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

Natural Resources PFT

Kansas Center for Agricultural Resources and the Environment (KCARE)

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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**

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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

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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.

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Water quality impacts of livestock operations and grazing management

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

Thursday, May 7

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Speakers

Will Boyer

KCARE Watershed Specialist, NE Kansas

Herschel George

KCARE Watershed Specialist, retired

Stacie Minson

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

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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

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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

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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 it's designated use
- **TMDLs set for**
  - Total Nitrogen (TN)
  - Total Phosphorus (TP)
  - Total Suspended Solids (TSS)
  - E.*coli* bacteria (fecal coliform)

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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

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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**

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Non-Confined Feeding Sites

Potential Pollution Concerns

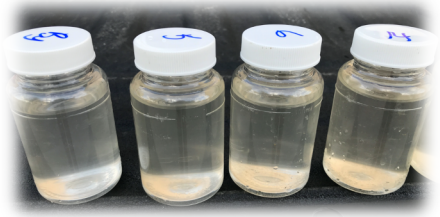
- **Overutilization and trampling create:**
  - Soil erosion
  - Bare areas
  - Nutrient runoff
  - Groundwater leaching

- **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

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Extension Outreach & Technical Assistance – Kansas State University

Approved EPA/KDHE WRAPS & TMDL Plans

Kansas Approved WRAPS Plans http://www.kswraps.org/kdhe- approved-nine-element-watershed-plans

Kansas TMDL Web Map 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.

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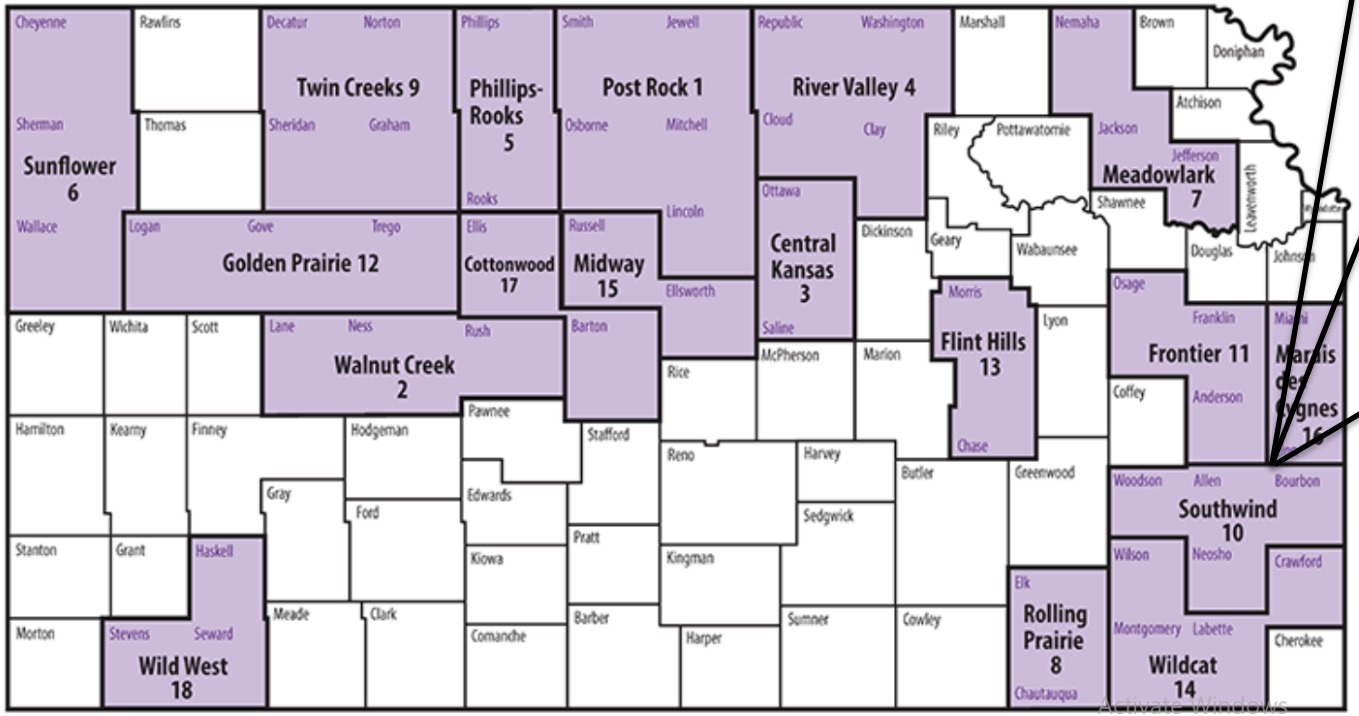
Herschel George



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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
  - enhance organic matter breakdown

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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.**

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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

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- Bunk may provide 50 to 100% of livestock intake

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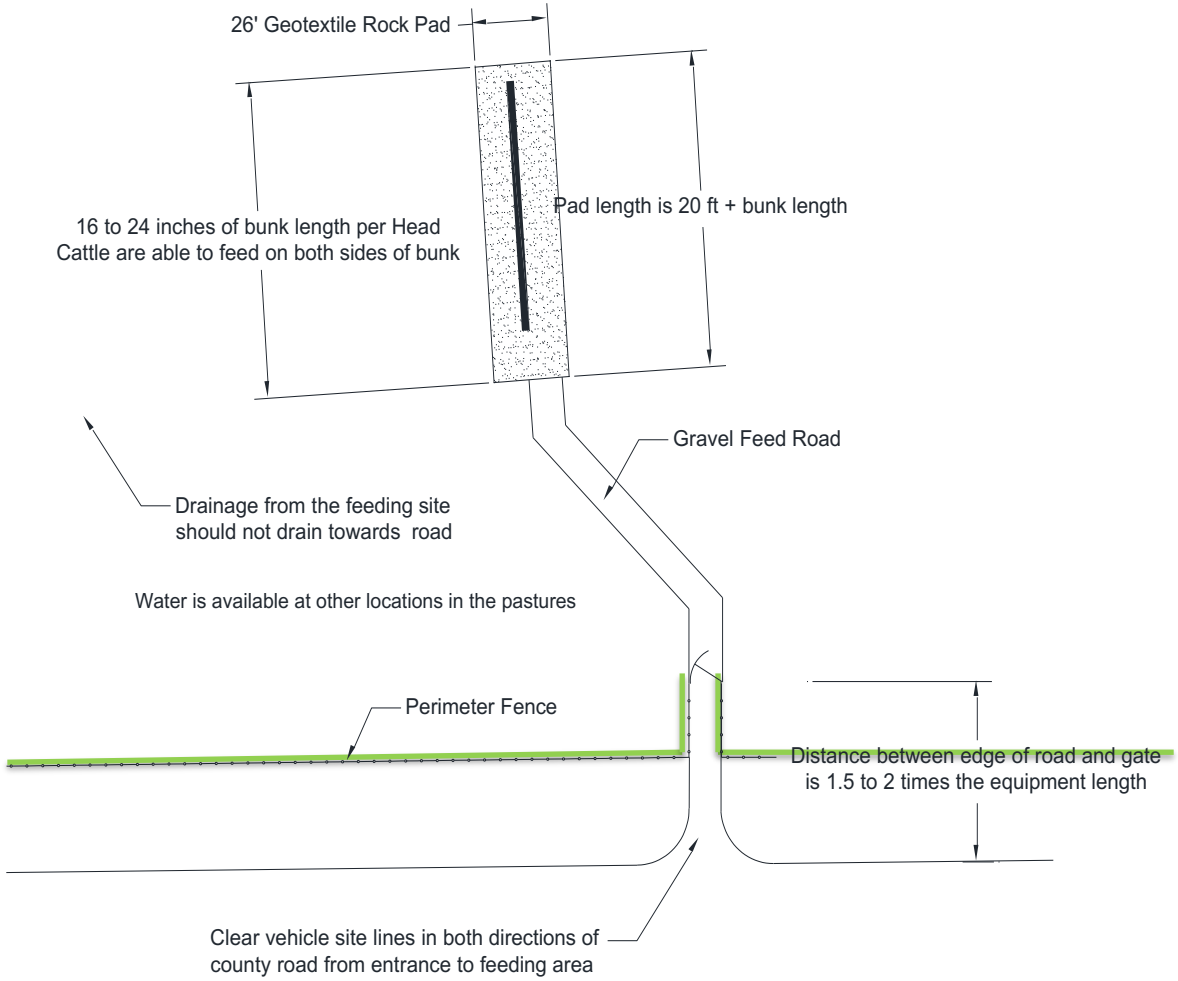

