Mitigation and Adaptation through Adaptive Conservation

North Bay Watershed Association
Ellie M. Cohen and PRBO staff

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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
Climate Change Happening Now

Greenland
Greatest surface ice melt on record

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

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

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

National Snow and Ice Data Center/NASA
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
Seabird Breeding Failure

Farallon National Wildlife Refuge  Cassin’s Auklet

www.prbo.org
Many Animals Depend on Krill!
Gelatinous zooplankton in Tucker samples

Total backscatter (Sv)

Mean biomass (g/m³)
cells identified as krill

Fish and Seabirds - similar diet, impacts

Cassin’s auklets
Mean productivity = 0.67

Number of Chicks raised

Chinook salmon
Mean Index = 0.72

Number of Salmon (x 10^6)

Auklets Predict Salmon

“Feds warn entire salmon season could be halted”
March 12, 2008
San Francisco Chronicle
Sea Level Rise, Coastal Flooding, Salinity

The Climate Project, 20 ft sea level rise

San Francisco
Flooding, Drought, Fire, Invasives

San Anselmo, CA Jan. 1, 2006

See: CA Climate Change Center
Enhance ecosystem resistance, resilience, & response to rapid climate change

Mitigate and adapt

Seavy et al, PRBO unpublished; Millar et al. (2007)
Employ Adaptive Conservation Strategies

Monitor key biological measures - e.g., focal species

Understand ecological mechanisms

Inform mitigation and adaptation actions

http://www.prbo.org/cms/docs/consplans/ACSGUIDEweb.pdf
“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](http://www.prbo.org/climatechange)
Develop Climate Change Conservation Plans

See [www.prbo.org/calpif/](http://www.prbo.org/calpif/)
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!

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

$Y$ (Common Yellowthroat density)

$X_4$ (vegetative diversity)

$X_3$ (proportion of *Scirpus*)

$X_2$ (proportion of *Typha*)

$X_1$ (distance to nearest channel)

Restoration Assessment Models
Bull Island, Napa River

Stralberg, D., et al, PRBO
Predict Future Wetlands - barriers?

Assumptions:
- 1 m sea level rise
- Increased salinity

Northern SF Bay Delta
Assumptions:
1 m sea level rise, increased salinity

Stralberg, D., et al, PRBO
Riparian “Restoration” = \uparrow \text{Water} + \uparrow \text{Wildlife}

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
Private Lands “Restoration”

Gale Ranch, Marin County RCD
Result: linked corridors, biodiversity

Gale Ranch, Marin County RCD
Some Recommendations

- 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 now
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