



APPLICATOR CORE

BASIC KNOWLEDGE REQUIREMENTS FOR PESTICIDE EDUCATION IN CANADA



Federal/Provincial/Territorial Committee
on Pest Management and Pesticides

Edition 2003



Health Canada
Pest Management Regulatory Agency

APPLICATOR CORE

BASIC KNOWLEDGE REQUIREMENTS

FOR

PESTICIDE EDUCATION IN CANADA

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Prepared by the Working Group on Pesticide Education, Training and Certification

Edition 2003

The Standard for Pesticide Education, Training and Certification in Canada is posted on the Pest Management Regulatory Agency's website at <http://www.hc-sc.gc.ca/pmra-arla/english/edutran/edutran-e.html>

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First edition 1995

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Edition 1995 was developed by the National Task Force on Pesticide Education, Training and Certification of the Canadian Association of Pest Control Officials. This Task Force was re-formed as the Working Group on Pesticide Education, Training and Certification in 1996.

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The Standard for Pesticide Education, Training and Certification in Canada (National Standard) was released in 1995 and adopted by all provinces and territories. It consists of a series of documents which outline a structure and criteria for pesticide applicator and vendor certification programs. For further information, please consult the Framework document of the National Standard.

The Basic Knowledge Requirements for pesticide APPLICATOR education in Canada consist of an Applicator Core and ten category specific modules. These documents direct trainers to instruct pesticide applicators to a basic level of knowledge which is common across Canada. Additional information may be included as appropriate but applicator training, manuals and certification exams must meet the basic knowledge requirements as a minimum.

The Applicator Core contains information that is relevant to all types of pesticide application. The category specific modules have been developed to accommodate training for various application specialities. They are based on the following ten pesticide application categories common across Canada: Aerial, Agriculture, Aquatic Vegetation, Forestry, Greenhouse, Industrial Vegetation, Landscape, Mosquito and Biting Flies, Fumigation, Structural. Descriptions of these application categories are found in the Framework.

Each category specific module consists of information that specialized applicators will learn in addition to the information contained in the Applicator Core. For example, to acquire certification in the aquatic category, the trainer must cover the information within the Applicator Core as well as additional information on pest management, details on relevant application equipment, and special safety guidelines, etc. pertaining to aquatic application. A broader category such as Agriculture will include additional information on weed, disease, insect and vertebrate management, as well as details on relevant application equipment and special safety guidelines pertaining to agriculture.

The Applicator Core and category specific modules are organized into ten concepts. They are:

1. General Information
2. Regulations
3. Labelling
4. Human Health
5. Pesticide Safety
6. Environment
7. Pest Management
8. Application Technology
9. Emergency Response
10. Professionalism

Each concept is written in a three column format: Course Outline, Instructional Objectives and Learning Outcomes. The Course Outline contains the information the applicator must know, the Instructional Objectives are what the instructor must ensure the applicator learns, and the Learning Outcomes are what the applicator must be able to do (how their knowledge is measured).

NOTE: The Emergency Response (first aid) section has been reviewed by physicians at the Canadian Medical Association for accuracy, thoroughness and applicability. As well, Environment Canada has reviewed the Environment Section. Stakeholders having a direct interest were asked to develop and review the category specific modules in conjunction with the Applicator Core.

APPLICATOR CORE

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Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Pesticides need to be used safely and effectively. Using pesticides properly minimizes risk to the applicator, consumers, bystanders and the environment.

Appreciate the need for safe and effective pesticide use.

List the reasons for safe and effective use of pesticides.

Pesticide misuse can:

- contaminate water or soil;
- kill fish, birds, bees or other animals;
- contaminate food;
- destroy plants;
- harm people, etc.

Know the adverse effects of pesticide misuse.

Describe potential adverse effects of pesticide misuse.

There are many reliable sources of information on pesticides and their safe and effective use. These include:

- pesticide labels;
- material safety data sheets (MSDS);
- federal and provincial publications;
- pesticide control officials, extension personnel;
- pesticide suppliers.

Know reliable information sources on pesticides and their safe and effective use.

Identify reliable sources of information on pesticides and their safe and effective use.

The label is an essential source of information for the user. The information on the labels resulted from many tests and was approved during the registration process.

Know that the label is an essential source of information for the user.

Identify the label as an essential source of information for the application.

Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Pesticide Terminology

A **pest** is a harmful, noxious or troublesome organism. Pests include weeds, insects, fungi, bacteria, viruses, rodents, or other plants or animal pests.

Know the term, pest, and the types of pests.

Define pest. List examples of different types of pests.

A **pesticide** is anything that is intended to prevent, destroy, repel, attract, or manage a pest. Pesticides also include plant growth regulators, plant defoliants and plant desiccants.

Know the term, pesticide.

Define pesticide.

A **formulation** is a mixture of active ingredients and formulants.

Know the term, formulation.

Define formulation.

An **active ingredient** (a.i.) is the part of a pesticide formulation that produces the desired effects.

Know the term, active ingredient.

Define active ingredient.

Formulants are inert or other materials that are added to the active ingredient to make it suitable for storage, handling, or application.

Know the term, inert ingredient.

Define inert ingredient.

Naming Pesticides

Pesticides are named by product names, common names, and chemical names.

Know how to distinguish between product name, common name and chemical name.

Describe the product name, common name and chemical name of a pesticide product.

A pesticide is assigned a registration number which is associated with a specific product name, trade name (registered trademark), manufacturer/registrant name, formulation type, concentration of active ingredients, and class designation.

The **common name** refers to the name of the active ingredient. Common names appear on pesticide labels next to the word guarantee.

The **chemical name** refers to the name of the chemical structure of the active ingredient. The chemical name does not usually appear on pesticide labels. It can be found on the Material Safety Data Sheet.

Grouping Pesticides

Pesticides can be grouped by the target, how they work, and by chemical family.

Know that pesticides can be grouped by the target, how they work, and by chemical family.

State three ways pesticides can be grouped.

Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Target

PESTICIDE TYPE

acaricide
algicide
avicide
bactericide
fungicide
herbicide
insecticide
miticide
molluscicide
nematicide
piscicide
rodenticide

TARGET

spiders, mites
algae
birds
bacteria
fungi
weeds
insects
mites
snails and slugs
nematodes
fish
rodents

Know the pesticide types and the target pests controlled by each.

List the pesticide types and identify the target pests for each (**related to the applicator certification category**).

How Pesticides Work

How pesticides work is described by their “mode of action” or their “route of entry”. Mode of action refers to the mechanism by which the pesticide controls the pest and route of entry refers to how the pesticide enters the pest.

Understand that how pesticides work is described as “mode of action” or “route of entry”.

Use and explain the terms used to describe how pesticides work.

Chemical Family

A **chemical family** is a group of chemicals that have similar chemical structures and properties, such as poisoning symptoms and persistence as well as similar first aid, clean-up and safety guidelines. Most pesticides can be categorized into chemical families/groups and some of the common families/groups will be discussed as appropriate for each application certification category.

Understand what chemical families/groups are and how knowledge of families can be helpful.

Define chemical family.

Knowing chemical families/groups helps an applicator understand how pesticides work and how to use them safely. Chemical families/groups also have an impact on pest resistance.

List advantages of knowing chemical families/groups.

Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Formulations

Pesticides are available in different formulations.

Know the types of pesticide formulations available.

List the types of formulations available.

Formulations can be in liquid or solid forms, or can be gases.

Pesticides that are designed to work as gases are fumigants. Fumigants are marketed in solid, liquid or gaseous form.

Liquid formulations include: emulsifiable concentrates, flowables, microcapsule suspensions and solutions.

List liquid formulations.

Solid formulations include: dusts, granulars, pellets, soluble granules, soluble powders, baits, tablets, dry flowables and wettable powders.

List solid formulations.

Common formulations include:

Know the properties of common formulations. Know advantages and disadvantages of common pesticide formulations.

Describe the properties of common formulations.

Baits are particulates that are active ingredients mixed with attractants or edible substances.

Dry flowables are small pellets or spheres that break down into wettable powders.

Dusts are dry materials made of active ingredient and inert materials. They are ready to use.

Emulsifiable concentrates or emulsions are liquids that contain the active ingredient, solvents and emulsifiers. They form milky spray mixtures when mixed with water.

Flowables or suspensions are liquids that consist of solid particles of active ingredient suspended in a liquid. They usually need to be diluted.

Granulars are a dry mixture of large, free-flowing particles with a low concentration of active ingredient.

Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Microcapsule suspensions are liquids. Small capsules of active ingredient are suspended in the liquid. They slowly release the active ingredient.

Pellets are mixtures of active ingredients and formulants. They are formed into spheres or cylinders.

Pressurized products are aerosols, sprays, foams, and dusts packed in a pressurized container. They may be liquids, solids or gases.

Soluble granules are solid materials like granulars, but can be dissolved in a liquid.

Soluble powders are dry materials similar to dusts, but are soluble in water.

Solutions are clear liquids composed of active ingredient dissolved in solvents.

Tablets are either active ingredients alone, or active ingredients and formulants. They are formed into small blocks or spheres.

Wettable powders are dry materials made of active ingredient and formulant (including a wetting agent). They are mixed with water and form a suspension.

Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Abbreviations are often used to indicate the type of formulation. Common abbreviations are:

Know the common abbreviations of pesticide formulations.

Identify common abbreviations for pesticide formulations.

- DF Dry flowable
- DU Dust
- EC Emulsifiable concentrate
- F Flowable
- GR Granular
- MS Microcapsule suspension
- PE Pellet
- PP Pressurized product
- SN Solution
- SP Soluble powder
- WP Wettable powder

Advantages of a few formulations are:

- DF less dusty and easier to handle than WP
- DU ready to use
- EC less agitation required, not abrasive, less visible residue
- F seldom clog nozzles
- GR no mixing required, ready to use, minimal drift
- PE easy to spot treat
- SN no agitation necessary
- SP containers empty easily
- WP easier to store in the cold

Identify advantages and disadvantages of commonly used formulations.

Concept: GENERAL INFORMATION

General Objective: To understand general information on pesticides (terms, naming pesticides, categorizing pesticides and formulations).

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Disadvantages of a few formulations are:

DU dusty, drifts, leaves a visible residue on plants
DF requires agitation
EC phytotoxicity hazard maybe higher
F a.i. may settle out, requires moderate agitation
PE often attractive to pets and children
WP dusty, requires agitation, can be abrasive, may leave visible residues

When selecting a formulation consider:

- effectiveness;
- risk to the applicator, bystanders and nontarget organisms;
- potential environmental damage;
- possibility of injuring the target;
- availability of safety and application equipment;
- cost of the pesticide and the application.

Know the factors to be considered when selecting a suitable formulation.

List the factors to consider when selecting a formulation.

Choose the formulation that will be effective but will minimize potential adverse effects.

An **adjuvant** is a substance added to a pesticide mixture to enhance the pesticide's qualities. Adjuvants are registered for specific uses with a specific pesticide. Adjuvants work by:

- making the spray stick to the surface of the target better;
- improving spray droplet uniformity to give more complete coverage;
- altering the pH of the spray water;
- increasing/decreasing evaporation to improve the drying of the spray mixture.

Know what adjuvants are and how they improve the effectiveness of a pesticide.

Define adjuvant. Describe how adjuvants can improve the effectiveness of a pesticide.

Concept: REGULATIONS

General Objective: To understand the need for pesticide regulations and types of pesticide regulations in Canada.

COURSE OUTLINE

Some types of adjuvants are:

- surfactants: improve the spreading, dispersing, and/or wetting properties of a pesticide mixture. Wetting agents and spreaders are types of surfactants;
- wetting agents: allow wettable powders and dry flowables to mix with water and stick on surfaces;
- spreaders: allow pesticide to form a uniform coating layer over the treated surface;
- stickers: allow pesticide to stay on the treated surface;
- drift retardants: reduce drift;
- thickeners: reduce drift by increasing droplet size;
- anti-foaming agents: reduce foaming of spray mixtures;
- buffers: slow chemical breakdown of some pesticides by lowering the pH of alkaline water.

Tank Mixes

Tank mixes are mixtures of different pesticides blended in the same spray tank. Registered tank mixes will have been tested for their physical compatibility, efficacy, safety and crop residues and will have clear use instructions for the tank mix on the product label. Use only tank mixes that are indicated on the label. Performance liability, which rests with the registrant, is limited to the terms set out on the label. In the absence of specific label directions regarding tank mixing, the user (including commercial applicators) assumes the risk and responsibility with respect to safety, efficacy and phytotoxicity. While pesticides should certainly not be mixed together unless their compatibility is stated on the label, such statements may only be indicators of physical compatibility. They do not guarantee that mixing will have no effects on the safety, efficacy or residues of the pesticides that are mixed.

In the case of herbicides, tank mixes indicated on product labels have been thoroughly evaluated for efficacy and crop tolerance. Apply only registered herbicide tank mixtures indicated on product labels.

Pesticides that are not compatible can cause:

- loss of effectiveness;
- non-target injury or damage; or
- settling out of solids creating a non-sprayable mixture.

INSTRUCTIONAL OBJECTIVES

Know common types of adjuvants.

Understand pesticide compatibility. Know that pesticides can only be mixed together if this is stated on the label.

Know that not all pesticides are compatible.

LEARNING OUTCOMES

List and describe the purpose of common types of adjuvants. **(commonly used with the applicator category).**

Describe pesticide compatibility. Identify label statements for pesticide tank mixes and compatibility.

Identify problems that can occur if pesticides that are not compatible are mixed together.

Concept: REGULATIONS

General Objective: To understand the need for pesticide regulations and types of pesticide regulations in Canada.

COURSE OUTLINE

Pesticide laws are designed to protect the purchaser, the applicator, the consumer, and the environment. They are based on current scientific knowledge.

Pesticides are regulated by federal, provincial and municipal governments.

Pest Control Products Act and Regulations

The major federal legislation regulating pesticides in Canada is the **Pest Control Products Act (PCPA) and Regulations**. A new PCPA was passed on December 12, 2002 and will come into force once the necessary regulations to support it are in place.

The main purpose of the **new PCPA and Regulations** is to prevent unacceptable risks to people and the environment from the use of pest control products. It also ensures that only pest control products of value (effectiveness and benefits) are approved for use in Canada, encourages the development of sustainable pest management strategies by facilitating access to products that pose lower risks, supports sustainable development designed to meet the needs of both present and future Canadians, and encourages public awareness and participation in the decision-making process.

The **new PCPA** prohibits anyone from:

1. Manufacturing, possessing, handling, storing, transporting, importing, distributing or using a pest control product that is not registered, except if authorized under the Act or regulations.
2. Manufacturing, importing, exporting or distributing a registered pest control product unless it conforms to the conditions of registration respecting its composition and other conditions of registration.
3. Storing, importing, exporting or distributing a pest control product that is not packaged in accordance with the regulations and conditions of registration.

INSTRUCTIONAL OBJECTIVES

Appreciate the need for regulating pesticides.

Be aware of the levels of government which regulate pesticides.

Know that the major federal legislation regulating pesticides in Canada is the **PCP Act and Regulations**.

Understand the purpose, prohibitions and administration of the **PCP Act and Regulations**, as they relate to applicator's work.

LEARNING OUTCOMES

Identify why there are pesticide laws.

List the levels of government that may regulate pesticides.

Identify the major federal legislation regulating pesticides in Canada.

Identify the main purposes of the **PCP Act and Regulations**.

Concept: REGULATIONS

General Objective: To understand the need for pesticide regulations and types of pesticide regulations in Canada.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

4. Handling, storing, transporting, using or disposing of a pest control product in a way that is inconsistent with the regulations or directions on the label.
5. Packaging or advertising a pest control product in a way that is false, misleading or likely to create an inaccurate impression about the product.
6. Manufacturing, possessing, handling, storing, transporting, distributing, using or disposing of a pest control product in a way that endangers human health or safety or the environment.

The Pest Management Regulatory Agency (PMRA) of Health Canada has the regulatory authority for pesticides and administers the PCPA.

All pesticides must be registered under the **PCPA**, after an extensive review to determine that any health or environmental risks posed by the pesticide, as well as its value, are acceptable. Once a pesticide is registered it is given a “registration” number.

A Pest Management Information Service is available which provides information on pesticides. The number is 1-800-267-6315.

The federal classification system classifies pesticides as Domestic, Commercial, Restricted, or Manufacturing depending on the toxicity and intended use.

Domestic pesticides are for use in or around the home. They can be safely handled with minimal protective clothing and without special training when label directions are followed. Domestic pesticides are available in small packages.

Commercial pesticides are for use in agriculture, forestry, industry and other commercial operations. They may be categorized as Agricultural or Industrial. Applicators need additional knowledge on safe handling procedures and personal protective equipment than for domestic pesticides. These pesticides may be more toxic or pose a greater risk to the environment than domestic pesticides.

Know that Health Canada has the regulatory authority for pesticides.

Know that all pesticides must be registered and given a registration number before they can be used.

Know that a Pest Management Information Service providing information on pesticides is available.

Know the four federal pesticide categories, and understand the basis of the federal classification system.

Know the major characteristics of domestic pesticides.

Know the major characteristics of commercial pesticides.

Name the federal department which has the regulatory authority for pesticides.

Identify what is required before pesticides can be used in Canada.

Describe the function of the Pest Management Information Service.

List the four federal pesticide categories. Identify the basis of the federal classification system.

Describe the major characteristics of domestic pesticides.

Describe the major characteristics of commercial pesticides.

Concept: REGULATIONS

General Objective: To understand the need for pesticide regulations and types of pesticide regulations in Canada.

COURSE OUTLINE

Restricted pesticides are commercial type pesticides with certain limitations on the label. Restrictions on the label are due to toxicity or environmental concerns. The limitations can involve: display, storage, distribution, usage or qualification of users.

Manufacturing pesticides are used in manufacturing, formulating or repackaging and are not for use by applicators.

Other Federal Acts

Other federal legislation regulates different aspects of pesticide use including pesticide residues in foods, damage to fish or fish habitat, damage to migratory birds and transport of dangerous goods. This legislation includes:

Food and Drugs Act and Regulations protect the health of consumers by prohibiting the sale of food that contains any harmful or poisonous substance. Where food residues are concerned, safety to consumers must be proven by Health Canada prior to registration under the **PCP Act**. Maximum residue limits are established under the **Food and Drugs Act** for pesticides in food products. Food containing too much residue can be confiscated and the people responsible can be fined or sent to jail. Grazing or feeding crop residue to livestock is also regulated. Excessive pesticide residues can be prevented by following label rates, days to harvest, number of applications per crop/season, and other label recommendations.

Migratory Birds Convention Act protects waterfowl and other migratory birds. It is offence to release pesticides or other substances that are harmful to migratory birds into any waters or any area frequented by migratory birds.

