Immediate Effects of Flooding on Forest Trees in Eastern North Carolina

Rob Trickel (North Carolina Division of Forest Resources) **Jim Steinman** (USDA Forest Service, Southern Research Station)

Abstract

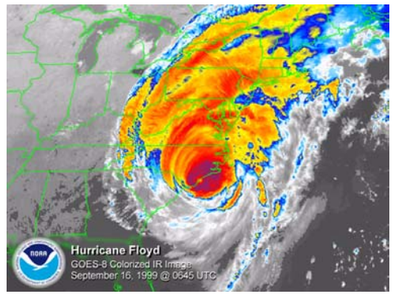
On September 16, 1999, Hurricane Floyd reached North Carolina and released more than 20 inches of rain on already saturated soils, producing inland floods that lasted for several weeks. A Forest Health Monitoring (FHM) Evaluation Project was funded in 2000 to assess the immediate effects of flooding on forest areas not accustomed to flooding. The North Carolina Division of Forest Resources led this effort by re-measuring randomly selected Forest Inventory and Analysis (FIA) plots in both flooded and non-flooded areas. Our assessment consisted of a comparison of measurements between 40 plots in non-flooded areas and 45 plots in flooded areas. The plots were located in oak-hickory, oak-pine, or loblolly pine forest types and stands that were of poletimber or sawtimber size.

Our evaluation did not show any immediate and dramatic effects of flooding on the health of forest trees in eastern North Carolina. The size (dbh) of living trees, numbers of dead trees, and incidence of damage were similar between flooded and non-flooded areas. The incidence of decay was slightly greater in flooded areas but not considered to be related to the flooding event. However, analyses do indicate some subtle effects that may become more pronounced in the future; crown conditions are somewhat poorer in flooded areas for many tree species. Long-term affects of flooding on forest trees will be evaluated using regularly scheduled re-measurements of FIA plots.

Introduction

On September 16, 1999, Hurricane Floyd reached North Carolina, dumping more than 20 inches of rain in the mid-Atlantic region. These rains combined with saturated soils from previous storms--including Hurricane Dennis only weeks earlier--to produce an inland flood disaster. Rivers crested up to 24 feet above flood stage and inundated populated areas, agricultural land, and both bottomland and upland forests

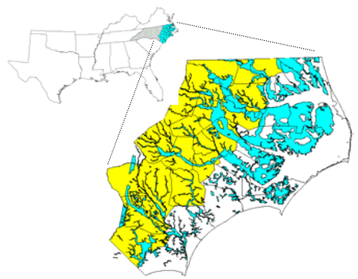
Emergency responses naturally focused on helping to alleviate losses of human life, property and agricultural livestock. Much forested land was also inundated with standing water, but effects on living trees were not readily noticed.



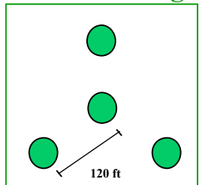
Evaluation Monitoring of FIA Plots

A Forest Health Monitoring (FHM) Evaluation Project was funded late in 2000 to assess immediate effects of Hurricane Floyd flooding on forests in eastern North Carolina. The North Carolina Division of Forest Resources led this effort by re-measuring Forest Inventory and Analysis (FIA) plots in both flooded and non-flooded areas using FHM crown and damage indicator protocols.

Evaluation Area



FIA Plot Design



Cluster of four 1/24 acre subplots

Sample Sizes

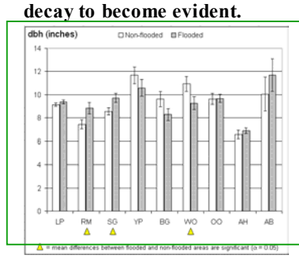
Table 1. Sample Sizes

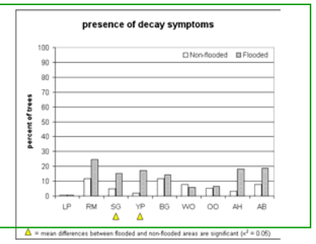
Species	Label	Non-flooded	Flooded
		number of trees	
loblolly pine	LP	629	411
red maple	RM	61	57
sweetgum	SG	120	145
yellow-poplar	YP	51	47
blackgum	BG	26	42
white oak	WO	52	53
other oaks	OO	75	138
American holly	AH	30	33
American beech	AB	13	16
Total		1057	942

We randomly selected and measured 40 plots in non-flooded areas and 45 plots in flooded areas. Selected plots had to be located in oak-hickory, oak-pine, or loblolly pine forest types and stands that were of poletimber or sawtimber size.

