

Forest ThreatNet

...sharing knowledge and tools needed to anticipate and respond to emerging forest threats

Eastern Forest Environmental Threat Assessment Center

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From the Director

One question that I am often asked is, "What geographical area is covered by the Eastern Threat Center?" Our original charter refers to the public and private forests of the East, with an emphasis on eastern hardwoods. Because there are only two threat centers (see map), a reasonable interpretation is all forests east of the Great Plains, with an emphasis on the upland hardwood forests. Two recent inquiries from Nebraska and Puerto Rico



The Eastern Threat Center is headquartered in Asheville, NC, and the Western Threat Center is located in Prineville, OR.

about information on our Web site show just how limiting the "eastern forest" delineation might be. My hope is that we would never turn away requests for information because they don't originate in our backyard, but at the same time we are obligated to remain true to our mission. The picture is a little more muddled because of the inclusion of two units within the Center that clearly have national and international responsibilities, namely, the National Forest Health Monitoring team and the Southern Global Change Program. Our collaborative efforts with the Western Threat Center and others mean that we invariably will be involved with projects that are national in scope, particularly as we build tools using remote sensing technologies and seek to leverage our efforts to gain economies of scale. There's also the realization that many of the threats to eastern forests either don't originate here (e.g., invasive plants and pests), or are not confined to the East in a way that makes a strictly regional perspective meaningful (e.g., climate change and globalization).

The bottom line is that our success is predicated on maintaining an appropriate mix of regional, national, and international activities. Take a look at some our activities highlighted here and visit our website at <http://www.forestthreats.org>, then tell us how we're doing and how we can better serve you.

Until next time....
Danny C. Lee

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Dr. Jim Reaves

Forest Service Names New Southern Research Station Director

Dr. Jim Reaves assumed the helm of the Forest Service's Southern Research Station (SRS), headquartered in Asheville, NC, in January 2008. He is only the second director since the Southeastern Forest Experiment Station in Asheville and the Southern Forest Experiment Station in New Orleans merged in 1995—creating the leading research organization for natural resource management and sustainability in the southern U.S. His leadership comes at a time when forest science research is poised to have a voice in land management decisions affecting changing wildland and urban landscapes.

"I am excited to come back to the South and work with the Station's esteemed scientists whose research is recognized internationally," says Reaves, who served as a SRS project leader, research scientist, and assistant station director from 1991-1998 as well as a team leader during the consolidation of the two experiment stations. "My hope is to foster an atmosphere that encourages our employees to conduct innovative and useable research that informs natural resources policy and land management decisions. I want the Station to be the premier natural resources organization that leads cutting-edge research and encourages and values a dynamic and diverse workforce."

Reaves is also looking forward to EFETAC playing a major role in the new dynamics of natural resources research. "EFETAC is developing and using accelerated tools and technology, with partners like NASA, that will benefit public and private landowners. The Center is well-positioned to attract non-traditional partners, integrate information across Forest Service Deputy areas and sister agencies, and incorporate State extension efforts." Unique partners and research "will enable people to view science in a different light and introduce forest research to new, and important, audiences."

A 26-year careerist with the Forest Service, Reaves understands the agency and knows his science. Most recently, as Associate Deputy Chief for Research and Development in Washington, DC, he provided national leadership for research programs and enhanced the agency's external partnerships. Reaves has also held key Forest Service positions and conducted research on the east and west coasts. Additionally, he represented the U.S. as a delegate to the United Nations Forum on Forestry in Switzerland, led scientists on a USDA delegation to China, and served as a keynote speaker at a forest restoration conference in Seoul, Korea. A pathologist by training, Reaves' research has been published in national and international science journals.

Reaves' wealth of experience gives him exceptional insight into leading a science organization that can lend sound science to emerging forest issues. "We will continue to place emphasis on forecasting natural resource issues for land managers and policy makers, ensuring our science is consistently relevant to current issues and diverse audiences," notes Reaves, who will focus on people, partnerships, and communications during his tenure. He is committed to helping employees "be empowered, grow, and contribute" to the agency; developing and enhancing effective partnerships to interconnect social and economic natural resources issues; and exploring new and improved communication technologies to share cutting-edge science with internal and external audiences.

"EFETAC is developing and using accelerated tools and technology, with partners like NASA, that will benefit public and private landowners."

"So much has changed regarding natural resources issues in the South since I last worked at the Station," reflects Reaves, who grew up on a tobacco farm in rural South Carolina. "This is an exciting time for natural resources research as we address rapidly changing land uses and serious impacts from drought, wildland fire, and other natural disturbances. I also strongly believe that SRS is positioned to deliver our science in a timely, effective manner that is comprehended by a variety of audiences. When people think about natural resources in the South, I want them to think of the Southern Research Station."

