

HABITAT CONSERVATION PLANNING IN AN ERA OF CLIMATE CHANGE

National HCP Coalition Meeting

November 13, 2019



**Jodi McGraw
Consulting**



**Institute for
Ecological Health**



**SANTA CLARA VALLEY
HABITAT AGENCY**



National HCP Coalition

Session Overview



Background



Climate-Adapted Approaches



Emergent Themes



Next Steps



Questions



Panel Discussion



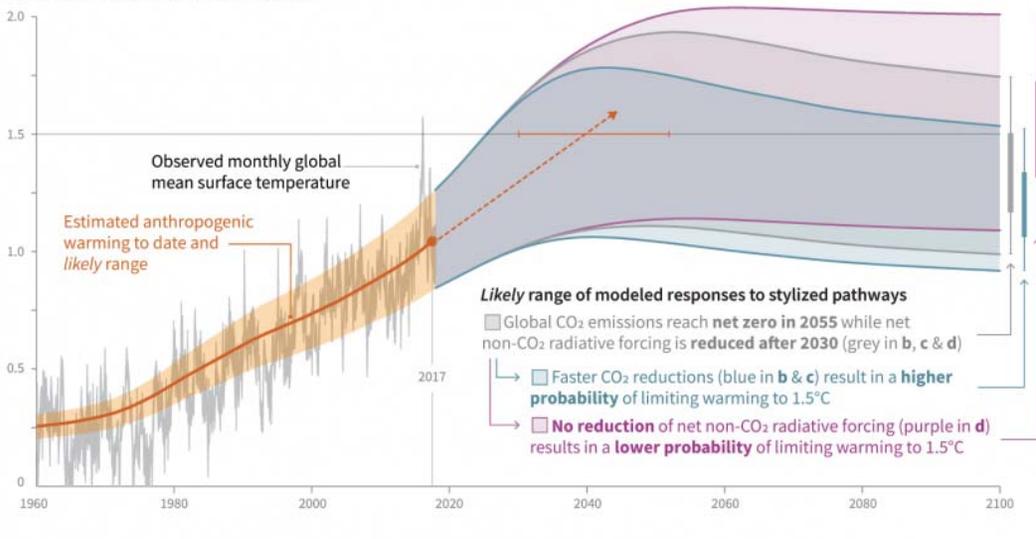
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BACKGROUND

Climate Change

Global warming relative to 1850-1900 (°C)



IPCC 2019

- Temperature : +0.2 °C (0.36 °F) /decade
 - 0.8 – 1.2 °C (1.4 – 2.2 °F) already caused
 - 1.5 °C (2.7 °F) likely by 2052
- Increases on land and oceans
- Perturbations to rainfall regimes include more extreme events (droughts and floods)
- Sea level rise: 0.3 – 0.8 m (0.9 – 2.5 ft) by 2100
- Ocean acidification
- Impacts/responses are local



