Setting a Proper Stocking Rate

- The Basics: Animal Units and Animal Unit Montsh

  - What is "**Carrying Capacity**" - The number of animals that a piece of land can support without causing land degradation

    - This is a land attribute set by soil type, climate, and vegetation type.

  - What is "**Stocking Rate**" - The number of animals that a manager decides to put on a piece of land for a specified period of time.
    - This is a management attribute that is set based on the goals, knowledge and philosophy of the manager.

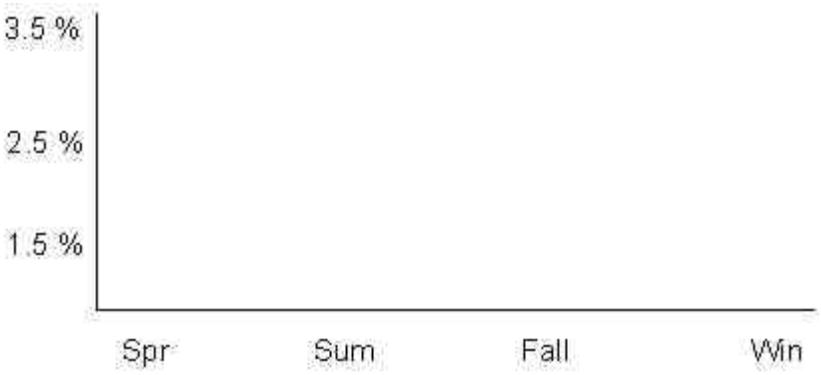
- **AU's and AUM's**
  - AU = Animal Unit = 1,000 pounds of grazing animal
  - AUE = Animal Unit Equivalent = The number of animal units that would account for an individual animal.
    - A term for comparing animals of different spcies on an AU basis. For example, 5 sheep could be expected to weight 1,000 pounds (all together), therefore each sheep is .2 of an AU. The AUE for sheep is usually said to be .2 or .15 on this basis
    - 1/AUE = number of individuals in an Animal Unit.

  - AUM = the amount of forage an AU will eat in a month

    - Depends on animal type
      - ruminants eat about 2.5% of body weight per day
        - Each AU eatsh 25 lbs/day
        - Then, and AUM = 25 lbs/day * 30 days = 750 lbs
        -

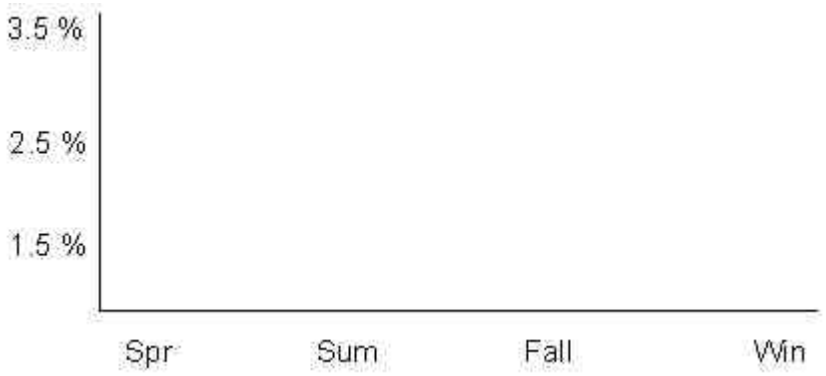
      - hind-gut fermentors (i.e., Horses, mules rabbits, rodents) eat about 3% of body weight per day.
        - Each 1000-lb h/g fermenter eats 30 lbs/day
        - Therefore, a 1000-lb h/g fermenter would eat 900 lbs in a month
        - Generally, take care of this difference by adjusting the AUE
          1 horse = 1,200 lbs = 1.8 AUs
          1 donkey = 700 lbs = 1.05 AUs

    - Depends on Season of Year



- Grazing animals eat more in the spring than in the fall because the food is more digestible and animals (especially ruminants) are simply *able* to eat more.

▹ Depends on Animal Growth Stage



- Intake is expected to increase as animal demand goes up based on growth, lactation.

