The Available Science Assessment Project (ASAP): Evaluating the Supporting Science behind Climate Adaptation Actions
Available Science Assessment Project

Team

EcoAdapt™

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Climate change is forcing a paradigm shift in decision making.

Challenges

• Struggle with identifying and prioritizing specific climate adaptation actions
• Ongoing tension between *producing* science and *using* science
• Conflicts over what is and is not “good” science
• Questions as to whether or not on-the-ground management actions rely on or are backed up by scientific and research evidence
How can managers identify and prioritize specific climate adaptation actions for implementation?

• Actions may have a higher probability of being successful if they are informed by available scientific knowledge and findings.

Applying a method of synthesizing technical information that relates to particular management questions or actions in a way that will be more readily accepted as both objective and actionable.
Goals

Identify, synthesize, and assess the body of scientific knowledge on specific, on-the-ground climate adaptation actions to determine the conditions, timeframes, and geographic areas where particular actions may be most effective for managers.

- Identify on-the-ground **Climate Adaptation Actions**
  - CAAs = actions taken to decrease vulnerability or increase resilience to CC
- Summarize and review **existing science** on select CAAs
- Assess **conditions** for using select CAAs in resource management

**Pilot Project Focus**
Develop **process** for review of science on select CAAs
Phase 1: Identify climate stressors from **CC Strategy Documents**

**Climate Stressors**
- Increased fire severity
- Sea level rise
- Reduced snowpack
- Invasive species spread
- ...

Phase 2: Identify CAAs used in response to chosen stressor from **CC Adaptation Plans**

**CAAs used in response to increased fire severity**
1. Forest thinning
2. Prescribed burns
3. Seed fire-resistant species
4. Remove fire-prone species
5. ...

Phase 3: Conduct systematic review of science of the most used CAAs

Phase 4. Evaluate and share the results of the fire review and the ASAP process
Phase 1: Identify climate stressors from strategy documents

- Use best available science
- Adopt integrated approaches
- Build strong partnerships
- Use ecosystem-based approaches
- Incentives and education
- Effective communication
- Monitoring and evaluation
### Phase 1: Identify climate stressors from strategy documents

<table>
<thead>
<tr>
<th>Climate Stressors</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changes in fire regimes</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sea level rise</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Reduced snowpack</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Extreme events</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Habitat loss</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Invasive species spread</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Why Fire?

- Climate-driven changes in fire regimes in the western United States
  - Threats to habitats, species, and public health and safety
  - Interacts with/drives insect outbreaks, diseases, invasive species establishment
  - Affects wilderness and non-wilderness areas

- Leading to.....
  - Altered forest landscapes ➔ species & habitat expansion, contraction, or conversion, affecting overall ecosystem health and productivity.
Why National Forests?

USFS National Forest System 2012 Planning Rule

DEPARTMENT OF AGRICULTURE
Forest Service
36 CFR Part 219
RIN 0596-AD02
National Forest System Land Management Planning

AGENCY: Forest Service, USDA.
ACTION: Final rule and record of decision.

SUMMARY: The U.S. Department of Agriculture is adopting a new National Forest System land management planning rule (planning rule). The new planning rule guides the development, amendment, and revision of land management plans for all units of the National Forest System (NFS), consisting of 155 national forests, 20 grasslands, and 1 prairie. This planning rule sets forth process and content requirements to guide the development, amendment, and revision of land management plans to maintain and restore NFS land and water.

USDA based this decision on the analyses presented in the Final Programmatic Environmental Impact Statement, National Forest System Land Management Planning (USDA, Forest Service, 2011) (PEIS). The PEIS was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA).

For the reasons set out in the discussion that follows, the Department hereby promulgates a regulation establishing a National Forest System land management planning rule as described in Modified Alternative A of the National Forest System Land Management Planning Rule Final Programmatic Environmental Impact Statement (USDA Forest Service, 2011) with clarifications, and the supporting record. The planning rule describes the process the Forest Service will use for development, amendment, and revision of national forest and grassland plans. It also sets out requirements for the structure of those plans and includes requirements for their content.

This planning rule replaces the final

Introduction and Background

The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation’s forests and grasslands to meet the needs of present and future generations. Responsible officials for each national forest, grassland, and prairie will follow the direction of the planning rule to develop, amend, and revise the forest and grassland management.

The new process for science and decision making is designed and within implement under the National Forest Management Act (NFM) and other legal requirements.

