Climate Change Vulnerability Assessment for Nez Perce-Clearwater National Forests

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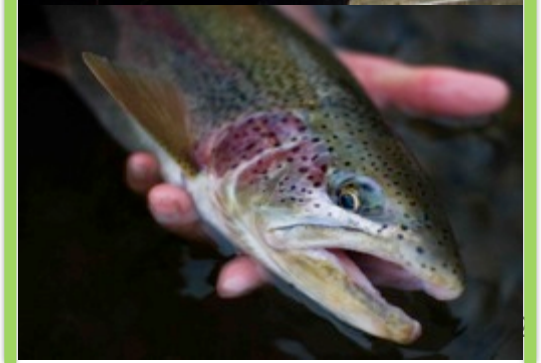
EcoAdapt™
Meeting the challenges of climate change

EcoAdapt

1. **State of Adaptation Program**
   finding out how people are fishing
2. **Climate Adaptation Knowledge Exchange**
   (CAKE; www.cakex.org)
   connecting fishermen
3. **Awareness to Action**
   teaching others to fish
4. **Adaptation Consultation**
   fishing for you

EcoAdapt™
Meeting the challenges of climate change


Photos: J. Armstrong



Outline

A. Project history & need
B. Vulnerability assessment
C. Broader impacts and application
D. Next steps



Project History

- **Fall 2012:** EcoAdapt contacted NPCW about leading a vulnerability assessment workshop
- **Fall 2013:** EcoAdapt & partners lead vulnerability assessment workshop
- **Spring 2014:** Release first version of vulnerability assessment report
- **Fall 2014**: Northern Rockies Adaptation Partnership workshop series on vulnerability and adaptation

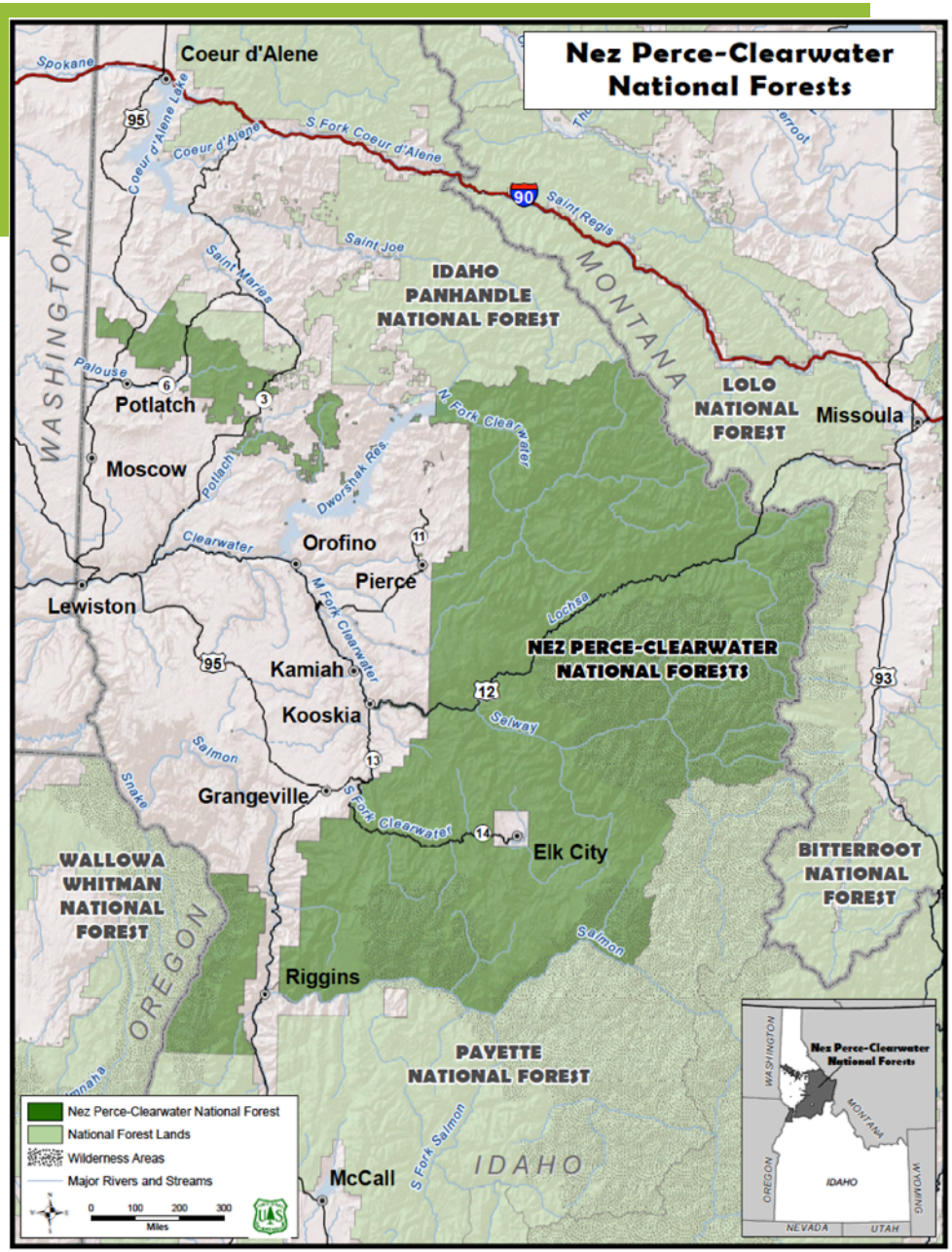
Project Need

- Climate Scorecard
- Forest Plan revision
- Project planning and NEPA

The Forest Service Climate Change Performance Scorecard, 2011 (version 1.3) To be completed annually by each National Forest or Grassland (Unit).		
Scorecard Element	**Unit Name**	**Yes/No**
Organizational Capacity		
1. Employee Education	Are all employees provided with training on the basics of climate change, impacts on forests and grasslands, and the Forest Service response? Are resource specialists made aware of the potential contribution of their own work to climate change response?	
2. Designated Climate Change Coordinators	Is at least one employee assigned to coordinate climate change activities and be a resource for climate change questions and issues? Is this employee provided with the training, time, and resources to make his/her assignment successful?	
3. Program Guidance	Does the Unit have written guidance for progressively integrating climate change considerations and activities into Unit-level operations?	
Engagement		
4. Science and Management Partnerships	Does the Unit actively engage with scientists and scientific organizations to improve its ability to respond to climate change?	
5. Other Partnerships	Have climate change related considerations and activities been incorporated into existing or new partnerships (other than science partnerships)?	
Adaptation		
6. Assessing Vulnerability	Has the Unit engaged in developing relevant information about the vulnerability of key resources, such as human communities and ecosystem elements, to the impacts of climate change?	
7. Adaptation Actions	Does the Unit conduct management actions that reduce the vulnerability of resources and places to climate change?	
8. Monitoring	Is monitoring being conducted to track climate change impacts and the effectiveness of adaptation activities?	
Mitigation and Sustainable Consumption		
9. Carbon Assessment and Stewardship	Does the Unit have a baseline assessment of carbon stocks and an assessment of the influence of disturbance and management activities on these stocks? Is the Unit integrating carbon stewardship with the management of other benefits being provided by the Unit?	
10. Sustainable Operations	Is progress being made toward achieving sustainable operations requirements to reduce the environmental footprint of the Agency?	

