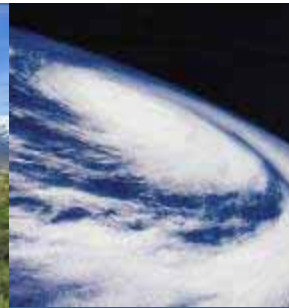




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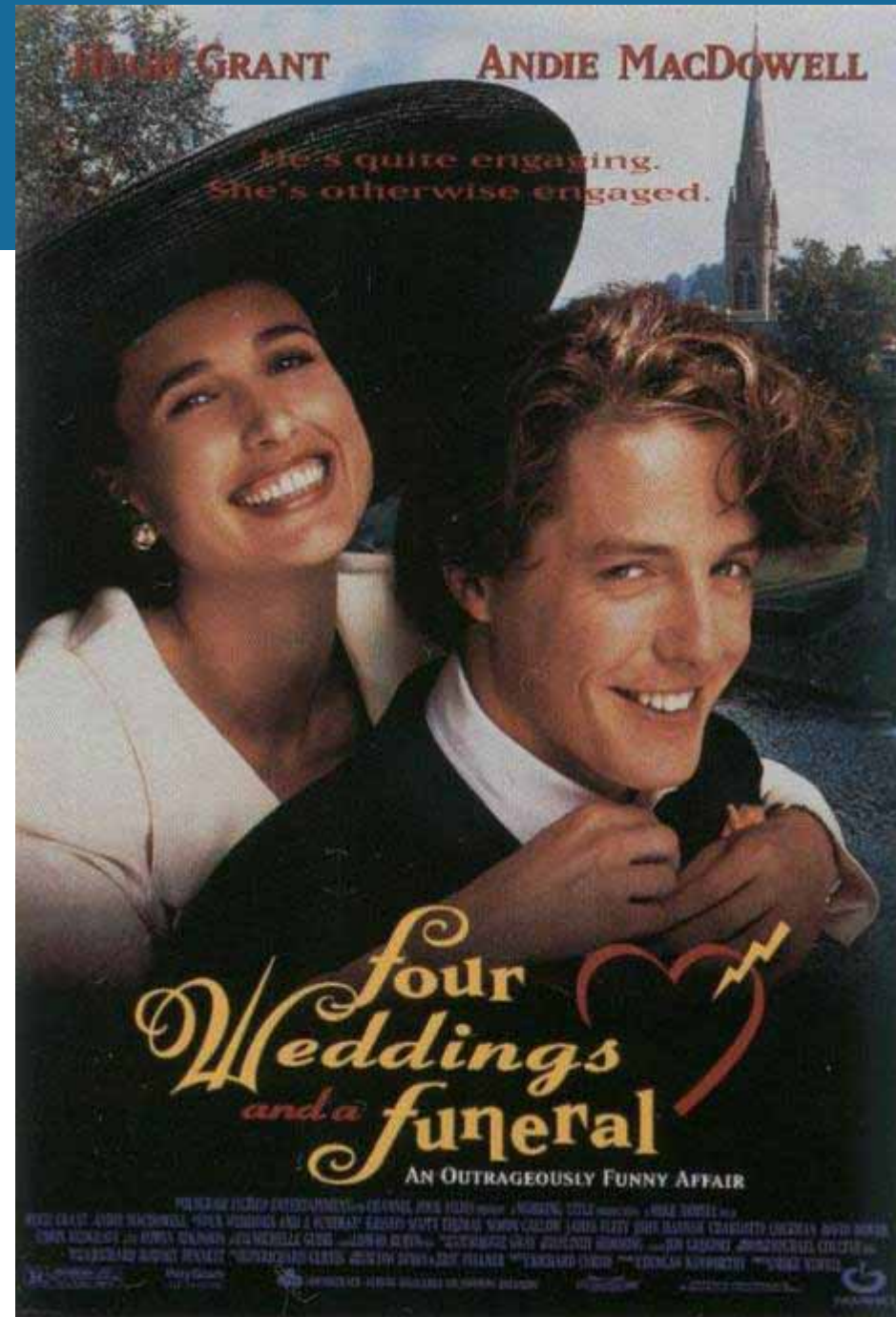
Bird Conservation, Resource Management, and Climate change

