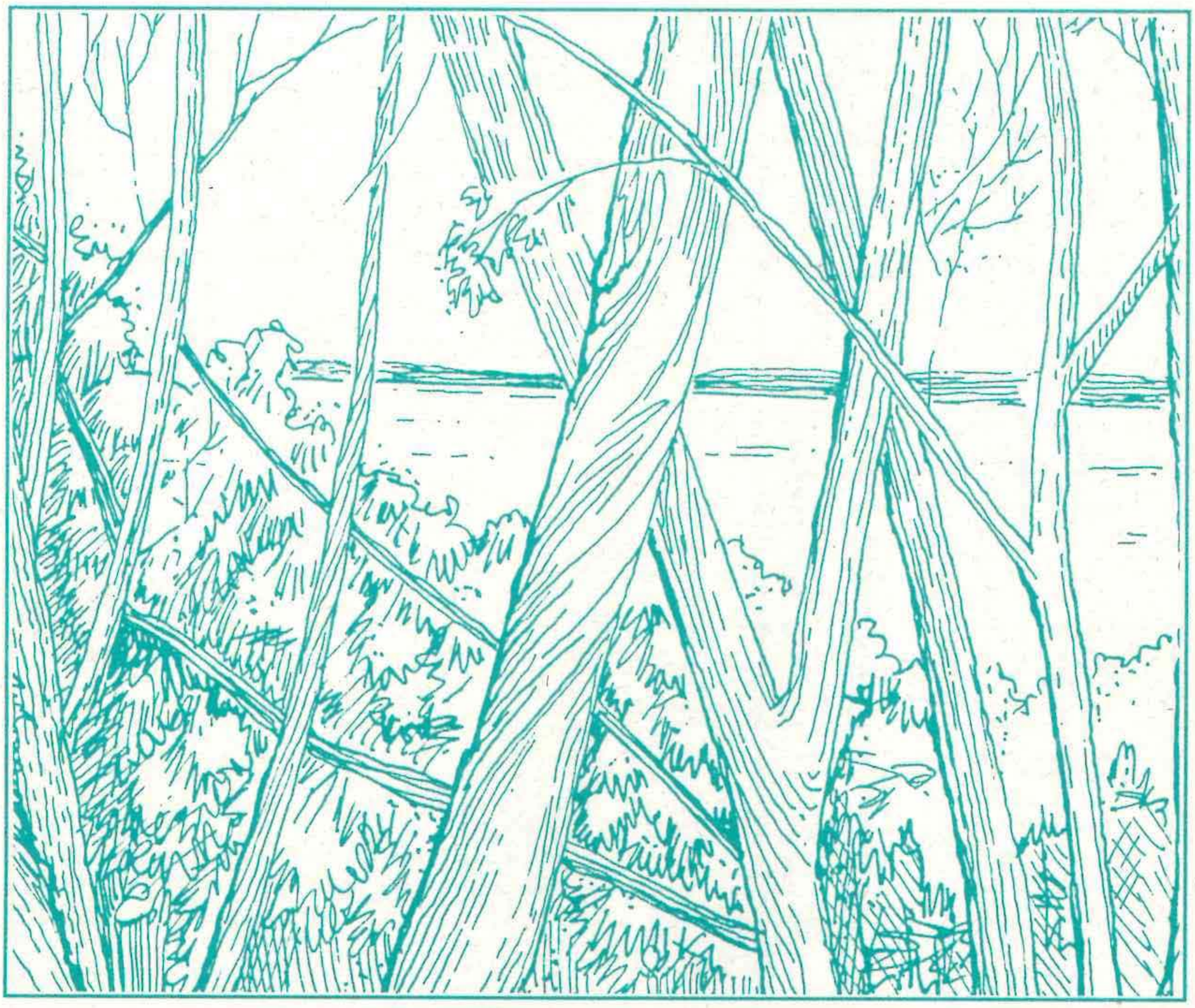
Fringing vegetation of Leschenault Estuary

Communities, changes and rehabilitation techniques



Waterways Information No 6

By Beverley Thurlow and Dr Luke Pen

Waterways Commission
February 1994

VALUES OF FRINGING VEGETATION

Fringing vegetation plays an important role in the maintenance of a functioning and healthy estuary. It provides food, shelter and breeding habitats for many different kinds of birds and other animals, stabilises the shoreline and filters nutrients and other pollutants.

