



Canadian Food  
Inspection Agency

Agence canadienne  
d'inspection des aliments

## Animal Biosecurity

# National Bee Farm-Level Biosecurity Standard



## Acknowledgments

CANADIAN HONEY COUNCIL



MANITOBA FORAGE SEED ASSOCIATION



SASKATCHEWAN LEAFCUTTERS ASSOCIATION



ALFALFA SEED COMMISSION (ALBERTA)



CANADIAN HORTICULTURE COUNCIL



KOPPERT CANADA LTD

BIOBEST CANADA LTD

© 2013 Her Majesty the Queen in Right of Canada  
(Canadian Food Inspection Agency), all rights reserved.  
Use without permission is prohibited.

CFIA P0838-13  
Catalogue No.: A104-107/2013  
ISBN: 978-1-100-54430-4

---



## Table of Contents

<b>About this Document.....</b>	<b>2</b>
Why a National Standard? .....	2
Value of The Canadian Bee Industry .....	2
Who is this document for? .....	3
What is biosecurity and why is it important? .....	3
What are the benefits? .....	3
Document development.....	4
How should this document be used? .....	4
<b>Glossary .....</b>	<b>6</b>
<b>Summary of Target Outcomes .....</b>	<b>10</b>
1.0 Bee Health Management .....	10
2.0 Operations Management.....	10
<b>Section 1: Bee Health Management .....</b>	<b>12</b>
1.1 Bee Sources .....	12
1.2 Prevention: Minimizing Susceptibility to Pests .....	13
1.3 Prevention: Minimizing Exposure.....	14
1.4 Diagnosis and Monitoring .....	15
1.5 Standard Response Plan .....	16
1.6 Elevated Response Plan .....	18
<b>Section 2: Operations Management.....</b>	<b>19</b>
2.1 Obtaining Production Inputs .....	19
2.2 Handling and Disposal of Production Inputs.....	20
2.3 Obtaining Bee Equipment .....	21
2.4 Management and Maintenance of Bee Equipment, Dead Bees, and Bee Products.....	21
2.5 Personal Sanitation.....	22
2.6 Design of Facilities .....	23
2.7 Maintenance of premises, buildings, vehicles and other equipment.....	24
2.8 Control of Weeds and Nuisance Pests .....	25
2.9 Training and Education .....	26
<b>Appendix A: BeeBAC Members and Project Advisors .....</b>	<b>28</b>
<b>Appendix B: Examples of Management Topics for Bee Sectors .....</b>	<b>30</b>

---

## About this document

### Why a National Standard?

The National Bee Farm-level Biosecurity Standard forms the basis of a comprehensive voluntary program designed to provide practical guidance for owners or managers involved in the three main Canadian bee sectors: honey bees, alfalfa leafcutting bees, and bumblebees. The Standard was developed in partnership with representatives from the Canadian Food Inspection Agency (CFIA), the Canadian Honey Council (on behalf of provincial beekeeping and honey producer associations), provincial apiarists, and the Canadian Association of Professional Apiculturists. Funding was supplied by Agriculture and Agri-Food Canada under Growing Forward.

The Canadian bee industry has practised farm-level biosecurity for many years. The objective of a national standard is to provide a consistent, country wide approach to the implementation of biosecurity practices for both small- and large scale operations. The development of farm-level biosecurity standards is a national initiative within and across agriculture industries, including both animals and plants. Beekeeping was identified as a priority sector for developing a voluntary farm-level biosecurity standard.

### Value of the Canadian bee industry

CANPOLIN, the Canadian Pollination Initiative, identifies Canada as the world's 12th largest producer of honey. The 2010 Canadian honey crop was valued at \$146 million. An estimated 35,000 tonnes were produced by nearly 7700 beekeepers.<sup>1</sup> Average honey production in Canada is about 60 kg per hive, which is more than twice the world average. Bee products (e.g. wax) and sales of bees and equipment are also important economic contributors.

In addition to the value of Canadian honey and bee products, many crops are reliant on pollination by managed bee species. Canada has seen rapid growth in pollination-dependent crops such as fruits and vegetables. The annual contribution of honey bee pollination to crop value is estimated at \$1.3 to \$1.7 billion annually, which is 10 to 20 times that of the value of honey.<sup>2</sup>

The pollination value of other bees, including alfalfa leafcutting bees and bumblebees, is more difficult to estimate but is in the hundreds of millions of dollars. In Alberta, Saskatchewan, and Manitoba, alfalfa leafcutting bees are used to pollinate alfalfa seed fields – a crop that is valued at \$40 million. Alfalfa leafcutting bees also provide about half of the pollination required for hybrid canola seed production,

- 
- 1 Melhim A, Weersink A, Daly Z, Bennett B. (2010) Beekeeping in Canada: Honey and Pollination Outlook, CANPOLIN publication #6.
  - 2 Statistics Canada Catalogue 23-221-X

---

resulting in a crop valued at \$325 million in farm gate receipts annually, along with other legume seed crops and lowbush blueberries.

Bumblebees may be used to pollinate 25 different crops, including fruit (especially berries), vegetable, and some seed crops. It is estimated that 95% of bumblebees are used to pollinate greenhouse tomatoes and peppers in Canada, crops that together are valued at \$800 million annually.<sup>3</sup> CANPOLIN estimates bumblebee pollination of greenhouse tomatoes at about 12% of the value of the greenhouse tomato crop in Ontario.<sup>4</sup>

## Who is this document for?

The National Standard has been developed as a tool for all people and businesses handling and keeping bees, including honey bees, alfalfa leafcutting bees, and bumblebees. For each sector, a producer guide provides detailed information on how to meet target outcomes described in the National Standard.

## What is biosecurity and why is it important?

Farm-level biosecurity is a series of management practices that are designed to minimize the introduction and spread of disease-causing pathogens, parasites, insect pests, and predators (referred to collectively as “pests”) onto, within, and beyond the farm.

An effective biosecurity program is based on the understanding and application of measures to minimize the transmission of pests in animal and plant populations, including their introduction (bioexclusion), spread within the populations (biomanagement), and release (biocontainment). When a component of the program has a weakness, or where biosecurity measures are not fully implemented, it provides a route by which pests may enter or remain in a bee population.

The risk of exposure of healthy bees to pests occurs when infected or infested bees, or equipment, are introduced to an operation. This can occur through intentional introductions or unintentional mixing of bees from other operations. Within an operation, pests can be spread through handling or sharing of water and feed sources. Training, monitoring, preventative management practices (including equipment and facility design), and timely treatment interventions are necessary to mitigate these risks.

## What are the benefits?

Some of the benefits of enhanced biosecurity management to the industry and individual beekeeping operations may be

- improved food security through the supply of healthy crop pollinators
- better production and pollination by healthier bees
- reduced losses and economic impacts from pests
- reduced risk of exposure, introduction and spread of pests
- saving time and money on treatments and pest management
- improved domestic and international marketability of bees and bee products

---

<sup>3</sup> Statistics Canada Catalogue 22-202-X

<sup>4</sup> Kevan P. (2010) Pollinators and Pollination: Canadian, Continental and Global Problems, CANPOLIN presentation to the Maritime Action Forum on Pollination Research.



