Prince Edward Island
CANADA

Environment,
Energy and Forestry

Prince Edward Island Manual Application of Herbicides

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Manual Application of Herbicides

This training material has been developed to provide basic information for individuals involved in the manual application of herbicides For the purposes of this document, manual application includes the use of weed wipers, weed rollers, and stump brushing. It also includes the use of a back-pack sprayer to do small spot treatments. This type of herbicide application is commonly used in the production of blueberries and cranberries, where small patches of weeds occur randomly throughout the field.

The Department of Environment, Energy and Forestry regulates the use of pesticides in P.E.I.. The provincial *Pesticides Control Act* and regulations outlines specific requirements for anyone who sells or applies pesticides. Various groups (i.e., agricultural, structural, landscape) must successfully demonstrate through an examination process that they possess the knowledge to safely handle and apply the pesticides they use. A Class I Pesticide Applicator Certificate will allow you to apply **herbicides** using the manual application technologies discussed below. **A Class I Pesticide Applicator Certificate will not allow you to apply a pesticide that is not a herbicide or to apply a herbicide using a power sprayer.**

Introduction

Agricultural applicators typically minimize the amount of pesticides they apply. They do this for both environmental and monetary reasons. However, the use of pesticides is sometimes necessary, especially for weed control. Pesticides used to control weeds are called **herbicides**. There are many types of herbicides, but they can be grouped by common characteristics. Choosing the correct herbicide is necessary to obtain good weed control. This training material will discuss the common characteristics of herbicides used to make manual applications.

In grain production, it is common to treat the entire field surface for weeds. Using manual application equipment, herbicide is applied only to specific plants and not to the entire field surface. Wick wipers and roller wipers apply herbicide to weeds that have grown taller that the field crop. In stump and basal bark treatments, the applicator manually applies a herbicide only to tree stumps or the bark of small trees. Spot treatments involve the application of a herbicide, often using a backpack sprayer, to small, localized areas. Manual applications involve the use of a herbicide mixture at a specific concentration. Proper calibration is achieved by correctly mixing the herbicide. This training material addresses the proper operation and maintenance of common manual application equipment..

Every herbicide product undergoes a detailed review process before it can be sold in Canada. This review evaluates the performance, safety, and environmental issues related to the use of the herbicide. After a positive review, a pesticide is registered for use in Canada under the federal *Pest Control Products Act*, and a product label is written. While the format of all pesticide labels is much the same, the actual content reflects the issues related to that specific herbicide. **It is a legal requirement to follow a pesticide label.** The label will outline what to do in an emergency, how to properly apply the pesticide, how to protect your health, and how to minimize environmental impacts. This training material will also introduce common means to safeguard human safety and the environment.

General Herbicide Characteristics

When sold by a vendor, most herbicides are in a concentrated (or formulated) form. A concentrated herbicide typically consists of two components, the active ingredient and an inert carrier. The active ingredient is that part of a herbicide that actually controls or kills the weed. The carrier is used to dilute the active ingredient. Most often, the carrier is water or an oil.

The statements on a pesticide label relate or apply specifically to that formulated product. Different pesticide formulations will pose different risks to the individuals using them and to the environment. For example, as the concentration of the active ingredient is increased in a herbicide, the label may require the person mixing the product to wear more safety equipment. The label may also place restrictions on the use of a herbicide, related to its specific risks or hazards. For example, if the active ingredient in the herbicide can kill fish, a buffer zone along streams and rivers may be required on the label. Refer to the sections on *Protecting Human Health* and *Protecting the Environment* for more information.

ALWAYS READ THE PESTICIDE LABEL BEFORE HANDLING, MIXING, OR APPLYING ANY PESTICIDE

Different active ingredients are designed to control a wide variety of weeds. For example, glyphosate is the most common active ingredient used with wick and roller wipers. Triclopyr and 2,4-D are the most common active ingredients used in stump and basal bark treatments. Herbicides can be further divided into distinct groups, based on how they work.

Systemic and Contact

Systemic herbicides are able to move throughout a plant. Movement can be from the roots to the leaves or from the leaves to the roots. For example, if a systemic herbicide is applied to the top leaf surfaces of a tall weed, it can be absorbed into the plant and move to the roots. Because of this movement, the entire weed is killed. The movement of systemic herbicides in plants is slow, so visible signs of weed control may not be seen until many days after a treatment. Glyphosate, triclopyr, and 2,4-D are examples of systemic herbicides.

