

# Reproductive Ecology of Waterbirds for the South Bay Salt Pond Restoration Project

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Photo by Ken Phenicie

# Acknowledgements



Don Edwards San Francisco Bay  
National Wildlife Refuge



RESOURCES LEGACY FUND

# Outline

- Breeding Waterbird Program for South Bay Restoration Project
- Reproductive Ecology
  - Nest Success
  - Chick Survival and Growth
- Research for South Bay Restoration Project

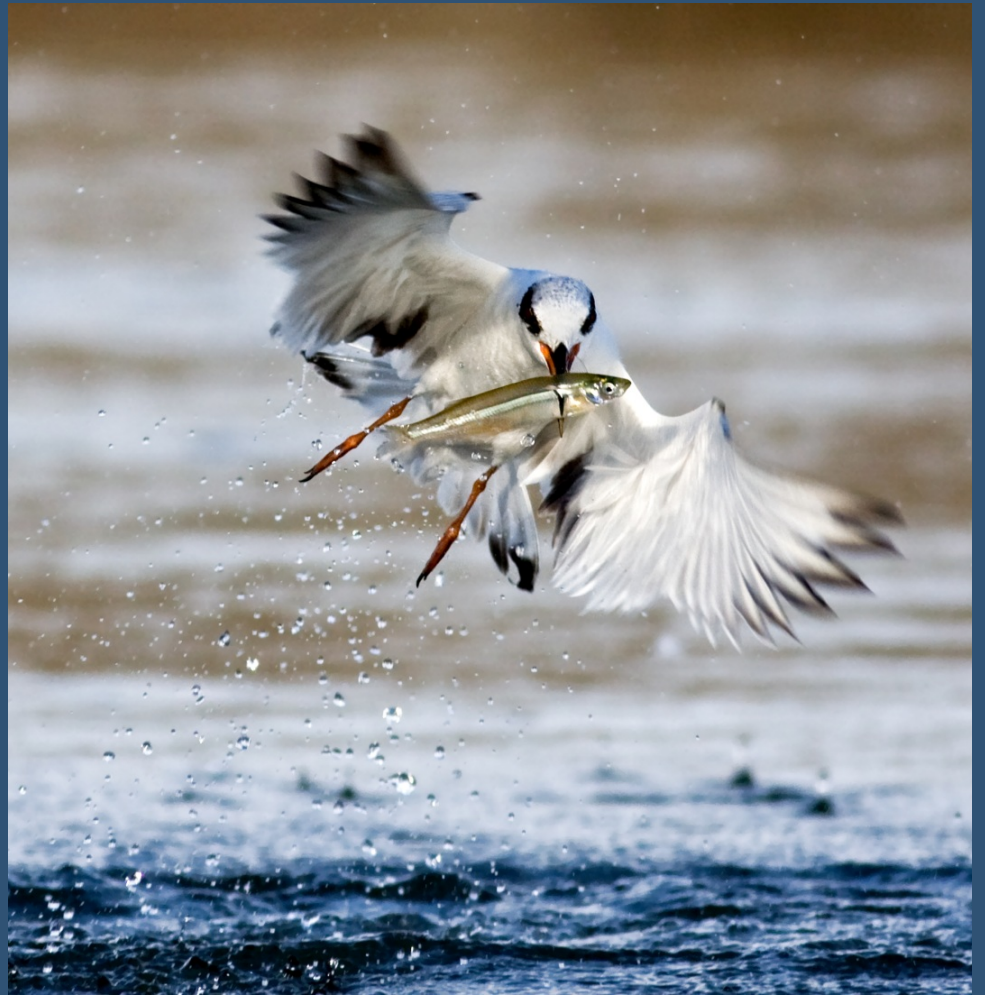


Photo by Ken Phenicie



# USGS Breeding Waterbird Program

*Performing long-term ecological research on waterbirds to provide reliable scientific information that informs conservation and management.*



Photo by Ken Phenicie



Photo by Michael Kern

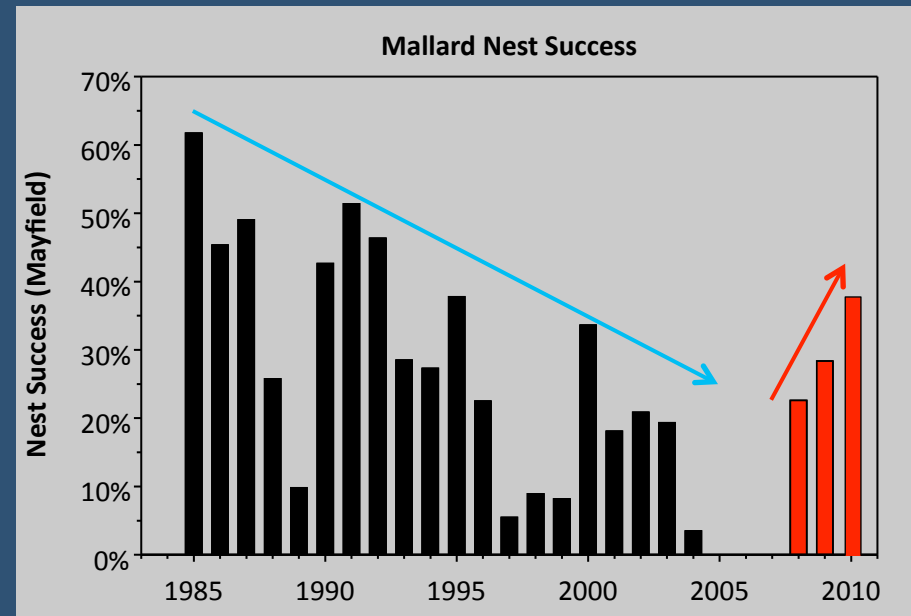


Photo by Ken Phenicie



Photo by Ken Phenicie

- Univ. of California Davis Field Station
  - John Muir Institute of the Environment
  - Southwest Climate Science Center
- Geographical Emphasis
  - San Francisco Bay
  - Delta
  - Central Valley
  - Great Salt Lake





