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Irrigated Hayland Perennial Cool Season Grass Trial – Quality Constituents

Hay samples of Luna and Mandan pubescent wheatgrass, NewHy hybrid wheatgrass, Rosana western wheatgrass, Critana thickspike wheatgrass, Hycrest crested wheatgrass, Bozoisky Russian wildrye, Manchar smooth brome grass, and Regar meadow brome grass from the plots at Ray Daly's along lower Piney Creek in southern Sheridan County and Larry Vignaroli's along Clear Creek in Northern Johnson County; and Manska pubescent wheatgrass, Oahe intermediate wheatgrass, NewHy hybrid wheatgrass, Critana thickspike wheatgrass, Manchar smooth brome grass, and Regar and Paddock meadow brome grass from the field at Daly's were analyzed for forage quality components: net energy maintenance, crude protein, phosphorus, calcium, potassium, magnesium, sulfur, iron, manganese, zinc, and copper.

March 2007

In this Issue:

Irrigated Hayland Perennial Cool Season Grass Trial – Quality Constituents
Rangeland Management Schools
The High Plains Ranch Practicum
GRP Rangeland Insurance for Wyoming
Sainfoin

Forage quality components were compared to the needs of a beef cow and sheep ewe and to the average amounts of northern U.S. alfalfa hay.

Grasses were sampled for hay yield on 23, 20, and 21 June 2004, 2005, and 2006, respectively, at Daly's, and on 30 June 2004 and 2005, and 26 June 2006 at Vignaroli's. Grasses from the field at Daly's were not sampled in 2004. Hay yields of the grasses were reported in the February 2007 issue of Land & Livestock.

The grasses contained similar amounts of net energy maintenance as that of early- to mid-bloom alfalfa and generally sufficient to meet the needs of a beef cow and sheep ewe in all stages of production (page 3).

Nitrogen fertilizer (100 lb N/ac) was applied to the grass plots and field at Daly's in April 2005 and May 2006 and to the plots at Vignaroli's in May 2006. As a result crude protein content of the grasses was generally comparable to that of late bloom alfalfa and sufficient for a lactating beef cow and gestating sheep ewe (page 4).

Phosphorus fertilizer (50 lb P/ac) applied at Daly's in April 2005 increased phosphorus (P) content of the grasses by an average of 0.15% compared to 2004 and 2006 when P fertilizer was not applied (page 5). As a result grass P content was adequate for a beef cow and sheep ewe. In addition, the grasses at Daly's in 2005 contained 0.05 to 0.19% more P compared to alfalfa. Non-P fertilized grass from Daly's in 2004 and 2006 and from Vignaroli's in 2005 and 2006 contained enough P to meet the needs of a beef cow in gestation but not a sheep ewe.

The grasses contained enough calcium (Ca) to meet the needs of a beef cow in late gestation and generally early lactation (page 6). However, grass Ca contents were below a sheep ewe's needs in late gestation and early lactation in 2004 and 2005 at Daly's and 2004 at Vignaroli's. Grass Ca P ratios were greater than 1.5:1, except at Daly's in 2005 where they averaged 0.8:1 due to the increase in grass P content as a result of P fertilization and lower Ca levels. A Ca supplement may be needed when feeding hay of these grasses. Compared to alfalfa hay the grasses contained much less Ca.

The grasses contained three to four times the amount of potassium a beef cow or sheep

ewe requires and levels were comparable to that of early bloom alfalfa (page 7).

Grass magnesium (Mg) levels generally were adequate to meet the needs of a beef cow or sheep ewe in gestation (page 8). However, Mg content in less than half the grasses was sufficient for a lactating beef cow and sheep ewe. Grass Mg contents were similar to that of early bloom alfalfa hay.

Sulfur (S) content of the grasses was adequate for a beef cow and sheep ewe but averaged 0.07% less than mid-bloom alfalfa hay (page 9).

The amount of iron (Fe) in the grasses was sufficient for a beef cow and sheep ewe but was three times less than the amount in alfalfa (page 10).

