North Central Research Station
NEWS

SPRING 2003

Fire Preparedness: It Takes A Village

SPECIAL EDITION:
Latest Findings from NC's National Fire Plan Research

Picture it: 84 fires burning; nearly 2 million acres of land in flames; 28,000 people on the firelines fighting the flames. This is a snapshot of our Nation during the summer of 2000—one of the most devastating fire seasons of the decade.

As the ashes cooled, the Forest Service drew up a National Fire Plan (NFP) to step up, coordinate, and concentrate activity on reducing fire risks. NC has been conducting several research projects as part of the plan. In this newsletter, you'll read about the latest progress, and meet the people who are helping land managers and community officials prepare for, cope with, and even prevent wildfire.

For city dwellers, fire preparedness can be as simple as a smoke detector and a call to 911. But as more people move to areas where wildfire is a regular occurrence, fire preparedness is a different kind of challenge.

Individuals can do much to reduce risk to their own properties, but communities are the real key to wildfire preparedness, says Pam Jakes, leader of NC's social sciences unit. As part of the National Fire Plan research, she and a team of social scientists set out to talk to community residents and decisionmakers in 15 communities. "Our goal," says Jakes, "was to increase wildfire preparedness by suggesting actions a community can take given its social and landscape characteristics."

Three communities were selected for initial study: Gunflint Trail in northern Minnesota; Bend, Oregon; and Waldo, Florida. In towns that had effective fire preparedness programs, the team identified critical success factors. With this, they built a model that could be tested in other communities that had

Building a foundation for community preparedness for wildfire.

experienced catastophic fire, but that were perhaps not as well prepared.

The initial interviews turned up five factors critical to wildfire preparedness:

Social capital: community characteristics that contribute to collective social action, such as strong leadership, networks to encourage coordination and cooperation, and the ability to mobilize resources.

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In The News

FOREST SERVICE
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The fire preparedness project is being funded by the National Fire Plan. Other members of the research team include Rachel Hudson, USDA Forest Service, NCRS; Linda Kruger, USDA Forest Service, Pacific Northwest Research Station; Martha Monroe and Shruti Agrawal, University of Florida; Kristen Nelson and Erika Lang, University of Minnesota; and Victoria Sturtevant, Southern Oregon University.

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Human capital: the knowledge and skills an individual obtains through education and training.

Cultural capital: The knowledge and skills people possess because of their heritage, experience, and attachment to place.

Agency involvement: one agency working alone, a couple of agencies working separately but towards a common goal, or multiple agencies truly integrating their activities.

Landscape: vegetation and topography as well as social aspects, such as land ownership.

With these in mind, the team interviewed three groups of people:

1. professionals responsible for wildfire preparedness, such as the federal lands fire management office, county emergency preparedness official, local fire chief, and sheriff
2. real estate agents, bankers, developers, contractors, and others whose jobs are tied to wildfire preparedness in the community
3. volunteers in wildfire preparedness.

From their initial work, Jakes cites three conditions found to be critical to successful preparedness programs:

- neighborhood mobilization, even in more dispersed areas
- an agency link and someone to lead community members through the morass of government programs and grants
- an understanding that wildfire preparedness is an ongoing process—a job that's never going to be 'done.'

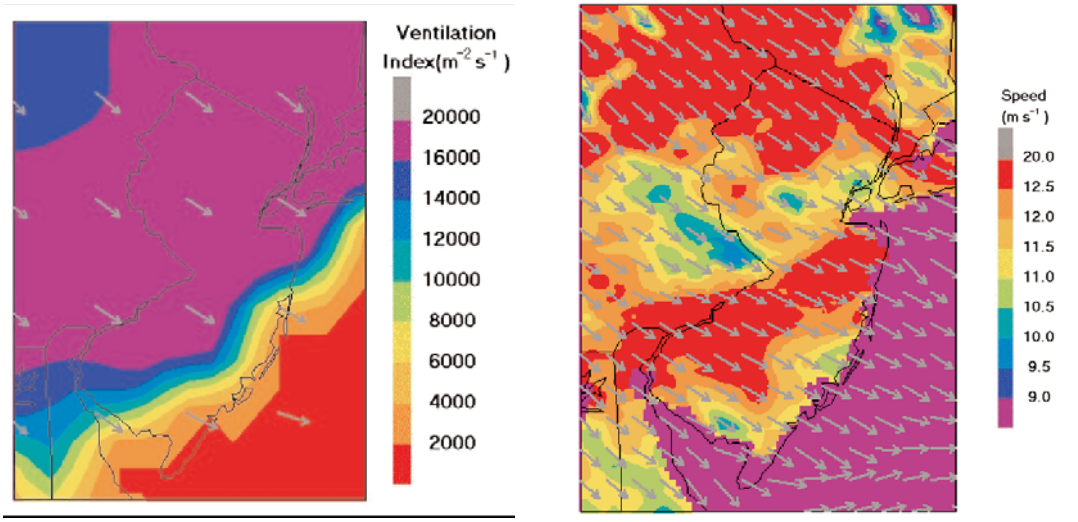
The report, due by the end of 2003, will recommend actions that communities, the government, and nongovernment agencies can take to increase wildfire preparedness based on the community's ecological and social characteristics. Jakes and her team hope these actions will help communities minimize losses from wildfire; more quickly and effectively recover and restore ecosystems after fire; and, perhaps, experience fewer fires.