Contact herbicides kill only the part of the plant that they directly contact. If a plant has ten leaves and only four of them are wiped with a contact herbicide, only those four leaves will be killed. The six other leaves and the root system will continue to grow. Reglone and Gramoxone are common contact herbicides.

Selective and Non-selective

Selective herbicides will control or kill only certain types of weeds. There are selective herbicides that will only kill grasses, and other selective herbicides that will only kill broadleaf weeds. Broadleaf weeds also include woody weeds, including small alders and other leafy trees. If the weed 'spot' contains a mixture of grasses and broadleaf weeds, the selective nature of the herbicide will result in only the broadleaf weeds being killed. If the crop is a broad-leafed plant, contact by these products will also kill it. Triclopyr and 2,4-D are examples of selective herbicides.

Non-selective herbicides will kill any plants that they contact. Glyphosate (Roundup) is a non-selective herbicide.

When glyphosate is applied to a weed, the weed will be killed. If the weed 'spot' contains a mixture of grasses and broadleaf weeds, both will be killed because of the non-selective nature of glyphosate. This means that, when using a non-selective herbicide like glyphosate, the applicator must not contact the crop with the pesticide mixture. If contact with an actively growing crop plant does occur, the crop plant is likely to die. Contact can occur from wiping mistakes or from dripping of herbicide from treated surfaces (e.g., weeds). To minimize the possibility of liquid herbicide dripping from treated leaf surfaces, most pesticide labels recommend that wiping be done only to dry leaves.

Residual and Non-residual

Residual herbicides do not break down quickly after they are applied. They can remain active in the soil for long periods of time. Sencor and Atrizine are examples of residual herbicides.

Non-residual herbicides break down quickly after they are applied. They become inactive in the soil soon after application. Glyphosate, triclopyr, and 2,4-D are examples of non-residual herbicides.

Application Equipment

Application equipment used to manually apply herbicides can be divided into two distinct groups. The first group includes equipment used to wipe a herbicide mixture onto weeds that have grown taller than the crop. The second group includes equipment used to paint a herbicide mixture onto the stems or stumps of trees. Throughout this manual, the term **"herbicide mixture"** will refer to the mixture made from diluting the concentrated product with a carrier, such as water or oil.

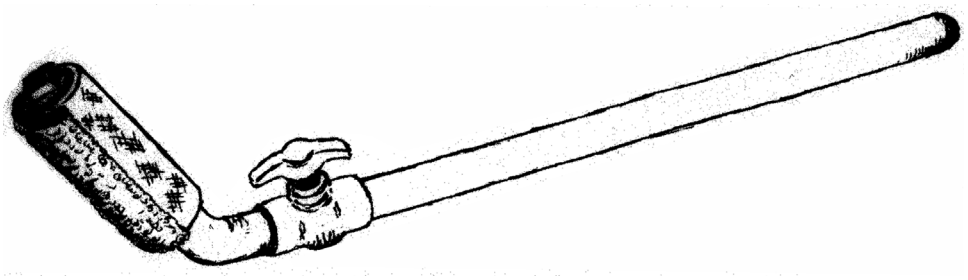
Wiping Equipment

Wiping equipment can be divided into three sub-groups based on the type of wiping surface and the method of operation. These are manual wick wipers, motorized wick wipers, and motorized roller wipers. When using manual wick wipers, it is very important that the applicator check the equipment frequently to ensure that it is functioning properly. It should thoroughly wet the weed surface, but not to the point of dripping herbicide mixture onto the crop.

Manual Wick Wipers

Manual wick wipers are hand-carried by the applicator. The actual wiping action results from arm movement. Many people refer to these wipers as "hockey sticks" due to their physical L-shape. They are usually made of 3/4" or 1" PVC plastic pipe. Both ends of the pipe are capped so that the pipe's interior chamber can be used to hold the herbicide mixture. Some wipers use a clear PVC pipe to allow the level of herbicide mixture to be monitored.

