



## RECLAMATION OF SURFACE WORKINGS FOR TREES

### I. LANDFORMS AND CULTIVATION, by W.O. Binns and D.F. Fourn

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#### Summary

Reclamation methods must provide air and water regimes in the soil-forming materials favourable to roots. Slopes must be sufficient to encourage water movement over and through the soil mass. Where slopes are less than 5°, ridges 30m and 1.5m high in the centre are necessary. Compaction must be relieved by deep ripping down-slope, ideally with winged tines mounted on a 300 hp crawler tractor. Loose-tipping of clays may remove the need for cultivation.

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#### Introduction

1. Most sites reclaimed after surface mining or quarrying are returned to agriculture but where the topsoil has been lost or the land was previously heath or woodland, forestry may be the preferred land use. Trees may also be planted for landscaping. The tree planter must ensure that site conditions are made as favourable as possible before planting, because that will be his only opportunity. The farmer, in contrast, can rip, mole and drain after cropping has begun, again and again if necessary. Though the reclamation package should always be site-specific, some or all of the measures described will be needed on most sites.

#### Landforms

2. Slopes encourage the movement under gravity of excess soil water to open drains and thence off site; adequate slopes are therefore basic to successful reclamation. Wherever land will have a slope after restoration of less than 5° (1:10 or 9 per cent), ridges 30m across and 1.5m high in the centre should be constructed to ensure water movement through and over the soil. Such ridges are conveniently made by the heavy earth-moving machines used by civil engineering contractors (e.g. box-scrappers, dozers, and dumpers) and can be constructed during the active restoration season from May to September. Erosion control is needed on slopes of 6-10°; contour drains or berms at 30m spacing intercept down-slope flow and prevent erosion. Slopes of 11-20° must be benched at about 20m vertical intervals, encouraging deep percolation and reducing surface flow. Any topsoil available can be spread on the surface.

#### Cultivation

3. Unfortunately heavy machines used on reclamation sites compact the spoil by closing the coarse pores necessary for drainage and aeration. Planting is then physically difficult and the conditions are unsuitable for healthy root growth. The compaction must be removed by ripping down-slope using a Caterpillar D8 or equivalent 300+ hp tractor carrying 3 heavy tines in a parallelogram mounting. The outer tines, at least, should be winged (Fig.1) and follow in the track lines. Tining must- and often can- only be done during dry weather in the May to September restoration season.

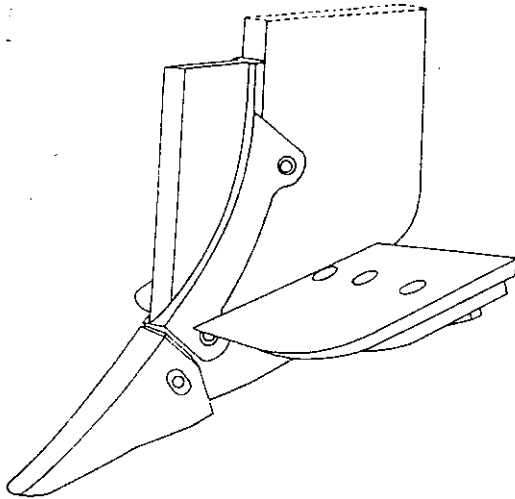


Figure 1 Winged tine

### Porous Sites

4. If porous strata underlie the site, cross ripping should be to 0.75m. A single pass along the furrow between ridges after complete ripping should provide sufficient through percolation to prevent run-off and erosion. (Fig.2)

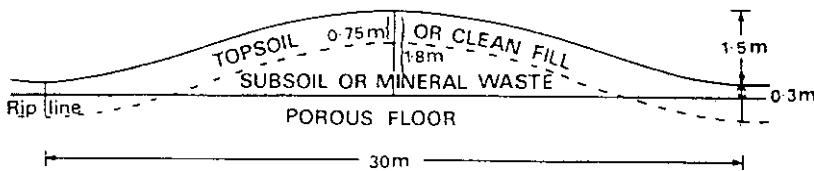


Figure 2. Landform for restoration over porous materials. Ridges ripped across by Caterpillar D8 with multi-shank ripper followed by one final pass long-ways, between ridges, to ensure thorough percolation; tool points at 0.75m. Vertical scale two times horizontal.

### Impervious Sites

5. Heavy textured spoils over impervious formations need only be ripped to 0.5m. On such sites, or where the compaction is very deep, the furrow between the ridges must be shaped and graded to form an open drain, using a side-acting bucket on a 360° tracked excavator working from the ridge top (Fig.3) The ridges themselves should therefore slope at about 1° longways. A set of heavy disks, again used crossways, will both provide small raised planting ridges and break up the clods left after ripping.

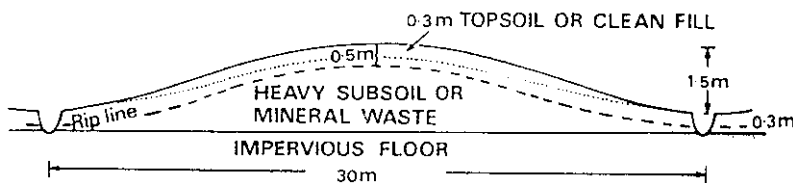


Figure 3. Landform for restoration over impervious materials. Ridges ripped as in Figure 1, but tool points at 0.5m on the ridges, 0.3m in the furrows. Drain put in by side-acting digger.

### Clay Spoils

6. Even after ridging and cultivation, physical conditions on the heaviest clay spoils may still be too bad for trees to grow. Trees planted into loose-tipped ridges, laid on such spoils as over-lapping heaps by (4x4 or 6x4 dumber trucks) without further cultivation, are showing promise.

### Topsoil

7. Importing topsoil is very expensive and it should always be conserved both for its nutrient content and its structure; it should be stored in low stacks on a well-drained base. Trees however seem to

establish well on most sites without good topsoil, so that a covering of clean mineral fill or subsoil will do. Furthermore, although weeds are happily rare on most restored sites, one of the disadvantages of topsoil is its content of dormant seeds. On sites without topsoil some alders or legumes are necessary to build up the site nitrogen (see ARN 38/84/SSS). It is of course essential to cover any noxious or difficult materials and to ensure that buried obstacles do not impede cultivation.

## **Grassing**

8. Grass or grass-clover swards may be sown on reclaimed areas before tree planting, to control erosion or improve appearance. Low maintenance mixtures of Brown bent and Crested dogstail are best, but pure legume swards are recommended for sites without topsoil (see ARN 38/84/SSS).

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