Protecting Your Forest Asset

MANAGING RISKS IN CHANGING TIMES

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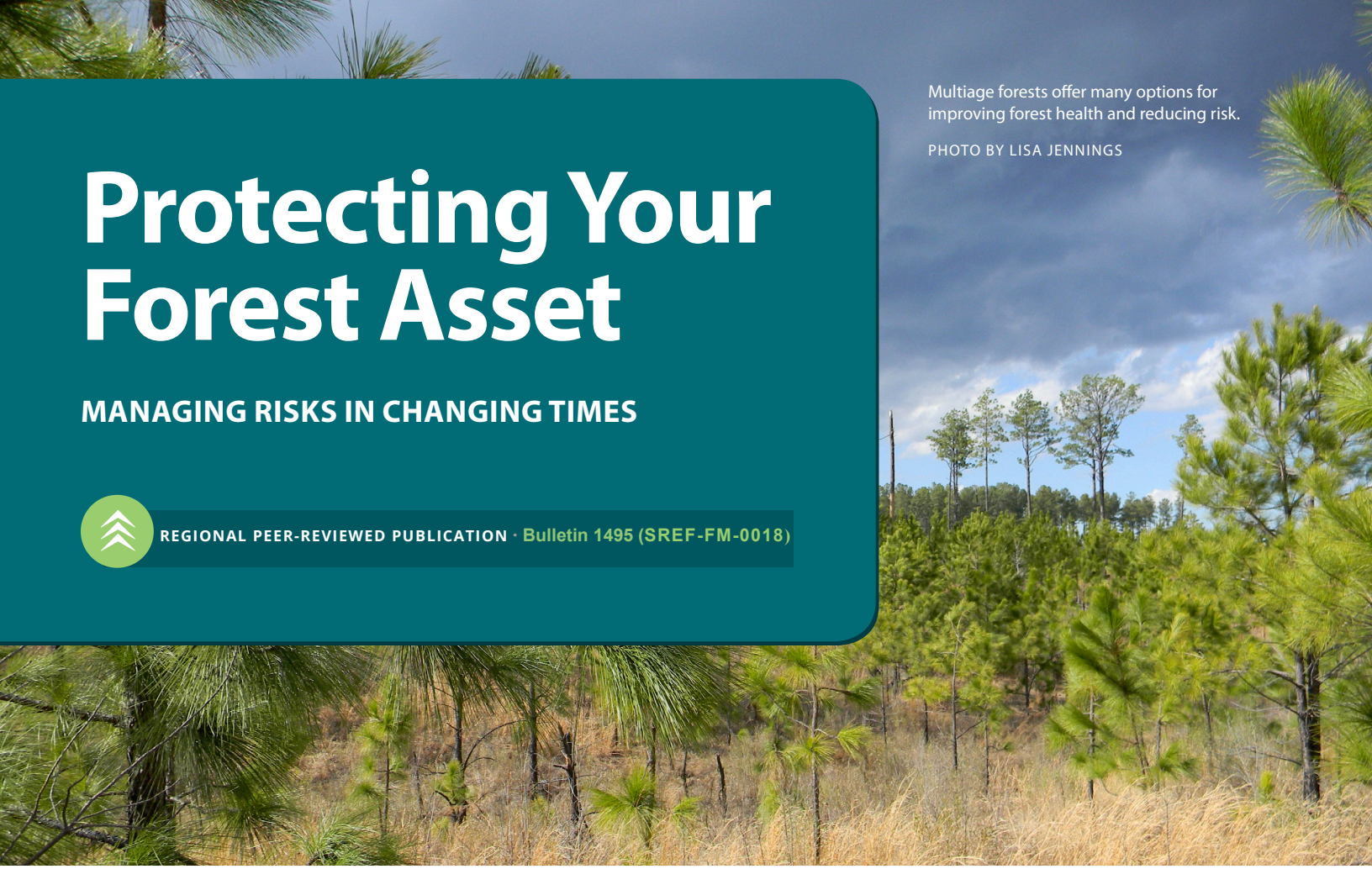