Nathaniel Seavy, Geoffrey Geupel, Mark Herzog, Stella Moss, and Diana Stralberg

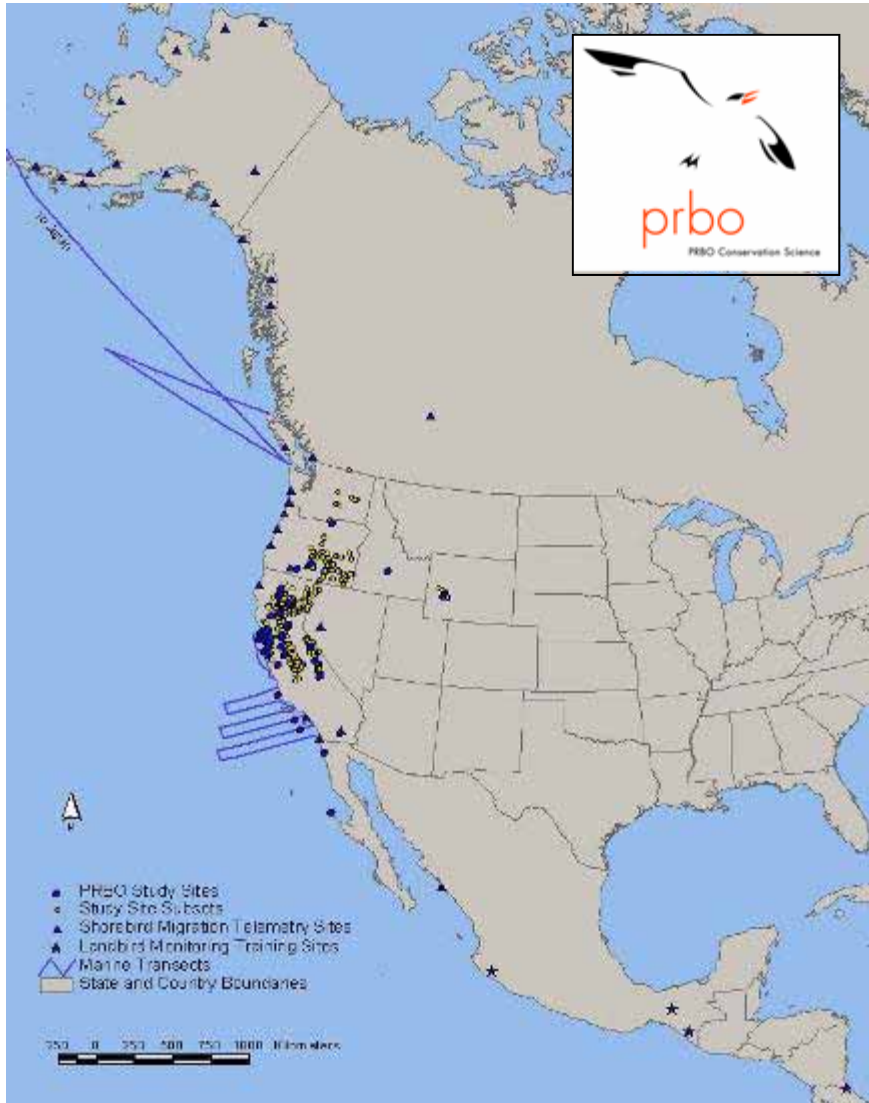
1. Stationarity is dead

We need to wed climate research to resource management in four ways:

1. Describe climate-resource interactions
2. Project conditions for future scenarios
3. Adapt resource management
4. Monitor future changes



Advancing conservation through science



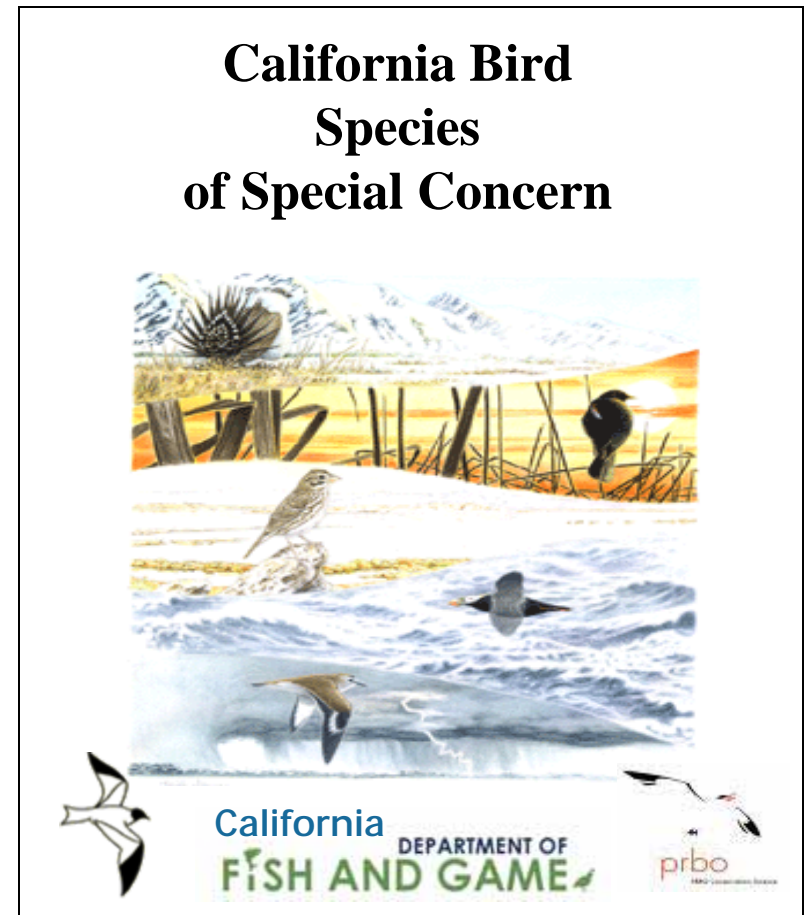
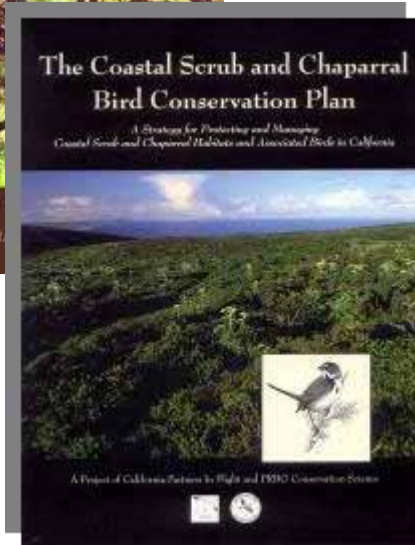
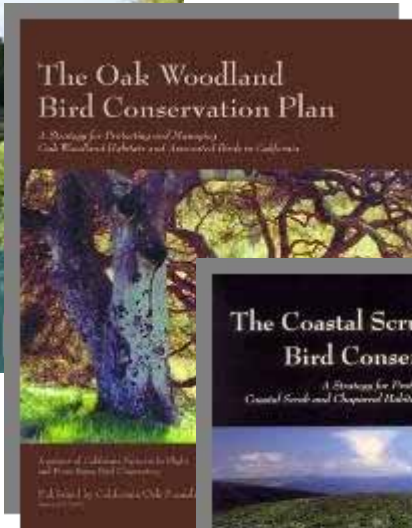
Headquarters in Petaluma



