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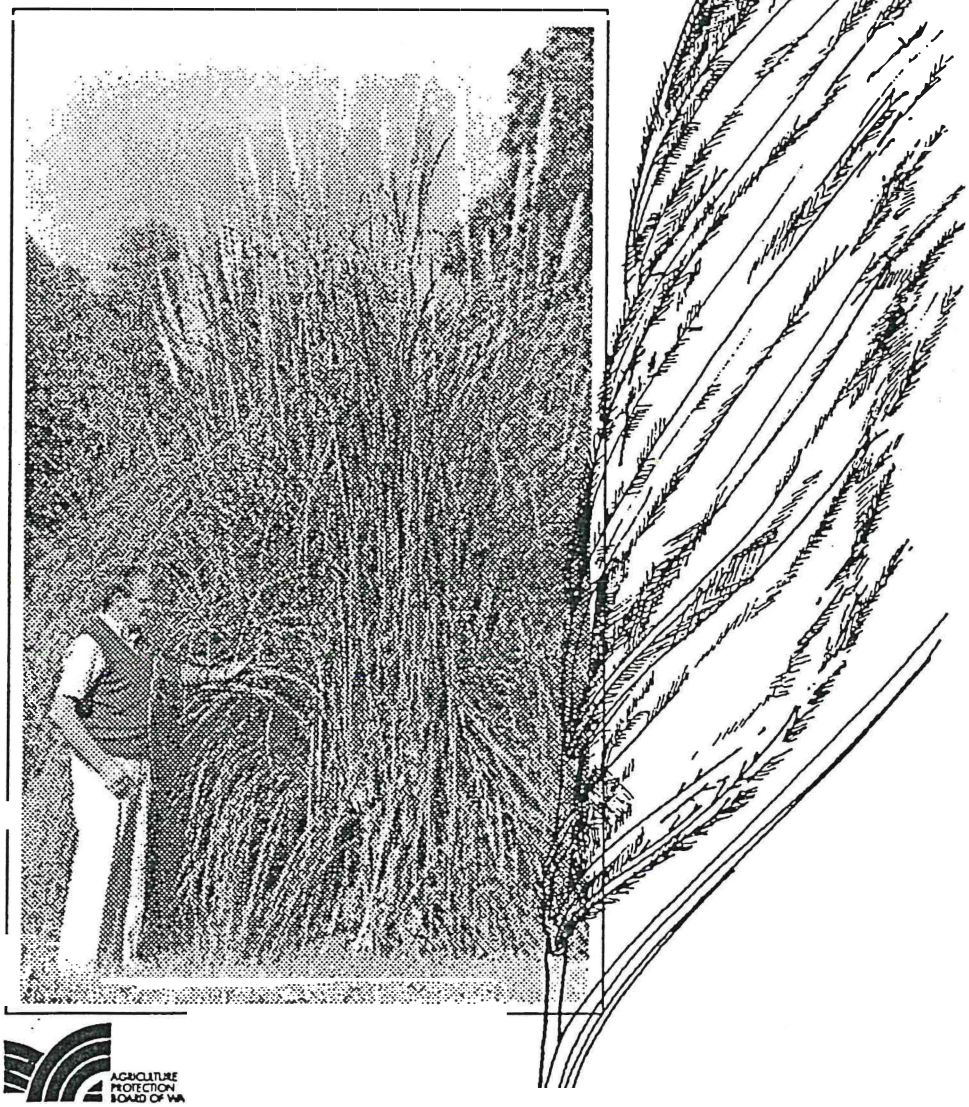

AGRICULTURE PROTECTION BOARD OF WA

DEPARTMENT OF AGRICULTURE WESTERN AUSTRALIA

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INTRODUCTION

The pampas grasses, *Cortaderia* spp, are giant, tussock-forming perennials that are native mainly to South America and New Zealand. The common ornamental pampas grass, *C. selloana*, is a South American species that has been grown in Australian gardens for many years. In recent years, however, it has become a pest by invading and dominating disturbed native and urban vegetation, wetlands and areas disturbed by forestry operations. Although pampas grass is not an agricultural weed, its increasing occurrence as a weed of conservation and forestry areas has resulted in New South Wales, Tasmania and New Zealand classifying it as a noxious weed. In addition to *C. selloana*, a related South American species, *C. jubata*, has become a major weed in New Zealand. This species has recently become established in Tasmania, where it was first recorded in 1986 and is now the target of an eradication programme. The large tussocks produced by these grasses smother existing vegetation, reducing the biological diversity of the invaded sites. The sharp leaf edges make stands of the plant hard to move through, while the dead leaves retained by old plants are a fire risk and its pollen can trigger asthma attacks and hay fever.

