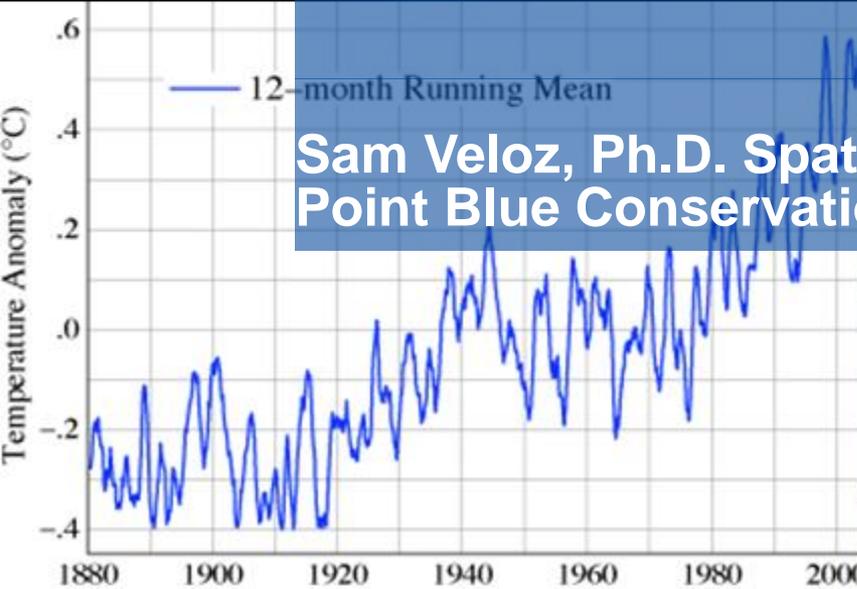




Preparing for ecological surprises: Climate smart conservation

Sam Veloz, Ph.D. Spatial Ecologist
Point Blue Conservation Science



To Prevent Total Climate Chaos- Must engage in mitigation and adaptation simultaneously

- **Mitigation:** reduce greenhouse gas emissions (GHG) and enhance carbon sinks



- **Adaptation:** actions to reduce the risks of, and adapt to, climate change impacts on the human and **natural environment**



‘Mitadaption’

Or... **Climate Smart**

Climate Smart Conservation

Specifically addresses impacts of climate change in concert with other threats, and

Promotes nature-based solutions for wildlife and people.

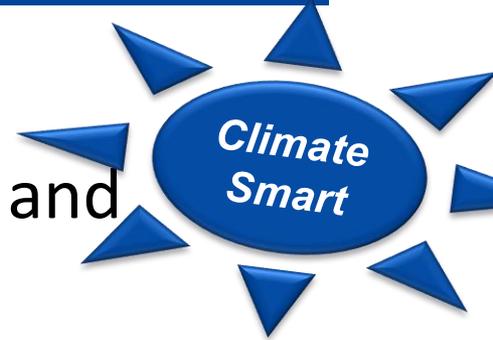


<http://www.seedsdream.org/Volunteering.html>

Climate Smart Conservation

Key Principles- Decision Making Lens

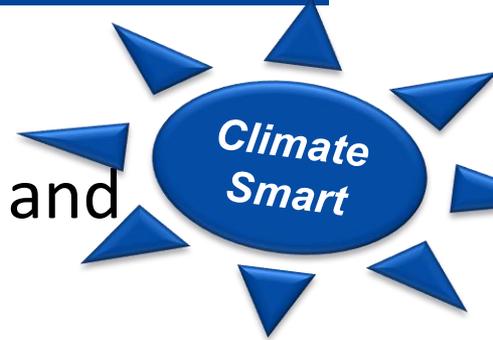
1. Plan for and focus on future, not past
2. Design actions in ecosystem, watershed and region-wide context
3. Employ flexible, adaptive approaches for timely response to continual change
4. Prioritize actions across multiple future scenarios for greatest benefits to wildlife and people
5. Collaborate & communicate across sectors for timely, long term solutions



Climate Smart Conservation

Key Principles- Decision Making Lens

1. Plan for and focus on future, not past
2. Design actions in ecosystem, watershed and region-wide context
3. Employ flexible, adaptive approaches for timely response to continual change
4. Prioritize actions across multiple future scenarios for greatest benefits to wildlife and people
5. Collaborate & communicate across sectors for timely, long term solutions

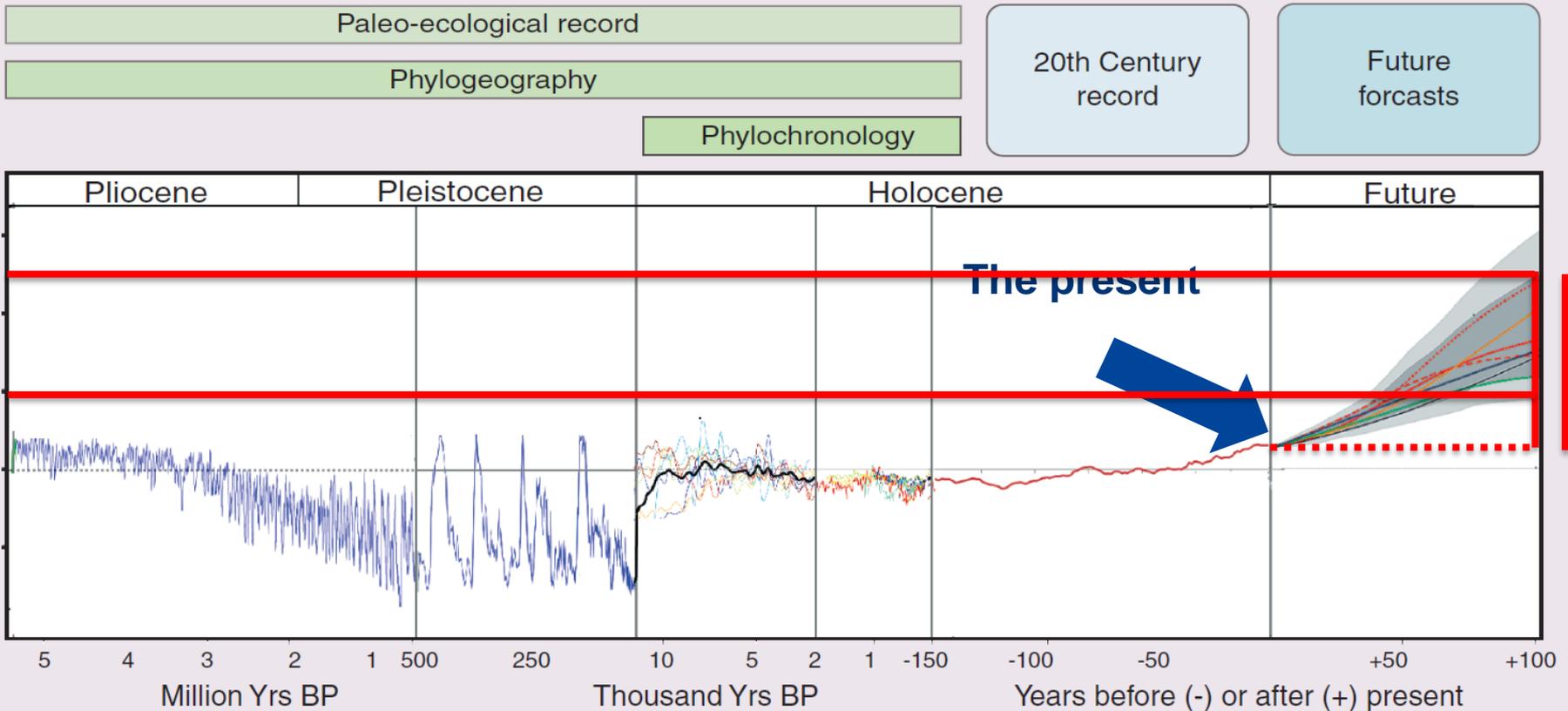


How vulnerable are species to climate change?

Are you an optimist
or a pessimist?

