Supporting **Incorporation of Climate Change into Federal Plan Revisions for Northern California** 

May 3, 2022



THE EVENT WILL START SHORTLY!







Supporting **Incorporation of Climate Change into Federal Plan Revisions for Northern California** 

May 3, 2022







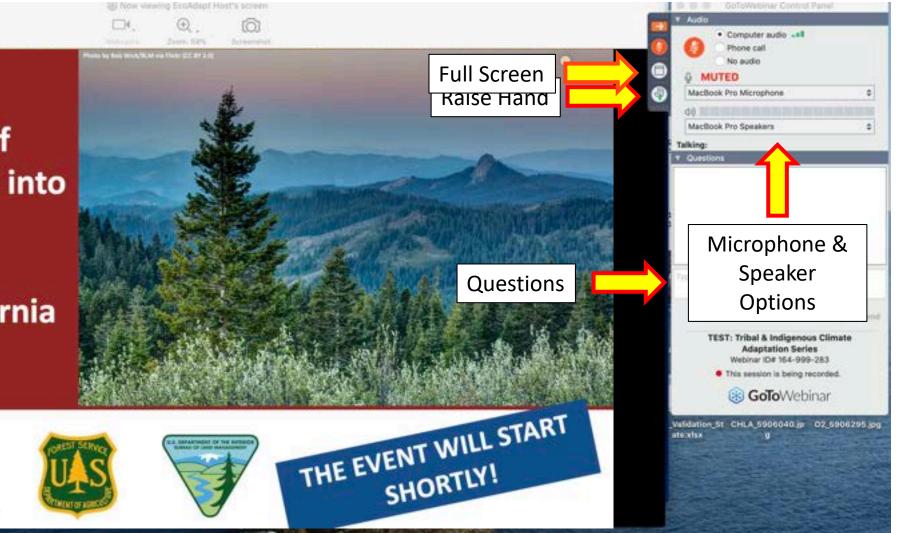


## **GoToWebinar Orientation**



Supporting Incorporation of Climate Change into Federal Plan Revisions for Northern California

Adapt



## **Northern California Climate Adaptation Project**



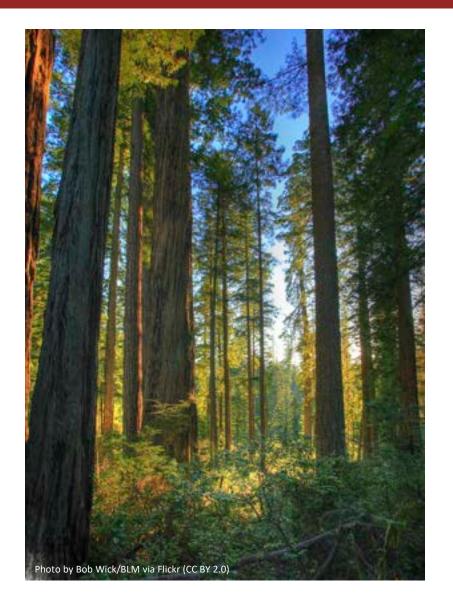


### **Project Goals**

- Improve understanding of how and why important Northern California resources may be vulnerable to changing climate conditions
- Identify adaptation actions that can be implemented to reduce vulnerabilities and/or increase overall resilience

## **Northern California Climate Adaptation Project**





- Synthesis of observed and projected future climatic changes
- Vulnerability assessments for focal habitats and species
- Stakeholder-developed adaptation strategies and actions
- Supporting maps and climate data on Data Basin
- A network of practitioners interested and engaged in adaptation

## Webinar Overview







## Welcome and Introduction

### **Bureau of Land Management**

- Climate Change Policy & Context (Jim Weigand)
- Application to BLM Planning Processes (Katie Flahive)

### **U.S. Forest Service**

- Climate Change Policy & Context (Lara Buluc & Logan Graham)
- Application to USFS Planning Processes (Sarah Sawyer)

### **Northern California Climate Adaptation Project**

• Project findings and available products

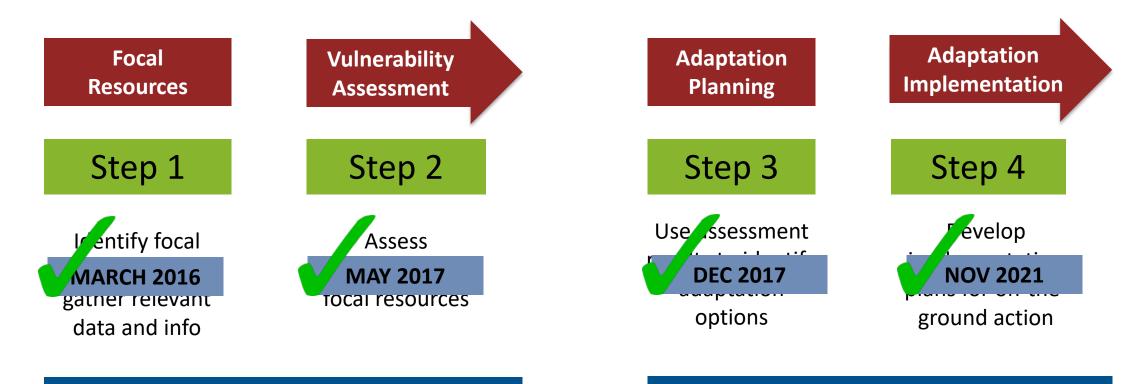




Vulnerability Assessments, Mapping, & Adaptation Strategies FOR NORTHWESTERN CALIFORNIA

## **Project Timeline**





Phase 1: Vulnerability Assessment Phase 2: Adaptation Planning

## **Project Findings**



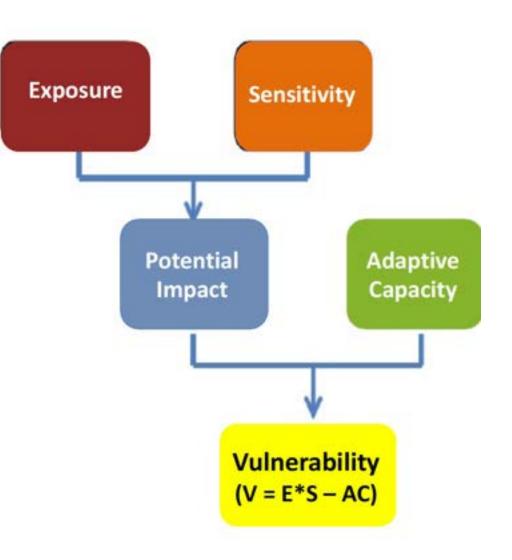


- Vulnerability Assessments
- Regional Climate Impacts
- Climatic Water Deficit Maps
- Adaptation Strategies & Actions
- Adaptation Implementation Plans

