

Introduction

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Environmental Farm Planning (EFP)

The long-term prosperity of British Columbia's agricultural sector is linked to its environmental sustainability. With increasing agricultural production intensity and expanding knowledge of our biological and physical environment, the need for improving farm practices has been recognized. The goal of the Environmental Farm Planning is to raise awareness amongst producers and enhance environmental farm stewardship. This can be accomplished through the establishment and implementation of Environmental Farm Plans. Environmental Farm Planning (EFP) is normally seen as a voluntary, confidential, producer-driven planning exercise that uses specifically designed resource materials and technical assistance.

In British Columbia both the senior governments and the agriculture industry recognize the value of EFP's, and programming is available in all agricultural regions of the Province. Between 2003 and 2008 recognized planning advisors working under the Canada-British Columbia Environmental Farm Planning Program provided *Planning Workbook* and *Reference Guide* materials to participating farmers. These materials are used to develop a farm plan that identifies on-farm environmental risks and subsequently establishes a priority sequence of action items for addressing those risks.

The EFP concept has been around for over two decades. The first in North America was the Farm-A-Syst program in Michigan. This was adapted by the Ontario Farm Environment Coalition for use by Ontario farmers. The Ontario program has been in place for well over 10 years. Since 2004 all Canadian provinces have had an EFP program in

place. EFPs are voluntary. There are no government laws or regulations that require a farmer or rancher to prepare a plan. Recently however, institutions such as banks, insurance companies and food processors and buyers are paying increasing attention to the impact of agriculture on the environment and are requesting some form of environmental risk assessment from their customers. Farmers may find their environmental farm plan to be a very useful tool when dealing with these other organizations.

What is an EFP?

An EFP is an agriculture-environment risk identification process. It is conducted through a comprehensive review of activities and facilities that exist on the farm or ranch with respect to their impact on the environment. The review also looks at the impact of the environment on the farm, for example impacts from wildlife or flooding. The review considers current environmental regulation requirements and beneficial management practices that should be in place on farm. It looks at the risk of the operation to the environment as well as the risk of the environment to the farm or ranch operation.

Why Do an EFP?

- To determine your standing with respect to environmental rules and regulations and the environmental risk of management practices.
- To sustain the resources used and affected by farming practices for long-term production.
- To increase public confidence that BC farmers are “doing it right” with respect to the environment.

- To improve farm/ranch profitability. Some potential economic benefits include making fertilizer dollars go further through nutrient management planning, reducing tillage costs by converting to conservation tillage practices, and minimizing cost of pesticides by using integrated pest management techniques.
- To differentiate your product(s) in the marketplace and thereby maintain or enhance marketing opportunities.
- To help plan for unforeseen contingencies such as floods, spills or fires.
- To demonstrate due diligence on the part of the producer.
- To reduce potential for new legislation/regulation.
- To improve relationships with regulatory agencies reducing the need for further regulation.

For more information on Environmental Farm Plans contact the BC Ministry of Agriculture and Lands or the BC Agriculture Council. Information is also available on the BCMAL website at

www.al.gov.bc.ca/resmgmt/EnviroFarmPlanning/index

Organic Crop Production

Though the roots of the organic movement trace back to the late 19th century in Europe, an internationally recognized standard for organic agriculture did not appear until 1980 when the International Federation of Organic Agriculture Movements (IFOAM) published their Basic Standards for Organic Production and Processing. This international standard led to the development of the global organic market that exists today. With the aim of leading, uniting and assisting the organic movement, IFOAM represents hundreds of organizations in countries all over the world. In September 2005, IFOAM approved the following revised version of their principles of organic agriculture:

“The Principles apply to agriculture in the broadest sense, including the way people tend soils, water, plants and animals in order to produce, prepare and distribute food and other goods. They concern the way people interact with living landscapes, relate to one another and shape the legacy of future generations.”

- *The Principle of Health: Organic Agriculture should sustain and enhance the health of soil, plant, animal and human as one and indivisible.*
- *The Principle of Ecology: Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.*
- *The Principle of Fairness: Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.*
- *The Principle of Care: Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.”*

Certification

Organic certification guarantees the process used to produce organic food products. The system is designed to ensure producers follow the standards and principles adopted by their certification body. Certification does not guarantee physical characteristics of the product produced, merely the processes and substances used in its production. The process of certification is carried out between an operator (e.g. farmer, processor) and a Certification Body (CB) and is reviewed annually. Certified organic operations are required to maintain records detailing all inputs, crop yields, receipts for purchases and sales, and copies of valid certified organic certificates from all sources of organic products.

While there are many CB's operating in Canada, the process of certification is essentially the same regardless of the CB performing certification. Of particular note, it is important to meet the requirements of the standard your operation is being certified to, as organic standards sometimes differ between CB's.

Steps to Organic Certification

1. Operator completes application process and submits the application with fees to the Certifying Body (CB) of their choice;
2. Certification Committee (CC) screens submissions, contacts applicants to fill in gaps, and once paperwork is complete, assigns the file to a capable Verification Officer (VO);
3. VO inspects the operation, reviews the required records (e.g. assessing if the production standard has been met) and presents the verification report to the CB;
4. CC reviews the file and determines the operation's eligibility for certification status;
5. Copy of VO report, along with the certification decision, is sent to the applicant. If no major non-compliances are identified, Status Certificate is issued;
6. If there are any non-compliances and the CB can verify corrective actions, the Status Certificate is issued;
7. Process is repeated annually.

Canada Organic National Standard

Canada's new Organic Products Regulations come into effect December 14, 2008 making certification mandatory for all interprovincial (between provinces) and international trade of organic products. The new regulation, enforced by the Canadian Food Inspection Agency (CFIA), governs the use of the new Canada Organic logo (shown at right) for agricultural products produced according to the Canadian Organic Production Standard



http://www.pwgsc.gc.ca/cgsb/on_the_net/organic/032_0310_2006-e.pdf

Compliance to the new standard is also required for intra-provincial trade (within the province) of product bearing the Canadian Organic logo. In addition to the Production Standard, producers of organic agricultural products are required to abide by the Permitted Substances Lists, a listing of generic materials approved for use in organic production systems

http://www.pwgsc.gc.ca/cgsb/on_the_net/organic/032_0311_2006-e.pdf

British Columbia Certified Organic Program

The British Columbia Certified Organic phrase or checkmark (shown at right) is licensed to the Certified Organic Association of British Columbia (COABC) by the province of British Columbia for use on products produced according to the procedures and standards maintained by the COABC.



There are eighteen CB's certifying organic operations in British Columbia. COABC is made up of eleven CB's, some certifying within specific regions, and others covering the entire province.

In addition to the CB's of COABC, there are also seven local and international organizations that certify British Columbia organic operations. Operations typically seek certification from CB's outside the COABC if export conditions make certification with those CB's more convenient, if a CB specializes in certifying their type of operation, or if they have ideological reasons for using another CB. For a complete listing of CB's certifying in British Columbia see Table 1.

Table 1: Certification Bodies Operating in British Columbia 2008

Accreditation	Certifier		Scope*
COABC Regional	BCARA	BC Ass. of Regenerative Agriculture	F, P/H
COABC Regional	BIOD	Biodynamic Agricultural Society of BC	F
COABC Regional	BOPA	Boundary Organic Producers Ass.	F, P/H
COABC Regional	IOPA	Island Organic Producers Ass.	F, OFP
COABC Regional	KOGS	Kootenay Organic Growers Society	F, P/H
COABC Regional	LEOGA	Living Earth Organic Growers Ass.	F
COABC Regional	NOOA	North Okanagan Organic Ass.	F
COABC Regional	SOOPA	Similkameen Okanagan Organic Producers Ass.	F, OFP
COABC Regional	STOPA	Shuswap Thompson Organic Producers Ass.	F, OFP
COABC ISO	FVOPA	Fraser Valley Organic Producers Ass.	F, P/H
COABC ISO	PACS	Pacific Agricultural Certification Society	F, P/H
	SOFS	Surrey Organic Farmers Ass.	F
SCC	PROCERT	OCP/Pro-Cert Canada Inc.	F/P/H
IOAS/CAAQ/ USDA/ JAS	OCIA	Organic Crop Improvement Ass.	F, P/H
IOAS/CAAQ/ USDA/ JAS	QAI	Quality Assurance International	P/H
USDA	OTCO	Oregon Tilth Certification Ass.	F, P/H
IOAS/USDA	WSDA OFP	Washington State Dept. of Agriculture, Organic Food Program	P/H
IOAS/USDA	CCOF	California Certified Organic Farmers Certification Services	F

*F = Farms; OFP = On-Farm Processing; P/H = Processors & handlers

Links to all CB's in Canada can be found at:

www.cog.ca/cb.htm

Organic Grains (Spelt, Food-grade Oats, Other Livestock Grains)

Crop rotation is the key control for weed, disease, fertility and pest management in organic grain production. In contrast to conventional grain and oilseed systems, where the use of synthetic fertilizers and pesticides allows for high frequencies of cash crops in a rotation, organic grains can only be grown for one, or at most two years successively, before land must be returned to grass and alfalfa, or a green manure to restore soil nutrients and disrupt weed and pest cycles. Many producers use at least a five-year crop rotation; however cropping patterns are unique to every farm. To be compliant with the Organic

Production Regulation a significant portion of soil fertility must be generated through cover crops, crop residues, animal manures and followed only then by augmentation with permitted commercial nutrient products.

