

### Forage Quality Averages by Season and Study Site

Proximate Analysis

Season	Site	Forage type	Family	Species	Dry Matter %	CP	ADF	aNDF	NFC	TDN	Fat (EE)	Ash
<b>Spring</b>	Bench Creek	Grass	Poaceae	Bromus tectorum	94.45	8.82	35.27	58.01	24.55	60.95	1.01	8.50
				Poa secunda								
				Achnatherum hymenoides								
<b>Summer</b>	Bench Creek	Grass	Poaceae	Bromus tectorum	94.96	6.31	38.74	64.63	17.19	54.19	1.20	11.73
				Poa secunda								
<b>Fall</b>	Bench Creek	Grass	Poaceae	Bromus tectorum	95.45	4.71	41.69	65.07	21.76	56.18	1.27	8.03
				Poa secunda								
				Elymus elymoides								
				Achnatherum thurberianum								
<b>Winter</b>	Bench Creek	Grass	Poaceae	Bromus tectorum	95.08	7.74	41.56	60.75	20.53	54.25	1.18	11.00
				Poa secunda								
				Elymus elymoides								
				Achnatherum thurberianum								
<b>Spring</b>	Bench Creek	Forb	Polemoniaceae	Leptodactylon californicum	93.89	11.73	QNS	QNS	QNS	QNS	QNS	15.81
			Brassicaceae	Descurainia pinnata								
<b>Summer</b>	Bench Creek	Forb	Polygonaceae	Eriogonum nudum	94.53	6.36	46.21	58.52	28.98	49.92	1.09	6.11
			Polemoniaceae	Leptodactylon californicum								
<b>Fall</b>	Bench Creek	Forb	Chenopodiaceae	Halogeton glomeratus	95.53	7.63	23.30	34.23	31.44	49.55	1.35	26.08
			Chenopodiaceae	Salsola kali								
			Polygonaceae	Eriogonum nudum								
			Malvaceae	Sphaeralcea sp								
<b>Winter</b>	Bench Creek	forb	Polemoniaceae	Leptodactylon californicum	95.27	5.62	53.64	66.80	20.97	43.35	0.98	6.49

<b>Spring</b>	Bench Creek	Shrub	Asteraceae Chenopodiaceae	Artemisia spinescens Atriplex confertifolia Grayia spinosa	95.21	7.85	46.24	59.09	23.19	42.49	1.69	9.45
	Bench Creek	shrub	Asteraceae Chenopodiaceae Asteraceae Chenopodiaceae	Tetradymia canescens Atriplex confertifolia Ericameria sp. Sarcobatus baileyi	95.71	7.33	36.07	49.51	29.37	47.91	2.11	13.06
<b>Fall</b>	Bench Creek	Shrub	Asteraceae Chenopodiaceae Asteraceae Chenopodiaceae	Ericameria sp. Atriplex confertifolia Artemisia spinescens Grayia spinosa	95.79	5.71	36.11	52.33	26.64	45.98	2.14	14.22
	Bench Creek	shrub	Chenopodiaceae Chenopodiaceae	Atriplex confertifolia Grayia spinosa	95.98	6.90	51.54	66.52	21.49	40.70	1.80	4.95
<b>Spring</b>	Little Angel	Grass	Poaceae	Bromus tectorum Poa secunda	94.34	7.09	30.80	53.10	33.43	61.77	1.18	6.88
	Little Angel	Grass	Poaceae	Bromus tectorum Poa secunda Elymus elymoides Achnatherum thurberianum	95.45	5.76	39.35	66.03	18.23	55.92	1.60	9.32
<b>Fall</b>	Little Angel	Grass	Poaceae	Bromus tectorum Poa secunda Elymus elymoides Achnatherum thurberianum	95.34	4.03	41.89	66.72	21.90	58.62	1.67	6.31
	Little Angel	Grass	Poaceae	Achnatherum thurberianum	94.88	8.59	39.45	QNS	QNS	QNS	QNS	7.05
<b>Summer</b>	Little Angel	Forb	Polemoniaceae Brassicaceae	Leptodactylon californicum Descurainia sp.	94.15	6.40	38.99	43.96	42.10	55.14	2.14	6.14
	Little Angel	Forb	Asteraceae Asteraceae	Gutierrezia sarothrae Chaetadelpa	95.31	5.40	47.22	60.17	30.74	46.72	1.40	3.68
<b>Winter</b>	Little Angel	forb	Polemoniaceae Asteraceae	Leptodactylon californicum Gutierrezia sarothrae	94.93	7.02	43.54	55.99	31.37	QNS	2.68	4.02