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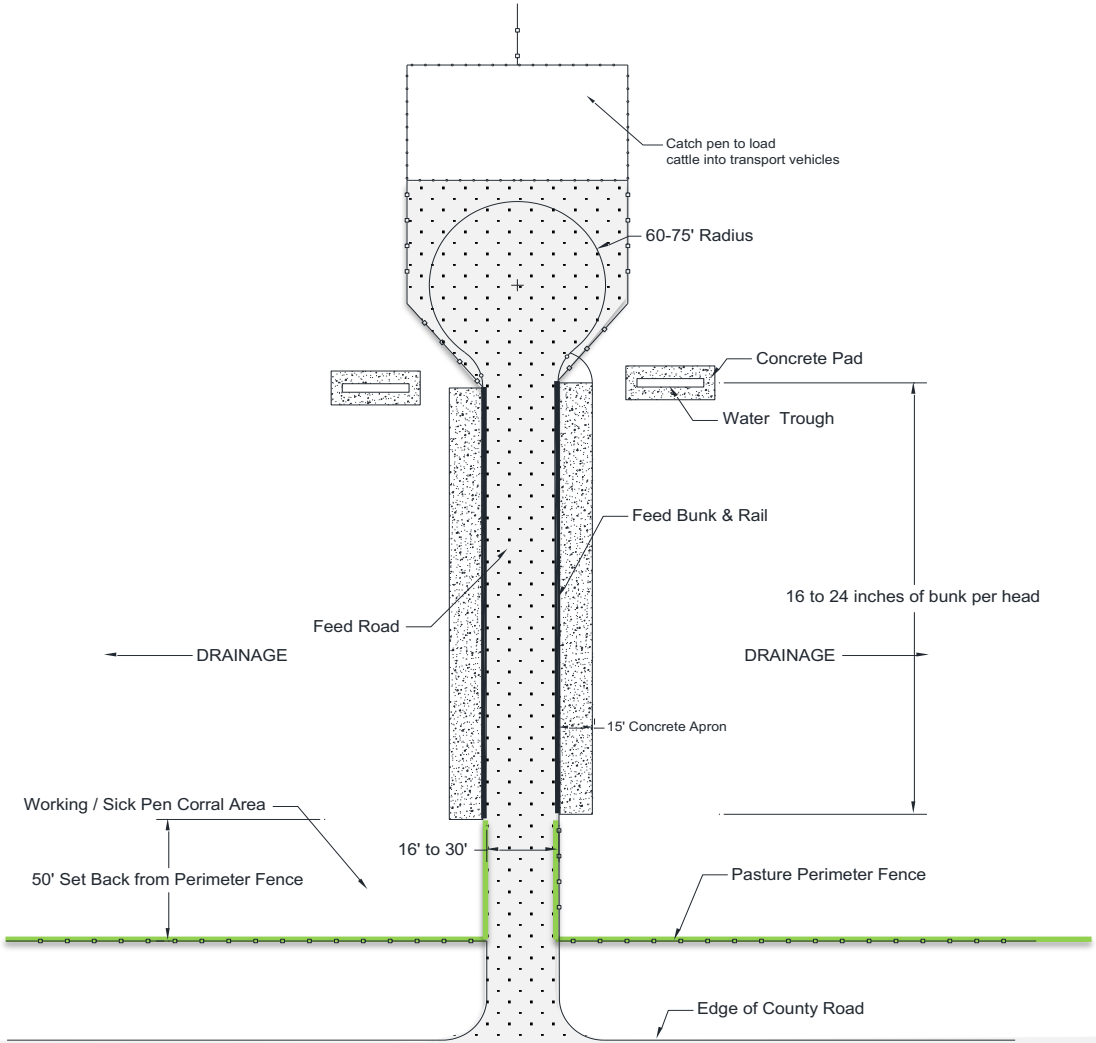