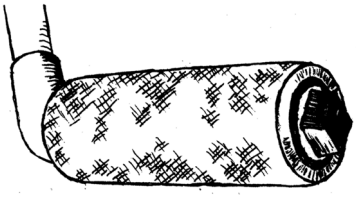
With wick wipers, the herbicide mixture essentially becomes air-locked in the handle. A gentle shaking motion allows air to enter the handle, and the herbicide mixture to escape. Too much shaking, however, can result in herbicide mixture dripping from the wiper. Some wiper manufacturers install a valve at the top of the handle. By opening or closing the valve the amount of air entering the handle can be controlled. A ball valve is often installed before the wiper head so that full units can be transported to the field. When using a manual wiper, ensure that the filler cap is tightly secured to prevent air from leaking in. To prevent spilling the herbicide mixture, always use a funnel when filling the handle. Over the years manufacturers of commercial wick wipers have developed many different wiping surfaces. Both sleeve and rope types are currently available.



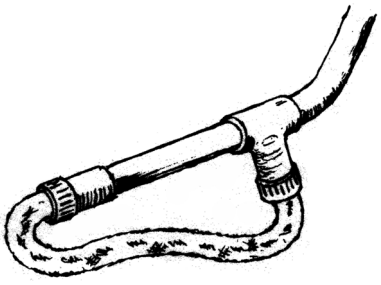
Typical Hockey Stick Wiper with a Pile Sleeve

Sleeve wipers resemble a paint roller. A specially designed sleeve is slid over the 'blade' of the hockey stick. The sleeve is fitted very tightly to prevent it from turning when the weeds are wiped. Different sleeve designs are available. A canvas wrap sleeve is made by tightly wrapping two layers of an absorbent canvas around the pipe. A pile sleeve uses a deep pile surface on the bottom half of the wiper to increase contact with the weed surface. A sponge sleeve is made from a sponge wrapped with a nylon mesh sock for increased durability in the field. Holes in the pipe underneath the sleeve allow the herbicide mixture to keep the sleeve saturated.

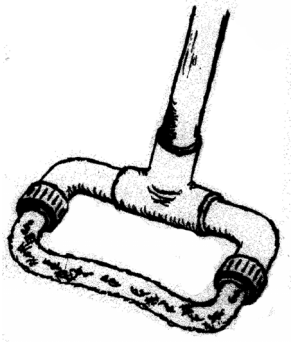
Rope wipers use a 20 to 30 cm (8 to 12 inch) length of rope to wick the herbicide mixture out of the handle. Compression fittings secure both ends of the rope into the piping. These connections must be tight to prevent leaks or dripping. Different rope materials are used by different manufacturers. Wipers are also available in a wide number of patterns. The choice of a manual wick wiper is quite subjective. Factors such as weight, shape, and wiping patterns determine operator preference.



Sponge Sleeve



L-pattern Rope

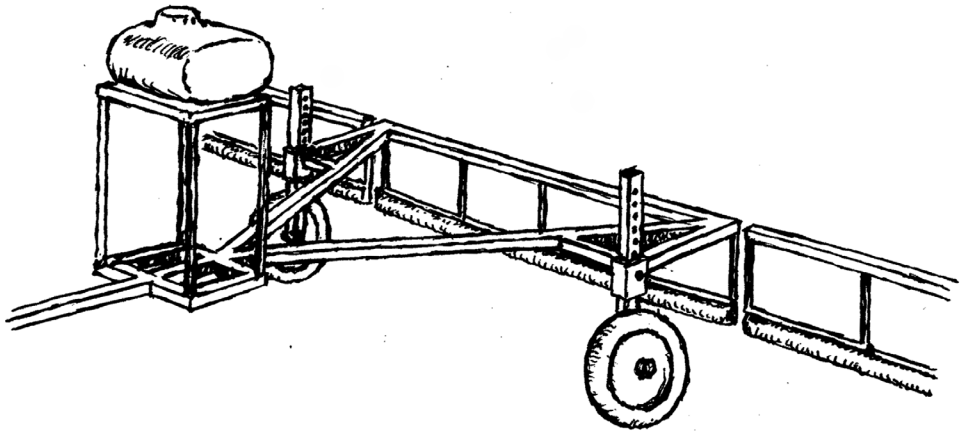


T-Pattern Rope

Motorized Wick Wipers

Motorized wick wipers are basically wider, more complex versions of hand-held wick wipers. As the wiper width increases, a structural frame is used to support the wicks. Individual wick sections are kept short (less than 1 m) to promote even wetting of the wick material. Typically, motorized wick wipers are pulled through the field using a tractor or an all-terrain vehicle.

