Japanese Beetle and Gypsy Moth: Key Pests in Michigan

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Japanese Beetle

Japanese beetle substantially increased its' range around the Detroit area this year with many reports of beetle swarming coming in from Macomb County and Lakeford township. Areas around Monroe, Battle Creek, Jackson and Kalamazoo continued to have problems with Japanese beetles.

Superintendents usually discover Japanese beetle or European chafer grubs in September or May, peak times for grub feeding and the resulting turf injury. These are also peak feeding times for skunks and raccoons that tear up turf in search of the grubs. Many times skunk damage is observed first before the grubs are found. Irrigated turf has a tremendous ability to recover from insect injury. However fairway turf with more than 20 grubs per square foot is at high risk to water stress because the root system becomes heavily pruned. More than 10 grubs per square foot may result in brown patches in turf that is not irrigated. It is wise to check for grubs in fairway turf in late August. Dig several square foot sections and count the number of grubs. If many grubs are found (>20/ft^2), late August and early September are the preferred times to apply an insecticide. All of the insecticides in Table 1 are effective against grubs. In general, Japanese beetle is easier to control than European chafer. The degree of control is highly variable from site to site and year to year. About the only consistent differences have been that Triumph (tees and greens only) is usually one of the most effective treatments (80-99% control) and Sevin or Sevimol one of the least effective (50-80%). In tests with European chafer it is not unusual to see that the best treatment only provides 70% control.

Be sure to apply all products at the proper rate for grub control, which is usually higher than the rates for other turf insects. When applying Mocap be careful not to overlap granular application too much or you may see some yellowing. All the sprayable materials must be watered immediately after application with 1/2" of irrigation. Early morning or evening is the preferred application time for sprayables. Be sure your water pH is at a level compatible with the insecticide. Several products such as Dylox with Turcam break down rapidly in high pH water. If your irrigation water is at a high pH choose a product that is stable in your pH range. Buffering the water in your spray tank will preserve the insecticide while it is in the tank but once it is applied to turf and irrigated heavily with high pH water it may break down at that time unless the turf and soil buffers the irrigation water.

Three weeks after applying an insecticide return to where you took the original grub samples and collect another set of samples. This will tell you how effective the insecticide was.

Milky Spore and Insect Parasitic Nematodes

Results of tests where milky spore has been applied for grub control have been consistently poor (0% control). I would not use the milky spore products until better test data are obtained. The insect parasitic nematodes also performed poorly in grub control tests last year (0-50% control). However, better results were obtained for cutworm and webworm control. It is on the label for the Biosafe and Biovector that they can be used for cutworms and webworms, but grubs are not mentioned. Insect parasitic nematodes may still be a good option for control of European chafer and June beetle grubs where insecticides are not very effective. If nematodes are applied, spray in early morning or evening. Water turf lightly before (1/4") and after application (1/4"). Do not apply nematodes to dry turf.

Table 1. Insecticides labeled for control of grubs in turf.

Insecticide	Amount per acre	Signal Word
*Triumph 4E	2.0 qt.	Warning
Oftanol 5G	40.0 lb.	Caution
Oftanol 2I	4.0 qt.	Warning
Proxol 80SP	10.2 lb.	Danger
Dylox 80SP	10.2 lb.	Danger
Mocap 5G	100.0 lb.	Warning
Turcam 76 WP	5.6 lb.	Warning
*Diazinon Ag500	6.0 qt.	Warning
*Diazinon 4E	5.5 qt.	Warning
Sevin 4SL	8.0 qt.	Caution
Sevin 80S	10.8 lb.	Caution

*Do not use Diazinon on golf courses or sod farms. Do not use Triumph on golf course fairways or sod farms. Triumph may be used on tees and green in Michigan.

Gypsy Moth

In 1990 the gypsy moth defoliated (>50% leaf loss) 350,000 acres in a 20 county area of central Michigan (Fig. 1). Nineteen counties participated in aerial spray programs where a microbial insecticide (Bacillus thuringiensis, B.t.) was applied to provide relief from dense populations of caterpillars and to protect woodlot trees from defoliation. State forest lands are not treated. As the number of counties experiencing gypsy moth defoliation grows to over 30 next year, more golf courses, landscapers, and city managers will be called on to protect trees and provide information about the gypsy moth.

