Adapting to Climate Change: A Risk Management Framework

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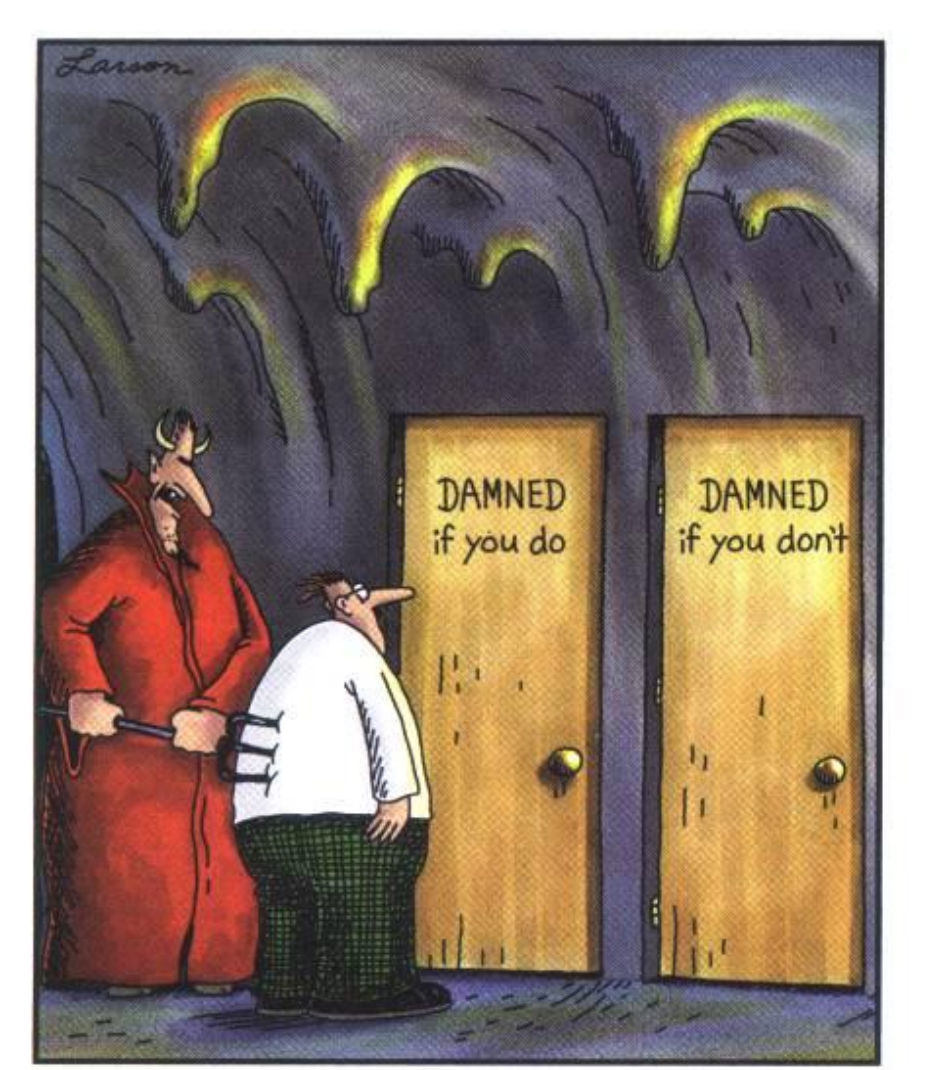
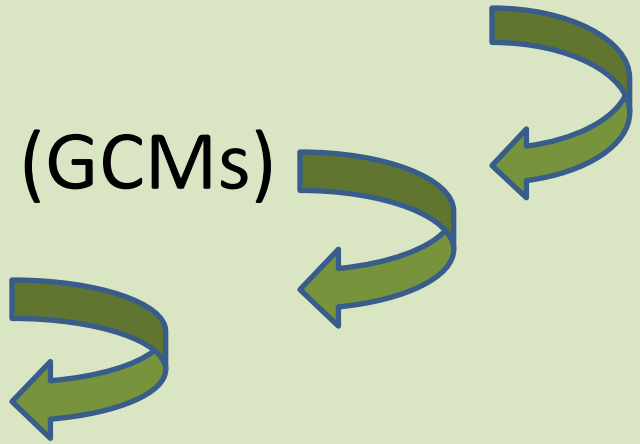
Management options for adapting to climate change?



