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Mitigation and Adaptation through Adaptive Conservation

North Bay Watershed Association

Ellie M. Cohen and PRBO staff

April 4, 2008

Key Points

1. Climate Change = happening now & accelerating
2. Birds = good indicators of ecosystem function, fisheries health
3. “Restoration” = a key mitigation & adaptation strategy
4. Monitoring = critical to adaptive conservation-- assessing & improving ecosystem resiliency during rapid change

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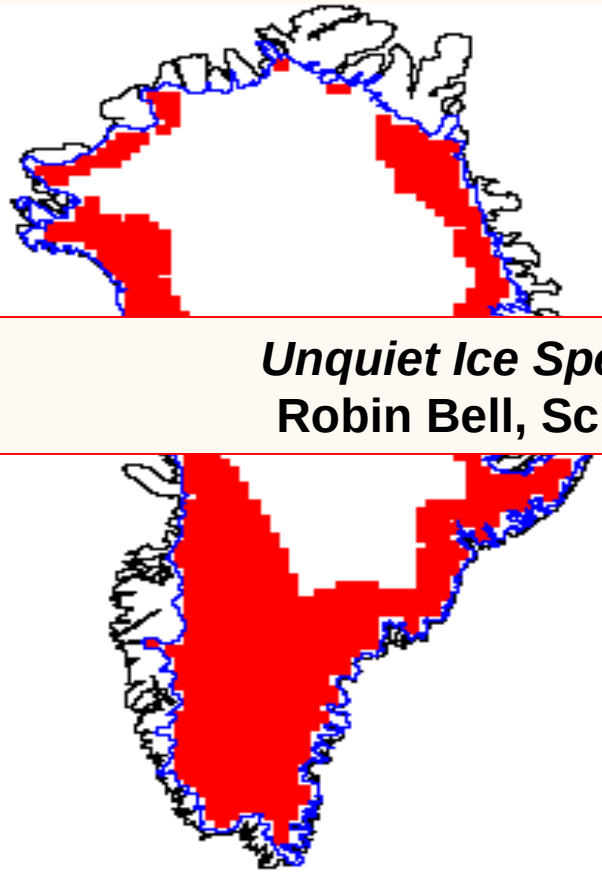
Climate Change Happening Now

Greenland
Greatest surface ice melt on record



Konrad Steffen, Russell Huff, CIRES,
University of Colorado, Boulder, 12-11-07

Antarctica
Wilkin's Ice Shelf Breaking Up
March 25, 2008

National Snow and Ice Data Center/NASA

Unquiet Ice Speaks Volumes on Global Warming.
Robin Bell, Scientific American, February, 2008

Climate Change Accelerating….

CO2 into atmosphere – 3x faster

Arctic melting – 3x faster, 30 years earlier

Greenland melting – 3x faster

Antarctica melting -- faster

Sea level rise – 2x faster

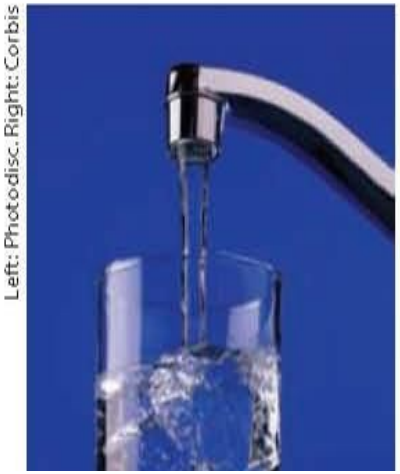
than IPCC 2007 predictions (www.climateinstitute.org.au)

American West temperatures – 2x faster

than rest of world (Rocky Mtn. Climate Organization/NRDC)

Climate Change Exacerbates other "Change"

- Habitat loss
- Biodiversity loss
- Invasive species
- Over-exploitation of resources
- Fresh water diversions
- Pollution



Left: Photodisc, Right: Corbis


Tom Van Sant- The Climate Project

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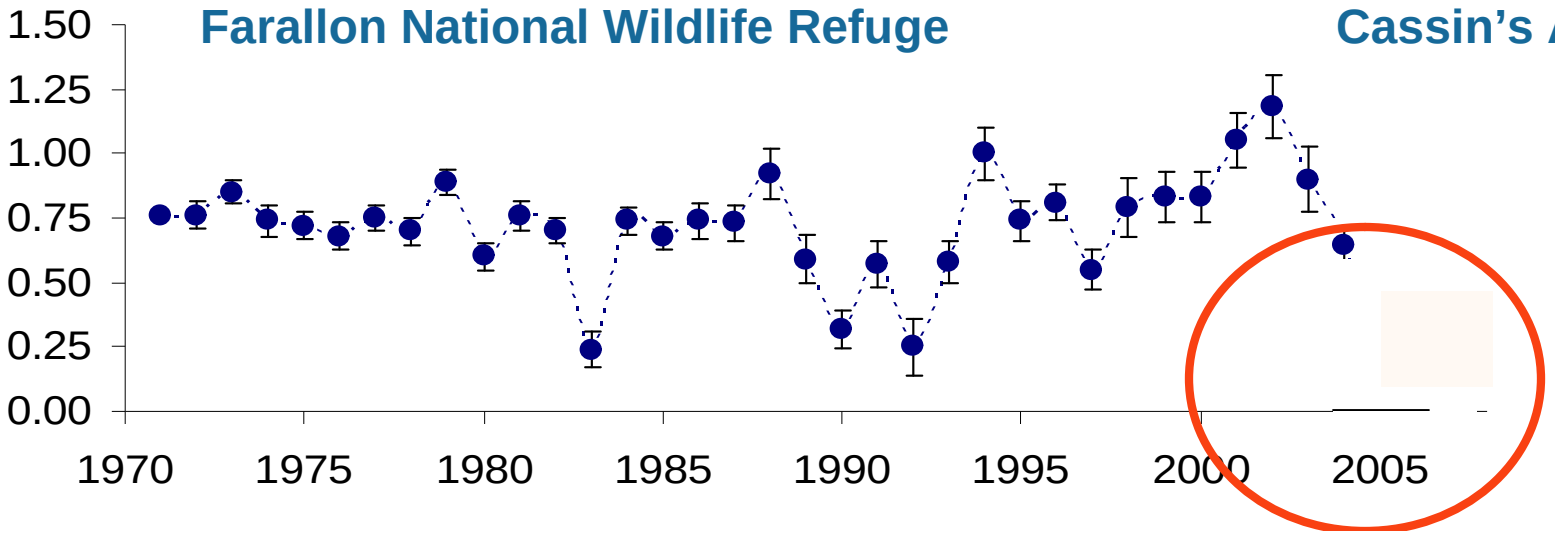
Seabird Breeding Failure

