

Shorebird and duck responses to pond management in the South Bay Salt Ponds

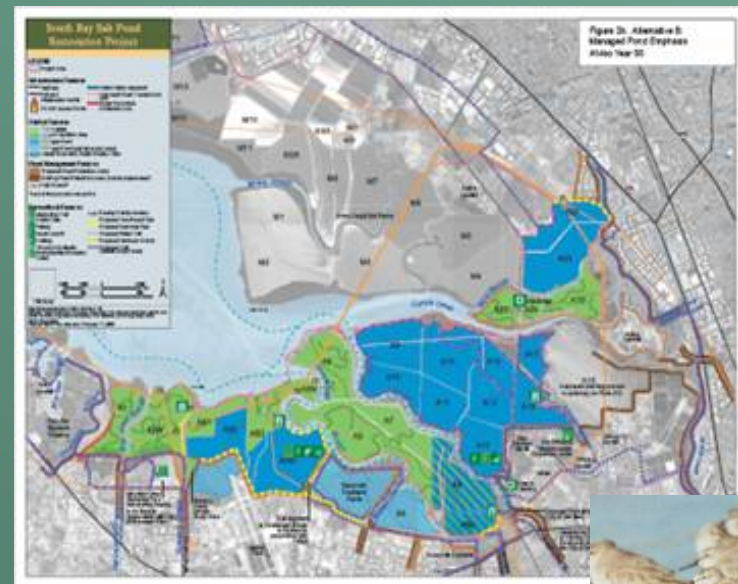
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- ¹ U. S. Geological Survey
- ² San Francisco Bay Bird Observatory
- ³ U. S. Fish and Wildlife Service
- ⁴ CA Department of Fish and Game

South Bay Salt Pond Restoration Project

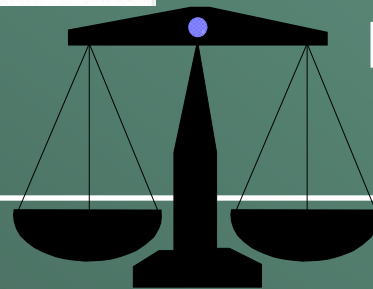
Progress towards 50% conversion



Tidal Marsh



Managed Pond



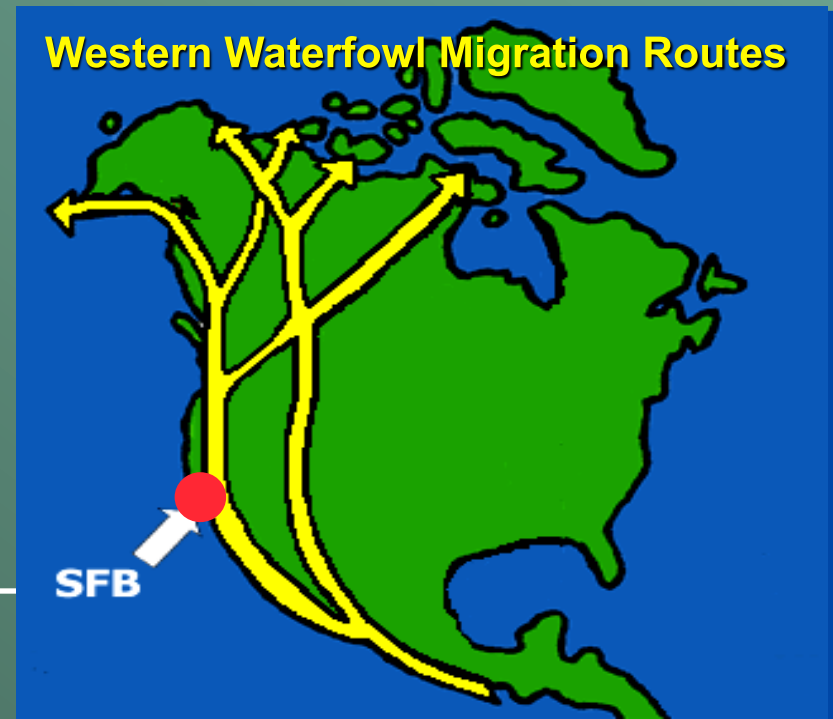
Critical region for migratory birds



- *Western Hemispheric Shorebird Reserve Network*
- *Pacific flyway - 20% of North American waterfowl*

Central challenge:

How to maintain waterbird populations in a reduced area?



Methods

Data collection

- Monthly counts at HT
- 250-m grid overlay

Data analysis

- Aggregate to pond scale
- Monthly sequence as time series variable
- GLS RE and ZIP regression, data summarization

