

Determination of Carrying Capacity and Grazing Capacity

Animals Unit (AU/au): It is referred to as a mature buffalo or its equivalent or a mature cow of 1000 Ibs with its calf on the ground up to six months

$$\text{Number of animals} = \frac{\text{pasture size} \times \text{pasture yield per acre}}{(\text{Daily intake} \times \text{average animal weight} \times \text{days of grazing})}$$

Grazing Capacity:

The maximum animal number that can graze each year on a given area of rangeland for a specific number of days of the year without inducing a downward trend of forage biomass production, forage and soil quality.

Carrying capacity:

The maximum number of individual animals that can survive the greatest period of stress each year on a given land area depending upon the range capability to produce different products and within inducing downward trend of the range condition. Thus, the carrying capacity is the number of individuals an environment can support without significant negative impacts to the given organism and its environment.

Grazing capacity	Carrying capacity
Maximum number of animals that produces greatest return from a given area of land	Maximum number of individuals that can survive
Without damaging the physical resources	Physical condition with in limitation
GC= $\frac{\text{Total forage production}}{\text{Forage requirement/animal/day} \times 365 \times \text{area of the grazing land}}$	CC= $\frac{\text{Total forage production in the rangeland}}{\text{forage acre requirement/animal AU}}$
Grazing capacity have less animals than Capacity.	Carrying capacity includes more than maximum numbers of animals that can survive in the given area.
Term used for rangeland management and livestock management	Wide coverage (Tourism, engineering, forestry)

Animal population can increase above the grazing capacity.	Below carrying capacity, populations typically increase, while above, they typically decrease.
Used simply for grazer	Use for willing animals such as area of suitable habitat, sufficient foraging area, appropriate cover and a large enough area to cater for social needs.

Limitation of Carrying Capacity Concept

- Possibilities of Underutilize (lower production year)
- Possibilities of over utilize of the forest resources (higher production year)
- Not suitable when animals to be grazed, its distribution, and the season to use are not obvious.
- It depends on different factors

Dependent factors:

- Biomass composition /Vegetation composition
- Palatable species/unpalatable species
- Environment factor (Temp, rainfall, wind,)
- Topographic factors (Slope, Aspect)

Range Condition Classification/ Concept and Definition

The condition of the rangeland depends on the seasonal factors. If rains have been frequent and temperature favourable, range are good. Range manager attempts to look beyond the immediate greenness of the herbage. It is the classification of the condition of the rangeland to the potential of a particular area that is capable of producing forage. Range-condition classification is based upon ecological concept of plant succession and climax. Range vegetation can be classified as climatic, edaphic, and biotic factors. The main factors responsible for depletion of range condition are:

- Early grazing
- Over grazing
- Selective grazing
- Invasion by the undesirable species of vegetation and
- Climatic variability

Classification System (Criteria for range condition classification).

The criteria for range condition depend on the purpose of classification (Soil Factors, Plant Composition and Forage value).

SN	Factors	Criteria Description
1	Soil factors	Depth of soil Soil Erosion- Soil Moisture Moisture retention capacity, Soil texture, Soil structure
2	Vegetation Composition	Vegetation Species. -Vigor- Density- Age- Litter formation Status of Regeneration and Reproducing capability
3	Forage Value	Nutritive of the forage, its palatability and Productivity

Methods of range condition classification

1. Quantitative Climax Approach

This approach is based on the percentage of climax vegetation or species composition. All range plants are grouped in three (Decreaser, Increaser, and Invaders). Commonly called Soil conservation service method. Range condition have been recognized in to (Dyksterihus, 1949);

Range Condition	Percent of Climax
Poor	0-25%
Fair	25-50%
Good	50-75%
Excellent	75-100%

2. USDA Forest Service Method

Due to the limitation of the Species composition classification which describe above, this method is used. This is based on various factors which determine range condition, these factors have been given rating and marks have been allotted for each.