<b>Spring</b>	Little Angel	Shrub	Chenopodiaceae	Grayia spinosa	94.94	9.17	39.61	49.85	31.59	50.93	2.58	7.87
			Ephedraceae	Ephedra sp.								
			Asteraceae	Artemisia spinescens Artemisia sp.								
<b>Summer</b>	Little Angel	shrub	Asteraceae	Artemesia sp.	95.05	7.02	39.91	50.67	32.35	52.60	3.18	8.01
			Asteraceae	Chrysothamnus nauseosus								
			Chenopodiaceae	Grayia spinosa								
			Asteraceae	Gutierrezia sarothrae								
			Asteraceae	Tetradymia canescens								
			Caprifoliaceae	Symphoricarpos albus								
			Chenopodiaceae	Sarcobatus baileyi								
			Chenopodiaceae	Atriplex confertifolia								
Chenopodiaceae	Krascheninnikovia lanata											
<b>Fall</b>	Little Angel	Shrub	Asteraceae	Ericameria sp.	94.74	6.63	39.62	50.11	33.59	52.64	3.51	7.52
			Chenopodiaceae	Atriplex confertifolia								
			Chenopodiaceae	Grayia spinosa								
			Asteraceae	Artemesia sp.								
			Chenopodiaceae	Krascheninnikovia lanata								
Asteraceae	Tetradymia canescens											
<b>Spring</b>	Horse Creek	Grass	Poaceae	Bromus tectorum Poa secunda	94.32	7.68	34.00	58.64	25.08	53.06	1.13	8.34
<b>Summer</b>	Horse Creek	Grass	Poaceae	Bromus tectorum Poa secunda	95.27	4.53	39.08	64.82	20.41	47.84	0.86	10.34
<b>Fall</b>	Horse Creek	Grass	Poaceae	Bromus tectorum Poa secunda Elymus elymoides	95.93	3.54	42.52	63.05	19.70	52.79	0.77	13.57
<b>Winter</b>	Horse Creek	Grass	Poaceae	Bromus tectorum	95.03	3.57	QNS	QNS	QNS	QNS	QNS	QNS
<b>Spring</b>	Horse Creek	Forb	Geraniaceae	Erodium sp.	93.10	QNS	QNS	QNS	QNS	QNS	QNS	QNS
			Malvaceae	Sphaeralcea sp								
			Boraginaceae	Amsinckia menziesii								
<b>Summer</b>	Horse Creek	Forb	Polemoniaceae	Leptodactylon californicum	94.53	6.36	46.21	58.52	28.98	49.92	1.09	6.11
			Malvaceae	Sphaeralcea sp								

<b>Spring</b>	Horse Creek	Shrub	Asteraceae	Chrysothamnus nauseosus Artemisia sp.	93.81	9.73	35.10	40.34	41.65	65.21	4.85	4.73
<b>Summer</b>	Horse Creek	shrub	Asteraceae Asteraceae Chenopodiaceae Asteraceae Asteraceae	Artemesia sp. Chrysothamnus nauseosus Atriplex confertifolia Ericameria sp. Tetradymia canescens	94.75	6.10	37.55	44.31	39.32	55.24	3.35	7.95
<b>Fall</b>	Horse Creek	Shrub	Asteraceae Chenopodiaceae Chenopodiaceae Asteraceae	Ericameria sp. Atriplex confertifolia Grayia spinosa Artemesia sp.	94.74	6.38	33.38	42.44	42.68	56.96	2.70	7.30
<b>Winter</b>	Horse Creek	shrub	Asteraceae Asteraceae	Chrysothamnus nauseosus Artemesia sp.	94.52	7.28	39.20	45.43	39.49	61.24	5.03	3.84
<b>Summer</b>	Deep canyon	Grass	Poaceae	Agropyron spicatum Bromus tectorum Poa secunda Achnatherum hymenoides	95.38	6.24	40.64	64.20	21.08	56.74	1.33	8.10
<b>Fall</b>	Deep canyon	Grass	Poaceae	Bromus tectorum Poa secunda Elymus elymoides Achnatherum thurberianum	95.65	4.20	44.86	63.31	20.67	53.41	1.16	11.29
<b>Winter</b>	Deep Canyon	Grass	Poaceae	Bromus tectorum	95.44	2.71	48.14	71.48	19.21	52.91	0.58	6.66
<b>Summer</b>	Deep canyon	Forb	Rubiaceae Scrophulariaceae Onagraceae Asteraceae	Galium multiflorum Scrophularia montana Epilobium sp. Machaeranthera canescens	94.78	8.47	40.05	49.00	33.77	60.81	3.57	6.88
<b>Fall</b>	Deep Canyon	Forb	Polemoniaceae Polygonaceae	Leptodactylon californicum Eriogonum microthecum	95.24	4.54	56.65	63.20	30.10	42.13	0.78	2.29
<b>Winter</b>	Deep Canyon	forb	Asteraceae	Gutierrezia sarothrae	94.14	7.90	38.91	55.97	30.01	61.96	4.43	2.95

