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Stereo Photo Series for Quantifying Natural Fuels

Volume XII: Post-Hurricane Fuels in Forests of the Southeast United States

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ABSTRACT

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Two series of single and stereo photographs display a range of natural conditions and fuel loadings in post-hurricane forests in the southeastern United States. Each group of photos includes inventory information summarizing vegetation composition, structure and loading, woody material loading and density by size class, forest floor loading, and various site characteristics. The natural fuels photo series is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, hurricane, wind damage, blowdown, sand hill, sand pine scrub, longleaf pine, *Pinus palustris*, loblolly pine, *Pinus taeda*, sand pine, *Pinus clausa*, shortleaf pine, *Pinus echinata*, slash pine, *Pinus elliotii*.

COOPERATORS

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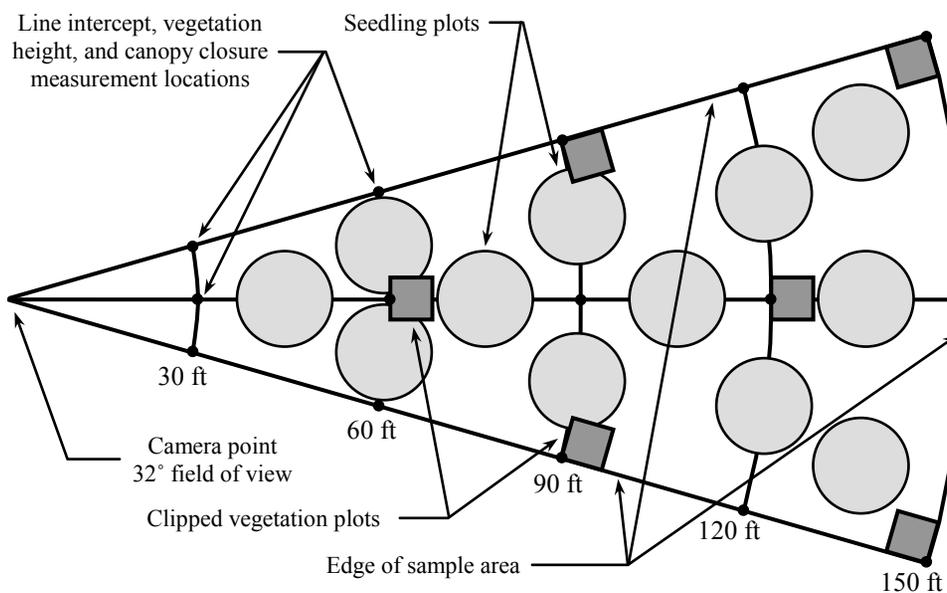
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WHAT IS THE NATURAL FUELS PHOTO SERIES?

The first phase of the natural fuels photo series was a collection of six volumes, each representing a region of the United States. Additional phases of the natural fuels photo series included new volumes (Volumes VII-XI and Hawaii) and supplemental volumes (Volumes IIa, Va, and VIa). Volume I included sites in mixed-conifer, western juniper, sagebrush, and grassland ecosystems in the interior Pacific Northwest. Volume II included sites in black and white spruce ecosystems in Alaska, and volume IIa included sites in hardwood ecosystems undergoing succession to spruce. Volume III included sites in lodgepole pine, quaking aspen, and gambel oak ecosystems in the Rocky Mountains. Volume IV included sites in pinyon-juniper, sagebrush, and chaparral ecosystems in the Southwest. Volume V included sites in red and white pine, northern tallgrass prairie, and mixed oak ecosystems in the Midwest, and volume Va included sites in jack pine ecosystems. Volume VI included sites in longleaf pine, pocosin, and marsh grass ecosystems in the Southeast, and volume VIa included sites in sand hill, sand pine scrub, and white pine-invaded hardwood ecosystems. Volume VII included sites in Oregon white oak, California deciduous oak, and mixed-conifer with shrub ecosystems in Washington, Oregon, and California. Volume VIII included sites in hardwood, pitch pine, and red spruce/balsam fir ecosystems in the Northeast. Volume IX included sites in oak-juniper ecosystems in southern Arizona and New Mexico. Volume X included sites in sagebrush with grass and ponderosa pine-juniper ecosystems in central Montana. Volume XI included sites in big sagebrush ecosystems that were ecotonal with grasses, western juniper, and ponderosa pine in eastern Oregon. An unnumbered volume included grassland, shrubland, and forest ecosystems in Hawaii.

Generally, sites include wide-angle and stereo-pair photographs supplemented with information on living and dead fuels, vegetation, and stand structure and composition within the area visible in the photographs (fig. 1). The sites in this volume provide a basis for appraising and describing woody material, vegetation, and stand conditions in many post-hurricane forest types in the Gulf and Atlantic coasts of the Southeast United States.

Figure 1--Photo series sample area layout. Twenty-one random azimuth line transects (one at each point on the 60-, 120- and 150-foot arcs, and two at each point on the 30- and 90-foot arcs) and 3 to 6 clipped vegetation plots were located within the sample area. Trees were inventoried in the entire sample area and seedlings were inventoried on 6 to 12 systematically located sample plots.



WHY IS THE PHOTO SERIES NEEDED?

These photo series are land management tools that can be used to assess landscapes through appraisal of living and dead woody material and vegetation (i.e., fuels) and stand characteristics. Once an assessment has been completed, stand treatment options, such as prescribed fire or harvesting, can be planned and implemented to better achieve desired effects while minimizing negative impacts on other resources.

The photo series has application in several branches of natural resource science and management. Inventory data such as these can be used as inputs for evaluating animal and insect habitat, nutrient cycling, and microclimate, for example. Fire managers will find these data useful for predicting fuel consumption, smoke production, fire behavior, and fire effects during wildfires and prescribed fires. In addition, the photo series can be used to appraise carbon sequestration, an important factor in predictions of future climate, and to link remotely sensed signatures to live and dead fuels on the ground.

Ground inventory procedures that directly measure site conditions (e.g., fuel loading and arrangement, vegetation structure and composition, etc.) exist for most ecosystem types and are useful when a high degree of accuracy is required. Ground inventory is time-consuming and expensive, however. Photo series can be used to make quick, easy, and inexpensive approximations of fuel quantities and stand conditions when less precise estimates are acceptable.

HOW WAS THE PHOTO SERIES DEVELOPED?

Sites photographed for the series in this volume were selected to show a range of fuel conditions following hurricanes in forests in the Southeast United States. The sites represent a range of forested stand conditions and blowdown damage. The sites sampled in this volume are divided into two series (Gulf Coast and Atlantic Coast post-hurricane fuels), one dominated by mixed forest species and the other by a heavy shrub understory, respectively. Within each series, sites are ordered by total loading of downed woody material. Photographs were taken, and fuel loading, stand structure, and composition data were collected by using the procedures of Maxwell and Ward (1980) as a guide. This volume presents a more extensive survey of hurricane-generated fuels than the work first published by Wade et al. (1993).

PHOTOGRAPHS

Stereo-pair photographs are included in this guide. The three-dimensional image obtained by viewing the photographs with a stereoscope will improve the ability of the land manager to appraise natural fuel, vegetation, and stand structure conditions. A larger, wide-angle photograph has been included for additional comparisons. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals to provide scale. The pole is 30 feet from the camera. The summary data relate to the field of view of the stereo-pair photographs but are based on measurements taken in the sample area only (see fig. 1). No sampling occurs in the foreground between the camera and the sign.

PHOTOGRAPH AND INFORMATION ARRANGEMENT

The photographs and accompanying data summaries are presented as single sites organized into two series. Each site is arranged to occupy two facing pages. The upper page contains the wide-angle (50mm) photograph and general site, stand, and forest floor information. The lower page includes the

stereo-pair photographs and summaries of overstory structure and composition, understory vegetation structure and composition, and downed woody material loading and density by size class.

SITE INFORMATION

The camera point of each site was located with a global positioning system (GPS) receiver using the WGS-84 datum. Aspect and slope were measured with a compass and clinometer, respectively. Ecological community classification (to the association level; NatureServe 2009), an indicator of current vegetation composition, was assigned for all sites. In addition, Society of American Foresters (SAF) cover type (Eyre 1980) was assigned to describe forest structure for each site. Sites impacted by hurricanes Francis (2004), Jeanne (2004), Katrina (2005), and Ike (2008) were sampled 1 month to 2.5 years post-hurricane.

STAND INFORMATION

Shrub, forb, and graminoid species coverage, was estimated by using line intercept transects (Canfield 1941). Tree and understory species (shrub, forb, and graminoid species) present at a site are listed in order of abundance.¹ The listing of understory species was not meant to be a complete vegetation inventory and may represent only a portion of the actual species richness of the sampled areas. The percentage of standing dead trees and trees with snapped off boles was determined by sampling within the site (fig. 1). Crown closure was measured with a forest densitometer (84 systematically located points). Seedling composition and density were determined either by using twelve 0.002-acre circular plots or six 43.06-square-foot square plots; all trees less than 4.5 feet tall were considered seedlings. *Quercus* species with a shrub-like growth habit were not counted as seedlings.²

FOREST FLOOR INFORMATION

Litter and duff were collected in three to six 5.38-square-foot plots, oven-dried, and weighed to compute loading on an area basis. Forest floor material is classified following the scheme outlined in Pritchett (1979), where the litter, or L-layer, comprises dead, undecomposed vegetation (including dead grass material that was detached from the plant base), and the duff, a combination of the F and H layers, consisting of dead vegetation in various stages of decay. Additionally, in sites with recent hurricane damage, conifer needles still attached to broken-off crowns lying within a projected columnar space above the 5.38-square-foot plots were collected, processed, and reported as “crown litter.”

SAPLINGS AND TREES

All overstory trees and saplings (i.e., trees ≥ 4.5 feet tall) within the sample area were counted and measured (fig. 1). Tree measurement data were summarized by diameter at breast height (d.b.h.)³ size class and by tree status (all, live, or dead). Trees that were snapped off during the hurricane were also noted. Height to crown base (reported as ladder fuel height in previous photo series volumes) was defined as the height of the lowest, continuous live or dead branch material of the tree canopy, and height to live crown was defined as the height of the lowest continuous live

¹ A list of scientific and common species names used in this volume appears on page 7.

² *Quercus* species with a shrub-like growth form are listed in the “Notes to Users” section before each series.

