Bison Nutrition

Update on bison nutrition and mineral supplementation

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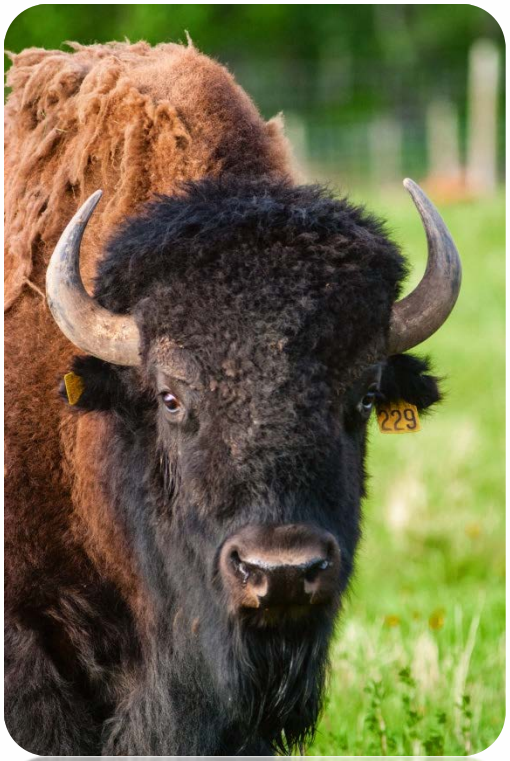
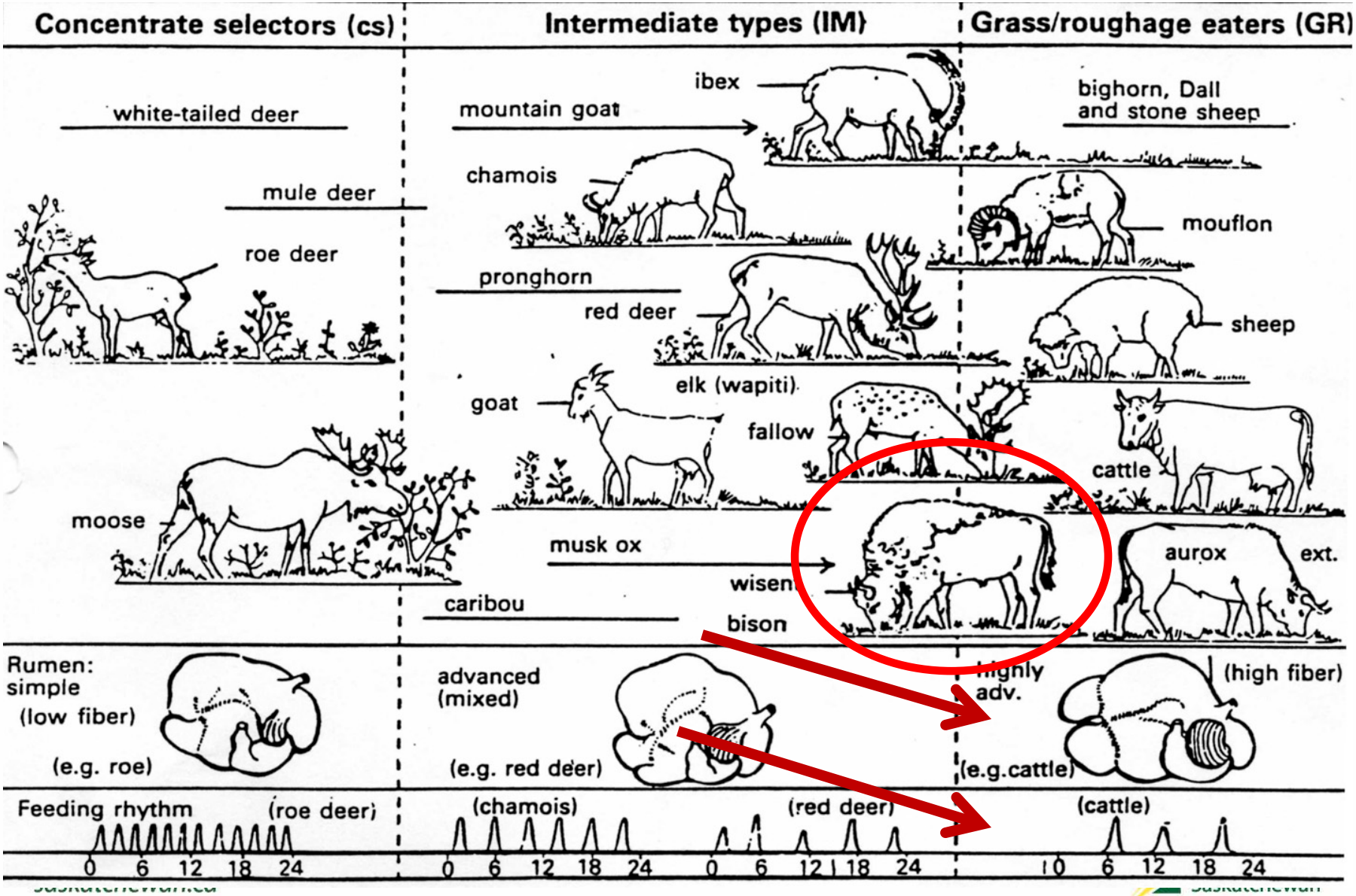
Bison Nutrition

- Refresher: What makes a Bison Unique?

- Recent Work
  1. Bison vs Bovine Bulls – Starch & Fibre
  2. Forage Mineral Content Study

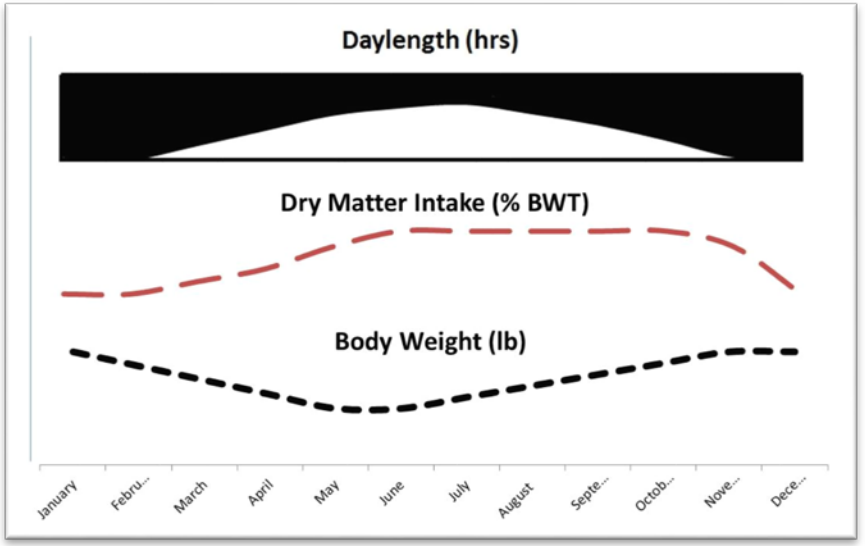


Ruminant Feeding Types (Hofmann)



Bison Energetics

- Normal Seasonal Variances
- Metabolism Affected by Day Length
  - Pineal Gland and Melatonin

