

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**

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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Schedule

- Day 1: Confined feeding sites: Helping a producer with site selection and planning
 - Tuesday, 5/5, 8:30-9:30 a.m.
 - Presenters: KCARE watershed specialists Ron Graber and Herschel George
- 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





Water quality impacts of livestock operations and grazing management

Confined Feeding Sites: Helping producers with site selection and planning

Tuesday, May 5



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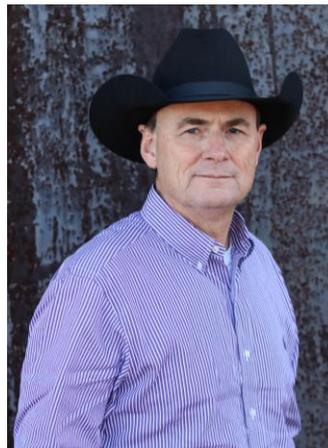
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Speakers



**Herschel
George**

KCARE Watershed
Specialist, retired



Ron Graber

KCARE Watershed
Specialist for Central
Kansas

Panelists

Cade Rensink, Central Kansas Extension District Director

Joe Harner, Kansas State University

Pat Murphy, Kansas State University



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Environmental issues impact all sizes of beef operations



Impairments

- Fecal coliform bacteria
- Nutrients
- Sediments



When it Rains it Pours

Iced Tea and Smoothies



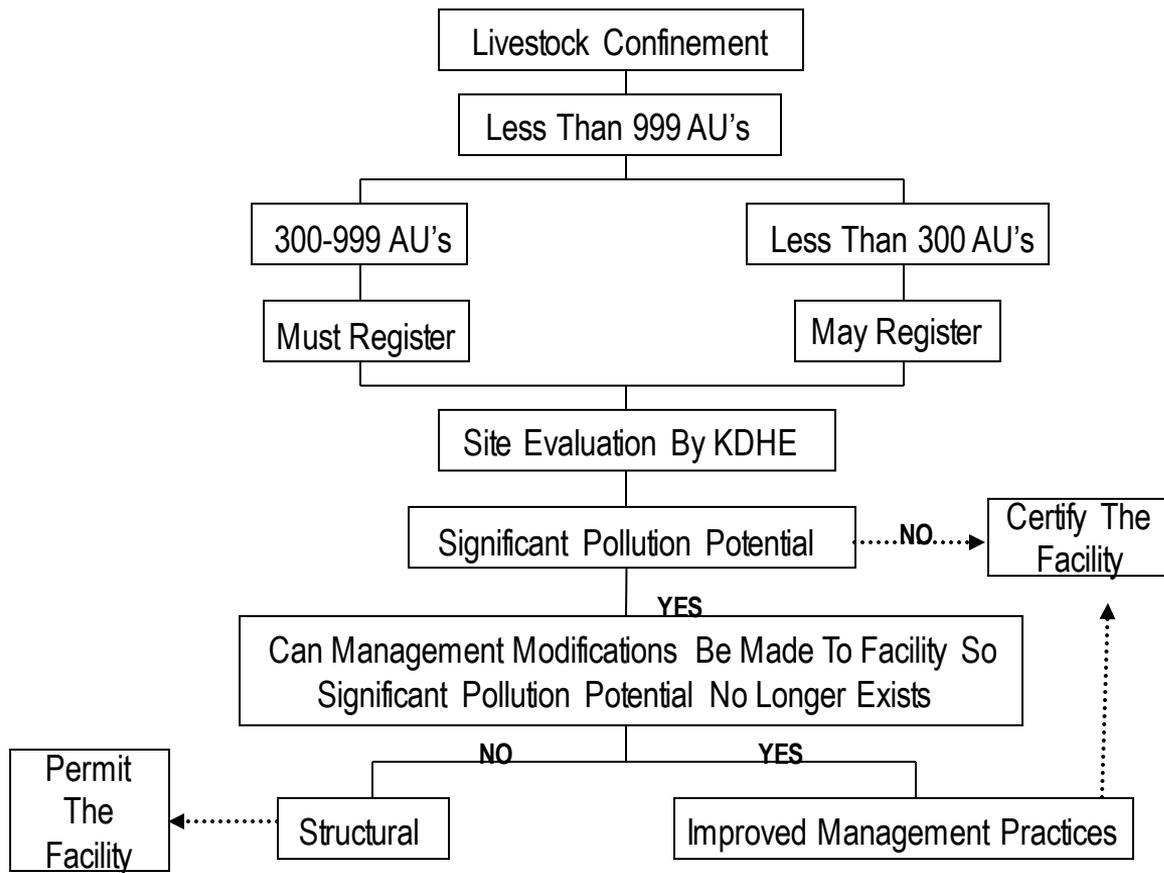
Confined Feeding



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Facility Compliance Process



Permit Required

- Over 999 head, or 300 AU and discharges through a manmade device
- Has a lagoon, pit, or tank for waste storage
- Has a classified stream or a channel with frequently or occasionally flooded soils through or adjacent to pens
- Uses improper waste collection, handling, or disposal
- Has daily discharge



