

2007

*accomplishment  
report  
for the*

EASTERN AND  
WESTERN  
FOREST  
ENVIRONMENTAL  
THREAT  
ASSESSMENT  
CENTERS



## FROM THE DIRECTORS...

As chance would have it, the Eastern Forest and Western Wildland Environmental Threat Assessment Centers were created the same year (2005) that the Forest Service celebrated its centennial anniversary as an agency of the U.S. Department of Agriculture. The historic birth of the Forest Service provides a nice backdrop to view our own more modest beginnings. Both events were motivated by a desire to protect and sustain the health of our Nation's treasured natural resources. Both also occurred during times of increasing concern about environmental threats. When Gifford Pinchot first championed the Forest Service, unfettered exploitation of public lands and the absence of scientific information to support land management decisions were primary issues. The controversies have changed, but not entirely. Today's headlines ring with concerns over wildland fire, climate change, invasive species, the loss of open space, and a perceived decline in amenities that forests and wildlands provide. Pinchot likely could recognize similarities with his own times. What remains utterly unchanged is the fundamental need for sound science and tools to support management.

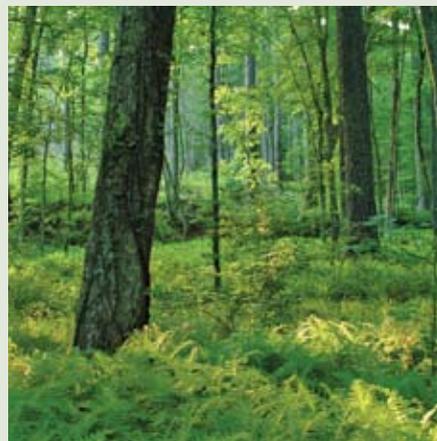
In this report, we highlight some of the accomplishments of the Centers in our brief history. We also touch on some of our more promising ongoing efforts. Our scientific teams are addressing a variety of complex forest threats issues that require

cross disciplinary integration, collaboration, and creativity. As we build on a wealth of existing information, we hope to complement efforts inside and outside of the Forest Service. We are also synthesizing this information, integrating our own research, and providing it in an easily accessible and user-friendly manner. We are committed to sharing our knowledge and tools, making forest science research relevant to everyday issues.

These highlights provide a snapshot of our many projects and collaborations throughout the U.S. Please visit our Web sites at [www.forestthreats.org](http://www.forestthreats.org) and [www.fs.fed.us/pnw/wwetac](http://www.fs.fed.us/pnw/wwetac), or contact us, for additional information.

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# ENVIRONMENTAL THREAT ASSESSMENT CENTERS

Forests and wildlands are subjected to a wide variety of environmental stresses such as insects, diseases, invasive species, drought, fire, severe weather and various impacts from human activities. Sometimes these stresses happen individually, but more often they work in combination. The resulting disturbances can be severe and cause significant, lasting effects on ecological and socioeconomic values.

Current approaches to addressing these environmental stresses are limited and piecemeal. There is a need to integrate how we address interacting, multiple stresses, so land managers may anticipate disturbances and act to prevent or lessen the effects. The Eastern Forest and Western Wildland Environmental Threat Assessment Centers were chartered in 2005 and directed to generate, integrate, and apply knowledge to predict, detect, and assess environmental threats to forests and wildlands, and to deliver this knowledge in timely, useful, and user friendly ways. The Centers have joined forces with other Forest Service units, federal and state government agencies, universities, and non-governmental partners to leverage resources and improve the collective capacity to meet this challenge.

Both Centers have initiated multipronged research programs that blend knowledge discovery, synthesis, and technology development and application. Experimentation and observation studies are used to understand causal relationships and interactions or quantify effects. Novel monitoring techniques and tools are being developed to help track forest and wildland conditions at multiple scales. Predictive modeling is used to forecast future conditions under various scenarios and simulate effects of management actions. Finally, tools for comparative risk assessment are being developed to help land managers and stakeholders explicitly consider the uncertainty inherent in any assessment.



