

PRBO Conservation Science

## PRBO Modeling Approach and Assumptions

- **Models empirically-based**
- **Habitat assumed to be limiting factor for birds**
- **Population indices represent relative bird value, not actual bird numbers**
- **Models and predictions limited to South Bay**

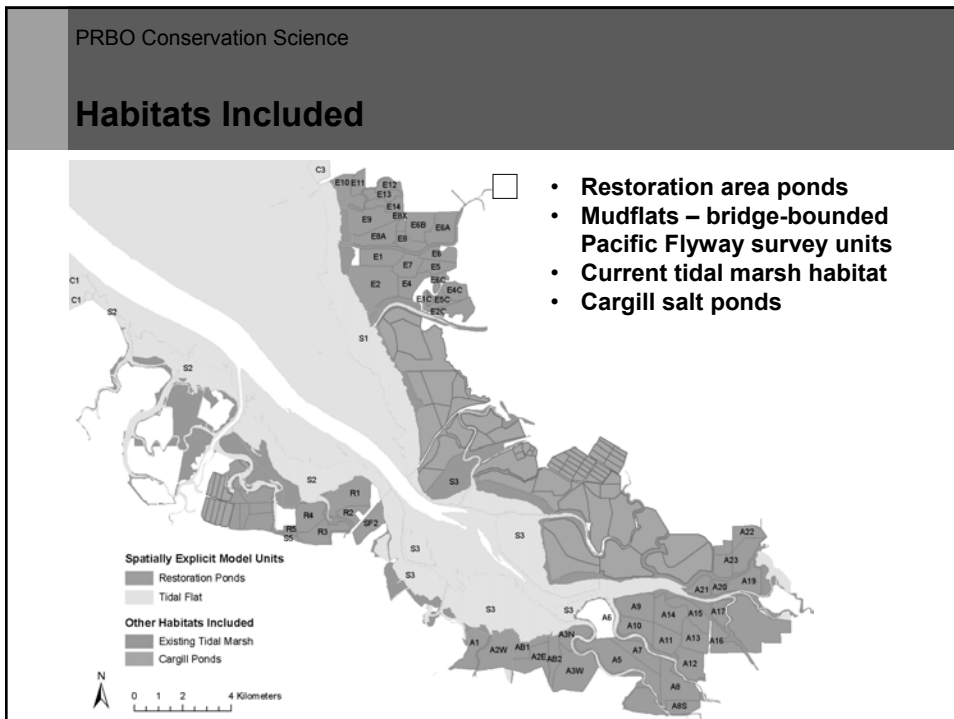
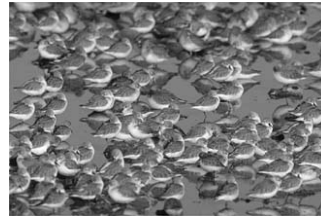
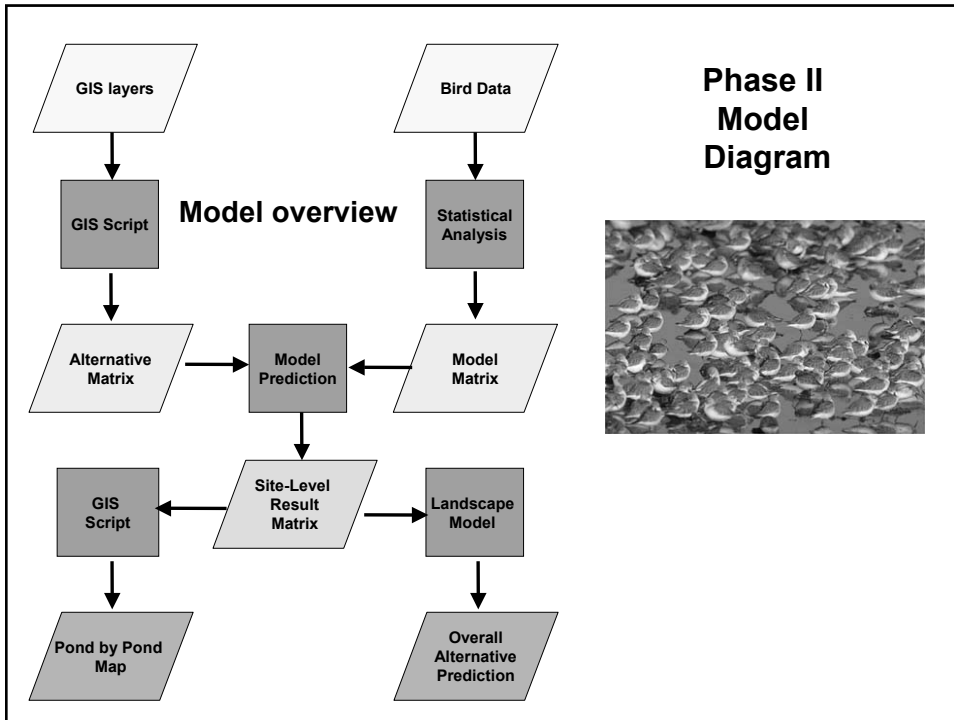


