USDA United States Department of Agriculture

Forest Service

Northern Research Station

Highlights 2007

FROM THE STATION DIRECTOR

We are pleased to present the 2007 highlights from the Northern Research Station. Here you will find key accomplishments and activities from the past fiscal year (October 1, 2006 – September 30, 2007). These program highlights depict the array of technical and scientific findings, breakthroughs, and discoveries from invasive species research to climate change to urban forests, to name a few.

In our first year as the Northern Research Station (NRS), we sharpened our capability to deliver research that improves people's lives and helps sustain natural resources in Northeast and Midwest. We realigned our research work units from 37 to 14 and centered our science program on five themes that address the pressing forest science issues of this region. Those themes are:

- **Forest Disturbance Processes**
- **Urban Natural Resources Stewardship**
- **Sustaining Forests**
- **Providing Clear Water and Air**
- **Natural Resources Inventory, Monitoring and Assessment**

In the coming year, we will expand existing partnerships and build new ones to enhance science capacity and continue working to foster stewardship of natural resources through an informed citizenry. We are committed to communicating research results quickly, widely and in ways that are easily understood. Working with other natural resources agencies and research institutions, we will continue to promote discovery and transfer of relevant technology.

I hope you find this information useful in meeting your forestry needs. If you have questions or comments or want detailed publications about our work, please contact us. We are committed to creating "Science You Can Use."

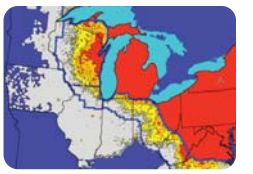
Michael T. Rains
Director

Cover photograph by USDA Forest Service, Keith Weller

Our work focuses on the pressing forest science issues relevant to this 20-state region. Science themes are integral to our effectiveness as an innovative and responsive research organization.

Forest Disturbance Processes

Understanding and managing disturbances to maintain healthy forests and protect people



USDA Forest Service: Patrick Tobin

Improving Gypsy Moth Containment Methods – NRS entomologists and colleagues generated a clearer understanding of why the gypsy moth expands its range in periodic pulses, due to an Allee effect, and demonstrated how the rate of spread was related to the strength of these Allee effects. This knowledge will help forest managers fine tune the Slow-the-Spread program, which seeks to identify and suppress population peaks along the gypsy moth expansion front to slow the rate of spread to uninfested forests.

▸ *Partners: Slow-the-Spread Foundation, U.S. Forest Service: State and Private Forestry – Forest Health Protection*

USDA Forest Service, Sara McCaffrey

Engaging the Public in Support of Fire Mitigation Efforts – The public plays an integral role in effective fire management by supporting efforts to reduce fire hazard on public lands (thinning and prescribed fire) and by decreasing fire risk on their property (defensible space) and within their community. Through studies in different areas of the nation, NRS researchers found that 60 to 80 percent of the population supports both thinning and prescribed burning as management tools to reduce fire risk and a majority engage in defensible-space activities. Researchers also confirmed that the most effective means of increasing public acceptance is an interactive one that allows managers to better understand key local concerns and establish trust, while allowing individuals and communities to clarify misconceptions.

▸ *Partners: Michigan State University, Oregon State University, Cornerstone Strategies, University of Massachusetts, University of Minnesota, University of Florida*

What is a Science Theme?

The Northern Research Station's (NRS) five Science Themes are the driving force of the NRS line of science with program direction achieved through the coordinated actions of 14 Research Work Units. Science Themes reflect our history, our science strengths, and the pressing natural resource issues relevant across the NRS region.

USDA Forest Service

USDA Forest Service, Paul Schaberg

Trees Need Calcium Supplements Too – NRS researchers demonstrated that restoring calcium levels in sites affected by acid rain-induced nutrient leaching has positive effects on the health of red spruce and sugar maple. Because calcium is essential to tree health, protracted loss of this nutrient from forests reduces tree health and productivity. These species are important in northern forest ecosystems and to rural economies. In red spruce, calcium restoration resulted in a dramatic reduction of foliar and bud freezing injury during the severe winter of 2003-04. For sugar maple, calcium restoration resulted in significant increases in growth and vast improvements in stem wound closure. This is particularly important to sugar maples, which are wounded annually to collect maple sap for maple syrup.

