

Setting Injury and Action Levels

Total eradication of pest organisms is virtually impossible to achieve. A more realistic goal is to determine the injury level—the number of pests or the amount of pest-related damage that can be tolerated without suffering an unacceptable medical, economic, or aesthetic loss. The action level—the number of pests necessary for treatment to occur to prevent the injury level being reached—depends largely on pest biology and environmental conditions supporting the pest.

4.1 Determine Injury Levels First

Before determining the action level, first determine the injury level. This is the level of damage or the level of the pest population that causes unacceptable injury. The injury level will be higher than the action level (see **Figure 4-1** for sample thresholds).

4.1.1 Three Types of Injury

There are three types of injury relevant to school IPM programs:

- *Aesthetic injury* applies mainly to plants. This refers to injury that affects the appearance without affecting the health of the plant. There are few indoor pests or pests of structures that cause only aesthetic damage.
- *Economic injury* refers to pest damage that causes monetary loss, e.g., clothes moths destroying band uniforms or a plant disease that causes the death of a tree.
- *Medical injury* relates to human health problems caused by pests such as rodents, flies, yellowjackets, and poison oak.

4.1.2 Injury Levels Differ Depending On The Pest And Its Location

The number of pests or amount of pest damage that can be tolerated (another way to think of injury level) will depend on the kind of pest and its location. A column of ants marching through an unused outbuilding is an entirely different situation from an ant invasion in the cafeteria. Many thousands of aphids can usually be tolerated on a tree, but one louse or nit on a child's head cannot.

Some pests are perceived as more frightening or disgusting than other pests, which in turn influences the number people will tolerate. Most people prefer crickets to cockroaches and find pigeons more acceptable than rats. Education and information can sometimes modify a person's tolerance level of a particular pest.

State, county, or local public health codes will have an impact on injury and action levels for pests such as rats, mice, cockroaches, and flies in areas where food is stored or prepared. In a public health emergency such as an outbreak of rabies or bubonic plague, government agencies may legally mandate control of certain pests. Consult the County Health Department for more information.

Box 4-1: Is a Response to an

Existing Pest Population Needed?

To determine whether a response is needed, ask the following questions:

- Are there state or county health codes requiring control of the pest problem (i.e., pests in areas where food is stored, prepared, or served)?
- Is the pest population growing?
- Are the pests located in a sensitive area (i.e., kitchens, cafeteria, or sick rooms)?
- Are the pests posing a health threat to humans?
- Are the pests damaging school property?
- Are the pests annoying or worrying students, faculty, and staff?
- Are the pests causing unacceptable aesthetic damage?

4.1.3 Don't Set the Level Too Low

One of the major causes of unnecessary treatments for pests is an unrealistically low tolerance level. Obviously, there is little leeway in tolerance for pests that have consequences for human health or the school budget, but for many other pests, the range of tolerance can be very wide. By understanding what damage is serious and by simply changing the way we view pests and pest damage, we can avoid many unnecessary treatments. For instance, most trees and shrubs can support substantial populations of caterpillars, aphids, psyllids, or leafhoppers without coming to any harm. Lawns can still be very attractive and functional even though the grass is not all of one kind and there are a number of weeds mixed in (as long as they don't pose a tripping hazard).

4.1.4 Determining the Injury Level

We all have intuitive, unspecified notions of injury level in various pest management situations, but these may not be accurate. In an IPM program, the aim is to try to make injury levels clear and precise. Monitoring is the only way to do this. It also takes knowledge and experience to understand the life cycles of pests, how fast their populations grow, and whether their damage will have serious consequences.

Example: Weeds in lawns are often only an aesthetic problem, but in other instances weaken ornamental plants. You may decide to set an aesthetic injury level in a lawn at 15 percent, or treat weeds in landscaped areas as soon as they begin to compete with ornamentals.

4.2 Determine Action Levels Based on Injury Levels

The action level is the level of pest damage or number of pests that triggers a pest management action to prevent pest numbers from reaching the injury level. The action is not necessarily a pesticide application. The action level will be lower than the injury level (see **Figure 4-1** for sample thresholds). Determining action levels involves making educated guesses about the likely impacts of numbers of pests present in a given place at a given time. In other words, an estimate of how high the pest population can grow before action is needed to prevent unacceptable injury. The action level must be determined and treatments applied before the injury level is reached.

Example: From previous experience, if more than ten cockroaches are found in a sticky trap in a classroom, teachers and students will complain. At one cockroach per trap, no one notices that roaches are present. When there are between

two and ten roaches per trap, the treatment may consist of tracking down the infestation, sealing holes and cracks near the infestation, fixing leaks, and applying cockroach bait. At the same time, review food storage, sanitation, and trash handling procedures with the teacher. If catches exceed ten roaches per trap, check equipment and other inaccessible areas for harborage; vacuum and thoroughly clean the room; and ask the teacher to remove clutter and straighten all storage areas.