Purpose of a vulnerability assessment:

Identify **which** resources are most vulnerable and **why** 

- Exposure
- Sensitivity
- Adaptive Capacity







**EXPOSURE** is a measure of *how much change* in climate that a resource is likely to experience

#### Factors considered:

- Direction and magnitude of change in climate stressors and disturbance regimes
- Degree of uncertainty associated with projected changes







**SENSITIVITY** is a measure of whether and how a resource is likely to be affected by a given change in climate factors

#### **Factors affecting sensitivity:**

- Climate drivers
- Disturbance regimes
- Non-climate stressors

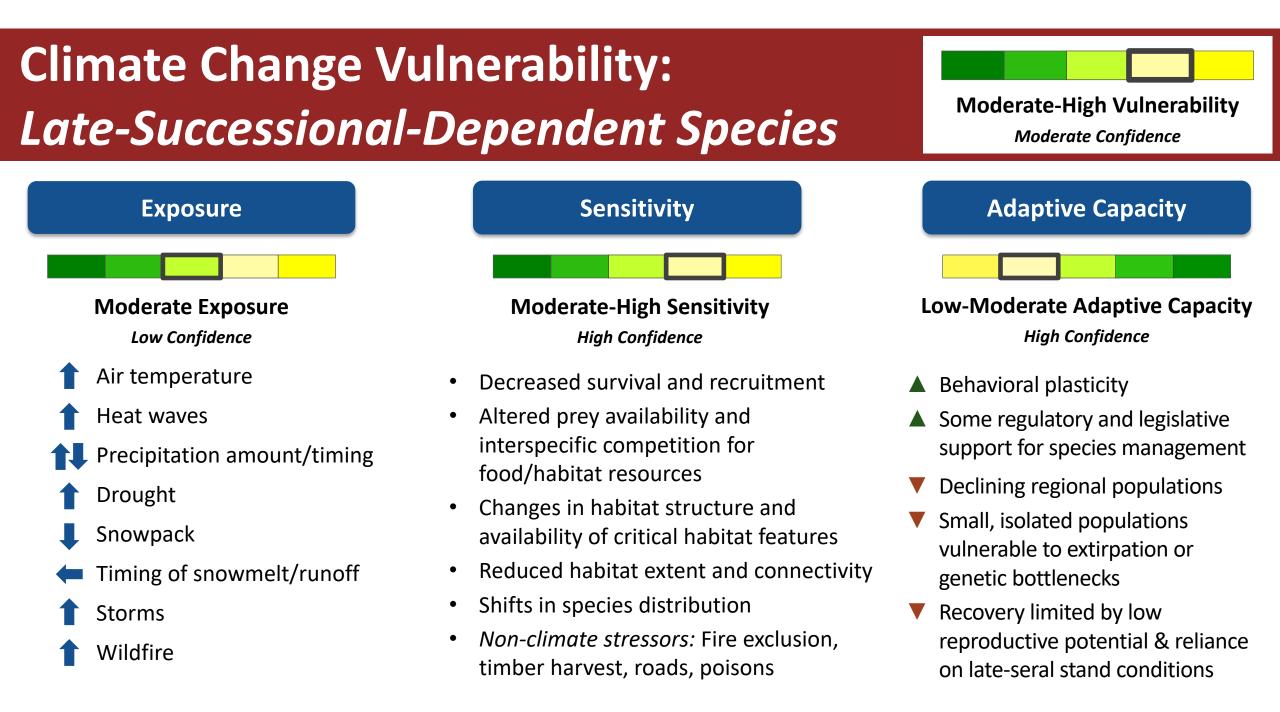


ADAPTIVE CAPACITY is a measure of a resource's ability to accommodate or cope with climate change impacts with minimal disruption

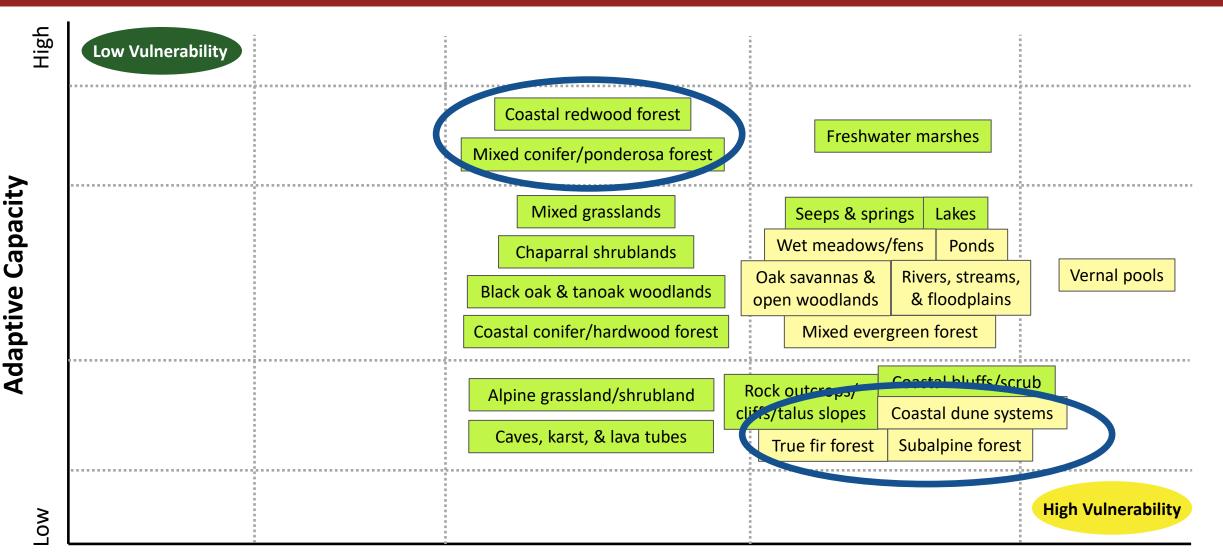
#### Factors affecting adaptive capacity:

- Extent & integrity
- Connectivity
- Resistance & recovery
- Diversity
- Public, societal, and cultural value
- Management potential





## **Vulnerability Results:** *Habitats*

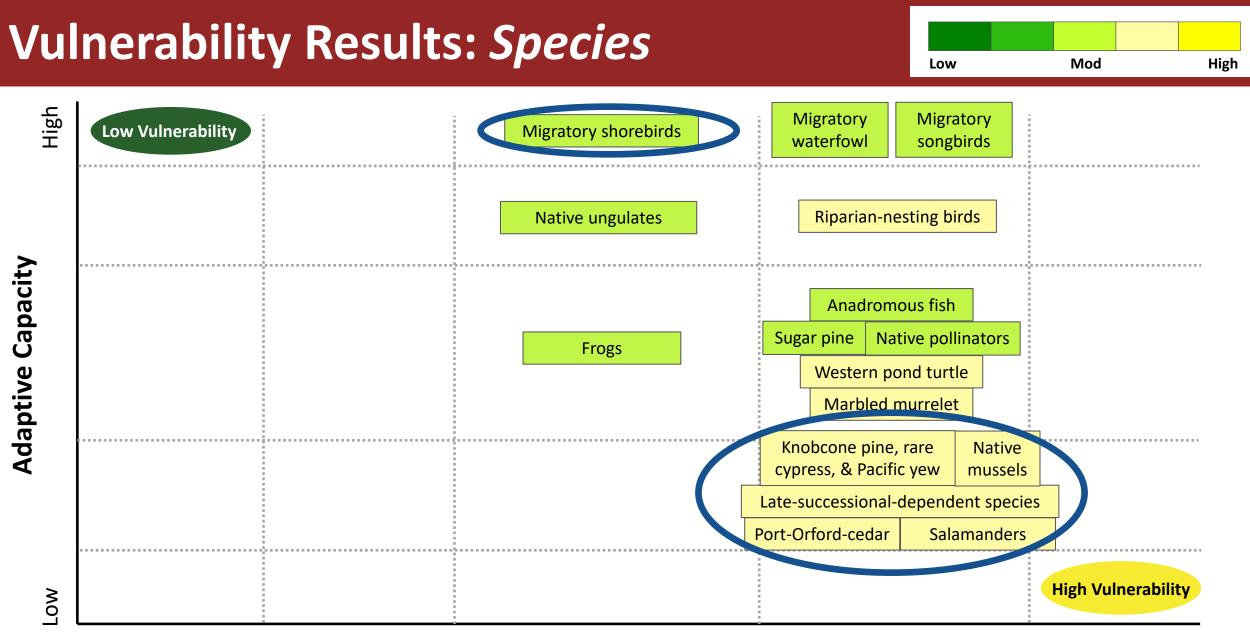


#### Sensitivity & Exposure

Mod

Low

High



Low

#### Sensitivity & Exposure

## **Vulnerability Assessment Trends**



#### **Climate Stressors**

- Precip/soil moisture
- Drought

#### **Disturbance Regimes**

- Wildfire
- Disease

#### **Non-Climate Stressors**

- Fire suppression
- Timber harvest
- Pollutions & poisons
- Dams & water diversions
- Roads, highways, & trails





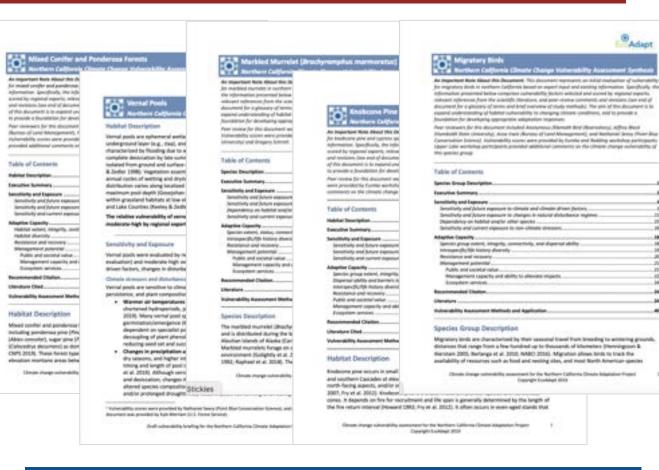
### Adaptive Capacity Factors

- High physical and topographical diversity
- Large areas of undeveloped/roadless land increase connectivity
- Many habitats & populations degraded
- Past management activities
- Low to mod management capacity & ability

## **Vulnerability Assessment Products**



- Expert assessment
- Downscaled climate projections
- Review of scientific literature
- Peer review and evaluation of results



**Product:** Vulnerability assessment syntheses for 33 focal resources



## **Regional Climate Impacts**



#### Northern California Climate Adaptation Project: Overview of Climate Trends and Projections Table of Contents Trends and Projections for Glavate and Clavate-Oriven Factors... Introduction. 26 Air Temperoture Water Temperature 18 Climatic Water Deficit & Soil Molature 18 19 Timing of Snowmelt and Aunoff. 19 21 Trends and Projections for Extreme Events and Natural Disturbance Regimes . Extreme Precipitation, Storms, and Rooding . Drought Widdow Literature Oted

**Product:** Climate impacts report summarizing trends & projections Table 1. Summary of trend direction and projected future changes for climate and climate-driven factors, extreme events, and major natural disturbance regimes within the Northern California Climate Adaptatics Project study area.

Variable	Trend	Projected Future Changes
Climate and clima	ste-driven	fectors
Air temperature	t	<ul> <li>2.2-6.1°C (4.0-11.0°F) increase in annual mean</li> </ul>
Water temperature	+	<ul> <li>0.4–0.8°C (0.8–1.4°F) increase in August stream 2080s</li> </ul>
Precipitation	++	<ul> <li>-23% to +38% change in mean annual precipitat</li> <li>Shortor, wetter winters and longer, drier summ interannual variability</li> </ul>
CWD	+	+ 4-43% increase in mean annual climatic water of
& Soll moisture	i.	+ Reduced soil moisture due to enhanced evapotr
Snowpack	+	· 61-100% decrease in April 1 show water equiva
4 Snowmelt	٠	S-15-day shift towards earlier timing of snowme
Streamflow	14	General increase in wet season flows and decre with overall increase in flow variability     30–40% decline in the lowest streamflow per de
Coustal fog	+	· Weak decline in the frequency of days with coat
Sea level rise	1	<ul> <li>High likelihood of 0.03-1.24 m (0.1-4.1 ft) sea is</li> </ul>
Extreme events o	nd netural	alstarbance regimes
Heat waves	+	<ul> <li>Significant increase in heat wave frequency and humid nighttime events and in coastal areas</li> </ul>
Storms & Flooding	•	<ul> <li>Increased storm intensity and duration, resultin frequent/intense extreme precipitation events 500–400% increase in the frequency of 200-yea</li> </ul>
Drought	+	<ul> <li>Drought years twice as likely to occur, with sign of prolonged and/or severe drought.</li> </ul>
Wildfire	٠	<ul> <li>77% increase in mean annual area burned state increase in montane forested areas of northern</li> <li>50% increase in the frequency of extremity large Significant increases in fire severity are likely do behavior combined with human activity and fue</li> </ul>

