Identifying Climate-Informed Management Options

Introduction to Adaptation and Examples from the Field
Climate Adaptation Framework

1. Define Goals and Identify Priorities
   - Identify habitats and species
   - Define project geography, climate variables

2. Assess Vulnerability to Climate Change
   - Sensitivity
   - Exposure
   - Adaptive capacity

3. Identify Adaptation Strategies and Actions
   - Decrease sensitivity, exposure
   - Increase adaptive capacity

4. Implement Adaptation Options
   - Changes in management, policy
   - Cooperation across organizations

5. Monitor, Review, Revise

TODAY!
- Changes in management, policy
- Cooperation across organizations

- Identify habitats and species
- Define project geography, climate variables

- Sensitivity
- Exposure
- Adaptive capacity
What are all the changes that will happen and how can I respond?
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What do I do, and how should I adjust that for the reality of climate change?
Current/same actions
- Remove invasive plants from intact remnant habitats

Modifications to actions
- Plant and seed with native species adapted to future conditions (e.g., drought-tolerant)

New/different actions
- Actively transition habitat to new ecological type (e.g., forest to shrubland)

Modified from Swanston et al. 2017
Defining Adaptation

Adaptation refers to adjustments in natural or human systems in response to changing climate conditions.

Adaptation is how we prepare for and respond to changes that we are already experiencing or are likely to experience.

Adaptation activities can build on sustainable management, conservation, and restoration of natural resources.

Parry et al. 2007, SCBD 2009, Groves et al. 2010
Applying Vulnerability Assessment Results in Adaptation Planning

Vulnerability = Exposure * Sensitivity - Adaptive Capacity

- Exposure
- Sensitivity
- Adaptive capacity
Applying Vulnerability Assessment Results in Adaptation Planning

➤ *Exposure*

- Protect resources and infrastructure from flood damage
- Plant riparian vegetation to shade streams
- Protect climate refugia
Applying Vulnerability Assessment Results in Adaptation Planning

**Sensitivity**

- Actively plant drought-tolerant native species in an area projected to get drier
- Reduce invasive species that outcompete native species
- Reduce pollutants that increase sensitivity of a resource to climate stressors
Applying Vulnerability Assessment Results in Adaptation Planning

↑ **Adaptive capacity**

• Remove barriers to species movement/migration
• Adjust timing or route of access for recreation opportunities
• Develop genetic banks for species restoration
Adaptation Approaches

RESISTANCE/RESILIENCE

ACCEPT/NO ACTION

DIRECT/RESPONSE

Managing for Persistence
Still recognizable as same system

Managing for Change
System fundamentally changed
Strategies or actions that maintain current conditions by limiting change

- Near-term approach
- Resource and/or management-intensive

Examples:
- Preventing the spread of invasive species
- Expanding fencing and ungulate removal in areas more resilient to invasion
- Increasing fire prevention and fuel management efforts in most intact habitats
Strategies or actions that accommodate some change but enable a return to a prior desired condition

- Near- to mid-term approach
- Management-intensive in the near-term; increasing resources needed to maintain desired condition

Examples:
- Promoting native genotypes and adapted genotypes of native species
- Increasing habitat heterogeneity
- Restoring hydrologic function (e.g., removing diversions)
Accept Change/No Action (aka “Let it go”)

Examples:
- Allow newly arriving species to persist
- Allow transition from one habitat type to another (e.g., forest to shrubland or grassland) in response to changing climate conditions
- Monitor climate changes and impacts and resource conditions and trends
Direct/Response

Strategies or actions that intentionally facilitate or direct change and adaptively respond to new conditions

- Long-term approach
- Variable intensity (e.g., may require more resources up front, or gradual changes to put into practice)

Examples:
- Introducing species not historically present but better adapted to future climate conditions
- Proactively creating new places for habitat to migrate
- Accelerating the trajectory of change from one habitat type to another
Strategies or actions to gather information about climate changes, impacts, and/or management effectiveness

- Near- to long-term approach
- May be a precursor to implementing another type of approach

Examples:
- Identifying and monitoring rare species that are the most vulnerable to climate change
- Improving methods for native species propagation
- Monitoring the long-term effectiveness of rare species management and restoration
Collaboration

Strategies or actions that focus on coordinating management efforts and/or capacity across organizational, jurisdictional, or political boundaries

- Near- to long-term approach

Examples:

- Improving data sharing within and between agencies and organizations
- Identifying and/or developing cooperative management and land acquisition opportunities to proactively address habitat shifts due to climate change
- Building support for habitat conservation by conducting public education and outreach about climate risks and management responses
Examples?