If migratory birds are harmed, an applicator can be prosecuted under this federal legislation. If other animals are harmed, an applicator may be prosecuted under provincial legislation.

INSTRUCTIONAL OBJECTIVES

Know the major characteristics of restricted pesticides.

Know the major characteristics of manufacturing pesticides.

Develop an awareness and general understanding of the major federal laws affecting pesticides and their use.

Be aware of the **Food and Drugs Act and Regulations** and how they can affect pesticides and their use.

Be aware of the **Migratory Birds Convention Act** and how it can affect the use of pesticides.

Know the implications of harming animals and birds.

LEARNING OUTCOMES

Describe the major characteristics of restricted pesticides.

Describe the major characteristics of manufacturing pesticides.

List the other federal laws which affect pesticides and their use.

Describe the implications to the consumer and applicator, of having excessive pesticide residues in crops. Describe how to prevent excessive pesticide residues in crops.

Name the federal legislation that protects water fowl and other birds.

Identify the implications to the applicator of harming animals and birds with pesticides.

Concept: REGULATIONS

General Objective: To understand the need for pesticide regulations and types of pesticide regulations in Canada.

COURSE OUTLINE

Fisheries Act protects fish and fish habitat (spawning grounds, nursery, rearing, food supply and migration areas). When using pesticides in areas where there is a stream, pond, lake, etc., attention must be given to the observance of the **Fisheries Act**. This Act considers any substance deleterious unless specifically exempted through a regulation.

Transportation of Dangerous Goods Act and Regulations permits the handling, offering for transport and transport of potentially dangerous goods only by people who are properly trained. Use of shipping documents, special labels and markings, proper number of vehicle placards and following certain safety procedures are additional requirements. The person who sends the dangerous goods, the person who receives them and the person who transports them all share responsibility for complying with the Act. The supplier, manufacturer and/or the distributor can clarify your transportation requirements and should tell you if the pesticides are considered dangerous goods and if you require documents, labels, or placards.

In certain instances, it may be possible to obtain permits that allow you to carry small amounts of pesticides with appropriate precautions.

There may also be existing permits for "Permit for Equivalent Level of Safety" between professional organizations (e.g., Ontario Pest Control Association) and Transport Canada.

Labour Codes (protect workers), Fire Codes (pesticide storage), Building Codes (pesticide storage), and other legislation may need to be considered when using pesticides.

Provincial Legislation

Provinces have legislation that may further restrict pesticide use for provincial conditions. Provincial legislation regulates the sale, purchase, storage, transportation, use, and disposal of registered products. For example, permits may be required for aerial application or buffer zones may be set around sensitive ecosystems. Provincial legislation may also regulate the control of specific pests.

Regulations vary from province to province.

INSTRUCTIONAL OBJECTIVES

Be aware of the **Fisheries Act** and how it affects the use of pesticides.

Be aware of how the **Transportation of Dangerous Goods Act and Regulations** affect the transportation of pesticides.

Know who can tell applicators about transport requirements for specific pesticides.

Know that permits might be obtained, or that there might be existing permits, for carrying pesticides.

Be aware of other legislation which affects pesticide management.

Develop an awareness and general understanding of the major provincial laws affecting pesticides and their use.

LEARNING OUTCOMES

Describe how the **Fisheries Act** protects fish and fish habitat.

Describe how the **Transportation of Dangerous Goods Act and Regulations** affect the transportation of pesticides. Describe the necessary documents/permits to transport pesticides according to regulations.

List places an applicator can obtain information on the transport of pesticides.

Identify permits that can be obtained, or that exist, for carrying pesticides.

Describe other legislation which affects pesticide management.

Identify the major provincial laws which regulate pesticide use in your province. Describe how these laws affect pesticides and their use.

Concept: REGULATIONS

General Objective: To understand the need for pesticide regulations and types of pesticide regulations in Canada.

Municipal Legislation

Each municipality may have by-laws that restrict pesticide use with respect to public health. Develop an awareness that municipal legislation may exist in your community. Identify municipal legislation which exists in your community.

Concept: LABELLING

General Objective: To identify, define and be able to use information on pesticide labels.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Legal Authority

Pesticide labels are legal documents. Pesticides must be used according to the instructions on the label. If label directions are not followed, laws are being broken. Before using any pesticide, read the label.

Know the legal status of pesticide labels. Be able to identify legal uses of a pesticide.

Describe the legal status of pesticide labels. Identify legal uses of a labelled product.

The label must be kept on the container and in good condition. If a label becomes illegible, contact your supplier for a replacement label and place the new label on the package.

Understand that the label must be kept on the container in good condition. Know what to do if a label becomes illegible.

Describe the required condition of a pesticide label. Describe what to do if a label becomes illegible.

Components

A pesticide label provides basic information on use, limitations, disposal, first aid, contents, precautions, formulation, and toxicology. A pesticide label has two panels.

Know the basic information on pesticide labels.

Describe the basic information provided on a pesticide label.

The components on the principal label panel are:

- product name;
- class designation;
- purpose;
- precautionary symbols;
- directions to read the label;
- guarantee statement;
- registration number (PCP number);
- net contents;
- name and address of registrant.

Know the components on the principal label panel.

List and identify the components on the principal label panel.

The components on the secondary label panel are:

- directions for use;
- precaution statements;
- first aid instructions;
- toxicological information;
- disposal;
- notice to user;
- notice to buyer.

Know the components on the secondary label panel.

List and identify the components on the secondary label panel.

Concept: LABELLING

General Objective: To identify, define and be able to use information on pesticide labels.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Interpretation of Pesticide Labels

Understanding and interpreting pesticide label information allows an applicator to safely and effectively use a product.

Know why it is important to be able to understand and interpret pesticide label information.

Identify why it is important to be able to understand and interpret pesticide label information.

Precautionary symbols can be one of three shapes; the octagon, which indicates extreme hazard and has the word danger associated with it; the diamond which indicates moderate hazard and has the word warning associated with it; and the inverted triangle, which indicates slight hazard and has the word caution associated with it.

Be able to interpret precautionary symbols on pesticide labels.

Describe the precautionary symbols on pesticide labels.

Precautionary symbols may have one of four pictures in the shape of the skull and cross bones, which indicates poison; the flame, which indicates flammability; the hand, which indicates corrosivity and the exploding grenade which indicates explosivity.

Identify the type and degree of hazard associated with each precautionary symbol.

The combination of shape, word and picture indicates the type and severity of the hazard associated with the pesticide. Precautionary symbols indicate:

Identify the words associated with each precautionary symbol.

- Danger Poison
- Warning Poison
- Caution Poison
- Danger Extremely Flammable
- Warning Flammable
- Caution Flammable
- Caution Explosive
- Danger Corrosive
- Warning Corrosive
- Caution Corrosive

All the relevant precautionary symbols are shown on the label. However, if there is more than one hazard, only the more restrictive hazardous word is used in the description.

Concept: LABELLING

General Objective: To identify, define and be able to use information on pesticide labels.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Precautionary symbols may not be needed on every pesticide label.	Know that precautionary symbols may not be needed on every pesticide label.	Identify when precautionary symbols are not needed.
The guarantee statement states the active ingredients in the product and the amount of each ingredient.	Interpret the guarantee statement on pesticide labels.	Describe and identify the guarantee statement on a label.
The product name may describe the formulation, use, active ingredient and distinctive brand or trademark.	Locate the product name on pesticide labels.	Identify the product name on a label.
The registration number is usually written as “REGISTRATION NO. 00000 PEST CONTROL PRODUCTS ACT”. The higher the number, the more recently the product was registered.	Locate the registration number on pesticide labels.	Identify the registration number on a label.
The net contents are listed as weight or as volume. This information will help the applicator to decide how many packages are needed.	Locate the net contents on pesticide labels.	Identify the net contents on a label.
The name and address of the registrant will be listed.	Be able to contact the registrant of the product.	Identify the name and address of the registrant on a label.
The directions for use provides information on the use including rates, use areas (e.g., crops), timing, mixing and loading, application and limitations (e.g., preharvest interval).	Interpret directions for use on pesticide labels.	Identify and describe the Directions for Use on a label.
Precautions provide information on hazards relating to the use, handling, storage, display or distribution of the product, instructions on how to lessen the hazards, such as personal protective equipment (PPE), and any decontamination procedures.	Interpret the precautions on pesticide labels.	Identify and describe the precautions on a label.
First aid instructions outline practical measures to follow in the event of a poisoning or accident.	Interpret the first aid instructions on pesticide labels.	Identify and describe the specific first aid procedures for the product on a label.
The toxicological information provides information for medical personnel to treat persons who have been poisoned, intoxicated or injured by the pesticide.	Be able to provide the toxicological information on pesticide labels to medical personnel.	Identify and describe the toxicological information on a label.
Disposal provides information on the proper disposal procedures for the product and the container.	Interpret the disposal section on pesticide labels.	Identify and describe the specific disposal procedures on a label.

Concept: LABELLING

General Objective: To identify, define and be able to use information on pesticide labels.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

The **notice to user** says the product can only be used according to the directions on the label.

Understand the notice to user.

Identify and describe what the notice to user says.

The **notice to buyer** is not on all pesticide labels, but may be present in the form of a Seller's guarantee, which states that the Seller's guarantee is limited to the instructions on the label, and that the buyer accepts the risks associated with the use of the product.

Understand the notice to buyer.

Identify and describe what the notice to buyer states.

Understanding and considering all areas of label information helps applicators make effective and environmentally sound decisions regarding pest control products. Commercial, restricted and manufacturing class products may reference the Material Safety Data Sheet.

Make decisions based on label information.

Given pesticide labels and use scenarios, choose the most suitable control and consider the toxicity, hazard level, formulation, uses, etc.

Material Safety Data Sheets

A Material Safety Data Sheet (MSDS) provides additional information about a pesticide product. Under the **new PCPA**, a MSDS will be required for all Commercial, Restricted and Manufacturing Class products by 2009.

Know the MSDS provides additional information on a pesticide product.

Identify the additional information on an MSDS.

MSDSs are organized into various sections. The sections the most relevant to pesticide applicators are listed below.

Know where to find information on an MSDS.

Identify where to find information on an MSDS.

The Chemical Product and Company Identification section gives the trade name, registration number and primary use of the product. It also gives the name, address and emergency telephone numbers of the registrant.

The Composition/Information on Ingredients section identifies the active ingredient, any hazardous ingredients in the product and their chemical registration numbers.

The Hazards Identification section lists the types of hazard posed by the product.

The First Aid Measures section explains what to do if someone is exposed to the product. Follow these instructions in an emergency, but always call for medical help.

Concept: LABELLING

General Objective: To identify, define and be able to use information on pesticide labels.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

The Fire-Fighting Measures section gives special procedures to use when fighting a fire such as flammability, means of extinction and nature of any hazardous combustion products.

The Accidental Release Measures section provides procedures to deal with leaks and spills.

The Handling and Storage section gives safe handling and storage procedures.

The Exposure Controls/Personal Protection section explains what personal protection must be used – such as eye, skin and respiratory protection.

The Physical and Chemical Properties section includes appearance, odour, specific gravity, boiling point, flash point and auto-ignition temperature of the pesticide.

The Stability and Reactivity section gives information on the chemical stability and reactivity of the product, incompatible substances and hazardous decomposition products.

The Toxicological Information section gives information on the likely routes of exposure and health effects of acute exposure and longer term exposure to the product.

There is also a Preparation Date and Group section to show who prepared the MSDS and its date.

A company may choose to include additional sections.

MSDSs may be obtained from the supplier or may come with a pesticide at the point of sale.

Understanding and considering the information on an MSDS helps applicators prepare for and make effective and environmentally sound decisions regarding emergency response and safe handling practices.

Know where to obtain an MSDS.

Know the importance of the information on an MSDS when making decisions.

Identify where to obtain an MSDS.

Identify the importance of understanding the information on an MSDS.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Toxicology

Pesticides are designed to control living organisms such as plants or animals, and may be dangerous or hazardous to people if not handled carefully.

Toxicity is the harm a particular pesticide can cause to an organism. Toxic effects can vary with sex, health, age, weight, route of exposure or exposure to other products.

Acute toxicity is the adverse effects which occur within a few hours to a few days after exposure. Acute toxic effects may result from a single dose, a single exposure, or from multiple doses received within 24 hours. Acute toxic effects are often reversible.

Chronic toxicity is the adverse effects which occur and persist over time after the exposure(s). Chronic effects are often irreversible, and may result from a single exposure or from repeated exposures. Symptoms resulting from chronic or long term exposures may not develop for many days, months or even years.

Chronic effects of pesticide exposure may include skin irritation, reduced body weight, organ damage, tumours, nerve damage or birth defects.

Chronic effects may occur in three situations:

- as a complication of acute exposure;
- as a slowly progressive condition;
- as the development of undesirable effects, years after exposure.

Acute effects of pesticides are listed in the section on poisoning symptoms.

Know that pesticides can be harmful if not handled carefully.

Understand basic toxicity terms.
Know what factors can cause toxic effects of a pesticide to vary.

Understand the difference between acute and chronic toxicity.

Know potential chronic effects of pesticides.

Understand how chronic effects of pesticides can occur.

Describe why pesticides must be handled carefully.

Describe toxicity.
List factors that can cause toxic effects of a pesticide to vary.

Describe acute toxicity. Describe chronic toxicity.

List examples of chronic effects of pesticide exposure.

Describe situations when chronic effects can occur.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Measuring Acute Toxicity

The acute toxicity of a product is indicated on the pesticide label by precautionary symbols, words and statements.

Interpret the toxicity of a pesticide from the pesticide label.

Given a pesticide label, identify whether the pesticide is very, moderately, or slightly poisonous to people.

The acute toxicity of a pesticide is measured primarily by the LD₅₀ or LC₅₀.

Know how the acute toxicity of a pesticide is measured.

Describe how the acute toxicity of a pesticide is measured.

LD₅₀ stands for lethal dose 50. It is the dose that will kill 50% of test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide. LD₅₀s only estimate the toxicity of a pesticide to people. LD₅₀s may be determined for oral and dermal exposure routes.

Understand LD₅₀ and LC₅₀.

Describe LD₅₀.

LC₅₀ stands for lethal concentration 50. It is the concentration of a pesticide in the air or water sufficient to kill half of the test animals exposed to the pesticide. The smaller the number, the more toxic the pesticide.

Describe LC₅₀.

Exposure

Exposure may occur through inhalation, ingestion, dermal absorption and ocular absorption.

Know the four routes of pesticide exposure.

List the four routes of pesticide exposure.

Inhalation is the absorption of airborne particles of a substance. Spray droplets, vapours or gases can be inhaled; inhalation exposure increases in enclosed spaces. Inhalation exposure can be reduced by the use of proper respiratory protective equipment and by following safety practices.

Understand inhalation exposure and know how it can be reduced.

Describe inhalation exposure. Describe how to minimize inhalation exposure.

Ingestion or oral exposure refers to the intake of a substance by mouth. It may result from accidental ingestion, suicide attempts, or contamination of food. The most common occurrence of oral intake is when pesticides are stored in food or beverage containers. Minimize the potential for oral exposure by following good hygiene practices and storing pesticides correctly.

Understand oral exposure and know how it can be reduced.

Describe oral exposure. Describe how to minimize oral exposure.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Dermal absorption is the intake of a substance through skin. It can result from direct contact with the spray concentrate, spray solution, or spray mist, or from wearing contaminated clothing. Absorption is affected by skin condition, location of the exposure and the pesticide. Skin on different areas of the body absorbs pesticides at different rates. The scrotal area, armpits, small of back, and the head tend to be more absorptive. Any area where moisture/perspiration occurs could be a problem. Dermal exposure can be reduced by following safety guidelines and wearing proper personal protective equipment.

Generally, dermal exposure, especially to the hands and forearms, accounts for the most exposure to applicators.

Ocular exposure is the intake of a substance through the eyes. Eyes are very sensitive and can absorb large amounts of chemicals. Eye exposure can result from splashes or spills, drift or rubbing the eyes. Ocular exposure can be reduced by wearing eye protection and following safety procedures.

Generally, the greatest amount of applicator exposure occurs during the mixing and loading of pesticides.

The type of formulation affects the amount of exposure and penetration. Certain formulations can penetrate the skin more easily than others; some are more volatile and can pose greater risk of inhalation exposure.

Understand dermal absorption. Know how dermal exposure can be reduced.

Know that dermal exposure is the most common route of exposure among applicators. Know the applicator's body areas which, are generally exposed to the most pesticide.

Understand ocular exposure. Know how ocular exposure can be reduced.

Know the activities that generally provide the greatest opportunity for applicator exposure.

Realize that the type of formulation can affect exposure and penetration.

Describe dermal absorption. Describe how to minimize dermal exposure.

Identify which route of exposure is most common among pesticide applicators. Describe the parts of an applicator's body that generally receive the most exposure to pesticides.

Describe ocular exposure. Describe how to minimize ocular exposure.

List the activities that provide the greatest opportunity for applicator exposure.

Describe how the type of formulation can affect exposure or penetration.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Exposure to pesticides can occur at any stage of pesticide handling or use including:

- transport;
- storage;
- handling;
- mixing and loading;
- application;
- equipment maintenance;
- cleanup;
- re-entry.

An applicator may be exposed to pesticides from:

- spills;
- splashes;
- vapours;
- drift;
- handling contaminated protective equipment, application equipment, or mixing utensils.

Applicators control the following four key things that affect the amount of exposure they are subjected to:

- 1) The applicator's attitude. An applicator who is safety conscious, tries to reduce exposure, practices good personal hygiene routines, and practices good work procedures to reduce exposure.
- 2) The method of application. Clean, calibrated and properly maintained and operated application equipment will reduce exposure.
- 3) The protective equipment used. Suitable, clean and properly maintained protective equipment reduces exposure when used properly.
- 4) The safety practises followed. Following proper safety practises will reduce the potential for exposure.

Understand when pesticide exposure can occur.

Understand how pesticide exposure can occur.

Understand how the applicator's attitude, the method of application, the protective equipment used, and the safety practises followed can affect the amount of exposure an applicator is subjected to.

Describe activities that can involve pesticide exposure.

Describe how pesticide exposure can occur.

Describe how the applicator's attitude, the method of application, the protective equipment used, and the safety practises followed can affect the amount of exposure an applicator is subjected to.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Risk

Risk is the chance that someone or something will be harmed by a pesticide.

Understand what risk is and how it is affected by pesticide toxicity and exposure.

Describe risk. Describe how pesticide toxicity and exposure affect risk.

Risk is primarily affected by the toxicity of the pesticide and the exposure to the pesticide.

$RISK = TOXICITY \times EXPOSURE$

The greater the toxicity, the greater the risk. The type of active ingredient and the concentration of active ingredient affect the toxicity of the product. Some active ingredients are more toxic than others. Higher concentrations of the same active ingredient increase toxicity.

