

Hurricanes and Timberland Investments

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Abstract

Hurricanes hit the Southeastern United States every year. Very strong hurricanes (e.g., Camille, Frederic, and Hugo) periodically cause major damage to timberland. There is a body of literature that examines the impacts of these hurricanes on timber. This literature typically discusses the amount and type of damage to trees and its impact on timber value, and salvage efforts and their impact on timber markets. While major hurricanes can cause significant damage, what is the likelihood that a timberland property will be struck by such a storm? We use GIS data to examine the strength and frequency of major hurricanes that have hit the South in the past 150 years.

Keywords: Hurricanes, Timberland, Investment

Introduction

Hurricane Camille hit the Gulf Coast in 1969 and caused significant damage to timber. Hurricane Frederic hit about the same area in 1979 and, again, caused significant damage to timber. Hurricane Katrina hit the same area in 2005. Days later, the focus of attention is on the destruction and human toll in the cities of New Orleans, Gulf Port and Biloxi, but it is highly likely that significant damage was done to timber. So how often do hurricanes hit the same place? Do you replace the destroyed stand only to have it hit again just before the new stand is ready to be cut?

Hurricane literature usually addresses two points: 1) what does the hurricane do to timber, and what is the best way to salvage whatever value is left, and 2) what does the volume of salvage timber do to timber markets immediately after the hurricane and over the long-term? (See, for example, Haight and Smith 1995, Nonnemacher 1970, Prestemon and Holmes 2000, and Sheffield and Thompson 1992.) Here we use GIS data to see how often hurricanes hit an area and how strong those hurricanes are. Our data are from the US Atlas (www.nationalatlas.gov) and include storms through 2003. They do not include such hurricanes as Ivan (2004) and Katrina (2005).

There are several factors that cause damage from hurricanes, but the major factor contributing to timber damage is wind. Hurricanes are classed according to wind speeds (Table 3) and winds associated with higher categories are very damaging. In addition, heavy rainfall leading to saturated soils can contribute to windthrow. A slower moving hurricane will inflict more damage than a faster moving hurricane of the same category, because it will drop more rain and subject trees to a longer period of wind.

Table 3. Saffir/Simpson Hurricane Scale

Category	Pressure	Winds	Surge	Damage
	(inches)		(feet)	
1	>28.91	74-95	4-5	Minimal
2	28.5-28.91	96-110	6-8	Moderate
3	27.91-28.47	111-130	9-12	Extensive
4	27.17-27.88	131-155	13-18	Extreme
5	<27.17	>155	>18	Catastrophic

So how bad must a hurricane be? The NOAA Hurricane Research Division classifies any storm of Category 3 or higher as a major hurricane, but smaller storms can inflict significant damage on forests. Note that the damage from Category 2 storms is “Moderate”.

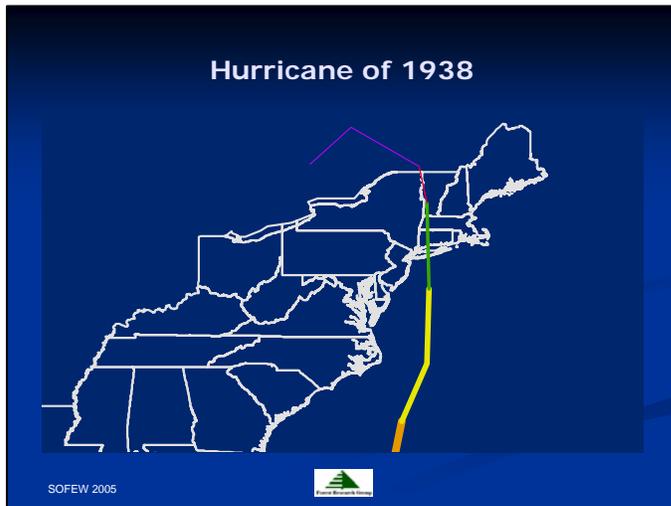
How strong a hurricane should we be worried about?

In the following illustrations, the storm categories are:

Red	Category 5
Orange	Category 4
Yellow	Category 3
Green	Category 2
Blue	Category 1
Purple	Tropical Storm
Dashed Purple	Extra-Tropical Storm or Tropical Depression

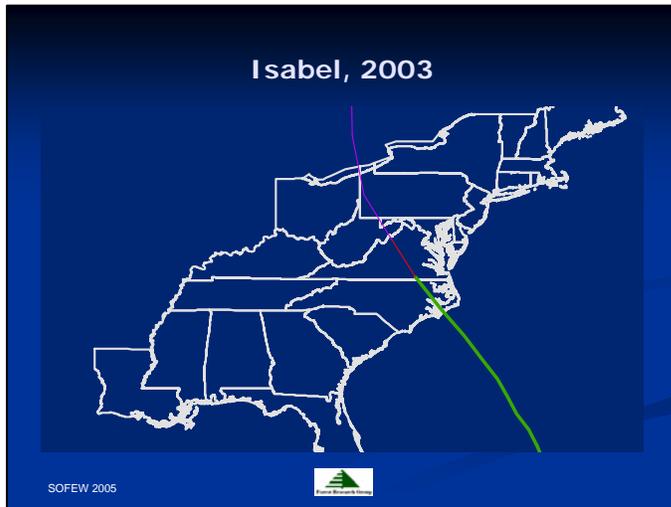
The '38 hurricane in the Northeast (Figure 2) was classified as extratropical when it went ashore on Long Island and Connecticut, but the winds were clocked at 100 mph—equivalent to a Category 2 hurricane. Over a billion board feet of white pine were blown down.