Project Overview

- **Audience:** land & resource managers
- **Scope:** NPCW region
- **Vulnerability of:**
  - Ecosystems
  - Species
  - Ecosystem services
- **Adaptation strategies for:**
  - Ecosystems
  - Species
  - Ecosystem services



Nez Perce-Clearwater Process

Pre-workshop	Vulnerability workshop	After workshop	Going forward
Step 1	Step 2	Step 3	Step 4
Identify Priority Resources; Gather Relevant Data and Info	Assess Components of Vulnerability	Synthesize Vulnerability Info	Apply Assessment Results in Adaptation Planning

Focal Resources

- Considered coarse versus fine filter approach in selecting a list
- Species (fine filter) were associated with ecosystems (coarse filter)
- Ultimately groups selected fine filter species given their expertise and whether the species was captured by coarse filter evaluation




Focal Resources: Final List

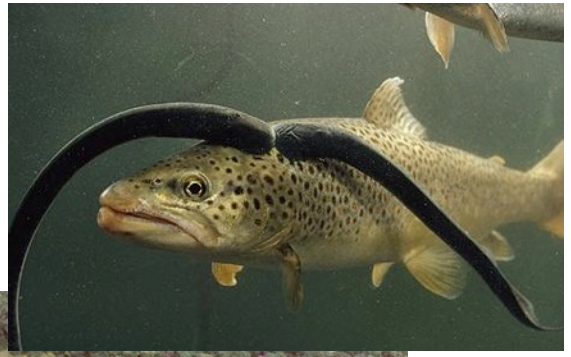
Coarse Filter (Ecosystem)	Fine Filter (Species)
Aquatic	Bull trout Cutthroat trout Fall & Spring Chinook salmon Interior redband trout Steelhead Westslope cutthroat trout
Coastal Disjunct	Red alder
Dry Forest	Flammulated owl Lewis's woodpecker Pygmy nuthatch White-headed woodpecker
Grassland	Spalding's catchfly
Mixed Mesic	Fisher
Riparian	Coeur D'Alene salamander Idaho giant salamander
Subalpine	Canada lynx Mountain goat Whitebark pine Wolverine
Wetlands/Moist Meadows/ Groundwater-Dependent Ecosystems	None

Ecosystem Services
Clean Air
Clean Water
Cultural Values
Flood Control
Forage
Hunting
Landslide Protection
Soil Stabilization
Trout & Salmon
Wildlife Viewing
Wood Products

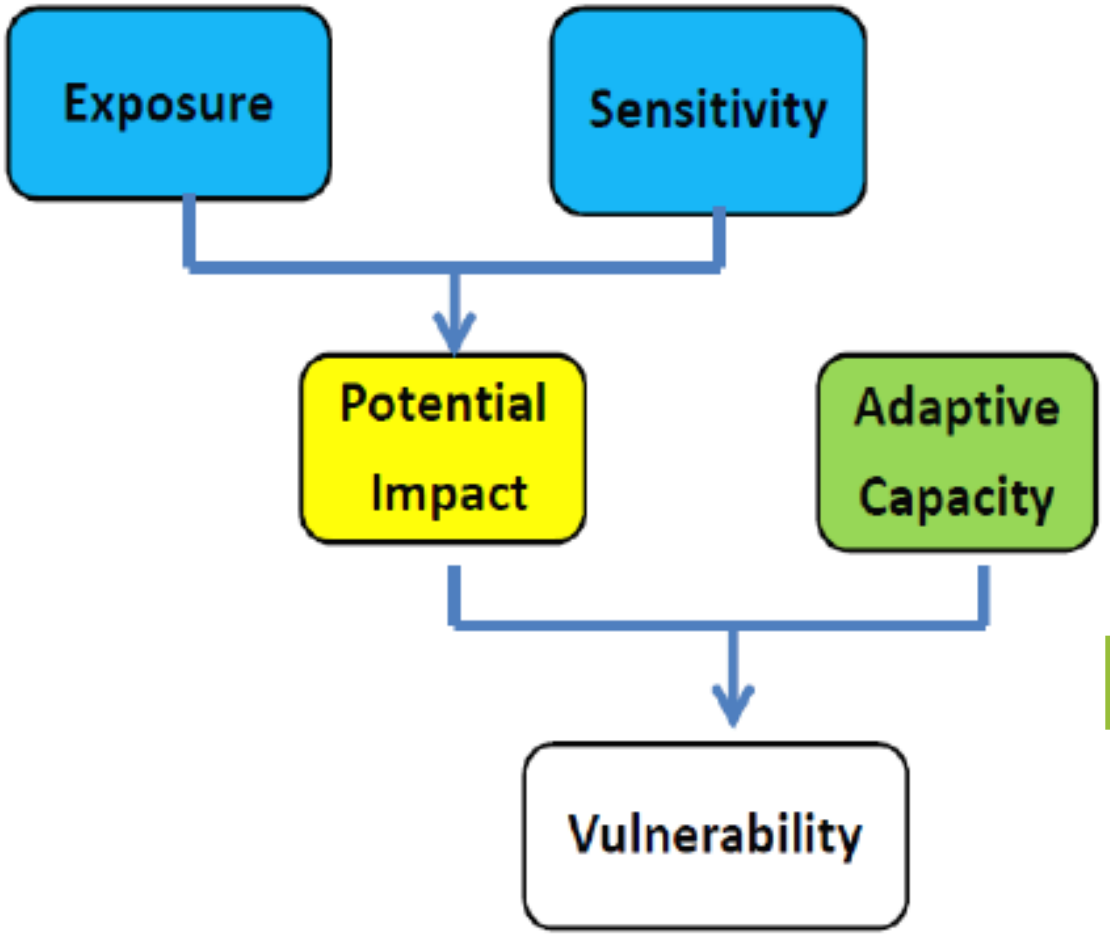
Defining Vulnerability

Climate change vulnerability refers to the extent to which a species, habitat, or ecosystem serviceis susceptible to harm from climate change impacts

