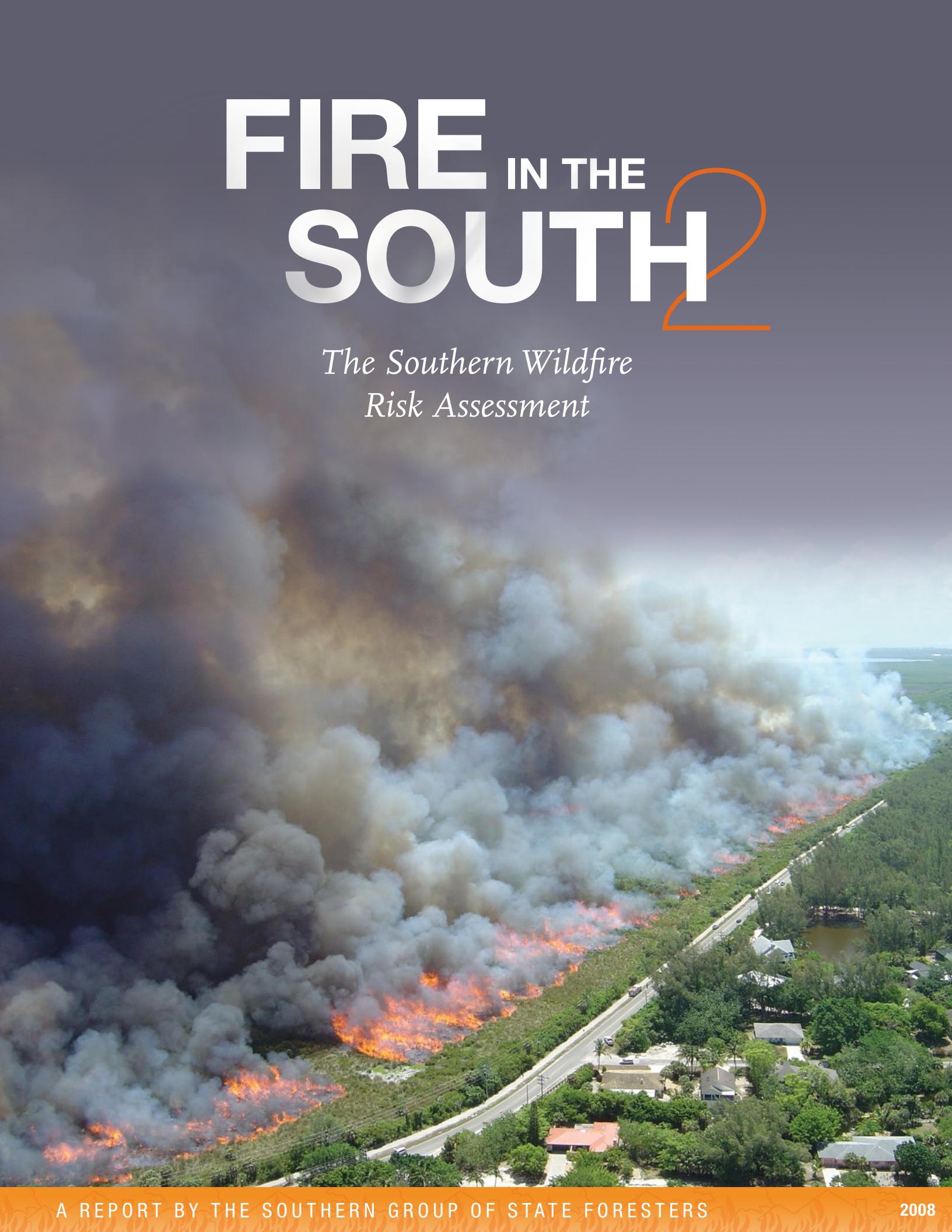


# FIRE IN THE SOUTH<sup>2</sup>

An aerial photograph capturing a massive wildfire. A dense plume of dark, billowing smoke dominates the left side of the frame, extending towards the horizon. Below the smoke, a bright orange and yellow line of fire cuts through a lush green landscape. This fire line is bordered by a thick cloud of smoke and ash. In the lower right corner, a paved road runs parallel to the fire. Along the road, several small houses with red roofs are visible, surrounded by green vegetation. The overall scene conveys a sense of the scale and intensity of the wildfire.

*The Southern Wildfire  
Risk Assessment*

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**COVER PHOTO:** USDI Fish & Wildlife Service

**Note:** This report is a follow up to *Fire in the South 1*, a comprehensive review of fire in the South describing cultural uses, landscape characteristics, and the associated impact of fire on the forest economy. *Fire in the South 1* is the starting baseline for the SWRA project.

*Fire in the South 1* can be accessed online at: [www.southernwildfirerisk.com/reports/FireInTheSouth1.pdf](http://www.southernwildfirerisk.com/reports/FireInTheSouth1.pdf)

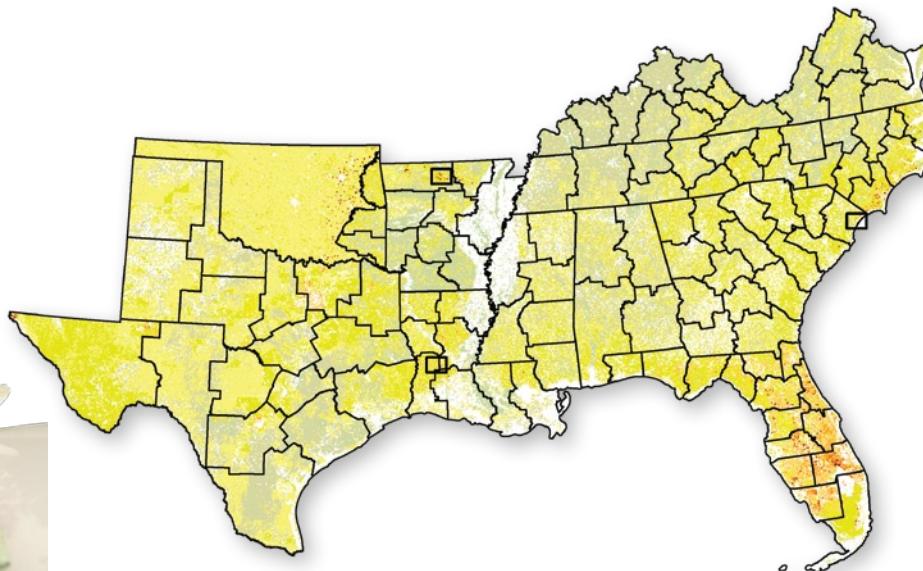
This publication, *Fire in the South 2*, can be accessed online at: [www.southernwildfirerisk.com/reports/FireInTheSouth2.pdf](http://www.southernwildfirerisk.com/reports/FireInTheSouth2.pdf)

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# Executive Summary

THE SOUTH IS ONE of the fastest growing regions in the nation, with an estimated population growth of 1.5 million people per year. The South also consistently has the highest number of wildfires per year. Population growth is pushing housing developments further into natural and forested areas where most of these wildfires occur. This situation puts many lives and communities at risk each year. For example, in 2006 most of the wildfires that occurred in Texas were less than two miles from a community. In that same year, the 10-year average of fires from October through March in a three parish area near New Orleans was 2,350 fires, which burned 27,000 acres.

The frequency of fires occurring in the South is highly variable, due in large part to the variability in weather patterns. Dry weather patterns can increase fire frequency and fire size; for example:

- During 2007, Tennessee had one of the worst droughts in its history and by June, 2,000 fires had burned 33,000 acres, which is a typical amount for an entire year.
- For one 30-day period during the dry spring fire season of 2004, Georgia averaged more than 100 wildfires per day.

- In a single day in 2008, North Carolina fought 302 fires that burned 9,400 acres, which is almost half of the 10-year average for acreage burned annually.
- Since 2005, the Kentucky Division of Forestry has suppressed 287 wildfires that were greater than 100 acres in size.
- In March of 2007, Alabama wildfires burned nearly 1,000 acres per day.

During dry years with higher than normal fire occurrence, effects on infrastructure and communities can

**The South consistently has the highest number of wildfires per year. Population growth is pushing housing developments further into natural and forested areas where most of these wildfires occur.**

be significant. Following are some examples:

- In 2006, nearly 2,500 structures were destroyed and at least 20 people were killed in wildfires in Texas and Oklahoma.
- In 2006, the Arkansas Forestry Commission fought 2,461 fires that destroyed 130 structures.
- During two days in 2008, South Carolina experienced 179 fires that damaged or destroyed 43 structures and threatened another 36 structures.

To address the significant wildfire problem in the South, all 13 southern states and several Federal agencies pooled their resources to conduct a regional Southern Wildfire Risk Assessment. Some of the main objectives of this assessment were to (1) identify areas most likely to have wildfires, (2) identify communities most susceptible to wildfire damage, (3) prioritize fuel reduction treatment programs, (4) help agencies work together to improve emergency response across jurisdictions, and (5) help prioritize and illustrate the need for Community Wildfire Protection Plans.

The wildfire risk assessment analyzed several key components of wildfire risk in





the South. Some of the major findings of the assessment were as follows:

- Wildfire risk is widespread across the South with more than 5 million acres at high risk of wildfire, based on the likelihood of each acre burning.
- There are 118,083 communities at risk of wildfire damage in the South and of those, 43 percent, or more than 50,000 communities, are at high to very high risk.
- Wildfire occurrence across the South is high; there are an average of 68,000 wildfires that burn a total of approximately 938,000 acres per year.
- The wildfire risk assessment classifies more than 100 million acres in the South as having moderate to extreme fire occurrence per year based on historical wildfire ignition data.
- In the South, more than 88 million acres are classified as wildland-urban interface (WUI), areas where communities and homes are next to or within fire-prone natural areas.

- The wildfire risk assessment mapped fuels consistently in each southern state for the first time, which enhances wildfire management and protection planning.

In the fire-adapted ecosystems of the South, the issue is not whether an area will burn but when it will burn and at what intensity. The Southern Wildfire Risk Assessment is being used to address this issue by state and federal agencies to support wildfire planning and protection efforts. At the local level, the assessment is being

used to increase awareness of the fire problem in the South and help the public understand fire management issues. The assessment also demonstrates the necessity for fuel reduction treatments, generates awareness of and support for wildfire protection planning, and helps agencies determine how they can work together to deploy limited firefighting resources. Additionally, it demonstrates the necessity for funding to implement regulatory actions, and it supports budget requests with concise and equitable state information about wildfire risk.

**In the fire-adapted ecosystems of the South, the issue is not whether an area will burn but when it will burn and at what intensity. The Southern Wildfire Risk Assessment is being used to address this issue by state and federal agencies to support wildfire planning and protection efforts.**

# Introduction

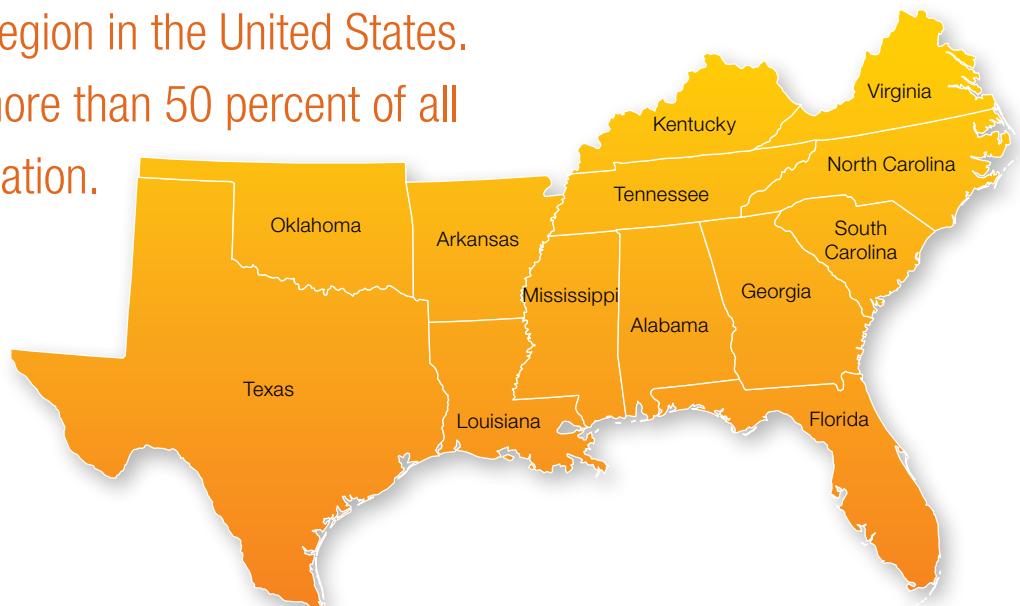
The South consistently has the highest number of wildfires per year of any region in the United States.

