SECTION THREE

Integrated Pest Management

Contents

SECTION 3: Integrated Pest Management

KEY CONCEPTS

- Integrated pest management (IPM) is a tool that needs to be developed for each golf course.
- It is a multidisciplinary, ecologically based pest management system.
- It will minimise the use of pesticides, thereby reducing the risk of chemical run-off and water pollution
- It utilises **all** the available methods to keep pests at acceptable levels and requires:
  - *understanding course conditions and characteristics;*
  - *surveying pest species and knowing their life cycles;*
  - *defining pest damage thresholds;*
  - *developing a monitoring and record keeping program; and*
  - *developing and implementing pest control strategies.*
- IPM strategies dictate using the most safe, effective, economical and environmentally friendly measures available.

3.1 INTRODUCTION

An integrated pest management (IPM) program is a multidisciplinary, ecologically based pest management system that uses all available methods to keep pests at acceptable levels while minimising the effects on people, environment and turf. Pesticides remain a part of an IPM program, but they are only one of several options available to managers for controlling pests. Other options include genetic, regulatory, physical, biological and cultural solutions.

An effective IPM program is based on tolerating a level of pest damage that does not significantly reduce the acceptability of the turf. For a golf course, acceptable levels can be defined as the number of pests beyond which the aesthetics of the course and the playability of the turfgrass are compromised.

The components of an IPM program can be defined under the following headings:

- understanding course conditions and characteristics;
- surveying pests on the course;
- defining pest damage thresholds;
- developing a monitoring and record-keeping program; and
- developing and implementing pest control strategies.

3.2 COURSE CONDITIONS

This component of an IPM program involves collecting information on existing course conditions that could affect the ability of the turfgrasses to withstand pest infestations. Specific information to be collected includes:

- grass types;
- amount of shade;
- tree effect on air movement;
- soil type;
- soil fertility;
- site drainage;
- current cultural practices (e.g. mowing, fertilisation, irrigation etc.); and
- other site factors that may influence turf vigour and pest infestation.

These factors should be described for each hole of the golf course and the following checklists (Tables 3.1 and 3.2) can be used to note the relevant information.

Table 3.1 Checklist: Golf course conditions — Fairways

Hole no.	Predominant soil type	Topography	Drainage features	Grass type(s)	Shade effects	Other comments

Examples of conditions:

Topography: flat, slightly undulating, steep
Drainage features: poorly drained, some low areas, good drainage
Shade effects: no shade, moderate, winter only

Table 3.2 Checklist: Golf course conditions — Greens/Tees

Hole no.	Predominant soil type	Thatch depth	Grass type	Shade and air movement	Root depth	Surface features	Drainage characteristics	Other comments

Examples of conditions:

Shade effects: no shade, moderate, heavy
Air movement: good air movement, poor, protected from north, south, east or west
Surface features: flat, undulating, limited pin placements
Drainage characteristics: good, moderate, poor

3.3 MONITORING PROGRAMS

The development of a reliable monitoring program is the key to a successful IPM program. Overseas research indicates that where successful monitoring programs are implemented, chemical reductions in the order of 40–50% can be achieved. (NZTCI 1995).

Monitoring is an ongoing process and provides:

- early detection of a developing problem;
- location of the problem pests; and
- pest population status, which can be evaluated at various times of the year.

Monitoring a turf area for pests involves inspecting the area regularly (at least weekly and daily during key periods when pests are likely to occur) and recording any insect, weed or disease. Accurate and detailed records are required and include:

- identification;
- location;
- number present; and
- stage of life cycle (insects).

Table 3.3 shows an example of a pest monitoring sheet.

Table 3.3 IPM monitoring report

Turf area (green, tee or fairway): _____ **Date:** _____

Person undertaking observations: _____ **Time of day:** _____

Hole no.	Location	Disease	Weeds	Insects	Comments

Examples of conditions:

Location: rear of green, poorly drained area of fairway
Disease: name if known, or describe symptoms
Weeds: name, size, extent
Insects: name or general description, larvae or adults
Comments: severity of pest present (e.g. number of spots, number of grubs, size of area affected), sample sent for identification.

In addition to the monitoring information, it is also important to record the climatic conditions, which are easily obtained from the Bureau of Meteorology (www.bom.gov.au).

Climatic data to be recorded include:

- maximum and minimum temperatures;
- rainfall;
- humidity;
- sunshine hours or cloud cover; and
- wind.

