

Developing a Site-Specific Program: Pest Management (Part 2)

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Bottom line: Use of historical climate information and ongoing evaluation of current weather trends can help you be better prepared to deal with insects, diseases, weeds and other pests. Attention to weather models can help you avoid unexpected pest damage and the costs of unnecessary chemical applications, can lead to more accurately timed cultural and chemical preventive practices and monitoring procedures, and can assist you in understanding and explaining the appearance and damage caused by specific pests.

In PACE Insights (Volume 9, number 1), we used the historical weather patterns at your location to begin designing an agronomic program that included turf stress management, cultural practices, plant nutrition and water management. In this issue, we will continue the process by providing the information necessary for developing a coordinated pest management program that takes into account the specific climate patterns at your location, and one that is well integrated with your overall agronomic program. This is a fairly complicated process that should take a few hours to complete, but we believe that the benefits – more efficient planning, scheduling, purchasing, budgeting and coordinating, and also improved communications with your crew and management – will make it well worth the effort.

Tools needed

You received the items below with your January PACE Insights. If you need more copies, please give us a call.

- A customized **Climate Appraisal form**: developed based on 30 years of data (the “30 year normals”) from a weather station that is as close as possible to your golf course.
- A **Management Plan** (you should have this partially filled in by now, according to the instructions in your January PACE Insights). If you need extra blank management plans, you can either call us for more, or you can find them on our website (www.pace-ptri.com) under “Events”, where they are available for printing, ideally onto 11X17 paper.
- An **erasable highlighter**: Remember that the white marker can be used to erase any errors you make with the yellow marker, but that you can only erase a given area once! The yellow marker will not work on any area that has been previously erased. So take some care before using the highlighter.

You will also need a **pencil and eraser** and access to **product labels** (see Table 11 of the enclosed handout)



In addition, we have included with this mailing:

- **Pest Worksheet**: This worksheet will be used to pencil out key pests at your location, potential control measures and their timing. The exercise of filling out this worksheet will help you to finalize a pest management plan that can then be transferred to your Management Plan.

- **PACE Reference 9:2**: This reference book contains a large body of technical information on the biology and management of key turf insect, disease and weed pests. We will ask you to refer to it periodically as you fill out your worksheets and management plans. It should also be helpful throughout the year for use in making pest management decisions.
- **Sample Management Plan and Sample Pest Worksheet**: To give you an idea of how we want you to fill out these forms, we have completed a sample Management Plan and Pest Worksheet, based on a hypothetical location in Riverside, CA. Refer to these periodically for an illustrated version of the process that we will describe below.

We will once again walk through this process with a focus on greens, but we strongly suggest that you repeat the process for fairways, tees and roughs as well.

Insects

On your Pest Management Worksheet:

List the top 5 insect pests that you deal with on greens, in order of importance. The first insect listed (I-1) should be your most important insect pest, while I-5 represents the least important. For each insect:

1. **Determine control strategy**: Decide whether you want to use preventive control (treatment BEFORE the insect appears) or curative control (treatment AFTER the insect appears). Consult Tables 3 and 4 for this information. Use a “P” or “C” in the column next to each insect’s name to indicate whether you plan to use preventive or curative control.

NOTE: For some insects (for example, billbugs or black turfgrass atenioides), either preventive or curative control is a viable option (Tables 3 and 4). If you deal with an insect like this and are uncertain about which strategy to use, a good rule of thumb is to focus on preventive control if you have had a history of problems with the insect in question. If you are merely trying to protect yourself against the possibility that this insect might occur, then curative control is probably your best option.

2. **Determine when insects are likely to appear**: Now consult Tables 3 and 4 once again to determine the **threat temperatures** for each insect.

NOTE: The threat temperatures are rough guidelines that we have proposed to try to predict when pests are likely to first begin causing damage on golf course turf.

