



## WILDERNESS AND CLIMATE CHANGE: A VITAL CONNECTION

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As the Forest Service grapples with the impacts of climate change in all ecosystems throughout the United States, how can the 35 million acres of congressionally designated wilderness administered by the Forest Service help the agency adapt to these impacts? And how would wilderness character monitoring help the Forest Service understand and manage these impacts? Two separate but related briefing papers are included here that answer these questions.

### **How Wilderness Helps the Forest Service Adapt to Climate Change**

Wilderness is a significant part of the Forest Service land portfolio, comprising nearly 20% of National Forest System land, with over 90% of the National Forests and Grasslands having direct administrative responsibility for wilderness. Wilderness can directly help the Forest Service adapt to the changes caused by climate in at least five ways:

- *Understanding ecological systems.* Because wilderness receives minimal hands-on management, it provides the best baseline we have for monitoring to understand how the full range of ecological systems, from grassland to alpine tundra, function and respond to a changing climate. This understanding includes, for example, how changing demography and distribution of plant and animal species, severity and timing of fire, and spread of insect and disease outbreaks are correlated with changing climate conditions.
- *Sustaining biodiversity.* The large scale and long-term protection of wilderness provides one of the best, and least expensive, opportunities to sustain the full suite of biodiversity in the face of climate change. The legal mandate to protect “the community of life” in wilderness allows Forest Service wilderness to uniquely protect entire ecosystems and the wide range of environmental gradients necessary for species migration, dispersal, and viable populations as the climate changes.
- *Connecting landscapes.* Wilderness is the anchor or core of all landscape-scale conservation strategies because it offers the largest and most long-term ecosystem protection. Wilderness provides the necessary connectivity across entire landscapes so plant and animal species have the opportunity to move from one area to another under a changing climate. Wilderness connectivity is the best tool we have for sustaining biodiversity and ecological services across working landscapes.
- *Providing ecosystem services.* Wilderness provides many goods and services that benefit people in surrounding landscapes, and such free ecosystem services will likely be increasingly important under a changing climate. For example, in the western states, more than 50% of the water supply comes for National Forest System land and most headwater watersheds are located in wilderness. With projected changes in precipitation patterns and increasing temperatures across much of this area, the water that falls in wilderness headwaters will be increasingly important for surface and underground water recharge to municipal water systems.
- *Fostering human-nature relationships.* Wilderness provides one of the last reminders of the human connection to the natural world. The inspirational, therapeutic, spiritual, cultural, and psychological values of this connection will be increasingly important in a world dominated by urbanization and anthropogenic climate change. Social science research confirms the value and role of wilderness experiences in fostering the connection between people and nature. With the effects of climate change becoming increasingly apparent and our response to these effects becoming increasingly strident, wilderness is increasingly important as an ethical antipode to the human domination of nature.

## How Wilderness Character Monitoring Would Help the Forest Service Understand and Adapt to the Effects of Climate Change

Once an area is designated as wilderness, why is monitoring needed? Wouldn't wilderness designation provide all the protection that is needed? When the Wilderness Act was passed by Congress in 1964, scientists believed that once an area was protected it would maintain the "enduring benefits" of wilderness in perpetuity. In addition, most agency staffs believed that since wilderness isn't traditionally managed, no monitoring would be needed. Now, a huge body of scientific literature firmly refutes the idea that the act of designation protects wilderness from a wide range of local, regional, and landscape scale threats. If wilderness is to provide the ecological and social benefits described earlier, monitoring is essential to understand the effects of the impacts occurring in wilderness, as well as the success of wilderness in providing these benefits. Simply, wilderness is the last best place to monitor the effects of climate change on a broad range of naturally functioning ecosystems across our nation.

