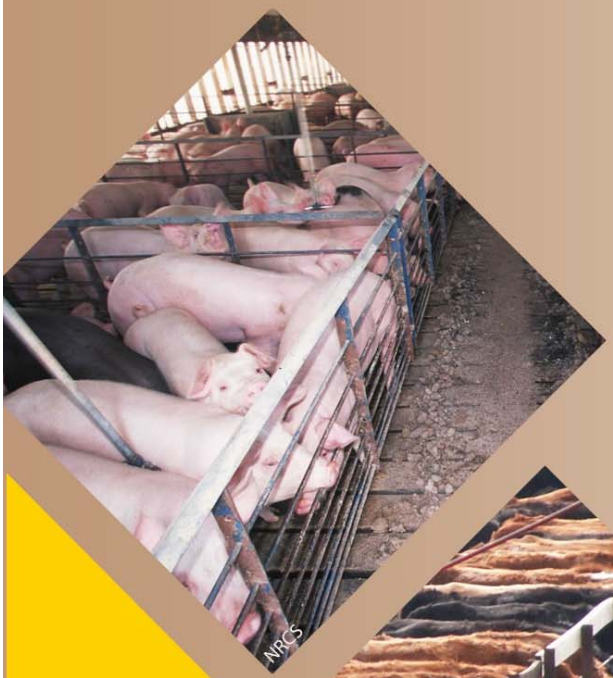



# Mass Animal Mortality Plan

Iowa DNR

2019

# Mass Animal Mortality Plan

## Iowa Department of Natural Resources

Updated in 2019 from the 2006 Foreign Animal Disease Plan

## Contents

## I. Executive Summary

Iowa consistently ranks in the top 10 in most livestock and poultry categories, and is number one in hog and egg production. The number of farm animals in Iowa makes it imperative that the Iowa Department of Natural Resources (DNR) be prepared to assist producers and our agency partners during a large-scale animal event. In 2003 the DNR developed its first comprehensive Foreign Animal Disease (FAD) plan as a result of the 2001 Foot-and-Mouth Disease outbreak in England. Since then, the FAD plan has expanded to include other diseases. It has proved useful during non-disease-related events like floods, tornados, and heating, ventilation and air conditioning system failures.

The DNR's Mass Animal Mortality Plan replaces the FAD plan, giving staff the flexibility to respond to a variety of disease and non-disease related mass animal mortality events. The plan is written generically, focusing on basic response methodologies. Event-specific information is contained in appendices. This flexibility allows the plan to be scaled to address incidents impacting livestock, poultry and wildlife in Iowa. All operations and activities undertaken by DNR staff in response to a mass animal mortality event will be conducted using the incident command, unified command and national incident management system as needed.

This plan complements other state operational plans and is based on the general plan set forth in Annex W of the Iowa Emergency Plan (2003) and Emergency Support Function-11 (ESF-11) of the Iowa Emergency Response Plan (2015). Intentional introductions of a foreign animal disease is considered a terrorist event and will involve federal law enforcement officials.

The occurrence of an animal disease in Iowa could have devastating socioeconomic consequences to the state, and it may take years to recover from such an incident. Likewise a non-disease mass animal mortality at a facility may devastate the economy of a local community. To mount an effective response to a foreign animal disease, producers, associations, researchers, regulators and emergency responders must stay abreast of developments, and plan and exercise together. The state of Iowa recommends all livestock or poultry operations prepare a catastrophic mortality disposal plan.

## II. Introduction

### a. Purpose

To identify, coordinate, and assign Iowa Department of Natural Resources (DNR) activities necessary to respond to a catastrophic mass animal mortality event in Iowa.

### b. Scope

This plan:

- This plan is activated when a large number of animals of a single species or multiple species in a defined geographical area die off or is at elevated risk of mass mortalities;
- Is activated for surveillance and detection, containment, control or disposal of animals impacted by a mass mortality event;
- Describes available resources and actions DNR will take to meet the goals of surveillance and detection, containment, control or disposal of animals impacted or potentially impacted by a mass mortality event, and;
- Is designed to work in concert with other state emergency plans as appropriate.

### c. Authority

The following administrative rules (IAC) and state law (Iowa Code) provide the legal authority for DNR (and other agencies) to proceed in an emergency situation. Find out more or read the specific references on the Iowa Legislature's website.

Iowa Code Chapter 29C grants extraordinary powers to the Governor through a Proclamation of Disaster in Iowa.

561 IAC Rule 10.4 (17A, 455A)—Criteria for Waiver or Variance, allows waiving or variance from appropriate rules based on criteria set forth in this plan.

- 567 IAC Rule 21.2 (455B) – Rules pertaining to applications for variances from applicable Air Quality rules and standards.
- 567 IAC Chapter 65 (459, 459B) — Provides the DNR the authority to regulate animal feeding operations.
- 567 IAC Rule 100.4 (455B) — Specific requirements for burial of dead farm animals.
- 567 IAC Chapter 101 (455B, 455D) — Rules pertaining to waste flow control (the movement of waste between landfills in different comprehensive solid waste planning areas).
- 567 IAC Rule 105.6 (455B, 455D) — Specific requirements for composting of dead farm animals.
- 567 IAC Chapter 113 (455B) — Specific requirements for operation of a sanitary landfill in Iowa.

### d. DNR Staff Roles

Any DNR staff may be asked to participate in a mass mortality event as needed and appropriate. Potential tasks for specific staff are indicated below.

**Law Enforcement & Parks Bureau** – Conservation Officers and Park Rangers are trained law enforcement officers with statewide jurisdiction. As such, they may be tasked with a variety of law enforcement-related activities including assisting in enforcing quarantine zones, standstill orders, or road closures. They may accompany other DNR staff if there is a potential for an aggravated or dangerous encounter with the public.

**Law Enforcement, Parks, Fisheries & Wildlife Bureaus** – Biologists and Technicians from these bureaus will conduct wildlife surveillance where wild animals may become infected, and have the potential to transmit the disease to domestic livestock and poultry. Law Enforcement staff may also be tasked with enforcement related tasks including enforcing standstill orders and quarantine zones. If wildlife control measures are necessary, these staff will coordinate and take necessary actions.

**Field Services and Compliance Bureau (field staff)** – Environmental Specialists from field offices will represent DNR in the field during a mass mortality event. They coordinate with central office program staff as necessary to ensure the best possible outcome. If the State Emergency Operations Center (SEOC) is activated, field staff will coordinate activities with DNR staff at the SEOC to ensure communication needs and priorities are met. Field staff will oversee and assist other agencies with all methods of mortality disposal, assist with disposal of wastewater generated during the event, assist with securing appropriate water sources, and assist with permitting requirements. Field staff from Emergency Response and staff from field offices (if staffing needs require) will assist with coordinating DNR operations from the SEOC.

**Communications staff** – Information Specialists may be asked to work at the Joint Information Center at the SEOC to help ensure a consistent message is prepared and disseminated to Iowans. If the SEOC has not been activated, communications staff will work with field staff and management to ensure Iowans receive timely and accurate information concerning the mass mortality event.

**Air Quality Bureau** – Staff from Air Quality may be tasked with air permit approvals, air dispersion modeling, or processing variance applications if incineration is chosen as a disposal method.

**Land Quality Bureau** – Geographical Information System (GIS) analysts will prepare and transmit GIS tools and products to the appropriate regional command centers and field offices. Staff in the solid waste section will assist field staff in evaluating and coordinating disposal options. Environmental Services Division staff may also assist field staff with data collection and field verification of burial locations.

**Water Quality Bureau** – Staff from the Water Quality Bureau may be tasked with determining wastewater disposal options, locating adequate water resources and protecting the state's water resources.

### e. Other Plans

This plan replaces previous DNR plans developed to address Foreign Animal Disease and the Wildlife Foot–and-Mouth Disease Response Plan. This plan is intended to complement ESF-11 of the Iowa Emergency Response Plan and any plans developed by the Iowa Department of Agriculture and Land

Stewardship (IDALS) or U.S. Department of Agriculture (USDA) for animal disease response. This plan is also intended to complement DNR's existing wildlife disease management plans.

## III. Planning Considerations

### a. Overview

This plan is designed to address a variety of mass animal mortality events. Mass animal mortalities can occur as the result of foreign and domestic animal diseases, catastrophic natural disasters or failures in the production environment. Because of the wide variety of potential events, this plan is designed to be scalable from local field office activation to full DNR/multi-agency activation. While no plan can predict all contingencies, and the natural environment and production processes can change over time, this plan is intended to address common issues and list methodologies to deal with the issues.

### b. Assumptions

Assumptions used in the development of this plan vary with the scale and nature of the mass animal mortality event. Responding to mass mortalities in Iowa can significantly impact a local economy, public health and safety, and Iowa's natural resources.

#### Disease-Related Mass Animal Mortality Event

- Response to an animal disease will be coordinated through IDALS or USDA depending on the disease and its severity.
- An animal disease affecting domestic livestock including, but not limited to, cattle, hogs, sheep, goats and poultry, will require containment actions potentially including depopulation and disposal. Local, state and federal staff and resources will be required.
- Large amounts of specialty machinery, supplies and materials may be required to respond to an outbreak of disease. DNR staff may be working around euthanasia equipment or chemicals, decontamination systems or heavy equipment needed for carcass disposal.
- Biosecurity and virus elimination procedures can be extensive and will follow guidelines established by IDALS/USDA based on the disease.
- An outbreak may directly affect wild animals by causing clinical disease or death. In some cases wildlife may be reservoirs or disseminators of diseases.
- Wildlife-related control measures may include surveillance of susceptible wildlife populations, depopulation of susceptible wildlife from selected areas, postponement or closure of hunting seasons in affected areas, prohibition of movement of wildlife or wildlife products, and restriction of access to certain geographic areas.

#### Non-Disease Related Mass Animal Mortality Event (in addition to those previously listed)

- Response to a non-disease related mass mortality event will be coordinated by the agency with local jurisdiction based on the type of event, impacted animal type, and animal use. For example, the fire department would respond to a facility fire and would be incident commander until the initial response phase is complete. DNR staff would coordinate with fire officials while the fire department is the lead.

- Access to impacted animals may be limited or delayed by site conditions, animal ownership status, or the event itself. For example at a contract farm the site owner may be different than the animal owner. This can lead to a delay in response efforts while liability is determined.
- Response to a mass animal mortality may also depend on the condition of the animals, the event leading to the mass mortality event and available resources.

### Natural Disaster Related Mass Animal Mortality Event (in addition to those previously listed)

- Access to the site may not be possible until the natural disaster has ended. For example, flood waters may need to recede before carcasses can be safely accessed.
- Resources during a natural disaster are often in short supply. For example, carbon source material may not be readily available for composting after an ice storm.
- Conditions during or immediately after a natural disaster may limit disposal options. For example, frozen ground can make burial difficult.

## IV. Training

The success or failure of any plan rests on two parts:

- The flexibility and adaptability of the plan and
- Experience and training of the staff who respond to the event.

DNR staff consist of professionals and experts in many fields. DNR staff training will consist of two parts:

- General response training in the Incident Command System (ICS), National Incident Management System (NIMS), and related trainings are available online from the Federal Emergency Management Agency or in class at the Law Enforcement Academy.
- Training on specific tasks laid out in the plan, e.g., wildlife tissue sampling or compost windrow construction.

### a. Required Training for DNR Staff

All DNR staff involved in responding to a mass mortality event should have received ICS 100 - Basic Incident Command and ICS 700 - National Incident Management System training. The training is available online through FEMA. (See Table IV.a - Training Requirements for DNR Staff Responding to a Mass Animal Mortality.) Staff in leadership roles or performing specific tasks may require additional incident command training. ICS training will take place when a staff member is assigned to a response role unless the assignment takes place at the time of response. At the time of a response staff temporarily assigned to a role will receive basic training needed to accomplish the tasks they are given. Refresher courses are not planned but may be required depending on frequency of use.

DNR staff in a response role will participate in training relevant to their role in implementing this plan and participate in planned internal and multi-agency exercises according to the schedule in Table IV.b – Exercise Schedule.

### Table IV-a. Training Requirements for DNR Staff Responding to a Mass Animal Mortality

| **Trainee Types** | **Level of Training Required** | | | | | | |
|---|---|---|---|---|---|---|---|
| | ICS 100 | ICS 200 | ICS 300 | ICS 400 | ICS 700 | WebEOC* | Response Role ** |
| Field Staff | R | R | O | O | R | R* | R |
| Program Area Staff | R | O | O | O | R | R* | R |
| Leadership*** | R | R | O | O | R | R* | R |

R – Required, O – Optional, ICS – Incident Command System training course

* *WebEOC training is required for staff serving at the State Emergency Operations Center physically or virtually.*

*** Training is specific to assigned staff duties.*

** *Depending on the role taken by leadership, Incident Command System (ICS) training level – 300 and ICS – 400 may be required.*

## b. Training Activities

### Workshops

Workshops usually focus on training and development of a particular aspect of the plan, such as compost windrow construction. During a workshop, attendees are often organized by functional groups or tasks to facilitate interaction and discussion. Results of workshops are often used to improve portions of the plan.

### Tabletop Exercises

Tabletop exercises involve staff in an informal setting to discuss simulated situations. This type of exercise is intended to encourage participants to discuss issues regarding a hypothetical situation. It can be used to assess plans, policies and procedures; or to assess the types of systems needed to guide the prevention of, response to and recovery from the defined event. Participants are encouraged to discuss issues in depth and develop decisions through slow-paced problem solving, rather than rapid, spontaneous decision-making that occurs under actual or simulated emergency conditions.

There are two categories of tabletop exercises: basic and advanced. In a basic exercise, the scene set by the scenario materials remains constant. The scene describes a simulated event or emergency incident, and brings participants up to the present time. Players apply their knowledge and skills to a list of problems presented by the leader/moderator. Problems are discussed as a group, and resolution is generally agreed upon, and then summarized by the leader.

In an advanced tabletop exercise, play revolves around delivery of pre-scripted messages to players that alter the original scenario. The exercise leader/moderator usually introduces simulated problems one at a time, in the form of a written message, telephone call, videotape, or other means. Participants discuss the issues raised by the problem, using appropriate plans and procedures, to come to a resolution.

### Full-Scale Exercises

Full Scale Exercises (FSE) are typically the most complex and resource-intensive type of exercise. They can involve multiple agencies, organizations, and jurisdictions and validate many facets of preparedness. FSEs often include many players operating under cooperative systems such as the Incident Command System (ICS) or Unified Command.

In a FSE, events are projected through an exercise scenario with event updates that drive activity at the operational level. FSEs are usually conducted in a real-time, stressful environment that is intended to mirror a real incident. Personnel and resources may be mobilized and deployed to the scene, where actions are performed as if a real incident had occurred. The FSE simulates reality by presenting complex and realistic problems that require critical thinking, rapid problem solving, and effective responses by trained personnel. The level of support needed to conduct an FSE is greater than that needed for other types of exercises. The exercise site for an FSE is usually large, and site logistics require close monitoring. Safety issues, particularly regarding the use of props and special effects, must be monitored. Throughout the duration of the exercise, many activities occur simultaneously.

### Table IV-b. Training Schedule by Type of Exercise*

| Trainee Types | Workshop | Table Top Exercise | Full Scale (role specific) Exercise |
|---|---|---|---|
| Field Staff | Every other odd year | Every other even year | Every 5 years (will take the place of the corresponding training) |
| Program Area Staff | Every other odd year | Every other even year | Every 5 years (will take the place of the corresponding training) |
| Leadership | Every other odd year | Every other even year | Every 5 years (will take the place of the corresponding training) |

** An actual event and the associated After Action Report will take the place of any training or exercise required for that year.*

## V. Communications and Coordination

Communications are an important part of response to any event. Poor communication is also often identified as a weakness during exercise and after action reports. For mass animal mortality events, internal and external communications are critical to prevent misinformation, rumors and confusion among DNR staff, our partner agencies and the public. The size of the activation determines the amount and types of communication, and who is included in the communications.

### a. Local Activation

During local activations, communications between the field and program staff are handled directly. The lead field office staff on-site coordinates with program staff by phone or e-mail. Public communications are coordinated with the DNR's public information officer (PIO) or the bureau's communication officer as needed. Designated DNR staff will be informed of the event through the event notification group e-mail (ESD-Notify). Field staff will communicate and coordinate activities with first responders and the producer involved in the event.

### b. Statewide Response (state lead)

During a statewide response, additional state agencies are likely involved. IDALS or Iowa Homeland Security and Emergency Management (HSEMD) may activate the SEOC. The addition of other state agencies to the response will require a more formal coordination of communication and information. In many cases the DNR will not be the lead agency and communications with the public will be coordinated by the lead agency and potentially a joint information center (JIC).

If the SEOC is activated, assigning tasks between agencies will be coordinated through direct communication at SEOC or through the state's virtual incident tracking tool, WebEOC. Any tasks assigned to DNR will be communicated to the DNR's SEOC liaison, who will assign it to the appropriate staff or program area. In some cases, tasks may be communicated peer to peer, but the SEOC liaison needs to be notified for proper coordination and tracking.

