

FALCON CREEK REVEGETATION
REPORT

9009-01
MARCH 1982

DILLON
Consulting Engineers & Planners



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OUR FILE: 9009-01
YOUR FILE:

29 March 1982

Regional Municipality of Halton
1151 Bronte Road
Oakville, Ontario

Attention: Mr. D. Morrier, P.Eng.
Manager of Operations

Falcon Creek Revegetation Report

Dear Sirs:

We are pleased to submit the Falcon Creek Revegetation Report describing the recommended program for revegetating the eroded slopes of Falcon Creek on the west boundary of the Burlington Landfill.

This revegetation program will help fulfill the Region's commitments made during a Hearing on the Burlington Landfill Extension application before the Environmental Assessment Board in 1979.

To ensure the success of the revegetation, remedial works to prevent surface drainage from the landfill from being directed over the eroded slopes must be completed before hydroseeding begins. Also, we recommend that an environmental inspector be used to ensure that the program is implemented correctly and to monitor the results. Could you please notify us when you plan to begin planting and hydroseeding?

Yours truly,

M.M. DILLON LIMITED

Denis G. Stevens, M.Sc.
Head, Ecology
for J.A. Hiraishi
Project Manager

DGS:dcs
Encl:

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FALCON CREEK REVEGETATION REPORT

1. INTRODUCTION

This report describes a program to revegetate the severely eroding slopes of Falcon Creek on the west boundary of the Burlington Landfill Site (Figure 1). The program is designed to encourage the eventual establishment of a permanent, environmentally stable forest community that is representative of the area before the erosion and, that is compatible with the neighbouring forests of the Sassafrass Woods Environmentally Sensitive Area (E.S.A.).

The program will consist of the activities:

1. Removal of the source of runoff from the landfill area beyond the slopes themselves so that only slope generated runoff occurs; all other runoff will be directed away from the slopes by retention of drainage structures to be installed before revegetation is completed.
2. Stabilization of the two deepest gullies at the north end of the slopes and preparation for hydroseeding.
3. Planting of native woody stock on selected areas of the slopes to induce re-establishment of a woodland which is representative of the surrounding native forests.

4. Application of a mixture of cover crop species by hydro-seeding to immediately produce a complete plant cover on the slopes, reducing soil loss and improving the soil conditions for ultimate forest vegetation.
5. Maintenance of plant cover, woody stock and any spontaneous vegetation by routine fertilization, watering, and plant replacement where necessary.
6. Environmental inspection of the slope stabilization program as implemented and post-implementation monitoring.

2. EXISTING CONDITIONS

2.1 Falcon Creek Watershed

The Falcon Creek Watershed is comprised of about 400 ha. and is drained by Falcon Creek and its various tributaries. The creek channel is roughly 7 km in length, flowing from its headwaters above the Niagara Escarpment to Lake Ontario. Some of the tributaries of Falcon Creek appear to be spring fed from the escarpment (M. M. Dillon 1979).

The Falcon Creek ravine is steep, and forested with a secondary growth of hardwood. Mature white pine are found in areas where gentle south facing slopes occur. Sugar maple is the dominant deciduous species. There are shagbark hickory, ironwood, red oak, white oak, bitternut hickory, basswood, white ash and witch hazel in association with the maple. Important elements of more southern flora include: sassafras, flowering dogwood, hoptree, honey locust and red hickory. (Regional Municipality of Halton 1978.) These species are generally considered representative of "carolinian" forests - a bioclimatic zone found in the temperate United States. They are rare and noteworthy in Canada.

In addition to woody vegetation of note, there is an abundance of herbaceous understory vegetation that is characteristic of these forests which includes rare species such as American columbo, yellow lady's slipper and three-leaved false solomon's seal. All require rich, well canopied

