

A Vulnerability Assessment and Adaptation Strategies for Focal Resources of the Sierra Nevada

Jessi Kershner, Lead Scientist
jessi@ecoadapt.org



Talk Goals

- Provide full project overview (how this workshop fits into a larger context)
- Introduce focal resource list
- Discuss workshop goals



Two Big Questions:

1. How vulnerable are the communities, ecosystems, species, habitats, services, etc. that we care about to climate change? [***Vulnerability Assessment***]
2. What can we do to limit or reduce vulnerability? [***Adaptation Planning***]

→ ***Setting out to answer these questions for resources of management importance in the Sierra Nevada***



Project Overview

- History
- About
 - Main partners: EcoAdapt, USFS TACCIMO, Geos Institute, CBI
 - Geographic scope
 - Funding, timeline
- Overall goal



Photos: Sierra Forest Legacy



Yale Mapping Framework



GEOS
INSTITUTE



TACCIMO
Template for Assessing Climate Change
Impacts and Management Options

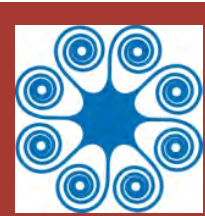


Objectives

1. Assess the vulnerability of a suite of focal resources to climate change;
2. Use spatial analysis and expert input to prioritize conservation areas or actions; and
3. Identify implementable management responses to climate change in the Sierra Nevada.

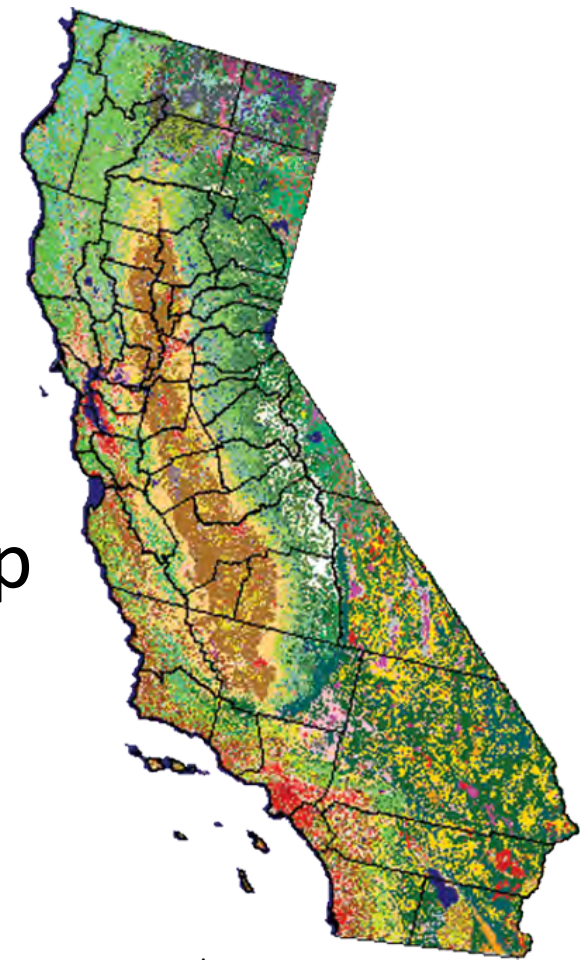
Photos: Jonny Armstrong





Project Components

1. Convene committees
2. Select focal resources
3. Vulnerability assessment workshop
4. Spatial analysis
5. Adaptation planning workshop
6. Finalize products



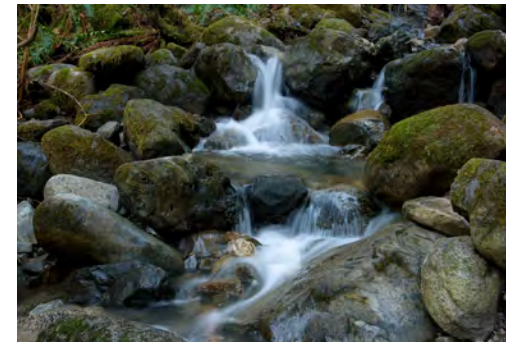
Photos: Jonny Armstrong



1. Convene Committees

1. Convene committees

- Science Advisory Group
- Stakeholder Advisory Committee



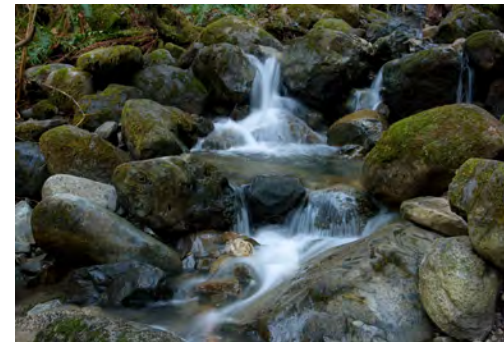
Photos: Jonny Armstrong



1. Convene Committees

1. Convene committees

- Science Advisory Group
 - Dominique Bachelet, CBI
 - Ryan Burnett, PRBO
 - Lorraine Flint, USGS
 - John Gallo, TWS
 - Dave Herbst, UCSB
 - Connie Millar, USFS
 - Hugh Safford, USFS
 - Nate Stephenson, USGS
 - Anthony Westerling, UC Merced



