Southeast Mississippi Forest Inventory

MISSISSIPPI INSTITUTE FOR FOREST INVENTORY

State of Mississippi
Southeast District
Forest Inventory
2006

Acknowledgments

The Mississippi Institute for Forest Inventory acknowledges the College of Forest Resources and the Forest and Wildlife Research Center at Mississippi State University for continued assistance and support with development of the timber inventory methodology and software. The inventory would not be possible without the cooperation of public agencies such as the Mississippi Automated Resource Information System (MARIS) for providing auxiliary data. Finally, MIFI extends a sincere debt of gratitude to private landowners in providing access to measurement plots.

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Front Cover Images:
Hurricane Katrina making landfall from the NOAA AVHRR sensor platform.
Typical damage incurred by hardwood and pine timber types MIFI stock photos.

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Executive Summary

The 2005 - 2006 inventory season as well as the 2006 calendar year posed significant challenges and oportunities for the Mississippi Institute for Forest Inventory. MIFI was prepared to implement the ground measurement phase of the inventory for Southeast Mississippi with signed agreements to execute on September 1, 2005 when disaster struck August 29, in the form of Hurricane Katrina. A finely orchestrated effort involving the Spatial Information Technologies Lab, the Department of Forestry, and the College of Forest Resources at Mississippi State University revised the inventory protocols that incorporated the impacts of the hurricane into the sampling frame. These protocols allowed, not only, for the assessment of the damage impacts from the hurricane but also allowed for the description of the forest components prior to the hurricane and the residual forest structure.

July 1, 2006 initiated the incorporation of MIFI into the Mississippi Forestry Commission. Under the direction of the new State Forester, Charlie Morgan, MIFI was welcomed as a division within MFC. This new arrangement strengthened the relationship that was started with the inception of the Mississippi Inventory Pilot Project that eventrually led to the formation of MIFI. MIFI's contribution to the MFC mission was enhanced with their involvement in designing inventory protocols that were utilized by six southern states impacted by the 2005 hurricane season in implementing the Emergency Forest Conservation Reserve Program.

MIFI continues to exceed expectations in fostering cooperation with other agencies. A joint publication on the initial impact of Hurricane Katrina was produced with the USDA Forest Service Forest Inventory and Analysis Unit for the Southern Research Station. This document represents the acceptance or "proof of concept" and the importance of MIFI's mission in providing resource information for forest policy development. Anticipating recent initiatives promoting alternative fuel development and biomass utilization, such as 25x'25, MIFI is now capable of reporting biomass metrics as well as the traditional volume metrics associated with timber production.

The inventory for each district is delivered both in writing and via the World Wide Web. Our Web site is the primary tool for retrieving inventory information. An interface allows the user to analyze inventory results and query specific geographic locations. To learn more about MIFI or access the inventory interface, visit our Web site at www.mifi.ms.gov.

Respectfully,

Mississippi Institute for Forest Inventory

Additional information about any aspect of this survey may be obtained from:
Mississippi Institute for Forest Inventory
P.O.Box 1667
Jackson, MS 39215-1667
601.359.2808
www.mifi.ms.gov

Remote Sensing

MIFI represents an advancement of forest inventory philosophy, the first production scale integration of satellite remote sensing and forest inventory. Neither of the technologies can separately answer the two most important questions posed with forest resource assessment: 1) How much volume is present? and 2) Where is that volume located? These two technologies are brought together through the use of a Geographical Information System (GIS). By combining spatial data as derived from satellite imagery through classification, and Global Positioning System (GPS) linked attribute data obtained from ground measurements; the GIS answers the questions associated with the forest resource assessment.

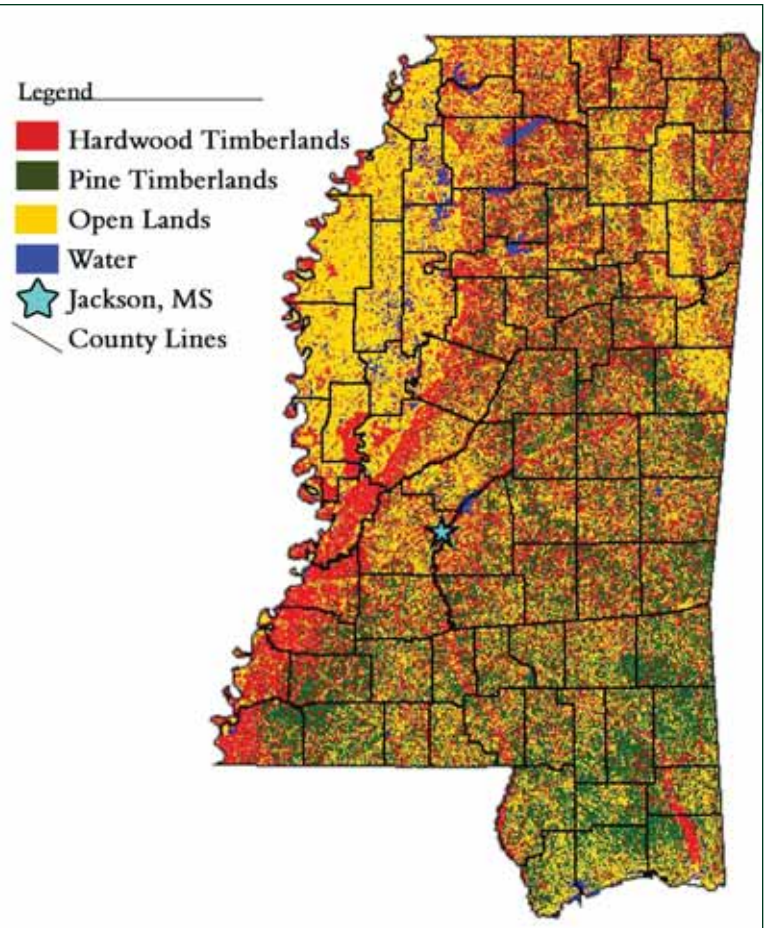

Figure 1. Thematic representation of principal timber land cover for Mississippi.

Area

The total productive land area of Mississippi is 30,521,018 acres. In 2003, the area of forestland totaled 19.79 million acres or 64.85% of the land area in MS. Pine forests cover 6.62 million acres or 33.45% of the forested area. Hardwood and oak-pine timber types combine to occupy over 53.11% of the state's timberland or 10.5 million acres. Land that is regenerating as forest area but is yet unclassified is 2.66 million acres or 13.45% of the current forested area.

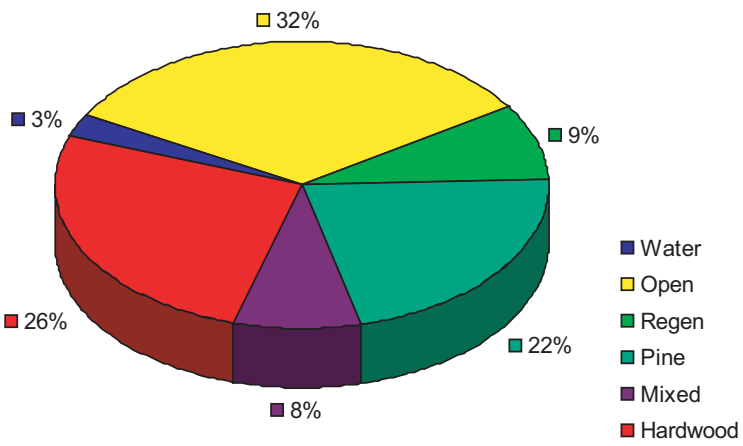

Figure 2. Mississippi land cover classification.

Ownership

Parcel ownership for land in Mississippi is predominated by family. Traditional family legacy subdivides large holdings into smaller parcels. Families acknowledge the legal distinction in ownership of the land but continue to manage the parcels as contiguous properties.

Mississippi has only recently begun transitioning to a digital format for property records. However, corporate and governmental ownership records are available in geo-referenced digital formats and MIFI has focused on the use of these records to create ownership descriptions. By process of elimination, the non-industrial private land ownership patterns can be discerned.

- Corporate timberland currently accounts for 3.1 million acres.
- Publicly owned federal timberland currently accounts for 2.2 million acres.
- Publicly owned state timberland currently accounts for approximately 1 million acres.
- Native American timberland in Mississippi amounts to approximately 25,000 acres.
- Almost 80% of the timberland in Mississippi is owned by private citizens.

Family forest owners dominate the private ownership group with 350,000 landowners who control parcels of 10 acres or greater.

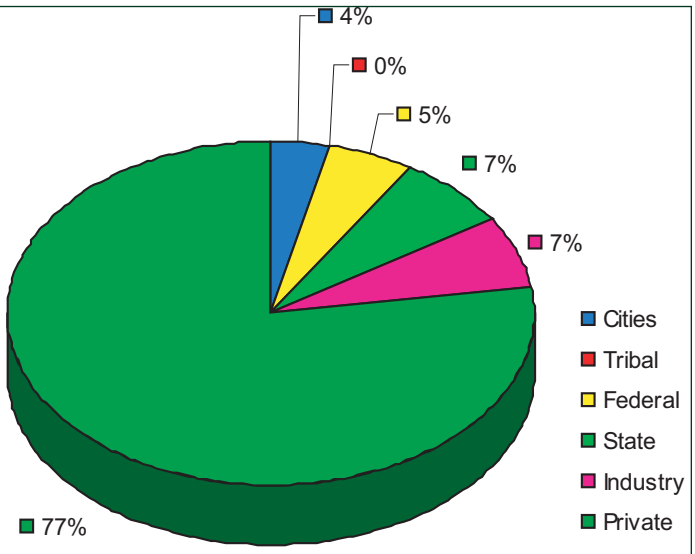

Figure 3. Mississippi land ownership patterns.

Growth

Sustainability of the forest resource is necessary to foster economic viability. Archival satellite imagery is used to assess the trend in resource utilization. The trend analysis utilizes satellite imagery that is classified into a forest/non-forest map of the state on an approximate 5-year cycle dating from 1973 to present.

