Melbourne Water Plant Selection and Provenance Standard

Melbourne Water is owned by the Victorian Government. We manage Melbourne's water supply catchments, remove and treat most of Melbourne's sewage, and manage rivers and creeks and major drainage systems throughout the Port Phillip and Westernport region.

Enhancing Life and Liveability

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Executive Summary

The purpose of this document is to provide Melbourne Water's stakeholders with a clear set of specifications regarding plant selection and provenance in line with Melbourne Waters *Wetland Design Manual Part A2: Deemed to comply design criteria and the various planting standards.*

Introduction

Melbourne Water invests substantial resources annually into the construction and management of Water Quality treatment Systems (constructed wetlands) across its operating area.

The selection and provenance of plants installed within these wetlands is a key determinant of plant establishment and survival and ultimately project success. Given the scope of these works and the amount of money invested, it is critical that Melbourne Water has clear standards articulating the organisation's needs, also adhering to the highest industry standards.

Overview

To maintain and protect the genetic diversity of Melbourne's indigenous flora and to provide advice about appropriate boundary's and definitions of local indigenous provenance.

This policy sets the standard for the supply of plants whether grown from seed or vegetative material for Melbourne Water projects. It will also ensure that planting activities do not adversely affect the genetic integrity of existing indigenous floral populations and provide replanted areas with the best chance of success under local conditions.

Parties undertaking planting works will need to ensure that they adhere to this plant supply policy and consider procurement issues well in advance to ensure that suitable plant material is used for each specific site or project.

The suitability of material will be guided by principles based upon the ecology of the individual species and the functional need of the site. When a species list is put together for a site it must consider the ecological requirements of a site and follow the relevant Ecological Vegetation Class (EVC), adhere to the Melbourne Water Vision Template for the site and be fit for purpose.

What is provenance?

Provenance is usually defined as the geographic place of origin of a population of seed or plants, or as the population of plants growing at a particular geographic location (Turnbull and Griffin 1986). The term provenance is used to reflect the genetic variability found at different locations and to distinguish between them.

Generally the wider the distribution of woody plants the greater the genetic diversity (Boland, 1986). For Grasses and sedges this can vary depending upon their ecology. The genetic diversity of plant populations is strongly influenced by the method of pollination (eg. insect, animal, self or wind) and the size and geographic continuity of populations.

This diversity is most obviously expressed as morphological differences and subtly as adaptations to the local conditions. Local diversity/adaptations are referred to as genotypes. Genetic diversity may not be apparent via a genotypic expression. But may also represent a significant portion of diversity.

Our remnant flora is a reflection of the situation pre-European colonisation, provenance considerations need to reflect this.

What influences genetic diversity within a plant species?

- Adaptations to local conditions over time (soil, rainfall etc.).
- Pollination, reproduction, seed/propagules dispersal mechanism.
- Population distribution; widespread continuous, widespread fragmented, restricted/localised.
- Physical barriers in the landscape (rivers, ridgelines, mountains, unfavourable environmental conditions, and distance).
- Regional factors such as prevailing wind.

What threatens biodiversity and genetic diversity?

- Loss of vegetation.
- Increased fragmentation.
- Loss of ecological integrity of populations (e.g. loss of pollinators).
- Introduction of different genotypes or closely related species which will cross pollinate with the local populations producing hybrids. This genetic contamination may have an adverse impact on the adaptation and viability of native populations (Byrne et al. 2008).

This policy will ensure that local genetic resources are not degraded by the introduction of genes from genetically divergent populations. Similarly isolated populations may benefit from the introduction of genetic resources from closely located genotypes.

How do we define provenance?

In the past this has been done via a number of general 'rules of thumb':

- As close as possible.
- Within 25km radius of the site.
- Within a catchment.
- Within a bioregion.
- Based upon biological attributes of individual species.

This policy will determine provenance based on the site conditions and biology of individual species.

How is provenance based on the site conditions and biology of individual species?

Initially we need to consider:

Species selection:
To determine if the species is fit for the purpose / function intended for the planting on a particular site the following points need to be considered.

