

Introduction to Ecology and Regulation of Tidal Wetlands in Central California and the San Francisco Bay

August 17, 2005



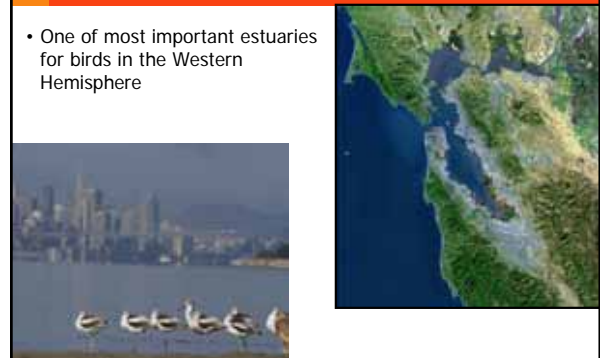
Birds within the San Francisco Bay Estuary : Ecology and Conservation

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San Francisco Bay Estuary


- One of most important estuaries for birds in the Western Hemisphere



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Shorebirds in SF Bay

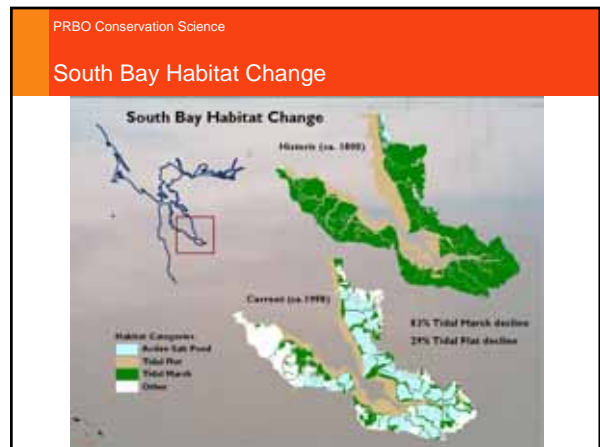
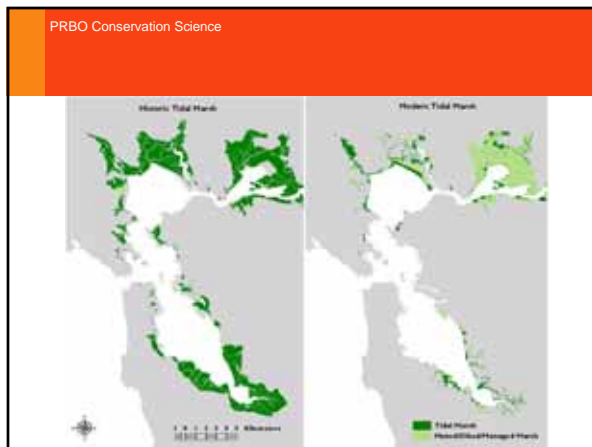
- One of 10 sites in Mexico, Canada, and US designated of Hemispheric importance
- >50% of all shorebirds counted on Pacific Coast of the US are found in SF Bay
- Single day counts in spring of up to a million birds



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SF Bay hosts many other federal and state listed bird species

- Snowy Plover
- Least Tern
- Black Rail
- Clapper Rail
- Song Sparrow (3 subspecies)
- Common Yellowthroat

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Habitat Change: Alterations and threats

- **Remaining habitat altered and degraded by:**
 - levees, man-made channels
 - powerlines and boardwalks
- **Other changes or threats due to:**
 - fragmentation
 - contaminants
 - non-native plants and animals
 - increases in native predator populations

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Talk Outline

- Discuss Habitat Types
 - Description
 - What resources they each provide for birds
- Discuss Species Guilds
 - Description
 - Basic ecology and requirements
- Discuss Threats, Conservation issues, and ecological processes
- Provide a couple examples

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Different Habitat Types


- Tidal Marsh
- Seasonal/Managed Wetlands
- Intertidal Mudflats
- Salt Ponds
- Adjacent Uplands

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Habitat Types – Tidal Marsh

Vegetated wetland that is subject to tidal action

- Larger non-vegetated channels used as foraging habitat primarily during high tides
- Marsh plain with low vegetation used as foraging and nocturnal roost habitat for some species
- Provides nesting habitat for numerous species
- Salt-water cordgrass invasion threatens quality of tidal flats and salt marshes



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Habitat Types - Seasonal / Managed Wetlands

Historical tidal marshes that have been isolated from tidal influence by dikes and levees

- Multiple Uses
 - Waterfowl in Fall/Winter
 - Shorebirds in Spring/Fall
 - Breeding Passerines and Waterfowl in Spring/Summer




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Habitat Types - Tidal Flats

FUEL FOR MIGRATORY AND OVER-WINTERING WATER BIRDS
Mud flats exposed by the falling tide are densely packed with invertebrates, the basis of most waterbird and fish diets in the Estuary.

- Primary foraging habitat for migrating and wintering shorebirds
- Losses due to diking or filling and sedimentation
- Degradation due to non-native vegetation, oyster farming, disturbance, and non-point pollution
- Threats from oil spill and sea level rise potential



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Habitat Types – Salt Ponds

SF Bay ponds host one of the largest breeding populations of the threatened Western Snowy Plover.