1. Capacity (AUs)	<ul style="list-style-type: none"> < 50 1 50 - 100 3 100 - 300 5 300 - 500 7 500 - 700 8 700 - 999 9 	AUs	
2. Pen Slope	<ul style="list-style-type: none"> < 1% 1 1 - 2% 3 2 - 3% 5 3 - 4% 7 4 - 5% 9 > 5% 10 	%	
3. Slope from pen to protected water body	<ul style="list-style-type: none"> < 1% 1 1 - 2% 3 2 - 3% 5 3 - 4% 7 4 - 5% 9 > 5% 10 	%	
4. Distance, pens to protected water body	<ul style="list-style-type: none"> > 5280' 1 4000 - 5280' 2 2640 - 4000' 4 1000 - 2640' 5 500 - 1000' 7 100 - 500' 9 < 100' 10 	feet	
5. Utilization	<ul style="list-style-type: none"> < 3 1 3 - 4 4 4 - 6 6 > 7 9 	months per year	
6. Soils between pens and water body	<ul style="list-style-type: none"> Clay 9 Silty Clay 7 Silt 5 Silty Sand 3 Sand 1 		
7. Buffer	<ul style="list-style-type: none"> Dense cover of grass 1 Grass with woody plants 4 Cultivated crop ground 6 Bare earth 10 		
8. Buffer Size	<ul style="list-style-type: none"> > 2 x Pen Area 1 1 - 2 x Pen Area 4 0.5 - 1 x Pen Area 7 < 0.5 x Pen Area 10 		
9. Extraneous Drainage	<ul style="list-style-type: none"> < 1 x Pen Area 1 1 - 3 x Pen Area 4 3 - 5 x Pen Area 7 > 5 x Pen Area 9 		
10. Annual Rainfall	<ul style="list-style-type: none"> < 20" 1 20 - 25" 3 25 - 30" 5 30 - 35" 7 35 - 40" 9 > 40" 10 	inches	
11. Rainfall Intensity (25-Yr. 24-Hr. Storm)	<ul style="list-style-type: none"> < 4.5" 1 4.5 - 5" 3 5 - 5.5" 5 5.5 - 6" 7 	inches	

1. Has one or more lagoons, pits, or tanks for waste storage and discharges through a manmade device	
2. Has one or more lagoons, pits, or tanks for waste storage	
3. Has a perennial, intermittent or ephemeral stream through or adjacent to pens	
4. Uses improper waste collection, handling, or disposal	
5. Has a daily discharge	

Section C Groundwater Protection	Factor	Comments
1. Capacity (AUs)	<ul style="list-style-type: none"> <50 1 50 - 100 3 100 - 300 5 300 - 500 7 500 - 700 8 700 - 999 9 	AU's
2. Annual Rainfall	<ul style="list-style-type: none"> < 20" 1 20 - 25" 3 25 - 30" 5 30 - 35" 7 35 - 40" 9 > 40" 10 	inches
3. Depth to groundwater	<ul style="list-style-type: none"> > 150' 1 25 - 150' 3 10 - 25' 6 5 - 10' 8 < 5' 10 	feet
4. Soils receiving runoff	<ul style="list-style-type: none"> Clay 1 Silty Clay 3 Silt 5 Silty Sand 7 Sand 9 	
5. Distance to nearest well (water, gas, oil) potentially impacted (down gradient)	<ul style="list-style-type: none"> > 600' 1 200 - 600' 3 100 - 200' 5 50 - 100' 7 0 - 50' 9 0 10 	feet
Section C Total:		0/25 or less is desired

Section D Special Conditions	Yes/No
1. Springs, seeps, rock outcrops in pens or direct runoff area	
2. Located in sensitive groundwater area	
3. Is the protected water body an Outstanding Natural Resource or Special Aquatic Life Use Surface Water?	

Section E Evaluation

1 Section A - any "yes" answer requires controls and a permit.

2 Section B - Sum of risk values > 60 is a significant pollution potential which requires controls and a permit or modification for operations.

3 Section C - Sum of risk values > 25 is a significant pollution potential which requires controls and a permit or modification for operations.

4 Section D -

e. If D1 or D2 is "yes" and groundwater Potential is > 20, a permit is required.

f. If D3 is "yes" and Surface Water Potential is > 50, a permit is required.

5 Section E - If facility evaluation does not require a permit, the facility is eligible for certification. Prior to the certification, the inspector shall review all



Feedlot Capacity

- Cattle > 700# --- 1.0 Animal Units
< 700# --- 0.5 AU
- Mature Dairy Cows --- 1.4 AU
- Hogs > 55# --- 0.4 AU
< 55# --- 0.1 AU
- Sheep/Goats --- 0.1 AU
- Horses --- 2.0 AU

Factors to Consider for Lot Location

- Neighbors
- Surface water
- Water table
- Property lines
- Water supply
- Soil type & terrain
- Land availability



