



UPDATING THE ANIMAL UNIT MONTH

Revised March 17, 2008
John G. Carter, PhD

The animal unit month (AUM) has historically been used as a unit of forage consumption and the basis of permits, stocking rates and fees for grazing public lands. This report provides a review and update of current livestock weights and forage consumption rates, clarifies the definition of an AUM and proposes means whereby agencies can validate and adjust stocking and billing rates.

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

The formula used for calculating the grazing fee, established by Congress in the 1978 Public Rangelands Improvement Act, has continued under a presidential executive order issued in 1986. Under that order, the grazing fee cannot fall below \$1.35 per AUM, and any increase or decrease cannot exceed 25 percent of the previous year's level. In a recent press release, the Forest Service and BLM defined an AUM as the amount of forage needed to sustain one cow and her calf, one horse, or five sheep or goats for a month¹.

In the 1994 Rangeland Reform Draft Environmental Impact Statement, BLM and the Forest Service defined an animal unit month as: *"The amount of forage needed to sustain one cow, five sheep, or five goats for a month. A full AUM's fee is charged for each month by adult animals if the grazing animal (1) is weaned, (2) is 6 months old or older when entering public land, or (3) will become 12 months old during the period of use. For fee purposes, an AUM is the amount of forage used by five weaned or adult sheep or goats or one cow, bull, steer, heifer, horse, or mule. The term AUM is commonly used in three ways: (1) stocking rate as in X acres per AUM, (b) forage allocation as in X AUMs in allotment A, and (3) utilization as in X AUMs consumed from Unit B"*².

These definitions avoid dealing with the actual weight and forage consumption of the various animals listed and ignore forage consumption by calves and lambs. Clarification and updating of these values is needed so that livestock producers are charged for the actual forage consumed by all animals grazed and the carrying capacity of the land is not exceeded. Other requirements in FLPMA stress grazing

¹ http://www.blm.gov/ca/st/en/info/newsroom/2006/02/wonews_grazingfees_2006.html for press release announcing 2006 grazing fees. US Dept of Interior, BLM.

² U.S Department of Interior, Bureau of Land Management in Cooperation with the Department of Agriculture Forest Service. 2004. Rangeland Reform '94 Draft Environmental Impact Statement.

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 pair³. BLM also does not clarify if this is air dry or oven dry weight. The Forest Service defines an AUM as *“The quantity of forage required by one mature cow and her calf (or the equivalent, in sheep or horses) for one month”*^{4, 5}. They use a value of 26 pounds of forage per day for a cow calf pair⁶ but have been used other values such as 34 pounds per day for a “head month” or cow/calf pair⁷. These inconsistencies need resolution.

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 by an animal unit for one month”*.⁸ 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 yet the definition of an animal unit includes a calf. 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.”*⁹. SRM also defined an Animal Unit Month as *“The amount of feed or forage required by an animal-unit for one month.”* In the 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 800 pounds per month.*¹⁰

It appears from these definitions that there is confusion over the amount of forage consumed by livestock and whether that is expressed as air-dry or oven-dry forage amounts. The later SRM definition also clouds the distinction between cow and calf

³ U.S. Dept. of Interior. 2006. Draft Pocatello Resource Management Plan and Environmental Impact Statement.

⁴ U.S. Forest Service Wasatch Cache National Forest. 1995. Final Environmental Impact Statement Rangeland Health.

⁵ U.S. Forest Service Caribou-Targhee National Forest. 2003. Final Environmental Impact Statement for the Caribou National Forest Revised Forest Plan.

⁶ U.S. Forest Service Bighorn National Forest. 2004. Battle Park Cattle & Horse, Mistymoon Sheep & Goat Allotment Management Plan Revision EIS

⁷ U.S. Department of Agriculture Caribou-Targhee National Forest. 2002. Final Environmental Impact Statement for the Curlew National Grassland.

⁸ USDA Natural Resources Conservation Service. 2003. National Range and Pasture Handbook Revision 1, Chapter 6. Grazing Lands Technology Institute.

⁹ Society for Range Management. 1974. Glossary of terms used in range management.

