

Water notes

Water notes for rivers management



ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION



Rushes and sedges

Rushes and sedges are terms commonly applied to species from the grass-like families Juncaceae, Restionaceae and Cyperaceae. While occurring in a wide range of habitats, from estuarine to desert, rushes and sedges are particularly important in wetlands. Unlike many tree and shrub species, they have shallow spreading surface roots, which bind the soil and reduce erosion. Erosion is one of the major constraints to successful river restoration.

Rushes and sedges are also pivotal to water quality improvement of wetlands. Their soil binding properties and growth habit means they are excellent at slowing the rate of water flow and trapping sediment within waterways. Dense stands of rushes and sedges planted along the foreshore or buffer areas of a wetland also trap soil and water run-off from adjacent land, which in turn limits the export of nutrients into waterbodies. Many species further improve water quality by acting as 'nutrient-strippers', accumulating significant amounts of nutrients in stems and rhizomes (underground stems), and supporting bacterial transformation of nutrients and other pollutants on their extensive root and rhizome mass.

The root systems of many species also help to oxygenate the water and sediment by 'leaking' excess oxygen through their roots. This is important for nutrient transformation and for providing microhabitat for invertebrate fauna. The dense structural habit of rushes and sedges is also important as a habitat refuge for native invertebrate and vertebrate fauna, such as Christmas spiders and little grass birds which are important mosquito predators.

When planted in dense stands, native rushes and sedges are excellent for weed control, excluding less desirable species and out-competing others. This is particularly important in the wheatbelt where many saline watercourses are being colonised by the exotic spiny rush, *Juncus acutus*. This species should be replaced with appropriate native analogues, such as *Juncus kraussii* and *Gahnia trifida*. A list of suitable species for planting in a wide range of conditions is given in Table 1.



Juncus kraussii (Sea rush).

Gahnia trifida
(Coast saw-sedge).



Figure 1: Beard's Natural Regions.

Natural Regions	Code	Phytogeographic Districts
Avon Wheatbelt	Av	Avon Botanical District
Coolgardie	Co	Coolgardie Botanical District
Esperance	Ey	Eyre Botanical District
Geraldton Sandplain	Ir	Irwin Botanical District
Jarrah Forest	DI/Me	Dale/Menzies Sub Districts
Mallee	Ro	Roe Botanical District
Swan Coastal Plain	Du	Drummond Sub District
Warren	Wa	Warren Sub District

