Grazing Systems

- Grazing systems are controlled grazing management practices that manipulate livestock to systematically control periods of grazing, deferment, or rest. An extremely important concept in creating grazing system is to select the appropriate season of grazing or rest:

    - Grazing during dormant season is least damaging (except for shrubs).
      At this time, the plant is not actively photosynthesizing and plant does not try to regrow after being grazed. However, grazing during this time may be detrimental to shrubs that are maintaining and forming buds which are accessible to herbivores.

    - Grazing when plants initiate growth has intermediate negative effect.
      The plant is actively growing and has significant demand for photosynthetic products. However, the conditions for growth are optimal (i.e., plenty of soil moisture and nutrients). This active photosynthesis can provide the carbohydrates (CHO's) necessary for growth. During drought years this period of effective soil moisture may be limited and grazing may be detrimental until the plant becomes senescent.

    - Grazing during flower initiation through seed development is most damaging.
      During this time, the plant's demand for soluble CHO's is considerable as the plant is near peak biomass (i.e., has a lot of biomass to support) and is using CHO's for seed development. Defoliation can also be detrimental during this time because the conditions for active photosynthesis are less favorable (i.e., less soil moisture, higher temperatures) and there is less time in the growing season to recover from defoliation

Terms to be use:

- **Grazing Systems =** planned effort by rangeland managers to leave some grazing areas unused for at least part of the year.

- **Grazing period** = The season and number of days during which a pasture is grazed.

- **Deferment** = A delay of grazing (or a period of non-grazing) in a pasture until the key forage species set seed and seeds mature.

- **Rest** = A period of non-grazing for a full year (or a full grazing season).

- **Prescribed Grazing** = the controlled harvest of vegetation with grazing animals, managed with the intent to achieve a specific objective.

- **Stock Density** = the number of animals that graze a specific unit of land at a specific time. Usually described as AU/acre or acres/AU.

Initiate on-line module (www.plantsciences.ucdavis.edu/gmcourse/module_resources/module4/pres3/index.htm). Advance slides through the presentation and follow along with these notes:

- **Objectives for grazing systems?** ~~Slide 4 in on-line module
    - Improve plant and animal productivity
        - Improve -

        - Reduce -

        - Ensure -

- Production & Conservation Objectives ~~slide 5

How can grazing systems affect the following? ~~Karen's notes (not in on-line module)

- **Livestock production?** (i.e., animal weight gain)
  - *Can increase forage production or quality over time*
  - *Can improve forage quality by grazing regrowth*
  - *Make better use of greater area of forage resources*
  - *Increase opportunities to observe livestock and reduce health problems, distribution problems, or other sources of lost animal gains*
- **Livestock distribution?**
  - *Create smaller pasture to increase uniformity of use by grazing animals*
  - *Increase stock density (i.e., greater number of animals per acer at any specific time)*
- **Plant community composition?**
  - *Affect evenness of grazing intensity among plants*
  - *Even out competition between plants*
  - *Provide a specific season of rest or deferment to benefit a specific group of plants*
- **Wildlife populations?**
  - *Leave biomass for cover or forage and remove excessive biomass when necessary*
  - *Change composition of plant community (i.e., favor shrubs over grasses)*
  - *Improve forage quality by removing dead material and promoting regrowth*
  - *Grazing systems determine where livestock are on the landscape so they can also provide for areas where livestock are absent*

- **Grazing systems cannot:** ~~Karen's notes
  - Rectify mismanagement:
    - Wrong species or class of animal
    - Incorrect stocking rate
    - Major distribution problems because of water availabiliy or topography
  - Achieve range improvement landscapes that are dominated by long-lived woody plants.
- **Major Grazing Systems** ~~Slide 6
  - Continuous grazing
  - Rotational grazing
  - Deferred grazing
  - Deferred rotation grazing
  - Rest rotation grazing

- **Major Types of Grazing Systems:**
  - **Continuous** ~~Slide 7
    - Grazing a specific unit of land throughout a year (i.e., year-long continuous) or for that part of the year (i.e., season-long continuous) during which grazing is feasible. (Often repeated year-after-year.)
    - **Suited for**: ~~Slide 7
      - Plants communities with frequent rains throughout the growing season (i.e., Great Plains including shortgrass prairie & northern mixed prairie) and annual grasslands (i.e. California annual grasslands) are adapted to year-long or season-long grazing.
      - Dry flat land without major topographic limitations.
      - Pastures with adequate water distribution.
      - Communities where most plants have grazing value.

