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Nova Scotia's Food Development Agency

NOVA SCOTIA LIVESTOCK MORTALITY MANAGEMENT GUIDELINES

Sustainable Canadian Agricultural Partnership

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DEFINITIONS AND ABBREVIATIONS

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Bovine spongiform encephalopathy (BSE): A progressive neurological disorder of cattle resulting from a prion infection.

Canadian Council of Ministers of the Environment (CCME): The primary minister-led intergovernmental forum for collective action on environmental issues of national and international concern.

Canadian Food Inspection Agency (CFIA): Regulatory agency dedicated to the safeguarding of food, plants and animals in Canada governed by the Minister of Agriculture and Agri-Food and Minister of Health.

Nova Scotia Department of Agriculture (NSDA): The Nova Scotia provincial government sector that helps support and grow agriculture and agri-food throughout the province.

Nova Scotia Environment and Climate Change (NSECC): The Nova Scotia provincial government sector responsible for delivering effective and efficient regulatory management for the protection of our environment.

Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA): Ontario government ministry responsible for the food, agriculture and rural sectors of Ontario.

Specified Risk Materials (SRM): The skull, brain, trigeminal ganglia, eyes, palatine tonsils, spinal cord and dorsal root ganglia (DRG) of cattle aged 30 months or older, as well as the distal ileum of cattle of all ages.

FOREWORD

This guide is intended to provide Nova Scotia livestock producers with knowledge of the available disposal method options for deadstock, both on and off-farm. It is intended to serve as a practical guide for establishing and managing deadstock for future mortality events, including routine mortalities of all scales and emergency mass moralities.

1. GENERAL INFORMATION

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1.1 Why is proper management important?

Deadstock management is essential to a livestock production plan, as livestock mortalities are inevitable despite vigorous efforts. Proper knowledge, planning and use of technology will sufficiently equip producers to manage deadstock. Awareness and education of the different disposal methods and identifying the right fit for a specific situation or farm is also key to having efficient and proper management, as this can be variable. All of this will ensure the prevention of environmental contamination, scavengers, spread of disease, odours and other issues associated with the mismanagement of deadstock.

Key Risks

- Biosecurity
- Environmental
- Human health
- Public trust

Figure 1: Four key risks of improper deadstock disposal management

1.2 What regulations currently exist in N.S.?

The Environment Act is the primary law governing pollution and prohibits the release of substances to the environment that causes "adverse effect."

Key details to note

- Deadstock collection service was discontinued in 2016
- Rendering facilities are no longer accepting red meat
- There are no incineration facilities available
- Off-farm disposal and composting facilities are available

When evaluating deadstock disposal options, explore the on-farm options first and move to off-farm options as a last resort.

On-Farm Composting

For on-farm composting, it is recommended that producers follow the Composting Facility Guidelines requirements with respect to the open-windrow section (for a summary of the guidelines, refer to the Appendix: Section 1, for a link to this resource, refer to section 7). The Composting Facility Guidelines are not enforced for "generally accepted farming activities" such as on-farm composting of farm-generated organic wastes, including deadstock. However, designing and operating on-farm composting infrastructure in accordance with the Compost Facility Guidelines reduces the potential for adverse environmental impacts.

On-Farm Burial

On-farm burial must follow "normal farming practices" as defined by the Nova Scotia Farm Practices Act (for a link to this resource, refer to section 7). "Normal farm practice" means a practice that is conducted as part of an agricultural operation:

I. In accordance with an approved code of practice,

II. In accordance with a directive, guideline or policy statement set by the Minister with respect to an agricultural operation or normal farm practice, or

III. In a manner consistent with proper and accepted customs and standards as established and followed by similar agricultural operations under similar circumstances, including the use of innovative technology used with advanced management practices.

Additionally, it is recommended that producers base any on-farm burial on the Industrial Landfill Guidelines (for a summary of the guidelines, refer to the Appendix: Section 1, for a link to this resource, refer to section 7). Designing and operating on-farm burial practices in accordance with the Industrial Landfill Guidelines reduces the potential for adverse environmental impacts.

Off-Farm Composting

For off-farm composting, contact your local Department of Agriculture and facility operators (see section 6). For off-farm composting facilities potentially available to receive deadstock, refer to Appendix: Table 1. Note that off-farm composting facilities must have the appropriate permitting from NSECC, and some carcasses would likely require pre-processing to remove any SRM if applicable, as no compost facilities in NS accept SRM.

Off-Farm Burial

For off-farm burial, contact your local Department of Agriculture and facility operators (see section 6). It would be advisable to contact facility operators in advance to see if they have any limitations. For operating off-farm landfill facilities potentially available to receive deadstock, refer to the Appendix: Table 2. Note that all landfill facilities will require a variance to the operating approval due to the organics ban in place. However, a variance is not likely to be issued other than in a case of a pandemic outbreak.

1.3 Planning

When looking to create a deadstock disposal plan, there are several key details to consider:

- What is the typical number of deaths per year? What period/s of the year do these typically occur?
- Plan for an emergency mass mortality event
- Size of livestock
- Type of livestock and possible contaminants associated (e.g., SRM)
- Equipment available
- Available on-farm sites suitable for on-farm disposal methods
- Pick-up options
- Off-farm disposal facilities available (and their location)
- Storage options until disposal

1.4 Considerations

1.4.1 Typical number of deaths

The typical number of deaths is an important factor when creating a deadstock management plan. The typical number of deaths will determine how much volume you will typically be disposing of, and this can greatly limit which disposal method will be able to handle the amount of volume presented at a given time.

In their On-Farm Bin Composting of Deadstock factsheet, OMAFRA reported estimations of the typical number of deaths for Ontario farm operations. Refer to the Appendix: Table 4 for a summary.

1.4.1.1 Routine vs. mass mortality

It is also important to consider potential mass mortality events and have plans in place to handle large volumes of deadstock appropriately and in a timely manner. Mass mortality events could be planned or could result from an emergency, requiring separate considerations (routine mortality disposal plan vs. emergency mass mortality disposal plan). For example, end-of-cycle spent hens or breeder flocks vs. avian influenza.

1.4.2 Cause of death

The cause of death is an important consideration when dealing with deadstock, as it could be the determining factor for the disposal method. For example, a mass mortality event due to a disease outbreak vs. a natural disaster could differ significantly in which disposal plan is best suited.

1.4.2.1 Disease vs. non-disease

Diseased deadstock needs to be managed with great attention to prevent the spread of disease, compared to deadstock that is not diseased. It is not recommended that diseased deadstock be transported off-site as this would increase the risk of spreading the disease. If a federally reportable disease is present, it is still the farmer's responsibility to dispose of the deadstock. However, CFIA oversees the response and must approve the disposal method. Refer to Appendix: Table 3 for a list of reportable diseases of terrestrial animals in Canada and any updates with the provided link.

1.4.3 Size of animal and how it is handled

The size of the animal carcasses and how they are handled are important considerations which could impact:

- disposal area requirements
- the volume of materials required
- cost of transportation
- transportation requirements
- acceptance of off-site disposal (pre-processing)
- area of land needed

Figure 2: Images demonstrating carcass size differences of different livestock species

1.4.4 Transportation

The transportation of deadstock is an important consideration, as any off-site disposal method will require transportation.

When transporting deadstock, there are key details to be considered:

- Proper cleaning and sanitization before and after transportation (to prevent biosecurity issues)
- Proper containment for leakage prevention
- Minimizing disturbance to the public, including concealing dead animals from public view
- In a disease situation, there may be biocontainment policies in place

1.4.4.1 SRM handling/transport permits

When transporting cattle carcasses, producers are required to have a federal SRM permit. An SRM permit is required for commercial and non-commercial transporters and is obtained by applying through the CFIA.

An SRM permit is required when transporting cattle deadstock containing SRM, raw, rendered, or composted SRM, or edible beef carcasses still containing SRM. This includes transporting to a non-contiguous site, even under the same land ownership. All transported SRM materials are required to be identified by dye. Deadstock cattle must be marked with a visible stripe down their back. While edible whole or partial cattle carcasses aged 30 months or older containing the dorsal root ganglia must be marked with a meat marking dye along the vertebral column. Rendered or composted products made from SRM must be dyed.

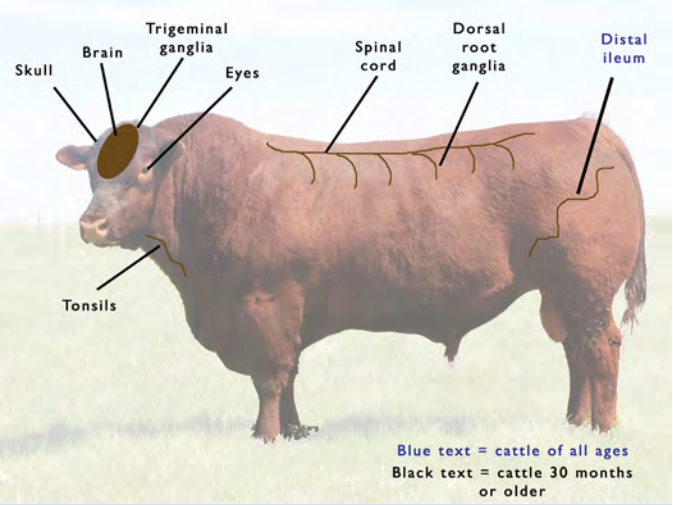


Figure 3: SRM Components of cattle (Image provided by Beef Cattle Research Council, https://www.beefresearch.ca/blog/srm-disposal-page-preview/)

An SRM permit is not required if SRM (including composted SRM) permanently remains on farm premises (the site the animal died on). However, on-site disposal must follow municipal and provincial/territorial regulations. An SRM permit is required if SRM is transported to a non-contiguous site, even under the same land ownership.