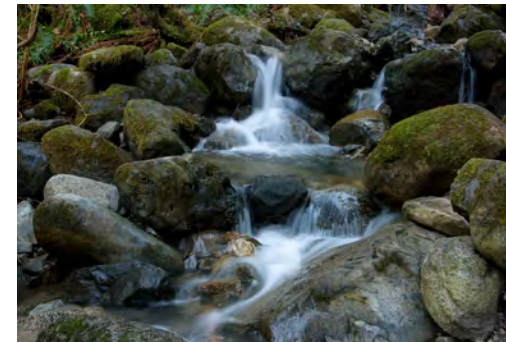
Photos: Jonny Armstrong



1. Convene Committees

1. Convene committees

- Science Advisory Group
- Stakeholder Advisory Committee
 - Whitney Albright, CDFW
 - Susan Antenen, CBI
 - Greg Aplet, TWS
 - Sue Britting, Sierra Forest Legacy
 - Aimee Delach, Defenders of Wildlife
 - Mark Drew, Cal Trout
 - Gavin Feiger, Sierra Nevada Alliance
 - Steve Frisch, Sierra Business Council
 - Bruce Goines, USFS Region 5
 - Bruce Hamilton, Sierra Club
 - Chrissy Howell, USFS Region 5
 - Susan Joyce, Inyo National Forest
 - Chris Keithley, Cal Fire
 - Bill Kuhn, Yosemite National Park
 - Kris Kuyper, Sierra Business Council
 - Marc Meyer, USFS Southern Sierra Province
 - Koren Nydick, Sequoia and Kings Canyon National Parks
 - Michelle Selmon, CDWR
 - Michele Slaton, Inyo National Forest

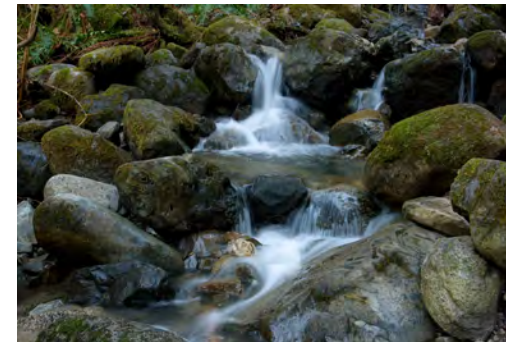


Photos: Jonny Armstrong



2. Select Focal Resources

1. Convene science and stakeholder committees
2. Develop common list of focal resources
 - Forest Service developed initial list
 - Shared list with science and stakeholder committees for input
 - Revised list



Photos: Jonny Armstrong



2. Select Focal Resources

- A. 9 ecosystems (we call “coarse filters”)
1. Subalpine and Alpine
 2. Yellow Pine and Mixed Conifer
 3. Meadows, Riparian, and Fen Ecosystems
 4. Aquatic Ecosystems
 5. Sagebrush (arid shrublands)
 6. Chaparral
 7. Oak Woodlands
 8. Red Fir
 9. Pinyon-Juniper



2. Select Focal Resources

- A. 9 ecosystems (we call “coarse filters”)
- B. 45 species or assemblages (we call “fine filters”)
 - Went through prioritization exercise



2. Select Focal Resources

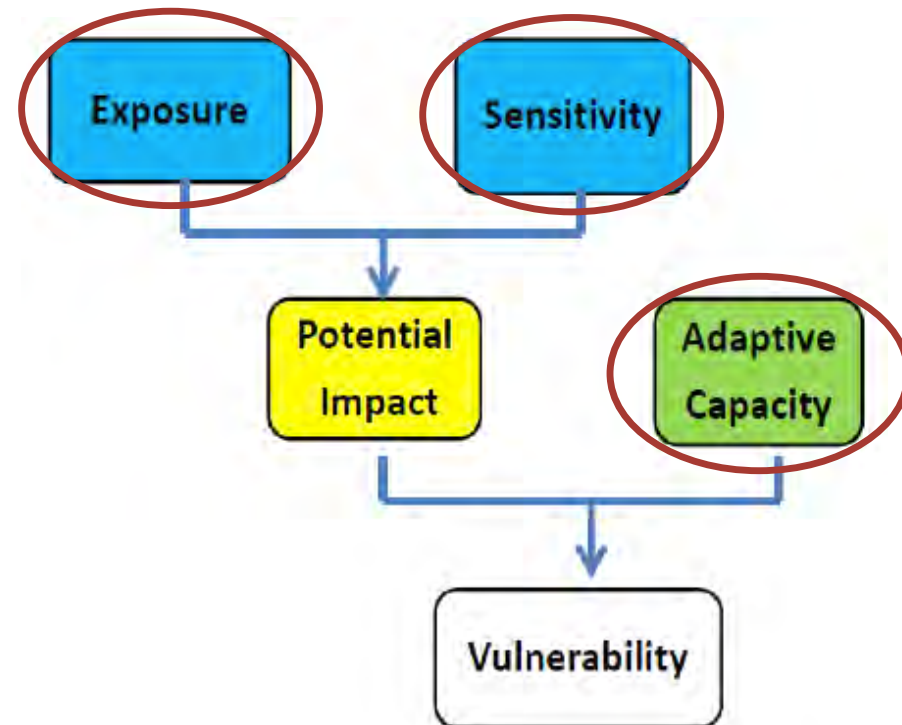
- A. 9 ecosystems (we call “coarse filters”)
- B. 45 species or assemblages (we call “fine filters”)
- C. 11 ecosystem services
 1. Biodiversity
 2. Forage production
 3. Timber production
 4. Freshwater
 5. Carbon storage
 6. Flood protection/Erosion control
 7. Groundwater recharge
 8. Water quality
 9. Nutrient regulation
 10. Fire
 11. Recreational and aesthetic values



