Virtual workshop series: Water quality impacts of livestock operations and grazing management

Natural Resources PFT
Kansas Center for Agricultural Resources and the Environment (KCARE)
Water quality impacts of livestock operations and grazing management

• Offered as a Professional Development Event in PEARS for county extension agents

• Date/Time: May 5 to May 13, 8:30 am to 9:30 am

• Zoom Meeting ID: 952 6066 1935
Schedule

• Day 2: Non-confined feeding sites: Assisting producers with site selection and planning
  – Thursday, 5/7, 8:30-9:30 a.m.
  – Presenters: KCARE watershed specialists Will Boyer, Herschel George and Stacie Minson

• Day 3: Extending the grazing season
  – Friday, 5/8, 8:30-9:30 a.m.
  – Presenter: Jeff Davidson, KCARE watershed specialist

• Day 4: Livestock watering systems
  – Tuesday, 5/12, 8:30-9:30 a.m.
  – Presenters: KCARE watershed specialists Herschel George and Will Boyer

• Day 5: Electric fence systems
  – Wednesday, 5/13, 8:30-9:30 a.m.
  – Presenter: Rod Schaub, Frontier Extension District Agent
Today’s format

• If you haven’t already, please mute your microphones.
• Speakers will present for 30-40 minutes
• Panelists will join the discussion at the end
• Please ask questions through the chat function (located at the lower part of your screen).
• Although our “end time” is posted for 9:30 a.m., participants are welcome to remain longer if they want to discuss the topic further.
Water quality impacts of livestock operations and grazing management

Non-confined feeding sites: Assisting producers with site selection and planning

Thursday, May 7
Speakers

Will Boyer  Herschel George  Stacie Minson

K CARE Watershed Specialist, NE Kansas  KCARE Watershed Specialist, retired  KCARE Watershed Specialist, Big Creek/Little Smoky Hill River Watershed

Panelists

Jody Holthaus, Meadowlark Extension District Agent; Brian Rees, Lyon County Extension Agent; Pat Murphy, Kansas State University; and Joe Harner, Kansas State University
Non-Confined Feeding Sites

Presented by:
Stacie Minson, Will Boyer, & Herschel George, KSU Watershed Specialists

Discussion by:
Joe Harner & Pat Murphy, KSU Bio & Ag Engineering
Brian Rees, KSRE Ag & Natural Resources Agent
Jody Holthaus, KSRE Livestock & Natural Resources Agent

• Understanding the need or justification for relocation/improvement of existing feeding sites

• Overview of Presentation
  • Water quality concerns
  • Site selection
  • Extraneous drainage
  • Bunk space/head
  • Topography
  • Buffer size
  • Geotextile feed pads
Non-Confined Feeding Sites

- Feeding sites are usually located on native grassland, pasture, crop residue, and/or cover crops
- Typical Feeding Site Locations
  - Along streams/creeks/rivers
  - Wind protection provided
  - Convenience with quick access to cattle, water, feed sources, etc.
  - Can increase pollution risk and water quality issues
Water Quality Concerns

- **Non-Point Source Pollution (NPS)**
  - Hard to Trace Point of Origin

- **Total Maximum Daily Load (TMDL)**
  - the amount of a pollutant that a body of water can have at any given time and still meet its designated use

- **TMDLs set for**
  - Total Nitrogen (TN)
  - Total Phosphorus (TP)
  - Total Suspended Solids (TSS)
  - *E. coli* bacteria (fecal coliform)
Pollutants & Sources

- **Total Nitrogen (TN)**
  - Human & Animal Waste, Fertilizer

- **Total Phosphorus (TP)**
  - Human & Animal Waste, Fertilizer

- **Total Suspended Solids (TSS)**
  - Erosion (overgrazing, overutilization, bare landscapes, crop fields, streambanks, construction, etc.)

- **E. coli bacteria**
  - Human & Animal Waste
Pollutant Concerns

• Total Nitrogen (TN) & Total Phosphorus (TP)
  – Groundwater pollution
  – Algae blooms
  – Foul taste and odor in drinking water sources
  – Depleted oxygen in water bodies can create fish kills

• Total Suspended Solids (TSS)
  – Erosion
  – Sedimentation

• E. coli bacteria
  – Human health concerns
Non-Confined Feeding Sites

Potential Pollution Concerns

- Overutilization and trampling create:
  - Soil erosion
  - Bare areas
  - Nutrient runoff
  - Groundwater leaching