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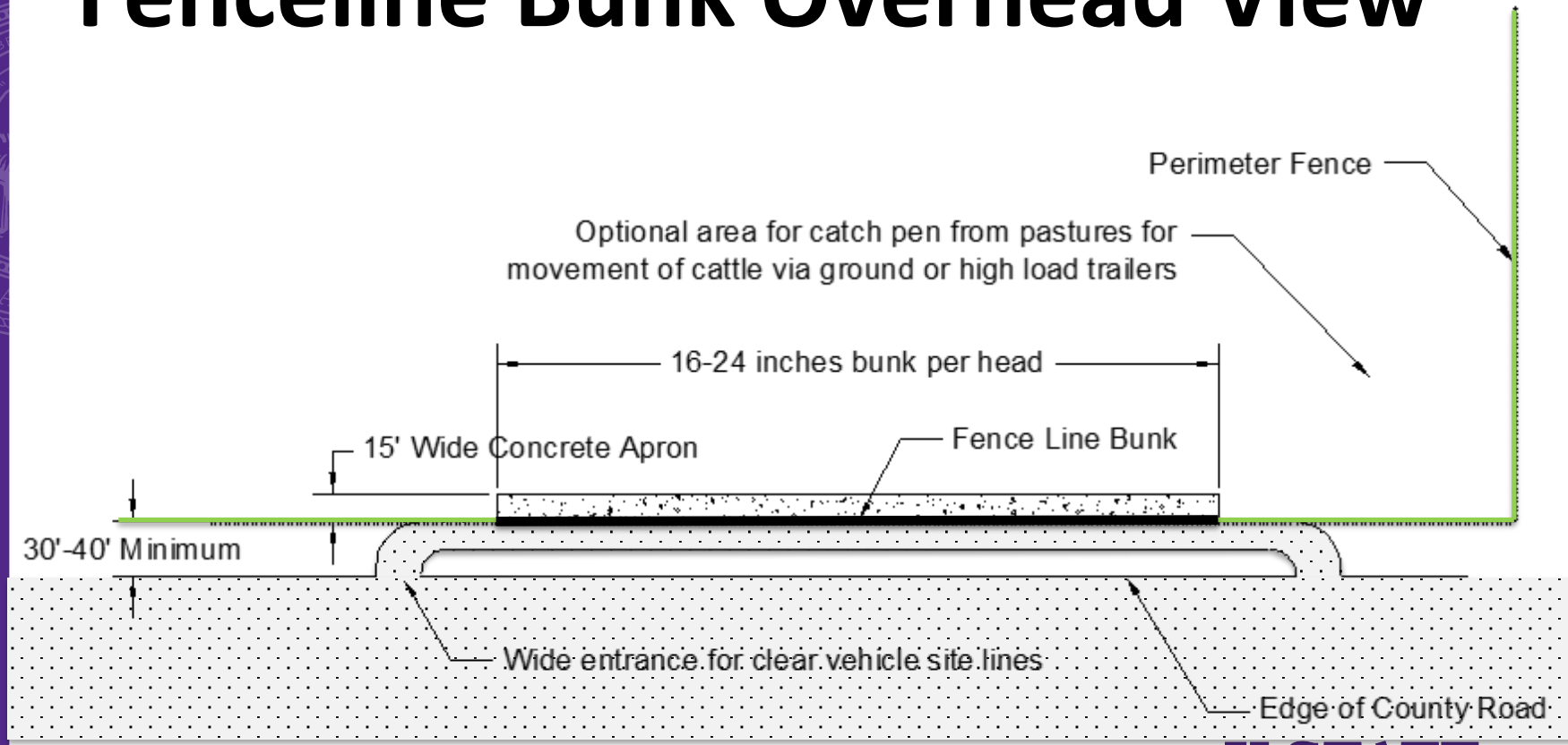
Fenceline Bunk Overhead View



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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

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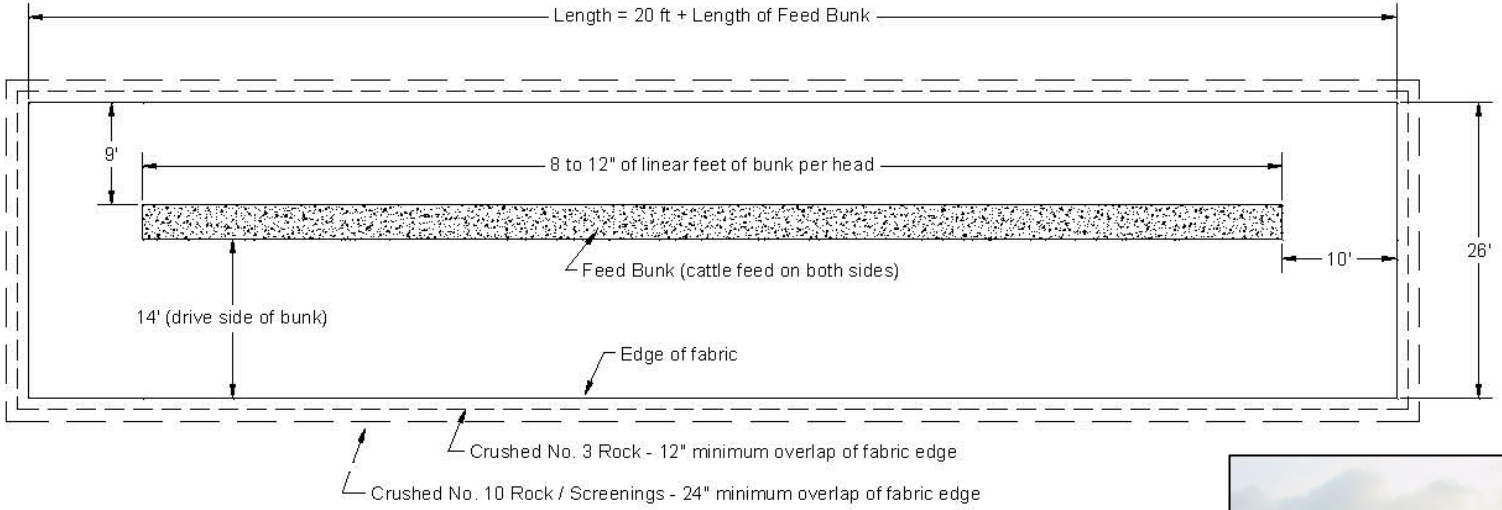
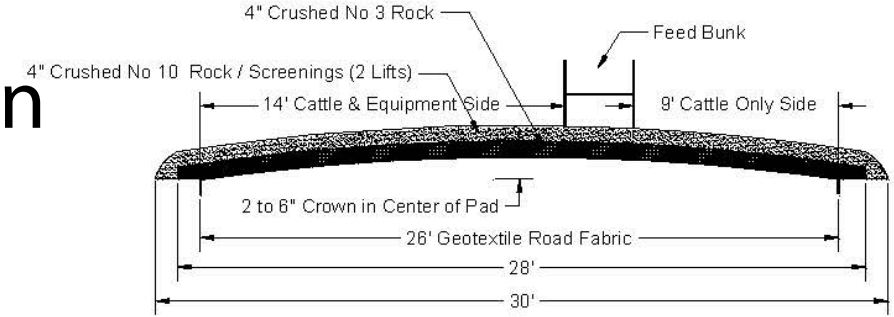
Overhead View