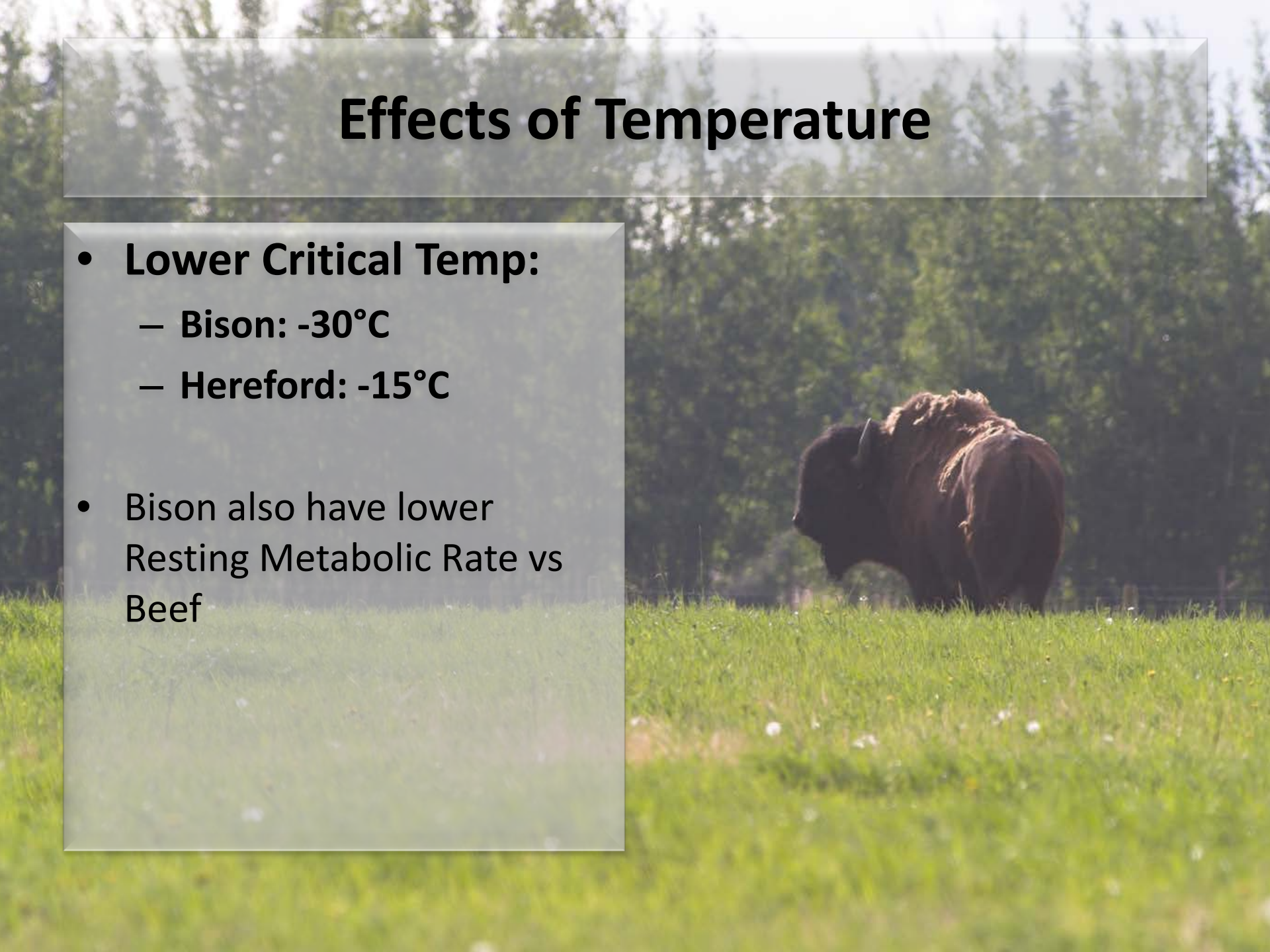


- Energy Requirements
  - Bison Cow:
    - Winter: 48-50% TDN
  - Beef Cow (May Calving):
    - Winter: 49-50% TDN
  - Beef Cow (March Calving):
    - Winter: 57-63% TDN
    - Body Condition Score Dependent

Effects of Temperature

- **Lower Critical Temp:**
  - **Bison: -30°C**
  - **Hereford: -15°C**

- Bison also have lower Resting Metabolic Rate vs Beef



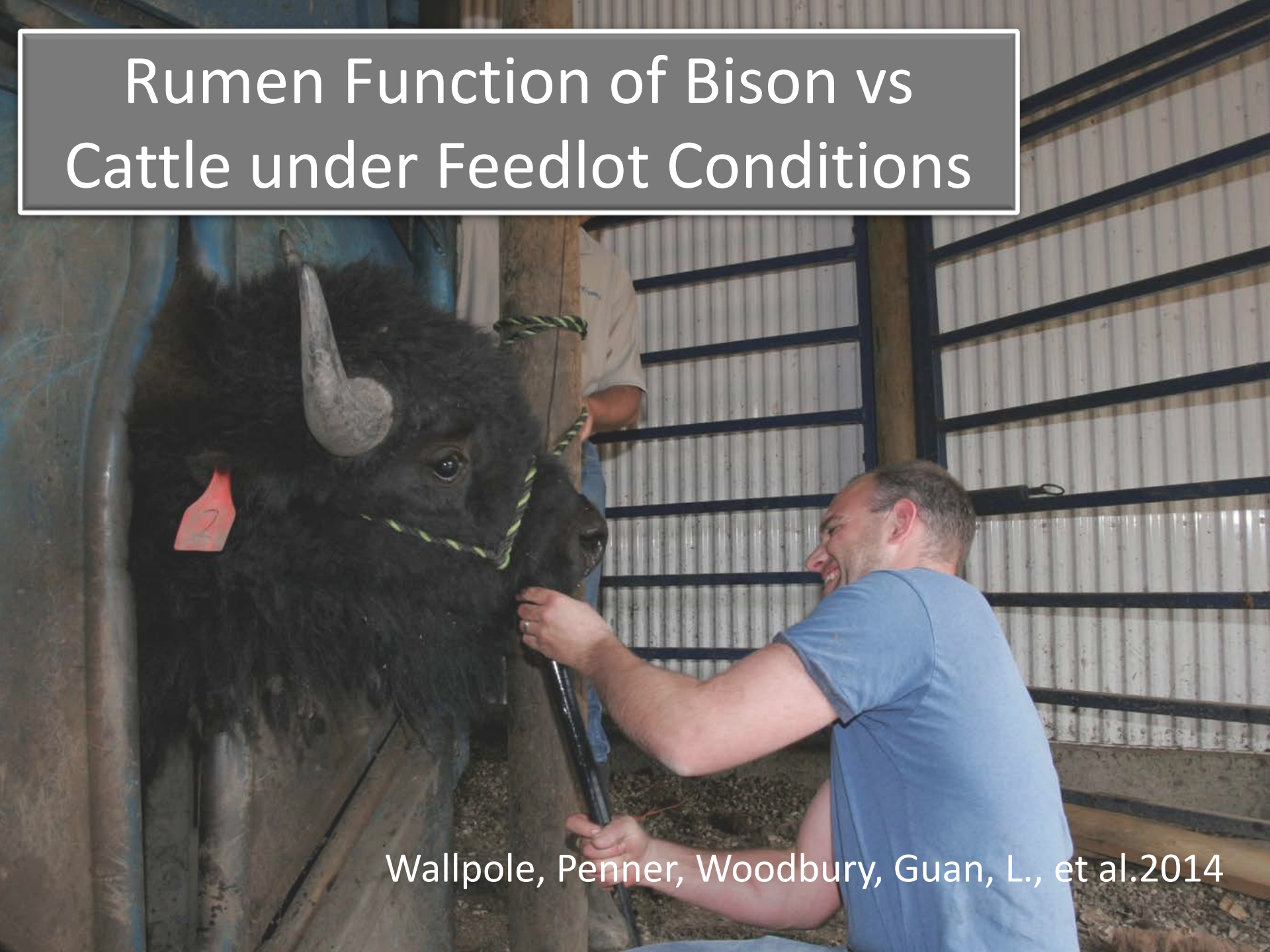
Forage quality is important to bison

more than just protein…..

