2138

POTENTIAL FOR GYPSY MOTH PROBLEMS IN SOUTHWEST OREGON

by

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ABSTRACT—Gypsy moth could become established in southwest Oregon. Numerous plant species native to the area appear to be suitable hosts, the oaks and Pacific madrone being particularly susceptible. Damage potential is highest in the interior valleys and surrounding foothills, with damage to conifer species likely limited to those growing in mixed stands with broadleaf hosts such as oaks, madrone, and alder.

KEYWORDS—Gypsy moth, Lymantria dispar, conifers, western host plants.

INTRODUCTION

The gypsy moth, Lymantria dispar (L), is a major defoliator of hardwood forests in Europe, western Asia, and northeastern North America (Doane and McManus 1981). Until recent years the western United States has been free of this pest. Since about 1980, however, detections of isolated infestations of gypsy moth have increased in the West, particularly in Washington, Oregon, and California. This trend coincides with a major four-year population explosion of gypsy moth in 1980-1983 when the insect defoliated more than 29 million acres in the northeastern United States. This major outbreak supplied a large reservoir of egg masses for accidental transport on vehicles, boats, outdoor furniture, etc., to new sites of introduction.

The situation in Oregon became particularly serious in 1984 when some 20,000 gypsy moth males were captured by pheromone-baited detection traps, and heavy egg mass deposits were discovered on rural forest land near Pleasant Hill, Oregon (Lane County). As part of a plan to eradicate the extensive Oregon infestations, over 220,000 acres of rural and urban lands were sprayed in 1985 with multiple applications of the microbial insecticide Bacillus thuringiensis (B.t.). The effectiveness of those sprays is still being evaluated, but already in 1985 the annual detection survey with pheromone-baited traps has turned up a new infestation of this pest near Glide, Oregon (Douglas County).

Because of an established gypsy moth population in the eastern United States and a continuing flow of travelers from that area, it is clear that the pressure of new introductions of this pest will continue, regardless of the effectiveness of eradication programs against isolated, local infestations. These circumstances make it realistic for the western states to consider where and how gypsy moth may pose a threat within their boundaries. In this paper we have attempted to evaluate the potential problems that may be caused by gypsy moth in southwest Oregon. By necessity some statements are speculative, although we have a degree of predictive capability based on activities of this insect elsewhere and on current research on host susceptibility being conducted at Oregon State University.

SUITABILITY OF NATIVE PLANTS AS HOSTS FOR GYPSY MOTH

More than 300 plant species are known to be adequate hosts for gypsy moth (Leonard 1981), but little is published about the suitability of plants native to

western North America as potential hosts for this insect. Jobin (1981) found that second instar and older larvae would feed and complete development on Douglas-fir, Pseudotsuga menziesii (Mirb.) Franco, and that all larval stages fed and completed development on western hemlock, Tsuga heterophylla (Raf.) Sarg. Studies of host suitability and preference were begun at Oregon State University in 1982. In this paper we have summarized preliminary findings about (1) suitability of selected western tree and shrub species for feeding and development and (2) preference of larvae for difference species when offered a choice in small laboratory cages.

Host-Plant Evaluations

Eleven conifer species and more than 100 broadleaved species native to Oregon were evaluated. Many of these are native to southwest Oregon. In this test, clipped foliage supplied with water was placed in a 1-pint plastic container with three larvae. Each container was supplied with one particular diet of foliage. If first instar larvae died, second instars were then tested on the same host, and so on.

Results of this evaluation show gypsy moth can survive on a variety of plant species native to southwest Oregon. Among the conifers, members of the Pinaceae appeared to be moderately suitable as host plants, whereas the Taxodiaceae were marginally suitable and the Taxaceae and Cupressaceae unsuitable. There was much variation among the broadleaf species evaluated, with the extremes represented by the highly suitable Fagaceae and the very unsuitable Oleaceae. Table 1 provides specific examples of southwest Oregon tree and shrub species according to their relative suitabilities for gypsy moth growth and development. The different categories of host suitability are based on rate of larval development and pupal weights attained. The "very suitable" host category contains the top 25 percent of the plant species for rate of development and pupal size, whereas the "moderately suitable" category represents host plants that supported insect growth and development through pupation but with a slower rate of growth and lower pupal weights. The "unsuitable" category includes plants the larvae would not touch or on which they fed only lightly and failed to complete development to adulthood.

Broadleaf-Conifer Host Preference Evaluations

Because of their high timber value, Douglas-fir and western hemlock were the two coniferous species emphasized in this feeding experiment. Oregon white oak or Garry oak, Quercus garryana Dougl., and red alder, Alnus rubra Nutt., were the two broadleaf species selected because of the likelihood of their being suitable host plants for gypsy moth, their occurrence in mixed stands with several western conifers, and their abundance near urban areas where gypsy moth introductions are most likely to occur.