In 2006, the South had more than 50 percent of all wildfires reported in the nation.

THE SOUTH, which consists of the 13 states shown in **figure 1**, is one of the fastest growing regions in the nation with an estimated population increase of 1.5 million people each year (U.S. Census Bureau 2007) and 65 of the top 100 fastest-growing counties in the nation (U.S. Census Bureau 2006). The South also consistently has the highest number of wildfires per year of any region in the United States (**figure 2**).

Some of those fires are quite large (more than 100 acres). In 2006, for example, the South had more than 50 percent of all wildfires reported in the nation (figure 2) and 42 percent of all large wildfires that were reported. One of the large fires that year, called the Amarillo Complex Fire, burned 907,245 acres in the Texas panhandle (**figure 3**). In 2007, the Georgia Bay Complex/Bugaboo Fire burned 563,119 acres in Georgia and Florida. With population growth and the resulting expansion of the wildland-urban interface (areas where homes and communities are next to or within fire-prone natural areas), there is an increase in the number of communities and people at risk of damage from these large wildfires.

Wildfires regularly burned across great expanses of the landscape during the South's prehistory. The vegetation in many parts of the South is adapted to fire,



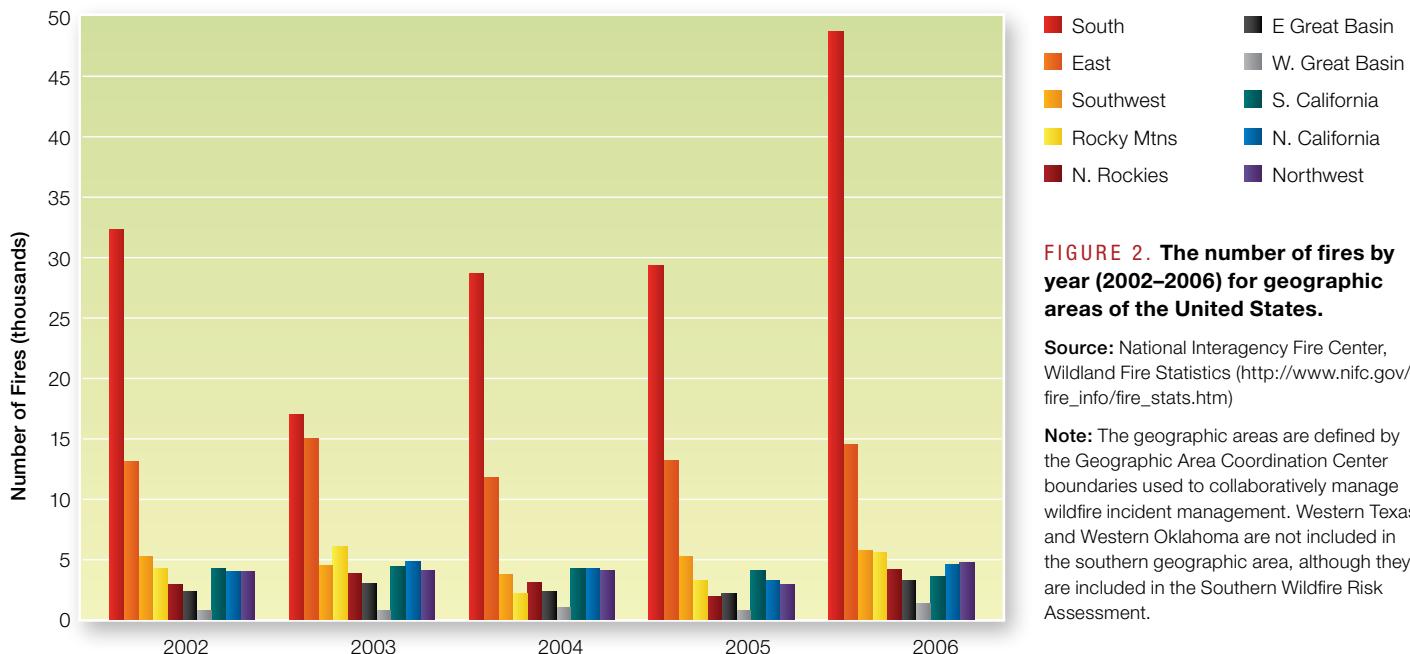
**FIGURE 1. Map of the 13 Southern States.**

with many plant species requiring fire for regeneration. Periodic wildfires helped to keep the build up of vegetation low. Native Americans and early European settlers frequently used fire to protect themselves from wildfires, improve wildlife habitat, and clear land for cultivation. Fire suppression programs were developed in the 1930s to protect regenerating forests. The suppression of fires in the South, however, has created an increase in fuel load for eventual wildfires, putting large numbers of people in the wildland-urban interface at risk.

To reduce these increased fuel accumulations and the risk of high intensity wildfires, forestry agencies now use prescribed fires and other fuel reduction techniques to reduce fuel loads on millions of acres each year in the South. In fact, more acres are treated

with prescribed fire in the South than in any other region—more than 2 million acres were treated in 2003. Vegetation grows back quickly in the mild climate and long growing season of the South, making frequent prescribed burning necessary to maintain fuel reduction benefits. Because the southern wildfire problem is so widespread and the fuels grow back so quickly, resources are stretched thin leaving many areas in need of fuel reduction treatments.

The frequency of fires occurring in the South is highly variable (for example, compare 2003 and 2006 in figure 2), due in large part to variability in weather patterns. Drought years generally lead to increased fire frequency and size due to (1) the increased flammability of vegetation (during drought conditions, most plants will burn if exposed to enough heat) and (2) a greater difficulty



**FIGURE 2. The number of fires by year (2002–2006) for geographic areas of the United States.**

**Source:** National Interagency Fire Center, Wildland Fire Statistics ([http://www.nifc.gov/fire\\_info/fire\\_stats.htm](http://www.nifc.gov/fire_info/fire_stats.htm))

**Note:** The geographic areas are defined by the Geographic Area Coordination Center boundaries used to collaboratively manage wildfire incident management. Western Texas and Western Oklahoma are not included in the southern geographic area, although they are included in the Southern Wildfire Risk Assessment.

of suppressing fires due to increased fire intensity and spot fires started by firebrands ahead of the main fire. For example, during 2007, Tennessee had one of the worst droughts in its history and by June, 2,000 fires had burned 33,000 acres, which is a typical amount

for an entire year. In a single day in 2008, North Carolina fought 302 wildfires that burned 9,400 acres, which is almost half of the 10-year average for acreage burned annually. For one 30-day period during a dry spring fire season of 2004, Georgia averaged more than 100 wildfires per

day. And during the dry March of 2007, wildfires in Alabama burned nearly 1,000 acres per day.

There tend to be fewer fires in wetter years. However, during some years, coastal areas may receive ample rainfall from tropical storms while inland areas

**FIGURE 3. The Amarillo Complex Fire burning at night.**

Jan Amen, Texas Forest Service





**FIGURE 4.** The build up of downed trees and branches after a hurricane can increase fire risk in future years.

receive no rainfall at all. For example, in 2005, the South had to simultaneously respond to flooding and wind damage from Hurricanes Katrina and Rita on the coast, while fighting an outbreak of wildfires inland. This caused a tremendous stretch of emergency response resources. Tropical storms can be helpful for putting out active wildfires, but the build up of downed trees and branches that these storms create can increase fire risk in future years (**figure 4**). Tornadoes, straight-line winds and ice damage, as well as insect and disease damage, also add to the build up of downed wood. This can result in large wildfires that are difficult to

control. And as the climate changes with global warming, experts predict further increases in fire frequency and intensity in the South.

During years with higher than normal fire occurrence, such as 2006 and 2007, effects on infrastructure and communities can be significant. From November 2005 through September 2006, for example, nearly 2,500 structures were destroyed and at least 20 people were killed in wildfires in Texas and Oklahoma. Eighty-five percent of the wildfires that occurred in Texas were less than two miles from a community. In 2006, the Arkansas Forestry Commission fought 2,461 wildfires that destroyed 130

structures. During just two days in 2008, South Carolina had 179 wildfires that damaged or destroyed 43 structures and threatened another 36 structures.

Wildfire risk in the South has been assessed to help state and federal agencies address the significant wildfire problem. This publication explains the objectives of the risk assessment, presents the key findings, and demonstrates through case studies some of its practical applications.

**FIGURE 5.** The risk assessment can help with planning for fire response and suppression resource needs.

# Assessing Wildfire Risk

Wildfire risk is not simply the risk of an area burning, but also includes the potential for damage to roads, homes, and other assets of value, as well as the difficulty of fighting the wildfire.

REALIZING THE FIRE PROBLEM that they face, all 13 southern states pooled their resources to conduct a comprehensive, regional wildfire risk assessment in partnership with several federal agencies, including the USDA Forest Service, USDI Fish and Wildlife Service, National Park Service, Bureau of Indian Affairs, and the Department of Defense. The main objectives of the assessment, called the Southern Wildfire Risk Assessment, were to

- identify areas most likely to have wildfires;
- identify communities most susceptible to wildfire damage;
- identify areas in need of Community Wildfire Protection Plans (which enable communities to plan how they will reduce their risk of wildfire damage);
- prioritize fuel reduction treatment programs;
- provide information to justify budget requests and spending;
- make it possible for agencies to work together to improve emergency response across jurisdictions;

- increase communication with local residents and address community needs and priorities;
- plan for fire response and suppression resource needs (**figure 5**); and
- establish a database and software tools that allow for continued monitoring and analysis of wildfire risk across the South (see appendix for information about the Southern Fire Risk Assessment System).

Wildfire risk is not simply the risk of an area burning, but also includes the potential for damage to roads, homes, and other assets of value, as well as the difficulty of fighting the wildfire. Therefore, the risk assessment process considered many factors—from historical weather and fire occurrence data to topography and fuel types to current infrastructure and initial fire response dispatch locations. Because all these factors were considered, the risk assessment can be used to illustrate several different aspects of fire risk and to conduct further analysis for planning wildfire protection efforts.

## Southern Wildfire Risk Assessment (SWRA)

A regionwide risk assessment that is the first comprehensive wildfire risk assessment of its kind in the nation. The SWRA can be a valuable tool to help fire managers predict and target more precisely those areas that are at high risk for wildfire.

The SWRA consists of a series of computer-based Geographic Information System (GIS) layers that can be used, separately or in combination, to provide powerful graphic images of wildfire occurrence and wildfire risk in the South. Because the SWRA outputs are based on numerical calculations, users can change inputs and re-run calculations to determine the new effect on the overall wildfire risk. Some of the outputs include the Wildland Fire Susceptibility Index (WFSI) and the Communities at Risk (CAR) rating.

SWRA data layers include fuels, wildfire history, initial dispatch locations, weather, topography, soils, land ownership, land use, and transportation infrastructure.

