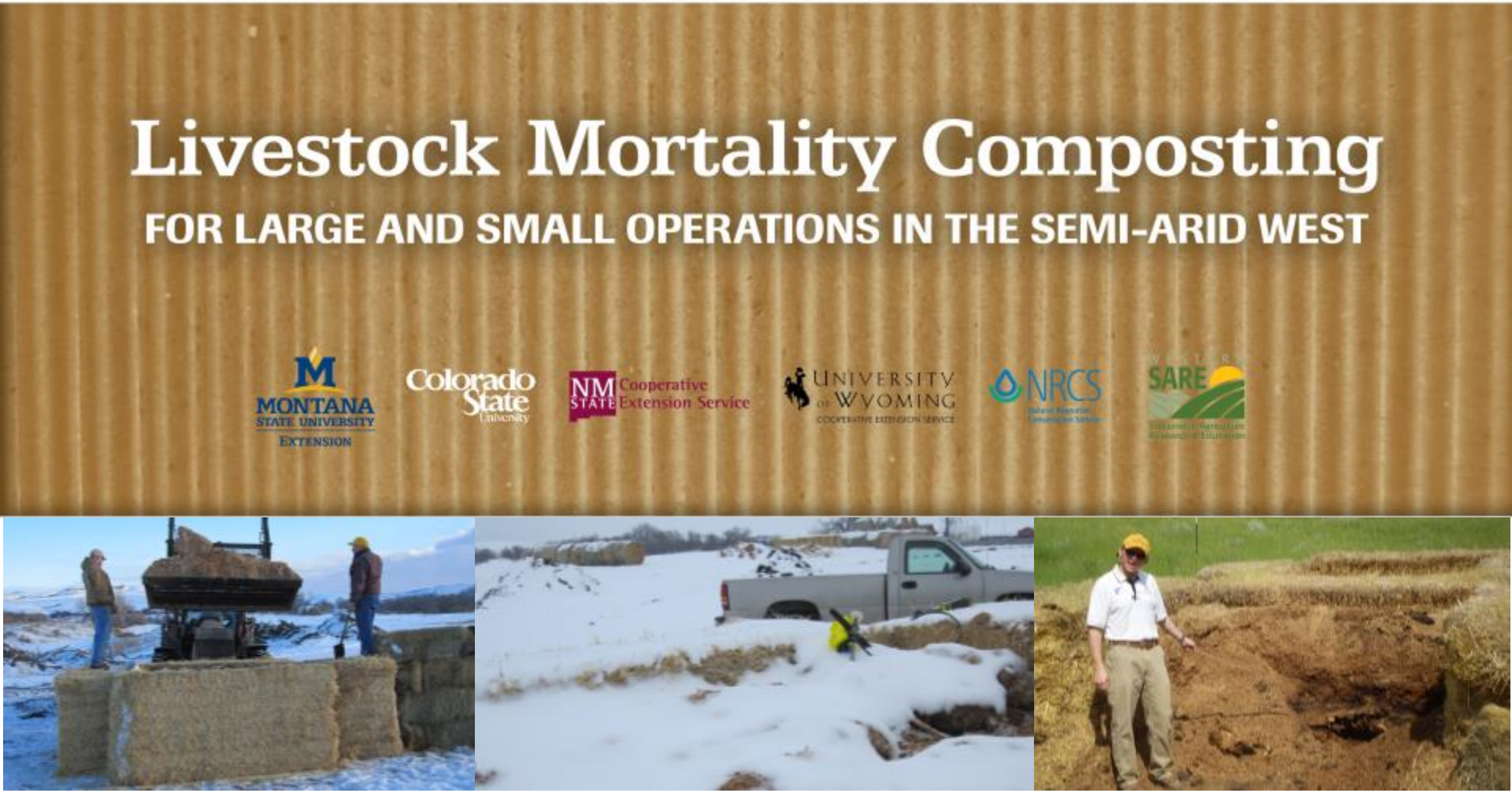
Resources for Extension and Conservation Educators: Teaching Benefits and Opportunities to Producers



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Project Products

- Manual (English and Spanish)
- Video
- Budget & Decision Tool
- PowerPoint Companion

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Mortality Management

- The purpose of proper mortality disposal is to:
  - prevent the spread of infectious, contagious and communicable diseases
  - reduce or prevent nuisance animals and insects
  - to protect air, water and soil quality.

