

## Integrated Pest Management



## WHAT YOU SHOULD KNOW

### What is Integrated Pest Management?

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Integrated Pest Management (IPM) is an approach to pest control that combines habitat modification, physical and biological methods, cultivation techniques, least toxic pesticide alternatives and, if necessary, chemical pesticides - so that the benefits of pest control are maximized and the risks to health and the environment are minimized.

Applying pesticides to crops, animals, buildings or landscapes on a routine basis, regardless of need, is not IPM. "Fogs" and "bombs" are not used in IPM as they do not effectively target the intended pest. Applications of pesticides are always the last resort in an IPM program. IPM is not, however, an anti-pesticide program. Rather, it involves selective use of pesticides designed specifically for an intended pest, and only in necessary amounts.

It is important to remember that not all insects or unsightly plants are pests. There are many beneficial insects which are natural predators of pests. To effectively manage pests, we must learn to identify which are beneficial and which can cause damage. The more we know about pests, the easier it is to manage them without reliance on pesticides.

### What is a pesticide?

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A pesticide is a general term for substances used to prevent, destroy or repel pests, or reduce the damage they cause. Some pesticides are formulated to be effective on specific pests while others (commonly called "broad spectrum" or "multi-purpose") are useful for a variety of pests.

While many think that pesticides are aimed at only insects, pesticides include (but are not limited to):

- Insecticides - for insects
- Herbicides - for plants
- Rodenticides - for rodents
- Nematocides -for microscopic animals, also called "roundworms." (Some nematodes decompose soil. Others live in water, and some are parasites.)
- Fungicides - for fungi
- Arachnicides - for spiders mites, ticks

All of these common products are considered pesticides:

- Cockroach sprays and baits.
- Insect repellents for personal use.
- Rat and other rodent poisons.
- Flea and tick sprays, powders, and pet collars.
- Kitchen, laundry, and bath disinfectants and sanitizers.
- Products that kill mold and mildew.
- Some lawn and garden products, such as weed killers.
- Some swimming pool chemicals.

### How can pesticides affect your health?

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#### A Chemical World

Chemicals (whether natural or manmade) can be found in our homes, our clothing, our food and food packaging, our computers, our hospitals, most of our workplaces - in virtually all aspects of modern life. Some chemicals are harmless, some are helpful, and some can create serious health hazards. Over 23,000 chemicals and substances are used commercially in Canada, and hundreds are generated every year.

An extensive battery of toxicity studies is required by the Pesticide Management Regulation Agency (PMRA) to determine the nature and extent of the hazard posed by a pest control product proposed for use in Canada. However, while individual chemicals are approved "one at a time" with a margin of safety, our modern lifestyles expose us to the synergistic effects of many chemicals "all at once." The effects of multiple exposures and chemical interactions on human health are not fully understood.

#### Pesticides and Human Health

It is generally recognized that the misuse of pesticides poses a hazard to human health. Pesticides may travel world-wide or settle on neighbors' properties, clotheslines, pools, toys and furniture. People and pets can track pesticide residues into the house. Even household pets are at risk of exposure to pesticides.

Pesticides can be absorbed through the skin, swallowed or inhaled. Possible adverse health effects could include cancer, leukemia, miscarriages, genetic damage, decreased fertility, liver damage, thyroid disorders, diabetes, neuropathy, still births, decreased sperm counts, asthma, low birth weight, birth defects and weakened immune systems as well as adverse effects to healthy brain development, child behaviour and ability to learn.

*The beaten path does not lead to new pastures.*

Indira Gandhi

## **Why worry about children's environmental health?**

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There is growing concern about the effects of exposures to pesticides, both outdoors and indoors, on prenatal and child health in Canada. Children are more sensitive to pesticides than adults, and their behavior and activity patterns bring them into greater contact with pesticides found in their environment. Increased hand-to-mouth activity and frequent contact with environmental surfaces (lawns, carpets) means they are more likely to ingest pesticide residue.

A child has a higher breathing rate than an adult, and a child's breathing zone is lower to the ground. Some pesticides will be found in greater concentration nearer to ground level. Their smaller size means that they are proportionately exposed to higher amounts of pesticides (i.e., higher surface areas to body mass ratio). Exposures to harmful substances during childhood can lead to adverse health conditions in later life.

The fetus, infant and toddler have the greatest susceptibility to adverse effects from pesticides due to biological differences. Immature organs and tissues (especially the brain, nervous system and lungs) are vulnerable to harm from toxic exposures for a long period of time. Adverse effects in these vulnerable tissues may be permanent and irreversible.

