Classes of Livestock

- **Cows**
  - Vary in age, between 2 and 15 years old
  - Vary in condition (fat vs. thin)

- **Calves**
  - Traditional system
  - Nursing during the summer, weaned in the fall
  - Feeding calves during the winter (backgrounding for feedlot)

- **Yearling Heifers**
  - Preparing for pregnancy and growth

Factors influencing Requirements

- Stage of production
- Desired production
- Cow age
- Cow size and condition
- Milking ability
- Disease and parasites
- Environment

Numbers to Remember

- Forage quality and intake
  - High quality 2.5-3.0% of BW
  - Medium quality 2.0-2.5% of BW
  - Low quality 1.5-2.0% of BW

- Why does intake change?
  - Passage rate

Total Digestible Nutrients (TDN)

- Measure of energy
  - \[ \text{TDN} = 88.9 - (0.79 \times \%ADF) \]

- NEm and NEg are used in the NRC 1996 and 2000 update. Most ranchers use TDN.

Crude Protein

- Crude Protein
  - N content x 6.25

- DIP and UIP system
  - DIP – Degradable Intake Protein
  - Protein that is degraded in the rumen
  - UIP – Undegraded Intake Protein
  - Also called bypass protein
  - Protein that is digested in the small intestine
Feedstuff composition

- TDN
  - Hay 50%
  - Grains 75%
  - SBM 75%
  - CSM 65%

- CP
  - Grains 9-12%
  - Alfalfa 12-20%
  - Grass 6-12%
  - SBM 50%
  - CSM 44%
  - Urea 281%

Minerals and Vitamins

- Maintain Ca:P ratio 2:1
- C is low in concentrates
- P is low in forages

- Microminerals
  - Use a trace mineral pack

- Vitamins
  - B – made in rumen
  - D – sun
  - A – forages
  - Use a vitamin pack

Condition Score

- Subjective measure of degree of body reserves
- Appraisal based on apparent external fat cover, muscle appearance, and apparent skeletal features
- Based on a 1 to 9 scoring system
- Want to have cows in condition score 5 (moderate condition) at calving and breeding

Beef Cow Production Cycle

<table>
<thead>
<tr>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Period 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-Gestation</td>
<td>60-90 days Precalving</td>
<td>Calving to Rebreeding</td>
<td>End of breeding to weaning</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Maintenance Rapid Fetal Growth Preparation for Lactation</td>
<td>Maintenance Lactation Regain wt loss Repair Repro Tract Cycle + Conceive</td>
<td>Maintenance Lactation</td>
</tr>
</tbody>
</table>

Beef Cow Requirements

<table>
<thead>
<tr>
<th></th>
<th>% TDN</th>
<th>%CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-gestation</td>
<td>44</td>
<td>6.3</td>
</tr>
<tr>
<td>60-90 days precalving</td>
<td>48</td>
<td>7.0</td>
</tr>
<tr>
<td>Lactation (10 lbs)</td>
<td>56</td>
<td>8.5</td>
</tr>
<tr>
<td>Lactation (20 lbs)</td>
<td>58</td>
<td>10.7</td>
</tr>
</tbody>
</table>

Summer Range

- Cardinal Principles of Grazing Management
  - Proper number of animals
  - Proper distribution of animals
  - Proper season of use
  - Proper kinds of animals
Crude Protein Content of Idaho Fescue and Bluebunch Wheatgrass

Crude protein content of diets selected by cattle grazing Northern Great Basin native rangelands (DelCurto, 1997).

Mature Cattle ADG (kg/d)

Calf Gains (kg/d) During Summer Grazing Period

Summer Range

- Cows and calves weight gains are different
- Options for increasing ADG during end of grazing period
  - Early weaning
  - Supplementation
  - Removal from summer range
  - Creep feeding
- Why was lactation not considered a major concern in the production cycle?

