



This project produced a straightforward tool that helps homeowners choose fire hazard reduction actions that will best protect their individual properties.

## Your House in Your Hands: Customized Wildfire Risk Assessment for Southern Homeowners

### *Summary*

Northeast Decision Model (NED) is a computer-based program originally developed to help land managers and property owners protect resources like timber, wildlife, watersheds and aesthetics. This project enhanced NED by integrating a do-it-yourself fire risk assessment and mitigation tool specifically for private property owners dwelling in the wildland-urban interface entitled—*Wildfire Risk Assessment Guide for Southern Homeowners*. The upgrade provides an easy way for homeowners in the Southeastern U.S. to evaluate wildfire risk for their own unique structures and property, and rank the effectiveness of different protective actions in reducing that risk.

## Southern discomfort

In late May 2009, noses in Horry County, South Carolina, were still filled with the aroma of charred pine, palmetto, wax myrtles and dreams. The Highway 31 Fire was ignited by rogue embers from a private debris burn on Friday, April 22. Fire behavior was extreme with rapid rates of spread. It made a 6-mile run that afternoon to Highway 31 and another run early Thursday morning across Highway 22 towards the Barefoot Resort area, where it caused the most damage. By the time it was over it had earned the title of the most destructive fire in state recorded history in terms of economic loss. 19,200 acres were consumed. Seventy-five homes were destroyed and over one hundred were damaged—carrying an estimated price tag of over twenty-five million dollars.

In many natural areas of the southern United States, wildfire is a natural process of renewal as old as the land itself. But as human settlement and infrastructure continue to expand across the south, more and more homes are built within, or adjacent to rural natural areas where they're at risk of being in a wildfire's path. It's becoming increasingly vital for people living in the wildland-urban interface (WUI) to understand that there may not be enough firefighting resources to protect every home during critical wildfire situations like the Highway 31 incident. Owners are vigorously encouraged to take personal responsibility for reducing fire hazard around all structures—*before a fire threatens*.

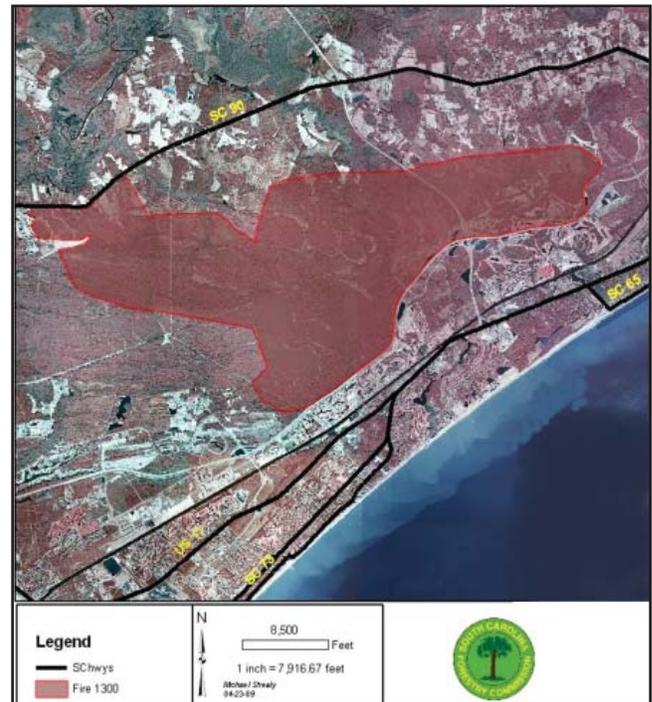
*During a wildfire, the structural components of a home and the surrounding fuel work together to affect survivability.*

During a wildfire, the structural components of a home and the surrounding fuel work together to affect survivability. Just a few changes in these areas can substantially increase the likelihood that a house, barn,

garage or other building will survive a wildfire. But proper prioritization of mitigation efforts is not always obvious, and not every homeowner has the time or resources to do it all. Residents needed more specific information about the changes that would be most effective for their individual situation, and which will bring the most bang for their fire prevention buck.



A home smolders after the April 2009 Highway 31 Fire in South Carolina.