Farallon National Wildlife Refuge

Cassin's Auklet



www.prbo.org

Many Animals Depend on Krill!

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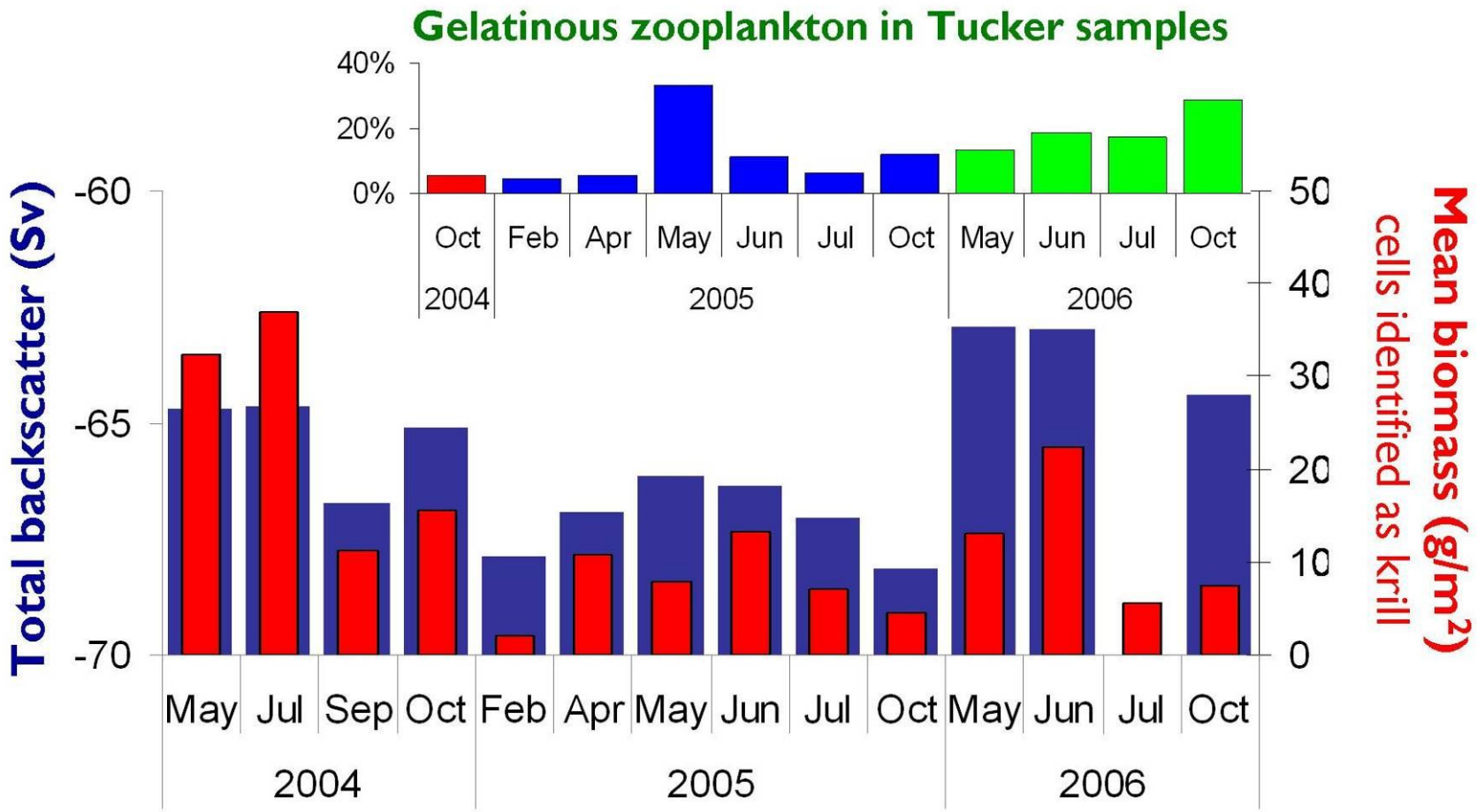
↓ Krill, ↑ Gelatinous Zooplankton