Jan Amen, Texas Forest Service



# Important Findings of the Risk Assessment

## Why the Wildfire Risk Assessment Was Needed

The South is at high risk of damage from wildfires. The following are some reasons for this high risk:

- The South has more fires than any other geographic area in the nation (*figure 2*).
- In some years the South has more acres burned than any other geographic area in the nation (*NIFC 2007*).
- The South has many large fires. Examples are the 2006 Amarillo Complex Fire in Texas, which burned 907,245 acres, and the 2007 Georgia Bay Complex/Bugaboo Fire in Georgia and Florida, which burned 563,119 acres.
- Many homes and structures are lost to fire each year in the South. For example, from 2001–2007 in Texas an average of 170 structures were lost annually with an average cost of more than \$7 million per year.
- The South has more than 50 percent of the wildland-urban interface acreage in the nation (*Stewart et al. 2005*).
- The long growing season in the South means that fuels grow rapidly and need repeated fuel reduction treatments to keep fire risk low.
- The South has a year round fire season, unlike most other regions that only have fires part of the year.

THE WILDFIRE RISK ASSESSMENT analyzed several key components of wildfire risk in the South, including the likelihood of an area igniting, the likelihood of an area actually burning, and the overall wildfire risk based on the likelihood of fire occurrence and the potential impacts to communities and other infrastructure. Through this process, the following five key findings emerged.

### 1 Wildfire risk is widespread but not evenly distributed across the South

More than 5 million acres are at high risk of wildfire in the South, based on the likelihood of each acre burning. Although this risk is not evenly distributed across the region, all states within the South have significant wildfire risk to be addressed in at least some areas of each state. By focusing on local areas within any southern state, it becomes clear that high-risk wildlands are often close to populated areas and valuable infrastructure (*figure 6*). For example, in

**figure 7** many of the areas with a moderate to very high likelihood of wildfire (represented by the Wildland Fire Susceptibility Index) are close to populated areas.

### 2 There are many communities at risk of wildfire damage in the South

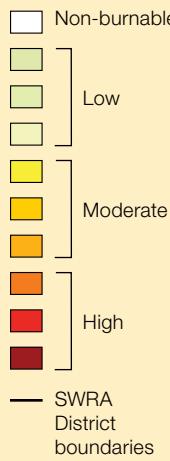
In the wildfire risk assessment, communities are defined as populated areas that contain at least 128 houses per square mile. There are 118,083 communities determined to be at some risk of damage by wildfire (measured by the Communities at Risk rating) throughout the South. Just 17 percent of these communities are considered to be at low risk, while 43 percent, or more than 50,000 communities across the South, are assessed at high to very high risk of damage by wildfire (*figure 8, page 12*). These numbers illustrate the extent of the wildfire problem in the South and highlight that many communities and lives are at considerable risk. For example, most of the area surrounding

**FIGURE 6. High-risk wildlands close to populated areas in South Carolina.**

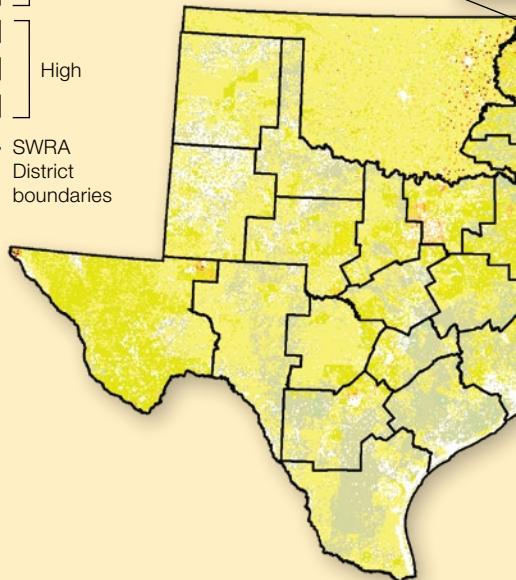
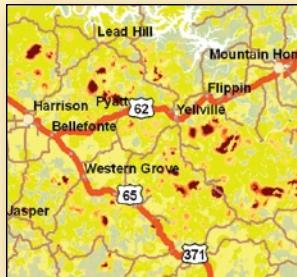


Michelle Johnson, South Carolina Forestry Commission

## Wildland Fire Susceptibility Index (Likelihood of an acre burning)



### Arkansas



South Carolina

Louisiana

**FIGURE 7.** The regionwide potential for wildfire, based on the likelihood of each acre burning, with three local examples in Arkansas, Louisiana, and South Carolina. The local examples clearly show that many areas with moderate to very high probability of wildfire are close to communities and valuable infrastructure.

Savannah, Georgia, is classified at high risk of wildfire damage (figure 9, page 12). The risk assessment locates areas, such as Savannah, where fuel reduction treatments could be focused to maximize benefits of budget resources for community wildfire protection.

### 3 Wildfire occurrence across the South is high

The South's fire professionals fight an average of 68,000 wildfires that burn a total of approximately 938,000 acres per year (1997–2002). The range of fire occurrence and size year to year is phenomenal. For example, during the 1999 fire season, 91,247 wildfires burned 1.4 million acres, whereas in the 2002 fire season, 52,636 wildfires burned slightly more than 0.5

million acres (figures 10A, 10B, page 13). The wildfire risk assessment classifies the potential for wildfire occurrence throughout the South (using Fire Occurrence Areas). More than 100 million acres in the South are classified as having moderate to extreme potential for wildfire occurrence. An example of the fire occurrence areas mapped in Mississippi is shown in figure 11 on page 13. The map shows clearly that the potential for wildfire ignitions is moderate to high throughout much of the state and this is true for all states in the South. Communities and cities can be surrounded by areas with very high potential for wildfire occurrence, as shown in the Hattiesburg area example.

### Wildland Fire Susceptibility Index (WFSI)

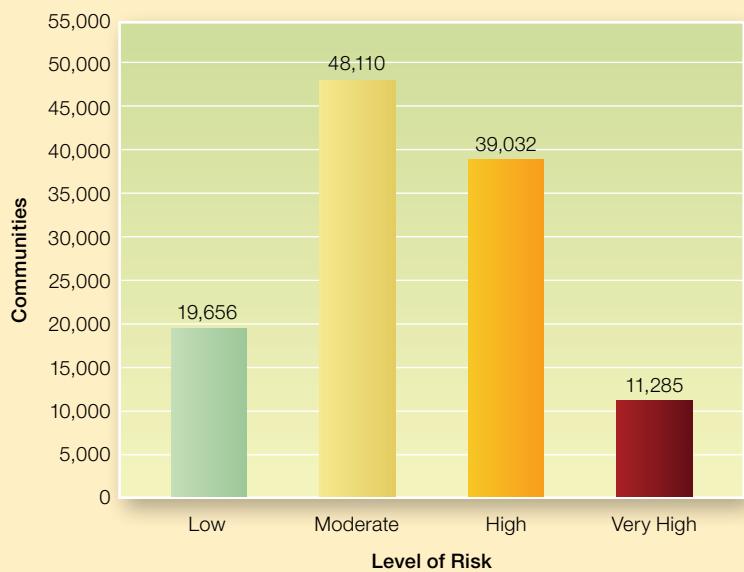
An index that represents the likelihood of an acre burning based on surface fuels and forest conditions, weather, historical fire sizes, and historical suppression effectiveness.

### Communities at Risk (CAR)

A rating that identifies the risk of wildfire damage to communities based on the average likelihood that the area surrounding the community will burn.

### Fire Occurrence Areas (FOA)

An area where the probability of each acre igniting is the same. FOA is described as the number of fires per 1,000 acres per year. The FOA is based on historic wildfire ignition data.