³ D.b.h. is measured 4.5 feet above the ground.

branches of the tree canopy. Live crown mass (branchwood and foliage) was calculated from species- and size-specific allometric equations (Baldwin 1989, Clark and Schroeder 1985, Clark et al. 1986, Ker 1980, Loomis and Blank 1981, Loomis et al. 1966, Martin et al. 1998, Perala 1993, Taras 1980, Taras and Phillips 1978, Ter-Mikaelian and Korzukhin 1997, Whittaker and Woodwell 1968). Generalized composite equations were used when species-specific equations were not available in the literature. A size-specific composite “soft hardwoods” equation was substituted for *Ilex* spp., *Ilex vomitoria*, and *Morrellia cerifera* (Clark and Schroeder 1985). A size-specific composite “hard hardwoods” equation was substituted for *Magnolia* spp., *Osmanthus americanus*, *Quercus laevis*, *Quercus laurifolia*, and *Quercus myrtifolia* (Clark and Schroeder 1985).

UNDERSTORY VEGETATION

Understory species coverage was estimated by using line intercept transects (Canfield 1941). Where species-specific coverage is not reported, understory vegetation coverage was estimated by lifeform category (shrub, forb, or graminoid) by using the line intercept transects. Understory vegetation heights were measured at 39 points located systematically throughout the sample area. Understory vegetation biomass was determined by sampling three to six square, clipped vegetation plots also located systematically throughout the sample area (fig. 1). Shrubs were collected in 43.06-square-foot plots; graminoids and forbs were collected in 10.76-square-foot plots. All live and dead understory vegetation (regardless of size) rooted in each plot was clipped at ground level, separated, and returned to the laboratory for oven drying. Understory vegetation and other collected material were oven dried at a minimum of 158° F for at least 48 hours before weighing and determination of area loading.

WOODY MATERIAL

Measurement techniques used for inventorying dead and down woody material were patterned after the planar intersect method outlined by Brown (1974) and described by Maxwell and Ward (1980). Twenty-one transects of random azimuth starting at 15 systematically located points within the sample area were used to determine woody material loading and density (fig. 1). Woody material data are reported by size classes that correspond to timelag fuel classes used in fire behavior modeling (Burgan and Rothermel 1984).⁴ Woody material in 1-hour, 10-hour, and 100-hour size classes was tallied on transects that were 3 feet, 10 feet, and 60 feet long, respectively. The decay class and the actual diameter at the point of intersection were measured for all pieces >3 inches in diameter. All woody material <3 inches in diameter was considered sound. Woody material loading and woody material density were calculated from relationships that use number of pieces intersected and transect length (and wood specific gravity for loading) developed by Brown (1974) and Safranyik and Linton (1987), respectively.

USING THE PHOTO SERIES

The natural fuels photo series is a tool for quickly and inexpensively evaluating a variety of fuel and vegetation conditions. Because of its ease of use, however, care must be taken when evaluating field sites to compare only with photo series sites that are appropriate matches. It is acceptable, however, to use the data from more than one site from the photo series when evaluating a site in the field (e.g., woody material loading from one site in the photo series and tree density from another site in the photo series to best match the conditions of a given field site).

⁴ 1-, 10-, 100- and 1,000-hour timelag fuels are defined as woody material ≤0.25 inch, 0.26-1.0 inch, 1.1-3.0 inches, and >3.0 inches in diameter, respectively.

Make a visual inventory of the site by observing fuel and stand conditions within the field of view and compare them with the stereo-pair photographs as follows, remembering that the data tables relate to the area behind the sign in the stereo-pair photographs:

- Observe each characteristic for a specific size class of woody material on the ground (e.g., 3.1- to 9.0-inch woody material loading).
- Select a photo series site (or sites) that nearly matches (or brackets) the observed characteristics.
- Obtain the quantitative value for the characteristic being estimated from the data summary accompanying the selected photo series site, or interpolate a value between sites.
- Repeat these steps for each size class or stand characteristic of interest.

The total loading or stand condition can then be calculated by summing the estimates. If the site being inventoried has areas with obvious differences in woody material or stand conditions, the user should make separate determinations for each area and then weight and cumulate the loading for the whole site.

Characteristics not distinguishable in the photographs are forest floor depth, loading, and bulk density, and proportions of sound and rotten woody material. If values for these characteristics are desired in the inventory, they must be derived from independent sampling or observations.

The 20 National Fire-Danger Rating System (Burgan 1988, Deeming et al. 1977) and the 13 fire behavior (Albini 1976) fuel models are very general in content and broadly applied. Each photo series encompasses a wider range of conditions, and individual sites represent fuel characteristics at greater resolution than can be gained by using fuel models; consequently, we chose not to assign one of these existing fuel models to individual sites in this photo series. The photo series was designed to provide sufficient fuel and vegetation data from which managers could generate their own customized fuel models.

METRIC CONVERSIONS

1 inch = 2.54 centimeters
 1 foot = 0.3048 meter
 1 square foot = 0.0929 square meter
 1 acre = 4,046.9 square meters
 1 acre = 0.4047 hectare

1 pound = 0.4536 kilogram
 1 ton = 907.2 kilograms
 1 ton = 0.9072 metric ton
 1 pound/acre = 1.1209E-04 kilogram/square meter
 1 pound/acre = 1.1209 kilograms/hectare

1 ton/acre = 0.2242 kilogram/square meter
 1 ton/acre = 2,241.7023 kilograms/hectare
 1 ton · acre⁻¹ · inch⁻¹ = 8.8256 kilograms/cubic meter
 1 ton · acre⁻¹ · inch⁻¹ = 8.8256E-03 grams/cubic centimeter
 1 ton · acre⁻¹ · inch⁻¹ = 8825.6 grams/cubic meter

SPECIES LIST

Scientific and common species names are from NRCS (2009). Species with a variable growth form may appear on both the shrub and tree lists.

SCIENTIFIC NAME

COMMON NAME

TREES:

<i>Acer rubrum</i> L.	Red maple
<i>Carya</i> spp.	Hickory
<i>Carya texana</i> Buckley	Black hickory
<i>Cornus florida</i> L.	Flowering dogwood
<i>Fraxinus</i> spp.	Ash
<i>Fraxinus nigra</i> Marsh.	Black ash
<i>Ilex</i> spp.	Holly
<i>Ilex vomitoria</i> Aiton	Yaupon
<i>Liquidambar styraciflua</i> L.	Sweetgum
<i>Magnolia</i> spp.	Magnolia
<i>Morella cerifera</i> (L.) Small (formerly <i>Myrica cerifera</i>)	Wax myrtle
<i>Nyssa sylvatica</i> Marsh.	Blackgum
<i>Osmanthus americanus</i> (L.) Benth. & Hook. f. ex A. Gray	Devilwood
<i>Ostrya virginiana</i> (Mill.) K. Koch	Hophornbeam
<i>Pinus clausa</i> (Chapm. ex Engelm.) Vasey ex Sarg.	Sand pine
<i>Pinus echinata</i> P. Mill.	Shortleaf pine
<i>Pinus elliotii</i> Engelm.	Slash pine
<i>Pinus palustris</i> P. Mill.	Longleaf pine
<i>Pinus taeda</i> L.	Loblolly pine
<i>Prunus</i> spp.	Cherry
<i>Quercus</i> spp.	Oak
<i>Quercus alba</i> L.	White oak
<i>Quercus chapmanii</i> Sarg.	Chapman oak
<i>Quercus geminata</i> Small	Sand live oak
<i>Quercus laevis</i> Walter	Turkey oak
<i>Quercus laurifolia</i> (Michx.)	Laurel oak
<i>Quercus myrtifolia</i> Willd.	Myrtle oak
<i>Quercus rubra</i> L.	Northern red oak
<i>Sabal palmetto</i> (Walter) Lodd. ex Schult & Schult. f.	Cabbage palmetto
<i>Sassafras albidum</i> (Nutt.) Nees	Sassafras

SHRUBS:

<i>Asimina reticulata</i> Shuttlw. ex Chapm.	Netted pawpaw
<i>Asimina triloba</i> (L.) Dunal	Pawpaw
<i>Callicarpa americana</i> L.	American beautyberry

SCIENTIFIC NAME

COMMON NAME

SHRUBS (CONTINUED):

<i>Cassutha filiformis</i> L.	Devil's gut
<i>Ceratiola ericoides</i> Michx.	Sand heath
<i>Ilex</i> spp.	Holly
<i>Ilex glabra</i> (L.) A. Gray	Inkberry (gallberry)
<i>Ilex vomitoria</i> Aiton	Yaupon
<i>Lyonia lucida</i> (Lam.) K. Koch	Fetterbush lyonia
<i>Morella cerifera</i> (L.) Small (formerly <i>Myrica cerifera</i>)	Wax myrtle
<i>Opuntia humifusa</i> (Raf.) Raf.	Eastern prickly pear
<i>Prunus umbellata</i> Elliot	Hog plum
<i>Quercus</i> spp.	Oak
<i>Quercus chapmanii</i> Sarg.	Chapman oak
<i>Quercus geminata</i> Small	Sand live oak
<i>Quercus laevis</i> Walter	Turkey oak
<i>Quercus laurifolia</i> (Michx.)	Laurel oak
<i>Quercus myrtifolia</i> Willd.	Myrtle oak
<i>Rubus</i> spp.	Blackberry
<i>Rhus</i> spp.	Sumac
<i>Serenoa repens</i> (Bartram) Small	Saw palmetto
<i>Smilax</i> spp.	Greenbrier
<i>Toxicodendron radicans</i> (L.) Kuntze	Eastern poison ivy
<i>Vaccinium</i> spp.	Blueberry
<i>Vaccinium arboreum</i> (Marsh.)	Farkleberry
<i>Vitis</i> spp.	Grape
<i>Vitis rotundifolia</i> Michx.	Muscadine

GRAMINOIDS, FORBS, AND LICHENS:

<i>Andropogon virginicus</i> L.	Broomsedge bluestem
<i>Aristida</i> spp.	Threeawn (wiregrass)
<i>Carex</i> spp.	Sedge
<i>Cladina evansii</i> (Abbayes) Hale & W.L. Culb.	Evan's reindeer lichen
<i>Cladina subtenuis</i> (Abbayes) Hale & W.L. Culb.	Reindeer lichen
<i>Nolina atopocarpa</i> Bartlett	Florida beargrass
<i>Palafoxia feay</i> A. Gray	Feay's palafox
<i>Sabatia gentianooides</i> Elliot	Pinewoods rose gentian

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GULF COAST POST-HURRICANE FUELS PHOTO SERIES

A SERIES OF 13 SITES
GCPH 01 THROUGH GCPH 13

NOTES TO USERS:

1. The sites in this series are ordered by increasing total downed woody material loading.
2. A list of scientific and common species names can be found on page 7.
3. Photographs were taken in February 2007 and October 2008. Sampling occurred February to March 2007 and October 2008.
4. The marker in these photographs is a 1-foot square and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
5. Forest floor and woody material loading are reported in tons per acre; understory biomass is reported in pounds per acre. Trace measurements of understory percentage coverage, understory biomass, and crown mass are reported as “trace” or as “t.”
6. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
7. Owing to forest density, certain species and size classes may be difficult to identify in the photographs. Trees more than 150 feet from the camera are out of the sample area, even though they may be visible in the photos.
8. *Quercus laurifolia* and *Quercus myrtifolia* are considered shrubs for understory coverage and biomass calculations and excluded from seedling counts. Individuals greater than 4.5 feet tall are included in summaries of saplings and trees.