1 Will it fulfil the role specified?
2 Is it known to grow in the site soil conditions to be planted? (local geology, nutrient levels, waterlogging, pH alkalinity/acidity, salinity, and soil depth).
3 Grows or is known to grow in the same position in landscape as proposed based on other knowledge of the species; aspect, position on slope etc.
4 Soil moisture over time is adequate
5 Will it establish within existing conditions and competition - presence of other indigenous plants or weeds (refer appendix A)?
6 Is the species appropriate to the desired EVC and bioregion?
7 Is it found locally or is it appropriate to grow locally based on historical information and knowledge about the plants ecological and physiological requirements?

If the answer to the above points is yes in each case, that species is appropriate.
If the answer is no to any of the points then another species should be considered.
If there are no other species suitable and the only point in the negative is (7) then a case needs to be mounted to use the plant specified (eg the site is severely affected by secondary salinity and no local plants will survive).

Provenance guideline

Once the species have been chosen there should be local seed/propagules available.
The distance range that the propagation plant material can come from now depends upon the individual species.

Species need to be assessed against different parameters.

GROUP	PROVENANCE DISTANCE	DETERMINING FACTORS
Group 1	Material can be moved UP TO 20 km and MUST BE within a catchment, MUST BE within a bioregion and MUST BE from the same parent soil material and MUST NOT be moved over a large landscape barrier. EXAMPLES • Snow Gum *Eucalyptus pauciflora* (Eg Barbers Creek and Plenty River), Yarra Gum *Eucalyptus yarraensis*, Clustered Everlasting *Chrysocephalum semipapposum*, Curly Sedge *Carex tasmanica,* Rock Correa *Correa glabra.*	Clear morphological differences between populations. Self or insect pollinated & seed dispersed by falling or insect. Highly fragmented population distribution pre-European colonization.
Group 2	Material CAN BE moved between 20 km and UP TO BUT NOT BEYOND 60km within a catchment. EXAMPLES • Spiny Headed Mat Rush *Lomandra longifolia* Prickly Moses *Acacia verticillata* Sweet Bursaria *Bursaria spinosa*, Hop Goodenia *Goodenia ovata*, Flax Lily *Dianella spp*. Native Raspberry *Rubus parvifolius*	Some morphological differences. Pollinated via animal or self. Dispersed via animal, wind or water. Fragmented or moderately restricted distribution.
Group 3	Material can be moved up to but not beyond 100	Few morphological

	km. EXAMPLES • Kangaroo Grass *Themeda triandra* (genetic evidence informing extent of variation within and between populations), Wallaby Grasses *Rhytidosperma spp*, widely distributed wetland species eg Pale Rush *Juncus pallidus,* River Club Rush *Schoenoplectus tabernaemontani*	differences. Pollinated via wind or self. Dispersed via wide ranging animal, wind or water Wide population range. Genetic analysis confirms wide variation within populations

The overall principle is to keep to the same parent soil type, same bioregion and as close to the site as possible. Suitable plant material needs to be sourced from within the allowable range as shown above. The majority of species will fall into Group 2.

Seed collection

Remnant populations of plants are generally the best sources of seed. However, many remnant populations are under stress due to their small size and from over collection. Also some species are in such low numbers the seed produced on some sites may show low fertility and inbreeding depression with progeny not viable in the long term.

With this in mind it is appropriate to collect seed from revegetation sites if:

- The seed collector can prove the origins of the plants on the site. I.e. material must adhere to a strict source to site principle so that all material during all stages can be traced back to its original remnant source when provided for a revegetation site.

Where the source of origin cannot be traced then that site is not suitable as a seed collection location.

Documentation required

All seed or plant collection must be conducted under a permit issued by the Department of Environment , Land, Water and Planning and using the Flora Bank Guidelines (*Model Code of Practice for community based collectors and suppliers of native seed*)

This is to ensure that collection of high quality and genetically diverse seed is undertaken in an ecologically sustainable way.

Care must be taken to ensure high quality seed is collected from as many parents as possible avoiding closely related and isolated individuals.

Detailed records of the seed collection need to be made so that the source of seed can be tracked throughout the propagation process. This includes collection, storage, propagation, growing and planting of plants on projects.

At a *minimum* the following MUST to be recorded:

- Species (Nomenclature to follow Census of the Vascular Plants of Victoria N.G. Walsh & V. Stajsic)
- Date collected.
- Unique site identifier (Name and map reference).
- Name of collector and permit number.