3. Vulnerability Assessment Workshop

Goal 1: Assess vulnerability of subset of identified focal resources through Expert Elicitation

- Day 1: Ecosystems
- Day 2: Species/Assemblages and Services

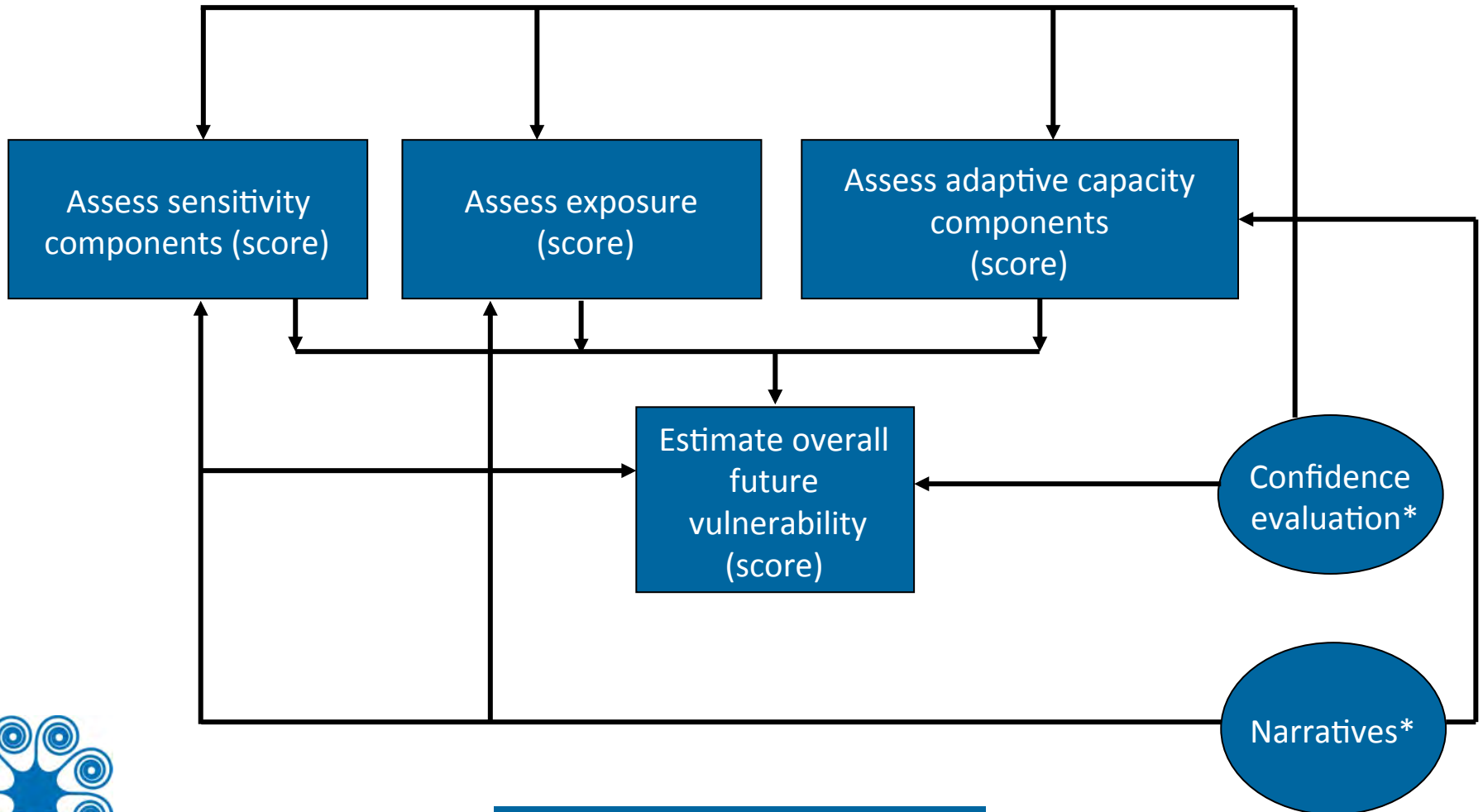


$$E + S - AC = \text{VULNERABILITY}$$



Estimating Vulnerability Through Expert Elicitation

Modified NEAFWA expert elicitation process



* Documenting uncertainty



3. Vulnerability Assessment Workshop

Goal 1: Assess vulnerability of subset of identified focal resources through Expert Elicitation

Goal 2: Use Yale Mapping Framework to identify spatial analysis needs

Photos: Jonny Armstrong



Yale Mapping Framework

- A. The Problem: many spatial approaches but not conveyed in ways to help choose the approach that matches a particular goal or need