<b>Summer</b>	Deep canyon	shrub	Asteraceae	Chrysothamnus nauseosus									
			Asteraceae	Artemesia sp.	94.67	9.49	38.71	43.76	37.45	57.02	3.19	6.97	
			Grossulariaceae	Ribes velutinum									
<b>Fall</b>	Deep canyon	Shrub	Rosaceae	Holodiscus discolor									
			Chenopodiaceae	Grayia spinosa									
			Asteraceae	Artemesia sp.	93.86	6.97	36.95	48.27	35.56	58.22	4.77	5.50	
			Asteraceae	Ericameria sp.									
<b>Winter</b>	Deep canyon	shrub	Asteraceae	Chrysothamnus nauseosus									
			Rosaceae	Prunus andersonii	95.66	3.42	55.19	QNS	QNS	QNS	1.06	QNS	
<b>Summer</b>	Cow Canyon	Grass	Poaceae	Hesperostipa comata									
				Bromus tectorum									
				Poa secunda									
				Achnatherum hymenoides	95.33	5.12	41.69	71.19	16.66	56.39	1.11	6.79	
				Achnatherum thurberianum									
<b>Fall</b>	Cow Canyon	Grass	Poaceae	Leymus cinereus									
				Elymus elymoides									
				Bromus tectorum									
				Poa secunda	95.73	5.49	43.55	67.26	17.53	54.64	1.39	9.18	
<b>Winter</b>	Cow Canyon	Grass	Poaceae	Elymus elymoides									
				Leymus cinereus									
				Bromus tectorum	93.71	3.28	QNS	QNS	QNS	QNS	QNS	6.31	

<b>Summer</b>	Cow Canyon	Forb	Polygonaceae	Eriogonum microthecum	94.91	6.51	53.95	56.35	19.96	38.27	1.24	17.61
			Polemoniaceae	Leptodactylon californicum								
			Chenopodiaceae	Salsola kali								
			Scrophulariaceae	Scrophularia montana								
			Asteraceae	Crepis accuminata								
Asteraceae	Erigeron aphanactis											
<b>Fall</b>	Cow Canyon	Forb	Polemoniaceae	Leptodactylon californicum	93.64	8.22	39.66	46.47	32.71	62.86	3.37	9.87
			Asteraceae	Lactuca sp.								
			Asteraceae	Crepis sp.								
			Onagraceae	Epilobium								
<b>Summer</b>	Cow Canyon	shrub	Asteraceae	Artemesia sp.	95.22	8.25	38.02	47.09	31.95	52.50	3.57	10.10
			Asteraceae	Chrysothamnus nauseosus								
			Chenopodiaceae	Atriplex confertifolia								
			Asteraceae	Gutierrezia sarothrae								
			Asteraceae	Ericameria sp.								
Asteraceae	Tetradymia canescens											
<b>Fall</b>	Cow Canyon	Shrub	Asteraceae	Chrysothamnus nauseosus	94.21	6.20	47.02	63.37	26.19	QNS	QNS	5.30

1) National Research Council. (1985). *Nutrient requirements of sheep* . Washington, D.C.: National Academy Press

### Forage Quality Averages by Season and Study Site

Season	Site	Forage type	Family	Species	Macro Minerals Requirement <sup>1</sup>							
					0.2-0.82 Ca%	0.16-0.38 P%	0.12-0.18 Mg%	0.5-0.8 K%	0.09-0.18 Na%	0.14-0.26 Cl%	0.14-0.26 S%	
Spring	Bench Creek	Grass	Poaceae	Bromus tectorum								
				Poa secunda	0.76	0.44	0.31	1.55	0.10	0.60	0.14	
				Achnatherum hymenoides								
Summer	Bench Creek	Grass	Poaceae	Bromus tectorum								
				Poa secunda	0.73	0.164	0.52	0.91	0.11	0.37	0.14	
Fall	Bench Creek	Grass	Poaceae	Bromus tectorum								
				Poa secunda								
				Elymus elymoides	0.43	<b>0.036</b>	0.24	0.96	<b>0.06</b>	0.41	0.18	
				Achnatherum thurberianum								
Winter	Bench Creek	Grass	Poaceae	Bromus tectorum								
				Poa secunda								
				Elymus elymoides	0.39	0.23	<b>0.02</b>	0.54	<b>0.03</b>	0.21	0.17	
				Achnatherum thurberianum								
Spring	Bench Creek	Forb	Polemoniaceae	Leptodactylon californicum	<b>0.11</b>	0.53	<b>0.11</b>	2.42	0.38	QNS	0.33	
			Brassicaceae	Descurainia pinnata								
Summer	Bench Creek	Forb	Polygonaceae	Eriogonum nudum	0.36	<b>0.039</b>	0.27	0.93	0.09	0.16	0.19	
			Polemoniaceae	Leptodactylon californicum								
Fall	Bench Creek	Forb	Chenopodiaceae	Halogeton glomeratus								
			Chenopodiaceae	Salsola kali	0.42	0.65	0.24	2.75	6.94	2.02	0.27	
			Polygonaceae	Eriogonum nudum								
			Malvaceae	Sphaeralcea sp								
Winter	Bench Creek	forb	Polemoniaceae	Leptodactylon californicum	0.41	0.78	<b>0.01</b>	0.57	<b>0.02</b>	0.02	0.19	

