

1154-92-2064

Greg Dwyer* (gdwyer@uchicago.edu), 1101 East 57th Street, Department of Ecology and Evolution, University of Chicago, Chicago, IL 60637-1573. *Using epidemiological theory to guide the use of pathogens in pest control.* Preliminary report.

Outbreaks of forest insects can cause severe defoliation, leading to widespread tree mortality, with severe impacts on timber production and recreation. Epidemics of naturally occurring viral diseases mitigate these effects, but often do not occur until defoliation has already caused high tree mortality. The ability to predict in advance when natural epidemics will occur would save the USDA Forest Service millions of dollars that would otherwise be spent on pest control. Models from human epidemiology can provide useful descriptions of the dynamics of insect viruses, but their parameters must be estimated from disease spread in nature, which in turn requires the application of advanced nonlinear fitting algorithms and high-performance computing. We used such an algorithm to fit an epidemiological model to data for the spread of a virus of the Douglas-fir tussock moth, a pest of fir trees in western North America. In 2019, we successfully used this model to help the Forest Service identify outbreaking populations that would collapse naturally, and to identify populations that should instead be subject to insecticidal spray. Our work demonstrates the usefulness of statistical computing in guiding resource management. (Received September 17, 2019)