The grasses contained an adequate amount of manganese (Mn) to meet the needs of a sheep ewe but only half the grasses had an adequate amount for a beef cow (page 11). Grass Mn content averaged 39 ppm, 3 ppm less than full and late bloom alfalfa.

None of the grasses contained an adequate amount of zinc to meet the needs of a beef cow or sheep ewe (page 12). Full and late bloom alfalfa also lacks enough zinc for a beef cow and sheep ewe.

Copper (Cu) content of the grasses generally was less than the needs of a beef cow and sheep ewe (page 13). Full and late bloom alfalfa averaged 2.5 ppm more Cu compared to the grasses.

Of the grasses, Hycrest crested wheatgrass was least likely to meet the nutritional needs of a beef cow or sheep ewe, especially when they were in early lactation.

Net energy maintenance content (Mcal/lb) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

<u>Grass</u>	Daly's				Vignaroli's				Overall
	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>Average</u>
Luna PWG ¹	0.65	0.62	0.63	0.63	0.60	0.67	0.60	0.62	0.63
Mandan PWG	0.62	0.60	0.62	0.61	0.61	0.65	0.61	0.62	0.62
NewHy HWG	0.66	0.62	0.64	0.64	0.71	0.64	0.64	0.67	0.65
Rosana WWG	0.56	0.65	0.61	0.61	0.73	0.67	0.64	0.68	0.64
Critana TWG	0.64	0.66	0.68	0.66	0.61	0.62	0.60	0.61	0.63
Hycrest CWG	0.67	0.64	0.69	0.66	0.60	0.70	0.65	0.65	0.66
Bozoisky RWR	0.63	0.58	0.66	0.62	0.63	0.61	0.63	0.62	0.62
Manchar SBG	0.70	0.65	0.68	0.68	0.59	0.68	0.66	0.64	0.66
Regar MBG	0.68	0.65	0.64	0.66	0.60	0.59	0.61	0.60	0.63
<u>Average</u>	<u>0.65</u>	<u>0.63</u>	<u>0.65</u>		<u>0.63</u>	<u>0.65</u>	<u>0.63</u>		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Net energy maintenance content (Mcal/lb) of the grasses from Daly's field in 2005 and 2006.

<u>Grass</u>	<u>2005</u>	<u>2006</u>	<u>Average</u>
Manska PWG ¹	0.56	0.68	0.62
Oahe IWG	0.58	0.59	0.58
NewHy HWG	0.61	0.63	0.62
Critana TWG	0.60	0.60	0.60
Manchar SBG	0.59	0.69	0.64
Regar MBG	0.58	0.62	0.60
Paddock MBG	0.53	0.64	0.59
<u>Average</u>	<u>0.58</u>	<u>0.63</u>	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Net energy maintenance contents of Northern alfalfa hay.

<u>Maturity Stage</u>	<u>Mcal/lb*</u>	<u>Maturity Stage</u>	<u>Mcal/lb*</u>
Early bloom	0.63	Full bloom	0.54
Mid-bloom	0.60	Late bloom	0.49

Beef cow (1200 lb) NEm requirement (Mcal/lb*): Late gestation 0.50; early lactation 0.60.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) NEm requirement (Mcal/lb**): First 15 weeks gestation 0.46; last 4 weeks gestation 0.50; first 6-8 weeks lactation 0.60 (suckling singles) – 0.62 (suckling twins).

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Crude protein content (%) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

Grass	Daly's				Vignaroli's				Overall
	2004	2005	2006	Avg.	2004	2005	2006	Avg.	Average
Luna PWG ¹	8.5	12.2	10.1	10.3	8.1	8.9	10.5	9.2	9.7
Mandan PWG	8.7	11.2	9.9	9.9	7.6	8.2	11.6	9.1	9.5
NewHy HWG	8.5	11.1	9.5	9.7	8.1	8.0	12.6	9.6	9.6
Rosana WWG	10.1	13.2	10.6	11.3	8.2	10.0	12.6	10.3	10.8
Critana TWG	11.2	12.5	12.2	12.0	7.7	8.1	12.2	9.3	10.7
Hycrest CWG	7.0	12.3	11.1	10.1	8.9	8.1	10.6	9.2	9.7
Bozoisky RWR	9.8	10.6	12.5	11.0	7.9	9.0	14.1	10.3	10.7
Manchar SBG	7.9	11.4	11.2	10.2	7.9	9.3	12.6	9.9	10.0
Regar MBG	9.8	11.0	9.6	10.1	8.5	7.4	12.4	9.4	9.8
Average	9.1	11.7	10.7		8.1	8.6	12.1		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Crude protein content (%) of the grasses from Daly's field in 2005 and 2006.

