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







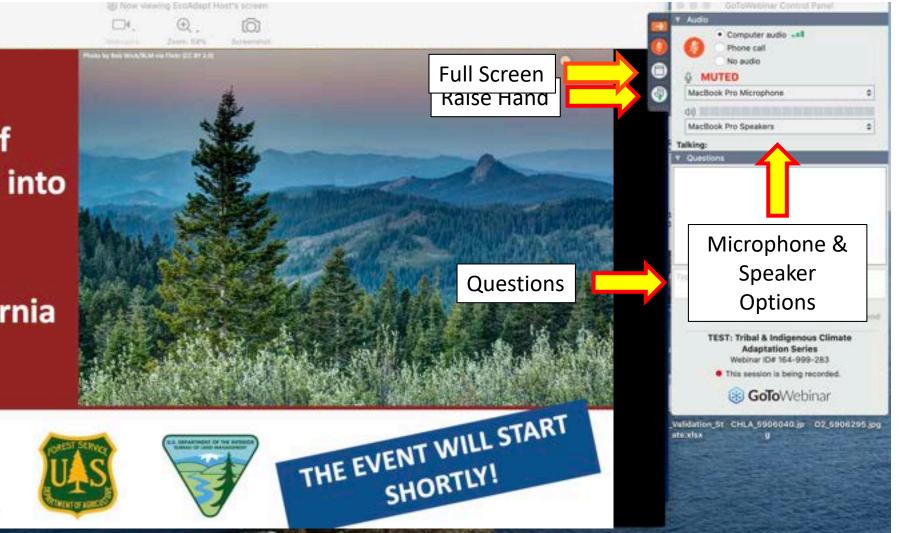


## **GoToWebinar Orientation**



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

Adapt



## **Northern California Climate Adaptation Project**



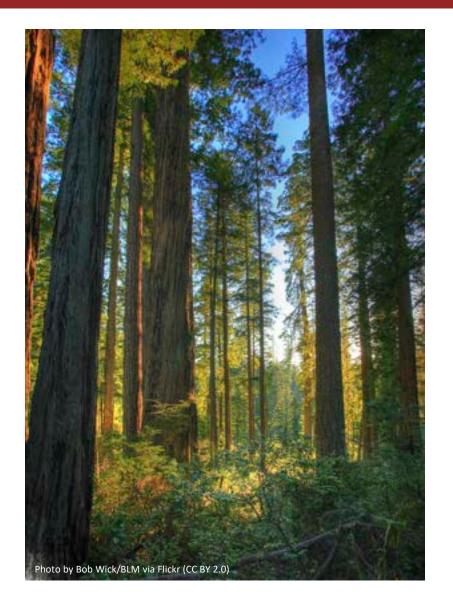


### **Project Goals**

- 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

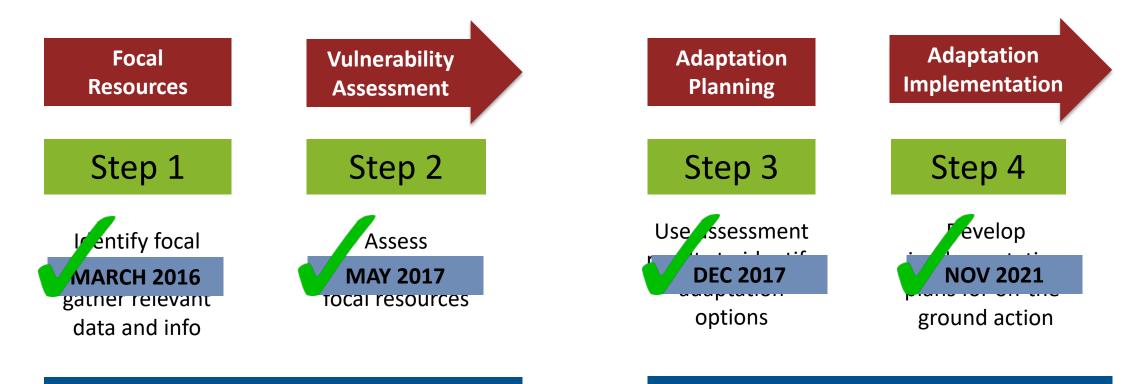




Vulnerability Assessments, Mapping, & Adaptation Strategies FOR NORTHWESTERN CALIFORNIA

## **Project Timeline**





Phase 1: Vulnerability Assessment Phase 2: Adaptation Planning

## **Project Findings**



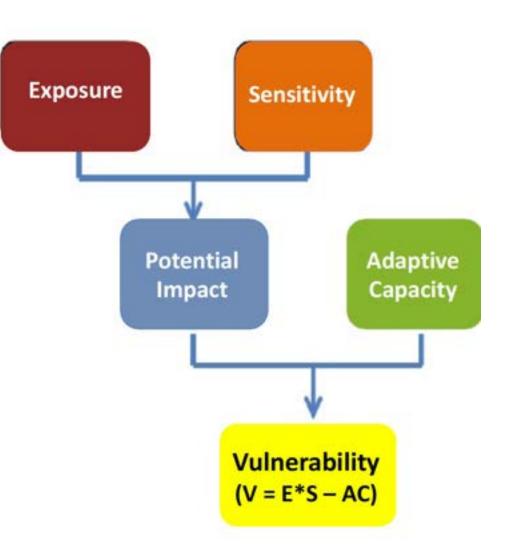


- Vulnerability Assessments
- Regional Climate Impacts
- Climatic Water Deficit Maps
- Adaptation Strategies & Actions
- Adaptation Implementation Plans

