Northern California Climate Vulnerability & Adaptation Workshop

Upper Lake, CA
October 3-4, 2017

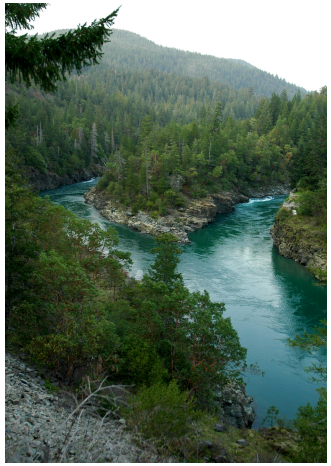
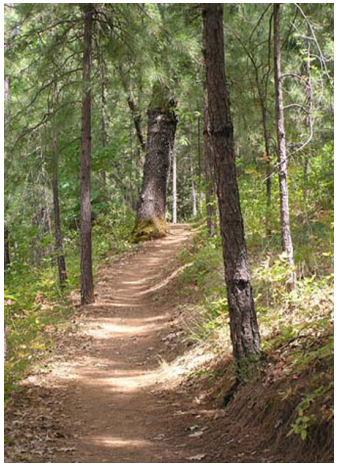
EcoAdapt™
Meeting the challenges of climate change

Jessi Kershner,
Senior Scientist
EcoAdapt
jessi@ecoadapt.org

Northern California Climate Adaptation Project

Project Goals

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


Project Overview

USFS

- Forest Plan Revisions
- Northwest Forest Plan Revision

BLM

- Resource Management Plan Revisions

Project planning & NEPA

Facilitate partnerships & collaboration

Other regional conservation efforts

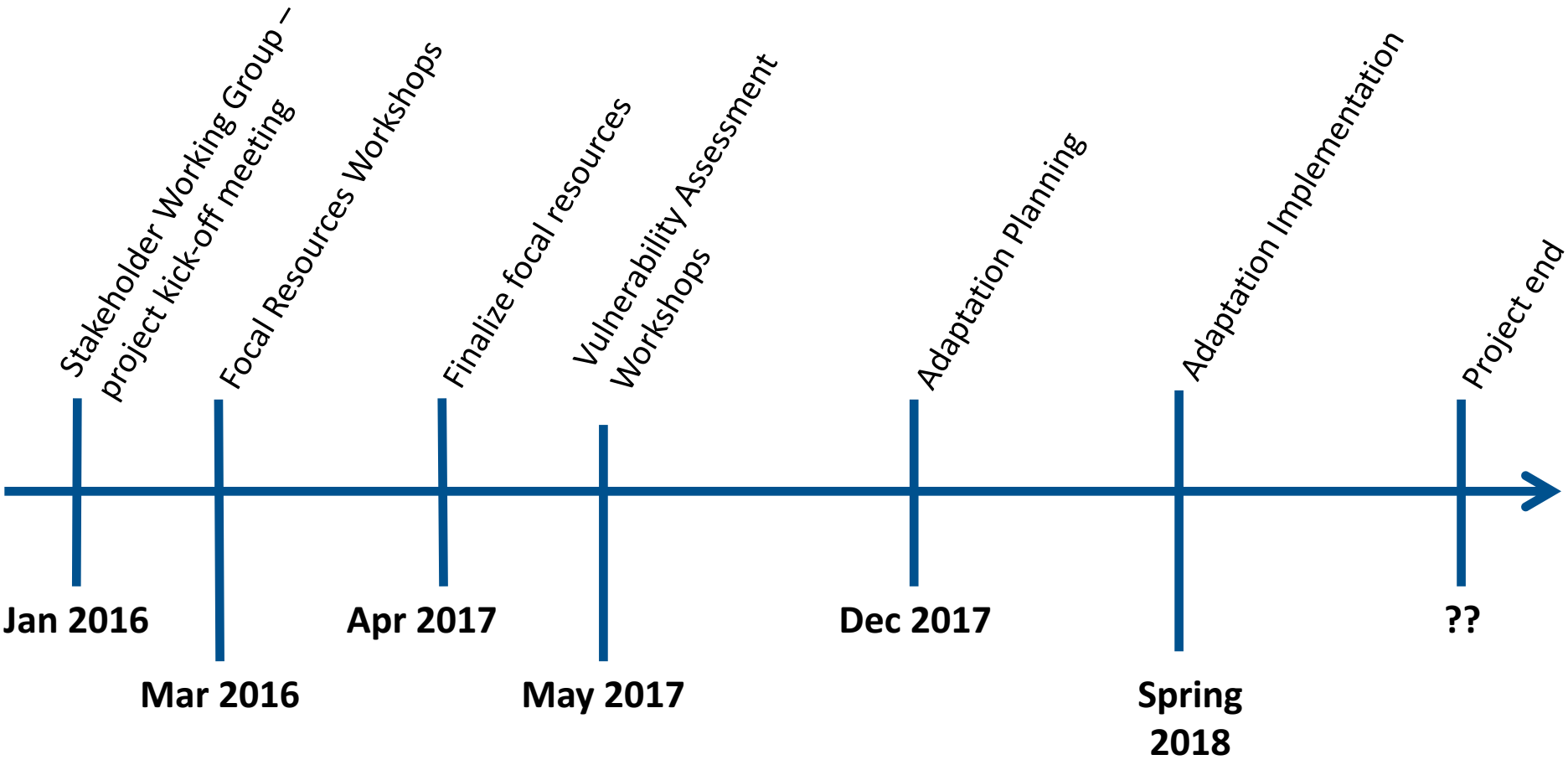
Project Methodology

Focal Resources	Vulnerability Assessment	Adaptation Planning	Adaptation Implementation
Step 1	Step 2	Step 3	Step 4
Identify focal resources; gather relevant data and info	Assess vulnerability of focal resources	Use assessment results to identify adaptation options	Develop implementation plans for on-the-ground action

Phase 1: Vulnerability Assessment

Phase 2: Adaptation Planning

Project Timeline



*** All workshops will be held in both Eureka and Redding**

Step 1: Identify Priorities

GOAL: Collaboratively identify regionally important resources

- Management, cultural, or socio-economic concern
- Habitats, Species/Species groups, Ecosystem services