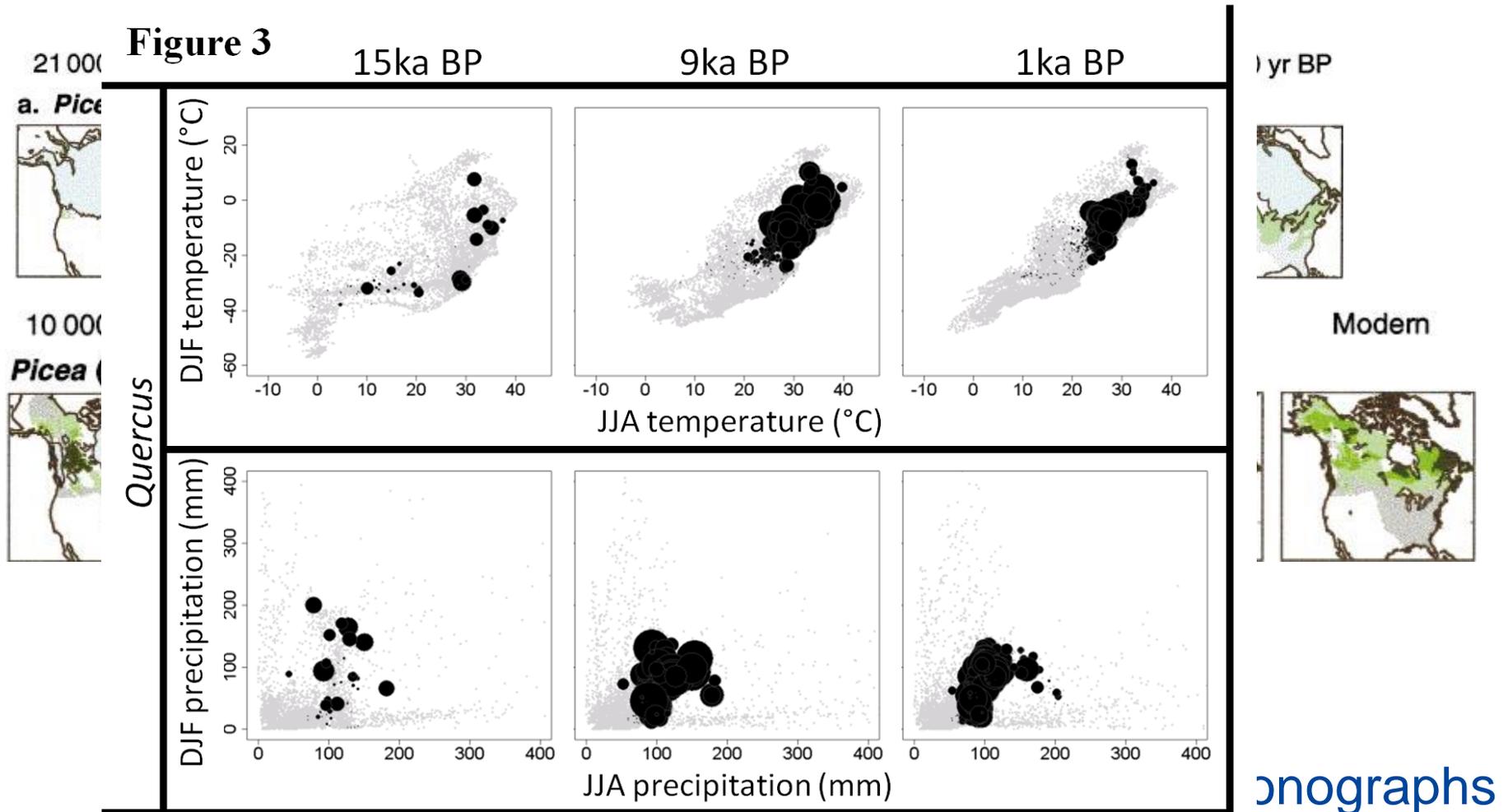


Past, Present and Future Global Climate

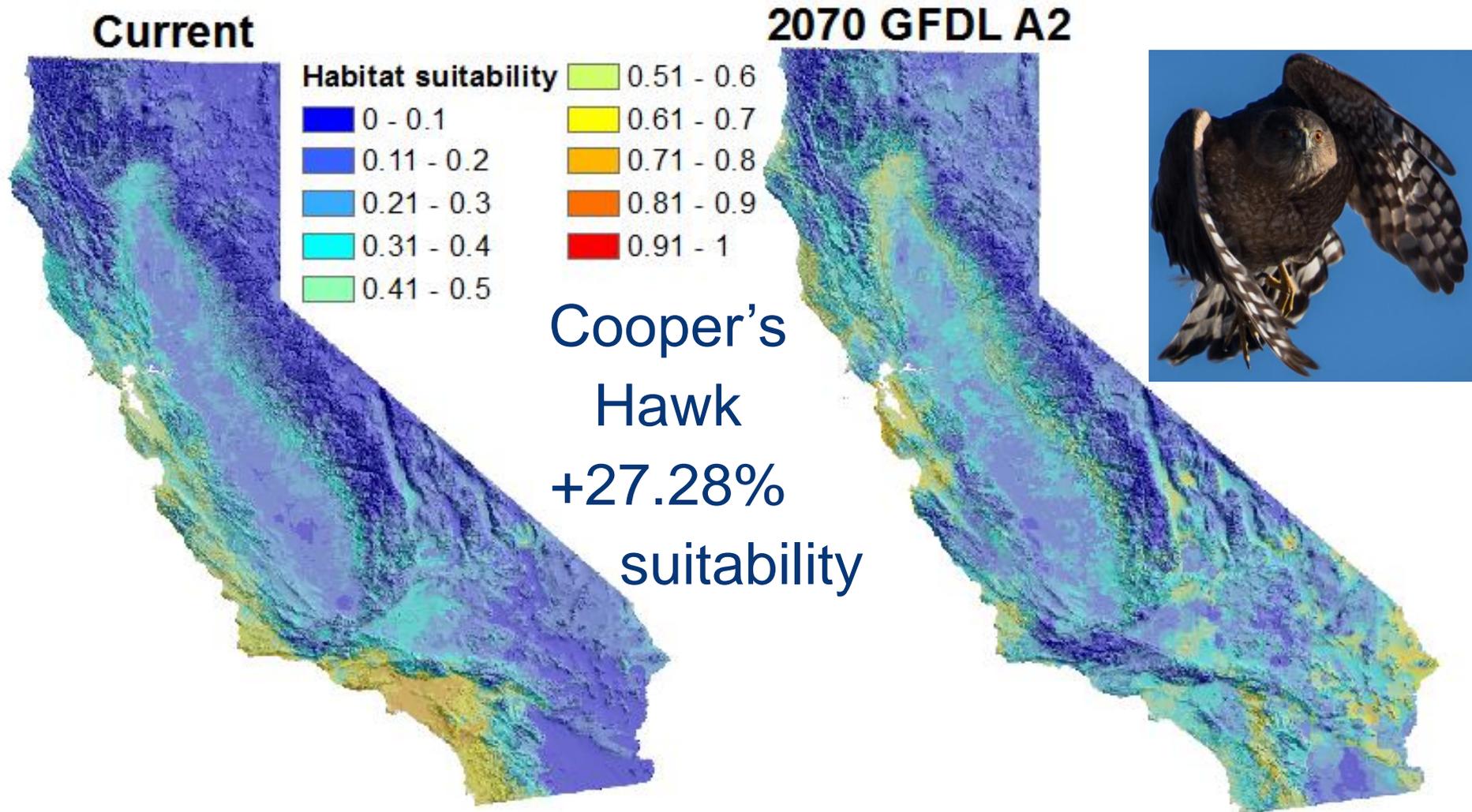


Moritz & Agudo, Science 2013

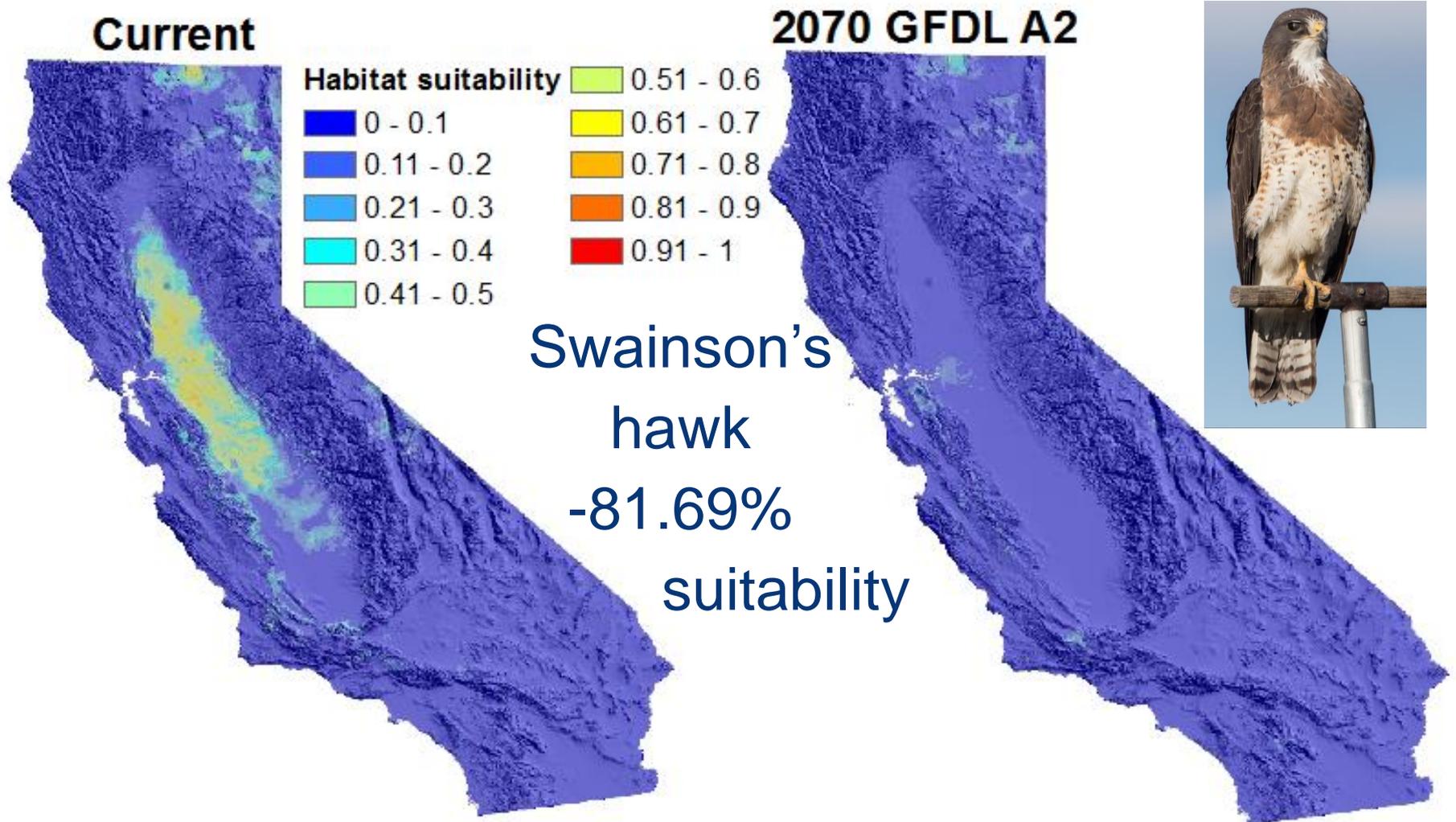
Species have successfully tracked suitable climate during historic changes