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

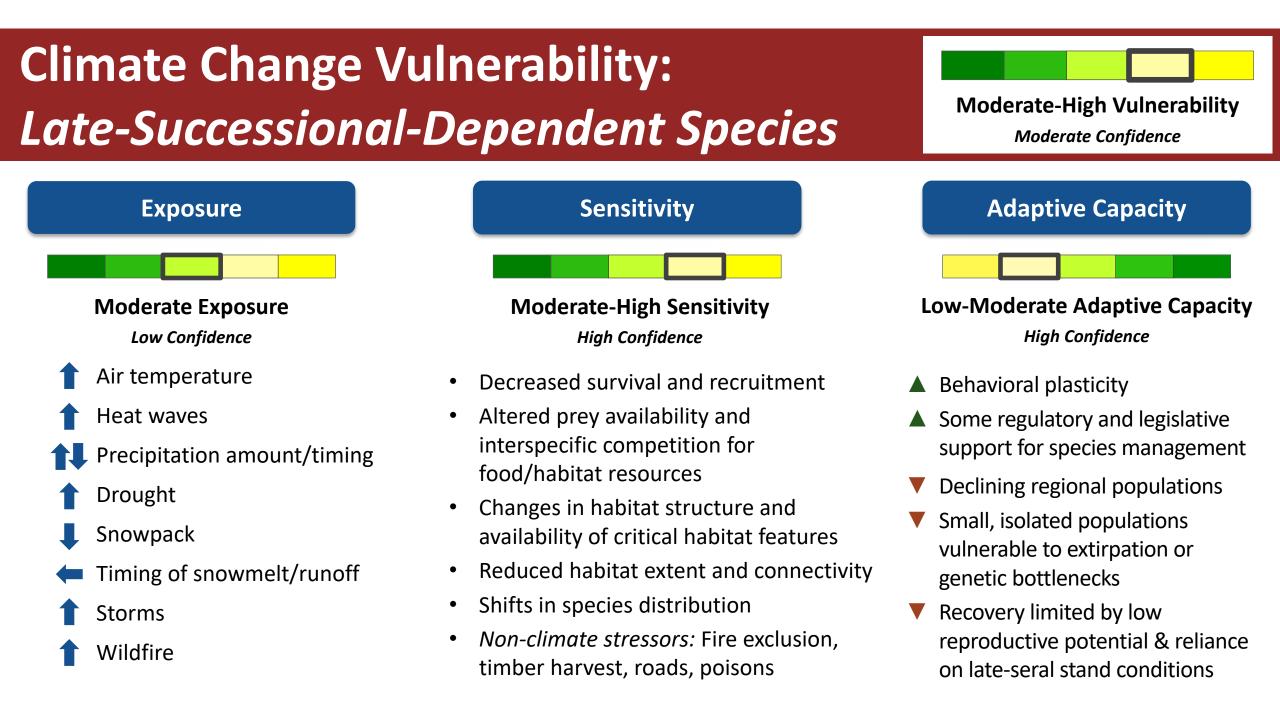


ADAPTIVE CAPACITY is a measure of a resource's ability to accommodate or cope with climate change impacts with minimal disruption

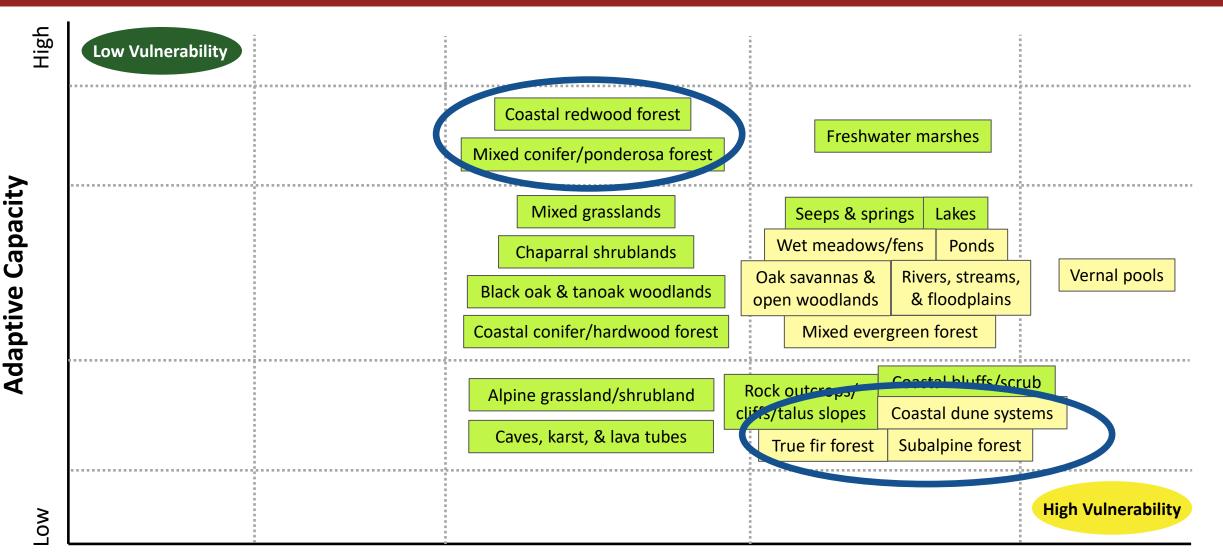
#### Factors affecting adaptive capacity:

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





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

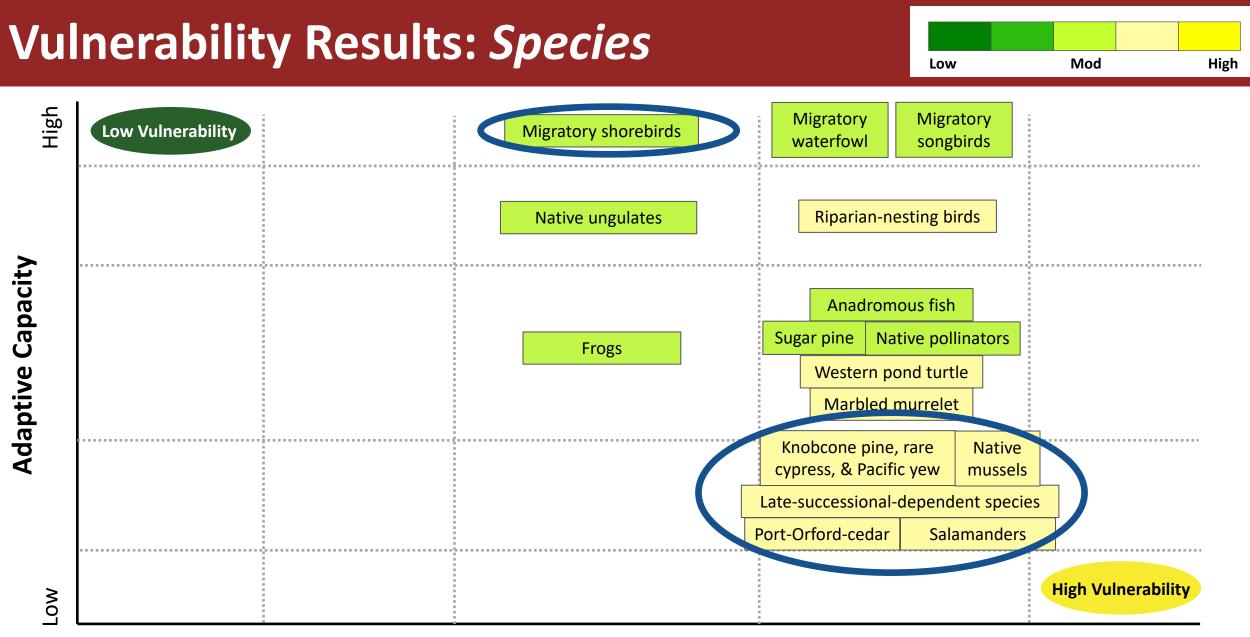


#### Sensitivity & Exposure

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





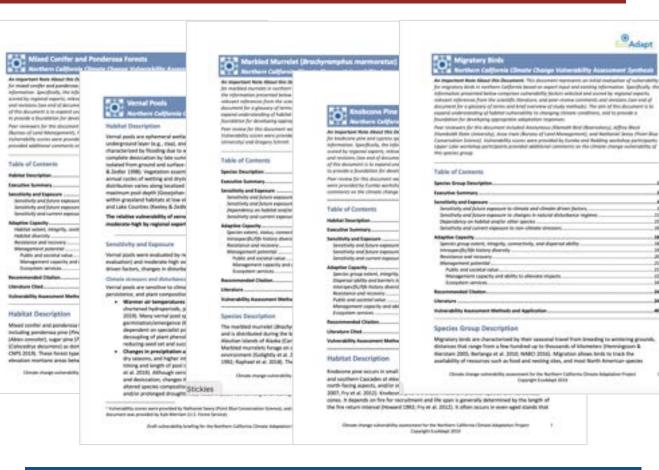
### Adaptive Capacity Factors

- 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)

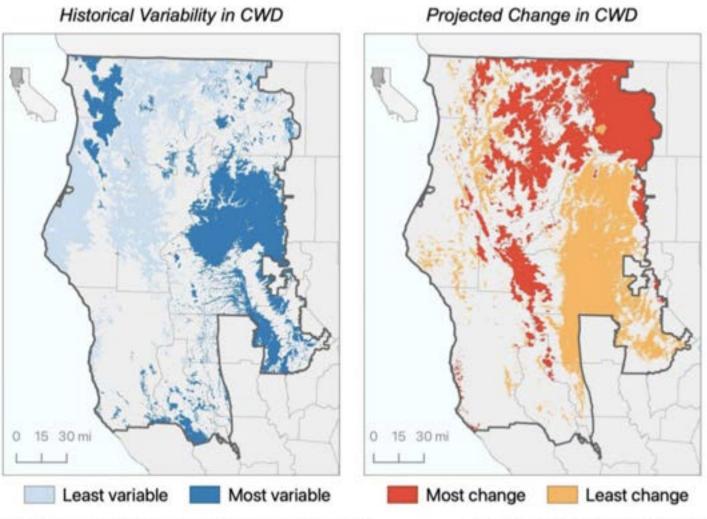
Figure 3. Annual mean temperature in degrees Calvius (\*C) for the Northern California Climate Adaptation Project study area lettween 1951 and 1980

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**



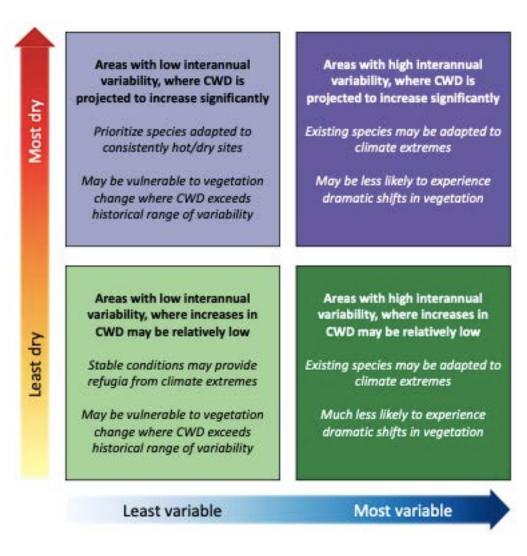
Some areas of the landscape may be more vulnerable to significant ecosystem changes

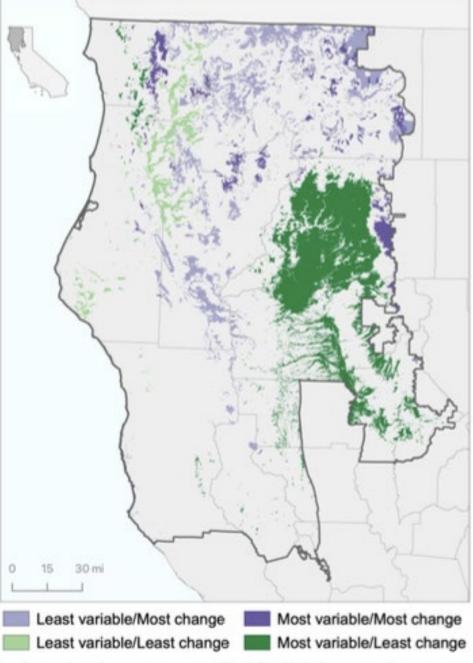


Data Sources: Basin Characterization Model (Flint & Flint 2014); Consequation Riology Institute

