Forest ThreatNet

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

In This Issue:

FROM THE DIRECTOR...

(This issue's Director's Message is written by Huai-Min Zhang, physical scientist with NOAA's National Climatic Data Center in Asheville, NC. He was detailed to EFETAC from November 2010 to February 2011.)

It has been a pleasure to work with the Southern Research Station (SRS) and Eastern Forest Environmental Threat Assessment Center for the past four months. This cross-agency assignment will be a highlight in my 18-month leadership development program, sponsored by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA). I began my detail wondering how the Forest Service and other agencies use climate data and information. I soon learned about the Station and Center's research activities as well as the newly formed Landscape Conservation Cooperatives and Climate Science Centers. With so many climate science activities and initiatives, it is extremely important to find effective ways to collaborate by leveraging expertise and strengths in order to maximize benefits while minimizing resource requirements. I am glad that, by working together, we have taken small steps toward a larger regional and national goal. Among these efforts is the grassroots, multiple-organization "Thirsty Thursday" Environmental Science Seminar series, organized to exchange knowledge and collaborative ideas. Visit http://thirstythursday.nemac.org/ for more details.

I am very impressed by the exciting science being conducted by EFETAC researchers and cooperators, including the science-based cohesive wildfire management strategy; the national Early Warning System; the Comparative Risk Assessment Framework and Tools for decision support; invasive and other plant species and climate change; the

Template for Assessing Climate Change Impacts and Management Options for land management planning; the Water Supply Stress Index - Carbon and Biodiversity model to assess potential impacts of changes in climate, land use, and population on the ecosystems; and the Forest Health Monitoring research to determine forest trends and genetic diversity.

Connecting science and technology to societal benefits and decision and policy making is an important component of a government research agency. EFETAC does an excellent job translating science and technical results into publically understandable terms. The newly established Technical User Group will act as a catalyst in this science delivery process.

Leaving the beautiful SRS campus is difficult, but the "Thirsty Thursdays" seminars will give me a legitimate reason to come back from time to time. See you then …

Huai-Min Zhang

Forest ThreatNet

is published by the Eastern Forest Environmental Threat Assessment Center (EFETAC), 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 USDA Forest Service's Research and Development, National Forest System, and State and Private Forestry, and is housed within the Southern Research Station in Asheville, NC.

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Forest Service Research and Development Leadership Changes

Jim Reaves

The Southern Research Station (SRS) said goodbye to Station Director **Jim Reaves** in late 2010 when he accepted the top job with Forest Service Research and Development (R&D)—that of Deputy Chief at the national headquarters in Washington, DC. Reaves had served as SRS Station Director since January 2008. At his new post, he will oversee the world's largest natural resource research organization. Reaves' natural resources career has spanned three decades, during which he held several senior-level leadership positions, including Forest Service R&D Associate Deputy Chief, Director of Forest Management Sciences, and National Budget Coordinator.

Rob Doudrick

Rob Doudrick rejoined SRS as Station Director in February after having served since 2005 as the national Forest Service Ecosystem Services Coordinator in Washington, DC. He has held several agency positions including North Central Research Station assistant director and Forest Service R&D budget coordinator. Doudrick is not new to SRS—he headed up the SRS Southern Institute of Forest Genetics in Saucier, MS, prior to serving as a SRS assistant director between 1998 and 2001.

Angela Coleman

Reaves will receive strategic advice and recommendations from **Angela Coleman**, named Research and Development Associate Deputy Chief last April. Coleman's Forest Service career spans 20 years, including positions as deputy regional forester for the Pacific Southwest Region in Vallejo, CA; chief of staff to the National Forest System Deputy Chief in Washington, DC; and regional communications director for the Forest Service Southern Region in Atlanta.

EFETAC's sister center, the Western Wildland Environmental Threat Assessment Center (WWETAC), has a new director. **Nancy Grulke** joined WWETAC in 2010 by way of the Forest Service Pacific Southwest Research Station. Grulke has worked in a variety of capacities for state and federal governments, universities, non-governmental organizations, and the private sector. Most recently, she served as a science coordinator for the Pacific Northwest and Pacific Southwest Research Stations' Climate Change Program.