Gypsy moth caterpillars can be annoying underfoot and around the home, especially during outbreaks. At this time caterpillars are common and are found munching on leaves of a variety of hardwood tress, including oak, birch, and aspen. Unhealthy trees are weakened by defoliation. This makes them subject to other insects and diseases which can kill a tree.

Fortunately, healthy trees are far less susceptible to the effects of gypsy moth feeding. Fertilizing in the spring and fall, watering frequently during dry spells, and avoiding mechanical damage and soil compaction will help keep your trees in good condition. A healthy hardwood tree can be stripped of all its leaves two or three years in a row without suffering any serious problems. During the three to four week period following defoliation, the tree will regrow the leaves which have been eaten. This is because healthy trees have a reserve of nutrients stored in their roots for replacing those lost to leaf-eating insects such as the gypsy moth. Still, defoliation is a nuisance and, in some cases, a potential threat to your trees. There are a number of techniques that can be used to help protect trees during gypsy moth outbreaks.

Preventive tree maintenance (April through October)

The best defense against the gypsy moth is to maintain healthy trees. A deciduous tree which loses 60 percent or more of its leaves will refoliate and continue to grow. It pays a price, however, in that it must utilize its energy reserve for the following year. This can place the tree under a considerable amount of stress. Coniferous trees, such as pines and spruces, are more likely to die from a single defoliation. However, they are not a preferred food and are only fed upon by the gypsy moth when other food has run out. Stressed trees are more likely to recover if they are provided with adequate water, sunlight and nutrients.

Watering (homeowners)

A tree will better withstand the effects of defoliation if adequate water is available. This is particularly true during periods of drought. Generally, 1 inch of water per week is considered sufficient during the growing season. An open container or rain gauge can be used to determine when supplemental water is needed. Periodic, heavy waterings are more effective than frequent, light waterings. In order for the tree to fully utilize the available moisture, soil in the area near shade trees should not be disturbed or compacted. This can adversely affect tree growth and health.

Fertilization (homeowners)

Providing additional nutrients can be of value in helping defoliated trees survive. While healthy trees growing on well-fertilized lawns do not normally benefit from added nutrients, those growing in or adjacent to areas where gypsy moth is established may be candidates for fertilization. Slow release formulations

containing a high percentage of nitrogen are recommended. These are available at your local nursery or garden store. Be sure to follow label directions.

Thinning (woodlot owners, homeowners)

Proper management through thinning can prevent dead trees. Thinning provides trees with an adequate supply of sunlight and ample room to grow. When thinning a stand, cut trees which are stressed, decadent or otherwise unhealthy. Leave those which appear to be growing well. Thinning should be done between gypsy moth outbreaks. Thinning is a tricky process involving a number of factors, including soil conditions and tree species and age. If you are unsure about how to do this you should consult a professional forester or arborist.

Planting (homeowners, woodlot owners)

Proper planting can help minimize future gypsy moth problems. Planting tree species less desirable to the gypsy moth is an effective, long-term approach. Species such as ash, maple, hickory, dogwood, mountain ash, and most conifers are largely ignored by the pest and are an attractive alternative for use in landscaping. While elimination of oaks from a woodlot may not be desirable, maintaining species diversity is important in managing the gypsy moth (Table 1).

Biological techniques (May)

When a decision is made to utilize an insecticide during a gypsy moth outbreak, it is important to remember that it will **not** eliminate gypsy moth from the treated area. It may, if applied correctly and at the right time, help decrease defoliation during the outbreak.

Bt

Several commercial preparations of the bacterium Bacillus thuringiensis area available. They are the safest pesticide currently labelled for use against the gypsy moth. Bt only kills caterpillars, is safe for use near water, is harmless to mammals (including humans) and birds when used as directed, and does not affect the natural enemy complex of the gypsy moth.

In order to be effective, Bt must be applied when the larvae are less than 1 inch long. Populations must be watched carefully to determine when larvae are at this susceptible stage. In order to achieve satisfactory results, more than one application may be needed. Bt can be applied from the ground, but it must reach the top of trees to be effective. A certified commercial pesticide applicator may be needed to apply the insecticide to large trees.

Chemical techniques (May)

The following chemicals have been registered for use against the gypsy moth and will kill larvae when used according to label directions. As with Bt, they should be used only as a means of protecting foliage, and then preferably only when other methods are inadequate. Remember that chemical pesticides are not a long term solution. In most cases it is best to wait at least one year after gypsy moth caterpillars are first observed before applying a chemical spray. Populations usually decline naturally after 2-3 years of infestation. Conifers growing in an area where defoliation is heavy may require treatment in the year that feeding is observed, since they can only sustain a single defoliation. **Follow pesticide label directions**. Note that some chemicals listed can only be applied by a licensed commercial pesticide applicator.