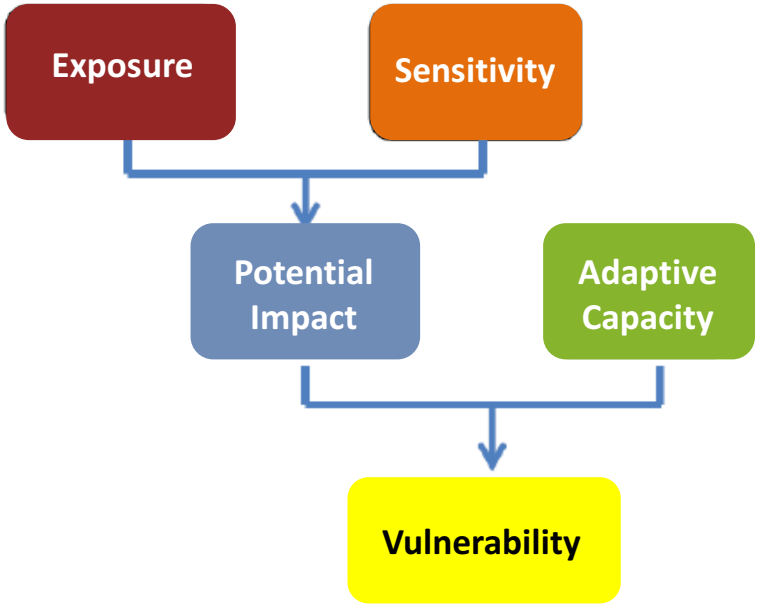
Step 1: Product

	Habitats	Species/Species Groups
Coastal	• **Coastal Dune Forest** (dune grassland, non-tidal wetlands, forest mosaic) • **Coastal/Bluff Scrub** (coastal bluff scrub, prairie)	• **Anadromous Fish** (salmonids, lamprey, sturgeon)
Woodland	• **Oak Woodlands** • **Mixed Conifer Woodlands/Mixed Evergreen Forest**	• **Native Ungulates** (Roosevelt elk, deer) • **Tanoak** • **Black oak**
Shrub/Grassland	• **Chaparral** • **Mixed Grasslands** (non-alpine) • **Alpine Grassland/Shrubland**	• **Native Pollinators** • **Migratory Birds**
Forest	• **Coastal Redwood** • **Mixed Conifer/Ponderosa** (dry and moist) • **Coastal Conifer Hardwood** (incl. pygmy forest) • **Coastal Pine Forest** • **True Fir Forest** • **Subalpine**	• **Salamanders** (Pacific Giant, endemic) • **Late Successional-Dependent Species** (marten, fisher, northern spotted owl) • **Marbled Murrelet** • **Rare Trees** (spruce, cedar, alpine, cypress, enriched conifers) • **Sugar pine**