Softwood growth rates represent a return on investment realized as the increase in volume over a given length of time and reported as an annualized percentage rate. The ability to quickly and repeatedly determine growth rates in pines, coupled with the dominance of pine volume in the market mandate the prevalence of softwood growth rates. This is not to say that hardwood growth rates are of less importance, but, the requirements to measure hardwood annual growth in the field are prohibitive and a legacy of hardwood growth and yield research obviates those measurements.

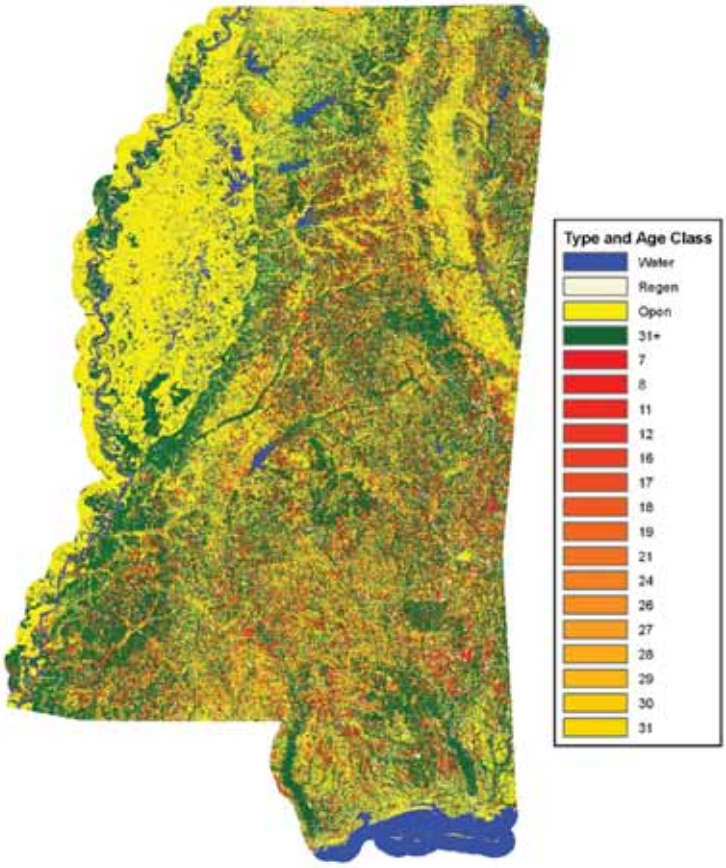

Figure 4. Type and ages of Mississippi forests.

- Softwood growth rate for the Southeast MIFI District is 11.7%.

- Hardwood growth rate for the Southeast MIFI District is 4.1%.

These growth rates can be compared to the interest rate paid upon a savings account and provide useful tools for investment analysis. The average current rate for a 5-year IRA CD is 4.18%. Pine timber production that is twice as profitable when compared to a savings account represents a competitive alternative for investors.

Figure 4 demonstrates the age distribution of Mississippi's forests. It also depicts the focus of harvesting activity throughout the years. The majority of harvesting occurs in a band in the center of the state from North to South and in the lower portion of the state below the I-20 corridor.

Economic Impact

Roundwood production is the mainstay of Mississippi's forest-based economy. Hardwood and softwood production supply the markets for everything from furniture and flooring raw material to construction grade solid wood products.

- Forestry, logging, primary wood products, and furniture manufacturing contribute between $11 and $14 billion annually to the State's economy.
- Approximately 54,000 individuals are directly employed in logging, forestry and other wood-processing industries with a combined income of $ 1.1 billion.
- Approximately 66,000 individuals are indirectly employed in secondary value added and materials handling related positions.

Available information pertaining to growth rates, harvest volumes, regeneration practices was collected to develop a growth to drain ratio. This measure of sustainability is a way of determining if the forest is being utilized to its maximum potential without creating conditions that will result in the total loss of forest resources in the future. The growth to drain ratio for Southeast Mississippi post-Katrina is 1.2. This number means that this region of the state is producing approximately 20% more volume than is being utilized. The loss of baseline volume due to hurricane Katrina significantly reduced the growth to drain ratio estimate.

Forces of Change

Mississippi's forestland is dynamic and constantly changing. The primary driving force in change is the human element. Population centers are expanding and the resulting landscape is a mixture of forest and urban land cover often within close proximity to each other.

The hurricane season for 2005 set a record with the National Oceanographic and Atmospheric Administration by having the highest number of named storms since tracking began. Mississippi was concerned with only one of those storms. Hurricane Katrina decimated the Mississippi Gulf Coast destroying almost 70,000 homes, obliterating the gaming and tourism industries, and severely reducing the near-shore shrimp and oyster harvests. However, the damage was not confined to the coast, timber resources as far north as Winston county suffered damage.

Whether natural or human induced, long-term or short-term, permanent or temporary, Mississippi's forestlands are changing constantly. These changes are reflected in the current condition of the State's forests as evidenced by trends in land use; stand composition; estimates of wood volume; and rates of net annual growth, removals, and mortality. The effects extend to overall forest health, as well as water quality, recreation potential, future timber availability and other aspects of forestland use and condition.

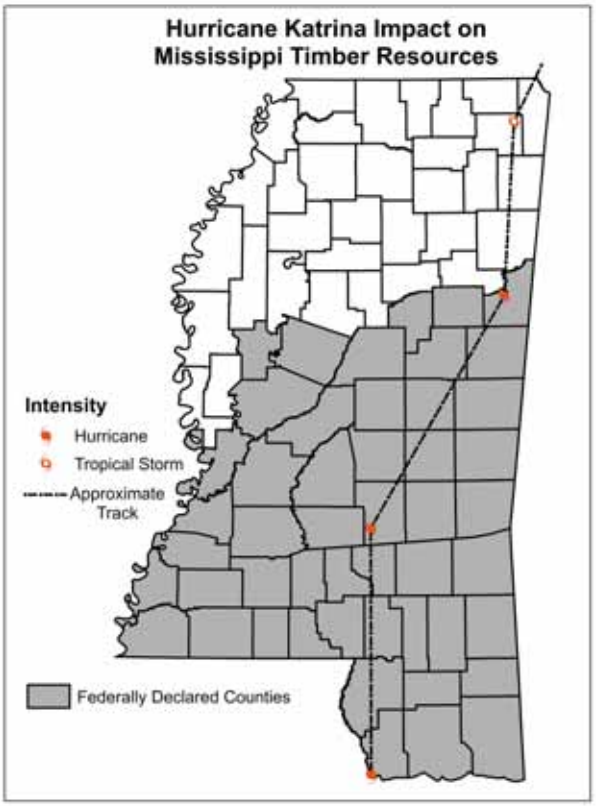

Figure 5. Map of Hurricane Katrina's path across Mississippi.

Classification of Damage and Non-Damged Forest Areas

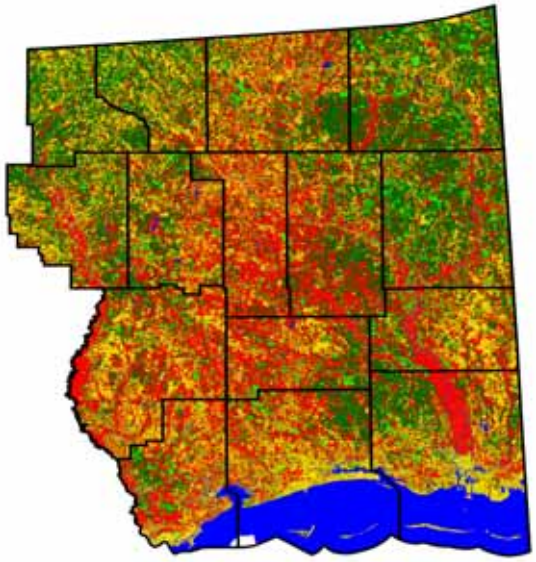

Figure 6. Damaged forest areas in Southeast Mississippi.

A Brief History of Mississippi Forests

From the earliest occupation of Mississippi by Native Americans, the forests have been the primary livelihood. Wood products were used to manufacture dwellings and wildlife in the forest represented both a source of food and trade goods. If by definition a "virgin forest" is a forest that has been uninfluenced by humans, then virgin forests have not existed in Mississippi since the pre-Colombian era.

Agriculture was the major force that shaped early Mississippi landscapes. The practice of slash and burn agriculture practiced by early settlers resulted in a highly fragmented landscape of forests that exhibited all the stages of secession. At the beginning of the 20th century, large lumbering firms of the Northeast and Great Lakes regions were looking for new resources as the large growth timber of those regions became exhausted. The presence of rail networks and largely untapped reserves of timber in the Southeast attracted their attention. Thus, mechanized timber production began in Mississippi.

Until the late 1930's, the primary focus on forestry was the production of timber with little regard for scientific-based management. Professional foresters began to foster the concept of actively managing pine forestland that could meet the demand for timber related products. As environmental awareness increased, management of forestland began to take a multi-use approach. Aesthetics, recreation, and water quality are principles that professional foresters are now trained to incorporate into their management practices.

The Continuing Role of Pine Plantations

A little more than 40 years ago, planted pine stands occupied less than 2 million acres in the South. By the late 1990s pine plantations accounted for nearly half of all pine stands. The dramatic increase in pine plantations has become one of the defining issues in southern forest management and is an issue in Mississippi as well.

Pine stands are often mechanically regenerated after harvest to ensure the site remains in production as a pine forest type. Since the inception of the Conservation Reserve Program (CRP) in 1985, combined with the Forest Resource Development Program (FRDP) and the Forest Incentive Program (FIP) for cost sharing, establishment of plantations in Mississippi has totaled 2,234,250 acres.

This represents 11% of the total timberland area and nearly a third of the pine timber area in Mississippi. When well managed, planted pines have substantially lower mortality rates and higher rates of net annual growth, averaging nearly 128 cubic feet of wood growth per acre per year, compared to 76 cubic feet for natural pine stands.