SITE INFORMATION

Site location: N 31° 02' 48.6" W 89° 14' 57.8"
Elev: 305 ft Aspect: -- Slope: 0%
Association: Shortleaf Pine–Loblolly Pin –(White Oak, Post Oak)–Mockernut Hickory/Sourwood Forest
SAF cover type: Longleaf Pine–Slash Pine
Time since hurricane: 1.5 years

STAND INFORMATION

Trees (% of stems): <i>Cornus florida</i> (42), <i>Pinus taeda</i> (19), <i>Pinus palustris</i> (15), <i>Pinus elliottii</i> (14), <i>Quercus rubra</i> (7), <i>Prunus</i> spp. (3)
Standing dead trees: 13% of stems
Trees w/ boles snapped off: 3% of stems
Crown closure: 37%
Understory (% cover): <i>Ilex vomitoria</i> (18), <i>Vitis</i> spp. (17), Graminoid spp. (8), <i>Quercus laurifolia</i> (4), <i>Smilax</i> spp. (3), Shrub spp. (3), <i>Ilex</i> spp. (1), Forb spp. (1)
Seedlings (% of stems): <i>Quercus rubra</i> (44), <i>Cornus florida</i> (31), <i>Pinus taeda</i> (11), <i>Pinus elliottii</i> (6), <i>Carya</i> spp. (3), <i>Prunus</i> spp. (3), <i>Magnolia</i> spp. (2)
Density: 2,550/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.4
Hardwood litter	1.0
Conifer litter	1.2
Other	0.2
Crown litter	--
Duff	0.5
Total	2.9



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Cornus florida</i> (100/0)	<i>Cornus florida</i> (76/4)	<i>Pinus taeda</i> (12/12)	<i>Pinus taeda</i> (29/7)	<i>Pinus taeda</i> (19/10)
Second most common species (percentage of stems: live/dead)	--	<i>Pinus taeda</i> (4/4)	<i>Pinus palustris</i> (18/6)	<i>Pinus elliottii</i> (29/0)	<i>Pinus elliottii</i> (26/0)
Tree density (stems/ac)	22	181	123	101	224
Live	22	159	101	94	195
Dead	0	22	22	7	29
Avg DBH (in)	2.0	2.9	6.4	10.9	8.4
Live	2.0	2.9	6.3	10.9	8.5
Dead	--	2.6	7.1	10.5	8.0
Avg height (ft)	20.3	22.4	38.2	54.3	45.5
Live	20.3	21.6	41.8	56.3	48.8
Dead	--	27.7	21.7	28.0	23.3
Avg height to crown base (ft)	9.3	11.7	27.1	35.3	31.1
Live	9.3	11.7	27.1	35.3	31.1
Dead	--	--	--	--	--
Avg height to live crown (ft)	9.3	11.7	27.5	37.1	32.1
Live crown mass (tons/ac)	0.02	0.60	1.62	5.23	6.85

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Ilex vomitoria</i> (18)	--	--
Second most common species (% cover)	<i>Vitis</i> spp. (17)	--	--
Coverage (percent)	46	1	8
Avg height (ft)	2.7	0.4	2.0
Biomass (lbs/ac)	1,758	19	131

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	1.2	--	1.2	--	--	--
1.1 - 3.0	2.9	--	2.9	--	--	--
3.1 - 9.0	2.8	0.6	3.4	83	23	107
> 9.0	0.0	0.0	0.0	0	0	0
Total	7.2	0.6	7.8	83	23	107



SITE INFORMATION

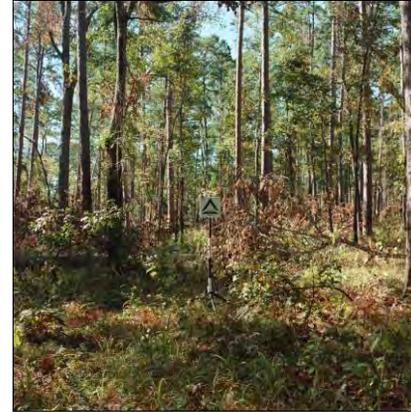
Site location: N 31° 24' 12.4" W 95° 08' 36.9"
 Elev: 421 ft Aspect: 20° Slope: 1%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine–Oak
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (31), *Quercus alba* (19), *Nyssa sylvatica* (13), *Acer rubrum* (13), *Liquidambar styraciflua* (13), *Fraxinus nigra* (6), *Carya texana* (5)
 Standing dead trees: 6% of stems
 Trees w/ boles snapped off: 6% of stems
 Crown closure: 67%
 Understory (% cover): Graminoid spp. (13), *Callicarpa americana* (4), *Morella cerifera* (3), Forb spp. (2), *Vaccinium arboreum* (1), *Toxicodendron radicans* (t), *Rubus* spp. (t)
 Seedlings (% of stems): *Quercus alba* (67), *Ostrya virginiana* (33)
 Density: 4,553/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	0.7
Hardwood litter	0.0
Conifer litter	0.7
Other	0.0
Crown litter	1.5
Duff	0.0
Total	2.2



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	<i>Acer rubrum</i> (25/0)	<i>Pinus echinata</i> (63/0)	<i>Pinus echinata</i> (31/0)
Second most common species (percentage of stems: live/dead)	--	--	<i>Quercus alba</i> (12/13)	<i>Nyssa sylvatica</i> (13/0)	<i>Quercus alba</i> (13/6)
Tree density (stems/ac)	0	0	58	58	115
Live	0	0	51	58	108
Dead	0	0	7	0	7
Avg DBH (in)	--	--	6.3	16.5	11.4
Live	--	--	6.5	16.5	11.8
Dead	--	--	5.5	--	5.5
Avg height (ft)	--	--	40.5	87.8	64.1
Live	--	--	42.4	87.8	66.6
Dead	--	--	27.0	--	27.0
Avg height to crown base (ft)	--	--	23.3	55.6	39.4
Live	--	--	22.7	55.6	40.2
Dead	--	--	27.0	--	27.0
Avg height to live crown (ft)	--	--	23.3	62.5	42.9
Live crown mass (tons/ac)	0.00	0.00	1.14	6.50	7.64

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Callicarpa americana</i> (4)	--	--
Second most common species (% cover)	<i>Morella cerifera</i> (3)	--	--
Coverage (percent)	8	2	13
Avg height (ft)	1.8	1.1	0.8
Biomass (lbs/ac)	176	23	195

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	1.0	--	1.0	--	--	--
1.1 - 3.0	1.7	--	1.7	--	--	--
3.1 - 9.0	2.6	0.3	2.9	97	5	102
> 9.0	15.4	0.0	15.4	46	0	46
Total	21.0	0.3	21.3	143	5	148



SITE INFORMATION

Site location: N 31° 03' 07.2" W 89° 15' 01.7"
Elev: 261 ft Aspect: -- Slope: 0%
Association: Shortleaf Pine–Loblolly Pine–(White Oak, Post Oak)–Mockernut Hickory/Sourwood Forest
SAF cover type: Longleaf Pine–Slash Pine
Time since hurricane: 1.5 years

STAND INFORMATION

Trees (% of stems): <i>Pinus elliotii</i> (51), <i>Carya</i> spp. (16), <i>Pinus taeda</i> (16), <i>Pinus palustris</i> (11), <i>Cornus florida</i> (3), <i>Quercus rubra</i> (3)
Standing dead trees: 38% of stems
Trees w/ boles snapped off: 5% of stems
Crown closure: 35%
Understory (% cover): <i>Smilax</i> spp. (15), <i>Ilex vomitoria</i> (7), <i>Quercus</i> spp. (7), Graminoid spp. (6), Shrub spp. (4), <i>Vaccinium</i> spp. (3), <i>Quercus laurifolia</i> (2)
Seedlings (% of stems): <i>Pinus taeda</i> (46), <i>Carya</i> spp. (31), <i>Pinus elliotii</i> (13), <i>Osmanthus americanus</i> (7), <i>Fraxinus</i> spp. (2), <i>Prunus</i> spp. (1)
Density: 924/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.6
Hardwood litter	0.0
Conifer litter	2.3
Other	0.3
Crown litter	--
Duff	1.5
Total	4.1



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Carya</i> spp. (100/0)	<i>Pinus palustris</i> (17/8)	<i>Pinus elliottii</i> (38/38)	<i>Pinus elliottii</i> (40/20)	<i>Pinus elliottii</i> (39/30)
Second most common species (percentage of stems: live/dead)	--	<i>Pinus elliottii</i> (0/25)	<i>Pinus palustris</i> (8/0)	<i>Pinus taeda</i> (20/20)	<i>Pinus taeda</i> (13/9)
Tree density (stems/ac)	14	87	94	72	166
Live	14	51	58	43	101
Dead	0	36	36	29	65
Avg DBH (in)	1.7	3.3	7.0	12.2	9.2
Live	1.7	3.2	7.4	12.7	9.7
Dead	--	3.6	6.3	11.4	8.6
Avg height (ft)	16.0	23.6	42.5	41.6	42.1
Live	16.0	26.6	48.4	61.3	53.9
Dead	--	18.4	33.0	12.1	23.7
Avg height to crown base (ft)	8.0	14.7	37.9	43.2	40.1
Live	8.0	14.7	37.9	43.2	40.1
Dead	--	--	--	--	--
Avg height to live crown (ft)	8.0	14.7	37.9	43.2	40.1
Live crown mass (tons/ac)	trace	0.19	1.02	3.51	4.53

