

# Managing the Breeding Bull



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UNL Beef Cow-Calf Specialist

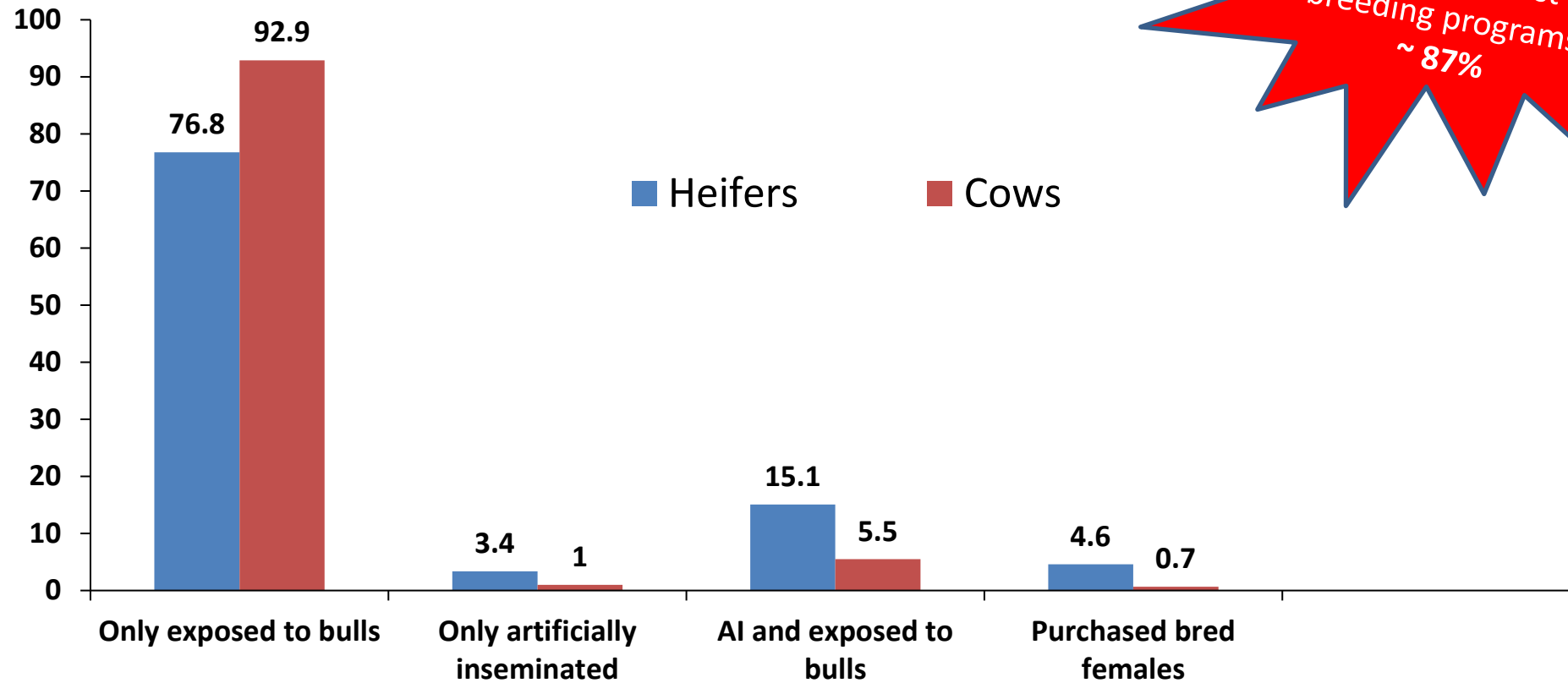
November 2, 2023

# Outline



- Importance of the bull during the breeding season
- Nutritional considerations
- Understanding components of BSE
- Cold weather impacts on fertility
- Getting ready for the next breeding season

# U.S. Breeding Methods



Bulls are highly utilized in most breeding programs ~ 87%

NAHMS, 2020



# How do we manage bulls to be successful?

- Critical Time Periods:
  - Pre-Weaning
  - Post-Weaning
  - Breeding Season
    - Pre- and post-breeding season



# Bull Development Principles

- Reach puberty in a timely fashion
- Pass a breeding soundness exam
- Be physically sound and healthy
- Have required libido to service females in wide range of environmental conditions

Engelken, 2008



# Pre-Weaning Development

- Rapid Sertoli cell Proliferation
  - 4 to 20 weeks of age
  - STOPS after that!
- Support developing sperm for the lifetime of the bull
  - ↑ Sertoli Cells = ↑ Sperm



# Poor Pre-Weaning Nutrition =

- ↓ Testicle size
- ↓ Sperm production
- ↑ Age at puberty

## Considerations:

- Bulls from cows vs bulls from heifers?
- Poor forage quality or availability?
- Creep feed cautions? Potential implications for heifers?
- How are you choosing cooperator embryo recipients?

# Poor Pre-Weaning Nutrition =

- Pre-weaning protein and energy restriction...
  - Delays attainment of puberty
  - Inhibits scrotal growth and development
  - Reduces proliferation of Leydig and Sertoli cells
  - Decreases the number of sperm recovered per semen collection
- These effects are not reversed by post-weaning management
- Don't expect post-weaning management to be a complete savior





# Post-Weaning Growth



- Bulls gaining  $>3.9$  lb/d = reduced semen characteristics vs. with bulls managed to gain  $< 2.2$  lb/d (Skinner et al., 1981)
- “Safe” targets for gain in bulls from 6 to 16 months = 2.2 to 3.5 lb/d (Brito et al., 2012)

# What do WE shoot for?

Table 1. Reproductive characteristics of yearling Angus bulls during development							
Item	Bull age in Months					SEM	P-Value
	9	10	11	12	13		
Body weight, lb	705	778	896	1006	1101	9.24	< 0.01
Scrotal circumference, cm	30.0	32.0	34.5	35.7	36.8	0.26	< 0.01
Ejaculate volume, mL	2.0	4.3	7.2	7.8	8.0	0.5	< 0.01
Concentration, million/mL	32.0	56.0	73.4	124.5	115.6	14.4	< 0.01
Total sperm, million	68	277	536	1048	937	142	< 0.01
Pubertal, %	22.2	72.2	88.8	94.4	100.0	0.05	< 0.01