It is important to note that SRM material must be destroyed or permanently contained. As it pertains to SRM, the term destroyed means to inactivate the BSE prions. Abnormal prions are very difficult to inactivate, as prions are resistant to conventional methods of "disinfection", such as heat, chemical disinfectants, and rendering. As it pertains to SRM, the term contained is a containment method that ensures no release of prions to the surrounding environment. Since composting does not destroy BSE prions, it will always require a permit when transporting. SRM compost is not to be applied to land that is to be used for food or feed production or directly grazed by domestic ruminants for at least 6 years.

For more information on how to apply for an SRM permit, refer to the CFIA link on SRM permits in Section 7: Useful Resources.

1.4.5 Necessary equipment and supplies

Equipment and supplies will be required for any deadstock disposal plan. Recognizing available resources, including human resources, will be important when planning a disposal plan. Additionally, resource availability could be different in a disease vs. non-disease event.

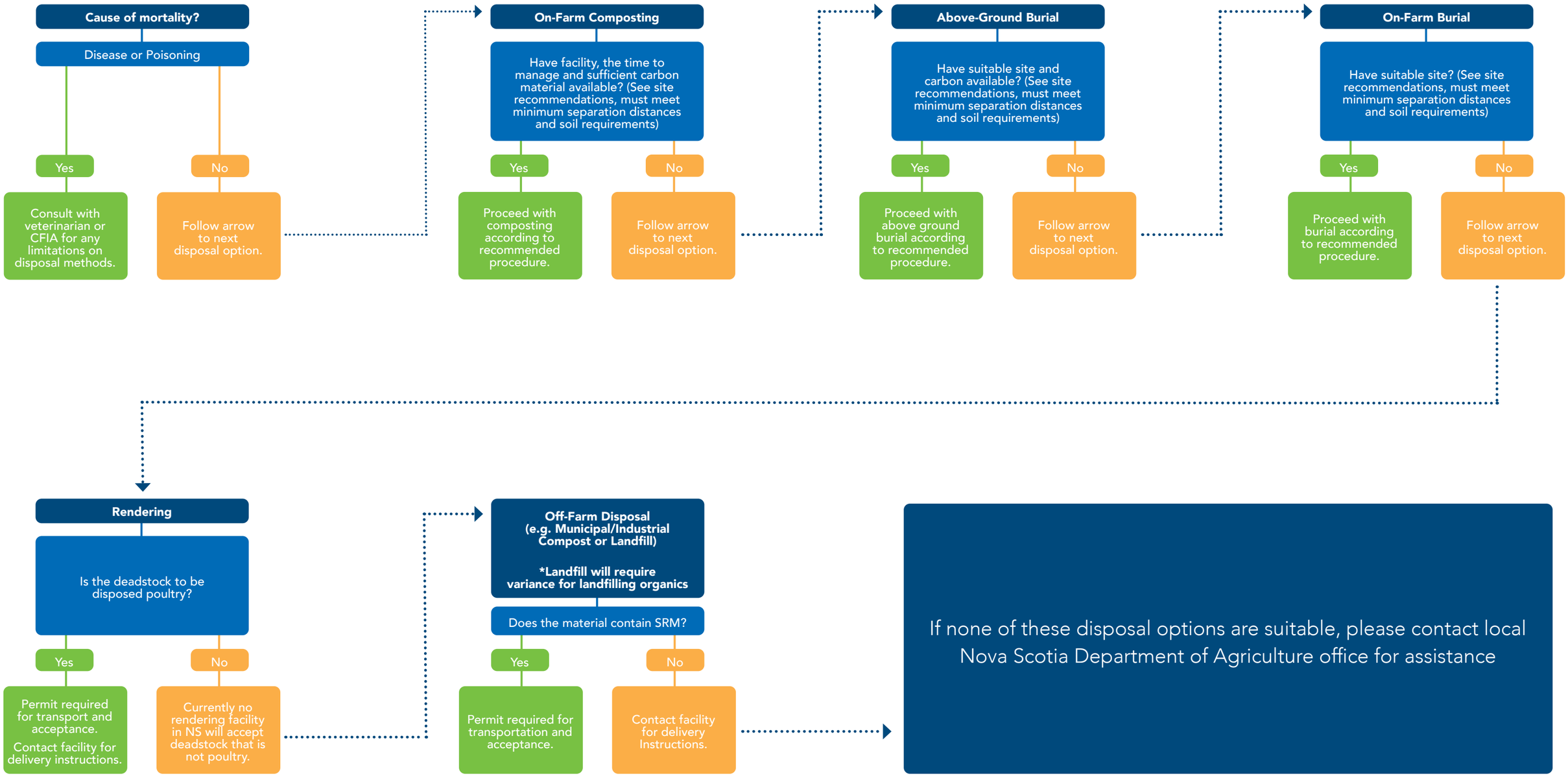
1.4.6 Proper storage

For the benefit of the workers, it is preferable that disposal is completed within 48 hours of death. However, the timing of death of the deadstock does not have a negative impact on the effectiveness of disposal methods. Before deadstock disposal, storage may be required. Having a proper storage facility and/or equipment will be an important consideration when developing a deadstock disposal plan. Proper storage could include complete enclosure and refrigeration/freezing to prevent decomposition and/or scavengers. Units of refrigeration/freezing should be large enough for the entire animal.

2. OPTIONS FLOWCHART

2. OPTIONS FLOWCHART

This options flowchart is a tool which can be used as a guide to roughly determine the most appropriate method of disposal for deadstock using the process of elimination. Begin with on-farm disposal methods first, specifically on-farm composting, followed by above-ground burial, and lastly, burial. Then move to off-farm methods, as landfill and compost facilities require additional approvals. There is limited rendering availability in Nova Scotia.



3. PROS AND CONS OF EACH DISPOSAL METHOD

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DISPOSAL METHOD	PROS	CONS
On-Farm Composting	• Waste stays on farm • Year-round access • Disease elimination or reduction • Fewer leachate concerns over burial • Relatively inexpensive • Good option for mass mortality events • Can inactivate many pathogens if done properly	• Requires adequate turning and monitoring to ensure pathogens are destroyed (Maintain temperatures above 55°C for 15 days to kill most pathogens and weed seeds) • Appropriate site and soil conditions required • Some experience required to construct effective compost piles/windrows • Planning, labour and management required • Carbon source required • Final compost from SRM deadstock is still classified as SRM (subject to all regulatory/permitting requirements) • SRM compost should not be applied to land that is to be used for food or feed production or directly grazed by domestic ruminants for at least 6 years • May be subject to CFIA or NSDA approval depending on the pathogen
On-Farm Above Ground Burial	• More bio-secure than burial • Cost-effective and relatively quick to implement • Minimal management • Waste stays on the farm • Good option for mass mortality events • No odour • No scavengers if constructed appropriately • Flexibility to be a temporary or permanent solution • Less environmental impact than traditional burial	• Appropriate site and soil conditions required • Not feasible if the ground is frozen • Need a backhoe/excavator • Amount of time for decomposition highly variable • Possible soil contamination after carcass decomposition (anthrax spores or prions) • May require long-term monitoring of the burial site • Will require assessment for future land use • May be subject to CFIA or NSDA approval depending on the pathogen • Requires some carbon source (but less than composting)
On-Farm Burial	• Cost-effective and relatively quick to develop • Minimal management • Waste stays on the farm • No odour • No scavengers	• Appropriate site and soil conditions required • May require multiple pits • Not feasible if the ground is frozen • Need a backhoe/excavator • Amount of time for decomposition highly variable • Potential long-term source of nutrients, bacteria and pathogen contamination of groundwater • Possible soil contamination after carcass decomposition (anthrax spores or prions) • May require long-term monitoring of the burial site • Will require assessment for future land use • May be subject to CFIA or NSDA approval depending on the pathogen