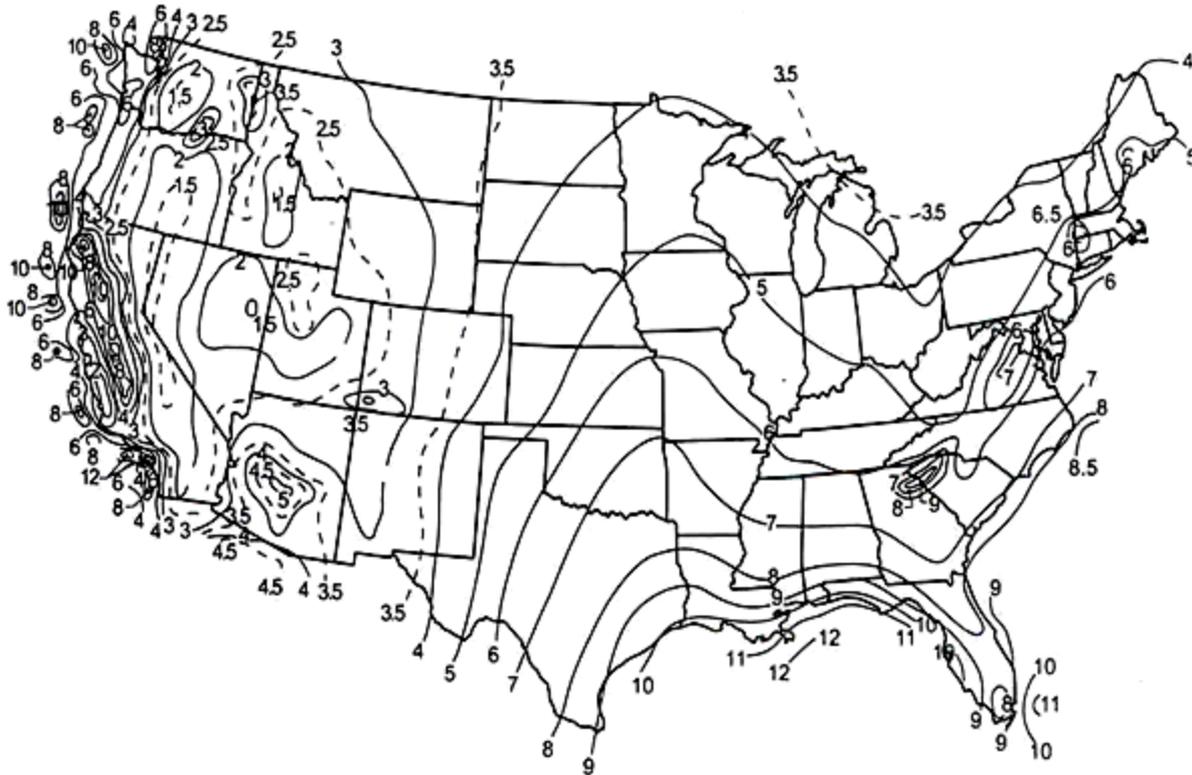
Initial Site Planning

- Approximately 1 acre of land is required per 100 AUs for pen space, alleys, and feed roads
- Preferred bunk orientation is in a north-south direction
- Normally, $\frac{1}{8}$ to $\frac{1}{2}$ acre is needed for working area
- A 2% to 5% land slope is recommended

Recommendation for Lots

- Lot space - 300 square feet per head
- Bunk space – 18-24 inches per head
- Mound space – 40-60 square feet per head
- Concrete Apron – 15 ft minimum
 - 12 ft behind bunk + 3 ft for bunk to rest on
- Gates – 16' preferred – 12' minimum
- Waterer – 20-30 ft from bunk w/ 12' apron

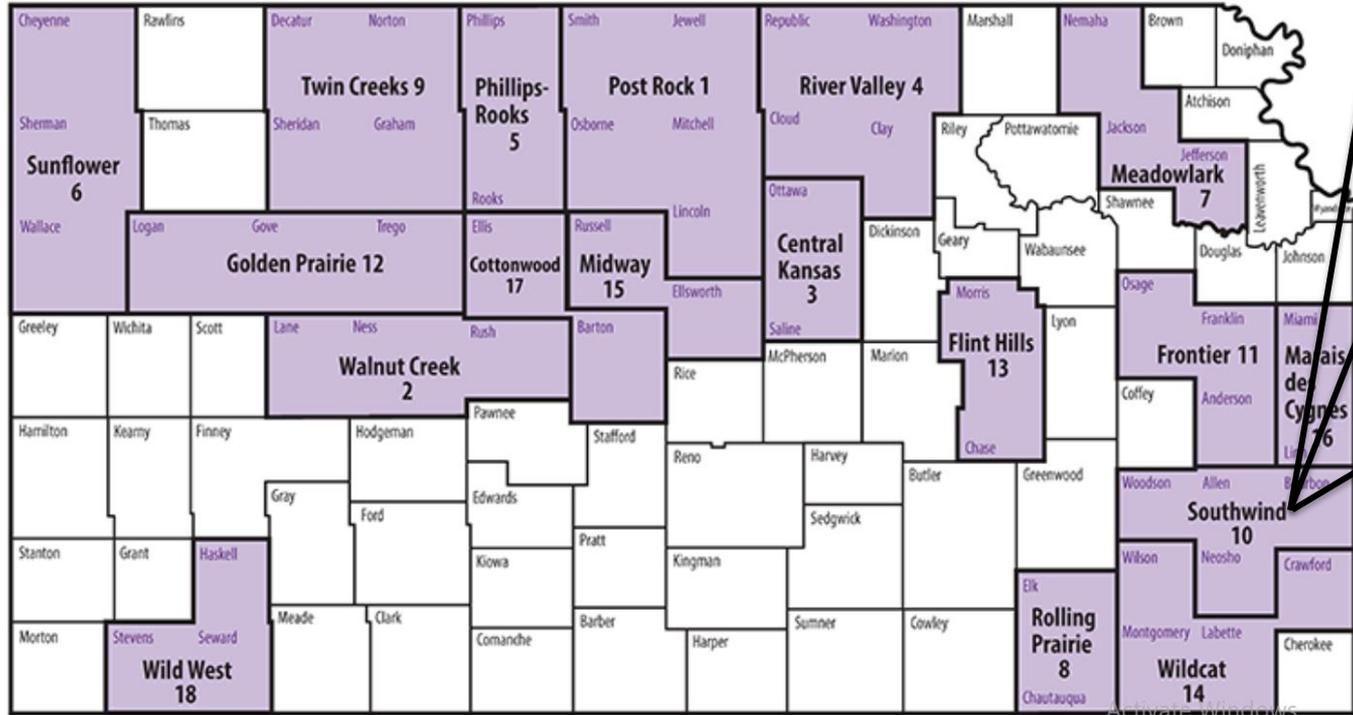
25 year 24 hour precipitation, inches.