▸ **Proper Stocking – A Plant's Perspective**

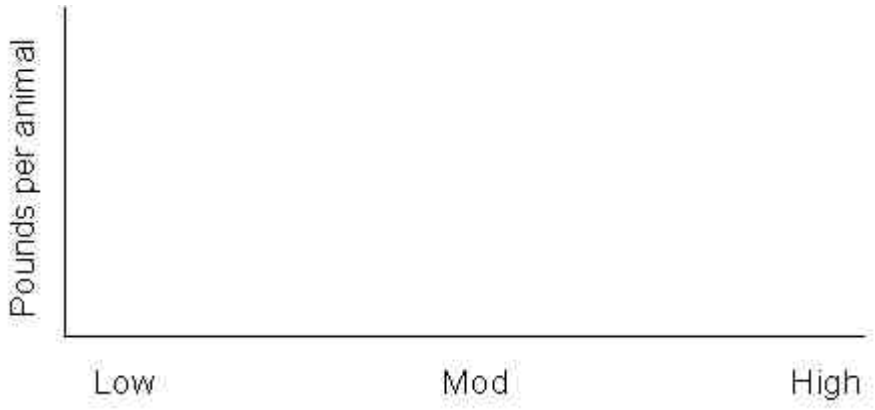
" Need to Maintain sufficient plant residue after grazing:
  ▹ Sustain adequate photosynthesis
  ▹ Maintain healthy soil conditions
  ▹ Sufficient biomass for healthy watersheds
  ▹ Provide for other animals in the environment

" Utilization Guidelines ("Proper Use" Factors)

Avg. Ann. Precipitation (Inches)	%use of major forage plants	Range Type
4-8	25-35	Salt desert shrub
8-12	30-40	Semi-desert grasslands
16-50	30-40	Mountain shrublands
10-16	40-50	Shortgrass prairie
8-10	30-40	Sagebrush grasslands

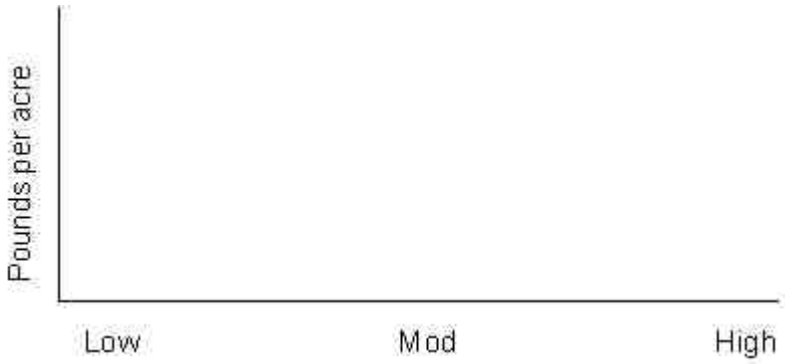
▹ Low stocking rates can have several (alleged) benefits to plant ecosystems:
- Decreased weedy plant invasion
- Improved drought resistance
- Improved condition of degraded land
- Healthy soil

- **Proper Stocking -- An animal's perspective**
  - " Stocking Rates affect production per animal



    - ▹ At high stocking rates individual animal performance is reduced because animals have to compete for forage, diet selection is limited, more energy is required for foraging, and stress and disease may increase

  - " Stocking rates affect production per acre
    - ▹ The pound of livestock produced per acer will increase with increasing stocking rate



    until factors that limit individual animal performance begin to exert themselves.

  - " Optimum stocking rate
    - ▹ Somewhere between maximum individual animal performance and maximum animal production per acre

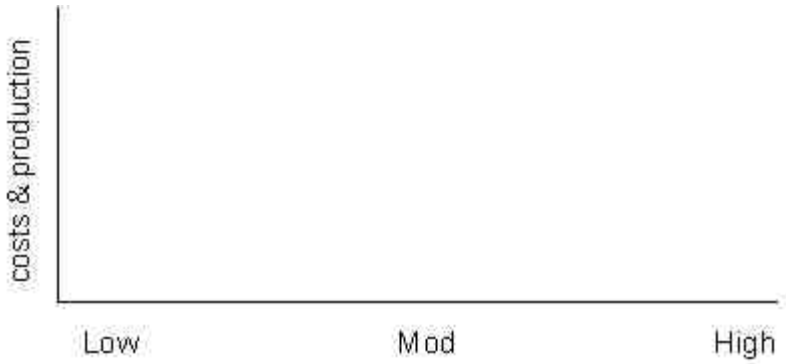
  - " Low stocking rates result in higher individual animal performance
    - ▹ higher reproductive success
    - ▹ higher winter survival
    - ▹ decreased need to supplement

- **Stocking Rate – An Economic Perspective**
  - " What determine profit in livestock enterprise
    - ▹ Selling price
    - ▹ Cost of production
    - ▹ Vegetation Production
    - ▹ Pounds of livestock
      - Stocking Rate
      - Vegetation production

" Costs of Production
  - Fixed Costs = costs that remain constant regardless of level of production
    e.g., land costs, taxes, pick up truck, etc.