DISPOSAL METHOD	PROS	CONS
Off-Farm Composting	• Disease elimination or reduction • Removal of carcasses from the farm removes any environmental risk to the farm	• Transportation of carcasses could spread disease (biosecurity concerns) • Limited composting facilities in N.S. which accept deadstock • Removal of SRM, preprocessing likely required for larger carcasses • Subject to CFIA restrictions (SRM or disease)
Landfill	• Can handle large volumes • Removes deadstock from the farm (removing any further management)	• Subject to the approval of NSECC (organics ban) - A variance is required for a landfill to accept organics • Limitations with which facilities will accept deadstock • Transportation of carcasses could spread disease (biosecurity concerns) • Most facilities will be unable to accept SRM (subject to CFIA requirements - SRM or disease)
Rendering	• Ability to produce secondary products • Destroys most pathogens • Well-established method of deadstock disposal • Removal of carcasses from the farm removes any environmental risk to the farm • Volume reduction of material for handling • Capacity for smaller carcasses	• Would have to find a rendering facility outside of N.S. for anything other than poultry – very limited capacity • Gas and odour emissions • Carcasses must be transported in a timely manner after death or stored properly • Transportation of carcasses could spread disease (biosecurity concerns) • Does not inactivate prion disease agents • May have negative implications for the rendering facility due to customer perceptions • Plants may be reluctant to accept infected carcasses/ materials • Subject to CFIA restrictions (SRM or disease)
Incineration	• Destroys all infective agents • Removal of carcasses from the farm removes any environmental risk to the farm	• No operational incinerators in N.S. • Concern about emission pollutants (dioxins, furans) • Transportation of carcasses could spread disease (biosecurity concerns) • Requires a major capital investment • Fuel costs are rising • High temperatures associated with this process can be a safety hazard • Subject to CFIA restrictions (SRM or disease)

4. ON-SITE DISPOSAL

4. ON-SITE DISPOSAL

When developing an on-site disposal plan to manage deadstock, site selection is the key aspect to ensuring environmental protection. Guidelines for suitability concerning minimum separation distances and soil requirements, including hydraulic conductivity and separation distance to groundwater, are provided below. If these requirements are not met, the use of a professional will be key to assessing the proposed location. **To find a professional for site assessment, reach out to Engineers Nova Scotia**, and they will identify consultants who specialize in environmental/geotechnical issues. See Section 6.

Figure 4: Constructed ditch

Figure 5: Constructed settling pond

If the water table elevation and the siting of the burial pits are not undertaken by a professional, then monitoring wells should be installed. The minimum recommendation is four wells (one upgradient and three downgradient). Depending upon the topography, surface water containment features such as ditches and settling ponds may also be recommended. With respect to the preparation of ditching, berms, or other surface water control features, refer to the Erosion and Sedimentation Control Handbook for Construction Sites (for a link to this resource, refer to section 7).

4.1 Composting

Composting deadstock is the process of placing deadstock into a carbon-rich substrate to naturally decompose them in an odourless and contained manner. Common carbon substrate sources include straw or sawdust. The compost pile is topped off with a covering layer of the carbon-rich substrate and must be monitored and aerated accordingly

When layering deadstock carcasses for composting, typically larger carcasses are placed in single layers, and smaller carcasses (poultry) can be mixed with carbon material. This ensures a proper rate of decomposition occurs. Deadstock can also able be shredded beforehand, which will speed up the decomposition rate.

The composting process occurs in two distinct phases of decomposition. The primary phase is a thermophilic phase where temperatures reach up to 70°C for several weeks. The secondary mesophilic phase temperatures range between 30-40°C for several months. An impermeable base should be used to prevent leachate leaking and contaminating underlying soil.

Traditionally, deadstock is composted on-farm using static piles, windrow systems, or a bin system. Windrows and static piles have a lower input and maintenance cost, while bin systems have more control over leachate impact on the environment.

Windrows and static piles are comparable in construction, where they are both piles constructed on an all-weather surface (low permeable soil or concrete) with a roof preferred if possible. However, windrows are extended length-wise, and static piles are extended height-wise as mortalities occur. A bin system is made up of three walls made of concrete or treated lumber and a roof (or plastic tarp) constructed on a concrete pad.

Figure 6: Compost pile with visible carbon-rich substrate

4.1.1 Advantages/Disadvantages

Advantages

- It can be relatively inexpensive
- It can be done year-round
- Pathogen kill occurs in thermophilic compost
- Takes 2 to 6 months for livestock to decompose (this could be an advantage or disadvantage depending on the scenario)

Disadvantages

- It can be relatively expensive (e.g., Figure 7 of a coverall building with windrows and associated equipment, e.g., windrow turner)
- It can be labour/management intensive and difficult to perform properly
- Carbon amendments require $$
- Scavenging animals can be attracted if performed and/or managed improperly
- Requires adequate space
- Requires an appropriate site with various restrictions
- Possible leachate leaking concerns
- Restrictions around the use of compost and SRM compost must remain on the farm
- Odour potential

4.1.2 Equipment and supplies needed

- Carbon source
- Machinery to aerate the compost
- Low permeable soil or concrete pad
- Treated lumber (if the bin method is used)
- Monitoring equipment (e.g., thermometers)
- Water to adjust compost moisture

4.1.3 Site size and restrictions

- For tonnage more than 1000t (which could be the case for carcasses for several farms being composted at one farm), a minimum of 1000m separation to residences and commercial/institutional buildings, and for less than 1000t, a minimum of 500m is advised due to odour potential and nuisance to adjoining property owners
- The minimum distance of 100m from wells, 100m to the nearest property boundary, and 30m to the nearest watercourse/water body is recommended
- The total area and volume requirements for the composting site will depend on the amount of deadstock to be composted – the daily average weight and volume of mortalities should be determined before establishing a composting site
- A site location that is accessible year-round is an important consideration
- When selecting a site location for composting, an area with soil high in clay/silt content and as low in hydraulic conductivity as possible is ideal for minimizing the risk of soil and groundwater contamination by leachate
    - » High clay soils can be rolled by hand into thin "ropes"; the longer the rope, the higher the clay content
    - » Ponding after rainfall will also indicate a high clay content
- Ideally, you would be looking for a hydraulic conductivity of 1 x 10^{-6} cm/sec several meters thick separation to the water table (at least 1m of 1 x 10^{-6} cm/sec, followed by at least another meter before you hit the water table)
    - » Therefore, you are looking for at least a meter between the high water level and the base of the disposal cell
- Soil maps or other information may be required to assess appropriateness for composting – can find a site that looks like it will work and then consult with regional NSECC for final determination if the site works
    - » Using soil maps would provide a good guide to identifying likely areas that may have suitable silts and clays
    - » Ideally, test pits could then be excavated to determine if there is sufficient thickness to the water table
- Refer to Appendix Table 5 for the soil classification guide
- For more information, **contact a professional engineer** (P.Eng.) or local soil scientist (see section 6)

4.1.4 Procedure

- When setting up and managing a composting site, it is important to understand the two basic phases of composting and the differentiating requirements for each
- In the primary thermophilic phase of composting, a bio-pile is formed consisting of deadstock and carbon amendment with a carbon:nitrogen (C:N) ratio of >50:1 to help avoid anaerobic conditions and associated odour etc.
    - » Approximately 2.5kg of sawdust is required per kg of carcass (Refer to Appendix: 4: Composting calculator for more information on guidelines for composting requirements)
    - » Little to no management is required during this phase – pile turning is delayed until carcasses have decomposed
    - » The temperature should always be monitored to ensure proper decomposition is occurring
        - o Temperature greater than 55°C in the primary phase is desirable, and the CCME guidelines require compost to remain 55°C or above for 3 to 15 consecutive days before most pathogens are destroyed
        - o The temperature in the secondary phase will increase with each turning of the pile and will not increase after a turn when the decomposition process is complete
        - o The temperature will also depend on C:N ratio, and the ambient temperature

- In the secondary mesophilic phase of composting, further decomposition and nutrient stabilization occurs, as well as aeration through mixing
- Critical parameters to monitor to ensure proper composting during the secondary phase include:
  - » C:N ratio should be between 25:1 to 30:1
  - » Moisture content: should be 50 – 60% (wet weight)
  - » The temperature should be monitored weekly
  - » Oxygen: the compost mixture should be turned bi-weekly to supply enough oxygen to micro-organisms
- The secondary phase is considered done when the temperature of the bio-pile does not increase after turning (minimum 30 days)
- The entire composting process typically takes between 8 and 18 months to complete from beginning to finish compost

Windrows

- When setting up a windrow for composting deadstock, the dimensions are typically 1 – 2.5m high and 3 – 6m wide
- Windrows extend length-wise as mortalities occur and are capped with a 30-60cm layer of C amendment
  - » The thickness of the C amendment layer will depend on the carbon material being used, and the type of carcasses being composted
  - » Monitoring of heat, moisture, predators and odour should be a regular occurrence to ensure proper composting is occurring (especially for C amendment cap layers that are less than the upper range of 60cm)
- Windrows are set up upon a concrete slab, asphalt, or a low-permeable soil, and a roof covering is ideal
- Turning/aeration of the windrow occurs following the primary phase, however due to the pile being continually extended, the timing of turning varies between the different sections of the windrow
  - » This is the common scenario for routine mortality windrow composting; however, catastrophic events will differ as it is likely that the pile is constructed all at once and not continually extended
- Stakes or markers are useful tools to differentiate the different sections of a windrow, as well as a log to determine the turning schedule
- Windrows are an ideal deadstock management strategy for mass-mortality event

Figure 7: Windrow compost piles on concrete pad

Figure 8: Finish windrow compost pile on concrete pad

Static piles

- Static piles are very similar in procedure to windrows; however, they are added upon in height rather than length
- Carcasses are layered in 30cm of C amendment in a static pile and, like windrows, capped with 30-60cm of C amendment
- Static piles are turned/aerated once the primary phase is complete