Reaves earned a bachelor's degree in biology from Voorhees College in Denmark, SC, and a master's and doctorate, both in biology/plant pathology, from Atlanta University in Georgia. He is a member of the Society of American Foresters, the American Phytopathological Society, the Smithsonian, the Kennedy Center, and Omega Psi Phi Fraternity. Reaves and wife, Adrienne Scott-Reaves, are avid dog lovers and enjoy the outdoors with their Bichon Friese and Japanese Akita.

What Happens to All the Carbon?

EFETAC scientist delves into how natural disturbances impact forest carbon sequestration



Damaged forests in the Pearl River Basin along the Louisiana-Mississippi border were photographed from the air in late 2005. (Photo credit: Louisiana State University Hurricane Katrina & Rita Cooperative)

Global change is today's hot topic – and Hurricanes Katrina and Rita have elevated carbon emission discussions to new heights. Why? Because according to recent reports, those hurricanes alone caused one of the greatest forestry disasters on record in the Nation. As a result, the more than 300 million trees killed or damaged in Mississippi and Louisiana will release a tremendous amount of carbon into the air, contributing to an already increased buildup of greenhouse gases nationally.

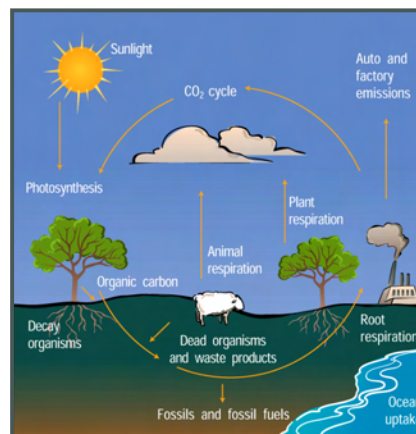
Steve McNulty, EFETAC's Southern Global Change Program (SGCP) team leader, seeks to track Katrina and Rita's carbon footprint, in addition to prints left by other natural disturbances. In a recent interview with National Public Radio, calculations of forest carbon loss using field surveys and aerial photography were highlighted as methods to assess carbon dioxide released from damaged and dying trees.

"The U.S. is the largest emitter of carbon dioxide in the world, but it's difficult to measure all damage from public and private lands that causes these emissions," says McNulty, whose carbon loss estimates are likely conservative relative to actual amounts of forest carbon loss. "Links between increased atmospheric carbon dioxide and global warming have prompted forest managers to consider using increased forest carbon sequestration as one way to partially offset these gross carbon emissions."

McNulty's research focuses on estimating potential changes in forest carbon sequestration due to impacts from three major disturbances—hurricanes, wildfires, and insects—which should result in more accurate estimations of U.S. forest carbon sequestration in the future. "Increasing forest carbon sequestration is part of the solution for reducing greenhouse gas buildup in the atmosphere, but natural disturbances such as insect outbreaks, wildfires, and hurricanes can significantly reduce a forest's carbon sequestration potential," he says.

During the past 50 years, wildfires have significantly reduced forest carbon sequestration. Forest carbon losses from all forms of disturbance are on the rise, with the southern U.S. witnessing a reduction in carbon sequestration due to an increase in hurricane severity and frequency. The amount of hurricane caused forest carbon loss has increased steadily since the 1950's. However, the amount of carbon loss is highly variable each year. A single storm such as Katrina or Rita can alone destroy over 40 teragrams (e.g., 10^{12} g) of forest carbon—with one teragram equal to the combined weight of 150,000 adult bull African Elephants!

Global warming will very likely continue to increase the amount of annual forest carbon lost across the U.S. in future decades. McNulty's research will assist land managers to develop new and innovative ways for managing forests in this increasingly dynamic environment.



The carbon cycle at work....

Forest ThreatNet is a Quarterly Newsletter

EFETAC is an interdisciplinary resource actively developing new technology and tools to anticipate and respond to emerging eastern forest threats. The Center is a joint effort of the Forest Service's Research and Development, National Forest System, and State and Private Forestry and housed within the Southern Research Station.

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EFETAC Director's Expertise Benefits Interagency Fire Planning Effort

If forest threats were judged solely on the basis of their prominence in agency spending, wildland fire would have no equal. Each year, the Federal government spends more than \$2 billion on wildland fire prevention, preparedness, suppression, and recovery. These funds are distributed among five Federal agencies—Forest Service, National Park Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, and Bureau of Land Management. As the extent and severity of wildland fires has increased in recent years due to multiple reasons, so has the demand for more funding. Increased funding has led to greater scrutiny by the General Accounting Office and others regarding the Federal fire program's effectiveness.

