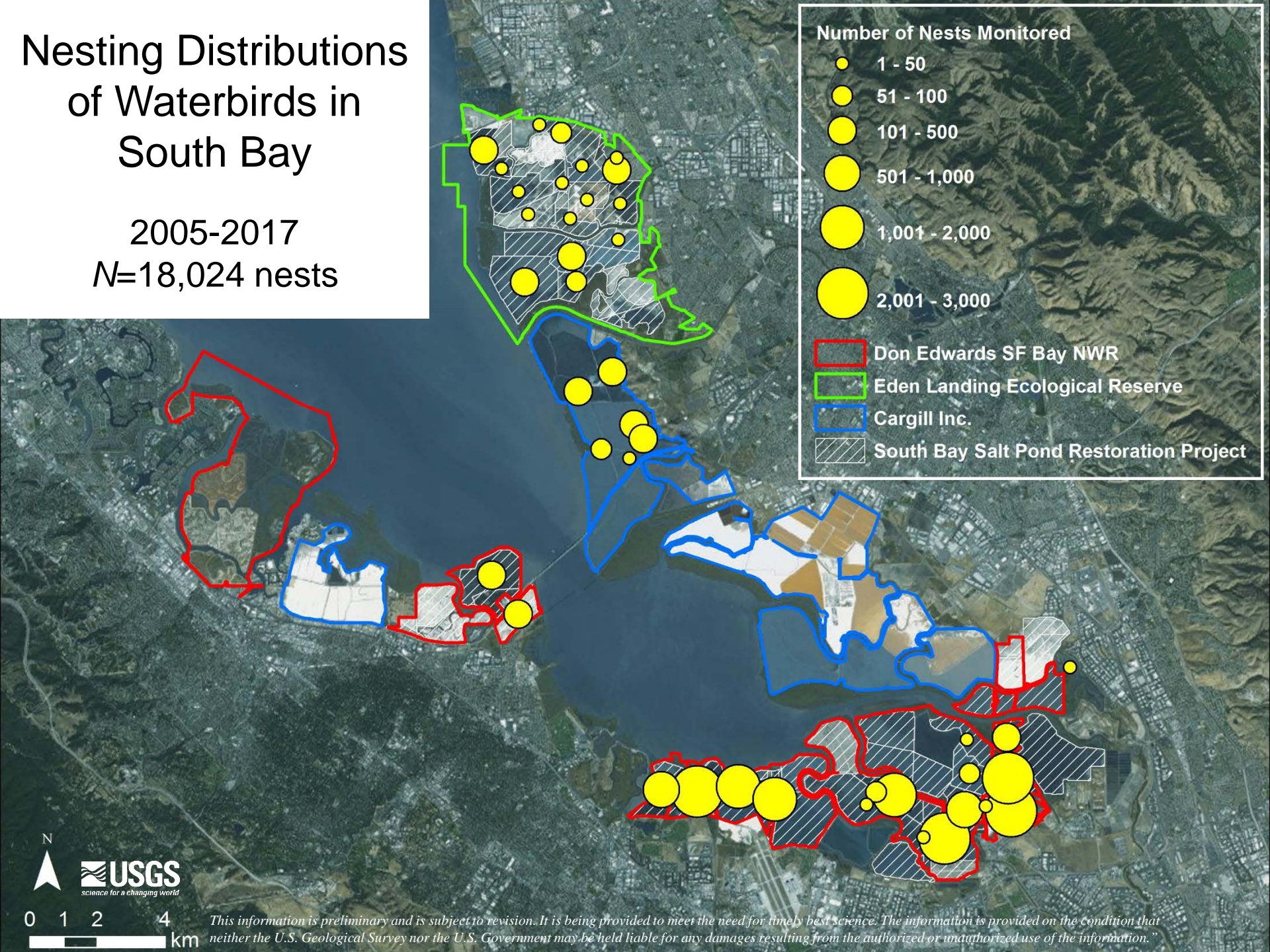
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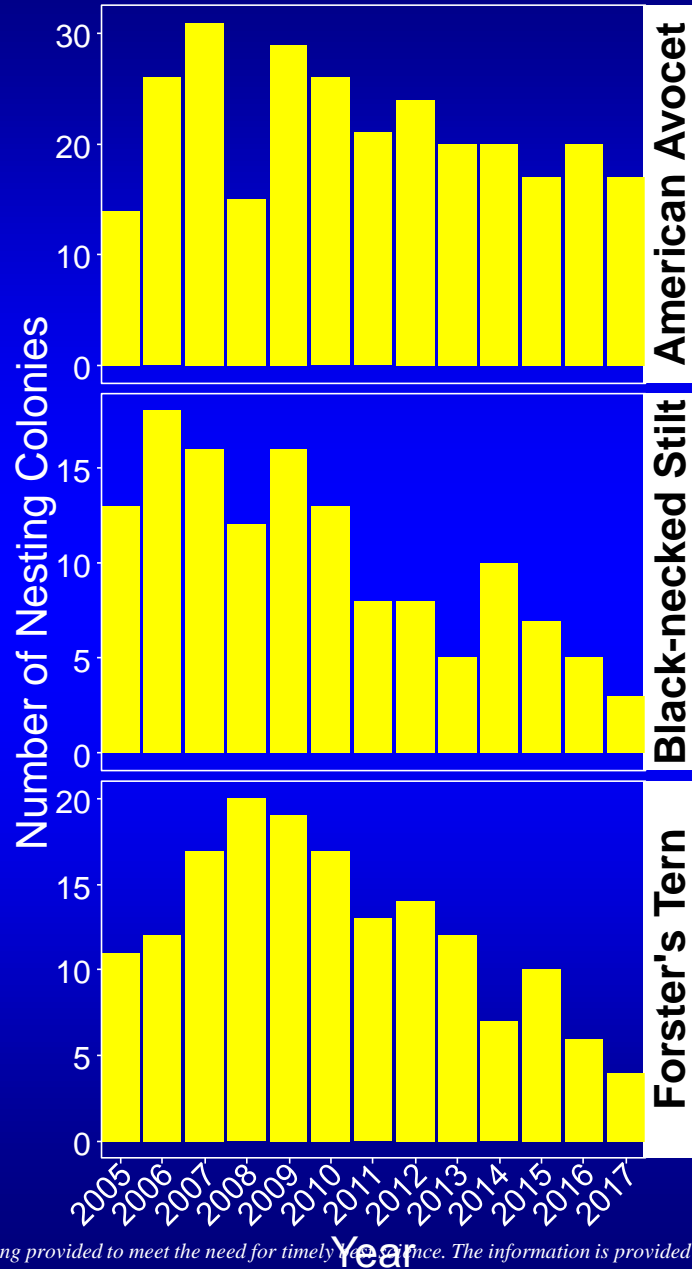
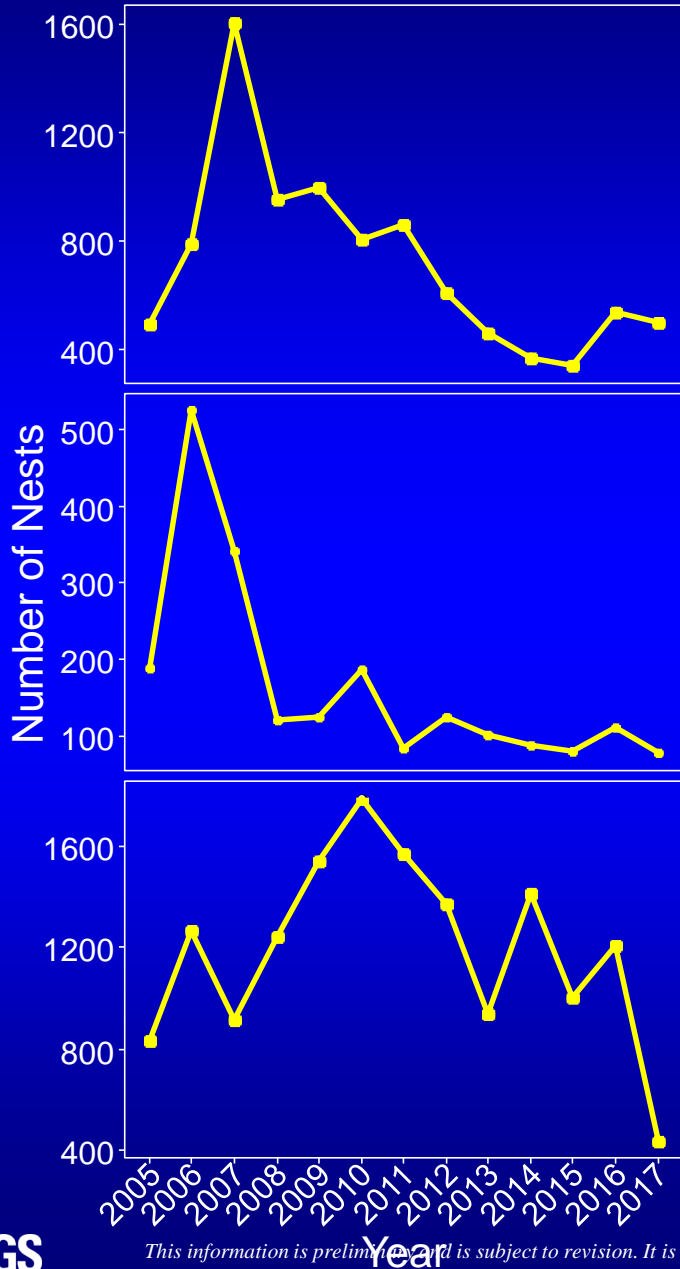
Nesting Distributions of Waterbirds in South Bay