Highway 31 fire map. Dated April 23, 2009 at 1 p.m. Approximately 14,500 acres affected.

Wildfire risk assessment and prevention planning are most often conducted at state, regional, community and municipal levels, and most include some evaluation of vegetation around homes or other structures. These assessments generally classify vegetation according to one of the 21 National Fire Danger Rating System (NFDRS) fuel models or one of the over a dozen fire behavior fuel models. Most are modeled after the hazard rating systems outlined in *Standards for the Protection of Life and Property*, or described in the booklet, *Wildland/Urban Interface Fire Hazard Assessment Methodology* (National Wildland/Urban Interface Fire Protection Program). They usually generate a mathematical summary of rating scores for each factor included in the evaluation and a qualitative description of hazard and risk (low, medium, high) depending on the total rating score. The rating is significant only for the system from which it was derived. These guidelines suggest general protection measures that can be useful for determining if a home is in a high hazard zone, but they don't provide custom assessments or recommendations based on the specific design, building materials, vegetation composition and structure of individual properties. They often contain a number of factors for risk assessment that are out of the control of individual homeowners, like topography, road access and characteristics, signage, utility placement, water sources, and fire history.

### Risk assessment for the home front

For this project, two existing hazard assessment tools were modified and integrated to give homeowners the specific information they need to take on the responsibility of making their property less vulnerable to damage or

destruction by wildfire. The Northeast Decision Model (NED) was developed by the U.S. Forest Service Northern and Southern Research Stations, to guide public and private forest management decisions. NED recommended actions that supported user defined outcomes for resources like timber, wildlife, watershed health and visual aesthetics. In 2004, Dr. Alan Long of the University of Florida published a do-it-yourself, fire risk mitigation guide specifically for WUI homeowners titled, *Wildfire Risk Assessment for Southern Homeowners*. Both tools contributed support to southern WUI communities, but individual homeowners needed the best of both in order to better protect themselves. With the support of the Joint Fire Science Program, the fusion of NED and Dr. Long's risk assessment was born. The result is known as NED2, and is easily accessible via the Interface South website ([www.interfacesouth.org](http://www.interfacesouth.org)).

### How NED2 works

If a home is in a subdivision surrounded by other homes or development with lots of green lawns and open space, or in the middle of an urban area, then wildfire risk is very low. But locations within, near or next to undeveloped, shrubby or wooded land, are at higher risk if a wildfire occurs. NED2 measures risk by evaluating building materials and design, the type, amount and location of nearby vegetation, and surrounding land use.

### Vegetation Hazard

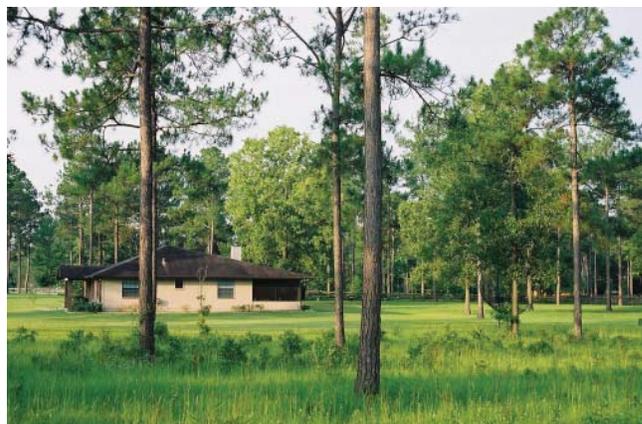
Vegetation hazard is evaluated by looking at defensible space and defining ecosystem type based on the major forested and grassland ecosystems of the Southeast. Five qualitative fire hazard ratings from very low to very high are assigned to each ecosystem based primarily on understory vegetation characteristics and fire behavior descriptions for fuel models. Quantitative rating scores from 0 to 5 are intended to reflect the proportionally greater fireline intensity and/or rate of spread in the different ecosystems and under dry, windy conditions.

