

Policy 11: Land Development Guidelines

Section 13 Water Sensitive Urban Design (WSUD) Guidelines

13.13 Plant Selection for WSUD Systems

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13.13.1 Introduction

Water Sensitive Urban Design is an integrated system that delivers both stormwater quality objectives and can also enhance the overall landscape amenity and sense of place. Plant selection plays an important role in achieving both these desired outcomes. Appropriate planting design will deliver a multifunctional role of aiding in stormwater quality management, visual aesthetics and habitat recreation.

Through a considered design process, issues such as on-going maintenance costs of planted areas can be managed and planned for with greater certainty of a sustainable outcome. Plant species for a variety of WSUD landscape systems are attached to this section and are as follows:

Table 13.13-A and Table 13.13-B:

- swales (and buffer strips);
- bioretention swales;
- bioretention basins.

Table 13.13-C and Table 13.13-D:

- sedimentation basins;
- wetlands.

The plant species lists are not exhaustive and other plants may be used provided their physiological and structural characteristics match the characteristics of the plant species listed in the tables.

The species listed are predominately for meeting stormwater quality requirements and do not cover many species that would contribute to a visually attractive landscape. When considering these additional species, an understanding of the impact on the local and regional natural environments should be high on the landscape architects checklist. Many hybrid native species are not endemic to local areas within the Gold Coast and could pose risks through invasion into natural remnant forests, by seed transfer through waterways. Gold Coast City Council has compiled a list of potentially environmentally damaging species, which is detailed in the **Gold Coast City Landscape Strategy Part 2 Landscape Works Documentation Manual Section D - 1.2 and 1.3**.

13.13.2 Swales and Buffer Strips, Bioretention Swales and Bioretention Basins

13.13.2.1 Required Plant Characteristics

The plant species listed in **Table 13.13-A** have been specifically selected, based on their life histories and physiological and structural characteristics, to meet the functional requirements of swales, buffer strips and bioretention systems (ie. bioretention swales and bioretention basins). Other species can be used provided they have the required features to fulfil the functional roles of the WSUD element. In general, the plant species in **Table 13.13-A** have the following features:

- they are able to tolerate short periods of inundation punctuated by longer dry periods. For bioretention systems these dry periods may be reasonably severe due to the free draining nature (relatively low water holding capacity) of bioretention filter media;
- they generally have spreading rather than clumped growth forms;
- they are perennial rather than annual;
- they have deep, fibrous root systems;
- groundcover plants can be turf, prostrate or tufted;
- prostrate species would typically be low mat forming stoloniferous or rhizomatous plants;
- tufted species would typically be rhizomatous plants with simple vertical leaves.

Shrubs and trees are not required within swales and bioretention swales, but can be integrated to provide amenity, character and landscape value. If using shrubs and trees, they must be accompanied by shade tolerant groundcover species with the above characteristics.

Planting for bioretention systems elements may consist of up to three vegetation types:

1. Groundcovers for stormwater treatment and erosion protection.
2. Shrubbery for screening, glare reduction and character.
3. Trees for shading, character and other landscape values.

a) Groundcovers

The plant (groundcover) species listed in **Table 13.13-A** have been specifically selected, based on their life histories and physiological and structural characteristics, to meet the functional requirements of swales, buffer strips and bioretention systems (ie. bioretention swales and bioretention basins). It should be noted that bioretention systems are designed to drain between events either through exfiltration to *in-situ* soils or through subsurface drainage placed in the base of the system. Some bioretention systems may be lined with geofabric and in this case efficient subsurface drainage is always provided within the lining to maintain free draining aerobic conditions in the filter media. Plant species selected for bioretention systems must therefore be able to tolerate these free draining conditions which result in long dry periods punctuated by very short periods of temporary inundation. Suitable plants species are listed in **Table 13.13-A**. Other species can be used provided they are tolerant of the filter media conditions and have the required features to fulfil the functional roles of the WSUD element.

