Adaptation Strategies for Climate & Fire in the Southwest

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NORTHERN ARIZONA UNIVERSITY

School of Forestry

Southwest FireCLiME

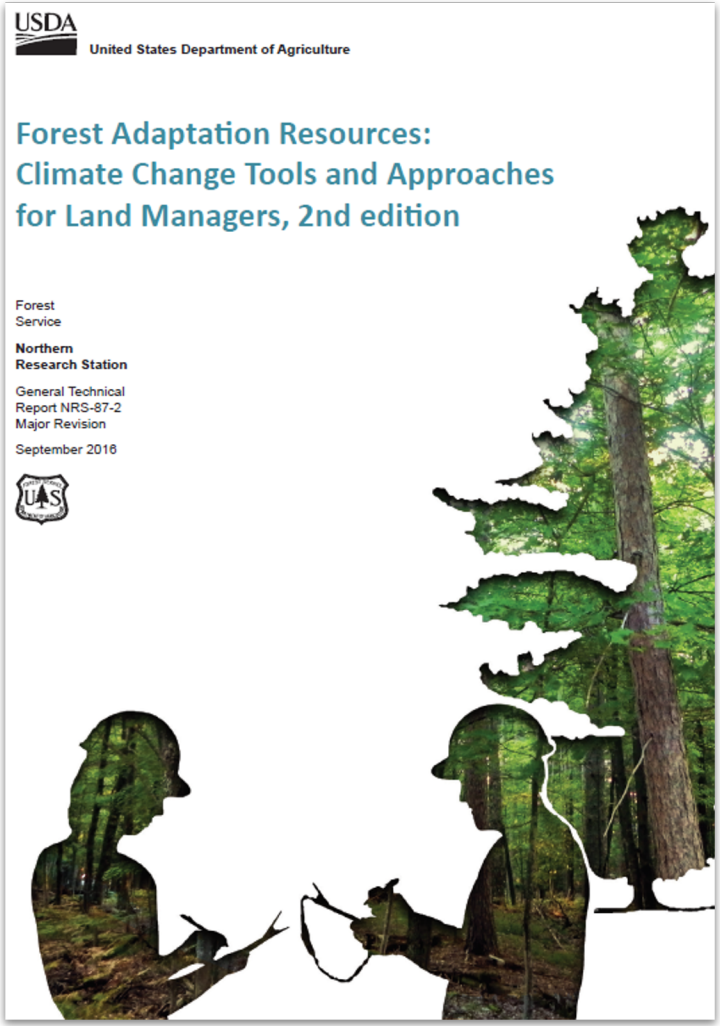
JOINT FIRE SCIENCE PROGRAM

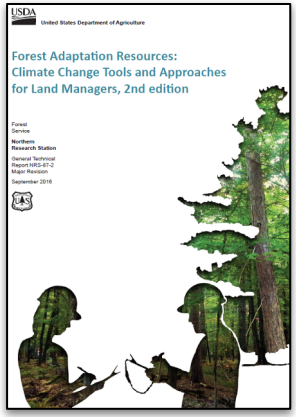
Applying FireCLIME results to management

- Project outcomes designed to be useful to managers
- Manager co-PIs and partners involved throughout project
- How to deliver FireCLIME products in an effective and practical way?
  - Information dump? *Overwhelming!*
  - Best Management Practices? *Too prescriptive!*
  - Other options????

"*Forests across the United States are expected to undergo numerous changes in response to the changing climate. This second edition of the Forest Adaptation Resources* ***provides a collection of resources designed to help forest managers incorporate climate change considerations into management and devise adaptation tactics****. It was developed as part of the Climate Change Response Framework and reflects the expertise, creativity, and feedback of dozens of direct contributors and hundreds of users of the first edition over the last several years..."*

Swanston et al., 2016, NRS-GTR-87-2





1. **DEFINE** location, project, and time frames.

Vulnerability assessments, scientific literature, and other resources

2. **ASSESS** site-specific climate change impacts and vulnerabilities

3. **EVALUATE** management objectives given projected impacts and vulnerabilities.

4. **IDENTIFY** adaptation approaches and tactics for implementation.

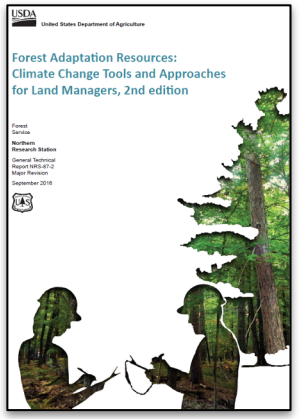
Adaptation Strategies and Approaches

5. **MONITOR** and evaluate effectiveness of implemented actions.