By sponsoring activities such as clean-up days, communities can encourage landowners to take steps to increase wildfire preparedness.

New Tools for Fire Weather Forecasters

The Eastern Area Modeling Consortium, organized in 2001 by NC researchers under the interagency National Fire Plan, consists of researchers, fire managers, air-quality managers, and natural resource managers from:

- *North Central Research Station*
- *Northeastern Research Station*
- *Region 9 Aviation and Fire Management Program*
- *Region 9 Air Resources Program*
- *Northeastern Area State and Private Forestry - Fire Management*
- *Interagency Eastern Area Coordination Center*



EAMC Weather Model Output for 2:00 pm, June 2, 2002 Double Troule Fire: Left is measure of smoke dispersion. Right is mixed-lyeer wind speed.

Firefighters depend on accurate fire weather forecasts—both on the fireline and when planning for prescribed burns. Imagine if they could head to the Web before they head to the field, and access local fire weather projections for the next 48 hours, plotted on a 1-square-mile grid that covers the entire country. This "heads up" could lend an extra margin of safety, spelling the difference between success and dangerous failure.

The dream of a Web-based fire-weather prediction tool for our region is becoming a reality, thanks to efforts of NC researchers and colleagues in a new network called the Eastern Area Modeling Consortium (EAMC).

The EAMC is one of five regional Fire Consortia for Advanced Modeling of Meteorology and Smoke in the U.S. Their charge is "to provide research products and associated technology to serve the needs of the fire management community, air resource managers, scientists, and policymakers."

Physics Fundamentals

"Some of the first research products will be fire-weather modeling tools that can alert firefighters when weather conditions are ripe for dangerous fire behavior," says Brian Potter, NC research meteorologist. Effective predictions could also help forest managers place fire equipment and crews where they are most needed. To create these tools, scientists must first understand how the atmosphere produces conditions conducive to extreme fire behavior, and how the atmosphere interacts with ongoing fires.

This physics-based knowledge will help team members develop new tools for fire-weather and fire behavior prediction that can be passed along to National Weather Service forecasters and fire managers. To find meaningful indicators, Potter seeks input from local forest managers and fire observers. "We really encourage the people in the field to get in touch with us with ideas. If someone thinks that humidity at sunset is the best measurement of the fire risk the next day, we can look at it and start calculating."

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Gaining Community Trust: Public Perceptions of Fire Management Treatment

McCaffrey shares early findings of the research that suggest:

- *Local agency sources of information are the most trusted.*
- *The Forest Service enjoys a relatively high level of credibility and respect.*
- *Government agencies working with the local public can be a potent tool in reducing wildfire hazard.*
- *Fire hazard treatment and defensible space messages will need to be tailored to the concerns of the audience based on the values of individual residents and the community.*

When land managers plan a fuel reduction treatment or a burned-area restoration, they pay great attention to ''fire" response. But there is an equally important "people" response. Citizens respond to fire management treatments in various ways, depending on where they live, how much they know about wildland fires, and how they perceive the risks imposed by the threat of fire and fire treatments.

That's why Sarah McCaffrey, a social scientist with NC's urban forestry unit, is coordinating research that will evaluate people's response to fire management treatments across a broad range of social and biophysical settings. She and her colleagues hope to give land managers insights into how local citizens will react to what is presented in the field, and to provide some tools of communication for land managers.

A Coordinated Effort

McCaffrey's research is being carried out in partnership with an extensive network of research partners in the U.S. and around the world who have worked with North Central on stand and landscape projects. This network includes researchers from the University of Arizona, State University of New York-Syracuse, University of Oregon, Virginia Tech, Penn State University, University of Michigan, University of British Columbia, Swiss Federal Institute of Technology, and University of Melbourne.

There are 11 coopertive research projects in all, including communities in the North Central region, Florida, Massachusetts, and the Western U.S. Their aim is to answer the following questions:

- ❒ Why do people choose to live in the wildland-urban interface?
- ❒ What fuel hazard treatments will residents accept?
- ❒ What characteristics of residents and communities are associated with proactive public views about fuels management?
- ❒ What do fire agencies need to show and prove to gain community trust?