Regular monitoring enables threshold damage levels to be determined. Once damage thresholds have been exceeded, control strategies can be implemented. If chemical treatment is necessary, treatments should be restricted to the target area rather than blanket spraying, which will substantially reduce the amount of chemical used.

3.3.1 Insect monitoring

- Irritating solutions can be used to flush surface-feeding insects to the surface. Dishwashing liquid (lemon-scented) at about 20 ml in 5 L of water and pyrethrum sprays (about 6 ml in 1 L of water) are effective flushing agents.
- Light traps and pheromone traps can be used to detect the presence of insects on the move (they do not provide accurate measure of numbers).
- Presence of underground grubs (e.g. scarabs) needs to be checked by peeling back the turf and examining the soil.
- Accurate identification is critical if cost-effective control is to be achieved.

3.3.2 Disease monitoring

- Most diseases require certain climatic conditions to develop (e.g. high night-time temperatures, high humidity).
- Indicator sites to be monitored daily. All golf courses have specific areas that are always affected first.
- Identify affected plant species/variety.
- Examine affected plants and identify any visible symptoms (e.g. lesions on leaves, lack of healthy roots etc.).
- Do not trust the pictures in the textbooks — have a positive identification made.

3.3.3 Weed monitoring

- Identify weed and size
- General site conditions
- Soils
- Drainage
- Compaction
- Shade

With regular monitoring, patterns will develop and can be useful to predict what is likely to happen in future years. When a pest is identified the following information should be recorded (Table 3.4).

Table 3.4 Pest monitoring sheet

Date of occurrence	Name of pests	Number of pests	Where encountered	Weather conditions	Method of control

3.4 DETERMINING PEST THRESHOLD DAMAGE LEVELS

Pest threshold damage levels describe the degree of pest infestation that can be tolerated in relation to course aesthetics and playability. Threshold levels can be very general (e.g. spraying for broadleaf weeds when they become visually noticeable), or quite specific (e.g. pesticide applications based on actual counts of insects).

It is essential that threshold levels be determined for each pest identified. They are going to be site-specific and developed in consultation with the course users and management. What is acceptable at one site may not be acceptable at another. Threshold levels should reflect the potential for serious turfgrass injury. For example, low threshold levels should be set for diseases that can cause extensive damage in a short period of time.

3.5 DEVELOPING AND IMPLEMENTING PEST CONTROL STRATEGIES

Pest control strategies can involve either cultural or non-cultural methods. Cultural methods are essentially preventative measures that reduce the extent of the pest problem and include:

- selecting appropriate turf cultivars;
- good fertility management;
- aerating compacted soils;
- improving drainage;
- thatch control;
- raising mowing heights;
- good irrigation management;
- minimising shade; and
- improving air movement.

Non-cultural techniques include:

- pesticides, and
- biological control agents.

The selection of a pesticide will take into account:

- selecting the lowest toxicity (yet effective) chemical;
- selecting a product that will be effective given soil and thatch conditions and grass type;
- the growth cycle of the pest;
- application method;
- duration of control required;
- rotation of pesticides of different modes of action; and
- possibility of environmental contamination.

Once a pest control strategy is implemented, check up on the result. Figures 3.1 and 3.2 provides an IPM decision flow chart that takes into account all factors connected with IPM programs.

Figure 3.1 Integrated Pest Management Decision Flow Chart (Peacock and Smart, 1995)

