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Nutritional Value of Range Plants in the Edwards Plateau Region of Texas

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Contents

Introduction 1

Procedure 1

Results and Discussion 2

Application 3

Conclusion 4

Literature Cited 4

Appendix: Nutrient composition of range plants in the Edwards Plateau region 5-16

KEYWORDS: Nutrition/range plants/Edwards Plateau/forage/animal production/Texas.

Nutritional Value of Range Plants in the Edwards Plateau Region of Texas

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The Edwards Plateau region of Texas comprises about 24 million acres of mostly rough terrain, well suited for production of cattle, sheep, and goats. The region also supports large populations of deer, turkey, javelina, and quail. The region lies north and northeast of the Rio Grande River at Del Rio and is bordered on the south and east by the Balcones Escarpment. The northern and western edges grade into the Rolling Plains and Trans-Pecos regions, respectively, with no distinct boundary. Soils are mostly calcareous clays and clay loams derived from limestone, with the exception of one fairly large area, the Central Basin, which is typified by sandy, granitic soils.

Average annual precipitation varies from about 33 inches on the eastern edge of the region to less than 15 inches on the western edge. The region receives below average rainfall during more than half the year. The most common wet months are May and September, although peak rainfall may occur during any month of the year. Typically, the winters and mid-summers are dry.

Temperature extremes during most years range from about 10°F to 110°F, with about equal numbers of days below 20°F and above 100°F. The frost-free period is usually from mid-March to mid-November, although early and late frosts are common.

Vegetation in the region is a complex mixture of grasses, forbs, and shrubs, highly variable in growth pattern and form. Historical information indicates that the woody or brush species were once minor components confined primarily to the dry stream beds, heads of draws, and to scattered tree motts. The upland flats and valleys were predominantly mixtures of grasses and forbs species. Extended periods of heavy use by livestock and deer have changed the forage species composition, but good diversity of vegetation still exists in much of the region. Because cattle, sheep, goats, and deer have unique diet preferences, greater efficiency of production is possible by grazing combinations of animals. Previous short-term studies of plant composition and animal diets in the Edwards Plateau have been reported (Cory, 1927; Fraps and Cory, 1940). However, greater refinement in accessing relative grazing values of these plants is needed to manage more effectively for a desirable combination of plants and to predict nutrient deficiencies of grazing animals. The nutritive value of Edwards Plateau plants and plant parts and the effects of season and climatic conditions on nutritive values were determined over a 3-year period (1973-75) as an initial phase of long-term research directed toward improving knowledge of range animal nutrition.

Procedure

Location

Plant samples were collected on the Texas A&M University Research Station at Sonora, located in Edwards and Sutton counties. The long-term studies of various grazing systems at the Research Station have resulted in a large variation in vegetative composition among the pastures, thus affording opportunity to select many plant species from a common environment. Therefore, differences in nutrient concentrations are considered inherent to the plants and not the result of grossly different soils or climatic parameters. Soil on the Research Station is mostly Tarrant stony clay.

Sampling Procedure

Samples were taken at monthly intervals. Some collection dates were during favorable growth periods and others were during extremely unfavorable periods. Samples were either total plant, selected plant parts, or "plucked" (simulated grazed sample). Samples were sealed in airtight plastic containers and taken to the laboratory at San Angelo, Texas, for weighing, drying, and analytical testing.

Analytical Procedures

Samples were analyzed for water, ash, cell wall (first year only), phosphorus (P), crude protein (CP), and digestible organic matter (DOM) contents. Fresh samples were weighed, dried at 60°C for 24 to 48 hours, reweighed to determine water content, ground through a 1-mm screen, and stored in glass containers. Ash and CP were determined by standard procedures (AOAC, 1970). Cell wall was determined by neutral detergent extraction (Van Soest and Wine, 1967) and phosphorus by a colorimetric method (Murphy and Riley, 1962). DOM was estimated *in vitro* by a two-stage procedure of incubating the sample in strained rumen fluid for 48 hours, followed by neutral detergent extraction (Van Soest, Wine and

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Moore, 1966). *In vitro* estimates were corrected to live animal values using standard forages of known *in vitro* and live animal digestibilities. DOM is a measure of the digestible energy value of feeds and closely approximates total digestible nutrients (TDN). Except for water, all values are expressed as percentages of dry matter. Statistical tests for differences between plants and seasons included analysis of variance and studentized range tests (Snedecor, 1956). Common and scientific plant names are listed according to Gould (1975).

Results and Discussion

Results from analyses of 573 samples that included one or more samples of 34 grasses, 42 forbs, and 19 browse species are reported in Appendix Table 1. Water, crude protein, digestible organic matter, and phosphorus contents in many of these plants were summarized and will be discussed in detail. Ash and cell wall contents were included for reference purposes and were not summarized.

Variations in the concentration of nutrients in the flora are indicative of the diversity of growth forms and phenology of Edwards Plateau range plants. In general, concentration of nutrients of a particular species was highest early in its growth period and lowest after growth had ceased, during dormancy. Because various species initiate growth at different times of the year, these nutrient peaks and lows occurred during various months. Usually, a mid-season peak occurred for warm-season, perennial grasses in response to favorable growth conditions. September was the most common month for this peak; however, mid-season peaks occurred from July through October. Precipitation during the 3-year period was above average, especially during July and August. Otherwise, the overall pattern was considered typical (Table 1).

Data collected on several representative plants were summarized in Tables 2 through 5 to illustrate the effects of plant type and season on concentrations of nutrients. Within the perennial, warm-season

TABLE 1. RAINFALL DURING 1973, 1974, AND 1975 AT THE TEXAS A&M UNIVERSITY RESEARCH STATION, SONORA, TEXAS

	Rainfall (In.)			
Month	1973	1974	1975	Average
January	0.45	0.23	2.28	0.99
February	1.87	0.00	3.18	1.68
March	0.31	1.23	0.10	0.55
April	0.68	3.15	3.50	2.44
May	0.87	5.18	5.10	3.72
June	1.16	1.23	1.47	1.29
July	4.68	1.25	5.45	3.79
August	0.00	11.77	0.53	4.10
September	5.01	7.26	2.09	4.79
October	6.22	4.44	1.76	4.14
November	0.18	1.29	2.72	1.40
December	0.00	2.13	0.19	0.77
TOTAL	21.43	39.16	28.37	29.66

TABLE 2. OVERALL AVERAGE NUTRIENT CONTENT IN THREE PLANT TYPES DURING THE GROWING SEASON IN THE EDWARDS PLATEAU REGION OF TEXAS[1]

Plant Type	Number of Observations	Nutrient Concentration(%)[2]			
		Water	C.P.	D.O.M.	P
Grass	66	42^{a}	7^{a}	39^{a}	$.11^{a}$
Forb	22	62^{b}	14^{b}	54^{b}	$.18^{b}$
Browse	44	58^{b}	12^{b}	64^{c}	$.15^{a,b}$

[1]Individual plants include:

Grasses	Forbs	Browse
Common curlymesquite	Common horehound	Elbow bush
Sideoats grama	Mexican sagewort	Pricklyash
Texas cupgrass	Orange zexmenia	White shin oak

[2]Crude protein (C.P.), digestible organic matter (D.O.M.), and phosphorus (P) are expressed as percent of dry matter. The values are averages for samples collected during the growing season only, i.e., no winter samples are included.