Information communicated to the public will be coordinated through the JIC. Either the lead agency for the event or Iowa Homeland Security and Emergency Management (HSEMD) will coordinate the JIC to ensure communicating a common message to the public. If the DNR is not the lead agency, DNR will provide a PIO if the JIC requests one.

If the SEOC is not activated, communication will be direct between the lead agency and the DNR liaison and/or staff involved in the response. The PIO of the lead agency will handle communications with the public with assistance from the DNR PIO as requested.

### c. Statewide or Regional Response (federal lead)

During a federally led regional or disease-related response, the SEOC will be activated and a federal Incident Management Team (IMT) will likely coordinate response activities. The IMT may be collocated at the SEOC and may include a representative from the DNR. The IMT/SEOC will assign tasks for the DNR liaison to coordinate. Communications with the public will be coordinated by the JIC. The DNR will provide communications staff as requested during the response.

## VI. DATA RESOURCES

### a. Non-Disease Outbreak

The DNR's Geographic Information System (GIS) section developed an online mapping tool to assess potential locations for burial sites. The tool can be used by facilities to develop emergency response plans. The interactive Burial Zone Siting map breaks down the land area of Iowa into three zones based on risk criteria. The three zones are: excluded from burial, burial allowed with precautions and burial allowed with no known restrictions.

The Animal Feeding Operation (AFO) database has information on specific facilities. Information can include the maximum number of animals housed at a facility, the footprint of a facility, ownership and management of a facility and facility design.

The Source Water Mapping on-line tool can be used to preplan response options or be used during a response to help select disposal options. The tool indicates protected water resources and creates a buffer around water system wells.

The DNR can collect additional data. See discussion under the Wildlife Considerations in section VIII Operations

### b. Disease Outbreak

During a disease outbreak, IDALS staff will gather data about the number, type and disposition of animals from the owners of the infected herd/flock. This data will be entered into GIS tools/maps, and used to track potentially infected herds and to plan for disposal. The DNR GIS section will assist other GIS staff at HSEMD and IDALS to generate geographic tools. Using generated maps, DNR GIS staff will identify potential burial zones and animal feeding operation locations. In addition, the GIS section will provide other GIS tools as requested including land cover maps, topographic maps and aerial photos.

As the outbreak progresses to its conclusion, DNR GIS staff will support the response with custom maps and reports as needed. If requested, DNR field staff may confirm information provided to the GIS section and field conditions indicated in burial zone maps. DNR wildlife staff can provide wildlife monitoring data to GIS staff as needed for a particular outbreak.

## VII. PLAN ACTIVATION

The DNR Mass Animal Mortality Plan is activated by the DNR Director or director's designee. For disease-related events, activation involves consultation with IDALS and HSEMD.

This plan can be activated under the following conditions:

**Localized Event** - by the DNR Director or an appointed representative. When:

- Significant numbers of animals are impacted by a mass mortality event that would violate normal mortality disposal regulations or are beyond the capability of a site's normal disposal methods, and
- Does not meet the requirements of other activation conditions.

**Disease Outbreak** - By the DNR Director or an appointed representative in consultation with IDALS and HSEMD when a significant number of animals are impacted or are potentially impacted by an animal disease.

- In response to an animal health emergency declared in an adjacent state or at the federal level.

**Governor's Disaster Proclamation** - In response to a Governor's Proclamation of Disaster Emergency resulting from an animal disease outbreak or natural disaster impacting or potentially impacting large numbers of livestock or wildlife.

**Monitoring-Indicated Event** - Portions of this plan may also be activated when routine monitoring indicates:

- One of the International Animal Health Code diseases, as designated by the World Organisation for Animal Health (OIE), is detected in the state or an adjacent state; or
- A highly contagious disease is detected in the state or a migration pathway that crosses the state.

## VIII. OPERATIONS

During declared disasters or animal disease outbreaks, the DNR will potentially be operating with local, state and federal partners to respond to the event. In most cases, the partner agency will be the lead agency and may request DNR to undertake tasks covered in this plan. DNR staff at the SEOC, Incident Management Team (IMT), Field Command Post or Regional Command Center in coordination with appropriate staff will evaluate the request to determine if DNR has the capability, training and experience to accomplish the task and respond accordingly.

During events not related to disasters or disease, the DNR will work with local agencies and the producer to appropriately respond to the event.

### a. Wildlife Consideration

The DNR is responsible for managing and protecting the state's natural resources. To ensure a vibrant and healthy wildlife population, DNR has ongoing programs to monitor and manage wildlife. This section of the plan is organized around three major goals outlined in Table VIII-a.

### Table VIII-a. Goals for Wildlife Monitoring and Management during a Mass Animal Mortality

| | |
|---|---|
| **Goal 1**<br>**Surveillance and Detection** | To track and monitor wildlife health throughout Iowa and to rapidly detect diseases that could adversely affect wildlife in Iowa. |
| **Goal 2**<br>**Containment** | To reduce the risk of spreading wildlife disease once it is detected within Iowa's borders. Potential actions could include, but are not limited to, postponing or closing hunting seasons in affected areas, prohibiting movement of wildlife or wildlife products, and restricting access to certain geographic areas. |
| **Goal 3**<br>**Depopulation** | To eliminate the presence of a wildlife disease within Iowa's borders by taking actions which include, but are not limited to, depopulation of susceptible wildlife from selected areas and appropriate carcass disposal. |

To accomplish these goals the DNR will take the following steps:

#### Monitoring

DNR staff monitor wildlife for the presence of several diseases each year. The monitoring program adjusts as necessary for emerging diseases and changes in priorities. Monitoring by DNR staff will occur in three phases.

- Pre-outbreak monitoring: this is DNR's normal wildlife monitoring program designed to manage wildlife and ensure a healthy wildlife population.
- Response monitoring: once a disease outbreak has been identified within the wild or domestic population, DNR will evaluate its monitoring program and adjust to best achieve response goals.

- Post response monitoring: once the response to an outbreak has ended, DNR will continue to monitor wildlife. The goal is to confirm the end of the outbreak and monitor for a recurrence. As time passes, DNR will evaluate the risks of a recurrence and transition to a pre-outbreak monitoring strategy.

DNR staff coordinate its internal monitoring program with local, state and federal partners to ensure an effective and efficient monitoring program. Monitoring information comes from samples collected from road kills, hunter-harvests and DNR-collected wildlife samples. Data can also include sampling animal feces, nesting/bedding material and other non-animal samples. The wildlife-monitoring program is evaluated and adjusted as necessary each year.

If a disease is detected in a wildlife population that has the potential to impact domestic livestock, DNR will contact IDALS. DNR staff will coordinate with IDALS staff to begin coordinated monitoring of the area where the disease was detected. If appropriate, DNR will begin response activities.

Response monitoring will be based on the disease and species impacted and will be based on a plan developed by DNR staff and partner agencies including IDALS, USDA, U.S. Fish and Wildlife Service, and other agencies. Following the conclusion of a response, partners will develop a post-response plan. The plan will include triggers for escalation and reduction of the monitoring.

### Containment and Control

The DNR, in cooperation with IDALS (as appropriate), will conduct a risk assessment (Appendix A). The assessment will be used to determine:

- Prevalence of wildlife infection,
- Probability of the disease spreading away from the affected area, and
- Probability of the disease spreading to domestic livestock.

If risk assessment warrants containment or control actions, the DNR may take the following actions:

- Order postponement or closure of hunting seasons to reduce movement of wildlife or wildlife products in affected areas.
- Restrict access to public lands in the affected area. This may include wildlife management areas, preserves, and parks or state forests where public access may increase the risk of spreading the disease.

### Population Reduction

DNR may consider population reduction, if results of the risk assessment indicate a disease has significantly affected wildlife and the affected wildlife poses a risk to transmit disease to uninfected domestic livestock, wildlife in other geographical areas or other wildlife species.

After consulting the Governor and partner local, state and federal agencies, the DNR Director may implement a wildlife population reduction plan within the affected area. At a minimum, the plan will include:

- Targeted geographical area,
- Method of population reduction,
- Plan to control movement of wildlife within the targeted area,

- Wildlife population levels at which disease transmission is unlikely,
- A plan for carcass disposal for the affected wildlife, and
- Biosecurity procedures (established by IDALS/USDA).

### b. Wastewater Containment

Liquid waste generated during a response to a mass animal mortality event can be a contaminant. The waste may contain hazardous chemicals and disease, and be difficult to contain for proper disposal. The DNR will assist facility owners, first responders and partner agencies in determining options for containment, collection and disposal of response-generated liquids.

#### Euthanasia-Generated Liquids

There are several options for the responsible party or partner agency when commercial livestock facilities need to be depopulated. For some options, such as foaming, the responsible party will need to deal with excess waste liquids. If the responsible party chooses other options, chemicals used in the euthanasia process, viable disease contaminants or other chemicals and pollutants may need special treatment. It is recommended the facility contain liquid waste within the structure being depopulated and avoid uncontrolled discharge of contaminated water from the site. DNR staff can help evaluate the waste, advise on containment options and assist with determining appropriate disposal.

#### Cleaning and Disinfection

The method used to disinfect, clean, or remove viable disease contaminants can generate additional liquid wastes. DNR staff can assist in evaluating the liquid waste and determining appropriate disposal options. DNR staff may also make recommendations for the containment of any generated wastewater.

#### Biosecurity Liquids

During a disaster, a facility may need to treat or contain waste from cleaners and disinfectants normally used in its biosecurity process. Facilities will need a designated biosecurity control point, which should include a method to contain and collect wastewater. DNR staff can help evaluate the collection and containment of wastewater and recommend disposal options.

### c. Carcass Disposal

The DNR has regulatory oversight for carcass disposal during a non-disease mass animal mortality event. IDALS has oversight of carcass disposal if mortalities are disease related or disease is suspected. However, to protect the environment, the disposal method must meet DNR requirements.

The following six methods of disposal may be considered in response to a mass animal mortality event: composting, burial, incineration, landfill, rendering and alkaline hydrolysis. The DNR will evaluate alternative methods of disposal on a case-by-case basis. The best option depends on event, site conditions and preventing the spread of disease. USDA/IDALS have determined that disposal will occur on-site except in extreme circumstances.

### Site Selection

Facilities must consider the location of residences and environmentally sensitive areas when selecting a site for carcass composting or burial. See Table VIII-a for the required separation distances for non-disease related mass mortalities. See Table VIII-b for the separation distances required when mass mortalities are disease related. See additional siting requirements according to specific disposal option.

### Table VIII-a. Separation Distances Required for Composting and Burials – Non-Disease Related*

| Object Requiring Separation Distance | Minimum Distance Required from Compost Windrows or Burial Sites in feet |
|---|---|
| Existing inhabited residences (except site owner or operator's residence) | 500 |
| Public wells | 200 |
| Private wells | 100 |
| Adjacent Property lines | 50 |
| Flowing or intermittent streams, lakes, or ponds. | 100 |
| Tile line | 200 |
| Floodplain (100-year) Wetlands, shoreline | Outside |
| Utilities | Avoid overhead utilities and aboveground utility infrastructure. Call Iowa One Call at 811 to exclude buried utilities. |

** 567 IAC 100.4(2), 567 IAC 105.3, 567 IAC 105.6 and 561 IAC 10.4*

### Table VIII-b. Separation Distances Required for Composting and Burials – Disease Outbreak*

| Object Requiring Separation Distance | Minimum Distance Required from Compost Windrows in feet | Minimum Distance Required from Burial Sites in feet |
|---|---|---|
| Existing inhabited residences (except site owner or operator's residence) | 500 | 500 |
| Public wells* | 200 | 2,500 |
| Private wells* | 100 | 200 |
| Adjacent Property lines | 50 | 50 |
| Flowing or intermittent streams, lakes, or ponds. | 100 | 100 |
| Tile line | 200 | 200 |
| Floodplain (100-year), Wetlands, shoreline | Outside | Outside |
| Utilities | Avoid overhead utilities and aboveground utility infrastructure | Call Iowa One Call to exclude buried utilities |

** 561 IAC 10.4*

**Composting**

Composting speeds up the normal decay processes caused by naturally occurring bacteria and fungi. It can be cost and labor effective for animal disposal. Proper construction, materials selection and adequate temperatures ensure quick, complete decay. Proper construction helps reduce foul odors and prevents releasing contaminated liquids. When done correctly, composting carcasses can effectively eliminate some animal diseases.

*Composting turkey carcasses.*

#### Factors influencing effective composting

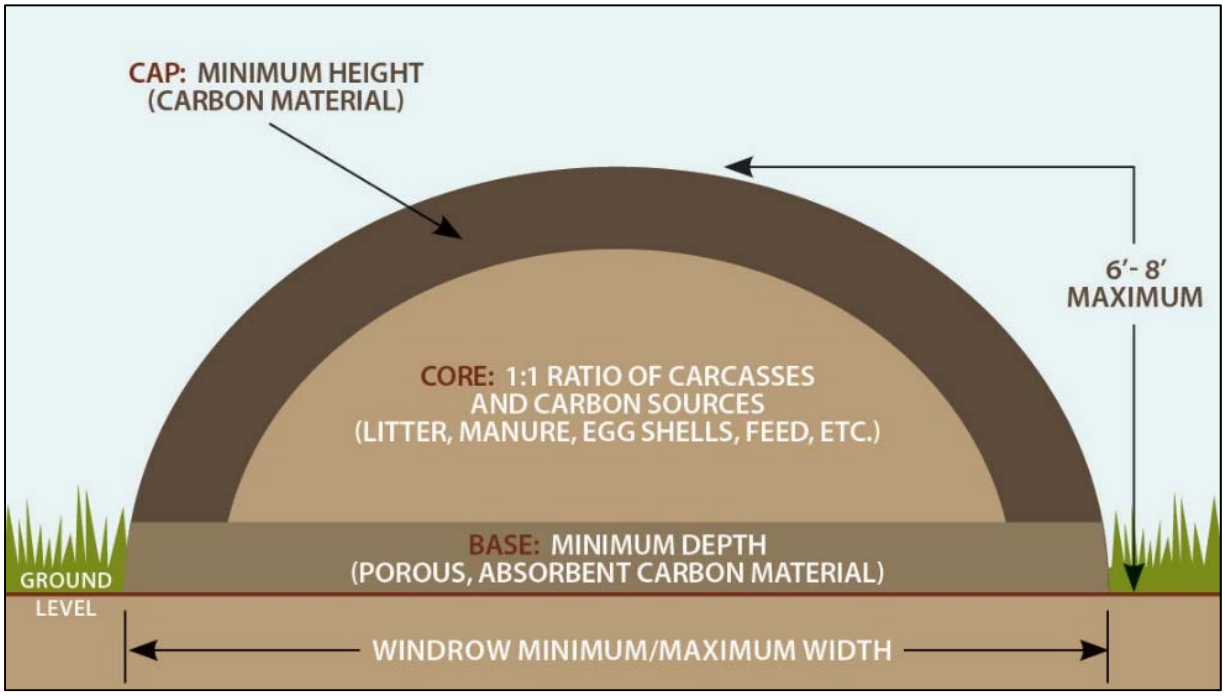
**Moisture** - For optimum performance, maintain moisture content between 40 and 60 percent. Compost should be moist but not soggy. If you can squeeze moisture from a handful of compost, mix it with drier material.

**Carbon Source** – High levels of microbial activity require carbon. The right materials keep compost porous allowing oxygen into the pile and permitting gases like ammonia—which inhibits microbial activity—to escape. Materials listed below are particularly good for absorbing excess liquid released by decaying carcasses, an important factor in preventing undesirable environmental impacts.

**Heat** – Heat is important for successful composting.

Reaching a specific temperature is required for disease-related composting. To inactivate the disease, take temperatures in the compost pile at depths, spacing and frequency specified in the USDA/IDALS compost plan. Make sure internal temperatures reach required temperatures for the required amount of time.

### Figure VIII-a. Composting Requirements.




### Materials needed for effective composting

- Carbon Source Material (CSM) – corn silage, ground hay/straw, saw dust, ground corn stalks, corn stover, mulch, wood chips (< 1-in size), poultry litter
- Cover Material – corn silage, wood chips (< 2-in size), ground hay/straw, ground corn stalks, corn stover, mulch
- Plan on roughly 12 cubic yards of cover/base material per 1,000 lbs. of carcasses

### Table VIII-c. Windrow Construction Size Requirements (see Figure VIII-a)

| | Poultry | Swine | Bovine |
|---|---|---|---|
| **Base Layer** | Minimum 15 in | Minimum 18 in | Minimum 24 in |
| **Compost Core** | 1:1 mix ratio with CSM* | 9 in CSM between carcasses | 12 in CSM between carcasses |
| **Height** | Maximum 8 ft. | Maximum 8 ft. | Maximum 8 ft. (1 layer of carcasses) |
| **Cover** | Minimum 12 in | Minimum 18 in | Minimum 18 in |
| **Windrow Width** | Less than 15 ft. | Less than 16-18 ft. | Less than 16-18 ft. |
| **Spacing of Windrows** | 2-3 loader lengths | 2-3 loader lengths | 2-3 loader lengths |
| **Length of windrow** | (total lbs.) / 250 = length | (total lbs.) / 250 = length | (# cattle) x 4 ft.-length = windrow |

** CSM – carbon source material*

#### Burial

On-site burial is an effective method to dispose of carcasses. When done correctly, it can be environmentally safe, cost effective and prevent the spread of disease. Some diseases may remain active so care should be exercised during disposal of diseased carcasses. Whenever possible, burial should be done at the affected premise or adjacent property owned by the same owner. If owner's property is unsuitable for burial, an adjacent property could be used under agreement with the adjacent property owner.