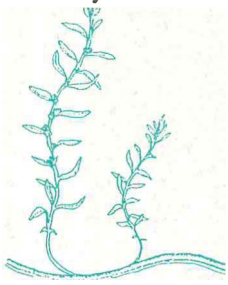
Wetland (swampy) areas are the most important for wildlife, providing breeding grounds for shrimps, molluscs and other invertebrates as well as more visible animals like egrets and ducks. Studies also indicate that samphire wetlands (salt marshes) contribute significantly to estuarine productivity in terms of decaying matter entering the food chain and are therefore vital for the fishery.

Fringing plants also play an important role in filtering drainage waters entering the estuary, trapping sediments and taking up nutrients. They also help to remove pollutants such as petroleum products and heavy metals. Nutrients and other pollutants may be stored in the soil of the fringing wetland or taken up by plants and stored in their tissues. This helps to protect the estuary's water quality.

ABOUT THE ESTUARY

The Leschenault Estuary is located immediately north of the city of Bunbury some 200 kilometres south of Perth. It is an elongate 'cigar shaped' estuary lying in an approximate north-south direction having a length of about 13.5 kilometres and a width of between 1.5 and 2.5 kilometres. The Collie and Preston Rivers enter the estuary in the lower 3 kilometre section and the mouths of both rivers are bordered by extensive vegetated deltas.

Originally there was only one waterbody at Bunbury. It was known as Leschenault Inlet. However in 1951 the natural outlet to the ocean at Point MacLeod was closed to eliminate the accumulation of river silt in the port area. At the same time, a connection to the ocean was cut through the sand dunes opposite the mouth of the Collie River. In 1968-69, the Preston River downstream of the Australind Road Bridge was realigned to allow for the construction of the Inner Harbour. In 1971, work on the Inner Harbour commenced, cutting off the southernmost part of the inlet. On completion of the Inner Harbour, a channel was cut at Point MacLeod to allow water circulation to this small body of water and to allow the passage of boats out to Koombana Bay. These modifications have resulted in the renaming of the waterbodies; the smaller waterbody at Point MacLeod is now known as Leschenault Inlet and the main waterbody to the north is called Leschenault Estuary.



Seablite

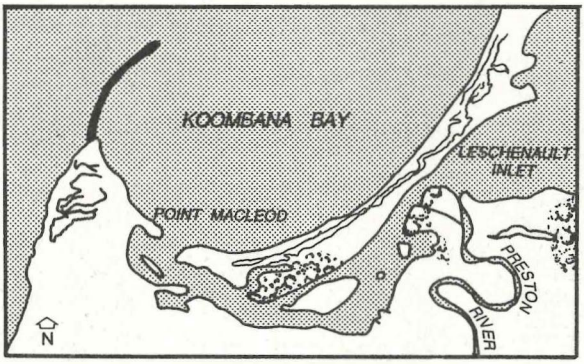
Many wading birds forage for food amongst seablite and other saltmarsh plants.

A CHANGING ENVIRONMENT

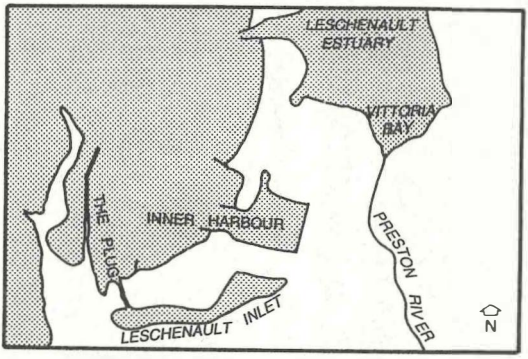
Prior to the 1950s the estuary was connected to the ocean at its southern end by a narrow 3 kilometre channel. This channel would have reduced tidal rises and falls in water level in the estuary and limited the exchange of saline ocean water and fresh river water throughout the year. In the winter, the estuary waters were probably quite fresh, following flushing with rainfall runoff. In

Alterations to the Leschenault Inlet

(From Le Page 1986)



LESCHENAULT INLET 1898



INNER HARBOUR AND THE PLUG 1976

CLOSURE OF POINT MACLEOD AND INSTALLATION OF THE CUT 1951

summer, due to evaporation, it would have been more salty than sea water (hypersaline).

