

Eyre Peninsula NRM Board

## PEST SPECIES REGIONAL MANAGEMENT PLAN

*Alternanthera pungens* - Khaki Weed



Natural Resources  
Eyre Peninsula



Government of South Australia  
Eyre Peninsula Natural Resources  
Management Board

# INTRODUCTION

## Synonyms

*Achyranthes repens* L., *Alternanthera repens* (L.), *Alternanthera achyrantha* R.Br., *Alternanthera echinata* Sm. in Rees, *Illecebrum achyrantha* L.

Creeping chaffweed, it-sit (Pakistan), khaki burr, khaki weed, springflower *Alternanthera*.

## Biology

Khaki weed *Alternanthera pungens* Kunth (Family: Amaranthaceae) is a prostrate, creeping, perennial herb with stems up to 60 cm long [1]. Leaves are round to oval, green with red-purple veins and short leaf stalks. The leaves are in pairs along the stem, ranging between five and 45 mm long. One leaf of the pair is significantly larger than its partner. The root system is perennial, with a large woody taproot, and the above ground growth is annual. Khaki weed reproduces both vegetatively from roots and by stems taking root at the leaf nodes, and sexually by seeds [1]. Clusters of very small inconspicuous white flowers in the leaf axils are produced mainly in summer and autumn (Table 1), but may grow in spring. Flowers are surrounded by tiny bracts that, after fertilisation, together form a prickly, khaki coloured burr (approximately one centimetre long) [1], with numerous small fruits and small round seeds inside [2].

Seeds germinate in the spring. A deep taproot and creeping stems are produced in spring and summer, with all aerial growth dying off in late summer. The fleshy taproot sustains the dormant plant. New growth is produced from the root crown in the following spring.

**Table 1: Summary of khaki weed seasonal growth patterns in temperate southern Australia.**

	J	F	M	A	M	J	J	A	S	O	N	D
Flowering	Y	Y	Y	Y	Y					O	O	Y
Seeding	Y	Y	Y	Y	Y							Y
Germination									Y	Y	Y	
Dormancy						Y	Y	Y	Y	Y		

**Legend:** Y = Yes, regularly, O = Occasionally.

Khaki weed is a summer-growing perennial that prefers light soils, warm temperatures and plenty of moisture. It is a C<sub>4</sub> plant capable of a relatively high rate of photosynthesis [3].

## Origin

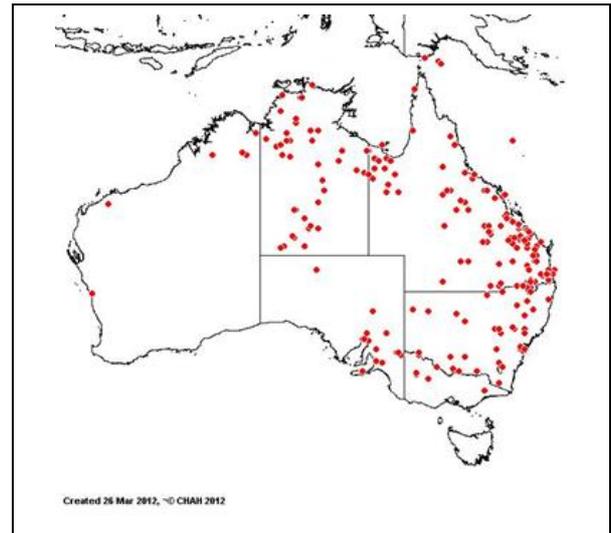
*Alternanthera pungens* is a native of central and southern America [1], in Brazil, Ecuador, Peru and Venezuela.

*A. pungens* was first recorded in NSW in 1898 and was in Queensland in 1910 [1]. Further introductions occurred after the Boer War with horses returning from South Africa,

where it is a pest species. It was first recorded in South Australia in 1957 [4] and was suspected to have been introduced in contaminated evening primrose seed [5]. The plants established in S.A. have a low palatability (Alcock, 1985).