Illegal or Discouraged Option

- **Carcass Abandonment**: likely illegal in most states in the U.S.
  - Promotes:
    - biological and disease hazard,
    - threats to water quality,
    - odors, flies, scavengers, rodents,
    - and visual pollution

Credit: Rilho – fotocommunity.com

Generally Accepted Options

- **Burial**: most commonly accepted method
- **Landfilling**: “buried” at licensed landfill
- **Rendering:** heat driven process to separate products from tissues
- **Incineration:** done in a properly engineered device with emission controls
- **Burning:** primarily an emergency measure

Generally Accepted Options

- **Composting**: is gaining more acceptance as a legal option in most states
  - natural process driven by oxygen, moisture and microbes
  - reduced environmental risks
  - and the generation of a useful end-product*

*limited use recommendations are covered later in this presentation.

Composting Principles

- "Farming microorganisms" – primarily bacteria and fungi; to compost, they require:
  - Carbon: wood chips, straw, and crop residues
  - Nitrogen: nutrient; component of manure, carcasses, and plant material
  - Oxygen: passive aeration and by turning
  - Water: ideal content is approximately 50%

Composting Principles

- Carbon and nitrogen are usually supplied in a 30:1 ratio for best results
  - commonly expressed as C:N = 30:1
- For livestock mortalities, the 30:1 wisdom does not apply
  - recommended carbon for dead animals far exceeds this

Composting Principles

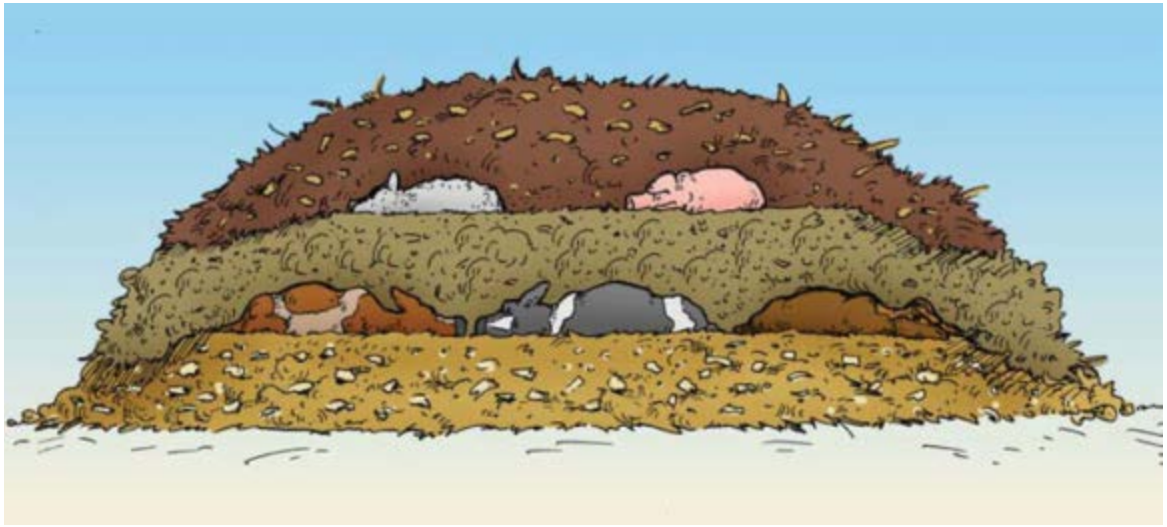
- Oxygen is maintained in aerobic composting by turning, and initial particle size.
  - however, mortality compost is turned on a limited basis
  - larger or coarser carbon material is recommended for mortality composting, especially base layer

