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Fertilization of Seedings On Range and Disturbed Lands

R. E. McDole and D. T. Booth

Applying fertilizer at fall planting time is a common practice when seeding rangelands and disturbed land such as mines, reclamation areas and road cuts. Research and practical experience of those directly involved with seeding disturbed lands suggests that this is not always the best practice. Fall applications of fertilizer can result in nutrients lost by leaching or carried away in run-off and erosion from rainstorms or melting snow. Up to 50% of fall-applied nitrogen can be lost before spring growth begins. Proposed solutions to problems of this type include the construction of an artificial impervious soil layer and the use of slow-release fertilizers. These methods can be costly and are unnecessary since a simple change in the time of application of nitrogen fertilizer will prevent most nitrogen loss with no reduction in stand establishment.

Rangeland

When properly done, reseeding rangeland can significantly increase forage production. However, fertilizer applications at seeding time do not improve seedling emergence or plant survival. High levels of nitrogen applied at seeding time have adversely affected germination and seedling vigor, both in arid areas and in mountainous areas having higher rainfall. Deferring fertilization until seeded grasses are well established helps to decrease weed competition.

Disturbed Lands

Considerable work has been done on fertilization in connection with seeding of disturbed areas. Generally, nitrogen applied at seeding time has not helped seedling emergence or seedling establishment. Some research indicates that high levels of nitrogen fertilizer produce detrimental effects. Thus, nitrogen fertilizer should be applied after the plants are well established rather than at seeding.

Studies on seeding road cuts in southern Idaho (unpublished data, C. G. Howard, USDA-SCS Plant Materials Center, Aberdeen, Idaho) indicate that fertilizer applications were detrimental to stand establishment. Howard concluded that fertilizer applications would be more beneficial on highway plantings after the seedlings were well established.

Another study conducted in southeast Idaho on reclaimed mine spoils further emphasizes the lack of benefit from fertilization at seeding time. Fertilizer treatments were applied to grass seedings to evaluate nitrogen losses from winter run-off and leaching and to compare slow-release fertilizers to the more conventional fertilizer materials. Treatments were also designed to compare nitrogen fertilization only with a complete fertilizer (nitrogen, phosphorus, potassium and sulfur). The plots were laid out, planted and fertilized in the fall of 1976.

The study was located at the J. R. Simplot Company's Gay Mine near Fort Hall. The elevation is approximately 6,000 feet in a 14- to 16-inch precipitation zone. The dark-colored, carbonaceous, rocky spoiled material was covered with 8 to 12 inches of light colored, medium-to-fine-textured alluvial material. The study area was ripped 12 to 15 inches deep on 53-inch centers and was cultipacked to firm the seedbed. Seedings were made with two perennial grasses, Siberian wheatgrass (P27) and intermediate wheatgrass (Tegmar). Nitrogen fertilizer was applied at the rate of 100 pounds/acre. P, K and S applications are shown in Table 1.

Plant stand counts were made in the fall of 1977 to determine stand density. Results showed density of seedlings on the unfertilized check plots was no different from density on the fertilized plots (Table

Table 1. Fertilizer treatment to plants established at Gay mine in southeastern Idaho.

Treatment	Fertilizer rate (lb/acre) N	P_2O_5	K_2O	S
Check	0	0	0	0
Osmocote[1] (19-6-12-4)	100	32	63	21
Lawn and Turf[2] (14-10-6-16)	100	71	43	114
Ammonium Sulfate (21-0-0-24)	100	0	0	114
Urea (46-0-0)	100	0	0	0

[1]Resin coated for slow release.

[2]Fe = 5%

Table 2. Seedling establishment for two perennial wheatgrasses under different fertilizer treatments, Gay mine, southeastern Idaho.

Treatment	Seedling density Intermediate (Tegmar)	Siberian (P-27)	Mean for Treatment
	Plant/sq. ft.		
Check	3.8	1.8	2.8
Osmocote	4.2	2.1	3.1
Lawn and Turf	3.5	2.0	2.8
Ammonium Sulfate	4.3	1.5	2.9
Urea	3.7	2.1	2.9
Mean	3.9	1.9	2.9

Difference between treatments were not statistically significant

2). Difference between the two grass species was significant. The Tegmar intermediate wheatgrass has superior seedling vigor, so Tegmar had higher seedling density than the Siberian wheatgrass.

Conclusions and Management Recommendations

Research in southeast Idaho and other areas shows that nitrogen fertilization at the time of seeding has little if any beneficial effect on seedling establishment and may in fact be detrimental. Seeds are able to germinate and plants can become established with no loss in density due to lack of nutrients. Fertilizer applied to established seedlings has resulted in rapid increase in cover and forage production, however.

Recommendations made for agricultural lands are applicable to efficient fertilizer use on disturbed lands. Important points are:

1. A soil test is the best guide in determining fertilizer needs.
2. Nitrogen fertilizers should be applied to seedlings after spring run-off and before the summer dry season.
3. Do not apply nitrogen fertilizer in the fall to poorly drained soils, to soils subject to excessive leaching or to soils subject to high winter precipitation. These conditions may result in excessive loss of fall-applied fertilizer nitrogen.
4. When nitrogen is applied in the fall, incorporate it into the seedbed. Volitization losses can take place if nitrogen materials are left on the surface.
5. Fertilizer nutrients other than nitrogen are best applied in fall and should be incorporated into the seedbed.

Applying nitrogen fertilizer in the spring to seedings minimizes losses of nitrogen through leaching, run-off and weed competition. If these practices are followed, revegetation projects will realize a greater benefit from fertilizer dollars.

THE AUTHORS — R. E. McDole is associate extension professor and extension soil specialist in the Department of Plant and Soil Sciences, University of Idaho, Moscow. D. T. Booth, at the time of this research, was a research scientist for the University of Idaho stationed at the USDA-SCS Plant Materials Center, Aberdeen. Booth is currently a range scientist with USDA SEA-Agricultural Research in Wyoming.

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