- possible continuation or early resumption of interprovincial and international trade in the event of a serious outbreak
- a marketing advantage if selling bees or used equipment or providing pollination services
- improved treatment efficacy and pest management effectiveness
- reduced chance of developing treatment resistance
- reduced chance of devastation from introducing a new biosecurity risk.

## Document development

Background work for the National Standard and respective producer guides prioritized those biosecurity interventions that have the greatest impact on risk reduction and on the spread of contagious pests. The National Standard and sector Producer Guides are based on clear and scientifically justified principles. They detail a range of measures that are intended to prevent pests from entering or leaving a location where bees are kept. The Standard addresses management practices that promote general bee health.

A set of target outcomes, described in this standard, were developed with significant contributions from representatives of the various beekeeping sectors, including the Bee Biosecurity Advisory Committee (BeeBAC), whose membership represents all potential users of this document. (Appendix A lists the BeeBAC representatives.) BeeBAC identified areas of practical effective controls, using an objective, impartial approach that drew on published research, existing regulations, recognized management practice manuals, and treatment recommendations.

Development of the Standard and producer guides involved participation, consultation, and review from the following:

- all provincial apiarists
- producer associations
- the Canadian Honey Council (CHC)
- alfalfa leafcutting bee industry associations (Alberta, Saskatchewan, Manitoba)
- bumblebee industry experts and researchers
- the CFIA's Office of Animal Biosecurity

Direct producer input was achieved through

- a series of on-farm case studies.
- comprehensive management practice benchmark consultations. All identified active producers in the honey bee and alfalfa leafcutting bee sectors in Canada were invited to participate. Over 600 honey beekeepers (10% of over 6000 beekeepers) and 86 alfalfa leafcutting bee producers participated (28% of over 300 producers).
- selected interviews with suppliers and users of bumblebees for pollination of greenhouse and field crops.
- selected participation in document review teams.

## How should this document be used?

The Canadian bee industry is a broad target audience that includes the hobbyist, large scale commercial honey producers, custom pollinators who use honey bees or alfalfa leafcutting bees, and greenhouse operators. Understandably, not all of the principles in this standard or the producer guides will be applicable or practical for every situation. Keeping this in mind, the National Standard has been organized into two sections:

- **Bee Health Management**
- **Operations Management**

---

Each section is subsequently divided into subsections that are introduced by a target outcome.

Each target outcome represents a goal for all those who manage bees: attempt to protect their bees from the introduction and spread of pests. Each section is summarized with a brief description, a statement of the risks associated with each target outcome, and examples of management strategies to achieve the target outcome.

The glossary defines certain terms that are used within the text.

Readers are encouraged to refer to the respective producer guides for a detailed description of these practices, producer tools (i.e. suggested record keeping templates, self-evaluation checklist) and resource lists.

All who manage bees should address biosecurity in each component of their operation. For those who are new to the concept of biosecurity, have limited resources, or are located where it is impractical or applicable to fully achieve each of the target outcomes, the three producer guides provide a set of examples of practices that can be implemented to meet the target outcomes.

The bee industry is dynamic. New strategies, products, and techniques to combat pests will evolve as the science behind managing bees continues to advance. New biosecurity risks will emerge. This document should therefore be considered a living document. The basic principles described in this standard and accompanying producer guides will apply into the future. It is the responsibility of producers to continually update their knowledge and consider current recommendations when implementing biosecurity management practices within their operation.

---

## Glossary

**Apiary:** The location and sum total of colonies, hives, and other equipment assembled at one site for beekeeping operations.

**Bee equipment:** Any structure, material, or enclosure and its related components that are provided by the beekeeper to protect and house bees. May include structures that facilitate egg laying and brood development or that contain food and bee product stores. Examples include hives (for honey bees), nest blocks (for leafcutting bees), and nest boxes (for bumblebees). For the purposes of this standard, “hives or nests” will be used to describe this equipment as it applies to all three types of bees.

**Beekeeper:** A generic term used to identify anyone who owns or is in possession of bees; utilizes pollination services; and handles bees, related bee equipment, production inputs and outputs, and waste material. The person may be the owner/operator, trained beekeeper, staff, or family member. The term “beekeeper” is commonly used in honey bee beekeeping. The term “producer” is used in the alfalfa leafcutting bee and bumblebee sectors, where the crop that the bees pollinate is the primary product.

**Bee industry authority:** A provincial apiarist, bee inspector, veterinarian or regulating authority, including the CFIA and Health Canada’s Pest Management Regulatory Agency (PMRA).

**Bee operation:** All aspects of the beekeeping, bee product production, and pollination operations for which the beekeeper is responsible, regardless of where the bees are placed; comparable to the “farm” in other types of agriculture.

**Biological control:** Means of controlling a pest with another organism; for example, through predation, parasitism, or with a pathogen.

**Biosecurity:** “Farm-level biosecurity” refers to a set of practices that are used to minimize the transmission of pests in animal and plant populations, including their introduction (bioexclusion), spread within the populations (biomanagement), and release (biocontainment).

**Biosecurity program:** A risk reduction program that conforms to the CFIA National Standard and is designed to prevent the introduction and spread of pests in bee operations.

**Biosecurity risk:** An activity, condition, or situation that, without mitigation, increases the risk of potential introduction or spread of a hazard in the form of a pathogen, parasite, or insect pest.

**Biosecurity standard:** A high-level, consistent set of principles and target outcomes that apply to all beekeepers (honey, leafcutting, and bumblebees) at the farm level. The goal of the Standard is to minimize the introduction and spread of pests onto, within, and beyond the farm.



---

**Brood:** For the purposes of this document, “brood” refers to the embryo or egg, and the larval and pupal stages in initial bee development. For alfalfa leafcutting bees, brood is enclosed in a cell structure made of leaf material, called a bee cell. This document may refer to brood and/or bee cells.

**Building:** Any indoor facility used in the bee-keeping operation, such as storage, maintenance, facilities used for overwintering or incubating bees, or processing.

**Clean:** Free of any visible accumulation of organic matter and debris or other residues. Also, refer to *disinfection* and *sanitation*.

**Chemical control:** Means of controlling a pest, using chemical-based control products, including acids, acaricides (miticides), pharmaceutical treatments, and disinfectants. Chemical control programs encompass applicable treatment rotation plans and the timing of treatment applications.

**Contaminated:** The presence of a pathogen, living parasite, or insect pest on a surface or in debris that may be transmitted directly or indirectly to a living host organism (e.g. bee or brood).

**Cultural method:** A non-chemical method for managing pests. Examples include hive or nest equipment manipulation, introducing new bee stock, supplemental feeding, and sanitation.

**Debris:** Any loose material that may be capable of harbouring pathogens, parasites, or pests. Examples include dead bees and bee parts, feces, dead parasites, and other discarded material.

**Disease:** An unhealthy condition in the bee caused, for example, by a biological agent such as bacteria, viral or fungal pathogen or parasite that may result in death.