- ***What*** things are most vulnerable
- ***Why*** they are vulnerable



Vulnerability Assessment



$$V = \frac{E*S}{AC}$$

Goal: Assess vulnerability of selected resources to climate and non-climate stressors using literature review, spatial climate info, and expert input

Assessing Sensitivity

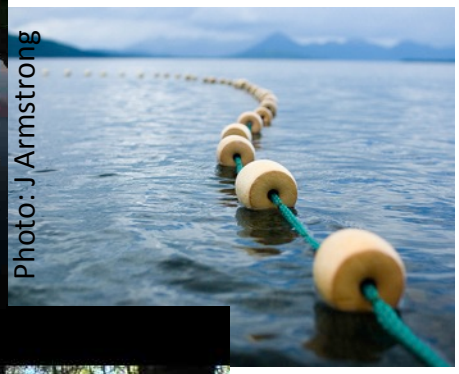
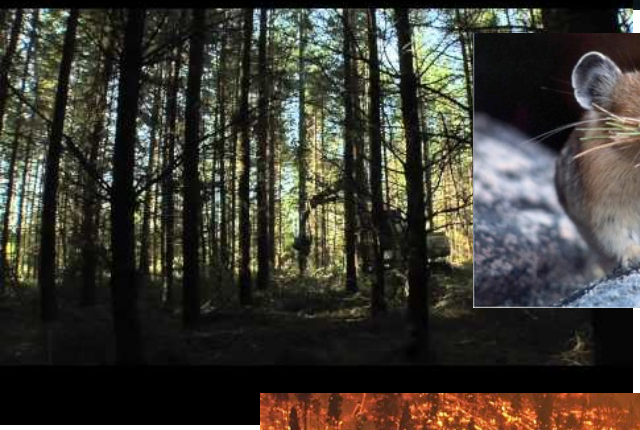


Photo: J Armstrong

Measure of whether and how a species or habitat is likely to be affected by a given change in climate.



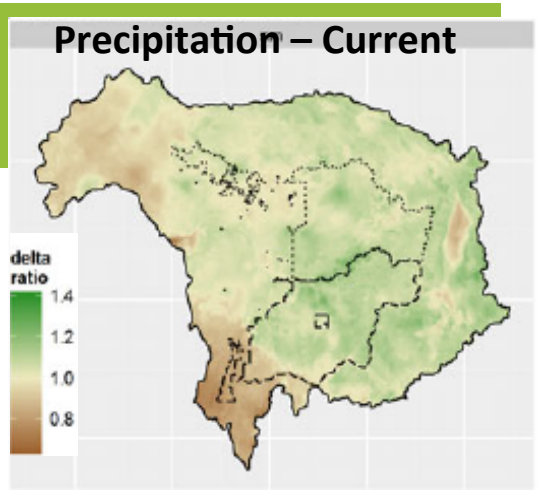
Factors affecting sensitivity of habitats or species:

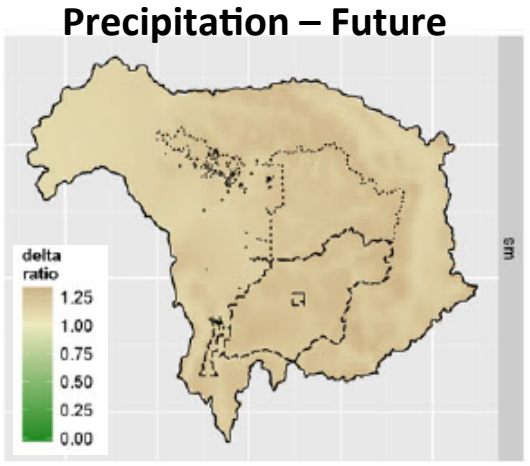
- Climate factors
- Disturbance regimes
- Non-climate stressors
- Dependencies
- Life history

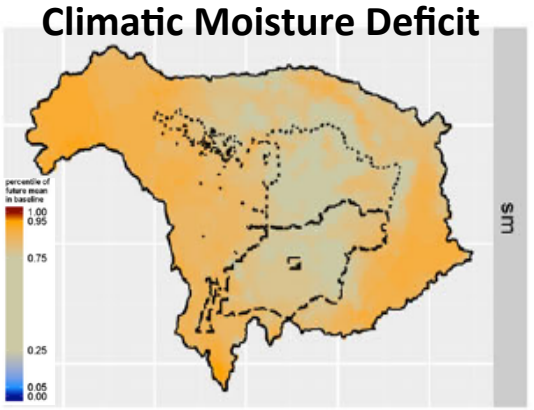
Assessing Exposure

Climate Variable	Current Trends	Projected Future Trends (2040)
Mean Temperature	-	+2.5˚C
Minimum Temperature	↑ all seasons	+3˚C summer
Maximum Temperature	↑ winter	+1.5 to 2˚C in winter +2.5˚C in summer
Precipitation	↑ spring ↓ winter	+10% in spring -20% in summer ↑ fall/winter
Climatic Moisture Deficit	-	↑ summer ↓ fall/winter/spring

Measure of how much of a change in climate or other environmental factor a species or habitat is likely to experience.