Freshwater	• **Rivers, Streams, Floodplain** • **Lakes, Ponds** • **Marshes, Vernal Pools** • **Seeps, Springs, Groundwater** • **Wet Meadows, Freshwater Wetlands, Fens** • **Riparian**	• **Frogs** (Northern Red-Legged, Foothill Yellow-Legged, Tailed) • **Port Orford Cedar** • **Western Pond Turtle** • **Riparian Nesting Birds** (warblers, grosbeak) • **Native mussels**
Endemic	• **Rock Outcrops, Cliffs, Talus, Caves**	• **Bats**

Step 2. Assess Vulnerabilities

GOAL: Assess vulnerabilities of focal resources to climate and non-climate stressors by considering sensitivity, exposure, and adaptive capacity

- Scientists, managers, and other stakeholders evaluate resource vulnerabilities
- Add information from scientific literature
- Stakeholders/Experts review draft vulnerability assessment results



Which focal resources are most vulnerable to climate change, and why?

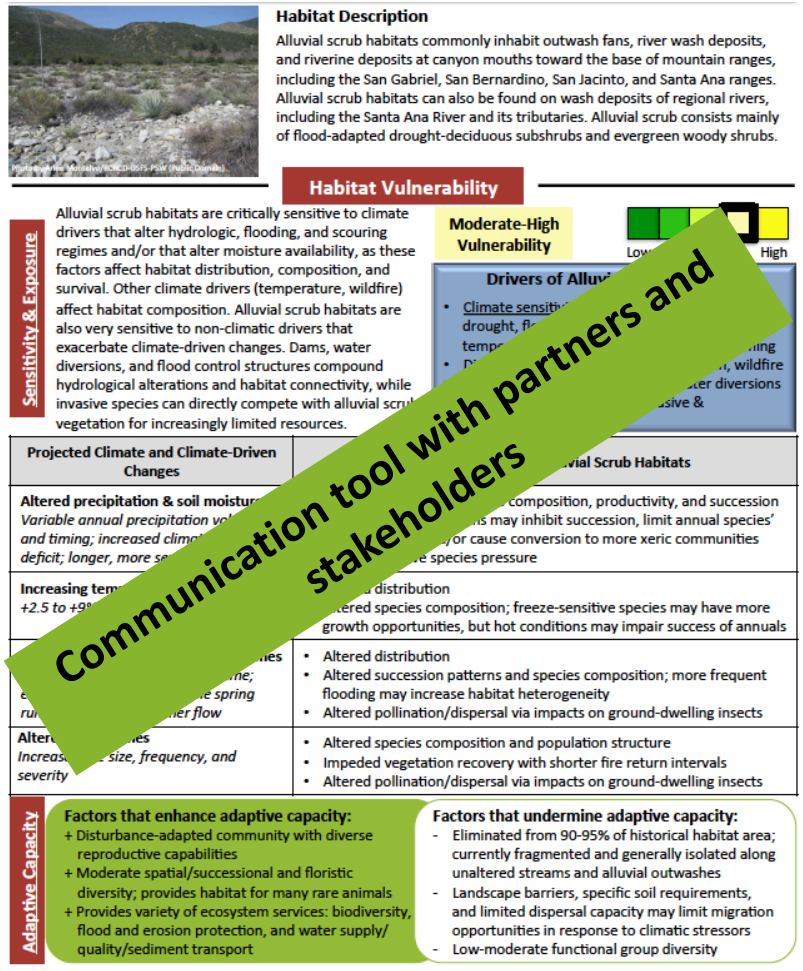
Step 2. Products

1. **Ranked List**
   - Most to least vulnerable

2. **Vulnerability Syntheses**
   - State-of-the-science assessment
   - Examines key vulnerabilities and provides in-depth discussions of potential impacts

