

THE NATIONAL COHESIVE WILDLAND FIRE STRATEGY

Southeast Regional Risk Analysis Report



Phase III
Science-
Based
Report



RESILIENT LANDSCAPES
FIRE-ADAPTED COMMUNITIES
FIREFIGHTER SAFETY

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EXECUTIVE SUMMARY

Wildland fire management in the Southeastern United States is complex and multi-faceted. The significant threat posed by unplanned or undesirable fires threatens the lives and well-being of emergency responders and the public, and damages or destroys homes, property, and other values-at-risk. Although the Southeastern region includes just thirteen states, the Commonwealth of Puerto Rico, and the U.S. Virgin Islands, it leads the nation in the number of annual wildland fire ignitions (Fig. 1), with an average of 41,500 unplanned ignitions burning a total of 1.9 million acres every year (NICC 2012).

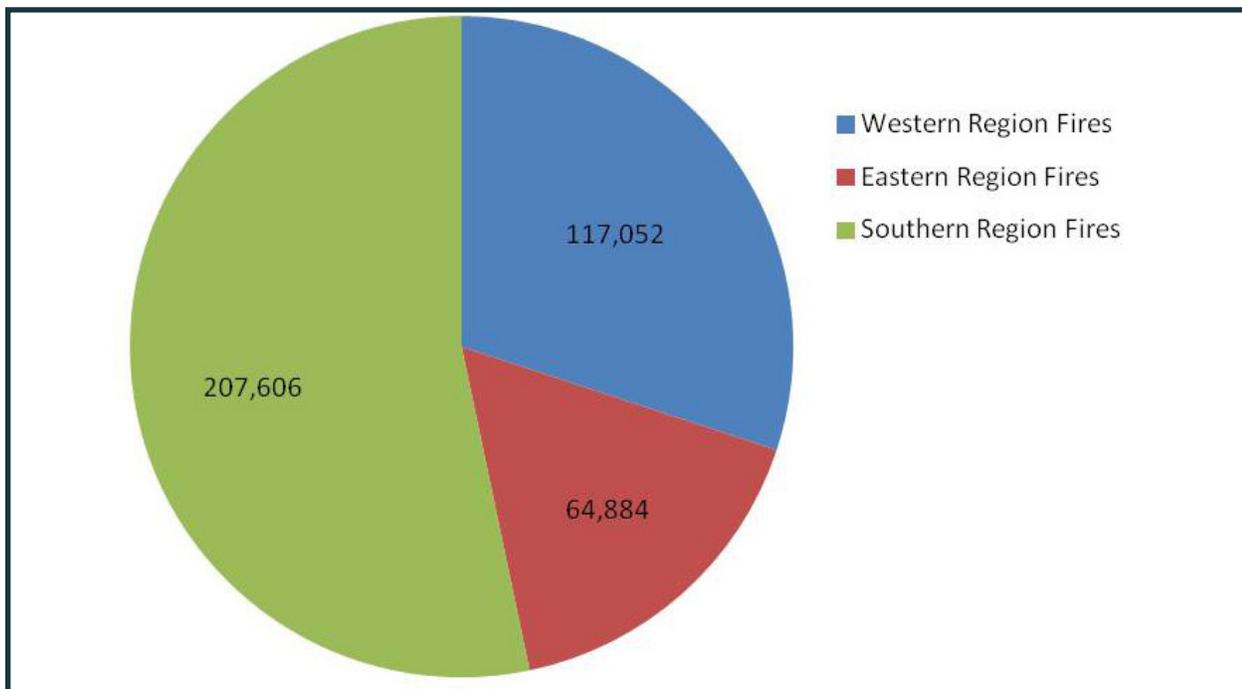


Figure 1. Number of fires by region, 2007–2011 Source: NICC 2012

This management challenge is exacerbated by rapid population growth, rapid expansion of wildland urban interface (WUI) areas, and the fragmentation of land ownership in the region. In 2011, 10 firefighters lost their lives during wildfire management in the Southeast (NIFC 2011). During that same year, in Texas alone 3,993,716 acres were burned by wildland fires, with 5,738 structures destroyed, including 2,946 homes (Texas Forest Service 2012). Today 118,083 Southeastern communities are considered at risk from wildfire (Southern Wildfire Risk Assessment 2006). Of these, 43 percent are assessed as being at very high or high risk from wildfire (Andreu 2008). Wildfire threat to homes is consistently above average due to the number and density of homes throughout the Southeast (Fig. 2).

Over the past decade, population growth in the Southeast has outpaced any other region in the country. According to the 2010 U.S. Census, the South's population grew 14.3 percent between 2000 and 2010 to reach 114.6 million inhabitants at the end of the decade (Fig. 3). As of 2010, six of the ten fastest growing counties were in Southeastern states along with a total of 36 percent of the nation's population (U.S. Census Brief 2010).

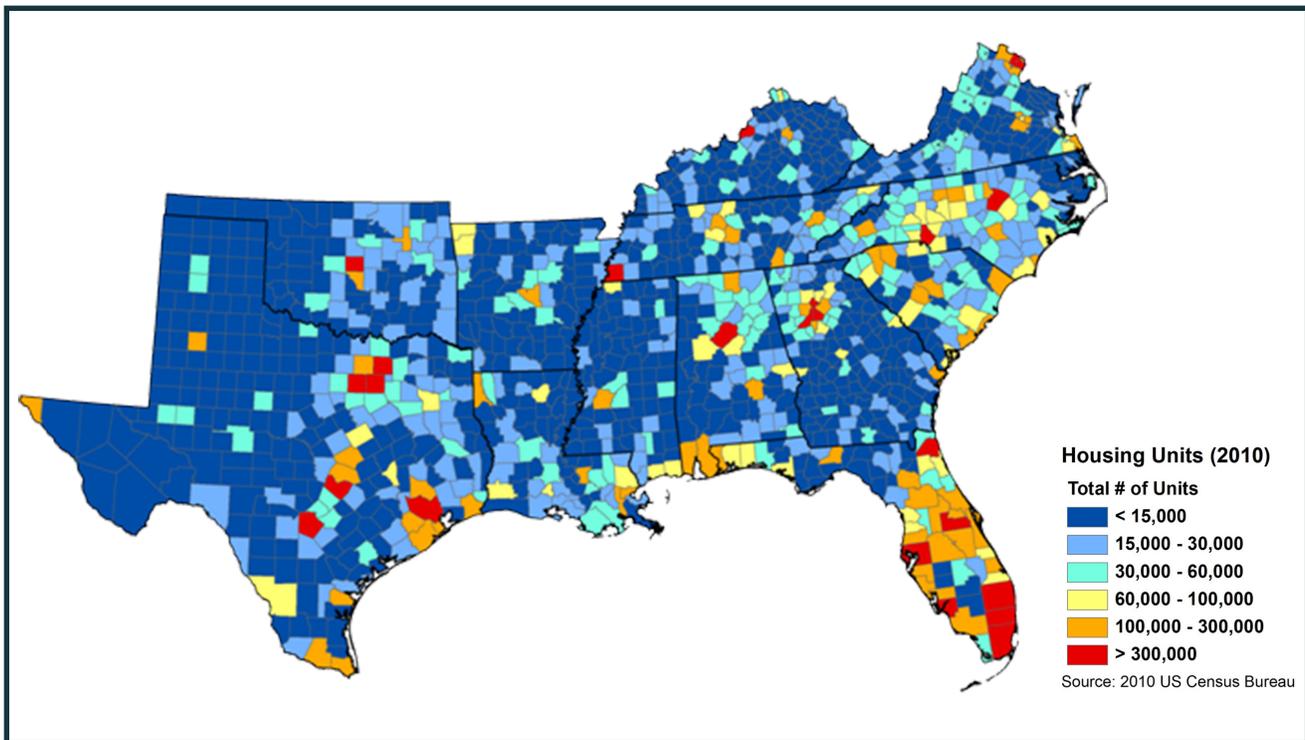


Figure 2. Number of housing units per county in the Southeast

In the past, the Southeastern fire and land management community has relied on cultural and historical acceptance of land management activities including prescribed fire to facilitate their implementation of appropriate management activities. New residents, however, are often unfamiliar with the use of fire as a valuable management tool. This population and an accompanying significant demographic shift, along with other factors, are creating new challenges for the fire management community. It is increasingly more difficult for agencies, organizations, and landowners to plan for and respond effectively to wildfire, while protecting vulnerable WUI communities and providing for firefighter safety. The Southeast has a complex fire environment unlike any other in the nation, with interrelated critical controlling factors influencing wildland fire management including:

1. **Wildfire Activity:** Between 2001 and 2010 nearly half of all national ignitions and over 40 percent of the country's large wildfires occurred in the Southeast.
2. **Large and Rapidly Expanding WUI:** As of 2000, more than half of WUI acres were located within the Southeast.
3. **Smoke Management Challenges:** Smoke impacts safety, health, and quality of life. Smoke-related impacts challenge the fire management community to implement management and response activities safely.
4. **Year-round Fire Season:** Wildland fires burn all 12 months of the year in the Southeast, stressing firefighting capacity and resources.
5. **Area Protected:** More than 420 million terrestrial acres are protected from wildfire by federal, Tribal, and state agencies with just under half (200 million acres) being forested lands.

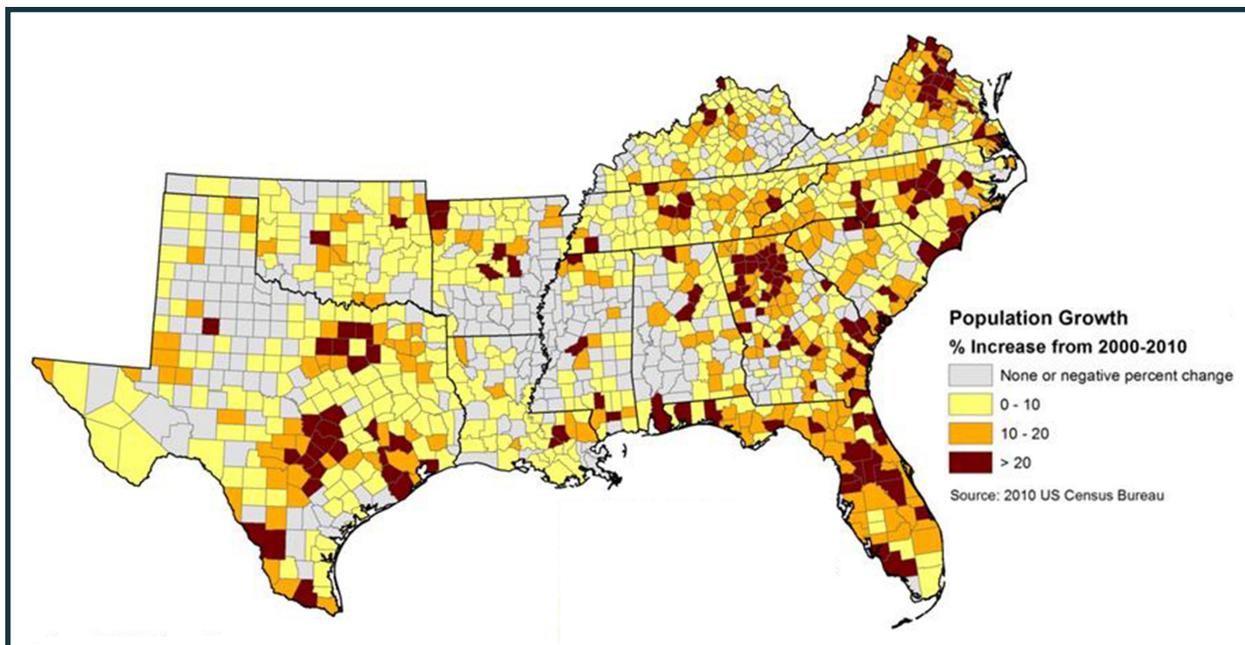


Figure 3. Population growth in the Southeast between 2000 and 2010

6. **Privately Owned Forestland:** Nearly 90 percent of forestland in the Southeast is owned by more than five million private landowners.
7. **Prescribed Burning:** The Southeast leads the nation in prescribed burn acres accomplished on silvicultural land; but issues related to capacity, smoke, and liability are significant obstacles to encouraging practitioners to increase prescribed burning. Prescribed fire must occur at a much greater frequency than elsewhere in the country as a result of the region's rapid vegetation regrowth rate.
8. **Invasive Species:** Many invasive species spread quickly after a wildfire event, contributing to fuel loading and otherwise influencing forest health (e.g., cogongrass (*Imperata cylindrica*)).
9. **Working Forests:** Traditional and new economically viable forest markets support local economies, help curb hazardous fuel accumulation, and serve as a source of local wildfire knowledge, but the long-term strength of these markets is unknown.
10. **Strong Relationships in the Fire Management Community:** An extensive history of excellent cooperation and working relationships exists between agencies, organizations, and local fire departments with other wildland fire management organizations, resulting in a safer, more effective response and collaborative planning for future occurrences.
11. **Rural Fire Departments:** An extensive network of rural fire departments, including many volunteer fire departments, are responsible for many initial responses to wildfires throughout the region.

No single agency, organization, or landowner can adequately address these complex and related challenges on their own. The National Wildland Fire Management Cohesive Strategy (Cohesive

Strategy) is a collaborative, three-phase effort to create a landscape-level national fire strategy that addresses these increasingly complex challenges of wildland fire management in the United States. This national effort is novel in that it has encouraged participation by all individuals and entities with a stake in fire management as partners during the strategy’s development. This diverse stakeholder group includes federal and state land management agencies, local governments, private landowners, environmental groups, Tribal groups, fire professionals, non-governmental organizations, and others. The Cohesive Strategy effort also marks the first time that regions of the country have had an opportunity to provide locally specific input for incorporation into a national strategy. Stakeholders from the Southeast have engaged in the Cohesive Strategy effort during the entire process. During Phase I, national goals were established and a framework for the creation of the strategy was developed. In Phase II, the Southeastern region identified three regional goals and objectives that highlighted challenges, resources, and evolving opportunities unique to the South. The goals identified are:



1. ***Restore and Maintain Landscapes:*** Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
2. ***Create Fire-Adapted Human Communities:*** Human populations and infrastructure can withstand a wildfire without loss of life and property.
3. ***Respond to Fire:*** All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

During the past ten months, the Southeastern region has been in the process of selecting regional alternatives as part of the Phase III process. These regional alternatives focus on identifying specific actions and activities that would best help achieve regional objectives while retaining maximum flexibility for land managers to determine the most appropriate management activities for their property. Six key values important to Southeastern stakeholders were identified early in the Cohesive Strategy process, and helped guide the development of regional alternatives, along with the regional goals and objectives developed during Phase II. For the purpose of this report, those six items were consolidated into five values:

1. ***Firefighter and Public Safety***
2. ***Marketable Products***
3. ***Ecological Services***
4. ***Cultural values***
5. ***Property Loss***

Three Goals of the Southeastern Cohesive Strategy

1. Restore and maintain landscapes
2. Create fire-adapted human communities
3. Respond to fire

Actions and activities from Phase II that were considered best able to enhance regional values and make progress towards achieving regional goals were identified for each of the five value areas. The goal of this process was to identify emphasized alternatives which, using a scientifically-informed approach, would potentially have the greatest positive impact in each value area, developing a suite of potential choices to be used in combination or singly. The diversity of ecosystems, land management goals, and landscapes across the Southeast means that a single solution will not work for everyone. Additionally, with nearly 90 percent of Southeastern land owned privately, decisions cannot be made at the state or regional level for the vast majority of landholdings.



Instead, partners in the Cohesive Strategy may, moving forward, work collectively with land managers and landowners, using the best available information, to encourage and inform their decision-making process to help address issues and challenges related to wildland fire. Several tools have been developed and made available that will continue to inform the decision-making process in the future. Twenty-five actions and activities were identified from the Phase II report and are included in the Alternatives section of this document.

Each decision includes trade-offs and associated costs. Having a number of feasible options that are efficient and effective at focusing on regional goals and values will be valuable for stakeholders. The Southeastern group, with the assistance of regional stakeholders, found several broad themes that ran throughout the actions and activities identified. These themes included:

- 1. Prescribed fire and fire use*
- 2. Fuels treatment other than fire*
- 3. Working forests*
- 4. Planning for fire, forest resiliency and community safety*
- 5. Incentives for fuels management*
- 6. Treatment and restoration of areas affected by natural events and fire*
- 7. Community protection and prevention programs, ordinances and construction, homeowner responsibility, fire prevention*
- 8. Community preparedness, evacuation, and planning by responders*
- 9. Use of technology to inform community leaders*
- 10. Specialized response equipment, training, developing and ensuring adequate staffing of responders*
- 11. Interagency suppression cooperation, MOUs, and Mutual Aid*

The Southeast faces significant and growing challenges related to wildland fire management. Decision-makers and land managers at all levels must weigh trade-offs, goals, and values-at-risk in order to select the most appropriate suite of alternatives that best serve to accomplish land management goals safely and effectively. However, faced with burgeoning population and rapidly growing WUI areas, along with climate change, land ownership fragmentation, decreasing budgets, and other concerns, it is clear that collective action is required. The National Cohesive Wildland Fire Management Cohesive Strategy serves as both a framework as well as a mechanism through which stakeholders in fire management can work together to prepare and protect vulnerable populations from wildfire risk, ensure effective wildfire response, and restore and maintain some of the most intact and extensive fire-adapted landscapes in the United States.

A. INTRODUCTION

The National Cohesive Wildland Fire Management Strategy (Cohesive Strategy) is an innovative national approach to the increasingly complex reality of wildland fire management in the United States. The Cohesive Strategy was developed in response to growing concern over mounting annual costs of fighting wildfires and devastating wildland fire losses to communities and values-at-risk. The Cohesive Strategy acknowledges the reality that fire is a natural process necessary for the maintenance of many ecosystems, and focuses on attempting to reduce the conflict between fire-prone landscapes and people. By simultaneously considering the role of fire in the landscape, the ability of humans to plan for and adapt to living with fire, and the need to be prepared to respond to fire when it occurs, the Cohesive Strategy takes a holistic approach to wildland fire.

The Cohesive Strategy encourages a broad range of stakeholders with an interest in wildland fire or responsibility to help manage fire, to discuss goals and collaboratively develop shared objectives. The Cohesive Strategy effort also engaged natural and social scientists to utilize a novel, facilitated decision making process. This process utilized stakeholder input, expert opinion and a powerful data driven modeling system to demonstrate impacts and tradeoffs around implementation of the Cohesive Strategy. Working through regional strategy committees representing the three distinct regions of the country – the Northeast, the Southeast, and the West, these groups are devising a shared strategy that will guide decision-making to best use ecological, social, and economic resources in preparing for, responding to, and recovering after inevitable wildland fires. The Cohesive Strategy effort in the Southeast owes a great deal to the strategic planning tools already being used by the fire management community in the region, including the Southern Wildfire Risk Assessment (SWRA), Southern Forest Futures, as well as state Forest and Wildlife Action plans. These documents represent valuable resources that are reflected in Southeastern values, and which guide regional and local action by decision-makers and land managers, and will be crucial to developing the Phase III implementation plan.

The Cohesive Strategy differs from previous fire strategies by taking an “all lands” view of wildland fire management. Fire recognizes no boundaries– neither ownership lines, nor jurisdictional borders. Policymakers must take a landscape-level approach and work across boundaries to implement effective management techniques. And all interested stakeholders must be incorporated, including those who own the land, those who use the land, and those who manage the land. The Cohesive Strategy is unprecedented in its focus on initiating dialogue and collaboration on a national scale.

This report will summarize the work done in the Southeast region during the first half of Phase III of the Cohesive Strategy. Actions from Phases I and II also will be described briefly in this report. More information on Phases I and II can be found on the website www.ForestsAndRangelands.gov, including the foundational national documents and Phase I and Phase II reports.

“The Cohesive Strategy differs from previous fire strategies by taking an ‘all lands’ view of wildland fire management.”



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Three Phases of the Cohesive Strategy

The Cohesive Strategy has been developed in three phases. In Phase I, stakeholders met to develop national goals, identify broad performance measures, and establish the guiding principles of the Cohesive Strategy. Phase I also created a framework under which the three regions would create individual assessments and strategies tailored to their unique needs. During Phase II, diverse groups of stakeholders representing each region met independently to identify regional challenges and opportunities as well as key priorities. They developed regional goals, which for the most part are identical to the national goals. The regions focused on how the processes of wildland fire, or the absence thereof, affect their values-at-risk. In Phase II, the Southeastern region broadly defined its objectives and identified actions and activities necessary to achieve those objectives. Phase III will serve as the conclusion of the planning stage of the Cohesive Strategy, during which the goals and objectives are analyzed scientifically, and a thorough risk assessment is added to select alternatives for implementation.

1. Cohesive Strategy Vision, Goals, Performance Measures and Objectives

Core Values and Vision for the Future

The Cohesive Strategy is built on core principles and values, including engaging stakeholders, managers, and scientists; using the best available science, knowledge, and experience; and emphasizing partnerships and collaboration. The Cohesive Strategy sets out a vision for the future of wildland fire management. The vision for the next century is to: “Safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and as a nation, live with wildland fire.”

Guiding Principles

The following guiding principles were crafted with stakeholders in Phase I. These precepts are a central set of principles that broadly apply to stakeholders in the wildland fire and land management community. The guiding principles are centered on the Cohesive Strategy’s three core focus areas: resilient landscapes, fire-adapted communities, and wildfire response. These core values were developed at the national level and were also adopted by the three regions as regional guiding principles:

1. *Reducing risk to firefighters and the public is the first priority in every fire management activity.*
2. *Sound risk management is the foundation for all management activities.*

NATIONAL COHESIVE STRATEGY VISION

To safely and effectively extinguish fire when needed; use fire where allowable; manage our natural resources; and, as a nation, to live with wildland fire.

3. *Actively manage the land to make it more resilient to disturbance, in accordance with management objectives.*
4. *Improve and sustain both community and individual responsibilities to prepare for, respond to and recover from wildfire through capacity-building activities.*
5. *Rigorous wildfire prevention programs are supported across all jurisdictions.*
6. *Wildland fire, as an essential ecological process and natural change agent, may be incorporated into the planning process and wildfire response.*

Three National Goals

Three primary focus areas were identified for the Cohesive Strategy. They are: restoring and maintaining resilient landscapes, creating fire-adapted communities, and responding to wildfires. Flowing from the guiding principles and core values, and focusing on the three primary focus areas, three national goals were adopted in Phase I. The three national goals are:

1. ***Restore and Maintain Landscapes:*** Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
2. ***Fire-Adapted Communities:*** Human populations and infrastructure can withstand a wildfire without loss of life and property.
3. ***Wildfire Response:*** All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

Three Goals of the National Cohesive Strategy

1. Restore and maintain landscapes
2. Fire-adapted communities
3. Wildfire response

In Phase II of the Cohesive Strategy, each of the regions adopted these goals with some modest changes, used them to define objectives and actions, and proposed performance measures and preliminary alternative implementation scenarios.

2. Cohesive Strategy Significance

The Cohesive Strategy represents a novel approach to wildland fire management. It differs from previous efforts in that it includes all the stakeholders as partners and is not focused on landscape management by single government agencies. This strategy is also firmly based on the compilation and analysis of an unprecedented amount and array of data, and uses a uniquely powerful data based analysis of tradeoffs, risks and impacts around the implementation of the strategy. This strategy is based on the best available science, and organized around how the broad consortium of stakeholders with an interest in wildland fire management will corporately approach decision-making. This new approach may not change tactics

that are used on the ground to deal with fire – the programs which exist to reduce excess fuels, to prepare and protect communities, or to suppress fires. It is a strategy, a way of looking at a national challenge and considering landscape-scale solutions that includes all interested stakeholders. The publication of the Phase III reports is not the end of the Cohesive Strategy process. It is only the end of the planning stage of the strategy development. A trade-off analysis process will be developed at the national process and included in the National Risk Analysis Plan to be completed in 2013. Implementation of the strategy by the diverse partners that have been involved in its development will continue.

This Southeastern Regional Risk Analysis report includes a description of the issues being addressed by the Cohesive Strategy, alternative approaches with emphasized actions grouped in five value sets available to address the risks, and a characterization of wildland fire risks. This report identifies and evaluates variables and the results will enable decision-makers to prepare communities for inevitable wildfire events without loss of life or critical infrastructure while decreasing the potential for extreme wildfire behavior through hazardous fuels reduction treatments.

America's wildland fire challenges are complex and difficult to solve independently. The risk analysis will also improve Southeastern stakeholders' collective understanding of the extent and geographic locations of risks and opportunities that could influence wildland fire management decisions. Risk assessment and analysis provides scalable information to managers for reducing risk at the national, regional, and local levels. Alternatives represent opportunities to focus on various regional Cohesive Strategy values that might be of particular interest to a stakeholder: cultural values, firefighter safety, marketable products, ecological values, and property loss. The analysis looks at wildland fire-related challenges and identifies opportunities managers at any level can use within the Southeastern region. The alternatives are not mutually exclusive, and there is no one preferred alternative to be applied across the Southeast. Rather, the emphasized alternatives present investment options that are believed to offer the greatest positive impact. They need to be balanced to achieve strategic goals and implement effective wildland fire management.

Narrative accompanied by graphics, tables, and maps are presented that highlight spatial differences and topical issues in the Southeastern Region. These narratives also highlight the opportunities and potential barriers to achieving substantial reduction in regional wildland fire risks. The intent of the risk analysis is not to make a final decision as to which alternative management options will be selected. Rather, the intent is to derive information useful for further deliberations among stakeholders, partners, agencies, and policymakers at all levels. This report is intended to enable Cohesive Strategy partners to understand how their choices might align with reductions in risk, given a common understanding of regional and national wildland fire risks across the landscape, supported by scientific analysis.





The Cohesive Strategy Phase III risk analysis and report establishes a new approach to implementing a national wildland fire management strategy by recognizing the significant differences in stakeholders, wildland fire challenges, and opportunities across the various regions of the Southeast. Success in achieving the three broad goals of the Cohesive Strategy is a long-term proposition – no single decision by policymakers or management action by land managers will solve

the nation's complex wildland fire issues. The strength and success of this Phase III report will lie in its ability to motivate collaborative action to reduce wildland fire risk by the diverse agencies, organizations, and partners involved in the wildland fire issue.

Alternatives neither identify specific implementation actions (i.e., who will do what, where, how, and when), nor specific process actions. However, it is expected that the analysis will inform specific actions the region may wish to pursue, such as increasing investments that improve the capability of local fire departments to assist with wildland fire suppression, or fostering collaborative action by communities that reduces their exposure to wildland fire risk. These types of specific actions will be identified as part of the Southeastern Regional Action Plan, developed by the Southeastern Regional Strategy Committee (RSC) in parallel with the other two regions.

Future Steps in Phase III

The Southeastern Risk Analysis, along with the other two regional risk analyses, will inform a national effort to assess and define national findings. The resulting national report will provide an executive summary of the regional risk analyses; document the risk analysis process including an explanation of risk characterization; summarize the regional analyses; describe the national-level findings and commitments based on regional risk analyses; and identify next steps for the Cohesive Strategy effort.

A Southeastern Regional Action Plan will follow the creation of the regional risk analysis focused on capturing actions the RSC has agreed to pursue during the next five years to make progress towards achieving the three national goals of the Cohesive Strategy. The action plan will develop a program of work and identify which stakeholders will be responsible for accomplishing specific plan elements along with a timeline for completion. The intent is to create a mechanism for recording commitments the RSC has made and to ensure accountability in completing the actions.

The actions outlined in the Regional Action Plan document are the initial efforts for implementation of the Cohesive Strategy at the regional and local levels, in an effort to make a positive difference on the ground. Specific actions will likely focus on process improvements related to the immediate opportunities for successful risk-reduction that were identified; the barriers and solutions within the region's decision space; pursuing the alternatives in whole or in part; providing information as a result of the regional or national risk analysis; presenting feedback received through the communication and outreach effort, and/or feedback based on stakeholder involvement throughout Phase III.

3. Role of Science in the Development of the Cohesive Strategy

Wildland fire is a complex issue that involves multiple interacting variables spanning the natural, human, and constructed environments. Over the past year, the National Science and Analysis Team (NSAT) has developed conceptual models to examine the interactions and relationships among variables related to wildland fire and risk. The NSAT identified a significant number of factors relevant to wildland fire management in the Southeastern region, and gathered data related to those factors. After amassing those data, the NSAT went through an expert-driven process to correct errors, eliminate gaps and standardize data resulting in a picture of wildland fire factors throughout the United States at the county level. Working closely with the RSC, the NSAT pared down the amount of data being considered to factors identified as clear priorities in the Southeast. In September 2012, the NSAT presented the results of their efforts to the RSC and engaged in a collaborative effort to identify regional alternatives using Bayesian Belief Networks (BBNs) to visually illustrate and explore relationships between the data. As a part of the Comparative Risk Analysis Framework and Tools (CRAFT) process (detailed below), this powerful approach has application well beyond this phase of the strategy. Moving forward, stakeholders in the Cohesive Strategy will have the opportunity to use BBNs and the CRAFT associated tools to understand the interactions and tradeoffs of these complex factors at the county, state and landscape level which should help guide management decisions at all levels.