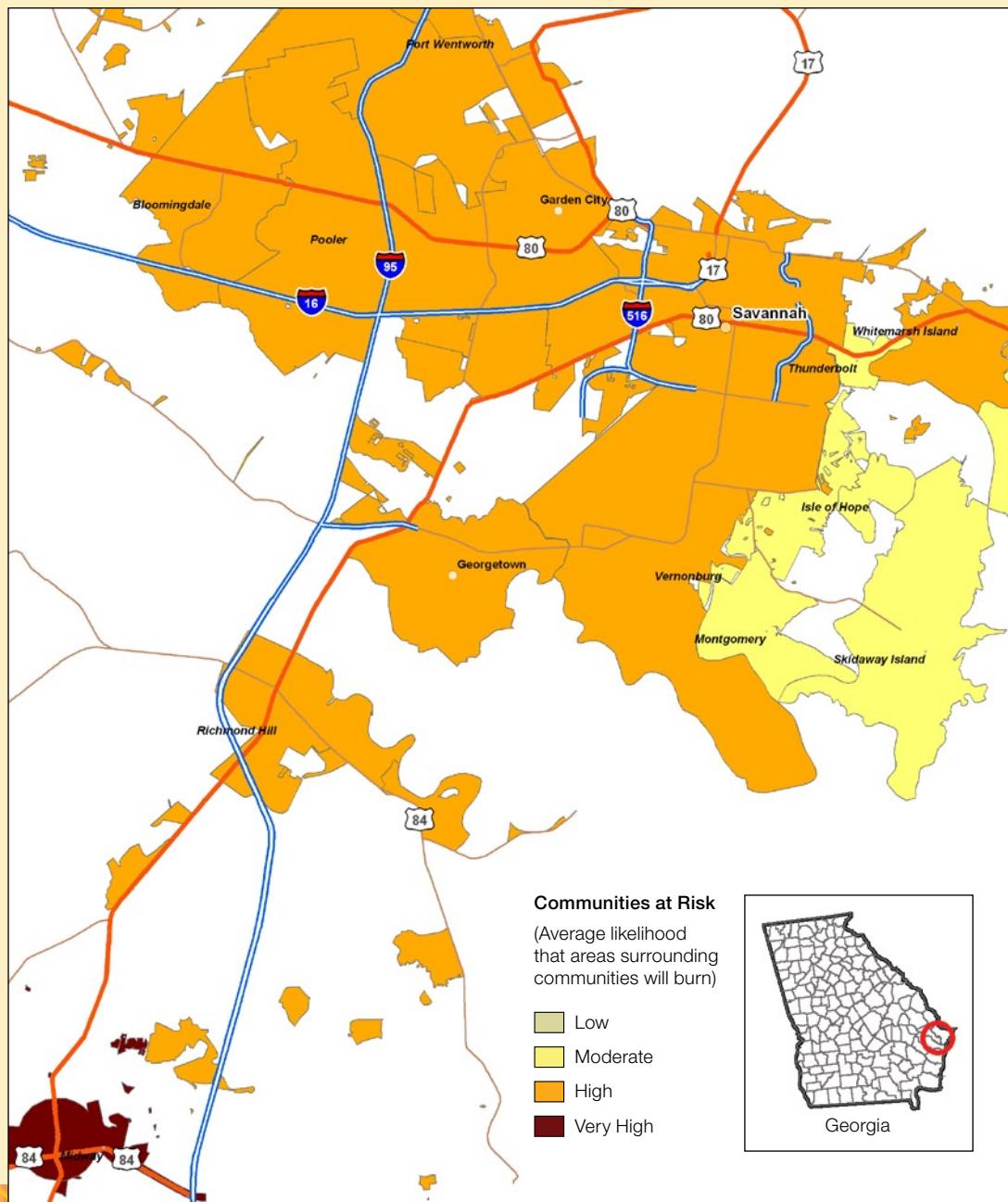


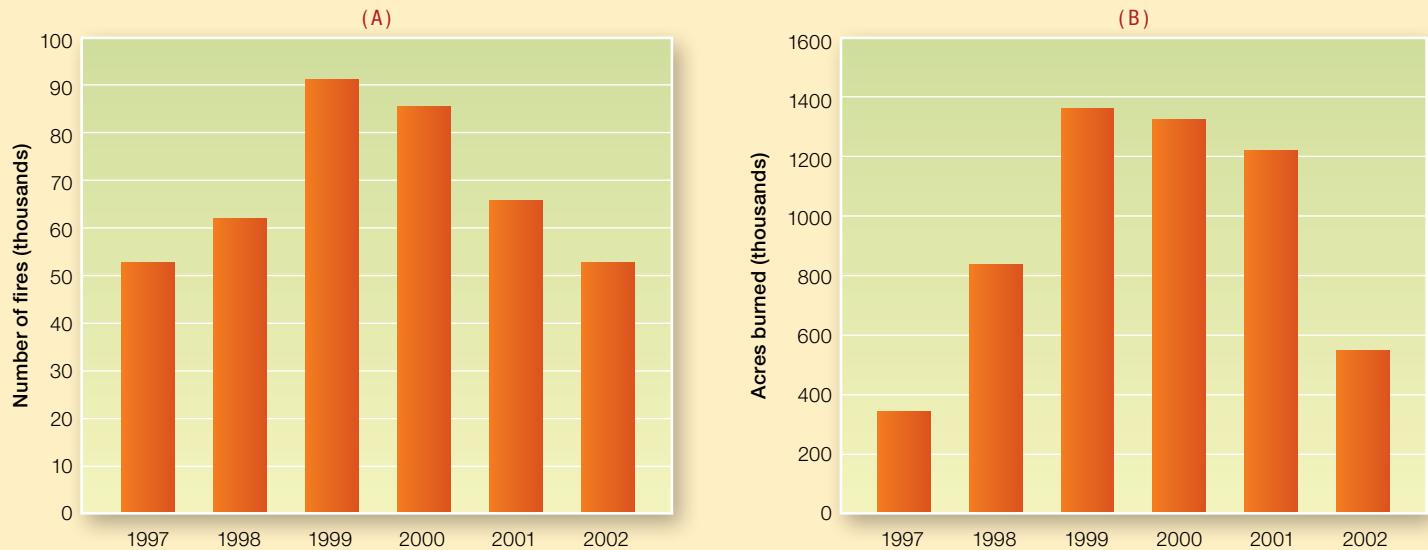
**FIGURE 8.** The number of southern communities in each wildfire damage risk class. The classification is based on the average likelihood of fire occurring in a three-mile area surrounding communities.

Source: Southern Wildfire Risk Assessment Southwide Summary Statistics of Published Results (2006).

Note: With continued updates to the wildfire risk assessment, the numbers of Communities at Risk may change as populated areas used for the mapping are grouped to reflect actual communities.

**FIGURE 9.** The communities at risk of wildfire damage in the area surrounding Savannah, Georgia. Most of the communities in this area, including Savannah, are classified at high risk of wildfire damage.

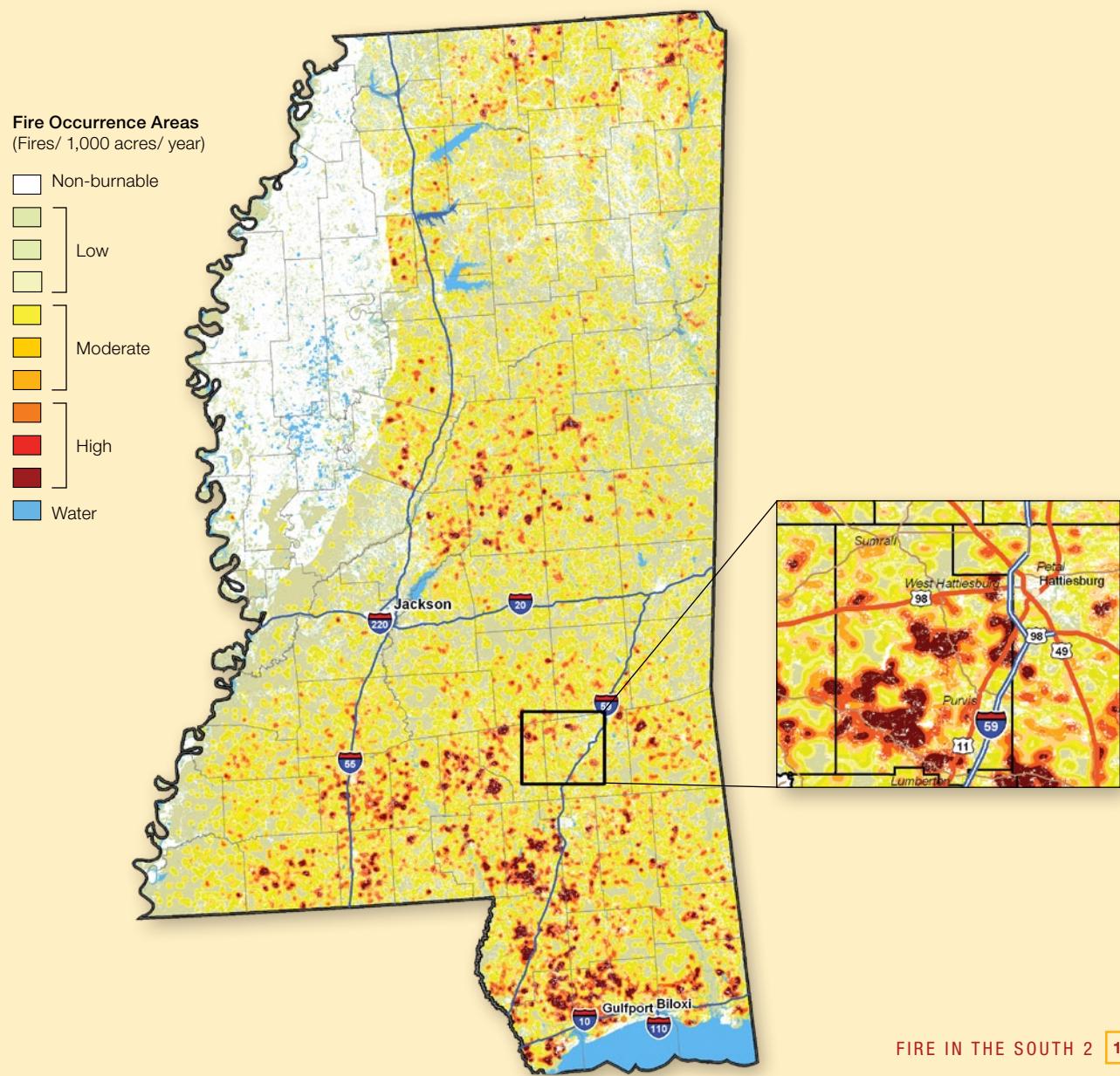




**FIGURE 10.** The number of fires (A) and acres burned (B) each year (1997–2002) in the South.

Source: Southern Wildfire Risk Assessment: Southwide Summary Statistics of Published Results (2006).

**FIGURE 11.** The potential for wildfire occurrence in Mississippi and a local example from the Hattiesburg area.



## 4 The wildland-urban interface is extensive in the South

Wildland-urban interface (WUI) areas are expanding rapidly in the South due to increased population growth and increased housing development. These areas are where homes, neighborhoods or other structures occur next to or within fire-prone natural areas, and they are a priority for wildfire fuel reduction treatments due to the lives and property that need to be protected (figure 12).

More than 88 million acres are classified as WUI in the South. North Carolina has the most acreage classified as WUI (12.8 million acres) and the average state in the South has more than 6.8 million WUI acres (figure 13).

By clearly identifying communities located in the WUI, the risk assessment helps target areas where fuel reduction efforts and wildfire protection are most needed. For example, in Palm Coast, Florida, the risk assessment was used to find where WUI areas coincide with a high probability of fire (based on Wildland Fire Susceptibility Index ratings) (figure 14). This can help fire professionals decide where to focus fuel reduction efforts. Notably, many places



**FIGURE 12.** Wildland urban interface area in Palm Coast, Florida.

with very high wildfire risk occur within a very small area in the wildland-urban interface.

## 5 Consistent fuels information across the region enables improved fire management planning and firefighting capability

The wildfire risk assessment mapped surface fuels consistently in each southern state for the first time, which enables managers to identify areas where fuels may need to be reduced through thinning, mowing, herbicide, or prescribed fire (figure 15, page 16).

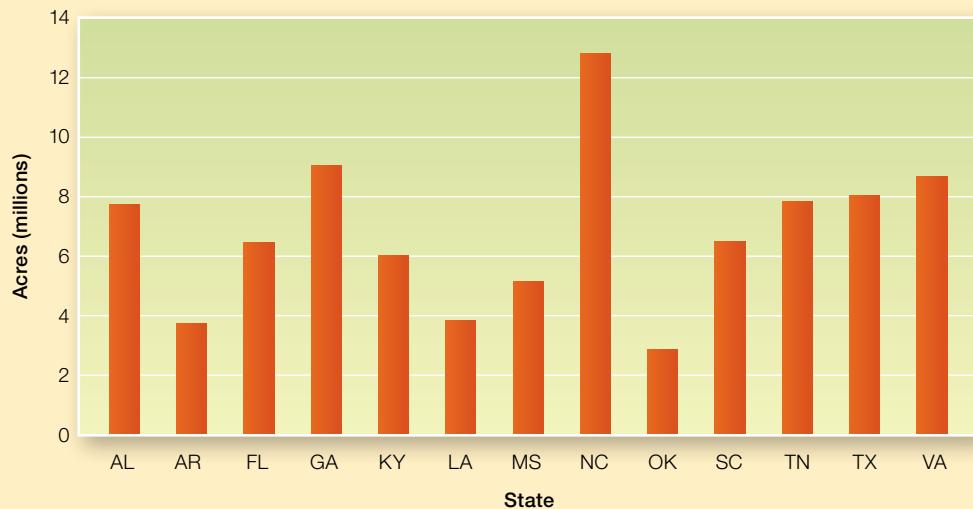
The risk assessment identifies the most

common fuels types in the South and where they occur on the landscape. During normal burning conditions, many of the common fuels tend to result in relatively fast-moving fires of low to moderate intensity. During drought conditions, these fuels can result in high-intensity fires that develop rapid rates of spread and crown fires. The location of fuels that can support intense fires, as identified by the risk assessment, aids fire management and protection planning. Furthermore, consistent fuel mapping across the region provides common information for fighting wildfires across state and jurisdiction boundaries.

