

## **ALFALFA INTERSEEDING TECHNIQUES TRIAL – 1984**

### **Dickinson Experiment Station**

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The alfalfa interseeding techniques trial is separated into three separate segments. These are: alfalfa interseeding row spacing techniques trial, alfalfa interseeding furrow width techniques trial, and interseeded alfalfa variety response to grazing trial.

The personnel at the Dickinson Experiment Station built an interseeding machine during the winter of 1982-83. The plans from a machine designed and tested at South Dakota State University (Chisholms et al. 1980) were used for the construction with slight alterations. This interseeder was used to establish the alfalfa interseeding plots in 1983.

### **ALFALFA INTERSEEDING ROW SPACING TECHNIQUES TRIAL**

This trial was designed to evaluate alfalfa interseeding into rangeland with different intervals between the rows. The intended purpose of the data will be primarily to assist in the determination of a recommended row spacing or row spacings for alfalfa interseeding into rangeland for pasture use in western North Dakota.

These plots were established on one acre located on the NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , SW $\frac{1}{4}$  sec. 23, T. 143 N., R. 96 W. at the ranch headquarters of the Dickinson Experiment Station. The 33 x 50 foot plots were arranged in a randomized block design with three replication. The soil was vebar fine sandy loam. The range site was sandy with a few thin claypan sites. Travois alfalfa was seeded at a rate of 0.50 lbs PLS/row/acre on 21 April 1983. A four inch twisted chisel plow shovel was used as the furrow opener. The intervals between the rows were 2, 3, 4, 5, 8 and 10 feet. A control plot of no interseeding was included in each replication.

The data that were collected from these plots were: above ground herbage production separated into nine categories, alfalfa seedling counts per meter of row, species composition by point frame and forb densities by use of one tenth meter square quadrats.

The above ground herbage production was sampled by clipping the vegetation to ground level in two  $\frac{1}{4}$  m<sup>2</sup> quadrats for each plot on 22 June 1984. The herbage was separated into nine categories, cool short, warm short, cool mid, western wheatgrass, warm mid, warm tall, sedge, forbs and shrubs. 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  $\frac{1}{4}$  m<sup>2</sup> 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 are means of the three replications for each treatment.

The alfalfa seedling counts were made by counting the number of seedlings along two randomly placed meter sticks for each row of each plot. The mean number of seedlings per meter of row was determined for each treatment. Seedling counts were conducted on 27 June 1984.

Quantitative species composition data for each plot was collected on 10 August 1984. 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). 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 three feet inside and parallel to the east boundary of each plot. Five minor transects were established perpendicular to the major transect at nine foot intervals starting nine feet from the south boundary of the plot. One hundred points were read on each minor transect equally spaced across the plot.

Forb and shrub densities were sampled by the use of one tenth meter square quadrats on 28 August 1984. The forbs and shrubs that were rooted within the frame were counted by species in each of the 25 quadrats per plot. Five 0.1 m<sup>2</sup> quadrats were spaced at 6 foot intervals along each of the five minor transects.

### Alfalfa Interseeding Row Spacing Techniques Trial

<b>Location:</b>	Dickinson Experiment Station Ranch Headquarters NE <sup>1</sup> / <sub>4</sub> , NW <sup>1</sup> / <sub>4</sub> , SW <sup>1</sup> / <sub>4</sub> Sec. 23, T. 143 N., R. 96 W.	
<b>Replications:</b>	Three	Randomized Block Design
<b>Study Size:</b>	183' x 241'	1.01 acres
<b>Plot Size:</b>	33' x 50'	0.04 acres
<b>Perimeter border:</b>	10' on west and south, 3' on north and 0' on east	
<b>Alleys:</b>	10'	
<b>Soil:</b>	Vebar	
<b>Range Site:</b>	Sandy with a few thin claypen sites	
<b>Seeding Date:</b>	21 Apr 1983	
<b>Seeding Rate:</b>	0.50 lbs. PLS/row/acre	
<b>Alfalfa Variety:</b>	Travois	
<b>Chisel Plow Shovel:</b>	4" twisted	
<b>Row Spacings:</b>	0, 2, 3, 4, 5, 8 and 10 foot	

**Figure 1:** Alfalfa Interseeding Row Spacing Techniques Trial

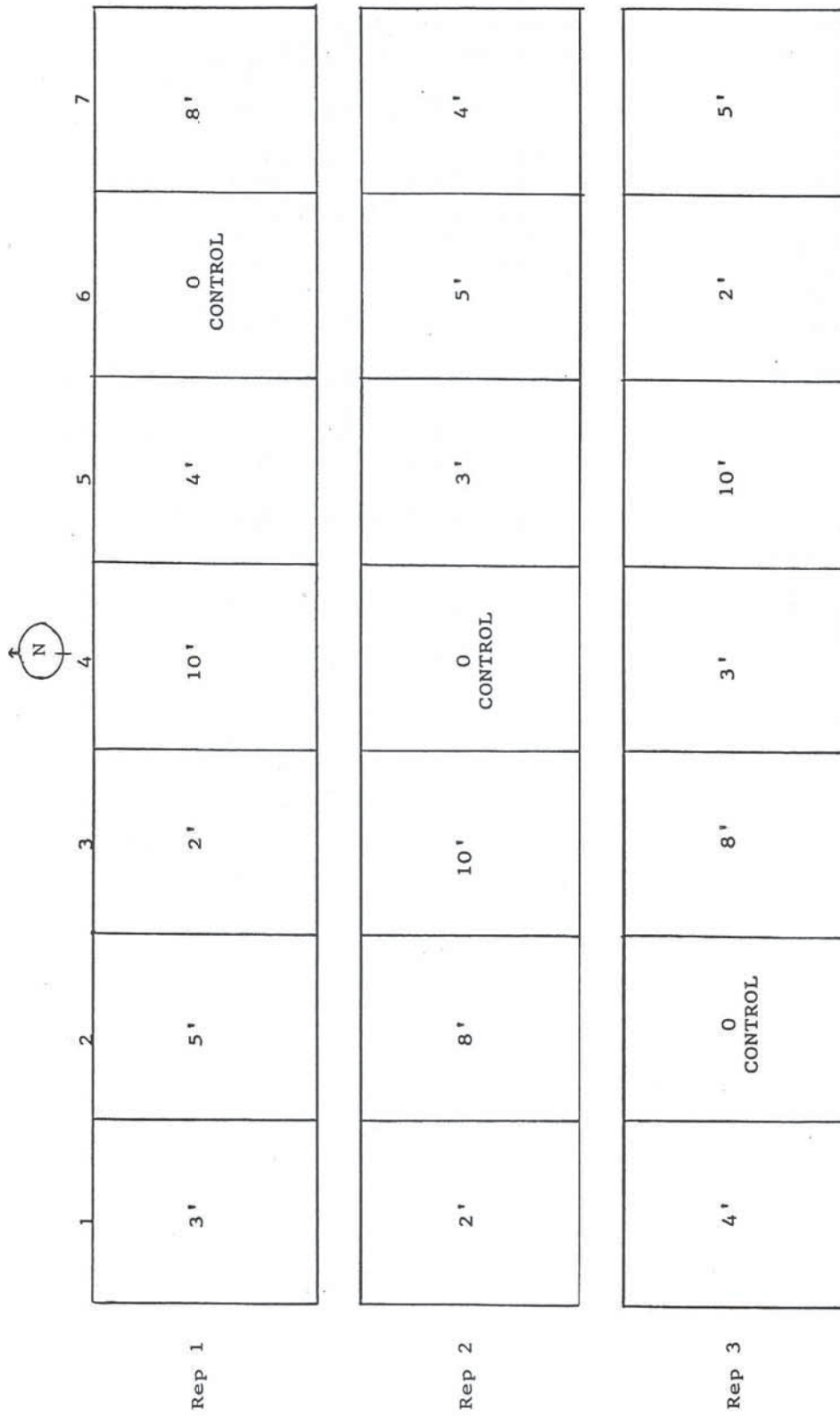


Figure 1. Alfalfa interseeding row spacing techniques trial with 0, 2, 3, 4, 5, 8 and 10 foot row spacings, seeded 21 Apr 1983.

**Table 1. Mean Above Ground Herbage Production by Category in Lbs/Acre for the Alfalfa Interseeding Row Spacing Techniques Trial at the Dickinson Experiment Station, 1984**

Clip Categories	Row Spacing						
	0 Foot	2 Foot	3 Foot	4 Foot	5 Foot	8 Foot	10 Foot
Cool Short	126.7	205.8	79.1	139.2	174.8	93.8	142.1
Warm Short	130.8	163.1	220.0	91.6	157.6	108.8	179.6
Cool Mid	144.0	215.9	264.6	318.2	274.1	195.7	105.3
Western Wheatgrass	14.2	38.1	11.9	5.4	6.5	7.1	31.5
Warm Mid	16.7	0.0	0.6	4.2	20.8	0.0	19.0
Warm Tall	25.0	0.0	3.6	10.1	0.6	0.0	27.4
Sedge	196.8	236.1	165.9	164.7	101.3	146.9	208.7
<b>Total Grass</b>	714.2	843.8	745.7	733.2	735.9	552.0	696.9
Forbs	75.5	111.2	96.3	145.1	127.9	88.6	66.0
Shrubs	0.0	0.0	1.2	20.2	3.0	2.4	0.0
<b>Total</b>	789.7	955.0	843.2	898.5	866.7	643.0	762.9

**Table 2. Alfalfa Plant Count per Meter of Row for the Alfalfa Interseeding Row Spacing Techniques Trial  
At the Dickinson Experiment Station, 27 Jun 1984**

Row Spacing	Rep 1			Rep 2			Rep 3			Mean		
	Seedling	Adult	Total	Seedling	Adult	Total	Seedling	Adult	Total	Seedling	Adult	Total
Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 foot	0.53	3.69	4.22	0.22	0.53	0.75	1.13	2.94	4.06	0.63	2.39	3.01
3 foot	0.92	4.00	4.92	0.21	0.92	1.13	0.08	0.33	0.42	0.42	1.75	2.15
4 foot	0.25	0.19	0.44	0.31	0.31	0.63	0.19	0.44	0.63	0.25	0.31	0.56
5 foot	0.58	4.58	5.17	0.17	0.50	0.67	0.50	2.08	2.58	0.42	2.39	2.81
8 foot	0.13	0.38	0.50	0.50	0.75	1.25	0.50	0.75	1.25	0.38	0.63	1.00
10 foot	0.50	0.75	1.25	0.25	0.50	0.75	0.38	0.50	0.88	0.38	0.58	0.96

**Table 3. Alfalfa Plant Count per Foot of Row for the Alfalfa Interseeding Row Spacing Techniques Trial  
At the Dickinson Experiment Station, 27 Jun 1984**

Row Spacing	Rep 1			Rep 2			Rep 3			Mean		
	Seedling	Adult	Total	Seedling	Adult	Total	Seedling	Adult	Total	Seedling	Adult	Total
Control	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 foot	0.16	1.13	1.29	0.07	0.16	0.23	0.34	0.90	1.24	0.19	0.73	0.92
3 foot	0.28	1.22	1.50	0.06	0.28	0.34	0.02	0.10	0.13	0.13	0.53	0.66
4 foot	0.08	0.06	0.13	0.09	0.09	0.19	0.06	0.13	0.19	0.08	0.09	0.17
5 foot	0.18	1.40	1.58	0.05	0.15	0.20	0.15	0.63	0.79	0.13	0.73	0.86
8 foot	0.04	0.12	0.15	0.15	0.23	0.38	0.15	0.23	0.38	0.12	0.19	0.30
10 foot	0.15	0.23	0.38	0.08	0.15	0.23	0.12	0.15	0.27	0.12	0.18	0.29

**Table 4. Points Analysis of the 0 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
<i>Agropyron smithii</i>	0.20	0.63	2.00	0.89	1.52
<i>Bouteloua gracilis</i>	11.27	35.73	56.00	24.93	60.66
<i>Calamovilfa longifolia</i>	1.73	5.50	16.00	7.12	12.62
<i>Koeleria pyramidata</i>	1.13	3.59	9.33	4.15	7.74
<i>Muhlenbergia cuspidata</i>	0.47	1.48	4.67	2.08	3.56
<i>Panicum oligosanthes</i>	0.13	0.42	0.67	0.30	0.72
<i>Stipa comata</i>	3.47	10.99	26.67	11.87	22.86
<i>Carex filifolia</i>	3.60	11.42	29.33	13.06	24.48
<i>Carex heliophila</i>	3.20	10.15	22.67	10.09	20.24
<i>Achillea millefolium</i>	0.20	0.63	2.00	0.89	1.52
<i>Antennaria parvifolia</i>	0.47	1.48	2.67	1.19	2.67
<i>Artemisia dracunculus</i>	0.40	1.27	4.00	1.78	3.05
<i>Artemisia frigida</i>	0.27	0.85	2.67	1.19	2.04
<i>Aster ericoides</i>	0.20	0.63	2.00	0.89	1.52
<i>Echinacea angustifolia</i>	0.20	0.63	2.00	0.89	1.52
<i>Glycyrrhiza lepidota</i>	0.20	0.63	2.00	0.89	1.52
<i>Grindelia squarrosa</i>	0.20	0.63	2.00	0.89	1.52
<i>Haplopappus spinulosus</i>	0.27	0.85	2.67	1.19	2.04
<i>Hedeoma hispida</i>	0.13	0.42	1.33	0.59	1.01
<i>Liatris punctata</i>	0.07	0.21	0.67	0.30	0.51
<i>Lygodesmia juncea</i>	0.07	0.21	0.67	0.30	0.51
<i>Opuntia fragilis</i>	0.13	0.42	1.33	0.59	1.01
<i>Petalostemon purpureum</i>	0.13	0.42	1.33	0.59	1.01
<i>Phlox hoodii</i>	0.53	1.69	4.67	2.08	3.77
<i>Psoralea argophylla</i>	0.13	0.42	1.33	0.59	1.01
<i>Psoralea esculenta</i>	0.07	0.21	0.67	0.30	0.51
<i>Solidago missouriensis</i>	0.07	0.21	0.67	0.30	0.51
<i>Solidago rigida</i>	0.07	0.21	0.67	0.30	0.51
<i>Taraxacum officinale</i>	0.07	0.21	0.67	0.30	0.51
<i>Rosa arkansana</i>	0.33	1.06	3.33	1.48	2.54
<i>Symphoricarpos occidentalis</i>	0.07	0.21	0.67	0.30	0.51
Lichen spp.	2.07	6.55	17.33	7.72	14.27
Furrow	0.00		0.00		
Litter	65.33		100.00		
Rock	0.67		4.00		
Sod	0.00		0.00		
Soil	2.47		11.33		

**Table 5. Points Analysis of the 2 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Basal Cover</b>	<b>Relative Basal Cover</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
Agropyron smithii	0.07	0.29	0.67	0.43	0.72
Bouteloua gracilis	11.80	51.75	62.67	40.52	92.27
Koeleria pyramidata	1.20	5.26	10.00	6.47	11.73
Stipa comata	2.73	11.99	24.67	15.95	27.94
Stipa viridula	0.40	1.75	3.33	2.16	3.91
Carex filifolia	3.60	15.79	25.33	16.38	32.17
Carex heliophila	0.27	1.17	2.00	1.29	2.46
Artemisia dracunculus	0.87	3.80	8.67	5.60	9.40
Artemisia frigida	0.07	0.29	0.67	0.43	0.72
Aster ericoides	0.07	0.29	0.67	0.43	0.72
Cirsium undulatum	0.07	0.29	0.67	0.43	0.72
Grindelia squarrosa	0.27	1.17	2.67	1.72	2.89
Hedeoma hispida	0.07	0.29	0.67	0.43	0.72
Lactuca oblongifolia	0.07	0.29	0.67	0.43	0.72
Liatis punctata	0.13	0.58	1.33	0.86	1.44
Lygodesmia juncea	0.07	0.29	0.67	0.43	0.72
Phlox hoodii	0.60	2.63	5.33	3.45	6.08
Psoralea argophylla	0.13	0.58	1.33	0.86	1.44
Rosa arkansana	0.07	0.29	0.67	0.43	0.72
Lichen spp.	0.27	1.17	2.00	1.29	2.46
Furrow	17.80		79.33		
Litter	36.13		95.33		
Rock	0.07		0.67		
Sod	22.00		59.33		
Soil	1.20		3.33		



**Table 6. Points Analysis of the 3 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

Species	Basal Cover	Basal Cover	Relative Percent Frequency	Percent Frequency	Relative Importance Value
<i>Bouteloua gracilis</i>	12.47	46.98	64.67	35.02	82.00
<i>Calamovilfa longifolia</i>	0.13	0.50	1.33	0.72	1.22
<i>Koeleria pyramidata</i>	1.73	6.53	13.33	7.22	13.75
<i>Stipa comata</i>	3.33	12.56	30.00	16.25	28.81
<i>Stipa viridula</i>	0.53	2.01	4.67	2.53	4.54
<i>Carex filifolia</i>	2.67	10.05	22.00	11.91	21.96
<i>Carex heliophila</i>	1.07	4.02	8.67	4.69	8.71
<i>Achillea millefolium</i>	0.07	0.25	0.67	0.36	0.61
<i>Antennaria parvifolia</i>	0.20	0.75	1.33	0.72	1.47
<i>Artemisia dracunculus</i>	0.67	2.51	5.33	2.89	5.40
<i>Artemisia frigida</i>	0.07	0.25	0.67	0.36	0.61
<i>Artemisia ludoviciana</i>	0.27	1.01	2.67	1.44	2.45
<i>Aster ericoides</i>	0.07	0.25	0.67	0.36	0.61
<i>Chrysopsis villosa</i>	0.07	0.25	0.67	0.36	0.61
<i>Glycyrrhiza lepidota</i>	0.20	0.75	2.00	1.08	1.83
<i>Grindelia squarrosa</i>	0.20	0.75	1.33	0.72	1.47
<i>Haplopappus spinulosus</i>	0.07	0.25	0.67	0.36	0.61
<i>Hedeoma hispida</i>	0.07	0.25	0.67	0.36	0.61
<i>Liatis punctata</i>	0.07	0.25	0.67	0.36	0.61
<i>Lygodesmia juncea</i>	0.13	0.50	1.33	0.72	1.22
<i>Phlox hoodii</i>	0.73	2.76	6.67	3.61	6.37
<i>Psoralea argophylla</i>	0.07	0.25	0.67	0.36	0.61
<i>Psoralea esculenta</i>	0.07	0.25	0.67	0.36	0.61
<i>Rosa arkansana</i>	0.07	0.25	0.67	0.36	0.61
<i>Symphoricarpos occidentalis</i>	0.07	0.25	0.67	0.36	0.61
Lichen spp.	1.47	5.53	12.00	6.50	12.03
Furrow	13.27		53.33		
Litter	45.40		97.33		
Rock	0.00		0.00		
Sod	14.00		42.00		
Soil	0.80		4.67		

**Table 7. Points Analysis of the 4 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Basal Cover</b>	<b>Relative Basal Cover</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
Agropyron smithii	0.27	0.98	2.00	0.99	1.97
Bouteloua gracilis	7.27	26.59	39.33	19.54	46.13
Calamovilfa longifolia	1.93	7.07	15.33	7.62	14.69
Koeleria pyramidata	0.47	1.71	4.00	1.99	3.70
Muhlenbergia cuspidata	0.93	3.41	6.67	3.31	6.72
Stipa comata	4.73	17.32	36.67	18.21	35.53
Carex filifolia	2.80	10.24	19.33	9.60	19.84
Carex heliophila	4.00	14.63	30.00	14.90	29.53
Antennaria parvifolia	0.27	0.98	2.67	1.32	2.30
Artemisia dracunculus	0.67	2.44	6.67	3.31	5.75
Artemisia frigida	0.47	1.71	4.67	2.32	4.03
Artemisia ludoviciana	0.13	0.49	1.33	0.66	1.15
Aster ericoides	0.20	0.73	2.00	0.99	1.72
Chrysopsis villosa	0.07	0.24	0.67	0.33	0.57
Echinacea angustifolia	0.13	0.49	1.33	0.66	1.15
Erysimum asperum	0.13	0.49	1.33	0.66	1.15
Glycyrrhiza lepidota	0.07	0.24	0.67	0.33	0.57
Grindelia squarrosa	0.13	0.49	1.33	0.66	1.15
Liatris punctata	0.07	0.24	0.67	0.33	0.57
Lygodesmia juncea	0.07	0.24	0.67	0.33	0.57
Oxytropis lambertii	0.33	1.22	3.33	1.66	2.88
Petalostemon purpureum	0.13	0.49	1.33	0.66	1.15
Phlox hoodia	0.53	1.95	4.67	2.32	4.27
Solidago rigida	0.40	1.46	3.33	1.66	3.12
Rosa arkansana	0.13	0.49	1.33	0.66	1.15
Lichen spp.	1.00	3.66	10.00	4.97	8.63
Furrow	5.27		23.33		
Litter	54.13		100.00		
Rock	0.00		0.00		
Sod	12.13		33.33		
Soil	1.13		6.00		

**Table 8. Points Analysis of the 5 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Basal Cover</b>	<b>Relative Basal Cover</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
<i>Bouteloua gracilis</i>	13.33	43.38	68.67	32.80	76.18
<i>Calamovilfa longifolia</i>	0.27	0.87	2.00	0.96	1.83
<i>Koeleria pyramidata</i>	1.73	5.64	15.33	7.32	12.96
<i>Muhlenbergia cuspidata</i>	0.20	0.65	2.00	0.96	1.61
<i>Panicum oligosanthes</i>	0.13	0.43	1.33	0.64	1.07
<i>Stipa comata</i>	3.33	10.85	28.00	13.38	24.23
<i>Stipa viridula</i>	0.27	0.87	2.67	1.27	2.14
<i>Carex filifolia</i>	4.47	14.53	30.67	14.65	29.18
<i>Carex heliophila</i>	1.40	4.56	10.67	5.10	9.66
<i>Antennaria parvifolia</i>	0.07	0.22	0.67	0.32	0.54
<i>Artemisia dracunculus</i>	0.67	2.17	6.67	3.18	5.35
<i>Artemisia frigida</i>	0.07	0.22	0.67	0.32	0.54
<i>Aster ericoides</i>	0.20	0.65	1.33	0.64	1.29
<i>Gaura coccinea</i>	0.07	0.22	0.67	0.32	0.54
<i>Glycyrrhiza lepidota</i>	0.27	0.87	2.67	1.27	2.14
<i>Haplopappus spinulosus</i>	0.20	0.65	2.00	0.96	1.61
<i>Hedeoma hispida</i>	0.07	0.22	0.67	0.32	0.54
<i>Lactuca oblongifolia</i>	0.07	0.22	0.67	0.32	0.54
<i>Lygodesmia juncea</i>	0.07	0.22	0.67	0.32	0.54
<i>Oxytropis lambertii</i>	0.13	0.43	1.33	0.64	1.07
<i>Petalostemon purpureum</i>	0.07	0.22	0.67	0.32	0.54
<i>Phlox hoodii</i>	1.40	4.56	10.67	5.10	9.66
<i>Potentilla pensylvanica</i>	0.07	0.22	0.67	0.32	0.54
<i>Psoralea argophylla</i>	0.13	0.43	1.33	0.64	1.07
<i>Sphaeralcea coccinea</i>	0.13	0.43	1.33	0.64	1.07
<i>Rosa arkansana</i>	0.33	1.08	3.33	1.59	2.67
<i>Symphoricarpos occidentalis</i>	0.07	0.22	0.67	0.32	0.54
<i>Selaginella densa</i>	0.27	0.87	0.67	0.32	1.19
Lichen spp.	1.27	4.12	10.67	5.10	9.22
Furrow	8.47		30.00		
Litter	49.40		98.00		
Rock	0.00		0.00		
Sod	11.13		27.33		
Soil	0.27		1.33		

**Table 9. Points Analysis of the 8 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Basal Cover</b>	<b>Relative Basal Cover</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
Agropyron smithii	0.07	0.22	0.67	0.30	0.52
Bouteloua gracilis	9.60	30.97	58.00	25.97	56.94
Calamovilfa longifolia	0.87	2.80	6.00	2.69	5.49
Koeleria pyramidata	1.40	4.52	14.00	6.27	10.79
Muhlenbergia cuspidata	0.20	0.65	2.00	0.90	1.55
Stipa comata	5.27	16.99	37.33	16.72	33.71
Stipa viridula	0.07	0.22	0.67	0.30	0.52
Carex filifolia	5.07	16.34	33.33	14.93	31.27
Carex heliophila	2.67	8.60	20.00	8.96	17.56
Antennaria parvifolia	0.47	1.51	4.00	1.79	3.30
Artemisia dracunculus	0.73	2.37	7.33	3.28	5.65
Artemisia frigida	0.27	0.86	2.67	1.19	2.05
Artemisia ludoviciana	0.07	0.22	0.67	0.30	0.52
Aster ericoides	0.40	1.29	4.00	1.79	3.08
Erysimum asperum	0.13	0.43	1.33	0.60	1.03
Grindelia squarrosa	0.07	0.22	0.67	0.30	0.52
Hedeoma hispida	0.07	0.22	0.67	0.30	0.52
Liatis punctata	0.33	1.08	3.33	1.49	2.57
Oxytropis lambertii	0.07	0.22	0.67	0.30	0.52
Phlox hoodii	0.13	0.43	1.33	0.60	1.03
Plantago purshii	0.13	0.43	1.33	0.60	1.03
Psoralea argophylla	0.13	0.43	1.33	0.60	1.03
Solidago rigida	0.67	2.15	6.00	2.69	4.84
Sphaeralcea coccinea	0.07	0.22	0.67	0.30	0.52
Rosa arkansana	0.33	1.08	3.33	1.49	2.57
Selaginella densa	0.20	0.65	0.67	0.30	0.95
Lichen spp.	1.53	4.95	11.33	5.07	10.02
Furrow	6.40		28.00		
Litter	56.60		100.00		
Rock	0.00		0.00		
Sod	5.60		18.67		
Soil	0.40		3.33		

**Table 10. Points Analysis of the 10 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Percent Frequency	Importance Value
Agropyron smithii	0.53	1.79	5.33	2.66	4.45
Andropogon scoparius	0.13	0.45	0.67	0.33	0.78
Bouteloua gracilis	12.67	42.41	62.67	31.23	73.64
Calamovilfa longifolia	0.27	0.89	2.00	1.00	1.89
Koeleria pyramidata	1.47	4.91	13.33	6.64	11.55
Muhlenbergia cuspidata	0.73	2.46	5.33	2.66	5.12
Munroa squarrosa	0.27	0.89	2.00	1.00	1.89
Stipa comata	2.20	7.37	18.00	8.97	16.34
Stipa viridula	0.07	0.22	0.67	0.33	0.55
Carex filifolia	5.53	18.53	38.00	18.94	37.47
Carex heliophila	0.87	2.90	5.33	2.66	5.56
Artemisia dracunculus	0.20	0.67	2.00	1.00	1.67
Artemisia frigida	0.47	1.56	4.67	2.33	3.89
Artemisia ludoviciana	0.07	0.22	0.67	0.33	0.55
Aster ericoides	0.40	1.34	3.33	1.66	3.00
Astragalus triphyllus	0.07	0.22	0.67	0.33	0.55
Echinacea angustifolia	0.07	0.22	0.67	0.33	0.55
Grindelia squarrosa	0.40	1.34	3.33	1.66	3.00
Gutierrezia sarothrae	0.20	0.67	2.00	1.00	1.67
Haplopappus spinulosus	0.07	0.22	0.67	0.33	0.55
Liatis punctata	0.27	0.89	2.00	1.00	1.89
Lygodesmia juncea	0.13	0.45	1.33	0.66	1.11
Opuntia fragilis	0.07	0.22	0.67	0.33	0.55
Phlox hoodii	0.60	2.01	6.00	2.99	5.00
Psoralea argophylla	0.07	0.22	0.67	0.33	0.55
Solidago rigida	0.07	0.22	0.67	0.33	0.55
Rosa arkansana	0.13	0.45	1.33	0.66	1.11
Symphoricarpos occidentalis	0.20	0.67	1.33	0.66	1.33
Selaginella densa	0.07	0.22	0.67	0.33	0.55
Lichen spp.	1.60	5.36	14.67	7.31	12.67
Furrow	5.80		24.36		
Litter	55.27		97.33		
Rock	0.00		0.00		
Sod	7.87		21.33		
Soil	1.20		6.00		

**Table 11. Mean Percentage of Basal Cover for the Alfalfa Interseeding Row Spacing Trial at the Dickinson Experiment Station, 1984**

Row Spacing	Club										
	Grass	Sedge	Forbs	Shrubs	Moss	Lichen	Furrow	Litter	Rock	Sod	Soil
0 foot	18.40	6.80	3.88	0.40	0.00	2.07	0.00	65.33	0.67	0.00	2.47
2 foot	16.20	3.87	2.42	0.07	0.00	0.27	17.80	36.13	0.07	22.00	1.20
3 foot	18.19	3.74	3.03	0.14	0.00	1.47	13.27	45.40	0.00	14.00	0.80
4 foot	15.60	6.80	3.80	0.13	0.00	1.00	5.27	54.13	0.00	12.13	1.13
5 foot	19.26	5.87	3.69	0.40	0.27	1.27	8.47	49.40	0.00	11.13	0.27
8 foot	17.48	7.74	3.74	0.33	0.20	1.53	6.40	56.60	0.00	5.60	0.40
10 foot	18.34	6.40	3.16	0.33	0.07	1.60	5.80	55.27	0.00	7.87	1.20

**Table 12. Density Analysis per 0.1 Sq. Meter of the 0 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Density</b>	<b>Relative Percent Density</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
<i>Achillea millefolium</i>	0.15	3.34	5.33	2.61	5.95
<i>Antennaria parvifolia</i>	0.01	0.30	1.33	0.65	0.95
<i>Artemisia dracunculoides</i>	0.24	5.47	17.33	8.50	13.97
<i>Artemisia frigida</i>	0.05	1.22	4.00	1.96	3.18
<i>Artemisia ludoviciana</i>	0.13	3.04	4.00	1.96	5.00
<i>Aster ericoides</i>	1.28	29.18	28.00	13.73	42.91
<i>Chrysopsis villosa</i>	0.04	0.91	4.00	1.96	2.87
<i>Echinacea angustifolia</i>	0.17	3.95	10.67	5.23	9.18
<i>Erysimum asperum</i>	0.13	3.04	10.67	5.23	8.27
<i>Gaura coccinea</i>	0.17	3.95	9.33	4.58	8.53
<i>Glycyrrhiza lepidota</i>	0.01	0.30	1.33	0.65	0.95
<i>Grindelia squarrosa</i>	0.56	12.77	17.33	8.50	21.27
<i>Gutierrezia sarothrae</i>	0.03	0.61	2.67	1.31	1.92
<i>Haplopappus spinulosus</i>	0.04	0.91	4.00	1.96	2.87
<i>Hedeoma hispida</i>	0.08	1.82	2.67	1.31	3.13
<i>Helianthus rigidus</i>	0.29	6.69	13.33	6.54	13.23
<i>Liatris punctata</i>	0.19	4.26	10.67	5.23	9.49
<i>Linum rigidum</i>	0.03	0.61	2.67	1.31	1.92
<i>Lygodesmia juncea</i>	0.01	0.30	1.33	0.65	0.95
<i>Oxytropis lambertii</i>	0.04	0.91	4.00	1.96	2.87
<i>Petalostemon purpureum</i>	0.27	6.08	14.67	7.19	13.27
<i>Phlox hoodii</i>	0.09	2.13	4.00	1.96	4.09
<i>Psoralea argophylla</i>	0.04	0.91	4.00	1.96	2.87
<i>Psoralea esculenta</i>	0.05	1.22	5.33	2.61	3.83
<i>Solidago missouriensis</i>	0.01	0.30	1.33	0.65	0.95
<i>Solidago rigida</i>	0.03	0.61	1.33	0.65	1.26
<i>Sphaeralcea coccinea</i>	0.03	0.61	2.67	1.31	1.92
<i>Rosa arkansana</i>	0.19	4.26	14.67	7.19	11.45
<i>Symphoricarpos occidentalis</i>	0.01	0.30	1.33	0.65	0.95

**Table 13. Density Analysis per 0.1 Sq. Meter of the 2 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Density</b>	<b>Relative Percent Density</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
<i>Antennaria parvifolia</i>	0.03	0.82	1.33	0.70	1.52
<i>Artemisia dracuncululus</i>	0.47	14.40	28.00	14.69	29.09
<i>Artemisia frigida</i>	0.08	2.47	6.67	3.50	5.97
<i>Artemisia ludoviciana</i>	0.11	3.29	1.33	0.70	3.99
<i>Aster ericoides</i>	0.63	19.34	16.00	8.39	27.73
<i>Chrysopsis villosa</i>	0.01	0.41	1.33	0.70	1.11
<i>Echinacea angustifolia</i>	0.01	0.41	1.33	0.70	1.11
<i>Erysimum asperum</i>	0.11	3.29	9.33	4.90	8.19
<i>Euphorbia geyeri</i>	0.01	0.41	1.33	0.70	1.11
<i>Gaura coccinea</i>	0.07	2.06	5.33	2.80	4.86
<i>Grindelia squarrosa</i>	0.19	5.76	13.33	6.99	12.75
<i>Gutierrezia sarothrae</i>	0.07	2.06	2.67	1.40	3.46
<i>Haplopappus spinulosus</i>	0.11	3.29	9.33	4.90	8.19
<i>Hedeoma hispida</i>	0.08	2.47	8.00	4.20	6.67
<i>Lepidium densiflorum</i>	0.04	1.23	4.00	2.10	3.33
<i>Liatris punctata</i>	0.33	10.29	17.33	9.09	19.38
<i>Linum rigidum</i>	0.05	1.65	4.00	2.10	3.75
<i>Lotus americanus</i>	0.01	0.41	1.33	0.70	1.11
<i>Lygodesmia juncea</i>	0.11	3.29	8.00	4.20	7.49
<i>Opuntia fragilis</i>	0.01	0.41	1.33	0.70	1.11
<i>Oxytropis lambertii</i>	0.03	0.82	2.67	1.40	2.22
<i>Petalostemon purpureum</i>	0.03	0.82	1.33	0.70	1.52
<i>Phlox hoodii</i>	0.23	7.00	12.00	6.29	13.29
<i>Plantago purshii</i>	0.01	0.41	1.33	0.70	1.11
<i>Potentilla pensylvanica</i>	0.01	0.41	1.33	0.70	1.11
<i>Psoralea argophylla</i>	0.05	1.65	5.33	2.80	4.45
<i>Psoralea esculenta</i>	0.08	2.47	8.00	4.20	6.67
<i>Ratibida columnifera</i>	0.04	1.23	4.00	2.10	3.33
<i>Solidago missouriensis</i>	0.03	0.82	1.33	0.70	1.52
<i>Sphaeralcea coccinea</i>	0.15	4.53	9.33	4.90	9.43
<i>Rosa arkansana</i>	0.07	2.06	2.67	1.40	3.46



**Table 14. Density Analysis per 0.1 Sq. Meter of the 3 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Density</b>	<b>Relative Percent Density</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
<i>Achillea millefolium</i>	0.01	0.37	1.33	0.60	0.97
<i>Artemisia dracuncululus</i>	0.41	11.52	32.00	14.46	25.98
<i>Artemisia frigida</i>	0.09	2.60	9.33	4.22	6.82
<i>Artemisia ludoviciana</i>	0.41	11.52	14.67	6.63	18.15
<i>Aster ericoides</i>	0.92	25.65	26.67	12.05	37.70
<i>Chrysopsis villosa</i>	0.01	0.37	1.33	0.60	0.97
<i>Echinacea angustifolia</i>	0.07	1.86	6.67	3.01	4.87
<i>Erysimum asperum</i>	0.03	0.74	2.67	1.20	1.94
<i>Gaura coccinea</i>	0.08	2.23	2.67	1.20	3.43
<i>Glycyrrhiza lepidota</i>	0.11	2.97	9.33	4.22	7.19
<i>Grindelia squarrosa</i>	0.25	7.06	17.33	7.83	14.89
<i>Gutierrezia sarothrae</i>	0.01	0.37	1.33	0.60	0.97
<i>Haplopappus spinulosus</i>	0.07	1.86	5.33	2.41	4.27
<i>Hedeoma hispida</i>	0.03	0.74	2.67	1.20	1.94
<i>Lepidium densiflorum</i>	0.04	1.12	4.00	1.81	2.93
<i>Liatis punctata</i>	0.24	6.69	16.00	7.23	13.92
<i>Linum rigidum</i>	0.05	1.49	5.33	2.41	3.90
<i>Lotus americanus</i>	0.01	0.37	1.33	0.60	0.97
<i>Lygodesmia juncea</i>	0.08	2.23	6.67	3.01	5.24
<i>Medicago falcata</i>	0.03	0.74	2.67	1.20	1.94
<i>Petalostemon purpureum</i>	0.12	3.35	10.67	4.82	8.17
<i>Phlox hoodii</i>	0.17	4.83	12.00	5.42	10.25
<i>Plantago purshii</i>	0.03	0.74	2.67	1.20	1.94
<i>Potentilla pensylvanica</i>	0.03	0.74	2.67	1.20	1.94
<i>Psoralea argophylla</i>	0.03	0.74	2.67	1.20	1.94
<i>Psoralea esculenta</i>	0.13	3.72	10.67	4.82	8.54
<i>Sphaeralcea coccinea</i>	0.04	1.12	4.00	1.81	2.93
<i>Rosa arkansana</i>	0.03	0.74	1.33	0.60	1.34
<i>Symphoricarpos occidentalis</i>	0.05	1.49	5.33	2.41	3.90

**Table 15. Density Analysis per 0.1 Sq. Meter of the 4 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

Species	Density	Relative Percent Density	Percent Frequency	Relative Percent Frequency	Importance Value
<i>Achillea millefolium</i>	0.01	0.33	1.33	0.53	0.86
<i>Antennaria parvifolia</i>	0.13	3.27	5.33	2.14	5.41
<i>Artemisia dracunculus</i>	0.11	2.61	9.33	3.74	6.35
<i>Artemisia frigida</i>	0.27	6.54	18.67	7.49	14.03
<i>Artemisia ludoviciana</i>	0.31	7.52	12.00	4.81	12.33
<i>Aster ericoides</i>	0.47	11.44	14.67	5.88	17.32
<i>Aster laevis</i>	0.01	0.33	1.33	0.53	0.86
<i>Chrysopsis villosa</i>	0.08	1.96	2.67	1.07	3.03
<i>Echinacea angustifolia</i>	0.44	10.78	28.00	11.23	22.01
<i>Erysimum asperum</i>	0.03	0.65	2.67	1.07	1.72
<i>Euphorbia geyeri</i>	0.07	1.63	1.33	0.53	2.16
<i>Gaura coccinea</i>	0.13	3.27	9.33	3.74	7.01
<i>Glycyrrhiza lepidota</i>	0.09	2.29	5.33	2.14	4.43
<i>Grindelia squarrosa</i>	0.19	4.58	9.33	3.74	8.32
<i>Gutierrezia sarothrae</i>	0.03	0.65	2.67	1.07	1.72
<i>Hedeoma hispida</i>	0.09	2.29	5.33	2.14	4.43
<i>Liatis punctata</i>	0.16	3.92	12.00	4.81	8.73
<i>Linum rigidum</i>	0.05	1.31	5.33	2.14	3.45
<i>Lotus americanus</i>	0.03	0.65	2.67	1.07	1.72
<i>Lygodesmia juncea</i>	0.05	1.31	5.33	2.14	3.45
<i>Oxytropis lambertii</i>	0.09	2.29	6.67	2.67	4.96
<i>Petalostemon purpureum</i>	0.47	11.44	30.67	12.30	23.74
<i>Phlox hoodii</i>	0.15	3.59	12.00	4.81	8.40
<i>Plantago purshii</i>	0.01	0.33	1.33	0.53	0.86
<i>Potentilla pensylvanica</i>	0.01	0.33	1.33	0.53	0.86
<i>Psoralea argophylla</i>	0.04	0.98	4.00	1.60	2.58
<i>Psoralea esculenta</i>	0.03	0.65	2.67	1.07	1.72
<i>Solidago missouriensis</i>	0.03	0.65	2.67	1.07	1.72
<i>Solidago rigida</i>	0.19	4.58	8.00	3.21	7.79
<i>Sphaeralcea coccinea</i>	0.03	0.65	1.33	0.53	1.18
<i>Taraxacum officinale</i>	0.03	0.65	1.33	0.53	1.18
<i>Rosa arkansana</i>	0.25	6.21	21.33	8.56	14.77
<i>Symphoricarpos occidentalis</i>	0.01	0.33	1.33	0.53	0.86

**Table 16. Density Analysis per 0.1 Sq. Meter of the 5 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Density</b>	<b>Relative Percent Density</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
Achillea millefolium	0.01	0.43	1.33	0.66	1.09
Antennaria parvifolia	0.08	2.56	2.67	1.32	3.88
Artemisia dracunculus	0.19	5.98	17.33	8.61	14.59
Artemisia frigida	0.05	1.71	5.33	2.65	4.36
Artemisia ludoviciana	0.03	0.85	2.67	1.32	2.17
Aster ericoides	0.44	14.10	14.67	7.28	21.38
Chrysopsis villosa	0.05	1.71	4.00	1.99	3.70
Cirsium undulatum	0.01	0.43	1.33	0.66	1.09
Echinacea angustifolia	0.21	6.84	17.33	8.61	15.45
Erysimum asperum	0.12	3.85	9.33	4.64	8.49
Euphorbia geyeri	0.01	0.43	1.33	0.66	1.09
Gaura coccinea	0.05	1.71	4.00	1.99	3.70
Glycyrrhiza lepidota	0.09	2.99	8.00	3.97	6.96
Grindelia squarrosa	0.32	10.26	16.00	7.95	18.21
Haplopappus spinulosus	0.08	2.56	8.00	3.97	6.53
Hedeoma hispida	0.08	2.56	6.67	3.31	5.87
Lepidium densiflorum	0.01	0.43	1.33	0.66	1.09
Liatris punctata	0.20	6.41	10.67	5.30	11.71
Linum rigidum	0.01	0.43	1.33	0.66	1.09
Lygodesmia juncea	0.09	2.99	9.33	4.64	7.63
Medicago falcata	0.01	0.43	1.33	0.66	1.09
Opuntia fragilis	0.01	0.43	1.33	0.66	1.09
Oxytropis lambertii	0.01	0.43	1.33	0.66	1.09
Petalostemon purpureum	0.23	7.26	10.67	5.30	12.56
Phlox hoodii	0.29	9.40	16.00	7.95	17.35
Plantago purshii	0.04	1.28	2.67	1.32	2.60
Psoralea argophylla	0.05	1.71	5.33	2.65	4.36
Psoralea esculenta	0.03	0.85	2.67	1.32	2.17
Sphaeralcea coccinea	0.15	4.70	8.00	3.97	8.67
Vicia americana	0.01	0.43	1.33	0.66	1.09
Rosa arkansana	0.09	2.99	6.67	3.31	6.30
Symphoricarpos occidentalis	0.03	0.85	1.33	0.66	1.51

**Table 17. Density Analysis per 0.1 Sq. Meter of the 8 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Density</b>	<b>Relative Percent Density</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
<i>Achillea millefolium</i>	0.04	1.35	2.67	1.30	2.65
<i>Antennaria parvifolia</i>	0.09	3.14	4.00	1.95	5.09
<i>Arabis holboellii</i>	0.03	0.90	2.67	1.30	2.20
<i>Artemisia dracuncululus</i>	0.24	8.07	20.00	9.74	17.81
<i>Artemisia frigida</i>	0.12	4.04	12.00	5.84	9.88
<i>Artemisia ludoviciana</i>	0.04	1.35	1.33	0.65	2.00
<i>Aster ericoides</i>	0.24	8.07	12.00	5.84	13.91
<i>Aster laevis</i>	0.15	4.93	4.00	1.95	6.88
<i>Cirsium undulatum</i>	0.01	0.45	1.33	0.65	1.10
<i>Echinacea angustifolia</i>	0.11	3.59	5.33	2.60	6.19
<i>Erysimum asperum</i>	0.12	4.04	10.67	5.19	9.23
<i>Gaura coccinea</i>	0.09	3.14	8.00	3.90	7.04
<i>Grindelia squarrosa</i>	0.12	4.04	10.67	5.19	9.23
<i>Haplopappus spinulosus</i>	0.11	3.59	8.00	3.90	7.49
<i>Hedeoma hispida</i>	0.08	2.69	5.33	2.60	5.29
<i>Helianthus rigidus</i>	0.20	6.73	10.67	5.19	11.92
<i>Liatis punctata</i>	0.17	5.83	16.00	7.79	13.62
<i>Linum rigidum</i>	0.03	0.90	2.67	1.30	2.20
<i>Lotus americanus</i>	0.13	4.48	10.67	5.19	9.67
<i>Lygodesmia juncea</i>	0.01	0.45	1.33	0.65	1.10
<i>Oxytropis lambertii</i>	0.01	0.45	1.33	0.65	1.10
<i>Petalostemon purpureum</i>	0.17	5.83	10.67	5.19	11.02
<i>Phlox hoodii</i>	0.05	1.79	2.67	1.30	3.09
<i>Plantago purshii</i>	0.09	3.14	6.67	3.25	6.39
<i>Psoralea esculenta</i>	0.04	1.35	4.00	1.95	3.30
<i>Solidago missouriensis</i>	0.07	2.24	4.00	1.95	4.19
<i>Solidago rigida</i>	0.07	2.24	5.33	2.60	4.84
<i>Sphaeralcea coccinea</i>	0.13	4.48	8.00	3.90	8.38
<i>Rosa arkansana</i>	0.20	6.73	13.33	6.49	13.22

**Table 18. Density Analysis per 0.1 Sq. Meter of the 10 Foot Row Spacing Treatment for the Alfalfa Interseeding Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Species</b>	<b>Density</b>	<b>Relative Percent Density</b>	<b>Percent Frequency</b>	<b>Relative Percent Frequency</b>	<b>Importance Value</b>
<i>Artemisia dracunculus</i>	0.29	8.37	25.33	12.75	21.12
<i>Artemisia frigida</i>	0.13	3.80	13.33	6.71	10.51
<i>Artemisia ludoviciana</i>	0.09	2.66	5.33	2.68	5.34
<i>Aster ericoides</i>	1.11	31.56	25.33	12.75	44.31
<i>Astragalus triphyllus</i>	0.07	1.90	4.00	2.01	3.91
<i>Chrysopsis villosa</i>	0.01	0.38	1.33	0.67	1.05
<i>Echinacea angustifolia</i>	0.11	3.04	5.33	2.68	5.72
<i>Gaura coccinea</i>	0.13	3.80	8.00	4.03	7.83
<i>Grindelia squarrosa</i>	0.31	8.75	17.33	8.72	17.47
<i>Gutierrezia sarothrae</i>	0.11	3.04	10.67	5.37	8.41
<i>Haplopappus spinulosus</i>	0.11	3.04	8.00	4.03	7.07
<i>Hedeoma hispida</i>	0.08	2.28	6.67	3.36	5.64
<i>Lactuca oblongifolia</i>	0.01	0.38	1.33	0.67	1.05
<i>Lepidium densiflorum</i>	0.01	0.38	1.33	0.67	1.05
<i>Liatris punctata</i>	0.16	4.56	10.67	5.37	9.93
<i>Linum rigidum</i>	0.03	0.76	2.67	1.34	2.10
<i>Lygodesmia juncea</i>	0.01	0.38	1.33	0.67	1.05
<i>Opuntia fragilis</i>	0.09	2.66	5.33	2.68	5.34
<i>Oxytropis lambertii</i>	0.05	1.52	5.33	2.68	4.20
<i>Petalostemon purpureum</i>	0.04	1.14	4.00	2.01	3.15
<i>Phlox hoodii</i>	0.15	4.18	9.33	4.70	8.88
<i>Psoralea argophylla</i>	0.04	1.14	4.00	2.01	3.15
<i>Psoralea esculenta</i>	0.07	1.90	6.67	3.36	5.26
<i>Solidago missouriensis</i>	0.04	1.14	1.33	0.67	1.81
<i>Sphaeralcea coccinea</i>	0.09	2.66	6.67	3.36	6.02
<i>Rosa arkansana</i>	0.08	2.28	4.00	2.01	4.29
<i>Symphoricarpos occidentalis</i>	0.08	2.28	4.00	2.01	4.29

**Table 19. Mean Density per 0.1 Sq. Meter for the Alfalfa Interseeding Row Spacing Techniques Trial at the Dickinson Experiment Station, 1984**

<b>Row Spacing</b>	<b>Forbs</b>	<b>Shrubs</b>
0 foot	4.17	0.20
2 foot	3.19	0.07
3 foot	3.50	0.08
4 foot	3.83	0.26
5 foot	2.96	0.12
8 foot	2.76	0.20
10 foot	3.34	0.16