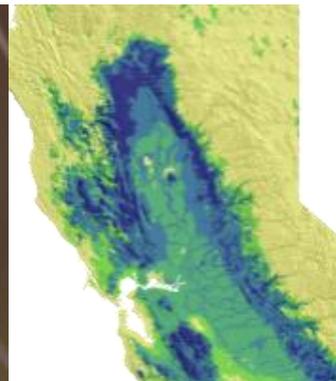
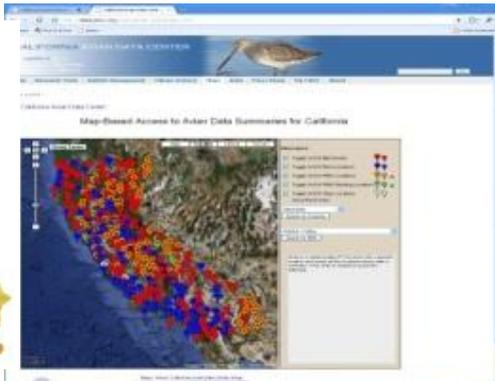
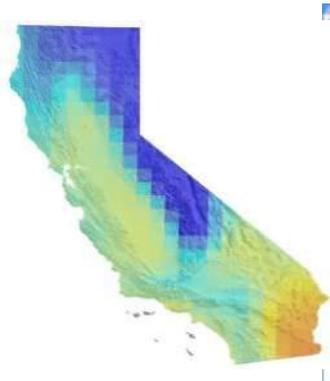




prbo
PRBO Conservation Science



Photos by Peter LaTourrette, Peter Knapp, and PRBO

Birds and Buffers on Military Lands The Impacts of Climate and Land-use Change

Dennis Jongsomjit, Sam Veloz, Chrissy Howell, John Wiens PRBO Conservation Science

Who Is PRBO?

- Founded 1965
- Long-term monitoring informs research
- Apply bird ecology to advance biodiversity conservation



Recent Focus Has Been Only On Climate Change

- **What are the comparative impacts of climate change and land-use change around military bases in CA?**
- **What are the potential impacts of land-use change across a range of housing densities?**
- **How will these impacts vary regionally?**

What are Department of Defense lands and why should we care?



Zack Denning

DoD Land Ownership In CA

- **Federal Gov't manages ~100 million acres of land**
- **DOD manages ~4 million acres (about 4%)**



Military Mission and Responsibilities

- **Maintain military readiness via testing and training**

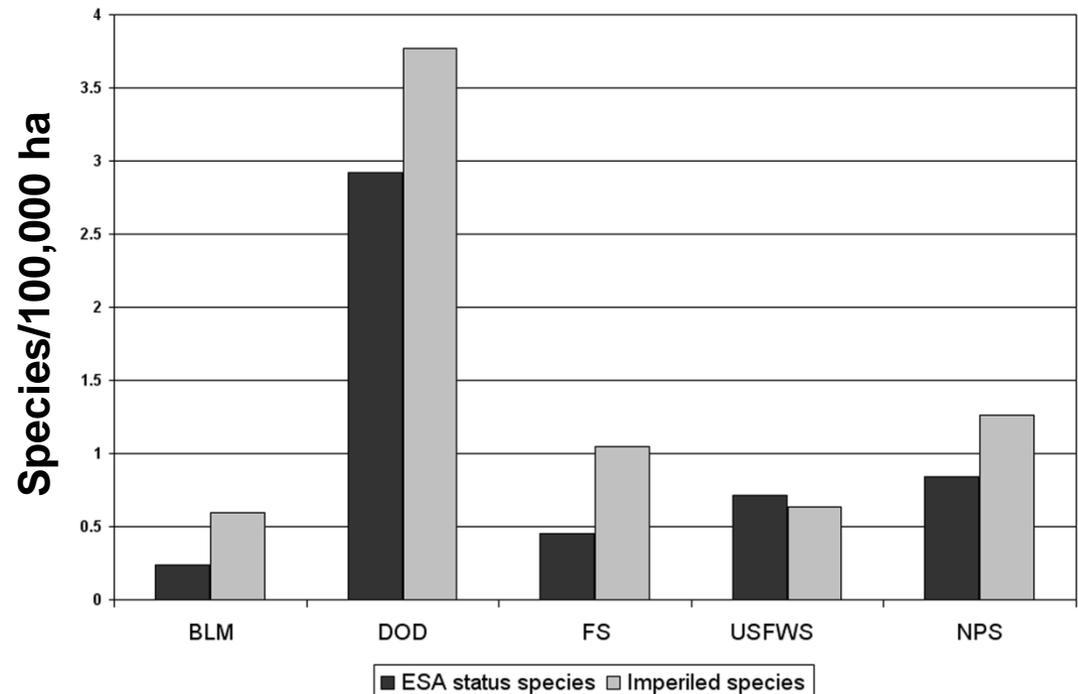


Military Mission and Responsibilities

- **Compliance with Federal laws**
- **Responsible for the protection and management of all T&E species on their land**
- **Restricted access has resulted in the persistence of species and habitats otherwise unprotected beyond their borders**

DoD Lands Are Important To Listed Species

- **The highest density of threatened, endangered, at-risk species than any other federal agency landowner**
- **Nearly 450 Threatened and Endangered species found on DoD lands**