2005-2017
N=18,024 nests

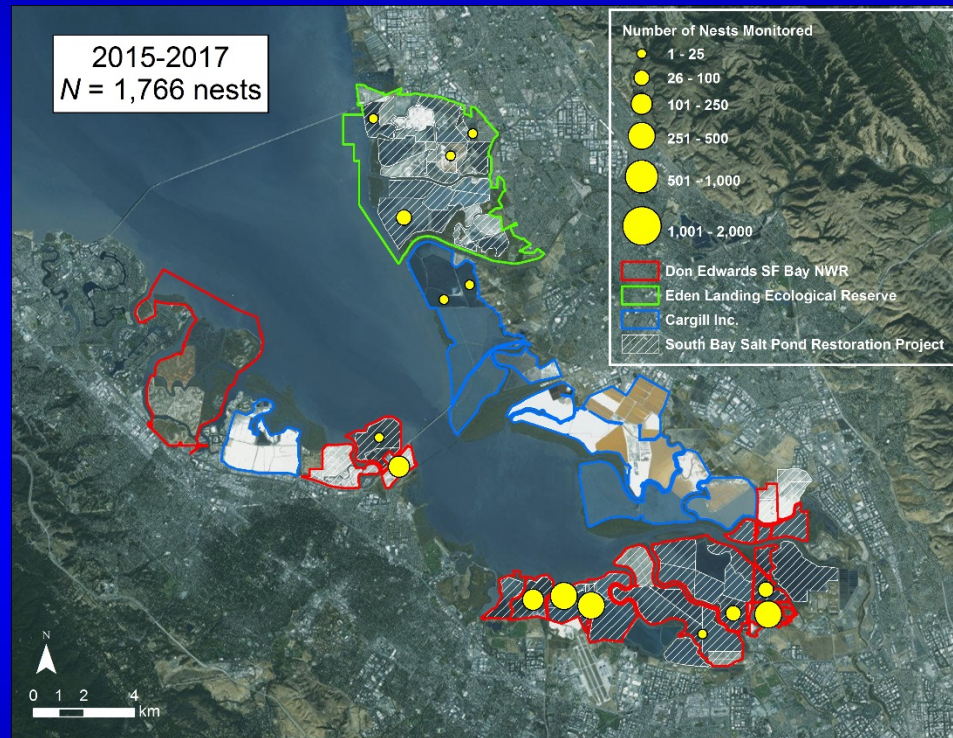
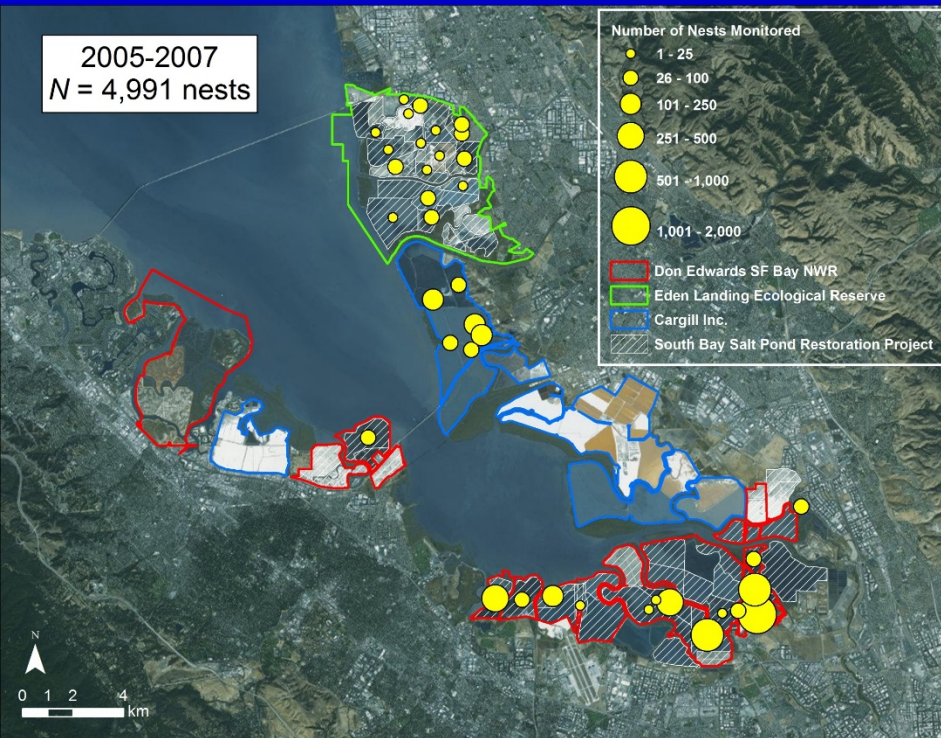


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Declining Populations & Colony Numbers in SF Bay