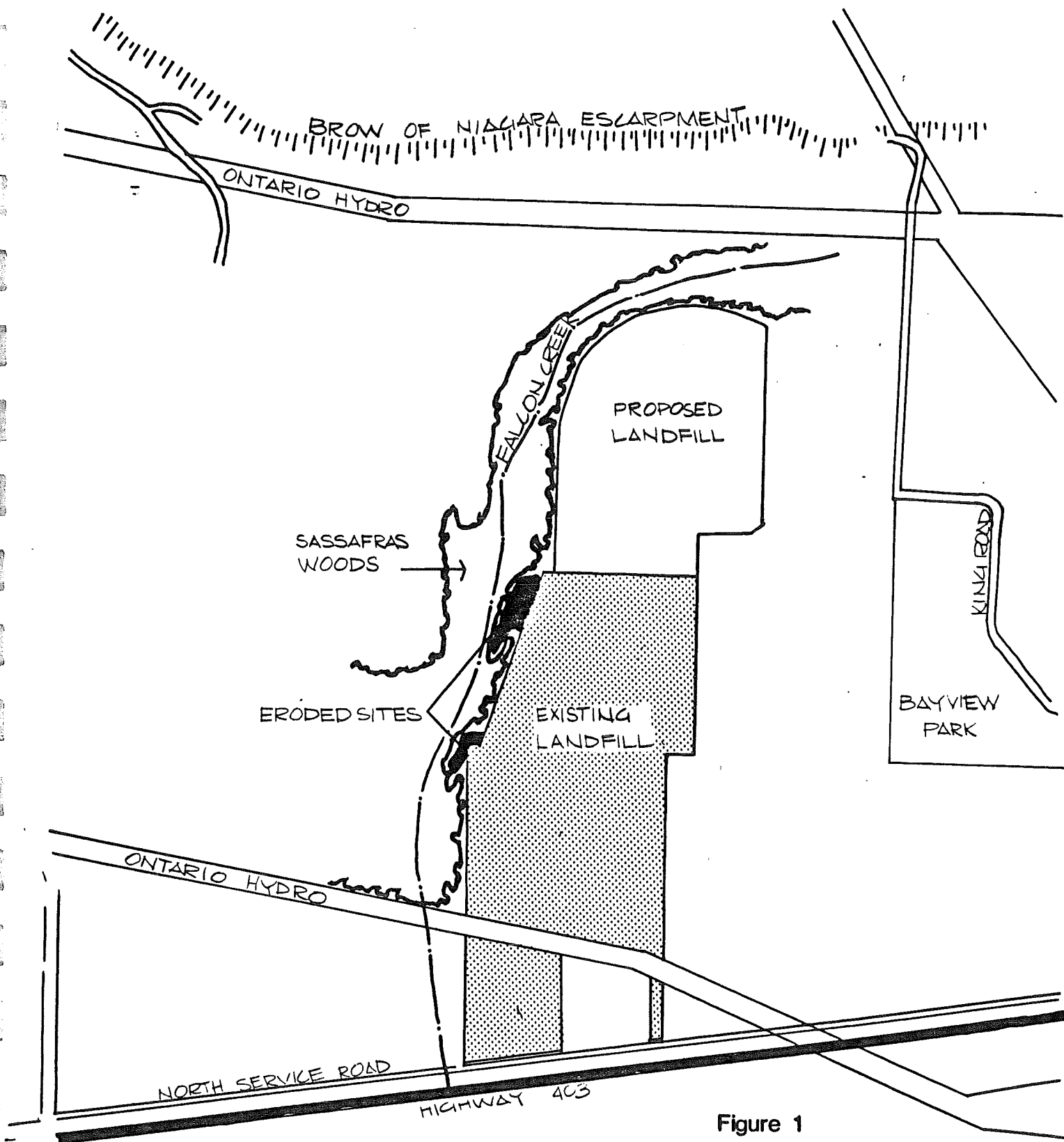


Figure 1

KEY MAP



1"=1000'

forests for survival. The sheltered ravine and south facing orientation of the land of the Niagara Escarpment produce the unique conditions for these forests.

2.2 Eroded Slopes

The eroded slopes occur on the west side of the Burlington Landfill, east of Falcon Creek (Figure 1). This area was apparently similarly forested before disturbance removed the vegetation and soil. Their total area is about 2.5 ha. Their length averages 50 m from crest to toe at a slope ratio range of about 2:1 to 3:1. The forests of Sassafrass Woods E.S.A. border the slopes on the north and the opposite ravine bank and bottom land.

The natural topsoil and plant cover have been completely removed, exposing a shaley C horizon or fragile weathered bedrock, known as Queenston shale, on the slope face.

One important factor in causing the erosion is the runoff from the landfill site at the top of the slope. This has resulted in the removal of plant cover which is an important factor in perpetuation of the present problem.

Surface runoff from the completed landfilling area is presently collected in drainage ditches along the eastern and northern site boundaries. Runoff is then diverted directly over the steep red shale slopes of the western ravine to Falcon Creek, as well as to swales entering Indian Creek on the southeast site of the landfill site.

The drainage ditches are currently not seeded or mulched. When consideration was given to expanding the landfill operations, the revegetation of these ditches was suspended.

Severe erosion of the ravine slopes and the sedimentation of the drainage swales has occurred. In turn, runoff from the site over the ravine slopes has prevented the re-establishment of vegetation and formed many deep gullies, particularly at the northern end of the eroded slope area.