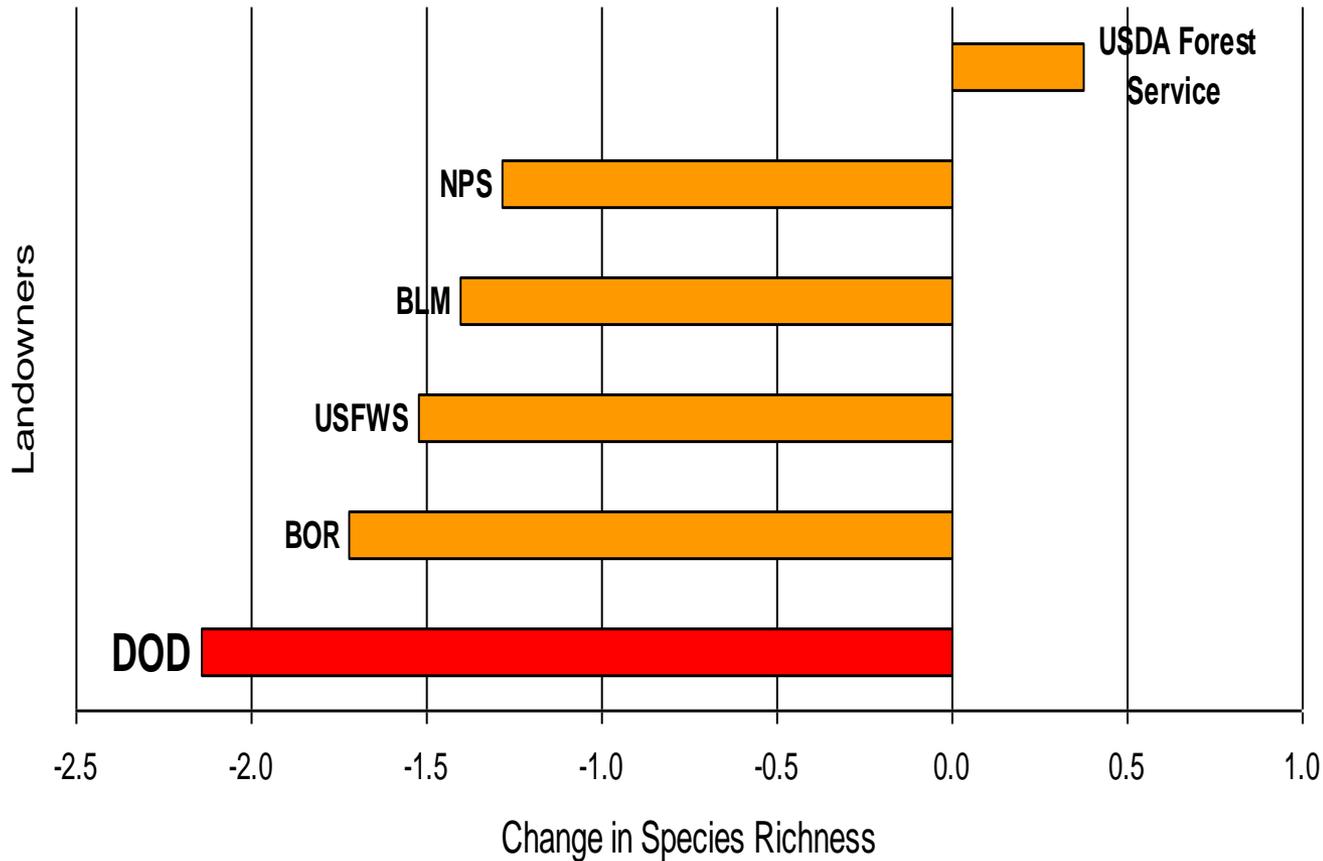


Conflicts with climate and land-use change



Sophie Webb

Climate Change May Cause Loss Of Species



Conflicts With Land-Use Encroachment

- **Urban and suburban areas are projected to nearly double by 2070**
- **Exurban development is projected to triple**



Effects On Birds/Habitat Well Documented

- **Fragments existing nearby habitat**
- **Introduction of non-native species**
- **Changes to natural community**
- **Interactions with human communities**

Consequences To DoD Lands

- **Increasing isolation of species populations**
- **Increased reliance on protected habitat**
- **More time and money spent managing habitat**

