USDA Forest Service
Caring for the land and serving people

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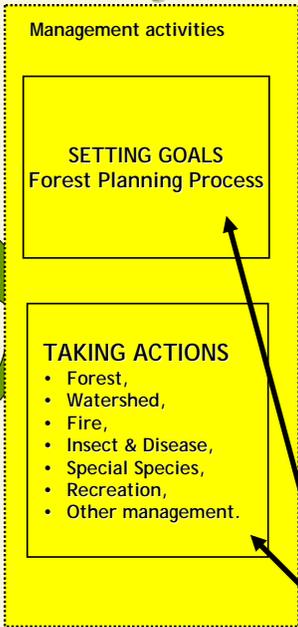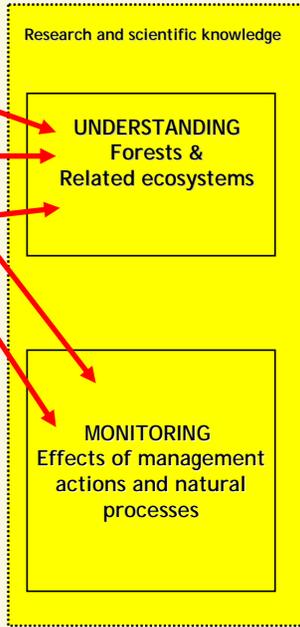Research and Development
Washington, D.C.

Climate Variability Research & Resource Management Decisions

Climate variability and changing climatic extremes affect the health and productivity of natural ecosystems. Understanding and coping with the consequences of climate variability is fundamental to land management but the USDA Forest Service has had no formal participation in this element of the current U.S. Global Change Research Program. This poster outlines how key Forest Service decisions can be better informed by capturing and utilizing climate variability research. We propose a refocused Forest Service research activity to link and adapt existing climate variability studies for application in land planning and land management activities of the Forest Service.

Forest Management Cycle

Forest Service proposes new and refocused research on effects of climate variability and extremes on forest planning and management

The current Forest Service component US Global Change Research Program

- Forest ecosystems processes sensitive to climate change
- Forest structure, function, and productivity changes in response to Climate Change
- Implications of climate change for forest management's capacity to sustain forest productivity, health, and diversity

Research and scientific knowledge

UNDERSTANDING
Forests &
Related ecosystems

MONITORING
Effects of management actions and natural processes

Management activities

SETTING GOALS
Forest Planning Process

TAKING ACTIONS
- Forest,
- Watershed,
- Fire,
- Insect & Disease,
- Special Species,
- Recreation,
- Other management.

Forests and related ecosystems result from, and, in general, can be considered to be in equilibrium with the current climate. Therefore, projected climate changes over this century will strongly influence the ecosystems that populate the United States. Forests evolve in response to disturbance: *drought, fire, storms, insects, diseases, invasive species,* all of which are fueled in different ways by increased variability of climate on daily to inter-annual scales; greater and less predictable extremes of temperature and precipitation and reduced reliability of climate norms. Since these changes will co-occur with more people in and near the forests and increased commodity demands, we anticipate greater stress on natural and managed ecosystems.

Forests and related ecosystems will adapt to these added stresses. However, as the steward for more than 191 million acres of national forests and grassland, 5% of our national land base, the USDA Forest Service must plan for and manage just how the forests adapt. The Forest Service job is to make informed decisions & responsibly implement them to ensure the health and productivity of our public forest resources. Knowing what will be possible for the forests and advising citizens about potential alternative futures, requires that climate variability information and research results are incorporated into the forest management cycle. This proposed initiative will build on results of the USGCRP, especially the Forest Service's work to date, while refocusing on delivery of this knowledge to inform planning and management processes.

1. How does climate variability and change impact forest and rangeland ecosystems?
2. What are the timing, frequency, and magnitude of extreme events and how do they impact forest and rangeland ecosystems and surrounding communities?
3. Can we develop and evaluate management options to prevent or mitigate the effects of extreme events on forests and rangeland ecosystems, and surrounding communities?
4. What are the effects of fire on forest and rangeland watersheds and can we develop management options to restore or rehabilitate fire damaged ecosystems given anticipated climate variability?

Strategic Research Questions

1. To what extent can uncertainties in model projections due to climate system feedbacks be reduced?

2. How can predictions of climate variability and projections of climate change be improved, and what are the limits of their predictability?

3. What is the likelihood of abrupt changes in the climate system such as the collapse of the ocean thermohaline circulation, inception of a decades-long mega-drought, or rapid melting of the major ice sheets?

4. How are extreme events, such as droughts, floods, wildfires, heat waves, and hurricanes, related to climate variability and change?

5. How can information on climate variability and change be most efficiently developed, integrated with non-climatic knowledge, and communicated in order to best serve societal needs?

US Global Change Research Program
www.usgcrp.gov

Climate Variability and Change Program Element

Applications to forest planning and landscape scale management activities

Improving forest planning and land management activities by incorporating climate variability research knowledge into Forest Service decision processes.

Forest Service research capacity & capabilities

An overview of FS research capacities:
- 480 scientists in hundreds of locations around the US;
& capabilities (from the left):
- the FCAMMS Modeling Consortia which provide high resolution meteorology to support fire & air quality research & applications;
- wind simulation for southern US;
- climate driven vegetation modeling;
- northern US climate change and fire research;
- landscape level climate research In:
  - Rocky Mountains;
  - California Sierra Nevada, and;
  - North Central US.