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Smilax</i> spp. (15)	--	--
Second most common species (% cover)	<i>Ilex vomitoria</i> (7)	--	--
Coverage (percent)	38	trace	6
Avg height (ft)	3.0	0.8	0.8
Biomass (lbs/ac)	864	trace	251

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	--	0.2	--	--	--
0.26 - 1.0	1.8	--	1.8	--	--	--
1.1 - 3.0	4.7	--	4.7	--	--	--
3.1 - 9.0	8.4	0.8	9.2	176	37	213
> 9.0	6.6	0.0	6.6	56	0	56
Total	21.7	0.8	22.5	232	37	269



SITE INFORMATION

Site location: N 30° 59' 14.9" W 89° 03' 03.1"
 Elev: 95 ft Aspect: -- Slope: 0%
 Association: Loblolly Pine-White Oak/Longleaf
 Woodoats Forest
 SAF cover type: Longleaf Pine
 Time since hurricane: 1.5 years

STAND INFORMATION

Trees (% of stems): *Pinus palustris* (39), *Acer rubrum* (17),
Quercus alba (13), *Cornus florida* (12), *Pinus taeda* (10),
Ilex vomitoria (7), *Morella cerifera* (2)
 Standing dead trees: 27% of stems
 Trees w/ boles snapped off: 0% of stems
 Crown closure: 66%
 Understory (% cover): *Lyonia lucida* (17), *Vitis* spp. (3),
Ilex vomitoria (3), *Quercus* spp. (2), Graminoid spp. (2)
 Seedlings (% of stems): *Acer rubrum* (71), *Quercus*
rubra (12), *Morella cerifera* (9), *Magnolia* spp. (6),
Pinus taeda (2)
 Density: 6,787/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.8
Hardwood litter	0.4
Conifer litter	2.4
Other	0.0
Crown litter	--
Duff	3.9
Total	6.7



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Acer rubrum</i> (100/0)	<i>Cornus florida</i> (33/0)	<i>Pinus palustris</i> (18/18)	<i>Pinus palustris</i> (50/21)	<i>Pinus palustris</i> (32/20)
Second most common species (percentage of stems: live/dead)	--	<i>Acer rubrum</i> (11/11)	<i>Acer rubrum</i> (18/0)	<i>Pinus taeda</i> (14/0)	<i>Pinus taeda</i> (6/6)
Tree density (stems/ac)	7	65	123	101	224
Live	7	43	87	79	166
Dead	0	22	36	22	58
Avg DBH (in)	1.0	3.3	6.7	14.7	10.3
Live	1.0	3.4	6.8	14.8	10.7
Dead	--	3.2	6.3	14.3	9.3
Avg height (ft)	11.0	23.9	49.2	82.1	64.1
Live	11.0	23.0	48.7	87.4	67.2
Dead	--	25.7	50.4	63.0	55.1
Avg height to crown base (ft)	8.0	15.3	29.3	55.4	41.7
Live	8.0	15.3	29.3	55.4	41.7
Dead	--	--	--	--	--
Avg height to live crown (ft)	8.0	15.3	29.3	55.4	41.7
Live crown mass (tons/ac)	trace	0.22	2.43	14.60	17.03

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Lyonia lucida</i> (17)	--	--
Second most common species (% cover)	<i>Vitis</i> spp. (3)	--	--
Coverage (percent)	25	0	2
Avg height (ft)	1.9	--	0.6
Biomass (lbs/ac)	447	0	23

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	--	0.2	--	--	--
0.26 - 1.0	1.4	--	1.4	--	--	--
1.1 - 3.0	2.3	--	2.3	--	--	--
3.1 - 9.0	7.4	1.9	9.3	222	46	268
> 9.0	21.8	4.1	25.9	107	28	135
Total	33.1	6.0	39.1	329	74	403



SITE INFORMATION

Site location: N 31° 24' 14.9" W 95° 08' 37.5"
 Elev: 367 ft Aspect: 26° Slope: 3%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (31), *Quercus alba* (27), *Nyssa sylvatica* (23), *Liquidambar styraciflua* (11), *Carya texana* (4), *Acer rubrum* (4)
 Standing dead trees: 31% of stems
 Trees w/ boles snapped off: 13% of stems
 Crown closure: 59%
 Understory (% cover): Graminoid spp. (32), *Morella cerifera* (9), Forb spp. (4), *Callicarpa americana* (3), *Vitis* spp. (1), *Ilex vomitoria* (t)
 Seedlings (% of stems): *Quercus alba* (68), *Sassafras albidum* (24), *Acer rubrum* (8)
 Density: 5,564/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	1.0
Hardwood litter	0.0
Conifer litter	1.0
Other	0.0
Crown litter	1.3
Duff	0.0
Total	2.3



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9	> 4
Most common species (percentage of stems: live/dead)	--	<i>Nyssa sylvatica</i> (0/100)	<i>Quercus alba</i> (36/9)	<i>Pinus echinata</i> (38/15)	<i>Pinus echinata</i> (21/13)
Second most common species (percentage of stems: live/dead)	--	--	<i>Nyssa sylvatica</i> (27/9)	<i>Liquidambar styraciflua</i> (15/0)	<i>Quercus alba</i> (21/8)
Tree density (stems/ac)	0	14	80	94	174
Live	0	0	58	72	130
Dead	0	14	22	22	44
Avg DBH (in)	--	3.5	6.8	15.3	11.4
Live	--	--	6.9	15.5	11.7
Dead	--	3.5	6.4	14.6	10.5
Avg height (ft)	--	25.0	37.2	56.5	27.1
Live	--	--	43.3	66.5	56.2
Dead	--	25.0	20.7	23.3	22.0
Avg height to crown base (ft)	--	10.3	16.6	33.5	47.7
Live	--	--	16.5	36.6	27.7
Dead	--	10.3	16.7	23.3	20.0
Avg height to live crown (ft)	--	--	18.5	34.3	20.0
Live crown mass (tons/ac)	0.00	0.00	1.75	11.35	13.10

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Morella cerifera</i> (9)	--	--
Second most common species (% cover)	<i>Callicarpa americana</i> (3)	--	--
Coverage (percent)	13	4	32
Avg height (ft)	1.7	0.5	0.7
Biomass (lbs/ac)	1,164	29	279

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	--	0.5	--	--	--
0.26 - 1.0	1.9	--	1.9	--	--	--
1.1 - 3.0	3.7	--	3.7	--	--	--
3.1 - 9.0	4.0	0.3	4.3	176	9	185
> 9.0	29.9	0.7	30.6	167	5	172
Total	40.0	1.0	41.0	343	14	357



SITE INFORMATION

Site location: N 30° 58' 47.8" W 89° 03' 22.5"
 Elev: 168 ft Aspect: -- Slope: 0%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Post Oak)–Mockernut Hickory/Sourwood Forest
 SAF cover type: Loblolly Pine
 Time since hurricane: 1.5 years

STAND INFORMATION

Trees (% of stems): *Quercus alba* (31), *Pinus taeda* (26), *Quercus laurifolia* (17), *Pinus palustris* (13), *Cornus florida* (8), *Prunus* spp. (5)
 Standing dead trees: 51% of stems
 Trees w/ boles snapped off: 0% of stems
 Crown closure: 48%
 Understory (% cover): *Ilex vomitoria* (12), Graminoid spp. (7), *Lyonia lucida* (3), *Quercus* spp. (3), *Vitis* spp. (3), Forb spp. (2), *Smilax* spp. (1)
 Seedlings (% of stems): *Quercus rubra* (59), *Prunus* spp. (17), *Liquidambar styraciflua* (14), *Acer rubrum* (4), *Magnolia* spp. (4), *Pinus taeda* (2)
 Density: 2,098/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	4.2
Hardwood litter	0.7
Conifer litter	3.5
Other	0.0
Crown litter	--
Duff	1.1
Total	5.3



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	<i>Quercus alba</i> (29/36)	<i>Pinus taeda</i> (18/24)	<i>Pinus palustris</i> (50/0)	<i>Pinus taeda</i> (24/16)
Second most common species (percentage of stems: live/dead)	--	<i>Cornus florida</i> (0/14)	<i>Quercus laurifolia</i> (6/24)	<i>Pinus taeda</i> (38/0)	<i>Quercus laurifolia</i> (8/16)
Tree density (stems/ac)	0	101	123	58	181
Live	0	51	29	58	87
Dead	0	50	94	0	94
Avg DBH (in)	--	3.4	5.2	15.5	8.5
Live	--	3.6	5.7	15.5	12.3
Dead	--	3.1	5.0	--	5.0
Avg height (ft)	--	25.9	30.0	58.4	39.1
Live	--	26.8	44.5	58.4	53.8
Dead	--	25.0	25.5	--	25.5
Avg height to crown base (ft)	--	17.5	19.9	37.1	31.4
Live	--	17.5	19.9	37.1	31.4
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	17.5	28.9	42.5	38.0
Live crown mass (tons/ac)	0.00	0.32	0.31	10.07	10.38

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Ilex vomitoria</i> (12)	--	--
Second most common species (% cover)	<i>Lyonia lucida</i> (3)	--	--
Coverage (percent)	18	2	7
Avg height (ft)	2.6	0.1	0.4
Biomass (lbs/ac)	466	trace	22

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	2.1	--	2.1	--	--	--
1.1 - 3.0	4.9	--	4.9	--	--	--
3.1 - 9.0	13.0	0.1	13.1	422	9	431
> 9.0	25.2	0.7	25.9	144	5	149
Total	45.5	0.8	46.3	566	14	580



SITE INFORMATION

Site location: N 30° 59' 13.6" W 89° 03' 01.8"
 Elev: 160 ft Aspect: -- Slope: 0%
 Association: White Oak–Northern Red Oak–
 (Mockernut Hickory, Shagbark Hickory)/Flowering
 Dogwood Acidic Forest
 SAF cover type: Loblolly Pine–Hardwood
 Time since hurricane: 1.5 years

STAND INFORMATION

Trees (% of stems): *Magnolia* spp. (25), *Cornus florida* (16),
Pinus taeda (12), *Ilex* spp. (10), *Liquidambar*
styraciflua (10), *Quercus myrtifolia* (8), *Prunus* spp. (7),
Quercus alba (6), *Pinus palustris* (4), *Acer rubrum* (2)
 Standing dead trees: 25% of stems
 Trees w/ boles snapped off: 2% of stems
 Crown closure: 46%
 Understory (% cover): *Lyonia lucida* (22), *Ilex vomitoria* (6),
 Shrub spp. (4), *Quercus myrtifolia* (3), *Vitis* spp. (2),
 Forb spp. (2), *Quercus* spp. (2), *Ilex* spp. (2)
 Seedlings (% of stems): *Quercus rubra* (31), *Magnolia* spp. (27),
Acer rubrum (25), *Pinus taeda* (10), *Quercus alba* (5),
Liquidambar styraciflua (2)
 Density: 2,427/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.0
Hardwood litter	0.8
Conifer litter	1.2
Other	0.0
Crown litter	--
Duff	4.6
Total	6.6