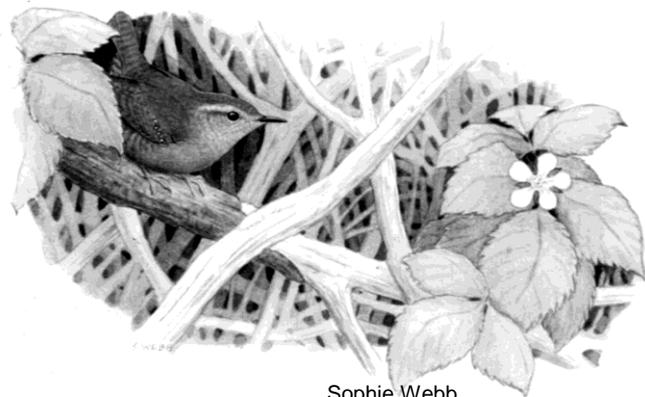


Increased restrictions on military training and testing



Compare climate and land-use change

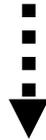
Methods



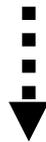
Sophie Webb

The Framework

**Model current bird distributions
(52 special status species)**

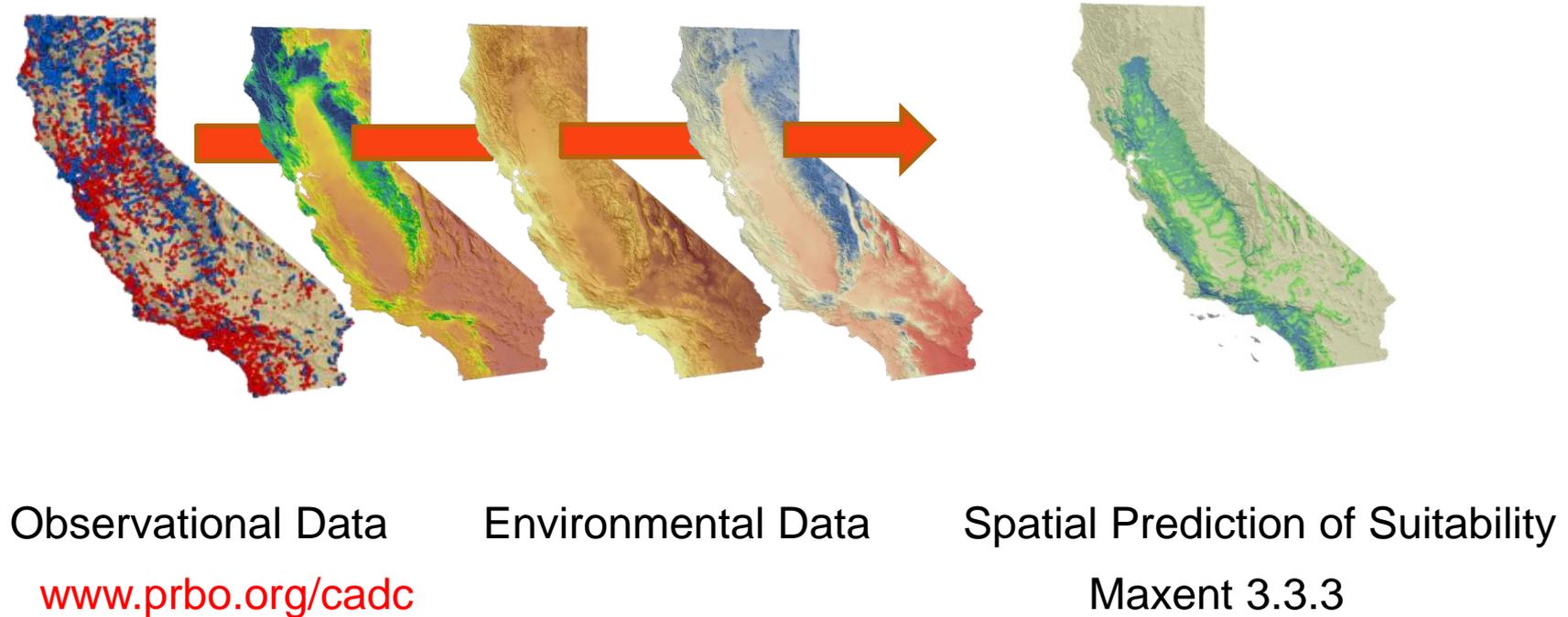


Project models using future climate change



**Calculate changes from climate
Calculate potential land-use impacts**