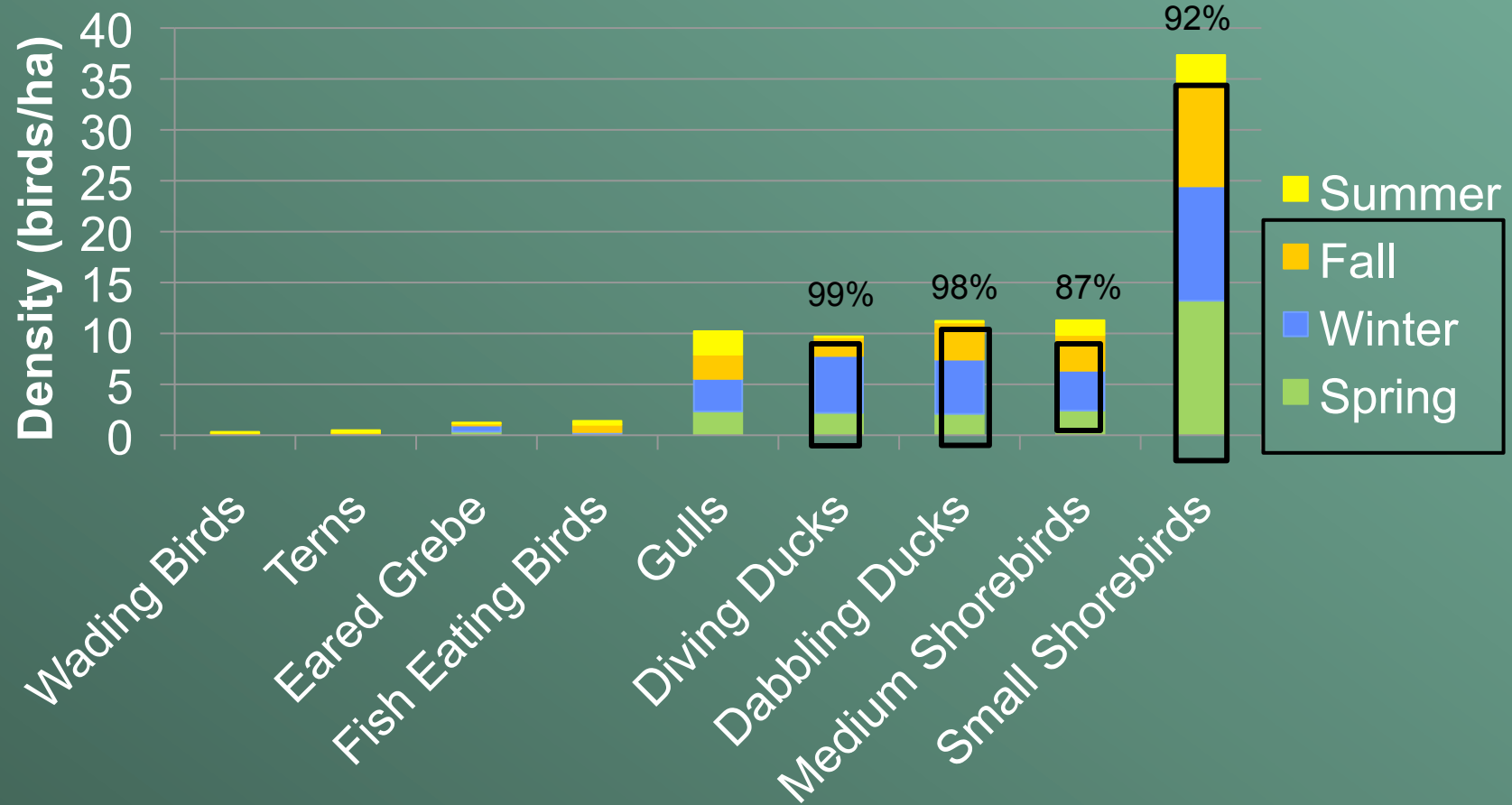


Avian Guilds

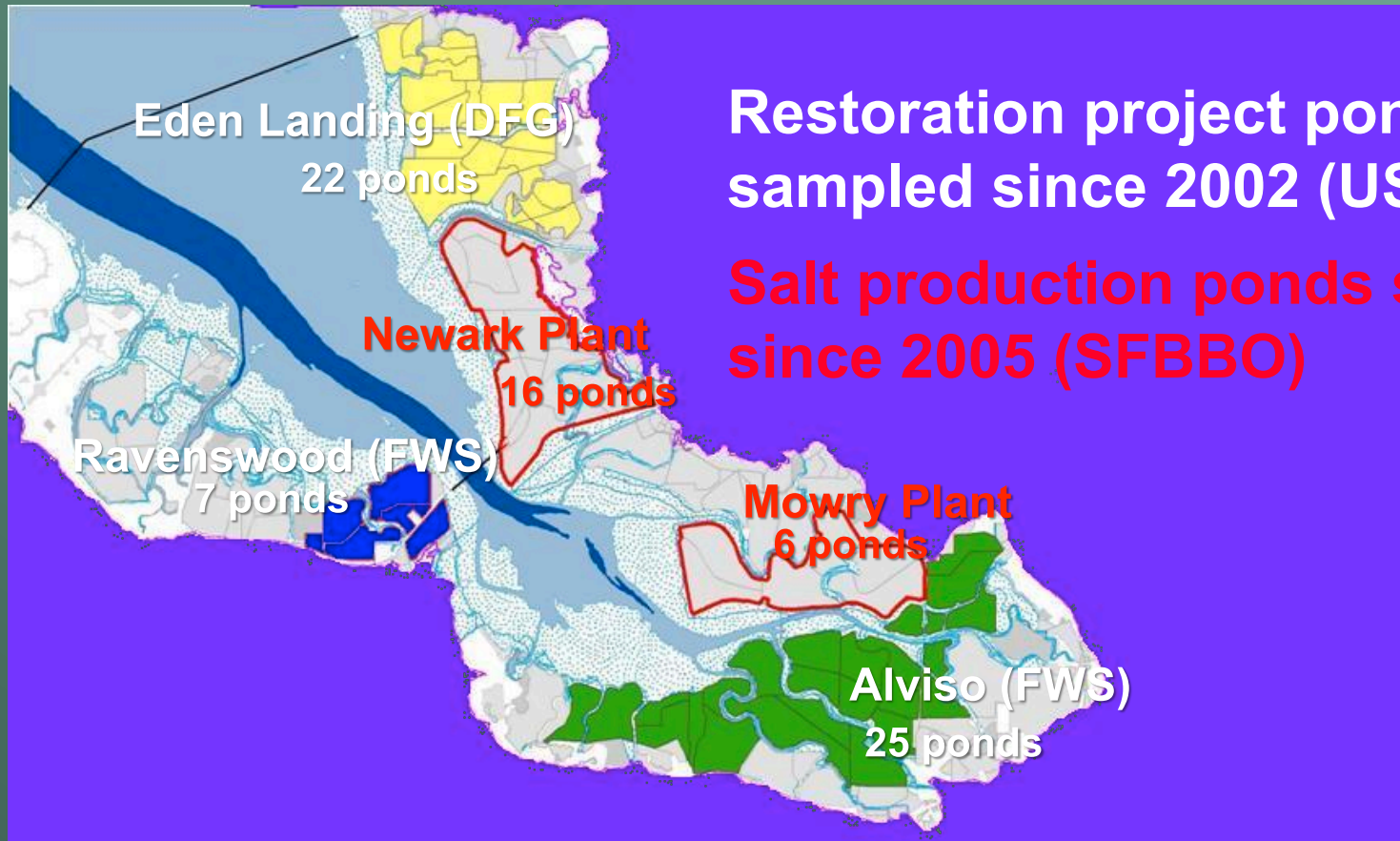


Drawing adapted from Warnock 2004

Avian guilds by season



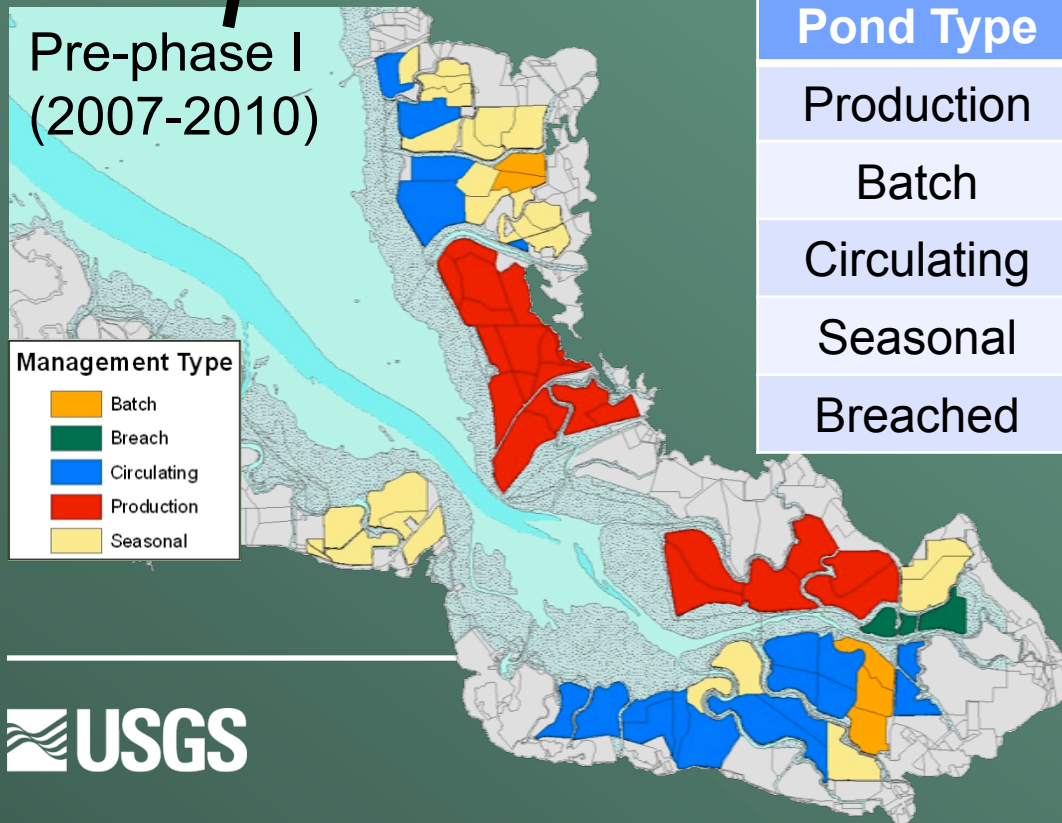
South Bay Salt Ponds



Restoration project ponds
sampled since 2002 (USGS)

Salt production ponds sampled
since 2005 (SFBBO)

