

COOL SEASON GRASS PRODUCTION LEEWARD OF A 25% WOOD-SLAT SNOWFENCE

U.S. CENTRAL GREAT PLAINS FIELD STATION
AKRON, COLORADO

B.W. Greb ¹

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The objectives of this experiment are three-fold: (1) to determine the deposition pattern of snowmelt water leeward of a 28% wood-slat snowfence 48 inches tall; (2) to compare the efficiency of Russian wildrye, Crested wheatgrass, and Intermediate wheatgrass to use snowmelt water for dry matter production; and (3) to increase water use efficiency of these grasses by applications of nitrogen fertilizer.

PROCEDURE

The snowfence was constructed east-west parallel to and 400 ft. south of the Burlington railroad right-of-way. As the railroad bed is several feet above ground level, the horizontal movement of snow begins with an unsaturated flow at the track. The fence is a standard highway snowfence in which every third wood-slat was removed and reducing the density from 42% to 28% wood. The fence was installed in the fall of 1964 to deposit snow leeward onto a 60 ft. wide strip of freshly plowed native sod Weld silt loam soil. In this manner soil water was increased during the 1964-1965 winter season and the grasses were planted during the spring of 1965. Each 48 x 60 ft. block of Russian wildrye, Crested wheatgrass and Intermediate wheatgrass was subdivided into 16 x 60 ft. subplots receiving rates of 0, 25, and 50 lbs/acre nitrogen per season. The nitrogen fertilizer (ammonium nitrate hand broadcast) was applied during February each year. Soil water samplings were taken at 5, 15, 25, 35, 45 and 55 ft. leeward of the fence early each fall and again the succeeding second week of April to determine both the residual soil water and the net gain of soil water by snowmelt. Snowstorms, snowdrift size and shape, and snow density characteristics were re-

corded during each winter season. Soil water was again sampled at the time of grass harvest to determine the total soil water use by the various grass and fertility treatments. Grass clippings of 1 sq. yd. were taken the same distance leeward of the fence as the soil water samples. Yields of Russian wildrye at 0 and 25 lbs/acre of N on a non-snow accumulating area served as a check.

RESULTS

1. Net soil water gains from snowdrifts averaged 2.72 inches leeward to 60 ft. of the snowfence during four relatively dry winter seasons (see Fig. 1 for pattern). A much higher level of snowmelt, averaging 9.11 inches was received during this immediate 1969-1970 winter season. This data is not included in the four-year average shown on Fig. 1.
2. Grass yields averaged 1995, 1700, and 1290 lbs/acre for Crested wheat, Intermediate wheatgrass, and Russian wildrye, respectively (Table 1). Water use efficiency during the active growing season averaged 320, 230, and 190 lbs/acre/inch for the same order of grasses above.
3. All grasses wasted considerable residual stored soil water and summer rainfall by failure to produce significant growth after mid-June.
4. Water use efficiency of these grasses is comparable to commercial grain crops during active growth but have almost zero efficiency with 3½ months growing season remaining.
5. The application of 25 and 50 lbs. nitrogen per acre significantly increased yields and water use efficiency for all three grasses tested. The average increase in yield was 490 and 805 lbs/acre for the 25 and 50 lbs N/acre, respectively.
6. The use of the snowfence on Russian wildrye exceeded the storage of water without a fence by an average 1.90 inch which increased yields by 440 lbs/acre.

¹ Research Soil Scientist, Northern Plains Branch, Soil and Water Conservation Research Division, Agricultural Research Service, USDA, in cooperation with the Colorado State University Experiment Station.