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

Sources of uncertainty

- Emissions scenarios
- Global Climate Models (GCMs)
- Downscaling methods
- Effects models
- Interactions among multiple stressors
- Scale of effects assessment vs. management actions



Uncertainty ≠ ignorance

- Usually high confidence in broad scale projections
- High confidence in mid-21st century projections than late century
- High confidence in projections of some climate variables (temperature vs. precipitation)
- Evaluate the evidence and judge confidence in projected effects for specific areas – look for convergence among effects models

Address climate change effects as ***risk***

Address adaptation as ***risk management***

- Uncertainty and risk management are common in natural resource management
- But climate change poses new risk management challenges
  - ✓ Non-analog conditions
  - ✓ Rapid rate of change
  - ✓ Evolving scientific understanding
  - ✓ Many interactions

A framework for adapting to climate change

1. Establish a science-management partnership
2. Identify scenarios for future conditions
3. Evaluate vulnerability and risk
4. Make “climate smart” decisions
5. Monitor, evaluate, and review

Establish a science-management partnership

- Develop a cadre of scientists and managers with multiple areas of expertise
- Focus on a consensus range of issues and resource disciplines
- Work together towards final products and outcomes

Information sources…

- Joyce et al. (2008). *Adaptation Options for Climate-Sensitive Ecosystems and Resources.* U.S. Climate Change Science Program.
- Littell et al. (2011). *U.S. National Forests adapt to climate change through science-management partnerships.* Climatic Change.
- Halofsky et al. (2011). *Adapting to climate change at Olympic National Forest and Olympic National Park.* U.S. Forest Service.
- Peterson et al. (2011). *Responding to climate change on National Forests: a guidebook for developing adaptation options.* U.S. Forest Service.

Now available…

Climate Change Resource Center
U.S. Forest Service

http://www.fs.fed.us/ccrc

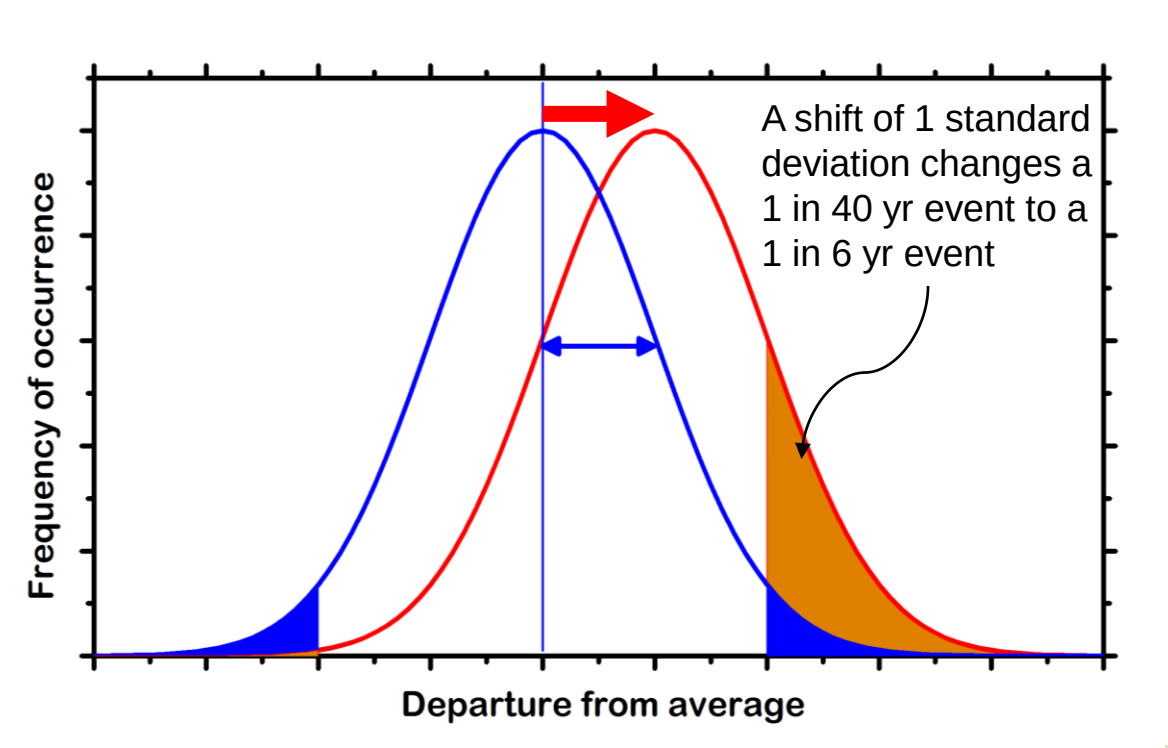
Information and tools *for land managers*