Bin system

- Bin systems are constructed as a 3-sided enclosure on a concrete pad with a roof
- The open side of the bin should be about 1 foot wider or more than the width of the bucket of the turning equipment being used
- Typical dimensions are 1.5m in depth and a width of 3m
- To determine bin size requirements, the rule of thumb for average daily loss is 1.25m^3 is required for each kg of carcass (the assumption that it is being added to daily) (Nova Scotia Environment, 2010)
- Bin systems require more maintenance than windrows or static piles and tend to struggle with getting sufficient airflow through the compost

- » Lack of sufficient airflow through the compost will result in poor compost temperature, excessive leachate and foul odours associated with anaerobic conditions
- » To manage this common limitation with bin systems, more frequent turning or a forced aeration system may need to be put in place to ensure sufficient oxygen and to control the temperature

Figure 10: Bin composting system

Step-by-step procedure

- The first step in either a windrow, static pile, or bin system is creating a base of 60cm of C amendment on the low impermeable surface of choice (carcasses will not decompose properly if carcasses are placed directly onto an impermeable surface such as concrete)
- Following the base establishment, a layer of carcasses is evenly placed (not stacked, 30cm of amendment between) 30cm from bin walls, or edges of the pile
- Cover the carcasses with 60cm of amendment in windrow systems; and 30cm in static piles and bin systems (and continue to layer)
- Cap the static piles and bin systems with 30-60cm of amendment once layering is complete, and mound the piles
  - » The thickness of the C amendment layer will depend on the carbon material being used, and the type of carcasses being used
  - » Monitoring of heat, moisture, predators and odour should be a regular occurrence to ensure proper composting is occurring (especially for C amendment cap layers that are less than the upper range of 60cm)
- Following system establishment, monitoring of temperature and adequate pile cover should be done to ensure decomposition is occurring
- Turn the pile ideally biweekly through the active composting phase
- Once the carcasses have all decomposed, after 3 to 12 months, material may be transferred to a secondary pile or bin for the second phase of composting
- After 1-5 months in the secondary phase, the composting process should be complete, and the material should be evaluated for possible use

Figure 11: Finished compost

- Time and temperature requirements would be in line with the CCME Compost Quality Guideline:
  - » An aerated static pile would be 55°C for at least 3 days, while turned windrows would be for 15 days
  - » Quality criteria would take into consideration metals, pathogens, foreign matter and maturity

4.1.5 Limitations

- Restrictions on the use of any mature compost would also have to consider CFIA recommendations (SRM)
  - » It is not recommended for the compost produced from SRM and remaining on the premises to be spread on land that is to be used for food or feed or directly grazed by domestic ruminants for at least six years
- Any runoff leachate from the compost piles should be collected and applied back onto the pile
- Common reasons for failed compost piles:
  - » Too much aeration
  - » Insufficient aeration – can result in lower temperatures due to lack of oxygen
  - » Elevated temperatures exceeding 70°C can result in sterilizing compost piles
  - » Not enough/too much carbon added
  - » Excessive moisture content (> 50 – 60%)
  - » Too dry
  - » Low density / High density
  - » Placing the carcasses too close together

4.1.6 In-Vessel Composting

Another method of composting on-farm is in-vessel composting. In-vessel composting consists of a closed vessel, such as a large-diameter drum, with continuous mixing/ aeration. With an enclosed vessel, there is a quicker start and shorter timeframe of the composting process compared to windrow or static pile composting. However, this composting method typically requires further decomposition or finishing of the material following the in-vessel process. This is usually done using windrows or static piles.

Figure 12: Novid in-vessel composter

Figure 13: Photos from Novid of in-vessel composting.

4.1.6.1 Advantages/Disadvantages

Advantages

- Requires less manual labour
- Requires less land space
- Requires less quantity of carbon-rich substrates
- High cost-to-benefit ratio
- Reduced composting time with the help of forced aeration and mechanical agitation
- Controlled conditions (i.e., moisture, temperature and aeration) as an enclosed system
- It may be less affected by weather conditions compared to other, more traditional composting systems
- Generates more consistent end product
- Lower risk of leaching or runoff as an enclosed system compared to other more traditional composting systems
- Less unpleasant odours and pathogens

Disadvantages

- High capital, operating and maintenance costs
- High demand for technical expertise to properly handle the equipment
- Restricted to small deadstock (<100 kg)
- The end product may benefit from curing for some applications

4.2 Above-Ground Burial

Above-ground burial is a newer disposal method developed from the combination of composting and deep-ground burial. Rather than a deep trench or pit, as with the traditional burial method, a shallow trench is used. A layer of carbon-rich material is placed at the bottom of the shallow trench upon which animal carcasses are placed. The excavated material is used to cover the deadstock, and the mound is seeded. The rationale behind this method is that it offers an on-site disposal method like traditional on-farm burial but has updated environmental considerations implemented. With a shallower depth compared to burial, and the addition of a carbon layer, there is less chance of contaminating groundwater.

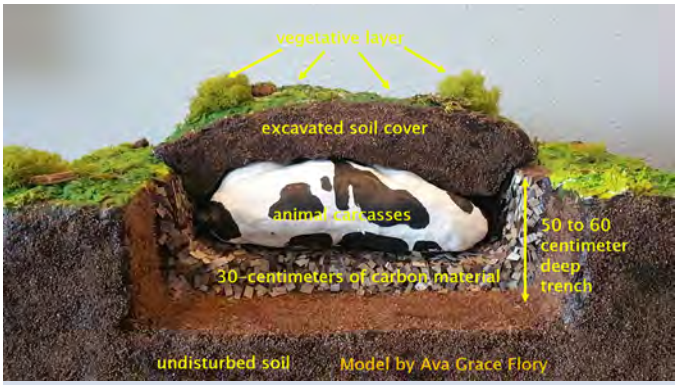


Figure 14: Conceptual diagram of above-ground burial method

4.2.1 Advantages/Disadvantages

Advantages

- Cost-effective
- Quick to implement
- Minimizes environmental impacts (reduces the risk of water contamination by using a shallower trench and a carbon layer as compared to traditional burial)
- Allows implementation in a larger variety of geologic sites
  - » Some soils may not have ideal soil conditions for traditional burial, but more flexibility with above-ground burial
- On-farm disposal reduces the spread of disease
- On-site disposal is an option to manage mass carcasses due to a natural disaster or disease outbreak
- It can be a temporary or permanent disposal method
  - » Animal carcasses could be excavated for other immediate and permanent disposal methods after initial disease elimination
  - » Mounds could be re-evaluated following complete decomposition and revegetated

Figure 15: Above-ground burial site completed

Disadvantages

- Decomposition of animal carcasses takes longer compared to traditional composting due to reduced oxygen availability, preventing thermophilic bacterial activity (this could also be an advantage)
- Pathogen is contained and may be inactivated – research is ongoing to determine which pathogens are inactivated
- Concern over environmental pollution – site selection will vary this risk

4.2.2 Equipment and supplies needed

- Excavator
- Carbon-rich material
- Seed for mound

4.2.3 Site size and restrictions

- Under at least 0.6m earth
- No bedrock outcrop
- No gravel pit or quarry
- At least 1m above bedrock
- At least 1m from the water table to the bottom of the pit
- 10m minimum from the field tile
- 100m minimum away from wells and watercourses
- 100m minimum from residence dwellings/property lines, 100m from livestock facility, 300m from the primary highway, 100m from the secondary highway and 50m from any other road

- 10m minimum between trenches
- Avoid high permeability (sandy) soils which receive high rainfall, low-lying areas prone to flooding and steep slopes
- Type A soil classification (sandy soils) are not recommended for burial, as very well-drained soils are a risk to groundwater contamination by leachate (CFIA)
- Low permeability soils (high clay/silt content) are recommended, with as low hydraulic conductivity as possible (1 x 10^{-6} cm/sec or less) to minimize the risk of groundwater contamination by leachate
  - » High clay soils can be rolled by hand into thin "ropes"; the longer the rope, the higher the clay content
  - » Ponding after rainfall will also indicate a high clay content
- Ideally, you would be looking for a hydraulic conductivity of 1 x 10^{-6} cm/sec several meters thick separation to the water table (at least 1 x 10^{-6} cm/sec, followed by at least another meter before you hit the water table)
  - » Therefore, you are looking for at least a meter between the high water level and the base of the disposal cell
- Refer to Appendix Table 5 for the soil classification guide
- For more information, **contact a professional engineer** (P.Eng.) or local soil scientist (see section 6)
- Soil maps or other information may be required to assess appropriateness for above-ground burial – can find a site that looks like it will work and then consult with regional NSECC for final determination if the site will work
  - » Using soil maps would provide a good guide to identifying likely areas that may have suitable silts and clays
  - » Ideally, test pits could then be excavated to determine if there is sufficient thickness to the water table

4.2.4 Procedure

A shallow trench is excavated with a depth of about 60cm. 20cm of carbon-rich material is placed in the trench first, then a single layer of deadstock. The deadstock is then covered with excavated soil, and the mound is seeded with regionally/seasonally appropriate vegetation to establish a cover. A perimeter trench is then dug around the mound to prevent surface water from entering the mound.
A temperature probe should be inserted to monitor temperature over time to ensure proper decomposition is occurring.