  - Variable Costs = costs that increase with increasing level of production
    e.g., feed, vaccination, number of herders

" Optimal Stocking Rate



  - economically optimum stocking rate is *always* lower than maximum production/acre

Summary of Perspectives

- Range Health =

- Livestock Production =

- Economic Returns =

" Why does overgrazing still occur?
  - Distribution problems

  - Some ranchers are too optimistic

  - Season of grazing can change effect of grazing

  - Ignorance... the land manager simply may not know any better

" Overgrazing is <u>not</u> due to a strict Profit Motive

" J.L. Launchbaugh's Axiom:
  - *"The economically optimum stacking rate is a biologically sound stocking rate"*

Setting a Proper Stocking Rate

" "Fence-rail" Approach
  - Establish stocking rate based on:
    - Past experience
    - Current situation
    - Long-range weather forecast
    - Financial goals

" Supply-Demand Balance Approach

4-step Procedure outlined by Holechek (1988)

- Calculate total usable forage
- Adjust total usable forage
- Calculate forage demand
- Balance supply/demand to stocking rate

Only useful to get a "guess" of initial stocking rat

- 1st Step - Calculate Total Usable Forage
  - Divide land into units of similar forage production
    - range site
    - habitat types
  - Determine area of each ecological unit
    - Use planimeter estimates from maps
    - Geographic information systems

  - Determine forage production for each ecological site
    - First define what "forage" is
    - Obtain estimates of biomass/acre
      "Book" Values
    - Clip and visually estimate of small areas
      - weigh & estimate double-sampling
      - comparative yield technique

  - Total forage = $\sum$ over all ecological sites (Area × production/area)

    For Example:
    Sandy uplands (500 ha × 600 kg/ha) = 300,000
    Overflow bottomlands (200 ha × 1,400 kg/ha) = 280,000 kg
    Kg total forage = 300,000 + 280,000 = 580,000 kg

  - Decrease <u>total forage</u> by "proper-use" factor to obtain <u>usable forage</u>

- 2nd Step - Adjust total usable forage
  - Adjust for slope
    - Slopes greater than 40% may be difficult for cows to access and may need to reduce initial estimates of how much forage is really available
    - Sheep can use slopes up to 45%
    - Many wildlife species are able to use slopes 50% +

  - Adjust for water location
    - May need to reduce the amount of forage "usable" to cattle if it is more than 1mile from water — *need to know the cows and the land.*
    - sheep and goats can use areas > 2 miles from water because they do not require water daily
    - affect of water on forage use/availability depends greatly on season

- 3rd - Calculate Forage Demand
  - How much will each animal in the herd/flock eat?

  - Average animal weight

- times 2.5 % for ruminants or 3.5% for non-ruminants
- time number of days on range (total area or pasture)

- 4th Balance Supply/Demand to get stocking rate

To manipulate the animal numbers:

- Total Usable forage ÷ forage demand per animal = number of animals that can be grazed

To manipulate days in grazing season:

- Total Usable forage ÷ total daily demand of herd/floc = number of days that the herd can be grazed

- **What to do with yearly variation in forage production**

Long-term Average

- **Flexible** - Find ways to increase stocking rate in years of excessive forage production and reduce stocking rate in bad years. This could include keeping stocker animals, weaning early, culling hard, or keeping calves over summer

- **Constant** - Set stocking rate low so that the determined rate would be appropriate in years when precipitation was 25% below average.

- **Keeping Track .....** Monitor, Monitor, Monitor

- Making objective decisions based on good information... the key to good range management.

- Establish ways to assess effects of grazing
  - Photographic records
  - Plant utilization maps
  - Animal Condition
  - Key species/Key area changes