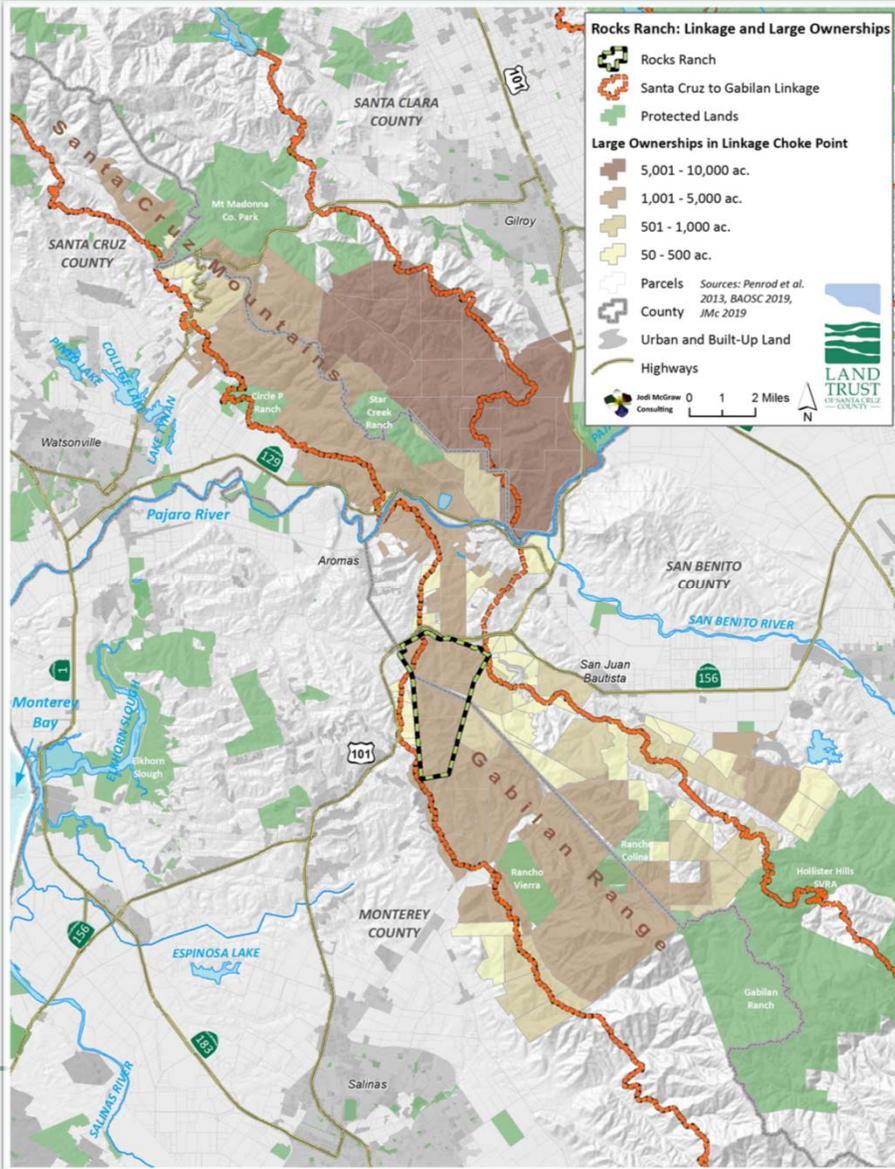
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Biological Implications

- 4% of land change ecosystems (IPCC 2018)
- Species losing $\geq 50\%$ their climatically determined geographic ranges
 - 8% of plants
 - 6% of insects
 - 4% of vertebrates
- 1 M (13%) plant and animal species threatened with extinction (UN 2019)



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Habitat Conservation Plans

- Protect, restore, and manage habitat for endangered species
- Plan for orderly growth while protecting endangered species
- Many address entire species' ranges

Why Address Climate Change in HCPs?

- **Effectiveness:** Anticipate and adapt to changes in climate to achieve conservation goals
- **Facilitate Permitting:** Streamline permitting process
 - ✓ Use best available science
 - ✓ Meet permit issuance criteria and enable the Services to make its findings
- **Costs:** Save money in long run by avoiding costly changes to conservation strategy



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HCPs and Climate Change Project

Goal: Help HCPs address climate change

Objectives:

1. Identify **climate change adaptation strategies** and **methods** to address each;
 2. **Evaluate the opportunities and constraints** through case studies; and
 3. **Recommend approaches** to increasing climate change resiliency
-

Project Elements

1. Literature Review
2. Technical Advisory Group
3. Case Studies and Interviews

Technical Advisory Group

Bruce Johnson, Stantec
Craig Grossenbacher, Miami-Dade County
Ed Sullivan, Santa Clara Valley Habitat Agency
Grace Botson, Ecological Associates Inc
John Hopkins, IEH, NHCPC
Jon White, Travis County
Joy Kline, Miami-Dade County
Melinda Mallia, Travis County
Mike Henry, Dudek
Mike Vasey, San Francisco Estuary Project
Nathan Pence, Guadalupe-Blanco River Authority
Rebecca Pflaller, Florida Fish and Wildlife Conservation Commission
Shannon Lucas, California Department of Fish and Wildlife
Trish Adams, United States Fish and Wildlife Service
Tom Ostertag, Florida Fish and Wildlife Conservation Commission
Tonya Sommer, United States Fish and Wildlife Service
Nicole Heller, Climate Change Adaptation Advisor