**Disinfection:** Applying a physical or chemical process to a surface for the purpose of destroying or inhibiting the activity of micro organisms. This is often done with a disinfecting agent, such as bleach, or by treatments, including heat, irradiation or fumigation, in conjunction with cleaning.

**Efficacy:** The effectiveness of an intervention or treatment in suppressing or eliminating a pest.

**Elevated response plan:** A farm-level intervention plan that is triggered by the suspected or confirmed presence of a high-risk, exotic, or unfamiliar pest within the bee operation, local area, or country.

**Endemic:** Pests that are regularly re-occurring or whose causative agent is established within a region or population.

**Exotic:** Infectious pests that normally do not occur in the region, either because they have never been present there or because they were eradicated and then kept out by government control measures or agricultural practices.

**Farm/farm-level:** Refer to *Bee Operation*.

**Federally reportable and notifiable:** There is a legal requirement to contact the CFIA if a specified reportable bee disease, caused by a pathogen, parasite, or insect pest, is suspected or if the diagnosis is confirmed. Only laboratories are required to contact the CFIA regarding specified notifiable diseases. Refer to the CFIA website for more information and a current listing of diseases applicable to the bee industry.

**Infected:** A living host organism (e.g. bee or brood) that is affected by a pathogen.

**Hive:** Human-constructed housing for bees. Also refer to *Bee Equipment*.

---

**Infested:** The presence of a living parasite or insect pest at any stage of its life cycle, on or in a living host organism (e.g. bee or brood) or its hive or nest.

**Insect pest:** Insect pests are predators that infest a hive or nest, that cause damage, and that consume brood and food stores, resulting in economic loss. Primary insect pests of bees live part of their life cycle within the hive or nest and can be spread with the movement of bees and equipment. Examples are small hive beetle and wax moths that infest honey bee colonies, or dried fruit moth and various beetles that infest alfalfa leafcutting bee nests. See also *Nuisance pest*.

**Inspector:** A person who inspects apiaries and bee shipments for compliance with regulations or insurance claims and who may offer advice or provide resources to beekeepers.

**Managed bees:** For the purposes of this standard, managed bees include honey bees, alfalfa leafcutting bees, and bumblebees for which some form of artificial housing is provided (i.e. hive or nest boxes). Unmanaged native and wild bees are excluded.

**Mechanical method:** A non-chemical method for managing pests. Examples include barriers, traps, screens, fences, use of hive or nest stands, and removal of foreign material from surfaces using a brush, broom, hand, or other object.

**Nuisance pest:** A nuisance pest may disturb the bees; cause distress; damage the hive or nest material; consume bees, brood and bee cells; rob food stores; spread diseases and parasites; and result in weakened bees that are more susceptible to other bee pests. Nuisance pests include insects such as ants and wasps, rodents, raccoons, skunks, and large mammals such as bears, as well as some birds and even pets. See also *Pests*.

**Parasite:** An organism that lives upon or within another living organism and that may be dependent upon the host for its survival. Examples include the *Varroa destructor* mite in honey bees and chalcid parasites (*Pteromalus venustus*) in alfalfa leafcutting bees.

**Pathogen:** A biological agent such as a bacteria, virus or fungus that has the potential to cause bee disease; for example, through the spread of spores.

**Personal equipment:** Includes items that are considered an extension of the bee handler's person and may come in contact with infected or infested bees and contaminated debris or hive equipment. Examples include tools, brushes, gloves, and protective clothing.

**Permit:** Applies to bees, bee equipment, bee products, and production inputs for which their importation, interprovincial movement, purchase, and/or use is regulated by the government and is permitted.

**Pest:** A pest is an unwanted organism. A pest may be a parasite, disease pathogen, predator, or insect pest. "Pest," used as a generic term in this document, refers to any of these living organisms.

**Physical method:** A non-chemical method for managing pests, such as freezing and heating.

**Premises:** A parcel of land with a continuous property boundary and that is defined by a legal land description or, in its absence, by geo-referenced coordinates. Premises include indoor facilities or outdoor locations used for the bee operation where the following are kept, used, or disposed of: bees, hives or nests, personal equipment, bee supplies, and moving, handling, and processing equipment.

---

**Producer guidance:** Voluntary guidelines and examples of beneficial management practices, targeted at producers to implement biosecurity measures, as defined by the Biosecurity Standard, at the farm level. Guidelines are specific to the industry sub-sector (honey, alfalfa leafcutting, and bumblebee beekeeping).

**Production input:** Production inputs include “consumable” products such as feed, water, treatment products for pest management or control, products used for cleaning and disinfection, and some materials used in hives or nests. Production inputs exclude live bees and reusable hive and nest equipment, tools, and protective clothing.

**Protocols:** A code of conduct, defined procedure, or series of steps to follow when implementing biosecurity management practices.

**Provincial apiarist (PA) or apiculturist:** Provincial government employees who study, educate, and administer regulation in the field of apiculture. Typically responsible for enforcing the *Apiary Act*, *Bee Act*, or equivalent. The PA is typically also an inspector.

**Quarantine:** A specific order applied to a particular premises, bees, or equipment by the provincial apiarist or the honey bee regulating authority and inspector to prevent further spread, or to detect a biosecurity risk or concern.

**Quarantine area:** An area specified by a provincial apiarist, or the honeybee regulating authority, in which additional efforts are made by industry and/or government to prevent further spread or to detect the biosecurity risk of concern.

**Recommended:** A product, treatment, or practice recommended by a bee industry authority. When used in reference to chemicals such as pesticides or pharmaceuticals, the term means products registered by the appropriate regulatory authority for the specific usage mentioned in the text.

**Sanitation:** A set of practices that reduce the presence of organic material/debris and that reduce the presence, survivability, and infectivity of disease causing agents from an object or surface. Forms of sanitation include physical or mechanical removal and (power) washing, and may be done in conjunction with disinfection.

**Threshold:** A measurable level of a factor that contributes to bee health, including a level of infection or infestation at which intervention should be taken to limit negative impact on bee health and on economic loss.

**Target outcomes:** Goals that all those who manage bees, regardless of the size of their operation, should try to attain to protect their bees from introducing and spreading pests.

**Weed:** Any unwanted vegetation, including cultivated and volunteer crops, growing in and around the apiary or buildings where bee are kept.

---



## Summary of Target Outcomes

Achieving the Target Outcomes summarized below, maintaining thorough records that are appropriate to the scale and complexity of the operation, complying with current acts and regulations, and working with your provincial apiarist (PA), or other resource personnel, allow you to play a significant role in keeping your bees and your industry as healthy as possible.

Putting preventative measures in place to keep bees healthy forms a biosecurity plan. A biosecurity plan should address bee management, health, access and movement.

### 1.0 Bee Health Management

- 1.1 Exposure to pests is minimized by introducing bee stocks of known health status. Sources are documented to enable traceability.
- 1.2 Factors are managed to reduce the bees' susceptibility to pests. A response is implemented when threshold levels are reached.
- 1.3 Direct and indirect contact with infected or infested bees is minimized.
- 1.4 Pests and their signs are accurately diagnosed. Bee operations are monitored to assess the risk of pests.
- 1.5 A standard response plan is in place to address treatment thresholds, options, and rotation plans, notification procedures, record keeping, and follow up actions.
- 1.6 An elevated response plan is in place, and the conditions under which it will be implemented are understood.