Ecosystem	Hazard Rating
Agricultural fields	0 (very low)
Hardwood forest	1 (low)
Mature pine plantations	
Seasonally flooded swamps	
Pine savannas (with grass)	3 (moderate)
Grasslands	
Seasonal marshes	
Pine forests with shrubs less than 6 feet tall	4 (high)
Young hardwoods/dense shrubs	
Recently logged forests	
Dense shrubs greater than 6 feet tall	5 (very high)

*Defensible space is defined as the area of modified vegetation around a structure that improves the likelihood that a home will survive a wildfire on its own even if fire crews can't reach it or maneuver their equipment on the property.*

Defensible space is defined as the area of modified vegetation around a structure that improves the likelihood that a home will survive a wildfire on its own even if fire crews can't reach it or maneuver their equipment on the property. Attaining defensible space does not necessarily require

clearing of all vegetation, but enough flammable shrubs, vines and dead fuels must be removed to reduce fire intensity and rate of spread. Four categories of defensible space are defined in NED2, and it assumes that fuel loads would be cut in half with each increase in defensible space width. The intent is to provide a reasonable representation of the diverse vegetation patterns that actually exist in WUI residential areas across the South. Overall hazard ratings for individual lots range from scores of zero to 20, with the highest score representing homes surrounded by dense high shrubs with little or no defensible space clearing.



Two properties at either end of the defensible space spectrum. Which position would you rather be in if a wildfire was threatening? Credit: Larry Korhnaak.

### Structural Hazards

The time it takes for wood surfaces to ignite increases rapidly at distances greater than 100 feet from a crown fire, although the extra wide space does not preclude risk related to wind-blown embers or other firebrands. If defensible

space is maintained for more than 100 feet, it's assumed there will be very little fire related heat load on structures. The structural risk component of NED2 is subdivided into three categories to account for the three potential ignition sources:

**Direct**—by which embers or other firebrands land on combustible surfaces that are part of the structure.

**Indirect**—by which adjacent combustibles such as wood piles, propane tanks, or fences can provide direct flame contact or heat load on the structure.

**Heat related**—where windows, siding, soffits, or other structural features are compromised by heat load from a nearby flame, creating an opening in the structure for firebrand entry.

Rating scores for several factors under each ignition source reflect the likelihood that the factor may be problematic for ignitions, and provide a means by which landowners can prioritize mitigation measures. Scores in the various categories range from zero to five, and were determined by comparing other risk evaluation systems for the same factors. However, unlike most other systems, Long's guidelines specify that although landowners should score all factors characteristic of their homes, they should only include the highest point factor in each of the three categories for the final risk score. Additionally, if defensible space is greater than 100 feet, the heat-related factors are not scored or included in the final score.

In all risk rating systems that address home construction, wood is scored substantially higher than non-flammable exteriors. The structural risk component focuses on exterior home construction materials as shown in the following list:

Firebrand Ignition Factors	Hazard Rating
Wood roof	5
Wood deck	3
Open/combustible soffits	3
Open space under house	3
<b>Indirect Ignition Factors</b>	
Slope greater than 30 percent	2
Wood fence attached to house	2
Adjacent structure within 50 feet	1
Stacked firewood or propane tanks within 30 feet	1
<b>Heat Related Factors</b>	
Wood siding	3
Vinyl siding or soffits	2
Single pane, non-tempered glass	2

### Customized recommendations

The highest point items in each category are added together, for a maximum of 10 points and added to the vegetation hazard rating for an overall home risk score with a maximum of 30 points. Four risk assessment categories (low to very high) are assigned final hazard rating scores

that assure that the most hazardous vegetation and home construction conditions would be rated as high or very high for use in NED2. Final risk assessment scores are as follows:

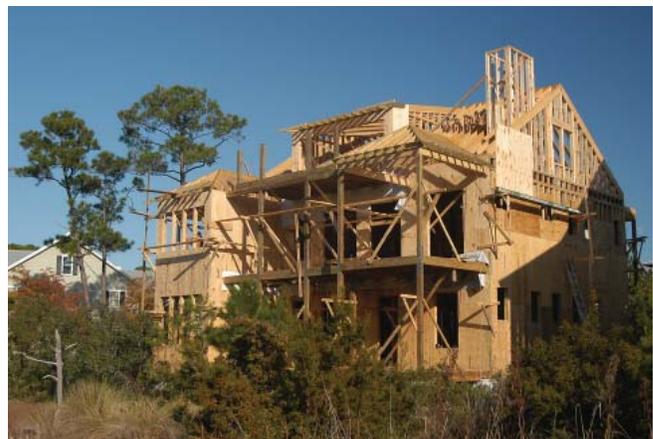
Final Risk Rating	Total Hazard Score
Low	Less than 5
Moderate	5–8
High	9–13
Very high	Greater than 13