Acephate (Orthene®) is used as both a ground and an aerial spray. It is toxic to gypsy moth parasites and insect predators.

Carbaryl (Sevin®) is used as both a ground and an aerial spray. It is toxic to gypsy moth parasites and insect predators. It is also extremely toxic to honeybees.

Difubenzuron (Dimilin®) is an insect growth regulator which inhibits development of the gypsy moth. While it is not toxic to gypsy moth parasites and predators, its use is restricted to forested and sparsely inhabited areas.

Malathion is a nonspecific insecticide which kills a wide variety of insects, including gypsy moth parasites and predators.

Methoxychlor is a nonspecific insecticide which is toxic to several types of insects, including gypsy moth parasites and predators.

Phosmet (Imidan®) is used primarily as a ground spray. It is not toxic to bees, but it will kill gypsy moth parasites and predators.

Chemical systemics

A number of chemicals are available in a form which can be taken up directly by the tree (e.g., Acecaps®, Medicaps®). These implants can be inserted directly into the tree trunk where they are absorbed and transported up to the foliage. They have been shown to be effective in reducing defoliation when used as directed. Systemic implants are an alternative to the homeowner or commercial pesticide applicator interested in reducing defoliation but concerned about the effects of aerial spraying. Because they are relatively expensive and time-consuming to use, they are not practical for use on a large scale.

Table 1. Susceptibility of shade and flowering trees to gypsy moth. Homeowners who have the most susceptible trees (Category I) should maintain their vigor and health and use B.t. or an insecticide to prevent more than 50% leaf loss. Obtain MSU Extension bulletin E-1947, "Planting & Care of Ornamental Landscape Plants". Trees in category II rarely suffer more than 30% defoliation and therefore do not need any treatment other than proper planting and care. Trees in category III are seldom colonized by gypsy moth caterpillars.

Category I	
Oaks (Quercus)	susceptible
Poplar (Populus)	
P. tremuloides	susceptible
P. grandidentata	susceptible
Birch (Betula)	
B. pendula (European white birch)	susceptible
B. populifolia	susceptible
B. papyrifera (paper birch)	susceptible
Willow (Salix)	
S. babylonica (weeping yellow willow)	susceptible
S. spp. (wild types)	variable
Crabapple (Malus)	all susceptible
Maple (Acer	
A. platanoides 'Royal red' (a red leaf Norway maple)	susceptible
A. platonoides 'Crimson sentry' (a red leaf Norway maple)	susceptible
Plums (Prunus)	
P. cerasifera 'Thundercloud' (Purple leaf plum)	susceptible
Category II	
Spirea (Spiraea)	resistant
Maple (Acer)	
A. rubrum ('October glory') (0-30% defoliation)	somewhat resistant
A. saccharum (sugar maple)	resistant

A. saccharinum (silver maple)	resistant
A. platanoides 'Deborah' (green leaf Norway maple)	resistant
A. platanoides 'Emerald queen' (green leaf Norway maple)	resistant
Serviceberry (Amelanchier)	resistant
Hickory (Carya)	resistant
Alder (Alnus)	resistant
Basswood (Tilia)	resistant
Ironwood (Ostrya)	resistant
Beech (Fagus)	resistant
Elm (Ulmus)	resistant
White pine (Pinus strobus)	resistant
Blue spruce (Picea pungens)	resistant
Sweetgum (Liquidambar)	resistant
Poplar (Populus) P. deltoides	resistant
Birch (Betula)	
B. nigra (river birch)	
B. lutea (yellow birch)	

Category III

Ash (Fraxinus)	usually avoided
Pear (Pyrus)	usually avoided
Honey locust (Gleditsia)	usually avoided
London plant tree (Platanus x acerifolia)	usually avoided
Juniper (Juniperus)	usually avoided
Tulip tree (Liriodendron)	usually avoided
Spruce (Picea)	usually avoided
Yew (Taxus)	usually avoided
Hemlock (Tsuga)	usually avoided
Fir (Abies)	usually avoided
Black Locust (Robinia)	usually avoided
Sycamore (Platanus)	usually avoided
Magnolia (Magnolia)	usually avoided
Lilac (Syringa)	usually avoided
Euonymus (Euonymus)	usually avoided
Dogwood (Cornus)	usually avoided
Catalpa (Catalpa)	usually avoided
Azalea (Azalea)	usually avoided
Arborvitae (Thuja)	usually avoided
Maidenhair tree (Ginkgo)	usually avoided
Black gum (Nyssa)	usually avoided

