THE PINCHOT LETTER

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# Climate Change Effects on Natural Resources: Avoiding the Unmanageable and Managing the Unavoidable on America's Federal Public Lands[1]

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Climate change, whether based on long-term climate cycles or anthropogenic causes, is expected to have significant effects throughout the continental US and Alaska during the next 75–100 years, regardless of near-term efforts to reduce greenhouse gas emissions (IPCC 2007). Within a range of plausible scenarios, these changes in average temperature, precipitation patterns, etc., are projected to significantly alter the environment in which federal land management agencies carry out their respective missions to conserve and sustainably manage various natural resources that serve the public interest by providing a variety of goods, services, and values.

These likely changes were summarized in a report issued by the Government Accountability Office in August 2007 at the request of Congress (GAO 2007). GAO's findings were based on information presented in a 2006 conference at the National Academy of Sciences, and on case studies conducted by GAO staff on several federal land management units administered by several different agencies. GAO's recommendations were focused on the need for agencies to develop improved processes for understanding the likely effects of climate change on lands under their stewardship, and determining actions needed.

In a recent forum on Capitol Hill, sponsored by the Pinchot Institute, top officials from the US Department of the Interior and the US Department of Agriculture reported on the strategies their agencies are now developing for adaptation to climate change, in order to sustain the purposes and values for which national forests, parks, wildlife refuges, and public domain lands were established. There continue to be important limitations on the ability of climate scientists to predict the likely climate change effects at the scale of a particular national park or forest, but the science underlying projections of overall climate trends has improved rapidly in recent years. What may be more limiting than the science of climate change is the existing institutional, legal, and policy structure within which federal land management agencies must operate.

## GAO Study on Effects of Climate Change on Federal Lands

The key findings and conclusions in the GAO report were based on both the latest scientific projections, and on case studies on four areas currently managed by federal agencies, according to Anne Johnson, a senior analyst at GAO and one of the authors of the study. In 2006, GAO gathered a group of 54 scientists, economists, and federal resource managers at the National Academy of Sciences to obtain experts' views on the effects of climate change on four ecosystem types—coasts and oceans, forests, fresh

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## About the Pinchot Institute

Recognized as a leader in forest conservation thought, policy and action, the Pinchot Institute for Conservation was dedicated in 1963 by President John F. Kennedy at Grey Towers National Historic Landmark (Milford, PA)—home of conservation leader Gifford Pinchot. The Institute is an independent nonprofit organization that works collaboratively with all Americans nationwide—from federal and state policymakers to citizens in rural communities—to strengthen forest conservation by advancing sustainable forest management, developing conservation leaders, and providing science-based solutions to emerging natural resource issues. Further information about the Pinchot Institute's programs and activities can be found at *www.pinchot.org*.



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water, and grasslands and shrublands. An overall finding was that "federal land and water resources are vulnerable to a wide range of effects from climate change, *some of which are already occurring*" [emphasis added]. These effects include, among others:

- Physical effects, such as droughts, floods, glacial melting, and sea level rise
- Biological effects, such as increases in insect and disease infestation, shifts in species distribution, and changes in the timing of natural events
- Economic and social effects, such as adverse impacts on resource uses

GAO followed up with a series of four case studies, one in each of the identified ecosystem types:

- Coasts and oceans ecosystem: Florida Keys National Marine Sanctuary (NOAA)
- Forests ecosystem: Chugach National Forest, Alaska (USDA Forest Service)
- Fresh waters ecosystem: Glacier National Park, Montana (US National Park Service)
- Grasslands and shrublands ecosystem: Kingman, Arizona (Bureau of Land Management)

In addition to key climate change effects identified on each individual land management unit, GAO listed several "management challenges" they found to be common across all the case studies and all the federal agencies involved. According to GAO:

> Resource managers from the five key resource management agencies . . . identified several challenges to addressing the observed and potential effects of climate change. These challenges include (1) the lack of priority given to addressing the effects of climate change within their agencies, (2) limited guidance

from headquarters about whether or how to address the effects of climate change in management actions and planning efforts, and (3) insufficient site-specific information to plan for and manage the effects of climate change on the federal resources they oversee. Resource managers further stated that climate change is a complex, global issue that is difficult for one resource unit or agency to address on its own.

GAO found that managers lack models for "local projections of expected changes," and that without such information, "managers are limited to reacting to already-observed climate change effects on their units, which makes it difficult to plan for future changes." A January 2001 executive order from the Secretary of the Interior directed the National Park Service, US Fish & Wildlife Service, and BLM to consider and analyze potential climate change effects in their management plans and activities. But this was one of the last official acts of outgoing Interior Secretary Bruce Babbitt, and it contained no specific deadline by which these steps were to be accomplished. As a result, no significant action has been taken to implement this executive order. GAO found that the strategic planning processes at the land management agencies in Interior still do not specifically address climate change. On-the-ground resource managers have limited guidance about whether or how to address climate change, and are uncertain about what actions—if any—they should take.