*Typical burial trench*

##### Factors affecting effective burial

Burial is most effectively accomplished under dry, warm conditions. Wet, muddy and frozen ground may require special equipment or extra care. Burial site location and conditions must meet DNR-established criteria and site conditions. DNR staff must verify site location and conditions. Puncture the rumen or stomach of large carcasses (cattle and larger hogs) to reduce gas production in trench.

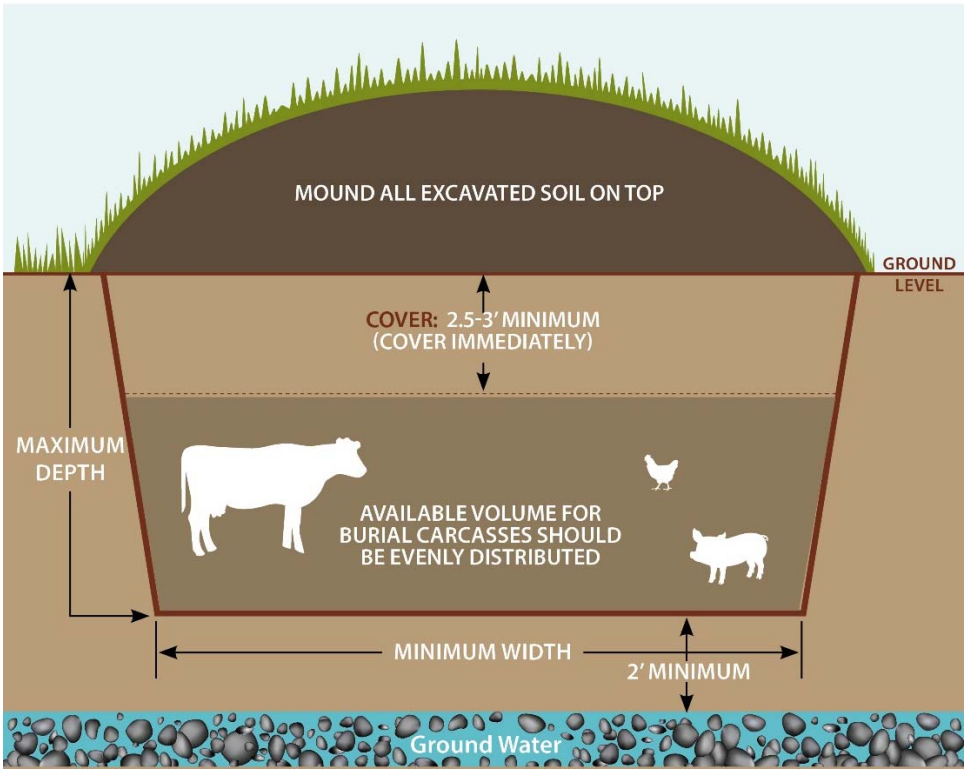
##### Site Selection Criteria

- **Exclude Utilities** - contact IOWA ONE CALL 811 to locate any buried utilities on proposed site. Premises owner must also ensure field drainage tile is located at least 200 feet from excavation.
- **Protect Wells and Well Source Water** - Ensure private wells and public wells are a safe distance

from the excavation. Use DNR's Source Water Mapping tool at https://programs.iowadnr.gov/sourcewater/maps/index.html to begin site varification. Field verify to confirm wells are a safe distance from the site.

- **Use Geographic Information System Maps** - Use DNR's Burial Zone Siting Atlas at http://programs.iowadnr.gov/maps/afo/burial.html to locate potential burial sites. A green or yellow area might be usable, but DNR field staff must visit the site and approve its use before burying. The following color codes indicate potential as a burial site:
  - Acceptable zone shaded in green - no known restrictions for burial.
  - Cautionary zone shaded in yellow - only limited burial recommended.
  - Exclusion zone shaded in red - no burial recommended.

### Figure VIII-b. Burial Trench Design Requirements




#### Trench Construction

Base the size of trench on the size and number of animals to bury. Minimum trench design is based on one bovine carcass (2 ft. of trench depth, 3 ft. of trench length, and 7 ft. of trench width (42 $ft^3$)). Five swine/sheep carcasses are equivalent to one bovine carcass.

### Table VIII-d: Burial Trench Size Requirements

| Dimensions | Poultry | Swine/Sheep | Bovine |
|---|---|---|---|
| Width (w) | 7-12 ft. | 7-14 ft. | 7-14 ft. |
| Depth (d) | 5-9 ft. | 6-9 ft. | 6-9 ft. |
| Length of trench needed | (Number of 2-lb ducks x 0.01)/(w x d)<br>(Number of 3-lb Chickens x 0.02)/(w x d)<br>(Number of 7-lb Turkeys x 0.6)/(w x d) | (Number of swine x 8.4)/ (w x d) | (Number of bovine x 42)/ (w x d) |

For an estimate of trench length for different trench sizes and animal units, reference the quick guides in Appendix D.

#### Construction Requirements (see Figure VIII-b.)

**Keep sides as vertical as possible.** If stability is a problem, slope the sides to prevent cave-in and ensure equipment can safely place carcasses while maintaining minimum trench width. Distribute carcasses evenly on the bottom of the trench.

**Groundwater Separation.** Maintain at least 2 feet between the trench bottom and groundwater. DNR staff must verify on-site groundwater separation before contractor can place carcasses in trench.

**Surface Water Control.** Construct berms to divert surface water around trenches if surface water runoff would flow into trenches.

**Trench Length and Setback Distances.** Although trench length and setbacks will vary with site factors, trenches must meet the following requirements:

- Follow contour lines as closely as possible
- Trench must be placed at least 50 (horizontal) feet from another trench
- Must not include any sand seams or pockets. Stop digging if the trench intersects a sand seam or pocket. Then backfill the last 10 feet of trench with non-sandy soil. Compact backfill area as much as possible. Dig a test pit every 10 feet beyond sandy area. Continue trenching after test pits show soil is free of sand.
- Meet all separation distances listed in Table VIII-a and Table VIII-b as appropriate.

**Cover excavation**

- Cover carcasses with 2.5 to 3 feet of cover below ground level
- Mound all excavated soil over the trench to avoid ponding water and allow for settling
- Avoid compacting the cover soil
- Seed the excavated area with shallow rooted cover crops such as oats, ryes, and clovers.

### Incineration

Incineration can be an effective method for disposing of carcasses. Incineration is particularly effective in inactivating many diseases, reducing the risk of spreading the disease. However, sizes and types of equipment vary greatly as does their efficiency, setup time and air quality impacts. It pays to consider capacity, fuel use and operating costs of available units. Specific separation distances from residences, property lines, and other structures may also be required for incineration.

DNR staff will assist facilities and USDA/IDALS to evaluate incinerator effectiveness and may conduct air dispersion modeling to determine air quality impacts. Consult with DNR air quality staff to obtain required permits or variances before starting operation. Permit fees may apply.

### Landfill

Landfill capacity and logistics limit disposing carcasses at sanitary landfills in Iowa. The areas where livestock production is the greatest is where landfill capacity is the most limited. DNR recommends other disposal options be considered before landfilling non-disease-related carcasses.

While disease- infected carcasses can be sent to a landfill, the landfill must approve their acceptance. Disposal must also meet landfill disposal criteria established by DNR, adhere to strict biosecurity measures at the farm and landfill, and be approved for movement off-site by IDALS. If landfilling is a preferred disposal management method, DNR recommends facilities begin pre-planning with local landfill agencies to discuss logistics and requirements.

### Rendering

If an event is disease related, DNR allows disposal at a rendering plant provided the rendering facility and USDA/IDALS approve. Use of a rendering facility for disposal depends on several factors:

- Distance from the carcass site to the rendering facility.
- Condition of the carcasses and ease of loading for transportation.
- Presence of animal disease (may preclude rendering facilities from taking carcasses).
- Number of carcasses and available capacity of the rendering facility.

### Alkaline Hydrolysis

Alkaline hydrolysis, or tissue digestion, uses alkali at elevated temperature to convert animal carcasses to a sterile liquid solution of amino acids, sugars and soaps. The process is used most often at research and university facilities and is limited in capacity and availability. The process is effective in eliminating prion-related diseases. Prion-related diseases are resistant to enzymes and chemicals that normally break down proteins, as well as resistant to heat and normal disinfection procedures.

Alkaline hydrolysis digestion is utilized because the high temperature and alkaline solution breaks down animal protein and produces a sterile mass, which can be safely used as compost or disposed of at a public landfill. The process will also generate significant amounts of liquid waste that will require proper disposal. The capacity limitations for the process are overridden by the necessity to ensure a biosecure end product, which poses no known health risks to animals or humans.

Alkaline hydrolysis digestion systems can be fixed or portable depending on availability in a given area. Biosecurity at the loading and unloading sites along with IDALS/USDA approval is required to transport carcasses.

#### Approval Process for Other Methods

As science and technology continue to advance and new diseases present themselves the DNR may be asked to evaluate disposal options and methodologies to best respond to an event. DNR will consult other local, state and federal agencies, as appropriate, prior to accepting a disposal method. The criteria used for evaluating methodologies will also evolve over time but will include:

- Effective elimination of carcass tissues.
- Effective inactivation of subject disease or the prevention of disease spread.
- Protection of air, soil and water resources from introduction of potential contamination or pollutants from the methodology, the carcasses, or the effects of the methodology on the carcass.
- Methodologies must not violate local, state, or federal regulations unless those regulations are waived as part of a normal response to a disaster event.

The DNR is always open to more effective and efficient methods to deal with mass animal mortality events.

### d. BioSecurity

DNR staff will follow biosecurity requirements established by the facility when responding to a non-disease related event. USDA and/or IDALS will establish biosecurity requirements at an event resulting from disease.

DNR staff will assist with establishing appropriate biosecurity based on the recommendations/requirements of USDA/IDALS. DNR staff will also assist with disposal requirements and options for biosecurity-related waste.

### e. Non-Carcass Waste Collection and Disposal

With assistance from solid waste and wastewater staff, DNR field office staff will assist the facility with non-disease related solid and liquid waste disposal after a mass animal mortality response. Collection of liquid waste may not be necessary if the waste does not constitute a pollutant based on its chemical makeup, quantity or other factors. All liquid wastes deemed to be a pollutant should be contained for treatment and/or disposal.

Uncontaminated animal waste can be disposed of according to normal handling and disposal procedures. If normal procedures are not available due to the event consult with DNR staff to determine best available options.

DNR staff will assist USDA/IDALS staff with disease-related waste handling and disposal to reduce the risk of disease spread. Waste associated with biosecurity efforts will be collected according to the appropriate biosecurity plan. USDA/IDALS staff will determine if liquid waste contains disease and determine appropriate requirements to inactivate the disease. USDA/IDALS staff will determine if solid

waste is contaminated or can be effectively decontaminated. DNR staff will assist USDA/IDALS staff with determining the proper handling and disposal of waste collected during a disease outbreak.

Organic solid waste and animal waste impacted by disease can be disposed of by several methods. Often these materials have a beneficial use that is viable (e.g., infected feed being used to feed animals scheduled for depopulation). Materials can be added to carcasses to enhance composting. DNR and USDA/IDALS staff will evaluate options based on the transmission risk of the particular disease.

## Appendices

## Appendix A – Wildlife Risk Assessment

Personnel in the command center or the field should use this decision key to help make decisions on the risks of wildlife species spreading the disease.

1. Is there a possibility of the disease occurring in wildlife?

   In making this decision, consider known relationships between the disease and wildlife species, and distribution of wildlife within the vicinity of the disease outbreak.

   - ☐ Yes. Go to 2
   - ☐ No. Go to 5
   - ☐ Do not know. Go to 3

2. Has a presumptive diagnosis of the disease been made in wildlife?

   - ☐ Yes. Go to 8
   - ☐ No. Go to 5

3. Determine the distribution and abundance of susceptible wildlife hosts.

   Determine the distribution and abundance of potential wildlife host species on the basis of local and other existing knowledge, and, where deemed necessary, a reconnaissance of the area using an aerial or ground survey. Based on survey results (numbers of wild animals, contact with domestic animals, etc.) is wildlife likely to pose a risk?

   - ☐ Yes. Go to 4
   - ☐ No. Go to 5

4. Do we know if wildlife and/or domestic animals are infected?

   - ☐ Disease thought to be present only in domestic animals. Go to 5
   - ☐ Disease thought to be present in domestic animals, status of wildlife unclear. Go to 5
   - ☐ Disease thought to be present in both wildlife and domestic animals. Go to 5
   - ☐ Disease thought to be present in wildlife, with the status of domestic animals unclear. Go to 6
   - ☐ Disease thought to be present only in wildlife. Go to 6

5. Should we ignore wildlife?

   - ☐ Yes. The perceived/real consequences of inaction are of little importance. Go to 13
   - ☐ No. Wildlife cannot be ignored. Go to 6

6. Sample wildlife for the presence of the disease agent.

   The time involved in this process may be prolonged until adequate data is obtained. This step is very dependent on circumstances and the consequences of getting it wrong.

   Consult experts to consider/initiate the following:

   - a detailed population survey; and/or
   - disease sampling.

   ☐ If disease is detected in wildlife, go to 8

   ☐ If no disease is detected in wildlife, go to 7

   *In some situations consider conducting operational procedures concurrently with disease sampling.*

7. Relevance of wildlife.

   Where there is inadequate data:

   ☐ If disease control in domestic animals does not proceed as quickly as expected consider increasing the intensity and range of testing of wildlife. Go to 6

   ☐ It may be necessary to delay taking into account data collection. Go to 6

   ☐ Consider whether to control and contain wildlife as a precautionary measure. Go to 9

   Where there is reliable data and:

   ☐ No disease is detected in wildlife during sampling. Go to 5

   ☐ Disease is detected in wildlife during sampling. Go to 8

8. Select appropriate control and/or containment strategies.

   Disease has been detected in wildlife. Select the appropriate methods to contain and control wildlife and/or the disease.

   ☐ No targeted action against wildlife. Go to 9

   ☐ Non-lethal disease control measures (including vaccination). Go to 10

   ☐ Lethal disease control measures for wildlife, and containment. Go to 11

   Modify control and containment methods depending on outcomes/assessment.

   ☐ Disease is no longer detected in susceptible hosts. Go to 12

9. Continue to monitor wildlife.

   Continue to monitor wildlife for the presence of disease during and after domestic animal operations.

   ☐ If there is continuing or increasing concern over disease in wildlife. Go to 8

   ☐ If there is a decrease in, or no concern over, disease in wildlife. Go to 12

10. Non-lethal disease control measures for wildlife.

    Implement appropriate methods, including vaccination and non-lethal population control methods.

    ☐ Disease is still detected in susceptible hosts. Go to 9

    ☐ Disease is no longer detected in susceptible hosts. Go to 12

11. Lethal disease control measures for wildlife, and containment.

    Implement appropriate methods to control and contain wildlife. Modify control and containment methods depending on outcome assessment.

    ☐ Disease is no longer detected in susceptible hosts. Go to 12

    ☐ Susceptible hosts eradicated. It may be necessary to exclude wildlife from the wildlife control area until any remaining virus etc. is inactivated. Go to 12

    ☐ Wildlife reduced below disease threshold and disease no longer detected. Go to 12

    ☐ Wildlife disease control operations fail to prevent expansion of outbreak and disease declared endemic. Go to 14

12. Monitor for residual disease.

    ☐ Disease detected. Go to 5

    ☐ Disease undetected. Go to 14

13. No action to be taken against wildlife.

    Periodically review the situation.

    ☐ Developing concern. Go to 5

    ☐ No concern. Go to 14

    Factors to consider in making this decision:

    - no wildlife species present is important in the maintenance and transmission of the disease; **and**
    - wildlife, even if infected, are unlikely to be a source of infection for domestic animals and/or people; **and**
    - any disease in wildlife will not persist after infection has been eliminated from domestic animals; **and**
    - disease control in domestic animals (if commenced) is proceeding as expected; **and**
    - action to test for the presence of disease in wildlife or to control wildlife is likely to have adverse consequences, for example:
        - spread disease by dispersing wildlife; **or**
        - lead to wildlife reinfecting domestic animals; **or**
        - greatly slow down disease control or other operations.

14. Cease operations – no further action.

The disease has been declared:

- ☐ endemic; **or**
- ☐ eradicated; **or**
- ☐ unresolved.

## Appendix B – Non-Disease Requirements

Disposal of mass animal mortalities that do not involve animal diseases are driven more by the quantity, condition, and accessibility of the carcasses. This appendix focuses on incidents that result from the two main causes of non-disease mass animal mortalities, disasters (including fire and natural or man-made disasters) and infrastructure failures (including heating, ventilation, and air conditioning (HVAC) systems). Each type of incident can pose its own problems.

