

# Mapping to Facilitate Adaptation Planning for the Sierra Nevada

Jessi Kershner, Lead Scientist  
jessi@ecoadapt.org



**EcoAdapt**<sup>TM</sup>  
*Meeting the challenges of climate change*

# Talk Goals

- How did we decide what to map? *Using the Vulnerability Assessment Workshop to identify key data layers and maps for resources*
- How mapping products can inform *implementation* of adaptation approaches and actions
- Introduction to Data Basin workshop page



# Why Use Maps in Adaptation Planning?

- We often develop adaptation strategies without specifying where they should be done
  - E.g., increasing connectivity, establishing new reserves
- A really great first step, but if we want to move from planning to implementation we need to identify **WHERE** to implement
- There is a large amount of spatial information out there – both climate and non-climate

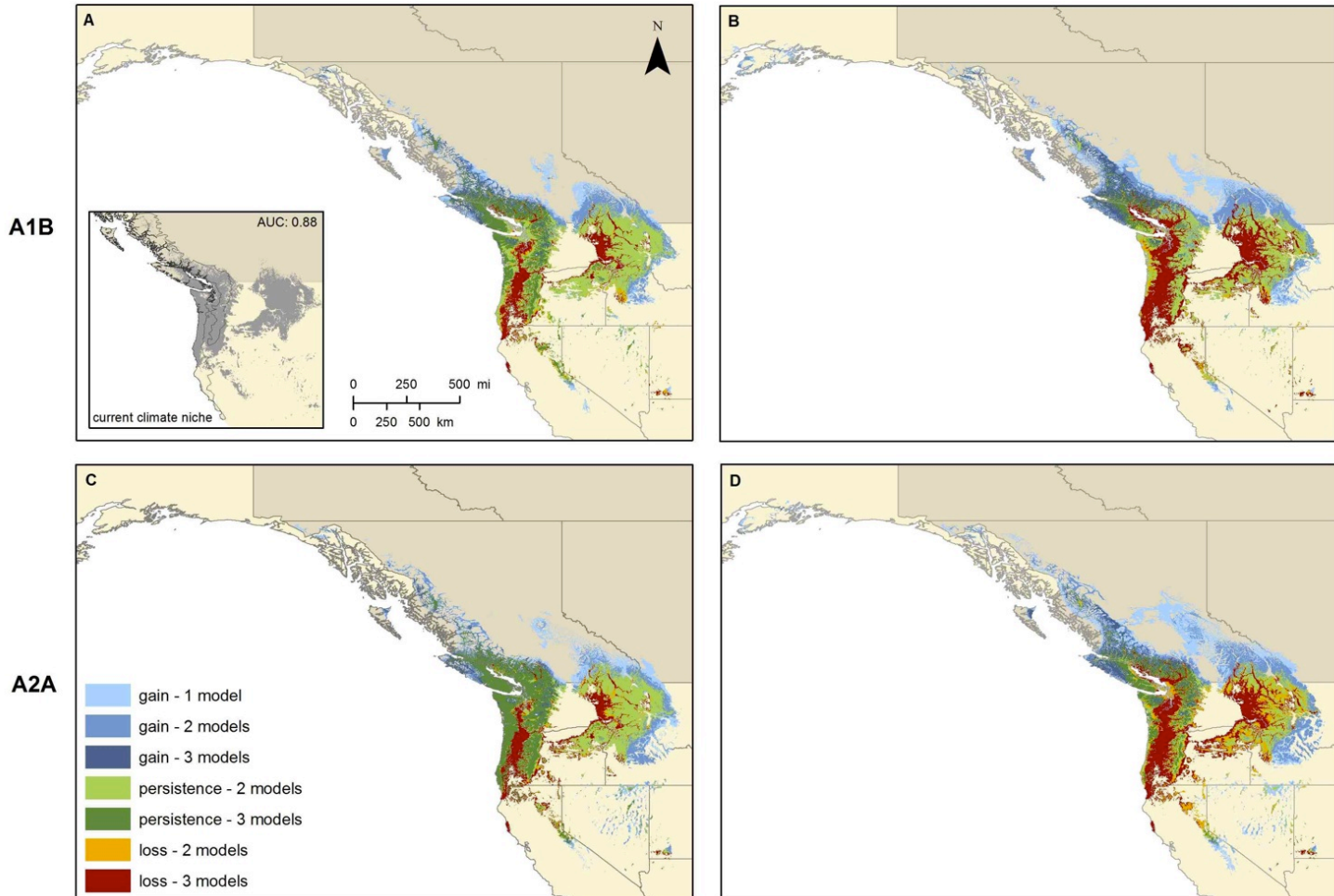


# How do we use this “stuff” in adaptation planning?

Sea Level Rise Projections (1-meter by 2100) for Site 1:  
Nooksac

2050

2080



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- There is a large amount of spatial information out there – both climate and non-climate
- **We just need to figure out how to use it to identify where to implement adaptation actions**



