Using IPM In The Landscape

Washington State University Urban IPM and Pesticide Safety Education Program

Integrated pest management (IPM) is an environmentally sensitive approach to controlling pests that does not rely heavily on pesticides. Successful IPM depends on frequent monitoring of plants and pests so that control strategies are used only when and where needed. Many scientists consider IPM a decision-making process that assesses pest status and determines logical and environmentally sound management strategies. A variety of control methods—cultural, mechanical, biological and chemical may be employed. Furthermore, IPM takes a holistic approach to pest control encompassing insects, mites, slugs, weeds and diseases rather than singling out only one pest problem at a time.

Summary

A comprehensive IPM program pays particular attention to landscape planning, plant needs and the biology and identification of pests. It is a proactive approach through which many pest problems can be avoided. If a pest problem does occur, the IPM practitioner will consider a variety of management options which usually reduces the need for broad-spectrum, environmentally harmful pesticides. The IPM process is not static. Whatever approaches are taken, it is necessary for IPM practitioners to continually evaluate their strategies and their results. Recordkeeping is necessary for accurate evaluation. Continuing education is a must for IPM practitioners, their employees and their clients. They must be open to change in the face of new or developing technologies.

Plant Health Care

Some horticulturists feel IPM does not go far enough. IPM emphasizes pest management, yet our concern is to have healthy plants that are vigorous and attractive. The difference may seem minor, but it makes a big difference in the way we approach landscape plant management. If we focus on pests, we overlook many basic cultural problems afflicting plants. At the Washington State University Puyallup Plant Diagnostic Laboratory for example, half of the sick plants submitted for diagnosis are not suffering from insect pests or disease organisms. Instead their problems result from cultural and environmental factors such as over-watering, drought stress or winter damage.

In an attempt to develop a more holistic system that focuses on healthy landscapes, several terms have been suggested—integrated plant management, integrated landscape management or sustainable landscaping. One term that has received widespread acceptance in the tree care industry is **plant health care (PHC)**.

PHC is as much a change in attitude as a change in technique. Not only does it emphasize plant health over pest management, it takes an ecosystem approach that emphasizes working with nature instead of fighting it; PHC sees proper culture as the foundation of a healthy landscape. PHC is not a rejection of IPM. Instead PHC has evolved from IPM, incorporating all of its principles but going beyond.

Plant Health Care

The first step in implementing a PHC system is to identify and list all plants in your yard. How can you take care of your plants if you don't know what they are? Once you have a plant list, do some research to learn more about your plants: their cultural needs, likely pest problems and common environmental problems. During this research you will uncover some key plants—those that are problem-prone and likely to require the most attention.

Once you have identified the plants in your garden you can determine the key problems, both biotic (living organisms such as insects, fungi, slugs and deer) and abiotic (non-living factors such as weather, fertility and irrigation). Key problems are the ones most likely to impact plant health and require your attention. For example, rhododendrons are often diagnosed as suffering from root weevils or poorly drained soil. Learn more about these key problems if you grow rhododendrons. For pests, learn to identify various stages of the life cycle, recognize symptoms of damage and know which management options are both effective and environmentally sound.

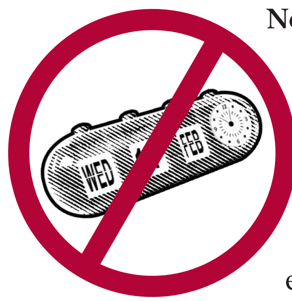
The next step is to study your landscape ecosystem. Your garden truly is an ecosystem with complex interrelationships among flora, fauna, soil, weather and other factors. Be aware of climatic factors, such as minimum temperatures, the amount of sun received by various parts of your garden, prevailing winds and seasonal patterns of precipitation. Understand soils and drainage patterns. This information is essential, because healthy gardens result from carefully matching plants to the habitats in your yard.

Landscapes are dynamic. Monitor them constantly to keep up with seasonal and long-term changes. A key to any plant health care program is frequent monitoring, at least every two weeks during the growing season and perhaps once a month during the winter. When monitoring, pay particular attention to signs of plant stress (yellow or wilted leaves, dead twigs, etc) and be on the lookout for developing pest problems. Concentrate your monitoring on key plants and key problems.

With knowledge of your plants, potential problems and the landscape ecosystem you have the tools to optimize plant health. A healthy landscape starts with smart planning. Select pest resistant plant species, match plants to the existing climatic and soil conditions ("right plant, right place"), and include a diversity of plant species to limit infestations. Then employ good cultural practices: improve soil conditions by using organic matter and mulches, practice correct planting methods and pay careful attention to watering, fertilizing, and pruning (too much of the last three may be just as bad as too little). Sound cultural practices are the basis of a PHC program. They benefit any landscape, whether new or well-established.