Nancy Grulke

New Features Enhance Web-Based Climate Change Tool

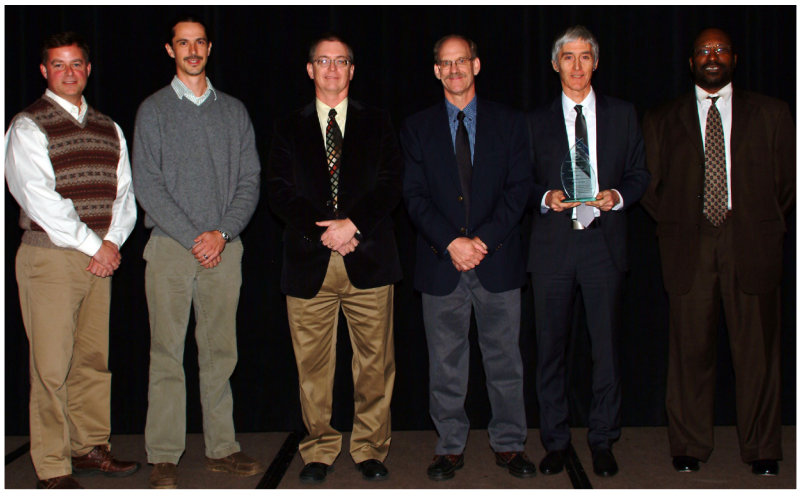
The Template for Assessing Climate Change Impacts and Management Options (TACCIMO), an interactive, web-based tool that provides users opportunity to integrate current climate change science into land management planning decisions, has added upgrades. TACCIMO version 2.0 features:

An enhanced Geographic Information Systems (GIS) tool -- TACCIMO links text with data maps, charts, and climate model projections in a GIS environment. Users can generate a standardized report highlighting trends in temperature and precipitation for any state, county, or National Forest in the contiguous United States and can easily examine these trends with the aid of an accompanying graphing tool.

An expanded Forest Service land and resource management plan database -- TACCIMO users can explore forest plans for all National Forests east of the Mississippi River. The forest plans can be directly linked to TACCIMO's database of climate change impacts or used as independent resources.

An expanded climate change science database -- TACCIMO users can generate customized reports based on an extensive database of direct climate change impacts and management options derived from peer reviewed literature. TACCIMO's climate change science database is constantly growing and is responsive to user requests and needs.

EFETAC scientists and staff are developing TACCIMO in partnership with Forest Service Southern Region Planning, Land and Resource Management, and Cooperative Forestry units. "The TACCIMO partnership has focused on building a sound foundation designed to meet the information needs of forest resource planners and managers associated with climate change. Now that the foundation is laid, we can begin expanding content responsive to emerging science and user information requirements," says **Emrys Treasure**, an EFETAC biological scientist working with the TACCIMO development team. "While we will continue to improve functionality where needed, the real emphasis going forward is capturing and transferring information critical to sustainable resource management under a changing climate, including assisting the National Forest System in developing successful strategies for climate change adaptation and mitigation."



The TACCIMO development team received the Regional Forester 2010 Honor Award for Technology Transfer – (left to right) Steve McNulty, Emrys Treasure, David Meriwether, Paul Arndt, Chris Liggett, and presenter Jerome Thomas.

Additional upgrades planned for mid-2011 include a keyword search functionality; a prototype application allowing users to view maps, graphs, and text simultaneously; and supplementary science and climate projection content. The TACCIMO development team offers demonstrations and customized training sessions for specific user groups and needs. To participate, contact EFETAC ecologist **Steve McNulty** at (919) 515-9489 or by email at steve_mcnulty@ncsu.edu and **Emrys Treasure** at (919) 515-9490 or by email at etreasure@fs.fed.us. Visit http://www.forestthreats.org/tools/taccimo to learn more.

TACCIMO Development Team Honored for Technology Transfer Efforts

The USDA Forest Service 2010 Regional Forester Honor Award for Technology Transfer (Southern Region) was presented to a team of EFETAC researchers and natural resource managers and planners from the Forest Service's Southern Region in Atlanta.

Jerome Thomas, Deputy Regional Forester for Natural Resources, presented the TACCIMO development team with the award during a December ceremony. Recipients were **Steve McNulty**, EFETAC ecologist; **Emrys Treasure**, EFETAC biological scientist; **Jennifer Moore Myers**, EFETAC resource information specialist; **Rob Herring**, EFETAC applications programmer; Chris Liggett, Southern Region planning director; David Meriwether, Southern Region ecosystem management coordinator; and Paul Arndt, Southern Region regional planner.

The team was selected for both TACCIMO development and numerous outreach activities, including online and face-to-face demonstrations and training sessions.

ForGRAS: Ranking Tree Species at Risk in the Southern Appalachians

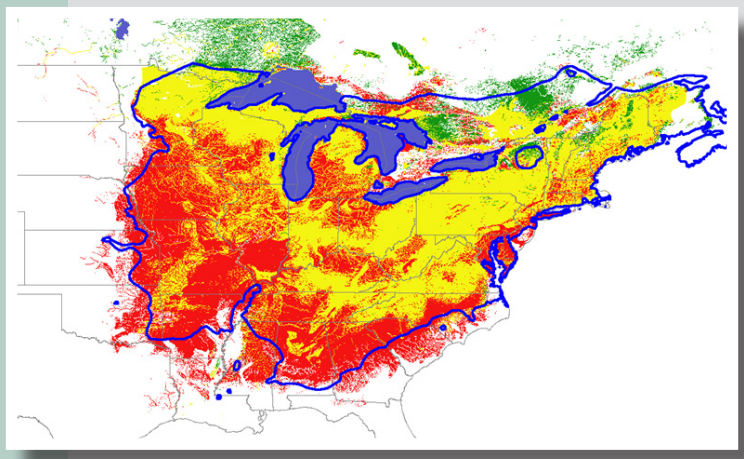
Forest management and genetic conservation strategies must be as complex and diverse as tree species' responses to threats like climate change and insect and disease infestation.

To help land managers and policy makers focus planning activities and thus make the most effective use of limited resources, Kevin Potter and Barbara Crane, Forest Service Southern Region regional geneticist, developed the Forest Tree Genetic Risk Assessment System (ForGRAS), a tool for ranking tree species' relative risk of genetic degradation. ForGRAS considers ecological and life history traits, species-specific projections of climate change pressure, and predictions of pest and pathogen susceptibility for 131 native Southern Appalachian tree species.

The ForGRAS framework can account for multiple threats to forest health that may cause the most severe genetic impacts, and is flexible enough to be applied at multiple scales and areas where appropriate data exist for the species of interest. In fact, it is also being used in genetic risk assessments in the Pacific Northwest. Contact Potter at kevinpotter@fs.fed.us for more information.

Trees in Transition ForeCASTS the Future *by Stephanie Worley Firley, EFETAC*

In forests as in life, the only constant is change. Forest species are ever adjusting to changing conditions resulting from seasonal fluctuations in temperature and precipitation, disturbances like storms and wildfire, and interactions with other species. But typical temperature and precipitation patterns are now also changing; in some areas, changes are occurring rather rapidly. Many tree populations may be hard pressed to survive given the rate of climatic change. Whether tree populations adapt on site to changing habitat conditions, shift their ranges to new suitable locations, or simply die out, the forests we know today—and the genetic makeup of the species within them—could be very different by the middle of the 21st century. Now, researchers are asking the question: in a future with a different climate, where might the trees be?



A ForeCASTS map shows the "minimum required movement" for northern red oak (Quercus rubra) to new suitable habitat under a lower greenhouse gas emissions climate scenario in 2050. Yellow areas are currently suitable and expected to be suitable in the future; green areas are expected to become suitable in the future; and red areas are currently suitable habitat areas expected to become unsuitable.

With support from the USDA Forest Service Forest Health Monitoring program, EFETAC ecologist **Bill Hargrove**, and North Carolina State University cooperating scientists **Kevin Potter** and **Frank Koch** are collaborating to develop Forecasts of Climate-Associated Shifts in Tree Species, or ForeCASTS. Using projections of future climate in combination with the concept of fine-scale ecoregions—land areas that share similar environmental characteristics, such as soils, topography, and climate variables—the researchers are developing maps depicting future suitable habitat ranges for North American tree species within the United States as well as across the globe. The maps can help scientists, land managers, and policy makers target tree species for monitoring, conservation, and management activities by pinpointing locations where climate change pressures are likely to be most intense.

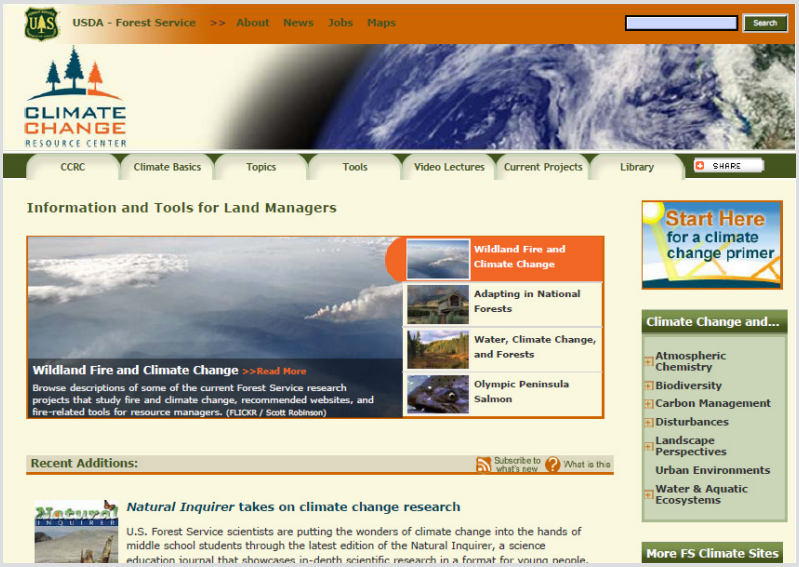
"The Forest Service has a long history of understanding that the seed source makes a huge difference in tree growth and performance, so the ForeCASTS maps can ultimately be used to assess the risk to genetic integrity of North American forest tree populations," explains Hargrove.

So far, maps have been developed for 213 tree species under varying climate models and scenarios for the years 2050 and 2100, including "minimum required movement" maps that quantify the distances between current habitat locations that may be unsuitable in the future and new suitable habitat ranges. "The general trend, as we would expect, is for tree ranges to expand at least a little bit to the north, and to drop off at least a little bit at their southern edges. Looking at species with ranges that include the Southern Appalachians, the ForeCASTS maps show nearly all species decreasing their overall suitable habitat area," says Potter.

The ForeCASTS maps are still provisional. As the project unfolds, the researchers are refining the available map products and adding additional species to the queue. They plan to identify closest "lifeboat" areas for tree species that may migrate from multiple locations as well as add measures of performance to determine where species may thrive in future projected habitat ranges. Later, the methods used in ForeCASTS could be employed to explore future distributions of invasive species. Visit http://www.forestthreats.org/tools/ForeCASTS to learn more.

Forest Service Climate Change Resource Center Goes National

Credible, science-based, and relevant information and tools are critical for the natural resource manager who must develop an effective plan to help ecosystems adapt to a changing climate—but, how does one begin to sort through endless quantities of climate change-related research articles, web sites, and technology? To assist managers with this challenge, the web-based Climate Change Resource Center (CCRC) was created to streamline and simplify access to a vast collection of climate change materials that inform and support natural resource management decision making. Originally developed with a focus on western U.S. forests and grasslands, the CCRC is now being expanded to include information and tools that can be applied at a national scale on public as well as privately owned lands.



The CCRC is a joint project sponsored by the Forest Service Research Stations (Pacific Northwest, Pacific Southwest, Rocky Mountain, Northern, and Southern) as well as EFETAC and its sister Center, the Western Wildland Environmental Threat Assessment Center. EFETAC's **Perdita Spriggs**, communications director, and **Stephanie Worley Firley**, biological science information specialist, serve on a collaborative development team responsible for coordinating the CCRC's regular updates and additions of educational information, such as basic science modules explaining climate and climate impacts, decision-support models, maps, simulations, case studies, and toolkits. The development team carefully evaluates potential new material for CCRC inclusion with the objective of selecting information and tools with the greatest utility for the target audience.

Currently, more than 20 scientists representing all research stations are working with the CCRC development team to refine older content and create new, original content, including syntheses of scientific literature as well as video lectures on ecosystem response, adaptation, and mitigation. Future phases of the CCRC's expansion will involve additional scientists and experts from a variety of disciplines across the Forest Service. "As the CCRC expands, we hope to really engage diverse audiences in climate change science, focusing on tools and information that anticipate land manager needs," says Spriggs. "The CCRC's user-friendly design and multimedia features provide a dynamic environment that guides users through resources that encourage them to visit the site often for new and enhanced information."

Spriggs and Worley Firley are joined on the development team by Chris Swanston (co-chair), Kristen Schmitt, and Sarah Hines–Northern Research Station and Michael Furniss (founder and co-chair), Jeffrey Guntle, and Andy Alm–Pacific Northwest Research Station.

Visit the CCRC and provide feedback at http://www.fs.fed.us/ccrc.

First Friday All Climate Change Talks Connect People and Research

Since June 2010, EFETAC has hosted First Friday All Climate Change Talks (FFACCTs), virtual information sharing forums for research activities focused on climate change impacts to eastern forest ecosystems. Held on the first Friday of each month, FFACCTs bring together scientists and staff from the Forest Service Northern and Southern Research Stations, Washington Office, the National Forest System, and State and Private Forestry for presentations, updates, and "round robin" discussions through video, internet, and telephone conferencing.

EFETAC ecologist **Steve McNulty**, who conceptualized FFACCTs, says, "Climate change research is an ongoing priority in the Forest Service and requires contributions from a great number of people. As a regular event that engages those directly involved in climate change science, FFACCTs strengthen the network of researchers and staff and help them identify complementary projects and potential opportunities for collaboration."

Visit http://www.forestthreats.org/news-events/ffaccts for more information and to view archived FFACCTs presentations and related resources.

Events Boost EFETAC Science Delivery and Technology Transfer

Themed conferences, workshops, and other gatherings provide opportunities for EFETAC scientists and staff to share information and tools with a wide range of interest groups, stakeholders, and collaborators. In 2011, EFETAC's research will be represented through presentations, posters, informational booths, and hands-on demonstrations at a variety of events, including:

- USDA Interagency Research Forum on Invasive Species
- U.S. Environmental Protection Agency Council for Regulatory Environmental Modeling workshop
- Minority Landowner magazine conference
- Comparative Risk Assessment Framework and Tools workshops
- U.S. Regional Association of the International Association for Landscape Ecology symposium
- Society of American Foresters' National Workshop on Climate and Forests
- Fire in Eastern Oaks conference

More events information involving EFETAC can be found at http://www.forestthreats.org/news-events.

Center Highlights

Rapid Risk Mapping Helps Managers Assess Emerging Eastern Forest Threat

EFETAC biometrician **Bill Smith** and cooperating North Carolina State University researcher **Frank Koch** were recognized by Forest Service Southern Regional Forest Health Protection (FHP) staff for swiftly producing maps projecting the preliminary risk of Thousand Cankers Disease (TCD). This devastating disease of black walnut trees—first discovered in the eastern United States last August in Tennessee—is caused by a fungus spread by the walnut twig beetle. Having previously modeled the spread of laurel wilt disease, also a fungus similarly carried by a beetle, Smith and Koch had a straightforward process for developing spread risk maps for TCD over the entire range of black walnut. During a crowded training session last fall, FHP plant pathologist Bill Jones presented the maps to Tennessee state and county foresters and spoke about the regional threat of TCD and potential for natural spread versus human-assisted movement. The training session participants later expressed appreciation for effective risk communication, including the methods used for generating the maps. "I felt this was a great exercise in quick cooperation. We developed a product that can help focus pest monitoring and management activities for the next five to 30 years," says Jones. For more information about the TCD risk maps, contact Bill Jones at wejones@fs.fed.us.

Thousand Cankers Disease results from a fungus (Geosmithia sp.) carried by the walnut twig beetle. Photo by Whitney Cranshaw, Colorado State University, Bugwood.org.

EFETAC Scientists Demonstrate Tool for International Users

International audiences are seeing firsthand how EFETAC's Water Supply Stress Index-Carbon and Biodiversity (WaSSI-CB) model can help assess climate change and land management impacts on carbon sequestration, water availability, and biological diversity. In 2010, Forest Service International Programs provided support for EFETAC ecologist **Steve McNulty**, research hydrologist **Ge Sun**, and resource information specialist **Erika Cohen** to conduct two workshops in Mexico City to introduce land managers and researchers to WaSSI-CB and demonstrate how the model could be implemented to address natural resource challenges in Mexico. Following the first workshop, the EFETAC scientists obtained data on water flows and basins, climate, soil, carbon, biodiversity, and forest cover in Mexico, which were incorporated into the WaSSI-CB model. McNulty, Sun, and Cohen have since been invited to play a role in watershed assessment and conservation projects in east Africa being conducted by International Programs in partnership with the U.S. Agency for International Development, Wildlife Conservation Society, and several U.S. universities. The trio will travel to Rwanda, Zambia, and Tanzania to meet with project partners and stakeholders, present an overview of WaSSI-CB, and identify databases for use in the assessment projects. WaSSI-CB will be used to quantify potential impacts of land use practices on water quantity and quality as part of an effort to develop economic incentives for conserving watershed ecosystem services.

Ge Sun (left) and Erika Cohen (center) demonstrate the WaSSI-CB model for a Mexico City workshop participant.

(continued next page)

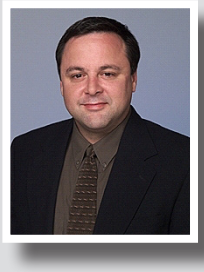
Center Highlights *(cont'd)*

WaSSI-CB will be accessible through a new online interface in mid-2011. For more information, contact McNulty at (919) 515-9489 or steve_mcnulty@ncsu.edu, or visit http://www.forestthreats.org.

EFETAC Scientists and Collaborators Join Thousands at American Geophysical Union Meeting

EFETAC ecologist **Bill Hargrove**, research hydrologist **Pete Caldwell**, and biological scientist **Johnny Boggs** were among more than 18,000 global attendees at the fall meeting of the American Geophysical Union (AGU) held in San Francisco, CA, in December. Hargrove and collaborating scientists presented four posters detailing the developing Early Warning System for detecting potential threats to forest health. Caldwell delivered a presentation about the Water Supply Stress Index (WaSSI) modeling project. In a carbon sequestration session co-chaired by several presenters including EFETAC cooperating scientists from North Carolina State University, **Asko Noormets** and **Jean-Christophe Domec,** Boggs presented a poster describing tree species conversions and impacts on water uptake. The annual AGU meeting allows researchers, teachers, students, and consultants to share and learn about the latest issues affecting the Earth, the planets, and their environments in space. Visit http://www.agu.org to learn more.

EFETAC Welcomes New Team Members



Bill Christie joined EFETAC in August 2010 as a biological scientist. His role involves technical and analytical Geographic Information Systems (GIS) operations, creating web-based mapping applications, advancing technology transfer, and creating partnerships to connect and deliver EFETAC's science and tools to public and private land management/forest stewardship entities. Christie received undergraduate degrees in forestry and geography and obtained his master's in geography from the University of South Carolina.

Brent Timothy joined EFETAC in June 2010 as a statistician located in Boise, ID. Timothy is currently working on the Fire Program Analysis (FPA), where he performs SAS programming and helps estimate large fire probability and cost. He received his bachelor's degree in statistics from Brigham Young University, his master's in statistics from George Washington University, and completed PhD coursework at the University of Wyoming.

Andy Tait joined EFETAC as a forestry technician through the Student Temporary Employment Program (STEP) and is building an eastern wildfire history database with research ecologist Steve Norman. Tait holds an Associate of Applied Science degree in forestry and has served as a field forestry technician at Bent Creek Experimental Forest. He is currently pursuing a Master of Science degree in forestry.

Jennifer Torgerson joined EFETAC in August 2010 as a STEP biological science technician. She works with ecologist Qinfeng Guo to advance population of the invasive and exotic plants database. Currently attending Western Carolina University, Torgerson is pursuing a master's degree in biology with a focus in botany and ecology. Her thesis work focuses on quantifying the genetic distance between and among populations of goldenseal, *Hydrastis canadensis*, in North Carolina.

New Publications and Products

For a complete list of EFETAC publications and products, please visit www.forestthreats.org or www.treesearch.fs.fed.us.

Boggs, J.L. and **G. Sun.** 2011. Urbanization alters watershed hydrology in the Piedmont of North Carolina. Ecohydrology. In press.

Guo, Q. and R.E. Ricklefs. 2010. Domestic exotics and the perception of invasibility. Diversity and Distributions 16:1034-1039.

Yemshanov, D., **F.H. Koch**, Y. Ben-Haim, and **W.D. Smith**. 2010. Detection capacity, information gaps and the design of surveillance programs for invasive forest pests. Journal of Environmental Management 91(12):2535-2546.