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

•	i fi la	Draw Page Las	out Formulae D	EcoAdapt_A	erthern Californi	a Adeptation Strategies & A	ctions_lan2022.slas		Q + Learth Sheet
	X Cut	Crist rage Lay			Column Int. 1		ALL DESCRIPTION OF		ZANNA AW. O.
1.	Copy +						21 11 11		Tra- 27
ete	of formal	4. 1. 1. 1.	- difference in	5 3 3 42 42	- Marga & Cantar	1 2 4 8 8 8 8 2	Constitural Formal Car Formating in Tation Brut		f // Clear+ Sort & Find &
	1 × ~	fi > Species dv	ensity (increases habitat s	uitability for native flora and	i fauna)				
		6	0		F	6	H	2 B (	1 A A
Ada	ptation Str	ategies & Actio	ins for Northern C	alifornia		VALNERABLE	IS ADDRESSED	BRICIN	INESS AT REDUCING CLIMATE CRANGE VICENERABLE
	the second s	Waterstown Coal	and the second se	and the second sec	Advention Assessed 17	Climate impacts Robustd 7	Adaption Capacity Factors Enforced	Coural Manhanana 🛛	Inerst-Testating Pferticence
	3 Caucial	Autor to report of some dense denses	Proved the trinstantion and actualityment of measure species and sensors existing applications	Remote Institut glants have bigs? network fact have bridge to the materia data estimate and haland date processor	Restants Perdense	n Paccystellen, solt mittalen, ötnigelt (mittalen, songertillen yfer solt mittalen) (haar levert in solten sond hodenment exercises) for mittel hoden mygetteler) (haar levert in solten for analitätige untersolt for analitätige untersolt for analitätige untersolt for homene glantis	s Species discretes (recreases hainter schalling for safer flore and Joanna)		Cauchy Reddence Tele (hand that remaining in submit data white failer significant multiple in one integration process spectrapic mobilities (strength one integration process spectrapic mobilities) intervals use the following part in Physics (Arwess Strendshifteduck of insulate gradients Arbites), and spectram, meaning and arbites in a gradiest Arbites, and another to the annu-advantation in gradiest Arbites, and annutation of the annu-advantation in a spectra for the annu- mentation of the annu-advantation in the insulation process annutation of the annu-advantation and insulational heating annutation of the annu-advantation and insulational heating annutation of the annu-advantation and insulational heating and heating proceeding the stream of the annual methods in heating to sharper these process treatment and an impact and heating to sharper these process treatment and an impact and particularly long for mobilized an annumal fitteement in a particularly long for mobilized an annumer in the streament in the streament of the streament of the streament of treament in the streament of the streament of treament of treaments in the annutation of the streament of the streament of treament in the streament of the streament of treament of treament in the streament of the streament of treament of treament of treament of the streament of treament of treament of treament of treament of the streament of treament of treament of treament of treament of treament of treament of treament of tream
	2. Created	Robus for impail of non-	Neversi ha tetraharlari and solahibrinest of treasies species and entroy enabling populations	Sel op av solv detector-ropal majoren program te proceser the amphishment of stopsive species on minual stops dominated dow systems	Sections, Nationa	n An temperatust (process engr opprotect of trausure plants) in People later of the second plant produces completion for soft measures in Sec level rise billions could insertion in Second plants for the second plant encountry for the second plants of plants in the second plants	* Sanchel diversity (Normann Indefait sokaldig for weine (Nor and Norm)	Mubret	
	1 Carded	Reduce the impact of sum-	Any-printle introduction and adaptitution of measure specific and writting angulation	increase public awareness of invasion particular product offers to durat helitatic produces resoluting climate vulnerability	Anotania Mediena Calabaratan	r Insaider gente	I Managament potential Stormann auf M podentanding that influences societier support for management)	la.	
		Relate for trapel of same		Protect sensitive dure helders off derivative the selector registration from methodisms impacts	Automation Perchange	Konsetsis Simit dibukanor Pur prokoto Sri genegirotalikhenen oʻ mesiar plonij inyaske glami, preventi Applephen d'utake approton oyo pentalikotor d'utake approton oyo pentalikotor d'utake approton oyo pentalikotor			
	- Contract		Screenshot	and the second second	Active of the second	- White		· ·	
		a contract of the second se	Autor and an	Insuring internal and estampt		- The anduran justificant building of both			

