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BEFORE THE
UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON NATURAL RESOURCES
SUBCOMMITTEE ON
NATIONAL PARKS, FORESTS, AND PUBLIC LANDS
MARCH 3, 2009

CONCERNING

THE ROLE OF FEDERAL LANDS IN COMBATING CLIMATE CHANGE

Mr. Chairman and members of the Subcommittee, thank you for inviting me today to discuss the important role national forests and grasslands play in addressing climate change. Healthy, resilient watersheds represent one of the best insurance policies we have in a changing climate. I will focus my remarks on the science-based management approaches we are employing to enhance the capacity of our national forests and grasslands to adapt to the effects and mitigate the impacts of climate change.

Forest Service Strategic Framework for Responding to Climate Change

Our national forests and grasslands provide a wide spectrum of ecosystem services on which society relies, including clean water, scenic beauty, outdoor recreation, fish and wildlife habitat, natural resource-based jobs, forest products, renewable energy, and carbon sequestration. However, observations show that climate change is currently impacting the nation's ecosystems and services in significant ways and those alterations are very likely to accelerate in the future, in some cases dramatically.[1]

The Forest Service's mission is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. To improve our ability to carry out our mission in a changing climate, the Forest Service developed a *Strategic Framework for Responding to Climate Change.*

[1] CCSP. May 2008. *Synthesis and Assessment Product 4.3 (SAP 4.3): The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States*, P. Backlund, A. Janetos, and D. Schimel, lead authors. A report by the U.S. Climate Change Science Program (CCSP). Abstract.

The Strategic Framework identified seven key goals to help us set priorities and make informed decisions for sustaining forest and grassland resources:

Science – Advance our understanding of climate change.
Adaptation – Enhance the capacity of forests and grasslands to adjust to the impacts of climate change.
Mitigation – Promote the management of forests and grasslands to reduce the build-up of greenhouse gases.
Policy – Integrate climate change considerations as appropriate into Forest Service policies, program guidance, and communications.
Sustainable Operations – Reduce the environmental footprint of our operations and facilities.
Education – Advance awareness and understanding.
Alliances – Establish, enhance, and retain strong alliances and partnerships.

These interrelated goals can assist our thinking in how we accomplish our work on National Forest System lands in the face of changing environmental, social, and economic conditions. To achieve these goals, the Forest Service will work collaboratively with the public and a broad range of agencies and partners. We recognize these goals will not be realized immediately. However, we plan to make our goals a reality over time through the ongoing implementation of actions to address climate change.

I highlight below our efforts on three Strategic Framework goals directly related to federal lands and climate change: Science, Adaptation, and Mitigation.

Science

Science that advances our understanding of the environmental, economic, and social implications of how climate change impacts forests and grasslands is essential for scientists, managers and policymakers. There is a wide range of existing science that needs to be translated into land management applications, tools and information. In addition, citizens knowledgeable about climate change and its impacts on ecosystems will be better prepared to participate in decisions and actions affecting their national forests and grasslands.

Climate change presents significant challenges to sustainable management of National Forest System lands. Decisions being made today by policymakers and resource managers will have implications through the next century. Recent reports from the U.S. Climate Change Science Program (CCSP) and the Intergovernmental Panel on Climate Change (IPCC) highlight the impacts of climate change on forests and grasslands. These impacts include changes in precipitation and water availability, shifts in plant and animal distribution, and longer, warmer growing seasons. In 2008, the CCSP released a Synthesis and Assessment Report on the Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity.[2]

[2] Id., p. 118.

The report found that:

- Climate change has very likely increased the number and frequency of forest fires and insect outbreaks in the Interior West (Colorado and the Great Basin), the Southwest, and Alaska, and will continue to do so.
- Rising CO_2 will very likely increase photosynthesis for forests, but this increase will likely only enhance wood production in young forests on fertile soils.
- Nitrogen deposition and warmer temperatures have very likely increased forest growth where adequate water is available and will continue to do so in the near future.
- The combined effects of rising temperatures and CO_2, nitrogen deposition, ozone, and forest disturbance on soil processes and soil carbon storage remain unclear.
- Projected increases in temperature and a lengthening of the growing season will likely extend forage production into late fall and early spring, thereby decreasing need for winter-season forage reserves.
- Climate-change-induced shifts in plant species are already under way in rangelands. Establishment of perennial herbaceous species is reducing soil water availability early in the growing season.

The Forest Service has a long history of researching and tracking many aspects of national forest and grassland ecosystems. We have over two decades of focused climate research, three decades of air pollution research, and experience in scientific assessments that provide a firm scientific foundation for addressing the challenges of managing these ecosystems relative to climate change. Over the years, nearly 125 Forest Service scientists have published climate change research reports and peer-reviewed publications. Thirteen Forest Service scientists were involved in the climate change work of the IPCC that shared in the 2007 Nobel Peace Prize. In addition, the Forest Service and its research partners in the university and private sectors have established a strong science base for informing management practices under a wide range of stressors and management objectives. This science base is being blended with newer findings to provide an evolving science and technology base for use in managing national forests and grasslands in a changing climate.

