REVEGETATION OF SANDY SLOPES*

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ABSTRACT

Sandy slopes present difficult conditions for revegetation following construction because of a number of factors including; droughtiness, infertility and temperature extremes.

The MTC conducted studies to examine the revegetation of sandy roadside slopes in northern and central Ontario. The studies focused on the use of certain sedge and prairie grass species relative to an MTC mix composed of trefoil and grass species.

After a program of seed testing and test plot planting, some understanding has been gained about the potential of these plant materials for revegetation.

Based on the first year's results, the grass species tested appear to hold immediate promise for sandy slope conditions. The use of sedge species will depend upon improving germination rates in subsequent years.

INTRODUCTION

Sandy slopes can present difficult conditions for plant growth owing to droughtiness, infertility and surface temperature extremes. In many cases, revegetation attempts on these sites have resulted in patchy plant growth, requiring further maintenance or replanting.

This paper addresses such a situation faced by the Ontario Ministry of Transportation and Communications (MTC) in some areas of central and northern Ontario. The Research and Development Branch of the MTC, at the request of the Maintenance Branch, commissioned work to examine sedges as an alternative group of plants for revegetating those sandy roadside slopes. That research program was expanded to include selected grasses also expected to hold promise for those situations.

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The following is a brief discussion of the approach and findings to date from those research efforts.

APPROACH

Detailed investigations were completed for six plant species; three sedges and three grasses.

Sedges:	Carex aenea	Sedge
	C. houghtoniana	Sedge
	C. lucorum	Sedge
Grasses:	Andropogon scoparius	Little Bluestem
	Panicum virgatum	Switchgrass
	Sporobolus cryptandrus	Sand Dropseed

They were selected because they possessed a number of important characteristics.

- The test species naturally inhabit droughty, infertile sites such as sand dunes and dry prairies.
- Each is native to various parts of Ontario.
- The sedges possess rhizomes capable of vigorous growth and therefore the rapid spread of populations.
- The grasses possess widespreading and deep fibrous root systems beneficial to the stabilization of surface soils of slopes.

Once the test species were selected, detailed research was conducted in five steps to confirm their practicality for sandy slope revegetation. The steps were: literature review, seed acquisition, germination testing, test plot planting and plot monitoring. Each is briefly described.

Literature review

Extensive literature review and a contact program were carried out to obtain information on seed collection, germination treatment, storage, planting techniques and planting schedules. No literature was located about the propagation of the specific sedges selected. The species apparently have not been studied. This program therefore represented pioneer research for certain species.

Seed acquisition

While the grass seed was available commercially, the seed sources for the sedges had to be identified from native populations. This was completed primarily through a search of herbaria records.

The sedge seed source locations examined ranged across Ontario, from Parry Sound to Buckhorn to Petawawa. At each collection location, a number of factors were assessed: species presence, seed ripening stage, seed amount, habitat and accessibility. Figure 1 shows Carex lucorum seed being harvested.

Figure 1: Carex lucorum seed harvesting near Petawawa, Ontario

The grass seed required was obtained from the United States, after discussions with several North American seedhouses. Viable seed, recently harvested, was desired from plants grown in a winter hardness climatic zone similar to the study area.

The Plant Health and Plant Products Directorate of Agriculture Canada was contacted regarding the weed potential of the grass seed imported from the United States. The seed was cleared and authorized for test planting by the Federal authorities.

Seed testing

Laboratory testing was conducted on the sedge seeds to determine requirements to stimulate germination. Germination rates for grasses had already been determined by the seed company. Germination tests of the collected sedge seeds were carried out by Oseco Incorporated of Brampton.

The selection of testing techniques was determined from a review of literature. Tremendous variability of treatments and results prompted a program to test the most commonly successful treatments.

These included;

- wet stratification,
- scarification,
- pre-chill, and
- heat treatment.

Wet stratification and pre-chill treatments simulate over-wintering conditions for the seeds, while the heat treatment simulates the high temperatures often found on ground level in the sand flats that some Carex species naturally populate.

Testing was completed using variations in duration and temperature for each of the four treatments mentioned above. Combinations of the four treatments were also tested.