# Deciding What to Map

Vulnerability Assessment Workshop (March 2013)

- Goal 1: To use the results of the vulnerability assessment to identify key climate and non-climate elements for each resource
- Goal 2: To use the results of the Yale Framework exercise to tie map products to adaptation strategies for each resource



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# Example: Oak Woodlands

## Key Climate Elements

- Precipitation
- Climatic water deficit
- Wildfire
- Runoff

## Key Non-Climate Elements

- Grazing
- Urbanization

## Data Basin

→ Created maps comparing existing oak woodlands with identified climate elements

→ Available to be added on as additional layers





# Example: Oak Woodlands

## Where to Implement

Adaptation Approach: Manage herbivory to protect or promote regeneration



Action: Fence priority areas



Use maps to identify “priority areas” such as:

1. Where oak woodlands are likely to be resistant to future climate changes
2. Where oak woodlands are projected to expand
3. Where oak woodlands are currently fragmented but likely to resist climate changes



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# Yale Mapping Framework

- Online tool to link general adaptation approaches to the kinds of mapping and modeling that will help you identify where on the landscape to implement the approach
- Focuses on 6 general approaches:
  - Protect current patterns of biodiversity
  - Protect intact natural landscapes and ecological processes
  - Protect the geophysical setting
  - Identify and manage areas that will provide future climate space for organisms
  - Identify and protect climate refugia
  - Maintain and restore ecological connectivity



# Yale Mapping Framework

Adaptation Approach	Ecological Level		
	Species & Population	Ecosystem	Landscape
1) Current patterns of biodiversity	Map species occurrences		Map biodiversity hotspots
2) Intact landscapes and ecological processes		Map potential future patterns of fire	
3) Geophysical setting		Map areas of high ecological integrity Map land facets	
4) Identify areas of future climate space	Map future climate envelopes		
5) Identify and protect refugia		Map areas projected to experience little vegetation change	Map drought refugia
6) Maintain and restore connectivity	Map movement corridors for species migration	Map connections between current and projected future locations	

Example Adaptation Approach: Identify and protect climate refugia for oak woodlands

→ Online tool provides examples of different maps, modeling/mapping approaches and tools, and case studies

# Deciding What to Map

Vulnerability Assessment Workshop (March 2013)

→ Goal 2: To use the results of the Yale Framework exercise to tie map products to adaptation strategies for each resource

→ **Participants created “wish list” of maps for resources**



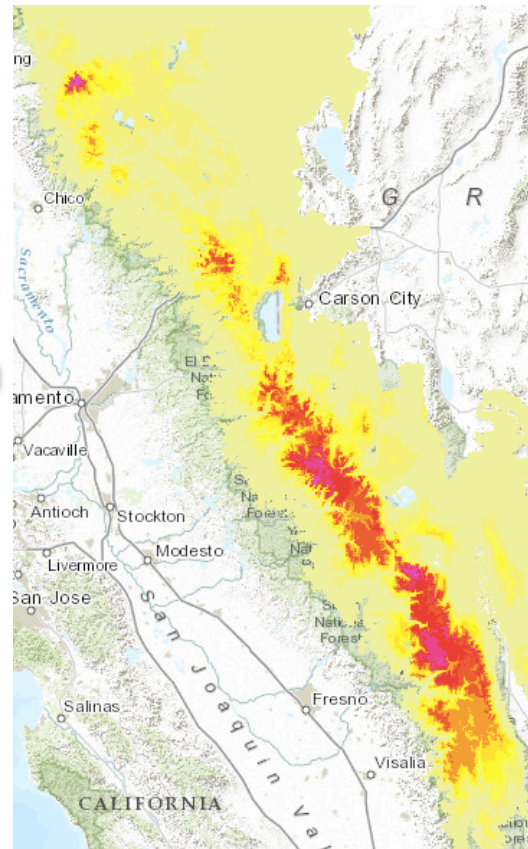
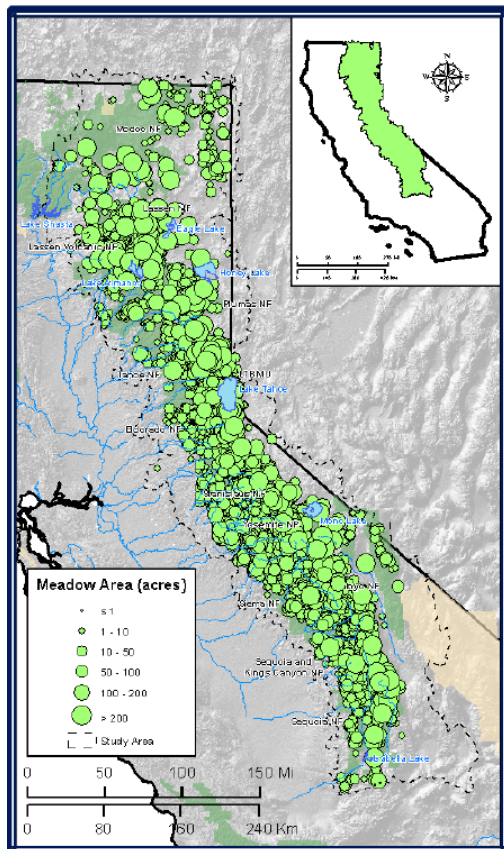
# Example: Meadow ecosystems