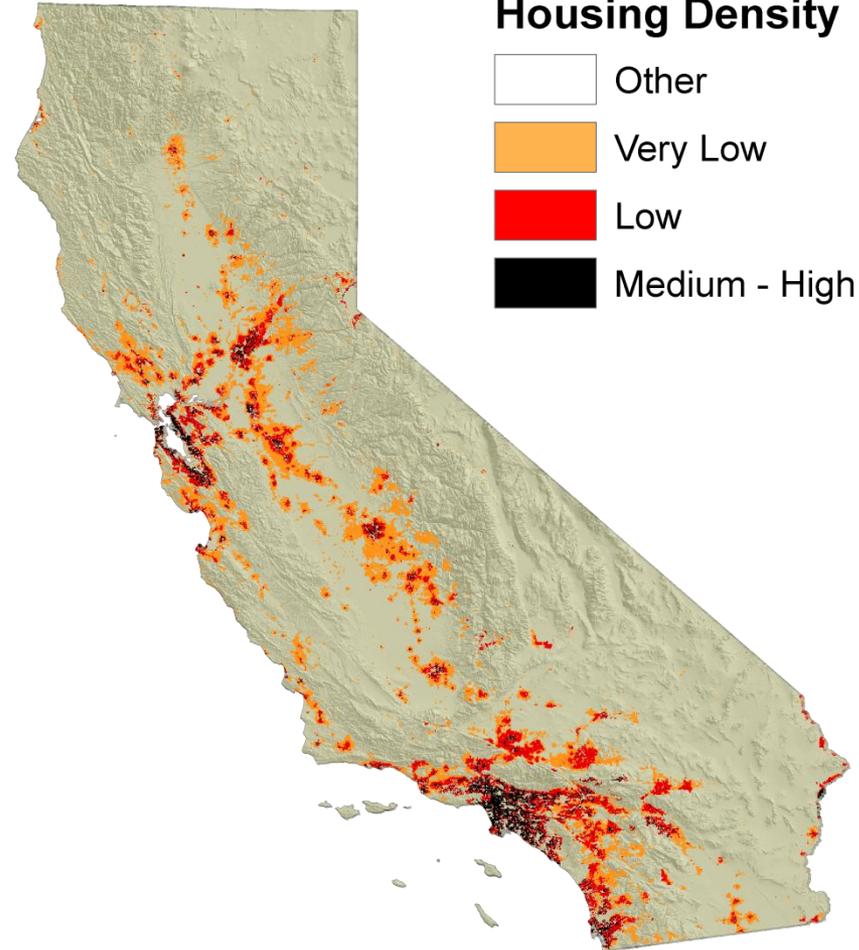
Species Distribution Models



Urbanization Will Continue To Grow

Year 2000

Year 2070



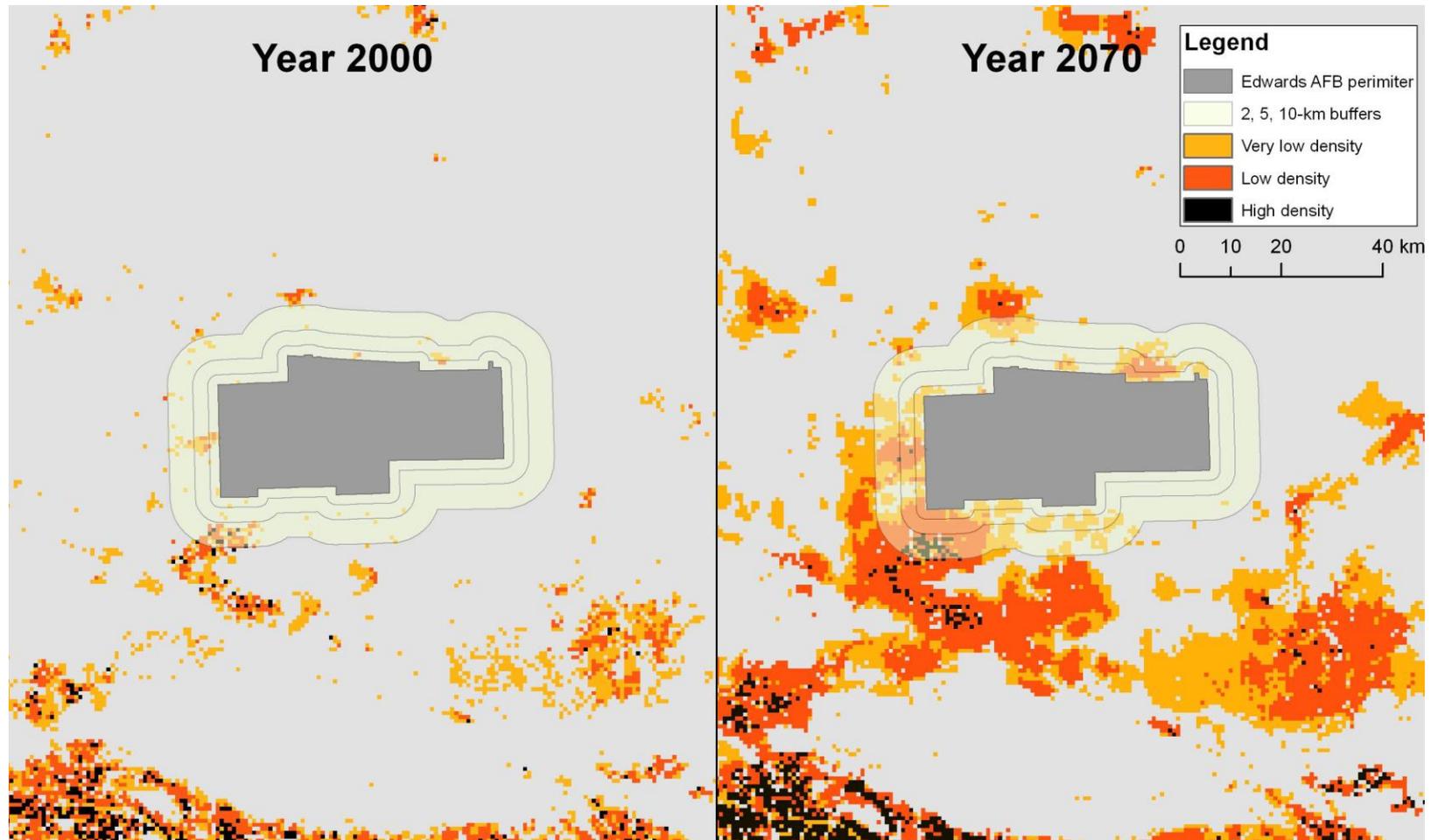
Housing Density



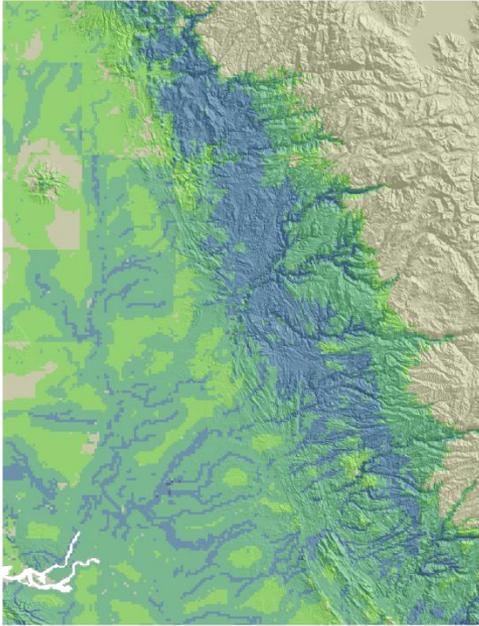
EPA 2009

Theobald 2005

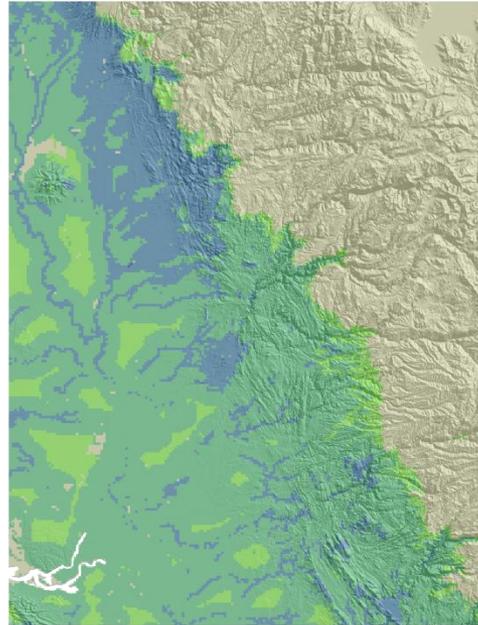
3 Buffers Examined



Climate Impact



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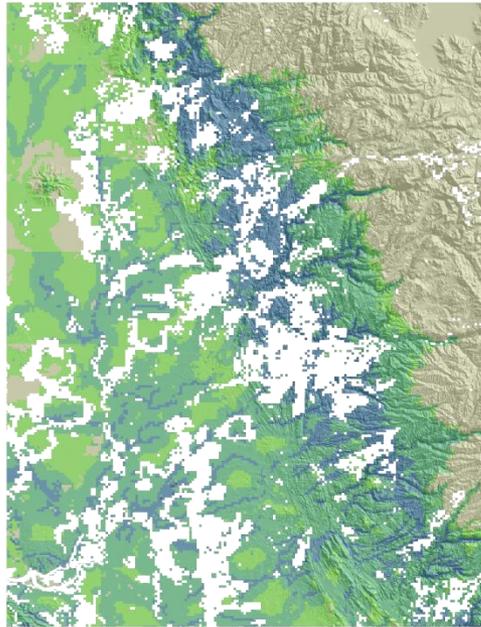
Impact of
climate

