Herbicides and Fertilizers For Restoring Native Pastures in North Dakota

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Proper management and utilization of native pasture can greatly benefit the farmer-rancher. As a large proportion of the total feed consumed by livestock is obtained from pasturage, proper grazing management is important for maintaining productive pastures. Continued over-grazing weakens and eventually eliminates desirable plant species and allows an increase in undesirable grasses, weeds and brush. This shift toward undesirable plant species can greatly reduce the carrying capacity of the pasture.

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Even though a pasture may deteriorate with misuse, there are practices that can be applied which will help to bring it back into condition. Among these are the use of fertilizer to increase the forage yield of the grasses; the use of herbicides to control weeds and brush; and perhaps most important, proper grazing management.

Studies were conducted near Williston from 1963 to 1965 to determine the effectiveness of fertilizer and herbicides, along with deferred grazing, in restoring an overgrazed pasture. A three year summary of the results of that experiment are reported here.

Figure 1. Herbicides and fertilizer can help bring a deteriorated pasture back into condition.

METHOD

The site selected for the trial was an overgrazed pasture in which weeds constituted approximately 40 per cent of the total plant population. Fringed sagewort (**Artemisia frigida** Willd.) constituted 95 per cent of the weed population, with the balance being prairie sages(**Artemisia gnapholodes** (Nutt.) T. & G.) and prairie wild rose (**Rosa arkansana** Porter). The desirable grass species and their per cent composition in the pasture consisted of western wheatgrass (**Agropyron smithii** Rydb.) 30 per cent, needle-and-thread(**Stipa comata** Trin. & Rupr.) 30 per cent, sedges (**Carex** spp.) 20 per cent, and blue grama (**Bouteiloua gracilis** (HKB.) Lag) 18 per cent. The remaining two per cent consisted of prairie junegrass (**Koeleria cristata** (L) Pers.) and green needlegrass (**Stipa viridula** Trin.)

Five herbicides, 2,4-D ester, 2,4-D amine, 2,4-D soluble amine (Dacamine 4D), piclorin (Tordon), and dicamba (Banvel D), were used, each at three rates of application. The herbicides were applied

Table 1. The Effect of Herbicides and a Fertilizer Application in 1963 on a Native Pasture

		Injury Rating[3]			Per Cent Grass Composition					
			Fringed	Other	No Fertilizer			Fertilized[4]		
Treatment[1]	Rate[2]	Grass	Sage	Weeds	1963	1964	1965	1963	1964	1965
Check					61			55		
2,4-D Ester	3/4	0.3	9.6	9.6	97	85	80	98	97	95
2,4-D Ester	1.5	0.8	9.9	9.6	99	99	95	99	100	100
2,4-D Ester	3.0	1.5	10.0	9.9	99	98	90	99	99	95
2,4-D Amine	3/4	0.7	9.0	9.5	98	94	80	98	96	90
2,4-D Amine	1.5	1.0	9.9	9.9	99	98	90	99	96	95
2,4-D Amine	3.0	2.3	9.9	9.9	99	95	95	99	94	85
Dacamine 4D	3/4	0.8	9.2	9.3	99	95	75	99	99	95
Dacamine 4D	1.5	0.8	9.9	9.9	99	99	100	99	97	95
Dacamine 4D	3.0	1.5	10.0	9.9	99	99	90	99	96	90
Tordon	1/8	0.0	9.0	9.0	98	95	65	98	94	95
Tordon	1/2	0.7	10.0	9.8	99	99	95	99	100	95
Tordon	1.0	1.5	10.0	9.9	99	100	100	99	100	100
Banvel D	3/4	0.7	9.8	9.8	99	98	95	99	100	100
Banvel D	1.5	1.5	9.9	9.9	99	99	95	99	100	95
Banvel D	3.0	2.7	10.0	9.9	98	99	95	99	99	95

[1]Herbicide applied May 29, 1963.
[2]Pounds/Acre active ingredients in 10 gal. water per acre.
[3]Injury rating - 0-10; 0 - No injury, 10 - complete kill, visual estimate August 5, 1963.
[4]Fertilizer applied April 5, 1963. 75 lbs/ac. Nitrogen (225 lbs/ac. 33.5-0-0).

Table 2. The Effect of Herbicides and a Fertilizer Application in 1964 on a Native Pasture.

		Injury Rating[3]		Per Cent Grass Composition			
				No Fertilizer		Fertilized[4]	
Treatment[1]	Rate[2]	Grass	Fringe Sage	1964	1965	1964	1965
Check				64		55	
2,4-D Ester	3/4	0.0	5.0	94	90	70	90
2,4-D Ester	1.5	1.0	9.0	100	90	65	85
2,4-D Ester	3.0	5.0	9.9	99	95	94	95
2,4-D Amine	3/4	0.0	2.5	80	75	70	85
2,4-D Amine	1.5	1.0	5.0	80	90	87	95
2,4-D Amine	3.0	5.0	9.0	98	95	95	95
Dacamine 4D	3/4	0.0	2.5	94	85	88	90
Dacamine 4D	1.5	1.0	9.0	97	100	97	100
Dacamine 4D	3.0	5.0	9.0	100	95	70	95
Tordon	1/8	0.0	5.0	87	95	70	75
Tordon	1/2	1.0	9.9	95	95	93	100
Tordon	1.0	5.0	9.9	100	100	100	100
Banvel D	3/4	0.0	7.5	95	100	93	100
Banvel D	1.5	5.0	9.0	100	90	88	90
Banvel D	3.0	5.0	9.9	100	95	95	95

[1]Herbicides applied May 27, 1964.
[2]Pounds/Acre active ingredients in 10 gal. water per acre.
[3]Injury rating, 0-10; 0 - No injury, 10 - complete kill, visual estimate, August 21, 1964.
[4]Fertilizer applied April 9, 1964. 33 lbs/ac Nitrogen lbs/ac 33.5-0-0).