Yale Mapping Framework

- A. The Problem: many spatial approaches but not conveyed in ways to help choose the approach that matches a particular goal or need
- B. The Yale Framework: what is it and how can it help?
- Science Panel distilled the many adaptation approaches down to 6 key approaches/objectives
 1. Protect current patterns of biodiversity
 2. Protect large, intact, natural landscapes
 3. Protect geophysical setting
 4. Identify and manage areas that will provide future climate space for species
 5. Identify and protect climate refugia
 6. Maintain and restore ecological connectivity



Yale Mapping Framework

Ecological Level			
Adaptation Approach	Species & Population	Ecosystem	Landscape
A. Strengthen current conservation efforts			
1) Protect current patterns of biodiversity	<ul style="list-style-type: none"> • Map species occurrences • Assess population sizes, viability, conservation status 	<ul style="list-style-type: none"> • Map terrestrial and aquatic ecosystems and their associated services 	<ul style="list-style-type: none"> • Map genetic pattern across the landscape • Map biodiversity hotspots
2) Protect large, intact, natural landscapes	<ul style="list-style-type: none"> • Forecast climate change effects on species viability • Forest climate change effects on pests, diseases, or invasive species 	<ul style="list-style-type: none"> • Map potential future patterns of fire, hydrology, carbon sequestration 	<ul style="list-style-type: none"> • Analyze projected trends in climate variables • Map factors related to ecological integrity (e.g., fragmentation)

3. Vulnerability Assessment Workshop

Goal 1: Assess vulnerability of subset of identified focal resources through Expert Elicitation

Goal 2: Use Yale Mapping Framework to identify spatial analysis needs

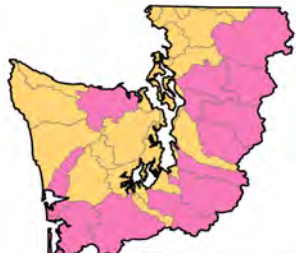
- What kinds of spatial info or mapping will help you make decisions/achieve your objectives for these resources?



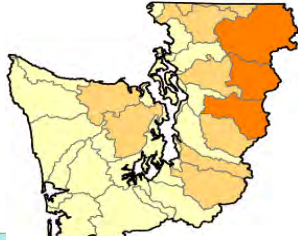
Photos: Jonny Armstrong



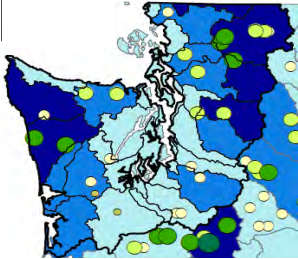
4. Spatial Analysis – DECIDED BY YOU!



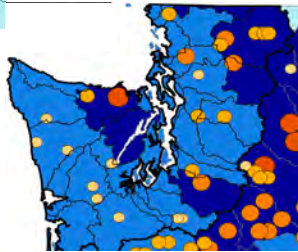
Temperature



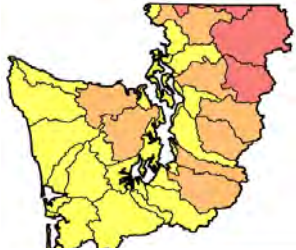
Timing of Flow



Low Flow

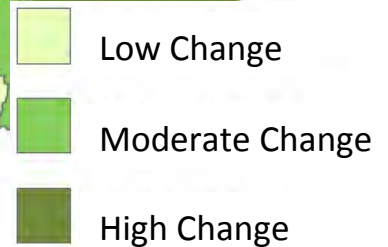
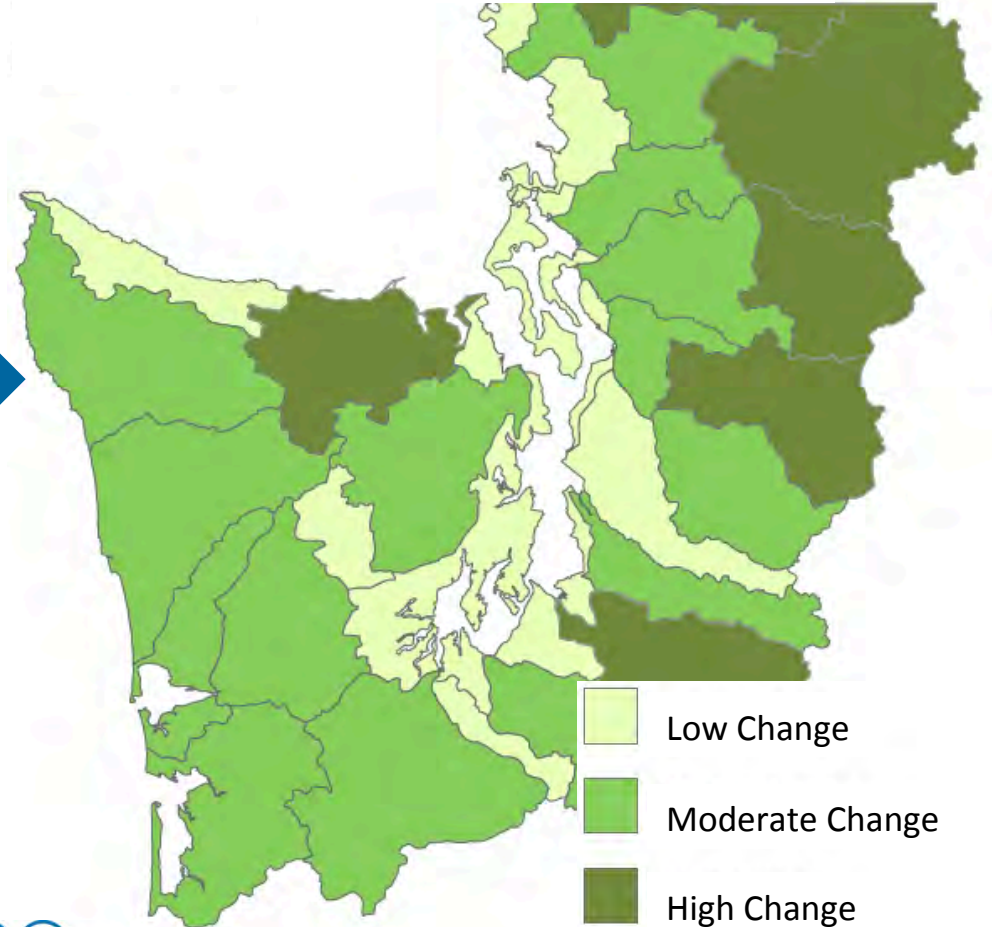