USFS Climate Change Performance Scorecard

<table>
<thead>
<tr>
<th>Scorecard Element</th>
<th>Unit Name</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Capacity</td>
<td>1. Employee Education</td>
<td>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 work to climate change response?</td>
</tr>
<tr>
<td></td>
<td>2. Designated Climate Change Coordinators</td>
<td>Is there a designated 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 their assignment successful?</td>
</tr>
<tr>
<td></td>
<td>3. Program Guidance</td>
<td>Does the Unit have written guidance for progressively integrating climate change considerations and activities into Unit-level operations?</td>
</tr>
<tr>
<td></td>
<td>4. Science and Management Partnerships</td>
<td>Does the Unit actively engage with scientists and scientific organizations to improve its ability to respond to climate change?</td>
</tr>
<tr>
<td></td>
<td>5. Other Partnerships</td>
<td>Have climate change relevant considerations and activities been incorporated into existing or new partnerships (other than science partnerships)?</td>
</tr>
<tr>
<td>Adaptation</td>
<td>6. Assessing Vulnerability</td>
<td>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?</td>
</tr>
<tr>
<td></td>
<td>7. Adaptation Actions</td>
<td>Does the Unit conduct management actions that reduce the vulnerability of resources and places to climate change?</td>
</tr>
<tr>
<td></td>
<td>8. Monitoring</td>
<td>Is monitoring being conducted to track climate change impacts and the effectiveness of adaptation activities?</td>
</tr>
<tr>
<td>Mitigation and Sustainable Consumption</td>
<td>9. Carbon Assessment and Stewardship</td>
<td>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?</td>
</tr>
<tr>
<td></td>
<td>10. Sustainable Operations</td>
<td>Is progress being made toward achieving sustainable operations requirements to reduce the environmental footprint of the Agency?</td>
</tr>
</tbody>
</table>
Phase 2: Identify specific fire-related climate adaptation actions

- Review and categorization of CAAs in the literature
- Verification through interviews with managers

- Derived from climate change strategy documents, forest management plans, fire management plans and policies
- Focused on fire
- List specific on-the-ground climate adaptation actions
Literature Review: Plans, Policies, Strategies

109 documents

34 National Forests
# Identifying Fire-Related Climate Adaptation Actions

<table>
<thead>
<tr>
<th>Action</th>
<th>General Description</th>
<th>Climate Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinning</td>
<td>Reducing density by cutting/removing vegetation</td>
<td>Reduces fire risk by reducing fuel quantities; Improves growing conditions and health of fire-resistant species</td>
</tr>
<tr>
<td>Mechanical Fuel Treatments</td>
<td>Using machines to physically remove dead, downed, and other fuels</td>
<td>Reduces fire risk by reducing fuel quantities</td>
</tr>
<tr>
<td>Prescribed fire</td>
<td>Intentional artificial ignition &amp; subsequent management of fire</td>
<td>Reduces risk of catastrophic fire by targeting/reducing fuels; Allows for re-introduction of natural fire regimes; Prepares seedbed for planting/re-seeding of fire-resistant species</td>
</tr>
<tr>
<td>Managed wildfire</td>
<td>Allowing naturally ignited fires to burn but actively managing fires</td>
<td>Regulates forest density and fuel conditions; Facilitates return of landscape to historic fire-resilient composition</td>
</tr>
<tr>
<td>Seeding fire-resistant species</td>
<td>Artificially planting/creating ideal conditions for natural regeneration of fire-resistant species</td>
<td>Increases stand and landscape resilience to fire</td>
</tr>
<tr>
<td>Removal of fire-prone species</td>
<td>Targeted selection/removal of tree species and/or individual trees that are vulnerable to fire</td>
<td>Increases stand and landscape resilience to fire</td>
</tr>
</tbody>
</table>
Scoring Fire-Related Climate Adaptation Actions in Forest Plans and Reports

<table>
<thead>
<tr>
<th>Prescribed Fire</th>
<th>Mechanical Fuel Treatments</th>
<th>Thinning</th>
<th>Managed Wildfire</th>
<th>Seeding fire-resistant species</th>
<th>Removal of fire-prone (pyrophytic) species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentional artificial ignition and subsequent management of fire on the landscape</td>
<td>Using machines to physically remove dead, downed, and other fuels from the landscape</td>
<td>Reducing forest density by cutting and/or physically removing vegetation from the landscape</td>
<td>Allowing naturally ignited fires to burn on the landscape, but actively managing fires (i.e., controlling burn path and extent) to protect areas of concern (i.e., structures, no-burn areas)</td>
<td>Artificially planting and/or creating ideal conditions for natural regeneration of fire-resistant species</td>
<td>Targeted selection and removal of tree species and/or individual trees that are vulnerable to fire</td>
</tr>
</tbody>
</table>