Identify scenarios for future climate and potential effects

- Identify a range of climate and effects projections for your area (from multiple models)
- Focus on a time horizon relevant for decision making, but also consider longer term
- Consider observed trends and variability

Extremes matter!

Frequency, extent, and severity of disturbances may be affected by climate change, altering the mean and *variability* of disturbance properties.



A shift in *distribution* of fire regime properties has a larger relative effect at the *extremes* than near the mean.

Evaluate vulnerability and risks

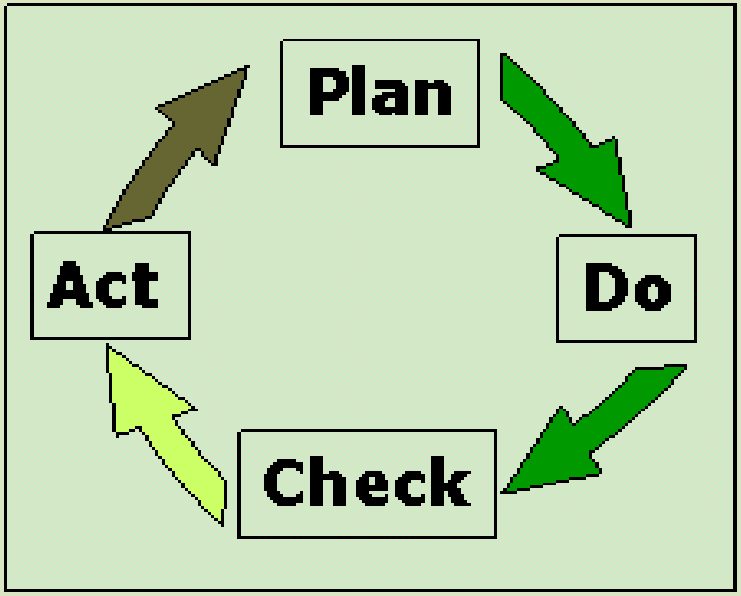
- Start with existing conditions and stressors (*sensitivity*)
- Consider observed variability and trends along with projected trends (*exposure*)
- Determine *adaptive capacity*
  - Potential for natural resources to respond favorably to an altered climate
  - Capability of organizations and institutions to respond effectively

Make “climate smart” decisions

- Strive for decisions that can accomplish objectives across a range of climate and effect projections
- Prioritize “no regrets” actions and projects with high probability of success/impact
- Use climate change as a context for
  - Identifying options
  - Evaluating tradeoffs among options
  - Final decision

Monitor, evaluate, and review

- Truly implement adaptive management
- Environmental Management System framework: plan, act, monitor, adjust