The Fire Program Analysis (FPA) is a special effort created specifically to respond to these concerns. FPA is a multi-agency effort that develops common interagency decision support tools for wildland fire planning and budgeting. This effort enables Federal wildland fire managers to jointly plan for funding allocations that cost-effectively accomplish interagency objectives. FPA also encourages State and local wildland fire partners to participate.

Since August 2006, **EFETAC Director Danny C. Lee** has co-lead the Interagency Science Team (IST), commissioned to provide FPA with scientific support. The original IST—which included 13 scientists from the Forest Service, the U.S. Geological Survey, and academia—designed an analytical system to meet FPA needs.

"The IST design was used by the FPA development team to create a prototype system, which should be fully operational this June," explains Lee. The system will analyze budget alternatives locally and nationally; determine relative costs and benefits for the full scope of fire management activities; and identify cost-effective mixes of personnel and assets to implement these activities within a specified budget. IST scientists continue to work closely with the FPA team on this effort.

The IST design incorporated a combination of simulation models, GIS analyses, and decision support tools to model potential costs and consequences of alternative investment strategies. Two separate simulation models play important and complementary roles. The initial response model simulates local responses to random wildland fire ignitions. Fires that escape initial response or are allowed to burn for resource benefits are simulated using a large fire model. Both models are based on tools previously developed by IST members and Forest Service researchers, Jeremy Fried (Pacific Northwest Research Station) and Mark Finney (Rocky Mountain Research Station). The FPA system uses results from the simulation models in a larger decision support framework that allows rigorous and systematic analysis of tradeoffs among alternatives.

The large fire model has been challenging to design and implement. Large fires typically exceed 300 acres and can grow to 500,000 acres or more. In much of the U.S.—especially western states—large fires are a small percentage of those started, but they torch the bulk of acres burned and account for the most suppression costs incurred. Even advanced computers are challenged to simulate the numerous fire possibilities that could burn under multiple alternatives, especially considering the short time window allowed for each FPA analysis. To overcome this hurdle, Lee, Finney, and FPA team members created a statistical approach that reasonably approximates the large fire model's results. This approach uses simulation results to produce a "model of the model" that can very quickly analyze multiple alternatives and produce spatially explicit estimates of burn probabilities and the flame intensities expected across a landscape.

Please visit FPA's Web site at <http://www.fpa.nifc.gov> for additional information.



Lightning-ignited wildfire burning during day, Blue Mountains. (Photo credit: Dave Powell, USDA Forest Service, www.bugwood.org)



Georgia fires raged in 2007. (Photo credit: National Interagency Fire Center Archive, www.bugwood.org)

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University Does Double Duty

North Carolina State finds niche with EFETAC forest monitoring and global change teams

Nearly 20 years ago, the Forest Service found an important partner in North Carolina State University (NCSU). Today, the partnership still exists and is essential to the research efforts of EFETAC's **Forest Health Monitoring (FHM) Team** and **Southern Global Change Program (SGCP)**. NCSU faculty and staff offer expertise, flexibility, dedication, and innovative ideas that enhance the partnership's research contributions that help monitor, assess, and manage the Nation's forests.

In the beginning....

In 1990, the U.S. Environmental Protection Agency (EPA) joined forces with the Forest Service to plan and implement the Forest Resource Group of the Environmental Monitoring and Assessment Program (EMAP-Forests). The FHM program manager, EMAP-Forests' technical director, and a small administrative staff were housed at the Forestry Sciences Laboratory in Research Triangle Park, NC.

Around that same time, the Global Change Research Act of 1990 provided funding for climate change research programs, including SGCP. Beginning in 1991, SGCP was temporarily housed near NCSU in Raleigh, NC, and later relocated to the University's Centennial Campus. NCSU's focus on natural resource issues fit naturally with SGCP's global change research, and a long-term partnership was born.

New Partner Joins Forest Health Monitoring

The Forest Service eventually assumed full responsibility for forest health monitoring research. FHM enlisted the expertise of NCSU Department of Forestry and Environmental Resources researchers to help analyze growing volumes of data. NCSU scientists have since become a valued partner in forest health monitoring research—producing a multitude of peer-reviewed publications and FHM products, including national-scale forest health assessments, risk-maps of forest insects and pathogens, and a variety of analytical tools and techniques.