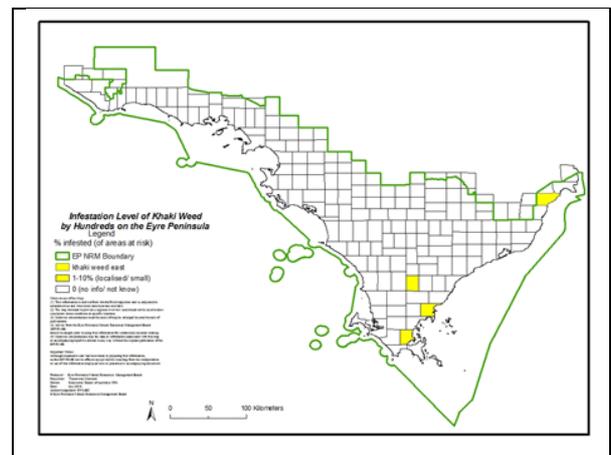
## Distribution

*A. pungens* has a worldwide distribution, occurring predominantly in warm temperate and tropical areas. It is found in all mainland states and territories in Australia (Figure 1 Error! Reference source not found.).



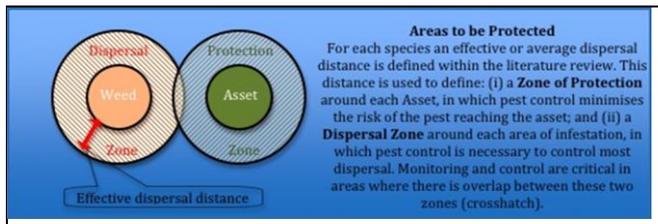
**Figure 1: Distribution records of *Alternanthera pungens* in Australia (red dot). Source: Australia's Virtual Herbarium (2012)**

In South Australia it is associated with irrigated areas and gardens, with a patchy distribution across the state (Figure 2).



**Figure 2: Distribution of *Alternanthera pungens* by hundreds and percentage infestation of areas on the Eyre Peninsula, 2008 data. Source: PIRSA.**

## RISK ASSESSMENT



### Pest Risk

Khaki weed is a prolific seeder, with seeds remaining viable for up to 4-5 years in some areas.

The burr containing the seeds readily becomes attached to animals, clothing and other objects (e.g. vehicle tyres). Burrs may also be dispersed by water movement and in contaminated agricultural produce (e.g. fodder and pasture seed). Machinery, livestock or cultivation can spread stem fragments. Longer distance dispersal occurs when burrs attach to clothing, animals or machinery. The plants readily colonise bare ground [2].

Seed dispersal distance is related to vector movement within and between properties. Where dispersal is via stock or fodder transport, or vehicle movement areas of protection should shift to roadsides and departure and arrival points.

This species initially tends to be found along roadsides and in other highly disturbed sites [6]. However, it can spread from these areas into disturbed natural environments and occasionally invades native pastures on sandy soils, where it out-competes most other species with its mat-forming habit [6]. Most infestations occur in camping grounds, parking bays, town streets, stockyards, waste places and private gardens [2]. Seeds are introduced on vehicles and camping equipment from interstate [4]. Khaki weed particularly favours areas like caravan parks that are watered in summer.

The deep taproot makes this weed relatively drought tolerant [7].

Khaki weed may spread over quite extensive areas, sometimes in dense mats that may prevent growth of other plants [2] and occasionally it establishes in native pastures where it out-competes other native species [5]. Khaki weed is not known to affect agricultural yields greatly, but in New South Wales it competes with both irrigated and dryland Lucerne [8].

Animals do not generally eat Khaki weed [1, 8]. It is suspected of poisoning sheep and pigs, and causing digestive disturbances and skin ailments in cattle [1, 8]. Horses that graze on areas containing large amounts of this species have developed a form of staggers [6]. At times young plants are moderately palatable to sheep and are consumed [1, 8]. Khaki weed is of low palatability to goats, but has no known risk of toxicity [9]. Its burrs can

contaminate lucerne hay and other stock feeds [6]. The burrs can also contribute to vegetable fault in wool and cause mechanical damage to the feet and mouths of stock [8].