Pond Management Types



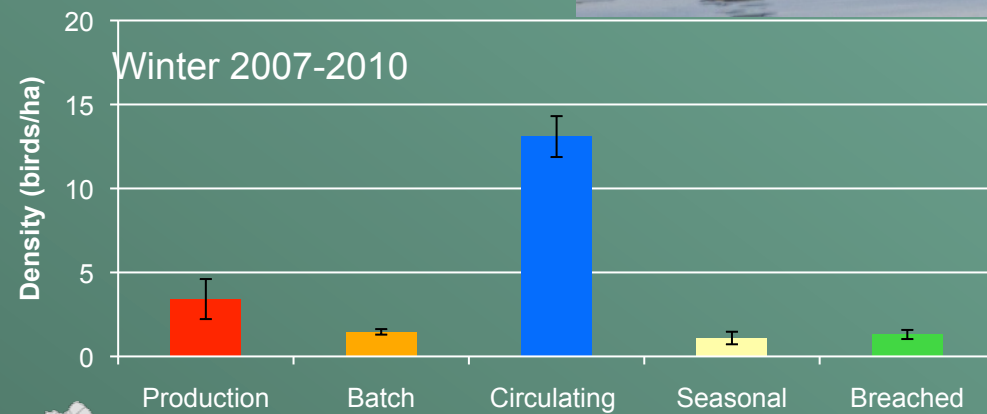
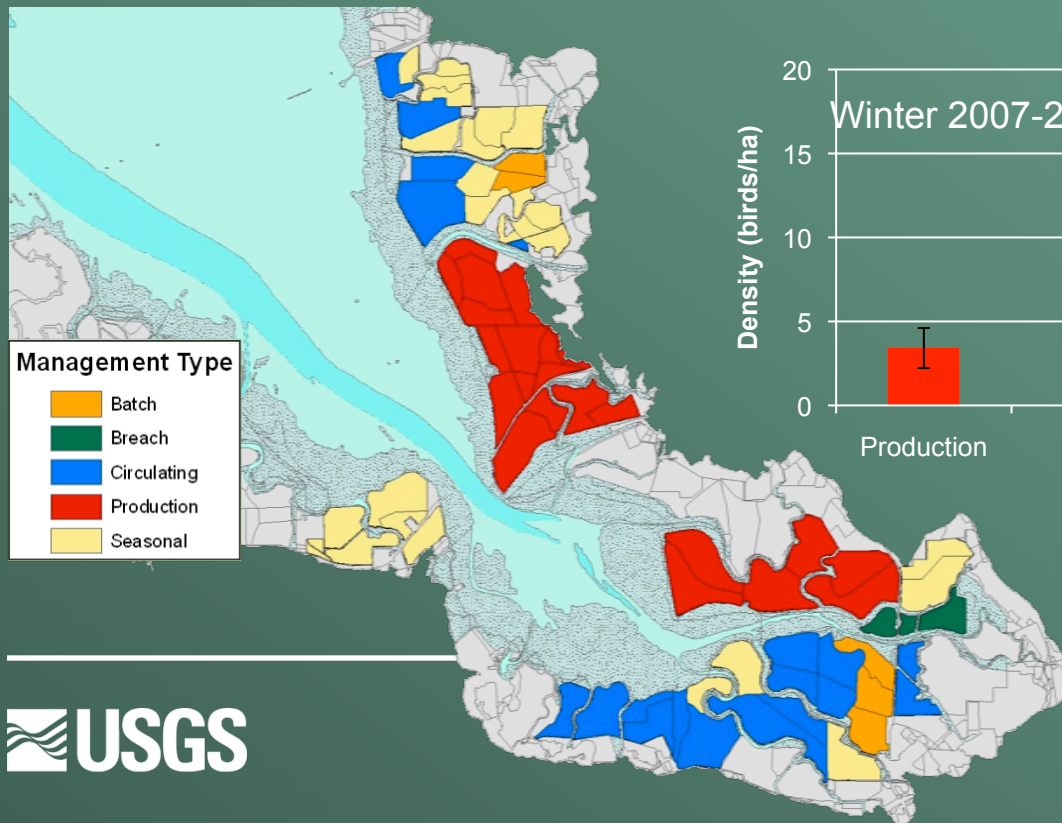
Management Type

Orange	Batch
Green	Breach
Blue	Circulating
Red	Production
Yellow	Seasonal

Pond Type	Salinity	Water Depth
Production	Med to High	Deep, variable
Batch	High	Deep
Circulating	Low	Deep
Seasonal	High	Shallow
Breached	Low	Med to deep

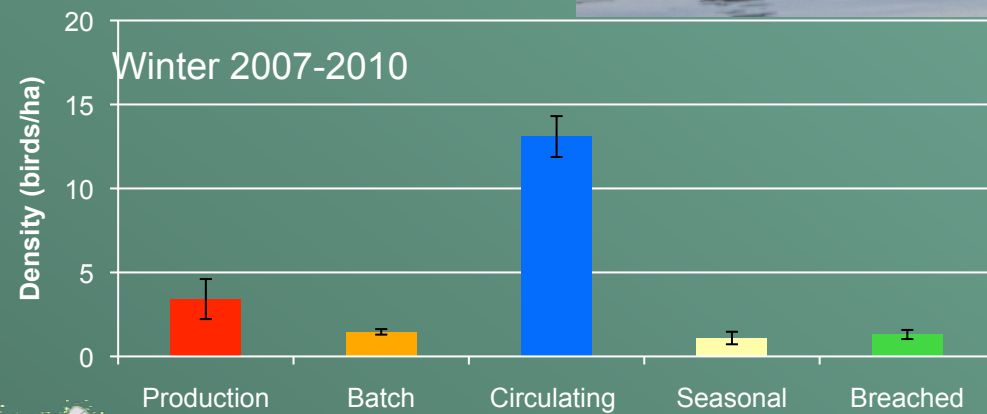
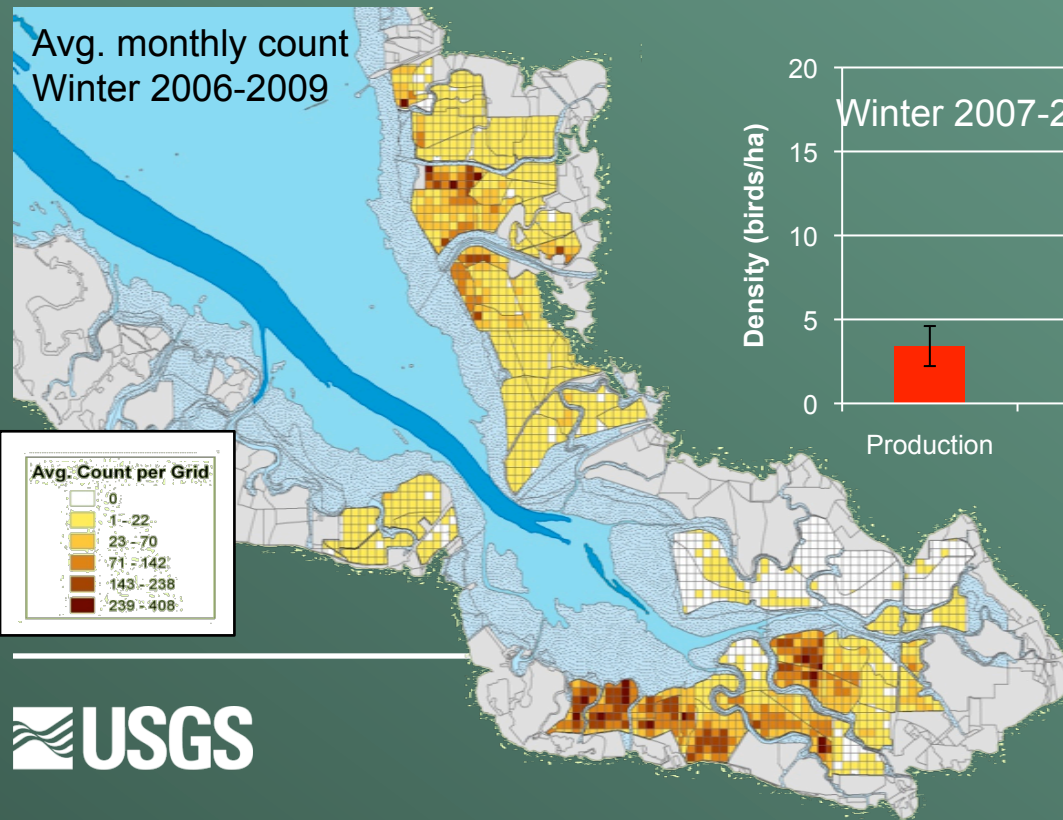
Diving ducks by pond type