Most of the slope is covered with gullies less than 2 m deep, indicating a fairly uniform distribution of runoff. There is little evidence of rill erosion between the gullies. Instead the soil seems to erode evenly in sheets towards the gullies and is then transported down slope. The lack of rill formation is probably due to the hard nature of the substrate and its manner of fracturing into evenly sized particles. This results in a loose unconsolidated layer of shale and clay. This surface is usually 10-20 cm deep across the ungullied portion of the slope face.

There is one gully which is in excess of 3 m deep. It, and the adjacent gully are caused by a major drainage ditch from the north end of the landfill. Whereas much of the off-slope drainage has recently been intercepted by a drainage swale at the top of the slope, this major ditch has yet to be diverted (M.M. Dillon 1979).

Even with the diversion of most of the off-slope drainage, the natural re-establishment of vegetation has been thwarted by the lack of topsoil, the barren, unconsolidated nature of the exposed material and the lack of protection on the bare slope. Common weeds, grasses and occasionally shrubs have invaded limited areas of the slope. These are generally on micro-topography that is flatter and sheltered from direct runoff from up-slope. Total natural plant cover of this type is sparse and less than 10 per cent of the eroded area.

3. APPROACH

The major features of our approach are:

- i) Protect the slope quickly to reduce further soil loss.
- ii) Produce site conditions that encourage suitable indigenous vegetation (i.e. deciduous hardwood forest).
- iii) Minimize implementation and maintenance costs.
- iv) Fulfill the Region's commitments to return the eroded area to pre-disturbance conditions as quickly as possible.

The establishment of a permanent, ecologically stable forest community is the prime objective of the program. Ecological succession will produce this forest if site conditions are established which allow natural vegetation development. Compatibility with the surrounding woodlots will occur once plants from the adjacent forests become established on the eroded area; after the harsh micro-climate is moderated, soil fertility is increased and slope runoff controlled.

We propose to establish these conditions by recommending a fast growing cover crop. The cover crop seed mixture has been selected to accommodate the acid substrate and exposed site conditions. An important consideration is that species be selected that do not persist to the exclusion of native plants and trees which will eventually develop into natural forests.

The woody plant stock recommended includes those that are native and typical of sites of this type. We have recommended some species that will establish quickly and others that will persist and help establish permanent forests. Both deciduous and coniferous species have been selected to provide year-round visual screening and slope protection.

Site modification has been minimized to the two most severe gullies. Work in these gullies is designed to stabilize the slope sufficiently to establish plant cover. Expensive site preparations have been minimized.

3.1 Revegetation

The revegetation method to be used at Falcon Creek is based on the application of a seed mixture and an organic mulch on one step. This method is known as hydroseeding and it provides a relatively rapid re-establishment of the desired plant cover (Appendix B).

The application of seed to a seed bed is a very common and relatively inexpensive erosion control practice. The application of a mulch and soil binder usually accompanies seeding to provide erosion protection during germination and growth and also creates a micro-climate conducive for seed germination. Large areas can be treated in a short period of time.

Protection of the slope from disturbance by machine activity will assist in the reestablishment of vegetation. To restrict access, the area should be fenced off while being restored.

3.2 Gully Modification

Gullies concentrate surface flows and intensify soil loss through scouring and soil transport. Steep gullies are difficult to revegetate unless their profile is moderated and flows through them are reduced.

Flow reduction will occur once the drainage diversion structures are implemented and only runoff from the immediate slope face is allowed into the gullies. Reshaping of the gullies will further reduce the tendency of gullies to concentrate flows and, at the same time, allow for the establishment of vegetation. To aid in stabilizing the gully, channel reinforcements such as compacted soil and protective netting or blankets, will be recommended.

4. METHODS

At the present time, very little work has been done to stabilize the eroded slopes at Falcon Creek. Preliminary re-establishment of vegetation was undertaken in the fall of 1981. Nursery stock from the Ministry of Natural Resources were planted on the eroded slopes. Jack pine (300 trees), Carolina poplar (300), black locust (300), white pine (200), white cedar (200) and red oak (100) were planted on the slopes.

The balance of the program will consist of.

4.1 Diversion of Surface Runoff

The diversion of off-slope drainage should be completed as recommended in 1979 so that the slope will conduct only slope-generated runoff.

4.2 Site Modifications

Once diversion of the off-slope drainage is complete, some site modifications should be undertaken to provide a site which will be conducive to both the permanent establishment of plant cover and the prevention of further erosion.

The diversion of off-slope drainage should reduce, if not eliminate, further gullying of the slope and the majority of the gullies are not severe enough to prevent the rapid establishment of vegetation. However, erosion may still result from slope-generated runoff in the two largest gullies at the

north end of the eroded area because of their size and tendency to concentrate flows. Therefore, the two largest gullies should be partially filled and the walls should be re-shaped by hand to become less steep. The filled portion of the gully channel should be compacted and the bottom given a slight dish shape. To protect the channel bottom from scouring, and to give support for seed establishment, it is proposed that it be lined with a continuous blanket of coarse synthetic netting (e.g. Enkamat) pegged to the surface.