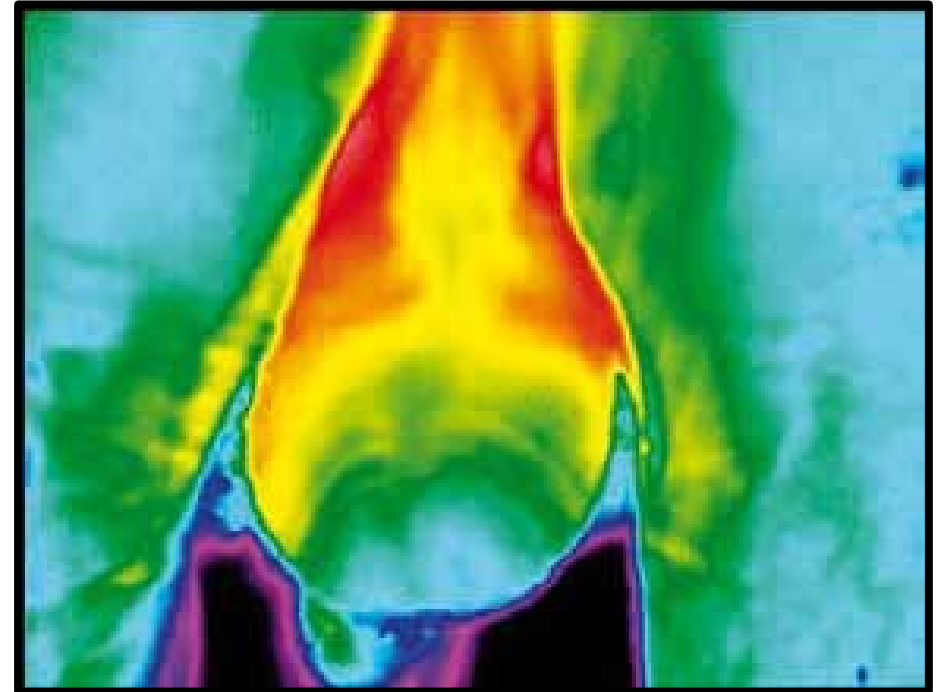
# Puberty

- Most common used definition:
  - Ejaculate collected contains minimum  $50 \times 10^6$  total spermatozoa with at least 10% progressive motility  
(Walker et al., 2009; Lunstra et al., 1978)



# Potential Complications

- Scrotal fat accumulation
  - ↑ scrotal temperature (Bourgon et al., 2018)
- Feet problems, liver abscesses, etc.



# How should we manage our “fat” bulls after the sale?

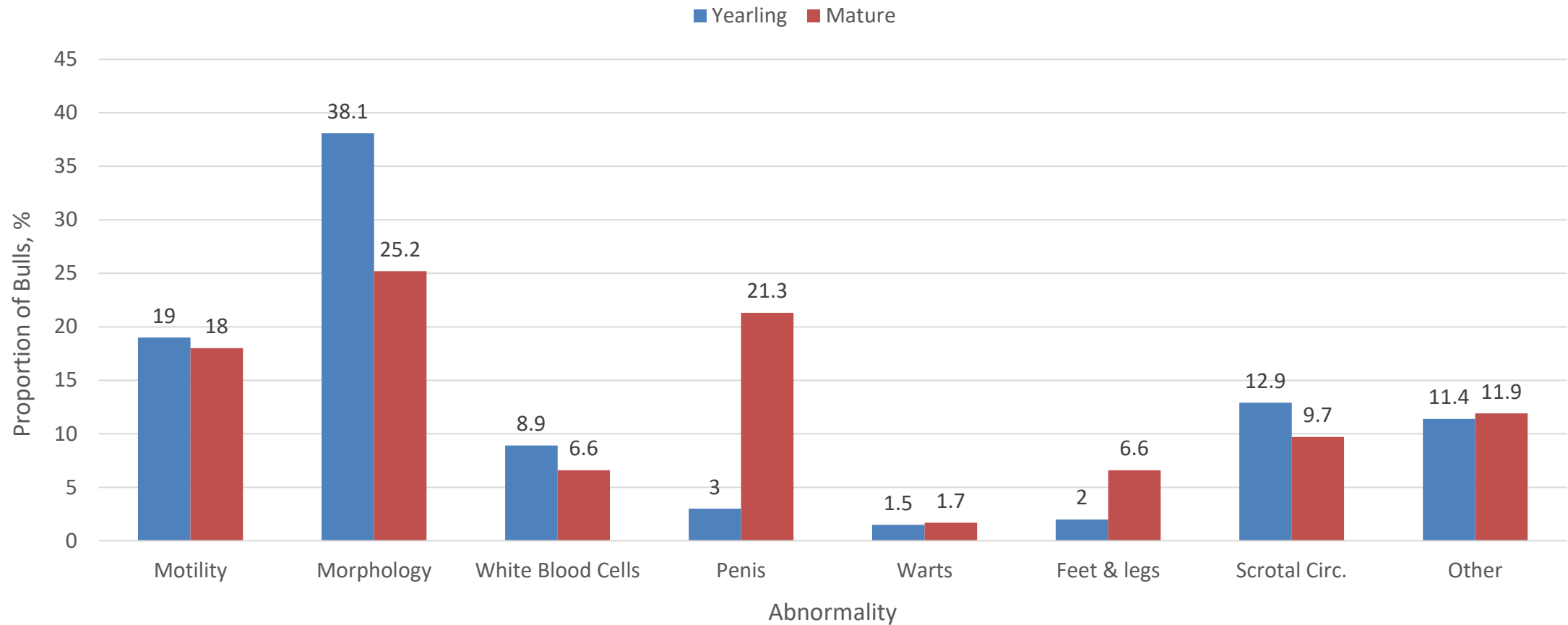


# After the Sale

- Change in diet, environment, etc.
- Potential for major weight loss
  - $\downarrow$  2.6 to 4.8 lb/d over ~50 days (Barth et al., 1995)
- Need to acclimate bulls (Walker et al., 1995)
  - Stored feed to grazing forages
  - New barns and pastures
- Conduct BSE!!