Pre-phase I



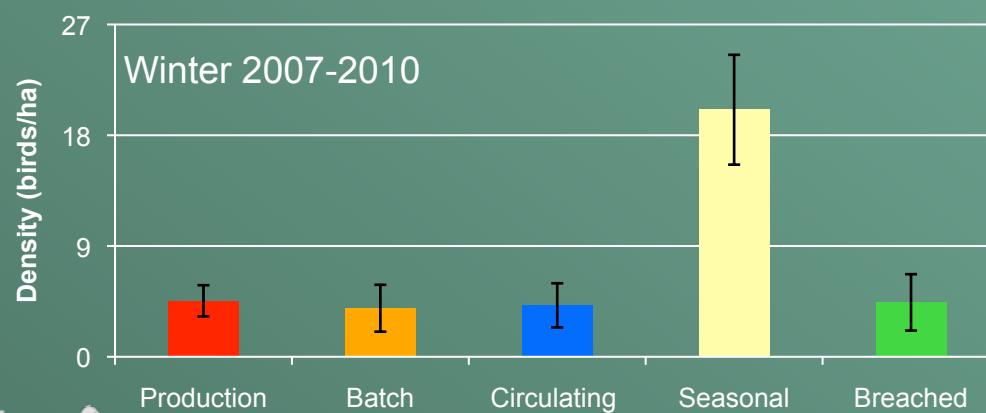
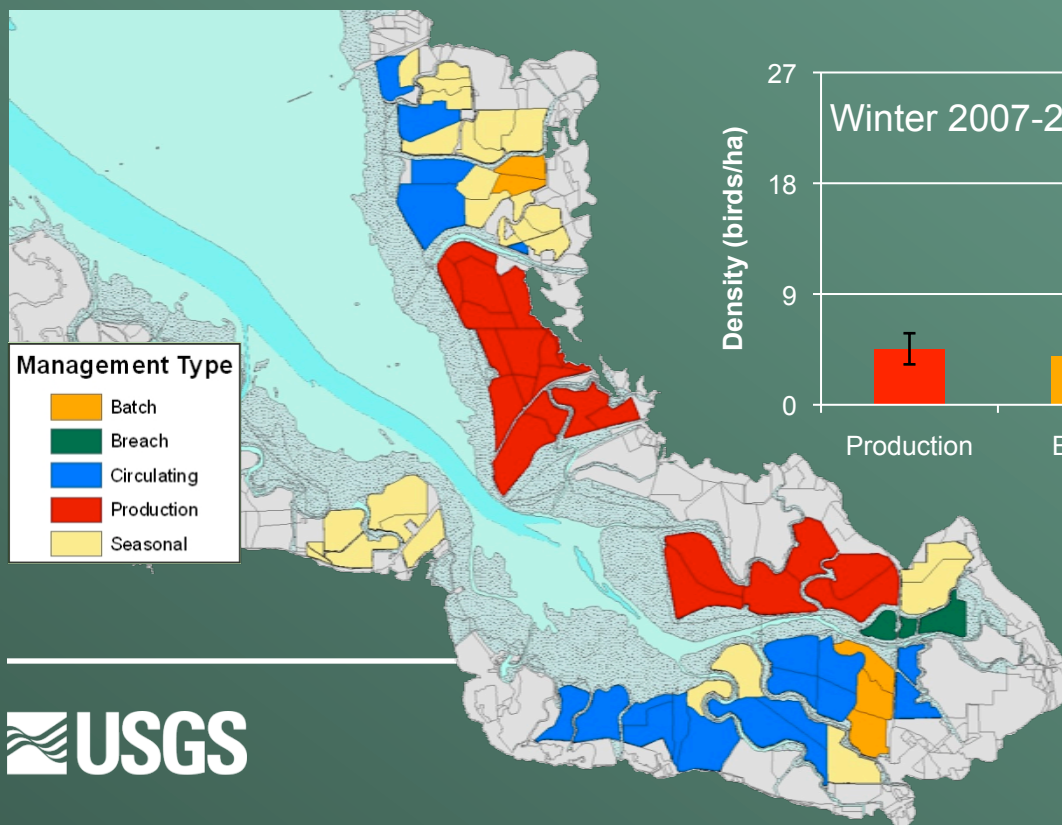
Diving ducks by pond type

Pre-phase I



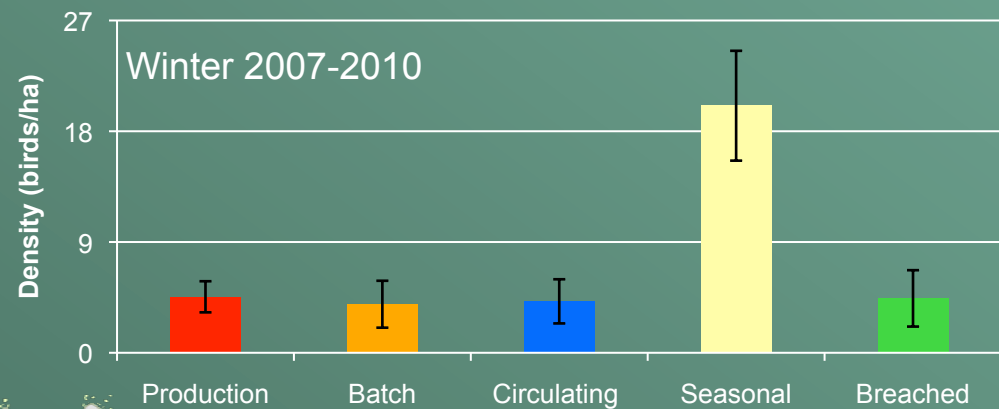
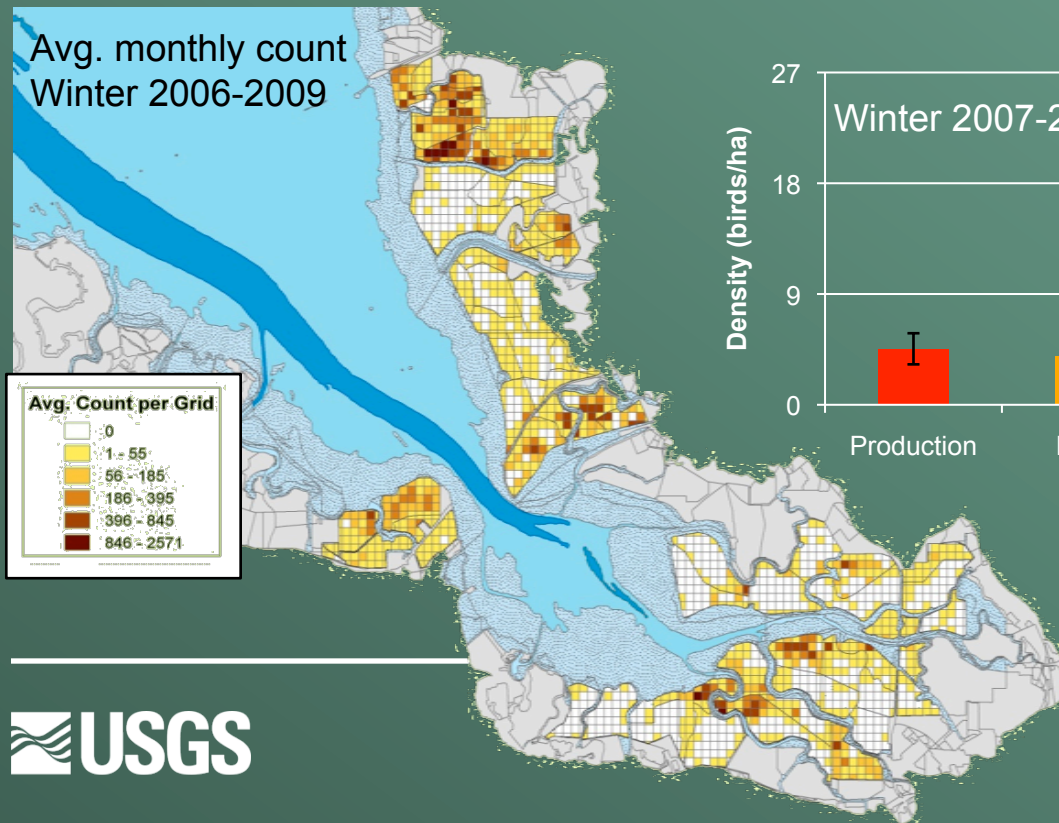
Small shorebirds by pond type