Swanston et al., 2016, NRS-GTR-87-2

CONCEPT → **ACTION**

OPTIONS	STRATEGIES	APPROACHES	TACTICS
Foundational adaptation concepts *(after Millar et al. 2007)*	Broad adaptation responses that consider ecological conditions and overarching management goals	More detailed adaptation responses with consideration of site conditions and management objectives	Prescriptive actions designed for specific site conditions and management objectives
RESISTANCE Buffer or protect from change.	Maintain or create refugia.	Prioritize and maintain sensitive or at-risk species or communities.	Reroute roads or trails away from at-risk communities.
RESILIENCE Promote the return to normal conditions after a disturbance.	Reduce the risk and long-term impacts of severe disturbances.	Alter structure or composition to reduce risk or severity of fire.	Restore fire in oak forests to reduce surface fuel and promote fire- and heat-tolerant species.
TRANSITION Actively facilitate or accommodate change.	Facilitate community adjustments through species transitions.	Introduce species that are expected to be adapted to future conditions.	Plant swamp white oak to replace ash lost to decline resulting from emerald ash borer.



Swanston et al., 2016, NRS-GTR-87-2

CHAPTER 3. Adaptation Strategies and Approaches

Box 10

Menu of Adaptation Strategies and Approaches

Strategy 1: Sustain fundamental ecological functions.
1.1. Reduce impacts to soils and nutrient cycling.
1.2. Maintain or restore hydrology.
1.3. Maintain or restore riparian areas.
1.4. Reduce competition for moisture, nutrients, and light.
1.5. Restore or maintain fire in fire-adapted ecosystems.

Strategy 2: Reduce the impact of biological stressors.
2.1. Maintain or improve the ability of forests to resist pests and pathogens.
2.2. Prevent the introduction and establishment of invasive plant species and remove existing invasive species.
2.3. Manage herbivory to promote regeneration of desired species.

Strategy 3: Reduce the risk and long-term impacts of severe disturbances.
3.1. Alter forest structure or composition to reduce risk or severity of wildfire.
3.2. Establish fuelbreaks to slow the spread of catastrophic fire.
3.3. Alter forest structure to reduce severity or extent of wind and ice damage.
3.4. Promptly revegetate sites after disturbance.

Strategy 4: Maintain or create refugia.
4.1. Prioritize and maintain unique sites.
4.2. Prioritize and maintain sensitive or at-risk species or communities.
4.3. Establish artificial reserves for at-risk and displaced species.

Strategy 5: Maintain and enhance species and structural diversity.
5.1. Promote diverse age classes.
5.2. Maintain and restore diversity of native species.
5.3. Retain biological legacies.
5.4. Establish reserves to maintain ecosystem diversity.

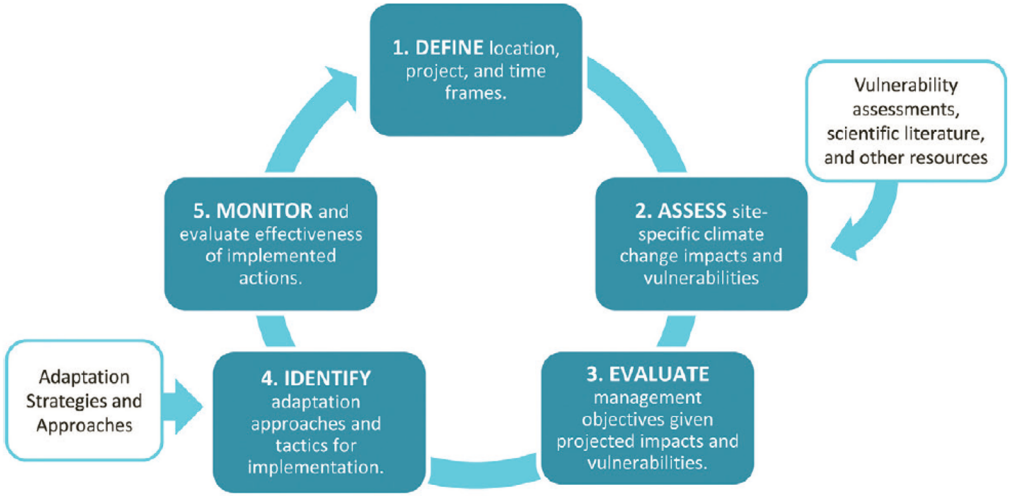
Strategy 6: Increase ecosystem redundancy across the landscape.
6.1. Manage habitats over a range of sites and conditions.
6.2. Expand the boundaries of reserves to increase diversity.