Long history of Eastern Sierra research



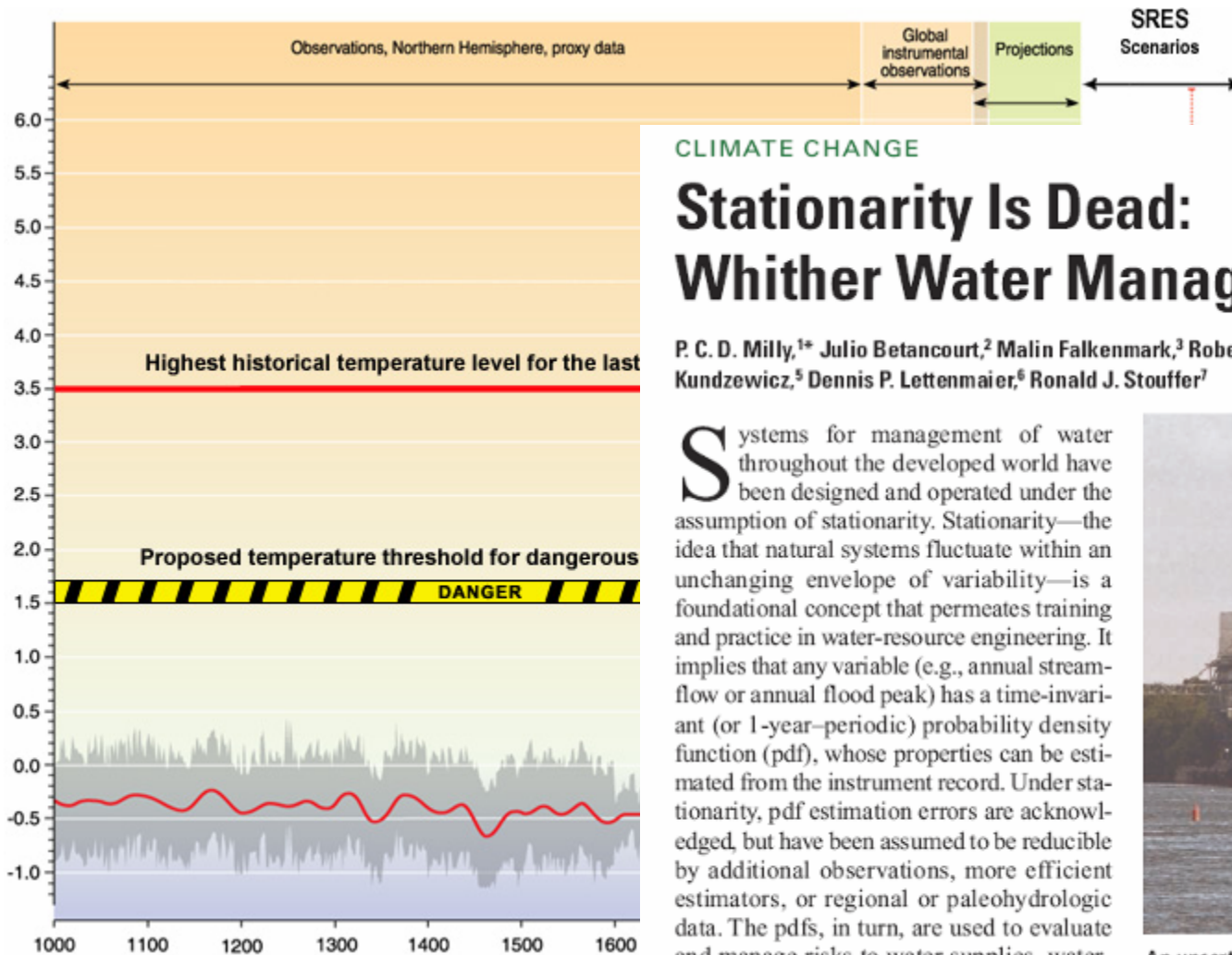
Providing bird science to guide conservation



Edited by Tom Gardali and Dave Shuford

www.prbo.org/cms/230

The context of resource management is changing



CLIMATE CHANGE

Stationarity Is Dead: Whither Water Management?