Individual wick sections can be constructed using either rope or sleeve type wicks. Rope wick designs use numerous short rope wicks on a section of pipe. Large diameter pipes are used because they double as the herbicide mixture reservoir. Sleeve designs use wider sponge widths on each wick section. The herbicide mixture is gravity fed from a small tank to small micro tubes positioned under the sponges. For effective application, it is critical that the wick height be kept constant as the unit travels across the field. Some wipers use adjustable dolly wheels to follow the contour of the field and keep the wick sections at the correct height.



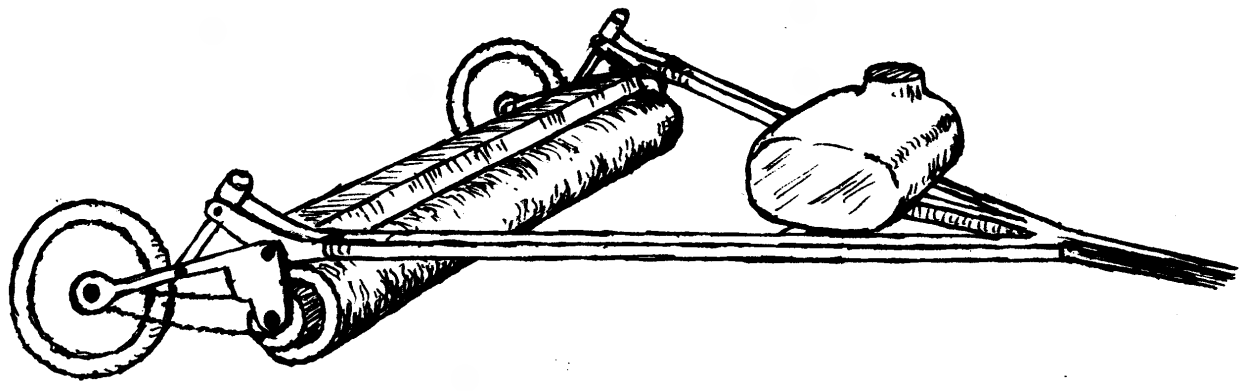
The wiping action occurs as the wiper is pulled across stationary weeds. The wiper should be adjusted so that the contact point is at least 5 cm (2 inches) above the crop plants. In rougher ground, this distance can be increased to provide greater crop protection. Wiping should be done when the weeds are a minimum of 15 cm (6 inches) above the crop plants.

Weed control can be affected by the forward speed of the wiper. Herbicide labels recommend that the wick wiper be operated at ground speeds between 4 and 10 km/h. As weed density increases, wiper ground speed should be reduced to insure good coverage. Best results are obtained when two applications are made in opposite directions. However, do not wipe in a second direction until the first pass has dried.

Motorized Roller Wipers

Motorized roller wipers are a cross between a field sprayer and a motorized wick wiper. The roller is typically 25 to 30 cm (10 to 12 inches) in diameter and covered with a carpet-like material. One manufacturer uses a large brush instead of a solid roller, on the concept that it increases leaf contact by the combing action of the brushes. For both designs, the roller rotates opposite to the direction in which the machine is traveling. For example, when traveling forward the roller rotates in a counter clockwise direction. The recommended rotational speed of the roller is 50 to 150 rpm. The roller is turned continuously to minimize dripping. Recommended travel speeds are the same as those for motorized wick wipers.

The roller is kept saturated by turning on and off a small 12-volt pump that pumps the herbicide mixture from the tank to a boom mounted above the roller. As the rotating roller comes into contact with a weed, the weed surface is wiped and herbicide is transferred from the roller to the leaves.



Motorized roller wiper

Preparing a Herbicide Mixture

All herbicide labels give detailed instructions on the mixing and application of that product. Application rates for manual wiping equipment are expressed in terms of a **solution percentage**. A solution percentage indicates the percent of the herbicide mixture that is concentrated product. Always read the label of the specific herbicide you are using before preparing a herbicide mixture.

Herbicide labels generally recommend that more concentrated (higher percentage) mixtures be used with wick wipers, and that weaker (lower percentage) mixtures be used with roller wipers. More concentrated solutions are used with wick wipers because it is harder to wet the surface of the leaf. For example, one herbicide label recommends a 33 percent solution when using a wick applicator yet only a 10 percent solution when using a roller wiper.

