FENCE, WATER, AND SHADE CONSIDERATIONS FOR LIVESTOCK GRAZING SYSTEMS

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Fence, Water, and Shade

- Management of these resources
  - important in designing and implementing grazing systems
  - key for good cattle health
  - enhances cattle comfort
  - increases animal productivity
  - improves labor efficiency
- Proper management means
  - must be appropriate for intended function
  - must be functional prior to cattle receiving
  - must be monitored
  - must be maintained

Fencing

Fencing

- Grazing management tool
- Assess farm resources
  - water, shade, facilities
- Select fencing type
  - permanent vs. semi-permanent
- Determine fence placement and layout
- Develop construction plans
  - construction specifics
  - materials list

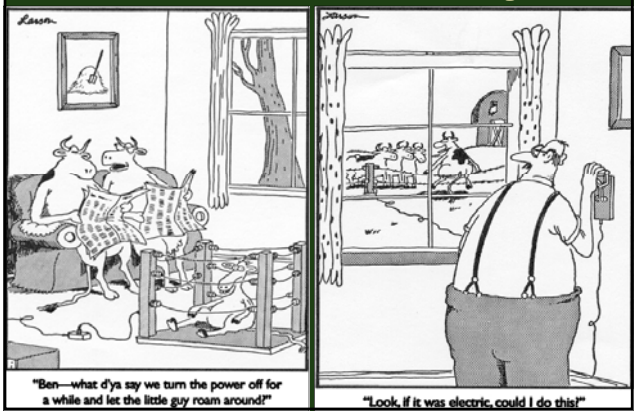
Fence Type

- **Boundary**
  - perimeter
    - most important fence
    - keeps livestock contained
    - important to keep well maintained to reduce liability
  - strong physical boundary needed
    - woven wire, 5-strand barbed wire
  - permanent
- **Cross fence**
  - interior
  - physical or psychological barrier
  - permanent or temporary subdivision

Fence Selection

- **Fence posts**
  - materials
    - wood (chemically treated, type)
    - metal (T-posts)
    - synthetic (fiberglass, plastic)
  - placement
- **Fence lines**
  - materials
    - wire (barbed, woven, high tensile, polywire / tape)
    - wood
    - pipe
  - number of strands / spacing

Electric Fencing



Electric Fencing

- **Advantages**
  - most cost-effective fencing
    - excellent choice for crossfencing
    - can run an electric wire offset around interior of perimeter fence
  - can be erected relatively quickly
    - must be installed properly (grounded, insulator use, adequate power supply, sufficient wire numbers and spacing)
  - portable forms available (tread-in posts, polywire / tape)
- **Disadvantages**
  - cattle must be trained to use
    - may not be ideal for stocker receiving
  - may not be effective if power lost for extended periods
  - requires routine maintenance
    - clearing vegetation, wire tightening

Fencing Cost Comparisons

Item[1]	Fence Type			
	Woven wire	Barbed wire	High-tensile nonelectric (8-strand)	High-tensile electric (5-strand)
Initial cost /foot	$1.51	$1.23	$1.12	$0.70
Estimated useful life	20 years	20 years	25 years	25 years
Maintenance cost/year	$159	$129	$74	$46
Total cost /year	$338	$274	$193	$121
Cost/foot/ year	$0.26	$0.21	$0.15	$0.09

[1] Based on a 1,320 ft fence

Source: Iowa State University Extension. July 2005. FM 1855.

Recommended Post and Wire Spacing for Cattle Fences

Cattle Type	Distance from Ground for Wire Number, inches				
	Wire 1	Wire 2	Wire 3	Wire 4	Wire 5
Cows	30				
Cows and calves	17	38			
Hard-to-hold cattle	17	27	38		
Boundary fence	5	10	17	27	38

Fence Type	Post Spacing, feet[1]
Woven wire	12 to 14
Barbed wire	12 to 14
Electric[2]	20 to 75
High tensile[2]	16 to 60
Board	8
Corrals	6

[1] Driven posts are 1.7 times as strong as tamped posts.

[2] Post spacing depends on terrain. Use battens (stays or droppers).