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Magnolia</i> spp. (70/0)	<i>Magnolia</i> spp. (27/0)	<i>Cornus florida</i> (9/9)	<i>Pinus taeda</i> (25/50)	<i>Pinus taeda</i> (8/15)
Second most common species (percentage of stems: live/dead)	<i>Cornus florida</i> (10/0)	<i>Cornus florida</i> (20/0)	<i>Liquidambar styraciflua</i> (14/4)	<i>Pinus palustris</i> (0/25)	<i>Cornus florida</i> (8/8)
Tree density (stems/ac)	72	108	159	29	188
Live	65	101	101	7	108
Dead	7	7	58	22	80
Avg DBH (in)	1.3	3.0	5.2	10.6	6.0
Live	1.3	2.9	5.2	11.1	5.6
Dead	1.6	4.0	5.1	10.5	6.5
Avg height (ft)	15.1	23.7	35.5	39.4	39.1
Live	14.9	23.3	39.4	72.0	41.6
Dead	17.0	29.0	28.8	28.5	28.7
Avg height to crown base (ft)	5.3	10.4	21.0	55.0	23.1
Live	5.3	10.4	20.7	55.0	23.0
Dead	--	--	25.0	--	25.0
Avg height to live crown (ft)	5.3	10.4	21.0	55.0	23.1
Live crown mass (tons/ac)	0.05	0.35	1.23	0.37	1.60

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Lyonia lucida</i> (22)	--	--
Second most common species (% cover)	<i>Ilex vomitoria</i> (6)	--	--
Coverage (percent)	41	2	trace
Avg height (ft)	2.5	0.2	0.1
Biomass (lbs/ac)	382	2	trace

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.2	--	0.2	--	--	--
0.26 - 1.0	2.1	--	2.1	--	--	--
1.1 - 3.0	3.1	--	3.1	--	--	--
3.1 - 9.0	5.7	3.0	8.7	190	121	311
> 9.0	36.0	1.0	37.0	199	9	208
Total	47.1	4.0	51.1	389	130	519



SITE INFORMATION

Site location: N 31° 03' 01.2" W 89° 14' 58.2"
 Elev: 273 ft Aspect: -- Slope: 0%
 Association Shortleaf Pine–Loblolly Pine–(White Oak, Post Oak)–Mockernut Hickory/Sourwood Forest
 SAF cover type: Slash Pine
 Time since hurricane: 1.5 years

STAND INFORMATION

Trees (% of stems): *Quercus laurifolia* (64), *Pinus elliotii* (10), *Pinus taeda* (8), *Carya* spp. (6), *Quercus alba* (5), *Cornus florida* (5), *Ilex* spp. (2)
 Standing dead trees: 21% of stems
 Trees w/ boles snapped off: 2% of stems
 Crown closure: 25%
 Understory (% cover): *Smilax* spp. (13), *Quercus* spp. (10), *Ilex vomitoria* (8), Graminoid spp. (6), Forb spp. (4), *Sabatia gentianoides* (2), *Ilex* spp. (1)
 Seedlings (% of stems): *Quercus rubra* (36), *Carya* spp. (34), *Cornus florida* (9), *Pinus elliotii* (9), *Fraxinus* spp. (5), *Liquidambar styraciflua* (3), *Acer rubrum* (2), *Prunus* spp. (2)
 Density: 462/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	1.7
Hardwood litter	1.3
Conifer litter	0.4
Other	0.0
Crown litter	--
Duff	2.0
Total	3.7



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Quercus laurifolia</i> (88/8)	<i>Quercus laurifolia</i> (55/20)	<i>Pinus elliottii</i> (33/33)	<i>Pinus taeda</i> (7/31)	<i>Pinus elliottii</i> (19/19)
Second most common species (percentage of stems: live/dead)	<i>Carya</i> spp. (4/0)	<i>Cornus florida</i> (10/0)	<i>Cornus florida</i> (33/0)	<i>Pinus elliottii</i> (15/15)	<i>Pinus taeda</i> (6/25)
Tree density (stems/ac)	188	145	22	94	116
Live	174	116	14	51	65
Dead	14	29	8	43	51
Avg DBH (in)	1.1	2.6	6.6	14.3	12.8
Live	1.1	2.6	5.9	13.2	11.6
Dead	1.1	2.7	8.0	15.5	14.4
Avg height (ft)	12.9	18.7	25.3	45.5	41.7
Live	12.9	19.0	35.5	51.0	47.6
Dead	12.5	17.3	5.0	39.0	34.1
Avg height to crown base (ft)	5.5	7.4	23.0	34.3	31.8
Live	5.5	7.4	23.0	34.3	31.8
Dead	6.0	--	--	--	--
Avg height to live crown (ft)	5.5	7.4	25.5	35.3	33.1
Live crown mass (tons/ac)	0.06	0.25	0.28	5.52	5.80

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Smilax</i> spp. (12)	<i>Sabatia gentianoides</i> (2)	--
Second most common species (% cover)	<i>Quercus</i> spp. (10)	--	--
Coverage (percent)	31	6	6
Avg height (ft)	4.4	1.4	2.4
Biomass (lbs/ac)	1,818	trace	19

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	--	0.4	--	--	--
0.26 - 1.0	2.1	--	2.1	--	--	--
1.1 - 3.0	4.8	--	4.8	--	--	--
3.1 - 9.0	8.5	1.5	10.0	255	23	278
> 9.0	38.0	2.8	40.8	204	19	223
Total	53.8	4.3	58.1	459	42	501



SITE INFORMATION

Site location: N 31° 03' 17.7" W 95° 10' 10.7"
 Elev: 261 ft Aspect: 20° Slope: 8%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (63), *Quercus alba* (37)
 Standing dead trees: 13% of stems
 Trees w/ boles snapped off: 13% of stems
 Crown closure: 31%
 Understory (% cover): Graminoid spp. (6), *Callicarpa americana* (6), *Vitis* spp. (4), Forb spp. (3), *Morella cerifera* (2), *Vaccinium* spp. (t)
 Seedlings (% of stems): *Quercus alba* (62), *Liquidambar styraciflua* (38)
 Density: 13,658/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	1.7
Hardwood litter	0.0
Conifer litter	1.7
Other	0.0
Crown litter	1.2
Duff	0.0
Total	2.9



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	<i>Pinus echinata</i> (50/13)	<i>Pinus echinata</i> (80/20)	<i>Pinus echinata</i> (50/13)
Second most common species (percentage of stems: live/dead)	--	--	<i>Carya texana</i> (4/0)	--	<i>Pinus echinata</i> (50/13)
Tree density (stems/ac)	0	0	22	36	58
Live	0	0	22	29	51
Dead	0	0	0	7	7
Avg DBH (in)	--	--	6.1	15.5	12.0
Live	--	--	6.1	16.4	12.0
Dead	--	--	--	12.0	12.0
Avg height (ft)	--	--	33.8	79.7	62.5
Live	--	--	33.8	95.3	69.0
Dead	--	--	--	17.0	17.0
Avg height to crown base (ft)	--	--	8.7	42.6	29.9
Live	--	--	8.7	49.0	31.8
Dead	--	--	--	17.0	17.0
Avg height to live crown (ft)	--	--	11.3	57.7	37.8
Live crown mass (tons/ac)	0.00	0.00	0.52	4.17	4.69

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Callicarpa americana</i> (6)	--	--
Second most common species (% cover)	<i>Morella cerifera</i> (2)	--	--
Coverage (percent)	12	3	6
Avg height (ft)	1.8	0.6	0.8
Biomass (lbs/ac)	571	25	135

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	--	0.4	--	--	--
0.26 - 1.0	1.1	--	1.1	--	--	--
1.1 - 3.0	4.3	--	4.3	--	--	--
3.1 - 9.0	10.0	0.1	10.1	450	5	455
> 9.0	46.4	0.0	46.4	218	0	218
Total	62.2	0.1	62.3	668	5	673



SITE INFORMATION

Site location: N 31° 23' 16.8" W 95° 11' 40.7"
 Elev: 460 ft Aspect: 109° Slope: 4%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (54), *Pinus taeda* (31), *Carya texana* (15)
 Standing dead trees: 23% of stems
 Trees w/ boles snapped off: 23% of stems
 Crown closure: 28%
 Understory (% cover): *Vitis* spp. (6), Forb spp. (6), Graminoid spp. (5), *Callicarpa americana* (5), *Toxicodendron radicans* (1), *Rhus* spp. (1)
 Seedlings (% of stems): *Quercus alba* (90), *Liquidambar styraciflua* (10)
 Density: 5,059/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	1.8
Hardwood litter	0.0
Conifer litter	1.8
Other	0.0
Crown litter	1.7
Duff	0.0
Total	3.5



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	<i>Pinus taeda</i> (67/0)	<i>Pinus echinata</i> (57/43)	<i>Pinus echinata</i> (31/23)
Second most common species (percentage of stems: live/dead)	--	--	<i>Carya texana</i> (33/0)	--	<i>Pinus taeda</i> (31/0)
Tree density (stems/ac)	0	0	43	51	94
Live	0	0	43	29	72
Dead	0	0	0	22	22
Avg DBH (in)	--	--	6.6	15.6	11.5
Live	--	--	6.0	16.1	10.4
Dead	--	--	--	15.0	15.0
Avg height (ft)	--	--	35.6	70.8	54.6
Live	--	--	35.6	101.0	61.8
Dead	--	--	--	30.5	30.5
Avg height to crown base (ft)	--	--	21.9	19.2	36.6
Live	--	--	21.9	63.2	38.4
Dead	--	--	--	30.5	30.5
Avg height to live crown (ft)	--	--	21.9	63.2	38.5
Live crown mass (tons/ac)	0.00	0.00	0.75	3.69	4.44

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Vitis</i> spp. (6)	--	--
Second most common species (% cover)	<i>Callicarpa americana</i> (5)	--	--
Coverage (percent)	12	6	5
Avg height (ft)	1.3	0.6	1.0
Biomass (lbs/ac)	582	116	163

