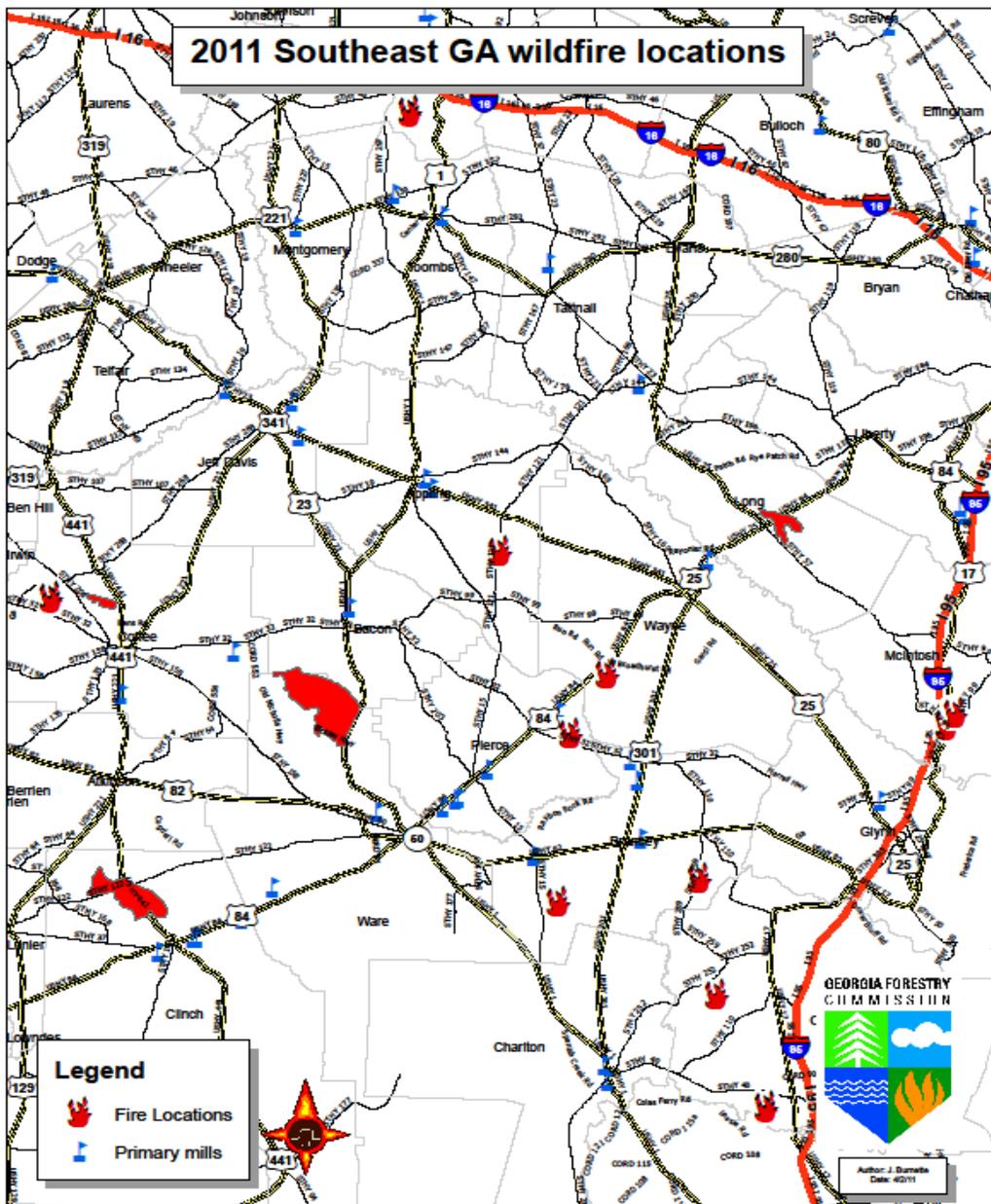




Wildfire Damage Assessment for the 2011 Southeast Complex Fires

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Background: On March 24, 2011, multiple wildfires began across southeast Georgia. Strong, gusty winds and low relative humidity created extreme fire behavior and dangerous firefighting conditions. By March 28, 2011 a state of emergency had been issued by Governor Nathan Deal for five counties in South Georgia (Coffee, Bacon, Ware, Clinch, and Long Counties), and over 43,500 acres was lost due to wildfire. The four largest fires in counties under a state of emergency were: Sessom Community Fire (Bacon/Ware Counties; 20,597 acres), Arabia Bay Fire (Clinch County; 11,673 acres), Elim Church Road Fire (Long County; 4,029 acres), and Mosley Road Fire (Coffee County; 1,418 acres). Long term drought and extreme fire weather conditions resulted in limited control and an estimated timber mortality rate of 70–90%.

The intensity and extent of damage resulting from each of these fires was more severe than damage sustained during the massive Waycross wildfires of 2007.