Inventory Methods

The Mississippi Institute for Forest Inventory began the inventory in 2004. The sampling scheme is significantly different than traditional forest surveys, which produced estimates for an entire state. This type of analysis prohibits the estimates of areas equivalent to the size of a county. MIFI directs sampling in a two stage process: analysis of satellite-based remote sensing with statistical validation for depicting the land cover types and subsequent change through time; and intensive ground measurement of the forest timber for a region or district of the state. This information provides statistical precision for county level estimates that can be used for economic development.

The remote sensing effort utilizes the spectral reflectance of vegetation captured in 6 or 7 spectral bands by the LandSat satellite during both active and dormant seasons. Through a combination of band analyses and mathematical modeling, primary classifications of water, non-forest, pine, hardwood, and mixed pine-hardwood classes are obtained. Additional imagery from previous surveys is analyzed and then layered to represent the change in land cover over time. This stacking effect creates another classification, immature forest vegetation, which lacks maturity to allow for assignment in one of the dominant forestland cover classifications.

The ground-based measurements were implemented on a one-fifth acre fixed radius plot located randomly from the forest cover classification of the remotely sensed data. Saw timber, pole and veneer volume were sampled and characteristics associated with stand dynamics were measured. A one-tenth acre plot was incorporated to measure the volume of products classes used to produce fiber for the pulp industry. Finally, a one-twentieth acre plot was inventoried to measure non-merchantable stems that range from 1.0 to 4.5 inches in diameter at breast height.

In the event there was no merchantable material located on a plot, such as following a harvest, a one-hundredth acre plot was established to measure reproduction material that will develop into a future timber stand. A representative sample of the current forest conditions was obtained at each sample location for all timber species, from the smallest seedling to the largest tree encountered on any of the plots. Individual tree attributes measured include species, product, observable damage, diameter at breast height, total height, height to absolute diameter limits for pulpwood and saw timber volume, crown length, bark thickness, 5- and 10-year radial growth, and age. Stand level attributes recorded include slope, size class, apparent stand level damages, over story composition with reference to the remote sensing products, logging operability, physiographic position, Society of American Foresters forest cover type designation, litter depth, and USFS fuel model designation.

To avoid statistical confounding, plots were located within a strictly homogenous stand condition. In the event an operational or management activity has disrupted the proposed plot site (e.g. the establishment of a right-of-way, property thinning, etc.), the plot was shifted a specified distance to the stand that exhibited the higher heterogeneity in volume. Estimates of timber volume and forest classifications were derived from tree measurements and classifications made at these locations. Volumes for individual tally trees were computed using profile equations for each of the 60 major species in Mississippi.

Reliability of Data

The measure of reliability of inventory statistics is provided by sampling errors. MIFI inventories supported by all the allocated sample plots are designed to achieve reliable statistical precision (± 15% at 95% confidence) at the county level for total cubic foot volume outside bark. However, users should note that sampling error increases at the same level of confidence, as the number of plots is lowered by reducing the area. Sampling errors are often unacceptably high for small components of the total resource. The opposite occurs when estimates are derived from larger areas. Sampling errors and confidence limits mean that the chances are 95 times out of 100 that the true population value is within the limits indicated by the range of the sampling error.

Unfortunately, operational costs following the economic impacts of national and international incidents have continued to escalate. Although, operational efficiencies are currently optimized with statification of sampling regimes and state of the art technology, the desired levels of precision are detrimentally impacted by insufficient funding.

District Volume

Mississippi was divided into five districts based on geography, physiography, economic and political characteristics. The arrival of Hurricane Katrina created a need to revise the sampling protocols utilized to collect volumetric information. Salvage activity initiated immediately following the hurricane posed a challenge in developing volume estimates for the resources prior to the hurricane. Additional measurements and applied regression analysis allowed for the development of pre- and post-hurricane volumes and the computation of damaged volume.

Figure 5. MIFI Southeast Inventory District depicting counties inventoried.

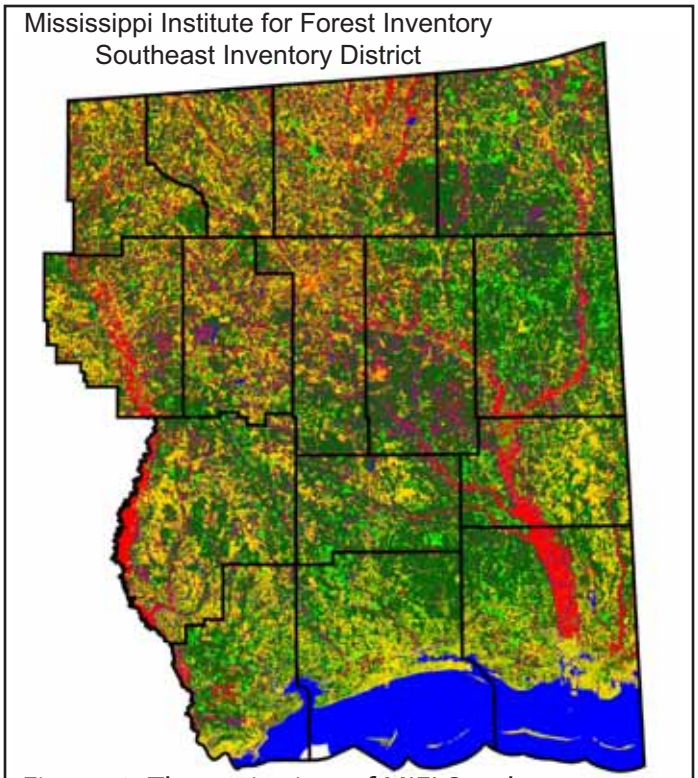

Figure 6. Thematic view of MIFI Southeast Inventory District depicting major land cover.

The following tables report the forest cover types, volumes, and sampling errors associated with the 15 counties of the Southeast MIFI district. Also included are the estimates for biomass and non-commercial forest regeneration that will provide the future timber supply.

Table 1. Major stratification land cover acreages for MIFI Southeast Inventory District.

Strata	Acres
Non-Forest	1,344,021
Reproduction	416,790
Pine	1,426,974
Mixed Pine-Hardwood	99,989
Hardwood	118,914
Damaged Pine	1,428,308
Damaged Mixed Pine-Hardwood	273,568
Damaged Hardwood	561,525
Total Forested	4,326,068
Total	5,670,089

Table 2. Corrected forested strata acreage estimates with associated sampling errors.

			Sampling Error		
Strata	Acres	Std. Error	97.5	95	90
Pine	1,378,976	11,035	1.8	1.6	1.3
Mixed Pine-Hardwood	97,815	2,072	4.8	4.2	3.5
Hardwood	112,491	2,622	5.3	4.6	3.9
Damaged Pine	1,340,149	15,353	2.6	2.3	1.9
Damaged Mixed Pine-Hardwood	97,031	0	0	0	0
Damaged Hardwood	534,828	6,349	2.7	2.3	2.0
Total	3,561,290	20,223	1.3	1.1	0.9

Table 3. Strata level per acre and total area estimates of pulpwood and sawtimber volumes[1] with associated sampling errors.

	Per Acre		Total[2]			
	Pulpwood	Sawtimber	Pulpwood	Error %	Sawtimber	Error %
Pine	386.1	875.6	532,337.7	8.5	1,207,450.2	11.3
Mixed Pine-Hardwood	319.9	799.3	31,285.4	19.7	78,186.8	23.0
Hardwood	339.0	739.3	38,141.8	22.1	83,160.7	27.8
Damaged Pine	367.3	1,078.0	492,217.9	7.0	1,444,645.7	8.3
Damaged Mixed Pine-Hardwood	374.6	963.4	36,340.3	18.8	93,484.2	21.3
Damaged Hardwood	412.1	1,042.8	220,409.4	9.9	557,695.0	11.2
Total	379.2	972.9	1,350,732.4	4.6	3,464,622.6	5.7

1 Volumes are expressed in cubic feet outside bark.
2 Total volumes are expressed in 1,000s.

District Biomass

Biomass is the term applied to any organic structure naturally produced on a site. In forestry, biomass typically refers to the trees and their component parts: main stem, branches, and foliage. The importance of estimating biomass relates to the future markets that are being developed for alternative fuel compounds and the current trade markets established for carbon credits. These markets, though common in European countries, are just beginning to emerge in the US and Mississippi possesses a sizeable resource base positioned to fully utilize these markets to the economic benefit of its residents.

Table 4. Strata level per acre and total area estimates of stem, branch and foliage weight[1].

	Per Acre			Total[2]		
	Stem	Branch	Foliage	Stem	Branch	Foliage
Pine	93,818	14,222	6,104	64,686.7	9,806.1	4,208.6
Mixed Pine-Hardwood	87,427	14,271	4,671	4,275.9	697.9	228.5
Hardwood	80,315	15,017	3,524	4,517.3	844.6	198.2
Damaged Pine	104,629	15,162	5,596	70,109.3	10,159.6	3,750.0
Damaged Mixed Pine-Hardwood	92,861	15,881	3,938	4,505.2	770.5	191.0
Damaged Hardwood	107,797	19,989	4,466	28,826.6	2,840.5	1,194.2
Total	99,358	15,514	5,487	176,920.9	27,624.1	9,770.6

1 Weights are expressed as green pounds outside bark per acre and green tons outside bark for total.
2 Total are expressed in 1,000s.

Individual County Volume

Table 5. Individual county volume estimates by species group and product class.