Scarification and seed bed preparation of the site is not required, as the weathered shale should provide an adequate seed bed. Site preparation, if undertaken, may actually aggravate the erosion problem.

4.3 Revegetation

Revegetation will consist of planting rooted woody stock on the slopes under the direction of an environmental inspector and establishing a herbaceous cover crop by hydroseeding, followed by regular maintenance (fertilization, watering).

4.3.1 Woody Stock

Approximately 1,400 tree seedlings supplied by the Ministry of Natural Resources were planted in the Autumn of 1981. Further planting of woody stock is recommended and should consist of the following species and amounts:

<u>Species</u>	<u>Amount</u>	<u>Size</u>
Black Walnut	30	small stock
Staghorn Sumac	30	whips or small stock
Sassafrass	25	whips or small stock
Wild Grape	25	rooted cuttings or small stock
Sugar Maple	30	whips or small stock

This woody stock should be planted before hydroseeding, during the last two weeks in April or early May when the weather is cool and clear, and the ground unfrozen. The planting stock should be dormant. Detailed planting specifications with an example diagram are included in Appendix A.

The stock should be planted in mixed groups throughout the site, away from steep gully sides on suitable terrain. The Environmental Inspector should be on site to advise on planting technique and locations within the site. Water should be available if the soil is dry.

4.3.2 Cover Crop

The cover crop will be applied by hydroseeding and will consist of the following seed mixture:

<u>Species</u>	<u>Percentage by Weight</u>
Birdsfoot Trefoil	40
Italian Rye-grass	20
Tall Fescue	10
Creeping Red Fescue	10
White Sweet-Clover	10
Brome grass	10

The seeds should be Canada No. 1 seed. Bacterial inoculant should be added to aid the legumes (Birdsfoot Trefoil, White Sweet-Clover) to fix nitrogen. Specifications for hydroseeding are included in Appendix B.

The fertilizer to be used should be a 5-20-10 analysis in granular form. Note: fertilization should occur three to six weeks after hydroseeding either by broadcasting or dissolving fertilizer in water.

Verdyol Mulch® with Verdyol Super® is recommended for the hydroseed mixture. Verdyol® is a product made from cotton waste, recycled newspaper and specialty treated straw and hay. Verdyol Super® is a binding and stabilizing agent. (See product specification in Appendix B.)

The mulch material is capable of dispersing rapidly in water to form a homogeneous slurry and it will remain in that state when mixed with the other hydroseed materials. When the mulch is applied, it will form an absorptive mat, allowing moisture to percolate into the underlying surface material. The mulch material should not contain any growth or germination inhibiting factors. The addition of fertilizer to the hydroseed mixture will tend to suppress germination and establishment of the legumes in the seed mixture. Therefore, we have recommended fertilization be undertaken after the legumes have germinated (three to six weeks).

The Contractor should measure the quantities of each of the materials, either by weight or by an approved system of weight calibrated volume measurements, to be charged into the hydroseeder or the water carrier for subsequent fertilization.

The rates of application, per hectare should be as indicated below:

Seed Mix	60 kg
Fertilizer	240 kg
Mulch (Verdyol® Super)	1,610 kg
Water	30,300 litres

The poor accessibility of the site and its steep slopes may require that the hydroseed be applied by hose from the tanker at the bottom of the slope. If applied from a truck at the top of the slope the contractor must ensure even coverage. Use of hoses hand directed by operators on the slope itself is the recommended option.

The Reen should provide a water truck with a suitable length hose to wet the site periodically for up to six weeks per application of the hydroseed. Caution should be taken in watering and fertilizing the newly established vegetation. The water should be a strong mist and should be applied uniformly over the slope. The watering of the site should be conducted in a manner which would cause further erosion of the slope and wash out the hydroseed (i.e. concerning watering or heavy flows during watering).

The application and maintenance of the hydroseed is not expected to have major negative impacts on the woody stock which have been planted.

The application of the hydroseed should be carried out during suitable weather and should begin after the completion of the clearing of the woody stock. Seeding should be completed mid-May.

Environmental inspection and monitoring should occur during and regularly after seeding. If the plant cover fails to become established, it must be replaced by contractor. Further measures may need to be recommended to establish a permanent, ecologically stable plant cover compatible with the natural forest vegetation of neighbouring forests if this option fails.

4.4 Fencing

Protection of the slope from disturbance by recreational vehicle and other machine activity will assist in the re-establishment of vegetation. Temporary snow fencing should be erected at the base of the slope and should remain there until the vegetation has become established or as directed by the Environmental Inspector.