- Effectiveness
- Feasibility
- Co-Benefits & Consequences



	Home Ins	and the second second	년 후 Page Layout Formulas	and the second	pt_Northern California / iew	Adaptation Strategies & Act	ons_Jan2022.xlxx		Q+ Search Sheel	Shere of		
	Paste Co	apy •				- (5 + % (3   % 21		Insert Delete Format	FIL- ZY-			
Putchergeligende allegation progetigende allegation progetifical progetigende allegation progetigende allegation proget	17 ‡	× √ fx										
Applicable Decision and Definition         We arready the state	A.					¢.				0		
The 21 Min runn of 2												
Part of the Minister Number 10 and the Minister Number 10 and Minist	Tribe 2019, Viennin planning, and land p Each adaptation ac analisholder input a Adaptation actions	i ef al. 2019. Yursk Tribe protection and prioritizat ction listed in this table h ant esperience with previ are provided for four hal	2018. Swamston et al. 2016). Although th or afflorts. as been evaluated by a mumber of oriteita our projects, and backed up by scientific stat groups: coastal habitats, forest and y	to table use created for use by the U a meant to esset land managers in Ide c evidence where possible. wooderst tabitats, freuhwater habitat	<ol> <li>Ponest Service and Buneau of Lan ntifying and prioritizing actions for in s. and shrubland and grassiand habit.</li> </ol>	d Management, the strategies and actions ; plementation. The evaluation others used a sta. Actions within each habital group are n	resented here are designed to be appli a larad below, along with their definitio rebed within troubler adaptation strategy	cable across a wide range of other regional o in and rankings (if applicable). Rankings were	onservation efforts such as project assigned by EccAdapt staff based o			
Number of the second	Please role that all	I of the information in col	urres P-S refers back to the adaptation a		el management approxities: resistan	cervellance, acceptance, directivesponee,	knowledge, and collaboration.	4 66 St	sh sh 966	_		
Number         Numer         Numer         Numer <td>0</td> <td></td> <td></td> <th></th> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td>	0									-		
Image: contrast biologic is subcature biologic induction is sub		Adaptative Capacity	- Climate impacts, including climate and	mate impacts, including climate and climate-driven stressons (e.g., air temperature, precipitation), climate-driven changes in disturbance regimes (e.g., dought, flooding, widdlint), and non-climate stressons that may interact with climate changes (e.g., invasive species, dams)								
Not the fiberation of evaluation of evaluation at evaluation at evaluation at evaluation of evaluation at interview in this approximated is not reach to explore the solution of the evaluation of evaluatio evaluation of evaluation of evaluation of evaluation o	EFFECTIVENESS AT REDUCINO CLIMATE CHANCE VULNERABUTY		Accures taction is successfully implemented at a meaning/utagonylee scale possibly to implement the action at a spatial scale that must effectively reduce charge interactivity should be reflected in a town flexibility scale)     Actives that indexisty metacles charge interactivity in comparison that may be entirely and a spatial scale that must effectively reduce charge interactivity should be reflected in a town flexibility scale)     Actives that indexisty metacles and increases that must adopt and increase that must adopt and increases that must adopt and increases that prevail reduces that must adopt and increases that prevails that adopt and increases that prevails that adopt a state that the active that adopt a state that a spatial scale that executes (e.g., must ve species, policities, water with disease, tend-use conversion to development, etc.)     Enhance support of or opacity for disease informed management (e.g., antitive flowes other diseases to disease the species, policities, and use conversion to development, etc.)     Reg question:     We implementing this adaptation action reduce the sensitivity or tensors to increase the adaptive capacity of the resource to the resource of the resource?     We implementing this adaptation action increase the adaptive capacity of the resource to the elevelopment actions that will reduce climate strange indexisted actions that prevent adaptive capacity of the resource?     We implementing this adaptation action increase the adaptive capacity of the resource that eleveloid interactions that adaptive strange interactive strange in adaptation action increase the adaptive capacity of the resource that eleveloid interactive strange in adaptation action to an effective step in suggesting undergoment actions that will reduce climate strange interactively of the resource?     High insertions the adaptation action is a adaptation adaptate interactive strange interactive interactive strange in adaptatine adaptace interactive step in suggesting undergoment actions th									
Constant Reservation       High Servary Reservation         Law (Rest Netable)       Addressence (Reservation Reservation R		Supporting Evidence for Effectiveness							ndior local knowledge/observations.			
Image: Constraint of the sector of the sector is the sector is replaced to sector is replaced to sector is replaced to sector is the sector)       Image: Constraint of the sector)         Image: Constraint of the sector is the sector is the sector is the sector is replaced to sector is replaced to sector is the sector)       Image: Constraint of the sector)         Image: Constraint of the sector is th		Overall Peachtry	High (very feasible) Moderate	ly be implemented at a scale that anu	d effectively reduce climate charge v	uhenställy						
AT A SOLAR SAT SOLAR	PEASIBILITY OF	1220	High (very affordable/inexpensive) Moderate	action (recludes what cost to regime	of the action as well as origing finan	cial resources needed to sustain the tenef	is of the action)					
Adaptation Evaluation Criteria     Adaptation Strategies & Action     Literature Cited	AT A BOALE THAT WOULD EFFECTIVELY	Technical Peasibility	High Jampie Trie resources required Moderate		its or technology required to implement	t the action						
		Educateding Evolution	inco Collecto	in Statutes & Artice	A Literature Cited							
	Ready	-Appresso Evalua	Min Ground Min Acaptan	ten Joaceges & Actor	<ul> <li>Denature Caso</li> </ul>	24				+ 87%		



Home	Insert	Draw Page Lay	out Formulas	Data Review View					1+ Share o
P .	X ou	+			Contraction 1			· · · · · · · · · · ·	- ZANSUN - AT- Q.
Paste	Copy *	■   J   <u>U</u> +	Also Also	$  \chi_{1}  _{\mathcal{D}} =   \chi_{1}  _{\mathcal{D}}   \chi_{1}  _{\mathcal{D}} =   \chi_{1}  _{\mathcal{D}$	- Nerge & Center	5.5.5 (3) 15.2	Conditional Permat Ce Formatting as Table Style		
1	\$ × ~		trategies & Actions for	Northern California					
A.	8	c			1	0	H	1	4
Adar	station Str		ons for Northern			VULNERABLI	THES ADDRESSED		VENESS AT REDUCING CLIMATE CHANGE VULNERABIL
lots.	Habitat Group	Ranagement Goal *	A aplation Strategy	Adaptation Action -1	Adaptation Approach 👻	Climate Impacts Reduced	Adaptive Capecity Factors Enhanced	Overall Effectiveness	* Sources Evaluating Effectiveness
1	t Caetal	Reduce the impact of non- climate streams	Prevent the incoduction and establishment of invasive species and remove existing acquisitions	Namure invasive plants from Hours memore dure habitate to allow for the recovery of native septration and national dure processes	Americance, Nonlinear	<ul> <li>Precipitation, soll montum, drought (reduces competitors, for sull mainture)</li> <li>Sea level rise (allows sand maxement morecassory for initial fabitur mapation)</li> <li>Widdler (and allow and allow and allow and allow and allow and allow and allow a second allower allows and allow a second allower allows and allow a second allower allows and allower allower allower allows</li> </ul>	* Species diversity (Increases hobitat satisfieldy for notive (fore and faunce)	-sp	Institute durate segetation resultation met deposition (process quarted wavelange) elements is ever the following years (any program of the segment of methods of invariant quarters remove segrements, manual removal resoluted in quarters remove or behavior to the universident of repositions. Software, not unitar to the universident reference table. Horidolde travalent pervisiones of standing Softwares, and machinalization theraper tables of standing Softwares and destroyed sig might facilitatie resultation resolution results. Software, so scholar to the universident reference table. Horidolde travalent pervisiones of standing Softwares of native species. Software, no reference table) tower native tables in classes and quarters table resultation in lower native tables in classes and quarters table in software tables (travalent damit) in longer resources to a full recovery of native dame communities travalent particularly long for mechanical removal texperiments (Pick
	2 Counted	Reduce the impact of num- climate streams	Prevent the introduction and establishment of insuline queries and remove entrong populations	Set up an early detection reput response program to provent the establishment of invasive species on reveals survive dominated dure systems	Resistance Residence	Ket temperature (prevents range expansion of investe parts) Previpilation, with mobiles, discapt (reduces competition for self molecure) Sas tevel (the (administrate) sorrecessory (the valued hobitor migrature) s.investive plants	r Species diversity (increases habitat suitability for restive flore and feared	Moderate	
	Cuestal	Reduce the impact of non-	Prevent the introduction and establishment of incosive queues and remove existing populations	Increase public awareness of awarave apoces removal efforts in durin fundates and their rule in reducing climate suberphility	Recotorce, Neclience Collaboration	e invative glants	> Management potential (increases public understanding that influences societal suggest for management)	-	
	Cherter	Reduce the impact of non-	Unit anthropoposic disturbances on service and/ high-quality stee	Protect sensitive dans habitats still or dominanted by ratios expectation from recreational impacts	Restance, Residence	<ul> <li>Recreation (limits disturbance that promotes the specod/instabilishment of swearce plants)</li> <li>Invasive plants) (prevents displacement of notice regetation and coexcitabilisation of mobile duries)</li> </ul>			
		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