Pre-phase I



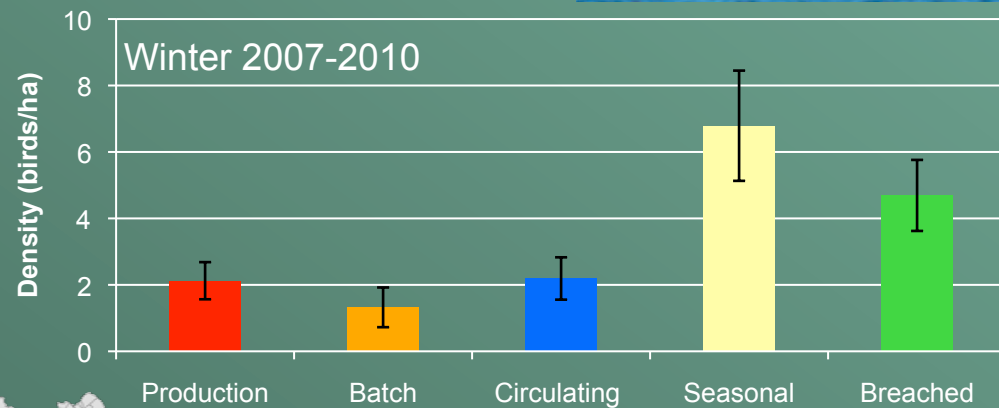
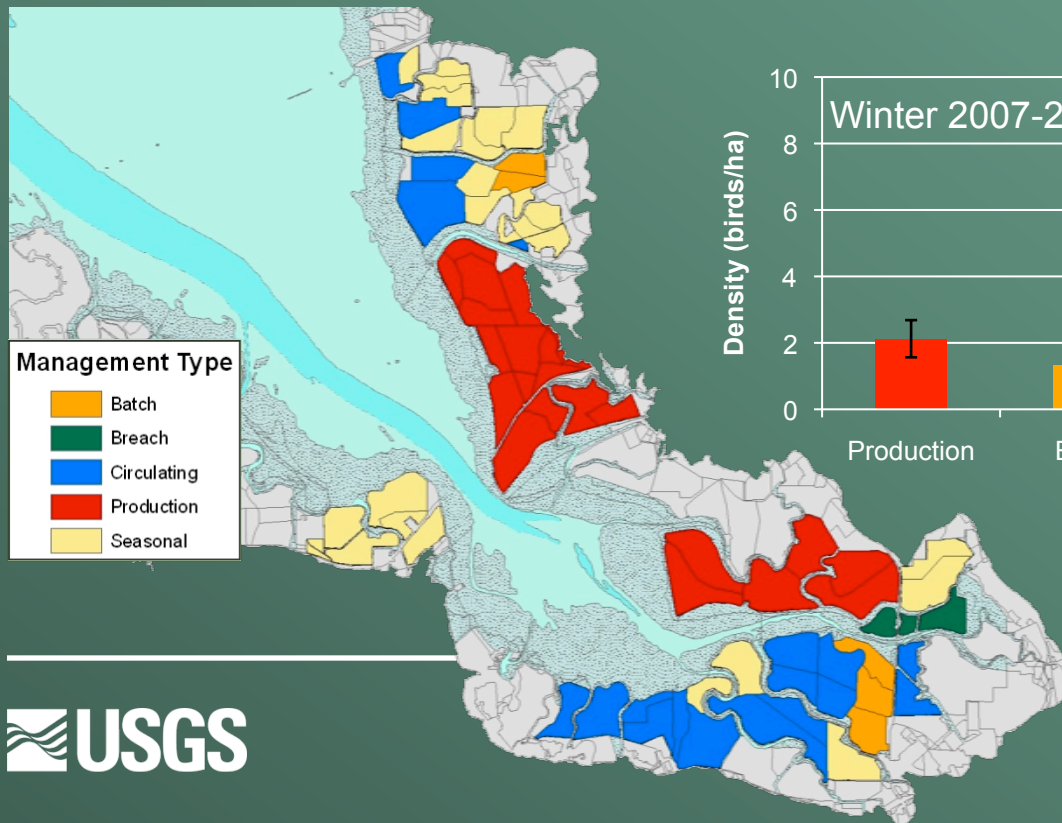
Small shorebirds by pond type