Jaime Jahncke, et al, PRBO, 2008

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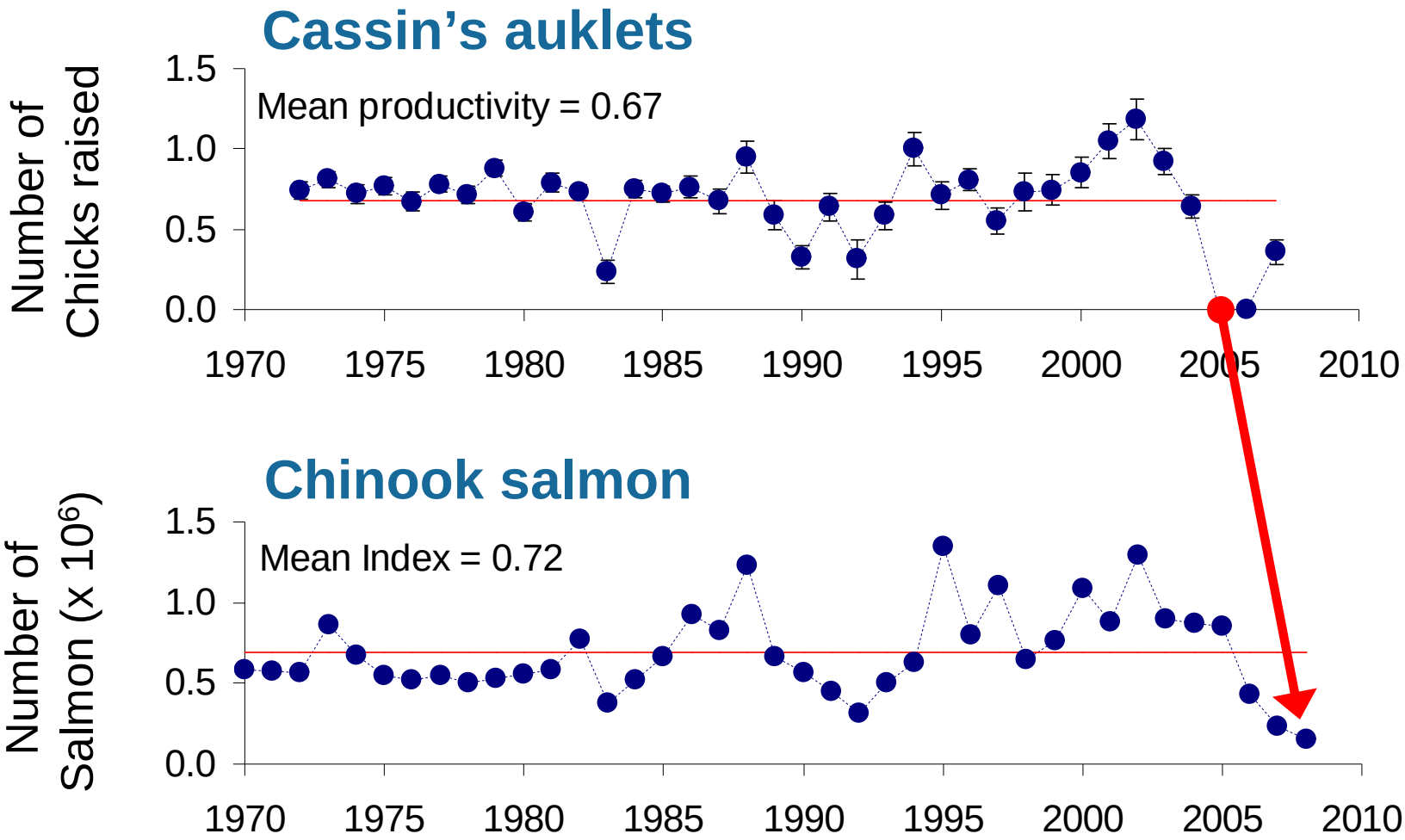
Fish and Seabirds- similar diet, impacts



Jaime Jahncke, et al, PRBO, 2008

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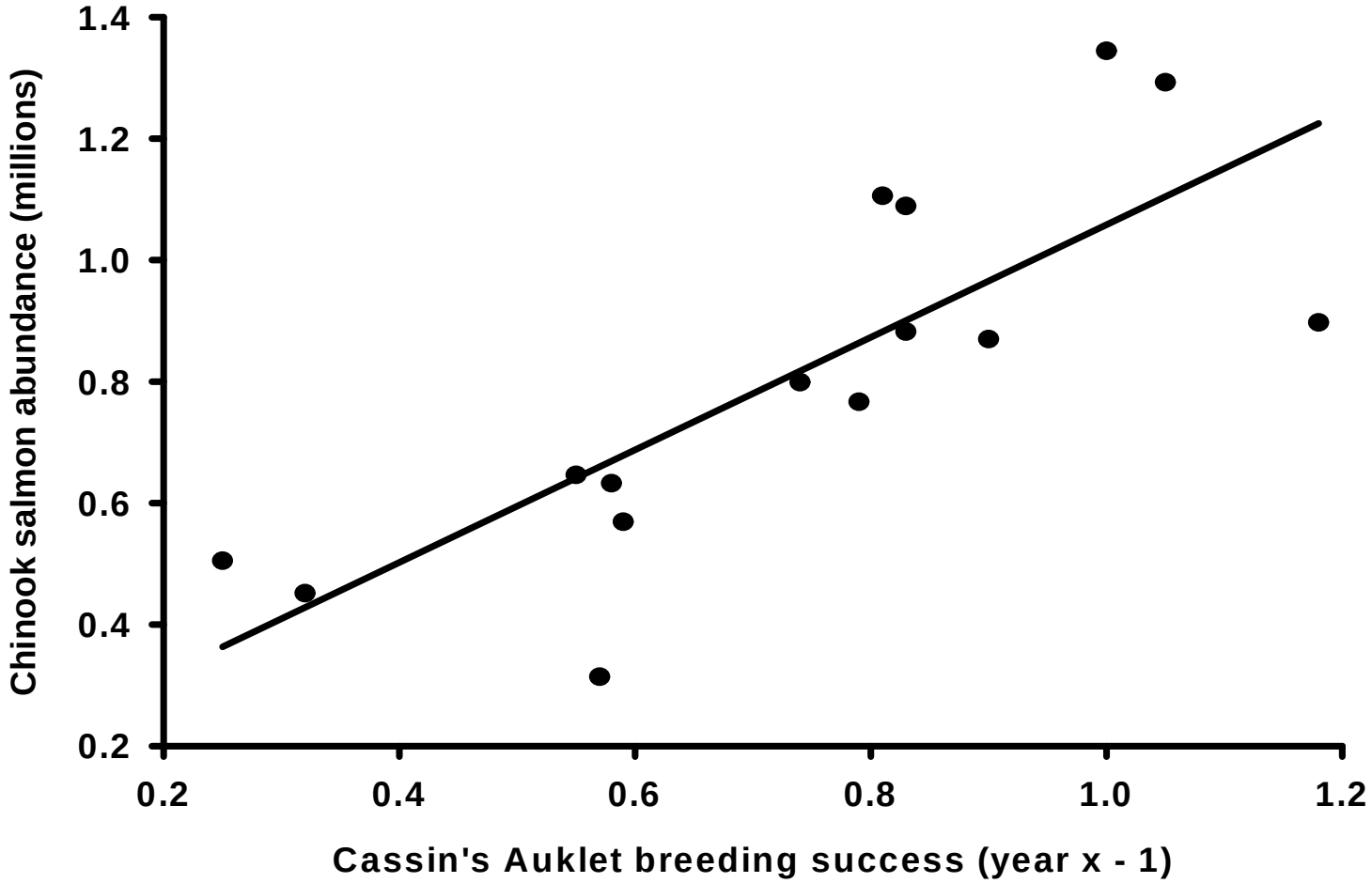
Auklets Predict Salmon



