



Manager's Responses to a Changing Climate Future Planning and Management Options for Adaptation

FS Current Mandate Responsibility with respect to climate change – RPA Assessment

- 1974 Resource Planning Act, amended by 1990 Farm Bill, added these analyses:
 - ✓ potential effects of climate change on the condition of renewable resources on the forests and rangelands of the United States, and
 - ✓ rural and urban forestry opportunities to mitigate the buildup of atmospheric carbon dioxide.

Assessing Climate Change Impacts on the US

- **Markets facilitate adaptation in the forest sector nationally.** Regional productivity and sectors are impacted more. Assessments assume that managers respond to new opportunities: salvage, planting.
- **Water identified as a concern in every region of the United States.** However, the nature of the vulnerabilities varies across the US: drought, floods, water quality, snowpack changes.
- **Surprises expected.** Very likely that some impacts of climate change will be totally unanticipated.

Natural Resource Management Responses to Climate Change – Current

- Managers from federal, state, and local governmental agencies and non-governmental organizations have engaged in informal discussions, assessments, monitoring, research, education and outreach, policy and planning, management (field-based), and mitigation activities.
- On-the-ground management activities
 - No action taken solely for climate change
 - Dealing with 'symptom' – drought, insects, fire
 - Focusing on resilience to address ecosystems ability to deal with stress, including climate
- Climate change in FS plans – no consideration, named as threat, identified opportunities for carbon sequestration, identified monitoring and research needs

Natural Resource Planning and Management Options under a Changing Change

- **No anticipatory plans or management actions to be taken,** address assumptions about climate.
- **Identify a climate signal in changing disturbance patterns;** incorporate climate-smart actions after the disturbance.
- **Anticipate climate change, its opportunities and effects,** plan and manage for change.

Adaptation Options for climate sensitive ecosystem – Management and Research Needs

- **Management Directions**
 - Embrace uncertainty, manage for change – climate change, invasive, WUI
 - Nurture and cultivate human capital – information, training, learning environment
 - Develop expertise and decision-support tools for tradeoff analysis and priority setting
 - Develop Priorities for Addressing Potential Species Extirpation under Climate Change:
 - Engage the Public on the Role of Climate in Natural Resource Management
 - Increase Collaboration Across Federally Managed Landscapes
 - Plan for the 'Next' Disturbance (fire, flooding, invasives) and for the next Ecosystem
 - Develop Climate-inclusive Analysis Tools for management analysis
- **Research Directions**
 - Develop techniques, methods and information to assess the consequences of climate change and variability on physical, biological, and socio-economic systems at varying spatial scales--regional, multi-forest and National Forest scales.
 - Develop a tool box for resource managers that can be used to assess current assumptions about climate and quantify effects of climate change on natural resources as a component of land management.
 - Develop and test management alternatives for adapting to and mitigating the effects of an uncertain and variable climate and other stressors on natural resource outputs and ecosystem services.