Digestibility Comparisons

Feed		Digestibility		Reference
		Bison	Cattle	
Sedge	Dry Matter	64	58	Richmond et al. 1977
	Nitrogen	54	47	
Grass	Dry Matter	74	62	
	Nitrogen	70	58	
Alfalfa	Dry Matter	78	76	
	Nitrogen	84	83	
Alfalfa brome	Dry Matter	50	52	Young et al. 1977
	Digestible Energy	49	50	
	Crude Protein	67	65	

Rumen Function of Bison vs Cattle under Feedlot Conditions



Wallpole, Penner, Woodbury, Guan, L., et al.2014

Bison Feeder Bull Production

- Bison tend to have more fibre in their feedlot diets vs beef
  - (30-40% vs 5-15% forage)

- ADG Limitations

	Backgrounding (lb/day)	Finishing (lb/day)
Bison	1.42 – 1.51	1.64 – 1.89
Beef	2.0	4.0

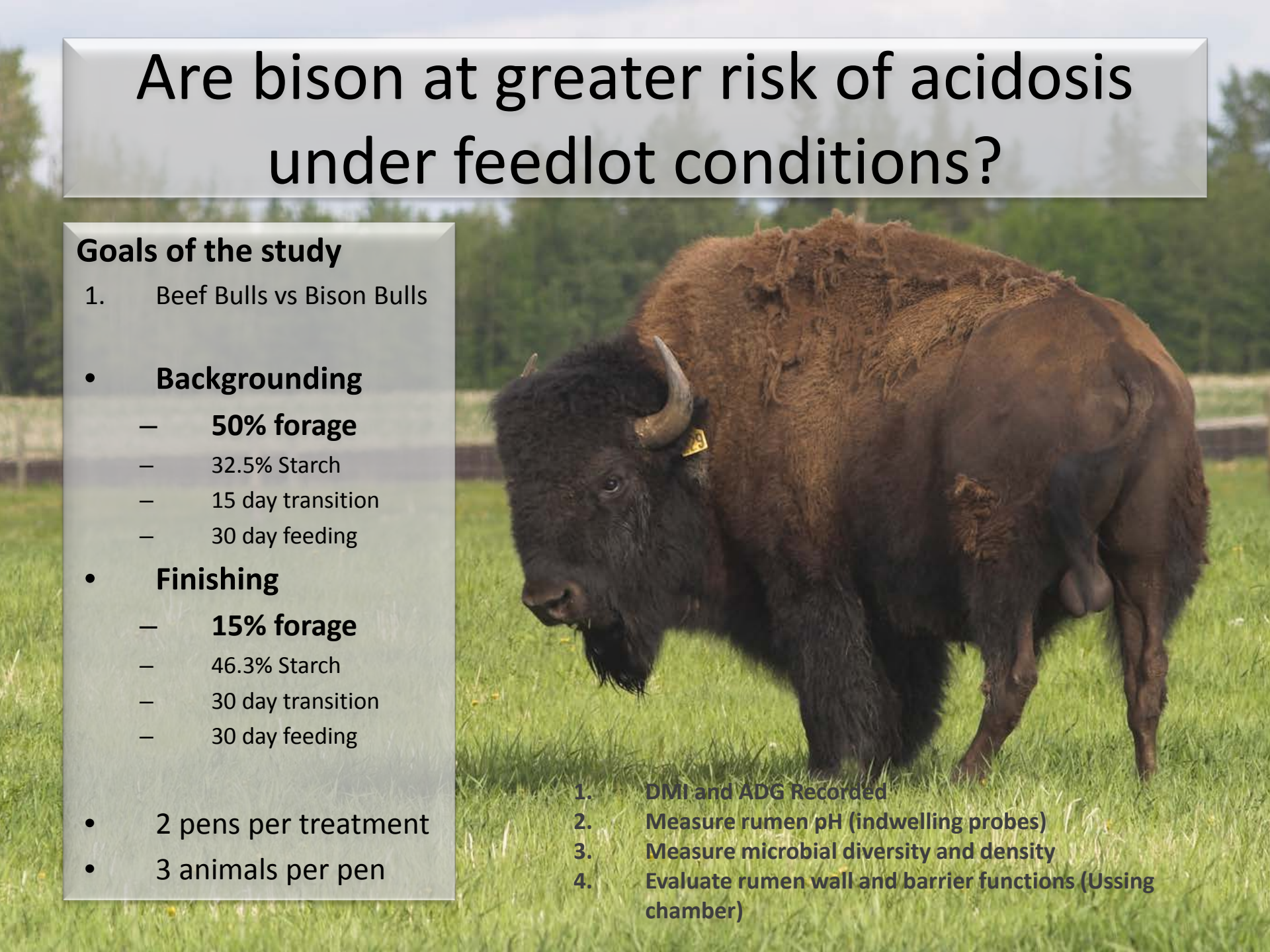
Are bison at greater risk of acidosis under feedlot conditions?

Goals of the study

1. Beef Bulls vs Bison Bulls

- **Backgrounding**
  - **50% forage**
  - 32.5% Starch
  - 15 day transition
  - 30 day feeding
- **Finishing**
  - **15% forage**
  - 46.3% Starch
  - 30 day transition
  - 30 day feeding

- 2 pens per treatment
- 3 animals per pen

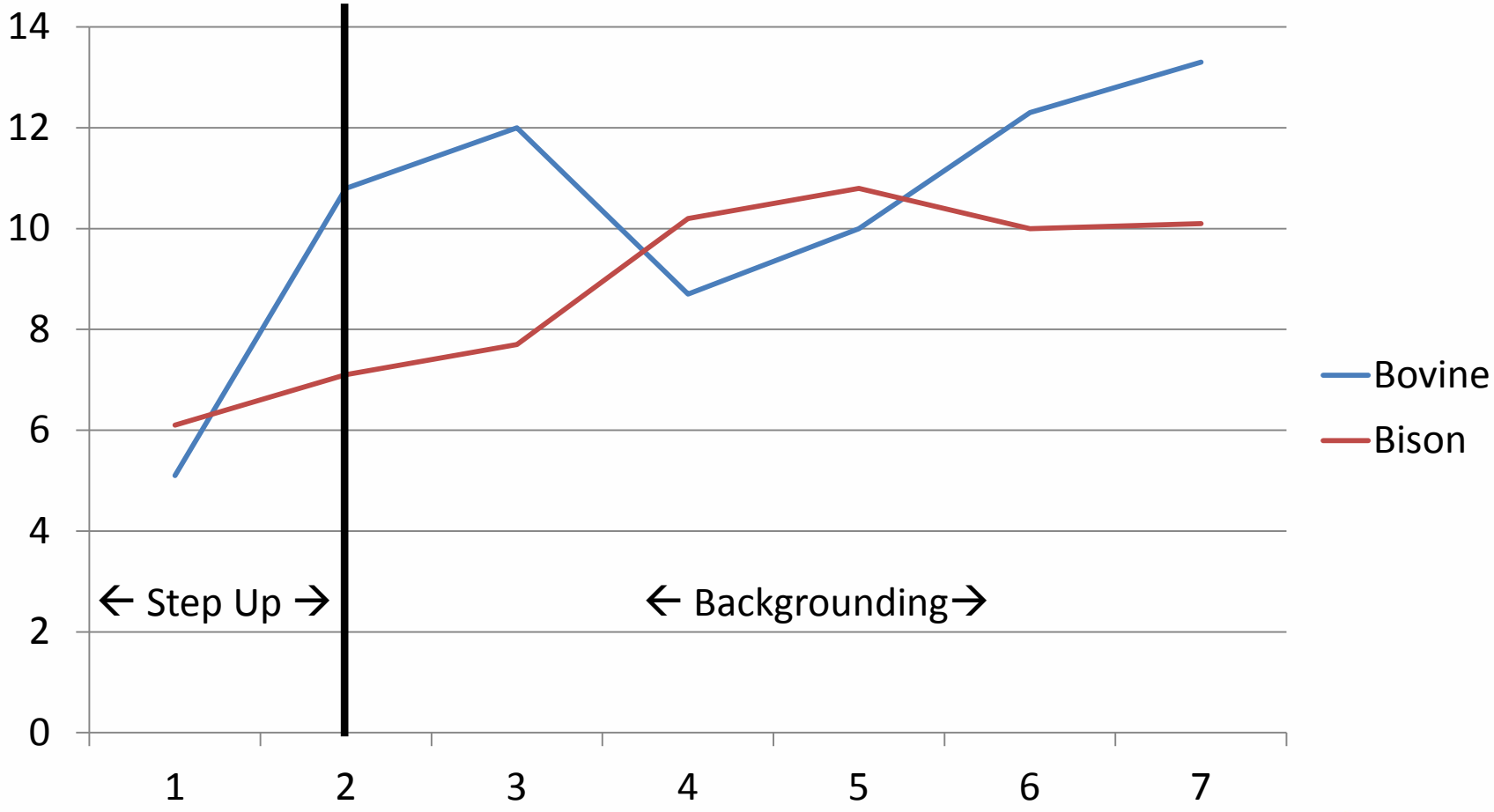


1. **DMI and ADG Recorded**
2. **Measure rumen pH (indwelling probes)**
3. **Measure microbial diversity and density**
4. **Evaluate rumen wall and barrier functions (Ussing chamber)**