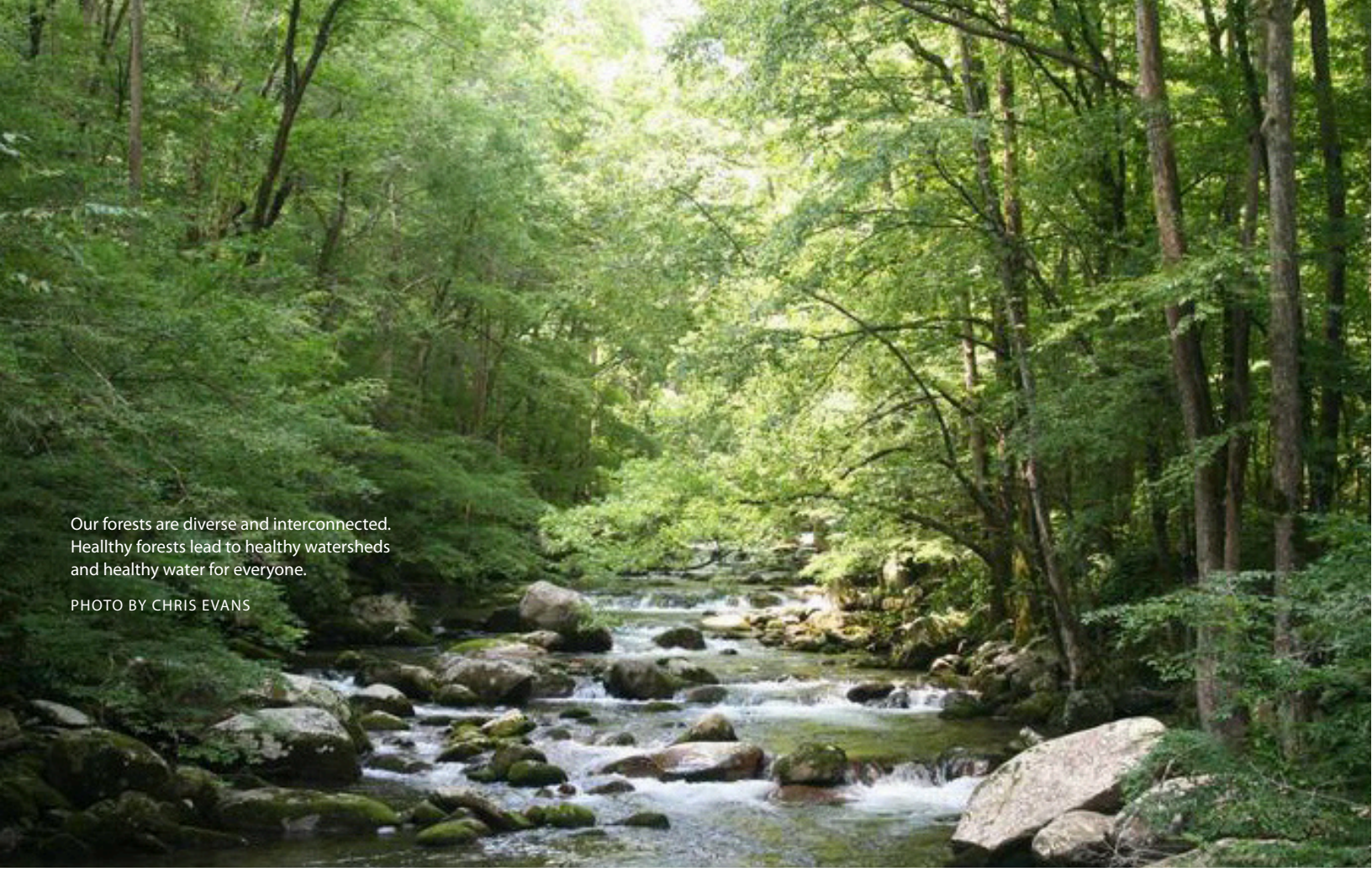
Multiage forests offer many options for improving forest health and reducing risk.