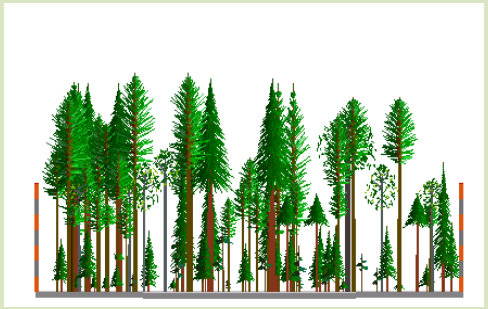


This adaptation framework…

- Has been used in 12 National Forests and 5 National Parks
- Has been documented in the peer-reviewed literature
- Is now incorporated in the national process used by the U.S. Forest Service

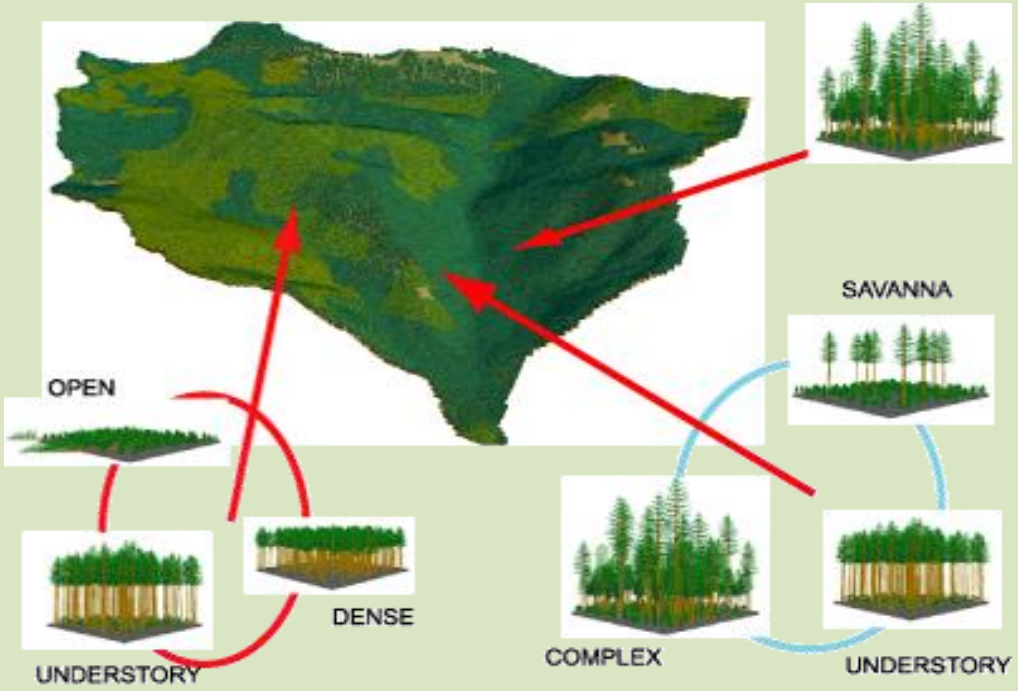
Increase resilience at large spatial scales

