

**MS Thesis**  
**Department of Environmental Science and Policy**  
**College of Science**  
**George Mason University**

**Candidate:** Casey M. Pehrson

**Defense Date and Time:** April 13, 2020, 10:00 am – 12:00 pm

**Defense Location:** Online Defense due to COVID-19

**Title:** Trophic changes in a freshwater tidal food web after water quality improvements and invasive species (*Ictalurus furcatus*) introduction.

**Thesis Director:** Kim de Mutsert

**Committee:** Joris van der Ham, R. Chris Jones

**ABSTRACT**

An ecosystem modeling approach was used to evaluate the impacts of water quality improvement and invasive species introduction on system structure and function in a freshwater tidal ecosystem, Gunston Cove, in the Potomac River in Virginia, USA. Two trophic models were constructed in Ecopath with Ecosim using long-term survey data and used to compare aquatic communities before and after the ecosystem underwent a stable state shift in which the primary production shifted from phytoplankton-dominated to submerged aquatic vegetation-dominated. Additionally, invasive Blue Catfish were introduced to Gunston Cove in 2001. Trophic changes accompanying water quality improvement and the subsequent stable state shift were evaluated, in addition to the trophic impacts of invasive species introduction. The comparative approach allowed evaluation of the effects of both events on trophic dynamics and ecosystem maturity and function. The comparison of Mixed Trophic Impacts showed that the invasive Blue Catfish have functionally displaced native catfishes in the Gunston Cove food web by reducing the native catfish trophic impacts on the greater food web. The comparison of system metrics showed evidence of a maturing system following water quality improvement. The food web model representing Gunston Cove in the current submerged aquatic vegetation stable state provides a foundation for future research and evaluation of management and policy decisions.