Spring	Bench Creek	Shrub	Asteraceae	Artemisia spinescens								
			Chenopodiaceae	Atriplex confertifolia	0.40	0.79	<b>0.01</b>	0.98	1.63	1.38	0.29	
Summer	Bench Creek	shrub	Asteraceae	Tetradymia canescens								
			Chenopodiaceae	Atriplex confertifolia	0.34	0.31	0.29	1.32	3.00	1.18	0.43	
			Asteraceae	Ericameria sp.								
Fall	Bench Creek	Shrub	Chenopodiaceae	Sarcobatus baileyi								
			Asteraceae	Ericameria sp.								
			Chenopodiaceae	Atriplex confertifolia	<b>0.11</b>	0.19	0.17	1.33	2.39	0.79	0.37	
Winter	Bench Creek	shrub	Asteraceae	Artemisia spinescens								
			Chenopodiaceae	Grayia spinosa								
Spring	Little Angel	Grass	Poaceae	Atriplex confertifolia	<b>0.11</b>	0.78	<b>0.03</b>	0.58	0.77	0.27	0.23	
			Chenopodiaceae	Grayia spinosa								
Spring	Little Angel	Grass	Poaceae	Bromus tectorum	0.39	0.48	0.18	1.21	<b>0.04</b>	0.43	<b>0.13</b>	
			Poaceae	Poa secunda								
Summer	Little Angel	Grass	Poaceae	Bromus tectorum								
			Poaceae	Poa secunda	0.81	0.176	0.54	0.87	0.03	0.34	0.16	
			Poaceae	Elymus elymoides								
Fall	Little Angel	Grass	Poaceae	Achnatherum thurberianum								
			Poaceae	Bromus tectorum								
			Poaceae	Poa secunda	0.34	<b>0.061</b>	0.43	0.61	0.03	0.34	0.16	
Winter	Little Angel	Grass	Poaceae	Elymus elymoides								
			Poaceae	Achnatherum thurberianum	0.41	0.25	0.24	0.75	<b>0.01</b>	0.32	0.15	
Summer	Little Angel	Forb	Polemoniaceae	Leptodactylon californicum	0.41	<b>0.045</b>	0.30	0.86	0.25	0.15	0.20	
			Brassicaceae	Descurainia sp.								
Fall	Little Angel	Forb	Asteraceae	Gutierrezia sarothrae	0.32	0.73	0.14	1.13	0.39	0.24	0.16	
			Asteraceae	Chaetadelpa								
Winter	Little Angel	forb	Polemoniaceae	Leptodactylon californicum	0.51	0.79	<b>0.00</b>	0.79	<b>0.03</b>	0.09	0.14	
			Asteraceae	Gutierrezia sarothrae								



Spring	Little Angel	Shrub	Chenopodiaceae	Grayia spinosa							
			Ephedraceae	Ephedra sp.	0.32	0.79	<b>0.03</b>	1.11	1.09	0.39	0.21
			Asteraceae	Artemisia spinescens Artemisia sp.							
Summer	Little Angel	shrub	Asteraceae	Artemesia sp.							
			Asteraceae	Chrysothamnus nauseosus							
			Chenopodiaceae	Grayia spinosa							
			Asteraceae	Gutierrezia sarothrae							
			Asteraceae	Tetradymia canescens	0.23	<b>0.036</b>	0.44	1.51	0.95	0.57	0.25
			Caprifoliaceae	Symphoricarpos albus							
			Chenopodiaceae	Sarcobatus baileyi							
			Chenopodiaceae	Atriplex confertifolia							
Chenopodiaceae	Krascheninnikovia lanata										
Fall	Little Angel	Shrub	Asteraceae	Ericameria sp.							
			Chenopodiaceae	Atriplex confertifolia							
			Chenopodiaceae	Grayia spinosa	0.24	0.20	0.24	1.25	0.77	0.52	0.22
			Asteraceae	Artemesia sp.							
			Chenopodiaceae	Krascheninnikovia lanata							
Asteraceae	Tetradymia canescens										
Spring	Horse Creek	Grass	Poaceae	Bromus tectorum Poa secunda	0.26	0.78	0.12	1.34	<b>0.03</b>	0.35	<b>0.13</b>
Summer	Horse Creek	Grass	Poaceae	Bromus tectorum Poa secunda	<b>0.18</b>	0.237	0.59	0.53	0.06	0.19	0.14
Fall	Horse Creek	Grass	Poaceae	Bromus tectorum							
				Poa secunda Elymus elymoides	0.60	0.165	0.43	0.51	0.06	0.15	0.10
Winter	Horse Creek	Grass	Poaceae	Bromus tectorum	0.20	0.18	<b>0.02</b>	<b>0.23</b>	<b>0.05</b>	QNS	<b>0.05</b>
Spring	Horse Creek	Forb	Geraniaceae	Erodium sp.							
			Malvaceae	Sphaeralcea sp	0.37	0.80	<b>0.11</b>	2.53	0.40	QNS	0.81
			Boraginaceae	Amsinckia menziesii							
Summer	Horse Creek	Forb	Polemoniaceae	Leptodactylon californicum	0.43	<b>0.045</b>	0.22	0.93	0.09	0.16	0.19
			Malvaceae	Sphaeralcea sp							