The higher the exposure, the greater the risk.

High exposure to a product with a low toxicity creates risk.

Risk can be minimized by choosing a less toxic pesticide or by reducing exposure or by both. Eliminating or minimizing exposure to a very toxic product minimizes risk.

Understand how to minimize risk.

List ways risk can be minimized.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Poisoning

Poisoning symptoms can include:

- headache;
- dizziness;
- thirst;
- excessive salivation;
- nausea, stomach cramps, vomiting;
- diarrhea;
- eye irritation, blurring of vision, constriction of pupils;
- skin irritation or burns;
- perspiration;
- weakness, fatigue or exhaustion;
- feeling of constriction in throat and chest, wheezing, coughing;
- rapid or weak pulse;
- trembling, muscle twitching, seizures;
- mental confusion;
- inability to breathe, blue lips or face;
- loss of reflexes, slurred speech, staggering gait;
- restlessness, apprehension, excitability;
- unconsciousness;
- allergic response.

Know poisoning symptoms.

List and describe poisoning symptoms.

Some poisoning symptoms may be vague and can be confused with other common ailments (flu, excess heat, hangover, food poisoning, etc.).

Know that poisoning symptoms are similar to symptoms of other ailments.

Describe common ailments which can be confused with poisoning symptoms.

Acute pesticide poisoning symptoms may appear within a few minutes of exposure or not for many (up to 96) hours after exposure.

Know that pesticide poisoning should not be eliminated as a cause of symptoms for some time after application.

Describe the length of time needed for acute poisoning symptoms to appear.

Being able to recognize poisoning symptoms warns you to eliminate exposure and begin preventative actions or first aid procedures. All pesticide products do not have the same poisoning symptoms. Applicators should be able to recognize the poisoning symptoms based on the type of pesticide being used. Some pesticide labels or MSDSs describe the poisoning symptoms.

Appreciate the importance of recognizing poisoning symptoms of the product being used. Know that poisoning symptoms might be described on the label.

Describe why it is important to review poisoning symptoms prior to using a pesticide. Identify poisoning symptoms on a pesticide label.

Note: Poisoning symptoms specific to a chemical family/group that have significant effects on human health will be discussed in the certification category module.

Concept: HUMAN HEALTH

General Objective: To understand acute and chronic toxicity, routes of exposure, factors affecting exposure, reducing exposure and risk. To know exposure symptoms and be able to recognize poisoning.

If anyone on the site is acting or feeling unusual or exhibiting poisoning symptoms, consult a doctor or Poison Control Centre.	Realize that a doctor should be consulted if anyone on the site is feeling abnormal or exhibiting any poisoning symptoms.	Describe what should be done if anyone on the site is feeling abnormal or exhibiting any poisoning symptoms.
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Concept: PESTICIDE SAFETY - ATTITUDE AND GENERAL PRECAUTIONS

General Objective: To know why pesticides must be handled in a careful, and knowledgeable way during all activities involving pesticides. To know general safety precautions for handling pesticides.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Attitude

Pesticides can poison people, pets, livestock and can harm a wide variety of beneficial organisms as well as the environment. Using pesticides safely minimizes risk to applicators, the general public and the environment. Work responsibly around pesticides.

Safety is critical for all activities using pesticides including selection and purchase, storage, transport, mixing and loading, application, cleanup and maintenance, and disposal.

Everyone who may come in contact with pesticides should be informed about safe practices to prevent them from harming themselves, others or the environment. For example, bystanders must be told to stay away from storage, mixing, and application areas. The person responsible for laundering contaminated clothing must be aware of proper laundry procedures. Re-entry times must be known and understood by affected people.

The actual safe use/handling of pesticides is the applicator's responsibility.

All people handling pesticides must regularly review safety procedures because:

- familiarity with a product or procedure may cause applicators to become careless, complacent;
- safety procedures or product information may have changed since information was last reviewed;
- repetition encourages automatic adoption of safety procedures.

Develop a responsible attitude towards pesticide safety.

Know who is responsible for the safe use/handling of pesticides.

Appreciate the importance of reviewing safety procedures.

Describe why an applicator should follow safety procedures when using pesticides.

Identify those areas where safety should be a part of pesticide applicator activities.

Describe why bystanders should be notified about pesticide use. Identify situations where people, other than applicators, should be informed about pesticide safety.

Identify who is responsible for the safe use/handling of pesticides.

List reasons why safety practices should be regularly reviewed.

Concept: PESTICIDE SAFETY - ATTITUDE AND GENERAL PRECAUTIONS

General Objective: To know why pesticides must be handled in a careful, and knowledgeable way during all activities involving pesticides. To know general safety precautions for handling pesticides.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

General Precautions

Common safety practices that should be used for all types of pesticide use/handling:

Know general safety practices that should be used for all types of pesticide use/handling.

List safety practices that are common to all types of pesticide use.

Never eat, drink or smoke when handling (mixing, loading, applying, disposing, etc.) pesticides.

Do not carry food or smoking items on your body when handling pesticides.

Always wash before eating, drinking, smoking or using the toilet.

Shower thoroughly, washing body, hair and under fingernails at the end of each day when applying pesticides.

Always carefully read and follow label information and directions.

Do not wear contact lenses when handling pesticides.

Immediately wash any spillage off the affected person and remove contaminated clothing.

Wear clean protective clothing.

Concept: PESTICIDE SAFETY - ATTITUDE AND GENERAL PRECAUTIONS

General Objective: To know why pesticides must be handled in a careful, and knowledgeable way during all activities involving pesticides. To know general safety precautions for handling pesticides.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Employee Training

Employers, employees, and supervisors must co-operate to reduce injuries and illnesses on the job. The employer has the most responsibility for health and safety in the work place. However, employees and supervisors also have duties and responsibilities.

Know who has the responsibility for health and safety in the workplace.

Identify who has the responsibility for health and safety in the workplace.

As an employer, have the proper protective clothing, and equipment available for employees and train employees on its proper use. Provide employees with information about their pesticides they handle. Have MSDSs when available. Train employees to work safely.

As an employer, know what can be done to help employees work safely.

Describe how employers can help employees work safely.

As an employee, wear any protective clothing or equipment that is required to protect you from exposure to the pesticide. Ask for information about the pesticides. Ask to be shown how to properly handle pesticides and clean up minor spills.

As an employee, know what can be done to work safely.

Describe how employees can work safely.

Concept: PESTICIDE SAFETY - SELECTING AND PURCHASING PESTICIDES

General Objective: To know how to select a suitable pesticide and determine the quantity to purchase.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Selection and Purchase

When selecting or purchasing a pesticide, make sure that:

- the product is registered for the intended use;
- suitable application equipment is available;
- suitable safety gear is available;
- the pesticide is recommended for the intended use by the local authorities;
- the pesticide can be used safely under the conditions at the site (non-target organisms, bystanders, environment, minimal impact);
- the pesticide is compatible with integrated pest management programs;
- the amount of pesticide needed has been calculated;
- the label restrictions are understood.

Know what to consider when selecting a pesticide.

List things to consider when selecting a pesticide.

Consider all of the above factors when choosing a pesticide.

Select an effective pesticide that is registered for the pest and site of application and can be used safely.

Know how to select the most suitable product for an application.

Given several products and information on the site, pest, type of application equipment and safety gear available, choose the most suitable product.

Carefully planning pesticide purchases can reduce:

- the amount of pesticides in storage and thereby reduce the risk of human or environmental exposure;
- the need for storage space by minimizing the amount of pesticide to be stored.

Know why pesticide purchases should be planned.

List and describe reasons why pesticide purchases should be planned.

Purchase/order only the amount of pesticide that can be used within one application season.

Know the maximum amount of pesticide that should be purchased.

Identify the maximum amount of pesticide to purchase.

Total amount of product required = pesticide rate x treatment area x number of treatments per year.

Know how to calculate the amount of product to purchase.

Given a rate, a number of applications and the size of the treatment areas, calculate the amount of product to purchase.

Number of containers to buy = total amount of product required ÷ size of container.

Given the size of pesticide container and the amount of product needed, calculate the number of containers to buy.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

The purpose of protective clothing and equipment is to limit exposure to pesticides. Know the purpose of protective clothing and equipment. Identify the purpose of protective clothing and equipment.

To be effective or beneficial, equipment and clothing must be:
- selected for the product being used (see label directions);
- used correctly;
- maintained correctly. Know what is needed to make protective equipment and clothing beneficial and effective. Describe the factors that are important if protective clothing and equipment is to be effective.

Protective equipment and clothing used for handling pesticides should not be used for any other purpose. Know that protective clothing and equipment for pesticides should not be used for any other purpose. Identify that protective clothing and equipment for pesticides, should not be used for activities other than pesticide handling.

The protective clothing and equipment needed for handling pesticides depends upon the risk during use or handling. Some factors that can change the risk include:
- the pesticide;
- the type of exposure;
- the length of exposure;
- the application method. Know what affects the type of personal protective clothing/equipment needed for handling a pesticide. List the factors that affect the personal protective clothing/equipment needed for handling a pesticide.

Pesticide

The toxicity, volatility and formulation of the pesticide will determine the protective clothing and equipment that is needed. Know what pesticide characteristics affect the protective clothing/equipment needed. Describe the pesticide characteristics that affect the type of protective clothing/ equipment needed.

Pesticides with greater toxicity will typically have more personal protective equipment requirements than less toxic pesticides. Hazard symbols on the pesticide label indicate the acute toxicity.

Generally the more volatile the product the greater the need for personal protective equipment.

The type of formulation can affect the amount of exposure. Pesticides which are solutions, emulsifiable concentrates or powders are more likely to be absorbed through the skin or inhaled.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

Type of Exposure

The type of exposure (ocular, dermal, inhalation) that may occur when handling a pesticide is another factor used in determining the protective clothing and equipment needed. For example, if the potential for exposure is primarily dermal, a respirator may not be required.

Know the types of exposure that may occur and how they determine the personal protective equipment and clothing needed.

Describe how the type of exposure affects the protective clothing/equipment needed.

Length of Exposure

The protective clothing and equipment used must be able to handle the rigours of the work and the length of exposure.

Know how the length of exposure affects the type of protective clothing/equipment needed.

Describe how the length of exposure affects the type of protective clothing/equipment needed.

Application Method

Protection during application will vary with the operation. Generally, a decrease in particle size will result in an increase in personal protective equipment and clothing.

Know how the application method (in relation to particle size) affects the protective clothing /equipment needed.

Describe how the application method (in relation to particle size) affects the protective clothing/equipment needed.

Instructions and Warnings on the Label

The pesticide label will provide information about the type of protective equipment needed when handling the pesticide product. The information on protective clothing will be under the "PRECAUTION" section. Always follow label directions.

Know a good source of information on protective equipment and clothing needed for a specific product.

Identify the label information for protective equipment needed when handling a specific pesticide.

Sometimes the label will not mention specific equipment, but will imply that protection is needed. For example, labels may say:

- keep from breathing dust or fumes;
- avoid skin contact;
- keep out of eyes.

Know how to interpret label statements on personal protective equipment.

Given label statements, state what personal protective equipment is needed to handle the pesticide.

Statements like these mean protection should be worn.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

Additional information on protective clothing and equipment for a specific pesticide may be found on Material Safety Data Sheets (MSDS), or obtained from pesticide company representatives. General information on protective clothing and equipment may be obtained from:

- product pamphlets;
- safety equipment suppliers;
- applicator handbooks;
- pesticide trainers.

Knowing several sources of information on protective clothing and equipment helps the applicator select the appropriate protective clothing/equipment.

Dermal Protection

The skin is the major route through which pesticides can enter the body.

The hands are the most highly exposed part of the body, especially during mixing and loading.

Gloves

Always wear gloves when handling pesticides, applying pesticides, rinsing or disposing of pesticide containers, repairing contaminated equipment, washing contaminated application or safety equipment.

Gloves must be:

- clean;
- chemical resistant;
- made of an appropriate chemical resistant material for the pesticide such as neoprene, nitrile, butyl rubber or pvc-supported (not leather or cloth);
- unlined;
- long enough to cover the wrist and lower forearm;
- in good condition (no holes, rips).

Know where additional information on protective clothing/equipment can be obtained.

Appreciate why an applicator should know several sources of information on protective clothing and equipment.

Know the major route of entry for pesticides.

Know what the most highly exposed part of the body is.

Know when you should wear gloves.

Know the type of gloves that should be used for protection from pesticides.

List sources of additional information on pesticide safety equipment and clothing.

Identify why an applicator should be familiar with sources of information on protective clothing and equipment.

Identify the major route of entry for pesticides.

Identify the most highly exposed part of the body.

Describe when gloves should be worn.

List the characteristics of suitable gloves for protection from pesticides.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

For best protection while wearing gloves, fold down the top to form a cuff. The cuff will prevent the pesticide from running down the glove and onto the arm when the arm is elevated above the head. Wear the sleeves of the coveralls or shirt over top of the gloves. This will stop pesticides from rolling down the sleeve and into the glove.

Know how to wear gloves properly.

Given a typical method of application, describe how the gloves should be worn. Describe how the gloves should be worn if the applicator is working with hands and arms overhead.

Always wash gloves before removing them. This will help avoid contaminating other equipment (e.g., tractor steering wheel).

Know when gloves need to be washed.

Identify when gloves should always be washed.

Body Covering

Anyone who handles pesticides should wear at least: long-sleeved shirt and long-legged trousers or a coverall-type garment. Disposable coveralls specifically designed for pesticide use may be used.

Know what type of body covering should be used for handling pesticides.

Describe the options of minimal body covering to use when handling pesticides.

Clothes should be:

- clean (pesticide free);
- of tightly woven fabric;
- waterproof if pesticides are likely to substantially wet the work clothes or coveralls.

Know the characteristics of suitable protective body coverings.

List the characteristics of suitable protective body coverings.

A liquid-proof chemical resistant apron should also be worn when measuring, mixing or loading pesticides.

Know when an apron should be worn.

Identify when an apron should be worn. Describe the apron.

Boots/Protective Footwear

Boots should be worn when handling pesticides. They should:

- be chemical resistant;
- be unlined;
- come above the ankle;
- be worn under pant legs.

Know what type of boots should be worn when handling pesticides.

List the important characteristics of boots suitable for pesticide applicators.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

Head Protection

Head protection should be worn when handling pesticides because the head and neck area can absorb pesticides much easier than most other body locations.

Know why it is important to wear head protection when handling pesticides.

Describe why it is important to wear head protection when handling pesticides.

Head protection should be:

- wide brimmed to cover neck and ears or
- be coveralls with a hood attached;
- of non-absorbent materials (e.g., not cloth or leather);
- easy to clean.

Know the characteristics of a suitable hat for handling certain pesticides.

Describe characteristics that are suitable for a hat used when handling pesticides.

Examples of unsuitable head protection for use while handling pesticides are baseball type caps and straw hats.

List examples of unsuitable hats for use while handling pesticides.

Eye and Face Protection

Goggles

Goggles should be worn because the eyes can easily absorb, and be harmed, by pesticides.

Know why goggles are important when handling pesticides.

Identify why it is important to wear goggles when handling pesticides.

Protect your eyes by wearing goggles when there is a chance of getting pesticide in the eyes. Eye glasses do not provide complete protection. Goggles fit easily over the top of normal eye glasses. Do not wear contact lenses when handling pesticides. Contact lenses absorb the pesticide and keep it in contact with the eyes.

Know when goggles or a face shield should be worn.

Identify when goggles or a face shield should be worn.

Goggles should:

- be tight fitting;
- not have air vents unless they have indirect air vents;
- have a rubber or plastic headband;
- be clean.

Know the characteristics of goggles that are suitable for use while handling pesticides.

List the characteristics of goggles that are suitable for use while handling pesticides.

Face Shields

Face shields provide protection for the full face from spills or splashes that may occur when mixing and loading pesticides.

Know why face shields are important when mixing and loading pesticides.

Identify why it is important to wear a face shield when mixing and loading pesticides.

Face shields when used alone may not protect the eyes from mist and volatile pesticides.

Understand that face shields may not protect the eyes from mist and volatile pesticides.

Identify the limitation of face shields.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

Respiratory Protection

A respirator may be required to prevent exposure by inhalation. A respirator is a unit that covers the mouth and nose to prevent pesticide spray droplets, particles, and vapours from entering the lungs.

Know the purpose of a respirator.

Identify the purpose of a respirator.

Respiratory protection is important because once in the lungs, pesticides can enter the blood stream rapidly and completely. If inhaled in sufficient amounts, pesticides can cause damage to nose, throat, and lung tissue.

Know why respiratory protection is important.

Describe why respiratory protection is important.

Respirators should be worn when the label says to or when a person may be exposed to harmful levels of pesticides in the air. Respirators must:

Know when a respirator should be worn. Know the characteristics of a suitable respirator for protection when handling pesticides.

Identify when a respirator should be worn. List the characteristics of a respirator suitable for protection from pesticides.

- have a CSA approval, MSHA-NIOSH approval (MSHA - Mines, Safety, Health Ass'n, NIOSH - National Institute of Occupational Safety & Health); or a British Health & Safety Executive (BHSE) approval for pesticide use;
- have an appropriate cartridge or cannister for specific pesticide use;
- fit properly;
- be clean;
- contain cartridges that are not over-saturated.

Fitting a Respirator

Only a properly fitted respirator will protect a person.

Understand why a respirator should be fitted properly.

Identify why it is important for a respirator to fit properly.

Respirators are available in different shapes and sizes. Select one that fits properly. Be clean shaven. Proper fit cannot be achieved with a beard or other facial hair; the hair prevents direct contact between the face and the edge of the respirator.

Know how to have a properly fitted respirator.

Describe how to have a properly fitted respirator.

Do a fit test each time the respirator is put on.

Know when and how to do a fit test.

Identify how often a fit test should be done.

Follow the manufacturer's instructions for respirator fit or use one of the two following fit tests:

Describe the ways to do a fit test.

1. Place the palm of the hand over exhalation valve cover and exhale gently. If the face piece bulges slightly and no air leaks between the face and face piece are detected, a proper fit has been obtained. If air leakage is detected, reposition the respirator on the face and/or readjust the tension of the elastic straps to eliminate the leakage. Repeat this fit test.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

2. Place flat pieces of paper or the palms of the hands over the open area of the cartridge cap, inhale gently and hold your breath for 5 to 10 seconds. If the face piece collapses slightly, a proper fit has been obtained. If air leakage is detected, reposition the respirator on the face and/or readjust the tension of the elastic straps to eliminate the leakage. Repeat this fit test.

Types of respiratory protection

Types of respirators available include:

- cartridge respirators;
- canister respirators;
- air-powered purifying respirators;
- self contained breathing equipment.