If we promote total plant health, we avoid many problems. Cultural and environmental problems are minimized and healthy plants are better able to withstand insect or disease damage.

When monitoring indicates that pests require attention, PHC employs an IPM approach to manage them.



Note: Pesticide applications or alternative strategies based on calendar dates are seldom used in PHC or IPM since they are often ineffective. The development of many disease and insect pests is closely linked to plant phenology—for example, the timing of budbreak or bloom. Since these events can occur at different times each year, pesticides and many of the possible alternatives must be applied to correspond to critical periods in the plant's development if they are to be effective. Properly timed applications maximize their effectiveness and reduce their potential impact on the environment.

Keys to Successful IPM

The primary keys to successful IPM are familiarity with pests' life cycles, correct diagnosis and monitoring. Monitoring is crucial but you must also have the correct identity, behavior, and life cycle information. One has to know for example, when to begin the monitoring process and to do this you have to know the pests' complete profile.

Monitoring
There are many methods of monitoring. The key methods are plant examination, pheromone traps, sticky colored traps and pitfall traps. Monitoring can be as simple as timely close observations (a magnifying lens is useful). Observing aphid buildup or disease symptoms and signs on susceptible plants might require multiple examinations. Weather can also be instrumental in determining when to monitor. Early season warming can trigger early emergence of pests and earlier damage. Monitoring is critical to the success of an IPM effort.

When is a Pest to be Managed?
There are various criteria used to answer this question. If the pest is life-threatening to the plant, mere presence may dictate management action. However mere presence does not always dictate action. For example, many deciduous trees can tolerate up to 25% defoliation before plant health is seriously impaired unless they are otherwise stressed.

In agriculture, pest managers often use an economic threshold (population level at which serious damage or yield losses occur) to signal that management action must be taken. This type of threshold is rarely practical for landscapes. In ornamental settings the aesthetic threshold usually determines management action. The aesthetic threshold is the damage level that is unacceptable to the viewer, even though plant health may not be at stake. Unfortunately ignorance about the pest and the plant's ability to withstand some damage often results in unnecessary pesticide applications.

IPM Methods

There are four general methods to manage insect, disease and weed problems: cultural control, biological control, mechanical control and chemical control. Several of these tactics may be carried on concurrently or implemented at different times to achieve a truly integrated management approach.

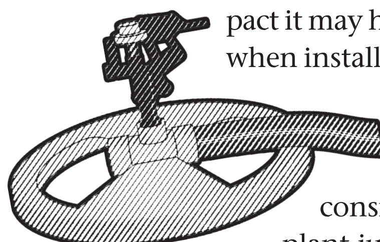
Cultural Control
Cultural control is the manipulation of the environment to avoid serious pest damage. It depends on knowledge of both the plant's needs and potential problems. For example, most plants have an ideal site in which they will flourish. In a poor site they become stressed and prone to pest attack.

- **Start Right.** Select plants adapted for the site you have in mind. For example, rhododendrons need good drainage, moisture and an acidic, organic soil. If planted in poorly drained clay soils you will subject them to root rots. Many junipers cannot handle wet, poorly drained soil for the same reason.

  Avoid using "pest-prone plants." Examples of "pest-prone plants" include skimmia (chronic spider mite problems), spruce (chronic aphid problems) and many crabapple varieties (powdery mildew and scab problems).

  Genetic expressions (leaf type, toxins in plant) make certain varieties resistant to pests whereas others of the same species are quite susceptible. For example, many rose and crabapple varieties are disease resistant and several rhododendron species and varieties are almost immune to leaf notching by root weevils. Ask experts about plant varieties or consult Washington State University Extension publications.

- **Water Management.** If you intend to change the moisture profile in the landscape, consider the impact it may have on plants. For example, when installing a lawn sprinkler system consider where the sprinkler heads will be in relation to junipers. Conversely, consider where you should not plant junipers.



- **Induced Competition.** This can be accomplished by establishing dense groundcovers that can reduce weeds by outcompeting them.

- **Remove Plants.** Roguing, the removal of a plant, is a perfectly viable cultural tool. If a plant consistently has pest problems, consider replacement with a more dependable species.

- **Modify the Environment.** Maximizing air circulation in tree or shrub canopies through pruning or by plant spacing can be another way to avoid serious pest buildup (e.g., proper pruning of apples can reduce scab; spacing roses to enhance air circulation can reduce powdery mildew and black spot diseases).

Biological Control

Biological control is the use of living organisms—either native or introduced—to suppress pests below levels of serious economic or aesthetic damage. There are three general strategies employed in biological control: conservation, augmentation and introduction (classical biological control).

