

Science-Management Collaborations: Developing Adaptation Options for National Forests

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Climate is constantly changing, prompting natural and managed ecosystems to adjust. As a natural process, adaptation refers to the reactive changes that species and ecosystems make in response to environmental changes. With human intervention, adaptation refers to management actions and decisions that help ecological, social, and economic systems accommodate challenges imposed by climate change. Management actions can be developed to anticipate climate change and associated changes in natural disturbances such as fire and insects. Adaptation options for resource management may focus on the short term to forestall climate change impacts or on the long term to anticipate and manage ecosystem change.

The U.S. Global Change Research Program (USGCRP) (formerly the U.S. Climate Change Science Program) prepares synthesis and assessment products to support policy-making and adaptation decisions regarding climate change. As part of the USGCRP Synthesis and Assessment Product (SAP) Report 4.4 “Preliminary Review of Adaptation Options for Climate-Sensitive Ecosystems and Resources,” adaptation options for three National Forests were identified using science-management collaborations.

Science-Management Collaboration

The goal of SAP Report 4.4 was to engage resource managers in a review of management options for adapting to climate variability and change in order to identify characteristics that promote successful implementation. Toward that goal, three National Forest staffs—Tahoe, Olympic, and Uwharrie—were invited to explore adaptation options in more depth. While the collaborative processes were tailored to each National Forest, the following is a general description of the process.

Scientists synthesized the current information on climate change and the resource impacts of climate change. Individual Forest information was presented in a workshop setting that spanned from a half day to two days. Following these presentations, a series of questions elicited feedback to ensure the available information was clear. These discussion questions also served to draw out the staffs’ experience with past weather

events, natural disturbances, ecosystem responses to these events, and which past management actions proved successful. Options for adaptation management were developed, primarily by the National Forest staffs. Barriers to these options and opportunities to overcome them were discussed. This collaborative process brought together information



Exploring Adaptation Options on National Forests

Land managers can bring a wealth of experience with weather events and resource management. Scientists can bring a wealth of information on climate change science. A series of focused questions can help start the dialogue between land managers and scientists on climate change in National Forests.

The initial question can be as simple as:

- ❖ What is your most pressing challenge with respect to climate change?

Questions can explore how management goals were affected by past weather events and what information would have been helpful to improve the management response at that time. Or questions can explore the management and planning environment for future climate change:

- ❖ What are the priorities for long-term resource management on a 50-year horizon?
- ❖ What is the policy and regulatory environment in which management and planning are currently being developed?
- ❖ What are the biggest concerns and ecological and social sensitivities in a changing climate?
- ❖ What are adaptation opportunities and how can barriers to these opportunities be overcome?



on key climate change impacts in the management context. These types of interactions enhanced the science-management partnership.

The National Forests

Each National Forest described in SAP 4.4 has certain characteristics of interest, including different management contexts and settings, that qualify it as a useful model for examining climate change adaptation options.

The **Tahoe National Forest** (TNF) in California is representative of west-slope Sierra Nevada forests with great ecological value and complex institutional contexts. Management is guided by the Sierra Nevada Forest Plan Amendment (FPA), which specifies goals for reducing fire risk and protecting old forests and other habitats. Adaptive management is a key component of the FPA. The TNF can serve as a model for studying climate change impacts and adaptations across the Sierra Nevada.

The **Olympic National Forest** (ONF) in Washington is a rainforest that stretches from sea level to snow-capped mountains and supports a diverse set of ecosystem services. Numerous stakeholders and mandates are associated with ONF's resources. Management objectives include enhancing native biodiversity, promoting the development of late-successional forests, and restoring and protecting aquatic ecosystems from the impacts of an aging road infrastructure.

The **Uwharrie National Forest** (UNF) in North Carolina consists of Federal land intermingled with private land parcels and is experiencing an increasing demand for recreational opportunities.

The combination of fragmented Federal land and high demand for ecosystem services will present management challenges as climate change affects resources such as regional water reserves.

Adaptation Opportunities

Following are a few of the adaptation options described by SAP 4.4 and examples of opportunities identified in the Tahoe, Olympic, and Uwharrie case studies.

Manage for drought- and heat-tolerant species to reduce potential stresses. In the UNF, re-establishing more fire- and drought-tolerant longleaf pine could improve resistance to severe fire disturbances and drought. Restoring historical sites of longleaf pine savannas on the UNF through logging or controlled burning would reduce water use, water stress, wildfire fuel loads, and wildfire risk as temperatures increase.

Reduce the impact of current anthropogenic stressors. The ONF plan recognizes that invasive species are best addressed using an early detection/rapid response approach. In the TNF, improving water infiltration to groundwater reservoirs (for example, by decreasing road densities) could reduce runoff and increase the quantity of groundwater storage for dry periods.

Identify the current level of climate adaptation and coordinate planning efforts to share information about local adaptation options. On the TNF, a rapid assessment could identify the level of climate adaptation already incorporated in current land management plans and practices and could suggest areas for

improvement. Coordinated revision of the land management plans for National Forests with similar natural resources offers an opportunity to develop regional-scale adaptations for similar ecosystems subject to similar stressors.

Conclusion

The Tahoe, Olympic, and Uwharrie case studies provide specific examples of opportunities and barriers to National Forest management under climate change. Studying the management opportunities Forest staffs identified reveals strategies and tools that might be effective in other National Forests.

Additional Information

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.globalchange.gov/publications/reports/scientific-assessments/saps/sap4-4>. For a summary of frequently asked questions about climate change, see *Climate Change and Ecosystems: Summary of Recent Findings*: <http://www.globalchange.gov/images/stories/reports/SAPs/4.4%20brochure.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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