# Evaluating Management Strategies and Keeping Records in IPM

## Introduction

Integrated Pest Management (IPM), or Intelligent Plant Management, involves assessing the entire golf course property, identifying areas where agronomic stresses may occur and noting places where turf pests are present and cause damage. Most golf course superintendents have excellent observational skills, and are very good at recognizing early signs or symptoms of pest activity (e.g., the subtle change in color of foliage when annual bluegrass weevil larvae begin to feed). They are also quick to recognize the early stages of localized dry spots or other agronomic imbalances. And they are very good at determining which management strategies might be best to address the problem they have identified.

The area where some superintendents are less successful is in determining whether the strategy they used actually worked. Was the "problem" reduced as a result of the action you took? How can you tell?

This fact sheet will discuss some of the concepts of evaluating the impact of your management strategies on the condition of the golf course – and some ways to maintain records so you can learn from your "mistakes" and build on your successes.

## Evaluating management strategies

### Pest populations before and after treatment

Managing pest populations (e.g., insects, pathogens, or weeds) below your tolerance level is a key concept of IPM. Once you determine that you have areas that are being affected by a pest, you begin to think about ways to reduce the pest population. But the only way you can determine whether your strategy "works" is to measure the density of the pest population before you treat, and then measure it again sometime after you treat.

Many articles have been written in *Golf Course Management* and *USGA Green Section Record* discussing ways to identify pests and sample for them.

An easy way to determine whether a pesticide application reduced a pest population is to **leave a small area untreated at the time of the application**. You can do this by turning off the sprayer for a few feet. Or you can put a temporary cover over a small area during the application and remove it afterward. Some superintendents use a plywood sheet for this purpose, while others use a tarp. (Remember that the plywood or tarp now have pesticide residue on them, so they must be rinsed afterward.) Be sure to mark the area that you left untreated with turf paint. Often the untreated area will exhibit severe symptoms from the pest (e.g., feeding damage from insect larvae or several disease patches), while the treated area will show much less damage. In fact, these untreated areas can be excellent "teaching moments" for your membership, as they can see how severe the damage might have been from a pest if you had not applied a pesticide.

The trick is to quantify pest presence as accurately as possible. Suggestions for surveying populations are described below. It is important to carry out the population survey BEFORE you treat and again AFTER you treat so you can compare the two. The length

of time you should wait after treatment depends on the pest you are surveying, the weather conditions (warmer temperatures usually drive faster development of the pest), and the pesticide you used. For example, if you use a slow-acting insecticide to control grubs, it does not make sense to take a look at the grub population a couple days – or even a couple weeks - after the application because the insecticide has not had time to work yet.

**Insects** can be counted using several different techniques**.** These include visual inspection of the thatch and foliage, soil samples, flotation, and soapy flushes, as well as other techniques. Each of these approaches can provide an estimate of the number of insects per square foot. Spend a little time, at least in the areas where insect activity is most apparent, sampling and getting an estimate of the density of the population BEFORE you apply an insecticide (or biological control agent or make an agronomic change in your approach). Then you can return to the same area a few days – or a couple weeks – later, sample again, and see whether there has been a decrease in the insect population. (As noted earlier, you may have to wait two to four months to assess the effectiveness of a very slow-acting insecticide like chlorantraniliprole against grubs.)

**Diseases** can sometimes be tricky to identify because the signs or symptoms may be similar for several different pathogens. Sometimes you need to send a sample to a trusted turf diagnostic lab to get a definitive answer as to what pathogen is present. (But you CAN see visible symptoms of the disease – whether it is several small discrete patches in a small area or a wider area that has been more generally affected. Perhaps the easiest thing is to take some photos of the affected turf before you make a fungicide application (or change something in your agronomic routine intended to minimize disease activity). Be sure to take photos from several different angles (looking toward the sun, sun behind the camera, sun to one side or the other). Include at least one photo that is directed straight down at the patch. Include something for scale – a car key, a jackknife, or a quarter. Repeat the process a few days after you apply a fungicide (or made a cultural change) and compare the photos. Be sure to take the pictures at about the same time of day and try to take them as close to the original location (and the same angle) as possible for the best comparison.

