CFIA-ACIA

Biosecurity for Canadian Cervid Farms

Producer Planning Guide

March 31, 2018

Growing Forward 2 | Cultivons l'avenir 2

CANADIAN CERVID ALLIANCE

Canada

Table of contents

Quick reference guide 6

Summary of principles, strategies and target outcomes 6

Chapter 1: Introduction and background 9

1.1 Purpose of a national standard and planning guide: 9

1.2 What is biosecurity? 9

1.3 Why is biosecurity important in the cervid industry? 10

What the standard and planning guide are and are not 10

Chapter 2: Overview and use of the producer planning guide 12

2.1 How to use the biosecurity guide: 12

2.2 Overview of the structure of the Producer Planning Guide: 12

2.3 Disclaimer 12

Chapter 3: Developing a farm biosecurity plan: 13

Steps in developing a farm specific biosecurity plan 13

Figure 1: Developing and maintaining your biosecurity plan 15

Chapter 4: The biosecurity standard 16

Principle 1: Management of farm, facilities and equipment 16

Strategy 1.1: Assess the biosecurity risks of the area where the farm is located or to be located. 16

Strategy 1.2: Assess and identify areas of risk on the farm 17

Strategy 1.3: Create a diagram of the farm layout 19

Strategy 1.4: Clean and disinfect facilities, equipment and vehicles 19

Strategy 1.5: Design and maintain facilities to reduce disease risks 21

Strategy 1.6: Reduce risk posed by equipment and vehicles 21

Strategy 1.7: Manage manure 22

Strategy 1.8: Manage feed, water and bedding 23

Strategy 1.9: Manage deadstock 24

Principle 2: Animal health management practices 26

Strategy 2.1: Sourcing cervids 26

Strategy 2.2: Separate herd additions and returning cervids of undetermined health status from the resident herd (Isolation). 26

Strategy 2.3: Minimize contact with other livestock, domestic animals and pests 27

Strategy 2.4: Develop and implement a herd health program 28

Strategy 2.5: Manage and treat sick animals 30

Strategy 2.6: Develop a response plan for disease outbreaks 31

Principle 3: Management of people 33

Strategy 3.1: Train farm workers in biosecurity 33
Strategy 3.2: Determine the risks posed by people 33
Figure 2: Assessing risks posed by people 35
Strategy 3.3: Develop and implement risk management practices for all people entering the farm 36
Strategy 3.4: Manage zoonotic disease risks 37
Principle 4: Protocols and record-keeping 38
Strategy 4.1: Protocols for animal health and farm management practices 38
Strategy 4.2: Herd and individual animal health records 38
Strategy 4.3: Farm management records 39
Strategy 4.4: Education and training activities 39
Appendix 1: Glossary 41
Appendix 2: Biosecurity risk evaluation checklist 43
Appendix 3: Sample cervid farm layouts 48
Figure 3: Sample Layout 48
Figure 4: Sample Layout 50
Figure 5: Sample layout of animal handling areas. 52
Figure 6: Sample layout of animal handling areas. 54
Figure 7: Spot the biosecurity concerns 55
Figure 8: Spot the biosecurity concerns 56
Appendix 4: Selected disinfectants 58
Recommendations on using bleach as a disinfectant: 60
Recommendations on using disinfectants containing hydrogen peroxide: 61
Appendix 5: Cleaning and disinfecting procedures (sample) 62
Appendix 6: Selected infectious diseases and parasites of cervids 64
Appendix 7: What are reportable/notifiable diseases? 69
Appendix 8: Links to select provincial and federal acts / regulations/ programs of importance 70
Appendix 9: Farm visitor log (Sample) 72
Appendix 10: Sample deadstock management plan 73
Appendix 11: Mortality log (Sample) 75
Appendix 12: Animal movement log (Sample) 76
Appendix 13: Personnel training log (Sample) 77
Appendix 14: Planned herd vaccination / deworming / medication / testing schedule (Sample) 78
Appendix 15: Animal health record (Sample) 79
Appendix 16: Biosecurity planning for emergencies (sample plan) 80

Appendix 17: Biosecurity requirements for entry to risk areas workers/staff and service providers (sample plan) 81

Appendix 18: Membership of the cervid biosecurity advisory committee (CerBAC) during production of producer planning guide 82

Quick reference guide

Summary of principles, strategies and target outcomes

Principle 1: Management of farm, facilities and equipment

Goal:	**Minimize the effect that farm, facilities and equipment have as contributors to disease transmission.**

Strategy 1.1: Assess the biosecurity risks of the area where the farm is located or to be located

***Target outcome*:** Producers understand the risks of the areas they have chosen or are choosing for their farm and manage the risks appropriately.

Strategy 1.2: Assess and identify areas of risk on the farm

Target outcome: Areas of risk on the farm are identified and managed to reduce risks.

Strategy 1.3: Create a diagram of the farm layout

Target outcome: A farm diagram is used to identify farm layout, infrastructure and risk areas.

Strategy 1.4: Clean and disinfect facilities, equipment and vehicles

Target outcome: Cleaning and disinfection methods that are effective in reducing the risk of disease transmission are established and are used for facilities, equipment and vehicles entering, exiting and on the farm.

Strategy 1.5: Design and maintain facilities to reduce disease risks

Target outcome: Facilities are designed and maintained in good repair to reduce access by pests, facilitate cleaning and disinfection, and reduce the accumulation of pathogens and populations of pests. Considerations for biosecurity should be included when selecting a location and designing or renovating facilities.

Strategy 1.6: Reduce risk posed by equipment and vehicles

Target outcome: Vehicle and equipment access to and movement within the farm premises is managed to reduce the risk of disease transmission.

Strategy 1.7: Manage manure

Target outcome: Accumulations of manure, particularly in winter housing, and around feeding and watering areas are regularly removed and moved in a manner that limits exposure to the herd. Dedicated tools and equipment are used for manure handling, or cleaned and disinfected, prior to other uses. Manure is disposed of or dispersed to minimize pathogen and pest populations.

Strategy 1.8: Manage feed, water and bedding

Target outcome: Management practices are in place to ensure that feed, water, and bedding are of sufficient quantity and quality, and mitigation measures are in place to reduce the risks posed by pathogens and pests.

Strategy 1.9: Manage deadstock

Target outcome: Deadstock, unless anthrax is suspected, are removed immediately from livestock rearing areas and moved in a manner that limits cross-contamination with the herd. Placentas and aborted material and other tissues are managed as deadstock. The deadstock disposal area is located away from the production area and is secured against pets and wildlife. Disposal respects local regulations and is done in a manner that limits disease exposure to the herd.

Principle 2: Animal health management practices

Goal:	**Maximize the health, well-being and productivity of the herd by implementing a herd health program, managing cervid movements and minimizing contact with other animals.**

Strategy 2.1: Sourcing cervids

Target outcome: Animals are sourced from suppliers with herds of known health status or the health status of new animals aligns with the resident herd.

Strategy 2.2: Separate herd additions and returning cervids of undetermined health status from the resident herd (isolation)

Target outcome: Animals brought onto the farm (herd additions and returning animals) are separated from the resident herd and isolated until their disease status has been determined or is resolved.

Strategy 2.3: Minimize contact with other livestock, domestic animals, and pests

Target outcome: Cervid farms are managed to maintain habitat for many desirable species of flora and fauna while minimizing disease risks. Cervids in the resident herd are housed, moved and pastured in such a manner that the risk of contact with other livestock and domestic animals of undetermined health status and pests is minimized. An integrated pest control program should be maintained.

Strategy 2.4: Develop and implement a herd health program

***Target outcome*:** A herd health program is implemented, and serves as the basis for monitoring herd health and proactively identifying and minimizing the risk of disease transmission. The program describes the health regimens and practices used for daily care and disease prevention and control.

Strategy 2.5: Manage and treat sick animals

Target outcome: Animals showing signs of disease may be treated within the herd or moved into an isolation area away from the healthy herd and treated as necessary.

Strategy 2.6: Develop a response plan for disease outbreaks

***Target outcome*:** A disease response plan is developed and implemented to guide response activities when disease is suspected, identified or there is deterioration in health status. The plan should identify triggers for activating the response plan, requirements for enhanced biosecurity and, if warranted self-imposed whole farm isolation procedures (biocontainment).

Principle 3: Management of people

Goal:	**Minimize the potential risk posed by all farm visitors and farm personnel through the establishment of protocols, training and communication.**

Strategy 3.1: Train farmworkers about biosecurity

***Target outcome**:* All farm workers and family members are trained in and consistently implement the farm's biosecurity practices. The farm biosecurity protocol is communicated to visitors and service providers and they comply with it.

Strategy 3.2: Determine the risks posed by people

Target outcome: The potential risks posed by visitors and farm personnel for disease transmission are determined.

Strategy 3.3: Develop and implement risk management practices for all people entering the farm

Target outcome: People working on, providing service to or visiting the farm are guided by defined risk management practices.

Strategy 3.4: Manage zoonotic disease risks

Target outcome: Family members, farm workers, visitors and service providers understand the risks posed by zoonotic diseases and take precautions to protect themselves other people and animals.

Principle 4: Protocols and record-keeping

Goal:	**Establish protocols and maintain records to facilitate managing, improving and validating the biosecurity program and health status of the herd.**

Strategy 4.1: Protocols for animal health and farm management practices

Target outcome: Important biosecurity protocols are readily available to staff, family and service providers as needed, to facilitate reference, training, review and consistent implementation.

Strategy 4.2: Herd and individual animal health records

***Target outcome*:** Herd health and individual animal health records are maintained and reviewed to ensure optimum health and productivity of the herd.

Strategy 4.3: Farm management records

Target outcome: Records of farm management activities, including biosecurity measures, are maintained and reviewed**.**

Strategy 4.4: Education and training activities

Target outcome: Records of education and training of farm workers are maintained and reviewed to ensure they have the requisite knowledge and skills to successfully conduct their duties.

Chapter 1: Introduction and background

1.1 Purpose of a national standard and planning guide:

This document has been developed to support the National ***Cervid***[1] Farm-Level ***Biosecurity*** Standard and assist producers in developing and implementing farm-specific biosecurity plans to manage infectious diseases in the cervid industry. It contains guidelines and recommendations on minimizing infectious disease risks and sample forms for producers to begin developing their biosecurity plan. The guide is organized in a similar manner to the standard and can be used in whole or in part.

Specialized knowledge in animal husbandry, behaviour and handling practices is required for raising cervids. Inexperienced cervid producers must educate themselves on species specific care and handling and should seek assistance from knowledgeable producers and/or provincial organizations to ensure the animal health and welfare needs of their animals are met.

1.2 What is biosecurity?

Biosecurity is used to protect the health of animals from ***infectious*** diseases. It is a set of principles and practices that are used to reduce the risks posed by ***pathogens*** and ***pests***. The biosecurity standard provides measures that cervid producers may take to minimize the introduction of pathogens and pests onto a farm, their spread within the operation, and release off the farm.

Biosecurity may be defined as a set of practices used to minimize the presence of pests and the transmission of pathogens in animal and plant populations including their introduction (bio-exclusion), spread within the populations (bio-management), and release (bio-containment).

Biosecurity relies on the consistent use of a combination of procedural measures and physical barriers designed to disrupt the transmission of pathogens. These measures and barriers target opportunities for pathogen transmission that occur during routine animal care (e.g. contact with potentially contaminated equipment or materials), risks posed by less frequent activities (e.g. introduction of new animals to the herd) and changing risks (e.g. increased movement of animals and people onto and off of a property). To be effective, biosecurity measures must be applied consistently day to day, and on an ongoing basis.

The threat of infectious disease is always present. In the context of most farm operations, completely eliminating all threats is usually impractical and not achievable. Therefore, at the farm level, it is more appropriate to view biosecurity in terms of ***risk*** management, rather than risk elimination.

Biosecurity requires balancing the:

- **risk of disease transmission;**
- **consequences of disease occurring; and**
- **measures required to minimize disease.**

[1] Words in ***bold italics*** are defined in the Glossary the first time they are used, indicating their meaning in the context of the Guide.

The level of disease risk that is considered acceptable is likely to vary among cervid producers based on their business goals, species raised, management practices, products marketed and individual risk tolerances. These factors should be taken into account when developing premises-specific biosecurity plans. Ideally, plan development should be accomplished with the assistance of a veterinarian familiar with the cervid industry and the internal and external disease threats. Biosecurity plans must be practical, achievable and sustainable. Because the consequences of disease are many and far reaching, cervid producers should not look at their own biosecurity and risk tolerance without consideration of the industry as a whole.

Biosecurity is not a new concept. Many daily activities that cervid producers perform include biosecurity measures. Many biosecurity measures are not difficult or expensive to implement.

1.3 Why is biosecurity important in the cervid industry?

Animal health, welfare and food safety are intricately linked. Society demands that farm-raised animals are well cared for, free of disease and the products obtained are safe and of high quality. Freedom from disease and a high herd health status are important in Canada's cervid industry which raises elk, red deer, white-tailed deer, fallow deer, mule deer and reindeer. High herd health status facilitates market access, which is important for promoting the wide variety of cervid products which include meat, antler velvet, hard antler, trophy animals, and breeding stock.

The impacts of infectious disease in cervids can be significant and devastating. Disease can range from mild illness to death, from sporadic cases to extensive disease outbreaks. Even mild disease can result in chronic or permanent damage, decreased production (e.g. reproduction, product, and growth), increased financial costs, welfare concerns and potential risks to human health. Farms and facilities with poor biosecurity may become a significant risk to the industry. Every cervid producer should have a biosecurity plan that is implemented and reviewed on an ongoing basis.

What the standard and planning guide are and are not

The standard and planning guide are:	The standard and planning guide are not:
Voluntary	Mandatory
A set of risk-based management guidelines, addressing disease in a broad context, warranting thought and consideration in most cervid operations across Canada	A list of "must-do(s)," designed for a specific disease, to be achieved regardless of regional and operational differences
Based upon target outcomes, each of which can be achieved in a variety of ways	A prescriptive set of practices
Specific to biosecurity practices used by the Canadian cervid industry	Taken from another sector or country, and re-designed for the Canadian cervid farming sector
Practical and science-based, developed with consideration for the transmission of infectious pathogens across the range of cervid production systems	Idealistic, developed without consideration for the feasibility of implementation

Developed to address a broad range of cervid diseases	Not focused on addressing a specific disease
A collaborative project, developed by producers, subject matter experts, advisory groups, and leaders in industry and government	The work of one stakeholder

Chapter 2: Overview and use of the producer planning guide

2.1 How to use the biosecurity guide:

The **National Standard** provides guidelines and recommendations that **may** be implemented. The complex and variable nature of the cervid industry, regional differences, and other factors prevent the development of one set of specific guidelines and recommendations that are optimal for all cervid species and production systems.

The **Producer Planning Guide** accompanies the National Standard. This Guide identifies additional details and biosecurity intervention measures for producers to consider as they work to implement the National Standard on their farms. The National Standard and the Producer Planning Guide work together to provide an integrated framework for use by cervid producers.

2.2 Overview of the structure of the Producer Planning Guide:

Both the National Standard and Producer Planning Guide consist of four sections, each relating to an on-farm biosecurity **Principle**.

- Management of farm, facilities and equipment
- Animal health management practices
- Management of people
- Written protocols and record-keeping

A general **goal** has been identified for each biosecurity principle. To support meeting the goals, **target outcomes**, organized by similar activities (**strategies)** have been developed to provide overall direction for reducing disease risks. The target outcome approach provides the flexibility for producers to design biosecurity plans that will work on their farms. **Best practices** for each target outcome provide practical guidance on how producers may achieve the desired result.

2.3 Disclaimer

This document is provided to producers for **information purposes only**.

Although the authors of this document have made efforts to ensure accuracy and completeness of this document, errors and omissions may have occurred. The authors of, and contributors to, this document, including their employees, accept no responsibility for any loss or damage sustained by any person and/or entity resulting from information contained in this document.

The authors of, and contributors to, this document including their employees, do not make any warranty, express or implied, and assume no legal liability or responsibility for the accuracy, reliability, completeness or usefulness of any information, product, or process in this Guide.

This document should not be relied upon to determine your legal obligations. If you wish to determine your legal obligations, you must consult the relevant law and you may wish to seek advice from a lawyer. In the event of a conflict between the information in this document and any applicable law, the law prevails.

The authors reserve the right to modify this document as required from time to time and without prior notice.

The information in this document is current as of March 31, 2018. There may be new information, not included here, that could affect the information contained in this document.

Chapter 3: Developing a farm biosecurity plan:

Steps in developing a farm specific biosecurity plan

Developing a farm or facility biosecurity plan involves achieving the right balance between disease **risk** and **prevention**. Biosecurity can substantially reduce disease risks; however, producers will need to evaluate the expected benefits (such as improved health, productivity and welfare) against the feasibility and costs of implementation, and the impacts associated with the disease occurring.

Prior to developing a biosecurity plan, it is important to understand the potential disease risks to the herd, the pathogens responsible and how they are transmitted.

Disease risks: Consider cervid diseases present in the herd, those that commonly occur in the local area and those that less commonly occur but may be present. Some diseases may be important to your herd or at a regional or national level.

Pathogens: Understand the pathogens responsible for the disease. Some bacteria such as those responsible for Johne's disease or tuberculosis (Mycobacteria) can be shed by infected animals and survive for a long time in the environment under cool, damp conditions. ***Prions*** associated with Chronic Wasting Disease have been shown to be extremely persistent in the environment.

Transmission route: know the routes of transmission of the diseases of primary concern. Each disease is transmitted in specific ways — for example, by ***direct contact*** with infected animals or by ***indirect contact*** with the infectious agent through manure, air, water and feed, or by contact with tools, equipment or any facilities contaminated with infectious material.

Ensuring the nutritional and physiological needs of cervids, which together with proper handling practices help minimize stress factors, thereby reducing susceptibility to infectious diseases.

Refer to the *National Cervid Farm-Level Biosecurity Standard*, Chapter 2: Principles of disease transmission.

Step 1: Review management practices (Assess /Plan)

The location of the premises and farm management practices pose risks for disease exposure and transmission. By examining the premises and identifying the activities that occur on the farm, potential disease transmission risks can be identified and then management practices developed to minimize their occurrence.

