

Adapting management of federal lands in the western United States to climate change

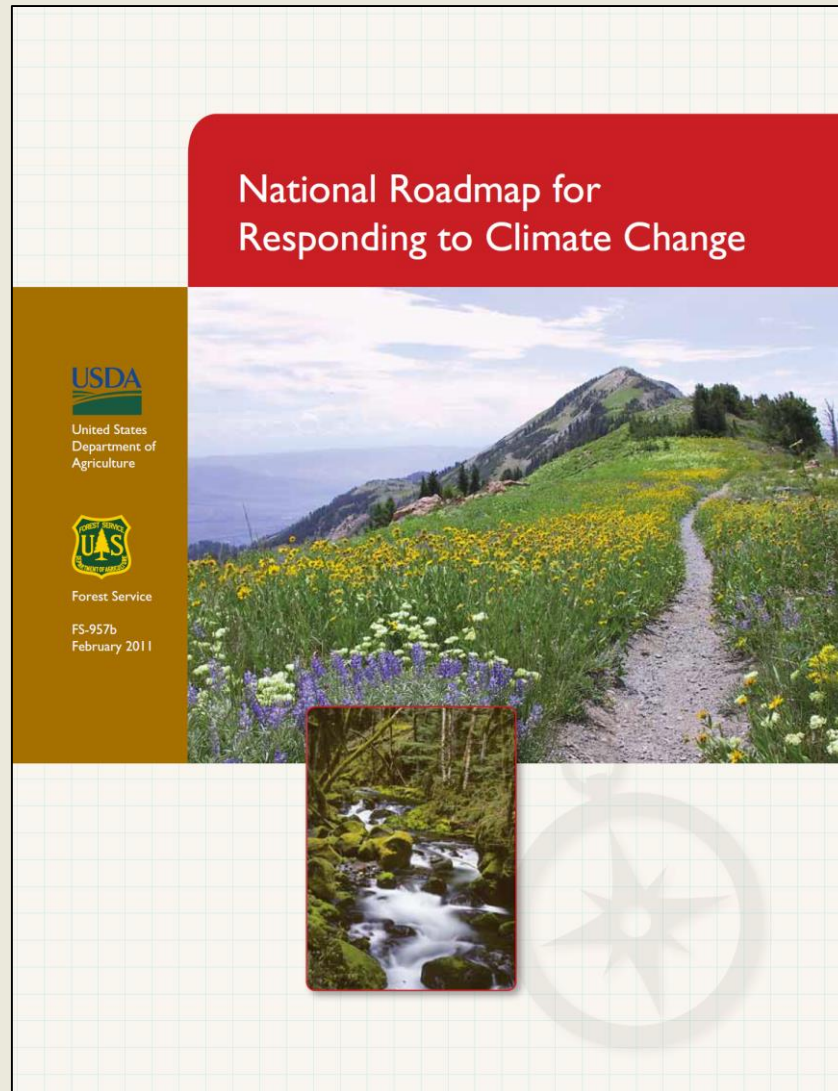


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Climate Change Adaptation in the U.S. Forest Service



Forest Service Scorecard



Organizational Capacity ✓

1. Employee education
2. Designated climate change coordinators
3. Program guidance

Mitigation and Sustainable Consumption

9. Carbon assessment and stewardship
10. Sustainable operations

USFS Climate Change Response

Engagement ✓

4. Integrate science and management
5. Other partnerships

Adaptation ✓

6. Assessing vulnerability
7. Adaptation actions
8. Monitoring



United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

General Technical Report
PNW-GTR-855

November 2011



Responding to Climate Change in National Forests: A Guidebook for Developing Adaptation Options

David L. Peterson, Constance I. Millar, Linda A. Joyce,
Michael J. Furniss, Jessica E. Halofsky, Ronald P. Neilson,
and Toni Lyn Morelli