Peak Flood

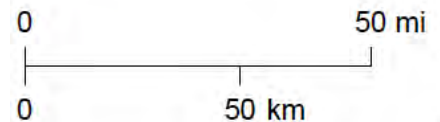


Precipitation
Type

Magnitude of Change by 2080

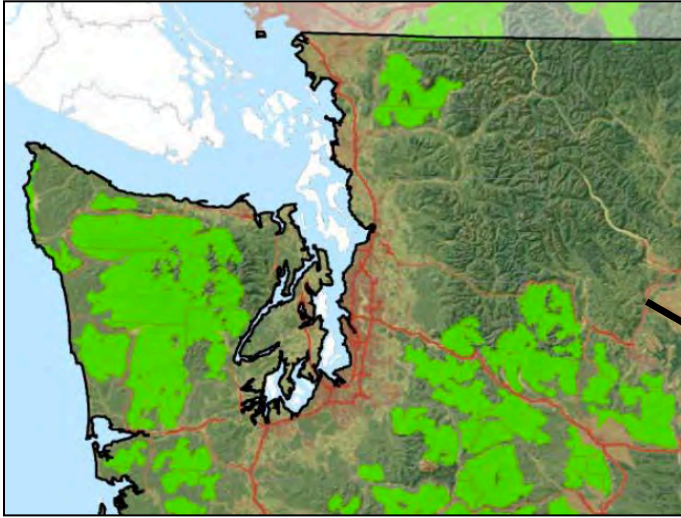


GEOS
INSTITUTE

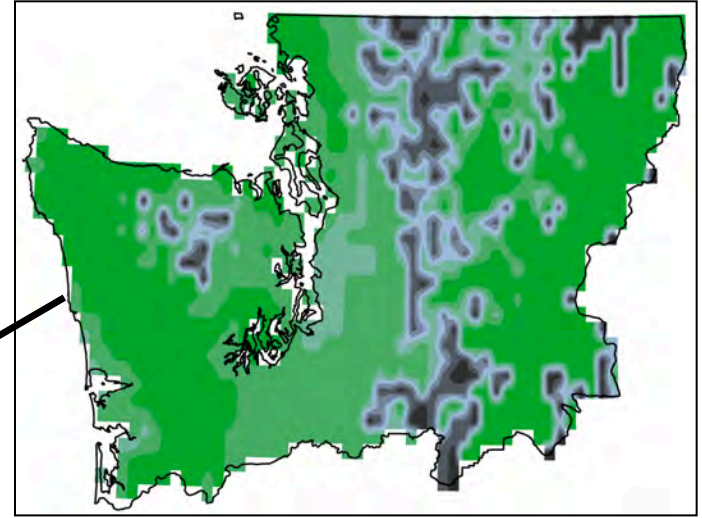


4. Spatial Analysis

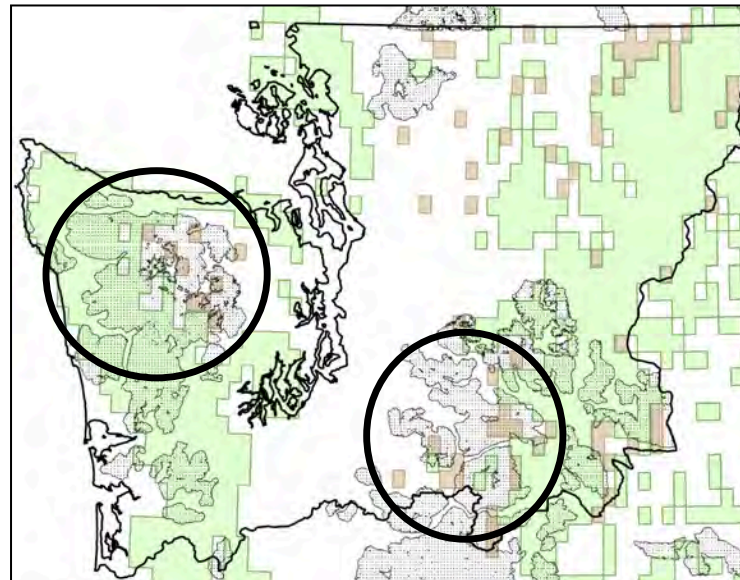
Species habitat concentration areas



Vegetation change



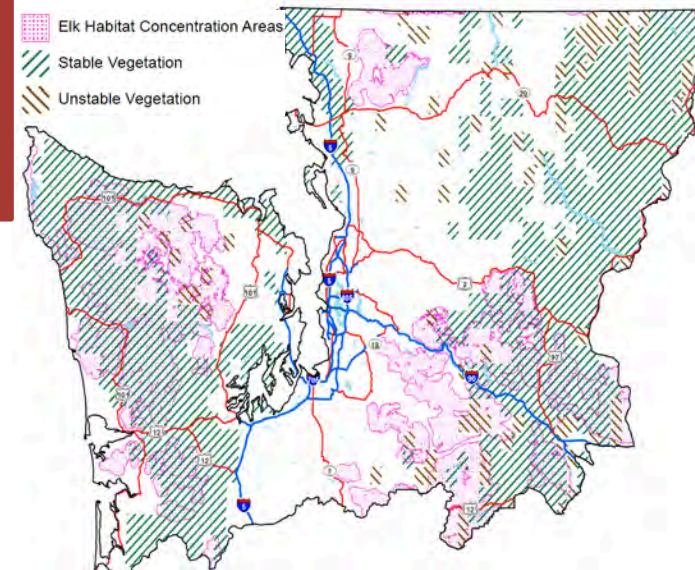
- + Land use
- + Existing or projected development
- + Protected areas



5. Adaptation Workshop