Pedestrian activity on the newly vegetated area should be kept to the absolute minimum required for seeding, watering, fertilization and inspection. No tracked machinery or other vehicles should be allowed on the slopes.

4.5 Environmental Inspection

During the process of slope modification an environmental inspector should be present on site to monitor the construction activities and to ensure that the site is prepared for the application of the hydroseed. The inspector will also ensure that the activities are compatible with the surrounding sensitive natural areas, in particular with Falcon Creek and with Sassafras Woods, designated an Environmentally Sensitive Area (Regional Municipal of Halton 1978).

The environmental inspector should also be present during hydroseeding to ensure that the hydroseed is applied to specifications. Supervision of the planting of the woody stock is also recommended. This will ensure that contractor supplied plant material is of the quality and vigour specified.

Monitoring of the site following the completion of slope modification, hydroseeding and planting of woody stock is also recommended. An inspection of the site weekly, (until plant cover is established) six months (in the autumn), and again one year after hydroseeding and planting, should be conducted to ensure that the vegetation has become established and that the slope has been stabilized. Replant or reseeding may be recommended for failed areas at the time.

5. ESTIMATE OF COST

Site grading (gully modification)	-	\$ 7,500
Enkamat® 7020 synthetic netting underlay and installation in two gullies	-	12,500
Hydroseeding	-	14,300
Woody and replacement stock (assume installation by Regional Municipality of Halton staff)	-	600
Environmental Inspection	-	<u>1,600</u>
Total Cost of Falcon Creek Slope Rehabilitation		<u>\$36,500</u>

6. SOURCES OF MATERIALS

Enkamat® 7020 netting and
underlay

Sprayturf Ltd.
466 Boler Road
London, Ontario

Hydroseeding:

Dol Brothers Ltd.
8760 Jane Street
Maple, Ontario

Woody Plant Stock:

Branxholme Nurseries
RR #1
Ariss, Ontario

REFERENCES

1. M. M. Dillon Limited, 1979. Burlington Landfill Site Hydrogeological Study. Prepared by Gartner Lee Associates Limited.
2. M. M. Dillon Limited, 1980. Burlington Landfill Site Design and Operations Report.
3. Regional Municipality of Halton, 1978. Environmentally Sensitive Area Study. Ecological and Environmental Advisory Committee.
4. Urban Drainage Committee, Technical Subcommittee No. 5. Erosion - Sediment Control. 1981. Erosion and Sediment Control during construction activities - Report prepared by M.M. Dillon Limited.
5. Dol Brothers Limited, Maple, Ontario.

appendices

APPENDIX A
STANDARDS AND SPECIFICATIONS
TREES AND SHRUBS

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STANDARDS AND SPECIFICATIONS
TREES AND SHRUBS

INTRODUCTION

Trees and shrubs are forms of vegetation that can be used to cover and stabilize disturbed areas as well as to prevent the initiation of erosion. They form a canopy above the ground and thus protect the soil from the full impact of falling rain and high winds. When the stand is well established, a layer of litter also covers the ground and, with decomposition, increases the soil absorption capacity. Trees, particularly evergreens, will slow down the melting of snow and runoff in the spring.

Herbaceous vegetation provides faster erosion control. Time is needed to establish a good stand of woody species, during which competing herbaceous vegetation must be controlled. Maintenance of established stands is inexpensive.

APPLICATION

Trees and shrubs may be used to protect graded or cleared areas from water and wind erosion where a permanent vegetative cover other than that of herbaceous species is wanted. They are best used on steep or rocky slopes where mowing is not feasible, in shady areas where herbaceous species experience difficulty, and where forestry, landscaping and wildlife features are desired.

Trees and shrubs will help to control foot traffic, will not require as much maintenance as mowed lawns, and will be more attractive than unmowed grass cover. However, these plants cannot prevent soil slippage on a soil that is not stable due to its texture, structure, water movement or excessive slope.

DESCRIPTION

Species Selection

A wide range of trees and shrubs can be grown in Ontario. While cost and availability are important, the choice of species should be based on a range of criteria including winter hardiness, tolerance of soil and air conditions, and suitability for the purpose of planting.

In general, the choice of species narrows as the planting site becomes drier, less fertile and colder. Since erosion prone soils are often dry and infertile as well as unstable, the site should be carefully inspected before the final selection of species.

In general, species that are native to the area can be expected to be winter hardy. Winter hardiness zones, based mainly on minimum winter temperatures, have been published for many species that are available in Ontario. These zones can be used as a guide when selecting among exotic species.