Choice tests with first instar larvae were conducted utilizing foliage of Oregon white oak, red alder, Douglas-fir, and western hemlock. Larvae were placed in a 1-pint plastic container with two types of foliage offered in paired choice tests. Four twigs, two of each foliage type, were placed in the containers in a crosswise pattern. Two larvae were placed on each of the four twigs. The relative amounts of defoliation, the frass production, and the location of the larvae were observed at days 3, 6, and 9. Each trial was replicated twice.

The results demonstrated that the two broadleaf species, in particular Oregon white oak, were highly preferred to the coniferous species. For the two conifers, Douglas-fir was preferred to hemlock, and particularly the one-year-old needles of Douglas-fir. These laboratory findings were partially validated by field observations in Lane County, Oregon, where most evidence of gypsy moth feeding was found on oak, with visible defoliation to Douglas-fir being generally limited to trees with foliage adjacent to or mixed with oak foliage. Red alder and western hemlock were not present in the heavily infested area. In summary, the insect prefers Garry oak to red alder, red alder to Douglas-fir, and Douglas-fir to hemlock.

TABLE 1.

RELATIVE SUITABILITIES OF SELECTED SOUTHWEST OREGON TREES AND SHRUBS AS HOST PLANTS FOR GYPSY MOTH.

Very suitable	Moderately suitable	Unsuitable
Oregon white oak	Maples	Himalayan blackberry
Pacific madrone	Alders (other than red)	Dogwood
Canyon live oak[a]	Oregon grape	Oregon ash
Tanoak[a]	Chokecherry	Ceanothus spp.
Red alder	Poplars	Rhamnus spp.
Manzanita	Rose (sweetbriar)	Snowberry
Willow	Hawthorn	California juniper
Hazel	Douglas-fir	Pacific yew
California black oak	Pines	Western redcedar
Poison oak	Western hemlock	Port-Orford-cedar
Huckleberry	Coast redwood	Incense-cedar
Salal	Spruce	California laurel
	Thimbleberry	
	True firs	
	Pacific bayberry	

[a]Smaller larvae require new foliage in order to complete development.

SUITABILITY OF CLIMATE

Are there climatic characteristics unique to Oregon, and southwest Oregon in particular, that might check gypsy moth infestations? Certainly the Oregon weather patterns vary greatly by subregion, but it is doubtful that climate will prove a serious barrier to establishment of this insect in much of the State. The gypsy moth already has demonstrated its ability to multiply to heavy densities in the western Oregon, Lane County, infestation. Also, the existence and pest status of this insect over much of Europe, western Asia, parts of North Africa, and North America (Leonard 1981) indicate its adaptability and general success in coping with a wide variety of physical environments. In the extreme, we can make some marginal predictions about regional susceptibility and climate. Surely the harsher conditions at higher elevations will be less hospitable to gypsy moth than the interior valleys and lower slopes of the Cascade Range, the Siskiyou Mountains, and the Coast Ranges. The cool, damp, marine air in much of the Coast Ranges may influence success of the gypsy moth, but a determination will likely have to await the test of time and the moth's performance in such areas.

POTENTIAL IMPACTS OF THE GYPSY MOTH

In North America the gypsy moth has been known primarily as an urban pest of ornamental hardwood trees in the northeastern part of the United States. There is little doubt that the insect could also become an urban pest in southwest Oregon, damaging ornamental trees and shrubs and possibly causing mild health problems from allergic reactions to the insect's hairs. Further, however, is the possibility of the insect causing other kinds of direct economic and environmental impacts. Such a possibility is of particular importance in southwest Oregon because of the significance of the forest to the local economy. The following is a list of potential impacts that could result from gypsy moth establishment in an area like southwest Oregon:

1. Quarantines on shipments of restricted commodities (Christmas trees, firewood, nursery ornamentals, logs, lumber)

2. Increase in agricultural costs (additional pesticide treatments)

3. Increase in costs to timber industry (special packaging or treatments to meet regulations for export or interstate shipment)

4. Forest damage (tree mortality and growth loss)

5. Urban nuisance problems (ornamental damage; malodorous fecal material and dead insects; larvae in yards, on cars, in and on houses, etc.)

