

USE OF ECOLOGICAL NETWORK ANALYSIS FOR ECOSYSTEM MANAGEMENT: THE NEUSE RIVER ESTUARY AS A CASE STUDY

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Abstract

Ecological network analysis is presented as a tool for functional assessment and ecosystem management. Hypoxia and fish kills in the lower Neuse River Estuary are used as a case study. Four network models characterize the trophic structure of the estuary during early and late summer of 1997 and 1998. The trophic effect of die-offs of a pelagic species (Menhaden - *Brevoortia tyrannus*), a demersal species (Spot - *Leiostomas xanthurus*), and a mollusc (*Macoma sp.*) are examined by quantifying the response of each species' ecotrophic efficiency.

The models indicate that fish kills of 10,000, 100,000, and 1 million individuals have little or no ecological impact with respect to energy flow as long as standing stocks are relatively large. Moreover, there is no difference in energy flow when comparing a fish kill of menhaden with one of spot. The models also show that a die-off of *Macoma sp.* can have a greater ecological impact with respect to energy flow than a comparable size fish kill of menhaden or spot.

This study demonstrates that network analysis can provide an objective approach for understanding the severity and ecological consequences of environmental phenomena such as hypoxic events and fish kills.