PHOTO BY LISA JENNINGS

Private forest owners control most of the southern forest resource and are critical to maintaining forest health in the South. Record droughts, rising temperatures, increased frequency and intensity of wildfires, insect and plant invasions, and more intense storm events all pose threats to the health of Southern forests. Scientists project that increases in temperature and changes in rainfall patterns will cause these disturbances to become more common, occurring with greater intensity or duration. This pamphlet reviews healthy forest strategies and approaches to decrease the risks associated with these disturbances on your forestland.

The use of sound management practices can prepare and protect trees and other forest resources from increasing risks. When individually owned private forest properties are managed well, they collectively protect the *overall* health of our landscape. Management strategies using the best current science will enable you as a landowner to better protect your land and resources and conserve the region's forests into the future.

Southern Regional Extension Forestry



Our forests are diverse and interconnected. Heallthy forests lead to healthy watersheds and healthy water for everyone.

PHOTO BY CHRIS EVANS

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Risks to Healthy Forests

Understanding the current and potential risks to your forested asset is critical for sound management. A professional forester can provide useful services such as monitoring the current health of your forest, and working with you to prepare for potential risks based on the health, the location of your forest, and the health of surrounding forests and agriculture properties. Some of the potential risks and threats are explained below.

Southern Pine Beetles are the greatest and most common threat to forest health as seen in this managed forest. The scope and intensity of forest risks are expected to increase in the coming decades.

PHOTO BY PAUL BUTTS
Georgia Forestry Commission, Bugwood.org

PESTS & INVASIVE SPECIES

Invasive and aggressive plant and insect species may increasingly outcompete or harm your forest and any native species you may have on your property. Winter freezes currently limit the range and amount of damage caused by many forest pests, but higher temperatures and longer growing seasons will allow these species to increase in number and outgrow native plants and trees. Destructive insects, such as bark beetles, will be better able to take advantage of forests stressed by more frequent drought. Plant species such as kudzu and cogongrass may rapidly expand into new areas.

TIMBER RISKS

Increasing concentrations of atmospheric carbon dioxide (CO_2) and fluctuating temperature and precipitation levels will impact timber resources. Higher CO_2 levels generally increase growth rates in trees, but decreased water and nutrient availability could offset these increased growth rates. Heat stress may also limit the growth of some southern pine and hardwood species. Intensified extreme weather events, such as hurricanes or ice storms, are also expected to lead to increased timber damage or loss.

WILDFIRE

Wildfire intensity and frequency is expected to increase across the region. More cloud-to-ground lightning due to warming may increase wildfire ignitions, while more frequent droughts and lower humidity will lead to drier fuels which will burn more easily and at hotter temperatures, contributing to more frequent and larger wildfires. Prescribed burning will remain an important tool to reduce fuels on forest lands, but the number of days when burning is prohibited may increase, due to dry, windy conditions.

WATER RESOURCE RISKS

Shifts in rainfall patterns will lead to periods of flooding and drought that can significantly impact water resources such as lakes, rivers and ponds. Increases in heavy downpours and more intense hurricanes can lead to greater erosion and more sedimentation in waterways. Increased periods of drought may decrease dissolved oxygen content and lead to poor water quality in some areas, as well as create shortages for water resources. Sea level rise can increase the potential for saltwater intrusion into coastal freshwater tables.

SOIL PRODUCTIVITY RISKS

Organic matter levels, nutrient cycling, and water availability in soils are expected to change in the future, which will lead to changes in soil productivity. Higher temperatures and changing rainfall patterns may lead to increased decomposition of organic matter in soils.