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Case Studies

Characteristic	Santa Clara Valley Habitat Plan	Balcones Canyonlands Conservation Plan
Term	50-year permit (2013-2063)	30-year permit (1996 – 2026)
Plan Area	510,000 ac. So. Santa Clara County, central coastal CA	561,000 ac. Travis County, TX (except a National Wildlife Refuge and non-participating cities)
Reserve Area	~46,900 ac.	31,780 ac. (exceeds min. 30,428 ac.)
Implementing Entities	Valley Habitat Agency: JPA of the County, three cities, and two local agencies	City of Austin Travis County
Covered Species	18 species: 9 plants and 9 animals <ul style="list-style-type: none"> • 1 invertebrate • 4 herps • 3 birds • 1 mammal 	8 endangered animals <ul style="list-style-type: none"> • 2 birds • 6 invertebrates (+27 species of concern to benefit from the preserve)





CLIMATE-
ADAPTIVE
HCP
APPROACHES

Climate Adaptation Approaches

1. Assess Climate Change Threats and Species Vulnerability
2. Conserve the Geophysical Stage
3. Protect Climate Refugia
4. Enhance Regional Connectivity
5. Sustain Ecosystem Processes
6. Use the Climate Smart Conservation Cycle to Enhance Effectiveness

-Adapted from Groves et al. 2012 and Stein et al. 2014



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Assess Climate Change and Vulnerability

Description

- Climate changes
 - Different climate variables
 - Multiple scenarios
- Direct and indirect effects (many mechanisms)
- Systems
 - Biological systems
 - Human systems

Bagne et al. 2011
Glick et al. 2011

Klausmeyer et al. 2011
Thomas et al. 2011

Williams et al. 2008
USFWS 2018

HCP Implications

1. Assess species/habitat
 - Exposure
 - Sensitivity
 - Adaptive capacity
2. Apply results to all aspects of the plan
 - Covered species
 - Conservation strategy (Goals, AMMs, etc.)
 - Changed circumstances
 - Adaptive management program



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Case Study: BCCP Vulnerability Analysis



John Ingram

Colin Strickland



- **Species:** Golden Cheeked Warbler
- **Habitat:** nests only in the Ashe juniper – oak forests of central Texas
- **Climate Change:**
 - increase in annual and seasonal temperature
 - more frequent high temperatures extremes
- **Direct Effects:** Spring heat waves threaten young
- **Indirect Effects:** Forests conversion to shrublands via:
 - Desiccation stress
 - Insect and pathogens
 - Fire
- Forest conversion will dry out karst caves that support **31 species of endemic invertebrates**



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Protect Climate Refugia

Description

- Areas that can moderate climate changes and buffer species from rapid change in temperature, sea level rise, or other conditions
 - wet areas
 - poleward-facing slopes
 - steep canyons or valleys
 - areas of greater canopy cover
- Areas of low climate velocity (Loarie et al. 2009) such as steep topographical gradients

Morelli et al. 2017
Loarie et al. 2009

HCP Implications

1. Refugia should be
 - defined and mapped
 - prioritized for protection
 - connected
 - restored and managed
 - monitored
2. Identify and protect areas of low climate velocity in reserves/linkages

