

Response of Waterbirds to Island Creation within an Estuarine Ecosystem

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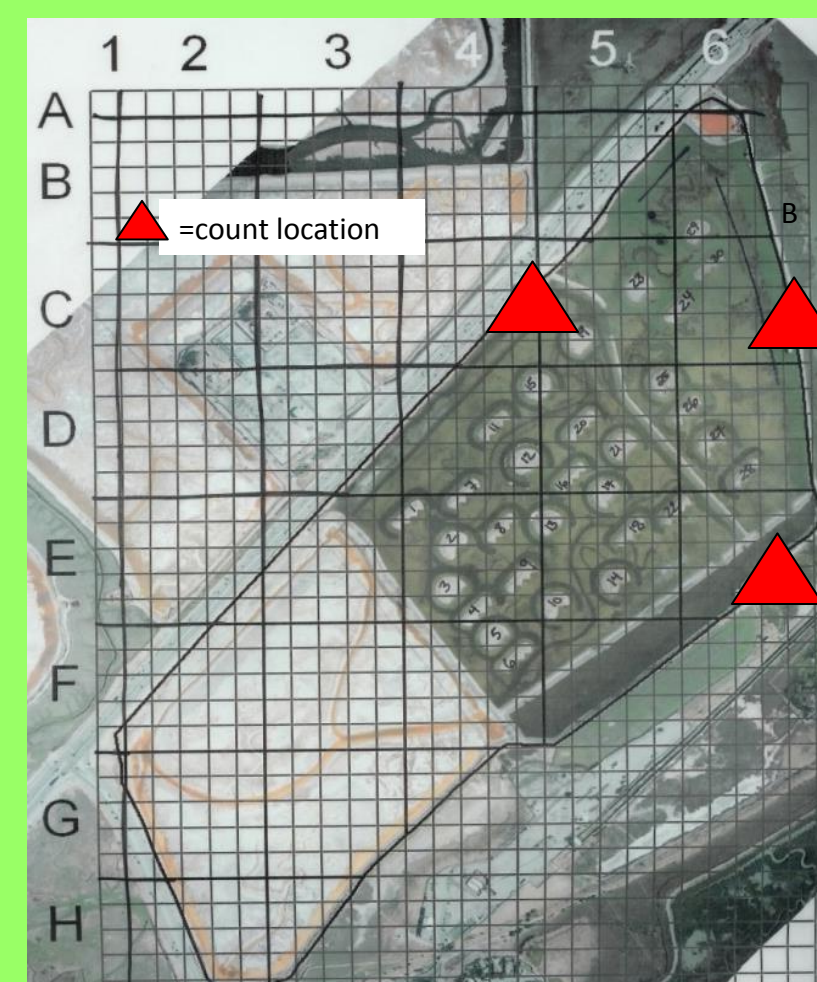
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Introduction

- The San Francisco Bay Estuary is of hemispheric importance due to the high number of migrating and wintering shorebirds that it supports in salt ponds, mudflats, and adjacent areas.
- The South Bay Salt Pond Restoration Project plans to convert 50 to 90% of the 6100 ha of former salt ponds to tidal marsh.
- A primary challenge is to maintain the abundance of migratory and wintering birds in a smaller footprint of managed ponds. The Project is experimenting with pond enhancements such as island construction.
- Pond SF2 (Fig. 1) had 63 ha enhanced by creating 30 islands of two different shapes (circular and linear) and allowing for tidal flow via the installation of water control structures.
- Our goal was to assess how wintering and migrating shorebirds respond to the SF2 enhancements.



Counting platform atop a pick-up truck



Count map with count locations

Methods

- We surveyed the pond weekly from three locations using a 50 m gridcell overlay from October 2010-May 2011 and October 2011- May 2012.
- We recorded all birds observed within the pond noting bird behavior (foraging or roosting) and habitat type (island, levee, water, pond bottom, or man-made).
- Using a generalized linear mixed model, we analyzed island characteristics to determine if certain variables supported higher abundances of birds.



Figure 1. South San Francisco Bay and Site Location (inset is pond SF2)

Results

- Mean waterbird abundance varies over time, with a spike in overall usage during spring migration which occurs in April (Fig. 2).