Fig. 1 - Soil Water Gains During Winter Leeward of Snowfence

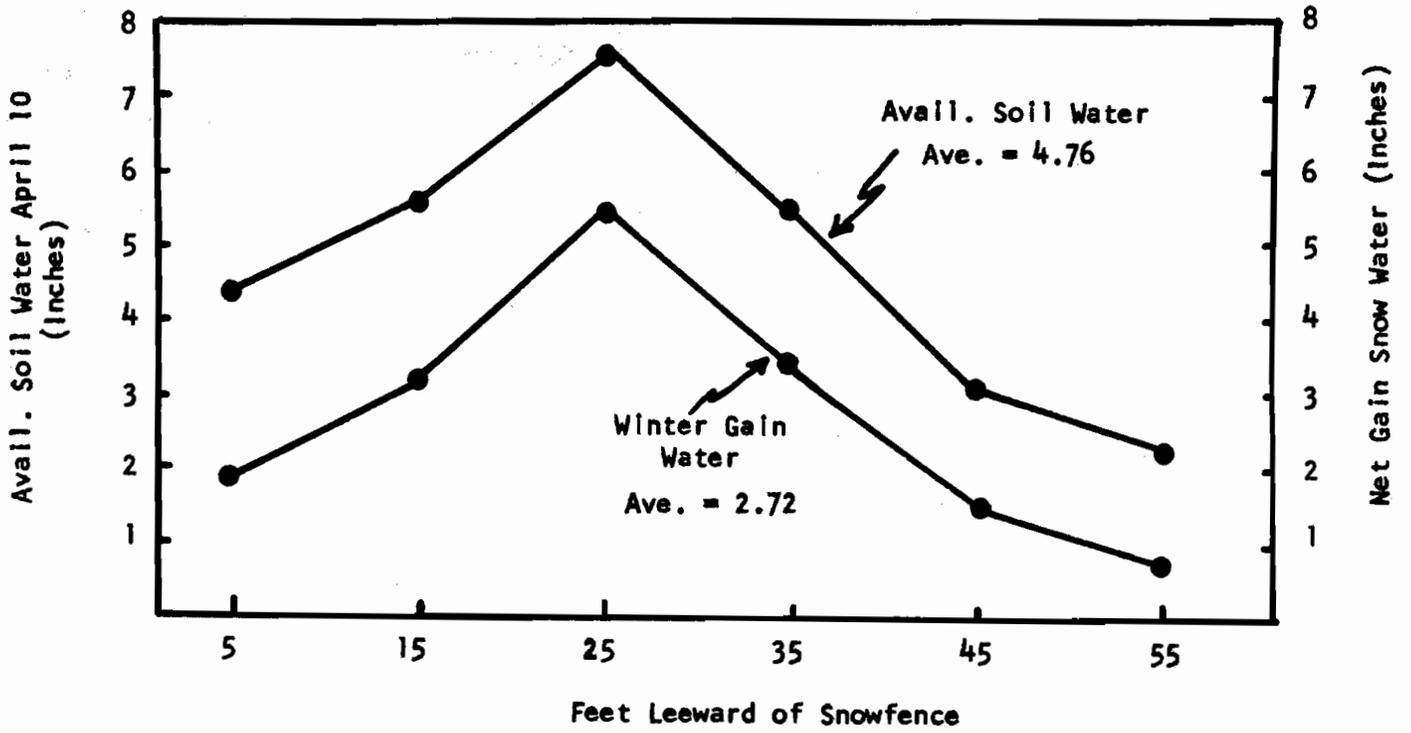


Fig. 2 - Relationship of Grass Yields to Total Water Use

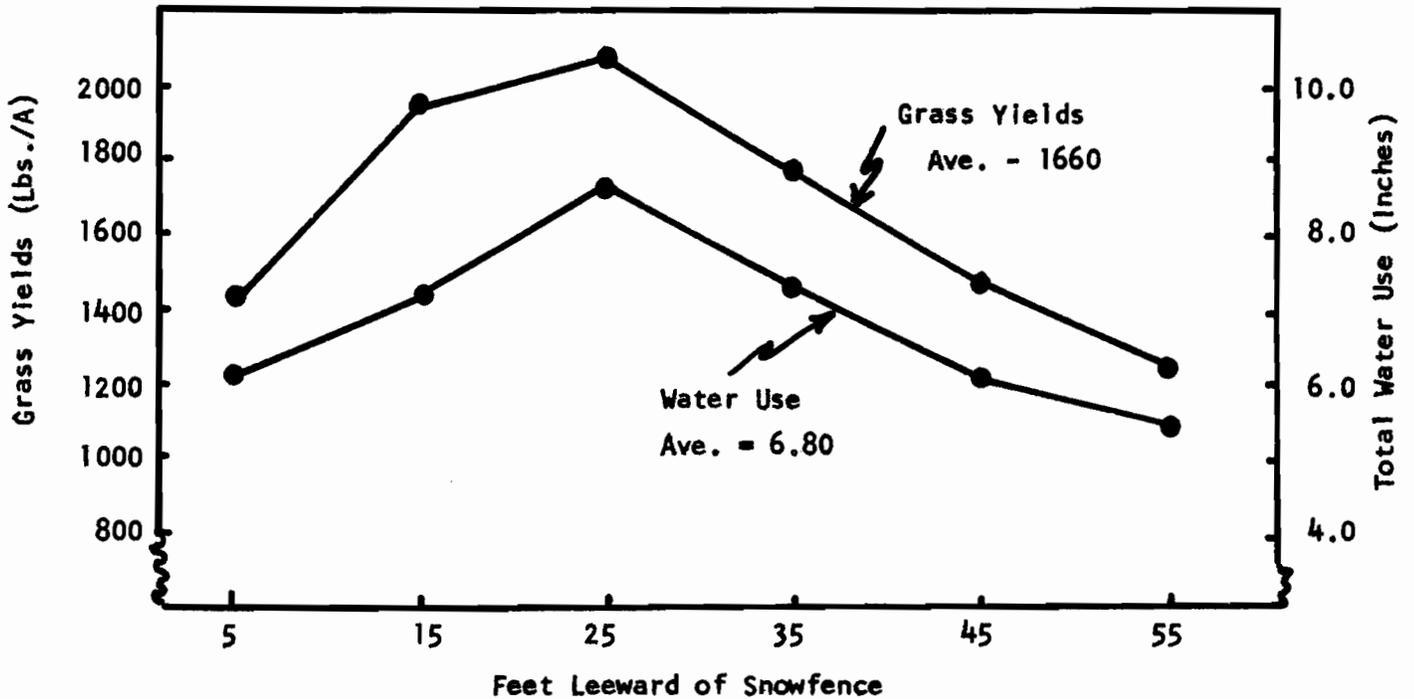


Table 1 - Four Year Average (1966-1969) of Cool-Season Grass Yields Leeward of a 28% Wood-Slat Snowfence.

Type Grass	Rates N Lbs/A	Total ET* Inches	Yield Grass** Lbs/A	Water Use Eff. Lbs/A/In.	Protein Content %	N Uptake Lbs/A.
Russian Wildrye	0	6.28	850	135	11.1	15
	25	7.64	1380	180	12.1	27
	50	6.33	1645	260	13.7	36
Ave.		6.75	1290	190	12.3	26
Intermediate Wheatgrass	0	7.36	1270	170	9.9	20
	25	7.32	1800	245	11.6	33
	50	7.60	2025	265	12.2	39
Ave.		7.43	1700	230	11.2	31
Crested Wheatgrass	0	6.21	1570	255	10.3	26
	25	6.25	1985	320	10.9	35
	50	6.16	2430	395	12.7	49
Ave.		6.21	1995	320	11.3	37
Ave. All Grasses	0	6.62	1230	185	10.4	20
	25	7.07	1720	250	11.5	32
	50	6.70	2035	305	12.9	41

* Based on soil water extraction plus 4.42 inches average crop season rainfall for Crested and Russian wildrye and 5.40 inches for intermediate wheatgrass.

** Oven dry wt.

Check (No Fence)

Russian Wildrye	0	4.78	500	105	12.0	10
	25	4.92	840	170	13.4	18
		4.85	670	140	12.7	14
Ave. Gain With Fence		1.90	440	20	-1.1	7