Mid-Gestation

- Sometimes considered the 2nd grazing period
- Only trying to maintain body condition
  - Want to leave this period with at least a condition score of 5
- May not be meeting nutritional requirements
  - 1st limiting nutrient – Protein
- In eastern Oregon cattle usually graze hay meadows or crop land
Problems with Low Quality Forages

- If CP is less than 7% in diet, inadequate to maintain rumen function
- Energy in the forage is of little use without protein to stimulate microbial fermentation

Supplementation

- **Goal** — promote the maximum utilization of the feed
  - Supplementation should be used to complement or enhance forage utilization
- **Protein supplements**
  - High in protein relative to other nutrients
  - Can also have high energy content
  - Examples:
    - DIP: SBM, CSM, Urea
    - UIP: blood meal, fish meal, feather meal

Supplementation cont.

- Energy supplements
  - Sources of concentrated nonstructural carbohydrates, readily available structural carbohydrates, or fat
  - Examples
    - Corn, wheat, barley, beet pulp
- What do you want to supplement with, protein or energy?

Effects of Supplementation

- **Protein supplementation (DIP)**
  1. Provides nitrogen for microbial growth
  2. Promotes improved fiber digestibility
  3. Animal is willing to accommodate increased fill, plus rates of digestion and passage rate are increased
  4. Promotes increased intake of poor quality forage (Positive Associative Effects)
- **Energy supplementation**
  1. Reduce microbial population
    - Microbial shift away from cellulolytic bacteria
    - Microbial preference for starch
  2. Depress fiber digestion
  3. Decrease forage intake (Negative Associative Effects)

Rules of Thumb for Effects of Nonstructural Carbohydrates on Utilization of Low Quality Forages

<table>
<thead>
<tr>
<th>% in Diet</th>
<th>% Reductions</th>
<th>Digestibility</th>
<th>Intake</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10-20</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>20-30</td>
<td>8</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>&gt;30</td>
<td>15</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

Questions to consider

- What do you want to supplement with, protein or energy?
- What form of protein, DIP or UIP?
Rules of Thumb for Supplementation

- Optimum % CP in the supplement be in the range of 20-25%
- If use nonstructural carbohydrates with low quality forages, keep level of use under 10%
- Structural carbohydrates are neutral in terms of associative effects

Rules of Thumb for Urea

- Remember: 100% DIP
- See toxic effects with urea at >3% of DM
- When combined in supplement, 30% urea and 70% natural protein
  - Sulfur and branched chain amino acids may become deficient

Delivery Methods of Supplement

- Daily or infrequent supplementation
- Liquid tubs
  - Intake controlled by palatability
- Lick blocks
  - Intake controlled by block hardness
- Free choice mineral/salt blocks
  - Should always have out

60 – 90 days Before Calving

- Nutritional status during this period determines the post partum anestrous interval (PPI)

<table>
<thead>
<tr>
<th>BCS</th>
<th>PPI (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>88.5</td>
</tr>
<tr>
<td>4</td>
<td>69.7</td>
</tr>
<tr>
<td>5</td>
<td>59.4</td>
</tr>
<tr>
<td>6</td>
<td>51.7</td>
</tr>
<tr>
<td>7</td>
<td>30.6</td>
</tr>
</tbody>
</table>


Calving to Breeding

- Highest demand on cows, but forage resources are low quality
- Must accommodate demands with supplementation strategies
- To keep calving interval at 365 days
  - Interval from parturition to breeding needs to be 80 days or less
  - First estrus is usually not fertile, now only have 60 days
- Intakes usually increase due to lactation

Effect of Postpartum BCS Status on Pregnancy Rate

<table>
<thead>
<tr>
<th>BCS Status</th>
<th>Preg. rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 &amp; decreasing BCS</td>
<td>69</td>
</tr>
<tr>
<td>&lt; 5 &amp; increasing BCS</td>
<td>100</td>
</tr>
<tr>
<td>5 &amp; maintaining BCS</td>
<td>100</td>
</tr>
<tr>
<td>&gt; 5 &amp; decreasing BCS</td>
<td>94</td>
</tr>
<tr>
<td>5 &amp; increasing BCS</td>
<td>75</td>
</tr>
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</table>

Replacement Heifers

Yearling heifers

Puberty
- Function of age and weight
- Older heifers likely to reach puberty by beginning of breeding
- Nutrition affects growth, which should be targeted so heifers have adequate weight to be pubertal by breeding
- Heifers should reach 65% of mature body weight by the beginning of breeding as yearlings so most (90% or more) have reached puberty
- Breed 20 – 30 prior to main herd