Farm location, particularly proximity to other farms with similar species and high livestock density, can increase opportunities for pathogens to be present and introduced into your herd. The presence of ponds and wild animal habitat can result in exposure to pathogens and animals of unknown health status.

Most animal care and management practices pose a risk for introducing and spreading disease whether it is daily feeding or less frequent service calls. One way to identify biosecurity risks is to list the steps involved in completing a task and asses the likelihood for disease transmission.

Complete a biosecurity risk evaluation and review the biosecurity plan annually.

Refer to Appendix 2: Biosecurity Risk Evaluation Checklist.

Step 2: Identify biosecurity goals and best practices (Plan)

Using the biosecurity standard and guide, identify biosecurity goals and best practices that can be implemented to address the biosecurity gaps. Many of the biosecurity measures will be effective at minimizing the risks posed by a wide range of pathogens and pests during farm activities. However, there are some pathogens and activities that may require specific interventions. Producers should discuss these needs with their veterinarian and/or provincial/industry specialists to ensure the biosecurity measures are adequate for the identified risks.

Step 3: Develop a strategy to implement the plan (Implement)

While all biosecurity risks need to be addressed, some will be more critical than others. Prioritize the biosecurity tasks and establish a timeline for their completion identifying short term and long-term goals. This can improve farm efficiencies by helping to direct resources (e.g. finances, time, and labour etc.) to the areas of greatest risk.

One method of prioritizing biosecurity risks is to consider the likelihood of the biosecurity risk to be present or to occur and the consequence of it occurring. The significance of the risk is then determined by the interaction of the likelihood and consequence of it occurring.

When looking to implement the plan, establish short term goals and activities. These:

- can be planned and implemented within 12 months;
- are aligned to the current objectives and goals of your farm or facility; and
- often require minimal investment of time and capital.

Establish long-term activities. These can:

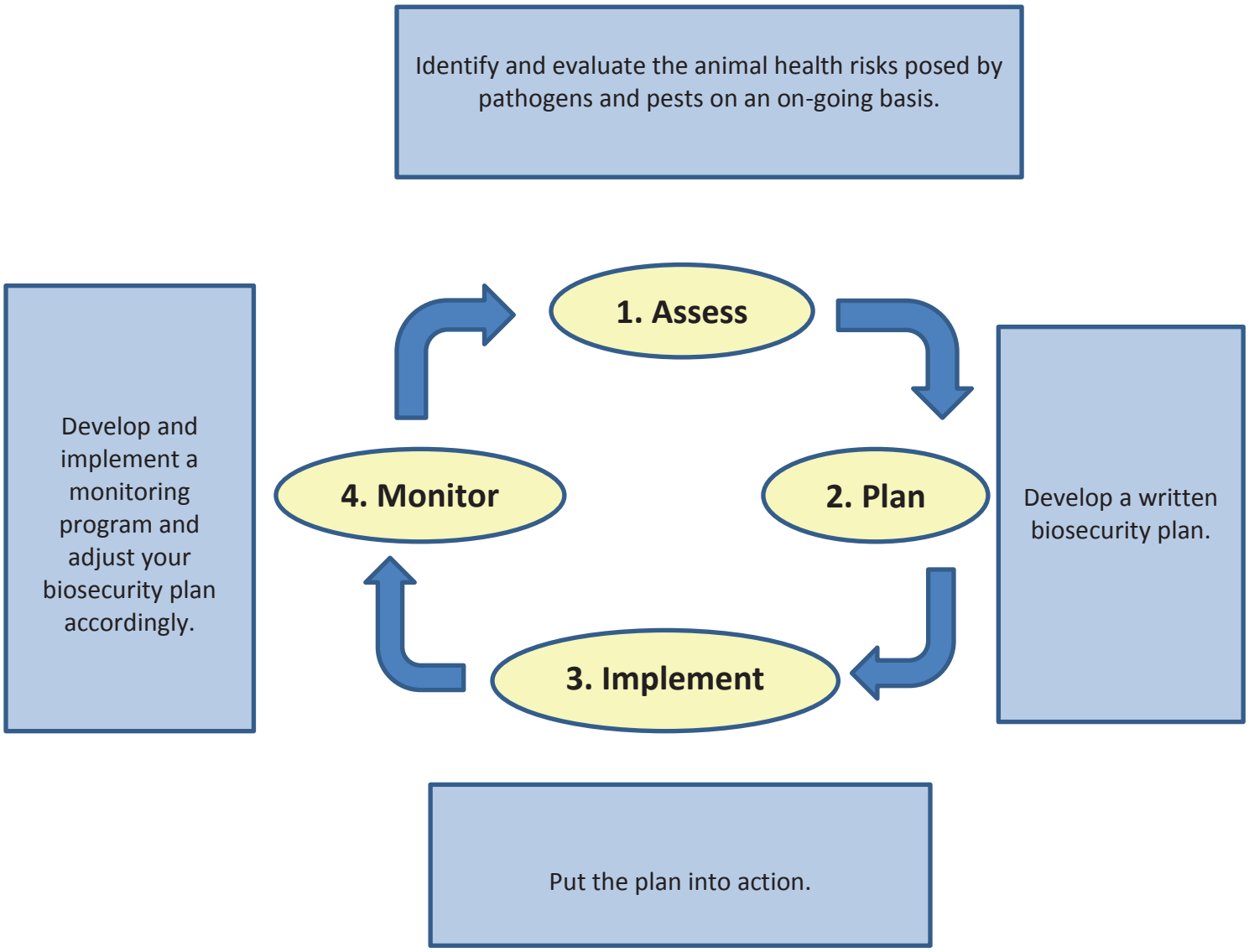
- be planned and implemented over more than one year;
- require changes in the physical infrastructure or layout of the farm or facility;
- require additional financial or personnel resources that are not currently available; and
- expand the overall goals and objectives of your management plan beyond their current scope.

Step 4: Review the effectiveness of the biosecurity plan and continuous improvement (Monitor)

The effectiveness of the biosecurity plan is measured by the integration of biosecurity practices, into daily routines and the impact on the health status of cervids on the property. It is through monitoring and reviewing the biosecurity program that improvements can be implemented.

- assess the applicability and effectiveness of the biosecurity practices by reviewing key health performance indicators from the herd health records during and after implementation of the biosecurity plan and as changes to the plan are made;
- consult with your veterinarian and other industry/provincial specialists on biosecurity and adjust your plan as necessary;
- meet with family and staff at least twice yearly or after implementing a new practice to discuss the feasibility and effectiveness of each of the practices in your biosecurity plan; and
- review education and training sessions to identify areas for improvement.

Figure 1: Developing and maintaining your biosecurity plan



Chapter 4: The biosecurity standard
Principle 1: Management of farm, facilities and equipment

Goal:	**Minimize the effect that farm, facilities and equipment have as contributors to disease transmission.**

Strategy 1.1: Assess the biosecurity risks of the area where the farm is located or to be located.

Target outcome:

Producers understand the risks of the areas they have chosen or are choosing for their farm and manage the risks appropriately.

Description:

The location of a farm can affect the risk of disease exposure, particularly the proximity to other farms raising similar species, other livestock operations, wild animal habitat and the presence of diseases that may affect the particular species that you are planning to raise. When higher animal densities are present in an area, there can be increased shedding and accumulation of pathogens resulting in a greater risk of exposure. However, not all pathogens pose the same risk. The properties of the pathogen, such as the length of time it survives in the environment, the mode of transmission and the number of organisms required to result in infection will influence infection rates. Understanding these differences and the role environmental conditions play in pathogen survival is important in adequately assessing risks.

If constructing a new facility, areas that are less densely populated by cervids can reduce the risk of exposure to pathogens. However, in less densely populated livestock areas, access to veterinary services, feed suppliers and other farm services may be reduced. Assess your needs and balance the potential benefits of a location with the accessibility to farm services.

Best practices:

- Determine, to the extent possible:
    - previous land use of the area; and
    - if land use includes previous or current livestock production, consider the risk of cervid pathogens and diseases on neighboring premises and within that region.
- Recognize that some pathogens can survive for extended periods of time in the environment (e.g. spore forming bacteria such as *Bacillus* spp. or *Clostridia* spp., and prions) or may be associated with certain environments due to their life-cycle (e.g. certain parasites)
- Consider the effect of local climate factors such as temperature, rainfall, and hours of sunlight on pasture conditions and pathogen survival. Cool, damp areas with minimal sunlight can promote survival of many organisms.
- Determine the proximity to potential sources of disease from other cervid and livestock producers, livestock auctions, renderers and deadstock operators to minimize potential disease exposure;
- Construct new operations at a sufficient distance from other cervid farms and livestock farms to minimize potential disease spread;
- Determine the proximity to veterinary clinics, feed and equipment suppliers; and

- Consider the proximity to wild animal habitat.

Strategy 1.2: Assess and identify areas of risk on the farm

Target outcome:

Areas of risk on the farm are identified and managed to reduce risks.

Description:

Biosecurity plans are based on a ***risk assessment*** of the farm's operations, the people on the farm, providing service or visiting the farm facilities. An accepted approach to risk assessment is to consider the diseases of concern to the farm, and to document how those diseases are known to be transmitted. Then, identify where risk points exist in cervid operations, human activities, presence of known ***vectors*** such as pests, and facilities and how they are maintained. Risk points in this context are where pathogens could be transmitted, both directly to cervids and also indirectly to cervids via other means.

There are some areas on a farm and some activities that pose a greater potential risk of disease spread. Identifying these areas and activities allows practices to be implemented for reducing potential contamination to minimize opportunities for transmission to the herd during day-to-day activities. They allow the separation of areas requiring elevated biosecurity, for example locations where animals congregate or where treatments and handling procedures occur. Locations where pathogens may be present pose a higher risk; for example, ***isolation*** areas for sick animals or animals of undetermined health status. Additionally, pens/pastures bordered by livestock of unknown health status or animals that pose a potential health risk.

Activities requiring a higher degree of biosecurity may include: breeding, vaccination, other proactive health treatments, and disease observation. If the areas are designed correctly, biosecurity practices can be implemented with minimal disruption to normal production activities.

Lower-risk areas include facilities that support animal production or are indirectly involved in animal production (for example, areas where service providers and farm workers circulate, laneways, parking areas, and equipment sheds). It may also include pastures not currently occupied with animals, depending on history of use.

The layout and management practices of individual farms help to decide whether deadstock handling, production waste (for example manure), and other aspects should be managed as higher or lower risk areas.
Within higher risk areas (where animals are present), there will be differences in the population of animals. There are:

- animals that pose a higher risk for transmitting a disease
    - animals that are clinically diseased
    - animals that have recently recovered from a disease
    - animals that have recently arrived and are of undetermined health status

- animals that pose a higher risk for acquiring disease
    - young animals
    - animals that are failing to thrive

- animals that have recently recovered from disease
- animals that have recently undergone medical treatments / surgeries
- animals exposed to a potentially stressful situation (for example: introduction of new animals, handling and transport of animals).

Designated risk areas can be enhanced when:

- **Risks are defined**: A risk assessment of the production activities is undertaken, and their specific disease risks are determined. In order to effectively manage risk areas, appropriate biosecurity practices must be implemented.
- **They create separation**: By using physical barriers (such as buildings, fences, and secure gates) and/or procedures (such as hand sanitation, clothing and footwear changes/cleaning and disinfection), the risk areas remain free of common contact between them.
- **They are visible**: The areas are clearly identified, and people understand the area-specific practices for entering, exiting and moving within them.
- **Access by people is managed**: Access by and movement of people (e.g. farm workers, family members, **service providers** and **visitors)** are managed to support bio-exclusion, bio-management and bio-containment.
- **Animal movement is managed**: Farm workers are aware of the risks of disease transmission associated with animal movement into and throughout the **premises**. Movement is planned to mitigate these risks.
- **Transition points are identified**: There is a visually-defined entry point through which all traffic (vehicles, people, animals, inputs and equipment) will enter risk areas, often referred to as controlled access points (CAPs). Specific biosecurity protocols may be in place at CAPs; for example, tools and equipment may be limited to use in only that area or specific cleaning and disinfection may be required. Hands may be washed, and protective clothing may be changed (e.g. coveralls) or cleaned (e.g. footwear).
- **They are specific to each operation**: The size and complexity of each operation and its existing facility layout will contribute to the establishment of risk areas.

Best practices:

- Designate areas of higher and lower risk on the farm;
- Locate high-risk areas away from higher traffic areas and potential sources of contamination such as manure and deadstock storage/disposal areas;
- Manage the flow of traffic to minimize ***cross-contamination*** between areas of higher and lower risk;
- Avoid overcrowding animals;
- Display biosecurity signage, particularly at areas of higher risk, advising it is an area of limited access and additional biosecurity procedures may be required;
- Schedule activities in a sequence that will minimize disease transmission by people, equipment, vehicles, and materials, and move from younger to older and then sick animals during routine care; and
- Establish CAPs, such as gates or doors, and provide the necessary equipment for implementing the required biosecurity measures.

Strategy 1.3: Create a diagram of the farm layout

Target outcome:

A farm diagram is used to illustrate farm layout, infrastructure and risk areas.

Description:

The use of a map or diagram of the farm layout is recommended to facilitate disease risk management. In addition to farm layout and infrastructure, the diagram can highlight areas of specific activities where cervids of different disease susceptibility might be exposed to one another; where people, tools, equipment and vehicles might come in contact with cervids; and where pathogens might be present on the farm.

Best practices:

Identify the following areas on a farm diagram:

- Property boundaries, fence lines, neighbouring livestock and wild animal habitat if present;
- Entrances to the property, other access points, gates, barriers, and the location of signage;
- Parking areas, driveways, lanes, and walkways;
- Home area;
- Farm buildings including animal shelters, equipment sheds, and farm office;
- Animal handling areas, loading and unloading facilities;
- Pastures, pens and isolation areas;
- Housing and pasture areas for other farm animals;
- Storage areas for feed, bedding, deadstock and/or ***compost***, wells and other water sources;
- Receiving and shipping area(s);
- Location of utilities and resource right of ways and fuel delivery/storage; and
- Traffic flows for the movements of vehicles, equipment, people and animals as appropriate (for example pasture rotation).

Refer to farm diagrams in Appendix 3

Strategy 1.4: Clean and disinfect facilities, equipment and vehicles

Target outcome:

Cleaning and disinfection methods that are effective in reducing the risk of disease transmission are established and are used for facilities, equipment and vehicles entering, exiting and on the farm.

Description:

Cleaning and ***disinfection*** are important activities to minimize the accumulation of pathogens and reduce the risk of disease transmission. Clean handling facilities, pen areas, feeders, waterers, equipment and vehicles as necessary to remove organic material that can harbour pathogens or other contaminants; disinfect as required. Frequent cleaning and disinfection reduces the build-up of ***biofilms*** on surfaces; biofilms can protect and even promote the growth of certain organisms. Biofilms can also damage surfaces so removing them can minimize damage to infrastructure. Scheduled cleaning and

disinfection minimizes the accumulation of pathogens, debris, organic material, and biofilms, and reduces the infection pressure to which animals are exposed.

Chemicals used to disinfect are not effective if the surface has not been previously thoroughly cleaned of organic matter. ***Disinfectant*** use is guided by the principle: the right product for the right contact time for the right reasons used in the right manner. Drying must occur after cleaning and after disinfection. Cleaning and disinfection protocols should be developed to address farm specific identified risks. The protocol should explain the cleaning procedure and identify which disinfectants are appropriate.

Employing a sufficient downtime cycle between uses—a period of time without animals—allows specific disease agents to be inactivated by natural processes and significantly reduces pathogen and parasite loads. The time period will vary depending on the disease agent of concern. However, some organisms will live for months (e.g. parasites) to years (e.g. the bacteria which cause necrobacillosis, Johne's disease, coccidial oocysts, spores which cause anthrax and clostridial diseases, and prions associated with Chronic Wasting Disease).

Refer to Appendix 4: Selected disinfectants and **Appendix 5: Cleaning and disinfecting procedures**

It is important that facilities be designed to facilitate cleaning and disinfection, and consideration is given to using materials and equipment that can readily be disinfected. Materials with porous surfaces should be avoided where possible.

Best practices:

- Implement a cleaning and disinfection plan for pathogen control on vehicles, equipment, tools and environmental surfaces. Establish cleaning and disinfection protocols and a schedule for cleaning and disinfecting the farm or facility. Common contact surfaces for animals are especially important. Protocols should address:
    - handling squeeze – should be cleaned and disinfected after each day of use;
    - shelters and handling facilities, equipment such as shovels, tractors, vehicles, and trailers;
    - feed storage areas and bins, feed and water troughs and bowls to eliminate contamination from rodents and other pests, and any manure or feces;
- Identify suitable locations for performing cleaning and disinfection of vehicles and portable equipment, particularly during inclement weather;
- Ensure the necessary equipment (e.g. washers, sprayers, shovels, etc.) and supplies (detergent, disinfectant, water, etc.) are available at the necessary locations, particularly CAPs.
- Clean and disinfect facilities, equipment and trailers prior to using for new animals, young animals and following illness in the herd;
- Clean and disinfect equipment used for invasive procedures between animals
- Always thoroughly clean surfaces before disinfecting because disinfectants are typically ineffective in the presence of organic material;
- Use an effective disinfectant that can inactivate the relevant pathogens;
- Employ downtime as part of the cleaning procedure for pens and pasture areas;
- Clean and, where possible, disinfect pens and other containment areas based on use and risk: deadstock, abortions, illness, animal density, level of contamination and health status of animals are considerations for cleaning and disinfection; and

- Keep pathways, CAPs, gates, and entrances to pens and pastures free of debris and manure to minimize tracking between areas.

Strategy 1.5: Design and maintain facilities to reduce disease risks

Target outcome:

Facilities are designed and maintained in good repair to reduce access by pests, facilitate cleaning and disinfection, and reduce the accumulation of pathogens and populations of pests. Considerations for biosecurity should be included when selecting a location and designing or renovating facilities.