## Federal Land Management Agency Response

Now that the national and international dialogue on climate change is beginning to openly consider options for adapting to climate change effects, and not simply the need to mitigate greenhouse gas emissions, the magnitude of this challenge is beginning to sink in (Bierbaum et al. 2007). The US Forest Service is moving assertively to consolidate what it has learned from a century of forest research, and two decades of research on climate change as it affects forests. According to the agency's Deputy Chief for Research & Development Ann Bartuska, the agency plans to establish a new basis for continuous learning and adjustment through ongoing experimentation. This approach, known generally as "adaptive management," was developed nearly two decades ago to address issues over biodiversity conservation and ecosystem management, but the agency has been slow to adopt it in practice. Now there is greater urgency.

In the short term, the Forest Service strategy focuses on building resilience, and maintaining as much flexibility as possible to modify management actions in response to changing climatic conditions. In managing for threatened or endangered species, for example, this may involve maintaining somewhat larger buffers than would otherwise be deemed necessary, and creating suitable habitat conditions not only where these species are located now, but where they are likely to migrate to in the future in response to climate change. For the longer term, the Forest Service is urging its planners and resource managers to be ready to accommodate rare events and extremes, not just the average (Solomon et al. 2007). Ecosystem restoration is seen as the key to long-term resilience—not necessarily to past conditions, but to conditions that maximize potential management options for an unforeseeable future.

At the Department of the Interior, land managers are recognizing that, even if mitigation efforts are reasonably successful, significant changes in climate patterns will continue to unfold in unpredictable ways over the next hundred years and beyond, according to Assistant Deputy Secretary Abe Haspel. The Interior agencies are attempting to grapple with the complexities of climate change while responding to other complex sources of ecological and economic stresses on the lands they manage. Local land use changes, population growth, pollution, overfishing, and other resource impacts unrelated to climate change are inseparable and must also be factored in.

In April 2007, Interior established a Climate Change Task Force to examine how climate change is expected to affect habitat protection, water resources management, disaster planning, and other core responsibilities. The task force, which involves more than 100 scientists and land management professionals across all the Interior agencies, is also working to "downscale" the information from existing climate models to make it more useful for federal land managers in the field. Top-level officials participated on a steering committee that has been formed to address three major aspects of the climate change issue: science; land and water resource management; and policy. The report to the Secretary, which is expected to soon be publicly available, will contain options for immediate action as well as steps to be taken over the longer term.

Significant changes are expected. Potential effects on native plant and animal species may call for entirely different tactics for biodiversity conservation than those used in the past, as entire ecological communities migrate across federal boundaries and into unprotected landscapes. More frequent and more severe fires could turn federal forests from carbon sinks to carbon sources, adding to the fact that forest burning is already one of the single greatest sources of human-induced greenhouse gas emissions worldwide.

The magnitude and nature of the changes that are likely to take place will call for a rethinking of the

approaches that land managers have been using to protect and sustain the resources and other public values on federal lands. Although the missions of federal agencies such as the National Park Service and US Forest Service are quite different, land management has focused largely on protecting and maintaining natural landscapes, while regulating human activities and resource uses to minimize their impacts. Large-scale and long-term changes in climate patterns may make it virtually impossible to maintain landscapes and ecosystems in their existing or historic states (Smith and Gow 2008). Should federal land managers even attempt to do this? Will land managers among different federal agencies answer this question differently?

The scope of these consequences extends well beyond the boundaries of the federal lands themselves. The critical role that federal lands play in guaranteeing abundant supplies of high-quality water for communities throughout the country—and the ways in which climate change could significantly diminish their ability to fulfill that role in the future—is of vital concern to these communities (Kaufman 2008, Kranhold 2008). Projected changes in hydrologic cycles, particularly in the interior West, raise the possibility that federal lands will be simply incapable of maintaining water supplies that cities, towns, farms, and tribal communities have come to rely upon (Barnett et al. 2008, Snover et al. 2007). Average water temperatures are expected to increase, raising concerns not only for fish habitat, but for waterborne diseases. The Interior task force is even considering the possible effects of extreme dust storm events, including potential increases in the incidence of airborne diseases—noting that dust from Africa is now regularly transported to the Caribbean, and dust from China has made its way to California.

## Institutional, Legal, and Policy Framework for Timely, Effective Action

Scientific challenges notwithstanding, it is unclear whether federal land management agencies have the institutional, legal, and policy framework necessary to serve as a basis for timely, effective action. Robin O'Malley of the John Heinz Center for Science, Economics and the Environment, sees a need for new institutional arrangements—across federal and state agencies, and with nongovernmental organizations—to closely monitor the indicators of ecosystem health as they are influenced by climate change, and provide the impetus for appropriate and timely responses through public-private cooperative efforts. Different states, and even different federal land management agencies, have taken individual approaches to determining what monitoring data to gather. Often, they hesitate to modify their own approach in order to facilitate information sharing, or allow scientists to combine information to obtain a larger regional perspective across jurisdictions.