### 2.0 Operations Management

- 2.1 Only recommended production inputs are utilized and are obtained from known and reliable sources.
- 2.2 The degradation and contamination of production inputs is prevented by safe and secure storage and disposal.

- 
- 2.3 Bee equipment is obtained from known and reliable sources. Used equipment is accompanied by proper permits, if required, and is cleaned and disinfected or treated upon arrival as needed.
  - 2.4 Bee equipment is regularly inspected and, when necessary, action is taken to minimize negative impacts to bee health.
  - 2.5 Precautions are taken to minimize the spread of pests through human contact with bees and equipment.
  - 2.6 Facilities are constructed to allow for ease in cleaning, are bee-tight if needed, and are consistent with government standards if applicable. The facilities have appropriate lighting and climate control for safe storage of bees and production inputs, and enable monitoring and pest management.
  - 2.7 A sanitation and maintenance program is implemented for all premises, buildings, vehicles, and other equipment.
  - 2.8 An integrated management program for weeds and nuisance pests is implemented.
  - 2.9 All those working in a beekeeping operation or utilizing bees are trained and regularly updated on biosecurity risks and protocols.

---

## Section

# 1

## Bee Health Management

**Examples of management topics for each bee sector can be found in Appendix B at the end of this document.**

### 1.1 Bee Sources

#### Target Outcome

Exposure to pests is minimized by introducing bee stocks of known health status. Sources are documented to enable traceability.

#### Description

Bees may be sourced in various forms: from within one's own operation, from breeders or other beekeepers, or producers in the province; from other provinces; or imported from suppliers located in other countries.

#### The Risks

1. Each form and source of bees represents varying degrees of risk of introducing pests to the operation.
2. Pests may be present on bees or in housing or packing material.

#### Management Strategies

Federal and provincial acts and regulations help to mitigate these risks by requiring inspections, documentation, and permits.

Implement management strategies to plan bee introductions and their movement within the operation:

1. Purchase from reliable sources with known health status.
2. Identify bees or equipment containing bees to allow for tracing through records.
3. Inspect bees before introduction, treat if indicated, and segregate from bees that have not been previously exposed to the infection or infestation.
4. Follow transport, post-arrival segregation, and treatment procedures when indicated.
5. If available, select resistant stock with hygienic behaviour.



---

## 1.2 Prevention: Minimizing Susceptibility to Pests

### Target Outcome

Factors are managed to reduce the bees' susceptibility to pests. A response is implemented when threshold levels are reached.

### Description

Bee health may be compromised by a number of factors that can be managed effectively within the bee operation. Factors that increase bee susceptibility to pests include weather, storage conditions, malnutrition, stocking rates, inadequate housing (e.g. nest material, overcrowding in hives).

If weakened, the bees will be more susceptible to infection or infestation, and less able to recover in response to treatments. If bees are distressed, they may expand their foraging area and increase the risk of intermixing with other bees that are infected or infested with pests.

The ability of bees to recover from most forms of mild-, periodic- and short duration distress is relatively good, with the exception of some forms of pesticide exposure that can cause permanent damage or immediate death.

### The Risks

The risk associated with increased susceptibility to bee pests varies with the type of bees and extent and duration of exposure.

Risks include the following:

1. elevated bee losses
2. reduced pollination effectiveness
3. suppressed brood formation
4. declines in honey production (if applicable)

### Management Strategies

Examples of strategies to manage bee susceptibility to pests include

1. minimizing exposure to less than optimal temperature, humidity, wind and light conditions, as well as other environmental factors through equipment, shelter, and facility design, insulation, set-up, and location of hives or nests during transportation and in climate control systems.
2. following recommended pollination stocking rates.
3. providing adequate space for bees, brood, and food stores in hives and nests.
4. ensuring access to adequate, uncontaminated feed and water if applicable.

---

## 1.3 Prevention: Minimizing Exposure

### Target Outcome

Direct and indirect contact with infected or infested bees is minimized.

### Description

The first line of defence against infection or infestation of healthy bees is to minimize exposure to bee pests.

### The Risks

Exposure risk occurs via the following:

1. Direct bee-to-bee contact:
  - a. an infected or infested bee passes the pest directly to a healthy bee or brood within the same colony or nest; and
  - b. bees – including bees of another species – drift or transfer to colonies or nests, other than their own (known as intermixing).

2. Indirect contact:

An infected or infested host bee contaminates some surface (e.g. tools and equipment, feed, pollen, or water) with, for example, feces. The pest may survive long enough to be picked up by another bee.

### Management Strategies

To minimize exposure via direct bee-to-bee contact, consider the following:

1. bee equipment design
2. segregation of infected or infested bees
3. eliminating opportunities for bee intermixing
4. being aware of neighbours' practices and bee health

Strategies to minimize exposure via indirect contact are addressed in section 2.0: Operations Management.

---

## 1.4 Diagnosis and Monitoring

### Target Outcome

Pests and their signs are accurately diagnosed. Bee operations are monitored to assess the risk of pests.

### Description

Monitoring is one of the cornerstones of effective pest management. Monitoring has direct application to biosecurity and has three key purposes:

1. To investigate the cause of signs of pests or problems, and rule out non-infectious/infestation causes before treatment
2. To identify and confirm pest presence or levels that may require appropriate treatment and notification actions
3. To evaluate treatment efficacy and decide whether another treatment is necessary

### The Risks

These are the risks of NOT monitoring for bee pests and their signs:

1. rapid spread throughout the operation
2. spread to neighbouring bee operations through intermixing of infected or infested bees
3. missing the bees' or pests' lifecycle window for administering effective treatments
4. misdiagnosis leading to the wrong treatment being administered
5. unnecessary treatment applications if the infection or infestation is only suspected and not confirmed, or if the recommended treatment thresholds have not been reached
6. the incorrect assumption that a treatment has been effective due to resistance or environmental factors

### Management Strategies

The following outlines the principles of effective monitoring:

1. Pay regular attention to area outbreaks and alerts.
2. Monitor environmental or other factors that may mimic the signs of infection or infestation.
3. Carry out regular monitoring that coincides with the lifecycle of the bees (when they are most vulnerable) and with the lifecycle of the pest (when they are most effectively controlled).
4. Recognize early visual signs that may indicate a problem (e.g. observing bees' production levels, behaviour and visible clinical signs). Further investigation into the cause is triggered to avoid unnecessary treatments.
5. Sample methods to determine infection or infestation levels (e.g. spore or parasite counts).
6. Identify samples by colony or nest and location.

- 
7. Ensure that sampling methods are thorough enough to represent the entire bee operation.
  8. Handle samples with care to avoid spread.
  9. Confirm, using microscopic tests, diagnostic laboratories, or inspection services, where indicated.
  10. Be aware of and participate in, where offered, voluntary inspection programs.
  11. Keep records of observations, dates, and data such as test results.
  12. Train and update beekeepers, producers, and staff to recognize common and exotic pests, and their signs.
  13. Administer tests, if applicable, for suspected treatment resistance.
  14. Assess treatment efficacy, if necessary, so that re-treatment can occur or ineffective treatments will not be repeated.

