Hurricane Rita Timber Damage Assessment
Texas Forest Service
30 September 2005

Hurricane Rita made landfall on 24 September 2005, around 2:30 am CDT on the extreme southwest coast of Louisiana between Sabine Pass and Johnson's Bayou. Rita made her way up through East Texas into Northeast Texas, then through the Mississippi Valley. Damage from the storm was evident throughout East and Southeast Texas, with Orange, eastern Hardin, and southern Jasper and Newton counties sustaining the worst damage.

On 26 September, Texas Forest Service began to implement a Timber Damage Assessment Plan it had designed a week earlier in close cooperation with Southern Research Station (SRS) of the USDA Forest Service.

Two Texas Forest Service foresters conducted an aerial survey of the impacted area on 26 – 27 September. The aerial survey refined the damage boundaries that were projected by SRS on a potential damage map, which was produced on 25 September based on wind and rainfall data from Hurricane Rita. Two days of flying and refining the estimated boundaries led to the creation of the Timber Damage Assessment map, shown in Figure 1. This map shows four zones of severity:

- **Scattered Light** – approximately 3 percent of forest stands damaged and affected
- **Light** – approximately 15 percent damaged and affected
- **Moderate** – approximately 50 percent damaged and affected
- **Heavy** – approximately 60 percent damaged and affected

Damaged includes trees that are uprooted, snapped off, leaning more than 45 degrees, or otherwise are likely to die within 12 months and thus will need to be salvaged. **Affected** includes trees that are leaning less than 45 degrees, have lost only part of their crown, have only a loss of foliage, or otherwise are not likely to die. However, future growth of affected trees will likely be impaired, and these trees will likely be more susceptible to insects and disease.

Eight Texas Forest Service Forest Inventory and Analysis (FIA) field crews and two SRS FIA crews collected ground-truthing data on 222 points in the impacted area on 28 – 29 September. Field crews collected the following data:

- forest type
- percent of pine **damaged**
- percent of hardwood **damaged**
- percent of pine **affected**
- percent of hardwood **affected**
- stand age
- stand density

The percentages of pine and hardwood damaged and affected as collected by the FIA crews are shown in Table 1. On September 30, this data was applied to the 2003 Texas FIA plot data in each damage zone to produce Tables 2 – 4.

Total volume of timber damaged and affected was estimated to be 967 million cubic feet for a total stumpage value of $833 million. Total damaged and affected acres were 771,000 acres. For perspective, East Texas contains almost 16 billion cubic feet of growing stock timber in 43 counties. Total damaged and affected volume by Hurricane Rita was about 6 percent of the total East Texas growing stock.

Total timber volume **damaged** by Hurricane Rita was 533 million cubic feet worth approximately $462 million. This timber damage occurred over 435,000 acres. Total timber volume **affected** was 435 million cubic feet worth approximately $371 million. This timber affected occurred over 335,000 acres.

Total poletimber **damage** was 1.5 million cords, while sawtimber damage was 2.1 billion board feet. Total poletimber **affected** was 1.2 million cords, while sawtimber affected was 1.7 billion board feet. For perspective, one billion board feet is enough to frame over 60,000 homes two-thousand square feet in size.

Sawtimber-size trees are at least 9.0 inches in diameter at breast height (4.5 feet above the ground) for pine and at least 11.0 inches in diameter for hardwood. Poletimber-size trees are at least 5.0 inches in diameter, but smaller than sawtimber size.

Texas Forest Service coordinated continuously with SRS to ensure methods and procedures were based on the best science available to produce the timber damage estimates. Questions about the Timber Damage Assessment should be directed to:

Texas Forest Service
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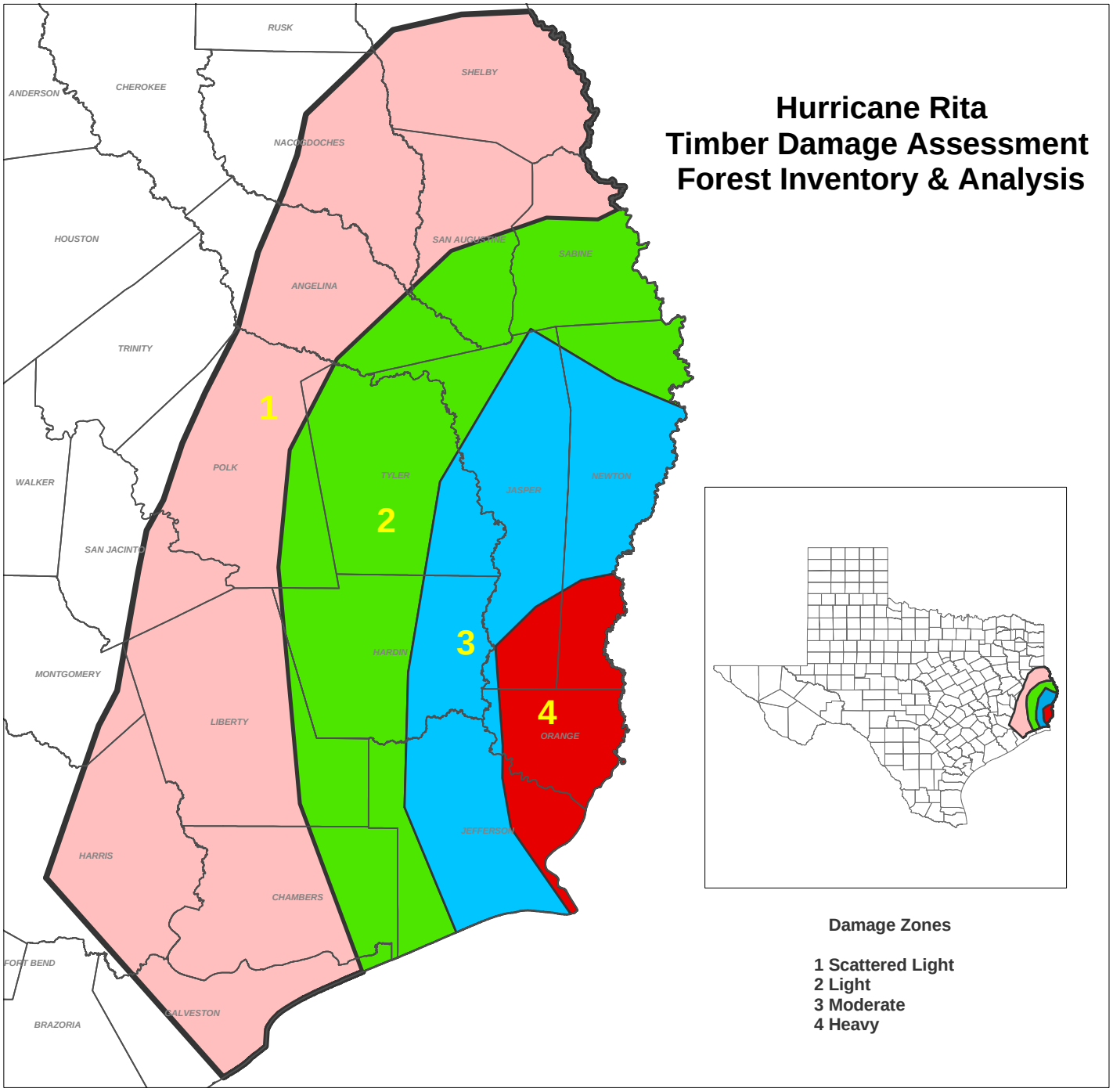
This report can also be downloaded from the Texas Forest Service web site at http://texasforestservice.tamu.edu/. Texas Forest Service is a Member of The Texas A&M University System.



Hurricane Rita
Timber Damage Assessment
Forest Inventory & Analysis

Damage Zones

1 Scattered Light
2 Light
3 Moderate
4 Heavy

0 25 50 Miles

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Sep 28, 2005

Table 1. Hurricane Rita Timber Damage Zones with Damaged and Affected Percents by Forest Type in Texas

Zone	Forest Type	Damaged			Affected		
		Pine	Hardwood	All	Pine	Hardwood	All
I. Scattered Light	Pine	1.0	0.6	0.8	0.9	0.4	0.7
	Pine/Hardwood	-	1.5	0.7	0.6	1.5	1.0
	Hardwood	-	5.0	4.2	3.3	5.7	5.3
	All	0.8	3.2	1.6	0.9	2.1	1.4
II. Light	Pine	5.3	5.0	5.2	6.0	5.2	5.8
	Pine/Hardwood	7.9	11.3	9.6	5.0	9.2	7.1
	Hardwood	1.0	17.5	10.0	2.0	12.5	7.7
	All	5.6	12.6	7.4	5.8	9.7	6.8
III. Moderate	Pine	14.3	22.9	15.9	8.3	12.1	9.1
	Pine/Hardwood	22.3	40.9	31.6	14.1	44.1	29.1
	Hardwood	5.0	51.3	31.4	5.0	52.5	32.1
	All	15.7	44.9	26.4	9.7	45.8	22.8
IV. Heavy	Pine	23.5	10.0	22.3	5.5	10.0	5.9
	Pine/Hardwood	56.7	60.0	58.3	10.8	21.7	16.3
	Hardwood	50.0	51.0	50.7	7.5	30.0	23.6
	All	39.9	49.6	43.6	8.1	25.1	14.6