# Reasons for BSE failure in yearling and mature beef bulls





What about nutrition during and after the breeding season?



# The Breeding Season and Bull Plane of Nutrition



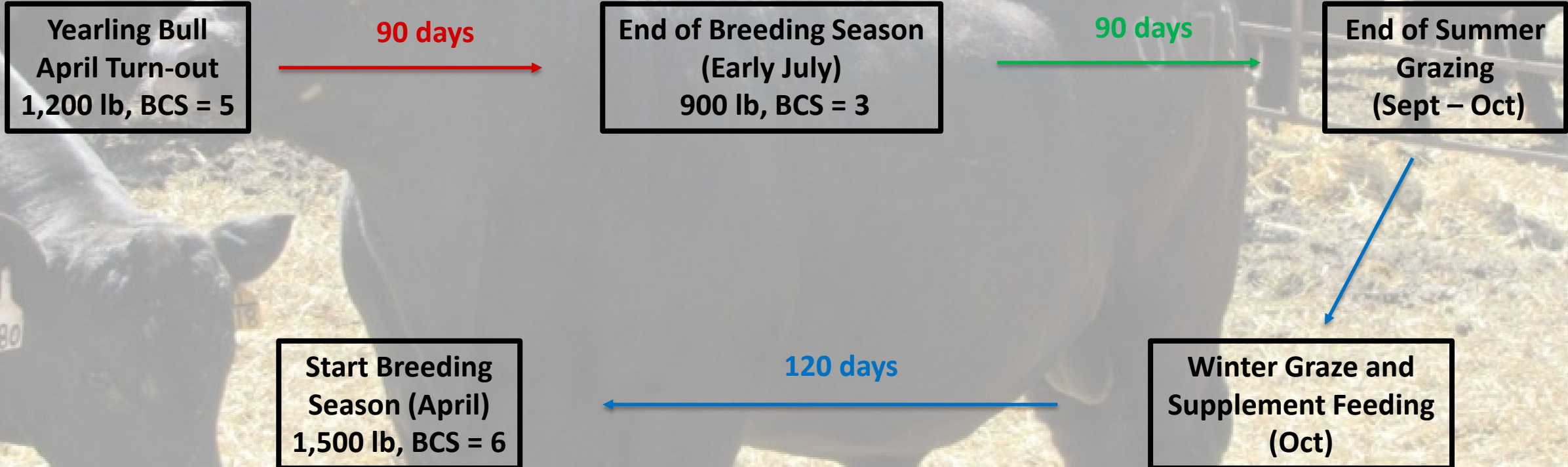
## All Bulls

- Variation in bull workload
  - Ranged from 4 to 80 females per bull (Dahlen and Stoltenow, 2015)
- Weight loss during the breeding season
  - Can be from 100 to 400 lbs (Boyles et al., 2011; Walker et al., 2009; Hersom and Thrift, 2008)
- Weight gain before next breeding season
  - Must regain BW in preparation for subsequent breeding season (Barth, 2013)

# Nutrient Requirements of Bulls at Varying Levels of Gain

Body Weight (lbs)	ADG (lbs/day)	Dry Matter Intake (lbs)	TDN (% DM)	CP (% DM)
1,200	1.0	25	56	7.8
1,200	2.0	26	63	8.4
1,400	1.0	27	56	7.5
1,400	2.0	28	64	8.0
1,600	0.0	27	48	6.9
1,600	1.0	30	56	7.3
1,800	0.0	29	48	6.8
1,800	0.5	31	52	7.0
2,000	0.0	31	48	6.8

# Reconditioning a Yearling Bull After Breeding Season



# Nutrition

- Goal BCS: 5.5 to 6.5
- Winter
  - Low temps and wind will increase feed requirements 25 to 30% above normal maintenance requirements
- Pre-breeding season
  - If on concentrate diet, gradually step down 30 to 60 days prior to turn out
    - Yearling bulls should continue to gain 1.5 to 2.0 lbs/day

# Nutrition

- Breeding season
  - Same plane of nutrition as cows
  - Continue to assess body condition of bulls
  - Bulls often lose 100 to 200 lbs during breeding

# Breeding Season

- Keep in mind bull use
  - One or two breeding seasons
    - Spring and Fall calving herds?
    - Work load will be important to think about and giving some time to rest
  - Young bulls are still growing
    - Consider # of cows to cover
    - Length of season
    - Nutrient demands for growth

# Post-breeding Season Nutrition

- Typically will turn out in separate pasture
  - Young bulls are still growing -- 1.5 to 2 lbs/day
- Good Mineral Program
  - Provide mineral and vitamins to help with growth and performance
    - Selenium critical for normal spermatogenesis
    - Zinc plays role in male fertility
      - Critical for sperm-cell plasma membrane integrity, tail morphology and thus motility
    - Iodine has been shown to help alleviate foot rot



# Bull to Cow ratio

- Variation: 1:10 up to 1:60
- Ratio depends on the capability of individual bulls and the situation
  - (i.e., synchronized or nonsynchronized herds)
  - Bull age
  - Mating ability
  - Semen quality
  - Libido

# Impact of Age

Item	Bull Age		
	1	2	3+
Mounts, n	207 <sup>x</sup>	120 <sup>y</sup>	85.8 <sup>y</sup>
Services, n	54.5	37.6	40.5
Estrus females serviced, %	69.4	73.8	72.0
Pregnant of serviced, %	39.6 <sup>x</sup>	59.4 <sup>y</sup>	62.2 <sup>y</sup>
Pregnant overall, %	30.9 <sup>x</sup>	41.5 <sup>y</sup>	49.9 <sup>y</sup>