Grains produced organically are cleaned and processed separately from conventional grains by certified processors.

Further information on organics in British Columbia can be obtained from COABC,

www.certifiedorganic.bc.ca

Integrated Pest Management

Integrated Pest Management (IPM) is a systematic decision-making process that supports a balanced approach to managing crop and livestock production systems for the effective, economical and environmentally-sound suppression of pests.

The elements of integrated pest management include:

- Planning and managing ecosystems to prevent organisms from becoming pests;
- Identifying potential pest organisms, their natural enemies and damage;
- Monitoring populations of pests and beneficial organisms, pest damage, and environmental conditions,
- Making control decisions based on potential damage, cost of control methods, value of production, impact on other pests, beneficial organisms and the environment:
- Reducing pest populations to acceptable levels using strategies that may include a combination of behavioral, biological, chemical, cultural, and mechanical controls, and
- Evaluating the effects and efficacy of pest management decisions.

The aim is to prevent economic losses due to pests while avoiding harm to people, non-target plants and animals, and the environment. This concept has evolved to reduce reliance on chemical pesticides by including alternative non-chemical methods and biological products in control programs. Adoption of IPM reduces risks to environmental and human health, reduces risk of pesticide resistance shortening the useful life of selective control products, improves the opportunity for biological control and in most cases reduces crop protection costs.

It is important to realize that an IPM program is more than a collection of control methods. Rather, it is a decision making process that gives the grower the information needed to decide whether or not action must be taken and, if so, to choose the best combination of control measures. A key idea is that it is necessary to take action against pests only when

their numbers warrant it, not as a preventative measure according to a calendar schedule. The goal is to suppress pest populations to non-damaging levels, not to eliminate them. Successful IPM programs are based on using good crop production and management practices to prevent pest problems and conserve beneficial species.

Components of an IPM Program

The **first** step in developing an IPM program is to implement crop production practices that prevent or minimize pest problems so that control actions are not required. Preventative practices are also applied as cultural control practices as part of an integrated approach to protecting crops from pests. Examples of preventative practices include planting only Certified seed, rotating crops to avoid build-up of pests, planting crop varieties suited to the soil type and climate to reduce stress that can predispose plants to pest attack or inability to compete with invasive plants.

The **second** component of an effective IPM program is to correctly identify the problem. Most treatments must be tailored to a particular species, therefore the more that is known about a pest the more effectively IPM can be applied. Once a pest is identified, information about its biology, behaviour, natural enemies and life cycle will help in deciding when controls will have the greatest effect.

The **third** step is monitoring the pest populations or their damage. This is crucial to IPM because it provides the information needed to make decisions about the timing of treatments and whether or not they are necessary. Monitoring programs are based on a regular inspection for pests or signs of their presence (damage). You can use a variety of sampling methods, such as timely visual inspections of plants, counting insects caught in pheromone-baited traps or in sweep nets, or counting the number of diseased plants, insects or weeds per square metre of crop. Growers often find that they use fewer sprays when they use a monitoring program to decide if and when sprays are necessary.

The information collected by monitoring is used in the **fourth** component of an IPM program to decide if the pest population or damage is at or

exceeded a pre-determined level above which an unacceptable level of crop loss can be expected. In agricultural crops this is usually an economic injury level, or action threshold. Economic thresholds are not available for all pest/crop combinations so producers must often base decisions on previous experience. How much damage is tolerable depends on what part of the plant is affected, the cost of the treatments (product and application) and the value of the crop that would be lost if not treated. It also depends on the cost of harmful side effects, such as the loss of beneficial insects that might occur by controlling pests in the crop.

The **fifth** component is reducing pest populations to below the action threshold to prevent economic crop loss. One or a combination of several treatments may be coordinated into a management program for a key pest or for the entire complex of pests on a crop:

1. Biological controls, such as predator insects, parasitic insects, plant and insect diseases.
2. Physical or mechanical controls, such as using barriers, screens, traps, flame weeders, mulches and cultivating weeds.
3. Cultural controls include planting resistant varieties, rotating crops to prevent disease or nematode build-up, providing good drainage and appropriate irrigation, and adopting good nutrient and waste management practices. Many cultural control methods are carried out as part of normal crop production operations.
4. Chemical controls, including synthetic and natural source pesticides (insecticides, herbicides, fungicides, and rodenticides), insect growth regulators and other products.

In IPM programs, pesticides are applied only if other control measures have failed to keep pests below the action threshold based on monitoring. They should be selected for their compatibility with other treatments and applied at the proper time (crop or target development stage) and rate. Insecticides that break down quickly and have relatively low toxicity to beneficial insects could be integrated with the use of predatory insects. To optimize the performance of pesticides, it is important to apply them using sprayers that are

properly, maintained, calibrated and operated (see Chapter 6). If monitoring indicates the pest problem is localized within a crop, consider using spot applications rather than overall or broadcast sprays to lessen potential risks to non-target species and the environment. Substituting biological, physical or cultural controls for chemicals is promoted in IPM programs wherever possible to conserve native beneficial species and reduce impacts on the environment.

Although treating pests is important, IPM programs emphasize making changes in the management of the crop or habitat to prevent pest problems from developing. Ideally, an integrated approach would also include revising aesthetic standards, such as cosmetic damage to crops that lead to unnecessary pesticide use.

The **sixth** component of an IPM program is evaluation. What went right or wrong, and why? This component requires accurate records of crop management inputs such as monitoring results, seeding dates, and nutrient and pesticide applications. Without such records, no valid or useful assessment of the pest management actions can be done. It is essential to review records to determine what worked, where improvements should be made and to review the costs and benefits of the program.

Invasive Alien Species

Invasive alien species are organisms that are introduced to a country or region outside their natural habitats. These include invasive plants, insects, mites, nematodes, fungi, bacteria and other micro-organisms. Many of these non-native pests fail to adapt to their new environment or do not cause appreciable damage to their hosts. Others can be very damaging and are quick to establish and spread if suitable food hosts and environmental conditions are present. The lack of natural enemies, which regulate their abundance in their home range, may also aid in their establishment and spread. In time, natural enemies or introduced biocontrol agents may reduce the damage and permit us to live with such pests. Some exotics never come into balance with their new environment and their presence may continue to cause trade restrictions.

Economic Impact and Challenges

The economic consequences of new pests may be direct due to a decrease in marketable yield or quality, or indirect such as quarantine restrictions and market closures. Some invasive alien pests threaten more than one plant-based sector (agriculture, forestry, horticulture). Not only are invasive alien species a threat to cultivated crops, ornamental plants, rangelands, and forests, but they also threaten native plants and animals (biodiversity) by competing for available space and food or by directly attacking native species. Therefore it is essential that affected sectors work together to minimize risks of introductions, establishment and spread.

Challenges in minimizing the risks from invasive alien species include:

- Expanding global movement of crops (in particular fruit, nursery and floriculture), vehicles and people.
- Increasing annual average temperatures making our climate more suitable for survival.
- Limited resources to maintain adequate surveillance for early detection of introductions and rapid response for application of remedial actions.

Surveillance and Regulation

Everyone has a responsibility to prevent the introduction of invasive alien pests. If you import and/or grow plants, seeds/propagative material, produce or processed plant products, be aware of and comply with pertinent legislation including import regulations.

In many cases, remedial measures to prevent the establishment and spread of newly introduced invasive pests are unavailable; therefore, the strict application of quarantine regulations and surveillance programs are essential. The Canadian Food Inspection Agency (CFIA) has the lead role in maintaining vigilance for specified invasive alien species to prevent their introduction into Canada and their spread between provinces. The CFIA regulates many pests and conducts Pest Risk Assessments of new pests. See their website at www.inspection.gc.ca/English/plaveg/protect/listpespare.shtml#R

for a list of pests regulated by Canada. The Agency maintains annual surveillance programs within Canada to document the absence of selected pests as well as to detect the presence of new invasive alien species.

The B.C. Ministry of Agriculture and Lands (BCMAL) administers the *Plant Protection Act*, the *Weed Control Act* and the *Animal Diseases Control Act* to help prevent the spread of pests, weeds and plant and animal diseases. Information on these and other Acts administered by the Ministry are available at www.al.gov.bc.ca/fsq/legislation.htm

In 2004, an Invasive Alien Species Strategy for Canada was released to address the threat of invasive alien species. A Terrestrial Plants and Plant Pests Working Group was formed and key initiatives and a proposed implementation plan was developed. The strategic goals of this Action Plan are prevention, early detection, and rapid response to new invasive alien species, and management of existing alien invasive species.