[a,b,c]Values in a column that do not share a common superscript differ significantly ($P<.05$).

TABLE 3. AVERAGE NUTRIENT CONTENT IN PERENNIAL, WARM-SEASON RANGE PLANTS DURING DIFFERENT SEASONS IN THE EDWARDS PLATEAU REGION OF TEXAS[1]

Plant Type	Season of Observation	Number of Observations	Nutrient Concentration(%)[2]			
			Water	C.P.	D.O.M.	P
Grass	Spring	21	48^{a}	8^{a}	44^{a}	$.13^{a}$
	Summer	22	43^{a}	$6^{a,b}$	43^{a}	$.11^{a,b}$
	Fall	23	38^{a}	5^{b}	34^{b}	$.08^{b,c}$
	Winter	15	14^{b}	5^{b}	31^{b}	$.06^{c}$
Forb	Spring	6	68^{a}	19^{a}	59^{a}	$.21^{a}$
	Summer	8	55^{b}	11^{b}	53^{a}	$.17^{a}$
	Fall	8	64^{a}	$14^{a,b}$	53^{a}	$.20^{a}$
	Winter	-	-	-	-	-
Browse	Spring	17	64^{a}	16^{a}	70^{a}	$.22^{a}$
	Summer	13	$58^{a,b}$	11^{b}	$64^{a,b}$	$.10^{b}$
	Fall	14	51^{b}	9^{b}	58^{b}	$.09^{b}$
	Winter	-	-	-	-	-

[1]Values are from individual plants identified in Table 1.

[2]Crude protein (C.P.), digestible organic matter (D.O.M.), and phosphorus (P) are expressed as percent of dry weight.

[a,b,c]Values in a column within a plant type that do not share a common superscript differ significantly ($P<.05$).

plant group, forbs and browse plants were more succulent and contained higher levels of nutrients during the growing season than grasses (Table 2). Browse plants contained higher DOM than either grasses or forbs. The effect of season on nutrient content was similar for the three plant types in that nutrients were highest during the spring and declined with advancing maturity (Table 3). An exception was the increase in protein and phosphorus noted in the fall sampling of forbs over the summer levels. Forbs and browse were of greater nutritional value than perennial grasses during the warm growing season. However, grasses remained accessible in a dormant state and declined only slightly in nutrient content during the winter, whereas warm-season forbs and deciduous browse dropped their leaves at or soon after the first fall frost. Certain perennial plants remained green yearlong and produced new growth whenever soil moisture and growing conditions were favorable (Table 4). Forage quality of these plants (Table 4) was less variable with season, compared with the warm-season perennials (Table 3) and was substantially higher in nutrient concentrations during winter, compared with dormant grasses. Annual grasses and forbs were usually higher in nutrients than perennials (Table 5 compared with Tables 3 and 4). Differences in the nutritional value of annual plants between seasons were small and not statistically significant.

Discussion

Animal productivity is a result of productive potential and level of nutrition. Productive potential is genetically controlled and is usually higher than actual production because the nutrition level is seldom high enough or consistent enough to support maximum production. Therefore, high productive potential does not assure high productivity. Animals having high productive potential and under conditions of limited nutrition are usually less productive than those having less potential. Conversely, animals having low potential are less productive than those having high potential under conditions of high nutrition.

TABLE 4. NUTRIENT CONTENT IN PLANTS THAT GROW YEARLONG IN THE EDWARDS PLATEAU REGION OF TEXAS[1]

Season	Number of Observations	Nutrient Concentration(%)[2] Water	C.P.	D.O.M.	P
Spring	23	61[a]	13[a]	50[a]	.17[a]
Summer	21	48[a]	8[a]	39[a]	.09[a]
Fall	28	52[a]	10[a]	41[a]	.13[a]
Winter	17	46[a]	10[a]	44[a]	.12[a,b]

[1]Includes approximately equal observations from:
Texas Wintergrass
Upright prairie-coneflower
Plateau Oak
Sedge

[2]Crude protein (C.P.), digestible organic matter (D.O.M.), and phosphorus (P) are expressed as percent of dry weight.

[a,b,c]Values in a column that do not share a common superscript differ significantly (P<.05).

TABLE 5. NUTRIENT CONTENT OF SELECTED ANNUAL GRASSES AND FORBS IN THE EDWARDS PLATEAU REGION OF TEXAS[1]

Season	Number of Observations	Nutrient Concentration(%)[2] Water	C.P.	D.O.M.	P
Spring	42	71[a]	12[a]	61[a]	.17[a]
Summer	7	63[a]	10[a]	55[a]	.17[a]
Fall	7	76[a]	13[a]	62[a]	.14[a]
Winter	7	68[a]	15[a]	66[a]	.17[a]

[1]Includes rescuegrass, little barley and 18 species of annual forbs.

[2]Crude protein (C.P.), digestible organic matter (D.O.M.), and phosphorus (P) are expressed as percent of dry weight.

[a]Values in the same column that do not share a common superscript differ significantly (P<.05).

Rangeland offers a mixture of potential dietary constituents which grazing animals select from in "cafeteria style". When given a choice of forage types, animals of different species and in different production states display unique diet preferences and levels of intake (Arnold, 1975; Dudzinski and Arnold, 1973; McMahan, 1974; Bryant, 1979). Cattle tend to be grass eaters, although at times they consume large amounts of non-grass materials such as pricklypear (Taylor, 1973). Sheep select less grass and more forbs and goats and deer prefer browse material (Bryant, 1979). However, all species and classes of animals select from all components of the vegetative profile and appear in search of high quality materials.

Application

It is impractical and unnecessary to base the nutritional profile of range vegetation on individual plant species because of the large numbers of plants having predictable similarities and of possible combinations. Therefore, five functional components of Edwards Plateau range vegetation are proposed.

(1) Perennial, warm-season grasses comprise the *production* component. As implied, this component supplies the major mass of potential dietary material and is the primary determinant of how many animals can be maintained (proper stocking rate). Although its nutritional value is relatively low, it is predictable and dependable and provides good overall nutrition for cattle.

(2) Perennial, warm-season forbs, legumes and browse plants are the *quality* component. Total production relative to grasses is usually low, but quality is high. This component enhances productivity of cattle and allows increased total production from the range when sheep and goats are added to the grazing population. Proper combination of animal species

can be used as a tool to hold the quality component relatively stable or to increase or decrease it. The deer population is usually benefited by low numbers of sheep and goats. However, maximum production results when this quality component is utilized by sheep and goats in conjunction with deer.

(3) The *level* component is the combined contribution of evergreen plants (Table 4). These plants reduce the production component but in return substitute for the quality component at a critical time, during winter dormancy of the production and quality components. These plants reduce the need for supplemental feed during winter.

(4) All desirable annual plants make up the *bonus* component. This group of plants is unpredictable and undependable but extremely valuable when present. It should be exploited immediately by animals having high productive potential (growing calves or lambs or ewes and lambs).

