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CHAPTER 1

Providing Adequate Late Season Crude Protein with Pasture Grasses

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Nutrient deficient forage is a problem for livestock weight gain.

Cool season and warm season native grass lead tillers drop below the crude protein requirements of lactating cows during the third and fourth weeks of July, respectively. Grasses on pastures managed with traditional grazing practices provide forage below the nutritional requirements of lactating cows after the end of July.

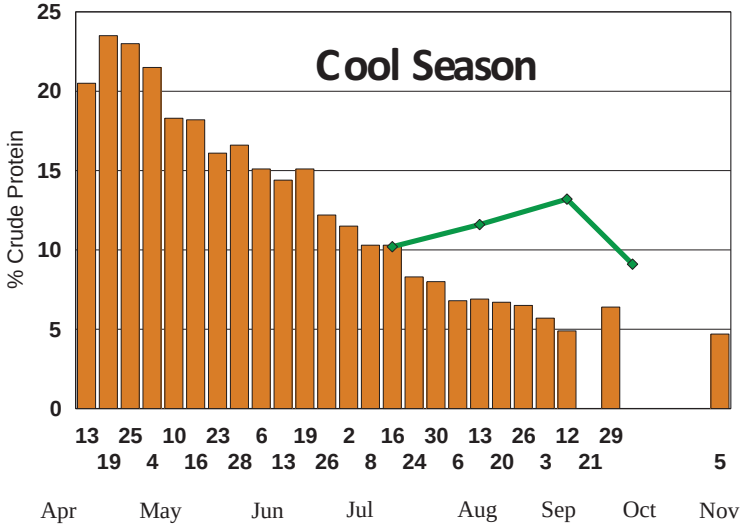


Fig 5. Mean percent crude protein of ungrazed native range warm season grasses in western North Dakota, data from Whitman et al. 1951 and secondary tiller data from Sedivec 1999.

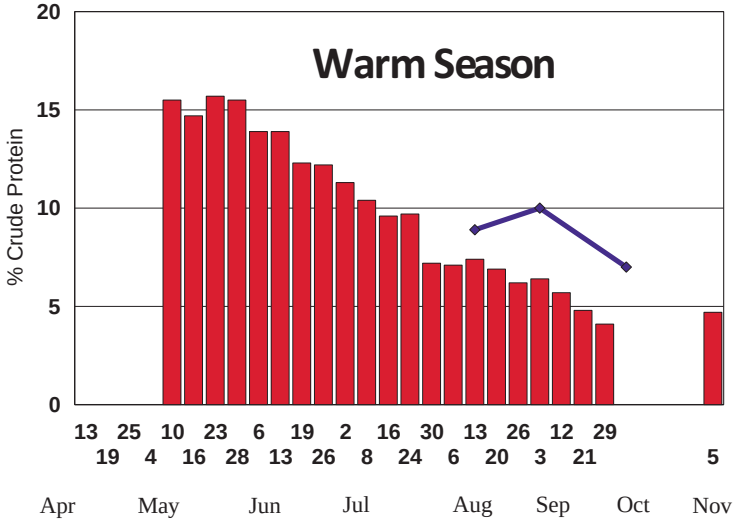
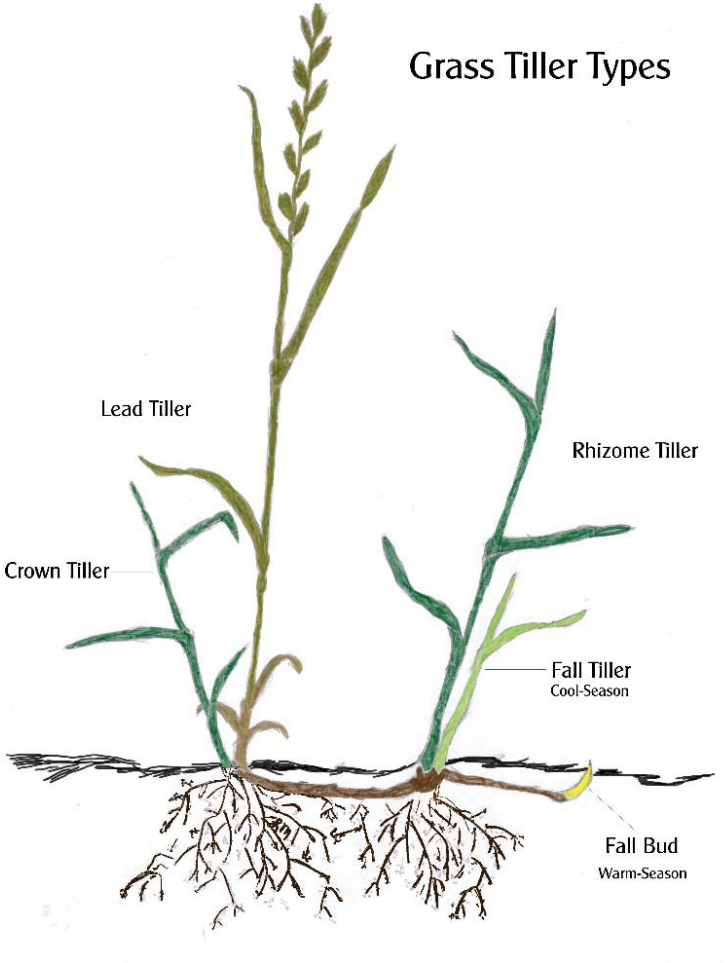
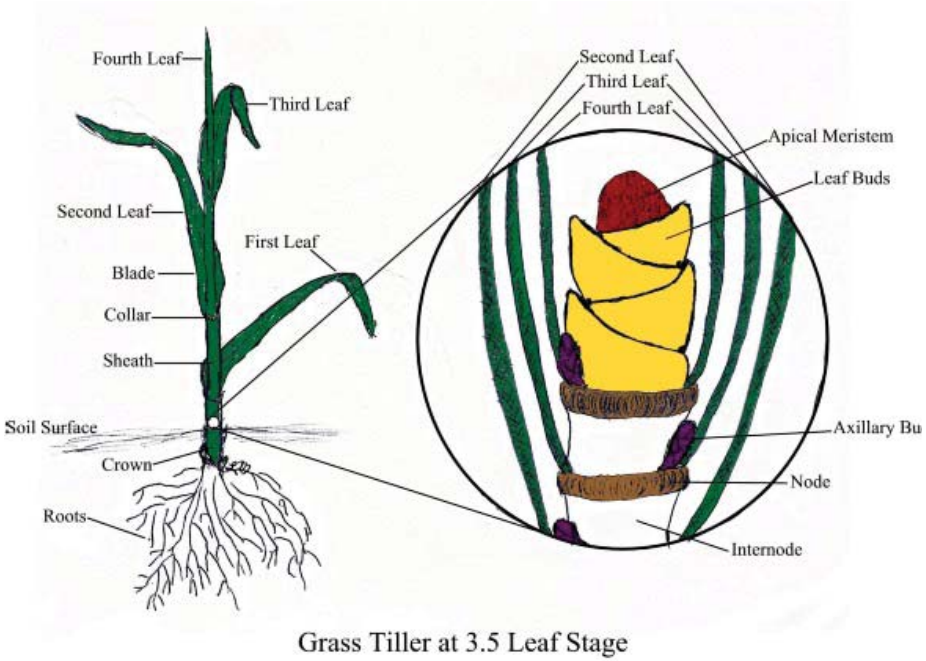


