Making ecological restoration climate-smart

Thomas Gardali, 14 May 2019

American Society of Landscape Architects

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Conservation science
for a healthy planet

Our Vision:

Because of our collaborative climate-smart conservation actions today, ecosystems will sustain thriving wildlife and human communities well into the future.

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Conservation science for a healthy planet.

- **Mission:** we work to advance the conservation of birds, other wildlife, and ecosystems through science, partnerships, and outreach
- **160 passionate & dedicated scientists, restorationists, and educators** on the ground and in partnership from Alaska to Peru, from the Sierra to the Sea, and as far as Antarctica
- **Founded in 1965** as Point Reyes Bird Observatory
- **SCIENCE** is at the core of everything we do
- **Our Priority:** increasing the pace and scale of climate-smart conservation to address one of the most pressing challenges of our time: climate change

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Outline for this presentation

1. Restoration Ecology
2. Climate-smart ecological restoration defined
3. Climate-smart ecological restoration principles
4. Principles to practice

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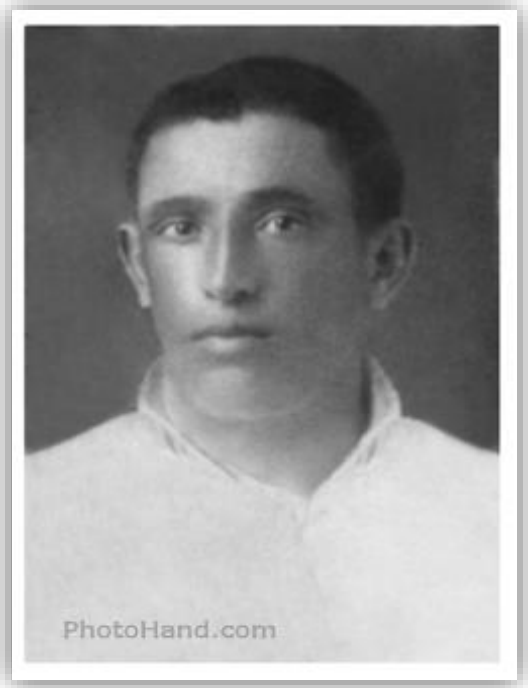
Restoration



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Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

Society for Ecological Restoration (2004)

SER SOCIETY FOR ECOLOGICAL RESTORATION

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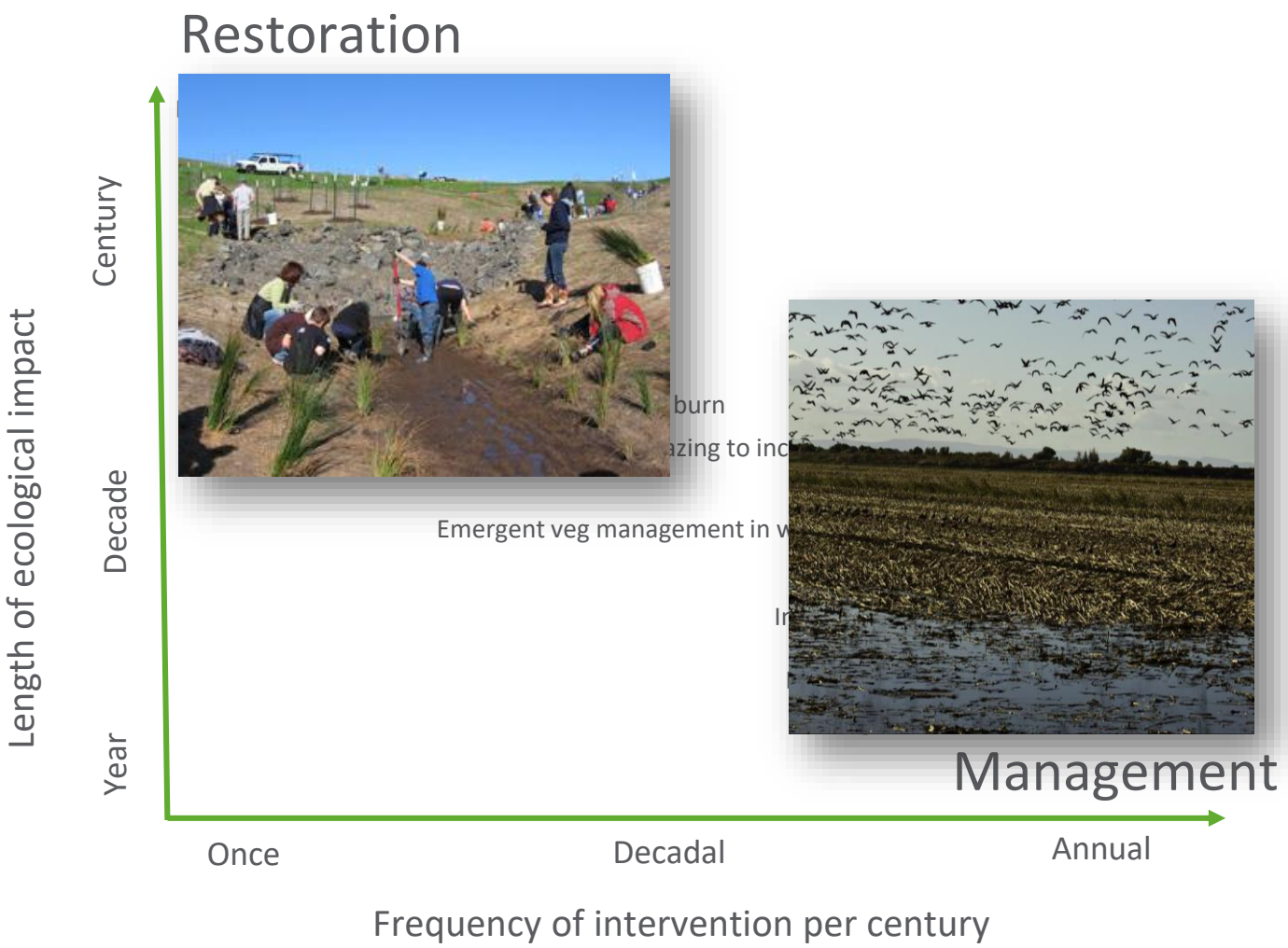
Contrasting restoration and management