Jennifer Roth, et al, 2007, Canadian J. Fisheries Aqua. Sci. -- www.prbo.org

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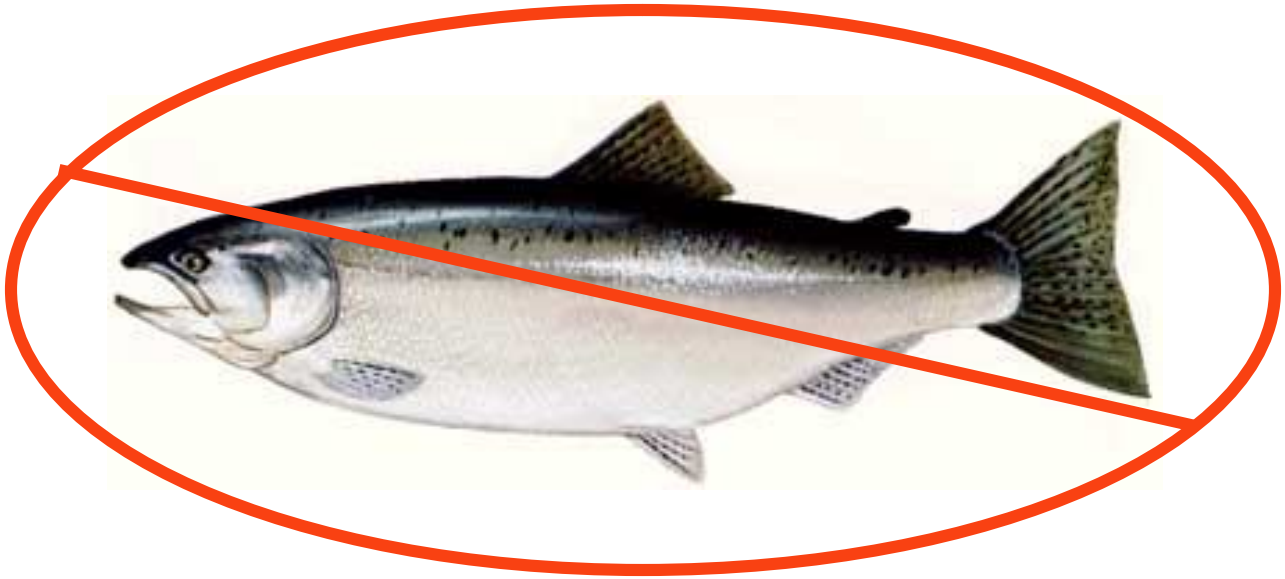
The Future of Salmon?



“Feds warn entire salmon season could be halted”

March 12, 2008

San Francisco Chronicle

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Sea Level Rise, Coastal Flooding, Salinity

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⬆ Flooding, Drought, Fire, Invasives

San Anselmo, CA Jan. 1,2006

See: CA Climate Change Center

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Key part of Solution: ECOSYSTEM CONSERVATION

Enhance ecosystem

resistance,

resilience, &

response

to rapid climate change

Mitigate *and* adapt

Seavy et al, PRBO unpublished; Millar et al. (2007)

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Employ Adaptive Conservation Strategies

<u>Monitor</u> key biological measures- e.g., focal species

<u>Understand</u> ecological mechanisms

<u>Inform</u> mitigation and adaptation actions

http://www.prbo.org/cms/docs/consplans/ACSGUIDEweb.pdf

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“Restore” or Design Landscapes to:

- **support biodiversity and ecosystem services**
- **forestall or soften ecological transitions**
- **establish habitat refugia, buffer zones, corridors**
- **facilitate species distribution shifts**





