

UPDATING THE ANIMAL UNIT MONTH May 15, 2007

**John G. Carter, PhD
Western Watersheds Project**

The animal unit month (AUM) has historically been used as a unit of forage consumption and the basis of permits and grazing fees for grazing public lands. This report provides a brief review and update of forage consumption rates for grazing animals and clarifies the definition of an AUM.

It is important to ensure that forage consumption rates by livestock are based on the size of animals present on the allotment. This is to insure that stocking rates and grazing periods are more closely balanced with available forage and also provide forage and cover for wildlife and watershed protection. It is also to ensure that grazing fees accurately represent the forage consumed by livestock to ensure the public trust is not violated by undercharging for the actual weights and forage consumption of livestock being grazed.

FLPMA [Sec. 4100.0-5] defines an AUM as *“the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month.”* FLPMA [Sec. 4230.8-1(c)] states that *“For purposes of calculating the fee, an animal unit month is defined as a month’s use and occupancy of range by 1 cow, bull, steer, heifer, horse, burro, mule, 5 sheep, or 5 goats over that age of 6 months at the time of entering the public lands or other lands administered by the Bureau of Land Management, by any such weaned animals regardless of age; and by such animals that will become 12 months of age during the authorized period of use. No charge shall be made for animals under 6 months of age at the time of entering the public lands or other lands administered by the Bureau of Land Management; that are the natural progeny of animals upon which fees are paid, provided they will not become 12 months of age during the authorized period of use, nor for progeny born during that period.”*

This definition in FLPMA avoids dealing with the actual weight and forage consumption of the various animals listed and ignores forage consumption by calves and lambs entirely. Other requirements in FLPMA stress grazing within the carrying capacity of forage within the allotment, the variability of forage production and the need for sustainable use [Sec. 4130.3-1(a); 4100.0-5]. In order to achieve the requirements for sustainable use without impairment, it is critical to align available forage with livestock stocking rates. BLM, for example, has typically used 800 lbs/month of forage as the consumption rate for a cow/calf pair while designating a cow/calf pair as an AUM, in conflict with the definition under FLPMA¹. BLM also does not clarify if this is air dry or oven dry weight.

NRCS, in its National Range and Pasture Handbook, defines an Animal Unit (AU) as one mature cow of approximately 1,000 pounds and a calf as old as 6 months, or their equivalent, then states, *“An animal unit month (AUM) is the amount of forage required*

¹ U.S. Dept. of Interior. 2006. Draft Pocatello Resource Management Plan and Environmental Impact Statement.

by an animal unit for one month”.² NRCS further defines the actual forage consumption as 26 pounds of oven-dry weight or 30 pounds of air-dry weight per day as “the standard forage demand for a 1,000 pound cow (one animal unit)”. This is 2.6% of body weight for oven-dry weight and 3% of body weight for air-dry weight of forage. Note that there is no forage allowance for the calf in this consumption rate. The same would be true for lambs, when considering sheep grazing.

The Society for Range Management (SRM) in 1974 defined an Animal Unit “to be one mature (1000 lb.) cow or the equivalent based upon average daily forage consumption of 26 lbs. dry matter per day.”³ SRM also defined an Animal Unit Month as “The amount of feed or forage required by an animal-unit for one month.” In its second edition, SRM revised this definition to include an *Animal-unit (AU)* as the forage consumption on the basis of one standard mature 1,000-pound cow, either dry or with calf up to 6 months old as consuming 26 pounds of air-dry forage per day or 780 pounds per month.⁴

Comparing the definitions between NRCS and SRM it appears that SRM has confused air-dry and oven-dry forage amounts. The later SRM definition also clouds the distinction between cow and calf forage consumption, making it appear as if the forage consumed by the calf is included in the daily or monthly amount. A careful reading shows that no forage is included for the calf. A review of some history provides some further insight into animal units and forage consumption.

The University of Nevada Agricultural Experiment Station published a report on cattle production in 1943⁵. That report analyzed 14 years of ranch operation for eleven ranches in northeastern Nevada. At that time, a mature cow was considered one unit and a branded calf or weaner as ½ cow unit, for a combined total of 1.5 cow units per cow/calf pair. Bulls were considered 1.5 cow units. For the period 1938 – 1940, the average turnoff weight (when they left the range) of mature cows was 959 pounds, calves were 381 pounds and bulls were 1222 pounds. This means that in the 1930’s, a cow/calf pair was 1340 pounds. With breeding, supplements and hormones, weights have increased over time, for example, Anderson et al (ca 2000) calculated a 35% increase in dressed weights per animal between 1975 and 1995⁶.

The 1964 Forest Service R-4 Range Analysis Handbook⁷ provided a detailed summary of forage consumption for cattle and sheep as air-dry amounts. This is reproduced in Table 1.