Worksheet
- Heifers wean at 500 lbs on Oct. 15
- Mature wt. is expected to be 1100 lbs.
- Heifer breeding season May 1
  - Begin calving on Feb 5.
- Oct 15 to May 1 = 198 days
- \((1100 \times 0.65) - 500 = 715 - 500 = 215\)
- \(ADG = 215/198 = 1.1\) lbs/day
- Avg. wt. for winter \((715+500)/2 = 610\) lbs
- Avg. age for winter \((7 + 12)/2 = 9.5\) months

Nutrient Requirements
- For heifers at Breeding
  - TDN = 56%
  - CP = 9.6%

2-year-old Heifer Production Cycle

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<table>
<thead>
<tr>
<th>Biological Functions</th>
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</thead>
<tbody>
<tr>
<td>Maintenance Growth</td>
</tr>
<tr>
<td>Rapid Fetal Growth</td>
</tr>
<tr>
<td>Preparation for Lactation</td>
</tr>
<tr>
<td>Growth</td>
</tr>
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<tr>
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<tr>
<td>Repair Repro Tract Cycle +</td>
</tr>
<tr>
<td>Conceive Growth</td>
</tr>
<tr>
<td>Maintenance Lactation Growth</td>
</tr>
</tbody>
</table>

2-year-old Heifer Requirements

Target wt: 85% of mature weight at calving

<table>
<thead>
<tr>
<th>Stage</th>
<th>% TDN</th>
<th>% CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-gestation</td>
<td>54</td>
<td>8</td>
</tr>
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<td>58</td>
<td>8.4</td>
</tr>
<tr>
<td>Lactation (10 lbs)</td>
<td>63</td>
<td>10.5</td>
</tr>
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Management Considerations
- Feed separate from mature cows
  - Cannot compete
  - Have higher nutrient demands
  - If mixed, heifers lower BCS at breeding, causing prolonged PPI and reduced fertility
- Do not limit nutrition during gestation to reduce birth weight
  - Small decrease in BWT
  - Increase in dystocia
  - Weak calves at birth
  - Lower colostrum and milk production
  - Increased calf sickness
  - Longer PPI and lower fertility

Management Considerations
- Do not overfeed
  - Fat deposited in pelvic opening increasing dystocia
- Even as 3-year-old, a cow is not at mature size

Calf Management
Why Creep Feed?
- Usually done at end of grazing season
- Done to increase ADG of calves
- May reduce BCS loss on cows
- Poor quality forage
- Supplemental feeds are cheap in relation to cattle prices
- Mainly practiced by pure bred breeders

What to Supplement
- Historical recommendation
  - Unlimited energy (grain based) creep
- Current recommendation
  - Usually a protein based supplement
  - Same reasons as why supplement protein with mature cows – Positive Associative Effects
  - Protein slightly lower in protein that mature cows, around 16-20% CP
- Green creep
  - Small acreage of high quality pasture adjacent to cow pasture that only calves have access to

Should potential heifers be creep fed?
- Extra nutrition can increase fat deposition in udder, decrease future milk production
- Only creep feed heifers in forage shortage emergencies (drought) to get them to a normal weaning weight, do not exceed normal weaning weights

Early Weaning, Instead of Creep Feeding
Early-Weaning Study @ Oregon State Univ.:

- 1/2 of calves weaned at 150 versus 205 days
- Weaned calves received 3 lbs rolled barley & grazed hay meadow regrowth.
- Cow/calf pairs and dry cows returned to graze native range (7.2% CP).

Early-Weaning Study @ Oregon State Univ.:

<table>
<thead>
<tr>
<th>Performance</th>
<th>Early weaned</th>
<th>Late weaned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calf Weight (205 d)</td>
<td>631</td>
<td>563</td>
</tr>
<tr>
<td>Cow Body Condition</td>
<td>6.2</td>
<td>5.6</td>
</tr>
<tr>
<td>Cow Weights</td>
<td>1147</td>
<td>1092</td>
</tr>
</tbody>
</table>

Turner & DelCurto, 1991