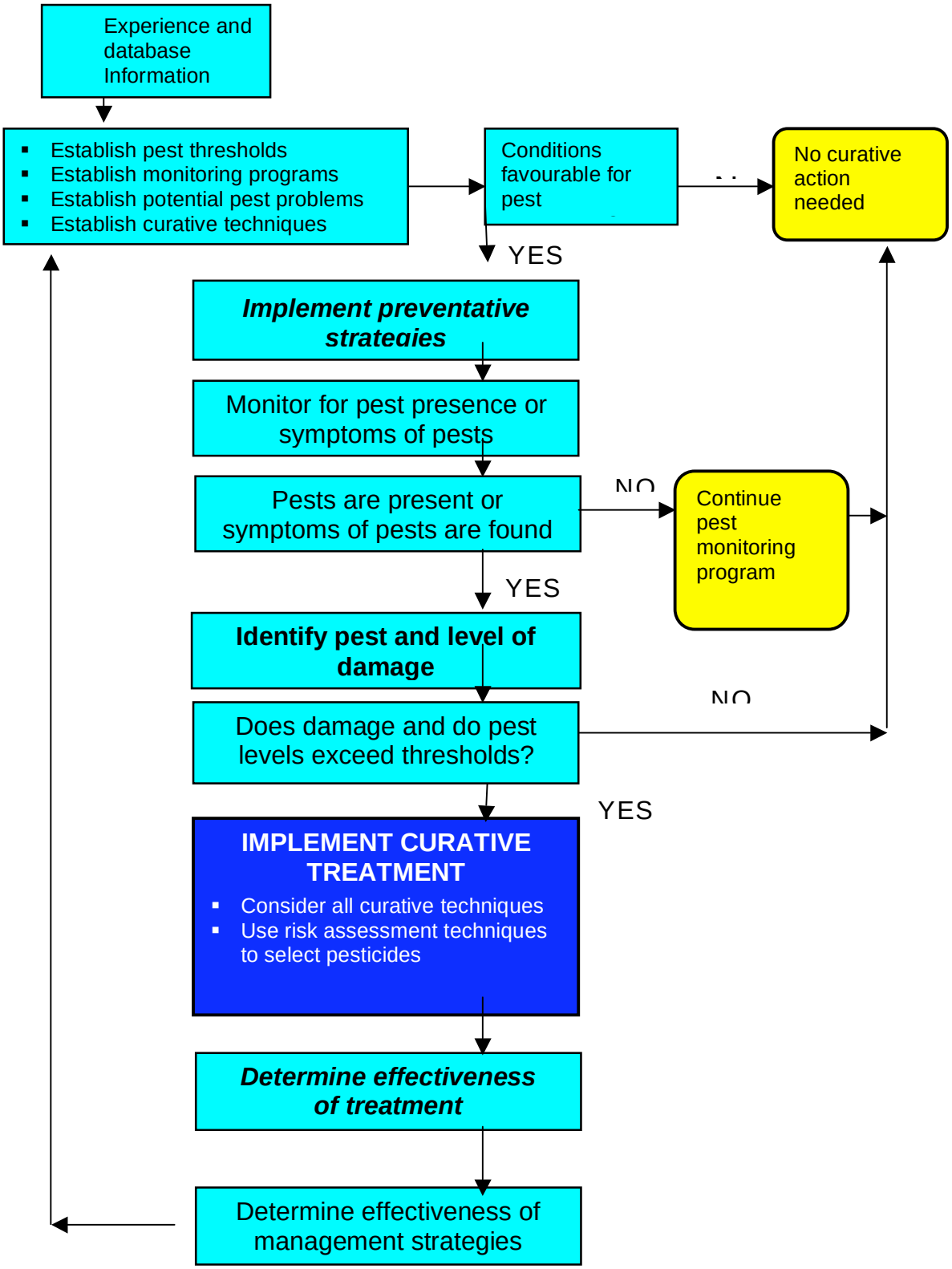
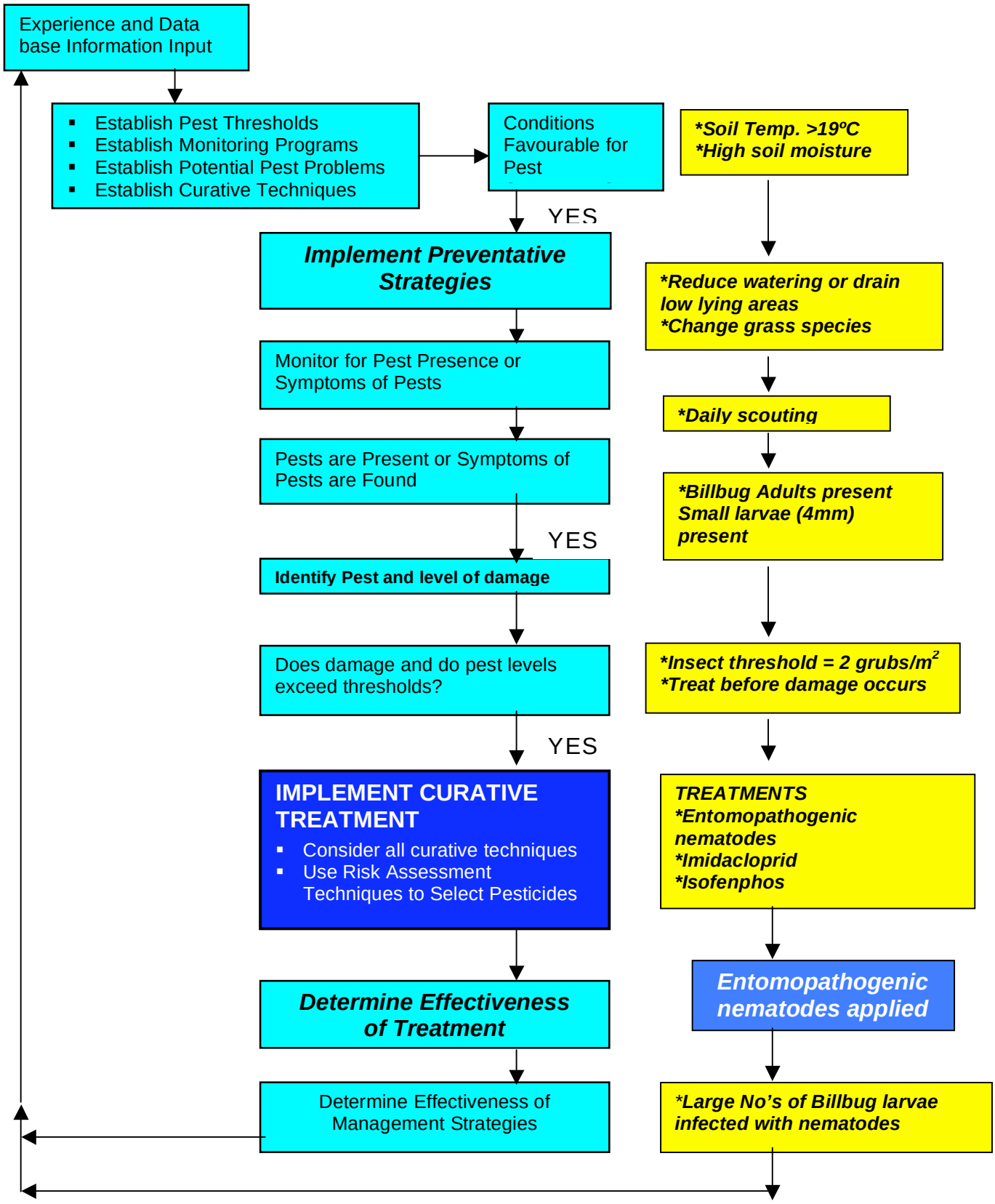