### 1. Fire/Natural Disasters

Mass animal mortalities resulting from fires and natural disasters can be problematic to manage. Carcasses are often in poor condition, comingled with other debris, or inaccessible in a timely manner. These issues often limit the disposal options producers can chose from.

Rendering facilities often do not accept carcasses in poor condition. Carcasses co-mingled with non-organic debris (metal, hazardous materials, sediments) will be difficult to compost and may require landfilling or burial. Incineration may be possible depending on co-mingled material and potential emissions. Consultation with air quality staff will be required prior to incineration.

### 2. Infrastructure Failures

Infrastructure consists of systems designed to maintain the life and health of livestock located at a facility. When these systems fail a mass animal mortality event can occur. Systems include: feed handling and distribution systems; watering systems; HVAC systems; and waste handling systems. A failure of one of these systems to operate properly can lead to an event. The most common cause of failure is an electrical failure or outage leading to an HVAC shut down.

An infrastructure failure generally leaves the carcasses intact and in relatively good condition for disposal. They are generally easy to access. The condition of carcasses will deteriorate over time which will limit disposal options. Early efforts should be directed towards rendering as a beneficial use of the carcasses. If rendering is not an option other options can be explored based on site conditions and available resources.

Staff should follow the facility's bio-security requirements when responding to an event at the facility. This is especially true at facilities where a limited number of buildings at the facility are impacted while others are not.

Once animal carcasses are dealt with cleanup and facility recovery can take place. Generally non-carcass waste generated is limited and can be managed using normal processes. DNR staff may provide technical and regulatory assistance to the producer to insure waste generated is properly dealt with and infrastructure system are more secure.

## Appendix C – Animal Diseases

Animal diseases vary greatly and the effectiveness of a disposal method to inactivate a disease will also vary. In this appendix we will include information on several diseases currently of concern. Keep in mind knowledge of diseases is always changing and information in this appendix is included as a guide. Specific disease information should be updated and confirmed with relevant experts including IDALS and USDA staff.

Table C-1 lists diseases currently of concern and indicates which disposal options are appropriate for disease inactivation or control in the carcass.

Use Table C1 as a tool to evaluate which disposal option to use.

**NOTE**: **It's important to consider**

- Cost of the method,
- **Risk of spreading disease during transport and handling,**
- Availability of equipment and materials, and
- Final carcass disposition.

## Table C-1. Disposal Options based on Disease

| Disease | Disease Type | Composting | Burial | Incineration | Landfill | Rendering** | Alkaline Hydrolysis |
|---|---|---|---|---|---|---|---|
| African Swine Fever* | V | A | A | P | A | A | A |
| Anthrax | B | P | P | A | A | P | A |
| Avian Influenza | V | A | A | P | A | A | A |
| Bovine Spongiform Encephalopathy (BSE) | Pr | P | P | A | P | N | A |
| Brucellosis | B | A | A | P | A | A | A |
| Chronic Wasting Disease | Pr | P | P | N | P | N | A |
| Classical swine fever | V | A | A | P | A | A | A |
| Duck Plague | V | A | A | P | A | A | A |
| Equine infectious anemia* | V | A | A | P | A | A | A |
| Foot and Mouth Disease | V | A | A | P | A | A | A |
| Newcastle Disease | V | A | A | P | A | A | A |
| Paratuberculosis (Johne's Disease) | B | A | A | P | A | A | A |
| Pseudorabies | V | A | A | P | A | A | A |
| Rift Valley Fever* | V | A | A | P | A | A | A |
| Schmallenberg Virus* | V | A | A | P | A | A | A |
| Scrapie | Pr | P | P | N | P | N | A |
| Tuberculosis | B | P | A | P | A | A | A |
| Tularemia* | B | A | A | P | A | A | A |
| Vesicular stomatitis* | V | A | A | P | A | A | A |
| West Nile virus* | V | A | A | P | A | A | A |

**Disease Types:** B – Bacteria, Pr – Prion, V – Virus

**Disposal Options:**

**A – Appropriate** - Event specific conditions must be taken into consideration

**P – Potentially Appropriate** – Disposal option can be used if event and disease specific conditions allow.

**N – Not Appropriate** – Disposal option not recommended for this disease

** Virus or Bacteria transmitted by a vector (insect or fomite - including clothes, feed, equipment)*

*** Rendering may also require special disposal of rendering end product.*

Disease-specific information is summarized from the following sources:

- USGS National Wildlife Health Center, Field Manual of Wildlife Diseases.
- USDA APHIS Animal Disease Information website
- ISU Center for Food Safety and Public Health Animal Disease Information website
- OIE World Organization for Animal Health

### 1. African Swine Fever - Virus

**Description:** African Swine Fever (ASF) virus is a DNA virus. It is the only known DNA arbovirus. ASF is a contagious viral disease that affects pigs of all ages, inducing a hemorrhagic fever. It can appear in a variety of forms ranging from peracute, acute, subacute, to chronic and unapparent. It is most often recognized in the acute form with an associated lethality of up to 100 percent. Today, the disease is considered endemic in sub-Saharan Africa, the Italian Mediterranean island of Sardinia, Asia and parts of the Caucasus and Eastern Europe. The extremely high potential for transboundary spread of ASF was demonstrated by its arrival in the Caucasus in 2007 and its progressive advance through the Russian Federation into Eastern Europe, where it now seems established.

ASF is stable at low temperatures and a wide pH range from 4 to 12. The virus can be inactivated at temperatures above 140 F for more than 20 minutes. Inactivated by sodium hydroxide, hypochlorites, chlorine, formalin, ortho-phenylphenol and iodine compounds at various concentrations.

The virus can survive for long periods in blood, feces and tissue; especially infected, uncooked or under-cooked pork products and can survive one year in bone marrow.

**Transmission:** Swine can become infected through:

- **Direct**
    - Contact between sick and healthy animals
- **Indirect**
    - Feeding on contaminated garbage (virus can be viable for 3-6 months in uncooked pork products)
    - Biological vectors – soft ticks
    - Fomites including premises, vehicles, equipment and clothing
    - Within tick vectors. ASF can be transmitted within a tick population

**Incubation Period:** Incubation period for ASF is 4-19 days.

**Mortality:** Peracute and acute forms are highly virulent approaching 100% mortality. Subacute form is moderately virulent varying from 30-70% mortality and chronic form has a low mortality rate.

### 2. Anthrax – Bacteria

**Description:** Anthrax is a bacterial disease. These bacteria release highly resistant spores, which contaminate the environment and help to spread the disease. Anthrax causes sudden death in cattle, sheep and goats, and can severely affect humans. Anthrax has also been used as a biological weapon.

Cattle, sheep, and goats are most at risk for anthrax. Other animals, including horses, pigs, dogs, cats, and wildlife can also get anthrax.

**Transmission:** Most animals get anthrax orally through soil contaminated with anthrax spores while grazing. The organism is very hardy, resistant to most disinfectants and can survive for long periods in the environment. Carnivores can get the disease by eating animals infected with anthrax.

**Incubation Period:** The incubation period varies from 1 to 20 days. In herbivores, infections become apparent after 3 to 7 days. The incubation period in pigs is usually 1 to 2 weeks.

**Mortality:** The mortality rate for anthrax varies with the species. Clinical infections in ruminants and horses are usually fatal; pigs often recover. In carnivores, mortality is also relatively low.

### 3. Avian Influenza - Virus

**Description:** Avian influenza is a viral disease that can affect bird species throughout the world. The disease can vary from mild to severe, depending on the virus strain involved. The most severe strain, called highly pathogenic avian influenza (HPAI), is caused by viruses with H5 or H7 surface proteins. Avian influenza primarily affects wild and domestic bird species.

**Transmission:** Avian influenza is spread by direct contact with the fecal matter or respiratory secretions of infected birds. The virus can live for a long time in the environment and can also be spread by objects or fomites (e.g., shoes, clothing, equipment) that have been contaminated with the virus. Mammals may be exposed by ingestion of infected birds. Avian influenza viruses survive best in the environment at low temperatures, and some studies suggest that they are more persistent in fresh or brackish water than salt water. In laboratory tests, some viruses may survive for several weeks to several months or more in distilled water or sterilized environmental water, especially under cold conditions. Most human cases result from close contact with sick birds.

**Incubation Period:** The incubation period for avian influenza is 3- 7 days.

**Mortality:** Waterfowl can carry the disease without becoming sick, however domestic poultry are very susceptible to the disease and can die in large numbers. Some strains of the virus can affect mammals, such as pigs, cats, horses, dogs and ferrets.

### 4. Bovine Spongiform Encephalopathy (BSE) - Prion

**Description:** Bovine spongiform encephalopathy (also called “mad cow disease” or BSE) is a fatal neurodegenerative disease, caused by a prion that mainly affects cattle. Other ruminant species, cats (feline spongiform encephalopathy), non-human primates and humans (variant Creutzfeldt-Jakob disease) are occasionally affected. BSE is a relatively new disease that was first reported in the United Kingdom in the 1980s.

Decontamination of prion-contaminated tissues, surfaces, and environments is difficult. These agents are highly resistant to most disinfectants, heat, ultraviolet radiation, and ionizing radiation, particularly when they are protected in organic material. A combination of chemical and physical decontamination can be more effective than either procedure alone; chemical disinfection should be carried out first, then the items should be rinsed and autoclaved. Even the harshest combination of chemical and physical disinfection is not guaranteed to destroy all prions. For this reason, disposable equipment and instruments may be recommended instead of disinfection during some medical procedures.

**Transmission:** It is spread by ingestion; animals or humans become infected when they eat prion-containing tissues from an infected animal. Cooking and standard disinfection procedures do not destroy this agent.

**Mortality:** Infected animals or people do not become ill for years; however, the disease is always progressive and fatal once the clinical signs develop.

**Incubation Period:** The incubation period for classical BSE is estimated to be 2 to 8 years in cattle. Classical BSE is seen most often in four- to five-year-old cattle, particularly dairy animals.

### 5. Brucellosis - Bacteria

**Description:** Brucellosis is a bacterial disease and an important zoonosis and a significant cause of reproductive losses in animals. Brucellosis affects cattle, small ruminants, pigs and dogs. Brucellosis is also found in wildlife populations including feral pigs, bison, elk and European hares. Most human cases are caused by occupational exposure to infected animals or the ingestion of unpasteurized dairy products.

Brucella species are readily killed by most commonly available disinfectants, however, organic matter and low temperatures decrease the efficacy of disinfectants. Autoclaving can be used to destroy Brucella species on contaminated equipment. These organisms can also be inactivated by dry heat (160-170°C for at least 1 hour). Boiling for 10 minutes is usually effective for liquids. Brucella species can also be inactivated by gamma irradiation (e.g., in colostrum) and pasteurization.

**Transmission:** Brucellosis is usually transmitted between animals by contact with the placenta, fetus, fetal fluids and vaginal discharges from an infected animal. Animals are infectious after either an abortion or full term delivery.

**Incubation Period:** The incubation period varies with the species and stage of gestation at infection. In cattle, reproductive losses typically occur during the second half of the pregnancy; thus, the incubation period is longer when animals are infected early in gestation.

**Mortality:** Abortions, placentitis, epididymitis and orchitis are the most common consequences, although other syndromes are also reported. The main impact is economic; deaths are rare except in the fetus and neonate.

### 6. Chronic Wasting Disease - Prion

**Description:** Chronic wasting disease (CWD) is a neurodegenerative disease caused by a prion that affects cervids including deer, elk, moose and reindeer. CWD originated in a small geographic area in northeastern Colorado and southeastern Wyoming. Today this disease is now found in wild and/or farmed cervids in many other states in the U.S., and in parts of Canada. Thousands of captive or wild deer and elk have been killed in the U.S. and Canada in control efforts.

There are concerns about potential for CWD to affect other species, including humans. Cooking does not destroy prions, and ingestion of another prion, the agent that causes bovine spongiform encephalopathy (BSE), has been linked to a fatal human neurological disease. CWD prions have been found in muscle (meat), as well as other tissues of cervids, and could enter the food supply. The evidence so far suggests that CWD does not affect humans, livestock or wild predators of cervids; nevertheless, the possibility that it could be zoonotic has not been ruled out.

Incineration is commonly used for carcasses, but two studies found that composting may reduce or eliminate CWD and other prions in tissues, while another suggested that soil microorganisms might degrade prions in buried carcasses.

**Transmission:** It is one of the most difficult prion diseases to control: CWD prions are transmitted from animal to animal, and they can also be spread from contaminated environments for up to two years or more.

**Incubation Period:** The minimum incubation period is thought to be approximately 16 months, and the average incubation period is probably 2 to 4 years.

**Mortality:** This disease is always fatal once the clinical signs appear, and most or all of a herd can eventually become infected.

### 7. Classical swine fever - Virus

**Description:** Classical swine fever is a highly contagious and economically significant viral disease of pigs. The severity of the illness varies with the strain of the virus, the age of the pig, and the immune status of the herd. Acute infections, which are caused by highly virulent isolates and have a high mortality rate in naive herds, are likely to be diagnosed rapidly. However, infections with less virulent isolates can be more difficult to recognize, particularly in older pigs. The range of clinical signs and similarity to other diseases can make classical swine fever challenging to diagnose.

Classical swine fever virus (CSFV) can be inactivated with sodium hypochlorite, phenolic compounds, detergents, organic solvents, quaternary ammonium compounds and aldehydes. It is also sensitive to drying, heat and ultraviolet light. This virus is reported to be destroyed by heating for a minute or less at 90-100ºC or 5 minutes at 70°C. In meat, CSFV is susceptible to a temperature of 65.5ºC or higher, maintained for 30 minutes. It is stable at pH 5-10, but inactivated by pH ≤ 3 or pH > 10.

**Transmission:** Pigs are mainly thought to become infected by the oral or oronasal routes. CSFV may also enter the body via other mucus membranes (including genital transmission in semen), and skin abrasions. CSFV can persist in blood and tissues after death and is readily spread by feeding uncooked swill that contains tissues from infected pigs. Aerosol transmission has been demonstrated experimentally with some strains. It is most likely to occur between mechanically ventilated buildings in close proximity, when there are large concentrations of animals.

**Incubation Period:** Incubation period for Classical Swine Fever is 2-14 days.

**Mortality:** Highly virulent strains of CSFV, which were prevalent at one time, cause outbreaks with morbidity and mortality rates that can approach 100%.

### 8. Duck Plague - Virus

**Description:** Duck plague is caused by a herpesvirus. Infection often results in an acute, contagious, and fatal disease. As with many other herpesviruses, duck plague virus can establish inapparent infections in birds that survive exposure to it, a state referred to as latency. During latency, the virus cannot be detected by standard methods for virus isolation. Destruction of infected flocks, including eggs, is recommended whenever possible because infected birds that survive are likely to become carriers and can initiate subsequent outbreaks.

Duck plague virus is hardy, and can remain viable for weeks under certain environmental conditions. Duck plague virus is instantly inactivated at pH 3 and below and at pH 11 and above. Therefore, rigorous decontamination of infected waters and grounds and burning or decontamination of physical structures, litter, and other materials at outbreak sites should be carried out to the extent practical. Carcass collection should be thorough and incineration used for disposal. Personnel and equipment used at outbreak sites should be de-contaminated before leaving the site to prevent mechanical spread of the virus to other waterfowl areas; chlorine bleach and phenol base disinfectants are suitable for this.

**Transmission:** Duck plague outbreaks are thought to be caused when birds that carry the virus shed it through fecal or oral discharge, thus releasing the virus into food and water with which susceptible birds may have contact. Bird-to-bird contact and contact with virus that has contaminated the environment perpetuate an outbreak. Scavenging and decomposition of carcasses of infected birds also contaminate the environment by releasing viruses from tissues and body fluids. Virus transmission through the egg has been reported, but the role of the egg in the disease cycle remains to be resolved.

**Incubation Period:** The incubation period between virus exposure and death is generally 3–7 days in domestic ducks, and experimental studies have found that it is as long as 14 days in wild waterfowl.

**Mortality:** Mortality varies with susceptibility of the flock and can range from 5% to 50% or more.

### 9. Equine infectious anemia – Vector transmitted Virus

**Description:** Equine infectious anemia (EIA) is a retroviral disease of equids that may be characterized by acute and/or chronic recurring clinical signs including fever, anemia, edema and cachexia in some animals. Many horses have very mild or inapparent signs on first exposure, and carry this virus subclinically. The owners of these animals are unlikely to realize that they are infected unless serological testing is done. All infected horses, including those that are subclinical, become carriers and are infectious for life. Infected animals must either be destroyed or remain permanently isolated from other equids to prevent transmission. High levels of viremia have also been reported during the early stages of the infection in mules. Significantly lower titers have been reported in donkeys inoculated with certain horse-adapted strains. Enveloped viruses such as EIAV are readily destroyed by most common disinfectants. This virus does not persist in insects, which are mechanical vectors.

**Transmission:** Equine infectious anemia virus is transmitted mechanically on the mouthparts of biting insects and sharing of needles between horse during routine care. In horses, this virus persists in blood leukocytes for life, and also occurs in plasma during febrile episodes. Symptomatic horses are more likely to transmit the disease than animals with inapparent infections; after visiting an subclinical carrier, only one out of every 6 million flies is likely to become a vector.