Fewer Nests in Fewer Places

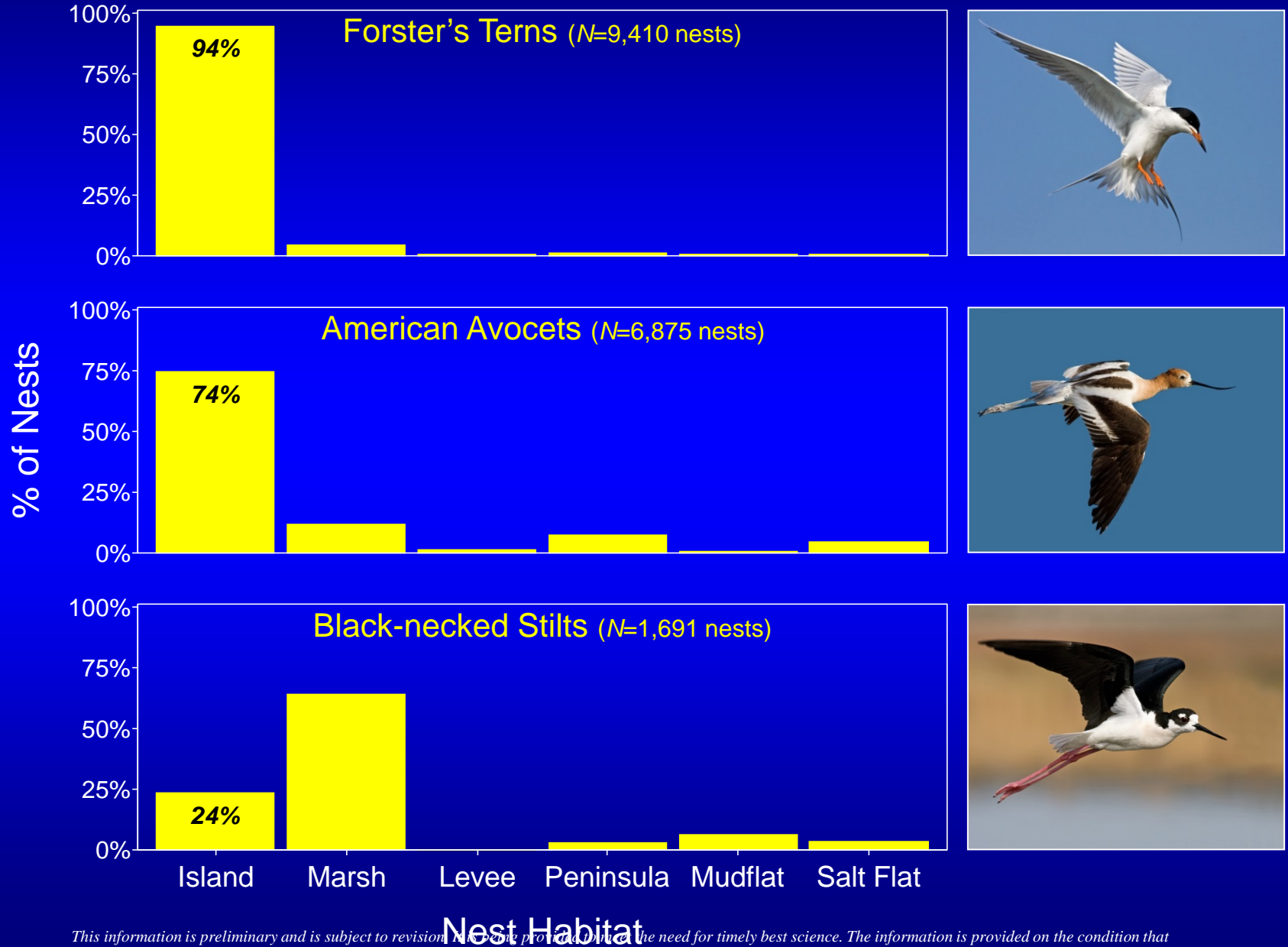


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Nests Are On Islands In Managed Ponds

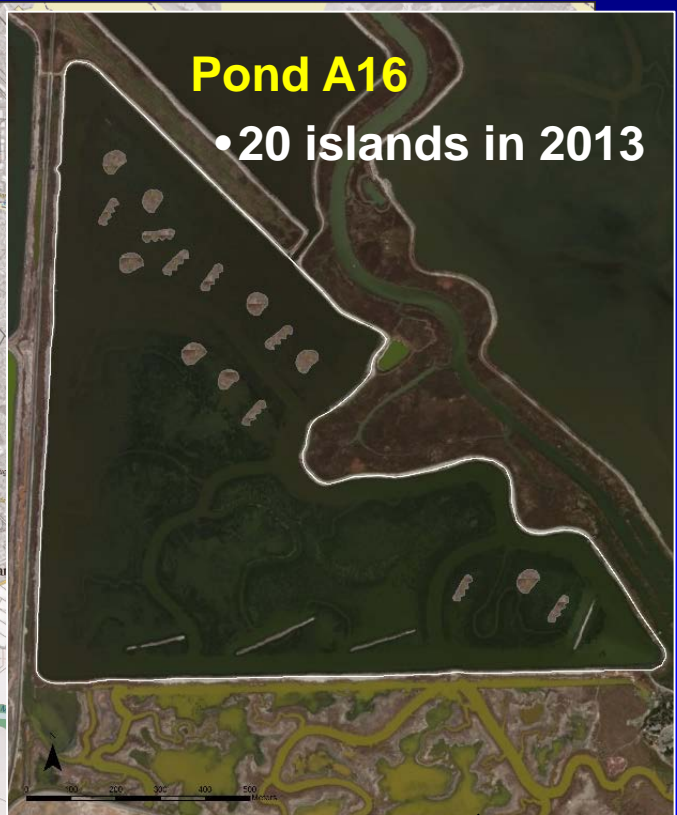
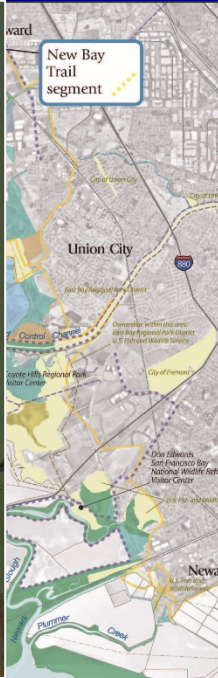


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South Bay Salt Pond Restoration Project



Initial Restoration Actions

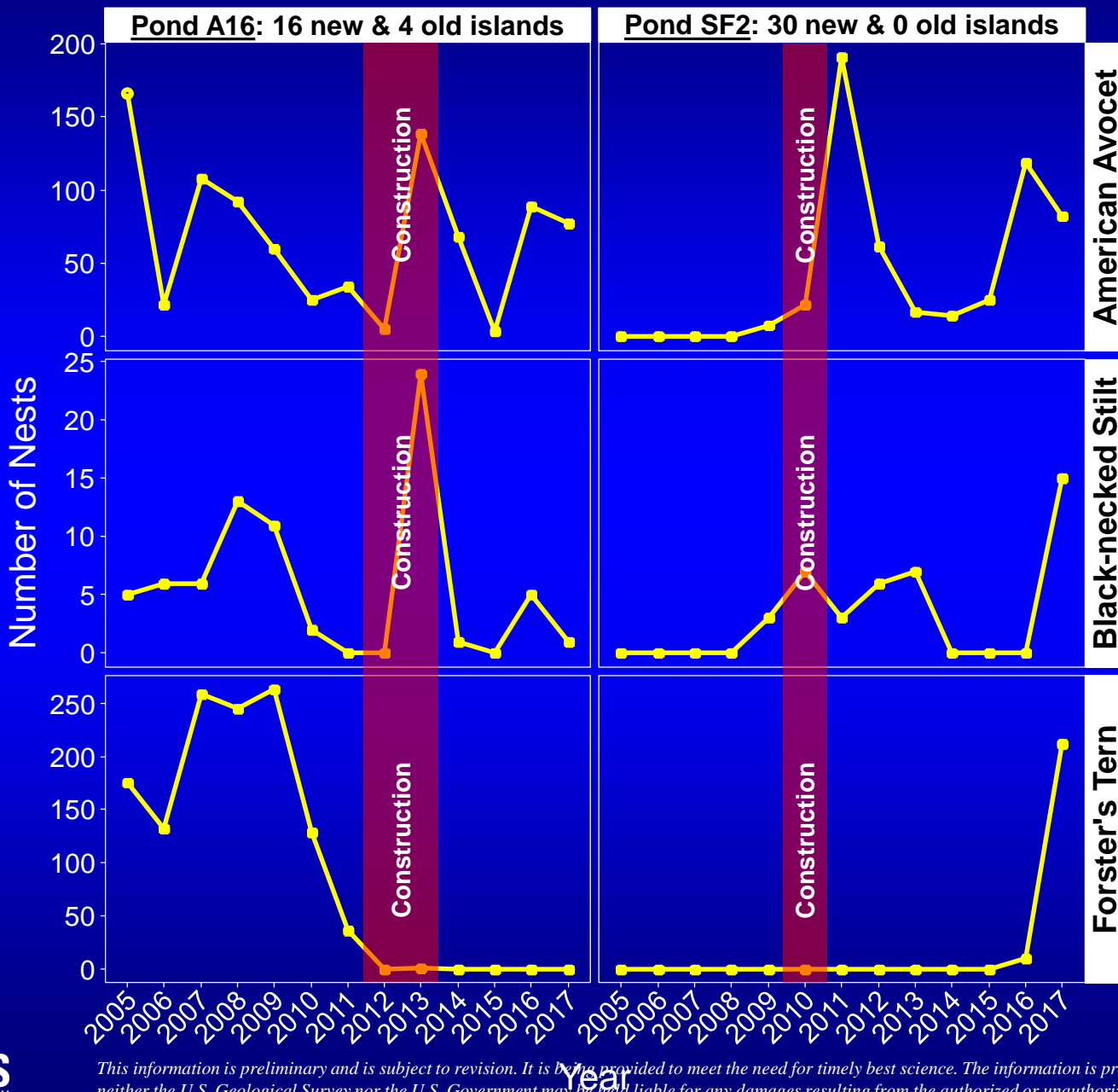
South Bay Salt Pond Restoration Project

2006 - 08 SBSP Phase 1

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Nesting Islands Constructed in Managed Ponds