Models project species specific responses to future climate change



Models project species specific responses to future climate change



Habitat loss and new barriers to dispersal
bring new challenges to species

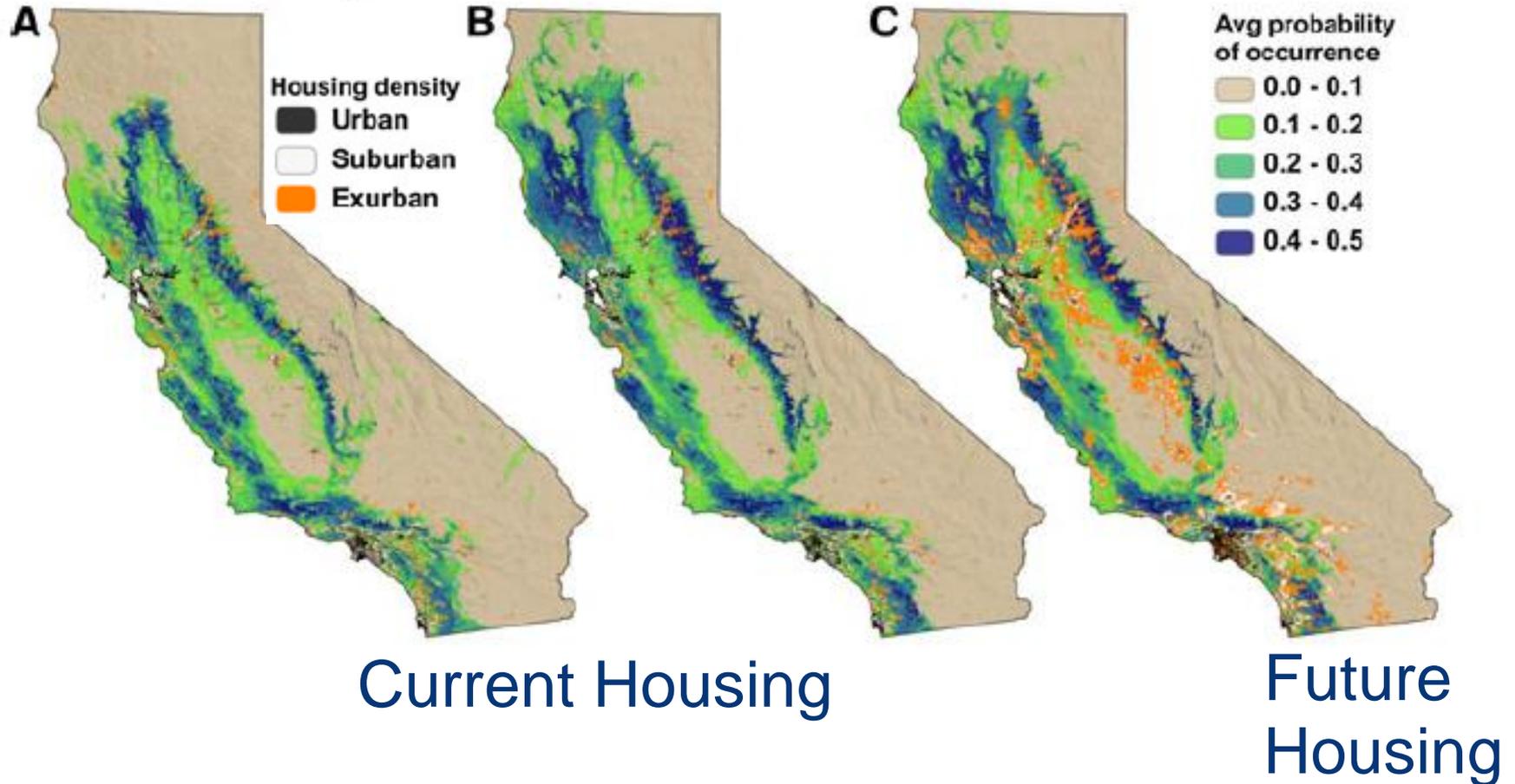


Land use changes will continue to be important

Current climate

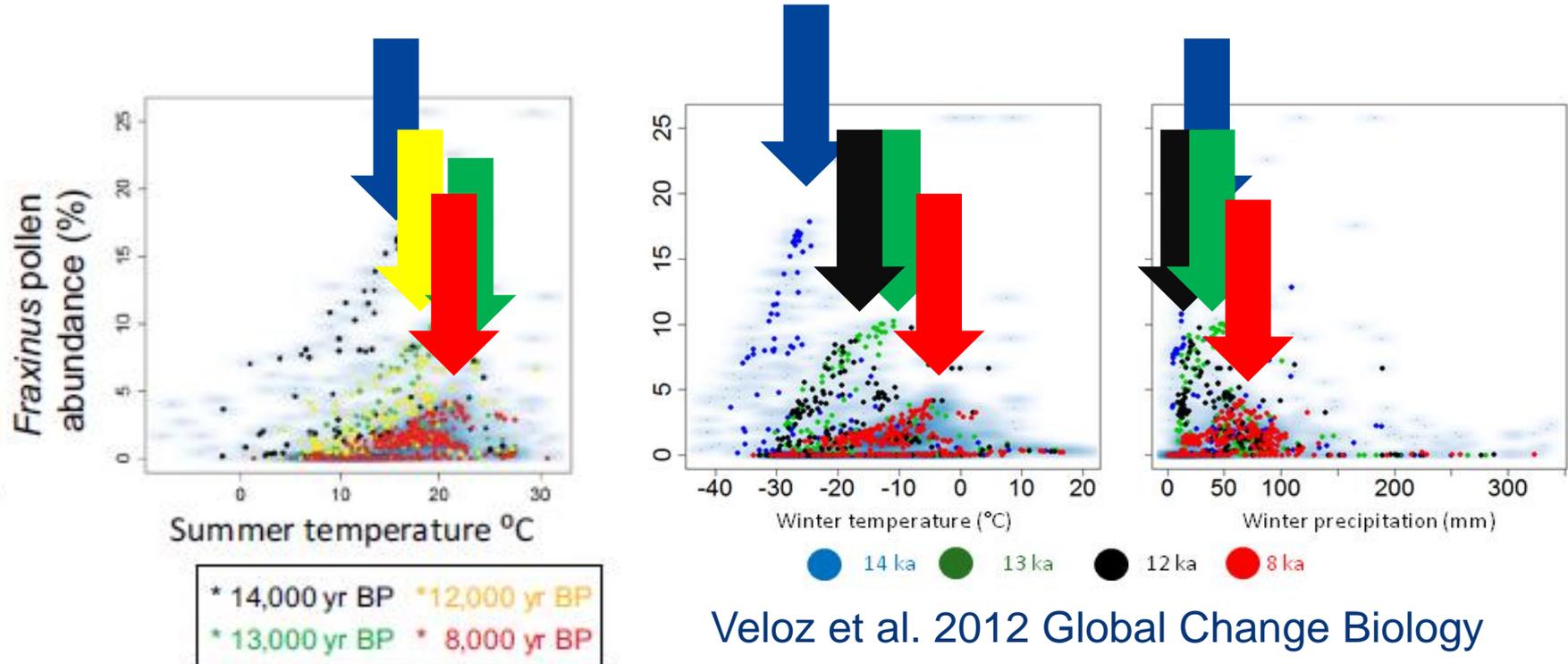
Future climate

Oak-woodland Group



How adaptable are species?

Over 14 thousand years, the realized climatic niche of *Fraxinus* has become warmer and wetter



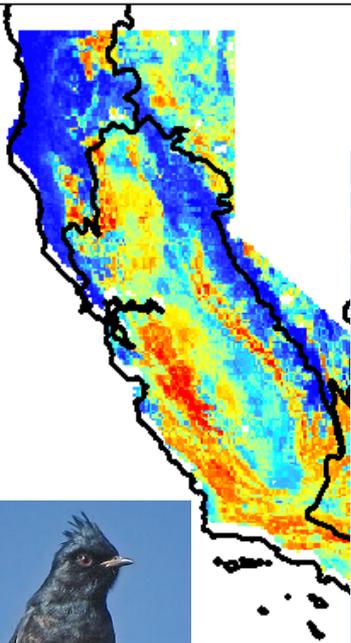
Veloz et al. 2012 Global Change Biology

Williams et al. 2013 Annals of the New York Academy of Sciences

Adaptive Capacity?