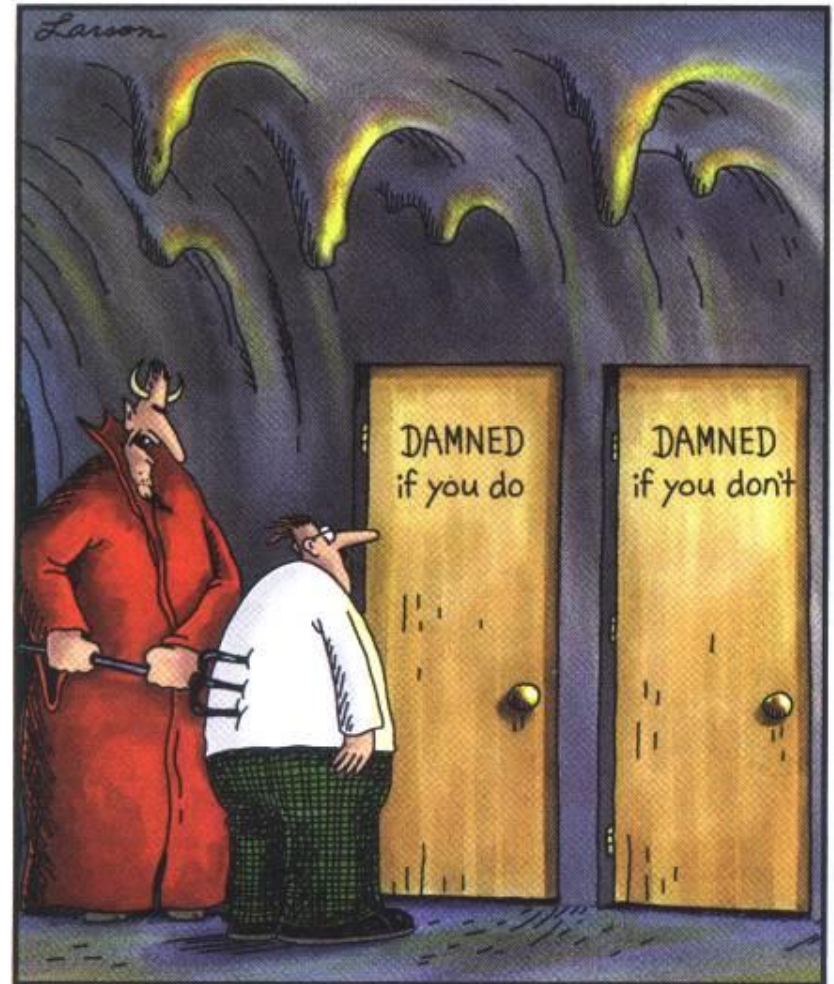


Adaptation – working definition

An effort to lower the potentially negative consequences of climate change

AND transition ecosystems and natural resources to a warmer climate.

= building resilience?



"C'mon, c'mon – it's either one or the other."