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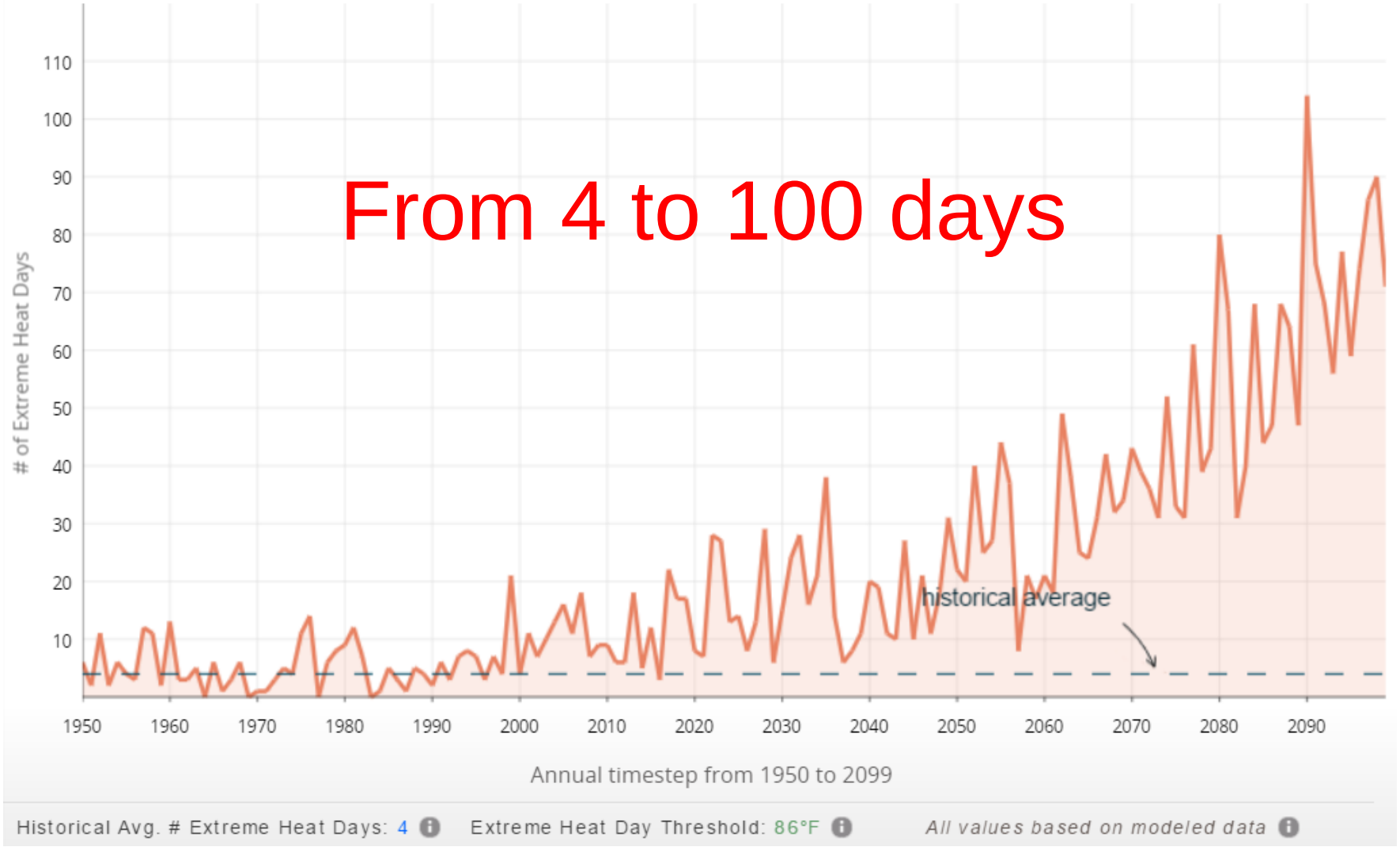
Climate change and restoration

Number of extreme heat days by year for Larkspur California



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Climate-smart ecological restoration is the process of enhancing ecological function of degraded or destroyed areas in a manner that makes them more resilient to the consequences of climate change.

