

United States Department of Agriculture Northern Forests Climate Hub

Incorporating Climate into Resource Management Decisions

Adaptation ideas and demonstrations

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Northern Institute of Applied Climate Science (aka NIACS)



Climate

Carbon



Chartered by USDA Forest Service, universities, non-profit and tribal conservation organizations









AMERICAN FORESTS

NCASI

Northern Institute of Applied Climate Science (aka NIACS)

Climate and Carbon Services

- Climate impacts modeling
- Vulnerability assessment
- Climate adaptation
- Carbon science & management
- Science translation & professional training

20 Staff Members (Forest Service/Universities)

- 9 climate outreach specialists
- 6 research scientists
- 2 web specialists
- 3 GIS/lab specialists







Adaptation is the adjustment of systems in response to climate change.



Adaptation actions are designed to intentionally address climate change impacts & vulnerabilities in order to meet goals and objectives

Adaptation is the adjustment of systems in response to climate change.



Ecosystem-based adaptation activities build on sustainable management, conservation, and restoration.

- What do you value?
- How much risk are you willing to tolerate?

Climate-Driven Changes



Desired Future Condition



ΤΙΜΕ

Climate-Driven Changes



What actions can be taken to enhance the ability of a system to cope with change

and

meet your goals and objectives?

Adaptation Options



Identify and implement actions that are **robust across a range of potential future conditions**

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Resistance

Improve the defenses of the system against anticipated changes or directly defending against disturbance in order to maintain relatively unchanged conditions.



Road crossings that can withstand flood events (USFS, Monongahela NF)



Threatened Dwarf lake iris (FWS)



Invasive species management (USFS)

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Resistance



Resistance



Resilience

Accommodate some degree of change or disruption, but be able to return to a similar condition after disturbance.

- Improve overall health & vigor
- Management of vegetation following disturbance



Prescribed burning to regenerate fireadapted species



Reducing overstocked stands (Tahoe NF)



Increasing setbacks to allow for fluctuating water levels.

Holling 1973, Millar et al. 2007, Swanston et al. 2016 See also – Moser et al. 2019



Transition

Intentionally encourage change, help ecosystems respond in a targeted fashion.

- Foster well-adapted native species
- Relocate visitor and recreation infrastructure
- Accommodate new & altered hydrologic processes



Favoring native species that are expected to be adapted to future conditions.



Relocate existing infrastructure to areas with less risk (P:Tom Hilton)



River & riparian area restoration in agricultural fields (P:Joann Kline)

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017



Managing Risk

RESISTANCE



- Improve defenses of forest against change and disturbance
- Maintain relatively unchanged conditions

RESILIENCE



- Accommodate some degree of change
- Return to prior reference condition following disturbance

TRANSITION



- Intentionally facilitate change
- Enable ecosystem to respond to changing and new conditions

Reduce impacts/maintain current conditions

Forward-looking/promote change

Adaptation Planning



Adaptation Planning

If you want a single "answer" for how to respond to climate change, it's

"It depends"

...ecosystem, objectives, climate pressure, risk tolerance, capacity...



Adaptation Resources

A flexible workbook and menu to address diverse needs

- Designed for a variety of land owners with diverse goals
- Does not make recommendations
- Includes:
 - Adaptation Workbook
 - Adaptation strategies for different resource areas (menus)



Swanston et al. 2016 (2nd edition); <u>www.treesearch.fs.fed.us/pubs/52760</u>; <u>www.adaptationworkbook.org</u>

Adaptation Workbook



Adaptation Workbook

| | Area of Interest/ Location | | Forest Type(s) | | Management Goals | | | Management Objectives | | Time Frames | | |
|------|-------------------------------|-------------------|----------------|--------|------------------|-------|----------|--------------------------|------------|----------------|-----------|--|
| | | | | | | | | | | | | |
| Step |) 1 | | | | | | | | | | | |
| | | Adaptation Action | | | | | | | | | | |
| | | | | | | Time | | | Drawbacks/ | | Recommend | |
| | | Strategy/Approach | | Tactic | | Frame | Benefits | | Barriers | | Tactic? | |
| | Step 4 | | | | | | | | | | | |

A "menu" of **possible** <u>actions</u> that allows you to decide what is *most relevant for a particular location and set of conditions.*



www.ForestAdaptation.org/strategies

Address challenges in implementing adaptation:

- 1. Connecting broad ideas to specific actions
- 2. Making adaptation intentional
- 3. Communicating your ideas
- 4. Boosting creativity



Fire-Adapted Ecosystems

Ocean Coastal Ecosystems

Wildlife Management

Fresh-Water Coastal

Ecosystems

Grasslands

- Specific to a discipline
- Organized into a tiered hierarchy
- Thoroughly researched, co-developed, and tested

Published:

- Forestry
- Urban Forestry
- Forested Watersheds
- Tribal Perspectives
- Agriculture
- Forest Carbon Management
- Recreation
- Non-Forested Wetlands
- Inland Glacial Lake Fisheries

www.forestadaptation.org/strategies

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In Preparation:

Fire-Adapted Ecosystems Strategies and Approaches

Strategy 1: Sustain fire as a fundamental ecological process

Approach 1.1. Restore or maintain fire in fire-adapted ecosystems Examples of adaptation tactics include :

- Use prescribed fire and mechanical treatments to manipulate structure and fuels
- Promote fire- and drought-adapted species and communities
- Increase intentional use of wildfires whenever possible
 Approach 1.2. Develop fire use strategies in altered or novel ecosystems

Approach 1.2. Develop fire use strategies in altered or novel ecosystems where fire can play a beneficial role

Examples of adaptation tactics include:

- Manage forest restoration for future range of variability
- Consider using more prescribed fire where supported by scientific evidence
- Consider using prescribed fire in non-traditional ways (e.g. law-intensity controlled burning in mesic mixed conifer to reduce fuels and risk of high-severity fire)

Approach 1.3. Protect fire-sensitive ecosystems from fire

- Examples of adaptation tactics include: • Reduce ignitions in areas sensitive to fire
- Gontrol nonnative invasive species
- Implement and maintain fuel breaks in strategic locations
- Encourage acceptable fire in buffers surrounding fire-sensitive areas

Strategy 2: Reduce the effects of biotic and abiotic stressors on fire regimes

Approach 2.1. Prevent the establishment and spread of nonnative invasive species, and remove existing populations

Examples of adaptation tactics include:

- Increase inventory and monitoring of nonnative invasive species
- Use mechanical or chemical means to eradicate high priority populations of nonnative invasive species
 Create and a first regulations for internal, toff contentors, and the public to request an idential
- Create and enforce regulations for internal staff, contractors, and the public to prevent accidental intraduction of nonnative invasive plant material

Approach 2.2. Maintain or improve the ability of for ests to resist pests and pathogens Examples of adaptation tactics include :

- Increase inventory and monitoring of pests and pathogens, focusing on high priority areas
- Anticipate the arrival of pests and pathagens and prioritize management actions
- Promote species, age class, and stand structure diversity to reduce density of a host species
- Use chemical control in heavily infested areas
- Promote pest- and pathogen-resistant species or genotypes during thinning and planting
- Restrict harvest and transportation of logs in or near stands with known infestations

Approach 2.3. Limit and selectively applyland uses that alter or degrade ecosystem structure and/or function Examples of adaptation tactics include:

- Consider and actively manage fire risk in areas of heavy recreational use
- Limit increased WUI are a resulting from development and urban expansion

Strategy 3: Reduce the risk of unacceptably severe fire

Approach 3.1. Alter forest structure and/or composition to reduce the risk of unacceptably severe wildfire Examples of adaptation tactics include:

- Implement strategic fuel treatments/fuel breaks to reduce fire behavior
- Reduce tree density within stands (thinning, Rx burning) considering historic ranges of variation and anticipated future conditions
- Reduce ladder fuels and increase crown base height using mechanical or Rx burn treatments
- Suppress wildfires that threaten to burn at unacceptably high severities

www.swfireclime.org/fire-climate-adaptation-tools/



CONCEPT

Option: Foundational adaptation concepts: resistance, resilience, and transition

Strategy: A strategy is a broad adaptation response that is applicable across a variety of resources and sites

Approach: An approach is an adaptation response that is more specific to a resource issue or geography

Tactic: The most specific adaptation response, providing prescriptive direction about actions that can be applied on the ground



Workbook + Menu





Austin Balcones Canyonlands: Vireo Preserve

Goals:

- Protect Golden-cheeked Warbler refugia
- Promote water retention, protect and build soils
- Develop pollinator alleys for connectivity

Climate Challenges

Hotter/drier + rain deluges
Habitat shifts – phenology/recruitment
Loss of seedbank



Select Actions for Ashe juniper-oak forests: Forestry Menu

- Plant drought-tolerant species in xeric sites to provide shade and improve soil for more mesic species.
- Increasing native plant and structural diversity (soil, ground cover, shrub cover, canopy).
- Protecting native seed banks and promoting habitat for pollinators.
- Recycling dead biomass of invasive plants in situ.

Iowa Tribe of Oklahoma

Goals:

- Restore a small wetland area
- Provide habitat and water source for wildlife
- Provide access for children and tribal citizens for education and enjoyment

Climate Challenges

- Seasonal precipitation changes
- Dry conditions
- Extreme heat or rainfall

Select Actions: Tribal Adaptation Menu



- Request elder input on the long-term management plan for the site.
- In the maintenance plan, include a strategy on how to involve the lowa youth program and day care.
- Consult elders on appropriate language for interpretive materials.

forestadaptation.org/demos

San Bernardino National Forest

Goals:

- Provide high-quality, safe recreational facilities
- Direct visitor use away from sensitive areas
- Maintain riparian health, stream connectivity

Climate Challenges

- More hot days = more visitors
- Drought potential & streamflow changes
- Extreme precipitation and wildfire

Select Actions: Recreation Menu

- Build toilets and other infrastructure to reduce exposure of visitors to heat (e.g. lighter colors).
- Add shade structures at picnic areas to help disperse picnicking outside of riparian corridor.
- Ensure enforcement staff and coverage are available for heavy recreation season (shoulder seasons).
- Work with local telecommunications company to get cell phone service in canyon for emergencies.

forestadaptation.org/demos

By the May... Online Adaptation Planning and Practices Courses

- 8-week course weekly lectures, bi-weekly discussion sessions, coaching
- Fall 2020, Winter and Spring 2021
- Identify climate change impacts, challenges, and opportunities
- Develop specific actions to adapt ecosystems to changing conditions
- Use the Adaptation Workbook to create "climate-informed" projects
- Better communicate with stakeholders
- Access post-training support from NIACS staff

www.forestadaptation.org/online-courses-2020





Concluding Thoughts

- Certainty is a myth plan for a range of futures
- Tools are helpful your judgement is critical
- Climate-informed choices are not always ideal
- Be clear about values and intent avoid doublespeak
- Learn by doing, share what you learn

Thank you!



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More Adaptation Approaches

www.fs.usda.gov/ccrc/climate-projects/adaptation-approaches

A National Compendium of Adaptation Strategies, Approaches, and Tactics



Alter forest structure to reduce severity or extent of wind and ice damage