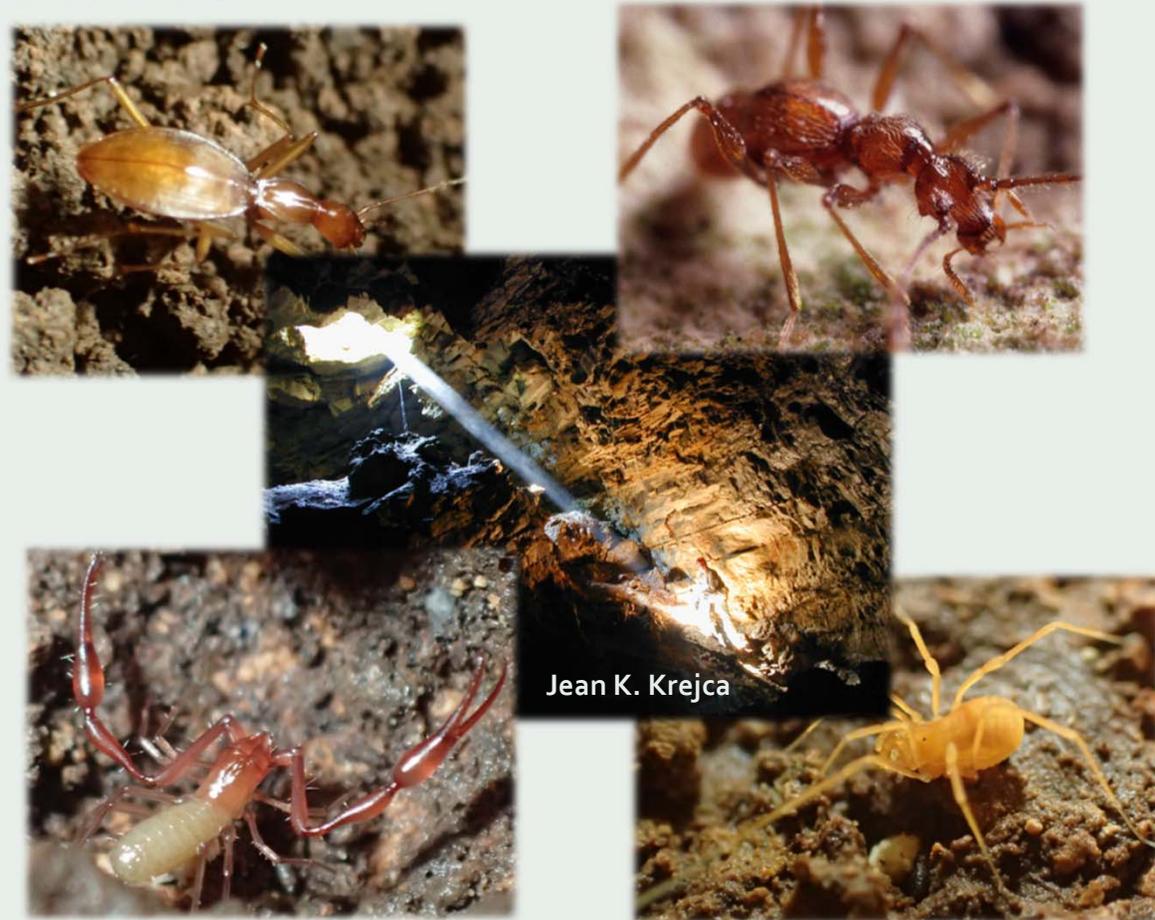
Klausmeyer et al. 2011



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Case Study: BCCP Caves

- **Species:** 31 species of karst cave endemic invertebrates
- Require high humidity, stable temperatures
- Deeper caves less vulnerable to temperature increases
- Refugia for Ashe Juniper – Oak forest
 - Wetter, deeper canyons
 - North-facing slopes



Jean K. Krejca

Troglobite Photos by Colin Strickland



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Enhance Landscape Connectivity

Description

- Species migrate to stay within their climate envelope
- Broad landscape linkages (≥ 2 km) promote migration over generations
- Corridors and steppingstone features can also be essential
- Assisted migration and gene flow for species that
 - Cannot migrate due to barriers
 - Don't have enough time to migrate/adapt

Keeley et al. 2018a,b
McLachlan et al. 2007

HCP Implications

1. Protect linkages between reserves
2. Use linkage models integrating climate
3. Protect abiotic gradients to facilitate migration and *in-situ* adaptation
4. Follow best practices in assisted migration/gen flow to enhance effectiveness and minimize risks

