Title: Modeling the effect of avian stage-dependent vector exposure on enzootic *West Nile virus* transmission and control

Abstract: *West Nile virus* (WNV) is major public health concern in the United States. Seasonal WNV outbreaks have been widely observed to be associated with the end of the avian nesting season. Newly hatched birds, or nestlings, have less feather coverage and fewer defense mechanisms than older birds, rendering them more vulnerable to mosquitoes. While total avian population size increases throughout the season, nestling abundance declines at the end of the brooding season. We investigate how this temporal variation in host stage abundance, along with the differential exposure of these stages to mosquito bites, may structure enzootic WNV transmission with a novel mathematical model incorporating avian (host) stage-structure and within-species heterogeneity in the form of stage-specific mosquito (vector) biting rates. Currently, the main control methods for WNV are mosquito larvicide and adulticide. We use optimal control as well as genetic algorithms to explore the viability of nestling vaccination as a new form of WNV control.