USDA Forest Service Research and Development
Eastern Forest Environmental Threat Assessment Center Update

THE FOREST THREATNET

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A camper transports firewood, a practice that increases the risk of spreading non-native insect pests. Photo by Rebekah D. Wallace, University of Georgia, Bugwood.org.

Danny C. Lee, PhD
Eastern Threat Center Director

FOREST SCIENCE AND MANAGEMENT CONNECTIONS ENABLE REAL-WORLD SOLUTIONS

Message from the Director

Greetings! It's apparent to me that we live in the age of cables. If you're like me, you have a box or drawer full of cables somewhere in addition to a dozen or so that are in active use. Each one came with some new device and either connected to the power supply or allowed one gadget to communicate with another. Many of the cables are highly specialized such that they can only be used with particular devices. Without the right cables, our prized electronic gizmos are useless. Similarly, a specialized cable is of limited value without the right device in working order.

I could use more cables. Not in the literal sense, but in the metaphorical sense of connecting and communicating. As scientists and technology developers, the Eastern Threat Center specializes in generating knowledge and producing tools. The ultimate goal of our work, however, is to enhance the management of our nation's forests. For that, we need connections. Our communications and technology transfer efforts provide those connections and come in multiple forms. Some are very broad—like this newsletter—while others are highly specialized and target specific users. We've been quite successful in some quarters, but I'm not ready to rest on our laurels. We continue to hear from stakeholders that more assistance is needed, so we're upping our efforts in the coming year. But there are two ends to every cable. To be effective, there has to be reciprocal efforts from partners to integrate new tools and information into real-world management processes. We also need your help in better understanding management needs so that we can craft our efforts accordingly. Give us a call. Let's work on this together.

- Danny C. Lee

Campers on the Move Provide Insight into Risks of Pest Invasion

Researchers concerned about invasive pests know that humans often play a role in helping insects spread. Transporting firewood from home to burn at a faraway campsite is one such way that people can unknowingly introduce non-native insects into a new environment where they could damage or destroy forest resources. Now, researchers have a better understanding of the origins and destinations of potentially infested firewood. Center research ecologist **Frank Koch** and partners used more than seven million federal campground reservations to model campers' travel patterns. As part of a recently published study, the researchers produced maps highlighting the riskiest areas in the lower 48 United States and seven Canadian provinces--those most likely to provide a source of insect-infested firewood. This information can help decision makers develop strategies for preventing the movement and spread of invasive insects via firewood bound for a recreational campfire. *Read more in CompassLive…*

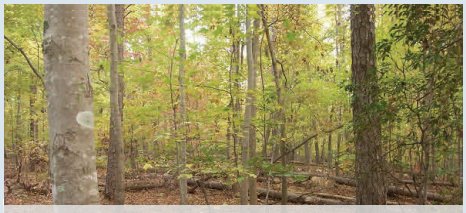
INSIDE THIS ISSUE

*The Eastern Threat Center welcomes **Lars Pomara** (p. 2).*

EASTERN THREAT CENTER HIGHLIGHTS

When Does Biodiversity Make a Difference?

Biodiversity can be like a forest's insurance policy. The more and varied the tree species that live there, the better the chance that the forest can remain healthy, stable, and resilient through times of disturbance. But as climate change prompts new forest management approaches intended to maximize growth and productivity for carbon storage, bioenergy, and other benefits, researchers are wondering: when exactly does biodiversity make a difference? **Kevin Potter**, a North Carolina State University scientist working with the Eastern Threat Center, collaborated to study the dynamics at play between tree biodiversity and live aboveground biomass. Results were recently published in the journal *Forest Ecology and Management*. *Read more in CompassLive…*



According to new research, tree species that are more distinct in terms of their evolutionary past may have uniquely important ecosystem functions in a forest community. Photo by Kevin Potter.

Scientist Connects Research and Landscape-scale Conservation

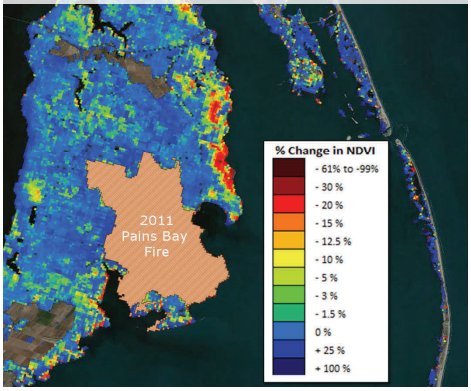
Ecologist **Lars Pomara's** research interests include biogeography, landscape ecology, and conservation of temperate and tropical forest ecosystems. Since joining the Eastern Threat Center in June, Lars is applying those interests to synthesize existing research on threats to ecosystem services and biodiversity across Appalachian landscapes and ecosystems. This work, involving the Appalachian Landscape Conservation Cooperative, will result in new strategies and tools to address future vulnerabilities in a coherent planning framework that will benefit the Appalachian region.

FOREST HEALTH EXPERTS EYE HURRICANE DAMAGE IN NC COASTAL FORESTS

For some residents of the North Carolina coast, the 2014 Independence Day weekend will be remembered not for fireworks and family cookouts, but for damage assessment and cleanup following the high winds and heavy rain that downed trees when Hurricane Arthur came ashore on July 3. Eastern Threat Center researchers believe that Arthur did relatively little harm to the state's coastal forests, but will continue to watch for delayed impacts using ***ForWarn***—a satellite-based forest monitoring tool which provides maps that compare current and past levels of vegetation greenness. Of greater concern to the researchers and ***ForWarn*** users in NC are the lingering effects of another storm: Hurricane Irene.

Irene made landfall over eastern NC on August 27, 2011, and significant flooding followed. A year later, Rob Trickel, head of the Forest Health branch of the North Carolina Forest Service, saw something peculiar in eastern NC highlighted on a ***ForWarn*** map. "In September 2012, I was perusing ***ForWarn*** and the Forest Disturbance Monitor*. Since the Pains Bay Fire on the coastal plain the year before, I made it a point to periodically check out that part of the state on ***ForWarn*** maps to see how green up was progressing," says Trickel. "On that day, I noticed an area of disturbance just east of the fire. I thought, 'Did I miss that part of the fire?' before realizing that this was not fire-related."

*A recent **ForWarn** map image shows lingering impacts of Hurricane Irene. The red colors signify areas with the greatest loss of vegetation greenness.*



Trickel continued his investigation by examining ***ForWarn***'s map archives and discovered that the greenness of the vegetation appeared to have begun declining a year earlier, in September 2011. "When I realized this, I hypothesized that the disturbance was related to saltwater storm surge from Irene."

While driving to a meeting on the coast soon after, Trickel observed the disturbance firsthand. "Many of the pines and hardwoods were dead and had already lost their leaves. Leaves on trees that were clinging to life were off-color," he remembers. "After talking to some locals who said the area was inundated with water after Irene, there was no doubt that this was salt damage that could be traced back to the storm surge from the hurricane." Today, most overstory trees in this area are dead, their leaves gone and bark sloughing off (above). These forests may eventually recover, but could require the assistance of land managers along the way.

Photo by Jamie Dunbar, NCFS.

This example demonstrates not only the power of weather and climate in shaping forests, but also the power of online tools and relationships that make remote forest monitoring possible. Center research ecologist **Steve Norman** uses ***ForWarn*** to watch vegetation in areas hit by wildfire and hurricanes. "What I find remarkable is how well we can track the post-disturbance response from space, and how it differs from recent fires or other past hurricanes," he says. "Sites like these coastal forests are particularly important to monitor over the long term because they are vulnerable to sea level rise, hurricanes, and wildfire. New technologies like ***ForWarn*** and information sharing through a network of users and land managers can help."

**The Forest Disturbance Monitor is a complementary tool from Forest Service Forest Health Protection.*

COULD INCREASING CLIMATE VARIABILITY USHER IN "THE AGE OF THE MEDIOCRE FOREST?"

In 2001, when large numbers of red spruce trees began dying atop Mt. Mitchell in western North Carolina, Eastern Threat Center researchers stepped in to investigate. During the four years before their arrival, unusual drought and abnormally high air temperatures combined with acid rain pollution and a rare outbreak of southern pine beetles to wreak havoc in those forests covering the tallest peak in the eastern United States. Some red spruce trees survived through it all, providing a unique opportunity for the researchers to examine the differences between the live and the dead trees. As the significance of these differences became clear, the researchers formulated an idea that could redefine forest health and management in a world with increasing climate variability.

The researchers measured physical, chemical, and atmospheric characteristics to uncover variations between Mt. Mitchell's unhealthy or "chronically stressed" red spruce trees—the slow-growing ones on drier sites with poor soils—and the previously healthy or "non-chronically stressed" trees. Some of the chronically stressed trees had died during the onslaught of threats between 1996 and 2000, but, overall, their survival rates surpassed those of their non-chronically stressed counterparts.

The researchers believe that the loss of the weakest chronically stressed trees may have reduced competition for water and enabled other similar trees to survive the drought and beetle attacks, while non-chronically stressed trees continued to compete for resources before they died. Researchers used these results as a case study published in the journal *New Forests* that explores the concept of inverse resilience—the possibility that trees growing under conditions of chronic, or long-term, environmental stress might better withstand acute, or short term, environmental disturbances and threats. Researchers have coined this scenario "The Age of the Mediocre Forest" to describe the endurance of less productive, yet potentially more resilient, chronically stressed trees.

"Traditionally, forests comprised of large, full-crowned, fast-growing trees with minimal insect and disease damage were considered the model of forest health, and our expectations of how trees will respond to changing climatic conditions have been based on historic observations of individual tree and forest responses to stress," says **Steve McNulty**, a research ecologist with the Eastern Threat Center and the article's lead author. "Our paper raises the central question of whether or not trees and ecosystems will continue to respond to ongoing or temporary environmental stresses in the same manner when faced with more extreme climate variability."

Read more in CompassLive…

The rust-colored needles of dead red spruce trees are visible across Mt. Mitchell in 2001. Photo by Johnny Boggs.

EASTERN THREAT CENTER HIGHLIGHTS

Research Communication—and Brevity—Earn Prize for Scientist
Center biological scientist **Serra Hoagland** took top honors at Northern Arizona University's (NAU) inaugural 3 Minute Research Presentation Project contest. The event at NAU, where Serra is pursuing a PhD in forest science, challenges graduate students to explain their research concisely and in plain language. Serra is partnering with the Mescalero Apache Tribe to study the effects of forest treatments on Mexican spotted owls, a threatened species, in order to develop active, sustainable management practices. Learn more…

Scientists and Students Test New Forest Monitoring Technology
Forest monitoring from space is made possible by special sensors aboard orbiting satellites. ***ForWarn*** relies on MODIS sensors to collect data that researchers use to calculate measures of vegetation greenness. The MODIS sensors were originally designed to have a six-year life span, but are now operating beyond those years. As part of the NASA DEVELOP program, Center research ecologist **Bill Hargrove** partnered with Stennis Space Center and students from the University of Southern Mississippi to test new methods for data collection and greenness calculation using a sensor that monitors weather and climate patterns. The students summarized the project in a video, which won a NASA DEVELOP "Best in Category" award. Learn more…

Celebrate National Hispanic Heritage Month

More than 50 million people in the United States are of Hispanic or Latino origin, representing important contributions to the nation. Since 1968, their culture and influences have been recognized during National Hispanic Heritage Month, which begins on September 15. The 2014 theme is "Hispanics: A legacy of history, a present of action and a future of success."
Learn more at www.hispanicheritagemonth.gov.

Sonia Sotomayor, Associate Justice of the Supreme Court of the United States

Center News, Publications, Products, and Events

- The Climate Change Resource Center (CCRC) has a new look and more resources to assist land managers. Take a tour of the updated CCRC during the First Friday All Climate Change Talks (FFACCTs) session on September 5 at 11:00 ET.
- Center researchers are engaged in the PINEMAP project to help southern landowners manage pine for resilience and sustainability in a changing environment. In a project video, research ecologist **Steve McNulty** explains how models are useful for planning and preparation and provides an overview of the Water Supply Stress Index model.
- How do wildfires and prescribed burns impact water quantity and quality across the landscape? Center researchers **Ge Sun**, **Steve Norman**, and **Steve McNulty** have begun a collaboration with SRS scientists to study this question on behalf of the Joint Fire Science Program. Their findings will support local watershed managers through engagement with the USDA Climate Hubs.
- The Eastern Threat Center thanks summer interns **Allison Bass**, **Aubrey Burgess**, **Ashley Newby**, and **Sarah Vial** for their assistance with a variety of research projects. Learn more about Center interns and research opportunities.
- ***New Publications and Products*** *(search Treesearch for all pubs and abstracts):*

  Koch, F.H., D. Yemshanov, R.A. Haack, and R.D. Magarey. 2014. Using a network model to assess risk of forest pest spread via recreational travel. PLOS ONE 9 (7):e102105.

  McNulty, S.G., **J.L. Boggs**, and **G. Sun**. 2014. The rise of the mediocre forest: why chronically stressed trees may better survive extreme episodic climate variability. New Forests 45:403-415.

  Guo, Q. 2014. Central-marginal population dynamics in species invasions. Frontiers in Ecology and Evolution 2:23.

Smokey Bear has shared his message of outdoor safety and forest protection for 70 years. The nation celebrated his birthday on August 9.
Images courtesy of USDA Forest Service.

CONTACT US

USDA Forest Service Research and Development • Eastern Forest Environmental Threat Assessment Center

The interdisciplinary Eastern Threat Center develops new technology and tools to anticipate and respond to emerging forest threats. The Eastern and Western Threat Centers are a joint effort of the USDA Forest Service Research and Development, National Forest System, and State and Private Forestry. The Eastern Threat Center is headquartered with the Southern Research Station in Asheville and has offices in Raleigh and Research Triangle Park, NC.

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