B. SOUTHEASTERN PHASE III REGIONAL REPORT

DRAFT ALTERNATIVES

Introduction

Managing fire in the Southeastern United States is complex. No single management scenario will adequately meet the various needs of all interested stakeholders and the public. The Southeastern mainland includes four geophysical zones and 19 ecological sections across 13 states with 86 percent of the forests in private ownership (Forest Futures 2011, Gramley 2006, Butler and Wear 2011, Wear and Greiss 2011). Prior to developing alternative management strategies, it was necessary to determine what drives the decision-making process for the wide variety of landowners across the diverse Southeastern landscape. Six values important to stakeholders across the region were identified (Fig. 4) at the onset of the Cohesive Strategy (for the purposes of this report Firefighter and Public Safety have been combined), including:

1. *Firefighter and Public Safety*
2. *Marketable Products*
3. *Property Loss*
4. *Ecological Services*
5. *Cultural values*

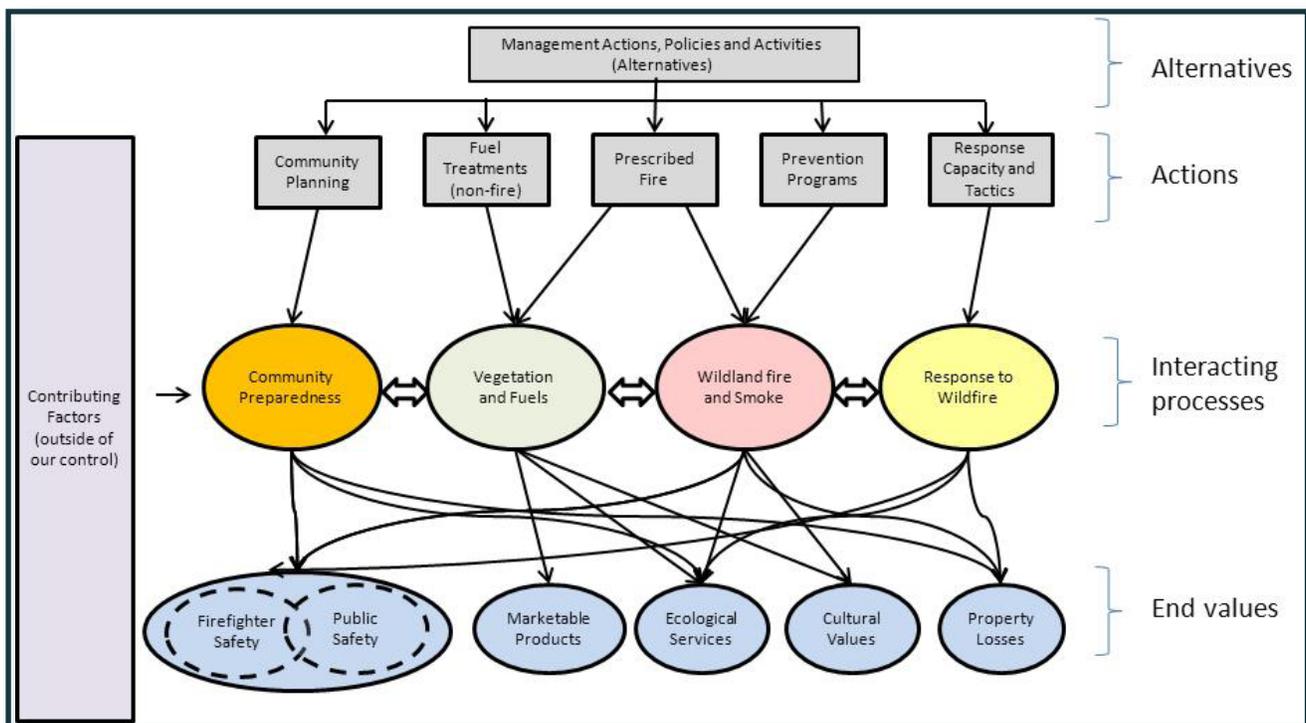


Figure 4. Roadmap infographic

When developing alternatives to current management scenarios, the foci were to improve or sustain these regional values while working toward accomplishing the Cohesive Strategy's three goals.

A key difference between the Cohesive Strategy effort and past collaborative planning efforts was the methodology employed for planning and analysis. A comparative risk assessment tool was used in Phases II and III, which built in the ability to comparatively evaluate the results of various alternative wildland fire management strategies. The Comparative Risk Assessment Framework



and Tools (CRAFT) planning and analysis process, implemented in Phase II, guided each region in identifying values, goals, objectives, actions, and activities. Using the CRAFT framework for Phase III, the Southeastern RSC was able to develop multiple management scenarios to aid in producing alternatives which could aid the region in meeting Southeastern identified goals and objectives. Multiple alternative strategies were developed for stakeholders and managers to consider in a risk trade-off analysis.

Given the premium placed on collaboration and engagement within the Cohesive Strategy, it was important that the quantitative aspects of risk assessment be embedded within a broader social discussion of values, options, potential consequences, and trade-offs. CRAFT is a structured process and set of tools designed to meet the needs of collaborative efforts to tackle complex resource management issues with conflicting values at stake and high levels of uncertainty.

The CRAFT framework provided a list of 26 questions for the Southeastern region to consider in the development of the Southeastern risk assessment during Phase II. The questions were developed in order to identify regional challenges and opportunities. This process included engagement in forums and the solicitation of stakeholder comments, which constituted an integral part of the risk assessment development. This effort yielded specific regional priority values and management objectives aimed at achieving the three regional goals of the Cohesive Strategy. Six values were developed; two (Firefighter and Public Safety) were combined for the purposes of this report.

By scoring the actions identified in phase II within each objective with the potential impact it had on each value, the stakeholders represented on the RSC were able to develop a process for determining regional investment options and alternatives to achieve the Cohesive Strategy goals in the Southeast. Due to time constraints, an analysis of different alternatives using the alternatives matrix described above was completed to assist in determining appropriate investment options. The process involved assigning numerical assessments of importance to the intersection of each value and management objective. The guidelines for completing this process are described in Appendix 9. The set of numbers after each activity and action listed for the regional values is consistent with the numbering from the Phase II Regional Assessment. Discussed below are the emphasized actions and activities separated into each of the five value sets. By grouping them by value set, stakeholders can easily associate with a value or two and easily focus on actions applicable to each value

Firefighter and Public Safety

Firefighters and the public throughout the Southeast are impacted by an increasingly complex, rapidly evolving fire environment. Population growth in the region has accelerated the development and growth of the WUI as well as increasing fragmentation and change in ownership of lands (Fig. 5 – Note that this is a map derived for the Southeast using the BBN approach as discussed in the Risk Analysis).

The WUI Area map was constructed using statistical techniques that produce a composite index based on a linear combination of multiple variables. These variables collectively characterize the spatial distribution of urban, rural, and agricultural communities and the proportions of homes within each.

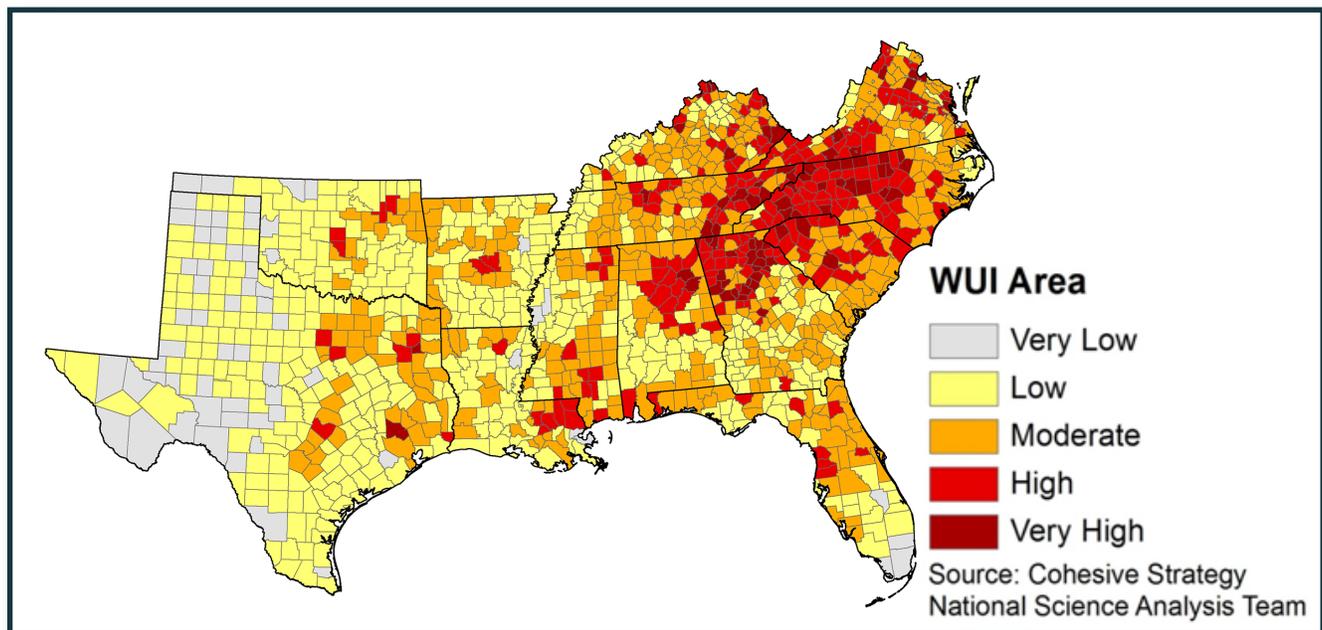


Figure 5. WUI area in the Southeast

This particular map is highly correlated with the amount of area within each county that is located within the wildland urban interface and moderately correlated with the proportion of homes located there. The map shows that the Southeast generally has a large percentage of total land area in a WUI setting. In other words, due to the high level of private ownership in the southeast, much of the rural landscape is characterized by homes in the forest.

More than 88 million acres in the Southeast are classified as WUI, which is characterized by homes or communities adjacent to or within fire-prone natural areas (Andreu 2008). Along with the increase in management complexity related to the growth of the WUI, fire management organizations face increased expectations and dwindling resources. Today, fire responses comprised of multiple agencies and organizations are standard, and ensuring firefighter safety depends on interagency training. This standardized training ensures effective communications and interoperability across agencies and jurisdictions. Capacity and capability building is also necessary to ensure adequate resources are available for a safe response, in addition to awareness of personal responsibility for safety during all fire management activities. Despite this preplanning and continuous training, each year emergency responders in the region suffer injuries and fatalities. Injuries and fatalities to emergency responders pose

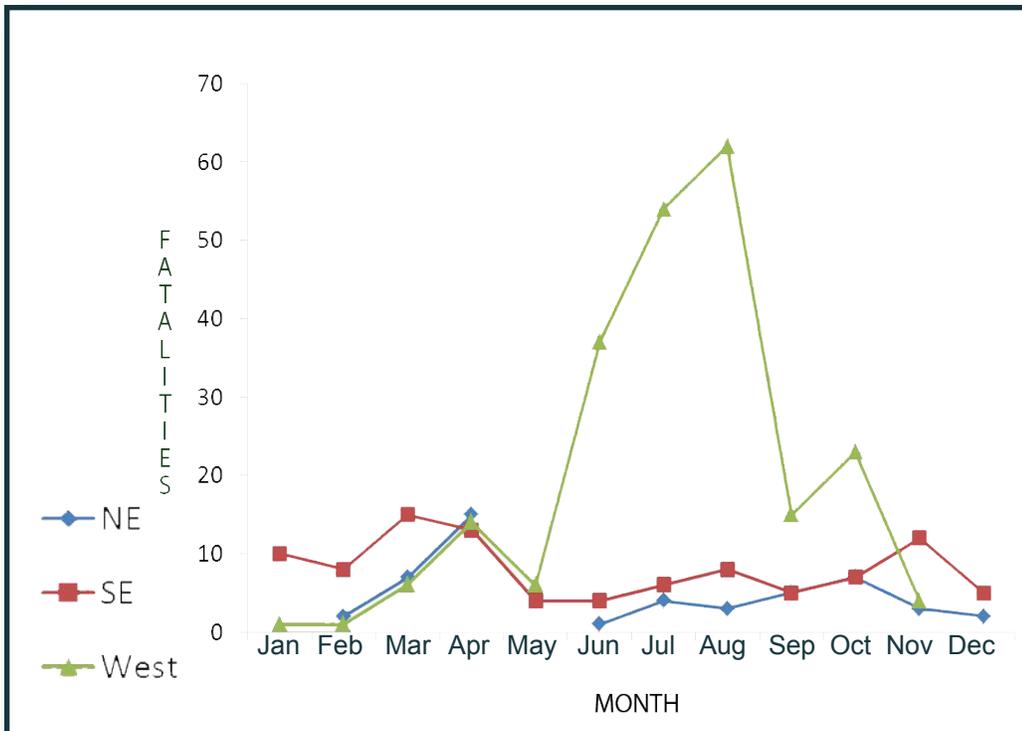


Figure 6. Monthly fatalities of firefighters responding to outdoor fires by region (1990 - 2002).

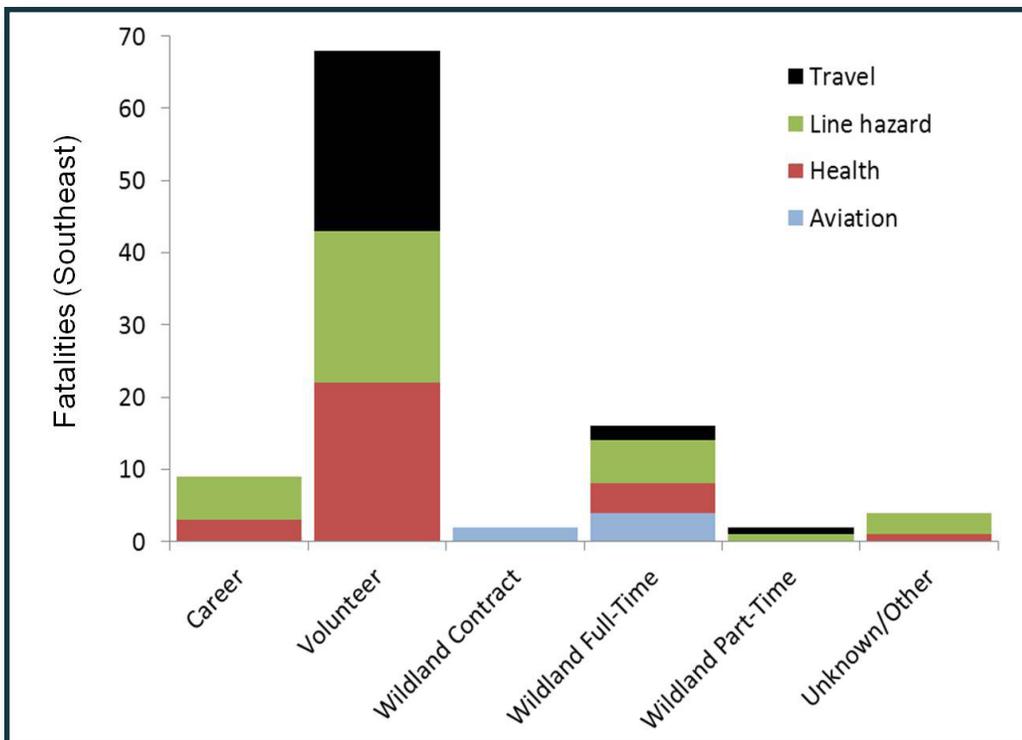


Figure 7. Firefighter fatalities during wildland fire response by occupation and activity (1990 - 2001)

a particular issue in the fire-prone Southeast, where wildfires burn twelve months out of the year (Fig. 6).

All emergency responders must maintain alertness and readiness for a safe fire response year-round. However, in the Southeast region, volunteer firefighters are at particularly high risk of death during wildfire response (Fig. 7).

The data analyzed by the NSAT demonstrate that volunteer firefighters experience higher occurrences of injuries or fatalities during wildland fire response. Risk to younger firefighters can be eased through capacity-building and training, but older firefighters require health screening to reduce the risk of injuries or death. Southeastern residents also are at risk of injury or death due to

wildland fire. One way to look at this risk is by examining demographic stress in the region. One of the key factors calculated in the NSAT's BBN analysis is a county-level understanding of demographic stress in the Southeastern region (Fig. 8).

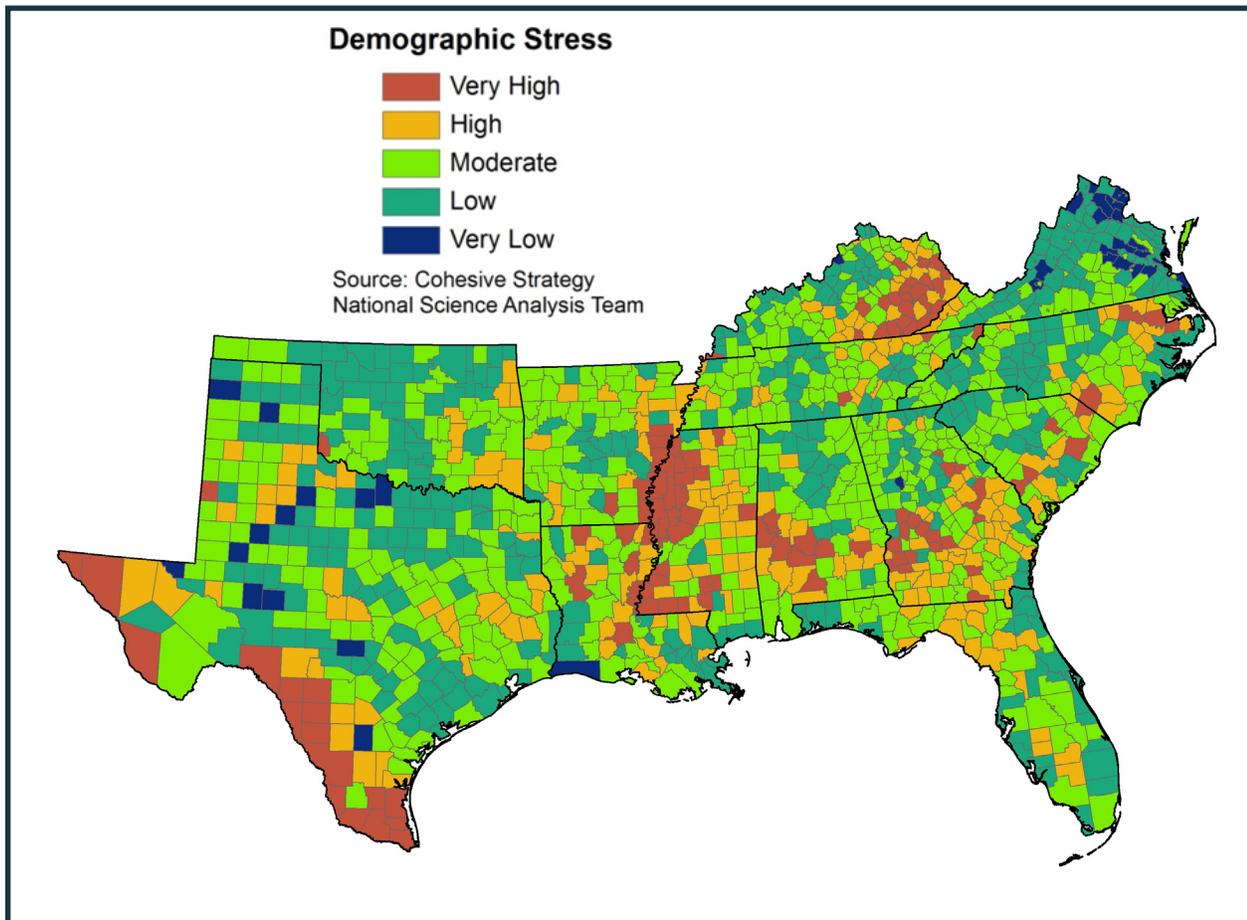


Figure 8. Demographic stress in the Southeast

The populations within these counties have high stress factors (i.e., overall low income, poor education, and experience high rates of unemployment, along with other demographics) that limit the ability of the local population to assume proactive personal responsibility to keep their families and their communities out of harm's way.

Feasible alternatives to the status quo would focus on actions and activities that reduce the risk of injury to firefighters and the public while eliminating loss of life during wildfire response. Actions and activities that would have the most significant impact on enhancing firefighter and public safety, as well as achieving regional goals, have been identified from the Phase II Regional Assessment and are as follows:

1. Utilize prioritization in SWRA and other efforts to identify and treat wildland fuels in areas that will facilitate tactical defense of human communities or ecological values and services from wildfire (tactical fuel breaks). (1.2.2)

2. Increase community preparedness and mobilization abilities (e.g., evacuation) and increase coordination and planning between local, state, and federal responders prior to wildfire ignition. (2.2.3)
3. Train, develop, and increase state, federal, Tribal, and local agencies and cooperating entities capacity for wildland fire management to ensure staffing levels meet operational needs. Utilize training academies and improved MOUs to increase response capacity, including awareness of risk management techniques. (3.1.1)
4. Investigate and invest in the development and deployment of specialized fire suppression equipment to increase the efficiency and effectiveness of wildland fire suppression activities. Ensure that specialized equipment is available to all entities that have a role in wildland fire suppression. (3.2.2)
5. Utilize relationships to increase interagency cooperation during wildland fire suppression. Develop/encourage the implementation of statewide mutual aid agreements and cross-jurisdiction MOUs, including Cooperative Fire Agreement billing. Support development of interagency all hazard Type 3 IMTs. (3.2.4)

SHARING SUCCESSES — EXPANDING OPPORTUNITIES

- *SouthWRAP* – This forthcoming update to the Southern Wildfire Risk Assessment (SWRA) will make SWRA data and reports accessible to community planners, wildfire responders, homeowners, and other interested stakeholders online. This development serves to significantly expand the utility of this valuable fire planning tool.
- *Texas Insurance Fund for Rural Fire Department (RFD) Support* – Since the beginning of the Rural Fire Department Assistance Program a decade ago, Texas A&M Forest Service has distributed grants to 1,683 different RFDs. These grants have been used to purchase much-needed equipment and provide training for the volunteers that staff them. Of the RFDs receiving grants, 1,415 have used them to purchase fire trucks, and 29 RFDs received emergency grants to replace damaged fire trucks. This innovative program might be used as a model for other Southeastern states interested in developing similar programs.

Fire response in the Southeast has historically depended on close collaboration between a variety of responders including federal, state and local government, volunteers, private industry and non-governmental organizations (NGO). Federal and state governments do not own large contiguous land-holdings in the Southeast but a patchwork of holdings spread across the landscape (Fig. 9). Thus, initial response is mostly local. The family segment of this figure represents more than three million families and individuals. The 29% that is held by corporate owners continues to shrink and become more fragmented.

Additionally, as fragmentation of private land in the Southeastern United States continues, challenges associated with land management and wildfire response are only expected to increase (Fig. 10).

Further expansion of the WUI is increasing the workload on fire management organizations at all levels. At the same time, agencies and organizations have experienced constrictions on available resources with which to accomplish wildland fire response and management. Today, rural fire departments are

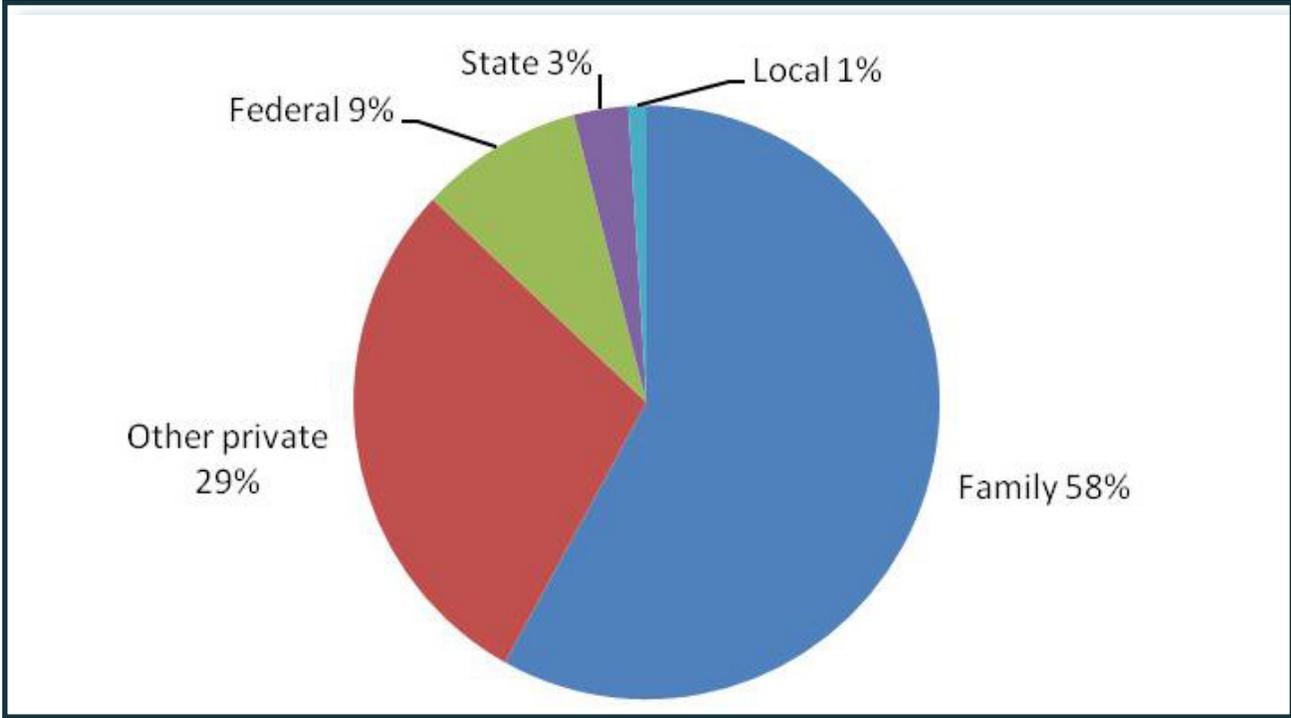


Figure 9. Distribution of forest ownership in the Southern U.S. 2006. Source: Southern Forest Futures Project.

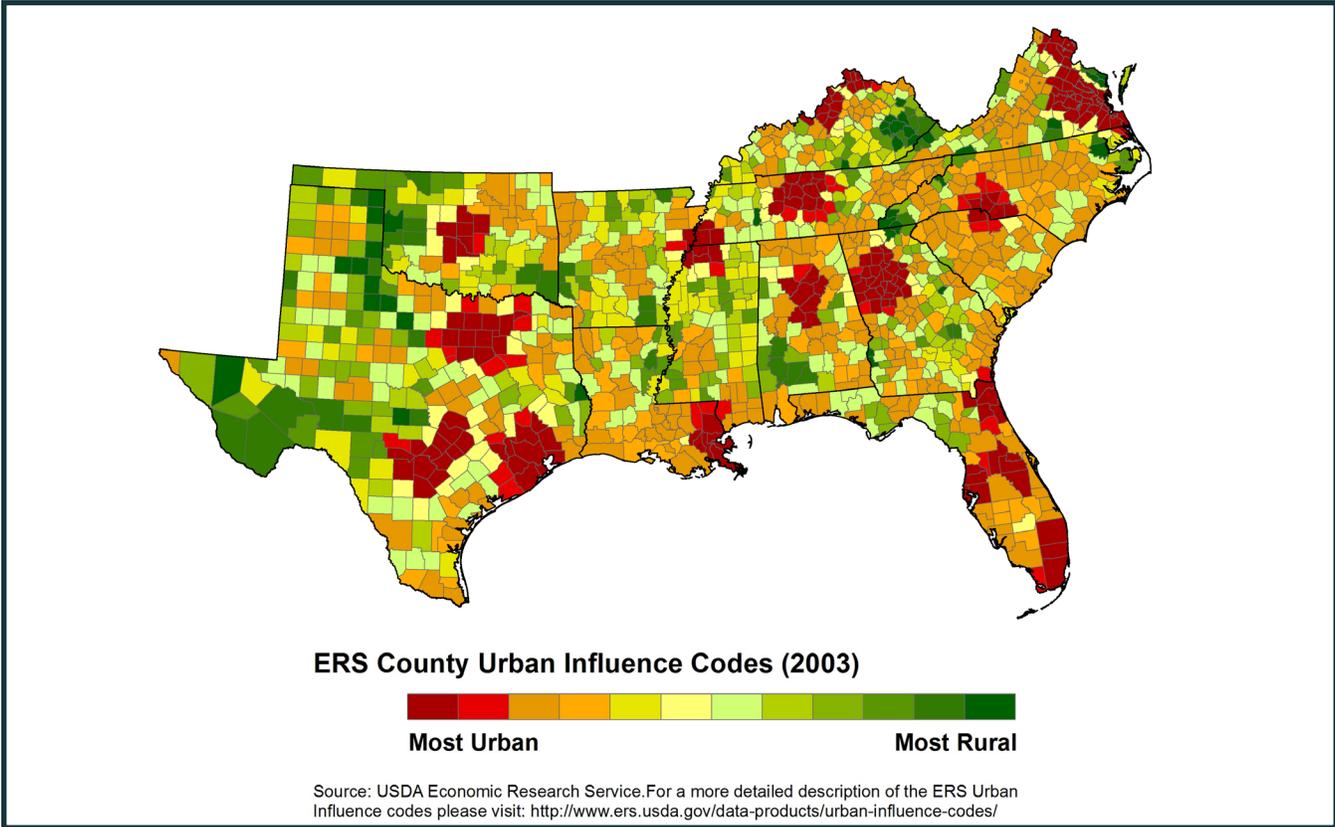


Figure 10. Urban to rural gradient map illustrating urban influence by county in the Southeast

increasingly responsible for initial response to wildfires throughout the Southeast, meaning the need for capacity-building and training is significant throughout the region. Too, in many areas of the Southeast, volunteer and rural fire departments are geographically distant from each other, increasing strain and risk on responders (Fig. 11).