Cross-Section View



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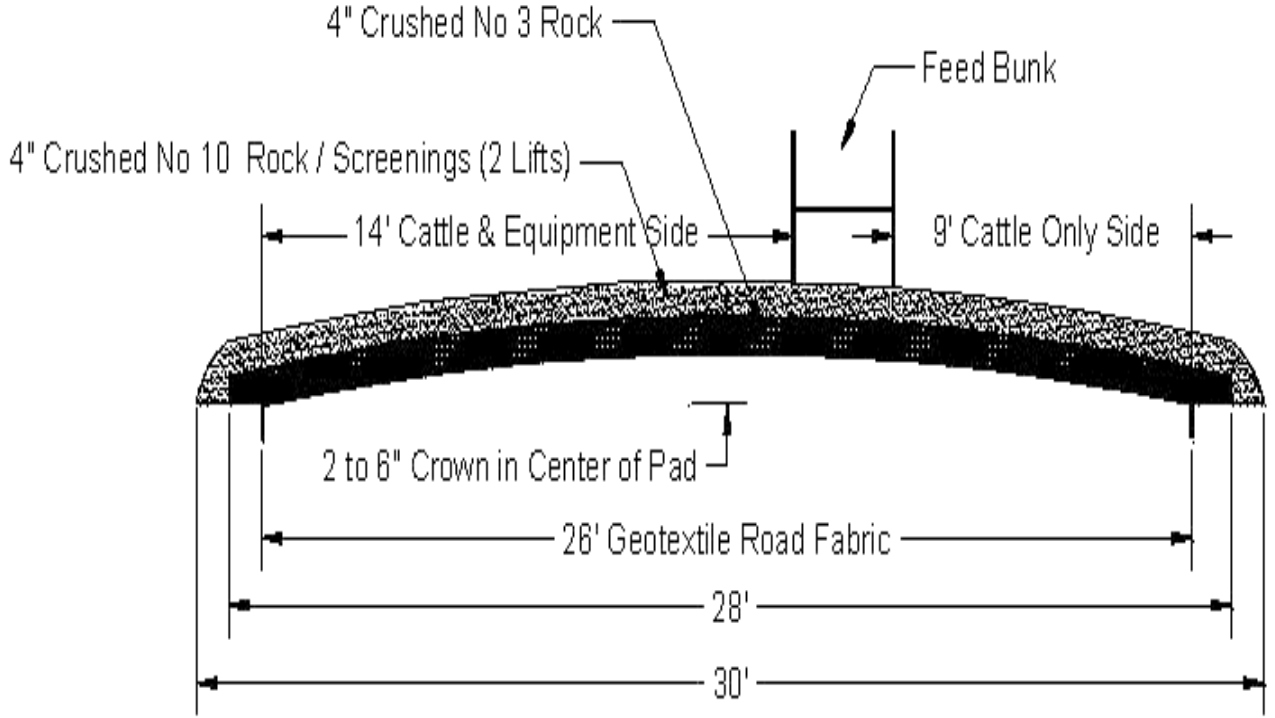
Cross-Section View



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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

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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

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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

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Manage Cover and Concentration

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“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

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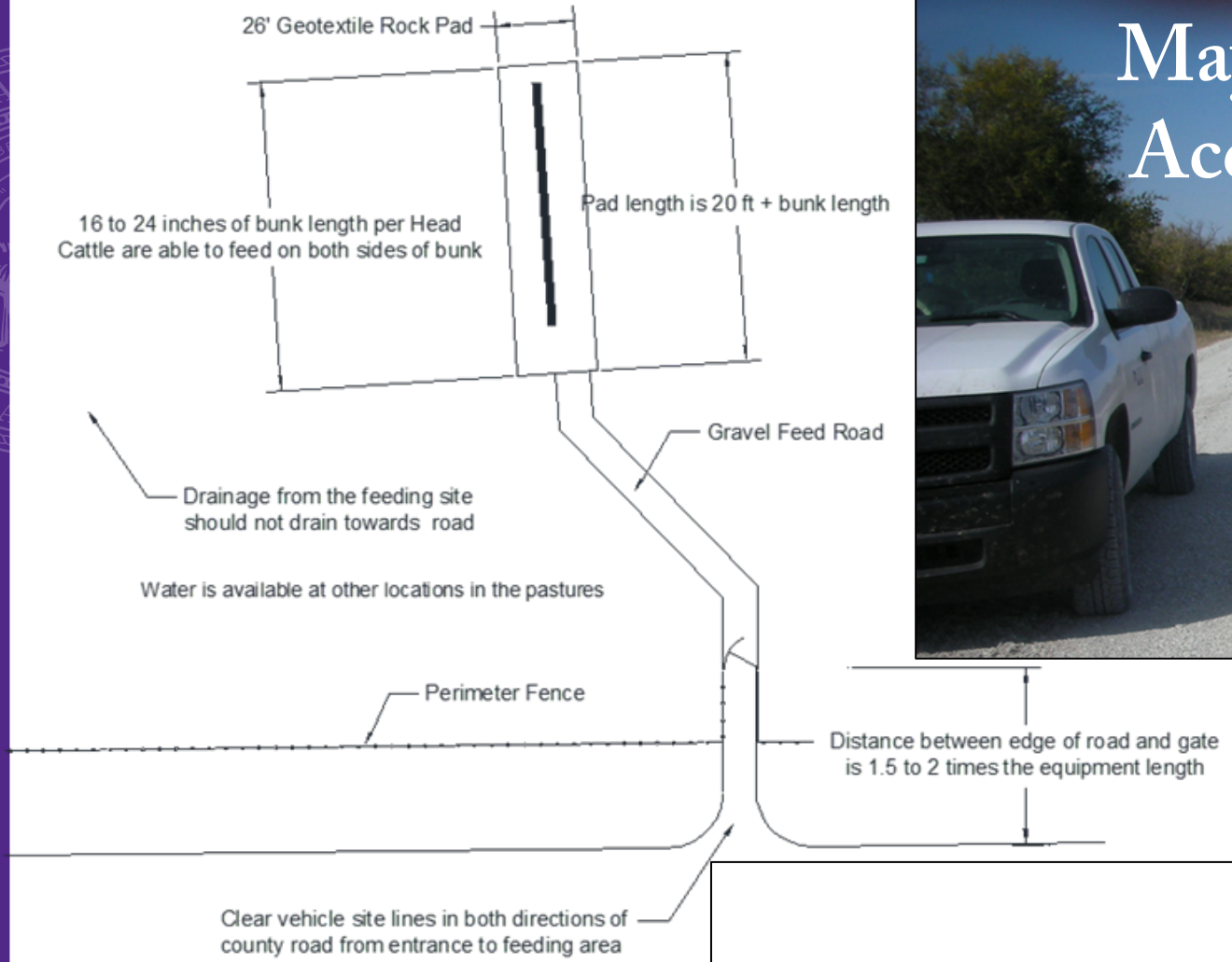
May Need an Access Road



