LANDSCAPE ECOLOGY OF GYPSY MOTH IN THE NORTHEASTERN UNITED STATES

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ABSTRACT

The gypsy moth was accidentally introduced to North America near Boston by E. Leopold Trouvelot in 1869. Since that time, the range of the gypsy moth has slowly spread and the generally infested region presently extends as far as Ohio, West Virginia, Virginia and North Carolina. A separate isolated but expanding population exists in Michigan. The goal of this study was to quantify the process of gypsy moth spread through North America and relate the process to other landscape features. The ultimate purpose of this research is the development of sound predictions of future gypsy moth spread.

The past spread of the gypsy moth in North America was quantified from historical quarantine records. Since the enactment of the Domestic Plant Quarantine Act of 1912, the federal government has designated certain parts of the United States as officially "infested" by the gypsy moth. Though there has been some variation in detection methods used to make this designation, it is the only record we have of past gypsy moth spread. We compiled these historical records to designate the yearly infestation status of each county in the United States and similar records that designate the status of each census district in Canada. We used the IDRISI geographical information system (GIS) to manage these data. County and census district coordinates were imported from the SAS system and were used to define the geographical boundaries of historical infested areas.

We used the historical spread data from 1966 to 1986 to model a county's time to infestation as a function of its minimum distance from the generally infested region and the county's mean minimum January temperature. The minimum distance was calculated using the GIS and minimum temperatures were interpolated from 30 year historical weather station data collected through out the area. Both distance and temperature contributed statistically significantly to the model. Extremely cold winter temperatures can kill overwintering gypsy moth egg masses and this is the most likely explanation of the effect of January temperatures on spread. When we applied the spread model that was developed from 1966-1986 data to the 1900 data, it greatly over-estimated the rate of spread from 1900-1950. This indicated that the rate of spread over the last 20 years has been much greater than it was during the earlier part of the century. There are many possible reasons for this change and we are currently attempting to incorporate this process in an improved model.