The Forest Service recently completed the Global Change Research Strategy for 2009-2019. The Strategy is aimed at providing science related to climate change for land managers, policymakers, scientists, and citizens. Our research will focus on adaptation, mitigation, decision support, and science delivery with support from research from other areas such as land use change, interactions between fire and fuels management, carbon cycles, ecosystem management, insects and disease, water, air, soils, wildlife, and social and economic sciences.

The Forest Inventory and Analysis Program has tracked changes in the extent, health, and productivity of forests since the 1930s. In the early 1990s, additional forest health indicators were added to the program and this data can be used over the long term to detect changes in forests at regional and national levels. In addition, the nationwide network of federal experimental forests and ranges provides up to 100 years of data on

climate, hydrology, soil productivity, and silvicultural treatments from selected locations representing all the major forest types in the United States. Further scientific support comes from partnerships with universities, federal and state agencies, non-governmental organizations, and the forest industry.

The challenge is to translate this science into information, tools, and technologies that people can use. In addition, we have important science gaps that need to be addressed. Climate models lack the ability to provide projections at the detailed scale that is most useful to land managers and local and regional planners. We lack critical information to determine the stresses of a warming climate and carbon dioxide on plant growth. We need more science about the timing, scale, and location of climate change impacts. Our scientists are looking for better ways of forecasting how terrestrial ecosystems will change in response to a changing climate and how the changes will affect animals and plants that depend on these ecosystems. The Strategic Framework, the Research Strategy and the USDA science strategy recognize these gaps, and the Forest Service is working with USDA and other federal agencies and partners to address them.

Adaptation

The goal of climate change adaptation for forests and grasslands is to enhance their ability to adapt to the environmental stresses of climate change, which will help to ensure their ability to serve as fully functioning ecosystems that provide a broad range of ecosystem services. The ability to adjust to climate change is critical because of its expected effects.

Even under the most optimistic carbon dioxide emission scenarios, important changes in sea level, regional and super-regional temperatures, and precipitation patterns will have profound effects. Management of water resources will become more challenging. Increased evidence of disturbances such as forest fires, insect outbreaks, severe storms, and drought will command public attention and place increasing demands on management resources. Ecosystems are likely to be pushed increasingly into alternate states with possible breakdown of traditional species relationships, such as pollinator/plant and predator/prey interactions, adding additional stresses and potential for system failures.[3]

Some forest systems may experience near-term productivity increases, but over the long term, many such systems are likely to experience overall decreases in productivity that could result in economic losses, diminished ecosystems services, and the need for new, and in many cases significant, changes to management regimes.[4]

Managers and policymakers will need to be nimble in using new information to adapt to changing conditions because the scope of climate change and its impacts on ecosystems are difficult to predict. In addition, dealing with risks and uncertainties introduced or made worse by climate change will need to be a more prominent part of our management

[3] Id., Abstract.
[4] Id., Abstract.

decision processes. In some cases, failing to take management actions will result in significant disruptions to ecosystems, so we must maintain as many options as possible now and in the future for handling unexpected events and conditions.

The primary focus of climate change efforts on National Forest System lands is to facilitate the adaptation of ecosystems to the effects of these changes. Each year, we manage millions of acres of National Forest System land to make forests and grasslands more resistant to wildland fires, insects and diseases, and more resilient to major disturbances such as intense wildfires, tropical storms, and floods. For example, we conduct prescribed burning and thin dense stands to reduce competition, alter species composition, reduce fuels, and improve forest health. These same treatments help our national forests and the species that depend on them adapt to the stresses associated with climate change.

Water is one of the most critical ecosystem services provided by forests and grasslands. Water quality, quantity, and the timing of water flow have important environmental, social, and economic consequences. Forests in the United States provide 53% of the Nation's drinking water to more than 180 million people, with 66 million relying directly on National Forest System lands as their water source. Plants, animals, natural and managed ecosystems, and human settlements are susceptible to variations in the storage, fluxes, and quality of water, all of which are sensitive to climate change. Precipitation, streamflow, and stream temperatures are increasing in most of the continental United States. The western United States is experiencing reduced snowpack and earlier peaks in spring runoff, and we are seeing increased drought severity and duration in the western and southwestern United States.[5] Clearly, we need effective approaches to address these changes, and we are developing a water strategy to address these issues.