Paddock Layout

- Number
- Size
- Shape
  - different fencing requirements
- Forage species, soil types, drainage
- Water and shade locations
- Feeding locations
  - hay, grain supplements, minerals and vitamins
- Gates, lanes, natural boundaries
- Proximity to cattle handling facilities

Grazing Formulas

Number of paddocks = $\frac{\text{days of rest}}{\text{days of grazing}} + 1$

Acres required per paddock =

average animal weight x dry matter consumed per animal as % of body weight x number of animals x days on the pasture

dry matter available in grazing area x % of dry matter utilized by grazing

Grazing Formulas

Total acres required = number of paddocks x acres required per paddock

Stocking rate = $\frac{\text{number of animals grazed}}{\text{total acres grazed}}$

Stocking density = $\frac{\text{number of animals grazed}}{\text{paddock size (acres)}}$

Water as a Nutrient

- Nutrient required in greatest quantities
  - used for body temperature regulation, growth, reproduction, lactation, digestion, nutrient utilization, mineral balance maintenance, pH buffering of body fluids, waste removal, joint lubrication, nervous system cushioning, hearing, and eyesight
- Provide quality fresh water at all times
  - cattle should not have to travel long distances
  - restricting water intake below animal need
    - reduced feed intake, lower performance, death

Factors Affecting Livestock Water Requirements

- air temperature
- milk production
- pregnancy status
- physical activity
- rate of gain
- type of diet
- moisture in diet
- salt intake
- daily dry matter intake

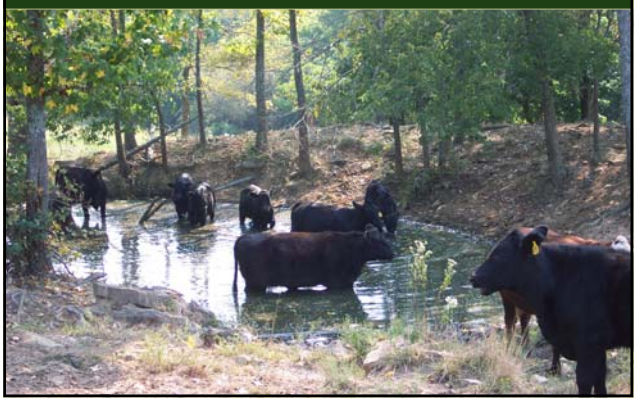
Water Requirements

Beef Animal	Daily water needs, gallons/head	
	50ºF	90ºF
400-lb calf	4	10
800-lb feeder	7	15
1,000-lb feeder	8	17
Cows and bulls	8	20

Adequate Water Availability

- Use adequate number and size of water sources
- Do not allow supplies to run low or out
  - livestock may go thirsty
  - livestock may damage water troughs
  - water quality declines
- Check daily

Water Quality is Important



Water Quality

- Impacts water intake, animal performance, animal health, and environment

Water Quality Parameter	Recommended Level[1]
pH	6.5 to 8.0
Total Dissolved Solids (TDS)	≤ 3000 ppm
Nitrate-nitrogen	≤ 10 ppm
Sulfates	≤ 500 ppm
Coliforms (fecal bacteria)	1 count / 10 mL
Blue-green algae	Avoid nutrient-enriched, warm water

[1] ppm = parts per million; 1 ppm = 1 mg/kg

Water Sources

- Water troughs
  - supplied by wells, springs, or community water
  - many different waterer designs available
  - may freeze in cold weather
- Ground water
  - ponds, lakes, streams, creeks
  - may be riparian sources (shared by others)

Riparian Zone Management

- **Livestock use of riparian areas and ponds**
  - **may lead to water contamination with nutrients, pathogens, and sediments**
- **Management options**
  - **excluding or limiting access by livestock**
  - **providing water troughs away from unfenced streams**
    - **only effective when environmental conditions do not create heat stress on animals**

Source: Franklin et al. 2009. J. Anim. Sci. 87:2151-2159.