rends and Projections for Climate and Climate-Driven Factors

#### Air Temperature

ual, minimum, and maximum peratures have increased state-wide over past century (LaDochy et al. 2007; dero et al. 2011; Pierce et al. 2018], with elerated rates of warming since the 1970s dero et al. 2011). Minimum temperatures presenting nighttime lows) have warmed er than mean and maximum peratures in most regions, including thern California (LaDochy et al. 2007) dero et al. 2011; Pierce et al. 2018). vever, mean annual temperatures have eased less in northern California (+0.6°C [F]] compared to the state-wide average B'C [1.5'F]; Grantham 2018; Pierce et al. 8), and maximum temperatures in the ion have exhibited very slight decreases pacciuolo et al. 2014). Within the study a, increases in annual and minimum peratures over the past century have in greatest in the Great Valley econegion; reases in maximum temperatures are also stest in this ecoregion (Rapacciuolo et al. 43.

By the end of the century (2070-2099), annual mean temperatures within the Northern California study area are projected to rise by 2.2-6.1°C (4.0-11.0°F) compared to



Tenternative Dealer (Prevention Science (Print & Harr 2014) Conservative Dealey (Prefix & Marr produced by Constants, Deale 2007)

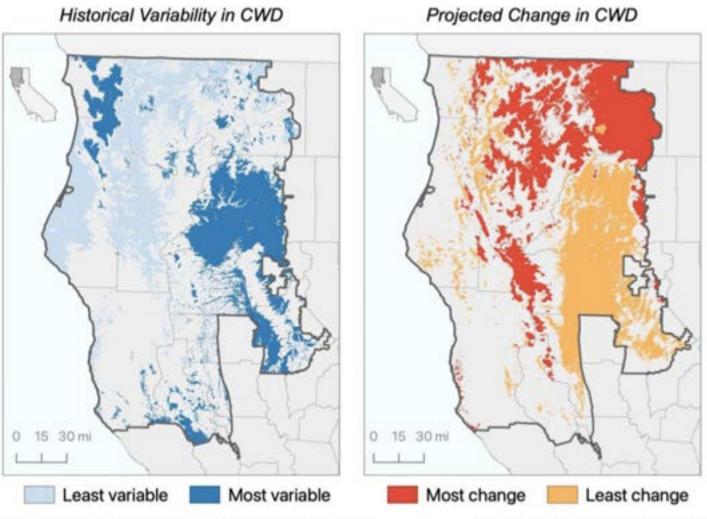
Figure 3. Annual mean temperature in degrees Calvius (\*C) for the Northern California Climate Adaptation Project study area lettween 1951 and 1980

historical temperatures (1951–1980; Figure 2 and Figure 3), with slightly greater warming projected in summer maximum temperatures (2.0–6.8°C [3.6–12.2°F]) compared to winter minimums (1.9–5.8°C [3.4–10.4°F]; Flint et al. 2013; Flint & Flint 2014; Table 2), Because oceans warm more slowly than land, interior zones are generally projected to experience greater temperature increases than coastal areas ventilated by ocean breezes (Pierce et al. 2018). Other factors associated with landscape-scale temperature variability include elevation and urbanization (LaDochy et al. 2007).

## **Climatic Water Deficit Maps**



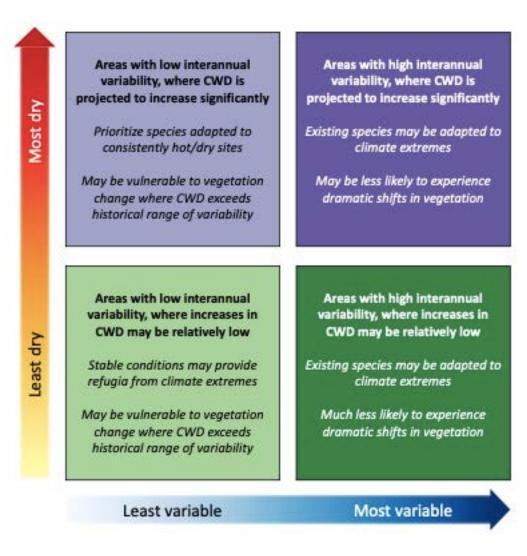
Some areas of the landscape may be more vulnerable to significant ecosystem changes

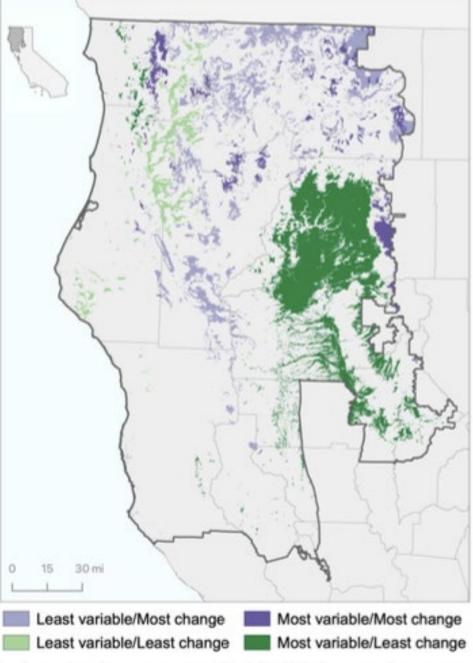


Data Sources: Basin Characterization Model (Flint & Flint 2014); Consequation Riology Institute

Map produced by EcoAdapt, Sept.2021

## **Climatic Water Deficit Maps**





Data Sources: Basin Characterization Model (Flint & Flint 2014); Conservation Biology Institute Map produced by EcoAdapt, Sept.2021