### Wildland-Urban Interface (WUI)

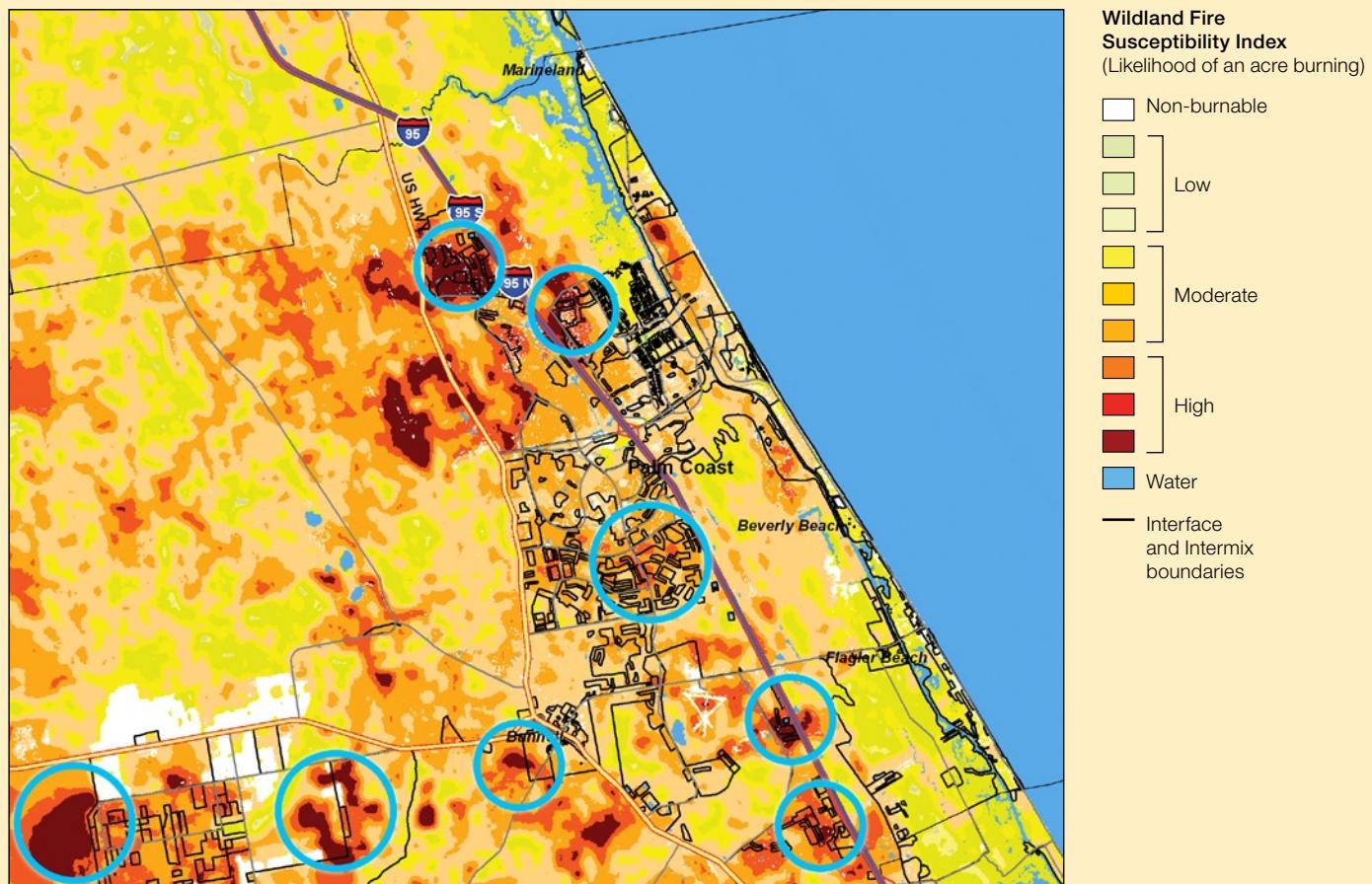
The wildland-urban interface definition used in the risk assessment includes interface and intermix communities, both of which must meet or exceed a minimum housing density of at least one house per 40 acres. Intermix WUI communities are places where housing and vegetation intermingle; interface WUI communities are areas with housing in the vicinity of contiguous vegetation (Radeloff et al. 2004).

Using the risk assessment to find areas where WUI areas coincide with a high probability of fire can help fire professionals decide where to focus fuel reduction efforts.



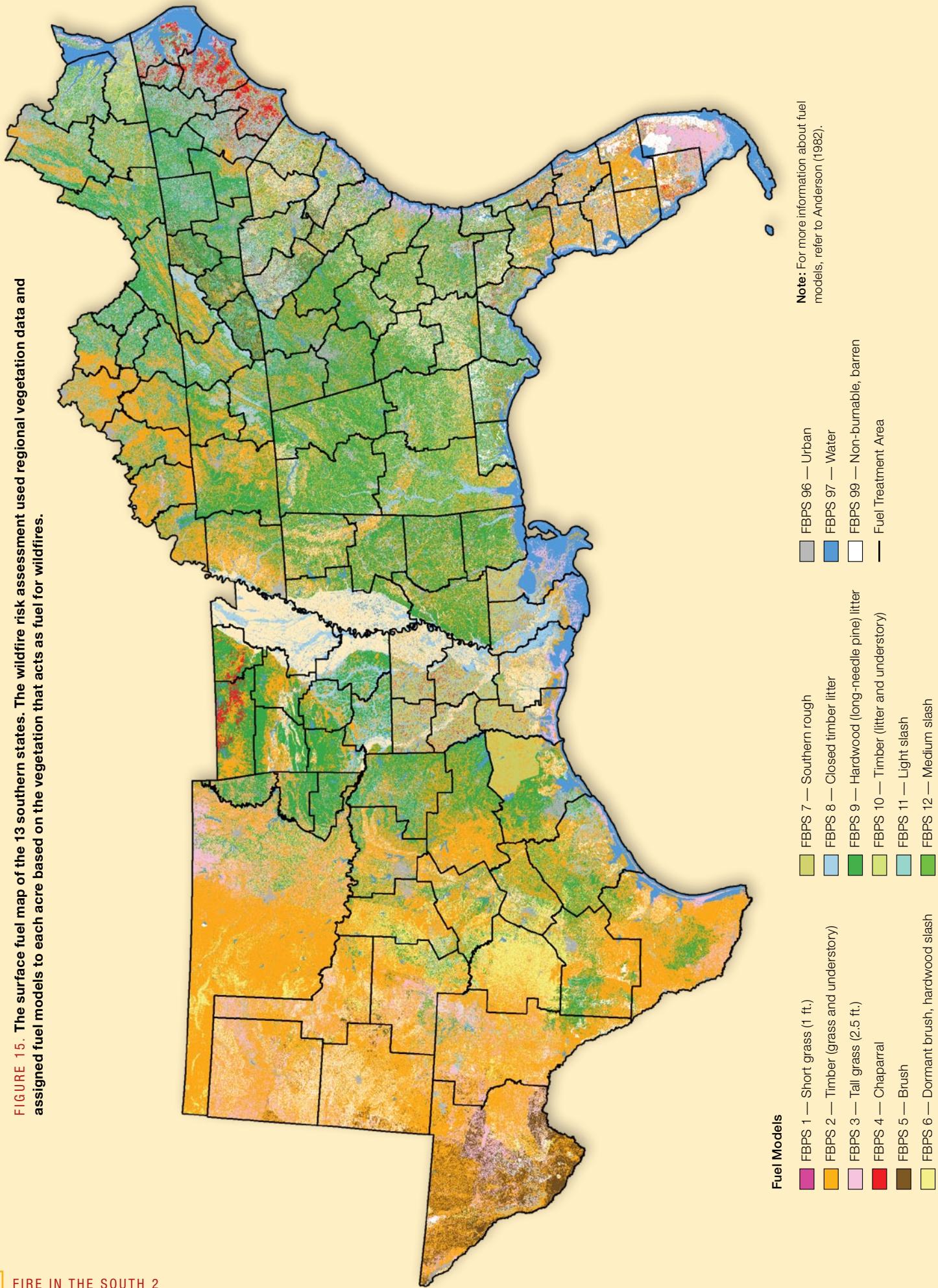
**FIGURE 13.** The number of wildland-urban interface acres in each southern state.

Source: Southern Wildfire Risk Assessment Southwide Summary Statistics of Published Results (2006).



**FIGURE 14.** The wildland-urban interface in Palm Coast, Florida, and the probability of a wildfire occurring. The areas circled in blue have a high likelihood of burning within the wildland-urban interface. These areas can be targeted for fuel reduction treatments.

**FIGURE 15.** The surface fuel map of the 13 southern states. The wildfire risk assessment used regional vegetation data and assigned fuel models to each acre based on the vegetation that acts as fuel for wildfires.



# Practical Applications

The Southern Wildfire Risk Assessment is being used by state and federal agencies to support wildfire planning and protection efforts.

## THE SOUTHERN WILDFIRE RISK

Assessment provides new opportunities for agencies to address wildfire problems ([figure 16](#)). The assessment can be used to illustrate and accomplish many objectives, such as helping to determine and display the susceptibility of communities and ecosystems to wildfires or the amount of WUI acreage in any area of interest, which can help prioritize areas in need of Community Wildfire Protection Plans (CWPPs). In addition, the wildfire risk assessment provides support tools to help groups such as Geographic Area Coordination Centers, multi-agency coordination groups, and Incident Management Teams with their wildfire response planning and reduction of firefighting costs. The assessment is also important for

communicating wildfire management issues to the public and to government officials. Following are some examples of how the wildfire risk assessment can help agencies address fire problems.

## Interagency Planning

All land ownership types in the South, including federal, state and local government lands and private lands, are represented in the wildfire risk assessment data and results. Therefore, fire planning across ownerships, across state boundaries, and across the South is now possible. Teamwork among states and agencies is enhanced by the risk assessment because the data for each state and ownership are consistent throughout the South.



Florida Division of Forestry

## CASE STUDY 1

### Interagency Planning and Collaboration

The area where the Alabama, Georgia, and Tennessee borders meet is a good place to illustrate how multiple agencies and states may need to interact to solve wildfire management problems. The area represented in [figures 17A](#) and [17B](#) on page 18 contains a mixture of land ownerships, which can create complications for interagency planning and the need for collaboration in fire emergencies. The area circled in blue has a slow emergency response time (as identified by the Fire Response Accessibility Index). This kind of information can demonstrate the need for Georgia and Tennessee state fire agencies and the Chattahoochee and Cherokee National Forests to work together to plan hazardous fuels treatment and wildfire response in this fire-prone area.

### Fire Response Accessibility Index (FRAI)

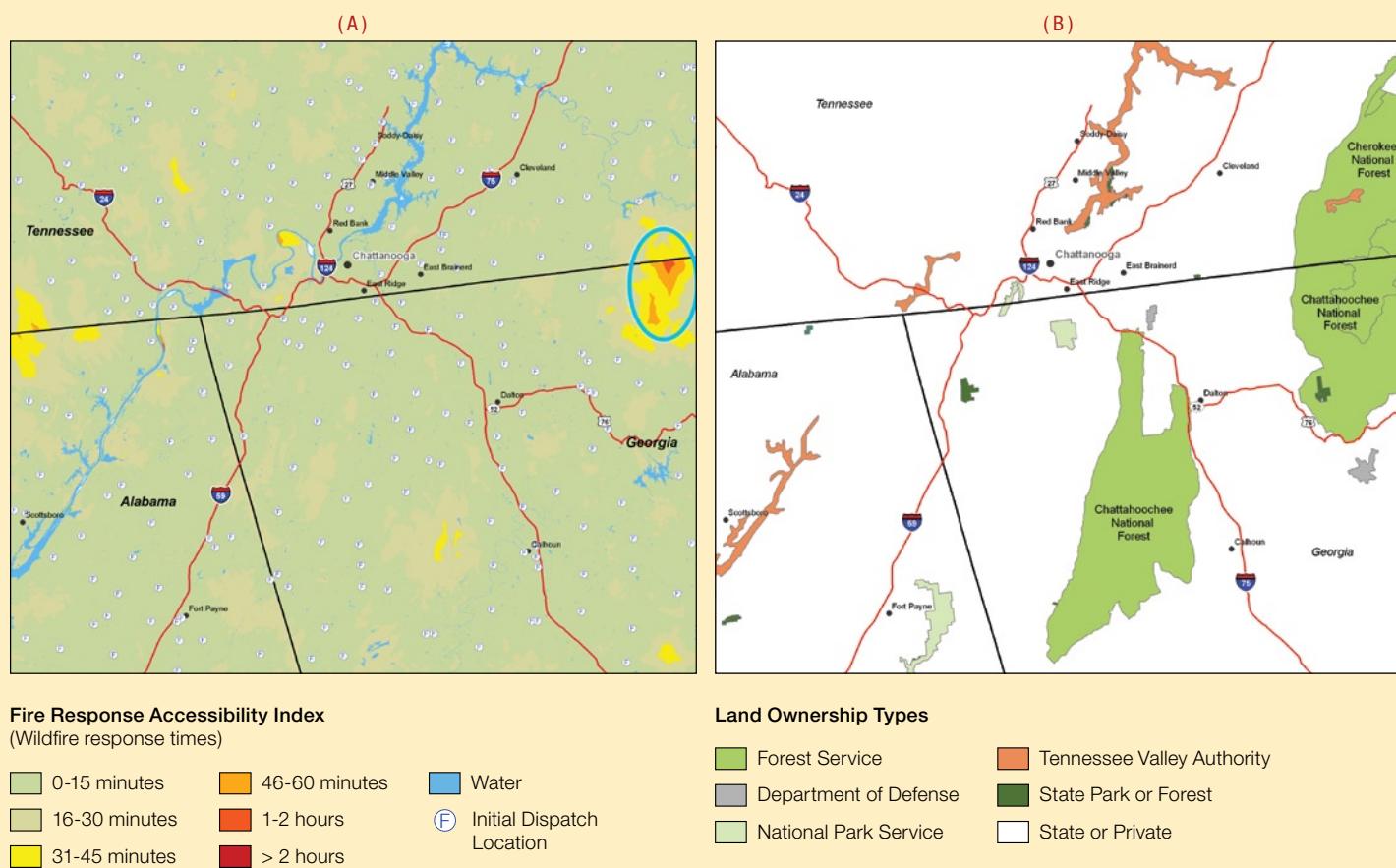
An index that represents the estimated time required for firefighting resources to reach an area. FRAI values range from a 0- 15-minute response time to more than 2 hours.