An increase in the exchange of ocean and estuarine water would have occurred in 1951 when the Cut was made through the Leschenault Peninsula. This would have reduced summer salinities and increased winter salinities. Furthermore, the old connection to the ocean probably formed a bottleneck causing the winter flood water coming down the rivers to swell the inlet in the winter. Water levels were probably much higher in the winter/spring periods of the past than they are today. If the original inlet mouth had a sand bar, then the initial winter water levels (prior to the breaching of the bar) would have been much higher than today.

The mean water level in the estuary has probably dropped significantly.

In 1960 the Wellington Dam on the Collie River was completed. This dam has reduced both the duration of flow and magnitude of freshwater input to the estuary from the river (Schwinghammer, 1982).

These physical changes are reflected by changes in vegetation around the estuary in the last 40 years.

This booklet describes the fringing vegetation, the changes which have occurred (Table 1), and species suitable for revegetating degraded areas (Table 2).

ESTUARINE FRINGING VEGETATION

The Leschenault Estuary supports 28 plant communities which are divided into saltmarsh (13), fringing vegetation (3), fringing estuarine forest (5), freshwater vegetation (3) and sandy rise vegetation (4). In addition there are eight vegetation types which are characterised by a high degree of replacement of native species by weeds, particularly grasses. The main communities are listed below. Examples of where the various communities can be found around the estuary are illustrated on the map opposite.

Saltmarshes

Saltmarshes develop in areas which are saline due to tidal inundation or evaporation of saline water trapped on the marsh by a shoreline levee. Thirteen communities of saltmarsh have been identified around the estuary.

Marsh club rush closed sedgeland ***(Bolboschoenus caldwellii)*** Appears as a stand of ridged grass up to 1.2 m high. Found in mud or sand in saline conditions with seasonal freshwater flushing. (1)

Shore rush closed rushland (*Juncus kraussii)* Appears as a 1 - 1.5 m stand of ridged grass leaves with seed pods at the top. Usually found at the water's edge fringed by samphire. (2)

Samphire saltmarsh complex *(Sarcocornia quinqueflora)* Samphire can range in colour from green and turquoise through to red and black. It generally has thick fleshy tissue that contains lots of water and takes the form of a meadow or shrubs. Four types of samphire communities are found around the estuary:

(i) **Samphire closed herbland *(Sarcocornia quinqueflora)***, appears as extensive mats fringing the shoreline or behind a strip of shore rush. (3)

(ii) **Seablite - samphire closed herbland *(Sueada australis - Sarcocornia quinqueflora)*** A combination of seablite and samphire where seablite is dominant. Appears as extensive mats fringing the shoreline or behind a strip of shore rush. (4)

(iii) **Creeping brookweed - samphire closed herbland *(Samolus repens - Sarcocornia quinqueflora)*** is a combination of samphire and the perennial herb creeping brookweed. It usually fringes seablite herbland. (5)

(iv) **Samphire - marsh club rush closed herbland *(Sarcocornia quinqueflora Bolboschoenus caldwellii)*** Here marsh club rush grows through the samphire during winter then dies off in spring. Appears as extensive mats fringing the shoreline or behind a strip of shore rush. (6)

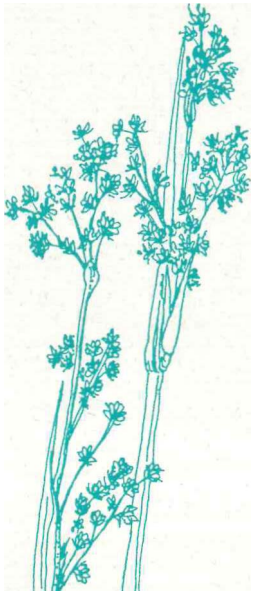
Seaheath, samphire and seablite low closed heath *(Frankenia pauciflora, Sarcocornia quinqueflora - Sueada australis)* This community usually forms a heath about 0.5 - 1 m high. (7)