The first three respirators do not supply any oxygen and therefore they should never be used in oxygen deficient atmospheres.

Dust masks are not respirators and should never be used in place of a respirator. They only provide protection from dust particles.

Cartridge respirators are the most common type of respiratory protective equipment used for pesticides. Some of these respirators are now disposable. They consist of a ½ mask or full mask with two types of protection.

- 1) Pre-filters to remove dust, small particles, and spray droplets.
- 2) One to two cartridges containing activated charcoal to remove vapours.

Special cartridges and pre-filters are needed for protection against pesticides. When buying or replacing cartridges and pre-filters, be sure to ask for equipment to protect against the type of pesticide you are applying (eg. organic).

Cartridges should be changed at least once a year. Consult the respirator directions for recommended usage times. If you can smell or taste chemical, your respirator is no longer providing appropriate protection.

Know the types of respirators available.

Know that dust masks should never be used in place of a respirator.

Know that cartridge respirators are the most common type of respiratory protective equipment used for pesticides.

Know that cartridges and pre-filters vary depending on the type of pesticide being applied.

Know when and how often cartridges should be changed.

List the types of respirators.

Describe why dust masks should not be used in place of a respirator.

Describe cartridge respirators.

Identify what you need to consider when buying or replacing cartridges and pre-filters.

Describe when and how often cartridges should be changed.

Concept: PESTICIDE SAFETY - PROTECTIVE CLOTHING AND EQUIPMENT

General Objective: To know how to select, correctly wear and maintain suitable clothing and equipment for the handling of pesticides.

Use pre-filters and cartridges together. Using one without the other is unsafe.	Know when cartridge respirators are appropriate.	Identify why pre-filters and cartridges must be used together.
Cartridge respirators are recommended for protection when exposed to low concentrations of pesticides.	Know that pre-filters and cartridges must be used together.	Identify when cartridge respirators should be used.
Canister respirators have a full face piece and a canister of charcoal. The large volume canister allows their use in higher vapour concentrations than where cartridge respirators are used.	Know that canister respirators are used in higher vapour concentrations than cartridge respirators.	Identify where canister respirators should be used.

Air-Powered Purifying Respirators

Air-powered purifying respirators use an electric pump to draw air through a charcoal cartridge and a filter removes particulates. The purified air is delivered to a tight fitting face mask or a loose fitting helmet. They may be a more comfortable option to the ½ mask/full mask respirator, especially on hot days when respiratory protection is needed for long periods of time.	Know how air-powered purifying respirators work. Know when this respirator might be needed.	Describe how an air-powered purifying respirator works, and when it might be needed.
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Self-Contained Breathing Equipment

Self-contained breathing equipment supplies air through a tube on the headpiece from a tank on the wearer's back. These respirators are used for the application of fumigants or for use in emergencies such as a fire or a major spill.	Know how self-contained breathing equipment works. Know when this equipment is used.	Describe how self-contained breathing equipment works and describe when it should be used.
Some tractor cabs are equipped with activated carbon cartridges and filters, which remove chemicals from the air while spraying in the field. A cab without cartridges should be ventilated by keeping the door or window open when used for pesticide applications. Tractor cabs equipped with dust filters only, and/or air conditioners can concentrate airborne spray droplets inside the cab. If the tractor's blower unit is not fitted with an organic vapour cartridge, a respirator with appropriate cartridge should be used, if it is recommended on the pesticide label.	Know what respiratory equipment should be used in a tractor cab.	Describe activated carbon cartridges. Identify the respiratory equipment to use if the tractor cab does not have an activated carbon filter.

Concept: PESTICIDE SAFETY - TRANSPORTATION

General Objective: To know how to transport pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Transportation Guidelines

Follow federal and provincial transportation regulations, where applicable.

Know how to transport pesticides safely.

Describe how to transport pesticides safely.

Pack containers securely.

Prevent contamination. Never transport pesticides with food, feed, fertilizer, clothing or household goods.

Only transport pesticide containers that have approved intact labels.

Never leave pesticides unattended in a vehicle, unless they are locked up in a compartment other than the passenger area.

Only transport containers that are in good condition. Make sure caps and plugs are tightly closed. Don't move broken bags or cartons or leaky containers. If bags are broken, repackage or dispose of the pesticides. (See emergency response section).

Transport containers of liquid upright.

Protect paper and cardboard containers from moisture (e.g., rain, snow, high humidity).

Never transport pesticides in the passenger compartment of a vehicle or let people ride in the same compartment with the pesticides (e.g., back of truck). Harmful fumes may be released; spills can cause injuries or contaminate the vehicle.

Don't transport pesticides on a wooden truck bed. Wood will absorb pesticide spills and contaminate future loads. Place pesticide containers in a metal or plastic storage box or on a waterproof tarp.

Always carry personal protective equipment and spill clean-up equipment in case of a spill.

Know how to be prepared for a spill.

Describe how you can be prepared for a spill.

Concept: PESTICIDE SAFETY - STORAGE

General Objective: To know how to store pesticides safely.

COURSE OUTLINE

Correct storage of pesticides protects people, animals and the environment. Children face a great risk from accidental poisoning due to incorrect storage. Correct storage can also extend the shelf life of pesticides and prevent cross-contamination.

Some provinces have legal requirements for pesticide storage.

Storage Location

The storage facility should have the following characteristics:

- be separate from work areas, living areas and areas where animals are kept;
- be away from wells, ditches or water bodies;
- be away from areas often used by people (untrained people, children and animals should be kept away from the storage area);
- not be on highly permeable soil;
- be away from areas where flooding may occur;
- be accessible by roadway emergency personnel.

Storage Facility

The storage facility should:

- only be used for storing pesticides;
- be locked;
- have a warning sign on the entrance indicating that chemicals are stored in the facility. Signs should be posted to indicate flammable materials and a no smoking sign should be posted;
- be built in such a way that pesticides are protected against adverse weather conditions;
- be made of fire resistant materials;
- have a floor that does not allow seepage (with a curb to retain spills);
- be able to contain spills;
- not have floor drains, unless they are self contained;
- be well-ventilated under all weather conditions;
- be well-lit;
- have shelves made of materials that do not absorb pesticides;

INSTRUCTIONAL OBJECTIVES

Know why proper pesticide storage is important.

Know that there can be legal requirements for pesticide storage.

Know the characteristics of a suitable site for a pesticide storage facility.

Know the characteristics of a good pesticide storage facility.

LEARNING OUTCOMES

Describe why proper pesticide storage is important.

Identify whether there are legal requirements for pesticide storage.

List characteristics of a suitable location for storing pesticides.

List characteristics of a good pesticide storage facility.

Concept: PESTICIDE SAFETY - STORAGE

General Objective: To know how to store pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

- have adequate electrical wiring (explosion and fire hazard);
- have a vegetation-free zone around the edge of the building;
- have appropriate fire extinguishers outside the storage area;
- have easy access to emergency equipment and protective clothing.

Temporary Pesticide Storage

Most of the principles that apply to permanent pesticide storage should apply to temporary pesticide storage.

Know how to store pesticides temporarily.

Describe how to temporarily store pesticides.
(for applicator categories that need to have temporary storage).

Storage Guidelines

Never store pesticides with or near livestock, food, animal feed, seed, veterinary supplies, wells, water supplies, or in your home.

Know how to store pesticides safely.

List guidelines for the safe storage of pesticides.

Read and follow storage instructions on pesticide labels.

Store pesticides in their original container with original labels.

Check containers regularly for leaks, tears, rust or loose lids.

Close containers when not in use.

Store pesticides in a dry area.

Store the minimal amount of pesticides. Make careful estimates of the amount needed.

Never store pesticides in containers that were used for food, drink or medicines.

Do not store containers in sunlight (fire hazard, degradation).

Store combustible materials away from heating systems.

Arrange pesticides in storage in a way so products are not confused or cross-contaminated. If possible, store herbicides separately from insecticides and fungicides to prevent cross-contamination.

Concept: PESTICIDE SAFETY - STORAGE

General Objective: To know how to store pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Keep containers off the floor.

Keep containers upright.

Keep an inventory of the quantity, type and age of the pesticides in storage. Keep this list up-to-date, handy, and away from the storage site.

Minimize handling pesticides by only taking the minimum number of containers from storage for use.

Return containers to storage when not in use.

Do not smoke in or around the storage area.

Inform the local fire department of the location and contents of the storage facility.

Keep appropriate protective clothing/equipment near (not in) the storage facility.

Lock up pesticide mixing equipment with the pesticides.

Keep emergency response equipment near (not in) the storage facility.
Keep clear access to emergency equipment at all times.

Keep a list of emergency telephone numbers easily accessible and posted in an appropriate location.

Protect pesticides from freezing if indicated on label.

Follow all building, fire and electrical codes.

Concept: PESTICIDE SAFETY - MIXING AND LOADING

General Objective: To know how to mix and load pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Mixing and loading pesticides is generally a very hazardous stage of pesticide use because the applicator can be exposed to the concentrated products.

Understand why mixing and loading pesticides requires special care.

Describe why mixing and loading pesticides requires special care.

Some pesticide products are available in “water soluble packaging” or are used in “closed mixer/loader systems” in order to reduce mixer/loader exposure.

Know that “water soluble packaging” and “closed mixer/loader systems” reduce mixer/loader exposure.

Describe how mixer/loader exposure can be reduced.

Wear protective clothing and safety equipment when mixing and loading pesticides. The pesticide label will indicate what should be worn.

Know what protective clothing and safety equipment is needed for mixing and loading pesticides. Know that the label will indicate what should be worn.

List the protective clothing and safety equipment needed for mixing and loading pesticides. Identify what protective clothing and safety equipment is indicated on a label.

General requirements for protective clothing and safety equipment during mixing and loading are:

- long sleeve shirt and pants or coveralls;
- water repellent head protection;
- chemical resistant gloves and boots; unlined
- a face shield or goggles;
- a chemical resistant apron.

Additional protection (e.g., respirator) may be needed for some pesticides.

Prior to mixing and loading:

- read the label to double check that the pesticide is registered for the intended use, check on safety precautions, review poisoning and first aid information, check mixing directions, pesticide rates and limitations;
- calculate how much pesticide is needed in each tank/application. Prepare only the amount of spray mixture needed;
- make sure clean-up and first aid equipment is handy;
- put on protective clothing and equipment.

Know how to safely prepare to mix and load pesticides.

List the things you should do prior to mixing and loading pesticides. List the things to check when reading a label before mixing and loading pesticides.

The mixing and loading site should be chosen with care to minimize human and environmental exposure.

Know why it is important to carefully choose a mixing and loading site.

Identify why a mixing and loading site must be carefully chosen.

Concept: PESTICIDE SAFETY - MIXING AND LOADING

General Objective: To know how to mix and load pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

The mixing and loading site should:

- be outside or in a well-lit and well-ventilated area;
- be close to the application site;
- be away from other people, livestock and pets;
- be located in an area where a spill or overflow would not get into a water supply (if mixing and loading must be done near a pond, stream or ditch, make sure the area is graded to slope away from the water);
- have an emergency water supply, soap, and relevant safety equipment nearby.

Know the characteristics of a good mixing and loading site.

List the characteristics of a good mixing and loading site.

Mix and measure pesticides on a sturdy level surface. It should be made of materials that will not absorb pesticides, or be covered with heavy duty plastic. Do not use this surface for any other purpose.

Know how to mix and load pesticides safely.

Describe how to mix and load pesticides safely.

Do not mix pesticides in windy conditions or other conditions that may increase the risk of exposure to applicators, the general public and the environment.

Hold the container below eye level when pouring.

Use the proper tools for opening containers. Don't tear open bags. Cut the bag with a sharp knife.

Measure accurately.

Make sure scales, measuring cups, pre-mixing pails and knives are used only for pesticides. Clean well with soap and water after use and return them to locked storage.

Concept: PESTICIDE SAFETY - MIXING AND LOADING

General Objective: To know how to mix and load pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

If a pesticide is splashed or spilled, stop and clean up immediately.

To mix pesticides in a spray tank:

1. Use clean water.
2. Fill tank half full of water.
3. Turn on agitator, if there is one.
4. Slowly add the pesticide.
5. Triple rinse or pressure rinse the empty container (if appropriate) and measuring equipment; put the rinse water in the spray tank.
6. Finish filling the tank. Do not overfill.
7. Wash gloved hands before continuing.

Know the steps for adding pesticides to a spray tank.

List the steps for adding pesticides to a spray tank.

To load a pesticide into a spray tank:

1. Add the pesticide to the tank below eye level.
2. Always stand on the ground or on a sturdy platform when adding pesticides to sprayers.
3. Prevent overflow of tanks. Do not leave a filling tank unattended.

Know how to safely load a pesticide into a spray tank.

List the guidelines for safely adding a pesticide in a spray tank.

Prevent contamination of the water supply by:

- filling a sprayer away from water bodies;
- using a nurse tank;
- keeping the filler hose above the water line in the spray tank and/or using anti-backflow devices;
- mixing/loading and cleaning application equipment at the application site.

Know how to prevent contamination of the water source.

List the precautions that can be taken to prevent contamination of the water source when filling a spray tank.

Before applying the pesticide, rinse measuring and other equipment, pouring all rinse water into the spray tank.

Know what to do with pesticide containers and measuring equipment after mixing and loading, but before applying the pesticide.

Describe what to do with pesticide containers and measuring equipment after mixing and loading, but before applying the pesticide.

Close and return containers and measuring equipment to locked storage.

Concept: PESTICIDE SAFETY - APPLICATION

General Objective: To know how to apply pesticides safely.

COURSE OUTLINE

Follow the safety guidelines for pesticide application:

Understand label information before making a pesticide application.

Wear protective clothing and equipment appropriate for the pesticide and method of application.

Carry a supply of clean water with you at the application site. Clean water tanks should be available and can be attached to application equipment. This water can be used for clean-up and emergencies.

Cover, or remove from the application site all items that should not be contaminated. For example, animal feed or water containers, toys, or food utensils, etc.

Remove livestock and pets from the area if they could be accidentally contaminated.

Have people not involved in the application leave the area to be treated.

Avoid working alone when handling pesticides under hazardous conditions. If you have to work alone, make sure another person knows what product you are using, where you are working and when you plan to finish.

When applying pesticides outdoors, do so only under favourable weather conditions.

Use calibrated application equipment that is suitable to the type of application and label recommendation.

Application equipment should be in good working order.

INSTRUCTIONAL OBJECTIVES

Know safety guidelines for pesticide application.

LEARNING OUTCOMES

List and describe the safety guidelines that should be followed during pesticide application.

Concept: PESTICIDE SAFETY - APPLICATION

General Objective: To know how to apply pesticides safely.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

To prevent cross contamination, thoroughly decontaminate application equipment well before switching pesticides.

Use and maintain the variables or settings (speed, pressure) chosen during calibration.

Stop application when travelling over an area that doesn't require treatment. For example, shut off spray nozzles on a boom when turning.

Make sure soil-incorporated granules are properly incorporated, even at the ends of rows.

Never apply pesticides in your irrigation system unless the label has specific instructions on chemigation.

Plan an application route so that you avoid passing through airborne spray or freshly treated areas.

If equipment malfunctions, immediately stop and repair it.

Wear safety equipment while repairing application equipment.

To clean a blocked nozzle, use a soft brush with clean water. Never blow out a nozzle with your mouth. Never use sharp objects to remove the blockage as the nozzle will be damaged.

Wear gloves and goggles when replacing or cleaning plugged nozzles.

Minimize pesticide drift onto non-target areas.

Prevent non-target contamination by observing such things as buffer zones and re-entry intervals.

Concept: PESTICIDE SAFETY - CLEANUP AND MAINTENANCE OF EQUIPMENT

General Objective: To know how to safely and effectively clean and maintain equipment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Clean up should be done at the application site, whenever possible.

Know where to do clean-up of equipment.

Identify where to do clean-up of equipment.

Care of Protective Clothing and Equipment

Clean protective clothing and equipment at the end of each day of use or when finishing a job.

Know when to clean protective clothing and equipment.

Describe when protective clothing and equipment should be cleaned.

Follow the manufacturers instructions for cleaning personal protective equipment and clothing.

Gloves

Clean gloves as follows:

- leave gloves on while removing and cleaning protective clothing and equipment;
- wash gloves before taking them off;
- wash thoroughly with detergent and rinse well after each day of use/application.

Know how to care for gloves used for protection from pesticides.

Describe how to care for gloves used for protection from pesticides.

Frequently check gloves for leaks, discard leaky gloves and replace gloves on a regular basis.

Body Covering

Clean body covering as follows:

- rinse off waterproof clothing before removal;
- discard heavily contaminated clothing;
- use disposable plastic garbage bags for temporary storage of pesticide-contaminated clothes prior to washing;
- wash clothing daily.

Know how to safely handle contaminated clothing. Know how to launder pesticide contaminated clothing.

Describe how to safely handle contaminated clothing.

To wash clothes:

- use chemical resistant gloves to handle clothing;
- use a prewash additive on contaminated areas;
- pre-soak and launder separately from normal laundry;
- avoid overcrowding clothes in the washing machine;

Describe how to launder pesticide contaminated clothing.

Concept: PESTICIDE SAFETY - CLEANUP AND MAINTENANCE OF EQUIPMENT

General Objective: To know how to safely and effectively clean and maintain equipment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

- pre-rinse clothing using the pre-soak cycle;
- use hot water;
- use full water level;
- use normal wash cycle;
- use a heavy duty detergent, bleach, or household ammonia (do not mix these cleaners);
- repeat wash cycles may be required to remove some chemicals;
- hang clothes out to dry to prevent possible contamination of the dryer;
- run the empty washing machine through a full cycle again after use, using hot water, and detergent to rinse it thoroughly.

Follow manufacturer's instructions for care/disposal of disposable coveralls.

Boots, Head Protection, Goggles and Face Shields

- wash thoroughly with soap and warm water after each day of use;
- discard leaky footwear.

Know how to care for boots, head protection, goggles and face shields used for protection during pesticide application.

Describe how to care for boots, head protection, goggles and face shields used for protection during pesticide application.

Respirators

- inspect regularly for damage;
- make sure all valves, mechanical pre-filters, and charcoal cartridges are properly positioned and sealed;
- take off pre-filters and cartridges/canisters after each day of use and place in a clean sealed plastic bag. This prevents the cartridge from being used up when not in use. Wash the respirator face piece in warm water with mild detergent, then rinse well;
- at a minimum, start each year with new cartridges/canisters;
- follow the manufacturer's instructions for replacing pre-filters and cartridges/canisters;
- always replace cartridges/canisters if you smell the chemical through the respirator.

Know how to care for respirators used for protection during pesticide application.

Describe how to care for respirators.

