

PhD Dissertation
Department of Environmental Science and Policy
College of Science
George Mason University

Candidate: Treda Grayson

Defense Date and Time: April 30, 2019, 1:00 pm

Defense Location: Potomac Science Center, Woodbridge, VA

Title: Responses of Benthic Macrofauna to Environmental Stressors: A Synthesis of Chesapeake Bay Data

Dissertation Director: Dr. Kim de Mutsert

Committee: Dr. Gregory Foster, Dr. Amy Fowler, Dr. Brandon Jones

ABSTRACT

Chesapeake Bay is the largest estuary in the United States, and is of ecological, historical, economic and cultural importance. The pressures of increased population density, land development, and agricultural practices have resulted in a threatened bay ecosystem that is in need of ongoing restoration and protection. There are a number of monitoring programs, research institutions, non-profit organizations, and local, state and federal agencies in the Chesapeake region that are dedicated and focused on collecting, monitoring, analyzing and developing management practices and tools to preserve and protect the Bay. Physical, chemical and biological data from these various research and assessment programs were used to identify specific individual taxa responses to specific stressors, first with correlation analysis followed by Generalized Additive Models (GAMs) to build models for amphipods *Ampelisca abdita*, *Ampelisca verrilli*, and polychaete *Spiochaetopterus costarum*. The models were tested with Delaware Bay taxa and one model – *A. verrilli* – performed well. Some model fine-tuning is necessary to make the models broadly applicable to systems outside of Chesapeake Bay. Once achieved, these models have the potential to complement benthic condition tools such as the Benthic Index of Biotic Integrity (B-IBI), to provide decision-makers with information to better manage and direct monitoring and assessment resources.