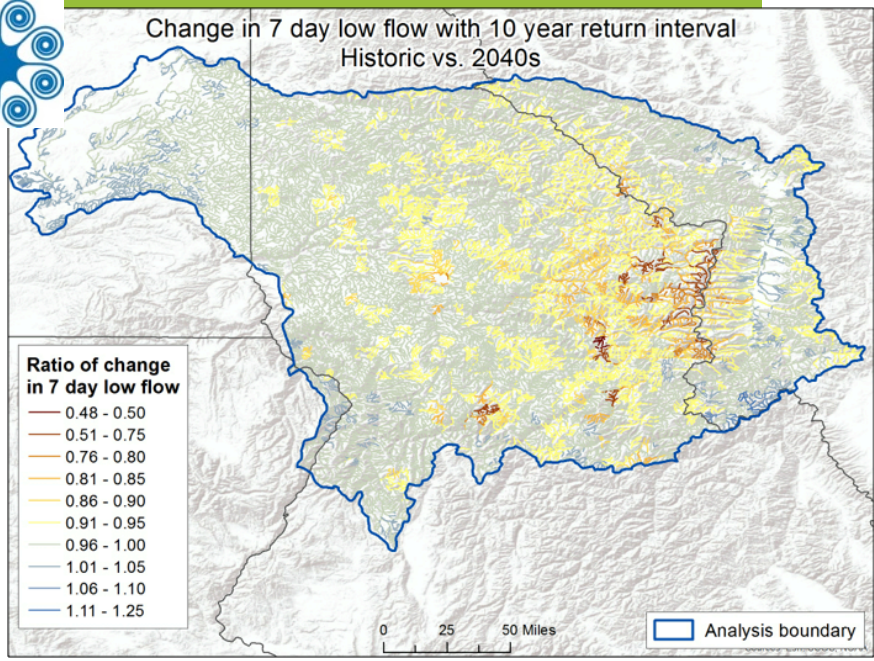


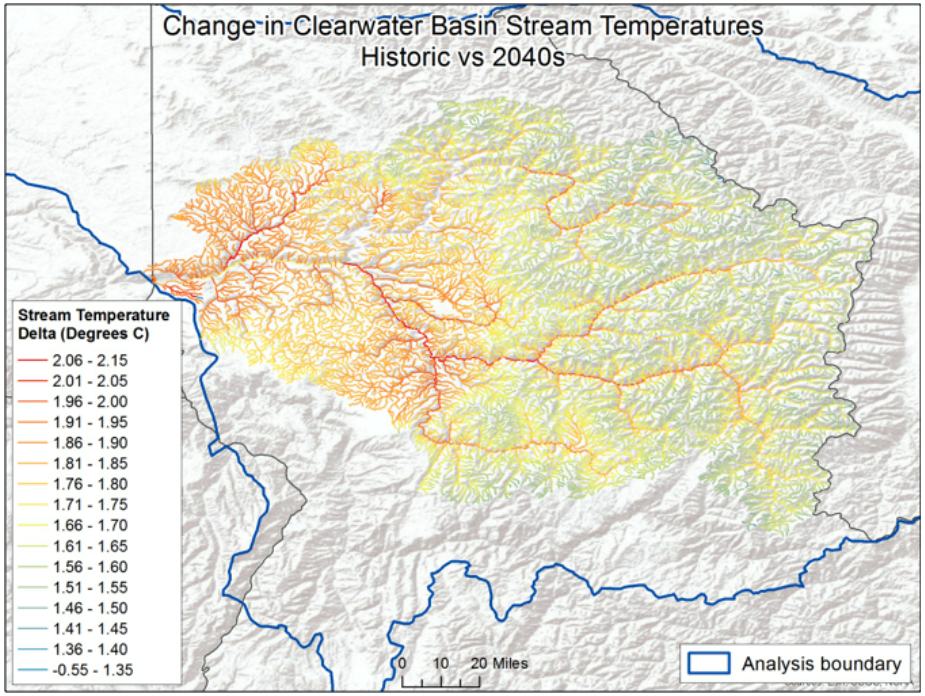


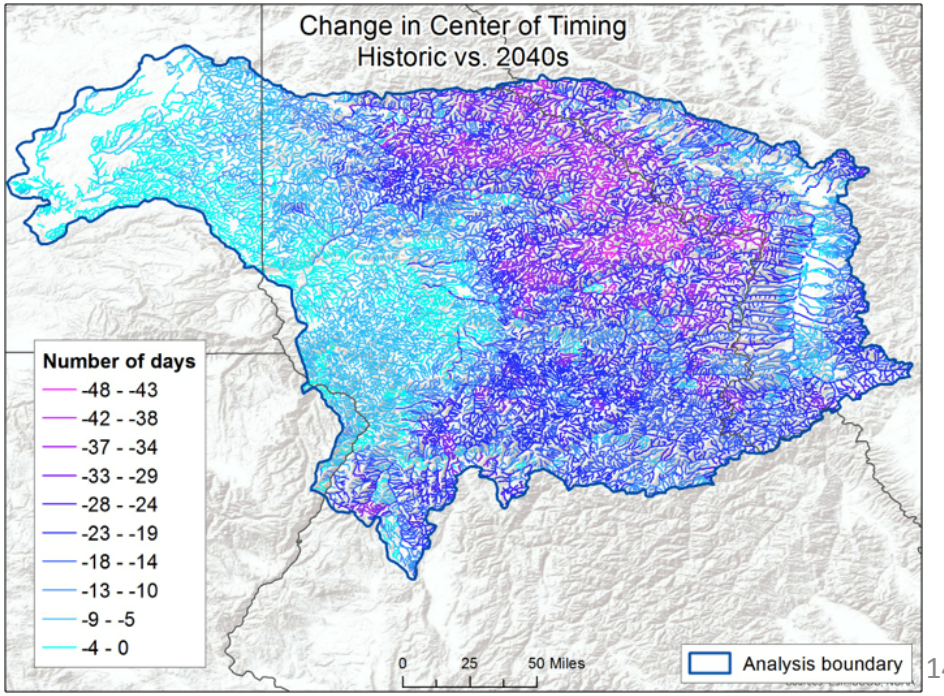


Assessing Exposure

Hydrologic Variable	Projected Future Change - 2040
Stream temperature	+2˚C, most warming in lowlands
Daily mean stream flow	-5 to 10% in southern portion +10 to 15% in northern portion
Channel flow	No distinct direction of change
Low flow	-50% in eastern, high elevations
Timing of flow	+6 weeks earlier

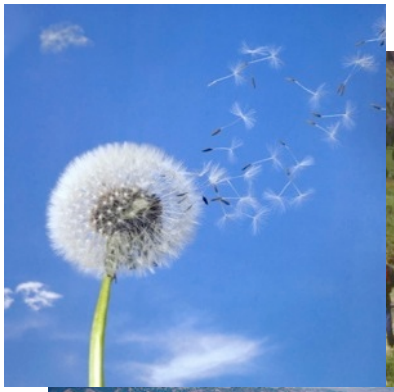


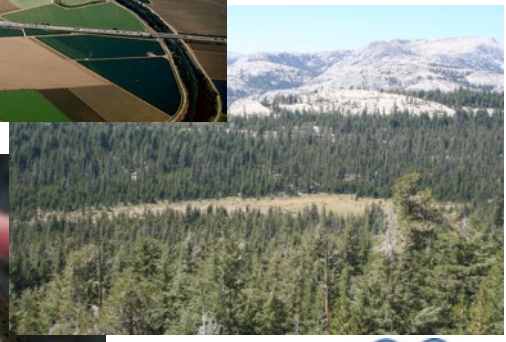




Assessing Adaptive Capacity

Ability to accommodate or cope with climate change impacts with minimal disruption.