There are two sexual forms of the plant, hermaphrodite and female. Hermaphrodite plants possess flowers that contain both male and female parts which should, therefore, be able to produce viable seeds. In most cases, however, the female parts are small and the hermaphrodite flower functions mainly as a pollen source, although seeds are formed occasionally. In female plants, flowers lack male parts and so cannot produce seeds on their own, unless fertilized by pollen from a hermaphrodite plant. Fertilized female plants can produce vast numbers of small seeds (around 100,000 seeds per plant) which are wind dispersed and can spread large distances (up to 25 km) from the parent plant.

It was generally thought that only female plants existed in Western Australia, although the presence of seed-producing plants has been suspected for several years (G. Perry, pers. comm.). Hermaphrodite and seed-producing plants were recently identified amongst specimens from Albany (T. Macfarlane, pers. comm.), which explains how pampas grass has become naturalized around Perth, Albany and other parts of the south west in recent years.

At the Agriculture Protection Board (A.P.B.) Weeds Committee meeting of July 1990, it was decided that a survey should be undertaken to

determine the distribution and significance of naturalized pampas grass in W.A. by documenting the shires which had infestations of the grass, and recording the sizes of infestations and the types of locations in which they occurred. The survey also aimed to reveal whether any other species of *Cortaderia* - especially *C. jubata* - were present in the State. Information of this kind is relevant to local authorities, conservation groups and government departments who are concerned about the spread and management of pampas grass.

METHODS

A questionnaire was sent to all A.P.B. Regional and District Officers in the south west of the State and the metropolitan area (A.P.B. Zones 4,5,6,7,8 and 10) in October 1990. The questionnaire required the reporting officer to state whether naturalized stands of pampas grass occurred in a particular shire. If the grass was naturalized, the officer was also asked to state the size of the infestation(s), the sort of situations in which it was growing and whether it was causing concern within the Shire.

Following the questionnaire survey, samples of plumes were requested from shires identified as having infestations of the grass, to enable identification of the species of *Cortaderia* involved and to permit the sexual form of naturalized plants to be determined (i.e. whether female or hermaphrodite).

RESULTS

A total of 268 plume samples were submitted from 21 infestations in the metropolitan area and from 65 infestations in 19 country shires.

IDENTIFICATION

All samples were of the common pampas grass, *Cortaderia selloana*. The plumes showed considerable colour variation, from white through cream to pink and pale purple.

DISTRIBUTION

Naturalized pampas grass is found throughout the metropolitan area (Table 1; Fig.1). Although the stands were fairly evenly spread, infestations were slightly more frequent in swamps and lakes in the northern corridor, along the Swan River foreshore between Perth and Guildford, along the Tonkin Highway near Wattle Grove and around Ranford Road, Canning Vale.

Outside the metropolitan area, naturalized pampas grass occurs widely throughout the lower south-west (Fig. 2). Infestations were reported from all shires in Zone 6, with the exception of the Shire of Serpentine/Jarrahdale. In Zone 5, Albany Shire was heavily infested, while minor infestations were reported from Plantagenet, Gnowangerup, Narrogin and Boddington shires.