Adaptation Approach	Ecological Level		
	Species & Population	Ecosystem	Landscape
1) Current patterns of biodiversity	Map of current species hotspots (e.g., birds, fishes, amphibians) Sierra-wide ★	Map of current meadow condition	
2) Intact landscapes and ecological processes		Identify areas with high meadow diversity along an elevation gradient	Map land ownership and identify intact landscapes ★
3) Geophysical setting		Identify areas with meadow form (soils, topography, etc.) that are currently resilient features	
4) Identify areas of future climate space	Climate envelope models for birds, amphibians, fish, insects	Determine meadow area above future predicted snowline ★	
5) Identify and protect refugia	Predict future distribution of species at the meadow scale	Using key climate variables to evaluate meadow vulnerability ★	
6) Maintain and restore connectivity		Map comparisons between current and projected future locations of meadows	Identify clusters of future meadows and riparian corridors that connect them



# Spatial Analysis: Meadows

Use key climate variables to evaluate meadow exposure to Identify & Protect Refugia



Climate Variables:  
-Snowpack  
-Climatic Water Deficit  
-Recharge  
-Runoff



# Spatial Analysis: Meadows

Meadow location + Climate variables + Grazing allotments

Identify:

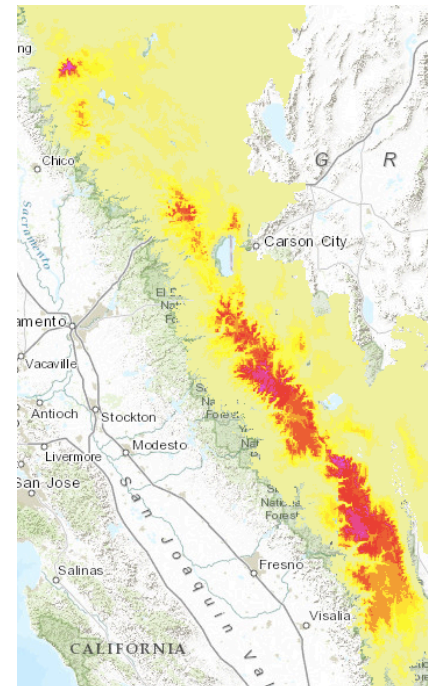
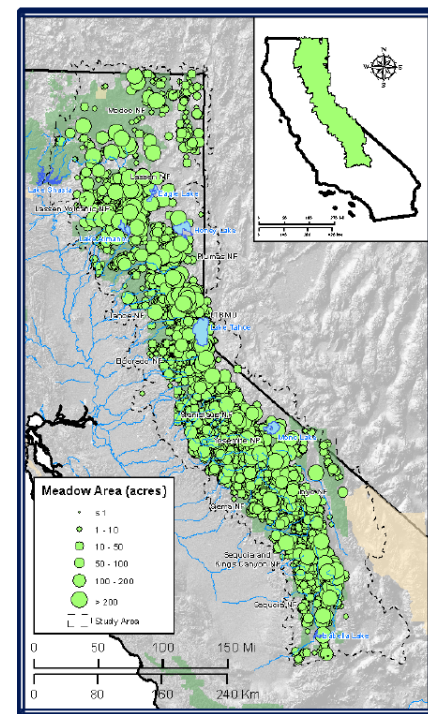
## 1. Meadows w/low exposure and no grazing (refugia)

- Protection/Passive management (federal/state lands)

Can also use maps to identify:

## 1. Meadows w/high exposure and no grazing

- Restoration to increase resilience, implement monitoring plan to track climate changes





# Implementation Plan – Day Two

DEVELOP implementation plan for priority actions.

- Who could implement – agency, organization, private landowner?
- Timeframe – near-term actions vs. longer-term
- **Where to implement – possible areas to target actions**