+ or —

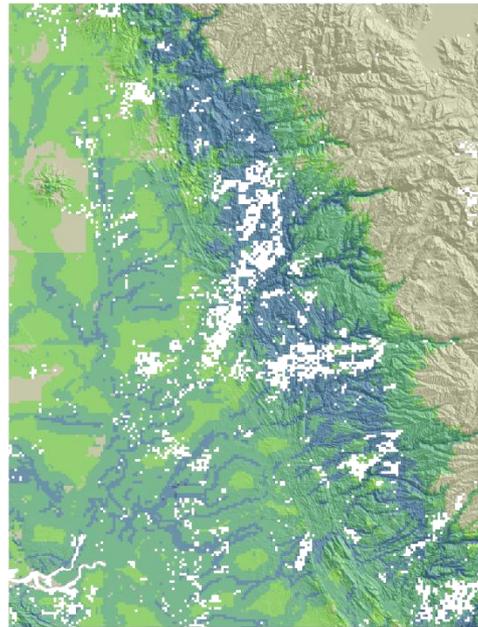
Future species projection

Current species projection

Land-use Impact



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Impact of
housing

Always —

Future species projection

remove

Future housing

Future species projection

remove

Current housing

Bases Grouped By Ecoregion

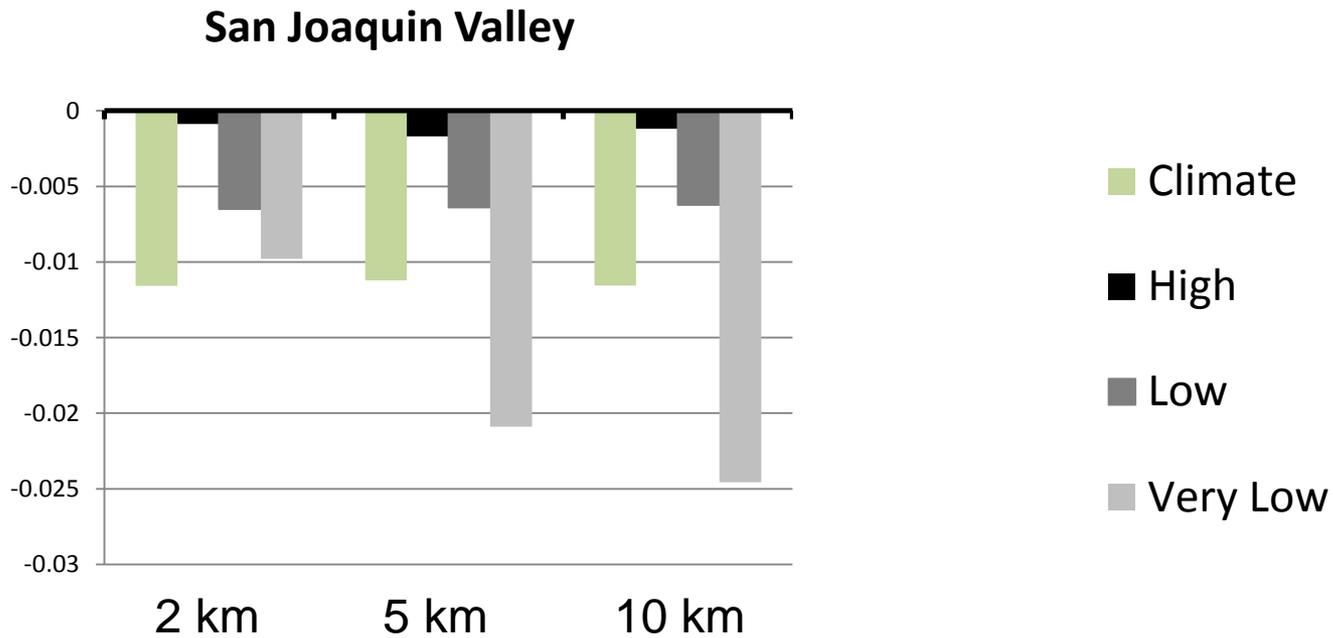


Results

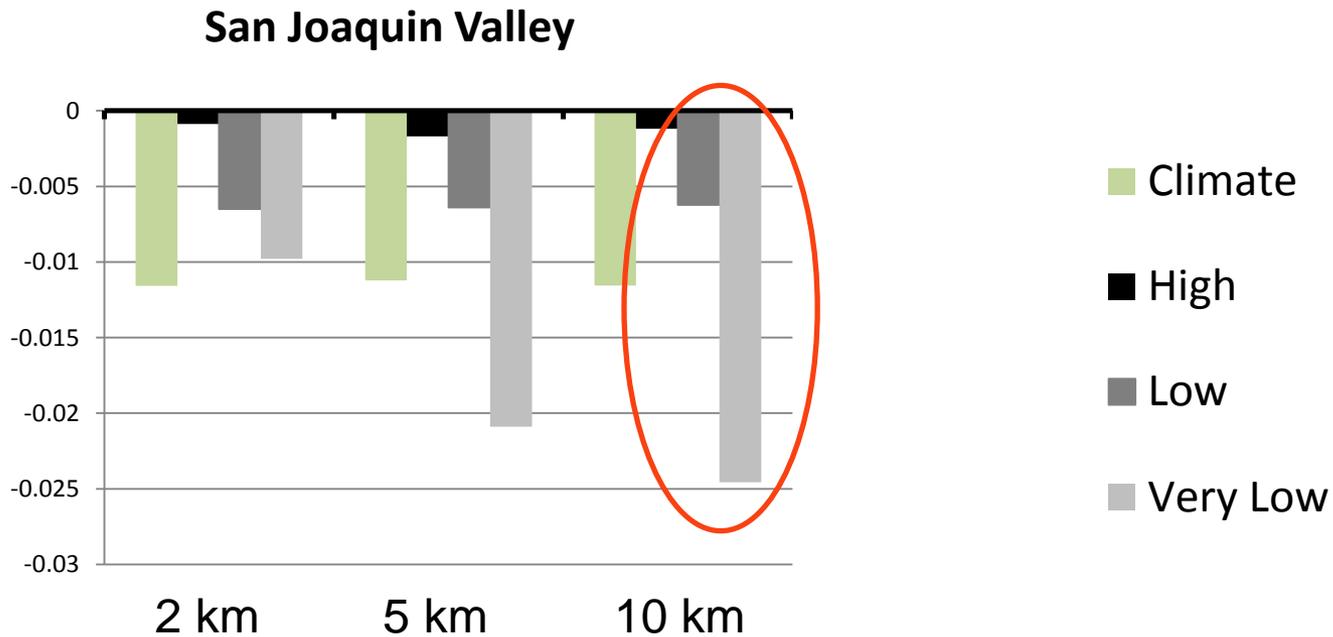


Sophie Webb

Urbanization impacts may be greater than climate change

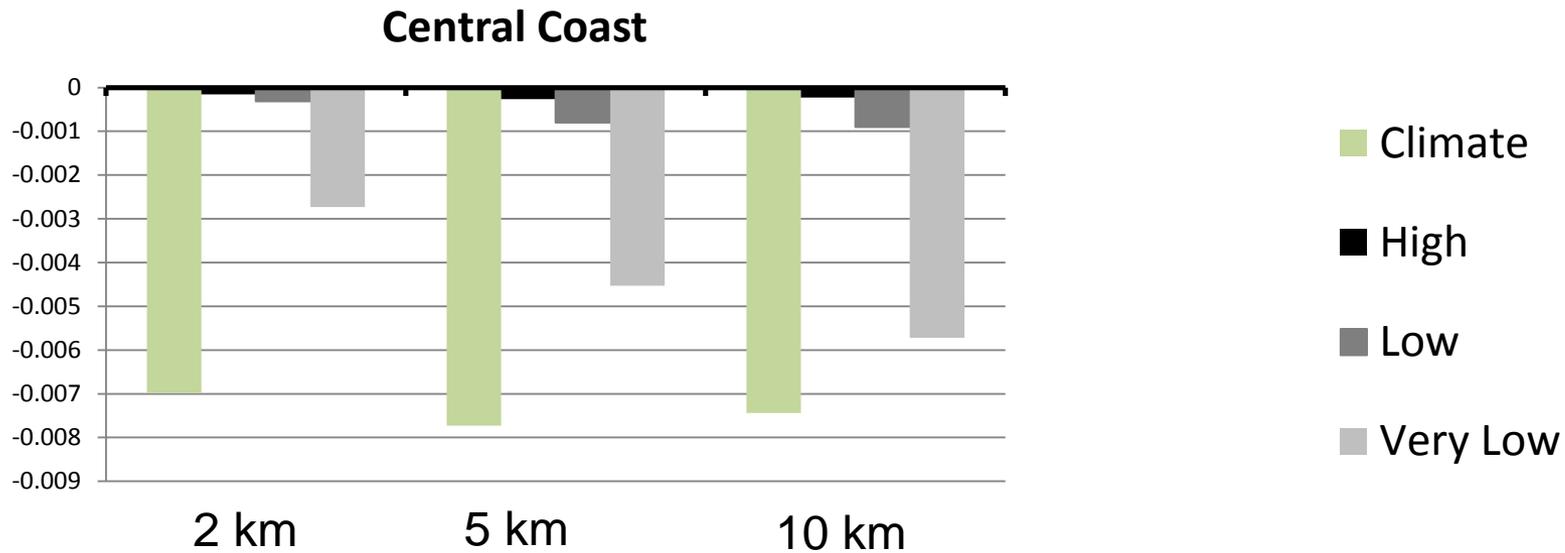


Urbanization impacts may be greater than climate change



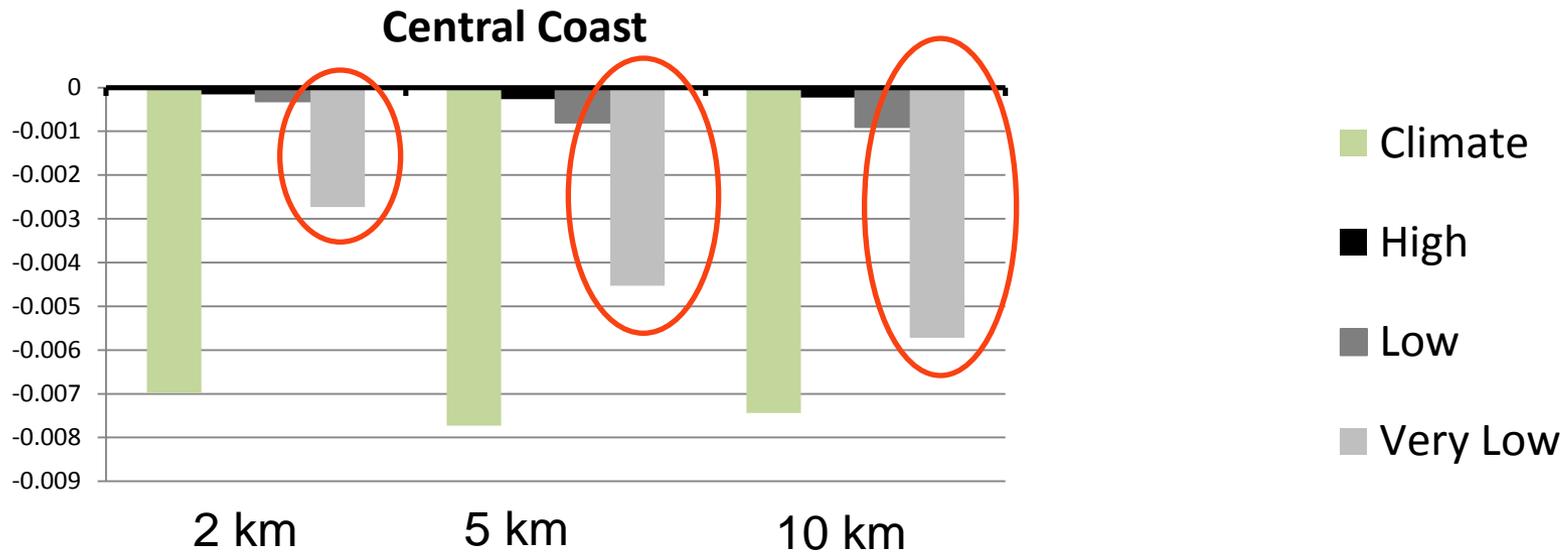
Low Density Housing May Have High Impacts