**Weed**s often appear as a result of some sort of agronomic stress and it is difficult to truly address weed encroachment without addressing the cause of the problem. Possible stresses include high or low soil temperatures, high or low soil moisture, soil compaction, high or low nitrogen levels, other nutrient imbalances, shade, or poor air circulation, among other things. You can quantify weed activity by:

- **Photographing areas** that are infested (following the suggestions for photographing diseases described above)
- **Setting out transect lines**
  Extend a rope or long hose across the width of a fairway (or green or tee), Walk along the rope and stop every 4 or 5 steps. Imagine an area roughly the size of a tennis ball, and count the weeds in that area (identify them to species if possible, but at the very least, note whether they are broadleaved or grassy weeds). Repeat the process until you get to the far end of the line. If weeds are more prevalent along the edges of the

area you are inspecting, make a note of that. After you apply an herbicide (or make an agronomic adjustment), repeat the process to see whether the weed population is declining. (Set the transect lines as close as possible to the original lines.)

- **Inspect random areas**
  Find an open ring or square of some sort (3 and 6 inches across). You can create a "frame" using a wire coat hanger or by bending similar wire into the desired shape. Toss it randomly onto the general turf area you want to survey, and count the weeds inside the ring or square. Repeat the process several times to get an overall assessment of weed activity in the area. The trick in this approach is to be truly "random" in tossing the ring. The temptation is to toss it in an area that is obviously heavily infested before you treat, and to toss it in an area that appears to be less weedy after you treat. Perhaps you should close your eyes and turn around a couple times before tossing the ring to have a better chance of a random toss.

**Agronomic conditions**

A golf course superintendent is constantly monitoring the overall health of the turf, which means he or she is always making judgments about the cultural strategies that are being practiced. For example, green speed can be manipulated by lowering the height of cut, double cutting, or rolling. If circumstances call for increasing green speed, one or more of those strategies may have to be adjusted. Keeping careful records of green speeds (measuring a few "indicator greens") on a daily basis with a Stimpmeter, coupled with tracking weather conditions, will help the superintendent determine which strategies have the greatest impact on the desired change.

Green speed is "quantifiable" – you can conduct a survey of greens with a Stimpmeter and get a good measure of ball roll under the specific conditions at the time. But it is more difficult to "quantify" the overall health of a fairway or collar or tee. One approach would be to do a visual assessment, similar to the "turf quality ratings" used by turf agronomists around the world. These ratings take into account the overall appearance of the turf and include such visible characteristics as color, leaf width, tiller density, and thatch buildup. A superintendent could devise a similar quality rating to make visual comparisons from one hole to another. Another approach is to monitor the volume of clippings that are removed from greens. More clippings can be an indication of faster growth.

In addition a superintendent can monitor the turf area in question and note obvious areas that need attention. Examples include ruts formed by golf carts being driven through areas that were very wet, greens that are more likely to experience diseases because of poor air circulation or shade, or localized dry spots that occur in areas where thatch is particularly thick or dense. As with pest management, it is important for superintendents to be able to compare conditions before they implement a change in cultural practices with conditions after they have carried out the change. The easiest way to do that is to take pictures before and after – noting the suggestions above. Take several pictures, at different angles and directions, highlighting different aspects of the condition, and try to replicate the conditions (time of day, same angles) when taking the "after" pictures.

**Keeping records**

Most golf course superintendents already keep records for many aspects of course maintenance. In many states, they are required to keep records on pesticide applications (what, when, where, why, and weather at the time of application), fertilizer applications, and water use (volume of water withdrawn from the source and pumped through the system). In addition most superintendents maintain at least some level of weather observation. Some even have sophisticated weather stations on site that record a wide range of meteorological data. Superintendents also keep track of labor assignments (who is mowing greens or fairways, who is maintaining bunkers, and so on) and often maintain those records for several years. Even if your state does not require you to keep the records mentioned here, it is good practice to do so, and can help guide your decisions.

Similarly it is important to maintain some additional records in an IPM program so you can further build on your experiences. In particular, it is important to record any observations or population surveys that were described earlier here, so you can go back to your records the following year and have a clear picture of the pest activity and responses of the pest to any control measures you took. Include the pictures or insect counts in your records, and include a short narrative that describes what you saw, what you did, and whether it worked.

Consolidate and organize your pest management records – perhaps separate files for insects, pathogens, and weeds – and cross reference them to your pesticide records. All of these steps will make it easier the next time you encounter that pest. You will know what you have tried before, how well that "worked", and whether you might need to make adjustments to your approach.