INTRODUCTION

Whether or not we realize it, all of us rely on effective pest management to ensure adequate food supplies. We compete with insects, diseases and weeds for our share of food. It has been estimated that without pest management, pre-harvest crop losses would average 40 percent.

Since World War II and the discovery of DDT, society has increasingly looked to pesticides for pest control. However, reliance on this single pest management tool has brought with it a number of new challenges, which include:

- ► the development of resistant pest populations that are no longer controlled by specific pesticides, such as house flies, Colorado potato beetles, apple scab and triazine-resistant weeds such as lamb's quarters
- ► environmental health concerns, especially the contamination of water, by persistent pesticides such as aldicarb
- ► the negative effects of pesticides on non-target species and beneficial species, e.g., fish and wildlife habitat adjacent to and beyond the areas being treated
- ► changes in the pest complex following the use of broad-spectrum pesticides, and the emergence of new pest species due to the elimination of competitors or beneficials, e.g., mites, white apple leafhopper in apples, pear psylla, nightshade in tomatoes
- ► a lack of new pesticides to counteract resistant populations and control emerging pests.

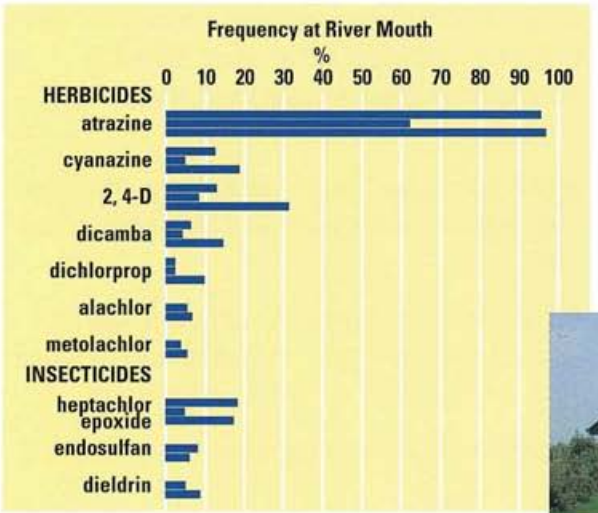
These challenges have sparked a search for new approaches to managing pests. Integrated Pest Management, or IPM, is a system of managing pests that involves aspects of more than one control method – cultural, biological or chemical – in a program that is both economically and environmentally sound.

Honeybees act as pollinators and are an essential part of fruit production. They can be mistakenly poisoned by spray drift.

Over 700 species of pests worldwide have become resistant to specific pesticides. Here are three examples: herbicide-resistant lamb's quarters (left); fungicide-resistant apple scab (centre); and insecticide-resistant Colorado potato beetle.

INTRODUCTION

Pesticides can be carried into streams and rivers via tile drains.



This chart shows how frequently the main pesticides appeared at the mouths of the Grand, Saugeen and Thames rivers, from 1981 to 1984.

Pesticide contamination of soil and water can be prevented by having a proper mixing and loading area.

Based on observation and knowledge, not a predetermined calendar date, IPM has four main steps:

- ▸ identifying the pest(s)
- ▸ monitoring pest and beneficial species
- ▸ determining pest thresholds
- ▸ choosing control options and assessing their effectiveness.

IPM involves more than simply knowing that a pest is present and needs to be controlled. The objective is to keep the pest species below the population density that causes economic loss.

Pest monitoring means the grower or scout looks in the field to establish the presence of pests.

Pest identification involves finding out which pests are present in the field.

Pest thresholds are reached when the pest numbers reach a certain level, and it's time to take action to control them.

Field weather-station equipment monitors temperature and leaf wetness, and helps to forecast disease episodes on onions.

Corn is scouted for European corn borer egg masses by checking plants by hand.

INTRODUCTION

THE BENEFITS

- it's a systems approach, based on unbiased monitoring techniques, and backed by research or field experience
- more efficient use of inputs such as pesticides, fuel, water and time than with conventional pest control
- less reliance on a single management method and greater use of a variety of methods – pest resistance develops more slowly due to reduced selection pressure from chemicals
- chemicals are only used when necessary
  - ▷ fewer applications of pesticides due to better timing of sprays
  - ▷ less impact on soil and water, and non-target species of fish and wildlife
  - ▷ more stability in the pest complex with fewer emerging problems, because competitors and beneficials are not eliminated
  - ▷ longer availability of registered pesticides, because efficacy remains consistently high and improved spray coverage reduces use
- often an initial dramatic reduction in pesticide use and an immediate economic benefit to growers
- no loss of quality or yield

Canadian Seed Growers' Association

Pest control can take several approaches: mechanical control of weed seedlings (top); cultural control of seed-borne pests through use of certified seed (centre); and biological control – in this case, of flies with the help of Muscovy ducks.

INTRODUCTION

COST TO ONTARIO APPLE GROWERS USING DIFFERENT SPRAY OPTIONS

	CALENDAR SPRAYS	REGIONAL AGRI-PHONE	IPM SCOUT
# SPRAYS PER SEASON	26	18.75	11.50
COST PER HECTARE	$1451.00	$1052.00	$636.00

*cost of scout @ $30.00/ha. Source: B. Solymar, OMAFRA

Lacewings are important for biological control of aphids in many crops.

