CHAPER 10 METRIC CONVERSIONS

Metric	Imperial Equivalent
2.5 µm	1/10,000 inch
4 m	13 feet
100 m	330 feet
500 m	1,650 feet
1 km	0.6 mile

Conversions in this table are rounded to a convenient number.
See Appendix E for exact conversion factor.

Values from tables and examples are not included in Metric Conversions

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CHAPTER 10

AIR

INTRODUCTION

This chapter discusses beneficial management practices for protection of air quality. It contains introductory information on the relationship between agriculture and air quality. It also contains information on concerns, legislation and beneficial management practices related to:

- Air emissions;
- Dust and particulate;
- Odours;
- Open burning.

This chapter addresses environmental concerns related to poor air quality, whereas Chapter 12 addresses environmental concerns related to climate change. Poor air quality and climate change are different phenomena, but the emission sources which cause both of these environmental issues may be similar. Taking actions to reduce air emissions from agricultural sources may help improve air quality and address climate change.

For information on these concerns:

➔ see Air Emissions, **page 10-6**

➔ see Impacts of Agriculture's Contribution to Climate Change, **page 12-5**

Air emissions versus air contaminants: what's the difference? In this document, an air emission refers to a substance introduced into the air that may or may not be an air contaminants as defined under the *Environmental Management Act*. All air contaminants are air emissions, but air emissions are not necessarily air contaminants. "Criteria air contaminants" is a term that is used in **Table 10.1** to refer to a group of seven specific substances.

AIR CONTAMINANTS

The key air emissions that affect air quality are gaseous emissions, dust and particulates. These substances can affect human health and the environment as well as contribute to climate change.

- BC State of the Air
- BC Air Quality Website
- Government of Canada Health Effects of Air Pollution Website.

Common Air Emissions

The following air emissions are listed in alphabetical order. While air quality can be influenced by agricultural production, it also may be influenced by many other human activities and natural phenomena.

Ammonia (NH_3). Ammonia easily volatilizes from urine, manure, fertilizer, compost and crop residues. Agriculture is the largest emitter of ammonia to the air both in BC and globally. Ammonia contributes to reduced visibility by reacting with other chemicals in the air to form fine particulate matter (i.e., ammonium sulphate and ammonium nitrate). Elevated levels of fine particulate matter are a concern to human health and reduce visibility in the Fraser Valley and other regions of B.C.

Carbon Monoxide (CO). Carbon monoxide originates mainly from the combustion of fuels used to heat buildings and greenhouses, and from farm equipment (both biomass and fossil fuels). The effects of carbon monoxide tend to be localized; at high concentrations the gas can cause asphyxiation, and at lower levels it produces symptoms of impaired perception and reflexes. Carbon monoxide also contributes to smog formation, but to a much lesser degree than nitrogen oxides or volatile organic compounds.

Nitrogen Oxides (NOx). Nitrogen oxides aid in the production of ground level ozone, a known respiratory irritant and crop growth retardant. Nitrogen oxides also contribute to acid rain production. Nitrogen oxides like carbon monoxide and sulphur oxides originate mainly from the combustion of fuels used to heat buildings and greenhouses, and from farm equipment (both biomass and fossil fuels).

Ozone (O_3). Ozone is unique among the atmospheric gases in that in the upper layers it is beneficial whereas near ground level, it is a indirect pollutant. Ground-level ozone is primarily formed by the reactions of other pollutants such as nitrogen oxides and volatile organic compounds. Both ground-level ozone and particulates contribute to smog formation, which has detrimental effects on the human cardio-respiratory system and on crop productivity. Human caused emissions have tended to deplete ozone in the upper atmosphere while increasing its concentration at ground level.

Sulphur Oxides (SOx). Sulphur oxides originate mainly from the combustion of fuels (both biomass and fossil fuels) used to heat buildings and greenhouses, and from farm equipment. Sulphur dioxide (SO_2) can damage vegetation and can have negative effects on the human cardio-respiratory system. Sulphate (SO_4^{2-}) reacts with other chemicals in the air to form, among other things, ammonium sulphate which contributes to acid rain and is also a major component in the formation of fine particles within the atmosphere.

Volatile Organic Compounds (VOC). Volatile organic compounds are released from various types of manure, petroleum products, and some types of pesticides. They are also emitted by plant production and many natural processes. Many volatile organic compounds and nitrous oxides aid in the production of ground level ozone, a known respiratory irritant and crop growth retardant. Volatile organic compounds can be a source of odours and also contribute to the formation of fine particulate matter, causing health and visibility concerns. Non-Methane Volatile Organic Compounds (NMVOC) are VOC without methane.

Dust and Particulates

The term "dust" is used to describe a range of particles sizes of material which can be transported by air. Dust has strict definition based on particle size, however in many instances when dust particles are transported in the air they are in close association with a wide range of particles including water molecules. At the particle size that is likely to cause pollution, irritation or nuisance, most of these particles (i.e., dust, mist, aerosol, or smoke) cannot be differentiated. The human sensory system can detect some of these particle sizes by sight and others by taste or touch, but it is dusts which obscure visibility and accumulate on surfaces which are considered as a nuisance.

Particulate matter is the tiny solid or liquid particles that float in the air. Some particles are large or dark enough to be seen as smoke, soot or dust. Others are so small that they can only be detected with an electron microscope.

Types of particulate matter:

1. Primary:

- Emitted directly into the atmosphere by wood and fossil fuel burning;
- Includes pollen, spores and road dust;

2. Secondary:

- Formed in the atmosphere through chemical reactions involving nitrogen dioxide, sulphur dioxide, volatile organic compounds and ammonia.

Particulate matter (PM) is measured in microns (one millionth of a metre). PM can make lakes and other sensitive areas more acidic, causing changes to the nutrient balance and harming aquatic life.

PM_{10}

- **Description**: particulate matter less than 10 microns and invisible to the naked eye and small enough to inhaled into our nose and throat.
- **Sources**: road dust, road construction, mixing and applying fertilizers/ pesticides, forest fires.
- **Health impact**: coarse particles irritate the nose and throat, but do not normally penetrate deep into the lungs.
- **Environmental impact**: PM is the main source of haze that reduces visibility. It takes hours to days for PM_{10} to settle out of the air.

$PM_{2.5}$

- **Description**: particulate matter that measures 2.5 microns and less.
- **Sources**: combustion of fossil fuels and wood (motor vehicles, woodstoves and fireplaces), industrial activity, garbage incineration, agricultural burning.
- **Health impact**: fine particles are small enough deep into the lungs. They are associated with all sorts of health problems — from a runny nose and coughing, to bronchitis, asthma, emphysema, pneumonia, heart disease, and even premature death.
- **Environmental impact**: $PM_{2.5}$ is the worst public health problem from air pollution in the Province, and because of its small size, takes significantly longer than PM_{10} to settle out of the air.

Greenhouse Gases (GHG)

When the sun's rays strike, the light energy is converted into heat energy which in turn is radiated back into the atmosphere. Certain gases called 'Greenhouse Gases' (also known as Global Warming Gases) absorb some of this heat energy, resulting in a warming of the earth's atmosphere. This is known as the greenhouse effect. Greenhouse gases such as carbon dioxide, methane, nitrous oxides and other gases are discharged by many human activities, including agriculture. Agriculture can be a net source of greenhouse gases or a net 'sink' by employing beneficial practices that minimize fossil fuel use and sequester carbon in soil and stewardship areas of the farm. When we manage agricultural air emissions we also reduce the release of GHGs.

For information on these concerns:

➔ see Climate Change Mitigation, **page 12-7** and Climate Change Adaptation, **page 12-15**

Trends in Greenhouse Gas Emissions in BC

Carbon Dioxide (CO_2). CO_2 is a greenhouse gas produced by the combustion of fossil fuels and biomass. CO_2 is a major contributor to the greenhouse effect and is therefore associated with climate change. Trees, vegetation and soil organic matter can remove CO_2 from the atmosphere and store as carbon. The use of gas and diesel engines and the burning of vegetation are major sources of on-farm CO_2 emissions.

Methane (CH_4). Methane is a powerful greenhouse gas produced during anaerobic decomposition (decomposition in the absence of oxygen) of organic wastes such as manures. Animals, particularly ruminants, emit methane gas that contributes to the greenhouse effect. Methane has approximately 25 times greater global warming potential than CO_2.

Nitrous Oxide (N_2O). Nitrous oxide is a very powerful greenhouse gas produced in the soil from the biochemical reduction of nitrate to gaseous nitrogen compounds, a process known as denitrification. Nitrous oxide has approximately 300 times greater global warming potential than CO_2.