**Climate change adaptation** refers to adjustments in natural or human systems in response to changing climate conditions

## **ADAPTATION STRATEGIES:**



**Reduce climate impacts** (sensitivity & exposure)



Increase climate resilience (adaptive capacity)



## **Adaptation Approaches**





#### **Resistance/Resilience**

Focused on managing for persistence of existing ecosystems

**Example:** Use exclusion fencing in upland areas to prevent herbivory of oak seedlings



#### Acceptance

Focused on accommodatingchange in response to novel conditions

**Example:** Identify areas where post-fire type conversion should be allowed to occur without management intervention



#### **Direct/Response**

Focused on actively facilitating change/ transformation in response to novel conditions

**Example:** Experiment with seeds from climate analog zones for restoration projects

#### Knowledge



Focused on gathering information about climate impacts and/or management effectiveness

**Example:** Expand research on hardwood silviculture techniques, esp. for drought- and heat-tolerant species



#### **Collaboration**

Focused on coordinating management efforts and/or capacity across organizations

**Example:** Develop and/or strengthen new and existing collaborative networks in order to leverage resources



**Product:** Suite of adaptation strategies and actions evaluated by criteria meant to assist land managers in identifying and prioritizing actions for implementation

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		Sustain fundamental ecological functions and	Review the rule of fire as an ecological process on the	Streamline internal and external permitting process for the use of		> Wildfee > Free exclusion (addresses dualidae of fuels due contribute to climate driven changes - Anno content	> Management potential (increases		

#### Management Goal

- Reduce the impact of non-climate stressors
- Reduce the risk/impacts of severe disturbances and extreme events
- Sustain ecological functions/processes
- Maintain and protect refugia
- Allow/facilitate habitat and species adjustments to better align with changing climate conditions



Management Goal

Strategy

Prevent the

introduction &

establishment of

invasive species

on the landscape

Maintain/create

Restore the role of fire

migration corridors for

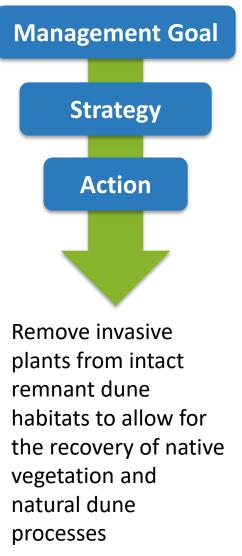
native plants/wildlife

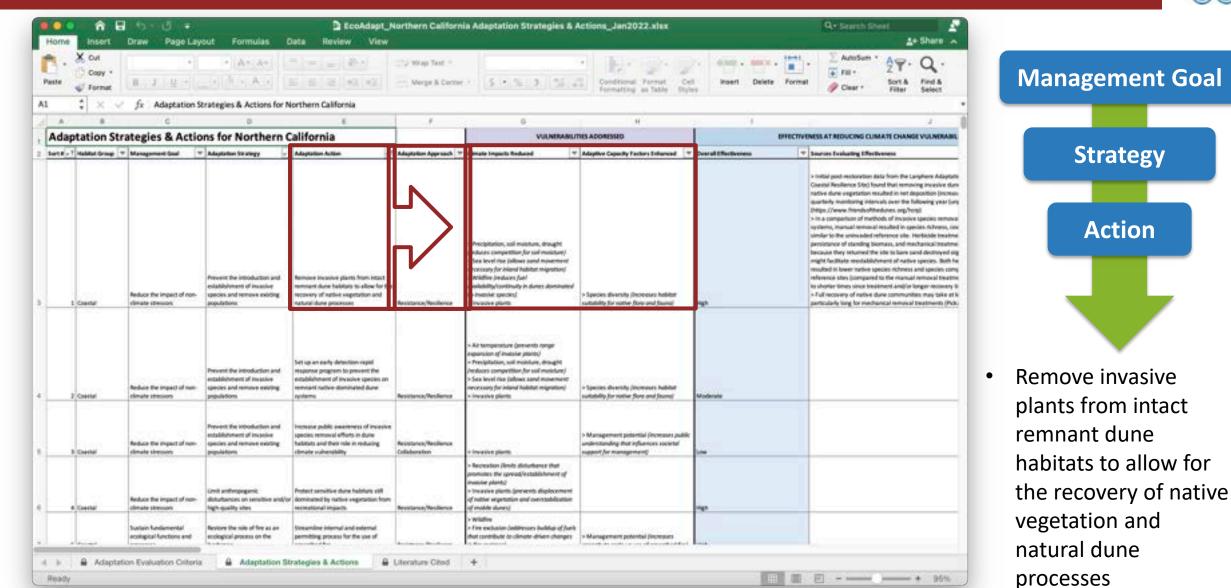
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lott-	T Habitat Group T	Management Goal	Adaptation 30 utegy	Adaptation Action - 1	daptation Approach *	Climate Impacts Reduced	Adaptive Capacity Factors Extensed	Overall Effectiveness	T Sources Evaluating Effectiveness
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E	1		L.	к		FEASIBILITY OF IMPLEMENTATIO	
alifornia		EFFECTIVE	NESS AT REDUCING CLIMATE CHANGE VULNERABILITY				
Adaptation Action	Overall Effectiveness	v	Sources Evaluating Effectiveness	Overall Feasibility	Y	Affordability	
Remove invasive plants from intact remnant dune habitats to allow for the recovery of native vegetation and natural dune processes	High		<ul> <li>Initial post-restoration data from the Lanphere Adaptation Site (part of the Humboldt Coastal Resilience Site) found that removing invasive dune grasses followed by planting native dune vegetation resulted in net deposition (increased foredune volume) during all quarterly monitoring intervals over the following year (unpublished, but see progress report (https://www.friendsofthedunes.org/hcrp)</li> <li>In a comparison of methods of invasive species removal in 3 northern California dune systems, manual removal resulted in species richness, cover, and composition that was most similar to the uninvaded reference site. Herbicide treatments resulted in higher cover to the persistance of standing biomass, and mechanical treatments resulted in lower cover, likely because they returned the site to bare sand destroyed organic matter and soil biota that might facilitate reestablishment of native species. Both herbicide and mechanical treatments resulted in lower native species richness and species composition that was less similar to the reference sites (compared to the manual removal treatments), though this may be partly due to shorter times since treatment and/or longer recovery times necessary (Pickart et al. 2021)</li> <li>Full recovery of native dune communities may take at least to 20 years, and is likely to be particularly long for mechanical removal treatments (Pickart et al. 2021)</li> </ul>			Moderate > Eradication requires ongoing inves over multiple years > Cost varies by method of removal manual removal is very expensive, mechanical removal is less so, and herbicide or a combination of burnin herbicide is relatively inexpensive (F et al. 2021)	

