Utilization Lecture

24 October
Read: Utilization Studies and Residual Measurements

Utilization

- Utilization is the proportion or degree of current year’s forage production that is consumed or destroyed by animals (including insects).
- Utilization may refer either to a single plant species, a group of species, or the vegetation as a whole.
- Utilization is synonymous with use.
- This process requires a comparison of the amount of herbage left compared with the amount of herbage produced during the year.

Animal based methods

![Graph showing cumulative resource use by three cows during 20 min. The continuous location data is shown projected onto a grid of 72m x 72m. Location data was collected every 8 s, each animal sampled approximately every 24 s. While paths between observed locations show no resource use, it is clear that some parts of the field are being used in preference to others.]

Residue Measuring Methods

- Stubble Height Method
- Visual Obstruction Method - Robel Pole
- Comparative Yield Method
- Clipping plots

Residual Measurements

- Residual measurement is the determination of herbage material or stubble height left after a grazing or use period.
  - Independent of the amount of annual production.
  - Management actions based on specified amount of foliage left regardless of the amount of annual production.
  - Impacts on plant health
  - Protects soil and watershed.
- Must determine the species and the appropriate residual stubble height or amount.
- Need correlation with land use.
- Includes: Robel pole, stubble height, comparative yield, and clipped plots
**Comparative Yield Method**

- The total production in a sample quadrat is compared to one of five reference quadrats; relative ranks are recorded rather than estimating the weight directly.
- **This method works best for herbaceous vegetation** but can also be used successfully with small shrubs and half-shrubs.
- **The advantage of the comparative yield method** is that a large number of samples can be obtained quickly. Total production is evaluated, so clipping calibration on a species basis is not needed. The process of developing reference quadrats for ranking purposes reduces both sampling and training time. Identification of individual species is not required.
- Often paired with DWR

---

**Removal Versus Residual**

- There are two problems with determining utilization or the amount of annual herbage removed:
  - measuring the amount of total production for the year
  - determining the amount of herbage that has been removed

---

**Utilization methods**

- Paired plot
- Ocular
- Key species
- Height-weight
- Actual weight
- Grazed class
- Landscape appearance

---

**Herbaceous Removal Methods**

- **Paired Plot Method**: Under the Paired Plot Method, forage from protected and unprotected plots is clipped and weighed at the end of the use period.
  - This method is suitable for all vegetation growth forms for which production and utilization data are commonly desired.
  - It is particularly applicable where periods of use are short, use is relatively uniform, and regrowth after foraging is not significant.

---

**Ocular Estimate of Removal**

- Utilization is determined along a transect by ocular estimate. The percentage by weight of forage removed is determined for individual plants or from all plants within small quadrats.
- Wide applicability and is suited for use with both grasses and forbs.
Ocular Estimate of Removal

- Advantages:
  - Fast.
  - Reasonably accurate, depending upon the ability of the examiners.
  - Vegetation is not disturbed.
  - Reliability of estimates is increased by limiting observations to individual plants or small areas (quadrats).
  - Errors in personal judgment on individual plants or quadrats frequently tend to be compensating.

- Disadvantages:
  - Exclosures, cages, or fenced areas may be needed for training.
  - Based on personal judgment

Key Species Method

(formerly the Modified Key Forage Plant Method)

- A combination of the Landscape Appearance Method (Section V.D) and the Ocular Estimate Method (Section V.C.2).
- Based on an ocular estimate of the amount of forage removed by weight on individual key species and observations are recorded in one of seven utilization classes.
- Adapted to areas where perennial grasses, forbs, and/or browse plants are the key species.

Key Species Method

- Advantages:
  - Fast
  - Estimate of forage removed is recorded in one of seven broad classes
  - More consistent than pure ocular
    - different examiners are more likely to estimate utilization in the same classes
    - observations are made by species.
  - Vegetation is not disturbed.
  - Reliability of estimates is increased by limiting observations to individual plants or small areas (quadrats).

- Disadvantages:
  - Exclosures, cages, or fenced areas may be needed for training
  - Personal judgment

Height-Weight Method

- Measure heights of ungrazed and grazed grass or grasslike plants to determine average utilization.
- Converted to percent of weight utilized by means of a utilization gauge (Lommasson and Jensen 1943).

- This method is adapted for obtaining utilization data where the key species are either bunch or rhizomatous/sod-forming grasses or grass-like species.

Utilization Gauge
**Height-Weight Method**

- **Advantages:**
  - Uniform, accurate, and reliable utilization determinations for perennial grasses and grass-like species.
  - Objective method; however, some estimation is required.
- **Disadvantages:**
  - Requires numerous ungrazed plants, which may be hard to locate.
  - Accurate utilization scales may not be available for the key species.
  - Development of the height-weight relationship curves and preparation of utilization gauges scales can be time-consuming.
  - Cannot be used for determining utilization of forbs and shrubs.

**Actual weight method**

- **The Actual Weight Method involves separately clipping and weighing current year’s growth from grazed and ungrazed plants along a transect. Only available forage plants are clipped along the transect.**

- **Advantages and Limitations.** The method is simple, accurate, and reduces personal error caused by estimation of utilization levels found in other methods. The actual weight method is restricted primarily to bunch and sod-forming grasses. This method is best adapted to short duration grazing on small pastures, which reduces the effects of regrowth.

**Grazed Class Method**

- **Uses photo guides of key species to make utilization estimates. These estimates reflect herbage removed but also show herbage remaining.**
- **Adapted for use on perennial grass, perennial grass forb, and grass-shrub rangelands where the key species are either bunch or rhizomatous/sod-forming grass or grasslike species.**
- **Designed for use after the plants have achieved full seasonal growth.**

**Grazed Class Method**

- **Advantages:**
  - Fast
  - Easy to learn and use.
  - Consistent and accurate estimates of utilization.
  - Mathematics involved are simple.
  - Reduce errors caused by variability in height growth.
  - Each grazed-class shows both the degree of use and the amount of herbage remaining.
  - Facilitates estimation of irregular grazing of plants.
  - Largely free from personal bias yet allows for experienced judgment on grazing use of irregularly grazed plants.

**Grazed Class Method**

- **Disadvantages:**
  - In poor growth years when plants do not mature, the guides will not distinguish between use and no-growth.
  - Difficult to develop photo guides based on average plants on a typical site that have a good photo-height-weight representation.
  - A minimum of 1 to 2 hours experience by examiners regardless of prior experience to produce uniform accuracy.
  - Errors can be encountered because of variations in plant growth between sites and ecoregions. Photographic guides must be checked.
  - Several guides may need to be developed for each key species to match wide year-to-year or site-to-site variations in growth form.
Qualitative Assessments
Landscape Appearance Method

- This technique uses an ocular estimate of forage utilization based on the general appearance of the rangeland.
- Utilization levels are determined by comparing observations with written descriptions of each utilization class.
- This method is adapted to areas where perennial grasses, forbs, and/or browse plants are present and to situations where utilization data must be obtained over large areas using only a few examiners.

Landscape Appearance Method

- Advantages:
  - Fast
  - Does not require unused areas for training purposes.
  - Estimates are based on a range (class) of utilization rather than a precise amount.
  - Different examiners are more likely to estimate utilization in the same classes than to estimate the same utilization percentages.
- Disadvantages:
  - Can still result in varying estimates because of different examiners.
  - No way to assess the precision of the estimate because the estimates are qualitative. It is an opinion.