Incorporating Animals into the Composting Process

- Carcasses should be laid on their side
- Base should be 18 to 24 inches of coarse carbon
- Margins of coverage should be 18- 24 inches as well

Incorporating Animals into the Composting Process

- Margins between layers of small carcasses can be 8-12 inches
  - final cover margin should still be 18-24 inches



Incorporating Animals into the Composting Process

Base and Cover

- Coarse base material aids in passive aeration for first 3-6 months
- Material around carcass may be finer
  - active compost, manure solids or spoiled silage help get microbial activity started
- Cap should be non-odorous, and will act as insulation and bio-filter
  - add extra cap/cover as needed

Tips!

- Ideal moisture of core materials (closest to carcass) is 50-60%
- Warm materials help start process in winter
- Carcasses not yet frozen from winter temps will heat faster

Tips!

- Even with freezing ambient temperatures, composting will happen!
  - core temps were 140F+, when this photo was taken at Havre, Montana

Carbon Options

- See carbon source table in manual for full list of examples:
  - course wood chips
  - sawdust
  - straw
  - silage
  - manure solids
  - corn stalks
  - crop processing wastes

Carbon Options

- Reminder:
  - materials with moisture of 50-60% will help maintain process for weeks without irrigation or turning
  - adequate base and cover will prevent leaching of carcass moisture and odors
  - **low odor reduces neighbor complaints and scavenger problems**

Windrows, Bins & Sizing

- Windrows have the largest footprint and will require the most carbon material
  - windrows may be ideal for multiple mortalities over a shorter period of time
- Bins will reduce footprint and conserve carbon material supply
  - **bins may be ideal for layered small carcasses or intermittent larger mortalities**

Tips on Bins

- Bins may be constructed of:
  - hay bales
  - concrete barriers
  - wooden structures
- **Bins are easier to fence/block to exclude scavengers**
- Passive aeration may be reduced with bins, and slightly lengthen process

Facilities Construction and Engineering

- Additional information and USDA-NRCS standards for this practice and *related facilities/structures* can be found in Practice Standard 316 and the National Engineering Handbook