Spring	Horse Creek	Shrub	Asteraceae	Chrysothamnus nauseosus Artemisia sp.	0.21	0.81	<b>0.09</b>	1.16	0.23	0.39	0.22
	Summer	Horse Creek	shrub	Asteraceae	Artemisia sp.	0.38	<b>0.053</b>	<b>0.44</b>	1.30	0.44	0.21
Asteraceae				Chrysothamnus nauseosus							
Chenopodiaceae				Atriplex confertifolia							
Asteraceae				Ericameria sp.							
Fall	Horse Creek	Shrub	Asteraceae	Ericameria sp.	0.23	0.42	<b>0.00</b>	1.25	0.42	0.25	0.23
			Chenopodiaceae	Atriplex confertifolia							
			Chenopodiaceae	Grayia spinosa							
Winter	Horse Creek	shrub	Asteraceae	Chrysothamnus nauseosus	0.20	0.81	0.29	0.86	<b>0.07</b>	0.07	0.18
			Asteraceae	Artemisia sp.							
Summer	Deep canyon	Grass	Poaceae	Agropyron spicatum	0.26	0.173	0.37	1.20	0.12	0.74	0.16
				Bromus tectorum							
				Poa secunda							
				Achnatherum hymenoides							
Fall	Deep canyon	Grass	Poaceae	Bromus tectorum	0.58	<b>0.124</b>	0.49	0.86	<b>0.06</b>	0.39	0.14
				Poa secunda							
				Elymus elymoides							
				Achnatherum thurberianum							
Winter	Deep Canyon	Grass	Poaceae	Bromus tectorum	<b>0.10</b>	0.20	0.25	<b>0.14</b>	<b>0.02</b>	0.02	<b>0.05</b>
Summer	Deep canyon	Forb	Rubiaceae	Galium multiflorum	0.33	<b>0.051</b>	0.45	1.49	<b>0.06</b>	0.47	0.15
			Scrophulariaceae	Scrophularia montana							
			Onagraceae	Epilobium sp.							
			Asteraceae	Machaeranthera canescens							
Fall	Deep Canyon	Forb	Polemoniaceae	Leptodactylon californicum	0.43	0.29	0.18	0.82	<b>0.06</b>	0.20	<b>0.12</b>
			Polygonaceae	Eriogonum microthecum							
Winter	Deep Canyon	forb	Asteraceae	Gutierrezia sarothrae	<b>0.16</b>	0.80	0.60	0.85	<b>0.02</b>	0.04	0.18

Summer	Deep canyon	shrub	Asteraceae	Chrysothamnus nauseosus							
			Asteraceae	Artemesia sp.	0.43	<b>0.086</b>	<b>0.64</b>	2.00	0.09	0.51	0.21
			Grossulariaceae	Ribes velutinum							
Fall	Deep canyon	Shrub	Rosaceae	Holodiscus discolor							
			Chenopodiaceae	Grayia spinosa							
			Asteraceae	Artemesia sp.	0.22	0.30	<b>0.05</b>	1.39	0.14	0.27	0.20
			Asteraceae	Ericameria sp.							
Winter	Deep canyon	shrub	Asteraceae	Chrysothamnus nauseosus							
			Rosaceae	Prunus andersonii	0.24	0.81	<b>0.06</b>	0.26	0.09	QNS	<b>0.05</b>
Summer	Cow Canyon	Grass	Poaceae	Hesperostipa comata							
				Bromus tectorum							
				Poa secunda							
				Achnatherum hymenoides	0.22	0.188	0.39	1.02	0.11	0.50	0.14
				Achnatherum thurberianum							
Fall	Cow Canyon	Grass	Poaceae	Bromus tectorum							
				Poa secunda							
				Elymus elymoides	0.51	0.273	0.46	0.99	<b>0.06</b>	0.48	0.14
				Leymus cinereus							
Winter	Cow Canyon	Grass	Poaceae	Bromus tectorum	<b>0.00</b>	0.16	0.17	<b>0.18</b>	<b>0.01</b>	0.02	<b>0.05</b>
				Elymus elymoides							