Grass	2005	2006	Average
Manska PWG ¹	10.3	10.0	10.1
Oahe IWG	10.1	9.5	9.8
NewHy HWG	10.9	11.5	11.2
Critana TWG	12.4	9.7	11.1
Manchar SBG	12.1	9.8	10.9
Regar MBG	12.2	9.6	10.9
Paddock MBG	7.7	8.7	8.2
Average	10.8	9.8	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Crude protein contents of Northern alfalfa hay.

Maturity Stage	%*	Maturity Stage	%*
Early bloom	19.9	Full bloom	13.0
Mid-bloom	17.0	Late bloom	12.0

Beef cow (1200 lb) crude protein requirement (%*): Late gestation 7.7; early lactation 10.7.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) crude protein requirement (%**): First 15 weeks gestation 9.3; last 4 weeks gestation 10.7; first 6-8 weeks lactation 13.4 (suckling singles) – 15.0 (suckling twins).

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Phosphorus content (%) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

Grass	Daly's				Vignaroli's				Overall
	2004	2005	2006	Avg.	2004	2005	2006	Avg.	Average
Luna PWG ¹	0.19	0.37	0.19	0.25	0.12	0.20	0.18	0.17	0.21
Mandan PWG	0.20	0.38	0.19	0.26	0.14	0.15	0.18	0.16	0.21
NewHy HWG	0.16	0.28	0.17	0.20	0.11	0.14	0.18	0.14	0.17
Rosana WWG	0.18	0.36	0.19	0.24	0.13	0.18	0.19	0.17	0.21
Critana TWG	0.20	0.29	0.18	0.22	0.11	0.18	0.18	0.16	0.19
Hycrest CWG	0.17	0.33	0.18	0.23	0.12	0.15	0.19	0.15	0.19
Bozoisky RWR	0.19	0.34	0.28	0.27	0.12	0.21	0.20	0.18	0.22
Manchar SBG	0.20	0.34	0.18	0.24	0.11	0.18	0.17	0.15	0.20
Regar MBG	0.17	0.31	0.20	0.22	0.09	0.15	0.15	0.13	0.18
Average	0.18	0.34	0.20		0.12	0.17	0.18		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth brome grass; MBG – meadow brome grass

Phosphorus content (%) of the grasses from Daly's field in 2005 and 2006.

Grass	2005	2006	Average
Manska PWG ¹	0.38	0.22	0.30
Oahe IWG	0.34	0.18	0.26
NewHy HWG	0.39	0.19	0.29
Critana TWG	0.43	0.25	0.34
Manchar SBG	0.36	0.19	0.28
Regar MBG	0.41	0.18	0.30
Paddock MBG	0.26	0.16	0.21
Average	0.37	0.19	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth brome grass; MBG – meadow brome grass

Phosphorus contents of Northern alfalfa hay.

Maturity Stage	%*	Maturity Stage	%*
Early bloom	0.22	Full bloom	0.24
Mid-bloom	0.24	Late bloom	0.24

Beef cow (1200 lb) phosphorus requirement (%*): Late gestation 0.16; early lactation 0.21.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) phosphorus requirement (%**): First 15 weeks gestation 0.20; last 4 weeks gestation 0.23; first 6-8 weeks lactation 0.26 (suckling singles) – 0.29 (suckling twins).