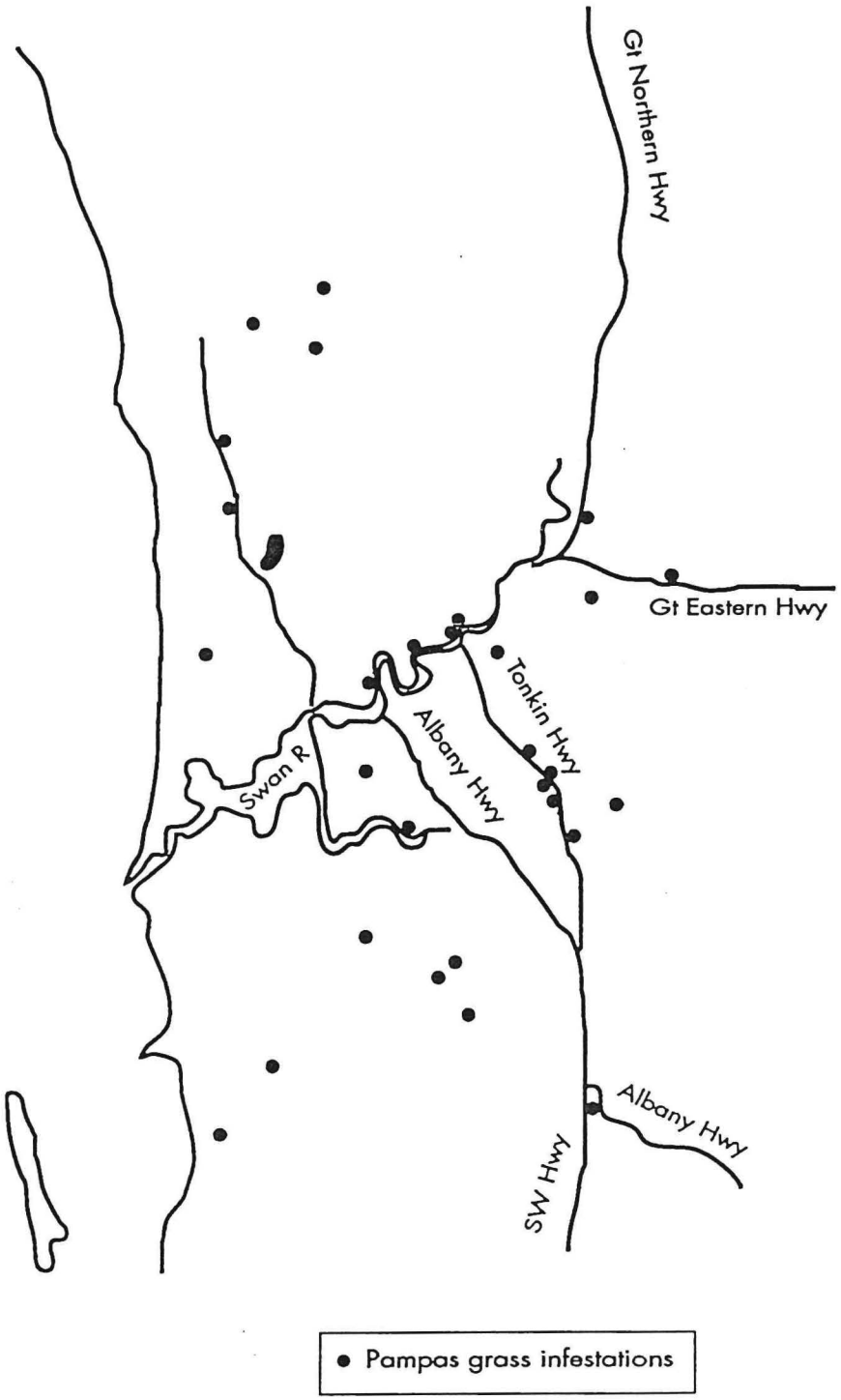
INFESTATION SIZE AND SEVERITY

The largest infestation around Perth is in the Osborne Park swamplands, where some 2 km² is densely infested. Other significant infestations are along the Swan River foreshore at Maylands/ Bayswater and at the Monier sand quarry off Ranford Road, Canning Vale. Several smaller infestations nearby were almost certainly derived from these large populations (Fig. 1). Most infestations in the metropolitan area were small, however.

Table 1 Location of pampas grass infestations in the metropolitan area

LOCALITY	SITE
Armadale	Bedfordale Hill Rd
Balcatta/Osborne Pk	Drained swamps W of Main St, N of Mitchell Fwy
Bayswater	North end of Redcliffe Bridge
	Corner of Colwyn Rd and Katanning St
Bullsbrook	Chittering Valley Rd
Canning Vale	Gosnells Golf Course.
	Monier sand quarry, Ranford Rd
	Balannup Rd
City Beach	Oceanic Drive, site of Skyline Drive-in Theatre
Como	Collier Park Golf Course
East Perth	Jewell St
Forrestfield	Tonkin Hwy, near Hale Rd
Greenwood	Mitchell Fwy, N of Warwick Rd
Greenmount	Wandu Rd
Gwelup	Careniup Swamp
Helena Valley	Roe Hwy, Helena River bridge
Jandabup	Lake Jandabup wetlands
Leeming	Near rubbish tip off Beasley Drive
Lesmurdie	Between Welshpool Rd and Melaleuca Rd
Maylands	Swan River foreshore, E end of Kelvin St, Peninsula Rd
Middle Swan	Corner of Great Northern Hwy and Bishop Rd
Orange Grove	Tonkin Hwy, near Kelvin Rd rubbish tip
Perth Airport	Within reserve
Success	Thomson's Lake reserve
Wanneroo	Badgerup Lake, Lake Joondalup
Wattle Grove	Tonkin Hwy, S of Hale Rd
	Tonkin Hwy, N of Welshpool Rd
Wattleup	Rockingham Rd, opposite shopping centre
Wilson	Centenary Ave, at Shelley Bridge