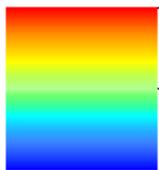


Adaptive Capacity



CC

Suitability



High : 1

Low : 0



Legend

Breeding range

Breeding Window

Jan-Apr

Feb-May

Mar-Jun

May-Aug

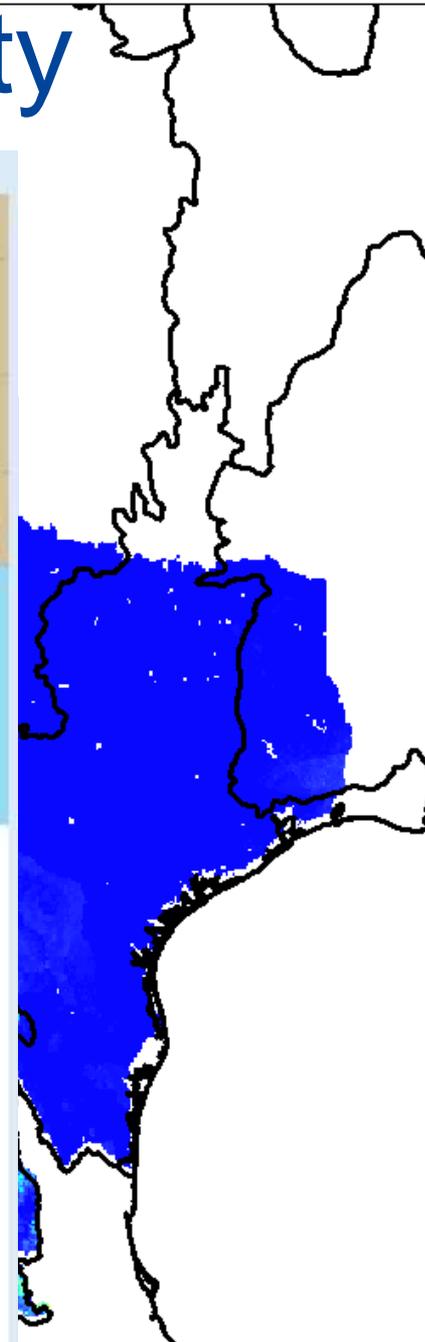
Apr-Jul

Jun-Sep

Jul-Oct

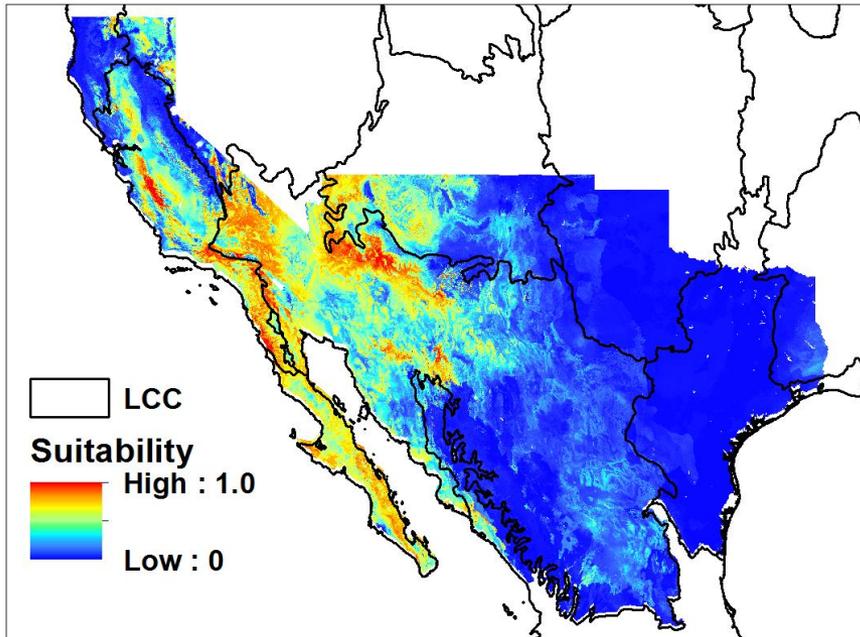
Does not breed

Dear Mary

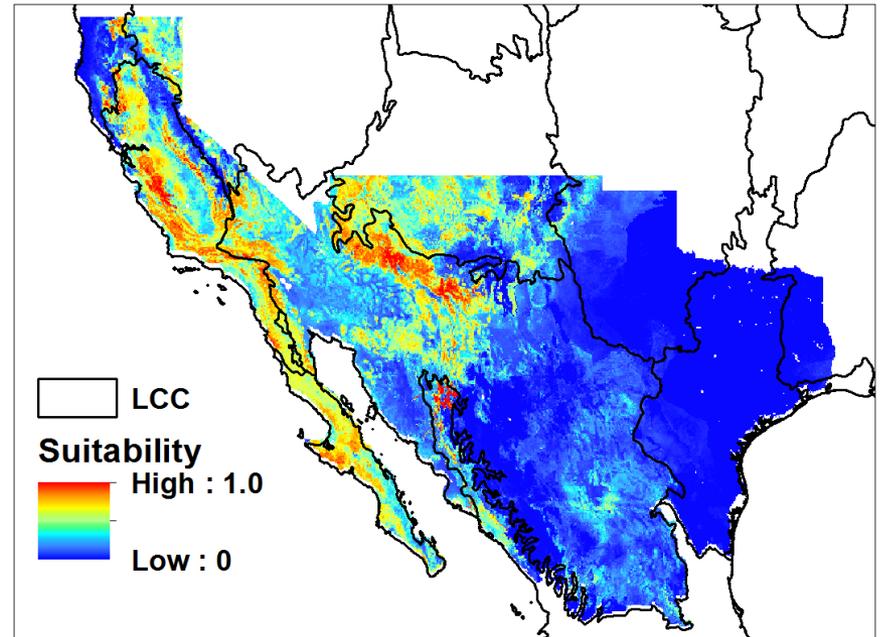


Adaptive Capacity Phainopepla?

Current



Future



~~Mapa - Mapa~~

Plan for and focus on the future,
not the past



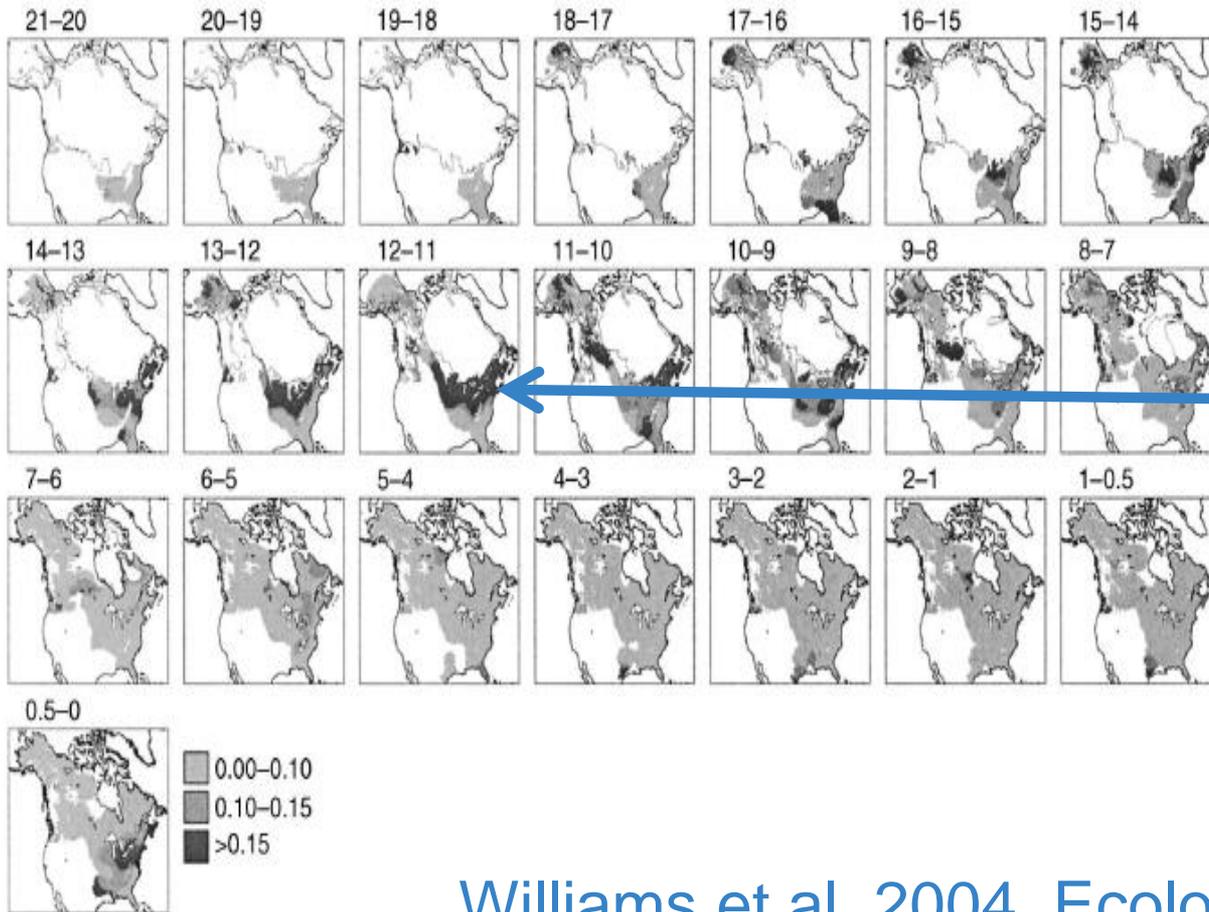
Point Blue

Conservation science
for a healthy planet.

“The further we move from the present, the more it becomes an inadequate model for past and future system behavior.”

Williams & Jackson, 2007

The composition of communities has also changed in response to past climate change