Figure 2. Hurricane of 1938



Isabel (Figure 3) was a Category 2 hurricane when it came ashore in 2003. In North Carolina, 833,000 acres were damaged (Timber Processing 2003), including 25-75% of all trees on 410,000 acres. Damage was estimated at \$565.9 million, including 3.9 million cords of pulpwood and 2.4 MMBF of sawtimber. By the time Isabel got to Virginia, it had been downgraded to a Category 1 storm. Approximately 10 million acres were affected in Virginia, with \$176 million in damage to timber, mostly to old-growth pine stands and bottomland hardwoods.

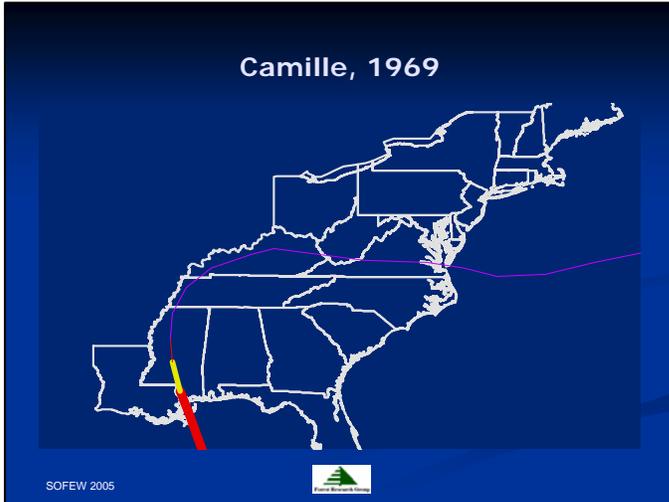
Figure 3. Hurricane Isabel



So Category 2 storms cause significant damage to timber, even though they are not classified as “major storms”.

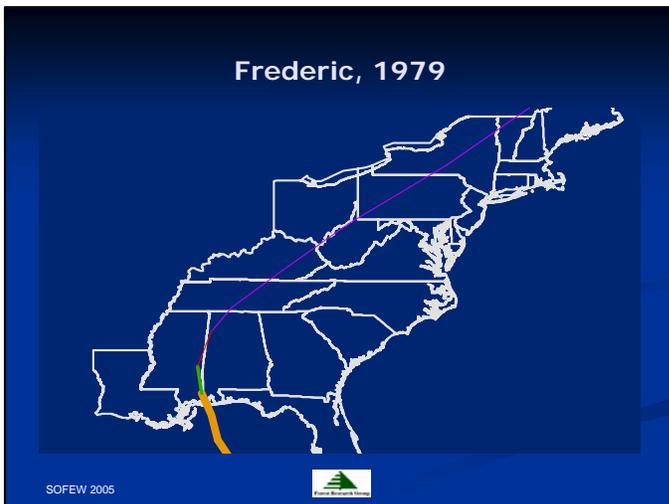
Camille (Figure 4) was a bad storm, the 11th most deadly, and the 5th most costly in US history through 2003 (Jarrell, Mayfield, and Rappaport, 2001). It came ashore as a Category 5, slowed to Category 3 by the time it hit Mississippi, then was a Category 1 storm for a short while.

Figure 4. Hurricane Camille



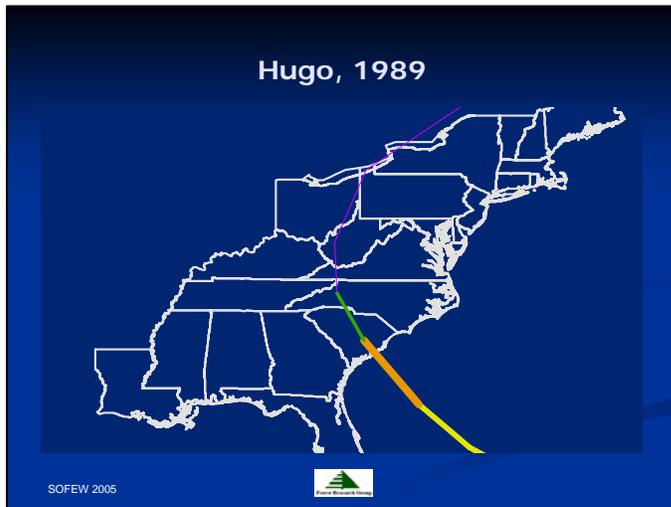
Frederic was also a bad storm for timber. It was the 7th most costly hurricane through 2003. Frederic came ashore as a Category 4 (Figure 5), slowed to Category 2, then Category 1 before leaving Mississippi

Figure 5. Hurricane Frederic



Hugo (Figure 6) first appeared as a Category 3 storm, then strengthened to Category 4 as it approached the coast. It is estimated to have damaged 20% of pine timber in the SC coastal plain.