Hewitt et al. 2011
Anderson et al. 2016



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Case Study: Santa Clara Valley Habitat Plan

- Protect landscape linkages to connect habitat
 - Within the Plan Area, to access climate refugia in mountains as the valleys heat up
 - Through the Plan Area, to facilitate movement along latitudinal gradients
 - Between two adjacent mountain ranges (Diablo and Santa Cruz), to address genetic 'pinch points'
- Promote landscape permeability by removing barriers to animal movement
- Monitor wildlife movement
- Collaborate with research institutions, and public and private organizations including landowners

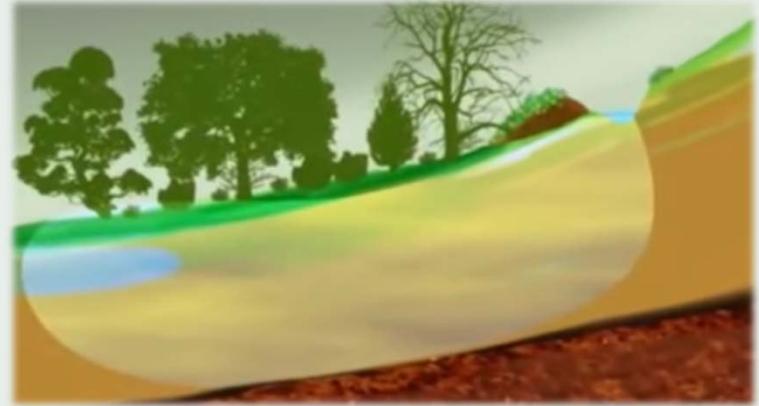


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Case Study: BCCP Adaptation to Drought

Conservation Elements to Address Drought

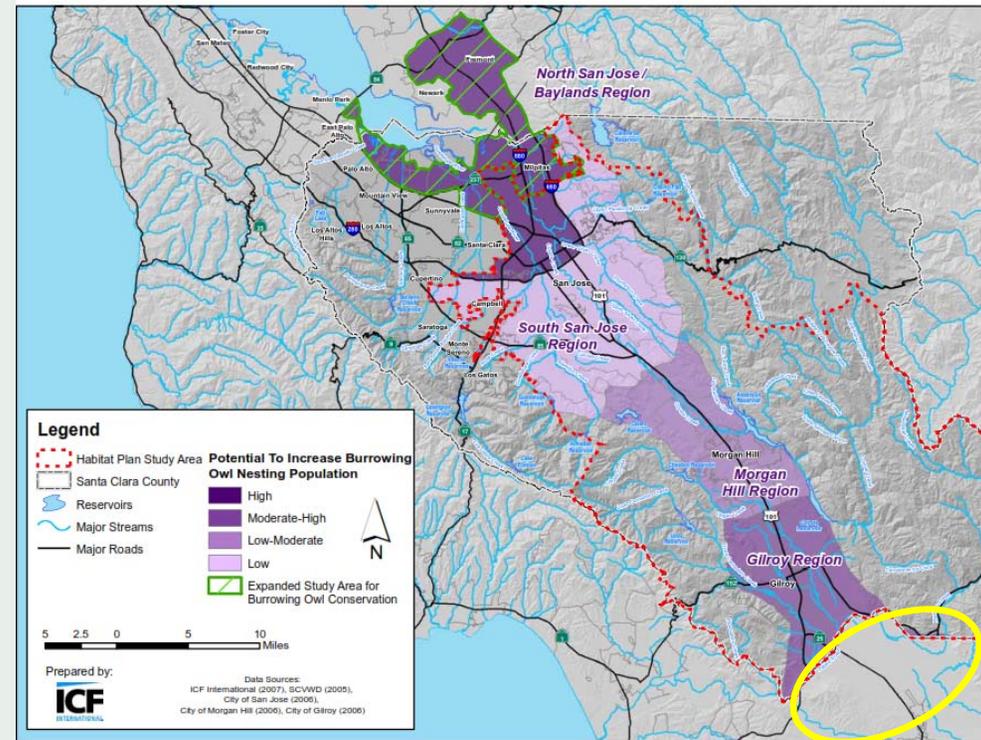
- Protect/buffer Ashe juniper - oak forests
 - Reduce forest edge effects and fire risk
- Promote mesic conditions
 - Capture, spread, and sink rainfall using swales and mounds
 - Increase tree establishment and canopy