Planting Stock

The success of any plantation will also largely depend on the quality and suitability of the planting stock. Good stock should be sturdy and have a well-branched root system.

When planting larger areas, it is usually best to use young plants grown in the nursery for only a few years. Young plants include rooted cuttings, seedlings (plants grown for one to three years from seed), transplants (seedlings that have been transplanted once) or small trees and shrubs 1 to 3 m tall. Larger stock for landscaping purposes may sometimes be needed, but this is more expensive and must be well cared for during the first few years. The best survival and growth will be shown by young stock that is relatively large for its age.

Seedlings and transplants are normally purchased bare-root (where soil is not kept around the roots) and the plant must be moved while the buds are completely inactive. However, trees 1 to 2 m tall should have soil kept around the roots in a root ball, either tied around with burlap (as balled and burlapped stock) or in a fibre or plastic pot (as containerized stock).

The Ontario Government will supply seedlings, cuttings and transplants of about 20 species at a very low cost to owners of at least 2 ha not including buildings. A wider range of trees and shrubs are available from commercial nurseries.

Wild plants may also be dug carefully and replanted on the property but this may be risky. Root pruning one or two years before digging may help by encouraging the growth of new roots. Small, shallow rooted deciduous trees growing in a clay loam soil are most easily transplanted.

INSTALLATION

Site Preparation

Site preparation is usually essential for planting most deciduous species. It may be in the form of complete or partial cultivation or chemical eradication of competing vegetation. However, site preparation has not been recommended for the Falcon Creek site.

Soil amendments and fertilizer can be applied at rates suggested by a soil test after trees are planted.

Planting

The best time to plant is in early spring, as soon as possible after frost leaves the ground. However, it may be more convenient to fall plant deciduous species that flush very early in the spring. Planting should be done when the plants are dormant.

Trees should be planted with minimum spacing of from 1.5 to 3 m apart. Shrubs may be planted at minimum spacings of 0.5 to 1.5 m.

Small Stock

Planting stock under 1 m in height should be planted by hand on steep or stony sites or on areas needing fewer than 4,000 trees. Hand planting involves making a hole with a hand shovel, placing the tree in the hole so that the roots are well extended below ground level with the stem upright above ground level, and packing the soil back firmly around the roots with the heel.

When larger number of plants are needed and gradients are accessible, a tractor-drawn planting machine with a two or three-man crew can be used.

Larger Stock

Plants 1 to 2 m tall are usually planted by hand.

Whenever possible, topsoil mixed with better quality subsoil should be used in the planting hole. If topsoil is unavailable, subsoil can be improved by mixing in 1/3 by volume of peat moss, composted manure, cocoa shells or well-rotted sawdust. About 0.03 kg of a complete fertilizer such as 10-10-10 per plant should then be added to the mixture going into the planting hole. Final depth of planting should be close to original depth.

With containerized stock, containers must be removed completely before planting. For balled and burlapped stock, any rope around the trunk is cut and removed after the tree has been placed in the hole. The burlap should be loosened and removed if practical without breaking the soil of the root ball. After the hole is half filled with soil, the soil should be packed firmly around the root ball. Water should be added to settle the soil and eliminate air pockets. When the water has drained off, the remainder of the hole can be filled and the soil packed as before. Extra soil can be used to form a shallow basin around the tree for holding irrigation water. (The basin should be eliminated before the following winter to prevent ice injury.)

Any corrective pruning should be done at the nursery prior to transportation to the planting site. If roots are broken or damaged, the tops of deciduous trees may be cut back to balance the root system. The leader on evergreens should remain untouched. (These conditions will be monitored by the forester or environmental inspector on-site.)

A temporary cover crop of non-competitive annuals can be used as an erosion control until planted materials offer protective cover. Where erosion hazard is very high, heavy jute netting or landscape mats of excelsior or fibreglass can be pegged to the slope (e.g. for larger gullies).

MAINTENANCE

Staking on the northwest side of the plant is necessary for trees over 1 m tall to prevent excessive swaying. A wooden or metal stake is driven firmly into the ground close to the tree and attached to the trunk by a commercial tie or a length of wire passed through a piece of rubber hose. Trees taller than 2 m may need two or three stakes or guy wires attached to pegs in the ground.

Ideally, young trees should receive about 2.5 cm of water each week for the first two years after planting. When rain does not supply this need, the trees should be watered deeply but not more than once per week. This is essential for larger stock in the first year. Poor soils can be fertilized according to soil test results.

Girdling by mice and browsing by ground-hogs and rabbits can cause heavy damage, particularly in deciduous plantations near grassy areas. Trees can be protected by wrapping the trunk with a commercial metal or plastic tree guard from ground level up to a height of 1 m. If necessary, mice populations may be temporarily reduced by the application of poisoned grain. (To be monitored by the environmental inspector.)