~~Slide 8

- Many speculate that continuous grazing led to over-use of preferred grasses because livestock could defoliate a plant several times during the season. However, research does not support this speculation:
  - Light stocking during growing season –
  - Light stocking animals allowed –
  - At proper stocking rates -
  - Allows access to all of pasture at once so many species -
  - Livestock are not moved from one pasture to another -

~~Karen's Notes

- Effect on **range condition**:
  - Can reduce desirable plants because of repeated selection by herbivores.
  - Affect depends on stocking rate and species of grazing animal.
  - Livestock have preferred grazing areas (i.e., riparian, preferred forage plants) these areas may be overgrazed because livestock are not restricted from using them.
- Effect on **animal performance**:
  - Usually improves animal gains because animals have maximum opportunities to select high quality forage and use plants when they are most palatable.
  - Low stress system because animals are not moved from pasture to pasture.
- **Management inputs** required:
  - Fencing around the pasture, but no cross-fencing.
  - Careful placement/development of water points to improve livestock distribution.
  - Careful attention to stocking rate.

Rotational Grazing = A grazing scheme where animals are moved through one or more grazing units, often on a schedule. Requites pasture subdivision to accomplish rotation

~~View Slides 10, 11, & 12

- **Deferred Rotation** ~ Slide 13 & 14
  - A delay in the start of grazing on an area or pasture for an adequate period of time to provide for establishment of new plants, restoration of vigor of existing plants or to provide for plant reproduction.
  - A deferment is provided to each range unit (or pasture) on a rotating basis. Requires at least 2 pastures and just 1 herd or flock.
  - Deferred-rotation grazing provides a better opportunity for preferred plants and areas to maintain and gain vigor than does continuous grazing.
  - **Suited for**: ~ Slide 15
    - Bunchgrass ranges (i.e., Palouse), mountain coniferous forests, mixed grass and tall grass prairie.
    - Not shown to improve plant vigor in flat sagebrush grasslands and shortgrass prairies
    - Riparian areas & stringer meadows

See example in ~~Slides 16 & 17

~~ Karen's notes

  - Effect on **range condition**:
    - Creates a period of non-grazing when plants are most sensitive to grazing. This can improve plant vigor.
    - Allows a period for seed-set.
    - Maintains balance between species (i.e., species are potentially used more evenly during the grazing season).
  - Effect on **animal performance**:
    - Often reduces animal gains because it limits animal selection. Plus, deferred pastures will have older, more mature forage, that will be less nutritious.
    - Over time improved range condition could lead to better forage supply and improved livestock gains.
    - Deferred systems are often implemented with increased stocking rates that can reduce livestock weight gains.
  - **Management inputs** required:
    - Increased labor to move livestock between pastures.
    - Increased fencing.

Rest Rotation Grazing (also known as**,** the **Hormay System)** ~~Slides 18, 19 & 20

- On western rangelands rest usually means leaving a pasture or grazing unit ungrazed for the entire season or year.
- However, internationally and in intensive rotational grazing systems rest is a non-grazing period of any length in between two grazing periods.
- Like deferment, rest provides adequate time for regrowth and restoration of vigor, establishment of new plants, or to provide for plant reproduction.
- A **Rest Period** is a period of no grazing included as part of a grazing system.
- **Rest-rotation** is a grazing management scheme in which rest periods for individual pastures, paddocks, or grazing units, are incorporated into a grazing rotation.
  - Has been applied using 3,4, 5 and more pastures.
  - In a 3 pasture scheme each year one pasture would be grazed all season, one would be deferred until flowering and one would be rested all season.

- ~~Karen's comment – In other words, this system allows for a full-year of rest from grazing for pastures on a rotating basis. This system requires at least 3 pastures and 1 herd. The rotation sequence for each pasture is usually defer (fall graze), then rest (no graze), then spring graze.
  - In a typical rotation:
    - A pasture is not grazed in spring so plants can set seed , then
    - Grazed in fall to plant seeds through hoof action, then
    - The pasture is rested so the seedling could establish before they are grazed the following spring.
- **Suited for**: ~~Slide 21
  - Mountain ranges where livestock distribution problems occur.
- Effect on **range condition**:
  - Improves plant vigor because plants have time to set seed and recover from grazing.
  - Has also failed to produce improvements in productivity, plant vigor and species composition in some instances.
  - Many failures attributed to heavy stocking rates.
  - Benefits of a full year of rest may be nullified if other pastures are overgrazed, especially in arid regions where drought can impede recovery.

~~View slide 22 & 23

- Effect on **animal performance**: ~~Karen's notes
  - Lower animal gains because animals are not consuming most nutritious forage. Livestock always graze a pasture after rest or deferment when there is dead material built up in the plant.
- **Management inputs** required:~~Karen's notes
  - Fencing for at least 3 pastures.
  - Labor for moving livestock during the rotation.
  - Water necessary for each pasture.

Short Duration or Intensive Gazing Management (1-herd: Multi-pasture) ~Slides 24, 25,& 26

- Involves greater control over the amount of time a given plant is exposed to a grazing animal.

- This system concentrates animals in a small area for a short period of time, followed by a period of rest (i.e., alternating rest and graze periods throughout the year).

