Engaging a Climate Ready Agency

From Dave Cleaves, Forest Service Climate Change Advisor

DECEMBER 8, 2010

Happy Holidays to everyone! For us, there's no better gift than an email from you about Forest Service activities related to climate change. Please continue to send them to us so that we can share these stories with your colleagues. See submission details in the last section of this update. Previous editions of the updates are posted on the Climate Change Advisor's website. You can also direct partners to this website so they can sign up for our climate change listserv–we'll send them an email to announce when a new update is available on the website.

MESSAGE FROM DAVE

Carbon Matters Too

So why should we care about forest and grassland carbon? Why is it a major dimension of the recently released Climate Change performance scorecard?

Carbon and greenhouse gas storage is part of a rapidly developing global policy conversation about forests and their function in society. In the growing concerns about climate change, the role of forests and grasslands as storehouses for carbon has become increasingly well recognized. Carbon storage is an important environmental benefit of the lands we manage, as are water, wildlife habitat, and wild foods. As public servants managing public lands and providing support to private landowners, we will be expected to understand and explain forest and grassland carbon to the public and our fellow employees.

Recently released Forest Inventory and Analysis (FIA) figures show that the nation's forests store 41 billion tons of carbon, the equivalent of approximately 20 years of fossil fuel emissions from the U.S. In 2008, our forests and wood products stored an additional (net of emissions) 216 million metric tons of carbon, about a quarter ton for every acre of forestland. This offset about 11 per cent of the country's entire annual fossil fuel emissions. Most of this additional storage results from the regrowth of our forests following the intensive harvesting of 1750-1930. A forest's ability to store carbon depends on the age of the trees, the site conditions, and other factors such as the management intensity. Generally, young forest stands have a higher storage rate, taking in more carbon over the course of a year, than older forest stands, but a healthy young stand will have less total carbon stored than a healthy older stand.

Our nation's forest carbon budget is presently in good shape–we have more carbon coming in to trees and soil than going out into the atmosphere from forests as a whole, and we are keeping the recent decades of stored carbon from contributing to an atmosphere already overburdened with CO_2. Today's positive forest carbon balance (more in than out) is the result of several factors: shifting land use from agriculture to forests, regrowth on cutover lands, aggressive afforestation and management programs, and many decades with lower fire impacts than we see today. However, many of our forests have reached a point where tree growth creating carbon storage and the stressors creating mortality, decline, and shifts to other land uses are in a more tenuous balance. Urbanization is now encroaching on millions of acres of forest lands and exposure to disturbances such as fire, insects, and disease has been heightened by a changing climate. Even under the mildest scenarios for climate

change impacts on the western U.S., the area burned is expected to at least double in the latter half of this century. Maintaining forests that store more carbon than they release will become more challenging in the future and will call for a creative blend of old and new forest management tools.

How we manage forests and grasslands has an influence on carbon and other valued ecosystem services that are linked to carbon, including water and wildlife. Maintaining the right balance of carbon storage and emissions in living vegetation and in the soil must be balanced with maintaining the total spectrum of values. These balances derive from ownership objectives. Private owners who can get payments for carbon offsets may want to emphasize carbon storage and wood products from sustainably managed forests; public land managers may have to reduce carbon storage to reduce the risk of disturbance to other ecosystem services. We should be the champions for the principle of considering carbon and other benefits together, for not neglecting carbon storage but also not focusing obsessively on carbon to the detriment or neglect of other vital services.

We have a strong basis for leading the national conversation and action on forest carbon. We know how trees and forests grow and how they are impacted by stressors and disturbances, and we are constantly learning more. We need to maintain a robust monitoring, analysis, and reporting system to keep ourselves and the public informed about the status and trends at scales ranging from national to state to individual forests and grasslands. We will need some new knowledge about the effects of forest and grassland management on the dynamics of carbon in different systems and about how the carbon cycle, the water cycle, and other ecosystem benefit patterns intersect. And we will need to rapidly soak up the emerging information about how forest and grassland carbon storage is being influenced by the changing climate itself. Our R&D division has much of the information needed and is at work on many of these unanswered questions.

We have a big opportunity to leverage an increase in public attention paid to trees, forests, and forest ecosystems. Concern about global deforestation has heightened the public's interest in forests, here and abroad. Major companies are heralding the dollars they donate to plant trees so they can offset their fossil fuel emissions in order be "carbon neutral." A recent issue of the Economist magazine featured a special report on forests entitled The World's Lungs. We need to be able to enlighten these discussions. An interested public is expecting us to know whether our forests are storing or releasing carbon and how what we do influences that balance.