Pre-phase I



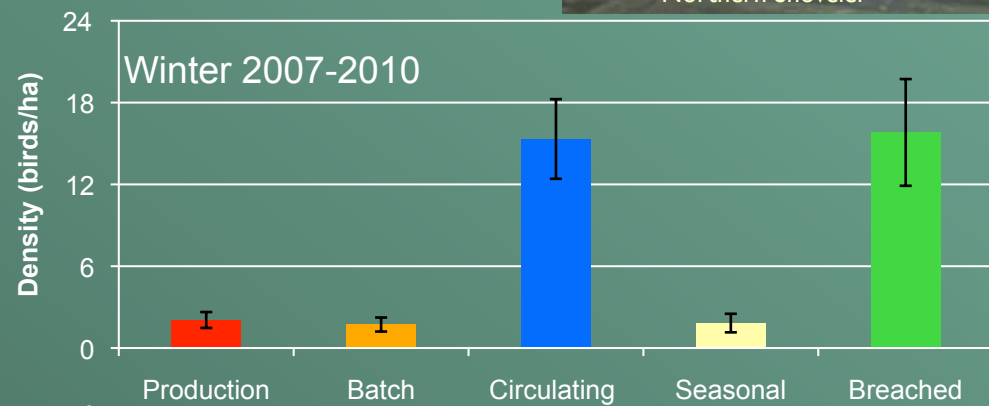
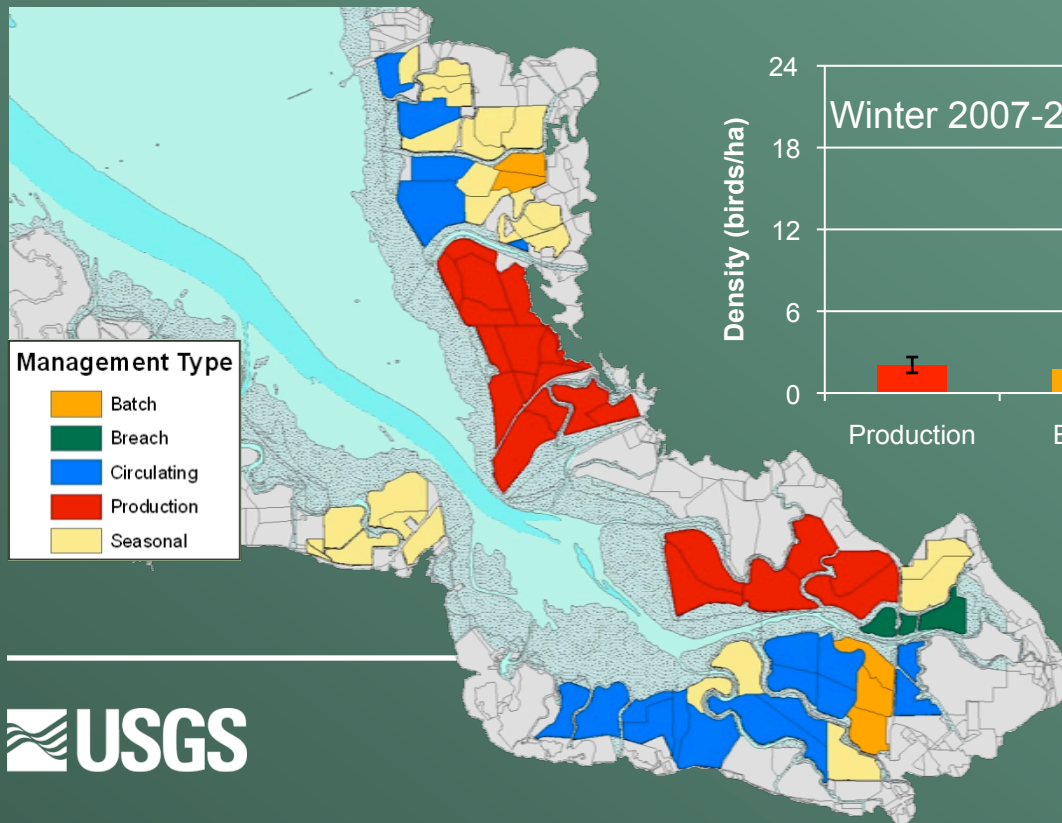
Medium shorebirds by pond type