Other vulnerable population groups include pregnant women and the elderly. The evidence is persuasive that the greater susceptibility of pregnant women and fetuses, infants, children and the elderly justifies prudent avoidance and precautionary measures to limit unnecessary exposures to pesticides for these vulnerable groups. In the absence of conclusive scientific evidence, one should exercise sound judgment in everyday decision-making to reduce or eliminate exposures to potentially harmful substances, especially where vulnerable populations are concerned.

## **How can pesticides affect the environment?**

The Pesticide Management Regulatory Agency assesses all pesticides, applying extra safety precautions to ensure the most sensitive sub-populations are protected. Pesticides reduce the negative impact of pests on crop production, enhance food production per acre, increase the variety of foods grown, and contribute significantly to our abundant, high quality, economical food supply. However, pesticides are also toxic to living organisms and can be harmful to the environment, particularly when they are misused. While they

may help rid the environment of unwanted pests, they can also contaminate water systems, pollute the air, damage agricultural lands, harm wildlife, and damage or destroy plant species.

### **Pesticides Travel Far and Last Long**

Pesticide particles can be carried thousands of miles via wind, rain, snow or surface water. Today, even seals in the Antarctic - thousands of miles from where pesticides are used - have DDT residues in their bodies. Today's chemicals have lower acute toxicity to wildlife so animals are less likely to suffer from immediate poisoning. However, the long-range effects of pesticides in our environment is cause for concern. Many chemicals do breakdown rapidly in the environment, but some persist for extended periods of time.

### **Bio-Accumulation Of Pesticides**

Pesticides can become concentrated via the food chain. Thus, an insect feeding on plants sprayed with pesticides might be eaten by another insect, which might then be eaten by a bird. Traces of pesticides too small to kill the targeted pest can accumulate to levels high enough to harm species (including birds, bears or people) farther on up the food chain.

### **Decreased Biodiversity**

Pests can develop resistance to the very chemicals aimed at them. They continually mutate to become pesticide-resistant. Because the natural enemies that once kept a pest under control may be destroyed through the application of the pesticide, the targeted pest may mutate and multiply.

Insecticides that wipe out one species of insect may give another species the chance to overpopulate. Insects never before considered to be a problem, because natural enemies kept their numbers low, may emerge as pests.

## **THE OZONE LAYER**

Certain widely used soil fumigants today are not only extremely toxic to most living organisms, but also play a disproportionately large role in depleting the stratospheric ozone layer.

- The treatment of agricultural soils with the fumigant, methyl bromide, has been suggested to be a significant source of atmospheric methyl bromide which is involved in stratospheric ozone loss. (U.S. Department of Energy (DOE) Office of Scientific and Technical Information)

***Don't fool around with pesticides. Wear protective equipment and follow instructions carefully to avoid misuse. Better yet, call a professional pesticide applicator who is trained and licensed.***

## THE SOIL

Pesticide use can damage agricultural land by:

- Harming beneficial insect species, soil microorganisms, and worms which naturally limit pest populations and maintain soil health,
- Weakening plant root systems and immune systems, and
- Reducing concentrations of essential plant nutrients in the soil such as nitrogen and phosphorous.

## WILDLIFE

### Birds

A large number of pesticides in use today are highly toxic to many bird species:

- Carbofuran, a pesticide used in agriculture, has been shown to be responsible for multiple bird kill incidents, with some kills numbering over 2000 birds.
- Insecticides were the culprits in bird kills during 1994-1995, afflicting many species such as ducks, Canada geese, blue jays, and others.
- At lower doses, birds and other wildlife may develop many of the same diseases as people.

### Fish

Pesticides can take a heavy toll on fish populations and other aquatic species. Fish can be poisoned by the presence of small traces of a pesticide's active ingredient in the water. Low doses of certain pesticides can result in reduced egg production and hatching, lower resistance to disease, decreased body weight, hormonal changes, and reduced avoidance of predators.

- Poisons from pesticides used on potatoes to kill weeds, insects and fungus, have been found to be the culprit behind "fish kills" in Prince Edward Island when they runoff into rivers. Some of these kills also involved frogs, turtles, mussels and other wildlife.
- In 1995, toxic concentrations of endosulfan and methyl parathion along a 16 mile stretch of the Tennessee River tributary in Alabama resulted in fish kills numbering over 240,000 within a few weeks.

### Non-Targeted Pests

Pesticides can stray from their point of application. Sprayed pesticides may move through the air ending up in soil or water or affecting air quality. Pesticides applied to the soil may percolate into groundwater, or run-off into nearby bodies of surface water. While some pesticides break down (or degrade), others are persistent in the environment and can harm in ways we may not expect. For example, pesticides may kill birds, fish and other animals besides the targeted pest. This disrupts ecological systems and erodes the genetic diversity of the earth.

## Beneficial Insects, Predators, Habitat And Food

**Sources** Pesticides that are not highly toxic can still be harmful to wildlife by reducing the abundance of beneficial insects, predators, habitat cover and food sources that other wildlife need in order to survive.