Concept: PESTICIDE SAFETY - CLEANUP AND MAINTENANCE OF EQUIPMENT

General Objective: To know how to safely and effectively clean and maintain equipment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Storage of Personal Protective Equipment

Do not store personal protective equipment in the pesticides storage area or with regular clothing. A cool dry storage area will help extend the life of protective clothing. Keeping waterproof clothing (e.g., gloves, boots, etc.) away from sunlight will help extend their life.

Know how to store personal protective equipment.

Describe where personal protective clothing should be stored.

Keep charcoal cartridges/canisters in a clean air-tight container.

Know how to store charcoal filters.

Describe how charcoal filters should be stored.

Applicator/Mixer/Loader

At the end of an application day, shower thoroughly, washing body, hair and under fingernails.

Know that applicators/mixer/loaders should clean themselves at the end of an application day.

Identify which parts of his or her body an applicator should take particular care with when washing at the end of an application day.

Application Equipment

Proper equipment maintenance is necessary for economic reasons, environmental safety and personal safety. Improper maintenance may result in:

- accidents;
- spills;
- hazards to personal safety;
- contamination of the environment;
- revenue loss due to "down time";
- costs for replacement parts and labour for repairs;
- damage to non-target sites;
- non-uniform application rates.

Know why proper equipment maintenance is necessary.

List major reasons why correct equipment maintenance is important. Describe the potential results of improper equipment maintenance.

Concept: PESTICIDE SAFETY - CLEANUP AND MAINTENANCE OF EQUIPMENT

General Objective: To know how to safely and effectively clean and maintain equipment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Safety guidelines for maintenance of application equipment:

Know general safety guidelines for maintenance of application equipment.

List and describe the general safety guidelines for maintenance of application equipment.

Clean equipment where wells, surface and ground water will not be contaminated.

Wear appropriate personal protective equipment when cleaning application equipment.

Do not leave pesticides in application equipment for extended times. They could:

- penetrate into hoses, gaskets and plastic;
- cause premature corrosion;
- reduce the effectiveness of the pesticide;
- suspension can settle out creating mechanical problems;
- granules can absorb moisture and harden into lumps.

Shut machinery off before making hazardous repairs or adjustments.

Empty and clean application equipment after each day's use, when changing pesticides, and before off-season storage.

Know when application equipment should be emptied and cleaned.

List the times when application equipment should be emptied and cleaned.

Assess the application equipment for wear and replace worn or damaged parts.

Understand which application equipment should be checked for wear.

Identify which application equipment should be checked for wear.

Concept: PESTICIDE SAFETY - DISPOSAL

General Objective: To know how to dispose of pesticide containers and pesticides safely and legally.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Container Disposal

Correct pesticide container disposal is important because:

- improperly rinsed containers may not be recycled;
- pesticide residues in unrinsed containers are hazardous to people (for example, children could play around containers and be poisoned);
- pesticide residues could contaminate the environment (for example, rain could wash container residues into a stream and kill fish);
- poor container disposal practices also create a bad public image (for example, customers who see sloppy disposal practices may refuse to carry on future business);
- poor disposal practices waste pesticides and money (for example, several dollars worth of pesticides are wasted in many improperly cleaned containers).

Appreciate the need to correctly dispose of pesticide containers.

List reasons why correct container disposal is important.

Domestic pesticide containers can be safely disposed of in the household garbage without cleaning. However, it is beneficial to clean and rinse these containers as well.

Know which containers do not need to be cleaned and rinsed.

Identify which containers can be discarded with the household garbage, without cleaning and rinsing.

Containers must be cleaned as soon as they are emptied because:

- it minimizes hazard to people and the environment;
- it is difficult to remove the pesticide residues from the container after they have dried;
- the rinse water can be put into the spray tank or on the application site and therefore does not create a disposal problem;
- some provinces have legal requirements for handling the rinsate.

Understand why it is important to clean containers as soon as they are empty.

List reasons why it is important to clean pesticide containers as soon as they are empty.

Clean containers by draining and triple rinsing or pressure rinsing unless contra-indicated on the product label.

Know how to clean pesticide containers.

Describe how to clean pesticide containers.

Concept: PESTICIDE SAFETY - DISPOSAL

General Objective: To know how to dispose of pesticide containers and pesticides safely and legally.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Steps for Container Disposal

1. Drain a container into the spray tank until there are no visible drips or shake out the bag into the tank or hopper.

Know how to dispose of empty pesticide containers.

List and describe the steps for container disposal.

2. Triple rinse or pressure rinse a container; gently single rinse bags when possible.

To triple rinse:

- A. Fill the empty container at least 10% full of diluent (usually water) and recap. The amount of rinse water required may vary. If the label states how much water to use, follow label directions.
- B. Shake or roll the container so the inside surfaces are well rinsed.
- C. Pour the rinse water into the spray tank.
- D. Repeat the procedure two more times.

To pressure rinse:

- A. Pressure rinse for 60 seconds.
- B. Pour the rinse water into the spray tank.

3. Make the empty container unsuitable for further use by cutting, puncturing and/or crushing plastic, metal or paper containers or by breaking glass containers in a plastic bag. This step prevents the owner or others from using the container for things such as a water bucket, harvesting container, sand pail, etc.

Exception: Refillable containers.

4. Finally, dispose of the container and cap according to provincial requirements. Return containers to collection depots for recycling/disposal where available.

If you cannot dispose of your containers immediately, return them to locked storage until you are able to do so.

Know what to do with containers which cannot be disposed of immediately.

Describe what should be done with rinsed containers that cannot be immediately disposed of.

Concept: PESTICIDE SAFETY - DISPOSAL

General Objective: To know how to dispose of pesticide containers and pesticides safely and legally.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Concentrate Disposal

Plan your pesticide purchases carefully so you do not have waste pesticides. Always use the old inventory before purchasing more pesticides. Make sure the old inventory is effective to use by contacting the manufacturer.

Know how to avoid having waste pesticides.

Describe how to avoid having waste pesticides.

Know who to contact to determine if an old pesticide is still effective.

Identify who to contact when using old inventory.

The safest way to dispose of pesticide concentrates is to use them according to label directions. If this is not possible, try to return unopened containers to the manufacturer or dealer. Applicators may also contact the provincial pesticide regulatory authority for information on disposal of unused or unwanted pesticide.

Know how to dispose of unwanted pesticide product.

List options for disposing of unwanted pesticide product.

Disposal of Surplus Tank Mixture

Avoid mixing surplus spray solutions by accurately measuring the area to be treated, calculating rates and calibrating application equipment.

Know how to avoid mixing surplus spray solutions.

List the activities that will help avoid mixing surplus spray solutions.

If there is excess spray mixture, use it up according to label directions. If this is not possible, contact the provincial pesticide regulatory authority for guidance.

Know what do with excess tank mixture.

Identify what to do with excess tank mixture.

Concept: PESTICIDE SAFETY - RE-ENTRY

General Objective: To know how to minimize exposure to pesticides by limiting re-entry into treated areas.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

People can be exposed to pesticide and possibly poisoned if they enter treated areas (without protection) too soon after a pesticide application. Exposure levels can be as high as during mixing, loading and applying. Waiting a period of time after treatment before going into the treated area, or wearing appropriate protective equipment/clothing will minimize exposure.

Know why it is important not to enter a treated area (without protection) too soon after application.

Identify why you should not enter a treated area (without protection) too soon after application.

The re-entry time, or re-entry interval is the minimum time required to stay out of the treated area, unless protective clothing and equipment is worn.

Know what a re-entry time is.

Describe re-entry time.

Make sure anyone who could enter a treated area is aware of the re-entry time (i.e., post signs).

Know who should be made aware of re-entry times.

Identify who should be aware of re-entry times.

If there is no re-entry time on the label, minimize exposure by following provincial re-entry guidelines or wait until the spray has dried.

Know how to minimize exposure when re-entry times have not been established.

Describe how to minimize exposure when re-entry times have not been established.

Wait for the re-entry time to pass before entering or allowing anyone without protective equipment to enter a treated area. If you must enter a treated area before the re-entry time is over, wear the recommended protective equipment/clothing and limit the time in the treated area.

Know the precautions to take if you must enter a treated area before the re-entry time is over.

List the precautions that should be followed if a person must enter a treated area before the re-entry time has elapsed.

Concept: PESTICIDE SAFETY - APPLICATION RECORDS

General Objective: To know how to keep useful records of pesticide application.

COURSE OUTLINE

Record keeping provides a history of pest problems and control methods used. It can be useful for planning future applications, re-entry times, harvest dates, and grazing times. Records provide details about the application and equipment settings. They also help answer questions and solve problems that come up after application (e.g., ineffective applications, crop or property damage, liability suits).

Application records should include:

- date and time of application;
- location of application;
- pest;
- target site;
- pesticide (Product name and PCP Act number);
- rate of application;
- applicator's name and license/certificate #;
- type of application equipment and equipment settings (e.g., nozzles used, pressure, spacing, speed, boom height, etc.);
- weather conditions (e.g., rain, wind, temperatures);
- anything else that might affect the application;
- preharvest interval, where applicable;
- adjacent areas (e.g., crops);
- environmental effects resulting from pesticide use;
- evaluation of the application;
- total amount of pesticide used;
- monitoring results (if used).

Provinces may have special legal requirements for record keeping. Check with provincial authorities to obtain details of record keeping.

INSTRUCTIONAL OBJECTIVES

Understand why it is important to keep records of pesticide applications.

Know what type of information should be included in a pesticide application record.

Know what you must legally record in an application record. (May vary from province to province).

LEARNING OUTCOMES

Describe why it is important to keep records of pesticide applications.

List the information that should be included in a pesticide application record.

List the items that provincial laws require you to record.

Concept: ENVIRONMENT - FATE OF PESTICIDES

General Objective: To understand what happens to pesticides once they are released into the environment.

COURSE OUTLINE

As soon as a pesticide is released into the environment, its fate is determined by various processes. These processes ultimately determine what impact the pesticide will have on the environment. These processes include: adsorption, desorption, volatilization, runoff, leaching, absorption, breakdown/degradation and drift.

Adsorption is the binding of chemicals to soil particles or other material. The amount that a pesticide binds to the soil varies with the type and concentration of the pesticide, soil, moisture, soil pH, and soil texture. Soils high in organic matter or clay are the most adsorptive. Most soil-bound pesticides are less likely to leach or be broken down by microbes. However, pesticides can be easily moved by wind or water when bound to soil particles. Desorption occurs when bound pesticides are released from the soil or other material. These released pesticide residues are then more available for uptake and effects on the environment.

Volatilization is the process where solid or liquid substances evaporate into a vapour (gas). The rate at which pesticides evaporate depends upon the pesticide and environmental conditions. Some pesticides can volatilize readily from sandy and wet soils. Hot dry windy weather increases volatilization. Small spray drops are more easily volatilized than larger droplets.

The pesticide vapours can move in the air. This movement is called **vapour drift**. Vapour drift from some herbicides during or after application can sometimes damage non-target plants.

INSTRUCTIONAL OBJECTIVES

Know which processes affect pesticides once they are released into the environment.

Understand what adsorption and desorption are and what affects the adsorption of pesticides. Realize that adsorbed pesticides may be able to contaminate the environment.

Understand volatilization.

Know what vapour drift is.

LEARNING OUTCOMES

List the processes that affect pesticides once they are released into the environment.

Describe adsorption and desorption. List and describe things that could affect the adsorption of pesticide onto soil particles. Describe how adsorbed pesticides may be able to contaminate the environment.

Describe volatilization. List and describe things that affect the volatility of a pesticide.

Describe vapour drift.

Concept: ENVIRONMENT - FATE OF PESTICIDES

General Objective: To understand what happens to pesticides once they are released into the environment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Spray drift is the airborne movement of spray droplets away from a treatment site during application.

Know what spray drift is.

Describe spray drift.

Spray drift is affected by:

- spray droplet size. The smaller the droplets, the more likely they will drift. Therefore, factors that decrease droplet size (e.g., high temperatures, low humidity) will increase drift;
- air movement. The more the air moves, the more pesticide spray will drift;
- stable or atmospheric inversion conditions (inversions occur when wind is calm and air temperature at the ground level is lower than the air above it). Inversion causes spray to remain suspended, then when wind does start, the suspended droplets move as well;
- the distance between nozzles and the target. The greater the distance, the more the air movement can affect the spray;
- speed of application equipment. The faster application equipment moves, the more likely it is that drift will occur.

Know what affects spray drift.

List the things that affect spray drift, and describe how.

Runoff is the movement of water over a sloping surface. Pesticides may be either mixed in the water or bound to soil particles that move with the water.

Know what runoff is.

Describe runoff. List ways pesticides move with runoff.

The pesticide's characteristics (formulation, solubility, etc.) will affect the amount of pesticide in the runoff.

Know what can affect the amount of pesticide in runoff.

List pesticide characteristics that can affect the amount of pesticide in runoff.

The amount of runoff depends on:

- the slope of the surface;
- the texture and type of the surface;
- adsorptive ability of the soil;
- the moisture content of the surface material;
- the amount of additional moisture (rainfall, irrigation, etc.);
- the type and amount of surface vegetation and root development.

Know what affects the amount of runoff.

List things that affect the amount of runoff.

Concept: ENVIRONMENT - FATE OF PESTICIDES

General Objective: To understand what happens to pesticides once they are released into the environment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Runoff from treated areas or areas contaminated by spills can pollute streams, ponds, lakes and wells. Pesticide residues in surface water can harm plants and animals and contaminate lakes, streams and groundwater.

Know adverse effects of pesticide-contaminated runoff.

Identify potential adverse effects of pesticide-contaminated runoff.

Leaching is the movement of pesticides with water through the soil. Wood preservatives can also leach out of wood. Leaching can occur downward, upward or sideways.

Understand what leaching is.

Describe what leaching is.

Leaching increases when:

- pesticide solubility increases;
- the soil has a low water holding capacity;
- adsorption of the pesticide to soil is low or desorption is high;
- additional water is added (rain, irrigation);
- the soil structure becomes coarser.

Know what increases leaching.

List the things that could increase the leaching of a pesticide.

Absorption is the movement of pesticides into organisms (plants, animals) or structures (e.g., soil, wood).

Understand what absorption is.

Describe absorption.

Degradation is the breakdown of pesticides into other compounds. The rate of breakdown is expressed as half life. The longer a pesticide takes to breakdown, the longer its half life.

Know what degradation is. Know how the rate of breakdown is expressed.

Describe what degradation is. Identify how the rate of degradation is expressed.

Pesticides are affected by three types of breakdown.

Know the types of breakdown that affect pesticides. Know the factors that affect the rate of microbial breakdown.

List and describe the types of breakdown that affect pesticides. Identify the factors that affect the rate of chemical breakdown.

1. Microbial breakdown includes the use of pesticides as an energy source for food by microbes. Temperature, pH, soil moisture, presence or absence of oxygen, soil fertility and chemical/physical properties of the pesticide all affect microbial breakdown.

2. Chemical breakdown is the breakdown of pesticides by chemical reactions. The rate of chemical reactions depends upon the temperature, pH, moisture and the pesticide.

Concept: ENVIRONMENT - FATE OF PESTICIDES

General Objective: To understand what happens to pesticides once they are released into the environment.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

3. Photodegradation is the breakdown of pesticides by sunlight.
Pesticides breakdown at different rates when exposed to sunlight.

The processes that affect pesticides can be beneficial or harmful.

Examples of benefits include:

- the movement (leaching) of herbicides into the root zone of weeds;
- adsorption, which reduces herbicide activity on the soil (may allow sensitive plants to grow soon after application);
- breakdown to reduce persistence and toxicity in the environment;
- volatilization of certain pesticides enhances control (e.g., fumigation).

Examples of harmful effects include:

- leaching of pesticides into groundwater;
- adsorption of pesticides on to soil slowing breakdown;
- breakdown by photodegradation reducing effectiveness;
- drift of pesticide vapours onto non-target areas.

Sometimes breakdown products can be more toxic than the original pesticide. If a pesticide persists in the environment (remains active), it may accumulate in plant or animal tissues.

Contamination Sources

After an area has been determined to be contaminated, the pesticide source is classed as either a point source or a non-point source. Point source contamination refers to when a large amount of pesticide is released in a small area (is accidental spill, pesticide fire or improper disposal). Non-point source refers to when the pesticide is applied over a large area.

Know that the processes that affect pesticides in the environment can have both beneficial and harmful effects.

Know the difference between point source and non-point source contamination.

List beneficial effects and harmful effects that may be caused by the processes that affect the fate of pesticides in the environment.

List the difference between point source and non-point source contamination.

Concept: ENVIRONMENT - AQUATIC IMPACT

General Objective: To know how to prevent pesticides from contaminating water.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Surface water is the water we can see (ditches, streams, ponds, rivers, lakes, oceans, etc).

Know what surface water is.

Describe surface water.

Groundwater is found below the surface of the earth. Most groundwater occurs in zones of rock, sand, or gravel that are saturated with water. These zones are known as aquifers.

Know what groundwater is.

Describe groundwater.

The water table is the level below which all the spaces are filled with water. The water table can vary.

Understand what the water table is.

Describe the water table.

Both surface water and groundwater can be contaminated by pesticides. Water can be contaminated by:

Know how water can become contaminated by pesticides.

List the ways that surface water and groundwater can become contaminated by pesticides.

- runoff;
- leaching;
- movement of soil that has adsorbed pesticides;
- direct application;
- drift;
- accidents, such as spills.

Once water is contaminated, any organism living in the water or using the water may be affected. These can include domestic animals, people, fish, plants, birds, wildlife, insects, etc. The water can affect them directly (contact or drinking), or indirectly (impact on food supply or recreational activities). It is very difficult (sometimes impossible), and expensive to decontaminate ground and surface water.

Appreciate why water must be protected.

Identify why water should be protected.

The best solution to water contamination is prevention.

Know the best solution to water contamination.

Identify the best solution to water contamination.

Prevent surface and groundwater contamination by handling and using pesticides responsibly.

Know how to prevent water contamination.

Identify how water contamination can be prevented.

Concept: ENVIRONMENT - AQUATIC IMPACT

General Objective: To know how to prevent pesticides from contaminating water.

COURSE OUTLINE

Prevent the back siphoning of the sprayer contents when filling the sprayer. Under certain circumstances the tank contents can flow back through the filler hose into the water supply causing direct contamination. This is called back siphoning. Prevent contamination of the original water source from back siphoning/flow by:

- filling a sprayer away from water bodies by using a nurse tank;
- keeping the end of a filler hose above the water level in the spray tank at all times;
- using an anti-backflow device (e.g., spring-loaded check valve) whenever taking water directly from a water source.