Gardali et al. in prep

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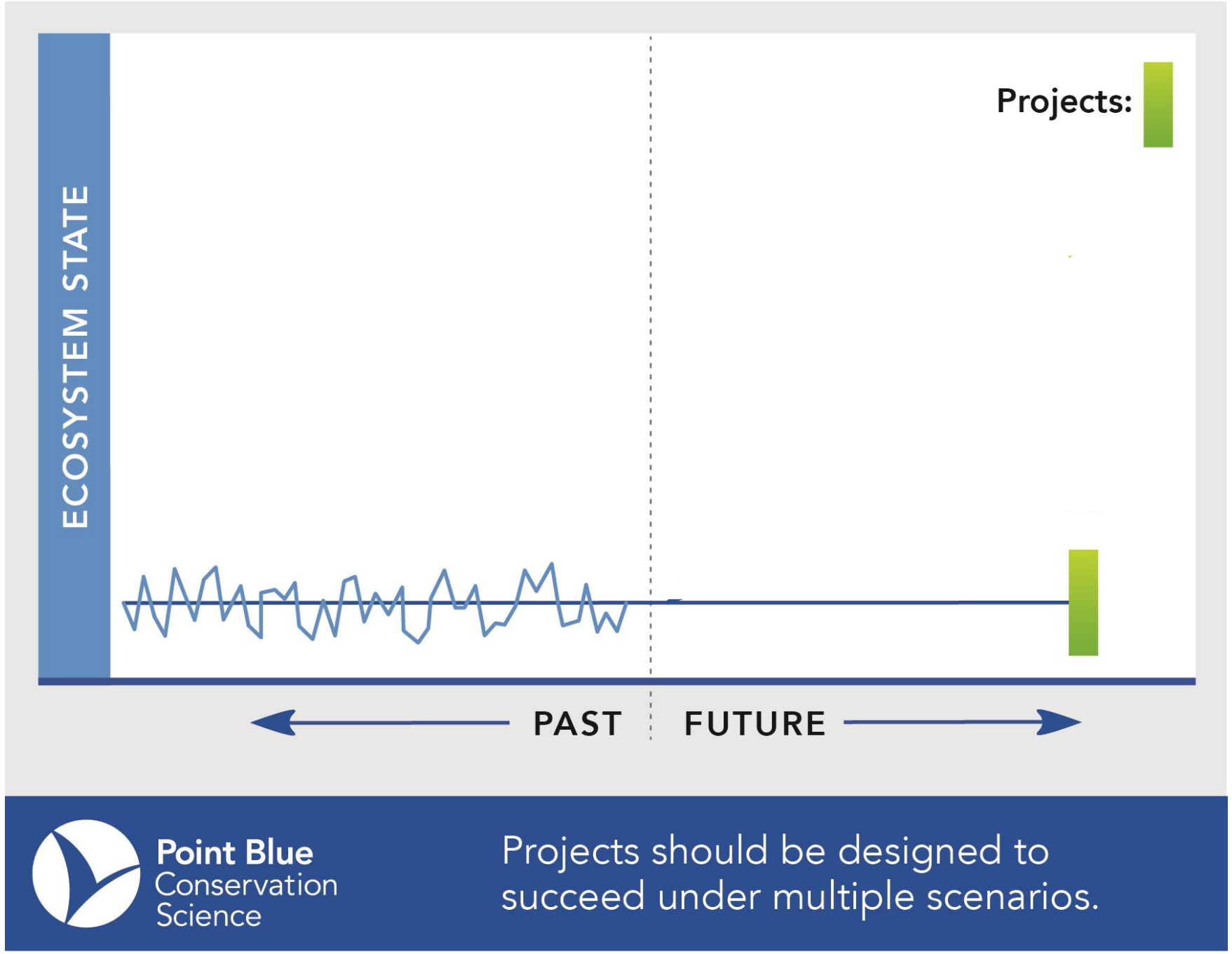
ECOSYSTEM STATE
Projects:
PAST
FUTURE
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Conservation
Science
Projects should be designed to
succeed under multiple scenarios.