This is a mindset that needs to change, according to O'Malley, if we are to have any hope of understanding the ecological effects of climate change in time to take appropriate actions. This may require the development of entirely new institutional relationships among agencies and the private sector, or possibly the intervention of a neutral third-party organization that is focused primarily on determining the needs of multiple users. Such an organization could utilize research from a variety of different sources to construct an information system that is consistent from the local scale to the national (and larger) scale, and also meets the needs of the users.

***On-the-ground resource managers have limited guidance about whether or how to address climate change, and are uncertain about what actions—if any—they should take.***

The uncertain pathway of climate change also calls for more intensive monitoring of the results of land management actions, to ensure that their effects are what they were intended to be. These actions will have to be planned and executed in a context of unprecedented uncertainty, and in an environment that is changing so quickly that consequences are far less predictable than in the past. What will this mean for the way federal agencies analyze the potential environmental effects of proposed actions? Will the increased uncertainty result in more environmental impact statements being rejected by the courts, leaving federal land management agencies paralyzed in response to mounting threats from climate change?

Jim McElfish, a senior attorney at the Environmental Law Institute, doesn't believe it has to be this way. Although the National Environmental Policy Act (NEPA) is nearly four decades old, it is a very forward-looking law that anticipated unforeseen environmental issues that would require new science and new management approaches. According to McElfish, NEPA was written in a way that accommodates scientific uncertainty and simply requires the consideration of "reasonably foreseeable" effects. In 1997, the Council on Environmental Quality issued draft guidelines for how agencies should consider the effects of climate change in their "programmatic" environmental impact statements. Later that year, these guidelines were used by the Minerals Management Service in their programmatic EIS for the Outer Continental Shelf oil and gas leasing program, which has withstood legal challenge.

Other examples from case law suggest that climate change is a factor that increasingly must be considered in planning major federal actions. In *Center for Biological Diversity v. National Highway Traffic Safety Administration,* the 9th Circuit Court of Appeals held that NEPA requires the agency to consider climate change when deciding not to set certain corporate average fuel economy (CAFÉ) standards. (9th Cir. November 15, 2007). Citing the NEPA regulations, the court stated: "The cumulative impacts regulation specifically provides that the agency must assess the 'impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.' 40 CFR 1508.7." It was the court's finding that "the impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct."

The Department of the Interior has taken the initiative to propose new NEPA rules (43 CFR 46.145) to guide federal land management agencies in the use of adaptive management strategies to address climate change:

> "The NEPA analysis conducted in support of a bureau's decision to adopt an adaptive management approach should identify the range of management options that may be taken in response to the results of monitoring and should analyze the effect of such options. The environmental effects of any adaptive management strategy must be evaluated in this or subsequent NEPA analysis" (73 Fed. Reg. 126; Jan. 2, 2008).

## Conclusion

The challenge of protecting and sustainably managing federal lands in the face of projected climate changes is daunting. The sheer magnitude and extent of the potential changes, the uncertainty over just what kinds of changes can be expected and in what locations, and the fact that there is very little in the history or experience of these agencies that prepares them for this kind of future, combine to present federal land managers with what may be the most formidable set of challenges they have ever faced.

Officials at the federal land management agencies offer no easy answers or quick solutions to these challenges. Rather, they are developing a variety of innovative approaches to get a handle on the problem. They are still in the initial stages of designing a strategy for dealing with a higher degree of uncertainty than they have ever faced before, and potential consequences that are larger-scale, and longer-term than anything we thought possible only a few years ago.

Each federal land management agency is charged with its distinct mission. Each has traditionally taken its own approach to preserving natural environments within a relatively narrow "historic range of variability" by managing or regulating the effects of human activities. Important questions remain in terms of science and policy, and possibly in terms of the fundamental philosophy underlying the statutory mandates of the various federal land management agencies. To what extent can—or should—federal agencies attempt to fend off the effects of continental-scale climate changes to preserve these lands and resources as we know them today? To what extent can—or should—these agencies simply adapt to new climate regimes, and find different ways than in the past to provide essential public values such as water, wildlife, and biodiversity? What changes are needed in the institutional, legal, and policy frameworks within which federal land management agencies operate to enable them to address the effect of climate change—to "avoid the unmanageable, and manage the unavoidable?"

***There is a higher degree of uncertainty than ever faced before; potential consequences are larger-scale and longer-term than anything we thought possible only a few years ago.***

## Notes

1. This article summarizes presentations and discussions at the Forum on Climate Change Effects on Federal Lands, held at the Russell Senate Office Building in Washington, DC on February 29, 2008. This forum is part of a series on *The Outlook for Future Developments in Sustainable Forest Management*, convened annually by the Pinchot Institute. Presentations and other informational materials can be downloaded at: http://www.pinchot.org/outlook_ forums/2008.

2. President, Pinchot Institute for Conservation, Washington, DC.

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