3. **Vulnerability Brief**
   - Vulnerability snapshot
   - Lists key vulnerabilities, and provides brief description of primary impacts

HABITAT	VULNERABILITY	CONFIDENCE
Pinyon-Juniper	Moderate-High	High
Alluvial Scrub	Moderate-High	High
Riparian	Moderate	Moderate
Desert	Moderate	High
River & Streams	Moderate	Moderate



Communication tool with partners and stakeholders

Step 3. Adaptation Planning

Goal: Develop adaptation strategies and actions to reduce vulnerabilities or increase resilience of focal resources

- Generate a suite of adaptation strategies and actions

Adaptation Strategy	Specific Adaptation Actions
Restore fluvial processes to streams that support alluvial scrub vegetation	• *Remove dikes, mining operations, and recharge basins that obstruct the migration ability of streams and sediment deposition areas* • Require undeveloped buffers along streams • *Raise roads out of washes*
Maintain and/or restore the natural and historical characteristics of a watershed	• Designate critical habitat where the most sensitive species are found, and in areas where the home ranges of several species overlap
Promote species that are tolerant of climatic changes	• Build a reserve of seeds and plants that are tolerant of disturbed conditions • *Restore habitat with native species that are tolerant of disturbed conditions and climatic extremes*

  - Where, when, and how those actions can be applied
  - Implementation feasibility and effectiveness
  - Stressors action helps to reduce or minimize

Step 3. Products

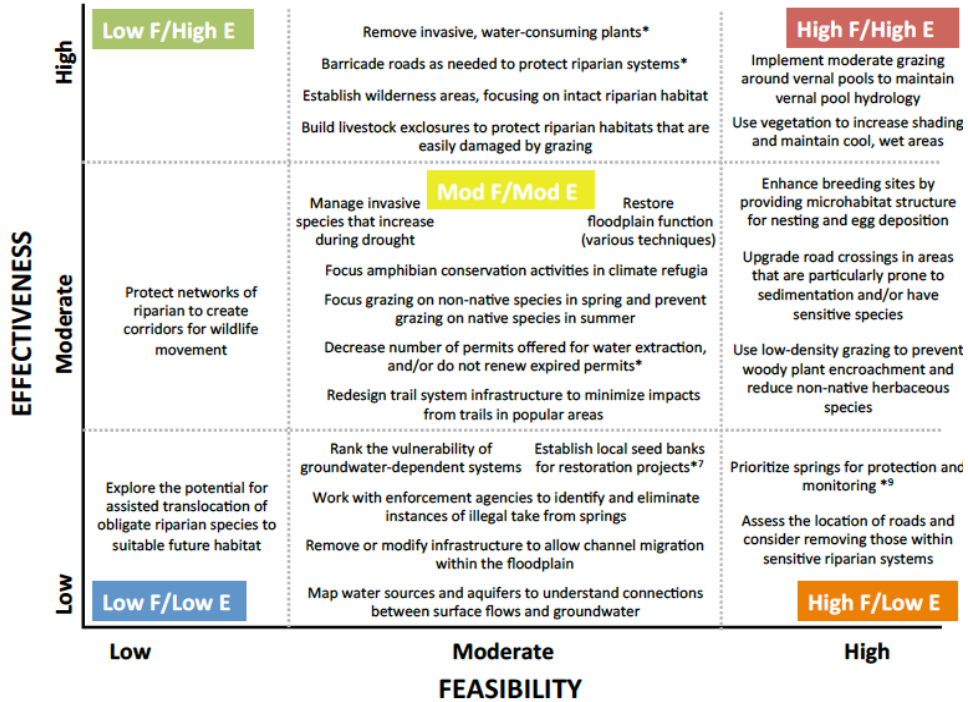
1. Adaptation Summaries

- Tables of adaptation options
- Adaptation actions linked to stressors
- Feasibility & Effectiveness figure