Description:

Facilities, including buildings, barns, handling squeeze, fences, and pens, are not generally the means of introducing disease to the herd. Nevertheless, their involvement may lie in the persistent transfer of disease within a herd, where they are repeatedly used to shelter or process cervids, some of which may have disease. Thus, keeping facilities clean helps reduce the possible transfer of disease within a herd.

Best practices:

- Maintain surfaces in good condition, especially those with which cervids can come into direct contact. Damaged surfaces, such as gaps, cracks, and pores, could result in ineffective cleaning and disinfection because of remaining viable infectious material;
- Select durable and non-porous materials when repairing, renovating or building farm infrastructure particularly for higher risk contact areas;
- Keep feed and bedding storage areas secure to minimize contamination from potential carriers of disease (e.g. wild animals, pests and rodents);
- Consider disease risks and the ability to implement biosecurity when selecting locations for either establishing a cervid farm and/or when managing existing operations; locating pasture and production areas, handling areas, handling squeeze, raceways, buildings and other infrastructure;
- Facility design should always consider reducing potential injury and stress, especially during handling procedures;
- Minimize the potential impacts of social structure and behavioural stressors on animals: for example, a pen of animals may need to be divided into two to manage animals that are being dominated/stressed by other animals. Consider behaviour differences in cervid species.

Strategy 1.6: Reduce risk posed by equipment and vehicles

Target outcome:

Vehicle and equipment access to and movement within the farm premises is managed to reduce the risk of disease transmission.

Description*:*

Vehicles, including cars, trucks, and trailers can serve as mechanical vectors for pathogen and pest transmission, often over long distances. Farm equipment such as quads, feed carts and tools can spread pathogens within the farm while service providers can spread pathogens between farms.

Best practices:

Entering and exiting the farm

- Limit the unnecessary access of vehicles to the property;
- Determine the potential risk posed by service vehicles and restrict access of vehicles including feed deliveries, contractors and other suppliers to lower risk areas where contact with animals will not occur;
- Designate parking areas outside of animal production areas and use farm dedicated transport vehicles within the production areas;
- Where practical, scrape out, clean and disinfect vehicles away from animal production areas.
- Clean and disinfect vehicles and equipment entering high risk areas;
- Give special consideration to:
    - high-risk vehicles, such as those that transport animals, especially animals from other herds; and
    - other vehicles, such as visitors' and service providers' vehicles, especially those that have driven on other farms.
- Clean the tires and undercarriage of vehicles and clean and disinfect the common contact surfaces used for animal transport.
- Wherever possible, provide loading and unloading facilities at the perimeter of the production area.
- Allow access of deadstock and manure haulers to areas where contact with animals and feed is unlikely to occur.

On farm

- Schedule farm activities such as feeding and the movement of feed carts, quads and other tools from lower risk to higher risk areas (e.g. from healthy calves to sick calves).
- Dedicate equipment and tools for use only with sick animals.

Strategy 1.7: Manage manure

Target outcome:

Accumulations of manure, particularly in winter housing, and around feeding and watering areas are regularly removed and moved in a manner that limits exposure to the herd. Manure is managed and disposed of to reduce the opportunity for the build-up of pathogens and pest populations and potential contamination of production areas and pastures. Dedicated tools and equipment are used for manure handling, or cleaned and disinfected, prior to other uses.

Description:

Many important pathogens including viruses, bacteria (e.g. necrobacillosis, Johne's), prions (e.g. CWD) and parasites are shed in cervid manure, and may be an important source of environmental contamination. The degree of risk posed by pathogens in manure may be greater in intensive management situations, where manure may more readily accumulate and is also protected from natural degradation by weather elements.

Manure that is brought on to the farm from other sources for use as fertilizer also poses a risk**.**

Composting can be an effective method of managing manure and involves the aerobic (in the presence of oxygen) decomposition of material. It is an active process; requires appropriate nutrient ratios, moisture and mixing; and generates heat. This process is distinct from anaerobic (without oxygen) decomposition of material and/or weathering of manure which does not produce sufficient heat to inactivate pathogens and pests. Aerobic composting also reduces odors that can occur through anaerobic composting or piling manure reduces the volume of material and increases the availability of nutrients.

Best practices:

- Minimize accumulations of manure and exposure to fecal parasites and pathogens by managing pasture and production areas;
- Manage feeding and pastures by moving feeding locations and using pasture rotation where appropriate;
- Manage stocking density to prevent accumulation and exposure to fecal parasites and pathogens;
- Regularly remove manure accumulations in winter housing areas, feeding and watering areas and calving pens;
- Only spread composted manure on pastures; and
- Avoid spreading manure on pastures currently being grazed.

Strategy 1.8: Manage feed, water and bedding

Target outcome:

Management practices are in place to ensure that feed, water, and bedding are of sufficient quantity and quality, and mitigation measures are in place to reduce the risk by pathogens and pests.

Description:

Feed, water, and bedding (where used) may all pose a risk of introduction of disease. Obtain inputs from safe and reliable sources and protect them from contamination by pathogen and pests when on farm. However, there may be circumstances in which the safety, reliability, or efficacy of certain inputs may be beyond a producer's control. For example, water may be contaminated by animals (domestic or wild) or other factors, on a seasonal basis or as a result of a specific event. Open water sources such as ponds and lakes and seasonally wet areas can be a source of and/or promote the survival of pathogens and parasites including those responsible for tuberculosis, Johne's disease, leptospirosis, necrobacillosis, and liver flukes among others.
Producers should be aware of these risks and manage them through a range of practices that may include selection of different sources, increased monitoring, and vaccination.

Best practices:

- Provide water from the cleanest source available. Municipal water supplies provide good assurance of potable water. Well water, natural streams and ponds or snow (if sufficient clean and loose snow cover is available) in extensive grazing systems can be used;

- Protect surface water sources from contamination and test the water supply if there are concerns to herd health;
- Treat water (e.g. filtration, ultraviolet light, chlorination or ozone) when water sources are suspected and/or determined to be contaminated with pathogens and other non-infectious materials (e.g. higher levels of minerals and other contaminants);
- Consider the grazing history/land use of forage and feed sources;
- Consider the source and potential risk of grain screenings prior to using as a feed source;
- Obtain feed from suppliers with protocols to ensure raw materials are harvested, stored, and transported in a manner that mitigates contamination from pathogens and pests and disease spread;
- Obtain feed ingredients supplements and concentrates from companies with quality control programs;
- Use feed bunks to minimize contamination of feed and supplements and accumulations of feed that may attract other livestock and pests;
- Clean feed bunks and water troughs (where used) regularly; feed accumulations, sediment, manure, saliva, respiratory secretions and biofilms can harbour pathogens and spread disease within a herd;
- Protect stored feed, harvested feed and supplements from contamination by pests, manure and from spoilage; use pest proof structures/bins/silos where practical. Alternatively, fencing and covered shelters (or tarps) can minimize access to feed by wild animals;
- Obtain clean, dry bedding from known sources and store in a manner to maintain quality;
- Where bedding is used, remove and replace soiled bedding regularly and after illness in the herd; pay additional attention to ensure bedding for calves and in isolation and sick pens is removed and replaced daily or at a high frequency to minimize pathogen accumulation.

Strategy 1.9: Manage deadstock

Target outcome:

Deadstock, unless anthrax is suspected, are removed immediately from livestock rearing areas and moved in a manner that limits cross-contamination with the herd. Aborted material and other tissues are managed as deadstock. The deadstock disposal area is located away from the production area and is secured against domestic and wild animals. Disposal respects local regulations and is done in a manner that limits disease exposure to the herd.

Description:

Preventing direct and indirect contact with deadstock is an important means of controlling disease. Deadstock and aborted fetuses may be associated with the presence of disease. Therefore, efforts should be made to determine the underlying cause. ***Post-mortem examinations*** and disease investigations should be conducted when the cause of death or abortion is not readily apparent. These examinations and investigations provide significant information and can assist in reducing additional health risks to the herd from infectious and non-infectious sources. Post-mortem examinations should be conducted as soon as possible following death of an animal to acquire tissue samples of high quality and to prevent scavenging of the carcass.

Where reportable and immediately notifiable diseases are a concern contact your veterinarian and the appropriate government authorities. Examples include anthrax and CWD.

Disposal by natural means is allowed in certain provinces on range or pasture, and is subject to conditions. Other means available for disposing of livestock may include burying, composting, burning, and rendering.

Best practices:

- Regularly check for deadstock;
- Unless anthrax is suspected (refer to Appendix 6), remove deadstock as soon as possible from contact with the herd to a deadstock disposal area or temporarily limit access to until disposal;
- Determine the underlying cause of death; If infectious disease is suspected, contact your veterinarian;
    - Conduct post-mortem examinations/necropsies as soon as possible following the death of an animal; these can be performed by your veterinarian or completed following protocols provided by them;
    - Understand the risks of ***zoonotic*** disease and wear appropriate PPE including gloves, protective eyewear and a respirator. Remove PPE and wash hands prior to resuming other duties.
- Dispose of deadstock in a manner that prevents contamination of feed and water sources and that prevents access by animals and pests;
- Recognize the risk of pathogen spread by deadstock service providers due to contact with other farm premises and collection of potentially infected animals;
- If deadstock is picked up by a disposal service, restrict access to the property and ensure the service provider maintains a safe distance from the herd and contact with feed and other materials;
- After using equipment for deadstock disposal, clean and, in some cases, disinfect prior to other uses;
- Inactivate potential disease agents in deadstock through composting or other approved methods; and
- Comply with federal, provincial and local regulations concerning deadstock disposal. Deep burial may be acceptable in some provinces with conditions. Refer to Appendix 8 for additional information on acts and regulations.

Principle 2: Animal health management practices

Goal:	**Maximize the health, well-being and productivity of the herd by implementing a herd health program, managing cervid movements and minimizing contact with other animals.**

Strategy 2.1: Sourcing cervids

Target outcome:

Animals are sourced from suppliers with herds of known health status or the health status of new animals aligns with the resident herd.

Description:

New animals pose a significant risk for the introduction of disease to resident cervids and premises. It is important to note that animals may be ***sub-clinically infected*** which means they appear healthy yet are carrying a pathogen. Measures can be taken to reduce this risk (e.g. testing for diseases and veterinary health exams prior to arrival), however, some infected animals may not be identified depending on the tests used and/or the stage of infection.

Best practices:

- Consider the use of semen and embryos for introducing new genetics as they pose the lowest risk of introducing pathogens;
- Purchase herd additions from a limited number of suppliers with a known herd health status that is equal to or greater than the resident herd;
- Know the historical health status of the premises from which animals are purchased;
- When purchasing animals at sales or auctions, where the possibility of ***commingling*** with animals of lesser or undetermined health status occurs, additional emphasis on biosecurity will need to be placed at the home location; and
- Obtain and review health records for all new animals and consider veterinary certification. Ensure there is a known origin, documented history and proper identification for all new animals and genetics.

Strategy 2.2: Separate herd additions and returning cervids of undetermined health status from the resident herd (Isolation).

Target outcome:

Animals brought onto the farm (herd additions and returning animals) are separated from the resident herd and isolated until their disease status has been determined or is resolved.

Description:

Separating animals that are of undetermined health status or known to be ill from the resident herd is an important disease control and prevention strategy referred to as isolation.

Isolation includes preventing direct contact between these animals and the resident herd and minimizing indirect contact with potentially contaminated equipment, clothing, and other materials on the site. During the period of isolation, the health status of the animals is monitored and vaccinations,

parasite control and other treatments can be administered to bring the incoming animals to the same health status as the resident herd.

While a permanently designated isolation area is ideal, temporary isolations areas can be created in a pen or pasture in a low traffic location using portable barriers, fencing and gates.

There are a number of factors that influence the length of the isolation period—consult your veterinarian to determine an appropriate length of time. The isolation period normally recommended is longer than the time frame for clinical signs to develop following exposure to the diseases of concern. For many diseases, the isolation period should be at least two to three times the length of the incubation period of the diseases of concern.

When animals are determined to be healthy and/or of equivalent health to the resident herd, they can be released from isolation to join the resident herd.

The stress of segregating animals can create both health and welfare issues. When a lone animal is acquired, a modified isolation whereby a healthy resident animal is placed with the lone animal can reduce the stress of separation. While this increases the risk of disease exposure to one animal, the resident herd is protected, and animal welfare is improved. A compatible animal of the same species should be selected as a herd-mate during this period. Additional considerations for modified isolation must be made during the breeding period.

Best practices:

- Establish requirements and protocols for animal isolation;
- Designate isolation areas for incoming animals. Ensure they are separated from animal shelters, pens and the areas used for the routine care and treatment of the resident herd;
- Isolate new and returning animals until their health status is determined to be equivalent to the resident herd;
- Consider the use of modified isolation. Note: the companion animal must remain in the modified isolation for the full duration;
- Monitor the health status of animals daily and maintain records;
- Assess the risks posed by the new or returning animals (in consultation with your veterinarian) and administer vaccinations and other treatments or diagnostic procedures as necessary;
- For new and returning animals, implement a parasite control and monitoring program to minimize the parasite burden, contamination of housing areas and pastures and subsequent exposure of resident animals;
- Provide care for animals in isolation, including health monitoring, feeding, bedding etc. after caring for the resident herd;
- Dedicate equipment, tools, clothing and footwear to isolation areas or clean and disinfect after use; and
- Control access to isolation areas and minimize contact with these animals;

Strategy 2.3: Minimize contact with other livestock, domestic animals and pests

Target outcome:

Cervid farms are managed to maintain habitat for many desirable species of flora and fauna while minimizing disease risks. Cervids in the resident herd are housed, moved and pastured in such a manner

that the risk of contact with other livestock and domestic animals of undetermined health status and pests is minimized. An integrated pest control program should be maintained.

Description:

All animals can be a source of pathogens and transmit them within their own populations and to other animal populations. Certain pathogens and pests have the potential to accumulate in the environment and increase the risk of disease in farmed herds.

Contact between different animal populations (domestic or wild) due to inadequate or broken fencing and gates is a significant concern for the transmission of pathogens.

Best practices:

While the precise health status of wild cervids surrounding your farm may not be known, information on the occurrence of specific diseases found in your area or province may be available, and could assist in determining the risk posed to your operation. Therefore, farms should be designed to minimize contact and interaction among different animal populations whether they are captive cervids, wild cervids or other wild animals, other livestock species or domestic pets. Before running other livestock species in the same or adjacent pasture as cervids, consult with your veterinarian regarding disease concerns.

Fencing:

- Enclose the property with clearly visible perimeter fencing capable of preventing the escape of cervids and the entry of domestic and wild animals to the extent practical; comply with applicable regulations;
- Consider enhanced/alternate fencing options in higher risk regions or areas on farms;
- Consider creating a pass-through at access points with a two-gate system to minimize the opportunity of animals escaping;
- Routinely inspect the integrity of fences and gates and repair as needed to prevent commingling;
- Use interior fencing to establish isolation areas, treatment pens, alleyways and corridors for moving and directing animals and people on the property; and
- Fence feed and standing water sources to minimize access by pests

Pests:

- Keep vegetation mowed short and compost or contain accumulations of manure (when present);
- Remove attractants for pets, pests, and other domestic animals by securely storing feed and promptly cleaning up feed spills, minimizing pooling water, and securing garbage; and
- Remove pest hiding and nesting areas by clearing debris from pastures and pens. Remove unnecessary equipment and materials from animal shelters and equipment storage area.

Strategy 2.4: Develop and implement a herd health program

***Target outcome*:**

A herd health program is implemented, and serves as the basis for monitoring herd health and proactively identifying and minimizing the risk of disease transmission. The program describes the health regimens and practices used for daily care and disease prevention and control.

Description:

Many producers already have established routines and procedures for managing the health of their herds, however, depending on the size and structure of the operation, written protocols may not be present. It is recommended that a herd health program be developed in consultation with a veterinarian or other technical and industry specialists to address the specific needs of the operation. A herd health program provides a consistent approach to manage and achieve high herd health while maintaining a focus on the producer's goals. The use of written documents facilitates consistency, review and training of staff. The herd health program addresses preventive elements such as the provision of high quality food and water, vaccination, parasite control protocols and veterinary care as required. Reactive components of a herd health program address the identification of and response to disease situations.

Best practices:

Components of a herd health program should include:

- Premises identification and individual cervid identification;
- Monitoring health:
    - observing and monitoring the health status of the herd. Consider monitoring animal weights throughout the production cycle as body condition scoring can be difficult to assess and requires experience; producers should have and use accurate scale;
    - calibrate and maintain scales on a regular schedule to ensure accurate measurements; and
    - diagnostic testing for assessing health status (e.g. serological testing) and post mortems for unexplained or increased ***mortality***.
- Maintaining animal health:
    - vaccination programs to control or prevent disease prior to or after entry of animals to the herd;
    - treatment should always be conducted under the consultation and supervision of a veterinarian;
    - the proper storage and disposal of veterinary medications and vaccines;
    - parasite control programs including pasture management and the use of medication (deworming: the type of product, timing interval, and monitoring by routine testing);
    - use medications as per directions; proper use can reduce opportunities for the development of antimicrobial and anti-parasitic drug resistance;
    - review health status and consider pre-purchase testing of prospective herd additions prior to inclusion in the herd;
    - consider disease susceptibility/resistance to disease when selecting and maintaining herd genetics and replacements; and
    - maintain and update herd health records.

- Responding to disease:
    - identifying ill health and procedures for response. This may include separation (isolation) of cervids with infectious disease or undetermined disease status (see Strategy 2.5);

    - treatment protocols for common ailments as appropriate. These protocols will include drug withdrawal periods for meat slaughter; and
    - euthanasia protocols for sick animals and/or when animal welfare is compromised.
- Management of the herd health plan:
    - annual review of the plan including identifying changes in disease status and risk of disease;
    - review of goals for animal health and productivity measures, and monitoring of those measures. For example: mortality rates; reproductive measures, growth rates; and
    - annual staff training and review of recognition of disease (early recognition of changes in physical condition, activity, animal behaviour, knowledge of normal animal health status etc.), and protocols for treating disease, including when to contact the herd veterinarian.

Strategy 2.5: Manage and treat sick animals

Target outcome:

Animals showing signs of disease may be treated within the herd or moved into an isolation area away from the healthy herd and treated as necessary.

