

DEMONSTRATION OF THE GYPSY MOTH ENERGY BUDGET MICROCLIMATE MODEL

D. E. Anderson¹, D. R. Miller¹ and W. E. Wallner²

¹University of Connecticut, Storrs, CT

²USDA Forest Service, Northeastern Forest Experiment Station,
51 Mill Pond Rd., Hamden, CT 06514

ABSTRACT

The use of a "User friendly" version of "GMMICRO" model to quantify the local environment and resulting core temperature of GM larvae under different conditions of canopy defoliation, different forest sites, and different weather conditions was demonstrated.

The model is a steady-state, one dimensional, numerical simulation of hardwood forest canopy and sub-canopy microclimate which was developed to examine some insect-host-environment interactions. The microclimate sub-model calculates radiation, leaf and air temperatures, and vapor pressure profiles. Soil and litter temperatures are calculated by the force-restore method. Caterpillar temperatures at each layer and for two contrasting resting positions are calculated with a four term energy budget equation. As the canopy undergoes defoliation by the insect, the model calculates the projected changes in microclimate.

In the PC version demonstrated here, the user can easily input various sites (slope, aspect, latitude), forest canopies, weather conditions, insect instars and time of the day. Therefore, comparisons of various conditions can be made and the effects of changes in these variables on the microclimate and larvae temperature at various locations in the forest from the top of the canopy to beneath the litter can be quantified.

The model can similarly be used to examine the physical environment of predators and parasites. Researchers in these areas are encouraged to try using the model.

The authors will give it, with instructions and help, to anyone interested in using it. It currently requires an IBM 286 PC or compatible to run the user friendly menu version. It can be made available as uncompiled Fortran77 code for use on the DG system or other mainframes.