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## PRBO Phase II Model Improvements

- **Identification of focal species and key seasons**
- **Incorporation of USGS salt pond bathymetry data**
- **Explicit consideration of marsh microhabitats (pond, channel, vegetation)**
- **Incorporation of intertidal mudflats**
- **Use of information theoretic approach to select models**
- **Evaluation of more realistic alternatives**





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## Focal Species and Metrics

	Habitats	Seasons	Density Metrics
<b>Passerines</b>	TM	Breeding	
Common Yellowthroat	TM	Breeding	Breeding
Song Sparrow	TM	Breeding	Breeding
Marsh Wren	TM	Breeding	Breeding
<b>Shorebirds</b>	SP, TM, TF	Winter, Fall, Spring	Feeding Biomass
American Avocet	SP, TM, TF	Winter, Breeding	Feeding, Breeding
Black-bellied Plover	SP, TM, TF	Winter	Feeding, Breeding
Black-necked Stilt	SP, TM, TF	Winter, Breeding	Feeding
Dunlin	SP, TM, TF	Winter, Spring	Feeding
Greater Yellowlegs	SP, TM, TF	Winter	Feeding
Least Sandpiper	SP, TM, TF	Winter, Fall, Spring	Feeding
Red-necked Phalarope	SP	Fall	Feeding
Semipalmated Plover	SP	Winter	Feeding
Snowy Plover	SP	Breeding	Breeding
Western Sandpiper	SP, TM, TF	Winter, Fall, Spring	Feeding
Wilson's Phalarope	SP, TM, TF	Fall	Feeding
Willet	SP, TM, TF	Winter, Fall	Feeding

SP = salt pond, TM = tidal marsh, TF = tidal flat

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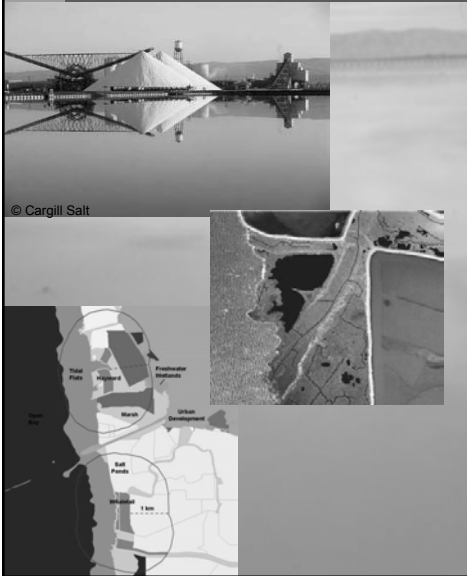
## Focal Species and Metrics

	Habitats	Seasons	Density Metrics
<b>Waterfowl</b>	SP, TM	Winter	Feeding Biomass
Canvasback	SP, TM	Winter	Feeding
Gadwall	SP, TM	Winter	Feeding
Mallard	SP, TM	Winter	Feeding
Northern Pintail	SP, TM	Winter	Feeding
Northern Shoveler	SP, TM	Winter	Feeding
Ruddy Duck	SP, TM	Winter	Feeding
Scaup	SP, TM	Winter	Feeding
<b>Other Waterbirds</b>			
American White Pelican	SP	Winter	Feeding
Eared Grebe	SP	Winter	Feeding
Forster's Tern	SP	Winter	Feeding, Breeding(?)
<b>Rails</b>			
Clapper Rail	TM	Breeding	Breeding
<b>Raptors</b>			
Northern Harrier	SP, TM	Winter	Feeding
<b>Hérons / Egrets</b>	SP, TM	Winter	Feeding Biomass