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Water Location

- Affects pasture utilization
  - provide water within 650 to 1000 feet of all pasture areas for optimum grazing uniformity
  - livestock may loaf near water sources, especially when heat stressed or ill
- Centralized watering stations
  - fencelines, lanes, wagon-wheel center
  - serve multiple paddocks
    - high traffic areas subject to trampling and nutrient concentation
- Temporary water locations
  - use couplers, pipes/hoses, and troughs
  - establish relatively easily off of existing waterers

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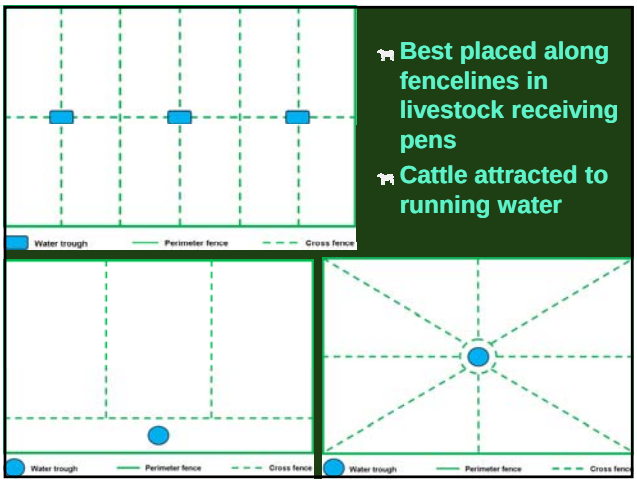
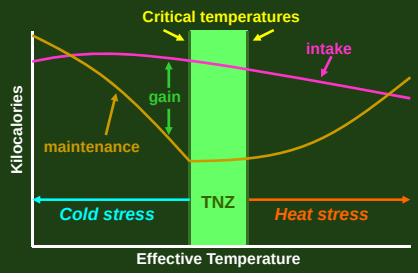


- Best placed along fencelines in livestock receiving pens
- Cattle attracted to running water

Thermoneutral Zone (TNZ)

Range in effective temperature where rate and efficiency of performance is maximized



Source: Taylor. 1994. Beef Production and Management Decisions. 2nd ed.

Livestock Heat Stress

- **Animals cannot adequately dissipate body heat**
  - environmental heat
  - metabolic heat (produced by body processes)
  - fermentation heat (produced in rumen as part of digestion)
    - more heat produced on low quality, high fiber forages
- **Heat stress effects**
  - lower feed intake
  - reduced growth performance
  - depressed milk production
  - decreased reproductive performance
  - increased dark cutter carcasses
  - possible death

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Heat Stress Effects on Reproduction

Heat stress = combination of temperature and humidity

- **Effects of heat stress on cows**
  - hormone imbalances
  - reduced ova quality
  - early embryo death
  - reduced blood flow to uterus
  - shortened gestation
- **Effects of heat stress on bulls**
  - sperm cell quality and numbers decline

Source: Sprott, 2000. Texas Agricultural Extension Service. L-5381.

Livestock Heat Stress

- **Heat stress caused by several factors**
  - primarily due to high air temperature
  - intensified by high humidity, thermal radiation, low air movement
- **Heat stress effects depend upon**
  - duration
  - magnitude
  - timing
  - cattle genotype (breed composition)
  - diet

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Heat Index

High Temp, °F	Relative Humidity, %											
	35	40	45	50	55	60	65	70	75	80	85	90
100	106	109	114	118	124	129	136	143	150	158	167	176
99	104	107	111	115	120	126	132	138	145	153	161	170
98	102	105	109	113	117	123	128	134	141	148	155	164
97	100	103	106	110	114	119	125	130	136	143	150	158
96	98	101	104	108	112	116	121	126	132	138	145	152
95	96	99	102	105	109	113	118	123	128	134	140	147
94	95	97	100	103	106	110	114	119	124	129	135	141
93	93	95	98	101	104	107	111	116	120	125	130	136
92	92	94	96	99	101	105	108	112	116	121	126	131
91	90	92	94	97	99	102	105	109	113	117	122	126
90	89	91	92	95	97	100	103	106	109	113	117	122
89	88	89	91	93	95	97	100	103	106	110	113	117
88	87	88	89	91	93	95	98	100	103	106	110	113