## Communication

In addition to enhancing interagency

**FIGURE 16.** The risk assessment maps can help agencies identify wildfire problem areas.

**FIGURE 17.** An example of an area with varied wildfire response times (A) and multiple land ownerships (B) located where the borders of Tennessee, Alabama, and Georgia meet near Chattanooga, Tennessee. The area circled in blue has a slow wildfire response time.



communications and planning, the risk assessment provides easily accessible information for improving communication with the public and local and state governments. The wildfire risk assessment can be used to

- increase awareness of the fire problem in the South;
- help the public understand fire management issues;
- demonstrate the necessity for regulatory actions;
- demonstrate the necessity for prescribed fire and other fuel reduction treatments;
- generate awareness of and support for wildfire protection planning; and
- support budget requests and initiatives with concise and equitable state

information about wildfire risk.

## CASE STUDY 2

### Fuel Reduction Treatment Planning

Fuel reduction treatments are used to remove or reduce dense vegetation that is fuel for wildfires. Dense vegetation can create intense fires that burn quickly and endanger nearby communities. Prescribed fire is one of many fuel reduction treatments and is generally an affordable and effective option. Due to the smoke that this treatment creates, it can be controversial when conducted near communities or major roads (figure 18). The wildfire risk assessment can be used to show local stakeholders how prescribed fire could reduce the

overall risk of wildfire (illustrated by the Level of Concern rating) to their communities. Figure 19 shows the overall level of wildfire risk in a fuel treatment area before a prescribed fire and after. Clearly, reducing the fuels reduces the risk of wildfire in the treatment area, which in turn reduces the likelihood that nearby communities will be damaged by wildfires. Graphically demonstrating reduced risk can be an effective way of gaining support for prescribed fire

#### Level of Concern (LOC)

A rating based on the likelihood of an acre burning, the difficulty of fire suppression, and the infrastructure at risk of damage by wildfire.

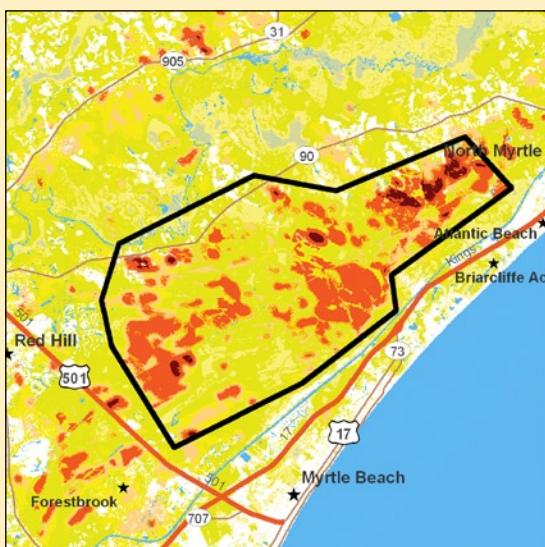


**FIGURE 18.** Prescribed fires conducted near roads and infrastructure.

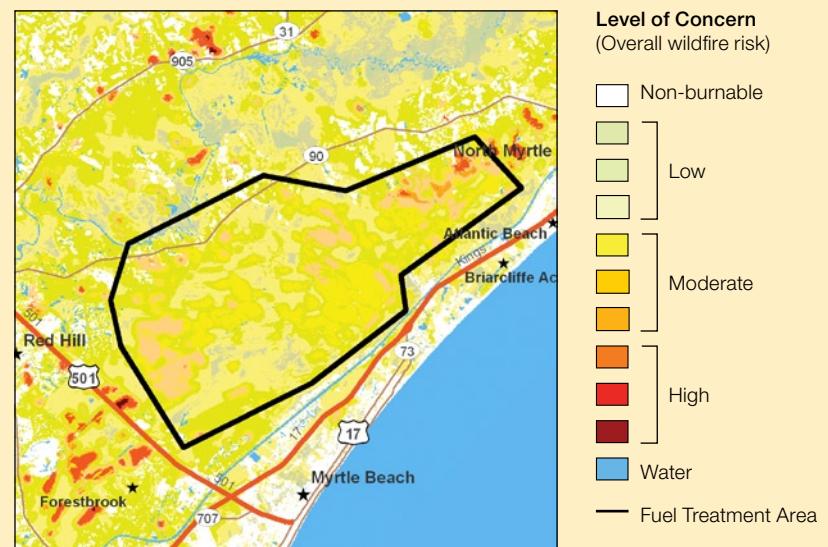


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Before prescribed fire



After prescribed fire



**FIGURE 19.** An example of how a prescribed fire fuel reduction treatment might decrease the overall risk of wildfire (Level of Concern rating) near Myrtle Beach, South Carolina.

programs near communities.

### CASE STUDY 3

#### Community Wildfire Protection Plans

Community Wildfire Protection Plans (CWPPs) enable communities to plan how they will reduce their risk of wildfire damage and assist in obtaining funding for fuel treatments around communities (Society of American Foresters 2004). The wildfire risk assessment identifies communities that are likely to be damaged by wildfire, enabling states to prioritize areas for completing CWPPs. Maps that show communities rated at high risk can be used to communicate to community officials and residents the

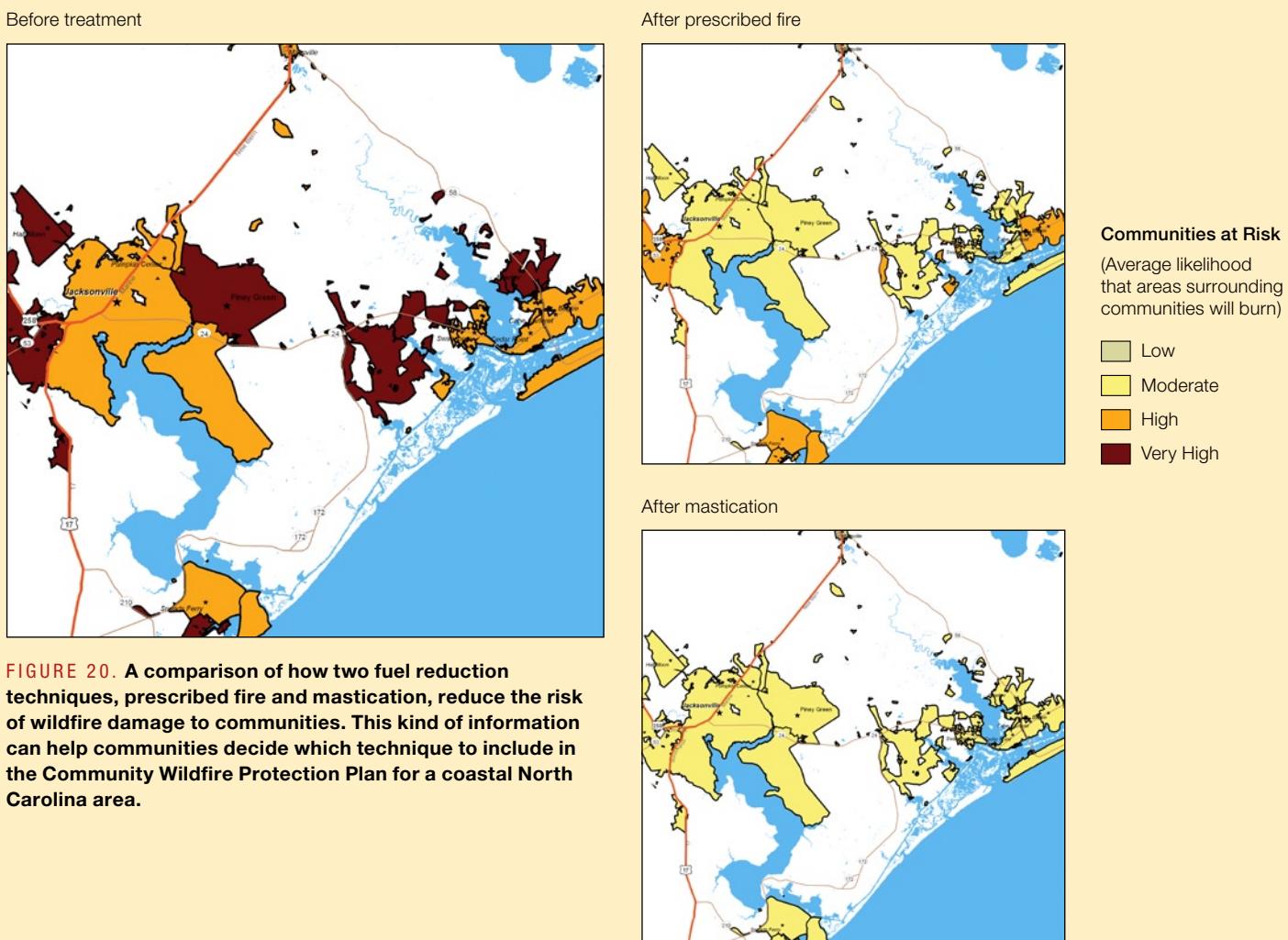
need for CWPPs and generate support for the process. In addition, the wildfire risk assessment maps can be used to decide which management actions should be taken to reduce wildfire risk to communities in the CWPP process.

For example, in **figure 20**, the benefits of two fuel reduction treatments, prescribed fire and mastication (a technique that involves crushing and chopping shrubs and small trees), are compared. By sharing these maps with community members, fire professionals can demonstrate that mastication will better reduce the community's risk of damage by wildfire (Communities at Risk rating) than prescribed fire. As the map shows, for this area in North Carolina, mastication would be the more effective

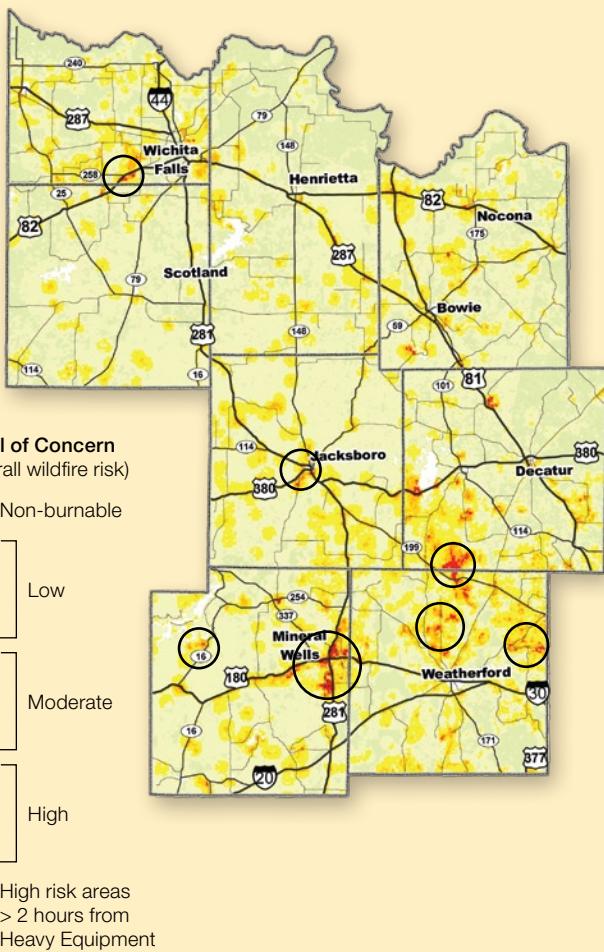
fuel reduction method to include in the CWPP.