¹⁰ Ortmann, John, L. Roy Roath, and E.T. Bartlett. 2000. Glossary of Range Management Terms No. 6. 105. Colorado State University Natural Resource Series.

forage consumption, making it appear as if the forage consumed by the calf is included in the daily or monthly amount for the 1,000 pound cow. 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 1943¹¹. That report analyzed 14 years of ranch operation for eleven ranches in northeastern Nevada. At that time, a mature cow was defined as 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 1995¹².

The 1964 Forest Service R-4 Range Analysis Handbook¹³ provided a detailed summary of forage consumption for cattle and sheep as air-dry amounts. This is reproduced in Table 1.

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

¹¹ 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.

¹² <http://agecon.uwyo.edu/RiskMgt/marketrisk/TheCattleCycle.pdf>

¹³ USDA Forest Service. 1964. Forest Service Handbook – R4 Range Analysis Handbook.

Table 2 is taken from the NRCS National Range and Pasture Handbook. It provides animal unit equivalents for different animals. Again, there appears to be inconsistency over the animal unit for cows and calves. Table 2 and their definition define an animal unit as a cow and calf, but their forage allocation does not include the calf.

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

To clarify this situation, USDA market statistics were researched.¹⁴ These 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 1072 pounds in 1984, or an increase of 15.8% in those 20 years¹⁵. The chart of that data is provided in Figure 1. 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 Services¹⁶. The *Livestock Monitor* shows for the week ending August 6, 2005, live weights of slaughter cattle averaged 1258 pounds.

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. This is because dry cows are usually culled and replaced in order to maximize production of calves by the herd and the weight gain of calves is important for income. Therefore, maximizing Body Condition Score is necessary to maximize calf production.

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

¹⁴ http://www.ams.usda.gov/mnreports/SJ_LS712.txt

¹⁵ <http://www.usda.gov/nass/pubs/agr05/acro05.htm>

¹⁶ <http://www.ag.ndsu.nodak.edu/aginfo/lsmkt/monitor.htm>

much as 10 percent.¹⁷ Frame size (height) scores show that cows at maturity can weigh much more than 1,000 pounds¹⁸. 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.