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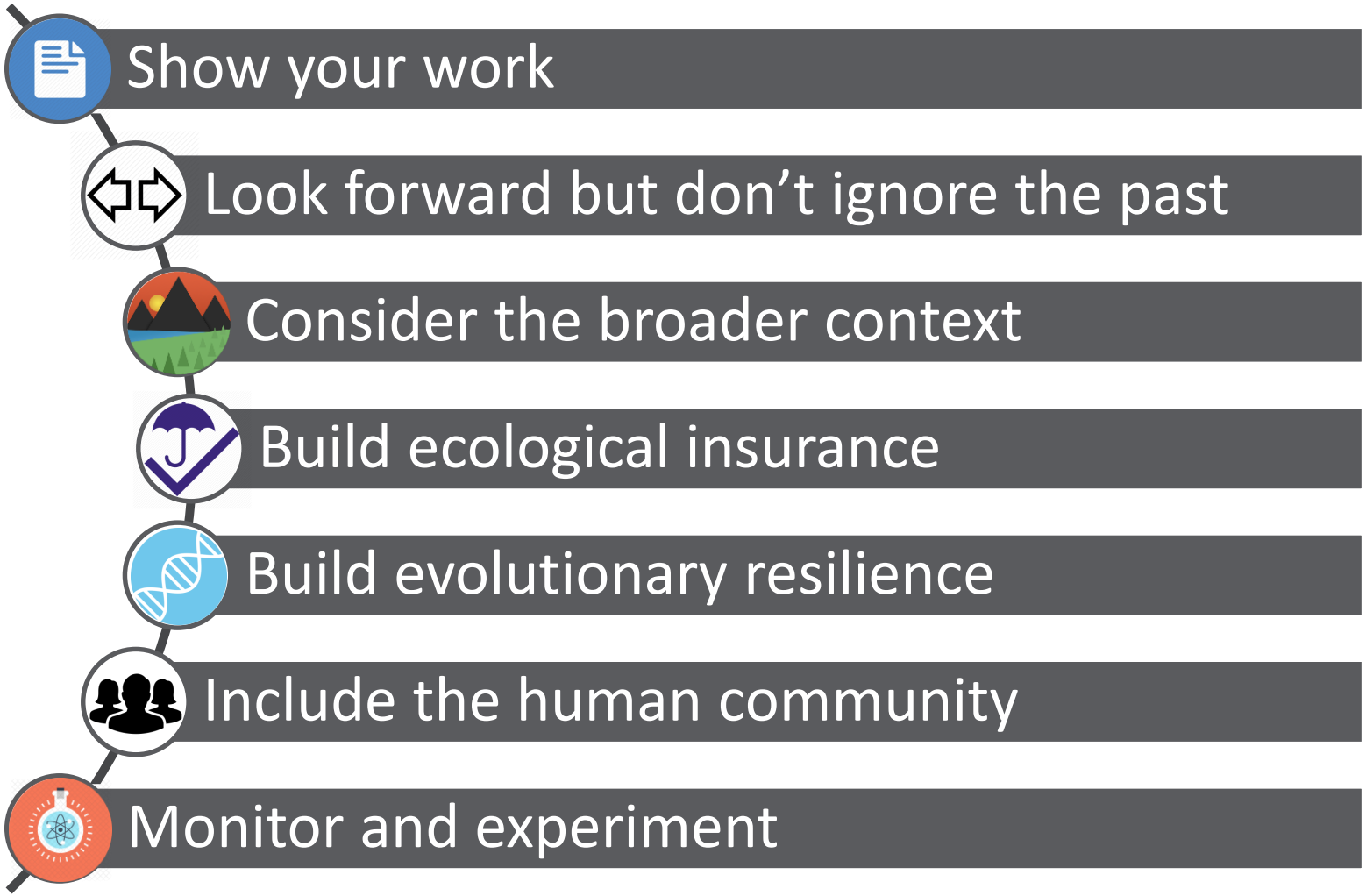
Seven climate-smart restoration principles



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http://www.nwf.org/, Palmer Est. & Coasts 32, Hansen et al. Con. Bio. 24

1. Show your work

- Records assumptions and decision process
- Explicitly addresses climate change
- Writing it down clarifies thinking
- Provide a record to guide future actions

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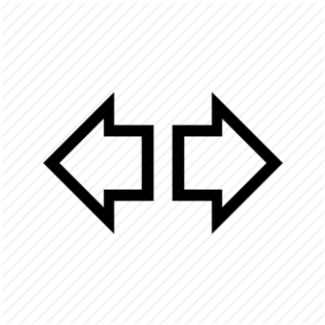
2. Look forward but don't ignore the past



- The past may not be the best guide to a future functioning equilibrium state

- Use best available climate projections and summarize for project region
  - Make comparisons to current conditions

- Use information on past conditions if available

- Identify **climate-change vulnerabilities**

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More on vulnerability

Vulnerability is the susceptibility or amount of risk of a population to negative impacts

A **Vulnerability Assessment** seeks to determine how susceptible a species or a system is to the negative impacts of climate change

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Smit et al. 2000. *Climatic Change* 45, Williams et al. 2008. *PloS Biology* 6

Components of a vulnerability assessment

Sensitivity refers to the intrinsic traits of organisms that make them vulnerable to climate change (such as physiological tolerances)

Exposure refers to the extrinsic factors that are driven by climate change (such as habitat loss)

Adaptive capacity addresses the ability of a species or system to accommodate or cope with climate change impacts.