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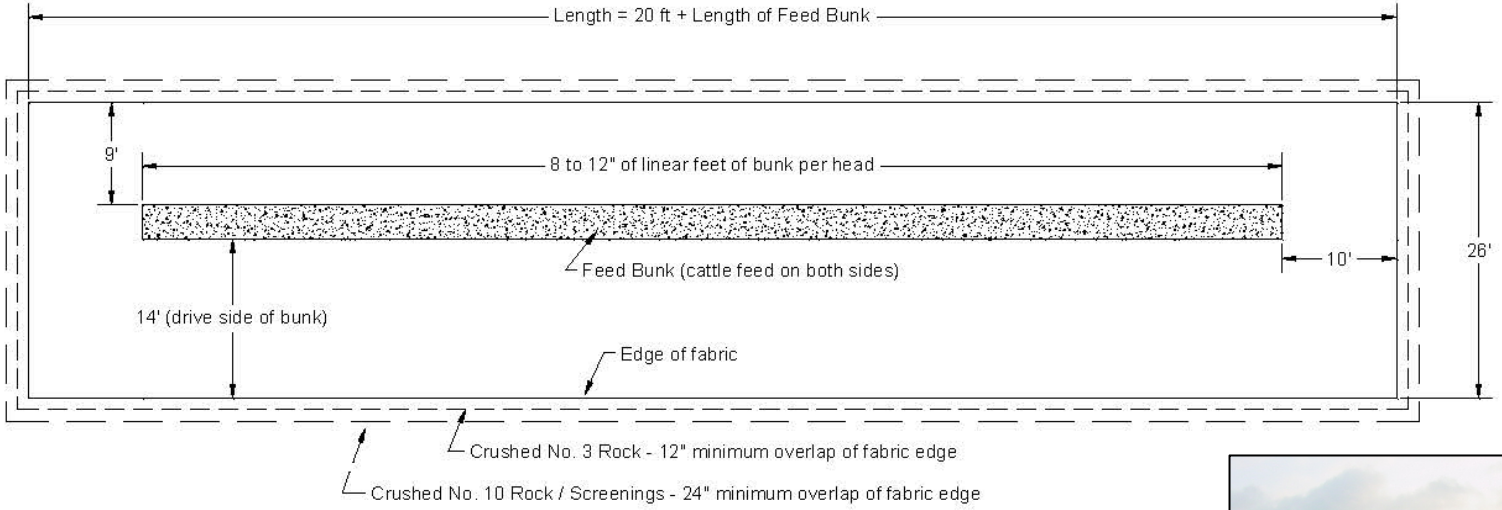
Overhead View



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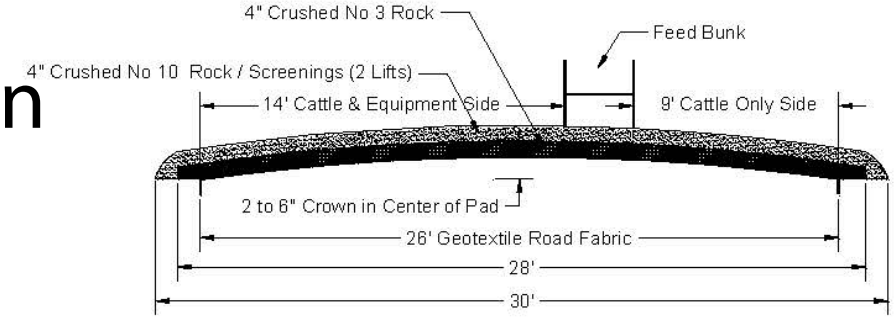

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COOPERATIVE EXTENSION SERVICE
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Using Geotextiles For Feeding and Traffic Surfaces

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. To help avoid the problems associated with mud and reduced performance, producers should consider using concrete pads or lower-cost all-weather surfaces wherever 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, an all-weather surface can be constructed of geotextile fabric, rock, and fine surface cover for less than one-third of the cost of concrete. Rock over bare soil in Kentucky requires approximately 12 inches of depth for stability, but using rock over geotextile fabrics can reduce rock depth by half. Repeated maintenance usually required for rock pads is also reduced because the fabric keeps the rock in place.

Floor or Pad Construction

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

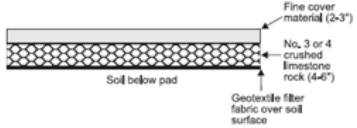


Figure 1. Construction details for animal-use pads.

The geotextile fabrics are porous, so water and moisture pass through the material while the rock is held in place. Even with mud and manure buildup on the surface, the animals have a solid footing so that 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 sifted lime or "dense grade" (sometimes called "road mix") material will allow for easier scraping of the surface and less loss of rock through the box manure spreader. Using the finer aggregate 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 surface material and is typically composed of aggregate no larger than 0.75 inch, with mostly finer aggregate and fines. The lime surface should be sifted so that it will not have a large portion of fines. However, some fines are desirable for packing and stability.

On-farm trials and a trial installation on the University of Kentucky Woodford County beef unit have been very successful in illustrating the effectiveness and durability of geotextile and rock pads. An Extension publication (AEU-68) 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 materials (Turner, 1996). A list of suppliers is also available at the following Biosystems and Agricultural Engineering Web site: <http://www.bae.uky.edu/> under "Departmental Research and Extension Information/Resources."

Costs

As shown in Table 1, the cost of geotextile pads is about $0.49/ft^2, while concrete costs in the range of $1.50/ft^2. One reason for the lesser cost is that less rock is required for stability when geotextile fabrics are used.

Table 1. Geotextile-based rock pad costs

Geotextile Filter Fabric	$0.10/ft^2
Rock Base (No. 4 Crushed Limestone)	$0.18/ft^2
Fine Cover Material	$0.09/ft^2
Total Materials	$0.37/ft^2
Labor/Grading Work	$0.12/ft^2
TOTAL COST	$0.49/ft^2

Facility Layout

Width, slope, and drainage. Feeding pads next to a bunk should be at least 10 to 12 feet wide, depending on the animals' size. Slopes should be 3/4 to 1 inch per foot away from the feed bunk. The bunk and pad should be located in a generally well-drained area that offers good drainage away from the site and where excess manure buildup can be stored if the pad is not scraped daily. For traffic surfaces, widths should be 8 to 12 feet. Traffic lanes should be slightly crowned in the center of the lane.

Layouts. Figures 2, 3, and 4 present typical layouts for feeding pads and facilities for cattle using geotextile pads. These installations will improve animal performance, while reducing erosion and runoff from feeding sites.

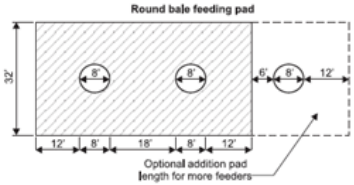


Figure 2. Large round bale feeding pad using hay rings.

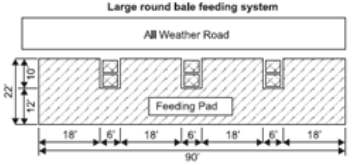


Figure 3. Large round bale feeding pad with drive-by all-weather road feeding.