Covington County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	74,547			
Reproduction	14,100			
Pine	93,873	162,689	543,806	27.3
Mixed Pine-Hardwood	12,076	7,291	73,970	84.6
Hardwood	19,682	27,272	100,654	53.4
Damaged Pine	21,083	40,957	191,243	47.8
Damaged Mixed Pine-Hardwood	8,762	NS	NS	NS
Damaged Hardwood	21,572	24,487	191,159	28.5
Forested	191,148	262,697	1,100,831	18.6

Forrest County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	62,804			
Reproduction	13,677			
Pine	30,779	92,986	157,672	29.4
Mixed Pine-Hardwood	1,913	2,775	11,072	160.0
Hardwood	2,291	2,911	4,802	171.7
Damaged Pine	122,228	322,424	1,767,908	24.2
Damaged Mixed Pine-Hardwood	24,241	NS	NS	NS
Damaged Hardwood	42,589	126,682	419,069	25.8
Forested	237,718	547,779	2,360,522	18.4

George County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	76,526			
Reproduction	33,359			
Pine	47,637	206,866	335,240	55.8
Mixed Pine-Hardwood	2,202	9,444	9,229	61.7
Hardwood	2,847	7,846	18,116	55.8
Damaged Pine	92,294	275,963	392,465	31.3
Damaged Mixed Pine-Hardwood	10,853	57,198	126,043	34.9
Damaged Hardwood	44,523	300,365	421,204	27.5
Forested	233,715	857,682	1,302,298	15.7

Greene County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	48,882			
Reproduction	50,573			
Pine	200,911	998,915	1,462,012	25.0
Mixed Pine-Hardwood	8,696	32,819	44,465	59.6
Hardwood	4,515	22,941	38,842	52.6
Damaged Pine	98,298	692,476	995,875	29.6
Damaged Mixed Pine-Hardwood	15,056	NS	NS	NS
Damaged Hardwood	32,759	219,987	299,835	30.3
Forested	410,808	1,967,138	2,841,030	17.3

Hancock County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	112,954			
Reproduction	31,002			
Pine	27,733	109,261	206,887	29.6
Mixed Pine-Hardwood	689	3,430	2,633	21.1
Hardwood	1,757	1,363	2,672	113.2
Damaged Pine	118,470	370,759	1,091,275	20.9
Damaged Mixed Pine-Hardwood	15,901	59,462	131,486	44.8
Damaged Hardwood	19,815	61,255	141,742	53.1
Forested	215,367	605,532	1,576,694	16.1

Harrison County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	148,337			
Reproduction	30,913			
Pine	54,642	143,380	655,157	26.2
Mixed Pine-Hardwood	245	293	435	78.3
Hardwood	712	993	3,934	152.0
Damaged Pine	139,909	511,770	1,503,088	17.6
Damaged Mixed Pine-Hardwood	7,517	40,011	125,429	33.2
Damaged Hardwood	7,695	37,391	88,157	47.6
Forested	241,632	733,838	2,376,201	13.7

JacksonCounty

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	170,510			
Reproduction	30,579			
Pine	93,828	266,176	768,577	25.4
Mixed Pine-Hardwood	890	3,271	11,979	48.2
Hardwood	4,426	2,380	8,511	114.0
Damaged Pine	106,861	305,344	1,151,587	25.5
Damaged Mixed Pine-Hardwood	4,648	14,384	31,316	51.8
Damaged Hardwood	69,632	409,001	1,126,225	21.3
Forested	310,863	1,000,556	3,098,195	14.0

Jefferson Davis County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	65,206			
Reproduction	12,854			
Pine	112,865	521,158	1,045,233	27.1
Mixed Pine-Hardwood	11,075	47,596	74,158	54.8
Hardwood	25,042	131,183	241,652	58.7
Damaged Pine	14,900	77,906	146,754	55.1
Damaged Mixed Pine-Hardwood	3,536	NS	NS	NS
Damaged Hardwood	15,657	101,867	174,916	40.3
Forested	195,930	879,711	1,682,712	20.1

Jones County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	113,310			
Reproduction	27,510			
Pine	100,678	178,299	1,207,866	27.0
Mixed Pine-Hardwood	7,472	4,475	25,491	137.7
Hardwood	11,787	7,739	48,258	94.2
Damaged Pine	78,528	78,498	780,718	38.4
Damaged Mixed Pine-Hardwood	28,733	NS	NS	NS
Damaged Hardwood	80,062	86,438	454,291	39.6
Forested	334,771	355,451	2,516,623	19.3

Lamar County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	75,192			
Reproduction	22,618			
Pine	65,740	222,445	674,825	41.1
Mixed Pine-Hardwood	8,407	39,654	90,439	83.9
Hardwood	9,474	38,471	92,865	47.0
Damaged Pine	79,795	199,095	802,352	34.0
Damaged Mixed Pine-Hardwood	23,374	NS	NS	NS
Damaged Hardwood	35,583	111,765	289,723	33.2
Forested	244,990	611,430	1,950,205	20.9

Marion County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	88,758			
Reproduction	21,372			
Pine	105,126	349,414	1,286,448	31.0
Mixed Pine-Hardwood	10,897	32,881	158,794	37.3
Hardwood	14,411	42,981	127,264	39.6
Damaged Pine	44,746	80,629	498,556	25.2
Damaged Mixed Pine-Hardwood	15,345	NS	NS	NS
Damaged Hardwood	52,307	227,550	716,772	40.2
Forested	264,204	733,456	2,787,833	18.8

Pearl River County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	143,378			
Reproduction	30,068			
Pine	58,468	169,031	240,193	42.6
Mixed Pine-Hardwood	4,070	15,506	38,156	62.7
Hardwood	3,469	20,578	32,276	94.5
Damaged Pine	178,049	651,398	1,422,441	17.9
Damaged Mixed Pine-Hardwood	43,634	125,916	347,037	39.3
Damaged Hardwood	66,296	225,218	660,368	40.5
Forested	384,054	1,207,629	2,740,471	14.9

Perry County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	46,525			
Reproduction	27,822			
Pine	127,944	305,447	692,571	34.9
Mixed Pine-Hardwood	6,739	18,655	62,090	61.5
Hardwood	4,515	10,517	26,830	79.1
Damaged Pine	131,302	471,110	1,456,052	27.9
Damaged Mixed Pine-Hardwood	35,205	NS	NS	NS
Damaged Hardwood	35,450	124,676	331,454	34.1
Forested	368,975	930,406	2,568,996	19.1

Stone County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	46,458			
Reproduction	23,196			
Pine	51,774	155,800	588,322	21.5
Mixed Pine-Hardwood	712	2,277	12,764	21.9
Hardwood	578	3,454	5,280	146.4
Damaged Pine	138,107	500,961	1,610,631	18.9
Damaged Mixed Pine-Hardwood	14,478	66,431	173,531	43.8
Damaged Hardwood	13,055	40,686	134,951	38.9
Forested	241,899	769,608	2,525,479	13.9

Wayne County

Strata	Acres	Pulpwood Volume	Sawtimber Volume	Sampling Error
Non-Forest	70,633			
Reproduction	47,148			
Pine	254,976	1,441,528	2,209,693	24.1
Mixed Pine-Hardwood	23,907	92,486	166,193	45.0
Hardwood	13,410	60,785	79,652	47.5
Damaged Pine	63,738	342,889	635,513	34.2
Damaged Mixed Pine-Hardwood	22,284	NS	NS	NS
Damaged Hardwood	24,530	106,724	127,085	44.8
Forested	449,993	2,044,412	3,218,136	18.6

Volume is reported in hundreds (100's) of cubic feet.
NS - Not adequately sampled.

Table 5. Estimates of pre-commercial stem counts for all species and projected pine productivity.

	Number of Stems Diameter Class				5-yr Projected Pine Volume		Annual Growth Rate	
County	1-inch	2-inch	3-inch	4-inch	Pulpwood	Sawtimber	Pulpwood	Sawtimber
Covington	11,034	9,948	7,331	3,014	355,576	1,412,731	16.5%	14.0%
Forrest	15,960	9,744	8,708	9,714	490,194	2,815,350	12.9%	9.8%
George	13,540	11,441	9,999	9,549	635,615	1,440,220	11.4%	11.7%
Greene	62,952	47,273	30,978	24,792	1,984,796	3,504,296	13.7%	9.9%
Hancock	15,876	15,820	12,718	8,845	550,025	1,841,272	10.2%	8.1%
Harrison	17,777	14,831	12,002	9,640	615,864	2,573,320	10.3%	7.2%
Jackson	20,662	15,113	13,998	13,587	703,696	2,486,850	13.3%	7.1%
Jefferson Davis	42,907	22,263	15,493	12,777	1,031,064	2,094,897	16.5%	12.6%
Jones	20,064	14,058	11,604	5,043	470,391	3,221,399	18.0%	9.8%
Lamar	22,307	10,737	6,532	9,198	535,101	2,303,627	11.1%	11.4%
Marion	19,394	17,941	17,073	10,857	643,865	2,677,703	13.9%	8.6%
Pearl River	43,219	32,231	23,799	19,083	1,269,199	2,604,969	19.3%	12.5%
Perry	8,989	16,996	14,170	13,553	1,167,377	3,325,963	13.5%	8.4%
Stone	16,479	13,393	14,151	14,327	931,684	3,078,185	17.1%	10.6%
Wayne	60,152	36,378	31,452	24,619	2,138,191	4,902,164	8.9%	12.2%

Volume is reported in hundreds (100's) of cubic feet.
Number of stems is reported in thousands (1,000's).

District Summaries

The four districts remaining in the state are designated for inventory according to the following schedule:

Southeast - 2005-2006
Central - 2006-2007
North - 2007-2008
Delta - 2008-2009.

The inventory cycle will then repeat itself starting with the Southwest district in the year 2009.

The utilization of GIS and remote sensing technology has provided a description of the current forest conditions in the remaining districts. Forested acreage for the districts are 4.35 million acres for the Southeast; 5.33 million acres for the Central; 3.93 million acres and 1.76 million acres for the North and Delta districts respectively.

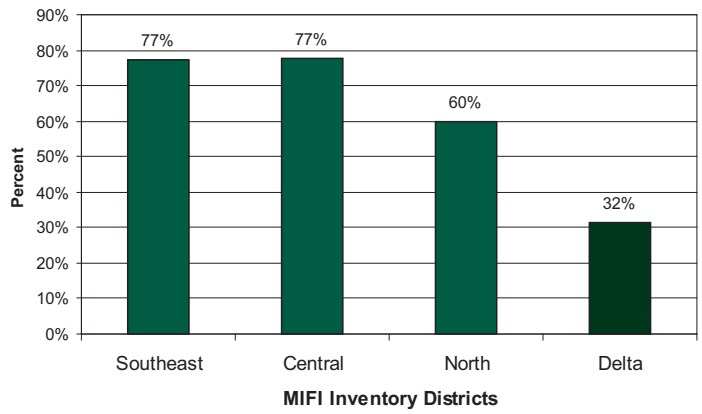

Figure7. Proportion of forested area to total area for each district.

