WHAT IS INTEGRATED PEST MANAGEMENT?

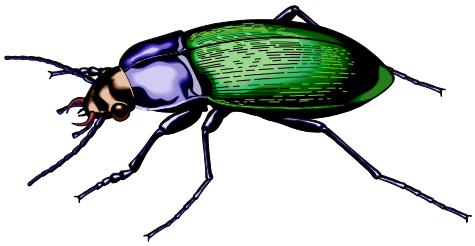
by Wendy D. Gelernter, Ph.D.

There is perhaps no concept in turf management that is so important, yet is so poorly understood as Integrated Pest Management (IPM). In recent years, a dizzying array of definitions of IPM has caused confusion among professionals and lay persons alike. Despite the confusion, IPM is practiced in some form by most Southern California golf course superintendents. A quick review of how the IPM concept was developed, some basic definitions, and a survey of IPM programs currently in place on Southern California golf courses should help remove some of the mystique from IPM.

History: The term Integrated Pest Management was coined in the 1950s by Dr. Vern Stern and other University of California scientists who were working with broad-spectrum insecticides such as DDT (Stern et. al., 1959). They observed that the use of insecticides sometimes resulted in an increase in insect numbers, rather than the expected decrease. The reason? Broad-spectrum insecticides were as good at killing beneficial insects (parasites and predators that feed on pest insects) as they were at killing pests. The result? Insects that were previously under control by beneficials were "released" from control through the application of insecticides, thereby creating more pest problems. The scientists reasoned that continued exclusive reliance on broad-spectrum products would result in more problems, and proposed that in the future, all available methods -- cultural control, biological control and chemical control -- be integrated in the development of future pest management strategies.

Definitions:

Biological Control: Use of living organisms (parasites, predators or diseases) to control pests. Examples of biological control implemented at Southern California golf courses includes the use of ladybird beetles to control aphids on ornamental plants, the use of ground beetles to control a wide variety of insect pests (see illustration below), the use of soil microbes such as *Trichoderma* to control plant diseases, and the use of nematodes and the bacterium, *Bacillus thuringiensis* to control caterpillar and grub pests on turf.



Ground beetle (Family Carabidae). These small, shiny black beetles are beneficials that feed on pest insects. To avoid confusing them with the damaging black turfgrass ataenius (BTA), note the ground beetles' long, thin antennae. In contrast, the BTA antennae are too small to see with the naked eye.

Cultural Control: Cultural control is based on the principle that healthy turf is the best strategy for avoiding weeds, insects and diseases. Thus, any agronomic practices that help make the environment favorable for turf growth and unfavorable for pests are regarded as cultural control. For example, superintendents recognize that accumulation of high levels of salt in soil causes turf to become stressed and therefore more susceptible to diseases such as anthracnose. Disease prevention is achieved by leaching (application of high volumes of water to turfgrass to remove salt build-up in soil) before salt levels become too high.

Chemical Control: The use of synthetic chemicals such as insecticides, fungicides and herbicides to control insects, diseases and weeds, respectively.

Integrated Pest Management relies on the use of a variety of pest management methods (biological, cultural and chemical control), with chemical pesticides as the last resort. The objective is to prevent pest problems from occurring -- the least costly

and most reliable way to deal with pests -- and to provide economical, long term solutions while minimizing hazards to humans and the environment (Pfadt, 1971; Vargas, 1994)

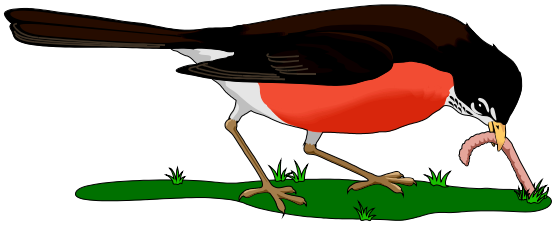
NOTE: More in-depth discussions on the pest control options listed above will be presented in future issues of Insights.

Examples of IPM Turf Programs Currently Practiced in Southern California

* Because high salt levels soil can kill turf or stress it to the point that it becomes susceptible to disease, superintendents supported research to develop a simple method for measuring soil salinity. This method has allowed superintendents to avoid turf diseases and also to avoid the fungicide applications needed to control diseases.