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Calcium content (%) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

Grass	Daly's				Vignaroli's				Overall
	2004	2005	2006	Avg.	2004	2005	2006	Avg.	Average
Luna PWG ¹	0.28	0.33	0.46	0.35	0.20	0.42	0.56	0.39	0.37
Mandan PWG	0.29	0.35	0.36	0.33	0.23	0.38	0.48	0.36	0.35
NewHy HWG	0.38	0.26	0.41	0.35	0.35	0.37	0.59	0.44	0.39
Rosana WWG	0.34	0.25	0.51	0.37	0.35	0.40	0.52	0.42	0.40
Critana TWG	0.42	0.25	0.37	0.34	0.43	0.35	0.50	0.43	0.39
Hycrest CWG	0.21	0.27	0.38	0.29	0.28	0.29	0.36	0.31	0.30
Bozoisky RWR	0.40	0.24	0.55	0.40	0.31	0.41	0.58	0.43	0.41
Manchar SBG	0.29	0.25	0.43	0.32	0.30	0.45	0.47	0.41	0.36
Regar MBG	0.36	0.25	0.43	0.35	0.40	0.44	0.68	0.50	0.43
Average	0.33	0.27	0.43		0.32	0.39	0.53		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Calcium content (%) of the grasses from Daly's field in 2005 and 2006.

Grass	2005	2006	Average
Manska PWG ¹	0.27	0.46	0.37
Oahe IWG	0.27	0.51	0.39
NewHy HWG	0.25	0.46	0.35
Critana TWG	0.28	0.48	0.38
Manchar SBG	0.26	0.37	0.32
Regar MBG	0.31	0.66	0.49
Paddock MBG	0.25	0.45	0.35
Average	0.27	0.49	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Calcium contents of Northern alfalfa hay.

Maturity Stage	%*	Maturity Stage	%*
Early bloom	1.63	Full bloom	1.19
Mid-bloom	1.39	Late bloom	1.19

Beef cow (1200 lb) calcium requirement (%*): Late gestation 0.25; early lactation 0.31.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) calcium requirement (%**): First 15 weeks gestation 0.25; last 4 weeks gestation 0.35; first 6-8 weeks lactation 0.32 (suckling singles) – 0.39 (suckling twins).

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Potassium content (%) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

Grass	Daly's				Vignaroli's				Overall
	2004	2005	2006	Avg.	2004	2005	2006	Avg.	Average
Luna PWG ¹	2.42	3.42	2.37	2.73	1.91	2.35	2.57	2.28	2.51
Mandan PWG	2.38	3.44	2.21	2.68	1.94	2.21	2.61	2.26	2.47
NewHy HWG	2.47	2.87	2.34	2.56	2.21	2.36	3.02	2.53	2.54
Rosana WWG	2.35	2.73	1.97	2.35	2.32	2.30	2.64	2.42	2.39
Critana TWG	2.37	2.75	2.25	2.46	2.20	1.53	2.24	1.99	2.22
Hycrest CWG	1.73	2.62	1.90	2.08	2.09	1.60	1.78	1.82	1.95
Bozoisky RWR	2.84	2.81	3.27	2.97	2.26	2.66	3.54	2.82	2.90
Manchar SBG	2.33	3.21	2.45	2.66	1.86	2.23	2.43	2.17	2.42
Regar MBG	2.46	3.24	2.40	2.70	2.21	1.87	3.14	2.40	2.55
Average	2.37	3.01	2.35		2.11	2.12	2.66		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Potassium content (%) of the grasses from Daly's field in 2005 and 2006.

Grass	2005	2006	Average
Manska PWG ¹	2.96	2.11	2.53
Oahe IWG	2.85	2.15	2.50
NewHy HWG	3.38	2.72	3.05
Critana TWG	2.83	1.55	2.19
Manchar SBG	2.80	2.25	2.52
Regar MBG	3.60	2.59	3.09
Paddock MBG	2.99	2.61	2.80
Average	3.06	2.28	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Northern alfalfa hay potassium contents at progressive maturity stages.

Maturity Stage	%*	Maturity Stage	%*
Early bloom	2.51	Full bloom	1.56
Mid-bloom	1.56	Late bloom	1.56

Beef cow (1200 lb) potassium requirement (%*): Gestation 0.60; early lactation 0.70.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) potassium requirement (%**): Gestation 0.60; first 6-8 weeks lactation 0.70 (suckling singles) – 0.80 (suckling twins).