Low Down in the Blowdown

Several projects are examining the "blowdown" area in and around northern Minnesota's Boundary Waters Canoe Area, where a single tremendous storm leveled hundreds of acres of trees, creating high fuel loads and fire danger. One of these projects explores

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The owner of this deeply embedded house might welcome treatments to reduce fuel loads. But how would people living in other settings respond?

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homeowner reactions to both the fire hazard and efforts to reduce the fuel load. Another is using biophysical data linked with photographs to develop computer simulations that are tied to attributes of a respective site. Individuals will be asked to evaluate treatments as they view simulated fire treatment scenarios. Ultimately, researchers will be able to create stand-level predictive models to assess public perceptions of aesthetic impacts and the social acceptability of fire treatments.

Models will also be developed to assess how various stakeholders—such as wildland-urban interface residents, visitors, and private timber producers—perceive treated sites. The aim is to better understand not only public perceptions of fuels management methods, but also the values underlying those views.

John Dwyer, project leader of the Chicago unit, comments that the research will help land managers avoid a "trial and error management approach" to what works or what doesn't work with the public, and help them spot where the problems may be in applying fire management treatments.

What's the secret of successful wildfire preparedness? NC researchers are studying community patterns that work.

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Where There's Smoke, There's Concern

NC researchers are also interested in how smoke behaves in the atmosphere. Ideally, researchers would like to better predict whether smoke will waft harmlessly skyward or roll ominously towards the nearest population center.

On a calm day, an intensely burning fire lofts its smoke and ash high enough into the air that it is highly diffused by the time it settles earthward. But on windy days or "inversion" days, the smoke stays close to the ground, potentially causing respiratory problems and limiting visibility.

The physics behind those processes is well understood, and National Weather Service models do a good job predicting inversions. "But getting down to an accurate estimate of how strong it will be and how long it will last is much more difficult," says Potter.

"Prescribed burn managers are under intense pressure to make sure they know where the smoke is going to go," says Potter.

That's why NC researchers are customizing BlueSky—the modeling program used in the Pacific Northwest to predict smoke patterns resulting from prescribed burns—for the North Central and Northeastern regions. "We'll be one of the first to test it outside the Pacific Northwest and see if it works as well here," says Potter.

BlueSky is just one of several models in the works—a tool set that eventually will give fire managers and fire fighters an extra measure of safety in a very dangerous profession.

National Fire Plan
Managing the Impact of Wildfires on Communities and the Environment

Eric Gustafson and his team are refining the LANDIS model to predict how ecosystem disturbances interact to influence ignition and spread of wildfires.

A Window Into Succession: Adding Fire Risk to LANDIS

It's time to once again revise land management plans on most of the region's national forests. This time, planners will be able to do something they've never done before: burn forest acres on their computer screen to avoid catastrophic fires on the ground.

The computer model is called LANDIS, and the new fire risk revisions—which show how ecosystem conditions impact ignition and spread of wildfire—are the work of team members Eric Gustafson, project leader of NC's landscape ecology research unit, Brian Sturtevant, NC research ecologist , David Mladenoff of the University of Wisconsin-Madison, and Hong He of the University of Missouri-Columbia. LANDIS (LANdscape DIsturbance and Succession) divides landscapes of 10,000 to 1 million acres into a grid of cells, modeling how disturbances—including fires, insect outbreaks, and human impacts such as timber cutting—change the direction and spatial patterns of succession. The fire module is being refined and several new LANDIS modules are in development to show how conditions within ecosystems impact the ignition and spread of wildfire.

Each acre that burns in the LANDIS computer simulation is one that may not have to actually burn on the ground

The new LANDIS will simulate:

- changes in live and dead biomass, and quality and quantity of fuel, leading to a more accurate prediction of fuel buildup and fire's response to fuels
- the effects of fuel reduction treatments on wildfire spread
- outbreaks of insects or disease that could lead to fuel buildup
- the influence of roads on the incidence and spread of fires.

A Trial Run in the Chequamegon

While new modules are in development, the team was able to trial run the improved fire module to help the Chequamegon National Forest in Wisconsin evaluate the management alternatives proposed for its Forest Plan revision. The modelers simulated each alternative for 25 decades and repeated the exercise 50 times. They noted the number of times each cell in the grid burned and used that to produce a fire risk map, identifying where the management method led to higher fire risk.

Once the new modules are in place, LANDIS will predict how a complete suite of disturbances interact to influence fire risk (in absolute rather than relative percentage risk). Planners can use these predictions to reduce the risk of catastrophic fire while improving the health of the land.

Published by
North Central Research Station
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