- Increasing buffer width shows larger influence of exurban density housing

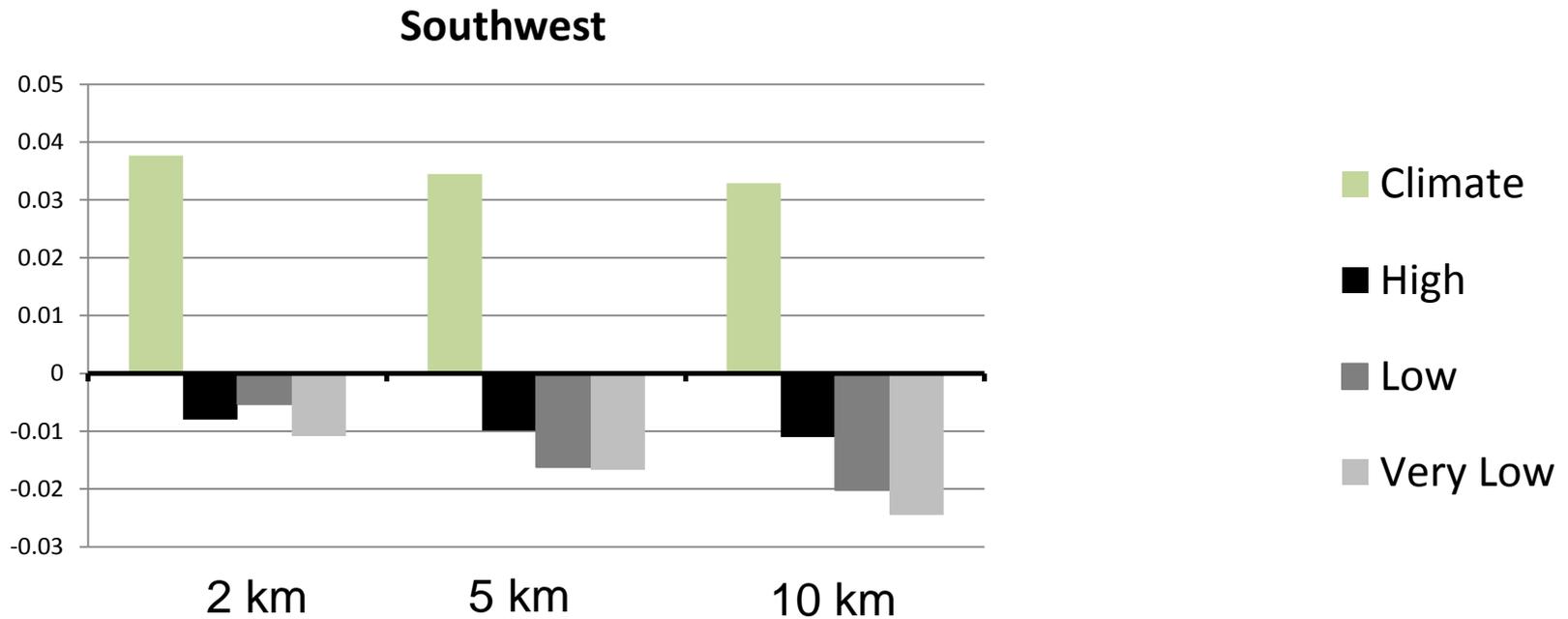


Low Density Housing May Have High Impacts

- Increasing buffer width shows larger influence of exurban density housing

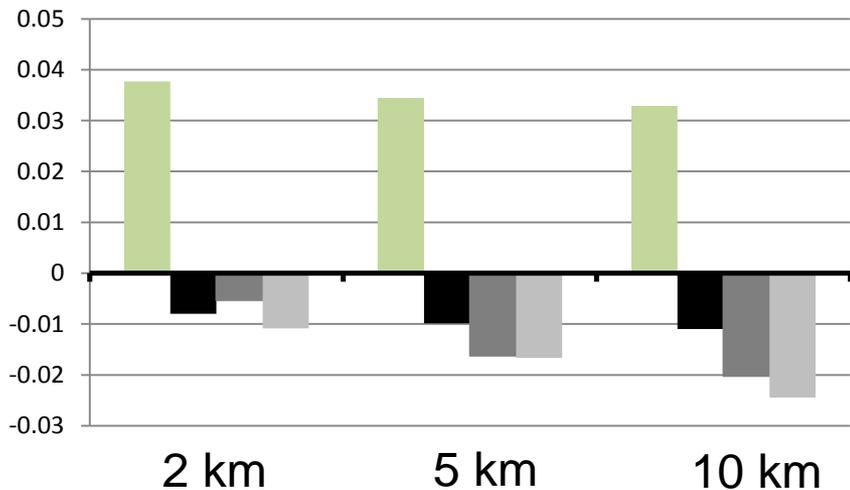


Climate Positives May Be Negated

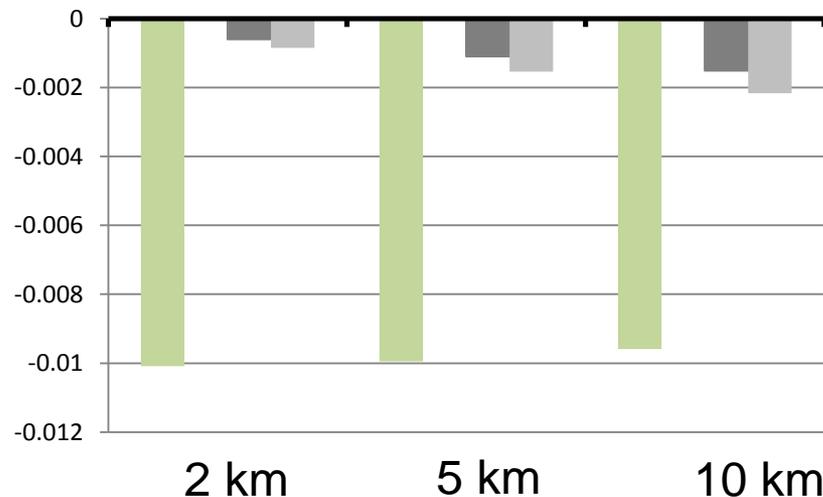


Regional Variation Calls For Regional Management

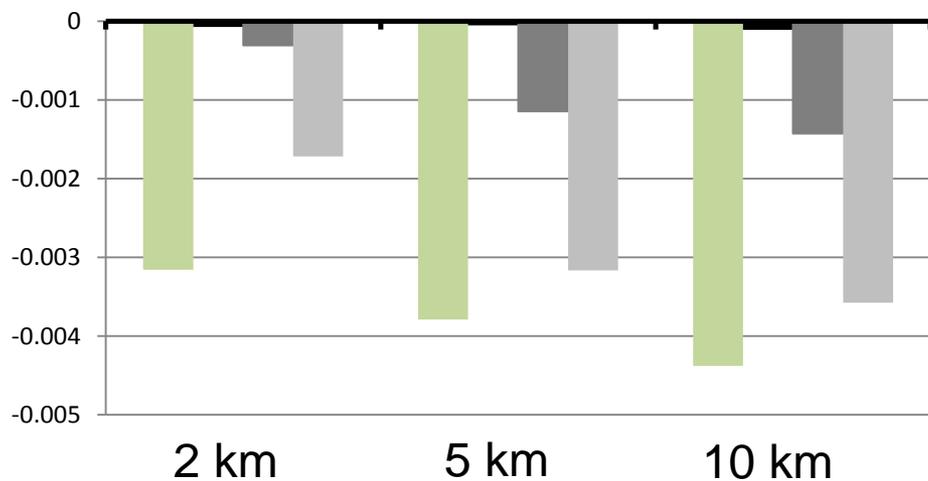
Southwest



Mojave Desert



Sonoran Desert



- Climate
- High
- Low
- Very Low

Conclusions

- **Urbanization has the potential to affect the suitability habitat more than climate change**
- **In some cases, increases in habitat suitability can be completely counteracted by urbanization**
- **Effects will depend on species specific sensitivity to urbanization**
- **Effects will vary regionally**

Combined Impacts May Lead To...