According to **FHM Team Leader Bill Bechtold**, "This collaborative relationship has persisted for so many years simply because these scientists are consistently able to deliver valuable research products needed by the Forest Service to effectively monitor the health of our Nation's forests." FHM scientists also contribute to the NCSU community, serving as faculty and staff in the Department of Forestry and Environmental Resources and participating in courses and special projects.

SGCP Gets in the Mix

Like forest health monitoring, SGCP benefits from immediate interaction with NCSU scientists, who are co-located on campus with the global change team. SGCP benefits immensely from their NCSU in-house partners, cooperatively producing numerous reports and national assessments, and collaborating on external funding proposals from sources such as NASA and EPA. Additionally, many undergraduate and graduate students, as well as post-doctoral researchers, work in the SGCP facility.

Team Leader Steve McNulty has managed SGCP since 2002 and emphasizes that NCSU collaborations are important because, "We strengthen the role between the Forest Service and NCSU by developing future areas of interaction. Our NCSU partners provide new perspectives to agency research, giving our programs added value and depth." The SGCP team also serves as guest lecturers, adjunct faculty and staff, and graduate student committee members.

Barbara Conkling, NCSU Department of Forestry and Environmental Resources research assistant professor, agrees the University/Federal partnership has multiple benefits. "The NCSU relationship with Forest Service research programs provides opportunities for cooperative program planning, support, research in areas important to forest health, and delivery of science information. These benefits are shared nationally and internationally, which really extends the reach, and impact, of our science."

NC STATE UNIVERSITY



NCSU Department of Forestry and Environmental Resources cooperators work closely with EFETAC's FHM and SGCP teams. FHM partners pictured are (l to r) Kevin Potter, research assistant professor; Frank Koch, research assistant professor; Mark Ambrose, research assistant; and (front) Barbara Conkling, research assistant professor. Not pictured: Professor Fred Cabbage.



Asko Noormets (l) and Jean-Christophe Domec, NCSU post-doctoral researchers, discuss instrumentation for sapflow measurements in a 15-year-old loblolly pine plantation. Data from these measurements will aid in understanding driving forces that influence forest growth and productivity as part of SGCP's study of changes in carbon, water, and energy flux in two loblolly pine plantations.

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The Kudzu Factor

EFETAC scientist investigates plants' invasive potential

When **EFETAC ecologist Qinfeng Guo** began his career in Santa Monica, CA, invasive species like kudzu did not seem like a big deal. After all, the Santa Monica Mountains are covered in exotic and indigenous herbs that are native to Chile and the Mediterranean and thrive in a climate similar to the California Mountains. Many foreign or exotic species are not considered invasive—Mediterranean olive trees dropping their fruit on California sidewalks are a common occurrence, but these species are not spreading along the highways and into native forests, like kudzu has taken over the South.

In the southeastern U.S., kudzu grows out of control, enveloping entire forests. Its leaves reach over the tops of the trees and unfurl in the hot southern sun. This drastic difference in growth led Guo to question which environmental factors welcome exotic plants to live harmoniously in their native ecology, and allow them to grow, spread, and become invasive in similar climates.

EFETAC Presents at Interagency Forum



EFETAC researchers shared invasive species research at the 19th Annual USDA Interagency Research Forum on Invasive Species. The conference facilitates research information exchange among agency scientists and university cooperators and includes researchers from Europe, Asia, and throughout North America. EFETAC's presentations included "Distributions of introduced species in native and exotic regions" and a poster highlighting "Spatio-temporal analysis of redbay ambrosia beetle invasion in the southeastern U.S."



EFETAC scientist Qinfeng Guo is surrounded by invasives research that he consults as he investigates plants' invasive potential.

Guo reasons that "most invasive plants have greater dispersibility, higher growth and reproduction rates, and greater compatibility. Some plants escape from their natural enemies, strong competitors, and predators after they are introduced." Guo's interest was piqued by this complex issue, and he soon found himself leaving California to continue his studies with EFETAC in Asheville, NC.

When Guo arrived in the Southeast, a noticeable hot spot for invasive species, he turned his attention to researching quantifiable factors that create an ideal climate and habitat for invasive exotics to thrive. Guo's immediate challenge was creating a plan to find the connections. "Most of the data on invasive plants are scattered and disconnected," Guo says. He soon recognized that the compilation and collection of this data would require an extensive collaborative effort to develop.