#### Will implementing this adaptation action reduce climate change vulnerability?

- Directly reducing impacts of climate stressors or climate-driven changes in disturbance regimes
- Reducing impacts of non-climate stressors that interact with climate changes
- Increasing general resilience of the resource (e.g., ability to absorb/recover from rapid change)
- Enhancing support/capacity for climate-informed management



E	к	13	м	N	0
alifornia		FEASIBILITY OF IMPLEMENTATION AT	A SCALE THAT WOULD EFFECTIVELY RED	DUCE CLIMATE CHANGE VULNERABILITY	
Adaptation Action	Overall Feasibility	Affordability 👻	Technical Feasibility	Institutional/Legal Feasibility	Sociopolitical Support
Remove invasive plants from intact remnant dune habitats to allow for the recovery of native vegetation and natural dune processes	Moderate	Moderate > Eradication requires ongoing investment over multiple years > Cost varies by method of removal - manual removal is very expensive, mechanical removal is less so, and herbicide or a combination of burning and herbicide is relatively inexpensive (Pickart et al. 2021)	Moderate   Treatments often must be repeated for full eradication to occur  Manual removal is very labor-intensive and difficult because of the deep rhizome systems of invasive dune grasses; there are also logistical challenges related to the need to repeatedly access remote sites for retreatment (Pickart et al. 2021) Mechanical removal with buldozers and excavators is less labor-intensive and less logistically challenging, making it more feasible to treat larger areas (Pickart et al. 2021)		Moderate > Possible conflict if the public (including adjacent landowners) believes that dun stabilization by invasive species is necessary to prevent erosion and reduc flooding risk

### How feasible is it to implement this action at a scale that would reduce vulnerability?

- Affordability Initial and ongoing costs associated with implementing the action & maintaining benefits of the action
- Technical Feasibility Time/labor, equipment, specialized technology/skills, other resources needed to implement the action



E	к	L	м	N	0
alifornia		FEASIBILITY OF IMPLEMENTATION AT	A SCALE THAT WOULD EFFECTIVELY RED		
Adaptation Action	Overall Feasibility	Affordability	Technical Feasibility	Institutional/Legal Feasibility	Sociopolitical Support
Remove invasive plants from intact remnant dune habitats to allow for the recovery of native vegetation and natural dune processes	Moderate	Moderate > Eradication requires ongoing investment over multiple years > Cost varies by method of removal - manual removal is very expensive, mechanical removal is less so, and herbicide or a combination of burning and herbicide is relatively inexpensive (Pickart et al. 2021)	Moderate		Moderate > Possible conflict if the public (including adjacent landowners) believes that dun stabilization by invasive species is necessary to prevent erosion and reduc flooding risk

### How feasible is it to implement this action at a scale that would reduce vulnerability?

- Institutional/Legal Feasibility Regulatory/administrative requirements, policy conflicts, potential legal challenges that may impact ability to implement the action
- Sociopolitical Support Public and/or political backing for implementation of the action



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alifornia		CO-BENEFITS & CONSEQUENCES		
Adaptation Action	Impacts on Non-Target Habitats and Species	Impacts on Human Well-being	Impacts on Climate Mitigation Efforts	Where/When/How
	(+) Threatened/endangered plant and wildlife species, including migratory shorebirds (+) Pollinators (attracted by increased diversity of native flora)	<ul> <li>(+) Flood protection (if dunes are able to persist by migrating inland)</li> <li>(+) Recreation</li> <li>(+) Aesthetic values/beauty (increased native flora includes colorful wildflowers that attract pollinators such as butterflies)</li> </ul>		> Prioritize higher-elevation areas away fr
Remove invasive plants from intact remnant dune habitats to allow for the recovery of native vegetation and natural dune processes	(-) Amphibians (frequently occupy coastal dune drainages in northern California where invasive plants have overstabilized the dunes; Halstead & Kleeman 2017)	(-) Recreation (recovery of threatened/endangered species might result in reduced availability of land for public use, at least in some areas and/or seasons)	(-) Reduces overall vegetative cover on dunes that were stabilized and become more mobile	erosion increases > Depending on site-specific characteristic invasive species > Periodic re-treatment will likely be required.

#### Are there co-benefits or potential conflicts/unintended consequences of the action?

- Impacts on non-target habitats, species, and/or ecosystem services
- Impacts on human well-being Food security, water supplies/quality, air quality, flood control, health/safety, recreation, economic opportunities (e.g., jobs), cultural well-being (e.g., availability of valued species, ability to maintain traditional practices, tribal sovereignty), sense of place, beauty



E	P	0	R	
alifornia		CO-BENEFITS & CONSEQUENCES		
Adaptation Action	Impacts on Non-Target Habitats and Species	Impacts on Human Well-being	Impacts on Climate Mitigation Efforts	Where/When/How
	(+) Threatened/endangered plant and wildlife species, including migratory shorebirds (+) Pollinators (attracted by increased diversity of native flora)	<ul> <li>(+) Flood protection (if dunes are able to persist by migrating inland)</li> <li>(+) Recreation</li> <li>(+) Aesthetic values/beauty (increased native flora includes colorful wildflowers that attract pollinators such as butterflies)</li> </ul>		> Prioritize higher-elevation areas away fr
Remove invasive plants from intact remnant dune habitats to allow for the recovery of native vegetation and natural dune processes	(-) Amphibians (frequently occupy coastal dune drainages in northern California where invasive plants have overstabilized the dunes; Halstead & Kleeman 2017)	(-) Recreation (recovery of threatened/endangered species might result in reduced availability of land for public use, at least in some areas and/or seasons)	(-) Reduces overall vegetative cover on dunes that were stabilized and become more mobile	erosion increases > Depending on site-specific characteristic invasive species > Periodic re-treatment will likely be required.