Most of the groundcover listed in **Table 13.13-A** are widespread, occurring throughout south-east Queensland. However, alternative locally endemic species that display the required features may be selected to tailor the species list to match the native vegetation associations of the area and to compliment surrounding vegetation communities. Please refer to the **Gold Coast City Landscape Strategy (Parts 1 and 2)** for further guidance on landscape works.

b) Shrubs and Trees

Shrubs and trees are not a functional requirement within swales, bioretention swales or bioretention basins, but can be integrated to provide amenity, character and landscape value. Planting trees and shrubs in bioretention systems requires the filter media to have a minimum depth of 800mm to avoid root interference with the perforated subsurface drainage pipes. They must also be accompanied by densely planted shade tolerant groundcover species with the characteristics outlined above. Trees and shrubs are to be managed so that the ground cover layer is not out-competed. To avoid over-shading, trees and shrubs should be planted at low densities. Periodic thinning of the upper vegetation layers may also be required. In general, tree and shrub species that can be incorporated into bioretention systems have the following general features:

- trees need to be able to tolerate short periods of inundation punctuated by longer dry periods. These dry periods may be reasonably severe due to the free draining nature (relatively low water holding capacity) of bioretention filter media;
- they need to have relatively sparse canopies to allow light penetration to support dense groundcover vegetation;
- have shallow root systems and root systems that are not known to be adventurous 'water seekers' to reduce the risk of root intrusion into subsurface drainage pipes;
- trees must not be deciduous;
- preferably native and occur naturally in the local area.

The shrubs and trees listed in **Table 13.13-B** are recommended as they display the above features.

Most of the shrub and tree species listed in **Table 13.13-B** are widespread, occurring throughout south-east Queensland. However, alternative locally occurring species that display the required features may be selected to tailor the species list to match the native vegetation associations of the area and to compliment surrounding vegetation communities.

13.13.2.2 Plant Species Selection

Well established uniform vegetation is crucial to the successful operation of swale and bioretention system treatment elements. As a result, plant species selection needs to consider both the aesthetic and functional requirements.

When selecting plant species from the lists provided, consideration must be given to the following factors:

- other WSUD objectives such as landscape, aesthetics, biodiversity, conservation and ecological value;
- region, climate, soil type and other abiotic factors;
- roughness of the channel (Manning's *n* roughness factor) (for swales);
- extended detention depth (for bioretention systems).

Typical heights of each plant species and comments relating to shade and salt tolerances and soil moisture requirements are provided in **Table 13.13-A** and will help with the selection process. The low growing and lawn species are suitable for swale elements that require a low hydraulic roughness. The treatment performance of bioretention systems, in particular, requires dense vegetation to a height equal to that of the extended detention depth. Therefore, a system with a 300 mm extended detention depth should have vegetation that will grow to at least 300 mm high. All of the selected plant species are able to tolerate periods of both wetting and drying.

Included in **Table 13.13-A** is a recommended planting density for each plant species. The planting densities should ensure that 70-80 % cover is achieved after two growing seasons (2 years) given adequate irrigation and weed control. These high densities are required to ensure runoff does not establish preferential flow paths around the plants and erode the swale/ bioretention surface. High density planting is also required to ensure a uniform root zone, which is particularly important in bioretention systems, and reduces maintenance costs associated with weed control.

If prostrate shrubs that form scrambling thickets are used (in place of or in conjunction with the plant species in **Table 13.13-A**) they should be planted at high densities (8-10 plants/m²) and may require pruning to ensure even plant cover and to maintain an even root distribution below ground.

13.13.2.3 Vegetation Establishment and Maintenance

Swales, buffer strips and bioretention basins are living systems and require two years of establishment before the vegetation matures and reaches fully functional form. During this establishment period, regular site monitoring and maintenance is critical to the success of these systems. In addition, specific requirements for plant stock sourcing, topsoil selection and testing and vegetation establishment, as detailed in the relevant WSUD element chapters, are necessary to maximise successful vegetation establishment and system treatment performance. Particular reference is made to the sections titled '**Landscape Design Notes**', '**Maintenance Requirements**' and '**Construction and Establishment**' for guidance on vegetation establishment and maintenance procedures. The '**Construction and Establishment**' section also details a staged implementation approach by which the functional elements of the WSUD system are protected from building site runoff and associated sedimentation, weeds and litter during the building phase.