More information can be found at the following three websites:

www.inspection.gc.ca/english/plaveg/invenv/action/phase1e.shtml

www.inspection.gc.ca/english/plaveg/invenv/action/phase2e.shtml

www.invasiveplantcouncilbc.ca/publications/forum_presentations/2006/CFIA%20Cree.pdf

There is only limited invasive plant legislation in Canada that regulates the import of aggressive or potentially noxious plants. Weed laws and regulations are normally enacted after a plant has proven itself as an invasive weed and to limit further spread. Federally, the *Seeds Act* regulates allowable weed seed content of crop seed and the *Plant Protection Act* regulates import of a few aquatic and parasitic plants. Provincially, 49 plant species are regulated under the *British Columbia Weed Control Act*. This Act places a duty on all land occupiers to control listed plants and to prevent their propagation and transport. Weeds currently legislated in British Columbia can be found at www.al.gov.bc.ca/cropprot/weedguid/weedguid.htm

In addition, The *Forest and Range Practices Act* requires holders of a Forest Stewardship Plan, Range Stewardship Plan, Range Use Plan, or Woodlot License Plan to identify measures to prevent the introduction or spread of invasive plant species listed in the Invasive Plants Regulation. See www.qp.gov.bc.ca/statreg/reg/F/ForRangPrac/18_2004.htm

More information on legislation pertaining to invasive plants is available on the Invasive Plant Council of BC website at

www.invasiveplantcouncilbc.ca/publications/ipcbc-reports/IPC3-Legislative-Guidebook.pdf

What is that Alien? How to Identify It

Crop monitoring is the most important practice producers can adopt for the early detection of alien pests inadvertently introduced in infested seed, machinery, soil, or plant material. Producers can aid in the detection of newly introduced alien species by taking specimens of unusual plants, plant diseases, insects or mites to their nearest BCMAL or CFIA office. The BCMAL Plant Diagnostic Laboratory in Abbotsford will accept suspect invasive alien species for identification. There is no fee for this service. For information on submitting samples, contact the laboratory at 1-888-221-7141 or visit the lab's website at www.al.gov.bc.ca/cropprot/lab.htm

If specialists identify a pest, plant or plant disease as a potential alien species, the samples will be sent

to Ottawa for final confirmation of identification. In the event it is an invasive alien species, you may be required to allow further crop inspection and sample collection by BCMAL and CFIA officials. Early detection allows early initiation of control actions to possibly eradicate the infestation before it has a chance to spread and become established. The BCMAL web site contains pictures and information on some non-native and invasive pests of immediate concern to B.C. at www.al.gov.bc.ca/cropprot/nonnativepests.htm

Reducing the Impact of Invasive Plants

Invasive plants can escape from producing fields, nurseries or gardens and negatively impact natural resources or industries such as agriculture, forestry, and tourism. For field crop producers, the surest way to prevent introduction of invasive plant species is to sow Certified seed. Certified seed ensures consistent field performance and seed quality, including high germination and a lower allowable tolerance for noxious weed seeds. Follow all ten steps listed under Integrated Weed Management - Preventative Strategies on page 88.

In BC, some ornamentals have escaped propagation to damage British Columbia's environment. The desirable characteristics for ornamental varieties and many domestic species (hardiness, persistence, self-seeding ability, pest resistance, and vigorous growth and establishment) are some of the same attributes that make a plant species a successful invader. Once established in an area, invasive plants are impossible to eradicate or difficult to control due to extensive creeping, rhizomatous roots or because they produce vast amounts of seed. Some BC examples include: Purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonum cuspidatum*), giant hogweed (*Heracleum mantegazzianum*), Russian olive (*Elaeagnus angustifolia*), Baby's-breath (*Gypsophila paniculata*), reed canarygrass (*Phalaris arundinacea*), Scotch broom (*Cytisus scoparius*), Policeman's helmet (*Impatiens glandulifera*), and English ivy (*Hedera helix*).

It has been estimated by Dr. S. Reichard, University of Washington, that 85% of the 235 woody plants invading natural areas in the U.S. were originally introduced for landscape purposes.

Invasive Plant Council of British Columbia

The Invasive Plant Council of British Columbia (IPCBC) is a registered Society formed as a primary recommendation of the *Invasive Plant Strategy for British Columbia*, produced in 2003. The goal of the strategy is to build cooperation and coordination to protect BC's environment and minimize negative social and economic impacts caused by the introduction, establishment and spread of invasive alien plants. Members represent a wide range of perspectives, including all orders of government (federal, provincial, local and First Nations), land and water-based user groups, resource-based businesses and industries, utilities and non-government organizations. View the IPCBC website at

www.invasiveplantcouncilbc.ca/

ATTENTION: If you find an uncommon, aggressive weed in your fields, consult the *Field Guide to Noxious and other Selected Weeds of British Columbia* as an aid to identification or contact your local BCMAL office or a CFIA Inspector for assistance.

Examples of Recent Invasive Species Introductions and Species to Watch For in BC

More information on these and other pests can be found at

www.inspection.gc.ca/english/plaveg/pestrava/comnome.shtml

and

www.al.gov.bc.ca/cropprot/nonnativepests.htm

Regulated pests must be reported to the CFIA.

Insects

Alfalfa Snout Beetle

The alfalfa snout beetle affects alfalfa, clovers and several other hosts. It has the capacity to cause severe damage to roots and increase susceptibility of alfalfa to winter injury. It has been found in Southern Ontario and in the Eastern USA and is regulated by the CFIA.

Cereal Leaf Beetle

The cereal leaf beetle is a pest of cereal crops and various grasses and has the potential to cause significant losses. In B.C., the beetle was found in the Creston Valley and Cranbrook area in 1998, and in the Armstrong area in 2006 and has resulted in movement restrictions from the infested areas. The cereal leaf beetle migrated north from Idaho and Montana, and likely was introduced into the North Okanagan in infested host material.

Cowpea Aphid

The cowpea aphid has many hosts and was discovered near Spences Bridge in 2006. The aphids produce a sticky honeydew upon which sooty mould grows. This mould impacts plant growth, creates problems with harvest and may make leaves unpalatable to livestock. Cowpea aphids can vector viruses that limit plant growth and are the only slate-gray to black aphids found on alfalfa in B.C. The origin of the cowpea aphid is unknown.

European Chafer

In 2001, European chafer was detected in lawns and boulevards in New Westminster and has since spread to Burnaby and Vancouver. The grubs feed on all types of grass, corn, potatoes and other crops. Considerable damage to turf can occur in the fall and winter from animals, especially skunks and birds digging up the grass to feed on the larger grubs.

European Corn Borer

European corn borer is a devastating insect that damages all above ground parts of a plant. Injury by this pest is often associated with an increased incidence of stalk rot in corn caused by fungi. It has a diverse host range that includes potato and wheat. This regulated pest occurs in Eastern Canada and the USA. It has been found as far west as Saskatchewan in Canada and Montana in the USA.

Diseases/Nematodes

Dwarf bunt (*Tilletia controversa*)

Dwarf bunt is a fungal disease that reduces yield and contaminates the grain making it unsuitable for milling or malting. It is limited to the North Okanagan/Shuswap, and Creston areas of B.C. It is predominantly a problem in winter wheat. This disease is regulated by the CFIA and many importing countries have zero tolerance for bunt-contaminated

wheat shipments. Refer to the disease section on page 42 for more information on dwarf bunt.

Karnal bunt (*Tilletia indica*)

Karnal bunt is a fungal disease that typically only affects a portion of the wheat kernel and therefore is also known as partial bunt. Yield is not affected significantly however flour quality is reduced. Many countries including Canada list karnal bunt as a quarantine pest. It was first detected in the USA in 1996 by the Arizona Department of Agriculture.

Corn downy mildew (*Peronosclerospora maydis*)

Downy mildew of corn is not present in North America and there are strict quarantine measures in place in both Canada and the USA to prevent importation of this disease. It is found in Australia, Asia and South America.

Clubroot of canola (*Plasmodiophora brassicae*)

Clubroot was first reported on canola in 2003 in Alberta and has not been found in the Peace River area of B.C. This disease is known to affect many cole crops (i.e. cabbage, broccoli, cauliflower). In April 2007, clubroot was added as a declared pest in the Alberta Agricultural Pests Act making owners or occupants of the land responsible for taking measures to prevent establishment and spread of this disease. Refer to the disease section on page 34 for more information on clubroot. Also see the Alberta Agriculture website

at [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex8593](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex8593)

Pea cyst nematode (*Heterodera goettingiana*)

Pea cyst nematode was found in Western Washington in 1992. There was one case each in Pennsylvania and Idaho and the nematodes were also reported in a greenhouse in Illinois. It is known to affect pea, fava bean and certain vetches. The affected plants are pale and stunted and develop poor root systems that lack nodules and produce few pods and seeds. The affected areas of the field often turn brilliant yellow before harvest time.

Weeds

Common Bugloss (*Anchusa officinalis*)

In BC, the largest infestations known are north-east of Rock Creek and east of Kelowna in the

Rutland - Black Mountain areas. Sitings have also been reported on Big White Mountain Road east of the Kettle River, west of Keremeos and in the Osoyoos area. Common bugloss invades pastures and rangelands and is commonly found on idle areas where competing vegetation is sparse. This weed is also a concern to alfalfa production because the succulent leaves and stalks mould the hay once it is baled. In Washington State, bugloss spread to cover approximately 200 square miles in a seven year period.

Kudzu (*Pueraria lobata. var. Montana*)

Kudzu is a rhizomatous, climbing or trailing perennial native to eastern Asia. It infests over 8 million acres in the south-eastern United States. In 2001 a small infestation was discovered along a highway at Vancouver, Washington. Rapid, creeping growth (vines can grow up to 60 feet per year) results in death of crops and trees as they are smothered and shaded from light. It is not yet known in British Columbia.

Perennial Pepperweed (*Lepidium latifolium*)

The first known B.C. infestation was found in the East Kootenay region north of Cranbrook in 1997. Subsequent infestations were found west of Kamloops near Walachin in 1998. Perennial pepperweed has spread rapidly in northern Europe, Mexico and all western U.S. states, except Arizona. It invades cropland, roadsides and idle areas but is a particular threat to riparian areas and rangelands where it degrades wildlife habitat, lowers the yield and quality of forage on pastures and hayfields and displaces native plant species.