Comparisons between Flooded and Non-flooded Areas

Tree sizes (dbh) and incidence of damage were determined to be similar prior to flooding. The slightly greater incidence of decay in flooded areas is thought to be coincidental as more time will be needed for flood related decay to become evident.

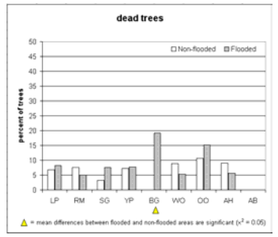




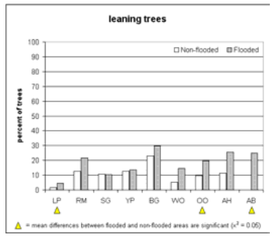
Results: Differences between Flooded and Non-flooded Areas

Species	Label
loblolly pine	LP
red maple	RM
sweetgum	SG
yellow-poplar	YP
blackgum	BG
white oak	WO
other oaks	OO
American holly	AH
American beech	AB

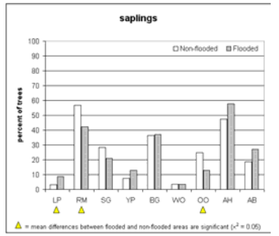
The Dead ...



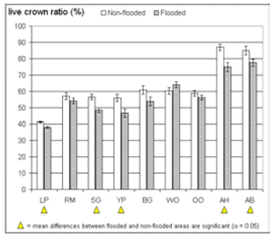
The Leaning ...

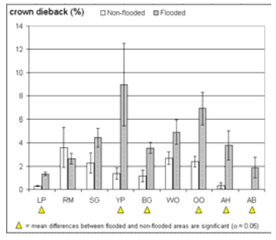


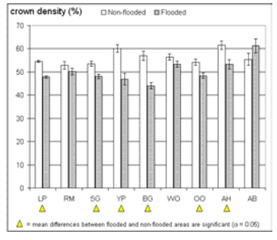
The Saplings ...

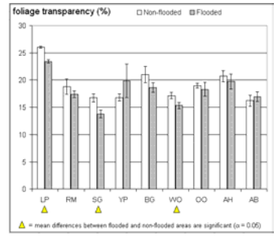


... and Crown Conditions of Living Trees









Conclusions

Our evaluation does not show any immediate and dramatic effects of flooding on:

1. tree mortality
2. leaning angle of living trees, or
3. abundance of saplings.

However, analyses do indicate the following:

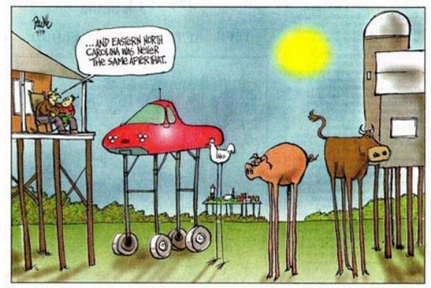
1. Crown conditions are somewhat poorer in flooded areas for many tree species.

1. Poorer crown conditions are mostly expressed through higher crown dieback and lower crown density.

2. Additional tree mortality may occur if crown conditions indeed deteriorate, or trees may actually benefit from nutrient loadings into the soil.

Assessing Long-term Effects

Long-term affects of flooding on forest trees will be evaluated using regularly scheduled re-measurements of FIA plots. Additional mortality or growth loss associated with flooding will be potentially noticeable from these data collected five to ten years from now.



Thank you: Chris Burkhardt, Tim Howell, Jamie Lytton, Richard Saunders, Robert Sykes and Tiffany Waters

Return to FHM Posters home page | Return to 2002 Posters