Strategy 7: Promote landscape connectivity.
7.1. Reduce landscape fragmentation.
7.2. Maintain and create habitat corridors through reforestation or restoration.

Strategy 8: Maintain and enhance genetic diversity.
8.1. Use seeds, germplasm, and other genetic material from across a greater geographic range.
8.2. Favor existing genotypes that are better adapted to future conditions.

Strategy 9: Facilitate community adjustments through species transitions.
9.1. Favor or restore native species that are expected to be adapted to future conditions.
9.2. Establish or encourage new mixes of native species.
9.3. Guide changes in species composition at early stages of stand development.
9.4. Protect future-adapted seedlings and saplings.
9.5. Disfavor species that are distinctly maladapted.
9.6. Manage for species and genotypes with wide moisture and temperature tolerances.
9.7. Introduce species that are expected to be adapted to future conditions.
9.8. Move at-risk species to locations that are expected to provide habitat.

Strategy 10: Realign ecosystems after disturbance.
10.1. Promptly revegetate sites after disturbance.
10.2. Allow for areas of natural regeneration to test for future-adapted species.
10.3. Realign significantly disrupted ecosystems to meet expected future conditions.



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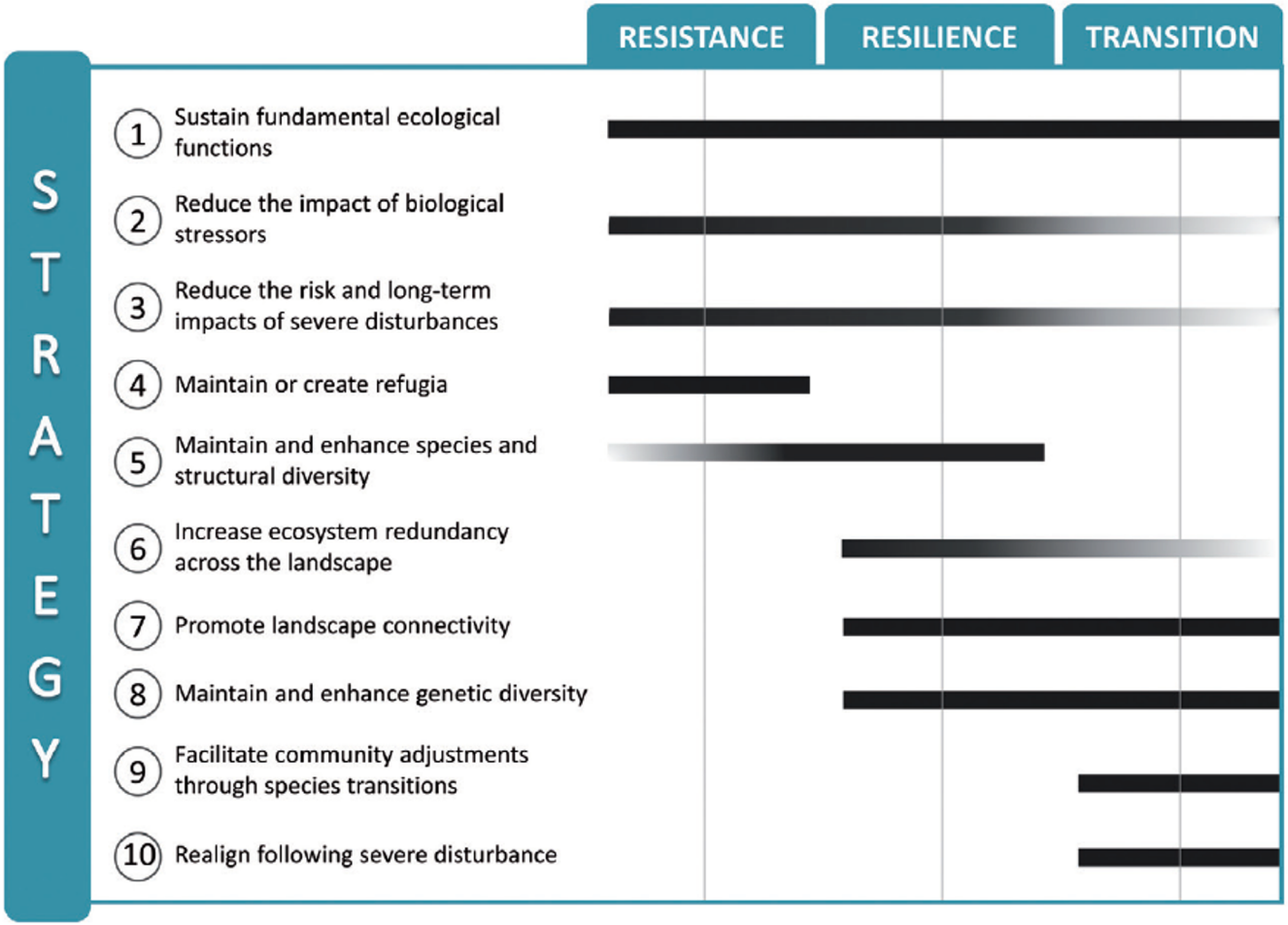

