

Appendix A

Procedure to Estimate Percent Reduction in Stocking Rate during Drought Conditions

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Stocking rates are affected by the amount of herbage biomass plants produce. During periods of below-normal precipitation, decreased herbage production may necessitate adjustments in stocking rates. The required percent reduction in the stocking rate can be estimated from the percent reduction in peak herbage biomass in healthy plants.

Effective grazing management can help minimize herbage reductions during periods of below-normal precipitation because herbage production is affected by both the type of management practices used and the level of precipitation in relation to normal amounts. The quantity of herbage biomass produced is related to plant size and plant density. These two characteristics are directly affected by the level of plant health, which is determined by the biological effectiveness of the management strategy used.

Management practices that do not meet the biological requirements of the plants slow plant processes. The resulting deterioration in the level of plant health is manifested as decreased plant density and diminished plant size that lead to reduced herbage production during periods with normal precipitation. Herbage reduction percentages caused by detrimental grazing management practices such as grazing before the third-leaf stage, grazing seasonlong, or grazing during the fall usually vary between 40 and 60 percent below the potential herbage biomass. The greatest reductions in herbage production observed in western North Dakota have occurred on domesticated grass spring pastures that were hayed during the summer and/or grazed during the fall, on native rangeland summer pastures that were grazed during the fall, and on domesticated grass and alfalfa haylands that were hayed late and/or grazed during the fall.

Herbage weight of perennial plants increases from early season through May, June, and July until peak herbage biomass, which occurs during the last couple weeks of July. Herbage weight then decreases as plants age and dry. The amount of herbage biomass produced by healthy plants is related to precipitation levels during January through July, which affect plant size and plant density.

Herbage reduction percentages caused by low precipitation are usually proportional to the levels of precipitation below the normal range. An estimate of the amount of herbage reduction low precipitation causes in healthy plants can be determined by a comparison between the local long-term mean precipitation received during January through July and the current year's precipitation for that period. The range of normal precipitation is plus or minus 25 percent of the long-term mean.

The procedure to estimate percent reduction in peak herbage biomass caused by below-normal precipitation requires just three simple calculations: first, the monthly precipitation for January through July is totaled to give the current seasonal precipitation; then, this precipitation amount is divided by the local long-term January through July precipitation amount to determine the current seasonal precipitation as a percentage of the long-term mean precipitation; next, that percentage is subtracted from 75 percent, which is the low-normal long-term precipitation value.

The resulting estimated percentage of reduction that below-normal precipitation has caused in peak herbage biomass provides a guideline for the percent reduction in stocking rate needed for the remainder of the grazing season--until mid October--on pastures that have been properly managed and have healthy plants. For example, if the January through July seasonal precipitation amount is 65 percent of the long-term mean, the estimated 10 percent reduction from normal herbage biomass would suggest a 10 percent reduction in stocking rate--assuming the proper stocking rate was being used. This method does not determine the amount for stocking rate adjustments required on pastures managed by practices that diminish the health status of plants below potential levels.

The long-term mean monthly precipitation amounts for numerous locations are available on the National Weather Service (NOAA) web site for North Dakota (www5.ncdc.noaa.gov/climatenormals/clim81/NDnorm.pdf). For the current season's precipitation, amounts collected at individual ranches and marked on the calendar can be used if a complete January through July data set is available. Another

source for the current season's precipitation amounts for many locations is the NDAWN web site (<http://ndawn.ndsu.nodak.edu>). These data start in April because NDAWN does not collect data for precipitation that occurs as snow. The precipitation amounts for January through March and the amount of precipitation that falls as snow during other periods must be obtained from other sources. Current season's precipitation data that include snow moisture amounts are available on the National Weather Service site (www.crh.noaa.gov/bis/OtherHydro.htm Click on "text" for the desired month's precipitation data).

If the percentages of reduction in herbage biomass produced on domesticated grass spring pastures, native rangeland pastures, or grass and alfalfa haylands are greater than the estimated percentage of herbage reduction reached by the comparison between the long-term and current

seasonal precipitation amounts, the health of the plants is below the potential level because management practices have not met the plant biological requirements. When management practices meet the biological requirements of the plants and the level of plant health is high, the percentages in herbage biomass reduction that occur during periods of below-normal precipitation are about equal to the percent reduction in precipitation. These herbage biomass reduction percentages are smaller and less problematic than reduction percentages on areas with diminished plant health.

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Table 1. Examples from three locations to illustrate the procedure to estimate percent reduction in peak herbage biomass in healthy plants as a result of below-normal January through July seasonal precipitation.

	Bowman		Hettinger		Pretty Rock	
	Long-term	2002	Long-term	2002	Long-term	2002
Jan	0.49	0.62	0.30	0.37	0.33	0.47
Feb	0.48	0.33	0.32	0.12	0.41	0.20
Mar	0.73	0.69	0.60	0.62	0.86	0.72
Apr	1.32	1.23	1.59	1.14	1.89	1.03
May	2.53	0.56	2.54	0.80	2.64	0.55
Jun	3.07	2.94	2.95	1.24	3.02	0.89
Jul	2.03	1.43	2.16	1.36	2.34	1.91
Total	10.65	7.80	10.46	5.65	11.49	5.77
% of Long-term		73.24		54.02		50.22
75% - % of Long-term		1.76%		20.98%		24.78%
% reduction of peak herbage biomass in healthy plants		2%		21%		25%
% stocking rate reduction on pastures with healthy plants		2%		21%		25%