Description:

Management of sick animals may include treatment within the herd, separation (isolation) from the herd and treatment as necessary, or euthanized if recovery is unlikely.

Treatment within the herd may be used for certain cervid species and diseases when separation may result in adverse outcomes and the risk of disease spread is believed to be minimal.

Isolation for sick animals involves preventing direct contact between these animals and the healthy herd and minimizing indirect contact from potentially contaminated equipment, clothing, and other materials on the site. During the period of isolation, the health status of the animals is monitored, diagnostic measures may be taken, and appropriate treatments can be implemented.

There are a number of factors that influence the length of the isolation period—consult your veterinarian to determine an appropriate time period. The objective of isolation is to achieve both a resolution of clinical illness and to minimize the potential for disease transmission. When the animal is deemed to no longer pose a health risk and/or is of equivalent health status, it can return to the general population.

The stress of segregating animals can create health and welfare issues; considerations for this must be taken into account. When a lone animal has been identified as being sick, a modified isolation whereby a healthy or resident animal is placed with the lone animal can reduce the stress of separation. While this increases the risk of disease exposure to one animal, the resident herd is protected, and animal welfare is improved. A compatible animal should be selected as a pen mate. Additional considerations for modified isolations must be made during the rutting period.

Sick animals may be an indication of a larger herd health issue.

Best practices:

- Monitor the health status of animals daily and maintain records;
- Identify and treat sick animals;
- Establish requirements and protocols for animal treatment including isolation;
- If an isolation area is used:
    - ensure it is separated from animal shelter areas, pens and the areas used by staff for the routine care and treatment of the resident herd;
    - upon the detection of a sick animal, isolate until their health status is determined to be equivalent to the resident herd;
    - consider the use of modified isolations; note: the sick and companion animal must remain in isolation until their health is determined and they do not pose a risk to the herd; and
    - treat and manage animals in isolation by scheduling the care and handling of these animals after caring and handling the general herd;
- Clean and disinfect equipment and tools following use with isolated animals or dedicate equipment and tools to their care; and
- Apply personal hygiene measures as appropriate to both protect yourself and prevent transmission out of isolation.
    - This may include:
        - the use of dedicated clothing and footwear or clothing changes and cleaning and disinfection of footwear;
        - gloves;
        - hand sanitizer or washing hands; and
        - when there is the risk of zoonotic disease, other biosecurity measures may be required (see Strategy 3.4).

Strategy 2.6: Develop a response plan for disease outbreaks

***Target outcome*:**

A disease response plan is developed and implemented to guide response activities when disease is suspected, identified or there is deterioration in health status. The plan should identify triggers for activating the response plan, requirements for enhanced biosecurity and, if warranted, self-imposed whole farm isolation procedures (biocontainment).

Description:

The Standard and Guide are focused on prevention of infection—those practices that can be adopted to reduce the risks of disease occurrence in farmed cervids. However, it is important that producers also have a farm-based plan for response to a disease ***outbreak*** or the suspicion of an outbreak on their farm or in their region.

A response plan is a pre-determined set of actions and conditions that are enacted when one or more occurrences, called "**trigger points**", are observed. The trigger points are an early warning that a disease may exist. The plan will include:

- Identification of potential trigger points;
- Initial response actions; and
- Additional biosecurity protocols to be initiated under specific circumstances.

Best practices:

The response plan should be readily accessible.

In developing such a plan, producers will need to identify the types of disease emergencies that may require a response. These "trigger points" may include:

- An outbreak of a commonly encountered disease that:
  - affects a higher than normal number of animals;
  - results in severe clinical signs of disease or reduced productivity;
  - is associated with higher than normal mortality rates; or
  - is presenting in an unusual manner.
- An occurrence of a disease not previously encountered within your operation;
- Any suspicion or confirmation of a notifiable/reportable (provincially or federally) disease on your operation or a neighbouring farm; or
- Any suspicion or confirmation of a provincially or federally ***reportable/notifiable*** disease on a farm that you have acquired animals from shared equipment or had other contact with.

An initial response may include:

- Observing and recording animal health clinical signs, herd health status and gathering herd health and medical records;
- Contacting a veterinarian to obtain a diagnosis and treatment plan;
- Notifying staff and family members of the health situation;
- Following the advice of your veterinarian, depending on the disease suspected or identified, there may be a need to notify a broader group (cervid producers, neighbours, service providers, government); and
- Temporarily halting all movements of animals on and off the site and enhancing biosecurity measures. The duration of the movement restrictions will vary depending on the nature of the disease incident.

Additional or enhanced biosecurity measures may include:

- Isolating affected animals from the resident herd, and;
- Restricting access to the isolated animals;
- Caring for isolated animals last, after tending to all other animals;
- Dedicating equipment and staff to care of isolated animals, or
- Cleaning and disinfecting equipment and changing outer clothes, cleaning and disinfecting hands and footwear prior to contact with other animals;
- Identifying other potentially exposed animals;
- Increasing the frequency of animal health monitoring as appropriate; and
- Halting the movement of all equipment, materials and people on and off the site until a tentative diagnosis and instructions have been obtained from a veterinarian.

Principle 3: Management of people

Goal:	**Minimize the potential risk posed by all farm visitors and farm personnel, through the establishment of protocols, training and communication.**

Strategy 3.1: Train farm workers in biosecurity

***Target outcome**:*

All farm workers and family members are trained in and consistently implement the farm's biosecurity practices. The farm biosecurity protocol is communicated to visitors and service providers and they comply with it.

Description:

The success of biosecurity plans requires the involvement and cooperation of family members and farm workers. They all need to understand and be regularly trained in the specific biosecurity protocols that guide their activities on the farm.

Farm service providers need to be informed of the practices established for the farms they service, both to ensure that they can carry them out and so that they can accommodate them within their own operational and biosecurity practices.

Best practices:

- Ensure staff are trained in the biosecurity practices of your farm. This may include one-on-one training, group sessions and on-the-job demonstrations;
- Ensure staff are trained and knowledgeable in the behaviour, care and handling of cervid species;
- Recommended that newcomers to the cervid industry work with an experienced producer or receive training on cervid handling;
- Staff are trained to recognize sick animals and procedures for notifying producers/farm managers of concerns; and
- Consider obtaining information and assistance from subject specialists (veterinarians and university extension personnel) and other sources (internet).

Strategy 3.2: Determine the risks posed by people

Target outcome:

The potential risks posed by visitors and farm personnel for disease transmission are determined.

Description:

The movements of people can spread pathogens onto, within and off of your farm. Clothing, footwear and skin that may be contaminated with pathogens and pests can pose a risk to livestock. It is recommended that producers consider the potential risk of all people entering the farm—family members, farm workers, service providers and visitors—and implement measures to manage the risks.

The potential risk posed by people can be determined by considering:

- Which pathogens/pests they may be carrying—consider previous livestock and farm contact and the biosecurity practices employed; and
- Opportunities for pathogen transmission to cervids on your farm—consider the area of the farm they will be accessing, particularly contact with animals.

People with recent livestock contact that will be coming into direct contact with animals pose a higher risk than those without recent livestock contact who will not be coming into contact with the animals. This may include livestock transport drivers and drivers delivering agricultural supplies.

Best practices:

- Determine the purpose of their visit and areas of the property they need to access, particularly the degree of contact with animals (domestic and wild);
- Determine what equipment or supplies people may be bringing onto the farm;
- Determine recent contact with livestock, agricultural premises, or any other circumstance that may pose a biosecurity risk. The level of biosecurity required is partially dependent on previous contacts; and
- Considerations should include clothing changes, dedicated footwear or cleaned and disinfected footwear and hand washing prior to entry or contact with animals.

In general, these groups could be described as follows:

- **Low risk:** travel to a farm without previous farm contact; do not come in direct contact with livestock and do not enter livestock rearing areas; for example, urban visitors, sales representatives.
- **Moderate risk:** travel from farm to farm but do not directly contact the livestock; for example, feed and fuel delivery.
- **High risk:** neighbouring producers or anyone who travels farm to farm and comes in direct contact with livestock and have been in contact with livestock from other farms (e.g. veterinarians, technicians). Foreign visitors and travellers returning from a foreign country pose a potential higher risk.
- A **Higher risk** classification can be considered for anyone who has been in contact with cervids on another farm (auction or assembly yard), or in another country, in contaminated facilities or near sick animals. If access to another herd is required, specific risk-reduction steps should be taken.

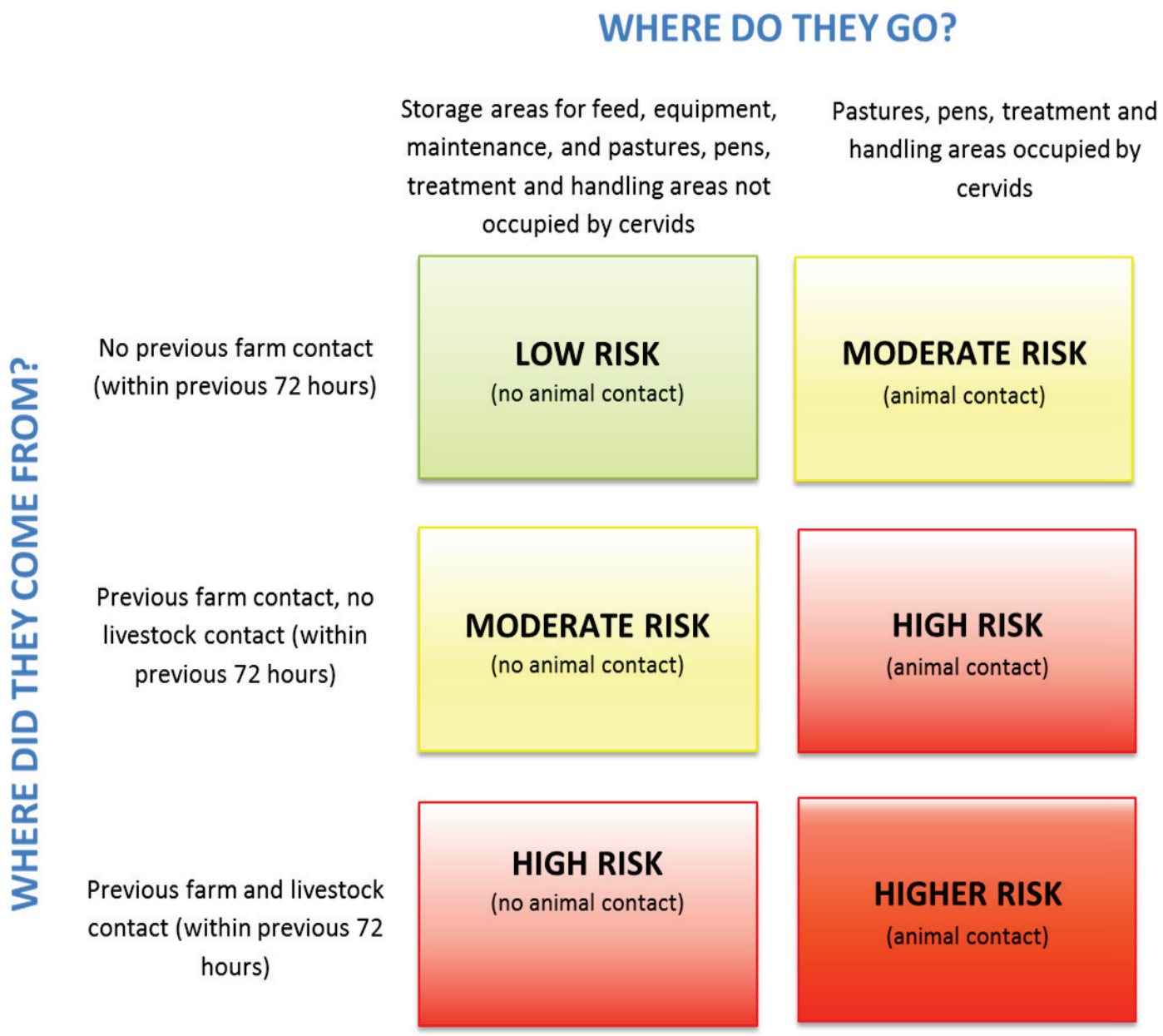


Figure 2: Assessing risks posed by people

The figure illustrates factors that can be used to determine the risk levels posed by people to a farm premises. Previous contact with farms and livestock and subsequent contact with cervids pose a higher biosecurity risk.

Strategy 3.3: Develop and implement risk management practices for all people entering the farm

Target outcome:

People working on, providing service to or visiting the farm are guided by defined risk management practices.

Description:

The biosecurity practices implemented for and by visitors, including service providers, is determined by producers. These practices need to be communicated to visitors. Some visitors and service providers are "biosecurity aware" but many are not. Discuss biosecurity expectations and requirements with visitors prior to their arrival and again on arrival. Accompany visitors to ensure biosecurity requirements are implemented appropriately.

All people entering the farm should be aware of the risk of their visit and activities while there. They should know and understand the biosecurity practices that are consistent with that risk determination, including the areas into which they are permitted to go.

The risk of each individual, based on where he/she is permitted to go on the farm, will determine the biosecurity practices that will be needed upon entry onto the farm and into the production area.

For people who are identified to be of high risk, those who have recently been on a farm and who have contacted other animals that are or may be diseased, the following practices can be used:

- Impose a minimum waiting period for visitors prior to arriving at the farm. CFIA currently recommends a period of 5 days for foreign visitors;
- Request visitors shower and clean and disinfect clothing and tools/equipment they need to bring to your farm before their arrival; and
- Restrict/minimize contact with the herd.

Best practices:

- Discuss with visitors their movement and contact history, and communicate your biosecurity precautions prior to their arrival; keep a visitor log;
- Schedule visits to ensure qualified staff are available to manage access, reiterate biosecurity precautions, confirm any pre-arrival arrangements (e.g. vehicle washing, clothing changes scheduling of previous sites visited) and escort visitors;
- Implement a combination of restrictions to access, and the requirement for cleanliness (footwear, clothing, clean hands and personal care) as the basic arsenal for visitors and service providers;
- Apply a higher level of biosecurity for anyone approaching and/or in direct contact with (touching/handling) the animals, and higher again for those approaching and/or in direct contact with isolated or sick animals;
- Consider the risks posed by foreign visitors/returning travellers, especially those who have had potential contact with livestock and other animals (domestic or wild);
- Pre-determined practices/protocols can be designed that apply to each of these classes of risk. Signs and information can be situated at boundaries, on building and pen entries and

on special-risk pens to advise visitors what their limits to access are, and when to apply the higher-level practices; and
- Escort visitors to help ensure that they are following the recommended biosecurity practices.

Strategy 3.4: Manage zoonotic disease risks

Target outcome:

Family members, farm workers, visitors and service providers understand the risks posed by zoonotic diseases and take precautions to protect themselves, other people and animals.

Description:

All livestock may carry pathogens/pests that can be transmitted to, and cause disease in humans. Some of these pathogens/pests may not cause clinical disease in the animals themselves. The risk of such transmission must be communicated to family, staff, and visitors and arrangements made for providing the biosecurity measures, practices and precautions including the necessary equipment.

Some zoonotic diseases are classified as reportable and/or notifiable at the federal or provincial level, and the relevant authorities must be informed.

Note: Animal/human disease transmission is not just one way; human diseases may also be transmitted to animals. Examples of zoonotic diseases include salmonellosis, brucellosis, tuberculosis, leptospirosis, and dermatophytosis.

Best practices:

- Advise family, staff and visitors of the potential risks of handling live animals, deadstock, manure and other materials;
- Provide opportunities for handwashing;
- Wear personal protective clothing such as gloves, coveralls, boots and masks as appropriate; this includes during routine handling of animals;
- Advise relevant authorities if a reportable/notifiable disease is suspected; and
- Consult a physician/veterinarian for advice.

Principle 4: Protocols and record-keeping

Goal:	**Establish protocols and maintain records to facilitate managing, improving and validating the biosecurity program, and health status of the herd.**

Strategy 4.1: Protocols for animal health and farm management practices

Target outcome:

Important biosecurity protocols are readily available to staff, family and service providers as needed, to facilitate reference, training, review and consistent implementation.

Description:

Biosecurity protocols allow for ready reference and periodic review, facilitate training, and help ensure consistency of application. Biosecurity protocols should be updated when there are changes in procedures. Documents should be readily accessible by staff.

Best practices:

- It is recommended that written farm specific protocols be developed for important biosecurity activities:
- Written protocols should include, but may not be limited to:
    - biosecurity plan, including farm map;
    - herd health plan;
    - farm management protocols; and
    - emergency farm management plan (Refer to Appendix 16 for a sample template).
- Both hardcopies and electronic copies can be beneficial;
- Protocols should be readily available;
- If changes are made to protocols, ensure all copies are amended; and
- Documents should indicate both the date produced and the author.

Refer to Section 2.4 on Herd Health and Appendix 15 and 16 for additional information on records and protocols.

Strategy 4.2: Herd and individual animal health records

***Target outcome*:**

Herd health and individual animal health records are maintained and reviewed to ensure optimum health and productivity of the herd.

***Description*:**

Animal health records provide more accurate data and enhance the ability to identify disease trends, review previous health issues, and determine the success/failure of treatments within the herd health programs. Records of health events and diagnostic test results are used to initiate interventions and changes to the herd health program, and are important to support herd health status when purchasing or selling animals.

Best practices:

- Maintain herd health records including ***morbidity*** and mortality, and management practices such as vaccinations, parasite treatments and herd health testing;

- Maintain health records for individual animals including illnesses, diagnostic tests, diagnoses and treatments. Treatment records should include treatment date, type of medication, dose, prescribing veterinarian, route of administration and withdrawal time if applicable;
- Ensure animals are uniquely identified and records of animal movements (purchases and sales) and health can be linked to each animal; and
- For some types of operations, maintain records of birth and weaning weights, carcass yield and antler harvest. To maintain and monitor animal health, consider obtaining pre-rut weight, mid-winter weight, during artificial insemination procedures and any opportunity to monitor weight when handling animals.

Strategy 4.3: Farm management records

Target outcome:

Records of farm management activities, including biosecurity measures, are maintained and reviewed.