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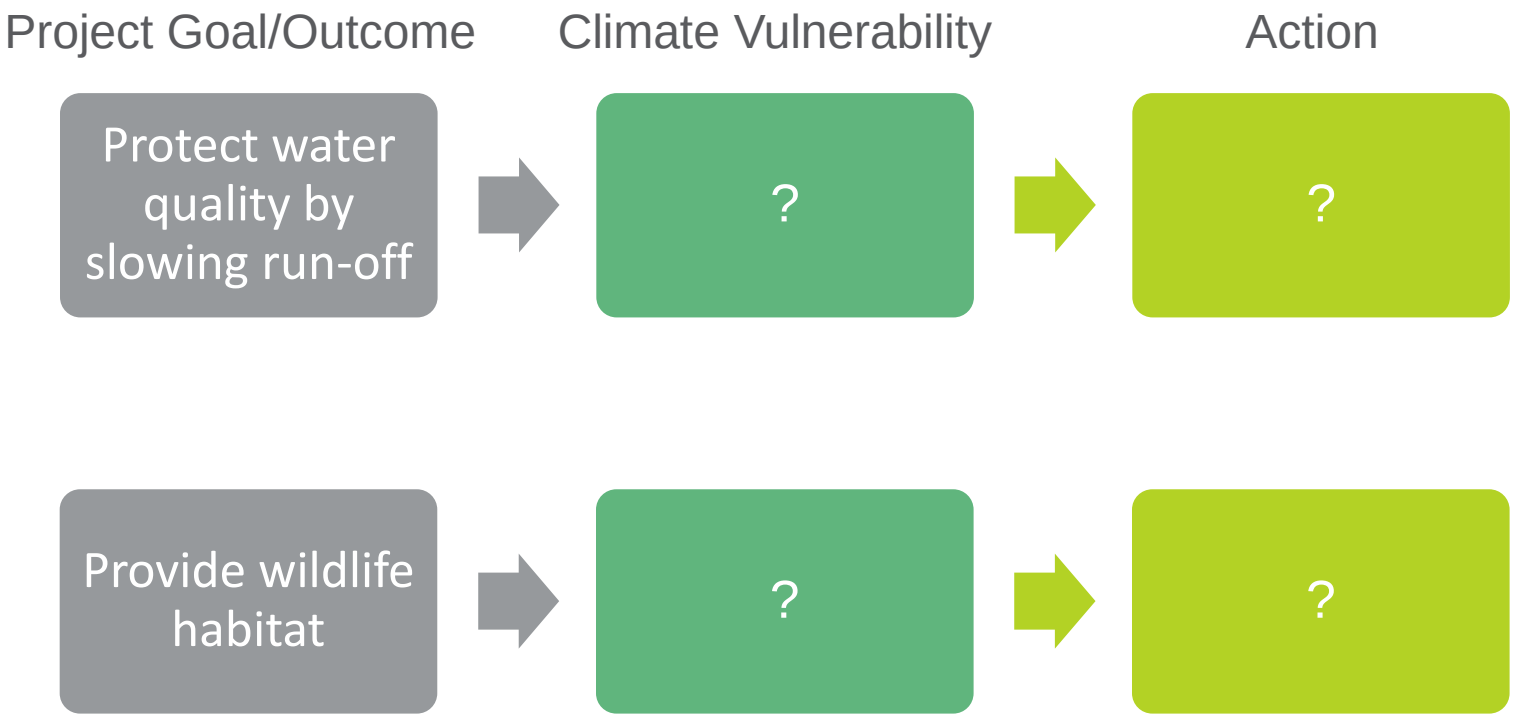
Actions to address climate change



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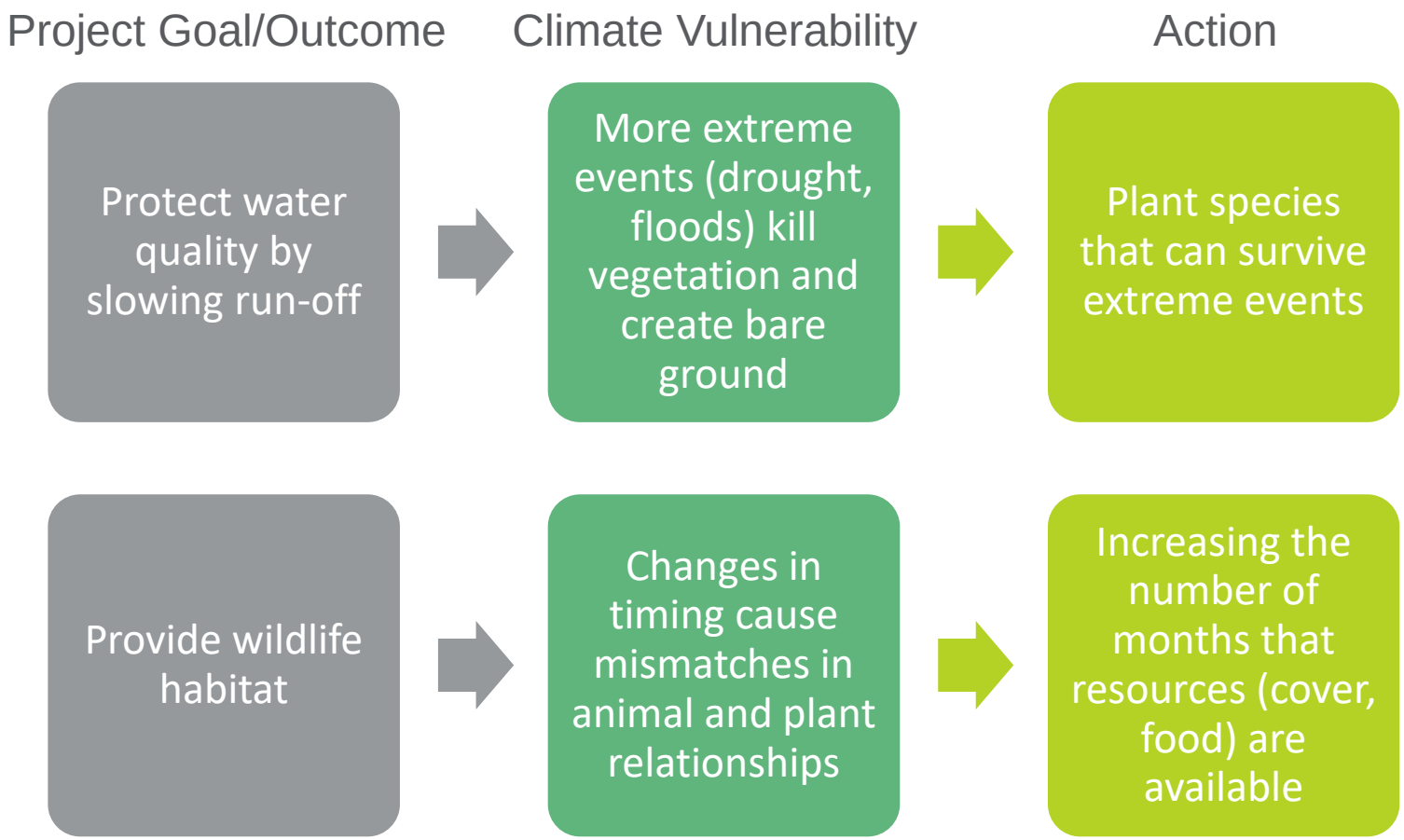
Actions to address climate change