As a rule of thumb, use a carbon: nitrogen ratio of 2:1 or 3:1 with monitoring for heat, predators and odour to adjust as necessary. See Appendix 5: Above-ground burial and composting calculator for further guidelines on requirements for this procedure.

4.2.5 Limitations

- This disposal method is relatively new, and improvements in the procedure may occur
- Takes longer to achieve decomposition and pathogen kill than traditional composting

Figure 16: Step one of above-ground burial: dig a shallow trench

Figure 17: Step two of above-ground burial: place a 20cm layer of carbon material

Figure 18: Step three of above-ground burial: place a layer of livestock carcass (should spread evenly)

Figure 19: Step four of above-ground burial: cover with excavated soil and seed mound

4.3 Burial

The burial of deadstock is a traditional method in which deadstock is disposed of in graves and trenches.

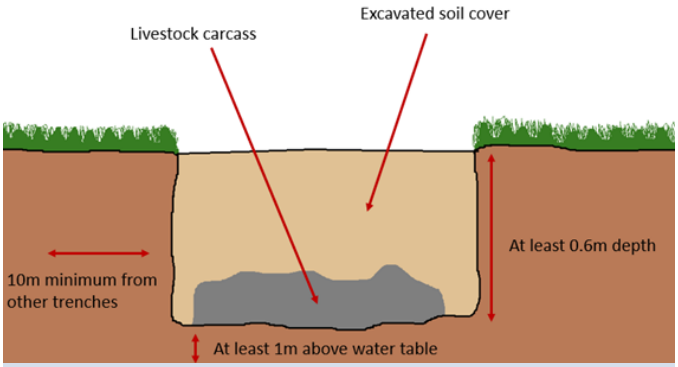


Figure 20: Conceptual diagram of burial

4.3.1 Advantages/Disadvantages

Advantages

- Can be done on-site if the land required is available
- Relatively straightforward
- Cost-effective

Disadvantages

- Concern over contamination of human and animal feed chain
- Concern over environmental pollution
- Specific site requirements
- Implications for future land use
- Carcasses may take many decades to decompose
- The fate of many pathogens is not well understood in the deep burial environment

4.3.2 Equipment and supplies needed

- Excavator

4.3.3 Site size and restrictions

- Under at least 0.6m earth
- No bedrock outcrop
- No gravel pit or quarry
- At least 1m above bedrock
- At least 1m from the water table to the bottom of the pit
- 10m minimum from the field tile
- 100m minimum away from wells and watercourses

- 100m minimum from residence dwellings/property lines, 100m from livestock facility, 300m from the primary highway, 100m from the secondary highway and 50m from any other road
- 10m minimum between trenches
- Avoid high permeability (sandy) soils which receive high rainfall, low-lying areas prone to flooding and steep slopes
- Type A soil classification (sandy soils) are not recommended for burial, as very well-drained soils are a risk to groundwater contamination by leachate (CFIA)
- Low permeability soils (high clay/silt content) are recommended, with as low hydraulic conductivity as possible (1 x 10^{-6} cm/sec or less) to minimize the risk of groundwater contamination by leachate
    - » High clay soils can be rolled by hand into thin "ropes"; the longer the rope, the higher the clay content
    - » Ponding after rainfall will also indicate a high clay content
- Ideally, you would be looking for a hydraulic conductivity of 1 x 10^{-6} cm/sec several meters thick separation to the water table (at least 1 x 10^{-6} cm/sec, followed by at least another meter before you hit the water table)
    - » Therefore, you are looking for at least a meter between the high water level and the base of the disposal cell
- Refer to Appendix Table 5 for the soil classification guide
- For more information, **contact a professional engineer** (P.Eng.) or local soil scientist (see section 6)
- Soil maps or other information may be required to assess appropriateness for burial – can find a site that looks like it will work and then consult with regional NSECC for final determination if the site works
    - » Using soil maps would provide a good guide to identifying likely areas that may have suitable silts and clays
    - » Ideally, test pits could then be excavated to determine if there is sufficient thickness to the water table

4.3.4 Procedure

The process of the burial method of deadstock involves digging a deep trench which allows at least 0.6m of earth to be placed over the buried deadstock.

4.3.5 Limitations

The amount of time it takes for deadstock to decompose for the burial method greatly depends on temperature, moisture, burial depth, soil type and drainage and carcass species and size.

4.4 Incineration

On-farm incineration is another method available for the disposal of deadstock. Incineration offers a quick method to reduce deadstock to inert ash. Incineration can be categorized into three broad categories of incineration techniques, open-air burning, air-curtain incineration and fixed-facility incineration. Consultation with NSECC is recommended if incineration is being considered for the disposal of deadstock.

Open-air burning includes the burning of deadstock on combustible heaps. Open-air burning of deadstock yields a relatively benign waste ash that does not attract scavengers or pests. However, hydrocarbons used as fuel can generate a significant volume of ash and environmental risk of groundwater and soil contamination (CFIA, 2020). Open-air burning requires a permit and should be conducted as far away as possible from the public. Many issues can arise with the use of open-air burning of deadstock, the CFIA recommends that only a limited number of deadstock be burnt and **should only be considered if no other disposal method is available** (CFIA, 2020). It is recommended that the Air Quality Unit of Nova Scotia Environment be included in the discussion of this option.

Air curtain incineration is the use of a portable machine with a large capacity fan driven by diesel engines which creates high-velocity air through a manifold down and across a container or trench. The high-velocity air creates a turbulent environment which accelerates the incineration process up to six times faster than open-air burning (CFIA, 2020). As with open-air burning, many issues can arise with the burning of deadstock. The CFIA recommends that only a limited number of deadstock be burnt and **should only be considered if no other disposal method is available** (CFIA, 2020). It is recommended that the Air Quality Unit of Nova Scotia Environment be included in the discussion of this option.

Fixed facility incineration includes on-farm incinerators, pet crematoria, waste-to-energy facilities and industrial power plants (CFIA, 2020). Commercial incineration is not available in Nova Scotia, leaving on-farm private operation the only option for the incineration of deadstock.

4.4.1 Advantages/Disadvantages

Advantages

- Instant reduction in volume
- No temporary storage required
- Fixed facility incineration at a temperature >850°C which reduces all organic material inputs to ash, is an acceptable method of destroying the abnormal prion in SRM deadstock

Disadvantages

- Safety and environmental hazards
- Not recommended if other disposal methods are available (open burning)
- Air quality concerns
- Possible opposition by the First Nations communities

4.4.2 Equipment and supplies needed

- Open-air burning:
  - » Fuel source (straw, hay, untreated timbers, kindling, wood, coal and/or diesel fuel)
  - » Equipment necessary for the creation of a trench (excavator) unless using pyre style
- Air-curtain incineration:
  - » Air-curtain equipment (firebox or trench system)
  - » Fuel source
- Fixed facility incineration:
  - » On-farm incinerator
  - » Fuel source (diesel, natural gas, or propane)

4.4.3 Site size and restrictions

Open-air burning should be conducted as far away as possible from the public (CFIA, 2020). Avoid open areas that are particularly windy to minimize fire hazards. **Open-air burning should only be considered if no other disposal method is available**, and it is recommended to consult NSECC/the Air Quality Unit of Nova Scotia Environment when considering this method (CFIA, 2020).

Separation distances

- At least 1m above bedrock
- At least 1m from the water table to the bottom of the pit
- 10m minimum from the field tile
- 100m minimum away from wells and watercourses
- 100m minimum from residence dwellings/property lines, 100m from livestock facility, 300m from the primary highway, 100m from the secondary highway and 50m from any other road
- 10m minimum between trenches
- Avoid high permeability (sandy) soils which receive high rainfall, low-lying areas prone to flooding and steep slopes
- Type A soil classification (sandy soils) are not recommended for incineration pits, as very well-drained soils are a risk to groundwater contamination by leachate (CFIA)
- Low permeability soils (high clay/silt content) are recommended, with as low hydraulic conductivity as possible (1 x 10^{-6} cm/sec or less) to minimize the risk of groundwater contamination
  - » High clay soils can be rolled by hand into thin "ropes"; the longer the rope, the higher the clay content
  - » Ponding after rainfall will also indicate a high clay content
- Ideally, you would be looking for a hydraulic conductivity of 1 x 10^{-6} cm/sec several meters thick separation to the water table (at least 1 x 10^{-6} cm/sec, followed by at least another meter before you hit the water table)
  - » Therefore, you are looking for at least a meter between the high water level and the base of the disposal cell
- Refer to Appendix Table 5 for the soil classification guide
- For more information, **contact a professional engineer** (P.Eng.) or local soil scientist (see section 6)
- Soil maps or other information may be required to assess appropriateness for burial – can find a site that looks like it will work and then consult with regional NSECC for final determination if the site will work
  - » Using soil maps would provide a good guide to identifying likely areas that may have suitable silts and clays
  - » Ideally, test pits could then be excavated to determine if there is sufficient thickness to the water table

4.4.4 Procedure

For open-air burning, digging a shallow pit with shallow trenches is advisable to provide a good supply of air. The fuel source, such as kindling wood, should be dry and have a low moisture content. The fuel source should be stacked in layers with alternating orientations to provide stability for the pyre. Monitoring of the pyre is required to ensure deadstock incineration is completed, typically 8 hours for small deadstock and longer for large-sized deadstock (CFIA, 2020).