But we want to emphasize the word “rough”. We have used the best information available from scientific publications, texts and our own experience to come up with these temperatures, but predicting the behavior of insects, diseases or weeds is very complex. For this reason, the threat temperatures provided are at best very fuzzy, so try to incorporate whatever experience you have to bolster this information. And please, let us know if you these temperatures don’t apply to your situation – we hope to constantly refine them as time goes on.

3. Using your **Climate Appraisal**, determine which month(s) those threat temperatures exist for. Now, on your **Pest Worksheet**, use the yellow marker to highlight the threat periods for each insect. See the **Sample Pest Worksheet** for an illustration of how this should be done.
4. Determine target life stage: Determine whether your control measures will target larvae (“L”) or adults (“A”) or both by consulting Tables 3-5. Indicate the target life stage with an “L” or “A”.
5. Time control measures: Using Tables 3 and 4, determine when control measures for each insect should begin. Mark an “X” to indicate potential dates for starting chemical or cultural control measures.

On your Management Plan:

Now it’s time to begin translating the information on your pest worksheet into decisions that will appear on your Management Plan (the nutrition and water management sections of your Plan should already be completed). Remember to consult the Sample Management Plan for an illustration of the process we describe below. **Remember that control measures should not be necessary outside of the highlighted threat periods for each insect.**

1. Select control measures for preventively controlled insects: Begin by focusing on the most important of the preventively controlled insects that you have listed on your Pest Worksheet. Go through the entire process described below for one insect at a time.
 - a) Use Tables 5 and 6 to select the optimum practice(s) or product(s) for each preventively controlled insect that you have listed. See Table 1 for information on the names of active ingredients and their corresponding commercial products.
 - b) List the names of these products or practices on the Management Plan.
 - c) Use the most current product labels to determine the rate that you plan to use, and indicate this rate on the Plan as well. If you don’t have a current copy of the labels, consult one of the websites listed in Table 11.
 - d) Use the letter “X” to indicate the timing of application for each of the products or practices. Consult your Pest Worksheet for information on when to initiate applications. Consult product labels for frequency of

follow-up applications, and indicate these applications with additional “X”s.

- e) Go through the same procedure for the remaining preventively controlled insects.

Make sure that product residual activity is long enough to control pests during their threat periods.

2. Curatively controlled insects: For these insects, it is almost impossible to predict exactly when control measures will be necessary – their timing will be based on when the insects are detected in your monitoring program. For this reason, the most important activity you can schedule for curatively controlled insects is monitoring.
 - a) Using Tables 3 and 4, determine at which temperatures monitoring for each insect should occur (note that monitoring isn’t absolutely necessary for those insects that are habitual problems and are preventively controlled).
 - b) Using your **Climate Appraisal**, determine when those monitoring temperatures begin.
 - c) Now, on your **Management Plan**, write the name of the monitoring practice in the left hand column, and place an “X” at the time the practice should begin. Place additional “X”s roughly every two weeks during the insect’s threat period.
 - d) Follow steps 1. a) -1. c) above for each curatively controlled insect.
 - e) For purposes of budgeting and/or planning, you may want to make some rough guesses on when control measures for curative insects will be made. Your records from previous years may be the most helpful in this respect – you can mark a tentative “(X)”, in parentheses to indicate it’s based on last year’s data, on the dates when you performed control measures last year.
 - f) Go through the same procedure for the remaining curatively controlled insects.
3. Identify target insects: Put the number of the insect pest (I1-I5) next to each management or monitoring practice that it addresses. Some practices will probably target multiple insect pests.
4. Refine your program: Now take a look at your insect management program. Can you streamline the program any further by targeting two or more insects with the same product or practice? By moving application dates around by one or two weeks? Are you targeting the right insect life stage with the right product? Have you taken into account resistance management guidelines, which recommend that you rotate among insecticide classes (Table 19)? Don’t become frustrated if you do a lot of erasing during this step – the idea is to get you to try out on paper several scenarios, and then judge which is the most efficient, most economically attractive, and most effective.