Staked trees should be checked before winter for two years to make sure the ties and wire are still secure. After two or three years, ties and stakes should be removed. Tree guards should also be checked in the fall to make sure they remain in place without damaging the trunk.

Health and survival of plants should be checked regularly after planting and the first fall or the following spring. If the survival rate is low, dead plants can be replaced by replanting.

As trees grow older, little maintenance is needed. Damaged or dead wood should usually be removed. However, this area will be left essentially unmanaged in a natural state.

WOODY STOCK SPECIFICATIONS

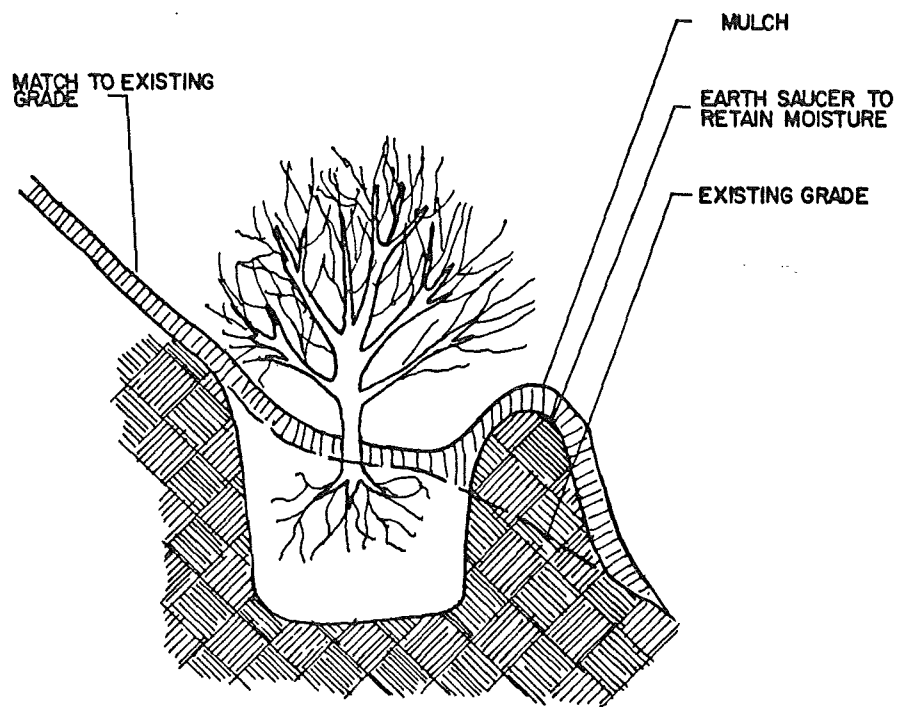
Planting Stock

1. Nursery stock shall be true to name, and of the size or grade stated. Sufficient labels or markings shall be used.
2. Nomenclature used to name specimens shall conform to the latest rules of the International Code of Nomenclature for Cultivated Plants.
3. Quality shall be normal for the species when grown under proper cultural practices. All nursery stock shall be viable, substantially free from pests and disease, and undamaged. Roots shall not be subject to long exposure to drying winds, sun or frost, between digging and delivery. Root balls or root soil shall be free from pernicious weeds such as couchgrass, horsetail, thistle and bindweed.
4. Packing or wrapping shall be adequate for the protection of the stock and sufficient to prevent heating or drying out during storage and transportation.
5. All normal quality nursery stock shall have an adequate fibrous root system cleanly cut at the ends. Split roots are not acceptable. Pertinent facts as to when larger stock was transplanted or root pruned should be available from supplier if requested.

6. Material dug from native stands or woodlots shall be designated as "collected".

Handling

1. Plants must be protected at all times from exposure to sun and drying winds by keeping the roots covered with moist material (e.g. peat moss, moist soil, wet sacking). Plants shall be shaded at all times between digging and planting.
2. Plants should be packed and tied tightly to prevent them from moving about and being damaged during transport.
3. Balled material must not be set on a concrete floor since earth balls will give off excessive moisture to the concrete and the roots will be damaged. Burlap balls should be laid on a sheet of polyethylene.
4. Plant material shall be handled as living material and not tossed around carelessly.
5. The time between digging and replanting shall be reduced to a minimum.
6. Plants that cannot be planted quickly shall be heeled in by placing the roots in a trench, inclining the stems at an angle of 45° or lower and covering the roots with soil. The soil covering the roots must be kept wet.