For air curtain incineration and fixed facility (on-farm) incinerators, equipment must be set up to the manufacturer's requirements. Deadstock is added according to the manufacturer's requirements or guidance and monitored until completion.

4.4.5 Limitations

Incineration is a disposal method with many limitations, and therefore other disposal methods, such as composting and burial, should be considered before considering incineration. Open burning and air-curtain incineration, in particular, should not be considered unless there is no other disposal method available. Fixed facility incineration comes with high investment and maintenance costs and may not be the most cost-effective disposal method. Incineration of deadstock may be opposed by the First Nations communities, as there has been an expression of preference to see that animal life is respected and likely would prefer to see deadstock composted. Commercial incineration is not available in Nova Scotia, leaving on-farm private operation the only option for incineration of deadstock.

4.5 Monitoring post-disposal

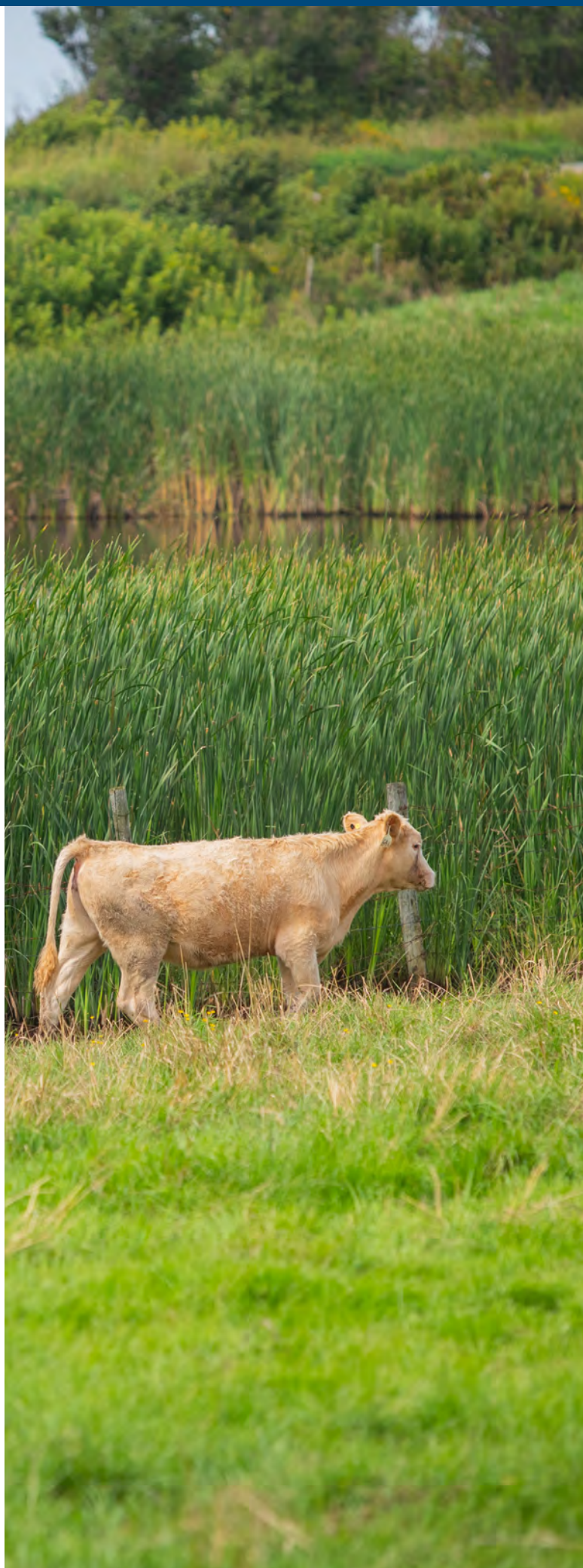
Monitoring post-disposal should be built into the disposal plan for on-farm deadstock disposal methods. It will ensure that:

- No environmental contamination is occurring
- The disposal site/s has not been disturbed

A general monitoring plan will include:

- General monitoring during the beginning stages of the disposal site's establishment
  - » Once or twice a year, walk the site, look for steeps, die off of vegetation
  - » Further monitoring may be required depending on the status of the site after general monitoring
- Site maintenance

Note that if the set guidelines have been carefully followed during the initial evaluation of site selection, monitoring post-disposal should remain fairly simple and straightforward, and further intensified monitoring, such as monitoring wells, will not likely be required.



5. OFF-SITE DISPOSAL

5. OFF-SITE DISPOSAL

Advantages

- Removes deadstock and corresponding environmental risks from farm
- Does not require pro-longed disposal management by the producer
- Does not require as much planning as other disposal methods

Disadvantages

- Cost of transportation
- Transportation of deadstock could spread disease (biosecurity concerns)
- Possible higher costs for disposal in comparison to other methods
- Facilities may not accept diseased deadstock
- Most facilities will be unable to accept SRM deadstock
- The location of the closest approved disposal site may be quite far from a farm, increasing overall disposal costs
- Deadstock may need to be temporarily stored depending on the transportation to disposal facilities

Considerations

When transporting approved waste off-site to a disposal facility, careful planning is required to ensure proper disposal is achieved. There are many logistical obstacles to be considered when planning, including:

- Assessment to transport
- What is to be transported
- Biocontainment during transport (for more information, refer to Section 7)
- Time to transport
- Where to transport to
- Back-up plan

5.1 Rendering

Rendering is a common deadstock disposal practice that is done in every province in Canada. It is the process of mechanically breaking down deadstock and by-products into remnants of homogenous size. The remnants are then heated and separated by the fat, proteinaceous material and water contents into secondary products, including meat, bone meal and tallow.

5.1.1 Advantages/Disadvantages

Advantages

- Ability to produce secondary products
- Destroys most pathogens

Disadvantages

- Possible greenhouse gas emissions produced from the rendering process
- Nova Scotia currently only has rendering capacity for a limited amount of poultry

5.1.2 Equipment and supplies needed

- Refrigeration or freezing appliances (if deadstock needs to be temporarily stored before transfer to the rendering facility)
- Means of transportation

5.1.3 Limitations – facility capacity

- Current N.S. capacity is limited
  - » With this limitation, ensure an understanding with the facility operator on the capacity that can be accepted
- There are other rendering facilities available outside of the province that may be willing to accept deadstock
- Refer to the Appendix under Section 1: Off-Site-disposal methods: 1.3 Rendering for more information
- Contact your regional Department of Agriculture office for more information

5.2 Composting

5.2.1 Advantages/Disadvantages

Advantages

- Ability to produce secondary products
- Destroys most pathogens

Disadvantages

- No compost facilities in N.S. are currently willing to accept SRM due to numerous barriers (CFIA)
  - » Barriers to moving composted materials off-site
  - » Excessively long retention time
  - » Equipment contamination
  - » Fencing
  - » Permits
  - » Potential for cross-contamination of non-SRM-containing compost

- Many facilities in N.S. operate an in-vessel system, making anything larger than a turkey or small pig difficult to incorporate
  - » Larger carcasses will have to be shredded first
- Availability and cost of bulking material may limit facility capacity
- The overall facility capacity is limited due to many facilities already being at or above their approved limit

Figure 22: Finished compost

5.2.2 Equipment and supplies needed

- Refrigeration or freezing appliances (if deadstock needs to be temporarily stored before being transferred to a composting facility)
- Means of transportation

5.2.3 Limitations – facility capacity

- Refer to Appendix: Section 1.2 Composting for more information on N.S. facilities that may be willing to accept deadstock for composting
- Contact your regional Department of Agriculture office for more information

5.3 Landfill

5.3.1 Advantages/Disadvantages

Advantages

- No current or foreseeable limitations on tonnage received/facility capacity

Disadvantages

- Any landfill in N.S. will require variances to accept any deadstock (ban on organics) approvals
  - » Landfill's responsibility
  - » Please contact NSECC for further details
- Possible requirement for pre-processing of larger carcasses
- Introducing large volumes of highly putrescible material (carcasses) can result in increased production of methane and leachate, which may hamper landfill operations
- Large volumes of carcasses can create pockets of unstable material within the landfill cell
- Landfilling carcasses requires increased vector management to prevent scavenger birds from becoming exposed to the infected carcasses
- All unwilling to accept SRM due to CFIA requirements to avoid cross contamination.