Site location recommendations to reduce the impact of runoff:

Reduce total runoff volume:

- Diversion of water from entering feeding area or pen
- Guttering of buildings to divert water
- Vegetation buffer
 - Generally 2 x the size surface area that feeding pen
 - Maintain a vegetation area between feeding area and surface water when pasture feeding (more infiltration)
- Clean confined pens routinely when not muddy



Waste Management Systems

Lagoons:

Buffers or Vegetative treatment system:

Waste Management Systems

Lagoons:

- All CAFO (Concentrated Animal Feeding operation)
 - All facilities of 1000 head of cattle
- Facilities with Daily Discharge (such as dairies)
- Most KDHE Permitted sites

Lagoon Management

- Must contain 120 days of runoff
 - PLUS a 25 yr. 24Hr. storm
- Monthly KDHE operation Log
- Must be pumped down to a low level Dec 1
- May require leasing equipment or custom hire the pumping
- Application can not exceed Agronomic rate
- Lagoon pumping is a continuing issue for Eastern Kansas producers

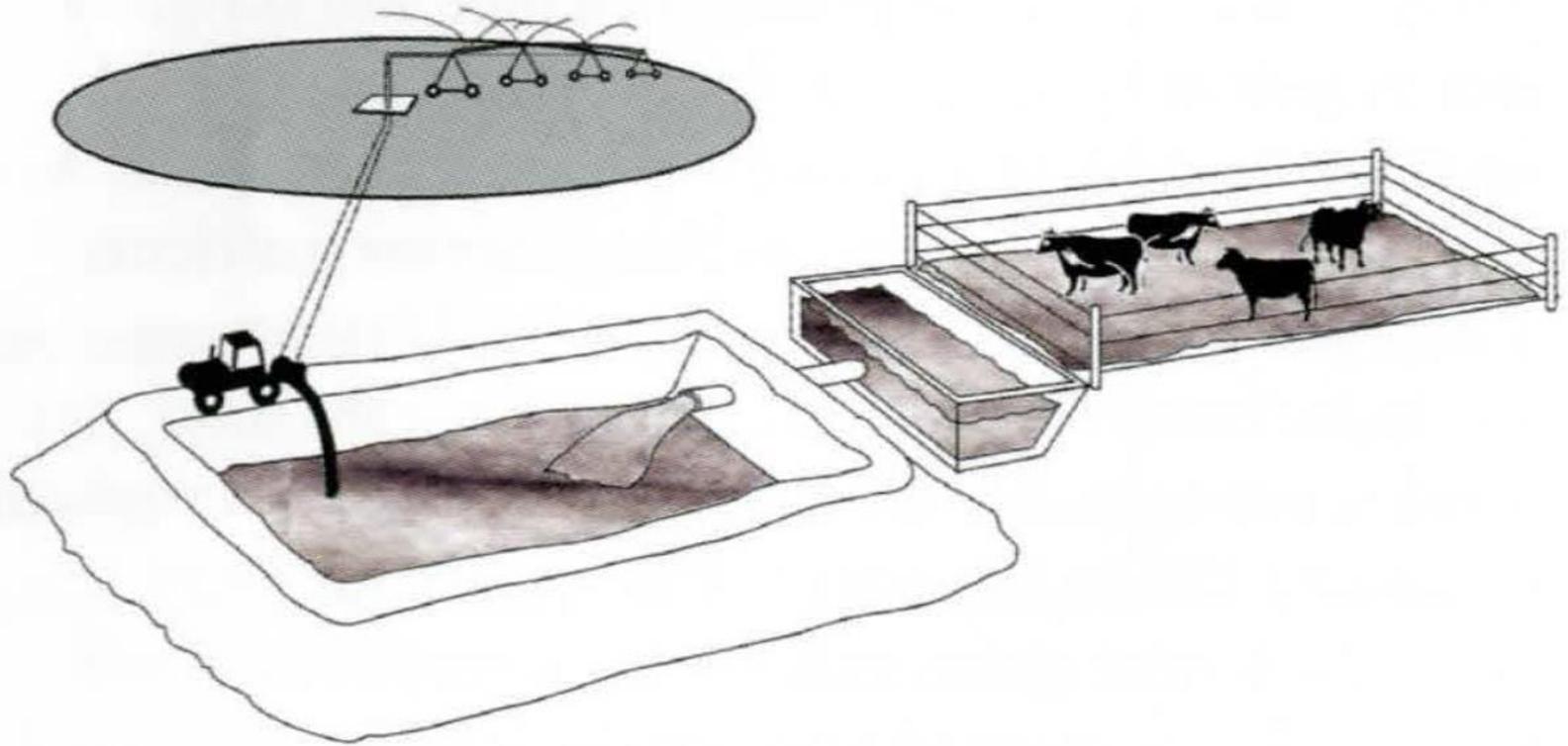
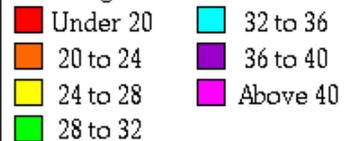


Figure 15. Holding pond system (full containment). Activate Windows
Go to Settings to activate Windows features.