American Avocet



Black-necked Stilt



Forster's Tern

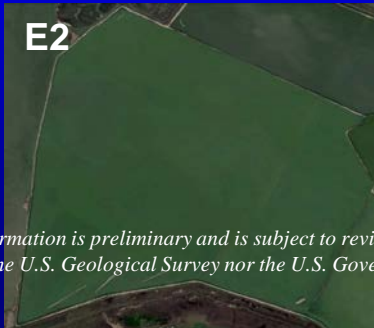
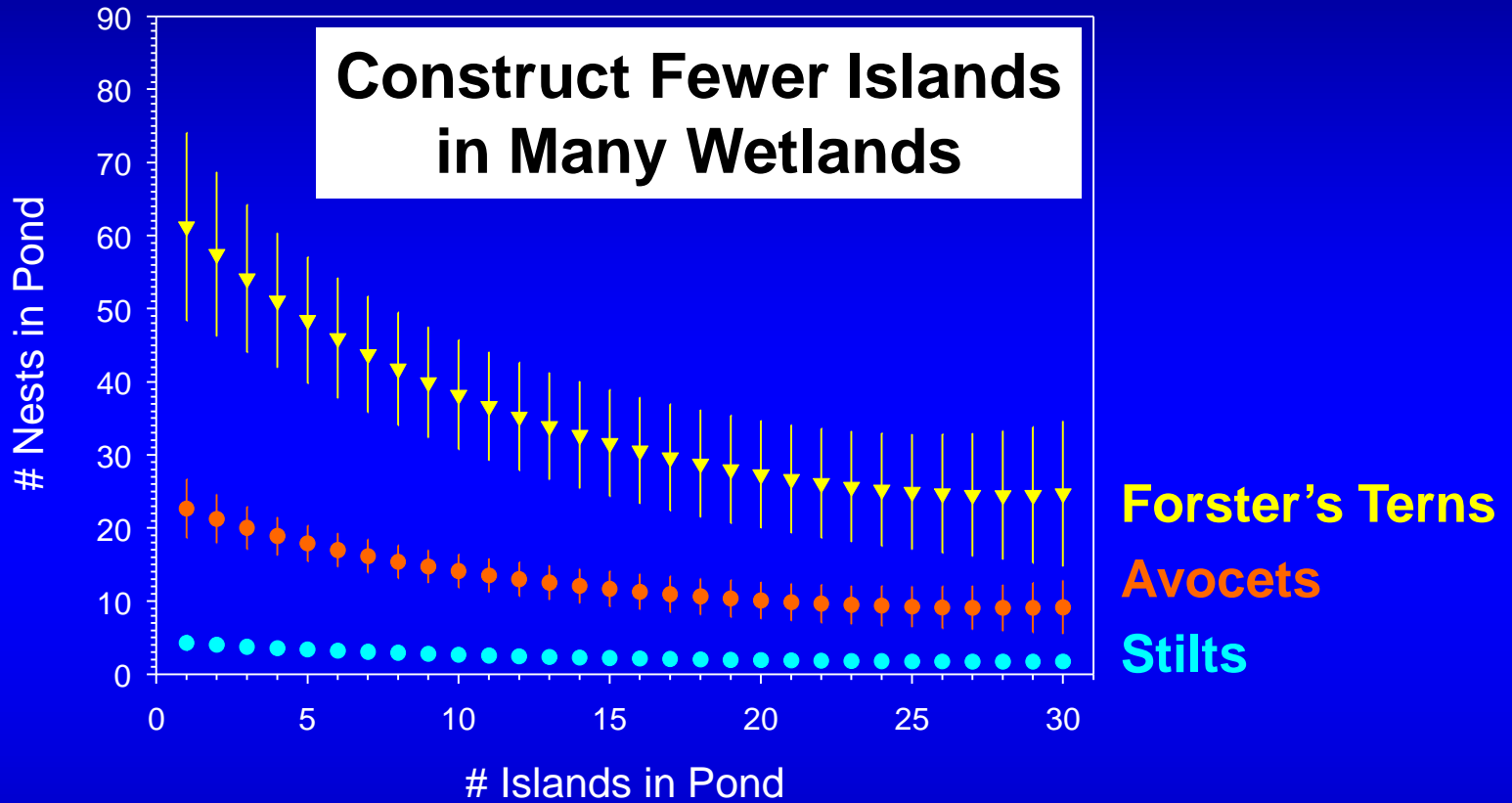
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Constructing Island Nesting Habitat

- 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?



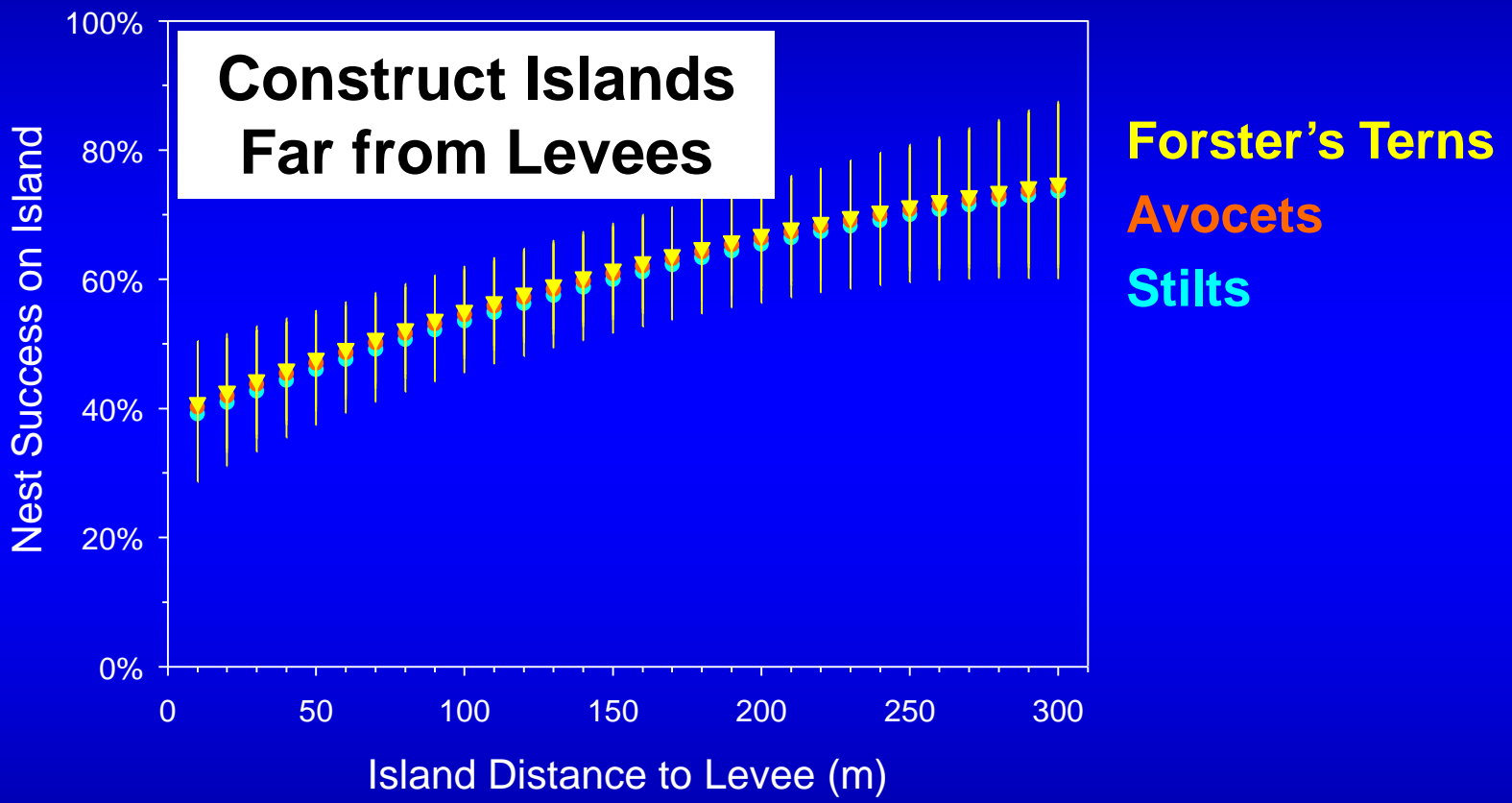
Number of Nesting Islands Within Wetlands