P. C. D. Milly,^{1*} Julio Betancourt,² Malin Falkenmark,³ Robert M. Hirsch,⁴ Zbigniew W. Kundzewicz,⁵ Dennis P. Lettenmaier,⁶ Ronald J. Stouffer⁷

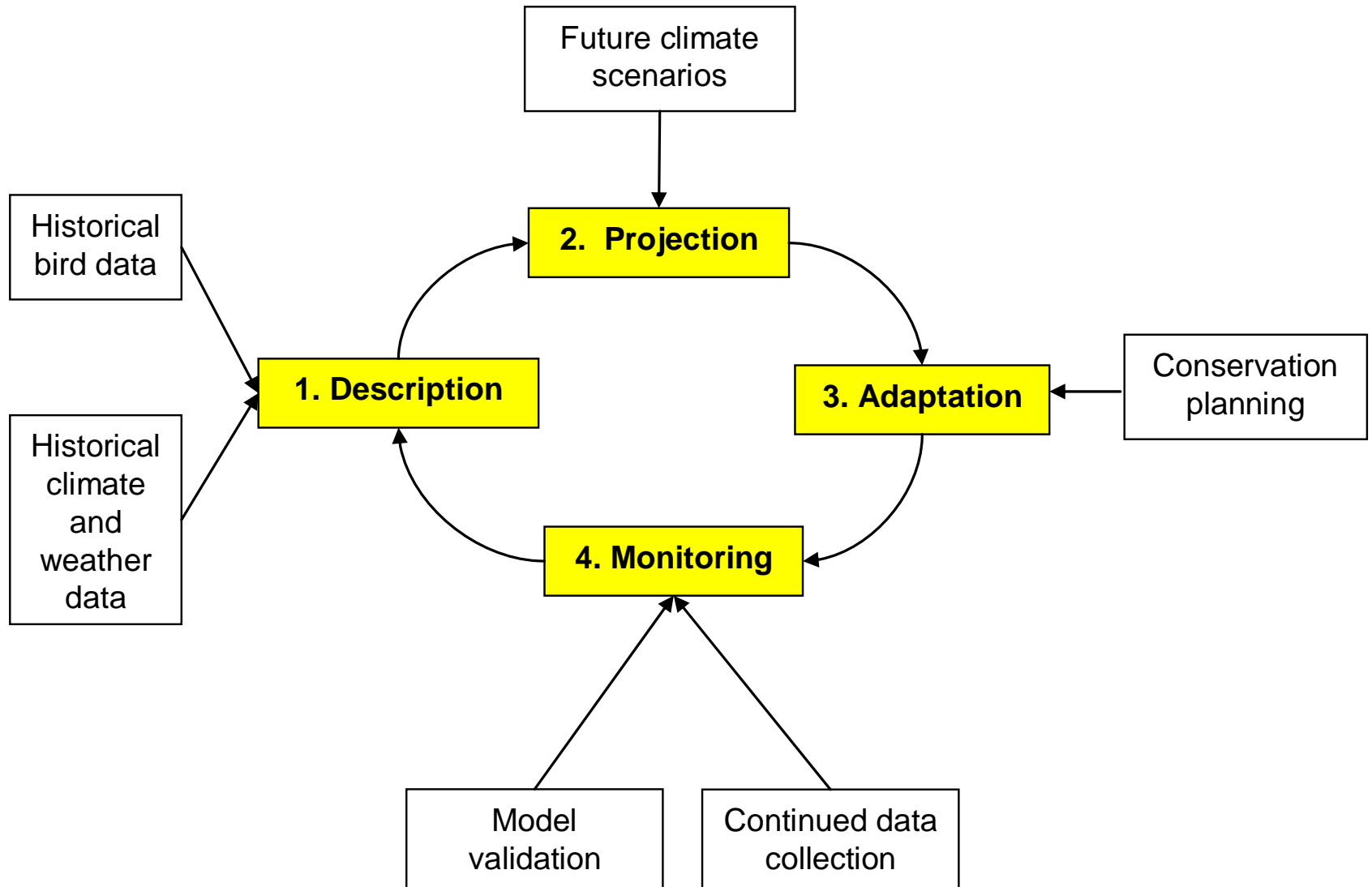
Systems for management of water throughout the developed world have been designed and operated under the assumption of stationarity. Stationarity—the idea that natural systems fluctuate within an unchanging envelope of variability—is a foundational concept that permeates training and practice in water-resource engineering. It implies that any variable (e.g., annual streamflow or annual flood peak) has a time-invariant (or 1-year-periodic) probability density function (pdf), whose properties can be estimated from the instrument record. Under stationarity, pdf estimation errors are acknowledged, but have been assumed to be reducible by additional observations, more efficient estimators, or regional or paleohydrologic data. The pdfs, in turn, are used to evaluate and manage risks to water supplies, water-



An uncertain future challenges water planners.

Milly et al. 2008. Science 319:573-574

Resource management and climate change



Describe historical interactions between climate and ecological systems

- Descriptive approaches (distribution modeling)
- Mechanistic approaches (weather effects on demographic rates)