- *Partners: University of Vermont*

USDA Forest Service, Leah Bauer

Biological Control Offers Hope for Management of Emerald Ash Borer – NRS scientists implemented the first field releases of stingless wasps that may provide biological control of the emerald ash borer (EAB), an invasive pest that is killing the ash trees in North America. EAB was discovered in Michigan and Ontario in 2002 and has since spread to Ohio, Indiana, Illinois, Maryland, Virginia, Pennsylvania, and West Virginia. Genetic comparisons by NRS research entomologists revealed that China is likely the country of origin for this destructive beetle. In northeast China, they discovered two new natural enemies specific to EAB – tiny wasps that parasitize and kill EAB eggs and larvae. After permits were issued in July 2007, NRS scientists released these parasitic wasps in four EAB-infested field sites as part of their ongoing search for tools to manage EAB populations.

- *Partners: Michigan State University*

USDA Forest Service, Jennifer Juzwik

Oak Wilt Risk Analysis Helps Keep Wisconsin Forests Healthy – NRS scientists developed a simple risk analysis methodology that helps prevent introduction and subsequent spread of an established invasive pathogen, the oak wilt fungus, in forest stands. This method is the basis of statewide guidelines for timber harvesting activities in Wisconsin oak timberlands and should reduce the risk of oak wilt introduction and spread.

- *Partners: Wisconsin Department of Natural Resources*

Urban Natural Resources Stewardship

Improving the quality of life in urban and urbanizing areas through better natural resources stewardship

Tree Software Benefits Cities and Their Trees – NRS staff completed analyses of urban forest structure and ecosystem services and their values for seven U.S. cities and four cities in Italy. Using the Urban Forest Effects (UFORE) model, these cities were able to quantify the value of their existing forest cover and identify the potential for increasing canopy cover and value to the city. UFORE is part of the i-Tree suite of urban and community forestry software tools that allow communities to collect, analyze, and display information on the structure, functions, condition, and costs and benefits of their urban forest (www.itreetools.org). This software is free, and since its release in autumn 2006, almost 2,300 copies have been distributed worldwide.

USDA Forest Service, Dave Nowak

▸ *Partners: Davey Tree Expert Company, National Arbor Day Foundation, Society of Municipal Arborists, International Society of Arboriculture*

Living Memorials Project Honored – The NRS's Living Memorials Project received top honors from the Environmental Design Research Foundation and Places Journal and from the Voices of September 11th organization this year for its documentation of the spaces people create or use as they shape the landscape to memorialize individuals, places, and events. The multimedia installation "Land-markings: 12 Journeys through 9/11 Living Memorials" was presented in New York City and Washington, D.C. and is being added to the Library of Congress archives. It brings together documentary photo, video, and archival information on more than 600 9/11 Living Memorial sites for the first time in one comprehensive exhibit. This exhibition presents the memorials as expressive markings on the land and interprets these remembrances through a collage of images overlaid with researchers' narratives.


USDA Forest Service, Erika Svendsen

▸ *Partners: Parsons The New School for Design and Tishman Environment and Design Center, Urban-Interface, National Park Service, Federal Hall National Memorial*

Wildland-Urban Interface Maps Aid Fire Planning – The 2007 southern California wildfires generated demand for the detailed maps of the wildland-urban interface (WUI) generated by NRS scientists and collaborators. California land managers and policymakers used the spatial detail of the maps in their efforts to protect 5.1 million WUI housing units (the nation's highest number). The WUI is an area where houses meet or intermingle with undeveloped wildland vegetation and is a focal area for human-environment conflicts, such as the destruction of homes by wildfires, habitat fragmentation, introduction of exotic species, and biodiversity decline. The NRS-created maps were also incorporated in the University of California-Berkeley's online fire information toolkit, allowing homeowners to search for their addresses and receive custom assessments and maps of local fire hazard and risk.


USDA Forest Service, Sue Stewart and University of WI, Volker Radloff

▸ *Partners: Oregon State University, University of Wisconsin-Madison*

Sustaining Forests

Developing knowledge and management tools to maintain and enhance forest productivity and benefits


USDA Forest Service, Mary Beth Adams

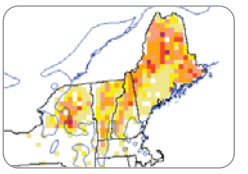
Forests and Floods: What We Know – Lingering questions about the relationship between forest management and flood severity were answered with the release of three NRS publications in fall 2007. NRS scientists and collaborators concluded that 1) Most hydrologic models are not designed to handle extreme events, such as flooding; therefore such models must be used as predictive tools with caution; and 2) The amount and intensity of rainfall are the main determinants of the level of peak flows and during very large storms, harvesting activities did not significantly affect peak flows. This trio of publications provides a technical review of hydrological models and their utility for predicting flooding; a bibliography of literature related to forestry and flooding; and an analysis of the 50 largest storms recorded on the Fernow Experimental Forest.