(5) The *toxic* component includes all plants which are poisonous or injurious to livestock. Although several plants should be assigned to this component regardless of nutrient concentration or short-term value (e.g., bitterweed), others overlap other components and are toxic or seriously injurious only when taken in extremes or by certain animal species (oak, mesquite beans, pricklypear, croton, Nuttall milkvetch, etc.).

Range management practices affect these components of the vegetation in various ways. Range renovation, including brush control and/or seeding, usually increases the production component dramatically, allowing an increased stocking rate. Often, accompanying reductions in the quality and level components result in reduced productivity per animal unit and/or increased supplemental feed requirements. Also the resulting vegetative profile tends to favor a disproportionate increase of cattle over sheep and goats. The non-intensive deferred-rotation grazing systems increase both the production and quality components and decrease the bonus and toxic components. The intensive, or short duration, grazing systems strongly increase the production component. Heavy, continuous grazing decreases the production and quality components and increases the bonus and toxic components.

Conclusion

Much is still to be learned about nutritional value in range plants. Oak brush, for example, contains high levels of tannins that bind up the protein, reducing digestibility and lowering the total value of the forage. Some plants are toxic in small amounts, while many more are good forage at moderate levels of consumption but can be toxic if consumed in large amounts. The data presented are of value in showing relative nutritional value of plants and plant types for animal production in the Edwards Plateau region of Texas. Two clear implications from these data are 1.) diversity of range plants provides a greater overall opportunity for high quality diet selection, and 2.) many forage species are excellent food sources and will be inefficiently utilized unless animals (e.g., sheep, goats and deer) that have special preferences for them are included in the grazing complex.

Literature Cited

A.O.A.C. 1970. Official Methods of Analysis (11th Ed.). Association of Official Agricultural Chemists. Washington, D.C.

Arnold, G.W. 1975. Herbage intake and grazing behavior in ewes of four breeds at different physiological states. Aust. J. Agr. Res. 26:1017-1024.

Bryant, F.C., M.M. Kothmann, and L.B. Merrill. 1979. Diets of sheep, Angora goats, Spanish goats, and white-tailed deer under excellent grazing conditions. J. Range Manage. 32:412-417.

Cory, V.L. 1927. Activities of livestock on the range. Texas Agr. Exp. Sta. Bull. 367.

Dudzinski, M.L. and G.W. Arnold. 1973. Comparisons of diets of sheep and cattle grazing together on sown pastures on the southern tablelands of New South Wales by principal components analysis. Aust. J. Agr. Res. 24:899-912.

Fraps, G.S. and V.L. Cory. 1940. Composition and utilization of range vegetation in Sutton and Edwards counties. Texas Agr. Exp. Sta. Bull. 586.

Gould, F.W. 1975. Texas plants — a checklist and ecological summary. Texas Agr. Exp. Sta. MP-585/Revised. 121 pp.

McMahan, Craig A. 1964. Comparative food habits of deer and three classes of livestock. J. Wildl. Manage. 28:798-808.

Murphy, J. and J.P. Riley. 1962. A modified single solution method of the determination of phosphate in natural waters. Anal. Chem. Acta. 27:31-36.

Snedecor, George W. 1956. *Statistical Methods*, 5th Ed. Iowa State University Press. Ames.

Taylor, C.A. 1973. The botanical composition of cattle diets on a 7-pasture high-intensity low-frequency grazing system. M.S. Thesis. Texas A&M University. 60 pp.

Van Soest, P.J. and R.H. Wine. 1967. Use of detergents in the analysis of feeds. IV. Determination of plant cell-wall constituents. J. Ass. Offic. Agr. Chem. 50:50-55.

Van Soest, P.J., R.H. Wine, and L.A. Moore. 1966. Estimation of the true digestibility of forage by the *in vitro* digestion of cell walls. Proc. 10th Int. Grassl. Cong. 10:438-441.

APPENDIX TABLE 1. Nutrient composition of range plants in the Edwards Plateau region.

Grasses

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Buffalograss (Buchloe dactyloides)							
green forage	5/3/73	51	10	70	0.13	13	60
leaves	5/24/73	54	8	67	0.16	11	58
leaves	6/28/73	50	11	69	0.23	11	44
leaves and stems	7/27/73	46	14	66	0.22	9	38
leaves and stems	10/25/73	42	13	68	0.21	8	33
leaves and stems	4/24/74	60	8		0.21	12	59
total	10/10/74	44	12		0.21	8	31
Canada wildrye (Elymus canadensis)							
leaves	4/13/73	62	10	56	0.11	14	69
leaves and stems	5/24/73	41	12	64	0.13	9	56
leaves and stems	6/28/73	57	10	65	0.22	8	48
leaves and stems	7/27/73	50	13	60	0.20	7	45
leaves and stems	10/25/73	60	13	66	0.22	9	49
Kleingrass (Panicum coloratum)							
leaves	4/13/73	49	11	68	0.12	8	33
leaves and stems	5/24/73	39	10	65	0.14	9	55
leaves and stems	6/28/73	58	9	66	0.15	9	57
leaves and stems	8/30/73	36	8	68	0.08	6	47
leaves and stems	10/3/73	47	5	74	0.07	6	40
leaves and stems	10/25/73	58	7	70	0.08	5	52
leaves and stems	12/27/73	11	9	71	0.03	3	48
leaves and stems	4/24/74	52	7		0.09	8	50
leaves and stems	6/25/74	24	9		0.06	4	38
leaves and stems	12/17/74	12	8		0.04	3	35
Common bermuda-grass (Cynodon dactylon)							
leaves and stems	5/24/73	63	11	62	0.22	12	58
leaves and stems	6/28/73	61	10	65	0.21	12	56
Common curlymesquite (Hilaria belangeri)							
old leaves	4/13/73	22	16	65	0.09	6	31
new leaves	4/13/73	48	12	65	0.12	10	47
forage	5/24/73	46	12	66	0.12	9	44
leaves and stems	6/28/73	56	10	66	0.19	11	52

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Common curlymesquite (cont.)							
leaves and stems	7/27/73	42	12	61	0.21	8	49
total	7/27/73	50	10	64	0.13	7	52
leaves and stems	8/30/73	26	12	65	0.06	5	43
leaves and stems	10/3/73	49	14	65	0.13	7	40
leaves and stems	10/25/73	48	14	67	0.09	6	32
leaves and stems	11/29/73	40	22	55	0.09	7	33
leaves and stems	12/27/73	12	14	68	0.07	5	33
leaves and stems	2/1/74	18	14	64	0.07	5	31
leaves and stems	2/28/74	12	17	60	0.09	6	34
leaves and stems	3/28/74	24	14		0.12	7	33
leaves and stems	4/24/74	52	13		0.14	10	52
total	5/24/74	52	12		0.12	8	41
total	6/25/74	21	12		0.08	6	40
total	8/15/74		11		0.11	7	46
leaves and stems	10/10/74	61	15		0.12	6	36
leaves and stems	11/15/74	35	17		0.07	5	30
total	12/17/74	16	17		0.07	5	25
leaves and stems	2/11/75	13	16		0.06	6	28
leaves and stems	4/15/75	42	18		0.16	8	38
total	6/4/75	50	18		0.11	7	38
total	7/11/75	32	12		0.06	5	38
leaves and stems	9/11/75	25	15		0.06	4	30
leaves and stems	10/31/75	32	13		0.08	6	38
leaves and stems	12/11/75	17	16		0.06	5	29
total	1/8/76	10	15		0.06	5	32
Fall witchgrass (Leptoloma cognatum)							
leaves and stems	10/3/73	55	10	66	0.09	6	54
leaves and stems	10/25/73	46	10	71	0.05	5	42
leaves and stems	8/15/74	61	8		0.13	8	58
Green sprangletop (Leptochloa dubia)							
leaves and stems	8/30/73	38	5	76	0.05	5	51
total	10/3/73	54	7	74	0.15	7	53
leaves	10/25/73	53	8	74	0.08	6	26

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Hairy grama (Bouteloua hirsuta)							
leaves and stems	4/15/75	36	14	68	0.09	7	
leaves and stems	7/27/75	54	10	69	0.09	8	62
leaves and stems	8/30/75	28	8	70	0.07	5	48
leaves and stems	10/3/75	37	10	75	0.08	5	44
leaves and stems	10/25/75	33	11	70	0.05	5	39
leaves and stems	12/27/75	16	15	65	0.05	5	33
leaves and stems	2/1/74	9	13	68	0.04	4	35
leaves and stems	2/28/74	17	14	64	0.06	6	35
leaves	3/28/74	10	16		0.08	6	
leaves and stems	10/10/74	49	12		0.08	6	45
Hairy tridens (Erioneuron pilosum)							
total	4/15/75	41	14	64	0.09	8	48
leaves and stems	6/28/75	38	8	69	0.14	11	60
total	7/27/75	46	12	67	0.23	9	56
leaves and stems	10/3/75	48	12	64	0.15	10	48
Halls panicum (Panicum hallii)							
leaves and stems	6/28/75	51	9	68	0.11	8	52
leaves and stems	7/27/75	46	12	62	0.13	8	56
leaves and stems	8/30/75	19	10	65	0.08	6	51
leaves and stems	10/3/75	60	11	67	0.14	8	52
leaves and stems	10/25/75	56	14	66	0.08	6	45
leaves and stems	12/27/75	10	12	66	0.08	4	43
leaves and stems	2/28/74	10	13	61	0.09	5	44
Johnson grass (Sorghum halepense)							
leaves	5/24/75	71	10	55	0.38	15	73
leaves and stems	6/28/75	68	9	60	0.21	12	70
leaves	10/25/75	76	9	66	0.16	10	63
King Ranch bluestem (Bothriochloa ischaemum							
leaves and stems var. songarica)	6/28/75	64	12	66	0.20	8	57
leaves and stems	7/27/75	58	10	68	0.11	8	54
leaves and stems	10/3/75	60	11	68	0.12	8	54

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
King Ranch bluestem (cont.)							
leaves and stems	12/27/75	7	11	71	0.04	4	44
leaves and stems	2/28/74	8	11	70	0.04	4	41
leaves and stems	2/11/75	4	11		0.05	4	36
Kleingrass (Panicum coloratum)							
green leaves and stems	5/3/75	76	10	63	0.21	17	66
Little barley (Hordeum pusillum)							
leaves and stems	5/24/75	55	11	65	0.19	9	54
Little bluestem (Schizachyrium scoparium							
leaves and stems var. frequens)	6/28/75	28	7	68	0.11	8	58
leaves and stems	8/30/75	34	8	70	0.06	4	41
leaves	10/25/75	44	8	75	0.05	4	30
leaves and stems	12/27/75	17	9	71	0.03	3	33
leaves and stems	2/1/74	16	10	74	0.04	3	31
leaves and stems	3/28/74	22	13		0.06	5	
leaves	5/24/74	60	9		0.11	9	52
leaves and stems	10/10/74	56	6		0.07	6	43
leaves and stems	11/15/74	48	8		0.04	4	29
leaves and stems	12/17/74	22	8		0.04	3	27
leaves and stems	2/11/75	9	9		0.04	4	23
total	9/11/75	48	10		0.07	4	40
total	10/31/75	36	8		0.03	3	26
total	1/8/76		9		0.02	2	27
Meadow dropseed (Sporobolus asper							
leaves var. drummondii)	7/27/75	55	9	69	0.16	7	48
Pinhole bluestem (Bothriochloa barbinodis							
leaves and stems var. perforata)	7/27/75	59	9	63	0.12	7	56
leaves and stems	10/3/75	55	8	68	0.08	4	
leaves and stems	11/29/75	32	10	72	0.04	2	
leaves and stems	2/28/74	13	8	68	0.04	4	38
leaves and stems	11/15/74	39	8		0.05	4	36
leaves and stems	12/17/74	10	8		0.06	3	36
leaves and stems	10/31/75	35	4		0.06	3	45

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Plains bristlegrass (Setaria leucopila)							
leaves and stems	10/25/73	57	11	70	0.21	8	37
Plains lovegrass (Eragrostis intermedia)							
leaves and stems	7/27/73	59	8	70	0.12	7	52
leaves and stems	10/3/73	54	7	69	0.09	6	50
leaves	10/25/73	58	10	72	0.08	5	37
leaves and stems	11/29/73	37	9	72	0.11	5	37
total	8/15/74	52	8		0.10	6	48
Red grama (Bouteloua trifida)							
leaves and stems	5/24/73	35	13	65	0.11	6	43
leaves	6/28/73	45	6	71	0.16	11	52
leaves and stems	7/27/73	42	12	69	0.19	9	50
leaves and stems	8/30/73	20	7	71	0.07	6	45
leaves, stems and seeds	10/3/73	44	9	72	0.13	8	40
leaves and stems	10/25/73	44	10	71	0.09	8	32
leaves and stems	12/27/73	16	13	69	0.09	4	28
leaves and stems	2/1/74	11	16	67	0.05	5	28
total	2/28/74	10	12	68	0.06	5	36
Rescue grass (Bromus unioloides)							
mostly leaves	3/27/73	72	12	46	0.19	14	75
leaves and heads	4/13/73	62	6	57	0.19	13	69
Sand dropseed (Sporobolus cryptandrus)							
leaves and stems	7/27/73	59	8	69	0.16	9	59
Sideoats grama (Bouteloua curtipendula)							
new leaves	4/13/73	64	10	71	0.17	11	63
green forage	5/24/73	45	11	67	0.11	8	53
leaves and stems	6/28/73	52	10	70	0.17	9	52
leaves and stems	7/27/73	45	10	68	0.11	7	48
leaves and stems	8/30/73	24	10	68	0.05	5	39
leaves and stems	10/3/73	40	11	70	0.08	5	40
leaves	10/25/73	49	15	67	0.08	7	36
leaves and stems	11/29/73	30	15	66	0.08	5	25
leaves and stems	12/27/73	10	18	65	0.05	4	29
leaves and stems	2/1/74	15	15	67	0.05	5	29
leaves and stems	2/28/74	9	13	68	0.05	3	30

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Sideoats grama (cont.)							
leaves and stems	4/24/74	30	12		0.09	6	39
leaves and stems	5/24/74	51	11		0.14	8	47
leaves and stems	6/25/74		14		0.07	5	36
leaves and stems	8/15/74	45	9		0.15	6	47
leaves and stems	10/10/74	44	11		0.08	4	36
leaves and stems	11/15/74	44	14		0.06	5	28
leaves and stems	12/17/74	13	17		0.04	3	30
leaves and stems	2/11/75	8	14		0.05	5	28
leaves and stems	4/15/75	25	14		0.08	6	36
total	6/4/75	44	13		0.08	6	38
leaves and stems	7/11/75	42	10		0.05	5	48
total	9/11/75	27	13		0.06	4	35
total	10/31/75	23	10		0.04	4	39
total	12/11/75	16	14		0.06	3	32
total	1/8/76	8	18		0.04	3	30
Silver bluestem (Bothriochloa saccharoides							
leaves and stems var. torreyanus)	5/24/73	66	10	63	0.16	9	62
Slim tridens (Tridens muticus							
old and new leaves var. muticus)	4/13/73	32	10	70	0.09	8	36
leaves and stems	5/24/73	64	8	73	0.13	7	56
leaves and stems	6/28/73	64	7	70	0.20	13	57
leaves and stems	10/3/73	44	7	72	0.11	6	48
leaves and stems	10/25/73	49	12	69	0.30	8	41
Texas cupgrass (Eriochloa sericea)							
leaves	4/13/73	71	10	69	0.18	13	58
leaves	5/24/73	67	10	74	0.13	10	52
leaves and stems	6/28/73	64	10	68	0.18	10	46
leaves and stems	7/27/73	61	11	67	0.11	8	48
leaves and stems	8/30/73	38	10	68	0.09	7	46
leaves and stems	10/3/73	58	10	68	0.14	8	39
leaves and stems	10/25/73	64	12	70	0.11	7	40
leaves and stems	11/29/73	52	12	67	0.11	8	34
leaves and stems	12/27/73	14	10	71	0.05	4	37
leaves and stems	2/1/74	17	11	70	0.05	5	28
leaves and stems	2/28/74	36	13	67	0.05	4	34

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Texas cupgrass (cont.)							
leaves and stems	3/28/74	31	11		0.12	6	[illegible]
leaves and stems	4/24/74	67	9		0.18	11	5[illegible]
leaves and stems	5/24/74	65	11		0.16	9	42
leaves and stems	6/25/74	41	12		0.08	6	31
leaves and stems	8/14/74	61	10		0.14	10	43
leaves and stems	10/10/74	51	10		0.10	7	36
leaves and stems	11/15/74	31	9		0.07	4	34
leaves and stems	12/17/74	20	10		0.06	4	35
leaves and stems	2/11/75	17	11		0.09	6	32
leaves and stems	4/15/75	47	10		0.12	8	41
total	6/4/75	63	11		0.11	8	41
leaves and stems	7/11/75	64	14		0.17	6	33
total	9/11/75	44	10		0.10	5	37
leaves and stems	10/31/75	37	7		0.06	4	36
total	1/8/76	12	10		0.06	4	36
Texas wintergrass (Stipa leucotricha)							
mostly leaves	3/27/73	54	12	67	0.12	12	44
green leaves	4/13/73	59	12	65	0.18	14	48
leaves	5/24/73	56	11	69	0.12	11	49
leaves	7/27/73	44	9	68	0.10	10	43
leaves and stems	10/25/73	48	15	68	0.12	9	38
leaves	11/29/73	54	14	66	0.12	11	37
leaves	12/27/73	26	15	66	0.08	6	31
leaves and stems	2/1/74	13	16	65	0.06	6	27
leaves and stems	2/28/74	23	11	68	0.06	6	37
leaves and stems	5/24/74	62	11		0.21	13	45
leaves and stems	6/25/74	39	10		0.08	8	39
leaves and stems	8/15/74	49	13		0.10	10	40
leaves	10/10/74	53	15		0.12	11	39
leaves and stems	11/15/74	45	18		0.11	9	26
leaves and stems	12/17/74	35	16		0.07	7	30
leaves	2/11/75	40	15		0.11	10	39
leaves and stems	4/15/75	59	11		0.15	10	53
leaves and stems	6/4/75	56	14		0.11	8	39

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Texas wintergrass (cont.)							
leaves and stems	7/11/75	45	14		0.08	7	34
total	9/11/75	38	16		0.07	6	27
leaves and stems	10/31/75	35	13		0.08	6	30
total	12/11/75	26	16		0.06	5	19
total	1/8/76		14		0.06	5	26
Tobosa (Hilaria mutica)							
green leaves	5/3/73	21	10	70	0.16	13	56
leaves and stems	5/31/73	44		71		9	
leaves	5/31/73	54		72		7	
Tumblegrass (Schedonnardus paniculatus)							
leaves and stems	5/24/73	39	8	69	0.12	6	53
leaves and stems	7/27/73	46	11	67	0.23	7	52
total	10/3/73	56	5	77	0.09	6	57
Tumble windmillgrass (Chloris verticillata)							
leaves and stems	10/25/73	52	16	64	0.36	9	36
Vinemesquite (Panicum obtusum)							
leaves and stems	7/27/73	53	8	70	0.14	7	53
leaves and stems	10/25/73	57	10	71	0.10	7	42
White tridens (Tridens albescens)							
leaves and stems	7/27/73	57	8	70	0.15	8	58
Wright threeawn (Aristida wrightii)							
leaves	4/13/73	32	11	71	0.08	7	36
old and new growth	5/24/73	35	9	74	0.08	7	42
leaves and stems	6/28/73	45	6	77	0.10	8	[illegible]
total	7/27/73	42	7	74	0.09	7	46
leaves	8/30/73	23	7	74	0.05	5	[illegible]
leaves and stems	10/3/73	38	5	79	0.07	6	[illegible]

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Wright threeawn (cont.)							
leaves and stems	10/25/73	40	9	74	0.09	7	34
leaves and stems	11/29/73	31	9	74	0.08	7	32
leaves and some old heads	12/27/73	13	8	75	0.05	5	40
leaves and stems	2/1/74	18	10	69	0.06	6	30
leaves and stems	2/28/74	13	9	71	0.05	5	31

Browse Plants

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Algerita (Berberis trifoliolata)							
shoots	3/27/73	69	4	14	0.27	16	86
shoots	4/13/73	48	3	20	0.25	13	85
shoots	10/25/73	71	4	14	0.27	16	87
leaves and stems	3/28/74	71	4		0.29	15	89
Ashe juniper (Juniperus ashei)							
leaves	4/13/73	48	6	34	0.08	6	68
leaves and stems	11/29/73	49	5	33	0.12	7	64
leaves and stems	12/27/73	50	7	34	0.11	7	63
leaves and stems	2/1/74	49	6	32	0.11	8	64
leaves and stems	2/28/74	44	6	31	0.08	6	62
leaves	5/24/74	48	5		0.07	5	64
leaves and berries	6/25/74	46	4		0.10	7	48
leaves	8/15/74	52	4		0.12	5	65
leaves	10/10/74	57	5		0.15	10	62
leaves	11/15/74	52	4		0.11	7	65
leaves	12/17/74	51	4		0.11	7	67
leaves	2/11/75	48	7		0.10	7	65
leaves	4/15/75	48	5		0.09	6	60
leaves	6/4/75	54	5		0.12	7	66
leaves	7/11/75	50	6		0.09	6	59
leaves	9/11/75	53	4		0.10	7	63
leaves	10/31/75	49	5		0.11	7	66
leaves	12/11/75	48	3		0.10	7	70
leaves	1/8/76	48	4		0.10	7	65
Catclaw acacia (Acacia greggii)							
leaves	4/13/73	69	4		0.41	30	83
leaves	5/24/73	61	4	25	0.27	21	78
leaves and twigs	6/28/73	50	5	36	0.13	19	62
leaves	7/27/73	48	5	33	0.15	17	62

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Elbow bush (Forestiera pubescens)							
leaves and twigs	3/27/73	67	5	34	0.32	21	
leaves and twigs	4/13/73	62	6	30	0.16	13	
leaves	5/24/73	59	6	33	0.16	13	77
leaves	6/28/73	57	6	35	0.12	10	79
leaves	8/30/73	48	7	28	0.07	8	80
leaves	10/25/73	52	7	28	0.07	7	74
leaves	3/28/74	64	4		0.26	20	67
leaves	4/15/75		6		0.21	14	71
leaves	6/4/75	57	6		0.11	11	66
leaves	7/11/75	57	7		0.08	10	67
leaves	9/11/75	54	8		0.07	8	73
leaves	10/31/75	54	6		0.05	5	
Mescalbean (Sophora secundiflora)							
seeds	6/28/73	6	3	35	0.11	12	85
leaves	6/28/73	50	6	41	0.10	17	57
leaves	7/27/73	52	6	46	0.12	18	53
Mesquite (Prosopis grandulosa)							
leaves	4/13/73	74	7	25	0.46	32	68
leaves	5/24/73	67	6	35	0.22	26	58
leaves and twigs	6/28/73	52	4	47	0.08	16	44
Netleaf hackberry (Celtis reticulata)							
leaves	10/25/73	44	19	26	0.08	8	52
Plateau oak (Quercus virginiana							
leaves and catkins var. fusiformis)	3/27/73	64	7	34	0.38	20	57
new leaves	4/13/73	33	4	22	0.28	19	77
leaves	5/24/73	69	4	36	0.19	12	60
leaves	6/28/73	53	4	48	0.10	10	44
leaves	7/27/73	48	6	46	0.08	10	44
leaves	10/25/73	49	6	48	0.12	12	44
leaves	11/29/73	48	5	48	0.09	10	43
leaves	12/27/73	45	6	47	0.09	10	44
leaves	2/1/74	44	6	49	0.08	9	42
leaves	2/28/74	45	7	42	0.08	9	46
leaves	5/24/74	51	5		0.11	10	38
leaves	6/25/74	51	5		0.10	9	37

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Plateau oak (cont.)							
leaves	8/15/74	47	4		0.08	10	40
leaves	10/10/74	44	5		0.08	9	43
leaves	11/15/74	46	5		0.08	9	41
leaves	12/17/74	46	5		0.11	9	47
leaves	2/11/75	46	6		0.09	8	49
leaves	4/15/75	57	4		0.18	13	42
leaves	6/4/75	55	3		0.12	11	38
leaves	7/11/75	52	4		0.08	9	41
leaves	9/11/75	47	7		0.10	10	38
leaves	10/31/75	49	5		0.09	9	49
leaves	12/11/75	43	4		0.08	9	41
leaves	1/8/76	42	5		0.08	9	46
Pricklyash (Zanthoxylum sp.)							
leaves and twigs	4/13/73	77	7	21	0.37	23	80
leaves	5/24/73	70	9	16	0.22	18	76
leaves	6/28/73	64	7	28	0.12	13	80
leaves	7/27/73	70	9	20	0.18	18	78
leaves	10/3/73	57	14	17	0.09	11	70
leaves	10/25/73	61	13	21	0.08	7	71
leaves	4/24/74	69	7			20	84
leaves	8/15/74	59	9		0.14	12	73
leaves	10/10/74	65	8		0.16	15	78
leaves	11/15/74	58	10		0.06	6	71
leaves	6/4/75	69	8		0.19	16	80
leaves	7/11/75	64	8		0.14	15	79
leaves	10/31/75	58	9		0.07	7	7
Prickly pear (Opuntia sp.)							
cladophylls	3/27/73	74	22	21	0.03	2	
cladophylls	4/13/73	81	20	33	0.06	4	6
cladophylls	5/24/73	89	15	32	0.16	7	71
fruit	7/27/73	74	12	52	0.13	7	35
cladophylls	2/1/74	64	32		0.03	2	53
cladophylls	2/28/74	57	19		0.05	3	63

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Alligator juniper (Juniperus pinchoti)							
leaves	4/13/73	56	6	34	0.10	7	66
leaves	12/27/73	49	5	37	0.11	8	60
leaves	5/24/74	54	4		0.13	8	
leaves	6/25/74	45	5		0.09	6	64
leaves	10/10/74	52	4		0.17		59
leaves	11/15/74	50	4		0.15	9	63
leaves	12/17/74	49	4		0.14	8	63
leaves	2/11/75	46	5		0.10	7	64
leaves	7/11/75	50	5		0.08	7	58
leaves	10/31/75	46	5		0.11	7	57
leaves	1/8/76	47	5		0.09	6	66
Sacahuista (Nolina texana)							
buds	3/27/73	85	6	25	0.36	19	71
buds	4/13/73	68	6	28	0.38	19	67
leaves	4/13/73	39	3	70	0.05	6	49
leaves	10/25/73	36	3	61	0.06	6	45
leaves	11/29/73	38	3	64	0.06	6	44
leaves	12/27/73	42	3	58	0.08	6	50
leaves	2/1/74	38	3	67	0.06	5	40
leaves	2/28/74	64	3	62	0.06	5	46
leaves	3/28/74	51	4		0.08	5	40
Sensitivebriar (Schrankia roemeriana)							
leaves and twigs	5/24/73	68	5	25	0.22	32	78
leaves	4/24/74	72	4		0.22	30	68
Skunkbush (Rhus aromatica var. flabelliformis)							
leaves and twigs	3/27/73	61	4	14	0.23	14	83
leaves and twigs	4/13/73	59	5	16	0.17	13	82
leaves	5/24/73	50	4	16	0.14	11	80
leaves	3/28/74	63	5		0.35	17	77
Texas persimmon (Diospyros texana)							
leaves and twigs	4/13/73	70	6	28	0.40	25	74
leaves	5/24/73	64	9	39	0.16	14	61
leaves	6/28/73	52	10	43	0.13	13	56
leaves	7/27/73	51	12	32	0.08	10	58

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Texas persimmon (cont.)							
leaves	10/3/73	50	12	31	0.09	11	60
leaves	10/25/73	52	9	34	0.08	10	58
leaves	3/28/74	70	7		0.41	24	73
leaves	4/24/74	61	7		0.17	15	66
leaves	5/24/74	68	6		0.22	18	
leaves	6/25/74	48	7		0.09	12	57
leaves	8/15/74	51	8		0.09	10	62
leaves	10/10/74	51	10		0.09	11	58
leaves	11/15/74	46	13		0.08	9	62
leaves	7/11/75	51	9		0.09	11	57
leaves	10/31/75	47	10		0.09	10	61
White honeysuckle (Lonicera albiflora var. albiflora)							
leaves	4/13/73	71	9	23	0.14	12	78
leaves	5/24/73	64	10	17	0.08	8	76
White shin oak (Quercus durandii var. breviloba)							
leaves and twigs	3/27/73	68	4	23	0.31	17	77
leaves	4/13/73	30	4	31	0.22	15	75
leaves	5/24/73	67	4	33	0.22	17	61
leaves	6/28/73	50	4	44	0.10	11	45
leaves	7/27/73	53	5	40	0.11	10	49
leaves	8/30/73	44	8	39	0.09	10	50
leaves	10/3/73	45	6	41	0.11	11	44
leaves	10/25/73	46	5	40	0.11	12	49
leaves	11/29/73	49	5	40	0.12	12	49
leaves	12/27/73	44	7	45	0.12	9	44
leaves	3/28/74	61	4		0.21	14	54
leaves	5/24/74	62	4		0.16	12	
leaves	6/25/74	57	3		0.09	10	35
leaves	11/15/74	45	3		0.26	14	43
leaves	12/17/74		6		0.06	7	37
leaves	4/15/75	50	3		0.18	14	45
leaves	6/4/75	47	4		0.13	11	44
leaves	7/11/75	44	4		0.07	9	44
leaves	10/31/75	42	6		0.09	8	46

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Yucca (Yucca sp.)							
flowers	3/27/73	84	7	14	0.51	22	89
flowers	4/13/73	85	8	15	0.45	22	87
flowers	5/24/73	85	8	11	0.47	14	58
leaves	10/25/73	59	4	69	0.10	7	42

Forbs

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Anemone (Anemone heterophylla)							
total	3/27/73	77	8	20	0.18	13	77
total	4/13/73	77	7	28	0.19	11	74
leaves and stems	12/17/74	75	8		0.15	12	81
leaves and stems	2/11/75	78			0.15	11	
total	1/8/76	50	6		0.17	11	79
Bitterweed (Hymenoxys odorata)							
total	3/27/73	80	11	25	0.24	13	70
total	4/13/73	73	8	27	0.21	11	74
total	5/24/73	73	9	41	0.23	13	57
total	6/28/73	59	12	35	0.15	12	53
leaves, stems and flowers	7/27/73	69	8	46	0.25	13	50
leaves and stems	11/29/73	73	14	18	0.25	18	68
leaves and stems	12/27/73	65	10	20	0.22	16	73
leaves and stems	2/1/74	74	11	21	0.22	23	68
total	2/28/74	74	10	26	0.23	17	70
leaves and stems	3/28/74	78	10		0.27	20	61
total	4/24/74	75	7		0.17	12	58
total	5/24/74	71	8		0.16	10	52
total	6/25/74	64	10		0.23	13	52
total	8/15/74	72	17		0.16	11	44
leaves and stems	10/10/74	81	13		0.31	18	60
total	11/15/74	80	11		0.24	16	71
total	12/17/74	77	10		0.23	16	80
leaves and stems	2/11/75	78	10		0.19	18	70
Bladderpod (Lesquerella gordoni)							
total	3/27/73	65	25	31	0.17	10	45
total	4/13/73	64	17	37	0.16	9	55
fruit	4/13/73	66	5	35		17	73
total	3/28/74	58	27		0.15	11	56
Blue-eyegrass (Sisyrinchium sp.)							
total	4/13/73	68	7	52	0.12	10	60

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Broadleaf milkweed (Asclepias latifolia)							
leaves	8/30/73	74	12	18	0.13	11	78
Buffalo gourd (Cucurbita foetidissima)							
leaves	7/27/73	79	20	19	0.23	27	67
leaves	8/30/73	76	18	22	0.19	20	69
leaves	10/3/73	80	23	17	0.21	17	65
leaves	10/25/73	5	37	19	0.19	16	54
leaves	5/24/73	85	10		0.36	30	80
leaves	10/10/74	82	18		0.33	27	65
Cedar plantain (Plantago helleri)							
total	4/13/73	64	8	40	0.14	9	67
total	3/28/74	66	9		0.14	12	66
Common broomweed (Xanthocephalum sp.)							
leaves and stems	5/24/73	58	7	39	0.18	12	59
Common dyssodia (Dyssodia pentachaeta)							
leaves and stems	6/25/74	43	9		0.06	6	49
Common horehound (Marrubium vulgare)							
total	3/27/73	73	29	19	0.22	17	53
leaves	4/13/73	66	12	28	0.03	30	65
leaves and stems	10/25/73	73	13	32	0.34	21	56
leaves and stems	11/29/73	75	16	32	0.32	22	56
total	3/28/74	68	13		0.22	22	67
total	8/15/74	70	16		0.25	22	65
leaves and stems	11/15/74	74	12		0.37	22	69
Cornsalad (Valerianella sp.)							
total	3/27/73	80		15		18	
total	4/24/74	68			0.11	9	

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Croton (Croton sp.)							
total	6/28/73	65	7	46	0.23	14	53
total	7/27/73	56	6	46	0.15	11	46
leaves and stems	10/25/73	61	7	42	0.17	18	54
leaves and stems	5/24/74	60	7		0.12	12	48
leaves and stems	6/25/74	54	6		0.08	9	51
total	8/15/74	61	7		0.19	15	51
total	8/15/74	67	9		0.14	17	62
total	10/10/74	61	6		0.15	12	50
total	11/15/74	59	6		0.17	12	52
total	2/11/75	58	7		0.21	16	52
Dayflower (Commelina sp.)							
total	10/3/73	83	19	41	0.13	12	60
Dozedaisy (Erigeron sp.)							
total	3/27/73	77	22	33	0.22	12	59
total	4/13/73	65	14	25	0.14	11	68
total	7/27/73	62	11	41	0.25	9	53
Dutchmans britches (Thamnosma texana)							
total	3/27/73	68	7	35	0.16	13	62
Engelmanndaisy (Engelmannia pinnatifida)							
total	4/13/73	76	38	22	0.18	14	39
leaves	5/24/73	33	18	26	0.13	12	59
total	5/24/73	70	11	49	0.17	9	44
total	11/15/74	76	12		0.20	14	65
Evax (Evax prolifera)							
total	3/27/73	69	18	45	0.20	14	52
total	4/13/73	54	15	39	0.19	10	54
total	3/28/74	56	38		0.16	12	43
total	4/24/74	57	34		0.15	10	41
Eveningprimrose (Oenothera sp.)							
total	3/27/73	78	16	16	0.17	11	72
total	4/13/73	78	13	17	0.23	12	77

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Feather dalea (Dalea formosa)							
leaves and twigs	4/13/73	60	6	46		17	
Indianmallow (Abutilon incanum)							
total	8/15/74	60	9		0.17	13	49
total	10/10/74	54	9		0.27	12	42
total	11/15/74	53	8		0.22	11	44
Lemon beebalm (Monarda citriodora)							
leaves and flowers	5/24/73	73	11	41	0.18	10	56
Mexican sagewort (Artemisia ludoviciana)							
leaves and stems	5/24/73	63	8	50	0.22	12	64
total	6/28/73	44	8	51	0.15	10	58
total	7/27/73	50	7	51	0.15	8	57
total	8/30/73	43	5	53	0.11	6	48
total	10/3/73	58	6	51	0.16	8	49
leaves and stems	10/25/73	56	7	56	0.15	10	51
Mountain pink (Centaurium beyrichii)							
total	6/4/75	73	5		0.14	9	6
total	7/11/75	54	3		0.10	7	63
Noseburn (Tragia sp.)							
total	8/15/74	57	10		0.20	15	50
Nuttall milkvetch (Astragalus nuttallianus)							
total	3/27/73	71	12	33	0.15	18	66
total	4/24/74	68	6		0.14	17	62
Orange zexmenia (Zexmenia hispida)							
total	3/27/73	77	17	39	0.31	20	57
leaves and stems	7/27/73	61	17	30	0.12	11	62
leaves	10/25/73	61	23	27	0.10	12	54
leaves and stems	5/24/74	69	16		0.19	14	47
leaves and stems	6/25/74	59	16		0.16	9	42
leaves and stems	10/10/74	64	20		0.12	11	38
total	7/11/75	59	18		0.07	9	47
total	9/11/75	57	23		0.18	8	41
leaves and stems	10/31/75	53	14		0.08	8	50

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Oxalis (Oxalis sp.)							
total	3/27/73	88	10	19	0.22	21	77
leaves and stems	11/29/73	88	15	20	0.19	18	69
leaves and stems	8/15/74	90			0.39	22	
leaves and stems	10/10/74	88	9		0.47	21	71
total	11/15/74	88	9		0.40	17	66
Pepperweed (Lepidium sp.)							
total	4/13/73	60	10	42	0.21	9	58
total	5/24/73	67	7	46	0.14	15	51
Portulaca (Portulaca sp.)							
total	8/15/74	88	17		0.22	11	69
Purple groundcherry (Physalis lobata)							
total	5/24/74	83	19		0.31	24	59
Redseed plantain (Plantago rhodosperma)							
total	3/27/73	84	26	28	0.14	11	45
total	4/13/73	80	21	32	0.16	10	50
inflorescence	5/24/73	58	9		0.22	12	55
leaves	5/24/73	72	25	20	0.10	8	55
total	12/27/73	75	24	21	0.17	11	54
total	2/28/74	44	20	17	0.14	20	64
total	3/28/74	77	21		0.16	11	51
total	4/24/74	83			0.14	10	
total	11/15/74	86	6		0.13	10	50
total	12/17/74	85	24		0.17	12	52
total	2/11/75	86	23		0.16	13	
total	4/15/75	82	17		0.13	8	56
Sage (Salvia sp.)							
total	4/24/74	63	13		0.14	11	

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Sedge (Carex sp.)							
total	3/27/73	62	9	65	0.15	12	48
leaves	4/13/73	61	9	63	0.13	12	53
leaves	5/24/73	73	11	66	0.11	8	38
leaves	6/28/73	51	10	64	0.08	7	44
leaves	7/27/73	54	9	66	0.10	9	44
leaves	8/30/73	37	10	64	0.08	7	42
leaves	10/3/73	50	9	66	0.09	13	33
leaves	10/25/73	56	10	68	0.09	11	42
leaves	11/29/73	53	10	62		12	44
leaves	12/27/73	37	11	64	0.07	7	32
leaves	2/1/74	40	10	64	0.08	7	34
leaves	2/28/74	39	11	63	0.07	7	38
leaves	3/28/74	30	9		0.06	6	32
leaves	6/25/74	41	10		0.08	7	41
leaves	10/10/74	55	11		0.11		43
leaves	11/15/74	57	11		0.17	12	37
leaves	12/17/74	43	10		0.10	9	30
leaves	2/11/75	48	11		0.11	10	37
leaves	4/15/75	54	9		0.09	9	42
leaves	6/4/75	54	12		0.10	8	34
total	7/11/75	43	10		0.07	7	42
leaves	9/11/75	44	12		0.07	6	35
leaves	10/31/75	44	10		0.08	7	30
leaves	12/11/75	42	11		0.09	6	26
leaves	1/8/76	38	11		0.07	6	28
Silverleaf nightshade (Solanum elaeagnifolium)							
leaves and stems	5/24/73	64	8	41	0.21	20	54
Spreading sida (Sida filicaulis)							
total	8/15/74	63	11		0.20	14	68
Sweet gaillardia (Gaillardia sauvis)							
total	3/27/73	81	16	26	0.28	19	68
leaves and stems	3/28/74	76	18		0.22	19	63

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Texas bluebonnet (Lupinus texensis)							
total	3/27/73	83	11	23	0.16	17	72
total	4/13/73	84	9	25	0.17	18	73
leaves	10/25/73	82	15	24	0.11	15	65
total	3/28/74	80	11		0.12	15	71
total	2/11/75	82	15		0.16	17	75
Texas filaree (Erodium texanum)							
total	4/13/73	70	13	32	0.26	14	65
Twoleaf senna (Cassia roemeriana)							
tops	6/28/73	66	17	18	0.11	12	68
leaves and twigs	7/27/73	65	11	25	0.23	17	70
leaves and stems	3/28/74	70	8		0.28	20	73
total	4/24/74	72	10		0.19	17	68
total	5/24/74	65	8		0.15	13	66
total	6/25/74	54	13		0.09	9	62
leaves and stems	10/10/74	69	10		0.14	12	66
leaves and stems	4/15/75	75	10		0.27	21	76
leaves and stems	6/4/75	67	11		0.10	10	67
total	9/11/75	60	9		0.14	11	57
Upright prairie-coneflower (Ratibida columnaris)							
total	4/13/73	79	16	32	0.24	18	62
total	7/27/73	60	12	46	0.17	10	43
leaves, stems and new growth	10/25/73	85	19	25	0.41	21	62
leaves and stems	3/28/74	76	16		0.27	20	58
total	5/24/74	71	10		0.18	13	54
total	6/25/74	41	7		0.10	6	33
leaves and stems	10/10/74	69	12		0.14	10	45
total	11/15/74	75	18		0.20	12	54
total	12/17/74	74	15		0.28	14	63
total	2/11/75	81	21		0.26	22	66
leaves and stems	4/15/75	82	18		0.29	19	68
total	6/4/75	72	11		0.15	11	49
total	7/11/75	55	12		0.08	6	41
total	9/11/75	56	10		0.07	6	32
total	10/31/75	39	7		0.06	4	24
leaves	12/11/75	67			0.26	19	
total	1/8/76	67	14		0.19	16	

Common Name (Scientific Name)	Collection Date	Composition (%)					
		Water	Ash	Cell Wall	Phosphorus	Protein	DOM
Wedgeleaf draba (Draba cuneifolia)							
total	2/11/75	73			0.29	16	
Yellow stonecrop (Sedum nuttallianum)							
total	4/13/73	90	27	11	0.20	6	58
total	5/24/73	87	22	26	0.14	7	53

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3.5M — 6-81