Management Activity	Adaptation Actions	Climate Stressors: ↑ Air temperature	Climate Stressors: Altered precipitation (timing & amount); ↓ Soil moisture	Disturbance Regimes: ↑ Flooding & soil erosion	Disturbance Regimes: Altered wildfire regimes	Non-Climate Stressors: Invasive & problematic species
Habitat Management and Restoration Activities	Designate critical habitat where the most sensitive species are found, and in areas where the home ranges of several species overlap		✔	✔	✔	✔
	Conduct a common garden experiment of plants from across the species' range in order to understand the level of adaptive variation within the population	✔	✔			
	Build a reserve of seeds and plants that are tolerant of disturbed conditions		✔	✔	✔	
	Restore habitat with native species that are tolerant of disturbed conditions and climatic extremes	✔	✔	✔	✔	✔
	Identify and protect areas that may be buffered from the effects of climate change, including microhabitats that may provide cooler temperatures or maintain higher soil moisture during periods of drought	✔	✔			
	Conduct a common garden experiment to determine which species are most likely to persist under projected climate conditions	✔	✔	✔	✔	
	Use species distribution modeling to improve understanding and acceptance of facilitated migration for plant species	✔	✔			
Watershed Improvement	Remove dikes, mining operations, and recharge basins that obstruct the migration ability of streams and sediment			✔		
	Require undeveloped buffers along streams			✔		
	Raise roads out of washes			✔		

2. Adaptation Brief

- Adaptation snapshot
- Lists key adaptation options, and provides brief description of implementation feasibility and effectiveness



Step 4. Adaptation Implementation

Goal: Create adaptation implementation plans for and/or integrate climate information into selected sites/projects

- Collaboratively integrate vulnerability and adaptation information into on-the-ground projects
  - Adaptation actions to implement first
  - How to implement
  - Lead organization/entity
  - Capacity needed

Step 4. Products

1. **Implementation Plans**
   - Outline steps to take in what order, lead entity, capacity needed

2. **Case Studies**
   - Demonstrate how to integrate climate vulnerability and adaptation information into on-the-ground projects

The Trabuco Creek Watershed Improvement Project

A Southern California Climate Change Adaptation Case Study

Overview

Climate change may affect the ability to achieve on-the-ground project goals and objectives. The following case study demonstrates how climate change vulnerability and adaptation information can be integrated into existing and future regional watershed improvement projects to increase overall project resilience. For this example, resource managers and regional stakeholders worked together to evaluate: 1) how climate and non-climate vulnerabilities could impact the ability to achieve project goals, 2) what current project actions help to address or minimize vulnerabilities, and 3) what new actions could be added to the project to address remaining vulnerabilities. While this specific project has already been completed, developing and revising watershed improvement plans is a common activity in southern California, and this type of process could easily be replicated in future projects.

Trabuco Creek Project Goals and Actions

The Cleveland National Forest conducted a watershed improvement project in Trabuco Creek, a stream in the semi-arid Santa Ana Mountains with high recreation use, including multiple private recreation residences, and several instream dams and hardened road crossings (i.e., fords). The goals of this project were to:

1. Improve aquatic organism passage by increasing and maintaining stream habitat connectivity; and
2. Improve stream and riparian habitat quality, sustainability, function, and availability for fish, reptiles, amphibians, and birds.

Primary project actions included:

- Remove barriers to aquatic organism passage (e.g., small-scale, non-functioning instream fords and dams)
- Add channel complexity
- Remove invasive vegetation

STEP ONE: Identifying Climate and Non-Climate Vulnerabilities

How may climate change and non-climate stressors affect the ability to meet goals or implement project actions?