Southeast District

Current inventory efforts are being conducted in the Southeast district. Although significant damage has been sustained from recent hurricane activity, the inventory methods are flexible enough to allow for the collection of additional damage measurements. Current imagery is being analyzed and will be incorporated with the inventory report for this district. However, the current proportions of major land cover classes and a district map indicating the included counties is presented.

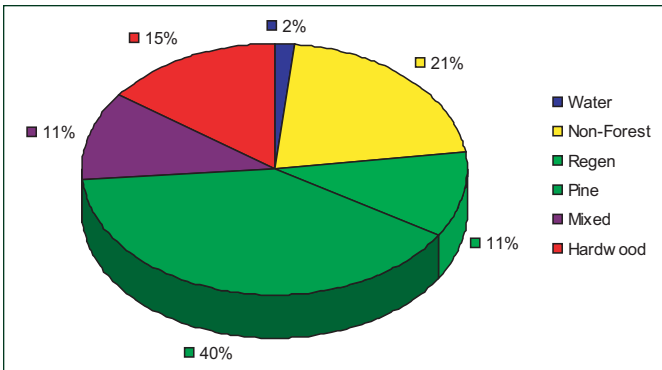

Figure 8. Southeast Mississippi land cover classification.

Figure 9. MIFI Southeast Inventory District.

Central District

Scheduled for inventory efforts to begin in 2006, the Central inventory district has the second highest number of counties to inventory. It is also the most variable in terrain.

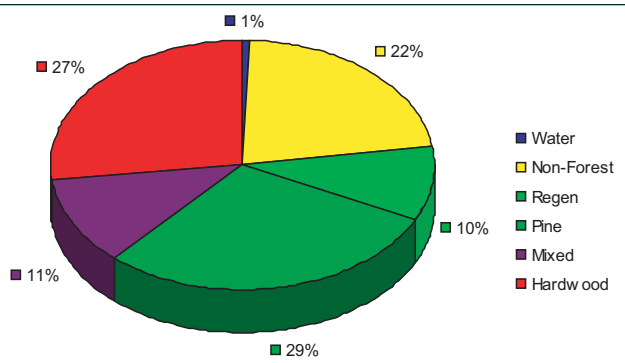

Figure 10. Central Mississippi land cover classification.

Figure 11. MIFI Central Inventory District.

North District

The North inventory district has the highest number of counties, for any district, to inventory and is scheduled to begin in 2007. This district also has some of the most difficult terrain to cross because of its geological age having allowed for the formation of steep sided river courses.

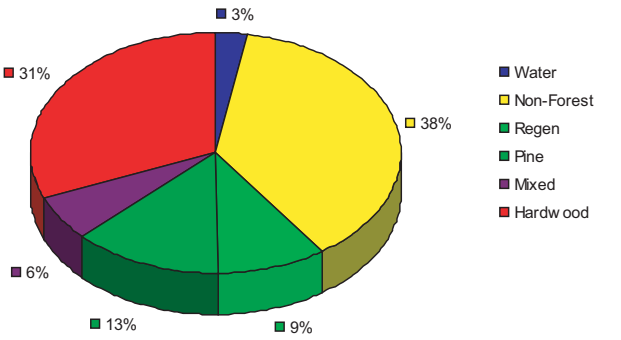

Figure 12. North Mississippi land cover classification.

Figure 13. MIFI North Inventory District.

Delta District

The Delta district presents some difficulties in inventory applications because of the nature of the forests following sloughs and stream courses. Although this district has the fewest number of acres of forest, the linear nature of these forests will cause the sampling layout to be modified.

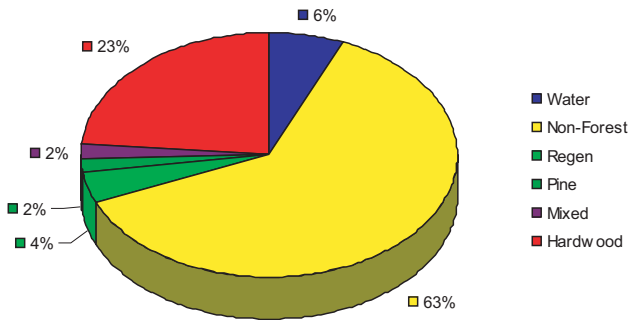

Figure 14. Delta Mississippi land cover classification.

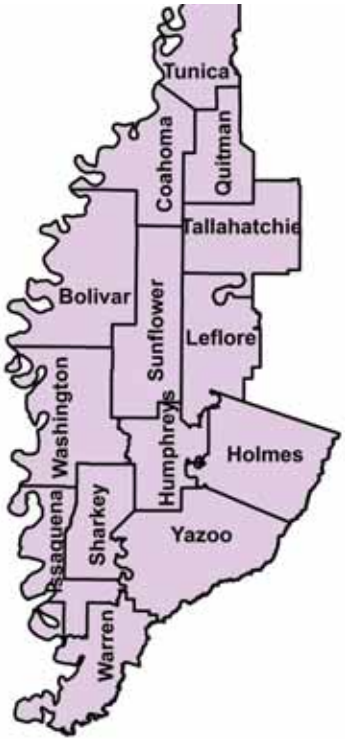

Figure 13. MIFI Delta Inventory District.

Obtaining Additional Information

To obtain additional assistance with the Dynamic Reporter software, the MIFI web site or to obtain a copy of the Dynamic Reporter Installation on Compact Disc then use the following information to contact the Director of Operations at the Mississippi Institute for Forest Inventory;

Director of Operations
MIFI
P.O. Box 6350
Miss. State, MS 39762
662-312-5954
e-mail: pglass@mifi.state.ms.us

Glossary of Terms

All terms and phrases utilized on the Dynamic Reporter Interface are explained in the Technical specifications located on the MIFI web site at the following link: www.mifi.ms.gov/Documents/Inventory_Guidelines.pdf

Basal area. The area in square feet of the cross section at breast height of a single tree or of all the trees in a stand, usually expressed in square feet per acre.

Commercial species. Tree species currently or potentially suitable for industrial wood products.

CRP. The Conservation Reserve Program, a major Federal afforestation program authorized by the 1985 Farm Bill.

D.b.h. Tree diameter in inches (outside bark) at breast height (4.5 feet aboveground).

Diameter Class. A classification of trees based on tree d.b.h. One-inch diameter classes are commonly used. For example, the 6-inch class includes trees 5.6 through 6.5 inches d.b.h.

D.o.b. (diameter outside bark) Stem diameter including bark.

Forest Land. Land at least 10 percent stocked by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use. The minimum area considered for classification is 1 acre.

Forest management type. A classification of timberland based on forest type and stand origin.

Forest type. A classification of forest land based on the species forming a plurality of live-tree stocking. Major Mississippi forest-type groups are:

Longleaf-slash pine. Forests in which longleaf or slash pine, singly or in combination, constitute a plurality of the stocking. (Common associates include oak, hickory, and gum).

Loblolly-shortleaf pine. Forests in which loblolly pine, shortleaf pine, or other southern yellow pines, except longleaf or slash pine, singly or in combination, constitute a plurality of

the stocking. (Common associates include oak, hickory and gum).

Oak-pine. Forests in which hardwoods (usually upland oaks) constitute a plurality of the stocking but in which pines account for 25 to 50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar).

Oak-hickory. Forests in which upland oaks or hickory, singly or in combination, constitutes a plurality of the stocking, except where pines account for 25 to 50 percent, in which case the stand would be classified oak-pine. (Common associates include yellow-poplar elm, maple, and black walnut).

Oak-gum-cypress. Bottom-land forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, constitutes a plurality of the stocking, except where pines account for 25 to 50 percent, in which case the stand would be classified oak-pine. (Common associates include cottonwood, willow, ash, elm, hackberry, and maple).

Elm-ash-cottonwood. Forests in which elm, ash, or cottonwood, singly or in combination, constitutes a plurality of the stocking. (Common associates include willow, sycamore, beech, and maple).

Maple-beech-birch. Forests in which maple, beech, or yellow birch, singly or in combination, constitute a plurality of the stocking. (Common associates include hemlock, elm, basswood, and white pine).

Nonstocked stands. Stands less than 10 percent stocked with live trees.
Pine plantation. Stands that (a) have been artificially regenerated by planting or direct seeding, (b) are classed as a pine or other softwood forest type, and (c) have at least 10 percent stocking.

Natural pine. Stands that (a) have not been artificially regenerated, (b) are classed as a pine or other softwood forest type, and (c) have at least 10 percent stocking.

Oak-pine. Stands that (a) have at least 10 percent stocking and classed as a forest type of oak-pine.

Upland hardwood. Stands that have at least 10 percent stocking and classed as an oak-hickory or maple-beech-birch forest type.

Lowland hardwood. Stands that have at least 10 percent stocking with a forest type of oak-gum-cypress, elm-ash-cottonwood, palm, or other tropical.

Nonstocked stand. Stands less than 10 percent stocked with live trees.

GIS - Geographical Information System. Combines traditional mapping skills with spatially referenced data in a computer to provide advanced maps.

Hardwoods. Dicotyledonous trees, usually broadleaf and deciduous.

Hard hardwoods. Hardwood species with an average specific gravity greater than 0.50 such as oaks, hard maples, hickories, and beech.

Soft hardwoods. Hardwood species with an average specific gravity of .50 or less, such as gums, yellow poplar, cottonwoods, red maple, basswoods, and willows.

Industrial wood. All roundwood products except fuelwood.