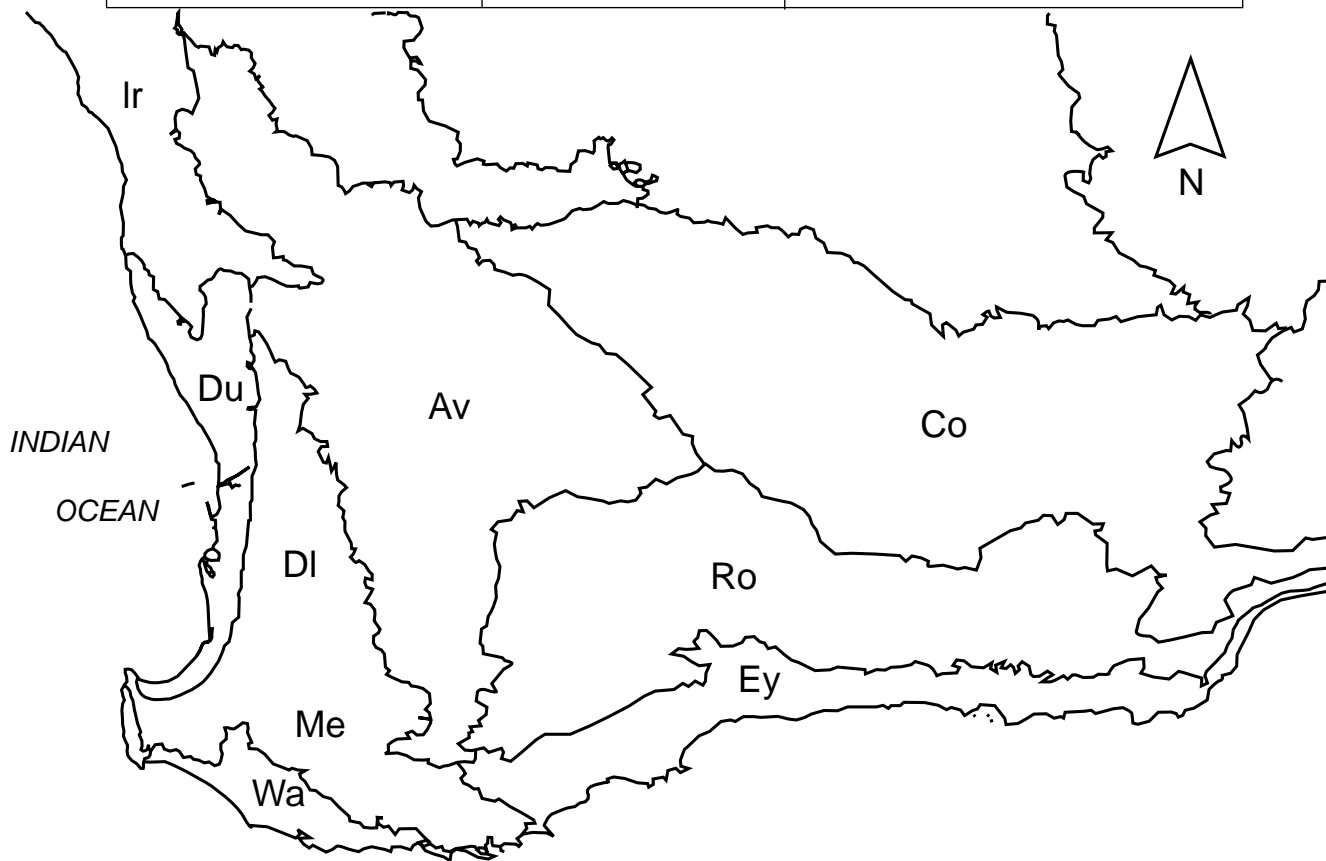


Table 1. Common sedges and rushes of south-west wetlands.

Species	River ¹		Creek ¹		Floodplain ¹	Wetland				Soil Type	Water Depth	Salt-tolerance ²	Availability ³	Distribution (See Figure 1)
	Channel	Embankment	Channel	Embankment		Lake ¹	Sump ¹	Dampland ¹	Palusplain ¹					
Sedges														
<i>Baumea articulata</i>					✓	✓	✓	✓		C, P, S	DW, SW, PWe	F, B	P	Du, DI, Me, Wa, Av, Ro, Ey
<i>Baumea juncea</i>		✓		✓	✓	✓	✓	✓		C, P, S	SW, PWe, SWe	F, B	P	Ir, Du, DI, Me, Wa, Av, Ro, Ey, Co
<i>Baumea preissii</i>						✓	✓	✓		P, S	SW, PWe, SWe	F, B	P	Du, DI, Me, Wa
<i>Baumea rubiginosa</i>										C, P, S	SW, PWe, SWe	F	P	Du, DI, Me, Wa
<i>Baumea vaginalis</i>		✓		✓						C, P, S	SW, PWe, SWe	F, B	P	Du, DI, Me, Wa
<i>Carex appressa</i>										C, P, S	PWe, SWe	F	P	Du, DI, Me, Wa
<i>Carex fascicularis</i>		✓		✓						C, P, S	SW, PWe, SWe	F	P	Du, Me, Wa
<i>Carex tereticaulis</i>										C, S	PWe, SWe	F	P	Du, DI
<i>Chorizandra enodis</i>					✓					C, S	SW, PWe, SWe	F, B	C	Ir, Du, DI, Av, Co, Ro, Ey, Me, Wa
<i>Cyperus gymnocaulos</i>		✓		✓						P, S	PWe	F, B	NA	Du, Ir
<i>Eleocharis acuta</i>										C, S	SW, PWe, SWe	F, B, S	P	Du, Ir, DI, Me, Av, Ro, Ey, Co
<i>Evandra pauciflora</i>										S	PWe, SWe	F	NA	Du, Me, Wa
<i>Evandra aristata</i>										S, P	PWe, SWe	F	NA	Me, Wa
<i>Gahnia decomposita</i>					✓					P, S	PWe, SWe	F, B	NA	Du, DI, Me, Wa, Ey
<i>Gahnia trifida</i>					✓					C, P, S	PWe, SWe	F, B, S	P	Ir, Du, DI, Me, Wa, Av, Co, Ro, Ey



Establishing rushes and sedges

Site examination and preparation

As with any revegetation program, areas to be planted or seeded must first be cleared of weeds. Species used should be selected according to the following criteria:

1. indigenous to the area;
2. suitable for each specific wetland zone (e.g. channel bed, bank or upland); and
3. suitable for current and future conditions, which may have changed substantially from the historical hydrologic/nutrient/salinity pattern.