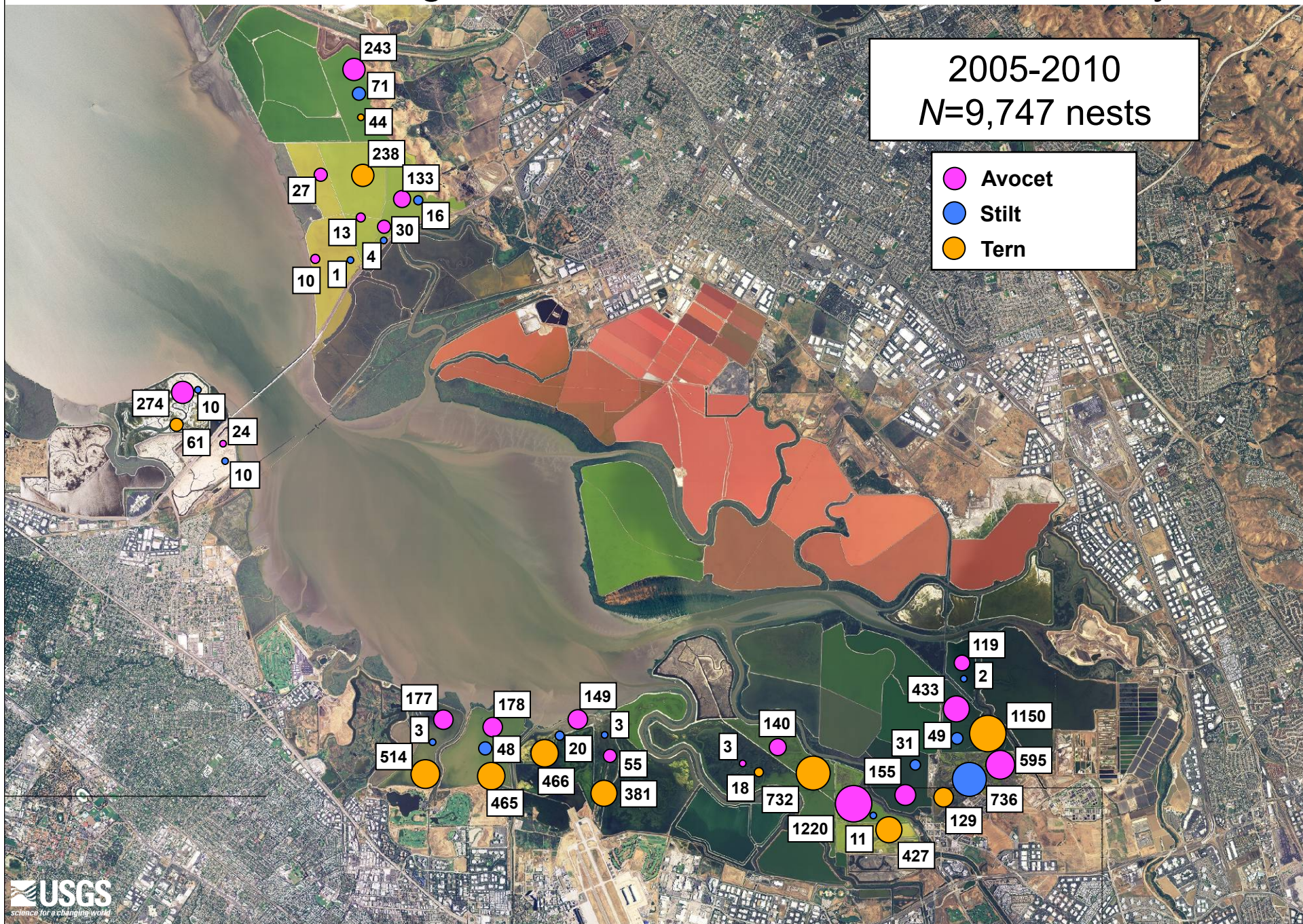
# Breeding Waterbirds of South San Francisco Bay Salt Ponds

- American Avocet
- Black-necked Stilt
- Forster's Tern
- California Gull





# Waterbird Nesting Colonies in South San Francisco Bay





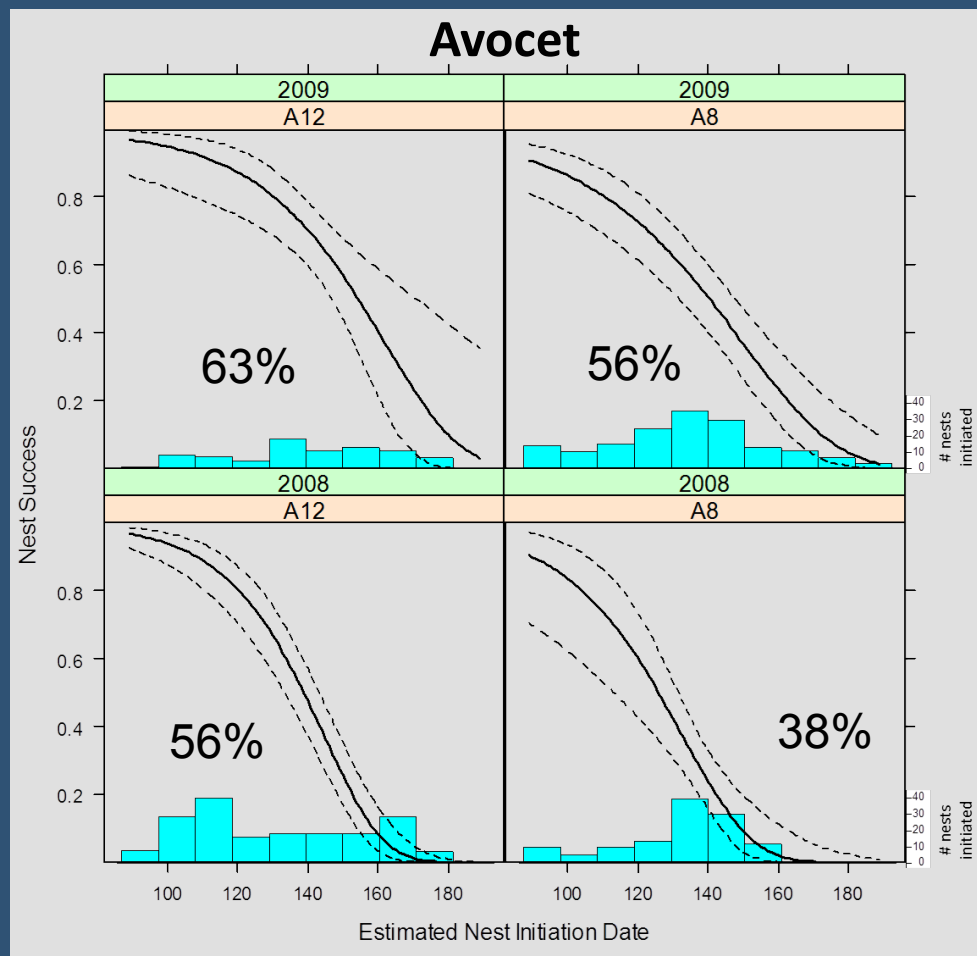
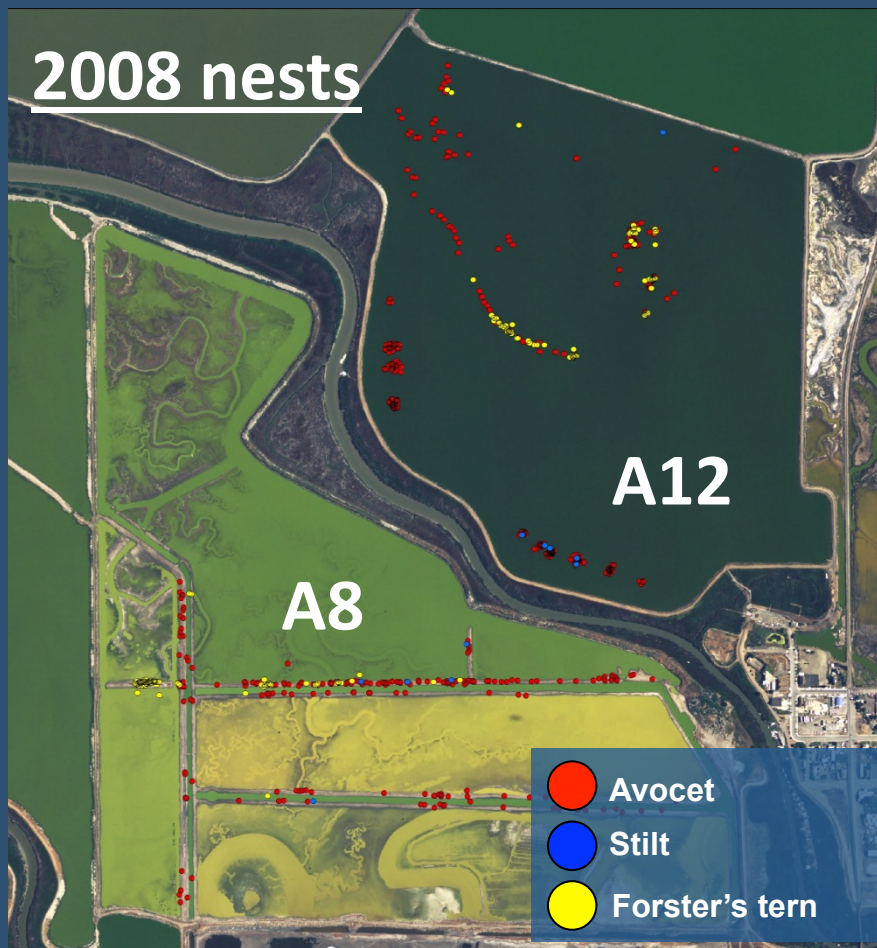
# Nest Success