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	2.0	--	2.0	--	--	--
1.1 - 3.0	8.6	--	8.6	--	--	--
3.1 - 9.0	5.7	1.1	6.8	264	28	292
> 9.0	53.8	1.4	54.2	246	9	255
Total	70.4	2.5	72.9	510	37	547



SITE INFORMATION

Site location: N 31° 29' 53.1" W 95° 10' 20.8"
 Elev: 326 ft Aspect: 330° Slope: 4%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (89), *Liquidambar styraciflua* (11)
 Standing dead trees: 44% of stems
 Trees w/ boles snapped off: 44% of stems
 Crown closure: 20%
 Understory (% cover): Graminoid spp. (13), *Callicarpa americana* (4), *Morella cerifera* (2), Forb spp. (2), *Vitis* spp. (1), *Vaccinium* spp. (1), *Toxicodendron radicans* (t), *Smilax* spp. (t), *Rubus* spp. (t)
 Seedlings (% of stems): *Liquidambar styraciflua* (52), *Pinus echinata* (48)
 Density: 3,541/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	0.5
Hardwood litter	0.0
Conifer litter	0.5
Other	0.0
Crown litter	1.0
Duff	0.0
Total	1.5



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	<i>Pinus echinata</i> (80/20)	<i>Pinus echinata</i> (25/50)	<i>Pinus echinata</i> (56/33)
Second most common species (percentage of stems: live/dead)	--	--	--	<i>Liquidambar styraciflua</i> (0/25)	<i>Liquidambar styraciflua</i> (0/11)
Tree density (stems/ac)	0	0	36	29	65
Live	0	0	29	7	36
Dead	0	0	7	22	29
Avg DBH (in)	--	--	5.8	12.7	8.9
Live	--	--	5.6	18.3	8.2
Dead	--	--	6.5	10.8	9.8
Avg height (ft)	--	--	41.8	32.3	37.6
Live	--	--	47.5	90.0	56.0
Dead	--	--	19.0	13.0	14.5
Avg height to crown base (ft)	--	--	31.4	25.0	28.6
Live	--	--	34.8	61.0	40.0
Dead	--	--	18.0	13.0	28.6
Avg height to live crown (ft)	--	--	34.8	61.0	40.0
Live crown mass (tons/ac)	0.00	0.00	0.32	1.23	1.55

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Callicarpa americana</i> (4)	--	--
Second most common species (% cover)	<i>Morella cerifera</i> (2)	--	--
Coverage (percent)	9	2	13
Avg height (ft)	2.6	0.4	0.7
Biomass (lbs/ac)	712	80	374

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	--	0.4	--	--	--
0.26 - 1.0	0.7	--	0.7	--	--	--
1.1 - 3.0	2.2	--	2.2	--	--	--
3.1 - 9.0	10.6	1.7	12.3	366	51	417
> 9.0	57.2	1.8	59.0	287	5	292
Total	71.1	3.5	74.6	653	56	709



SITE INFORMATION

Site location: N 31° 23' 06.7" W 95° 11' 30.7"
 Elev: 421 ft Aspect: 85° Slope: 1%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (100)
 Standing dead trees: 75% of stems
 Trees w/ boles snapped off: 75% of stems
 Crown closure: 20%
 Understory (% cover): Forb spp. (15), Graminoid spp. (10),
Rhus spp. (6), *Callicarpa americana* (2), *Vitis* spp. (2)
 Seedlings (% of stems): *Quercus alba* (70), *Liquidambar styraciflua* (26), *Pinus echinata* (4)
 Density: 8,937/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	1.4
Hardwood litter	0.0
Conifer litter	1.4
Other	0.0
Crown litter	2.6
Duff	0.0
Total	4.0



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	<i>Pinus echinata</i> (100/0)	<i>Pinus echinata</i> (14/86)	<i>Pinus echinata</i> (25/75)
Second most common species (percentage of stems: live/dead)	--	--	--	--	--
Tree density (stems/ac)	0	0	7	50	57
Live	0	0	7	7	14
Dead	0	0	0	43	43
Avg DBH (in)	--	--	7.9	14.5	13.7
Live	--	--	7.9	11.5	9.7
Dead	--	--	--	15.0	15.0
Avg height (ft)	--	--	59.0	31.6	35.0
Live	--	--	59.0	67.0	63.0
Dead	--	--	--	25.7	25.7
Avg height to crown base (ft)	--	--	46.0	29.9	31.9
Live	--	--	46.0	55.0	50.5
Dead	--	--	--	25.7	25.7
Avg height to live crown (ft)	--	--	46.0	55.0	50.5
Live crown mass (tons/ac)	0.00	0.00	0.17	0.40	0.57

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Rhus</i> spp. (6)	--	--
Second most common species (% cover)	<i>Callicarpa americana</i> (2)	--	--
Coverage (percent)	10	15	10
Avg height (ft)	2.3	0.7	0.5
Biomass (lbs/ac)	391	71	154

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.3	--	0.3	--	--	--
0.26 - 1.0	0.9	--	0.9	--	--	--
1.1 - 3.0	4.4	--	4.4	--	--	--
3.1 - 9.0	6.6	2.6	9.2	214	54	268
> 9.0	57.2	10.7	67.9	326	78	404
Total	69.4	13.3	82.7	540	132	672



SITE INFORMATION

Site location: N 31° 27' 52.7" W 95° 12' 25.7"
 Elev: 327 ft Aspect: -- Slope: 0%
 Association: Shortleaf Pine–Loblolly Pine–(White Oak, Southern Red Oak, Post Oak) Forest
 SAF cover type: Shortleaf Pine
 Time since hurricane: 1 month

STAND INFORMATION

Trees (% of stems): *Pinus echinata* (100)
 Standing dead trees: 0% of stems*
 Trees w/ boles snapped off: 0% of stems
 Crown closure: 22%
 Understory (% cover): Graminoid spp. (12), *Rhus* spp. (7), *Callicarpa americana* (3), *Ilex vomitoria* (2), *Vitis* spp. (2), *Toxicodendron radicans* (1), *Vaccinium* spp. (t), *Morella cerifera* (t), Forb spp. (t)
 Seedlings (% of stems): *Quercus alba* (77), *Liquidambar styraciflua* (23)
 Density: 5,059/ac

* Standing dead trees visible in these photos are located beyond sample area (see fig. 1).

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.3
Hardwood litter	0.0
Conifer litter	2.3
Other	0.0
Crown litter	1.7
Duff	0.0
Total	4.0



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	--	<i>Pinus echinata</i> (100/0)	<i>Pinus echinata</i> (100/0)
Second most common species (percentage of stems: live/dead)	--	--	--	--	--
Tree density (stems/ac)	0	0	0	29	29
Live	0	0	0	29	29
Dead	0	0	0	0	0
Avg DBH (in)	--	--	--	20.0	20.0
Live	--	--	--	20.0	20.0
Dead	--	--	--	--	--
Avg height (ft)	--	--	--	104.2	104.2
Live	--	--	--	104.2	104.2
Dead	--	--	--	--	--
Avg height to crown base (ft)	--	--	--	60.1	60.1
Live	--	--	--	60.1	60.1
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	--	--	60.1	60.1
Live crown mass (tons/ac)	0.00	0.00	0.00	6.16	6.16

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Rhus</i> spp. (7)	--	--
Second most common species (% cover)	<i>Callicarpa americana</i> (3)	--	--
Coverage (percent)	15	trace	12
Avg height (ft)	2.6	0.2	1.2
Biomass (lbs/ac)	584	10	297

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.4	--	0.4	--	--	--
0.26 - 1.0	1.3	--	1.3	--	--	--
1.1 - 3.0	2.9	--	2.9	--	--	--
3.1 - 9.0	5.3	0.1	5.4	148	5	153
> 9.0	76.5	1.7	78.2	394	5	399
Total	86.4	1.8	88.2	542	10	552

ATLANTIC COAST POST-HURRICANE FUELS PHOTO SERIES

A SERIES OF 7 SITES
ACPH 01 THROUGH ACPH 07

NOTES TO USERS:

1. The sites in this series are ordered by increasing total downed woody material loading.
2. A list of scientific and common species names can be found on page 7.
3. Photographs were taken in February 2007. Sampling occurred February to March 2007.
4. The marker in these photographs is a 1-foot square, and the pole is painted in contrasting colors at 1-foot intervals. The pole is 30 feet from the camera.
5. Forest floor and woody material loading are reported in tons per acre; understory biomass is reported in pounds per acre. Trace measurements of understory percentage coverage and biomass are reported as “trace” or as “t.”
6. A distinction is made between rotten and sound woody material for pieces larger than 3 inches in diameter.
7. Owing to forest density, certain species and size classes may be difficult to identify in the photographs. Trees more than 150 feet from the camera are out of the sample area, even though they may be visible in the photos with the exception of ACPH 01 and ACPH 06, which extended 230 feet and 180 feet from the camera, respectively.
8. *Quercus chapmanii*, *Quercus geminata*, *Quercus laevis*, and *Quercus myrtifolia* are considered shrubs for understory coverage and biomass calculations and excluded from seedling counts. Individuals greater than 4.5 feet tall are included in summaries of saplings and trees.
9. *Sabal palmetto* is not included in the crown mass calculations for ACPH 03. No species-specific or appropriate substitution equations were available.