For each of the high risk factors, a set of recommendations is provided to encourage landowners to correct the particular factors that were most important in their risk assessment. For example, if a house has wood shingles or a wood deck, recommendations include:

1. Replace wood shingles with Class A shingles.
2. Install nonflammable skirting around a wood deck.
3. Install a sprinkler system to cover the roof and/or deck.
4. Convert deck to a screened porch with metal screen.



This property has excellent defensible space and would likely be ranked at low risk for wildfire damage by NED2. Credit: Larry Korhnak.



This property, with the home still under construction, would likely be ranked at very high risk by NED2. Credit: Larry Korhnak.

## Goal: No homes at high risk

NED2 does not recommend particular treatment procedures to meet the goals of the user. Instead, it simulates a user-entered treatment plan and projects the effect of different treatments on the goal of managing, or reducing, fire risk. There are no guarantees that following all the assessment procedures and recommendations in the guidelines will eliminate all risk in extreme fire conditions, but doing so will greatly increase the likelihood that a home will be protected. It is important of course for changes to be sooner rather than later, and that changes are maintained. The ultimate goal is for NED2 to be used successfully by all

*If homeowners take advantage of this tool now, property losses like those of the Highway 31 Fire will hopefully be a thing of past.*

homeowners in the southern WUI, and that eventually there won't be any buildings in the 'high' or 'very high' risk categories. If homeowners take advantage of this tool now, property losses like those of the Highway 31 Fire will hopefully be a thing of past.

## Management Implications

- NED2 is now a keystone component of a WUI professional development program providing state and federal natural resource agencies with a set of flexible training resources that build skills and provide tools to successfully tackle WUI issues—right down to the level of individual properties.

## Further Information: Publications and Web Resources

Southern Center for Wildland-Urban Interface Research and Information: <http://www.interfacesouth.org/>, [http://www.interfacesouth.org/products/wildfire\\_ra.html](http://www.interfacesouth.org/products/wildfire_ra.html)

## Contact Information

For more information on this subject, contact:

*Pete Knopp* can be reached at:  
USDA Forest Service  
Northern Science, Technology, and Applied  
Results (NorthSTAR) Program  
Delaware, OH / Burlington, VT  
Phone: 740-368-0057  
Email: [pknopp@fs.fed.us](mailto:pknopp@fs.fed.us)



## An Interagency Research, Development, and Applications Partnership



JFSP *Fire Science Brief*  
is published monthly.  
Our goal is to help managers  
find and use the best available  
fire science information.

Learn more about the  
Joint Fire Science Program at  
[www.firescience.gov](http://www.firescience.gov)

John Cissel  
Program Manager  
208-387-5349  
National Interagency Fire Center  
3833 S. Development Ave.  
Boise, ID 83705-5354

Tim Swedberg  
Communication Director  
[Timothy\\_Swedberg@nifc.blm.gov](mailto:Timothy_Swedberg@nifc.blm.gov)  
208-387-5865

Writer  
Marjie Brown  
[marjie@marjiefbrown.com](mailto:marjie@marjiefbrown.com)

Design and Layout  
RED, Inc. Communications  
[red@redinc.com](mailto:red@redinc.com)  
208-528-0051

The mention of company names,  
trade names, or commercial products  
does not constitute endorsement  
or recommendation for use  
by the federal government.

*Results presented in JFSP Final Reports may not have been peer-reviewed and should be interpreted as tentative until published in a peer-reviewed source.*

**The information in this Brief is written from JFSP Project Number 01-1-7-03, which is available at [www.firescience.gov](http://www.firescience.gov).**