Streaked arrowgrass closed herbland *(Triglochin striata)* This is a native erect slender low-growing perennial herb up to 0.5 m high. It has only been found on Leschenault Peninsula. (8)

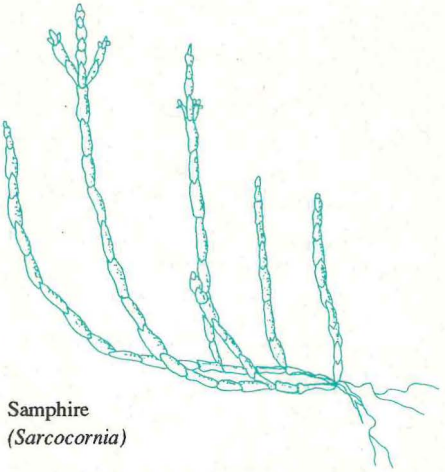
Creeping brookweed closed herbland *(Samolus repens)* Appears as a perennial herb with erect stems up to 0.5 m high. (9)

Saltwater couch grassland *(Sporobolus virginicus)* This is a perennial creeping grass which forms extensive mats. It is sometimes mixed with samphire and watercouch. (10)

Note:
These are examples of where to find vegetation associations not a distribution map.



Shore rush

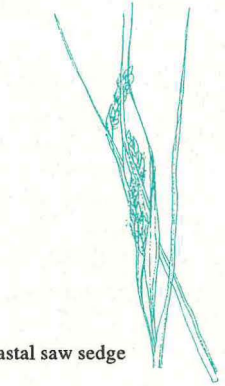


Samphire
(Sarcocornia)

Samphire glasswort low open heath ***(Halosarcia halocnemoides)*** This is an erect much-branched small shrub growing up to 1 m high forming a heath in most saline regions of saltmarsh. It tends to grow over samphire, seablite and saltwater couch. (11)

Shrubby samphire low open heath ***(Halosarcia indica bidens)*** This is a large shrub growing up to 2 m high. It forms an open heath in high but saline areas and tends to be mixed with seablite, marsh saltbush, samphire and seaheath. (12)

Coast saw sedge open sedgeland ***(Gahnia trifida)*** A large tufted sedge about 1.5 m high and 1 m across. Mostly found in fringing forest bordering saltmarsh. (13)



Coastal saw sedge

Fringing vegetation

Fringing vegetation is classified as emergent species which live more or less permanently in shallow water. Three groups are found around the estuary.

Lake club rush closed sedgeland ***(Schoenoplectus validus)*** Appears as a tall weeping sedge in the shallow waters forming long, 1-3 m wide bands often 1-3 m from the shoreline. It reaches 2 m in height. (14)

Water couch low closed grassland ***(Paspalum distichum)*** This introduced emergent grass forms dense mats on beaches or sometimes near saltmarsh or fringing forest vegetation where the soil is waterlogged. (15)

Water couch and marsh club rush closed grass and sedgeland ***(Paspalum distichum - Bolboschoenus caldwellii)*** In this complex the marsh club rush grows over the water couch. (16)

Freshwater vegetation

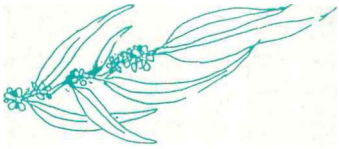
Freshwater vegetation occurs close to the estuary in areas receiving substantial freshwater input from drains and creeks or from groundwater seepage which typically occurs at the base of a ridge or sand dune.