While different herbicides can contain the same active ingredient, the concentration of the active ingredient in the concentrated product often varies. For example, a herbicide can contain 356 grams of glyphosate per litre. Another herbicide can contain 480 grams of glyphosate per litre. On the specific herbicide label, differences in the active ingredient concentration will be reflected in the mixing instructions. In general, as active ingredient concentration increases, the solution percentage recommended on the product label will decrease.

Product	Active Ingredient Concentration	Equipment	Solution Percentage
"A"	356 grams/litre	Wick Wiper	33 %
"B"	480 grams/litre	Wick Wiper	25 %

Herbicides should be mixed in a spray tank used only for this purpose. Never mix more herbicide than can be used that day. If the mixing tank is used to fill other applicators, it should be designed to allow for easy pouring. Herbicide should never be mixed or stored in containers that once held food or drink. If surplus herbicide mixture must be stored, always use an empty container that originally contained the herbicide in the mixture. Clearly mark the container "DILUTED" and indicate the herbicide name and *PCP* number, solution percentage, and date of preparation.

Colourants are sometimes added to herbicide mixtures to help show which weeds have been treated. A blue, water-soluble colourant is easily added. Colourants can be purchased from many local agricultural pesticide vendors.

Glyphosate performance is linked to water quality. Mixing glyphosate with water containing high levels of organic material or with water that is considered hard, can reduce herbicide performance. The use of only clean well water is recommended for the dilution of glyphosate. For similar reasons, it is important to keep wiping surfaces clean. If the wiper becomes dirty with soil, it should be cleaned. Excessive dirt on weeds near access roads can also reduce herbicide performance. Treatments in these areas should be scheduled to follow a rain event so that at least some of the dust is removed before application of the herbicide.

Glyphosate should never be mixed or stored in galvanized steel or unlined steel containers. The concentrated herbicide or herbicide mixture can react with these containers to produce hydrogen gas, which may form a highly combustible gas mixture. If ignited by an open flame (e.g., spark, welder's torch, lighted cigarette), this gas mixture could flash or explode and cause serious personal injury.

Herbicide Mixture Calculations

The herbicide label may recommend only a percent solution, and not give specific mixing instructions. If the solution percentage of the herbicide mixture is known, the amount of concentrated herbicide and the amount of water can be calculated. This can be done for a fixed volume of herbicide mixture, a fixed amount of concentrated herbicide, or a fixed volume of water.

Example of Fixed Volume of Herbicide Mixture

Assume that the label recommends a 22 percent solution for a wick wiper application. Assume also that 5 liters of the herbicide mixture must be prepared.

Calculate the volume of concentrated herbicide and volume of water to be mixed.

Volume of concentrated herbicide (L) = Mixture Volume (L) X (Solution Percentage ÷ 100)

Volume of concentrated herbicide (L) = 5 litres X (22 ÷ 100)

Volume of concentrated herbicide (L) = 5 litres X (0.22)

Volume of concentrated herbicide (L) = 1.1 litres of concentrated herbicide

Volume of Water (L) = Mixture Volume (L) - Volume of concentrated herbicide (L)

Volume of Water (L) = 5 litres - 1.1 litres

Volume of Water (L) = 3.9 litres of water

Therefore. To prepare 5 litres of herbicide mixture with a 22 percent solution, it will be necessary to mix together 1.1 litres of concentrated herbicide and 3.9 litres of water.

Example of Fixed Volume of Concentrated Herbicide

Assume that the label recommends a 5 percent solution for a roller wiper application. Assume also that a 1.0 litre container of concentrated herbicide must be mixed.

Calculate the total volume of herbicide mixture and volume of water**.**

Mixture Volume (L) = Volume of concentrated herbicide (L) ÷ (Solution Percentage ÷ 100)

Mixture Volume (L) = 1 litre ÷ (5 ÷ 100)

Mixture Volume (L) = 1 litre ÷ (0.05)

Mixture Volume (L) = 20 litres of herbicide mixture

Volume of Water (L) = Mixture Volume (L) - Volume of concentrated herbicide (L)

Volume of Water (L) = 20 litres - 1 litre

Volume of Water (L) = 19 litres of water

Therefore, to dilute 1 litre of concentrated herbicide into a 5 percent solution it will be necessary to mix together 1 litre of concentrated herbicide and 19 litres of water, for a total herbicide mixture of 20 litres.