NRCS Natural Resources Conservation Service

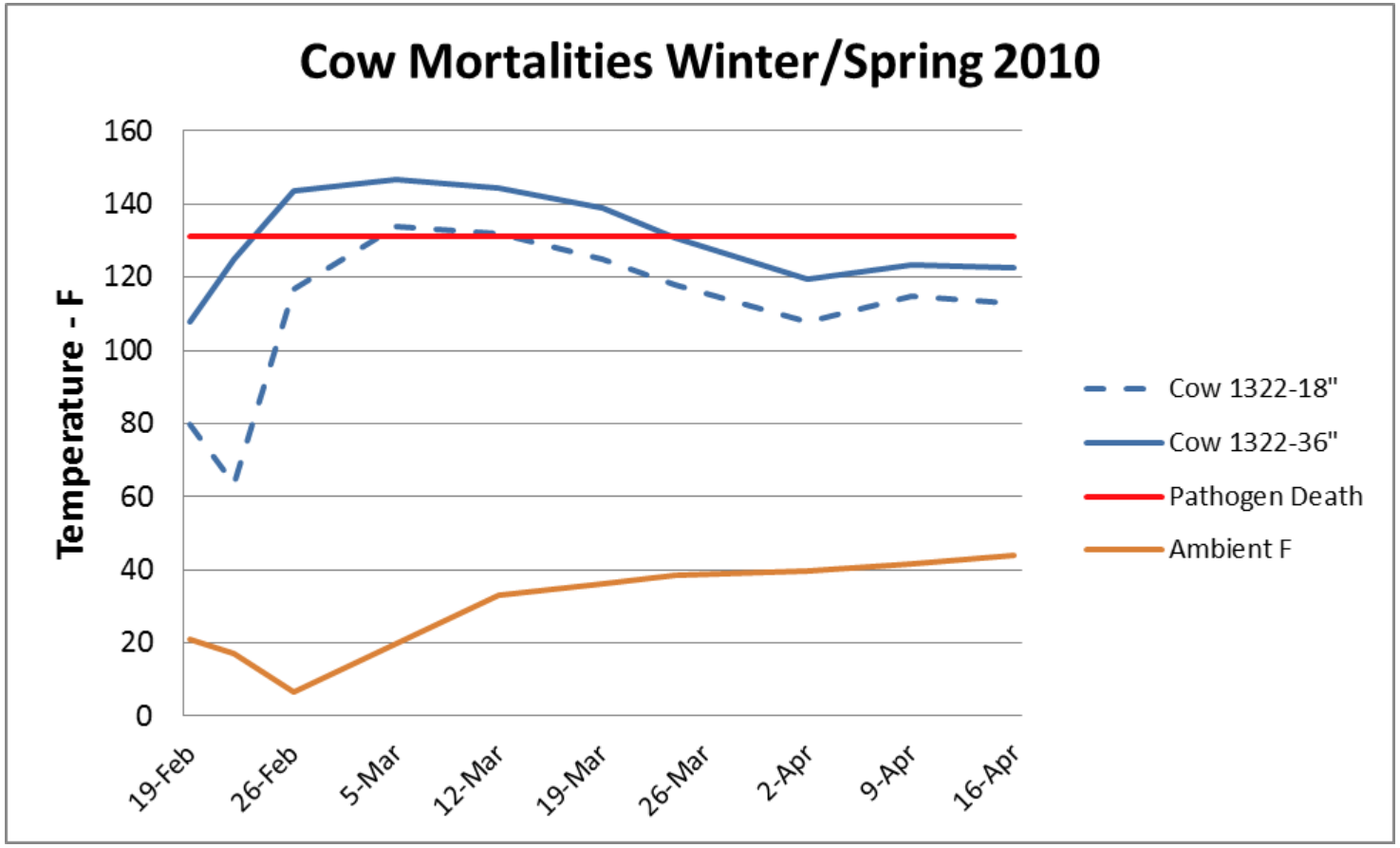
Monitoring and Management

- Composting takes 4-12 months depending on mortality size and mixture
- The process is passive and should not be turned for 4-6 months
  - the pile, windrow or bin can be turned after this point
- Most soft tissue will be gone within 6-8 weeks!

Monitoring and Management

- Temperature:
  - optimum composting happens with core temperatures between 120 F – 150 F
  - below 80 F, microorganisms are not thriving
  - could be too dry or have low oxygen
  - temperature can be checked with a probe thermometer