Factors affecting adaptive capacity of habitats or species:

- Extent, status, dispersal ability
- Dispersal barriers/landscape permeability
- Life history or habitat diversity
- Management potential

What Happens at a Vulnerability Assessment Workshop?

Species Sensitivity Assessment

Please pay close attention to the gray boxes in each section. If time is limiting the project team can populate the non-gray fields although we may ask for participants to review answers later.

1. Taxonomy

Scientific Name: *Genus and species*	
Common Name: *All that apply*	
Realm *Put an X next to one or more:* Freshwater / Terrestrial	
Geography *For what geographic extent is this sensitivity information relevant? You may list its entire range in the Sierra Nevada, or regions, such as North, Central, South, or East.*	

2. Generalist/Specialist

Generalist: species that use multiple habitats, have multiple prey or forage species, or have multiple host plants (= less sensitive to climate change)
Specialist: species with very narrow habitat needs, single forage or prey species, or single host-plant species (= more sensitive)

Broadly, where does this species fall on the spectrum of generalist to specialist? *Please circle.*

Generalist | Neither/In-between | Specialist

Confidence in your assessment of the degree to which the species is a generalist or specialist? *Please circle.*

Low | Moderate | High

Please specify which factors make the species more of a specialist:
Please circle the relevant relationship(s) that apply. If none apply, do not circle any.

- Predator/prey relationship
- Foraging dependency
- Seed dispersal dependency
- Host plant dependency
- Phenology dependency
- Pollinator dependency
- Symbiont/Mutualist/Parasite
- Other dependencies (please describe)

Comments and Citations: *Please further describe the relationships that make the species more of a specialist. List all relevant relationships and component species. For example, if the species being assessed is dependent on one host plant, please describe that relationship (e.g., food resource) and list the host plant.*

Worksheets for the Climate Adaptation Project for the Sierra Nevada; EcoAdapt (2013). Questions and guidance from *Scanning the Conservation Horizon* (2011) and the *Pacific Northwest Climate Change Vulnerability Assessment* (2010). 1

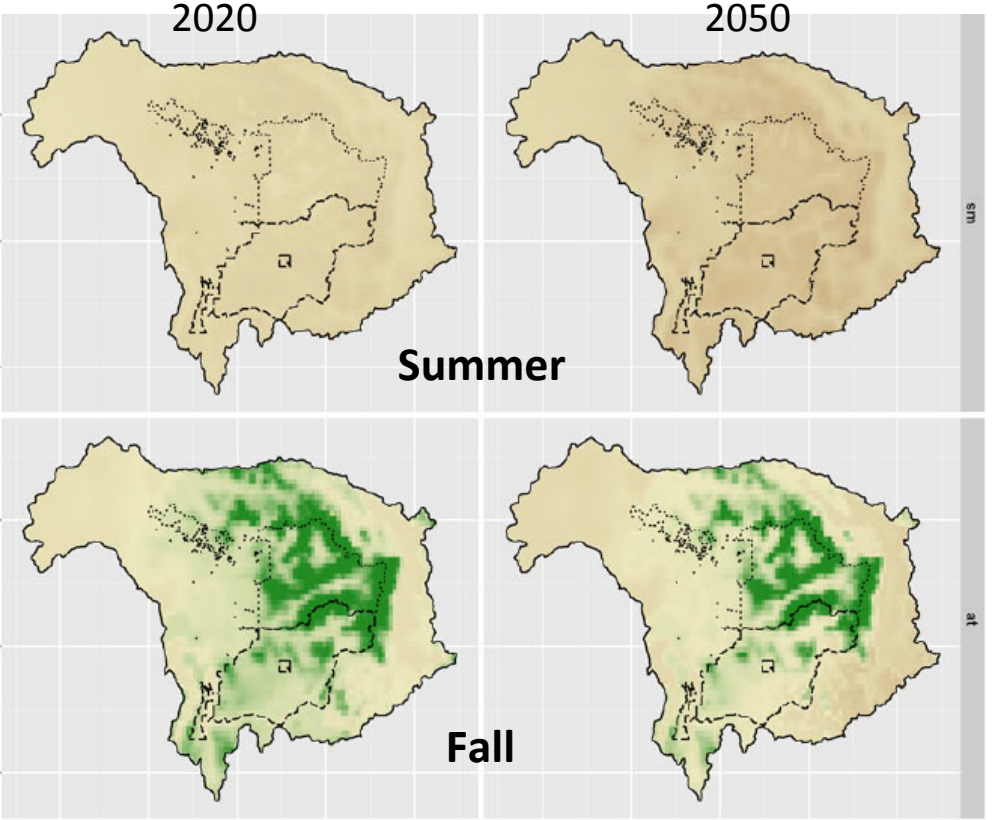
Vulnerability Assessment Findings: Dry Forest Ecosystems

- **Sensitivities to climatic changes (high):**
  - Soil moisture
  - Drought
  - Wildfire
- **Sensitivities to non-climate stressors (high):**
  - Fire suppression practices
  - Insect and disease outbreaks

Vulnerability Assessment Findings: Dry Forest Ecosystems

- **Future climate exposure:**
  - Altered wildfire regimes
  - Reduced soil moisture
  - Increased drought