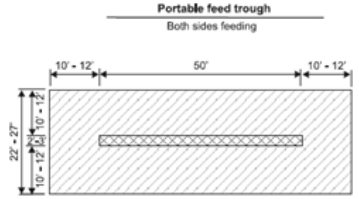
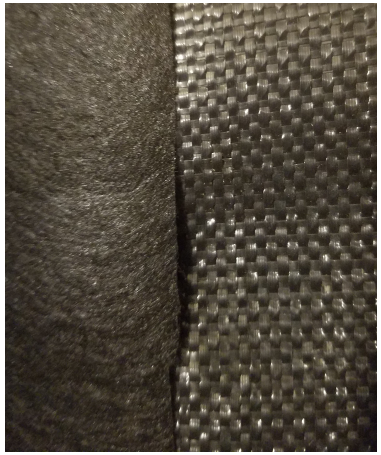


Figure 4. Geotextile pad for feeding with portable trough.



References

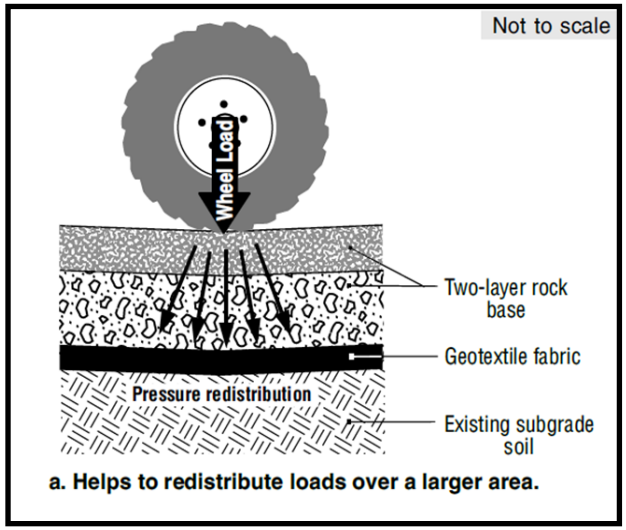
Turner, L.W. 1996. "Reducing Mud Using Highway-Type Filter Materials," AEU-68, Department of Biosystems and Agricultural Engineering, Cooperative Extension Service, College of Agriculture, University of Kentucky, Lexington.

"All-Weather Geotextile Surfaces for Livestock and Vehicle Areas." VAE-1051. Length: 11:06. Cooperative Extension Service video, available from the University of Kentucky Cooperative Extension Service, Department of Agricultural Communications Services.

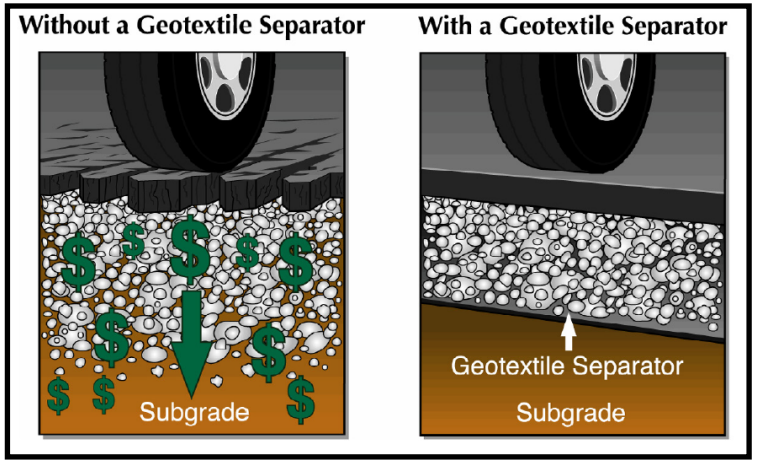
Turner, L.W. 1997. Listing of Geotextile Fabric Sources. Biosystems and Agricultural Engineering Web Site: <http://www.bae.uky.edu/> under "Departmental Research and Extension Information/Resources."

Issued 8/97, 3000 copies

Geotextile Provides:



Weight Redistribution



Separation Between Rock and Subgrade

Surface for Livestock, Feeding Equipment and Waste Removal

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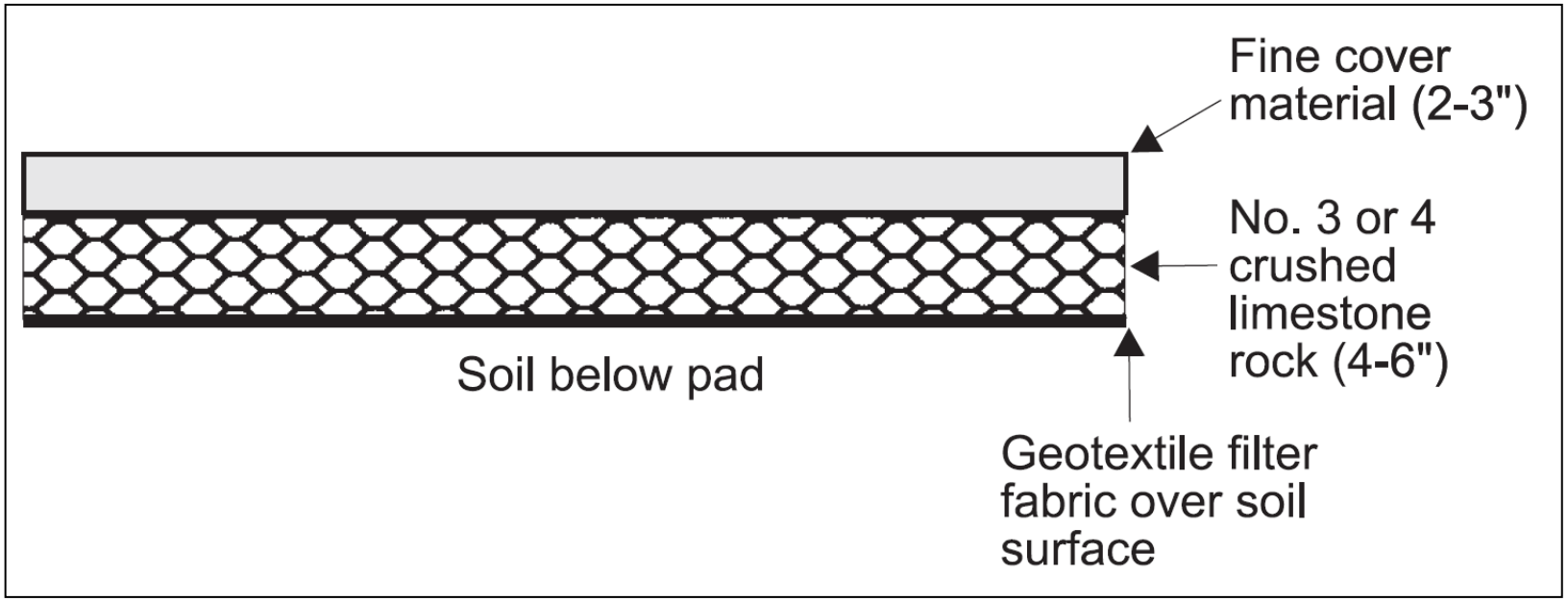
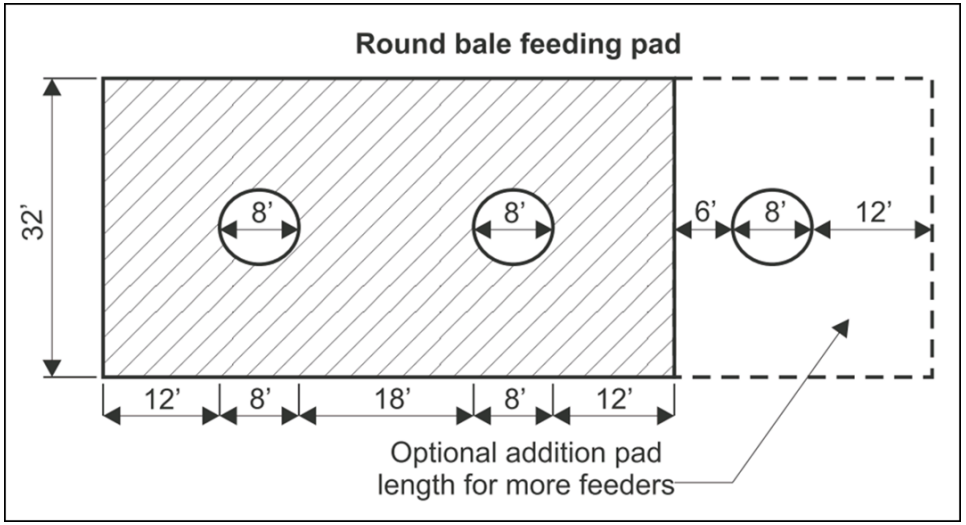
Feed Pad Cross-Section