SP = salt pond, TM = tidal marsh

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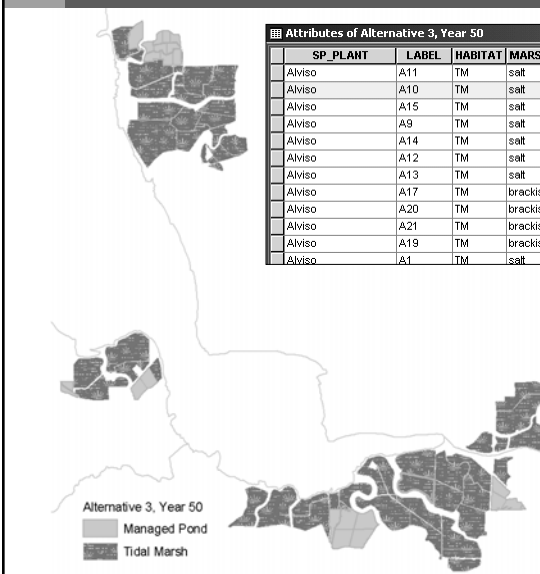
## Site and landscape variables



- Salt ponds
  - Salinity
  - Pond depth
- Tidal Marsh
  - Ponds, pannes, channels
- Landscape
  - Proportion within 1 km – development, salt ponds, tidal marsh, etc.

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## Site-Level Alternative Evaluations

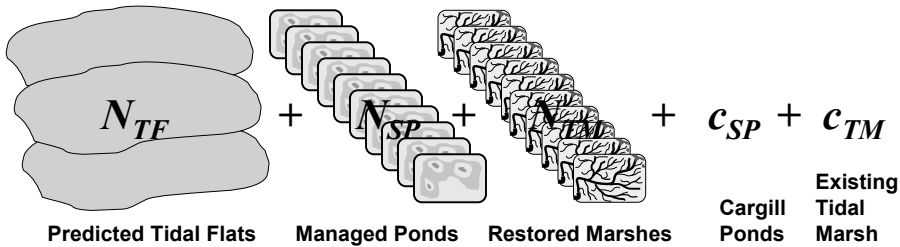


Attributes of Alternative 3, Year 50

SP_PLANT	LABEL	HABITAT	MARSH_T	MARSHAREA	MUDAREA	VEGAREA	PONDAREA	CHANAREA
Alviso	A11	TM	salt	104.9375	0	89.19688	2.09875	13.64188
Alviso	A10	TM	salt	98.6875	0	83.88438	1.97375	12.82938
Alviso	A15	TM	salt	98.1875	0	79.53187	1.96375	16.69188
Alviso	A9	TM	salt	144.0125	0	121.6425	2.89625	20.27375
Alviso	A14	TM	salt	136.3125	0	110.41313	2.72625	23.17313
Alviso	A12	TM	salt	123.5	0	104.975	2.47	16.055
Alviso	A13	TM	salt	107.125	0	86.77125	2.1425	18.21125
Alviso	A17	TM	brackish	51.3125	0	44.12875	4.105	3.07875
Alviso	A20	TM	brackish	24.625	0	21.42375	1.97	1.23125
Alviso	A21	TM	brackish	57	0	49.59	4.56	2.85
Alviso	A19	TM	brackish	105	0	90.3	8.4	6.3
Alviso	A1	TM	salt	108.125	0	95.07323	3.32052	9.73125

For each alternative, plug habitat and landscape values for each site (pond) into bird models to obtain predicted densities.

## Landscape-level Alternative Evaluations



- For each alternative-species-season, combine predictions across all habitats (weighted to avoid over-counting).
- Landscape-level *population indices* not meant to represent actual bird numbers.

$N$  = model-predicted numbers,  $c$  = constant numbers  
 $SP$  = salt ponds,  $TM$  = tidal marsh,  $TF$  = tidal flats

## PRBO Alternative Evaluation Goals

1. Evaluate specific alternatives provided by PWA / HT Harvey.
2. Generate and evaluate additional feasible “mixed” alternatives based on restoration conditions predicted by PWA.
3. Rank alternatives for different species-seasons.
4. Identify alternatives that meet specific management criteria (e.g., 500 Snowy Plovers or 1,000 Clapper Rails).