An initial assessment was made by the Georgia Forestry Commission on Sessom Community Fire, Arabia Bay Fire, Elim Church Road Fire, and Mosley Road Fire to determine fire severity and possibly predict survival of the damaged stands. Based upon previous research done in the 1960's, 1980's and 1990's on wildfires in Florida, stands were rated for damage and classified in one of three categories: **Light, Moderate, and Severe**. Although one might assume that pine bark beetles automatically play a decimating role following fires of this magnitude, this has not always been the case, as documented in the 1990's research (Hanula, Meeker, Barnard, et al). The 1980's research conducted by Dixon (et al) did indicate an increase in Ips Engraver Beetles for up to two growing seasons following an April wildfire. One fact that is certain is that catastrophic wildfires often coincide with long term drought, and both of these factors cause tree stress, decline of growth and mortality. There are numerous factors to consider when assessing fire impact, and pine bark beetles are just one. Other stand factors that were observed are: *Root Damage, Basal Stem Damage, Stem Char and Severity, Crown Consumption and Scorch, Appearance and Damage of Growing Shoots (if present), and overall appearance of the stands.*

Survey Methods: Wildfires burn with different levels of intensities. They are impacted by time of day, daily weather patterns, and fuel composition. These variations result in a mosaic of burn patterns across the landscape, variations within each stand and from section to section. Survey efforts sought to classify each stand for its overall appearance and damage levels. It should be noted that this is not an exact science, but rather an overall indicator of forest health. In marginal areas, future weather patterns, particularly rainfall, will play a major role in tree survival throughout the remainder of the 2011 growing season.

Fires burned through most sampled areas two weeks prior to this survey. Evaluations were made primarily along travel corridors in an effort to get reliable samples and to make worthwhile observations and predictions. A great deal of timber salvage has begun, but it is only a small percentage of what needs to occur.

Timber Evaluation Protocol: Most observers evaluate the severity of a burn by looking at the canopy of the stand or tree. A thorough and more accurate evaluation should be conducted by using a systematic approach which forecasts potential insect and disease problems and associated tree mortality. This process begins with the root system and litter layer, followed by examination of the bole for stem damage and char, and then up to the crown, inspecting for crown consumption and scorch, damage to shoot growth, and the overall appearance of the stand. Any sign or symptom of insect presence must be noted. A post-fire evaluation guidelines form is available to document this process.

<http://www.gatrees.org/ForestManagement/documents/PostFireEvaluationGuidelinesApr2011.pdf>

Root Damage: Most tree roots can be found in the top six inches of soil, with many roots positioned at the soil surface. As fire burns the litter and duff layer, tree roots are exposed and feeder roots are killed. When fire burns into the ground, organic material is removed, which produces a depression around the tree's base - "The Halo of Death"



"Halo of Death"

Stem Damage and Char: Stem char refers to the blackened portion of the stem that was exposed to direct flame. After needles drop and crown scorch can't be effectively measured, the stem char line remains as a permanent record indicating fire severity on the tree.

Stem damage is a good visual representation of the intensity and duration of the fire around the stem of the tree. Complete charring on all sides of the stem or noticeable bark consumption are indicators of possible injury to the cambium layer. Normally, clear sap flowing between the bark plates is evidence of cambial damage, and it is highly attractive to insects. The higher the bark char the greater the potential for mortality.



"Bark Char"



"Stem Damage and Char"

Crown Consumption and Scorch: Crown scorch refers to needles that weren't directly burned in the fire, but were exposed to lethal temperatures during the fire event. These needles will typically drop from the tree within 30 days of turning reddish – brown. Crown consumption indicates the portion of the crown/living needles that were directly burned off by the fire. These stands should be harvested immediately.



"Crown Consumption"

Terminal Bud Damage and Mortality: Heat, of varying levels, over 140 degrees for more than one minute is lethal to most plant tissues. In the early spring to summer, candling terminal buds are highly susceptible to damage from excessive heat and are a key identification point in determining tree survival.



"Shepherd's Crook"

Crown scorch does not automatically indicate mortality of the tree. Surrounding needles can protect the terminal bud from severe scorch or consumption providing a chance for survival. Normally a significant portion of green canopy will be noted at the top of the tree and the terminal bud will be straight and unburned. If the terminal bud is "Shepherd's Crooked" there is little to no chance for survival.

Insect Sign and Symptoms: Southern Bark beetles and Ambrosia beetles are attracted to stressed and fire-damaged stands. Any indication of boring dust or insect entry holes should be noted.

Hardwood Damage: Hardwoods also face serious damage from fire. Many Southern hardwood species have thin bark and shallow root systems, making them more susceptible to fire damage and eventual death from the direct exposure to flames and heat. Fire will not normally burn in the lower, wet areas where we find hardwood stands, but the extended drought conditions have produced lower moisture levels and dry organic material that can be several inches to multiple feet deep. Hardwood stands with heavy fuel build-up around the bases of trees experienced long burn periods that may have damaged the stem bases and root system. These damaged trees may experience more complications from root and fungal disease and insects.



Hardwood Damage

Survey Findings:

Using the 2007 Waycross Complex Fires as a reference; the Southeast Complex fires in Coffee, Bacon, Ware, Clinch, and Long Counties were more severe in damage and are expected to have a greater mortality rate. The “Big Turnaround Fire” in 2007 had an overall mortality rate of 60 -70 % with a severity rating of 52%.