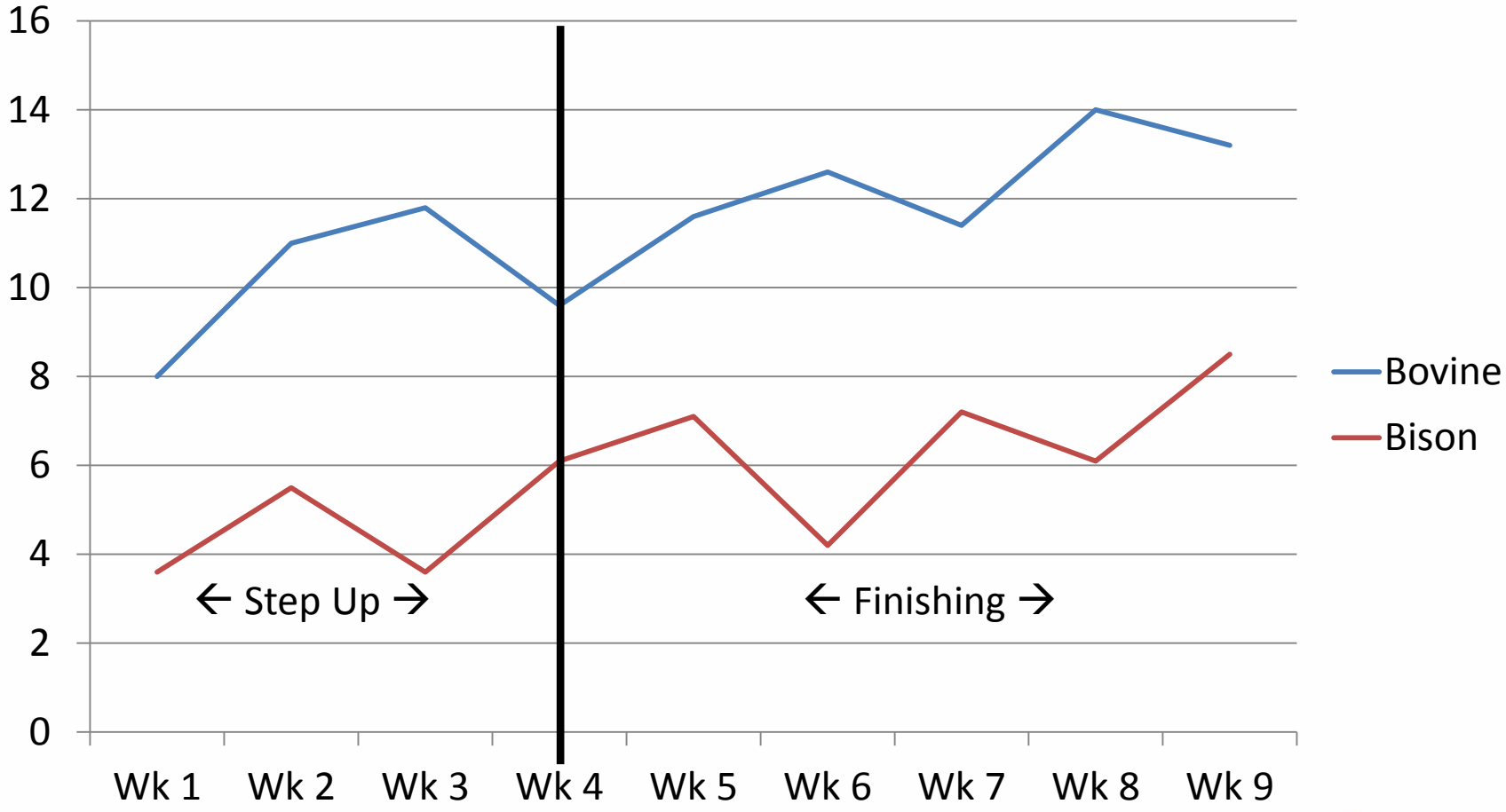
Results: Performance

	Bovine		Bison		
Item	Background	Finish	Background	Finish	P Value (species)
Start Test BW, kg	454	453	350	319	<0.001
End Test BW, kg	536	558	392	385	<0.001
DMI, kg/d	13.4	13.2	10.1	8.5	0.069
DMI, % BW	2.40	3.38	1.88	2.25	0.068
ADG, kg/d	2.02	2.24	1.38	1.36	<0.001

Change in Dry Matter Intake (Backgrounding, 50% Forage)

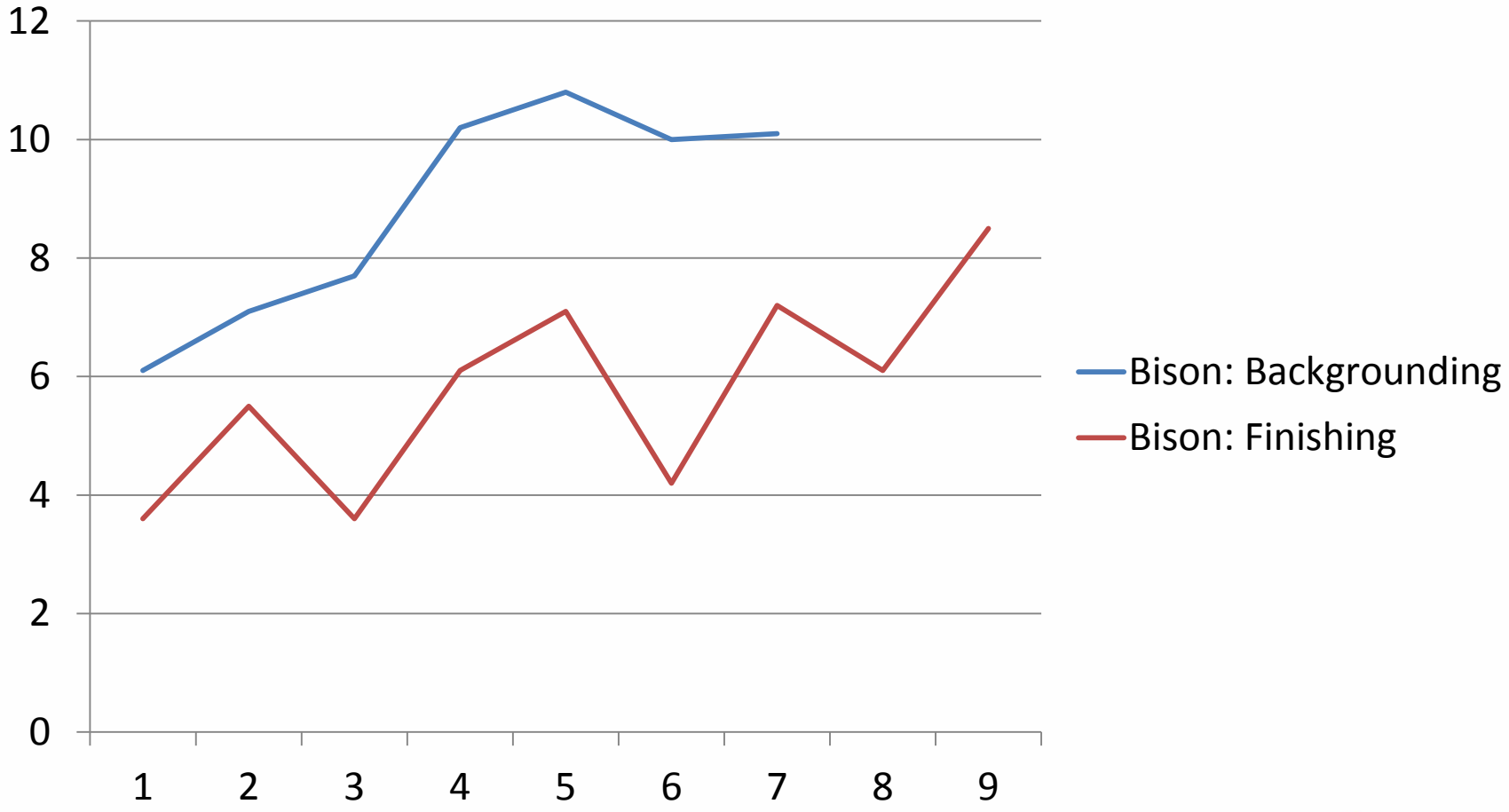


Change in Dry Matter Intake (Finishing, 15% Forage)