Summer	Cow Canyon	Forb	Polygonaceae	Eriogonum microthecum							
			Polemoniaceae	Leptodactylon californicum							
			Chenopodiaceae	Salsola kali	0.31	<b>0.052</b>	0.36	1.26	0.40	0.24	0.15
			Scrophulariaceae	Scrophularia montana							
			Asteraceae	Crepis accuminata							
			Asteraceae	Erigeron aphanactis							
Fall	Cow Canyon	Forb	Polemoniaceae	Leptodactylon californicum							
			Asteraceae	Lactuca sp.	0.29	0.23	0.26	2.39	0.02	0.95	0.29
			Asteraceae	Crepis sp.							
			Onagraceae	Epilobium							
Summer	Cow Canyon	shrub	Asteraceae	Artemesia sp.							
			Asteraceae	Chrysothamnus nauseosus							
			Chenopodiaceae	Atriplex confertifolia	0.28	<b>0.140</b>	0.39	2.22	2.00	1.39	0.28
			Asteraceae	Gutierrezia sarothrae							
			Asteraceae	Ericameria sp.							
			Asteraceae	Tetradymia canescens							
Fall	Cow Canyon	Shrub	Asteraceae	Chrysothamnus nauseosus	0.39	0.24	0.28	1.44	0.12	QNS	0.40

1) National Research Council. (1985). *Nutrient requirements of sheep*. Washington, D.C.: National Academy Press

**Forage Quality Averages by Season and Study Site**

Season	Site	Foragetype	Family	Species	Micro Minerals						
					Requirement/Maimum Tolerable Level <sup>1</sup>						
					0.1-0.2/10 Co ppm	0.5/10 Mo ppm	0.1-0.2/2 Se ppm	20-33/750 Zn ppm	30-50/500 Fe ppm	20-40/1,000 Mn ppm	7.0-11.0/25 Cu ppm
<b>Spring</b>	Bench Creek	Grass	Poaceae	Bromus tectorum							
				Poa secunda	0.47	1.58	<b>0.05</b>	90.32	34.20	253.40	14.00
				Achnatherum hymenoides							
<b>Summer</b>	Bench Creek	Grass	Poaceae	Bromus tectorum	1.08	2.14	<b>0.05</b>	50.41	165.80	38.10	12.76
				Poa secunda							
<b>Fall</b>	Bench Creek	Grass	Poaceae	Bromus tectorum							
				Poa secunda							
				Elymus elymoides	0.47	1.69	<b>0.07</b>	44.77	42.46	173.20	26.80
				Achnatherum thurberianum							
<b>Winter</b>	Bench Creek	Grass	Poaceae	Bromus tectorum							
				Poa secunda							
				Elymus elymoides	0.20	1.57	<b>0.05</b>	31.43	117	178.5	18.3
				Achnatherum thurberianum							
<b>Spring</b>	Bench Creek	Forb	Polemoniaceae	Leptodactylon californicum	1.12	1.86	<b>0.05</b>	29.66	371.90	483.90	31.10
			Brassicaceae	Descurainia pinnata							
<b>Summer</b>	Bench Creek	Forb	Polygonaceae	Eriogonum nudum	0.20	0.49	<b>0.05</b>	42.35	45.91	121.60	26.92
			Polemoniaceae	Leptodactylon californicum							
<b>Fall</b>	Bench Creek	Forb	Chenopodiaceae	Halogeton glomeratus							
			Chenopodiaceae	Salsola kali	0.22	1.07	<b>0.09</b>	<b>913.50</b>	71.41	164.90	23.96
			Polygonaceae	Eriogonum nudum							
			Malvaceae	Sphaeralcea sp							
<b>Winter</b>	Bench Creek	forb	Polemoniaceae	Leptodactylon californicum	0.38	0.90	<b>0.05</b>	48.14	57.15	204.40	17.70

