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# Effects of Sampling Date on the Forage Quality and Quantity of Stockpiled Native Range in Southwestern North Dakota

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**ABSTRACT:** The objective of this study was to characterize changes in biomass and nutrient concentration of stockpiled native range from early November to late January. In each of four years, dry beef cows were grazed in a single pasture. For sampling purposes, the pasture was separated into two halves with five permanent sampling sites established in each half. Forage samples were collected from each sampling site on 14-day intervals. In the last three years, forage samples were pooled within each site, sampling date and pasture half for nutrient analysis. Forage samples were analyzed for concentrations of crude protein (CP), acid (ADF) and neutral (NDF) detergent fibers, calcium (Ca), phosphorus (P), magnesium (Mg), and potassium (K). Total digestible nutrient (TDN) concentration was calculated using a standard procedure. The concentration of all reported nutrients, with the exception of P ($P>.35$), was affected by advancing season. Concentrations of CP ($P<.1$) and Ca ($P<.05$) increased and then decreased with advancing season. Concentrations of TDN ($P<.02$), Mg ($P<.1$) and K ($P<.1$) decreased, and ADF ($P=.01$) increased, linearly with advancing season. NDF concentration ($P<.1$) increased in one year and remained constant in the other two years. Average total forage biomass available for grazing varied with year ($P=.03$). The lowest level was in year 1 and the highest in year 2 (900, 1584, 1370 and 1151 kg/ha for years 1, 2, 3, and 4, respectively). Biomass disappearance per animal unit (AU) was estimated to be 35.0, 30.9 and 4.1 kg/d for total, grass and forbs, respectively. Stockpiled native range is a readily available source of grazing for use in extending the grazing season of dry beef cows into the late fall and early winter. Nutritional supplementation that offsets declining forage quality, coupled with appropriate stocking rates, will be essential for optimizing the use of this grazing resource.

Key Words: Stockpiled Forage Quality, Biomass Disappearance

## Introduction

Extending the grazing period can potentially reduce the dependence on harvested forage for the winter. The forage availability and nutrient content in native range pastures in southwestern North Dakota may limit it's usefulness as a grazing resource for beef cows in late fall and early winter. Forage stockpiling is a method considered to be somewhat successful at extending the grazing period past the normal growing season. This method allows forage to grow during the times of active growth and saved for use at some other time of the year. Stockpiling native range has been shown to be a viable mechanism for extending the grazing season. However, stockpiled forage may not always meet the cattle's nutrition requirements and additional dietary supplementation may be required. An understanding of the forage quality and quantity of stockpiled native range throughout an extended grazing period is essential for designing effective supplementation strategies. The objective of this study was to characterize changes in forage quality and quantity of stockpiled native range from early November to late January.

## Materials and Methods

In each of four years (Table 1), dry pregnant beef cows were grazed on a single stockpiled native range pasture (approximately 116.6 ha) during a period from early November to late January. Forage available for grazing was sampled at regular intervals throughout the grazing period to detect changes in forage dry matter (DM) available for grazing. For sampling purposes, the pasture was virtually divided into an east and a west section and five permanent sampling sites were established in each section. On each sampling date, total forage was removed from two randomly selected 0.25-$m^2$ areas at ground level at each site and separated into forbs and grasses. Forage samples were dried (55° C until constant weight) and dry matter yields calculated. In three years, forage samples were then pooled within section and sampling day for nutrient

analysis. Forage samples were analyzed for crude protein (CP), acid (ADF) and neutral (NDF) detergent fiber, calcium (Ca), phosphorus (P), magnesium (Mg), and potassium (K) in a commercial laboratory. Total digestible nutrients (TDN) concentration was calculated using a standard procedure.

Forage composition and DM available for grazing were analyzed for the effects of sampling year and date using a split-plot in time analysis within a randomized complete block design. Pasture section represented the blocking factor. A commercial statistical software program (SAS; Cary, NC) was used to perform all analytical procedures.