² USDA Natural Resources Conservation Service. 2003. National Range and Pasture Handbook Revision 1, Chapter 6. Grazing Lands Technology Institute.

³ Society for Range Management. 1974. Glossary of terms used in range management.

⁴ Ortmann, John, L. Roy Roath, and E.T. Bartlett. 2000. Glossary of Range Management Terms No. 6. 105. Colorado State University Natural Resource Series.

⁵ Brennan, C.A. and Fred B. Harris. 1943. Fourteen Years Cattle Production and Ranch Earning Power in Northeastern Nevada 1928 to 1941. University of Nevada Agricultural Experiment Station, Reno, Nevada.

⁶ <http://agecon.uwyo.edu/RiskMgt/marketrisk/TheCattleCycle.pdf>

⁷ USDA Forest Service. 1964. Forest Service Handbook – R4 Range Analysis Handbook.

Table 1. Air Dry Forage Consumption 1964 R4 Range Analysis Handbook

Cattle	Animal Unit Factor	Daily Air Dry Weight Consumption
1,000 lb animal	1.00	24
Dry cow	1.00	24
Cow plus 300 lb calf	1.36	33
Cow plus 400 lb calf	1.46	35
Cow plus 500 lb calf	1.55	37
Yearling	0.74	18
Sheep	Animal Unit Factor	Daily Air Dry Weight Consumption
125 lb ewe	1.0	4.1
Ewe plus 30 to 40 lb lamb	1.3	5.3
Ewe plus 40 to 50 lb lamb	1.4	5.7
Ewe plus 50 to 60 lb lamb	1.5	6.2
Ewe plus 60 to 70 lb lamb	1.6	6.6
Ewe plus 70 to 80 lb lamb	1.65	6.8
Ewe plus 80 to 90 lb lamb	1.7	7.0
Ewe plus 90 to 100 lb lamb	1.8	7.4
Ewe plus 100 to 110 lb lamb	1.9	7.8

Table 2 is taken from the NRCS National Range and Pasture Handbook. It provides animal unit equivalents for different animals.

Table 2. NRCS Animal Unit Equivalents

Kind of Animal	Animal Unit Equivalent
Cow with calf	1.00
Mature bull	1.35
Mature Horse	1.25
Mature sheep	0.2
Lamb, 1 year old	0.15
Mature mule deer	0.2
Mature elk	0.6
Mature antelope	0.2
Mature bighorn sheep	0.2

USDA market statistics⁸ give the average weights of slaughter cattle for the week ending August 14, 2004 as 1251 pounds. The estimate for the same week in 2005 for slaughter cattle average weight was 1260 pounds. The USDA National Agricultural Statistics Service data for average live weight of cattle slaughtered in 2004 was 1242 pounds compared to 1187 pounds in 1995, or an increase of nearly 8.5% in those 10 years⁹. The Livestock Monitor is a newsletter produced by the North Dakota State University Extension Service Livestock Marketing Information Center in cooperation with USDA State Extension Services¹⁰. The Livestock Monitor shows for the week ending August 6, 2005, live weights of slaughter cattle averaged 1258 pounds.

⁸ http://www.ams.usda.gov/mnreports/SJ_LS712.txt

⁹ <http://www.usda.gov/nass/pubs/agr05/acro05.htm>

¹⁰ <http://www.ag.ndsu.nodak.edu/aginfo/lsmkt/monitor.htm>

The potential weights of mature cows can be even larger than these numbers. For example, NRCS in its National Range and Pasture Handbook, referenced above, defines body condition scores in a range of 1 to 9. A body condition score of 6 which is described as *“Good, smooth appearance throughout. Some fat deposits in brisket and over the tailhead. Ribs covered and back appears rounded.”* This body condition score relates to a pregnancy percentage of 88%, which is important as a goal for cow/calf operations as dry cows are usually culled and replaced because the weight gain of calves is important for income. Mature cow weight varies approximately 7 to 8 percent for each unit change in Body Condition Score (range 1 to 9), and extremes in muscling can cause weight to vary as much as 10 percent.¹¹ Frame size (height) scores show that cows at maturity can weigh much more than 1,000 pounds¹². Table 3 is reproduced from the North Dakota State University publication cited. These figures were for average condition cattle (body condition score of 5). Actual weights will vary due to differences in muscling, body length, condition and other factors. These figures were adapted from a 1991 publication, so represent weights from nearly two decades ago.