Some Tips:

- Wind!!! ☹
- Bury Edges
- Overlap 1 – 2 feet
- Apply fines in 2 lifts
- Protect edges
- Repair when needed



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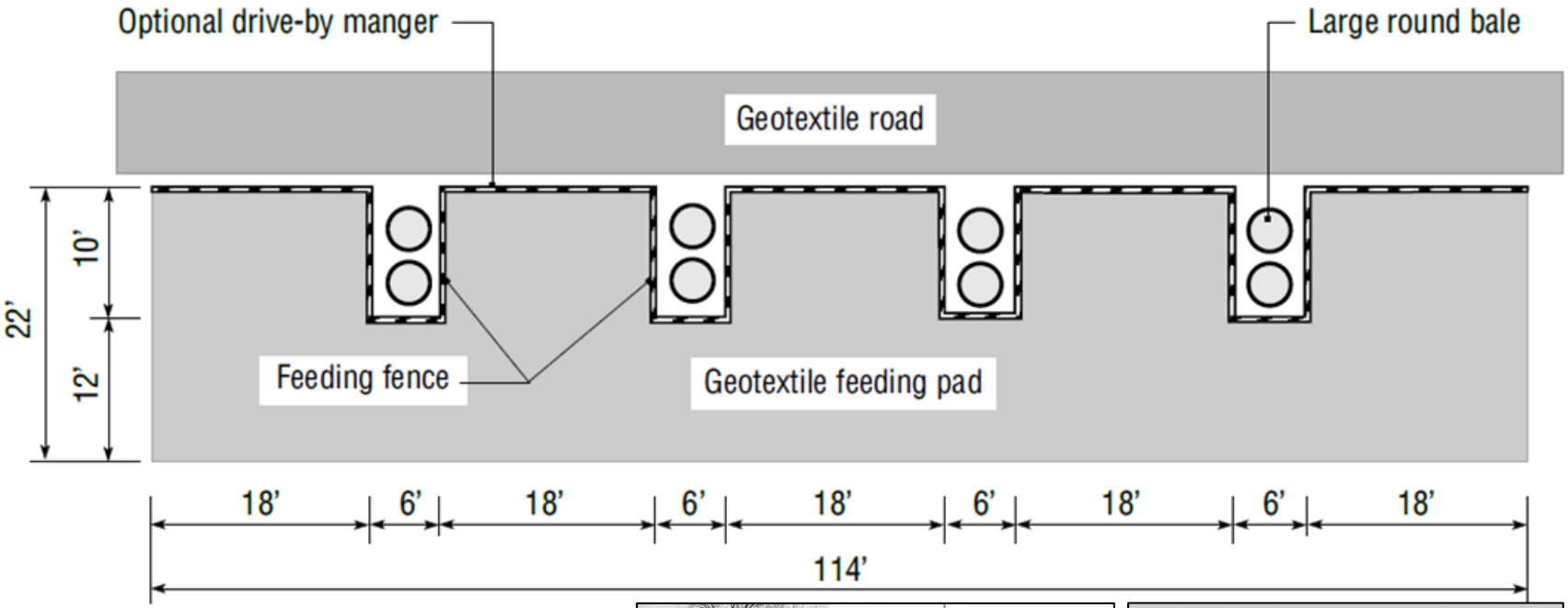

3-Side Bale Feeder System

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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