Much of the U.S. infestation is associated with river systems and wetland areas. The extensive, woody, deep creeping root systems make perennial pepperweed exceptionally difficult to control.

Rush Skeletonweed (*Chondrilla juncea*)

Rush skeletonweed was first discovered in B.C. in the North Okanagan region of Spallumcheen in 1983. Subsequent infestations were found at Sirdar and the Slocan Valley in the Central Kootenay region around 1991 and Kimberley in the East Kootenay region in 1998. Native to southern Russia and now spread throughout much of the world, this weed poses a serious threat to BC rangelands and other agricultural resources including both dryland and irrigated cereal production. Over 5 million acres have been infested in the Pacific

Northwest states and it is currently spreading at a rate of 100,000 acres per year. Since its introduction to Australia in 1935, the expansion of rush skeletonweed has resulted in estimated annual losses to wheat production in excess of \$30 million.

Velvetleaf (*Abutilon theophrasti*)

Velvetleaf was first discovered in B.C. at Chilliwack in 1990 as a small infestation in corn and raspberry plantings and in Oliver in 2005 in a private garden. Rated as one of the worst weeds in the U.S., velvetleaf now infests extensive corn and soybean acreages in Ontario and Quebec. Velvetleaf acts as a host to insects, diseases and nematodes of crops, produces chemicals that reduce crop seed germination and root formation and can reduce corn yield by more than 70%. Costs for control in the U.S. in one year alone were estimated at \$343 million.

Wild Chervil (*Anthriscus sylvestris*)

Recent infestations have been found in northern Washington as a possible introduction in British wildflower mixes. Wild chervil is not aromatic like the domestic herb, salad chervil. In British Columbia wild chervil is only known from the Fraser Valley. It is spreading rapidly along road rights-of-way, ditches, fencelines and in to pastures in the Abbotsford-Chilliwack districts. Wild chervil out-competes pasture and hay crops reducing forage available to grazing animals. It is also a known host for a virus disease that infects carrots, celery and parsnips. Extremely deep taproots and tolerance to selective herbicides make control very difficult.

Yellow Starthistle (*Centaurea solstitialis*)

Yellow starthistle is a continuing threat to British Columbia from adjacent infestations in Washington and Idaho states where it infests over 1.25 million acres. In California it infests over 800 million acres. To date, only one isolated plant has been found in BC (Kamloops). It will invade areas ranging from roadsides and disturbed areas to undisturbed, healthy grasslands. This invasive reduces the diversity of native plant communities and reduces production of forage for livestock and wildlife. It also invades cropland, reducing yield, quality and can hinder harvesting. Yellow starthistle causes a neurological disorder in horses known as ‘chewing disease’. Death is often the result and there is no known cure.

Pesticide Regulations and Safety

This information on safe pesticide use is summarized from the “B.C. Pesticide Applicator Course for Agricultural Producers”. The course is available from Office Products Centre at 1-800-282-7955.

Legislation

Laws protect applicators, bystanders, consumers and the environment. You can be fined for breaking the laws.

Canadian Laws

Pest Control Products Act and Regulations

Every pesticide used or sold in B.C. must be registered by Health Canada. Each label must have a PCP Act number on it. Using pesticides without a PCP Act number (from other countries) is against the law unless you have a pesticide own use import permit. The Pest Management Regulatory Authority (PMRA) takes random crop samples during the growing season to check for residues of unregistered pesticides. Information on the Grower-Requested Own Use (GROU) import program is available at:

www.pmra-arla.gc.ca/english/appregis/oui/oui-e.html

Each label must also list the crops and pests the pesticide can be used on. Using pesticides for uses not on the label is against the law. However, there are a few minor pesticide uses that may be approved but not be on the label. This guide includes these minor uses. Information on minor use is available at:

http://www.al.gov.bc.ca/pesticides/j_4.htm

Pesticides are labeled as Domestic, Commercial or Restricted. Restricted products are more hazardous and have special restrictions on the label.

The Food and Drugs Act

All foods must be free of harmful amounts of substances. Health Canada sets levels of allowable pesticide residues on crops at harvest. These levels are called maximum residue limits or MRLs. The Canadian Food Inspection Agency (CFIA) takes

random samples of crops to test for pesticide residues at the time of sale. If residues are more than the MRL the crop may be seized. If you follow the recommendations on the labels or in this production guide and wait the required days before harvest, you should not be over the limit.

The Fisheries Act and Migratory Birds Regulations

You can be charged if you kill or harm fish or migratory birds with pesticides. This applies to creeks, rivers, and lakes on your own property as well as on public land. It is illegal to introduce pesticides into waters either directly or indirectly through spray drift or run-off.

Transportation of Dangerous Goods Act

Certain dangerous goods cannot be transported unless you use shipping documents, special labels, and vehicle signs. Ask the pesticide dealer if the product that is bought needs special transport procedures. Growers are usually exempt from this when they are transporting less than 500 kg of pesticide.

British Columbia Laws

Integrated Pest Management Act and Regulations

B.C. Ministry of Environment also has rules about the sale and use of pesticides in B.C.

Rules that apply to farmers include:

1. Pesticides labeled “Restricted” or “Commercial” must be kept in locked storage that is vented to the outside and has a warning sign on the door.
2. Anyone buying or using pesticides labeled “Restricted” must have an applicator certificate. Table 2 lists all pesticides referred to in this guide including those that can be purchased and used only by certified applicators under the Integrated Pest Management Act.
3. An authorization such as a pesticide use licence, pest management plan or permit is required to apply pesticides to public land. Contact the regional Ministry of Environment office for details.

4. Businesses selling pesticides must be licenced and their sales people must be certified.
5. Anyone applying pesticides in exchange for a fee must have an applicator certificate and a Pesticide Use Licence. But, if you spray your neighbour’s crops you do not need a licence if the work is done as a favor and no money is exchanged.
6. Everyone must dispose of containers and left-over pesticides safely.

WorkSafeBC (formerly: Workers’ Compensation Board)

WorkSafeBC Regulations for Occupational Health and Safety apply to farmers who must be registered by WorkSafeBC. If you are unsure whether they apply to you, call WorkSafeBC at 1-888-621-7233. FARSHA (Farm and Ranch Safety and Health Association) at 1-877-533-1789 can also provide information on WorkSafeBC regulations.

The WorkSafeBC regulations cover conditions of workplaces such as general safety procedures, hazardous substances, pesticides, confined spaces such as silos and storage bins, protective clothing and equipment, tools, machinery and equipment, and animal handling.

The regulations on pesticides outline requirements for pesticide applicator certification, emergency medical care, washing facilities, personal protective clothing and equipment, application equipment, pesticide application, posting warning signs, re-entry into treated areas, record-keeping, drift prevention, and aerial application. Copies of the regulations are available from any WorkSafeBC office.

Their pesticide regulations state that workers must be over 16 years old and must have a valid pesticide applicator certificate from the BC Ministry of Environment if they mix, load or apply moderately toxic or very toxic pesticides; or if they clean or maintain application equipment for these pesticides. Table 2 identifies all pesticides referred to in this guide including those that can only be used by certified applicators. Anyone under the age of 25 years is considered a young employee and must complete a “new or young employee” orientation. FARSHA (1-877-533.1789) can help develop or present a program for your farm.

The WorkSafeBC re-entry requirements are discussed in the “Re-entry Restrictions” section of this chapter. Re-entry dates for pesticides used should be recorded on the grower spray record. Refer to the regulations for the rest of WorkSafeBC’s requirements.

Toxicity

Some pesticides are more poisonous or toxic than others. Pesticides are often categorized as very, moderately or slightly toxic. The ratings indicate short-term toxicity and are based on the LD50 of the active ingredient. The LD50s which correspond to the categories are:

Toxicity	Oral ^{LD₅₀} (mg/kg)	Dermal ^{LD₅₀} (mg/kg)
Very toxic	0 to 50	0 to 200
Moderately toxic	51 to 500	201 to 1,000
Slightly toxic	over 500	over 1,000

The values are only a guide to the toxicity in humans.

BC Field Crop Pesticides

The following table indicates applicator certification requirements from the BC Ministry of Environment and/or WorkSafeBC. Any pesticide labeled “Restricted” requires certification by MoE. Pesticides with an LD50 value rating it as moderately to very toxic require WorkSafeBC certification.

