**Doing the Math: Calculating a Sustainable Stocking Rate**

*Adapted from Amanda Hancock, Range & Natural Resource Specialist, CGREC*

**Introduction**

**AUM or Animal Unit Month =**The amount of feed required to sustain a 1,000 lb cow and her calf (up to 6 months of age) for one month. (Roughly 800 lbs of oven dry forage). An average 1,000-lb cow will eat approximately 26.1 lbs of oven dried forage per day or 80% of her body weight per month.

**Carrying capacity =**The maximum number of individuals of a given species that a site can support over a certain period of time without causing deterioration of the site. (How many animals the forage base is capable of supporting- subject to change due to growing conditions)

**Stocking rate =**The number of animals per unit area over a given period. (How long your animals are out on your pasture)

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| **Table 1. Common animal unit equivalents (AUEs; Pratt and Rasmussen 2001).** | |
| **Type of Animal** | **Animal Unit Equivalent** |
| Cow calf pair (1,000 lb cow)  Each additional 100 lbs of cow  Bull  Steer  Heifer  Sheep  Deer  Elk  Bison bull  Bighorn sheep | 1.00  0.10  1.40  0.85  0.80  0.20  0.20  0.70  1.50  0.15 |

**CARRYING CAPACITY**

Forage produced annually depends on a number of factors, including precipitation, soils, grazing history, plant community composition, management practices, etc. Determine forage production by clipping a small area of known size. Weigh that forage and then multiply it by the total acreage ultimately determining pounds per acre. If we assume that we have 640 acres in the Central region and assume the land produces 1,700 pounds of forage per acre annually. This means that the land can produce a total of 1,088,000 lbs of forage annually.

***640 acres x 1,700 lbs/acre = 1,088,000 lbs***

Theoretically, a herd of cows could eat all 1,088,000 lbs of this, but in reality, we know this isn’t true. First off, we know that current recommendations are: take half of the forage, leave half.

***1,088,000 lbs x 0.5 proper grazing factor = 544,000 lbs***

Out of these 544,000 pounds, cattle will only fully utilize about half of that. The other half cattle will trampled, bed down in, and urinate and defecate on.

***544,000 lbs x 0.5 proper utilization factor = 272,000 lbs***

Carrying capacity is typically expressed in AUMs or how many 1,000-lb cows

with a calf could graze for one month (30 days):

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**STOCKING RATE**

There are different ways of expressing stocking rate for a given herd of livestock but the most commonly used is:

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To determine our AUMs, we multiply our AU by how many months the animals will be out on pasture. Let’s assume we’ll keep the herd out on this pasture from May 15 to August 15, three months. If we have 130 AUs:

***130 AUs x 3 months = 390 AUMs***

Note at this point, we have already exceeded our carrying capacity for our 640 acre pasture that produces 1,700 lbs per acre. To calculate stocking rate, we need our acres:

***390 AUMs / 640 acres = 0.6 AUMs per acre***

**SUSTAINABLE STOCKING RATE**

In the current scenario, we are overstocking our 640 acres. We can reduce our stocking rate a couple of ways; we could increase the number of acres the herd is grazing, we could decrease the number of animals in the herd, or we could reduce the amount of time the herd is out on pasture. Is there a way to find out how long we should keep the herd out on pasture without causing adverse effects? The following is an equation for calculating a sustainable stocking rate, based on the current herd:

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640 acres and assuming that acreage produces 1,700 lbs per acre = 1,088,000 lbs of forage produced per year in a normal year (640 x 1,700 = 1,088,000). Discount for take half, leave half. Discount for 50% utilization. 1,088,000 lbs x 0.5 = 544,000 lbs of forage available for our herd of 100 cows. We also need to take the proper utilization factor of 0.5 as well. So, 544,000 lbs x 0.5 = 272,000 lbs.

Our 130 cattle each eat 26.1 lbs of forage per day or 783 lbs per month for a total of 101,790 lbs of feed per month, so if we have 272,000 lbs of forage available ÷ 101,790 lbs the herd eats in a month = 2.67 months. Our section (640 acres) can support our herd of 130 cows for about 2.65 months or about 80 days.

***272,000 lbs / 101,790 lbs per month = 2.67 months***

Following is a sample worksheet designed to help you determine your stocking rate. This worksheet is designed to give you an approximation of stocking rate, not a “hard, fast” answer. The available forage can and does change rapidly with climatic conditions, such as drought. I would highly recommend seeking professional assistance, particularly with clipping forage samples as different sizes of frames have different conversion factors. Your local soil conservation district office and county extension office are excellent resources.