Khaki weed has been recorded in conservation areas in South Australia i.e. Coorong National Park [6]. In Western Australia, khaki weed grows along creek banks, drainage channels and in grasslands and other disturbed natural vegetation [6]. It is widespread in New South Wales, where it has been reported from disturbed sites in conservation areas, particularly in drier inland regions [6].

The sharp spines of the khaki weed's burrs are a great annoyance to bare-footed children and fruit-pickers and may affect some recreational activities [1, 5, 8].

It is known to cause hay fever, asthma and dermatitis in some people [5].

### Feasibility of Control

The best control strategy for khaki weed is to keep it off the property [7]. Purchases of fodder, produce, stock and soil need to be checked to ensure they are free of weed seeds. If stock is brought from infested areas they should be kept for at least 14 days in a holding paddock that can be checked later for khaki weed seedlings [7]. Keep stock away from fruiting plants to prevent burr transfer to new sites.

Any plants found should be destroyed before setting seed to prevent infestation. After initial treatment successful control of khaki weed involves destroying recurrent germinations.

For existing infestations, a planned strategic approach using an integrated control strategy consisting of mechanical, biological and chemical control is recommended. Timing is important, as killing the plant only at the end of its season will not help control the infestation.

Mechanical control consisting of cultivation and hand pulling can be effective. Cultivation can be successful if it is deep enough to prevent the taproot from reshooting [1]. Cultivation may also spread root fragments, which may produce new plants that can be destroyed by another cultivation [1]. Use of a hand hoe works well on small infestations before seeds form [1, 7]. Ensure the entire taproot is removed and dispose of plants by burning [1, 7].

Burning with a gas gun to get the top of the taproot seems to be the best control (D. Hughes, *Pers. Comm.* 14/05/2012).

Replacement of khaki weed with competitive pasture species will reduce reinfestation [7].

Herbicides should be applied when the weeds are actively growing and not under stress of any kind. It is best to treat seedlings as they require less chemical and are easier to kill

[7]. Control treatments must be applied persistently, without missing a year, until the khaki weed infestation is eradicated. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a national framework for environmental management (including the recognition of nationally threatened species and ecological communities), thereby directing resources towards the delivery of improved environmental protection. The EPBC Act applies where khaki weed threatens any listed species or ecological community or where its control may have adverse effects on matters of national environmental significance on Commonwealth land.

## Status

Within the EPNRM region a risk management assessment (Table 2) shows Khaki Weed merits: site protection in farming system land use zones to prevent spread of the weed species to key sites / assets of high economic, environmental and / or social value; control to prevent spread in perennial pasture land use zones with the aim of significantly reducing its extent and impact; and destruction of infestations in urban and horticultural land use areas with the aim of significantly reducing the extent of the species in the management area.

Table 2: Regional Assessment

Land Use	Pest Risk	Feasibility of Control	Management Action
Farming Systems	Low	Very High	Protect Sites
Perennial Pasture	Medium	Very High	Contain Spread
Urban / Horticulture	High	Very High	Destroy

## REGIONAL RESPONSE

### Special Considerations/Board Position

Khaki weed is a very effective competitor with established vegetation, including irrigated lawns.

Rubber wheeled vehicles, human foot traffic, contaminated produce and terrestrial animal movements readily spread Khaki weed burrs. As such, dispersal mainly occurs point to point, particularly along roads and tracks and can be over long distances.

Coordination of management with both private and public landholders and also community stakeholder groups is important because of the transfer of this weed between properties, the role of the public in dispersing the weed, and the impact of the weed on recreational areas.

## Outcomes

To prevent the establishment of new infestations and reduce the distribution of Khaki weed on the Eyre Peninsula.

## Objectives

To:

- eliminate or control any new outbreaks as quickly as possible;
- develop partnerships with stakeholders affected by Khaki weed to prevent any spread from infected sites;
- protect the economic, environmental and social values of all sites not currently infested with Khaki weed;
- protect the farming industry from loss of productivity caused by Khaki weed;
- increase awareness about the impacts of Khaki weed; and
- map all infestations across the region.

## Area/s to be protected

Habitat associated with existing khaki weed.