- *Conservation* is protecting and enhancing the biological control agents that are already present. To protect naturally occurring beneficial organism populations, avoid unnecessary spraying and broad-spectrum pesticides. One conservation practice is to use selective pesticides. One such material is the bacterial insecticide *Bacillus thuringiensis*, which now comes in various strains to control caterpillars, certain mosquitoes and leaf-feeding beetles. This material kills only target pests and has no direct effect on bees or other beneficial creatures.

- *Augmentation* adds to the established base of beneficial organisms or restores a decimated population. This method is becoming more popular for both residential and commercial operations. Green lacewings and predatory mites can be purchased to control aphids and spider mites, respectively. Insect-eating nematodes are now commercially available and can manage pests such as root weevils. When using these beneficial organisms, it is critical to pay attention to criteria for successful release (e.g., time of release, weather conditions, and food availability).

  Some beneficial organisms are not good candidates for release on small tracts of land. Lady beetles for example, are genetically programmed to disperse after hibernation before they will settle down, mate and lay eggs. Since lady beetles are normally collected during hibernation and sold before dispersal flight occurs, the purchaser is usually confused by disappearance of their lady beetles, often occurring one day after being released. Research is being done on how to keep these insects from leaving the release site. There are lists of suppliers of beneficial organisms available and WSU Extension entomologists can provide these upon request.

- *Introduction or classical biocontrol* is normally carried out by government agencies for a variety of reasons. Private citizens are not usually involved because of prohibitive costs. However there are opportunities to be involved in programs relative to biological control of weeds. One example is the release of the cinnabar moth to control tansy ragwort, a noxious weed. Private citizens helped release and protect this insect in cooperation with county weed boards and university research programs. There is one concern about this insect to be aware of—the ornamental dusty miller is in the same genus as tansy ragwort and the caterpillars will feed on it.

  Another form of biological control emerging as a success story is peculiar to certain plant diseases. The control takes place through competitive exclusion. A notable example is the control of crown gall (*Agrobacterium tumefaciens*) by using noninfective *A. radiobacter* in advance of infection. Infection sites are locked up by the noninfective bacterial strain preventing establishment of the infective strain.

Mechanical Control

Mechanical control can be achieved in many instances and is most effective if implemented when pest populations are low. Some examples of insect control include pinching leafrollers, washing aphids off leaves with a garden hose, pruning out tent caterpillars and fall webworms and creating various destructive barriers for slugs and weevils.

Mechanical control of weeds can be quite effective early in the season and can be accomplished through simple hand pulling or shallow cultivation. Various types of mulches (bark chips, geotextiles, etc.) can suppress weeds.

Certain plant diseases can be suppressed by pinching off diseased parts and dispatching them. This limits reinfection and the spread of the disease.

Chemical Control

Although there are pest problems that may require the use of a broad-spectrum pesticide, it is the philosophy of IPM practitioners to consider more selective materials first.

A number of selective products are available, including horticultural oils, insecticidal soaps and botanically-derived pesticides such as neem seed extracts, pyrethrum and nicotine. Remember, pest vulnerability to these or any material depends on life stage and exposure. For materials to be effective we must accurately assess the "window of opportunity" and time our applications accordingly. The University of Maryland's landscape IPM project reduced pesticide use by more than 90%, mainly by proper timing and targeted application (spot treatments).

If a pesticide application is necessary, a number of questions need to be asked. Do I have the right equipment? Where on the plant is the pest feeding? Spider mites for example, feed largely on the undersides of leaves, so the product must reach this location. How many applications are needed to break the pest's life cycle? Have I chosen an effective product? If any of these questions are ignored, your efforts may result in failure.

Resurgence and Similar "Envirodisasters"

It is important to point out the impact of using broad-spectrum insecticides. While most users understand the general concerns of pollution and human safety surrounding these chemicals, most have little idea of the impact these materials have on desirable nontarget organisms. The best understood of the impacts are resurgence and secondary pest outbreaks.

Resurgence of a target pest occurs when a broad-spectrum insecticide is applied before it is necessary. This often results in a rapid rebounding of the pest to levels higher than at the time of application due to the elimination of the pest's predators or parasites. Resurgence occurs often enough to warrant seeking other solutions and at least waiting to see if a pesticide application is really necessary.

Secondary pest outbreaks occur when broad-spectrum insecticides are applied to control one target pest and eliminate parasites and predators of other pests as well.

Summary

A comprehensive IPM program pays particular attention to landscape planning, plant needs, and the biology and identification of pests. It is a proactive approach through which many pest problems can be avoided. If a pest problem does occur, the IPM practitioner will consider a variety of management options that usually reduce or preclude the need for broad-spectrum, environmentally harmful pesticides. The IPM process is not static. Whatever approaches are taken, IPM practitioners must continually evaluate their strategies and their results. Record keeping is necessary for accurate evaluation. Continuing education is a must for IPM practitioners, their employees, and their clients (if applicable). They must be open to change in the face of new or developing technologies.