Description:

Important farm management activities should be recorded. Farm records assist in managing the day-to-day activities on the farm (including the details of specific tasks, who was assigned the task and if the task was completed), as well as help to inform management decisions.

Best practices:

Maintain and review the following farm management records:

- When cleaning and disinfection of the facility, equipment and other items was performed and how it was conducted including location and the type of disinfectant used;
- Livestock and pest control activities;
- Deadstock disposal;
- Manure collection (where applicable);
- Feed and supplement purchases;
- Other biosecurity practices on the farm such as visitor access (i.e. visitor logs) and biosecurity breaches; and
- Consider the use of data/record management software to facilitate collection and analysis of farm data.

Ongoing analysis of these records allows producers to determine whether all required biosecurity activities are being followed and whether there are gaps to address. In addition, biosecurity records and animal health records can be reviewed together to understand whether biosecurity practices have contributed to changes in animal health on the farm.

Refer to the Appendices for sample biosecurity templates.

Strategy 4.4: Education and training activities

Target outcome:

Records of education and training of farm workers are maintained and reviewed to ensure they have the requisite knowledge and skills to successfully conduct their duties.

Description:

Records of education and training assist in ensuring staff have the appropriate current knowledge to conduct the farm biosecurity practices.

Best practices:

- Record and review education and training activities for all persons working on the farm;
- Review farm worker education and training records following changes in procedures and when there are changes in the health status of the herd to determine if knowledge and training may have contributed to the change;
- Obtain education and training materials from industry, breed associations and universities;
- Resources for producers include the **Elk Farming Handbook**, which is available online, and the **Code of Practice for the Care and Handling of Farmed Deer (Cervidae)**.

Appendix 1: Glossary

Biofilm: A community/aggregation of microbial organisms (often bacteria) held together by secretions that form a mucus-like layer on the surfaces of objects including living tissue. The organisms within biofilms bind tightly to each other and to surfaces and are more difficult to remove and inactivate.

Biosecurity: A set of practices used to minimize the presence of pests and the transmission of pathogens in animal and plant populations including their introduction *(bio-exclusion),* spread within the populations *(bio-management*), and release *(bio-containment*).

Cervid: Pertaining to or a member of the family cervidae or the deer family of ruminants. Species farmed in Canada include elk, red deer, white-tailed deer, fallow deer, sika deer, mule deer, reindeer and moose.

Cleaning: The physical removal of organic material from a surface. It includes dry cleaning (scraping, brushing, wiping), a wet cleaning procedure (washing the surface with water and a detergent, soap, enzyme or other chemical) and drying of surfaces**.** It precedes disinfection**.**

Commingling: The mixing of groups of animals of the same species or between animals of a different species.

Composted/Composting: Is the actively managed process of aerobic decomposition of organic material, primarily by microbes into humus.

Controlled Access Point (CAP): A visually-defined entry point through which all traffic (vehicles, people, animals, inputs and equipment) will enter a risk area. The CAP provides the ability to control access/movements and implement biosecurity measures to minimize pathogen transmission between risk areas.

Cross-contamination: The distribution of potentially infectious material from one animal to another, or between facilities, equipment or vehicles by animals, people or things.

Direct contact: Close physical contact between animals including nose-to-nose, social interaction or breeding.

Disinfectant: A chemical applied to surfaces to destroy or irreversibly inactivate microorganisms.

Disinfection: The application of a physical or chemical process to a surface for the purpose of destroying micro-organisms.

Emerging disease: A new disease or syndrome that occurs from the evolution or change of an existing pathogen or parasite resulting in a change of host range, vector, pathogenicity or strain; or the occurrence of a previously unrecognized infection or disease.

Endemic disease: Is the constant presence of disease or infectious agent in a specific population or area. In animals, it is sometimes referred to as enzootic disease.

Indirect contact*:* Transmission of a pathogen that occurs without directly coming into contact with the source (for example: transferring or a pathogen via an aerosol or contaminated object).

Infection*:* The invasion and multiplication or reproduction of pathogens such as bacteria, viruses, prions and parasites in the tissues of a living animal.

Infectious disease: Disease caused by pathogens (e.g. parasites, bacteria, viruses, fungi or prions).

Isolation: The strategy of segregating animals, new or returning animals, and animals that are known to be ill from the resident herd or the general population for a specified time period to ensure an inapparent or subclinical disease/pathogen is not introduced into the resident herd or population.

Morbidity: Illness or disease; a measure of the frequency of a disease or illness in a population.

Mortality: Is the measure of the number of deaths in a population.

Outbreak: The occurrence of more cases of disease than expected in a population of animals.

Pathogen: Any disease producing agent or microorganism including but not limited to bacteria, fungi, viruses, prion and parasites.

Pest: Is an organism (plant, animal—domestic or wild—fungus, bacteria etc.), that injures, irritates or damages livestock or crops or poses a risk for the transmission of disease.

Prion: Infectious proteins that are abnormal forms of normal cellular proteins, that proliferate by inducing the normal protein to convert to the abnormal form, and may include pathogenic forms which arise sporadically, as a result of genetic mutation, or by transmission (as by ingestion of infected tissue) and which upon accumulation in the brain cause a prion disease.

Post-mortem examination: A medical procedure conducted on an animal carcass to determine the cause of death and/or the presence of other physical changes, injuries and/or diseases**.**

Reportable/Notifiable diseases: May be provincial or federal requirements for the reporting of diseases outlined in their animal disease legislation. For additional information, contact the appropriate authorities.

Risk: The chance of an unfavourable event occurring that affects animal and/or human health.

Risk assessment: The process of evaluating the potential risk a pathogen and/or organism has of causing an unfavourable event that affects animal health/productivity and/or human health and the impact of the event.

Sub-clinical infection: When an animal is infected with a pathogen without showing clinical signs of disease. May occur early in infection (during the incubation period) or with a very mild form, or following clinical disease. Sub-clinically infected animals may shed pathogens/pests and pose a risk of transmission.

Vector: An organism such as a mosquito, fly, flea, tick, rodent, animal or person that transmits pathogens from an infected host (a deer or elk) to another animal. A biological vector is one in which the pathogen develops or multiplies in the vector's body before becoming infective to the recipient animal. A mechanical vector is one which transmits an infective organism from one host to another, but which is not essential to the life cycle of the pathogen.

Zoonotic disease: A disease that can be shared between animals and humans.

Appendix 2: Biosecurity risk evaluation checklist

Biosecurity relies on the consistent use of a combination of procedural measures and physical barriers designed to disrupt the transmission of pathogens. The level of disease risk that is considered acceptable is likely to vary among cervid producers based on their business goals, species raised, management practices, products marketed and individual risk tolerances.

Checklists are provided below for each of the four biosecurity Principles along with summary charts for you to identify any biosecurity gaps and possible actions to correct those gaps.

1. Management of Farm, Facilities and Equipment

Biosecurity practices for farm, facilities and equipment	Evaluation Checklist				
	Yes GOOD	Sometimes WARNING	No ALERT	N/A	Actions to consider
I maintain a written biosecurity plan.					
I have made changes to my operation within the past 12 months that are considered in the biosecurity plan.					
I have knowledge of the previous land use of the area where my farm is located.					
My farm is located away from possible sources of disease (other cervid/livestock operations, wildlife, etc.).					
I have an updated farm diagram.					
High-traffic areas are identified in the farm diagram (handling facilities, shipping/receiving areas, etc.).					
High-risk areas are identified in the farm diagram (sick pens, deadstock storage/disposal, isolation areas, etc.).					
High-traffic areas are away from high-risk areas.					
I have established traffic flows for movement of vehicles, equipment, people and animals within my farm.					
My farm has a designated, signed parking area, outside of animal production areas, for visitors, and/or employees.					
My farm has designated protocols for cleaning and disinfecting vehicles, equipment, tools and surfaces.					

Vehicles, equipment, tools and surfaces in contact with incoming animals or sick animals are cleaned and disinfected.					
I have adequate tools and equipment (i.e. pressure washer) to properly clean and disinfect.					
I have dedicated equipment and/or tools to handle contaminated material (deadstock, manure, etc.).					
Facilities (including buildings, barns, chutes, fences, and pens) are maintained in good repair.					
Manure is removed regularly and stored securely.					
Feeders and feeding areas are kept in good condition and clean of manure, old feed and other contaminants.					
Feed and supplements are stored in a location that is dry and secured from access by pests and animals.					
My cervids have access to high quality, clean water.					
Water bowls and water troughs are kept in good condition and cleaned regularly.					
For deadstock, cause of death is determined.					
Deadstock is disposed of appropriately (for example removed to an area away from the herd, facilities, food and water, and secured from scavengers and pests).					
Equipment and tools used to move and handle deadstock is kept in good condition, cleaned and disinfected immediately after use.					

Risk factor review: **GOOD** – meeting basic biosecurity practices | **WARNING** – potential for failure of biosecurity element, action required | **ALERT** – biosecurity gap identified, action required

1. What Farm, Facility and Equipment gaps (Warnings and Alerts) have I identified on my farm?
2. What steps can I take to correct those gaps?

2. Animal Health Management Practices

Biosecurity practices for animal health management	Evaluation Checklist				
	Yes GOOD	Sometimes WARNING	No ALERT	N/A	Actions to consider
The cervids needed to maintain and grow my herd are produced on my farm.					
I purchase new cervids from a limited number of sources with known herd health status equal, or better than mine.					
I introduce new genetics in my herd via semen and embryos.					
All newly-acquired, or returning cervids that are brought to my farm are isolated for a period of time.					
My farm has an isolation area away from areas used by the resident herd, where incoming cervids are monitored daily.					
My farm has designated protocols for animals in isolation.					
My perimeter fence prevents the escape of cervids and the entry of domestic animals and pests.					
I have a written herd health program developed in consultation and supervision of a veterinarian.					
My farm has designated protocols to care for sick animals.					
I have a written disease response plan that outlines what to do in case of a disease outbreak on my farm.					

Risk factor review: **GOOD** – meeting basic biosecurity practices | **WARNING** – potential for failure of biosecurity element, action required | **ALERT** – biosecurity gap identified, action required

1. What Animal Health Management gaps (Warnings and Alerts) have I identified on my farm?
2. What steps can I take to correct those gaps?

3. Management of People

Biosecurity practices for management of people	Evaluation Checklist				
	Yes GOOD	Sometimes WARNING	No ALERT	N/A	Actions to consider
I have a written biosecurity plan describing the practices to follow in different areas of my farm.					
All farm workers (including family members) are trained in the biosecurity practices of my farm.					
I request visitors to announce themselves prior to arrival so they are aware of my biosecurity requirements.					
I ask questions to determine the potential risk for disease transmission posed by visitors and farm personnel.					
I know that livestock can be a source of human disease and advise my family, workers and visitors to follow good hygiene practices after contact with animals or their environment.					

Risk factor review: **GOOD** – meeting basic biosecurity practices | **WARNING** – potential for failure of biosecurity element, action required | **ALERT** – biosecurity gap identified, action required

1. What gaps (Warnings and Alerts) on Management of People have I identified on my farm?
2. What steps can I take to correct those gaps?

4. Protocols and Record-Keeping

Biosecurity practices for Protocols and Record-Keeping	Evaluation Checklist				
	Yes	Sometimes	No	N/A	Actions to consider
	GOOD	WARNING	ALERT		
I have written farm-specific biosecurity protocols.					
My farm-specific biosecurity protocols are available to personnel, family and service providers.					
I maintain and review herd and individual animal health records, which help to identify and address any health issues.					
I record events such as illnesses, treatments, disinfections, vaccinations, dewormings, birthdates, and deaths of animals of my herd in the proper place.					
I record, review and update important farm management activities.					
I record, review and update biosecurity, education and training activities.					

Risk factor review: **GOOD** – meeting basic biosecurity practices | **WARNING** – potential for failure of biosecurity element, action required | **ALERT** – biosecurity gap identified, action required

1. What Protocol and Record-Keeping gaps (Warnings and Alerts) have I identified on my farm?
2. What steps can I take to correct those gaps?

Appendix 3: Sample cervid farm layouts

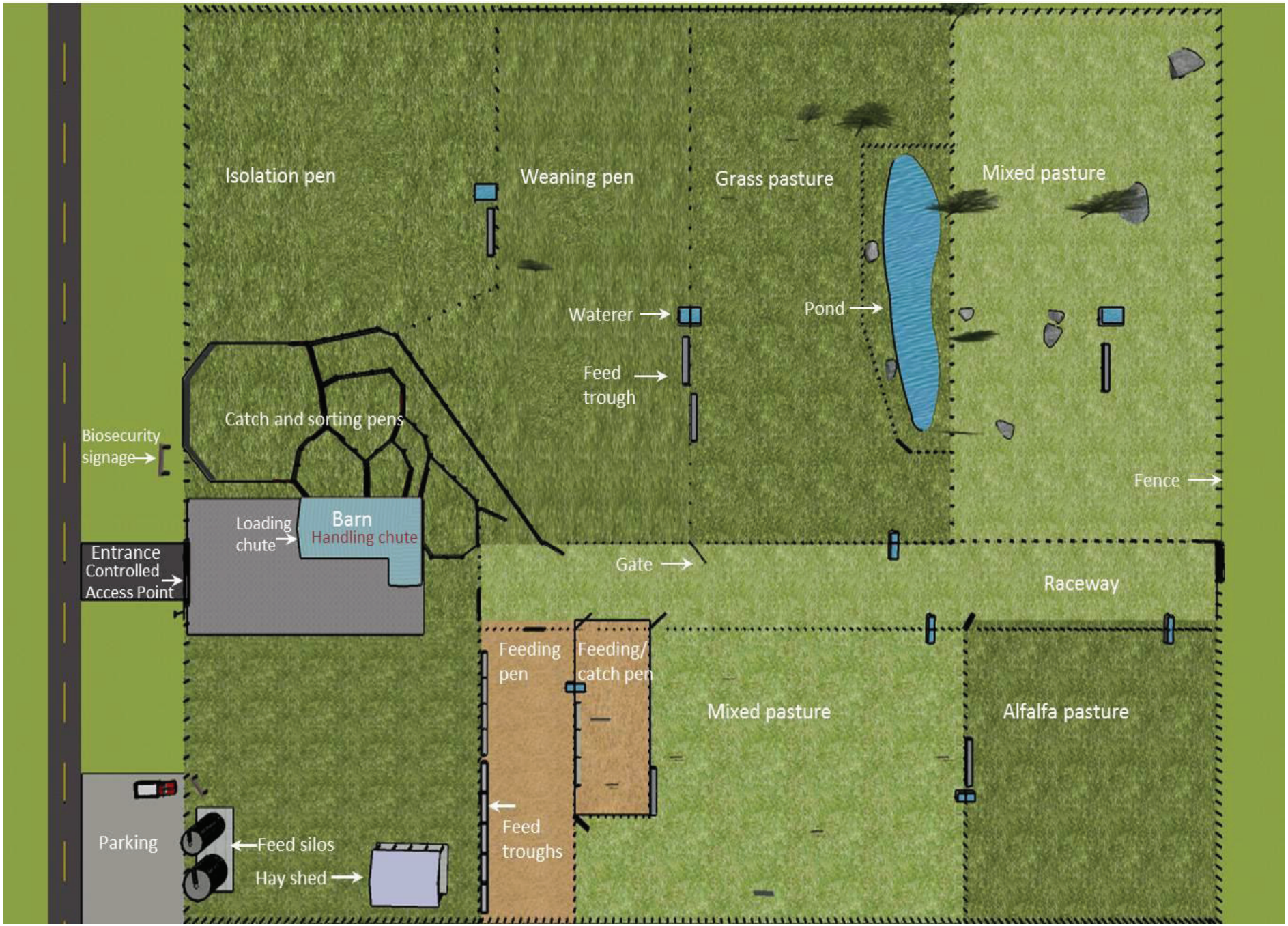


Figure 3: Sample Layout

This overhead view of a stylized cervid farm depicts some critical infrastructure and biosecurity concepts for routine production.

Clockwise from the bottom left:

1. The farm premises is completely enclosed with a fence to contain farmed cervids and deter entry by other animals and humans.
2. Internal fencing is used to: separate work and production areas on the premises, separate areas of risk and manage production and traffic flows. Gates are situated to facilitate animal management and worker access.
3. A paved parking area outside the work/production area minimizes unnecessary access by people and potential pathogen introduction.
4. Access to the premises is managed through a designated entrance and gate that can be secured. This entrance functions as a Controlled Access Point allowing an assessment of the risks posed by people / equipment and the implementation of appropriate biosecurity measures.
5. A hard surface area surrounds the barn which contains the handling chute / loading chute and storage areas. The loading chute is located near the entrance and is physically separated from the pens / pasture areas the herd occupies.
6. Biosecurity signage informs the public and directs service providers that biosecurity measures are in place and must be adhered to.
7. Catch pens and sorting pens are designed to safely and humanely handle animals.
8. A isolation pen allows sick or newly acquired animals to be separated from the herd until their health has improved or their health status is determined to not pose a risk to the resident herd. This pen has its own waterer and movable feed trough.
9. A weaning pen provides physical separation of younger animals from the herd and minimizes exposure to animals of different health status. It has a movable feed trough and shares a waterer with the grass pasture area.
10. The pond in the grass pasture is enclosed by fence to prevent access by farmed cervids and other animals.
11. The pasture areas are planted and managed to provide forage throughout the season and allows rotational grazing to minimize accumulations of manure and potential pathogens.
12. One of the mixed pastures has a fenced feeding and catch pen to facilitate animal management. The ground is sand and gravel that promotes drainage and minimizes accumulation of organic debris.
13. The feeding pen has a sand and gravel surface. There are multiple concrete feed troughs to accommodate large numbers of animals and allow cleaning and disinfection as necessary.
14. A hay shed and feed silos help protect feed from contamination.