Pre-phase I

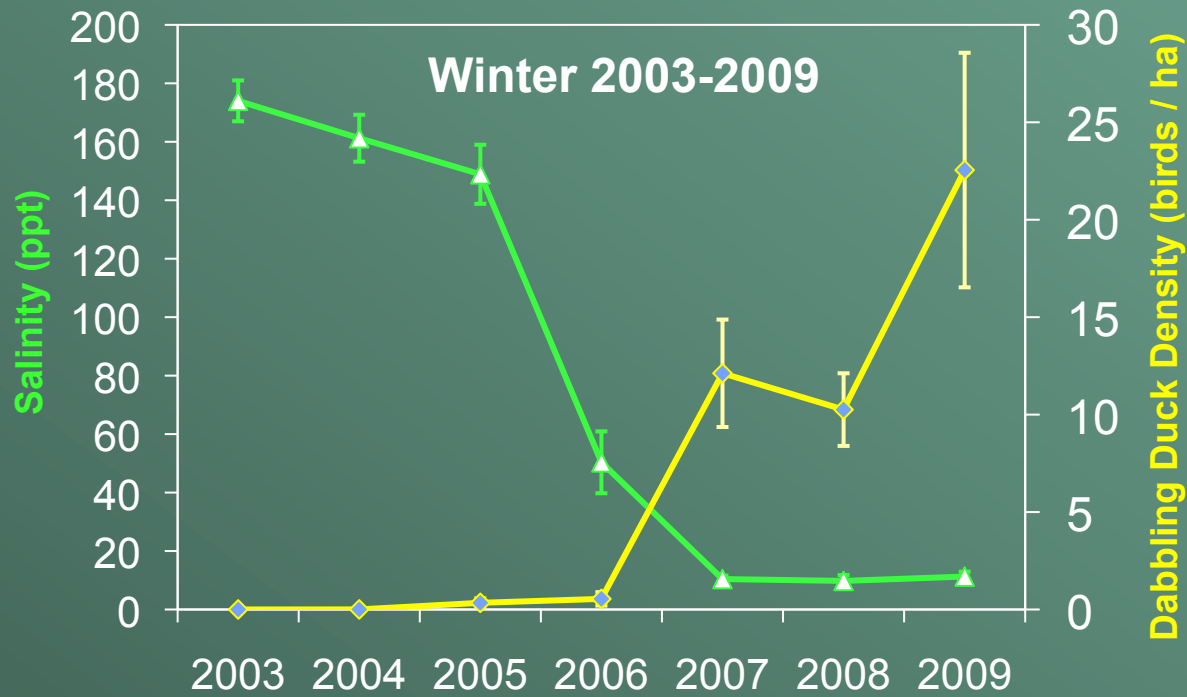


Dabbling ducks by pond type

Pre-phase I



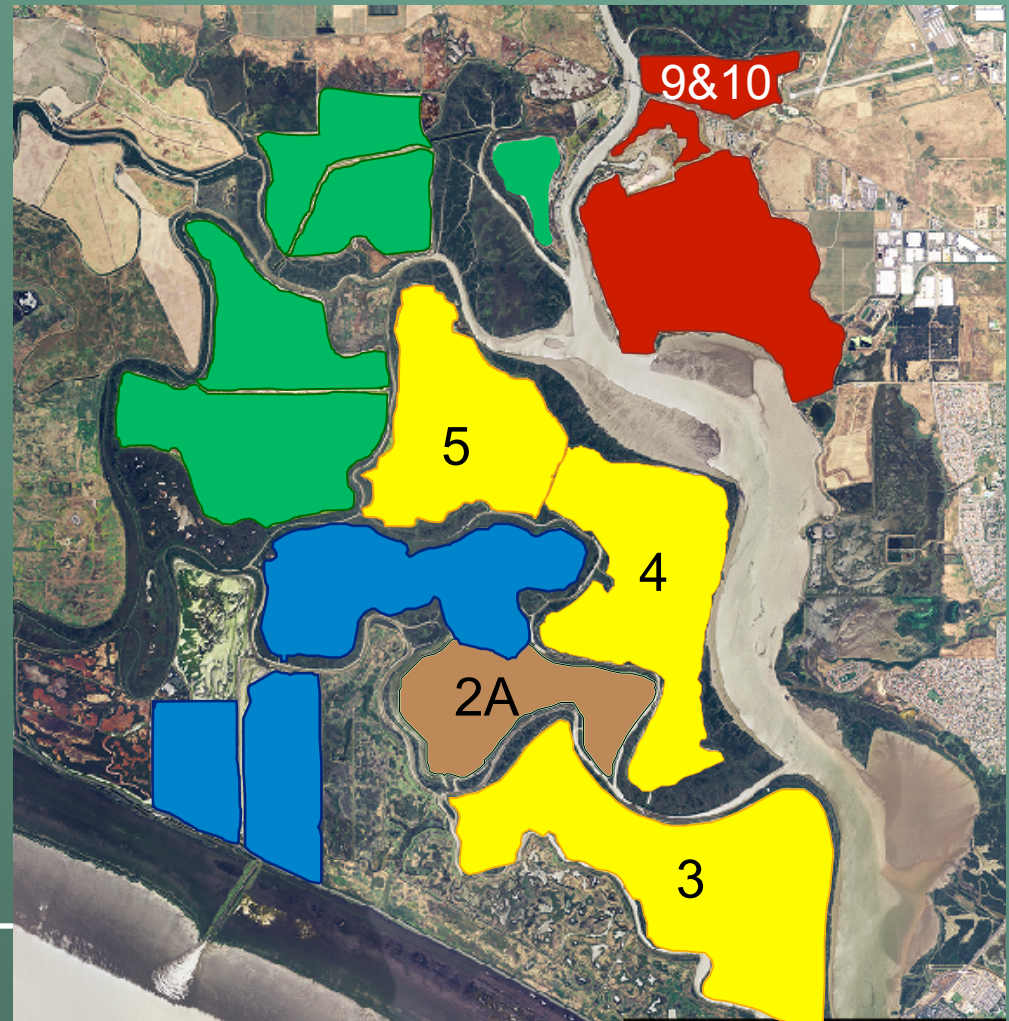
Breached Ponds A19-A21



Napa Sonoma Marshes Wildlife Area

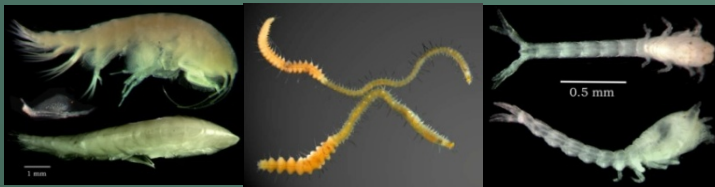
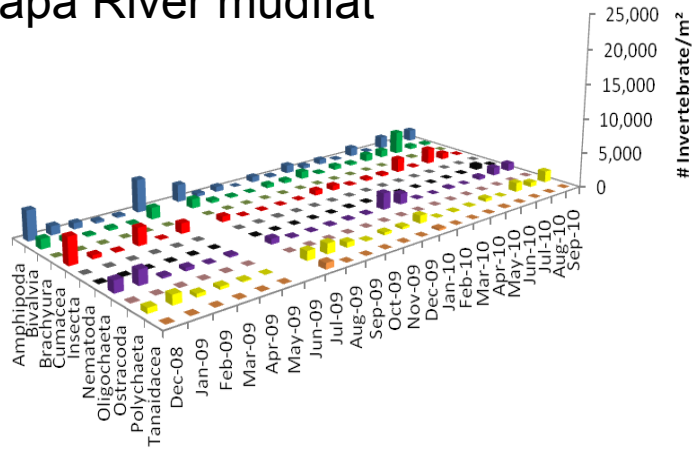
- I: Managed Ponds 1, 1A, 2
- II: Breached Ponds 3, 4, 5
- III: Breached Ponds NPS
- IV: Managed Ponds 6-8

1500 ha salt pond
conversion to tidal
wetlands



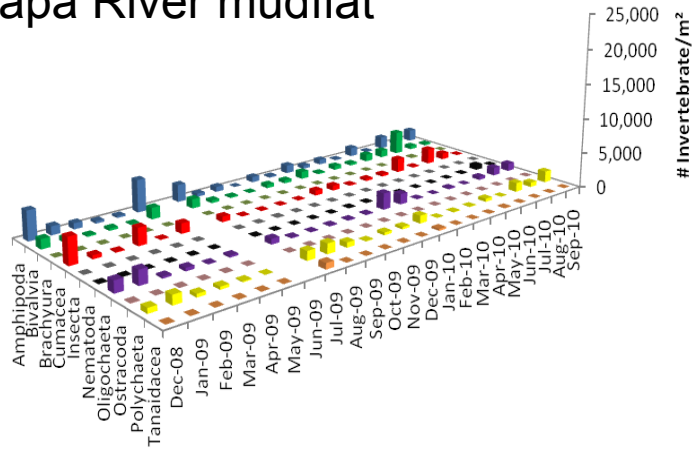
Early invertebrate colonization at Ponds 9 & 10

Napa River mudflat

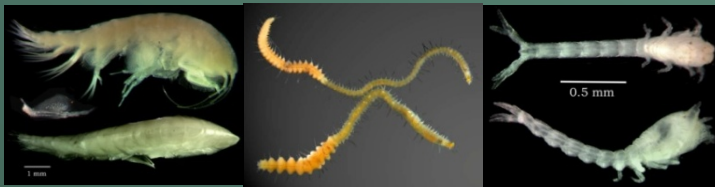
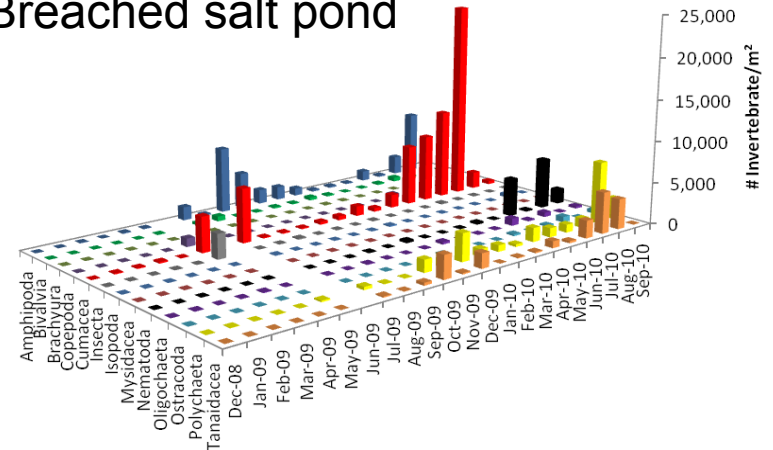