Table 13.13-A: Groundcover Plant Species List for Swales (Incorporating Buffer Strips), Bioretention Swales and Bioretention Basins

Scientific Name	Common Name	Form	Height (mm)	¹ Planting Density (Qty/m ²)	Comments
<i>Cynodon dactylon</i>	Couch	Turf	50-150	Seeded or rolled	Mowing required to achieve smaller heights
<i>Digitaria didactyla</i>	Blue Couch	Turf	50-150	Seeded or rolled	Mowing required to achieve smaller heights
<i>Paspalum distichum</i>	Water Couch	Turf	To 500	Seeded or rolled	Not suitable for sandy soils with low water holding capacity
<i>Paspalum vaginatum</i> cv 'Saltene'	Salt Water Couch	Turf	To 500	Seeded or rolled	Salt tolerant
<i>Sporobolus virginicus</i>	Marine Couch	Turf	To 400	Seeded or rolled	Salt tolerant
<i>Stenotaphrum secundatum</i>	Buffalo	Turf	50-150	Seeded or rolled	Mowing required to achieve smaller heights
<i>Bacopa monnieri</i>	Bacopa	Prostrate	100	6-8	Not suitable for sandy soils with low water holding capacity
<i>Myoporum parvifolium</i>	Creeping Boobialla	Prostrate	150	4-6	
<i>Baumea teretifolia</i>		Tufted	300-1000	6-8	Not suitable for sandy soils with low water holding capacity
<i>Carex appressa</i>	Tall Sedge	Tufted	1000	6-8	Not suitable for sandy soils with low water holding capacity
<i>Carex fascicularis</i>	Tassel Sedge	Tufted	1000	6-8	Not suitable for sandy soils with low water holding capacity
<i>Carex gaudichaudiana</i>	Tufted Sedge	Tufted	600	6-8	Not suitable for sandy soils with low water holding capacity
<i>Carex polyantha</i>	Creek Sedge	Tufted	To 900	6-8	Not suitable for sandy soils with low water holding capacity
<i>Carex pumila</i>	Coastal Sedge	Tufted	250	8-10	Salt tolerant
<i>Cymbopogon refractus</i>	Barbed Wire Grass	Tufted	300	8-10	
<i>Cyperus gunnii</i>	Fleeced Flat-sedge	Tufted	1000	6-8	Not suitable for sandy soils with low water holding capacity
<i>Cyperus polystachyos</i>	Bunchy Sedge	Tufted	600	6-8	
<i>Dianella brevipedunculata</i>	Flax Lily	Tufted	500	4-6	
<i>Dianella caerulea</i> cv 'Breeze'	Blue Flax-lily	Tufted	600	4-6	
<i>Dianella caerulea</i> cv 'Little Jess'	Blue Flax-lily	Tufted	400	4-6	Shade tolerant
<i>Dianella longifolia</i> var. <i>longifolia</i>	Pale Flax-lily	Tufted	300-800	6-8	Shade tolerant
<i>Dianella tasmanica</i>	Tasman Flax-lily	Tufted	1500	4-6	Shade tolerant
<i>Dichelachne crinita</i>	Long Haired Plume Grass	Tufted	200	6-8	
<i>Dietes bicolor</i>	Dietes	Tufted	1000	4-6	Exotic
<i>Dietes grandiflora</i>	Dietes	Tufted	750	4-6	Exotic
<i>Eragrostis elongata</i> cv 'Elvera'	Elvera	Tufted	300	6-8	
<i>Gahnia aspera</i>	Saw Sedge	Tufted	1000	4-6	Not suitable for sandy soils with low water holding capacity
<i>Gahnia sieberiana</i>	Red-fruited Sword Sedge	Tufted	1500-3000	4-6	
<i>Imperata cylindrica</i>	Blady Grass	Tufted	500	6-8	