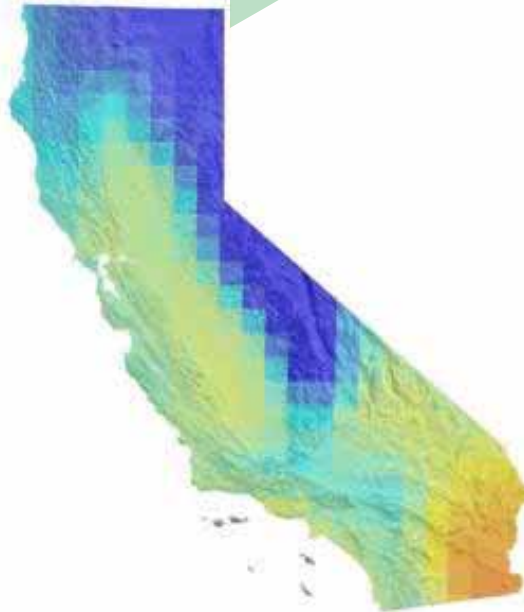
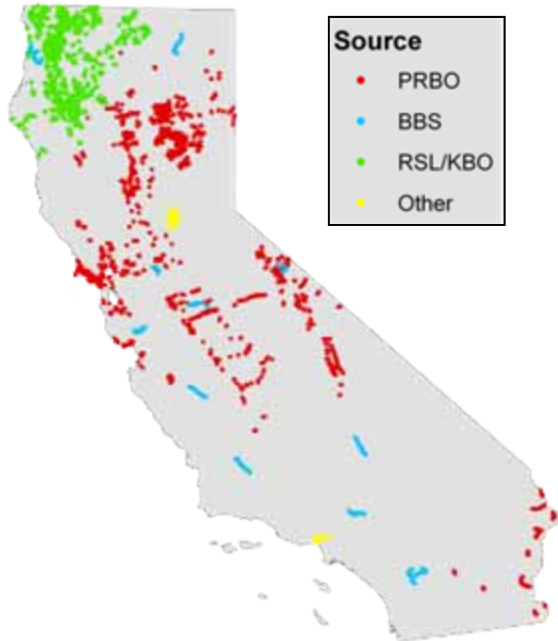
Distribution modeling of California birds

Dennis Jongsomjit, Diana Stralberg, Chrissy Howell, John Wiens (PRBO), Mark Snyder (UCSC), Terry Root (Stanford)

Bird location data

Vegetation and climate data

Current bird distribution



Project how future climate scenarios will influence ecological systems

- Combine climate projections with information about historical interactions
- Identify shifts in distribution
- Predict important changes in population dynamics

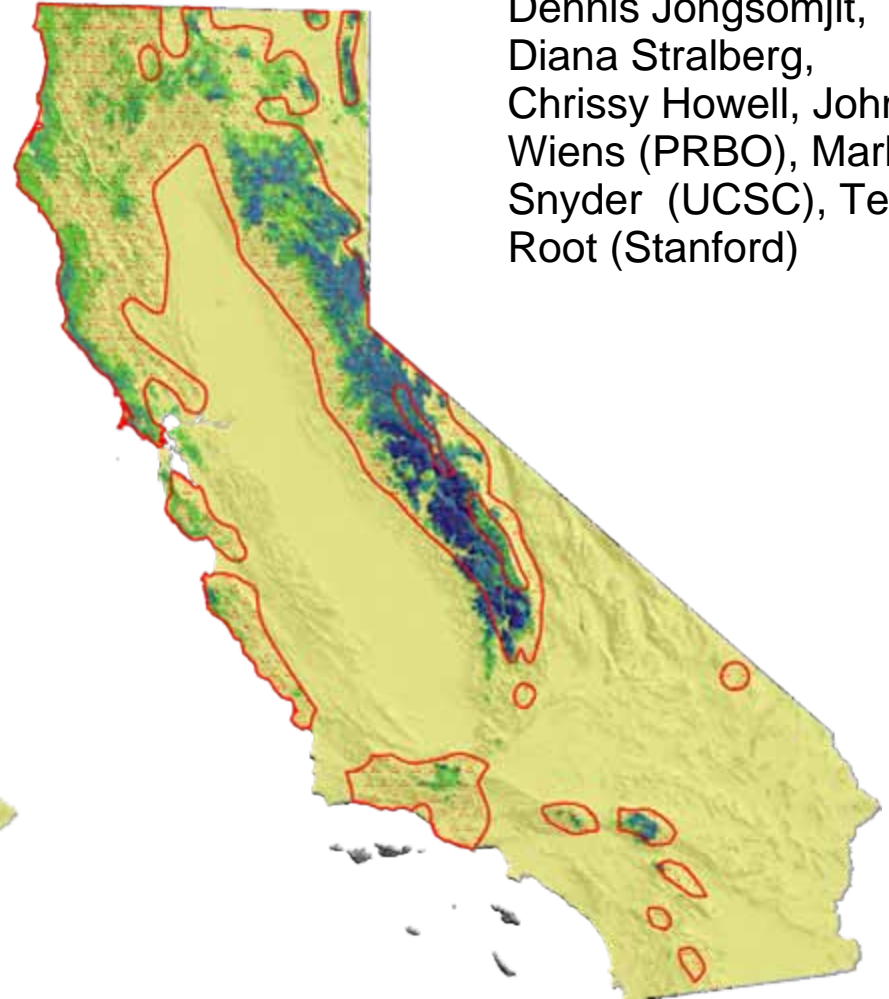
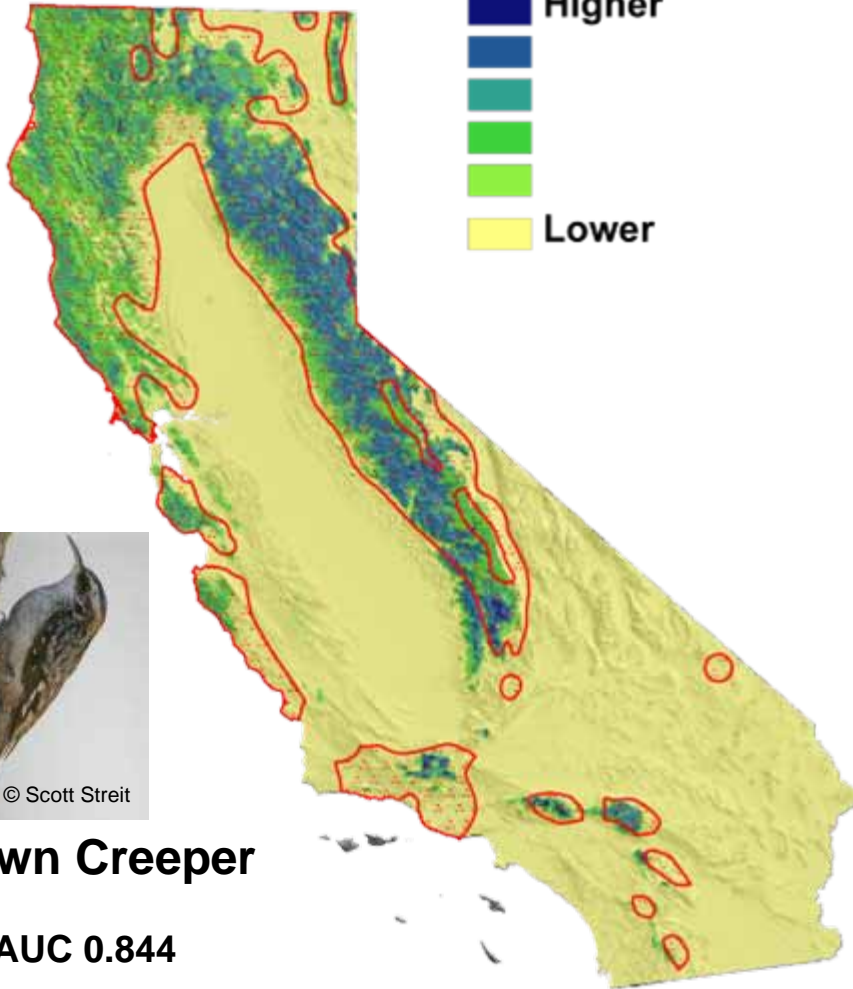
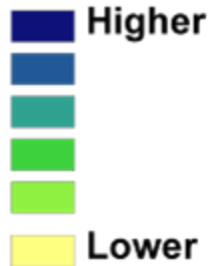