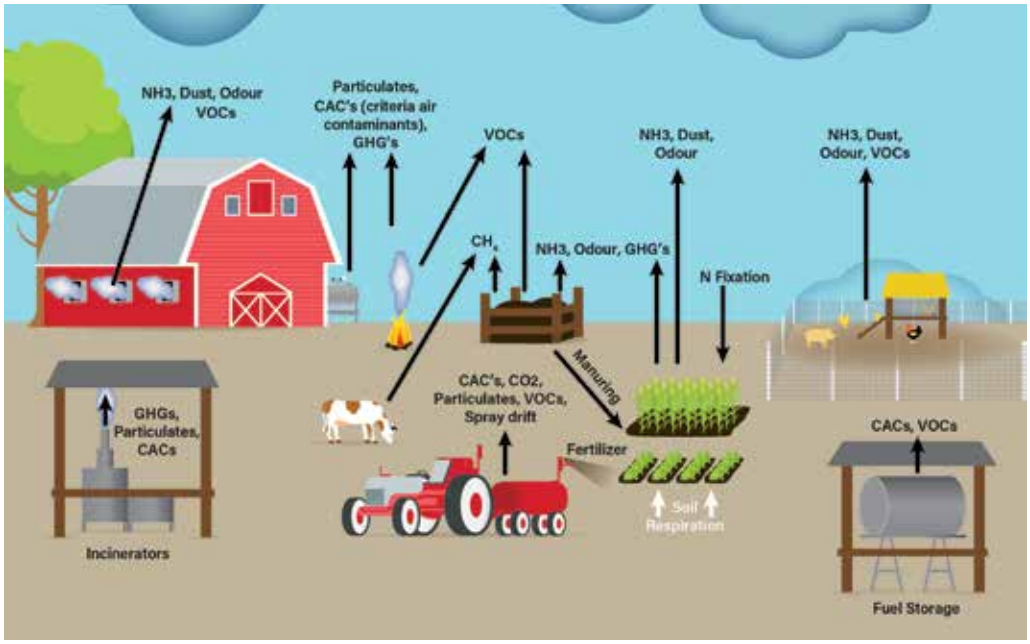


FIGURE 10.1 Farm emissions sources
NMVOC = Non Methane Volatile Organic Compounds

IMPACTS ON AIR QUALITY

Heat Production and Agriculture Boilers

Heat is used in greenhouse production, animal housing and for general space heating. Traditional fuel sources for boilers include natural gas and in some cases, coal. These fuel sources are being replaced by biomass and subsequently new regulations that set standards for air quality have been implemented. Burning biomass in boilers produces particulate matter, CO_2 and other air contaminants. There are several ways to reduce the impact of biomass boilers with emission control technology and beneficial management practices.

➔see Heat Production and Agricultural Boilers, **page 2-61**

Indoor Poultry and Livestock Housing

Indoor poultry and livestock housing contribute to dust, PM, and ammonia ($NH_{3)}$ emissions, as well as odour that occurs outside of the animal housing area. In animal facilities, ammonia results primarily from the breakdown of manure. Undigested feed protein and wasted feed are additional sources of ammonia in animal production systems. Strategies to reduce ammonia from animal housing focus primarily on preventing ammonia formation and volatilization, or downwind transmission of ammonia after it is volatilized.

➔see Indoor Poultry and Livestock Housing, **page 3-3**

Manure Handling and Storage

The main pollutants associated with the production and handling of manure are methane (CH_4), NH_3 and nitrous oxide (N_2O). Methane is produced under anaerobic conditions during the microbial breakdown of organic compounds in manure. Manure handled as liquid or slurry will emit methane. Manures handled as a solid will have a lesser moisture content and will emit less methane if kept dry. Ammonia is produced in the decomposition of the organic nitrogen compounds in manure. Methane and ammonia are present during both storage and handling of manure. N_2O emissions occur mainly from manure application to soils. N_2O emissions will be significant if the manure is first handled dry and then handled wet. VOCs are also formed from the breakdown of manure both anaerobically and aerobically.

Noise

For the purposes of this publication, noise is considered a nuisance, not an environmental concern. Noise generated by farm activities has the greatest potential for creating nuisance in densely populated areas where farm sites are developed near property boundaries.

Nutrient and Chemical Applications

Pathogens. Many organic wastes, including manures, contain micro-organisms such as bacteria, viruses and parasites. Some of these micro-organisms may be pathogenic (disease causing) to animals of the same or of a different species. Many diseases are transmissible between animals and human beings. Most pathogens die off rapidly when dried or exposed to sunlight. However, there are some that can remain infectious in the air over extended distances and periods of time.

Pesticides. Pesticides include insecticides, herbicides, fungicides and rodenticides. The application of pesticides can result in the formation of spray droplets, mists, or dusts. These airborne particles are prone to drift and can be transported over many kilometres to contaminate other properties. In addition, these pesticide particles may be hazardous to non-target organisms. Applicators and workers may be affected if restricted entry intervals as specified on labels are disregarded.

Active ingredients within some pesticides are volatile and can evaporate from target areas and move with air currents to unwanted locations.

Odours

The handling, storing and composting of wastes; the application of manure and pesticides; and the decomposition of crop wastes can create odours that are offensive to neighbours. Odours, which are generated by farming activities in compliance with the *AEM Code* and with the practices outlined in this publication, should be considered nuisances rather than health hazards.

Open Burning

Open burning produces many harmful air emissions. Smoke from the open burning of vegetation and wood introduces a range of contaminants into the air, including particulate matter, carbon dioxide, carbon monoxide, nitrogen oxides, and hydrocarbon compounds.

In agriculture, ash and dust particulates are introduced into the air mainly by open burning of plant prunings and other similar materials. Fly ash, a term for the larger particulates in burning emissions, can create aesthetic concerns and nuisance complaints. Open burning of plastics and other specific wastes as defined by the *Open Burning Smoke Control Regulation* and *Waste Discharge Regulation* Schedule 1, SECTION 2, is prohibited. Burning prohibited materials produces many harmful air emissions that can cause localized environmental problems and health impacts.

Poor management of open burning and lack of fuel management on the farm or ranch could also result in an uncontrolled wildfire, with the risk of catastrophic impacts on the farm operations and surrounding areas.

AIR EMISSIONS

AIR EMISSION ENVIRONMENTAL CONCERNS

Primary environmental concerns related to air emissions from agriculture are:

- Pollution caused by fossil fuel combustion, wood burning, livestock emissions, waste disposal, soil emissions, and manure handling which results in the following:
  - Release of ammonia (NH_3), sulphur oxides (SO_x), volatile organic compounds and nitrogen oxides (NO_x) which can chemically produce secondary particulate which poses a risk to human health and reduces visibility.
  - Release of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) (i.e., manure, petroleum) that create ground level ozone and lead to the formation of smog which is a concern to human and vegetative health.
  - Release of greenhouse gases, mainly carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which are linked to global climate change.

ENV has jurisdiction over air emissions via the *Environmental Management Act*. Under the *Environmental Management Act*, Metro Vancouver has been delegated authority to manage air quality within its boundaries.

Learn more about Metro Vancouver's Air Quality Regulatory Program on

Metro Vancouver Air Quality Website

Metro Vancouver Ambient Air Quality Objectives

The Province has developed an Air Quality Regulatory Framework which is a series of regulations, codes and acts that set standards for air quality emissions from business and industry in British Columbia.

Air quality objectives are limits on the acceptable presence of particular substances in the atmosphere. These are established by government agencies to protect human health and the environment. Objectives and standards are used to guide air management decisions.

BC Government Air Quality Objectives and Standards

BC has adopted air quality objectives and standards for a number of substances, including: particulate matter $(PM)_{10}$, $PM_{2.5}$, ozone, sulphur dioxide, nitrogen dioxide and carbon monoxide. They are generally expressed in terms of a concentration (e.g., micrograms per cubic metre, or parts per billion) measured over a specific period of time (e.g., one hour, 24 hours or one year). Objectives are one kind of "criteria." Criteria also include standards, guidelines and planning goals.

They are typically used to:

- Assess current or historical air quality;
- Guide decisions on the permitting of new or modified facilities;
- Guide decisions on episode management, such as air quality advisories;
- Develop long-term air-management strategies and evaluate progress, and
- Aid regulatory development.

AIR EMISSION LEGISLATION

The following is a brief outline of the main legislation that applies to air emissions.

➔ see **page A-1** for a summary of these and other Acts and Regulations

Local Bylaws

Regional and municipal governments can pass bylaws to control emissions such as backyard and open burning, wood stoves and vehicle idling. These governments can also address air pollution through land-use and transportation planning, regional growth strategies and sustainability plans. Local Governments can put in place bylaws that restrict air emissions from industrial and business operations. Farms are not necessarily exempt from these local bylaws, particularly smoke control bylaws, and operators should check with their local or regional government. Local bylaws can be more restrictive than provincial regulations. For instance, a municipality or regional district can have a 'fire' bylaw that covers open burning. Local governments often have a burn ban at certain times of the year for fire safety reasons. Check with the local government office or the fire department to find out about the rules and restrictions. A permit may be required. A permit for burning diseased material may be given during restricted times in extreme circumstances, check with the local fire department about potential exemptions from the local bylaw.