Example of Fixed Volume of Water

Assume that the label recommends a 13.4 percent solution for a wick wiper application. Assume also that the concentrated pesticide will be added to 60 liters of water.

Calculate the total volume of herbicide mixture and volume of concentrated herbicide.

Mixture Volume (L) = Volume of water (L) ÷ [(100 - Solution Percentage) ÷ 100]

Mixture Volume (L) = 60 litres ÷ [(100 - 13.4) ÷ 100]

Mixture Volume (L) = 60 litres ÷ [(86.6) ÷ 100]

Mixture Volume (L) = 60 litres ÷ [0.866]

Mixture Volume (L) = 69.3 litres of herbicide mixture

Volume of concentrated herbicide (L) = Mixture Volume (L) - Volume of water (L)

Volume of concentrated herbicide (L) = 69.3 litres - 60 litres

Volume of concentrated herbicide (L) = 9.3 litres of concentrated herbicide

Therefore, to prepare a 13.4 percent solution with 60 litres of water, it will be necessary to add 9.3 litres of concentrated herbicide to yield a total herbicide mixture of 69.3 litres.

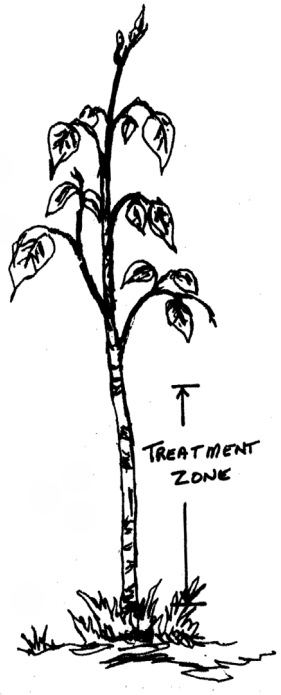
Stump and Basal Bark Treatments

Stump and basal bark treatments can be used to control trees growing in crop fields. These treatments are typically done in non-fruit bearing years. The herbicide label may recommend that trees of a specific size be cut down and the stump treated. In these cases the labels may give a specific tree height (e.g., taller than 2.5 meters or 8 feet) or a specific tree trunk diameter (e.g., if greater than 10 cm or 4 inches) to indicate which trees should be cut down.

The application of stump and basal bark treatments is a very simple process. The concentrated herbicide is usually diluted with oil. A paint brush is then used to 'paint' the herbicide mixture onto the stump or tree trunk bark. Herbicide labels may also provide recommendations for stump and basal bark treatments when the application is done using a backpack sprayer.

Stump Treatments

The purpose of a stump treatment is to prevent new shoots from growing out of the stump. Usually, stump treatments are made to recently cut tree stumps that are 5 cm (2 inches) or greater in diameter. The label may recommend that old stumps be split or have holes drilled in them before applying a herbicide treatment. The treatment involves painting a herbicide mixture onto the stump. Stumps are manually treated one at a time. A dye is often added to the mixture so that treated stumps can be easily identified.



Basal Bark Treatments

The purpose of making basal bark treatments is to kill small trees. The treatment involves manually painting the bark of the tree with a herbicide mixture. Label directions for basal bark treatments vary depending upon the herbicide used. The product label may also state where on the trunk the herbicide mixture should be applied. For example, one label states that a 5 cm (2 inch) wide strip of herbicide must be applied all the way around the trunk at a height of 30–50 cm (12–20 inch) off the ground. Another label states that the mixture should be applied to the stump, from ground level a height of 50 cm (20 inch). Always read the herbicide label before making a basal bark application.

For effective control, more herbicide mixture must be applied to old, rough bark than to young, smooth bark. Some product labels recommend cutting the bark surface with an axe to improve herbicide uptake. The addition of dye and dilution with oil are the same as for making a stump treatment.

Mixing Stump and Basal Bark Treatments

Most stump and basal bark treatments recommend diluting the concentrated herbicide with an oil. Diesel fuel and kerosene are commonly recommended oils. However, you should check the herbicide label or your local pesticide vendor to see if a more environmentally friendly oil, such as mineral or vegetable oil**,** can be used instead. It should be noted that fora few herbicides, water is used for dilution when applying stump and basal bark treatments.