The 2011 Southeast Complex fires have an overall expected mortality rate approximately 20% - 25% higher than the 2007 Waycross Complex.

Damage Estimate-	Arabia Bay	Elim Church Rd.	Mosely Rd.	Sessom Comm.
Severe	84%	63%	83%	68%
Moderate	13%	17%	14%	10%
Light	3%	20%	3%	22%

Stands rated as **severe** had extreme damage, and a significant portion of the trees are already dead or will not likely survive this growing season.

Moderate stands had significant damage, but a portion of the trees likely will survive this growing season. The resulting stand, however, may not be fully stocked and some landowners should liquidate these areas.

Light stands had relatively minor damage, and a majority of trees within these areas will survive. Some mortality has or will likely occur within these areas also, but it is expected to be relatively minor and no management action should be needed.

Overall: A mortality rate of **90%** could be applied to the Arabia Bay and Mosely Road fires, while a mortality rate of **70-80%** could be applied to the Elim Church Road and Sessom Community fires.

Product Class-	Arabia Bay	Elim Church Rd.	Mosely Rd.	Sessom Comm.
Premerchantable	29%	9%	2%	23%
Pulpwood	44%	39%	15%	48%
Chip-n-Saw	10%	22%	58%	19%
Sawtimber	11%	20%	20%	6%
Hardwood Drain	6%	10%	5%	4%

Almost all areas other than Hardwood Drains were pine plantations, so the above product classes refer to one of the pine species listed below.

Species-	Arabia Bay	Elim Church Rd.	Mosely Rd.	Sessom Comm.
Loblolly Pine	35%	32%	28%	35%
Slash Pine	47%	57%	66%	60%
Longleaf Pine	0%	1%	1%	1%
Hardwood/Cypress	18%	10%	5%	4%

Variation in Fire Damage within Timber Stands and Across the Landscape...



Severe fire activity and crown consumption can be seen in the black areas



Brown needles indicate crown scorch and less severe damage



Green canopy indicates the lowest levels of damage (if little to no basal stem or root damage occurred).



Two weeks post-burn. Stem char is approximately 75%, crown scorch is close to 100%. This stand would be rated as “severely” damaged. Note that when all needles fall, the potential for re-burn exists.



Two weeks post-burn. Crown was completely consumed by fire. Obviously, this stand is “severely” damaged and should be harvested immediately.



Younger stands tended to suffer more severe damage if they were greater than 3 years old (4 year old stand at left)



Stands that had heavy fuel buildup around the bases of trees (right) experienced long burn periods that may have damaged the stem bases and roots. This has been indicated as a mortality factor in the past.

Salvage harvest operations began immediately after the fire.



Post-Fire Evaluation Guidelines for Forecasting Potential Insect and Disease Problems and Associated Tree Mortality

Stand: _____

Date: _____

1. Average Basal Root Damage: (See Page 2)

- 0 -25% (Low) 26 – 50% (Moderate) >50 (Severe)

2. Average Stem Damage:

a. Relative Height of Stem Char

- 0 -25% (Low) 26 – 50% (Moderate) >50 (Severe)

3. Average Crown Damage:

a. Percent Crown Scorch

i. *Dormant Season* (October 1 – February 28)

- 0 -25% (Low) 26 – 50% (Moderate) >50 (Severe)

ii. *Growing Season* (March 1 – September 30)

- 0 -25% (Low) 26 – 50% (Moderate) >50 (Severe)

b. Terminal Bud Mortality (“Shepherd’s Crooked”)

- Absent (Low) Present (Severe)

4. Sign and symptom of insect attacks (e.g., pitch tubes or boring dust from bark beetles, boring dust from Ambrosia beetles, oviposition pits or excelsior from wood borers, etc.)

- Absent (Uncertain) Present (Severe)

5. Note that the effects of multiple damages are somewhat additive.

For example: Moderate Crown Scorch + Moderate Stem Char + Moderate Basal/Root Damage, likely equal a severe probability of insect infestation and tree mortality.

Overall Rating: _____

Survey Conducted By: _____

Post-Fire Evaluation Guidelines for Forecasting Potential Insect and Disease Problems and Associated Tree Mortality

Fire Damage Rating Matrix for Basal and Root Portion of Trees			
	DAMAGE		
Indicator	Light	Moderate	Severe
Lower Bole	Bark partially charred, a side or plate only	Bark completely charred, all sides plates and fissures	Bark completely charred and noticeable consumed
Ground Substrate	Litter charred to partially consumed, remains recognizable; upper duff burned to partially consumed	Litter mostly to entirely consumed; duff partially consumed, feeder roots burned in duff layer	Litter and duff entirely consumed, leaving ash or exposed mineral soil, and crater effects around roots
Roots	Concealed, not evident	Slightly exposed and charring, particularly on one side or at the tree base, feeder roots burned in duff layer	Abundant exposure and charring to partial or complete consumption

Notes:

Adapted from: James R. Meeker, USDA Forest Service