Impact of Water Contamination on Fish and Aquatic Organisms

Pesticides that contaminate water may harm the aquatic ecosystem including fish and other aquatic organisms. The majority of pesticides will have an impact on aquatic communities. Some pesticides are very toxic to fish and aquatic organisms even if they are not very toxic to people. Use extreme care around water bodies and check the pesticide label to see if it indicates the product is toxic to fish.

Fish and aquatic organisms can be harmed directly by pesticides. Fish and aquatic organism kills can result from pesticides getting into water. This can happen through drift, runoff, soil erosion, leaching or through the deliberate or careless release (e.g., spills or overspray of water) of pesticides into the water.

Fish and aquatic organisms could be harmed indirectly if pesticides remove food organisms or aquatic or streamside vegetation.

Death of fish and aquatic organisms could be immediate or delayed. Fish and aquatic organisms may not be killed but could suffer long term damage, reproductive effects, or could accumulate pesticides in their tissues and be unfit for consumption.

INSTRUCTIONAL OBJECTIVES

Understand back siphoning and know how to prevent it.

Know to check the label to find out if the pesticide being used is toxic to fish.

Know how fish can be harmed by pesticides.

LEARNING OUTCOMES

Describe backflow or back siphoning. List ways to prevent backflow or back siphoning.

Identify where to find out if the pesticide being used is toxic to fish.

List ways fish could be harmed by pesticides. **(related to the application category).**

Concept: ENVIRONMENT - AQUATIC IMPACT

General Objective: To know how to prevent pesticides from contaminating water.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Protect fish and aquatic organisms by preventing contamination of water sources and/or destruction of food sources. Important ways to accomplish this are by:

- following safety guidelines;
- using the correct pesticide rate;
- choosing pesticides carefully when applying near water or shallow aquifers and avoiding pesticides with a
 - high tendency to leach to shallow aquifers
 - high runoff potential
 - high aquatic toxicity;
- maintaining buffer zones during filling and applications;
- exercising extra care and restraint when applying pesticides near fish habitat or to areas that drain into fish habitat.

Know how to protect fish.

Describe how fish can be protected and list ways to help accomplish this.

People who damage fish or fish habitat as a result of pesticide use can be prosecuted under the **Fisheries Act**.

Know it is illegal to damage fish or fish habitat.

Describe the legal implications, to the applicator, of harming fish and/or fish habitat.

Impact of Water Contamination on Other Forms of Life

Water contaminated with pesticides can affect all living organisms. It can harm people, domestic animals, birds and wildlife or plants. These organisms could be killed or suffer long term damage or be otherwise adversely affected.

Realize that water contaminated by pesticides can affect all living organisms.

Identify that other forms of life can be affected by water contaminated by pesticides.

Concept: ENVIRONMENT - LAND IMPACT

General Objective: To know how to prevent pesticides from harming the land environment and its inhabitants.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Soil

Soil can be contaminated by spills that occur during mixing and loading, application equipment overflow, improper disposal, or exceeding the proper rate of application. Contamination of sandy or coarse soils can lead to contamination of groundwater, whereas spills on clay or fine soils remain on the soil surface longer and are more likely to move by surface runoff over time.

Know how soil can be contaminated by pesticides.

List ways soil can be contaminated by pesticides.

Prevent soil contamination by following safety guidelines/practices described in this standard.

Know how to prevent soil contamination.

Identify ways to prevent soil contamination.

Air

Air can be contaminated by pesticides. Spray droplets, mists, dusts, or vapours can move in the air. Once in the air they can be transported to water bodies, non-target organisms or soil. They can also be concentrated within enclosed spaces and harm applicators, bystanders or non-target organisms.

Know how to prevent air contamination.

Describe how air can be contaminated by pesticides and how to prevent air contamination.

Prevent air contamination by following pesticide safety guidelines that minimize drift.

Animals

(Wildlife, birds, domestic animals, and other land animals).

All animals are part of our ecosystem. Using pesticides indiscriminately can alter or destroy the ecosystem. Many animals provide a very useful function in controlling pests and so all attempts should be made to remove pests with minimal impact to other animals of the ecosystem.

Know how animals and other organisms could be harmed by pesticides. Realize the animal and bird populations can be harmed by destruction of their habitat or food supply.

List ways animals could be harmed by pesticides. Identify whether destruction of animal and bird habitat can harm their populations.

Concept: ENVIRONMENT - LAND IMPACT

General Objective: To know how to prevent pesticides from harming the land environment and its inhabitants.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Animals can be harmed by pesticides. They may be killed or could suffer adverse affects (e.g., weight loss, reproductive failure), long-term damage, or could accumulate pesticides in their tissues (this could harm them or make them unfit for consumption). They can be harmed directly by exposure during application (contact or inhalation) or indirectly by contacting contaminated water, vegetation (e.g., brushing against it), soil, or food (e.g., treated seed, poisoned animals, or contaminated vegetation). Contaminating nests, dens and burrows, destroying wildlife habitat, or destroying their food supply can also harm the animal and bird population. Soil organisms can also be harmed by pesticides in the soil.

Insecticides and rodenticides are generally more poisonous to wildlife than other forms of pesticides.

To prevent animals from being harmed:

- be sensitive to the presence of wildlife and their young;
- read and follow all pesticide label information;
- follow safety guidelines described in this standard;
- use pesticides only when necessary;
- select the least toxic and least persistent of the registered and recommended pesticides;
- use a target-specific pesticide to minimize impact on desirable organisms;
- be aware of the effects that granular pesticides and treated seed may have on wildlife, and ensure that such products are properly used and stored. Poisoned rodents may result in secondary poisoning; therefore should be disposed of appropriately;
- avoid using products that are known to move away from the area of application through drift or runoff;
- leave buffer zones around sensitive areas.

Beneficial Insects

Beneficial insects are part of the natural ecosystem and can be killed by pesticides. Many insects are beneficial. They may be pollinators, insect predators, parasites, or decomposers.

Know which types of pesticide are generally more toxic to wildlife.

Know how to prevent animals from being harmed by pesticides.

Appreciate why beneficial insects should not be harmed by pesticides.

Identify which pesticides are generally more toxic to wildlife.

List things an applicator can do to protect animals from pesticides.

List reasons why harm to beneficial insects should be minimized.

Concept: ENVIRONMENT - LAND IMPACT

General Objective: To know how to prevent pesticides from harming the land environment and its inhabitants.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Minimize harm to beneficial insects by following general guidelines. For example:

- minimizing pesticide usage;
- choosing the pesticide least harmful to beneficial insects;
- not treating edges of treatment areas where insect predators take shelter;
- minimizing drift onto areas with beneficial insects.

Know general guidelines for minimizing harm to beneficial insects.

List the general guidelines for minimizing harm to beneficial insects.

Pollinators (e.g., bees) are a special group of beneficial insects that are essential for the survival of many plants. They can also be killed by pesticides. Protect bees by:

- letting nearby beekeepers and local beekeeper associations know when hazardous pesticides will be applied outdoors;
- not applying pesticides that are toxic to bees on blooming areas;
- mow cover crops and weeds to remove blooms prior to spraying;
- select the pesticide product that is least harmful to bees;
- attempt to time applications when bees are inactive;
- minimize spray drift.

Know how to protect bees from pesticides.

List the things an applicator can do to protect bees from pesticides.

Plants

Both target and non-target plants can be injured by pesticides. Chemicals that damage or injure plants are said to be phytotoxic. Most damage is caused by herbicides, however, in cases of insecticide or fungicide use, the crop may be a non-target plant. Refer to the product label for possible non-target sensitivities. In addition to being affected by spray operations, pesticides can drift, runoff or leach from treated areas as well as from mixing, disposal and storage sites to affect non-target plants.

Know what phytotoxic means. Know how pesticides can damage plants.

Describe the term phytotoxic. Identify how pesticides can damage non-target plants.

Protect non-target plants by taking steps to prevent the movement of pesticides onto non-target areas.

Know how to protect non-target plants from pesticide damage.

Describe how to prevent non-target plants from pesticide damage.

Damage of stream-side vegetation can affect:

- bank stability;
- temperature (removal of shade) of land and water;
- fish food sources.

Know the results of damaging stream-side vegetation.

List the potential result of damaging stream-side vegetation.

Concept: ENVIRONMENT - LAND IMPACT

General Objective: To know how to prevent pesticides from harming the land environment and its inhabitants.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Stream-side vegetation is also important to other wildlife.

The damage of non-target vegetation can harm wildlife by affecting:

- food sources;
- habitat.

Know how damaging non-target vegetation can harm wildlife.

List ways harming non-target vegetation can harm wildlife.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

The goal of pest management is to manage pests effectively, economically, and safely.

Know the goal of pest management.

Identify the goal of pest management.

Pest management usually involves suppression of pest numbers to acceptable levels. It does not usually involve eradication, which is the total elimination of a pest population.

Know whether pest management usually involves suppression or eradication.

Describe whether the objective of pest management is usually suppression or eradication of pests.

Always use an integrated pest management approach, especially if pesticides are to be used.

Know when to use an integrated pest management approach.

Identify when an integrated approach to pest management should be used.

Integrated Pest Management (IPM) Definition

IPM is a decision making process for preventing pest problems and for determining what actions to take when pest problems occur. In IPM programs, all available information and treatment methods are considered in order to manage pest populations effectively, economically and in an environmentally sound manner.

Know what integrated pest management is.

Describe what integrated pest management is.

The elements of integrated pest management are:

Know the elements of integrated pest management.

List the elements of integrated pest management.

1. Preventing organisms from becoming pest problems by planning and managing ecosystems;
2. Identifying pest and beneficial species;
3. Monitoring pest and beneficial species populations, pest damage and environmental conditions;
4. Using injury and action thresholds to determine when to treat pests;
5. Using treatments that usually include a combination of methods, such as cultural, biological, physical, mechanical, behavioural, or chemical methods, to achieve acceptable control with minimal impact on the environment;
6. Evaluating the effects and efficacy of pest management strategies.

IPM programs also involve communicating with employees, customers, agencies and the public to inform them of the goals, methods, results and benefits of using IPM.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Prevention

A well-developed IPM program emphasises making changes in the management of plants/crops and the design of the site to prevent pest problems from occurring.

Prevention is important because avoiding pest problems is often more economical and gives better and longer-term results than relying on treatments. Reducing pest problems through preventative steps also makes any pest treatments more effective if they are required.

Many of the pest treatment methods categorised as cultural or physical could also be considered preventative, such as selecting disease or insect resistant plants, managing growing conditions to produce healthy plants, cleaning to eliminate food sources for pests or screening buildings to keep out pests.

The advantages of using IPM are that it can help to:

- provide long-term solutions to pest problems;
- protect the environment and human health by reducing pesticide use;
- minimize harm to beneficial organisms that control pests;
- reduce the development of pesticide resistant pests; and
- provide pest control options where pesticides cannot be used.

Identification

Correct identification of pests and beneficial species is important to IPM because:

- it enables pest managers to research their biology,
- it minimises the chance that beneficial species may be mistaken for pests, and
- it may indicate treatments are not required if certain beneficial species are present in sufficient numbers.

Beneficial species are important primarily for insect and mite pest management but can suppress other types of pests such as weeds, molluscs and vertebrate pests.

Know what prevention involves and why it is important in an IPM program.

Know which pest treatment methods are preventative in nature.

Know the advantages of using IPM.

Know why correct identification of organisms is important.

Describe what prevention involves and why it is an important component of IPM.

List preventative pest management methods.

Describe advantages of using IPM.

Describe why it is important to correctly identify species.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

Knowledge of the biology of pests and beneficial species will help when making management decisions. Important biological information includes the following:

- knowing the life cycle and stages of growth of the pest allows treatments to be made when the pest is most susceptible (there may only be a very short time when a treatment will be effective);
- knowing how rapidly the pest species reproduces helps determine the timing and number of treatments;
- knowing how rapidly beneficial species reproduce helps in deciding whether treatments may be required;
- the life cycle of the host may be important since certain treatments can harm the host if applied at the wrong stage;
- the behaviour of the pest may influence the timing or choice of a treatment (e.g., the pest may only be present at certain times of the day or night or in certain locations).

Pests can be identified by examining the pest and/or the characteristic damage the pest causes.

If you cannot identify the pest, obtain help so that a correct identification can be made. Information on pest and beneficial species identification and biology may be available from:

- government and scientific publications;
- government and other diagnostic services including pest monitoring service firms;
- pest control representatives (e.g., pest management firms, technicians, pesticide company sales/technical reps, etc.);
- government pest management specialists;
- universities and colleges;
- the Internet or other electronic references.

NOTE: Knowledge requirements on the biology of insects, mites, diseases, weeds, and vertebrate pests are listed in the category specific modules.

Monitoring

Monitoring provides information about pest populations and sites for making pest management decisions such as whether treatments are needed, and when they will be most effective.

INSTRUCTIONAL OBJECTIVES

Understand why it is important to know about the life cycle and behaviour of pests, beneficial species and hosts.

Know how to go about identifying pests.

Know where to obtain advice or information on pest identification.

Understand why monitoring is used and list examples of what could be monitored to help make management decisions in an IPM program.

LEARNING OUTCOMES

Identify why it is important to know about the life cycle and behaviour of pests, beneficial species and hosts.

Describe what to examine when identifying a pest.

List places where information on advice on pest identification can be obtained.

Describe why monitoring is used and list examples of what could be monitored to help make management decisions in and IPM program.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Monitoring consists of making regular inspections and writing down the results (making records). Monitoring includes checking, and often counting, to determine:

- pest damage;
- pest presence, species and abundance (does the pest population exceed the injury threshold?);
- weather conditions (do they favour pest development, such as diseases?);
- the pest's life stage (is it at a stage susceptible to a particular management method?);
- the host's stage and condition (is it suitable for the management action being considered?);
- beneficial organism presence, species and abundance (are there enough to keep the pest population below the injury threshold?).

Written records are an essential part of monitoring so that results from different observation dates can be compared.

Monitoring helps to:

- locate the centre of an infestation so that treatments can be directed at the source, limiting the spread of the pest and the number of future treatments needed;
- find the cause of a pest problem, which helps identify actions to be taken to help prevent future outbreaks;
- select and revise action thresholds;
- assess treatment results; and
- plan improvements that will make the pest management program more effective.

A good monitoring program can:

- significantly reduce the need for treatments,
- improve the success of pest management programs, and
- reduce treatment costs.

Monitoring methods generally are of two types: 1) visual inspections or 2) counting and measuring methods.

Know methods for monitoring and the need for written records.

Understand the benefits that can be achieved from monitoring.

Know the difference between visual inspections and counting and measuring methods and what they can be used to monitor.

List methods that can be used for monitoring.

List benefits that can be achieved from monitoring.

Describe the difference between visual inspections and counting and measuring methods and what they can be used to monitor.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

A **visual inspection** is a careful look for signs of pest problems or conditions that favour pests. It should be done regularly and written notes must be kept. The value of such observations depends on the knowledge and experience of the person doing the inspections.

Visual inspections are most useful when checking for:

- presence or absence of pests, damage symptoms or beneficial species,
- growing conditions or plant health, or
- environmental conditions that attract pests or provide them with shelter, food or water.

Counting and measuring methods give numerical information about pest populations or levels of damage. If the same method is followed each time, the results can be compared to counts done at other times and by different people.

Counting methods are useful for:

- estimating the size and spread of a pest population;
- comparing records from others sites or dates;
- establishing injury and action levels; or
- evaluating effects of treatments on pest populations.

Items to count or measure include:

- number of pests or signs of pest damage on leaves or plants;
- number of pests (e.g., weeds) in a measured area;
- number of pests caught in various types of traps;
- size of an infestation (e.g., diseased areas on leaves or turf); or
- number of days with weather conditions that favour a pest (e.g., a plant disease).

Sampling theory: when using monitoring methods based on counting and measuring (e.g., number of pests, beneficial insects, damaged leaves, etc.), the aim is to obtain an accurate estimate for the whole site being monitored. How good this estimate is depends on:

- how many samples are counted (sample size) and
- whether the samples are chosen randomly (sample randomness).

INSTRUCTIONAL OBJECTIVES

Know what two things the accuracy of population estimates from counting and measuring depends upon.

LEARNING OUTCOMES

List the two things that the accuracy of population estimates from counting and measuring depends upon.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

Sample size: generally, the more samples that are counted, the more likely it is that the results will give a reliable estimate of what is being counted for the whole site. There is a practical limit to how many samples can be taken, but for acceptable accuracy it is usually necessary to take between 10 and 50 samples.

Before starting a monitoring program, find out how many samples must be taken to obtain an acceptable level of accuracy. A simple method for determining this is:

1. Take 10 samples, count the number of pests (or other things being counted), add up the total counts and divide by 10 to calculate the average.
2. Take 40 samples, count the pests and calculate the average.
3. Compare the two averages. If they are within 10-20% of each other, it shows that 10 samples was probably enough because the result didn't change when more samples were taken.
4. If there is a larger difference between the two averages it means that 10 samples wasn't enough. Try the average of 15, 20 or more samples until you find a sample number that gives about the same results as taking 40 samples.

Sample randomness: usually samples must be taken randomly to make sure results are not influenced by the person doing the sampling. This means picking the sample locations by chance, without looking at them first and deciding which to take. If samples were intentionally picked from the most damaged area, the pest situation could appear worse than it really is; if samples were only picked from undamaged areas, the pest situation would be underestimated.

To make sure samples are taken randomly, decide on a sampling plan ahead of time and stick to it. Ways to do this include:

- plotting a grid on a map showing where samples will be taken, or
- taking samples at pre-determined points, such as every fifth plant in a row or at 1-metre intervals along a transect line.

It is meaningless to compare counts from non-random sampling with counts from random sampling. The same methods must be used each time to be able to compare results.

INSTRUCTIONAL OBJECTIVES

Know how to roughly estimate an adequate sample number.

Know why samples for estimating counts (such as pests or beneficials) should be randomly taken in the area being monitored.

Know ways to sample randomly.

LEARNING OUTCOMES

Describe how to roughly estimate an adequate sample number.

Describe why samples for estimating counts (such as pests or beneficials) should be randomly taken in the area being monitored.

Describe ways to sample randomly.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Injury and Action Thresholds

Deciding when to apply treatments involves using monitoring information to determine the injury threshold (sometimes called injury level) and the action threshold (sometimes called treatment threshold or action or treatment level) for a pest.

Understand injury threshold and action threshold.

Describe injury threshold and action threshold.

The injury threshold is when a pest population reaches numbers such that it causes unacceptable injury or damage, sufficient to justify treatment. A few individuals of a pest population can usually be tolerated. Treatments should only be considered if numbers increase to, or are likely to increase to, the injury threshold. Pest treatments have financial costs, and may have other impacts, such as on wildlife or fish habitat or beneficial species. These impacts must be weighed against the benefits of treatment, to determine whether or not treatment is justified.