Table 2: Applicator Certification Requirements

Active Ingredient	Trade Names	Certificate Needed	
		MoE	WorkSafeBC
<i>2,4-D amine, ester</i>	Many	No	No
<i>2,4-D plus dichlorprop</i>	Dichlorprop-D, Estaprop, Estaprop Plus, Turboprop	No	No
<i>2,4-D plus mecoprop-p plus dicamba</i>	Dyvel DSp	No	No
<i>2,4-DB</i>	Embutox, Caliber, Cobutox	No	No
<i>ac 299,263 120 as plus fluroxypyr plus MCPA ester 600</i>	Altitude FX		No
<i>amitrol</i>	Amitrol	No	No
<i>bentazon</i>	Basagran	No	No
<i>bromoxynil</i>	Bromotril, Brotex, Koril, Pardner	No	Yes
<i>bromoxynil plus 2,4-D</i>	Approve, Thumper	No	Yes
<i>bromoxynil plus MCPA</i>	Badge, Buctril M, Logic M, Mextrol	No	Yes
<i>clethodim</i>	Arrow, Centurion, Select	No	No
<i>clodinafop-propargyl</i>	Horizon	No	No
<i>clodinafop-propargyl plus bromoxynil plus MCPA ester</i>	Horizon BTM	No	Yes
<i>clodinafop-propargyl plus thifensulfuron methyl plus tribenuron methyl plus dicamba</i>	Harmony K	No	No
<i>clodinafop-propargyl plus thifensulfuron methyl plus tribenuron methyl</i>	Harmony Total, Harmony SG	No	No
<i>copyralid</i>	Lontrel	No	No
<i>copyralid plus glyphosate</i>	Eclipse II	No	No
<i>copyralid plus MCPA</i>	Curtail M	No	No
<i>dicamba</i>	Banvel II, Oracle	No	No
<i>dicamba plus MCPA K salt</i>	Dyvel	No	No
<i>diclofop-methyl plus bromoxynil</i>	Hoe-Grass II	No	Yes
<i>difenzoquat</i>	Avenge 200-C	No	Yes
<i>diquat</i>	Reglone	No	Yes
<i>EPTC</i>	Eptam, Eradicane	No	No
<i>ethalfuralin</i>	Edge	No	No
<i>ethametsulfuron-methyl</i>	Muster	No	No
<i>fenoxaprop-p-ethyl</i>	Puma 120 Super	No	No
<i>fenoxaprop-p-ethyl plus fluzifop-p-butyl</i>	Fusion	No	No
<i>florasulam plus 2,4-D ester</i>	Frontline 2,4-D	No	No
<i>florasulam plus clopyralid plus MCPA</i>	Spectrum	No	No
<i>florasulam plus glyphosate</i>	Pre-Pass	No	No
<i>florasulam plus MCPA ester</i>	Frontline	No	No
<i>fluzifop-p-butyl</i>	Venture L	No	No
<i>flucarbazone sodium</i>	Everest	No	No
<i>fluroxypyr plus 2,4-D ester</i>	Attain	No	No
<i>fluroxypyr plus clopyralid plus MCPA</i>	Prestige	No	No
<i>fluroxypyr plus MCPA ester</i>	Trophy	No	No
<i>glufosinate ammonium</i>	Liberty	No	No
<i>glyphosate</i>	Many	No	No
<i>glyphosate plus dicamba</i>	Rustler	No	No
<i>hexazinone</i>	Velpar	No	No
<i>imazamethabenz</i>	Assert 300 SC	No	No
<i>imazamox</i>	Solo	No	No
<i>imazamox plus 2,4-D ester</i>	Adrenalin SC	No	No
<i>imazamox plus imazethypyr</i>	Odyssey	No	No
<i>imazamox plus imazethapyr plus clopyralid</i>	Absolute	No	No
<i>imazethypyr</i>	Pursuit	No	No
<i>isoxaflutole</i>	Converge Pro	No	No
<i>MCPA</i>	Many	No	No

Table 2: Applicator Certification Requirements *Continued*

<i>MCPA plus mecoprop plus dicamba plus</i>	Target, Tracker SP, Sword	No	No
<i>MCPB plus MCPA</i>	Clovitox Plus, Topside, Tropotox Plus	No	No
<i>mecoprop</i>	Compitox, Mecoprop	No	No
<i>metolochlor</i>	Dual II Magnum	No	No
<i>metribuzin</i>	Sencor	No	No
<i>metsulfuron-methyl</i>	Ally	No	No
<i>nicosulfuron</i>	Accent	No	No
<i>paraquat</i>	Gramoxone	No	Yes
<i>pinoxaden</i>	Axial	No	No
<i>pyrasulfotole plus bromoxynil</i>	Infinity	No	Yes
<i>quizalofop-p-ethyl</i>	Assure II	No	No
<i>quizalofop-p-ethyl plus ethametsulfuron-methyl</i>	Muster Gold II	No	No
<i>sethoxydim</i>	Poast Ultra	No	No
<i>sethoxydim plus imazethypyr</i>	Pursuit Ultra	No	No
<i>simazine</i>	Princep Nine-T	No	No
<i>sulfosulfuron</i>	Sundance	No	No
<i>tepraloxydim</i>	Equinox	No	No
<i>thifensulfuron methyl plus tribenuron methyl</i>	Refine Extra, Refine SG	No	No
<i>thifensulfuron methyl plus tribenuron methyl plus MCPA ester</i>	Refine M-DF, Refine M-SG	No	No
<i>thifensulfuron methyl plus tribenuron methyl plus quinclorac</i>	Triton C	No	No
<i>tralkoxydim</i>	Achieve Liquid	No	No
<i>tralkoxydim plus bromoxynil plus MCPA</i>	Achieve Liquid Gold	No	Yes
<i>tralkoxydim plus clopyralid plus MCPA</i>	Prevail	No	No
<i>triallate</i>	Extra Strength Avadex BW, Avadex MicroActiv	No	No
<i>triallate plus trifluralin</i>	Fortress	No	No
<i>tribenuron methyl</i>	Express Toss-N-Go, Express SG	No	No
<i>tribenuron methyl plus 2,4-D ester</i>	Express Pack	No	No
<i>trifluralin</i>	Advance, Bonanza, Rival, Treflan	No	No

Fungicides

<i>azoxystrobin</i>	Quadris	No	No
<i>Bacillus subtilis</i>	Serenade MAX	No	No
<i>boscalid</i>	Lance	No	No
<i>iprodione</i>	Rovral	No	No
<i>mancozeb</i>	Dithane DG, Manzate, Penncozeb	No	No
<i>propinconazole</i>	Bumper, Pivot, Tilt	No	No
<i>propiconazole plus trifloxystrobin</i>	Stratego	No	No
<i>pyraclostrobin</i>	Headline	No	No
<i>sulphur</i>	Kumulus	No	No
<i>tebuconazole</i>	Folicur	No	No
<i>vinclozolin</i>	Ronilan	No	No

Table 2: Applicator Certification Requirements *Continued***Insecticides**

<i>carbaryl</i>	Eco Bran, Sevin	No	No
<i>carbofuran</i>	Furadan	Yes	Yes
<i>chlorpyrifos</i>	Lorsban, Pyrinex, Nufos, Clorex	Yes	Yes
<i>cyhalothrin lambda</i>	Matador	No	Yes
<i>cypermethrin</i>	Ripcord	No	Yes
<i>diazinon</i>	Diazinon	No	Yes
<i>deltamethrin</i>	Decis	No	Yes
<i>dimethoate</i>	Cygon, Lagon, Dimethoate	No	Yes
<i>malathion</i>	Malathion	No	No
<i>methomyl</i>	Lannate	Yes	Yes
<i>naled</i>	Dibrom	Yes	Yes
<i>permethrin</i>	Pounce	No	Yes
<i>phosmet</i>	Imidan	No	Yes

Fungicide and Insecticide Seed Treatments

<i>azoxystrobin</i>	Dynasty FS	No	No
<i>captan</i>	Captan	No	No
<i>carbathiin plus thiram</i>	Vitavax RS, Vitaflo 280, Vitaflo 220	No	No
<i>Clothianidin</i> Commercial seed treatment facilities only	Poncho FS, Poncho TM	No	
<i>clothianidin plus carbathiin plus thiram plus metalaxyl</i> Commercial treatment facilities only	Prosper	No	
<i>diazinon plus captan</i>	Agrox B-2, Agrox CD	No	Yes
<i>difenoconazole plus metalaxyl</i>	Dividend XL RTA	No	No
<i>fludioxonil</i> Potato seed piece treatment can be applied by growers; other seed piece treatments are by commercial seed treaters only	Maxim		
<i>fludioxonil plus metalaxyl</i>	Apron Maxx RTA	No	No
<i>imidacloprid</i>	Gaucho 600 FL	No	Yes
<i>imidacloprid plus carbathiin plus thiram</i>	Gaucho CS FL	No	Yes
<i>iprodione plus thiram</i>	Foundation Lite	No	No
<i>maneb</i>	DB-Red L	No	No
<i>metalaxyl</i>	Apron, Allegiance	No	No
<i>tebuconazole</i> For use by commercial seed treatment facilities	Raxil FL	No	No
<i>tebuconazole plus thiram</i>	Raxil T	No	No
<i>thiamethoxam</i>	Cruiser FS	No	No
<i>thiamethoxam plus difenoconazole plus metalaxyl plus fludioxonil</i>	Helix	No	No
<i>thiram</i>	Thiram	No	No
<i>triadimenol</i>	Baytan	No	No
<i>triticonazole</i>	Charter	No	No
<i>triticonazole plus thiram</i>	Gemini	No	No

Pesticide Hazard Shapes and Symbols

Shapes and symbols on pesticide labels tell how harmful a pesticide can be. The shapes indicate how hazardous the product is. The symbols inside the shapes show the type of hazard. If symbols are not on labels, the pesticide has very low hazard. The symbols on the labels are:

<p>most poisonous</p>  <p>DANGER POISON</p> <ul style="list-style-type: none"> • very poisonous • (oral LD₅₀ less than 500) • always wear a respirator • always wear eye protection 	<p>→</p>  <p>WARNING POISON</p> <ul style="list-style-type: none"> • moderately poisonous • (oral LD₅₀ 500 to 1000) • wear a respirator in confined spaces 	<p>less poisonous</p>  <p>CAUTION POISON</p> <ul style="list-style-type: none"> • slightly poisonous • (oral LD₅₀ over 1000) • wear a respirator in confined spaces • could be an eye irritant
<p>most flammable</p>  <p>DANGER EXTREMELY FLAMMABLE</p>	<p>→</p>  <p>WARNING FLAMMABLE</p>	<p>less flammable</p>  <p>CAUTION FLAMMABLE</p>
<p>most corrosive</p>  <p>DANGER EXTREMELY CORROSIVE</p>	<p>→</p>  <p>WARNING CORROSIVE</p>	<p>less corrosive</p>  <p>CAUTION CORROSIVE</p>

Exposure

Pesticides can enter the body through the skin (dermally), the mouth (orally), the nose (inhalation), or the eyes. The skin is the most common route of poisoning for pesticide applicators. Skin contact may occur from a splash, spill or drift. The skin is most likely to get contaminated when mixing and loading pesticides.