Table 2. Hurricane Rita Timber Damaged and Affected by County in Texas

County	Damaged						Affected					
	Volume			Value	Area	Volume Percent[3]	Volume			Value	Area	Volume Percent[3]
	Poletimber (cord)	Sawtimber (1,000 board feet[1])	All[2] (1,000 cubic feet)	($1,000)	(Acre)		Poletimber (cord)	Sawtimber (1,000 board feet[1])	All[2] (1,000 cubic feet)	($,1000)	(Acre)	
Angelina	14,585	46,351	9,624	10,250	4,832	2.1	15,604	50,692	10,437	11,213	5,216	2.3
Chambers	322	1,537	353	306	448	1.5	330	2,036	452	421	557	1.9
Hardin	257,365	274,113	75,678	60,145	57,990	14.5	210,066	225,756	62,501	48,742	47,865	12.0
Harris	2,680	11,416	2,420	2,269	1,739	1.9	3,102	15,226	3,116	3,066	2,217	2.4
Jasper	335,337	662,815	148,457	137,906	102,773	24.2	255,530	502,038	113,596	99,756	74,724	18.5
Jefferson	44,294	52,534	15,400	11,950	16,780	29.0	40,380	50,753	14,691	11,370	13,817	27.7
Liberty	17,244	35,965	8,595	7,125	9,108	2.8	18,724	44,550	10,353	9,066	10,800	3.4
Montgomery	389	1,716	370	306	643	1.7	465	3,211	616	605	911	2.9
Nacogdoches	17,065	32,297	7,596	6,514	4,936	1.9	18,630	37,033	8,577	7,452	5,649	2.1
Newton	347,257	327,560	98,148	78,528	103,317	22.0	236,202	250,333	72,535	57,628	71,354	16.2
Orange	98,038	146,106	35,018	30,920	43,833	42.7	46,562	54,235	13,953	10,901	17,427	17.0
Polk	31,538	67,543	15,599	14,313	10,342	3.6	28,948	66,828	14,954	14,159	9,795	3.4
Sabine	57,292	113,809	25,939	26,148	12,673	5.2	60,277	107,777	25,151	25,181	12,783	5.0
San Augustine	38,563	52,856	13,515	12,797	9,098	2.8	40,981	56,481	14,396	13,663	9,061	3.0
San Jacinto	1,663	8,675	2,103	1,801	496	3.1	2,181	11,379	2,699	2,436	594	4.0
Shelby	16,064	28,971	7,077	6,184	5,898	1.5	17,574	30,586	7,515	6,510	6,812	1.6
Tyler	181,538	247,913	66,744	54,581	50,226	11.6	154,767	220,777	59,007	48,559	45,859	10.2
Total	1,461,233	2,112,177	532,634	462,043	435,131	9.5	1,150,323	1,729,692	434,549	370,728	335,440	7.8

[1]International ¼-inch rule.

[2]All volume refers to all growing stock volume.

[3]Volume percent applies to area as well except for timberland where there are no growing stock trees.

Table 3. Hurricane Rita Timber Damaged and Affected by Damage Zone and Major Species Group in Texas