- **Species seeking refuge on DoD lands**
- **Establishment of non-native or invasive species or threaten the population viability of native species**
- **Isolation, restricting species ability to shift and making them more susceptible to rapidly changing climate**

Recommendations

- **Habitat managers and planners need to take into account impacts beyond climate change**
- **Large potential impacts of low density housing suggest opportunities to reduce impacts through reductions in sprawl**
- **Buffers can benefit all stakeholders but will require cooperation.**

Acknowledgments

Funders

- DoD Legacy Program
- CA Landscape Conservation Cooperative
- Faucett Family Foundation
- NSF (DBI-0542868)
- Anonymous PRBO donor



Collaborators

Mark Snyder – Climate Change and Impacts Lab, UCSC

Diana Stralberg, Grant Ballard - PRBO

John Alexander - Klamath Bird Observatory

C.J. Ralph - Redwood Sciences Lab

Brian Sullivan - Cornell Lab of Ornithology

Andrea Jones - Audubon California

PRBO project leaders, Steven Phillips, interns and volunteers

PRISM Climate Group www.prism.oregonstate.edu/

Thank You

www.prbo.org/cadc

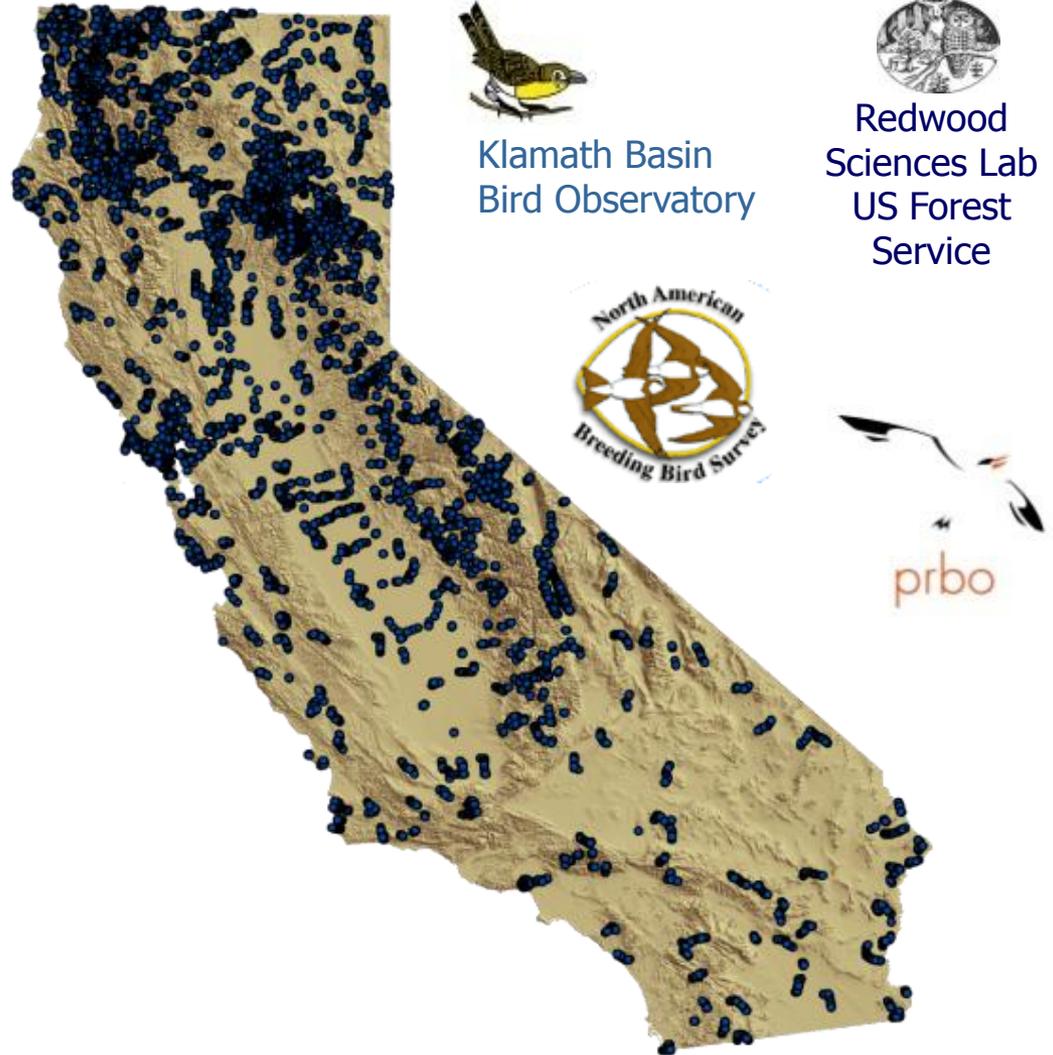
djongsomjit@prbo.org

Point Count Data Sources

Data available via
CA Avian Data Center

Filters

- Presence only used
- Breeding season/range
- Spatial accuracy



“Citizen” Data Sources

Data available via
CA Avian Data Center

Filters

- Presence only used
- Breeding season/range
- Spatial accuracy – 5km

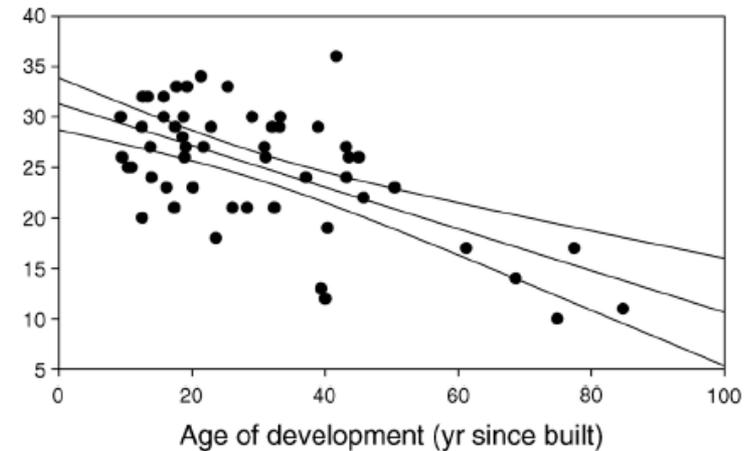


The Urban Gradient

Urbanization effects:

- Habitat fragmentation
- Reduced vegetation
- Changes in predator community
- Fewer native species
- Higher predation rates
- Higher parasitism

Source: Marzluff 2005 Urban Ecosystems



Urban Densities

- CA population continues to grow
- Very low density urbanization continues growing at higher rates

Housing Density	Units per ha	Difference 2000 to 2070 (ha)
Very Low	0.247 - 2.47	2,115,128
Low	2.47 - 12.36	846,580
Medium - High	>12.36	223,773

DoD Lands Are Important To Birds

- **Birds are the top 9 out of the top 10 most heavily invested in taxa**
- **Over \$373 million invested for these top 10 over the last 18 years**



Wrangling The Data

- **8 Environmental Space Variables**

- Annual mean temp, precipitation of the driest quarter, annual precipitation