6. Health problems (allergic skin reactions from urticaceous larval hairs, respiratory problems for some individuals)

7. Increase in pesticide use (increased use of pesticides by public agencies and private individuals to minimize all the above impacts)

Quarantines and increased agricultural and timber production costs could result from the detection of only light and scattered infestations of gypsy moth. Any product entering interstate commerce or export to another country can be discriminated against because it may harbor gypsy moth eggs. Consequently, selected products may be banned from certain routes of commerce merely because of light infestations at the source location which provide the possibility of pest introduction. Such circumstances can lead to partial loss of markets, or costly precautionary treatments necessary to certify pest-free commodities. An obvious example of such a commodity is the Christmas tree. Christmas tree growers in the Lane County area met with varying degrees of difficulty in 1984 when marketing their trees. These difficulties originated from quarantine regulations calling for fumigation of trees to be shipped, and from interpretations and resulting prejudices of buyers regarding the gypsy moth situation in Oregon. As a consequence, most Oregon Christmas tree growers have resorted to "insurance" sprays with carbaryl in 1985. This is perhaps a classic example of how the possible presence of the gypsy moth can (1) lead to quarantine regulations, (2) increase production costs, and (3) increase the use of pesticides.

The potential of gypsy moth infestation can also lead to increased costs to the timber industry and for the production of certain agricultural crops. Products for interstate commerce or for export, particularly to Asian markets, may have to be treated prior to shipment. Logs may have to be debarked, mulch products may require heat treatments, and veneer and lumber may have to be treated in some way to ensure that viable gypsy moth eggs will not be transported with the product. In the orchard industry, increased sprays may be necessary to guard against potential damage to pears, apples, filberts, and possibly other crops. Where gypsy moth populations reach outbreak proportions, we can expect forest damage by tree mortality and growth loss; by the usual urban problems of high nuisance factor from larvae crawling in and on houses, cars, outdoor furniture, etc.; by the health hazard from the insect's hairs and body parts causing allergic reactions; and finally, by the damage to shade trees and ornamental plants in the community. Use of pesticides would again increase as homeowners and public officials attempted to lessen the various effects of gypsy moth infestation.

DISCUSSION AND SUMMARY

It is clear from the studies on host suitability and by the performance of the gypsy moth in Lane County, that parts of southwest Oregon are susceptible to infestation by this pest. The interior valleys and lower elevations are perhaps most susceptible because these areas harbor a high proportion of the hardwoods and evergreen trees and shrubs that are suitable hosts. Most of the human population in these interior valleys exist in the cities of Roseburg, Grants Pass, Medford, and Ashland. Accordingly, it is in these communities and nearby parks and other recreation sites that the gypsy moth is most likely to be introduced by travelers from the heavily infested eastern United States. Surrounding these communities are habitats that are generally highly hospitable to the gypsy moth because of the prevalence of oaks, madrone, tanoak, and other plant species categorized as suitable or very suitable. In addition, the towns and cities contain many other exotic trees and shrubs that are favored as host plants. Thus, the stage is set for continued

introduction and establishment of gypsy moth in the interior valleys and lower elevations of southwest Oregon.

Projections of how damaging gypsy moth might be outside the interior valleys of southwest Oregon is more speculative. The insect's success in the valleys and up to elevations of about 1,200 feet appears generally assured. The next level of 1,200 to about 2,500 feet might be categorized as a probable problem zone because of the prevalence of broadleaved species such as madrone and the oaks mixed with the conifers (Franklin and Dyrness 1973). We do not anticipate serious gypsy moth damage where conifer species predominate on a site. For this reason, it is doubtful that this insect will ever become a pest in southwest Oregon at elevations higher than 3,000 feet. In the coastal mountains where there is an influence of the cool, damp, marine air from the Pacific Ocean, the question of gypsy moth success is again speculative. Many suitable hosts exist in this area, but the influence of the mild but wet physical environment is not known. Also, the synchronization of host plant phenology as it corresponds to egg hatching and other critical points in the insect's life cycle may differ in this zone.

Numerous negative impacts are associated with the gypsy moth. Economic impacts can result from quarantine regulations restricting shipments of certain commodities; increased pesticide treatments related to gypsy moth problems are costly; heavy infestations could reduce productivity in the forests where commercial timber species grow in mixtures with the more susceptible broadleaved hosts; and health and nuisance problems related to heavy infestations can develop in communities. When populations have reached epidemic proportions in the eastern United States, gypsy moth impacts have negatively affected property values. All such negative impacts result in greater pesticide use in forest, agricultural, and urban environments.

On the plus side, there is the possibility that an established gypsy moth population could be partly beneficial to southwest Oregon. The insect's preference for certain shrub and tree species to others could alleviate some of the brushfield problems in this area. Its preference for the oaks and red alder to the conifers, for instance, would appear to favor growth of species preferred by land managers. In a high density infestation, however, it is most likely the conifers would also suffer heavy damage where they were mixed with the more susceptible host plants.