### Fire Management Program Planning

In addition to streamlining decision-making processes for fuels management, the wildfire risk assessment provides a framework to analyze alternatives for fire suppression planning (e.g., initial firefighting resource locations, initial wildfire control decisions, and large fire support decisions). Fire managers can save time and money by testing different potential solutions to these problems and comparing the results for decision making.



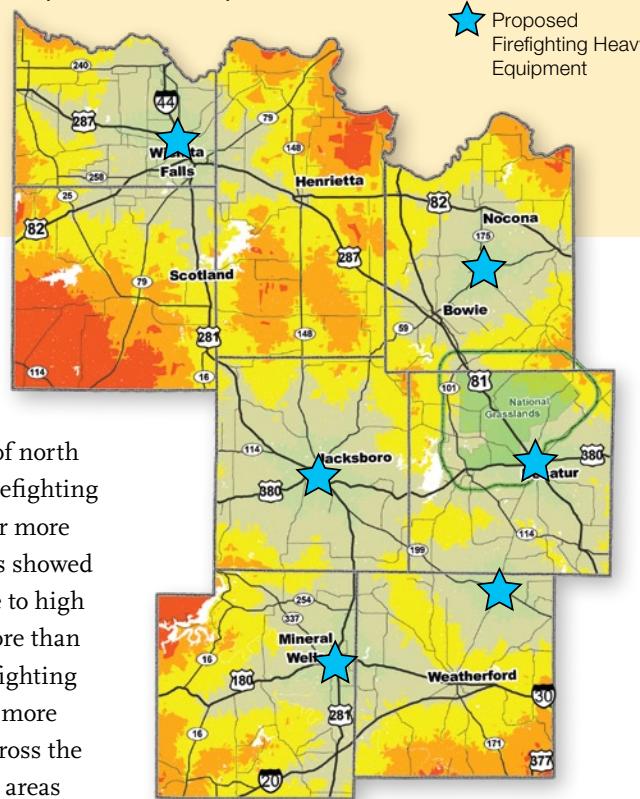
### Current Wildfire Risk



### Current Wildfire Response Times



### Proposed Wildfire Response Times



**FIGURE 21.** The Texas Forest Service firefighting equipment response time analysis of the Wise District in central Texas. The analysis shows how adding more firefighting equipment across the region would reduce the emergency response time to areas at high risk of wildfire damage.

### CASE STUDY 4

#### Texas Forest Service Wildfire Response Analysis

The strategic location of firefighting resources is essential for effective initial wildfire control efforts. Using the risk assessment results, southern fire managers can identify areas where emergency response resources, such as bulldozers or tractor plows, may need to be relocated to provide responses that are quicker and better equipped for fighting wildfires. The Texas Forest

Service used the wildfire risk assessment to complete this type of analysis in the Wise District, a fire-prone area of north central Texas, to determine if firefighting resources should be relocated for more effective responses. The analysis showed that several areas with moderate to high risk of wildfire damage were more than two hours from the nearest firefighting equipment locations. By adding more firefighting heavy equipment across the district, response times to those areas could be reduced substantially (figure 21).

## CASE STUDY 5

### Interagency Firefighting

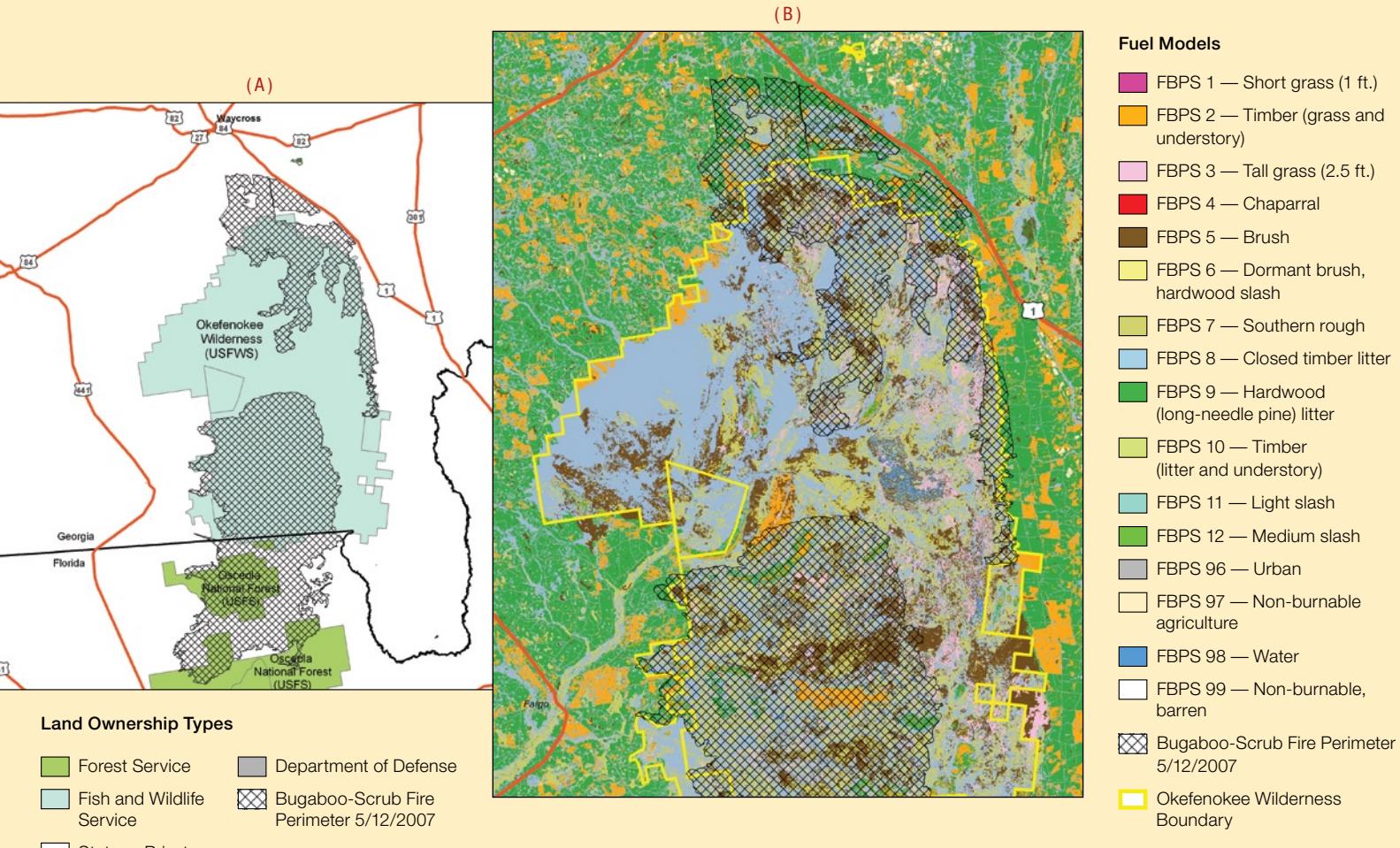
The 2007 Georgia Bay Complex/Bugaboo Fire that burned through the Okefenokee National Wildlife Refuge and beyond in to parts of Georgia and Florida was a firefighting challenge that involved firefighting agencies from the state-level, as well as the USDI Fish and Wildlife Service and the USDA Forest Service (figures 22, 23A). Interagency fire planning personnel first tried using national fuel model maps to predict fire behavior and where the fire might be heading next. However, the Southern

Wildfire Risk Assessment surface fuel model maps were found to be more accurate (figure 23B) for much of the area affected by the fire, especially for the Okefenokee National Wildlife Refuge. Consequently, the risk assessment fuel model maps were used to understand how the fire might progress to help firefighters plan their wildfire response strategies.



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**FIGURE 23.** The perimeter of and land ownership types involved in the Georgia Bay Complex/Bugaboo Fire of 2007 (A) and the Southern Wildfire Risk Assessment surface fuel model map (B) that was used to plan firefighting efforts in the Okefenokee National Wildlife Refuge.



**Note:** For more information about fuel models, refer to Anderson (1982).

# Conclusion

The Southern Wildfire Risk Assessment is a powerful tool that can be used by state and federal fire planning agencies and at the local level to increase awareness of the wildfire problem in the South, to help the public understand fire management issues, and to demonstrate the necessity for funding to manage the wildfire problem.

IN THE FIRE-ADAPTED ecosystems of the South, the issue is not whether it will burn but when it will burn and at what intensity. Since the wildland-urban interface is so widespread in the South, many communities and lives could be affected if wildfires occur (**figure 24**). The Southern Wildfire Risk Assessment is a powerful tool that can be used by state

and federal fire planning agencies and at the local level to increase awareness of the wildfire problem in the South, to help the public understand fire management issues, and to demonstrate the necessity for funding to manage the wildfire problem. The identification of wildfire risks provides the South with the ability to plan for fire protection and also with

the ability to prepare and respond to wildfires as they occur. Ultimately, the Southern Wildfire Risk Assessment provides the information and tools to achieve wildfire protection goals on state, federal, and private lands throughout the South.

**FIGURE 24.** Since the wildland-urban interface is so widespread in the South, many communities and lives could be affected if wildfires occur.

Jan Amen, Texas Forest Service





Wildfire occurrence across the South is high; there are an average of 68,000 wildfires that burn a total of approximately 938,000 acres per year. More than 100 million acres in the South are classified as having moderate to extreme potential for wildfire occurrence.



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There are 118,083 communities at risk of wildfire damage in the South. Of those communities, 43 percent, or more than 50,000 communities, are at high to very high risk.



South Carolina Forestry Commission



Florida Division of Forestry



Georgia Forestry Commission

# Appendix

## Glossary



**Crown fire:** A fire that advances from top to top of trees or shrubs more or less independent of a surface fire.



**Firebrand:** Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or by gravity into unburned fuels.

**Fuels:** Any combustible material, especially petroleum-based products and wildland fuels. The fuels discussed in this publication are wildland fuels (primarily vegetation such as shrubs, grasses, downed trees or branches, and leaf litter).

**Fuel model:** Simulated fuel complex for which all fuel descriptors required for the solution of a mathematical rate of spread model have been specified. For this publication, the relevant information to know about fuel models is that the potential rate of spread of a fire as predicted by the fuel model is an important indicator of how a fire will burn and how difficult a fire may be to control.

**Geographic area:** Areas of the United States that are served by Geographic Area Coordination Centers (GACCs). These centers coordinate firefighting activities within their service areas. For more information and maps of the areas, visit <http://www.nifc.gov/nicc/>

**Fuel reduction or fuel modification:** Manipulation or removal of fuels to reduce the likelihood of ignition and/or to lessen potential damage and resistance to control through treatments such as prescribed fire, mastication, herbicide, or mowing.



**Mastication:** A vegetation fuel reduction technique that involves crushing and chopping shrubs and small trees.



**Prescribed fire:** Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and environmental requirements (where applicable) must be met, prior to ignition. In most cases discussed in this publication, these are fires that are purposefully set under specific conditions in order to reduce vegetation fuels.

**Spot fire:** Fire ignited outside the perimeter of the main fire by a firebrand.

**Wildfire risk:** The chance of occurrence of an unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.

**Note:** These definitions were adapted from the National Wildfire Coordinating Group's Glossary of Wildland Fire Terminology ([www.nwcg.gov/pms/pubs/glossary/f.htm](http://www.nwcg.gov/pms/pubs/glossary/f.htm)).

