

# An Agent-Based Ecological Model of West Nile Virus for Classroom Use

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West Nile virus (WNV) first invaded North America in 1999; its death toll now exceeds 2,100. WNV is known to result from the bite of mosquitoes and to be carried by birds. The ecological complexity of the interactions among the three actors—mosquitoes, birds and human beings—is extensive and is the subject of intense ongoing study. This project applies the well-known shareware program NetLogo to present an agent-based ecological model of WNV for use in an upper-level biology or ecology class. The model incorporates the complexity of disease spread while remaining simple and user-friendly. The number of mosquito bites in a given area depends on the temperature and the moisture levels; their appetite for particular species of birds and humans changes as the summer progresses. The bird species vary in their host competence—the degree to which blood from an infected bird is sufficiently virulent to infect a third party—their migration and roosting patterns, and their reproductive cycles. This model is intended as a teaching tool and to serve as an introduction to agent-based modeling for non-mathematicians. Students can add or omit variables, giving them hands-on experience with the modeling process and with the use of models to address a real-life problem such as the spread of disease.