As age increases, percent of pregnant cows serviced increases

Younger bulls are still trying to figure out how to do their job, i.e. greater # of mounts

# Social Dominance

- Social ranking is dependent on size, age and seniority within the group
- Keep in mind when you are turning bulls out to a breeding pasture, that they have established dominance prior to breeding to ensure ranking has been determined
  - Want them to focus on their job



# Libido

- Service Capacity Tests
  - 2 non-estrus females
  - Bull introduced to pen for ~10 minutes
  - Range of services: 0 to 5
- Not an indicator of fertility
- Influenced by breed type

Keep in mind that a BSE does not evaluate a bull's libido, nor does it ensure that a bull will remain a satisfactory potential breeding the entire breeding season



# Stocking Rate

	Bull:Heifer Ratio			
	1:50	1:50	1:25	1:16
	<i>Non-Synch</i>	<i>Synchronized</i>		
<b>Bulls/100 heifers, n</b>	2	2	4	6
<b>Pregnant by d 6, %</b>	40	38	41	53
<b>Pregnant by d 28, %</b>	82	77 <sup>a</sup>	83	84 <sup>b</sup>
<b>Day of conception</b>	10 <sup>a</sup>	10 <sup>a</sup>	11 <sup>a</sup>	8 <sup>b</sup>
<i>a,b Means within row differ (P &lt; 0.05)</i>		<i>Healy et al., 1993</i>		

1:25 was best \$\$ Value!



## Breeding Soundness Exam (BSE)

- A uniform method of assessing a bull's likelihood of establishing pregnancy in an appropriate number of open, healthy, cycling cows or heifers in a defined breeding season.
- Includes 4 components:
  - Physical Exam
  - Scrotal circumference
  - Sperm motility
  - Sperm morphology





### Bull Breeding Soundness Evaluation

Guidelines Established by Society for Theriogenology  
P.O. Box 3007 • Montgomery, AL 36109  
Phone 334/395-4666 • Fax 334/270-3399 • www.therio.org

OWNER	CASE NO.
ADDRESS	BULL NAME
ZIP	I.D. NO.
TELEPHONE	BIRTH DATE
HISTORY: Previous BSE	DATE
	CASE NO.

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CASE NO.	DATE
BULL NAME	BREED
I.D. NO.	Brand <input type="checkbox"/> Tattoo <input type="checkbox"/> Ear Tag <input type="checkbox"/>
BIRTH DATE	AGE (MO.)
CASE NO.	CLASSIFICATION

## Two Main Components of BSE:

1. Physical Examination
2. Semen Examination

#### PHYSICAL EXAMINATION

Body Condition Score  Thin  Moderate  Good  Obese   
Beef 1, 2, 3, 4, 5, 6, 7, 8, 9 Pelvic Ht.  Width  Area   
Dairy 1, 2, 3, 4, 5

Feet/Legs	<input type="checkbox"/>
Eyes	<input type="checkbox"/>
Vesicular Glands	<input type="checkbox"/>
Ampullae/Prostate	<input type="checkbox"/>
Inguinal Rings	<input type="checkbox"/>
Penis/Prepuce	<input type="checkbox"/>
Testes/Spermatic Cord	<input type="checkbox"/>
Epididymides	<input type="checkbox"/>
Scrotum (Shape)	<input type="checkbox"/>

Other

SCROTAL CIRCUMFERENCE (CM) \_\_\_\_\_

This bull has been examined for physical soundness and quality of semen only. Unless otherwise noted, no diagnostic tests were undertaken for libido, mating ability or infectious disease status of this bull.

Remarks and Interpretation (diagnosis, prognosis, recommendations) \_\_\_\_\_

#### SEMEN EXAMINATION

Collection Method: EE  AV  Massage   
Response: Erection  Protrusion  Ejaculation

Semen Characteristics	Ejaculate 1	Ejaculate 2
Motility	Gross (or) Individual (%)	
% Normal Cells		
% Primary Abnormalities		
% Secondary Abnormalities		
WBC, RBC, Other		

#### CLASSIFICATION

Interpretation of data resulting from this examination would indicate that on this date, this bull is a:  
 Satisfactory potential breeder  
 Unsatisfactory potential breeder  
 Classification Deferred

Re-examination recommended on \_\_\_\_\_ DATE

Signed: \_\_\_\_\_  
MEMBER—SOCIETY FOR THERIOGENOLOGY

Clinic: \_\_\_\_\_

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# Why do a BSE?

- Economically, it has shown to pay over \$17/cow return when you invest in bull BSE
- If a bull is exposed to 30 cows.....  
\$510
- Checking bulls, so they can do their job
  - Make sure nothing is wrong with them physically or with sperm production





# When should we BSE?

- Individual ranch decides...
  - Before purchasing the bull
  - Just before the breeding season\*\*
  - Immediately after the breeding season
    - Sell poor bulls
    - Poor semen tests could be due to over use
  - At weaning time
    - Time to recover– not as good as at beginning of the breeding season
    - A lot can happen between now and the next breeding season



\*\*Keep in mind the length of the spermatogenesis cycle.... **61 days**

# Physical Exam

- Identification!!
  - Bulls need to be able to see what they are doing and what cows they need to cover
- A bull needs to see, eat, smell, and move
  - Eyes
    - Dangerous to handle when they are unsure of surroundings
    - Can't see mounting behavior
    - Examine eyes for early eye cancer growths
    - Old pink eye scars result in poor vision



# Physical Exam

- Teeth and mouth
  - Older bulls need to be examined for lost or severely worn teeth
    - Examine changes in BCS or weight due to issues eating to meet their needs
  - Lump jaw (Actinomyces) is a chronic bone and soft tissue infection that is not responsive to treatment. Cull bull



# Physical Exam

- Body condition
  - There should be enough condition to be strong with some reserves of energy in the form of fat.
    - Keep in mind they are there to work, so they will be using energy to cover cows.
  - Varies due to time of year, age, size, kind of rangeland, length of breeding season, and # cows/bull
  - Generally, a BCS of 5 to 6 is recommended.