Wiens, J., September, 2007, www.prbo.org/climatechange

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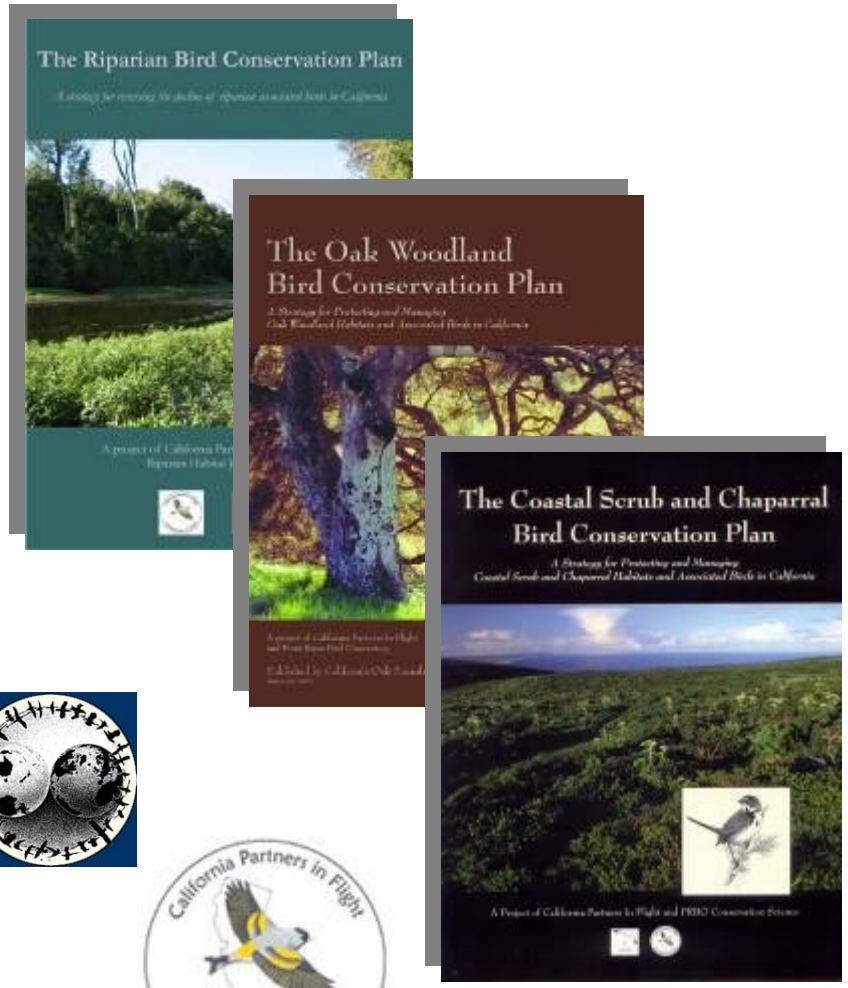
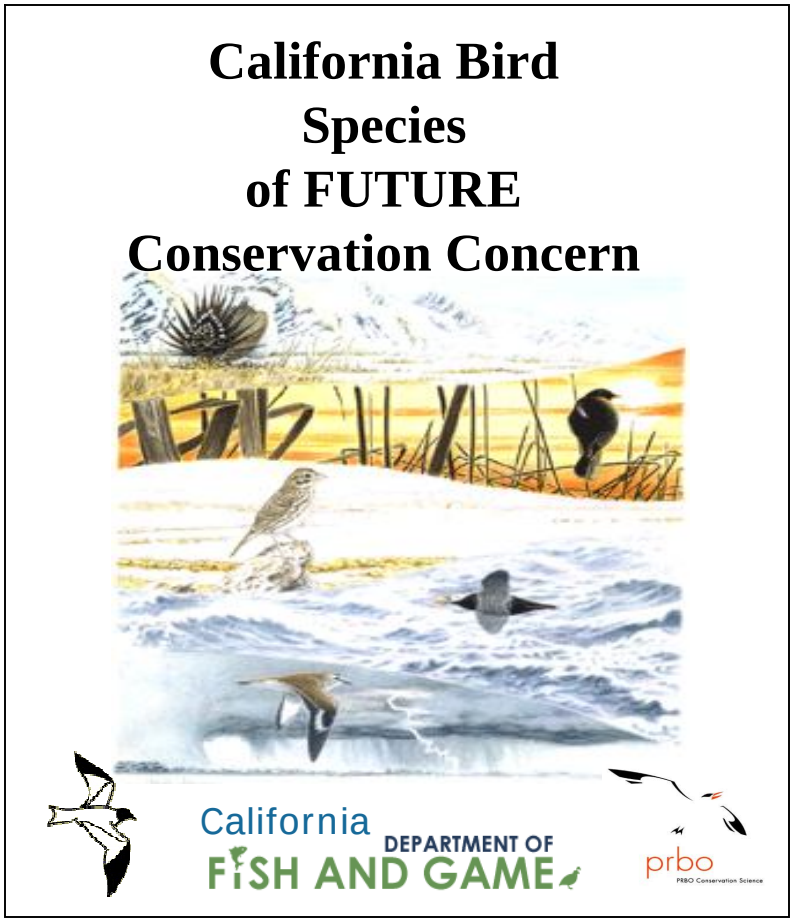
Develop Climate Change Conservation Plans