#### Are there co-benefits or potential conflicts/unintended consequences of the action?

 Impacts on climate mitigation efforts – Greenhouse gas emissions, rate of carbon sequestration, carbon stocks



E	S	т	U	V	W	×
alifornia	IMPLEMENTATION DETAILS					
Adaptation Action	Where/When/How					
	> Prioritize higher-elevation areas away from bluff edges and other locations more likely to persist as sea levels rise and					
Remove invasive plants from intact	erosion increases					
remnant dune habitats to allow for the recovery of native vegetation and	> Depending on site-specific characteristics, use hand-pulling, mechanical removal, or prescribed pile burning to remove invasive species					
natural dune processes	> Periodic re-treatment will likely be required in an ongoing way					

#### Where, when, and how should this action be implemented?

## Vulnerability-Adaptation Summaries



**Product:** Vulnerabilityadaptation summaries linking suite of adaptation strategies & actions to *identified vulnerabilities* 

- Summary of key habitat and species vulnerabilities
- Table linking suite of adaptation strategies & actions to identified vulnerabilities



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## **Vulnerability-Adaptation Summaries**



#### **Key Climate Vulnerabilities**

#### Forest and Woodland Habitats

Forest and woodland habitats in northwestern California are primarily sensitive to climate stressors that increase moisture stress, resulting in shifts in tree growth and recruitment as well as species composition and habitat structure. Changes in the frequency and/or intensity of disturbances (e.g., wildfire, insects, disease) may also cause more extensive tree mortality, especially where increased competition for soil moisture reduces. tree vigor. Historical logging followed by decades of fire exclusion has significantly altered most forests and woodlands in the region, simplifying habitat structure and increasing vulnerability to disturbance-related mortality.

Forests and woodlands are extensive across northwestern California, although the extent and integrity of some types have declined significantly. High physical/topographic diversity in the region increases resistance to climate stressors and disturbances, but moisturestressed forests exhibit delayed recovery from disturbances. Generally, high public and societal value increases support for management, and many management actions are known to effectively reduce the impacts of climate change.



Photo by Bulk WARRAND, Mr 2 20

#### **Vulnerability Rankings for Forest and Woodland Habitats**



#### Sensitivity & Exposure

Potential impacts of projected climate changes on forest and woodland habitats in northwestern California include:

- · Altered patterns of tree survival and recruitment due to moisture stress, resulting in shifts in species composition and increased vulneral
- Possible increases.
- high elevations du Increased tree more
- stand structure du particularly where reduce tree vigor

 Possible type conv severity fires that p

- woodlands · Shifts in habitat str
- insect pests cause · Loss of culturally-v
- and fungal resourc Non-climate stressor

 Fire exclusion/suppr well as the availabil vulnerability to distu · Roads, highways, or sudden oak death, · Livestock grazing is

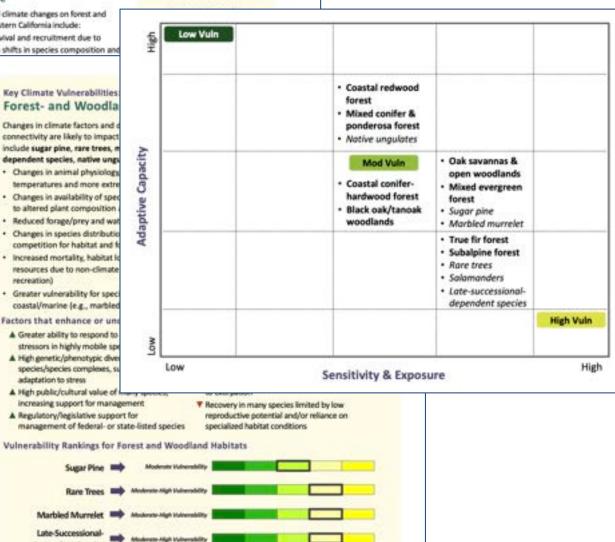
may be removed to spreads invasive pl

- \*\*\*\*\*\*\*\*\* Adaptive Cap
- Intrinsic (i.e., inheren
- or undermine the at Intrinsic factors:
- A Extensive distribut A Heterogeneous la
- species diversity, from disturbance
- A Many species/hab
- A Significant cultural A Provide critical eci
- knowledge and sci

CUMATE CHANGE VIA

- Extrinsic factors: A Climate-informed

**Dependent Species** 



## **Vulnerability-Adaptation Summaries**

#### **GOAL 1. REDUCE THE IMPACT OF NON-CLIMATE STRESSORS**

1.1 Prevent the introduction and establishment of invasive species and remove existing populations

#### **1.2 M** GOAL 8. MAINTAIN AND PROTECT REFUGIA

- 1.3 Re 8.1 Prioritize and maintain sites that may be more resistant to changes in climate (e.g., cooler, wetter sites), harbor
- high biodiversity, and/or provide habitat for rare species 1.4 Re

#### GOAL

Example adaptation actions:

- Identify forest areas of least/slower change to support the protection and management of potential climate change
- refugia (R/K) 2.2 Er
- GOAL Protect mature and late-successional forests (R)
- Expand reserve boundaries to include mid-seral and complex early-seral forests that have high structural diversity 3.1 Re and the potential to develop old-growth characteristics over time (R)
- 3.2 Re
- Vulnerabilities addressed: 3.3 Re



4.1 In

- $\checkmark$  Land-use conversion and human land uses that result in habitat loss and fragmentation
- ✓ Air temperature, precipitation, soil moisture, drought, wildfire (loss of cool, moist refugia in mature and latesuccessional forests)
- ✓ Habitat diversity (loss of structural complexity and range of successional stages)

## **Adaptation Implementation Workshop Proceedings**



**Product:** Proceedings from November 2021 Adaptation Implementation Workshops

- Overview of climate adaptation planning
- Description of workshop activities
- Review of priority sites selected for implementation planning
- Adaptation implementation plans created by workshop participants for 6 priority sites in the northwestern California study area



<sup>2021</sup> 





## **Priority Site Selection**



Site Name	Value	Condition	Suitability	Adaptation Approach
Rancho Breisgau riparian oak woodland	High	Poor	Suitable	Resistance/Resilience
Plaskett-Keller Post-Fire Restoration Site, Mendocino National Forest	High	Poor	Suitable	Resistance/Resilience
East Fork Scott River meadow/floodplain complex	High	Moderate to Poor	Probably unsuitable	Resistance/Resilience Direct/Respond Acceptance
North Spit Humboldt Bay	High	Moderate	Suitable	Resistance/Resilience
Black oak and tanoak stands on Yurok tribal lands	High	Poor	Suitable	Resistance/Resilience
Indian Creek watershed of the Mid-Klamath	High	Poor	Uncertain	Resistance/Resilience Direct/Respond Acceptance