The concept of "wilderness character" provides a fundamental organizing framework based on law and agency policy for monitoring ecological and social resources, and impacts to these resources, inside wilderness. The Forest Service began developing this framework in 2001, and in partnership with its three sister wilderness agencies (BLM, FWS, NPS), recently published a cost-effective strategy for monitoring trends in wilderness character in every wilderness across the entire National Wilderness Preservation System. The Forest Service also recently published protocols to use and synthesize data the agency already collects to assess trends in wilderness character. These protocols would pull data from nearly every program area within the Forest Service, including lands, engineering, ecosystems, wildlife, vegetation, recreation, heritage, water, and FIA, fostering better communication and integration across staff areas. These protocols validate the agency intent to "collect data once, use it many times."

Wilderness character is composed of four necessary and interrelated qualities that together comprise the integrated ecological and social system of wilderness:

- *Untrammeled*. This quality assesses the degree to which ecological systems inside wilderness are not intentionally manipulated. Trend in this quality would be assessed by monitoring actions that are either authorized or unauthorized by the Federal land manager that manipulate any ecological component or process, such as actions to suppress natural fire ignitions, or to introduce plants or animals (for example, stocked fish in naturally fishless lakes), or to remove predators.

The untrammeled quality is important because it directly evaluates the capability of wilderness to provide baseline ecological information and benchmarks about how relatively unmanipulated or natural systems respond to climate change. This quality is also important as a social and ethical symbol for restraint and humility in our actions towards nature, just as the Statue of Liberty is a symbol for liberty. The untrammeled symbol will be an increasingly important indicator as climate change increases calls for "assisted species migration" and other actions to adapt ecological systems.

- *Natural*. This quality assesses the degree to which wilderness sustains ecological systems that are substantially free from the effects of modern civilization. Trend in this quality would be assessed by monitoring three indicators: plant and animal species and communities, physical resources including air and water, and biophysical processes such as fire regimes and the effects of climate change.

The natural quality is important because it directly evaluates the degree to which the ecological system inside wilderness is functioning within the natural range of conditions and processes, and the degree to which wilderness protects biological diversity in the face of climate change. Monitoring the natural quality would build on the data currently available inside wilderness and foster better integration across resource staff areas within the Forest Service.

- *Undeveloped.* This quality assesses the degree to which wilderness is free from permanent improvements or modern human occupation. Trend in this quality would be assessed by monitoring three indicators: physical developments that include structures and installations, the use of motorized vehicles and equipment or mechanical transport, and the area and impact of inholdings.

The undeveloped quality is important socially for sustaining wilderness as a place where people can feel their connection and interdependence with nature unencumbered by modern developments, and ecologically as a place free from “improvements” such as dams that disrupt hydrological flows or roads that fragment wildlife habitat. Both social and ecological characteristics of the undeveloped quality will be increasingly important to sustain as climate change increases the demand for exploiting resources, for example to adapt to changing precipitation patterns.

- *Solitude or primitive and unconfined recreation.* This quality assesses the degree to which wilderness provides the settings and opportunities for people to experience challenge, self-discovery, inspiration, and awe. Trend in this quality would be assessed by monitoring five indicators: remoteness from sights and sounds of other people inside the wilderness, remoteness from sights and sounds of modern civilization intruding from outside the wilderness, facilities that decrease opportunities for self-reliant recreation, trail development level, and management restrictions on the freedom of visitor behavior.

The importance of this quality has been amply demonstrated by social science research that people derive significant recreational and therapeutic benefits from outstanding opportunities for solitude or primitive and unconfined recreation provided by wilderness. These benefits will be increasingly rare and important for the Forest Service to provide as climate change reinforces the reality of pervasive human impact on nature. With climate change, wilderness offers what may be the last and best place to experience nature and derive the benefits that come from this experience.

Only by monitoring these four qualities of wilderness character can the Forest Service understand whether wilderness continues to provide substantive ecological and social benefits to society. National scale monitoring programs, such as FIA to understand trend in forest cover and composition, IMPROVE to understand the effects of air pollutants, and NVUM to understand visitor use across the National Forest System, inform agency decision-making to sustain desired resource conditions and human opportunities to benefit from our natural resources. Likewise, a national program to monitor wilderness character would help the Forest Service understand trends in the benefits provided by wilderness and help the agency play a leadership role in adapting to climate change.