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Magnesium content (%) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

<u>Grass</u>	Daly's				Vignaroli's				Overall
	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>Average</u>
Luna PWG ¹	0.15	0.20	0.16	0.17	0.09	0.21	0.20	0.17	0.17
Mandan PWG	0.11	0.20	0.12	0.14	0.10	0.13	0.24	0.16	0.15
NewHy HWG	0.17	0.20	0.23	0.20	0.14	0.19	0.25	0.19	0.20
Rosana WWG	0.11	0.16	0.13	0.13	0.15	0.17	0.16	0.16	0.15
Critana TWG	0.16	0.18	0.15	0.16	0.19	0.13	0.19	0.17	0.17
Hycrest CWG	0.07	0.15	0.14	0.12	0.12	0.14	0.16	0.14	0.13
Bozoisky RWR	0.25	0.22	0.24	0.24	0.17	0.27	0.31	0.25	0.24
Manchar SBG	0.17	0.20	0.13	0.16	0.15	0.27	0.21	0.21	0.19
Regar MBG	0.21	0.24	0.25	0.23	0.16	0.19	0.32	0.22	0.23
<u>Average</u>	<u>0.15</u>	<u>0.19</u>	<u>0.17</u>		<u>0.14</u>	<u>0.19</u>	<u>0.23</u>		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth brome grass; MBG – meadow brome grass

Magnesium content (%) of the grasses from Daly's field in 2005 and 2006.

<u>Grass</u>	<u>2005</u>	<u>2006</u>	<u>Average</u>
Manska PWG ¹	0.15	0.22	0.19
Oahe IWG	0.16	0.25	0.20
NewHy HWG	0.25	0.19	0.22
Critana TWG	0.19	0.22	0.20
Manchar SBG	0.19	0.19	0.19
Regar MBG	0.22	0.34	0.28
Paddock MBG	0.24	0.14	0.19
<u>Average</u>	<u>0.20</u>	<u>0.22</u>	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth brome grass; MBG – meadow brome grass

Magnesium contents Northern alfalfa hay.

<u>Maturity Stage</u>	<u>%*</u>	<u>Maturity Stage</u>	<u>%*</u>
Early bloom	0.21	Full bloom	0.27
Mid-bloom	0.35	Late bloom	0.27

Beef cow (1200 lb) magnesium requirement (%*): Gestation 0.12; early lactation 0.20.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) magnesium requirement (%**): First 15 weeks gestation 0.12; last 4 weeks gestation 0.15; first 6-8 weeks lactation 0.18.

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Sulfur content (%) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

<u>Grass</u>	Daly's				Vignaroli's				Overall
	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>Average</u>
Luna PWG ¹	0.18	0.19	0.21	0.19	0.14	0.15	0.23	0.17	0.18
Mandan PWG	0.18	0.21	0.22	0.20	0.15	0.20	0.23	0.19	0.20
NewHy HWG	0.20	0.19	0.26	0.22	0.19	0.21	0.27	0.22	0.22
Rosana WWG	0.24	0.21	0.22	0.23	0.17	0.19	0.25	0.20	0.22
Critana TWG	0.24	0.23	0.29	0.25	0.17	0.15	0.23	0.18	0.22
Hycrest CWG	0.19	0.22	0.26	0.22	0.23	0.18	0.25	0.22	0.22
Bozoisky RWR	0.23	0.17	0.31	0.24	0.19	0.19	0.32	0.24	0.24
Manchar SBG	0.21	0.21	0.21	0.21	0.16	0.24	0.26	0.22	0.22
Regar MBG	0.18	0.21	0.22	0.20	0.19	0.15	0.29	0.21	0.21
<u>Average</u>	<u>0.21</u>	<u>0.20</u>	<u>0.24</u>		<u>0.18</u>	<u>0.19</u>	<u>0.26</u>		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth brome grass; MBG – meadow brome grass

Sulfur content (%) of the grasses from Daly's field in 2005 and 2006.

