North Dakota State University * Dickinson Research Extension Center
1133 State Avenue, Dickinson, ND 58601 Voice: (701) 483-2348 FAX: (701) 483-2005

RANGELAND RESEEDING AND NATURAL PLANT COMMUNITY MANIPULATION TO IMPROVE PRODUCTION EFFICIENCY

Project No. 1908

L.L. Manske and H. Goetz

Native Range Fertilization with Ammonium Nitrate and Urea

A considerable amount of native range fertilization research has previously been conducted in North Dakota. This fertilization research was conducted by using ammonium nitrate as the source of nitrogen. Most commercial fertilizer suppliers no longer handle ammonium nitrate because of potential storage problems and carry only urea as a source of nitrogen. One purpose of this study was to test if similar rated of ammonium nitrate and urea would give similar results on rangeland. If the results were not similar would there be a relationship between the two sources of nitrogen that could be used to convert previously conducted research data using ammonium nitrate to predict the results using urea on rangelands. Previous range fertilization research has documented an undesirable shift in grass species composition to predominantly cool season species with annual treatments of nitrogen. A second purpose of this study was to test if biennial treatments of nitrogen would reduce the shift of the species composition.

Procedure

A small plot study that compares fertilization of native range between ammonium nitrate and urea applied annually and biennially was started at the Dickinson Experiment Station in the spring of 1982. The fertilization treatments were 40 and 60 pounds of nitrogen per acre applied annually and biennially, and 100 pounds of nitrogen per acre applied biennially for ammonium nitrate and urea. Each of the three replications contained two control plots of no treatment. The fertilizer was broadcast applied on 4 May 1982-1985 for the annual treatments and in 1982 and 1984

for the biennial treatments.

The data that were collected from these plots were: above ground herbage production, 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 inside 1/4m^2 quadrats with the herbage separated into seven categories, cool short, warm short, cool mid, western wheatgrass, warm mid, sedge and forbs. The samples were oven dried at 80^oC. The mean herbage production for each category and the total production from each plot were determined for each clipping period. Quantitative species composition data for each plot were collected by the ten pin point-frame method with fifteen hundred points read for each treatment. Soil moisture was collected by the gravimetric method. Soil nutrient samples were collected using the one inch Veihmeyer soil tube. The samples will be analyzed for nutrient content by the soils laboratory at North Dakota State University.

Results and Discussion

Mean total above ground herbage production for the four years of this study are shown in table 1. The herbage production on the unfertilized control plots was generally similar between 3 of the 4 years. The effects of the fertilization was variable between rates and years.

The number of days between fertilization application and the first measurable precipitation was variable between years. The number of days was 3, 2, 33 and 9 for 1982, 1983, 1984 and 1985, respectively. The length of time between application and first precipitation seems to greatly influence the effects of the fertilization treatments. Table 2 shows the mean percentage of herbage production increase for the fertilization treatments compared to the herbage production on the unfertilized control plots. A short period from application to precipitation occurred in 1982 and 1983. A mid and long period occurred in 1984 and 1985. Both the ammonium nitrate and the urea had reduced effects on herbage production increase in 1984-1985.

Ammonium nitrate and urea have not had similar effects on the herbage production at the same rates of treatment. The differences in the effects have not been constant over the years. Volatization of the ammonia in the fertilizer seems to be a problem with broadcast applied fertilizer on grassland. This problems seems to be greatly increased as length of time between application and the first precipitation is increased for both ammonium nitrate and urea.

This seems to effect urea to slightly greater extent than ammonium nitrate.

There is a difference in effect on herbage production between ammonium nitrate and urea. This difference is not constant between rates nor years.

Additional research data needs to be collected on this study before definitive conclusions on the differences in the effects of annual vs biennial application on the species composition can be made.

Table 1. Mean Total Above Ground Herbage Production

Treatment lbs of nitrogen/acre	1982	1983	1984	1985	Mean
	lbs/acre				
Control	1124	1148	2386	1112	1443
Ammonium nitrate					
40EY	1898	1731	2794	1208	1908
40EOY	1687	1436	2667	1168	1740
60EY	1989	1696	3140	1317	2036
60EOY	1901	1790	2953	1272	1979
100EOY	2360	1664	2945	1238	2052
Urea					
40EY	1918	1763	2622	1167	1867
40EOY	1606	1370	2549	1044	1642
60EY	1710	1711	2636	1238	1824

60EOY	2073	1584	2584	1044	1821
100EOY	2431	1864	3040	1309	2161

EY = annually

EOY = biennially

Table 2. Mean Percentage of Herbage Production Increase Compared to Unfertilized Control

Treatment lbs of nitrogen/acre	1982-1983	1984-1985	1982-1985
	%		
Ammonium nitrate			
40EY	60	14	32
40EOY	38	10	21
60EY	62	27	41
60EOY	63	21	37
100EOY	77	20	42
Urea			
40EY	62	8	29
40EOY	31	3	14
60EY	51	11	26
60EOY	61	5	26

100EOY	89	24	50

EY = annually

EOY = biennially

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Email: drec@ndsuext.nodak.edu