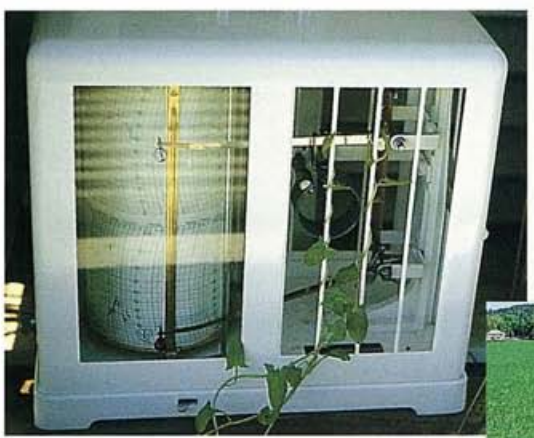
Calibrate your sprayer regularly: this will ensure that pesticides are applied at the correct rate with maximum spray coverage.

INTRODUCTION

THE CHALLENGES

- ▸ IPM is knowledge-driven, and requires a greater understanding and commitment on the part of growers than conventional pest control
  - ▷ pest management is complex and requires an understanding of the interactions among the species involved
  - ▷ effects of pest management on the environment, and wildlife and their habitat must be minimized
  - ▷ growers must be willing to keep up-to-date with research findings and monitoring techniques
  - ▷ IPM requires a long-term commitment
- ▸ IPM requires a sound research base, which is an expensive upfront investment for society
  - ▷ research component must be ongoing because living systems are dynamic
  - ▷ for some crops and pests, extensive research is needed to develop systems that are specific to each growing area
- ▸ on some crops, intensive IPM doesn't make economic sense, because the treatment costs and the amount of pesticide needed in conventional systems are low
- ▸ some expense is involved with monitoring equipment, weather-recording machines, scouts and consultants

A researcher studies insect pests.



This weather recorder continually tracks temperature in an orchard.

Small research plots are used to test new IPM techniques in onions.

You can learn the latest IPM techniques at twilight meetings like this one in the Alliston area.

INTRODUCTION

- ▸ availability of IPM systems varies from place to place, and is often unavailable to growers in isolated areas
  - ▷ cost of delivering a knowledge-based system is prohibitive where only a small area is grown
- ▸ IPM programs aren't easily transferred from area to area
  - ▷ programs are unique to each crop production area because of variations in climates and pest complexes

The Hirst spore trap is used to trap spores that initiate plant diseases.

The temperature recorder is kept in a ventilated white box called a Stevenson screen. A second machine, the Dewitt leaf wetness recorder, collects data to predict apple scab infection periods.

Pheromone traps are used to track the flight of tentiform leaf miner adults in apple orchards.

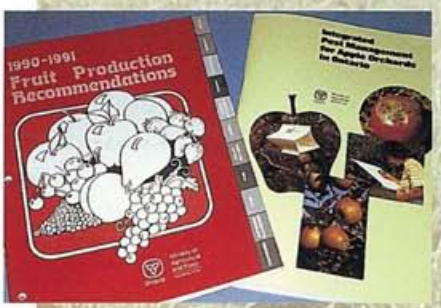
INTRODUCTION

INFORMATION SOURCES

How you obtain crop-specific pest management information will depend on the crop and the complexity of the problem. For relatively low-value crops such as hay or corn, with a per-hectare value of about $600, information is delivered on a regional basis through radio broadcasts, newspapers, government publications and winter meetings.

For high-value crops such as apples (per-hectare value of $7,500), or greenhouse flowers (per-hectare under-glass value of $300,000-$400,000), information is available through weekly on-farm scouting, daily recorded phone messages, as well as publications, newsletters and twilight meetings.

In some instances, growers may run their own IPM programs, generating their own information while using extension staff as a resource.



Government publications are a good source of pest management information. Some titles are listed on the back cover.

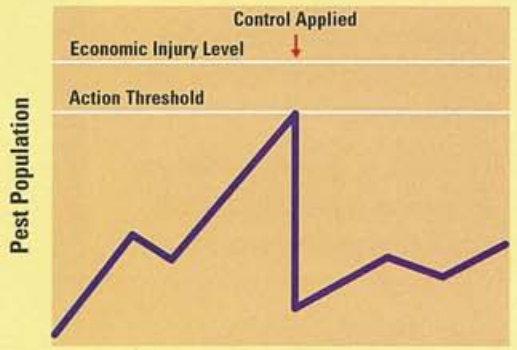
TERMINOLOGY

Throughout this booklet, we'll be using terms that are basic to IPM. Here are some definitions to see you through.

DIRECT PEST	• one that injures the portion of the crop that is sold, e.g., the codling moth, which attacks the fruit of apples
INDIRECT PEST	• one that injures part of the crop plant, but not the part that is sold or consumed • generally we tolerate higher levels of indirect pests than direct pests because they are less harmful economically
ECONOMIC INJURY LEVEL	• the pest density that causes damage equal in value to the cost of the treatment • researchers hope to have numerical values for all crops and pests, but in reality very few have been well-documented – in fact, the economic injury level for a given pest may vary, depending on the crop growth stage, crop stress and market demands
TREATMENT OR ACTION THRESHOLD	• the density of pests at which control measures should be applied • lower than the economic injury level, allowing time for control measures to take effect
BENEFICIALS	• natural enemies of crop pests that help control them and keep populations in balance • could be predators or parasites, insects or diseases

INTRODUCTION

TIMING OF PEST CONTROL



Controls are applied as soon as the pest levels reach the action threshold.

This direct pest, the codling moth, attacks the apple fruit. This means there is a very low tolerance level of them in commercial orchards.

This indirect pest, the tentiform leaf miner, attacks apple foliage. A low level is tolerated in commercial orchards.

A stink bug is considered a beneficial insect. It helps to reduce the Colorado potato beetle population by eating beetle eggs.