<u>Grass</u>	<u>2005</u>	<u>2006</u>	<u>Average</u>
Manska PWG ¹	0.18	0.21	0.19
Oahe IWG	0.20	0.25	0.23
NewHy HWG	0.20	0.30	0.25
Critana TWG	0.24	0.21	0.22
Manchar SBG	0.23	0.23	0.23
Regar MBG	0.19	0.22	0.21
Paddock MBG	0.16	0.17	0.17
<u>Average</u>	<u>0.20</u>	<u>0.23</u>	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth brome grass; MBG – meadow brome grass

Sulfur contents of Northern alfalfa hay.

<u>Maturity Stage</u>	<u>%*</u>	<u>Maturity Stage</u>	<u>%*</u>
Early bloom	0.54	Full bloom	0.30
Mid-bloom	0.28	Late bloom	0.30

Beef cow (1200 lb) sulfur requirement (%*): All production stages 0.15.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) sulfur requirement (%**): First 15 weeks gestation 0.14; last 4 weeks gestation 0.15; first 6-8 weeks lactation 0.18.

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Iron content (ppm) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

Grass	Daly's				Vignaroli's				Overall
	2004	2005	2006	Avg.	2004	2005	2006	Avg.	Average
Luna PWG ¹	58	57	64	60	48	55	78	60	60
Mandan PWG	63	59	59	60	61	54	85	67	63
NewHy HWG	57	48	52	52	78	55	91	75	64
Rosana WWG	77	78	73	76	67	81	116	88	82
Critana TWG	81	41	60	61	94	66	127	96	78
Hycrest CWG	41	44	64	50	75	56	73	68	59
Bozoisky RWR	90	51	95	79	68	75	137	93	86
Manchar SBG	51	47	59	52	52	56	82	63	58
Regar MBG	51	63	59	58	85	49	183	106	82
<u>Average</u>	63	54	65		70	61	108		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Iron content (ppm) of the grasses from Daly's field in 2005 and 2006.

Grass	2005	2006	Average
Manska PWG ¹	57	47	52
Oahe IWG	50	72	61
NewHy HWG	52	63	57
Critana TWG	59	58	59
Manchar SBG	47	58	52
Regar MBG	59	67	63
Paddock MBG	43	83	63
<u>Average</u>	52	64	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Iron contents of Northern alfalfa hay.

<u>Maturity Stage</u>	<u>ppm*</u>	<u>Maturity Stage</u>	<u>ppm*</u>
Early bloom	240	Full bloom	160
Mid-bloom	225	Late bloom	160

Beef cow (1200 lb) iron requirements (ppm*): All production stages 50.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) iron requirement (ppm**): All production stages 30.

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Manganese content (ppm) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

Grass	Daly's				Vignaroli's				Overall
	2004	2005	2006	Avg.	2004	2005	2006	Avg.	Average
Luna PWG ¹	36	39	40	38	27	39	55	40	39
Mandan PWG	32	41	42	39	24	31	50	35	37
NewHy HWG	38	42	52	44	26	36	45	36	40
Rosana WWG	41	29	40	37	41	43	46	43	40
Critana TWG	45	34	41	40	31	28	34	31	35
Hycrest CWG	21	26	64	37	20	22	20	21	29
Bozoisky RWR	33	43	30	35	19	26	40	28	32
Manchar SBG	42	31	49	41	38	62	54	51	46
Regar MBG	39	28	42	36	32	47	53	44	40
<u>Average</u>	36	35	45		29	37	44		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Manganese content (ppm) of the grasses from Daly's field in 2005 and 2006.

Grass	2005	2006	Average
Manska PWG ¹	53	36	44
Oahe IWG	48	59	53
NewHy HWG	34	38	36
Critana TWG	23	26	24
Manchar SBG	51	43	47
Regar MBG	43	73	58
Paddock MBG	39	55	47
<u>Average</u>	41	47	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Manganese contents of Northern alfalfa hay.