### Animal Immune Systems

Pesticides often have particularly potent effects on animal immune systems, which can be seen as a causal factor in die-offs from diseases seen in whales and dolphins in recent decades.

## OUR WATER

The leaching of pesticides and fertilizers from farms and lawns into rivers, lakes, streams and underground wells can threaten the quality of recreational and drinking water.

- Over 15 million Americans drink water from pesticide contaminated wells.
- Eutrophication - During the spring and summer, runoff from fertilizers (which contains nitrogen and phosphorus) is partly to blame for the proliferation of weeds and algae in lakes. Too much algae growth (phytoplankton), which results from the increase in available nutrients, disrupts the ecosystem by choking out other plants. This can lead to water that is unfit to swim in or drink as well as an oxygen-deprived environment for fish.

## What is a pest?

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### Broad Definition

A pest is any living thing (plant or animal) that...

- bothers or annoys us,
- bothers or annoys our pets or animals,
- damages things we value,
- causes unacceptable changes to appearance (aesthetics),
- occurs where we do not want it, or
- causes or spreads disease.

The definition above is a broad definition. In fact, most people don't always agree that something is a pest. What is a pest to one person may not be a pest to another. For example, a dandelion may be a noxious plant (or pest) to one person and a wildflower to another.

It is important to remember that pests aren't "trying" to hurt or bother us. They have even contributed significantly to our understanding of genetics, evolution, animal and plant science, pollution and even sociology. However, when their activity falls under the broad definition (above) to an extent that is intolerable, they can be considered to be pests.

## When is a pest NOT a pest?

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### When Pests are NOT Pests

All living things have roles in the environment that are important. When they are doing their ecological jobs, they should not be considered pests:

- Plant pollination (birds, bees and all kinds of insects)
- Soil decomposition, enrichment and aeration (worms, earwigs, termites, ants, roaches, larvae of some flies, beetles and more)
- Staple in the food chain (countless number and variety of insects and other animals)
- Control of other insects and noxious weeds (preying mantis, spiders, centipedes, dragonflies, bees, wasps and ants)
- Producers (honey, beeswax and silk are some of the most economically valuable insect products)

### When Pests are Pests

Decomposition of old trees in the forest is important to the ecosystem. But what happens when decomposers like termites infest your house? Then you have a problem because they are damaging something you value. Only when plants and animals invade our personal space to an extent that is intolerable, damage or destroy something we value, or pose health risks to us or our pets, can they be considered to be pests.

## How can you control pests without using chemicals?

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The control of unwanted insects, weeds and rodents (otherwise known as pests) does not have to depend on pesticides. With a little work, these pests can usually be controlled by using alternative measures. There are a variety of control methods that can help to reduce pest populations while protecting human health and the environment. Pesticides may be used in combination with other control methods - but should only be used as a last resort.

### Criteria for Selecting Control Methods

Treatment strategies should be:

- Least hazardous to human health,
- Least disruptive to natural controls in landscapes,
- Least toxic to non-targeted organisms,
- Most likely to be permanent and prevent the recurrence of the pest problem,
- Cost-effective in the short and long-term, and
- Appropriate to the site.

## Key Strategies for Controlling Pests without Chemicals

### **HABITAT MODIFICATION**

The goal of habitat modification is to prevent the conditions which allowed pests flourish in the first place. We need to learn what about the building or grounds is providing them with the habitat they need to thrive. We may then choose to modify the habitat so that it no longer provides them with a suitable environment in which to live. This may involve:

- Sanitation - Remove or clean up those conditions that attract pests. Take away their hiding places by removing clutter.
- Take away their water - Fix leaks and eliminate standing water and moisture.
- Take away their food.
- Keep pests out - Keep your home in good repair so that pests can't get in.
- Eliminate the pest habitat - Remove dense vegetation near the house or building to eliminate hiding places.

### **PHYSICAL METHODS**

Physical control methods remove or kill existing pests in mechanical or non-chemical ways such as:

- Barriers
- Traps
- Vacuuming
- Fly swatters (or other ways of removing pests by hand)
- Hand-pulling / hand-digging weeds or unwanted plants

### **BIOLOGICAL CONTROLS**

- Attract, use and preserve natural predators (like birds, ladybugs, spiders and cats).
- Use organic gardening and lawn care practices.
- Gardeners, farmers, and foresters need to return to tried and true pest control methods such as crop rotation, companion planting, and biological controls.

**For additional information on IPM strategies, refer to these FACT SHEETS:**

- Integrated Pest Management for a Healthier LAWN
- Integrated Pest Management for a Healthier HOME

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# The 6 Steps of Integrated Pest Management

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Integrated Pest Management uses knowledge about pest biology and habitats to choose the best combination of common-sense control methods to keep pests under control. Whether the pest situation is in a greenhouse, field, yard or inside a home or school, IPM uses a series of steps to make pest management decisions with the least harmful effect on people, pets and the environment.