Bare twig rush sedgeland ***(Baumea juncea)*** Perennial herb up to 1.2 m with erect stems. Two or three leaves widely spaced up the stem. Similar to shore rush and can often be overlooked. Occurs between shore rush and parkland grasses in low-lying areas prone to freshwater flushing. (17)

Swamp paperbark low open-closed forest ***(Melaleuca rhaphiophylla)*** A small to medium tree up to 10 m with white bark that strips off in papery sheets. Grows over

dense shore rush, landward side of samphire community or saltwater paperbark. (18)

Swamp paperbark - peppermint low open closed forest ***(Melaleuca rhaphiophylla - Agonis flexuosa)*** A mixture of the swamp paperbark and the peppermint. The latter appears as a large shrub or small tree up to 6 m in height. It is strongly influenced by freshwater flushing. This community is usually found between high dry pasture or sandy rise vegetation and waterlogged pasture or between saltmarsh and waterlogged pasture. (19)



Peppermint

Swamp paperbark

Sandy rise vegetation

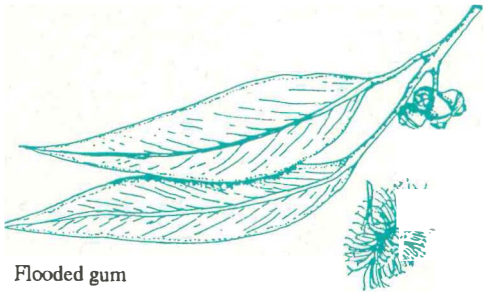
Sandy rise vegetation occurs on the margins of high coastal sand dunes or low estuarine beach dunes.

Grey stinkwood open-closed scrub ***(Jacksonia furcellata)*** This upright shrub or small tree grows up to 3-4 m and occurs on sandy rises or sand dunes on the beach front or behind shore rush. (20)

Flooded gum and swamp paperbark woodland ***(Eucalyptus rudis - Melaleuca rhaphiophylla)*** Combination of flooded gum, which grows to about 9 -15 m, and swamp paperbark. It tends to occur in low-lying areas beyond the strong influence of salt water. Most of the native understorey has been replaced by veldt grass, other weeds and grass areas for parks. (21)

Orange wattle low closed forest ***(Acacia saligna)*** This is a dense spreading shrub which grows up to 6 m. It has taken over other species and is currently forming its own forest. This is in part due to the effect of repeated fire in these areas. (22)

Shore rush and knotted club rush low closed sedgeland ***(Juncus kraussii - Isolepis nodosa)*** Combination of two types of rushes. Knotted club rush grows to 1 m high and apart from the light brown or tan coloured spikelets it looks very similar to shore rush. Where the foreshore abuts a sand dune the knotted club rush abuts fringing shore rush on the landward side. In other locations, clearing has left only a narrow remnant strip bordering lawn. (23)



Flooded gum

Fringing estuarine forest

Fringing estuarine forest is typically composed of the small saltwater sheoak *(Casuarina obesa)*, and the saltwater paperbark *(Melaleuca cuticularis)*, the mohan paperbark *(M. viminea)* and the swamp paperbark *(M. rhaphiophylla)*. It usually occurs where the ground level rises and salinity levels, although high at times of year, are not extreme.

White mangrove closed scrub ***(Avicennia marina)*** Appears as a shrub or tree up to 6 m high on the estuarine sand or mud flats. It has pneumatophores (rising) from underground roots. (24)

Saltwater paperbark low open-closed forest ***(Melaleuca cuticularis)*** Small tree 3 - 5 m with papery bark growing at water's edge. Tolerates water-logging for most of the year. Abuts saltmarsh or fringing shoreline rushes. Interspersed with saltwater sheoak, saltwater paperbark and orange wattle. (25)

Swamp and saltwater paperbark low open forest ***(Melaleuca rhaphiophylla - M cuticularis)*** Combination of swamp and saltwater paperbark communities. Occurs between shore rush and landward pasture. (26)

Saltwater paperbark

Mohan paperbark low open forest ***(Melaleuca viminea)*** Shrub or small paperbark tree up to 7 m. Found along the shoreline with an understorey of saltmarsh species. (27)

Saltwater sheoak low open-closed forest ***(Casuarina obesa)*** Tree up to 10 m with 'leaves' like needles. Abuts seablite, samphire and shore rush with an understorey of coastal saw sedge, watercouch and seaheath. (28)

Disturbed communities

A number of disturbed and chaotic communities have been identified where there is frequent disturbance. Plant assemblages develop which are distingushed by an absence of native plant regeneration or a high degree of weed infestation of a variety of types.