Environmental Management Act

According to this Act, "air contaminant" means a substance that is introduced into the air and that

(a) Injures or is capable of injuring the health or safety of a person,

(b) Injures or is capable of injuring property or any life form,

(c) Interferes with or is capable of interfering with visibility,

(d) Interferes with or is capable of interfering with the normal conduct of business,

(e) Causes or is capable of causing material physical discomfort to a person, or

(f) Damages or is capable of damaging the environment.

The *Code of Practice for Agricultural Environmental Management* (AEM Code of Practice) requires persons to use environmentally responsible and sustainable agricultural practices when carrying out agricutural operations, for the purpose of minimizing the introduction of waste into the environment and preventing adverse impacts to the environment and human health. The Code of Practice includes requirements which address air emissions from agricultural activities.

Requirements for boilers and heaters are outlined in Part 2 and 3 of the AEM Code of Practice. Part 2 SECTIONS 4 and 5 note the requirements and exemptions from registration with ENV. Part 3 includes more specific requirements for the operation of boilers and heaters with respect to air emissions.

- Part 3 includes requirements for the type of fuel for a boiler or a heater (SECTION 9), opacity limits (SECTION 10) and particulate matter limits (SECTION 11).
- If corrective actions are required to address emission opacity or particulate matter, corrective actions are required by SECTION 12.
- Records keeping for biomass fuelled boilers and heaters is specified in SECTION 14.

Part 3 of the AEM Code of Practice contains general requirements in SECTION 6 for ensuring that air contaminants from forced air ventilation systems do not enter a watercourse or cross a property boundary. Similarly, other sections of the AEM code stipulate that certain activities, processes or structures be managed to ensure that air contaminants do not cross a property boundary. These include stored by-products (SECTION 34), composting (SECTION 40), confined livestock or poultry areas (SECTION 62), mortality and processing wastes (SECTION 68).

SECTION 75 of the AEM Code of Practice specifies requirements for incinerators used to dispose of mortalities and solid or semi-solid waste from slaughter. The incinerator must be designed for the disposal of mortalities and meet specific limits for particulate matter emissions and opacity.

Under the *Environmental Management Act*, local governments may be delegated authority to manage air quality within their boundaries. For example, Metro Vancouver has been delegated authority to manage air quality within its boundaries. It administers laws that regulate emissions from industrial, commercial and industrial sources, through permits, compliance promotion and enforcement.

The Act also enables the Province to regulate the emissions from industrial and business operations through the issuance and enforcement of air emission permits.

The *Open Burning Smoke Control Regulation* governs smoke from open burning of vegetative debris from smoke sensitivity zones, agriculture, forestry, land development, and individual property owners. It sets conditions such as setbacks, smoke release periods and venting conditions that must be met. The Regulation enables compliance and enforcement and the ability to issue fines.

The *Waste Discharge Regulation* regulates various industries and their waste discharges into the environment. It prohibits certain materials from being burned and/or incinerated and exempts industries who discharge wastes in accordance with applicable codes of practice from SECTION 6(2) and (3) of the *Environmental Management Act*.

Motor Vehicle Act

The *Motor Vehicle Act* is administered by the Ministry of Transportation and Infrastructure and requires emission control devices on certain heavy diesel vehicles in the Province.

As of October 1, 2010, in accordance with the *Motor Vehicle Act*, heavy diesel vehicle emission control devices must be installed on all BC registered commercial diesel vehicles of model years 1989-1993 with a Licensed Gross Vehicle Weight (LGVW) of more than 8,200 kg. Farm vehicles with a LGVW under 17,300 kg are exempt from these retrofit requirements.

Canadian Environmental Protection Act

The federal government's role in addressing air quality issues is defined through the *Canadian Environmental Protection Act*. Administered by Environment and Climate Change Canada with Health Canada, this Act applies to all lands in Canada and concerns toxic substances, hazardous materials, new substances, export and import of substances, fuels, international air pollution, ocean disposal, etc. Many emission sources that lie beyond provincial authority are subject to federal regulation, standards and guidelines. These include motor vehicles and fuels, marine vessels, railways and off-road engines applicable to agricultural vehicles.

The *Off-Road Compression-Ignition Engine Emission Regulation* introduces emission standards for diesel engines used in off-road applications such as those typically found in construction, mining, farming and forestry. Emissions from engines used in agriculture that are newer than 2006 are subject to the regulation.

➔ see Climate Change Mitigation Legislation, **page 12-7**

➔ see **page A-1** for a summary of these and other Acts and Regulations

AIR EMISSION REDUCTION BENEFICIAL MANAGEMENT PRACTICES

Proper management of manure, crops, nutrients and machinery will greatly assist in reducing pollution causing air emissions from farm operations. Poor air quality and climate change are different phenomena, but their causes are similar. Taking actions to reduce the pollution from agricultural sources will help improve air quality and address climate change.

Comply with applicable air emission related legislation, including the above, and where appropriate, implement the following beneficial management practices to reduce air emissions from agriculture.

Table 10.1 outlines some common farm practices and the resulting air emission(s). The table will help to determine the positive impact that the following beneficial management practices will have on reducing air emissions from agriculture.

TABLE 10.1 Agricultural Air Emission Sources

Practice	Ammonia	Dust	Particulates	GHG	Odour	Criteria Air Contaminants Particulate matter, Sulphur Oxides, Nitrogen Oxides, Volatile Organic Compounds, Carbon Monoxide
Livestock and poultry housing (exhaust fans)	✓	✓	✓	✓	✓	
Poultry barn clean out		✓	✓		✓	
Manure storage	✓			✓	✓	
Manure spreading	✓	✓	✓		✓	
Manure injection				✓		
Open burning		✓	✓	✓	✓	✓
Dry field tillage		✓	✓	✓		
Diesel use			✓	✓		✓
Fuel use			✓	✓		✓
Using boilers for heat production			✓	✓		✓
Incinerators			✓	✓		✓
Turning of compost windrows	✓		✓	✓		✓
Grazing ruminants				✓		

Air Emissions Reduction

Implement the following practices to reduce air emissions:

- Maximize the use of renewable energy, such as electricity, wind or solar,

  ➔ see Climate Change Mitigation Beneficial Management Practices, **page 12-9,** and refer to On-Farm Energy Production;
- Use energy-efficient equipment and operating practices;
- Use high efficiency motors and pumps;
- Use efficient irrigation equipment to reduce pumping energy requirements;
- Maintain engines in efficient running order;
- Use energy saving practices to reduce fuel usage by farm machinery:
  - Avoid unnecessary idling;
  - Keep tires inflated at optimum tire pressure.
- Graze livestock rather than growing forages that require transport to separate feeding areas or feedlots;
  - Reduce tillage and therefore reduce the use of machinery and the fossil fuel used for equipment.
- Keep internal combustion engines well maintained and include emission control devices if necessary (such as air filters, diesel injectors or catalytic converters).
  - For compliance with the *Motor Vehicle Act* diesel retrofit requirements, emission reduction devices are verified by the following agencies:

  ➔ see Air Emission Legislation, **page 10-7**
- Use appropriately sized and efficiently operated heating plants for greenhouse and other production facilities.
  - Use energy management systems that ensure optimization of temperature and humidity.
  - If used, ensure solid fuels have optimum moisture content (less than 20% moisture, suggested).
  - Implement rigorous maintenance programs for all heating system components, particularly for solid fuel boilers.
  - Ensure that biomass fuelled boilers meet emission testing requirements.

  ➔ see Climate Change Mitigation Beneficial Management Practices, **page 12-9**, and refer to Energy Conservation and Fuel Switching,
- Change livestock feed rations to:
  - Reduce nitrogen content of excretions thus reducing ammonia emissions.
  - Reduce methane emissions.
- Use nutrient application handling practices that minimize emissions and drift:
  - During strong, divergent windy conditions apply nutrients below the soil surface or a crop canopy having a height of at least 8 cm.
  - Make more frequent manure applications at lower application rates using sleighfoot or shallow injection equipment for more efficient use of nitrogen.
  - Use covered manure storages to reduce methane and ammonia emissions.
  - Use solid rather than liquid manure handling systems.

  ➔ see Manure Gas Emissions Reduction, **page 3-42**
- Use drainage or irrigation systems to optimize soil water content.

  Drainage Management Guide

  B.C. Irrigation Management Guide;

- Apply nutrients and manure efficiently to match crop needs.

  Nutrient Management web page;

- Establish and maintain adequate windbreak or shelterbelt buffers around farm buildings and livestock facilities to improve energy efficiency reduce drift and minimize emissions of particulate matter, pesticides and odorous compounds.

  ➔ see Buffers, **page 11-4;**

- Increase carbon within the soil to reduce carbon entering the atmosphere.
  - Increase soil organic matter,
  - Minimize cultivation,
  - Grow perennial crops,
  - Avoid the burning of crop residue, and incorporate residues into soils.
- Follow beneficial management practices for open burning.

  ➔ see Open Burning Beneficial Management Practices, **page 10-26**

Ozone Production Reduction

Ozone is a secondary pollutant formed mainly from VOCs reacting with other substances in the atmosphere. Ground level ozone can have a negative impact on crop production. To reduce ozone production, reduce VOC production and reduce the production of NOx.

Ammonia Emissions Reduction

Agriculture is the largest emitter of ammonia to the air both in BC and globally. Ammonia easily volatilizes from urine, manure, fertilizer, compost and crop residues. It contributes to reduced visibility and reacts with other chemicals in the air to form secondary particulate matter, (i.e., ammonium sulphate and ammonium nitrate). These compounds are a major component of fine particulate matter in the air of the Fraser Valley. Elevated levels of fine particulate can reduce visibility and are a concern to human health.

➔ see Manure, **page 3-42**, and refer to Manure Gas Emission Reduction

➔ see Nutrient Application, **page 6-1**, and refer to Field Spreading Emission Reduction

VOC Emission Reduction from Fuel Evaporation

Fuel evaporation during storage results in VOC emissions and is an environmental concern. Evaporation from aboveground tanks is due to heating of the tank by the sun which causes the fuel to volatilize and vent to the atmosphere. Underground tanks have lower evaporation losses.

➔ see Petroleum Beneficial Management Practices, **page 2-35** and refer to Petroleum Storage

Farm Storage and Handling of Petroleum Products

DUST AND PARTICULATE

DUST & PARTICULATE ENVIRONMENTAL CONCERNS

Dust can result from many farm practices and could be a source of complaint concerning farm activities. The human sensory system can detect some of these particle sizes by sight and others by taste or touch, but it is dusts which obscure visibility and accumulate on surfaces which are considered as a nuisance. There is a fine line in references as to when a dust changes from being a nuisance to being a pollutant.

Particulate matter is the tiny solid or liquid particles that are mush smaller then dust. They result from animal bedding and manures, burning, fuel usage and tillage. Particulate like dust can be considered a nuisance but can also be considered a pollutant when it travels distances or is not controlled through good production practices.

Primary environmental concerns related to dust and particulate are:

- Release of mineral or organic compounds that contribute to particulate or secondary particulate formation that results in:
  - Health risks when inhaling the particulate;
  - Visual impairment such as smog from the particulate in the outdoor (ambient) air.
- Wind erosion causing dust to be transported to other areas and cause damage, such as:
  - Waterways, causing impacts to fish;
  - Farm fields, creating a dust cover on crops; and;
  - Residential areas, creating visibility and breathing concerns.

For information on these concerns:

➔ see Air Emissions, **page 10-12**, and refer to Dust and Particulate

DUST & PARTICULATE LEGISLATION

The following is a brief outline of the main legislation that applies to dust and particulate.

➔ see **page A-1** for a summary of these and other Acts and Regulations

Local Bylaws

Regional and municipal governments can pass bylaws to control emissions from activities such as backyard and open burning, wood stoves and vehicle idling. These governments can also address air pollution through land-use and transportation planning, regional growth strategies and sustainability plans. Permits may be given by local governments that restrict emissions from industry and business operations. Farms are not necessarily exempt from these local bylaws, particularly smoke control bylaws, and operators should check with their local or regional government. Local bylaws can be more restrictive than provincial regulations. For instance, a municipality or regional district can have a 'fire' bylaw that covers open burning. Local governments often have a burn ban at certain times of the year for fire safety reasons. Check with the local government office or the fire department to find out about the rules and restrictions. A permit for burning diseased material may be given during restricted times in extreme circumstances, check with the local fire department about potential exemptions from the local bylaw.

Environmental Management Act

SECTION 6(5) of the *Environmental Management Act*: states that "nothing in this section or in a regulation... prohibits"

- (6)(i): Emission into the air of soil particles or grit in the course of agriculture or horticulture.

The Act is unclear on whether the release of "organic dust" from livestock barns through ventilation systems or from activities associated with grain cleaning and handling requires a discharge permit. However, regardless of permit requirements, pollution must not occur from any emission into the air.

The *Code of Practice for Agricultural Environmental Management* requires persons to use environmentally responsible and sustainable agricultural practices when carrying out agricultural operations, for the purpose of minimizing the introduction of waste into the environment and preventing adverse impacts to the environment and human health. The AEM Code of Practice includes requirements which address air emissions from agricultural activities.

Requirements for boilers and heaters are outlined in Part 2 and 3 of the AEM Code of Practice. Part 2 sections 4 and 5 note the requirements and exemptions from registration with ENV. Part 3 includes more specific requirements for the operation of boilers and heaters with respect to air emissions.

- Part 3 includes requirements for the type of fuel for a boiler or a heater (SECTION 9), opacity limits (SECTION 10) and particulate matter limits (SECTION 11).
- If corrective actions are required to address emission opacity or particulate matter, corrective actions are required by SECTION 12.
- Records keeping for biomass fuelled boilers and heaters is specified in SECTION 14.

SECTION 6 of the AEM Code of Practice has requirements for ensuring that air contaminants from forced air ventilation systems do not enter a watercourse or cross a property boundary. Similarly, other sections of the AEM Code of Practice stipulate that certain activities, processes or structures be managed to ensure that air contaminants do not cross a property boundary. These include stored by-products (SECTION 34), composting (SECTION 40), confined livestock or poultry areas (SECTION 62), mortality and processing wastes (SECTION 68).

SECTION 75 of the AEM Code specifies requirements for incinerators used to dispose of mortalities and solid or semi-solid waste from slaughter. The incinerator must be designed for the disposal of mortalities and meet specific limits for particulate matter emissions and opacity.

Farm Practices Protection (Right to Farm) Act

This Act protects farmers from liability in lawsuits alleging nuisance associated with dust resulting from the farm operation when they meet certain regulatory conditions.

The *Farm Practices Protection (Right to Farm) Act* (FPPA) provides that a farmer is not liable in nuisance to any person for any odour, noise, dust or other disturbance resulting from that farm operation. However, for this protection to apply, the farmer must comply with the *Environmental Management Act* (EMA), among other things. The applicability of a burning bylaw to a farm operation in relation to the (FPPA) depends on the location of the farm and the local authority under which the bylaw was prepared.

DUST & PARTICULATE BENEFICIAL MANAGEMENT PRACTICES

Suppression measures to prevent the release of dust from livestock barns and fields will contribute significantly towards reducing the potential for pollution and complaints. Comply with applicable dust related legislation, including the above, and where appropriate, implement the following beneficial management practices to protect the environment.

Dust Suppression

Dust can result from a variety of farm practices and can be a nuisance to neighbours. Several measures can be taken to reduce the amount of dust generated from farm activities. Implement the following practices for dust suppression:

- Avoid cultivation in situations where the soil will become or is excessively dry.
- Minimize the amount of time soil is left bare in fields.
- Evaluate and modify activities that may create dust such as tillage, harvesting, grain handling, livestock handling, feed processing.
  - Work soils when moisture conditions are least likely to generate dust.
  - Practice minimum tillage.
  - Bale straw instead of chopping.
- Choose manure application methods that apply manure directly to the soil rather than into the air.
- Change bedding in livestock housing on a regular basis to reduce dust accumulation.

➔ see Indoor Poultry and Livestock Housing, **page 3-2**

- Choose cropping, crop residue and cover crop management practices that minimize soil loss by wind erosion.

➔ see Soil Erosion Risk, **page 8-12**

- Design ventilation structures to deliver emissions either to the ground or to the air in a manner that reduces dust drift.
- Chose spray equipment which places spray on the target rather than into the air when there is a risk of drift.

➔ see Pesticide Use, **page 5-25**

Farm Nuisance-Dust

Particulate Suppression

Particulate matter can remain suspended in the air. Implement the following practices for particulate suppression:

- Avoid burning crop residue or land clearing, chop the crop residue instead and apply it to the land

➔ see Open Burning, **page 10-22**

- Maintain general sanitation and housekeeping in livestock housing.

➔ see Indoor Poultry and Livestock Housing, **page 3-2**

- Reduce ammonia production that leads to secondary particulate formation.

➔ see Manure Handling and Storage Beneficial Management Practices, **page 3-30** and refer to Nutrition and Ration Management

Management of Dust in Broiler Operations

Siting and Management of Poultry Operations

Farm Practice Factsheet: Ventilation

Fine Particulates – What They are and How They Affect Us

BC Agriculture Air Management Website

Dust and Particulate Capture

Some sources of particulates can be controlled using emission control devices to catch dust and particulates. This can be used for ventilated animal housing, boilers and internal combustion engines.

- Keep internal combustion engines well maintained and include emission control devices if necessary (e.g., air filters, diesel injectors or catalytic converters).
- Install chemical or wet scrubbers or cartridge filters on building ventilation fans.
- Install dust suppression system, such as an electrostatic precipitators, that will reduce airborne particulates and exhausted particles.
- Install bio-filters on animal housing to reduce dust and odours.
- install vegetative filters to provide capture of dust at exhaust fan outlets.

➔ see Indoor Poultry and Livestock Housing, **page 3-2**, and refer to Protection of Air Quality

- Install emission control devices on biomass burners.
  - Visually assess the opacity of emissions from the boiler or heater at least once each day that it is operating and during any start up and shutdown procedures.
  - Conduct regular testing of emissions of particulate matter from boilers or heaters that are using biomass as fuel.
- Install secondary burners on mortality incinerators.
  - Visually assess the opacity of emissions from the incinerator at every 12 hours that it is operating and during each burn cycle.
- Keep proper records operating a biomass boiler or heater, or mortality incinerator.
- Use greenhouse boilers with low particulate generation.
  - Ensure solid fuels have optimum moisture content (< 20% moisture content, suggested).
  - Implement a rigorous maintenance program for all heating system components, particularly for solid fuel boilers.

➔ see Heat Production and Agricultural Boilers, **page 2-58**

- Develop wind screens, breaks or strategies to reduce dust movement off the property.

Vegetative Buffers

Vegetative buffers around farm buildings and farm activities can be used to catch dust and particulates before they become problems in other areas. Vegetative buffers address some issues better than others. The potential effectiveness of properly designed, healthy vegetative buffers to address various objectives (**Figure 10-2**) is compared in **Table 10.2**.

Dust mitigation: Vegetative buffers act as a filter by collecting dust and changing airflow patterns.

Odour mitigation: Odour plumes often occur at ground level and may be partly mitigated by buffers. Odours are often attached to the dust and particulate coming from livestock barns, so controlling the dust will help to minimize the odours fom livestock operations. Visual screening also reduces the perception of odour, which is an important aspect of odour mitigation.

Pesticide drift mitigation: Spray drift occurs when spray droplets are transported by air currents during pesticide application. Vegetative buffers intercept and capture spray droplets. Research has shown that with a proper design, a vegetative buffer can reduce pesticide drift by 50-90%.

TABLE 10.2	Relative effectiveness of vegetative buffers	
Objective (issue being addressed)		Relative Efficacy
Primary objective	Pesticide drift mitigation Dust mitigation Odour mitigation	High Moderate – high Low – moderate
Secondary objective	Visual screening/aesthetics Energy efficiency Noise and light reduction Biodiversity/riparian enhancement	High Moderate Low Low

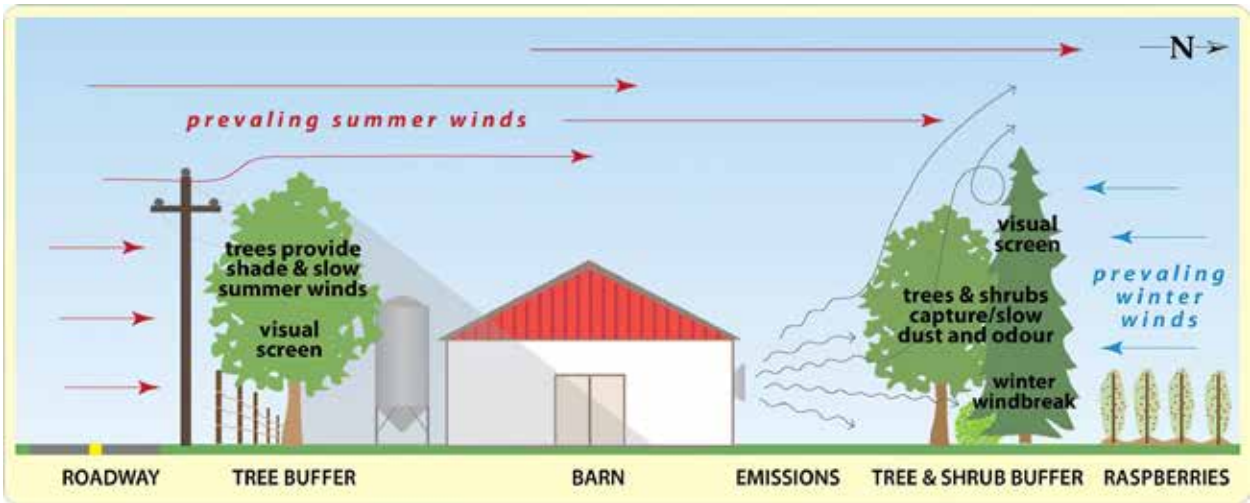


FIGURE 10.2 Example of vegetative buffer objectives.

Vegetative Buffers Intensive Agricultural Operations in BC

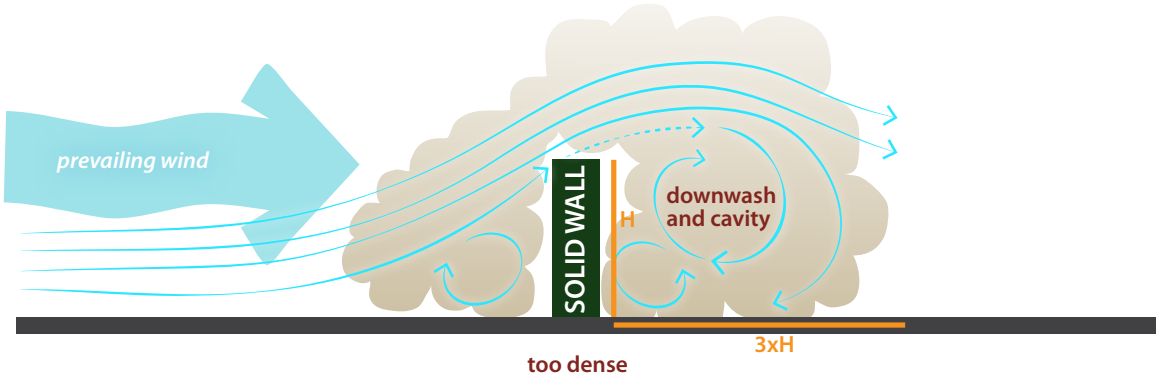


FIGURE 10.3 Effect when buffer vegetation is too dense (low canopy porosity)

ODOURS

ODOUR ENVIRONMENTAL CONCERNS

Vegetative buffers around farm buildings and farm activities can be used to catch dust and particulate and also odor and spray drift before they become problems in other areas. Vegetative buffers are trees or vegetation areas that are designed in interface areas to intercept the airflow to capture the dust/odour or pesticide. Refer to the vegetative buffer guidebook for detailed information on how to plan and design a buffer for an interface area. Primary environmental concerns related to farm odours are:

- Direct odours and particulate carrying odorous compounds that come from animal housing areas, manure handling and storage areas and land where manure is applied, resulting in:
  - High levels of odours that result in air pollution and health impacts to humans;
  - The nuisance they pose to neighbours.

For information on these concerns:

➔ see Odours, **page 10-17,**

ODOUR LEGISLATION

The following is a brief outline of the main legislation that applies to odours.

➔ see **page A-1** for a summary of these and other Acts and Regulations

Farm Practices Protection (Right to Farm) Act

This Act protects farmers from liability in lawsuits alleging nuisance associated with odour resulting from the farm operation when they meet certain regulatory conditions.

The *Farm Practices Protection* (Right to Farm) *Act* (FPPA) provides that a farmer is not liable in nuisance to any person for any odour, noise, dust or other disturbance resulting from that farm operation. However, for this protection to apply, the farmer must comply with the *Environmental Management Act* (EMA), among other things. The applicability of a burning bylaw to a farm in relation to the FPPA depends on the authority under which the bylaw was prepared.

Environmental Management Act

According to the *Environmental Management Act* (EMA), "air contaminant" means a substance that is introduced into the air and that

(a) Injures or is capable of injuring the health or safety of a person,

(b) Injures or is capable of injuring property or any life form,

(c) Interferes with or is capable of interfering with visibility,

(d) Interferes with or is capable of interfering with the normal conduct of business,

(e) Causes or is capable of causing material physical discomfort to a person, or

(f) Damages or is capable of damaging the environment.

The *Code of Practice for Agricultural Environmental Management* requires persons to use environmentally responsible and sustainable agricultural practices when carrying out agricutural operations, for the purpose of minimizing the introduction of waste into the environment and preventing adverse impacts to the environment and human health.

The AEM Code of Practice provides a definition of odour in Section 7 which specifies that an odour does not interfere with the normal conduct of business if:

> a) The odour is produced in carrying out an agricultural operation in accordance with normal agricultural practices; and
>
> b) Ammonia, sulphur, and other harmful compounds associated with the odour do not settle out of the air into a watercourse or across a property boundary at a level that would cause injury, interference, discomfort or damage.

Substances associated with odour might be considered air contaminants if they cause material physical discomfort, whether or not normal agricultural practices are followed. However, the Environmental Appeal Board (EAB) has previously stated that "material physical discomfort to a person' means more than just unpleasantness. It implies a physically measurable effect." How odour is regulated under the *Environmental Management Act* may be evolving, but it is clear that not all substances associated with odours are air contaminants.

Read decisions from the EAB regarding odour and material physical discomfort:

- Appeal No. 96/01(c)
- Decision Nos. 2007-EMA-007(a); 2008-EMA-005(a)

ODOUR BENEFICIAL MANAGEMENT PRACTICES

Comply with applicable odour related legislation, including the above, and where appropriate, implement the following beneficial management practices to protect the environment and minimize nuisance to neighbours.

Odours from Livestock. Odours in livestock production typically originate from indoor livestock housing; from manure handling, storage and composting areas; and from fields during the course of manure spreading. Odours come from many sources, the most common are:

- Ammonia from manure in indoor livestock housing;
- Odorous compounds carried on dust from indoor livestock housing, and from manure spreading;
- Odorous gases from manure storage, either wet or dry;
- Harmful odorous compounds from manure breakdown in the lack of oxygen (anaerobic conditions).

Odours associated with livestock operations are largely the result of gases produced from manure and other decomposing organic matter. Livestock housing can also produce odourous ammonia emissions from dry manure as well as dust that carries odour.

When manure decomposes in the presence of sufficient oxygen, a process known as aerobic decomposition, few odorous gases are produced. On the other hand, the decomposition of manure in the absence of oxygen, known as anaerobic decomposition, results in the release of many odorous and often dangerous gases, including ammonia, hydrogen sulphide, methane, and other toxic organic chemical substances. Manure odours from solid manure can be minimized by keeping the manure sufficiently dry to allow air movement and aerobic conditions through the pile to occur, by applying it as soon as possible, and/or by mixing it with bulking agents for further composting action.

➔ see Manure Gas Emissions Reduction, **page 3-42**

Odours from Crop Residues. Decomposition of post-harvest crop residues or vegetative processing waste can result in significant odour generation if not managed properly. Specifically, residues from cole crops pose a high risk of odour generation that can be a nuisance to neighbours. In order to minimize odours from crop residues, incorporate residues into the soil immediately post-harvest. Dispose of waste from crop processing in a manner that minimizes odour generation.

➔ see On-farm Processing and Sales Beneficial Management Practices, **page 2-66**

Strategies to reduce odours can either be to prevent the gaseous emissions, cover gaseous emissions, or reduce particles carrying odour or prevent drift of particles carrying odour.

Farm Nuisance - Odour

Vegetative Buffers. Through the establishment of adequate buffers, odours can usually be managed to reduce nuisance or pollution. The use of vegetative buffers surrounding exhaust fans and farm boundaries, **Figure 10.3 , 10.4 and 10.5**, can effectively reduce the impact of odours.

- Install vegetative buffers around exhaust fans or farm borders.
- Seek expert guidance when attempting to construct vegetative filters for odour or dust reduction purposes.

➔ see Buffers, **page 11-4**

Demonstration site summaries of vegetative buffers being used for odour management in BC

Vegetative Buffers for Intensive Agricultural Operations in BC

BC Vegetative Buffers Website

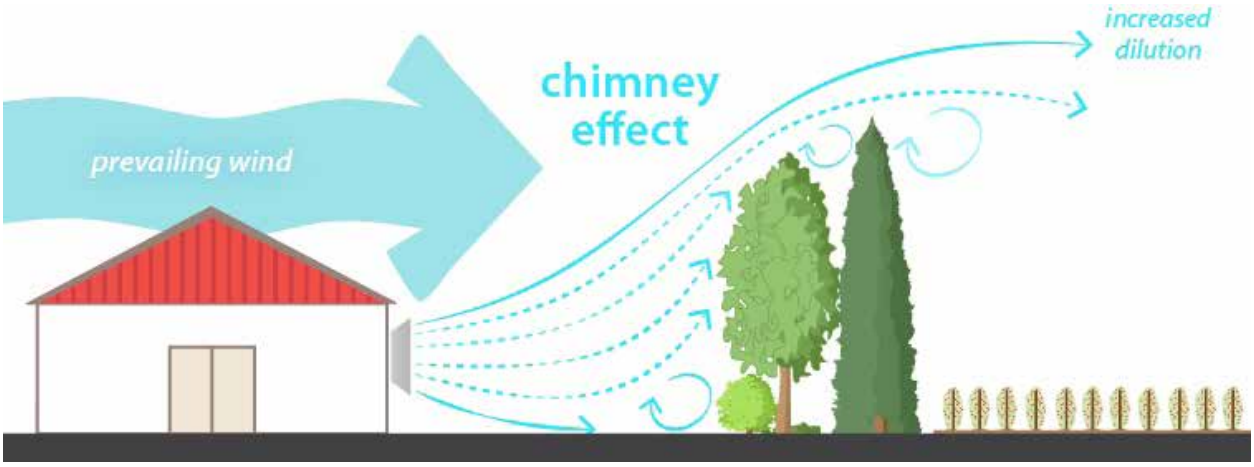


FIGURE 10.4 Vegetative Buffer Around Ventilation Exhaust

FIGURE 10.5 Example of Vegetative Buffer Between Farms

Outdoor Livestock Odour Reduction

Implement the following practices to reduce odours from outdoor livestock areas:

- Handle the manure as a solid and keep it as dry as possible, or mix in bulking agents.
- Minimize the area covered by manure in confined livestock areas.
- Clean pens often and move manure to storage facilities.
- Drain puddles and other standing water.
- Remove livestock mortalities promptly and dispose in an approved manner.

Indoor Barn Odour Reduction

Implement the following practices to reduce odours from barns:

- Handle solid manure in as dry a state as possible.
- Remove wet manure from buildings frequently.
- Remove dead animals promptly and dispose in an approved manner.
- Install vegetative buffers surrounding barn exhaust fans.
- Use mechanical filters on barn exhaust to trap odorous dust particles.

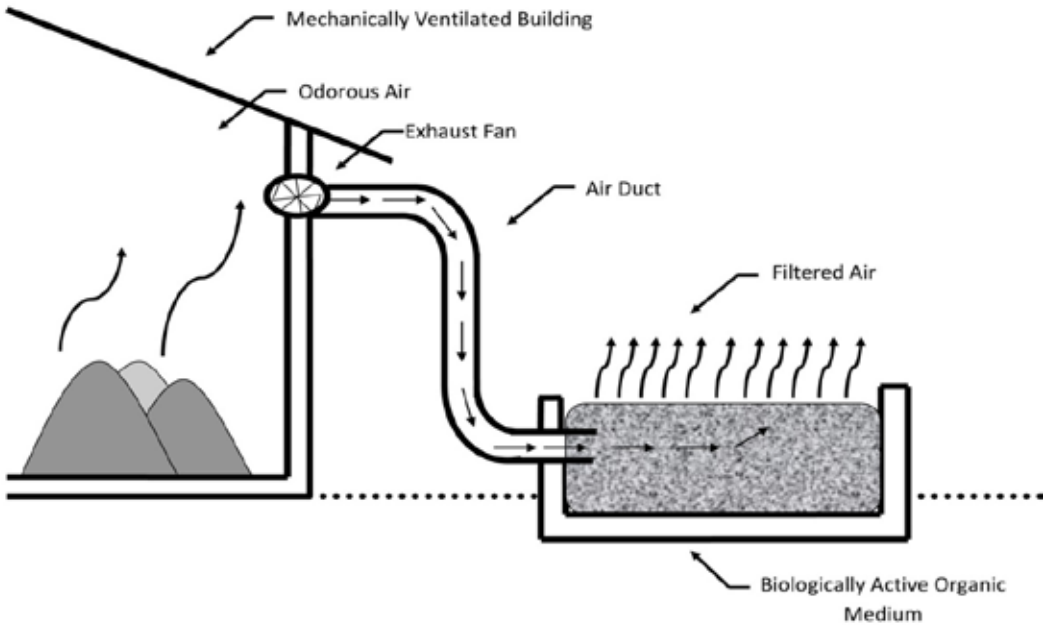
➔ see Indoor Poultry and Livestock Housing, **page 3-2**, and refer to Protection of Air Quality

- Use chemical or biological odour control agents when other management methods are unsuccessful.
  - Several such agents are available commercially, but they have been used in the past with varying degrees of success.
  - Evaluate odour control products on farm before buying large quantities.

Biofilters. Biofilters are used in farm operations to trap and degrade odours within the air before they leave an indoor facility. Biofilters trap particulates that can carry odorous compounds and also reduce ammonia and hydrogen sulphide emissions by providing an environment for biological degradation of the trapped compounds.

- Use biofilters or filters on barn exhaust systems.

➔ see Indoor Poultry and Livestock Housing, **page 3-2**, and refer to Protection of Air Quality



Manure Storage and Handling

Long-term storage of manure is a necessity on many farms. Livestock and poultry producers farming on minimal land areas require storage to facilitate the timely sale or delivery of manure to crop producers. Carefully plan and manage the handling, composting, spreading or storage of all wastes to avoid the creation of odorous conditions. Comply with all manure storage regulations and implement the following beneficial management practices to avoid generation of odours:

- Minimize disturbance of stored manure when putting fresh manure into storage tanks.
- Use covers on manure storage areas.
- Minimize surface area of manure to reduce emissions.

➔ see Manure Gas Emissions Reduction, **page 3-42**

Manure Treatment for Odours

In situations where well-managed manure storages or field spreading practices are not enough to control odours, manure treatment options can be considered. These could include aerobic treatment and carbon reduction for liquid manure systems and composting for solid manure. Where appropriate, implement the following manure treatment options:

- Apply regular frequent aerobic treatments by mixing or turning manure to prevent anaerobic conditions.
- Consider neighbouring proprieties my considering the time of the day or week and wind direction for field application.
- Apply additives to manure piles to reduce the impact of odours when land applying.
- Compost manure following the guidelines outlined in Chapter 2.

➔ see Compost, **page 2-48**, and refer to Compost Beneficial Management Practices

➔ see Manure Gas Emissions Reduction, **page 3-42**

OPEN BURNING

The term "open burning"is defined in the *Open Burning Smoke Control Regulation* means the combustion of vegetative debris using an open fire, other than:

a) For a domestic or agricultural purpose, if all of the vegetative debris is branches or other pieces of vegetative debris, with or without leaves, each branch or piece of which is less than 3 cm in diameter, and includes foliage referred to in section 6 (5) (e) of the *Environmental Management Act*, or

b) A campfire.

An "open fire" meanse the combustion of material without using a stack or chimney to vent the emitted products of combustion to the atmosphere.

OPEN BURNING ENVIRONMENTAL CONCERNS

Primary environmental concerns related to open burning are:

- Release of fine particles into the air that:
  - Results in a health risk from inhaling the particulate;
  - Results in visual impairment from the particulate.
- Escape of the open fire that results in a fire safety risk to the environment.
- Release of greenhouse gases, mainly carbon dioxide (CO_2) and release of other air contaminants that effect local air pollution.
- Release of other contaminants as a result of illegal burning of waste other than agricultural debris (e.g., plastics, coated woods and waste, solvents, wire, etc.).
  - Results in health risks from inhaling the particulate; and
  - Results in health risks and environmental risks from deposition of contaminants in the localized environment.

For information on these concerns:

➔ see Air Emissions, **page 10-7**

OPEN BURNING LEGISLATION

The following is a brief outline of the main legislation that applies to open burning.

➔ see **page A-1** for a summary of these and other Acts and Regulations

Because burning is practiced in a wide range of farm activities, agriculture is given special consideration in legislation. Both municipal and provincial governments regulate open burning. Before carrying out any burning operation, check for:

- Restrictions imposed by local government bylaws.
- Pollution concerns regulated by ENV under the *Environmental Management Act.*
- Fire safety concerns regulated by the Ministry of Forests, Lands and Natural Resource Operations under the *Forests and Range Practices Act.*

Note: the following is only a summary of burning requirements, contact all relative agencies regarding necessary details before igniting any fire.

Local Bylaws

Local fire departments, municipalities, improvement districts or regional districts may have smoke management plans (guidelines), specific bylaws or restrictions on open burning. Farms are not necessarily exempt from these local bylaws, particularly smoke control bylaws, and operators should check with their local or regional government. Local bylaws can be more restrictive than provincial regulations. For instance, a municipality or regional district can have a 'fire' bylaw that covers open burning. Local governments often have a burn ban at certain times of the year for fire safety reasons which may include the prohibition and the quenching of all open burning in the area. Requirements and classification of smoke sensitivity zones for open burning may also be substituted with another for a given time, if deemed necessary. Check with the local government office or the fire department to find out about the rules and restrictions. A permit may be required. A permit for burning diseased material may be given during restricted times in extreme circumstances, check with the local fire department about potential exemptions from the local bylaw.

Where local regulatory requirements are more stringent, they apply over provincial legislation.

 Farm Practices Protection (Right to Farm) Act

This Act protects farmers from liability in lawsuits alleging nuisance associated with odour, noise, dust or other disturbance resulting from the farm operation when they meet certain regulatory conditions. The applicability of a burning bylaw to a farm in relation to the *Farm Practices Protection (Right to Farm) Act* (FPPA) depends on the authority under which the bylaw was prepared. The FPPA provides that a farmer is not liable in nuisance to any person for any odour, noise, dust or other disturbance resulting from that farm operation. However, for this protection to apply, the farmer must comply with the *Environmental Management Act* (EMA), among other things.

 Environmental Management Act

The *Open Burning Control Regulation* applies to open burning for a domestic or an agricultural purpose as follows:

a) If all of the vegetative debris open burned is branches or other pieces of vegetative debris, with or without leaves, each branch or piece of which is less than 10 cm in diameter but of which at least some of the individual branches or pieces are 3 cm or greater, only Sections 9, 12 and 30 of this regulation apply to the open burning;

b) If all of the vegetative debris is branches or other pieces of vegetative debris, with our without leaves, of which at least some of the individual branches or pieces are 10 cm or greater in diameter, this regulation applies with respect to the open burning:

If the burning of agricultural vegetative debris is branches or other pieces of vegetative debris of which the pieces are less than 3 cm in diameter, then this regulation does not apply. However, local bylaws regarding burning and smoke control will continue to apply.

There are specific standards and exemptions under the *Open Burning Smoke Control Regulation* and *Code of Practice for Agricultural Environmental Management* for various materials burned on the farm. A waste discharge approval or permit for burns is not required under this Act for:

- Agricultural burning of leaves, crops, weeds, foliage or stubble.
- Residential (i.e., backyard) burning of leaves, foliage, weeds, crops or stubble.
- Burns that satisfy all the terms and conditions set out in the *Open Burning Smoke Control Regulation*.
- Burns conducted to comply with the *Weed Control Act*.

Agricultural vegetative debris diameter (cm) Application of OBSCR

- < 3cm Exempt (local bylaws still apply).
- > 3cm to < 10cm Burning must stay within 5 km of original location.
- Prohibited materials must not be included nor used as an accelerant.
- Must adhere to any prohibitions issued by a Director.
- > 10cm No exemptions.

In addition, specific requirements are set forth for the burning of diseased vegetative debris (see Division 3, SECTIONS 24 AND 25).

All other burns (e.g., household, industrial) require a waste discharge approval or permit from ENV.

Under the *Environmental Management Act*, Metro Vancouver has been delegated authority to manage air quality within its boundaries. Open burning in Metro Vancouver will typically require a permit or approval from Metro Vancouver.

Even though permitted, open burning must not pollute the air. SECTION 2, Schedule 1 of the *Waste Discharge Regulation* provides a list of materials that are prohibited from being open burned.

The *OBSCR* sets forth regulations for open burning based on smoke sensitivity zones, which are categorized as High, Medium, and Low. These zones are listed in Schedule 3 of the regulation. The regulations pertaining to duration and venting index vary depending on sensitivity zone. See Part 3 Division 1 of the OBSCR for more information on smoke sensitivity zones. Regardless of smoke sensitivity zone, the OBSCR requires a burn operator to (see Table 10.3 on page 10-28 for the full list of prohibited materials):

- Explore all possible options to reduce, reuse or recycle as much of the material as possible (i.e., not burn).
- Burn only vegetative debris such as foliage branches, limbs, roots, shrubs, etc.
- Only burn the targeted vegetative debris within 5 km radius of where it originates from.
- Do not burn prohibited materials, or substances that normally emit dense smoke or noxious odours.
- Burn the material more than 500 m from a neighbouring residence or business and more than 1,000 m from a hospital, continuing care facility, or school unless otherwise exempted under SECTION 4. These setbacks may be relaxed to 100 m and 500 m respectively if specific best management practices are undertaken. See Part 2, SECTION 13(2) of the OBSCR.
- Open burning may be prohibited if it poses a hazard to population centres, work camps, or airports by significantly reducing visibility.
- Ensure that the ventilation index is:
  - "Good" on the day the burn is started and forecast to be "good" or "fair" on the second day for burning in high and medium smoke sensitivity zones, and
  - "Good" or "fair" on the day the burn is started and forecast to be "good" or "fair" on the second day for burning in high and medium smoke sensitivity zones (see the regulation for further information and requirements).

  BC Venting Index

- Ensure satisfactory control and feeding of the fire, and make sure adequate equipment and staff are available to ensure the regulatory limits are met.
- Follow all of the burning restrictions that are relevant to the smoke sensitivity zone.
  - These restrictions include a smoke release period and restrictions on the number and frequency of burns per year that is no more than 12 days per calender year and 6 days in each month on a small, private land within a high smoke sensitivity area (see regulation for further information and requirements).
  - Ensure that all reasonable efforts are taken to minimize the amount of smoke emitted by open burning (see Part 2, SECTION 11 in the OBSCR for further information).
  - Ensure that proper records are made and kept if open burning is carried out using one or more category 3 open fires or air curtain incinerators.
  - A list of smoke senstivity zones can be found in Schedule 3 of the OBSCR.

BC Open Burning Regulation Map

BC Open Burning Smoke Control Regulation Information Page

Interactive GIS Map of Venting in BC

Wildfire Act

This Act regulates **open fires within 1 km of forest land or grass land.** It is administered by the Ministry of Forests, Lands and Natural Resource Operations.

- SECTION 2: requires reporting a forest land or grass land fire.
- SECTION 3: prohibits dropping, releasing or mishandling a burning substance, or any other thing that the person reasonably ought to know is likely to cause a fire.
- SECTION 4: states Section 5 & 6 do not apply to the City of Vancouver or a municipality or a local government having an open fire bylaw.
- SECTION 5 & 6: regulates non-industrial and industrial open fires.

Wildfire Regulation. This regulation applies to all **open fires within 1 km of forest land or grass land**.

- SECTIONS 4 – 12: outline fire prevention requirements.
- SECTIONS 13 – 17: outline fire control requirements.
- SECTIONS 18 – 24: outline permissible open fires (category 1, 2, 3 and resource management fires) - a burn registration number is required for category 3 fires – call toll free **1-888-797-1717.**
- SCHEDULE 1: outlines three Danger Regions of BC.
- SCHEDULE 2: defines five different Fire Danger Classes using a matrix of Build-up Index and Fire Weather Index.
- SCHEDULE 3: provides restrictions on High Risk Activities as required in Section 6(3).

Category 1 Open Fire. Camp fires and piles under 1 m in height and diameter

Category 2 Open Fire. For open fires that are:

- No more than 2 piles that are less than 2 m in height and 3 m in width;
- Or burns of stubble or grass over an area not exceeding 0.2 ha.

Category 3 Fires. For open fires that are:

- Burning material in 3 or more piles not exceeding 2 m in height and 3 m in width;
- Or for 1 or more piles exceeding 2 m in height and 3 m in width;
- Or for one or more windrows, or for burning stubble over an area exceeding 0.2 ha.

BC Wildfire Service website for fire information including the Fire Danger Class information for areas of BC

OPEN BURNING BENEFICIAL MANAGEMENT PRACTICES

Comply with applicable open burning related legislation, including the above, and where appropriate, consider the following beneficial management practices to protect the environment.

Open Burning

The risks associated with outdoor fires are the reason for local and provincial regulations.

- Whenever possible, consider alternatives to burning such as:
  - Reducing the size of the materials (such as by chipping) to allow it to be used as mulch or used as a compost material.
  - Recycling as much material as possible before burning.
- Any fire attendee should have equipment and water on hand appropriate to control for the size and type of fire. Follow the information in the *Wildfire Act* and *Regulation.*
- Use the flow chart in **Figure 10.6 on page 10-27** to determine if the *Open Burning Smoke Control Regulation* applies to the open burn.

Alternatives to Open Burning in BC (Directory)

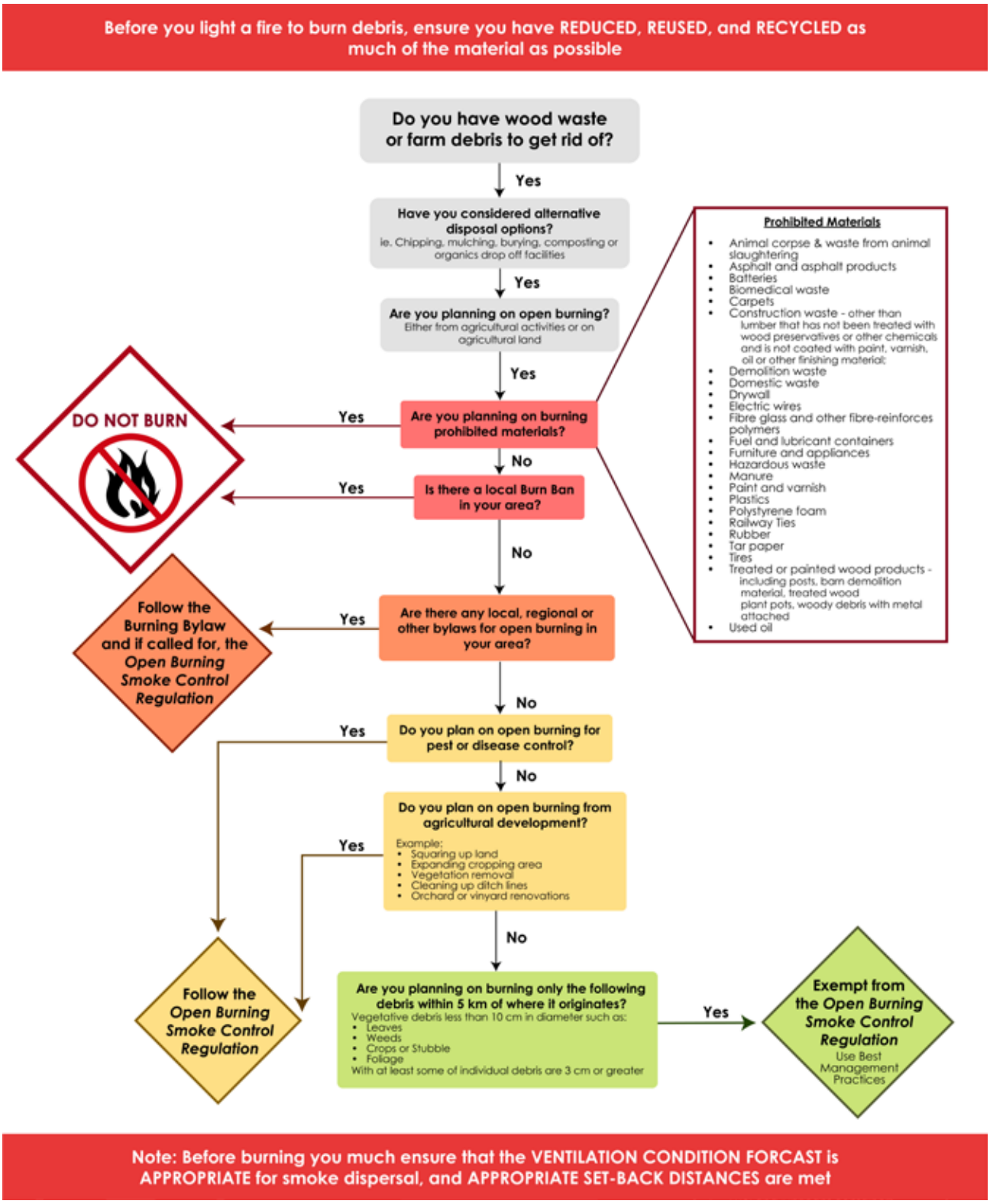


FIGURE 10.6 Burning Practices Flow Chart

Where agricultural burning is necessary (if the option of chopping the vegetative residue and/or applying it to land has already been explored), many smoke-related problems result from poor open burning practices. Emissions containing particulate matter from open burning can limit visibility, release harmful gases, and aggravate respiratory conditions in susceptible individuals. Particulate emissions and pollution can be reduced by implementing the following practices to reduce smoke production:

- Build good piles with clean, dry debris (do not include stumps, rocks, or soil) to reduce smouldering stage.
  - Pile to approximate a haystack shape where the material does not splay out at the sides, and the dimensions approximate a base-to-height ratio of 1:1.
  - Avoid overloading of fires that may restrict combustion, and cause smouldering and increased smoke.
- Minimize the smouldering stage, as this stage can contribute more than half of the total particulate emitted during the burn.
- Control the fuel properties.
  - Avoid compaction of the material.
  - Allow fuel to dry before burning to reduce the moisture content of the pile.
- Use forced air technology (i.e., air curtain incinerators, or other appropriate air-assist technology) as these can reduce emissions by up to 90%.
- Avoid burning during periods of calm stable air or when the venting index is poor, when smoke is unlikely to disperse properly.
- Use wood residue as heating fuel instead of open burning.
- Follow local smoke management plans guidelines on open burning within your municipality.
- Use controlled burning, in conjunction with regional wildfire risk abatement plans, to lower the wildfire hazard risk around farm infrastructure.
- Follow required setback distances from residences, schools, and hospitals, as detailed in the OBSCR SECTION 13.

Note: ensure that there are no contaminants in the fire, such as tires, plastic or other prohibited materials , as listed through the *Waste Discharge Regulation*. SECTION 2, Schedule 1. (see **Table 10.3**)

TABLE 10.3 Materials Prohibited from being burnt under the *Waste Discharge Regulation*

animal carcasses and waste from animal slaughtering	hazardous waste
asphalt and asphalt products	manure
batteries	paint and varnish
biomedical waste	plastics
carpets	polystyrene foam
construction waste other than lumber that has not been treated with wood preservatives or other chemicals and is not coated with paint, varnish, oil, or other finishing material	railway ties
demolition waste	rubber
domestic waste	tar paper
drywall	tires
electrical wire	treated or painted wood products
fibreglass and other fibre-reinforced polymers	used oil
fuel and lubricant containers	