<b>Spring</b>	Bench Creek	Shrub	Asteraceae	Artemisia spinescens	0.40	0.86	<b>0.05</b>	46.77	75.52	72.53	17.80
			Chenopodiaceae	Atriplex confertifolia Grayia spinosa							
<b>Summer</b>	Bench Creek	shrub	Asteraceae	Tetradymia canescens	0.38	<b>0.49</b>	<b>0.08</b>	289.20	61.47	68.32	15.66
			Chenopodiaceae	Atriplex confertifolia							
			Asteraceae	Ericameria sp.							
<b>Fall</b>	Bench Creek	Shrub	Chenopodiaceae	Sarcobatus baileyi	0.26	0.77	0.10	73.72	92.80	96.70	22.95
			Asteraceae	Ericameria sp.							
			Asteraceae	Atriplex confertifolia							
			Chenopodiaceae	Artemisia spinescens Grayia spinosa							
<b>Winter</b>	Bench Creek	shrub	Chenopodiaceae	Atriplex confertifolia	0.20	<b>0.42</b>	<b>0.07</b>	25.36	<b>20.54</b>	104.70	10.95
			Chenopodiaceae	Grayia spinosa							
<b>Spring</b>	Little Angel	Grass	Poaceae	Bromus tectorum	0.31	1.20	<b>0.05</b>		<b>22.29</b>	334.80	<b>27.30</b>
				Poa secunda							
<b>Summer</b>	Little Angel	Grass	Poaceae	Bromus tectorum	0.62	1.60	<b>0.05</b>	<b>10.52</b>	180.50	106.70	8.90
				Poa secunda							
				Elymus elymoides							
				Achnatherum thurberianum							
<b>Fall</b>	Little Angel	Grass	Poaceae	Bromus tectorum	0.20	1.55	<b>0.05</b>	40.53	113.80	58.99	26.52
				Poa secunda							
				Elymus elymoides							
				Achnatherum thurberianum							
<b>Winter</b>	Little Angel	Grass	Poaceae	Achnatherum thurberianum	0.20	1.24	<b>0.05</b>	<b>15.88</b>	157.80	183.40	15.20
<b>Summer</b>	Little Angel	Forb	Polemoniaceae	Leptodactylon californicum	0.41	1.06	<b>0.07</b>	<b>13.97</b>	66.48		27.22
			Brassicaceae	Descurainia sp.							
<b>Fall</b>	Little Angel	Forb	Asteraceae	Gutierrezia sarothrae	0.38	0.70	<b>0.06</b>	263.40	81.49	63.34	14.42
			Asteraceae	Chaetadelpa							
<b>Winter</b>	Little Angel	forb	Polemoniaceae	Leptodactylon californicum	0.31	<b>0.43</b>	<b>0.00</b>	43.48	51.96	217.70	14.60
			Asteraceae	Gutierrezia sarothrae							

Spring	Little Angel	Shrub	Chenopodiaceae	Grayia spinosa	0.38	0.85	0.08	42.22	7.74	480.50	17.60
			Ephedraceae	Ephedra sp.							
			Asteraceae	Artemisia spinescens Artemisia sp.							
Summer	Little Angel	shrub	Asteraceae	Artemisia sp.	0.33	0.75	0.10	28.24	44.32	59.10	25.34
			Asteraceae	Chrysothamnus nauseosus							
			Chenopodiaceae	Grayia spinosa							
			Asteraceae	Gutierrezia sarothrae							
			Asteraceae	Tetradymia canescens							
			Caprifoliaceae	Symphoricarpos albus							
			Chenopodiaceae	Sarcobatus baileyi							
			Chenopodiaceae	Atriplex confertifolia							
Chenopodiaceae	Krascheninnikovia lanata										
Fall	Little Angel	Shrub	Asteraceae	Ericameria sp.	0.31	0.65	0.05	93.72	59.02	95.40	15.97
			Chenopodiaceae	Atriplex confertifolia							
			Chenopodiaceae	Grayia spinosa							
			Asteraceae	Artemisia sp.							
			Chenopodiaceae	Krascheninnikovia lanata							
Asteraceae	Tetradymia canescens										
Spring	Horse Creek	Grass	Poaceae	Bromus tectorum	0.45	1.51	0.05	22.28	17.81	196.80	
Summer	Horse Creek	Grass	Poaceae	Bromus tectorum	0.83	1.51	0.33	10.80	185.60	100.80	12.77
				Poa secunda							
Fall	Horse Creek	Grass	Poaceae	Bromus tectorum	0.99	1.85	0.05	34.86	168.50	114.20	18.99
				Poa secunda							
Winter	Horse Creek	Grass	Poaceae	Elymus elymoides	0.64	2.22	0.05	15.45	276.20	140.60	5.90
				Bromus tectorum							
Spring	Horse Creek	Forb	Geraniaceae	Erodium sp.	0.22	2.04	0.12	11.96	48.85	164.20	32.40
			Malvaceae	Sphaeralcea sp							
			Boraginaceae	Amsinckia menziesii							
Summer	Horse Creek	Forb	Asteraceae	Lactuca sp.	0.20	0.49	0.05	41.83	20.30	172.20	26.45
			Polemoniaceae	Leptodactylon californicum							
			Malvaceae	Sphaeralcea sp							