4.2.1 Set Conservative Action Levels in the Beginning

During the beginning phase of an IPM program, it is wise to be conservative when establishing an initial action level. Set it low enough (i.e., low numbers of pests trigger treatments) to insure a wide margin of safety while learning monitoring methods. The initial action level should then be compared with other action levels for the same pest at different sites or locations. This is necessary to determine if the action level is set too high or too low, if treatments were necessary or not, and if they were properly timed.

The easiest way to collect comparative data is to set aside a portion of a school that remains untreated at the time another area is treated, or to monitor two schools where different action levels are applied to the same pest. By monitoring both sites, and comparing records, adjustment of the initial action level up or down can be evaluated.

Periodically, the action level should be re-evaluated for each pest and for each site. Changes in weather conditions, plant cultivars grown, horticultural practices, level of IPM experience of employees and building renovations can affect the setting of injury levels. See **Table 4-1** for

example action levels for common school pests.

4.2.2 Avoid “Revenge” Treatments

Sometimes action takes place after the injury level has been reached and the pest population has begun to decline naturally, such as with seasonal changes (**Figure 4-2**). These “revenge” treatments are generally useless at controlling pests, are damaging to the environment, and an unnecessary expenditure of time and resources.

4.3 Declaring an Emergency Under the Healthy Schools Act

In the Healthy Schools Act, “emergency conditions” are defined as “circumstances in which the school designee deems that the immediate use of a pesticide is necessary to protect the health and safety of pupils, staff, or other persons, or the schoolsite.” (Education Code section 17608(c))

Before an emergency occurs, the IPM coordinator (pest manager) must establish a communication “tree” with the names and phone numbers of people to contact in a crisis. Each contact should have a set of clearly defined responsibilities. For instance, the IPM coordinator notifies the public information officer who then handles the concerns of parents and the public. The IPM coordinator also notifies school administrators who decide who to notify at higher levels. The IPM coordinator must communicate effectively with all those involved in the emergency and must choose information that is appropriate for each person with whom he or she communicates. For instance, the superintendent will not need to be informed of specific mixing instructions for the pesticide, and the pesticide applicator will not need to know the names of the students and staff involved.

It is important to thoroughly document the emergency condition. Ask the following questions:

- **Who** is the person who is warning about the emergency? Is the person credible? Does he or she have the necessary knowledge to make a determination of an emergency?
- **What** is the problem? Find out as much as possible about the problem and what is causing it. What kind of pest is involved? Is the problem one of health and/or safety?
- **Where** is the problem? Is the location such that it is an immediate threat to health and safety? Can the area be cordoned off to prevent further problems?
- **When** did the problem occur? Is it happening at this moment, or did it happen two weeks ago, and is just now being reported?
- **How** did the problem occur? What are the circumstances surrounding the incident?
- **Why** did the problem occur? What factors contributed to the creation of the problem?

Once an emergency is declared and the channels of communication are open, the next step to take is assessing the possible options for solving the problem and choosing the most effective one. Once the treatment has been chosen, the IPM coordinator should communicate this decision. When the emergency is over, it is important to assess the effectiveness of the chosen course of action (see section 5 for more information) and to make adjustments in the pest management system so that the problem doesn't recur. This evaluation and the changes that are made should be reported to those involved in the emergency.

IPM is not simply a matter of substituting “good” pesticides for “bad” pesticides. Too often, we want an easy solution, a magic bullet that will solve all our problems in one shot. Unfortunately, pest management is complicated, and we cannot always expect a simple solution to pest problems. IPM works because combined strategies for pest management are more effective in the end than a single strategy. A good pest manager considers as many options as possible and tries to combine them into an effective program. The best pest managers have ideas for new and creative ways to solve pest problems. As defined by the Healthy Schools Act, IPM takes a preventive approach by identifying and removing, to the degree feasible, the basic causes of the problem rather than merely attacking the symptoms (the pests). This prevention-oriented approach is also best achieved by combining a number of treatment strategies.