We have a positive story to tell. Forest and grassland management makes good sense through the lens of carbon storage. But we have not fully clarified or featured their carbon storage impacts and benefits. Keeping forests as forests, as in our Open Space Conservation strategy, is one of the most cost-effective carbon storage measures. Restoration, getting badly disturbed forests and grasslands back to producing a full range of environmental services, is another. Ensuring rapid regeneration after disturbance is especially important for retaining carbon in the forest landscape. Maintaining forest health through appropriate fire, insect, disease, and invasive species management also has strong carbon storage and protection benefits. Even though practices such as thinning and prescribed fire may release carbon in the short term, they focus growth and storage for the future on trees that are at lower risk and/or are more resilient to disturbance. Appropriate forest management and protection can substitute lighter, strategically placed, and more recoverable emissions for disturbance emissions that would be more severe, extensive, and less reversible. It's risk management on a large scale, and forest and grassland managers are, among other roles, the risk managers for ecosystems.

Managing carbon in a forest is not the same as managing the forest for carbon. Carbon management is one part of sustainable land management. Our job is to maintain the long-term health of forests and grasslands and all of their benefits–the ones on which we have traditionally focused as well as those whose importance may not have been as well recognized. Carbon adds another dimension to

our work, and requires a different perspective on basic principles. There will be tradeoffs between carbon and other services, but dealing with tradeoffs and creating new synergies has always been part of our resource management mission.

Special thanks to Mike Ryan (RMRS) and Rich Birdsey (NRS) for their comments and suggestions on an early version of this essay.

FROM THE WASHINGTON OFFICE

Forest Service Presentations at the United Nations Conference

The Forest Service was involved in several side events at the United Nations climate change conference in Cancun. Side events are a forum for observer organizations to highlight diverse climate change issues through presentations and discussions. The U.S. Center broadcast all U.S. sponsored side events live at their website, and archived select presentations. The complete schedule of U.S. events included Adaptation and Sustainable Forest Management with Dave Cleaves (WO), Dave Peterson (PNW), and Kathy O'Halloran (Olympic NF); The Impact of Fires with Wei Min Hao (RMRS); Forest and Terrestrial Carbon Monitoring with Rich Birdsey (NRS); U.S. National Water Census with Dave Cleaves. There's still time to catch the presentation on the North American Carbon Budget on Friday, December 10, 11:45-13:15 (note this is Cancun time, same as our Central time zone).

Funding for Climate Change Related Research

The Strategic Environmental Research and Development Program (SERDP), the Department of Defense's (DoD) environmental science and technology program, is soliciting proposals for basic and applied research and advanced technology development. Statements of need include Climate Change Impacts to DoD Installations and Method Development for Assessment and Monitoring of Biological Diversity.

FROM THE FIELD

Climate Change *Talking Points* synthesize climate changes and associated impacts

The RMRS Fire, Fuel and Smoke Program (FFS), with the National Park Service and U.S. Fish and Wildlife Service, developed bioregional climate change syntheses that describe climate changes and associated impacts within six sectors: temperature, water, vegetation, wildlife, disturbance, and human dimensions. *Talking Points* provide land managers, interpreters, and other audiences with a scientific understanding of climate changes and impacts within specific bioregional zones, that can then be used to help direct development of effective strategies for mitigating and adapting to current and future landscape changes. Each document is backed by an extensive literature review and citation database, allowing readers wanting more in-depth information to retrieve primary sources. The *Talking Points* are available via TreeSearch, the National Park Service Climate Change Response Program, and the RMRS FFS Climate-Fire Dynamics Group . For more information contact Rachel Loehman, raloehman@fs.fed.us.

Umatilla National Forest and RMRS Climate Change Prediction Modeling

The Umatilla National Forest worked with the RMRS Climate Change Prediction research unit in an effort to estimate what the future might bring to the South George Project on the Pomeroy Ranger District. Utilizing information from an RMRS website, the Forest was able to downscale or focus the

modeling results to the project area and thereby incorporate the climate change research completed by the lab to date in order to evaluate species change through time. The work by RMRS has greatly enhanced the Forest's ability to use general climate models in a practical sense as it pertains to project planning. In addition, the Forest also attempted to model future stand conditions using the Forest Vegetation Simulator (FVS) in order to project what a stand might look like in the future as a consequence of climate change. Development work by Nicholas Crookston provides FVS users with the capability to simulate future climate-affected stand conditions by downloading climate-ready FVS data files from the lab's website. For more information, contact Donald Justice or Lorette Ray.