- What does it mean to be successful?





# How will waterbirds respond to newly available habitat?

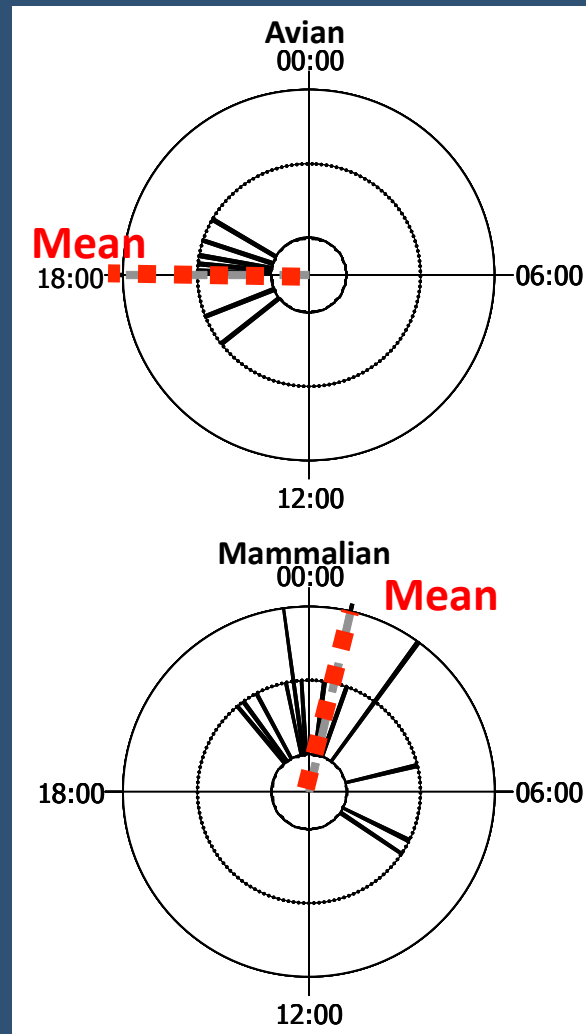


# Predators of Waterbird Nests

71% mammals

29% avian

- 13% of nests depredated by California Gulls



Herring et al. 2011,  
*Southwest Naturalist*

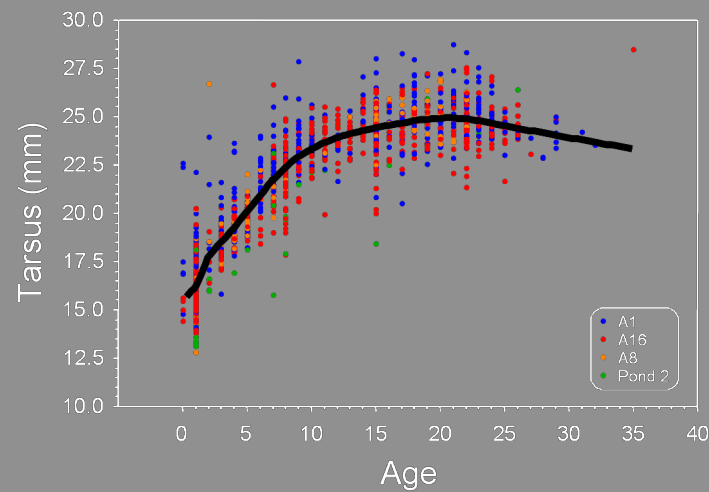
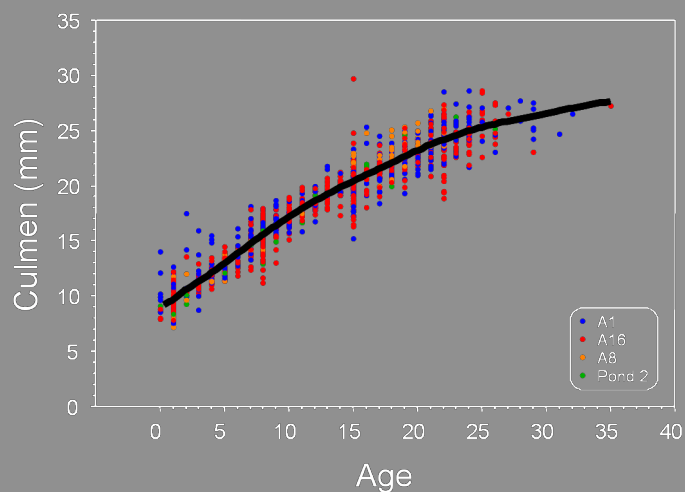
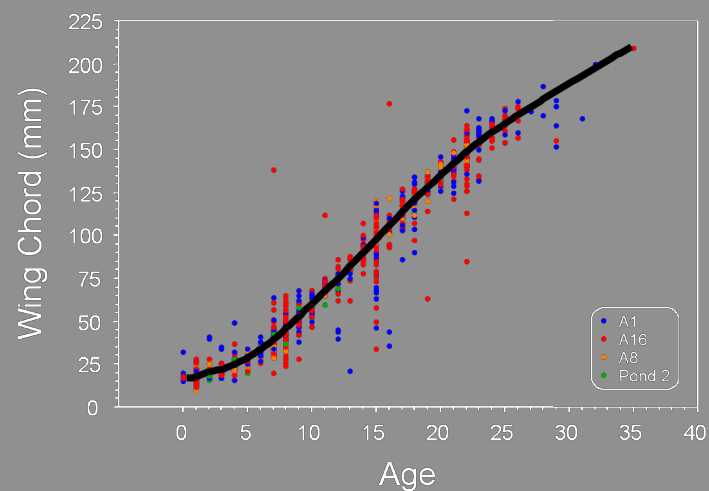
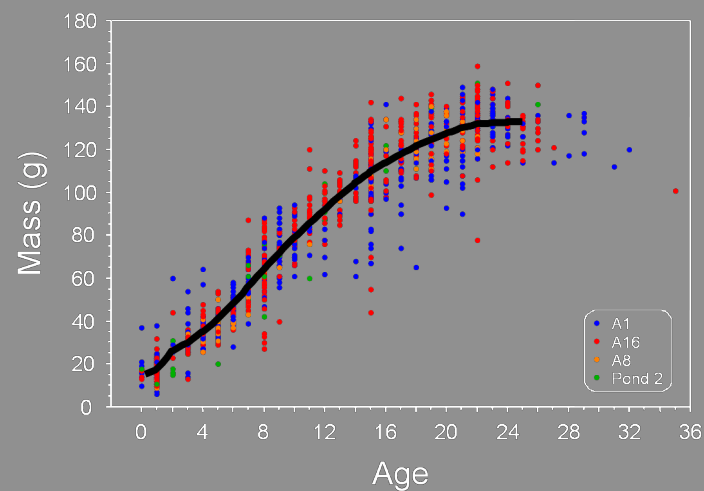
# Chick Growth and Survival