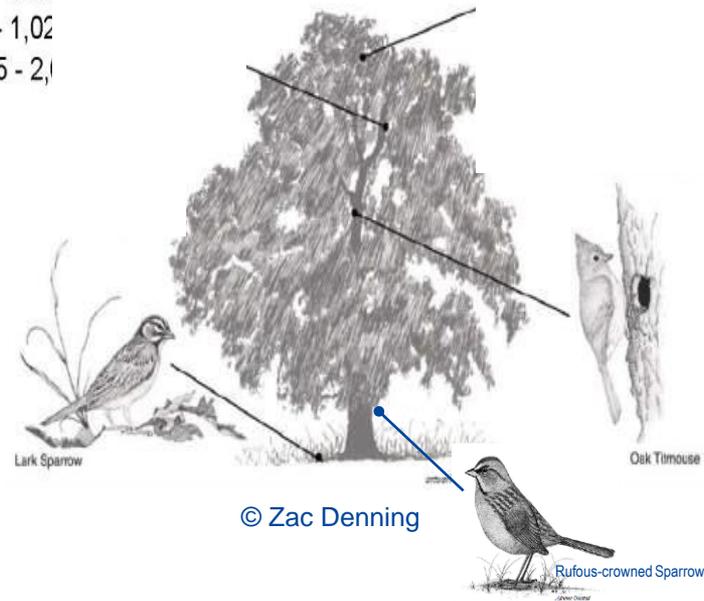
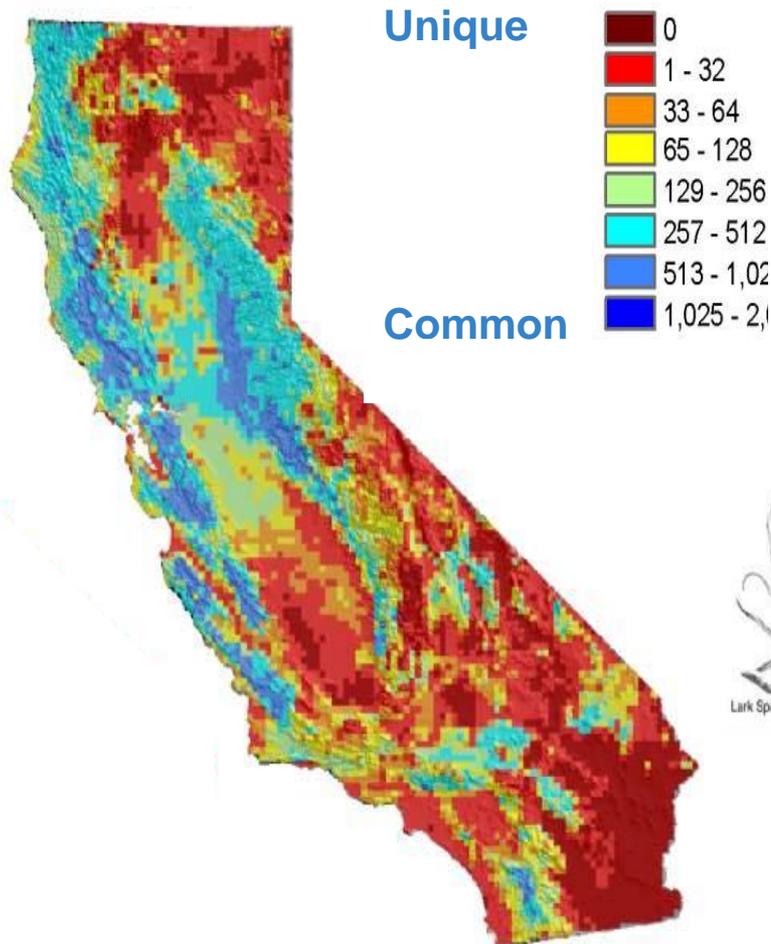


**No-analog
communities**

Williams et al. 2004, Ecological Monographs

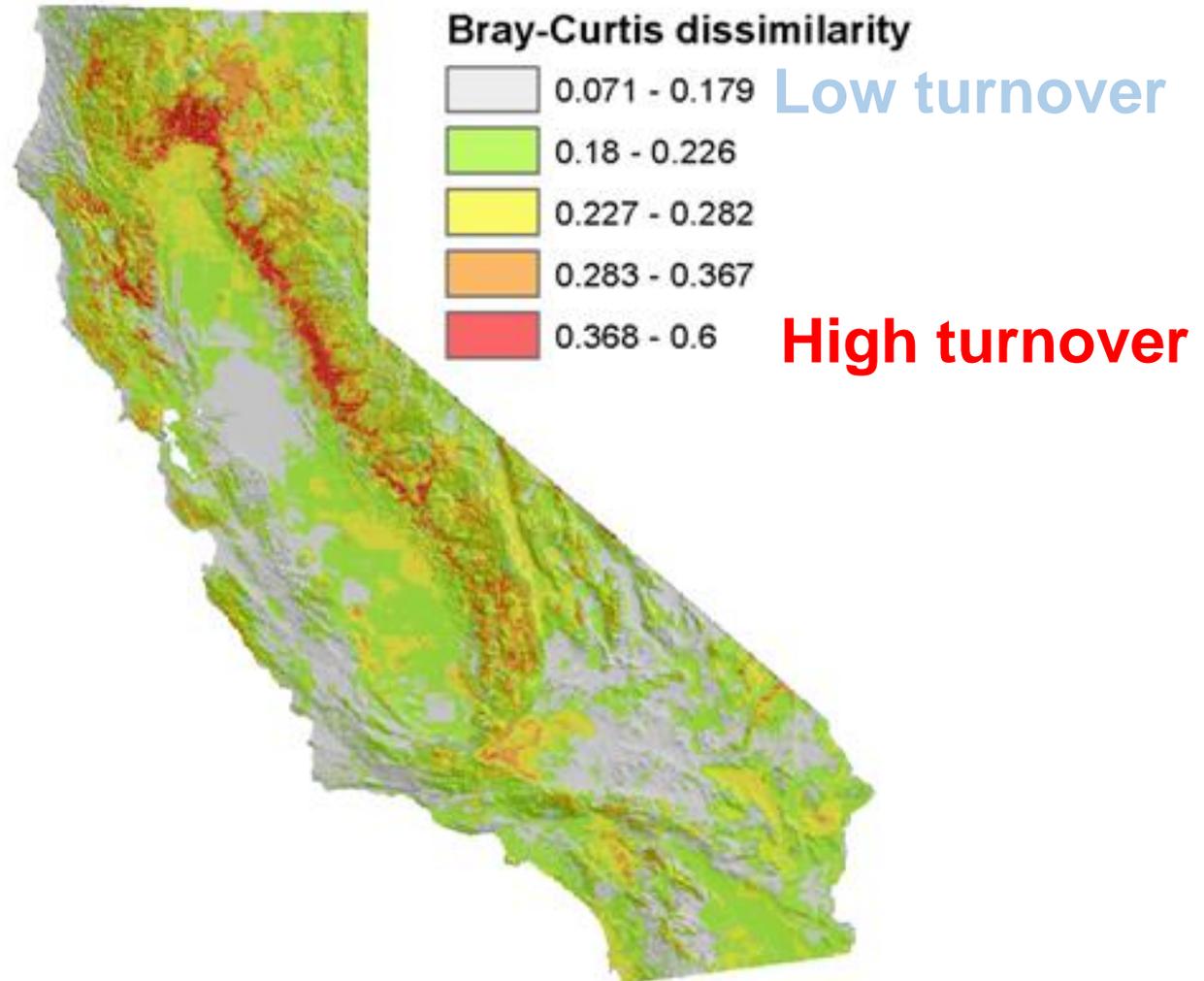
No-analog communities in the future

Future Bird Communities: Number of Modern Analogs



Stralberg et al. 2009, PLoS ONE

Community turnover: Changes in bird community composition (200 species)

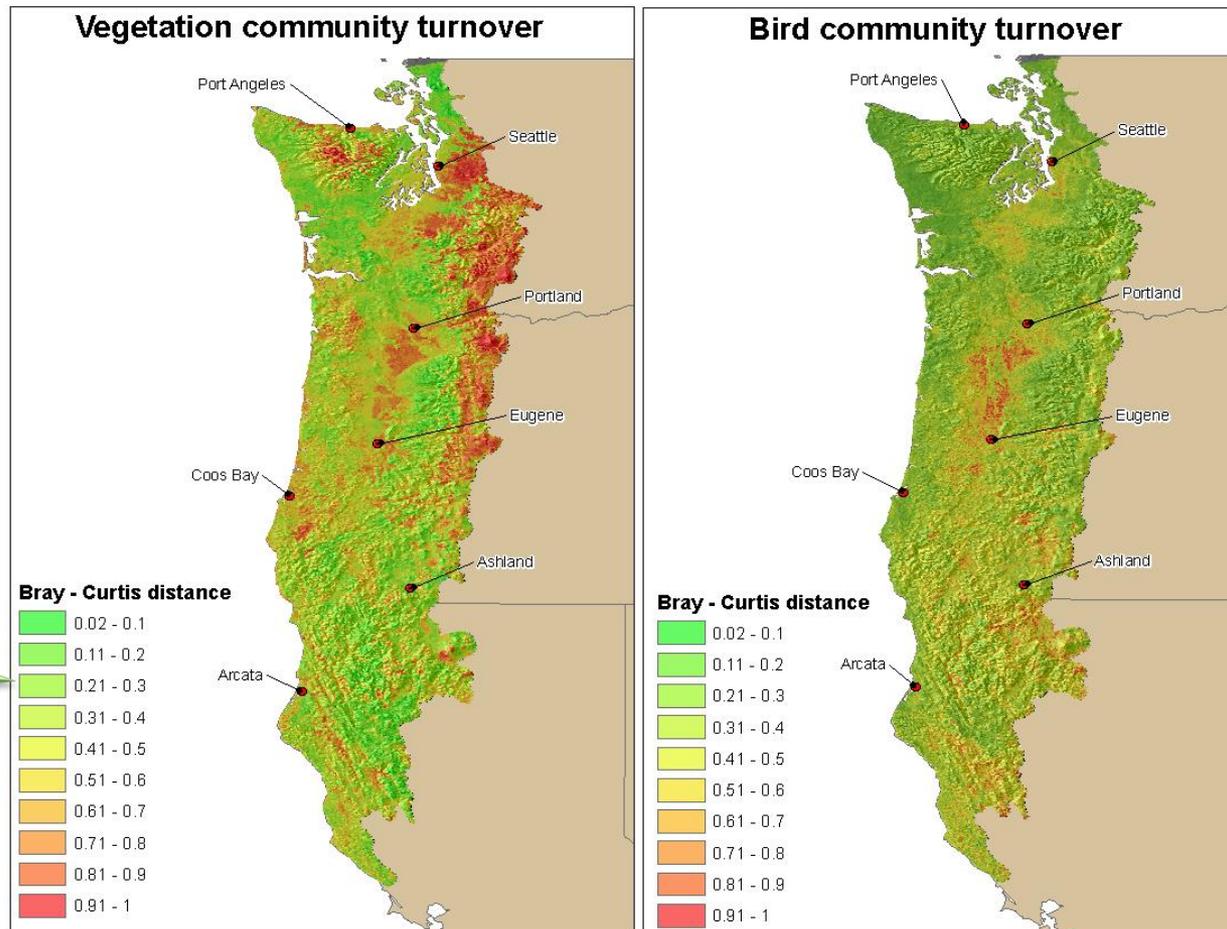


Managing for communities of today (or the past) may be mal-adaptive for the future