- Non-Point Source Pollution (NPS)
  - Runoff from precipitation that travels across the ground; picks up and carries pollutants into water sources
Pollutant Management
Approved EPA/KDHE WRAPS & TMDL Plans

• **Total Nitrogen (TN) & Total Phosphorus (TP)**
  – Clean sites regularly during the season & during off-season
  – Adequate buffers for infiltration of nutrients

• **Total Suspended Solids (TSS)**
  – Uniform use of site to reduce erosion
  – Maintain grass density including quality and quantity of grass species
  – Underutilize the area; Maintain consistent crop residue or cover crops

• **E.coli bacteria**
  – Clean sites regularly during the season & during off-season
Extension Outreach & Technical Assistance – Kansas State University

Approved EPA/KDHE WRAPS & TMDL Plans


Kansas TMDL Web Map [https://maps.kdhe.state.ks.us/kstmdl/](https://maps.kdhe.state.ks.us/kstmdl/)

- Educate agricultural producers on sediment, nutrient, and pasture management.
- Educate livestock producers on livestock waste management, land applied manure applications, and nutrient management planning.
- Provide technical assistance on livestock waste management systems and nutrient management planning.
- Provide technical assistance on buffer strip design and minimizing cropland runoff.
- Encourage annual soil testing to determine capacity of field to hold phosphorus.
- Educate residents, landowners, and watershed stakeholders about nonpoint source pollution.
- Promote and utilize Big Creek – Middle Smoky Hill WRAPS efforts at pollution prevention, runoff control and resource management.
Herschel George
Non-Confined Feeding Sites

- Most often used for Backgrounding cattle from 400# to 900#
- Do not have sites well suited for Confinement feeding
- Utilizing seasonal feeding
- Used while gleaning fields after crop harvest
- Used with Cover crops to enhance organic matter breakdown
Non-Confined Feeding Sites

• Is used by producers where Livestock are fed on grass (or other forages).
  – To reduce the stress on livestock
    • Shade
    • Mud
    • Dust

• It extends the period a group of livestock can utilize a grazing area.
Non-Confined Feeding Sites

- Disadvantages include
  - Additional distance to travel with feeding equipment
  - More difficult to treat illnesses
  - Load-out facilities are not as accessible
  - Greater land cost on per head basis
• Bunk may provide 50 to 100% of livestock intake
26’ Geotextile Rock Pad

16 to 24 inches of bunk length per Head
Cattle are able to feed on both sides of bunk

Pad length is 20 ft + bunk length

Gravel Feed Road

Drainage from the feeding site should not drain towards road

Water is available at other locations in the pastures

Perimeter Fence

Distance between edge of road and gate is 1.5 to 2 times the equipment length

Clear vehicle site lines in both directions of county road from entrance to feeding area
Pasture Perimeter Fence

Working / Sick Pen Corral Area

Edge of County Road

50' Set Back from Perimeter Fence

16' to 30'

16 to 24 inches of bunk per head

60-75' Radius

Concrete Pad

Water Trough

Feed Bunk & Rail

15' Concrete Apron

DRAINAGE

Feed Road

Catch pen to load cattle into transport vehicles

DRAINAGE

Pasture Perimeter Fence

Edge of County Road

15' to 30'

K-State Research and Extension
Fenceline Bunk Overhead View

- Optional area for catch pen from pastures for movement of cattle via ground or high load trailers

- 16-24 inches bunk per head

- 15' Wide Concrete Apron

- Fence Line Bunk

- Wide entrance for clear vehicle site lines

- Perimeter Fence

- 30'–40' Minimum

- Edge of County Road
Maintenance of Non-Confined Feeding Sites

• Must be cleaned to remove manure
  – And field applied to cropland or grassland
• Most feeding pads are of gravel
  – Reshaping and rebuilding as needed
• Grassland is the waste treatment
  – Dense grass stand is desired
Overhead View

Length = 20 ft + Length of Feed Bunk

8 to 12" of linear feet of bunk per head

Feed Bunk (cattle feed on both sides)

Edge of fabric

Crushed No. 3 Rock - 12" minimum overlap of fabric edge
Crushed No. 10 Rock / Screenings - 24" minimum overlap of fabric edge

Cross-Section View

4" Crushed No. 3 Rock

4" Crushed No. 10 Rock / Screenings (2 Lifts)

14' Cattle & Equipment Side

9' Cattle Only Side

2 to 6" Crown in Center of Pad

26" Geotextile Road Fabric

28'