**Incubation Period:** The incubation period is a week to 45 days or longer. Some horses remain subclinical until they are stressed.

**Mortality:** Epizootics with high morbidity and mortality rates have been reported, but deaths are otherwise uncommon in naturally infected horses. Experimental inoculation with a high viral dose can result in mortality rates as high as 80%.

## 10. Foot and Mouth Disease - Virus

**Description:** Foot and mouth disease (FMD) is a highly contagious viral disease that primarily affects cloven-hooved livestock and wildlife. Foot and mouth disease was once found worldwide; however, it has been eradicated from some regions including all of North America and western Europe. Where it is endemic, this disease is a major constraint to the international livestock trade. Unless strict precautions are followed, FMD can be readily re-introduced into disease-free regions via animals or animal products. Once introduced, the virus can spread rapidly, particularly if livestock densities are high or detection is delayed. Outbreaks can severely disrupt livestock production, result in embargoes by trade partners, and require significant resources to control.

There is limited information on the survival of FMDV in the environment, but most studies suggest that it remains viable for three months or less. In very cold climates, survival up to six months may be possible. The presence of organic material, as well as protection from sunlight, also promote longer survival. FMDV is sensitive to pH, and it is inactivated at pH below 6.0 or above 9.0. This virus can persist in meat and other animal products when the pH remains above 6.0, but it is inactivated by acidification of muscles during rigor mortis. Because acidification does not occur to this extent in the bones and glands, FMDV may persist in these tissues.

Various disinfectants are effective against FMDV. The disinfectant concentration and time needed can differ with the surface type and other factors. Measures taken to control an FMD outbreak include quarantines and movement restrictions, euthanasia of affected and exposed animals, and cleaning and disinfection of affected premises, equipment and vehicles. Additional actions may include euthanasia of animals at risk of being infected and/or vaccination.

Infected carcasses must be disposed of safely by incineration, rendering, burial or other techniques.

**Transmission:** FMDV can be found in all secretions and excretions from acutely infected animals, including expired air, saliva, milk, urine, feces and semen, as well as in the fluid from FMD-associated vesicles, and in amniotic fluid and aborted fetuses in sheep. The amount of virus shed by each route can be influenced by the host species and viral strain. Pigs produce large amounts of aerosolized virus, and the presence of large herds of infected swine may increase the risk of airborne spread.

**Incubation Period:** The incubation period for FMD can vary with the species of animal, the dose of virus, the viral strain and the route of inoculation. It is reported to be one to 12 days in sheep, with most infections appearing in 2-8 days; 2 to 14 days in cattle; and usually 2 days or more in pigs (with some experiments reporting clinical signs in as little as 18-24 hours). Other reported incubation periods are 4 days in wild boar, 2 days in feral pigs, 2-3 days in elk, 2-14 days in Bactrian camels, and possibly up to 21 days in water buffalo infected by direct contact.

**Mortality:** Although adult animals generally recover, the morbidity rate is very high in naïve populations, and significant pain and distress occur in some species. High mortality rates can sometimes occur in young animals or in some wildlife populations. In lambs, reported mortality rates range from 5% to 94%. Mortality has also been reported to reach 80% in some groups of calves, and 100% in suckling piglets (with lower rates in older piglets).

## 11. Newcastle Disease - Virus

**Description:** Newcastle disease (ND) is a highly contagious and often severe disease found worldwide that affects birds including domestic poultry. It is caused by a virus in the family of paramyxoviruses. The disease appears in three forms: lentogenic (mild), mesogenic (moderate) and velogenic (very virulent, also called exotic Newcastle disease). The lentogenic strains are very widespread, but cause few disease outbreaks.

Newcastle disease viruses can survive for several weeks in the environment, especially in cool weather. The virus is present in all parts of the carcass of an infected bird. The disease is very contagious.

When the disease appears in a previously disease free area, a stamping out policy is practiced in most countries. This includes: strict isolation or quarantine of outbreaks; humane destruction of all infected and exposed birds; thorough cleaning and disinfection of premises; proper carcass disposal; pest control in flocks; depopulation followed by 21 days without poultry before restocking; avoidance of contact with birds of unknown health status; control of access to poultry farms.

**Transmission:** ND is transmitted most often by direct contact with diseased or carrier birds. Infected birds may shed the virus in their feces, contaminating the environment. Transmission can then occur by direct contact with feces and respiratory discharges or by contaminated food, water, equipment, and human clothing.

**Incubation Period:** The disease has a rapid onset with clinical signs appearing between two and twelve days after exposure, and spreads rapidly through the flock.

**Mortality:** When the virus is introduced into a susceptible flock, virtually all the birds will be infected within two to six days. Mortality rates are variable but can reach 100%.

## 12. Paratuberculosis (Johne's Disease) - Bacteria

**Description:** Paratuberculosis is a chronic mycobacterial disease characterized by irreversible wasting, diarrhea and death from cachexia in ruminants. Infection generally occurs early in life, and many infected animals become chronic carriers. Unless testing is done, paratuberculosis can exist undetected in a herd for years. Only a few carriers develop overt disease, usually after several years, and the clinical signs can be confused with other diseases. Paratuberculosis also causes production losses in subclinicalally infected animals. Subclinical carriers are estimated to produce 15-16% less milk, with losses of 1,300-2,800 pounds of milk per lactation. There is no effective treatment. Unless measures are taken to control or eradicate the organism, the prevalence of infection gradually increases in the herd and greater numbers of animals become clinically ill.

In an endemic herd, only a minority of the animals develops clinical signs; most animals either eliminate the infection or become subclinical carriers. In a newly infected herd, the infection usually spreads for years before the first clinical signs appear. If no preventative measures are taken, the number of infected animals in the herd gradually rises, young animals are exposed to increasing doses of bacteria, and clinical cases appear – first in older animals and later, as the exposure level increases, also in younger animals. In herds where the organism is widespread, clinical signs can be seen in second- and first-calf cows, and even springers or bred heifers. The percentage of subclinical carriers that develop overt disease is unknown.

**Transmission:** In ruminants, paratuberculosis is mainly transmitted by the fecal–oral route. Infected animals can shed large numbers of organisms in the feces; this shedding can begin before the onset of clinical signs. Subclinical carriers may shed the bacteria intermittently. *M. avium* subsp. paratuberculosis has also been isolated from colostrum, milk, udder, and the male and female reproductive tracts. Transmission can occur on fomites, and insects may act as mechanical vectors.

**Incubation Period:** The incubation period is usually months or years; periods ranging from 4 months to 15 years have been reported. Calves generally become infected soon after birth but rarely show clinical signs before they are two years old.

**Mortality:** The mortality rate is approximately 1% in most herds, but up to 50% of the animals may be subclinical infected, resulting in losses in production. Once clinical signs appear, paratuberculosis is progressive and affected animals eventually die.

### 13. Pseudorabies - Virus

**Description:** Aujeszky's disease (pseudorabies) is a highly contagious, economically significant disease of pigs. Other species may be infected when they come in contact with infected pigs, resulting in a universally fatal CNS disease. Aujeszky's disease can result in trade restrictions from regions where it is endemic. Eradication programs are underway or have been successful in many countries. In the United States, all states are now considered to be free of the virus in domesticated swine, and a surveillance program is ongoing. The presence of the virus in feral pigs remains a concern. Aujeszky's disease is most common in pigs. Feral swine tend to become infected with attenuated strains as adults, and neither illness nor deaths are usually seen.

Disinfection is important in controlling the spread of Aujeszky's disease. ADV is susceptible to ortho-phenylphenols and quaternary ammonium compounds. It is also inactivated by sunlight, drying, and high temperatures.

**Transmission:** Aujeszky's disease virus is usually transmitted between pigs by the respiratory or oral routes. During acute infections, the virus is present for more than two weeks in the tonsillar epithelium, milk, urine, and vaginal and preputial secretions. Aujeszky's disease is usually spread directly between animals by nose-to-nose transmission; however, the virus can remain infectious for as long as seven hours in the air, if the relative humidity is at least 55%, and it may travel up to two kilometers as an aerosol. It can also be transmitted on fomites and in carcasses. Under favorable conditions, ADV can survive for several days in contaminated bedding and water. Venereal transmission is possible, and may be the most important method of spread in wild pigs. Piglets can be infected transplacentally.

**Incubation Period:** The incubation period is usually 2 to 4 days in suckling pigs, and 3 to 6 days in weaned or adult pigs.

**Mortality:** This viral infection causes central nervous system (CNS) signs and high mortality rates in young animals, and respiratory illness in older pigs. The mortality rate decreases with increasing age; it may be as low as 1 to 2% in grower and finisher pigs, 5- 10% in weaner pigs, up to 50% (or higher) in nursery pigs, and as high as 100% in animals less than a week old. Approximately 20% or fewer sows abort. Sporadic cases occur in other species in close contact with pigs. In these species, Aujeszky's disease is always fatal.

## 14. Rift Valley Fever – Vector transmitted Virus

**Description:** Rift Valley fever is a viral disease spread primarily by mosquitoes, which can affect both humans and animals causing high mortality in young animals and/or abortions in adults. Sheep, cattle, and goats are the most severely affected. Other animals such as water buffalo, camels, monkeys, rodents, cats, dogs, and horses can also be infected. Rift Valley fever occurs throughout most of Africa, and has been reported in Egypt, Saudi Arabia, and Yemen. The disease has not occurred in the United States.

**Transmission:** Rift Valley fever is spread to animals through the bite of an infected mosquito, and possibly ticks and biting midges. Many human cases are caused by occupational exposure to blood and tissues from infected animals, but mosquito-borne transmission can also occur.

**Incubation Period:** The incubation period in sheep, goats and cattle is thought to be approximately 1-3 days, based on laboratory experiments. Young ruminants and puppies can develop clinical signs as early as 12 hours after inoculation.

**Mortality:** The case fatality rate can be very high in young animals, with fatalities decreasing in older age groups. The mortality rate may reach 70% to 100% in newborn lambs and kids, while mortality in calves, and older lambs and kids, varies from 10% to 70%. Overall, the mortality rate is estimated to be 10-30% in adult sheep and < 10% in adult cattle. Mortality rates were 81% in experimentally infected young kittens (≤ 2 weeks of age), and 50-100% in young puppies (≤ 1 week of age), but no adult cats or dogs 2 weeks of age or older died.

## 15. Schmallenberg Virus – Vector transmitted Virus

**Description:** The virus is thought to be distributed by flying insects such as midges and possibly mosquitos. Infection with the virus causes transient disease in adult cattle, sheep and goats, resulting in production losses; but has also been associated with a high percentage of fetal malformations, abortions, dystocias and death of infected pregnant animals. No treatments or vaccines are currently available, and testing is currently limited in nature. The “Schmallenberg virus” (SBV) is an enveloped, negative-sense, segmented, single-stranded RNA virus. The Schmallenberg virus is a member of the Simbu serogroup viruses, which includes Shamonda, Akabane, and Aino viruses. The Simbu viruses which are most related to SBV are Sathuperi and Douglas virus. Infectivity is lost (or significantly reduced) at 50–60°C for at least 30 minutes. The virus is susceptible to common disinfectants (1% sodium hypochlorite, 2% glutaraldehyde, 70% ethanol, formaldehyde).

**Transmission:** Transmission in animals is by insect vectors and then vertically in utero.

**Incubation Period:** In experimental challenge trials, three calves inoculated intravenously or subcutaneously with blood that was Polymerase chain reaction (PCR) analysis positive for SBV became infected and had positive PCR results 2-5 days post-inoculation. The viremic stage in cattle seems to be short, as viral detection was negative in all three infected animals six days after inoculation, and clinical signs subsided within a few days (Hoffmann et al. 2012). In other experimental infection tests cattle and sheep showed no clinical signs or mild clinical signs at 3 to 5 days post-inoculation with an incubation period of between 1 and 4 days and viraemia lasting for 1 to 5 days.

**Mortality:** Associated with a high percentage of fetal malformations, abortions, dystocias and death of infected pregnant animals.

## 16. Scrapie - Prion

**Description:** Scrapie is a neurodegenerative disease, caused by a prion that affects sheep and occasionally goats. Scrapie is a member of the transmissible spongiform encephalopathies (TSEs), a group of neurodegenerative disorders caused by unconventional disease agents. These agents are resistant to the treatments that ordinarily destroy bacteria, spores, viruses and fungi. In sheep, the animal's genotype strongly influences the incidence of disease. The presence of this disease can result in trade sanctions, and many countries are conducting control or eradication programs.

As a result of scrapie surveillance, an atypical form of this disease has recently been detected in many countries in Europe, as well as in the United States. This novel form of scrapie, which was first reported from Norway in 1998, is called Nor98. Nor98 scrapie can occur in sheep that are genetically resistant to classical scrapie. The tissue distribution of the Nor98 prion differs from that of the classical prion protein, and some testing protocols must be modified to detect this form. Other atypical forms of scrapie have also been found in some countries.

**Transmission:** Infected animals carry the scrapie prion for life, and can transmit the agent even if they remain subclinical. Most animals become infected from their dam, either at or soon after birth. In confined lambing areas, the disease can also spread to the offspring of uninfected sheep. Uninfected adult ewes may be infected from this source, although they are more resistant. Vertical transmission in utero might be possible, but current evidence suggests that transmission mainly occurs after birth. This prion has also been isolated from an experimentally contaminated soil sample after three years. Transmission via contaminated fomites such as knives is theoretically possible, and transmission has been reported in a contaminated vaccine.

**Incubation Period:** The incubation period is usually 2 to 5 years in sheep; cases are rare in sheep less than a year old.

**Mortality:** Genetically susceptible sheep do not become ill for several years; however, scrapie is progressive and fatal once the clinical signs develop. Typically, scrapie results in production losses and an annual mortality rate of 3-5% in a flock; in severely affected flocks, the annual mortality rate can reach 20%.

## 17. Bovine Tuberculosis - Bacteria

**Description:** Bovine tuberculosis (TB) is a chronic bacterial disease of cattle that occasionally affects other species of mammals. This disease is a significant zoonosis that can spread to humans, typically by the inhalation of aerosols or the ingestion of unpasteurized milk. It is caused by three specific types of bacteria that are part of the *Mycobacterium* group: *Mycobacterium bovis*, *M. avium*, and *M. tuberculosis*. Bovine TB, caused by *M. bovis*, can be transmitted from livestock to humans and other animals.

In developed countries, eradication programs have reduced or eliminated tuberculosis in cattle, and human disease is now rare; however, reservoirs in wildlife can make complete eradication difficult. Bovine tuberculosis is still common in less developed countries, and severe economic losses can occur from livestock deaths, chronic disease and trade restrictions. In some situations, this disease may also be a serious threat to endangered species.

**Transmission:** Bovine Tuberculosis can be transmitted by the inhalation of aerosols, by ingestion, or through breaks in the skin. Cattle shed bovine tuberculosis in respiratory secretions, feces and milk, and sometimes in the urine, vaginal secretions or semen.

**Incubation Period:** The clinical signs of bovine tuberculosis usually take months to develop in cattle. Infections can also remain dormant for years and reactivate during periods of stress or in old age. Similarly, severe disease can develop in some deer within a few months of infection, while other deer do not become symptomatic for years.

**Mortality:** The severity of the disease varies with the dose of infectious organisms and individual immunity. Infected animals may remain subclinical, become ill only after stress or in old age, or develop a chronic, debilitating fatal disease. In developed countries, most reactors are detected during routine testing and mortality from tuberculosis is rare.

### 18. Tularemia - Bacteria

**Description:** Tularemia is a zoonotic bacterial disease that can affect many mammals. It is most prevalent among wild animals, but clinical cases occur regularly in cats, and outbreaks have been reported among sheep, captive prairie dogs and ranched mink. Tularemia is considered to be a potential bioterrorism agent.

This organism is found in the blood and tissues of infected animals, and it can survive for long periods on fomites including food and water. Aquatic animals may develop tularemia after being immersed in contaminated water, and some human outbreaks have been linked to drinking from natural springs and wells. Carnivores can be infected by ingesting carcasses, and cannibalism seemed to be the primary route of transmission during an outbreak in captive prairie dogs. Susceptibility varies among domesticated animals. Epizootics of tularemia were once common among range sheep in Idaho, Montana and Wyoming, and occasional outbreaks can still occur. The morbidity rate/ abortion rate in this species can be as high as 50%.

**Transmission:** *F. tularensis* can be transmitted by ingestion, inhalation, arthropod–borne transfer, or direct contact with mucous membranes and broken skin.

**Incubation Period:** The incubation period is 1 to 10 days.

**Mortality:** A variety of syndromes can be seen, but fatal septicemia is common in some animal species. In humans, the disease varies from a localized illness to fulminant, life-threatening pneumonia or septicemia. Mortality rates up to 10-15% are seen in untreated lambs, but adult sheep do not usually develop systemic signs. Cats seem to be relatively susceptible to tularemia. Sick cats often have severe clinical signs, and the mortality rate is high if the disease is not treated early. Tularemia is relatively common and highly fatal in some species of wild animals.