When developing your insect, weed or disease plans, always consult the most current version of all product labels and confirm that your plan is within the manufacturer's labeled guidelines.

Diseases

On your Pest Management Worksheet:

List the top 5 diseases that you deal with on greens in order of importance. The first disease listed (D-1) should be your most important disease, while D-5 represents the least important. For each disease:

1. Determine control strategy: Determine whether you want to use preventive control (treatment BEFORE the disease appears) or curative control (treatment AFTER the disease appears), and use a "P" or "C" in the column next to each disease name to indicate your preference. If you are uncertain, a good rule of thumb is to focus on preventive control if you have had a history of problems with the disease in question, and curative control if you are trying to prevent the possibility of a problem.
2. Determine when diseases are likely to appear: Consult Table 9 to determine the **threat temperatures** for each disease. Using your **Climate Appraisal**, determine which month(s) those threat temperatures exist for. Now, on your **Pest Worksheet**, use the yellow marker to highlight the threat periods for each disease.
3. Determine when to begin control measures: Mark an "X" on your Pest Worksheet to indicate potential dates for starting control measures (chemical or cultural). For preventively controlled diseases, begin treatment 2-4 weeks before the threat period begins (4 weeks for root infecting diseases such as summer patch, take-all patch, spring dead spot, Bermuda decline). For curatively controlled diseases, place an "X" at the beginning of the threat period.

On your Management Plan:

1. Select control measures for preventively controlled diseases: Begin by focusing on the most important of the preventively controlled diseases that you have listed. Go through the entire process described below for one disease at a time.
 - a. Use Tables 7, 8 and 10 to select the optimum practice(s) or product(s) for each preventively controlled disease that you have listed on your **Pest Worksheet**.
 - b. List the names of these products or practices on the **Management Plan**.
 - c. Use the most current product label versions to determine the rate that you plan to use, and indicate this on the Plan as well. If you don't have a current copy of the labels, consult one of the websites listed in Table 11. If there is a choice in spray interval frequencies, the 14 day interval (with the 14 day rate recommendation) is usually optimal.

- d. Use the letter "X" to indicate the timing of application for each of the products or practices. See your **Pest Worksheet** for information on when to initiate applications. Consult product labels for frequency of follow-up applications, and indicate these applications with additional "X"s.
- e. Determine optimal product placement by consulting Table 8. For each product, write an "S" for soil applications or an "F" for foliar applications. Foliar or crown placement relies on low volume applications of 1-2 gallons/1000 sq ft, while soil (root) placement relies on higher volume applications of 2 – 4 gallons/1000 sq ft (or low volume applications watered in with approximately 0.1 inches of irrigation).
- f. Go through the same procedure for the remaining preventively and curatively controlled diseases. Remember that the timings for curatively controlled pests are going to be rough guesses at best – you will want to use monitoring to confirm that curatively controlled diseases are present before beginning control measures.
3. Monitoring: Follow the monitoring guidelines in Table 10. Write the name of the monitoring practices that you want to implement in the left hand column of your **Management Plan**, and place an "X" at the time the practice should begin. Place additional "X"s roughly every two weeks during the disease's threat period.
4. Identify target diseases: Put the number of the disease (D1-D5) next to each management practice that it addresses. Some practices will probably target multiple diseases.
5. Refine your program: Now take a look at your disease management program. See the questions posed at the bottom of page 2 under "4. Refine your program." Also, make sure that the disease threat periods are sufficiently covered by your control measures. Remember that in many cases, preventive control practices will also control diseases that are listed for curative control. Have you taken into account resistance management guidelines, which recommend that you rotate among fungicide classes (Table 20)?