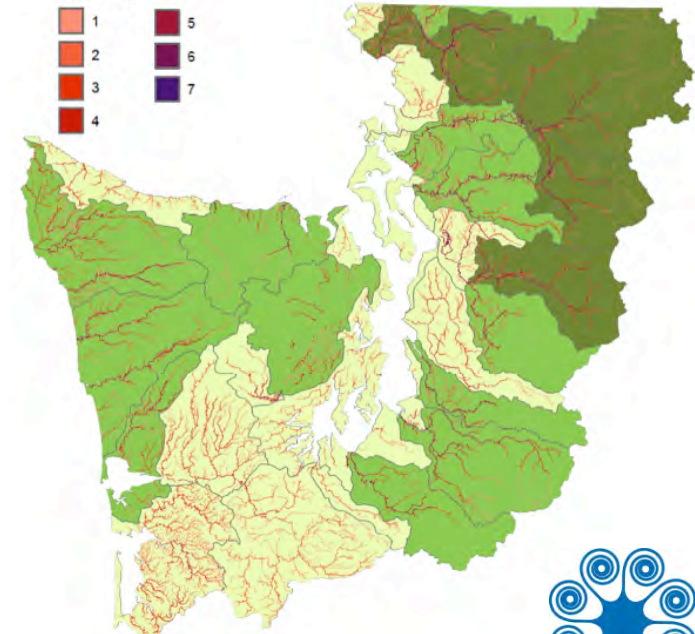
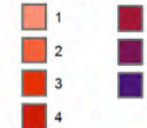
5. Adaptation Planning Workshop (late May 2013)

- Review VA results
- Review results/utility of spatial analysis



Number of Fish Species

(includes Chinook, coho, sockeye, pink, and chum salmon; bull trout; and steelhead)



5. Adaptation Workshop

5. Adaptation Planning Workshop (May 2013)

- Review VA results
- Review results/utility of spatial analysis
- Principles of adaptation and basic training