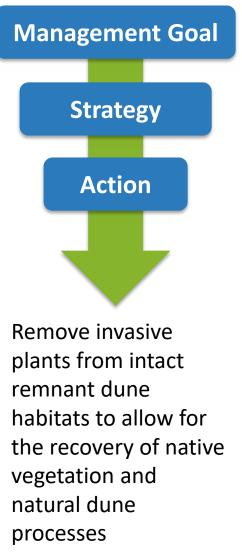
native plants/wildlife

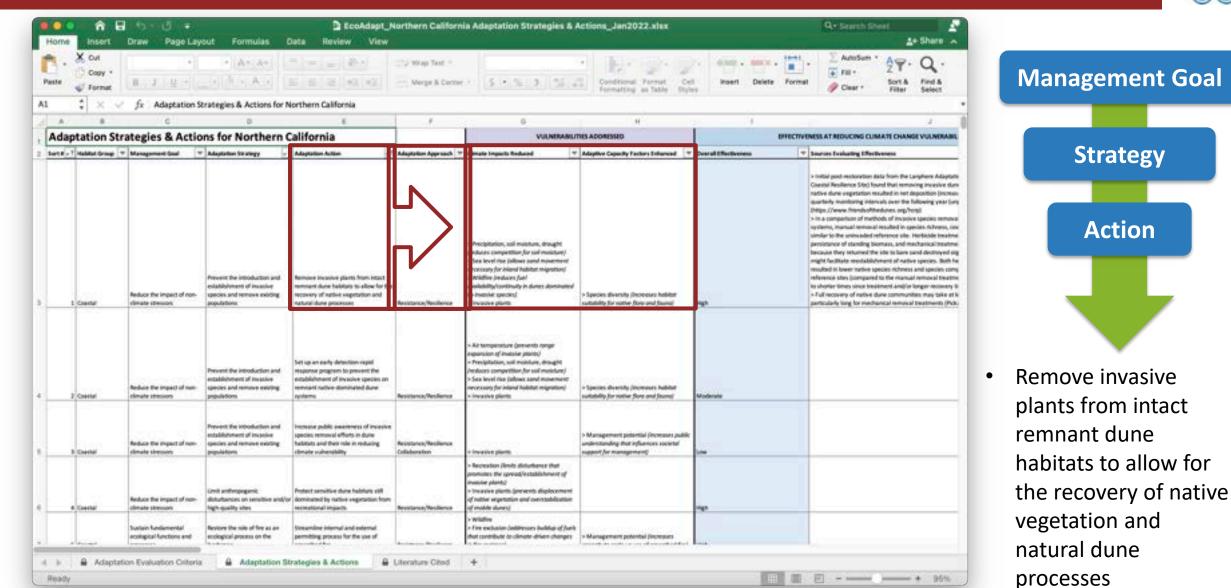
as an ecological process

ñ -	X CVI	+	• [Ar. Ar.]		The West Test 1			·	. E AutoSum * AT. Q .
Paste	Copy *	$[0, [T_i], [U_i]^{\ast}]$	A MARKED	s = s [ a ] (a) (a)	- Norge & Corto	5.5.5 (5.5)	Conditional Format Cell Formatting as Table Style		Fill+ Z Sort & Find & Clear+ Filter Select
1	\$ × ~	fx Adaptation S	trategies & Actions for N	iorthern California					
A.		c	0	.1		0	н		
			ons for Northern C				NIS ADDREVIED		ENESS AT REDUCING CLIMATE CHANGE VULNERABIL
lots-	Habitat Group	Management Goal	Adaptation Strategy -	Adaptation Action - 1	Adaptation Approach *	Climate Impacts Reduced T	Adaptive Capacity Factors Exhanced	Overall Effectiveness 🔻	Sources Evaluating Effectiveness
) <u> </u>	t Coestel	Reduce the impact of non- climate stressors	Prevent the indoduction and existbol/ment of inscribe species and remove existing populations	Remove invasive plants from intact memory dura bability to allow for the seconstry of miller superstation and natural dura processes	Sevicence/Neulience	<ul> <li>Precipitation, soll mooture, drought (induces competition for soll mointure)</li> <li>Sea level rise (allows cond mointure)</li> <li>Midline (induces for)</li> <li>Widline (induces for)</li> <li>Widline (induces for)</li> <li>Widline (induces for)</li> </ul>	> Species diversity (increase holdine suitability for notive flow and found)		Control Renierce Sicol Isond that removing investive dur- native dura segmetation resultation in tel deposition (increase quantidy sumiliaring intervals over the following year (and (https://www.framtuckdhedures.org/horg) > in a comparison of methods of invasion spaces remove systems, manual removal resulted in species dohness, our sample to the antervalent reference she. Herbidde treatme periodicano of standing Sommas, and mechanical insolute because they returned the site to laws panel destroyed arg might facilitate mechadia/where of native species. Both he resulted in beam rative species diverse species, both he resulted in beam rative species down destroyed arg reference sites (compared to the manual removal treatme to shorter lines size treatment and/or large meaning to anticular long of eacher daw communities may take at a particularly long for mechanical removal treatments (Pick)
1	2 Coestal	Reduce the impact of num- climate iterators	Prevent the introduction and establishment of impaire species and remove eaking populations	Set up an early detection repail requiries program to prevent the establishment of invalve species on remnant nurfue dominipted dure systems	Nexistance/NecSence	Kir temperature (prevents range reperation of investie patients) respective, sold involved, checked (reducer competition for soil melisture) Sala level rise (altern sold melisture) Shas level rise (altern sold melisture) Shashevel rise (altern sold melisture) Shashevel rise (altern sold melisture) Shashevel rise	<ul> <li>Species diversity (Increases Aubited satisfiely for notive flow and fiscand)</li> </ul>	Moderate	
	Crester	Reduce the impact of non-	Prevent the inhoduction and establishment of incusive species and remove existing populations	Increase public awareness of invasive species removal offices in durin factors and berinde in inducing climate submittelity	Resistance/Resilience Collaboration	+ Invasive plants	> Management potential (increases public andientianding that efficiences societal suggest (for management))	la.	
	CHINA	Reduce the impact of non-	Cent anthropogenic disturbances on sensitive and/or high-quality sites	Protect semilitive durie habiturs still dominand by notice regetation from recreational impacts	Restance/Bealierce	<ul> <li>Recreation (limits disturbance that promotes the upwood/establishment of invasive plants)</li> <li>Invasive (plants) prevents displacement of native segretation and overstabilization of mobile shares)</li> </ul>			
		Tustain fundamental ecological functions and	Restore the sale of free as an ecological process on the	Steamline internal and external permitting process for the use of		> Wildfee > Fire exclusion (addresses buildia) of (helt deat contribute to climate driven changes 	> Management potential (Increases		