30'
Cross-Section View

- 4" Crushed No 3 Rock
- 4" Crushed No 10 Rock / Screenings (2 Lifts)
- 14' Cattle & Equipment Side
- 9' Cattle Only Side
- 2 to 6" Crown in Center of Pad
- 28' Geotextile Road Fabric
- 28'
- 30'
Management of Livestock waste

From Livestock aspect:
• Mud causes loss of performance

From a nutrient loss standpoint:
• Nitrogen and Phosphorus from the diet

From a Water Quality standpoint
• Algae production
• Municipal water usage
Non-Confined Sites vs. Cow-Calf Wintering/Seasonal Feeding/Concentration Areas/Sacrifice Areas

• Shorter period of use but substantial waste accumulation; manure and hay
Non-Confined vs. Cow-Calf Wintering/Seasonal Feeding/Concentration Areas/Sacrifice Areas

- Shorter use period but substantial waste accumulation; manure and hay
- Feeding practices, hay quality, bedding
Non-Confined vs Cow-Calf Wintering/Seasonal Feeding/Concentration Areas/Sacrifice Areas

- Shorter use period but substantial waste accumulation; hay and manure
- Feeding practices, hay quality, bedding
- Feed, Shelter and Water; concentration and cover
Manage Cover and Concentration
“Good Site” Characteristics

• Protects pasture during muddy times, promotes infiltration, has not confining fences

• Good Feeding Site Characteristics:
  – On a ridge
  – No extraneous drainage
  – Drainage away from public road
  – < 5% slope
  – Drains to a 100’+ grass buffer
  – Watering from a tank
  – Protection available
  – Easy access for feeding and waste removal
May Need an Access Road

- 26' Geotextile Rock Pad
- Pad length is 20 ft + bunk length
- 18 to 24 inches of bunk length per Head
- Cattle are able to feed on both sides of bunk
- Drainage from the feeding site should not drain towards road
- Water is available at other locations in the pastures
- Gravel Feed Road
- Perimeter Fence
- Distance between edge of road and gate is 1.5 to 2 times the equipment length
- Clear vehicle site lines in both directions of county road from entrance to feeding area
Overhead View

Cross-Section View

 Crushed No. 3 Rock - 12" minimum overlap of fabric edge
 Crushed No. 10 Rock / Screenings - 34" minimum overlap of fabric edge

Feed Bunk (cattle feed on both sides)
Edge of fabric

Crushed No. 3 Rock
4" Crushed No. 10 Rock / Screenings (2 Lifts)

14' Cattle & Equipment Side
9' Cattle Only Side

2 to 6" Crown in Center of Pad
26' Geotextile Road Fabric
Using Geotextiles For Feeding and Traffic Surfaces

Larry W. Turner, Extension Agricultural Engineer
Department of Biosystems & Agricultural Engineering

Mud robs Kentucky beef and dairy producers of performance from their cattle herds in winter and spring. One solution to improve animal performance and reduce mud-related performance problems is to use concrete pads or low-cost, all-weather surfaces whenever animals congregate, e.g., feeding areas, animal traffic areas, and loafing areas. Although concrete is probably the most desirable surface for durability and low maintenance, all-weather surfaces can be constructed of geotextile fabric, rock, and fine surface cover for less than one-third of the cost of concrete. Rock over sand is used in Kentucky where approximately 12 inches of depth for stability, but using rock over geotextile fabrics can reduce rock depth by half. Repeat maintenance usually required for rock pads is also reduced because the fabric keeps the rocks in place.

Floor or Pad Construction

Geotextile fabrics are basically of two types: a "geotextile" fabric material, or a plastic-derivative cross-linked "round wire" type geotextile fabric material. Both are used in highway industry to support rock bases for roadbeds and to distribute the loads of vehicular traffic. Figure 1 illustrates the recommended construction details for animal use pads.

The geotextile fabrics are porous, so water and moisture pass through the material while the rock is held in place. Even with rock and manure buildup on the surface, the animals have a solid footing so they do not sink in mud. In Kentucky, recommendations are for a 4- to 6-inch layer of No. 4 crushed limestone rock for the base material. A 2- to 3-inch cover of tilled or loose "dirt" (silted soil) will allow for easier scraping of the surface and easier of rock from the surface. If the geotextile fabric is pre-wetted, the geotextile fabric is a "geotextile" fabric material, allowing for easier scraping of the surface and less loss of rock through the fabric or "dry" material. Using the finer soil for surface cover instead of crushed rock also improves animal comfort and welfare and reduces the potential for foot injuries. A sand surface was also tested, but the sand tended to shift easily and did not provide as firm a footing.

