

# PRELIMINARY MAPPING OF OVERWASH FROM HURRICANE FRAN, SEPTEMBER 5, 1996 CAPE FEAR TO BOGUE INLET, NORTH CAROLINA



U.S. DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

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## Summary

On September 5, 1996, Hurricane Fran, a category 3 hurricane, made landfall on the North Carolina coast at Cape Fear. Two days later, the U.S. Geological Survey flew an aerial survey of the coast north of landfall to document coastal erosion caused by this storm. The survey included oblique video, 35 mm photography, and global positioning system (GPS) locations. A previous survey conducted in July after Hurricane Bertha (a category 2 storm) provides a reference for the impact of Fran. The video was interpreted to estimate the occurrence of dune overwash resulting from the storm for a 100-km section of the coast. Example pairs of before and after photography show the erosion impact at five specific locations.

## Introduction

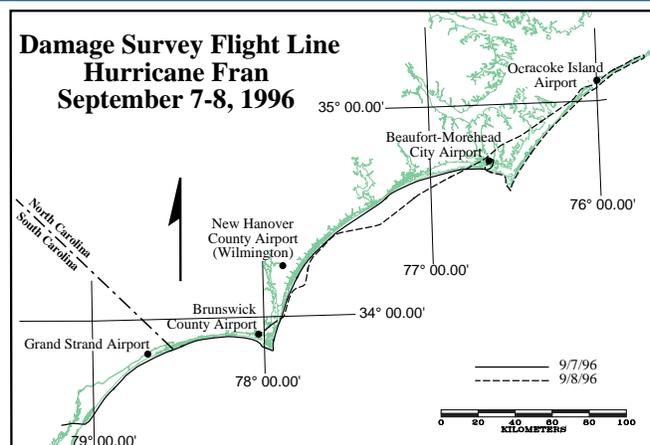
The U.S. Geological Survey has begun investigations on the effects of major hurricanes on the US coastline. The current research is intended to determine the erosion potential of major hurricanes. For this, we are using low altitude video and photography to document the erosion and storm impacts along the coast.



On September 5, 1996 at 9:00 PM EDT, Hurricane Fran made landfall near Cape Fear, North Carolina. Fran had maximum sustained winds at landfall of 115 mph (185 km/h) and a minimum central pressure of 854 mb. Fran was only the second major (category 3 or greater) hurricane to strike North Carolina in the last 30 years.

Initial reports indicated substantial damage to coastal communities due to flooding, waves, and erosion.

On September 7-8, we conducted a post-storm aerial survey of the coast extending over 300 km starting at the South Carolina line. Pre-storm information was provided by a survey conducted in July following the landfall of Hurricane Bertha, a category 2 storm, just north of Cape Fear. The two surveys permit us to evaluate the impact of Fran and ultimately provide some comparison of the relative effects of the two storms.



## Methods

The surveys were made flying in a Dehavilland DHC-6 Twin Otter operated by NOAA Aircraft Operations Center at MacDill AFB, Tampa, at a nominal speed of 100 knots (193 km/h) at an altitude of 500 feet (150 m). Video was collected using a VHS type camera. GPS latitude, longitude, heading, date and time are recorded on the video and on a personal computer. Still photography used 35 mm transparency film with time stamp from an SLR camera. Selected photographs were scanned to Kodak PhotoCD™ format for display and future analysis.

To provide an initial assessment of the erosion caused by the storm, we mapped the extent of dune overwash along the coast. At points spaced approximately 50m apart, a determination of overwash versus no overwash was made. The percentage of overwash was calculated for 500m sections of the coast and tabulated to produce Plate 1. We have mapped the 100 km from Cape Fear to Bogue Inlet, as this was the area of greatest impact.

## Conclusions

Aerial video surveys permit an immediate assessment of the degree of dune overwash resulting from this storm. Pre- and post-storm photography provide examples of the extent of overwash occurring in both developed and undeveloped areas. Extensive overwash was observed after Hurricane Fran between Cape Fear and Bogue Inlet. The overwash patterns were related to many complex factors including dune geomorphology, wave intensity, storm surge, and offshore bathymetry. Further interpretations will be expanded to cover the rest of the North Carolina coast and provide an in-depth analysis between the aerial photography and other ground based data sets.