Temperature-Humidity Index

THI used to calculate Livestock Weather Safety Index

Temp., ºF	Relative Humidity, %											
	30	35	40	45	50	55	60	65	70	75	80	85
100	84	85	86	87	88	90	91	92	93	94	95	97
98	83	84	85	86	87	88	89	90	91	93	94	95
96	81	82	83	85	86	87	88	89	90	91	92	93
94	80	81	82	83	84	85	86	87	88	89	90	91
92	79	80	81	82	83	84	85	85	86	87	88	89
90	78	79	79	80	81	82	83	84	85	86	86	87
88	76	77	78	79	80	81	81	82	83	84	85	86
86	75	76	77	78	78	79	80	81	81	82	83	84
84	74	75	75	76	77	78	78	79	80	80	81	82
82	73	73	74	75	75	76	77	77	78	79	79	80
80	72	72	73	73	74	75	75	76	76	77	78	78
78	70	71	71	72	73	73	74	74	75	75	76	76
76	69	70	70	71	71	72	72	73	73	74	74	75
Livestock Weather Safety Index	Normal <74			Alert 75 to 78			Danger 79 to 83			Emergency >84		

Source: Ingraham et al. 1974. J. Dairy Sci. 57:476.

Livestock Heat Stress

- Need to provide adequate
  - water
  - shade
  - ventilation

Adequate Shade

- At least 30 to 40 ft² per head for mature cows on pasture
  - sheds, barns, trees
  - do not allow flexibility in grazing system
  - can develop mud problems
- Cooling potential reduced as cattle crowd together under limited shade
  - can be worse than no shade at all

Shade Type

- **Permanent**
  - sheds, barns, trees
  - do not allow flexibility in grazing system
  - can develop mud problems
- **Portable**
  - can be moved
    - to accommodate different grazing systems
    - to avoid mud and manure accumulation
  - usually less expensive
    - e.g., welded pipe and shade cloth
  - must be constructed to withstand damage by animals

Mud

- **Hurts animal performance**
  - impacts feeding behavior
    - suction on hooves, more difficult to move
  - 4 to 8 inches of mud
    - 4 to 8% lower feed intake
    - 14% lower ADG
  - belly deep mud
    - 30% lower feed intake

- **Creates disease/health risk**
  - foot rot, scours, naval ill
  - calves born into or trapped in mudholes

Shade Type

- **Natural**
  - trees, other vegetation
  - livestock can kill trees
    - problematic when livestock congregate around a few trees in a pasture
- **Manmade**
  - sheds, barns
  - make sure metal roof insulated
    - minimize radiant heat
  - only use 80% shade cloth or higher
  - adequate ventilation important
    - at least 10 feet off the ground for good airflow
    - important for confined cattle

Shade Location

- Affects pasture utilization
  - livestock "camp" under shade
    - concentrate nutrients
    - stress trees, damage vegetation
    - create bare ground, mud
  - strategic placement along fencelines
    - on west side for afternoon shade

Cattle Comfort

- Adequate space
  - comfort, socialization, environmental management
- Pasture, pen, and facilities
  - mud/dust reduction, weather extreme protection
  - safe design and sufficient maintenance/cleaning
- Timely marketing
- Stress reduction
- Sufficient nutrition
- Euthanasia considering animal welfare

Animal Welfare

- Ranchers are responsible for the basic requirements of animals they raise
  - access to ample feed and clean water
  - timely and appropriate veterinary care to prevent and treat disease
  - practice appropriate and efficient movement, restraint, and transport of livestock
- Animal care and stewardship improves:
  - perception
  - production

Producer Code of Cattle Care

- Provide necessary food, water, and care to protect the health and well-being of animals
- Provide disease prevention practices to protect herd health, including access to veterinary care
- Provide facilities that allow safe, humane, and efficient movement and/or restraint of cattle
- Make timely observations of cattle to ensure basic needs are being met
- Minimize stress when transporting cattle