nome	X ovi	Draw Page Lay		lata Boview View		1.		100	Le Share A
<b>D</b> .	Copy *				The West Test 1			· · · · · · · ·	. 2¥· Q.
Paste	💞 Format	1. 3. 1. 6. 1.	Telliptic Viel II	5.5.2.41.41	Nerge & Certe	<ol> <li>S. S. S. (2) [2014</li> </ol>	Conditional Fermat Cel Fermatting as Table Style		mail 🥜 Clear * Filter Select
1	\$ × ~	fx Adaptation S	trategies & Actions for N	orthern California					L.
A.		c	0		1		H	2 0	
	and the second se		ons for Northern	alifornia		VULNERABLI	THE ADDREVED	errec	TIVENESS AT REDUCING CUMATE CHANGE VULNERABL
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
	1 Castle	Reduce the impact of non- climate streaces	Prevent the introduction and establishment of inservice species and remove mixing populations	Remove involve plants from intext remnant dura habitats to the for the tocovery of minister superation and satural dura processes	Resistance/Resilience	<ul> <li>Prodpitation, soil moleture, drought (reduces competition for sail moleture)</li> <li>Sea level rise (allows sand molecomer) monosassy (reduces fuel moleculary) (reduces fuel webliefty/continuity in dunes dominated by instalse points.</li> </ul>	* Species diversity (Increase Indelter sustability for notive (fore and faunce)		In Initial point restoration itals from the Langhtee Adaptate Classifial Realisence Step) found that removing postcolor (increa- native dama suggestation resulted in text deposition (increa- quartiely waveliance) intercholar of invariant spectra semanary in the sumparison of methods of invariant spectra semanary systems, manual resulted in intercholar software systems, manual resulted in species-shiftees, and strategies of assisting Sistmans, and reschaolar training pensitration of adapting Sistmans, and reschaolar training because they returned the site to lase said destinyed sity might functions even tables appears richness and species camp indefine eventability of the site section of species camp indefine sections and to the manual removal treatment to shorter these sizes tables target and species camp indefine sections and the state and species target is shorter these sizes target areas and species target is shorter than sizes and target and and in the strategies target and the species and the species data target and target areas and the species and the species and target and target areas and the species and the species and the species target and the species and the species and the species target and the species and the species and the species target and the species and the species and target and the species target and the species and the species and the species target and the species and the species and the species and the species target and the species and the species and the species target and the species and the species and the species and the species target and the species and the species and the species and the species target and the species and the species and the species and the species target and the species and the species a
-	2 Constal	Neduce the impact of num- climate iterators	Prevent the introduction and establishment of invasion species and remove easing populations	Set up an early detection repoil response program to prevent the establishment of invasive species on remnant nurve diaminated dure systems	Resistance/Resilience	Kir temperature (prevents range reparation of invester plants) Presipilation, soll readers, desight (reducer: competition, for soil molecure) Sea level rise (altern soil molecure) News level rise (altern soil) Newseave plants) Newseave plants	<ul> <li>Species diversity (increases habitat subsidity for notive flow and fissing)</li> </ul>	Moderate	
	1 Curtal	Reduce the impact of non-	Prevent the introduction and establishment of insolve questes and remove existing populations	Increase public awareness of invasive species removal offices in durin habitats and their role in obuving climate submittelity	Resistance/Resilience Collaboration	+ Investor plants	> Management potential (increases public anderstanding that influences societal suggest for management)	-	
	Cantal	Reduce the impact of non-	Umil anthropogenic disturbances on sensitive and/or high-quality sites	Protect sensitive duce habitats still docimanted by racine vegetation from recreational impacts	Residence/Residence	<ul> <li>Recreation (limits disturbance that promotes the upword/establishment of invasive plants)</li> <li>Invasive plants (prevents displacement of notive regretation and coestablishmen of model shares)</li> </ul>			
		Sustain fundamental ecological functions and	Restore the sale of fire as an ecological process on the	Dreamline internal and external permitting process for the use of		> Wilding > Fire exclusion (addresses building of fuelt dust contribute to climate driven changes	• Management potential (increases		







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



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 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



a constitution all nestes if any heat'relet the last of a labor and any sectors of the sectors in the sector of the sectors of

that are dependent on ar banafit from groundwater for participance

that the shows it. I are

In northeastern California, and meadmen and

fers, primarily taxue to markage and substative

arman (3.953-6.400-%, although they cart also

is based in loans alreading increasing college and

deprivations. Wet meadures are incoted in areas

that confine or slow the release of groundwater

mar the landscape, and can range from eases.