When to plant

Rushes and sedges should be planted in permanently wet or moist areas in spring and summer during their peak growth phase. This ensures rapid establishment and growth, which reduces the opportunity for weed invasion. Seasonally wet areas, including upper channel banks, should be planted in winter to ensure roots have a chance to establish before the onset of the first summer. Wetland plants are generally available either as tube-stock or as bare-rooted plants. Take care to include provisions for temporary fencing where waterbirds and/or rabbits are in high numbers, or opt for more mature plants in planting programs.

When to direct seed

Direct seeding is an option for level areas with minimal weed problems. Species suitable for direct seeding include *Juncus* spp., and some sedges, including *Carex*, *Isolepis* and *Schoenoplectus*. Since conditions are rarely that favourable in restoration situations, the best approach is to direct seed under or onto organic matting, which is then secured onto the soil surface. Use of organic matting has the added advantage of assisting in erosion and weed control.

What densities

As a general rule, rushes and sedges should be planted at 6 – 9 plants/m². Species with spreading rhizomes will spread between 0.5 – 1m in two years. Tufted species should be planted at the higher density. Approximately half of the wetland area should be planted, and each species should be planted in single-species groups to mimic the natural situation and avoid competition losses. A professionally prepared planting plan is a good idea for large-scale projects.

Propagation

Propagation of many rushes and sedges from seed is very difficult and many require advanced tissue culture techniques. However, seed propagation is an easy method for *Juncus* spp., which produce massive amounts of small seeds within papery capsules. Seeding heads should be collected and dried, and the seeds shaken into storage containers or directly onto the surface of a basic seed propagation mix. Seeds germinate best in full light in warm conditions.

Some of the sedges, which have nuts instead of capsules, can also be readily germinated. *Carex*, *Schoenoplectus* and *Cyperus* species produce abundant seed which will germinate if sown in high temperature conditions (>26°C).

Many species propagate very well by vegetative division. Plants can be easily split into individual plantlets (known as 'ramets') every two months or so. If you have access to a nursery facility, or a temporary wet storage area such as a pond, a good idea is to purchase a small number of plants of difficult to grow species, and use these as stock plants for generating divisions for each year's planting.

Other wetland herbs & grasses

A number of grasses and other herbs are also important in wetlands. Many native grasses share the same seed dormancy problems as the rushes and sedges, and require an after-ripening period and pretreatments (such as exposure to smoke water) to promote germination.

Matgrass (*Hemarthria uncinata*), is common along creeklines, withstanding brackish conditions. This species and Weeping grass (*Microlaena stipoides*) both have a rhizomatous habit and are excellent for erosion control. Because of their palatability, they are good species to use in grazed transitional zones between paddocks and the fenced creek.



Sporobolus virginicus
(Marine couch) excellent for
reclamation of salt-affected areas.



One of the most common grasses in saline situations is salt couch (*Sporobolus virginicus*). This species is excellent for reclamation of salt-affected scalds, and for erosion control of saline creek embankments.

One of the most elegant grasses is *Spartachloa*, which favours creeklines and seeps throughout the southwest. This species propagates readily from seed.

Availability and cost

Many rushes and sedges, and a few grasses, have recently become available from commercial nurseries. A list of the species and type of propagule available for purchase is given in Table 1. It is wise to note that many of these species can be vegetatively divided after purchase with simple facilities. Purchasing of plants as stock for further vegetative division, rather than as end-products, makes the final unit cost of plants relatively cheap. If you intend doing this, make sure you purchase plants well ahead of the planting period.

As a guide, seedlings range in price from \$0.50-\$1.50 per unit, and mature plants between \$1.50 and \$10. In most revegetation situations, seedlings are preferable. If plants need to be contract grown via tissue culture, you will need to place advance orders, usually 6-12 months ahead of your intended planting date. Price depends on species, but ranges from \$1.50 to \$4.50.

Further reading

Available from Water and Rivers Commission

Pen, L. 1999, *Managing Our Rivers: A guide to the nature and management of streams in south-west Western Australia*, Water and Rivers Commission, Perth, Western Australia.

Regeneration Technology Pty Ltd. 1999, *Best Management Practices for Rural Drains*, Water & Rivers Commission, Perth, Western Australia.

Water and Rivers Commission 1997, *Native vegetation of freshwater rivers & creeks in south Western Australia*, Water and Rivers Commission & Department of Conservation and Land Management, Perth, Western Australia.

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Available from other sources

Bell, U. 1999, *A Guide to Native Grasses in the Perth Hills*, Wildflower Society of Western Australia.

Meney, K. A. and Pate, J. S. 1999, *Australian Rushes*, UWA Press, Perth, Western Australia.

Sainty, G. R. and Jacobs, S. W. L. 1994, *Waterplants in Australia: A Field Guide*, Sainty and Associates, Darlinghurst, Australia.



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