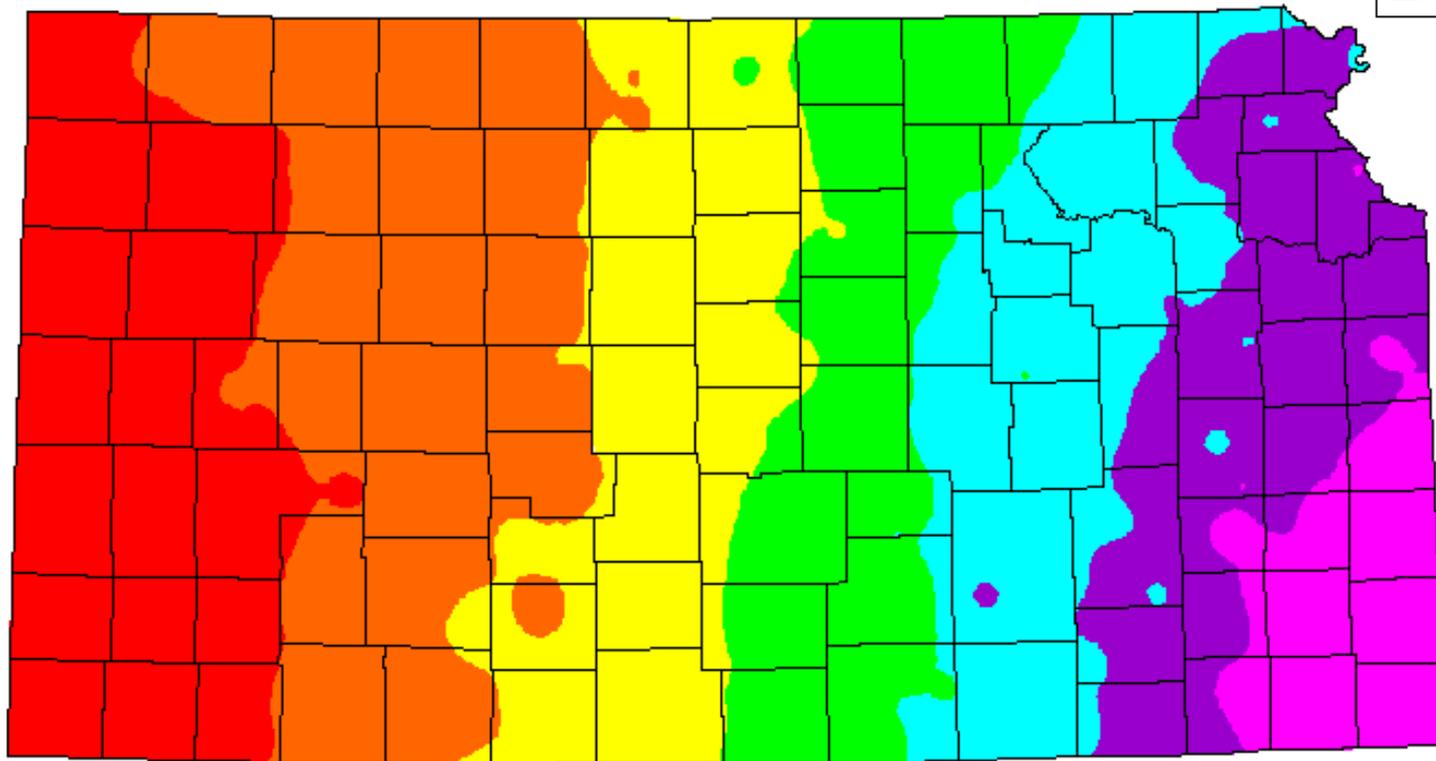
Average Annual Precipitation

Kansas

Legend (in inches)



Period: 1961-1990



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Waste Management Systems

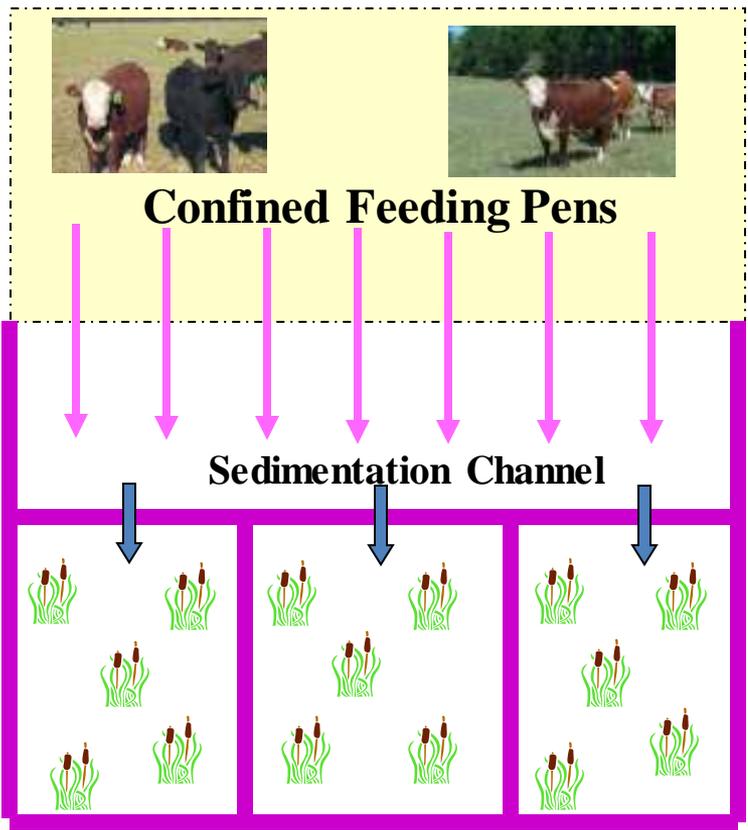
Buffers or Vegetative treatment system:

- Non-permitted
- Many cattle facilities with 500 head or less.
- Eastern Kansas may require buffer area = 2X pen size