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3. Consider the broader context

- Identify **other stressors to the system** that could be addressed by the project
- Other logistical constraints
- Importance of project to the region and beyond

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4. Build Ecological Insurance - Redundancy

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Dunwiddie et al., Ecol. Rest. v27

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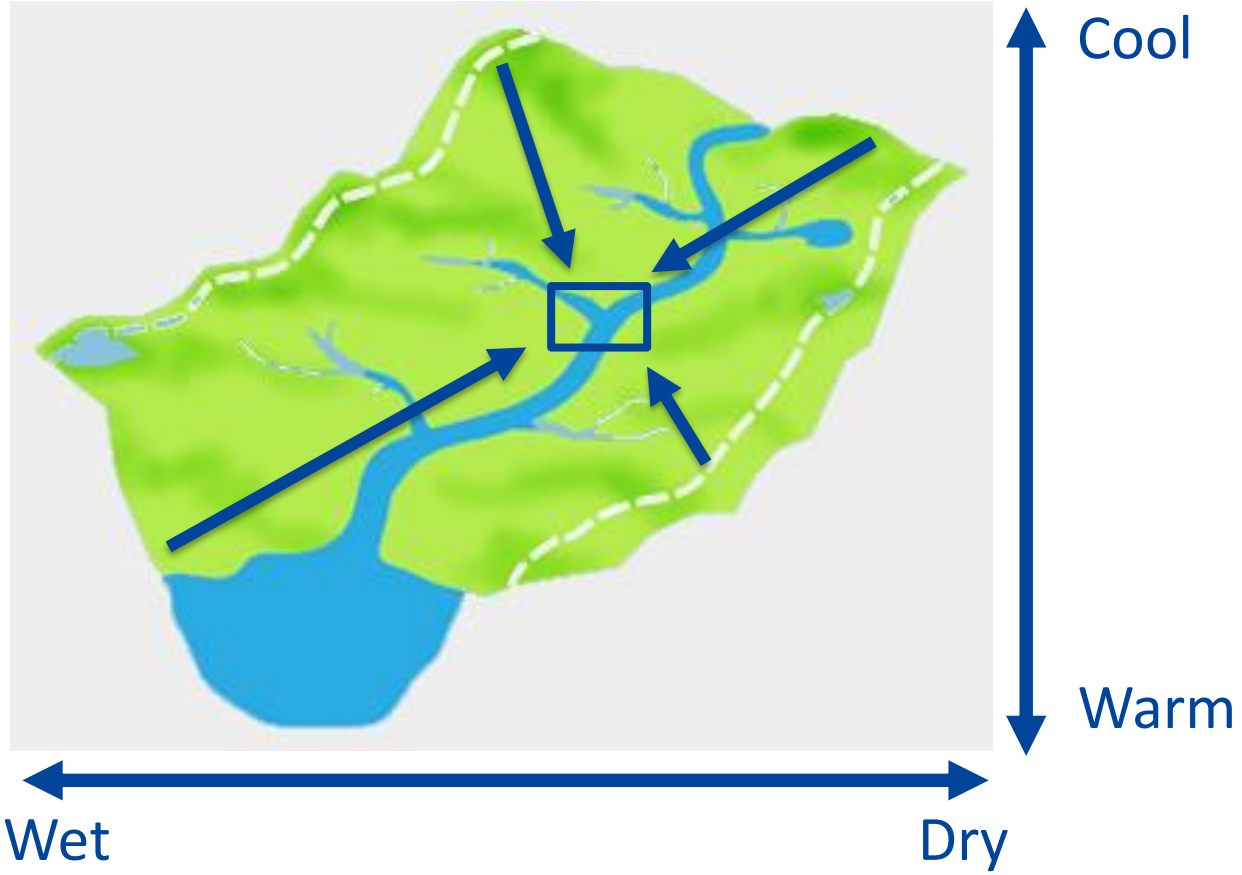
5. Build Evolutionary Resilience



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Seavy et al., Ecol. Rest. v27

6. Include the Human Community

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Risk

- The probability of an outcome (usually negative) in a specified period of time

- An estimate of risk can help provide the evidence (show your work!) to:
    - make restoration decisions
    - allocate scarce resources