WETLANDS RISKS

Wetlands will be particularly vulnerable to changes in water supply brought on by altered temperature and rainfall patterns in some parts of the South. Wetland plant and animal communities will be affected by changes in the length of time that the wetlands hold water as well as by increases in extreme events such as hurricanes. Groundwater-fed wetlands will be most vulnerable to changes in groundwater table levels. Seasonally dry wetlands will be particularly vulnerable to catastrophic fires as thick organic (peat) soils dry out, especially in those areas with a history of altered drainage.

WILDLIFE AND FISH RISKS

Wildlife species will be affected in different ways, depending on their needs and ability to adapt to change. Increased temperatures may begin to change the region's ground cover from cool to warm season grasses, which could impact wildlife forage quality. Populations of large mammals such as deer and bear may increase with warmer winter temperatures due to higher winter survival rates. On the other hand, birds may decrease in population as vegetation types change and heat stress makes migration more difficult. To adapt, arrival date and nesting times of some common birds may start earlier in the year. Warmer water temperatures and changes in stream flow will affect the abundance and distribution of fish species. With higher water temperatures, fish communities in northern streams will begin to resemble communities in more southerly locations. Cold-water species, such as trout, will be the most vulnerable to population declines with future warming.

BIOLOGICAL DIVERSITY (BIODIVERSITY) RISKS

Plants and animals at risk from fluctuating conditions will respond to environmental changes by adapting, moving, or declining in numbers. Species better able to adapt to varying climatic states will be more likely to survive in new conditions and may increase in number, while highly specialized and habitat-restricted species may decline or relocate. Higher temperatures will cause many species to shift ranges, generally moving north or up in elevation. However, in many cases, land use changes will restrict the ability of plants and animals to move into suitable habitat. In many cases, invasive exotic species such as cogongrass or Japanese climbing fern are better equipped to adapt, survive and even thrive under projected changes.

RECREATION & AESTHETIC QUALITY RISKS

Environmental changes may impact recreational experiences due to increasing temperatures or changes to the plant and animal communities that make those recreational experiences unique. Higher smog levels could decrease the visibility of mountain views, and increasing stresses on forests may impact the vividness of fall foliage colors.

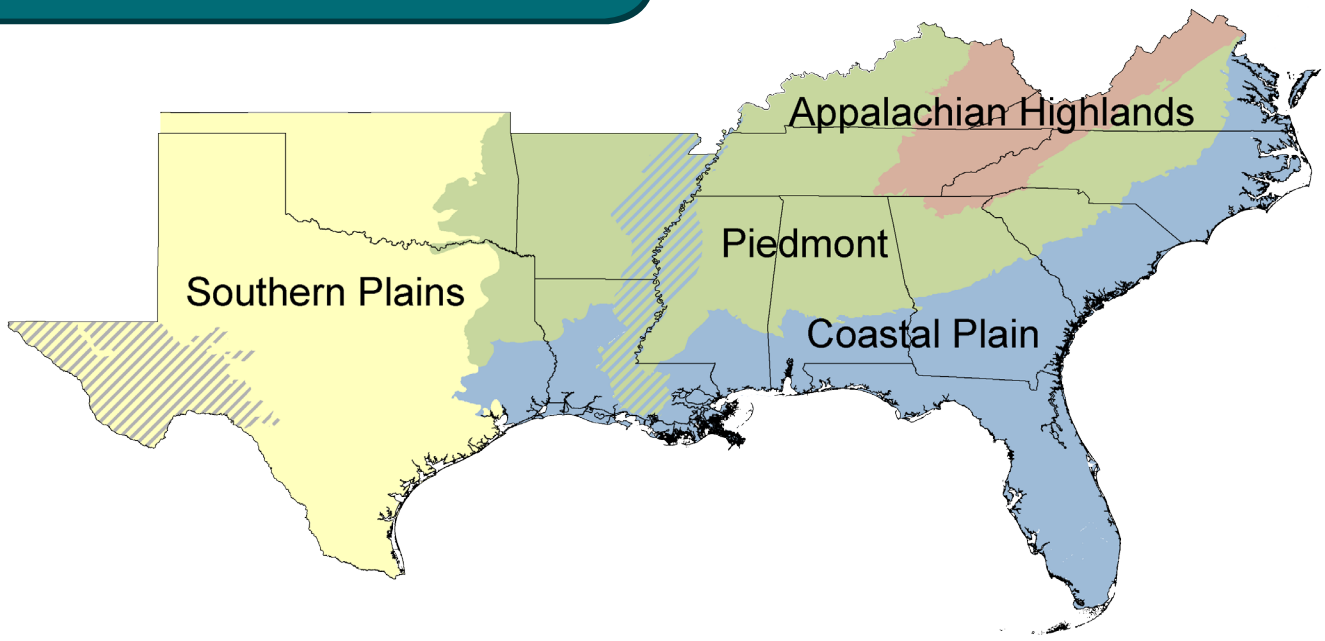
Top | Changing climatic conditions may decrease biodiversity in the future.
PHOTO BY DAVID CAPPAERT, *Michigan State University, Bugwood.org*