Future steps:

Use projections of range shifts and community turnover to design future monitoring studies

RCM3_GFDL
A2_2070
regional
climate model



Climate-Smart Riparian Restoration



Planting more species that:

- Withstand extremes
- Provide food year-round for disrupted phenologies

- **Climate-smart Restoration Tool Kit:**
<http://www.pointblue.org/our-science-and-services/conservation-science/habitat-restoration/climate-smart-restorationtoolkit/>
- Seavy et al., **Why climate change makes riparian restoration more important than ever.** 2009. *Ecological Restoration Ecol. Rest.* v27

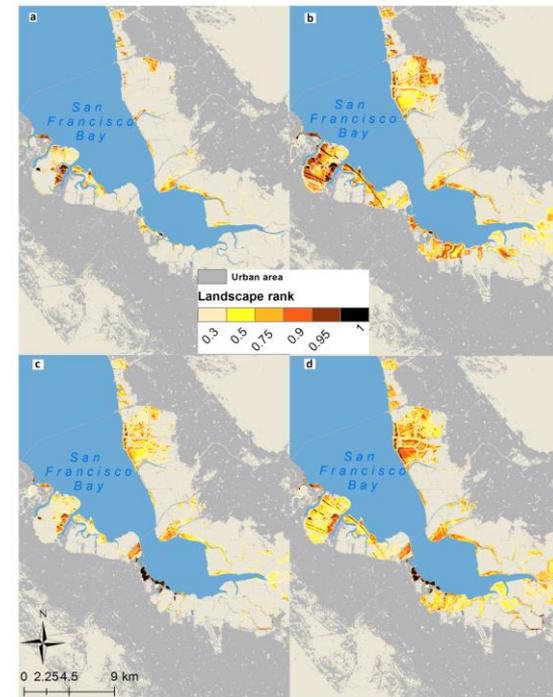
**Prioritize actions across multiple
future scenarios for greatest
benefits to wildlife and people**



Point Blue

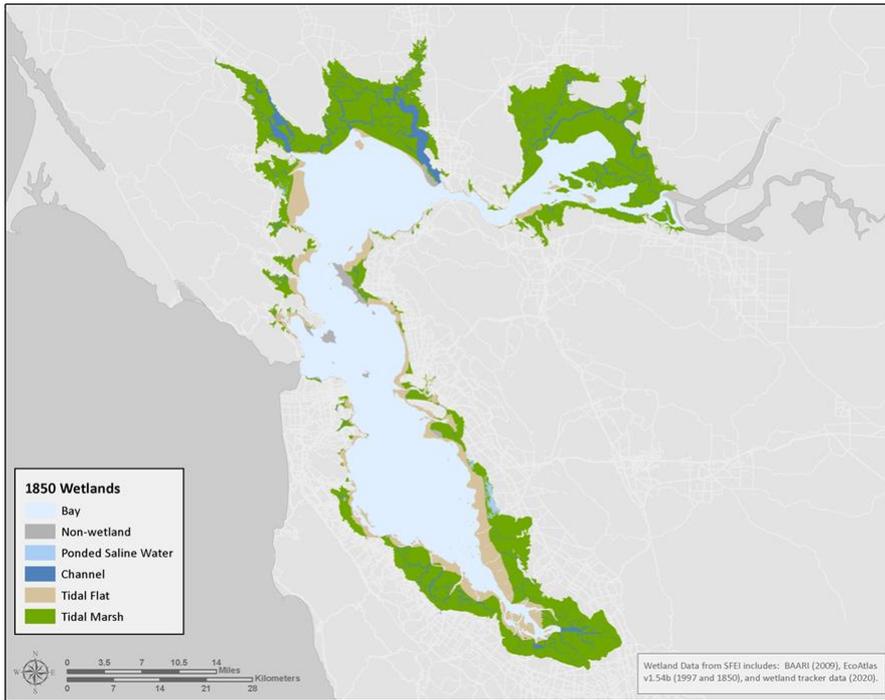
Conservation science
for a healthy planet.

Tidal marsh restoration and conservation planning in the face of uncertainty

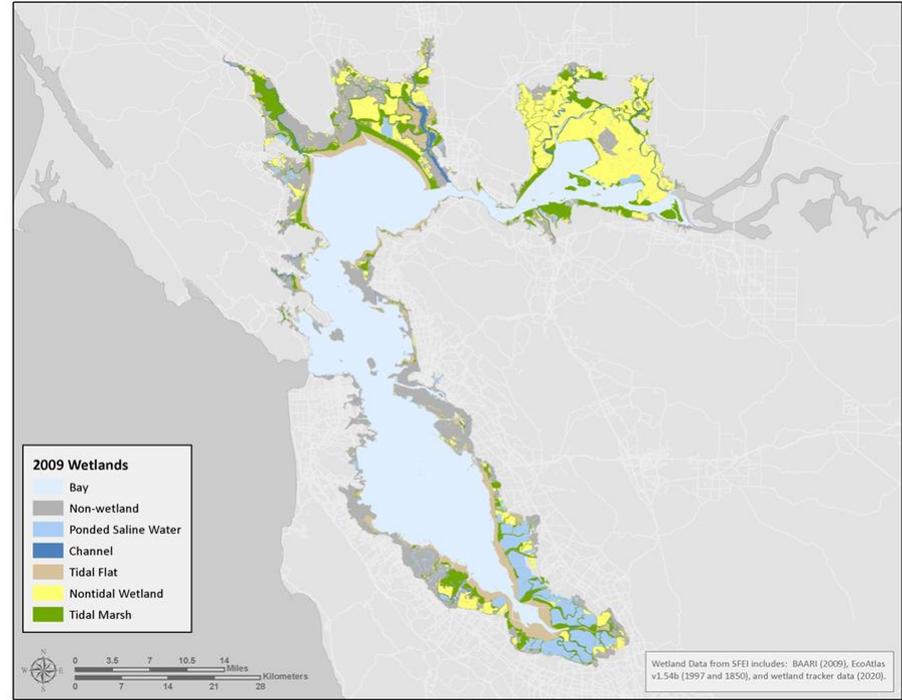


Where should we prioritize restoration?

90% loss of historic tidal marsh ecosystems



1850

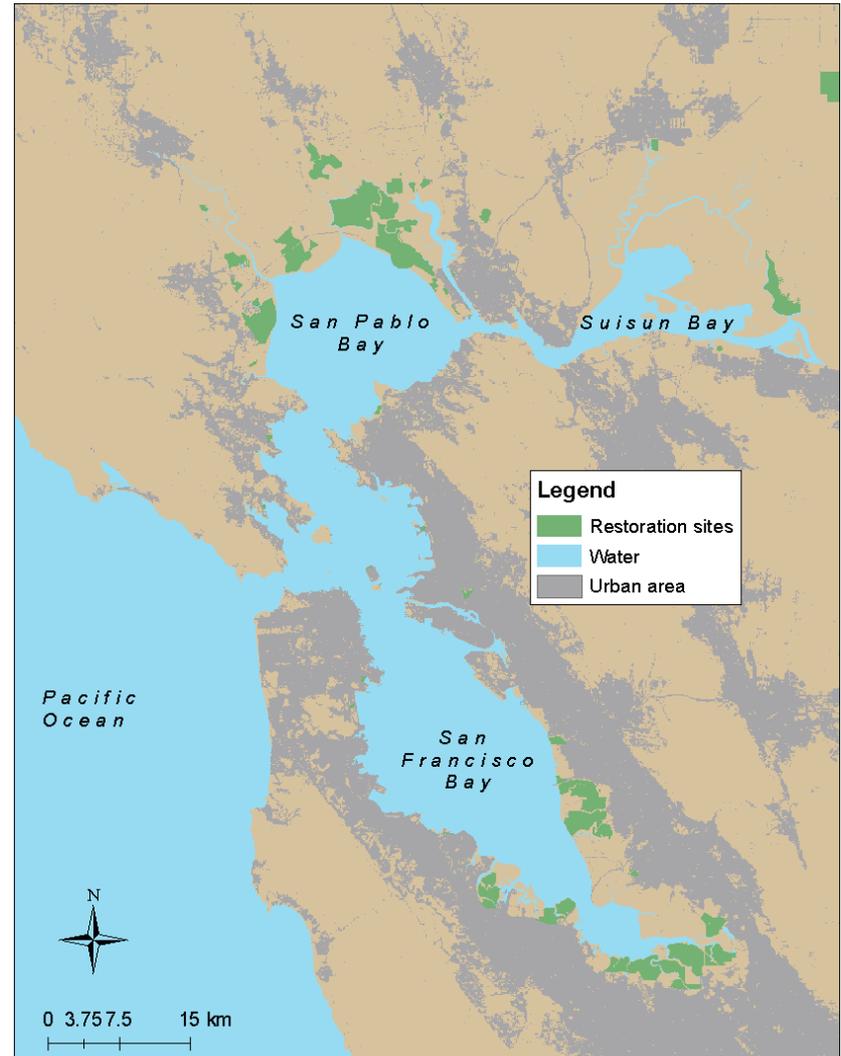


2009

Figures San Francisco Estuary Institute

Sea level rise poses a restoration dilemma

- 1999 SF Bayland Goals report: 265% increase in tidal marsh habitat (100,000 acres)
- Will restoration projects be sustainable with sea level rise?
- Which projects should we prioritize?