Zone	Major Species Group	Damaged						Affected					
		Volume			Value	Area	Volume Percent[3]	Volume			Value	Area	Volume Percent[3]
		Poletimber (cord)	Sawtimber (1,000 board feet[1])	All[2] (1,000 cubic feet)	($1,000)	(Acre)		Poletimber (cord)	Sawtimber (1,000 board feet[1])	All[2] (1,000 cubic feet)	($1,000)	(Acre)	
I. Scattered Light	Pine	29,252	58,569	13,381	14,337	6,999	0.8	31,042	72,303	15,918	17,568	9,287	1.0
	Hardwood	53,436	115,967	27,911	21,718	23,837	3.2	57,007	128,278	30,672	23,950	26,215	3.5
	All	82,688	174,536	41,292	36,054	30,836	1.6	88,049	200,581	46,590	41,518	35,502	1.9
II. Light	Pine	211,367	323,983	76,811	79,055	48,513	5.6	232,027	326,028	79,399	80,264	51,154	5.8
	Hardwood	147,950	236,458	62,605	47,340	46,842	12.6	119,693	180,259	48,397	36,338	36,565	9.7
	All	359,317	560,441	139,415	126,395	95,354	7.4	351,720	506,287	127,796	116,601	87,719	6.8
III. Moderate	Pine	328,256	395,699	101,468	100,246	86,718	15.7	194,337	248,608	62,613	62,725	52,548	9.7
	Hardwood	437,275	648,269	166,344	123,630	124,525	44.9	428,365	667,636	169,445	126,767	124,710	45.8
	All	765,530	1,043,968	267,812	223,876	211,244	26.4	622,702	916,244	232,058	189,492	177,258	22.8
IV. Heavy	Pine	129,195	207,033	47,634	50,001	45,892	39.9	27,836	41,046	9,659	9,971	9,454	8.1
	Hardwood	124,503	126,198	36,480	25,716	51,805	49.6	60,015	65,534	18,445	13,146	25,506	25.1
	All	253,698	333,232	84,114	75,717	97,698	43.6	87,851	106,580	28,104	23,117	34,960	14.6
All	Pine	698,070	985,285	239,294	243,639	188,122	6.3	485,242	687,984	167,589	170,527	122,443	4.4
	Hardwood	763,163	1,126,892	293,340	218,404	247,009	16.1	665,081	1,041,707	266,960	200,201	212,997	14.7
	All	1,461,233	2,112,177	532,634	462,043	435,131	9.5	1,150,323	1,729,692	434,549	370,728	335,440	7.8

[1]International ¼-inch rule.

[2]All volume refers to all growing stock volume.

[3]Volume percent applies to area as well except for timberland where there are no growing stock trees.

Table 4. Hurricane Rita Timber Damaged and Affected by Ownership Group and Forest Type in Texas

Ownership Group	Forest Type	Damaged						Affected					
		Volume			Value	Area	Volume Percent[3]	Volume			Value	Area	Volume Percent[3]
		Poletimber (cord)	Sawtimber (1,000 board feet[1])	All[2] (1,000 cubic feet)	($1,000)	(Acre)		Poletimber (cord)	Sawtimber (1,000 board feet[1])	All[2] (1,000 cubic feet)	($1,000)	(Acre)	
Family/Individual	Pine	102,790	154,265	37,275	37,436	26,625	3.8	76,218	126,139	29,627	30,289	20,211	3.0
	Pine/Hardwood	152,712	350,193	79,112	76,659	66,619	15.1	110,926	219,657	51,750	46,629	42,815	9.8
	Hardwood	161,164	288,728	71,930	55,188	71,243	13.9	145,659	273,684	67,450	52,659	66,370	13.0
	All	416,666	793,187	188,317	169,283	164,487	9.3	332,803	619,480	148,827	129,577	129,396	7.3
Industry/TIMO	Pine	534,822	243,356	96,397	70,207	109,170	5.9	380,367	184,637	70,871	52,623	75,951	4.4
	Pine/Hardwood	185,227	414,332	91,386	89,661	60,732	20.8	131,944	290,691	65,803	60,618	37,561	15.0
	Hardwood	261,985	477,826	118,530	91,927	85,471	20.8	242,871	448,525	110,524	86,111	77,452	19.4
	All	982,033	1,135,514	306,312	251,795	255,373	11.7	755,182	923,853	247,198	199,351	190,964	9.4
Public	Pine	37,065	126,573	25,551	29,315	9,497	7.4	37,637	138,967	27,760	32,148	9,813	6.8
	Pine/Hardwood	7,670	44,146	8,507	8,959	2,345	15.7	6,200	31,914	6,317	6,455	1,825	9.7
	Hardwood	17,798	12,758	3,947	2,690	3,429	44.9	18,500	15,478	4,447	3,196	3,441	45.8
	All	62,533	183,476	38,005	40,965	15,271	26.4	62,338	186,359	38,524	41,800	15,079	22.8
All	Pine	674,677	524,194	159,223	136,958	145,292	4.7	494,222	449,742	128,258	115,060	105,975	3.8
	Pine/Hardwood	345,609	808,671	179,005	175,279	129,696	16.6	249,071	542,262	123,870	113,702	82,201	11.5
	Hardwood	440,946	779,312	194,407	149,805	160,143	16.9	407,030	737,687	182,421	141,966	147,263	15.8
	All	1,461,233	2,112,177	532,634	462,043	435,131	9.5	1,150,323	1,729,692	434,549	370,728	335,440	7.8

[1]International ¼-inch rule.

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[3]Volume percent applies to area as well except for timberland where there are no growing stock trees.