0 = no presence  
1 = presence  
2 = focus/priority in document
Interviews with Managers: Process

- 125 regional contacts; 78 climate-related
  - Level
    - 41 project-specific, 11 program-specific, 3 plan-specific, 23 other (mixture of project, program, plan, all, or blank)
  - Location
    - 34 all/not-specific, 23 non-wilderness, 3 wilderness, 5 WUI, 13 other (combinations of wilderness, non-, WUI, N/A)
- Selected initial 30 contacts that represent each of the NFs in the region:

<table>
<thead>
<tr>
<th>Climate Relevance</th>
<th>Level</th>
<th>Location</th>
<th>National Forests</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Yes</td>
<td>2 Plan</td>
<td>9 Non-wilderness</td>
<td>7 Idaho</td>
</tr>
<tr>
<td>3 No/Not sure</td>
<td>7 Program</td>
<td>2 Wilderness</td>
<td>8 Montana</td>
</tr>
<tr>
<td>16 Project</td>
<td>2 WUI</td>
<td></td>
<td>10 Oregon</td>
</tr>
<tr>
<td>5 Other</td>
<td>17 Other</td>
<td></td>
<td>5 Washington</td>
</tr>
</tbody>
</table>
Interviews with Managers in PNW National Forests

- Siuslaw NF
- Deschutes NF
- Mt. Hood NF
- Gifford Pinchot NF
- Okanogan-Wenatchee NF
- Idaho Panhandle NF*
- Nez Perce-Clearwater NF
- Payette NF
- Sawtooth NF
- Beaverhead-Deerlodge NF
- Custer-Gallatin NF
- Targhee NF
- Caribou-Targhee NF
- Malheur NF
- Umatilla NF
- Colville NF

* Coeur d’Alene, St. Joe, and Kaniksu Forests
<table>
<thead>
<tr>
<th>National Forest</th>
<th>State</th>
<th>Thinning</th>
<th>Mechanical Fuel Treatments</th>
<th>Prescribed fire</th>
<th>Managed wildfire</th>
<th>Seeding fire-resistant species</th>
<th>Removal of fire-prone species</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sawtooth NF</td>
<td>ID</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Fire suppression</td>
</tr>
<tr>
<td>Payette NF</td>
<td>ID</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Nez-Perce Clearwater NF</td>
<td>ID</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Caribou-Targhee NF</td>
<td>ID</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Caribou-Targhee NF</td>
<td>ID</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
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</tr>
<tr>
<td>Idaho Panhandle NF</td>
<td>ID</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Beaverhead-Deerlodge NF</td>
<td>MT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>Use livestock grazing to manage vegetation</td>
</tr>
<tr>
<td>Custer-Gallatin NF</td>
<td>MT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Helena-Lewis &amp; Clark NF</td>
<td>MT</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
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</tr>
<tr>
<td>Malheur NF</td>
<td>OR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>Remove bug-prone species</td>
</tr>
<tr>
<td>Umatilla/Blue Mountains NF</td>
<td>OR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>Seeding native species</td>
</tr>
<tr>
<td>Siuslaw NF</td>
<td>OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Deschutes/Ohoco NF</td>
<td>OR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Mt Hood NF</td>
<td>OR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Willamette NF/Deschutes NF</td>
<td>OR</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Okanogan-Wenatchee NF</td>
<td>WA</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>Education</td>
</tr>
<tr>
<td>Colville NF</td>
<td>WA</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Gifford Pinchot NF</td>
<td>WA</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>17</strong></td>
<td><strong>10</strong></td>
<td><strong>11</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>
Interviews: Purpose

- Fire preparedness
- Fire response/Post-fire
- Climate-related changes in fire regimes
Thinning
Mechanical Fuel Treatments
Prescribed fire
Managed wildfire
Seeding fire-resistant species
Removal of fire-prone (pyrophytic) species
Other

Location
Wilderness
Non-wilderness
WUI
## Comparison: Literature Review & Interviews