Bottom | Camping & hiking are recreation activities common in forested land.
PHOTO BY LISA JENNINGS

Minimizing Threats With Healthy Forest Management

Risks to forest health vary by location and dominant species.

PHOTO BY JENNIFER MOORE MYERS



APPALACHIAN HIGHLANDS

High-Elevation Forest Risks: Changing temperature and rainfall patterns may threaten the survival of northern hardwood trees in mountain forests. Higher temperatures may allow species from lower elevations to migrate up-slope into higher elevation areas, changing the forest communities we see today. Hardwood forests may experience stress from higher temperatures, allowing pines and other fast-growing species to become more dominant at the expense of slower-growing species such as hickories and oaks.

PIEDMONT & SOUTHERN PLAINS

Drought and Forest Dieback: Warmer temperatures, along with changes in spring and summer rain, are projected to lead to increased periods of drought throughout the Southeast. Forests are more susceptible to damage from pests such as southern pine beetles and Ips bark beetles during droughts. Higher winter temperatures are likely to increase the distribution and intensity of pine beetle outbreaks in the following growing season. Stress from drought, and/or higher temperatures, in combination with pest outbreaks, have the potential to cause large-scale forest dieback.

COASTAL PLAIN

Sea Level Rise: Coastal areas in the Southeast have already experienced an average of one inch of sea level rise per decade over the 20th century, a rate that will continue to increase in the future. As saltwater flooding expands, low-lying coastal wetland forests could become marshland. Increasing salinity of coastal aquifers from sea level rise may affect forests up to three miles away from the coast.

Management Strategies To Minimize Forest Threats

Revenue producing actions like thinning or low intensity prescribed fire promotes forest health as shown here.

PHOTO BY DAVID J. MOORHEAD
University of Georgia, Bugwood.org

Practicing sound forest management can increase the resilience of your forest for years to come.

Timber management activities provide forest managers and landowners with an opportunity to increase their forest's health and resilience. Resilience allows the forest to withstand multiple threats, like drought, invasive species, disease, and wildfire. Improving forest resilience provides multiple benefits and does not have to be costly. Sound forest management practices promote the immediate and long-term health of your forest, protecting your investment against potential threats.

THINNING

Periodic thinning reduces overcrowded conditions and promotes growth of your best trees. Commercial thinning not only produces revenue, but can also increase water and nutrient availability to the remaining stand of trees. Reducing stand densities minimizes risk from insects, disease, wildfires, and warmer temperatures. Where drought stress is anticipated, consider thinning more aggressively than traditionally done in the past. New markets for biomass for energy production may allow for removal of damaged or diseased trees at a profit to increase health and resources for residual trees.