More extensive application of these efforts is vital for adaptation of national forests and grasslands, and will need to be part of future research, planning and management actions. To accelerate our learning and understanding, we are practicing science-based adaptive management, an approach that promotes learning through doing. This approach involves actively making decisions and monitoring results to improve our understanding about the complex systems we manage.

Some management actions may need to be expanded, such as planting a more diverse species mix in reforestation efforts that may be better adapted to future climate projections. New management strategies may be useful, such as assisted migration of species and solutions to moderate extreme stream flows. Specific techniques need to be continually developed, tested and evaluated. Monitoring the effectiveness of our actions is a critically important component of this adaptive adjustment process.

[5] Id. Executive Summary.

Mitigation

Adaptation and mitigation activities are inherently interrelated. The goal of climate change mitigation for forests and grasslands is to reduce the buildup of greenhouse gases by removing carbon from the atmosphere while sustaining these ecosystems. To significantly reduce its greenhouse gas emissions, the United States will need to implement a variety of mitigation strategies, including sequestering more carbon in forests, grasslands, wetlands, soils, and wood products, planting trees, implementing carbon capture and storage from point sources, and conserving energy through multiple options, including product substitution and use of alternative fuels. A wide variety of strategies can cumulatively contribute to a significant decrease in emissions.

Net carbon uptake by terrestrial ecosystems in the United States, coupled with storage in wood products and landfills, currently offsets about 12 percent of United States greenhouse gas emissions from fossil fuel combustion and cement production.[6] Management of forests and grasslands to enhance terrestrial carbon storage, including planting trees and avoiding forest conversion, has considerable potential as an important component of the global capacity to mitigate effects of fossil fuel emissions.

The long-term ability of forests to sequester carbon depends in part on their resilience. Mitigation is actually dependent on how successful we are in keeping forests well-adapted to the changing climate we are trying to remedy. The interplay between mitigation and adaptation can result in delicate balances and difficult tradeoffs in our decision-making.

Active management may increase the resiliency of forests and arid lands to respond to climate change. Forest thinning can reduce fire intensity, increase drought tolerance and reduce susceptibility to insect attack. Grazing management and control of invasive species can promote vegetation cover, reduce fire risk, and reduce erosion.[7] These management practices, designed to restore ecosystem health, may in the near-term reduce total stored carbon below current levels. However, in the long-term the overall capacity of these ecosystems to sequester carbon can be enhanced.

As one of the mitigation strategies, the Forest Service is looking at ways to use smaller diameter woody biomass from overcrowded forests. Biomass removal through forest restoration projects reduces the risk of damage from wildfires and other disturbances and provides a source of cellulose for bio-energy and wood products. The removed biomass also decreases the net effective emissions from disturbance events, offsets fossil fuel emissions, and increases long-term carbon storage. The Forest Service Bioenergy and Bio-based Products Strategic Direction was recently completed and is aimed at providing science to analyze and inform policy and develop a variety of tools useful for landowners and land managers. We are working to provide the science and technology to effectively utilize this type of biomass.

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[6] US EPA. April 2008. Inventory of U. S. Greenhouse Gas Emissions and Sinks: 1990-2006. USEPA #430-R-08-005

[7] CCSP. May 2008. SAP 4.3. p. 78.

The implementation of restoration activities and increases in renewable energy products and bio-fuels can provide jobs for economically depressed areas with high unemployment and contribute to the long-term economic stability of rural forest communities. Sustainable forest management can provide woody biomass materials that could be used in the future production of renewable energy which may reduce greenhouse gas emissions.

The 2007 Energy Act amended the Renewable Fuel Standards to increase annual amounts of transportation fuel required to be obtained from renewable fuels. The Clean Air Act defines renewable fuels as transportation fuel produced from renewable biomass. The 2007 Energy Act's definition of renewable biomass excludes materials from federal lands except those obtained from the immediate vicinity of buildings and other areas regularly occupied by people, or public infrastructure, at risk of wildfire. We continue our analyses of these and other provisions of these laws, and are in the process of developing policy considerations to utilize woody biomass from federal lands through improvement in infrastructure to process woody biomass, better the economic utility of this biomass as a source of renewable energy, and enhance cost-effective forest restoration treatments that improve forest health and reduce risk of wildfire.

Conclusion

The changing climate is shifting precipitation patterns, vegetation and species distribution, and disturbance patterns, none of which respect administrative boundaries. We are taking science-based adaptive management approaches today to improve the health and sustainability of our national forests and grasslands, which in turn will help these ecosystems adapt to the effects of climate change and mitigate the amount of carbon in the atmosphere. Private forests and rangelands also have a very significant role to play in combating climate change. We are working with partners to adapt our forest and rangeland management programs to anticipate the effects of climate change and mitigate the potential impacts across all ownerships.

Thank you for the opportunity to discuss these issues with the Subcommittee. I would be happy to answer any questions you may have.