**GRUNDY COUNTY
DEMONSTRATION SITE**

**PHASE II
PROGRESS REPORT
FOR 1975-1976**

**BY
B. B. GREEN AND
S. D. ZELLMER**

MASTER

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ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

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PHASE II

PROGRESS REPORT FOR 1975-1976

by

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INTRODUCTION AND REVIEW

When dealing with reclamation in Illinois, one major problem quickly emerges: reclamation of abandoned lands. Many of these sites are acidic, creating environmental hazards in the form of toxic wastes for surrounding communities and native environments. In recognition of this problem, the Illinois Institute for Environmental Quality has funded Argonne National Laboratory to investigate feasible methods for reclaiming these areas. The site selected as a demonstration was an abandoned mine adjacent to Goose Lake Prairie State Park in Grundy County.

In 1972, the Illinois State Department of Conservation purchased the 110 acres between Lorenzo Road and Goose Lake Prairie State Park (Fig. 1). About 50 acres had been affected by surface mining in the early 1940's. The state regraded the site in 1972-1973 to the configuration which appears in Fig. 1. Seeding and topsoiling also occurred at that time. Site surveys conducted by Argonne in 1975 indicated that the reclamation operation was not entirely successful. About 35 acres, including the majority of the slopes and the flat areas to the north of Lakes A and B, were unvegetated. The pH of the unvegetated soils ranged from 2.9 to 3.5 while the pH of Lakes A, B, C, D and E were 3.5, 3.5, 4.0, 5.4 and 3.3, respectively. A more detailed discussion of the site history and the Argonne findings appears in Green and Zellmer (1975).

In the fall of 1975 Argonne initiated reclamation activities, beginning Phase II of the Grundy County Project. This phase will continue for at least three years to obtain data on the cost-effectiveness of selected treatments for abandoned lands.

METHODS

Half-acre treatment sites were set up on the slopes and flat areas of the Grundy County Site. These treatments were designed primarily to increase infiltration and control erosion, and they included the following:

Flat Area

Scrubber slag
 Topsoil
 Sludge
 Lime
 Control (no treatment)

Slopes

Chemical stabilizer
 Sludge
 Straw mulch
 Control (no treatment)

Treatment placement appears in Fig. 2. Scrubber slag was obtained from a coal-fired power plant in Joliet. It was applied first by truck (Fig. 3) and then graded to a depth of 3 in. Topsoil was borrowed from an old field adjacent to the site and applied at a depth of approximately 2 in. Lime was applied at a rate sufficient to neutralize the pH in the range of 4.5-6.0. Sludge was delivered to the site but proved extremely difficult to spread, rendering data gathered from these plots unreliable. Chemical stabilizer¹ was applied by hydroseeder (Fig. 4) at the recommended rate for clay soil.

All slope sites were limed, gouged, treated, and seeded. Flat area sites were manipulated in a similar manner although lime was not applied to all plots. Seed was applied to all areas at 15-20 lbs per acre (Table 1). Seedling emergence was recorded in 1 ft² quadrats spaced 10 feet apart for 66 feet. There were two of these transects in each treatment.

Based on data gathered in the fall of 1975, the site was reseeded in the spring of 1976. All areas outside the treatment sites were treated with a straw mulch and seeded. The seedling rate for the entire site was 212 lbs per acre (Table 2). Fertilizer (10-20-10) was also added with the seed at 320 nutrient lbs per acre. Erosion plots (Green and Zellmer, 1975) are currently being installed (Fig. 5), and data on sedimentation and runoff as well as seedling emergence will be available in the fall of 1976.

¹Phillips Petroset SB

EXPERIMENTAL DESIGN FOR GRUNDY COUNTY

Fig. 2. Treatment Design for the Grundy County Demonstration Project as Applied in the Fall of 1975.

Fig. 3. Scrubber Slag Application at the Grundy County Demonstration Project in the Fall of 1975.