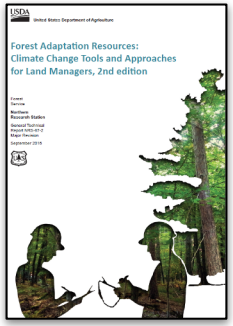

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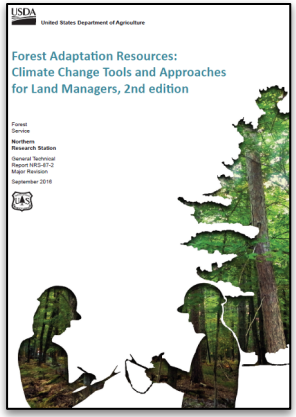

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Southwest FireCLiME

Annotated Bib & VA

Southwest FireCLiME

Fire Adaptation Strategies

Swanston et al., 2016, NRS-GTR-87-2

Fire Adaptation Strategies and Approaches

Strategy 1: Sustain fire as a fundamental ecological process
1.1. Restore or maintain fire in fire-adapted ecosystems
1.2. Develop fire use strategies in altered or novel ecosystems where fire can play a beneficial role
1.3. Protect fire-sensitive ecosystems from fire

Strategy 2: Reduce the effects of biotic and abiotic stressors on fire regimes
2.1. Prevent the establishment and spread of nonnative invasive species and remove existing populations
2.2. Maintain or improve the ability of forests to resist pest and pathogens
2.3. Limit or selectively apply land uses that significantly alter or degrade ecosystem structure and/or function

Strategy 3: Reduce the risk of severe fire
3.1. Alter forest structure or composition to reduce risk or severity of wildfire
3.2. Establish fuel breaks to slow the spread of catastrophic wildfire
3.3. Manage fire-prone ecosystems to reduce uncharacteristically extreme fire behavior

Strategy 4: Reduce long-term effects of severe fire and promote post-fire recovery
4.1. Promote post-fire ecosystem recovery
4.2. Consider using fire effects as a tool to align vegetation communities with changing climate regimes
4.3. Promote habitat connectivity and increase ecosystem redundancy at the landscape scale

Strategy 5: Maintain or create refugia
5.1. Identify and maintain refugia from past fires and other disturbances
5.2. Identify and protect focal areas for regeneration and recovery following a disturbance
5.3. Prioritize and maintain unique sites and sensitive or at-risk ecological communities

Strategy 6: Maintain and enhance structural, species, and community diversity
6.1. Promote diverse age classes.
6.2. Increase structural diversity at the landscape scale
6.3. Increase landscape-scale heterogeneity of structural and community diversity
6.4. Maintain or restore diversity of native plant species

Strategy 7: Maintain and enhance genetic diversity to promote resilient genotypes
7.1. Use seeds, germplasm, and other genetic material from across a greater geographic range
7.2. Favor existing genotypes that are better adapted to future conditions

Strategy 8: Facilitate ecosystem adaptation to expected future climate and fire regimes
8.1. Promote native species that are expected to be resilient to future climate and fire regimes
8.2. Disfavor species that are distinctly maladapted to changing climate and fire regimes
8.3. Facilitate the movement of species that are expected to be adapted to future conditions and fire regimes

Strategy 9: Realign ecosystems after fire events
9.1. Promptly revegetate burned areas using fire-tolerant and drought-adapted species and genotypes
9.2. Allow for areas of natural regeneration to test for future-adapted species
9.3. Realign ecosystems that have undergone post-fire vegetation type conversion to meet expected future conditions

Strategy 10: Facilitate organizational and operational change
10.1 Anticipate changing staffing and budgeting needs
10.2. Anticipate changing ecological conditions during the planning process

Strategy 11: Promote fire-adapted human communities
11.1 Increase fuel reduction treatments in the wildland-urban interface
11.2. Increase outreach and education about anticipated effects of climate change on local fire regimes

This outline is a start, but…

We need your feedback!

Please take a copy of the ‘Fire Adaptation Strategies and Approaches’ print out

Email your comments/edits to martha.sample@nau.edu

OR, put your email on our sign-up sheet and I will email you a digital copy