California Partners in Flight
Compañeros en Vuelo

See www.prbo.org/calpif/

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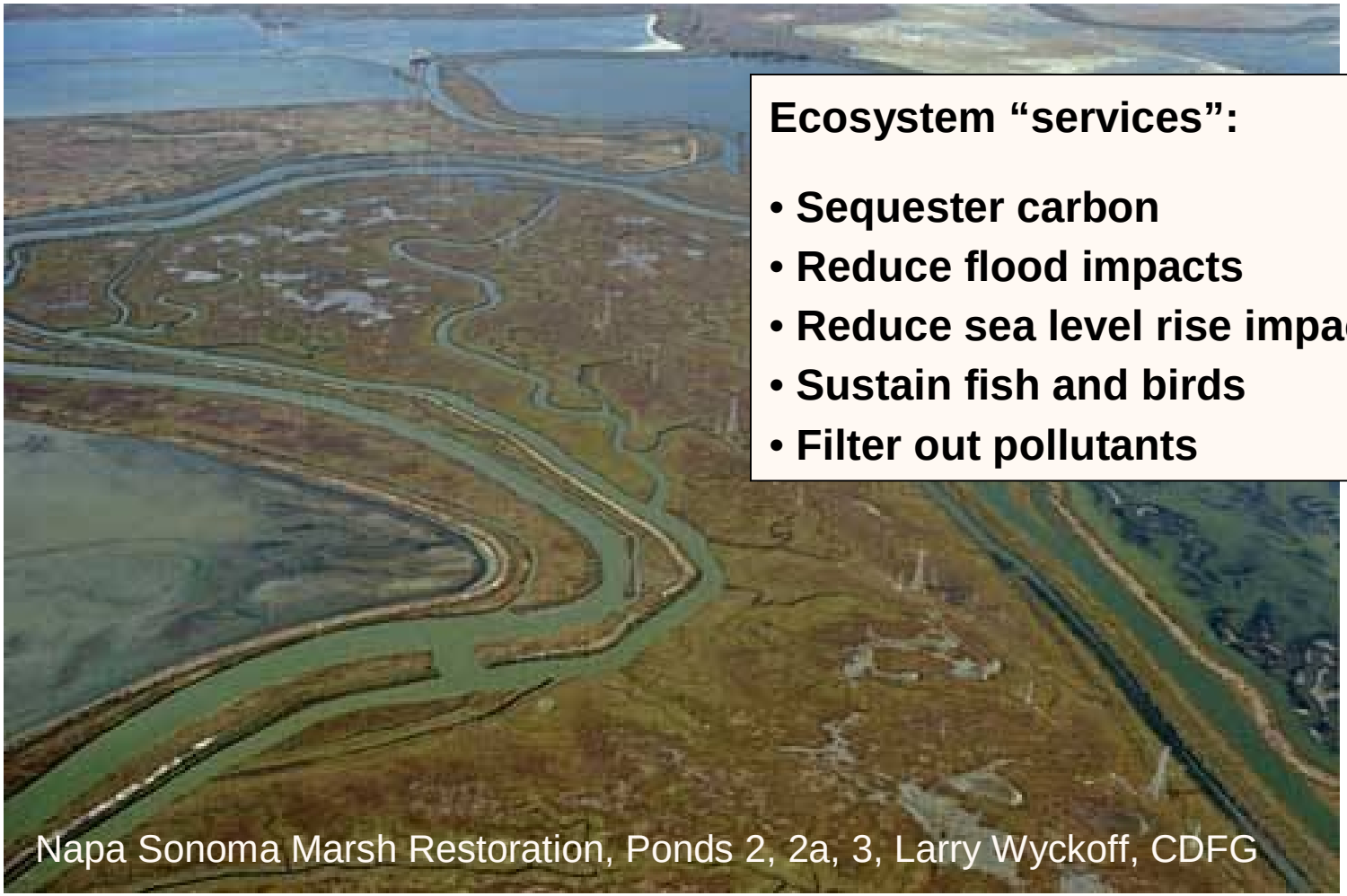
Tidal Wetland “Restoration”

San Pablo Bay: ~50,000 acres total goal



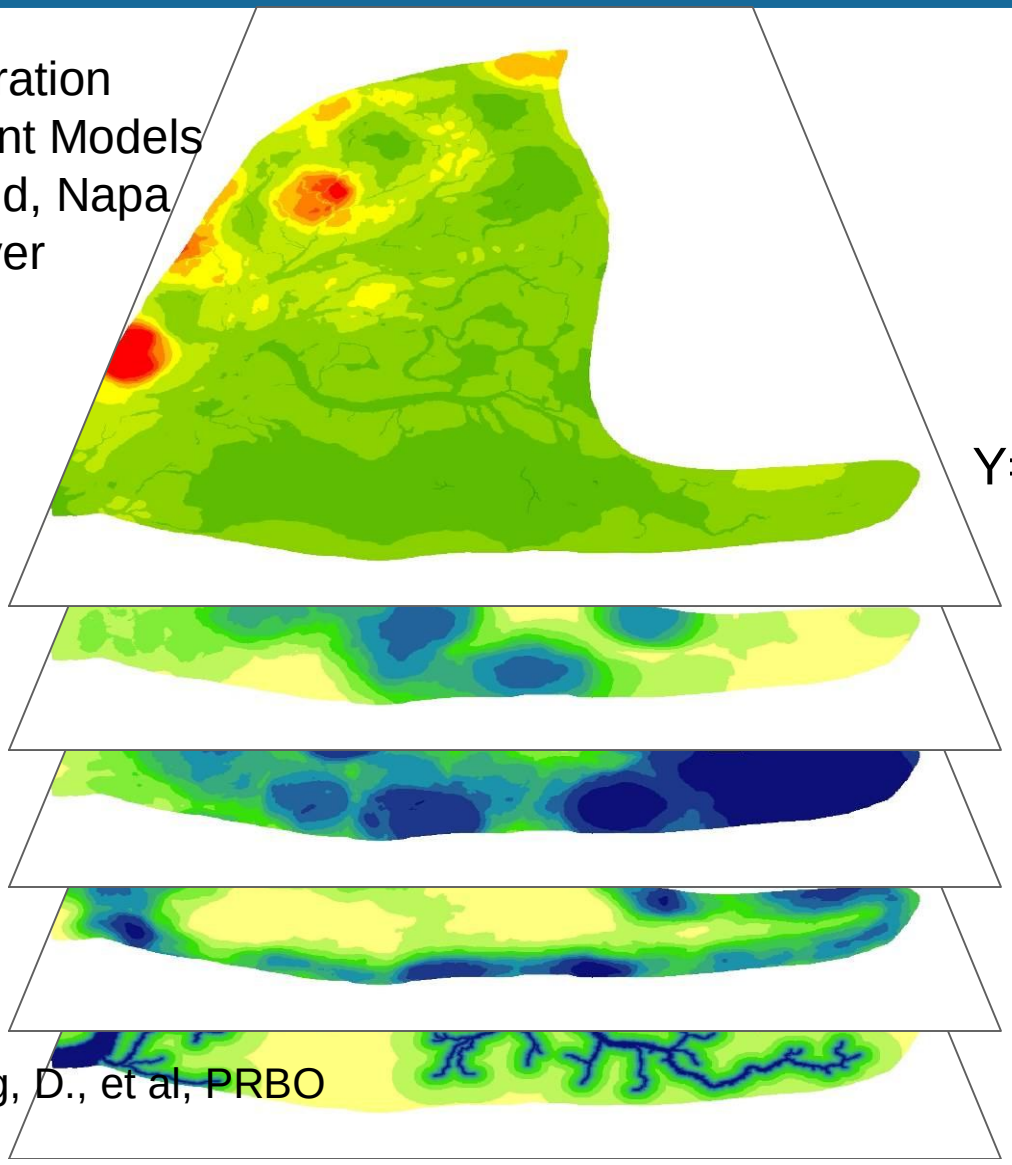
Ecosystem “services”:

- **Sequester carbon**
- **Reduce flood impacts**
- **Reduce sea level rise impacts**
- **Sustain fish and birds**
- **Filter out pollutants**

Napa Sonoma Marsh Restoration, Ponds 2, 2a, 3, Larry Wyckoff, CDFG

Monitoring: Not all designs created equally!

Restoration Assessment Models Bull Island, Napa River



$Y=m_1x_1+m_2x_2+m_3x_3+m_4x_4+b$

Y (Common Yellowthroat density)

X_4 (vegetative diversity)

X_3 (proportion of *Scirpus)*

X_2 (proportion of *Typha*)

X_1(distance to nearest channel)

Stralberg, D., et al, PRBO

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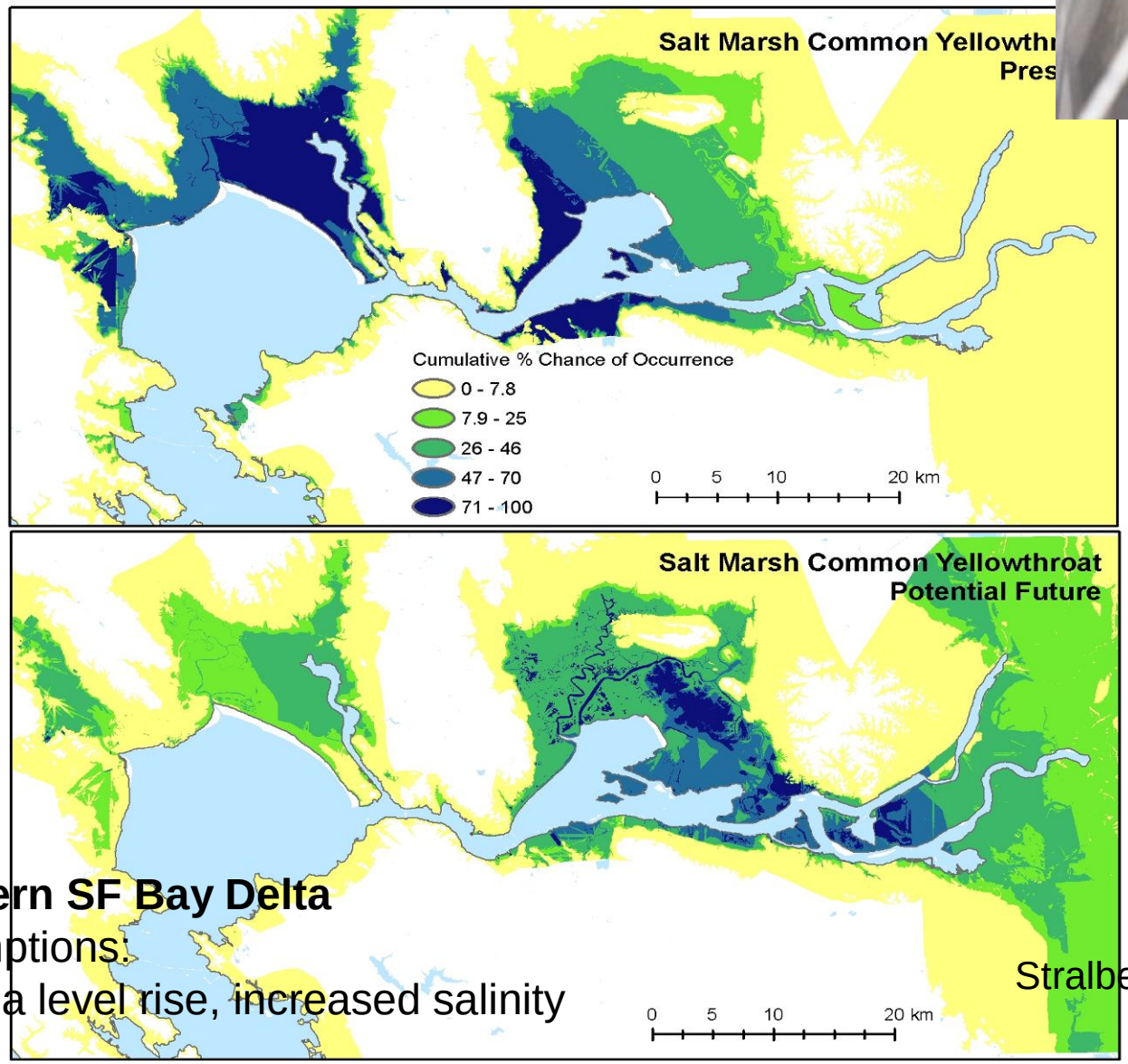
Predict Future Wetlands- barriers?