PLANTING DETAIL FOR SHRUBS ON SLOPE

APPENDIX B
STANDARDS AND SPECIFICATIONS
HYDROSEEDING

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HYDROSEEDING

INTRODUCTION

Hydroseeding refers to the establishment of plant cover by applying in one operation seeds of annual and perennial plants along with mulch, soil adhesives and water. Seed, mulch, soil adhesives and water are mixed together in a holding tank to form a slurry. The slurry is held in suspension by continuous agitation. Using a high pressure pump, the mixture is sprayed on the area to be revegetated.

APPLICATION

Hydroseeding is used to provide soil stabilization in disturbed areas. It is economical, adaptable to site conditions and it allows selection of the most appropriate plant materials. Hydroseeding will allow the rapid revegetation of the steep, shale slopes of Falcon Creek.

INSTALLATION

The surface soil must be loose enough for water infiltration and root protection. (Note: general seed bed preparation of Falcon Creek slopes is not recommended at this time.)

In the holding tank of the hydroseeding unit, the seed, mulch and water flurry are continuously agitated throughout the entire period of application to ensure a constant mixture.

The pressure required to spray the mix onto the site is produced by a special heavy pump. The hydroseeding unit is equipped with a mobile spray gun with a range of 60 m. Hoses increase the range of the unit to 150 m.

Hydroseeding is a relatively fast operation as seed, mulch, and soil binders are applied in one step. Depending on site conditions, between 4,000 and 20,000 m² can be hydroseeded in one day by one unit.

MAINTENANCE

It is necessary to water and fertilize the site, depending upon weather and soil conditions, during the year following the application of the seed. Fertilizer will need to be applied to the site, three to six weeks after installation, and as prescribed by the Environmental Inspector.

Prompt reseeding should occur in areas where the seeding has failed to catch.

HYDROSEEDING SPECIFICATIONS

1. Hydroseeding shall not be permitted during periods of heavy rain, strong winds or frost.
2. The slurry should be thicker than the normal 0.2 to 2 cm, due to the adverse site conditions. If more than one application is necessary the second layer should not be added until the first layer has dried or settled.
3. The bacterial inoculant should be applied at four times the normal rate, as legumes are included in the seed mix. Normal rate will be specified by the supplier. Inoculant must be added to water at room temperature.

VERDYOL SUPER

<i>Area of Use:</i>	Hydroseeding on—drastically disturbed soils —mine wastes —nutrient deficient soils —steep slopes —subsoils
	For —erosion control —dust binding —adhesion of seeds and mulch —soil stabilization without seeding.
<i>Product Specification:</i>	water-soluble brown powder weight per volume: 0.7 pH value: 7.3 does not form film on soil surface.
<i>Main components:</i>	polymerised, organic substances, derived from oceanic and land vegetation.
<i>Tolerability:</i>	VERDYOL SUPER is absolutely non-toxic.
<i>Application:</i>	Fill the hydroseeder as follows: —water —seed mix —VERDYOL MULCH (when required) —VERDYOL SUPER Mix thoroughly for about 10 minutes, then spray evenly onto the soil surface to obtain immediate erosion control.
<i>Recommended dosage:</i>	88 lbs/acre (40 kg/ha).
<i>Package:</i>	bags of 33 lbs (15 kg).

Canadian Distributor: VERDYOL MULCH OF CANADA LTD.
R. R. #4, Cookstown, Ontario, L0L 1L0
Telephone: (705) 458-9601

VERDYOL MULCH STANDARD

<i>Area of Use:</i>	Hydroseeding on—drastically disturbed soils —mine wastes —nutrient deficient soils —steep slopes —subsoils For —erosion control —seed protection.
<i>Product Specification:</i>	natural plant fibre fibre length: 0.6"-1.0" (15-25 mm) weight per volume: 0.25 in bales.
<i>Main components:</i>	sun-dried plant fibres (straw and hay) and cellulose-pulp.
<i>Potential of water uptake:</i>	tested in a cylinder of 0.4" in diameter and 1.6" high (1 x 4 cm) after 1 hour 320% by weight after 24 hours 532% by weight after 216 hours 701% by weight.
<i>Tolerability:</i>	VERDYOL MULCH is absolutely non-toxic.
<i>Application:</i>	Fill the hydroseeder as follows: —water —seed mix —VERDYOL MULCH (start as soon as tank is half-filled with water) —VERDYOL COMPLEX 50 or VERDYOL SUPER (when required) Mix thoroughly for about 10 minutes, then spray evenly onto the soil surface to obtain immediate erosion control.
<i>Recommended dosage:</i>	1,000-2,000 lbs/acre (1,120-2,240 kg/ha) depending upon site conditions.
<i>Package:</i>	bags of 50 lbs (22.7 kg).

Patent registered in Switzerland 548152 Patent applied for in Canada 263672 Patent applied for in U.S.A. 730544

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