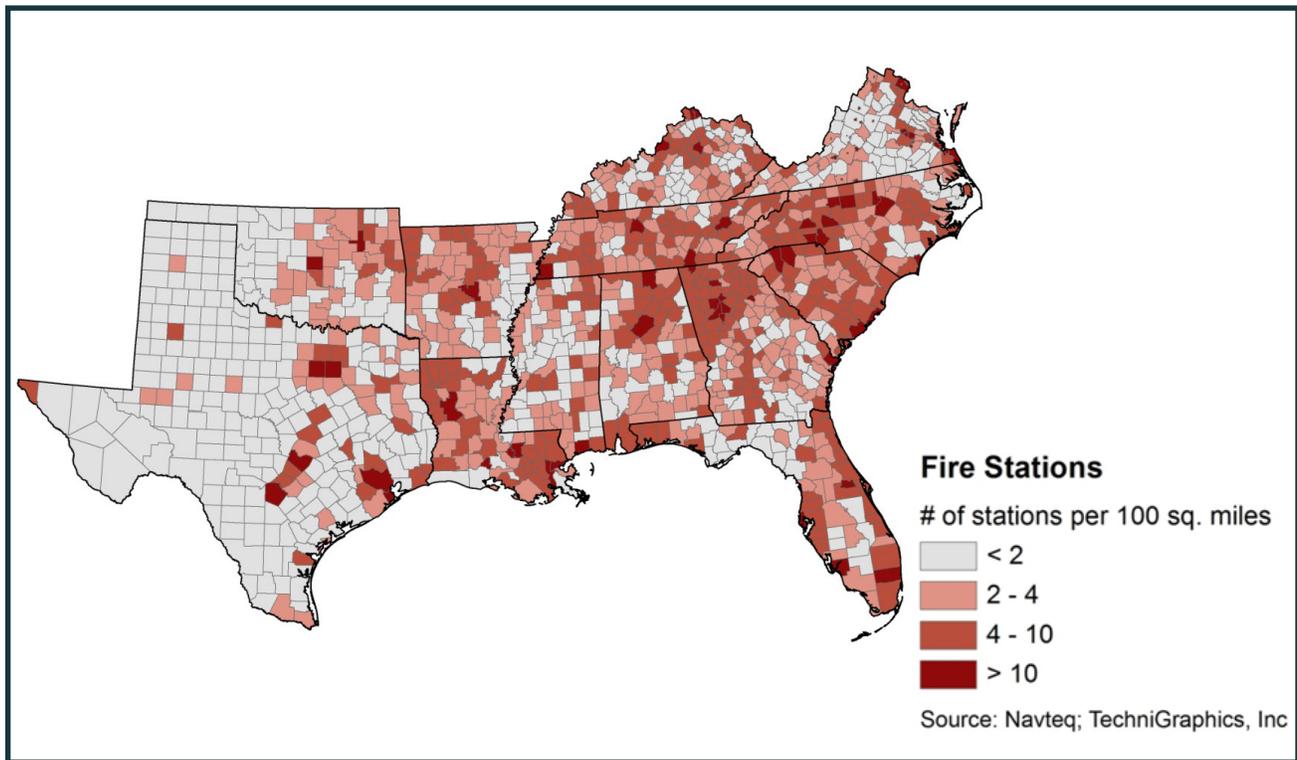


Figure 11. Fire stations in the Southeast

Continuous interagency training that emphasizes interoperability and interdependence may be the only way to ensure a safe and effective response to fire. Agencies and organizations may realize cost savings through cost pooling, by utilizing common resources and by conducting training in partnership with multiple fire management organizations. These multi-agency/organization trainings also provide opportunities to develop professional relationships between agencies, organizations and first responders at all levels.

The current environment of limited resources requires prioritizing fuel treatments to achieve the greatest return on investment. Regional tools have been developed to guide the effective location and implementation of wildland fuels treatments, such as the SWRA and other documents. The SWRA provides a strategic view for wildland fire and environmental managers who are focused on improving public safety, and protecting Southeastern states from significant property losses (Spencer 2010). State forest action plans and wildlife action plans also serve as significant resources in setting management priorities.

The rapid growth of the WUI in the Southeast means that firefighters responding to wildfires are increasingly responding to WUI fires, in which fire is burning in both undeveloped vegetation as well as endangering or burning managed vegetation or human structures (Fig. 12).

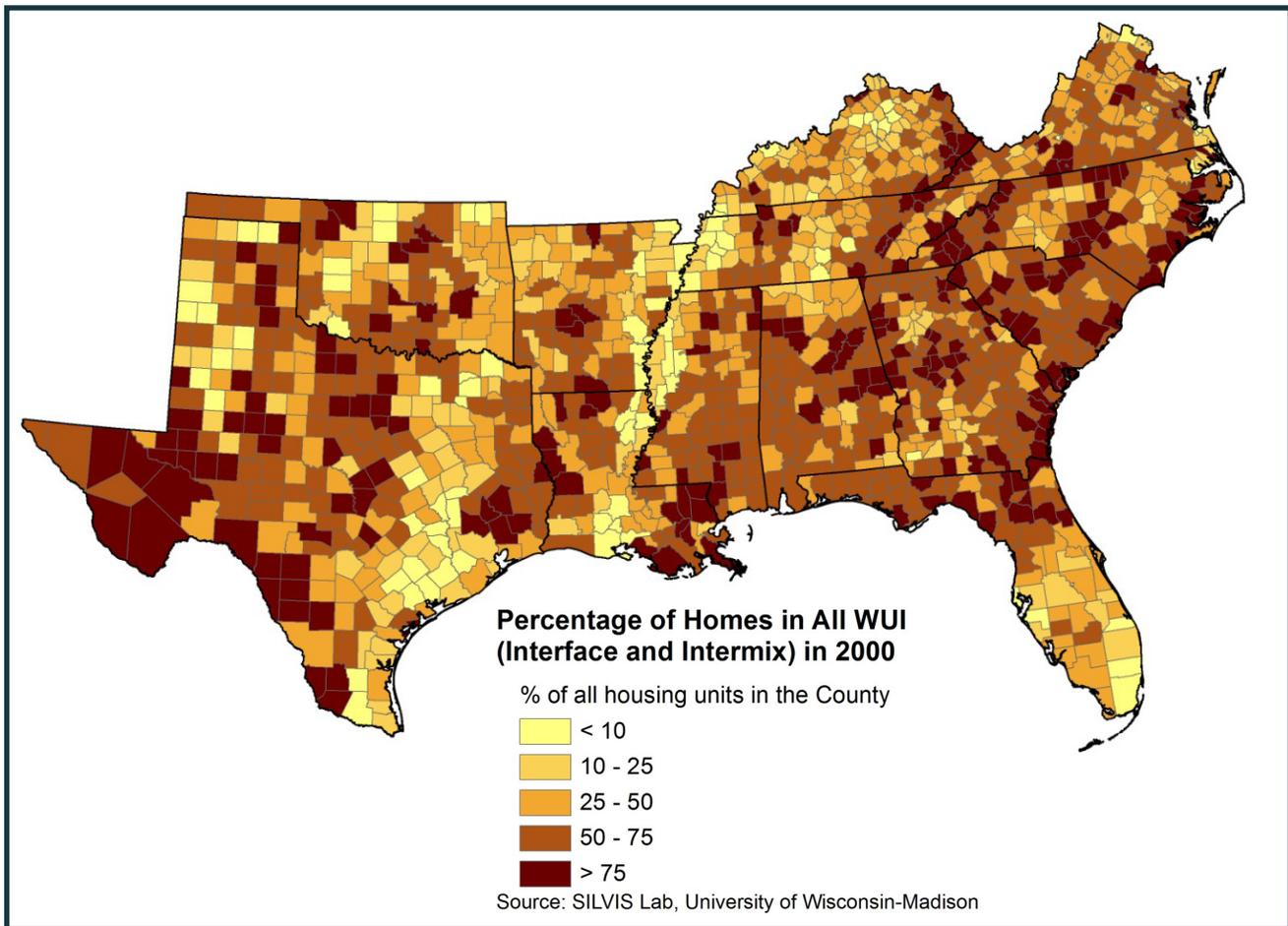


Figure 12. Percent of homes in all WUI (interface and intermix) in 2000 in the Southeast

The WUI environment is a more complex and potentially more dangerous environment than the traditional wildland environment. In the Southeastern U.S., 43 percent, or more than 50,000 communities, are at high to very high risk of wildfire damage (Andreu 2008). Outreach to those who live and work in WUI areas and development of preparedness and evacuation plans results in safer and faster public egress from WUI areas, as well as safer ingress for first responders. Numerous efforts focused on community engagement exist, including Firewise Communities/USA®, “Ready, Set, Go!” and the “One Message, Many Voices” campaign. Figure 13 shows fire hazard (based on the combined wildfire and outdoor fire occurrence records in federal, state and local (NFIRS) datasets) relative to known Fire-Adapted Communities (FAC) programs.

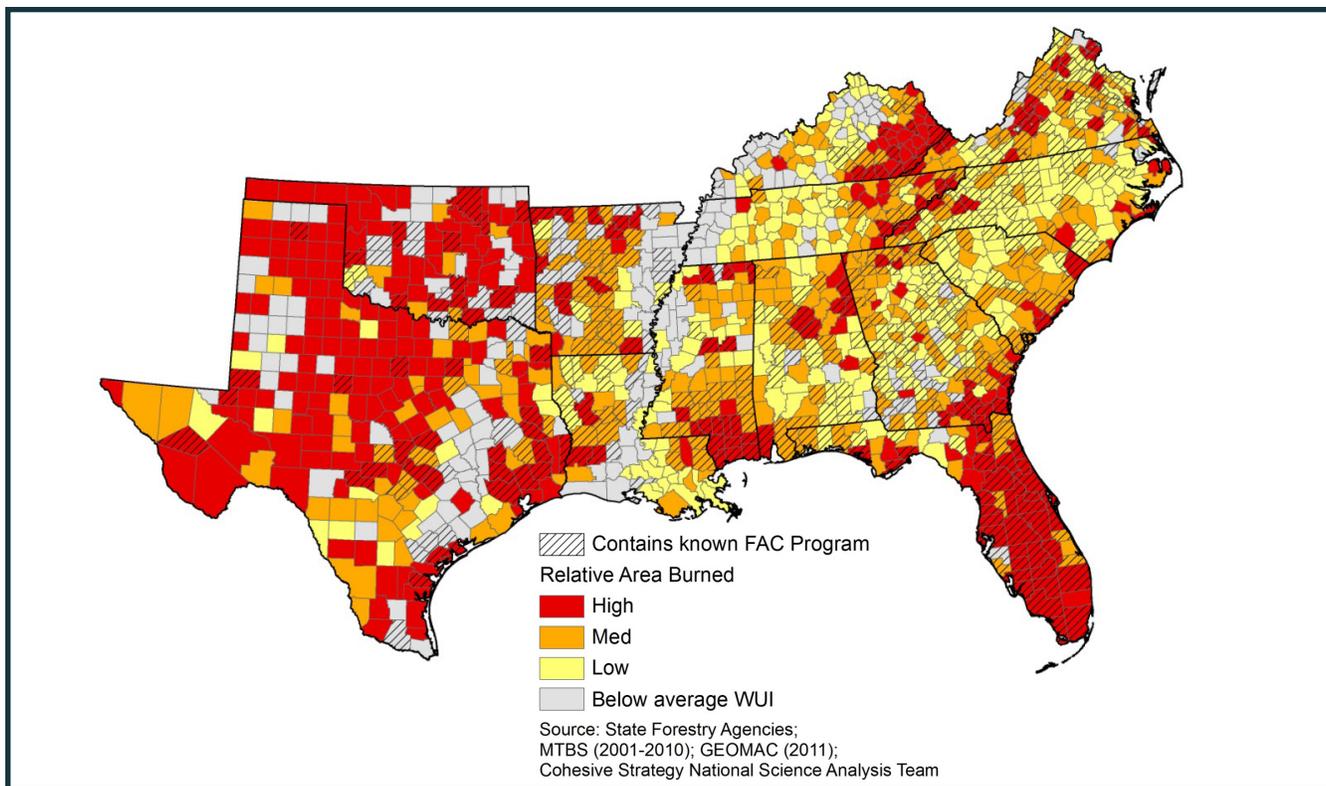


Figure 13. Fire-Adapted Community (FAC) programs and fire risk for the Southeast.

Prestemon et al. (2010) showed that increasing wildfire prevention education (WPE) could lead to benefits (i.e. a reduction in damages caused by wildfires) that were 35 times more effective than the additional spending associated with the increased education. In addition to community outreach, fire management agencies and organizations at all levels may realize substantial returns on investment by engaging in proactive planning with government and non-governmental emergency response partners prior to an ignition.

Developing professional relationships among incident responders and between responders and the public, creating the tools necessary to increase efficiency and effectiveness during a response, increasing community preparedness, and treating fuels could increase safety for the public and firefighters.

Mitigating risk of injury or death to responders as well as the public as a result of fire management activities is of key importance in the Southeast. These selected actions and activities may, as part of a suite of other alternatives, serve to reduce the risk to responders and the public during wildfire response.

At the national level, Phase III will continue with development of a national risk analysis and a national action plan. The NSAT will develop a comparative risk model using the data sets, and will develop a national trade-off analysis. When the comparative risk and trade-off analyses are complete, a National Phase III Risk Analysis Report will be written to bring together the issues and alternatives discussed in the three regional reports. A National Action Plan will be developed based on the national risk and trade-off analyses.

Marketable Products

Though the Southeast has significant and diverse number of marketable products that directly or indirectly are sourced from forest products, ranging from traditional goods such as baskets woven by Tribal crafters to wild-crafted products harvested from forest lands, timber production constitutes the largest market in the region. Forest landowners in the Southeastern U.S. produce more timber than any country outside the United States (Fig. 14). Favorable climate, soils, and species composition coupled with effective forest management has led to steady increases in growing stock volume over the past century (Wear et al. 2011).

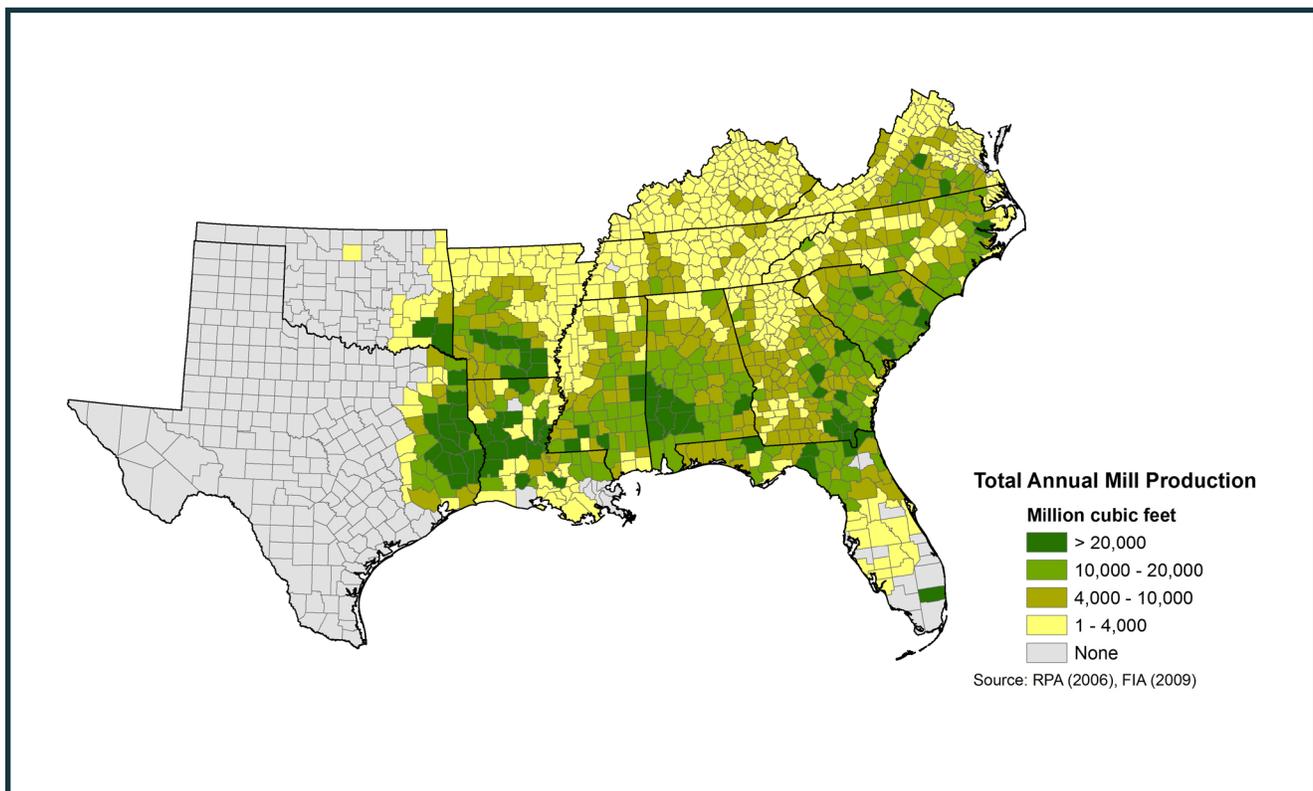


Figure 14. Timber production in the Southeast

Marketable products provide an opportunity for mechanical fuel treatments in the Southeast. As individuals and communities, especially in the WUI, look for ways to treat their fuel problems, the economic markets available in the Southeast may offer the greatest number of viable options. The timber produced has been used primarily for traditional purposes, such as lumber and pulp. Recently, contraction of the national housing market has caused a reduction in market demand for timber, and thus a drop in falling lumber values, resulting in decreased timber harvesting in the region. However, other potential

opportunities exist for landowners outside traditional timber markets including agroforestry systems, specialized forest products, biomass-based energy (Fig. 15), and CO₂ sequestration.

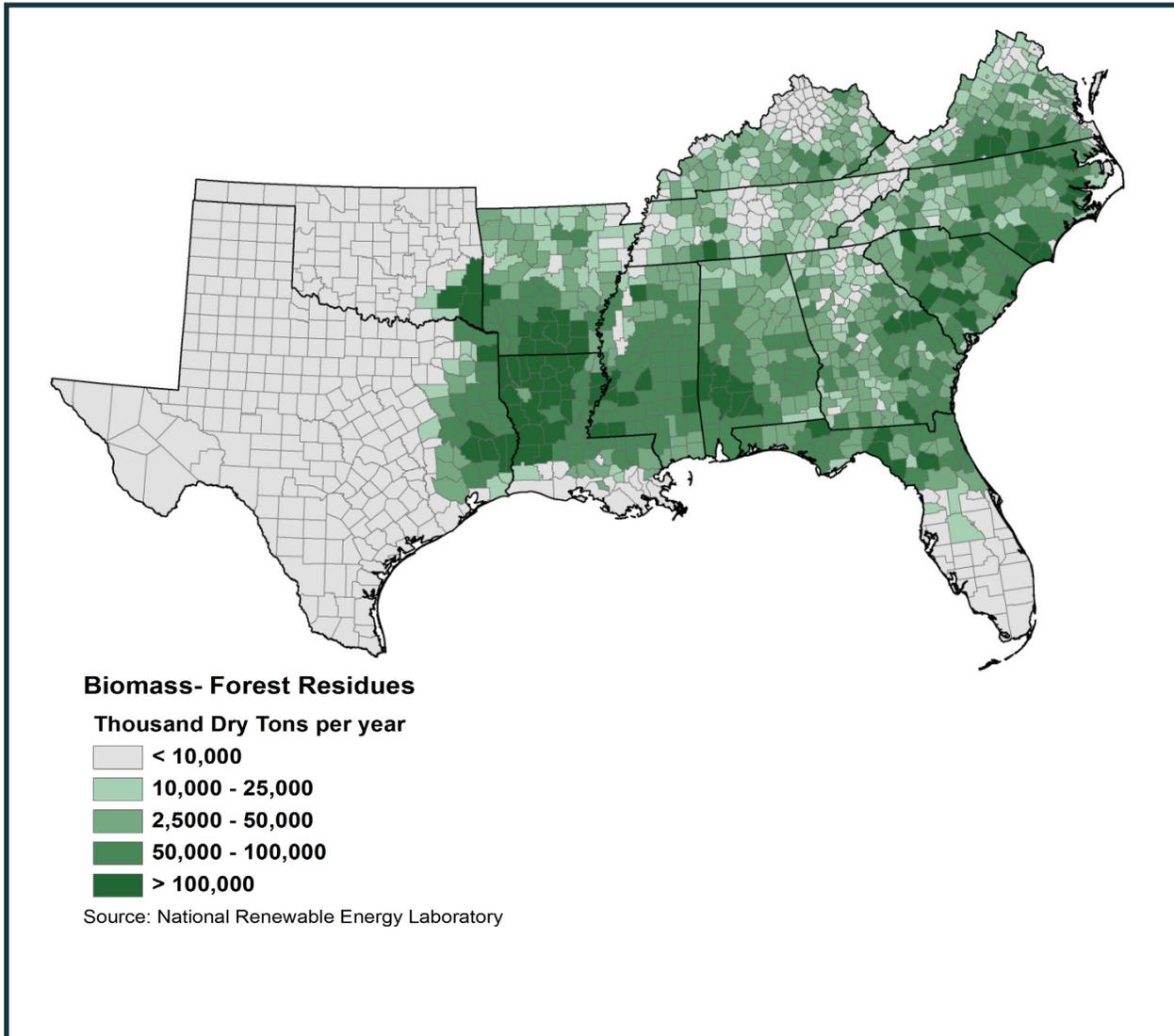


Figure 15. Southeastern biomass – forest residues, in thousand dry tons per year.

Fire management programs that include hazardous fuels reduction objectives have an opportunity to contribute to traditional and non-traditional forest product markets in the region by providing the supply for non-traditional products.

Feasible management alternatives to the status quo would focus on actions and activities that encourage development and sustainable production of marketable products from Southeastern landscapes. Actions

and activities that would have the most significant impact on marketable products, as well as achieving regional goals, have been identified from the Phase II Regional Assessment and are as follows:

1. Encourage the use of alternative management techniques (mechanical, grazing, etc.) to restore and maintain fire dependent ecosystems where fire is not feasible or desirable. (1.1.4)
2. Use education and incentive programs to encourage new and nontraditional private landowners to manage their lands to contribute to resiliency while providing forest products and expanding ecosystem markets. (1.1.5)
3. Encourage traditional and developing economic markets, such as biomass, to enhance economic viability of timber harvesting and mechanical fuel treatments. (1.2.4)
4. Encourage landowners, particularly new and non-traditional landowners to deliberately actively manage land regardless of ownership objectives, including fuels management. (1.2.5)
5. Control invasive species that alter fire regimes and ecosystem function. (1.5.2)

Traditional timber market demand in the Southeast is closely linked with the housing market and pulp production. Both housing market demand and pulp production have decreased considerably over the last decade while the available timber supply has increased. Effective forest management, an increase in intensively managed plantations, conversion of agricultural land to forest, and the success of traditional and emerging genetic breeding programs have led to greater production. New markets for woody products have emerged, but the success of these markets is largely

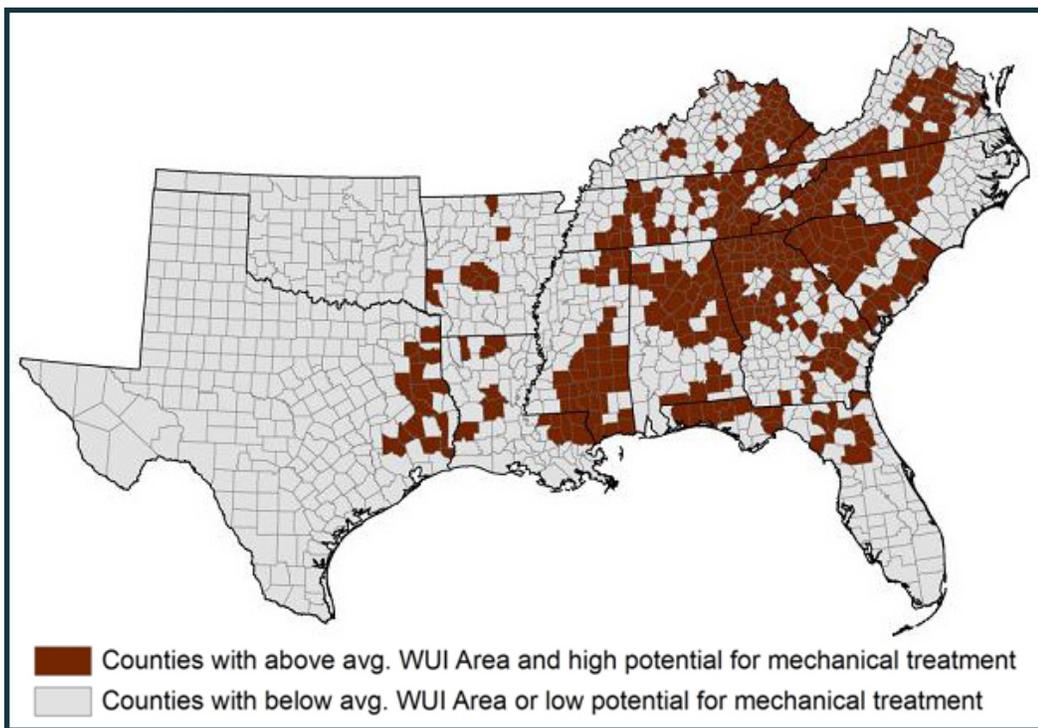
SHARING SUCCESSES — EXPANDING OPPORTUNITIES

- *Changing Roles: Wildland Urban Interface Development Program* – This is a multi-organizational partnership between the Southern Group of State Foresters, the U.S. Forest Service, the Florida School of Forest Resources, and the U.S. Fish and Wildlife Service. Each module in the multi-module program is designed to target a specific area of issues and opportunities. Module 2 specifically addresses managing interface forests and presents ways to address new and non-traditional landowners in practicing silviculture, small scale harvesting, managing for fire and wildlife among other activities. The program can be targeted to specific audiences or as an introduction to issues faced throughout the Southeast in the WUI.



dependent on public policy and land ownership. Several policies have been implemented at the federal level to encourage biofuels markets. Specifically, the 2002 Farm Bill, 2005 Energy Policy Act, the 2007 Energy Independence Security Act, and the 2008 Farm Bill all include provisions encouraging cellulosic biofuels production.

Woody biomass can be used to generate heat and electricity through co-firing with coal, as a stand-alone supply of cellulose, and in combined heat and power plants. Each of these methods is currently employed in the Southeast and there are at least 27 co-fired plants in operation (Alavalapati et al. 2011). Also, Alavalapati et al. (2011) conducted a demand analysis that indicated harvesting residues or biomass from timber markets would be required for wood from bioenergy markets as early as 2013 (Fig. 13). Woody biomass for energy production and bio-char are promising new markets that could use material from mechanical fuel reduction projects or harvests that would promote resilient and sustainable forests in addition to providing income for landowners. Reducing available fuel in the WUI would also decrease the probability of wildfire damages or losses. Figure 16 displays the Southeastern counties with the highest percentage which has both an above average WUI area and high potential for mechanical treatment.



Educating landowners and using incentive programs to enhance traditional and non-traditional markets could benefit fire management programs in the Southeast by reducing hazardous fuel loading. Currently, it is not economically feasible to implement large-scale mechanical fuel reduction treatments and these treatments have fewer ecosystems benefits than prescribed

Figure 16. Areas with above average WUI area (see Figure 5) that have high potential for mechanical treatment (at least 50 percent of county) (see Figure 17)

fire (Stanturf 2011). However, encouraging and supporting policy initiatives that help develop new markets could result in increased prosperity for landowners while positively impacting local and regional economies.

An additional forest product that requires consideration is clean water. By maintaining resilient forests through management and reduction of risk from fire, water supply managers can save costs from rebuilding natural systems disturbed by wildfire. Mechanical treatments and development of new markets

could also help mitigate climate change and encourage the development of resilient and sustainable ecosystems, especially in areas where prescribed burning is not feasible (Fig. 17).

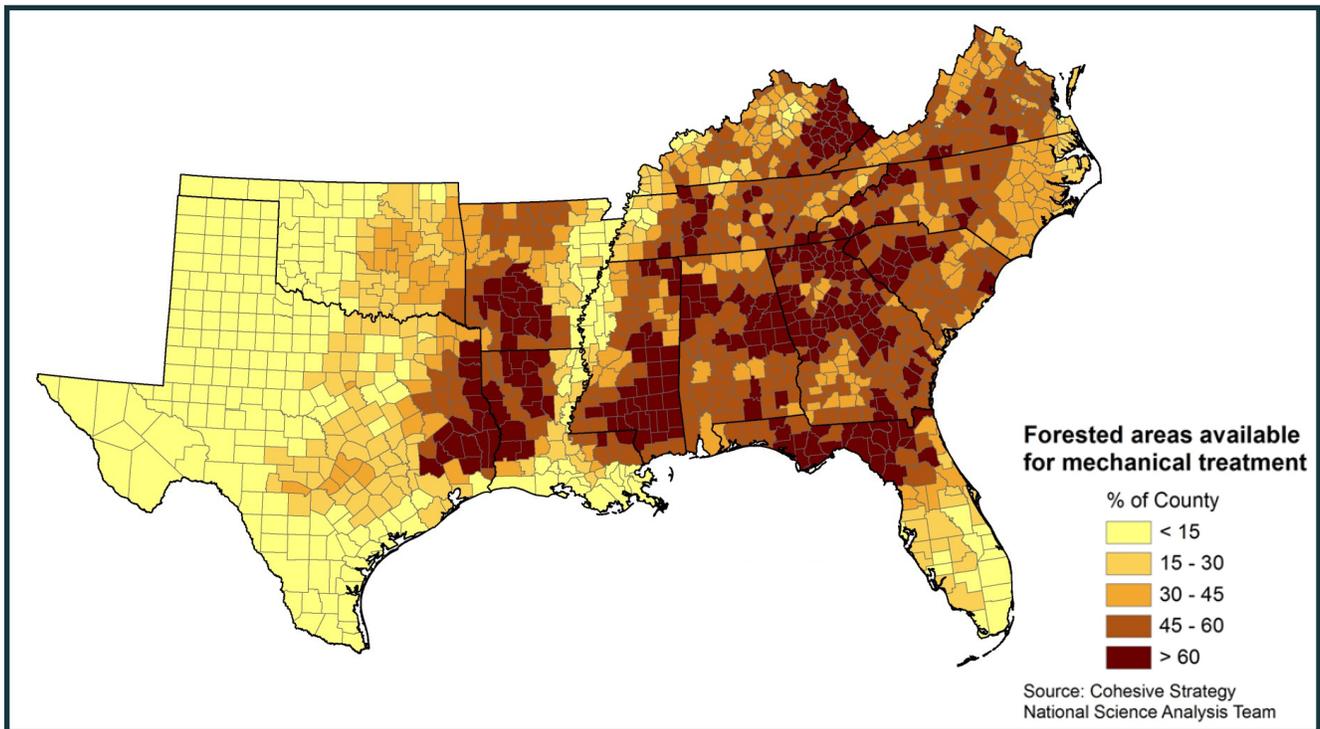


Figure 17. Forested area available for mechanical fuels treatments in the Southeast based on burnable fuels, road and slope access, and jurisdictional and legal constraints using non-federal wilderness areas and non-inventoried roadless areas on Forest Service lands.

If implemented, these selected actions and activities might serve to emphasize existing and assist in the development of new markets that use forest products in the Southeast, including not only large markets such as lumber and pulp but also specialty products such as Tribal woven baskets and new evolving markets such as biomass.