Northern SF Bay Delta

Assumptions:

1 m sea level rise, increased salinity

Stralberg, D., et al, PRBO

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Riparian "Restoration" = ↑Water + ↑Wildlife

Yellow Warbler

Cosumnes Preserve

Ecosystem "Services":

- **Reduce flood damage**
- **Provide wildlife corridors**
- **Sustain fish and birds**
- **Replenish ground water**
- **Store water**
- **Nourish upland habitat**

Grosholz, T., et al, UC Davis

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Private Lands “Restoration”

Gale Ranch, Marin County RCD

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Result: linked corridors, ↑biodiversity

Gale Ranch, Marin County RCD

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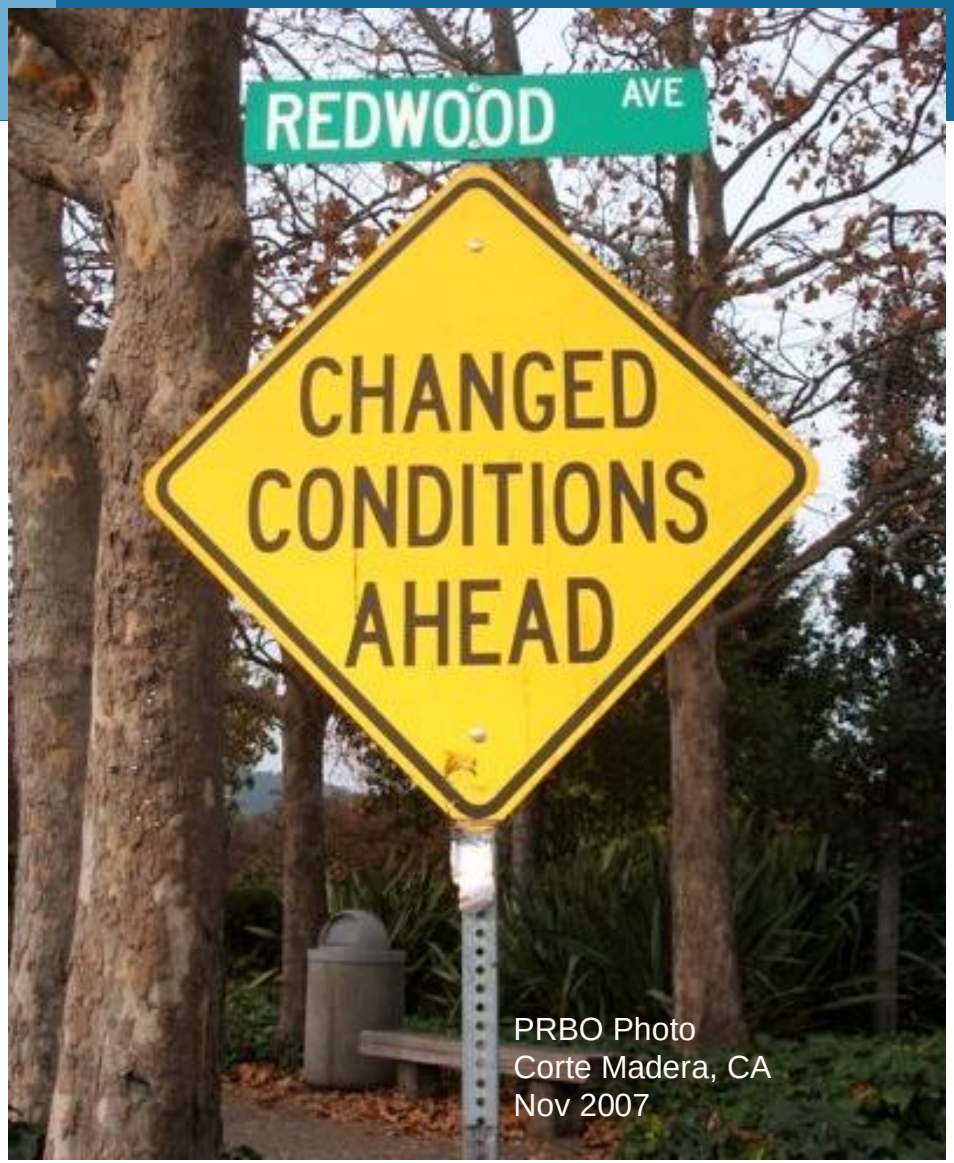
Some Recommendations www.prbo.org/climatechange

- Expand biological monitoring, long term data sets
- Use bird ecology studies - early warning indicators
- Employ adaptive conservation- feedback cycle
- Incorporate real time conditions – fisheries, other
- Salmon: separate riverine from ocean effects on salmon- How many smolts entering ocean? Include diet?
- ID, protect current *and* future refugia (e.g. ocean food web “hotspots,” uplands)
- Recognize change is inevitable, losses will occur -- prioritize investments and act now!



- "The longer action is delayed, the more it will cost." (IPCC, Nov 2007)
- Reduce CO2 *and* expand conservation <u>now</u>

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THANK YOU!

PRBO scientists, support staff, Board, members, and:

American Bird Conservancy
Anonymous
S.D. Bechtel, Jr. Foundation
Bureau of Reclamation
Bureau of Land Management
California Coastal Conservancy
California Department of Fish and Game
California Bay Delta Authority
California Audubon
California Seagrant
Central Valley Joint Venture
Cornell Lab of Ornithology
DMARLOU Foundation
Richard Grand Foundation
Giles Mead Foundation
Moore Family Foundation/Gordon & Betty Moore Foundation
David and Lucile Packard Foundation
National Fish and Wildlife Foundation
National Science Foundation
NOAA Fisheries, Marine Sanctuaries
Natural Resource Conservation Service
Resources Law Group/Resources Legacy Fund Foundation
Riparian Habitat Joint Venture
San Francisco Bay Joint Venture
The Climate Project/ Al Gore
The Nature Conservancy
U.S. Fish and Wildlife Service
USDA Forest Service