* Ten golf courses are participating in insect monitoring studies that determine which pest insects occur, and at what times of the year, thus allowing insect control measures to be applied less frequently, and at the optimum time and place. Using information on pest biology to time treatments will also improve the performance of biological insecticides such as *Bacillus thuringiensis.*

* Nothing looks better to insects, plant diseases or weeds than the well fertilized, moist and homogeneous environment of the traditional golf course. In fact, several scientific papers have documented that pest populations increase as crops become more and more homogenous (Ricklefs, 1974). For example, in a study on vegetable crops, aphid and flea beetle pests were present in high numbers when only one type of collard plant was present. In contrast, when collards were planted with 300 other species of plants, the pest insects were kept under control. This is because beneficial organisms -- birds, insects and even microorganisms that feed on pests -- thrive when plant life is diverse. It makes sense that an environment that consists only of turfgrass will attract primarily turfgrass pests. If this environment is diversified a little, however, the way has been paved for establishment of additional wildlife, some of which will be beneficial to pest management efforts. Several golf courses have taken this information to heart and have added plantings of native grasses, trees and wildflowers in out-of-play areas. In addition to providing a more natural and aesthetically pleasing setting, this strategy should help reduce the incidence of several turfgrass pests.



* Weed problems have been minimized through development of a regular soil fertility monitoring program. By addressing imbalances in soil fertility through techniques such as leaching, aerification or fertilizer applications, conditions can be optimized to favor turf growth, as opposed to weed growth.

IPM References

Pfadt, R.E. 1971. Fundamentals of Applied Entomology. MacMillan Publishing Co., NY.

Ricklefs, R.E. 1974. Ecology. Chiron Press, Newton, MA. pp. 771-75.

Stern, V. R., Smith, R., van den Bosch, R. and K. Hagen. 1959. Hilgardia, 29:81.

Vargas, J.M. 1994. Management of Turfgrass Diseases. Lewis Publishers, Boca Raton.

THE AUDOBON COOPERATIVE SANCTUARY PROGRAM FOR GOLF COURSES

Superintendents who are implementing IPM programs have already met one of the criteria for becoming certified in the Audobon

Cooperative Sanctuary Program (ACSP). The program, which originated with the New York Audobon Society and is supported by the USGA, has certified over 450 golf courses across the country so far. The goal of the program is to provide support for and recognize golf courses that are taking leadership roles in conservation programs such as establishment of IPM programs, wildlife conservation, waste management, energy efficiency or water conservation. If you are interested in learning more about the certification program, contact either the Audobon Society or the USGA at the addresses below:

Audobon Society of New York
Hollyhock Hollow Sanctuary
Route 2, Box 131
Selkirk, NY 12158
518-767-9051

USGA
Golf House
P.O. Box 708
Far Hills, NJ 07931-0708
908-234-2300

LETTERS

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WHAT'S GOING ON WITH THE WEATHER?

The California floods of 1995 and the Midwestern floods of 1993. The Western U.S. drought of the early 1990s. Our current wet May. Is the weather really getting stranger and more variable, or are our memories of the past just rose colored? A recent issue of the journal Science (volume 268, pages 363-64) reports that Dr. Thomas Karl, a senior scientist at the National Climactic Data Center, has found evidence that the U.S. climate has been abnormal for the past 15 years, with more flooding, droughts and higher temperatures than in the past. The culprit, according to Dr. Karl is the famous "greenhouse" or "global warming" effect. According to the Encyclopedia Brittanica, the greenhouse effect results when the Earth becomes warmer than normal due to the fact that a greenhouse-like barrier, made up of carbon dioxide (CO_2) and water vapor has formed in the atmosphere. This barrier prevents excess heat from escaping from the Earth into space, very much in the same way that glass keeps heat inside a greenhouse. Over the past 15 - 20 years, CO_2 levels, and thus the strength of this greenhouse barrier have increased due to increased combustion of coal, oil and natural gas.

While Dr. Karl's data is convincing, climatologists are still not certain that global warming is actually occurring. Additional long-term studies will be needed (and are in progress) to convince scientists and policy makers of this hypothesis. In the meantime, we need to continue, as in the past, to closely monitor weather, to be prepared for unexpected changes in weather patterns, and to have the appropriate management responses ready, no matter how abnormal the weather seems.