

# National Forest Management Options in Response to Climate Change

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The U.S. Forest Service's mission is to sustain ecosystem health, diversity, and productivity to meet the needs of present and future generations. Climate change will amplify the already difficult task of managing National Forests for multiple goals. The U.S. Climate Change Science Program prepares synthesis and assessment products (SAPs) to support policy and decisionmaking related to climate change. One of these reports, SAP 4.4, reviews management options for adapting to climate variability and change in selected federally protected and managed areas. We provide an overview of the National Forest chapter here.

## Adaptation Strategies

The effect of climate change on ecosystem structure, function, and services will depend on the ecosystem's degree of sensitivity to climate change, the natural ability of plants and animals to adapt, and the availability of effective management options. Sensitivity to climate change is a function of ecosystem health and environmental stresses such as air pollution and invasive species. In nature, adaptation occurs as plants and animals react to environmental changes, including climate. Natural adaptation comes about through genetic changes, changes in phenology, and changes in behavior.

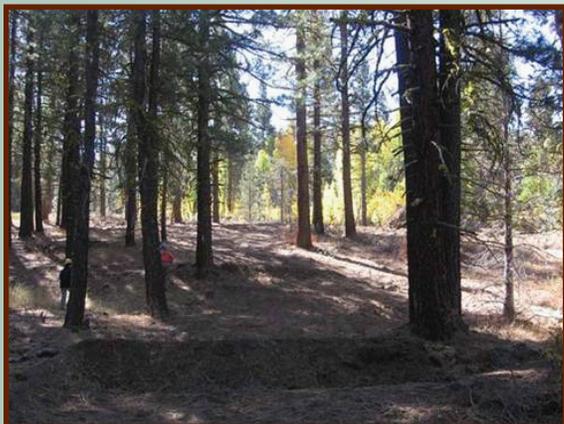


Photo courtesy of Tahoe National Forest.

The term "adaptation" is defined here as adjusting management of ecological, social, or economic systems in response to observed or anticipated climate change. The goal of adaptation is to reduce the risk of negative impacts to ecosystem services and to take advantage of any potential opportunities or benefits from climate change.

Broadly, adaptation may involve strategies of short-term management options that forestall the impacts of climate change

and long-term options for anticipating and managing ecosystem change. Forestalling ecosystem change focuses on managing plants and animals so they are able to resist climate change effects. This option may allow time for further considerations while seeking to maintain existing ecosystem services. For animal species, enhanced coordination among multiple agencies that manage adjacent lands might sustain habitat continuity in the short-term. Under a continually changing climate, it might not be possible to manage all climate change effects. One goal of managing ecosystem change is to enable forests and rangelands to naturally adapt to climate change effects. These options seek to work with natural processes, such as species migration, stand mortality, and colonization events. The intentions are to avoid crossing thresholds and to avoid extreme loss that might occur if natural change is resisted or progresses unmodified through disturbance events altered by climate change.

## Strategies to Help National Forest Managers Effectively Manage Climate Change Effects

- ❖ Reduce current environmental stresses
- ❖ Create resistance against climate-exacerbated disturbances such as wildfire or insect outbreaks by thinning and fuel abatement treatments at landscape scales and strategically placed area treatments
- ❖ Apply early detection and rapid response systems to identify plant, animal, and ecosystem responses to climate change
- ❖ Plan for higher-elevation insect outbreaks, species mortality events, and altered fire regimes
- ❖ Facilitate natural selection by enhancing disturbances that initiate increased seedling development and genetic mixing
- ❖ Reduce homogeneity of stand structure and synchrony of disturbance patterns across broad landscapes by promoting diverse age classes, species mixes, and genetic diversity
- ❖ Cultivate an increased understanding of climate change among FS employees
- ❖ Expand partnerships to capitalize on potential new ecosystem services opportunities under climate change
- ❖ Increase collaboration among federal agencies



## Planning for Climate Change

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Integrating climate change into policy development and planning could identify potential opportunities and barriers to adaptation across all levels of the agency. Quantitative assessments at the national/regional scales might provide strategic guidance for management options at finer scales. Further, broader social and economic factors and their influences across regions in terms of supplying ecosystem services could be evaluated quantitatively at the national level. Within a National Forest, planning offers the opportunity to identify vulnerabilities to climate change, such as the magnitude and timing (now or later) of potential impacts, the likelihood of impacts and confidence of those estimates, the potential for adaptation, and the vulnerabilities of associated human communities and economies.

## Managing for Climate Change

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A toolbox of multiple management options provides the most flexibility to address the spatial and temporal scales of management and decisionmaking. For example, management adjustments may best be made in some cases during or after a climatic event (such as drought) or disturbances (such as a wildfire). Large-scale disturbances would be viewed as windows of opportunity, during which a previously prepared adaptation plan would be implemented. Alternatively, management responses that anticipate future climate change would use information about the changing ecosystems and disturbance regimes to identify a proactive suite of management options.

Adaptation is increasingly viewed as a necessary and complementary strategy to mitigation. Mitigation means reducing anthropogenic greenhouse gas emissions from energy use and land use changes and increasing carbon sequestration potential in order to minimize the pace and extent of climate change.

## Additional Information

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We provide only a brief overview of the National Forest chapter. Additional information and the scientific background for this overview can be found in SAP 4.4: *Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources: A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research* at <http://www.climatescience.gov/Library/sap/sap4-4/final-report/>. For a summary of frequently asked questions about climate change, see *Climate Change and Ecosystems: Summary of Recent Findings* <http://www.climatescience.gov/Library/sap/sap4-4/final-report/sap4-4-brochure-FAQ.pdf>. For more information about climate change and natural resource management, see the U.S. Forest Service Climate Change Resource Center Web site: <http://www.fs.fed.us/ccrc>.

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