Distribution modeling of California birds

Current

Future

Probability



Dennis Jongsomjit,
Diana Stralberg,
Chrissy Howell, John
Wiens (PRBO), Mark
Snyder (UCSC), Terry
Root (Stanford)



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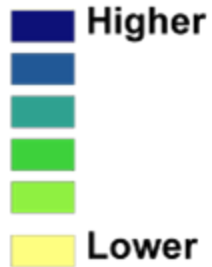
Brown Creeper

AUC 0.844

Distribution modeling of California birds

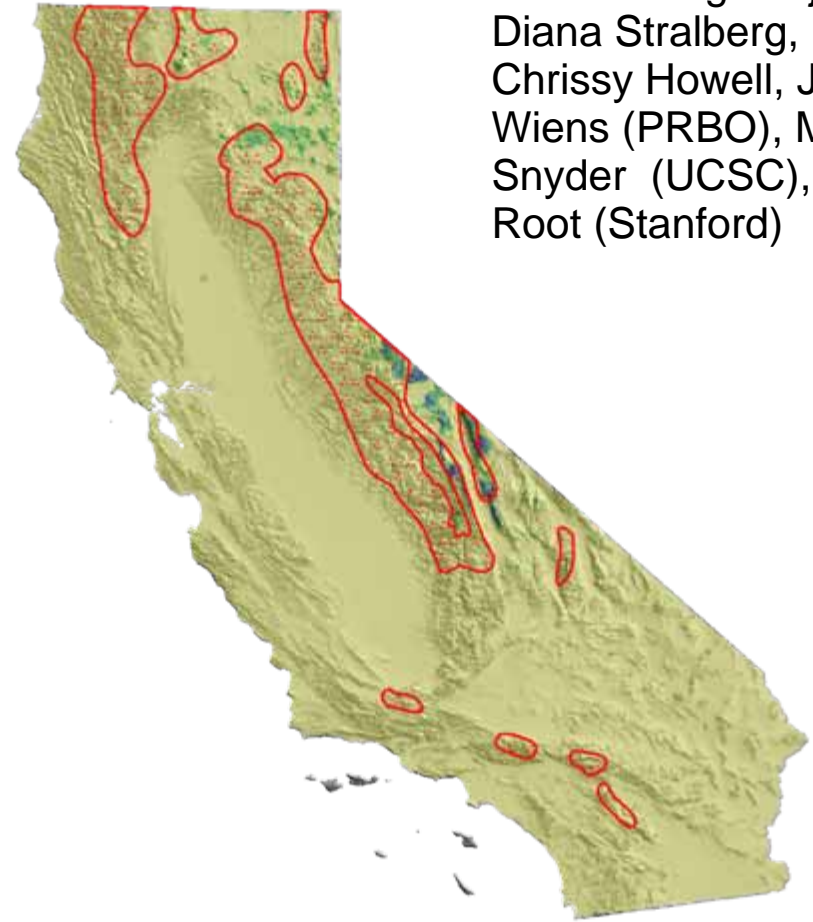
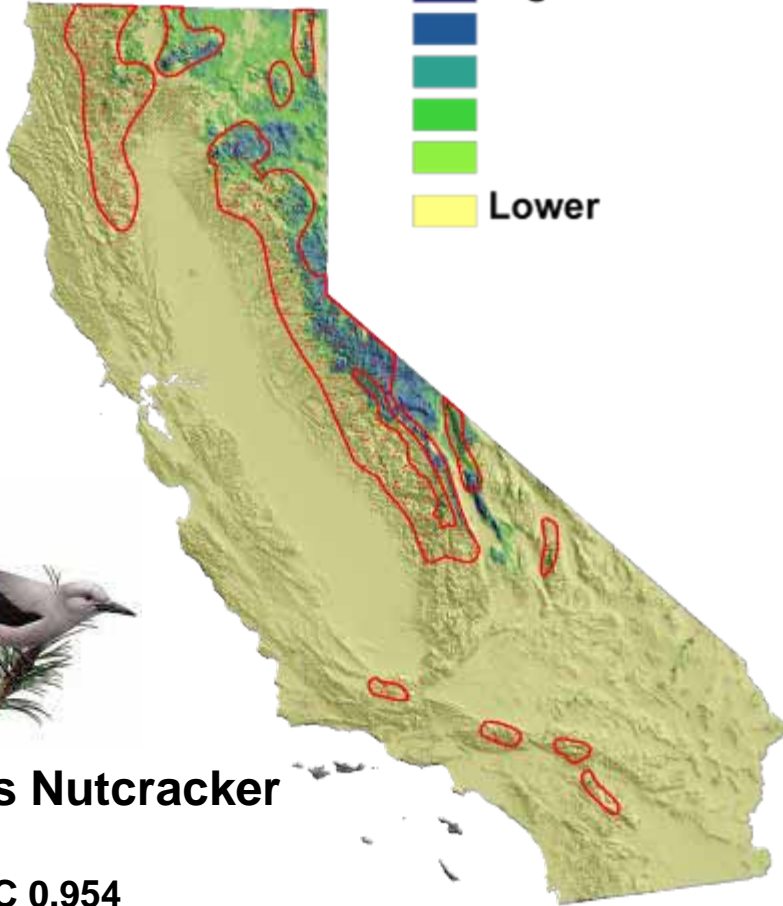
Current