**Results and Discussion**

Average nutrient concentrations of ADF (P=.32), Ca (P=.20) and P (P=.79) did not differ among years (Table 2). Concentrations of CP (P = 0.10), TDN (P = 0.11), NDF (P<.05), Mg (P<.05) and K (P<.05) varied significantly in at least one sampling year.

Changes in forage quality with advancing season are shown in Figures 1 and 2. Concentrations of CP (P = .09) and Ca (P = 0.05) changed quadratically with both concentrations increasing and then decreasing as grazing season advanced. Concentrations of TDN (P = 0.02), Mg (P = 0.08) and K (P = .09) decreased, and ADF (P = 0.01) increased, linearly with advancing season. The change in NDF concentration with advancing season was not consistent across years (P = 0.09). NDF increased in one year, while remaining constant in the other two years, as season advanced.

Total grazing days per season ranged from 63 to 85 (Table 1). Annual animal unit grazing days per ha ranged from 16.1 to 19.4 and annual stocking rate ranged from 1.56 to 1.90 ha per animal unit month.

Changes in forage biomass available for grazing (kg DM/ha) among years and with advancing season are shown in Table 2 and Figure 2, respectively. Average annual total, grass and forbs biomass available for grazing varied across years (P<.05) and declined linearly with advancing season (P<.01). The average rate of DM disappearance was 34.9, 30.7 and 4.2 kg per animal unit grazing day for total, grass and forbs, respectively.

Forage quality of stockpiled native range in the late fall and early winter period varies both within and across years. However, with the exception of NDF concentration, forage quality changes with advancing season seem to be consistent across years. Since the opportunity exists for grazing animals to select a diet higher in quality than the average of what is offered, further work in the forage quality of stockpiled native range needs to focus on quantifying potential animal selectivity.

Forage quantity of stockpiled native range also changes with year and advancing season. The response to advancing seasons seems to be linear and is related to accumulated animal unit grazing days. Assuming a 50% utilization of total DM, the total DM removal rate suggests that this pasture would support approximately 11 animal unit grazing days per acre or require approximately 2.8 acres per animal unit month of grazing at this time of the year.

**Implications**

Stockpiled native range is a readily available source of grazing for use in extending the grazing season of dry beef cows into the late fall and early winter. Nutritional supplementation to offset declining forage quality and appropriate stocking rates will be essential for optimizing the use of this grazing resource

**Literature cited**

**Encinias, A.M. and G. Lardy. 2000.** Body condition scoring I: managing your cow herd through body condition scoring. Ext. Publ. AS-1026. North Dakota State University. (http://www.ext.nodak.edu/extpubs/ansci/beef/as1026w.htm, January 27, 2003).

**Table 1.** Animal and grazing information.

| | Year | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Number of cows | 23 | 21 | 24 | 24 |
| Initial: | | | | |
| Body weight, lb | 604 ± 41 | 629 ± 64 | 509 ± 39 | 572 ± 59 |
| Body condition score[a] | 5.8 ± .7 | 6.8 ± .6 | 4.5 ± 1.1 | 4.8 ± 1.0 |
| Grazing Dates: | | | | |
| Beginning | November 22 | November 14 | November 6 | December 4 |
| End | January 31 | January 23 | January 29 | February 5[c] |
| Total grazing days | 70 | 70 | 85 | 63 |
| AU[b] grazing days/ha | 16.2 | 16.1 | 19.1 | 19.4 |
| Hectares/(AUM[b]) | 1.86 | 1.90 | 1.60 | 1.56 |

[a] Estimate of body fatness (1 to 9 scale; Encinias and Lardy, 2000).

[b] Animal unit (AU) and animal unit month (AUM).

[c] Biomass sampling stopped in mid January of Year 4..