Table 3. Forage Yield[1] of Plots treated with Herbicides and Fertilizer.

1963 Herbicide and Fertilizer Application

	1963 Yield		Per Cent	1963-65 Yield		Per Cent
	Total	Grass	Grass	Total	Grass	Grass
Check	2662	1624	61.0	1694	1033	61.0
Herbicide Only[2]	1893	1868	98.7	1372	1302	94.9
Herbicide plus Fertilizer	2679	2647	98.8	2042	1983	97.1
Fertilizer Only[3]	4953	2724	55.0	3088	1698	55.0

1964 Herbicide and Fertilizer Application

	1964 Yield		Per Cent	1964-65 Yield		Per Cent
	Total	Grass	Grass	Total	Grass	Grass
Check	3142	2011	64.0	2013	1288	64.0
Herbicide Only[4]	2019	1902	94.2	1327	1234	93.0
Herbicide plus Fertilizer	2168	1843	85.0	1491	1328	89.1
Fertilizer Only[5]	3031	1667	55.0	1987	1093	55.0

[1]Yield in pounds per acre at 12% moisture.
[2]Herbicide applied May 29, 1963. Yield is average of all herbicides and rates.
[3]Fertilizer applied April 5, 1963. (75 pounds per acre actual nitrogen).
[4]Herbicide applied May 27, 1964. Yield is average of all herbicides and rates.
[5]Fertilizer applied April 9, 1964. (33 pounds per acre actual nitrogen).

in the latter part of May in two separate applications, one in 1963 and the other in 1964.

The nitrogen fertilizer (ammonium nitrate) was applied in a broadcast application in early April in both 1963 and 1964. In 1963, 75 pounds per acre of actual nitrogen was applied and in 1964, 33 pounds of actual nitrogen per acre was applied.

The plots were harvested in August each year after plant growth for the season had been completed. No livestock were allowed to graze in the plot area during the term of the trial.

RESULTS

1963 Herbicide and Fertilizer Application

A summary of weed control, grass injury, and resultant plant composition for each of the herbicide applications is presented in Table 1.

Precipitation in 1963 was above normal, while temperatures were slightly below normal. This combination of precipitation and temperatures was conducive to good plant growth and a good response was obtained from the nitrogen fertilizer.

All of the herbicides used gave excellent weed control at all rates of application. The prairie wild rose was the only undesirable species that was tolerant to the chemicals. Some grass injury occurred at the higher rates of chemical application. The sedges were more susceptible to injury than the grasses.

The grass composition of the plots that received lower herbicide rates gradually decreased in both the fertilized and unfertilized plots during the two year period following the 1963 application. This would indicate that the weed control was not as complete or long lasting at the lower rates. The decrease in grass composition was less on the fertilized plots than on the unfertilized plots. With the better grass growth, after fertilization, weed growth was depressed.

1964 Herbicide and Fertilizer Application

A summary of weed control, grass injury and resultant plant composition for each of the herbicide applications is presented in Table 2.

Weed control in 1964 was less successful than in 1963. Only at the higher rates of application was weed control satisfactory and at these rates the grass injury was high. Precipitation in 1964 was below normal while temperatures were above normal. This could explain in part the lower yields and poorer weed control of the herbicides.

The per cent of grass composition in those plots treated in 1964 reflects the reduced weed control and greater grass injury. The grass percentage in the fertilized plots was generally less than that on the unfertilized plots. During the two year period, grass percentage generally increased during the second year on the fertilized plot, but on the unfertilized plots the grass percentage generally decreased slightly. This decrease was probably due to a greater amount of weed competition resulting from less vigorous grass growth.

The forage yields from the plots treated with herbicides and fertilizer in 1963 and 1964 are given in Table 3.

The yield results indicate that to obtain the highest grass yields it is necessary to use both fertilizer and herbicides. When fertilizer is used alone, total yield can be increased, but the grass percentage in the forage is reduced. Using a herbicide alone can increase the grass percentage in a pasture but not necessarily forage yield.

SUMMARY

The use of herbicides and fertilizer is an effective method of restoring native pastures. These practices, along with good pasture management and deferred grazing, can increase the grass yields and subsequent carrying capacity of many overgrazed pastures.

The effectiveness of herbicides in controlling weeds can vary from one year to the next. This degree of effectiveness is probably due in a large part to weather.

To obtain the highest forage yields, fertilizer should be used in combination with herbicides. A combination of the two gives grass the greatest boost by elimination of weed competition in conjunction with an increase of available plant food for greater growth. Recommended fertilizer rates should be followed.

Acknowledgement:

The authors are indebted to George Kapusta, former assistant agronomist, for the studies conducted prior to 1964.

FROM THE DIRECTOR (Continued From Page 2) sults become compounding and benefit all citizens in North Dakota.

All the departments in the Agricultural Experiment Station have long and impressive records of contributing to the wealth of the state through agricultural research. To even touch on these attainments and the current and proposed work would require several pages. Part of them have been reported in previous issues of Farm Research.

The departments of the Agricultural Experiment Station cooperate with each other and with the USDA in many projects, increasing the dollar-value efficiency of research at NDSU through team research. The facilities and personnel of the six branch research stations and the Agronomy Seed Farm at Casselton also play an important role in the total research program of North Dakota State University.