Increased drought

- Impacts stream habitat availability and conn
  by reducing or eliminating streamflow
- Impacts riparian habitat quality and compos
  decreasing water availability, and may favor
  species

Increased flooding

- Impacts stream habitat quality and function
  increasing erosion, channel scour, and pollu
- Impacts riparian habitat quality, composition
  distribution by increasing disturbance

Increased air temperature

- May affect movement or survival of tempera
  sensitive aquatic organisms by increasing w
  temperature

Increased invasive plants

STEP TWO: Reducing Vulnerabilities Through Existing Project Actions

Which existing project actions help address potential vulnerabilities?

ACTION: Remove barriers to aquatic organism passage
- ✔ Increases stream habitat connectivity and aquatic organism passage by removing physical barriers
- ✔ Increases stream habitat availability by allowing access to upstream areas

ACTION: Add channel complexity
- ✔ Increases stream habitat quality by slowing floodwaters to minimize channel scour and erosion
- ✔ Increases stream habitat availability and functioning by increasing habitat complexity
- ✔ Increases available refugia from high water temperatures by promoting pooling of cool, deep water
- ✔ Increases water availability for riparian habitats by slowing floodwaters
- ✔ Reduces potential for riparian habitat composition and distribution changes by slowing floodwaters

ACTION: Remove invasive vegetation
- ✔ Increases riparian habitat quality and functioning by reducing invasive species pressure
- ✔ Maintains riparian and stream habitat quality by reducing risk of wildfire and associated elevated erosion

STEP THREE: Integrating New Project Actions to Address Remaining Vulnerabilities

Which additional actions could be implemented in the future to further reduce identified vulnerabilities?

ACTION: Build a system water budget to better manage water and multiple uses
- ✔ Increases stream habitat availability and connectivity and maintains water availability for riparian vegetation by mitigating potential harmful water extractions that could reduce streamflow

ACTION: Manage recreation in sensitive habitat areas
- ✔ Reduces erosion and unwanted sediment movement
- ✔ Maintains riparian water availability and increases stream habitat availability and connectivity by limiting recreational water use and extractions

ACTION: Manage erosion and sedimentation associated with roads and other infrastructure
- ✔ Reduces erosion and unwanted sediment movement

ACTION: Manage for fire (e.g., consider fire risk in restoration projects)
- ✔ Reduces likelihood of erosion and unwanted sediment movement by mitigating fire risk
- ✔ Reduces flood volumes by promoting a vegetated landscape that slows runoff

EcoAdapt™

P.O. Box 11195
Bainbridge Island, WA 98110
+1 206 201 3834
info@ecoadapt.or

Product of EcoAdapt's Awareness to Action Program Southern California Climate Adaptation Project.
Funded by the U.S. Forest Service and California Landscape Conservation Cooperative.

Opportunities for Collaboration

1. **Vulnerability assessment**: Review draft assessments for resources of interest
2. **Adaptation planning**: Review draft strategies/actions
3. **Adaptation implementation:** Participate in workshops (date TBD)

Project Methodology

Focal Resources

Vulnerability Assessment

Adaptation Planning

Adaptation Implementation

Step 1

Identify focal resources; gather relevant data and info

Step 2

Assess vulnerability of focal resources

Step 3

Use assessment results to identify adaptation options

Step 4

Develop implementation plans for on-the-ground action

Phase 1: Vulnerability Assessment

Phase 2: Adaptation Planning

Workshop Objectives

Day 1

- Provide participants with an overview of projected future trends for the region
- Assess vulnerabilities of habitats to climate change and identify adaptation strategies

Day 2

- Present case studies of moving from adaptation planning to implementation
- Assess vulnerabilities of species groups/species and identify adaptation strategies

Questions?

Example products from other efforts:

- Climate Adaptation Project for the Sierra Nevada
  - http://ecoadapt.org/programs/adaptation-consultations/calcc
- Southern California Climate Adaptation Project
  - http://ecoadapt.org/programs/adaptation-consultations/socal

EcoAdapt™
Meeting the challenges of climate change

FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

CONSERVATION
BIOLOGY
INSTITUTE