Scientific Name	Common Name	Form	Height (mm)	¹ Planting Density (Qty/m ²)	Comments
<i>Ficinia nodosa</i> (Syn. <i>Issolepis nodosa</i>)	Knobby Club Rush	Tufted	600	4-6	Salt tolerant, sandy conditions
<i>Juncus kraussii</i>	Sea Rush	Tufted	600-2300	8-10	Salt tolerant
<i>Juncus usitatus</i>	Common Rush	Tufted	500	8-10	Not suitable for sandy soils with low water holding capacity
<i>Lepidosperma laterale</i>	Variable Sword Sedge	Tufted	500-1000	6-8	Shade tolerant
<i>Lomandra confertifolia subsp confertifolia</i>	Matting Lomandra	Tufted	300	4-6	Shade tolerant
<i>Lomandra confertifolia subsp pallida</i>	Mat Rush	Tufted	400	4-6	Shade tolerant
<i>Lomandra hystrix</i>	Creek Matt Rush	Tufted	1000	4-6	Shade tolerant, not suitable for sandy soils with low water holding capacity
<i>Lomandra longifolia</i>	Matt Rush	Tufted	1000	4-6	Shade tolerant
<i>Lomandra longifolia</i> cv 'Tanika'	Tanika	Tufted	500	4-6	Shade tolerant
<i>Poa labillardiere</i> cv 'Eskdale'	Eskdale	Tufted	450	6-8	
<i>Themeda australis</i>	Kangaroo Grass	Tufted	300-500	6-8	
<i>Themeda australis</i> cv 'Mingo'	Mingo	Tufted	200	8-10	

Notes:

1 Planting density indicates the mean number of plants per square metre for the species spatial distribution within the zone. The planting densities recommended are suggested minimums. Any reduction in planting density has the potential to reduce the rate of vegetation establishment, increase the risk of weed invasion, and increase maintenance costs.

* *Pennisetum alopecuroides* is native to Australia and is not invasive as it has low seed viability and is grown by division. This species is not to be confused with *Pennisetum setaceum* an introduced African variety that has become a weed in Australia.

Table 13.13-B: Shrub and Tree Plant Species List for Swales (incorporating Buffer Strips), Bioretention Swales and Bioretention Basins

Scientific Name	Common Name	Form	Height (mm)	² Planting Density (Qty/m ²)	Comments
<i>Breytia oblongifolia</i>	False Coffee Bush	Shrub	1.0-2.0	2-4	
<i>Callistemon sieberi</i>	River Bottlebrush	Shrub	3-10	1	Requires moist conditions during establishment but tolerates dry periods once established
<i>Hardenbergia violacea</i>	Purple Coral Pea	Shrub	1.0-3.0	2-4	Scrambling or prostrate, full sun to light shade
<i>Jacksenia scoparia</i>	Dogwood	Shrub	1.0-3.0	2-4	Sunny position
<i>Kunzea ericoides</i>	Burgan	Shrub	2-6	<1	
<i>Leptospermum polygalifolium</i>	Wild May	Shrub	1.0-4.0	2-4	Sunny position
<i>Lomatia silaifolia</i>	Crinkle Bush	Shrub	1.0-2.0	2-4	Partial sun or shade
<i>Myoporum acuminatum</i>	Coastal Boobialla	Shrub	0.5-6.0	2-4	Sun or semi-shade, salt tolerant
<i>Callistemon salignus</i>	White Bottlebrush	Tree	2.0-15.0	1	Full sun to semi-shade
<i>Callistemon sieberi</i>	River Bottlebrush	Shrub	3-10	1	Requires moist conditions during establishment but tolerates dry periods once established
<i>Callistemon viminalis</i>	Weeping Bottle Brush	Tree	5.0-10.0	<1	Requires moist soils during establishment but tolerates dry periods once established
<i>Elaeocarpus obovatus</i>	Hard Quandong	Tree	5.0-30.0	<1	
<i>Eucalyptus camaldulensis</i>	River Red Gum	Tree	12-50	<1	
<i>Eucalyptus ovata</i>	Swamp Gum	Tree	8-30	<1	
<i>Lophostemon confertus</i>	Brush Box	Tree	10-30	<1	
<i>Lophostemon suaveolens</i>	Swamp Box	Tree	5.0-25.0	<1	Sunny position
<i>Melaleuca bracteata</i>	River Tea Tree	Tree	5.0-15.0	<1	Sunny position
<i>Melaleuca linariifolia</i>	Flax-leaf Paperbark	Tree	5.0-10.0	<1	
<i>Melaleuca nodosa</i>	Prickly-leafed Paperbark	Tree	2.0-7.0	2-4	Sunny position
<i>Melaleuca quinquenervia</i>	Broad-leafed Paperbark	Tree	8.0-25.0	<1	
<i>Melaleuca sieberi</i>	Small-leaved Paperbark	Tree	2.0-10.0	<1	