Early invertebrate colonization at Ponds 9 & 10

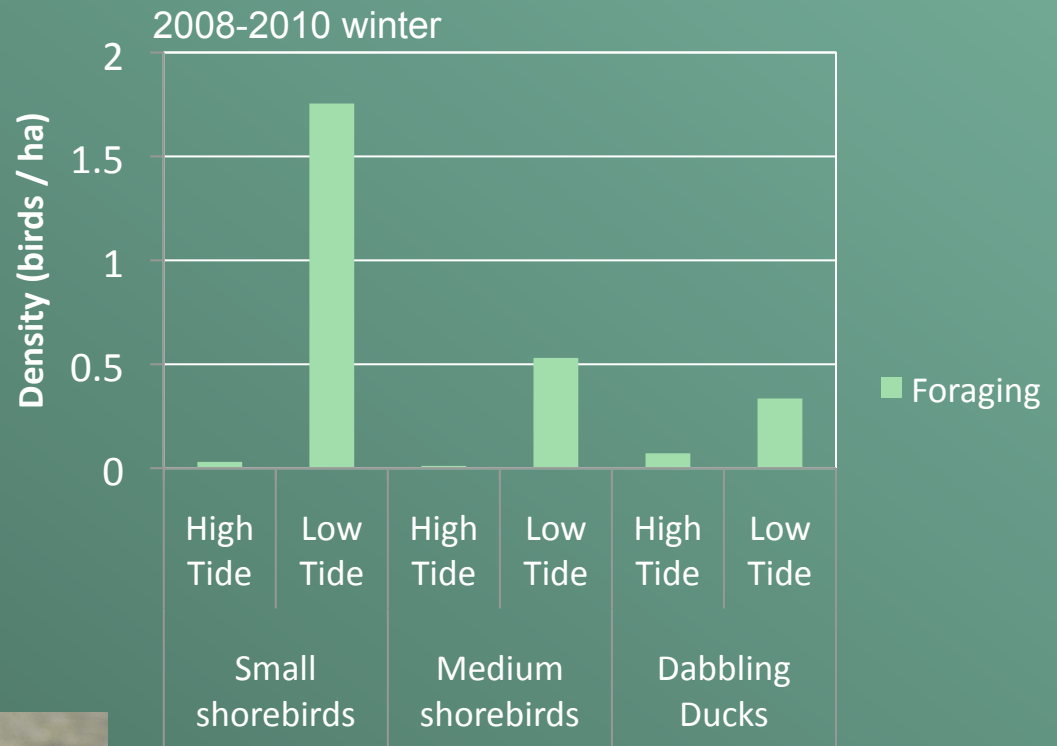
Napa River mudflat



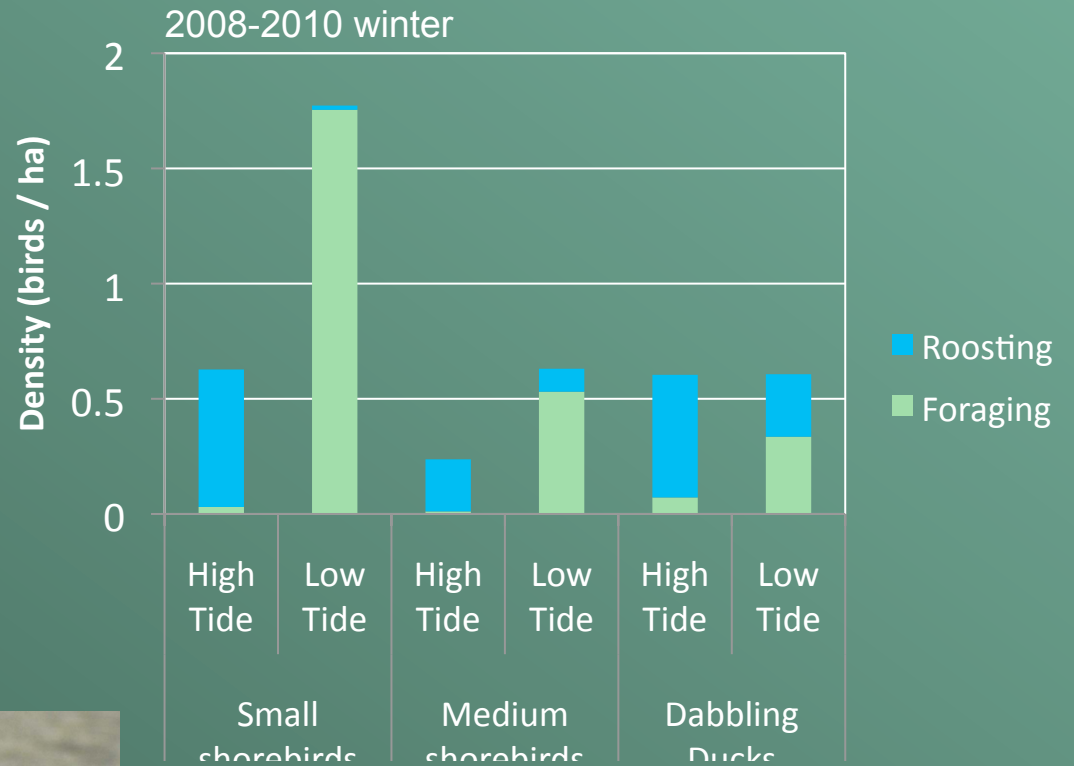
Breached salt pond



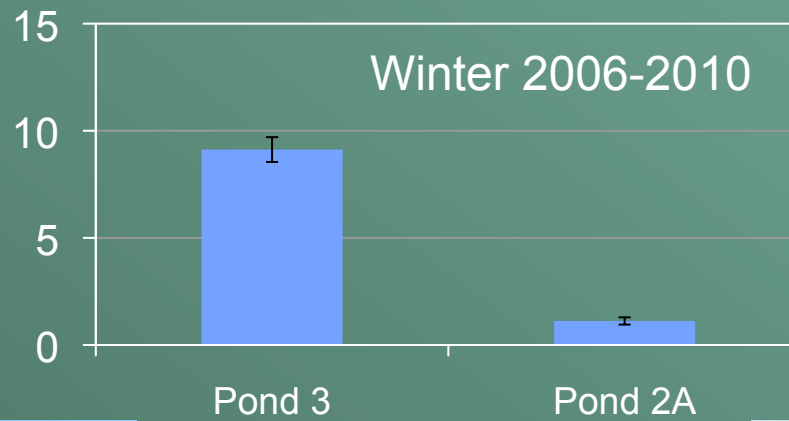
Use of breached ponds 3, 4, 5 at low versus high tide



Use of breached ponds 3, 4, 5 at low versus high tide



Dabbling ducks in Pond 3 vs. Pond 2A at High Tide

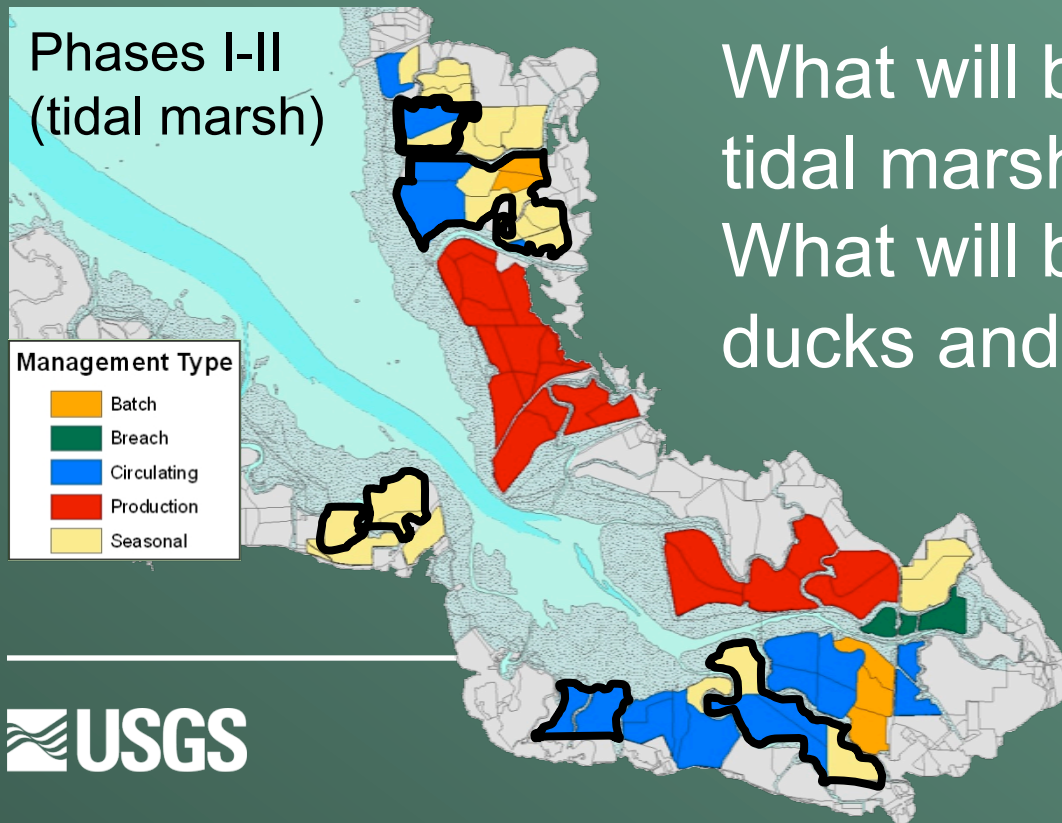


Assuming
 $\text{Pr}(\text{detection})=1$

Assuming
 $\text{Pr}(\text{detection})=0.25$



Pond to marsh conversion during Phases I&II



What will be the benefits for tidal marsh species?
What will be the impact for ducks and shorebirds?

Future studies

- Scenario models
- Landscape-scale abundance based model that incorporates habitat type and context changes over time for different species/guilds
- Implemented within a Decision Support System



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