Pelican Point

In 1991 this area had a wide range of native and introduced species typical of saline and freshwater environments and a range of weeds. It is considered that frequent fires, physical disturbance and frequent alteration to the salinity/freshwater flushing regime caused by the Cut, drains, reclamation and the construction of Taylor Road have affected the vegetation of the area. (29)

Pastured woodlands

Relic trees from past stands of forest and woodland communities remain over parkland or pasture grasses. These can be found in some areas of the eastern and southern foreshores. Examples include stands of saltwater paperbark trees (30), peppermint woodlands (31) and flooded gum (32).

Saltwater sheoak

VEGETATION STATUS

Between 1941 and 1989 about 350 hectares (approximately half) of the fringing vegetation has been lost through clearing, mainly in the northern and southern regions of the estuary. Degradation of the remaining native vegetation is occurring through invasion by mainly introduced species. Major changes to vegetation are listed in Table 1.

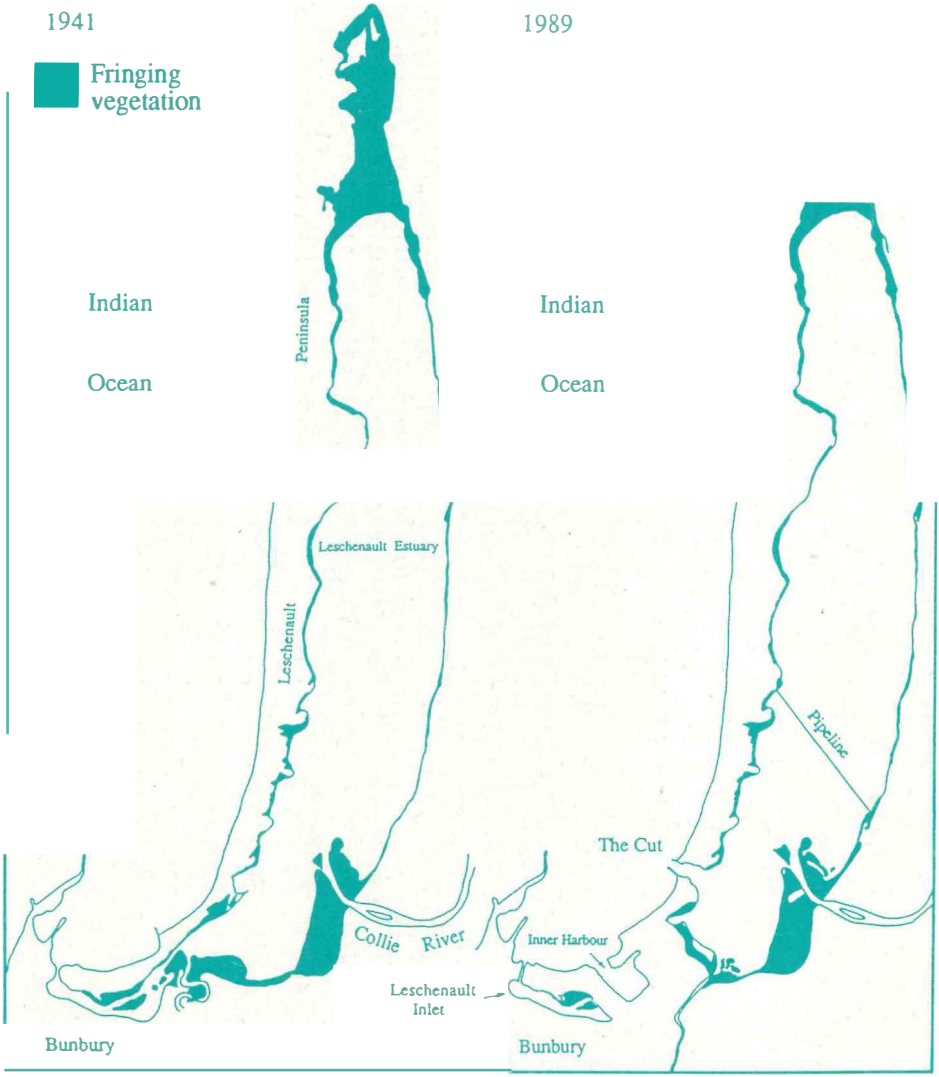


TABLE: 1 VEGETATION CHANGES

Changes	Location	Reason	Vegetation change	Solution
Clearing of fringing vegetation	North of Buffalo Road	Clearing and drainage for agriculture	Loss of samphire glasswort heath and fringing forests of paperbark and peppermint	
	Vittoria Bay	Harbour construction	Loss of mangroves	Replant around estuary especially near the Cut
	Eastern foreshore	Agriculture and roadworks	Loss of swamp paperbark forest, tuart and peppermint forest	
	Australind foreshore and Point Douro	Agriculture, urban expansion and roadworks	Loss of flooded gum and swamp paperbark forest	
Decline of estuarine fringing vegetation	North western estuary foreshore	Unknown	Saltwater and swamp paperbark deaths	
	Crimp Crescent	Salinity rise caused by artificial drainage	Loss of shore-rush and increase in samphire species	
	Pelican Point (central area)	Salinity rise caused by artificial drainage	Paperbarks replaced by saltmarsh and chaotic plant assemblages	
Encroachment of shore-rush into estuary	Eastern foreshore locations	Reduction in mean water level during winter as a result of the Cut	Shorerush growing into the estuary over samphire, beach sand or estuary bottom. 5-20 m over 40 years	
Colonisation of river deltas	Bar Island, Preston River Delta, mud flats at Point Mornington	New habitat created by recently deposited river sediments	Samphire and shorerush colonising low-lying mud flats since mid 1970s. Saltwater sheoak forest developing on east bank of higher ground	This is desirable. Ensure protection of these areas and allow plant community succession to take place