Note:

- 2** Planting density indicates the mean number of plants per square metre for the species spatial distribution within the zone. The planting densities recommended are suggested minimums. Any reduction in planting density has the potential to reduce the rate of vegetation establishment, increase the risk of weed invasion, and increase maintenance costs.

13.13.3 Wetlands, Sedimentation Basins, Ponds and Lakes

13.13.3.1 Required Plant Characteristics

Planting for wetlands and sedimentation basins may consist of two vegetation types:

- macrophytes and groundcovers for stormwater treatment and erosion protection. The macrophytes are divided further into a range of different zones as outlined in **Table 13.13-C**;
- shrubbery and trees for screening, shading, character and other landscape values.

a) Macrophytes and Groundcovers

The plant species listed in **Table 13.13-C** have been specifically selected based on their life histories and physiological and structural characteristics, to meet the functional requirements of wetland systems. Plant species suitable for wetlands will also be suitable for edge planting around sedimentation basins at corresponding depth ranges. The following sections address wetlands specifically as they have very defined vegetation requirements for stormwater treatment. This includes consideration of the wetland zone/ depth range, typical extended detention time (typically 48-72 hrs) and extended detention depth (typically 0.25-0.5 m).

Other species can be used to supplement the core species listed in **Table 13.13-C** provided they have the required features to fulfil the functional roles of the wetland zone. Careful consideration of the water depth range and wetland hydrological regime (water depth and inundation period) is also required to assess the suitability of alternate species for constructed wetlands.

In general, the species in **Table 13.13-C** have the following features:

- they grow in water as either submerged or emergent macrophytes, or they grow adjacent to water and tolerate periods of inundation (typically sedge, rush or reed species);
- they generally have spreading rather than clumped growth forms;
- they are perennial rather than annual;
- they generally have rhizomatous growth forms;
- they have fibrous root systems;
- they are generally erect species with simple vertical leaves (eg. *Juncus spp*, *Baumea spp*).

b) Shrubs and Trees

Shrubs and trees are not a required element of wetlands or sedimentation basins but can be integrated to provide amenity, character and landscape value. Shrubs and trees (generally only planted in the littoral or ephemeral zones) should be accompanied by shade tolerant groundcover species with the above characteristics as an understorey as periodic inundation during extended detention may occur. **Table 13.13-D** provides a list of shrubs and trees that are natives to south-east Queensland and are suitable for planting in the littoral zone (ie. on the batters) around wetlands and sedimentation basins.

Littoral zone vegetation (as opposed to ephemeral marsh vegetation) is primarily for batter stabilisation, aesthetics and to restrict public access, rather than for stormwater treatment. For this reason, species that do not have all of the above structural features, but fulfil the primary littoral zone requirements (eg. erosion protection) and landscape objectives may still be acceptable for inclusion in this zone (refer to the 'Landscape Design Notes' section in the relevant WSUD chapter).

13.13.3.2 Plant Species Selection

Plant species listed in **Table 13.13-C** are recommended as core species for wetland planting. These plant species have been grouped into a wetland macrophyte zone according to their preferred water depth and the hydrologic conditions of the zone.

While individual plant species can have very specific water depth requirements other species can be quite adaptive to growing across various zones over time. It is however, recommended that the suggested zones and plant groups are adhered to for planting purposes. Plant species listed against the shallow marsh and ephemeral marsh wetland zones are equally suitable for edge planting (at equivalent depths) in sedimentation basins, ponds and lakes. Planting densities recommended should ensure that 70-80% cover is achieved after two growing seasons (2 years).