## Physical Exam

- Feet and legs
  - Structural soundness of the feet and legs is paramount!
  - Foot rot and other injuries could result in a soon to be lame bull

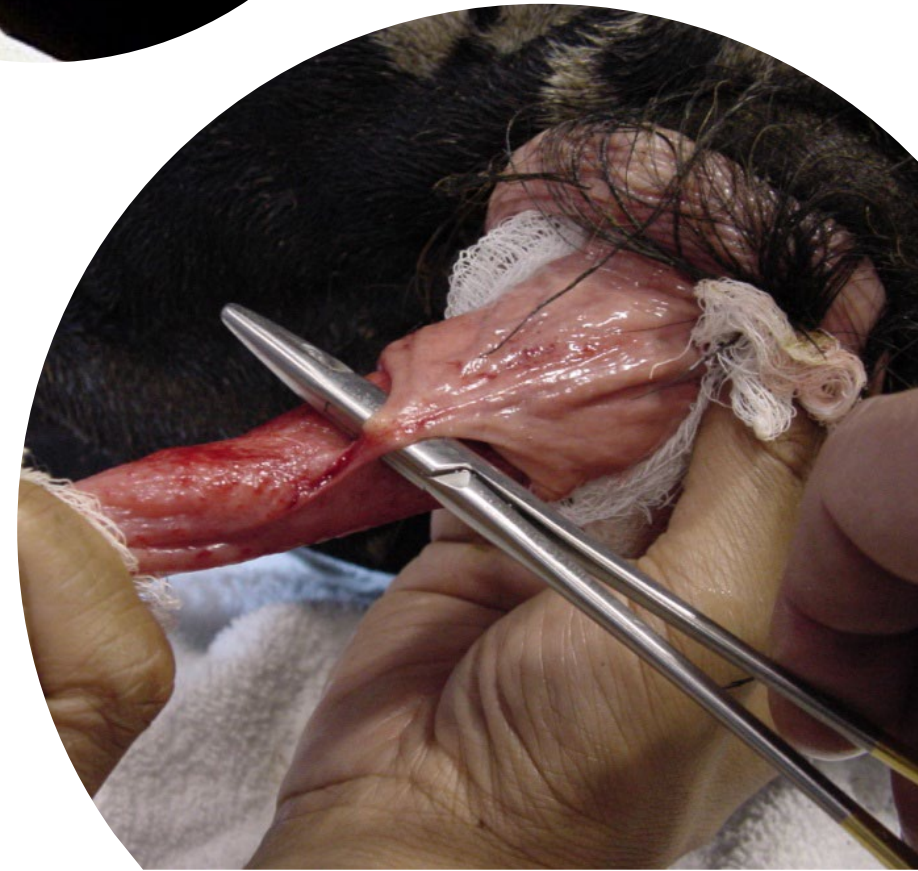
# Physical Exam– The GOOD, the BAD and the UGLY!

- Sheath
  - Confirmation. It should point at the ground between the bulls front feet
  - Absence of abscesses, eversion, or prolapse.



# Examining the Reproductive Organs

- Penis
  - When the bull ejaculates, make sure the bull can fully extend the penis.
  - Check for a persistent frenulum (prepuce remains attached to the glans penis). Heritable condition



# Penis

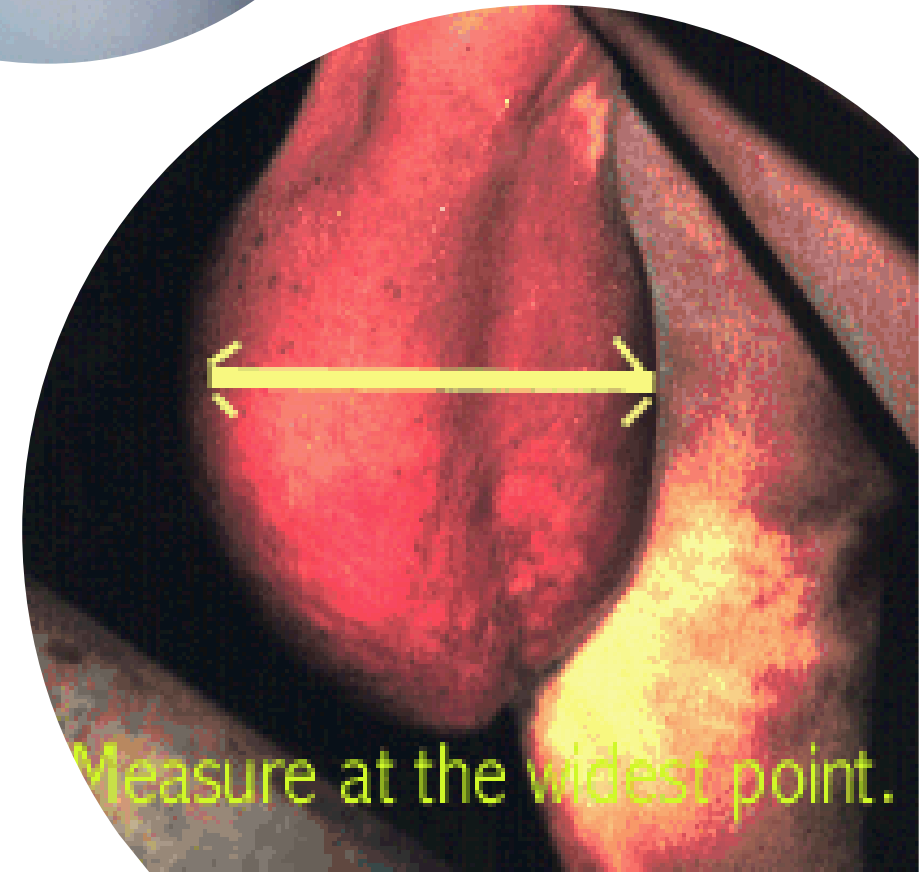
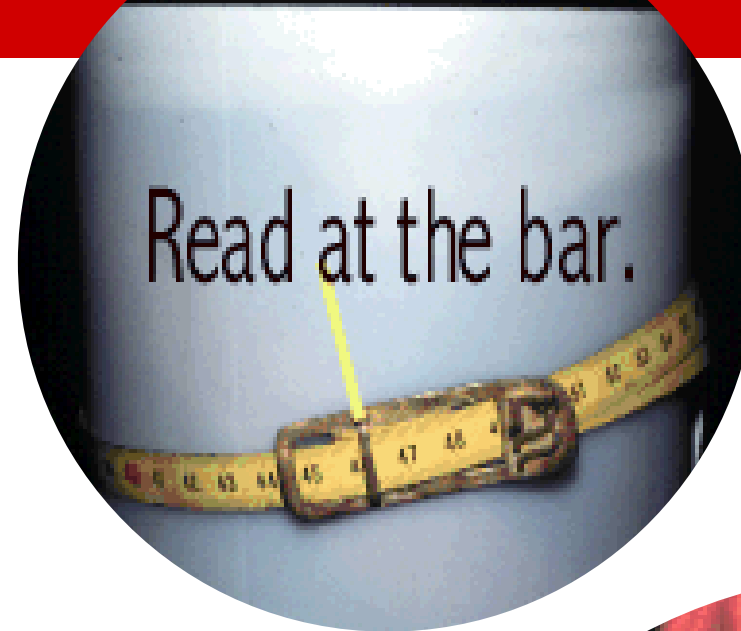
- Adequate length is needed
  - Should come almost between the front legs
- Other deviations (don't want)
  - Corkscrew, rainbows, lateral deviations
- Fibropapilloma may cause hemorrhage and result in infertility