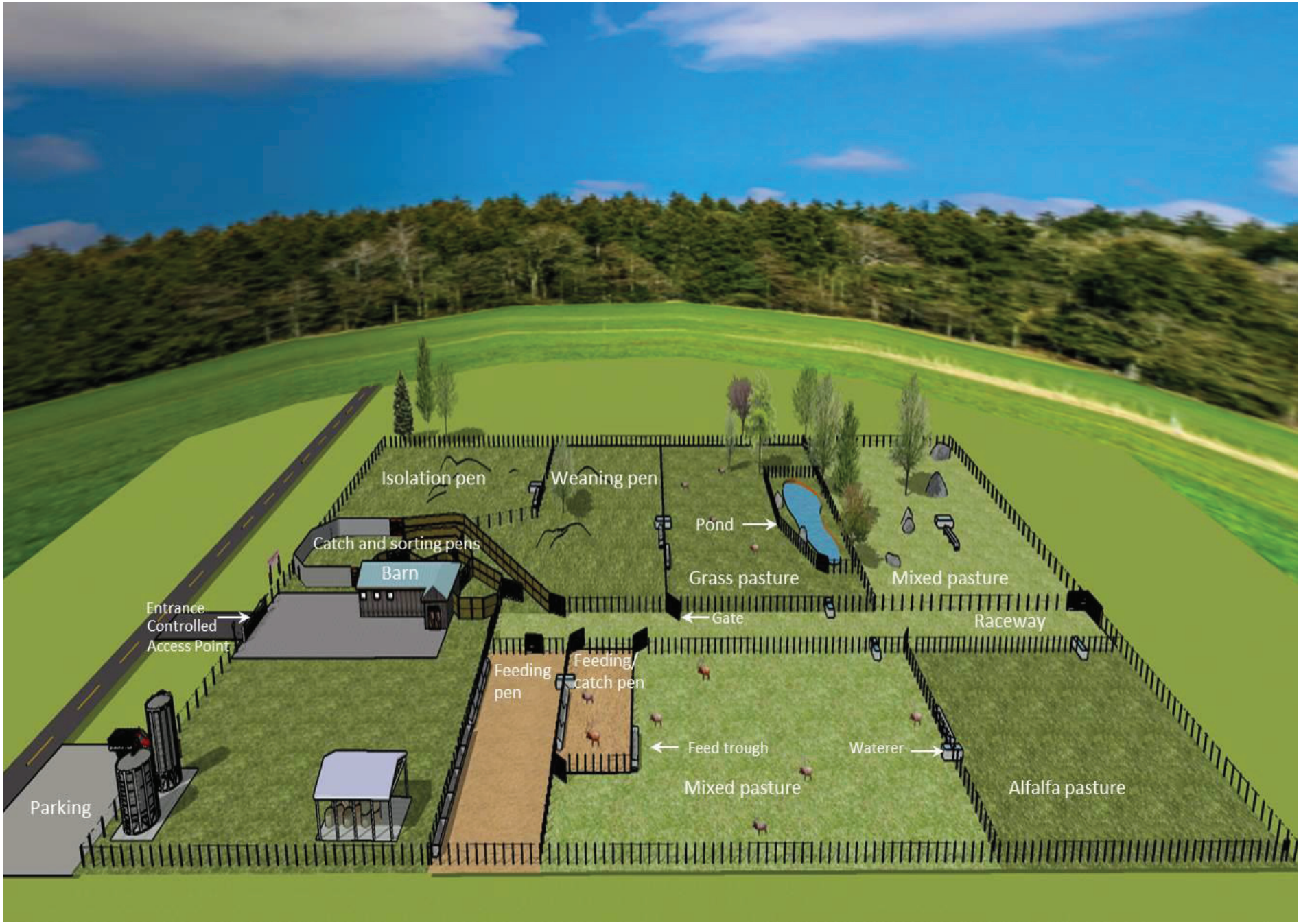


Figure 4: Sample Layout

This diagram provides a different view of the premises in figure 3. Notable biosecurity infrastructure includes:

1. The concrete slabs under the feed silos and hay shed help to minimize contamination of feed.
2. Feed troughs and waterers are present in all pens and pasture areas (excluding the catch and sorting pens). The isolation pen has its own waterer and feed trough.
3. The pond is fenced to minimize access by animals.
4. The catch and sorting pens are constructed of durable materials. The large catch pen is constructed of metal panels that can be easily cleaned and disinfected. The other catch/sort pens are constructed of plywood sealed with a non-toxic animal safe sealant to protect the wood and facilitate cleaning and disinfection.
5. The feed silos are located near the edge of the premises adjacent to the parking area. The silos can be filled without feed delivery vehicles entering the property.
6. High use feeding pens use a sand and gravel surface to promote drainage and minimize the accumulation of organic debris.

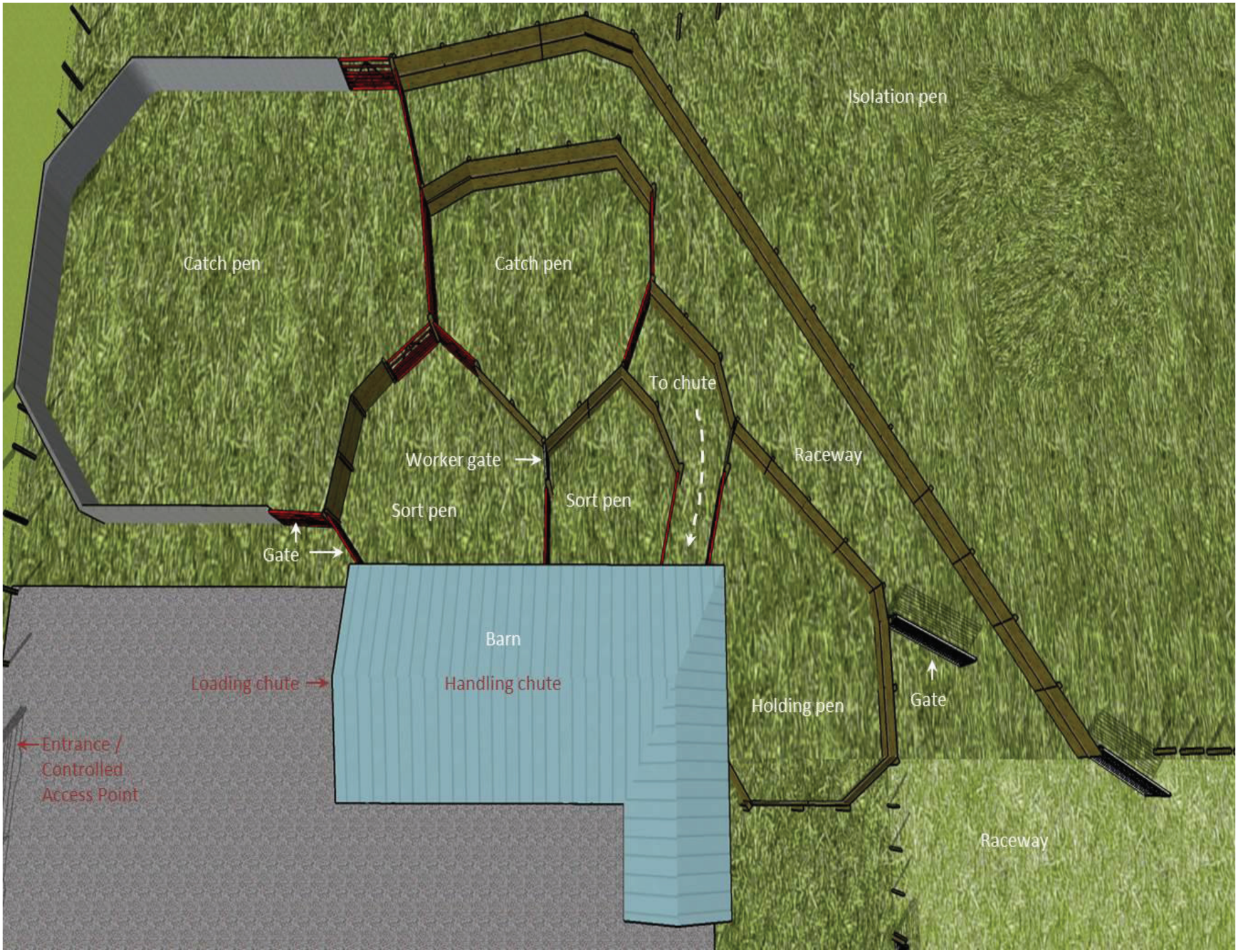


Figure 5: Sample layout of animal handling areas.

A closer view of the animal handling areas depicted in figures 3 and 4.

1. The main entrance and gate which serves as a Controlled Access Point is located at the far bottom left of the diagram. The barn is sited on a hard surface that extends beyond the building walls. The hard surface is sloped to direct water away from the barn, entrance and pen areas.
2. The barn protects the loading and handling chute and storage areas from the elements and unwanted access by people and animals. It provides a controlled environment to handle and perform animal treatments and a location for people to clean and disinfect footwear, equipment, sanitize hands and perform clothing changes as necessary. It provides storage for materials and small equipment used on the farm and the equipment and supplies to clean and disinfect when needed. Storage areas are enclosed to minimize potential exposure and contamination of stored items during animal handling procedures.
3. The catch and sorting pens are constructed of durable materials. The large catch pen wall is constructed of metal panels that can be easily cleaned and disinfected. The other catch/sort pen walls are constructed of plywood sealed with a non-toxic animal safe sealant to protect the wood and facilitate cleaning and disinfection. For safety purposes, the plywood panels have a ledge to allow animal handlers footing to climb over if needed.
4. Metal gates allow movements between the pens. Installing smaller “worker gates” allow people to move between the pens with the risk of animal escape.

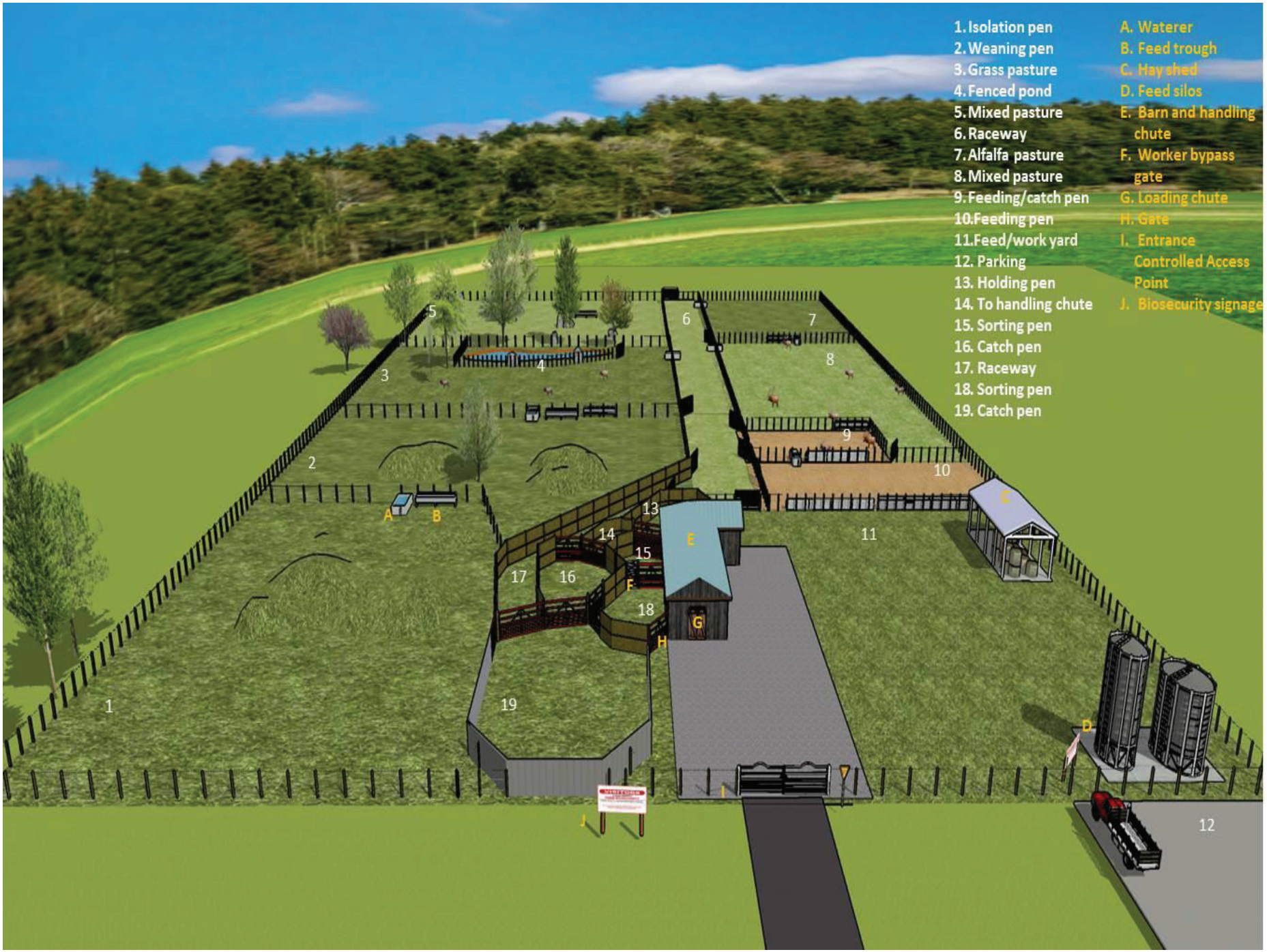


Figure 6: Sample layout of animal handling areas.

This diagram provides a different view of the previous premises. A legend identifies the relevant areas. See description in diagram 3 and 4.

Figure 7: Spot the biosecurity concerns

Figures 7 and 8 are stylized examples of a cervid farm that depict a number of biosecurity concerns. How many biosecurity concerns can you identify?
See figure 8 for a description of figure 7.

Figure 8: Spot the biosecurity concerns

Figures 7 and 8 are stylized examples of a cervid farm that depict a number of biosecurity concerns. How many biosecurity concerns can you identify?

Biosecurity concerns:

- There is no designated parking area outside the farm premises to manage vehicle and truck traffic. Vehicles are parked in various locations on the property; work vehicles can be a potential source for the introduction and spread of pathogens from off the farm, pose hazards to animals and provide shelter/nesting areas for animals.
- The front gates to the premises are open allowing unobstructed access by people and animals.
- There is no biosecurity signage to inform the public and direct suppliers.
- Portions of the perimeter fence are broken and falling down.
- The barn doors are open allowing potential access by people and animals to the handling and chute system and stored supplies.
- There is no hard surface around the barn.
- The hay shed roof and floor are damaged allowing contamination of stored feed by water, soil and potential pathogens.
- Hay bales have been left unprotected in a pasture area and work area; improperly stored feed can attract animals and be contaminated by animals and pathogens in the environment.
- The surface under the feed silos is bare soil which prohibits cleaning and disinfection and may allow contamination of feed and the vehicles distributing feed.
- There is debris (wooden pallets, 45 gallon metal drums, and temporary fence panels etc.) in some of the pastures and storage locations which can provide nesting areas for rodents, pose a physical / chemical hazard to animals and interfere with property maintenance. The temporary fence panels, if used on other premises, pose additional biosecurity risk.
- A few feed and water troughs are dirty / filled with organic material. The feed and water troughs need to be cleaned and disinfected. Spoiled feed, accumulations of organic debris and biofilms on feed and water troughs pose potential health risks to animals.
- Some of the water troughs are leaking and flooding pasture areas.
- There is damage to some of the handling areas which pose safety risks and difficulty cleaning and disinfecting surfaces.
- The isolation pen has a shared water trough with the adjacent weaning pen and there is no fencing in place to prevent animals moving between these areas. Animals of only one health status could occupy these pens unless fencing is completed and separate water troughs installed.
- Animals have access to surface water - a pond - which can be a source of pathogens and also be an attractant for other animals.
- There are piles of soil / manure in the pond pasture and the waterer extends beyond the exterior fenceline allowing potential contamination by other animals.
- There are beef bulls in a few of the pens. Mixing animals of a different species and production use (e.g. the beef bulls) provides increased opportunity for pathogen introduction and spread.

Appendix 4: Selected disinfectants

This is a short list of selected disinfectants suitable for routine cleaning and disinfection of environmental surfaces and equipment. Always follow manufacturers' recommendations

Active agent	Product examples	Contact time	Advantages	Disadvantages	Comments
Hypochlorite	Bleach. 1:10-1:50 dilution of household bleach with clean water	10 min	- Broad spectrum, effective against most resistant organisms (enveloped viruses, bacterial spores, and dermatophytes). - Readily available. - Cost effective.	- Corrosive for some surfaces. - Poor stability when exposed to light. - Poorly active in the presence of organic debris (for example, dirt and manure). - Can bleach coloured fabrics.	- Good for various environmental surfaces. - Efficacy decreases with increasing pH, decreasing temperature, presence of ammonia and nitrogen. - Reserve high concentration (1:10) for specific circumstances with resistant microorganisms. - 1:32-1:50 more commonly used. - Never mix with other chemicals as this can result in the production of harmful vapours. - Change diluted solutions daily. - Do not store in clear containers.
Potassium peroxymonosulfate	Virkon Trifectant	10 min	- Broad spectrum, with activity against enveloped viruses and bacterial spores. - Active in the presence of moderate organic debris.	- Corrosive, especially with metal surfaces.	- Commonly used routine disinfectant. - Care must be taken when handling concentrated products. - Consider rinsing metal and concrete surfaces after required contact time.
Accelerated hydrogen peroxide	PREvail	5–10 min	- Broad spectrum, with activity against enveloped viruses, bacterial spores and ringworm. - Good activity in moderate organic debris. - Low toxicity. - Biodegradable. -Does not appear to be corrosive	- More expensive than other options.	- Excellent choice for environmental disinfection.
Quaternary ammoniums	Various	10–30 min	- Low cost. - Low toxicity. - Stable under storage. - Good against gram-negative and many gram-positive bacteria, and enveloped viruses.	- Limited impact on non-enveloped viruses, bacterial spores and ringworm. - Inhibited by organic debris	-Common environmental disinfectant, however, spectrum may be suboptimal for some situations.
Phenolics	Various	10 min	- Good activity in organic debris.	- Limited activity against non-enveloped viruses and bacterial spores. - Can be irritating to skin and mucous membranes.	- Not recommended because of toxicity, spectrum and lack of significant advantages over better options. Potentially toxic.