# Tables of State and Federal Summary Statistics

**TABLE 1.** Number and percent of communities in each class of Communities at Risk ratings by state and federal agency. These four classes define the risk of wildfire damage to communities based on the likelihood of fire occurring in areas surrounding the communities.

	Low		Moderate		High		Very High	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<b>Alabama</b>	1,020	12.0	6,683	78.6	787	9.3	16	0.2
<b>Arkansas</b>	1,107	27.4	2,045	50.6	835	20.7	53	1.3
<b>Florida</b>	115	0.8	534	3.7	4,903	34.2	8,799	61.3
<b>Georgia</b>	815	6.9	5,887	50.0	4,970	42.2	96	0.8
<b>Kentucky</b>	4,674	57.1	2,567	31.4	930	11.4	13	0.2
<b>Louisiana</b>	1,929	39.5	1,031	21.1	1,725	35.3	200	4.1
<b>Mississippi</b>	747	15.4	3,095	63.7	1,017	20.9	0	0.0
<b>N. Carolina</b>	1,418	9.2	5,191	33.6	7,766	50.3	1,069	6.9
<b>Oklahoma</b>	277	6.7	769	18.6	2,728	66.1	355	8.6
<b>S. Carolina</b>	26	0.3	3,265	34.4	6,125	64.6	72	0.8
<b>Tennessee</b>	3,627	37.1	5,550	56.8	601	6.1	0	0.0
<b>Texas</b>	2,457	16.9	5,576	38.4	5,861	40.4	612	4.2
<b>Virginia</b>	1,444	17.7	5,917	72.7	780	9.6	0	0.0
<b>USFS</b>	1,480	10.9	5,289	39.1	5,661	41.8	1,109	8.2
<b>USFWS</b>	1,054	20.5	1,498	29.1	1,595	31.0	1,006	19.5
<b>NPS</b>	1,346	17.3	3,307	42.5	2,750	35.4	378	4.8
<b>DOD</b>	2,690	18.4	5,547	38.0	5,057	34.7	1,287	8.8
<b>BIA</b>	398	6.6	1,065	17.7	4,070	67.5	499	8.3
<b>Other Federal Agencies</b>	238	22.2	463	43.3	369	34.5	0	0.0

**TABLE 2.** Number of acres in each of the top five Level of Concern risk classes by state and federal agency. The Level of Concern rates the overall fire risk, including the likelihood of a fire occurring, historical suppression costs, and the infrastructure that would be threatened if a fire occurred.

	Moderate	Mod. High	High	Very High	Extreme	Total
<b>Alabama</b>	217,522	81,225	2,871	137	0	301,755
<b>Arkansas</b>	348,956	116,075	4,794	933	1,015	471,773
<b>Florida</b>	5,416,241	5,029,879	1,961,914	1,941,463	14,209	14,363,706
<b>Georgia</b>	1,154,532	479,461	31,195	4,341	0	1,669,529
<b>Kentucky</b>	122,731	28,848	718	97	0	152,394
<b>Louisiana</b>	1,302,259	1,182,767	243,359	128,689	503	2,857,577
<b>Mississippi</b>	291,379	41,007	11	0	0	332,397
<b>N. Carolina</b>	1,611,367	1,000,398	121,479	59,723	3,537	2,796,504
<b>Oklahoma</b>	536,212	421,857	77,112	74,607	4,756	1,114,544
<b>S. Carolina</b>	1,125,778	644,043	46,565	8,839	332	1,825,557
<b>Tennessee</b>	94,859	3,750	1	0	0	98,610
<b>Texas</b>	1,606,312	615,573	43,719	52,177	4,560	2,322,341
<b>Virginia</b>	218,196	20,202	9	60	0	238,467
<b>USFS</b>	321,759	466,356	184,908	164,400	3,984	1,141,407
<b>USFWS</b>	82,085	60,974	20,840	22,919	3,505	190,323
<b>NPS</b>	91,441	33,678	8,157	7,073	317	140,666
<b>BLM</b>	0	0	0	0	0	0
<b>DOD</b>	328,382	127,790	48,873	47,709	707	553,461
<b>BIA</b>	608,664	493,697	116,061	216,920	27,711	1,463,053
<b>Other Federal Agencies</b>	801	364	56	12	0	1,233

### Wildland Fire Susceptibility Index Classes

	<b>Moderate</b>	<b>Mod. High</b>	<b>High</b>	<b>Very High</b>	<b>Extreme</b>	<b>Total</b>
<b>Alabama</b>	160,066	55,139	0	0	0	<b>215,205</b>
<b>Arkansas</b>	205,900	150,229	55,096	28,767	32,173	<b>472,165</b>
<b>Florida</b>	7,102,420	7,530,014	2,787,743	585,359	162,361	<b>18,167,897</b>
<b>Georgia</b>	476,334	134,933	11,874	0	0	<b>623,141</b>
<b>Kentucky</b>	62,787	17,558	323	7	0	<b>80,675</b>
<b>Louisiana</b>	1,148,378	663,434	134,956	18,748	2,043	<b>1,967,559</b>
<b>Mississippi</b>	68,570	4,353	0	0	0	<b>72,923</b>
<b>N. Carolina</b>	1,307,657	797,907	235,210	104,892	48,887	<b>2,494,553</b>
<b>Oklahoma</b>	1,280,149	564,117	222,662	153,669	100,340	<b>2,320,937</b>
<b>S. Carolina</b>	702,759	207,889	21,340	1,858	572	<b>934,418</b>
<b>Tennessee</b>	8,474	121	0	0	0	<b>8,595</b>
<b>Texas</b>	2,230,030	983,298	297,849	36,179	23,548	<b>3,570,904</b>
<b>Virginia</b>	32,999	2,283	0	0	0	<b>35,282</b>
<b>USFS</b>	515,351	362,665	59,931	16,386	6,443	<b>960,776</b>
<b>USFWS</b>	126,801	85,257	35,602	17,346	11,129	<b>276,135</b>
<b>NPS</b>	382,177	173,879	20,164	4,128	2,060	<b>582,408</b>
<b>BLM</b>	0	0	0	0	0	<b>0</b>
<b>DOD</b>	159,424	174,139	36,747	5,745	5,235	<b>381,290</b>
<b>BIA</b>	1,168,632	600,800	231,899	156,575	109,348	<b>2,648,544</b>
<b>Other Federal Agencies</b>	524	58	0	0	0	<b>582</b>

**TABLE 3.** Number of acres in each of the top five Wildland Fire Susceptibility Index classes by state and federal agency. This index rates the likelihood of each acre burning based on factors like its fuels, forest conditions, average weather, and fire history.

### Wildland-Urban Interface Acreage and Percent by State

	<b>WUI Acres</b>	<b>Percent</b>
<b>Alabama</b>	7,717,348	8.70%
<b>Arkansas</b>	3,707,445	4.20%
<b>Florida</b>	6,455,596	7.30%
<b>Georgia</b>	9,012,124	10.20%
<b>Kentucky</b>	6,011,150	6.80%
<b>Louisiana</b>	3,814,381	4.30%
<b>Mississippi</b>	5,139,675	5.80%
<b>N. Carolina</b>	12,772,497	14.40%
<b>Oklahoma</b>	2,850,113	3.20%
<b>S. Carolina</b>	6,468,498	7.30%
<b>Tennessee</b>	7,820,454	8.80%
<b>Texas</b>	8,006,315	9.10%
<b>Virginia</b>	8,658,057	9.80%

**TABLE 4.** Wildland-urban interface acreage and percent of total southern WUI acres by state.

# The Southern Fire Risk Assessment System

The Southern Fire Risk Assessment System (SFRAS) is the software framework for viewing, modeling and creating the wildfire risk assessment maps. It is also used to further analyze wildfire risk and to facilitate planning, management, and fuel reduction activities within any area of interest.

This powerful modeling software can be used to

- determine where fuel reduction efforts can be most effective and which treatments would be most efficient in a local situation,

- display the effect of fuel reduction treatments on reducing risk to communities,
- display the effects of fuel reduction treatments in relation to wildland-urban interface (WUI) or other infrastructure,
- estimate changes in fuels resulting from fuel reduction treatments over a 10-year period, and
- analyze the effect of reallocating fire suppression resource dispatch locations.

In addition, the results of the wildfire risk assessment can be updated in the SFRAS as new information (such as fire history, fuel model acreages, or WUI boundaries) becomes available, which allows for ongoing and current analysis.

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# Additional Resources

## Southern Wildfire Risk Assessment (SWRA)

For more information about the Southern Wildfire Risk Assessment, refer to the following resources:

**Southern Wildfire Risk Assessment:**  
[www.southernwildfirerisk.com](http://www.southernwildfirerisk.com)

**Southern Wildfire Risk Assessment Final Report and Summary Statistics:**  
[www.southernwildfirerisk.com/reports/projectreports.html](http://www.southernwildfirerisk.com/reports/projectreports.html)

**Fire in the South: A Report by the Southern Group of State Foresters:**  
[www.southernwildfirerisk.com/reports/FireInTheSouth1.pdf](http://www.southernwildfirerisk.com/reports/FireInTheSouth1.pdf)

## SWRA Partners

For more information about the partners in this effort, refer to the following Web sites:

**Alabama Forestry Commission**  
[www.forestry.state.al.us](http://www.forestry.state.al.us)

**Arkansas Forestry Commission**  
[www.forestry.state.ar.us](http://www.forestry.state.ar.us)

**Bureau of Indian Affairs**  
[www.doi.gov/bia/](http://www.doi.gov/bia/)

**Florida Division of Forestry**  
[www.fl-dof.com](http://www.fl-dof.com)

**Georgia Forestry Commission**  
[www.gfc.state.ga.us](http://www.gfc.state.ga.us)

**Kentucky Division of Forestry**  
[www.forestry.ky.gov](http://www.forestry.ky.gov)

**Louisiana Department of Agriculture and Forestry**  
[www.ldaf.state.la.us](http://www.ldaf.state.la.us)

**Mississippi Forestry Commission**  
[www.mfc.state.ms.us](http://www.mfc.state.ms.us)

**National Park Service**  
[www.nps.gov](http://www.nps.gov)

**North Carolina Division of Forest Resources**  
[www.dfr.state.nc.us](http://www.dfr.state.nc.us)

**Oklahoma State Department of Agriculture – Forestry Services**  
[www.forestry.ok.gov](http://www.forestry.ok.gov)

**South Carolina Forestry Commission**  
[www.state.sc.us/forest/](http://www.state.sc.us/forest/)

**Southern Group of State Foresters**  
[www.southernforests.org](http://www.southernforests.org)

**Tennessee Department of Agriculture – Division of Forestry**  
[www.state.tn.us/agriculture/forestry/](http://www.state.tn.us/agriculture/forestry/)

**Texas Forest Service**  
[txforestservice.tamu.edu](http://txforestservice.tamu.edu)

**Virginia Department of Forestry**  
[www.dof.virginia.gov](http://www.dof.virginia.gov)

**U.S. Department of Defense**  
[www.defenselink.mil](http://www.defenselink.mil)

**USDI Fish and Wildlife, Southeast Region**  
[www.fws.gov/southeast/](http://www.fws.gov/southeast/)

**USDA Forest Service, InterfaceSouth**  
[www.interfacesouth.org](http://www.interfacesouth.org)

**USDA Forest Service, Region 8**  
[www.fs.fed.us/r8/](http://www.fs.fed.us/r8/)

**USDA Forest Service, Southern Research Station**  
[www.srs.fs.usda.gov](http://www.srs.fs.usda.gov)

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In the **fire-adapted** ecosystems  
of the **South**, the issue is not whether  
an area **will burn** but **when**  
it will burn and at what **intensity**.