The action threshold is the point at which treatment should take place in order to prevent the pest population from reaching the injury threshold. The action threshold depends on the type of treatment as well as on the life cycle and reproductive rate of the pest.

To establish injury and action thresholds, pest managers may find information is available:

Know where information on injury and action levels may be available.

List sources of information on injury and action levels.

- in government and scientific publications;
- from pest management specialists;
- from universities or colleges; and
- from growers' organizations.

If information is not available, pest managers should collect the necessary information in the monitoring program and communicate with clients and site users to set injury and action thresholds.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Treatments

IPM involves using all available information to select treatments and apply them in a co-ordinated approach. Most treatments fall into the following general categories:

- cultural;
- biological;
- mechanical/physical;
- behavioural; and
- chemical (pesticide).

Cultural category - includes treatments that can prevent pests from developing or spreading. They may disrupt the pest or host life cycle, or make the environment less favourable for survival of the pest. They include rotating crops, tilling the soil, providing optimum plant growing conditions, sanitation practices and the replacement of plants susceptible to infestation with more resistant cultivars or species.

Mechanical/Physical category - includes treatments that use equipment or devices or the manipulation of environmental factors such as temperature and humidity to prevent the spread of pests or reduce pest populations. This category includes the use of mechanical cultivators, mowers and brushing equipment, traps, screens, vacuums, freezers, heat application equipment, and sound and other repellent devices.

Biological category – includes treatments that use living organisms to control/kill the pest. Biological treatments include:

- introducing predators, parasites or micro-organisms to attack pests;
- conserving naturally occurring predators and parasites;
- using grazing animals to consume weeds.

Use of parasites and predators involves careful planning since they are effective only in certain locations and times and may have an impact on plant or animal species that are not pests.

Know the general categories of pest treatments.

Understand how cultural treatments are used to manage pests. Know examples of cultural treatments.

Understand how mechanical and physical treatments are used to manage pests. Know examples of mechanical and physical treatments.

Understand how biological treatments are used to manage pests. Know examples of biological treatment methods.

List pest management methods.

Describe how cultural treatments are used to manage pests. List examples of cultural treatments.

Describe how mechanical and physical treatments are used to manage pests. List examples of mechanical and physical treatments.

Describe how biological treatments are used to manage pests. List examples of biological treatment methods.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Behavioural category – includes treatments that take advantage of a pest’s natural behaviour to suppress the population. This includes:
- using pheromones (which are chemicals produced by insects to repel or attract other insects of the same species) to disrupt mating patterns or to attract pests to a trap; or
- releasing sterile males to inhibit pest reproduction.

Understand how behavioural treatments are used to manage pests and what pheromones are.

Describe how behavioural treatments are used to manage pests and what pheromones are.

Chemical category – includes treatments that use naturally derived or synthesized pesticides to kill, attract, repel, or alter the growth of pests.

Understand how chemical treatments are used to manage pests.

Identify the difference between selective and non-selective pesticides.

Pesticides are categorised according to their properties such as selective, non-selective, residual, persistent and non-persistent.

Selective pesticides are toxic to some pests, but have little or no effect on other pests or non-target organisms.

Understand the difference between selective and non-selective pesticides.

Describe how chemical methods are used to manage pests.

Non-selective pesticides are toxic to a wide range of pests, beneficial species and other non-target organisms.

Residual pesticides continue to be effective on a treated surface or in the treated area for an extended period following application (long term control).

Understand the term residual pesticides.

Describe what a residual pesticide is.

Persistent pesticides are those that remain active in the environment for a long time. Sometimes they can accumulate in animal or plant tissues.

Understand the difference between persistent and non-persistent pesticides.

Identify the difference between persistent and non-persistent pesticides.

Non-persistent pesticides do not remain active in the environment for more than one year.

ASIDE: Other categories of pesticides, including systemic, contact, stomach poisons and fumigants are defined in the Pest Management Sections of the category specific modules.

A major consideration for use of pesticides is the development of pest resistance. Resistant pest populations are not controlled effectively by the usual application rate or frequency of use of a particular pesticide.

Understand the term pest resistance.

Describe what pest resistance is.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Pesticide Resistance

Resistant pest populations develop when a few individual pests in a population are not affected by (are resistant to) a pesticide because of some genetic difference. When these pests reproduce, they pass on the resistant traits. If a pesticide is used on such a population, the susceptible individuals are eliminated while the resistant ones continue to reproduce and become dominant.

After a pest population develops resistance to a pesticide, effectiveness of pesticides in the same chemical family/group having the same or similar mode of action may also be reduced. Some users may attempt to achieve control of the pest by increasing the pesticide application rate, but this will result in increased selection pressure and hence will speed up the development of resistance. If resistance cannot be prevented, it is important to slow its development in order to prolong the life span and efficacy of current pesticides. If pest population resistance is not managed properly, it can become very difficult, and sometimes impossible, to achieve effective control of the pest with pesticides.

The development of pesticide resistance may be avoided or slowed by:

- using a variety of control methods, particularly non-chemical methods;
- only using pesticides when monitoring shows they are necessary (i.e., action thresholds have been reached);
- alternating pesticides from different chemical families/groups.

Environmental Considerations for Treatments - Observing and recording environmental conditions at or near a proposed treatment site will help when making treatment decisions. Environmental conditions can influence the effectiveness of the treatment and its safety (environmental and human). Environmental considerations are particularly important for pesticide treatments, but may be important for non-pesticide treatments as well.

Understand how resistant pest populations can develop.

Know why it is important to slow the development of pesticide resistance in pest populations.

Know how to try to slow the development of pesticide resistance.

Understand why applicators should be aware of environmental conditions at or near the treatment site.

Describe how resistant pest populations can develop.

Identify why it is important to slow the development of pesticide resistance in pest populations.

List things an applicator can do to slow the development of pesticide resistance.

Describe why applicators should be aware of environmental conditions at or near the treatment site.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

Environmental conditions to observe include:

- temperature (e.g., a parasite may require certain temperatures to survive; some pesticides require certain temperatures to be effective);
- relative humidity (e.g., some plant diseases will not develop when the relative humidity is low);
- precipitation (e.g., rain may reduce a pesticide's effectiveness by washing it off the treated surface);
- air movement (e.g., air movement can spread pests or can carry pesticides away from the target);
- nearby sensitive areas (e.g., adjacent fish bearing water may affect the choice of treatment methods);
- topography (e.g., steep land may eliminate certain treatment options).

Check pesticide labels for cautions on specific environmental conditions related to a product.

Treatment Selection - Treatment selection requires analysis of information regarding the pest, beneficials and host, monitoring results, injury and action thresholds, environmental conditions and treatment characteristics. Treatments should be selected that are:

- least hazardous to human health,
- least toxic or otherwise damaging to non-target organisms and the environment,
- most likely to produce long-term improvements and
- most cost-effective over time.

In an IPM program, usually, several treatment methods are used in a co-ordinated approach. Using a combination of treatment methods is usually more effective than relying on only one method. If a pesticide is to be used, one criterion for its selection is compatibility with other treatments.

INSTRUCTIONAL OBJECTIVES

Know what and how environmental conditions can affect pest treatment decisions.

Know what information is required to select pest treatments.

Know why several treatment methods should be emphasised in an IPM program and why this is important for selecting a pesticide treatment.

Know where information on pest treatment methods can be obtained.

LEARNING OUTCOMES

List environmental conditions that could affect pest treatment decisions.

List the information required to select pest treatments.

Describe why several treatment methods should be emphasised in an IPM program and why this is important for selecting a pesticide treatment.

List sources of information on pest treatment methods.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Sources of information on pest treatment methods include:

- literature (government and scientific publications, pest management industry journals, magazines, etc.);
- pest management representatives (pest management firms, technicians and industry associations; product suppliers; pest monitoring service firms, etc.);
- government pest management specialists;
- universities and colleges;
- the internet and other electronic resources.

Treatment Records - For all pest treatment actions, detailed information should be recorded on treatments used, timing, rates and weather conditions. This information is important for the evaluation step in an IPM program.

Know what treatment records should be made and why.

List what treatment records should be made and why.

Evaluation of Pest Management Results

Know what evaluation is used for and what information is required.

Describe what evaluation is used for and what information is required.

Evaluation is used to:

- evaluate the effectiveness of the pest management program;
- modify and improve the pest management program, including actions to prevent pests;
- anticipate and plan for seasonal pest infestations;
- keep track of costs and benefits of the pest management program.

Evaluation involves:

- making post-treatment observations on pests and non-target organisms;
- comparing post-treatment observations with pre-treatment monitoring records to determine treatment effects;
- reviewing treatment records, including methods, dates, times, rates, costs, etc.;
- if possible, obtaining feedback from clients or site users about treatment effectiveness; and
- identifying any possible improvements to pest management, including preventative actions that could be taken.

Concept: PEST MANAGEMENT

General Objective: To understand pest management principles required to carry out safe effective pest control.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Communication

Contacts and communication with local pest experts, government agencies, trade associations, other IPM practitioners, etc. is essential for gathering valuable information to improve the success of the pest management program.

Details of the IPM program and its goals should be communicated to employees/workers who will be carrying out the various aspects of the program. The chances of a successful program will be greatest if all employees fully understand the principles of IPM, what their roles are, and how they can contribute to its success.

Communicating about the IPM program to clients and the public (including potential clients) is also very important for success. Explaining in advance to clients what will be done, and why, including benefits, will allay their concerns and ensure their satisfaction with your services.

Know the types of communication that are needed in an IPM program, and why they are important.

Describe the types of communication that are needed in an IPM program, and why they are important.

Concept: APPLICATION TECHNOLOGY

General Objective: To understand the general principles of application technology necessary for proper pesticide application.

COURSE OUTLINE

Sources of information on pest management include:

- literature (government publications, magazines, books, etc.);
- pest management representatives (integrated pest management firms, product suppliers, technicians, etc.);
- government crop management specialists;
- universities and colleges;
- the Internet and other electronic resources.

NOTE:

Additional information on insects and mites, diseases, weeds, and vertebrate pests will be added to the category specific modules.

The principles of application technology involve application equipment and the environmental constraints that affect the application of pesticides.

Application Equipment

Application equipment is the key component in the transfer of the active ingredient from the product to the final target. This transfer may include:

- spray droplet formation (for liquids);
- transport to the target;
- contact by the target;
- distribution and retention on the target.

Application equipment should apply the pesticide uniformly to the desired target at the correct rate and not contaminate non-target sites. The equipment must therefore:

- be selected carefully;
- have the proper components;
- be operated correctly;
- be calibrated accurately;
- be maintained;
- be designed to minimize applicator exposure during loading and application.

INSTRUCTIONAL OBJECTIVES

Know where information on pest management can be obtained.

Know that the basic objective of application equipment should be to apply the pesticide uniformly to the desired target at the correct rate and not contaminate non-target areas. Know what is necessary to achieve the basic objective of pesticide application equipment.

LEARNING OUTCOMES

List sources of information on pest management.

Identify the basic objective of application equipment. List the criteria necessary to achieve a uniform pesticide application to the desired target, at the correct rate, without contaminating non-target areas.

Concept: APPLICATION TECHNOLOGY

General Objective: To understand the general principles of application technology necessary for proper pesticide application.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Selection of Application Equipment

A variety of application equipment is available for applying pesticides. Knowing the types and characteristics of available equipment as well as details of the application (e.g., pest, site), will allow an applicator to choose suitable equipment.

Understand why it is important to know the types and characteristics of available application equipment as well as the details of the application.

Describe why it is important to know the types and characteristics of available application equipment as well as the details on the application.

Select the type and size of application equipment suitable for the:

- type of application (e.g., spray, fog, dust, fumigation);
- application location (e.g., outdoors vs indoors);
- pesticide formulation;
- environmental conditions (e.g., windy area);
- size, shape and topography of the application site;
- target site or pest;
- available application time.

Know what to consider when selecting pesticide application equipment.

List the things to consider when selecting application equipment.

Components

Application equipment is made up of different components that work together to apply the pesticide. Each component has a specific function (e.g., hold, metre, or distribute the pesticide within the system). Being familiar with the components, their purpose, maintenance and adjustment, will help ensure proper calibration and operation of the application equipment.

Realize that application equipment is made of different components. Understand why it is important to be familiar with application equipment components, their purpose, maintenance, and adjustment.

Identify why it is important to be familiar with application equipment components, their purpose, maintenance, and adjustment.

Operation

The applicator is responsible for operating the pesticide application equipment in the correct manner.

Know who is responsible for the correct operation of application equipment.

Identify who is responsible for the correct operation of application equipment.

Equipment will only perform well if it is used correctly.

Realize that application equipment must be operated correctly.

Identify why application equipment must be operated correctly.

Concept: APPLICATION TECHNOLOGY

General Objective: To understand the general principles of application technology necessary for proper pesticide application.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

To operate application equipment correctly one must:

- understand how the equipment works;
- follow the equipment manufacturer's instructions;
- follow the instructions on the pesticide label;
- calibrate for uniformity and rate of application.

Know how to operate application equipment correctly.

List the guidelines for correct operation of application equipment.

Know what affects the method of operation.

List the factors that affect how application equipment is operated.

The operation of the application equipment may vary depending on:

- the type of equipment;
- the type of pesticide;
- the environmental conditions;
- the proximity to sensitive areas;
- the location of the pest;
- the proximity to bystanders.

Label Rates

The "Directions for Use" section of pesticide labels will indicate to the applicator how much pesticide should be applied.

Know where to find information on how much pesticide should be used.

State where information on how much pesticide should be used can be found.

For ready to use formulations, the label will recommend the amount of formulated pesticide that is to be applied per area or volume (recommended pesticide rate). For formulations that are to be diluted, the label will recommend; 1) the amount of formulated pesticide that is to be applied per area or volume (recommended pesticide rate), and 2) the amount of diluent or carrier that is to be applied per area or volume (recommended sprayer output). The terminology used to describe these rates varies widely on labels.

Know what recommended pesticide rate and recommended sprayer output refers to.

Define recommended pesticide rate and recommended sprayer output.

Concept: APPLICATION TECHNOLOGY

General Objective: To understand the general principles of application technology necessary for proper pesticide application.

COURSE OUTLINE

The pesticide rate may be stated on the label using various terms; including application rate, rate, dose or dosage. Sprayer output may be stated on the label using terms; including application rate, spray volume required, volume, apply in, add to, and use.

Labels may recommend a range of pesticide rates and sprayer outputs to the applicator. Consultations with the pesticide vendor or extension staff can allow the applicator to determine which rates may be optimum.

Prior to use, the sprayer must be calibrated so that it will deliver the correct amount of sprayer mixtures. The output of the sprayer is referred to as the calibrated sprayer output.

Calibration

Calibration is a procedure for checking and adjusting the delivery rate of the application equipment. Properly calibrated equipment will deliver the correct amount of pesticide to the treatment area, in a uniform distribution, when the equipment is operated correctly.

There are many different calibration procedures. Use an accurate calibration method suited for the type of application equipment used.

Calibration procedures for specific application equipment may be suggested in the operator manual or recommended by industry or government specialists.

Equipment that is not calibrated may apply the pesticide at an incorrect rate or in a non-uniform distribution, resulting in areas of over or under application.

INSTRUCTIONAL OBJECTIVES

Be familiar with the various terminology used to indicate rates on labels.

Know who to consult for information on optimum rates.

Know what calibrated sprayer output refers to.

Know what calibration is. Understand why it is important to calibrate application equipment.

Know where to obtain information on calibration procedures.

LEARNING OUTCOMES

Given a label, state the recommended pesticide rate and the recommended sprayer output for a specific situation.

State who to consult for information on optimum rates.

Define calibrated sprayer output.

Describe calibration. Identify why it is important to calibrate application equipment.

State sources of information on specific calibration procedures.

Concept: APPLICATION TECHNOLOGY

General Objective: To understand the general principles of application technology necessary for proper pesticide application.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Over-application of pesticides may result in:

- increased application costs;
- damage to the application site;
- damage to the environment;
- increased applicator or bystander exposure;
- excessive pesticide residues.

Understand the potential results of over-application.

List the potential results of over-application of pesticides.

Application of pesticides in excess of label rates is illegal.

Understand that it is illegal to apply pesticides in excess of label rates.

Identify that it is illegal to apply pesticides in excess of label rates.

Under-application of pesticides may result in:

- poor control of the pest;
- need to re-treat the area (increased application time and costs);
- development of resistant strains of pests.

Understand the potential results of under-application of pesticides.

List potential results of under-application of pesticides.

Maintenance

Proper maintenance of application equipment is necessary to:

- minimize breakdowns (they can result in environmental or human contamination and downtime);
- increase service life;
- ensure that the correct application rate will be uniformly applied.

Know why proper maintenance of equipment is important.

Identify why proper maintenance of application equipment is important.

A proper maintenance program includes daily cleaning and servicing, and yearly overhauls.

Know what a maintenance program involves.

List activities that should be included in a application equipment maintenance program.

Environmental Conditions

Environmental conditions, such as air movement, relative humidity, and temperature can affect pesticide applications and/or pesticide effectiveness. Consider environmental factors before applying pesticides.

Know that environmental conditions can affect pesticide application.

List environmental conditions that can affect pesticide application.

Certain weather conditions will increase the likelihood of pesticide drift. Limitations on application temperature and wind speed may be on the pesticide label or defined under provincial legislation.

Understand the importance of considering weather factors when applying pesticides.

Identify why it is important to consider weather factors when applying pesticides.

Concept: APPLICATION TECHNOLOGY

General Objective: To understand the general principles of application technology necessary for proper pesticide application.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Pesticide drift is the movement of pesticide from the intended target to off-target areas. Drift can harm crops, beneficial organisms, people, nearby plants (including crops), wildlife, fish, birds and other organisms. Two types of pesticide drift can occur: vapour drift and particle drift.

Know what pesticide drift is. Know potential results of pesticide drift.

Describe drift. List potential results of pesticide drift.

Vapour drift occurs when pesticides evaporate and release vapours into the air or when fumigant/volatile material applications are not properly sealed. Minimize the amount of vapour drift by:

Know how vapour drift occurs.

Describe how vapour drift occurs.

- selecting less volatile pesticides;
- applying pesticides when weather conditions do not favour evaporation or volatilization (ie., avoid high temperatures);
- properly sealing fumigant or other volatile materials after application;
- avoiding atmospheric inversions.

Know how to minimize vapour drift.

List ways to minimize vapour drift.

Particle drift occurs when pesticide droplets or particles remain in the air and move away from the treatment site.

Know what particle drift is.

Describe how particle drift occurs.

Particle drift may be minimized by:

Know when particle drift occurs.

List ways of minimizing particle drift.