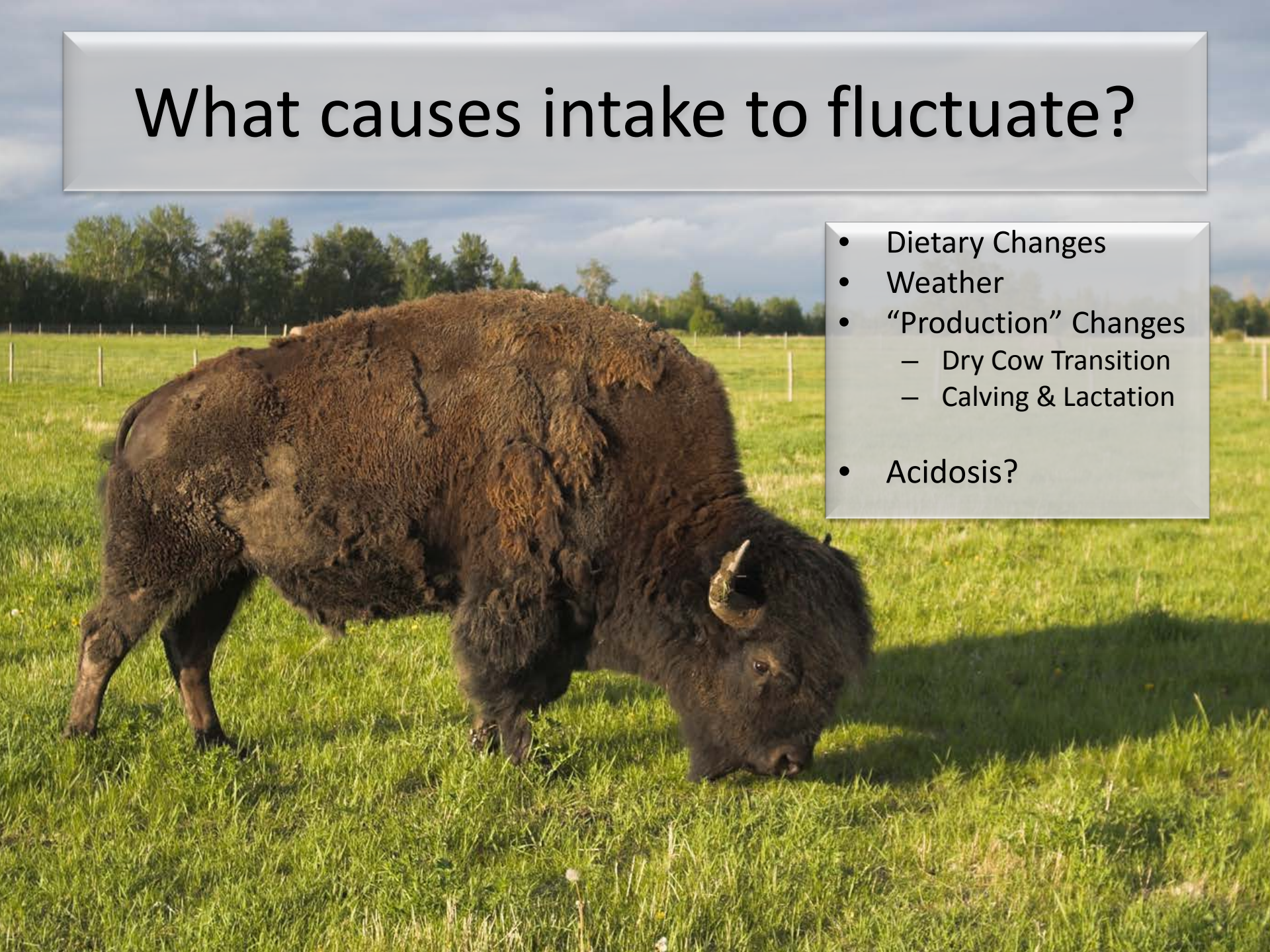


Bison: Backgrounding vs Finishing

Dry Matter Intake, kg/day (averaged end of week weights)



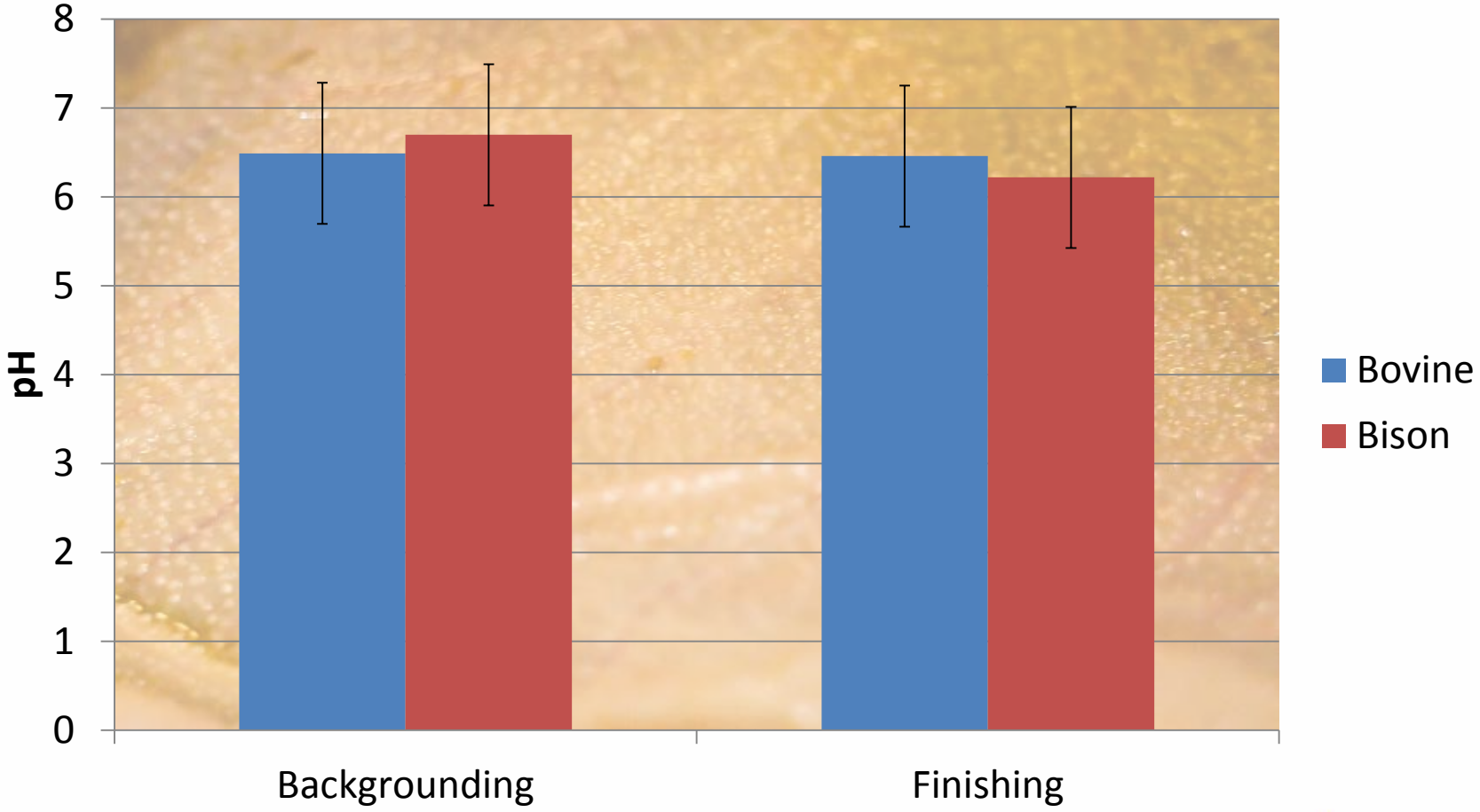
What causes intake to fluctuate?