Test plot planting

The site selected for test planting was on an approach fill of a newly constructed overpass (North Kashe Lake Road) on Highway 11, 10 km south of Gravenhurst, Ontario. The test plots were located on north and south-facing slopes west of Highway 11. The slopes were constructed of fine sandy soils.

Within four test areas (two on the north-facing and two on the south-facing slopes), numerous individual plots were established. The plots were prepared by raking and fertilizing prior to seeding. Half of them were seeded in the fall, 1985 and the other half in the spring, 1986. Planting was completed by hand-seeding. All plots were hydromulched.

The remainder of the surrounding slopes was seeded with; Bird's-foot Trefoil (Leo), Canada Bluegrass, Creeping Red Fescue (Fortress), Hard Fescue (Biljart),

Alsike Clover and Annual Ryegrass. These are some of the species sometimes recommended by the MTC for roadside revegetation of problem sandy slopes (MTC , 1986).

Plot Monitoring

Intensive monitoring of growth was conducted in the fall, 1985, and the spring and fall 1986. Observations were made of species presence, percent cover, height, vigor and presence of fruiting structures.

SUMMARY OF FINDINGS

Findings are discussed under two main areas, seed test results and test plot results. The results, especially for seed testing were quite complex and only a summary of the highlights is presented here.

Seed test results

- All sedges tested had generally poor germination success (0 to 70%).
- All sedge seeds were slow to germinate, taking on average almost two months. Figure 2 illustrates the time taken for germination to occur in a control seed lot (no germination pre-treatments).
- Germination rates varied substantially for the same species harvested from different populations.
- Germination rates varied for the same species and population harvested at different times during the growing season.
- Carex lucorum provided the highest germination rates of the three sedge species tested.
- Of all pre-treatments, only those involving scarification appeared to result in improved germination success.

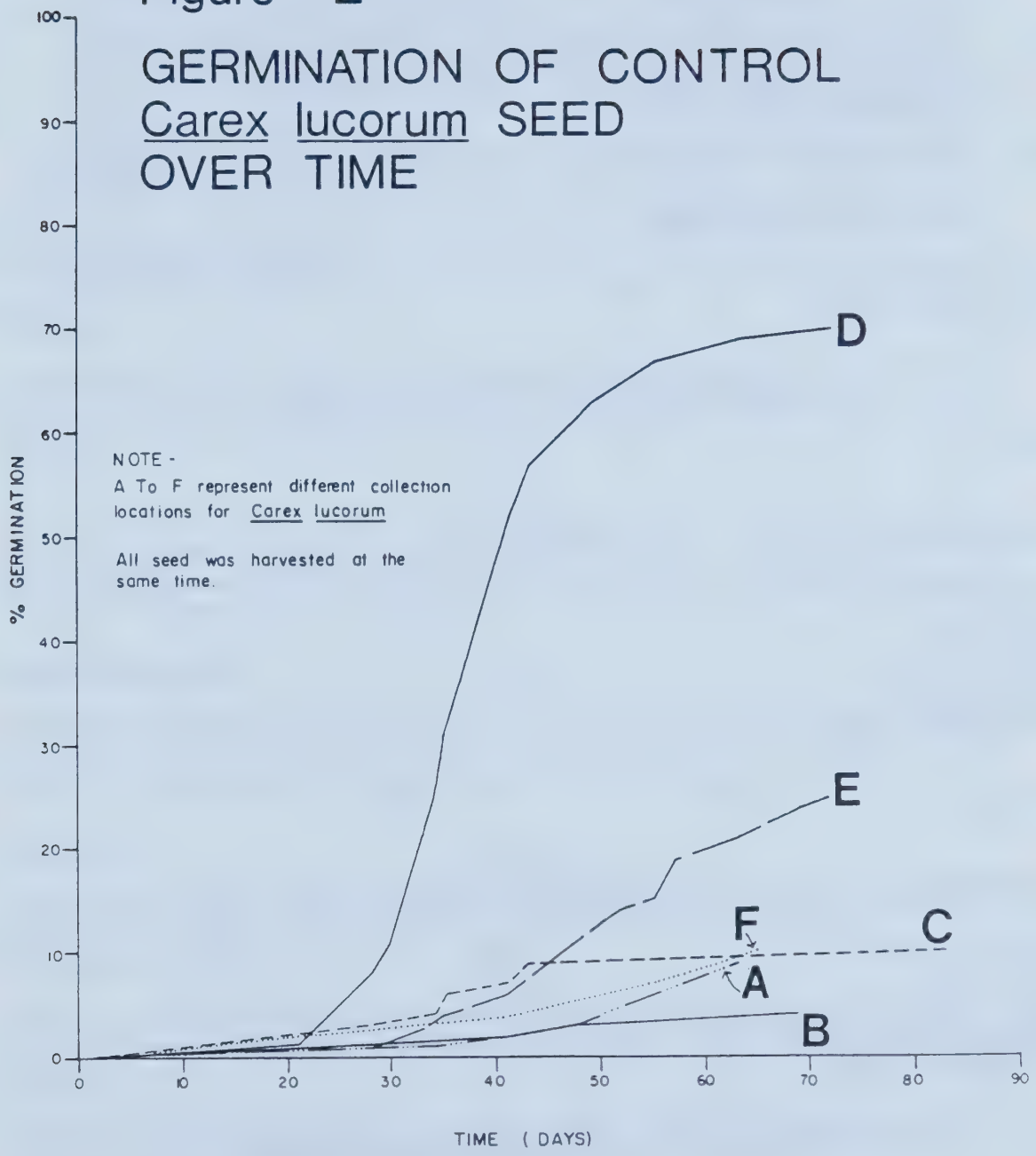
The following summarizes germination rates for each test species. Rates for grasses were determined by Sharp Brothers Seed Company, Kansas.