## ORGANIZATION AND FUNDING

The Centers are a collaborative effort administered within Forest Service Research and Development, and receive additional funding and direction from two other branches of the Forest Service—the National Forest System and State and Private Forestry. The Western Center is a unit of the Pacific Northwest Research Station and is located in Prineville, OR. The Eastern Center is housed within the Southern Research Station and is headquartered in Asheville, NC. When the Southern Research Station reorganized in 2006, the Eastern Center merged with the Southern Global Change Program in Raleigh and the Forest Health Monitoring unit in Research Triangle Park, NC—two existing research units with complementary missions. The merger substantively increased the research capacity and infrastructure of the Eastern Center.

The Centers annually receive approximately \$2.4 million each, targeted at environmental threat assessment, with each branch of the Forest Service providing an equal share (\$800,000). The Eastern Center receives an additional \$2 million to fund research on climate change and forest health monitoring. These funds principally come from Research and Development but also include contributions from State and Private Forestry and non-Forest Service partners.

## WORKING WITH PARTNERS

The Centers work with scientists and professionals nationally and internationally from multiple federal, state, and local government agencies, universities, and non-governmental organizations. These partnerships span the gamut of both Centers' research and technology development efforts and share a common theme. Namely, collaborations allow leveraging of resources and talent for mutual benefits.

In 2006 and 2007 combined, the Centers provided \$5.5 million to partners for collaborative, mission-related projects. Partners are generally required to provide 20 percent matching funds or in-kind contributions. Because many of the Centers' projects focus on applications of emerging technologies, the contribution of partners in terms of existing knowledge, technology, and expertise, are vital to success and dwarf the financial contributions.



# ACCOMPLISHMENT HIGHLIGHTS

The following accomplishments represent progress in threat detection, predictive tools, threat assessment and planning, and synthesis and communication.

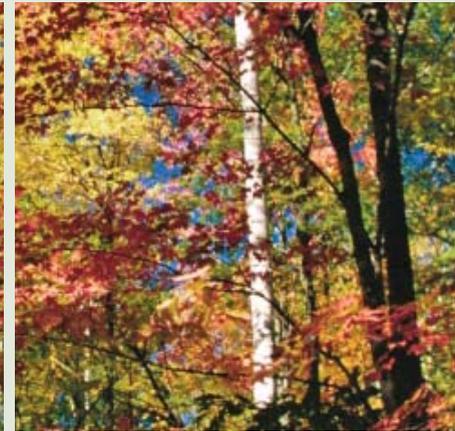
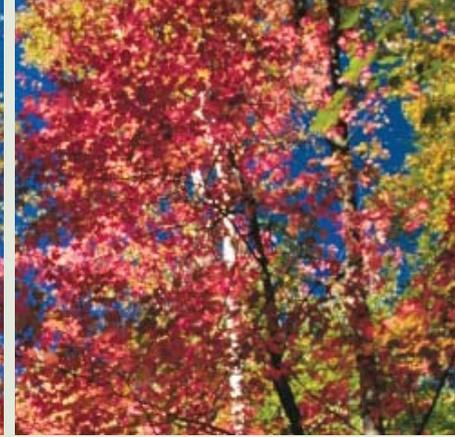
## THREAT DETECTION

**Advanced Technology Monitors Forest Change**—Many forest and wildland changes are dispersed over broad areas or occur in remote locations, making it difficult to detect and quantify the extent and magnitude of the disturbance. Eastern and Western Center scientists have teamed up with NASA and other partners to develop an early warning system that uses advanced satellite imagery to detect and characterize changes in vegetation at relatively frequent time intervals. This system will provide a cost-effective, synoptic survey of all lands, which can be used for multiple applications.

**Remote Sensing Imagery Detects Fire Fuels**—Southeastern landscapes are potentially at high-risk for increased wildfires. Eastern Center researchers are using remote sensing imagery to evaluate, project, and map wildland pre-and post burn forest fuels. Projections will assess impacts of various disturbances, including climate change.

**Noxious Weed Studies Broaden Communication**—At the county scale, location, climate, roads, and land uses often increase susceptibility to noxious, or harmful, weeds. Western Center scientists are mapping available weed data for Crook County, Oregon, developing land management contacts and encouraging discussions with surrounding counties. Advanced research technology will update weed presence, model future spread, and aid in land management efforts.