EFETAC and the Southern Research Station's Youth and Partnerships Program recently collaborated to develop a series of colorful **bookmarks** highlighting climate and severe weather, wildland fire, invasive plants, and insects and diseases. Please visit http://www.forestthreats.org to view, print, and order bookmarks.

Visit http://www.forestthreats.org/publications/fact-sheets to view, download, and print new **EFETAC fact sheets.**

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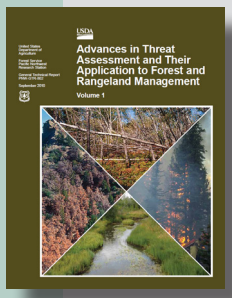
In the News....

EFETAC Partners with University of North Carolina Asheville to Enhance Technology Transfer

EFETAC and the University of North Carolina Asheville's National Environmental Modeling and Analysis Center (NEMAC) have entered into a joint venture agreement that extends established collaborative efforts to enhance delivery of forest science to a range of stakeholders through 2015. NEMAC contributes unique skills in computer modeling and programming, database management, Geographic Information Systems, and education and outreach to assist EFETAC in developing web-based resources and related communication materials.

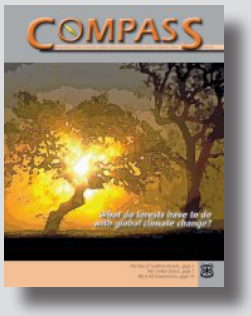
Threat Assessment Conference Results in Comprehensive Two-Volume Publication



EFETAC and sister center, the Western Wildland Environmental Threat Assessment Center, hosted a conference themed, "Advances in Threat Assessment and Their Application to Forest and Rangeland Management," that drew more than 170 researchers and managers from the United States, Canada, and Mexico to discuss the state of the science in environmental threat assessment. A two-volume compilation of the peer-reviewed papers presented during the 3-day conference was recently published. The report—organized by topics of land, air and water, fire, and pests/biota—features syntheses and case studies and is intended to foster exchange and collaboration between forest and rangeland managers and scientists developing knowledge and tools for threat assessment. View, download, or request the report at http://www.forestthreats.org/publications.

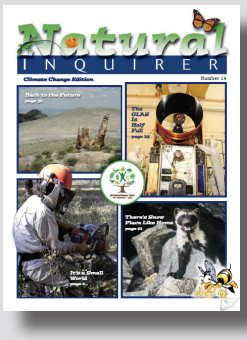
Upcoming Compass Magazine Issue to Highlight EFETAC Climate Change Research

The spring 2011 issue of the Southern Research Station's (SRS) *Compass* magazine will focus on SRS research strategies aimed at forest adaptation in response to climatic changes and disturbances. Several articles will feature EFETAC research projects and tools including the Template for Assessing Climate Change Impacts and Management Options, Comparative Risk Assessment Framework and Tools, Water Supply Stress Index model, and Forecasts of Climate-Associated Shifts in Tree Species (ForeCASTS), as well as research investigating the effects of climate change on invasive plant species. Current and archived issues of Compass are available at http://www.srs.fs.usda.gov/compass.



EFETAC Invasive Insect Risk Research Featured in Online and Radio News Stories

Recently published research on rates of invasive insect introductions by EFETAC North Carolina State University cooperating scientist **Frank Koch** and EFETAC biometrician and co-author **Bill Smith** is highlighted in a *LiveScience* Web article titled "Insect Scourge: Two New Species Invade U.S. Every Year." Koch also discussed biological and economic impacts of insect invasion in a radio interview that aired on KRLD News Radio 1080 in Dallas, TX. Read more and listen in at http://www.forestthreats.org/news-events/in-the-news.



Natural Inquirer *Features EFETAC Hydrology Research*

The *Natural Inquirer*, a Forest Service Research and Development middle school science education journal, features EFETAC hydrology research in a climate change-themed edition. EFETAC scientists **Johnny Boggs, Ge Sun, Steve McNulty**, and **Emrys Treasure** are also profiled for the article, adapted from a research paper presented during a 2009 American Water Resources Association conference. The article, "Did They Make the Gradient? Climate and Stream Temperatures Now and Into the Future," can be accessed at http://www.forestthreats.org/news-events/in-the-news.