Integrated Pest Management (IPM) of Midwest Landscapes

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Healthy landscape plants are important components of our urban environment. Trees and lawns provide recreational areas; well cared for landscapes foster a sense of well-being and community pride; landscapes increase property value; our backyards and urban forests are a place for wildlife to coexist with people.

The goal of this book is to provide information to plant managers about the insect and mite pests that commonly attack landscape plants, when these pests are most vulnerable to control measures, and biorational and conventional control options. The 131 most common pests in the Midwest are incorporated into this book. Also included are 50 of the most common beneficial insects. Managing the 131 pests of landscape plants is a technically rich endeavor.

Many abiotic and biotic factors can affect tree health. In this book, we discuss how to diagnose which pest is damaging the host, so that knowledge of its life history can be used to choose a pesticide and time its application. Management of insects is accomplished by a process called Integrated Pest Management (IPM). IPM is the practice of using a variety of cultural, biological, and chemical techniques to reduce pest problems. IPM is a decision-making process which includes regularly examining plant materials for signs and symptoms of trouble (scouting), using traps for monitoring insect populations, establishing damage thresholds, and timing insecticide applications to the most vulnerable stage in the insect's life history.

If beneficial insects are present and there is the chance that they can mitigate the harmful effects of the pest insect, use of a biorational pesticide is suggested. Biorational pesticides have low toxicity to nontarget insects, and degrade rapidly. However, they must be applied repeatedly in most cases for effective management. Examples of biorational pesticides are horticultural oils and soaps; halofenozide, an insect growth regulator; spinosad; *Bacillus thuringiensis* var. *kurstaki*; *Beauveria bassiana* (a fungus); and *Heterorhabditis bacteriophora* or *Steinernena carpocapsae* (nematodes).

Biological control is the management of pests by beneficial insects and pathogens. Parasitoids lay their eggs on or in harmful insects, thereby killing them. Predators, such as lady beetles and lacewings, eat insects and their eggs. These biological controls are naturally found in the environment, but the widespread use of conventional insecticides often kills them.

Scouting, or the routine examination of landscape plants, helps to determine when pest problems are reaching a critical treatment threshold so that damage can be prevented. Scouting also helps to determine the stage (egg, larva, pupa, adult) of the insect or mite. If damage is noticed before a pest population is firmly established and when the insect is at a vulnerable stage, many problems can be easily thwarted. For instance, low populations of aphids can be sprayed with horticultural oils or soaps, which will not harm foraging ladybird beetles, such as *Coleomegilla maculata*. However, large aphid populations probably can not be reduced by lady beetles before they cause damage. They require the use of conventional broad spectrum pesticides that will also kill lady beetles and other natural enemies. In some cases, scouting reveals the presence of an insect, but that insect cannot be managed until a suitable, vulnerable stage in its life history is reached. For instance armored scales, (i.e. euonymus scale), cannot be controlled when you see the cover of mature females; they must be controlled when crawlers have emerged from beneath the female's cover. Oils work well on pine needle scale as the covers are not "tight" on needles.

Monitoring traps can alert you to the presence of pests, allowing you to determine when thresholds have been reached. Sesiid (clearwing borers) are cryptic and difficult to detect, yet they have a high risk of damaging trees and shrubs. Using clearwing borer pheromone traps can help detect adult males and aid in timing of pesticide application. This is important, because the larva is difficult to kill once it tunnels under the bark. Only recently hatched larvae and the egg-laying female can be killed. Other borers, such as bronze birch borer, also must be controlled when larvae hatch and before they tunnel under the bark.

Tree top death caused by bronze birch borer larvae. This borer is not often controlled by natural enemies and offers a high risk of mortality. Use a conventional pesticide before larvae penetrate the bark. (27)
Photo: John Davidson

Plant phenology and/or degree-day modeling are other aids in predicting pest activity and vulnerability to control efforts. Phenology studies the relationship of visible plant events, such as flowering, to weather conditions and, by extension, to insect activity. Degree-day modeling is based on threshold temperture for development and the number of days the actual average temperatures are above the minimum threshold for particular insect pest activity. These models help predict when pest populations are active and can be managed (see chapter 11).

Tables concerned with pesticide choice and use are located at the end of the book. The tables, **Ornamentals: Information About Insecticides/Miticides** and **Turf: Information About Turf Insecticides/Miticides**, lists chemicals and their toxicity to people, a very important safety issue to applicators. The **Types of Registration for Pesticides** table provides information on who can use the product, such as homeowners, registered applicators, or registered applicators with restricted use capabilities. A table on **Pesticide Compatibility with Biological Control** is provided to help determine pesticide compatibility with a biological control agent.

How to develop a pest management program

This book provides the components needed to develop a successful IPM program. For each pest, information is given on how to scout or monitor for the pest, how to time the pesticide application, and how to choose a biorational or, if necessary, a conventional pesticide. The risk potential of the pest identifies whether it will kill a plant or cause minimal injury. In developing an IPM program, first decide whether there is enough biological control potential to warrant no pesticide use or whether to choose a biorational pesticide that is compatible with conserving (maintaining) beneficial insects. If the pest has very little potential to be controlled by beneficial insects, a conventional pesticide may be a better choice.

Biorational pesticides are natural organisms or plant derived products such as bacterial formulations (*Bacillus thuringiensis*), microbial products (spinosad), or fungi (*Beauveria bassiana*). Many of these are compatible with biological control. Check the table showing compatibility of pesticides with controlling beneficial insects in the table **Pesticide Compatibility with Biological Control.**

Most pesticides recently had their registration reviewed under the EPA re-registration process for pesticides under the new Food Quality Protection Act (FQPA). Many pesticides did not have their registration renewed, and although they no longer can be manufactured after a certain date, they can still be purchased until stocks are sold and owners of the pesticide can use the product. Pesticides that are no longer available are bendiocarb, chlorpyrifos (home owner's use), diazinon, dimethoate, endosulfan, isofenphos, lindane, and oftanol.

All the tactics described in this introduction, such as proper insect identification, determination of the stage of the insect, recognition of current injury level, detection of beneficial insects, evaluation of risk to plant health, and pesticide choice, are tools used to develop an IPM program to manage a landscape pest.

Close-up of terminal galls caused by of Cooley spruce gall adelgid feeding. Pesticides need to be used before the gall is initiated. After females leave the gall, old woody galls should not be sprayed, but removed by pruning. (66)
Photo: John Davidson

Leaf damage caused by elm leaf beetle. Larvae skeletonize leaves, while adults cause shot hole damage. Spray *Bacillus thuringiensis var. tenebrionis* on small larvae or spray *Beauveria bassiana* on larvae and pupae aggregating under the tree. (92)
Photo: David Laughlin