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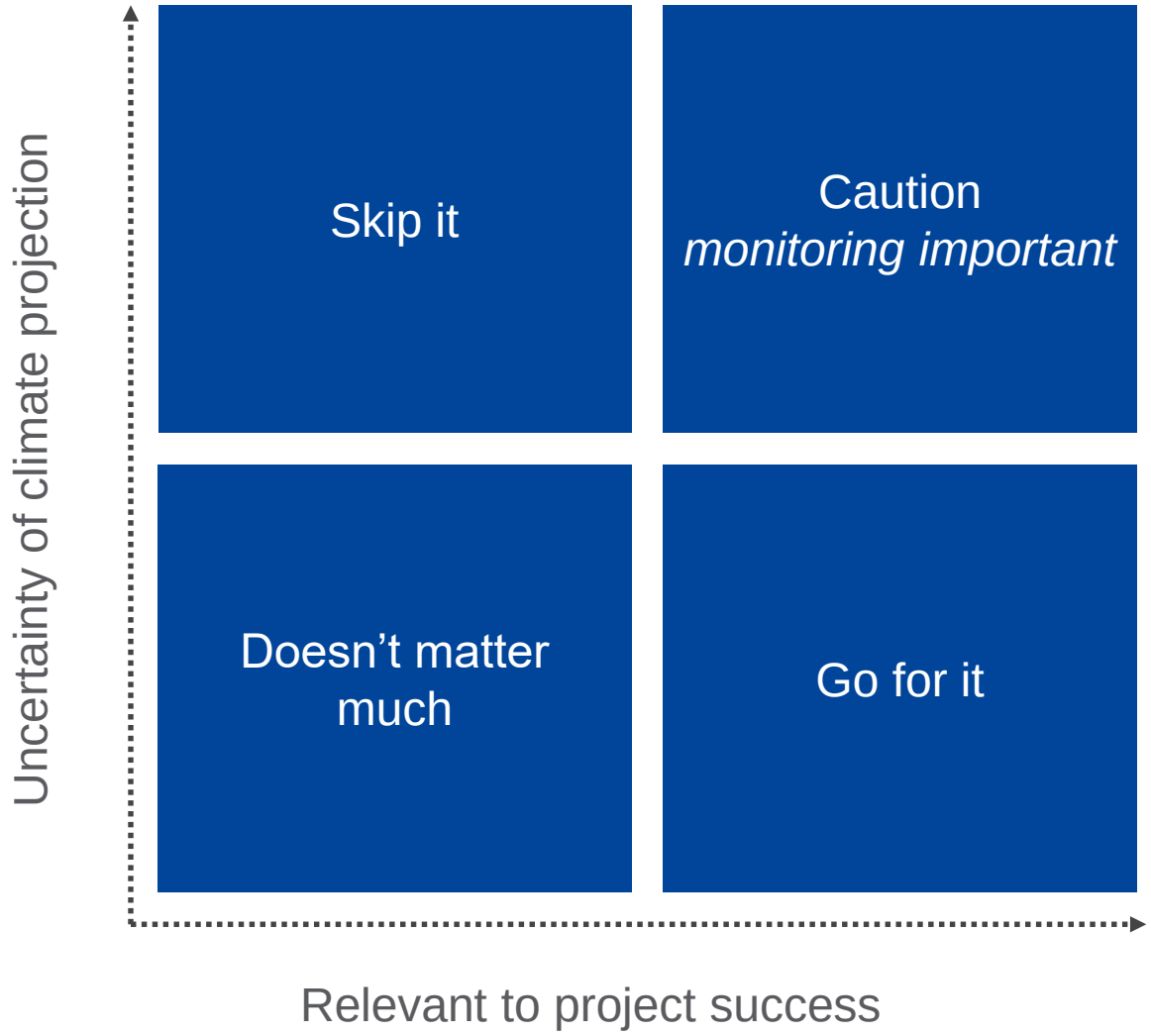
Risk



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7. Research and Monitoring

- Given the great **uncertainties** around how climate change will impact ecosystems and how society will respond, it is important to **conduct ecological monitoring to manage adaptively**.

- Restoration experiments can help provide **answer to key uncertainties**, provide **tools to access key information**, and help **evaluate effectiveness**.