***Sample worksheet***

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| I have **130** cows and they weigh an average of **1,000** lbs |
| One of my cows eats 26.1 lbs per day  **26.1** lbs x **30** = **783** lbs per month |
| My **130** cows x eat **783** lbs each per month, so my herd eats **101,790** lbs per month |
| I have **640** acres of land |
| My land produces **1,700** lbs of forage per acre |
| My land will likely produce **1,088,000** lbs of forage per year  **640** acres x **1,700** lbs per acre = **1,088,000** lbs of total forage per year |
| Proper grazing factor = Take half, leave half = **0.5** |
| **1,088,000** lbs of total forage per year x **0.5** = **544,000** lbs of available forage per year |
| Proper utilization factor = **0.5** |
| **544,000** lbs x **0.5** = **272,000** lbs of utilizable forage per year |
| **544,000** lbs of utilizable forage per year ÷ (26.1 lbs per day x 30 days) =  **347.4** AUMs of ***carrying capacity*** |
| If I leave my herd out to pasture for **3** months |
| My required AUMs for my herd are: **130** AU x **3** months = **390** ***AUMs*** |
| My ***stocking rate*** is **390** AUMs ÷ **640** acres = **0.6** AUMs per acre |
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| My land can support my **130** cows for **2.67** months (utilizable lbs forage ÷  lbs of feed consumed per month) **272,000** ÷ **102,720**= **2.65** months  ***Sustainable Stocking Rate*** |

***Worksheet***

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| I have \_\_\_\_\_\_\_\_cows and they weigh an average of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ lbs |
| My adjusted animal unit (AU) is \_\_\_\_\_\_\_\_\_\_\_ cows x \_\_\_\_\_\_\_\_\_\_ AUE = \_\_\_\_\_\_\_\_\_\_ ***AU*** |
| One of my cows eats 80% of her \_\_\_\_\_\_\_\_lbs per month   \_\_\_\_\_\_\_\_\_ lbs x **0.8** = \_\_\_\_\_\_\_\_\_\_lbs per month |
| My \_\_\_\_\_\_\_\_ cows eat \_\_\_\_\_\_\_\_ lbs each per month, so my herd eats \_\_\_\_\_\_\_\_\_\_ per month |
| I have\_\_\_\_\_\_\_\_\_\_\_\_\_\_ acres of land |
| My land produces\_\_\_\_\_\_\_\_\_\_\_\_ lbs of forage per acre (see Table 1) |
| My land will likely produce \_\_\_\_\_\_\_\_\_\_ lbs of forage per year  \_\_\_\_\_\_\_\_\_\_ acres x \_\_\_\_\_\_\_\_\_ lbs per acre = \_\_\_\_\_\_\_\_\_\_ lbs of total forage per  year |
| Proper grazing factor = Take half, leave half = **0.5** |
| lbs of total forage per year x **0.5** = lbs of available forage per year |
| Proper utilization factor = **0.5** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_ lbs x **0.5** = \_\_\_\_\_\_\_\_\_\_ lbs of utilizable forage per year |
| \_\_\_\_\_\_\_\_\_\_\_\_\_ lbs of utilizable forage per year ÷ (26.1 lbs per day x 30 days) =  \_\_\_\_\_\_\_\_\_\_\_\_\_ AUMs of ***carrying capacity*** |
| If I leave my herd out to pasture for \_\_\_\_\_\_\_\_\_months |
| My adjusted AU: \_\_\_\_\_\_\_\_\_\_\_AU x \_\_\_\_\_\_\_\_\_\_ months = \_\_\_\_\_\_\_\_\_\_\_\_ ***AUMs*** |
| My ***stocking rate*** is \_\_\_\_\_\_\_\_\_\_ AUMs ÷ \_\_\_\_\_\_\_ acres = \_\_\_\_\_\_\_\_\_\_\_AUMs per acre |
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| My land can support my \_\_\_\_\_\_\_\_\_cows for \_\_\_\_\_\_ months (utilizable lbs forage ÷ lbs of feed consumed per month) \_\_\_\_\_\_\_\_\_\_÷\_\_\_\_\_\_\_\_\_\_=\_\_\_\_\_\_\_\_\_ months or \_\_\_\_\_\_\_\_ days  ***Sustainable Stocking Rate*** |