

## ABSTRACT

Mathematical Models of Insect Movement with  
Emphasis on Boll Weevil Emigration. (May 1976)

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The dispersal from initial residence locations of such insects as the Mexican boll weevil is an important factor in their persistent existence. Insects and other small organisms dispersed from a point of initial concentration frequently produce a pattern of population density steeply peaked at the point of origin. Various researchers have fitted a variety of curves to data of this type. Models based on Gaussian diffusion can also describe these patterns.

The insect is assumed to move randomly so that a Gaussian diffusion model describes the basic dispersal process. Several models of the duration of dispersal activity are considered. As a simplest case the flight time durations are assumed to be exponentially distributed random variables. The total time spent

in dispersal may result from a series of flights. The successive flight durations are assumed to follow exponential distributions with means either all the same or all different. Gamma distributed flight durations are also used. Some consideration is given to a random number of flights. Wind effects are examined in some models. Certain of the derived models, primarily the simplest one; are fitted to data from the literature. Several other models found in the literature are compared using the same data. Since modified Bessel functions figure prominently in the derived models, a brief survey of modified Bessel functions involved in statistical distributions is given.