kerbaceous dominated areas to densely parties

provide, and concepts concept three their 2.5 acress and

mentate sortion space for a significant portion of

the user frees are characterized by a thick paid

substrate that suggests many delitedise plant

California pitcher plant (Zerlingtonia

alterna de

**Loope & Springt** 

species, including musses and the insection/mat

been and springs are the physical locations when

meaningly depending on the depth and size of the

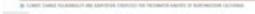
suggesting applies. Seeps and springs support colour. Exiting ally this entrophysics, and can reliab aquatic, welland, and benefitial species

providenter is disharped from aquilers to the

Earth's surface, with discharge rates earlying

rigarian photofolds, Rans, which may accur

within out theadlant or adjacent to later, or



## **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

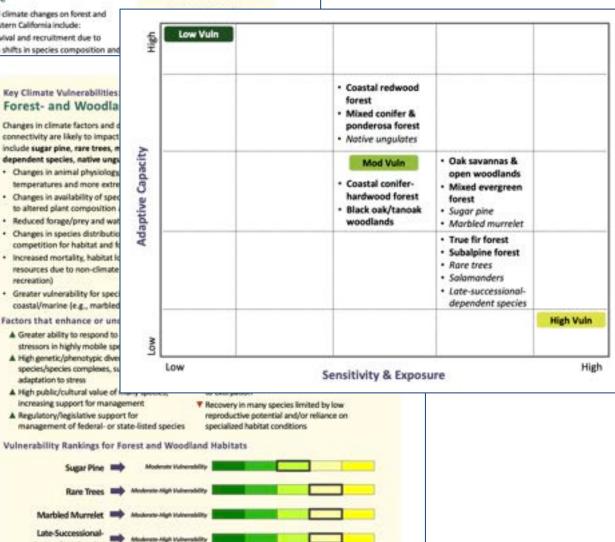
may be removed to spreads invasive pl

- \*\*\*\*\*\*\*\*\* 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** 

Trends and Projections I

Mater Desperature.

**Taning of Excernell an** 

franks and Projections

**Extransp** Providentian

Air Tamparentum.

Presidentian. **Climatic Water Defloit** 

Second ...

denoration ...

Country' Rep.

Here Lance' Aller

Heat Weiers ...

(maght ...

wides.

Liberature Ched.

International Contract



#### Adapt Northern Colifornia Climate Adoptation Project: **Overview of Climate Trends and Projections** Adapt rthers California Obsate Charge Vallerabil As important have deput this December. This described expression or build conjustee of expressions to plante Are system is written (althoughted a agent size and antip identifies another in the second second data constants, advected in the second and experience optional segments, neetward televisions, draw the assembly. Historical, and peror reviews continents and dans (see and a) download (or a general's of terms and brief warview of code methods). He was of We document to be append understanding of habital substrability in changing climate conditions, and in priorité et finantemie des dénanteurs agantacións adaptemis responses.

New resonance, the cho-alexanent included Autors (anone (Major Autoral Resources (Rainetwork), Socie Auto Dourse Apallence Apartments ( Analyse Pitter) U.S. Put and Wildle Service), tor Walker intrinsing three University), and are provided to Foreka an

Table of Contents Rakitat Description. Establish Internal y ... benefitivity and Exposure ... Senaiturity and fature view **Devaluation and Nature stage** intelliging and turnent ex-Adaptive Capacity .... Names and Adaptive Recommended Cit material diversity Indiang 12, Karolmar MI. 1 Residence and recovery California Climata Malasta Reception areas Public and sociated using Anagement organity Exception interest

contracted Chattion ....

Subardeling Research Mr.

**Habitat Description** 

Northern California cosinial

periodes while and used to

Wadeham 2008 Greet 2

storeducted in a narrow, do

Wedenard 188, Green

no") to +200 how" (10.4 m)"

Single dange taken

Interisture Chief

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.

#### Courted Darks Trainmant

Coastal Arre autority in incidentian California are also buted in a narrow. discontinuous band that varies in width among the manifest Dates large burn mainly Revealances to sprint or Refly-stabilized shares. dominated its date granes and, or the other durus, unall patches of ferent characterized he latesh ping (Ping) contarts contarting disc called thesis pinal. Suite membrings and accings are interrupt impacted for wind and induced pand minimum and from the beach, m. self as land-use charge and management activities that impact and movement and regetation development. Vegetation comparison are characterized by species takened of the rotationst probability, high water statuage, sall care, and and decisions.

#### 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

a const logic polynemic's as meters, instant of the negative a second in a second

Statute into home within \$7.00 at \$1.00

the that sense species and low should adapted to

an intellable indednate, said index air, and said

stuffs suggest spane plast conversion of

accumulating safe. Marine terraces are

generally occupied by denser countal scrub.

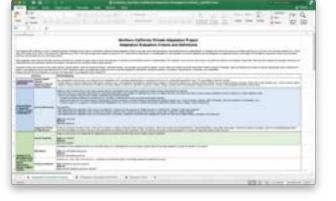
segmation, which is dominated to drought-

decidurus or sensi exergines shrubs with

shallow root systems such as soyote brook

(Ascrime plateric), salescelarry (Rature

temperary land use



Northern California Climate Adaptation Project Adaptation Implementation Workshop Proceedings

2021

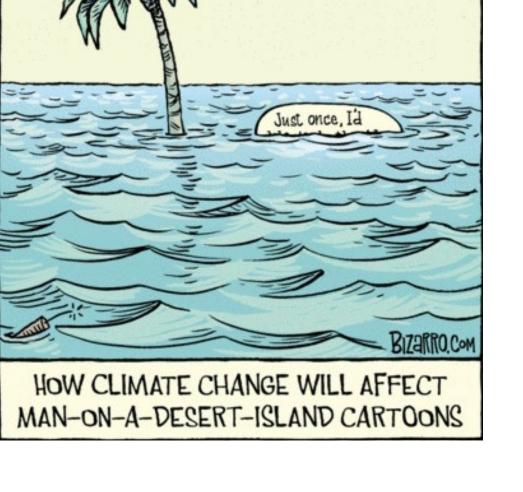




# Questions?

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

https://tinyurl.com/NorCalAdaptation



Dist & King Fatures BIZARROCOMIC. BLOGSPOT.COM









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