Monitoring and Management



Monitoring and Management

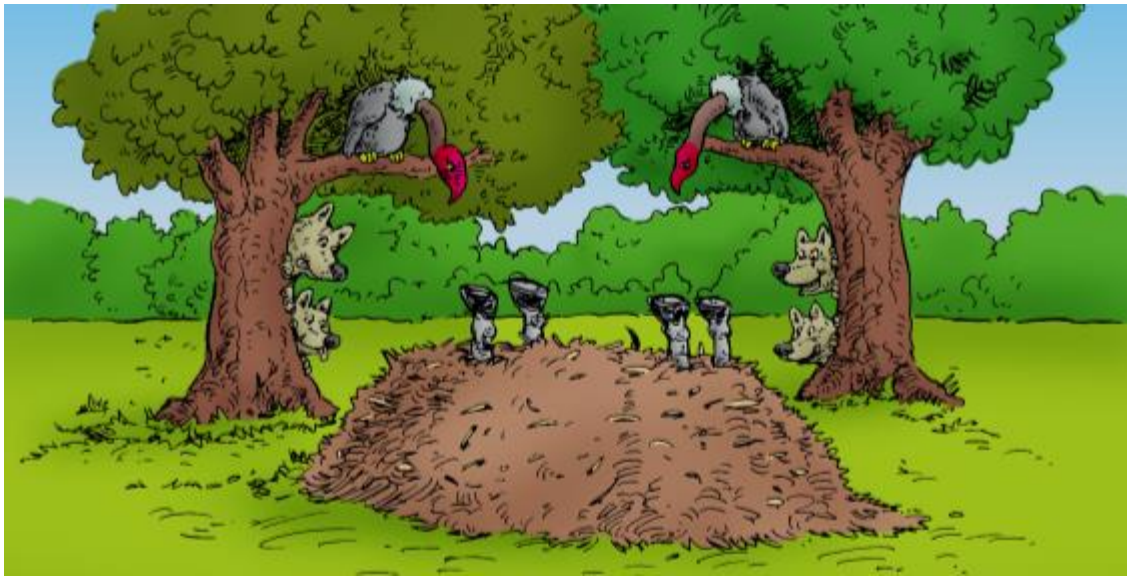
- Moisture:
  - this process is largely passive, starting with proper moisture is important
  - carbon sources with 50% – 60% moisture are ideal
  - after the passive phase, water can be added with turning

Monitoring and Management

- Other Issues:
  - monitor for scavenger activity and excessive flies
  - make sure cover is adequate over time
- The compost area should be free of these problems if basic directions are followed
  - i.e.: good carbon materials, proper starting moisture, and proper cover

Monitoring and Management

- Maintaining cover should prevent scavengers
  - at research sites, known dogs, coyotes and birds did NOT disturb properly covered piles



Curing and Storage

- After 4-6 months of passive/static phase…
  - turn
  - irrigate if necessary
  - remove large bones if desired
  - let “cure” for another 4-8 months

Curing and Storage

- Curing: period of warm, but not hot, composting
  - final breakdown will occur
  - temperature will cool to near ambient conditions
  - may use compost for new mortalities or limited land-application

Site Selection

- An appropriate site will:
  - help to protect water and soil quality
  - **protect bio-security (prevent spread of pathogens or disease)**
  - **prevent complaints and negative reactions of neighbors**
  - decrease nuisance problems

Site Selection

- Location of the composting site should be:
  - above/out of floodplains
  - easily accessible (in most weather) for carcass transportation and material handling
  - maintain an adequate distance from live production animals

Site Selection

- The compost site should also be:
  - well drained; on soils of low permeability or a pad
  - graded to prevent “pooling” or “ponding”
  - protected from run-on from land above site
- Check local regulations for depth above groundwater and separation from surface water and wells!

Site Selection

- Storm water
  - divert storm water from land area above site with berms or ditches
  - if excessive storm water is possible, a run-off collection system may be necessary
  - grass filter strips may also be appropriate
  - **shed roof may be appropriate in humid climates**

Equipment Decisions

- Most mortality composting can be **done with basic equipment already on-site**
  - front end loader or skid steer loader
  - probe thermometer
  - water source and hose
  - screen (optional)

Equipment Decisions

- Hand-made screen to separate bones and unfinished coarse materials
  - these may be added back to another hot pile

Compost Quality and Use

- Finished mortality compost can have limited use on-site
  - use for future mortality composting
  - use on non-food crops as soil amendment or fertilizer
  - do NOT export from operation or sell
  - consult veterinarian if mortalities are disease related

Diseases and Prions

- Consult with veterinarian, before composting is started, regarding all disease issues
- Prion diseases may not be killed by composting
  - BSE may be unlikely due to USDA/FDA controls
  - however, **scrapie (in sheep and goats) in small ruminants is known to exist in North America**
  - chronic wasting disease is known in deer and elk

Emergency Situations

- Composting can be a valuable tool for emergency management
- **Catastrophic mortality events can be managed with composting**
- **Compost range carcasses in place**
- Consult veterinarians and emergency managers before initiating emergency mortality compost measures!