- Dietary Changes
- Weather
- “Production” Changes
  - Dry Cow Transition
  - Calving & Lactation
- Acidosis?

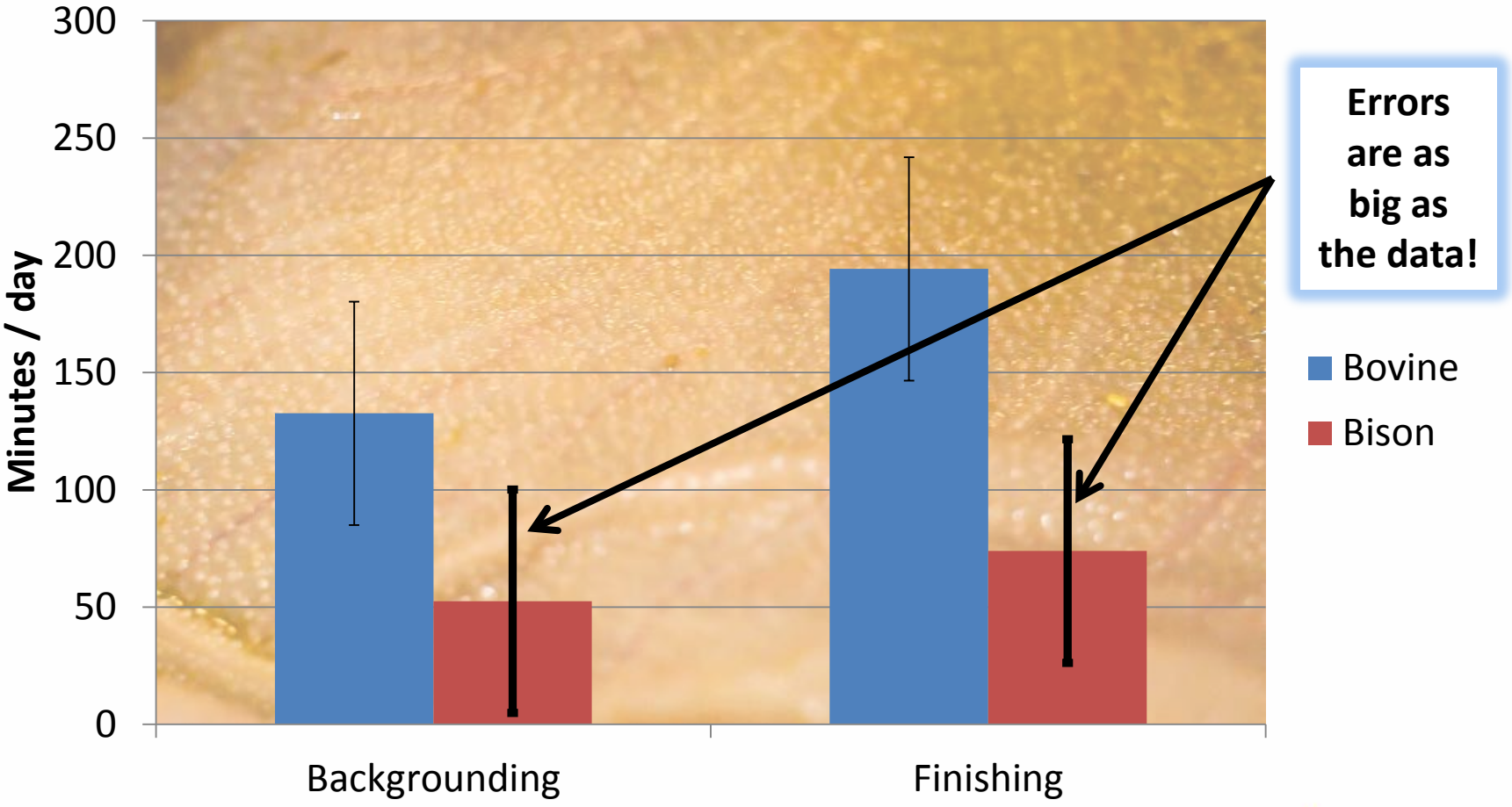
Mean Rumen pH

(in-dwelling pH meter)



Duration pH < 5.5

(in-dwelling pH meter)



pH Observations

1. Feed (starch) enters rumen
2. Microbes consume starch and create acid
3. Acid pools in rumen and dissipates across rumen wall
4. Effect buffers, saliva, etc.

- No feed consumed → no acid → hungry → overeat → acidosis

- Overeat Grain → creates acid → (-) feedback → drops intake → hungry → overeat…….

pH Observations: Backgrounding

Key Finding: Bison did not experience acidic pH as low or as long compared to Bovine

1. Average rumen pH was higher in bison than cattle
2. Minimum rumen pH was higher in bison than cattle
3. Rumen pH time < 5.5 was shorter but highly variable

pH Observations: Finishing

Key Finding: Bison experienced an acidic pH <5.5 for a longer period of time than backgrounded

1. Average rumen pH was lower in bison than cattle
2. Minimum rumen pH was lower in bison than cattle
3. Rumen pH time < 5.5 shorter period of time but highly variable

Findings and Results

1. Bison - finishing: lower minimum and mean pH

2. Bison – finishing: large variability in rumen pH from basic → acidic = problems for consistent feed intake

3. Bison had slightly higher pooled concentration of rumen fatty acids in finishing period with more butyric and less proprionic acid vs beef bulls
   - Less efficient acid = less efficient gains

Findings and Results

- Bison papillae were smaller and more dense
- Bison papillae did not increase length in response to more starch

Consider erratic feed intake patterns when fed high grain diets…..

Bison do not have the capacity to adapt to higher starch diets compared to bovine

Management Implications?

- Be selective of grains used
  - Peas, fat products, blending
- Incorporate fiber into pellets
  - Digestible fibre – soybean hulls, distiller grains
- Grain Screening Pellets
  - Opportunity feed
  - Manage for quality (fusarium, ergot)

More to come….

1. Microbial analysis
2. Rumen wall function
3. Nutrient transfer from rumen to bloodstream

Trace Mineral Status of Saskatchewan Pastures

(slide courtesy of Leanne Thompson, Saskatchewan Forage Council)

Trace Mineral Study

(slide courtesy of Leanne Thompson, Saskatchewan Forage Council)

- Saskatchewan Forage Council recently completed a study looking at trace mineral status of pastures across SK
  - Look at effect of season, soil zone and forage type
  - Lack of info on this for SK
- Intent was to collect and share this data for use by SK producers

Sask Forage Council an.ca

Government of Saskatchewan

Trace Mineral Study

(slide courtesy of Leanne Thompson, Saskatchewan Forage Council)

- Sampled pastures across SK in 2012 and 2013
  - Two seasons (spring vs fall)
  - 4 soil zones (Gray, black, dark brown and brown)
  - Various forage species
    - Alfalfa,
    - Kentucky blue grass,
    - Crested wheat grass
    - Smooth brome grass
    - Meadow brome grass
    - Western wheat grass
    - Native

Results – Seasonal Affect

(slide courtesy of Leanne Thompson, Saskatchewan Forage Council)

- Season had a large effect on trace mineral concentration
  - Fe, Mn, Mo increased from spring to fall
  - Cu, Zn, decreased from spring to fall
  - Se remained somewhat consistent
- Similar effect from season across all soil zones and forage species

Results – Soil Zone Affect

(slide courtesy of Leanne Thompson, Saskatchewan Forage Council)