- *Partners: Virginia Tech, West Virginia Division of Forestry*


USDA Forest Service, Frank Thompson

Winter Ranges of North American Birds are Shifting Northward – NRS scientists and cooperators determined that the northern boundaries of bird species' winter ranges shifted northward, on average 26.7 miles, from 1975 to 2004. While some regional or human-related activities could affect these range shifts, the pervasiveness of this pattern suggests global scale factors, such as climate change, are primarily responsible. These results are consistent with observations from Europe, but this study was conducted on a larger geographic scope and number of species examined. This provides strong evidence that animal distributions are responding to global change in ways consistent with a global warming and that wildlife communities are affected through range shifts.

- *Partners: University of Missouri*


USDA Forest Service, Louis Iverson

Projecting Potential Impact of Global Change on Eastern Forests – NRS researchers expanded their online Climate Change Atlas to encompass 134 tree species and 147 bird species, more accurate modeling tools, and newer climate models. The Website (www.nrs.fs.fed.us/atlas) illustrates potential species distribution in response to various climate change scenarios and is a resource for researchers, foresters, and other partners studying global climate change. The atlas also helps the public and policymakers anticipate possible localized effects of global climate change.

- *Partners: University of California, Davis*

Providing Clean Air and Water

Developing information and tools to sustain or increase production of clean air and water for a growing population


Tim Pearson, Winrock International

Fostering Broader Participation in Greenhouse Gas Registries and Carbon Markets – In 2007, NRS scientists developed advanced decision-support tools that enable organizations to participate in the U.S. Department of Energy's national greenhouse gas registry. The tools permit public and private entities to inexpensively report activities that increase carbon storage in forests or reduce greenhouse gas emissions. Such activities can help reduce the demand for energy or substitute biomass for fossil fuel, provide cleaner air, and reduce the threat of adverse climate change impacts. In addition, the Chicago Climate Exchange began using Forest Service-developed methods to estimate and report accomplishments and begin payments to landowners for registering their forests.

▸ *Partners: National Council for Air and Stream Improvement, Winrock International, U.S. Forest Service—National Forest System and State and Private Forestry*


USDA Forest Service

Predicting Prescribed Fire Effects on Watershed Cycling of Mercury – With funding through the Joint Fire Sciences program, NRS scientists are studying possible effects of prescribed fire on mercury cycling in the forest system. Prescribed fires set in the Boundary Waters Canoe Area Wilderness to reduce wildfire threats are the primary study focus. Early findings indicate that both wild and prescribed fires are significant sources of mercury to the atmosphere. A fraction of that mercury is redeposited directly into lakes or wetlands potentially affecting fish and posing a health risk to those who consume it. This project was awarded a Chief's Rise to the Future Award in 2006.

▸ *Partners: University of Minnesota, Superior National Forest, U.S. Geological Survey, Minnesota Pollution Control Agency*

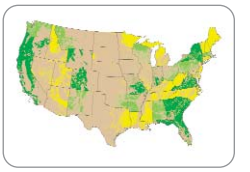

USDA Forest Service, Ron Zalesny

Woody Crops Produce Energy and Reduce Pollution – NRS scientists are combining intensive forestry and waste management methods to increase the uses of wood for fiber and energy, while decreasing the environmental degradation associated with waste disposal and wastewater production. Trees take up some of the contaminants reducing the potential for leaching into the soil and nearby waterways. Scientists and resource managers are studying the response of specific tree species to wide-ranging contamination sources. Application of this research provides the opportunity for ecologically sustainable production of alternative biomass feedstock for bioenergy using irrigation and fertilization from waste waters including landfill leachate. The resulting energy system helps maintain environmental quality and the natural resource base on which agriculture, forestry, and recreation depend.

▸ *Partners: Oneida County Wisconsin Solid Waste Department, Wisconsin Department of Natural Resources, Iowa State University, University of Wisconsin-Madison*

Natural Resources Inventory, Monitoring, and Assessment

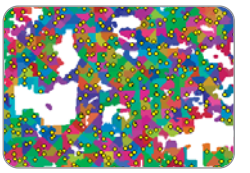
Taking the pulse and census of our Nation's forests to ensure forest health and community well being



USDA Forest Service: Jim Smith

State and Regional Carbon Estimates Now Available for U.S. Forests – NRS researchers produced a tool that uses data from the Forest Service's Forest Inventory and Analysis Program to produce state-level estimates of forest carbon stocks and net changes, beginning in the base year 1990. Summing the state estimates, which are consistent with standard international carbon estimation methodologies, results in the national-level forest estimates reported in the official greenhouse gas statistics of the United States. The software, user's guide, and example data sets are available online at http://nrs.fs.fed.us/carbon/tools/.