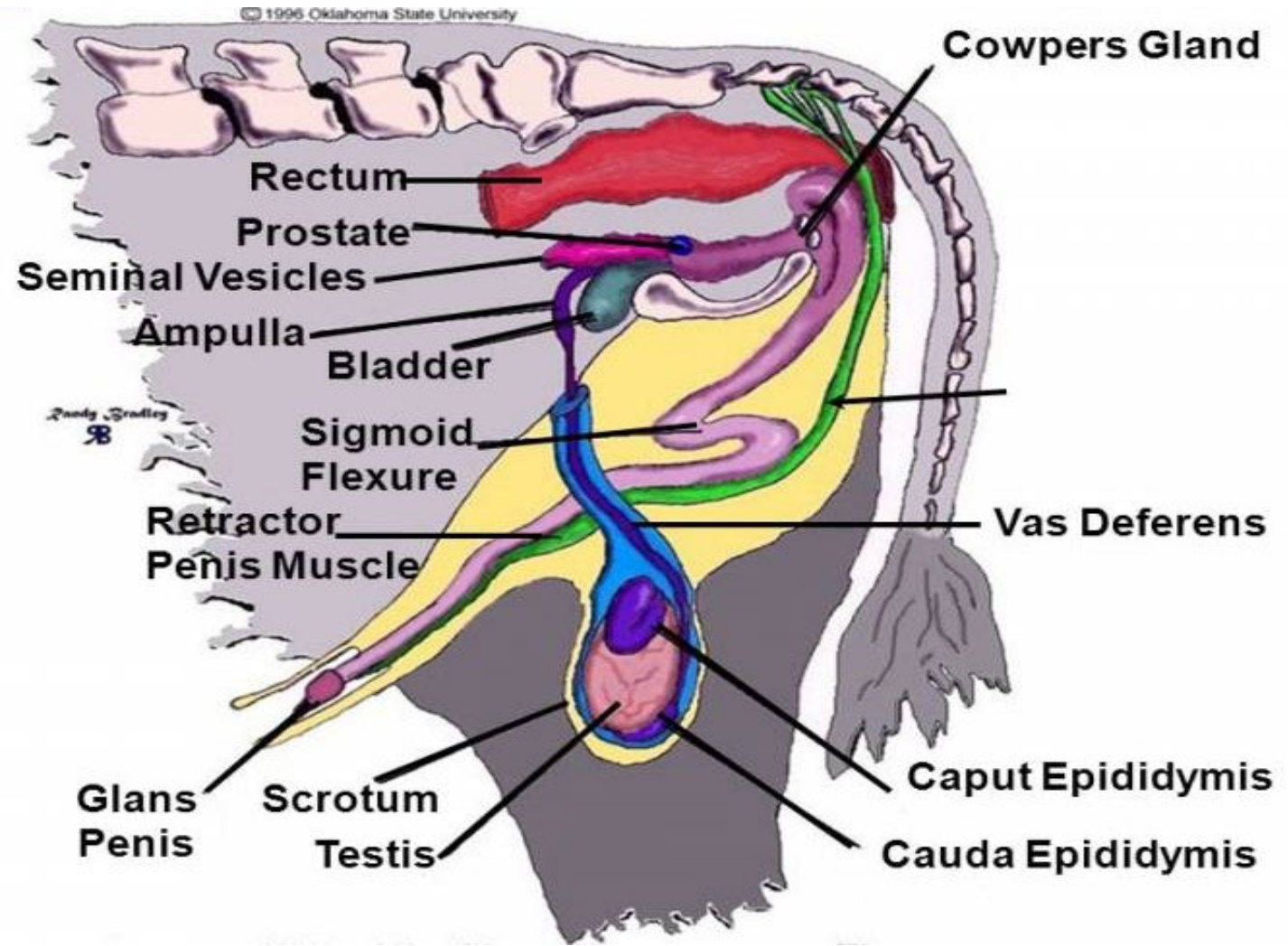
## Testes

- Should be examined for carriage, consistency and size
- Shape is important: “neck” should be present for thermoregulation
- Testes should freely move in the scrotum
- Symmetric in size
- Size is highly correlated with sperm production
  - Measure at the widest part of the scrotum



# Internal Accessory Glands

During the BSE, palpation of the internal accessory glands is required.



# Internal Accessory Glands

- Prostate— just a landmark
- Ampulla— distal portion of vas.
- Seminal vesicles
  - Vesiculitis is fairly common in bulls— asymmetry or pain associated with palpation
- Inguinal rings
  - Can just get your finger in the ring. If too large, could become herniated.