Hazard

The hazard of using a pesticide depends on both its toxicity and the amount of exposure. Reduce hazards by choosing pesticides with low toxicity and by reducing exposure. Wear protective gear and follow safety guidelines.

Poisoning and First Aid

Symptoms of Pesticide Poisoning

Know the poisoning symptoms of the pesticides you use. Read pesticide labels for symptoms. Effects from pesticide poisoning vary from person to person and are often hard to recognize. Some poisoning symptoms are headache, tiredness, nausea, dizziness, irritation of the skin or nose or throat, blurred vision, tiny pupils, trembling, perspiration, difficulty breathing, vomiting, and unconsciousness. Call the Poison Control Centre (Toll free 1-800-567-8911) or a doctor immediately if you suspect poisoning.

First Aid

Make sure you and other people working on the farm know what to do in case of an emergency. Consider taking a first aid course and CPR course.

If someone has been poisoned:

1. Protect yourself.
2. Move the victim from the area of contamination.
3. Check if the victim is breathing. If breathing has stopped or is very weak, clear the airway and begin artificial respiration. Continue until the victim is breathing normally or until medical help arrives. When doing mouth-to-mouth resuscitation, use a plastic mask to protect yourself from poison.

4. Call the Poison Control Centre (1-800-567-8911) or ambulance. Be ready to tell them the pesticide name, active ingredient and PCP Act registration number.
5. Unless the Poison Control Centre or doctor tells you otherwise, follow the procedures listed below, then;
6. Transport the patient to the nearest hospital.

If a pesticide contacts the eyes, put on waterproof gloves and hold the eyelids open and rinse with clean water for 15 minutes or more. Do not use an eye cup. Do not use chemicals or drugs in wash water.

If pesticide contacts the skin, put on waterproof gloves, remove the contaminated clothing, and wash the affected area of the skin with lots of soap and water. Cover burned areas with a loosely applied, clean cloth. Do not apply any drugs or medications to the burned area. Do not use ointments, greases, creams, lotions or other drugs. If the victim is in shock, keep the person lying down and warm until medical help arrives.

If pesticide was breathed in, take the victim to fresh air as quickly as possible; loosen tight clothing and watch for signs of unconsciousness or convulsions. Keep the airway open and begin resuscitation if breathing has stopped or is difficult. Use a plastic face mask to protect yourself. To prevent chilling, wrap the patient in blankets but do not overheat. Keep patient as quiet as possible.

If a pesticide is swallowed:

- If a person is conscious and able to swallow, give them 1/2 to 1 glass of milk or water. Larger quantities may cause vomiting.
- Do not induce vomiting.
- Call the Poison Control Centre at 1-800-567-8911 for further advice.
- If the patient is retching or vomiting, place the patient face down with their head lower than their body in the recovery position. This prevents vomit from entering the lungs and causing more damage. Do not let the patient lie on their back. Clean the vomit from the patient and collect some in case the doctor needs it for chemical tests.
- When medical advice cannot be obtained, check and follow the pesticide label for directions.

- The doctor may recommend activated charcoal be administered to adsorb any remaining pesticide in the stomach. Follow the doctor's instructions. Activated charcoal should be administered only with the advice of a medical attendant or doctor.

Protective Clothing and Equipment

Wear protective clothing and equipment to minimize exposure to pesticides. Remember to wear safety equipment during mixing and loading, application, and clean-up. Always wear coveralls, waterproof boots, waterproof gloves, and a proper hat. You may also need to wear eye or face protection, respirator, waterproof apron, waterproof pants and jacket. The equipment you wear depends on the pesticide and type of application. Therefore, follow the safety recommendations on the pesticide label.

Coveralls

Wear long sleeved coveralls over full length pants and long-sleeved shirts. Make sure the coveralls are closed at the neckline and wrists. Remove your coveralls as soon as you have finished your pesticide activities. Remove them immediately if they become wet through with pesticide. Wear waterproof clothing if you might get wet during pesticide application.

Some disposable coveralls are suitable for pesticide use. Check with your supplier to see which ones can be used for pesticide application. When removing disposable coveralls, take care not to contaminate the inside if you will wear them again. Between wearing, hang them in a well-ventilated area away from other clothing. Do not launder disposable coveralls but do wash clothing worn under disposable coveralls as you would other clothing worn during pesticide use. Replace with a new coverall when severe pilling (balls on the surface), rips or holes appear. To discard, place in a plastic garbage bag and take to a landfill site. Do not burn.

Gloves

Always wear gloves when handling pesticides. Many glove materials are available. Use unlined waterproof gloves unless the pesticide label recommends a specific material. Do not use gloves made of leather, cloth, or natural rubber or gloves with cloth linings. Make sure the gloves do not have holes or leaks. Keep your coverall sleeves over

the gloves and fold down the tops of the gloves to make cuffs. Wash your gloves before removing them and after each use.

Boots

Wear waterproof, unlined knee-high boots of rubber or neoprene when you load, mix or apply pesticides. Wear your pant legs outside of your boots. Do not wear boots made of leather or fabric. Wash the outside of your boots after each use.

Goggles and Face Shields

Wear goggles if there is a chance of getting pesticide spray or dust in your eyes. Do not use goggles with cloth or foam headbands. Do not wear contact lenses when handling pesticides. Face shields provide extra protection when mixing and loading toxic pesticides. Wash goggles and face shields after use.

Hats

Wear a waterproof hat when pesticides may be splashed or when you could be exposed to drift. Wear a wide brimmed waterproof hat when you will get wet with spray. Do not wear baseball caps, fabric hats, or hats with leather or cloth inner bands.

Aprons

Wear a waterproof apron when you pour and mix concentrated pesticides.

Respirators

Wear a respirator when the label says to wear one; or when the label says to avoid inhalation of dust, vapour, or spray mist; or if there is a danger poison symbol on the label; or if you are applying pesticides in an enclosed space. Make sure your respirator fits. Men should shave before using a respirator as facial hair prevents a proper fit.

Full-face respirators give more protection and may be more comfortable than a half-face mask and goggles.

Do not use dust masks when applying pesticides. They do not protect you from the fumes.

Specially designed, enclosed tractor cabs fitted with air-purifying devices can protect you from pesticide vapours. A regular enclosed cab is not adequate protection if a respirator is required.

Special respirators must be worn when using a highly toxic fumigant such as methyl bromide. Check the label for details.

Respirators must be approved by NIOSH or an agency sanctioned by the WorkSafe BC (previously Workers' Compensation Board). The cartridges remove toxic fumes from the air. Cartridges labeled for organic vapours or pesticides are needed for most pesticides. Filters remove dust and mist. Both filters and cartridges must be replaced regularly for the respirator to work.

When using respirators:

- Check the intake and exhaust valves.
- Make sure there are no air leaks around the face mask. Do an inhalation or exhalation test.
- Change the dust filter after 4 hours of use or more often if breathing becomes difficult.
- Change the cartridges after 8 hours of use or sooner if you can smell the pesticide. Replace cartridges at least once a year, and more often if you use them frequently.
- Cleaning Protective Clothing and Equipment

After application wash your gloves, boots, goggles, face shield and apron. Wash your respirator face piece with soap and warm water. Then rinse it with clean water and dry it with a clean cloth. Keep the cleaned respirator in a plastic bag in a clean, dry place. Store the respirator and protective clothing away from pesticides and spray equipment.

Discard any clothing that has become soaked with a pesticide.

Launder all your clothing after each day of applying pesticides. Wash protective clothing separately from the rest of the laundry. Do not touch contaminated clothing with bare hands. Use rubber gloves. Pre-rinse clothing using the pre-soak cycle. Use a high water level and the hottest water setting on your machine. Use a heavy-duty detergent.

If clothes are heavily contaminated, run two complete cycles. Hang clothes outside to dry in the sunlight if possible. Clean the washing machine by running it through a full cycle with detergent and no clothes to remove any pesticide residue.

Personal and Environmental Safety Guidelines

Buying Pesticides

Make sure the pesticide is registered for your specific use (crop and pest).

Buy only what you can use up in a year.

Transporting Pesticides

- Never transport pesticides with food, feed, fertilizer, clothing, or household goods.
- Lock up the pesticides if you leave your vehicle.
- Never transport pesticides in the passenger section of any vehicle.
- Ask the supplier if you need shipping papers and vehicle warning signs.