Buffer Management

- Maintain “Sheet Flow”
- Must have acceptable site
 - Size
 - Slope
 - Distance to streams and/or terraces
- Lot Manure management is critical
- Harvest nutrients from Buffer (Grass hay) throughout year
- Repair erosion as needed
- Significant Pollution Potential guidelines
- Location!, Location!, Location





Field borders as a total containment system for controlling runoff

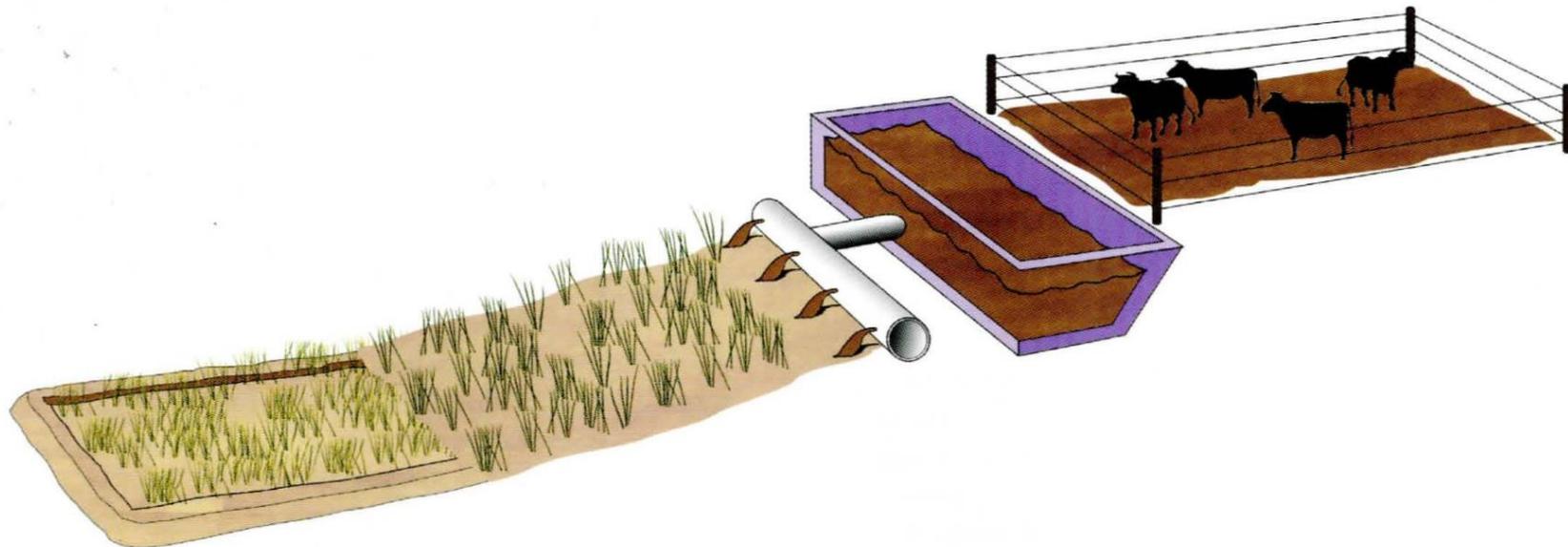


Figure 16. Vegetative treatment system.



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Management of Livestock waste from feedlots:

From Livestock aspect:

- Clean confined pens routinely when not muddy
- Mud causes loss of performance

Influence of Mud on Cattle Performance

- Bond et al. (1970) reported that data collected from 3 trials revealed that **mud had the greatest influence** on cattle performance, followed by exposure to rain, while **wind had the least influence**. Mud reduced daily gains of animals by 25 – 37%, and increased the amount of feed required per lb of gain by 20 – 33%.
- University of Nebraska (1991) reported that the potential loss of gain as mud increased was:
 - No mud = 0%
 - Dewclaw deep = 7%
 - Shin deep = 14%
 - Below hock = 21%
 - Hock deep = 28%
 - Belly deep = 35%



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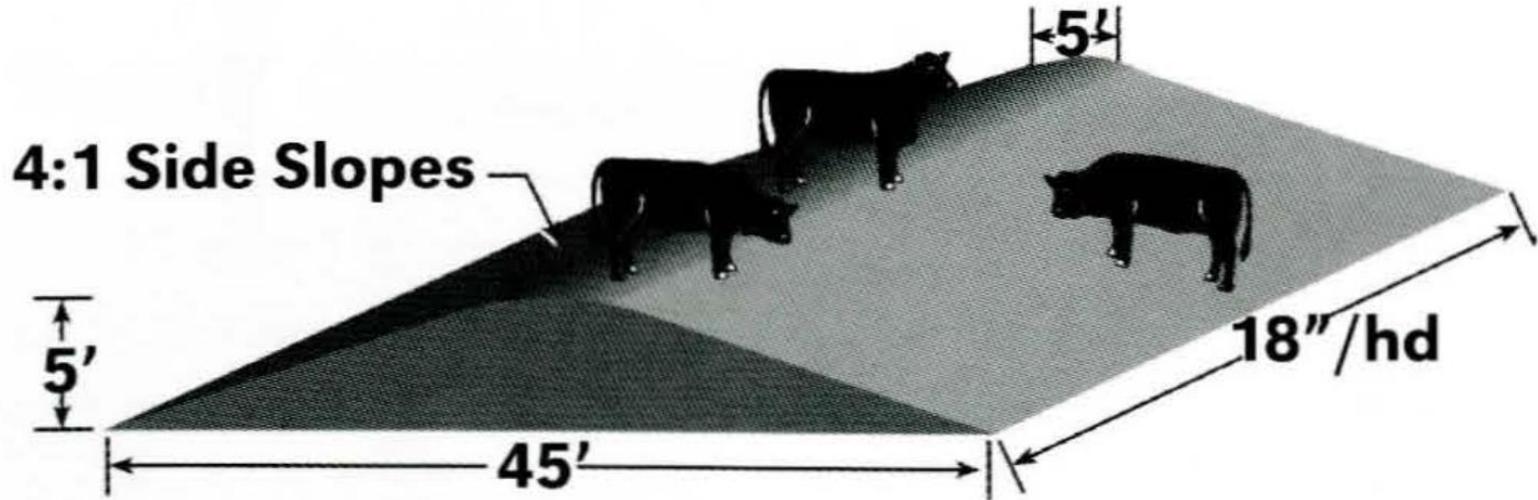


Figure 12. Typical cross section of a mound.