The Oregon Department of Agriculture and cooperating public agencies are conducting very thorough surveys to detect new infestations of this pest. These annual surveys are designed to pinpoint new infestations at an early stage when eradication may still be a feasible option. Perhaps the most prudent recommendation that can be made to land managers and residents of the southwest Oregon region is to support this annual survey program to the extent possible. This pest may ultimately become established throughout Oregon, as it has over much of the northern hemisphere. The potential damage it can cause, however, is sufficient to warrant our concerted efforts to keep it from permanent establishment as long as possible.

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2138

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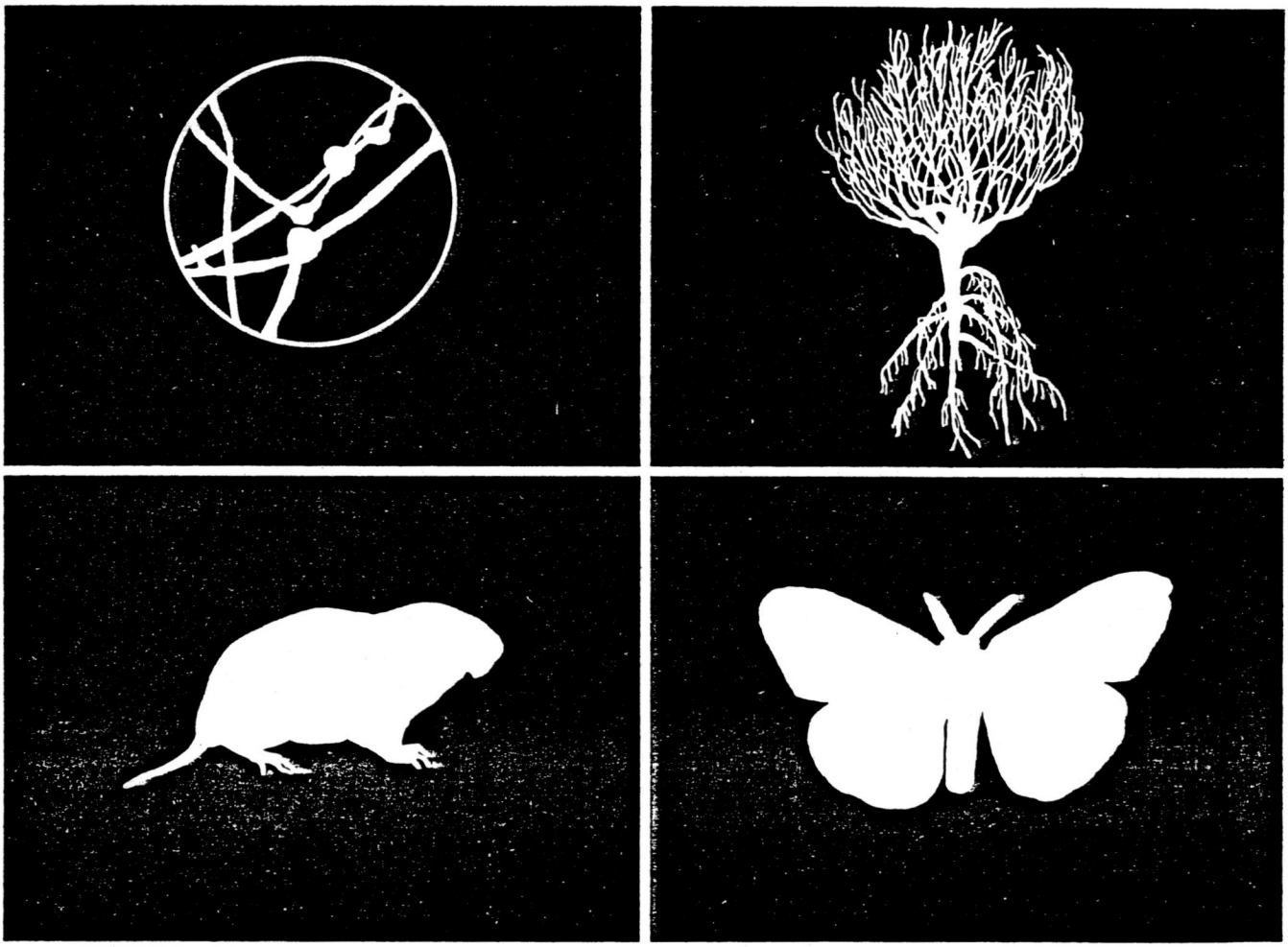

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