



Environmental Science  
& Policy Program  
at Michigan State University

# Macrosystems Ecology: Tackling Regional-to-Continental Scale Ecological Challenges

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### ESPP and Fisheries & Wildlife



**ABSTRACT:** Many critical 21st century ecological challenges occur over macroscales — regional-to-continental expanses. These macroscale challenges include biological, geophysical and even socio-cultural phenomena like species invasion, climate change, and habitat alteration. Despite their importance, macroscale phenomena have been studied inadequately. They have typically been examined in isolation and researchers have not, until recently, considered that macroscale-level ecological problems form macrosystems, or complex networks in which macroscale components interact with one another and with phenomena occurring at other spatial scales. This presentation will focus on my dissertation research, which applies a macrosystems-informed approach to the study of mosquito-borne disease. I examine whether local-scale wetland characteristics — wetland size, connectivity, and inundation regime — have an important effect on macroscale human West Nile virus (WNV) outbreak in the northeastern and midwestern United States. My findings suggest that the aggregated effects of phenomena occurring within individual wetlands are associated with 100 to 300 percent increases in macroscale human WNV incidence, and that these patterns may be mediated by other spatial and non-spatial factors such as vector species-specific traits and regional climate. This new understanding, facilitated by a macrosystems approach, can help to predict the occurrence of WNV outbreaks and can inform policy aimed at ameliorating the risk of potentially devastating human infections. Additionally, the panel discussion after my presentation will address several other applications of a macrosystem approach, including research on co-dependent human and natural ecosystems, and on geographical variation in nutrient concentrations and carbon storage in lakes.

### Panelists

Dr. Kendra Spence Cheruvelil, Associate  
Professor, Lyman Briggs College,

Department of Fisheries and Wildlife

Dr. Sarah Collins, Postdoctoral Research  
Fellow, Department of Fisheries and

Wildlife

Dr. Jean-Francois Lapierre, Postdoctoral  
Research Fellow, Department of Fisheries  
and Wildlife

3:30 p.m.

Thursday

Feb. 25, 2016

274 Giltner Hall

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