- *Partners: U.S. Environmental Protection Agency*



USDA Forest Service, Andy Lister

Monitoring Network Helps Wisconsin Maintain its Sustainable Forest Certification – To establish a monitoring network on Wisconsin's state-owned forest lands, NRS Forest Inventory and Analysis scientists developed a fractal-based technique to create spatially balanced networks of sample plots. The technique assures an even distribution of plots across the forest and over time. The scientists worked with state employees to develop a field manual and software that allow analysis of the monitoring data collected. This monitoring network will help Wisconsin maintain forest certification on more than 500,000 acres and detect invasive plant species. Other states, including Indiana, are adopting the methods and tools developed in Wisconsin.

- *Partners: Wisconsin Department of Natural Resources*

USDA Forest Service, Matt Riederer

Better Monitoring for Less Cost on the Mark Twain National Forest – NRS scientists worked collaboratively with the Mark Twain National Forest to investigate ways to provide inventory and monitoring information. Each National Forest must develop a monitoring plan to track the implementation and effectiveness of its forest plan. The Forest used a Forest Inventory and Analysis inventory and monitoring tool to link the plan's desired conditions, objectives, and monitoring questions to metrics that answer vegetation-related questions. Of particular interest were movement toward desired forest condition, oak decline, restoration of natural forest types, forest fuels, effects of prescribed burning, non-native species, species richness, wildlife habitat, tree regeneration, growth, removals, mortality, biomass, and carbon. This new monitoring plan improved the Mark Twain National Forest staff's knowledge base for making land management decisions and reduced projected monitoring costs.

- *Partners: Mark Twain National Forest*

Environmental Literacy

The goal of the NRS Environmental Literacy Program (ELP) is to integrate NRS research into regional efforts to improve environmental literacy. Environmental literacy encompasses sustained, lifelong, place-based, inquiry-based learning that develops the knowledge, skills, and motivation for people to make responsible choices about the environment.

Environmental Literacy Efforts in Urban Areas – In 2007, NRS staff reached out to students, teachers, and partners in cities such as New York, Baltimore, Philadelphia, Chicago, and Detroit to connect people and their environment. For example, scientists at the New York City Field Station supplemented one school's curriculum with hands-on experience in forests, wetlands, and restoration sites throughout the city and helped to provide more than 5,500 copies of the Natural Inquirer, a science-based middle school education journal to the NYC Housing Authority's after-school and summer day camp programs. In Baltimore, NRS staff partnered on the Schoolyard Habitat and Education project to provide field trips; hands-on, inquiry-based activities; student-directed long term schoolyard restoration projects; and teacher workshops. In Detroit, NRS scientists provided research results and met with students at the Henry Ford Academy to help integrate science and outdoor inquiry. All of these projects were funded in part by Forest Service's *More Kids in the Woods* grants.

▸ *Partners: In New York: Harlem Link Charter School, NYC Housing Authority, U.S. Forest Service* Natural Inquirer*. In Baltimore: U.S. Forest Service State and Private Forestry, Parks and People Foundation, U.S. Fish and Wildlife Service, Hooked on Nature, URBANtells. In Detroit: Henry Ford Academy, Greenfield Village, U.S. Fish and Wildlife Service, Michigan Department of Natural Resources, U.S. Forest Service Urban Connections and* Natural Inquirer*, University of Michigan—Dearborn Interpretive Center*

Helping Students Understand Invasive Species – Dempsey Middle School students are monitoring their own school grounds for signs of emerald ash borer with inventory and monitoring protocols developed by NRS scientists in Delaware, Ohio. Students will estimate the severity and distribution of the EAB infestation using GPS units to mark and locate plots and map the spread of the infestation within their woodlots over time. These methods have been shared with other schools across the Station and were provided as part of the Station's support for the Great Plains Tree and Forest Invasive Initiative's education and outreach project.

▸ *Partners: Delaware City Schools, Ohio Department of Agriculture*

USDA Forest Service, Joanne Rebbeck

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Northern
RESEARCH STATION
USDA Forest Service

"Capitalizing on the strengths of existing science capacity in the Northeast and Midwest to attain a more integrated, cohesive, landscape-scale research program"