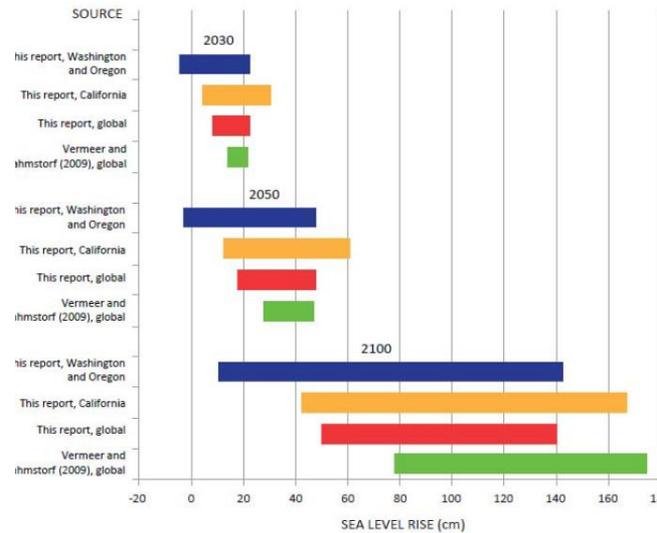
Major drivers of future changes in tidal marsh ecosystems

How do we know what future to manage for?

Science of sea level rise



Sea level rise: other



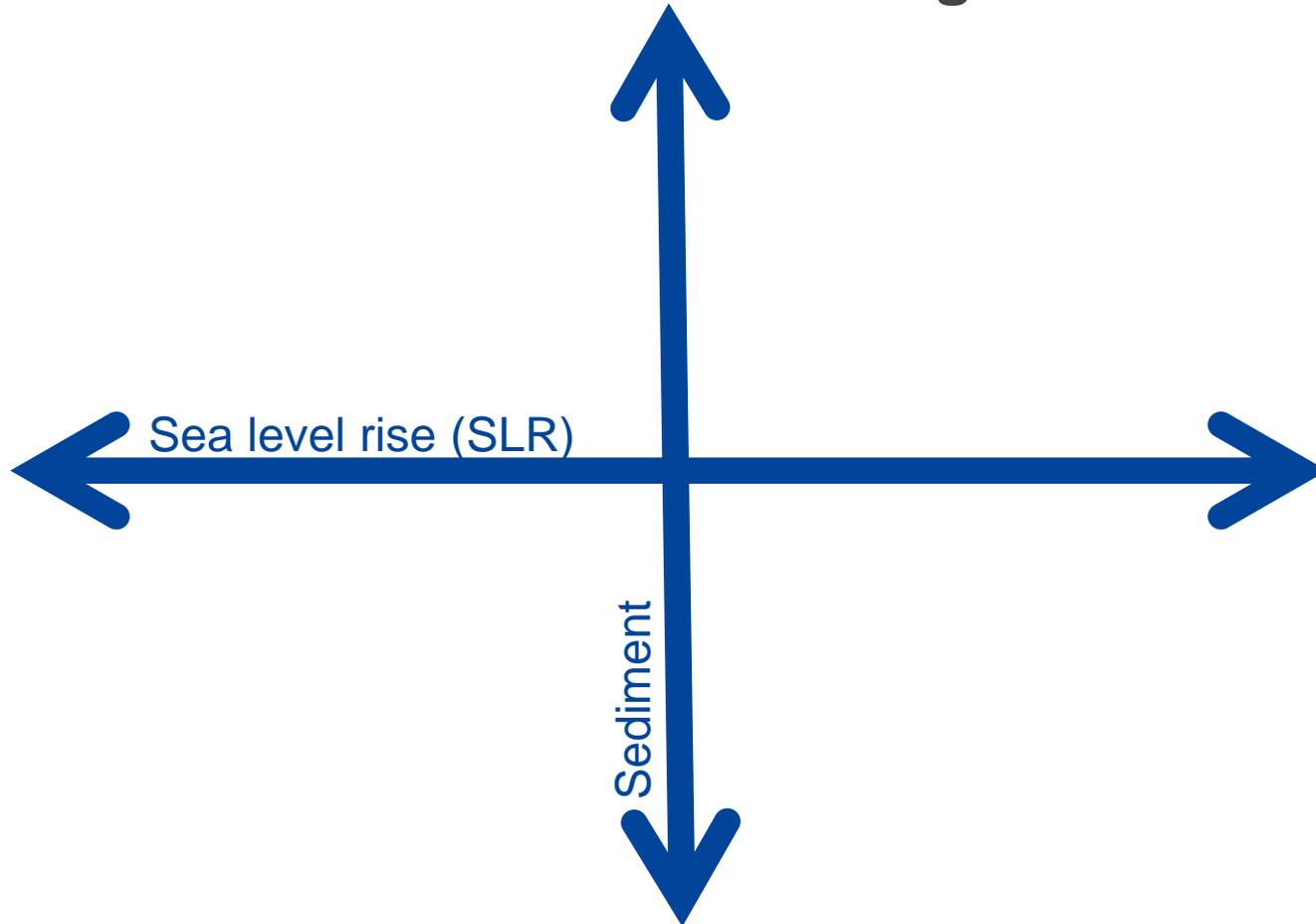
Human decisions



Future SF Bay Tidal Marsh Scenarios

Low SLR/ Low Sediment

High SLR/ Low Sediment



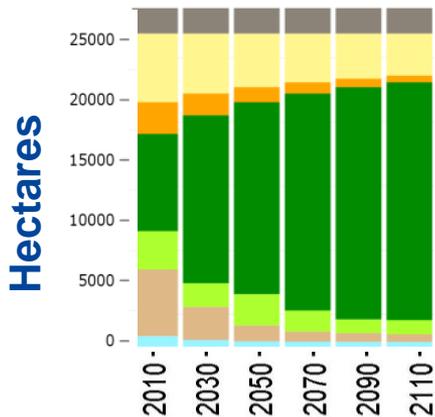
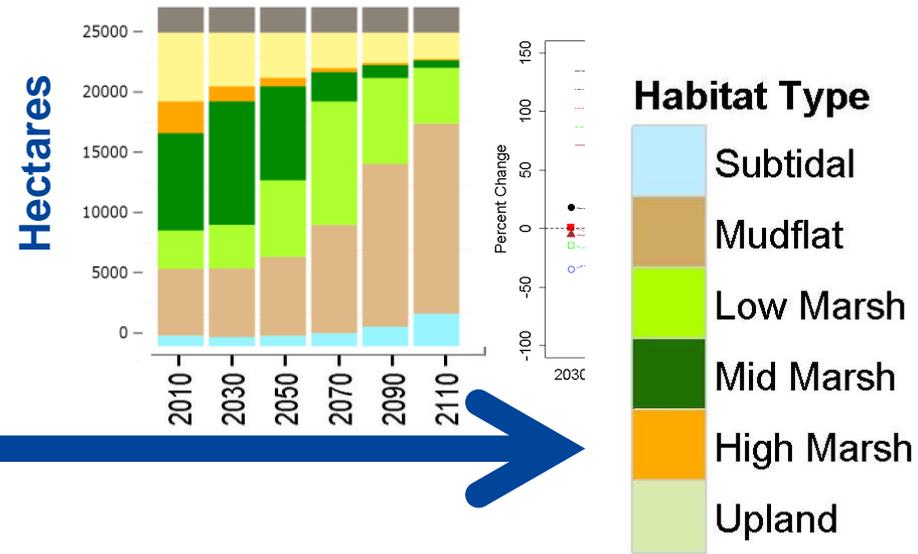
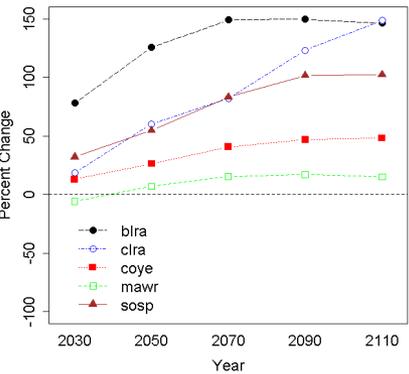
Low SLR/ High Sediment