Ecological Services

Forests in the Southeastern United States provide a host of diverse ecological services. These services have been identified as an important value that should receive consideration when developing strategic land and fire management plans. Resilient ecosystems protect and enhance critical watersheds, ensure diverse recreational opportunities across the landscape, mitigate the impacts of climate change, provide habitat for wildlife, protect threatened and endangered plant and animal species, maintain and improve air quality, and offer protection from natural disturbances, such as hurricanes and flooding. Recognizing the value of these services, fire management programs and stakeholders throughout the Southeast can contribute to their sustainability and enhancement. Figure 18 displays the proportion of counties for whom surface drinking water is vitally important, demonstrating the value of maintaining clean drinking water.

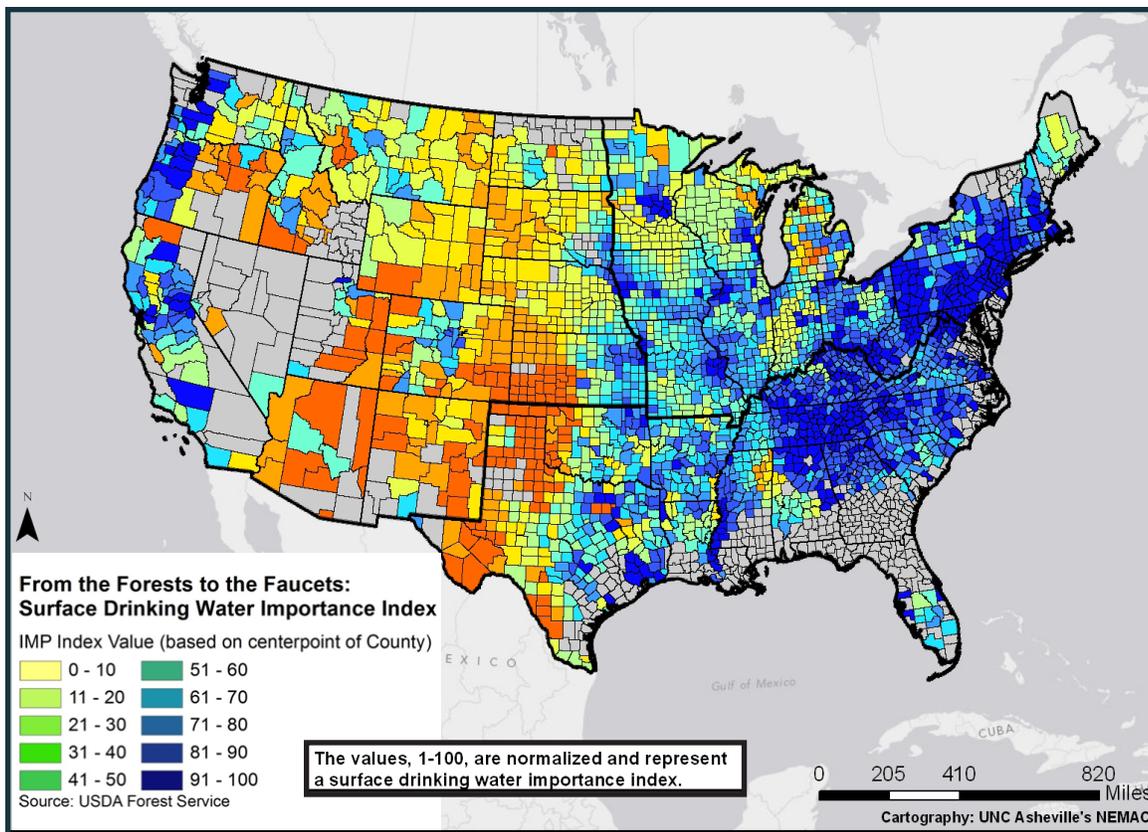


Figure 18. Forests to Faucets Importance Index

Feasible management alternatives to the status quo would focus on actions and activities that improve the ecological services of Southeastern landscapes. Actions and activities that would have the most significant impact on enhancing ecological services, as well as achieving regional goals, have been identified from the Phase II Regional Assessment. Some of these actions and activities have been slightly revised to reflect the changing needs perceived by stakeholders involved in the Cohesive Strategy process. The identified actions and activities are:

1. Promote and use fire to emulate natural disturbance patterns to maintain and improve ecological systems, balancing social, cultural, and economic needs, especially over large contiguous landscapes. (1.1.1)
2. Plan and implement post-fire stabilization and rehabilitation activities and education to reduce site degradation and potential impact from

SHARING SUCCESSES — EXPANDING OPPORTUNITIES

- *Coming Together to Address Smoke Management Issues while Supporting Longleaf Pine Restoration* – EPA is fully engaged with federal, state, and non-governmental organization (NGO) partners in longleaf pine ecosystem restoration efforts. Prescribed burning is a necessary component of longleaf restoration and maintenance. EPA Region Four supports increased prescribed burning for achieving the longleaf restoration goals, provided that smoke management procedures are followed to minimize impacts on air quality and human health.

hydrological events, invasive plant infestations, and other events that follow severe fires. (1.1.6)

3. Support efforts to increase prescribed burning for ecosystem restoration (e.g., SERPPAS efforts for Longleaf pine restoration). (1.1.7)
4. Work with regulatory agencies and entities (i.e., air quality) to ensure that prescribed fire remains a viable management tool and maximize flexibility for its use (including liability issues). (1.2.3)
5. Control invasive species that alter fire regimes and ecosystem function. (1.5.2)

Effective working relationships with air quality agencies and other regulatory agencies to ensure prescribed burning remains a viable land management option is key in the Southeast. Burning vegetation can be a source of air pollution, producing fine particulate matter (PM_{2.5}), CO₂, and CO. Large fires consuming above average fuel loads can far surpass regulatory agency standards for air quality. Further complicating regional air quality issues are drier conditions, which are predicted to worsen in the coming decades, resulting in increased fuel consumption and emissions (Stanturf 2011). Focusing on maintaining fire adapted ecosystems can mitigate the effects of increasing emissions through smoke management techniques such as prescribed burning when atmospheric

conditions are optimal and conducting more frequent, low intensity burns to maintain a fuel load that results in lower emissions when consumed. Working with air quality agencies to ensure that prescribed fire is a viable management tool, even as emission thresholds are decreased, should be an important part of strategic land management plans (Fig. 19).

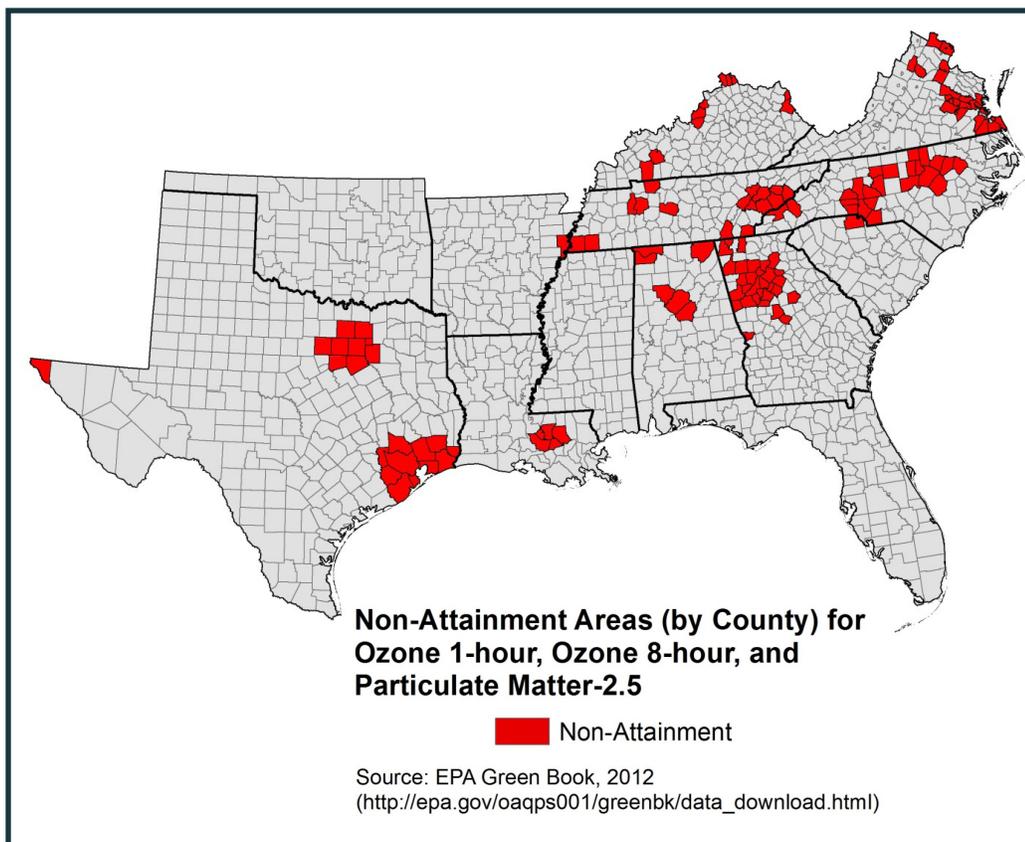


Figure 19. Non-attainment areas by county for ozone 1-hour, ozone 8-hour, and particulate matter 2.5 (N=553)

Most ecosystems in the Southeastern U.S. are fire adapted, many relying on frequent, low intensity fires to maintain characteristic ecosystem structure. These fires reduce vegetative competition, release seeds from serotinous cones, stimulate seed germination, improve regeneration, provide habitat and food for a variety of wildlife species, and increase soil fertility while aiding nutrient cycling. Excluding fire from these ecosystems decreases their resiliency and negatively impacts ecosystem services. For example, several species of wildlife depend on grasses and other herbaceous plants for food or cover that becomes abundant after a fire. In ecosystems where fire has been excluded, a developed mid-story prevents needed sunlight from reaching the forest floor, effectively eliminating the grass and herbaceous component, and significantly increasing wildfire risks. Promoting and using fire to emulate natural disturbance patterns naturally encourages an array of valuable ecological services (Fig. 20).

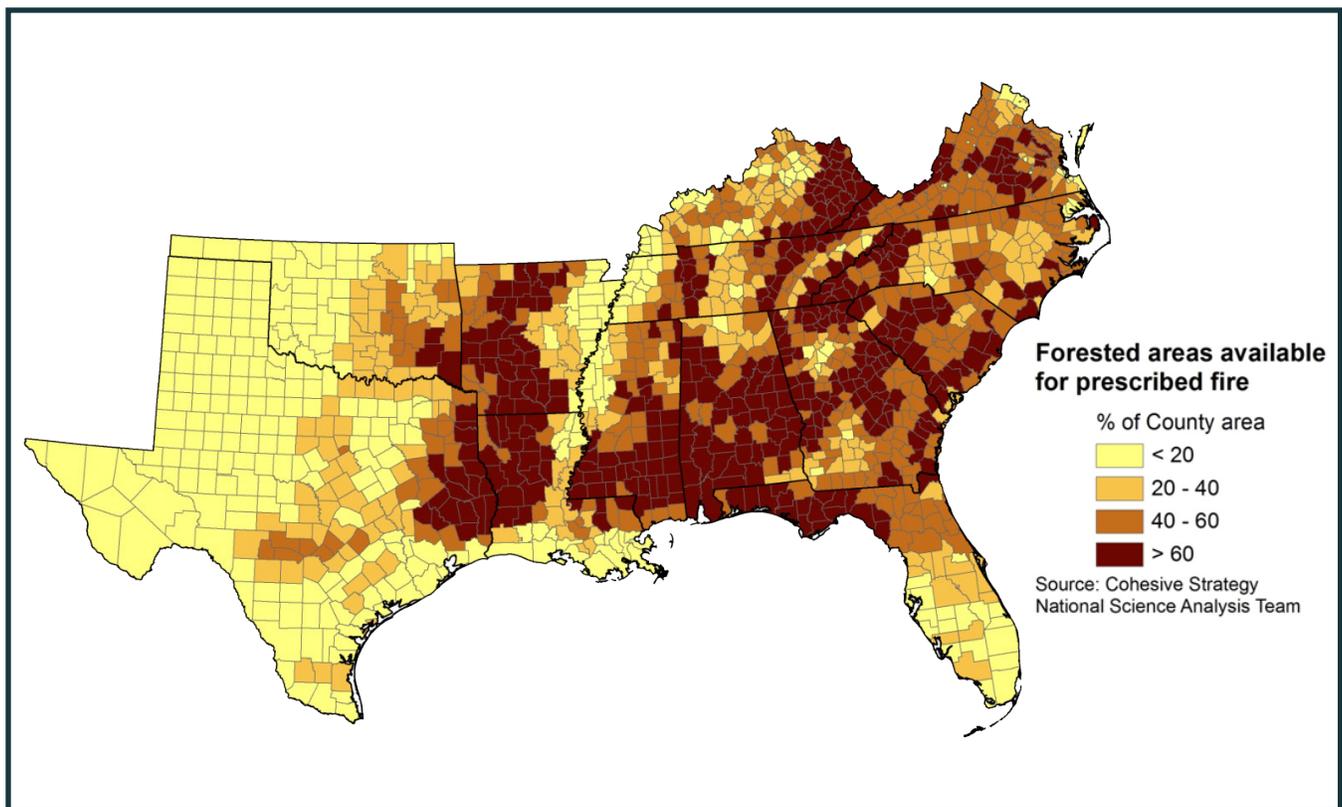


Figure 20. Percent of Southeastern counties generally available for prescribed fire that are forested based on historical fire regime groups 1-4 and a filter removing urban, agricultural and mixed-use land cover types

People depend on forests to help clean the air they breathe of harmful pollutants such as CO₂, SO₂, and ozone. Trees capture gaseous pollutants through their stomata and transport them to the soil to be broken down and utilized by microbes or stored in the soil. They can also capture larger pollutants on their leaves and branches that are then incorporated into the forest floor after rain, helping to prevent inhalation by humans and animals. Urban forests provide shade that reduces temperatures, evaporation of hydrocarbons, and use of electricity to cool structures (decreasing emissions from fossil fuel based power production facilities).

Invasive species potentially have the greatest negative impact on the ecological services that Southeastern forests and grasslands provide. Invasive species can reduce biodiversity, stop natural regeneration, negatively impact ecological processes ranging from soil formation to microbe population, and limit access to land for recreational purposes. Landscapes are particularly vulnerable to invasive species after disturbance because these species tend to have accelerated early growth rates and tolerance to environmental extremes, such as temperature and precipitation (Miller et al. 2011). For example, cogongrass (*Imperata cylindrical*) grows rapidly in disturbed ecosystems in the Southeast and forms dense mats of rhizomes that exclude native species. Also, cogongrass burns much hotter than native Southeastern plant species, even in winter, creating more areas of disturbance available for species propagation. Controlling or eliminating the spread of non-native invasive species facilitates normal ecosystem function and utilization of the services they provide.



Protecting ecosystems from further disturbance after fire ensures continuation of ecological services and decreases the recovery time toward realizing maximum service benefits. Protecting forest soils and adjacent water supplies, preventing non-native species infestations, and encouraging regeneration promote reestablishment of healthy ecosystems that are resilient to future disturbance.

As an example, another activity that would enhance the Southeastern forest ecological services is increasing prescribed burning to promote longleaf pine (*Pinus palustris*) restoration. Longleaf pine ecosystems are estimated to have covered 90 million acres or more historically while only covering roughly three million acres today (Frost 1993). These ecosystems are some of the most diverse in North America, and provide habitat for numerous threatened and endangered plant and animal species. Longleaf pine ecosystems are dependent on frequent fire, and have suffered as a result of aggressive fire control and a reduction in prescribed burning. Restoring these ecosystems would increase plant and animal diversity throughout the Southeast, while providing wildlife habitat and other ecological services (Fig. 21).

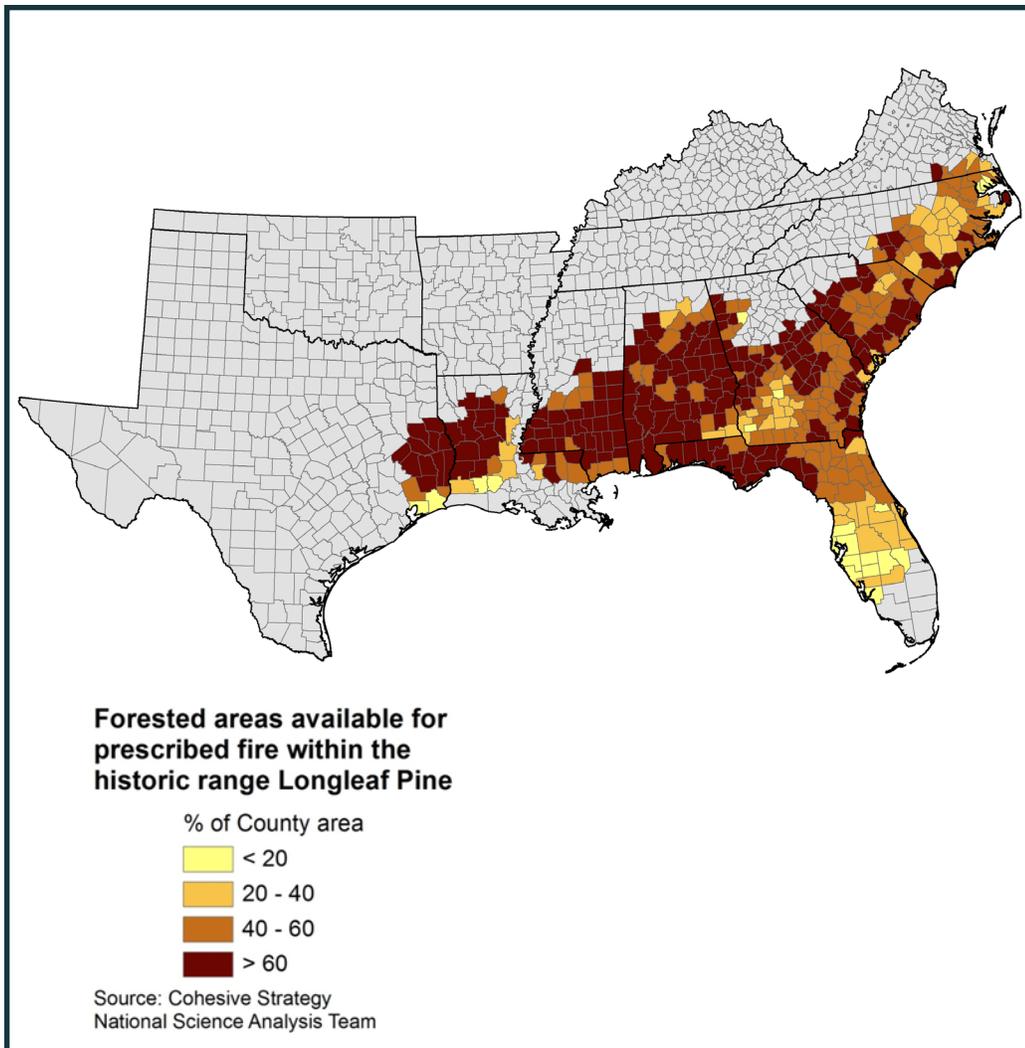


Figure 21. Potential for prescribed fire by county in historic longleaf pine range

(SERPPAS) group, Longleaf Alliance, America’s Longleaf Restoration Initiative (ALRI), etc.) with an ambitious goal of restoring and increasing Longleaf pine to eight million acres in the coming decade. An increase in prescribed fire acres will facilitate an increase in longleaf pine acres.

The Southeast includes a diverse range of ecosystems – (e.g. coastal marshes, pocosin wetlands, longleaf pine forests, oak savannas, cedar glades, and cove forests). Finding ways to support ecological services are of significant importance to protecting the quality of life of local residents, as well as the local environment. Should they be selected and implemented, these actions and activities could serve to restore and protect key ecological services considered priorities by Southeastern residents, from clean drinking water to wildlife habitats to air quality.

Significant opportunities still exist, though, to restore longleaf pine ecosystems in the Southeast. Prescribed burning is the primary land management tool used in the restoration of longleaf pine and other fire-adapted species in the Southeast. Key Southeastern conservation and management partners have cooperated through many unified efforts and programs (i.e., the Southeast Regional Partnership for Planning and Sustainability

Cultural Values

Fire is embedded in Southeastern history and culture. Residents traditionally have a strong relationship with prescribed burning and the wildfires that recur in the region's fire-prone ecosystems. Cultural values that are important to residents include aesthetics, Tribal land uses, traditional land uses such as hunting, fishing, recreation, grazing, and farming, and private property rights including ability to burn and manage land. The Forest appendix of the 1880 U.S. Census included a map displaying the amount of forestland burned during a single year (Fig. 22).

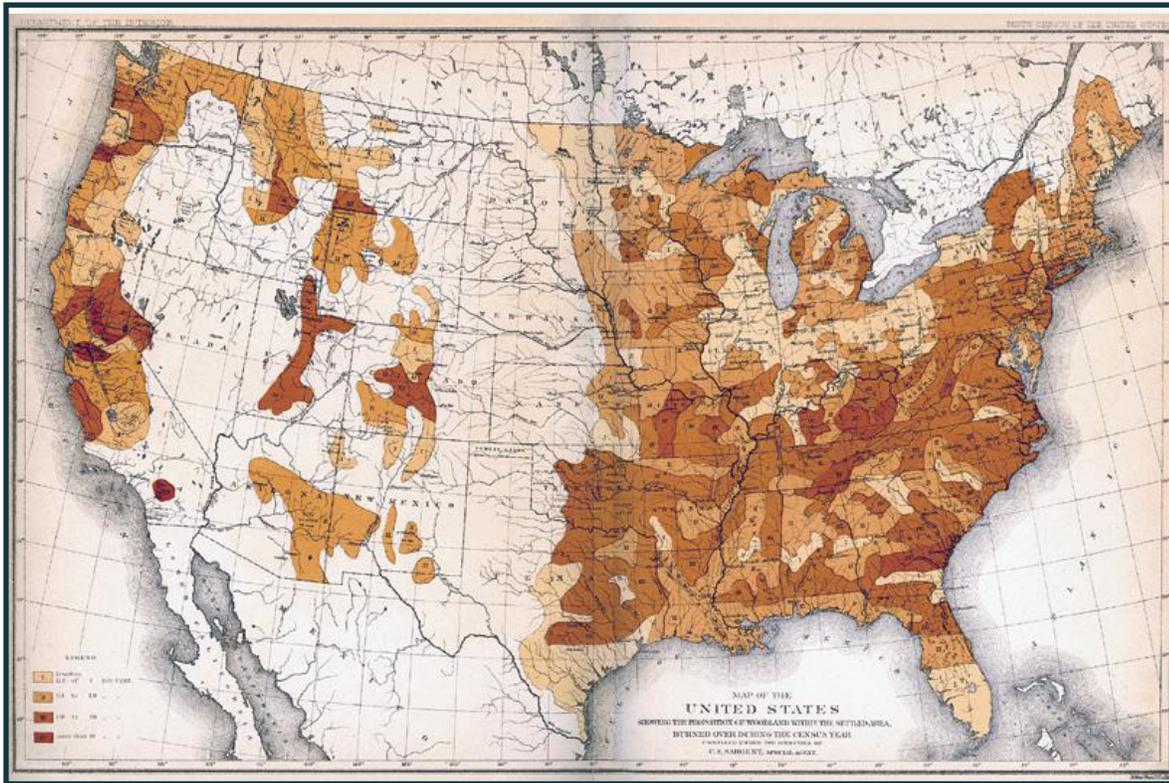


Figure 22. Map of the United States showing the Proportion of Woodland Burned During the Census Year 1880 Source: Forest History Society

Maintaining cultural values in the Southeastern region has become increasingly challenging due to land use changes and an influx of new residents lacking exposure to or experience with Southeastern culture such as understanding prescribed fire or wildland fire. It is important to involve communities when developing prescribed fire plans that encourage sustainable, resilient ecosystems that enhance these values. Engaging communities during the planning phase provides an opportunity to share what potential ecological benefits will be realized from fuels treatments. It is also an opportunity to discuss possible negative outcomes for communities from wildfire. Open discussions with community participation could lead to a greater acceptance of burning, which would lead to healthier ecosystems and enhance regional cultural values.

Feasible alternatives to the status quo would focus on actions and activities that protect and maintain cultural values. Actions and activities that would have the most significant impact on protecting and enhancing cultural values, as well as achieving regional goals, have been identified from the Phase II regional assessment and are as follows:

1. Use education and incentive programs to encourage new and nontraditional private landowners to manage their lands to contribute to resiliency while providing forest products and expanding ecosystem markets (“working forests”).
 - Support the “One Message, Many Voices” campaign and development of other unified prescribed fire education programs. (1.1.5)
2. Support efforts to increase prescribed burning for ecosystem restoration (e.g., SERPPAS efforts for Longleaf pine restoration). (1.1.7)
3. Work with regulatory agencies and entities (i.e., air quality) to ensure that prescribed fire remains a viable management tool and maximize flexibility for its use (including liability issues). (1.2.3)
4. Appropriately use cost-effective technology (social media, SWRA, etc.) and systems to ensure decision-makers (county commissioners, urban planners, town councils, etc.) have access to information in a timely manner. (2.3.2)

The Southeastern U.S. is unique in that 86 percent of the over 200 million acres of forested lands are privately owned (Butler 2011). Deliberate management of privately held forest lands helps contribute to resiliency and is necessary to conserve cultural values. Forest ownership dynamics across the region have changed dramatically over the past decade as forest industry has divested 75 percent of their ownership, and family forests are fragmented through estate disposal and urban development (Butler 2011). As fragmentation of privately held lands continues alongside an influx of new landowners who lack experience with forest management, it is critical to use education and incentive programs such as the “One Message, Many Voices” campaign to encourage new landowners to engage in active land management. Given the patchwork of management in the Southeast, implementing these programs requires involving a variety of partners (Fig. 23).

SHARING SUCCESSES — EXPANDING OPPORTUNITIES

- *State Certified Burn Manager Programs* – Several Southeastern states have Certified Prescribed Burn Manager programs. Although the programs vary somewhat from state to state, they generally provide some protection from liability if the burn manager is certified by meeting training requirements, has a written burn plan, and follows all applicable laws.
- *One Message, Many Voices Campaign* – This project of the Southeastern Group of State Foresters and Tall Timbers Research Station and Land Conservancy is designed to provide a consistent message about the value of prescribed burning. Advertisements encourage visiting a website for information on outdoor recreation opportunities (visitmyforest.org). Viewers are then encouraged to learn more about “good fire” by visiting goodfires.org.

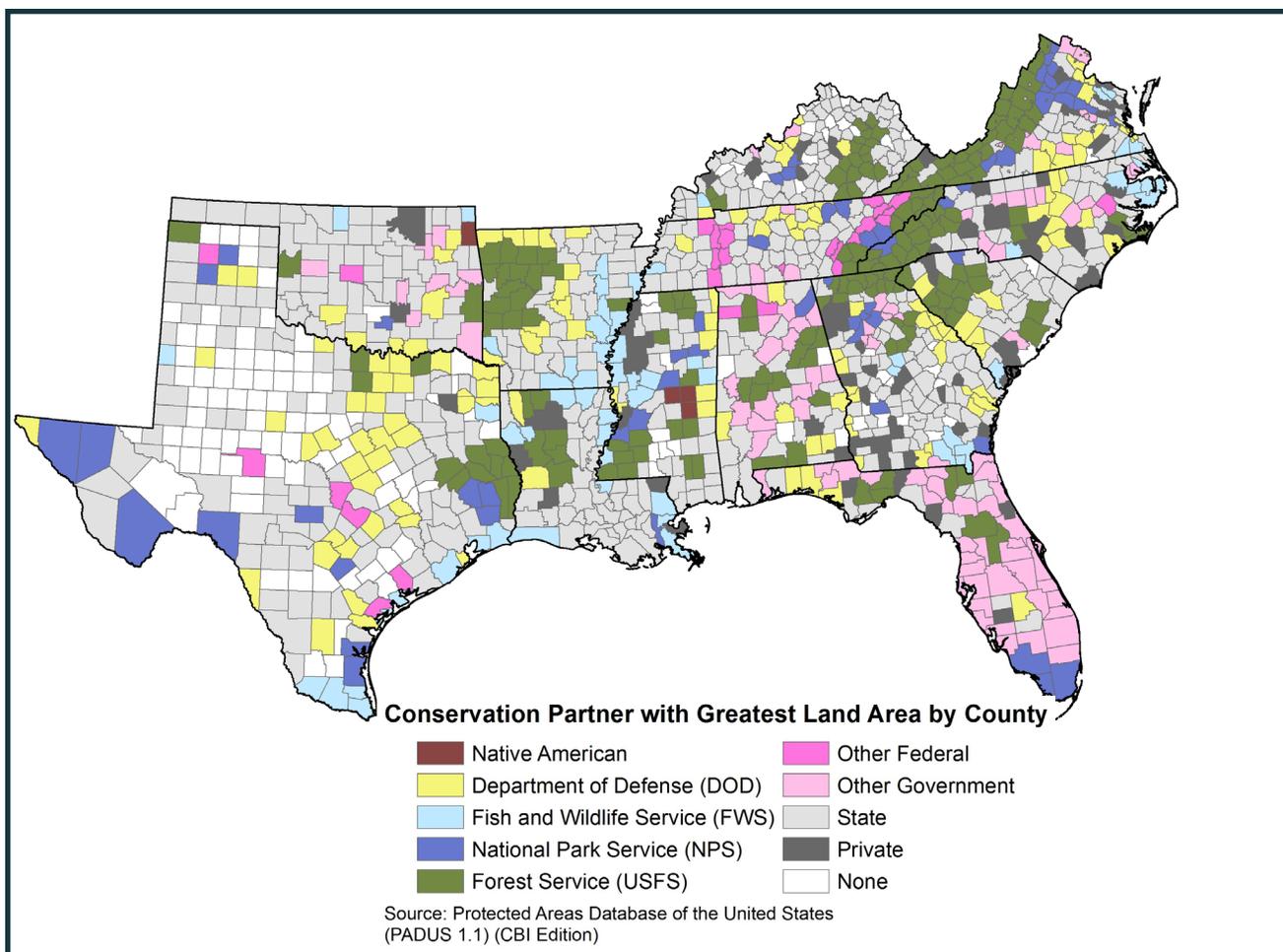


Figure 23. Dominant conservation partner in the Southeast

These landowners can participate in sustaining traditional markets and creating new markets for products. The associated management practices would contribute to the growth of the local and regional economy and add to ecosystem resiliency while reducing the risk of wildfire.