In addition the following information SHOULD BE AVAILABLE

- Number of parent plants (if greater than 20 - record 20+)
- Quantity collected (field volume and post cleaning amount should be noted).
- Site status (Land owner, remnant or revegetation population etc.)
- Parent Soil Type, EVC.
- Timing of seed crop (early, peak or post maturity).

As the seed is used from a seed lot the amount taken should be tracked.

All plants supplied need to have the provenance (Site Identifier) indicated on the delivery docket. This will need to be verifiable via an audit trail from the field collection of seed through cleaning, storing, propagation and growing of the plants then delivery to site.

References

Boland (1986) Delineating seed provenance areas for revegetation from patterns of genetic variation

Byrne et al. (2008) Assessing genetic risk in revegetation

Florabank (2018) http://www.florabank.org.au/default.asp?V_DOC_ID=755.

N.G. Walsh & V. Stajsic (2007) Nomenclature to follow Census of the Vascular Plants of Victoria

Appendix A: PRIORITY WEED SPECIES

The below is an indicative list of problem weed species, additional species may be required to be controlled depending on their impact.

State controlled and state prohibited weeds are not included however any contractor suspecting that these species are present must inform Melbourne Water and DELWP to ensure appropriate control is undertaken.

PRIMARY CONTROL USUALLY FOR SITE PREPARATION

Agrostis capillaris s.l.	Brown-top Bent
Anthoxanthum spp.	Vernal Grass
Crocosmia X crocosmiiflora	Montbretia
Cynodon dactylon var. dactylon	Couch
Cyperus eragrostis	Drain Flat-sedge
Dactylis glomerata	Cocksfoot
DOCK	Any genus eg Acetosa, Rumex etc.
Echium plantagineum	Paterson's Curse
Echinochloa spp.	Barnyard Grass
Ehrharta spp.	Veldt Grass
Galenia pubescens var. pubescens	Galenia
Genista spp.	Broom
Glyceria spp.	Eg Reed Sweet Grass
Holcus spp.	Fog Grass
Hordeum spp.	Barley Grass
Juncus spp.	Eg Jointed Rush
Leersia oryzoides	Rice Cut-grass
Myriophyllum aquaticum	Parrot's Feather
Nassella spp.	Eg Serrated Tussock, Chilean Neddle Grass etc
Nasturtium spp.	Watercress
Oxalis spp. (naturalised)	Wood Sorrel
Paspalum spp.	Eg Water Couch, Paspalum
Pennisetum spp.	Eg Kikuyu
Phalaris spp.	Canary Grass
Phytolacca octandra	Red-ink Weed
Plantago spp.	Eg Ribwort
Polygonum aviculare s.l.	Prostrate Knotweed
Polypogon spp.	Beard Grass
Ranunculus spp.	Eg Creeping Buttercup
Romulea spp.	Onion Grass
Rubus fruticosus spp. agg.	Blackberry
Sagittaria spp.	Sagittaria
Sparaxis spp.	Harlequin Flower
THISTLES	Any genus eg. Cirsium, Helminthotheca, Cynara
Typha spp.	Eg Lesser Reed Mace
Vinca spp.	Periwinkle
Watsonia spp.	Watsonia

SECONDARY CONTROL USUALLY FOR MAINTENANCE

Allium triquetrum	Three-corner Garlic
Arctotheca calendula	Cape Weed
Aster spp.	Aster
Avena spp.	Oat
Brassica spp.	Turnip
Briza spp.	Quaking Grass
Bromus spp.	Bromus
Chenopodium spp.	Fat Hen
Conyza spp.	Fleabane
Echium spp.	Bugloss
Erodium spp.	Eg Common Herons Bill
Fumaria spp.	Fumitory
Galium aparine	Cleavers
Lactuca spp.	Lettuce
Lolium spp.	Rye Grass
Lotus spp. (naturalised)	Trefoil
Medicago spp.	Medic
Ornithopus spp.	Bird's Foot
Sisymbrium spp.	Mustard
Solanum spp.	Eg Black Nightshade
Sonchus sp	Eg Common Sow Thistle
Taraxacum species group 1	Garden Dandelion
THISTLES	Any genus eg. Cirsium, Helminthotheca, Cynara
Trifolium spp.	Clover

NB Species have designated into PRIMARY and SECONDARY as an indication of when control efforts are most likely to be required however individual sites may respond differently depending on management and external factors. Species may be present in one or both phases and control will be required at the discretion of Melbourne Water.