Maturity Stage	ppm*	Maturity Stage	ppm*
Early bloom	47	Full bloom	42
Mid-bloom	61	Late bloom	42

Beef cow (1200 lb) manganese requirement (ppm*): All production stages 40.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) manganese requirement (ppm**): All production stages 20.

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Zinc content (ppm) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

<u>Grass</u>	<u>Daly's</u>				<u>Vignaroli's</u>				<u>Overall</u>
	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>Average</u>
Luna PWG ¹	16.8	25.1	21.0	21.0	17.3	19.3	23.1	19.9	20.4
Mandan PWG	16.5	19.7	20.3	18.8	21.1	21.0	22.3	21.5	20.1
NewHy HWG	13.9	16.3	13.4	14.5	16.6	15.1	21.5	17.7	16.1
Rosana WWG	15.1	14.3	15.4	14.9	20.8	23.4	22.2	22.1	18.5
Critana TWG	16.5	18.3	22.2	19.0	21.3	16.1	16.5	18.0	18.5
Hycrest CWG	13.3	21.6	21.7	18.9	23.3	15.3	17.7	18.8	18.8
Bozoisky RWR	12.6	14.5	17.0	14.7	22.6	17.0	18.0	19.2	17.0
Manchar SBG	12.7	15.3	20.3	16.1	16.1	20.3	24.4	20.3	18.2
Regar MBG	13.1	11.5	11.8	12.1	14.3	12.9	15.9	14.4	13.3
<u>Average</u>	<u>14.5</u>	<u>17.4</u>	<u>18.1</u>		<u>19.3</u>	<u>17.8</u>	<u>20.2</u>		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Zinc content (ppm) of the grasses from Daly's field in 2005 and 2006.

<u>Grass</u>	<u>2005</u>	<u>2006</u>	<u>Average</u>
Manska PWG ¹	19.6	18.6	19.1
Oahe IWG	20.8	25.5	23.2
NewHy HWG	15.7	21.1	18.4
Critana TWG	12.5	14.3	13.4
Manchar SBG	15.9	15.8	15.8
Regar MBG	17.5	12.8	15.1
Paddock MBG	10.0	14.1	12.1
<u>Average</u>	<u>16.0</u>	<u>17.5</u>	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Zinc contents of Northern alfalfa hay.

<u>Maturity Stage</u>	<u>ppm*</u>	<u>Maturity Stage</u>	<u>ppm*</u>
Early bloom	37	Full bloom	26
Mid-bloom	31	Late bloom	26

Beef cow (1200 lb) zinc requirement (ppm*): All production stages 30.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) zinc requirement (ppm**): All production stages 33.

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Copper content (ppm) of the grasses from the plots at Daly's and Vignaroli's in 2004, 2005, and 2006.

<u>Grass</u>	Daly's				Vignaroli's				Overall
	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>Avg.</u>	<u>Average</u>
Luna PWG ¹	7.6	8.1	7.2	7.6	7.3	7.3	10.7	8.4	8.0
Mandan PWG	9.8	9.3	8.4	9.2	10.0	10.0	8.4	8.6	8.9
NewHy HWG	7.3	5.8	4.3	5.8	7.8	7.8	10.7	8.8	7.3
Rosana WWG	8.5	4.2	5.5	6.1	9.8	9.8	9.5	8.7	7.4
Critana TWG	6.6	6.2	8.9	7.2	6.9	6.9	7.3	7.0	7.1
Hycrest CWG	7.6	8.1	6.9	7.5	10.5	10.5	7.7	7.6	7.5
Bozoisky RWR	6.3	7.3	4.1	5.9	5.9	5.9	7.9	6.6	6.2
Manchar SBG	6.8	9.0	8.1	8.0	5.7	5.7	8.8	6.9	7.4
Regar MBG	7.8	6.1	7.8	7.2	5.3	5.3	9.6	7.1	7.2
<u>Average</u>	<u>7.6</u>	<u>7.1</u>	<u>6.8</u>		<u>7.7</u>	<u>7.7</u>	<u>8.9</u>		

¹PWG – pubescent wheatgrass; HWG – hybrid wheatgrass; WWG – western wheatgrass; TWG – thickspike wheatgrass; CWG – crested wheatgrass; RWR – Russian wildrye; SBG – smooth bromegrass; MBG – meadow bromegrass

Copper content (ppm) of the grasses from Daly's field in 2005 and 2006.