Spring	Horse Creek	Shrub	Asteraceae	Chrysothamnus nauseosus Artemisia sp.	0.22	1.02	<b>0.07</b>	56.54	38.06	460.40	12.30
	Summer	Horse Creek	shrub	Asteraceae	Artemisia sp.	0.42	0.61	0.10	25.13	49.35	
Asteraceae				Chrysothamnus nauseosus							
Chenopodiaceae				Atriplex confertifolia							
Asteraceae				Ericameria sp.							
Fall	Horse Creek	Shrub	Asteraceae	Ericameria sp.	0.30	<b>0.33</b>	<b>0.05</b>	65.90	109.04	92.68	<b>28.75</b>
			Chenopodiaceae	Atriplex confertifolia							
			Chenopodiaceae	Grayia spinosa							
Winter	Horse Creek	shrub	Asteraceae	Chrysothamnus nauseosus	0.21	1.62	0.15	70.82	<b>16.68</b>	118.60	14.40
			Asteraceae	Artemisia sp.							
Summer	Deep canyon	Grass	Poaceae	Agropyron spicatum	0.39	1.44	1.44	<b>16.50</b>	187.70	132.10	17.20
				Bromus tectorum							
				Poa secunda							
				Achnatherum hymenoides							
Fall	Deep canyon	Grass	Poaceae	Bromus tectorum	0.48	1.38	<b>0.05</b>	34.55	167.80	114.66	7.69
				Poa secunda							
				Elymus elymoides							
				Achnatherum thurberianum							
Winter	Deep Canyon	Grass	Poaceae	Bromus tectorum	0.53	1.28	<b>0.05</b>	19.12		54.20	<b>4.20</b>
Summer	Deep canyon	Forb	Rubiaceae	Galium multiflorum	0.20	<b>0.43</b>	<b>0.05</b>	32.54	104.20	57.42	<b>26.10</b>
			Scrophulariaceae	Scrophularia montana							
			Onagraceae	Epilobium sp.							
			Asteraceae	Machaeranthera canescens							
Fall	Deep Canyon	Forb	Polemoniaceae	Leptodactylon californicum	0.20	<b>0.30</b>	<b>0.05</b>	281.00	74.28	65.82	<b>28.28</b>
			Polygonaceae	Eriogonum microthecum							
Winter	Deep Canyon	forb	Asteraceae	Gutierrezia sarothrae	0.22	0.92	<b>0.05</b>	<b>16.15</b>	333.40	131.70	<b>33.21</b>



<b>Summer</b>	Deep canyon	shrub	Asteraceae	Chrysothamnus nauseosus							
			Asteraceae	Artemesia sp.	0.20	0.60	<b>0.06</b>	24.57	47.28	81.35	<b>26.75</b>
			Grossulariaceae	Ribes velutinum							
<b>Fall</b>	Deep canyon	Shrub	Rosaceae	Holodiscus discolor							
			Chenopodiaceae	Grayia spinosa							
			Asteraceae	Artemesia sp.	0.22	0.53	<b>0.05</b>	68.30	102.64	90.54	<b>160.10</b>
			Asteraceae	Ericameria sp.							
<b>Winter</b>	Deep canyon	shrub	Asteraceae	Chrysothamnus nauseosus							
			Rosaceae	Prunus andersonii	0.20	<b>0.30</b>	<b>0.05</b>	46.87	<b>8.08</b>	188.00	15.10
<b>Summer</b>	Cow Canyon	Grass	Poaceae	Hesperostipa comata							
				Bromus tectorum							
				Poa secunda							
				Achnatherum hymenoides	0.34	1.84	<b>0.06</b>	23.58	136.90		7.95
				Achnatherum thurberianum							
<b>Fall</b>	Cow Canyon	Grass	Poaceae	Bromus tectorum							
				Poa secunda							
				Elymus elymoides	0.27	1.44	<b>0.05</b>	26.96	167.60	154.20	<b>7.27</b>
				Leymus cinereus							
<b>Winter</b>	Cow Canyon	Grass	Poaceae	Bromus tectorum							
				Elymus elymoides	0.42	1.27	<b>0.05</b>	<b>18.15</b>	119.70	173.90	11.00

Summer	Cow Canyon	Forb	Polygonaceae	Eriogonum microthecum							
			Polemoniaceae	Leptodactylon californicum							
			Chenopodiaceae	Salsola kali	1.37	1.48	<b>0.06</b>	24.39	102.70	111.70	26.59
			Scrophulariaceae	Scrophularia montana							
			Asteraceae	Crepis accuminata							
Fall	Cow Canyon	Forb	Asteraceae	Erigeron aphanactis							
			Polemoniaceae	Leptodactylon californicum							
			Asteraceae	Lactuca sp.	0.20	1.92	<b>0.05</b>	170.70	38.78	159.70	<b>29.73</b>
			Asteraceae	Crepis sp.							
Summer	Cow Canyon	shrub	Onagraceae	Epilobium							
			Asteraceae	Artemesia sp.							
			Asteraceae	Chrysothamnus nauseosus							
			Chenopodiaceae	Atriplex confertifolia	0.20	1.24	<b>0.07</b>	32.75	104.40	99.75	26.91
			Asteraceae	Gutierrezia sarothrae							
Fall	Cow Canyon	Shrub	Asteraceae	Ericameria sp.							
			Asteraceae	Tetradymia canescens							
			Asteraceae	Chrysothamnus nauseosus	0.20	0.59	<b>0.05</b>	160.00	35.81	75.33	10.74

1) National Research Council. (1985). *Nutrient requirements of sheep*. Washington, D.C.: National Academy Press