Fig. 4. Chemical Stabilizer Application at the Grundy County Demonstration Project in the Fall of 1975.

Table 1. Seed Applied to the Grundy County
Demonstration Site in October, 1975.

Species	Seeding Rate (lbs/acre)
Red Fescue	8.0
Red Clover	8.0
Alsike Clover	2.0
Ladino Clover	0.5

Table 2. Seed Applied to the Grundy County
Demonstration Site in April, 1976.

Species	Seeding Rate (lbs/acre)
Tall Fescue	32
Red Fescue	32
Red Clover	32
Alsike Clover	8
Ladino Clover	2

Fig. 5. Runoff/Sedimentation Plot Installation at the Grundy County Demonstration Project in the Fall of 1975.

RESULTS

Seedling data indicate that the straw mulch was significantly more effective (at the 99% level) in aiding germination and establishment on the slopes (Figs. 6a, 6b, and 7). The chemical stabilizer was significantly more effective (at the 95% level) in grass establishment than was the control, but it was not as effective as the straw mulch. None of the flat area treatments was significantly more effective than the control although the data indicate that both topsoil and scrubber slag improve germination (Fig. 8).

PRELIMINARY CONCLUSIONS

The key factor limiting seedling emergence in fescue and clover at the demonstration site appears to be water availability. Droughty soils are common to almost all surface mine spoils irrespective of geographical region. At Grundy County, high clay content and heavy equipment have caused the surface to "crust" and the spoils to compact, reducing the infiltration rate. The gouging treatment was designed to break up the crust and to provide safe sites for germination by collecting runoff in pockets created by the machine. The straw mulch preserved the beneficial effects of the surface treatment by reducing evaporation and preventing crust formation. Topsoil and slag treatments also prevented crusting, and germination was best in the troughs caused by the gouging treatment. The chemical stabilizer was successful primarily through reducing runoff, preventing the seed from washing away.

Low pH is definitely a factor in reducing germination and survival of most plant species, but by seeding at high rates and using species tolerant of low pH conditions, the pH effect was minimized.

Data gathered this growing season will provide further information on the treatments necessary for revegetating acid spoils in Illinois. Research, however, will be in no way complete. The ultimate goal of the Grundy County Project is to revegetate with native Illinois prairie species. There is therefore additional information required.

ADDITIONAL RESEARCH

Beginning this spring, laboratory studies will be initiated concerning the competitive ability of native species when seeded with fescues and clover on acid mine spoils. The information gathered in these experiments will

Fig. 6a. Spoil Conditions in the Fall of 1975 Before Straw Application at the Grundy County Demonstration Project.

Fig. 6b. Vegetation Establishment in the Straw Mulch Treatment in the Spring of 1976 at the Grundy County Demonstration Project.

Fig. 7. Average Number of Seedlings per Sample for Each Treatment on the Slopes at the Grundy County Demonstration Site in the Fall of 1975.

Fig. 8. Average Number of Seedlings per Sample for Each Treatment on the Flat Area at the Grundy County Demonstration Site in the Fall of 1975.

indicate the prairie species which would be most likely to establish under conditions at Grundy County. This research will supplement field trials that will be initiated at Grundy County this summer and fall. Two sites on acid material will be disced and treated as follows:

1. Prairie hay applied in fall (this contains seed) - no additional seeding.
2. Fallow over winter, spring seed.
3. Seed fescue/clover mix in fall, plow after 2 years, spring seed prairie species.

The above three treatments will indicate the best method to be used in restoring native prairie to the site. The site is intended to be used as a high use nature area for Goose Lake Prairie State Park and will provide valuable information on the requirements of establishing recreation sites on abandoned lands.

LITERATURE CITED

Green, B. B. and S. D. Zellmer. 1975. *Grundy County Demonstration Site. Phase I Planning (Final Report)*. Argonne National Laboratory, Energy and Environmental Systems Division. 35pp.