Formation of tidal lagoons or pools	Southern foreshore of Leschenault Peninsula	Sand trapped from drifting sand dunes forming pools within a peninsula of sand	Fringing vegetation colonises pool edge and eventually fills in entire pool leaving triangular areas of vegetation	This is natural succession. May slow down as Peninsula vegetation is rehabilitated and sand dune blowouts become less frequent

Continued over

TABLE 1: VEGETATION CHANGES CONTINUED

Changes	Location	Reason	Vegetation change	Solution
Weed invasion of shorerush community	South-eastern foreshore	Reduction in mean water level due to the Cut, clearing of native vegetation for parks and encouraging grasses by mowing, watering and fertilising	Couch, kikuyu, water couch, buffalo grass and pigface invading the shore-rush on the landward side of the narrow shoreline strip of shore-rush.	Replant species which were cleared for parks - bare twigrush, knotted clubrush, swamp paperbark, peppermint, golden spray and flooded gum. Plant trees to shade weed species. Weedicides (short-term use only).
Local infestation of *Acacia saligna* (orange wattle)	North-eastern foreshore	Favoured by frequent fires	So successful that it is developing its own fringing forest.	Reduce risk of fire.
Local infestation of *Typha orientalis* (bulrush) and *Bolboschoenus caldwellii* (marsh clubrush)	Drains and freshwater seeps at base of sand dunes and fringing tidal pools of Preston River	These species favoured by localised reductions in salinity.	Few outbreaks at the moment but it does not represent a major threat as is the case on the Swan system.	Stabilise environmental conditions and encourage native species by weed eradication and suitable plantings.
Infestation of water couch	Preston River	Removal of native species	Forms extensive grassy mats on beach sand and narrow mats in and about shore-rush. Can help control erosion of foreshore. Replaces shorerush on higher ground.	
Infestation of *Myrsiphyllum asparagoides* (bridle creeper)	North of Crimp Crescent	Seeds possibly spread from market and private gardens through drainage system.	Abundant in the paperbark/peppermint forest. Can smother native shrubs and juvenile trees.	Remove by hand or spray with environmentally sensitive herbicide .
Drainage network	North-eastern side of estuary north of Crimp Crescent	Increased salinity due to drainage water going straight into estuary rather than flushing.	Fringing forest to salt marsh specifically shorerush to samphire. Current volume of drainage water is low so minimal impact.	Clear drains of obstructions of weed and sediments to ensure water discharged directly to estuary. Plant native species along edge of drain and in pasture areas to increase uptake of nutrients and stabilise drainage.