PRESCRIBED FIRE

Prescribed fire reduces fuel loads and the chance of catastrophic wildfires ensuring ecosystem health. Landowners and managers using this management tool may need to consider changes in the timing of the "spring green-up period" of tree and understory growth as the climate warms. Prescribed fires should be conducted during periods that minimize tree damage and benefit understory species. Future prescribed fires may be forced into a shorter season due to projected changes in seasonal temperature, rainfall patterns, and intensity of extreme events such as hurricanes.

HARVEST

Heavy equipment is used to harvest pine trees.
PHOTO BY JACOB SPRINKLE, *USDA Forest Service, Bugwood.org*

Tree growth may be affected by changes in temperatures and rainfall patterns, which means that traditionally recommended harvest rotation lengths may need to be altered. If these changes have signficantly affected your trees' growth and a different tree variety or species would grow better in those same conditions, then it may be advisable to harvest the established trees at a shorter rotation length and replant with a more resistant variety. Conversely, landowners who are interested in managing for other objectives, such as wildlife, carbon storage or biodiversity, may want to consider longer rotation lengths and will need to adapt stand density and other measures to ensure forest health over greater periods of time.

SITE PREPARATION

Keeping some residual vegetation on site will help lower soil temperatures and maintain nutrients and soil moisture as temperature and rainfall levels fluctuate. Wider-spaced site preparation could be help minimize future threats. Herbicide and fertilizer prescriptions may also need to be altered as invasive plants become more aggressive and new species move into the region. Prescribed fire will remain an important site preparation tool, but in some instances may need to be replaced with heavy equipment or herbicide alternatives due to fewer days with safe, desirable conditions for burning. Bedding in certain areas, especially near the coast, may increase survival rates.

PLANTING

Tree nurseries that diversify their seed banks by using either mixes of species or mixes of genetic traits from a single species will help forest owners protect their investment against future threats. Single-aged monocultures from one genetic origin will be most susceptible to future threats, while multi-aged mixed forests consisting of species with varying traits will be most resilient. Choosing species known to grow in a wide range of conditions and withstand disturbances, including heat and drought conditions, will also help maintain the health of your forest. In areas susceptible to salt water intrusion, special care to identify salt-tolerant varieties is advisable. The single decision of "what kind of seedlings to plant" will have lasting impacts on how you manage and maintain the health of your forests for decades to come.

FERTILIZATION

Forest productivity could potentially increase with more carbon dioxide (CO_2) in the atmosphere, although any decrease in rainfall at the same time could moderate this growth increase. Higher fertilization rates might allow managers to take advantage of the boost in forest productivity from higher atmospheric CO_2 levels, especially where nitrogen (N) is a limiting factor. However, increased atmospheric N concentrations though may lead to more N deposition in some areas, requiring that levels be monitored prior to any application of fertilizer. Over-fertilization could lead to trees with a smaller root area and more canopy growth, causing increased susceptibility to future drought stress, wind throw, or a number of other problems.

Fertilization can have significant effects on tree growth.

In conclusion, understanding the current and potential risks to your forest due to changing weather and climate is an important step when considering the management alternatives available to you to protect your forest asset. Professional foresters and other forms of information and assistance are available to you for many of your needs. Additional research is needed to study the impacts of this increased risk and the vulnerability of the southern forest to a changing climate. Be sure to keep in touch with those experts who can assist with the proper care and management of your forest.

For more information on management options for your woodlands, contact your county Extension agent or visit the Southern Regional Extension Forestry Website at **www.sref.info**

Information in this pamphlet is summarized from over 300 peer-reviewed science papers found in the USDA Forest Service's TACCIMO tool. TACCIMO (the Template for Assessing Climate Change Impacts and Management Options) is a web-based application integrating climate change science with management and planning options through search and reporting tools that connect land managers with peer-reviewed information they can trust. For more information and the latest science about managing healthy forests for the future visit the TACCIMO tool online: www.forestthreats.org/taccimotool

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PINEMAP

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TACCIMO
Science at your Fingertips

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