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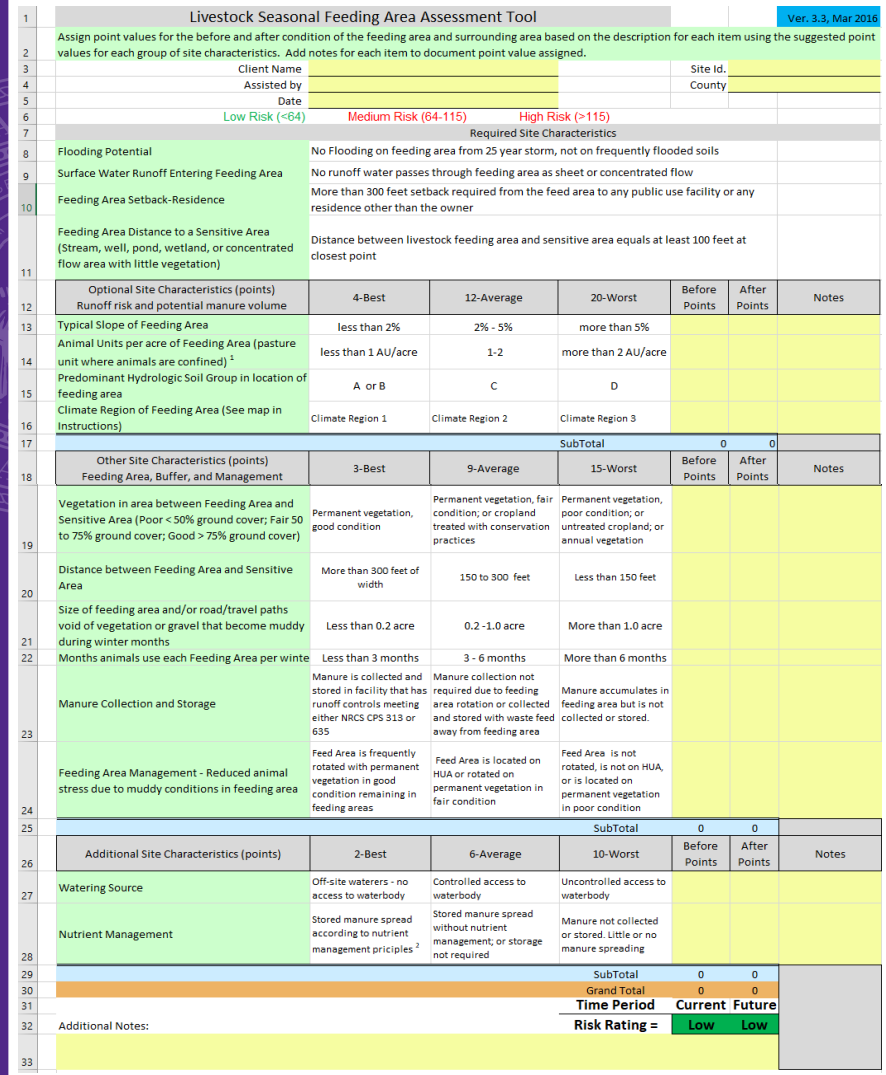

Livestock Seasonal Feeding Area Assessment Tool — Ver. 3.3, Mar 2016

Assign point values for the before and after condition of the feeding area and surrounding area based on the description for each item using the suggested point values for each group of site characteristics. Add notes for each item to document point value assigned.

Client Name | Site Id.
Assisted by | County
Date

Low Risk (<64) | Medium Risk (64-115) | High Risk (>115)

Required Site Characteristics

Flooding Potential	No Flooding on feeding area from 25 year storm, not on frequently flooded soils
Surface Water Runoff Entering Feeding Area	No runoff water passes through feeding area as sheet or concentrated flow
Feeding Area Setback-Residence	More than 300 feet setback required from the feed area to any public use facility or any residence other than the owner
Feeding Area Distance to a Sensitive Area (Stream, well, pond, wetland, or concentrated flow area with little vegetation)	Distance between livestock feeding area and sensitive area equals at least 100 feet at closest point

Optional Site Characteristics (points) Runoff risk and potential manure volume	4-Best	12-Average	20-Worst	Before Points	After Points	Notes
Typical Slope of Feeding Area	less than 2%	2% - 5%	more than 5%			
Animal Units per acre of Feeding Area (pasture unit where animals are confined) [1]	less than 1 AU/acre	1-2	more than 2 AU/acre			
Predominant Hydrologic Soil Group in location of feeding area	A or B	C	D			
Climate Region of Feeding Area (See map in Instructions)	Climate Region 1	Climate Region 2	Climate Region 3			
			SubTotal	0	0	

Other Site Characteristics (points) Feeding Area, Buffer, and Management	3-Best	9-Average	15-Worst	Before Points	After Points	Notes
Vegetation in area between Feeding Area and Sensitive Area (Poor < 50% ground cover; Fair 50 to 75% ground cover; Good > 75% ground cover)	Permanent vegetation, good condition	Permanent vegetation, fair condition; or cropland treated with conservation practices	Permanent vegetation, poor condition; or untreated cropland; or annual vegetation			
Distance between Feeding Area and Sensitive Area	More than 300 feet of width	150 to 300 feet	Less than 150 feet			
Size of feeding area and/or road/travel paths void of vegetation or gravel that become muddy during winter months	Less than 0.2 acre	0.2 -1.0 acre	More than 1.0 acre			
Months animals use each Feeding Area per winte	Less than 3 months	3 - 6 months	More than 6 months			
Manure Collection and Storage	Manure is collected and stored in facility that has runoff controls meeting either NRCS CPS 313 or 635	Manure collection not required due to feeding area rotation or collected and stored with waste feed away from feeding area	Manure accumulates in feeding area but is not collected or stored.			
Feeding Area Management - Reduced animal stress due to muddy conditions in feeding area	Feed Area is frequently rotated with permanent vegetation in good condition remaining in feeding areas	Feed Area is located on HUA or rotated on permanent vegetation in fair condition	Feed Area is not rotated, is not on HUA, or is located on permanent vegetation in poor condition			
			SubTotal	0	0	

Additional Site Characteristics (points)	2-Best	6-Average	10-Worst	Before Points	After Points	Notes
Watering Source	Off-site waterers - no access to waterbody	Controlled access to waterbody	Uncontrolled access to waterbody			
Nutrient Management	Stored manure spread according to nutrient management priciples [2]	Stored manure spread without nutrient management; or storage not required	Manure not collected or stored. Little or no manure spreading			
			SubTotal	0	0	
			Grand Total	0	0	
			Time Period	Current	Future	
			Risk Rating =	Low	Low	

Additional Notes:

Cost Share

- Heavy Use Protection
  - USDA NRCS
  - Conservation Districts
- WRAPS

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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.

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- 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.

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Is this Non-Confined feeding?

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- “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.

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Reference Sources

- Non-Confined Beef Cattle Feeding Sites https://www.kcare.k-state.edu/NC%20feeding%20PUB.pdf
- Protecting Water Quality from Agricultural Runoff https://www.epa.gov/sites/production/files/2015-09/documents/ag_runoff_fact_sheet.pdf
- Alternative Winter Feeding Strategies for Beef Cattle Management https://www.ag.ndsu.edu/publications/livestock/alternative-winter-feeding-strategies-for-beef-cattle-management
- 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
- Using Geotextiles for Feeding and Traffic Surfaces https://www.uky.edu/bae/sites/www.uky.edu.bae/files/aen79.pdf
- How Feeding Site Mud and Temperature Affect Animal Performance https://bookstore.ksre.ksu.edu/pubs/mf2673.pdf
- Managing Stable Fly Production at Pasture Feeding Sites
- https://www.kcare.k-state.edu/pubs/livestock_management/flies%20and%20pasture%20feeding%20MF2662.pdf
- Kansas NRCS Winter Feeding Area Assessment https://efotg.sc.egov.usda.gov/references/public/KS/WinterFeedAreaAssessment_wksht.xlsx

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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

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