The Southeastern American population has grown considerably faster than the nation as a whole in recent years and is expected to grow 60 percent by 2060, compared with a 47 percent increase for the rest of the country (Cordell 2011). Rapid regional population growth and turnover coupled with diminishing outreach resources will require fire management organizations to find creative ways of engaging and educating the public. Effective communication and collaboration with local governments and communities using cost-effective technology is one way the fire and land management community can leverage limited resources.

Southeastern residents have long-held cultural values associated with the deliberate use of fire to maintain ecosystems, aid in farming and range management, silviculture, and a host of other activities. Selecting actions and activities that help to maintain cultural values in the Southeast is a significant priority for regional residents as well as the fire and land management community.

Property Loss

Property loss due to wildfire in the Southeastern United States is a costly and constant challenge. Annual structural losses are disproportionately greater in the Southeastern region as a result of nearly 45,000 annual wildfires, a figure which leads the nation (Gramley 2005, Monroe 2002). Unlike other regions of the country, wildfire ignitions in the Southeast take place throughout the year thereby increasing the challenges on personnel and resources. Fire-adapted ecosystems require regular fire or treatment with fire surrogates. Losses increase when wildfire complexity and size are amplified by quick hazardous fuel build-up triggered by frequent and large scale natural disturbances (e.g., hurricane, tornado, drought, insect, disease).

In recent decades, rapid population growth and corresponding community development have dramatically increased property exposure to wildland fire. Today, the Southeast contains 88 million WUI and intermix acres, more than any other region of the country (Andreu 2008). As a result of this WUI expansion, the region has 118,000 communities at risk of wildfire losses, and of those, 43 percent are considered to be at high to very high risk (Andreu 2008). Life and property exposure to wildland fire risk and potential loss is only projected to increase as population growth and development continue.

Protecting life and property are critical values. Enhancing community and firefighter capability and capacity to prevent, mitigate, and prepare for wildland fires regardless of compounding factors is essential to protecting life and property. Proactive firefighter, community, and individual awareness and actions are vital to protecting this value.

Building all components of a fire-adapted human community is extremely important. Properly managed forests, fuels reduction, defensible space, community planning and fire resistant construction all contribute to a community that has a greater chance of withstanding a destructive wildfire.

Feasible alternatives to the status quo would focus on actions and activities that protect life and property. Actions and activities that would have the most significant impact on protecting property, as well as achieving regional

SHARING SUCCESSES — EXPANDING OPPORTUNITIES

- *Marion County, Multi-Agency Wildfire Task Force* - Marion County, Florida established this task force to coordinate wildfire response resources and management among the USDA Forest Service, the Florida Forest Service, and the Marion County Fire Rescue Department. The Task Force meets regularly to review wildfire conditions and forecasts, plan for wildfire response, determine needs for training of local firefighters, and to plan and coordinate prevention activities within the County. Perhaps the greatest benefit of the Task Force is the creation of a “stakeholder environment” amongst the participating agencies (including federal, state, and local agencies) that enhances response, command and control, and firefighter and public safety. There is an opportunity in many other locations throughout the region to create similar taskforces for mutual benefit.

goals, have been identified from the Phase II Regional Assessment and are as follows:

1. Utilize prioritization in SWRA and other efforts to identify and treat wildland fuels in areas that will facilitate tactical defense of human communities or ecological values and services from wildfire (tactical fuel breaks). (1.2.2)
2. Promote establishment of insurance incentives, building and landscape ordinances, and ignition resistant construction techniques through communication and collective action with planners and insurers, emphasizing Firewise concepts when planning communities and building homes to reduce wildfire impacts. (2.1.3)
3. Increase awareness of community and homeowner responsibility for fire preparedness and prevention. (2.1.4)
4. Encourage development and implementation of CWPP and Firewise or equivalent concepts, prioritizing CARs in greatest need of CWPPs. (2.1.5)
5. Increase community preparedness and mobilization abilities (e.g., evacuation) and increase coordination and planning between local, state, Tribal, and federal responders prior to wildfire ignition. (2.2.3)

Federal, State, Tribal, and local fire managers have worked diligently with hundreds of communities and thousands of homeowners and landowners throughout the Southeast to increase wildland fire hazard prevention, mitigation, and preparedness awareness and actions, such as Community Wildfire Protection Plans (Fig. 24).

SHARING SUCCESSES — EXPANDING OPPORTUNITIES

- *Taylor Community Wildfire Protection Plan* - The rural unincorporated community of Taylor, Florida, rests in the midst of large national forest, state forest, national wildlife refuge, and commercial and private forest holdings in northeast Florida, an area with frequent ignitions and large wildfires. The CWPP is alive with regular community meetings between the CWPP officers, the local fire department, and representatives of the national forest, state forest, national wildlife refuge, and local county and community Fire Chiefs. The fuel breaks established through the CWPP are maintained several times annually through community work days, as are structure protection fuel breaks. Community residents maintain a high situational awareness through regular meetings where current wildfire conditions and forecasts are discussed, resulting in prepared residents who are active in preventing unwanted ignitions and reliably report wildfires and smoke within or near their community. This is an excellent example of a living CWPP with a strong shared understanding of roles and responsibilities built on mutual respect.

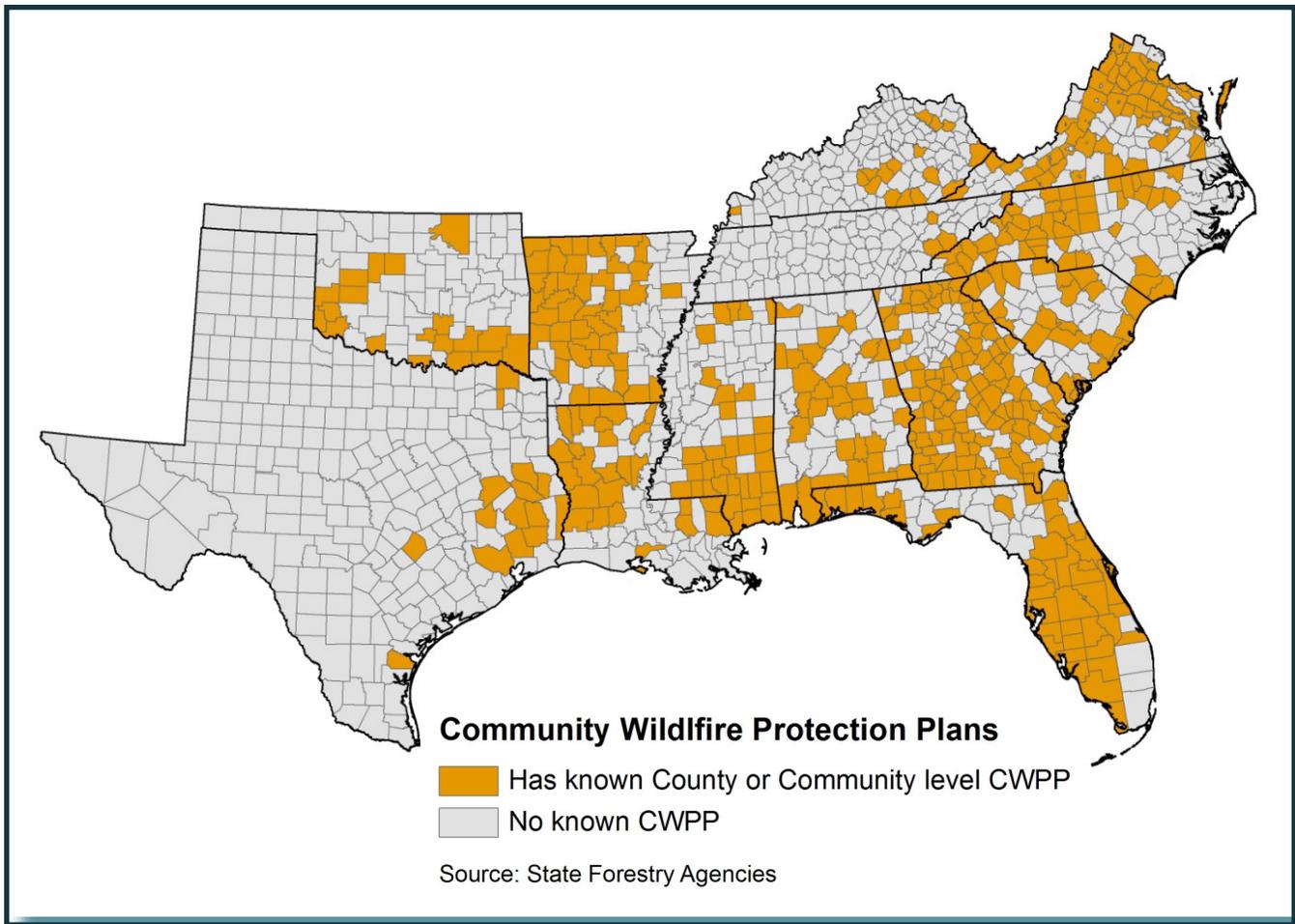


Figure 24. CWPP by county in the Southeast

As of 2011, 4,494 communities at risk in the Southeast were covered by a CWPP. Funding through various sources, including the National Fire Plan, has supported thousands of projects to mitigate hazards in communities across the Southeast. However, finite budgets and existing efforts are not able to keep up with WUI growth. There is a need to focus the limited funding and resources on prevention, mitigation, and preparedness actions identified in this document. Protecting property must be a joint venture between personal responsibility and effective response organizations. By working collaboratively, the negative impacts of wildfire can be lessened.

Around the region, tens of thousands of Southeastern communities are considered at high or very high risk of damage from fire. Each year, wildfires destroy thousands of homes and other structures as well as damage or destroy other valued property. Selecting actions and activities that assist in mitigating damage to property is of key concern throughout the region.

Across Regional Values

Five activities and actions were identified from the Phase II report that would have a positive impact across all five of the regional values as well as region goals identified during the Cohesive Strategy development. Understanding these broad themes can help stakeholders identify additional actions from Phase II that address each specific theme. These actions and activities are:

1. Use education and incentive programs to encourage new and nontraditional private landowners to manage their lands to contribute to resiliency while providing forest products and expanding ecosystem markets. (1.1.5)
2. Encourage planning efforts across landscapes between practitioners and land managers to address wildland fire and landscape resiliency and community safety balancing other concerns, emphasizing plan development in high risk areas. (1.2.1)
3. Work with regulatory agencies and entities (i.e., air quality) to ensure that prescribed fire remains a viable management tool and maximize flexibility for its use (including liability issues). (1.2.3)
4. Encourage greater public smoke tolerance through outreach and understanding. (1.4.2)
5. Control invasive species that alter fire regimes and ecosystem function. (1.5.2)



Though each of the numerous actions and activities identified are considered fundamental to addressing regional values, these five cross-cutting actions and activities simultaneously address all five regional values. Implementing any of these actions and activities would significantly help address regional goals and objectives.

Broad Themes within the Alternatives

Similar or related actions and activities from the Phase II Objectives Hierarchy were group together to form broad themes within the alternatives.

1. Prescribed Fire and Fire Use - 1.1.1, 1.1.2, 1.1.3, 1.1.7, 1.2.3, 1.3.1
2. Fuels Treatment Other Than Fire – 1.1.4
3. Working Forest - 1.1.5, 1.2.4, 1.2.5
4. Planning For Fire, Forest Resiliency and Community Safety - 1.2.1, 1.2.2
5. Incentives for Fuels Management - 1.4.3
6. Treat and Restore Areas Affected by Natural Events and Fire – 1.5.1, 1.5.2
7. Ordinances and Fire Safe Construction, Homeowner Responsibility, Fire Prevention, CWPPs - 2.1.3, 2.1.4, 2.1.5, 2.2.1
8. Community Preparedness, Evacuation and Planning by Responders – 2.2.3
9. Use of Technology to Inform Community Leaders – 2.3.2
10. Specialized Response Equipment, Train, Develop and Ensure Adequate Staffing of Responders – 3.1.1, 3.2.2
11. Inter-Agency Suppression Cooperation, MOUs, Mutual Aid, Coop Fire Agreement Billing, Type 3 IMTs – 3.2.3

Trade-offs

The goal of the alternatives section is to provide stakeholders across the Southeast a suite of strategic options for managing fire, a complex task that does not lend itself to a single solution. Simplifying the decision-making process by actions and activities grouped by value can inform stakeholder decisions that would accomplish both value enhancement and progress towards regional goals. The management activities that would be most efficient and effective should be evaluated based on the situation, and at the appropriate scale. There are trade-offs and opportunity costs for every decision. Hopefully identifying the values most important to the stakeholders will help focus on specific actions and activates discussed above.



Barriers

This report identifies actions at the local to regional level that can have the most impact on advancing Southeastern issues, however, there are multiple challenges and barriers associated with these opportunities. Addressing these barriers at the national level, where possible, is necessary to further the success of the strategy. The top tier opportunities for impacting fire issues in the Southeast are listed below. The major challenges and barriers are listed as sub bullets, and would need to be addressed to maximize the opportunities.

1. Increase fuels management on private land
 - Smoke and fire liability issues
 - EPA restrictions associated with smoke
 - Incorporate or incentivize prescribe burning in additional federal programs (USDA Natural Resources Conservation Service, etc.)
2. Encourage state and local ordinances related to fire prevention to be enforceable
 - Coordinate new ordinances where desired
 - Develop best practices that reduce potential spread of wildfire
 - Incentivize the creation of enforceable state and/or local ordinances
 - Tie federal funding to activity that falls within best practices (e.g., development loans)
3. Incentivize the development of laws that require wildland fire risk reduction activities and the maintenance of wildland fire risk reduction practices
 - Develop best practices at the national level with appropriate organizations (American Pyrotechnics Association)
 - Work with the insurance industry on products that motivate homeowners to create fire-adapted homes
 - Construct a federal incentive program to reimburse for the creation of fire-adapted communities through CWPPs and other comprehensive community planning practices
4. Increase effectiveness and efficiencies in sharing of resources among agencies and groups with appropriate capabilities
 - Resolve the Coop Fire Billing issue
 - Overcome barriers to qualification standard inconsistencies
 - Address preparedness strategically
 - Improve the process for training and sharing prescribed fire resources

These top tier opportunities and barriers identified in the Southeast will be matched with input from the other regions and presented to the Wildland Fire Leadership Council and other national organizations. This will hopefully aid in finding solutions to these barriers and decreasing or eliminating any negative impacts. Additional opportunities and barriers can be found in Appendix 11. The Southeast will continue to work within the Cohesive Strategy structure to emphasize the importance of Southeastern regional barriers at the national level, and to enhance partnerships regionally and nationally to move these issues forward.

Outreach and Communications

The Cohesive Strategy has been developed as a landscape-level effort inclusive of all lands and a diversity of stakeholders. The ambitious vision of the Cohesive Strategy requires collaboration between an array of partners and stakeholders locally, regionally, and nationally to be implemented successfully. It must be relevant to stakeholders and their needs, adaptable and dynamic in its approach, and reflect and include regional perspectives. Extensive outreach efforts have been conducted to engage stakeholders in all phases of the Cohesive Strategy.

The Cohesive Strategy has been a three phase process. During Phase I, 14 regional forums were held around the country involving stakeholders in developing the Cohesive Strategy framework, and identifying guiding principles and national goals. In Phase II, regional goals were established, and regional challenges and opportunities were identified as part of the development of regional objectives. Regional alternatives containing emphasized actions and activities were enumerated in Phase III as part of expert-driven process to select options with the potential to realize Southeastern objectives.

The Southeast has a history of collaboration among fire managers, agencies, and prescribed fire councils with a wide network of collaborators. This network helped launch the Phase II regional outreach effort during the summer of 2011. Two public meetings and an online survey gathered input or comments from more than 400 individuals and organizations in July and August of that year. Since then, updates of regional work have been available to stakeholders at the following website: <http://www.ForestsAndRangelands.gov/strategy/index.shtml>. Beginning in Phase III, a monthly electronic newsletter has kept Cohesive Strategy contributors and stakeholders informed and engaged. In September, four focus groups held in Texas, Mississippi, Georgia, and South Carolina resulted in over 100 individuals providing direct feedback on proposed strategies and actions.



A social network analysis of Southeastern stakeholders with three focal groupings (Fire Resilient Landscapes, Fire-Adapted Human Communities, and Response to Fire) is under way and expected to be completed by spring 2013. This analysis is intended to broaden the network and develop an understanding of how communication flows among stakeholders. Both steps are essential to ensure key stakeholders are informed and engaged in implementing the Cohesive Strategy in the future. See Appendix 5 and 6 for further detail on stakeholder input and outreach efforts.

ForestsAndRangelands.gov/strategy/index.shtml

C. RISK ANALYSIS SECTION

Introduction

Wildland fire is a complex issue that involves multiple interacting factors spanning the natural, human, and built environments. The Cohesive Strategy process has allowed the Southeast to broaden understanding of complex fire issues utilizing the best available data and science. A consistent framework (CRAFT) has guided the identification of goals and objectives, formulation of alternatives, and evaluation of the possible consequences of these alternatives. The alternatives described in the previous section reflect the collective regional experience of the Southeastern fire community and stakeholders consulted in Phase II and III, and are designed to promote specific regional goals and objectives. The NSAT compiled, summarized, and edited data specific to the goals, values, actions and alternatives identified by the regional committees. Many of these data were used in preceding sections to describe current conditions or illustrate the rationale for various proposed alternatives. In this section these data are used to better understand the factors contributing to risk across Southeastern landscapes, and to demonstrate how quantitative modeling may be used to explore options for reducing risk. Example analyses are presented to illustrate the use of this modeling approach. Further examples will be created as this risk analysis process is used more extensively across the region in the future.

1. Key Questions

Why is wildland fire an issue in the Southeast?

Among the many components of wildland fire, wildfires are the most visible and destructive component, threatening homes, lives, and property throughout the Southeast, and altering landscapes regardless of ownership. Every year, federal, state, and local fire departments in the Southeast respond to tens of thousands of wildland fires. Historically there are 70,000 reported wildland fire ignitions reported per year, but a compilation of current data from NFIRS, NASF, and other federal records suggests that number may comprise more than 150,000 annual ignitions. Although most large wildfires ignite in the spring or fall, wildfires can occur 12 months out of the year in the Southeast. Compounded effects of land cover and land use changes, climate change, extreme weather conditions, invasive species, and population growth contribute to the complexity of wildland fire management. The past two decades have seen an increased occurrence of extreme fire behavior, increased risk to responders, home and property losses, and more frequent threats to communities and landscapes (Fig. 25).

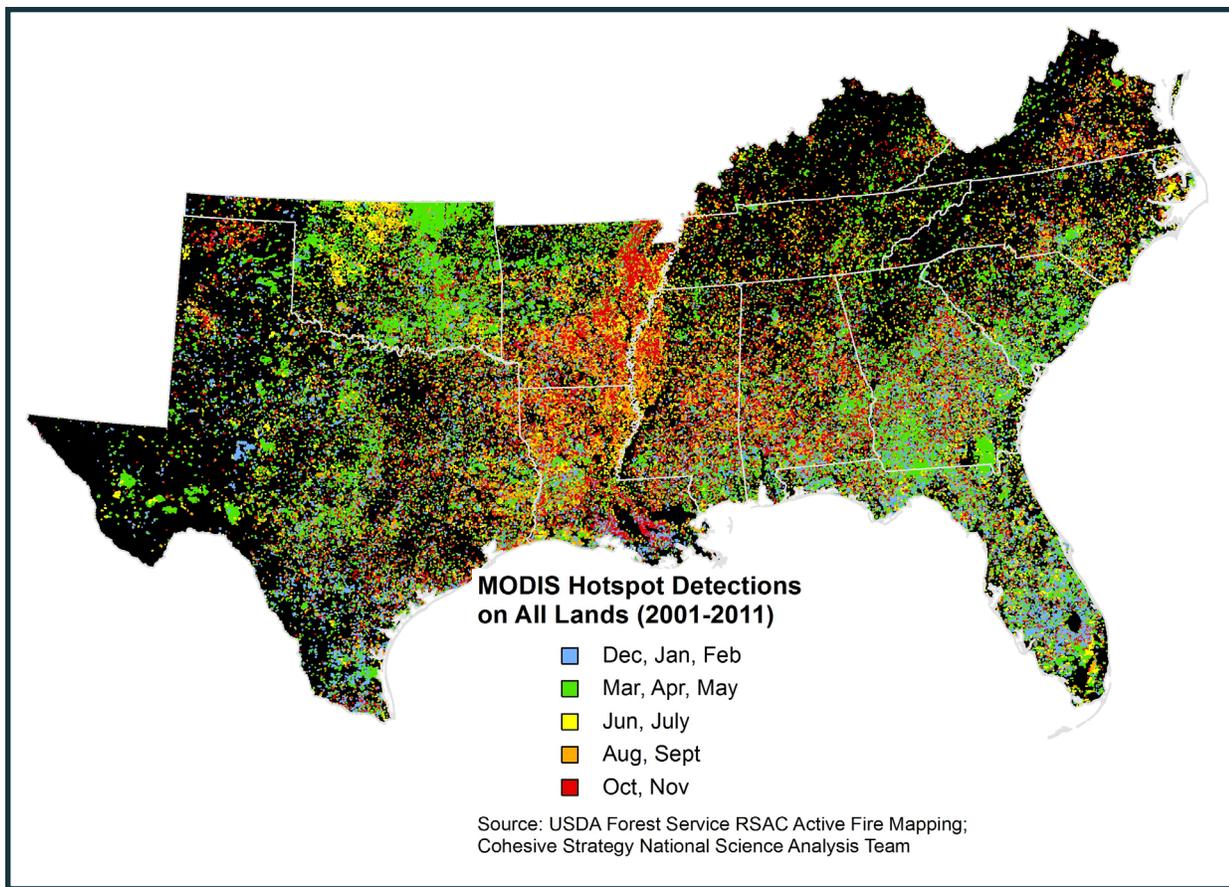


Figure 25. The seasonality of fire from space

How does wildland fire vary across the landscape?

Wildland fire varies greatly across the landscape, depending in part on vegetative type, local climate, fuel conditions, population density, and a myriad of other factors. Additionally, fire and land management objectives and goals play a fundamental role in how wildland fire is managed across the landscape. The diversity and uniqueness of systems of the Southeast are evidenced by the wide range of fire dependent habitats within the region, ranging from the saw grass (*Cladium jamaicense*) prairies of South Florida to the oak-hickory forests of the Appalachian Mountains. Prescribed burning has traditionally been used extensively within these systems for various reasons. The Southeast implements more silvicultural prescribed burns, with more acres treated than any other region of the country, with 6.5 out of the total 7.8 million acres treated in 2011 (National Prescribed Fire Use Survey Report 2012). Due to biophysical settings and climatic conditions, vegetation recovers quickly from fire or mechanical fuel reduction treatments in many Southeastern ecosystems. Frequent fires are critical to maintaining wildlife habitat and biodiversity in the Southeast, from the coastal swamps of Louisiana to the pocosin wetlands of North Carolina to the longleaf pine (*Pinus palustris*) forests of North Florida. Wildland fire is a key process in most Southeastern ecosystems, maintaining resiliency, ecosystem health, wildlife habitat, and providing critical ecosystem services. Southeastern land managers conduct more prescribed burning

in forested landscapes than any other region (NICC 2012). Appropriate wildland fire management is integral to the sustenance of the timber production industry, to reduce hazardous fuels and lower the risk of damaging wildfires to valuable timber stock.

How can our management actions mitigate the impacts of wildland fire?

Though fire is a natural part of the Southeastern landscape, the negative impacts of wildfire can be mitigated through proactive management. In the Southeast, 43 percent of communities are deemed at high or very-high risk from wildfire (Southern Wildfire Risk Assessment 2006). Most of these ignitions are caused by human activities and start near homes or developed areas (Fig. 26).

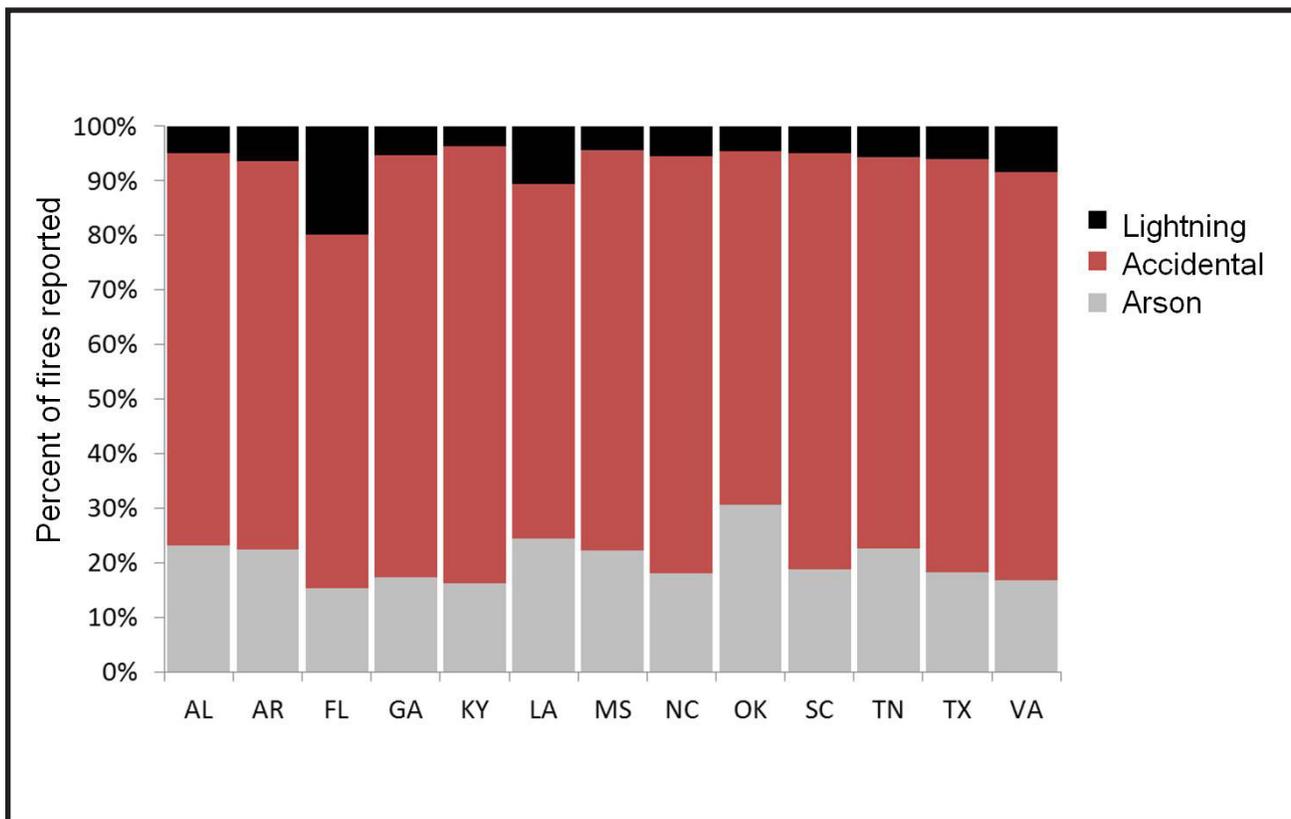


Figure 26. Percent of reported fires caused by lightning, accidental and arson per year for states in the Southeast using state, federal and local for data (NFIRS, NASF, Federal Reporting System).

Cooperation between the wildland fire management community and local community members can help them prepare their homes and communities for fire.

2. Characterization of Wildland Fire Risk

Understanding risk begins with a conceptual model that simplifies the problem into a set of basic components which provide a framework for discussing strategic options. An example of such a model can be based on understanding a wildfire event. Taken without context, wildfire ignitions are simply events. Each event can be characterized by its fire behavior, which depends on the interactions of five interrelated factors: the ignition source, available fuels, topography, weather, and suppression response. It can also be described by its location, intensity, duration, extent, or other attributes, but it has no normative value—it is neither good nor bad. The consequences matter, however, whenever values-at-risk are threatened. Naturally, the extent of the loss of value depends on the extent and intensity of the fire and what values-at-risk are affected.

This simple model of risk can be completed by adding consequences (value changes) and management options available that might directly affect factors contributing to risk (Fig. 27). For example, a fire prevention program could diminish the probability of human-caused ignitions. Similarly, a fuels treatment program might alter fire behavior and make ignitions less damaging or easier to suppress. Another way to impact factors contributing to risk might be to consider investing in firefighting capacity so that wildfires may be more frequently contained before they grow large and damaging. Additionally, consideration could be given to reducing the likelihood of a wildfire damaging homes or other structures by creating communities adapted to fire, or by focusing protection and prevention activities in the immediate area adjacent to values-at-risk.

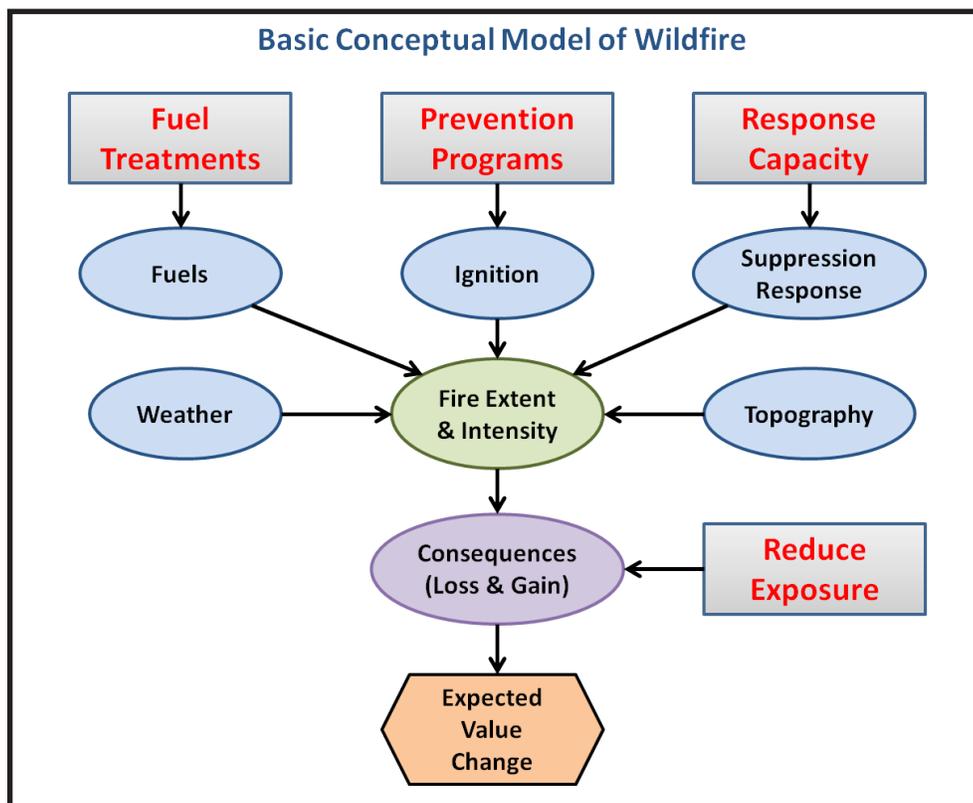


Figure 27. A simple conceptual model of wildfire, its contributing factors, consequences, and management options

During Phase II, various conceptual models were developed to examine different aspects of wildland fire. The purpose of these models was to display the interactions and relationships among factors, such as the correlation between fuel treatments and the extent and intensity of wildfire.

