



## **Assessing and Adapting to the Effects of Climate Change on Western Ecosystems: A Research – Management Partnership *Draft***

A Research Prospectus by the Rocky Mountain Research Station, Pacific Northwest Research Station and Pacific Southwest Research Station

### **Background and Vision**

Climate change impacts have been identified at many locations on Western public lands, and have drawn increasing attention in the media. Chief Dale Bosworth recently stated his personal concern about this issue. Western landscapes are distinctive in terms of high-mountain topography, diversity in climate and vegetation, large amounts of public land, and increasing urbanization in rural areas. Addressing climate change in this biogeographic context requires an interdisciplinary research effort coordinated among large sectors of the natural resource community.

This proposal brings together the Western Forest Service research stations to assess vulnerability of natural resources and develop management options that will facilitate adaptation to a changing climate. Our vision is that within five years, the Forest Service will achieve the following outcomes relative to climate change:

- Provide state-of-science information on climate change to resource managers as a routine component of operations.
- Fully incorporate climate change as a consideration in resource management and planning, including planning documentation.
- Have a leading Research and Development effort on climate change, with expanded allocation of resources to climate change science in the Western Research Stations.
- Promote syntheses of disciplinary research related to climate and integrate FS science with other climate-related research and monitoring efforts of western universities and agencies

### **Objectives**

- Assess the consequences of climate change and variability on physical, biological, and socio-economic systems at the Westwide, regional, multi-forest and National Forest scales.
- Develop a tool box for resource managers that can be used to quantify effects of climate change on natural resources as a component of land management planning.
- Develop management alternatives for adapting to and mitigating the effects of an uncertain and variable climate on natural resource outputs and ecosystem services.

### **Approach**

A research-management partnership will address these objectives as follows:

*Assessment: Quantify the effects of climate change on natural resources at different spatial and temporal scales in Western national forests, multi-forests, regional and westwide*

- Assess the effects of climate change on natural resources and ecosystem services at scales and topics relevant to National Forests and their management and planning needs.
- Case studies for forest plan revision, project planning, and biological evaluations – these will reflect the ecological diversity of the West (maritime [PNW] vs. dry [PSW] vs. continental [RMRS]), and specific ecosystem services (water resources, air quality, forest products)
- Develop climate assessments at multiple spatial scales: multi-forest, Regional, Westwide.

Case studies will simultaneously address ecosystem stressors and specific management challenges, such as fire, insects, water supply, and urban-wildland interface issues. They will focus on interdisciplinary science in collaboration with other agencies, NGOs, and local stakeholders. Each case study will (1) learn and develop the information needed to include climate change information within planning and management processes, and (2) identify the datasets, models, and other management tools that need to have climate incorporated into them to provide scientifically credible outputs.

*Tool Box: Develop a set of tools that link potential climate change outcomes with management issues to facilitate planning and decision making.*

- Science-based products that deliver state-of-the-art information derived from data, qualitative models, and quantitative models in accessible formats, including a web-based portal on climate-change science. Training package on climate change that can be delivered through workshops and online tutorials.
- Decision Support Applications – Decision support models that incorporate the dynamics of climate, climate variability, and climate change into natural resource management planning.

At present, most established planning and operational tools do not directly incorporate climate variability and change and need to be informed by recent scientific data on climate trends. Research can contribute immediately to the revision of popular tools such as FVS, thereby improving their accuracy for a variety of applications. A web-based portal on climate change customized for the needs of Forest Service users will be an important component of the tool box, providing one-stop shopping for scientific information, key publications, and climate-smart models. A training curriculum and tutorials will ensure that Forest Service managers receive current, consistent information on climate change issues.

*Management options: Develop a set of viable alternatives for managing natural resources in the face of climate change, and other environmental stressors.*

- Develop a range of science-based management alternatives for adapting to and mitigating the effects of climate change on major resource values (water, vegetation, wildlife, recreation, etc.).
- Connect these management alternatives to specific management and planning documentation for a range of climate scenarios and desired outcomes.

Incorporating climate change science into land management planning is in its infancy, and needs to be accelerated to ensure that management objectives are met. National forest plans and other planning documents need to be “climate smart” in order to accurately plan for resource values and outputs at large spatial scales and long time scales. Using the case studies mentioned above, it will be possible to work closely with resource managers and line officers to determine an optimal approach for integrating climate change information in planning documentation, thereby providing the flexibility needed for science-based adaptive management.

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