Storing Pesticides and Shelf Life

Pesticides vary in their stability and response to storage conditions. Try to only purchase quantities of pesticides that can be used up in one growing season. However, under proper storage conditions most pesticides can be used after at least one year of storage. Follow these guidelines for storage:

- The law says "Commercial" and "Restricted" pesticides must be kept in locked storage that is vented to the outside and that has a warning sign on the door.
- Store pesticides in their original container with the original label. If a label is illegible or missing, label it with the trade name, active ingredient, quantity in the container and PCP number. Then obtain a replacement label from your dealer or the PMRA website http://pr-rp.pmra-arla.gc.ca/portal/page?_pageid=34,17551&_dad=portal&_schema=PORTAL.
- Never keep pesticides near livestock, food, feed, seed, wells, water supplies, or in your home.
- Pesticide storage should be 30.5 metres from any well.
- Keep herbicides separate from other pesticides.
- Return pesticides to storage when not in use.
- Keep a list of the pesticides in storage.

- Protect the pesticides from extreme temperatures. Some liquid pesticides are destroyed by freezing.
- Close containers when not in use.
- Dispose of unwanted, unmarked and damaged containers.
- Keep containers above floor level to protect from dampness and flooding.
- Post emergency numbers nearby.
- Keep a fire extinguisher, broom and shovel, absorptive material, and protective clothing nearby in case of emergencies.

Mixing and Loading Pesticides

- Wear protective clothing and equipment.
- Read and follow label directions.
- Choose a mixing and loading site away from people, livestock, pets, wells, and water bodies.
- Measure accurately.
- Do not rip open paper pesticide bags. Slit them open with a sharp knife.
- Mix pesticides in still or low wind conditions. Stand upwind of the pesticide.
- Hold the container below eye level when measuring or adding pesticide into the spray equipment.
- Only use mixing equipment for pesticides and return it to locked storage when not in use.
- Triple rinse pesticide containers as soon as they are empty. Rinse measuring and mixing equipment. Put rinse water into the sprayer.
- Use clean water. The pH of the water should be from 5.0 to 7.0.
- Prevent overflow. Don't leave the tank unattended.
- Prevent contaminating the water supply by leaving at least a 15 cm air gap between the end of the filler hose and the water in the spray tank. You can also use a backflow preventer valve.
- Do not open water-soluble bags containing pesticides.

Applying Pesticides

- Read and follow label directions.
- Use calibrated application equipment.
- Use the label or production guide rate.
- Wash before eating, drinking, smoking, or using the toilet.
- Have fresh water and emergency supplies on hand.
- Make sure the area to be treated is clear of people and animals.
- Don't work alone when handling very toxic pesticides.
- Post warning signs if necessary to keep people out of treated areas.
- Use separate equipment for applying herbicides.
- Cover or remove animal food and water containers near the treatment area.
- Wear gloves to replace or clean plugged nozzles. Do not blow out a plugged nozzle or screen with your mouth. Use a soft brush or toothpick.
- Shut off the spray nozzles when you turn and stop the flow of granulars at the end of rows.
- Pesticides must be registered for aerial application before they can be applied by aircraft. The label will specify whether the product can be applied by air.
- Pesticides must be registered for chemigation before they can be applied through irrigation systems. Therefore only apply pesticides through the irrigation system when the label has instructions for chemigation. If chemigation is used, follow "Chemigation Guidelines for B.C." This publication is available from BCMAL.
- Use and maintain the tractor speed chosen during calibration.
- Prevent pesticides from contaminating non-target areas. Leave an untreated area around lakes, streams, ditches, and wells. Spray downwind from sensitive areas.

Minimize drift by:

- not spraying in strong winds or dead calm. There is usually less wind in the early morning and late evening.
- not spraying when temperatures are greater than 30°C.
- using boom sprayers with as low pressure as possible, the correct nozzles, large volumes of water, and setting the boom as near to the ground as possible to still get uniform coverage.
- using a drift control agent.
- using drift guard or other specialty nozzles that reduce drift.

After Applying Pesticides

- Clean equipment away from water supplies.
- Remove and clean protective clothing and equipment.
- Shower.
- Keep records of every application.

Disposal of Unwanted Pesticides

- Calculate the amount needed so none is left over.
- Do not re-spray an area to get rid of leftover spray.
- Apply left over material according to label directions on another site or crop listed on the label. Do not put unwanted pesticides into sewers, down drains, or on the land.
- Contact the regional office of the B.C. Ministry of Environment or BCMAL for information on the disposal of unwanted pesticides.

Disposal of Containers

- Drain the container into the spray tank for at least 30 seconds or shake out the bag.
- Triple or pressure rinse drums, glass bottles, plastic and metal containers. Single rinse plastic and paper bags.
- Put the rinse water into the spray tank.
- Crush, puncture or damage empty containers so they cannot be re-used.

- Return the containers to your pesticide storage until you can take them to a public dump, back to the supplier, or to a collection site. Containers can be buried on your land 0.5 metres below the surface. The burial site must be flat, not a bog, gravel or sandy soil and at least 200 metres from wells, lakes, rivers, streams or ponds.
- Do not burn pesticide containers.

Re-entry Restrictions

Poisoning may occur when people work in treated areas too soon after pesticides have been used. Such poisoning may be from breathing pesticide fumes or handling treated plants e.g. hand weeding, hand thinning. Warn farm workers of areas recently sprayed.

Some pesticide labels tell when treated areas can be re-entered. Follow these directions.

When there are no re-entry times on a pesticide label, follow the Workers' Compensation Board regulations. They state people may not enter a treated field until they have waited the following re-entry or restricted entry intervals:

- 24 hours for a slightly toxic pesticides;
- 48 hours for moderately or very toxic pesticides.

If a person needs to enter a treated area before the re-entry period is over, wear protective gear. Farmers must post a sign at fields to tell workers when they can enter the field. The sign must state the application date and the re-entry time. FARSHA gives out signs to use.

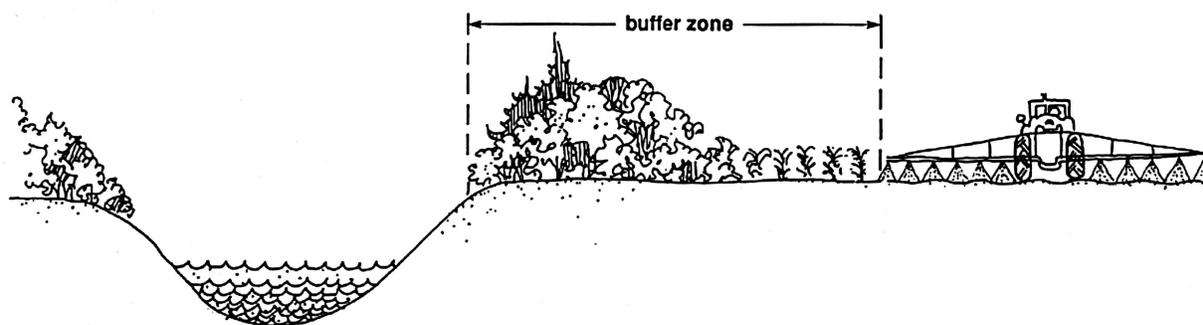
Grazing Restrictions

If animals are to graze a treated area, check the pesticide label for grazing restrictions. Wait the required time before grazing.

Harvesting Restrictions

Wait the pre-harvest interval (days to harvest) before harvesting to avoid illegal pesticide residues on crops. Pre-harvest intervals are on labels.

Buffer Zone



Special Environmental Precautions

Buffer Zones

Many pesticide labels now have buffer zone information. Buffer Zones are strips of land next to sensitive areas that cannot be treated with a pesticide. The purpose of the buffer zone is to protect sensitive areas from pesticide drift. Applicators are required to leave a buffer zone when the label says to. A buffer zone only needs to be left between the end of the spray boom and the downwind sensitive area. Labels will tell you what sensitive areas must be protected and the size of the buffer zone. Labels may require protection of water bodies (aquatic) or planted areas (terrestrial).

Protecting Fish and Other Wildlife

All insecticides, as well as some fungicides and herbicides, are very toxic to fish. Insecticides are also toxic to birds and wildlife. Exposure to trace amounts of these pesticides may kill fish or birds. Destroying the vegetation along fish-bearing water harms fish by removing food and shelter.

Protect fish and wildlife from pesticide poisoning by following label precautions, safety guidelines in the guide, and the guidelines below:

- Use pesticides only when necessary.
- Select the least toxic and least persistent pesticides.
- Leave a buffer zone along all bodies of water to keep pesticides out of the water.

- Do not destroy vegetation along fish bearing waters and do not spray with pesticide.
- Incorporate granular insecticides.
- Use precautions to prevent drift, leaching and run-off to areas outside the treated area.
- Store treated seed where it cannot be eaten by animals.
- Place baits in covered bait stations.

Protecting Bees and Beneficial Insects

Bees and other pollinating insects are essential for the production of many crops. Some other insects help control pests. Many pesticides, particularly insecticides, are very toxic to honeybees, wild bees, and beneficial insects. Refer to Best Management Considerations - Protecting Pollinating Insects on page 26.

Protecting Groundwater

Groundwater is the source of water for wells and springs. It is very difficult to clean contaminated groundwater. The best solution to groundwater contamination is prevention.