Activate W

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

- Municipal water usage
- Algae production



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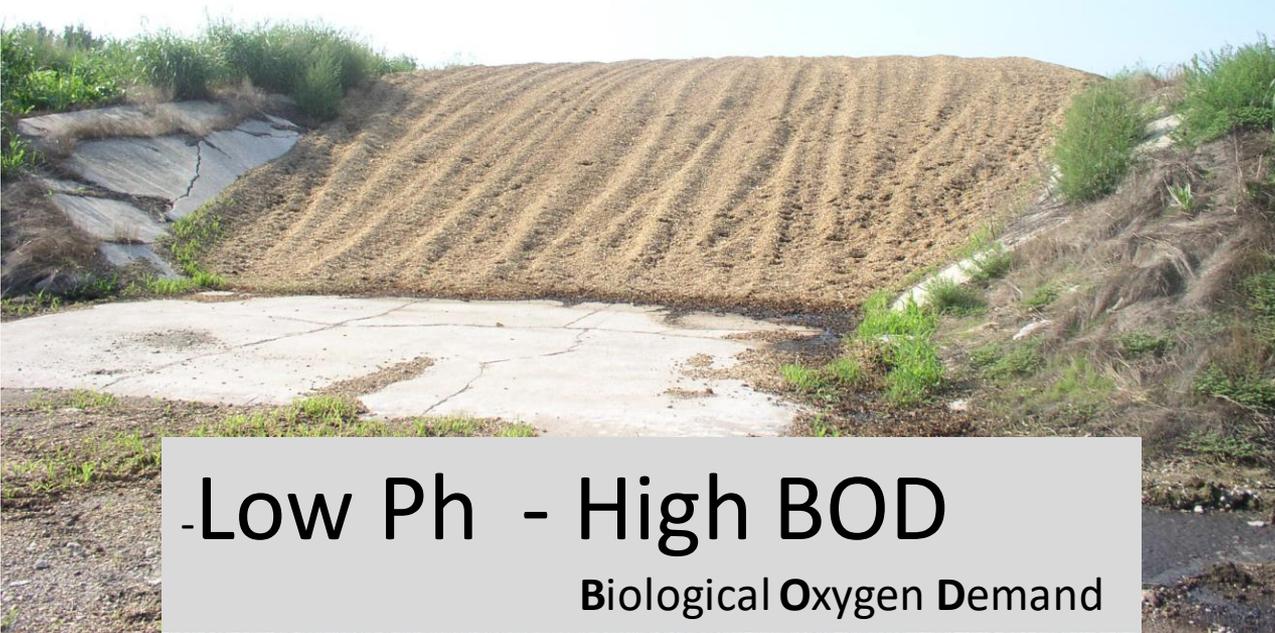
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Silage Weep



-Low Ph - High BOD

Biological Oxygen Demand



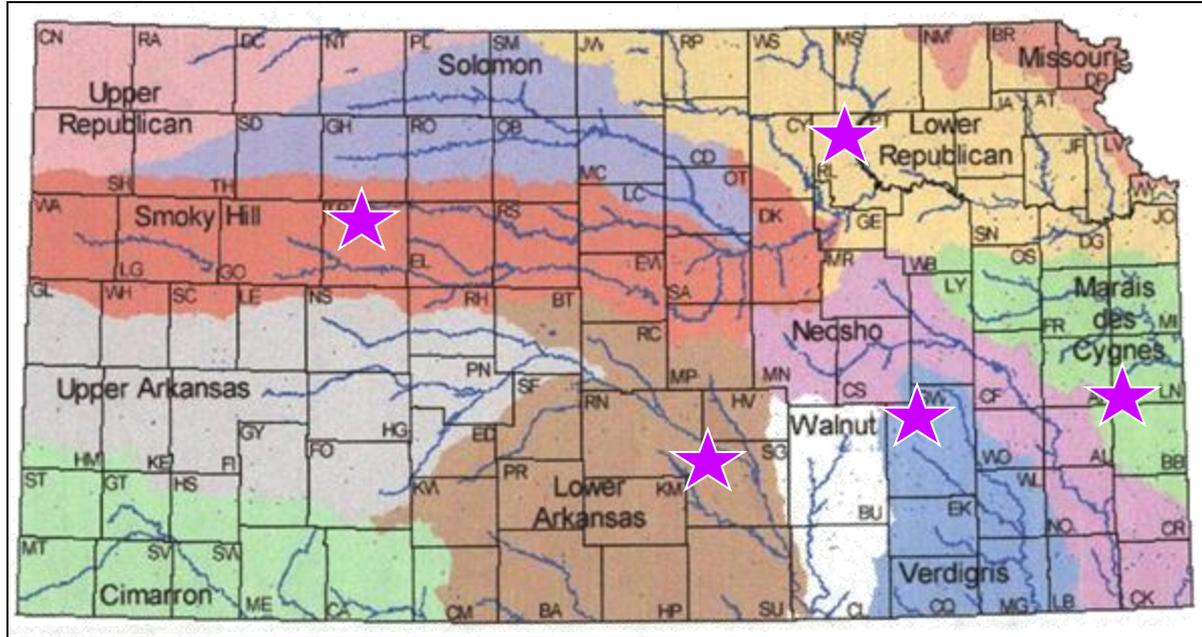
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Resources