Land area. The area of dry land and land temporarily or partly covered by water,

such as marshes, swamps, and river floodplains (omitting tidal flats below mean high tide), streams sloughs, estuaries, and canals less than 200 feet wide, and lakes, reservoirs, and ponds less than 4.5 acres in area.

Live trees. All living trees, all size classes, all tree classes, and both commercial and noncommercial species are included.

Log Grade. A classification of logs based on external characteristics indicating quality or value.

Logging residues. The unused merchantable portion of growing-stock trees cut or destroyed during logging operations.

Noncommercial species. Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land. Land that has never supported forests and land formerly forested where timber production is precluded by development for other uses.

Nonstocked stands. Stands less than 10 percent stocked with live trees.

Ownership. The property owned by one ownership unit, including all parcels of land in the United States.

National forest land. Forest land that has been legally designated as national forests or purchase units, and other land under the administration of the Forest Service, including experimental areas and Bank head-Jones Title III land.

Forest industry land. Land owned by companies or individuals operating primary wood-using plants.

Nonindustrial private forest (NIPF) land. Privately owned land excluding forest industry land or forest industry-leased land.
Corporate. Owned by corporations, including incorporated farm ownerships.

State, county, and municipal land. Land owned by States, counties, and local public agencies or municipalities or land leased to these governmental units for 50 years or more.

Primary wood-using plants. Industries receiving roundwood or chips from roundwood for the manufacture of products, such as veneer, pulp, and lumber.

Reforestation. Area of land previously classified as forest that is regenerated by planting trees or natural regeneration.

Remote Sensing. The use of aircraft or satellite imagery to identify and describe the land cover and land use.

Roundwood (roundwood logs). Logs, bolts, or other round sections cut from trees for industrial or consumer uses.

Roundwood chipped. Any timber cut primarily for pulpwood, delivered to non-pulp mills, chipped, and then sold to pulp mills as residues, including chipped tops, jump sections, whole trees, and pulpwood sticks.

Roundwood products. Any primary product such as lumber, poles, pilings, pulp, or fuelwood, that is produced from roundwood.

Saw Log. A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, with a minimum diameter inside bark for softwoods of six inches (8 inches for hardwoods).

Saw log portion. The part of the bole of sawtimber trees between a 1-foot stump and the saw-log top.

Saw-log top. The point on the bole of sawtimber trees above which a conventional saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b for hardwoods.

Sawtimber-size trees. Softwoods 8.0 inches d.b.h and larger and hardwoods 11.0 inches d.b.h. and larger.

Sawtimber volume. Growing-stock volume in the sawlog portion of sawtimber-size trees in board feet.

Seedlings. Trees less than 1.0 inch d.b.h. and greater than 1 foot tall for hardwoods, greater than 6 inches tall for softwood, and greater than .5 inch in diameter at ground level for longleaf pine.

Select red oaks. A group of several red oak species composed of cherrybark, Shumard, and northern red oaks. Other red oak species are included in the "other red oaks" group.

Select white oaks. A group of several white oak species composed of white, swamp chestnut, swamp white, chinkapin, Durand, and bur oaks. Other white oak species are included in the "other white oaks@" group.

Site class. A classification of forest land in terms of potential capacity to grow crops of industrial wood based on fully stocked natural stands.

Softwoods. Coniferous trees, usually evergreen, having leaves that are needles or scalelike.

Yellow pines. Loblolly, longleaf, slash, pond, shortleaf pitch, Virginia, sand, spruce, and Table Mountain pines.

Other softwoods. Cypress, eastern red-cedar, white-cedar, eastern white pine, eastern hemlock, spruce and fir.

Spectral reflectance. Sunlight reflected from the ground or canopy of the forest that is recorded by the sensor in the satellite or aircraft that is separated into small classes (bands).

Stand age. The average age of dominant and co-dominant trees in the stand.

Stand origin. A classification of forest stands describing their means of origin.

Planted. Planted or artificially seeded.

Natural. No evidence of artificial regeneration.

Stand-size class. A classification of forest land based on the diameter class distribution of live trees in the stand.

Statistical Precision. The ability to achieve the same results with repeated measurements.

Sawtimber stands. Stands at least 10 percent stocked with live trees, with half or more of total stocking in sawtimber and poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Stocking. The degree of occupancy of land by trees, measured by basal area or the number of trees in a stand and spacing in the stand, compared with a minimum standard, depending on tree size, required to fully utilize the growth potential of the land.

Thematic map. Displays complex map data using classes that combine similar data.

Timberland. Forest land capable of producing 20 cubic feet of industrial wood per acre per year and not withdrawn from timber utilization.

Timber products. Roundwood products and byproducts.

Tree. Woody plants having one erect perennial stem or trunk at least 3-inches d.b.h. a more or less definitely formed crown for foliage and a height of at least 13 feet (at maturity).

Tree Grade. A classification of the saw-log portion of sawtimber trees based on: (1) the grade of the butt log or (2) the ability to produce at least one 12-foot or two 8-foot logs in the upper section of the saw-log portion. Tree grade is an indicator of quality; grade 1 is the best quality.

Upper-stem portion. The part of the main stem or fork of sawtimber trees above the saw-log top to minimum top diameter 4.0 inches outside bark or to the point where the main stem or fork breaks into limbs.

Volume of live trees. The cubic-foot volume of sound wood in live trees at least 4.6 inches d.b.h from a 1-foot stump to a minimum 3.0 inch top d.o.b of the central stem for softwood and 4.0 inches for hardwoods.

Credits

Patrick Glass, author
Matt Ladner, designer
Karen Brasher, editor
Photos by Patrick Glass

Hurricane Katrina: Impacts on Different Pine Species and Implications for Landowners

H. Glenn Hughes, Extension Professor, MSU Extension Service, P.O. Box 348, Purvis, MS 39475. Email: ghughes@ext.msstate.edu

Introduction

Hurricane Katrina roared through Mississippi on August 29, 2005. In her path, some 1.2 million acres of forestland were damaged. About 2 years worth of annual harvest for Mississippi was blown down in one day, with the greatest damage occurring in southeast Mississippi. Hardwood bottomlands, pine sawtimber, and recently thinned pine stands were most severely damaged.

Although hurricane damage to forestland was heaviest near the coast, hurricane force winds (in excess of 73 mph) extended to Meridian, some 140 miles inland. Most of the forestland damaged by Katrina was owned by private landowners.

Not all pine species appeared to be affected equally. Several foresters noted that loblolly pine was most severely affected by high winds. If so, this will have long term implications for landowners as they recover from Katrina. This is particularly important facing reports from the National Weather Service that we are in a period of increased hurricane activity and intensity for the next 15 to 30 years.

Plantations exist in south Mississippi that contain different pine species, were planted in the same year, on the same site, and received similar thinning treatments. Analyzing these plantations will allow us to determine differences in hurricane damage among pine species.

The objective of this note is to examine the hurricane damage suffered on two separate Forrest County tracts containing loblolly, slash, and longleaf pine planted 20 years ago. All were bare-root stock, and all were thinned about 4 years ago. This analysis will help landowners in south Mississippi make informed decisions about species to replant in the aftermath of Katrina.

Methods

Two areas on the Chambliss Tree Farm were planted in 1985 in southern Forrest County; the Slade Tract and the Black Creek Tract. The tracts are about 3 miles apart, and each was planted with loblolly, slash, and longleaf pine. Each area was thinned abut 4 years ago to approximately 70 square feet of basal area per acre, a typical density for a first thinning. Loblolly and slash pine were thinned with 5th row thinnings, and longleaf, because of the lower initial basal area, had fewer trees removed selectively.

Hurricane Katrina caused considerable damage in this vicinity. Both areas are in the "Severely Damaged" areas as determined by wind speed. Preliminary estimates for Forrest County were that 30 percent of the timber volume was damaged.

Following Hurricane Katrina, plots were established in each planting. Information was collected on tree diameter, damage (none, snapped, blown over, leaning), product before Katrina, product after Katrina, merchantable height before and after Katrina, and site information. Global positioning system (GPS) locations were also collected on each plot.

Damage to Loblolly Pine

Loblolly pine suffered catastrophic wind damage (Table 1). Across both sites, only 16% of the loblolly pines were undamaged after Katrina. Most of the loblolly damage (75.9% of all loblolly surveyed) were snapped. Leaning and blown over trees accounted for almost 8% of all loblolly surveyed.

The amount and type of damage to loblolly pine resulted in an unmanageable stand. Snapped trees suffered a significant and immediate reduction in quality, sometimes in excess of 90% of its pre-hurricane value. Chip-N-Saw trees selling for $20 to $25 per ton before Katrina sold as pulpwood for $2 to $3 per ton if landowners could find a buyer. In addition, snapped trees rapidly lose weight, further decreasing their value because trees are largely sold on a weight basis.

Most of the loblolly was clearcut. This represents a significant financial loss, as a large majority of the value obtained from pine management accrues from production of higher value products (sawtimber) in mature stands.

Table 1. Wind damage from Hurricane Katrina

	Hurricane Damage (%)			
Species	None	Snapped	Leaning	Blown Over
Loblolly	16.3	75.9	5.7	2.0
Slash	52.4	38.1	7.8	1.7
Longleaf	64.0	8.9	16.9	10.2

Damage to Slash Pine

Slash pine suffered less damage than loblolly pine (Table 1). More than half (52.4%) of the slash pine inventoried was undamaged. The bulk of the damage, as with loblolly pine, was in snapped trees.

While the damage is significant, there is sufficient undamaged slash pine to retain as a manageable stand. This is critical as landowners have significant time and money invested in such stands, and deciding to clearcut now at salvage prices would further compound an already significant economic loss. Managing the undamaged trees will enable landowners to capitalize on the anticipated increase in stumpage prices once the initial flush in timber is exhausted in the restoration effort.