## 1.5 Standard Response Plan

### Target Outcome

A standard response plan is in place to address treatment thresholds, options, and rotation plans, notification procedures, record keeping, and follow-up actions.

### Description

A standard response refers to interventions that address the pests that are commonly encountered in the operation or the general area. Such biosecurity risks may be associated with provincial requirements or alert advisories.

A standard response plan includes procedures for segregation, destruction, cultural and chemical treatments, and communication and notification.

### The Risks

The risks associated with NOT having a standard response plan are

1. reduced treatment efficacy or treatment failure, resulting in weakened bees or death.
2. more rapid spread of the pest, both within the operation and to other operations.
3. greater likelihood of re-infection or re-infestation.
4. increased probability of treatment resistance.
5. weakened and pest-susceptible bees.

---

## Management Strategies

Response planning requires beekeepers, producers, and their staff to be trained on procedures in order to implement the plan and know when and how to contact authorities or specialists.

Standard response planning entails

1. keeping up to date with recommended pest management recommendations.
2. understanding environmental influences that could reduce treatment effectiveness.
3. establishing triggers for the response plan:
  - a. a certain percentage of bees, hives, or nests showing signs of disease;
  - b. the number of parasites or insect pests present;
  - c. treatment thresholds;
  - d. a significant decrease in production;
  - e. a lack of response to routine treatments; and
  - f. unanticipated mortality rates.
4. limiting movements of (suspected or confirmed) infected or infested bees.
5. keeping records of treatments and results.

Response strategies include physical, cultural, mechanical, and chemical management and controls.

Administering chemical controls involves

1. understanding and following product labels.
2. following industry-recognized recommendations for the timing and scope of treatment application.
3. rotating and alternating treatments to reduce the development of resistance.
4. removing treatment products at the conclusion of the treatment period.
5. coordinating chemical treatments with sanitation and disinfection procedures to avoid re-exposure.

---

## 1.6 Elevated Response Plan

### Target Outcome

An elevated response plan is in place, and the conditions under which it will be implemented are understood.

### Description

An elevated response is triggered when a high-risk, exotic, or unfamiliar pest is suspected or where its presence is confirmed. Such biosecurity risks are usually associated with provincial reporting requirements as specified by provincial acts and regulations, as well as the CFIA's listing of reportable and notifiable diseases.

### The Risks

The following outlines the risks associated with NOT having an elevated response plan:

1. potentially significant economic loss if an appropriate action is taken on short notice or if there is no treatment available;
2. possible quarantine order placed on premises where bees are kept that may remain in effect for an extended period;
3. possible disruptions to bee movement (or bee and supplies purchase or sale) associated with mandatory quarantine areas; and
4. more rapid spread of the pest, both within the operation and to other operations.

### Management Strategies

An elevated response plan includes all elements of a Standard Response Plan as well as:

1. an elevated communications and notification plan;
2. a bee management protocol if
  - a. a biosecurity risk is suspected but not yet confirmed; and
  - b. a biosecurity risk is confirmed;
3. quarantine protocols if a quarantine order or declared area has been decreed;
4. a visitor protocol; and
5. signage.



---

## Section 2

## Operations Management

**Examples of management topics for each bee sector can be found in Appendix B at the end of this document.**

### 2.1 Obtaining Production Inputs

#### Target Outcome

Only recommended production inputs are utilized and are obtained from known and reliable sources.

#### Description

**Production inputs** include “consumable” products:

- treatment products for pest management
- products used for cleaning and disinfection
- feed and water where applicable
- some materials used in hives or nests

Production inputs exclude bees and reusable hive and nest equipment, tools, and protective clothing.

#### The Risks

The risks associated with using production inputs that are not approved or not obtained from documented safe sources include

1. reduced treatment efficacy
2. introduction of pests to healthy bees
3. spread of pests within the operation or to other operations through exposure of healthy bees to contaminated inputs where applicable

---

## Management Strategies

Examples of management strategies are as follows:

1. Know your suppliers.
2. Avoid used or expired production inputs or those that have not been properly stored or disinfected prior to purchase.
3. Ensure production inputs derived from your own operation are pest-free where applicable.
4. Keep records to enable traceback.

## 2.2 Handling and Disposal of Production Inputs

### Target Outcome

The degradation and contamination of production inputs is prevented by safe and secure storage, and disposal.

### Description

Some types of treatment products require climate-controlled storage to prevent degradation. Some treatments must be removed following the recommended treatment period. In some types of bee operations, contaminated production inputs can be a source of infection or infestation (e.g. feed and water that are reused or accessed by healthy bees due to improper storage, sanitation, or disposal).

### The Risks

There are three types of risk associated with improper handling and disposal of production inputs:

1. reduced treatment efficacy
2. potential for treatment-resistance development
3. spread of pests within the operation or to other operations through exposure of healthy bees to contaminated inputs where applicable.

### Management Strategies

Examples of management strategies are as follows:

1. Follow recommended treatments.
2. Follow all product labels.
3. Avoid reusing production inputs that have been exposed to bees where applicable.
4. Use storage and disposal containers that bees cannot readily access where applicable.
5. Promptly remove bee attractants where applicable.
6. Properly and promptly dispose of used or excess production inputs.

---

## 2.3 Obtaining Bee Equipment

### Target Outcome

Bee equipment is obtained from known and reliable sources. Used equipment is accompanied by proper permits, if required, and is cleaned and disinfected or treated upon arrival as needed.

### Description

Bee equipment includes reusable hive or nest equipment.

Bee equipment excludes production inputs, tools and personal protection equipment.

### The Risks

1. Exposure of healthy bees to pests may be brought in with the used equipment and spread throughout the operation.
2. Using inferior hives or nests can contribute to bee susceptibility to pests and allow entry of unwanted bees or other pests.
3. Poorly designed equipment may impede ease of inspection.

### Management Strategies

These are examples of management strategies:

1. Know your suppliers.
2. Avoid used equipment, unless the health status is known and the equipment has been cleaned and disinfected.
3. Maintain records to enable traceback.

## 2.4 Management and Maintenance of Bee Equipment, Dead Bees, and Bee Products

### Target Outcome

Bee equipment is regularly inspected, and, when necessary, action is taken to minimize negative impact to bee health.

### Description

Managing, cleaning, disinfecting, and maintaining bee equipment in a manner that prevents or removes pests and unwanted bees will reduce this biosecurity risk.

---

## The Risks

1. Pathogen spores can survive on wood and metal surfaces of equipment, on or in dead bees, or in bee products.
2. Parasites can survive on or in the bee equipment or other material for short periods of time without a live host bee.
3. Insect pests can survive in bee equipment for much longer periods, providing there is a food source and depending on its lifecycle stage.
4. Unused equipment can provide shelter to unwanted bees, and poorly maintained equipment can provide entry points for robber bees and other insect predators.