Suitable plant species for the batters that surround wetlands, ponds, lakes and sedimentation basins have also been recommended in **Table 13.13-C**. The batters relate to the berms or embankments around the systems that may extend from the permanent pool water level to (typically) 0.5 m above this design water level (ie. within the extended detention depth). Plants that have a drier habit should be planted towards the top of batters, whereas those that are adapted to more moist conditions should be planted closer to the water line.

13.13.3.3 Vegetation Establishment and Maintenance

The period of establishment and maintenance of vegetation within a wetland system is a critical phase of the wetland construction and operation process. To maximise the success of plant establishment in wetland macrophyte zones specific procedures are required in site preparation, stock sourcing, vegetation establishment and maintenance. Reference is to be made to procedures detailed in 'Landscape Design Notes' and 'Construction and Establishment' sections in **Wetlands Section 13.7**.

- sourcing plant stock;
 - lead times for ordering plants;
 - recommended planting systems/ products;
- topsoil specification and preparation;
 - sourcing, testing and amendment;
 - top soil treatments (eg. gypsum, lime, fertiliser);
- vegetation establishment;
 - weed control;
 - watering;
 - water level manipulation.

Constructed wetlands are living systems and they require two years of establishment before the vegetation matures and reaches fully functional form. During this establishment period, regular site monitoring and maintenance is critical to the success of these systems. Reference must also be made to the sections titled '**Maintenance Requirements**' (**Section 13.7.5**) and '**Construction Advice**' (**Section 13.7.6.5**) for guidance on maintenance procedures and vegetation establishment.

Similarly, the vegetation planted in sedimentation basins, ponds and lakes require an equivalent vegetation establishment period (ie. 2 years) and level of attention to site preparation, stock sourcing, vegetation establishment and maintenance to ensure success. Reference must be made to the sections entitled '**Landscape Design Notes**', '**Maintenance Requirements**' and '**Construction and Establishment**' in relevant chapters.

Table 13.13-C: Macrophyte and Groundcover Plant Species List for Wetlands and Sedimentation Basins

Key to Table 13.13-C:

Zone		Depth*(m)	Form
P	Pool	1.5-0.5	S Submerged macrophytes
DM	Deep Marsh	0.5-0.35	M Emergent macrophytes
M	Marsh	0.5-0.2	G Groundcover
SM	Shallow Marsh	0.2-0	T Tufted
EM	Ephemeral Marsh	0-+0.2**	
B	Batters	+0.2-+0.5**	

Notes:

* 'Depth' refers to depth below permanent pool water level

** '+' denotes levels above permanent pool water level

Scientific name	Common name	Zone	Form	Height (mm)	³ Planting Density (Qty/m ²)	Comments
<i>Myriophyllum papillosum</i>	Common Water-milfoil	P	S	To 200	1	
<i>Myriophyllum verrucosum</i>	Red Water-milfoil	P	S	100-1500	1	
<i>Potamogeton crispus</i>	Curly Pondweed	P	S	To 4500	1	Growth can be dense
<i>Potamogeton ochreatus</i>	Blunt Pondweed	P	S	To 4500	1	Rapid growth; aesthetic; seasonal; salt tolerant (2000 ppm)
<i>Vallisneria gigantea</i>	Ribbonweed	P	S	To 3000	1	Rapid growth; salt tolerant (1500 ppm)
<i>Vallisneria spiralis</i>	Eel Weed	P	S	150-300	1	
<i>Baumea articulata</i>	Jointed Twig-rush	DM	M	1000-2000	6-8	Slow growth, plant solo
<i>Bolboschoenus fluviatilis</i>	Marsh Club-rush	DM	M	1000-2000	4-6	Plant solo, flow resistant
<i>Eleocharis sphacelata</i>	Tall Spike-rush	DM	M	500-2000	6-8	Plant solo, rhizomes can restrict growth of other plants; slow establishment, flow resistant
<i>Schoenoplectus litoralis</i>	Shore Club-rush	DM	M	600-1500	4-6	
<i>Schoenoplectus validus</i>	River Club-rush	DM	M	600-1600	4-6	
<i>Baumea arthropophylla</i>	Fine Twig-rush	M	M	300-1300	6-8	Spreads quickly