5.3.2 Equipment and supplies needed

- Refrigeration or freezing appliances (if deadstock needs to be temporarily stored before being transferred to the composting facility)
- Means of transportation

5.3.3 Limitations – facility capacity

- Any landfill facility in N.S. will require additional approval from NSECC to accept deadstock (a ban on organics in landfills would require a variance)
- Refer to Appendix: Section 1.1 Landfills for more information on N.S. landfill facilities that may be willing to accept deadstock
- Contact your regional Department of Agriculture office for more information

Figure 23: Landfills

6. CONCLUSION

6. CONCLUSION – WHERE TO GO FOR QUESTIONS

Nova Scotia Federation of Agriculture (Nova Scotia Environmental Farm Plan)

Phone: 902-893-2293
Federation Website: http://www.nsfa-fane.ca
EFP Website: Nova Scotia Environmental Farm Plan (EFP) (nsefp.ca)

7 Atlantic Central Drive
East Mountain, N.S.
B6L 2Z2

Nova Scotia Department of Agriculture

Regional Offices: https://novascotia.ca/agri/programs-and-services/regional-services/

Funding Programs: https://novascotia.ca/programs/

Perennia

Website: https://perennia.ca/agriculture

Kentville Location:
32 Main Street,
Kentville, N.S.
B4N 1J5

Phone: 902-678-7722
Email: info@perennia.ca

Truro Location:
173 Dr Bernie MacDonald Drive,
Bible Hill, N.S.
B6L 2H5

Phone: 902-896-8782
Email: innovation@perennia.ca

Nova Scotia New Farmer

Website: https://nsnewfarmer.ca/

Nova Scotia Department of Environment and Climate Change

Regional and District NSECC office locations: https://novascotia.ca/nse/dept/regional-office-locations.asp

Nova Scotia Department Lands and Forestry

Offices: https://novascotia.ca/natr/staffdir/offices.asp

Engineers of Nova Scotia

Website: https://www.engineersnovascotia.ca/

Phone: 902-429-2250
Email: info@engineersnovascotia.ca
Mail: 1355 Barrington

7. USEFUL RESOURCES

7. USEFUL RESOURCES

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8. SOURCES

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9. APPENDIX

9. APPENDIX

1. On-Site Disposal

Composting Facility Guidelines Summary

The Compost Facility requirements for the open-windrow section are summarized:

- The receiving and tipping, composting, and curing areas
  - » All areas of the composting process should be underlain by an impermeable pad, the surface of which shall be concrete or asphalt
  - » Shall utilize permanent roof structures and/or management techniques to control moisture, minimize odour and leachate generation
  - » All drainage shall be collected for treatment or return to the process
  - » Where space limitations prevent the production of mature finished compost, immature compost may be transferred to an approved composting facility to complete the maturation process (with requirements as listed in the document)
- Leachate management systems
  - » Should consist of infrastructure and monitoring systems to collect, monitor, control and treat leachate
- Surface water management
  - » Should divert surface and stormwater from active areas, control run-off, erosion, sedimentation, siltation and flooding, and minimize the generation of leachate
- Groundwater management
  - » Should consist of at least one well above the gradient of the active area and at least three wells below the gradient direction
- Odour control
  - » Provision to the Department of detailed management techniques for the control of odours from the composting process

Industrial Landfill Guidelines Summary

The Industrial Landfill Guidelines are sectioned into two:

1. Landfill Site design:

- Liner
  - » A synthetic liner or sufficient separation (1.5 meters of native clay, permeability 1 x 10^{-6} cm/sec) must be included to keep separation of waste material from the bedrock or seasonally high-water table level
- Buffer zone
  - » Minimum 30m
- Surface run-on and run-off
  - » Drainage system to prevent infiltration of surface water into the solid waste deposited at the landfill site
  - » Surface drainage which has not come into contact with the solid waste will be directed to sediment control ponds if treatment for total suspended solids is required
  - » Surface water that has been contaminated by contact with the solid waste shall be handled as if it were leachate
- Groundwater monitoring systems
  - » A system consisting of observation wells located in areas hydraulically upgradient (background quality) and downgradient of the active area
  - » Adequate depth to provide an indication of the potential impact of the landfill on the upper water-bearing strata
  - » The number of wells required is dependent upon the size of the predicted leachate plume, and that assurance is provided that the potential of leachate to affect off-site groundwater quality can be adequately assessed
- Leachate collection and treatment
  - » If natural leachate attenuation capabilities at the site are not sufficient to prevent the contamination of groundwater resources outside of the site boundary, an engineered leachate collection and removal/treatment system is required
- Conceptual closure plan
  - » Required within the first year of operation

2. Landfill Operation:

- Compaction
  - » Solid waste is to be compacted to the maximum amount possible as it is deposited
- Interim cover
  - » Regular interim cover of the solid waste is required to minimize leachate production
  - » The frequency of the cover will vary but no less than once every month
  - » More frequent “Intermediate” cover is also required if odours are generated
- Domestic garbage
  - » No domestic refuse will be disposed of

- Burning
  - » Burning of wastes is not permitted
- Surface and groundwater monitoring
  - » Baseline data to be collected covering the quality of the existing surface waters in the area and groundwater in the boreholes on and around the site (including wells of residents in the potential zone of influence)
  - » Surface and groundwater station locations and a monitoring program
- Leachate monitoring
  - » Leachate monitoring program
- Closure
  - » Final cover to be placed at the earliest possible time on all areas that have reached the final design elevation
  - » Cover consisting of approximately one meter of silty clay underlying a minimum of 0.3 meters of topsoil
  - » Suitable vegetative cover to be established to prevent erosion (must ensure vegetation is still growing two years after the final cover)
  - » Water does not pool over landfill
- Post closure
  - » Maintain the integrity of the final cover and diversion and drainage structures
  - » Maintain and operate surface water and groundwater monitoring and leachate collection systems

2. Off-Site Disposal

2.1 Composting

Table 1: Municipal Composting Facilities that may be willing to accept any significant quantities or carcasses

N.S. Composting Facilities
Guysborough Waste Management Facility
Northridge Farms NS Ltd.
Pictou County Solid Waste Management System
Miller Composting Corporation
Atlantic Country Composting

***Important to note:** Any composting facility receiving carcasses would likely require larger livestock (cattle, sheep, hogs) to be shredded before being used as feedstock, and ideally, the SRM component would be managed separately.

2.2 Landfills

Table 2: N.S. landfills that may be willing to accept livestock carcasses if permitted by NSECC

NS Landfills
Guysborough Waste Management Facility
Kaizer Meadow Landfill
GFL Environmental Inc. – West Hants Landfill

***Important to note:** Any landfill facility receiving carcasses will require additional approval as there is an organics ban for landfills (this includes deadstock).

2.3 Rendering

S.F. Rendering

- Only renders poultry
- Capacity of roughly 30,000 kg (or approximately 15,000 birds for layers)

3. Reportable Diseases

Table 3: Reportable Diseases in Canada

African horse sickness	Fowl typhoid
African swine fever	Lumpy skin disease
Avian influenza	Newcastle disease
Anthrax	Peste des petits ruminants
Bluetongue	Pseudorabies
Bovine spongiform encephalopathy (BSE)	Pullorum disease
Bovine tuberculosis	Rabies
Brucellosis	Rift Valley fever
Chronic wasting disease	Rinderpest
Classical swine fever	Scrapie
Contagious bovine pleuropneumonia	Sheep and goat pox
Contagious equine metritis	Swine vesicular disease
Cysticercosis	Trichinellosis
Equine infectious anemia	Venezuelan equine encephalomyelitis
Equine piroplasmosis	Vesicular stomatitis
Foot-and-mouth disease	

Reportable diseases: Terrestrial animals - Canadian Food Inspection Agency (canada.ca)

4. Typical Death Loss

Table 4: Estimated Death Losses for Typical Farm Operations in Ontario

100c Beef Cow-Calf	13 dead	3,050 kg	30.5 kg/cow
1,000 Beef Feeders (1 cycle/yr)	20 dead	7,253 kg	7.25 kg/feeder
100 Dairy Cows (Large-Frame Holsteins)	14 dead	2,786 kg	27.86 kg/cow
100 Dairy Goat Does	20 dead	458 kg	4.58 kg/doe
10 Riding Horses	0.4 dead	126 kg	12.61 kg/horse
1,000 Breeding Female Mink (not inc. pelting losses)	399 dead	321 kg	0.32 kg/female
100 Breeding Rabbits (Does)	678 dead	523 kg	5.23 kg/doe
100,000 Chicken Broilers (6 cycles/year)	24,000 dead	18,240 kg	0.03 kg/broiler
10,000 Broiler-Breeder Hens	900 dead	2,457 kg	0.25 kg/broiler-breeder hen
10,000 Layer Hens	550 dead	788 kg	0.16 kg/hen
10,00 Turkey Hens (4 cycles/year)	2,400 dead	6,392 kg	0.16 kg/hen
10,000 Turkey Toms (3 cycles/ year)	3,000 dead	14,920 kg	0.50 kg/tom
1,000 Sow Segregated Early Weaning (SEW)	4,212 dead	22,602 kg	22.6 kg/sow
1,000 SEW Weaners (6.5 cycles/ year)	150 dead	1,875 kg	0.29 kg/weaner
1,000 Grower/Finishers (3 cycles/ year)	60 dead	3,460 kg	1.15 kg/finisher
100 Meat Ewes	25 dead	700 kg	7.0 kg/meat ewe
1,000 Grain-Fed Veal Calves (1 cycle/year)	70 dead	9,403 kg	9.4 kg/calf
1,000 Milk-Fed Veal Calves (2.5 cycles/year)	100 dead	10,167 kg	4.07 kg/calf

*For more details, refer to the OMAFRA factsheet (OMAFRA, 2009)

5. Soil Classification

Table 5: Soil types and their characteristics. Note that soil texture classifications can fall under different soil types, and soils could be classed under dual hydrologic soil groups (adapted from USDA, 2007).