**U.S. and China Wary of Boomerang Effect**—A Western Center project is identifying fungi in western North America and China associated with the red turpentine beetle (*Dendroctonus valens*). The beetle was introduced into China from the U.S., causing serious concerns in pine plantations. Generally not a threat to the U.S., the beetle could potentially pick-up new, invasive fungi in China which could be inadvertently reintroduced into the U.S. South African scientists are also helping with fungi identification on beetles found in both the U.S. and China.



## PREDICTIVE TOOLS

**Multiple Stresses Impact Water Resources**—The southeastern U.S. has traditionally been water-rich, having enough water resources to sustain economic growth and support urban, agricultural, and industrial water needs. Comprehensive tools developed by Eastern Center scientists project long-term impacts on water resulting from climate change, population, and land use and project annual water availability.

**Prescribed Burns Produce Mixed Effects**—Fire plays a significant role in runoff, sediment yield, and nutrient transport in land and water ecosystems in mountain watersheds. Eastern Center scientists are evaluating the positive and negative effects of prescribed burning across the mountain, piedmont, and coastal plain regions of the southeastern U.S. Results will be used to build predictive models.

**Current Land Use Changes Provide Futuristic View**—Most land use changes result from population increases and new home construction in semi- or undeveloped areas. Eastern Center researchers and the European Commission have partnered to better understand these land use changes and predict future impacts on amenities like biodiversity and water quality.

**Pacific Coast Benefits from Enhanced Vegetation Data**—Severe disturbances are causing great concern throughout the West and could be predicted, and adaptive strategies modeled, more accurately with detailed vegetation data. Western

Center researchers are helping to develop enhanced maps for Washington, Oregon, and northern California that use advanced statistical techniques to extrapolate existing sample data to fill in knowledge gaps and provide high-resolution data for a variety of modeling applications.

**Plant Traits Often Determine Invasive Potential**—Thousands of plant species are introduced into non-native habitats, though few earn the title “invasive” by spreading to surrounding areas and multiplying profusely. Eastern Center scientists are studying biological traits such as life history and genetic information that are associated with invasion success. Insight gained in these studies will be used to develop predictive models.



## THREAT ASSESSMENT AND PLANNING

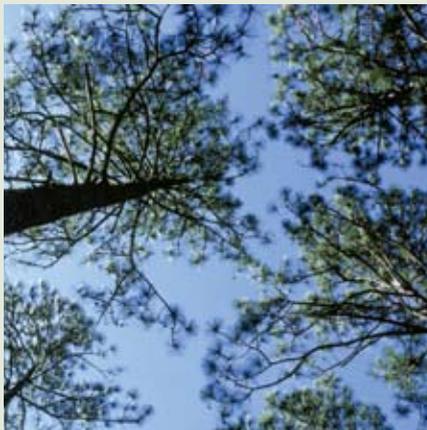
**Landscape Assessment Tools Aid Land Managers**—Strategic planning is necessary to design effective land use strategies that sustain resource values. Eastern Center researchers developed and used new landscape pattern indicators for large-scale natural resource assessments, which provide land managers and policy makers with new tools for strategic planning at regional, national, and international scales.

**Rapid Assessments Produce Timely Results**—Quick, targeted assessments are useful to determine risks associated with a particular threat, event, or situation and to clearly articulate the likelihood of expected physical and value loss. Western Center researchers recently conducted several timely assessments including—

- gene spills from genetically modified organisms on western public lands
- western bark beetles and climate change
- tamarisk (invasive plant) in the Pacific Northwest
- western forest pathogens and climate change

**Case Studies Examine Ecological/Social Impacts**—Interdisciplinary research perspectives encourage a balanced approach as natural resource communities adapt to potential climate change impacts. Western Center researchers are coordinating case studies that assess the vulnerability of natural resources and explore potential land management options to facilitate ecological and social adaptation to changing climates.

**How Vulnerable is the Ecosystem?**—Climate change impacts on the ecosystem are still relatively unknown. The Western Center is partnering with the three western Forest Service research stations to address ecosystem vulnerability and climate change interactions with other stressors and land uses under various scenarios. A Center-hosted workshop also explored the interaction between insects and climate change in support of the west-wide Climate Change Initiative.