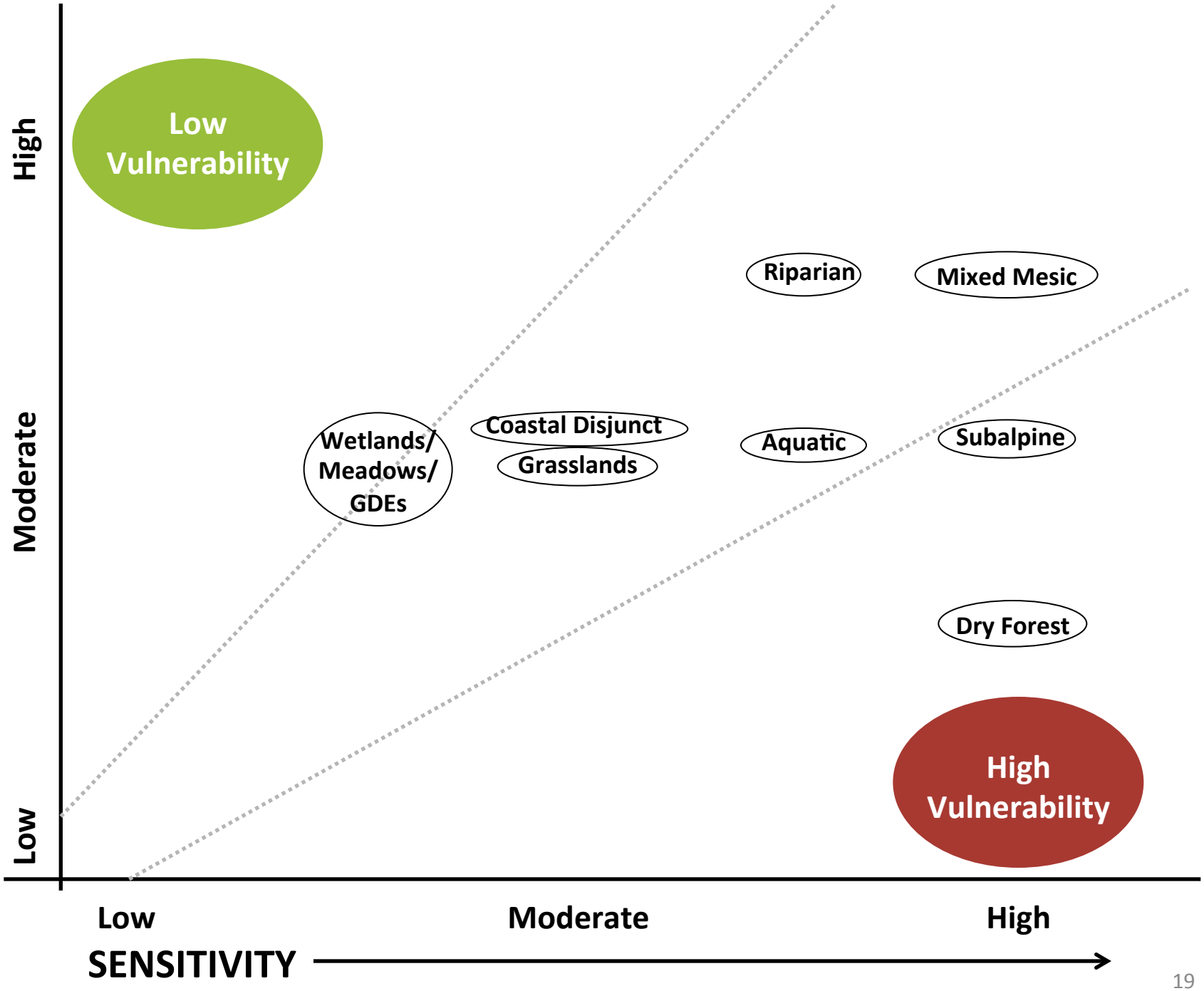
- **Adaptive capacity (low-mod):**
  (+) Moderate geographic extent
  (-) Degraded structural and functional integrity
  (-) Historical forest structure and composition exists in isolated patches