Damage to Longleaf Pine

Longleaf pine suffered the least damage of all species. Across both sites, 64% of longleaf surveyed was undamaged (Table 1). Unlike loblolly or slash, leaning trees comprised the greatest type of damage across both sites. Snapped trees were the least frequently encountered type of hurricane damage. This is important, as leaning trees or those blown over by the root system (also called clay-rooted) remain alive into the spring, and retain more moisture (hence weight) longer than snapped trees. This creates a wider window of opportunity for salvaging leaning and blown over trees, and provides more income due to higher quality products and higher weights.

As a result of the limited damage, the longleaf stands surveyed can be managed with few modifications. There are isolated pockets of heavy damage, but these could be salvaged and regenerated to create more diverse age classes. This diversity in age classes would help reduce risk.

Several factors probably contributed to longleaf pine's success in surviving hurricane force winds from Katrina. First, the grass stage resulted in longleaf having a smaller diameter and shorter height than loblolly or slash pine. The smaller diameter and height enabled it to be more flexible in high winds, thus reducing damage. Second, the thinning was not a traditional fifth-row thinning as in the loblolly and slash stands. Due to the smaller size of longleaf at the time of thinning, and the smaller basal area, the thinning was more selective than with the loblolly or slash thinnings. Isolated trees or small groups of trees were removed instead of entire rows.

Looking Forward

Hurricanes are part of our past, present, and future. This type of catastrophic damage will happen again; when is unknown. Landowners, particularly those with land south of Hattiesburg, should consider whether or not loblolly pine is worth the risk. This preliminary analysis illustrates increased risk with loblolly pine, particularly after it has been thinned. Risk averse landowners might consider planting slash or longleaf.

Although longleaf suffered the least damage, it has its own share of risks and problems. Landowners considering longleaf should be committed to proper site preparation to control competing vegetation, particularly grasses that compete for water and nutrients. Also, longleaf containerized seedling are about 4 times the cost of bare root loblolly or slash pine. Landowners considering longleaf, particularly those unfamiliar with its specific requirements, should use a forester experienced with longleaf.

The grass stage in longleaf is less of a problem now than in the past due to containerized seedlings and proper site preparation. However, longleaf will likely be smaller in both diameter and height than loblolly or slash, at least initially.

A considerable reforestation effort faces Mississippi landowners due to hurricane Katrina. Recent federal legislation (H.R. 2863) signed by the President in December 2005 provides funding to landowners through a variety of emergency programs. This study will help landowners as they plan and implement reforestation projects on their property in the wake of hurricane Katrina.

Initial Estimates of Hurricane Katrina Impacts on Mississippi Gulf Coast Forest Resources

Patrick A. Glass and Sonja N. Oswalt

Focus Area

Hurricane Katrina pummeled the Gulf Coast of Mississippi on August 29, 2005. The eye wall of the storm passed directly over Hancock and Pearl River Counties. Harrison, Jackson, Stone, and George Counties on the windward side of the hurricane's path sustained severe damage before the storm's strength dissipated as it moved farther inland (fig. 1).

Current estimates indicate that these counties contain about 1.7 million acres of forest land and account for 9 percent of the total forested acreage within the State.

Hurricane Katrina approaching the Gulf Coast, August 29, 2005. (Photo courtesy of NASA/JAXA)

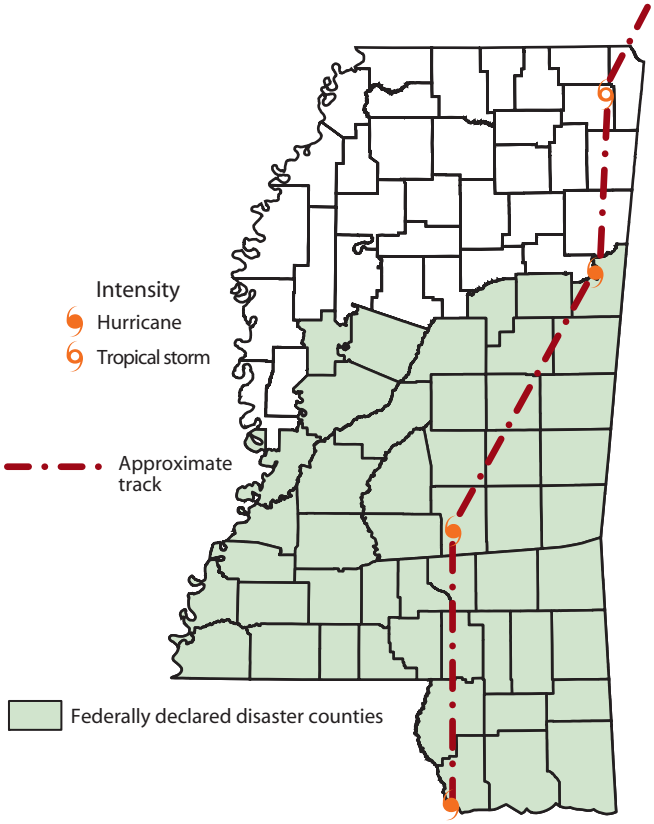

Figure 1—Hurricane Katrina's path through Mississippi with initial damage projections.

Assessment Methods

Damage assessment was an immediate priority for federal, State, and local governments. Development of policy and aid packages was of paramount concern to mitigate impacts to local and regional economies resulting from the destruction of forest resources. To successfully accommodate these mandates the U.S. Department of Agriculture Forest Service, Forest Inventory and Analysis (FIA) unit from the Southern Research Station employed remeasurement methods of previous (1994) forest inventories, along with protocols for establishing a new, annualized sampling frame. Working in conjunction with FIA, the Mississippi Institute for Forest Inventory (MIFI) and Mississippi Forestry Commission (MFC) also implemented their standard protocols for assessing timber inventory.

Sample Size and Estimation Procedures

The combined efforts of MFC-MIFI and FIA resulted in 1,349 sample plots in the 6 focus-area counties in southeastern Mississippi. Crews measured a total of 33,634 trees (>1 inch d.b.h.). The estimates and descriptive statistics presented herein were not compiled utilizing traditional FIA processing systems. Therefore, they are not intended to replace or supplant the inventory analysis results that will be published upon conclusion of the FIA effort in Mississippi. Nor are they intended to take precedence over the MIFI regional publications projected for completion in 2007.

Trees per acre values derived from FIA inventory information were obtained by dividing the number of trees in the category of interest by the area sampled for that category rather than using a standard expansion factor, therefore, per acre values will change once FIA phase one forest area estimates have been generated. Condition class proportions were incorporated during sample area computations. The estimates presented are based on the current inventory and do not include tree mortality or any other remeasurement statistics from previous inventory cycles.

Per acre values developed from MIFI inventory information were obtained using classical expansion methods. Nested plots were used to sample according to product classification as defined through a surrogate of d.b.h. Both FIA and MIFI employ a hierarchical tally structure utilized to classify damage levels for both stand structure and individual tree occurrence.

Plot and Condition Level Damage

Incidence of damage recorded at the plot level was distributed consistently across forest types and ownership groups. Figure 2 illustrates the occurrence of damage as detected from remote sensing data represented by thematic classification of foliar signature for image differences from pre- and post-hurricane LandSat imagery.

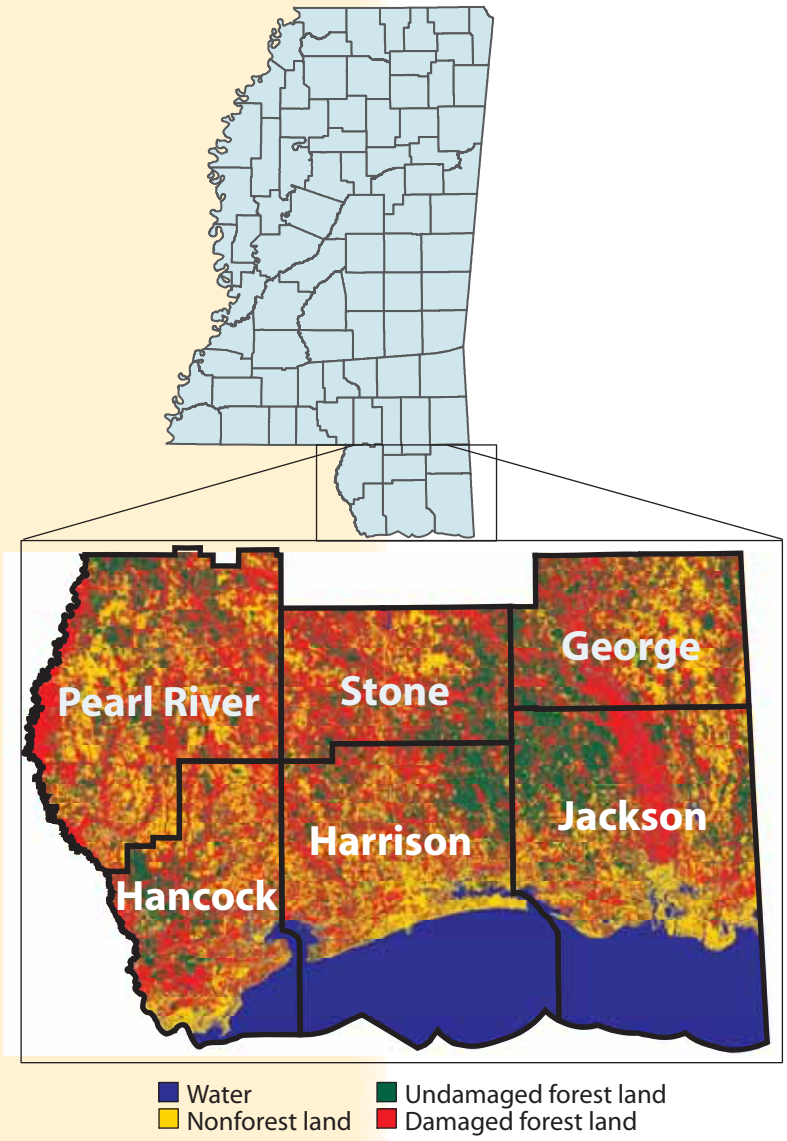

Figure 2—Thematic classification of damage upon forest land.

Eighty-eight percent of forested plots sampled contained some indication of hurricane damage. The largest percentage of plots containing damage fell in Harrison County while the lowest percentage fell in Jackson County.