Figure 1 Location of Pampas grass infestations in the metropolitan area



Outside the metropolitan area, the majority of infestations were small and consisted of one or a few plants. The shires most heavily affected were Albany (both Town and Shire Council areas), Augusta/Margaret River and Bunbury (Table 2). In these shires, the densest and most extensive infestations were in the major towns, i.e. Albany, Augusta and Bunbury. The grass is especially abundant and widespread in Albany and Augusta. Bunbury appears to have fewer sizeable infestations than the other two, but some occupy several hectares.

Shires classified as being moderately affected mostly had a few small infestations, occupying 2 ha or less, within which the plants were few and scattered. Exceptions to this were Waroona Shire where plants were reported to be scattered over 100 ha, and Mandurah with 4-15 ha of scattered plants. In the remaining shires, infestations were limited to a few stands of one or a few plants (Table 2).

Table 2 Country shires with naturalized pampas grass, grouped according to severity of infestation

LIGHT*	MEDIUM	HEAVY
Boddington	Busselton	Albany(Town and Shire)
Boyup Brook	Dardanup	Augusta/Margaret River
Bridgetown	Donnybrook/Balingup	Bunbury
Capel	Mandurah	
Collie	Manjimup	
Gnowangerup	Murray	
Harvey	Waroona	
Nannup		
Narrogin		
Plantagenet		

*Categories

LIGHT: only a few infestations, each consisting of a few plants

MEDIUM: infestations generally occupying a small area (1-5ha), plants scattered

HEAVY: numerous infestations, often large (occupying several hectares) and dense

Figure 2 Distribution of Shires with pampas grass infestations

HABITATS

Around Perth, pampas grass grew mainly in artificial or disturbed habitats such as roadsides, wetlands (including drained swamps and lake edges), industrial lands and vacant, disturbed land. Other situations where pampas grass was reported included golf courses and recreation reserves, a sand quarry and around Perth airport. At a few sites, the grass occurred within native vegetation where it abutted a road verge or fire break, while along Welshpool Road, Lesmurdie, it was found amongst native shrubs growing on a seepage area on the crest of a road cutting.

A similar pattern was seen in country areas, where pampas grass was most frequently found around towns, growing mainly along roadsides, on vacant, disturbed or industrial land and in urban swamps and wetlands (Table 3).

Table 3 Major sources of pampas grass specimens collected from country Shires

	NO. SPECIMENS
a) IN OR NEAR TOWN SITES	
Roadsides	23
Vacant, disturbed land	20
Unspecified urban	15
Industrial land	11
Swamps and wetlands	10
River banks	5
Caravan parks	5
Bushland	4
Railway reserves	4
Drains and creek lines	2
Gardens	2
Recreation reserves	2
	103
b) AWAY FROM TOWNS	
Plantations	14*
Roadsides	11
Bushland	4
Drains and creek lines	3
Swamps and wetlands	2
Unspecified	1
	35

*all specimens came from a single plantation

Away from the towns, pampas grass was found in a limited number of situations (Table 3). A number of reports indicated that pampas grass was growing in native vegetation in forestry or conservation reserves. These are summarized in Table 4. The details of each report are unknown, however, and require checking before the significance of the problem can be assessed. Pampas grass was recorded in pine plantations in Albany, Dardanup, Donnybrook/Balingup and Nannup shires, within State Forest in Capel, Manjimup and Murray shires and in bushland (of unspecified status or condition) in most of the shires listed in Table 4.

