# LRC-X-37
# EVALUATING THE SUCCESS
# OF RECLAIMED GRASSLANDS

**CONTRACTOR:**        North Dakota State University
Animal & Range Sciences Department

**PRINCIPAL INVESTIGATOR:**    Donald R. Kirby, Ph.D.
Phone: (701) 231-8386
Fax: (701) 231-7590

## PARTICIPANTS

| Sponsor | Cost Share |
|---|---|
| Lignite Energy Council | $13,500 |
| North Dakota State University | 24,000 |
| ND Industrial Commission | 13,500 |
| Total | $51,000 |

**Project Schedule - 3 Years**
Contract Date - 9/21/92
Start Date - 9/1/92
Completion Date - 2/6/96

**Project Deliverables**
Semiannual Progress Reports ✓
Annual Report - 9/93 ✓
Annual Report - 9/94 ✓
Final Report - 2/6/96 ✓

## OBJECTIVE / STATEMENT OF WORK

The objective of this program is to provide a long-term database on reclaimed grasslands. Goals of this program are to evaluate grassland reclamation and regulation success. Grasslands reclaimed between 1988 and 1994, and undisturbed native grasslands were evaluated on the Glenharold, Baukol Noonan, Indian Head, Knife River and Coteau mine sites. Topographic data was collected at 400 sites. Samples were taken and analyzed for soil depth, texture, bulk density, quality, (SP – saturation percentage, SAR – sodium adsorption ratio, EC – electrical conductivity) and topographic position. Vegetation analyses including herbaceous yields, cover and diversity were done. The data was subjected to multi-variant analysis to determine reclamation criteria for successful vegetation production, cover and species diversity.

## STATUS

Regression analysis of the data does not show a significant correlation between herbaceous yield, cover and diversity and soil depth.

11/19/2001

In order to categorize reclaimed areas as successful or unsuccessful, a standard was established based on the means for herbaceous yield, cover and diversity within each reference area topographic unit (TEUI and TEUII). The following table illustrates the results of the characterizations for respread topsoil and suitable plant growth material (SPGM).

Table 3. Soil depths (cm) associated with successful (S) and nonsuccessful (NS) points on reclaimed sites, 1988-1994.

| Soil Class | | Topsoil | | | | SPGM | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | TEUI | | TEUII | | TEUI | | TEUII | |
| | | S | NS | S | NS | S | NS | S | NS |
| Silty | Yield | 15.3 | 11.2 | 15.0 | 8.7 | 45.9 | 33.2 | 41.3 | 25.5 |
| | Cover | 18.4 | 13.3 | n/d | 11.9 | 53.8 | 39.8 | n/d | 33.5 |
| | Diversity | 13.1 | 14.3 | 6.9 | 12.4 | 42.4 | 41.6 | 24.3 | 34.4 |
| Sandy | Yield | 31.0 | 30.3 | 35.5 | n/d | 73.4 | 62.5 | 83.5 | n/d |
| | Cover | 31.0 | 30.9 | 32.5 | 36.4 | 76.2 | 70.8 | 75.9 | 85.8 |
| | Diversity | 26.8 | 33.1 | 35.6 | 35.5 | 79.1 | 66.7 | 102.9 | 79.3 |
| Thin claypan | Yield | 5.7 | 3.6 | 5.2 | 5.2 | 29.9 | 18.0 | 27.0 | 22.3 |
| | Cover | n/d | 5.1 | 4.5 | 5.3 | 11.4 | 26.1 | 22.3 | 25.6 |
| | Diversity | 6.6 | 4.4 | 5.2 | 5.2 | 30.6 | 23.9 | 25.7 | 25.0 |
| n/d Not able to determine. | | | | | | | | | |

In order to establish statistically significant correlations, the silty soil data was subjected to Topographic Unit Analysis (TEU). Two statistically significant topographic units were identified, TEU I - the convex arid position, and TEU II - the concave or down slope position. Sample points for the two TEU data sets were separated into successful and nonsuccessful groups based on herbaceous yields. The successful and nonsuccessful herbaceous yield data was separated based on sample point exceeding (success) or not exceeding (nonsuccess) 90% of the mean annual herbaceous yield of the silty rangeland reference site. Soil depths associated with these groups were then tested for differences with analysis of variance techniques and a t-test (P = 0.05).

Current North Dakota regulations on SPGM redistribution thickness for the silty soil grasslands used in this study required an SPGM thickness of 35.4 inches. Using regression analysis, the SPGM depth requirement to successfully reclaim silty soil grasslands would be 11.6 inches. The principal investigator does not endorse the regression analysis method because of the low correlation coefficient ($r^2 = 0.43$). Using the TEU analysis method developed in this study, the SPGM depth requirement to successfully reclaim silty soil grasslands is an SPGM thickness of 24 inches.

Current regulations for soil redistribution depths for silty soil on reclaimed permanent grasslands are excessive based on the results of this study.

11/19/2001