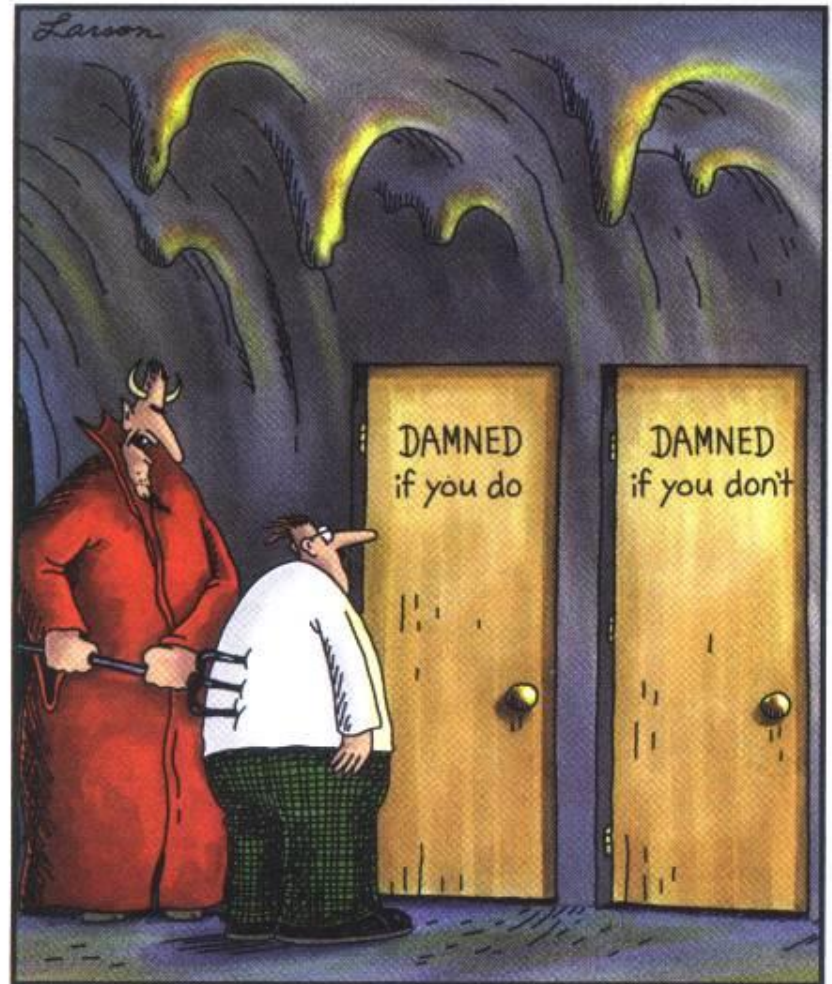
Adaptation – national forest context

Fine tuning and prioritizing current planning and management

Component of sustainable resource management

A form of risk management

Required by federal planning regulations



"C'mon, c'mon – it's either one or the other."

Adaptation Partnership Goals

- Increase climate change awareness
- Assess vulnerability of natural resources
- Develop adaptation strategies and tactics



The adaptation process

*Start with a science-
management partnership*

1. Education

Hold workshops and webinars to increase climate change knowledge.

2. Vulnerability Assessment

Review climate projections and identify resource sensitivities.

3. Adaptation Planning

Develop science-based adaptation options.

4. Implementation

Incorporate adaptation strategies into existing management plans.



Adaptation Partnership Locations

(completed or in progress)



Completed Adaptation Partnerships

Project	Resource Managers	Scientists	Area (ha)	National Forests	National Parks
Olympic	118	31	630,000	1	1
North Cascadia	500	11	2.4 million	2	2
Blue Mountains	50	10	2.1 million	3	0
Northern Rockies	210	18	6.9 million	15	3
Intermountain	199	10	12.4 million	12	22
South Central Oregon	80	8	2.0 million	4	1
Southwest Washington	49	6	550,000	1	0

