



**North Carolina Forest Service**  
*To protect, manage, and promote forest resources for the citizens of North Carolina*

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## Longleaf Pine is Resilient in the Face of Hurricane Winds

Many scientists today agree that significant changes in climate will occur from global warming. Temperature increases, less frequent but heavier rainfall, and increase in storm intensity are predicated. These predicted climate extremes are likely to increase the frequency and severity of hurricanes. Longleaf pine's higher wood density, lower bole taper, and deep rooting nature increase its tolerance to storm damage. Hurricane Katrina provided an opportunity to document that ability to withstand damaging storm winds.

Hurricane Katrina made landfall in Mississippi on August 2005 as a Category 3 storm damaging some 1.2 million acres of forestland in its path. Many pine stands were affected, but two research studies showed that not all southern pines species were damaged the same.

A study by USFS researcher Kurt Johnsen<sup>1</sup> published in the Southern Journal of Applied Forestry evaluated storm damage to slash, loblolly and longleaf trees on a study site originally established in 1960. The 45-year-old trees were measured for DBH and rated as undamaged, downed, or bole snapped. Trees that were snapped or down were considered killed. The amount of damage caused by winds differed significantly across species. Longleaf pine generally suffered less damage than the other two species.

- Longleaf suffered significantly less mortality (7%) than loblolly (26%).
- Snapped boles accounted for 75% of the loblolly mortality, but only 50% of the longleaf mortality. Leaning or uprooted trees can be salvaged.
- Longleaf lost significantly fewer stems and less basal area.
- More damage occurred with taller trees, but was greatest in loblolly pine at any given height mortality.

Wind damage was evaluated with a second study<sup>2</sup> by Glen Hughes, Extension Forester at Mississippi State University, on a 20-year-old loblolly, slash, and longleaf plantation. This study also demonstrates the percent of trees without damage, and the type of damage varied by species. Longleaf was again the most resistant to wind damage. The results are tabulated below:

Table 1. Percent damage by type for loblolly, slash and longleaf pine after Hurricane Katrina (Hughes 2006)<sup>2</sup>.

Species	Type of Damage (%)			
	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

Hurricanes are a fact of life in the coastal plain of North Carolina. A cycle of higher hurricane activity is expected over the next 10 – 40 years. For landowners and managers living in the Coastal Plain, converting loblolly pine stands to longleaf pine will increase the resiliency of their forests and lower the risk of catastrophic loss.

The abstract for the Johnsen (2009) paper follows:

*Some evidence suggests that longleaf pine might be more tolerant of high winds than either slash pine (Pinus elliottii Englem.) or loblolly pine (Pinus taeda L.). We studied wind damage to these three pine species in a common garden experiment in southeast Mississippi following Hurricane Katrina, a very large, Category 3 hurricane that directly affected the stand in August 2005. The experiment, a factorial arrangement of silvicultural treatments established in 1960, included 120 plots of 100 trees each, covering about 22 ha. Following the hurricane, dbh was measured on all trees, and each tree was rated with respect to mortality from wind damage. Longleaf pine suffered less mortality (7%) than the other two species (slash pine, 14%; loblolly pine, 26%), although the differences in mortality were statistically significant only between longleaf pine and loblolly pine. Longleaf pine lost significantly fewer stems per hectare and less basal area than the two other species. Differences in mortality among species were not a function of mean plot tree height or plot density. Our analyses indicate that longleaf pine is more resistant to wind damage than loblolly pine.*

Both articles are available to download from the links provided in the citations below.

### Citations:

<sup>1</sup> Johnsen, Kurt H.; Butnor, John R.; Kush, John S.; Schmidtling, Ronald C.; Nelson, C. Dana. 2009. Hurricane Katrina winds damaged longleaf pine less than loblolly pine. South. J. Appl. For., Vol. 33(4): 178-181. <https://www.srs.fs.usda.gov/pubs/34098>

<sup>2</sup> Hughes, G. 2006. Hurricane Katrina impacts on pine species: implications for landowners, Southern Reg. Ext. Forestry. Available online: <http://www.sref.info/news/articles/hurricane-katrina-impacts-on-pine-species>