<u>Grass</u>	<u>2005</u>	<u>2006</u>	<u>Average</u>
Manska PWG ¹	8.2	7.2	7.7
Oahe IWG	8.6	9.7	9.2
NewHy HWG	7.9	9.5	8.7
Critana TWG	6.4	4.5	5.5
Manchar SBG	7.0	6.3	6.7
Regar MBG	7.0	7.9	7.5
Paddock MBG	3.9	6.2	5.1
<u>Average</u>	<u>7.0</u>	<u>7.3</u>	

¹PWG – pubescent wheatgrass; IWG – intermediate wheatgrass; HWG – hybrid wheatgrass; TWG – thickspike wheatgrass; SBG – smooth bromegrass; MBG – meadow bromegrass

Copper contents of Northern alfalfa hay.

<u>Maturity Stage</u>	<u>ppm*</u>	<u>Maturity Stage</u>	<u>ppm*</u>
Early bloom	11.4	Full bloom	9.9
Mid-bloom	17.1	Late bloom	9.9

Beef cow (1200 lb) copper requirement (ppm*): All production stages 10.

*Nutrient Requirements of Beef Cattle, 7th rev. ed., 1996, National Research Council, National Academy of Science, Washington, D.C.

Sheep ewe (200 lb) copper requirement (ppm**): Gestation 10; lactation 8.

**Nutrient Requirements of Sheep, 6th rev. ed., 1985, National Research Council, National Academy of Science, Washington, D.C.

Rangeland Management Schools

A Rangeland Management 301 School will be held June 5 – 7 at the Willow Creek Ranch at the Hole-in-the-Wall southwest of Kaycee. In addition, there will be a Rangeland Management 501 School in Casper at the Natrona County Extension Office and Fairgrounds the week of June 25. More information on these schools will be forthcoming.

The High Plains Ranch Practicum

The University of Wyoming Cooperative Extension Service and Agricultural Experiment Station along with the University of Nebraska Cooperative Extension Service are providing a hands-on educational program designed to give ranchers the skills and management tools they need to survive in today's complex ranching environment. Applications to attend the Practicum are due by May 1. A brochure and application form is attached. You can also access these and additional information about the Practicum from the following web site: <http://HPRanchPracticum.com>

GRP Rangeland Insurance for Wyoming

Ranchers of Johnson and Sheridan counties are eligible to participate in a Group Risk Plan (GRP) Rangeland Insurance product offered by USDA's Risk Management Agency (RMA). This product is available through crop insurance agencies. If you would like more information on this product an 11-page publication is available from the Johnson County Extension Office or on line at the following website: www.ampc.montana.edu/policypaper/policy8.pdf

Another federal crop insurance plan that was recently approved for Wyoming producers is AGR-Lite – short for Adjusted Gross Revenue-Lite. This is a whole-farm/ranch revenue insurance program that combines all enterprises of a farm or ranch (crop or livestock) and insures against losses in total revenue. Apparently the closing date for this year was March 15 but check with your crop insurance agent on this. A two-page fact sheet on this insurance plan is available from the Johnson County Extension Office or on line at the following website: www.rma.usda.gov/pubs/2003/PAN-1667-07.pdf

Sainfoin

I have received a number of calls seeking information on sainfoin a perennial legume but unfortunately I have not had any experience with this forage crop. However, Montana State University Cooperative Extension Service has a fact sheet available on this forage legume (see attached) and the Plant Sciences department at the University of Wyoming developed a new variety "Shoshone" that was released this past year (see attached press release). Hopefully this information will assist you in deciding whether or not to plant sainfoin. Shoshone and Remount varieties may be included in a grass & alfalfa trial at the Wyoming Girls School.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Glen Whipple, Director, Cooperative Extension Service, University of Wyoming, Laramie, Wyoming 82071.

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