High SLR/ High Sediment

Future SF Bay Tidal Marsh Scenarios

Low SLR/ Low Sediment

High SLR/ Low Sediment

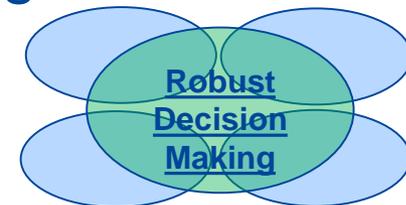


Low SLR/ High Sediment

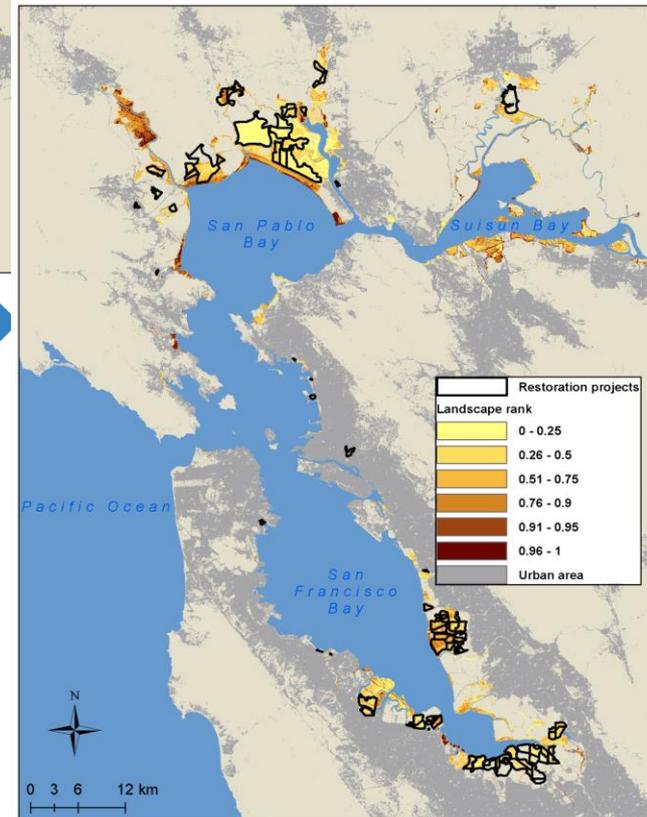
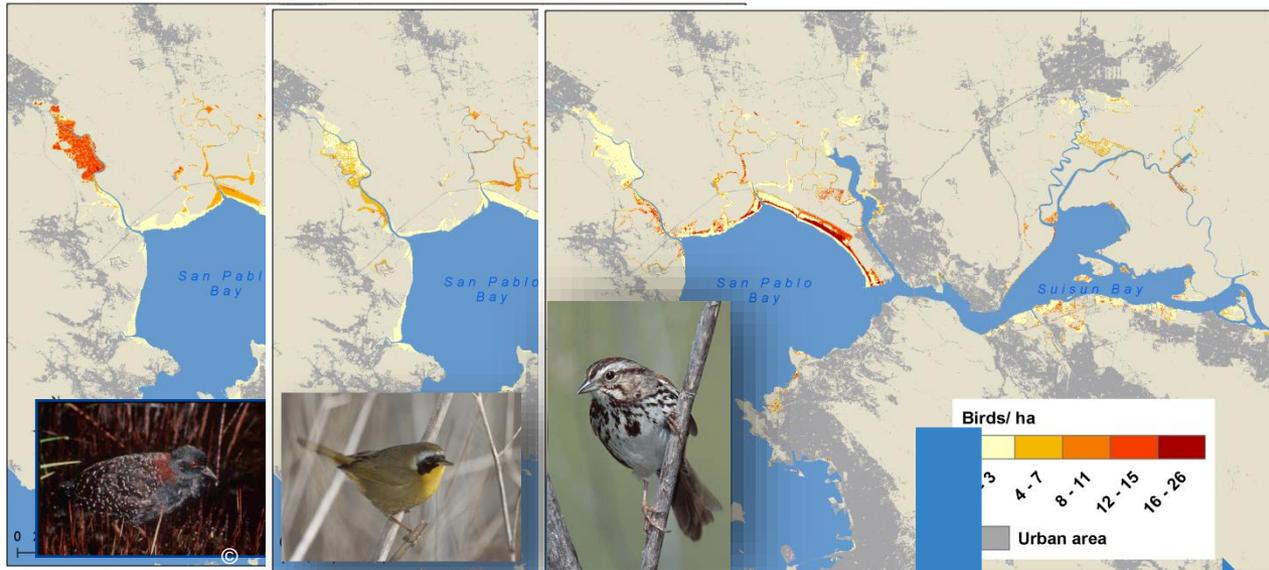
High SLR/ High Sediment

Different ways to select scenarios and prioritize

- “Head in the Sand”
 - Uncertainty is too high just use current conditions to prioritize.
- “I feel lucky”
 - Choose a single future scenario and use those models to prioritize.
- “Combined”
 - Use current and all future scenarios together



Which restoration projects will be successful under which scenario?

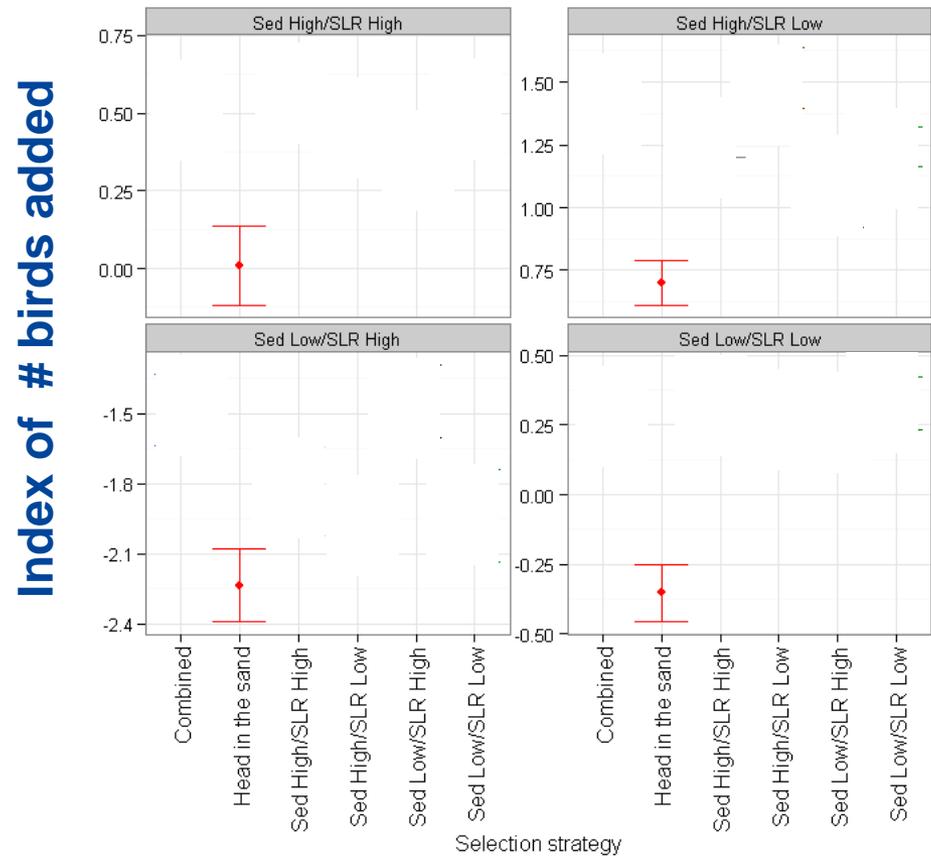


1. Select top 25% of restoration projects
2. Evaluate performance using all future scenarios

Scenario planning results

The most robust strategy is the combined approach

None of the scenarios are right but together they can frame robust decisions.



Some lessons learned: Planning with deep uncertainty

- All restoration projects provide additional bird habitat but...
- Many projects are not resilient to some future scenarios
- A plausible range of future scenarios can help identify projects that consistently perform well



In Summary:

1. Change is coming, but we can work to slow change and help systems adapt!
2. There will be winners and losers, we need to start planning now to avoid being a loser
3. Actively apply **CANADIANS** adaptive management
4. Plan for multiple regrets solutions



FOR GLOBAL WARMING

www.pointblue.org/climatechange

Questions?



Point Blue

Conservation science
for a healthy planet.

sveloz@pointblue.org

<http://www.pointblue.org/>

www.prbo.org/sfbayslr

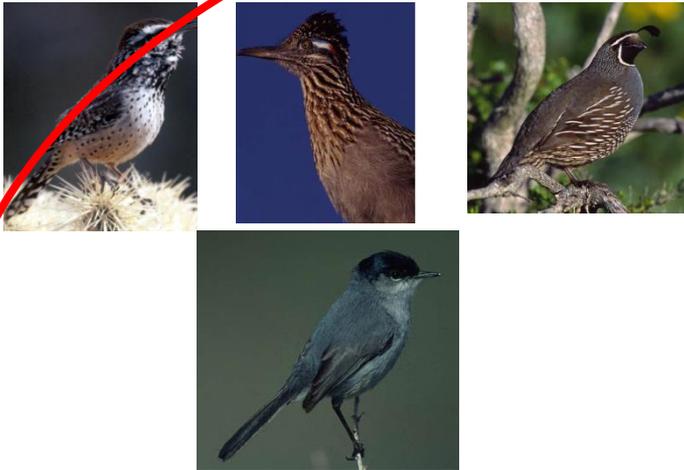
<http://data.prbo.org/apps/ecn>

How has conservation planning been applied?

Protect places where many species occur

Location A (4 species)

Coastal scrub and chaparral



Location B (3 species)

Riparian



Location C (6 species)

Oak woodland



So let's focus on one community type, you can protect 2 sites

Location A (3 species)



Location B (2 species)



Location C (3 species)



All sites may not be equal

Location A (3 species)



Location B (3 species)



Location C (3 species)



All sites may not be equal

Location A (3 species)



Location B (3 species)



Location C (3 species)



What about climate change?

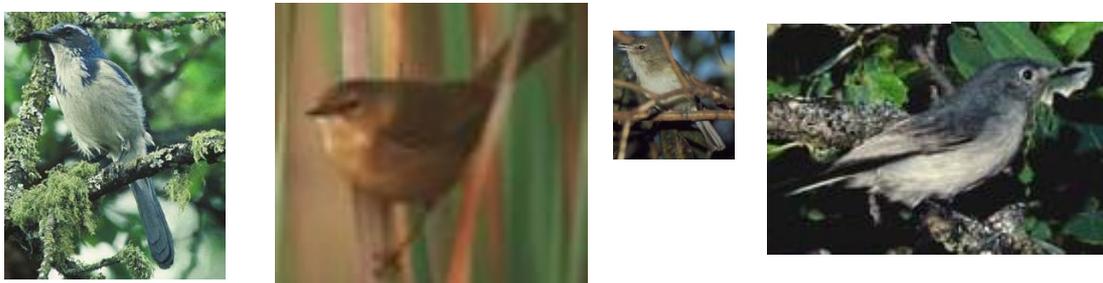
Location A (3 species)



Location B (3 species)



Location C (4 species)





Point Blue

Conservation science
for a healthy planet.

Color Palette Reference Guide

Please use this page as a visual reference only for choosing colors from your custom color palette. This page is not editable.

Primary Palette



Bright Blue

Green

Dark Blue

Bright Blue, Green, and Dark Blue are the primary colors and take priority over the secondary palette.

Secondary Palette



Lichen

Poppy

Light Grey

Dark Grey

Lichen, Poppy, Light Grey, and Dark Grey are used minimally and when you need more colors than the Blues and Green.