<table>
<thead>
<tr>
<th>Fire-Related Climate Adaptation Actions</th>
<th>Prescribed Fire</th>
<th>Mechanical Fuel Treatments</th>
<th>Thinning</th>
<th>Managed Wildfire</th>
<th>Seeding fire-resistant species</th>
<th>Removal of fire-prone species</th>
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</thead>
<tbody>
<tr>
<td>Literature Review (109)</td>
<td>102.5</td>
<td>75.5</td>
<td>75</td>
<td>56</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>94%</td>
<td>69%</td>
<td>68%</td>
<td>51%</td>
<td>12.80%</td>
<td>12.80%</td>
</tr>
<tr>
<td>Interviews (18)</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>94%</td>
<td>94%</td>
<td>94%</td>
<td>94%</td>
<td>55.5%</td>
<td>61%</td>
</tr>
</tbody>
</table>
Seeing changes in moisture levels ➔ dry vegetation/fuels; seasonality of fire shifting; larger fires; diseases and insect outbreaks

- Variability in weather patterns may create new management opportunities (practices and timing) while restricting others.

Many of these actions address current fire issues, but also prepare the landscape for climate change.

“The actions currently being used will likely be the same tools used in the future - there are only so many management options in Forest landscapes.”

Fire management includes implicit risk assessment: “I’m thinking ‘What are the conditions out there now? What might the impacts to resources and people be? What are the actions that I need to take based on that checklist?’”
Informing Phase 3: Systematic review

Evaluating science behind Rx fire

- Conditions (e.g., weather, purpose, monitoring, fuel types, moisture level)
- Techniques (e.g., ground ignition, aerial ignition, avoidance techniques)
- Time frame (e.g., # of days, time of day, burn period)
- Scale(s) (e.g., acreage, forest-wide, etc.)
- Location(s) (e.g., Nat'l Forest, WUI, non-wilderness, elevation)
Phase 3: Systematic review of science

- Identify question or management action(s)
- Develop the protocol and search strategy
- Literature search and compilation
- “Coarse” filter of compiled list
- Review literature
- Assess quality and relevance of each study
- Write narrative synthesis
- Results workshop and further outreach and engagement
Primary Questions: In consideration of projected climate-driven shifts in fire regimes, what evidence is there (if any) that could potentially alter established scientific consensus regarding the use and application of prescribed fire? How might the use and application of prescribed fire evolve in response to climate change with respect to implementation conditions, techniques, time frames, scales, and locations?

Secondary Questions: Are there any instances where the standard use and application of prescribed fire has been altered specifically in response to climate-driven shifts in wildfire regimes? If so, to what extent/in what way did implementation conditions, techniques, time frames, scales, and/or locations of prescribed fire use change?
Initial literature search:
Articles in academic databases containing 3 search terms [climate + fire + adaptation] (n=71)

Duplicates removed (n=27)

Expanded literature search:
Articles in academic databases containing 2 search terms [climate + fire] (n=314)

Duplicates removed (n=126)

Records rejected because of geography (n=17) or irrelevance to study question (n=90)

Records rejected due to irrelevance (n=28)

Gray literature search:
Articles in government and NGO websites (n=40)

Peer-reviewed articles discovered through the search for gray literature (n=16)

Peer-reviewed articles from academic search (n=43)

Gray literature (n=40)

Peer-reviewed articles from gray literature search (n=16)

Articles suggested by reviewers (n=25)

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• Solicit expert opinion on the use and application of Rx fire under changing climatic conditions
• Identify knowledge gaps and research opportunities
• Discussion of key themes:
  1. Carbon carrying capacity of forests
  2. Biome shifts
  3. Where to use Rx fire
  4. Wildland fire use under climate change
Science Review Panel: Findings

• Rationale/guidelines for Rx fire use may shift (e.g., greater attention to effects on moisture stressed trees, changes in seasonal burn windows) but actual mechanics not likely to change much

• What is known:
  • Rx fire and fuels management can reduce the intensity of severity of wildfire at the forest stand level

• What is not known:
  • Effectiveness of Rx fire (and other fuels reduction efforts) in reducing number or extent of large wildfires at the landscape level, regardless of whether or not these fires are “climate related”
January 2016 manager-scientist workshop

- Discuss management agency plans and priorities for managing fire (with specific reference to the role of Rx fire) under future climate conditions
- Share the scientific consensus on the use of Rx fire in mitigating wildfire risk, severity, intensity, frequency, and extent
- Discuss what aspects of the scientific consensus on Rx fire’s mitigation effects become uncertain in the context of climate change
- Identify knowledge gaps around Rx fire use and climate change and describe the intended management application of desired future science products
- Develop partnerships between fire experts and forest/fire managers to ensure future research is addressing specific management agency needs
- Help refine the NW CSC Science Agenda in the area of fire regimes and climate change

Questions?

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