Persistent hypersaline ponds that are intermittently flooded with Bay water

- High diversity of habitats, resulting from varied levels of salinity and depth
- Roosting and feeding areas for over 70 species of water birds, including nearly a million migrating shorebirds
- Nesting sites for more than a dozen gull, tern, shorebird, and other water bird species
- Deep water habitat for diving ducks, grebes and other fish-eating birds.





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Avian Species Guilds

- Shorebirds
- Waterfowl
- Herons and Egrets
- Seabirds and other waterbirds
- Raptors, Owls, Corvids
- Rails
- Passerines

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Shorebirds


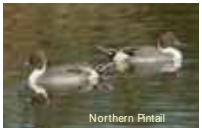
Western Sandpiper	Long-billed Curlew
Least Sandpiper	Black-bellied Plover
Dunlin	American Avocet
Semipalmated Plover	Red Knot
Killdeer	Dowitchers
Sanderling	Greater Yellowlegs
Marbled Godwit	Black-necked Stilt
Willet	Snowy Plover

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Waterfowl

➤ **Average of 450,000 birds present in January**



➤ **One of 34 waterfowl habitat areas of major concern in U.S. and Canada**

Northern Pintail	Green-winged Teal
Northern Shoveler	American Wigeon
Mallard	Cinnamon Teal
Gadwall	Canvasback
Common Goldeneye	Greater and Lesser Scaup
Ruddy Duck	Bufflehead
Red-breasted Merganser	American Coot

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Herons and Egrets

Great Egret
Snowy Egret
Great Blue Heron

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Seabirds and other waterbirds

Forster's Tern	Eared Grebe
California Gull	Western/Clarks Grebe
Bonaparte's Gull	Pied-billed Grebe
Mew Gull	Double-crested Cormorant
Herring Gull	Brown Pelican
Western Gull	American White Pelican
Ring-billed Gull	


Photos by David Leahy

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Raptors, Owls, Corvids

- Northern Harrier
- Red-tailed Hawk
- White-tailed Kite
- Short-eared Owl
- Common Raven




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Rails






Black Rail
Clapper Rail

© Peter LaTourrette

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Passerines

- Salt Marsh Common Yellowthroat
- Savannah Sparrow
- Song Sparrow
- Marsh Wren

Photo: © Tom Vavra

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Conservation Issues: Threats and Ecological Processes (see Takekawa et al. 2005?)

- **Habitat Fragmentation**
 - Effects dispersal and movement
 - Increases edge effects
- **Sedimentation Rates and sediment load**
 - Maintenance of tidal mudflats
 - Dams have reduced (by 50%) the amount of sediment coming into the estuary
- **Contaminants**
 - Hg, Se, PCB's
 - Oils Spills
- **Sea Level Rise**
 - Loss of mudflats
 - Increase in flood events
 - Change in Salinity

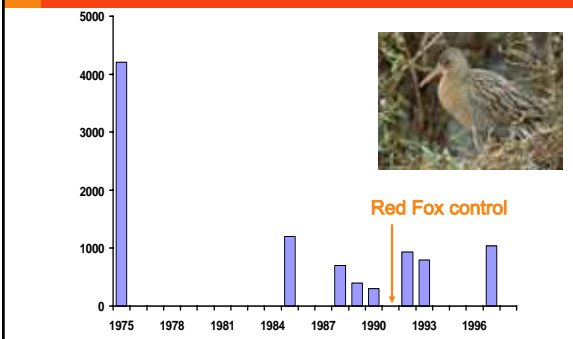
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Conservation Issues: Threats and Ecological Processes (see Takekawa et al. 2005?)

- **Water Quality**
 - Effect Salinity
 - Effect productivity
 - Eutrophication
- **Invasive Species**
 - Vegetation (*Spartina alterniflora*)
 - Vertebrate predators (red fox, norway rates, house cats)
 - Invertebrates (clams, mussels, crabs, isopods)
- **Predation**
 - Introduced non-native predators
 - Changes in distribution of native predators – especially "urban tolerant" species
 - Influence of predation effectiveness due to human disturbances
- **Human Disturbances**
- **Mosquitoes and Mosquito Control**

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Endangered Clapper Rails in SF Bay (Goals 2001, USFWS unpubl. data)



Year	Population
1975	4200
1984	1200
1987	800
1989	400
1990	200
1991	1000
1992	800
1993	1000
1996	1000

Red Fox control

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Edge Effects on Song Sparrow Nest Survival

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SONG SPARROW, *Melospiza melodia*

3 distinctive subspecies (races), confined to salt marsh habitat of San Francisco Bay

- Alameda Song Sparrow, *M. m. pusillula*
- Samuel's or San Pablo Song Sparrow, *M. m. samuelis*
- Suisun Song Sparrow, *M. m. maxillaris*

All are California "Species of Special Concern"

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SONG SPARROW NESTLINGS

Photo: Cully Nordby

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TIDAL MARSH NEST MONITORING SITES

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CAUSES OF SONG SPARROW REPRODUCTIVE FAILURE

Site	Flood	Fledge	Depredated	Other
CC	10	28	55	7
RM	8	30	55	7
BJ	10	30	50	10
RR	2	18	75	5
SB	5	18	70	7

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WHY IS REPRODUCTIVE SUCCESS OF SONG SPARROWS SO LOW?