### 19. Vesicular stomatitis – Vector transmitted Virus

**Description:** Vesicular stomatitis is an important vector borne viral disease of livestock in the Americas. These outbreaks end after freezing temperatures kill the insect vectors that transmit vesicular stomatitis; however, the introduced viruses may overwinter for a year or two, re-emerging in the spring. It can affect ruminants, horses and pigs, causing vesicles, erosions and ulcers on the mouth, feet and udder. Vesicular stomatitis viruses are endemic from southern Mexico to northern South America, but

regularly spread north and south from these regions, causing outbreaks and epidemics. While these viruses are no longer endemic in the U.S., they are introduced periodically into the southwestern states, and can sometimes spread farther north.

Vesicular stomatitis is clinically indistinguishable from several other vesicular diseases of livestock including foot-and-mouth disease (FMD). Prompt diagnosis is important not only for containing vesicular stomatitis outbreaks, which can restrict international trade, but also in preventing major livestock diseases such as FMD from spreading undetected. People who work with vesicular stomatitis viruses or come in close contact with infected animals sometimes become infected and develop an influenza-like illness. The animal morbidity rate for vesicular stomatitis is highly variable, and ranges from 5% to more than 90%.

**Transmission:** Insect vectors are thought to introduce vesicular stomatitis virus (VSV) into populations of domesticated animals. Sand flies (*Lutzomyia* sp.), blackflies (family *Simuliidae*) and *Culicoides* midges can act as biological vectors. Sand flies seem to be important vectors in endemic areas, but have a limited flight range and are not thought to spread the viruses long distances. Blackflies are believed to be particularly important vectors in parts of the western U.S. Once animals develop lesions, however, insects may become infected by feeding on viruses in these lesions or contaminated secretions. In addition, infected blackflies can transmit VSV to other blackflies feeding at the same time on a host, even if the host is not infected. Once it has been introduced into a herd, vesicular stomatitis can spread from animal to animal by direct contact. Broken skin or mucous membranes may facilitate entry of the virus. Infected animals shed VSV in vesicle material. Viruses from lesions in the mouth and on the muzzle can contaminate saliva, and to a lesser extent, nasal secretions.

**Incubation Period:** The incubation period is usually 3-7 days, but longer or shorter incubation periods have been reported.

**Mortality:** Although deaths are rare, these lesions can result in pain, anorexia and secondary bacterial mastitis, and some animals may lose their hooves after developing laminitis.

### 20. West Nile Virus – Vector transmitted Virus

**Description:** West Nile virus (WNV) is a mosquito-borne virus that circulates among birds, but can also affect other species, particularly humans and horses. Many WNV strains are thought to be maintained in Africa. However, migrating birds carry these viruses to other continents each year, and some strains have become established outside Africa. At one time, the distribution of WNV was limited to the Eastern Hemisphere, and it was infrequently associated with serious illness. Clinical cases usually occurred sporadically in humans and horses, or as relatively small epidemics in rural areas. Most human infections were subclinical, and if clinical signs occurred, they were typically mild and flu-like. Severe illnesses, characterized by neurological signs, seemed to be uncommon in most outbreaks.

Birds appeared to be unaffected throughout the Eastern Hemisphere, possibly because they had become resistant to the virus through repeated exposure. It is reported to be longer in transplant patients than in people who are not immunocompromised. Among domesticated mammals, West Nile outbreaks occur mainly in equids. Many infections in horses are subclinical. While seroprevalence rates vary greatly between studies (and cross-reactivity with other flaviviruses can be a concern), up to 90% of horses are reported to be seropositive in some parts of Africa. During outbreaks, 10-43% of infected horses are estimated to develop neurological signs.

**Transmission:** West Nile virus is primarily transmitted by mosquitoes. Members of the genus *Culex* are the main vectors worldwide, although other mosquito genera can also be infected. In North America alone, there is evidence of infection in more than 60 mosquito species.

**Incubation Period:** The incubation period in horses is 3 to 15 days. Infections in other mammals are uncommon, and the incubation period is unknown. Clinical cases are reported to occur in birds, on average, approximately 5 days after experimental inoculation. The incubation period is approximately 2 to 14 days.

**Mortality:** The reported case fatality rate ranges from 23% to 57%. It is approximately 30-40% in the U.S., and was 30% during a lineage 2 outbreak in Hungary. Once a mammal develops neurological signs, the case fatality rate seems to be high. Most clinically affected animals, which included sheep, alpacas, reindeer, dogs, cats, wolves, deer and a bear, have died, although one alpaca with relatively mild neurological signs recovered. Both rhinoceroses affected in a zoo and one of two seals also recovered.

## Appendix D – Quick Guides

### Poultry

Quick Disease Response Guide

### Swine

Quick Disease Response Guide

### Cattle

Quick Disease Response Guide

IOWA DEPARTMENT OF NATURAL RESOURCES

# A Quick Guide for Ag Producers
# Response to a Poultry Disease Outbreak

*Avian influenza hit Iowa turkey and layer producers hard in 2015. Producers faced agonizing choices as they lost their flocks. They had to make quick decisions on how to dispose of their losses — humanely, economically and safely — for the health of their neighbors and the environment, now and in the future.*

*Composting at turkey facility.*

Poultry producers can use this guide when they have a disease outbreak or are planning for a potential outbreak. Look for these sections: the five carcass disposal options in Iowa, disposal of potentially contaminated waste, supplies, equipment, and the disposal of wastewater generated when decontaminating equipment, vehicles and staff.

## Carcass Disposal

There are five disposal options. Which one you use depends on the disease, facility location, and other qualifying factors. The Iowa Department of Natural Resources (DNR) must approve disposal options prior to disposal. The Iowa Department of Agriculture and Land Stewardship (IDALS) must approve any movement off-site and required biosecurity measures.

### 1 Composting

Composting carcasses effectively inactivates viruses when done correctly. It can be cost and labor effective. Composting speeds up normal decay processes caused by naturally occurring bacteria and fungi. Follow recommendations for construction, materials and temperature monitoring to ensure quick, complete decay, avoid foul odors and prevent releasing of highly contaminated liquids.

### Materials needed for effective composting:

- Carbon Source Material – corn silage, poultry litter, hay/straw, saw dust, ground corn stalks
- Cover Material – corn silage, wood chips, hay/straw, ground corn stalks
- Plan on roughly 12 cubic yards of cover/base material per 1,000 lbs. of carcasses
- To estimate the length of windrow needed, allow one foot of windrow for:
  - 82 ducks
  - 50 chickens
  - 14 turkeys

### Factors indicating effective composting:

**Moisture** — For optimum performance, maintain moisture content between 40 and 60 percent.

Compost should be moist but not soggy. If you can squeeze moisture from a handful of compost, mix it with drier material.

**Carbon Source** — Carbon is needed for high levels of microbial activity. The right materials keep compost porous allowing oxygen into the pile and permitting gases like ammonia - which inhibits microbial activity - to escape. Some materials are particularly good for absorbing excess liquid released by decaying carcasses, an important factor in preventing undesirable environmental impacts.

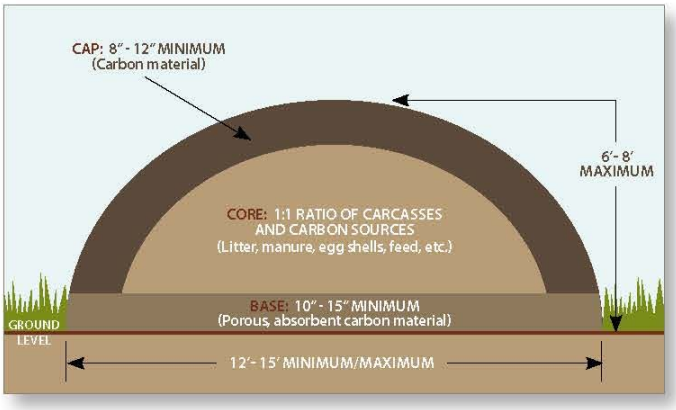
**Heat** — Heat is important for successful composting. Check temperatures frequently to ensure viruses are inactivated. Measure at two depths in the compost pile (18" and 36" from surface) at 10 to 12 locations along the length of the windrow to insure temperatures reach 130 to 150°F for 3 consecutive days.

### Construction:

See Diagram 1 and Table 1 for separation distances.

- Base Layer: Uncompacted and minimum of 15 in deep to absorb leachate.
- Compost Core: 1:1 mix of poultry and carbon source material
- Height: Maximum 8 ft.
- Cover: Minimum 12 in to retain heat and absorb odor and excess precipitation.
- Windrow Width: 15-ft. maximum base; 14-ft. maximum windrow to ensure oxygen penetration.
- Width between Windrows: Two loader lengths

### Diagram 1: Composting Requirements




## 2 Burial

On-site burial can effectively inactivate viruses. When done correctly, it can also be environmentally safe and cost effective. If some animals cannot be buried onsite, consider burial on neighboring properties subject to the owner's approval.

### Site Selection Criteria:

**Materials** — No additional materials needed.

**Factors affecting effective burial** — Burial is easiest and best under dry, warm conditions. Wet, muddy and frozen ground may require special equipment or extra care. Burial site location and conditions must meet DNR-established criteria and site conditions. Verify site location with DNR field staff.

**Exclude Utilities** —First contact IOWA ONE CALL at 800-292-8989 to locate any buried utilities on proposed site. Premises owner must also ensure field drainage tile is located at least 200 feet from excavation.

**Protect Wells and Well Source Water** — Ensure private wells are more than 200 feet and public wells are more than 2,500 feet from the excavation. Check and confirm burial site is not within a source water protection zone for wells regulated by the DNR. Find source water zones at: programs.iowadnr.gov/sourcewater/maps/index.html.

**Use of Geographic Information System Maps** — Use DNR's Burial Zone Siting Atlas at programs.iowadnr.gov/maps/afo/burial.html to locate potential burial sites. The maps assign risks to groundwater contamination based on alluvial soils and karst topography. They also map known private and public wells. The first two zones might be usable,

## Table 1. Separation Distance Required Between Object and Windrow or Trench

| Separation Distance Required (in Feet) | | Object |
|---|---|---|
| Windrow | Burial Trench | |
| 100 | 200 | Private well |
| 200 | 2,500 | Public well |
| 50 | 50 | Adjacent property line |
| 500 | 500 | Existing neighboring residence |
| 100 | 100 | Any surface water body |
| 200 | 200 | Tile line |
| Outside | Outside | Floodplain boundaries, wetland or shoreline area |

but DNR field staff must approve its use before burying:

- Acceptable zone shaded in green - no known restrictions for burial.
- Cautionary zone shaded in yellow - only limited burial recommended.
- Exclusion zone shaded in red - no burial recommended.

**Surface Water Control —** Construct berms to divert surface water around trenches if surface water runoff would flow into trenches.

**Trench Length and Setback Distances—**Although trench length and setbacks will vary with site factors, trenches must meet the following requirements:

- Follow contour lines as closely as possible
- Trench must be placed at least 50 (horizontal) feet from another trench
- Must not include any sand seams or pockets. Stop digging if the trench intersects a sand seam or pocket. Then backfill the last 10 feet of trench with non-sandy soil. Compact backfill area as much as possible. Dig a test pit every 10 feet beyond sandy area. Continue trenching after test pits show soil is free of sand.
- Meet all separation distances listed in Table 1

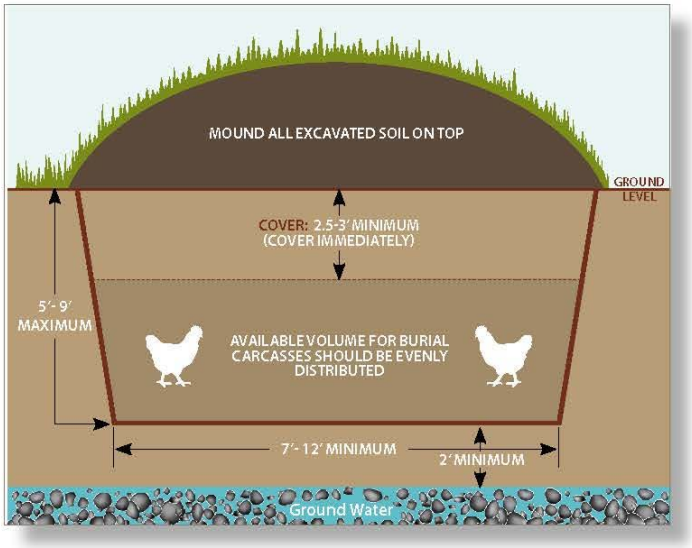
**Trench Construction**

Base size of trench on the size and number of animals to bury. Using Table 2, multiply number of animals by volume per animal to determine volume needed for disposal. Divide by desired width of trench (7 to 12 feet). Divide remaining number by depth (between 5 and 9 feet) to determine the length of trench needed.

**Trench Width —** Between 7 and 12 feet.

**Depth —** Trench should be between 5 and 9 feet deep. Keep sides as vertical as possible. If stability is a problem, slope sides to prevent cave-in and ensure equipment can safely place carcasses. Distribute carcasses evenly on the bottom of the trench.

## Diagram 2: Trench Design Requirements




## Table 2: Volume Estimator

| Type of Animals | Number of Animals | Multiply | Volume in Cubic Feet/ Animal | Trench Volume Needed – width x depth x length (Cubic Feet) |
|---|---|---|---|---|
| 2-lb. Duck | | X | 0.01 | |
| 3-lb. Chicken | | X | 0.02 | |
| 7-lb. Turkey | | X | 0.6 | |

**Groundwater Separation—** Maintain at least 2 feet between the trench bottom and groundwater. Groundwater depth must be verified on site before trenching begins.

**Cover —**

- Cover carcasses with 2.5 to 3 feet of cover below ground level
- Mound all excavated soil over the trench
- Avoid compacting the cover soil
- Seed the excavated area with shallow rooted cover crops such as oats, ryes, and clovers.

## 3 Incineration/Thermal Treatment

While carcasses can be incinerated, sizes and types of equipment vary greatly as does their efficiency. It pays to consider capacity, fuel use and operating costs of available units. Consult with DNR staff to obtain any required permits, waivers or variances before starting operation.

## 4 Landfill

While carcasses can be sent to a landfill, the landfill must approve their acceptance. Also, disposal must meet landfill disposal criteria established by DNR, adhere to strict biosecurity measures at the farm and landfill, and be approved for movement off-site by the Iowa Department of Agriculture and Land Stewardship (IDALS).

## 5 Rendering

While sending carcasses to a rendering plant is approved, the facility must be willing to accept the carcasses. Also strict biosecurity measures must be met at the farm and rendering facility and IDALS must approve moving carcasses off-site. Obtain approval from the DNR and IDALS for the final disposal of the rendered product before choosing this option.

## Non-Carcass Solid Waste

Whenever possible, disinfect and handle non-carcass solid waste as non-infected waste. Discuss disposal options with the veterinarian in charge to determine what material is infected, if the virus can be inactivated, or if materials can be moved off site. If disinfection is not economical or efficient, there are other options.

Contaminated litter/manure, feed, egg products and similar miscellaneous material may have a beneficial use. Egg products may be pasteurized and sold. Consider composting organic material including litter/manure and feed.

Wood, cardboard, paper and similar solid waste can be burned on-site following the DNR disaster debris disposal guidance for burning of tree and brush. If DNR requirements cannot be met, the material can be burned at an approved off site area, taken to a landfill, or incinerated on or off-site with DNR approved incineration equipment. Obtain approvals for off-site disposal according to the method chosen.

## Wastewater

It's important to follow guidelines to safely dispose of wastewater generated when responding to a disease outbreak. Wastewater includes water generated from decontamination and biosecurity, cleaning and disinfection, normal operations or any other wastewater generated at an infected premise. Whenever possible, dispose of wastewater at the infected premise. Take biosecurity measures and get approval from IDALS for off-site disposal.

*Treating wastewater onsite requires approval from DNR and IDALS. Obtain IDALS' approval to transport wastewater to an offsite treatment facility.*

**Disposal options:**

If the site has on-site treatment, obtain DNR and IDALS approval and treat wastewater at the site.

Some thermal units need additional water to process carcasses. Wastewater generated on site can be treated as part of the thermal unit's operating process. Producers can haul wastewater to a thermal unit if they take biosecurity measures and IDALS approves.

Some city or other permitted wastewater treatment facilities will accept wastewater from response operations, including activated sludge treatment plants that use ultra-violet (preferred) or chlorine disinfection. During winter when disinfection units don't normally operate, the facility should activate disinfection units. Alternative treatment such as fixed film may be considered if approved by the DNR field office. Once DNR approves, the treatment facility must agree to accept the wastewater, the producer must adhere to strict biosecurity measures at the farm and the treatment facility, and IDALS must approve moving wastewater off-site.