## 1. **INSPECT and INVESTIGATE**

Inspect and investigate areas where pests are occurring on a regular basis to pinpoint infestations and problem areas. Where are they coming from? How are they getting in? Are they causing any damage?

## 2. **IDENTIFY and LEARN**

Identify the pests you have and learn about them. Find out what they eat, when and how they reproduce and the living conditions (habitat) they need to survive and thrive.

## 3. **MONITOR**

Remember, in IPM, you want to take the least toxic approach to managing pests. So before you make any decisions about methods to deal with a pest, take time to monitor the situation to decide if this pest IS or IS NOT a pest. Check the problem area on a regular basis. Keep records of the activity you find. What are they eating? Where are they coming from? When do they seem to be most prevalent? Why are they thriving in this habitat? What specific damage are they causing? Is the damage or annoyance tolerable? Can you live with this pest “as is” or do you need to take action? Look for the “root cause” of the pest problem. If you decide to take action choose control methods in Step #4 that will treat the cause - not the symptom. Ask yourself...What is the least toxic method to use for managing this pest?

## 4. **CHOOSE CONTROL METHODS**

- a. Habitat Modification
- b. Physical Methods
- c. Biological Controls
- d. Alternatives or Pesticides - Use the least toxic alternative first (such as baits, natural oils, soaps and plant-based remedies) before resorting to chemical pesticides.)

## 5. **EVALUATE**

Keep checking to see if the pests are still there and which control methods are working. By keeping records of the numbers of pests captured, you can learn which methods are working best. Ask yourself, were the actions we took necessary, or would the problem have improved without any action at all? Did the actions we took and the treatments used solve the problem? Would we do things differently the next time? Do we need more or better information to help us make pest management decisions in the future? Adjust or change your methods if necessary - always using the least toxic approach.

## 6. **EDUCATE**

Contribute to a healthier world. Teach others how to manage and live with pests in a way that does the least harm to human health and the environment.

# QUICKLINKS and REFERENCES

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**Child Health and the Environment - A Primer**

[http://www.healthyenvironmentforkids.ca/img\\_upload/13297cd6a147585a24c1c6233d8d96d8/Primer.pdf](http://www.healthyenvironmentforkids.ca/img_upload/13297cd6a147585a24c1c6233d8d96d8/Primer.pdf)

**Environment Canada**

[http://www.ns.ec.gc.ca/epb/factsheets/bkyard\\_bug/bugs\\_brch.html](http://www.ns.ec.gc.ca/epb/factsheets/bkyard_bug/bugs_brch.html)

[http://www.atl.ec.gc.ca/epb/factsheets/12\\_steps.html](http://www.atl.ec.gc.ca/epb/factsheets/12_steps.html)

**Go for Green - Gardening for Life Program**

<http://www.goforgreen.ca/gardening/index.html>

**Health Canada - Healthy Lawns**

<http://www.healthylawns.net/english/index-e.html>

**Health Canada - Pest Management Regulatory Agency**

<http://www.pmra-arla.gc.ca/english/index-e.html>

**Integrated Pest Management in Schools**

<http://schoolipm.ifas.ufl.edu/teach.htm>

**Landscape Ontario**

<http://www.landscapeontario.com/pdf/Healthy%20lawns%2C%20healthy%20families.pdf>

**Malathion (Ministry of Health and Long Term Care)**

[http://www.health.gov.on.ca/english/public/pub/ministry\\_reports/wnv\\_plan\\_2005/app\\_8a.pdf](http://www.health.gov.on.ca/english/public/pub/ministry_reports/wnv_plan_2005/app_8a.pdf)

**Michigan State University Pesticide Education**

<http://www.pested.msu.edu/CommunitySchoolIpm/curriculumpdf/wholedoc.pdf>

**Ontario Ministry of Agriculture, Food and Rural Affairs**

<http://www.omafra.gov.on.ca/english/environment/bmp/series.htm#IPM>

**Pesticides - Making The Right Choice For The Protection Of Health And The Environment:**

Report of the Standing Committee on Environment and Sustainable Development, May 2000

<http://www.parl.gc.ca/InfoComDoc/36/2/ENVI/Studies/Reports/envi01/04-toc-e.html>

**Toronto Public Health**

<http://www.toronto.ca/health/pesticides/>

**Urban IPM Materials Center**

<http://www.pested.msu.edu/CommunitySchoolIpm/urbanmaterials.htm>

**World Wildlife Federation**

<http://www.picosearch.com/cgi-bin/ts.pl>