## Management Strategies

1. Identify bee equipment to assist in bee management and traceback.
2. Perform routine inspections.
3. Avoid exchanging bee equipment between hives or nests without cleaning and disinfecting first.
4. Use mechanical methods such as brushing and scraping to remove the majority of debris on equipment surfaces, before washing and, if required, disinfecting.
5. Promptly replace or repair worn bee equipment.
6. Store unused bee equipment in facilities that bees cannot easily access, where applicable.
7. Properly dispose of equipment that cannot be reused or cannot be cleaned and disinfected.
8. Ideally, schedule and keep records to track cleaning, disinfection, repair, and disposal activities.

## 2.5 Personal Sanitation

### Target Outcome

Precautions are taken to minimize the spread of pests through human contact with bees and equipment.

### Description

Personal contact with bees may be via bare hands and via contact with personal protective equipment, including gloves, coveralls, head gear, footwear, or tools.

### The Risks

When moving between hives or nests and between the field, greenhouse, storage and processing facilities, there is a potential for spreading pests by

1. hand
2. personal protective equipment
3. tools

---

## Management Strategies

Recommended strategies:

1. handwashing.
2. changing and disinfecting gloves and protective clothing
3. tool cleaning and disinfection when applicable
4. proper disposal of personal protective equipment and tools that are not for reuse

## 2.6 Design of Facilities

### Target Outcome

Facilities are constructed to allow for ease in cleaning, are bee-tight if needed, and are consistent with government standards if applicable. The facilities have appropriate lighting and climate control for safe storage of bees and production inputs, and enable monitoring and pest management.

### Description

Facilities include

- bee storage and incubation;
- buildings used for processing;
- storage facilities for bee production inputs, including feed, treatment products, and other supplies;
- storage for unused bee equipment, tools, and protective clothing;
- storage of bee products and packaging material;
- equipment repair shop; and
- garages for housing transportation equipment.

Facilities management extends to building exteriors and loading areas.

### The Risks

While the risk of pest transmission to healthy bees via contact with the surfaces of facilities is low relative to direct contact with hive or nest equipment, the following risks may be mitigated by carefully considered facility design.

1. Bees in storage may be susceptible to biosecurity risks directly or indirectly from exposure to pests, rodents, lack of ventilation, and poor temperature control.
2. Stored treatment products may be degraded by high temperatures and light exposure, reducing efficacy and possibly leading to treatment resistance.
3. Poor facility design may lead to the requirement to use more chemical controls, leading to potential treatment resistance.

- 
4. The effectiveness of some indoor wintering treatments may be impacted by temperature and ventilation.
  5. Inadequate ability to physically segregate infected or infested bees, or contaminated hive and nest equipment, tools, or other materials presents a risk of more rapid spread throughout the operation.

## Management Strategies

It is recommended that facilities be designed to

1. be bee-tight to exclude carriers of pests where appropriate.
2. limit rodent entry.
3. enable segregation, inspection, monitoring, treatment, cleaning and disinfection if there is a risk of introduction or spread.
4. have adequate climate control (light, temperature, air exchange, and humidity) to limit susceptibility of bees in storage to pests and to prevent degradation of production inputs.
5. have floors and walls that can be thoroughly cleaned and disinfected.
6. address solid and liquid waste disposal.

Controlled cold or heated storage may also be used to effectively treat equipment for some pests.

## 2.7 Maintenance of premises, buildings, vehicles, and other equipment

### Target Outcome

A sanitation and maintenance program is implemented for all premises, buildings, vehicles, and other equipment.

### Description

Pests that survive in premises, on building surfaces, vehicles, forklifts, dollies, pallets, and other equipment (e.g. processing or incubating equipment) can be spread directly to bees or bee equipment. Buildings and other equipment can also provide shelter to unwanted bees.

### The Risks

1. Disease spores can survive on wood and metal surfaces, and in carrier substances such as water. If diseased bees are handled by vehicles and equipment that are subsequently used to handle healthy bees, there is a risk of disease spread.
2. Insect pests and parasites can survive on equipment, buildings, and unused bee equipment, although some for only short periods of time. These pests can be spread to healthy bees through contact with infested surfaces.
3. Some equipment may present a housing environment for pests or infected/infested bees that could be accessed by healthy bees.



---

## Management Strategies

Managing, cleaning, disinfecting, and maintaining premises, buildings, vehicles and other equipment in a manner that prevents or removes pests and unwanted bees will reduce this biosecurity risk as follows:

1. Plan and schedule cleaning and disinfection operations.
2. Segregate items that could harbour pests and bees from areas where bees are kept. This includes old vehicles, shelters, and farm equipment.
3. Have designated cleaning areas for vehicles, handling equipment, and processing equipment.
4. Use mechanical methods such as sweeping, brushing, and scraping to remove the majority of debris on surfaces, before power-washing and, if required, disinfecting.
5. Ensure that buildings are kept in optimal condition and remain bee-tight if applicable.
6. Ensure that buildings are maintained.

## 2.8 Control of Weeds and Nuisance Pests

### Target Outcome

An integrated management program for weeds and nuisance pests is implemented.

### Description

**A weed** is defined as any unwanted vegetation, including cultivated and volunteer crops, growing in and around any indoor or outdoor location where bees are kept.

**Nuisance pests** include insects, such as ants and wasps, rodents, skunks, raccoons, and large mammals such as bears and cattle, as well as some birds.

**Pesticides** (referred to in this section) include herbicides (to kill weeds), insecticides (to kill insects), and rodenticides (to kill rodents).

### The Risks

Weeds and unwanted vegetation growing in and around hives or nests placed in the field can facilitate the following:

1. Provide nesting sites for nuisance pests and unwanted bees.
2. Serve as “bridges” or a way in to the hive or nest.
3. Obstruct entrances to hives or nests, and inhibit bee foraging.
4. Hold moisture that can deteriorate the base of the equipment or promote bee diseases that thrive in high humidity conditions.
5. Obstruct the performance of routine inspections and management.

---

Nuisance pests may damage the hive or nest material; consume bees, bee cells, and brood; rob food stores; spread diseases and parasites; and result in weakened bees that are more susceptible to bee pests. Nuisance pests may be a biosecurity risk to bees placed outdoors, in greenhouses, or stored in indoor overwintering facilities.

## Management Strategies

1. Monitor weed growth, the presence of nuisance pests, and visual signs of infestation and disturbance.
2. Ensure facilities and equipment are in good repair.
3. Remove nests, potential nesting sites, and other pest attractants.
4. Use physical barriers such as fences or screens, and set hives or nests off the ground.
5. Set mechanical or poison bait traps for rodents, and regularly monitor the traps.
6. Follow provincial wildlife management regulations regarding trapping and shooting larger predators.
7. Choose bee placement sites away from areas normally frequented by large predators, and move bees if subject to repeated attacks.
8. Use deterrents (reflectors, sound, dogs).
9. Apply pesticides according to label directions, and take extreme caution when applied around bees.
10. Use weed control methods that minimize disturbance to bees where applicable.

## 2.9 Training and Education

### Target Outcome

All those working in a beekeeping operation or utilizing bees are trained and regularly updated on biosecurity risks and protocols.