Economics

- Mortality composting **may be the most economic practice**
  - less labor than digging pits
  - same site can be reused
  - no transportation, tipping fees or rendering fees
  - basic equipment is likely already on-site

Economics

- See “partial budgeting” tool and worksheet
- Will mortality composting be of economic benefit to the business?
  - Additional Returns: **not likely** as mortality compost is not recommended for sale
  - Reduced Costs: **likely** as composting can be the least cost practice

Economics – Decisions

- Work with producer to analyze all benefits and costs
- **Advise but let producer weigh options and make decision**

Regulations and Permitting

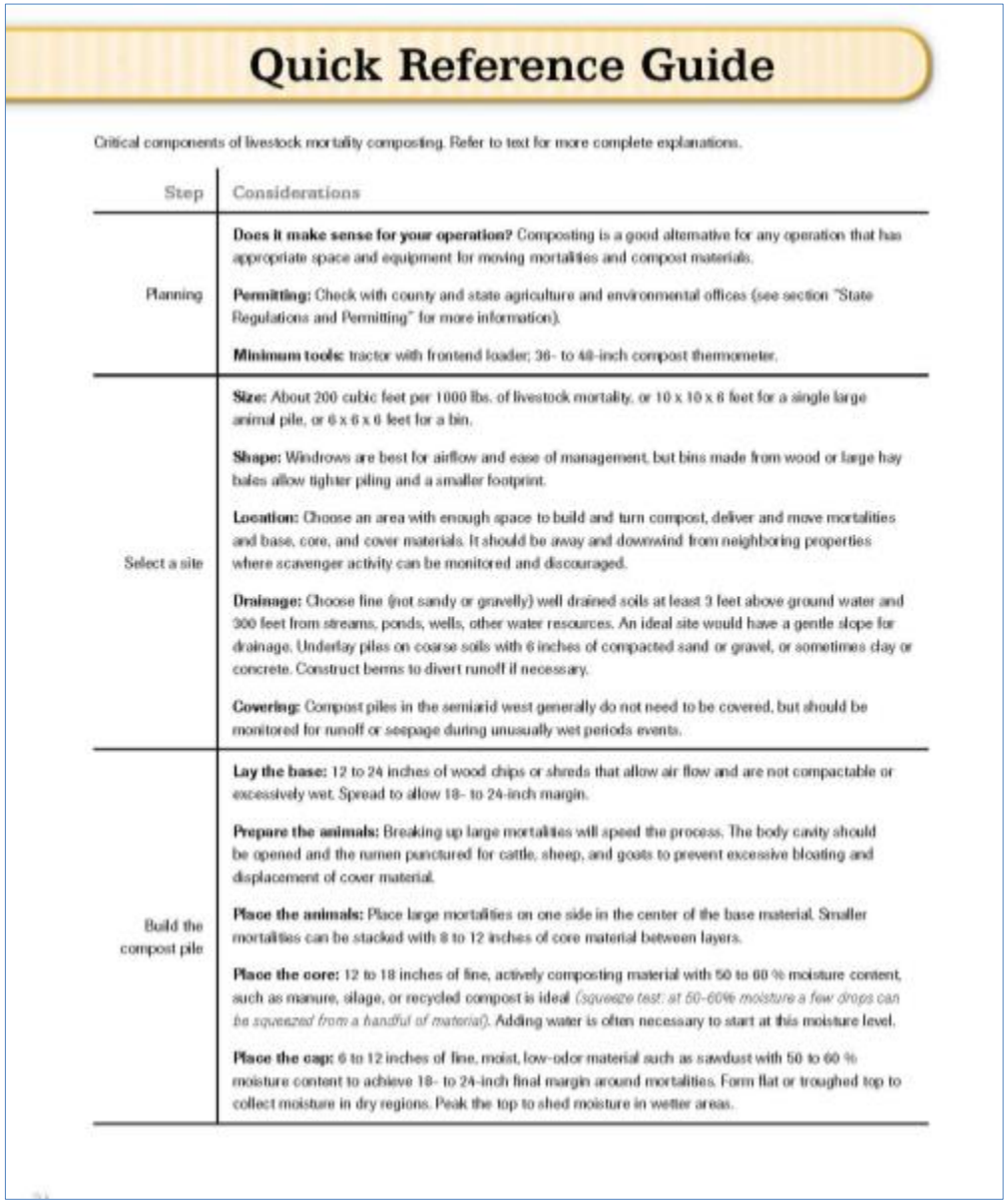
- Composting is likely regulated!
  - stand-alone regulations
  - already covered by AFO/CAFO permit
- May be supervised by a state:
  - Department of Agriculture
  - Department of Livestock
  - Environmental or Waste Department