The dense grade material is generally available from suppliers of highway material and is typically composed of aggregate no larger than 0.75 inch, with mostly finer aggregate and fines. The fine surface should be sifted out so it will not have a large portion of fines. However, some fines are desirable for packing and stability. On-farm trials and trial installations on the University of Kentucky Woodford County beef unit have been very successful in demonstrating the effectiveness and durability of geotextile and rock pads. An extension publication (AEU-061) developed by the Biosystems and Agricultural Engineering Department at the University of Kentucky provides additional construction information and a list of suppliers of the geotextile fabric material (Turner, 1990). A list of suppliers is also available at the following Biosystems and Agricultural Engineering Web site: www.lsa.uky.edu/ under "Departmental Research and Extension Information/Resources.”

Costs

As shown in Table 1, the cost of geotextile pads is about $0.99/B, while concrete costs in the range of $1.50/B. One reason for the lower cost is that rock is required for stability when geotextile fabric is used.

<table>
<thead>
<tr>
<th>Material</th>
<th>Cost per Linear Foot (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geotextile Fabric</td>
<td>$0.09</td>
</tr>
<tr>
<td>Rock Base (No. 4 Crushed Limestone)</td>
<td>$0.09</td>
</tr>
<tr>
<td>Fire Cover Material</td>
<td>$0.09</td>
</tr>
<tr>
<td>Labor</td>
<td>$0.13</td>
</tr>
<tr>
<td>TOTAL COST</td>
<td>$0.40</td>
</tr>
</tbody>
</table>

Facility Layout

Width, shape, and drainage. Feeding pads next to a bank should be at least 10 to 12 feet wide, depending on the animal’s size. Slopes should be 3:1 or 4:1, free of drainage away from the site and where excess manure buildup can be stored if the pad is not enclosed. For traffic surfaces, widths should be at least 10 feet. Traffic lanes should be slightly crowned in the center of the lane.

Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin.

References


“All-Weather Geotextile Surfaces for Livestock and Vehicle Areas.” UAS-051. Length: 11:06. Cooperative Extension Service video is available from the University of Kentucky Cooperative Extension Service, Department of Agricultural Communications Services.

Geotextile Provides:

- Weight Redistribution
- Separation Between Rock and Subgrade

Surface for Livestock, Feeding Equipment and Waste Removal
Feed Pad Cross-Section

- Fine cover material (2-3"
- No. 3 or 4 crushed limestone rock (4-6"
- Soil below pad
- Geotextile filter fabric over soil surface
Some Tips:

• Wind!!! 😞
• Bury Edges
• Overlap 1 – 2 feet
• Apply fines in 2 lifts
• Protect edges
• Repair when needed
3-Side Bale Feeder System
Incentives to Relocate or Improve Feeding Sites

- Improved Water Quality
- Dry Surface
  - Reduced Mud
    - Improved animal health and performance
- Good Access for Cleaning Waste
  - Stable Flies and Performance
  - Nutrient Value of Manure
- Cost Share
### Cost Share

- **Heavy Use Protection**
  - USDA NRCS
  - Conservation Districts
  - WRAPS
TAKE HOME MESSAGES

• A **100 ft. grass buffer** between the denuded area around the bunks and any drainage channel (ditches, waterways, terraces, etc)

• **Frequently remove manure** from the denuded area around the bunks and apply at agronomic crop rates.

• A **quality (and quantity) grass stand** is necessary with non-confined feeding sites.
TAKE HOME MESSAGES

• The public may consider a non-confined feeding area the same as a confined feeding area due to the lack of grass near the feed bunks;
  – therefore consider visibility with management decisions and locations of non-confined feeding site.

• Bunks and water troughs should not be within any permanent confinement fencing.
Is this Non-Confined feeding?
TAKE HOME MESSAGES

- “If it looks like a feed lot”, the regulatory persons may call it a feedlot and apply the similar requirements for registration and permitting as a confined feeding facilities.
Reference Sources

- Non-Confined Beef Cattle Feeding Sites https://www.kcare.k-state.edu/NC%20feeding%20PUB.pdf
- Kansas TMDL Web Map https://maps.kdhe.state.ks.us/kstmdl/
- Kansas Approved WRAPS Plans http://www.kswraps.org/kdhe-approved-nine-element-watershed-plans
Water quality impacts of livestock operations and grazing management

Upcoming session: Friday, May 8, 8:30am

Topic: Extending the grazing season

Presenters: Jeff Davidson, KCARE watershed specialist

Hosted by: Natural Resources PFT and KCARE