Guo began collecting information on existing plants in their native and introduced range, including the climate regime in the originating country and current location. He even collected data on the ethnobotanical—or relationship between plants and people—history for each species. Until recently, Guo used a series of spreadsheets to organize his huge amount of data. Through collaboration with the University of North Carolina Asheville's National Environmental Modeling and Analysis Center (NEMAC), Guo is updating his technique and migrating his data to a relational database built by Joe Brownsmith (Department of Computer Science/NEMAC). Brownsmith encourages scientists to consider working with relational databases rather than spreadsheets. He believes that although a relational database is more work initially to create, it will eventually allow Guo to gain a greater understanding of the relationships among groups of data, such as regional soil pH, climate factors such as moisture and heat, and existence of predators.

This large project is only in its second year and has many collaborators from the U.S. and China, Guo says, with research assistants aiding in data input. While he hopes the database will be finished in another two years, Guo plans updates as information becomes available. When asked how the database will benefit others, Guo simply states "when complete, it should improve our understanding of species invasiveness."

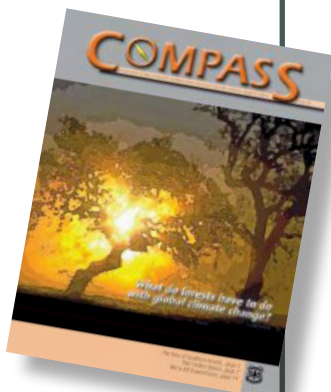
In the News...

More FHM news......FHM recently released the 2005 national technical report, providing results of forest health analyses from a national perspective. Additionally, peruse a synopsis of yearly reports in *The Forest Health Monitoring National Technical Reports: Examples of Analyses and Results from 2001-2004* at <http://www.forestthreats.org>.



EFETAC's Climate Change Research Highlighted in *Compass* Magazine

EFETAC is featured in the 10th issue of the Southern Research Station's quarterly science magazine, *Compass*, themed "What do forests have to do with climate change?" Articles feature EFETAC's climate change-related work, an interview with EFETAC Director Danny C. Lee, and an introduction to four new EFETAC scientists. Read more about the Center's research and scientists at <http://www.forestthreats.org>.



A New Focus on Climate Change

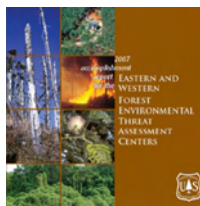
EFETAC's Forest Health Monitoring engages in climate change

Global climate change is a top Forest Service priority, affecting forests directly and indirectly and presenting many unknowns, challenges, and opportunities for forest management. These themes sparked lively discussions during the climate change focus group at the national FHM Work Group Meeting held February 11-14 in San Antonio, Texas. Bill Bechtold, EFETAC's FHM team lead, co-organized the event, which included fellow **EFETAC team members Danny C. Lee, Steve McNulty, Bill Hargrove, and Kevin Potter** as presenters and panelists.

The FHM focus group supported the agency's global change research strategy and engaged scientists and policy makers in discussions to describe climate change and its potential threat to forest ecosystem health. Participants heard that increases in fire, extreme weather, disease, and insect events will influence forest ecosystems' response to climate change. The session revealed ways FHM could advance climate change understanding, identify internal and external collaborative opportunities, and allocate program resources.

The session culminated with six resolutions designed to guide FHM's future climate change efforts. Visit <http://www.fhm.fs.fed.us> for additional information.

EFETAC in the News



EFETAC and WWETAC Highlight 2007 Accomplishments

The Threat Centers have reached another milestone! The Eastern Forest and Western Wildland Environmental Threat Assessment Centers released their first accomplishment report in February. This joint report features progress of recent projects and collaborations as well as ongoing and future research efforts focused on threat detection, predictive tools, assessment and planning, and synthesis and communication. The *2007 Accomplishment Report for the Eastern and Western Forest Environmental Threat Assessment Centers* is available at www.forestthreats.org.

EFETAC Scientist Featured on National Public Radio's *All Things Considered*



In January 2008, National Public Radio (NPR) aired a story entitled "Trees Lost to Katrina May Present Climate Challenge" as part of the *Climate Connections* series on the daily news program *All Things Considered*. **Steve McNulty**, SGCP team leader, referenced his field surveys and aerial photography to help quantify carbon dioxide that will be released from trees damaged during Hurricanes Katrina and Rita. Read the full article at <http://www.forestthreats.org/news-events/in-the-news>.

Asheville Citizen-Times Helps Launch EFETAC's New Web Tool

EFETAC Director **Danny C. Lee** was interviewed following the initial release of the forest threats summary viewer. "Forest Service Unveils New Threat Summary Online," highlighted the web-based tool that provides descriptions, images, distribution maps, and forestry contact information related to various forest health threats in the eastern U.S. Find your favorite threat at <http://www.forestthreats.org/tools/forest-threat-summary-viewer>.

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