The product label will give specific information on how to mix the herbicide. Most labels state the amount of concentrated herbicide to be added to a given amount of carrier oil. For example, one label states “add 30 litres of concentrated product to1,000 litres of oil.” In this case, the mixing container would hold a total of 1,030 litres.

Others labels state the amount of concentrated herbicide that must be added to make a specific volume of herbicide mixture. For example, “add 30 litres of concentrated herbicide to enough oil to make 100 litres of mixture.” In this case, the 30 litres of concentrated herbicide must be added to 70 litres of oil, to make a total of 100 litres in the mixing container.

Yet other labels state “use a solution of one part concentrated herbicide to two parts carrier.” In this case, 1 litre of concentrated herbicide must be added to 2 litres of oil, to make a total herbicide mixture of 3 litres. Due to the wide variety of mixing instructions used for stump and basal bark treatments, always check the product label before preparing a herbicide mixture.

Protecting Human Health

When compared to significantly more toxic pesticides, most herbicides do not pose a great risk to human health. While this relative comparison can provide some comfort, it is important to remember that some herbicides can harm you. Human exposure to certain herbicides can cause injury or poisoning. Therefore, it is important for anyone who handles, mixes, or applies any pesticide to follow the safety instructions on the product label. It is equally important that they wear all recommended personal protective equipment.

The concentration of active ingredient in many of the newer herbicide formulations is much higher than in older products. Therefore, you can be exposed to greater risk when handling or mixing these newer formulations. This increased risk is reflected in precautionary symbols and statements on the product label (*see* Chapter 1: Pesticide Labels).

Emergency Response

As an applicator, you must always be prepared to deal with a herbicide poisoning Keep a source of clean water available in the field for hand washing, eye washing, and other emergencies. Soap and hand towels should also be available. Always identify a way to contact emergency help (vehicle, radio or cell phone) when working in the field. Also, be able to provide detailed directions to your work site. You may need to provide this information to direct emergency personnel to your location.

All herbicide labels give specific instructions for dealing with an accidental exposure. When a herbicide is spilled on your body, the first thing to do is to stop further exposure by washing off the herbicide. If your clothes have been contaminated, take them off as quickly as possible. If a herbicide gets on your skin, flush the contaminated area with plenty of clean water and then wash with soap and water. If a herbicide does get in your eyes, flush them with clean water for at least 15 minutes.

In those cases where a herbicide has been swallowed, the proper emergency response will depend upon the specific product you are using. For most glyphosate products, the general recommendation is to immediately dilute the product in the stomach by drinking water or milk. Some of the 2,4-D products state that vomiting should be induced; others state that vomiting should not be induced due to the specific formulation. Always check the label for safety instructions before using any herbicide. This will save valuable time, and perhaps your life or the life of another person, in the case of an accident. Should any of these accidents occur, immediately call 911 or the Maritime Poison Control Centre (1-800-565-8161).

In the event of a pesticide poisoning**,** you must be able to tell the medical responders what herbicide was being used. Currently there are 29 registered products with the name "Round-up." There are 149 with the active ingredient "glyphosate." As noted in Chapter 1: Pesticide Labels, the product label will identify the name of the herbicide, the name of the active ingredient, and the *PCP Act* registration number. Providing this information to medical responders will allow them to source detailed information about the specific herbicide.

Personal Protective Equipment

Every herbicide label will identify what personal protective equipment should be worn when mixing concentrated product and applying the herbicide mixture. Because the herbicide is in a concentrated form, it is common for more protective equipment to be required when preparing a herbicide mixture than when applying the same mixture.

All herbicides applied using manual equipment can cause skin and eye irritation. For this reason, long pants and long-sleeved shirts should be worn to cover the skin. Wearing overalls (cloth or Tyvek) over these clothes will provide another layer of protection for the skin. Rubberized splash aprons can also be worn to give additional body protection during mixing.

Eye protection should be worn when preparing any herbicide mixture. When pouring a liquid, there is always a risk of splashed product. If concentrated herbicide splashes into your eyes, serious damage can occur. For this reason, goggles or a face shield are recommended when mixing and handling a concentrated herbicide.