**Table 2.** Annual averages for nutrient concentrations (% DM) and forage available for grazing (kg DM/ha).

| | Year | | | |
|---|---|---|---|---|
| | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 |
| Nutrient | | | | |
| Crude protein | -- | 4.8[a] | 5.3[b] | 5.4[b] |
| Acid detergent fiber | -- | 47.5 | 48.0 | 48.3 |
| Neutral detergent fiber | -- | 70.8[x] | 73.5[z] | 60.9[x] |
| Total digestible nutrients | -- | 52.6[b] | 51.5[a] | 51.3[a] |
| Calcium | -- | .65 | .67 | .47 |
| Phosphorus | -- | .073 | .076 | .076 |
| Magnesium | -- | .097[y] | .095[y] | .069[x] |
| Potassium | -- | .34[y] | .16[x] | .15[x] |
| Forage available for grazing | | | | |
| Total | 900.7[x] | 1584.5[z] | 1369.1[yz] | 1150.6[xy] |
| Grass | 793.5[x] | 1402.8[z] | 1240.8[yz] | 1106.3[y] |
| Forb | 107.2[y] | 181.7[z] | 128.3[y] | 44.5[x] |

[a,b] Means within a row with differing superscripts differ ($P < 0.15$).
[x,y,z] Means within a row with differing superscripts differ ($P < 0.05$)

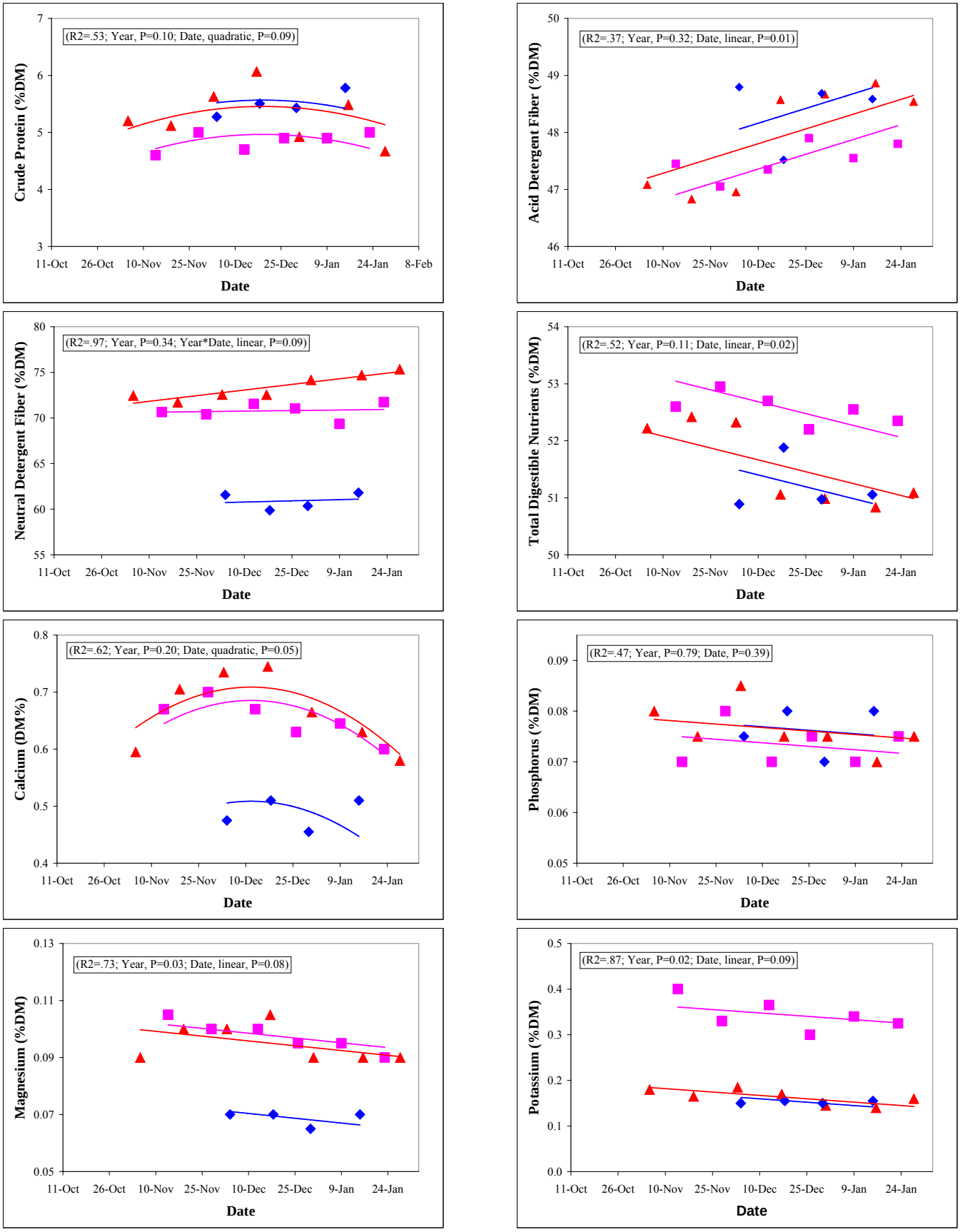
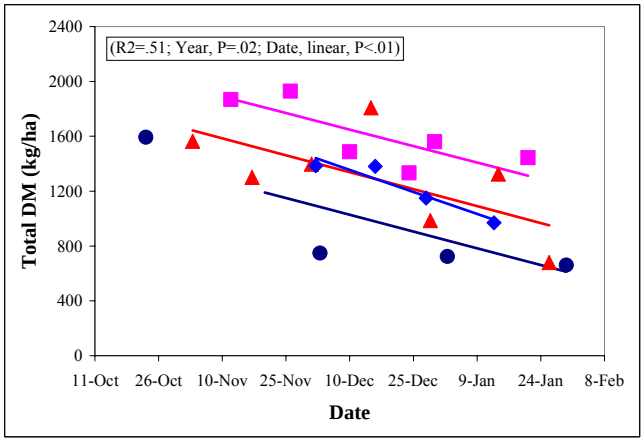
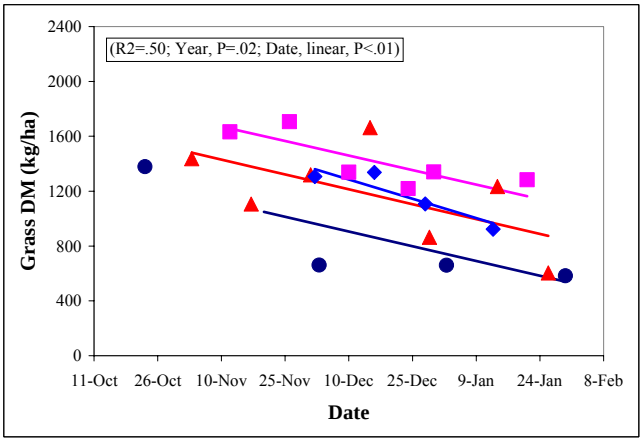