### Description

Biosecurity training includes, but is not limited to, knowledge of

- biosecurity principles, risks, and why biosecurity is important;
- a basic understanding of bee and pest biology;
- a basic understanding of predator behaviour;
- monitoring procedures, how to recognize signs and their causes, and when to escalate reporting of observations;
- procedures that prevent the spread of pests while performing regular duties;
- treatment-application methods;
- current regulations governing registration, bee purchase, sale and movement permits, notification and treatments;

- 
- key contacts;
  - bee and equipment identification systems; and
  - record-keeping systems.

Biosecurity training may be delivered by

- in-house staff-orientation training sessions or meetings
- on-the-job training by working under direct supervision
- self-study
- attending courses

## The Risks

Failure to train and keep up to date with advancements in bee biosecurity protocols may lead to

1. exposure and/or spread of pests to healthy bees.
2. missed or delayed diagnosis of a pest, resulting in economic loss.
3. wrong diagnosis of a pest, resulting in unnecessary or ineffective treatment.
4. errors in administering treatments that could reduce efficacy or be toxic to bees.
5. risks to staff health and safety when administering treatments to address biosecurity risks.

## Management Strategies

A Bee Biosecurity Training Plan is recommended to include the following:

1. Develop standard operating procedures (SOPs) that are reviewed at least annually.
2. Source, develop, illustrate, and translate, if applicable, resource material (e.g. a handbook, posters).
3. Schedule staff training, and update on biosecurity measures that are relevant to their job functions.
4. Maintain records of staff training.

Consult with and involve staff in developing and revising the biosecurity plan.

Where available, it is advisable to join a beekeeping or related producer association.

# Appendix A

## BeeBAC Members and Project Advisors

Member	Membership
<b>Industry</b>	
Rod Scarlett	Canadian Honey Council Executive Director, BeeBAC
Gerry McKee	Canadian Honey Council Chair and BC producer, BeeBAC
Corey Bacon	Canadian Honey Council Former Chair and Saskatchewan producer, BeeBAC
Heather Clay	Canadian Honey Council – Former Executive Director and producer, BeeBAC
Lee Townsend	Canadian Honey Council Vice Chair and Alberta producer, BeeBAC
Tom Trueman	Canadian Honey Council – New Brunswick producer, BeeBAC
Bryan Ash	Canadian Honey Council – Manitoba Beekeepers’ Association and producer
Wayne Goerzen	Research Scientist / former Executive Director - SASPA / SASPDC- Alfalfa Leafcutting Bee Subcommittee, BeeBAC
Don Grieg	Manitoba Forage Seed Producers Association - Alfalfa Leafcutting Bee Subcommittee, BeeBAC
Gordon Frank	Alberta Alfalfa Seed Commission - Alfalfa Leafcutting Bee Subcommittee, BeeBAC
Darren Nikkel	Alberta Alfalfa Seed Commission - Alfalfa Leafcutting Bee Subcommittee, BeeBAC
Heather McBey	Manitoba Forage Seed Association - Alfalfa Leafcutting Bee Subcommittee, BeeBAC
Richard Ward	Biobest Canada – Bumblebee Subcommittee
Rene Ruiter	Koppert Biological Systems – Bumblebee Subcommittee
Iris Bitterlich	Canadian Horticulture Council – Bumblebee Subcommittee
Leanne Wilson	Canadian Horticulture Council – Bumblebee Subcommittee
<b>Academia/Research</b>	
Rob Currie	University of Manitoba, BeeBAC
Steve Pernal	Agriculture and Agri-Food Canada – Research Scientist, Apiculture, Officer-in-Charge, Beaverlodge Research Farm, BeeBAC
Kenna MacKenzie	Agriculture and Agri-Food Canada – Research Manager, Pacific Agri-Food Research Centre, Summerland, British Columbia, Bumblebee Subcommittee

Member	Membership
<b>Provincial Government Apiarists or Veterinarians</b>	
Paul van Westendorp	British Columbia
Medhat Nasr	Alberta
Geoff Wilson	Saskatchewan
Rheal Lafreniere	Manitoba
David Ostermann	(Assistant PA) Manitoba
Paul Kozak	Ontario
Claude Boucher	Quebec
Chris Maund	New Brunswick
Joanne Moran	Nova Scotia
Chris Jordan	Prince Edward Island
Krista Head	Newfoundland and Labrador
<b>Federal Government - Canadian Food Inspection Agency – Office of Animal Biosecurity (OAB) Project Management Team</b>	
Tim Talbot	Biosecurity Specialist, OAB
Lorne Jordan	Chief Biosecurity Specialist, OAB
Manon Racicot	Veterinary Program Specialist, OAB
Katie Clow	Veterinarian, OAB
<b>Serecon Management Consulting Inc.</b>	
Scott Ingledew	Project Manager and Leafcutting Bee Lead Consultant
Karen Paul	Honey Bee Lead Consultant
Markus Weber	Bumblebee Lead Consultant

## Appendix B

# Examples of Management Topics for Bee Sectors

Overall outcome of this Standard: To minimize the introduction to and spread of pests within and beyond the bee operation. Most of the topics described below require some level of record keeping to achieve the target outcome and are described in more detail in the Producer Guides.

## Section 1: Bee Health Management

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>1.1 Bee Sources</b> <b>TARGET OUTCOME:</b> Exposure to pests is minimized by introducing bee stocks of known health status. Sources are documented to enable traceability.		
External Purchase source Selection of resistant stock and stock that exhibits hygienic behaviour Management of purchased queens (removing attendants, replacing queen cages) Segregation (of bees and nucs) Internal sources (nucs and queen rearing) Capturing swarms Uniting Inspection/Assessment/Testing/Monitoring Preventative treatment Documentation and regulatory compliance Traceback	Supplier and stock selection Lot establishment Sampling Testing Regulatory compliance Documentation and traceback	Supplier selection Regulations and compliance Receiving, inspection, and assessment Placing bees Sanitation



Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>1.2 Prevention: Minimizing Susceptibility to Pests</b> <b>TARGET OUTCOME:</b> Factors are managed to reduce the bees' susceptibility to pests. A response is implemented when threshold levels are reached.		
Equipment set-up (stacking off ground/spacing) Environmental exposure (wind, temperature, humidity) Feeding (supplements/nectar flow) Watering Field stocking rates Transportation Movement within season Avoid pesticide exposure Preventative treatments Cultural methods (drone trapping, interruption of brood rearing, splitting) Uniting colonies Queen/nuc production	Storage and incubation conditions Nest construction Shelter maintenance Manage bee drifting and intermixing Irrigation management	Protection from weather extremes: <ul style="list-style-type: none"> <li>• Reduce overcrowding</li> <li>• Hive orientation</li> <li>• Shade</li> <li>• High carbon dioxide avoidance</li> <li>• Hives placed off the ground</li> <li>• Wind shelter</li> </ul> Ensure adequate feed and water Minimize disturbance: <ul style="list-style-type: none"> <li>• Moving hives</li> <li>• Transportation</li> <li>• Avoid pesticide exposure</li> </ul>
<b>1.3 Prevention: Minimizing Exposure</b> <b>TARGET OUTCOME:</b> Direct and indirect contact with infected or infested bees is minimized.		
Equipment (# of brood chambers, using excluders, screened bottom boards) Apiary placement (segregation) Proximity to extraction facilities Feeding method Robbing and drifting Intermixing with other bee species Swarm prevention Awareness of neighbours' practices and bee health Queen/nuc production	Storage and incubation conditions Removing trays and emerged bee cells from field Shelter selection, shelter placement, and orientation Stocking rates Bee release and field health Filled nest block removal Bee cell processing Transport	Hive placement Transportation Restricting movement Screen entrances Queen excluder