# Semen Collection

- **Artificial vagina (AV)** is used (only trained bulls)
- **Electroejaculation** – most commonly used
  - Mild ejaculation stimulates nerves
  - Make sure slowly work bulls up with voltage (gradual stimulation and ejection of penis for observation and collection)



# BSE—Break down

Passing scrotal depends on age of bull and if they meet the minimum requirement

Age (months)	< 15	15-18	19-21	22-24	>24
Minimum scrotal circumference (cm)	30	31	32	33	34

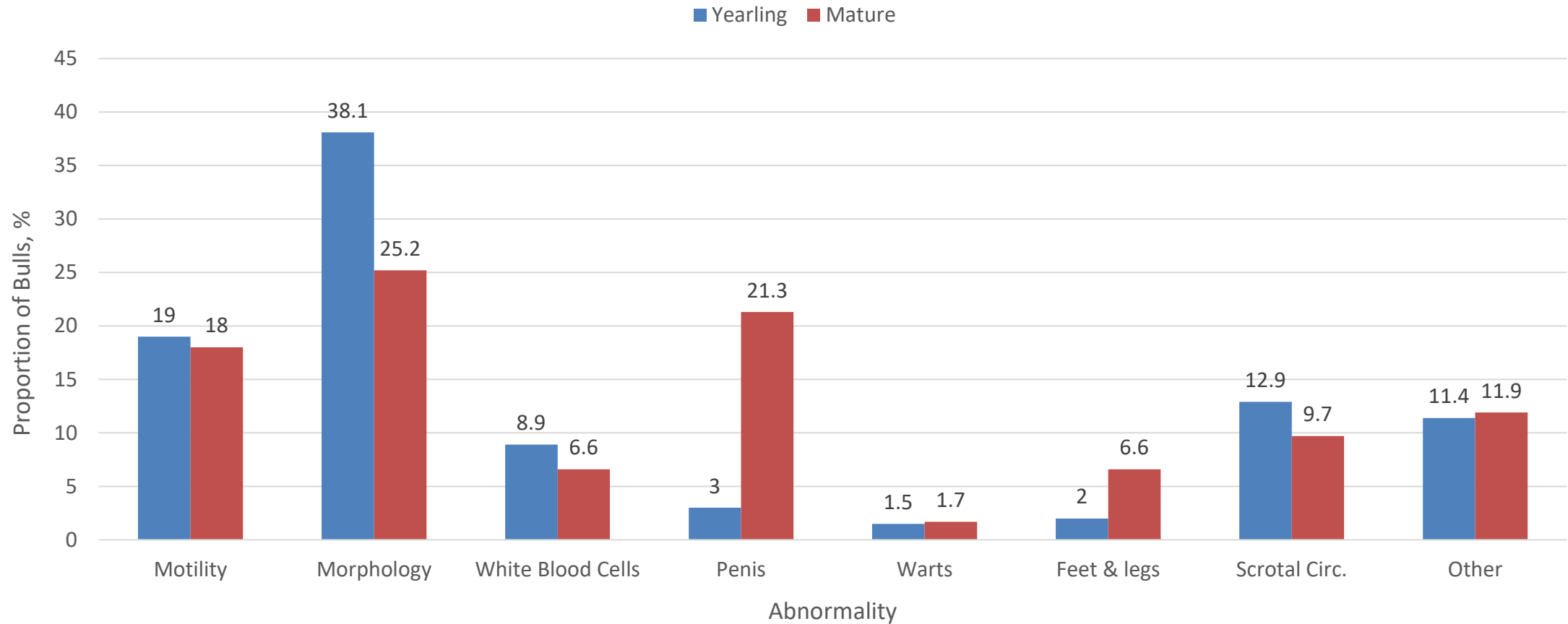
Motility		
Gross activity	Individual activity	Rating
Rapid swirling	~70%	Very good
Slower swirling	50-69%	Good
Generalized oscillation	30-49%	Fair
Sporadic oscillation	<30%	Poor

Morphology
Minimum is 70% normal sperm heads

Goal for examining morphology is to determine the % and types of sperm abnormalities present in a sample and record morphology

SEMEN EXAMINATION		
Collection Method: EE <input type="checkbox"/> AV <input type="checkbox"/> Massage <input type="checkbox"/>		
Response: Erection <input type="checkbox"/> Protrusion <input type="checkbox"/> Ejaculation <input type="checkbox"/>		
Semen Characteristics	Ejaculate 1	Ejaculate 2
Motility Gross (or) Individual (%)		
% Normal Cells		
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WBC, RBC, Other		
<b>CLASSIFICATION</b> Interpretation of data resulting from this examination would indicate that on this date, this bull is a: <ul style="list-style-type: none"> <li><input type="checkbox"/> Satisfactory potential breeder</li> <li><input type="checkbox"/> Unsatisfactory potential breeder</li> <li><input type="checkbox"/> Classification Deferred</li> </ul>		
Re-examination recommended on _____ DATE		
Signed: _____ <small>MEMBER—SOCIETY FOR THERIOGENOLOGY</small>		
Clinic: _____		

# Reasons for BSE failure in yearling and mature beef bulls



# Pelvic Measurements

Age	Weight	Pelvic area
Yearling	900-1000 lb	150 cm <sup>2</sup>
	1000-1200 lb	170 cm <sup>2</sup>
2 year old	1300-1500 lb	190-200 cm <sup>2</sup>

- Research reports that heritability of pelvic area in bulls correlates to his daughters
  - So increased pelvic size in sire would equate to an increased pelvic size in his daughter– increased calving ease

# Trichomoniasis Testing

- A venereal disease that can negatively impacts reproduction in cows
- Abortions within the first 4 months of pregnancy
- Early loss– lots of open cow; breed back later– extends calving season
- Protozoan found in prepuce.
- Tested by DVM



# Health



- Affect the individual bull
  - Johne's Disease
  - Lameness due to injury or infection
  - Pinkeye
  - Vesticulitis
- These can influence the bull's ability to service the female or depress the semen quality