Scientific name	Common name	Zone	Form	Height (mm)	³ Planting Density (Qty/m ²)	Comments
<i>Baumea rubiginosa</i>	Soft Twig-rush	M	M	300-1000	6-8	Can be slow to establish
<i>Bolboschoenus caldwellii</i>	Sea Club-rush	M	M	300-900	4-6	Rapid establishment, salt tolerant
<i>Lepironia articulata</i>	Grey Rush	M	M	600-2300	4-6	
<i>Schoenoplectus mucronatus</i>	Star Club-rush	M	M	350-1000	4-6	Shade tolerant
<i>Triglochin procerum</i>	Water-ribbon	M	M	200-500	4-6	Aesthetic; spreading
<i>Baumea juncea</i>	Bare Twig-rush	SM	T	300-1000	8-10	Slow establishment
<i>Carex fascicularis</i>	Tassel Sedge	SM	M	500-1000	6-8	Aesthetic
<i>Carex gaudichadiana</i>	Tufted sedge	SM	M	100-600	6-8	Aesthetic; tolerates drawdown
<i>Cyperus exaltatus</i>	Giant Sedge	SM	M	1000-2000	4-6	Short lived
<i>Eleocharis acuta</i>	Common Spike-rush	SM	M	300-900	6-8	High surface area
<i>Eleocharis dulcis</i>	Chinese Water Chestnut	SM	M	To 1500	6-8	
<i>Eleocharis equisetina</i>	Spike-rush	SM	M	500-1000	6-8	
<i>Eleocharis pusilla</i>	Small Spike-rush	SM	T	To 250	6-10	Readily grown
<i>Ficinia nodosa (syn. isolepis nodosa)</i>	Knobby Club-rush	SM	M	500-1500	6-8	
<i>Isolepis inundata</i>	Swamp Club-rush	SM	M	To 300	6-8	High surface area; rapid growth
<i>Juncus subsecundus</i>	Finger Rush	SM	M	500-1000	8-10	
<i>Juncus usitatus</i>	Common Rush	SM	M	300-1200	8-10	Rapid growth
<i>Phylidrium lanuginosum</i>	Woolly Water Lily	SM	T	500-1000	6-8	Aesthetic
<i>Restio pallens</i>	Cord Rush	SM	M	500-1000	8-10	
<i>Restio tetraphyllus</i>	Tassel Cord-rush	SM	M	500-1500	6-8	
<i>Carex appressa</i>	Tall Sedge	EM	M	500-1200	4-8	High surface area
<i>Carex inversa</i>	Knob Sedge	EM	M	100-300	8-10	Rapid establishment
<i>Carex polyantha</i>	Creek Sedge	EM	M	To 900	6-8	

Scientific name	Common name	Zone	Form	Height (mm)	³ Planting Density (Qty/m ²)	Comments
<i>Cyperus gunnii</i>	Flecked Flat Sedge	EM	M	600-1000	6-8	High surface area
<i>Juncus flavidus</i>	Yellow Rush	EM	M	400-1200	8-10	Aesthetic
<i>Juncus prismatocarpus</i>	Branching Rush	EM	M	300-600	6-8	
<i>Lepidosperma laterale</i> var. <i>laterale</i>	Variable Sword-sedge	EM	M	400-900	6-8	Shade tolerant
<i>Lepidosperma longitudinale</i>	Common Sword-sedge	EM	M	600-1700	6-8	Aesthetic
<i>Carex breviculmis</i>	Short-stem sedge	B	T	To 150	6-8	Very adaptable
<i>Carex pumila</i>	Coastal Sedge	B	T	100-250	8-10	Salt tolerant, drought tolerant
<i>Cyperus polystachyos</i>	Bunchy Sedge	B	T	To 600	6-8	
<i>Dianella longifolia</i> var. <i>longifolia</i>	Pale Flax-lily	B	T	300-800	6-8	Aesthetic; shade tolerant
<i>Gahnia clarkei</i>	Tall Saw-sedge	B	T	1500-2500	4-6	Plant solo
<i>Gahnia siberiana</i>	Red-fruited Sword Sedge	B	T	1500-3000	4-6	Aesthetic
<i>Lomandra filiformis</i> spp. <i>filiformis</i>	Wattle Mat-rush	B	T	150-500	6-8	Shade tolerant when established
<i>Lomandra longifolia</i> var. <i>longifolia</i>	Spiny-headed Mat Rush	B	T	500-1000	4-6	Shade tolerant
<i>Poa labillardieri</i>	Tussock Grass	B	T	300-1200	6-8	
<i>Schoenus apogon</i>	Common Bog-rush	B	G	To 300	8-10	
<i>Viola hederacea</i>	Native Violet	B	G	To 150	2-4	Rapid growth; aesthetic; prolific growth once established