Case Studies for Adaptation: Valley Habitat Plan

Burrowing Owl Conservation Areas

- Designated areas unoccupied; threatened by sea-level rise
- Occupied habitat in Upper Pajaro River Floodplain
- Plan amendment required to change reserve areas





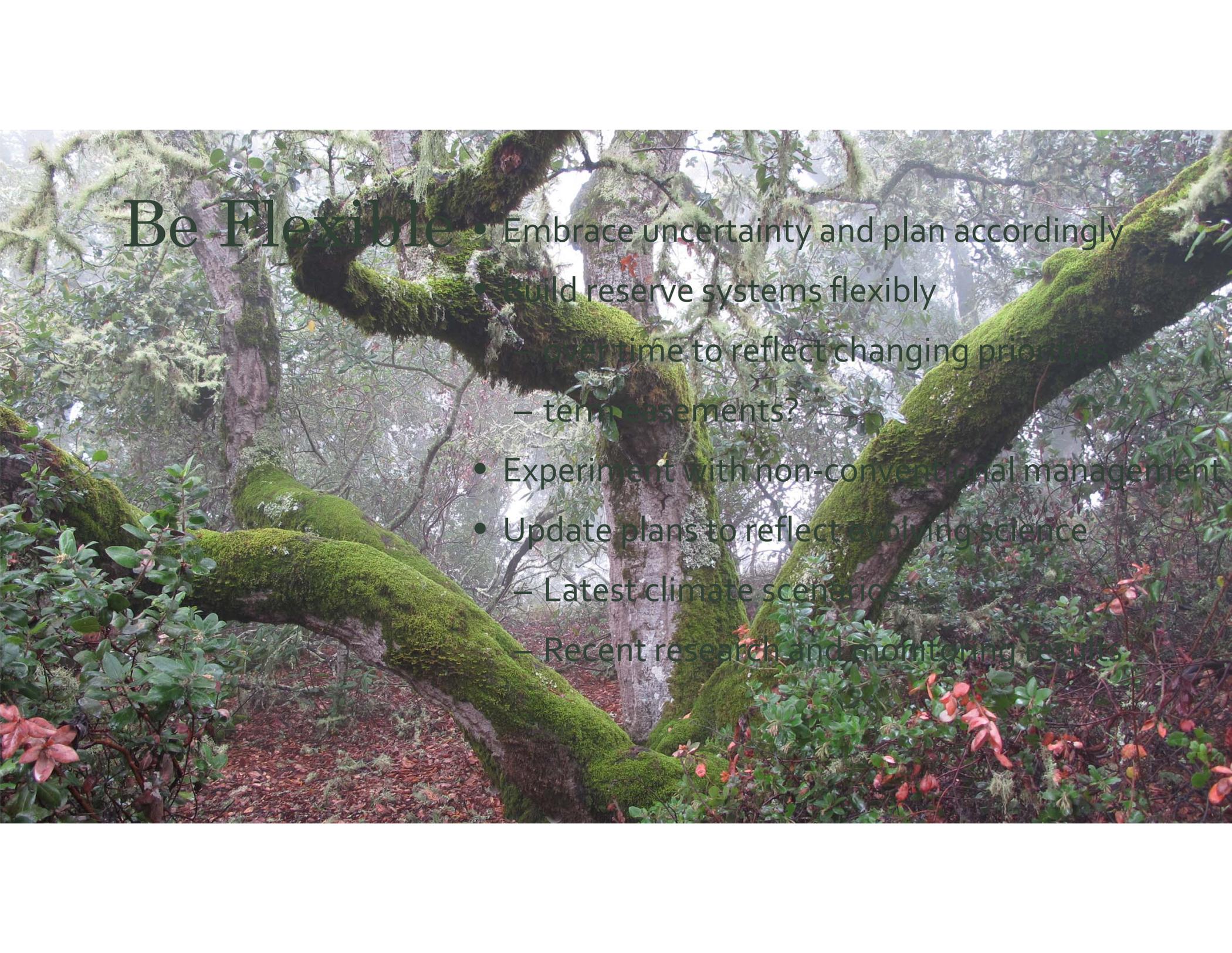
THEMES

Bigger is Better

- Bigger reserve system
 - Buffer against edge effects
 - Incorporate more landscape diversity = resiliency
 - Address uncertainty
- Bigger corridors (landscape linkages ≥ 2 km wide)
- Bigger planning area
 - Address a larger, more inter-dependent landscape
 - Include areas outside permit area in reserve system
- Bigger scope of habitat management
 - Alternate other stressors
 - Restore the landscape to add resiliency

Bigger *is* Better

- Bigger (longer) timeframes
- Bigger (better) data
 - Higher resolution climate data/projections
 - More species/community/ecosystem monitoring
- Bigger (more rigorous) scientific approaches
 - Broader ecological models
 - Bigger and more integrated databases
- Bigger tent
 - Partnerships with research institutions/universities
 - Greater coordination (incl. private landowners)
 - Broader community outreach/education



Be Flexible

- Embrace uncertainty and plan accordingly
- Build reserve systems flexibly
 - over time to reflect changing priorities
 - term easements?
- Experiment with non-conventional management
- Update plans to reflect evolving science
 - Latest climate scenarios
 - Recent research and monitoring results

A scenic landscape featuring a river flowing through a valley. The foreground is filled with green grass and numerous yellow wildflowers. The middle ground shows a calm river reflecting the sky. In the background, there are rolling green hills and a line of trees under a clear blue sky.

Be Flexible

- Plans need to be adapted to be successful
 - Address substantive changes through adaptive management