Pay special attention to high disease stress periods when air temperatures exceed 70 F and rainfall exceeds 1"/month

Weeds

On your Pest Management Worksheet:

List the top 5 weeds that you deal with in order of importance. The first weed listed (W-1) should be your most important weed, while W-5 represents the least important of the five. For each weed:

1. Determine control strategy: Determine whether you want to use pre-emergence control (BEFORE the weed appears) or post-emergence control (treatment

AFTER the weed appears), and use a “Pre” or “Post” in the column next to each weed name to indicate your preference. See Tables 14-16 for information on pre- vs. post- strategies.

2. Determine when weeds are likely to appear: Consult Table 13 to determine the **threat temperatures** for each weed. Using your **Climate Appraisal**, determine which month(s) those threat temperatures exist for. Now, on your **Pest Worksheet**, use the yellow marker to highlight the threat periods for each weed.
3. Determine when to begin control measures: Mark an “X” on your Pest Worksheet to indicate potential dates for starting chemical or cultural control measures (see Table 13).

On your Management Plan:

1. Select control measures for weeds that are controlled pre-emergence: Begin by focusing on your most important pre-emergence weed. Go through the entire process described below for each weed.
 - a) Use Tables 12, 15 and 16 to select the optimum practice(s) or product(s) for each preventively controlled weed that you have listed on your Pest Worksheet. Remember to take into account the sensitivity of your specific turf type to each weed control product (Tables 17-18)
 - b) List the names of these products or practices on the Management Plan.
 - c) Use the most current product label versions to determine the rate that you plan to use, and indicate this on the Plan as well. If you don't have a current copy of the labels, consult one of the websites listed in Table 11.
 - d) Use the letter “X” to indicate the timing of application for each of the products or practices. Consult your Pest Worksheet for information on when to initiate applications. Consult product labels for frequency of follow-up applications, and indicate these applications with additional “X”s. Make sure that product residual activity is long enough to control each target pest.
 - e) Go through the same procedure for the remaining pre- and then post-emerge controlled weeds. Remember that the timings for post-emergence weeds are going to be rough guesses at best – you will want to use monitoring to confirm that these weeds are present before beginning control measures
2. Monitoring is especially important for weeds that are controlled post-emergence. Once the average air temperatures are greater than 50F, weekly visual monitoring should begin. Use your **Climate Appraisal** to determine when visual monitoring begins, and mark with an “X” on the **Management Plan**.

3. Identify target weeds: Put the number of the weed (W1 – W5) next to each management practice that it addresses. Some practices will probably target multiple weeds.
4. Refine your program: Now take a look at your weed management program. See the questions posed at the bottom of page 2 under “4. Refine your program.” In addition, make sure that you have taken overseeding timing and turf sensitivities into account. Have you incorporated resistance management guidelines, which recommend that you rotate among pesticide classes (Table 21)?

Almost done!

The next-to-final step in this process is to look over your entire Management Plan and make the necessary adjustments. Some of the questions you should be asking include:

- Are there stressful practices (aeration, products with risks of phytotoxicity, products that cause damage when air temperatures are high) scheduled during especially stressful periods of time for the turf? Can you re-schedule the procedure and/or substitute gentler products?
- Can products that are scheduled for application at similar times be safely mixed in the spray tank?
- Are all label rates and recommendations being complied with?
- Are cultural practices being taken full advantage of in order to maximize turf health and potentially reduce pesticide applications?
- If you overseed, are products and practices timed to avoid any scheduling conflicts with renovation and overseeding procedures?

The Management Plan: A dynamic tool

The **Management Plans** that you will come up with are based on the historical weather patterns at your location, averaged over the past 30 years. This average represents some years with very hot or dry weather, others with very cold or wet weather, and some years that are in-between. These averages can give you some idea of what to expect in the coming year, but obviously they can be quite far off the mark in years, like this one, that are shaping up to have some extreme weather. For this reason, it is very important to review, fine tune and update your management plan periodically (we suggest monthly), and to re-write it on a blank Management Plan form when reality deviates significantly from your original predictions. The Management Plan is not a static document to be filed away – it should instead be a dynamic planning tool that reflects changes in weather, turf performance, budget constraints, and management expectations as the year progresses.