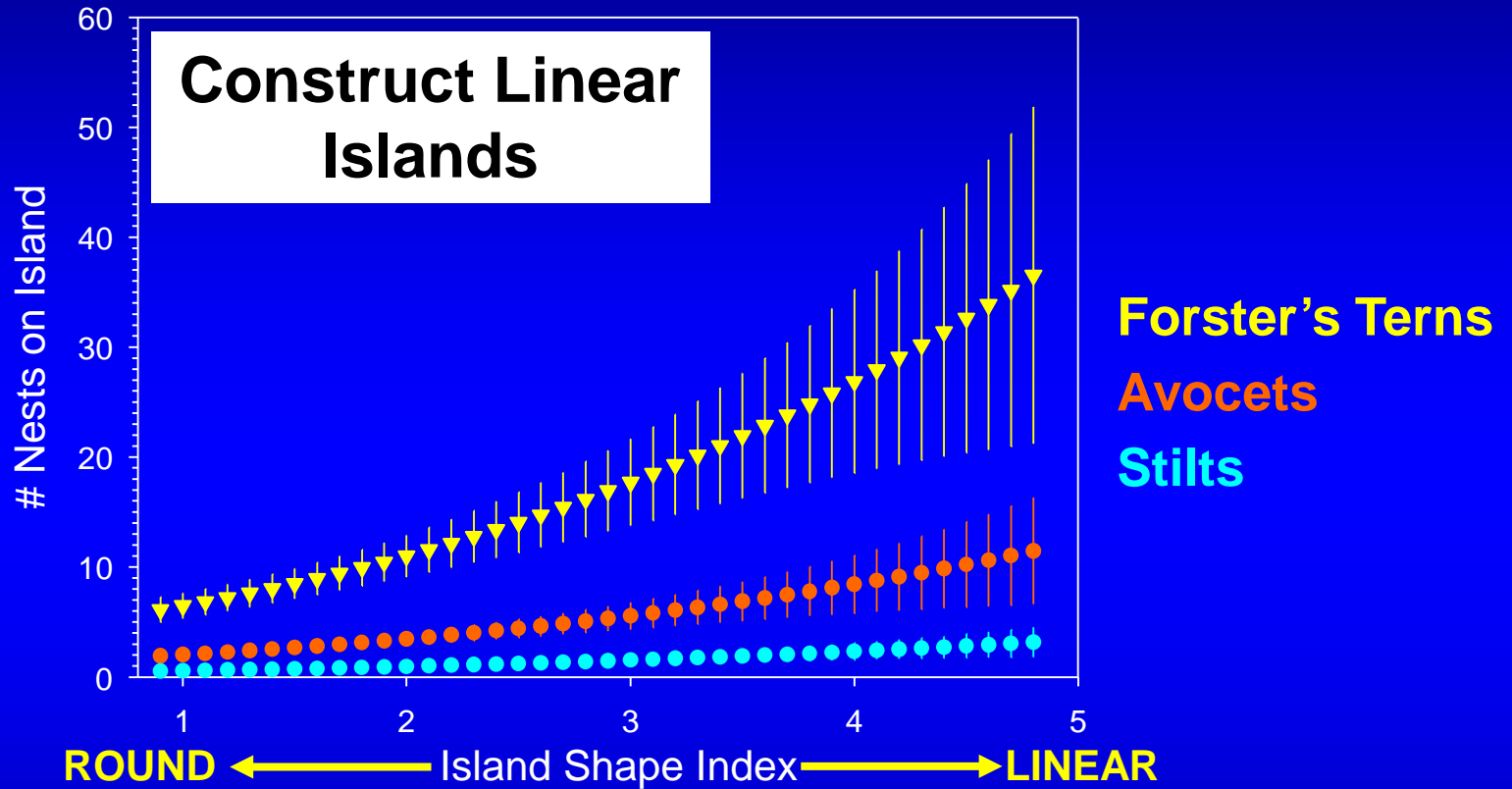
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Hartman et al. 2016 *Journal of Wildlife Management* 80:1177-1188

Nesting Island Location Within Wetlands



Nesting Island Shape



Constructing Island Nesting Habitat

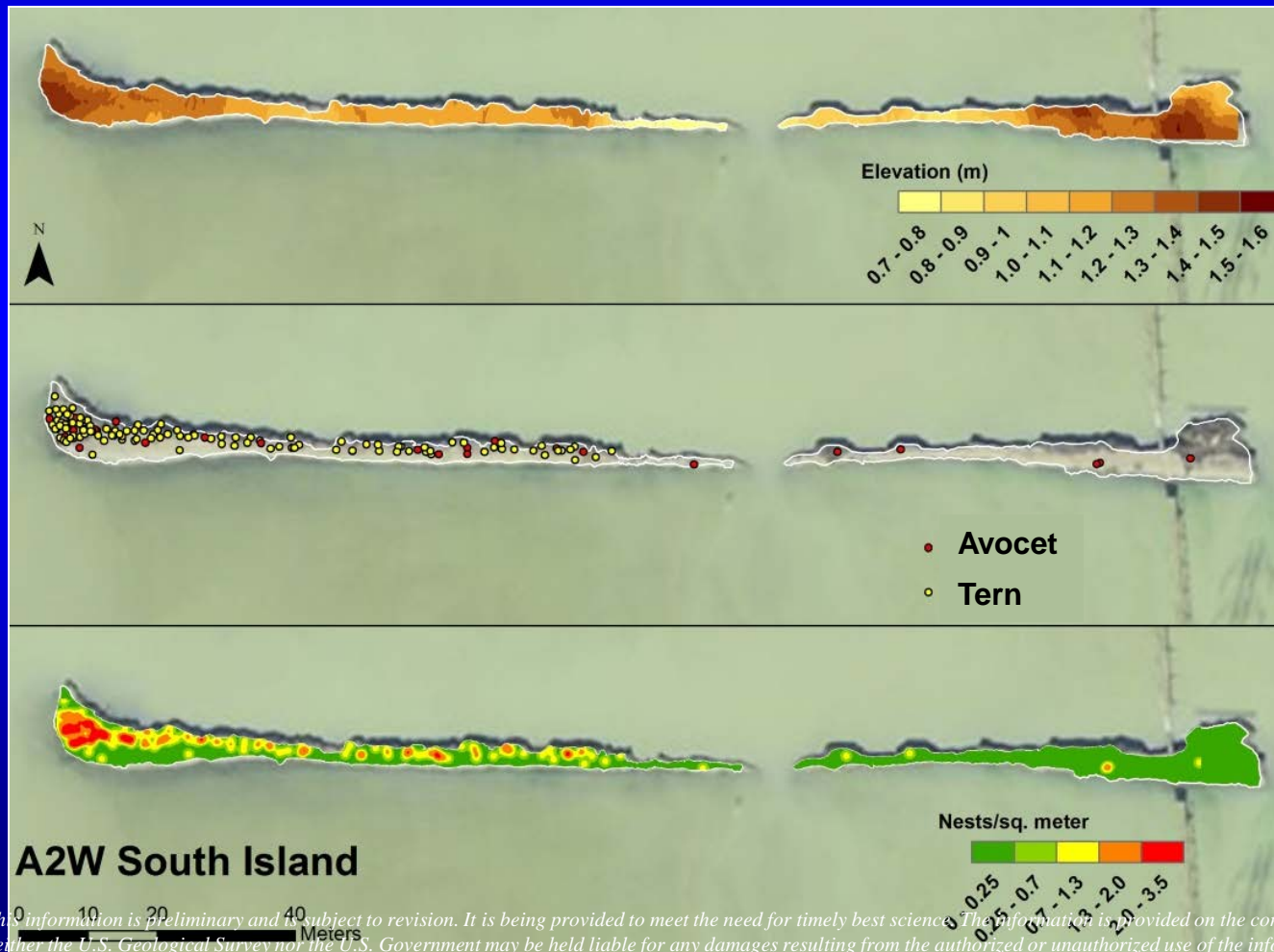
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Island Topography & Nest Site Selection