Chemical-resistant gloves should always be worn when handling or mixing a concentrated herbicide. Some labels state that gloves should be worn during application of the herbicide mixture and others do not. Always wash the outside surface of your gloves before removing them.

While not directly mentioned on all labels, rubber boots will keep your feet dry when applying liquid herbicides. Do not wear footwear that can absorb the herbicide. Always read the label to confirm what personal protective equipment is recommended for the specific herbicide being used.

If your clothes have been contaminated, take them off as quickly as possible and wash them before reuse. Wash them separately from other clothes, and hang them to dry. Then run the empty washing machine through at least one full cycle to minimize the risk of contaminating other clothing.

Always wash your hands before eating, drinking or smoking. Herbicides on your hands can be transferred to your food or lips and in turn**,** swallowed. Also, wash your hands before using the toilet. The herbicide absorption rate through skin in the genital area is 100 percent, so from an exposure perspective it is no different than eating the herbicide.

Protecting the Environment

Everyone shares responsibility for protecting the natural environment. Pesticide applicators must protect land and water resources from contamination. As a province**,** our natural quality of surface and groundwater is excellent. The challenge is to keep it that way.

Under the provincial *Environmental Protection Act*, there are many regulations that help protect our water resources. On PEI, no discharge (spill or otherwise) of contaminants is allowed. This law requires that if you do have spill or accidently discharge a herbicide you must notify the Department of Environment, Energy and Forestry, and then undertake recommended corrective action. Herbicide spills can be reported by calling PEI's 24-hour Environmental Emergency Response Number at **1-800-565-1633**.

Manually applying herbicides is a good way to practice environmental stewardship. Herbicide use is reduced because only problematic weeds are treated. Most application equipment does not use a pressurized mixture, so there is little possibility for spray drift or the contamination of surface water. Typically, the herbicides used with manual application equipment are also non-residual. Following application**,** the products become inactive in the soil and do not affect future crops.

This does not mean, however, that herbicides cannot harm the environment. Glyphosate is the most common active ingredient used with wick and roller wipers. Triclopyr and 2,4-D are the most common active ingredients used in stump and basal bark treatments. Glyphosate is toxic to aquatic organisms. Triclopyr is highly toxic to fish. Most herbicides containing 2,4-D also contain petroleum distillates that range from moderately to highly toxic to fish. Care must be taken to ensure that surface water (streams, ponds) is not contaminated.

The greatest potential for surface water contamination is from improper cleaning of application equipment and the disposal of empty herbicide containers. Never rinse your hands or a dirty wick applicator in the stream, pond, or other body of open water.

Pesticide application equipment should be washed out on a grassy area well away from wells and watercourses. Check the herbicide label for legal buffer zone setbacks from wells and watercourses. Under the PEI *Pesticides Control Act* and regulations, pesticide application equipment cannot be filled, discharged, washed, or flushed out within 25 metres of an open body of water. All plastic pesticide containers should be triple rinsed and returned to the vendor for recycling. It is against the law to fill pesticide application equipment directly from an open body of water in PEI.

Do not apply a herbicide if rainfall is forecast during the time of application. Heavy rainfall immediately after an application can wash the product off the foliage. It can also result in the herbicide being carried in the runoff water to nearby streams. Not only will the herbicide need to be re-applied, but harm could be done to environment. The herbicide label may indicate the time period that is required after application and before a rainfall occurs.

If you are making a spot treatment, and using a liquid herbicide under pressure, then the wind speed at the point of application must not exceed 20 km/hr. This too is a regulation under PEI's *Pesticides Control Act*. There is no wind speed restriction for the use of wick or roller applicators.

Record Keeping

Under the PEI *Pesticides Control Act* and regulations, any pesticide applicator must maintain a written record of each product application. This includes those individuals who hold a Class I Pesticide Applicator Certificate and who apply herbicides for weed control. These records must include the following information:

a) the name, address, telephone number, and the Pesticide Applicator Certificate Number of the applicator;
b) the name, address, and telephone number of the person for whom the herbicide is being applied;
c) the location and dimensions of the area where the pesticide was applied;
d) the date and start time of the pesticide application;
e) the air temperature, wind speed, and wind direction at the start time of the pesticide application;
f) the name of any pest to be controlled or the purpose of the pesticide application;
g) the trade name and *PCP Act* registration number of the pesticide applied; and
h) the rate of pesticide application.