SITE INFORMATION

Site location: N 27° 49' 38.1" W 80° 35' 17.0"
 Elev: 38 ft Aspect: -- Slope: 0%
 Association: Longleaf Pine/Saw Palmetto Flatwoods
 SAF cover type: Longleaf Pine
 Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Pinus palustris* (100)
 Standing dead trees: 86% of stems
 Trees w/ boles snapped off: 29% of stems
 Crown closure: 6%
 Understory (% cover): *Serenoa repens* (57), *Aristida* spp. (21), *Ilex glabra* (12), *Vaccinium* spp. (4), *Quercus laevis* (1), *Quercus myrtifolia* (1), *Carex* spp. (1)
 Seedlings (% of stems): none
 Density: 0/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	0.8
Hardwood litter	0.0
Conifer litter	0.4
Other	0.4
Duff	0.1
Total	0.9



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	--	--	--	<i>Pinus palustris</i> (14/86)	<i>Pinus palustris</i> (14/86)
Second most common species (percentage of stems: live/dead)	--	--	--	--	--
Tree density (stems/ac)	0	0	0	33	33
Live	0	0	0	5	5
Dead	0	0	0	28	28
Avg DBH (in)	--	--	--	12.3	12.3
Live	--	--	--	14.4	14.4
Dead	--	--	--	11.9	11.9
Avg height (ft)	--	--	--	34.2	34.2
Live	--	--	--	52.3	52.3
Dead	--	--	--	31.2	31.2
Avg height to crown base (ft)	--	--	--	29.0	29.0
Live	--	--	--	29.0	29.0
Dead	--	--	--	--	--
Avg height to live crown (ft)	--	--	--	31.0	31.0
Live crown mass (tons/ac)	0.00	0.00	0.00	0.61	0.61

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Serenoa repens</i> (57)	--	<i>Aristida</i> spp. (21)
Second most common species (% cover)	<i>Ilex glabra</i> (12)	--	<i>Carex</i> spp. (t)
Coverage (percent)	75	trace	21
Avg height (ft)	2.9	1.1	1.2
Biomass (lbs/ac)	3,694	trace	724

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.1	--	0.1	--	--	--
0.26 - 1.0	1.1	--	1.1	--	--	--
1.1 - 3.0	2.4	--	2.4	--	--	--
3.1 - 9.0	2.3	0.6	2.9	74	9	83
> 9.0	1.8	0.6	2.4	9	5	14
Total	7.7	1.2	8.9	83	14	97



SITE INFORMATION

Site location: N 27° 01' 21.0" W 80° 06' 34.1"
 Elev: 36 ft Aspect: -- Slope: 0%
 Association: Sand Pine/Sand-Heath/Cup Lichen
 Species Woodland
 SAF cover type: Sand Pine
 Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Pinus clausa* (33), *Quercus geminata* (31),
Quercus myrtifolia (25), *Quercus chapmanii* (11)
 Standing dead trees: 39% of stems
 Trees w/ boles snapped off: 24% of stems
 Crown closure: <1%
 Understory (% cover): *Quercus myrtifolia* (55), *Ceratiola
 ericoides* (8), *Quercus chapmanii* (4), *Quercus
 geminata* (3), *Cladina evansii* (2), *Cladina subtenuis* (1)
 Seedlings (% of stems): none
 Density: 0/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.0
Hardwood litter	2.0
Conifer litter	0.0
Other	0.0
Duff	3.9
Total	5.9



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Quercus geminata</i> (41/0)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/86)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/88)
Second most common species (percentage of stems: live/dead)	<i>Quercus myrtifolia</i> (32/6)	--	<i>Quercus geminata</i> (0/14)	--	<i>Quercus geminata</i> (0/12)
Tree density (stems/ac)	246	7	101	14	115
Live	224	0	0	0	0
Dead	22	7	101	14	115
Avg DBH (in)	1.0	3.4	7.2	10.4	7.6
Live	1.0	--	--	--	--
Dead	0.9	3.4	7.2	10.4	7.6
Avg height (ft)	7.9	23.5	20.1	6.9	18.5
Live	7.9	--	--	--	--
Dead	7.8	23.5	20.1	6.9	18.5
Avg height to crown base (ft)	4.1	--	--	--	--
Live	4.1	--	--	--	--
Dead	--	--	--	--	--
Avg height to live crown (ft)	4.1	--	--	--	--
Live crown mass (tons/ac)	0.06	0.00	0.00	0.00	0.00

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Quercus myrtifolia</i> (55)	--	--
Second most common species (% cover)	<i>Ceratiola ericoides</i> (8)	--	--
Coverage (percent)	73	0	0
Avg height (ft)	3.4	--	--
Biomass (lbs/ac)	7,772	0	0

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	1.4	--	1.4	--	--	--
0.26 - 1.0	2.8	--	2.8	--	--	--
1.1 - 3.0	2.7	--	2.7	--	--	--
3.1 - 9.0	4.9	1.4	6.3	190	51	241
> 9.0	2.1	0.0	2.1	19	0	19
Total	13.9	1.4	15.3	209	51	260



SITE INFORMATION

Site location: N 27° 00' 21.9" W 80° 06' 10.3"
 Elev: 21 ft Aspect: -- Slope: 0%
 Association: Sand Pine/Sand Live Oak–Myrtle
 Oak–False Rosemary Woodland
 SAF cover type: Sand Pine
 Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Quercus myrtifolia* (58), *Pinus clausa* (40), *Quercus geminata* (1), *Sabal palmetto* (1)
 Standing dead trees: 10% of stems
 Trees w/ boles snapped off: 4% of stems
 Crown closure: 18%
 Understory (% cover): *Quercus myrtifolia* (42), *Quercus chapmanii* (5), *Quercus geminata* (4), *Ceratiola ericoides* (4), *Andropogon virginicus* (1), *Serenoa repens* (1), *Nolina atopocarpa* (1), *Asimina triloba* (1), *Aristida* spp. (t), *Smilax* spp. (t), *Prunus umbellata* (t)
 Seedlings (% of stems): *Pinus clausa* (100)
 Density: 946/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	1.3
Hardwood litter	1.0
Conifer litter	0.1
Other	0.2
Duff	1.8
Total	3.1



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Quercus myrtifolia</i> (65/0)	<i>Pinus clausa</i> (100/0)	<i>Pinus clausa</i> (0/50)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/73)
Second most common species (percentage of stems: live/dead)	<i>Pinus clausa</i> (33/0)	--	<i>Quercus myrtifolia</i> (33/0)	--	<i>Quercus myrtifolia</i> (18/0)
Tree density (stems/ac)	477	7	44	36	80
Live	477	7	22	0	22
Dead	0	0	22	36	58
Avg DBH (in)	0.8	4.0	7.3	12.6	9.7
Live	0.8	4.0	6.6	--	6.6
Dead	--	--	8.0	12.6	10.9
Avg height (ft)	7.8	18.0	11.5	14.9	13.0
Live	7.8	18.0	11.8	--	11.8
Dead	--	--	11.2	14.9	13.5
Avg height to crown base (ft)	3.3	14.0	8.3	--	8.3
Live	3.3	14.0	8.3	--	8.3
Dead	--	--	--	--	--
Avg height to live crown (ft)	3.3	14.0	8.3	--	8.3
Live crown mass (tons/ac)	0.07	0.03	0.21	0.00	0.21

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Quercus myrtifolia</i> (42)	--	<i>Andropogon virginicus</i> (1)
Second most common species (% cover)	<i>Quercus chapmanii</i> (5)	--	<i>Nolina atopocarpa</i> (1)
Coverage (percent)	57	0	3
Avg height (ft)	1.7	--	0.8
Biomass (lbs/ac)	10,142	--	21

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.6	--	0.6	--	--	--
0.26 - 1.0	2.0	--	2.0	--	--	--
1.1 - 3.0	2.0	--	2.0	--	--	--
3.1 - 9.0	6.6	2.2	8.8	213	42	255
> 9.0	5.3	3.6	8.9	32	19	51
Total	16.5	5.8	22.3	245	61	306



SITE INFORMATION

Site location: N 27° 00' 15.4" W 80° 06' 05.3"
 Elev: 24 ft Aspect: -- Slope: 0%
 Association: Sand Pine/Sand-Heath/Cup Lichen
 Species Woodland
 SAF cover type: Sand Pine
 Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Pinus clausa* (35), *Quercus geminata* (28),
Quercus myrtifolia (25), *Quercus chapmanii* (12)
 Standing dead trees: 48% of stems
 Trees w/ boles snapped off: 13% of stems
 Crown closure: 11%
 Understory (% cover): *Quercus myrtifolia* (39), *Quercus
 geminata* (8), *Serenoa repens* (8), *Nolina atopocarpa* (6),
Quercus chapmanii (4), *Aristida* spp. (2), *Cladina
 evansii* (2), *Ceratiola ericoides* (1), *Smilax* spp. (t),
Vaccinium spp. (t), *Cladina subtenuis* (t), *Asimina
 reticulata* (t)
 Seedlings (% of stems): none
 Density: 0/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.1
Hardwood litter	1.4
Conifer litter	0.2
Other	0.5
Duff	3.6
Total	5.7



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Quercus myrtifolia</i> (40/5)	<i>Quercus geminata</i> (63/0)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/100)
Second most common species (percentage of stems: live/dead)	<i>Quercus geminata</i> (25/5)	<i>Pinus clausa</i> (0/25)	--	--	--
Tree density (stems/ac)	144	58	29	58	87
Live	115	36	0	0	0
Dead	29	22	29	58	87
Avg DBH (in)	1.4	2.8	7.5	11.6	10.3
Live	1.4	2.5	--	--	--
Dead	1.5	3.4	7.5	11.6	10.3
Avg height (ft)	9.0	12.9	19.1	19.5	19.4
Live	9.0	10.4	--	--	--
Dead	8.9	17.2	19.1	19.5	19.4
Avg height to crown base (ft)	4.4	3.8	--	--	--
Live	4.4	3.8	--	--	--
Dead	--	--	--	--	--
Avg height to live crown (ft)	4.4	3.8	--	--	--
Live crown mass (tons/ac)	0.06	0.07	0.00	0.00	0.00

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Quercus myrtifolia</i> (39)	--	<i>Nolina atopocarpa</i> (6)
Second most common species (% cover)	<i>Quercus geminata</i> (8)	--	<i>Aristida</i> spp. (2)
Coverage (percent)	59	trace	9
Avg height (ft)	2.5	1.2	0.8
Biomass (lbs/ac)	4,928	trace	16

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	1.0	--	1.0	--	--	--
0.26 - 1.0	3.5	--	3.5	--	--	--
1.1 - 3.0	3.8	--	3.8	--	--	--
3.1 - 9.0	7.7	0.5	8.2	260	14	274
> 9.0	6.5	0.0	6.5	46	0	46
Total	22.5	0.5	23.0	306	14	320



SITE INFORMATION

Site location: N 27° 19' 21.3" W 80° 16' 08.7"
 Elev: 16 ft Aspect: -- Slope: 0%
 Association: Sand Pine/Sand-Heath/Cup Lichen
 Species Woodland
 SAF cover type: Sand Pine
 Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Quercus geminata* (30), *Quercus myrtifolia* (27), *Quercus chapmanii* (24), *Pinus clausa* (18), *Osmanthus americanus* (1)
 Standing dead trees: 26% of stems
 Trees w/ boles snapped off: 7% of stems
 Crown closure: 13%
 Understory (% cover): *Quercus myrtifolia* (35), *Quercus geminata* (16), *Quercus chapmanii* (11), *Vitis rotundifolia* (5), *Palafoxia feay* (2), *Smilax* spp. (1), *Cladina evansii* (t), *Opuntia humifusa* (t), *Cassytha filiformis* (t)
 Seedlings (% of stems): *Pinus clausa* (100)
 Density: 41/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.0
Hardwood litter	2.0
Conifer litter	0.0
Other	0.0
Duff	2.7
Total	4.7