SUMMARY OF GERMINATION TESTS

Species	Germination Rates (%)
Little Bluestem	78
Sand Dropseed	77
Switchgrass	97
Carex lucorum	1 to 70
C. houghtoniana	0 to 5
C. aenea	1 to 36

Figure 2

GERMINATION OF CONTROL *Carex lucorum* SEED OVER TIME



Test plot results (first season)

- Spring planting had a higher degree of success than fall planting
- Both Little Bluestem and Switchgrass provided almost 50% plot cover at a rate of 60 kg/ha
- Other species tested, particularly the sedges, showed a poor growth response: Carex lucorum produced small amounts of cover: C. houghtoniana did not appear.
- The remainder of the slope, which received the MTC seed mix, displayed generally more complete coverage than any of the test plots. The MTC mix was applied at 100 kg/ha.

The following summarizes the vegetation cover for the test species for both fall and spring planting.

SUMMARY OF TEST PLOT COVER

Fall:

Test Species	Amount of Plot Cover (%)
Little Bluestem	1
Switchgrass	1
Sand Dropseed	0 to 2
Carex lucorum	0 to 1
C. houghtoniana	0

Spring:

Test Species	Amount of Plot Cover (%)
Little Bluestem	5 to 40
Switchgrass	20 to 30
Sand Dropseed	7 to 10
Carex lucorum	0 to 2
C. houghtoniana	0

IMPLICATIONS FOR REVEGETATION

This program has revealed numerous implications for the use of the test grasses and sedges for the revegetation of sandy slopes.

Sedges

The practicality of the sedges studied for revegetating sandy, erodible, roadside slopes appears limited by a number of factors.

- In Ontario, seed availability is limited to scattered known populations: collections for large-scale propagation may be expensive.
- Germination rates were generally low and very variable; commercial propagation over several years could reduce the variability. Vegetative reproduction may be a more reliable and less costly means of propagation.
- Most germination rates were slow. These three species may not present an instant vegetation cover as do some of the more traditional cover crop grasses (e.g., Rye).

These limiting factors likely do not relate solely to Carex lucorum, C. houghtoniana and C. aenea.

Grasses

The grasses studied present more immediate potential as alternate revegetation species. The seed is commercially available with high germination rates. There would be no delay in locating or developing seed sources.

These conclusions are based upon observations of growth after one field season. Further studies are planned to determine the longevity of the test species to the infertile, droughty roadside conditions.

Acknowledgements

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