## DNR Contacts

| Field Office | Business Hours Phone | After Hours Phone (Duty Officer) |
|---|---|---|
| 1 – NE Iowa | 563-927-2640 | 515-725-8694 |
| 2 – NC Iowa | 641-424-4073 | 515-725-8694 |
| 3 – NW Iowa | 712-262-4177 | 515-725-8694 |
| 4 – SW Iowa | 712-243-1934 | 515-725-8694 |
| 5 – SC Iowa | 515-725-0268 | 515-725-8694 |
| 6 – SE Iowa | 319-653-2135 | 515-725-8694 |
| Emergency Response | 515-725-0386 | 515-725-8694 |

rev. October 2016

IOWA DEPARTMENT OF NATURAL RESOURCES

# A Quick Guide for Ag Producers
# Response to a Swine Disease Outbreak

*Hogs are susceptible to multiple disease threats: from porcine epidemic diarrhea, to porcine reproductive and respiratory syndrome, to foot and mouth disease.*

*While no one wants to face the heart-breaking loss of animals, planning ahead can help swine producers make informed decisions. A plan can help producers dispose of their losses—humanely, economically and safely—for the health of their neighbors and the environment.*

Swine producers can use this guide during a disease outbreak or to plan for a potential outbreak. Look for these sections: five carcass disposal options, disposal of potentially contaminated solid waste, and disposal of wastewater generated during decontamination.

Generally, animal carcasses and associated waste products are not considered hazardous waste unless the U. S. Department of Agriculture (USDA) and/or Iowa Department of Agriculture and Land Stewardship (IDALS) categorizes them as hazardous. If enough hazardous material like acids, pesticides or fertilizers contaminates carcasses, the carcasses may be considered hazardous waste.

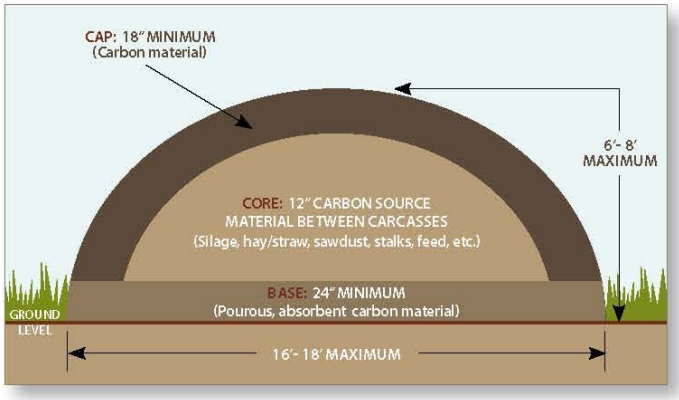
## Carcass Disposal

There are five disposal options. Which one you use depends on the disease, facility location and other qualifying factors. The Iowa Department of Natural Resources (DNR) must approve disposal options prior to disposal. IDALS must approve any movement off-site and requires biosecurity measures.

### 1 Composting

Composting carcasses effectively eliminates viruses when done correctly. It can be cost and labor effective. Composting speeds up normal decay processes caused by naturally occurring bacteria and fungi. Follow recommendations for construction, materials and temperature monitoring to ensure quick, complete decay, avoid foul odors and prevent releasing contaminated liquids.

## Diagram 1: Composting Requirements




### Materials needed for effective composting:

- Carbon Source Material—corn silage, hay/straw, saw dust, ground corn stalks
- Cover Material—corn silage, wood chips, hay/straw, ground corn stalks
- Plan on roughly 12 cubic yards of cover/base material per 1,000 lbs. of carcasses
- Length of windrow needed: length (ft.) = 4 x number of animal units (1 unit = 1,000 lb. animal)

### Factors indicating effective composting:

**Moisture**—For optimum performance, maintain moisture content between 40 and 60 percent. Compost should be moist but not soggy. If you can squeeze moisture from a handful of compost, mix it with drier material.

**Carbon Source**—Carbon is needed for high levels of microbial activity. The right materials keep compost porous allowing oxygen into the pile and permitting gases like ammonia, which inhibits microbial activity, to escape. Some materials are particularly good for absorbing excess liquid released by decaying carcasses, an important factor in preventing undesirable environmental impacts.

**Heat**—Heat is important for successful composting. Check temperatures frequently to ensure viruses are inactivated. Measure at two depths in the compost pile (18 in. and 36 in. from surface) at 10 to 12 locations along the length of the windrow to ensure temperatures reach 130° to 150°F for three consecutive days.

**Construction**—See Diagram 1 and Table 1 for separation distances.

- Base Layer: Minimum of 24 in. depth to absorb leachate.
- Compost Core: 9 in. carbon source material between carcasses
- Height: Maximum 8 ft. (2 layers of mature carcasses)
- Cover: Minimum 18 in. thick to retain heat, and absorb odor and excess precipitation.
- Windrow Width: Less than 16 ft. wide to ensure oxygen penetration.
- Width between Windrows: 2 to 3 loader lengths
- Site Location: Choose a site that is isolated from residences, wells, property lines, tile lines, surface water, flood plain and utilities (See Table 1).

### Table 1. Separation Distances Required from Objects for Composting and Burials

| Separation Distance Required (in Feet) | | Object |
|---|---|---|
| Compost Windrows | Burial Sites | |
| 100 | 200 | Private well |
| 200 | 2,500 | Public well |
| 50 | 50 | Adjacent property lines |
| 500 | 500 | Existing inhabited neighboring residence |
| 100 | 100 | Any surface water body |
| 200 | 200 | Tile line |
| Outside | Outside | Floodplain, wetland or shoreline area |
| Exclude | Exclude | Call Iowa One Call to exclude buried utilities |

## 2 Burial

On-site burial can effectively eliminate viruses. When done correctly, it can also be environmentally safe and cost effective. If some animals cannot be buried onsite, consider burial on neighboring properties subject to the owner's approval.

**Materials and Equipment**— Equipment needed to dig trench and move carcasses. No additional materials needed.

**Factors affecting effective burial**—Burial is easiest and best under dry, warm conditions. Wet, muddy and frozen ground may require special equipment or extra care. Burial site location and conditions must meet DNR-established criteria and site conditions. Verify site location with DNR field staff. Puncture stomach of carcass to reduce gas production in trench.

### Site Selection Criteria:

Choose a site that is isolated from residences, wells, property lines, tile lines, surface water, flood plain and utilities (See Table 1).

**Exclude Utilities**—First contact IOWA ONE CALL at 800-292-8989 to locate any buried utilities on proposed site. Premises owner must also ensure field drainage tile is located at least 200 feet from excavation.

**Protect Wells and Well Source Water**—Ensure private wells are more than 200 feet and public wells

are more than 2,500 feet from the excavation. Check and confirm burial site is not within a source water protection zone for wells regulated by the DNR. Find source water zones at: https://programs.iowadnr.gov/sourcewater/maps/index.html.

**Use of Geographic Information System Maps**—Use DNR's Burial Zone Siting Atlas at https://programs.iowadnr.gov/maps/afo/burial.html to locate potential burial sites. The maps assign risks to groundwater contamination based on the presence of alluvial soils and fractured bedrock. They also map known private and public wells. Areas shown in green and yellow might be usable, but DNR field staff must visit the site and approve its use before burying:

- Acceptable zone shaded in green—no known restrictions for burial.
- Cautionary zone shaded in yellow—only limited burial recommended.
- Exclusion zone shaded in red—no burial recommended.

## Trench Construction

Base size of trench on size and number of animals to bury. Minimum trench design and length (L) is based on one animal unit (AU). Five swine carcasses weighing 1,000-lb. equals one animal unit and requires 42 cubic feet for burial. See Diagram 2.

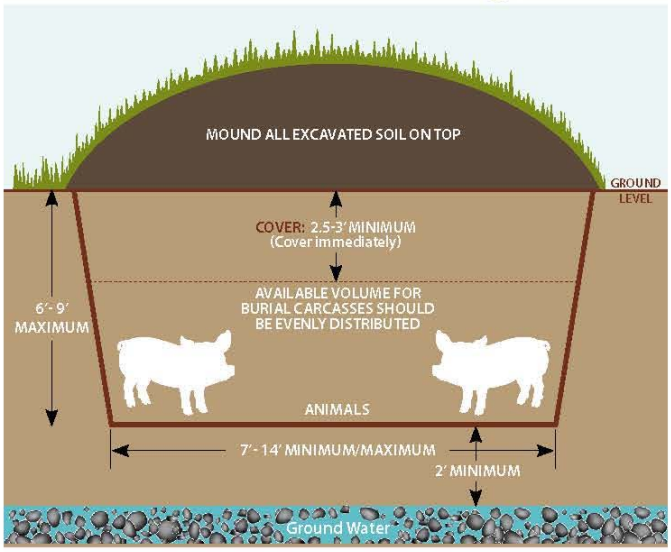
Use Table 2 to calculate trench length (L) and depth (D). Choose desired number of animal layers from Column A and trench width from Col. B, then enter the number of animal units you're burying in Col. C. Multiply animal units by the multiplication factor in Col. E, solving for trench length. Determine trench depth from Col. G. See example in Table 2 to bury 2,500 hogs (1,000 AU) two layers deep. Dig trench 1,500 ft. long and 6.5 to 7 ft. deep.

### Table 2: Multiplication Factors to Calculate Trench Length

| A. Choose No. of Layers * | B. Choose Trench Width | C. Enter Animal Units | D. Col. C X Col. E | E. Factor | F. Trench Length (ft.) | G. Trench Depth * (ft.) |
|---|---|---|---|---|---|---|
| 1 | 7 ft. | | X | 3.0 | | 4.5 - 5 |
| 2 | 7 ft. | | X | 1.5 | | 6.5 - 7 |
| 3 | 7 ft. | | X | 1.0 | | 8.5 - 9 |
| 1 | 14 ft. | | X | 1.5 | | 4.5 - 5 |
| 2 | 14 ft. | | X | 0.75 | | 6.5 - 7 |
| 3 | 14 ft. | | X | 0.5 | | 8.5 - 9 |
| Example: 2 layers | 7 ft. | 1,000 | X | 1.5 | 1,500. | 6.5 - 7 ft. |

*Allow 2-ft. depth/layer, plus 2.5-3 ft. = maximum depth of 6 - 9 ft.

### Diagram 2: Trench Design Requirements




**Trench Width**—Between 7 and 14 feet.

**Depth**—Trench should be between 6 and 9 feet deep. Keep sides as vertical as possible. If stability is a problem, slope sides to prevent cave-in and ensure equipment can safely place carcasses while maintaining minimum trench width. Distribute carcasses evenly on the bottom of the trench.

**Groundwater Separation**—Maintain at least 2 feet between the trench bottom and groundwater. DNR staff must verify on-site groundwater separation before trenching starts.

**Surface Water Control**—Construct berms to divert surface water around trenches if surface water runoff would flow into trenches.

**Trench Length and Setback Distances**—Although trench length and setbacks will vary with site factors, trenches must meet the following requirements:

- Follow contour lines as closely as possible
- Trench must be placed at least 50 (horizontal) feet from another trench
- Must not include any sand seams or pockets. Stop digging if trench intersects a sand seam or pocket. Then backfill the last 10 feet of trench with non-sandy soil. Compact backfill area as much as possible. Dig a test pit every 10 feet beyond sandy area. Continue trenching after test pits show soil is free of sand.
- Meet all separation distances listed in Table 1

### Cover

- Cover carcasses with a minimum of 2.5 to 3 feet of cover below ground level
- Mound remaining excavated soil over the trench to avoid ponding water and allow for settling

- Avoid compacting the carcass cover and mounded soil above the trench.
- Seed the excavated area with shallow rooted cover crops such as oats, rye and clover.

### 3 Incineration/Thermal Treatment

While carcasses can be incinerated, sizes and types of equipment vary greatly as does their efficiency and setup time. It pays to consider capacity, fuel use and operating costs of available units. Specific separation distances from residences, property lines and other structures may also be required for incineration. Check with DNR staff for equipment-specific setbacks and to obtain any required waivers or variances before starting operation.

### 4 Landfill

While carcasses can be sent to a landfill, the landfill must approve their acceptance. Also, disposal must meet landfill disposal criteria established by DNR, adhere to strict biosecurity measures at the farm and landfill, and be approved for movement off-site by IDALS. Pre-planning with local landfill agencies to discuss logistics and requirements can speed disposal.

### 5 Rendering

While sending carcasses to a rendering plant is an approved method, make sure the facility is willing to accept the carcasses. Before choosing this option, obtain approval from DNR and IDALS for final disposal of the rendered product. Follow strict biosecurity measures at the farm and rendering facility. Finally, IDALS must approve moving carcasses off-site.

## Non-Carcass Solid Waste

Whenever possible, disinfect and handle non-carcass solid waste as non-infected waste. Discuss disposal options with the veterinarian in charge to determine what material is infected, if the virus can be eliminated, or if materials can be moved off site. If disinfection is not economical or efficient, there are other options. IDALS must approve removing materials from a site and biosecurity measures.

**Contaminated manure, feed** and similar organic material may have a beneficial use. Consider using contaminated organic material, including manure and feed, in the core of a compost windrow.

**Wood** and similar solid waste can be burned on site following the DNR disaster debris disposal guidance for burning trees and brush. If DNR requirements cannot be met, the material can burned at an approved off-site area, taken to a landfill, or incinerated on or off site with DNR approved incineration equipment. Obtain approvals for off-site disposal according to the method chosen.

**Personal Protective Equipment** (PPE) and other contaminated facility solid waste. Solid waste that cannot be decontaminated or disposed of on site will need to be containerized and disposed of at an approved landfill.

## Wastewater

It's important to follow guidelines to safely dispose of wastewater generated when responding to a disease outbreak. Wastewater includes water generated from decontamination and biosecurity, cleaning and disinfection, normal operations or any other wastewater generated at an infected premise. Whenever possible, dispose of wastewater at the infected premise. Take biosecurity measures and get approval from IDALS for off-site disposal.

**Disposal options**: If the site has on-site treatment, obtain DNR and IDALS approval and treat wastewater at the site. Check with IDALS if planning to use a thermal unit to process carcasses.

Some city or other permitted wastewater treatment facilities will accept wastewater from response operations, including activated sludge treatment plants that use ultra-violet (preferred) or chlorine disinfection. During winter when disinfection units don't normally operate, the facility should activate disinfection units. Alternative treatment such as fixed film may be considered if approved by the DNR field office. Once DNR approves, the treatment facility must agree to accept the wastewater, the producer must adhere to strict biosecurity measures at the farm and treatment facility, and IDALS must approve moving wastewater off-site.

## DNR Contacts

| Field Office | Location | Business Hours Phone |
|---|---|---|
| 1 – NE Iowa | Manchester | 563-927-2640 |
| 2 – NC Iowa | Mason City | 641-424-4073 |
| 3 – NW Iowa | Spencer | 712-262-4177 |
| 4 – SW Iowa | Atlantic | 712-243-1934 |
| 5 – SC Iowa | Des Moines | 515-725-0268 |
| 6 – SE Iowa | Washington | 319-653-2135 |
| **Emergency Response After Hours Phone** (Duty Officer) | | 515-725-8694 |

IOWA DEPARTMENT OF NATURAL RESOURCES

# A Quick Guide for Ag Producers
# Response to a Cattle Disease Outbreak

*Avian influenza hit Iowa turkey and layer producers hard in 2015, just as a 2001 outbreak of foot and mouth disease decimated sheep and cattle in Great Britain. While no one wants to face the heart-breaking loss of animals, planning ahead can help cattle and dairy producers make informed decisions. A plan can help producers dispose of their losses — humanely, economically and safely — for the health of their neighbors and the environment.*


Cattle producers can use this guide when they have a disease outbreak or to plan for a potential outbreak. Look for these sections: five carcass disposal options in Iowa, disposal of potentially contaminated waste, supplies, equipment, and disposal of wastewater generated when decontaminating equipment, vehicles and staff.

Generally, animal carcasses and associated waste products are not considered hazardous waste unless the U. S. Department of Agriculture (USDA) and/or Iowa Department of Agriculture and Land Stewardship (IDALS) categorizes them as hazardous. If enough hazardous material like acids, pesticides or fertilizers contaminates carcasses, the carcasses may be considered hazardous waste.

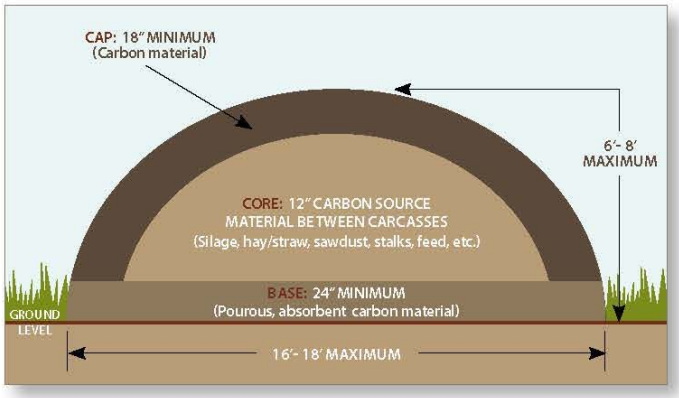
## Carcass Disposal

There are five disposal options. Which one you use depends on the disease, facility location and other qualifying factors. The Iowa Department of Natural Resources (DNR) must approve disposal options prior to disposal. IDALS must approve any movement off-site and requires biosecurity measures.

### 1 Composting

Composting carcasses effectively eliminates viruses when done correctly. It can be cost and labor effective. Composting speeds up normal decay processes caused by naturally occurring bacteria and fungi. Follow recommendations for construction, materials and temperature monitoring to ensure quick, complete decay, avoid foul odors and prevent releasing contaminated liquids.