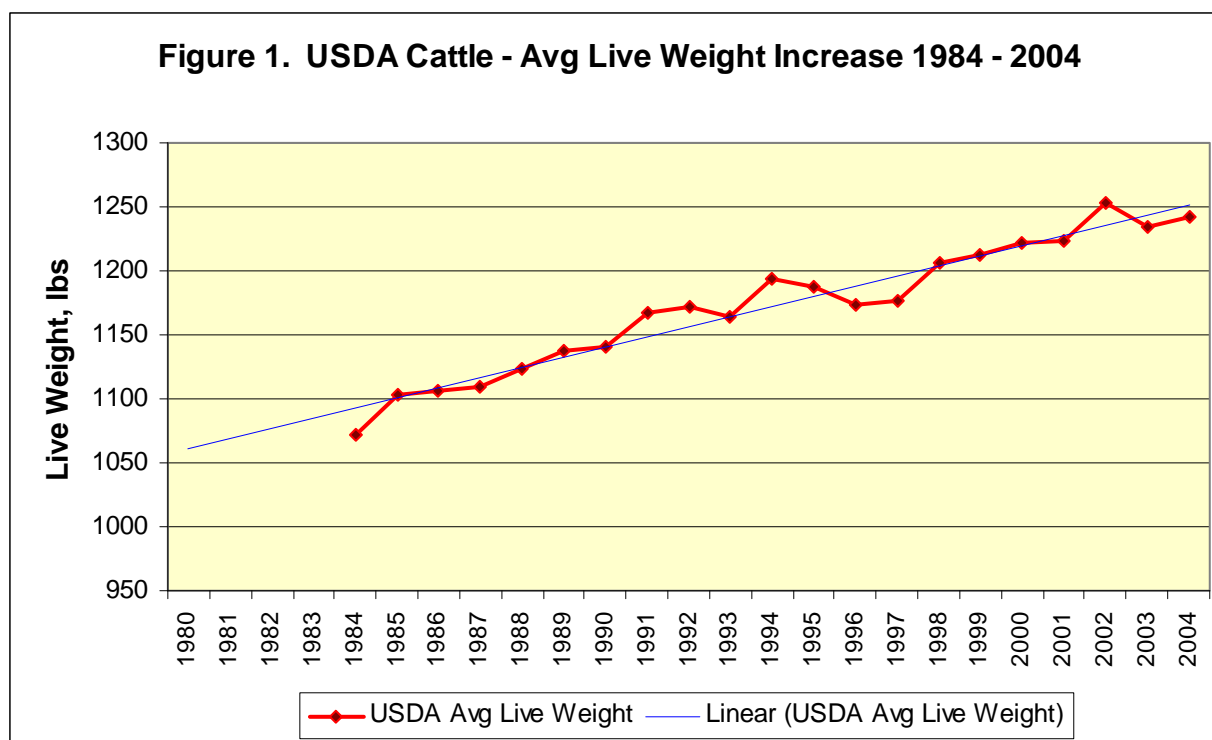


Table 3. Cattle Weight as Function of Frame Size for Average Condition Cattle

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

¹⁷ Hammack, Stephen P. and Ronald J. Gill. 1997. Frame Score and Weight of Cattle. Texas Agriculture Experiment Station, Texas A & M University System.

¹⁸ 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>).

Holechek et al (2001) summarized the weaning weights of calves grazed on various types of rangelands at different stocking rates¹⁹. 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 calves²⁰. Using the current market statistics for slaughter cattle of 1250 pounds and the average weaning weight of 430 pounds provided by Holechek et al (2001) gives an estimate for the average weight of a cow/calf pair during the grazing season of 1,680 pounds.

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 weight for a 1,000 pound cow. Applying this to the current weight of 1,680 pounds for a cow/calf pair, the daily forage consumption would be 50.4 lbs of air-dry forage per day, or for a month (30.4 days), 1532 pounds of forage per AUM.

BLM and the Forest Service should update their 800 lb/month forage consumption rates (26 lb/day) to current forage consumption rates based on this best available information. Based on these figures, BLM and the Forest Service are generally underestimating forage consumption for a cow/calf pair by 732 lb/month, or nearly 50%. To account for this in grazing permits and annual billings, stocking rates must be reduced by a corresponding amount.

The forage needs for domestic sheep must also be determined. Based on current USDA published weights for ewes and lambs at sale, adult domestic sheep weigh from 165 to 440 pounds,²¹ and lambs are about 129 pounds.²² Data downloaded from USDA NASS²³ 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 twins²⁴.

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 weight²⁵. Thus, the 275 pounds of sheep would consume 276 pounds of air-dry forage per month. As defined

¹⁹ Holechek, Jerry L., Rex D. Pieper and Carlton H. Herbel. 2001. Range Management: Principles and Practices, Fourth Edition. Prentice-Hall, New Jersey. 587p

²⁰ 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.

²¹ http://www.wildlifeprairiestatepark.org/animalpages/domestic_sheep.htm

²² http://www.usda.gov/nass/pubs/agr04/04_ch7.pdf

²³ <http://www.nass.usda.gov/index.asp>

²⁴ Bradford, G. E. 2007. Selection for Reproductive Efficiency. American Sheep Industry Association, Sheep and Goat Research Journal.

²⁵ USDA Forest Service Intermountain Region. 1964. R-4 Range Analysis Handbook

an AUM consists of 5 sheep, leading to calculated forage consumption by one AUM of sheep to be 1380 pounds of air dry forage per month. As for cattle, stocking rates must be adjusted to take this into account.

Federal and State Lands Agencies should begin recalculating their stocking rates, permitted numbers and grazing seasons based on this updated research. Permits, Billing Statements and Annual Operating Plans should be modified to take this update into account. If permittee sale records are available, those might be used to validate weights and therefore, forage consumption rates. Frame size and body condition scoring also provide a means of making field determinations of the sizes of cattle and could be used to calculate an allotment specific average animal weight and forage consumption rate.