Table 4-1: Examples of Action Levels* for Schools

Pest	Classrooms/ Public Areas	Maintenance Area	Infirmary	Kitchen	Grounds
Ants, Argentine	5/room	5/100 ft ² in 2 successive periods	1/room	3/room	1 nest within 25 ft of bldg.
Ants, carpenter	3/room	3/room	1/room	2/room	1 nest within 25 ft of bldg.
Bees, honey	1/room	3/room	1/room	1/room	If children threatened
Bees, bumble	1/room	3/room	1/room	1/room	If children threatened
Bees, carpenter	1/room	3/room	1/room	1/room	If children threatened; 1 carpenter bee/5 linear ft
Cockroaches	2/room	5/room	1/room	1/room	If noticeable or invading
Crickets	3/room	10/room	1/room	2/room	If nuisance
Grain & flour pests	1/package or container	N/A	N/A	1/package or container	N/A
Houseflies	3/room	5/room	1/room	1/room	5/trash can or 10 dumpster
Landscape Pest (general)	N/A	N/A	N/A	N/A	whenever damage approaches 10% per plant
Lawn pest (insects, nema- tode, disease)	N/A	N/A	N/A	N/A	whenever visible damage approaches 10% in any 100 ft ² area
Lice (head or body)	Take no action, refer to nurse				
Mice	1/room	1/room	1/room	1/room	burrows or activity in any student area
Pigeons	Public area or roof: whenever droppings accumulate more than 1 inch or nests obstruct gutters or equipment. Roof ledges: 10/building for 3 consecutive inspections				
Poison Oak	Outdoor student activity areas: 1 plant Wooded areas: no control necessary unless near path or student activity area				
Rats	1/room	1/room	1/room	1/room	any burrow/activity
Silverfish	1/room	2/room	1/room	1/room	NA
Spiders, poisonous	1/room	1/room	1/room	1/room	1/activity area
Spiders, others	1/room	3/room	1/room	1/room	only if nuisance
Weeds	Lawns: whenever weeds approach 15% in any 100 ft ² area Ornamental plantings: whenever competing with ornamental plans or whenever aesthetically displeasing				
Yellow jackets	Inside: 1/room; outside: 10/10 minutes at trash (this triggers more frequent trash pickup and/or search for nests) Outside in traps in early spring: 30 to 40 in 4 hours in a trap (this triggers area wide baiting)				

* The specific action levels mentioned in this table are offered as examples only. They are not required by regulation or law. Each school using action thresholds should develop action levels of their own, suited to specific conditions at the school.

This table was adapted from Pinto and Kraft, 2000.

Figure 4-1: Injury and Action Levels

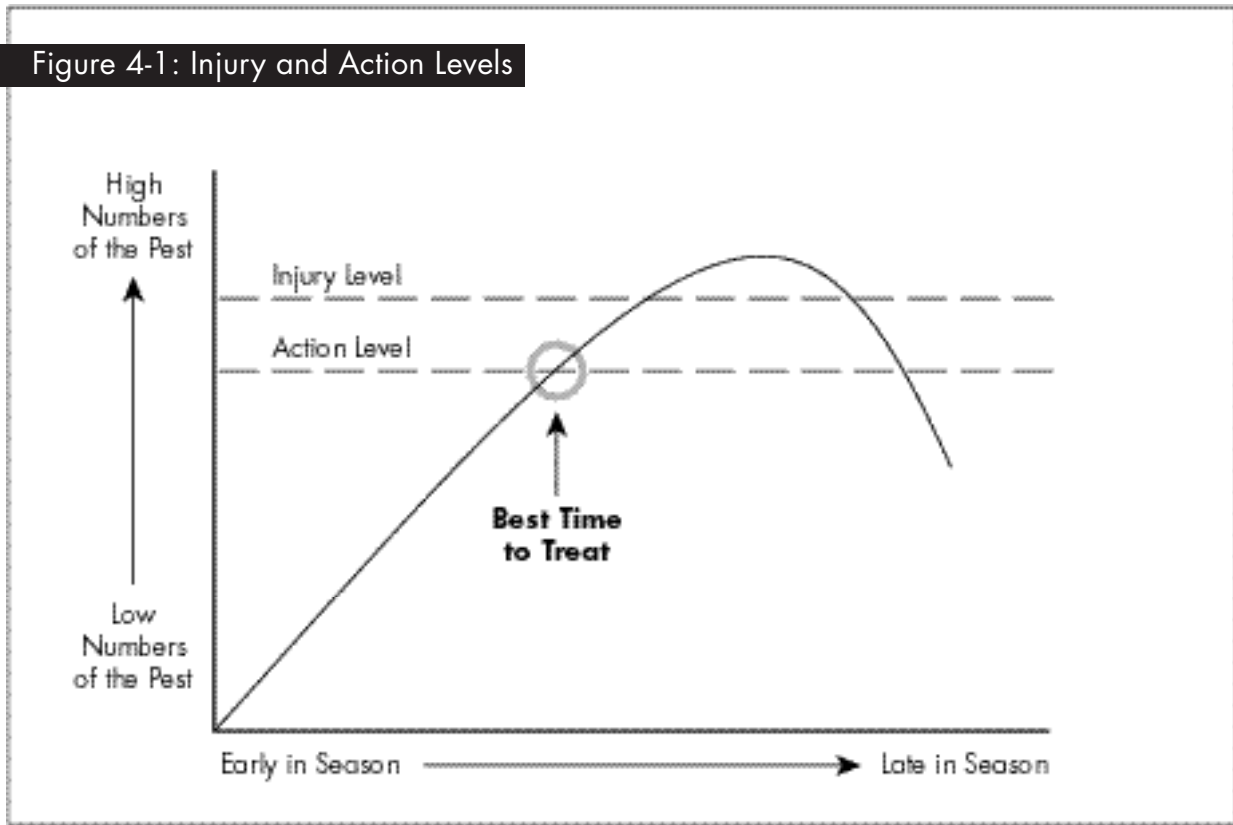


Figure 4-2: Effect of "revenge" treatments.

