FLOODPLAIN SEDIMENTATION DURING AN EXTREME FLOOD: THE 1999 FLOOD ON THE TAR RIVER, EASTERN NORTH CAROLINA

Scott A. Lecce, Patrick P. Pease, and *Paul A. Gares*
Tobacco Road Research Team
Department of Geography
East Carolina University
Greenville, North Carolina 27858

Catherine A. Rigsby
Department of Geology
East Carolina University
Greenville, North Carolina 27858

Abstract: This study examines floodplain sedimentation following the largest flood in the 98-yr. record on the Tar River, North Carolina. Hurricane Floyd made landfall just 10 days after Hurricane Dennis in September 1999, bringing unprecedented rainfall (30–46 cm) and flooding to eastern North Carolina. A field survey of the lower 350 km of the river showed that this >500 yr. flood deposited very little overbank sediment (<1 mm) on most of the floodplain. We used suspended sediment concentrations measured on the Tar River from 1958–1967 to suggest that the seasonal timing and sequencing of flood events in 1999 are the most probable explanations for the minimal geomorphic impact of this extreme flood. The early autumn timing of the flood coincided with crops that were mature but not yet harvested, and when natural vegetation was very dense and effective at stabilizing channel banks, hillslopes, and floodplain soils. Hurricane Dennis may have exhausted the available sediment supply and transported this sediment to the Pamlico Sound before reaching flood stage, thereby reducing the sediment available to be transported and deposited by the flood that followed Hurricane Floyd. [Key words: floods, floodplain sedimentation, Hurricane Floyd.]

INTRODUCTION

The geomorphic impact of floods with varying magnitudes and frequencies has been the focus of considerable research (reviewed by Kochel, 1988). Although Wolman and Miller (1960) concluded that the most geomorphic work (defined by the amount of suspended sediment transport) was accomplished by flow events of moderate magnitude and frequency (recurrence intervals of 1–2 yrs.), they also recognized that large floods can produce significant changes in floodplain and channel morphology. Wolman and Gerson (1978) later defined the broader concept of geomorphic effectiveness—the ability of an event to modify landforms in a way that persists over long periods of time. Such modifications require that critical thresholds for the entrainment of sediment are exceeded. Because low-frequency, high-magnitude events exert the largest forces on the landscape and have the greatest capacities to transport sediment, it is reasonable to assume that they have the

Physical Geography, 2004, **25**, 4, pp. 334–346.