Native Range Fertilization with Ammonium Nitrate and Urea – 1984

Dickinson Experiment Station

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A study that compares fertilization of native range between ammonium nitrate and urea was started at the Dickinson Experiment Station in the spring of 1982. The trial was established on 2.6 acres located on the SW¼ SW¼ NW¼ sec. 16, T. 143 N., R. 96 W. at the ranch headquarters of the Dickinson Experiment Station. The 30 X 60 foot plots were arranged in a randomized block design with three replications. The alleys between the replications were 10 feet wide and the perimeter border was 40 feet wide. A barbed wire fence was constructed to exclude grazing on the plots until after all of the data for that season were collected. The soil was moreau silty clay. The range site was clayey. The fertilization treatments were 40 and 60 pounds of nitrogen per acre for ammonium nitrate and urea applied annually and biennially, and 100 pounds of nitrogen per acre for ammonium nitrate and urea applied biennially. A total of ten fertilizer treatments and two control plots with no treatment were included in each replication. The fertilizer was broadcast applied on 4 May 1982, 1983, and 1984. The data that were collected from these plots were: above ground herbage production separated into seven categories, leaf height measurements and phenological phases of five major graminoid species, quantitative species composition, soil moisture and soil nutrient content at increments to 48 inches in depth.

The above ground herbage production was sampled by clipping to ground level two ¼m^2 quadrats for each plot. The herbage was separated into seven categories, cool short, warm short, cool mid, western wheatgrass, warm mid, sedge and forbs. The samples were oven dried at 80°C. The dried samples were then weighted in grams. The average weight of each category for the two ¼m^2 quadrats was determined and the average pounds per acre of herbage production was calculated for each category by multiplying the average weight in grams by 35.68. The total average production for each plot was found by the summation of the average pounds per acre for each category. The reported figures were means of the three replications for each treatment. Five clips were made for the 1984 season. The dates for these were 30 May, 25 June, 18 July, 1 August and 15 August.

The herbage samples were ground in a Wiley mill and analyzed for nutrient content by proximate analysis at the nutrition laboratory in the animal science department at North Dakota State University under direction of Dr. Duane Erickson. The results of these analysis will be made available at a later date.

Leaf height measurements and phenological development of the flower stalks were collected for five dominant graminoid species, Carex filifolia, Bouteloua gracilis, Koeleria pyramidata, Agropyron smithii and Stipa comata. Twelve plants of each species were selected at random on each plot. All of the leaves of each plant were outstretched and measured to the nearest millimeter in sequence from the oldest to the youngest. Along with the length measurements, the degree of dryness for the leaf blades were recorded. The categories of dryness used were: 0, 0.1-2, 2.1-25, 25.1-50, 50.1-75, 75.1-98 and 100 percent dry. The highest figure of the category was used to record the percentage of dryness for each leaf blade.

If the flower stalks were present, the height was measured and the phenological stage of development was recorded. The categories used were: flower stalk developing, head emergence, anthesis, seeds developing and seeds being shed. Leaf height and phenological development data were collected in the 1984 season. The dates for these were 7-8 June, 19-20 July and 23 August.

Quantitative species composition data for each plot was collected during the period of 23-30 July for the 1984 season. The herbacious plants were sampled by the ten pin point-frame method (Levy and Madden 1933, Tinney, Aamodt, and Ahlgren 1937, Heady and Rader 1958, and Smith 1959). The point frame was a metal frame that was constructed to stand at a 60° angle with holes for ten pins spaced at 5 cm intervals. The frame was set down and the pins raised and then allowed to move down through the existing vegetation. If a pin hit the basal portion of a living plant, the species of that plant was recorded. Hits on Selaginella densa and the various species of lichens were also recorded as hits. The pins that did not make contact with living vegetation were counted as no hits. These were divided into litter (dead and decaying vegetation), soil (mineral soil not covered by litter or living vegetation) and rock (a hard mass of mineral substance large enough to obstruct plant growth, about the size of a half dollar or larger). Aerial hits were not recorded. Fifteen hundred points were read for each treatment (500 points per plot). A systematic sampling scheme was used for each plot. A permanent major transect was established two feet inside and parallel to the north boundary of each plot. Five minor transects were established perpendicular to the major transect at three foot intervals starting three feet from the east boundary of the plot. One hundred points were read on each minor transect.

Forb and shrub densities were sampled by the use of one tenth meter square quadrats. The forbs and shrubs that were rooted within the frame were counted by species in each of the 10 quadrats per plot, 30 quadrats per treatment.

Soil moisture by the gravimetric method was taken three times during the 1984 season. The dates for these were 26 June, 25 July, and 27 August. The one inch Veihmeyer soil tube was used to collect the samples. Three locations were selected as sample sites for the trial, at the north end, in the center and at the south end. Two replications were taken at each location. The samples were collected at increments of 0-6, 6-12, 12-24, 24-36 and 36-48 inches in depth. Each subsample was placed in a numbered steel can of known weight. These were weighted, then oven dried at 100°C. The dried soil cans were again weighted. The difference in weight was the weight of the soil water. Percent soil moisture was then calculated.

Soil nutrient content was collected monthly during the 1984 season. The dates for these were 26 June, 26 July and 27 August. The samples were collected using the one inch Veihmeyer soil tube. Three replications were taken from each treatment. The samples were collected at increments of 0-6, 6-12, 12-24, 24-36, and 36-48 inches in depth. Each subsample was placed in labeled soil bags and frozen. The samples were analyzed for nutrient content by the soils laboratory at North Dakota State University.

The month of May was very dry. The first precipitation occurred 33 days after the application of the fertilizer. It was suspected that a large amount of the ammonia from the fertilizer volatized in 1984.

Figure 1: Native Range Fertilization with Ammonium Nitrate (A) and Urea (U) Randomized Block Plot Design with Three Replications.

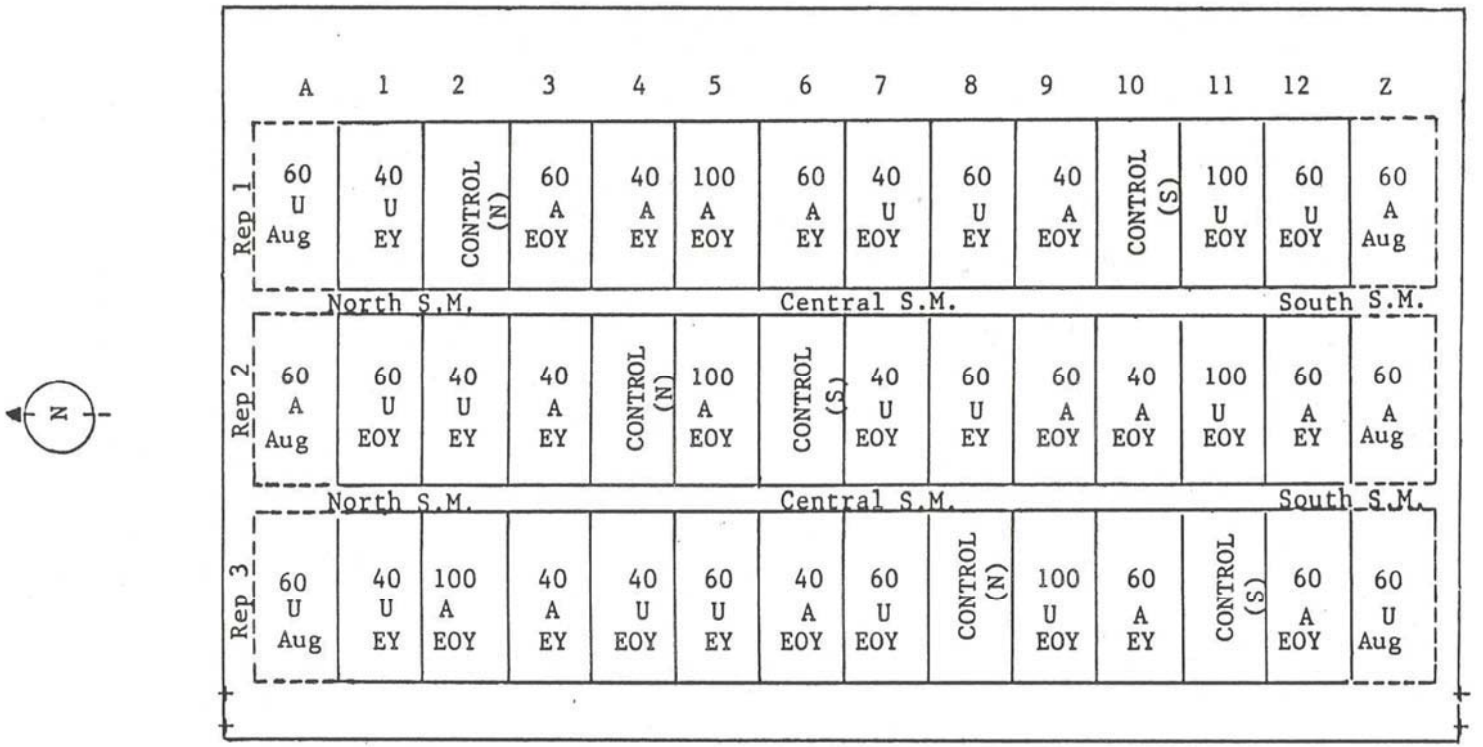

Figure 1. Native range fertilization with ammonium nitrate (A) and urea (U) randomized block plot design with three replications. Rates are 40, 60 and 100 lbs. of nitrogen per acre. Fertilizer is broadcast applied annually (EY) or biennially (EOY). Soil moisture (S.M.) samples collected at north, central and south location in each alley.

Table 1. Monthly Mean Maximum, Minimum and Average Temperatures in Fahrenheit (°F) and Monthly Precipitation in Inches (in) at the Ranch Headquarters, Dickinson Experiment Station, Jan-Dec, 1984

	Temperature			
Month	**Max (°F)**	**Min (°F)**	**Avg (°F)**	**Precipitation (in)**
January	25.90	7.45	16.68	0.31
February	42.00	18.83	30.42	0.10
March	35.39	15.10	25.25	0.38
April	54.37	28.33	41.35	2.87
May	66.00	36.23	51.12	T
June	73.40	49.30	61.35	5.30
July	85.10	54.45	69.78	0.11
August	87.16	56.23	71.70	1.92
September	63.67	37.13	50.40	0.53
October	53.97	30.35	42.16	0.96
November	40.67	15.57	28.12	0.05
December	17.35	-4.90	6.23	0.35

Table 2. Mean Above Ground Herbage Production by Category in Lbs/Acre For the Ammonium Nitrate Fertilization Treatment on Native Range At the Dickinson Experiment Station, 1984

Lbs of N/Acre EY = Annually EOY = Biennially	30 May	25 Jun	18 Jul	2 Aug	15 Aug
Control:					
Cool Short	101.1	209.1	262.6	481.4	411.5
Warm Short	143.0	291.1	317.9	740.7	630.1
Cool Mid	117.5	292.6	435.0	599.8	577.9
Western whtg.	49.4	55.6	199.5	415.1	346.4
Warm Mid	21.4	5.1	31.5	34.2	165.9
Sedge	147.8	108.2	231.3	442.8	402.3
Grass Total	580.1	947.4	1477.7	2743.9	2533.3
Forbs	155.8	184.1	443.0	651.8	562.6
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	735.9	1131.4	1920.8	3395.6	3095.8
40 EY:					
Cool Short	76.1	281.9	264.0	426.4	416.9
Warm Short	70.2	182.6	475.1	652.4	592.9
Cool Mid	183.2	668.4	792.7	867.6	709.4
Western whtg.	133.8	72.0	213.5	390.1	488.8
Warm Mid	0.0	51.1	16.7	68.4	127.9
Sedge	212.3	96.9	123.7	425.4	260.5
Grass Total	675.5	1352.9	1885.7	2830.2	2596.3
Forbs	168.3	302.7	656.5	980.6	664.2
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	843.8	1655.6	2542.2	3719.2	3260.6
40EOY:					
Cool Short	112.4	136.8	293.8	479.3	318.7
Warm Short	109.4	378.2	343.7	825.4	724.3
Cool Mid	133.2	380.0	742.1	902.7	660.1
Western whtg.	44.0	83.3	189.1	457.3	424.0
Warm Mid	6.0	3.0	73.2	447.2	73.7
Sedge	261.1	240.3	170.1	515.6	363.3
Grass Total	666.0	1221.5	1811.9	3627.5	2564.2
Forbs	173.1	238.5	554.8	592.9	415.3
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	839.1	1459.9	2366.8	4220.8	2621.5

Table 2. (Cont.) Mean Above Ground Herbage Production by Category in Lbs/Acre For the Ammonium Nitrate Fertilization Treatment on Native Range at the Dickinson Experiment Station, 1984

Lbs of N/Acre EY = Annually EOY = Biennially	30 May	25 Jun	18 Jul	2 Aug	15 Aug
60 EY:					
Cool Short	163.5	122.2	321.1	456.7	441.2
Warm Short	168.3	412.1	303.3	1034.7	815.3
Cool Mid	198.6	648.2	899.0	1128.1	748.7
Western whtg.	90.4	90.4	76.7	959.2	341.3
Warm Mid	0.0	0.0	239.7	63.6	155.2
Sedge	297.3	316.4	303.3	585.8	416.9
Grass Total	918.2	1619.3	2143.2	4228.1	2918.6
Forbs	162.3	187.8	453.8	667.8	595.9
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	1080.4	1553.6	2596.9	4895.9	3514.5
60 EOY:					
Cool Short	100.5	240.8	276.5	521.5	418.7
Warm Short	148.1	284.1	476.3	949.1	745.7
Cool Mid	247.4	654.1	812.9	1158.4	715.4
Western whtg.	70.2	249.1	248.0	471.0	437.7
Warm Mid	0.0	0.0	2.4	0.0	152.2
Sedge	182.6	131.4	283.1	441.2	325.3
Grass Total	748.69	1499.6	2099.2	3541.2	2794.9
Forbs	160.0	198.0	418.7	768.3	490.0
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	908.7	1697.6	2517.8	4309.6	3284.9
100 EOY:					
Cool Short	148.1	70.2	276.5	579.2	278.9
Warm Short	130.2	516.8	446.0	904.5	777.6
Cool Mid	295.0	578.0	616.7	1002.0	777.8
Western whtg.	94.6	178.4	308.0	568.5	447.8
Warm Mid	1.2	1.2	11.9	0.0	133.8
Sedge	305.1	245.6	358.0	479.3	346.1
Grass Total	974.1	1591.8	2017.1	3533.5	2852.0
Forbs	142.1	259.9	508.4	688.6	582.8
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	1116.2	1596.7	2525.5	4222.1	3434.8

Table 3. Mean Above Ground Herbage Production by Category in Lbs/Acre for the Urea Fertilization Treatment on Native Range at the Dickinson Experiment Station, 1984

Lbs of N/Acre EY = Annually EOY = Biennially	30 May	25 Jun	18 Jul	2 Aug	15 Aug
Control:					
Cool Short	101.1	206.1	262.6	481.4	411.5
Warm Short	143.0	291.1	317.9	740.7	630.1
Cool Mid	117.5	292.6	435.0	599.8	577.1
Western whtg.	49.4	55.6	199.5	415.1	346.4
Warm Mid	21.4	5.1	31.5	34.2	165.9
Sedge	147.8	108.2	231.3	442.8	402.3
Grass Total	580.1	947.4	1477.7	2743.9	2533.3
Forbs	155.8	184.1	443.0	651.8	562.6
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	735.9	1131.4	1920.8	3395.6	3095.8
40 EY:					
Cool Short	77.3	213.5	309.8	417.5	419.8
Warm Short	77.9	170.1	543.5	749.9	650.0
Cool Mid	106.5	381.7	427.0	786.8	739.2
Western whtg.	172.5	187.3	421.6	566.7	381.2
Warm Mid	3.0	0.6	73.2	134.4	0.0
Sedge	63.6	110.0	123.1	329.6	198.0
Grass Total	500.7	1163.2	1864.8	2984.6	2388.2
Forbs	276.5	477.5	343.1	719.6	545.9
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	77.2	1640.7	2207.9	3704.2	2934.1
40 EOY:					
Cool Short	108.1	170.1	271.2	503.1	371.7
Warm Short	224.2	247.4	391.3	625.6	730.9
Cool Mid	120.1	481.7	573.3	958.6	627.4
Western whtg.	59.5	42.8	192.7	424.4	325.9
Warm Mid	1.2	0.0	88.0	198.0	131.4
Sedge	169.5	95.7	180.2	306.9	427.0
Grass Total	682.5	1037.7	1631.9	2956.5	2614.2
Forbs	131.4	152.1	420.4	700.5	615.5
Shrubs	44.6	0.0	0.0	0.0	0.0
TOTAL	858.5	1258.3	2052.4	3657.0	3229.6

Table 3. **(Cont.) Mean Above Ground Herbage Production by Category in Lbs/Acre for the Urea Fertilization Treatment on Native Range at the Dickinson Experiment Station, 1984**

Lbs of N/Acre EY = Annually EOY = Biennially	30 May	25 Jun	18 Jul	2 Aug	15 Aug
60 EY:					
Cool Short	160.6	190.9	251.6	529.3	453.1
Warm Short	126.7	248.0	255.1	647.0	634.5
Cool Mid	218.8	532.2	689.8	907.5	729.7
Western whtg.	124.3	127.9	421.6	441.8	361.6
Warm mid	0.0	2.4	1.8	276.5	152.2
Sedge	272.4	240.3	123.1	416.9	374.6
Grass Total	902.7	1236.6	1864.8	3218.9	2705.7
Forbs	186.7	168.9	343.1	526.3	478.7
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	1089.4	1405.5	2207.9	3745.2	3184.4
60 EOY:					
Cool Short	109.4	100.5	220.6	471.6	273.6
Warm Short	140.3	374.6	275.3	752.3	763.6
Cool Mid	270.0	577.4	777.2	792.7	602.4
Western whtg.	124.3	82.1	243.2	490.0	367.5
Warm mid	17.8	0.0	1.2	63.0	0.0
Sedge	299.1	174.2	255.7	546.5	388.3
Grass Total	961.0	1308.9	1773.3	3116.1	2395.3
Forbs	176.0	182.6	394.9	581.6	583.4
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	1137.0	1491.4	2168.2	3697.6	2978.7
100 EOY:					
Cool short	111.8	166.5	166.5	449.6	440.1
Warm short	103.5	473.4	589.3	771.9	599.4
Cool mid	436.5	663.7	723.7	987.2	909.3
Western whtg.	64.8	140.9	140.3	605.4	371.1
Warm mid	0.0	0.0	77.3	207.5	168.3
Sedge	312.2	335.4	308.6	578.0	468.6
Grass Total	1028.8	1779.8	2005.2	3599.5	2741.2
Forbs	214.1	240.3	389.5	614.9	763.0
Shrubs	0.0	0.0	0.0	0.0	0.0
TOTAL	1242.9	1995.1	2394.7	4214.4	3554.7

Table 4. **Mean Percentage of Herbage Production Increase for the Fertilization Treatments Compared to the Herbage Production on the Unfertilized Plots for 1982, 1983 and 1984**

Rate Lbs of N/Acre	Ammonium Nitrate			Urea		
	1982	**1983**	**1984**	**1982**	**1983**	**1984**
40 EY	67.1	51.9	16.9	72.1	52.3	9.6
40 EOY	49.3	25.4	12.0	44.1	18.2	7.6
60 EY	74.0	55.9	32.7	53.6	50.1	13.2
60 EOY	69.0	51.8	23.7	86.0	41.1	11.6
100 EOY	111.3	45.2	25.5	117.9	71.3	30.4

Table 5. Points Analysis of the Control Treatment (North and South) for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.10	2.18	11.00	3.40	5.58
Andropogon scoparius	0.10	0.20	0.33	0.10	0.30
Aristida longiseta	0.13	0.26	1.33	0.41	0.67
Bouteloua gracilis	14.37	28.51	75.67	23.35	51.86
Buchloe dactyloides	0.03	0.07	0.33	0.10	0.17
Koeleria pyramidata	2.67	5.29	19.00	5.86	11.15
Muhlenbergia cuspidata	2.03	4.03	12.67	3.91	7.94
Munroa squarrosa	0.07	0.13	0.67	0.21	0.34
Stipa comata	5.00	9.92	38.33	11.83	21.75
Stipa viridula	1.20	2.38	9.33	2.88	5.26
Carex filifolia	4.47	8.86	31.67	9.77	18.63
Carex heliophila	0.03	0.07	0.33	0.10	0.17
Achillea millefolium	0.33	0.66	3.33	1.03	1.69
Antennaria parvifolia	0.97	1.92	6.67	2.06	3.98
Artemisia dracunculus	0.43	0.86	3.67	1.13	1.99
Artemisia frigida	0.87	1.72	8.00	2.47	4.19
Aster ericoides	0.03	0.07	0.33	0.10	0.17
Astragalus canadensis	0.03	0.07	0.33	0.10	0.17
Astragalus crassicarpus	0.10	0.20	1.00	0.31	0.51
Chrysopsis villosa	0.17	0.33	0.67	0.21	0.54
Cirsium undulatum	0.03	0.07	0.33	0.10	0.17
Erysimum asperum	0.07	0.13	0.67	0.21	0.34
Gaura coccinea	0.03	0.07	0.33	0.10	0.17
Grindelia squarrosa	0.13	0.26	1.33	0.41	0.67
Hedeoma hispida	0.03	0.07	0.33	0.10	0.17
Lactuca oblongifolia	0.30	0.60	3.00	0.93	1.53
Liatris punctata	0.10	0.20	1.00	0.31	0.51
Lotus americanus	0.20	0.40	1.67	0.51	0.91
Orthocarpus luteus	0.03	0.07	0.33	0.10	0.17
Petalostemon purpureum	0.03	0.07	0.33	0.10	0.17
Phlox hoodii	0.83	1.65	7.67	2.37	4.02
Plantago purshii	0.07	0.13	0.67	0.21	0.34
Polygala alba	0.27	0.53	2.67	0.82	1.35
Psoralea argophylla	0.07	0.13	0.67	0.21	0.34
Ratibida columnifera	0.63	1.26	6.00	1.85	3.11
Solidago rigida	0.17	0.33	1.67	0.51	0.84
Sphaeralcea coccinea	0.73	1.46	7.00	2.16	3.62
Selaginella densa	7.70	15.28	35.33	10.91	26.19
Lichen spp.	4.83	9.59	28.33	8.74	18.33
Litter	49.43		100.00		
Rock	0.00		0.00		
Soil	0.17		1.33		

Table 6. Points Analysis of the Control Treatment (North) for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.13	2.19	11.33	3.42	5.61
Aristida longiseta	0.07	0.13	0.67	0.20	0.33
Bouteloua gracilis	13.67	26.38	74.67	22.54	48.92
Koeleria pyramidata	2.87	5.53	24.67	7.44	12.97
Muhlenbergia cuspidata	1.20	2.32	6.00	1.81	4.13
Munroa squarrosa	0.07	0.13	0.67	0.20	0.33
Stipa comata	4.20	8.11	36.67	11.07	19.18
Stipa viridula	1.33	2.57	9.33	2.82	5.39
Carex filifolia	3.87	7.46	28.00	8.45	15.91
Carex heliophila	0.07	0.13	0.67	0.20	0.33
Achillea millefolium	0.33	0.64	3.33	1.01	1.65
Antennaria parvifolia	1.40	2.70	8.67	2.62	5.32
Artemisia dracunculus	0.47	0.90	4.67	1.41	2.31
Artemisia frigida	0.67	1.29	6.00	1.81	3.10
Astragalus canadensis	0.07	0.13	0.67	0.20	0.33
Grindelia squarrosa	0.20	0.39	2.00	0.60	0.99
Lactuca oblongifolia	0.33	0.64	3.33	1.01	1.65
Liatris punctata	0.07	0.13	0.67	0.20	0.33
Lotus americanus	0.33	0.64	2.67	0.80	1.44
Petalostemon purpureum	0.07	0.13	0.67	0.20	0.33
Phlox hoodii	0.87	1.67	8.67	2.62	4.29
Polygala alba	0.07	0.13	0.67	0.20	0.33
Psoralea argophylla	0.13	0.26	1.33	0.40	0.66
Ratibida columnifera	0.67	1.29	6.00	1.81	3.10
Sphaeralcea coccinea	0.60	1.16	6.00	1.81	2.97
Selaginella densa	14.13	27.28	62.67	18.91	46.19
Lichen spp.	2.93	5.66	20.67	6.24	11.90
Litter	48.13		100.00		
Rock	0.00		0.00		
Soil	0.07		0.67		

Table 7. Points Analysis of the Control Treatment (South) for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.07	2.18	10.67	3.37	5.55
Andropogon scoparius	0.20	0.41	0.67	0.21	0.62
Aristida longiseta	0.20	0.41	2.00	0.63	1.04
Bouteloua gracilis	15.07	30.75	76.67	24.21	54.96
Buchloe dactyloides	0.07	0.14	0.67	0.21	0.35
Koeleria pyramidata	2.47	5.03	13.33	4.21	9.24
Muhlenbergia cuspidata	2.87	5.85	19.33	6.11	11.96
Munroa squarrosa	0.07	0.14	0.67	0.21	0.35
Stipa comata	5.80	11.84	40.00	12.63	24.47
Stipa viridula	1.07	2.18	9.33	2.95	5.13
Carex filifolia	5.07	10.34	35.33	11.16	21.50
Achillea millefolium	0.33	0.68	3.33	1.05	1.73
Antennaria parvifolia	0.53	1.09	4.67	1.47	2.56
Artemisia dracunculus	0.40	0.82	2.67	0.84	1.66
Artemisia frigida	1.07	2.18	10.00	3.16	5.34
Aster ericoides	0.07	0.14	0.67	0.21	0.35
Astragalus crassicarpus	0.20	0.41	2.00	0.63	1.04
Chrysopsis villosa	0.33	0.68	1.33	0.42	1.10
Cirsium undulatum	0.07	0.14	0.67	0.21	0.35
Erysimum asperum	0.13	0.27	1.33	0.42	0.69
Gaura coccinea	0.07	0.14	0.67	0.21	0.35
Grindelia squarrosa	0.07	0.14	0.67	0.21	0.35
Hedeoma hispida	0.07	0.14	0.67	0.21	0.35
Lactuca oblongifolia	0.27	0.54	2.67	0.84	1.38
Liatris punctata	0.13	0.27	1.33	0.42	0.69
Lotus americanus	0.07	0.14	0.67	0.21	0.35
Orthocarpus luteus	0.07	0.14	0.67	0.21	0.35
Phlox hoodii	0.80	1.63	6.67	2.11	3.74
Plantago purshii	0.13	0.27	1.33	0.42	0.69
Polygala alba	0.47	0.95	4.67	1.47	2.42
Ratibida columnifera	0.60	1.22	6.00	1.89	3.11
Solidago rigida	0.33	0.68	3.33	1.05	1.73
Sphaeralcea coccinea	0.87	1.77	8.00	2.53	4.30
Selaginella densa	1.27	2.59	8.00	2.53	5.12
Lichen	6.73	13.74	36.00	11.37	25.11
Litter	50.73		100.00		
Rock	0.00		0.00		
Soil	0.27		2.00		

Table 8. Points Analysis of the Ammonium Nitrate Treatment at the 40 Pounds of Nitrogen Per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.53	2.88	15.33	4.35	7.23
Bouteloua gracilis	12.53	23.56	71.33	20.23	43.79
Koeleria pyramidata	2.80	5.26	24.67	6.99	12.25
Muhlenbergia cuspidata	0.60	1.13	5.33	1.51	2.64
Stipa comata	5.67	10.65	40.67	11.53	22.18
Stipa viridula	1.93	3.63	17.33	4.91	8.54
Carex filifolia	3.87	7.27	29.33	8.32	15.59
Achillea millefolium	0.73	1.38	7.33	2.08	3.46
Antennaria parvifolia	1.07	2.01	9.33	2.65	4.66
Arabis holboellii	0.20	0.38	2.00	0.57	0.95
Artemisia dracunculus	0.27	0.50	2.67	0.76	1.26
Artemisia frigida	0.47	0.88	4.67	1.32	2.20
Commandra umbellata	0.07	0.13	0.67	0.19	0.32
Erysimum asperum	0.07	0.13	0.67	0.19	0.32
Grindelia squarrosa	0.07	0.13	0.67	0.19	0.32
Gutierrezia sarothrae	0.13	0.25	1.33	0.38	0.63
Hedeoma hispida	0.20	0.38	2.00	0.57	0.95
Liatris punctata	0.13	0.25	0.67	0.19	0.44
Opuntia fragilis	0.13	0.25	1.33	0.38	0.63
Phlox hoodii	1.27	2.38	12.00	3.40	5.78
Plantago purshii	0.27	0.50	2.67	0.76	1.26
Polygala alba	0.07	0.13	0.67	0.19	0.32
Potentilla pensylvanica	0.17	0.13	0.67	0.19	0.32
Ratibida columnifera	1.40	2.63	13.33	3.78	6.41
Solidago rigida	0.13	0.25	1.33	0.38	0.63
Sphaeralcea coccinea	0.60	1.13	5.33	1.51	2.64
Rosa arkansana	0.07	0.13	0.67	0.19	0.32
Selaginella densa	7.87	14.79	26.67	7.56	22.35
Lichen spp.	9.00	16.92	52.00	14.74	31.66
Litter	46.73		98.67		
Rock	0.00		0.00		
Soil	0.01		0.67		

Table 9. Points Analysis of the Ammonium Nitrate Treatment at the 40 Pounds of Nitrogen Per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	0.80	1.49	7.33	2.23	3.72
Andropogon scoparius	0.07	0.12	0.67	0.20	0.32
Bouteloua gracilis	14.60	27.17	70.00	21.26	48.43
Calamovilfa longifolia	0.07	0.12	0.67	0.20	0.32
Koeleria pyramidata	3.13	5.83	24.67	7.49	13.32
Muhlenbergia cuspidata	0.93	1.74	6.67	2.02	3.76
Stipa comata	6.07	11.29	44.67	13.56	24.85
Stipa viridula	1.80	3.35	14.00	4.25	7.60
Carex filifolia	4.87	9.06	36.67	11.13	20.19
Achillea millefolium	0.53	0.99	4.67	1.42	2.41
Agoseris glauca	0.07	0.12	0.67	0.20	0.32
Antennaria parvifolia	1.27	2.36	6.67	2.02	4.38
Artemisia dracunculus	0.40	0.74	4.00	1.21	1.95
Artemisia frigida	0.33	0.62	3.33	1.01	1.63
Astragalus crassicarpus	0.07	0.12	0.67	0.20	0.32
Erigeron strigosus	0.07	0.12	0.67	0.20	0.32
Erysimum asperum	0.27	0.50	2.67	0.81	1.31
Gaura coccinea	0.07	0.12	0.67	0.20	0.32
Haplopappus spinulosus	0.13	0.25	1.33	0.40	0.65
Hedeoma hispida	0.40	0.74	4.00	1.21	1.95
Liatris punctata	0.20	0.37	2.00	0.61	0.98
Linum rigidum	0.07	0.12	0.67	0.20	0.32
Lithospermum incisum	0.07	0.12	0.67	0.20	0.32
Orthocarpus luteus	0.07	0.12	0.67	0.20	0.32
Phlox hoodii	1.27	2.36	10.67	3.24	5.60
Plantago purshii	0.20	0.37	2.00	0.61	0.98
Potentilla pensylvanica	0.20	0.37	2.00	0.61	0.98
Psoralea esculenta	0.20	0.37	1.33	0.40	0.77
Ratibida columnifera	0.87	1.61	8.00	2.43	4.04
Sphaeralcea coccinea	0.07	0.12	0.67	0.20	0.32
Selaginella densa	7.40	13.77	27.33	8.30	22.07
Lichen spp.	7.20	13.40	38.67	11.74	25.14
Litter	46.07		100.00		
Rock	0.00		0.00		
Soil	0.20		1.33		

Table 10. Points Analysis of the Ammonium Nitrate Treatment at the 60 Pounds of Nitrogen Per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.60	3.48	14.67	4.84	8.32
Bouteloua gracilis	13.53	29.42	66.67	21.98	51.40
Koeleria pyramidata	2.53	5.51	21.33	7.03	12.54
Muhlenbergia cuspidata	0.67	1.45	4.00	1.32	2.77
Poa compressa	0.07	0.14	0.67	0.22	0.36
Stipa comata	6.80	14.78	47.33	15.60	30.38
Stipa viridula	0.93	2.03	8.67	2.86	4.89
Carex filifolia	7.60	16.52	48.67	16.04	32.56
Carex heliophila	0.13	0.29	0.67	0.22	0.51
Achillea millefolium	0.67	1.45	4.67	1.54	2.99
Antennaria parvifolia	0.60	1.30	4.67	1.54	2.84
Arabis holboellii	0.13	0.29	1.33	0.44	0.73
Artemisia dracunculus	0.53	1.16	4.67	1.54	2.70
Artemisia frigida	1.53	3.33	13.33	4.40	7.73
Commandra umbellata	0.13	0.29	1.33	0.44	0.73
Erysimum asperum	0.13	0.29	1.33	0.44	0.73
Grindelia squarrosa	0.33	0.72	2.67	0.88	1.60
Hedeoma hispida	0.07	0.14	0.67	0.22	0.36
Liatris punctata	0.20	0.43	2.00	0.66	1.09
Oxytropis lambertii	0.07	0.14	0.67	0.22	0.36
Phlox hoodii	0.67	1.45	4.00	1.32	2.77
Polygala alba	0.07	0.14	0.67	0.22	0.36
Psoralea argophylla	0.07	0.14	0.67	0.22	0.36
Ratibida columnifera	0.60	1.30	5.33	1.76	3.06
Sphaeralcea coccinea	1.27	2.75	12.00	3.96	6.71
Selaginella densa	0.40	0.87	2.67	0.88	1.75
Lichen spp.	4.67	10.14	28.00	9.23	19.37
Litter	54.00		100.00		
Rock	0.00		0.00		
Soil	0.00		0.00		

Table 11. Points Analysis of the Ammonium Nitrate Treatment at the 60 Pounds of Nitrogen Per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.20	2.31	11.33	3.50	5.81
Bouteloua gracilis	15.20	29.27	74.00	22.84	52.11
Koeleria pyramidata	3.20	6.16	24.67	7.61	13.77
Muhlenbergia cuspidata	0.13	0.26	1.33	0.41	0.67
Poa compressa	0.13	0.26	1.33	0.41	0.67
Stipa comata	7.13	13.74	51.33	15.84	29.58
Stipa viridula	1.47	2.82	11.33	3.50	6.32
Carex filifolia	4.47	8.60	28.67	8.85	17.45
Achillea millefolium	0.27	0.51	2.67	0.82	1.33
Antennaria parvifolia	0.53	1.03	4.00	1.23	2.26
Artemisia dracunculus	0.40	0.77	3.33	1.03	1.80
Artemisia frigida	1.07	2.05	9.33	2.88	4.93
Erysimum asperum	0.07	0.13	0.67	0.21	0.34
Grindelia squarrosa	0.20	0.39	2.00	0.62	1.01
Gutierrezia sarothrae	0.07	0.13	0.67	0.21	0.34
Haplopappus spinulosus	0.07	0.13	0.67	0.21	0.34
Hedeoma hispida	0.07	0.13	0.67	0.21	0.34
Liatris punctata	0.40	0.77	4.00	1.23	2.00
Linum rigidum	0.07	0.13	0.67	0.21	0.34
Lithospermum incisum	0.07	0.13	0.67	0.21	0.34
Phlox hoodii	2.67	5.13	18.67	5.76	10.89
Potentilla pensylvanica	0.07	0.13	0.67	0.21	0.34
Psoralea esculenta	0.27	0.51	2.67	0.82	1.33
Ratibida columnifera	0.53	1.03	5.33	1.65	2.68
Sphaeralcea coccinea	0.53	1.03	4.67	1.44	2.47
Taraxacum officinale	0.07	0.13	0.67	0.21	0.34
Rosa arkansana	0.07	0.13	0.67	0.21	0.34
Selaginella densa	9.87	19.00	43.33	13.37	32.37
Lichen spp.	1.67	3.21	14.00	4.32	7.53
Litter	48.07		100.00		
Rock	0.00		0.00		
Soil	0.00		0.00		

Table 12. Points Analysis of the Ammonium Nitrate Treatment at the 100 Pounds of Nitrogen Per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.67	3.43	14.00	4.15	7.58
Bouteloua gracilis	11.00	22.63	62.67	18.58	41.21
Koeleria pyramidata	2.33	4.80	18.00	5.34	10.14
Muhlenbergia cuspidata	0.73	1.51	4.67	1.38	2.89
Panicum oligosanthes	0.73	1.51	6.00	1.78	3.29
Poa compressa	0.13	0.27	1.33	0.40	0.67
Stipa comata	7.93	16.32	53.33	15.81	32.13
Stipa viridula	2.93	6.04	19.33	5.73	11.77
Carex filifolia	4.67	9.60	30.67	9.09	18.69
Carex heliophila	0.20	0.41	2.00	0.59	1.00
Achillea millefolium	1.20	2.47	10.00	2.96	5.43
Antennaria parvifolia	0.60	1.23	4.67	1.38	2.61
Arabis holboellii	0.07	0.14	0.67	0.20	0.34
Artemisia dracunculus	0.20	0.41	2.00	0.59	1.00
Artemisia frigida	1.40	2.88	13.33	3.95	6.83
Cirsium undulatum	0.07	0.14	0.67	0.20	0.34
Echinacea angustifolia	0.13	0.27	1.33	0.40	0.67
Erigeron strigosus	0.07	0.14	0.67	0.20	0.34
Erysimum asperum	0.47	0.96	4.00	1.19	2.15
Grindelia squarrosa	0.33	0.69	2.67	0.79	1.48
Hedeoma hispida	0.13	0.27	1.33	0.40	0.67
Lactuca oblongifolia	0.07	0.14	0.67	0.20	0.34
Liatris punctata	0.07	0.14	0.67	0.20	0.34
Linum rigidum	0.07	0.14	0.67	0.20	0.34
Orthocarpus luteus	0.07	0.14	0.67	0.20	0.34
Phlox hoodii	0.67	1.37	6.00	1.78	3.15
Plantago purshii	0.13	0.27	1.33	0.40	0.67
Potentilla pensylvanica	0.07	0.14	0.67	0.20	0.34
Psoralea argophylla	0.07	0.14	0.67	0.20	0.34
Psoralea esculenta	0.07	0.14	0.67	0.20	0.34
Ratibida columnifera	1.13	2.33	10.67	3.16	5.49
Senecio plattensis	0.07	0.14	0.67	0.20	0.34
Sphaeralcea coccinea	1.00	2.06	10.00	2.96	5.02
Symphoricarpos occidentalis	0.07	0.14	0.67	0.20	0.34
Selaginella densa	1.73	3.57	7.33	2.17	5.74
Lichen spp.	6.33	13.03	42.67	12.65	25.68
Litter	51.33		100.00		
Rock	0.00		0.00		
Soil	0.07		0.67		

Table 13. Points Analysis of the Urea Treatment at the 40 Pounds of Nitrogen per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	2.13	4.26	17.33	5.58	9.84
Andropogon scoparius	0.07	0.13	0.67	0.21	0.34
Bouteloua gracilis	12.53	25.00	68.67	22.10	47.10
Buchloe dactyloides	0.07	0.13	0.67	0.21	0.34
Koeleria pyramidata	2.73	5.45	24.00	7.73	13.18
Muhlenbergia cuspidata	0.67	1.33	4.67	1.50	2.83
Stipa comata	5.53	11.04	40.67	13.09	24.13
Stipa viridula	1.27	2.53	12.00	3.86	6.39
Carex filifolia	1.53	3.06	14.00	4.51	7.57
Carex heliophila	0.07	0.13	0.67	0.21	0.34
Achillea millefolium	0.73	1.46	5.33	1.72	3.18
Antennaria parvifolia	1.67	3.32	12.00	3.86	7.18
Artemisia dracunculus	0.07	0.13	0.67	0.21	0.34
Artemisia frigida	0.87	1.73	7.33	2.36	4.09
Aster ericoides	0.13	0.27	1.33	0.43	0.70
Cerastium arvense	0.07	0.13	0.67	0.21	0.34
Erigeron strigosus	0.13	0.27	1.33	0.43	0.70
Erysimum asperum	0.13	0.27	1.33	0.43	0.70
Grindelia squarrosa	0.13	0.27	0.67	0.21	0.48
Hedeoma hispida	0.27	0.53	2.67	0.86	1.39
Liatris punctata	0.13	0.27	1.33	0.43	0.70
Linum rigidum	0.20	0.40	2.00	0.64	1.04
Phlox hoodii	0.87	1.73	6.00	1.93	3.66
Psoralea esculenta	0.07	0.13	0.67	0.21	0.34
Ratibida columnifera	1.07	2.13	10.67	3.43	5.56
Sphaeralcea coccinea	0.53	1.06	5.33	1.72	2.78
Selaginella densa	7.67	15.29	28.00	9.01	24.30
Lichen spp.	8.80	17.55	40.00	12.88	30.43
Litter	49.87		100.00		
Rock	0.00		0.00		
Soil	0.00		0.00		

Table 14. Points Analysis of the Urea Treatment at the 40 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.93	3.67	16.67	4.78	8.45
Bouteloua gracilis	16.13	30.63	78.67	22.56	53.19
Koeleria pyramidata	2.93	5.57	24.00	6.88	12.45
Muhlenbergia cuspidata	0.40	0.76	3.33	0.96	1.72
Munroa squarrosa	0.13	0.25	1.33	0.38	0.63
Poa compressa	0.20	0.38	1.33	0.38	0.76
Stipa comata	6.27	11.90	43.33	12.43	24.33
Stipa viridula	1.60	3.04	14.67	4.21	7.25
Carex filifolia	5.00	9.49	34.00	9.75	19.24
Carex heliophila	0.07	0.13	0.67	0.19	0.32
Achillea millefolium	0.53	1.01	5.33	1.53	2.54
Androsace occidentalis	0.07	0.13	0.67	0.19	0.32
Antennaria parvifolia	0.87	1.65	6.67	1.91	3.56
Arabis holboellii	0.13	0.25	1.33	0.38	0.63
Artemisia dracunculus	0.27	0.51	2.67	0.76	1.27
Artemisia frigida	1.27	2.41	12.00	3.44	5.85
Aster ericoides	0.13	0.25	1.33	0.38	0.63
Chrysopsis villosa	0.07	0.13	0.67	0.19	0.32
Erigeron strigosus	0.20	0.38	2.00	0.57	0.95
Grindelia squarrosa	0.07	0.13	0.67	0.19	0.32
Haplopappus spinulosus	0.07	0.13	0.67	0.19	0.32
Hedeoma hispida	0.13	0.25	1.33	0.38	0.63
Liatris punctata	0.20	0.38	2.00	0.57	0.95
Linum rigidum	0.13	0.25	1.33	0.38	0.63
Opuntia fragilis	0.13	0.25	0.67	0.19	0.44
Orthocarpus luteus	0.07	0.13	0.67	0.19	0.32
Petalostemon purpureum	1.73	3.29	14.67	4.21	7.50
Phlox hoodii	0.33	0.63	3.33	0.96	1.59
Plantago purshii	0.13	0.25	0.67	0.19	0.44
Polygala alba	0.07	0.13	0.67	0.19	0.32
Psoralea esculenta	0.93	1.77	9.33	2.68	4.45
Solidago rigida	0.87	1.65	8.67	2.49	4.14
Selaginella densa	2.60	4.94	12.67	3.63	8.57
Lichen spp.	7.00	13.29	40.67	11.66	
Litter	47.27		100.00		
Rock	0.00		0.00		
Soil	0.07		0.67		

Table 15. Points Analysis of the Urea Treatment at the 60 Pounds of Nitrogen per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	0.93	1.83	9.33	2.79	4.62
Bouteloua gracilis	12.40	24.28	63.33	18.96	43.24
Buchloe dactyloides	0.07	0.13	0.67	0.20	0.33
Koeleria pyramidata	2.40	4.70	21.33	6.39	11.09
Muhlenbergia cuspidata	1.13	2.22	5.33	1.60	3.82
Munroa squarrosa	0.07	0.13	0.67	0.20	0.33
Poa compressa	0.13	0.26	1.33	0.40	0.66
Stipa comata	7.40	14.49	51.33	15.37	29.86
Stipa viridula	1.80	3.52	16.00	4.79	8.31
Carex filifolia	4.80	9.40	34.00	10.18	19.58
Achillea millefolium	0.40	0.78	4.00	1.20	1.98
Antennaria parvifolia	0.93	1.83	6.00	1.80	3.63
Artemisia dracunculus	0.33	0.65	3.33	1.00	1.65
Artemisia frigida	1.13	2.22	10.67	3.19	5.41
Aster ericoides	0.07	0.13	0.67	0.20	0.33
Cirsium undulatum	0.07	0.13	0.67	0.20	0.33
Commandra umbellata	0.07	0.13	0.67	0.20	0.33
Erigeron strigosus	0.07	0.13	0.67	0.20	0.33
Grindelia squarrosa	0.20	0.39	2.00	0.60	0.99
Gutierrezia sarothrae	0.13	0.26	1.33	0.40	0.66
Hedeoma hispida	0.07	0.13	0.67	0.20	0.33
Liatris punctata	0.07	0.13	0.67	0.20	0.33
Opuntia fragilis	0.07	0.13	0.67	0.20	0.33
Phlox hoodii	1.80	3.52	13.33	3.99	7.51
Psoralea argophylla	0.07	0.13	0.67	0.20	0.33
Ratibida columnifera	1.00	1.96	10.00	2.99	4.95
Sphaeralcea coccinea	0.67	1.31	5.33	1.60	2.91
Selaginella densa	6.47	12.66	28.67	8.58	21.24
Lichen spp.	6.33	12.40	40.67	12.18	24.58
Litter	48.60		100.00		
Rock	0.00		0.00		
Soil	0.33		2.00		

Table 16. Points Analysis of the Urea Treatment at the 60 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.07	2.01	8.67	2.59	4.60
Andropogon scoparius	0.27	0.50	1.33	0.40	0.90
Bouteloua gracilis	10.73	20.25	60.67	18.13	38.38
Koeleria pyramidata	2.33	4.40	16.67	4.98	9.38
Muhlenbergia cuspidata	1.73	3.27	13.33	3.98	7.25
Stipa comata	6.87	12.96	52.00	15.54	28.50
Stipa viridula	2.20	4.15	16.00	4.78	8.93
Carex filifolia	7.27	13.71	34.00	10.16	23.87
Carex heliophila	0.07	0.13	0.67	0.20	0.33
Achillea millefolium	0.73	1.38	7.33	2.19	3.57
Antennaria parvifolia	2.27	4.28	12.67	3.78	8.06
Arabis holboellii	0.07	0.13	0.67	0.20	0.33
Artemisia dracunculus	0.07	0.13	0.67	0.20	0.33
Artemisia frigida	1.13	2.14	8.67	2.59	4.73
Aster ericoides	0.13	0.25	0.67	0.20	0.45
Echinacea angustifolia	0.93	1.76	7.33	2.19	3.95
Erysimum asperum	0.07	0.13	0.67	0.20	0.33
Grindelia squarrosa	0.27	0.50	2.67	0.80	1.30
Haplopappus spinulosus	0.13	0.25	1.33	0.40	0.65
Hedeoma hispida	0.27	0.50	2.67	0.80	1.30
Lepidium densiflorum	0.27	0.50	2.00	0.60	1.10
Liatris punctata	0.27	0.50	2.67	0.80	1.30
Linum rigidum	0.33	0.63	2.67	0.80	1.43
Lotus americanus	0.07	0.13	0.67	0.20	0.33
Orthocarpus luteus	0.13	0.25	1.33	0.40	0.65
Phlox hoodii	0.93	1.76	7.33	2.19	3.95
Plantago purshii	0.40	0.75	4.00	1.20	1.95
Polygala alba	0.13	0.25	1.33	0.40	0.65
Ratibida columnifera	0.67	1.26	6.67	1.99	3.25
Sphaeralcea coccinea	0.60	1.13	6.00	1.79	2.92
Selaginella densa	7.60	14.34	31.33	9.36	23.70
Lichen spp.	3.00	5.66	20.00	5.98	11.64
Litter	46.47		100.00		
Rock	0.00		0.00		
Soil	0.53		2.67		

Table 17. Points Analysis of the Urea Treatment at the 100 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	1.13	2.26	11.33	3.64	5.90
Aristida longiseta	0.07	0.13	0.67	0.21	0.34
Bouteloua gracilis	16.80	33.51	76.00	24.41	57.92
Koeleria pyramidata	2.40	4.79	16.67	5.35	10.14
Muhlenbergia cuspidata	0.40	0.80	2.67	0.86	1.66
Poa compressa	0.07	0.13	0.67	0.21	0.34
Stipa comata	7.07	14.10	50.00	16.06	30.16
Stipa viridula	1.47	2.93	12.67	4.07	7.00
Carex filifolia	7.07	14.10	42.00	13.49	27.59
Carex heliophila	0.60	1.20	5.33	1.71	2.91
Achillea millefolium	0.47	0.93	4.00	1.28	2.21
Antennaria parvifolia	0.20	0.40	0.67	0.21	0.61
Artemisia dracunculus	0.33	0.66	3.33	1.07	1.73
Artemisia frigida	0.53	1.06	4.67	1.50	2.56
Haplopappus spinulosus	0.07	0.13	0.67	0.21	0.34
Liatris punctata	0.20	0.40	2.00	0.64	1.04
Linum rigidum	0.07	0.13	0.67	0.21	0.34
Lotus americanus	0.07	0.13	0.67	0.21	0.34
Orthocarpus luteus	0.07	0.13	0.67	0.21	0.34
Petalostemon purpureum	0.13	0.27	0.67	0.21	0.48
Phlox hoodia	1.07	2.13	8.00	2.57	4.70
Polygala alba	0.13	0.27	1.33	0.43	0.70
Psoralea esculenta	0.07	0.13	0.67	0.21	0.34
Ratibida columnifera	0.73	1.46	7.33	2.36	3.82
Sphaeralcea coccinea	0.80	1.60	8.00	2.57	4.17
Selaginella densa	4.60	9.18	24.00	7.71	16.89
Lichen spp.	3.53	7.05	26.00	8.35	15.40
Litter	49.73		100.00		
Rock	0.00		0.00		
Soil	0.13		1.33		

Table 18. Mean Percentage of Basal Cover for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Treatment	Application Rate	Grass	Sedge	Forbs	Shrubs	Club Moss	Lichen	Litter	Rock	Soil
Control	0 lbs	26.70	4.50	6.65	0.00	7.70	4.83	49.43	0.00	0.17
Ammonium Nitrate	40 lbs EY	25.06	3.87	7.35	0.07	7.87	9.00	46.73	0.00	0.01
	40 lbs EOY	27.47	4.87	6.83	0.00	7.40	7.20	46.07	0.00	0.20
	60 lbs EY	26.13	7.73	7.07	0.00	0.40	4.67	54.00	0.00	0.00
	60 lbs EOY	28.46	4.47	7.43	0.07	9.87	1.67	48.07	0.00	0.00
	100 lbs EOY	27.45	4.87	8.16	0.07	1.73	6.33	51.33	0.00	0.07
Urea	40 lbs EY	25.00	1.60	7.07	0.00	7.67	8.80	49.87	0.00	0.00
	40 lbs EOY	29.59	5.07	8.40	0.00	2.60	7.00	47.27	0.00	0.07
	60 lbs EY	26.33	4.80	7.15	0.00	6.47	6.33	48.60	0.00	0.33
	60 lbs EOY	25.20	7.34	9.87	0.00	7.60	3.00	46.47	0.00	0.53
	100 lbs EOY	29.41	7.67	4.94	0.00	4.60	3.53	49.73	0.00	0.13

Table 19. Density Analysis per 0.1 Sq. Meter of the Control Treatment (North and South) for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.27	2.57	15.00	3.21	5.78
Androsace occidentalis	0.12	1.12	5.00	1.07	2.19
Antennaria parvifolia	0.55	5.30	11.67	2.50	7.80
Arabis hirsuta	0.03	0.32	3.33	0.71	1.03
Arabis holboellii	0.03	0.32	3.33	0.71	1.03
Artemisia dracunculus	0.27	2.57	21.67	4.64	7.21
Artemisia frigida	0.67	6.42	45.00	9.64	16.06
Astragalus agrestis	0.10	0.96	3.33	0.71	1.67
Astragalus crassicarpus	0.02	0.16	1.67	0.36	0.52
Collomia linearis	0.03	0.32	3.33	0.71	1.03
Draba nemorosa	0.15	1.44	6.67	1.43	2.87
Erigeron glabellus	0.08	0.80	8.33	1.79	2.59
Gaura coccinea	0.12	1.12	3.33	0.71	1.83
Grindelia squarrosa	0.07	0.64	5.00	1.07	1.71
Hedeoma hispida	1.37	13.16	45.00	9.64	22.80
Lactuca oblongifolia	0.12	1.12	10.00	2.14	3.26
Liatris punctata	0.03	0.32	3.33	0.71	1.03
Linum rigidum	0.18	1.77	18.33	3.93	5.70
Lotus americanus	0.58	5.62	23.33	5.00	10.62
Melilotus officinalis	0.02	0.16	1.67	0.36	0.52
Orthocarpus luteus	0.07	0.64	5.00	1.07	1.71
Petalostemon purpureum	0.03	0.32	3.33	0.71	1.03
Phlox hoodia	0.90	8.67	26.67	5.71	14.38
Plantago purshii	1.38	13.32	40.00	8.57	21.89
Polygala alba	0.13	1.28	8.33	1.79	3.07
Potentilla argute	0.03	0.32	1.67	0.36	0.68
Potentilla pensylvanica	0.02	0.16	1.67	0.36	0.52
Psoralea argophylla	0.18	1.77	10.00	2.14	3.91
Psoralea esculenta	0.12	1.12	8.33	1.79	2.91
Ratibida columnifera	1.17	11.24	50.00	10.71	21.95
Solidago rigida	0.03	0.32	1.67	0.36	0.68
Sphaeralcea coccinea	1.23	11.88	51.67	11.07	22.95
Taraxacum officinale	0.15	1.44	6.67	1.43	2.87
Vicia americana	0.13	1.28	13.33	2.86	4.14

Table 20. Density Analysis per 0.1 Sq. Meter of the Control Treatment (North) for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.47	4.62	26.67	6.11	10.73
Antennaria parvifolia	0.73	7.26	13.33	3.05	10.31
Arabis holboellii	0.03	0.33	3.33	0.76	1.09
Artemisia dracunculus	0.30	2.97	26.67	6.11	9.08
Artemisia frigida	0.43	4.29	30.00	6.87	11.16
Astragalus agrestis	0.20	1.98	6.67	1.53	3.51
Draba nemorosa	0.27	2.64	10.00	2.29	4.93
Grindelia squarrosa	0.13	1.32	10.00	2.29	3.61
Hedeoma hispida	0.93	9.24	26.67	6.11	15.35
Lactuca oblongifolia	0.10	0.99	10.00	2.29	3.28
Liatris punctate	0.07	0.66	6.67	1.53	2.19
Linum rigidum	0.10	0.99	10.00	2.29	3.28
Lotus americanus	1.03	10.23	33.33	7.63	17.86
Melilotus officinalis	0.03	0.33	3.33	0.76	1.09
Orthocarpus luteus	0.03	0.33	3.33	0.76	1.09
Petalostemon purpureum	0.03	0.33	3.33	0.76	1.09
Phlox hoodia	0.70	6.93	20.00	4.58	11.51
Plantago purshii	1.03	10.23	30.00	6.87	17.10
Polygala alba	0.17	1.65	6.67	1.53	3.18
Potentilla arguta	0.07	0.66	3.33	0.76	1.42
Potentilla pensylvanica	0.03	0.33	3.33	0.76	1.09
Psoralea argophylla	0.37	3.63	20.00	4.58	8.21
Psoralea esculenta	0.17	1.65	10.00	2.29	3.94
Ratibida columnifera	1.23	12.21	50.00	11.45	23.66
Sphaeralcea coccinea	1.20	11.88	46.67	10.69	22.57
Vicia americana	0.23	2.31	23.33	5.34	7.65

Table 21. Density Analysis per 0.1 Sq. Meter of the Control Treatment (South) for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.07	0.63	3.33	0.67	1.30
Androsace occidentalis	0.23	2.19	10.00	2.01	4.20
Antennaria parvifolia	0.37	3.44	10.00	2.01	5.45
Arabis hirsute	0.07	0.63	6.67	1.34	1.97
Arabis holboellii	0.03	0.31	3.33	0.67	0.98
Artemisia dracunculus	0.23	2.19	16.67	3.36	5.55
Artemisia frigida	0.90	8.44	60.00	12.08	20.52
Astragalus crassicarpus	0.03	0.31	3.33	0.67	0.98
Collomia linearis	0.07	0.63	6.67	1.34	1.97
Draba nemorosa	0.03	0.31	3.33	0.67	0.98
Erigeron glabellus	0.17	1.56	16.67	3.36	4.92
Gaura coccinea	0.23	2.19	6.67	1.34	3.53
Hedeoma hispida	1.80	16.88	63.33	12.75	29.63
Lactuca oblongifolia	0.13	1.25	10.00	2.01	3.26
Linum rigidum	0.27	2.50	26.67	5.37	7.87
Lotus americanus	0.13	1.25	13.33	2.68	3.93
Orthocarpus luteus	0.10	0.94	6.67	1.34	2.28
Petalostemon purpureum	0.03	0.31	3.33	0.67	0.98
Phlox hoodii	1.10	10.31	33.33	6.71	17.02
Plantago purshii	1.73	16.25	50.00	10.07	26.32
Polygala alba	0.10	0.94	10.00	2.01	2.95
Psoralea esculenta	0.07	0.63	6.67	1.34	1.97
Ratibida columnifera	1.10	10.31	50.00	10.07	20.38
Solidago rigida	0.07	0.63	3.33	0.67	1.30
Sphaeralcea coccinea	1.27	11.88	56.67	11.41	23.29
Taraxacum officinale	0.30	2.81	13.33	2.68	5.49
Vicia americana	0.03	0.31	3.33	0.67	0.98

Table 22. Density Analysis per 0.1 Sq. Meter of the Ammonium Nitrate Treatment at the 40 Pounds of Nitrogen per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	1.10	11.83	43.33	9.70	21.53
Androsace occidentalis	0.17	1.79	3.33	0.75	2.54
Antennaria parvifolia	0.90	9.68	16.67	3.73	13.41
Arabis hirsuta	0.13	1.43	10.00	2.24	3.67
Arabis holboellii	0.03	0.36	3.33	0.75	1.11
Artemisia dracunculus	0.23	2.51	16.67	3.73	6.24
Artemisia frigida	0.23	2.51	20.00	4.48	6.99
Aster ericoides	0.27	2.87	10.00	2.24	5.11
Cerastium arvense	0.13	1.43	10.00	2.24	3.67
Collomia linearis	0.33	3.58	20.00	4.48	8.06
Echinacea angustifolia	0.10	1.08	6.67	1.49	2.57
Erigeron glabellus	0.07	0.72	3.33	0.75	1.47
Grindelia squarrosa	0.07	0.72	6.67	1.49	2.21
Gutierrezia sarothrae	0.07	0.72	3.33	0.75	1.47
Hedeoma hispida	0.80	8.60	33.33	7.46	16.06
Lepidium densiflorum	0.13	1.43	6.67	1.49	2.92
Linum rigidum	0.13	1.43	13.33	2.99	4.42
Lotus americanus	0.27	2.87	10.00	2.24	5.11
Melilotus officinalis	0.03	0.36	3.33	0.75	1.11
Opuntia fragilis	0.03	0.36	3.33	0.75	1.11
Penstemon gracilis	0.10	1.08	3.33	0.75	1.83
Phlox hoodii	0.50	5.38	20.00	4.48	9.86
Plantago purshii	1.20	12.90	63.33	14.18	27.08
Ratibida columnifera	1.13	12.19	50.00	11.19	23.38
Sphaeralcea coccinea	0.90	9.68	46.67	10.45	20.13
Taraxacum officinale	0.20	2.15	16.67	3.73	5.88
Vicia americana	0.03	0.36	3.33	0.75	1.11

Table 23. Density Analysis per 0.1 Sq. Meter of the Ammonium Nitrate Treatment at the 40 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.70	6.44	20.00	4.65	11.09
Androsace occidentalis	0.07	0.61	3.33	0.78	1.39
Antennaria parvifolia	0.43	3.99	13.33	3.10	7.09
Arabis holboellii	0.10	0.92	6.67	1.55	2.47
Artemisia dracunculus	0.23	2.15	16.67	3.88	6.03
Artemisia frigida	0.30	2.76	30.00	6.98	9.74
Aster ericoides	2.60	23.93	33.33	7.75	31.68
Astragalus crassicarpus	0.03	0.31	3.33	0.78	1.09
Astragalus missouriensis	0.03	0.31	3.33	0.78	1.09
Bahia oppositifolia	0.10	0.92	10.00	2.33	3.25
Erigeron glabellus	0.23	2.15	6.67	1.55	3.70
Erysimum asperum	0.03	0.31	3.33	0.78	1.09
Gaura coccinea	0.03	0.31	3.33	0.78	1.09
Grindelia squarrosa	0.20	1.84	13.33	3.10	4.94
Haplopappus spinulosus	0.07	0.61	6.67	1.55	2.16
Hedeoma hispida	1.70	15.64	46.67	10.85	26.49
Liatris punctata	0.23	2.15	13.33	3.10	5.25
Linum rigidum	0.13	1.23	13.33	3.10	4.33
Lithospermum incisum	0.07	0.61	3.33	0.78	1.39
Lotus americanus	0.10	0.92	10.00	2.33	3.25
Orthocarpus luteus	0.03	0.31	3.33	0.78	1.09
Oxytropis lambertii	0.07	0.61	6.67	1.55	2.16
Penstemon gracilis	0.03	0.31	3.33	0.78	1.09
Petalostemon purpureum	0.07	0.61	6.67	1.55	2.16
Phlox hoodii	0.70	6.44	20.00	4.65	11.09
Plantago purshii	1.27	11.66	43.33	10.08	21.74
Polygala alba	0.07	0.61	3.33	0.78	1.39
Potentilla arguta	0.03	0.31	3.33	0.78	1.09
Psoralea esculenta	0.10	0.92	6.67	1.55	2.47
Ratibida columnifera	0.77	7.06	50.00	11.63	18.69
Sphaeralcea coccinea	0.13	1.23	6.67	1.55	2.78
Taraxacum officinale	0.10	0.92	6.67	1.55	2.47
Vicia americana	0.10	0.92	10.00	2.33	3.25

Table 24. Density Analysis per 0.1 Sq. Meter of the Ammonium Nitrate Treatment at the 60 Pounds of Nitrogen per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.43	5.28	20.00	4.92	10.20
Antennaria parvifolia	0.57	6.91	6.67	1.64	8.55
Artemisia dracunculus	0.37	4.47	33.33	8.20	12.67
Artemisia frigida	0.93	11.38	63.33	15.57	26.95
Cerastium arvense	0.17	2.03	3.33	0.82	2.85
Collomia linearis	0.03	0.41	3.33	0.82	1.23
Erigeron glabellus	0.07	0.81	6.67	1.64	2.45
Gaura coccinea	0.07	0.81	6.67	1.64	2.45
Grindelia squarrosa	0.23	2.85	16.67	4.10	6.95
Hedeoma hispida	0.33	4.07	23.33	5.74	9.81
Lepidium densiflorum	0.03	0.41	3.33	0.82	1.23
Lotus americanus	0.10	1.22	6.67	1.64	2.86
Phlox hoodii	1.23	15.04	16.67	4.10	19.14
Plantago purshii	0.50	6.10	30.00	7.38	13.48
Potentilla arguta	0.03	0.41	3.33	0.82	1.23
Psoralea esculenta	0.30	3.66	20.00	4.92	8.58
Ratibida columnifera	0.90	10.98	43.33	10.66	21.64
Solidago missouriensis	0.03	0.41	3.33	0.82	1.23
Sphaeralcea coccinea	1.57	19.11	76.67	18.85	37.96
Taraxacum officinale	0.13	1.63	6.67	1.64	3.27
Vicia americana	0.17	2.03	13.33	3.28	5.31

Table 25. Density Analysis per 0.1 Sq. Meter of the Ammonium Nitrate Treatment at the 60 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.67	8.93	23.33	6.80	15.73
Antennaria parvifolia	0.63	8.48	10.00	2.91	11.39
Artemisia dracunculus	0.17	2.23	16.67	4.85	7.08
Artemisia frigida	0.37	4.91	30.00	8.74	13.65
Aster ericoides	0.40	5.36	6.67	1.94	7.30
Grindelia squarrosa	0.17	2.23	16.67	4.85	7.08
Gutierrezia sarothrae	0.03	0.45	3.33	0.97	1.42
Haplopappus spinulosus	0.03	0.45	3.33	0.97	1.42
Hedeoma hispida	0.27	3.57	16.67	4.85	8.42
Lepidium densiflorum	0.10	1.34	3.33	0.97	2.31
Liatris punctata	0.33	4.46	20.00	5.83	10.29
Linum lewisii	0.10	1.34	6.67	1.94	3.28
Lotus americanus	0.07	0.89	6.67	1.94	2.83
Phlox hoodii	2.03	27.23	56.67	16.50	43.73
Plantago purshii	0.50	6.70	23.33	6.80	13.50
Psoralea esculenta	0.13	1.79	13.33	3.88	5.67
Ratibida columnifera	0.40	5.36	26.67	7.77	13.13
Sphaeralcea coccinea	0.67	8.93	36.67	10.68	19.61
Taraxacum officinale	0.07	0.89	6.67	1.94	2.83
Rosa arkansana	0.13	1.79	10.00	2.91	4.70
Symphoricarpos occidentalis	0.20	2.68	6.67	1.94	4.62

Table 26. Density Analysis per 0.1 Sq. Meter of the Ammonium Nitrate Treatment at the 100 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	2.03	25.10	26.67	7.34	32.44
Androsace occidentalis	0.03	0.41	3.33	0.92	1.33
Antennaria parvifolia	0.03	0.41	3.33	0.92	1.33
Arabis hirsuta	0.03	0.41	3.33	0.92	1.33
Arabis holboellii	0.07	0.82	6.67	1.83	2.65
Artemisia dracunculus	0.07	0.82	6.67	1.83	2.65
Artemisia frigida	0.47	5.76	40.00	11.01	16.77
Collomia linearis	0.13	1.65	3.33	0.92	2.57
Grindelia squarrosa	0.07	0.82	6.67	1.83	2.65
Gutierrezia sarothrae	0.07	0.82	3.33	0.92	1.74
Hedeoma hispida	0.93	11.52	43.33	11.93	23.45
Lactuca oblongifolia	0.13	1.65	6.67	1.83	3.48
Linum rigidum	0.10	1.23	10.00	2.75	3.98
Lotus americanus	0.03	0.41	3.33	0.92	1.33
Orthocarpus luteus	0.03	0.41	3.33	0.92	1.33
Penstemon albidus	0.10	1.23	3.33	0.92	2.15
Penstemon gracilis	0.07	0.82	3.33	0.92	1.74
Phlox hoodii	0.77	9.47	23.33	6.42	15.89
Plantago purshii	0.27	3.29	10.00	2.75	6.04
Polygala alba	0.07	0.82	6.67	1.83	2.65
Psoralea esculenta	0.10	1.23	6.67	1.83	3.06
Ratibida columnifera	0.77	9.47	46.67	12.84	22.31
Sphaeralcea coccinea	1.13	13.99	60.00	16.51	30.50
Taraxacum officinale	0.53	6.58	26.67	7.34	13.92
Symphoricarpos occidentalis	0.07	0.82	6.67	1.83	2.65

Table 27. Density Analysis per 0.1 Sq. Meter of the Urea Treatment at the 40 Pounds of Nitrogen per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	1.80	16.31	53.33	10.53	26.84
Antennaria parvifolia	0.60	5.44	23.33	4.61	10.05
Arabis hirsuta	0.13	1.21	10.00	1.97	3.18
Arabis holboellii	0.10	0.91	10.00	1.97	2.88
Artemisia dracunculus	0.07	0.60	6.67	1.32	1.92
Artemisia frigida	0.57	5.14	40.00	7.89	13.03
Astragalus agrestis	0.03	0.30	3.33	0.66	0.96
Cerastium arvense	0.37	3.32	10.00	1.97	5.29
Draba nemorosa	0.03	0.30	3.33	0.66	0.96
Erigeron glabellus	0.50	4.53	33.33	6.58	11.11
Grindelia squarrosa	0.03	0.30	3.33	0.66	0.96
Hedeoma hispida	1.73	15.71	56.67	11.18	26.89
Lactuca oblongifolia	0.03	0.30	3.33	0.66	0.96
Linum rigidum	0.30	2.72	23.33	4.61	7.33
Lotus americanus	0.10	0.91	10.00	1.97	2.88
Opuntia fragilis	0.03	0.30	3.33	0.66	0.96
Penstemon gracilis	0.03	0.30	3.33	0.66	0.96
Phlox hoodii	0.93	8.46	33.33	6.58	15.04
Plantago purshii	0.63	5.74	33.33	6.58	12.32
Potentilla arguta	0.03	0.30	3.33	0.66	0.96
Psoralea argophylla	0.13	1.21	10.00	1.97	3.18
Ratibida columnifera	1.33	12.08	43.33	8.55	20.63
Solidago rigida	0.07	0.60	3.33	0.66	1.26
Sphaeralcea coccinea	0.87	7.85	46.67	9.21	17.06
Taraxacum officinale	0.57	5.14	36.67	7.24	12.38

Table 28. Density Analysis per 0.1 Sq. Meter of the Urea Treatment at the 40 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.57	5.61	26.67	5.59	11.20
Androsace occidentalis	0.07	0.66	3.33	0.70	1.36
Antennaria parvifolia	0.53	5.28	16.67	3.50	8.78
Arabis hirsuta	0.03	0.33	3.33	0.70	1.03
Arabis holboellii	0.03	0.33	3.33	0.70	1.03
Artemisia dracunculus	0.20	1.98	20.00	4.20	6.18
Artemisia frigida	0.67	6.60	46.67	9.79	16.39
Aster ericoides	0.57	5.61	3.33	0.70	6.31
Cirsium undulatum	0.03	0.33	3.33	0.70	1.03
Collomia linearis	0.03	0.33	3.33	0.70	1.03
Erigeron glabellus	0.33	3.30	16.67	3.50	6.80
Grindelia squarrosa	0.07	0.66	6.67	1.40	2.06
Hedeoma hispida	2.17	21.45	56.67	11.89	33.34
Liatris punctata	0.13	1.32	13.33	2.80	4.12
Linum rigidum	0.17	1.65	16.67	3.50	5.15
Phlox hoodii	1.00	9.90	36.67	7.69	17.59
Plantago purshii	0.23	2.31	20.00	4.20	6.51
Polygala alba	0.07	0.66	6.67	1.40	2.06
Potentilla arguta	0.03	0.33	3.33	0.70	1.03
Psoralea esculenta	0.23	2.31	16.67	3.50	5.81
Ratibida columnifera	1.10	10.89	56.67	11.89	22.78
Sphaeralcea coccinea	1.43	14.19	76.67	16.08	30.27
Taraxacum officinale	0.23	2.31	10.00	2.10	4.41
Vicia americana	0.17	1.65	10.00	2.10	3.75

Table 29. Density Analysis per 0.1 Sq. Meter of the Urea Treatment at the 60 Pounds of Nitrogen per Acre Rate Applied Annually for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	1.37	17.52	36.67	10.48	28.00
Antennaria parvifolia	0.37	4.70	6.67	1.90	6.60
Arabis holboellii	0.03	0.43	3.33	0.95	1.38
Artemisia dracunculus	0.13	1.71	13.33	3.81	5.52
Artemisia frigida	0.87	11.11	56.67	16.19	27.30
Aster ericoides	0.23	2.99	10.00	2.86	5.85
Astragalus agrestis	0.17	2.14	6.67	1.90	4.04
Cirsium undulatum	0.07	0.85	6.67	1.90	2.75
Erigeron glabellus	0.03	0.43	3.33	0.95	1.38
Hedeoma hispida	0.80	10.26	30.00	8.57	18.83
Lepidium densiflorum	0.03	0.43	3.33	0.95	1.38
Liatris punctata	0.03	0.43	3.33	0.95	1.38
Linum lewisii	0.07	0.85	6.67	1.90	2.75
Linum rigidum	0.07	0.85	6.67	1.90	2.75
Lotus americanus	0.03	0.43	3.33	0.95	1.38
Penstemon albidus	0.43	5.56	3.33	0.95	6.51
Phlox hoodii	1.07	13.68	30.00	8.57	22.25
Plantago purshii	0.53	6.84	23.33	6.67	13.51
Potentilla arguta	0.07	0.85	6.67	1.90	2.75
Psoralea esculenta	0.03	0.43	3.33	0.95	1.38
Ratibida columnifera	0.67	8.55	46.67	13.33	21.88
Sphaeralcea coccinea	0.70	8.97	40.00	11.43	20.40

Table 30. Density Analysis per 0.1 Sq. Meter of the Urea Treatment at the 60 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.43	3.28	20.00	4.17	7.45
Androsace occidentalis	0.33	2.53	6.67	1.39	3.92
Antennaria parvifolia	2.97	22.47	20.00	4.17	26.64
Arabis holboellii	0.03	0.25	3.33	0.69	0.94
Artemisia dracunculus	0.03	0.25	3.33	0.69	0.94
Artemisia frigida	0.40	3.03	26.67	5.56	8.59
Aster ericoides	0.60	4.55	20.00	4.17	8.72
Astragalus crassicarpus	0.03	0.25	3.33	0.69	0.94
Echinacea angustifolia	0.77	5.81	30.00	6.25	12.06
Erigeron glabellus	0.10	0.76	6.67	1.39	2.15
Erysimum asperum	0.03	0.25	3.33	0.69	0.94
Gaura coccinea	0.37	2.78	16.67	3.47	6.25
Grindelia squarrosa	0.13	1.01	13.33	2.78	3.79
Gutierrezia sarothrae	0.03	0.25	3.33	0.69	0.94
Haplopappus spinulosus	0.07	0.51	6.67	1.39	1.90
Hedeoma hispida	1.63	12.37	36.67	7.64	20.01
Lepidium densiflorum	0.13	1.01	6.67	1.39	2.40
Liatris punctata	0.30	2.27	23.33	4.86	7.13
Linum rigidum	0.20	1.52	16.67	3.47	4.99
Lotus americanus	0.60	4.55	30.00	6.25	10.80
Orthocarpus luteus	0.03	0.25	3.33	0.69	0.94
Oxytropis lambertii	0.07	0.51	6.67	1.39	1.90
Petalostemon purpureum	0.13	1.01	10.00	2.08	3.09
Phlox hoodii	0.73	5.56	23.33	4.86	10.42
Plantago purshii	1.47	11.11	40.00	8.33	19.44
Polygala alba	0.07	0.51	6.67	1.39	1.90
Psoralea argophylla	0.20	1.52	10.00	2.08	3.60
Ratibida columnifera	0.70	5.30	43.33	9.03	14.33
Sphaeralcea coccinea	0.50	3.79	30.00	6.25	10.04
Taraxacum officinale	0.10	0.76	10.00	2.08	2.84

Table 31. Density Analysis per 0.1 Sq. Meter of the Urea Treatment at the 100 Pounds of Nitrogen per Acre Rate Applied Biennially for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
Achillea millefolium	0.47	10.69	16.67	7.46	18.15
Antennaria parvifolia	0.07	1.53	3.33	1.49	3.02
Arabis holboellii	0.03	0.76	3.33	1.49	2.25
Artemisia dracunculus	0.17	3.82	13.33	5.97	9.79
Artemisia frigida	0.40	9.16	23.33	10.45	19.61
Astragalus missouriensis	0.03	0.76	3.33	1.49	2.25
Bahia oppositifolia	0.17	3.82	13.33	5.97	9.79
Hedeoma hispida	0.67	15.27	16.67	7.46	22.73
Lepidium densiflorum	0.07	1.53	6.67	2.99	4.52
Liatris punctata	0.07	1.53	6.67	2.99	4.52
Lotus americanus	0.03	0.76	3.33	1.49	2.25
Phlox hoodii	0.53	12.21	13.33	5.97	18.18
Plantago purshii	0.47	10.69	20.00	8.96	19.65
Polygala alba	0.03	0.76	3.33	1.49	2.25
Psoralea esculenta	0.10	2.29	10.00	4.48	6.77
Ratibida columnifera	0.20	4.58	16.67	7.46	12.04
Sphaeralcea coccinea	0.60	13.74	26.67	11.94	25.68
Taraxacum officinale	0.10	2.29	10.00	4.48	6.77
Vicia americana	0.17	3.82	13.33	5.97	9.79

Table 32. Mean Density per 0.1 Sq. Meter for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

Treatment	Application Rate	Forbs	Shrubs
Control	0 lbs	10.38	0.00
Ammonium Nitrate	40 lbs EY	9.28	0.00
	40 lbs EOY	10.85	0.00
	60 lbs EY	8.19	0.00
	60 lbs EOY	7.14	0.33
	100 lbs EOY	8.66	0.07
Urea	40 lbs EY	11.01	0.00
	40 lbs EOY	10.09	0.00
	60 lbs EY	7.80	0.00
	60 lbs EOY	13.18	0.00
	100 lbs EOY	4.38	0.00

Table 33. Percentage of Soil Moisture for the Native Range Fertilization Trial At the Dickinson Experiment Station, 1984

Sample Location	26 Jun			25 Jul			27 Aug		
Depth (in)	East Rep	West Rep	Mean	East Rep	West Rep	Mean	East Rep	West Rep	Mean
North:									
0-6	21.8	32.0	26.9	10.3	9.6	10.0	9.6	9.4	9.5
6-12	22.7	25.7	24.2	12.0	9.8	10.9	10.2	10.2	10.2
12-24	10.8	19.7	15.3	12.2	5.3	8.8	11.0	10.3	10.7
24-36	12.3	12.9	12.6	13.8	11.8	12.8	12.4	11.0	11.7
36-48	13.9	11.1	12.5	14.6	14.8	14.7	14.2	12.5	13.4
Central:									
0-6	24.1	23.0	23.6	9.7	10.1	9.9	10.9	9.6	10.3
6-12	24.7	23.7	24.2	9.7	8.7	9.2	8.6	8.4	8.5
12-24	19.6	13.3	16.5	9.4	9.1	9.3	8.8	10.9	9.9
24-36	13.4	12.8	13.1	12.8	12.2	12.5	10.2	10.9	10.6
36-48	14.7	14.3	14.5	15.2	17.1	16.2	12.3	7.2	9.8
South:									
0-6	20.6	26.3	23.5	10.0	8.0	9.0	9.8	11.6	10.7
6-12	20.6	25.8	23.2	9.9	10.5	10.2	8.3	7.9	8.1
12-24	12.3	11.9	12.1	10.2	11.0	10.6	7.9	4.3	6.1
24-36	13.3	13.2	13.3	17.8	11.5	14.7	11.5	12.8	12.2
36-48	14.7	19.1	16.9	16.3	12.8	14.6	15.7	14.4	15.1

Table 34. Mean Percentage of Soil Moisture for the Native Range Fertilization Trial At the Dickinson Experiment Station, 1984

Depth in Inches	26 JUN	25 JUL	27 AUG
0-6	24.6	9.6	10.2
6-12	23.9	10.1	8.9
12-24	14.6	9.5	8.9
24-36	13.0	13.3	11.5
36-48	14.6	15.1	12.7

Table 35. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 14 Jun 1982

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.7	10.8	5.5	588.8	0.89		
	6-12	8.5	12.0	2.8	392.5	0.91		
	12-24	6.5	24.0	1.5	253.8	0.88		10.0
	24-36	8.9	23.0	1.3	188.8	2.00		30.0
	36-48	8.9	22.0	2.3	227.5	1.84		61.3
40 EY	0-6	8.0	7.5	4.0	707.5	1.23		13.0
	6-12	8.0	6.0	2.5	530.0	0.62		
	12-24	8.3	23.0	3.0	280.0	0.61		7.5
	24-36	8.8	19.0	1.0	207.5	0.65		8.5
	36-48	9.0	24.0	2.5	215.0	0.81		60.0
40 EOY	0-6	7.8	9.5	4.0	547.5	0.79		
	6-12	8.1	7.5	3.5	482.5	0.66		7.0
	12-24	8.4	15.0	1.0	280.0	0.67		8.5
	24-36	9.0	15.0	1.0	172.5	0.76		11.0
	36-48	9.2	12.0	2.0	200.0	1.35		68.5
60 EY	0-6	7.5	10.5	3.5	570.0	0.59		80.0
	6-12	7.8	5.5	2.0	360.0	0.45		
	12-24	8.3	18.5	2.0	262.5	0.58		9.0
	24-36	9.1	15.0	1.0	182.5	0.84		46.5
	36-48	9.0	16.0	2.0	382.5	0.54		52.5
60 EOY	0-6	7.6	11.0	4.0	625.0	0.95		80.0
	6-12	7.8	11.0	2.0	450.0	1.00		80.0
	12-24	8.6	14.0	1.0	247.5	0.70		
	24-36	9.0	14.0	1.0	172.5	0.90		11.0
	36-48	8.3	18.0	1.5	212.5	0.83		47.5
100 EOY	0-6	7.7	10.5	4.0	640.0	0.70		7.0
	6-12	8.0	10.5	3.5	490.0	0.50		
	12-24	8.3	30.0	1.5	265.0	0.65		10.0
	24-36	8.8	17.0	1.0	165.0	0.68		10.5
	36-48	9.1	18.0	1.5	180.0	0.81		20.5

Table 36. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 19 Jul 1982

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.6	11.9	4.7	553.3	0.63		6.7
	6-12	7.7	10.8	3.0	503.8	0.56		6.5
	12-24	8.6	19.0	1.2	213.8	0.73		27.0
	24-36	8.9	20.5	1.3	157.9	0.65		34.3
	36-48	9.0	22.7	2.2	170.0	0.65		46.9
40 EY	0-6	7.4	15.7	4.7	711.7	0.55		5.0
	6-12	7.7	14.0	2.7	495.0	0.56		6.7
	12-24	8.5	23.3	1.3	228.3	0.67		19.3
	24-36	8.7	21.3	1.0	205.0	0.42		47.3
	36-48	8.9	20.7	1.7	211.7	1.03		29.0
40 EOY	0-6	7.5	11.7	3.7	621.7	0.53		6.0
	6-12	7.9	11.7	2.0	413.3	0.57		5.0
	12-24	8.5	20.0	1.0	178.3	0.47		7.3
	24-36	9.3	23.3	1.3	155.0	0.55		14.0
	36-48	9.3	22.0	2.0	197.5	0.93		80.0
60 EY	0-6	7.5	6.0	4.0	716.7	0.58		5.7
	6-12	7.8	6.3	1.7	440.0	0.86		14.7
	12-24	8.5	15.3	1.7	173.3	0.54		6.0
	24-36	9.1	15.3	1.3	136.7	0.76		22.0
	36-48	8.9	13.3	2.0	205.0	0.46		65.7
60 EOY	0-6	7.6	9.5	4.0	1082.5	0.56		5.0
	6-12	8.0	6.0	1.5	525.0	0.58		3.0
	12-24	8.4	16.0	1.5	200.0	0.49		8.5
	24-36	9.0	16.0	1.0	135.0	0.55		30.0
	36-48	9.2	18.0	2.0	192.5	0.96		30.5
100 EOY	0-6	7.5	13.7	8.3	721.7	0.55		6.3
	6-12	7.9	21.0	2.0	397.5	0.64		7.5
	12-24	8.6	40.0	1.0	182.3	0.71		25.3
	24-36	8.7	38.7	1.7	168.3	0.50		32.3
	36-48	9.0	38.7	3.3	241.7	0.70		49.3

Table 37. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 12 Aug 1982

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.3	12.7	4.7	766.7	0.66		6.5
	6-12	8.2	12.2	2.3	451.7	0.53		4.8
	12-24	8.7	23.7	1.2	203.3	0.75		11.0
	24-36	8.5	20.7	1.2	160.0	1.41		38.3
	36-48	8.5	20.0	2.8	189.2	1.56		68.8
40 EY	0-6	7.5	5.3	4.3	751.7	0.57		43.5
	6-12	7.9	4.0	2.3	466.7	0.53		2.0
	12-24	8.5	12.7	1.0	201.7	0.77		12.5
	24-36	8.7	14.0	1.3	185.0	1.26		51.5
	36-48	8.8	16.0	2.7	213.3	1.41		58.3
40 EOY	0-6	7.7	11.0	4.3	663.3	0.54		5.0
	6-12	7.9	9.7	2.3	463.3	0.53		6.0
	12-24	8.4	16.7	1.0	171.7	0.49		7.5
	24-36	9.1	18.7	2.0	168.3	0.67		19.0
	36-48	8.9	20.0	2.7	185.0	1.77		80.0
60 EY	0-6	7.7	15.3	5.0	756.7	0.67		6.0
	6-12	8.1	9.3	2.3	441.7	0.59		8.0
	12-24	8.5	19.3	1.0	158.3	0.58		9.0
	24-36	9.1	20.7	1.0	133.3	0.95		53.7
	36-48	8.7	22.7	1.7	191.7	1.14		70.7
60 EOY	0-6	7.9	13.0	4.3	601.7	0.60		14.5
	6-12	8.3	13.0	2.3	356.7	0.61		7.0
	12-24	8.4	25.3	1.7	143.3	0.56		14.0
	24-36	8.8	20.0	1.0	110.0	0.58		11.0
	36-48	8.5	20.7	2.3	158.3	0.88		49.0
100 EOY	0-6	7.3	6.7	3.3	835.0	0.52		3.5
	6-12	7.6	9.3	2.3	478.3	0.52		
	12-24	8.5	18.0	1.3	178.3	0.75		9.5
	24-36	8.7	24.7	1.7	165.0	1.96		35.7
	36-48	8.8	22.0	3.3	218.3	1.91		67.0

Table 38. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 14 Jun 1982

Treatment	Depth In.	Ph	NO_3-N	P	K	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
			Lbs/Acre					
Control	0-6	7.7	10.8	5.5	558.8	0.89		
	6-12	8.5	12.0	2.8	392.5	0.91		
	12-24	6.5	24.0	1.5	253.8	0.88		10.0
	24-36	8.9	23.0	1.3	188.8	2.00		30.0
	36-48	8.9	22.0	2.3	227.5	1.84		61.3
40 EY	0-6	7.5	10.0	5.5	645.0	0.57		
	6-12		10.0	2.5	527.5			
	12-24	8.5	13.0	1.0	270.0	2.46		9.0
	24-36	8.3	15.0	2.0	200.0	2.67		80.0
	36-48	8.3	15.0	4.0	302.5	2.00		80.0
40 EOY	0-6	7.7	10.0	4.0	645.0	0.85		7.0
	6-12	8.2	6.5	2.5	277.5	0.66		
	12-24	8.5	17.0	1.0	152.5	0.70		9.0
	24-36	9.0	7.5	1.0	160.0	0.58		7.0
	36-48	9.1	17.0	3.0	177.5	1.04		45.0
60 EY	0-6	7.8	12.0	5.5	637.5	0.83		7.0
	6-12	8.1	9.0	2.0	482.5	0.74		
	12-24	8.5	16.0	2.0	230.0	0.70		9.0
	24-36	9.0	16.0	1.0	182.5	0.90		11.0
	36-48	8.5	22.0	3.5	215.0	0.85		43.5
60 EOY	0-6	7.8	9.0	5.0	517.5	0.98		9.0
	6-12	8.3	7.5	2.5	347.5	0.90		6.0
	12-24	8.8	15.0	1.0	177.5	1.05		8.0
	24-36	9.1	13.0	2.0	200.0	1.26		44.5
	36-48	8.8	16.0	3.0	260.0	2.15		80.0
100 EOY	0-6	7.8	85.0	8.0	717.5	1.51		7.0
	6-12	8.1	66.5	3.0	532.5	0.96		8.0
	12-24	8.7	28.0	2.0	225.0	0.74		9.0
	24-36	9.2	24.0	1.0	157.5	1.23		42.0
	36-48	9.0	21.0	3.5	520.0	1.35		80.0

Table 39. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 19 Jul 1982

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P	K	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.6	11.9	4.7	553.3	0.63		6.7
	6-12	7.7	10.8	3.0	503.8	0.56		6.5
	12-24	8.6	19.0	1.2	213.8	0.73		27.0
	24-36	8.9	20.5	1.3	157.9	0.65		34.3
	36-48	9.0	22.7	2.2	170.0	0.65		46.9
40 EY	0-6	7.4	10.7	5.0	673.3	0.58		7.3
	6-12	7.9	10.0	3.0	428.3	0.56		27.0
	12-24	8.8	20.0	1.7	213.3	0.88		44.3
	24-36	8.8	21.3	2.3	205.0	1.15		80.0
	36-48	8.7	20.0	4.3	265.0	0.74		62.0
40 EOY	0-6	7.5	11.0	4.3	515.0	0.56		8.0
	6-12	8.2	11.7	1.7	275.0	0.58		4.0
	12-24	8.6	16.0	1.0	163.3	0.70		56.0
	24-36	8.9	16.0	1.3	121.7	0.50		59.3
	36-48	9.0	18.7	2.0	173.3	0.74		72.0
60 EY	0-6	7.5	9.3	4.3	606.7	0.64		24.3
	6-12	8.0	13.7	2.3	445.0	0.53		6.0
	12-24	8.5	20.7	1.3	165.0	0.47		5.0
	24-36	9.2	22.7	1.3	140.0	0.73		27.0
	36-48	9.3	18.0	3.0	210.0	1.38		80.0
60 EOY	0-6	7.8	10.3	4.0	556.7	0.55		6.0
	6-12	8.1	9.7	2.3	363.3	0.61		5.0
	12-24	8.8	21.3	1.3	145.0	0.58		9.7
	24-36	9.2	21.3	1.7	165.0	0.56		45.7
	36-48	8.8	21.3	2.3	208.3	1.34		80.0
100 EOY	0-6	7.5	67.0	4.3	671.7	0.79		8.0
	6-12	8.1	24.7	2.7	486.7	0.65		9.3
	12-24	8.6	17.3	2.0	198.3	0.50		10.7
	24-36	9.4	16.7	1.3	138.3	1.17		40.0
	36-48	9.1	18.0	1.3	216.7	1.06		80.0

Table 40. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 12 Aug 1982

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.3	12.7	4.7	766.7	0.66		6.5
	6-12	8.2	12.2	2.3	451.7	0.53		4.8
	12-24	8.7	23.7	1.2	203.3	0.75		11.0
	24-36	8.5	20.7	1.2	160.0	1.41		38.3
	36-48	8.5	20.0	2.8	189.2	1.56		68.8
40 EY	0-6	7.1	6.0	4.3	641.7	0.53		7.0
	6-12	7.8	7.0	2.3	458.3	0.55		
	12-24	8.7	12.7	1.0	185.0	0.99		22.0
	24-36	8.7	16.0	1.3	198.3	2.33		80.0
	36-48	8.5	18.7	2.7	273.3	2.10		80.0
40 EOY	0-6	7.5	12.7	4.3	543.3	0.53		2.0
	6-12	8.2	11.0	2.3	266.7	0.53		
	12-24	8.4	20.0	1.0	146.7	0.55		10.0
	24-36	9.0	25.3	2.0	115.0	0.73		10.0
	36-48	9.0	27.3	2.7	166.7	1.81		59.7
60 EY	0-6	7.7	12.0	5.0	620.0	0.58		7.0
	6-12	8.2	14.0	2.3	363.3	0.53		8.5
	12-24	8.6	24.0	1.0	150.0	0.55		8.0
	24-36	8.9	24.7	1.0	141.7	0.52		35.0
	36-48	8.7	29.0	1.7	265.0	0.78		80.0
60 EOY	0-6	7.9	12.3	4.3	571.7	0.70		14.0
	6-12	8.2	9.0	2.3	351.7	0.56		2.0
	12-24	8.5	12.0	1.7	186.7	1.02		52.5
	24-36	8.8	12.7	1.0	388.3	0.80		72.3
	36-48	8.3	12.0	2.3	251.7	2.54		54.0
100 EOY	0-6	7.7	26.7	3.3	676.7	0.84		7.0
	6-12	8.0	9.0	2.3	471.7	1.01		21.0
	12-24	8.5	26.0	1.3	183.3	0.96		15.0
	24-36	9.2	23.3	1.7	131.7	0.85		34.3
	36-48	8.7	21.3	3.3	186.7	2.38		80.0

Table 41. Soil Nitrogen Content in Lbs/Acre for the Native Range Fertilization Trial At the Dickinson Experiment Station, 1982

		Ammonium Nitrate			Urea		
		14 Jun	19 Jul	12 Aug	14 Jun	19 Jul	12 Aug
Control	0-6	10.8	11.9	12.7	10.8	11.9	12.7
	6-12	12.0	10.8	12.2	12.0	10.8	12.2
	12-24	24.0	19.0	23.7	24.0	19.0	23.7
	24-36	23.0	20.5	20.7	23.0	20.5	20.7
	36-48	22.0	22.7	20.0	22.0	22.7	20.0
40 EY	0-6	7.5	15.7	5.3	10.0	10.7	6.0
	6-12	6.0	14.0	4.0	10.0	10.0	7.0
	12-24	23.0	23.3	12.7	13.0	20.0	12.7
	24-36	19.0	21.3	14.0	15.0	21.3	16.0
	36-48	24.0	20.7	16.0	15.0	20.0	18.7
40 EOY	0-6	9.5	11.7	11.0	10.0	11.0	12.7
	6-12	7.5	11.7	9.7	6.5	11.7	11.0
	12-24	15.0	20.0	16.7	17.0	16.0	20.0
	24-36	15.0	23.3	18.7	7.5	16.0	25.3
	36-48	12.0	22.0	20.0	17.0	18.7	27.3
60 EY	0-6	10.5	6.0	15.3	12.0	9.3	12.0
	6-12	5.5	6.3	9.3	9.0	13.7	14.0
	12-24	18.5	15.3	19.3	16.0	20.7	24.0
	24-36	15.0	15.3	20.7	16.0	22.7	24.7
	36-48	16.0	13.3	22.7	22.0	18.0	29.0
60 EOY	0-6	11.0	9.5	13.0	9.0	10.3	12.3
	6-12	11.0	6.0	13.0	7.5	9.7	9.0
	12-24	14.0	16.0	25.3	15.0	21.3	12.0
	24-36	14.0	16.0	20.0	13.0	21.3	12.7
	36-48	18.0	18.0	20.7	16.0	21.3	12.0
100 EOY	0-6	10.5	13.7	6.7	85.0	67.0	26.7
	6-12	10.5	21.0	9.3	66.5	24.7	9.0
	12-24	30.0	40.0	18.0	28.0	17.3	26.0
	24-36	17.0	38.7	24.7	24.0	16.7	23.3
	36-48	18.0	38.7	22.0	21.0	18.0	21.3

Table 42. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 21 Jun 1983

Treatment	Depth In.	pH	NO_3-N	P	K	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
			Lbs/Acre					
Control	0-6	7.7	14.3	7.3	625.0	0.36	7.1	21.3
	6-12	7.7	8.3	2.8	476.7	0.35		11.2
	12-24	8.4	11.7	1.3	310.0	0.92		19.0
	24-36	8.9	12.0	1.5	320.8	1.26		55.5
	36-48	8.7	13.3	3.3	368.3	2.28		77.2
40 EY	0-6	7.3	32.3	4.7	605.0	0.37	5.9	23.7
	6-12	7.8	6.7	2.0	440.0	0.33		12.3
	12-24	8.5	12.7	2.3	298.3	0.50		10.7
	24-36	8.7	10.0	1.7	331.7	1.12		48.3
	36-48	8.6	11.3	4.0	356.7	1.57		80.0
40 EOY	0-6	7.6	23.3	5.7	695.0	0.40	6.0	11.3
	6-12	8.0	10.0	2.7	515.0	0.32		4.7
	12-24	8.4	14.7	2.7	338.3	0.36		6.3
	24-36	9.0	14.7	2.7	308.3	0.63		30.3
	36-48	8.7	22.7	1.3	360.0	1.95		75.7
60 EY	0-6	7.4	47.0	7.3	763.3	0.44	6.0	17.3
	6-12	7.7	8.7	2.7	465.0	0.31		6.3
	12-24	8.3	12.0	1.7	271.7	0.37		6.0
	24-36	9.0	12.0	1.3	238.3	0.54		33.7
	36-48	8.6	16.7	2.3	330.0	0.73		68.3
60 EOY	0-6	7.5	14.3	6.3	660.0	0.52	5.5	22.7
	6-12	7.9	7.0	3.7	570.0	0.33		7.0
	12-24	8.3	12.7	2.0	360.0	0.44		6.7
	24-36	9.1	10.7	1.3	293.3	0.65		23.7
	36-48	8.9	18.0	2.0	345.0	1.61		85.7
100 EOY	0-6	7.5	17.7	4.0	638.3	0.44	5.4	12.0
	6-12	8.3	8.7	2.0	425.0	0.45		7.0
	12-24	8.3	11.3	1.7	336.7	0.31		20.7
	24-36	8.7	9.3	2.3	363.3	0.75		32.0
	36-48	8.9	16.7	2.3	358.3	0.78		56.3

Table 43. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 15 Jul 1983

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	9.0	4.7	618.3	0.45	5.7	16.3
	6-12	7.8	4.5	4.0	506.7	0.39		8.0
	12-24	8.7	11.0	2.0	350.9	0.51		9.5
	24-36	9.0	19.0	2.3	346.7	1.03		67.3
	36-48	8.5	21.3	3.2	355.9	3.18		72.8
40 EY	0-6	7.2	4.0	3.7	643.3	0.37	5.7	10.0
	6-12	7.6	4.0	1.7	481.7	0.34		5.7
	12-24	8.5	8.0	1.0	308.3	0.38		9.3
	24-36	8.6	11.0	2.3	340.0	1.50		32.0
	36-48	8.6	24.0	5.0	331.7	1.41		56.7
40 EOY	0-6	7.7	6.0	5.3	620.0	0.43	5.6	13.0
	6-12	8.0	5.0	4.0	463.3	0.37		7.0
	12-24	8.6	11.3	2.0	355.0	0.43		11.3
	24-36	9.1	18.0	1.7	311.7	0.75		35.7
	36-48	8.5	23.3	2.0	363.3	2.10		80.0
60 EY	0-6	7.5	6.0	4.7	571.7	0.43	5.5	13.3
	6-12	7.7	4.3	3.3	461.7	0.37		5.0
	12-24	8.4	9.3	2.7	341.7	0.43		6.3
	24-36	8.9	12.7	1.7	335.0	0.74		70.7
	36-48	8.3	14.7	2.0	355.0	2.45		67.7
60 EOY	0-6	7.4	4.7	4.7	621.7	0.48	6.3	10.7
	6-12	7.7	4.3	3.0	518.3	0.44		9.0
	12-24	8.4	8.7	2.0	288.3	0.36		6.0
	24-36	9.0	10.0	2.3	275.0	0.54		18.7
	36-48	9.1	18.0	2.0	310.0	1.14		58.0
100 EOY	0-6	7.2	3.7	5.3	603.3	0.32	5.2	10.0
	6-12	7.8	4.3	3.0	441.7	0.37		8.0
	12-24	8.5	9.3	1.3	303.3	0.49		11.0
	24-36	8.7	10.0	2.0	318.3	1.53		38.3
	36-48	8.6	15.3	4.7	370.0	1.48		76.7

Table 44. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 8 Aug 1983

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	8.7	6.3	631.7	0.54	6.0	17.3
	6-12	7.9	5.5	3.2	443.4	0.43		7.5
	12-24	8.5	7.7	2.5	307.5	0.39		7.5
	24-36	9.0	13.3	1.5	311.7	0.71		33.5
	36-48	8.8	21.0	2.5	355.0	1.71		70.7
40 EY	0-6	7.5	5.3	4.7	653.3	0.36	5.8	9.0
	6-12	7.8	5.0	4.0	518.3	0.41		7.0
	12-24	8.5	9.3	1.7	345.0	0.45		5.3
	24-36	8.6	9.3	2.7	380.0	1.40		34.0
	36-48	8.7	12.0	4.0	381.7	1.19		44.3
40 EOY	0-6	7.8	9.0	5.7	611.7	0.43	5.9	22.0
	6-12	8.1	4.0	3.0	458.3	0.43		5.0
	12-24	8.7	9.3	1.7	313.3	0.39		9.3
	24-36	8.9	12.0	1.3	293.3	1.17		32.7
	36-48	8.6	22.7	2.0	375.0	2.11		80.0
60 EY	0-6	7.3	6.7	4.0	665.0	0.41	6.0	13.0
	6-12	7.7	4.0	3.3	403.3	0.36		9.3
	12-24	8.5	8.0	2.0	296.7	0.44		6.7
	24-36	8.9	10.7	1.3	291.7	0.71		48.0
	36-48	8.7	10.7	1.3	340.0	1.99		77.3
60 EOY	0-6	7.7	6.7	4.3	673.3	0.50	5.7	14.0
	6-12	7.8	4.0	2.7	515.0	0.40		6.3
	12-24	8.5	9.3	2.3	310.0	0.39		6.3
	24-36	9.0	9.3	1.7	233.3	0.50		9.3
	36-48	8.9	16.7	2.0	310.0	0.94		57.0
100 EOY	0-6	7.3	6.7	4.0	586.7	0.90	5.1	32.7
	6-12	7.5	5.0	3.0	426.7	0.33		9.7
	12-24	8.5	9.3	1.3	303.3	0.50		15.7
	24-36	8.7	10.7	2.0	306.7	1.37		38.0
	36-48	8.7	15.3	4.7	408.3	1.34		80.0

Table 45. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 21 Jun 1983

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.7	14.3	7.3	625.0	0.36	7.1	21.3
	6-12	7.7	8.3	2.8	476.7	0.35		11.2
	12-24	8.4	11.7	1.3	310.0	0.92		19.0
	24-36	8.9	12.0	1.5	320.8	1.26		55.5
	36-48	8.7	13.3	3.3	368.3	2.28		77.2
40 EY	0-6	7.2	18.0	4.3	600.0	0.46	5.4	16.0
	6-12	7.8	7.7	2.0	540.0	0.32		7.0
	12-24	8.6	14.7	1.0	486.7	0.53		15.3
	24-36	8.4	11.3	4.3	521.7	2.48		70.0
	36-48	8.5	12.0	7.3	436.7	3.20		80.0
40 EOY	0-6	7.5	17.3	4.3	570.0	0.41	6.1	10.0
	6-12	8.1	8.3	2.0	371.7	0.37		6.7
	12-24	8.5	12.0	1.0	283.3	0.52		21.0
	24-36	8.7	11.3	1.0	248.3	1.52		40.7
	36-48	8.8	14.7	2.0	326.7	1.82		66.3
60 EY	0-6	7.4	36.7	4.7	585.0	0.35	5.9	18.0
	6-12	8.0	8.3	1.7	405.0	0.36		7.0
	12-24	8.6	16.7	1.3	278.3	0.49		10.7
	24-36	9.0	11.3	1.3	288.3	0.68		21.3
	36-48	8.9	13.3	1.7	325.0	0.94		76.7
60 EOY	0-6	7.7	22.0	6.3	548.3	0.49	5.7	20.0
	6-12	8.1	8.0	2.3	376.7	0.31		7.7
	12-24	8.8	13.3	1.7	256.7	0.47		11.0
	24-36	9.0	18.0	3.3	331.7	1.17		72.0
	36-48	8.2	11.3	5.0	385.0	3.60		80.0
100 EOY	0-6	7.6	31.0	7.0	656.7	0.57	6.4	32.0
	6-12	8.0	10.0	4.0	386.7	0.33		6.3
	12-24	8.6	14.7	2.0	240.0	0.35		7.3
	24-36	9.1	19.3	1.0	280.0	0.80		64.0
	36-48	8.3	15.3	2.0	353.3	2.44		80.0

Table 46. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 15 Jul 1983

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	9.0	4.7	618.3	0.45	5.7	16.3
	6-12	7.8	4.5	4.0	506.7	0.39		8.0
	12-24	8.7	11.0	2.0	350.9	0.51		9.5
	24-36	9.0	19.0	2.3	346.7	1.03		67.3
	36-48	8.5	21.3	3.2	355.9	3.18		72.8
40 EY	0-6	7.4	3.7	3.0	538.3	0.46	4.8	17.7
	6-12	7.8	4.3	2.3	488.3	0.39		14.3
	12-24	8.7	13.3	3.3	390.0	1.10		62.3
	24-36	8.4	11.3	4.3	443.3	1.84		59.7
	36-48	8.0	10.7	7.0	423.3	3.37		80.0
40 EOY	0-6	7.5	4.3	3.3	525.0	0.44	5.5	14.0
	6-12	7.8	3.0	2.3	403.3	0.34		6.7
	12-24	8.5	10.7	2.3	300.0	0.58		23.0
	24-36	8.6	10.0	1.3	295.0	1.53		36.7
	36-48	8.7	12.7	1.7	345.0	1.51		51.3
60 EY	0-6	7.5	16.3	4.7	748.3	0.55	6.2	11.7
	6-12	7.9	9.7	1.7	435.0	0.31		6.0
	12-24	8.6	14.7	1.0	256.7	0.38		6.0
	24-36	8.9	22.7	2.3	325.0	0.86		56.7
	36-48	8.6	21.3	3.3	361.7	1.71		80.0
60 EOY	0-6	7.5	3.7	6.7	575.0	0.55	5.7	70.0
	6-12	7.9	3.3	4.0	498.3	0.46		11.7
	12-24	8.6	8.7	2.0	283.3	0.45		13.7
	24-36	8.8	12.0	3.3	330.0	1.35		67.7
	36-48	8.1	10.0	4.7	413.3	3.33		80.0
100 EOY	0-6	7.3	9.7	8.0	576.7	0.56	5.3	29.0
	6-12	7.6	25.3	5.7	523.3	0.39		9.0
	12-24	8.4	42.7	2.0	265.0	0.37		7.7
	24-36	9.0	36.7	1.7	273.3	0.63		37.3
	36-48	8.5	25.3	2.3	400.0	2.03		79.7

Table 47. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 8 Aug 1983

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	8.7	6.3	631.7	0.54	6.0	17.3
	6-12	7.9	5.5	3.2	443.4	0.43		7.5
	12-24	8.5	7.7	2.5	307.5	0.39		7.5
	24-36	9.0	13.3	1.5	311.7	0.71		33.5
	36-48	8.8	21.0	2.5	355.0	1.71		70.7
40 EY	0-6	7.2	6.3	4.0	578.3	0.52	6.2	24.3
	6-12	8.0	4.3	1.7	425.0	0.35		12.3
	12-24	8.7	11.3	1.3	323.3	0.71		36.7
	24-36	8.4	13.3	3.7	380.0	2.30		80.0
	36-48	8.2	13.3	7.0	461.7	2.98		80.0
40 EOY	0-6	7.5	3.7	3.3	573.3	0.43	5.9	16.7
	6-12	8.0	4.0	1.7	386.7	0.35		9.0
	12-24	8.5	8.7	1.0	298.3	0.52		28.7
	24-36	8.7	9.3	1.3	285.0	1.44		37.0
	36-48	8.7	12.0	4.0	345.0	1.77		63.7
60 EY	0-6	7.5	10.0	4.0	556.7	0.40	5.4	13.3
	6-12	8.0	5.0	2.0	421.7	0.34		5.3
	12-24	8.7	12.0	1.3	291.7	0.43		10.7
	24-36	8.7	14.7	1.0	340.0	1.57		63.3
	36-48	8.4	11.3	2.7	346.7	2.52		80.0
60 EOY	0-6	7.5	6.3	6.3	673.3	2.62	5.7	23.0
	6-12	7.8	4.3	3.3	458.3	0.44		17.3
	12-24	8.6	9.3	2.7	315.0	0.50		11.7
	24-36	8.9	10.7	3.3	346.7	1.03		61.3
	36-48	8.4	14.7	4.3	415.0	2.68		80.0
100 EOY	0-6	7.8	13.7	7.7	833.3	0.41	5.9	14.0
	6-12	8.0	6.3	4.7	578.3	0.37		10.3
	12-24	8.6	12.0	2.0	296.7	0.40		8.3
	24-36	9.2	27.3	2.0	275.0	0.77		53.7
	36-48	8.6	18.7	1.0	340.0	1.93		80.0

Table 48. Soil Nitrogen Content in Lbs/Acre for the Native Range Fertilization Trial At the Dickinson Experiment Station, 1983

		Ammonium Nitrate			Urea		
		21 Jun	15 Jul	8 Aug	21 Jun	15 Jul	8 Aug
Control	0-6	14.3	9.0	8.7	14.3	9.0	8.7
	6-12	8.3	4.5	5.5	8.3	4.5	5.5
	12-24	11.7	11.0	7.7	11.7	11.0	7.7
	24-36	12.0	19.0	13.3	12.0	19.0	13.3
	36-48	13.3	21.3	21.0	13.3	21.3	21.0
40 EY	0-6	32.3	4.0	5.3	18.0	3.7	6.3
	6-12	6.7	4.0	5.0	7.7	4.3	4.3
	12-24	12.7	8.0	9.3	14.7	13.3	11.3
	24-36	10.0	11.0	9.3	11.3	11.3	13.3
	36-48	11.3	24.0	12.0	12.0	10.7	13.3
40 EOY	0-6	23.3	6.0	9.0	17.3	4.3	3.7
	6-12	10.0	5.0	4.0	8.3	3.0	4.0
	12-24	14.7	11.3	9.3	12.0	10.7	8.7
	24-36	14.7	18.0	12.0	11.3	10.0	9.3
	36-48	22.7	23.3	22.7	14.7	12.7	12.0
60 EY	0-6	47.0	6.0	6.7	36.7	16.3	10.0
	6-12	8.7	4.3	4.0	8.3	9.7	5.0
	12-24	12.0	9.3	8.0	16.7	14.7	12.0
	24-36	12.0	12.7	10.7	11.3	22.7	14.7
	36-48	16.7	14.7	10.7	13.3	21.3	11.3
60 EOY	0-6	14.3	4.7	6.7	22.0	3.7	6.3
	6-12	7.0	4.3	4.0	8.0	3.3	4.3
	12-24	12.7	8.7	9.3	13.3	8.7	9.3
	24-36	10.7	10.0	9.3	18.0	12.0	10.7
	36-48	18.0	18.0	16.7	11.3	10.0	14.7
100 EOY	0-6	17.7	3.7	6.7	31.0	9.7	13.7
	6-12	8.7	4.3	5.0	10.0	25.3	6.3
	12-24	11.3	9.3	9.3	14.7	42.7	12.0
	24-36	9.3	10.0	10.7	19.3	36.7	27.3
	36-48	16.7	15.3	15.3	15.3	25.3	18.7

Table 49. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 26 Jun 1984

Treatment	Depth In.	pH	NO_3-N	P	K	E.C. Mmhos /cm	Org. Matter %	So_4-S ppm
			Lbs/Acre					
Control	0-6	7.5	10.7	4.5	691.7	0.69	6.7	19.0
	6-12		10.7	2.5	527.5		3.6	
	12-24	8.4	11.7	1.0	365.8	0.66		10.0
	24-36	8.9	15.3	1.2	377.5	1.07		55.3
	36-48	8.6	18.7	3.2	371.7	2.96		80.0
40 EY	0-6	7.4	16.3	4.3	665.0	0.66	5.9	4.0
	6-12	8.2	7.0	1.7	530.0	0.56	3.4	
	12-24	8.7	16.7	1.0	411.7	0.72		4.0
	24-36	8.6	9.3	1.3	430.0	1.93		36.7
	36-48	8.7	10.0	4.0	421.7	2.09		50.7
40 EOY	0-6	7.7	17.7	7.3	561.7	0.61	7.8	20.0
	6-12		9.0	4.0	341.7		3.0	
	12-24	8.5	11.3	1.0	211.7	0.62		25.0
	24-36	8.8	12.7	1.3	336.7	1.62		37.7
	36-48	8.6	12.0	1.7	338.3	2.59		80.0
60 EY	0-6	7.3	29.3	5.3	778.3	0.59	8.4	18.0
	6-12	7.8	14.7	3.0	478.3	0.54	3.9	2.0
	12-24	8.2	23.3	1.3	278.3	0.55		12.0
	24-36	8.9	11.3	1.0	243.3	0.71		26.0
	36-48	8.6	10.7	2.0	340.0	2.33		77.3
60 EOY	0-6	7.5	19.7	5.3	711.7	0.64	6.5	19.0
	6-12	7.9	11.7	2.3	578.3	0.49	3.7	
	12-24	8.3	10.7	2.3	345.0	0.57		9.0
	24-36	8.8	10.0	1.0	285.0	0.73		29.0
	36-48	8.7	15.3	2.3	348.3	0.90		80.0
100 EOY	0-6	7.5	26.0	4.0	670.0	0.61	5.2	18.0
	6-12		22.7	2.3	496.7		3.7	
	12-24	8.2	13.3	1.0	370.0	1.73		33.3
	24-36	8.4	10.7	1.3	328.3	2.04		44.0
	36-48	8.5	25.3	4.7	366.7	2.32		80.0

Table 50. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 25 Jul 1984

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	3.0	4.0	558.3	0.59	6.2	17.7
	6-12	7.8	3.3	3.2	450.0	0.55	3.6	14.0
	12-24	8.4	6.0	1.3	354.2	0.62		8.7
	24-36	8.8	11.3	2.3	324.2	1.37		42.2
	36-48	8.6	14.7	3.0	355.0	2.42		72.5
40 EY	0-6	7.4	2.7	3.7	598.3	0.54	5.6	10.5
	6-12	7.9	4.0	1.3	480.0	0.55	3.2	2.0
	12-24	8.5	10.0	1.0	361.7	0.63		26.7
	24-36	8.6	10.0	2.3	415.0	1.75		59.0
	36-48	8.6	10.0	5.0	398.3	5.06		56.3
40 EOY	0-6	7.7	3.0	3.3	771.7	0.61	5.0	9.3
	6-12	7.9	3.0	3.0	486.7	0.54	2.5	12.0
	12-24	8.5	11.3	1.3	351.7	0.62		12.0
	24-36	8.7	8.0	1.7	370.0	2.06		35.0
	36-48	8.6	14.0	1.0	363.3	2.64		80.0
60 EY	0-6	7.4	4.0	3.3	615.0	0.67	5.6	10.0
	6-12	7.7	5.0	2.3	446.7	0.57	3.8	6.0
	12-24	8.3	9.3	2.0	313.3	0.59		8.0
	24-36	8.6	12.0	1.3	296.7	0.85		32.0
	36-48	8.6	9.3	2.0	345.0	2.40		62.0
60 EOY	0-6	7.5	4.0	5.3	678.3	0.69	5.2	13.0
	6-12	7.7	3.7	3.0	498.3	0.58	3.7	16.0
	12-24	8.2	7.3	2.3	345.0	0.61		8.0
	24-36	8.7	13.3	1.3	303.3	0.87		34.7
	36-48	8.6	9.3	2.3	401.7	0.82		70.3
100 EOY	0-6	7.3	7.3	3.7	535.0	0.68	5.4	15.5
	6-12	7.5	15.3	2.3	481.7	0.57	5.1	9.0
	12-24	8.0	10.0	1.0	355.0	1.76		30.0
	24-36	8.5	12.0	1.7	403.3	2.13		34.7
	36-48	8.7	22.7	4.0	413.3	1.83		67.7

Table 51. Soil Analysis of the Ammonium Nitrate Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 27 Aug 1984

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	2.7	4.7	566.7	0.60	5.7	15.0
	6-12	7.7	4.2	2.7	457.5	0.55	3.3	15.5
	12-24	8.4	7.7	1.3	356.7	0.63		9.2
	24-36	8.8	14.7	1.3	362.5	0.89		46.2
	36-48	8.8	13.3	2.3	359.2	2.16		69.5
40 EY	0-6	7.3	4.7	4.7	726.7	2.58	5.4	12.3
	6-12	7.7	4.0	1.7	530.0	0.58	2.8	5.7
	12-24	8.4	11.3	2.0	413.3	0.76		44.0
	24-36	8.4	26.7	3.3	485.0	2.10		55.3
	36-48	8.5	14.0	3.0	410.0	2.11		67.0
40 EOY	0-6	7.7	3.0	5.0	638.3	0.58	6.6	12.3
	6-12	8.0	2.7	2.0	436.7	0.51	2.7	8.5
	12-24	8.5	6.7	1.7	350.0	0.61		9.3
	24-36	8.7	9.3	1.7	341.7	2.02		37.3
	36-48	8.6	10.0	2.0	368.3	2.61		80.0
60 EY	0-6	7.4	13.3	4.7	670.0	0.67	6.8	13.3
	6-12	7.8	7.3	1.7	448.3	0.55	4.0	4.0
	12-24	8.2	10.7	1.7	266.7	0.54		15.7
	24-36	8.9	12.0	1.0	270.0	0.79		36.0
	36-48	8.6	11.3	1.3	360.0	2.43		76.7
60 EOY	0-6	7.5	4.7	3.0	693.3	0.58	6.4	20.7
	6-12	7.8	3.3	2.3	543.3	0.57	3.8	10.5
	12-24	8.2	6.7	1.3	330.0	0.57		12.7
	24-36	8.8	8.0	1.3	285.0	0.75		34.7
	36-48	8.7	9.3	1.7	375.0	2.24		77.3
100 EOY	0-6	7.4	9.7	3.3	623.3	0.58	5.3	8.5
	6-12	7.8	7.7	2.0	438.3	0.54	3.3	2.0
	12-24	8.3	11.3	1.0	386.7	0.88		30.0
	24-36	8.5	10.0	1.7	376.7	2.13		31.0
	36-48	8.6	10.7	3.7	421.7	2.28		80.0

Table 52. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 26 Jun 1984

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	10.7	4.5	691.7	0.69	6.7	19.0
	6-12		10.7	2.5	527.5		3.6	
	12-24	8.4	11.7	1.0	365.8	0.66		10.0
	24-36	8.9	15.3	1.2	377.5	1.07		55.3
	36-48	8.6	18.7	3.2	371.7	2.96		80.0
40 EY	0-6	7.4	29.0	5.0	631.7	0.73	5.6	15.0
	6-12	8.4	14.0	3.3	510.0	0.85	3.3	
	12-24	8.8	18.0	1.3	400.0	0.66		80.0
	24-36	8.3	9.3	2.7	398.3	3.87		80.0
	36-48	8.0	7.3	5.7	493.3	5.30		80.0
40 EOY	0-6	7.5	17.3	4.7	596.7	0.60	6.7	19.5
	6-12		6.0	1.3	413.3		3.2	
	12-24	8.6	10.7	1.0	335.0	0.61		13.0
	24-36	8.9	14.7	1.0	281.7	0.83		18.3
	36-48	8.9	24.0	2.3	328.3	1.20		64.3
60 EY	0-6	7.6	33.0	4.7	715.0	0.66	6.3	16.0
	6-12	8.0	15.3	2.0	370.0	0.58	3.4	20.0
	12-24	8.4	16.0	1.3	261.7	0.56		9.0
	24-36	8.7	13.3	1.0	358.3	0.88		49.3
	36-48	8.7	10.7	1.3	343.3	2.49		61.0
60 EOY	0-6	7.5	22.7	4.3	603.3	0.60	6.0	31.0
	6-12	7.9	7.5	1.3	466.7	0.59	3.1	13.0
	12-24	8.6	10.0	1.0	285.0	0.68		8.0
	24-36	8.9	13.3	1.3	353.3	1.89		68.7
	36-48	8.1	7.3	3.3	433.3	5.27		80.0
100 EOY	0-6	7.7	49.7	7.3	650.0	0.71	6.6	22.0
	6-12	7.9	28.7	2.3	481.7	0.56	4.4	
	12-24	8.4	23.3	1.3	315.0	0.56		14.3
	24-36	8.9	13.3	1.0	265.0	0.94		55.0
	36-48	8.2	6.0	1.0	293.3	4.60		80.0

Table 53. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 25 Jul 1984

Treatment	Depth In.	pH	NO_3-N	P	K	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
			Lbs/Acre					
Control	0-6	7.5	3.0	4.0	558.3	0.59	6.2	17.7
	6-12	7.8	3.3	3.2	450.0	0.55	3.6	14.0
	12-24	8.4	6.0	1.3	354.2	0.62		8.7
	24-36	8.8	11.3	2.3	324.2	1.37		42.2
	36-48	8.6	14.7	3.0	355.0	2.42		72.5
40 EY	0-6	7.4	3.3	3.7	561.7	0.74	6.1	58.5
	6-12	7.7	4.0	2.3	465.0	0.61	4.1	13.0
	12-24	8.6	10.0	2.0	400.0	1.09		62.0
	24-36	8.4	10.0	3.3	446.7	3.35		106.7
	36-48	8.1	7.3	6.0	483.3	5.02		80.0
40 EOY	0-6	7.4	3.3	4.0	568.3	0.57	5.5	10.0
	6-12	7.9	3.7	1.3	421.7	0.52	3.2	7.0
	12-24	8.3	8.0	1.0	396.7	0.71		29.0
	24-36	8.4	8.0	1.7	350.0	2.14		51.5
	36-48	8.6	12.7	2.7	415.0	2.14		59.7
60 EY	0-6	7.6	3.7	3.7	531.7	0.63	5.8	17.0
	6-12	7.8	4.7	2.0	413.3	0.56	3.5	8.7
	12-24	8.4	8.0	1.3	315.0	1.04		13.0
	24-36	8.6	10.7	1.3	361.7	2.27		41.7
	36-48	8.6	13.3	3.0	371.7	2.56		73.3
60 EOY	0-6	7.6	3.3	3.3	561.7	0.65	5.1	9.7
	6-12	8.1	4.0	2.3	445.0	0.59	3.6	4.0
	12-24	8.5	9.3	2.3	361.7	0.80		32.7
	24-36	8.6	10.0	1.3	398.3	2.86		80.0
	36-48	8.2	7.3	3.0	448.3	4.37		80.0
100 EOY	0-6	7.4	13.7	5.7	538.3	0.65	4.7	14.7
	6-12	7.8	10.3	2.3	430.0	0.56	3.7	7.0
	12-24	8.4	10.0	1.3	283.3	0.59		9.7
	24-36	8.8	12.0	1.0	355.0	0.90		42.0
	36-48	8.3	8.7	1.3	381.7	3.77		80.0

Table 54. Soil Analysis of the Urea Treatments for the Native Range Fertilization Trial at the Dickinson Experiment Station, 27 Aug 1984

Treatment	Depth In.	pH	NO_3-N Lbs/Acre	P Lbs/Acre	K Lbs/Acre	E.C. Mmhos /cm	Org. Matter %	SO_4-S ppm
Control	0-6	7.5	2.7	4.7	566.7	0.60	5.7	15.0
	6-12	7.7	4.2	2.7	457.5	0.55	3.3	15.5
	12-24	8.4	7.7	1.3	356.7	0.63		9.2
	24-36	8.8	14.7	1.3	362.5	0.89		46.2
	36-48	8.8	13.3	2.3	359.2	2.16		69.5
40 EY	0-6	7.4	9.0	4.7	608.3	0.72	5.0	30.0
	6-12	7.8	3.7	2.3	505.0	0.60	2.8	12.0
	12-24	8.6	10.0	1.0	393.3	0.79		13.0
	24-36	8.5	11.3	3.0	416.7	2.68		105.3
	36-48	8.1	8.7	5.3	481.7	4.37		80.0
40 EOY	0-6	7.6	4.0	4.3	506.7	0.56	4.9	8.7
	6-12	8.0	4.3	1.7	403.3	0.52	2.9	4.0
	12-24	8.4	10.0	2.0	398.3	0.71		27.7
	24-36	8.4	10.0	1.7	391.7	1.97		36.3
	36-48	8.5	14.0	2.7	405.0	2.71		40.7
60 EY	0-6	7.6	4.7	3.7	535.0	0.53	6.2	15.3
	6-12	7.9	3.3	1.3	358.3	0.53	2.9	5.7
	12-24	8.5	7.3	1.0	266.7	0.51		8.7
	24-36	8.8	10.7	1.0	350.0	0.99		37.3
	36-48	8.8	13.3	2.7	385.0	1.98		73.3
60 EOY	0-6	7.7	4.0	2.7	533.3	0.64	5.2	20.7
	6-12	7.8	4.3	2.0	473.3	0.58	3.6	15.0
	12-24	8.7	9.3	1.3	331.7	0.64		13.0
	24-36	8.8	11.3	2.3	371.7	1.70		55.7
	36-48	8.1	8.7	2.7	420.0	3.79		80.0
100 EOY	0-6	7.7	14.3	3.7	608.3	2.65	7.9	12.5
	6-12	7.6	21.3	2.3	441.7	0.68	4.2	12.5
	12-24	8.4	18.0	1.0	281.7	0.58		9.7
	24-36	8.7	16.7	2.7	328.3	0.90		51.3
	36-48	8.4	11.3	2.0	333.3	3.57		80.0

Table 55. Soil Nitrogen Content in Lbs/Acre for the Native Range Fertilization Trial At the Dickinson Experiment Station, 1984

		Ammonium Nitrate			Urea		
		26 Jun	25 Jul	27 Aug	26 Jun	25 Jul	27 Aug
Control	0-6	10.7	3.0	2.7	10.7	3.0	2.7
	6-12	10.7	3.3	4.2	10.7	3.3	4.2
	12-24	11.7	6.0	7.7	11.7	6.0	7.7
	24-36	15.3	11.3	14.7	15.3	11.3	14.7
	36-48	18.7	14.7	13.3	18.7	14.7	13.3
40 EY	0-6	16.3	2.7	4.7	29.0	3.3	9.0
	6-12	7.0	4.0	4.0	14.0	4.0	3.7
	12-24	16.7	10.0	11.3	18.0	10.0	10.0
	24-36	9.3	10.0	26.7	9.3	10.0	11.3
	36-48	10.0	10.0	14.0	7.3	7.3	8.7
40 EOY	0-6	17.7	3.0	3.0	17.3	3.3	4.0
	6-12	9.0	3.0	2.7	6.0	3.7	4.3
	12-24	11.3	11.3	6.7	10.7	8.0	10.0
	24-36	12.7	8.0	9.3	14.7	8.0	10.0
	36-48	12.0	14.0	10.0	24.0	12.7	14.0
60 EY	0-6	29.3	4.0	13.3	33.0	3.7	4.7
	6-12	14.7	5.0	7.3	15.3	4.7	3.3
	12-24	23.3	9.3	10.7	16.0	8.0	7.3
	24-36	11.3	12.0	12.0	13.3	10.7	10.7
	36-48	10.7	9.3	11.3	10.7	13.3	13.3
60 EOY	0-6	19.7	4.0	4.7	22.7	3.3	4.0
	6-12	11.7	3.7	3.3	7.5	4.0	4.3
	12-24	10.7	7.3	6.7	10.0	9.3	9.3
	24-36	10.0	13.3	8.0	13.3	10.0	11.3
	36-48	15.3	9.3	9.3	7.3	7.3	8.7
100 EOY	0-6	26.0	7.3	9.7	49.7	13.7	14.3
	6-12	22.7	15.3	7.7	28.7	10.3	21.3
	12-24	13.3	10.0	11.3	23.3	10.0	18.0
	24-36	10.7	12.0	10.0	13.3	12.0	16.7
	36-48	25.3	22.7	10.7	6.0	8.7	11.3

Table 56. Soil Texture by Rep for the Native Range Fertilization Trial at the Dickinson Experiment Station, 1984

			Ammonium Nitrate				Urea		
			Rep 1	**Rep 2**	**Rep 3**		**Rep 1**	**Rep 2**	**Rep 3**
Control	0-6	(SOUTH)	L	L	L	(NORTH)	L	L	L
	6-12		L	L	L		SiL	L	SiL
	12-24		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL
	24-36		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL
	36-48		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL
40 EY	0-6		L	[L]	[L]		[L]	L	L
	6-12		SiL	L	[L]		[SiL]	L	L
	12-24		SiL	L	SiCL		SiL	L	SiCL
	24-36		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL
	36-48		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL
40 Eoy	0-6		L	L	L		L	L	L
	6-12		L	L	L		[L]	L	L
	12-24		SiCL	SiCL	L		SiCL	SiCL	SiCL
	24-36		SiCL	SiCL	SiL		SiCL	SiCL	SiCL
	36-48		SiCL	SiCL	SiL		SiCL	SiCL	SiCL
60 EY	0-6		L	L	L		L	L	L
	6-12		SiL	L	L		L	L	SiL
	12-24		SiCL	SiCL	L		SiCL	L	SiL
	24-36		SiCL	SiCL	SiCL		SiCL	SiCL	SiL
	36-48		SiCL	SiCL	SiCL		SiCL	SiCL	SiL
60 EOY	0-6		L	L	L		L	L	L
	6-12		[SiL]	L	L		[L]	L	L
	12-24		SiCL	SiL	SiCL		SiL	SiCL	SiL
	24-36		SiCL	SiL	SiCL		SiL	SiCL	SiCL
	36-48		SiCL	SiL	SiCL		SiL	SiCL	SiCL
100 EOY	0-6		L	L	L		L	L	L
	6-12		SiL	L	L		[L]	L	L
	12-24		SiCL	SiCL	SiCL		SiCL	SiCL	L
	24-36		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL
	36-48		SiCL	SiCL	SiCL		SiCL	SiCL	SiCL

L: Loam
SiCL: Silty clay loam
SiL: Silty loam
[ ]: Tentative classification

PLANT SPECIES LIST OF THE NATIVE RANGE FERTILIZATION TRIAL, DICKINSON EXPERIMENT STATION, 1984

Graminoids:

Ag sm	Agropyron smithii	Western wheatgrass
Ag sp	Agropyron spicatum	Bluebunch wheatgrass
Ag tr	Agropyron trachycaulum	Slender wheatgrass
An sc	Andropogon scoparius	Little bluestem
Ar lo	Aristida longiseta	Red threeawn
Bo gr	Bouteloua gracilis	Blue gramma
Bu da	Buchloe dactyloides	Buffalo grass
Ca mo	Calamagrostis montanensis	Plains reedgrass
Ca lo	Calamovilfa longifolia	Prairie sandreed
Ko py	Koeleria pyramidata	Prairie junegrass
Mu cu	Muhlenbergia cuspidata	Plains muhly
Mu sq	Munroa squarrosa	False buffalo grass
Pa ol	Panicum oligosanthes	Scribner panic grass
Po co	Poa compressa	Canada bluegrass
St co	Stipa comata	Needleandthread
St vi	Stipa viridula	Green needlegrass
Ca fi	Carex filifolia	Threadleaved sedge
Ca he	Carex heliophila	Yellow sedge

Forbs:

Ac mi	Achillea millefolium	Yarrow
Ag gl	Agoseris glauca	Prairie dandelion
An oc	Androsace occidentalis	Fairy candelabra
An cy	Anemone cylindrica	Cottonweed
An pa	Antennaria parvifolia	Pussytoes
Ar hi	Arabis hirsuta	Hairy rockcress

Forbs (Continued):

Ar ho	Arabis holboellii	Slim rockcress
Ar fu	Arnica fulgens	Arnica
Ar dr	Artemisia dracunculus	Green sage
Ar fr	Artemisia frigida	Fringed sage
Ar lu	Artemisia ludoviciana	White sage
As er	Aster ericoides	White prairie aster
As ob	Aster oblongifolius	Aromatic aster
As ag	Astragalus agrestis	Wild milkvetch
As ca	Astragalus canadensis	Little rattlepod
As cr	Astragalus crassicarpus	Ground plum
As mi	Astragalus missouriensis	Missouri milkvetch
Ba op	Bahia oppositifolia	Bahia beggartick
Ce ar	Cerastium arvense	Prairie chickweed
Ch al	Chenopodium album	Lamb's quarters
Ch vi	Chrysopsis villosa	Golden aster
Ci un	Cirsium undulatum	Prairie thistle
Co li	Collomia linearis	Collomia
Co um	Commandra umbellata	Bastard toadflax
Co ar	Convolvulus arvensis	Field bindweed
Co ca	Conyza canadensis	Horseweed
Dr ne	Draba nemorosa	Yellow whitlowwort
Ec an	Echinacea angustifolia	Purple coneflower
Er gl	Erigeron glabellus	Rough erigeron
Er as	Erysimum asperum	Western wallflower
Ga bo	Galium boreale	Northern bedstraw
Ga co	Gaura coccinea	Gaura
Gr sq	Grindelia squarrosa	Gumweed
Gu sa	Gutierrezia sarothrae	Broomweed
Ha sp	Haplopappus spinulosus	Spiny ironweed
He hi	Hedeoma hispida	Rough pennyroyal

Forbs (Continued):

He ri	Helianthus rigidus	Stiff sunflower
Hi vu	Hippuris vulgaris	Marestail
Ko sc	Kochia scoparia	Kochia
La ob	Lactuca oblongifolia	Blue wild lettuce
Le de	Lepidium densiflorum	Peppergrass
Li pu	Liatris punctata	Blazing star
Li le	Linum lewisii	Wild blueflax
Le ri	Linum rigidum	Stiffstem flax
Li in	Lithospermum incisum	Narrow-leaved puccoon
Lo am	Lotus americanus	Prairie bird's foot trefoil
Me of	Melilotus officinalis	Yellow sweetclover
Ne pa	Neslia paniculata	Ball mustard
Op fr	Opuntia fragilis	Brittle prickly pear
Or lu	Orthocarpus luteus	Owl clover
Ox la	Oxytropis lambertii	Purple loco
Pe al	Penstemon albidus	White beardtongue
Pe gr	Penstemon gracilis	Slender beardtongue
Pe pu	Petalostemon purpureum	Purple prairie clover
Ph ho	Phlox hoodii	Moss phlox
Pl pu	Plantago purshii	Woolly plantain
Po al	Polygala alba	White milkwort
Po ar	Potentilla arguta	Tall cinguefoil
Po pe	Potentilla pensylvanica	Potentilla
Ps ar	Psoralea argophylla	Silverleaf scurfpea
Ps es	Psoralea esculenta	Indian breadroot
Ra co	Ratibida columnifera	Long headed coneflower
Sa ka	Salsola kali	Russian thistle
Se pl	Senecio plattensis	Prairie ragwort
Si mo	Sisyrinchium montanum	Blue-eyed grass
So mi	Solidago missouriensis	Early goldenrod

Forbs (Continued):

So mo	Solidago mollis	Soft goldenrod
So ri	Solidago rigida	Stiff goldenrod
Sp co	Sphaeralcea coccinea	Scarlet globemallow
Ta of	Taraxacum officinale	Dandelion
Ve fa	Veronia fasciculata	Ironweed
Vi am	Vicia americana	Wild vetch
Vi nu	Viola nuttallii	Nutall's violet

Shrubs:

Ro ar	Rosa arkansana	Prairie wild rose
Sy oc	Symphoricarpos occidentalis	Wolfberry

Lycopods:

Se de	Selaginella densa	Club moss

Eumycota:

Li spp.	Species of lichens	Lichens

LITERATURE CITED

Heady, H.F. and L. Rader. 1958. "Modifications of the Point Frame". Journal of Range Management, Vol. II (2): 95-96.

Levy, E.B. and E.A. Madden. 1933. "The Point Method of Pasture Analysis". New Zealand Journal of Agriculture, Vol. 46: 267-279.

Smith, Justin G. 1959. "Additional Modifications of the Point Frame". Journal of Range Management, Vol. 12 (4): 204-205.

Tinney, F.W., O.S. Aamodt and H.L. Ahlgren. 1937. "Preliminary Report of a Study on Methods Used in Botanical Analysis of Pasture Swards". Journal of the American Society of Agronomy, Vol. 29 (10): 835-840.