 - Streamline amendment processes
 - Avoid 'implementing the plan at all costs'
- Funding for an evolving strategy
 - Contingency
 - Remedial funding
 - Surety/performance bonds
 - Adaptive financial management
- Embrace uncertainty and implement accordingly



NEXT STEPS

HCPs and Climate Change Project: Next Steps

- Refine approaches and recommendations per feedback
 - Technical Advisory Group
 - Broader community of practice (HCPs/NCCPs)
- Identify available tools and resources
- Prepare report (NHCPC Website)
- Phase II
 - Vet tools through HCPs in preparation
 - Address coastal/aquatic considerations
 - Develop an HCP Mentorship Program



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Santa Clara Valley Habitat Agency

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- Terah Donovan

Balcones Canyonlands Preserve

- Melinda Mallia (Travis County)
- Kimberlee Harvey (City of Austin)
- Sherri Kuhl (City of Austin)

Coachella Valley MSHCP/NCCP

- Katie Barrows
- Kathleen Brundige

Technical Advisory Group Members

Resources Legacy Fund

National HCP Coalition

QUESTIONS



PANEL

Edmund Sullivan

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Terah Donovan

Biologist, ESA Associates (formerly Santa Clara Valley Habitat Agency)

Melinda Mallia

Natural Resource Program Manager, Travis County, Texas

Kimberlee Harvey

*Environmental Conservation Program Manager and Balcones Canyonlands
Conservation Plan Coordinating Committee Secretary*

Mike Thomas

Division Chief, Conservation Planning, US Fish and Wildlife Service (Sacramento)



PANEL DISCUSSION

What are the biggest challenges to adequately addressing climate change in HCPs and what are ways we can begin to address each?

How can applicants and agencies increase the flexibility and adaptability of HCPs, to best address the inherent uncertainty presented by climate change?