- PREDATION** - Predominant cause of nest failure
 - Avian, Mammalian Predators: Snakes
- FLOODING** - About 10% of nests fail each year due to flooding
- CONTAMINANTS** - Heavy Metals, PCB's, Dioxin, Pesticides
- INVASIVE SPECIES** - Invasive Predators and Plants e.g., smooth cordgrass (*Spartina alterniflora*)

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HIGH RATES OF PREDATION LEAD US TO ASK THE QUESTIONS:

- Are nests closer to an upland edge more susceptible to predation?
We might expect so, if terrestrial predators are the culprit
- Are nests closer to water's edge more susceptible to predation?
They may be less susceptible if water provides shelter from terrestrial predators;
But more susceptible if predator access is from the water.

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DISTRIBUTION OF SONG SPARROW NESTS FOUND AT CHINA CAMP 1997

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RESULTS – PROXIMITY TO EDGE

- Is most closely related to survival of the nest in the egg stage (not nestling stage)
- Much stronger relationship between proximity to water's edge than to proximity to upland edge
- The *closer* a nest is to a major slough or bay the *higher* is the probability the nest will survive (minor sloughs not as important)

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Effects of South San Francisco Bay Habitat Restoration on Birds

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Background

- State of California, Federal Government and NGOs have purchased 16,500 acres of salt ponds for restoration and enhancement, to be managed by state and federal wildlife agencies
- Regional multi-agency planning report ("Goals Project") recommends a threefold increase in South Bay tidal marsh habitat (9,000 to 25-30,000 acres)
- This will be the largest estuarine restoration project in the country

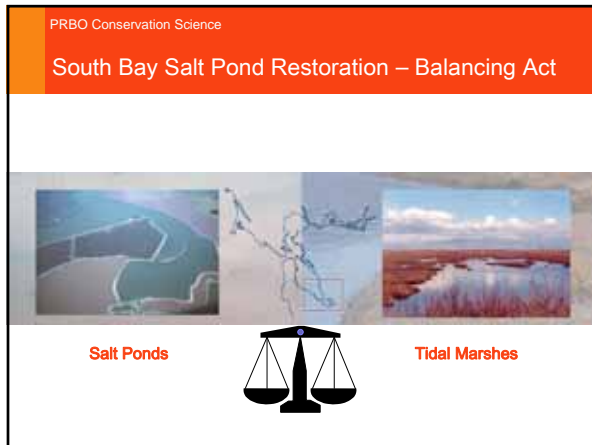
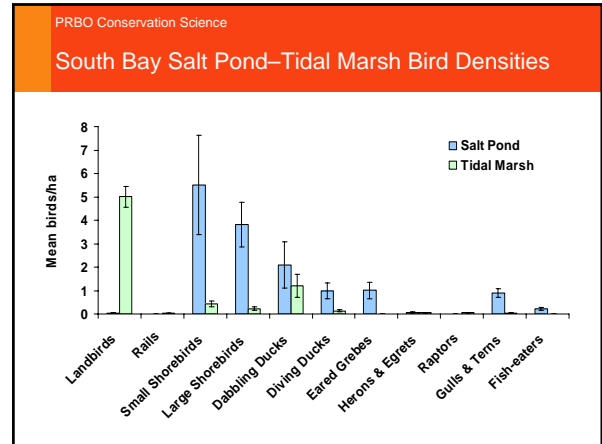
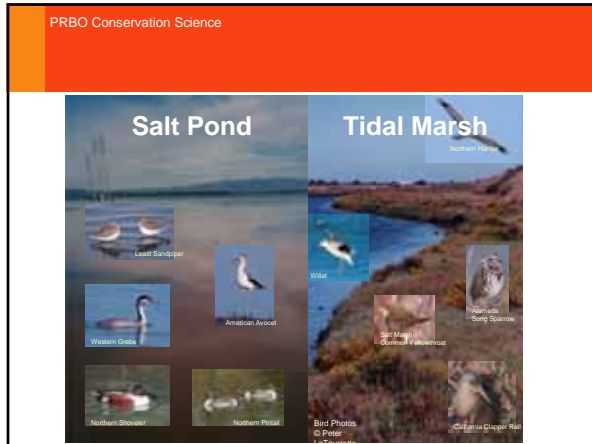
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San Francisco Bay Habitat Restoration

- South Bay project covers 5,471 ha
- One of the largest wetland restoration projects in North America

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South Bay Salt Pond Restoration – Consequences

- Landbirds and rails could benefit greatly from creation of new tidal marsh habitat.
- Loss of salt ponds may cause substantial reduction in waterbird numbers, especially diving ducks and small shorebirds.
- Potential to reduce and/or avoid waterbird losses through design and management of individual restoration sites.
- Critical for waterbirds to retain some salt ponds in a habitat mosaic (more important than tidal marsh design and management).