Cross-Boundary Adaptation Options for National Forests and Parks

The inter-agency workshop "Border Crossing: Preparing for and Adapting to Climate Change Effects in Northern Colorado" was held November 16-17 in Estes Park. This workshop was supported by the Forest Service, National Park Service, U.S. Geological Survey, Colorado State University and funding from the Cooperative Ecosystem Studies Unit (CESU) National Network, through the Rocky Mountains CESU. Participants came from Rocky Mountain National Park, Arapaho and Roosevelt National Forest, Pawnee National Grassland, Routt and Medicine Bow National Forest and Thunder Basin Grassland, Colorado Department of Wildlife, City of Estes Park, Bureau of Land Management, National Park Service Climate Change Response Program, USGS, Rocky Mountain Research Station, Pacific Northwest Research Station, and Colorado State University. The objectives of the workshop were to increase awareness of the observed and projected climate change impacts in northern Colorado, provide the opportunity for practitioners to gain experience with climate change adaptation, to increase and reinforce relevance to work across jurisdictional boundaries, and to begin to develop a shared vision and set of common approaches for managing shared resources that will help build resilience to climate change. The workshop involved presentations on climate change, natural resource management under climate change, agency tools for adaptation planning, and the Olympic National Forest adaptation case study as well as breakout sessions to identify climate change effects, adaptation options, and priorities for collaboration across administrative boundaries. This workshop is one of several in the western U.S. to develop a process for facilitating cross-boundary adaptation options for National Parks and Forests. Organizers included Jes Thompson, Colorado State University; Jill Baron, USGS; Judy Visty, NPS; Chris Lemiuex, University of Waterloo (Canada); David Peterson, USFS; and Linda Joyce, USFS (ljoyce@fs.fed.us). For more information, including workshop presentations and supplemental materials, visit the workshop updates website.

Forest Service - Savannah River (FSSR) Carbon Dioxide Measurements

In 2007, FSSR partnered with University of Georgia and Savannah River National Laboratory to install a carbon dioxide (CO_2) flux tower. The tower was installed to measure changes in CO_2 in a southeastern longleaf pine forest over time in conjunction with companion studies on regional CO_2 fluxes. The CO_2 changes associated with atmospheric conditions, silvicultural practices, and prescribed fire are being measured and the results will be made available through journal publications. Contact John Blake, jblake@fs.fed.us.

Forest Service - Savannah River (FSSR) Baseline for Carbon Stocks and Fluxes

Partnering with the Southern Research Station (SRS), FSSR has completed a baseline for carbon stocks and fluxes to meet IPCC standards. Current and historical timber inventories, harvest data, fire emissions, stream exports, and a soils database were integrated. Reforestation of old-field and cut-over forests in the 1950's increased net carbon sequestration by approximately 14-fold in the live

vegetation. The export of carbon from annual prescribed fires is comparable to annual wood removals for the forest. The amount of carbon in the forest floor and mineral soil increased slightly in the same period. The results will be made available in 2011 through the SRS. Contact Carl Trettin, ctrettin@fs.fed.us.

Sustainable Operations Summit – Leading by Example to Conserve Natural Resources

Innovative projects, new technologies, and tools to establish green practices were highlighted at the 2010 Forest Service Sustainable Operations Summit, November 16-18, hosted by Dr. Jim Reaves, Deputy Chief of R&D (formerly Director of SRS) and Liz Agpaoa, Regional Forester of the Southern Region. As with the 2008 summit in Madison and the 2009 summit in Portland, this year's summit in Atlanta was planned with limited travel for a small group of onsite participants with additional participants attending virtually via telephone conferencing, video teleconferencing, and webinar. You can view session archives at the summit website. For more information, visit the National Sustainable Operations website.

Changing Roles Webinar Series – Climate Change

An archived version of the webinar presented by Dr. Steve McNulty of the Eastern Forest Environmental Threats Assessment Center is available online. This webinar provides an introduction to climate change, the interactions between climate change and other environmental stresses on forest health, the potential changes in insect and disease outbreak, and long-term climate change leading to changes in ecosystem composition, fisheries, and wildlife habitat, forest and range land productivity, and stream flow.