TABLE 2: CONSIDERATIONS FOR CONSERVATION - VEGETATION REHABILITATION

It is important that future management of the estuary and its foreshores address the distribution of plant communities around the estuary and maintains representative stands of the various elements of the fringing vegetation. Species suitable for revegetation are listed below.

Area	Species	Common name
Immediate foreshore or beach	*Juncus kraussii* *Schoenoplectus validus** *Sarcocornia quinqueflora* *Avicennia marina** *Casuarina obesa*	shore rush lake club rush samphire white mangrove saltwater sheoak
Salt marsh often inundated by the tide and fringing the estuary waters	*Sarcocornia quinqueflora* *Suaeda australis* *Samolus repens* *Sporobolis virginicus* *Halosarcia halocnemoides* *Frankenia pauciflora*	samphire seablite creeping brookweed saltwater couch samphire glasswort seaheath
High salt-marsh only inundated at high tide but very saline	*Halosarcia halocnemoides* *Halosarcia indica bidens* *Halosarcia syncarpa** *Sarcocornia blackiana** *Melaleuca viminea*	samphire glasswort shrubby glasswort samphire paperbark
Landward periphery or saltmarsh - receiving freshwater input	*Juncus kraussii* *Gahnia trifida* *Melaleuca cuticularis*	shorerush saw sedge saltwater paperbark
Land adjacent to the saltmarsh or estuarine fringing forest - receiving considerable freshwater	*Melaleuca rhaphiophylla* *Agonis flexuosa* *Viminaria juncea* *Juncus kraussii* *Baumea juncea* *Lepidosperma longitudinale* *Lepidosperma gladiatum*	swamp paperbark peppermint golden spray shore-rush bare twigrush common sword sedge coast sword sedge
Small permanent freshwater pools	*Baumea articulata* *Melaleuca rhaphiophylla*	jointed twigrush swamp paperbark
Sandy rises	*Isolepis nodosa* *Jacksonia furcellata* *Jacksonia sternbergiana* *Hakea prostata* *Viminaria juncea*	knotted clubrush grey stinkwood green stinkwood harsh hakea golden spray

TABLE 2: CONTINUED

Area	Species	Common name
Sandy rises cont.	*Eucalyptus rudis* - moist soils only	flooded gum
Base of the dunes along the Peninsula	*Isolepis nodosa* *Lepidosperma gladiatum* *Spyridium globulosum* *Acacia cochlearis* *Hibbertia cuneiformis* *Agonis linearifolia* *Melaleuca rhaphiophylla* - damp conditions only	knotted clubrush coast sword sedge basket brush rigid wattle cutleaf hibbertia swamp peppermint swamp paperbark
Winterwet pastured floodplain - along Cathedral Avenue north of Crimp Crescent	*Melaleuca rhaphiophylla* *Melaleuca preissiana* *Agonis flexuosa*	swamp paperbark moonah paperbark peppermint
High pastured floodplain - north-east area cornered by Buffalo Road and Old Coast Road	*Eucalyptus gomphocephala* *Agonis linearifolia*	tuart swamp peppermint
Periphery of freshwater sections of drains	*Melaleuca rhaphiophylla* *Agonis flexuosa* *Baumea juncea* *Lepidosperma gladiatum*	swamp paperbark peppermint twig rush coast sword sedge
Periphery of saline sections of drains	*Melaleuca cuticularis* *Casuarina obesa* *Sarcocornia quinqueflora* *Juncus kraussii*	saltwater paperbark saltwater sheoak samphire shorerush
Nutrient traps in pastured areas	*Typha orientalis* *Typha domingensis* - on the edge of very wet areas	bulrush native bulrush

* indicates rare or restricted species which should receive special attention

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Field Guide

This booklet is designed as an introduction to vegetation of the Leschenault estuary, its changes and rehabilitation. It is not intended to be used as a field guide for identification. The Waterways Commission is currently preparing a field guide of common fringing vegetation of south west estuaries.

This booklet is one in a series on aspects of Western Australian waterways.
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