Groundwater contamination is most likely to occur where soils are gravelly or sandy, the water table is close to the soil surface, there is high rainfall or extensive irrigation, or the pesticide is injected or incorporated into the soil. Pesticides that are

persistent in the soil, are weakly absorbed and leach quickly, or are highly soluble may contaminate groundwater.

Remember to avoid spills, drift, and irrigation run off and to properly dispose of unwanted pesticides and empty containers. Never store pesticides near wells or pumphouses and guard against leaking containers.

Well construction, maintenance and location can be factors in contamination. Maintain proper seals between pump and pump base, as well as seals between well casings.

Streamside Protection

Growers are encouraged to examine their farm activities and modify any practices that could put fish habitats at risk. Some areas where risk may occur include the use of pesticides, fertilizer, manure and woodwaste.

Emergency Response

- Keep the phone numbers for Poison Control Centre, doctor, ambulance, and Provincial Emergency number for dangerous goods spills nearby (1-800-663-3456).
- Have protective gear and equipment easily available.
- Keep absorptive material, a container for contaminated waste, tools to pick up contaminated material, bleach, and hydrated lime available.

Spills

- Protect yourself.
- Keep bystanders away.
- Don't eat, smoke or drink during clean-up.
- Work upwind of the spill.
- Contain the spill. Surround and cover with absorbent material.

- Clean up the spill.
- Decontaminate the area using bleach or detergent. Absorb excess liquid with absorbent material.
- Put absorbent material in the special waste container and seal it.
- Remove and wash protective gear. Shower.
- If you need help, call the Provincial Emergency number (1-800-663-3456).
- All spills greater than 5 kg or 5 L must be reported to the Provincial Emergency Program (1-800-663-3456).

Fires

Fires involving pesticides can be very dangerous. Burning pesticides may release toxic fumes that are poisonous to firefighters, bystanders, and animals or contaminate the environment. Pressurized containers can explode. Pesticides can spill out of containers damaged by the fire. Runoff from fighting a fire can contaminate a larger area.

Ahead of time, give your fire department a list of all pesticides in storage (brand names, active ingredient, PCP #'s and quantity remaining). Update the list each year.

In case of fire, call the fire department and tell them the fire involves pesticides. Keep people and animals away.

For more information on practices to reduce the potential of fires and dealing with fires involving pesticides see the BCMAL Pesticide Wise website:

www.al.gov.bc.ca/pesticides/g_5.htm

Finding Pesticide Labels on the Internet

Pesticide labels provide important information on the crops and pests that the pesticide can be used on, the amount of pesticide that can be used, how to best use the pesticide, safety precautions for applicators and workers, as well as special environmental protection actions. Pesticide applicators are required by law, to follow directions on the pesticide label.

The labels of all pesticides registered for use in Canada are on Health Canada's Pest Management Regulatory Agency (PMRA) website at the link shown below. The complete text of the labels, including the pamphlets attached to the labels, can be read at this site.

PMRA Label Site:

http://pr-rp.pmra-arla.gc.ca/portal/page?_pageid=34,17551&_dad=portal&_schema=PORTAL

Sometimes it can be challenging to find the pesticide label you want to read on the web site. If you need instructions to find a specific pesticide label look at the top right side of the computer screen and click on "How to search product information". The computer will describe 3 ways to search for the label you want.

When searching for pesticide labels on the web, the computer will ask for certain information. This can include:

CAS Number is the Chemical Abstracts Service Registry Number. You will not need this number to search for a pesticide label as it is usually only used by scientists.

Active ingredient is the common name of the chemical that affects the pest. It is only one of the components of a pesticide product. The name of the active ingredient is found beside the word "guarantee" on the pesticide label. For example, the guarantee on the Roundup Original Liquid Herbicide label is glyphosate, 356 grams acid equivalent per litre present as isopropylamine salt. Thus the active ingredient is glyphosate.

Product Name is the name the manufacturer or registrant gives the pesticide. The product name is the most prominent part of the pesticide label. For example, Roundup Original Liquid Herbicide, Rustler Liquid Herbicide, Touchdown 480 Herbicide Liquid, and Vantage Plus Max Herbicide Solution are all different Product or Trade Names that registrants have called herbicides that contain glyphosate (active ingredient).

Registrant Name is the name of the company that asked for the pesticide to be registered. This is usually the name of the company that produces or formulates the pesticide. It is located on the front panel of the pesticide label. Examples of registrant names include: Syngenta Crop Protection Canada Inc., Monsanto Canada Inc., Dow AgroSciences Canada Inc., Cheminova Canada Inc.

Registration Number is the number Health Canada assigns the pesticide product when it is registered for use in Canada. Each pesticide has its own unique number. All pesticides used in Canada must have a registration or PCP Act number. PCP stands for Pest Control Products Act. The registration number is on the front panel of the pesticide label beside the words "Registration No."

Registration Status tells you whether the pesticide is currently registered, is exempt from registration or was registered before (historical). If you want to find a label that is no longer registered, mark "Historical".

Marketing Type is assigned to each pesticide product when it is registered. Marketing types include: "Domestic" which are designed for use around the home and garden, "Commercial" (or "Agricultural") which are designed for use by businesses such as farms, forestry, or pest control operators, "Manufacturing Concentrate" which is designed for use by registrants, "Technical Active" which is designed for use by registrants, "Restricted" which is designed for use by professionals with training, or "Historical" and is not specified. Most pesticides used in agriculture are classed "Commercial", "Agricultural" or "Restricted". Anyone purchasing or using a "Restricted" pesticide in BC must have a valid pesticide applicator certificate issued by the Ministry of Environment. The marketing type is located on the front panel of the pesticide label.

Best Management Considerations

PROTECTING POLLINATING INSECTS (HONEY BEE, LEAFCUTTER BEE, MASON BEE)

Bees are invaluable to the pollination of many crops. There are many different kinds of bees but in modern agriculture only a few species are available in sufficient numbers to meet crop pollination requirements. It is estimated that 1/3 of the human diet involves crops that are insect-pollination dependent. Of the many different kinds of bees, the honey bee is the most important pollinating insect in the world. In Western Canada only a few bee species are used in the pollination of field crops including the honey bee *Apis mellifera*, alfalfa leafcutter bee *Megachile rotundata*, and the mason bee *Osmia lignaria*. The honey bee is especially useful in the pollination of different clovers and canola-rapeseed, while the alfalfa leafcutter bee is ideally suited to pollinate alfalfa. Mason bees have a similar life cycle to alfalfa leafcutter bees but are active in cooler conditions and available from about March to June.

Care should be taken to avoid bee poisoning when applying insecticides to any crop and especially to field crops pollinated by bees. The following precautions will reduce bee poisoning:

- Do not apply insecticides on windy days to avoid drift onto hives or flowering crops.
- Do not apply insecticides that are toxic to bees during crops in bloom.
- If insecticides must be applied, apply sprays in the evening when bees are not foraging. Morning sprays could be used, but they pose a greater hazard to bees.
- In case of emergency where insecticides must be applied to a crop visited by bees, notify nearby beekeepers who may protect or move their hives.
- Whenever possible, choose the less hazardous

formulation. Liquid formulations are less toxic than powder formulations.

- Ground applications are less hazardous than aerial applications since there is little drift.
- Do not apply insecticides when temperatures are expected to be unusually low following treatment as insecticide residues will remain toxic for a longer time.

Leafcutter bees and mason bees can be protected from insecticide sprays by removing the nest blocks or closing them off. Nesting blocks can be stored in a cool room or root cellar for a few days while the field is being treated. Nesting blocks should only be moved at night when the adult bees are inside the tubular nests. Alternatively, nesting shelters of leafcutters and mason bees can be covered or closed during insecticide applications. Care must be taken not to confine the bees for too long at high temperatures as the bees may overheat. Caution should also be exercised in applying insecticides at low temperatures since pesticides break down slower. When placing leafcutters and mason bees on fields in a rotation plan, consult the Bee Toxicity table below before moving nest shelters.

Field Hazard of Insecticides to Bees

The following table indicates the maximum time required for the insecticides listed in the Guide to be degraded by weather to a low hazard level for bees. These times are to be used as general guidelines only. Most of these insecticides have not been tested under Western Canadian conditions and environmental conditions influence the rate at which pesticides degrade. This table is reproduced with permission from *Guide to Field Crop Protection*, © 2007 Saskatchewan Agriculture & Food, and Manitoba Agriculture, Food, and Rural Initiatives.

Table 3: Bee Toxicity Table

INSECTICIDE	TOXICITY RATING		RESIDUE HAZARD (Days) ^a
	Honey bee	Leafcutter bee	
Admire/Alias	1	1	?
Cygon/Lagon	1	1	10
Decis	2	2	1
Diazinon	?	?	?
Dibrom	1	1	?
Eco Bran	3	3	N/A
Furadan	1	1	5
Lannate	1	1	1.5
Lorsban/Pyrinex/Nufos/ Clorex	1	1	3.5
Malathion	2	1	2 (Honey bee) 6 (Leafcutter bee)
Matador	2	2	1
Monitor	1	1	1
Pounce	1	1	5
Ripcord	?	?	?
Sevin	1	1	7
Thiodan/Endosulfan	2	1	2

TOXICITY RATING 1 = High 2 = Moderate 3 = Low

^a Residue hazard represents the average time (days) that residues poisonous to bees will remain on the foliage. Most of this information has not been generated under Western Canadian growing conditions and should only be used as a guideline.

[?] Information not currently available, although these products are known to be toxic to bees.