- Guidelines for Planning Cattle Feedlots - MF 3392
- Planning Cattle Feedlots - MF 2316
- Vegetative Filter Strip Systems for AFO - MF 2454
- Cattle Pen Maintenance
- Designing A Bud Box - MF 3349
- How Feeding Site Mud and Temperature Affect Animal Performance – MF 2673
- KS Floodplain - <http://gis2.kda.ks.gov/gis/ksfloodplain/>
- NRCS Soil Survey - <https://websoilsurvey.nrcs.usda.gov/app/>
- KDHE Livestock Waste - <https://www.kdheks.gov/feedlots/>
- Well Completion Records - <http://www.kgs.ku.edu/Magellan/WaterWell/>
- Google Earth Pro
- Watershed Specialists

KSU Watershed Specialists



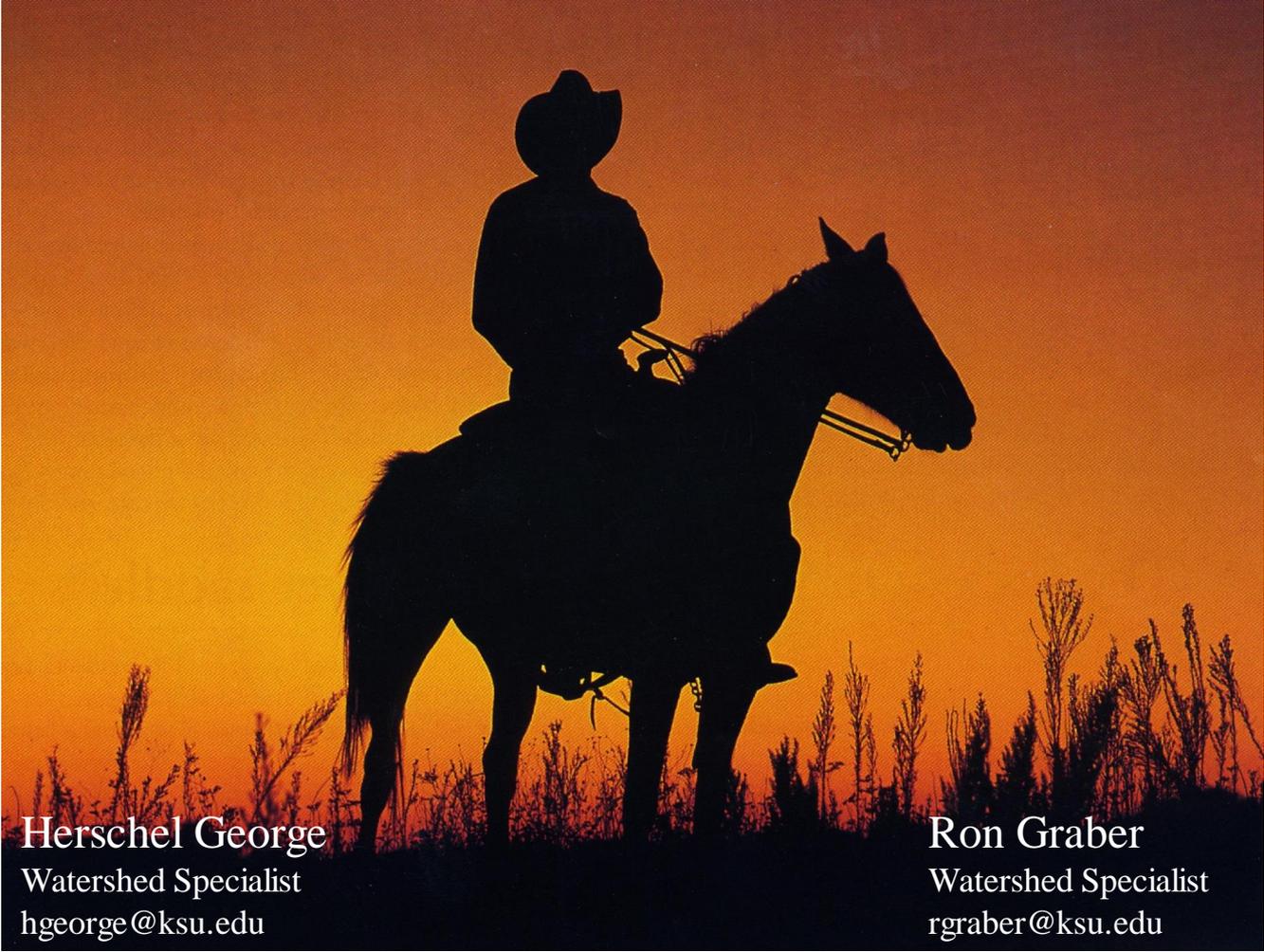
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A silhouette of a cowboy wearing a hat, riding a horse against a bright orange sunset sky. The background shows the silhouettes of trees and a field.

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Water quality impacts of livestock operations and grazing management

Upcoming session: Thursday, May 7, 8:30am

Topic: Non-confined Feeding Sites: Assisting producers with site selection and planning

Presenters: Will Boyer, Herschel George and Stacie Minson, KCARE watershed specialists

Hosted by: Natural Resources PFT and KCARE