Table 4 Reports of pampas grass in native vegetation and plantations

SHIRE	DETAILS
Albany	Isolated plants in reserves and pine plantations
	Spreading from roadsides into bush within Town Council area
Augusta/ Margaret River	In areas adjoining National Parks
	In coastal heath, Cape Leeuwin
Capel	One plant in State Forest
	One or two small plants at Peppermint Grove Beach
Dardanup	A few plants in pine and tuart forests, including Wellington Plantation
Donnybrook/Balingup	In Grimwade Pine Plantation. Approx. 2ha along creek and amongst young pines
Mandurah	In 4-15ha of bushland (probably highly disturbed) within town
Manjimup	In and beside some timber and conservation reserves. Eradication in progress
Murray	Scarp Rd, East Pinjarra (AMG 048 835, on C.A.L.M. plan "Pinjarra")
	Black Lake, North Yunderup (Public Recreation reserve no. 35283)
Nannup	One large plant in C.A.L.M. pine plantation. Eradication in progress

FREQUENCY OF FERTILE PLANTS

Two-thirds of the 268 plume specimens were females and half of these possessed seeds. Only one of the 91 hermaphrodite specimens had seeds. Seed producing plants were collected throughout the distribution of pampas grass. The few Shires from which seed-producing specimens were not obtained usually contained hermaphrodite and female plants, and therefore had the potential for seed production (Table 5).

Table 5 Numbers of hermaphrodite and female plumes obtained from the metropolitan area and country shires. The figures in brackets are the numbers of seed-bearing plumes

	NO. SPECIMENS	
SOURCE	HERMAPHRODITE	FEMALE
Metro area	52	70 (20)
Albany	4	41 (27)
Augusta/Margaret River	4	8 (3)
Boddington	1	0
Boyup Brook	1	2 (1)
Bridgetown	2 (1)	3
Bunbury	2	2
Busselton	3	4 (4)
Collie	0	1
Dardanup	0	4
Donnybrook/Balingup	41	4 (12)
Gnowangerup	10	
Harvey	1	1
Mandurah	1	3 (3)
Manjimup	6	13 (8)
Murray	2	2
Nannup	0	1
Narrogin	0	1 (1)
Plantagenet	3	2 (1)
Waroona	2	5 (4)

LEVEL OF CONCERN

As well as the general call for action from the Busselton Naturalists Club, there are several reports of concern about pampas grass, or its control. In Albany, the Town and Shire councils both actively undertake control of this weed, especially on roadsides where infestations reduce visibility to road users, in situations where it poses a significant fire hazard and where it is spreading into areas of bushland.

The Shire of Augusta/Margaret River is concerned about the amount of pampas grass around Augusta and has sought control advice from the A.P.B., while the Department of Conservation and Land Management (C.A.L.M.) has carried out some control in reserves and National Parks around the town. Shire personnel and C.A.L.M. are collaborating to eradicate pampas grass in Nannup, while in Manjimup their combined efforts have led to the eradication of pampas grass at Walpole.

The disappearance of a few plants reported along roadsides in 1986/87 indicates that successful eradication has been achieved by various authorities (C.A.L.M., Main Roads Department, A.P.B., Shires).

DISCUSSION

Naturalized pampas grass is widespread in the lower south-west of the State and in the metropolitan area. At present the majority of infestations are small and most country shires and metropolitan local authorities are affected by only a few infestations. Most infestations were in parts of the south-west that received >750mm annual rainfall (Fig.2). Throughout its distribution, naturalized pampas grass was most frequently associated with roadsides and disturbed situations in and around towns, especially where drains, creeks or swamps provided wet soil.

Hermaphrodite and seed-producing plants were present in virtually all infestations. This finding has two important implications; firstly, it explains why pampas grass plants are to be found in situations, and in quantities, that could not have been the result of deliberate or accidental introduction of vegetatively-propagated material. Secondly, it identifies the mechanism by which further spread is likely to occur. Since seed-producing pampas grass is now scattered widely throughout climatically-suitable areas of the State, it seems inevitable that the incidence of this grass will increase as seeds disperse to suitable habitats to give rise to new infestations.

Apart from Albany where the town and shire councils have been undertaking control of pampas grass for a number of years, most shires and local authorities carry out either sporadic, *ad hoc* control, or none at all. Given the small, low-density nature of most infestations, it appears that pampas grass is only just beginning to become established and widespread in this State. This is the ideal opportunity to implement eradication measures, before infestations become too large or abundant.

The A.P.B. has not gazetted pampas grass as a Declared Plant, since it is not an agriculturally-significant weed. The Board recognises the environmental significance of this weed, however, and urges local authorities to prescribe pampas grass a Pest Plant, under the appropriate legislation, and to develop an eradication programme. The A.P.B. will support fully with this classification of pampas grass and can provide recommendations for its eradication by mechanical and chemical means.

Unless appropriate action is taken soon, there is a risk that pampas grass will continue spreading and that some infestations will expand to reach the proportions already found in the worst-affected parts of the State