				Potentially toxic to other species (e.g. cats, pigs)	
Alcohol, povidone iodine, chlorhexidine, acids					- Not recommended because of activity in the environment or spectrum.

Information on use and efficacy of selected disinfectants

Disinfectants are regulated by Health Canada for safety, efficacy and quality when used according to the label directions. However, **efficacy is determined under controlled laboratory conditions, and if using disinfectants in a farm environment, they must be used according to the manufacturer's recommendations and considerations given to increased organic load and environmental conditions.** Disinfectants are most effective when applied to clean, dry surfaces; their effectiveness is affected by many factors including temperature, pH of the water, presence of other chemicals, concentration and contact time.

Disinfectants that meet Health Canadas requirements are given a Drug Identification Number (DIN). Health Canada maintains a searchable database of registered disinfectants (the Drug Product Database). It is recommended to use a disinfectant product that has a DIN and is effective against the pathogen targeted. Note: foreign approvals by the US Environmental Protection Agency or US Food and Drug Administration are not recognized in Canada. Not all disinfectants are equal in their ability to inactivate pathogens.

- Low level disinfectants will contain a DIN and the term "disinfectant" on the label.
- Medium level disinfectants will contain a DIN, the term "disinfectant" and also have a "TB", "Tuberculocidal", or "Mycobacterium" claim on the label.
- High level disinfectants will contain a DIN, the term "disinfectant" and also have a "TB", "Tuberculocidal", or "Mycobacterium" claim and a "Sporocidal" claim on the label.

As temperatures drop below 10°C, many chemical disinfectants require increased contact time and/or a higher concentration to achieve effective disinfection. Quaternary ammonium compounds are more affected by decreased temperatures than hydrogen peroxide, bleach and potassium peroxymonosulfate. As temperatures approach freezing, disinfection becomes difficult; trailers, equipment and other items should be cleaned and disinfected in a heated building.

At temperatures below 0°C, products to prevent freezing such as propylene glycol or calcium chloride can be added to some disinfectant solutions used to increase "wet contact" time. Speak to disinfectant manufacturers to determine suitability and concentrations.

The effectiveness of disinfectants registered in Canada is determined under controlled laboratory conditions.

When using disinfectants in a farm environment, they must be used according to the manufacturer's recommendations and considerations given to increased organic load and environmental conditions.

Recommendations on using bleach as a disinfectant:

Bleach is a generic term for products comprised of sodium hypochlorite (NaOCl). Some products containing sodium hypochlorite are registered as disinfectants and have been granted a DIN. Bleach is available in various concentrations with 5% to 8.5% being more common. Knowing the concentration of bleach in the bottle is necessary when diluting to use as a disinfectant. The following concentrations and dilutions are suggested for "routine disinfection".

Bleach 5.25% Volume	Dilution Ratio	Water Inclusion Rate	Per Cent (%) NaOCl	Parts per million (ppm) Cl	Use
10ml	1:249	2490ml	0.02%	200ppm	Household use – kitchen surfaces (for reference)
50ml	1:49	2450ml	0.1%	1 000ppm	Handheld equipment/tools
250ml	1:9	2250ml	0.5%	5 000ppm	Building surfaces, pens, barns
1000ml	1:1.625	1625ml	2.0%	20 000ppm	Tuberculosis, prions

Considerations when using bleach:

- Surfaces must be clean before applying: bleach is a poor cleaner and is inactivated by dirt and other organic material.
- **Never mix bleach with other chemicals: bleach reacts with acids and ammonia to produce toxic gases.**
- Rinse surfaces after contact time is achieved: bleach is corrosive to metals and can damage fabrics and rubber surfaces at higher concentrations.
- Always prepare fresh solutions: bleach quickly loses activity once mixed and fresh solutions should be prepared daily.
- The pH and mineral concentration of water can affect the efficacy of the disinfectant.
- Know the concentration of bleach in the product used: bleach is available in a variety of concentrations.
- Store stock solutions in a cool, dark location: bleach loses activity when exposed to sunlight.
- Bleach can be irritating to mucous membranes, eyes, skin and the respiratory tract: take appropriate measures when using such as wearing gloves, goggles and protecting skin.

Recommendations on using disinfectants containing hydrogen peroxide:

Hydrogen peroxide (H_2O_2) has long been used as a disinfectant. Favourable characteristics include a broad spectrum of activity, little odour, and minimal environmental concerns due to it breaking down into water and oxygen. Unfortunately, hydrogen peroxide can be corrosive to soft metals and its rapid decomposition can reduce effectiveness as a disinfectant. Hydrogen peroxide can be obtained in concentrations of 3 to 5% through retail stores and in concentrations up to 30% (which is diluted on farm) through farm/agri-business suppliers. Personal protective equipment must be worn when handling/diluting 30% hydrogen peroxide to concentrations of 3 to 5% for use on farm as it can damage skin, mucous membranes and eyes. Newer formulations of hydrogen peroxide products are superior disinfectants.

Stabilized hydrogen peroxide disinfectants contain additives to minimize the decomposition into water and oxygen and increase the time they remain effective as a disinfectant.

Hydrogen peroxide enhanced action formulations (HPEAF) are newer products with increased disinfection action. These products contain additives that improve their ability to remove fats and biofilms, increase their cleaning ability, reduce binding and degradation by other chemicals and improve their effectiveness in cold water. They require lower concentrations of hydrogen peroxide and are more effective in the presence of organic material.

A product referred to as Accelerated hydrogen peroxide (AHP®) manufactured by Virox Technologies Incorporated is a type of HPEAF. This product, among other HPEAF disinfectants, provides producers with safe and effective disinfectant option for a variety of pathogens.

Appendix 5: Cleaning and disinfecting procedures (sample)

The five-step process of cleaning and disinfection

Cleaning and disinfection are two different processes. Cleaning refers to the physical removal of organic material to allow exposure of the object's surface (for example, equipment or stall) to a disinfectant. The cleaning procedure is composed of a dry cleaning and a wet cleaning process. Dry cleaning removes the majority of organic debris (manure, bedding, debris and soil) while wet cleaning helps remove residues and biofilms from the surfaces with the use of hot water and detergents.

Disinfection refers to the application of a disinfectant (often a chemical) to a clean surface to destroy the majority of remaining pathogens. No single disinfectant is adequate for all situations. Disinfection protocols used on a daily basis will differ from those used to control an infectious disease outbreak. However, both disinfection protocols require thorough cleaning and washing before applying any disinfectant.

The full process of cleaning and disinfection involves five steps in the following order:

Step 1: Dry cleaning

Begin by moving all animals out of the areas to be cleaned. Remove any garbage, materials and equipment; remove feed and water buckets/troughs, handling equipment and anything else that has found a resting place in the area to be cleaned.

Starting at the top of the surface to be cleaned and working down, scrape, knock, brush or wipe off accumulations of organic debris. Work from cleaner to dirtier areas to minimize unnecessary contamination of surfaces. Collect and dispose of organic debris in the manure pile. By thoroughly dry cleaning, the wet cleaning will be easier.

Step 2: Wet cleaning

Using a LOW-PRESSURE SPRAY (to minimize spreading pathogens), wet down surfaces with a solution of warm water and a detergent or degreaser. The detergent/degreaser assists in removing soil, oils and biofilms (colonies of microbes protected by a slimy/mucoid substance). The removal of biofilms is critical to eliminating organisms that may potentially cause disease.

Start by applying the solution to the most heavily contaminated areas and then proceed to apply from the top down. After allowing the solution to fully saturate the organic debris, continue cleaning using a low-pressure spray and warm water: scrub surfaces using brushes and scrapers as necessary. When the surfaces are visibly clean, thoroughly rinse with warm water to remove any remaining detergent and biofilm. Use a squeegee to remove water from floor surfaces to facilitate drying.

Step 3: Drying

Allow the surfaces to thoroughly dry. This assists in destroying the pathogens and minimizes dilution of the disinfectant. Use fans or heaters to speed up the drying process.

Step 4: Disinfection
Select an appropriate disinfectant and prepare it according to the label directions. Protect yourself by wearing appropriate clothing and personal protective equipment (for example, gloves, eye protection, boots and coveralls). Apply the disinfectant to the clean dry surfaces to the point of runoff moving from the top down. Reapply the disinfectant as necessary to ensure the surfaces remain wet for the appropriate contact time specified by the manufacturer. This will usually be a minimum of 10 minutes. Rinse surfaces if required by the manufacturer. Always rinse food and water troughs before refilling.

Step 5: Drying
Allow all surfaces to thoroughly dry before use. Use fans or heaters to speed up the drying process.

Appendix 6: Selected infectious diseases and parasites of cervids

Viral and Prion Diseases
Adenovirus (adenovirus hemorrhagic disease , adenoviral bronchiolitis) - several serotypes of adenovirus - an emerging disease first detected in 2006 in wild mule deer in BC and AB - disease: respiratory or gastrointestinal disease or hemorrhagic syndromes resembling bluetongue (BT), or epizootic hemorrhagic disease (EHD) - disease transmission: via respiratory secretions, fomites, fecal-oral contamination, and infectious droplets
Bluetongue (sore muzzle) - a reportable, non-contagious, viral hemorrhagic disease affecting multiple species. Present in Canada and the US. - disease: animals may present with fever, anorexia, weight loss, nasal discharge, and swelling and erosions in the mouth - disease transmission: transmitted from animal to animal by insects (midges in the genus Culicoides).
Epizootic Hemorrhagic Disease (EHD, hemorrhagic disease) - EHD viruses (EHDV) closely related to Bluetongue viruses - a notifiable often fatal hemorrhagic disease of deer, and occasionally cattle, endemic in North America, but uncommon in Canada - disease: animals may present with fever, small hemorrhages or bruises in the mouth and nose and swelling of the head, neck, tongue, and lips - disease transmission: direct contact by biting flies especially midges in the genus Culicoides, (*C. variipennis*), gnats and mosquitoes
Foot and Mouth Disease (FMD) - a reportable, severe, highly contagious viral disease affecting primarily cloven hooved animals including cattle, pigs, goats, sheep and deer - not present in North America - disease: animals may present with fever, vesicles and erosions in the mouth, on mammary glands and between digits of hooves, leading to lameness - disease transmission: direct contact from aerosols, bodily secretions or excretions of infected animals including respiratory, amniotic fluid and related tissue, mechanical transmission by equipment andvehicles etc. Flies and other insects may transmit the virus
Malignant Catarrhal Fever (MCF) - a serious, often fatal, viral disease affecting cattle, bison, deer, moose, exotic ruminants, and pigs worldwide - disease: animals may die quickly with few visible lesions or lose body condition, develop a rough hair coat, nasal discharge, corneal opacity, bloody diarrhea and bloody urine - disease transmission: the virus is carried by domestic and wild sheep and goats without showing signs of disease. Deer are exposed by direct contact or indirect contact, especially during lambing
Pseudorabies (Aujeszky's disease) - a reportable herpesvirus that infects the central nervous system and other organs, such as the respiratory tract, of a range of domestic and wild mammals, including feral swine (natural maintenance host), cattle, sheep, dogs, etc. Worldwide distribution. Present in the US but not Canada - disease: animals may present with fever, intense itching, tremors and other central nervous system signs, and respiratory disease -disease transmission: direct contact through contaminated secretions, excretions and aerosols, and in some species, during breeding through venereal transmission
Rabies - zoonotic, reportable viral disease that affects the central nervous system (CNS) of a very broad range of wild and domesticated mammals and maintenance hosts (bat, fox and skunk species, each with unique host strains) and has an extremely high case fatality rate from neurological disorders. Worldwide distribution - disease transmission: transmitted by direct contact from infected to uninfected animals primarily from bites or other wounds contaminated with infectious saliva

Chronic Wasting Disease (CWD)

-a reportable, fatal neurodegenerative disease or transmissible spongiform encephalopathy (TSE) of cervids, associated with CWD prions (PrP^{CWD}). Present in Canada

- natural transmission to humans not conclusively demonstrated but it is recommended to avoid consumption of products from CWD infected animals

- disease: typified by chronic weight loss (wasting) leading to death. Signs include unusual behaviour, lack of coordination, depression, excessive salivation, difficulty swallowing, paralysis, separation from herd mates, increased thirst, excessive urination, and pneumonia

- disease transmission: Shedding of the agent in saliva, blood, milk, and feces. Direct transmission (animal-to-animal) both horizontally between animals through body secretions (saliva, blood) or feces, and vertically (dam to offspring, before or after birth). Indirect environmental (animal-to-premises-to-animal) transmission via contaminated feed, facilities, equipment and soil. The incubation period typically lasts for 16 to 36 months

Bacterial

Anthrax

(Bacilus anthracis)

-a zoonotic, reportable serious multi-species disease that in one of three forms affects cutaneous tissue, the gastrointestinal tract and/or respiratory system of most mammals, including ruminants, in addition to some amphibians and birds. Worldwide distribution

-human cases associated with an animal outbreak are rare if proper precautions are taken when handling and moving affected animals and carcasses

- Signs of anthrax: Often the first sign of an anthrax outbreak is one or more sudden deaths in affected livestock. In highly susceptible species like cattle, the time between the onset of mild symptoms (such as feed refusal and/or lower milk production) and death can be a matter of hours

- Animals that do not die suddenly may:

- appear distressed
- have difficulty breathing
- stop eating and drinking
- develop swellings, under the jaw where the head joins the neck and lower abdomen
- have a normal or elevated temperature

After death, the animal carcass may leak bloody fluids from body openings (rectum, nostrils, mouth, etc.) and bloat rapidly. Rigor mortis might not occur, and blood may not clot

- DO NOT MOVE CARCASS IF ANTHRAX SUSPECTED

- **Disease transmission: The bacterium is shed by an animal that has died of anthrax. This provides a source of infection for other animals. It can be inhaled or it can enter the body through an existing break in the skin or mucous membrane. Livestock are most commonly infected by ingesting the spores from contaminated pastures, feed or soil (while grazing). Once ingested, the bacterium grows and multiplies in the blood stream**

Brucellosis (**contagious abortion**)

(Brucella abortus and Brucella suis(biovar 4) affect cervids)

- a reportable, zoonotic worldwide bacterial multi-species disease that can cause various issues, most notably abortions and septic joints ("joint ill")

- Canada is free of B. abortus and B. suis in all farmed livestock species. There is a wildlife reservoir of B. abortus in free-ranging bison in and near Wood Buffalo National Park, and B. suis (biovar 4) in free-ranging caribou and muskox in the North.

- disease transmission: direct and indirect contact with the infectious agent through ingestion or inhalation, through conjunctiva or skin abrasions; this is most often through contact with infected aborted material or drinking infected milk

- control under CFIA jurisdiction:

- testing of imported animals and animals intended for export
- testing associated with the Cervid Movement Permit (under review)

- testing at slaughter
- disease investigation and response

Clostridial diseases
*(*pulpy kidney *(Clostridium perfringens - Type D);* black leg, gas gangrene *(C. chauvocei novyi);* tetanus *(C. tetani);* malignant edema *(C. specticum);* redwater disease*,* bacillary hemoglobinuria *(C. hemolyticum))*
- disease: a wide range of bacterial diseases in domestic livestock and wildlife characterized by infection of the intestinal tract and circulatory system (or trauma site) associated with young stock and cows during late pregnancy and calving that causes toxic excretions , depressed immunity and death. Worldwide distribution
- disease transmission: contact with spore-forming soil-borne anaerobic bacteria that produce specific exotoxins in hosts with trauma or other deep puncture wounds (including injection sites)

Johne's Disease (Paratuberculosis)
Mycobacterium avium subsp. *paratuberculosis* (MAP)
a worldwide chronic mycobacterial disease of the intestinal tract
- disease: characterized by irreversible wasting, chronic weight loss with/without diarrhea, and death from cachexia (weakness and wasting of the body due to severe chronic illness) in ruminants
- disease transmission:ingestion of bacteria in fecal-contaminated food and water and indirect contact with contaminated surfaces; pathways for disease uncertain in deer and elk, but hand raised calves fed MAP-contaminated milk is a source transmission of disease

Leptospirosis
(*Leptospira* spp., various serovars)
- infection of kidneys and urinary tract resulting in a range of disease signs, clinical disease is noted by jaundice, kidney lesions, blood in urine and often by sudden death
- disease transmission: direct contact through cuts or abrasions of the skin, through mucous membranes (eyes, nose, mouth) or through ingestion of water contaminated with urine of infected host

Necrobacillosis
(Fusobacterium necrophorum)
- a common soil borne bacteria
- disease: infection results in foot rot and necrotic stomatitis (tongue and throat abscesses)
- disease transmission: direct contact through cuts or abrasions to skin or mucous membranes in mouth from contact with coarse feed or other sharp objects

Salmonellosis (non-typhoidal)
(Salmonella spp., various species)
- a zoonotic bacterial infection found in the intestinal tract of wide range of mammals
- disease: diarrheal illness and death in acute cases in fawns
- disease transmission: direct contact with disease agent in feces from infected animals

Tuberculosis (TB, bovine tuberculosis)
(Mycobacterium bovis)
- zoonotic, reportable chronic, bacterial disease of cattle worldwide that occasionally affects numerous spillover hosts including cervids among other species of domestic and wild mammals
- Canada is currently free of tuberculosis in the farmed cervid population
- disease: a chronic, progressive disease that can cause gradual debilitation, weight loss, lethargy, and intolerance to exercise. Coughing, nasal discharge, and difficulty breathing may occur and occasionally superficial lymph nodes in the neck will develop large abscesses that may rupture and drain through the skin
- disease transmission: direct contact with excretions (variable shedding in saliva, nasal secretions, feces, urine, other exudates with infected species) and indirect contact from infected hosts (e.g. ingestion of contaminated feed and water); aerosol transmission may be the most significant form of disease transmission
- CFIA Cervid Movement Permit requirements: negative status required (maintained by whole herd testing every five years) before cervid movements are permitted (other than to slaughter), unique identification, and adequate deer inventory records

Yersiniosis
(Yersinia enterocolitica)
- an worldwide enteric bacteria predominant in wild and domestic animals including farmed elk, red deer and fallow deer

- disease: invades intestinal mucosa causing diarrhea, weight loss, and systemic infection, most common in stressed recently weaned animals (4-6 months old), leading to sudden death; a common initiating sign in outbreaks
- disease transmission: ingestion of bacteria from contaminated soil, water and from contact with feces of infected hosts and wild birds and rodents (e.g. beavers) which may be infected by the bacteria without appearing ill

Other Microbial

Dermatophytosis (Ringworm, Dermatomycosis)
(*Epidermophyton*, *Microsporum*, *Trichophyton* sp.)
- zoonotic fungal agents that cause skin disease and hair loss in animals. Can infect humans
- disease transmission:direct contact between infected and susceptible animals or via a contaminated environment (e.g. bedding) and facilities (especially overwintering sites)

Parasitic

Bovine Babesioisis
(Babesia spp.*)*
- a tick-borne (*Ixodes scapularis*) parasitic protozoan infection of cervids
- disease: parasite attacks and destroys red blood cells causing significant morbidity and mortality in ruminants from fever, hemoglobinuria, and hemolytic anemia; infected animals become anemic, lethargic and lose weight
- disease transmission: spread by biting ticks

Cryptosporidiosis
(Cryptosporidia parvum)
-an internal parasitic zoonotic gastrointestinal and diarrheal disease that affects most mammals, especially young and/or susceptible hosts. Worldwide distribution
- disease transmission: direct contact with infectious oocytes (parasite eggs), or indirectly through contamination of food or water by shed oocytes in feces of infected hosts

Dictyocaulosis (lungworm)
(Dictyocaulus spp*., D. viviparus)*
- a nematode (worm) that infests lung tissues leading to respiratory disease (parasitic bronchitis, pneumonia), loss of condition, retarded growth, roughened coats and sudden death in seriously infected animals, especially under 2 yrs of age.
- disease transmission: ingestion of infective larvae on vegetation in open range contaminated by feces of infected hosts; no intermediate host required

Elaphostrongylosis (tissue worm, muscle worm)
(*Elaphostrongylus cervi, E. rangeriferi)*
- nematode (worm) found in several tissues including intermuscular tissue and the central nervous system resulting in disease; not common in North America but endemic in farmed and wild cervids in NZ
- disease transmission: direct transmission by ingestion of infected intermediate host (snail)

Fascioliasis (large liver fluke)
(Fasciola magna)
- a widespread flatworm internal parasite that resides in the liver, and rarely lungs, of a range of ruminants including elk and other cervids
- disease transmission: indirect through contact with infected snails and slugs and ingestion of infective parasites on aquatic plants.