Summary

- Mortality composting is feasible in most North American climates
- Composting may be preferable for:
  - Convenience/labor
  - economic reasons
  - biosecurity
  - public and neighbor relations

Summary

- A Quick Reference Guide is provided at the end of manual
  - Step-by-step, 2-page summary



Quick Reference Guide

Critical components of livestock mortality composting. Refer to text for more complete explanations.

Step	Considerations
Planning	**Does it make sense for your operation?** Composting is a good alternative for any operation that has appropriate space and equipment for moving mortalities and compost materials. **Permitting:** Check with county and state agriculture and environmental offices (see section "State Regulations and Permitting" for more information). **Minimum tools:** tractor with frontend loader; 36- to 48-inch compost thermometer.
Select a site	**Size:** About 200 cubic feet per 1000 lbs. of livestock mortality, or 10 x 10 x 6 feet for a single large animal pile, or 6 x 6 x 6 feet for a bin. **Shape:** Windrows are best for airflow and ease of management, but bins made from wood or large hay bales allow tighter piling and a smaller footprint. **Location:** Choose an area with enough space to build and turn compost, deliver and move mortalities and base, core, and cover materials. It should be away and downwind from neighboring properties where scavenger activity can be monitored and discouraged. **Drainage:** Choose fine (not sandy or gravelly) well drained soils at least 3 feet above ground water and 300 feet from streams, ponds, wells, other water resources. An ideal site would have a gentle slope for drainage. Underlay piles on coarse soils with 6 inches of compacted sand or gravel, or sometimes clay or concrete. Construct berms to divert runoff if necessary. **Covering:** Compost piles in the semiarid west generally do not need to be covered, but should be monitored for runoff or seepage during unusually wet periods events.
Build the compost pile	**Lay the base:** 12 to 24 inches of wood chips or shreds that allow air flow and are not compactable or excessively wet. Spread to allow 18- to 24-inch margin. **Prepare the animals:** Breaking up large mortalities will speed the process. The body cavity should be opened and the rumen punctured for cattle, sheep, and goats to prevent excessive bloating and displacement of cover material. **Place the animals:** Place large mortalities on one side in the center of the base material. Smaller mortalities can be stacked with 8 to 12 inches of core material between layers. **Place the core:** 12 to 18 inches of fine, actively composting material with 50 to 60 % moisture content, such as manure, silage, or recycled compost is ideal *(squeeze test: at 50-60% moisture a few drops can be squeezed from a handful of material)*. Adding water is often necessary to start at this moisture level. **Place the cap:** 6 to 12 inches of fine, moist, low-odor material such as sawdust with 50 to 60 % moisture content to achieve 18- to 24-inch final margin around mortalities. Form flat or troughed top to collect moisture in dry regions. Peak the top to shed moisture in wetter areas.

Summary

- Contact: Tommy Bass tmbass@montana.edu for additional educational materials
- Online versions of products referenced in Workshop Proceedings
- Questions and Comments?

Thank you for your time!