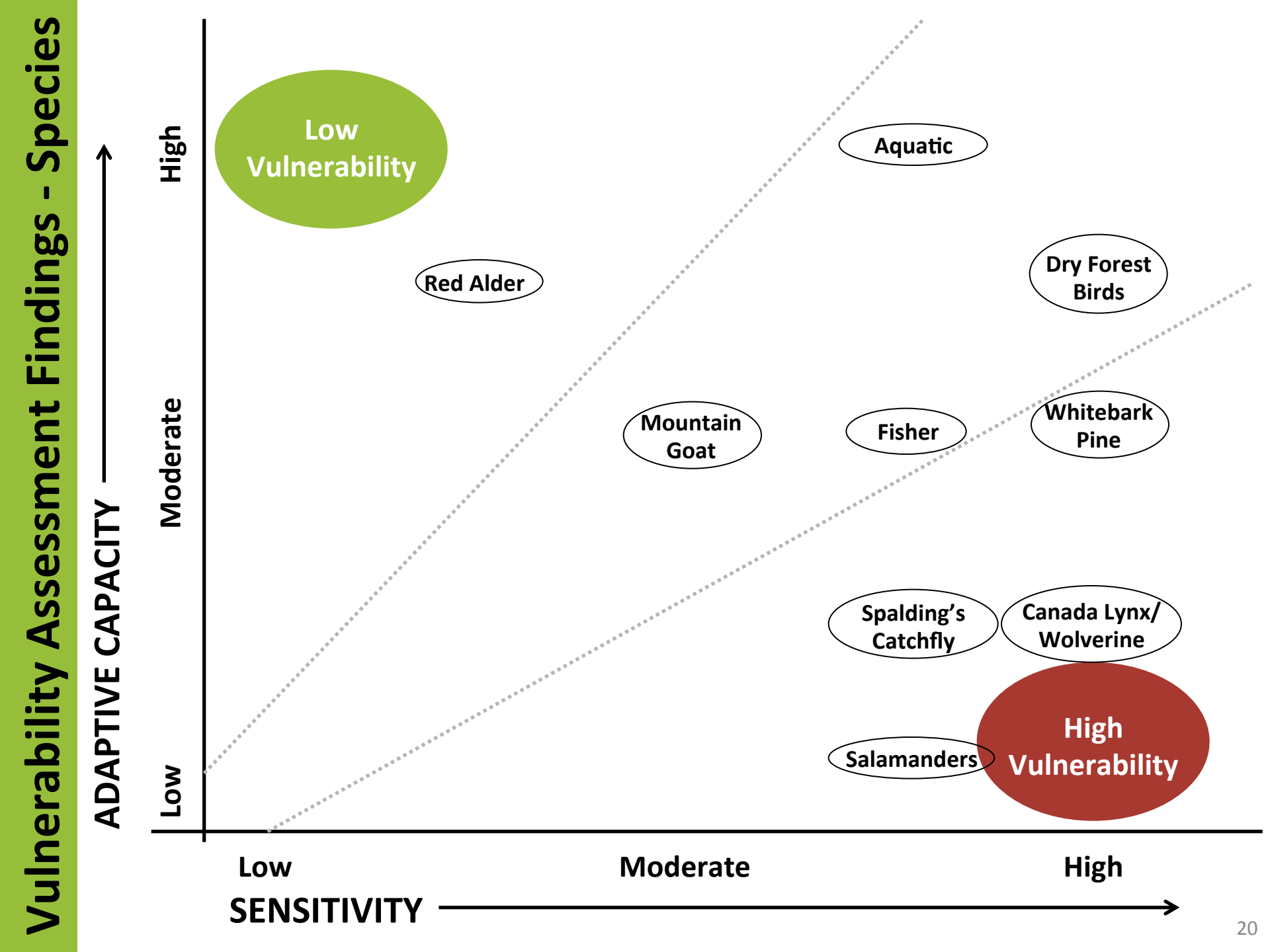
Brown = ↑ soil moisture deficits

Green = ↓ soil moisture deficits

Vulnerability Assessment Findings - Systems



Vulnerability Assessment Findings - Species

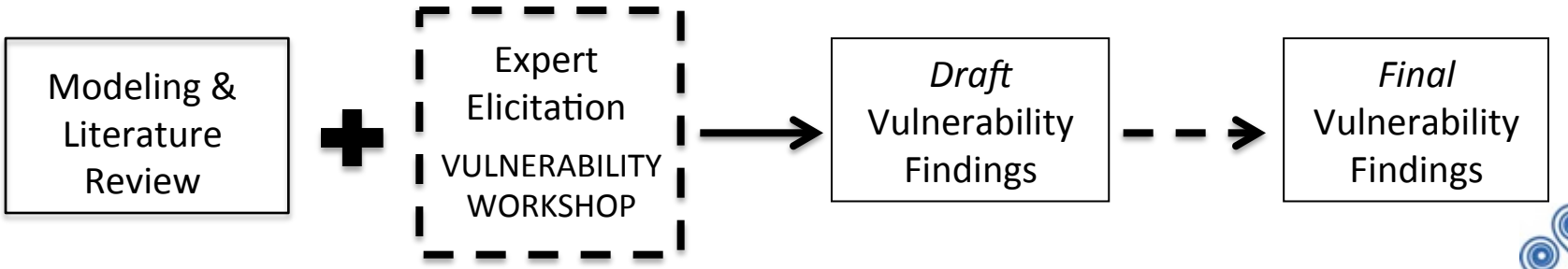


Vulnerability Assessment Findings

ECOSYSTEM	SENSITIVITY	EXPOSURE	ADAPTIVE CAPACITY
AQUATIC **Relative Vulnerability: Moderate**	**Overall Sensitivity: Mod-High** **Sensitivities to Climate and Climate-Driven Changes (High):** 2. Increased stream temperatures 3. Changes that affect hydrologic regimes (e.g., low, high flows) including: a. Snowpack depth b. Shifts from snow- to rain-dominant watersheds c. Snowmelt and runoff timing **Sensitivities to Non-Climate Stressors (Mod-High):** 1. Transportation corridors 2. Fire suppression practices 3. Timber harvest 4. Dams and water diversions	**Key Exposure Factors:** • Warming air temperatures (leading to increased stream temperatures) • Changes in precipitation type, timing and amount that affect hydrologic regimes: o Decreased snowpack o Shifts from snow to rain o Earlier snowmelt and runoff timing • Altered wildfire regimes	**Overall Adaptive Capacity: Moderate** **Key Factors Influencing Adaptive Capacity:** • (+) High physical and topographical diversity • (+) Moderate to highly continuous in the region • (+) Moderate component species and functional group diversity • (-) Features disruptions due to human-related activities (e.g., dams, habitat alteration) • (-) Somewhat degraded structural and functional integrity
COASTAL DISJUNCT **Relative Vulnerability: Moderate**	**Overall Sensitivity: Moderate** **Sensitivities to Climate and Climate-Driven Changes (Mod-High):** 4. Reduced soil moisture 5. Drought 6. Extreme temperature events 7. Wildfire **Sensitivities to Non-Climate Stressors (Mod-High):** 5. Timber harvest 6. Fire suppression 7. Grazing 8. Recreation	**Key Exposure Factors:** • Drought • Reduced soil moisture • Extreme hot or cold events • Increased wildfire frequency and severity	**Overall Adaptive Capacity: Moderate** **Key Factors Influencing Adaptive Capacity:** • (+) High component species and functional group diversity • (-) Exists in limited, "patchy" areas due to moist microclimate requirements and limited dispersal ability • (-) Barriers to system continuity (e.g., timber harvest, land use conversion) • (-) Degraded structural and functional integrity

Vulnerability Assessment Checklist

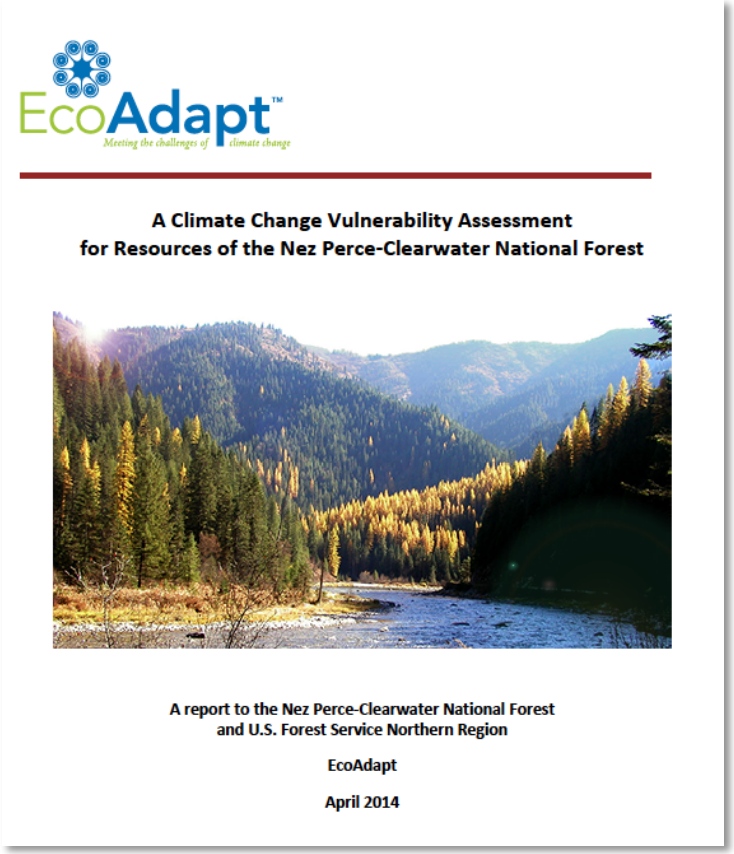
- ❑ Collaboratively identify focal resources
  - Species
  - Ecosystems
  - Ecosystem services
- ❑ Collaboratively assess resource vulnerabilities
- ❑ Expert review of vulnerability findings