Gastrontestinal Nematodiasis (stomach worms)
(trichostronglyoid nematodes, Ostertagia spp., Haemonchus spp.)
- an internal parasitic disease caused by a group of nematode species; worldwide distribution.
- disease: larvae and adult nematodes inhabit the abomasum (true stomach) of infected hosts (domestic and wild ruminants, including cattle, sheep and goats) causing diarrhea and weight loss in susceptible animals; whereas infestations of *Haemonchus* spp. cause anemia in affected hosts
- disease transmission: biting flies transmit parasite

Parelaphostrongylosis (meningeal brain worm, brainworm, ``moose sickness``, muscleworms)
(*Parelaphostrongylus tenuis, P. andersoni, P. odocoilei)*
- an internal nematode (roundworm) disease
- disease: roundworm damages meningeal tissues in the central nervous system leading to impaired neurological functions and altered behaviour
- disease transmission: ingestion of plant material carrying infected snails or slugs

Tick Disease (exotic) (cattle tick, southern cattle tick)
(Amblyomma variegatum, Amblyomma hebraeum, Rhipicephalus microplus, Rhipicephalus annulatus, Rhipicephalus appendiculatus, Ixodes ricinus)
- external parasitic hard ticks affecting a wide range of mammalian hosts and spread a number of diseases
- heavy tick infestation itself can cause significant illness
- *A. variegatum* and *A. hebraeum* can transmit *Ehrlichia ruminantium* (heartwater),
- *I. ricinus* transmits *Babesia divergens* (babesiosis), louping ill virus and tick-borne encephalitis virus, exotic to the Americas
- *R. microplus* and *R. annulatus* transmit babesiosis and anaplasmosis, caused by *Anaplasma marginale*,
- disease transmission: direct contact of disease agents from blood-feeding ticks

Multi-Agent Syndrome

Calf Scours
- *Bacterial: Enterotoxigenic Escherichia coli, Clostridium perfringens* type D*, Salmonella* spp.,
- *Viral:* rotavirus, coronavirus, Bovine Virus Diarrhea (BVD) virus*,*
- *Protozoan: Cryptosporidium* sp., *coccidiosis, Eimeria* sp*.*
- worldwide distribution
- disease: a serious clinical syndrome associated with several intestinal tract diseases causing diarrhea and rapid dehydration and death in young animals if left untreated
- disease transmission: direct contact with infected animals or indirect contact with food-borne or water-borne infectious disease agents or other contaminated sources in the environment

Appendix 7: What are reportable/notifiable diseases?

While many microorganisms are natural elements of human and animal ecosystems and not likely to cause disease in healthy animals or humans, a small number do cause disease and are referred to as pathogens. The provinces, territories and federal government regulate certain diseases that can have a significant impact locally, nationally or internationally. Federally, livestock diseases are categorized as: reportable, immediately notifiable and annually notifiable. Provincially, livestock diseases are categorized as reportable or notifiable. Cervid producers and stakeholders should be aware of these diseases and their reporting/management obligations to minimize their impact:

A reportable disease refers to diseases in federal and/or provincial acts and regulations. **Federally reportable diseases** are outlined in the *Health of Animals Act* and *Reportable Diseases Regulations* and are usually of significant importance to human or animal health or to the Canadian economy. Producers/animal owners, veterinarians and laboratories are required to immediately report the presence of an animal that is contaminated or suspected of being contaminated with one of these diseases to a Canadian Food Inspection Agency district veterinarian. Control or eradication measures may be applied immediately. A list of federally reportable diseases is available on the CFIA website at:

http://www.inspection.gc.ca/animals/terrestrial-animals/diseases/reportable/2014/eng/1329499145620/1329499272021

Immediately notifiable diseases, in general, are diseases exotic to Canada for which there are no control or eradication programs and are to be reported immediately to a specific government agency.

The Canadian Food Inspection Agency can undertake control measures for such diseases when notified of their presence in Canada. This category also includes some local rarely occurring diseases. A herd or flock of origin must be certified as being free from these diseases in order to meet import requirements of trading partners. Some provincial ministries may require notification for surveillance and/or control of certain immediately notifiable diseases.

Annually notifiable diseases are diseases that must be reported to the CFIA by laboratories and which CFIA reports on annually to the world organization for animal health.

Provincial reportable/notifiable diseases: Some provincial agriculture departments require reporting of diseases outlined in their provincial animal disease legislation. For additional information, contact the respective provincial agriculture department. Refer to Appendix 8.

Zoonotic diseases: Certain pathogens cause illness in humans and animals and can be transmitted from humans to animals and/or animals to humans. Examples include: Salmonella sp., Brucella sp., Leptospira sp., and Mycobacteria sp., among others. If zoonotic disease is suspected in a herd, producers should recognize the potential health risks and implement biosecurity measures necessary to protect human and animal health.

Appendix 8: Links to select provincial and federal acts / regulations/ programs of importance

British Columbia

- Animal Health Act
- Game Farm Regulation
- Ministry of Agriculture
- College of Veterinarians of British Columbia

Alberta

- Animal Health Act
- Livestock Industry Diversification Act
- Domestic Cervid Industry Regulation
- Alberta Mandatory Chronic Wasting Disease Surveillance Program
- Ministry of Agriculture and Forestry
- Alberta Veterinary Medical Association

Saskatchewan

- The Animal Products Act
- The Domestic Game Farm Regulations
- The Animal Protection Act
- The Diseases of Animals Act
- Saskatchewan Veterinary Medical Association

Manitoba

- The Animal Care Act
- The Animal Diseases Act
- The Livestock Industry Diversification Act
- Elk Game Production Regulation
- Manitoba Veterinary Medical Association

Quebec

- Act respecting the conservation and development of wildlife
- Animal Health Protection Act
- Food Products Act
- Programme de certification relative à la maladie débilitante chronique des cervidés (MDC) (French only)
- Regulation to designate contagious or parasitic diseases, infectious agents and syndromes
- Identification and traceability (French only)
- Maladie débilitante chronique (MDC) (French only)
- Ordre des médecins vétérinaires du Québec (French only)

Ontario

- Animal Health Act
- Farming and Food Production Protection Act
- White-tailed Deer Management Policy for Ontario
- Wildlife management
- Livestock and Livestock Products Act
- Legislation Affecting the Ontario Livestock Industry

- Ministry of Agriculture Food and Rural Affairs
- College of Veterinarians of Ontario

New Brunswick

- Fish and Wildlife Act
- New Brunswick Veterinary Medical Association

Newfoundland and Labrador

- Newfoundland and Labrador Veterinary Medical Association

Nova Scotia

- Deer Farming and Marketing of Deer Products Regulations
- Wildlife Act
- Farm Practices Act
- Nova Scotia Department of Agriculture
- Nova Scotia Veterinary Medical Association

Prince Edward Island

- Farm Practices Act
- Animal Welfare Act
- Animal Health Act
- Prince Edward Island Veterinary Medical Association

North West Territories

- Game Farm Licence
- Wildlife Act
- Reindeer Act
- Reindeer Regulations

Yukon

- Animal Health Act
- Game Farm Regulations
- Wildlife Act
- Wildlife Regulation
- Yukon Mandatory Cervid Chronic Wasting Disease Surveillance Program
- Environment Ministry

Federal acts, regulations and programs (others may be applicable)

- Health of Animals Act
- Health of Animals Regulations
- Chronic Wasting Disease Voluntary Herd Certification Program
- Feeds Act
- Feeds Regulations

Appendix 9: Farm visitor log (Sample)

Premises Identification (PID) Number: _____

For biosecurity purposes, all visitor entries are recorded. Entry is recorded at the earliest point of entering the operation.
Visitors include all people entering with permission (e.g. service providers and professionals, school tours, international visitors, etc.).
Excludes farm personnel (owner/operators, staff, and family etc.)

Date	Name	Company	Purpose of visit	Contact with cervids, other livestock within last 72 hours? Yes / No	Will you be entering farm production area? Yes / No	Will you be in contact with animals? Yes / No	Comments

Appendix 10: Sample deadstock management plan

(Producers should confirm that their deadstock management practices comply with municipal, provincial and federal regulations.)

Operation name:			**PID Number:**	**Province:**
Disposal method	**Is this permitted in province? Y / N**	**Is this method available? Y / N**	**Comments**	
Burial				
Composting				
Incineration				
Natural disposal				
Rendering				
Other				
Preferred means of disposal is:				
Location of disposal:				
How disposal is conducted:				
Biosecurity measures used:	☐ Dedicated equipment ☐ Non-dedicated equipment – cleaned and disinfected after use	☐ Dedicated clothing ☐ Dedicated footwear	☐ Disposable gloves ☐ Hand washing or hand sanitation following disposal	Other measures:
Disposal is not permitted if:				
Comments:				
Alternate means of disposal is:				
Location of disposal:				
How disposal is conducted:				
Biosecurity measures used:	☐ Dedicated Equipment ☐ Non-dedicated equipment – cleaned and disinfected after use	☐ Dedicated clothing ☐ Dedicated footwear	☐ Disposable gloves ☐ Hand washing or hand sanitation following disposal	Other measures:
Disposal is not permitted if:				

Comments:	
Temporary deadstock storage	
Is deadstock temporarily stored prior to disposal?	☐ Yes ☐ No
Location of temporary deadstock storage, if used:	
Method of temporary deadstock storage:	

Appendix 11: Mortality log (Sample)

Premises Identification (PID) Number: _____

Date	Animal ID	VHCP level	Necropsy performed Yes / No	Cause of death	Disposal method	Disposal location (PID if on property OR company name & address)	Drug withdrawal (if required)	Comments

Appendix 12: Animal movement log (Sample)

Movement record for animals moved, purchased, sold/shipped Year: _____ Premises Identification (PID) Number:_____

This sample movement log does not replace the need for official federal cervid movement permits or movement reporting as specified by CFIA.

Date	Animal ID	Reason for animal movement (Moved, Purchased, Sold, Shipped)	CWD VHCP level	Moved from (location or address)	Moved to (location or address)	CWD VHCP level	Drug withdrawal (if required)	Comments

Appendix 13: Personnel training log (Sample)

Premises Identification (PID) Number: _____

Name:	Position/duties:

Date of training	Description / content of training	Source of training (e.g. Training institution/Trainer name/Website or resource used)	Signature of trainee	Signature of trainer (if applicable)

Training/biosecurity program information/ updates required	Date training to be completed by	Source of training	Comments

Appendix 14: Planned herd vaccination / deworming / medication / testing schedule (Sample)

Premises Identification (PID) Number: _____

Animal cohort	Date / Time of Year	Medication type (e.g. vaccine, antibiotic, dewormer)	Product name and concentration	Dose used	Method of administration	Drug withdrawal (if required)	Comments
Males							
Females							
Calves							
Other							

Appendix 15: Animal health record (Sample)

Premises Identification (PID) Number: _____

Animal Identification	Date / Time of Year	Medication type (e.g. vaccine, antibiotic, dewormer)	Product name and concentration	Dose used	Method of administration	Drug withdrawal (if required)	Comments

Appendix 16: Biosecurity planning for emergencies (sample plan)

Premises Identification (PID) Number: _____

Flood, fire, inclement weather, and damage to farm infrastructure may result in risks to animal health and welfare including exposure to infectious diseases. While preserving the life of humans and animals is the priority, planning ahead can reduce unnecessary biosecurity risks to the herd. Consider alternate sources and arrangements for feed and water and housing animals in the event these items have been compromised.

Item	Management details	Comments / concerns
Feed	Alternate source of feed (feed supplier and contact information):	
Feed	Quantity required (per day or per week):	
Feed	Method of feeding:	
Feed	Equipment required:	
Feed	Other considerations:	
Water	Alternate source of water:	
Water	Volume required (per day or per week):	
Water	Method of watering:	
Water	Equipment required:	
Water	Other considerations:	
Premises	Alternate premises for temporary housing of animals (location, name, contact information):	
Premises	Biosecurity considerations of site (other cervids present, health status of other herd, requirements for entry and exit of property, etc.):	
Premises	Transport considerations (conveyance used, capacity, number of loads):	
Premises	Facility infrastructure (presence and location of loading and unloading areas, chutes, handling and treatment areas, etc.):	

Appendix 17: Biosecurity requirements for entry to risk areas workers/staff and service providers (sample plan)

Premises Identification (PID) Number: _____

Function / role of individual	Area accessed	Biosecurity measures	Equipment / supplies required	Location required	Monitoring effectiveness (who, how, when)
Workers/staff	Entry and exit of lower risk areas of farm (e.g. equipment sheds, fallow/empty pasture, parking areas etc.)	☐ Hand washing/sanitation on entry/exit ☐ Wear gloves ☐ Change boots/C&D boots on entry/exit ☐ Change outerwear on entry/exit ☐ Other			
Workers/staff	Entry and exit of higher risk areas of farm (isolation areas, treatment areas, etc.)	☐ Hand washing/sanitation on entry/exit ☐ Wear gloves ☐ Change boots/C&D boots on entry/exit ☐ Change outerwear on entry/exit ☐ Other			
Service providers	Entry and exit of lower risk areas of farm (e.g. equipment sheds, fallow/empty pasture, parking areas etc.)	☐ Hand washing/sanitation on entry/exit ☐ Wear gloves ☐ Change boots/C&D boots on entry/exit ☐ Change outerwear on entry/exit ☐ Accompanied by farm worker ☐ Other			
Service providers	Entry and exit of higher risk areas of farm (isolation areas, treatment areas, etc.)	☐ Hand washing/sanitation on entry/exit ☐ Wear gloves ☐ Change boots/C&D boots on entry/exit ☐ Change outerwear on entry/exit ☐ Accompanied by farm worker ☐ Other			

Appendix 18: Membership of the cervid biosecurity advisory committee (CerBAC) during production of producer planning guide

Representative	Organization
Robert Boos	Alberta elk producer
Herman Bulten	Canadian Cervid Alliance Alberta elk producer
Glenda Elkow	Canadian Cervid Alliance Alberta elk producer
Connie Seutter	President, Canadian Cervid Alliance Alberta elk producer
Logan Dolan	Alberta Elk Producer
Harvey Petracek	Canadian Cervid Alliance Saskatchewan elk producer
Blaine Weber	Saskatchewan elk producer
Randy Wehrkamp	Past president, Canadian Cervid Alliance Saskatchewan elk producer
Ian Thorleifson	Canadian Cervid Alliance Manitoba elk producer
Lucien Beaupré	Canadian Cervid Alliance Quebec elk producer
Mark Hébert	Canadian Cervid Alliance Quebec elk producer
Gaétan Lehoux	Canadian Cervid Alliance Quebec red deer producer
Shelley Lefler	Canadian Cervid Alliance Ontario white tail deer producer
Rick Ewert	North American Elk Breeders
Travis Lowe	North American Elk Breeders Canadian Cervid Alliance
Dr. Bob Wright	Private veterinary practitioner Fergus, Ontario
Dr. Martin Wenkoff	Private veterinary practitioner Alberta
Dr. Murray Woodbury	Western College of Veterinary Medicine University of Saskatchewan
Dr. Hernan Ortegon Dr. Ana Ulmer-Franco	Government of Alberta
Kathryn Tonita	Government of Saskatchewan
Dr. Cathy Furness	Government of Ontario
Sarah-Claude Vanlandeghem Dr. Chantal Proulx	Government of Quebec
Diane Blanford	Agriculture and Agri-Food Canada
Dr. Daniel Schwartz	Canadian Food Inspection Agency Animal Welfare, Biosecurity and Assurance Programs
Dr. Lorne Jordan	Canadian Food Inspection Agency Animal Welfare Biosecurity and Assurance Programs

Notes: