

ALFALFA INTER-SEEDING FURROW WIDTH TECHNIQUES TRIAL

This trial was designed to evaluate alfalfa inter-seeding into rangeland with different widths of the furrow openings. The intended purpose of the data will be primarily to assist in the determination of a recommended furrow width for alfalfa inter-seeding into rangeland for pasture use in western North Dakota.

These plots were established on 0.60 acres 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 replications. The soil is vebar fine sandy loam. The range site is 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 three foot row spacing was used. A two inch straight, a three inch twisted and a four inch twisted chisel plow shovels were used as the furrow openers. A control plot of no inter-seeding 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 three $\frac{1}{4}$ m² quadrats for each plot on 22 July 1983. The herbage was separated in 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 average herbage production for each category and the total production for each plot were determined. 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 23 June and 30 August 1983.

Quantitative species composition data for each plot was collected on 31 August 1983. The herbaceous 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 31 August 1983. 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 m² quadrats were spaced at 6 foot intervals along each of the five minor transects.

ALFALFA INTER-SEEDING FURROW WIDTH TECHNIQUES TRIAL

Location:	Dickinson Experiment Station Ranch Headquarters NE¼, NW¼, SW¼ Sec. 23, T. 143 N., R. 96 W.	
Replications:	Three	Randomized Block Design
Study Size:	183' X 142'	0.60 acres
Plot Size:	33' X 50'	0.04 acres
Perimeter Border:	10' on east and south, 3' on north and 0' on west	
Alleys:	10'	
Soil:	Vebar	
Range Site:	Sandy with a few thin claypan sites	
Seeding Date:	21 Apr 1983	
Seeding Rate:	0.50 lbs. PLS/row/acre	
Alfalfa Variety:	Travois	
Row Spacing:	3'	
Chisel Plow Shovels:	0", 2", 3" twisted and 4" twisted	

Table 19. Mean Above Ground Herbage Production by Category in Lbs/Acre for the Alfalfa Inter-seeding Furrow Width Techniques Trial at the Dickinson Experiment Station, 1983

Clip Categories	Furrow Width			
	0 Inch	2 Inch	3 Inch	4 Inch
Cool short	207.7	320.7	280.7	178.0
Warm short	140.7	319.9	362.8	198.6
Cool mid	290.2	174.4	211.3	290.6
Western wheatgrass	39.6	11.9	67.0	4.0
Warm mid	50.4	59.5	2.4	54.3
Warm tall	27.4	0.8	2.4	13.9
Sedge	269.5	221.6	172.1	253.3
Total Grass	1025.5	1108.8	1098.7	992.7
Forbs	395.6	304.1	260.5	289.8
Shrubs	0.0	0.0	0.0	0.0
Total	1421.1	1412.9	1359.2	1282.5

Table 20. Alfalfa Seedling Count per Meter of Row for the Alfalfa Inter-seeding Furrow Width Techniques Trial, Dickinson Experiment Station-23 Jun and 30 Aug 1983

Furrow Width	Rep 1		Rep 2		Rep 3		Mean	
	23 Jun	30 Aug	23 Jun	30 Aug	23 Jun	30 Aug	23 Jun	30 Aug
Control	0	0	0	0	0	0	0	0
2 Inch	34.08	1.79	27.88	0.42	23.96	0.79	28.64	1.00
3 Inch	29.71	0.33	25.79	1.75	25.25	0.25	26.92	0.78
4 Inch	25.08	0.54	25.04	1.38	15.67	1.13	21.93	1.01

Table 21. Alfalfa Seedling Count per Foot of Row for the Alfalfa Inter-seeding Furrow Width Techniques Trial, Dickinson Experiment Station-23 Jun and 30 Aug 1983

Furrow Width	Rep 1		Rep 2		Rep 3		Rep 4	
	23 Jun	30 Aug	23 Jun	30 Aug	23 Jun	30 Aug	23 Jun	30 Aug
Control	0	0	0	0	0	0	0	0
2 Inch	10.39	0.55	8.50	0.13	7.30	0.24	8.73	0.30
3 Inch	9.06	0.10	7.86	0.53	7.70	0.08	8.21	0.24
4 Inch	7.65	0.16	7.63	0.42	4.78	0.34	6.69	0.31

Table 22. Basal Cover, Relative Basal Cover, Frequency, Relative Frequency, and Importance Value of Species as Sampled by Points for Alfalfa Inter-seeding, Furrow Width 0 Inches, 1983

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Frequency	Importance Value
<i>Agropyron smithii</i>	0.73	1.73	7.33	3.04	4.77
<i>Aristida longiseta</i>	0.07	0.16	0.67	0.28	0.44
<i>Bouteloua gracilis</i>	18.53	43.71	63.33	26.24	69.95
<i>Calamovilfa longifolia</i>	0.60	1.42	5.33	2.21	3.63
<i>Koeleria pyramidata</i>	3.47	8.18	26.67	11.05	19.23
<i>Muhlenbergia cuspidata</i>	0.60	1.42	4.67	1.93	3.35
<i>Panicum oligosanthos</i>	0.13	0.31	1.33	0.55	0.86
<i>Stipa comata</i>	1.33	3.14	10.00	4.14	7.28
<i>Stipa viridula</i>	1.67	3.93	15.33	6.35	10.28
<i>Carex eleocharis</i>	0.13	0.31	0.67	0.28	0.59
<i>Carex filifolia</i>	6.53	15.41	40.00	16.57	31.98
<i>Carex heliophila</i>	3.20	7.55	24.00	9.94	17.49
<i>Androsace occidentalis</i>	0.07	0.16	0.67	0.28	0.44
<i>Antennaria parvifolia</i>	0.33	0.79	2.00	0.83	1.62
<i>Artemisia dracunculus</i>	0.13	0.31	1.33	0.55	0.86
<i>Artemisia frigida</i>	0.07	0.16	0.67	0.28	0.44
<i>Aster ericoides</i>	0.33	0.79	3.33	1.38	2.17
<i>Echinacea angustifolia</i>	0.13	0.31	1.33	0.55	0.86
<i>Erysimum asperum</i>	0.13	0.31	0.67	0.28	0.59
<i>Euphorbia geyeri</i>	0.07	0.16	0.67	0.28	0.44
<i>Haplopappus spinulosus</i>	0.13	0.31	1.33	0.55	0.86
<i>Hedeoma hispida</i>	0.13	0.31	1.33	0.55	0.86
<i>Liatris punctata</i>	0.07	0.16	0.67	0.28	0.44
<i>Petalostemon purpureum</i>	0.07	0.16	0.67	0.28	0.44
<i>Phlox hoodii</i>	0.27	0.63	2.67	1.10	1.73
<i>Plantago purshii</i>	0.07	0.16	0.67	0.28	0.44
<i>Solidago missouriensis</i>	0.07	0.16	0.67	0.28	0.44
<i>Solidago mollis</i>	0.07	0.16	0.67	0.28	0.44
<i>Vicia americana</i>	0.07	0.16	0.67	0.28	0.44
<i>Selaginella densa</i>	0.33	0.79	0.67	0.28	1.07
Lichen spp.	2.87	6.76	21.33	8.84	15.60
Litter	47.00		99.33		
Sod	0.00		0.00		
Furrow	0.00		0.00		
Soil	10.47		50.67		
Rock	0.13		1.33		

Table 23. Basal Cover, Relative Basal Cover, Frequency, Relative Frequency, and Importance Value of Species as Sampled by Points for Alfalfa Inter-seeding, Furrow Width 2 Inches, 1983

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Frequency	Importance Value
<i>Agropyron smithii</i>	0.93	1.98	8.00	2.82	4.80
<i>Bouteloua gracilis</i>	19.40	41.22	80.00	28.17	69.39
<i>Calamovilfa longifolia</i>	0.33	0.71	3.33	1.17	1.88
<i>Koeleria pyramidata</i>	8.33	17.71	48.67	17.14	34.85
<i>Muhlenbergia cuspidata</i>	2.13	4.53	15.33	5.40	9.93
<i>Stipa comata</i>	1.93	4.11	18.00	6.34	10.45
<i>Stipa viridula</i>	1.07	2.27	8.67	3.05	5.32
<i>Carex filifolia</i>	4.80	10.20	34.00	11.97	22.17
<i>Carex heliophila</i>	1.93	4.11	18.67	6.57	10.68
<i>Antennaria parvifolia</i>	0.33	0.71	2.00	0.70	1.41
<i>Artemisia frigida</i>	0.13	0.28	1.33	0.47	0.75
<i>Artemisia ludoviciana</i>	0.07	0.14	0.67	0.23	0.37
<i>Aster ericoides</i>	0.20	0.42	2.00	0.70	1.12
<i>Echinacea angustifolia</i>	0.20	0.42	2.00	0.70	1.12
<i>Erysimum asperum</i>	0.13	0.28	1.33	0.47	0.75
<i>Hedeoma hispida</i>	0.07	0.14	0.67	0.23	0.37
<i>Liatris punctata</i>	0.07	0.14	0.67	0.23	0.37
<i>Lotus americanus</i>	0.13	0.28	1.33	0.47	0.75
<i>Lygodesmia juncea</i>	0.13	0.28	1.33	0.47	0.75
<i>Phlox hoodii</i>	0.73	1.56	6.67	2.35	3.91
<i>Psoralea esculenta</i>	0.07	0.14	0.67	0.23	0.37
<i>Solidago missouriensis</i>	0.07	0.14	0.67	0.23	0.37
<i>Vicia americana</i>	0.07	0.14	0.67	0.23	0.37
<i>Rosa arkansana</i>	0.07	0.14	0.67	0.23	0.37
Lichen spp.	3.73	7.93	26.67	9.39	17.32
Litter	17.33		55.33		
Sod	17.53		54.00		
Furrow	10.00		42.00		
Soil	8.07		36.00		
Rock	0.00		0.00		

Table 24. Basal Cover, Relative Basal Cover, Frequency, Relative Frequency, and Importance Value of Species as Sampled by Points for Alfalfa Inter-seeding, Furrow Width 3 Inches, 1983

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Frequency	Importance Value
Agropyron smithii	0.67	1.55	6.67	2.82	4.37
Bouteloua gracilis	20.00	46.58	66.67	28.25	74.83
Calamovilfa longifolia	0.13	0.31	1.33	0.56	0.87
Koeleria pyramidata	6.13	14.29	41.33	17.51	31.80
Muhlenbergia cuspidata	0.47	1.09	4.00	1.69	2.78
Stipa comata	2.33	5.43	18.67	7.91	13.34
Stipa viridula	2.27	5.28	16.67	7.06	12.34
Carex filifolia	5.00	11.65	36.00	15.25	26.90
Carex heliophila	1.27	2.95	10.67	4.52	7.47
Antennaria parvifolia	0.13	0.31	0.67	0.28	0.59
Artemisia frigida	0.07	0.16	0.67	0.28	0.44
Aster ericoides	0.07	0.16	0.67	0.28	0.44
Commandra umbellata	0.13	0.31	1.33	0.56	0.87
Echinacea angustifolia	0.07	0.16	0.67	0.28	0.44
Erysimum asperum	0.07	0.16	0.67	0.28	0.44
Euphorbia geyeri	0.07	0.16	0.67	0.28	0.44
Gaura coccinea	0.13	0.31	1.33	0.56	0.87
Helianthus rigidus	0.20	0.47	1.33	0.56	1.03
Liatris punctata	0.27	0.62	2.00	0.85	1.47
Lotus americanus	0.27	0.62	2.67	1.13	1.75
Lygodesmia juncea	0.07	0.16	0.67	0.28	0.44
Phlox hoodii	0.07	0.16	0.67	0.28	0.44
Solidago missouriensis	0.13	0.31	1.33	0.56	0.87
Taraxacum officinale	0.07	0.16	0.67	0.28	0.44
Lichen spp.	2.87	6.68	18.00	7.63	14.31
Litter	27.87		43.33		
Sod	7.13		26.67		
Furrow	15.87		66.67		
Soil	6.20		24.67		
Rock	0.00		0.00		

Table 25. Basal Cover, Relative Basal Cover, Frequency, Relative Frequency, and Importance Value of Species as Sampled by Points for Alfalfa Inter-seeding, Furrow Width 4 Inches, 1983

Species	Basal Cover	Relative Basal Cover	Percent Frequency	Relative Frequency	Importance Value
Agropyron smithii	1.07	2.93	10.00	4.45	7.38
Bouteloua gracilis	13.33	36.56	52.00	23.15	59.71
Koeleria pyramidata	5.53	15.17	34.00	15.13	30.30
Muhlenbergia cuspidata	2.13	5.85	12.00	5.34	11.19
Stipa comata	1.27	3.47	9.33	4.15	7.62
Stipa viridula	2.93	8.04	22.67	10.09	18.13
Carex eleocharis	0.07	0.18	0.67	0.30	0.48
Carex filifolia	1.73	4.75	13.33	5.93	10.68
Carex heliophila	3.40	9.32	27.33	12.17	21.49
Antennaria parvifolia	0.20	0.55	2.00	0.89	1.44
Artemisia dracunculus	0.13	0.37	1.33	0.59	0.96
Artemisia frigida	0.13	0.37	1.33	0.59	0.96
Artemisia ludoviciana	0.07	0.18	0.67	0.30	0.48
Aster ericoides	0.20	0.55	2.00	0.89	1.44
Aster oblongifolius	0.07	0.18	0.67	0.30	0.48
Euphorbia geyeri	0.13	0.37	1.33	0.59	0.96
Hedeoma hispida	0.20	0.55	2.00	0.89	1.44
Helianthus annuus	0.07	0.18	0.67	0.30	0.48
Linum rigidum	0.07	0.18	0.67	0.30	0.48
Lotus americanus	0.13	0.37	1.33	0.59	0.96
Opuntia fragilis	0.07	0.18	0.67	0.30	0.48
Phlox hoodii	0.07	0.18	0.67	0.30	0.48
Psoralea argophylla	0.07	0.18	0.67	0.30	0.48
Sphaeralcea coccinea	0.20	0.55	1.33	0.59	1.14
Viola nuttallii	0.07	0.18	0.67	0.30	0.48
Symphoricarpos occidentalis	0.13	0.37	0.67	0.30	0.67
Lichen spp.	3.00	8.23	24.67	10.98	19.21
Litter	33.80		93.33		
Sod	11.40		31.33		
Furrow	16.33		58.67		
Soil	2.00		10.67		
Rock	0.00		0.00		

Table 26. Mean Percent Basal Cover for the Alfalfa Inter-seeding Furrow Width Trial at the Dickinson Experiment Station – 1983

Furrow Width	Grass	Sedge	Forbs	Shrubs	Club Moss	Lichen	Litter	Sod	Furrow	Soil	Rock
0 Inch	27.13	9.86	2.21	0.00	0.33	2.87	47.00	0.00	0.00	10.47	0.13
2 Inch	34.12	6.73	2.40	0.07	0.00	3.73	17.33	17.53	10.00	8.07	0.00
3 Inch	32.00	6.27	1.82	0.00	0.00	2.87	27.87	7.13	15.87	6.20	0.00
4 Inch	26.26	5.20	1.88	0.13	0.00	3.00	33.80	11.40	16.33	2.00	0.00

Table 27. Density, Relative Density, Frequency, Relative Frequency, and Importance Value per 0.1 Sq. Meter on the Alfalfa Inter-seeding Trial, Control, at the Dickinson Experiment Station, 1983

Species	Density	Relative % Density	% Frequency	Relative % Frequency	Importance Value
<i>Achillea millefolium</i>	0.19	1.00	5.71	1.26	2.26
<i>Androsace occidentalis</i>	0.13	0.70	8.57	1.89	2.59
<i>Antennaria parvifolia</i>	0.74	4.02	5.71	1.26	5.28
<i>Artemisia dracunculus</i>	0.31	1.70	10.00	2.21	3.91
<i>Artemisia frigida</i>	0.20	1.08	7.14	1.58	2.66
<i>Artemisia ludoviciana</i>	0.09	0.46	2.86	0.63	1.09
<i>Aster ericoides</i>	5.50	29.75	32.86	7.26	37.01
<i>Aster laevis</i>	0.67	3.63	14.29	3.15	6.78
<i>Astragalus canadensis</i>	0.01	0.08	1.43	0.32	0.40
<i>Chenopodium album</i>	0.01	0.08	1.43	0.32	0.40
<i>Chrysopsis villosa</i>	0.01	0.08	1.43	0.32	0.40
<i>Commandra umbellata</i>	0.09	0.46	7.14	1.58	2.04
<i>Echinacea angustifolia</i>	0.16	0.85	8.57	1.89	2.74
<i>Erysimum asperum</i>	0.01	0.08	1.43	0.32	0.40
<i>Euphorbia geyeri</i>	0.33	1.78	17.14	3.79	5.57
<i>Galium boreale</i>	0.07	0.39	5.71	1.26	1.65
<i>Gaura coccinea</i>	0.14	0.77	10.00	2.21	2.98
<i>Hedeoma hispida</i>	1.29	6.96	38.57	8.52	15.48
<i>Helianthus annuus</i>	0.34	1.85	7.14	1.58	3.43
<i>Helianthus rigidus</i>	0.33	1.78	17.14	3.79	5.57
<i>Kochia scoparia</i>	0.01	0.08	1.43	0.32	0.40
<i>Lepidium densiflorum</i>	0.14	0.77	8.57	1.89	2.66
<i>Liatris punctata</i>	0.34	1.85	7.14	1.58	3.43
<i>Linum rigidum</i>	0.14	0.77	11.43	2.52	3.29
<i>Lithospermum incisum</i>	0.01	0.08	1.43	0.32	0.40
<i>Lotus americanus</i>	0.59	3.17	38.57	8.52	11.69
<i>Lygodesmia juncea</i>	0.04	0.23	2.86	0.63	0.86
<i>Melilotus officinalis</i>	0.06	0.31	2.86	0.63	0.94
<i>Musineon divaricatum</i>	0.04	0.23	4.29	0.95	1.18
<i>Neslia paniculata</i>	0.09	0.46	8.57	1.89	2.35
<i>Oxytropis lambertii</i>	0.10	0.54	1.43	0.32	0.86
<i>Penstemon albidus</i>	0.01	0.08	1.43	0.32	0.40
<i>Petalostemon purpureum</i>	0.24	1.31	5.71	1.26	2.57
<i>Phlox hoodii</i>	0.14	0.77	5.71	1.26	2.03
<i>Plantago purshii</i>	1.06	5.72	24.29	5.36	11.08
<i>Polygala alba</i>	0.01	0.08	1.43	0.32	0.40
<i>Polygonum convolvulus</i>	0.01	0.08	1.43	0.32	0.40
<i>Psoralea argophylla</i>	0.24	1.31	17.14	3.79	5.10
<i>Solidago missouriensis</i>	0.31	1.70	12.86	2.84	4.54
<i>Sphaeralcea coccinea</i>	0.06	0.31	4.29	0.95	1.26
<i>Vicia americana</i>	0.30	1.62	8.57	1.89	3.51
<i>Arctostaphylos uva-ursi</i>	0.06	0.31	4.29	0.95	1.26
<i>Rosa arkansana</i>	0.11	0.62	10.00	2.21	2.83
<i>Symphoricarpos occidentalis</i>	0.01	0.08	1.43	0.32	0.40
Lichen spp.	3.70	20.02	61.43	13.56	33.58

Table 28. Density, Relative Density, Frequency, Relative Frequency, and Importance Value per 0.1 Sq. Meter on the Alfalfa Inter-seeding Trial, 2 In. Furrow Width, at the Dickinson Experiment Station, 1983

Species	Density	Relative % Density	% Frequency	Relative % Frequency	Importance Value
<i>Achillea millefolium</i>	0.03	0.30	2.67	0.77	1.07
<i>Antennaria parvifolia</i>	0.44	4.95	2.67	0.77	5.72
<i>Artemisia dracunculus</i>	0.39	4.35	13.33	3.85	8.20
<i>Artemisia frigida</i>	0.15	1.65	9.33	2.69	4.34
<i>Artemisia ludoviciana</i>	0.05	0.60	2.67	0.77	1.37
<i>Aster ericoides</i>	0.52	5.85	14.67	4.23	10.08
<i>Aster laevis</i>	0.09	1.05	1.33	0.38	1.43
<i>Chrysopsis villosa</i>	0.04	0.45	2.67	0.77	1.22
<i>Echinacea angustifolia</i>	0.15	1.65	12.00	3.46	5.11
<i>Erysimum asperum</i>	0.08	0.90	8.00	2.31	3.21
<i>Euphorbia geyeri</i>	0.05	0.60	5.33	1.54	2.14
<i>Gaura coccinea</i>	0.01	0.15	1.33	0.38	0.53
<i>Grindelia squarrosa</i>	0.11	1.20	6.67	1.92	3.12
<i>Hedeoma hispida</i>	0.29	3.30	18.67	5.38	8.68
<i>Helianthus rigidus</i>	0.03	0.30	1.33	0.38	0.68
<i>Lepidium densiflorum</i>	0.03	0.30	2.67	0.77	1.07
<i>Liatris punctata</i>	0.35	3.90	16.00	4.62	8.52
<i>Linum rigidum</i>	0.03	0.30	2.67	0.77	1.07
<i>Lithospermum incisum</i>	0.05	0.60	2.67	0.77	1.37
<i>Lotus americanus</i>	2.64	29.69	84.00	24.23	53.92
<i>Lygodesmia juncea</i>	0.03	0.30	2.67	0.77	1.07
<i>Medicago falcata</i>	0.13	1.50	5.33	1.54	3.04
<i>Melilotus officinalis</i>	0.03	0.30	1.33	0.38	0.68
<i>Musineon divaricatum</i>	0.01	0.15	1.33	0.38	0.53
<i>Oxytropis lambertii</i>	0.12	1.35	4.00	1.15	2.50
<i>Petalostemon purpureum</i>	0.19	2.10	4.00	1.15	3.25
<i>Phlox hoodii</i>	0.41	4.65	22.67	6.54	11.19
<i>Plantago purshii</i>	0.09	1.05	6.67	1.92	2.97
<i>Psoralea argophylla</i>	0.11	1.20	10.67	3.08	4.28
<i>Psoralea esculenta</i>	0.09	1.05	5.33	1.54	2.59
<i>Salsola kali</i>	0.04	0.45	2.67	0.77	1.22
<i>Solidago missouriensis</i>	0.33	3.75	4.00	1.15	4.90
<i>Solidago rigida</i>	0.04	0.45	1.33	0.38	0.83
<i>Sphaeralcea coccinea</i>	0.09	1.05	4.00	1.15	2.20
<i>Tragopogon dubius</i>	0.03	0.30	1.33	0.38	0.68
<i>Vernonia fasciculata</i>	0.01	0.15	1.33	0.38	0.53
<i>Vicia americana</i>	0.24	2.70	10.67	3.08	5.78
<i>Rosa arkansana</i>	0.28	3.15	14.67	4.23	7.38
<i>Symphoricarpos occidentalis</i>	0.01	0.15	1.33	0.38	0.53
Lichen spp.	1.08	12.14	30.67	8.85	20.99

Table 29. Density, Relative Density, Frequency, Relative Frequency, and Importance Value per 0.1 Sq. Meter on the Alfalfa Inter-seeding Trial, 3 In. Furrow Width, at the Dickinson Experiment Station, 1983

Species	Density	Relative % Density	% Frequency	Relative % Frequency	Importance Value
<i>Achillea millefolium</i>	0.03	0.33	1.33	0.39	0.72
<i>Androsace occidentalis</i>	0.04	0.49	2.67	0.78	1.27
<i>Antennaria neglecta</i>	0.01	0.16	1.33	0.39	0.55
<i>Antennaria parvifolia</i>	0.15	1.81	2.67	0.78	2.59
<i>Artemisia dracunculus</i>	0.23	2.79	10.67	3.14	5.93
<i>Artemisia frigida</i>	0.04	0.49	2.67	0.78	1.27
<i>Aster ericoides</i>	0.29	3.61	8.00	2.35	5.96
<i>Aster laevis</i>	0.01	0.16	1.33	0.39	0.55
<i>Aster ptarmicoides</i>	0.04	0.49	2.67	0.78	1.27
<i>Cerastium arvense</i>	0.01	0.16	1.33	0.39	0.55
<i>Chrysopsis villosa</i>	0.09	1.15	2.67	0.78	1.93
<i>Commandra umbellata</i>	0.01	0.16	1.33	0.39	0.55
<i>Conyza canadensis</i>	0.03	0.33	1.33	0.39	0.72
<i>Echinacea angustifolia</i>	0.25	3.12	16.00	4.71	7.83
<i>Erysimum asperum</i>	0.04	0.49	4.00	1.18	1.67
<i>Euphorbia geyeri</i>	0.15	1.81	9.33	2.75	4.56
<i>Gaura coccinea</i>	0.09	1.15	5.33	1.57	2.72
<i>Grindelia squarrosa</i>	0.01	0.16	1.33	0.39	0.55
<i>Hedeoma hispida</i>	0.45	5.58	24.00	7.06	12.64
<i>Helianthus rigidus</i>	0.23	2.79	13.33	3.92	6.71
<i>Lepidium densiflorum</i>	0.23	2.79	10.67	3.14	5.93
<i>Liatris punctata</i>	0.13	1.64	6.67	1.96	3.60
<i>Linum rigidum</i>	0.07	0.82	6.67	1.96	2.78
<i>Lithospermum incisum</i>	0.01	0.16	1.33	0.39	0.55
<i>Lotus americanus</i>	2.37	29.23	78.67	23.14	52.37
<i>Lygodesmia juncea</i>	0.11	1.31	6.67	1.96	3.27
<i>Medicago falcata</i>	0.08	0.99	6.67	1.96	2.95
<i>Opuntia fragilis</i>	0.01	0.16	1.33	0.39	0.55
<i>Penstemon albidus</i>	0.04	0.49	4.00	1.18	1.67
<i>Petalostemon purpureum</i>	0.27	3.28	13.33	3.92	7.20
<i>Phlox hoodii</i>	0.16	1.97	6.67	1.96	3.93
<i>Psoralea argophylla</i>	0.17	2.13	14.67	4.31	6.44
<i>Psoralea esculenta</i>	0.01	0.16	1.33	0.39	0.55
<i>Ratibida columnifera</i>	0.01	0.16	1.33	0.39	0.55
<i>Solidago missouriensis</i>	0.29	3.61	10.67	3.14	6.75
<i>Sphaeralcea coccinea</i>	0.09	1.15	5.33	1.57	2.72
<i>Taraxacum officinale</i>	0.01	0.16	1.33	0.39	0.55
<i>Vicia americana</i>	0.01	0.16	1.33	0.39	0.55
<i>Rhus trilobata</i>	0.01	0.16	1.33	0.39	0.55
<i>Rosa arkansana</i>	0.11	1.31	5.33	1.57	2.88
<i>Symphoricarpos occidentalis</i>	0.01	0.16	1.33	0.39	0.55
Lichen spp.	1.68	20.69	40.00	11.76	32.45

Table 30. Density, Relative Density, Frequency, Relative Frequency, and Importance Value per 0.1 Sq. Meter on the Alfalfa Inter-seeding Trial, 4 In. Furrow Width, at the Dickinson Experiment Station, 1983

Species	Density	Relative % Density	% Frequency	Relative % Frequency	Importance Value
<i>Achillea millefolium</i>	0.07	0.65	1.33	0.40	1.05
<i>Androsace occidentalis</i>	0.01	0.13	1.33	0.40	0.53
<i>Antennaria parvifolia</i>	0.83	8.10	8.00	2.38	10.48
<i>Artemisia dracunculus</i>	0.21	2.09	5.33	1.59	3.68
<i>Artemisia frigida</i>	0.24	2.35	9.33	2.78	5.13
<i>Aster ericoides</i>	0.80	7.84	20.00	5.95	13.79
<i>Chrysopsis villosa</i>	0.01	0.13	1.33	0.40	0.53
<i>Commandra umbellata</i>	0.07	0.65	2.67	0.79	1.44
<i>Conyza canadensis</i>	0.08	0.78	6.67	1.98	2.76
<i>Echinacea angustifolia</i>	0.20	1.96	12.00	3.57	5.53
<i>Erysimum asperum</i>	0.01	0.13	1.33	0.40	0.53
<i>Euphorbia geyeri</i>	0.07	0.65	5.33	1.59	2.24
<i>Gaura coccinea</i>	0.08	0.78	6.67	1.98	2.76
<i>Grindelia squarrosa</i>	0.01	0.13	1.33	0.40	0.53
<i>Hedeoma hispida</i>	0.16	1.57	9.33	2.78	4.35
<i>Helianthus rigidus</i>	0.01	0.13	1.33	0.40	0.53
<i>Lepidium densiflorum</i>	0.03	0.26	1.33	0.40	0.66
<i>Liatris punctata</i>	0.09	0.92	5.33	1.59	2.51
<i>Linum rigidum</i>	0.04	0.39	2.67	0.79	1.18
<i>Lotus americanus</i>	3.49	34.25	84.00	25.00	59.25
<i>Lygodesmia juncea</i>	0.01	0.13	1.33	0.40	0.53
<i>Medicago falcata</i>	0.09	0.92	9.33	2.78	3.70
<i>Neslia paniculata</i>	0.01	0.13	1.33	0.40	0.53
<i>Oxytropis lambertii</i>	0.15	1.44	9.33	2.78	4.22
<i>Petalostemon purpureum</i>	0.20	1.96	12.00	3.57	5.53
<i>Phlox hoodii</i>	0.23	2.22	10.67	3.17	5.39
<i>Plantago purshii</i>	0.03	0.26	1.33	0.40	0.66
<i>Psoralea argophylla</i>	0.28	2.75	17.33	5.16	7.91
<i>Ratibida columnifera</i>	0.05	0.52	2.67	0.79	1.31
<i>Solidago missouriensis</i>	0.47	4.58	14.67	4.37	8.95
<i>Solidago rigida</i>	0.05	0.52	1.33	0.40	0.92
<i>Sphaeralcea coccinea</i>	0.36	3.53	12.00	3.57	7.10
<i>Rosa arkansana</i>	0.27	2.61	18.67	5.56	8.17
<i>Symphoricarpos occidentalis</i>	0.05	0.52	1.33	0.40	0.92
Lichen spp.	1.43	13.99	36.00	10.71	24.70