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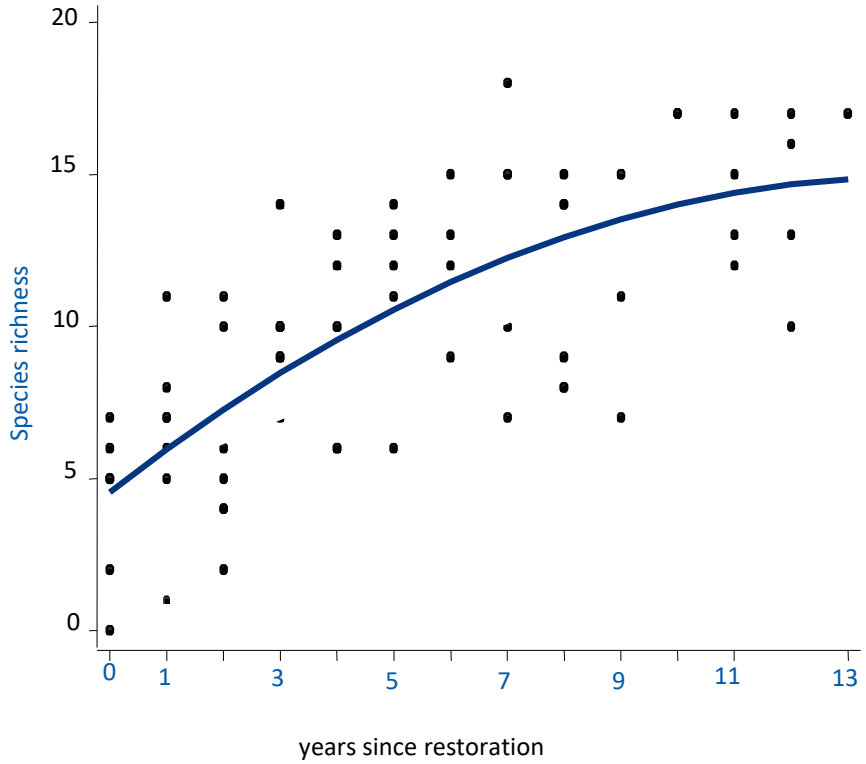
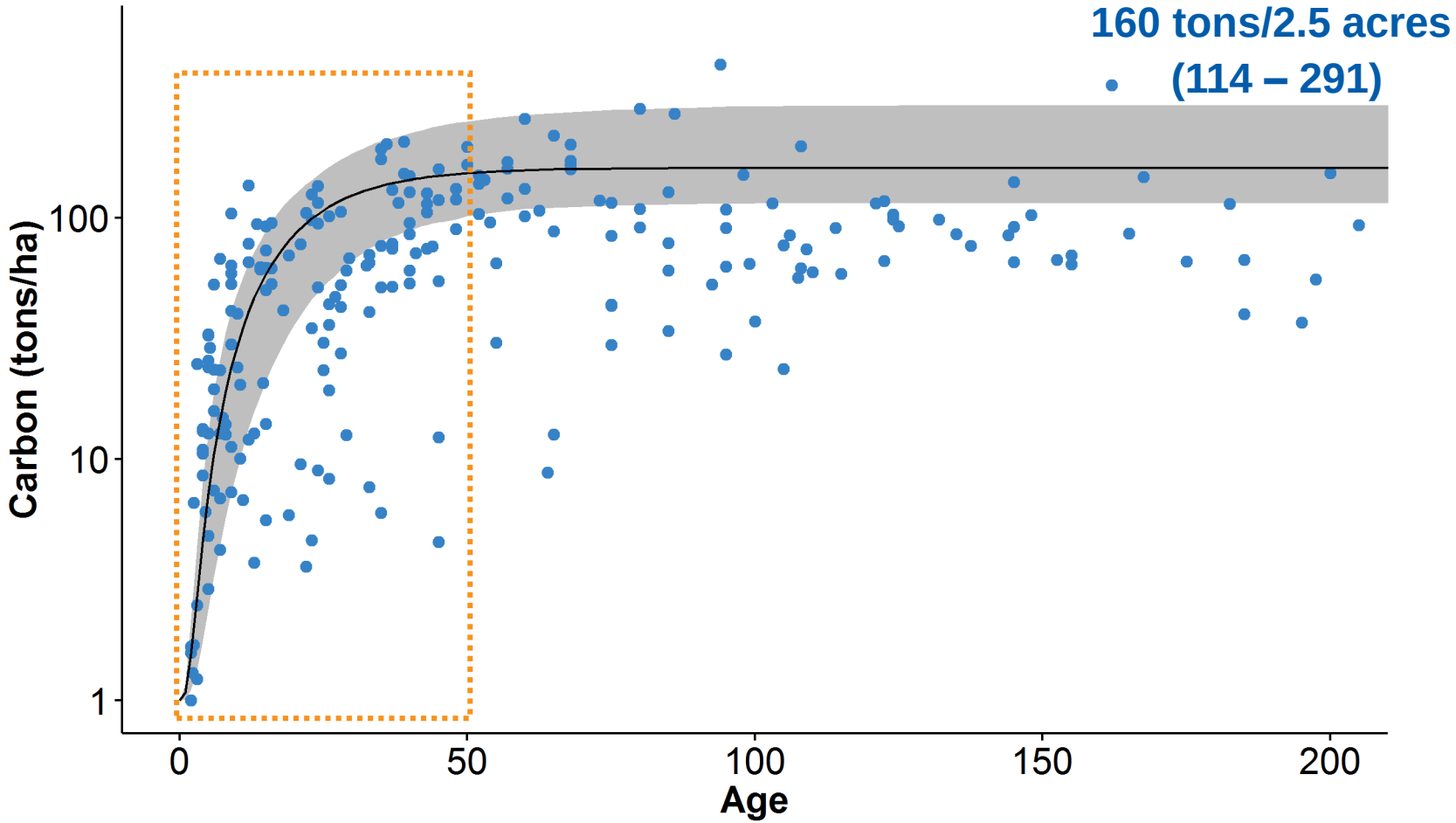
Restoration works to bring back birds



Golet et al. 2008, *San Francisco Estuary and Watershed Science*

Restoration works to sequester carbon



Dybala et al., 2018, *Global Change Biology*

Thanks!

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