The next step in the comparative risk assessment was translating the conceptual models into quantitative, probabilistic models. These analytical models

were constructed for the primary purpose of relating causal or contributing factors to variables which collectively index levels of risk. These risk metrics include measures of hazard such as frequency and magnitude of wildfire, any direct measures of loss or injury, and various measures related to exposure, such as the number or density of homes in the WUI. Although hazard and loss are often combined into single measures of risk, such measures were not constructed in the NSAT's analysis due in part to the county-level resolution of the original data. For example, the data for a particular county demonstrated that there were homes distributed throughout the WUI and large wildfires were likely within the county, but it was not able to predict which portion of the county is most likely to experience wildfire or which off-site effects of wildfire might be relevant to overall impacts. Such spatial interactions are important for producing an accurate and precise estimate of risk. Lacking more specific information, the NSAT used a more straightforward and simple assumption that the total risk was proportional to county-level hazard, exposure, and potential loss.

Models were parameterized and validated using rigorous statistical methods, and checked against empirical data to meet the standard of high-quality risk assessment tools. Determining the appropriate balance between model complexity, data demands, and utility posed a significant challenge. The resulting analyses helped further the process of identifying and describing alternatives that addressed various levels of wildland fire risk across the Southeastern region.

3. Modeling

Many of the analytical models used in the Phase III analysis were constructed using Bayesian networks. Bayesian networks are decision analysis tools that use conditional probabilities to link variables together and express the degree of relationship between them. They provide a highly flexible modeling environment that works equally well with simple and complex problems. Bayesian networks begin with simple graphs such as in Figure 28, but explicitly define the nodes and quantify the relationships using empirical data or expert opinion. Each node in the network can be represented by a single quantitative variable. Arrows are used within the Bayesian networks to identify conditional dependencies, much as the arrows in Figure 28 are used to relate one variable to another. The direction of the arrows are important, in that they indicate causal dependencies as well as determine how information can flow from one node to another. Probability histograms are used to indicate both the various states or values possible within each node and the level of uncertainty associated with them (Fig. 28). For a more complete explanation of Bayesian Belief Networks and the NSAT process, see Appendix 4.

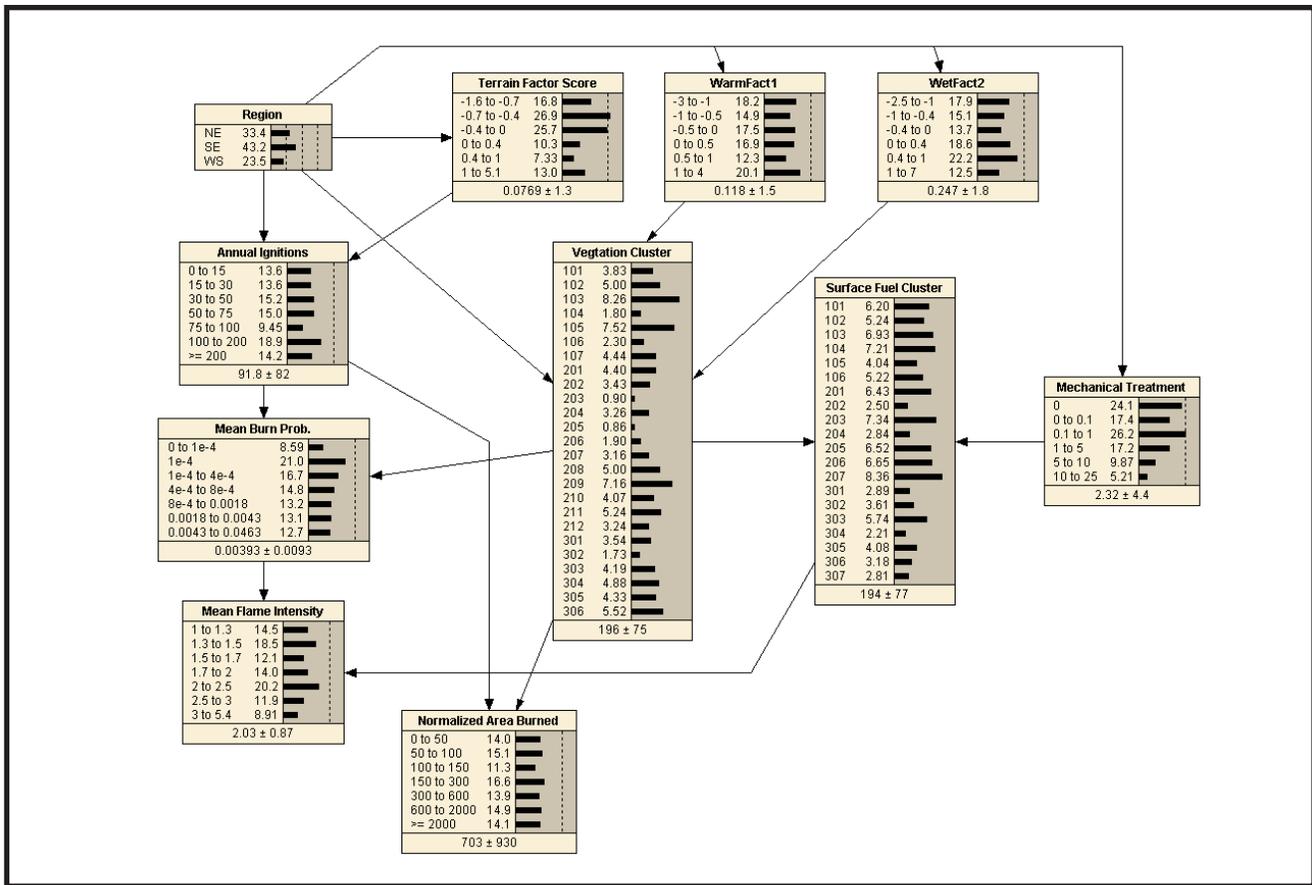


Figure 28. Example Bayesian Belief Network

The primary value of a Bayesian network is that it allows one to view the relationships among many variables simultaneously. Such analyses are made easier by having all data summarized at a common scale. Data from all available sources were processed to fit within a common sampling frame—the county. For some data sets, for example many of the social economic variables, data were originally provided at the county level and no reformatting was necessary. Other, higher-resolution data were processed using GIS techniques to provide a county-level summary. The county-level resolution was chosen for purposes of intra-, and inter-regional comparisons; as well as intra-, and inter-state comparisons. Maps and other graphical representations of the data were produced to aid in review of the results.

The following figure shows the relationship of one of the BBNs that the Southeast RSC used to explore the relationship between key drivers for an alternative related to mechanical thinning to reduce risk in the WUI. Three nodes were selected (WUI area factor, Mechanical Treatment in Forested Areas, and Area Burned Index) and a map created to show the prime areas where this alternative would be most effective. The resultant map (Fig. 28) shows that this alternative is very worthwhile to explore through many parts of the Southeast and would be viable to consider in future risk analysis.

Southeast Fires, Fuels, and Homes BBN

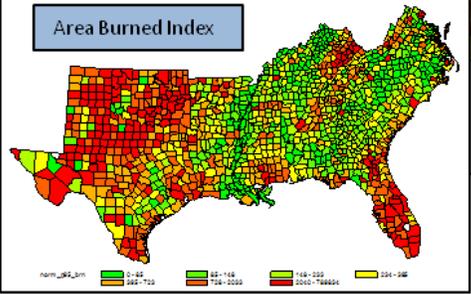
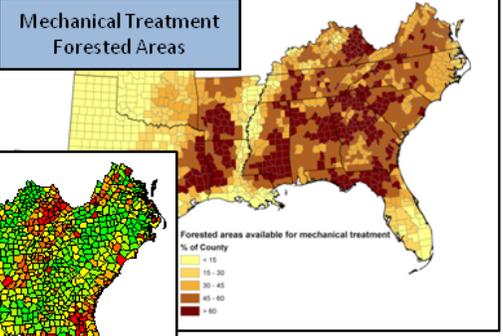
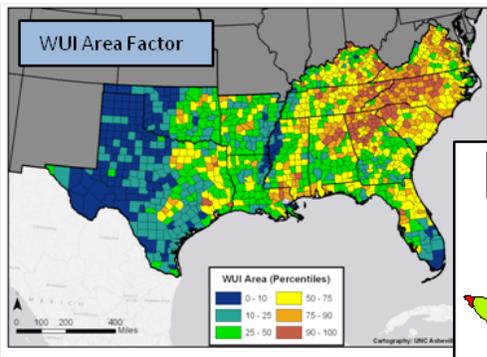
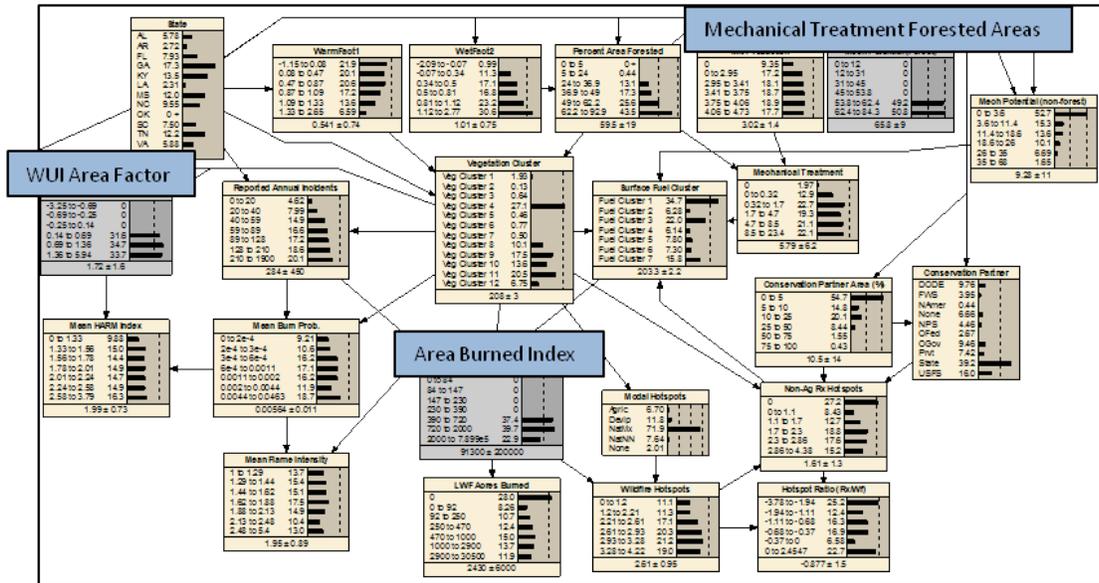
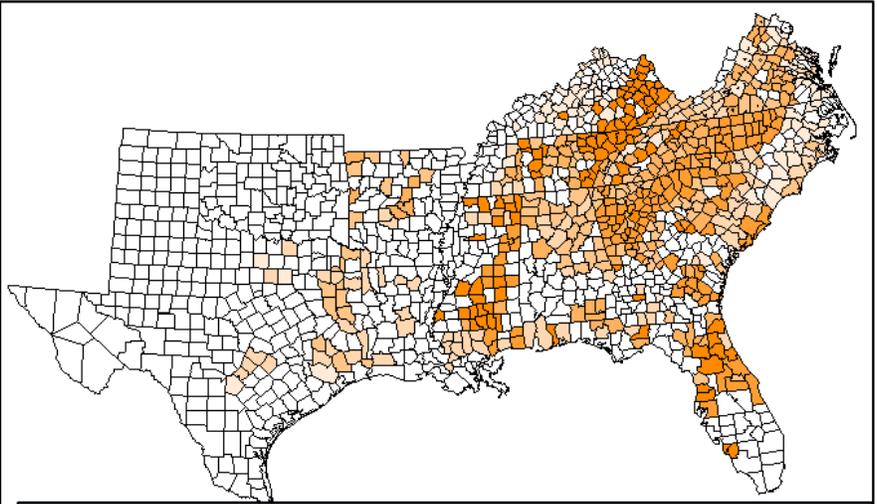


Figure 29 - By using the BBN for Fire, Fuels and Homes that the NSAT generated, the SE RSC was able to determine the primary areas that faced a high risk of fire and that could effectively use mechanical treatments to reduce fuel loads in the WUI.



Counties that possess the greatest risk of fire and the greatest possibility of using mechanical treatments to reduce fuel loads in the WUI.

The WUI influence represents just one of the many interconnected components that help tell the story of the Southeastern region in the risk analysis. The varying shades of blue indicate that WUI is a key issue across the Southeastern region (Fig. 30).

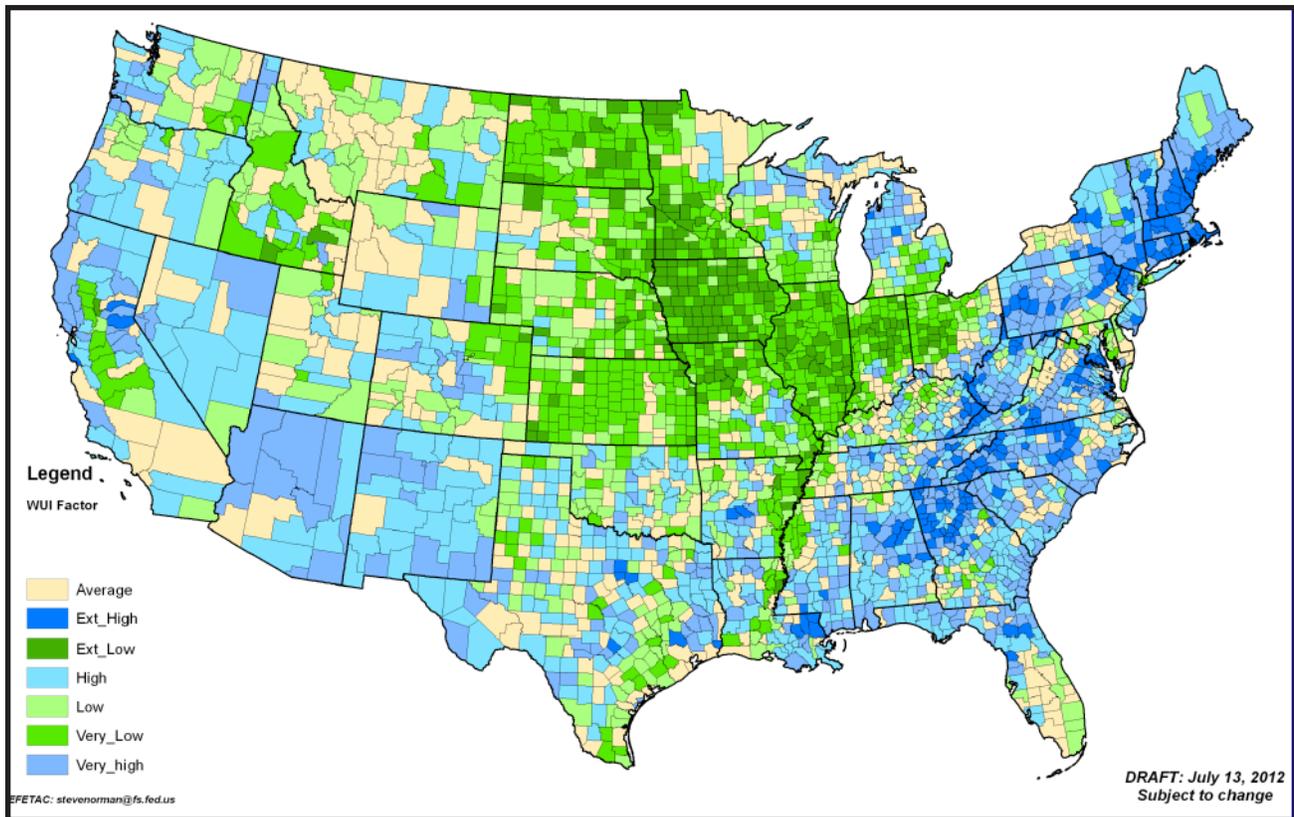


Figure 30. WUI area in the Southeast

Each of the factors influences the overall belief network, and may be graphically represented to understand the relationships between the components (Fig. 31).

8. Variable burn probability with variety of area burned
9. Fires occur in all environments
10. Higher rate of intentional ignitions than the other regions
11. Large proportion of homes in the wildland urban interface/intermix
12. Large proportion of the landscape in the WUI/intermix
13. Higher demographic stress

The NSAT risk analysis reveals a region with pressures both on the environment and the people who live here. It is a region with significant forested area that supports high mill production, a large number of homes and communities in the WUI, and a significant rate of fire occurrence. To achieve the Cohesive Strategy goals of Restore and Maintain Landscapes, Fire-adapted Human Communities, and Response to Fire, the RSC will use findings from the risk analysis along with trends in the values matrix to develop management and investment options for the Southeastern region.

Additional tools available to the region are the Southern Wildfire Risk Assessment (SWRA), the State Forest Resource Assessments, and the State Wildlife Action Plans. The SWRA was created by the Southern Group of State Foresters (SGSF) and their federal partners to assess the wildland fire risk footprint across the region. With a thirty meter resolution, it allows for analysis of wildfire risk down to the community level. The latest update to the SWRA called SouthWRAP includes a tool called Community Editor, which will allow individual states to assess risk to communities and assist them in helping raise awareness across the region. It is designed to allow local planners access to the fire risk data from the SWRA, and incorporate it into their hazard mitigation and community wildfire protection plans (CWPP). Additionally, forest action plans and wildlife action plans were created at the state level to help managers prioritize decisions, including land management and wildfire actions. State Forest Resource Assessments were developed by each state in response to the Forest Service's State and Private Forestry redesign program in 2008. Under this program, each state was required to analyze its forest conditions and trends over the entire state, and delineate priority rural and urban forest landscapes (Fig. 32).

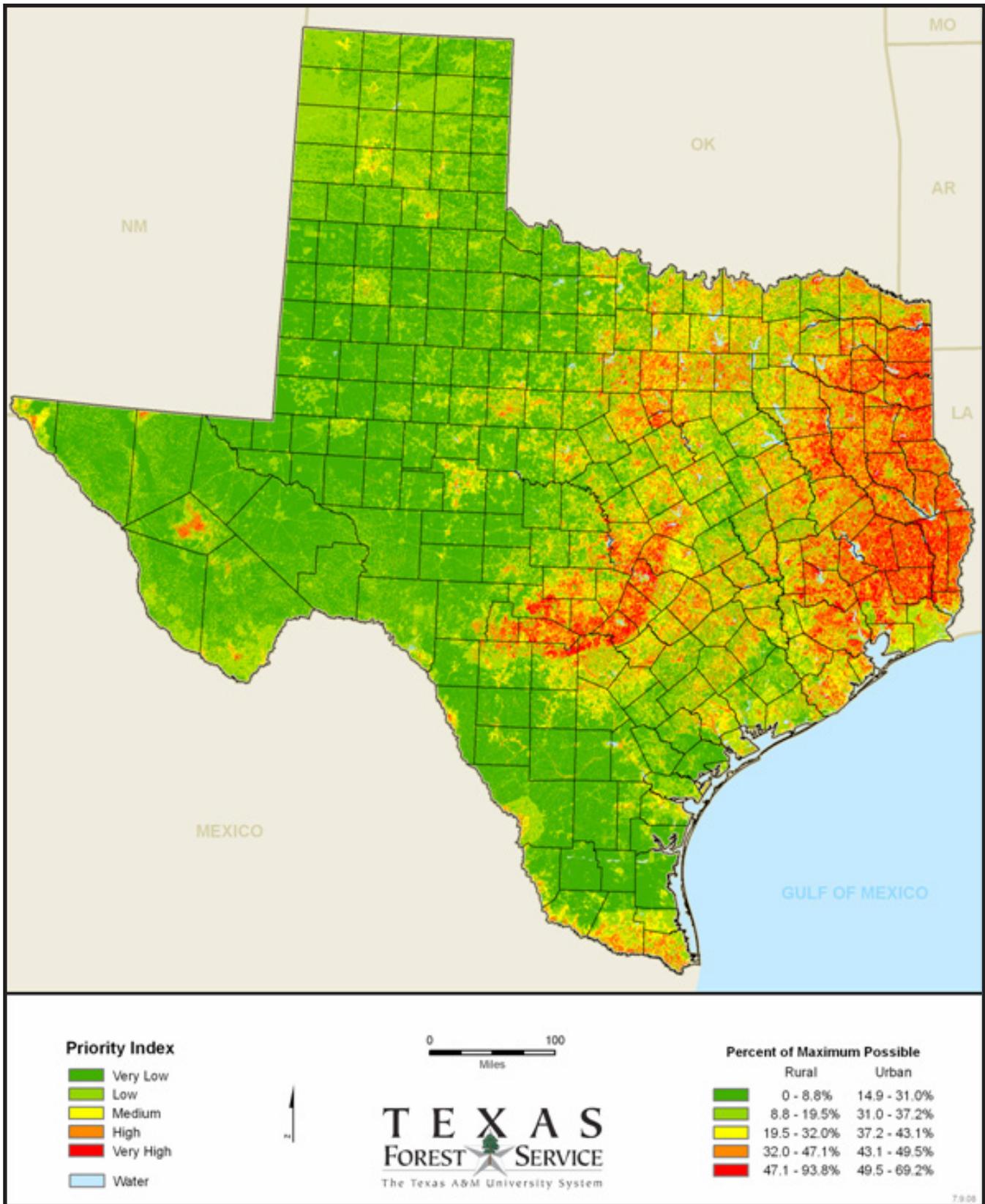


Figure 32. Texas rural and urban analysis combined map, state forest resource assessment

These plans were focused on three national themes: conserve working forests, protect forests, and enhance benefits from trees and forests. Each state assessment identifies primary issues impacting these themes within their respective states, and lays out an action plan to help inform and guide planning and mitigation efforts. Additional resources are the State Wildlife Action Plans. State Wildlife Action plans resulted from the 2008 Farm Bill, which directed each state to examine the health of wildlife and prescribe actions to conserve wildlife and vital habitat before they become more rare and costly to protect. The action plans contain two sets of priorities: terrestrial conservation and inland aquatic conservation. States are intended to include the Wildlife Action Plan in with their forest resource planning efforts.

The process for evaluating risk across the Southeast will be iterative and continuous. The BBNs and other tools described above will allow managers easier access to greater amounts of data in a spatially driven and understandable manner. As the Cohesive Strategy moves into implementation, these tools will help drive the priorities and actions in the Southeast.

D. PERFORMANCE MEASURES

The level of annual fire activity is directly correlated to the amount of risk to which firefighters are exposed and can be correlated to the impact on communities. Similarly, weather patterns are correlated with the number of acres treated for hazardous fuels reduction and the level of wildfire activity. The annual variability within these factors decreases the confidence that an individual year’s “measurement” is representative of whether or not a particular goal/objective is being reached. Trend data (i.e., rolling 10 year average) would better describe progress towards an objective.

The performance measures listed below can be considered a temporary surrogate until systematic measures can be developed. Trying to determine performance measures has not only highlighted inconsistencies in how different entities collect the same type data, but also the absence of data collection. Scientists and statisticians will need to explore various tools (e.g., remote sensing) to develop measures that are systematic and independent of all but the most dependable data sources.

Restore and Maintain Landscapes

National Performance Measure

Risk to Landscapes is Diminished

The majority of Southeastern landscapes are dependent on fire to maintain characteristic ecosystem structure. Excluding fire from these habitats threatens values-at-risk by magnifying the consequences of undesirable ignitions. High rates of fuel production in these ecosystems can result in hazardous levels of fuel accumulation if historic fire regimes are altered, or fire is excluded. In addition to rapid fuel accumulation, it is possible to have wildfire ignitions 12 months a year in the Southeast. Absent prescribed burning, wildfire, or a surrogate fuels reduction treatment, the potential for severe, catastrophic wildfires that can damage the forest and surrounding areas, or even damage the soil system increases exponentially. Sustained periods of fire exclusion will result in wholesale landscape alternation, called type conversion. Fire helps to maintain pine forest by removing competition from long-lived species. Infrequent ignitions would result in a shift in pine forests towards hardwood-dominated landscapes. This shift would have significant impacts on the diversity of ecosystem flora and fauna.

While wildland fire is the most efficient tool for reducing fuel loading, other management tools can mimic wildland fire’s role on the landscape. Examples would include thinning forests to remove live fuel or using mechanical mulchers to decrease hazardous fuel loading by rearranging understory vegetation in areas where prescribed burns are not feasible.

Regional Performance Measures for Objective 1.1

1. Acres burned or otherwise treated [to reduce hazardous fuels and improve ecosystem function]
2. Acres under stewardship programs or equivalent certifications

The number of acres treated in any way to reduce hazardous fuel loading directly reduces the risk to the landscape. Though all states and Tribes can track acres burned through internal permitting systems, data collection and management is not consistent across states and Tribes and permitting systems do not capture non-fire treatments. While the challenge of tracking non-fire treatments has not been addressed, efforts are underway to consolidate and standardize prescribed fire data regionally and nationally.

Acres in stewardship programs are deliberately managed to minimize risk to forest health using wildland fire and fire surrogates. Registries of stewardship or easement programs must be developed that accurately estimate the amount of forest being actively managed.

Fire Adapted Communities

National Performance Measures

1. Risk of wildfires to communities is diminished
2. Individuals and communities accept and act upon their responsibility to prepare their properties for wildfire
3. Jurisdictions assess level of risk and establish roles and responsibilities for mitigating both the threat and the consequences of wildfire
4. Effectiveness of mitigation activities is monitored, collected, and shared.

The Southeast experiences significant wildfire activity year-round. More than half of the nation's wildfire ignitions and more than 40 percent of large fires occur in the region. Because of this wildfire activity and the rapidly increasing WUI, the risk to communities is steadily increasing. As more development has occurred adjacent to historically agricultural/rural areas, the management of smoke from wildfires and prescribed fires has become an ever more significant challenge for land managers, the fire community, as well as the public at large.

With coordination among fire managers, community planners, policymakers, landowners, and area residents, communities can adapt to inevitable wildfire incidents without loss of life or significant damage to infrastructure. Effective education efforts are critical in accomplishing this effort. These adapted communities will recover more rapidly and thrive economically while allowing fire to assume its natural function as a component of healthy ecosystems.

Regional Performance Measures for Objective 2.1

Number of communities-at-risk (CAR) covered by a Community Wildfire Protection Plan (CWPP) or equivalent.

Evidence that a community is improving its wildland fire preparedness can be represented by any of the following:

1. Adoption of Firewise or equivalent principles to safeguard homes.
2. Adoption of “Ready, Set, Go!” or equivalent principles to prepare for fire and evacuation.
3. Enaction of mitigation/fire prevention ordinances.
4. High priority hazardous fuels identified in a CWPP or equivalent are reduced or appropriate fuel levels on such lands are maintained in accordance with a plan.

Today 43 percent of the communities in the Southeast are considered to be at high or very high risk of damage from wildfire (Andreu 2008). Communities at risk from wildfire can work collaboratively with wildland fire agencies, local fire departments, and other entities to prepare their homes and neighborhoods, to reduce losses during a fire, and to accelerate post-fire recovery. The fire management community must work to engage communities with moderate to high risk of wildfire and encourage the adoption of Firewise, Ready, Set, Go, and similar programs. State fire management agencies and other organizations, such as Firewise U.S.A., maintain records of communities that participate in these fire risk-abatement programs. These data can be used to track longevity of participation of existing communities, and the number of new communities involved in such efforts at the regional, state, Tribal, and county level.

Leaders in the fire management community must work in partnership with policymakers to develop ordinances that encourage wildfire prevention and mitigation activities. While no central registry of local ordinances exists, state wildland fire management agencies are familiar with most fire-related county ordinances.

Wildfire Response

National Performance Measures

1. Injuries and loss of life to the public and firefighters are diminished
2. Response to shared-jurisdiction wildfire is efficient and effective
3. Pre-fire multi-jurisdictional planning occurs.

Firefighter and public safety are the primary objectives in every Incident Action Plan. Though risk management is increasingly emphasized throughout the fire management community, avoidable accidents continue to occur, and every year firefighters and members of the public lose their lives or are injured during fire events. Tracking the number of fire personnel injuries and accidents, particularly as a

percentage of assignments, may be an effective way to measure the success of the safety message as well as the risk-based decision-making process.

In the South, the juxtaposition of jurisdictions requires the various suppression agencies to coordinate efforts to effectively and efficiently respond to wildfire. Preplanning among these agencies offers opportunities for incident responders to develop professional relationships. These relationships increase interoperability and ensure effective communications during wildfire response, decreasing the risk of accidents or injuries.

Regional Performance Measure for Objective 3.1

Trend change in number of firefighter injuries and firefighter fatalities during wildfire suppression activities compared to previous years.

Studying the trend in the numbers of firefighters killed or injured during wildfire response is critical to reducing the risks related to wildfire response, identifying interagency lessons learned, and communicating an effective safety message throughout the wildfire management community (Fig. 33).