Dashed lines indicate stakeholder and/or expert collaboration

Vulnerability Assessment Products

- Workshop support page http://ecoadapt.org/workshops/va-workshop-npc
- Vulnerability assessment report
- Resource findings summarized in separate sections (~7-16 pgs)
- Living resource via TACCIMO

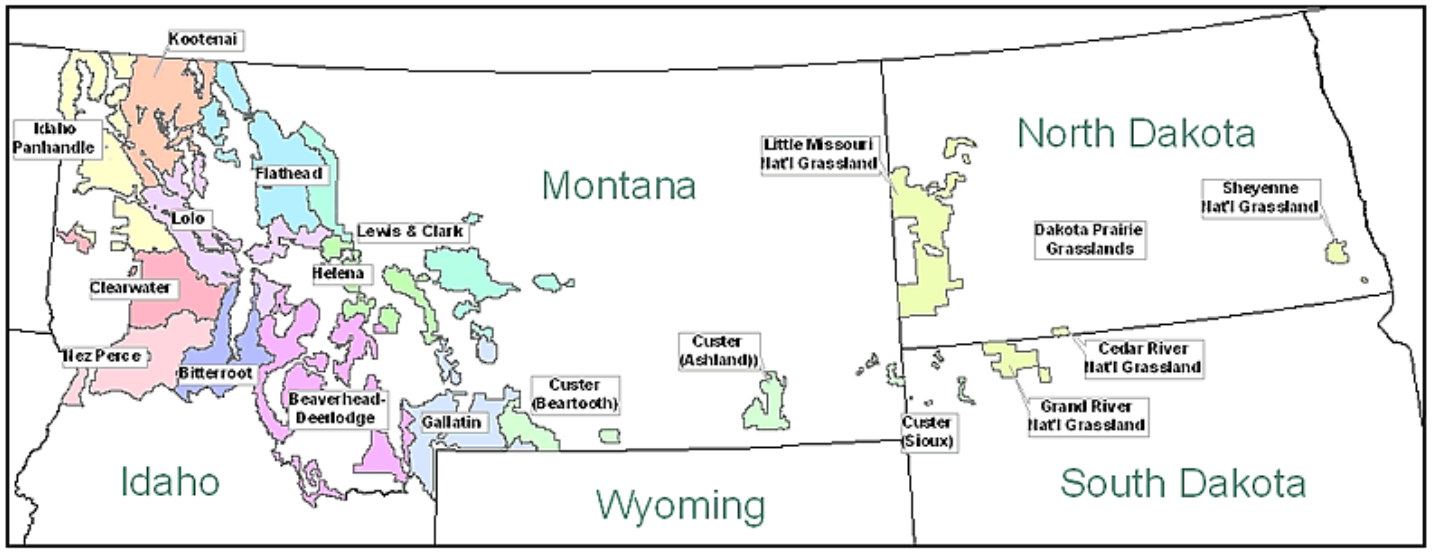


TACCIMO - http://www.sgcp.ncsu.edu:8090

USFS Northern Region

- **Audience:** land managers
- **Scope:** All of Northern Region

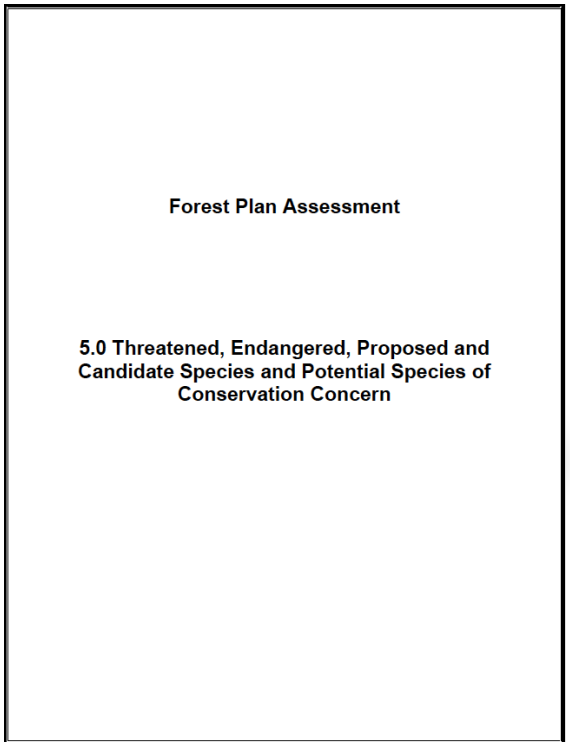
- **Vulnerability & Adaptation:**
  - Ecosystems
  - Species
  - Ecosystem services



Completing USFS General Technical Report with vulnerability and adaptation information from across the region.

Applying Vulnerability Information in Management Operations

- **Management Assessments**
  - Forest Plan Assessments, Watershed Assessments
- **Resource Management Strategies**
  - Conservation strategies, Fire Management Plan, Travel Management Plan, etc.
- **Monitoring Plans**
  - Provides knowledge gaps where monitoring could be implemented


Forest Plan Assessment

5.0 Threatened, Endangered, Proposed and Candidate Species and Potential Species of Conservation Concern

"Vegetation conditions, particularly structure and composition, are resilient to climate change, the frequency, extent and severity of ecological processes such as fire in fire-adapted systems, drought, and flooding in riparian systems."

Benefits from Vulnerability & Adaptation Process

- *WHAT* and *WHY*
- Brings ecosystem service issues to the table
- Highlights cross-sector opportunities
- May drive additional research and scientific studies to fill data gaps

Broader Impacts & Application

- Multiple operational levels at NPCW
- Sierra Nevada forests
- Tongass National Forest
- Gulf of the Farallones National Marine Sanctuary
- New Southern California forests project

Nez Perce-Clearwater Process

Pre-workshop	Vulnerability workshop	After workshop	Adaptation workshop
Step 1	Step 2	Step 3	Step 4
Identify Focal Resources; Gather Relevant Data and Info	Assess Components of Vulnerability	Synthesize Vulnerability Info	Apply Assessment Results in Adaptation Planning

Acknowledgements

Funders:

Wilburforce foundation

Yale Mapping Framework

Partners:

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

σ² Sound Science For Better Decisions

HEADWATERS ECONOMICS

TACCIMO
Template for Assessing Climate Change Impacts and Management Options