Probability



Future

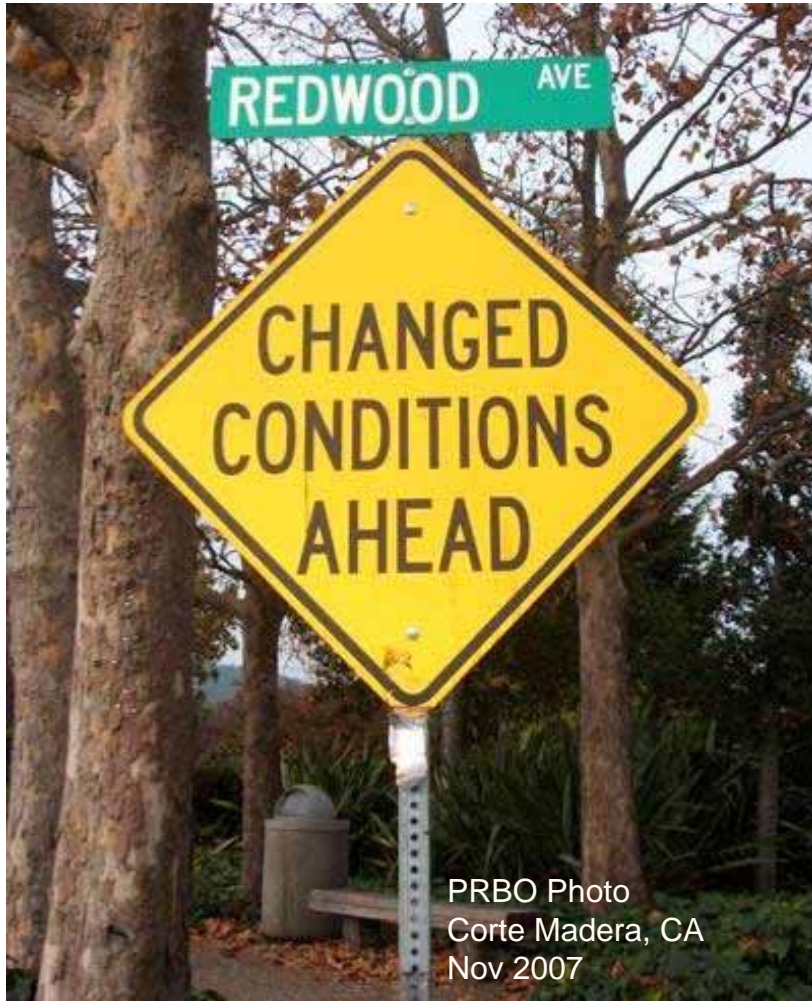
Dennis Jongsomjit,
Diana Stralberg,
Chrissy Howell, John
Wiens (PRBO), Mark
Snyder (UCSC), Terry
Root (Stanford)