Implement treatments that minimize loss of structural and functional groups



Increase resilience at large spatial scales

Increase landscape diversity

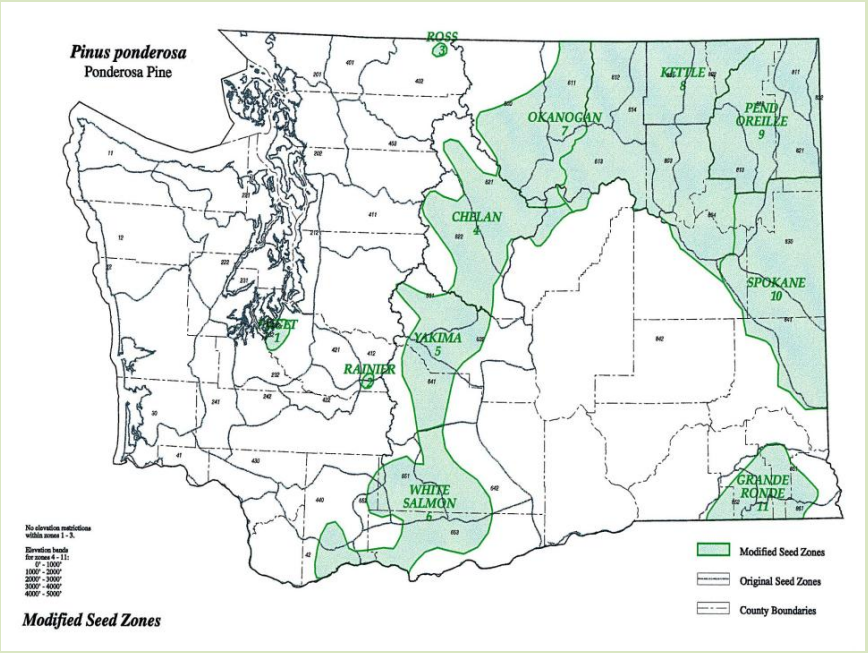


Maintain biological diversity

Identify species and populations sensitive to increased disturbance

Maintain biological diversity

Experiment with species and genotypes



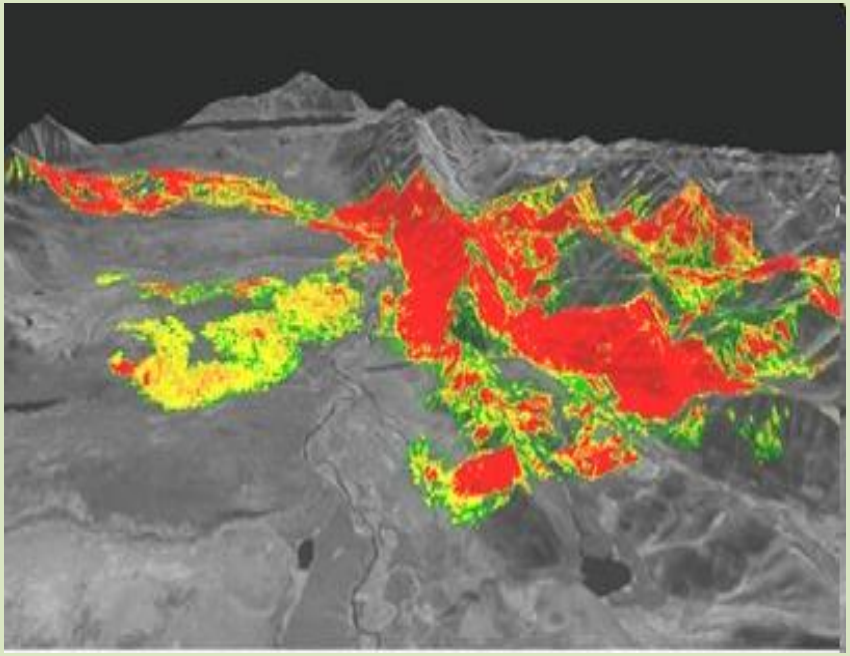
Implement early detection/rapid response
Control exotic species

Implement early detection/rapid response

Monitor post-disturbance conditions

Plan for post-disturbance management

Anticipate extreme events through scenario planning



Plan for post-disturbance management

Incorporate responses in planning documentation

We can do this!

- We have successfully addressed more difficult challenges in the past
- Climate smart management is mostly about managing for resilience to disturbance
- Choose your battles wisely
- Work with your neighbors – share your experiences

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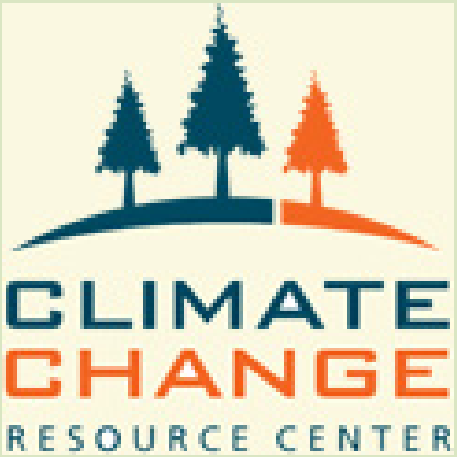

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