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>1.4 Diagnosis and Monitoring</b> <b>TARGET OUTCOME:</b> Pests and their signs are accurately diagnosed. Bee operations are monitored to assess the risk of pests.		
Ongoing health assessment Investigation triggers (bee health and productivity thresholds) Identification of pests and their signs (endemic and exotic) Testing/verification Test for suspected resistance Treatment efficacy Area outbreaks and alerts	Ongoing health assessment Investigation triggers (bee health and productivity thresholds) Identification of pests and their signs (known Canadian problems and those from abroad) Sampling, testing/verification	Area/supplier/industry alerts Ongoing assessment Investigation triggers Identification of pests and their signs Sampling/testing
<b>1.5 Standard Response Plan</b> <b>TARGET OUTCOME:</b> A standard response plan is in place to address treatment thresholds, options and rotation plans, notification procedures, record keeping, and follow-up actions.		
Seasonal treatment thresholds Treatment plan (segregation, culling, cultural and chemical) Treatment scope (# and location of colonies treated) Product rotation plan Follow annual treatment recommendations Follow strip removal/disposal recommendations Follow product labels Communication and notification	Treatment thresholds Treatment plan (culling, selling, cultural and chemical) Follow product labels Techniques used for control of chalkbrood, parasites and stored product pests.	Hive disposal and replacement Principles of treating with chemicals Follow recommendations Product labels

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>1.6 Elevated Response Plan</b> <b>TARGET OUTCOME:</b> An elevated response plan is in place, and the conditions under which it will be implemented are understood.		
List of conditions to trigger an elevated response plan Response plan includes: Communications and notification (contact telephone numbers) Management protocol for bee introductions, shipments Bee-management protocol Quarantine protocols Visitor and supplier protocol Signage	List of conditions to trigger an elevated response plan Response plan includes: Communications and notification (contact telephone numbers) Management protocol for bee purchases and shipments Bee management protocol (additional sanitation protocol) Quarantine protocols Visitor and supplier protocol Signage	List of conditions to trigger an elevated response plan Response plan includes: Communication and notification (contact telephone numbers) Management protocol for bee introductions, shipments Bee-management protocol Quarantine protocols Visitor and supplier protocol Signage

## Section 2: Operations Management

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>2.1 Obtaining production inputs</b> <b>TARGET OUTCOME:</b> Only recommended production inputs are utilized and are obtained from known and reliable sources.		
Feed, supplements, other treatments (e.g. essential oils) Pollen and pollen substitutes Water Pest management and treatment products	Pest management and treatment products	Feed Water Treatments
<b>2.2 Handling and disposal of production inputs</b> <b>TARGET OUTCOME:</b> The degradation and contamination of production inputs is prevented by safe and secure storage and disposal.		
Disposal of excess sugar and other feed and water Disinfection or disposal of packing material (imported bees) Storage and handling of pharmaceuticals, chemical treatments, and supplies	Storage and handling of chemical treatments and supplies	Disposal of excess or contaminated production inputs Handling of feed and water Storage of production inputs

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>2.3 Obtaining bee equipment</b> <b>TARGET OUTCOME:</b> Bee equipment is obtained from known and reliable sources. Used equipment is accompanied by proper permits, if required, and is cleaned and disinfected or treated upon arrival as needed.		
Bee equipment type (hive boxes, frames, screens, foundation type, excluders) Identification of equipment New/used	Bee equipment type (nest blocks, nest block backing, trays, shelters) Receiving and treating used equipment	Purchase new equipment only from a recognized supplier.
<b>2.4 Management and maintenance of bee equipment, dead bees, and bee products</b> <b>TARGET OUTCOME:</b> Bee equipment is regularly inspected and, when necessary, action is taken to minimize negative impact to bee health.		
Inspection Repair/replacement Clean and disinfect Routine disposal Contaminated segregation and disposal (e.g. American foulbrood) Storage/disposal of black combs and other used material Storage practices	Inspection Equipment culling and repair Cleaning and debris management Equipment disposal Equipment disinfection Equipment storage	Disposal of hive boxes
<b>2.5 Personal Sanitation</b> <b>TARGET OUTCOME:</b> Precautions are taken to minimize the spread of pests through human contact with bees and equipment.		
Gloves/clothing Handwashing Tool disinfection	Order of handling Handwashing Gloves/clothing	Gloves/clothing Handwashing Tool disinfection

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>2.6 Design of facilities</b> <b>TARGET OUTCOME:</b> Facilities are constructed to allow for ease in cleaning, are bee-tight if needed, and are consistent with government standards, if applicable. The facilities have appropriate lighting and climate control for safe storage of bees and production inputs, and enable monitoring and control of pest management.		
Bee- and insect-proof Temperature and humidity controlled storage Appropriate ventilation Adequate lighting Washable floor material surfaces (i.e. floors, walls)	Facility design Construction materials Temperature and humidity controlled storage and incubation Ventilation Dust control Vapour-tight buildings for paraformaldehyde fumigation Pest-tight buildings Adequate lighting Building segregation Cleaning and waste disposal	Section not included
<b>2.7 Maintenance of premises, buildings, vehicles and other equipment</b> <b>TARGET OUTCOME:</b> A sanitation and maintenance program is implemented for all premises, buildings, vehicles, and other equipment.		
Designated cleaning areas Sanitation (cleaning/washing) Disinfection Waste-water disposal Yard and premises' maintenance Links to on-farm food safety programs	Premises maintenance Sanitation (cleaning/washing) Disinfection Premises maintenance Designated cleaning areas	Remove old hive boxes Clean and disinfect the area from where hive boxes are being removed Monitor ventilation and temperature systems in greenhouses
<b>2.8 Control of weeds and nuisance pests</b> <b>TARGET OUTCOME:</b> An integrated management program for weeds and other nuisance pests is implemented.		
Weeds Insects (wasps, wax moths, ants) Rodents (mice), raccoons, and skunks Large mammals (bear, cattle) Birds	Monitoring General control Weeds Insects Rodents (mice) Birds	Weeds Wasps Mice Larger mammals Birds

Honey Bee	Alfalfa Leafcutting Bee	Bumblebee
<b>2.9 Training and Education</b> <b>TARGET OUTCOME:</b> All those working in a beekeeping operation or utilizing bees are trained and regularly updated on biosecurity risks and protocols.		
Plan Permits and regulations (where applicable) Beekeeper education and updates Staff training and update	Plan Producer education and updates Staff training and update	Plan Education and updates Staff training and update