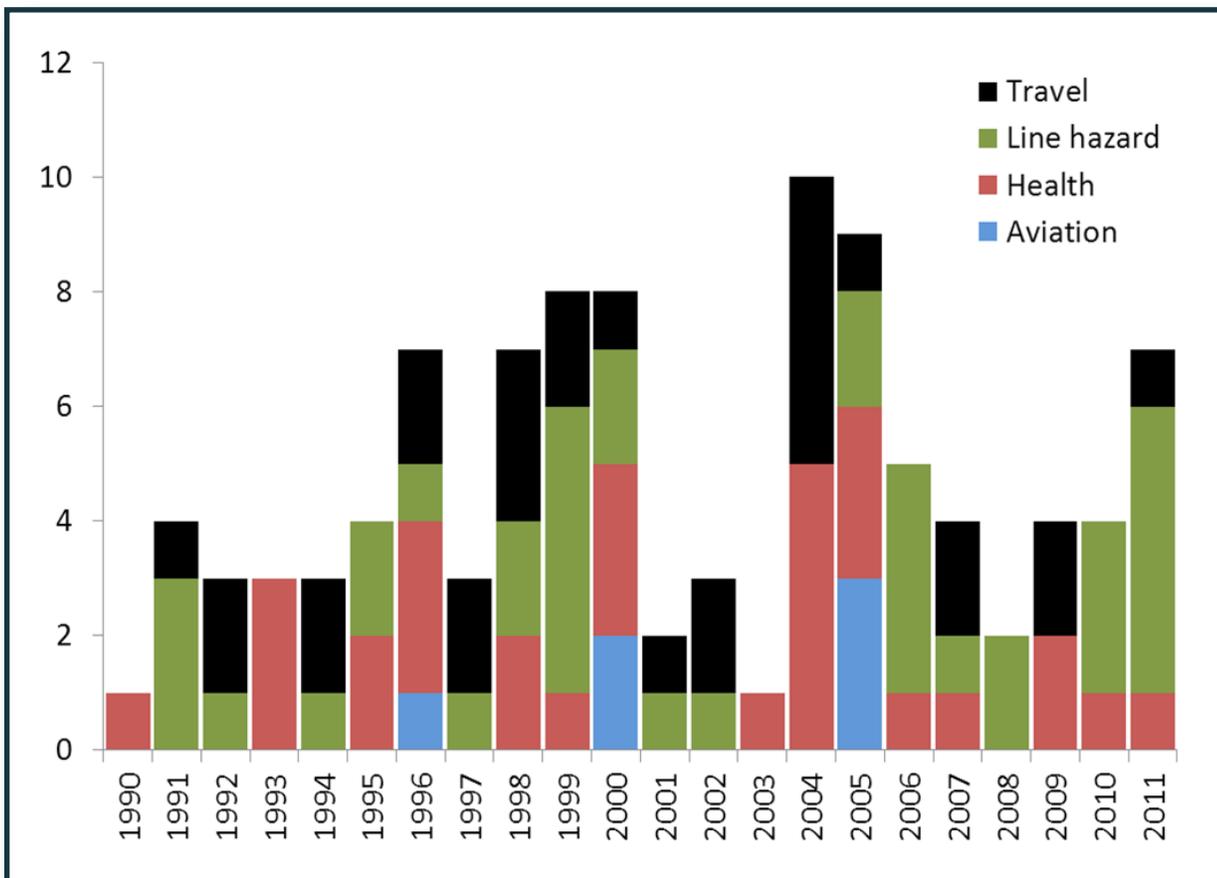


Figure 33. Wildland and outdoor firefighter fatalities for the Southern area (1990 - 2011). Source: National Fallen Firefighters Foundation. www.firehero.org

This performance measure parallels a national performance measure. Annual statistics related to firefighter injuries and fatalities can be easily and accurately tracked using national databases.

Regional Performance Measures for Objective 3.2

Percent increase in the number of firefighters receiving wildland fire training compared to previous years

Increasing the number of firefighters who receive proper training in wildland tactics will reduce the numbers of injuries and fatalities experienced by firefighters and the public. Most professional wildland firefighters' qualifications can be tracked in the Incident Qualifications and Certification System (IQCS), for federal responders, or Incident Qualification System (IQS) for state responders. Structural fire departments have a different qualification tracking system, but basic wildland firefighter training can be studied in order to ascertain trends.

Structures and other values-at-risk saved from damage or destruction by wildland fire are recorded inconsistently throughout the Southeast. It is particularly challenging to estimate the values-at-risk protected given the significant number of wildfire ignitions that are quickly suppressed and never recorded. The Southeast has a culture of independence and self-sufficiency, and it is rare that a rural inhabitant would see a small fire and fail to stop and extinguish it. These ignitions are virtually never reported to any fire management organization. It is likely that the actual number of wildfire ignitions in the Southeast is significantly larger than the 41,500 that are recorded on average each year. Generating an accurate estimate may require the creation of a geospatial database containing wildfire origins throughout the region.

Statewide Mutual Aid Agreements increase the ability of wildland fire managers and responders to safely and effectively respond to wildfires across jurisdictional lines.

Prevention is also an essential element of wildfire abatement in the Southeast, and effective prevention programs may significantly reduce human-caused wildfire incidents.

The Southeastern performance measures are designed to be strategic, outcome-oriented measures that will assist the region in achieving national and regional objectives. Paired with the national performance measures, these performance measures are intended as interim measures which may be updated or replaced as scientists and researchers develop more sophisticated approaches using remotely sensed data and other tools. These performance measures will provide key guidance in the development and implementation of the Phase III Southeastern action plan.

E. CONCLUSIONS

The Cohesive Strategy in the Southeast has been developed for use by managers at any level. The Southeast has regionally attempted to evaluate and determine which actions and activities from Phase II would have the most significant positive impact and to encourage managers at all levels to consider those that were identified when planning on the ground activity. These actions and activities were selected as the Southeast's emphasized alternatives. It is important to note, however, that with nearly 90 percent of the forested landscape held in private ownership, much of the responsibility and opportunity for action must occur in a collaborative manner. Private property rights are an important part of Southeastern culture and must be respected in decision-making.

The Southeast is facing many challenges as it relates to wildfire such as:

1. Diminishing capacity of response organizations and land management agencies
2. Weakening traditional markets due to the global economy
3. New landowners who do not understand land management decision-making
4. New residents who do not have the historical cultural background of the Southeast (i.e., intolerance of fire and smoke)
5. Rapidly increasing WUI extent throughout the region

Additionally, a list of barriers were developed to better articulate specific challenges that need direct assistance to be addressed at the national level. Along with the challenges come unique opportunities. By working together with partners not only in fire management but also in community planning, ecological management, and other areas, Southeastern stakeholders can collectively capitalize on the opportunities while addressing the challenges.

The information and tools provided by the NSAT offer data that can easily be understood, analyzed, and used by stakeholders. The emphasized alternatives that were developed will continue to be emphasized across the region at all levels. The benefit of the Cohesive Strategy is the development of a network of partners that understand each other's issues and the importance of implementing landscape-scale solutions. What has developed over the past year is something that is difficult to capture in a technical report. An extension of partnerships built on trust is what will ultimately benefit the residents and the forests in the South.

The development of the strategy is merely a starting point. Emphasized alternatives are a way of capturing those actions believed to have the greatest impact. By continuing to use the best available science to inform decisions, and leveraging the diverse Southeastern partnership base, the region will continue to make strides in policy, planning, and management that result in a positive impact to protecting lives and property, reducing risk and constructing landscapes and communities resilient to fire.

F. NEXT STEPS

Over the past 10 months the Southeastern region has been engaged in Phase III of the Cohesive Strategy development, planning for the regional implementation of the strategy. The Southeastern Risk Analysis uses current and potential strategies from the wildland fire management community in an attempt to synthesize wildfire risk on the landscape. The alternatives developed through the Phase III process constitute current and emerging opportunities that, singly and in combination may be used by wildland fire managers and other stakeholders to address the challenges of wildland fire management in the Southeastern United States. The Southeastern Risk Analysis Report, together with the reports developed by the Northeast and the West will inform the development of a National Risk Analysis document, which will be drafted in the winter of 2012-13 with input and assistance from key Southeastern stakeholders.

With the completion of the Southeastern Risk Analysis, the Southeastern Region will focus on the development of a regional Action Plan and begin formulating next steps. This Southeastern Action Plan will target feasible means of implementing the emphasized alternatives identified in the Risk Analysis to move towards achieving the three regional and national goals of the Cohesive Strategy. The Southeastern Action Plan will specifically identify what actions will be taken around the region, which stakeholders will be involved in the actions, and where the actions may occur. The Southeastern Action Plan will focus on achievable and tangible successes that move stakeholders and the region towards accomplishing the three key goals.

While execution of the identified actions has already begun, with the completion of Phase III, the entire focus will be on the implementation of the Southeastern Action Plan. The networks that have been developed over the last three years will be nourished through regional newsletter updates. The newsletter will highlight successes and share emerging opportunities, facilitating communication between diverse stakeholders. Beyond 2013, the focus of the Cohesive Strategy effort in the Southeast will be implementation of the actions and activities recommended in the Risk Analysis and periodic evaluation of the results of implementation on achieving regional and national goals.

G. APPENDICES

APPENDIX 1 – GLOSSARY

The National Wildfire Coordinating Group (NWCG) maintains an extensive glossary of fire management terminology and acronyms (found at www.nwcg.gov/pms//pubs/glossary/index.htm). Some terms used in this document that have specific meaning in the context of wildland fire management, but are not found in the NWCG glossary are defined below.

Affected party: A person or group of people who are affected by the outcome of a decision or action.

Biomass: Any organic matter that is available on a renewable or recurring basis. Under the Farm Security and Rural Investment Act of 2002 (Title IX, Sec. 9001), biomass includes agricultural crops, trees grown for energy production, wood waste and wood residues, plants (including aquatic plants and grasses), residues, fibers, animal wastes and other waste materials, and fats, oils, and greases (including recycled fats, oils, and greases), but not recycled paper or unsegregated solid waste. (From Farm Bill Glossary on the National Agricultural Law Center website <http://nationalaglawcenter.org/#>.)

Fire-adapted community: Human communities consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire.

Fire-adapted ecosystem: An ecosystem is “an interacting, natural system, including all the component organisms, together with the abiotic environment and processes affecting them” (NWCG Glossary). A fire-adapted ecosystem is one that collectively has the ability to survive or regenerate (including natural successional processes) in an environment in which fire is a natural process.

Fire exclusion: Land management activity of keeping vegetation or ecosystems from burning in a wildland fire.

Fire management community: A subset of the fire community that has a role and responsibility for managing wildland fires and their effects on the environment [according to the Phase I report glossary].

Fragmentation: Physical process whereby large, uniform areas are progressively divided into smaller fragments that are physically or ecologically dissimilar. Fragmentation can occur through natural disturbances such as wildfire, or more commonly, through land use conversion by humans (e.g., urbanization).

Landscape resilience: The ability of a landscape to absorb the effects of fire by regaining or maintaining its characteristic structural, compositional and functional attributes. The amount of resilience a landscape possesses is proportional to the magnitude of fire effects required to fundamentally change the system.

Parcellation: Process of subdividing a large, intact area under single ownership into smaller parcels with multiple owners. The term can also apply to an administrative process of dividing a landscape into multiple management units with different management objectives. Parcellation is often a precursor of fragmentation because of differences in management priorities among property owners.

Prescribed Fire: Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements (where applicable) must be met, prior to ignition.

Silviculture: “The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis” - definition from John A. Helms, ed., 1998. The Dictionary of Forestry. The Society of American Foresters, Bethesda, Maryland.

Stakeholder: A person or group of people who has an interest and involvement in the process and outcome of a land management, fire management, or policy decision. Viewshed An area of land, water, or other environmental element that is visible to the human eye from a fixed vantage point.

Wildfire: 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.

Wildland Fire: Any non-structure fire that occurs in the wildland. Three distinct types of wildland fire have been defined and include wildfire, wildland fire use, and prescribed fire.

APPENDIX 2 – ACRONYMS

BIA	Bureau of Indian Affairs
CAR	Community at Risk
CWPP	Community Wildfire Protection Plan
DAG	Directed Acrylic Graph
DOD	Department of Defense
DOI	Department of the Interior
EMAC	Emergency Management Assistance Compact
EMDS	Ecosystem Management Decision Support system
FLAME	Federal Land Assistance, Management and Enhancement Act
FPA	Fire Program Analysis
FPU	Fire Planning Unit
FWS	Fish and Wildlife Service
GAO	General Accounting Office
HVR	Highly Valued Resource
IAFC	International Association of Fire Chiefs
ICS	Incident Command System
IMT	Incident Management Team
IQCS	Incident Qualifications and Certifications System
IQS	Incident Qualification System
MOU	Memorandum of Understanding
NASF	National Association of State Foresters
NFPA	National Fire Protection Association
NGO	Non-Governmental Organization (e.g. nonprofit)
NICC	National Interagency Coordination Center
NIFC	National Interagency Fire Center

NPS	National Park Service
NSAT	National Science Assessment Team
NVC	Net Value Change
NWCG	National Wildfire Coordinating Group
PDSI	Palmer Drought Severity Index
ROSS	Resource Ordering Status System
RFD	Rural Fire Departments (including volunteer fire departments)
RSC	Regional Strategy Committee
SERPPAS	Southern Regional Partnership for Planning and Sustainability
SGA	Southern Governors' Association
SGSF	Southern Group of State Foresters
SWRA	Southern Wildfire Risk Assessment
TIMO	Timber Investment Management Organizations
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USFS	United States Forest Service
VFD	Volunteer Fire Department
WFDSS	Wildfire Decision Support System
WFEC	Wildland Fire Executive Council
WFLC	Wildland Fire Leadership Council
WPE	Wildfire Prevention Education
WUI	Wildland-Urban Interface

APPENDIX 3 – REFERENCES

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APPENDIX 4 – AVAILABLE SCIENCE/MODELS TO BETTER INFORM THE DECISIONS FOR IMPLEMENTING ALTERNATIVES, MONITORING DATA AND PERFORMANCE MEASURES

Data and Methods for Exploring Opportunities to Reduce Risk

Wildland fire is a complex issue that involves multiple interacting factors spanning the natural, human, and built environments. During Phase II, the NSAT examined various aspects of wildland fire and developed conceptual models specific to each component. The purpose of these models was to display the interactions and relationships among factors, such as the relationship between fuel treatments and the extent and intensity of wildfire. The NSAT also identified various data sets that might be used in Phase III to build analytical models consistent with the concepts articulated in Phase II. Building on these efforts, Phase III has involved an extensive effort to collect data necessary to quantify relationships and provide a rigorous examination of risk.

The types of data collected can be broadly categorized into five general types: biophysical, socioeconomic, land-use and ownership, wildfire frequency and extent, and incident response. Biophysical variables include physical measures such as precipitation, temperature, and terrain. They also include characteristics of vegetation that contribute to wildfire behavior. Socioeconomic variables describe the demographic and economic characteristics of populations and communities within each county, and also describe the distribution of homes within the wildland-urban interface. Land-use and ownership describes the mixture of public and private lands and also helps quantify the extent to which lands might be suitable for active management, e.g., by highlighting areas that historically supported timber harvest. Variables describing wildfire frequency and extent have been gathered from various reporting systems that have been put in place by federal, state, Tribal, and local fire departments. They also include data from independent monitoring systems that track wildfire using satellites and other remote devices. Finally, they include a series of modeled products from governmental and private entities. Similarly, incident response information has been gathered from many of the same reporting systems. These variables track who responded to wildfire, how long they took to arrive on site, and how long was required before the fire was contained. Information on injuries and casualties can also be found in these same reporting systems. All of the variables available for use in the Phase III analyses are listed at the end of this Appendix.

Before data were used in analysis, three additional steps were accomplished. The first step was one of quality control. Obvious errors in the data were corrected where it was apparent that the corrections would enhance the fidelity of the original data. In some cases limited numbers of observations were omitted from further consideration due to obvious mistakes that could not be corrected or missing information. The second step involved compiling, reformatting, or summarizing data to fit within a common sampling frame—the county. For some data sets, for example many of the social economic variables, data were originally provided at the county level

and no reformatting was necessary. Other, higher-resolution data were processed using GIS techniques to provide a county-level summary. Many data were also normalized to provide comparative area-based or incident-based metrics such as acres burned per hundred square miles or firefighter injuries per 1000 incidents.

The third step in data preparation involved filtering and consolidation. In this step, a preliminary correlation analysis was used to identify common patterns among the data that allowed a subset of the data to be used to characterize conditions efficiently. That is, a smaller set of variables were identified that were highly correlated with other variables and could be used alone without significant loss of information. Statistical techniques including factor analysis and clustering were used to reduce the number of variables further by creating super variables that were either linear combinations of other variables (from factor analysis) or categorical groupings of counties based on their similarities (using cluster analysis). The combination of filtering and consolidation techniques allowed the total number of variables considered to be reduced by nearly two-thirds. Even so, there were more than 100 variables available for potential analysis.

Modeling

Various analytical models were constructed for the primary purpose of relating causal or contributing factors to variables which collectively index levels of risk. These risk metrics include measures of hazard such as frequency and magnitude of wildfire, any direct measures of loss or injury, and various measures related to exposure, such as the number or density of homes in the wildland-urban interface. Although hazard and loss are often combined into single measures of risk, such measures were not constructed in the NSAT's analysis due in part to the county-level resolution of the original data. For example, when analyzing data for a particular county, it is evident that are homes distributed throughout the WUI and large wildfires are likely within the county, but which portion of the county is most likely to experience wildfire or which off-site effects of wildfire might be relevant to overall impacts cannot be discerned. Such spatial interactions are important for producing an accurate and precise estimate of risk. Lacking more specific information, the NSAT used a more straightforward and simple assumption that the total risk is proportional to county-level hazard, exposure, and potential loss.

Many of the analytical models used in the NSAT's analysis were constructed using Bayesian networks. Bayesian networks are decision analysis tools that use conditional probabilities to link variables together and express the degree of relationship between them. They provide a highly flexible modeling environment that works equally well with simple and complex problems. Here, the NSAT used a simple example using climate, fuel, and wildfire to illustrate the basics behind a Bayesian network. Consider the two graphs shown in Figure 1. In the first graph on the left, it is assumed that climate affects both vegetation (fuels) and wildfire, but vegetative fuels and wildfire are independent given climate (i.e., there is no connection between fuels and wildfire that does not pass through climate). The second graph uses the same three nodes, but specifies a different relationship in that vegetative fuels and wildfire are both related to climate, but vegetation has an additional direct on wildfire. The principal difference in the two graphs is that the first graph suggests that manipulation of vegetation would have no measurable effect on wildfire. Only by changing climate could one expect wildfire to change. In contrast, the second graph allows for changes in vegetation to have an effect on wildfire independent of changes in climate. Importantly, quantitative models based on either graph could be based on exactly the same data, but they would have very different implications for management.

Bayesian networks begin with graphs like these, but then quantify the relationships using empirical data or expert opinion. Each node in the network can be represented by a single quantitative variable. Arrows are used within the Bayesian networks to identify conditional dependencies, much as the arrows in the graph above are used to relate one variable to another. The direction of the arrows are important, in that they indicate causal dependencies as well as determine how information can flow from one node to another. In this context, information is defined explicitly as that which causes a change in probability assignment. To facilitate calculation—as well as communication—continuous variables are often broken into discrete classes; discrete or categorical variables require no such modification.

As an example, consider the Bayesian network shown in Figure 2 and Figure 3. This simple network has three nodes: *Region*, *Annual Ignitions*, and *Normalized Area Burned*. *Region* simply refers to the three regions identified within the Cohesive Strategy. *Annual Ignitions* is the mean number of outdoor fires reported per year, summed from three separate reporting systems representing federal, state, Tribal, and local response units. *Normalized Area Burned* is an estimate of the expected number of acres burned in these reported incidents during a high-fire-occurrence year (i.e., the 95th percentile). This network was parameterized (trained) using data from all of the counties in the conterminous United States (lower 48 states), where each county was treated as a single observation and weighed equally regardless of area. The unconditional network (Figure 2) shows the marginal distributions of the values of each variable. One can see from the probability histograms, for example, that 33.4 percent of the counties are in the Northeast, 15 percent of the counties reported between 50 and 75 outdoor fires per year, and 14.3 percent of the counties might expect to burn 2000 or more acres (much more in some counties) in a bad wildfire year. Conditioning on region (Figure 3) provides a quick visual comparison of the differences among regions. For example, the West stands out in that it has a higher than normal percentage of counties with relatively few incidents, but also higher than average numbers of counties with very high expectations for area burned.

The Bayesian networks constructed for the NSAT's analyses are necessarily more elaborate than the simple graphs depicted above, but they use the same basic concepts. For example, the network depicted in Figure 4 uses logic similar to Figure 1 regarding the relationship between climate, fuels, and wildfire, but expands that concept by using multiple nodes or variables for each component. This particular network uses three super variables (*Warmness Factor 1*, *Wetness Factor 2*, and *Terrain Factor 3*) from a factor analysis of physical attributes including seasonal precipitation and temperature, elevation, and slope, and regional cluster analyses of vegetation and surface fuels. It also includes *Region*, *Annual Ignitions*, and *Normalized Area Burned* from Figures 2 and 3, and additional nodes from an independent modeling exercise, *Mean Burn Probability* and *Mean Flame Intensity*. A primary difference between the networks in Figure 4 and Figure 2 is the relationship between *Region* and *Normalized Area Burned* now passes through a series of intermediate nodes related to climate and vegetation, which allows for greater exploration of the causal factors influencing area burned by wildfires.

Five basic models or templates were created for use by the Southeast in order to explore opportunities for reducing risk. They are described only briefly here. The first was an Ignition Model, which focused on understanding where human-caused wildfire ignitions occurred and where they might be reduced through targeted actions at preventing either accidental or intentional ignitions alone or in combination. The second template—Fire, Fuels, and Homes—explored the intersection of homes and wildfire and

included variables that might suggest where either mechanical treatments or prescribed fire might be productively employed to alter the composition of surface fuels and affect wildfire behavior. Conversely, they could also be used to identify areas where such options are problematic. The third template—Prescribed Fire and Ecological Resiliency—focused more on the potential application of prescribed fire in areas removed from human communities where the primary goal might be to restore a fire regime more consistent with historical conditions. Fire Adapted Communities formed the basis of the fourth template, which used information about current programs to suggest the extent to which evidence of local actions are tied to socioeconomic factors as well as to factors more directly indicative of risk to human communities from wildfire. Finally, the fifth template emphasized Incident Response Capacity and Workload. The purpose of this template was to help understand the relative contribution of federal, state, Tribal, and local departments to incident response and explore the factors contributing to variation in response metrics such as arrival and containment time and fire size.

These templates and associated data were customized for each region and shared with the regional work groups during a workshop in Denver in early September. Ensuing discussions with each workgroup led to the creation of a series of summary tables, graphs, and maps that highlighted findings relevant to objectives and goals articulated by each region. These summary products have been incorporated in the regional reports as noted.



Figure 1. Simple graphical models of two possible hypotheses of the relationships among climate, vegetative fuels and wildfire.

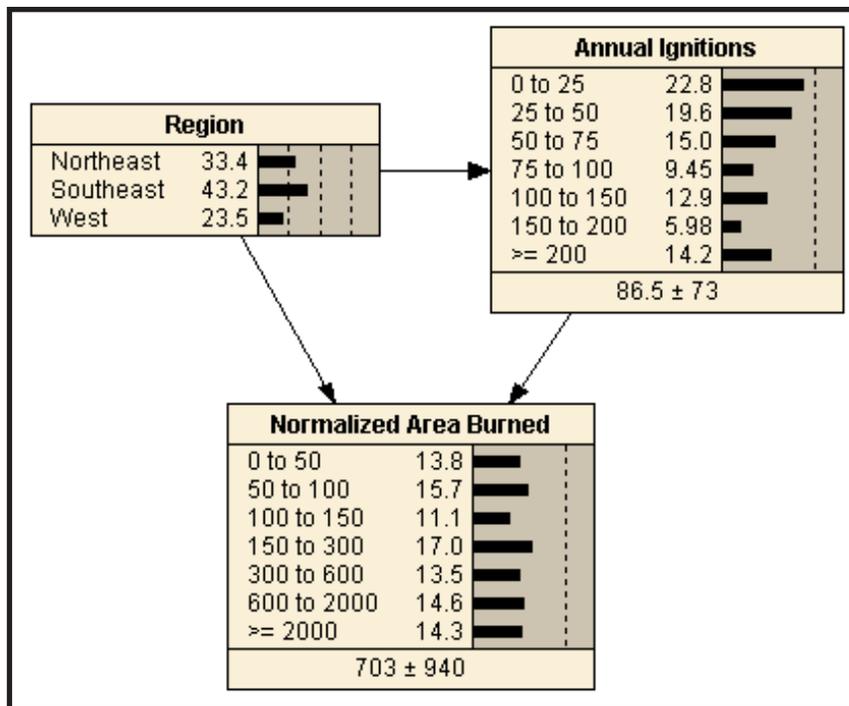


Figure 2. Simple Bayesian network illustrating the relationships among Cohesive Strategy region, annual ignitions, and normalized area burned. Probability histograms represent the percent of the counties within the conterminous United States within each class.

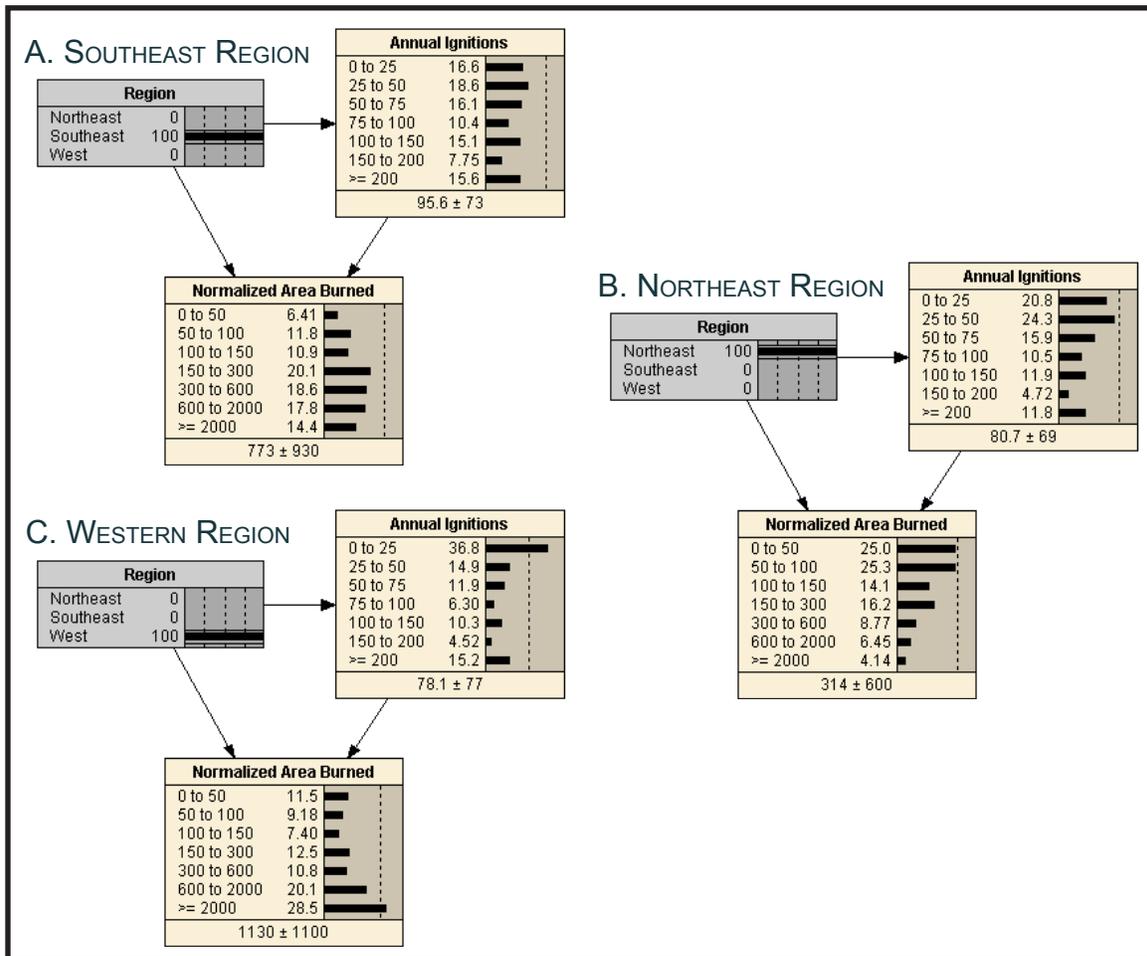


Figure 3. Simple Bayesian network illustrating the relationships among Cohesive Strategy region, annual ignitions, and normalized area burned, conditioned on region. Probability histograms represent the percent of the counties within each region within each class.