- Chick growth
  - mark and recapture
  
- Chick survival
  - radio telemetry

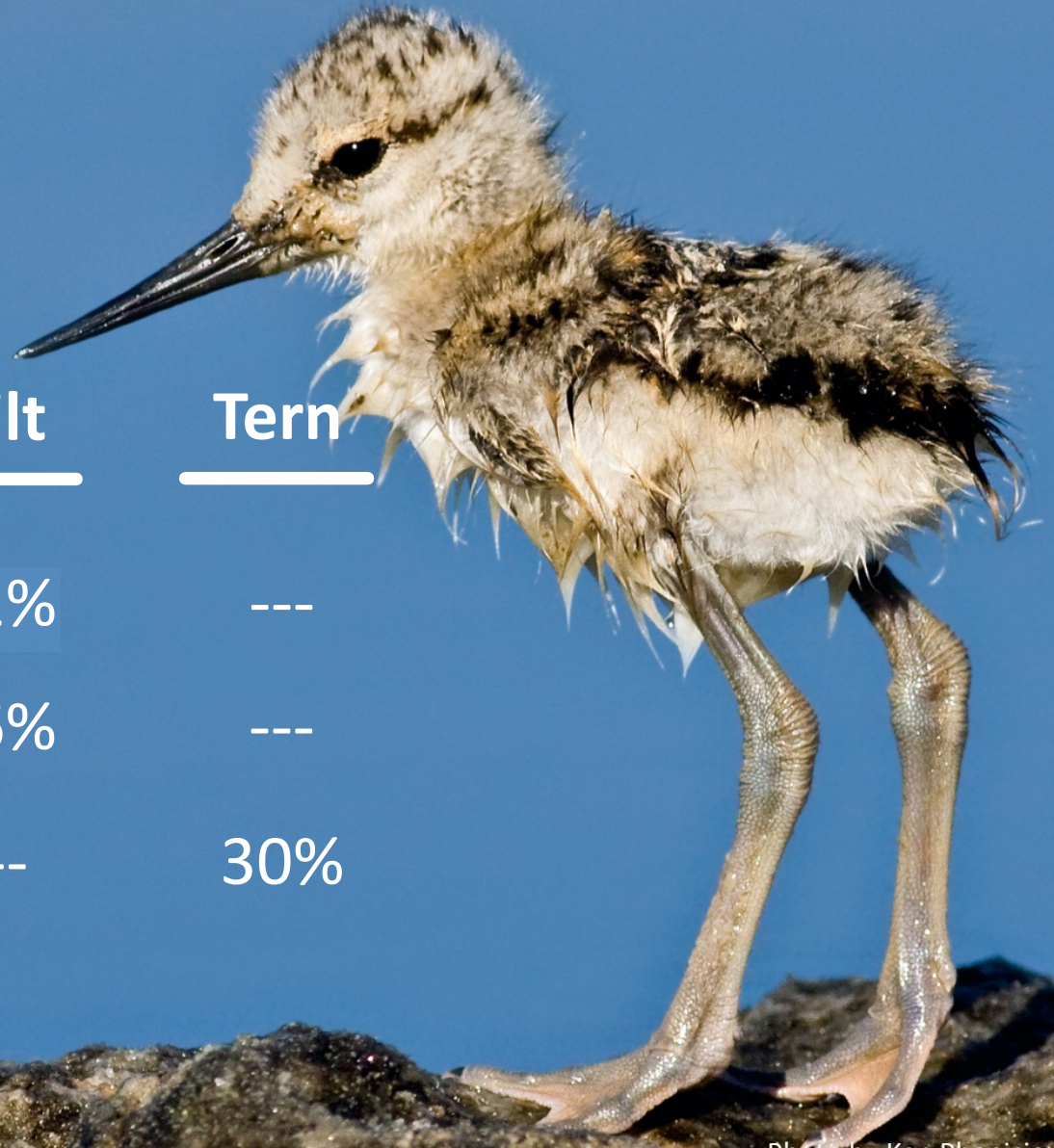




# Growth Indicates Habitat Quality



# Chick Survival



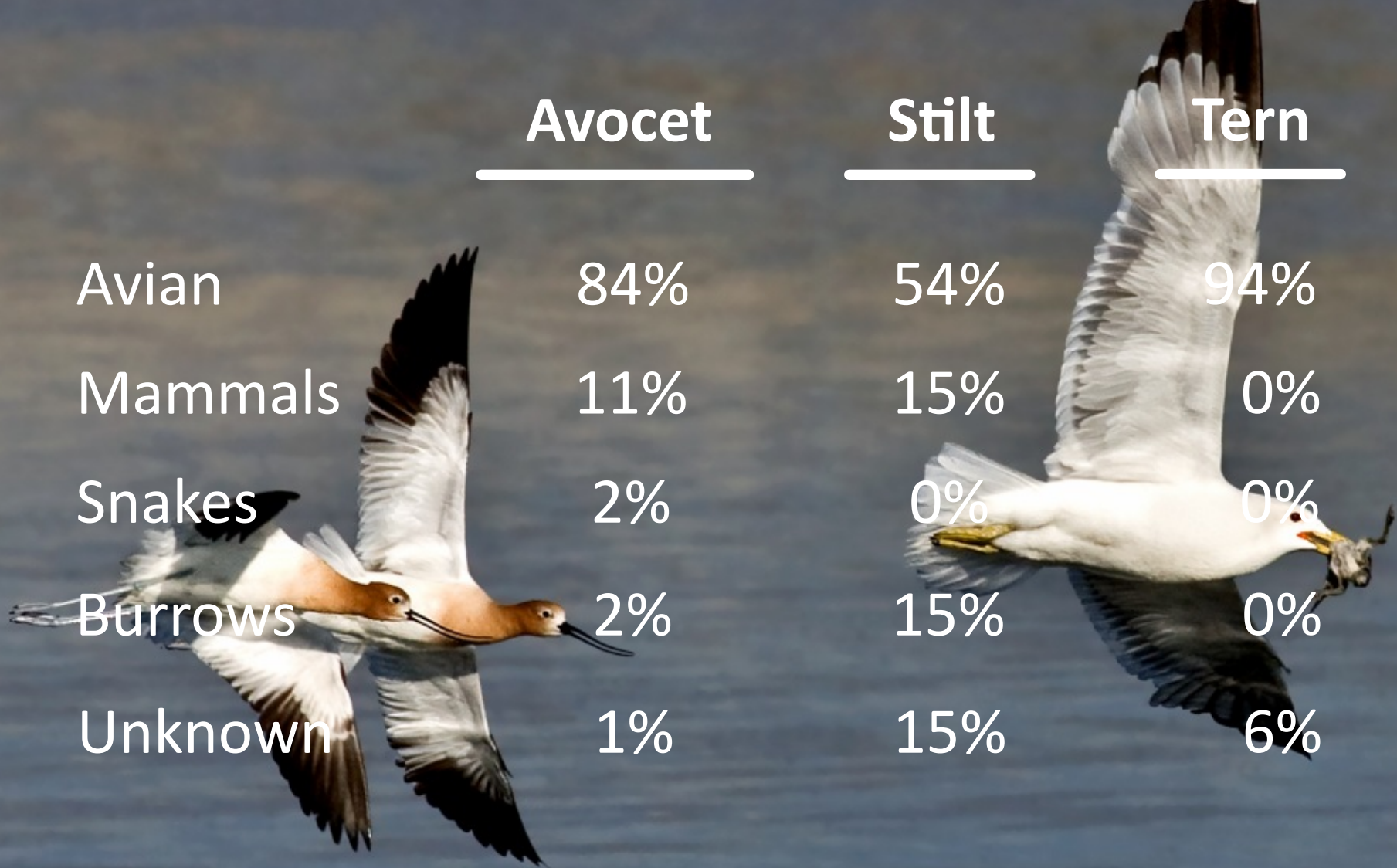
	<u>Avocet</u>	<u>Stilt</u>	<u>Tern</u>
2005	14%	32%	---
2006	5%	56%	---
2010	---	---	30%

Photo by Ken Phenicie



# Predators of Waterbird Chicks

	<u>Avocet</u>	<u>Stilt</u>	<u>Tern</u>
Avian	84%	54%	94%
Mammals	11%	15%	0%
Snakes	2%	0%	0%
Burrows	2%	15%	0%
Unknown	1%	15%	6%





# Predators of Waterbird Chicks

Avocet

Stilt

Tern

Avian

84%

54%

94%

Mammals

11%

15%

0%

Snakes

2%

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Burrows

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# Predators of Waterbird Chicks