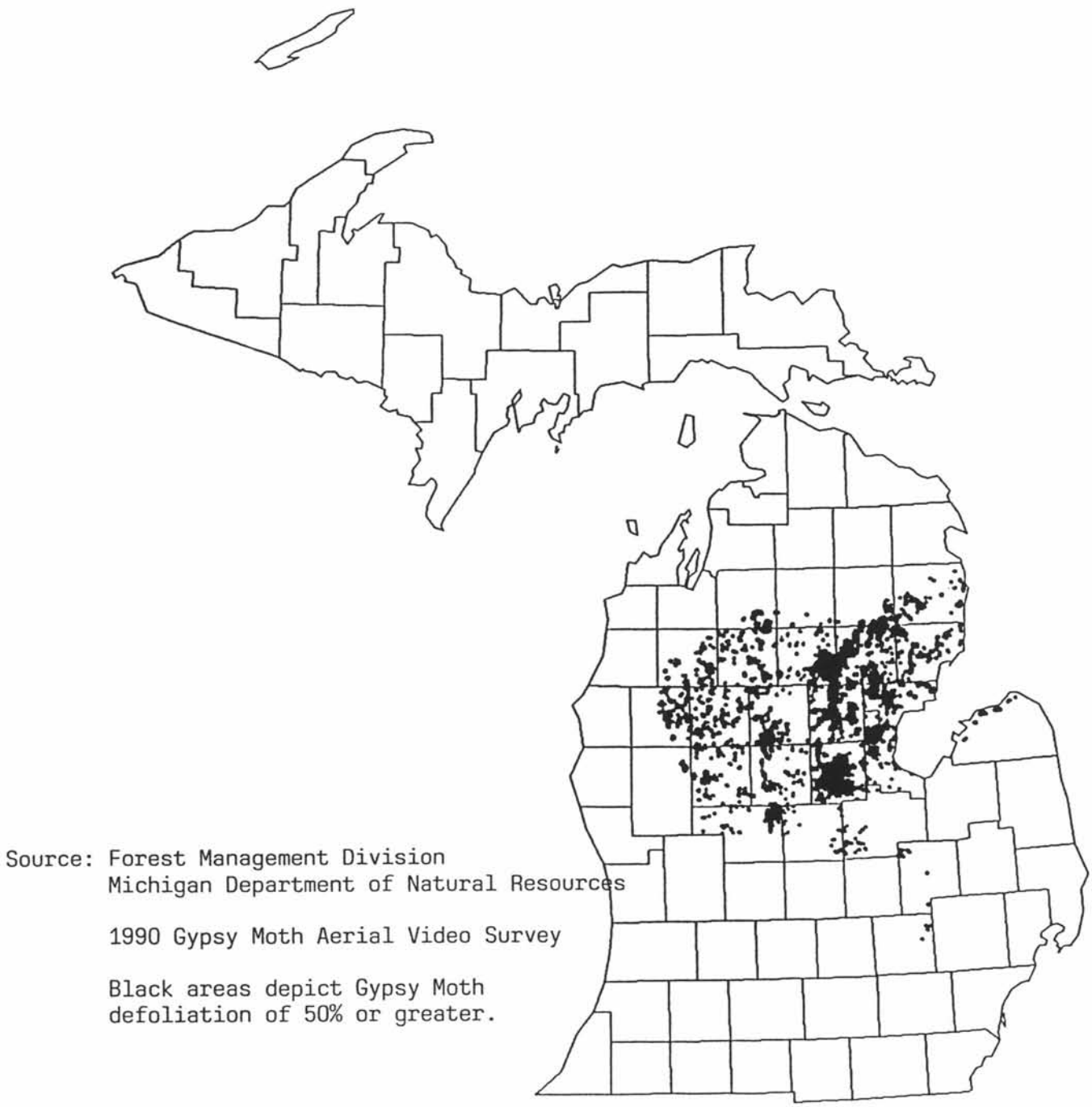

Figure 1. Gypsy Moth Defoliation of Michigan Forests In Early July, 1990