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Quercus myrtifolia</i> (37/2)	<i>Quercus geminata</i> (45/5)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (0/100)
Second most common species (percentage of stems: live/dead)	<i>Quercus geminata</i> (17/12)	<i>Quercus chapmanii</i> (30/0)	--	--	--
Tree density (stems/ac)	296	144	51	43	94
Live	253	137	0	0	0
Dead	43	7	51	43	94
Avg DBH (in)	1.3	2.7	6.1	10.8	8.3
Live	1.3	2.7	--	--	--
Dead	1.5	2.5	6.1	10.8	8.3
Avg height (ft)	8.7	13.9	18.3	17.2	17.8
Live	8.4	14.3	--	--	--
Dead	10.5	6.9	18.3	17.2	17.8
Avg height to crown base (ft)	4.3	7.0	--	--	--
Live	4.3	7.0	--	--	--
Dead	--	--	--	--	--
Avg height to live crown (ft)	4.3	7.0	--	--	--
Live crown mass (tons/ac)	0.13	0.37	0.00	0.00	0.00

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Quercus myrtifolia</i> (35)	<i>Palafoxia feay</i> (2)	--
Second most common species (% cover)	<i>Quercus geminata</i> (16)	--	--
Coverage (percent)	68	2	trace
Avg height (ft)	2.4	1.0	0.5
Biomass (lbs/ac)	6,263	trace	trace

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	1.0	--	1.0	--	--	--
0.26 - 1.0	3.4	--	3.4	--	--	--
1.1 - 3.0	4.4	--	4.4	--	--	--
3.1 - 9.0	9.1	0.4	9.5	301	19	320
> 9.0	10.0	1.0	11.0	83	9	92
Total	27.9	1.4	29.3	384	28	412



SITE INFORMATION

Site location: N 28° 00' 33.5" W 80° 35' 43.4"
 Elev: 22 ft Aspect: -- Slope: 0%

Association: Longleaf Pine/Saw Palmetto Flatwoods

SAF cover type: Sand Pine

Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Quercus myrtifolia* (40), *Pinus clausa* (31), *Quercus geminata* (13), *Quercus laevis* (6), *Quercus chapmanii* (5), *Quercus* spp. (2), *Pinus elliotii* (2), *Pinus palustris* (1)

Standing dead trees: 16% of stems

Trees w/ boles snapped off: 2% of stems

Crown closure: 18%

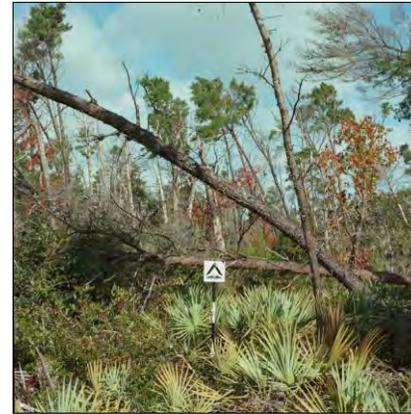
Understory (% cover): *Quercus geminata* (32), *Serenoa repens* (12), *Aristida* spp. (7), *Graminoid* spp. (4), *Quercus chapmanii* (2), *Ilex* spp. (1), *Quercus laevis* (1), *Vaccinium* spp. (t), Forb spp. (t)

Seedlings (% of stems): *Pinus clausa* (100)

Density: 4,730/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	3.5
Hardwood litter	2.2
Conifer litter	0.0
Other	1.3
Duff	3.2
Total	6.7



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Quercus myrtifolia</i> (54/0)	<i>Pinus clausa</i> (0/57)	<i>Pinus clausa</i> (26/43)	<i>Pinus clausa</i> (33/50)	<i>Pinus clausa</i> (29/46)
Second most common species (percentage of stems: live/dead)	<i>Pinus clausa</i> (16/1)	<i>Quercus geminata</i> (36/0)	<i>Quercus laevis</i> (22/0)	<i>Pinus elliottii</i> (0/17)	<i>Quercus laevis</i> (14/0)
Tree density (stems/ac)	968	101	166	87	253
Live	953	36	87	29	116
Dead	15	65	79	58	137
Avg DBH (in)	0.7	2.9	6.2	11.4	8.0
Live	0.7	2.5	6.4	10.0	7.3
Dead	1.3	3.1	6.1	12.1	8.6
Avg height (ft)	7.9	15.2	33.3	33.4	33.3
Live	7.7	10.5	33.4	49.5	37.4
Dead	21.5	17.8	33.2	25.4	29.9
Avg height to crown base (ft)	2.9	4.7	15.5	34.3	20.2
Live	2.9	4.7	15.5	34.3	20.2
Dead	--	--	--	--	--
Avg height to live crown (ft)	2.9	4.7	19.2	37.5	23.8
Live crown mass (tons/ac)	0.18	0.08	1.65	1.34	2.99

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Quercus geminata</i> (32)	--	<i>Aristida</i> spp. (7)
Second most common species (% cover)	<i>Serenoa repens</i> (12)	--	--
Coverage (percent)	48	trace	11
Avg height (ft)	3.5	1.3	1.4
Biomass (lbs/ac)	6,375	295	16

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	0.5	--	0.5	--	--	--
0.26 - 1.0	1.8	--	1.8	--	--	--
1.1 - 3.0	5.1	--	5.1	--	--	--
3.1 - 9.0	9.9	1.1	11.0	315	37	352
> 9.0	19.5	4.2	23.7	120	37	157
Total	36.8	5.3	42.1	435	74	509



SITE INFORMATION

Site location: N 28° 00' 45.2" W 80° 35' 49.1"
 Elev: 21 ft Aspect: -- Slope: 0%

Association: Longleaf Pine/Saw Palmetto Flatwoods

SAF cover type: Sand Pine

Time since hurricane: 2.5 years

STAND INFORMATION

Trees (% of stems): *Pinus clausa* (53), *Quercus myrtifolia* (32), *Quercus laevis* (5), *Osmanthus americanus* (5), *Quercus geminata* (4), *Quercus chapmanii* (1)

Standing dead trees: 10% of stems

Trees w/ boles snapped off: 3% of stems

Crown closure: 35%

Understory (% cover): *Quercus myrtifolia* (31), *Serenoa repens* (22), *Aristida* spp. (8), *Nolina atopocarpa* (5), *Quercus chapmanii* (2), *Quercus geminata* (1), *Vaccinium* spp. (1), *Quercus laevis* (1), *Ilex* spp. (1), Forb spp. (t)

Seedlings (% of stems): *Osmanthus americanus* (60), *Pinus clausa* (40)

Density: 2,591/ac

FOREST FLOOR INFORMATION

	Loading (tons/ac)
Surface material	2.1
Hardwood litter	0.4
Conifer litter	0.6
Other	1.1
Duff	3.2
Total	5.3



SAPLINGS AND TREES

	Size class (diameter at breast height)				
	≤ 2 in	2 - 4 in	4 - 9 in	> 9 in	> 4 in
Most common species (percentage of stems: live/dead)	<i>Pinus clausa</i> (49/3)	<i>Pinus clausa</i> (29/6)	<i>Pinus clausa</i> (67/16)	<i>Pinus clausa</i> (0/100)	<i>Pinus clausa</i> (40/50)
Second most common species (percentage of stems: live/dead)	<i>Quercus myrtifolia</i> (38/2)	<i>Quercus myrtifolia</i> (24/0)	<i>Quercus laevis</i> (17/0)	--	<i>Quercus laevis</i> (10/0)
Tree density (stems/ac)	455	123	43	29	72
Live	433	116	36	0	36
Dead	22	7	7	29	36
Avg DBH (in)	0.9	2.9	5.2	17.0	9.9
Live	0.9	3.0	5.2	--	5.2
Dead	0.9	2.5	5.2	17.0	14.7
Avg height (ft)	9.5	16.8	30.5	29.0	29.9
Live	9.5	17.4	34.8	--	34.8
Dead	10.0	6.7	8.8	29.0	25.0
Avg height to crown base (ft)	3.6	7.5	18.8	--	18.8
Live	3.6	7.5	18.8	--	18.8
Dead	--	--	--	--	--
Avg height to live crown (ft)	3.9	7.7	21.2	--	21.2
Live crown mass (tons/ac)	0.13	0.36	0.44	0.00	0.44

UNDERSTORY VEGETATION

	Lifeform		
	Shrub	Forb	Graminoid
Most common species (% cover)	<i>Quercus myrtifolia</i> (31)	--	<i>Aristida</i> spp. (8)
Second most common species (% cover)	<i>Serenoa repens</i> (22)	--	<i>Nolina atopocarpa</i> (5)
Coverage (percent)	59	trace	13
Avg height (ft)	3.6	1.0	0.9
Biomass (lbs/ac)	9,472	trace	247

WOODY MATERIAL

Diameter (in)	Loading (tons/ac)			Density (pieces/ac)		
	Sound	Rotten	Total	Sound	Rotten	Total
≤ 0.25	1.0	--	1.0	--	--	--
0.26 - 1.0	3.9	--	3.9	--	--	--
1.1 - 3.0	4.7	--	4.7	--	--	--
3.1 - 9.0	5.8	2.7	8.5	199	60	259
> 9.0	26.7	1.6	28.3	148	9	157
Total	42.1	4.3	46.4	347	69	416

Vihnanek, Robert E.; Balog, Cameron S.; Wright, Clinton S.; Ottmar, Roger D.; Kelly, Jeffrey W. 2009. Stereo photo series for quantifying natural fuels. Volume XII: Post-hurricane fuels in forests of the Southeast United States. Gen. Tech. Rep. PNW-GTR-803. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.

Two series of single and stereo photographs display a range of natural conditions and fuel loadings in post-hurricane forests in the southeastern United States. Each group of photos includes inventory information summarizing vegetation composition, structure and loading, woody material loading and density by size class, forest floor loading, and various site characteristics. The natural fuels photo series is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, hurricane, wind damage, blowdown, sand hill, sand pine scrub, longleaf pine, *Pinus palustris*, loblolly pine, *Pinus taeda*, sand pine, *Pinus clausa*, shortleaf pine, *Pinus echinata*, slash pine, *Pinus elliottii*.