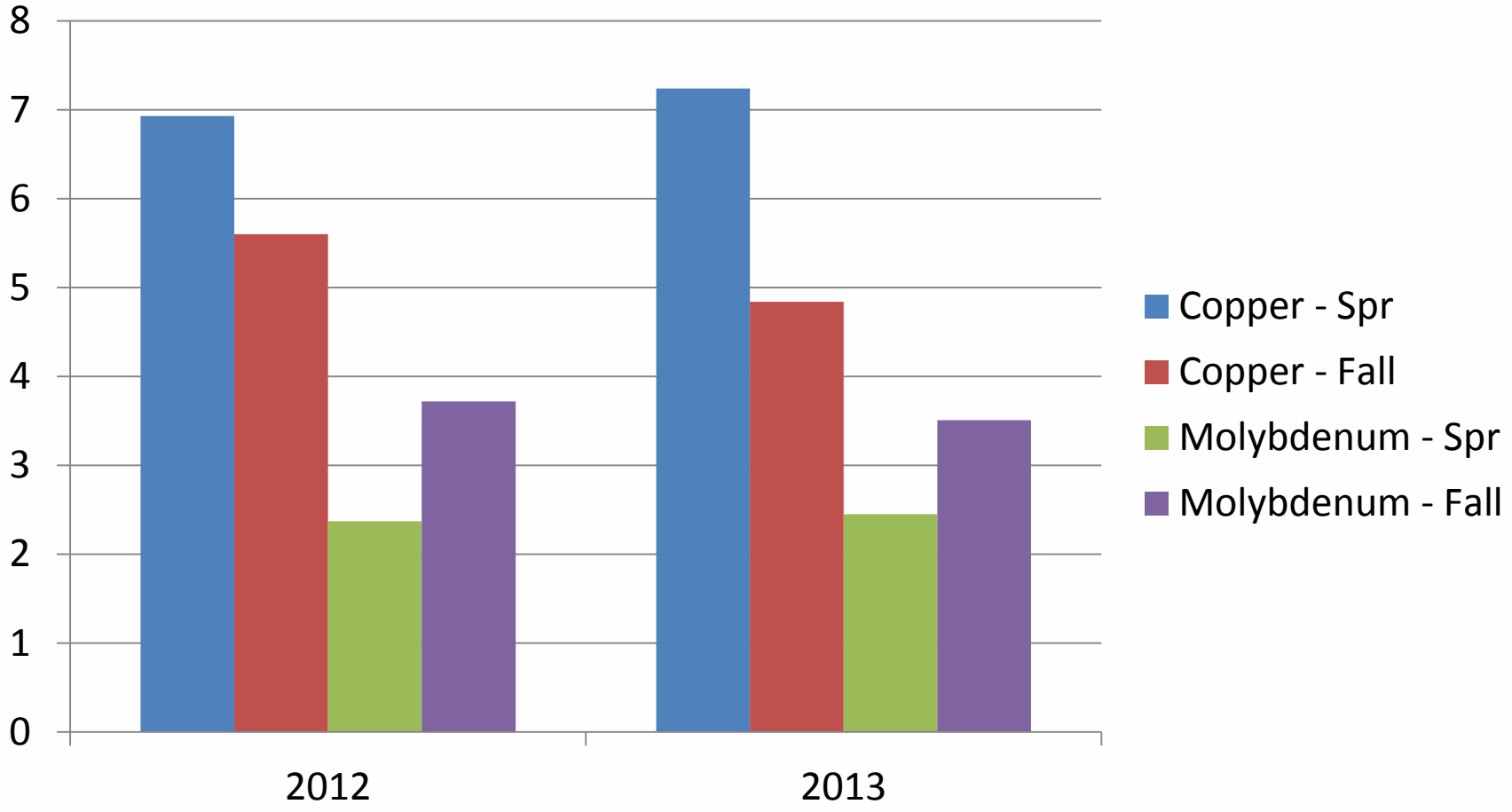
- Fe numerically highest in gray, but adequate in all soil zones
- Zn and Mn concentrations similar
- Cu tended to be lowest in brown and dark brown during fall
- Cu and Zn lacking across SK in both seasons and across forage types

Results – Soil Zone Affect

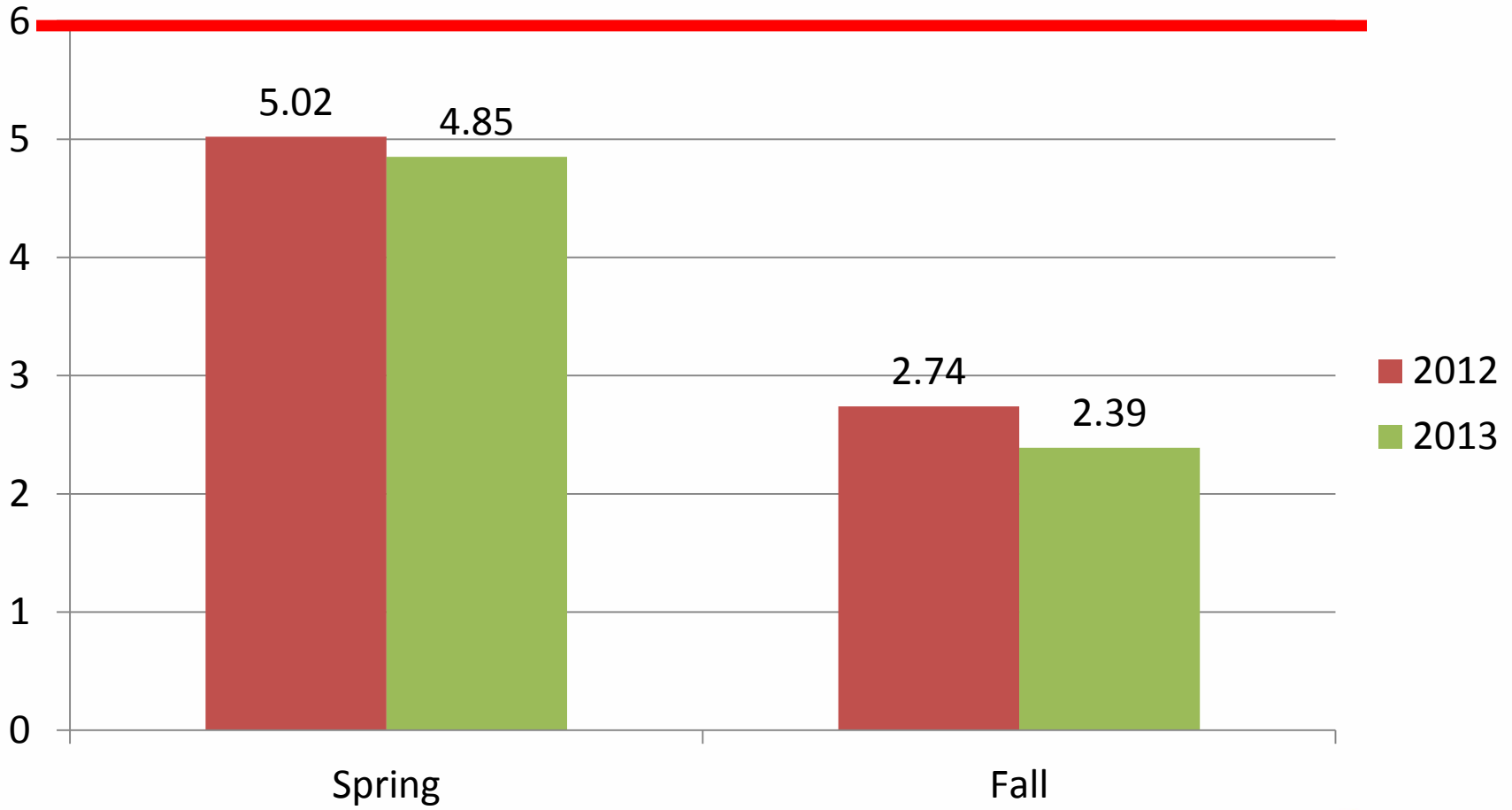
(slide courtesy of Leanne Thompson, Saskatchewan Forage Council)

- Mo highest in gray during the fall and lowest in dark brown during spring
- Cu:Mo ratio is of concern due to interaction
  - Ratio lowest in gray soil zone during the fall (due to low CU and high Mo)