a) Soil Condition

Class	Characteristic	Point 20%
Class 1	No soil loss, well dispersed accumulation of litter and older litter	Rating 20
Class 2	Soil movement slight, noticed of rill erosion, no accumulation of past litter	Rating 17
Class 3	Soil loss more noticeable, top soil loss, rill marks and poorly dispersed litter	Rating 7
Class 4	Advance stage of erosion, active gullies, exposed plant roots	Rating 0

b) Density of ground cover

Density	Rating 10%
0.50 plus	10
0.45	9
0.40	8
0.35	7
0.30	6
0.25	5
0.20	4
0.15	3
0.10	2
Less than 0.10	1

c) Vegetation Composition and Age

Class	Characteristics	Rating
1	The perennial herbaceous forage of better quality is abundant.	10
2	The perennial herbaceous forage of better quality is moderately,	7
3	The perennial herbaceous forage of better quality is scarce	5
4	The perennial herbaceous forage of better quality are relics.	1

d) Plant Vigour

Class	Characteristics	Rating
1	Palatable plants vigorous, grasses robust with numerous leaves, leaves dark green.	10
2	Palatable plants lacking in vigour. Forage species are shorter, fewer seed stalks,	7
3	Palatable plants lacking in vigour, grasses weak forage plants are nor reproducing	5
4	Palatable plants sickly and weak. Grasses may be pale yellowish in colour, seed stalks few and short, no seedling	1

You need to add above A, B, C and D number according the condition and compare your data with the table below to find range condition.

Range condition	Point
Good	Over 40 pts.
Fair	30-40
Poor	15-29
Very poor	Less than 15

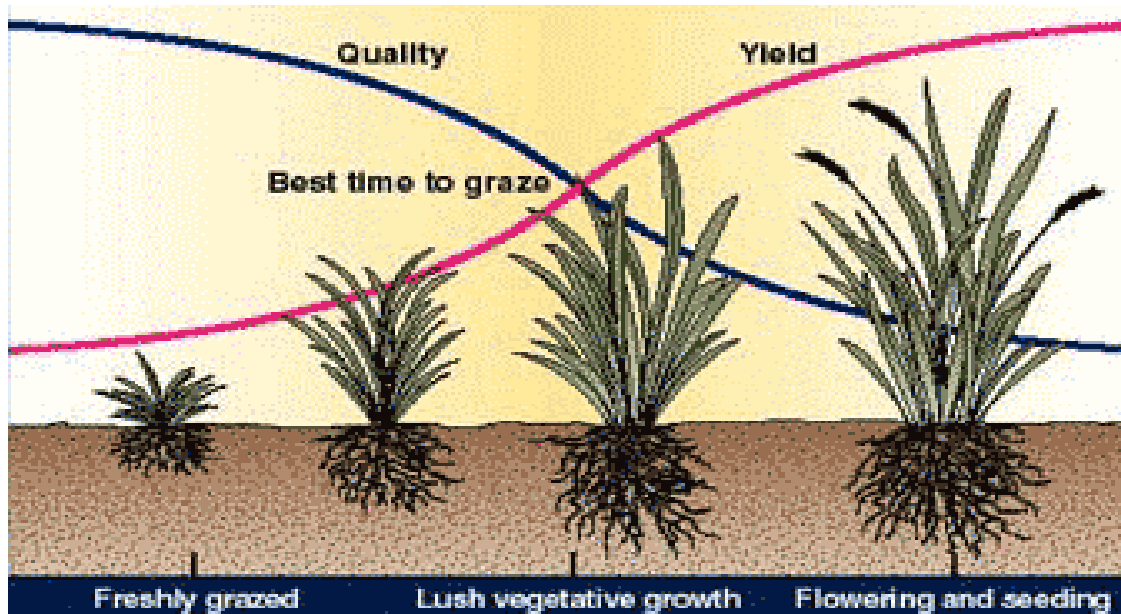
3. Site Potential approach

SN	Range condition	Vegetation type	Percent composition
1	Excellent	Palatable grass, herbs, forbs, Browse	75-100
2	Good	Above species in less amounts	50-75
3	Fair	Above species in lesser amounts	25-50
4	Poor	Above species in very Less Amounts	0-25

Condition Trend Analysis

The nutritive value of the forage change with its growth and maturity. Such as the protein content is higher during earlier stage and biomass increase with the age. Higher nutritive value as well as palatability is realized at the mid of maturity period when the biomass is also at its optimum and advise to fed to animal for maximum benefit. With maturity, the protein as well as the phosphorus content of vegetation decrease and consequently, the carbohydrate content increases. Mature grasses have more fibre content and less palatable. At the same time, the vitamin content is reduced with the age

of the plant. Judging range trend is even more hazardous than judging range conditions, because there are few objective means for assessing trend. We analyze the soil factors and Plant factors for this.



Soil factors

- Presence of litter
- Evidence of soil trampling
- Presence condition of gullies

Plant factors

- Plant vigor
- Seeding establishment
- Degree of percent utilization
- Evidence of past utilization