Hydrologic soil group	Clay content	Soil texture classification	Runoff Potential	Saturated Hydraulic conductivity	Depth to impermeable layer	Depth to water table
Type A	<10%	Gravel, peat, loamy sand, sandy loam, loam, silt, silt loam, sand	Low	>40.0 µm sec-1	50-100 cm	60-100 cm
Type B	10-20%	Sandy loam, loam, silt loam, silt, sandy clay loam	Moderately low	10.0 – 40.0 µm sec-1	50-100 cm	60-100 cm
Type C	20-40%	Sandy clay loam, loam, silt loam, clay loam, silty clay loam, sandy clay	Moderately high	1.0 -10.0 µm sec-1	50-100 cm	60-100 cm
Type D	>40%	Sandy clay, silty clay, clay	High	≤ 1.0 µm sec-1	50-100 cm	≤ 60 cm

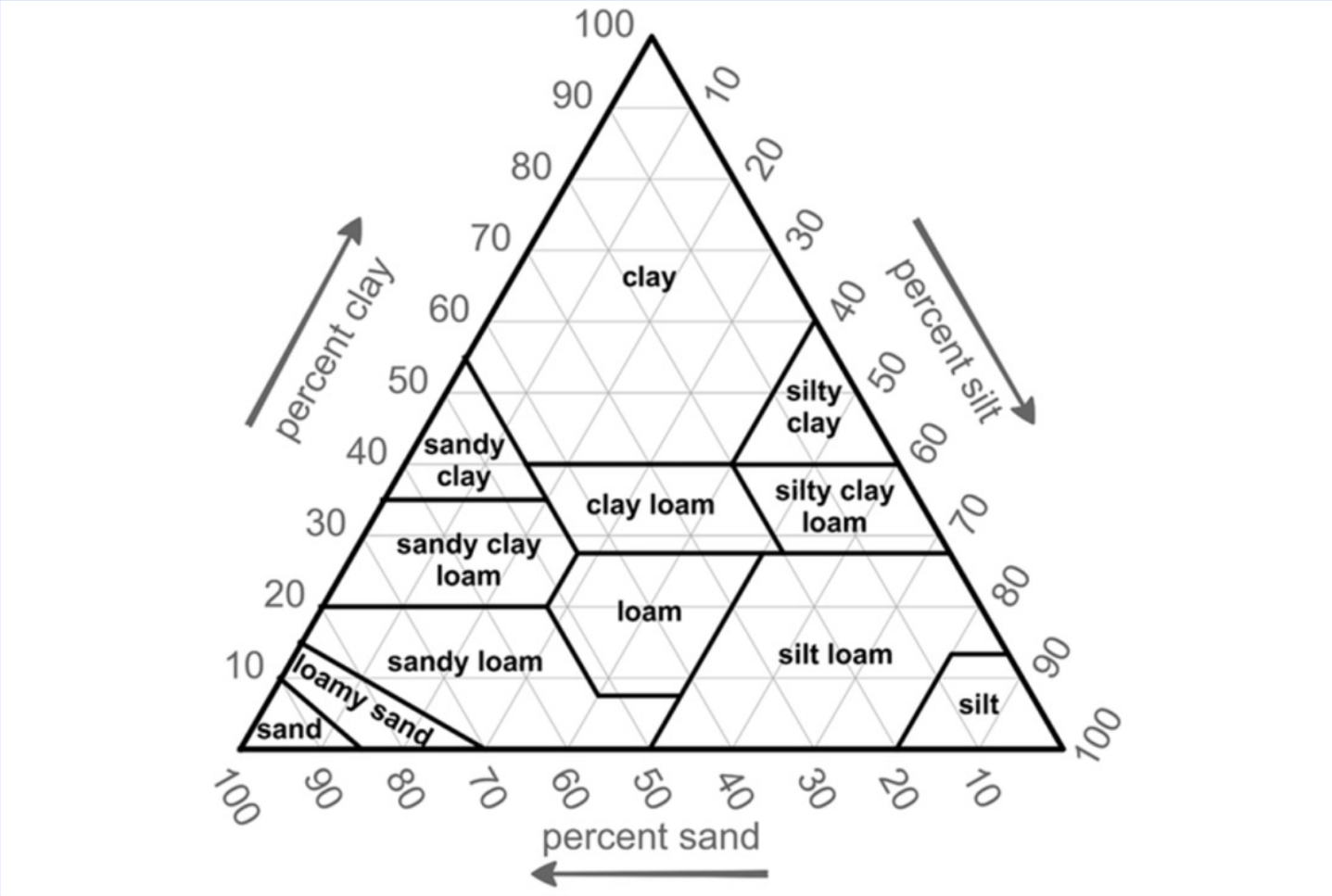

Figure 1. The soil texture triangle (image from USDA-NRCS)

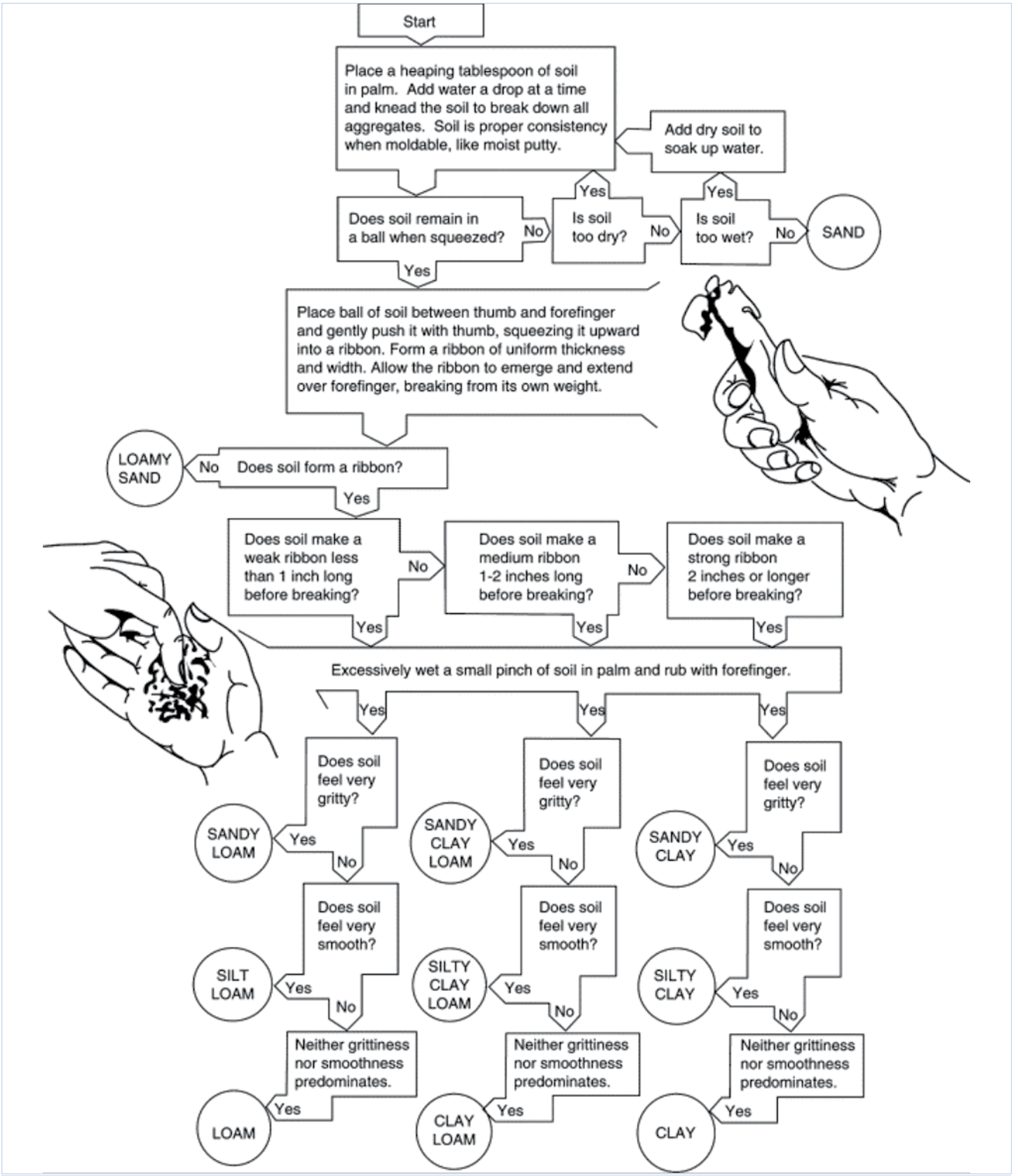

Figure 2. Soil texture classification using the hand texturing method (Yolcubal et al., 2004)

6. Above-ground burial and composting calculator

https://www.iowapork.org/wp-content/uploads/2020/05/Above-Ground-Burial-Comp-Calc_Flory.xlsx


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