## SYNTHESIS AND COMMUNICATION

**Online Encyclopedia Houses Forest Threats Research**—Forest science is useful to researchers, land managers, and policy makers when achieving land management goals. Eastern and Western Centers jointly sponsored development of the Encyclopedia of Environmental Forest Threats, which will house peer-reviewed scientific research and case studies. The encyclopedia will be available at <http://www.threats.forestencyclopedia.net>.

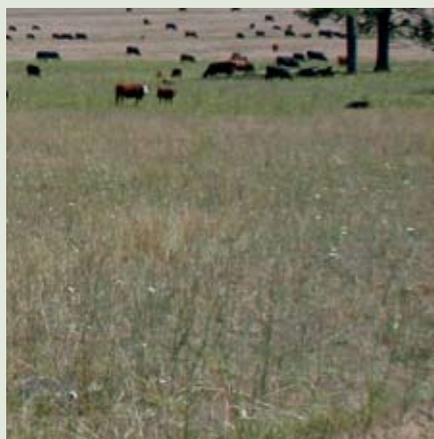
**Web-based Tool Highlights Forest Threats**—Land users often try to identify forest threats themselves before seeking additional expertise. Eastern Center scientists and partners launched the forest threat summary viewer, a tool that provides images, threat distribution maps, additional forestry contact information, and brief descriptions about forest threats throughout the eastern U.S. The tool can be viewed at <http://threatsummary.foresthreats.org/>.

**Annual Reports Highlight Condition of Nation's Forests**—Trends in forest health are extremely important for land managers and policy makers. Eastern Center scientists and North Carolina State University researchers produce annual reports synthesizing trends in forest health. These reports highlight forest sustainability potential based on criteria such as carbon cycling, soil conservation, and biological diversity.

**Agencies Discuss Wildland Fire**—Wildland fires have become a major concern throughout the U.S. The Western Center hosted two 3-day roundtables for the interagency Joint Fire Sciences Program to gather information regarding current knowledge and practices in wildland fire as well as identify knowledge gaps for assessing fire and fire management risks.

**Fire is a Worldwide Issue**—A Western Center scientist presented at the 5th International Conference on Forest Fire Research in Portugal to help European scientists and resource managers learn about the latest Forest Service research available to manage wildland fires and reduce the threat of forest fuels build-up.

**Chinese Partnership Studies Affect Land Management**—A U.S.-China consortium on carbon and water contributes global comparisons and understanding of climate change's interactive effects with land management and the consequent impacts on carbon sequestration and water resources. Eastern Center scientists are consortium members actively involved in designing research protocols, project updates, and graduate student workshops.



**Canada Hosts Climate Change Discussion**—An Eastern Center researcher presented at the 23rd session of the North American Forest Commission in Kamloops, British Columbia, Canada, to help North American forest management agencies better understand climate change and how to best allocate management resources to minimize negative climate change impacts.

**European Scientists Study Invasive Species**—The chief Western Center scientist was selected to be the U.S. representative among 22 European nations developing a strategy to address invasive species in European forests. This European Union funded project invited scientists from four other nations (U.S., China, South Africa, and Australia) to participate in strategy development.

**China and U.S. Collaborate on Biocontrol of Invasive Species**—The Western Center director presented current Forest Service research information at the international biological control of forest invasive species workshop in Beijing, China.

**What's Fueling the Fire?**—Science-based landscape fuel treatment strategies will greatly assist land management agencies in prioritizing fuel reduction projects. Western Center researchers developed an integrated framework that uses an actuarial-based risk approach coupled with recent advances in fire behavior modeling. This new approach to landscape design (Arc Fuels) can be accessed at <http://www.fs.fed.us/pnw/wwetac>.

## ONGOING RESEARCH IS A PRIORITY

*Several research efforts recently initiated will result in advanced knowledge and user-friendly tools available in the near future.*

**Forest Threats Get Complicated**—Complex interactions among forest threats, such as fire, invasive plants, and insects and disease, can impact forest health. Eastern and Western Center scientists are analyzing these interactions and developing methods to advance knowledge and understanding. Initial research focuses on wildfire risk assessments by using ARC GIS risk analysis systems that quantify potential wildfire impacts.



**Advanced Technology Supports Integrated Threat Assessment Tools**—The Eastern Center’s collaboration with the University of North Carolina Asheville’s National Environmental Modeling and Analysis Center supports development of advanced tools and technology that share knowledge and understanding of forest threats with a variety of audiences. Activities include improved data collection, management, and analysis that create user-friendly tools.