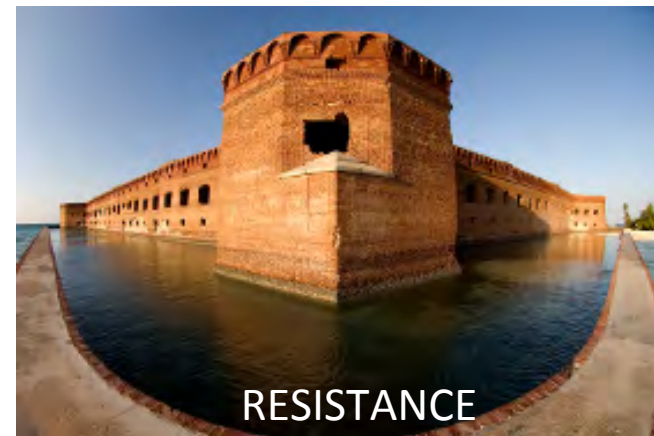


1. LIMIT CHANGE

- Protect places likely to change less
- Limit local/regional change

2. SUPPORT RESISTANCE, RESILIENCE, RESPONSE

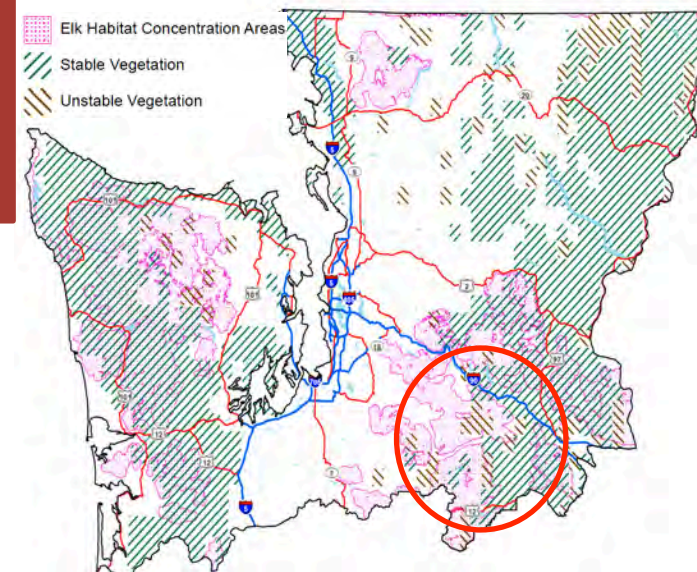
3. MANAGE FOR UNCERTAINTY



5. Adaptation Workshop

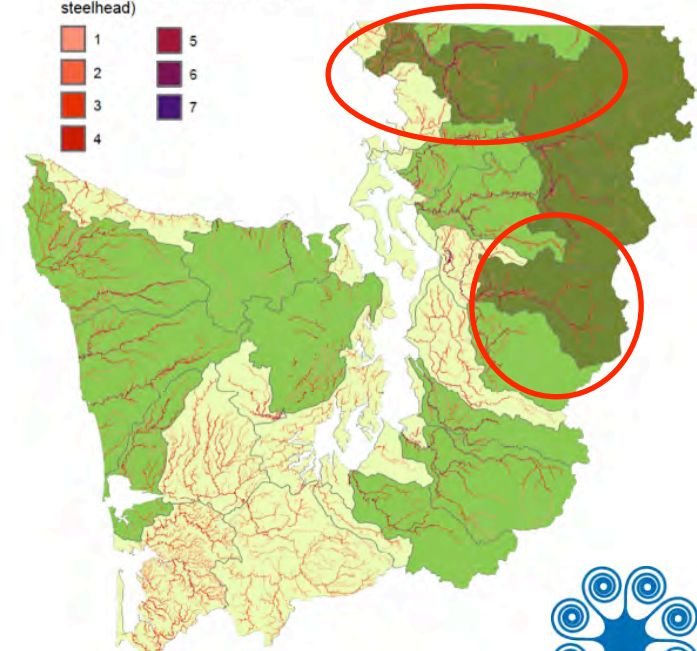
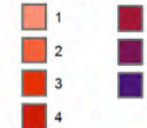
5. Adaptation Planning Workshop (May 2013)

- Review VA results
- Review results/utility of spatial analysis
- Principles of adaptation and basic training
- Develop adaptation strategies and prioritize areas or actions



Number of Fish Species

(includes Chinook, coho, sockeye, pink, and chum salmon; bull trout; and steelhead)

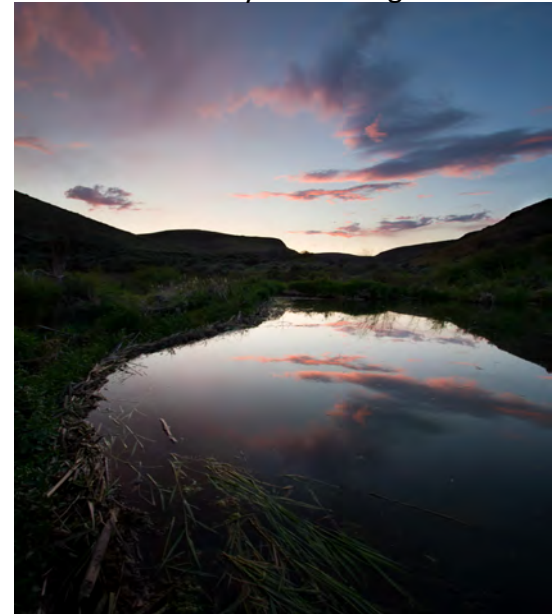


6. Finalize Products

1. Online resource of vulnerability assessment findings
 - Narratives, scores, peer-reviewed resources
2. Comparative maps (digital, pdf)
 - Inform VA and adaptation strategy development
3. Online resource of adaptation strategies for focal resources and the region
4. Workshop support pages
 - Presentations, handouts, worksheets, etc.