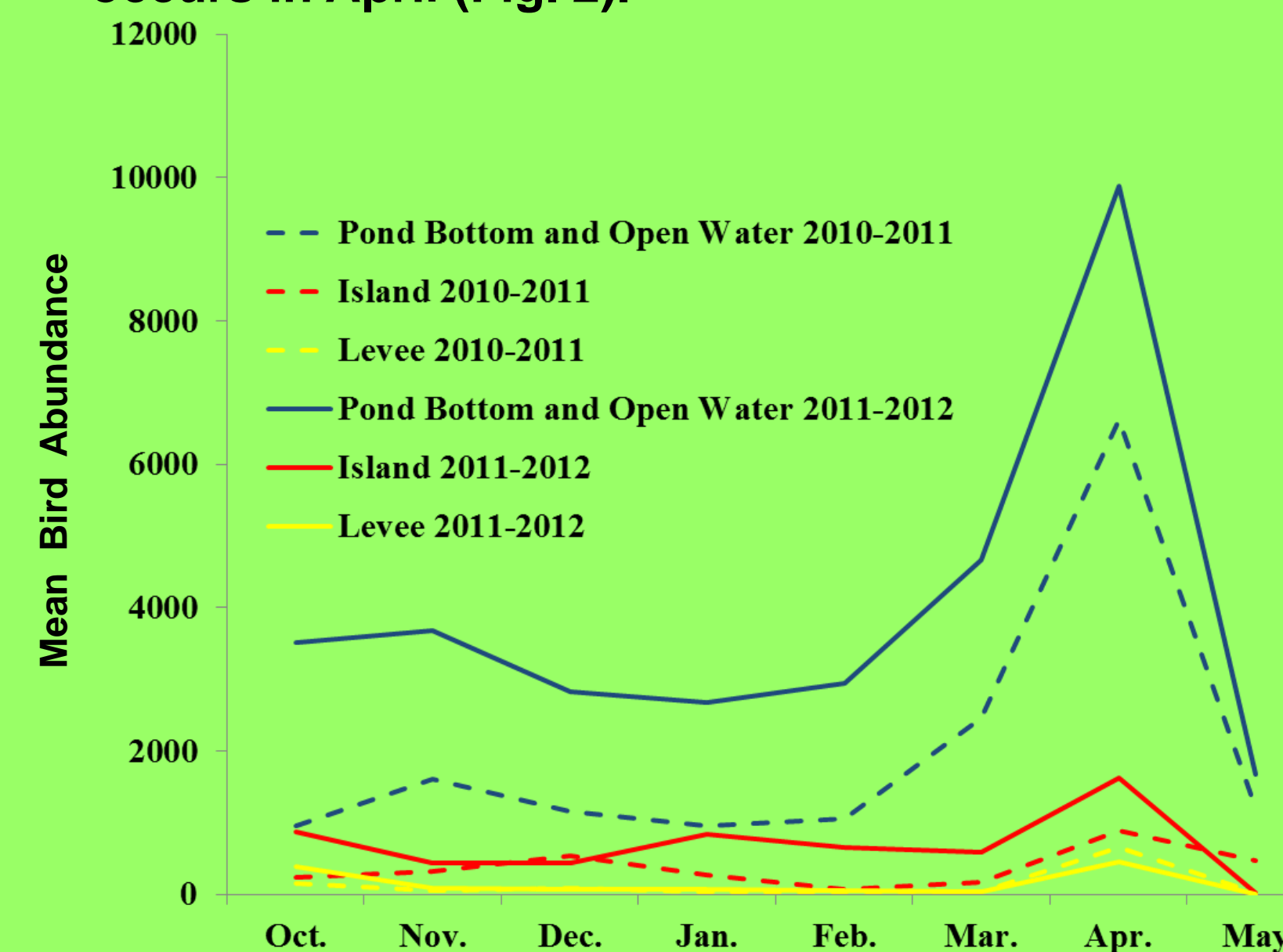


Figure 2. Mean Bird Abundance By Major Habitat Types Over Time

Results - continued

- As far as habitat type, the highest mean bird density was found on islands (54.90 birds/ha² ± 7.35 SE), then on pond bottoms/open water (30.86 birds/ha² ± 4.22 SE), and finally on levees (19.24 birds/ha² ± 5.67 SE).
- Generalized Linear Mixed Model results (Table 1) indicated that higher abundances of most foraging guilds were observed:
 - when the island was more isolated
 - at high tide



Table 1. GLMM results summarized. A (+) indicates that a higher abundance of birds was supported by a farther distance, higher mean elevation, circular island, or in the afternoon. A (-) indicates a higher abundance of birds was supported on a island with a more gradual slope or in the morning. An empty box indicates that there was no statistical relationship between the variable and guild abundance.

	Tern	Small Shorebird	Piscivore	Medium Shorebird	Gull	Diver	Dabbler
Distance to highway							
Distance to nearest island			+	+	+		+
Distance to mudflat							
Distance to nearest levee							+
Island elevation		+					
Island slope		-					
Island shape					+		
Time of day		-			-		-
Tide		+	+	+	+		+

Conclusions

- Highest usage of the pond was during spring migration.
- Small shorebird were seen in higher abundances on islands that were higher in elevation and more gradual in slope.
- Islands that are more isolated (farther nearest neighbor) supported higher abundances of multiple guilds.
- Many guilds may have used the islands as a nocturnal roost.