- Allows for an increase in stock density

- Proponents Suggest Benefits ~~ Slide 27 notes
  - Improved -
  - Increased -
  - Increased photosynthesis -
  - Improved animal distribution and -
  - Reduced percentage of -
  - Lower labor costs -
  - Better individual -
  - Improved rangeland -
  - Higher stocking rate used -

▹ Benefits not supported ~~ Slide 28

- Concentration of animals in smaller pastures can -
- Productivity improvement have also -
- However, proper application of Short duration grazing can -

~~Karen's Notes

▹ Designed to force animals to eat less palatable plants. The intent is to reduce competition to the more palatable plants from unpalatable plants that are not eaten and prevents the development of tall, course, ungrazed "wolf" plants.

▹ Works best for grassland vegetation types where most plants have good forage value and recover quickly from grazing (i.e., are grazing tolerant).

▹ Benefit - can be used as a tool for vegetation manipulation (i.e., oak in Colorado/Utah; fire lanes in California).

▹ Problem - Individual animal performance is adversely affected because animals are forced to eat course, old, unpalatable vegetation.

~~ Karen's Notes

▹ Effect on **animal performance**:

- System was designed to maintain or improve animal performance by consistently allowing animals to graze new growth or re-growth plant material. However, research has shown that animal performance is usually lower than other systems because animals are not given an opportunity to select preferred forages and need to use a large proportion of all plants available to encourage regrowth which will be available in subsequent grazing periods.

▹ Effect on **range condition**:

- Generally, maintains condition. This system requires that stocking rates be high enough to even out utilization among plants. Therefore, it is designed to reduce animal impact on some plants more than others. Also, because high stock densities are achieved, livestock distribution is usually improved.

▹ **Management inputs** required:

- Fencing for several pastures (usually 8 or more)
- Labor for moving livestock during the rotation.
- Water necessary for each pasture; often provided in the center of all paddocks.

Continuous compared to Rotation Systems ~~ Slide 29

A recent review (one of your reading assignments) of studies that compared rotational and continuous grazing systems on rangeland [Briske et al. 2008. Rangeland Ecology and Management 61:3-17]

Continues (CG) and rotational grazing (RG) systems:

▹ **Plant production** was = or > with continuous grazing in 87 % (20 of 23) of the experiments

▹ **Animal production** per head was = or > with CG 92 %(35 of 38) of studies.

▹ **Animal production** per acre was = or > with CG in 84 % (27 of 32) studies.

~~ View and consider slides 31, 31, and 33 that compare rotation to continuous (take notes)

Seasonal Suitability ~~ Slide 34

- This system creates movement of livestock to different areas of range depending on the growth patterns of different vegetation types. Flexible rotation schedule that fits the needs of the ranch operation.

~~Karen's notes

- This system is widely used in mountain states because ranchers cant take advantage of plants the mature at different times because of increasing elevation.
- For example, the patterns of rangeland sheep production exemplifies this system. In most range-sheep operations, sheep winter on the cold desert, have their lambs on the benchlands, move progressively up the mountain as the season progresses, lambs are sold and trucked off the mountain in September, then sheep are trailed back to winter range.
- **Suited for**:
  - Rugged terrain with a strong elevation or latitude gradient.
  - Land including vegetation types that green-up and mature at different times of the season.
- Effect on **animal performance**:
  - Generally, high animal performance because animals have access to young green forage for an extended time. In this system animals "follow the green" up the mountain and "lead the snow" down the mountain.
  - Animal performance is also high because the winter range of most seasonal suitability systems are shrub-dominated giving the advantage of the higher relative winter nutritive value of shrubs, compared to grasses and forbs.
- Effect on **range condition**:
  - Usually, maintains or improves range condition because, if done right, plants experience defoliation well before flowering and seed production at a time when they are not highly susceptible to damage.
- **Management inputs** required:
  - Fencing or herding is required to control livestock movements.

Targeted Grazing ~~ Slide 35

Targeted grazing is the application of a specific kind of livestock at a determined season, duration, frequency and intensity to accomplish defined vegetation or landscape goals.

~~Karen's notes – we will discuss targeted grazing in the next section of class as we discuss ways to accomplish landscape goals with grazing, fire, plant manipulation, etc.

Management is Key ~~ Slide 36

- No grazing systems will -
- They must be adapted to -
- Does not eliminate the need to follow basic grazing management principles of:

  1)

  2)

  3)

  4)

- Grazing systems are management intensive. The manager is -
- Increased attention of range and livestock management may be the -
- Still need to use -
- Rangeland monitoring can document success sand failures so that managers can -
- Grazing systems should be evaluated over -

~~ Karen's notes

- The exact ways that rest, deferment, grazing, and rotation are combined can create new and appropriate systems. There are thousands of variations on these themes.
- No matter the system – stocking rate and species of grazing animal are very important in determining how the systems affect vegetation communities.
- All systems need to be flexible to manage unexpected disturbances such as fire or weed invasions.

View Slides 37 38 (take notes)