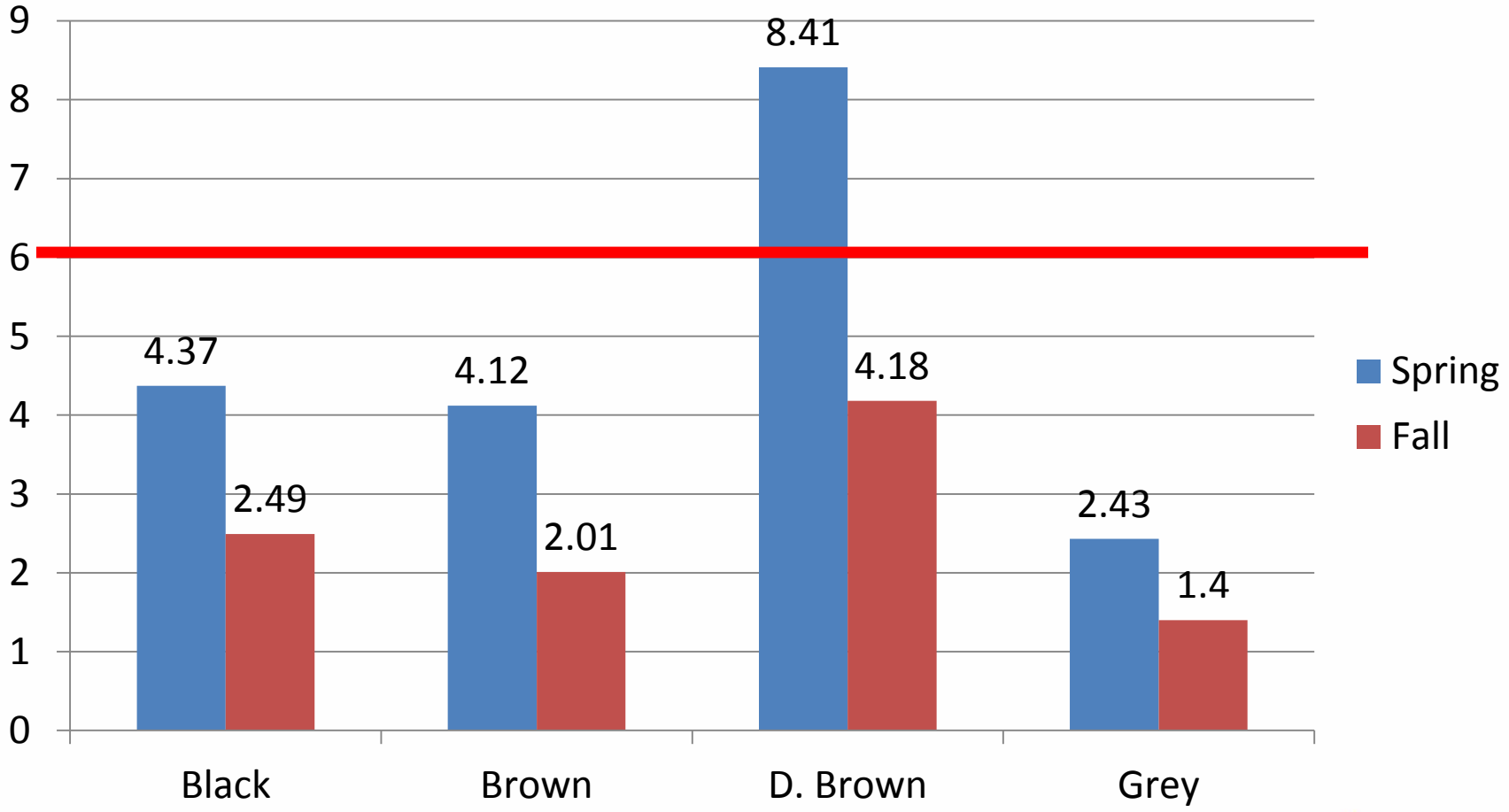
Copper and Molybdenum Change by Season (mg kg^{-1})



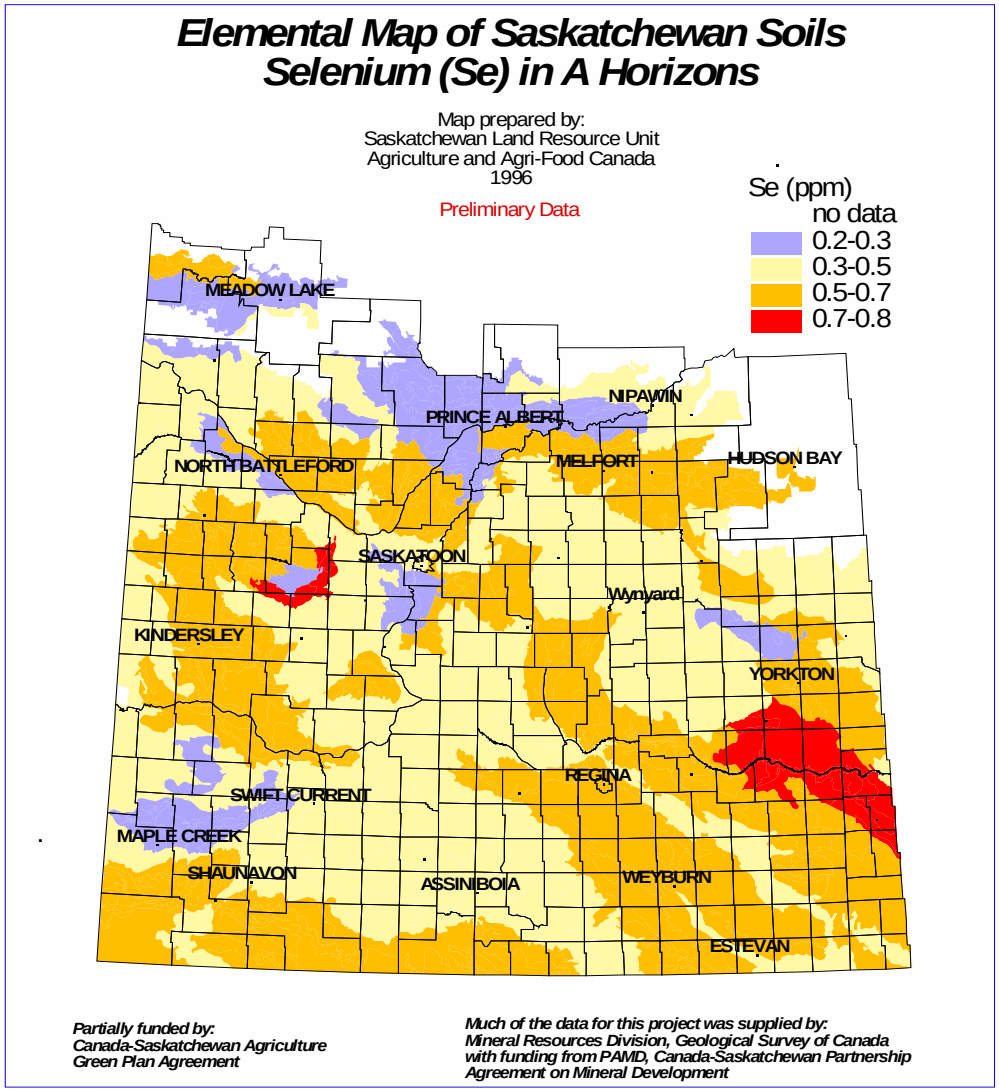
Copper:Molybdenum
Saskatchewan Pasture Grasses



Copper:Molybdenum Ratio by Soil Zone



Selenium in Saskatchewan



- Selenium was the highest in forages from the brown soil zone and similar across other three soil zones
- Selenium supplementation?

Mineral Feeding Solutions

- Mix up the salt (10-50%)
- Try salt-free mineral
- Mix in molassess
- Switch to molasses
  - Tubs, blocks, molasses “chips”
- Chase digestibility (chelated)

http://www.nurtur-health.eu/WebRoot/StoreNL/Shops/62902058/50AB/33F7/232B/F188/F3CD/C0A8/28BE/BCA0/SBPacks.JPG

- Holy Grail = Fortified Pellets

Feeding Recommendations

- Get the intake when you can!
- Mineral consumption wintering period is important - before pasture turnout/calving
  - Better control of intake (?)
  - Restore body reserves

www.saskforage.ca


Thank you for your time…
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