

PLANT SELECTION FOR DISTURBED SITES

Introduction

Disturbed sites are those which have had their topsoil disrupted or removed. This can happen because of earthworks or major soil erosion. Exposed subsoils lack the nutrients and organic matter of topsoils and are often difficult places to establish new vegetation. Plants are required that will tolerate limited fertility and soil moisture. Revegetation of disturbed sites should be carried out as soon as possible to take advantage of the available remaining soil moisture and before seed bed conditions deteriorate.

Site Preparation

To optimise conditions for plant establishment on disturbed sites, save topsoil wherever possible for respreading over the site. To enable new vegetation to establish, livestock should be excluded from the site and pests such as rabbits or wallabies should be well controlled. A number of other considerations should also be addressed.

Runoff Control

On soil erosion sites, runoff should be diverted to remove the cause of soil movement and further erosion. Use an appropriate runoff control such as a diversion bank, a cut-off drain or a detention dam (see *Sustainable Options SC09/98* Runoff Management on Pastures, and *SC10/98* Detention Dams).

On earthworks sites, runoff must also be controlled.

- Diversion banks or cut-off drains at the top of cut slopes will intercept runoff from upper slopes.
- Cut-off drains or culverts will reduce the volume of runoff flow in track/road water tables (see *Sustainable Options 05/98* Farm Tracks: Planning, Construction and Maintenance).
- Flumes will carry discharge from cut-off drains and culverts over fill slopes.
- Benches at 10-15 m vertical intervals on cut or fill slopes, with gradients of 1:50 (2% slope) or less, will intercept and divert run-off on slope faces.

Slope Stability

On sites where slope failures have occurred or the natural slope of the terrain exceeds 14° (25% slope), cut batters should have a gradient no steeper than 3:1. (i.e. rising 1m over a 3m distance) If the slope of

terrain is less than 14°, batter gradients up to 2:1 can be used. For fill slopes, a batter gradient of 3:1 is recommended. Where conditions allow, reduce the gradient of fill slopes as much as possible. This will increase their stability and provide a better surface for plant establishment.

Stabilising the toe of cut or fill slopes is also important, as any undercutting of this zone will rapidly lead to slope failure. At the base of cut slopes, a water table (drain) with gently sloping sides should be constructed 1-2m from the toe. This should be sown with grass seed (see below) as soon as possible, and not be deepened excessively during routine cleaning. Fill slopes are readily undercut at the toe, by running water in a permanent stream channel or ephemeral (temporary) channel. These zones can be protected with heavy rock material and/or the planting of vigorously rooting tree and shrub species.

Ground Cover Species

A diversity of grass and legume species combined with a high sowing rate will improve the likelihood of quick establishment and good cover. Where conditions are favourable – gentle slopes and a good layer of topsoil – conventional pasture mixes are adequate. For temporary, fast establishing cover, oats or barley can be sown at rates of 120 kg/ha to 150 kg/ha. Alternatively, blue lupin can be sown at around 100 kg/ha.

Seed mixes for oversowing most disturbed sites are suggested in Table 1. Sowing rates may be increased by 25% where conditions are particularly harsh, or be decreased by 25% if some topsoil is present. When oversowing slip faces, use the ‘pumice’ mix and add 3 kg/ha of red clover (eg ‘Grasslands Colenso’) plus 10 kg/ha of birdsfoot trefoil (eg ‘Grasslands Goldie’).

Establishment

Ensure that all legume seed has been inoculated with a suitable *rhizobium* before sowing. If soil pH is below 5.0, lime as required. As a general fertiliser recommendation, apply superphosphate at 450 kg/ha and sulphate of ammonia at 250 kg/ha (split between two dressings). Alternatively, use a single application of a compound NPK fertiliser (12:10:10) at 500 kg/ha.

Cultivating the site in some way will help to incorporate seed into the soil and improve germination. This can be done with a mob of sheep,

Table 1 Grass/legume Seed Mixes for Disturbed Sites

Species/Cultivar	Standard	Pumice
Annual ryegrass 'Grassland Moata'	24	30
Browntop 'Grassland Muster'	6	6
Cocksfoot 'Grassland Wana'	18	6
<i>Lotus pedunculatus</i> 'Grassland Maku'	6	12
Perennial ryegrass 'Grassland Nui'	15	15
Subterranean clover 'Mt Barker'	24	12
Suckling clover	6	12
White Clover 'Grassland Pitau'	18	12
Yorkshire Fog 'Massey Basyn'	18	30
Total	135	135

NB: "Pumice mix is suggested for coarse ash soils and pumice country.

or with chain harrows if access permits. Sites may also be mulched to protect against rain splash and drying out, and to help retain seed and fertiliser in place. Shredded paper or wood fibre can be used for this at rates of 1,000-1,500 kg/ha, or straw at rates of 2,500-6,500 kg/ha.



Use of chain harrows to mix seed into topsoil spread on a dam embankment. Harrows are being dragged by excavator arm

On steep slopes where oversown seed is not easily retained, an alternative establishment method is hydroseeding. This involves spraying a slurry of mulch material, seed and fertiliser, adhesives and water over the site. Specialised equipment is required and a number of commercial operators provide this service.

Trees and Shrubs

In addition to ground cover species, deeper rooting tree and shrub species are also useful for stabilising and protecting disturbed sites. The following species are suitable, and the addition of 60g of coarse grade 'MagAmp' fertiliser is recommended for incorporation in planting holes.

Indigenous Species

<i>Carmichaelia grandiflora</i>	Whaupaku
<i>Cassinia leptophylla</i>	Tauhinu, Cottonwood
<i>Coprosma lucida</i>	Shinning Karamu
<i>C. robusta</i>	Karamu
<i>Cortaderia fulvida</i>	Toetoe
<i>Dodonaea viscosa</i>	Akeake
<i>Griselinia littoralis</i>	Papauma, Broadleaf
<i>G. lucida</i>	Puka
<i>Hebe stricta</i>	Koromiko
<i>Kunzea ericoides</i>	Kanuka
<i>Leptospermum scoparium</i>	Manuka
<i>Metrosideros excelsa</i>	Pohutukawa
<i>Olearia albida</i>	Tanguru
<i>O. paniculata</i>	Akiraho
<i>O. solandri</i>	Coastal Tree Daisy
<i>Phormium tenax</i>	Harakeke, Flax
<i>Pittosporum crassifolium</i>	Karo
<i>P. tenuifolium</i>	Kohuhu
<i>Pomaderris apetala</i>	Tainui
<i>Sophora tetraptera</i>	Kowhai

Exotic Species

<i>Acacia. dealbata</i>	Silver Wattle
<i>Alnus incana</i>	Grey Alder
<i>A. viridis</i>	Green Alder
<i>Chamaecytisus palmensis</i>	Tagasaste, Tree Lucerne
<i>Robinia pseudoacacia</i>	Black Locust
<i>Salix purpurea</i>	Osier Willow c.v. 'Irette'
<i>S. x reichardtii</i>	Pussey Willow c.v. 'PN215'

Further Information

For further information contact a local Environment B·O·P soil conservator on freephone 0800 ENVBOP (0800 368 267)

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Further Reading

Plant Materials Handbook for Soil Conservation, Vol I-III CWS Van Kraayenoord and R L Hathaway (eds) Water and Soil Misc. Publ. No's 93, 94 and 95, NWASCO, Wellington

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