CLIMATE SCIENCE YOU CAN USE

Climate Change Effects on Streams and Fish Habitat

An Interview with Dan Isaak, RMRS

Dan Isaak is a Fisheries Research Scientist at the RMRS and was the lead author on a recently published research paper* on the effects of climate change and wildfire on stream temperature and fish habitat in central Idaho. Dan answered a few questions about his research:

What do your research results indicate about the impacts of climate change on fish species?

> Evidence of climate change is already apparent, with summer stream temperatures across a large mountain river network in central Idaho warming at the rate of nearly half a degree Fahrenheit each decade over the last 30 years. Most of this stream warming is related to increases in air temperatures (70%), but warming is also related to summer flow decreases (20%), and wildfires (10%). Different species of fish are affected differently depending on their historical distribution and tolerance to warmth. A species like bull trout, which is often confined to the coldest areas of headwater streams in the Pacific Northwest, is experiencing a net loss of habitat at a rate of about 10% - 20% per decade. Species which occur further downstream in the network like rainbow trout are not experiencing a net gain or loss of habitat, but only a shift towards higher elevations.

Are many national forests and grasslands, or other land managers, monitoring stream temperatures?

> Yes, there's a huge untapped resource of stream temperature data that exists. Small, inexpensive sensors make it easy and cheap to collect annual temperature data, so literally hundreds, and sometimes thousands, of these observations exist on individual forests that have been collected

for a variety of reasons over the last couple decades. Moreover, efforts are underway to coordinate and develop regional sensor networks that will systematically measure stream temperature responses to climate change across a range of spatial scales.

Once the basic temperature databases have been organized (summarized and georeferenced) by a national forest, our modeling approach can be quickly applied to develop thermal maps for all the streams on a national forest that show both historical and future climate scenarios specific to that particular landscape. Easy-to-follow instructions for organizing, analyzing, and modeling stream temperature data are available on our temperature website.

How can land managers improve the resilience of fish populations to climate change and other stresses?

Detailed temperature predictions throughout the stream network on a national forest can be used to identify suitable habitat for different fish species and places where their tolerances to warmth could be exceeded in the future. Our models are accurate enough that they can guide site selection and prioritization for specific projects designed to enhance fish population resilience.

How big was the biggest bull trout you've ever seen?

Maybe 2 feet. They don't let me out of the office very much anymore.

*Issak, D.J., C.H. Luce, B.E. Rieman, D.E. Nagel, E.E. Peterson, D.L. Horan, S. Parkes, & G.L. Chandler. 2010. Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. *Ecological Applications* 20(5): 1250-1371.

RECOMMENDED READING

Climate Change Adaptation: What Federal Agencies Are Doing

Pew Center on Global Climate Change

This November 2010 report highlights the initiatives and strategies, programs and institutional mechanisms, and tools and resources of federal agencies that are considering climate change adaptation across their programs and policies. The report should help facilitate communication and collaboration across federal agencies as well as with numerous non-federal stakeholders focused on domestic adaptation policy.

Facilitating Climate Change Responses: A Report of Two Workshops on Knowledge from the Social and Behavioral Sciences

Paul C. Stern & Roger E. Kasperson, Editors

This report illustrates some of the ways the behavioral and social sciences can contribute to climate research. The workshops focused on two broad areas: (1) mitigation (behavioral elements of a strategy to reduce the net future human influence on climate) and (2) adaptation (behavioral and social determinants of societal capacity to minimize the damage from climate changes that are not avoided).

Seeing the Wood: A Special Report on Forests

James Astill, The Economist

This issue of The Economist includes several articles on forests as sources of water and food, treasure-houses of species, and their role in the climate system and the livelihoods of the world's

poorest people. Forests around the world face two big threats – hungry people who clear forests for agricultural land and climate change.

SUBMISSIONS

Please send your submissions on Forest Service climate change related activities to Cathy Dowd: cdowd@fs.fed.us. It's most helpful to have a short description with a web link to more information.

The purpose of these updates is to help us keep our eyes on the prize of healthy and functioning ecological, social, and economic systems as the climate around them changes. We are working to bring climate change knowledge into our organizational expectations and actions. We will be learning by doing and learning from each other as we work to connect the strong fibers of this vast organization.