Note:

3 Planting density indicates the mean number of plants per square metre for the species spatial distribution within the zone. The planting densities recommended are suggested minimums. Any reduction in planting density has the potential to reduce the rate of vegetation establishment, increase the risk of weed invasion, and increase maintenance costs.

Table 13.13-D: Shrub and Tree Plant Species List for Wetlands and Sedimentation Basins

Scientific name	Common name	Zone	Form	Height (mm)	⁴ Planting Density (Qty/m ²)	Comments
<i>Callistemon sieberi</i>	River Bottlebrush	B	Shrub	3-10	1	Very wet to moist conditions in heavy clay soils, tolerates dry conditions once established
<i>Banksia robur</i>	Swamp Banksia	B	Shrub	1-1.5	2-4	Moist soils on coastal sand and peat soils
<i>Leptospermum liversidgei</i>		B	Shrub	1.0-3.0	2-4	Moist soil, sunny position
<i>Myoporum acuminatum</i>	Coastal Boobialla	B	Shrub	0.5-6.0	2-4	Sun or semi-shade, salt tolerant
<i>Callistemon salignus</i>	White Bottlebrush	B	Tree	2.0-15.0	1	Moist sandy and alluvial soils, full sun to semi-shade
<i>Callistemon viminalis</i>	Weeping Bottle Brush	B	Tree	5.0-10.0	<1	Moist, medium to heavy soils, tolerates dry periods once established
<i>Casuarina cunninghamiana</i>	River She-oak	B	Tree	10-35	<1	
<i>Elaeocarpus obovatus</i>	Hard Quandong	B	Tree	5.0-30.0	<1	Moist soils, tolerates water logged soils, hardy and fast growing
<i>Eucalyptus camaldulensis</i>	River Red Gum	B	Tree	12-50	<1	Damp alluvial soils, tolerates inundation and very dry periods once established
<i>Eucalyptus ovata</i>	Swamp Gum	B	Tree	8-30	<1	Moist soils, tolerates inundation and dry periods
<i>Lophostemon confertus</i>	Brush Box	B	Tree	10-30	<1	Moist deep alluvial clay soils or moist sandy soils
<i>Lophostemon suaveolens</i>	Swamp Box	B	Tree	5.0-25.0	<1	Moist sandy soils
<i>Melaleuca bracteata</i>	River Tea Tree	B	Tree	5.0-15.0	<1	Moist, free draining soils
<i>Melaleuca linariifolia</i>	Flax-leaf Paperbark	B	Tree	5.0-10.0	<1	Moist sandy soils and swampy areas
<i>Melaleuca nodosa</i>	Prickly-leafed Paperbark	B	Tree	2.0-7.0	2-4	Deep sands and moist sandy soils
<i>Melaleuca quinquenervia</i>	Broad-leafed Paperbark	B	Tree	8.0-25.0	<1	Very moist sands and alluvial soils, tolerates inundation
<i>Melaleuca sieberi</i>	Small-leafed Paperbark	B	Tree	2.0-10.0	<1	Moist sandy or poorly drained soil

Note:

4 Planting density indicates the mean number of plants per square metre for the species spatial distribution within the zone. The planting densities recommended are suggested minimums. Any reduction in planting density has the potential to reduce the rate of vegetation establishment, increase the risk of weed invasion, and increase maintenance costs.

13.13.4 References

BCC 2005, **Growing Native Plants in Brisbane**, BCC, Brisbane, accessed 25th July 2005, http://www.brisbane.qld.gov.au/BCC:STANDARD::pc=PC_1927 .

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