- only applying pesticides in favourable weather conditions (avoid high winds, unstable weather, very hot weather, low relative humidity, and air inversions);
- adjusting application equipment (reducing pressure, lowering booms, orienting nozzles, reducing travel speed);
- using drift control agents.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Spills

Pesticide spills are hazardous because the pesticide or vapours may poison people, animals, or plants. Spilled pesticides may also contaminate soil, sewer systems, streams, food or feed, surfaces (e.g., wood or concrete), lakes, wells, and other water sources. Applicators must minimize the risk of spills and hazards from spills.

Know why pesticide spills are hazardous.

Identify why pesticide spills are hazardous.

Be prepared to respond to accidental spills by:

- knowing the hazards associated with the products being used;
- being able to recognize a hazardous spill situation as per provincial guidelines;
- keeping emergency phone numbers handy. The numbers should include the provincial government emergency number, police, fire, ambulance, poison control centre, doctor, and Canutec (if applicable); Canutec can provide information for major transportation spills;
- reading the product label (first aid, precautions, etc.). Product labels may contain useful information regarding spills, such as a 24 hour emergency response number for assistance/information;
- have adequate emergency protective gear and equipment available in a spill response kit;
- having a plan of action for emergency spills and the MSDS available.

Know how to be prepared for accidental pesticide spills.

List and describe ways to be prepared for pesticide spills. List the emergency numbers that should be posted near the phone.

If a spill occurs:

Know how to safely and effectively respond to pesticide spills.

Describe how to respond to a spill. **(typical to the certification category).**

1. Protect yourself and others from exposure by:
 - wearing protective gear;
 - ventilating the area;
 - keeping bystanders and animals away;
 - following safety practices (not smoking, eating, or drinking during clean up, etc.).
2. Check the label and MSDS for instructions and the registrant's emergency phone number.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

3. Contain and control the spilled material. Cover liquid spills with absorbent material. Prevent the spill from entering storm drains, wells, water systems and waterways.
4. Call the provincial government emergency number if the spill is likely to:
 - harm the environment;
 - injure or damage property, livestock or people;
 - affect safety of the area;
 - interfere with normal activities.
5. Clean up the spill. Follow emergency guidelines if provided, otherwise: sweep or shovel absorptive material into a designated solid waste container lined with a heavy duty plastic bag. Dry formulations can be swept up and reused or placed directly into the designated waste container if they are wet or contaminated.
6. Decontaminate the spill area. Decontaminate hard surfaces by:
 - using as small amount of wash water as possible (only enough to extract the pesticide, not dilute it);
 - containing the wash water to the contaminated area;
 - using bleach only when specified on the label;
 - working the cleaning material into the spill area with a coarse broom;
 - absorbing the excess liquid with more absorbent material, then sweeping it into the special waste container;
 - sealing the waste container, placing a warning label on it and storing it until it can be properly disposed of. If unsure of how to dispose of the material contact the provincial pesticide regulatory authority.

Describe how to clean up the spill area. **(typical to the certification category).**

Describe how to decontaminate the spill area. **(typical to the certification category).**

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

For soil contamination:

Contact the manufacturer or provincial authority for information on decontaminating soil saturated with pesticide.

For information on minor application errors or minor spills, refer to the MSDS.

7. Decontaminate clean-up equipment and protective gear.

8. Shower.

Spill Response Kit

Applicators should have a decontamination kit on hand, fully equipped, and easy to get in an emergency. Inspect the kit regularly. Label the kit properly.

Know that a decontamination kit should be on hand and easily accessible in case of an emergency.

Identify the need for a decontamination kit.

An example of a well-equipped spill response kit is:

- heavy duty detergent;
- absorbent material;
- sodium hypochlorite (laundry bleach);
- hydrated lime (do not mix bleach and lime);
- square mouthed shovels or spades;
- yard brooms;
- hand pump with hose;
- open-head drums with lids;
- sealable drums;
- open-head drums with lids;
- heavy plastic bags;
- cartridge type respirators;
- safety goggles;
- industrial chemical resistant gloves;
- chemical resistant boots;
- overalls.

Know the contents of a well-equipped decontamination kit for pesticide emergencies.

List the items of a well-equipped decontamination kit for pesticide emergencies.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Fires

Pesticide fires are hazardous because: pesticides are flammable; a few pesticides could be explosive; some pesticides produce highly toxic fumes when they burn; the toxicity and hazards of many pesticides burning together in the same fire are unknown; fumes may poison people (including fire fighters), animals, or plants; and the run-off water from fire fighting may contain pesticide residue that could contaminate soil, sewers, streams, lakes, wells, and other water sources.

Know why fire involving pesticides are hazardous.

List reasons why fires involving pesticides are hazardous.

Be prepared to respond to a fire involving pesticides by:

- keeping an inventory of stored pesticides in easily accessible locations away from the storage area;
- letting the fire department know where the pesticides are stored;
- posting a warning sign on all entrances to the storage facility;
- keeping emergency phone numbers handy;
- keeping a fire-extinguisher approved for chemical fires near the storage area.

Know how to be prepared for a fire involving pesticides.

List ways of being prepared for a fire involving pesticides.

If a fire occurs:

- call the fire department immediately;
- account for all personnel;
- keep people and animals away/upwind from the area so they are not exposed to toxic fumes, run-off or explosions;
- remind fire fighters that pesticides are in the building;
- provide the fire fighters with an inventory list;
- report fire involving pesticides to the provincial pesticide regulatory authority.

Know how to respond to a fire involving pesticides.

Describe what to do if a fire involving pesticides occurs.

Prevent fires by:

- not using open flames for welding, burning, cutting, etc. in the pesticide storage;
- making sure the pesticide storage follows the required codes (i.e. National Fire Code, National Building Code, National Electrical Code);
- securing doors and windows to prevent unauthorized people from entering your property.

Know how to prevent fires.

Describe what can be done to prevent fires.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Theft

Help prevent theft of pesticides by always keeping pesticides securely stored. The owner may be liable in the event of an accident. If pesticides are stolen, inform the provincial regulatory authority, the supplier, and the police.

Know how to help prevent theft of pesticides. Know what to do if pesticides are stolen.

Describe how to help prevent theft of pesticides.
Describe what to do if pesticides are stolen.

First Aid

First aid provides immediate assistance (helps stabilize a person and sustain life) until medical help can be reached.

Understand what first aid is.

Identify the purpose of first aid.

If a person feels ill during or after handling pesticides, seek medical attention immediately.

Know what to do if a person feels ill during or after handling pesticides.

Describe what to do if a person feels ill during or after handling pesticides.

People working with pesticides or closely associated with pesticide applicators should be familiar with:

- the relevant emergency phone numbers;
- signs and symptoms of pesticide poisonings;
- first aid for pesticide poisoning for the products being used;
- the pesticide being used;
- where the application takes place;
- when the applicator will return.

Know that applicators and people closely associated with them should be familiar with location of emergency phone numbers, first aid for pesticide poisoning, what pesticide is being used, where the application takes place and when the applicator will return.

List the things people working with pesticides or closely associated with pesticide applicators should know regarding pesticide poisoning.

Know the emergency phone numbers which should be posted by the phone.

List the emergency phone numbers which should be posted by the phone.

Post emergency phone numbers by the phone.

Know where kits for pesticide emergencies should be kept.

Describe where kits for pesticide emergencies should be kept.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

The following items should be available for emergency response near the application site and pesticide storage area:

<u>ITEM</u>	<u>PURPOSE</u>
clean water	drinking, washing skin or eyes
soap	washing pesticide off skin
gloves	protecting person administering first aid
cup	for drinking
face mask	protection during mouth to mouth resuscitation
bandages	prevents pesticides entering wounds
blanket	cover victim
phone numbers	to get help
paper towel	cleaning
plastic bag	collecting vomit

PLUS:

Syrup of Ipecac induces vomiting, activated charcoal absorbs pesticide in stomach. These two remedies **ARE ONLY TO BE ADMINISTERED UPON INSTRUCTION OF A POISON CONTROL CENTRE OR DOCTOR, AND IF THE PATIENT IS ALERT.**

Regular inspection of the expiry date of Syrup of Ipecac is necessary due to its short shelf life.

Rapid and organized response in poisoning emergencies is important, as it minimizes negative effects to a poisoned person.

General procedures for any pesticide poisoning are:

1. Protect yourself.
2. Remove the person from contamination. (Note: only move the person if you don't suspect spinal cord injury).
3. Check if the person is conscious. If the person is unconscious, check if the person is breathing, and give artificial respiration if necessary. Wear a face mask to prevent pesticide exposure from the person's mouth. Cardiopulmonary resuscitation (CPR) may be necessary if the pulse disappears. CPR should only be done by trained people.
4. Call the Poison Control Centre or Doctor.
5. Keep the person quiet, warm, comfortable and reassured.

INSTRUCTIONAL OBJECTIVES

Know what should be in a kit designed for pesticide emergencies.

Know the purpose of the individual items in the emergency kit.

Know what are the functions of Syrup of Ipecac and activated charcoal. Know when they should be administered.

Know why inspection of the expiry date of the Syrup of Ipecac is necessary.

Understand the need for rapid and organized response to poisoning emergencies.

Know the general emergency procedures for any pesticide poisoning.

LEARNING OUTCOMES

List the items that should be in a kit designed for pesticide emergencies.

Describe the purpose of the items in the emergency kit.

Identify the functions of Syrup of Ipecac and activated charcoal. Identify when they should be administered.

Identify why inspection of the expiry date of the Syrup of Ipecac is necessary.

Identify why a rapid and organized response is needed for poisoning emergencies.

List the general procedures for any pesticide poisoning.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Position the person. Place the person on their side with the head lower than the rest of the body and turned to one side. If the person is not conscious, keep the chin pulled forward and head back to allow breathing to take place. (An unconscious person should never be transported flat on their back).

Know how to position the person.

Describe the position the person should be placed in.

Specific emergency procedures for dermal exposure, oral exposure, ocular exposure, or respiratory exposure are below. Always treat respiratory exposure first, eye contamination second, skin contamination third and ingestion fourth. Applicators could suffer from both physical injury and a pesticide accident at the same time. Internal injuries usually take precedence over the contamination.

Know the order of first aid procedures in case of a dermal, oral, eye, respiratory, and internal injury.

List the four types of exposure and internal injuries in the order of importance for treatment.

DERMAL:

Know the first aid procedures for dermal exposure.

List in order of precedence, the emergency procedures for dermal exposure.

1. Remove contaminated clothing, including footwear.
2. Immediately drench skin with water. Cold water is preferred; hot water opens pores and increases absorption.
3. Wash skin and hair with soap and water; clean under fingernails and toenails.
4. Get medical help.

For Chemical Burns:

Know the first aid procedures for chemical burns.

List, in order of precedence, the specific emergency procedures for chemical burns.

1. If a shower is available, enter the shower first and then remove contaminated clothing.
2. If no shower is available, remove contaminated clothing.
3. Wash with lots of running water.
4. Cover burned area with loose, wet, clean cloth. DO NOT apply anything to the burn.
5. Get medical help.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

ORAL:

Know the first aid procedures for oral exposure.

List, in order of precedence, the specific emergency procedures for oral exposure. Identify when you should induce vomiting, and when you should not induce vomiting. Describe how to induce vomiting.

1. Get medical help immediately.
2. Read label for instructions.
3. Do not induce vomiting unless specifically indicated on the label. Do not induce vomiting if the person is unconscious or having convulsions or if a corrosive material was swallowed. Never give anything by mouth to an unconscious or drowsy person.
4. To induce vomiting, give person water, position the person upright in a sitting or standing position and gently tickle the back of the throat with a finger or blunt object. Collect some of the vomitus for the doctor.

EYE:

Know the first aid procedures for eye exposure.

List, in order of precedence, the specific emergency procedures for eye exposure.

1. Hold eyelid open and wash eye immediately with clean running water for 15 minutes or more.
2. Get medical help.

RESPIRATORY:

Know the first aid procedures for respiratory exposure.

List, in order of precedence, the specific emergency procedures for respiratory exposure.

(NOTE: If person is in an enclosed space, don't forget to protect yourself).

1. Move person to fresh air.
2. Loosen tight clothing.
3. Apply artificial respiration if breathing has stopped. Place a blanket underneath person's shoulder and tilt the head back with the chin forward to clear air passages.
4. Prevent chilling or overheating.
5. Keep person quiet.
6. Get medical help.

If the person is having a seizure/convulsion, lay the person down in safe surroundings. Do not forcibly restrain them.

Know what to do if a person is having a seizure/convulsion.

Describe what to do if a person is having a seizure/convulsion.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

Information that medical personnel need to know about a pesticide poisoning is:

- name of pesticide (active ingredient), label and container if possible;
- type of exposure;
- symptoms;
- registration number (the PCP number on the front panel of the product label);
- length of exposure or amount ingested;
- age and weight of person exposed;
- first aid performed;
- preexisting medical conditions (check for medical alert bracelet or necklace).

If full recovery takes place after first aid measures, seek assessment by medical personnel before person returns to work.

Study what went wrong to avoid accident recurrence and review emergency response plan.

Emergency Response Plan

Be prepared to deal with an emergency by having an emergency response plan. An emergency response plan will:

- prevent an emergency from becoming a major disaster;
- protect the community;
- protect the business;
- protect the employees;
- reduce your liability for damages;
- keep environmental damage to a minimum;
- build confidence with neighbours.

An emergency response plan is a very important business document.

INSTRUCTIONAL OBJECTIVES

Know the information which medical personnel need to know about a pesticide poisoning.

Understand that medical assessment should be obtained if full recovery takes place after first aid measures.

Appreciate why the accident should be reviewed.

LEARNING OUTCOMES

List the information medical personnel need to know about a pesticide poisoning.

Identify the need for medical assessment although full recovery took place after first aid measures.

Identify why an accident should be reviewed.

Concept: EMERGENCY RESPONSE

General Objective: To know how to safely and effectively respond to pesticide emergencies.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Include procedures for all types of emergencies. Kinds of emergencies include:

- fires;
- explosions;
- gas and odour release;
- spills;
- serious injury;
- natural disasters (lightning, tornado);
- threats (phone calls);
- transport accident (highway and rail).

Know the different kinds of emergencies that could occur.

List the kinds of emergencies that could occur.

Concept: PROFESSIONALISM

General Objective: To know and understand the principles that enable an applicator to deal professionally with the public.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Professionalism refers to the responsibilities of the pesticide applicator on the job, and the interactions between the applicator and other people. Other people include: bystanders, residents, customers, and other concerned citizens (e.g., very sensitive people) or groups. Each has its own interests, needs, concerns, priorities, preferences, perceptions and organizations.

Know what professionalism refers to. Realize that the people and groups which make up the public vary greatly.

Describe what professionalism refers to. List the things that can cause the public (groups or individuals) to be different.

Professionalism on the job will:

- enhance credibility;
- improve public trust/confidence;
- enhance customer confidence;
- help produce an informed public that is involved, interested, thoughtful, solution oriented, collaborative and supportive;
- help you understand the public's concerns and misconceptions;
- help to deal with complaints or difficulties arising from pest control activities.

Appreciate why an applicator should exhibit professionalism on the job.

List the reasons why it is advantageous to exhibit professionalism.

Factors affecting professionalism: knowledge, attitude, image, work habits/activities, and communication.

Know factors affecting professionalism.

List the factors that affect professionalism.

Professionalism is:

- being knowledgeable about your profession;
- having a good attitude;
- projecting a professional image;
- carrying out work activities in a professional manner;
- communicating with the public.

Know what professionalism is.

List qualities that describe professionalism.

Concept: PROFESSIONALISM

General Objective: To know and understand the principles that enable an applicator to deal professionally with the public.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Knowledge

Know and understand:

- the information required for pesticide applicator certification;
- current health concerns, public issues and environmental concerns;
- resources (people, publications, organizations, etc.) that could provide information;
- the most recent information about the control of specific pests;
- the relationship between the pest, host, and the environment;
- the values and risks of the pest and the pest control methods;
- the appropriate legislation.

Continually upgrade your knowledge (e.g, attend seminars, trade shows, courses, read journals, papers, and other literature).

Being knowledgeable about your profession will help you make responsible decisions about pest control, and will allow you to inform others about your profession and pest control decisions. If you do not know the answer to a question, say so, do not guess. Obtain an answer and get back to the client.

Attitude

Have a good attitude by:

- maintaining safety for yourself and the environment as a foremost concern;
- refusing to work unsafely;
- responding quickly and effectively to requests for information, complaints, concerns or emergencies;
- staying within your area of expertise;
- making recommendations only when the facts are known (when you are sure it is right);
- considering bystander/neighbour concerns;
- being willing to spend time with the client or public to explain aspects of the operation;
- only doing necessary applications.

Know the type of information that a professional applicator should know.

Know that learning is an ongoing activity.

Know why it is important to be knowledgeable about your profession. Know what to do if you lack knowledge in a particular area.

Know how to have a professional attitude.

List and describe the types of information that a professional applicator should know.

List ways you can continually upgrade your knowledge.

Identify why it is important to be knowledgeable about your profession. Describe what you should do if you lack knowledge in a particular area.

List the qualities of a professional attitude.

Concept: PROFESSIONALISM

General Objective: To know and understand the principles that enable an applicator to deal professionally with the public.

COURSE OUTLINE

INSTRUCTIONAL OBJECTIVES

LEARNING OUTCOMES

Work Habits/Activities

Conduct your work activities professionally by:

- applying pesticides responsibly, and according to the label. For example: notifying people (when appropriate) about pesticide applications; avoiding pesticide application when bystanders are present; following IPM techniques; using correct pesticide rates; keeping records; avoiding applications during adverse weather conditions, etc.;
- communicating within your business (e.g., supervisors, head office);
- using clean, well-maintained equipment;
- becoming familiar with the equipment in advance of application;
- preparing application equipment ahead of the application;
- operating equipment/vehicles in a safe and sensible manner. Consider ground, weather, and road conditions, speed limits, etc.;
- identifying yourself to clients/public verbally and by marking vehicles and application equipment;
- checking to be sure it is the correct site for application;
- thinking ahead to avoid problems in application;
- preventing the spread of pests by equipment or people (e.g., cleaning equipment between sites);
- having plans (e.g., pest management, emergency response, communication);
- following up on pesticide applications.

Know professional work habits/activities.

List the habits/activities that contribute to a professional job.

Communication

Communicate with the public by:

- listening to the public's concerns and trying to understand and appreciate their viewpoint;
- involving the public/client in the decisions which may affect them;
- participating in public forums;
- planning and evaluating communication efforts;
- being honest, frank, open, and cooperative;
- speaking clearly, and with sincerity;
- meeting the needs of the media;
- avoiding misguided or misleading statements;
- distributing factual information.

Know how to communicate with the public.

List guidelines to help communicate with the public.