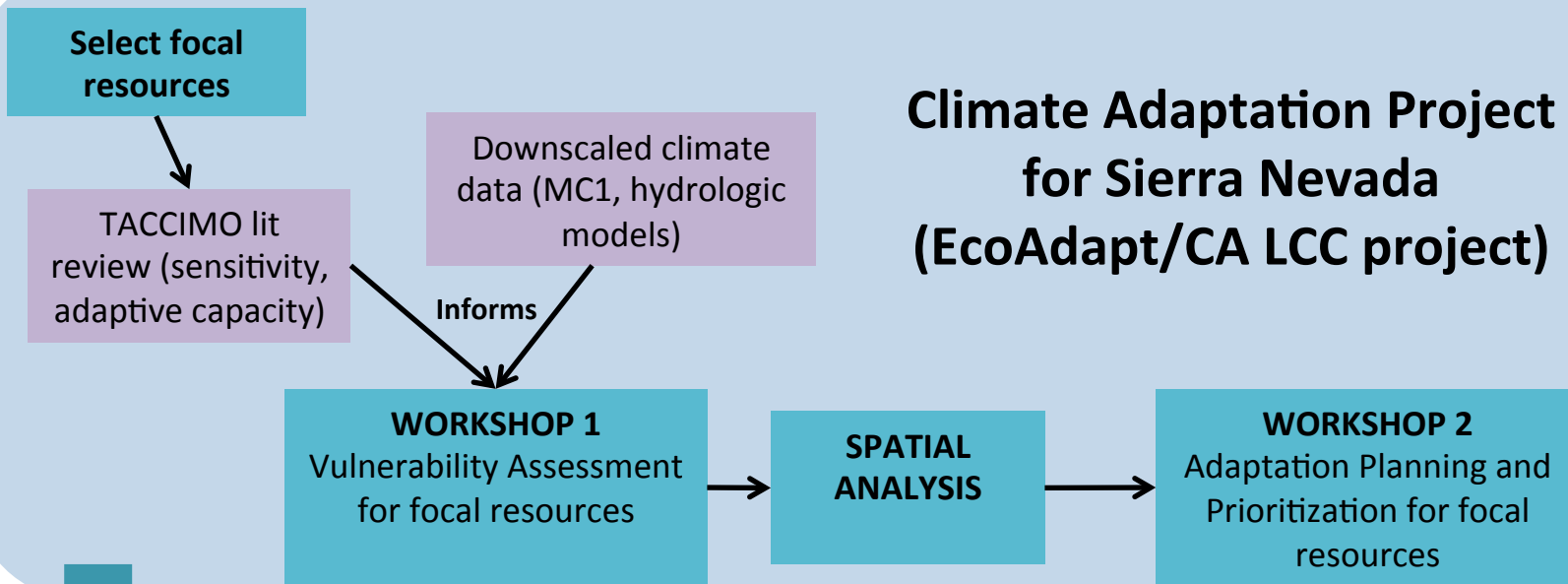


Photos: Jonny Armstrong

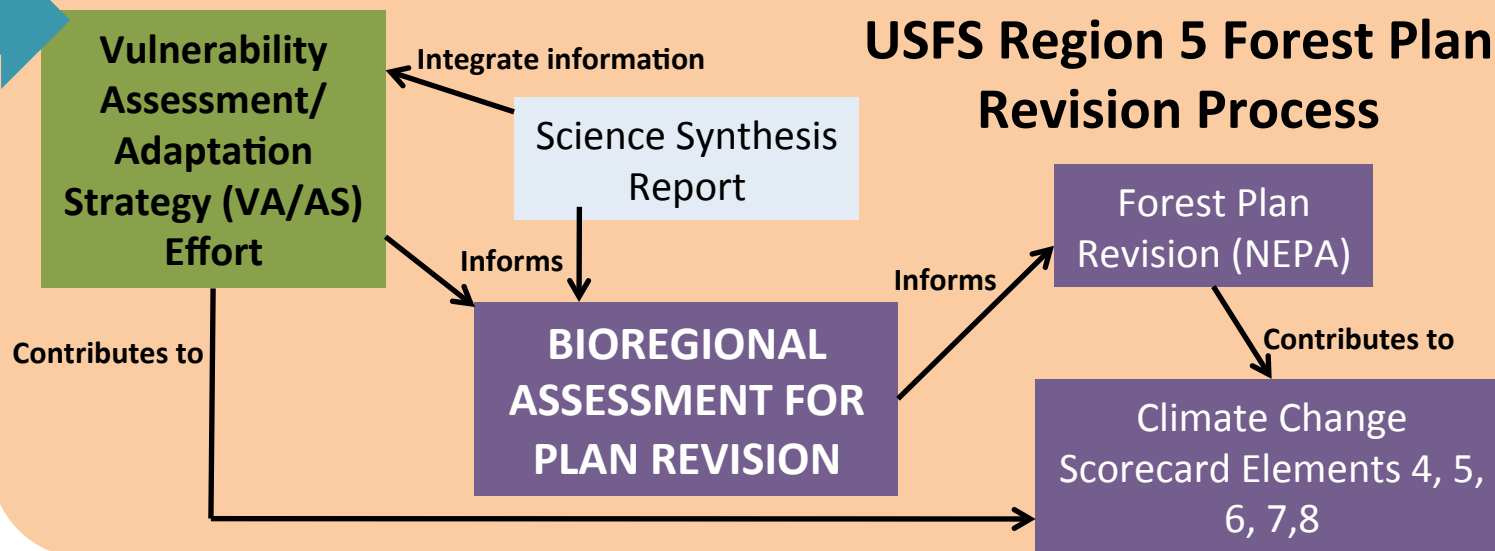


Products will be available online (through CA LCC, EcoAdapt, Data Basin)

Climate Adaptation Project for Sierra Nevada (EcoAdapt/CA LCC project)



How Project Fits with Forest Plan Revisions



Up Next: An Overview of Climate Trends in the Sierra Nevada