## **Adaptation Implementation Plans**

#### Adaptation Implementation Plan for Plaskett-Keller Post-Fire Restoration Site, Mendocino National Forest

#### SECTION 1. BACKGROUND

	a second and that a second		
Value: High	Current Condition: Poor	Future Suitability: Suitable	Potential Approach: Resistance/Resilience
	agement goal: Manage fuels to -fire restoration, increase shrubl		ablands (and preserve connectivity of shrublands
<ul> <li>Extreme hydro</li> <li>More rain, less</li> <li>Increased tem</li> <li>Altered w</li> </ul>	peratures & climatic water defici atershed response – loss of soil p		), water moves offsite quicker
<ul> <li>Mixed owner</li> <li>Grazing representation</li> <li>Lack of resou</li> <li>Potential con</li> <li>Conifer domi</li> </ul>	esents a challenge for grassland h rces (personnel, \$\$) cern from local tribes about man nance in FS (cultural challenge)	ealth (invasive spp.) & fire recove agement of the land (unknown a netary/cultural backing that the o	t this time)
<ul> <li>Potential imp</li> <li>Summer hom</li> </ul>	1996년 2017년 2017년 CAMPAGAR STRATES (1997년 1997년 19	corridor ct area – public use is a concern	cies, human communities, and/or other managed at this point



The Black Butte River Valley in Mendocino National Forest, which was burned in the 2020 August Complex Fire. (Photo © Chad Roberts)



Pathens Langy Uther Connect Contact





#### Northern California Climate Adaptation Products

The goal of the Northern California Climate Adaptation Project is to increase. the understanding of and capacity to reduce climate-related vulnerabilities of habitats and species of natural and cultural importance in northwestern California. For more information about the project, please visit the project

#### Product Description

Programm



The Overview of Climate Trends and Projections summarizes observed changes and expected future conditions for the Northern California Climate Adaptation Project study area.

The Vulnerability/Adaptation Summaries (linked below) provide a highlevel overview of vulnerability for habitats and associated species within the four major habitat groups (coastal habitats, forest and woodland habitats, freshwater habitats, and shrubland and grassiand habitats), as well as a table of adaptation strategies and actions linked to those vulnerabilities.

The Vulnerability Assessment Syntheses (linked below) provide an indepth review of how habitats and species are likely to be impacted by climate change, and include information gathered from regional experts, the scientific literature, and peer-review comments and revisions. Each synthesis examines the sensitivity of a given habitat, species, or species group to climate change, its exposure to projected changes, and its capacity to adapt. The aim of these syntheses is to expand understanding of habitat and species vulnerability to changing climate conditions, and to provide a foundation for developing accompliate adaptation responses.

ation Strategies and Actions Table presents a suite of poadaptation strategies and actions for the northern California study area, which were generated by area stakeholders and supplemented by strategies and actions from previous EcoAdapt workshops and sources in the scientific literature. Adaptation actions are provided for the four major habitat groups, and action listed in the table has been evaluated by a number of oriteria meant to assist land managers in identifying and prioritizing actions for ementation (e.g., effectiveness, feasibility, potential co-benefits a

The A e Implementation Workshop Proceedings summarize the activities and outcomes of the Northern California Adaptation Implementation Workshops held for the Redding and Eureka/Arcata regions in November 2021. The report includes an overview of climate adaptation planning and a description of the workshop activities, then presents adaptation implementation plans created by workshop participants for six priority sites. in the northwestern California study area.

#### **Coastal Habitats**

consequ

**Vulnerability Assessment Syntheses** Habitate: Coastal Dune Systems **Coastal Bluffs & Scrub** 

#### https://tinyurl.com/NorCalAdaptationProducts

### Products

**Table of Contents** 

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Further information on th project ambound fortune (1 Concession of Chicago, To.

#### **COASTAL HABITATS** Cinate Dange Matemiality and Adaptation Strategies for Northwestern California **Coastal Habitat Descriptions**

The summary metalles information about search habitate considered within the propert area of the Northern California Climate Adaptation Project, which includes the Kamath, Serfleen, Mendesine, and Shada Trivity National female as well as public lateix managed by the Ruman of Land Management, techniting Anala, Netbing and pairties of the likely held offices.

The following coastal highlight types are considered in this commercy.

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#### Countral Bhuffs & Scrub Guarda Tetra Paral Northern coasied which

spectability, and the statements (R. aver-phone). communities occur along the Pacific stant, but printing samparties a drongly influenced can belond up to 20 miles mand. Adjacent to the By introduction and, topography, disturbance Natury and Subscript/ occurs or basy, imply serviced unconsolid

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generally occupied by denser countal scrub.

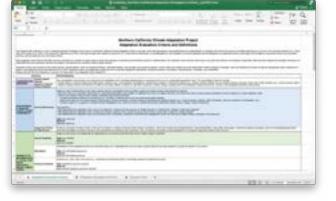
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decidurus or sensi exergines shrubs with

shallow root systems such as soyote brook

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Northern California Climate Adaptation Project Adaptation Implementation Workshop Proceedings

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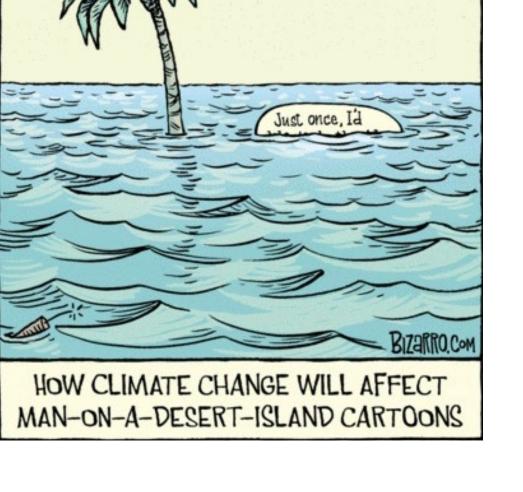




# Questions?

Laura Hilberg, Lead Scientist laura.hilberg@ecoadapt.org

https://tinyurl.com/NorCalAdaptation



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Webinar recording will be sent to all registrants and posted online with the slides at <u>https://tinyurl.com/NorCalAdaptation</u>