Blowdown (windthrow) was the most common type of damage observed at the stand level. Although, this type of damage was more common in deciduous forest types, blowdowns did occur in stands of longleaf pine and denser stands of loblolly and slash pine. Wind-shear damage was the second most common type of damage and was experienced only in coniferous stands. Shearing took place most often between heights of 3 to 15 feet. Plots located in younger or denser stands appeared to be less susceptible to these significant types of damage, but sustained higher incidents of crown and foliar damage.

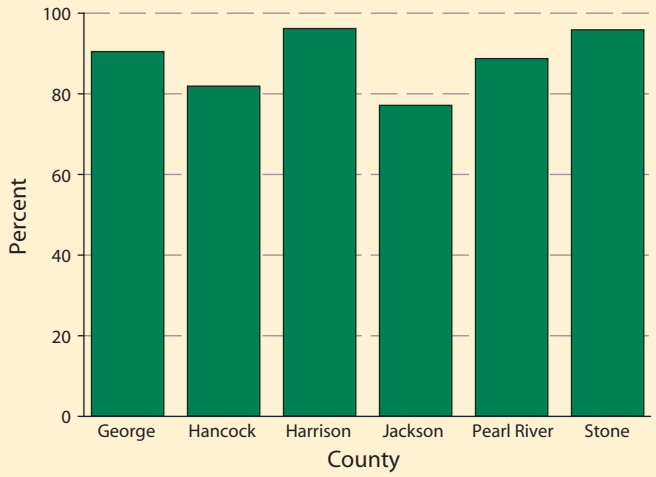

Figure 3—Percent of FIA plots containing some indication of damage by county, southeastern Mississippi, 2006.

Table 1—Plot level percentage categories of bole damage by county and type

County	Lean	Blowdown	Shear
		percent	
George	7.0	30.1	9.1
Hancock	4.8	21.8	18.4
Harrison	8.0	28.7	12.7
Jackson	8.0	15.5	6.1
Pearl River	4.3	25.5	18.4
Stone	9.3	21.9	15.9

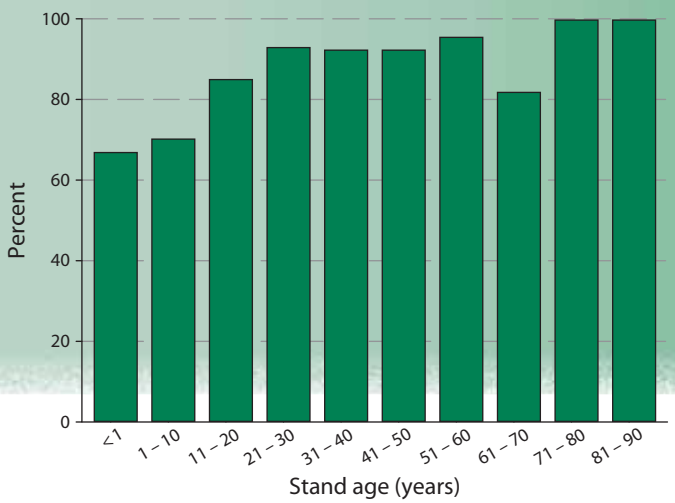

Figure 4—Percent of plots containing some indication of stand damage by stand age, southeastern Mississippi, 2006.

Merchantable Tree Damage

Though 88 percent of forested plots contained an indication of damage, only 34 percent (about 50 trees per acre) of merchantable live trees ≥5 inches d.b.h. showed signs of damage.

Only 18 percent of saplings (trees <5 inches d.b.h.) showed signs of damage. A higher percentage of saplings sustained damage in Pearl River and Stone Counties than in any of the other four counties. Remarkably, only 6 percent of saplings in Jackson County exhibited signs of damage.

Trees >5 inches d.b.h. contributed an average of 66 ft^2 per acre of basal area throughout the 6-county region studied. Pearl River County sustained about 26 ft^2 per acre of basal area damage to trees >5 inches d.b.h.

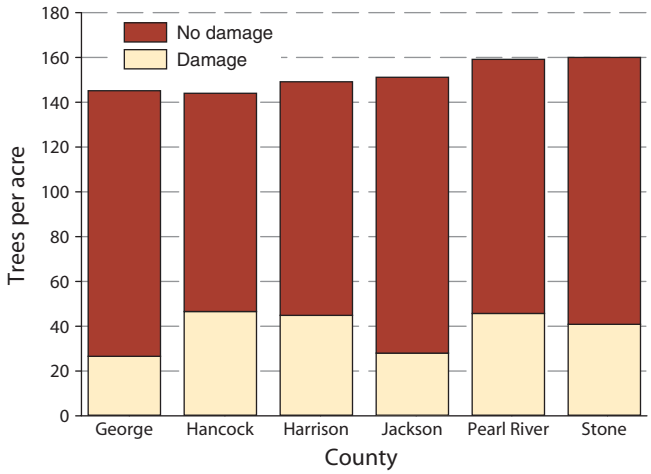

Figure 5—Damaged versus undamaged trees >5 inches d.b.h. per acre on southeastern Mississippi forest land, 2006.

The Authors:

Patrick A. Glass, Director of Operations, Mississippi Institute for Forest Inventory, Mississippi Forestry Commission, P.O. Box 1667, Jackson, MS 39215-1667.
Email: pglass@mifi.state.ms.u

Sonja N. Oswalt, Forest Resource Analyst, U.S. Department of Agriculture Forest Service, Southern Research Station, Forest Inventory and Analysis, 4700 Old Kingston Pike, Knoxville, TN 37919.
Email: soswalt@fs.fed.us

Hurricane Katrina damage to planted pine, Picayune, MS, 2005. (Photo courtesy of Ricky Layson, Forest Resource Consultants, Inc., www.forestryimages.org)

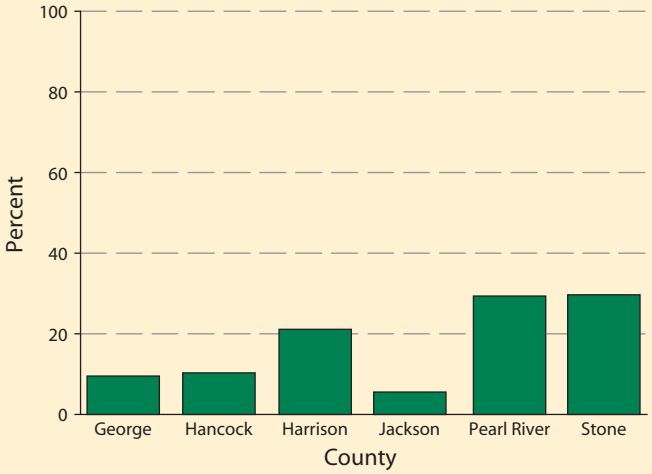

Figure 6—Percent of saplings (trees <5 inches d.b.h.) containing some indication of damage by county, southeastern Mississippi, 2006.

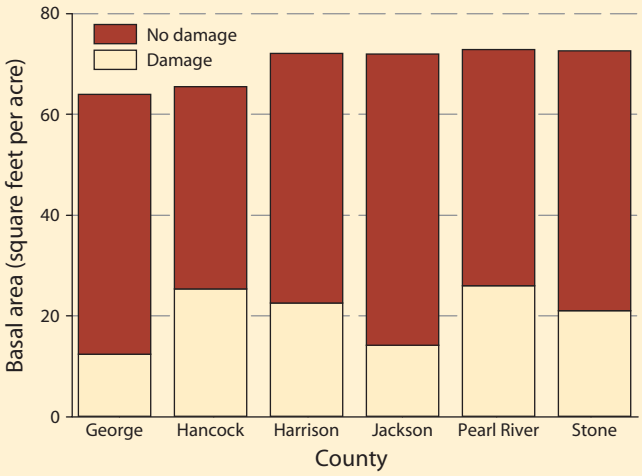

Figure 7—Basal area by damage and county, southeastern Mississippi, 2006.

Slightly more than 50 percent of the basal area in the oak-pine, oak-hickory, and elm-ash-cottonwood forest-type groups sustained some degree of hurricane damage. Only 28 percent of the basal area in the longleaf-slash pine type sustained damage. Overall, damage levels were highest in oak-gum-cypress stands with about 40 percent of the basal area in that forest-type group impacted.

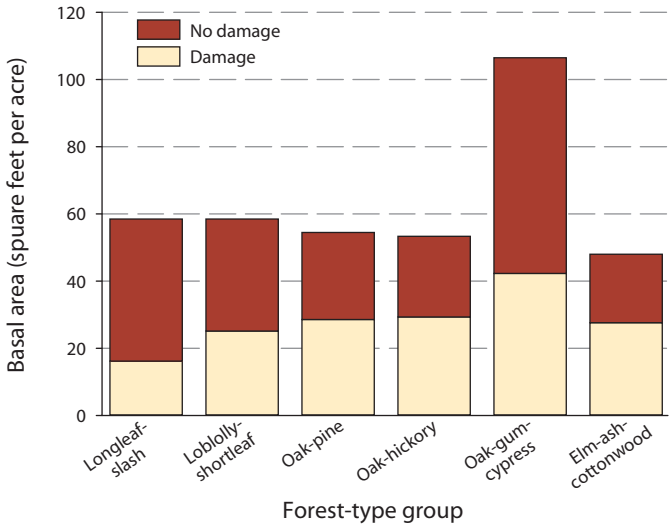

Figure 8—Basal area by damage and forest-type group, southeastern Mississippi, 2006.

Caveat

The data presented in this document are preliminary and subject to revision when field data collection, validation, and processing procedures are completed. Readers are cautioned that statistical error increases as domain size decreases. Therefore, estimates at the state and multi-county level are more reliable than estimates at the individual county level.

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SITL Spatial Information Technologies Laboratory
MISSISSIPPI STATE UNIVERSITY
FOREST AND WILDLIFE RESEARCH CENTER
DEPARTMENT OF FORESTRY

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