Clark's Nutcracker

AUC 0.954

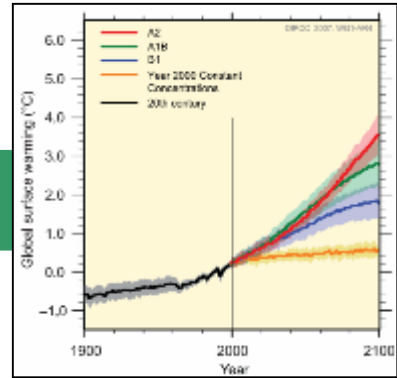
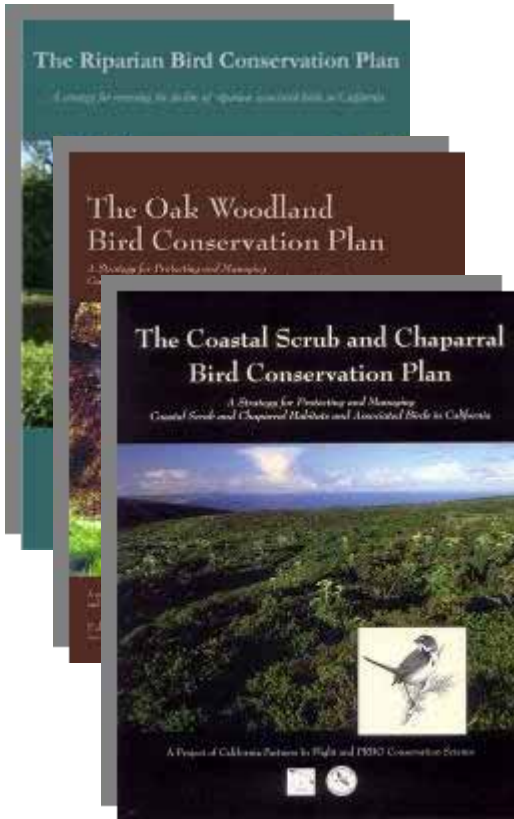
Adapt resource management to the challenges of climate change



- “The longer action is delayed, the more it will cost.” *IPCC, 2007*
- “Most recommendations are vague or general principles... Few suggested a process a manager could use to develop an adaptation plan and evaluate its usefulness.” *Heller and Zavaleta. In press. Biodiversity management in the face of climate change: a synthesis of 20 years of recommendations. Biological Conservation*

Adapting bird conservation plans

Chrissy Howell (PRBO)
Rodney Siegel (IBP)



Climate Change Bird Conservation Plan: Adaptation Strategies to Reduce the Effects of Climate Change on California Birds

Monitor changes in ecological systems

- **Detect oncoming thresholds**
- **Validate model predictions**
- **Increase spatial and temporal extent and resolution of monitoring**

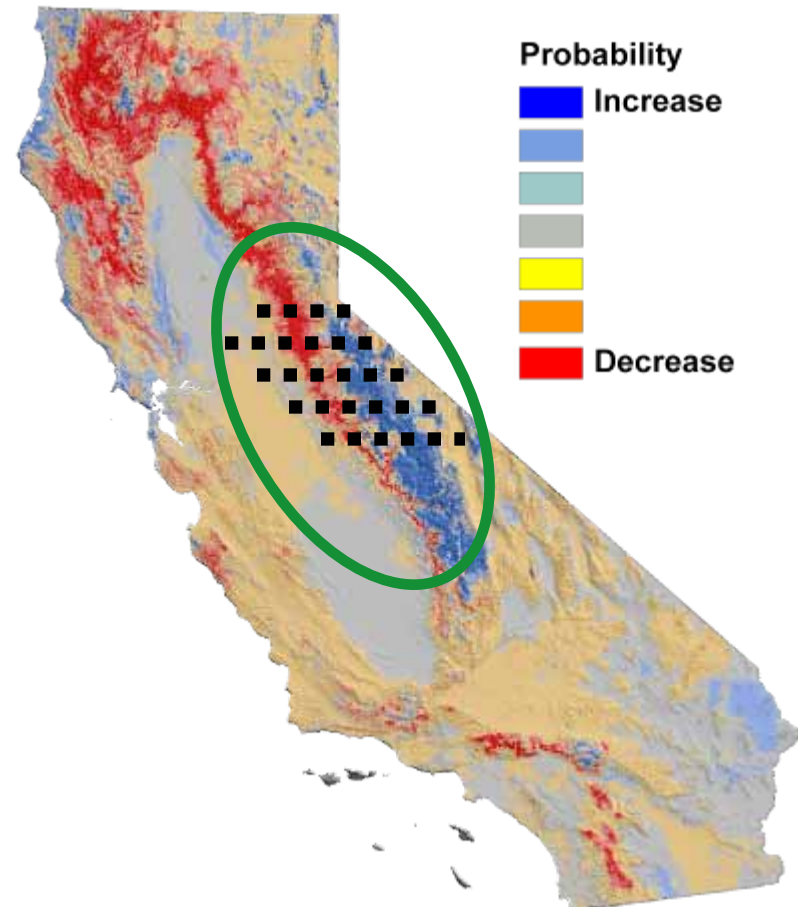


Develop a system of monitoring “buoys”

Target areas with elevational or compositional gradients

Target areas where rapid turnover is projected

Average difference for conifer species



California Avian Data Center and Avian Knowledge Network: Web-based data interface



More data out:
Tools for researchers and managers will make data easy to access and synthesize
and resolution of data collection

Resource management without stationarity

Use historical data to identify important interactions between climate and ecosystems

Make projections about ecological systems under future climate scenarios

Adapt resource management to climate change (what do resilience, resistance, and response look like on the ground?)

Monitor changes in ecological systems

Acknowledgments

PRBO scientists, support staff, Board, members, and:
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California Department of Fish and Game
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Ecosystem Sciences
Joel Ellis, Jan Simis and Dechambeau Creek
Inyo National Forest
Mono Basin Bird Chautauqua
Mono Lake Committee
Mono Lake Tufa State Reserve
Mono Market
National Fish and Wildlife Foundation
North American Fund for Environmental Collaboration
Oikonos
USFS Region 5 and Region 4 Partners in Flight
White Mountain Research Station (ESICE)