Figure 3.2 Integrated Pest Management Decision Flow Chart — Example (Peacock and Smart, 1995)



THE COSTS AND BENEFITS OF AN IPM PROGRAM

1. IPM monitoring and recording

7.5hrs/week @ $25/hr **$9,759per annum**

Regular monitoring formalises the process of gathering information about the golf course that assists in other management activities for example:

- irrigation,
- fertilising, and
- drainage.

2. An IPM program allows pests to be controlled at the most vulnerable time of the life cycle. This will often result in a single pesticide application rather than multiple applications.

For example: to control an insect pest using Dursban® (chlorpyrifos) will cost **$314/ha or $6,280 over 20 ha** (see section 4.1).

If we assume the IPM strategy provides 100% control then the potential benefits are:

- Not having to initiate a second or possibly third pesticide application (**saving $6,280 to $12,560**)
- Strategic spraying of 'hot' areas versus blanket spraying. Pest infestations often only cause a problem on 10–20% of the turf area. A risk assessment has to be undertaken based on the particular pest and the established damage thresholds.
- **Potential savings $5,024 to $5,652**

3. Environmental/ ecological benefits

In the future it may be necessary to close down sections of the golf course each time a pesticide is applied. There are obvious benefits in minimising the number of pesticide applications and the consequent inconvenience to golfers and reduced revenue streams.

REFERENCES

Bruneau, A (Editor), *Turfgrass Pest Management Manual. A Guide to Major Turfgrass Pests and Turfgrasses*, North Carolina State University.

NZTCI 1995, *Legislative and Environmental Issues. A Practical Handbook for Sportsturf Managers*, New Zealand Turf Culture Institute.

Peacock, C and Smart, M. 1995, *IPM, Monitoring and management plans — a mandate for the future*, USGA Greens Section Record May/June 1995.