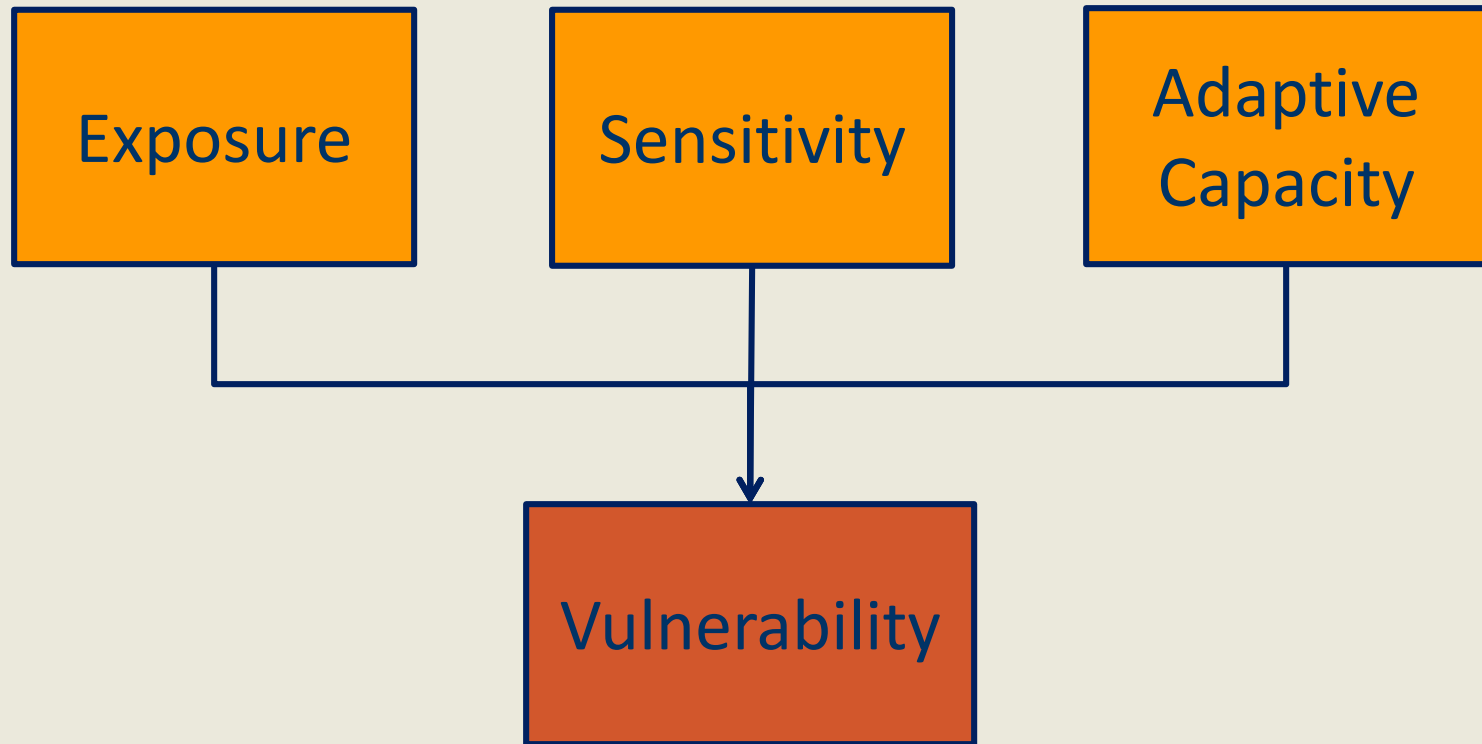
Typical assessment topics

- Vegetation (ecological disturbance)
- Wildlife
- Water
- Fish

New assessment topics

- Recreation
- Infrastructure
- Ecosystem services
- Cultural resources

Assessing Climate Change Vulnerability



Development of adaptation strategies and tactics by resource managers

Expected Outcome	Adaptation Strategy	Adaptation Tactic	Barriers
Increased insect outbreaks	Increase individual tree vigor and increase species and structural diversity	Conduct thinning to promote late seral forest conditions	Funding to conduct treatments
		Incorporate gap creation in thinning treatments to increase species diversity	

Vulnerabilities and adaptation

VEGETATION

Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Wildfire will burn more area and over a longer fire season



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Wildfire will burn more area and over a longer fire season



Adaptation strategy

- Increase resilience of forest ecosystems to more frequent fire



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Wildfire will burn more area and over a longer fire season



Adaptation tactics

- Reduce stand densities
- Accelerate hazardous fuel treatments
- Manage for diversity



Vulnerabilities and adaptation

VEGETATION

Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Areas with limited species and genetic diversity will likely be more susceptible to climate change stressors



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Areas with limited species and genetic diversity will likely be more susceptible to climate change stressors



Adaptation strategy

- Promote species and genetic diversity



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Areas with limited species and genetic diversity will likely be more susceptible to climate change stressors



Adaptation tactics

- Plant potential microsites with mix of species and genotypes
- Interplant to supplement natural regeneration



Vulnerabilities and adaptation

VEGETATION

Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Increased drought stress will decrease forest productivity at lower elevations



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Increased drought stress will decrease forest productivity at lower elevations



Adaptation strategy

- Increase resilience of forests to drought



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Increased drought stress will decrease forest productivity at lower elevations

Adaptation tactics

- Decrease forest stand density
- Plant drought-tolerant species and genotypes
- Protect trees that exhibit adaptation to water stress



Vulnerabilities and adaptation

VEGETATION

Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Increased disturbance will negatively affect whitebark pine



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Increased disturbance will negatively affect whitebark pine



Adaptation strategy

- Increase competitive ability and resilience of whitebark pine to more frequent disturbance



Vulnerabilities and adaptation

VEGETATION

Vulnerability

- Increased disturbance will negatively affect whitebark pine



Adaptation tactics

- Control beetles
- Create fuelbreaks
- Plant disease-resistant genotypes



Climate Change Adaptation Library

<http://adaptationpartners.org/library.php>

HOME WHAT WE DO WHO WE ARE ADAPTATION LIBRARY PROJECTS

ADAPTATION PARTNERS

SCIENCE-MANAGEMENT PARTNERSHIPS FOCUSED
ON CLIMATE CHANGE ADAPTATION IN THE
WESTERN UNITED STATES

Products and outcomes

- Climate change thinking and awareness
- Climate change partnerships
- Data gathering and information sharing
- Website (<http://adaptationpartners.org>)
- USFS General Technical Report
 - Reference for climate change projections and effects
 - Menu of adaptation options
- Journal articles
- Follow-up projects in the region

Products and outcomes

The most important outcome is building organizational capacity to address the effects of climate change on natural resources.



Adaptation is a marathon, not a sprint

<http://adaptationpartners.org/>