Fig 7. Mean percent crude protein of ungrazed native range warm season grasses in western North Dakota, data from Whitman et al. 1951 and secondary tiller data from Sedivec 1999.

Vegetative secondary tiller crude protein is at or above lactating cow requirements.

Grass tillers live for two growing seasons, first as a vegetative tiller and second as a reproductive lead tiller. Each growing season, the tillers have the potential to produce 6 to 8 leaves. Each leaf has an axillary bud that is able to develop into a new tiller. Vegetative secondary tillers are the biological source of late season crude protein.





Grass Tiller at 3.5 Leaf Stage

Numerous plant mechanisms and ecosystem biogeochemical processes need to be activated in order to increase the quantity of vegetative secondary tillers.

Four major plant mechanisms must be operational.

Compensatory Physiological Processes.

Nutrient Resource Uptake Competitiveness.

Water Use Efficiency.

Vegetative Reproduction by Tillering.

Operation of these major plant mechanisms requires 100 lbs/ac mineral nitrogen or greater to be available. Mineralization of adequate mineral nitrogen from soil organic matter needs a large quantity of soil microbes.

Photo from R Campbell

Fungi

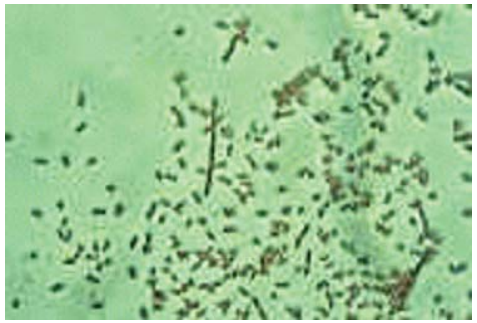


Photo from M.T. Holmes

Bacteria

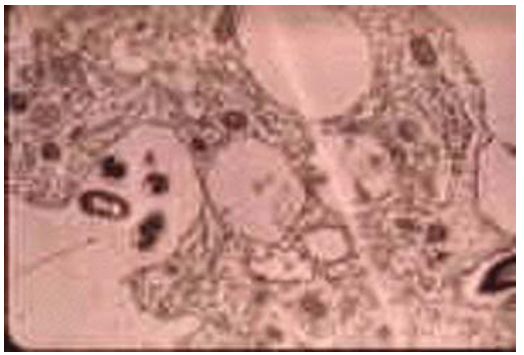


Photo from J.P. Martin

Protozoa

Soil microbe biomass is limited by access to plant fixed energy.

Grass plants exudate short chain carbon energy into the rhizosphere surrounding the roots, and the variable amounts determine the biomass of the soil microbes which regulates the quantity of available mineral nitrogen. The type of management practice used effects the rate of all of these biological processes and determines the quantity of available mineral nitrogen.

Nongrazing	yields	24 to 42 lbs/ac	mineral nitrogen
Traditional seasonlong	yields	31 to 77 lbs/ac	mineral nitrogen
Twice-over rotation	yields	100 to 178 lbs/ac	mineral nitrogen

The biologically effective management that makes everything happen.

Removal of 25% to 33% of lead tiller weight by grazing graminivores during grass plant vegetative growth stages between the 3.5 new leaf stage and the flower stage, 1 June to 15 July, each growing season on a 3 to 6 native range pasture Twice-over rotation system causes large quantities of short chain carbon energy to be exudated from grass tillers into the rhizosphere, providing energy for a large biomass of soil microbes, which mineralize the soil organic matter into available mineral nitrogen at quantities greater than 100 lbs/ac. The four major plant mechanisms becomes operational, resulting in activation of vegetative secondary tillers at adequate quantities and sufficient quality of crude protein to meet the requirements of lactating cows after late July until late September or mid October.

For more information go to http://www.grazinghandbook.com