Table 3. Cattle Weight as Function of Frame Size for Average Condition Cattle

Frame Score	Frame Size	Mature Cow Weight lbs	Steer Slaughter Weight lbs	Heifer Slaughter Weight lbs
2	Small	955	850	700
3		1030	950	800
4	Medium	1100	1050	900
5		1175	1150	1000
6	Large	1250	1250	1100
7		1320	1350	1200
8		1395	1450	1300
9		1470	1550	1400

Holechek et al (2001) summarized the weaning weights of calves grazed on various types of rangelands at different stocking rates¹³. The data for the period since 1990 produced an average weaning weight of 430 pounds and a range of 382 – 475 pounds. Ray et al (2004) gave a weaning weight of 480 pounds for calves¹⁴. Using the current market statistics for slaughter cattle at about 1250 pounds and assuming a calf weight of 300 pounds to allow for weight gain during the grazing season, an estimate for the average weight of a cow/calf pair during the grazing season of 1,500 pounds appears reasonable.

As pointed out above, the NRCS used 26 lbs/day of oven dry weight for a 1,000 pound cow and stated this was equivalent to 30 pounds per day air-dry weight. The NRCS Range and Pasture Handbook value of 30 pounds air-dry weight would be 3% of body

¹¹ Hammack, Stephen P. and Ronald J. Gill. 1997. Frame Score and Weight of Cattle. Texas Agriculture Experiment Station, Texas A & M University System.

¹² John Dhuyvetter. 1995. Beef Cattle Frame Scores. North Dakota State University Agriculture and University Extension Publication AS-1091 (<http://showsteers.com/Frame%20Score%20Chart.htm>).

¹³ Holechek, Jerry L., Rex D. Pieper and Carlton H. Herbel. 2001. Range Management: Principles and Practices, Fourth Edition. Prentice-Hall, New Jersey. 587p

¹⁴ Ray, D.E., A.M. Lane, C.B. Roubicek, and R.W. Rice. 2004. Range beef herd growth statistics. In: Arizona Rancher's Management Guide. Arizona Cooperative Extension, College of Agriculture, University of Arizona.

weight for a 1,000 pound cow. Applying this to the estimate of a current weight of 1,500 pounds for a cow/calf pair, the daily forage consumption would be 45 lbs of air-dry forage per day, or for a month (30.4 days), 1368 pounds of forage per AUM. It appears BLM's 800 pound/month figure for a cow/calf pair is oven-dry weight (26 lb/day). If this is corrected to the 30 lb/day air-dry rate, the forage consumption for BLM's 1,000 pound cow would be 912 lb/month. **When this is compared to the 1,368 lb/month above, BLM is understating forage consumption by cow/calf pairs by a nominal 50% based on the average body condition and frame scores.** The implication of this on stocking rates is obvious. Based on forage consumption alone, not considering proper utilization, forage capacity and capability factors, BLM is over stocking allotments 33% based on failure to take into account current cattle weights and calves.

The forage needs for domestic sheep must also be determined. Based on current USDA published weights for ewes and lambs, adult domestic sheep weigh from 165 to 440 pounds,¹⁵ and lambs about 129 pounds.¹⁶ Data downloaded from USDA NASS¹⁷ for Idaho, Utah, Nevada and Wyoming for the period 2000 – 2006, show that the average lamb crop is 1.1 lambs per ewe, ranging up to 1.3. According to the American Sheep Industry Association, selective breeding is able to increase lamb birth rates by about 1 – 2% per year, leading to a possible 20% increase in the number of lambs per ewe over 10 years by increasing the number of ewes having twins. Twin survival rates are 1.63 lambs per set of twins¹⁸.

If the low end weight of a sheep at 165 pounds and a lamb at 100 pounds were used and considering that the average lamb crop is 1.1 lambs per ewe, the weight of sheep for a forage consumption calculation would be 275 pounds for the ewe and lambs. The forage consumption rate for sheep given in the 1964 R4 Range Analysis Handbook was 3.3% of body weight per day consumed as air dry forage weight¹⁹. Thus, the 275 pounds of sheep would consume 276 pounds of air-dry forage per month. As defined in FLPMA above, an AUM consists of 5 sheep, leading to a calculated forage consumption of the sheep permitted by BLM of 1380 pounds of air dry forage per month.

Federal and State Lands Agencies should begin recalculating their stocking rates, permitted numbers and grazing seasons based on this updated research. Alternatively, actual counts of animals when entering the allotment combined with body condition scoring and frame sizes could be used to calculate an allotment specific average animal weight and forage consumption for permit adjustments.

¹⁵ http://www.wildlifeprairiestatepark.org/animalpages/domestic_sheep.htm

¹⁶ http://www.usda.gov/nass/pubs/agr04/04_ch7.pdf

¹⁷ <http://www.nass.usda.gov/index.asp>

¹⁸ Bradford, G. E. 2007. Selection for Reproductive Efficiency. American Sheep Industry Association, Sheep and Goat Research Journal.

¹⁹ USDA Forest Service Intermountain Region. 1964. R-4 Range Analysis Handbook