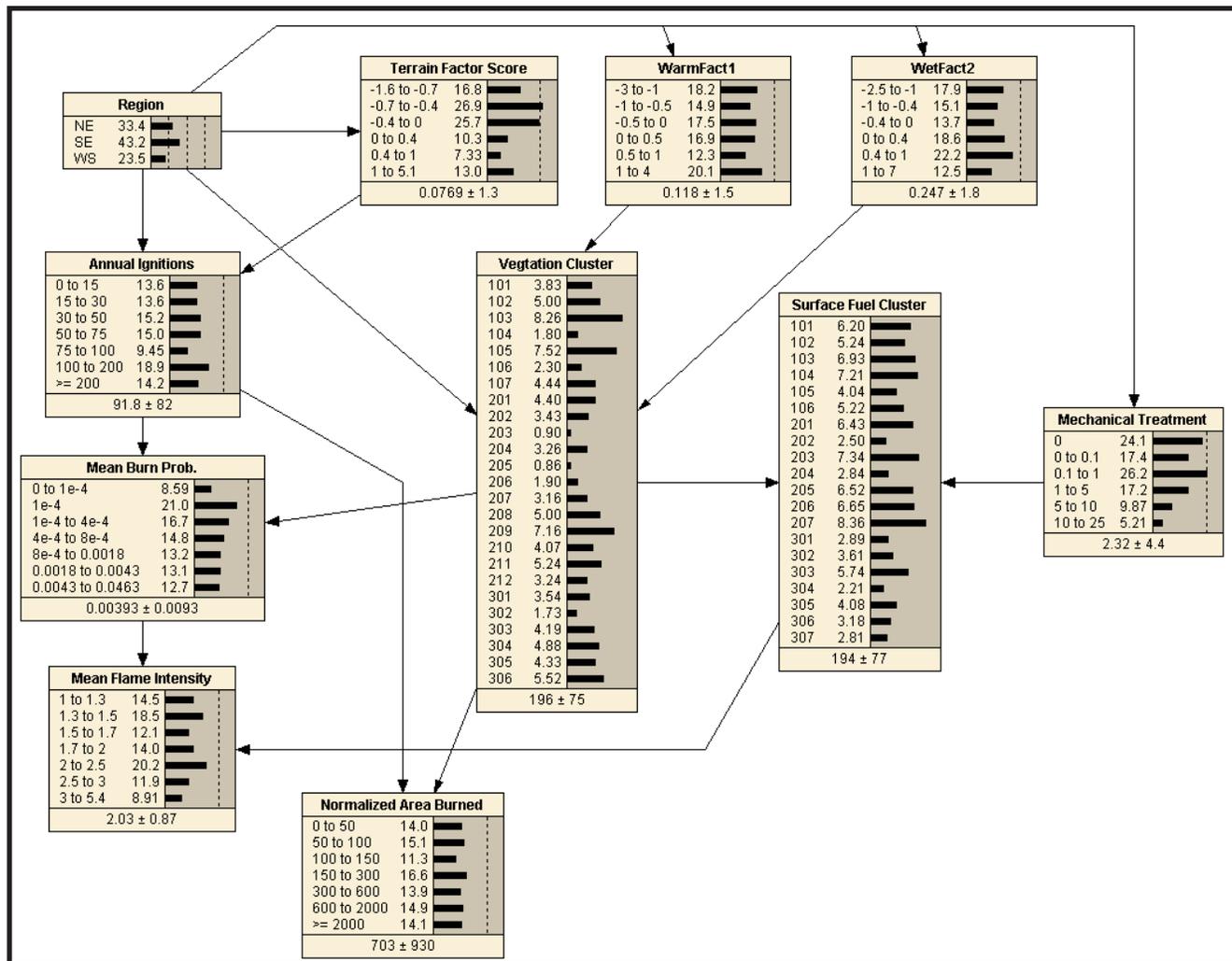


Figure 4. Bayesian network illustrating relationships among variables reflecting the physical environment, vegetation and surface fuels, mechanical treatments in forested areas, wildfire ignitions, and various measures of wildfire extent and intensity.

Variables available for use in the Phase III analyses.

Variable	Group	Description
COUNTY	A	County FIPS code
FIPS5	A	5-digit state and county combined FIPS code
STATE	A	State FIPS code
D_Mchn_pct	B	Landfire disturbance by mechanical treatment (%)
Dom_PAD	B	primary conservation partner
Log_All_Prds	B	index of forest product production
rdbuff_pct	B	percent of county withn 540 m of road
region	B	Cohesive Strategy region
SQMI	B	area of county in square miles
stateabv	B	state abbreviation
tot_dstb_pct	B	Landfire disturbance by all causes (%)
tot_pct_fed	B	federal ownership (% of area)
Tot_Pct_PAD	B	total conservation partner (% of area)
fmech_35	B	forested area available for mechanical treatment (% of county)
nfmech_35	B	non-forested area available for mechanical treatment (% of county)
Ecoregion	C	Bailey's ecoregion (modal value)
FuelClusR	C	Surface fuel cluster
FuelDist	C	deviation from cluster mean
ModeFRG	C	modal fire regime group
pct_forest	C	forested area (% of county)
TerrFact3	C	physical factor score weighted to terrain and summer precip.
VegClusR	C	existing vegetation cluster
VegDist	C	deviation from cluster mean
WarmFact1	C	physical environment factor score weighted to seasonal temperature
WetFact2	C	physical environment factor score weighted to seasonal precip.
Avg_vdep_NN	C	mean veg departure in natural areas
STD_vdep_NN	C	STD of veg departure in natural areas
Avg_vdep_Nm	C	mean veg departure in mixed natural areas
STD_vdep_Nm	C	STD of veg departure in mixed natural areas
APG90_10	D	annualized population growth 1990 - 2010
DemoFact1	D	demographic factor score (stress)
DemoFact2	D	demographic factor score (advantage)
EconType	D	dominant economic activity
HUWUI00	D	housing units within WUI 2000
MeanUrban	D	Mean urban value from Hargrove and Edwards map
Pct_Tmbr_Jbs	D	Forest industry jobs (% of employment)

Variable	Group	Description
Timber_Jobs	D	Number of forest industry jobs
Total_Popu	D	total population 2010
UrbanInf	D	Urban economic influence (ERS typology)
WUIFact1	D	WUI factor score (WUI area weighted)
WUIFact2	D	WUI factor score (weighted toward urban or % agriculture)
WUIFact3	D	WUI factor score (home density in interface and % of homes)
Pct_Nm	D	area in mixed-natural landcover (%)
Pct_NN	D	area in natural vegetation landcover (%)
FAC_index1	D	fire adapted community index (version 1)
FAC_index2	D	fire adapted community index (version 2)
Avg_HARM	E	mean HARM values from Anchorpoint product
b_fil_pct	E	area of county with burnable fuel types (%)
bp_b_MEAN	E	mean burn probability of burnable area
bp_b_STD	E	STD of burn probability of burnable area
D_fire_pct	E	Landfire disturbance by fire (%)
MeanFIL	E	mean fireline intensity level (FSIM modeled)
mode_HS	E	landcove type with most hotspots
NHrm_HPlus	E	area with high or greater HARM index (%)
norm_avg_brn	E	mean normalized area burned
norm_p95_brn	E	95th percentile of normalized area burned
nrmHS_A	E	hotspot density in agricultural areas
nrmHS_All	E	hotspot density in all areas
nrmHS_D	E	hotspot density in developed areas
nrmHS_Nm	E	hotspot density in mixed-natural areas
nrmHS_NN	E	hotspot density in natural areas
PrbFIL_4P	E	proportion of county with FIL => 4
PrbFIL_5P	E	proportion of county with FIL => 5
RX_ac_100sm	E	MTBS prescribed fire per unit area
RxF_pct	E	MTBS prescribed fire in forested area (% of Rx fire)
WF_ac_100sm	E	MTBS wildfire per unit area
for_rx	E	area available for prescribed fire in forested landscapes (%)
nfor_rx	E	area available for prescribed fire in non-forested landscapes (%)
RxSum	E	Hotspots attributed to prescribed fire
WfSum	E	Hotspots attributed to wildfire
log10_RxHS	E	Index of hotspot density (wildfire)
log10_WfHS	E	Index of hotspot density (Rx fire)
RxWf_HSratio	E	ratio of prescribed fire to wildfire

Variable	Group	Description
arv_ratio	F	index of variation in containment time (NFIRS)
cnt_ratio	F	index of variation in arrival time (NFIRS)
Combined_FPY	F	incidents per year, all sources combined
FED_FPY	F	federal incidents per year
FF_DEATH	F	fire-fighter injuries per 1000 incidents (NFIRS)
FF_INJ	F	fire-fighter deaths per 1000 incidents (NFIRS)
max_fsz_fed	F	max fire size, federal records
max_fsz_sf	F	max fire size, NASF records
med_arv_nfir	F	median arrival time, NFIRS (minutes)
med_cnt_nfir	F	median containment time, NFIRS (minutes)
med_dur_fed	F	median incident duration, federal (days)
med_dur_sf	F	median incident duration, NASF (minutes)
med_fsz_fed	F	median fire size, federal
med_fsz_nfir	F	median fire size, NFIRS
med_fsz_sf	F	median fire size, NASF
NASF_FPY	F	fires per year, NASF
NFIR_FPY	F	fires per year, NFIRS
p95_arv_nfir	F	95th percentile for arrival time, NFIRS
p95_cnt_nfir	F	95th percentile for containment time, NFIRS
p99_fsz_nfir	F	95th percentile for fire size, NFIRS
pct_int_HCF	F	intentional fires as percentage of human-caused ignitions
pct_nat_KNF	F	natural ignitions as percentage of all known causes
PctRep_FED	F	federal response as percent of total reported incidents
PctRep_NASF	F	state response as percent of total reported incidents
PctRep_NFIR	F	local (NFIRS) response as percent of total reported incidents
pers_p_100sm	F	first responders per 100 square miles
stat_p_100sm	F	fire stations per 100 square miles
stat_p_10Kpop	F	fire stations per 10,000 people in county
SUP_PER	F	total suppression personnel in county
TOTALPERS	F	total response personnel in county
bldg_p_1K	F	mean buildings involved per 1000 incidents (NFIRS)
Natural_FPY	F	natural caused fires per year (total, extrapolated)
Human_FPY	F	human caused fires per year (total, extrapolated)
Arson_FPY	F	intentional human caused fires per year (total, extrapolated)

APPENDIX 5 – STAKEHOLDER INVOLVEMENT

Summary of Phase III Outreach Forums – National Wildfire Management Cohesive Strategy – Southeastern Region

Four forums were organized and held throughout the Southeast to more fully engage key partners and stakeholders at the local level. The forums, held in Longview, Texas (September 21st, 2012), Pearl, Mississippi (September 25th, 2012), Tifton, Georgia (September 26th, 2012), and Greenville, South Carolina (September 27th, 2012), included the opportunity to call in on a toll free line or utilize a webinar service online at <http://go.ncsu.edu/fire>. In summary, over 100 individuals had the opportunity to listen to the key points of the Strategy and provide input into the Core Values and Alternatives. Overall, those in attendance were supportive of the Strategy and Alternatives. Several individual comments and points were made and captured in a ten-page document that will be used to update the Strategy. In addition, a few key points are summarized in the ensuing paragraphs.

Key comments from the forums included the need to include more grazing and rangeland discussion in the alternatives, a strong desire to include the management strategies and culture of those within the land management sections of the timber investment management organizations (TIMO), and a stronger emphasis on the need for and resulting benefits associated with prescribed fire. Prescribed fire, many believe, ties many of the cultural, property and ecological services together.

There was also a concern from several participants that liability protection strategies were important and should be included to a greater extent in the Plan, that relying too much on the services of Volunteer Fire Departments (VFD) was dangerous due to overloading, and that the Plan focused heavily on training, development and increasing capacity at a time when most agencies are reducing capacity. Several in attendance at the forums noted the need to ensure that the Strategy adequately deals with public health, and specifically air and water quality, and emergency preparedness.

Finally, there were comments concerning the need for coordinated databases, training, education, equipment and expertise sharing, and shared MOU's.

In addition to the forums, an informal social network analysis SNA was conducted via phone interviews with initial Southeastern Region Strategy Committee team members in the South. The goal of this phase of the analysis was to determine the potential networks and audiences that will need to be reached in order for successful implementation of the Strategy. This initial analysis resulted in a database of several hundred individuals and agencies.

APPENDIX 6 – COMMUNICATIONS ACTIVITIES

Communications and outreach activities have been a critical component in the development of the regional risk analysis. In addition to stakeholder engagement through cohesive strategy specific forums and the ongoing work with our social network analysis, multiple communications activities, both direct and indirect, have occurred to further the reach and involvement with partners in development of the strategy.

Directly, members of the RSC and WG have been outgoing during Phase III in presenting or participating in many meetings where Cohesive Strategy has been on the agenda. Organizations that have included Cohesive Strategy discussions include, but not limited to: Association of Fish and Wildlife Agencies, Natural Areas Association, SGSF, The Nature Conservancy, multiple state prescribed fire associations, International Association of Fire Chiefs, Fire Learning Network, federal FMO meetings, FWS Refuge Leadership, regional federal agency directors strategic meeting, Southeast Regional Planning Partnership for Sustainability, Southeast Natural Resource Leaders Group, National Council of Forestry Association Executives, Forest Landowners Association, Southeast Association of University Forest Resource Programs among others.

Beginning in Phase III, the Southeast began distributing monthly newsletters during Phase III. These newsletters were electronically circulated to all stakeholders involved in current or past phases of the Cohesive Strategy as well as the increasing list of interested organizations and individuals. A particular target for outreach and communications activities were regional and state organizations which present efficient network by which to distribute information and building partnerships with regional leadership. A secondary benefit of the newsletter is the formation of an active, engaged network of collaborators that will remain vital and active well after the Cohesive Strategy is fully implemented in 2013 and beyond.

Another new activity in Phase III has been identifying and highlighting regional success stories. This presents as an opportunity for stakeholders to learn about effective activities others within the region are engaged in as well as to help offer ideas that may be implemented in various locations across the region. As a result, groups and organizations may be able to read about a program or activity elsewhere in the region and develop a similar project locally. As the implementation of the strategy fully begins, the leadership of the regional strategy committee will work more directly in helping to identify these opportunities and working with local partners in their development.

APPENDIX 7 – LINKS TO THE PHASE I AND II REPORTS AND OTHER KEY NATIONAL AND REGIONAL DOCUMENTS*

*Web links valid as of September, 2012

A Cohesive Wildland Fire Management Strategy. Phase I Report. Available at http://forestsandrangelands.gov/strategy/documents/reports/1_CohesiveStrategy03172011.pdf

The Federal Land Assistance, Management and Enhancement Act of 2009 Report to Congress. Phase I Report. Available at http://forestsandrangelands.gov/strategy/documents/reports/2_ReportToCongress03172011.pdf

Southeast Regional Assessment. Phase II Report. Available at http://www.forestsandrangelands.gov/strategy/documents/wfec/meetings/04nov2011/regreports_presentations/cs_sersc_presentation20111007.pdf

A National Cohesive Wildland Fire Strategy: Southeastern Regional Assessment. Phase II Report. Available at http://www.forestsandrangelands.gov/strategy/documents/wfec/meetings/04nov2011/regreports_presentations/phase2_report_se20110930.pdf

Cohesive Wildland Key national and foundational documents

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: A 10-Year Strategy. Western Governors Association, 2001

Quadrennial Fire and Fuel Review Final Report 2005. The National Wildfire Coordinating Group Executive Board, July 2005. Available at http://www.nafri.gov/Assets/QFFR_Final_Report_July_19_2005.pdf

Protecting People and Natural Resources – A Cohesive Fuel Treatment Strategy, US DOI, Released April 2006.

Restoring Fire-Adapted Ecosystems on Federal Land. U.S. Department of the Interior and USDA Forest Service, 2002

Wildland Fire Protection and Response in the United States, The Responsibilities, Authorities, and Roles of Federal, State, Local, and Tribal Government, <http://www.forestsandrangelands.gov/strategy/documents/ildlandfireprotectionandresponseusaug09.pdf>

Cohesive Strategy Southeastern key and foundational documents

Andreu, A. and L. A. Hermansen-Baez. 2008. Southern Group of State Foresters. Fire in the South 2. The Southern Wildfire Risk Assessment.

Briefing paper: Identifying Communities at Risk and Prioritizing Risk-Reduction Projects, July 2010 <http://www.stateforesters.org/files/201007-NASF-CAR-Briefing-Paper.pdf>

Buckley, D., Carlton, D., Krieter, D., and K. Sabourin. (2006). Southern Wildfire Risk Assessment Final Report. <http://www.southernwildfirerisk.com/reports/projectreports.html>

Hermansen-Baez, L.A., Prestemon, J.P., Butry, D.T., Abt, K.L., Sutphen, R. The Economic Benefits of Wildfire Prevention Education. 2011. http://www.interfaceSoutheast.org/products/fact_sheets_the-economic-benefits-of-wildfire-prevention-education/ or www.srs.fs.usda.gov/pubs/ja/ja_hermansen002.pdf

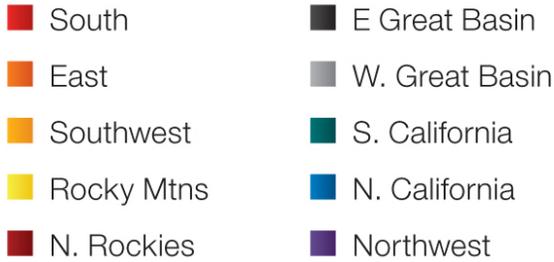
Prestemon, J.P., Butry, D.T., Abt, K.L., and R. Sutphen. 2010. Net benefits of wildfire prevention education efforts. *Forest Science* 56 (2): 181-192.

Wear, D. N. and J. G. Greis. 2011. The Southern Forest Futures Project Summary Report (Draft). U.S. Forest Service.

Appendix 8 — Graphics

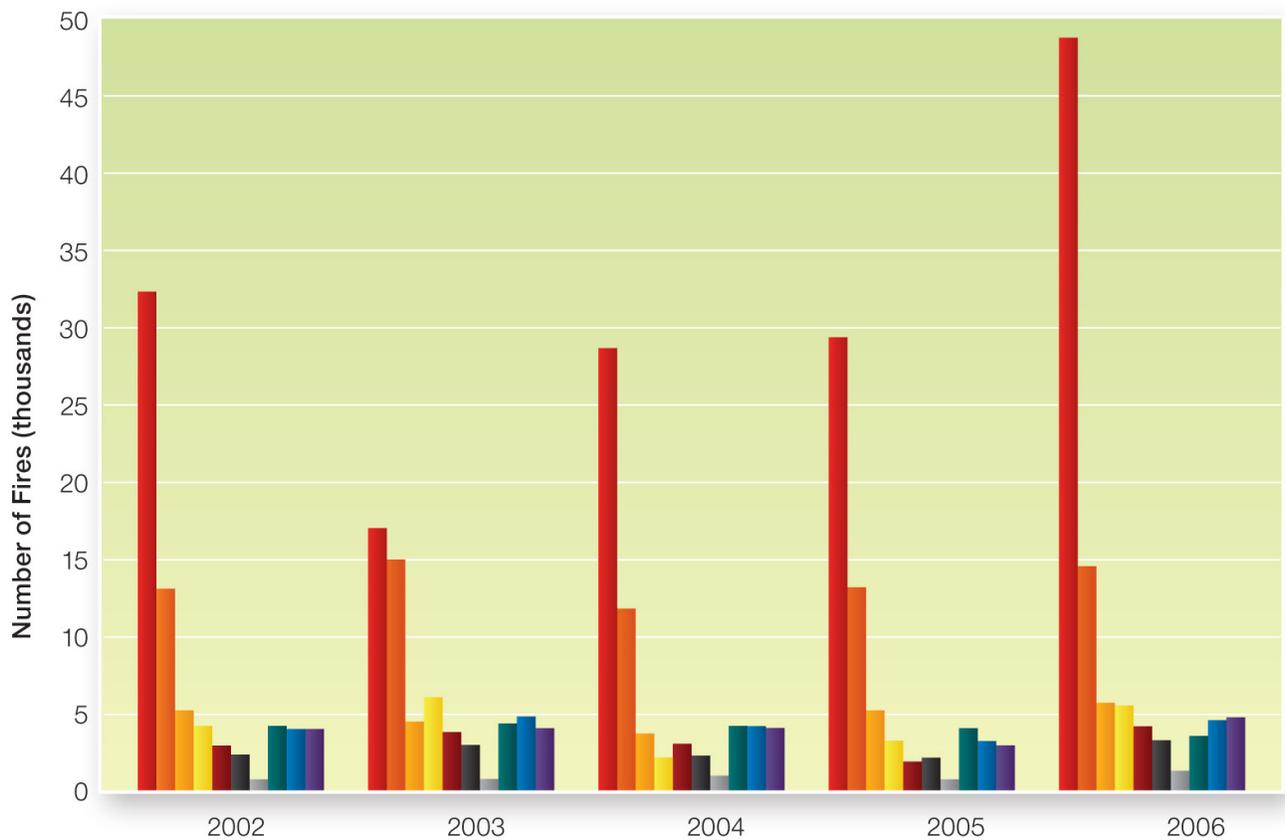
Wildland-Urban Interface Acreage and Percent by State		
	WUI Acres	Percent
Alabama	7,717,348	8.70%
Arkansas	3,707,445	4.20%
Florida	6,455,596	7.30%
Georgia	9,012,124	10.20%
Kentucky	6,011,150	6.80%
Louisiana	3,814,381	4.30%
Mississippi	5,139,675	5.80%
N. Carolina	12,772,497	14.40%
Oklahoma	2,850,113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

Graphic 1. Wildland urban interface (WUI) acreage and percent of total Southeastern WUI acres by state (SWRA).



Source: National Interagency Fire Center, Wildland Fire Statistics (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.



Graphic 2. The number of fires by year (2002 - 2006) for geographic areas of the United States.

APPENDIX 9 – OTHER PERTINENT REGIONAL INFORMATION

Phase III Alternatives Matrix Instructions

The Southeastern Regional Strategy Committee identified priorities for consideration of management alternatives for inclusion in the Phase III report. Emphasizing management activities that achieve objectives identified in the Phase II report and will represent “Alternatives” for the purposes of this report. Ratings will reflect the effectiveness of each objective/alternative in addressing the regional issue in the table. Results will be used to guide the alternatives narrative and trade-off analysis that will be submitted to the RCSC for review and recommendations.

In the intersecting box for each alternative/issue, please enter the appropriate number using the following scale:

- 9 – Most Significant Impact
- 8 – Very Significant Impact
- 7 – Significant Impact
- 6 – Somewhat Significant Impact
- 5 – Neutral or No Impact
- 4 – Somewhat Negative Impact
- 3 – Negative Impact
- 2 – Very Negative Impact
- 1 – Most Negative Impact

These results represent the opinion of experienced and knowledgeable fire professionals and serve as a starting point for the Phase III process.

All individual matrixes were compiled, then added together to calculate an average value for each box in the matrix itself.

From the compiled matrix, an analysis was completed by the RSC and Southeastern Technical Group to identify potential trends. Trends identified were color-coded as follows:

<u>COLOR</u>	<u>TREND</u>
Light Blue	Top actions overall
Light Green	Action high for value
Light Red	Action low for value
Light Brown	Low actions overall

APPENDIX 10 – REGIONAL STRATEGY COMMITTEE/ TECHNICAL GROUP MEMBERS

Southeast Regional Strategy Committee

Mike Zupko	RSC Chair, Southern Governors' Association Representative
Liz Agpaoa	RSC Co-Chair, Regional Forester, Southern Region, USDA - Forest Service (FS)
Forrest Blackbear	Bureau of Indian Affairs (BIA)
Tom Boggus	Texas State Forester, National Association of State Foresters (NASF)
Rob Doudrick	Station Director, Southern Research Station (SRS), USDA - FS
Wade Johnson	National Association of Counties (NACo)
Jim Karels	Wildland Fire Executive Council Liaison, Florida State Forester
Kier Klepzig	Assistant Director, SRS, USDA - FS (SRS Alternate)
Pete Kubiak	Chief, Division of Fire Management, US Fish and Wildlife Service (FWS)
Samuel Larry	National Park Service (NPS)
Tom Lowry	Choctaw Nation
Will May	International Association of Fire Chiefs (representing local Fire Service)
Alexa McKerrow	Biologist, US Geological Survey (USGS)
Dan Olsen	Deputy Director, Fire & Aviation Management, Southern Region USDA - FS
Alan Quan	USDA - FS
Shardul Raval	Assistant Director, Fire & Aviation Management, Southern Region, USDA - FS (FS Alternate)

Southeast Technical Group

David Frederick	Chair, Fire Director, Southern Group of State Foresters
Darryl Jones	Vice Chair, State Fire Chief, South Carolina Forestry Commission, Southern Group of State Foresters (SGSF)
Tom Spencer	Vice Chair, Predictive Services Department Head, Texas Forest Service, SGSF
Margit Bucher	North Carolina Fire Manager, The Nature Conservancy
Vince Carver	Regional Fire Ecologist, FWS
Scott Goodrick	Research Meteorologist, USDA - FS
Wade Johnson	NACo
Reese Kerbow	Fire Management Officer, BIA
Alexa McKerrow	Biologist, USGS
Daniel McInnis	Biologist, USDA - FS
Mark Melvin	Jones Research Station, Prescribed Fire Councils
Shardul Raval	Assistant Director, Fire & Aviation Management, Southern Region, USDA - FS
Rachel C. Smith	Emergency Operations Specialist, USDA - FS
Liz Struhar	Fire Planner, NPS
Ronda Sutphen	Florida Department of Forestry
Marshall Williams	Department of Defense

APPENDIX 11 – ACKNOWLEDGEMENTS

Alabama Forestry Commission
Alabama Prescribed Fire Council
Arkansas Forestry Commission
Arkansas Prescribed Fire Network
Bureau of Indian Affairs
Central Florida Prescribed Fire Council
Firewise Communities U.S.A.
Florida Forest Service
Forest History Society
Georgia Forestry Commission
Georgia Prescribed Fire Council
International Association of Fire Chiefs
Jones Research Center
Kentucky Division of Forestry
Kentucky Prescribed Fire Council
Louisiana Department of Agriculture and Forestry
Louisiana Prescribed Fire Council
Mississippi Forestry Commission
Mississippi Prescribed Fire Council
North Carolina Forest Service
North Carolina Prescribed Fire Council
Northern Florida Prescribed Fire Council
Oklahoma Forestry Service
Oklahoma Prescribed Fire Council
Prescribed Burn Alliance of Texas
Puerto Rico Forest Service
South Carolina Forestry Commission
South Carolina Prescribed Fire Council
Southern Florida Prescribed Fire Council
Southern Group of State Foresters
Southern Governors' Association
Texas A&M Forest Service
Tennessee Division of Forestry
The Culinary Institute of America
The Nature Conservancy
University of Georgia Southern Region Extension
U.S. Department of Agriculture Forest Service
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. National Park Service
Virginia Department of Forestry
Virginia Prescribed Fire Council

APPENDIX 12 – COMPLETE LIST OF SOUTHEASTERN BARRIERS AND OPPORTUNITIES

The intent of listing these as priority national barriers from the Southern perspective is the fact that they need to be addressed at the national level to be most effective.

5	Need incentives to increase fuels management on private land.	<ol style="list-style-type: none"> 1. Develop landowner incentives (e.g., tax breaks, free disposal of material, increased use of Wyden Amendment and other finance or cost-share authorities). 2. Work with NRCS, FSA and other USDA agencies to better incorporate and/or incentivize prescribed burning on tribal and private lands. (e.g. Rx ranking for landowners wanting to use could be weighted higher) 3. Work with DOI to develop additional programs for fuels management on private lands in proximity to federal holdings. 4. Work with EPA to reduce restriction to use of prescribed fire due to Smoke tolerance and emissions (air quality) this is both for wildfires and prescribed fires. Part is education of the general public – the other part is education/science working with EPA on short-term effects v long-term impacts and extent of emissions. 5. Address the smoke and fire liability issue that is a hindrance to both landowner performing prescribed burns and practitioners in offering burning as a service. 6. Require federal lands to use the fire frequency as set in their approved management plans. Tie execution to performance evaluations. 7. Work with FEMA to maximize fuels reduction across the landscape.
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10	Need adequate state and/or local ordinances related to wildfire prevention which are enforceable.	<ol style="list-style-type: none"> 1. Determine use and effectiveness of existing state and/or local ordinances related to prevention. 2. Establish/coordinate new state and/or local ordinances (or nationally best practices) related to wildfire prevention. 3. Issue authorities (or incentivize the creation) to enforce state and/or local prevention ordinances. 4. Develop extensive listing of lessons learned and model ordinances that can be shared nationally. 5. Evaluate practices such as permanent fuel breaks, property edge setbacks, and access for emergency response resources as potential future BMPs to reduce the potential spread of wildfire.
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20	Need growth management, land development, and zoning laws that require defensible-space wildland fire risk reduction actions as communities develop, and the maintenance of wildland fire risk reduction practices prior to development. ¹	<ol style="list-style-type: none"> 1. Work with planners/developers to develop best practices at the national level (e.g. APA) 2. Work with insurance industry on products that motivate homeowners to create fire adapted homes 3. Create a model fire adapted community concept that can be replicated in planning and target in fire-prone areas with reduced fees and higher ISO ratings (compared to locale). 4. Encourage and incentivize homeowners to create both managed natural and landscaped plantings, trees and shrubs on parcels, and build/retrofit the exterior of structures with fire resistive materials and protected ventilation openings resulting in greatly diminished risk from wildland fire through aggressive and long term sponsored education programs 5. Construct a federal incentive program to reimburse for the creation of fire adapted communities through CWPPs and other comprehensive community planning practices. 6. Work with States and local governments to require comparable fire response growth with Community growth. 7. At Federal Agency, State and local government level develop codes and standards for developing and maintaining Fire Adapted Communities reflecting regional and local wildland fire risks to Human Communities, including landscape and structure components/issues.
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33	<p>Must be able to effectively and efficiently share resources. Need to remove policy barriers and process complexities which affect the ability to effectively and efficiently share resources, not only for wildfire, but for fuels and prescribed fire work.</p>	<ol style="list-style-type: none"> 1. Identify policy barriers that prevent the effective sharing of resources – then change those policies at the national level (such as FS cooperative fire billing agreements). 2. Overcome barriers to qualification standard inconsistencies within federal agencies as well as between federal agencies and non-federal firefighters that pose challenges during the sharing of resources. 3. Identify complexities that need to be simplified in order to efficiently share resources 4. Improve organizational efficiencies and wildfire response effectiveness. 5. Address preparedness strategically for greater efficiency and cost effectiveness. 6. Develop a flexible and mobile response capacity to better utilize local resources. 7. Create an improved process for the sharing of trained prescribed fire resources including, but not limited to, utilization of the national prescribed fire training center. (and make sure it is consistent among all federal agencies) 8. Interoperability radio issues (not sure if this ties to original intent of the barrier, but may be appropriate here as well)
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Second Tier

2	x					<p>Need new technologies and local infrastructure for biomass removal and utilization.</p>			<ol style="list-style-type: none"> 1. Identify new technologies, 2. Identify existing technologies which are unutilized. 3. Encourage incentives through existing legislation or enact new legislation such as Farm/Energy Bill incentives that address industry needs.
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11		x						<ol style="list-style-type: none"> 1. Engage elected officials at all levels – city, county, state, tribal, and federal. 2. Actively encourage State, Tribal and local governments and officials to adopt WUI Codes, Growth Management Policy for the WUI, and associate Land Development Regulations, and enforcement of all. The Federal government must take a lead roll in this and all WUI and FAC endeavors. 3. State and local governments must implement increased response capability with every WUI develop plan approved to become available as 50% of the development is completed/occupied. 4. Increased social science research to learn more about WUI residents and potential new WUI residents and why they want to live in the WUI, and how to advise them to accept their share of the risk and mitigation of the risk.
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