# Health

- Infectious diseases
  - BVD
  - Trichomoniasis
  - Leptospirosis
  - Vibriosis
  - IBR
- All these impact the profitability through reduced number of calves born

# Bull Recommendations

- Age of 2+, previous experience
- Satisfactory BSE
- High Libido
- “Normal” Stocking rates ~1:25

**WATCH GROUPS CLOSELY!**

# Bull Management During Winter



# Question

- **Where do your bulls go over winter?**
  - a. Bull pasture**
  - b. Dry lot**
  - c. Stay out with the cows**
  - d. Corn residue**
  - e. Other**



# Cold Weather Impacts on Fertility



- Cold weather and wind chill can result in bull infertility
  - Tissue Damage
    - Can cause blisters and scabs from frostbite
    - Frostbite will appear as discoloration, a scab, and/or sloughing of the lower scrotal portion
  - **Spermatogenesis takes 61 days**
    - Reevaluate bulls with BSE 45-60 days after injury

# Importance of a Breeding Soundness Exam before the Breeding Season

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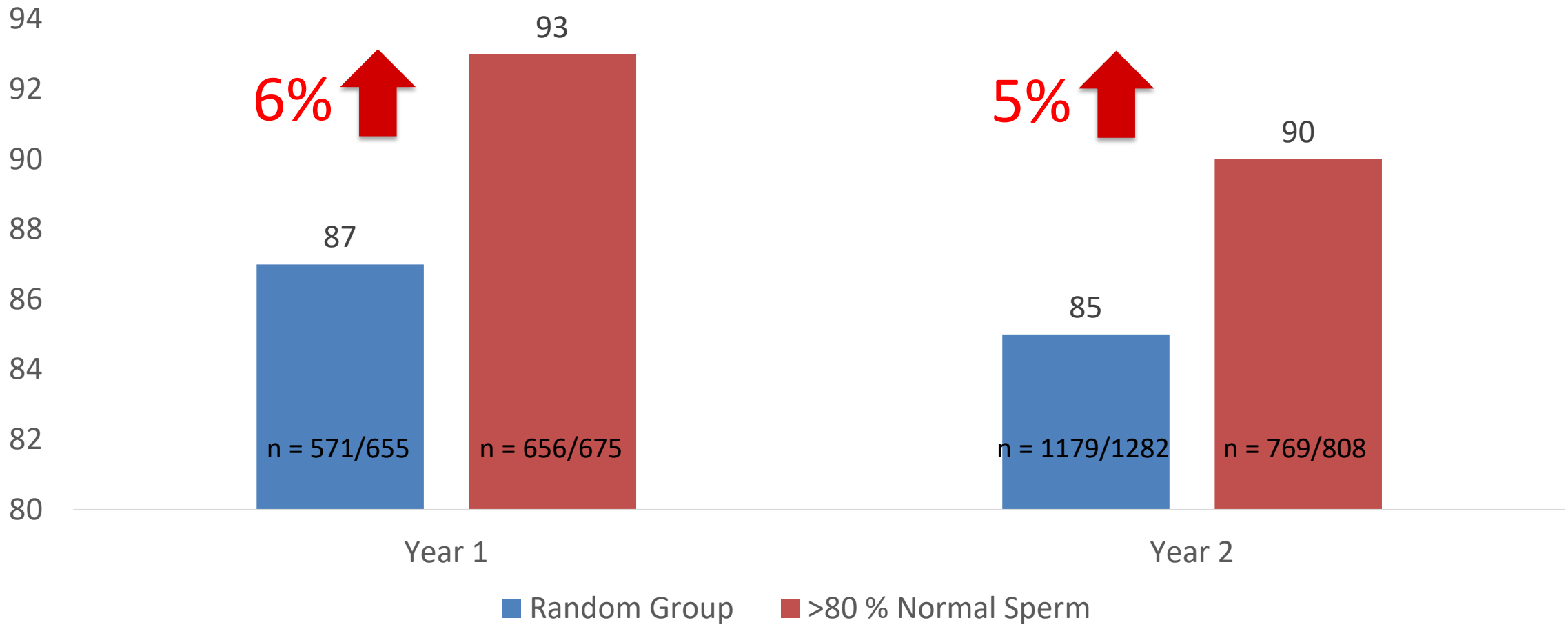
Effect of severity of frostbite on semen quality in bulls

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Breeding	Severity of Frostbite		
	<u>Mild</u>	<u>Moderate</u>	<u>Severe</u>
Soundness Score			
Satisfactory (%)	89.5	48.0	2.1
Questionable (%)	9.5	25.3	9.2
Unsatisfactory (%)	1.0	26.7	88.7

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# How Sperm Quality Affects the Pregnancy Rate of the Herd



Wiltbank and Parish, 1986



# Question

- **Do you have a Breeding Soundness Exam performed on bulls that you purchase?**

- a. Yes
- b. No

- **Do you have a Breeding Soundness Exam performed on bulls that are already on your operation (i.e. not recently purchased)?**

- a. Yes
- b. No

**57% of operations that purchase bulls had a BSE conducted on newly introduced bulls**

**Only 17% of cow-calf operations had a BSE done on bulls that were already on their operation**

(NAHMS, 2007)

# Getting Ready for the Next Breeding Season



- Consider performing a BSE on each bull 30-60 days before the start of the breeding season
- Other annual evaluations –
  - Vaccinations
  - Control for lice and flies
  - Check feet and legs
- Establish social dominance

# Cold Weather Prevention

- Plenty of space
- Shelter
- Windbreaks
- Bedding to help protect from frozen ground



# Bottom Line

- **Nutritional management of bulls is critical – a bull contributes half the genetics to your cowherd and his fertility is important**
- **After fall culling, older bulls should be separated from young and thin bulls**
- **Give bulls plenty of space and offer protection from severe weather to avoid frostbite**
- **Consider performing a BSE on each bull 30-60 days before the start of the breeding season**


# Thank You!



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