**Foresters Partner to Address Land Use Issues**—Urbanization will strongly influence forested landscapes in the future. Eastern Center researchers are collaborating with the Southern Group of State Foresters to evaluate consequences of urbanization, fragmentation, and parcellation of southern forests with case studies planned for the southern Appalachians and coastal South Carolina.

**Combined Maps Give Realistic View**—Environmental threats are often studied in isolation, making similar information challenging to view and interpret simultaneously. Western Center researchers are developing new approaches to delivering integrated models and maps so users can easily access and realistically understand overlapping information.

**Models Evaluate Climate Change Impacts**—Vegetation and insects are potentially impacted by climate change under a variety of scenarios. Western Center scientists are developing gypsy moth and climate models for vegetation in the Pacific Northwest, sensitizing these models to climate changes that predict locations of Asian gypsy moth. They are also evaluating climate change effects on forest trees and assessing genetic and silvicultural options to maintain adaptability, productivity, and value of forests.



**Synthesized Information Heightens Awareness**—Centralized environmental threats information will help land managers make informed decisions when addressing forest threats—particularly wildland fire and multiple threats interaction under changing climates. Western Center scientists are working to synthesize existing fuels planning, incident response, and climate change information, which will enhance existing information and aid in prioritizing future research.

**National-scale Risk Maps Target Invasive Pests**—Several non-native forests pests, including the sirex woodwasp and sudden oak death, are emerging in previously uninfested areas. Eastern Center researchers are working to increase knowledge concerning long-distance pest spread and pests’ access to host species in developed and non-developed landscapes.

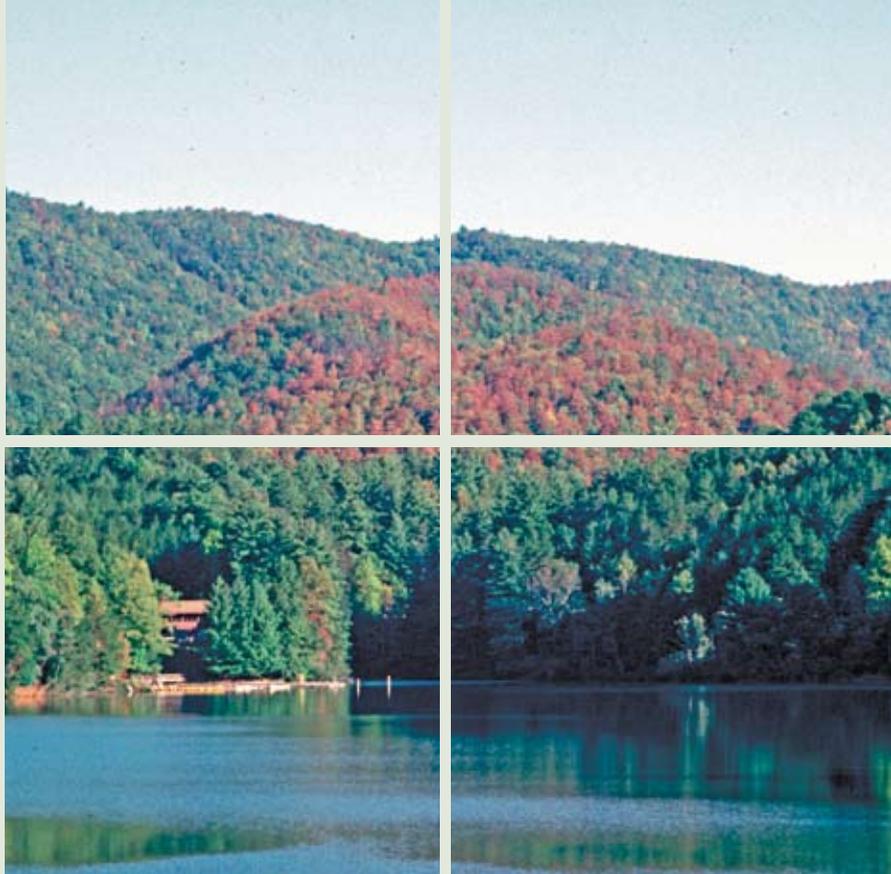


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