

Effects of mineral soil exposure and bird-repellent treatment on jack or red pine seeding

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For successful stand establishment broadcast or direct seeding requires a working knowledge of the effects of bare mineral soil exposure, the bird or rodent activity requiring repellent, treated seed, the time of seeding, and the field-germination capacity of the selected species seed.

Following a heavy infestation of spruce budworm in our balsam stands, primarily in eastern Oneida County, Wis., we were faced with a variety of reforestation challenges, generally requiring thorough site preparation followed with seeding or planting. Through a cost-return analysis, we decided that most of the area would receive site scarification. A standard 10-tooth root rake with alternate teeth removed, frontmounted on a crawler tractor, was used to scarify and windrow 43 acres in the fall of 1970. The following May, jack pine was seeded. Initial phases of the operation were designed to give experience in what appeared to be the most promising establishment method on these conversion areas. Our company had gathered much experience in hand and machine planting, but had little experience in seeding.

Roe¹ points out that jack pine was used in four-fifths of successful seeding attempts. Adequate exposure of mineral soil was required for good germination conditions and reduction

¹Roe, Eugene L., 1963, Direct Seeding of Conifers in the Lake States: A review of Past Trials. U.S. Forest Service Research Paper LS-3.

of vegetative competition. Also, of major importance was the protection against seed loss caused by rodents and birds. Consequently, we felt that consistent success using seeding would require quantitative estimates for the effects of exposed mineral soil, species, seed treatment, and seeding time.

The Study

In May of 1971, plots were established on four different areas which had been scarified the previous fall. Each plot consisted of three 4' x 12' subplots. Within each subplot were three replications of each of the following comparisons:

1. Species: Jack pine versus red pine.
2. Method: Broadcast versus direct. Broadcast seeding is simulated by dropping a seed on the surface at regular intervals. Direct seeding is simulated by placing each seed one-quarter inch below surface at regular intervals.
3. Treated versus untreated.

Seed treatment: Dow latex
Anthraquinone
Arasan 75 W
Aluminum flake

Each of the three subplots represented a different exposure as follows:

1. Control: Subplots completely enclosed with wire mesh.
2. Bird access: Subplot open on top.
3. Rodent access: Subplot covered with wire mesh at 1 to 2 inches off the ground, sides left uncovered.

Within each 4' x 12' subplot were

twelve 1' x 3' individual plots. Each 1' x 3' plot consisted of 96 seeds, 48 of which were untreated and 48 treated. Six of the twelve 1' x 3' plots were jack pine and six were red pine. Three 1' x 3' plots per species were broadcast seeded and three were direct seeded.

Three plots were established May 10 and 11, 1971, and the fourth plot was established on June 4, 1971. All seedlings in the study were counted on June 2, and again every 7 days through July 15. The final counts, taken on October 15, 1971 are the basis for this article.

Results and Discussion

Statistical analysis of the three exposures-control, rodent access, and bird access-revealed no significant seed loss because of rodents or birds. Observations made the first month on light snow cover also revealed no significant rodent activity in the seeded plots. Root raking as compared to spot scarification, removes the surrounding rodent habitat, exposing and limiting rodent activities in the open areas.

In May 1971, generally cool temperatures prevailed, including several light snowfalls. June of 1971 presented ideal germination conditions with weekly light rainfall and seasonably warm temperatures. Seed in the May plots lay dormant for about five weeks following seeding. Seed in the June plot began germination one week following seeding. Figures 1 and 2 indicate the desirability-

ty of seeding just prior to optimum produced better results. conditions, minimizing seed loss and deterioration because of the elements.

In 1971, June 1 was the optimum seeding time. However, in 1972, we learned another lesson in "weather extremely complex, and highly accurate unpredictability." June 1972 was results are rarely obtained, especially under unusually hot and dry. Areas seeded that month produced extremely poor germination who makes a fairly rigid attempt at gathering and survival. Through casual observation, such information within the operational area however, we have found germination still will find it extremely educational in improving occurring the second year following seeding his reforestation management techniques. (1973), somewhat offsetting potential losses. Seeding in May 1972, with seasonably cool, moist conditions, and in spite of longer germination periods, produced satisfactory stocking. Thus far, our experience indicates that seeding the first two weeks in May still provides the best overall success.

Conclusions

Percentage of exposed mineral soil was the largest single variable in this study. Percentage of exposed mineral soil was visually estimated for each 1' x 1.5' plot. Germination results were then grouped and evaluated according to the exposure groups shown in the figures.

Unfortunately, the full significance of soil exposure on germination was not realized prior to, nor originally included in, this study. Consequently, some bare mineral soil percentage germination combinations have significantly more replications than do others, accounting for some wide trend variances in the results.

The horizontal structure of balsam and pine duff provides high vertical penetration resistance as well as good internal air circulation for rapid drying and heating when the overstory is removed. Therefore, even placing the seed within the duff layer as demonstrated with direct seeding does not provide good germination and survival conditions, such as might be possible in a hardwood-type litter. Heavy vegetative competition erupting out of the nondisturbed duff layer following cutting further discourages seedling development. The effects of bare mineral soil exposure is most evident in broadcast seeding (figures 2 and 3). Jack pine normally germinates quite well even under marginal conditions. Red pine, being more demanding of mineral soil and moisture, requires a more favorable environment. Consequently, the indication of germination retardation because of treatment is more evident with the better competitor, jack pine.

The effects of treatment and percentage of exposed mineral soil is more variable in direct seeding even though, generally, the nontreated

seeds with a high degree of scarification still