## Diagram 1: Composting Requirements




### Materials needed for effective composting:

- Carbon Source Material—corn silage, hay/straw, saw dust, ground corn stalks
- Cover Material—corn silage, wood chips, hay/straw, ground corn stalks
- Plan on roughly 12 cubic yards of cover/base material per 1,000 lbs. of carcasses
- Length of windrow needed: length (ft.) = 4 x number of animal units (1 unit = 1,000 lb. animal)

### Factors indicating effective composting:

**Moisture**—For optimum performance, maintain moisture content between 40 and 60 percent. Compost should be moist but not soggy. If you can squeeze moisture from a handful of compost, mix it with drier material.

**Carbon Source**—Carbon is needed for high levels of microbial activity. The right materials keep compost porous allowing oxygen into the pile and permitting gases like ammonia, which inhibits microbial activity, to escape. Some materials are particularly good for absorbing excess liquid released by decaying carcasses, an important factor in preventing undesirable environmental impacts.

**Heat**—Heat is important for successful composting. Check temperatures frequently to ensure viruses are inactivated. Measure at two depths in the compost pile (18 in. and 36 in. from surface) at 10 to 12 locations along the length of the windrow to ensure temperatures reach 130° to 150°F for three consecutive days.

**Construction**—See Diagram 1 and Table 1 for separation distances.

- Base Layer: Minimum of 24 in. depth to absorb leachate.
- Compost Core: 12 in. carbon source material between carcasses
- Height: Maximum 8 ft. (1 layer of mature carcasses)
- Cover: Minimum 18 in. thick to retain heat and absorb odor and excess precipitation.
- Windrow Width: Less than 16 to 18 ft. wide to ensure oxygen penetration.
- Width between Windrows: 2 to 3 loader lengths
- Site Location: Choose a site that is isolated from residences, wells, property lines, tile lines, surface water, flood plain and utilities (See Table 1).

## 2 Burial

On-site burial can effectively eliminate viruses. When done correctly, it can also be environmentally safe and cost effective. If some animals cannot be buried onsite, consider burial on neighboring properties subject to the owner's approval.

**Materials and Equipment**— Equipment needed to dig trench and move carcasses. No additional materials needed.

Factors affecting effective burial—Burial is easiest and best under dry, warm conditions. Wet, muddy and frozen ground may require special equipment or extra care. Burial site location and conditions must meet DNR-established criteria and site conditions. Verify site location with DNR field staff. Puncture rumen or stomach of carcass to reduce gas production in trench.

### Site Selection Criteria:

Choose a site that is isolated from residences, wells, property lines, tile lines, surface water, flood plain and utilities (See Table 1).

**Exclude Utilities**—First contact IOWA ONE CALL at 800-292-8989 to locate any buried utilities on proposed site. Premises owner must also ensure field drainage tile is located at least 200 feet from excavation.

**Protect Wells and Well Source Water**—Ensure private wells are more than 200 feet and public wells are more than 2,500 feet from the excavation. Check and confirm burial site is not within a source water protection zone for wells regulated by the DNR. Find source water zones at: https://programs.iowadnr.gov/sourcewater/maps/index.html.

**Use of Geographic Information System Maps**—Use DNR's Burial Zone Siting Atlas at https://programs.iowadnr.gov/maps/afo/burial.html to locate potential burial sites. The maps assign risks to groundwater contamination based on the presence of alluvial soils and fractured bedrock. They also map known private and public wells. Areas shown in

### Table 1. Separation Distances Required from Objects for Composting and Burials

| Separation Distance Required (in Feet) | | Object |
|---|---|---|
| Compost Windrow | Burial Sites | |
| 100 | 200 | Private well |
| 200 | 2,500 | Public well |
| 50 | 50 | Adjacent property line |
| 500 | 500 | Existing neighboring residence |
| 100 | 100 | Any surface water body |
| 200 | 200 | Tile line |
| Outside | Outside | Floodplain, wetland or shoreline area |
| Exclude | Exclude | Call Iowa One Call to exclude buried utilities |

green and yellow might be usable, but DNR field staff must visit the site and approve its use before burying:

- Acceptable zone shaded in green—no known restrictions for burial.
- Cautionary zone shaded in yellow—only limited burial recommended.
- Exclusion zone shaded in red—no burial recommended.

## Trench Construction

Minimum trench design and length is based on the size and number of animals to bury using one animal unit (AU)—one 1,000-lb. cattle carcass (2 ft. deep by 3 ft. wide and 7 ft. long or 42 cubic feet) to estimate volume. Or, L = [V/(W X D)] X no. of AUs.

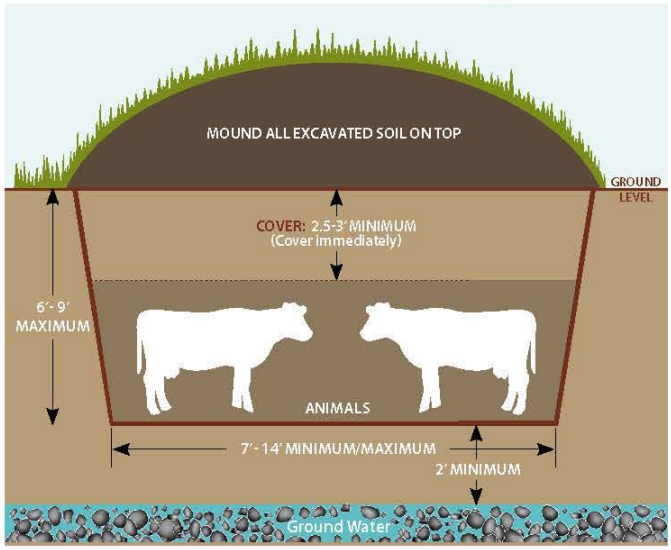
Use Table 2 to calculate trench length and depth. Choose number of animal layers from Column A and width from Col. B, then enter the number of animal units you're burying in Col. C. Multiply animal units by the multiplication factor in Col. E, solving for trench length. Determine trench depth from Col. G. See example in Table 2 to bury 250 steers weighing

### Table 2: Multiplication Factors to Calculate Trench Length

| A. Choose No. of Layers * | B. Choose Trench Width | C. Enter Animal Units | D. Col. C X Col. E | E. Factor | F. Trench Length (ft.) | G. Trench Depth * (ft.) |
|---|---|---|---|---|---|---|
| 1 | 7 ft. | | X | 3.0 | | 4.5 - 5 |
| 2 | 7 ft. | | X | 1.5 | | 6.5 - 7 |
| 3 | 7 ft. | | X | 1.0 | | 8.5 - 9 |
| 1 | 14 ft. | | X | 1.5 | | 4.5 - 5 |
| 2 | 14 ft. | | X | 0.75 | | 6.5 - 7 |
| 3 | 14 ft. | | X | 0.5 | | 8.5 - 9 |
| Example: 2 layers | 7 ft. | 250 | X | 1.5 | 375 ft. | 6.5 - 7 ft. |

*Allow 2-ft. depth/layer, plus 2.5-3 ft. = maximum depth of 6 - 9 ft.

### Diagram 2: Trench Design Requirements




1,000 lbs. each (1 AU). Dig trench 375 ft. long and 6.5 to 7 ft. deep.

**Trench Width**—Between 7 and 14 feet.

**Depth**—Trench should be between 6 and 9 feet deep. Keep sides as vertical as possible. If stability is a problem, slope sides to prevent cave-in and ensure equipment can safely place carcasses while maintaining minimum trench width. Distribute carcasses evenly on the bottom of the trench.

**Groundwater Separation**—Maintain at least 2 feet between the trench bottom and groundwater. DNR staff must verify on-site groundwater separation before trenching begins.

**Surface Water Control**—Construct berms to divert surface water around trenches if surface water runoff would flow into trenches.

**Trench Length and Setback Distances**—Although trench length and setbacks will vary with site factors, trenches must meet the following requirements:

- Follow contour lines as closely as possible
- Trench must be placed at least 50 (horizontal) feet from another trench
- Must not include any sand seams or pockets. Stop digging if the trench intersects a sand seam or pocket. Then backfill the last 10 feet of trench with non-sandy soil. Compact backfill area as much as possible. Dig a test pit every 10 feet beyond sandy area. Continue trenching after test pits show soil is free of sand.
- Meet all separation distances listed in Table 1

## Cover

- Cover carcasses with 2.5 to 3 feet of cover below ground level

- Mound all excavated soil over the trench to avoid ponding water and allow for settling
- Avoid compacting the carcass cover and mounded soil above the trench.
- Seed the excavated area with shallow rooted cover crops such as oats, ryes and clovers.

### 3 Incineration/Thermal Treatment

While carcasses can be incinerated, sizes and types of equipment vary greatly as does their efficiency and setup time. It pays to consider capacity, fuel use and operating costs of available units. Consult with DNR staff to obtain any required waivers or variances before starting operation. Specific separation distances from residences, property lines and other structures may be required for incineration. Check with DNR staff for equipment-specific setbacks.

### 4 Landfill

While carcasses can be sent to a landfill, the landfill must approve their acceptance. Also, disposal must meet landfill disposal criteria established by DNR, adhere to strict biosecurity measures at the farm and landfill, and be approved for movement off-site by IDALS.

### 5 Rendering

While sending carcasses to a rendering plant is an approved method, make sure the facility is willing to accept the carcasses. Before choosing this option, obtain approval from DNR and IDALS for final disposal of the rendered product. Follow strict biosecurity measures at the farm and rendering facility. Finally, IDALS must approve moving carcasses off-site.

## Non-Carcass Solid Waste

Whenever possible, disinfect and handle non-carcass solid waste as non-infected waste. Discuss disposal options with the veterinarian in charge to determine what material is infected, if the virus can be eliminated, or if materials can be moved off site. If disinfection is not economical or efficient, there are other options. IDALS must approve removing materials from a site and biosecurity measures.

Contaminated manure, feed, milk and similar organic material may have a beneficial use. Consider using contaminated organic material, including manure and feed, in the core of a compost windrow.

Wood and similar solid waste can be burned on site following the DNR disaster debris disposal guidance for burning trees and brush. If DNR requirements cannot be met, the material can burned at an approved off-site area, taken to a landfill, or incinerated on or off site with DNR approved incineration equipment. Obtain approvals for off-site disposal according to the method chosen.

## Wastewater

It's important to follow guidelines to safely dispose of wastewater generated when responding to a disease outbreak. Wastewater includes water generated from decontamination and biosecurity, cleaning and disinfection, normal operations or any other wastewater generated at an infected premise. Whenever possible, dispose of wastewater at the infected premise. Take biosecurity measures and get approval from IDALS for off-site disposal.

**Disposal options:**

If the site has on-site treatment, obtain DNR and IDALS approval and treat wastewater at the site.

Some thermal units need additional water to process carcasses. Wastewater generated on site can be treated as part of the thermal unit's operating process. Producers can haul wastewater to a thermal unit if they take biosecurity measures and IDALS approves.

Some city or other permitted wastewater treatment facilities will accept wastewater from response operations, including activated sludge treatment plants that use ultra-violet (preferred) or chlorine disinfection. During winter when disinfection units don't normally operate, the facility should activate disinfection units. Alternative treatment such as fixed film may be considered if approved by the DNR field office. Once DNR approves, the treatment facility must agree to accept the wastewater, the producer must adhere to strict biosecurity measures at the farm and the treatment facility, and IDALS must approve moving wastewater off-site.

## DNR Contacts

| Field Office | Location | Business Hours Phone |
|---|---|---|
| 1 – NE Iowa | Manchester | 563-927-2640 |
| 2 – NC Iowa | Mason City | 641-424-4073 |
| 3 – NW Iowa | Spencer | 712-262-4177 |
| 4 – SW Iowa | Atlantic | 712-243-1934 |
| 5 – SC Iowa | Des Moines | 515-725-0268 |
| 6 – SE Iowa | Washington | 319-653-2135 |
| Emergency Response After Hours Phone (Duty Officer) | | 515-725-8694 |

# Appendix E – Glossary

## 1. Acronyms and Abbreviations

### Agencies

APHIS – Animal and Plant Health (part of USDA)

CFSPH – Iowa State University Center for Food Safety & Public Health

DNR – Iowa Department of Natural Resources

FEMA – Federal Emergency Management Agency

FOA - Food and Agriculture Organization of the United Nations

HSEMD – Iowa Homeland Security and Emergency Management

IDALS – Iowa Department of Agriculture and Land Stewardship

ISU – Iowa State University

OIE - World Organization for Animal Health

USDA – United States Department of Agriculture

USGS - United States Geological Survey

## 2. Terms

AFO – Animal Feeding Operation

CSM – Carbon Source Material

ESF – Emergency Support Function

FAD – Foreign Animal Disease

GIS – Geographic Information Center

IAC – Iowa Administrative Code

ICS – Incident Command System

IMT – Incident Management Team

JIC – Joint Information Center

PIO – Public Information Officer

NIMS – National Incident Management System

SEOC – State Emergency Operations Center

## 3. Definitions

**Alkaline hydrolysis** - Alkaline hydrolysis of carcasses is a process by which heat and pressure dissolve and sterilize animal carcasses in a strong solution of sodium or potassium hydroxide.

**Biosecurity** - Biosecurity is a set of preventive measures designed to reduce the risk of transmission of infectious diseases between crops, livestock and wildlife.

**Burial Zone Siting map –** Interactive GIS maps designed to aid livestock producers in determining if burial of carcasses is appropriate at their site. The GIS maps are based on several factors that indicate risk of contamination.

**Carbon Source –** organic material that can provide carbon to a biological decomposition process, e.g., corn silage, ground hay/straw, saw dust, ground corn stalks, corn stover, mulch, wood chips (< 1-in size), poultry litter.

**Emergency Support Function (ESF)** - ESFs align categories of resources and provide strategic objectives for their use. ESFs utilize standardized resource management concepts such as typing, inventorying, and tracking to facilitate the dispatch, deployment, and recovery of resources before, during, and after an incident.

**Euthanasia** - the practice of intentionally ending a life to relieve pain and suffering or to prevent the spread of disease.

**Field Command Post** - A command center, either mobile or fixed, set up in a location convenient to the accident site, to facilitate emergency response, especially, for example, accident assessment activities such as direction of the field monitoring teams.

**Full Scale Exercise (FSE)** - FSEs are typically the most complex and resource-intensive type of exercise. They involve multiple agencies, organizations, and jurisdictions and validate many facets of preparedness. FSEs often include many players operating under cooperative systems such as the Incident Command System (ICS) or Unified Command. In an FSE, events are projected through an exercise scenario with event updates that drive activity at the operational level.

**Incident Command System (ICS) –** A system of incident management with a single individual with ultimate authority

**Incident Management Team (IMT)** - IMTs are a cadre of multi-agency, multi-jurisdictional professionals, activated to support incident management at large or complex incidents, disasters or special events.

**National Incident Management System (NIMS)** - A structure for management large-scale or multi-jurisdictional incidents.

**Office International Des Epizooties (OIE)** - The World Organization for Animal Health (OIE) is an intergovernmental organization coordinating, supporting and promoting animal disease control.

**Regional Command Center** - A command center, either mobile or fixed, set up in a central location to facilitate large scale emergency response, especially, for example, natural disaster activities. Regional command centers focus on overall response direction and resource procurement and allocation over a large area.

**Rendering** - Rendering is a process that converts waste animal tissue into stable, usable materials. Rendering can refer to any processing of animal products into more useful materials, or, more narrowly, to the rendering of whole animal fatty tissue into purified fats like lard or tallow.

**Tabletop Exercise (TTX)** - A TTX is intended to generate discussion of various issues regarding a hypothetical, simulated emergency. TTXs can be used to enhance general awareness, validate plans and

procedures, rehearse concepts, and/or assess the types of systems needed to guide the prevention of, protection from, mitigation of, response to, and recovery from a defined incident.

**Unified Command System (UCS)** - A system of incident management with multiple individuals with shared ultimate authority

**Workshop** – Workshops are discussion-based exercises used to familiarize players with, or develop new, plans, policies, agreements, and procedures. Facilitators and/or presenters usually lead the discussion, keeping participants on track towards meeting exercise objectives.

## 4. Resources/Links to Additional Information

Iowa DNR Disaster Assistance – DNR

**Key Partner Agencies:**

Center for Food Safety & Public Health – ISU
Food and Agriculture Organization of the United Nations
Iowa Department of Agriculture and Land Stewardship
Iowa Department of Public Health
National Wildlife Health Center
US Animal Health Association
USDA Disaster Webpage
World Organization for Animal Health

**General Foreign Animal Disease Outbreak info**

- **Center for Food Safety & Public Health – ISU - Accurate information on transboundary animal diseases and zoonotic diseases**
- **Interactive Burial Zone Map – DNR maps designed to aid livestock producers in determining if burial of carcasses is appropriate at their site.**

**Disease Links**

- **Iowa DNR Chronic Wasting Disease Information – DNR**
- **Iowa DNR Epizootic Hemorrhagic Disease Information – DNR**
- **National Wildlife Health Center – USGS**
- **Wildlife Diseases – DNR**

**Wildlife Field Safety**

- **National Wildlife Health Center Field Manual - USGS**
- **Safe Practices to Avoid Zoonotic Disease from Wildlife - National Park Service**