**Figure 1.** Effect of year and advancing season on nutrient concentrations (%DM) of stockpiled native range. Solid lines indicate annual change with advancing season (■=year 2, ▲=year 3, and ♦=year 4).



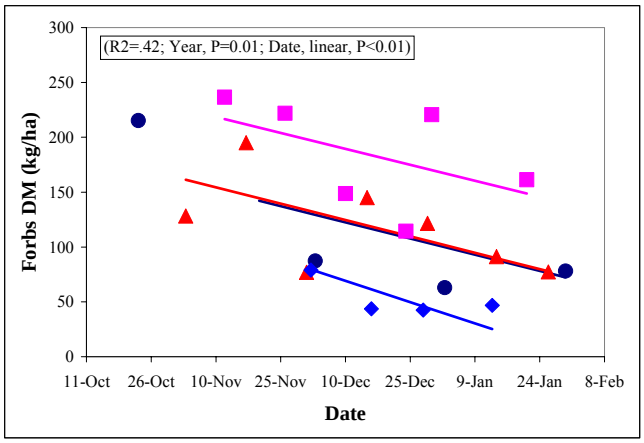




**Figure 2.** Effect of year and advancing season on total, grass and forbs DM available for grazing (kg/ha). Solid lines indicate DM disappearance for each biomass type per accumulated animal unit grazing days assuming a year dependent intercept and a common rate of DM disappearance (●=year 1, ■=year 2, ▲= year 3 and ♦=year 4).