Real-time kinetics (RTK) GPS (1cm accuracy)

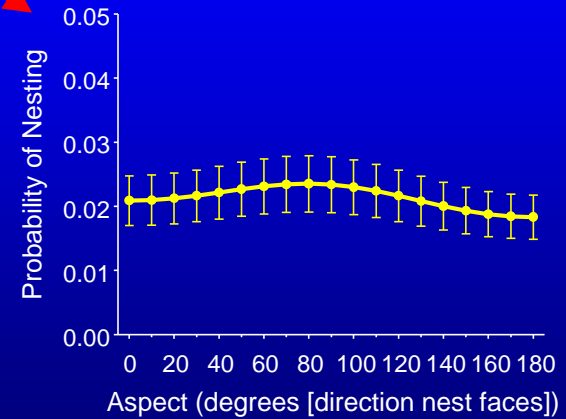
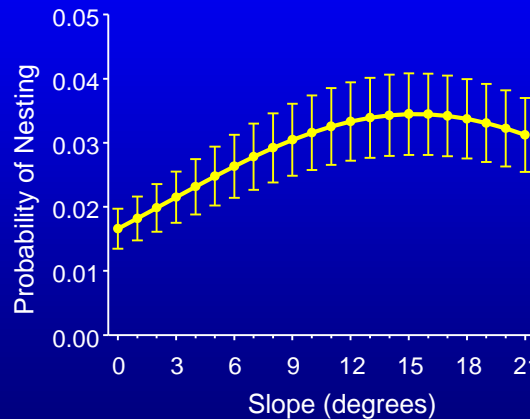
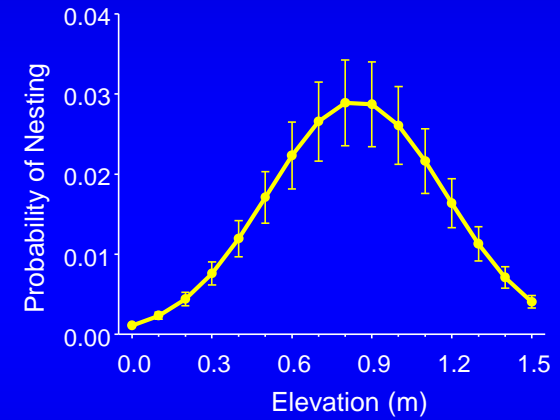
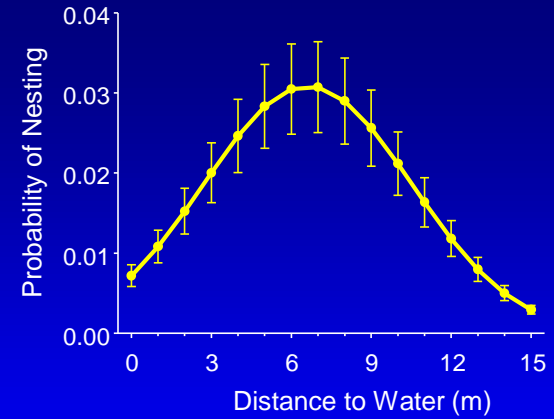
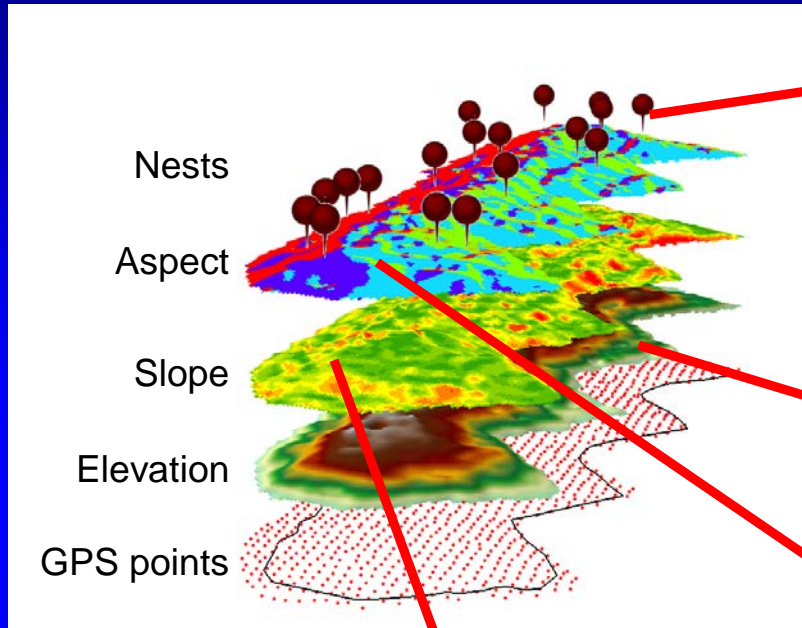
- Topography of 30 nesting islands
- Locations of >1,600 nests on islands



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Nest Site Location on Islands

(Avocets)



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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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Caspian Tern Social Attraction Islands

Pond SF2



 Caspian tern islands

Pond A16



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Caspian Tern Social Attraction

- 5 islands (2 in Pond A16, 3 in Pond SF2)
- Enhanced substrate: 10,000 yards³ of $\frac{3}{8}$ " pea-gravel
- 50-150 tern decoys on each island
- Sound system broadcasting colony sounds March-September

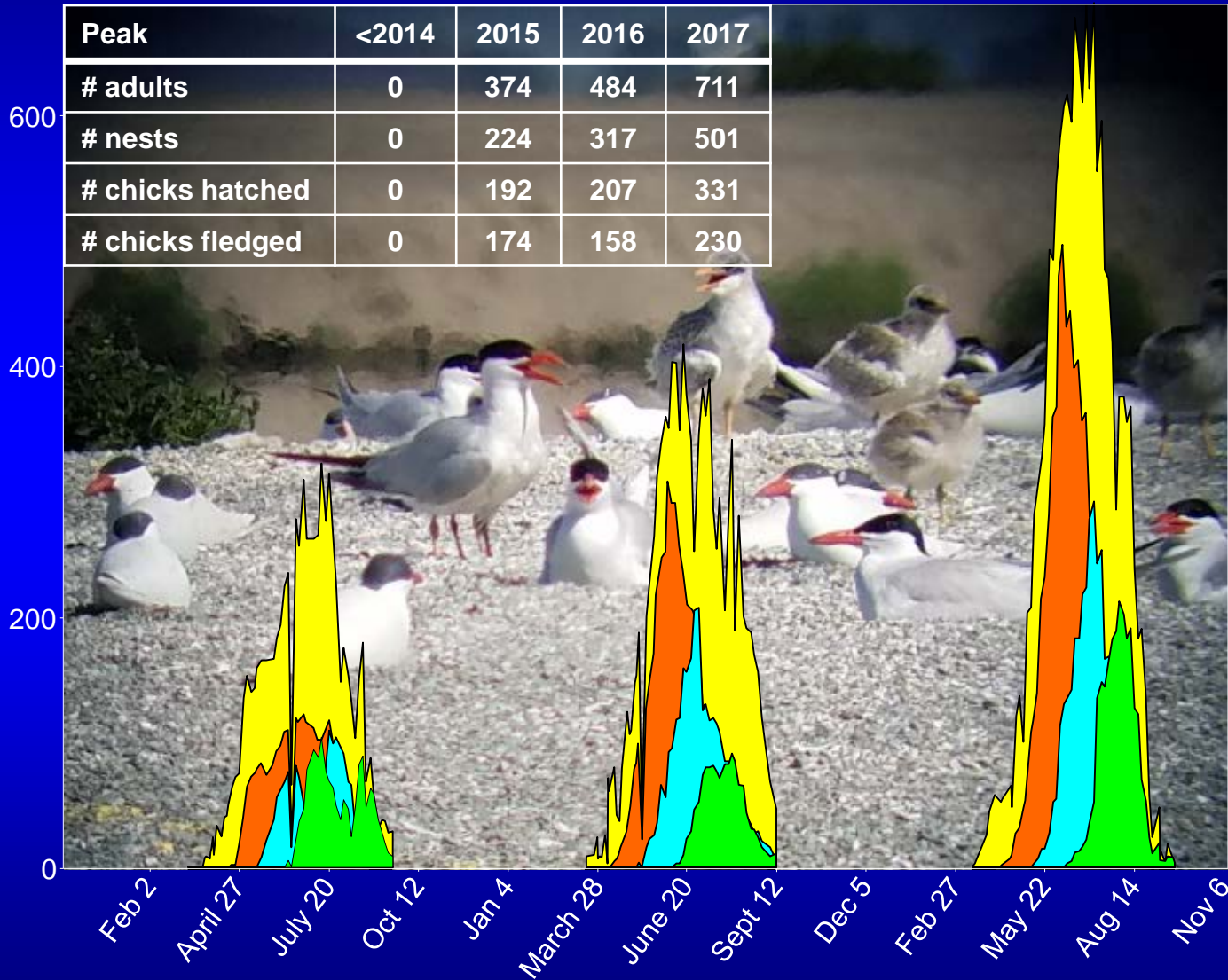


Caspian Tern Social Attraction

ADULTS **NESTS** **CHICKS** **FLEDGED**

Peak	<2014	2015	2016	2017
# adults	0	374	484	711
# nests	0	224	317	501
# chicks hatched	0	192	207	331
# chicks fledged	0	174	158	230

Number of Caspian Terns



2015 **2016** **2017**

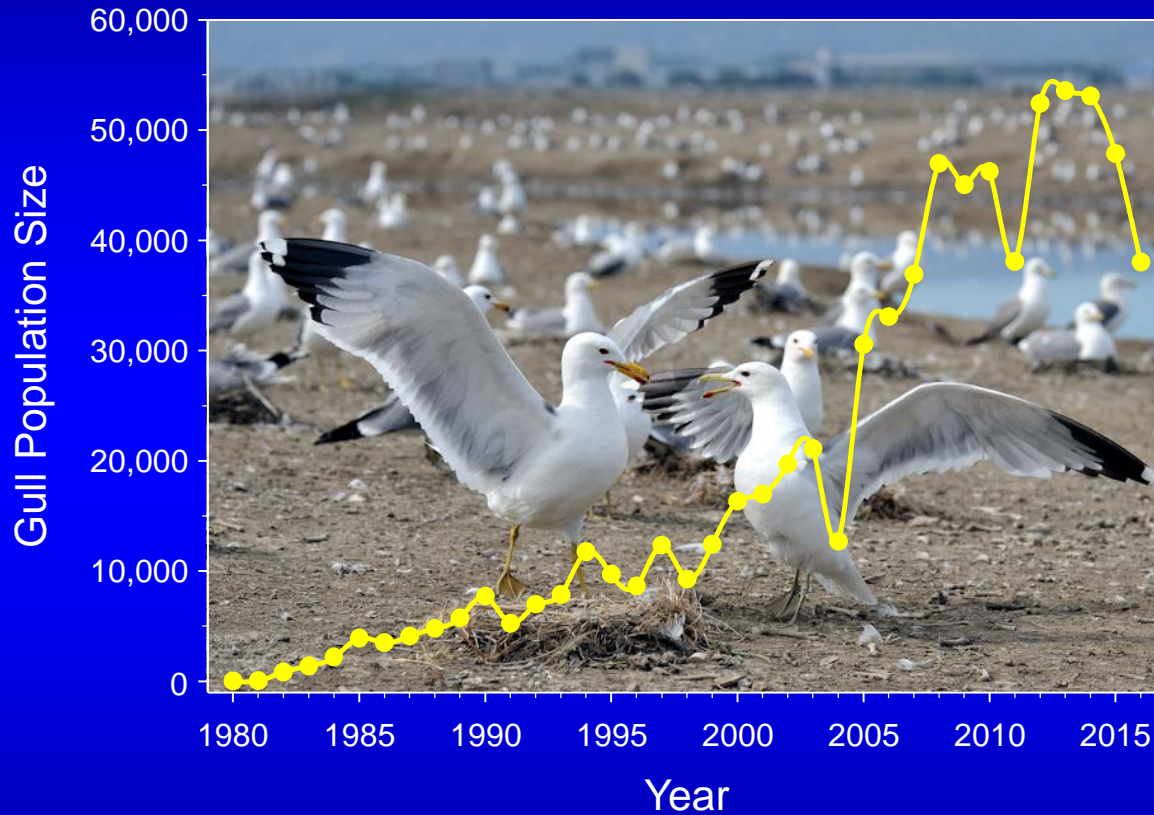
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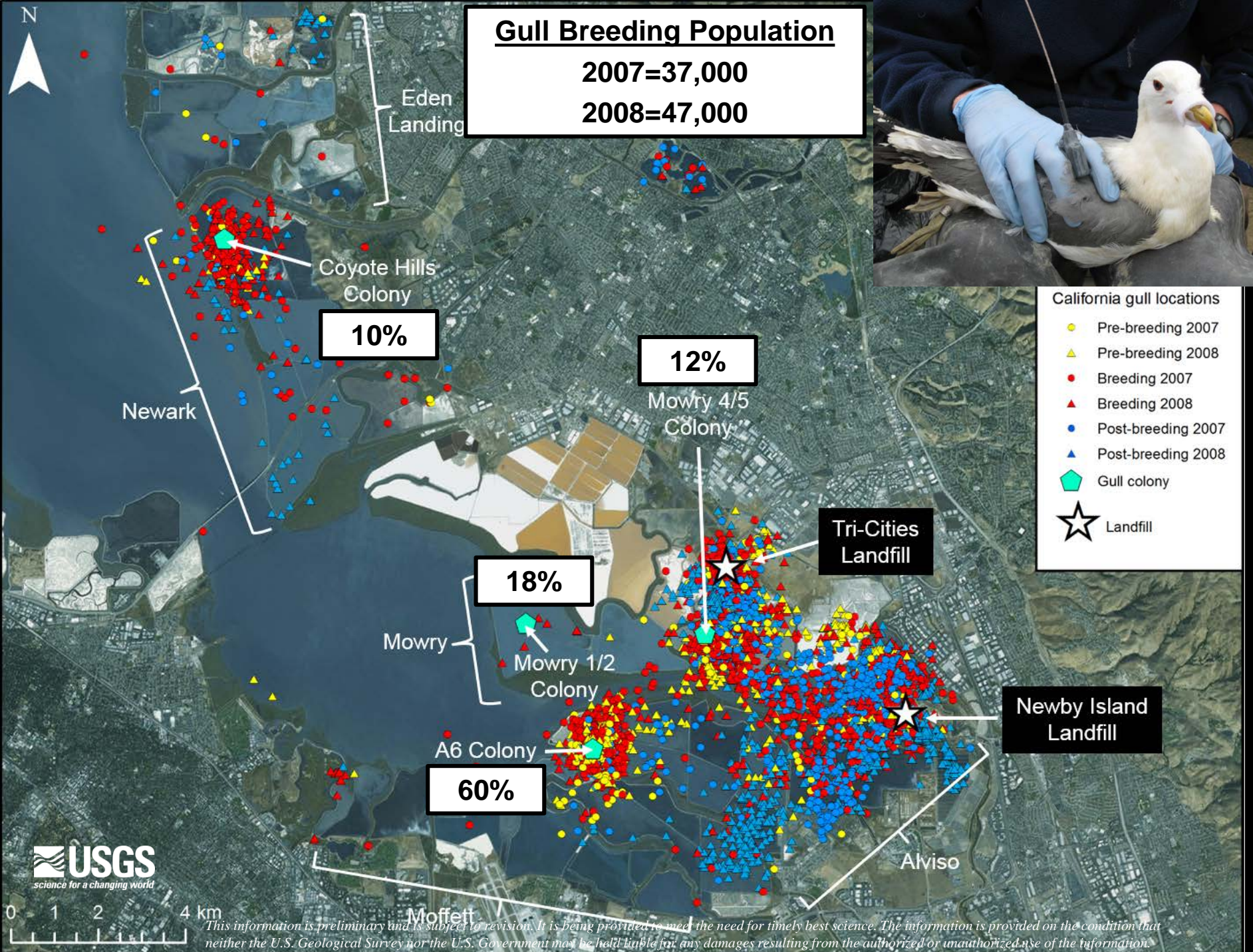
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California Gull Breeding Population Growth in San Francisco Bay



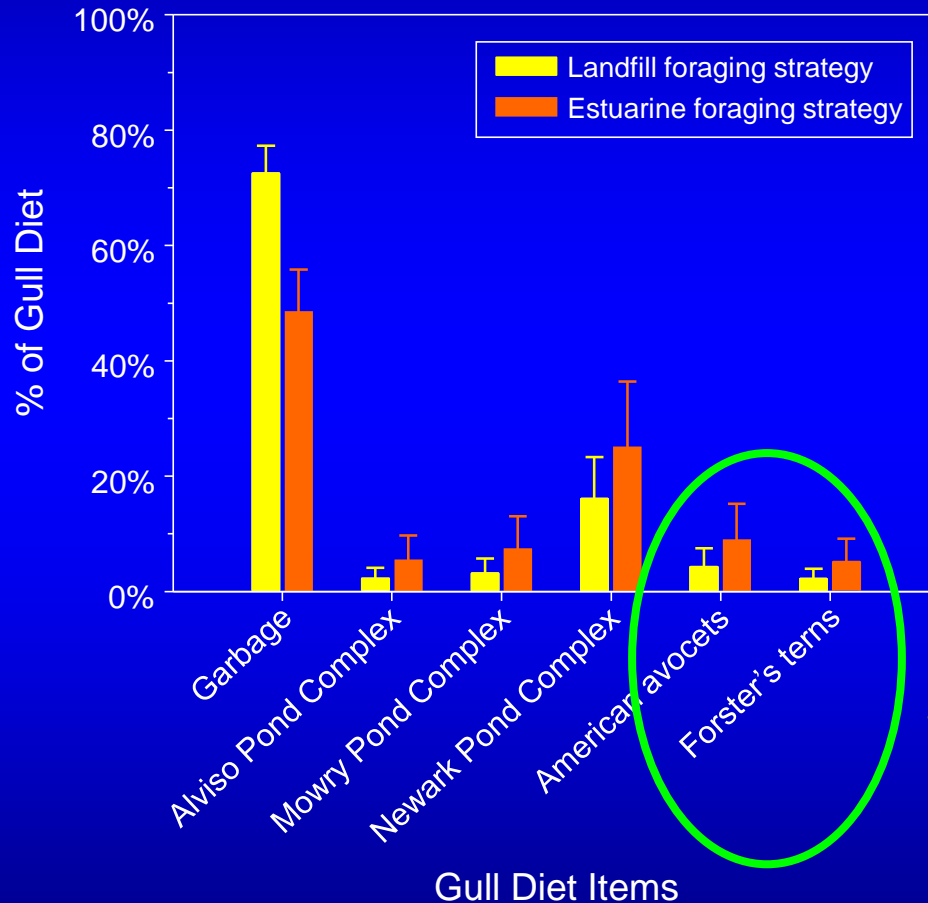
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Burns, CE, JT Ackerman, N Washburn, J Bluso-Demers, C Robinson-Nilsen, and C Strong. 2018. Three decades of California gull population growth and ecological impacts in the San Francisco Bay Estuary. *Studies of Western Birds* in press.



Gull Diet in San Francisco Bay

(based on stable isotope analysis)



Individual gulls will specialize on prey;
1 gull killed ≥ 11 tern chicks

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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



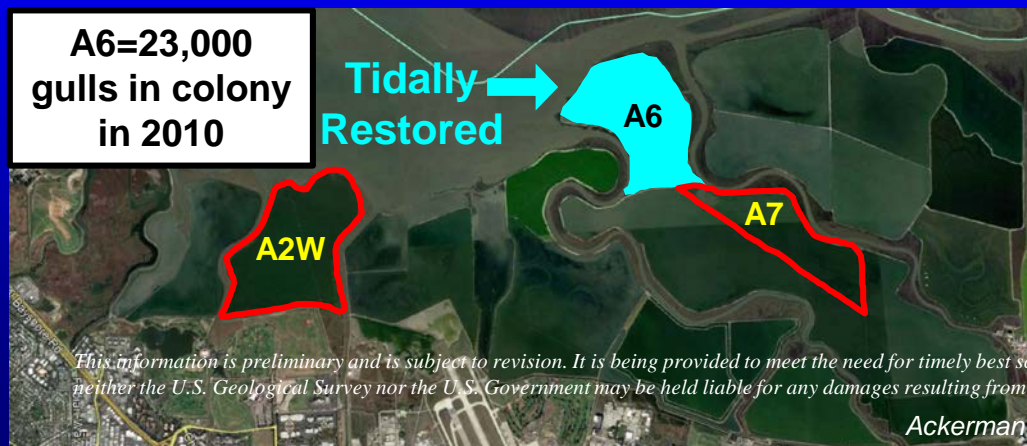
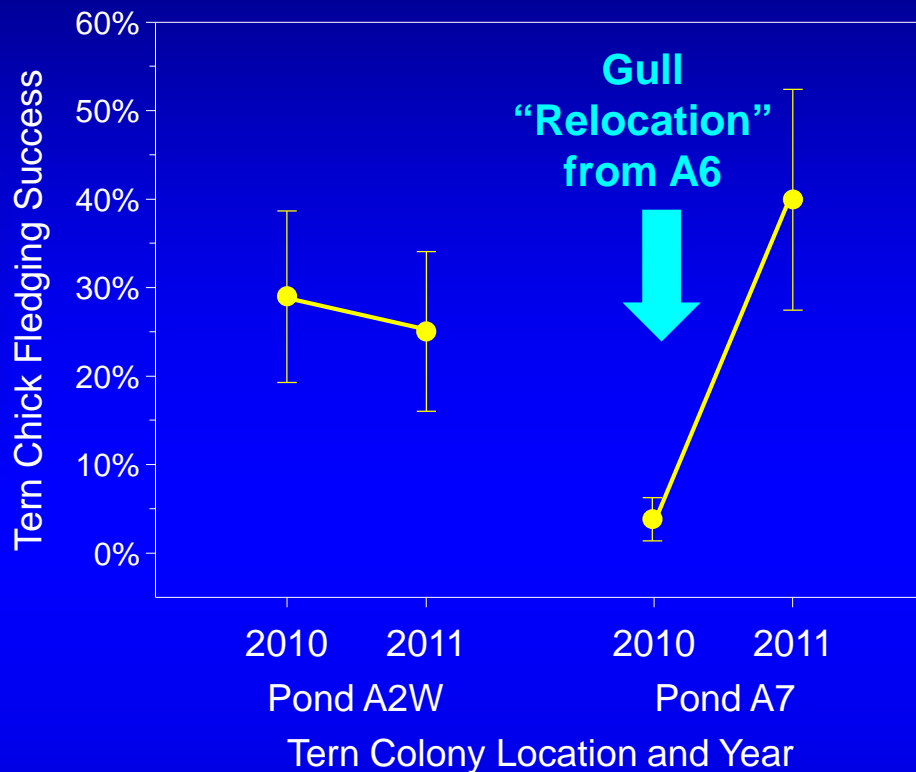
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Ackerman et al. 2014 *Journal of Wildlife Management* 78:818-829

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

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

900% Increase in Tern Chick Survival at Pond A7 after Gull Colony Relocation



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Conclusions

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Acknowledgments



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- South Bay Salt Pond Restoration Project
- Don Edwards San Francisco Bay National Wildlife Refuge
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- Ca. Dept. Fish and Wildlife
- San Francisco Bay Bird Observatory
- California Coastal Conservancy
- Resources Legacy Fund
- U.S. Army Corps of Engineers
- Santa Clara Valley Water District
- CALFED Ecosystem Restoration Program

Photos by:

- Ken Phenicie, Michael Kern, Abe Borker, and Crystal Shore

Contact

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