UP NEXT!

- Resistance/Resilience
- Accept/No Action
- Direct/Response
- Knowledge
- Collaboration
Restoring Riparian and Wet Meadow Habitats for Sage-grouse

The Challenge: Brood-rearing habitats already impacted by erosion and lowered water tables, and likely to be further degraded by increasing drought

Feasibility + Spatial Analysis

Value (High)
- Location within potential brood rearing habitat
- Close proximity to lek locations (≤ 2 miles)

Condition (Moderate and Poor)
- Riparian Condition Index (extent of floodplain, riparian vegetation)
- Restoration Potential Index (difference in greenness b/w wet and dry years)
Restoring Riparian and Wet Meadow Habitats for Sage-grouse

**Actions**

- Grade control structures (one rock dams, low water crossings)
- Flow dispersal structures (media lunas, plug and spread)
  - “Plug and spread” experiment in areas where transporting rock is not practical or channel incision is too deep
- Headcut control structures (log and fabric structures)
- Long-term monitoring

[Images of different restoration methods and diagrams]

Knowledge
Collaboration
Resilience/Resilience
The Challenge: Western Larch Forests

- Occupies cool and moist, mid-elevation sites in the interior northwest
- Shade-intolerant
- Resilient to and dependent on disturbances (e.g., insect outbreaks, wildfire)
- Predicted to be one of the most vulnerable forest types to warming and drying climate

The Response: Adaptive Silviculture for Climate Change

- Experimental effort to cooperatively develop silvicultural strategies that mitigate the negative effects of future climate
- Highly collaborative
- Identify four types of treatments: No Action, Resistance, Resilience, Response
- Short- and long-term monitoring

Crotteau et al. 2019
Adaptive Silviculture for Climate Change: Flathead NF

Resistance

- Strategies: maintain current tree species through thinning

Resilience

- Strategies: increase proportion of disturbance-adapted species, increase spatial and structural heterogeneity, plant seed from higher and mid-elevations

Direct/Response

- Strategies: increase proportion of disturbance-adapted species, introduce drought-resistant, fire-resistant species (i.e. ponderosa pine), plant seed from higher and mid-elevations

Crotteau et al. 2019
Ojai Community Defense Zone Project

- Ojai Ranger District within Los Padres National Forest
- Focused on creating fuel breaks in the wildland-urban interface
- Project has already been completed
- Purpose was to re-evaluate project goals and activities in light of climate impacts and vulnerabilities to identify adaptation options for future fuel breaks activities in the region
Ojai Community Defense Zone Project

Primary vulnerabilities:
1. Increased fire size, severity, and frequency makes it more dangerous for firefighters and the public
2. Fewer but higher intensity precipitation events can lead to high erosion, especially in areas with less vegetation
3. Increased abundance of invasive grasses, leading to flashier fuels and more fire

Do current project activities reduce any vulnerabilities?
1. Manage ground cover to result in mixture of bare ground, native grasses and forbs
   ✔ Invasive grasses
2. Use irregular shapes in fuel break design
   ✔ Erosion
3. Expand width of fuel break
   ✔ Increased rate of spread of fire

Resistance/Resilience
What new actions could be added to further reduce vulnerabilities?

1. Plant future-adapted native perennial grasses within fuel break
   - ✔️ Invasive grasses, flashy fire behavior, erosion

2. Establish trigger points for recreation closures and restrictions
   - ✔️ Reduces likelihood of human-caused ignitions
Adaptation Planning Activity

1. What current actions/activities can we keep doing given climate impacts, and can they be modified to better address impacts/vulnerabilities?

2. What new actions/activities could we consider implementing to further reduce vulnerabilities?

Adding a Scenario Planning component to the activity
Scenario Planning: A Primer

- Scenario planning is a process in which we envision multiple plausible futures given what we know now.
- Allows us to consider the impacts on our priorities and decisions and capture potential adaptation strategies.
- Identify common, near-term strategies that work across scenarios.
Adaptation Planning Activity – Up Next!

1. For each scenario (e.g., warmer/wetter), summarize potential impacts on your habitat/resource of interest.

2. What current actions/activities can we keep doing given these impacts, and can they be modified to better address impacts/vulnerabilities?

3. What new actions/activities could we consider implementing to further reduce vulnerabilities?

4. What actions show up in both scenarios? Would you select these as priorities for implementation?