Figure 6. Hurricane Hugo



The five storms above were some of the biggest timber-damaging storms. How often do such storms hit? How often do they strike the same area? Figure 7 shows all tracked storms since 1851. This is an impressive picture, but it includes Category 1 storms and tropical storms and depressions.

Figure 7. All Hurricanes, Tropical Storms and Tropical Depressions, 1851-2003

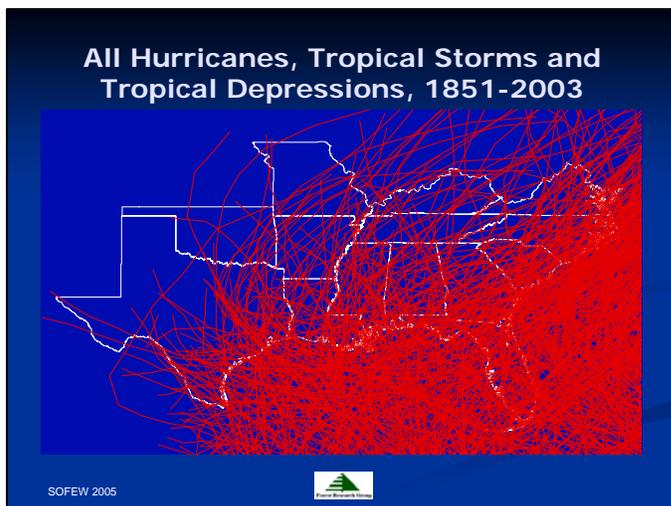


Figure 8 excludes the lesser storms and shows where Category 2 through 5 storms have hit between 1851 and 2003. It is clear from this figure that you must stay out of the coastal plain if you don't want your timberland to be hit by a hurricane. Georgia looks safe, except right along the coast. Virginia has had one Category 2 storm run along the coast, another (Isabel) turned to a Category 1 just as it reached the border, and a Category 3 dropped to Category 1 at the border. The South Carolina coastal plain has been a repeated target. There is hardly a part of Florida that has not been hit.

Figure 8. All Category 2-5 Hurricanes, 1851-2003

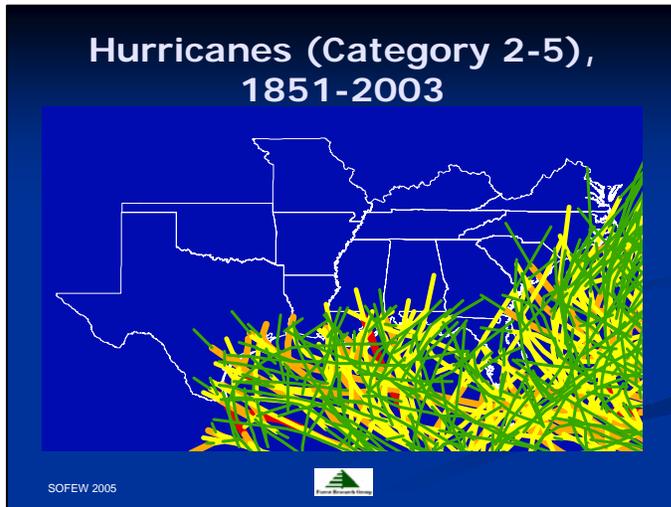


Table 4 shows the frequency of Category 2 through 5 storms hitting southern states. All states except Virginia have had more than one of these storms hit in a single year. All states except Florida have had up to 24 years between such storms—which means it is possible to go through a single rotation without a plantation being hit by a Category 2 or stronger hurricane. However, the *average* time between these storms is 3-17 years, which means it is *unlikely* that any given stand will go through a rotation without being hit.

Table 4. Category 2-5 Hurricane Frequencies for Southern States

State	Total 1851-2003	Average Years Between	Standard Deviation	Maximum Years Between	Minimum Years Between
VA	9	16.9	11.9	37	1
NC	38	4.0	5.6	25	0
SC	19	7.8	10.0	36	0
FL-north	43	3.3	3.7	17	0
GA	25	5.4	7.8	29	0
AL	22	6.7	10.4	49	0
MS	19	7.7	9.2	39	0
LA	39	3.9	4.4	24	0
TX-east	16	8.3	6.6	26	0

Conclusion

Timber damage can be significant from hurricanes that are Category 2 or stronger. The US coastal plain is subject to these hurricanes on a regular basis. The piedmont and mountains are almost never subjected to storms of this strength. Forest managers on the coastal plain must allow for hurricane damage in their management and operation plans.

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