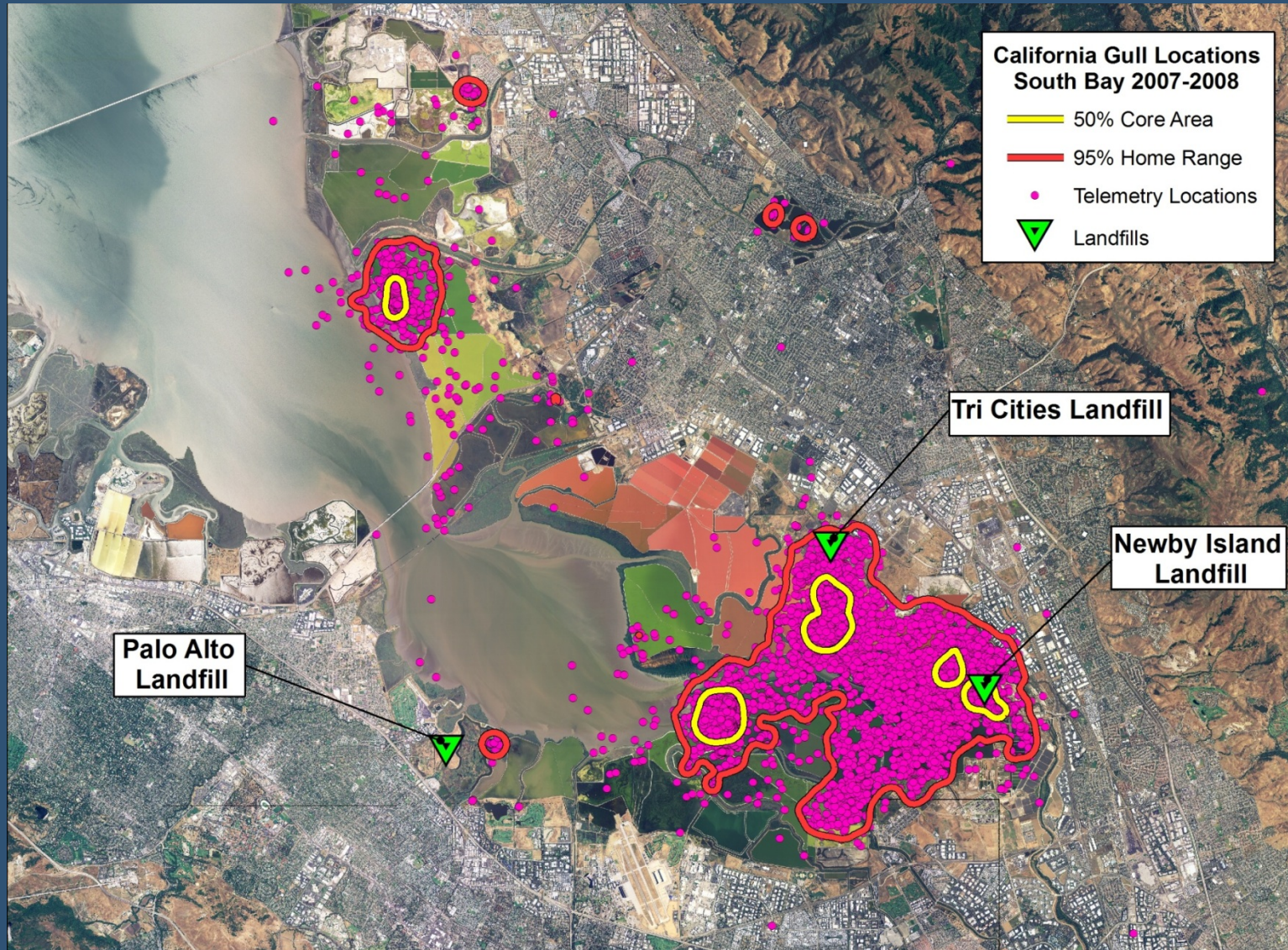
## Predation by California Gulls

- Avocet chicks: 61%
- Stilt chicks: 23%
- Tern chicks: 94%





# California Gull Habitat Use





2005-2010  
N=9,747 nests

California Gull Locations  
& Waterbird Nests  
South Bay 2007-2008

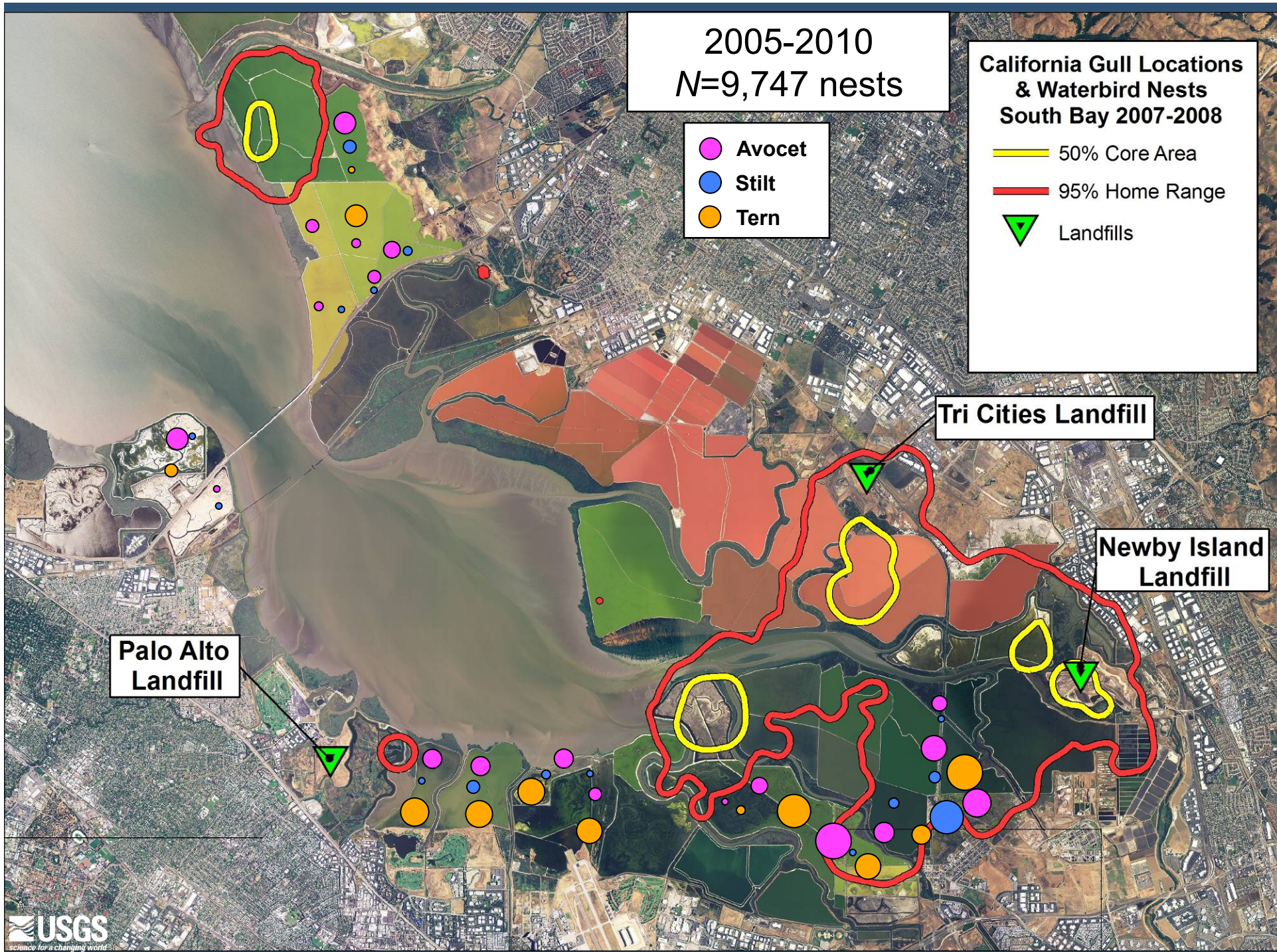
- Avocet
- Stilt
- Tern

- 50% Core Area
- 95% Home Range
- ▼ Landfills

Palo Alto  
Landfill

Tri Cities  
Landfill

Newby Island  
Landfill



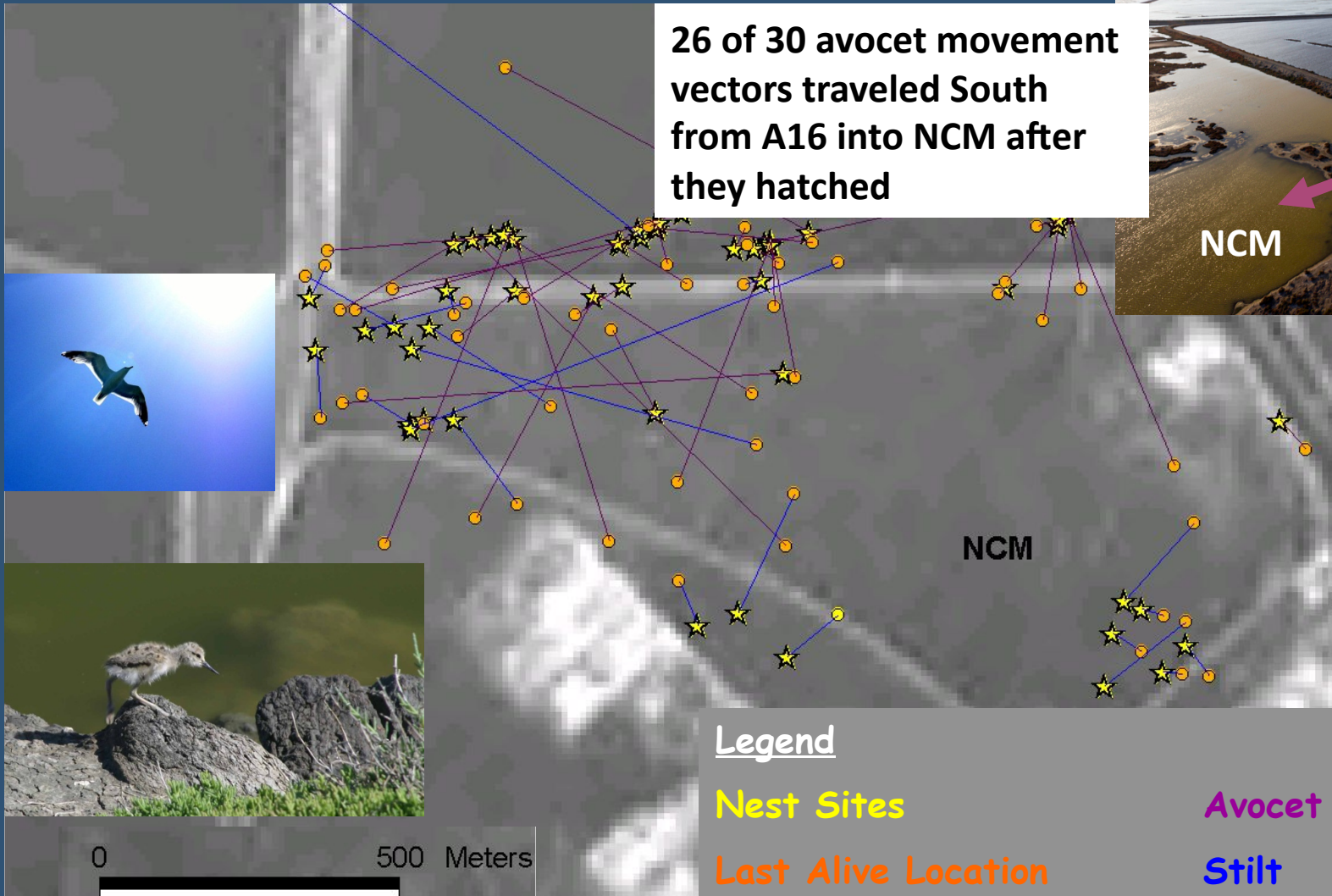


# Informing Restoration Design

26 of 30 avocet movement vectors traveled South from A16 into NCM after they hatched

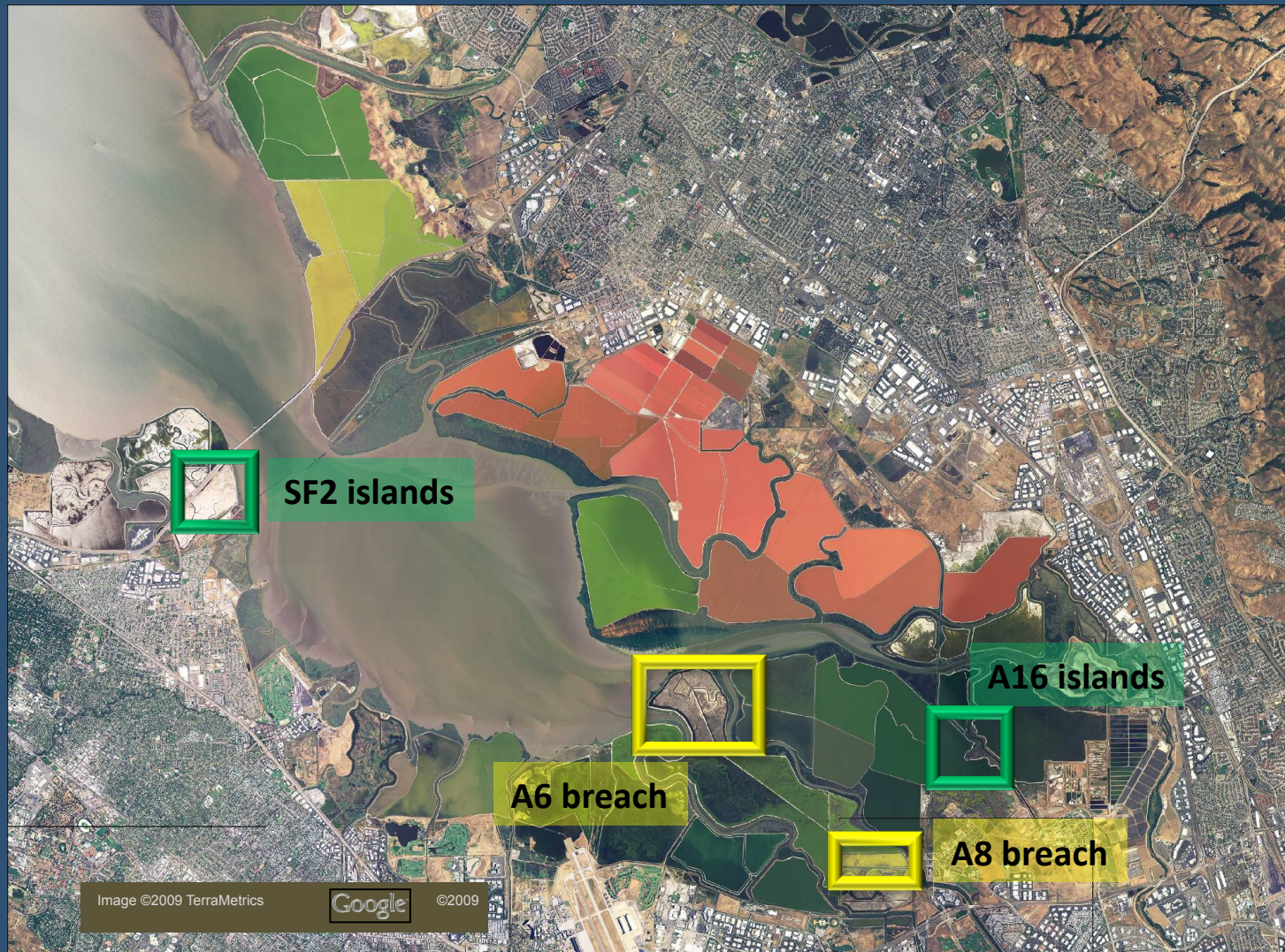


Photo by  
Cris Benton





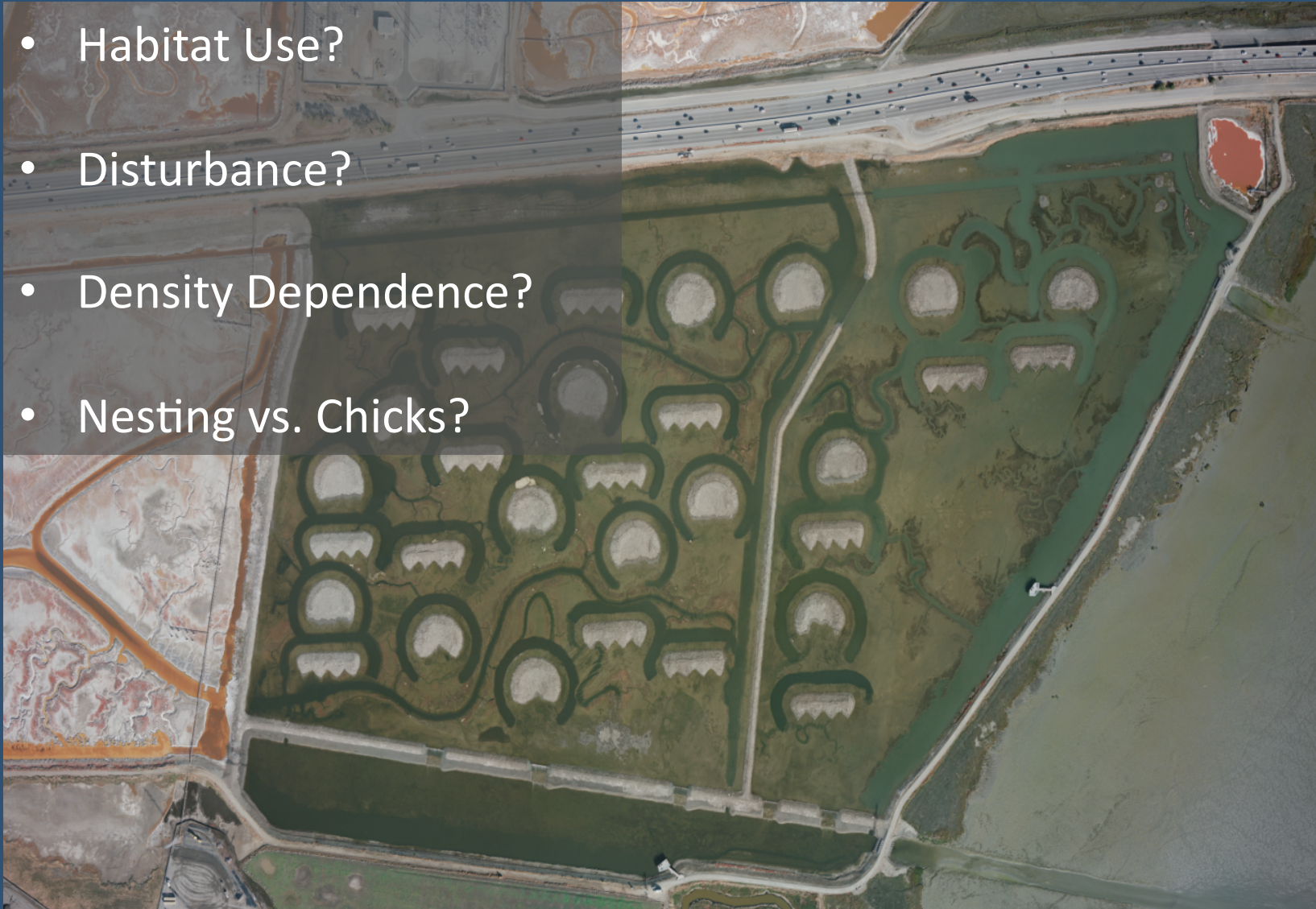
# Learning From Current Restoration To Inform Future Actions





# How Will Breeding Waterbirds Respond to SF2?

- Habitat Use?
- Disturbance?
- Density Dependence?
- Nesting vs. Chicks?

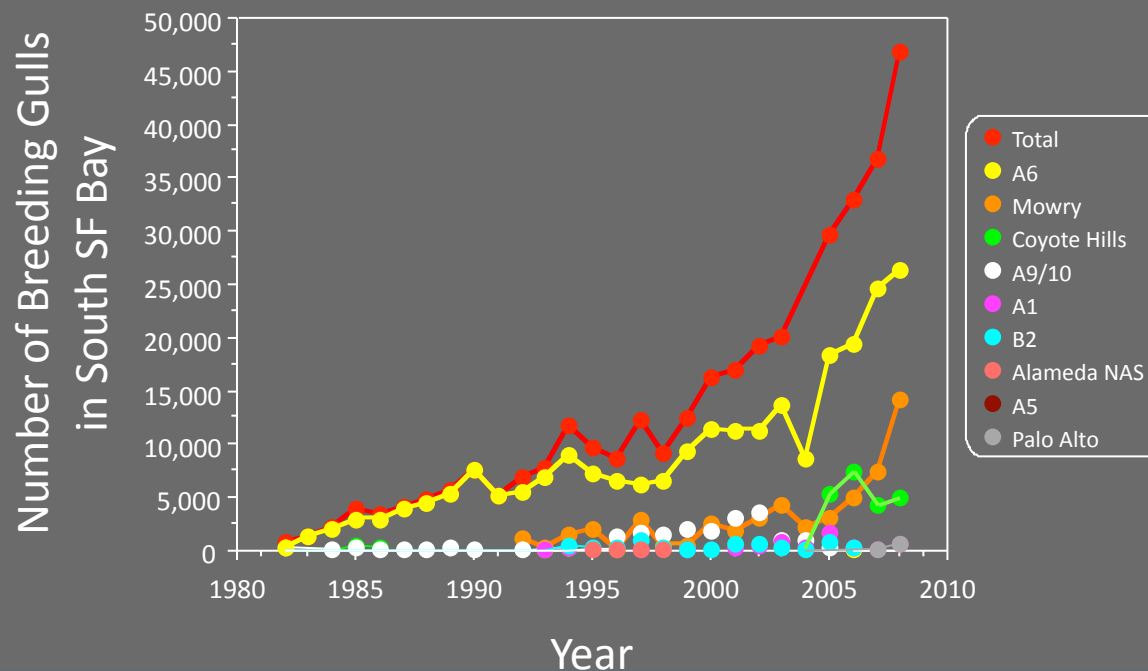


# Impact of A6 Breach

- Where will 23,000 gulls from A6 go?
- Will gull displacement impact waterbird reproductive success?



Photo by Cheryl Strong





# Breeding Waterbird Program

- Continued monitoring is critical for evaluating success of restoration
- Adaptive management and assessment of impact not possible without continued research / monitoring