## Actions

To:

1. investigate reports, inspect, map and monitor all infestations and key dispersal points of Khaki weed (Authorised Officers);
2. implement an awareness campaign targeting the impacts of Khaki weed in farming systems and urban areas;
3. facilitate, encourage or compel control of khaki weed, to eradicate all infestations; and
4. facilitate, encourage or compel landholders to follow hygiene practises to minimise spread of plant materials through stock, produce, or equipment movement.

## Evaluation

Evaluation of success will be based on:

- analysis of compliance data to assess changes in number and size of new infestations and the effectiveness of control efforts in preventing khaki weed establishment; and
- annual review of known sites, and evaluation of the monitoring program across all districts at the NRM regional level every five years.

## Declarations

In South Australia khaki weed *Alternanthera pungens* is a Schedule 2 (CLASS 1 – Sections 175 (1)(2), 177 (1)(2), 180, 182 (1), and 185) declared weed under the *Natural Resources Management Act 2004* ().

Table 3).



**Table 3: Relevant sections of the *Natural Resource Management Act 2004* and provisions for the whole of state for khaki weed - *Alternanthera pungens*.**

Section	How the section applies
175 (1) (2)	Cannot bring the plant into the state Cannot transport the plant or anything with the plant in it in the state
177 (1) (2)	Cannot sell the plant Cannot sell any produce/goods carrying the plant
180	Land owner must notify the NRM authority of the presence of the plant on their land
182 (1)	Land owner must destroy the plant on their land
185	NRM authority may recover costs for control of plants on roadsides from adjoining land owners

Which means that the movement or transport of the plant on a public road by itself or as a contaminant, its entry to the State, or the sale by itself or as a contaminant are prohibited. In all regions, land owners are required to destroy khaki weed plants growing on their land. Notification of infestations is necessary to ensure these are destroyed. NRM authorities are required to destroy plants growing on road reserves, and may recover costs from the adjoining land owners. Khaki weed is declared in category 1 under the Act for the purpose of setting maximum penalties and for other purposes. Any permit to allow its movement or sale can only be issued by the Chief Officer pursuant to section 188. Under the Natural Resources Management (General) Regulations 2005, the transport or movement of grain for milling or wool for cleaning is exempt from the operation of sections 175 and the sale of wool or grain is exempt from section 177(2) if at the time of the sale the person believes on reasonable grounds that the purchaser will remove the plant from the wool or grain before any re-sale.

## References

1. Parsons, W.T., *Noxious Weeds of Victoria*. . 1973, Melbourne: Inkata Press. 300.
2. Cunningham, G.M., et al., *Plants of Western New South Wales*. 1999, Melbourne: Inkata Press. 766.
3. Rajendrudu, G., J.S.R. Prasad, and V.S.R. Das, *C<sub>3</sub>-C<sub>4</sub> Intermediate species in Alternanthera (Amaranthaceae)*. *Plant Physiology*, 1986. **80**: p. 409-414.
4. Anonymous. *Declared Plant Policy Khaki weed (Alternanthera pungens)*. 2011 8 November 2011; Available from: [\[http://www.pir.sa.gov.au/biosecuritysa/nrm\\_biosecurity/weeds/pest\\_weed\\_policies.\]](http://www.pir.sa.gov.au/biosecuritysa/nrm_biosecurity/weeds/pest_weed_policies)
5. Kloot, P.M., *Checklist of the Introduced Species Naturalised in South Australia*. 1986, Department of Agriculture South Australia Technical Paper No.14.: Adelaide, SA.
6. Anonymous. *Khaki Weed*. 2012 05/04/2012 [cited 2012 16/04/2012]; Available from: [\[http://www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds/weeds/other-declared-weeds/khaki-weed\]](http://www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds/weeds/other-declared-weeds/khaki-weed).
7. Anonymous. *Weed control Notes. Khaki Weed*. 2012 [cited 2012 16/04/2012]; Available from: [\[http://www.mitchamcouncil.sa.gov.au/webdata/resources/files/khaki\\_weed\\_control1.pdf\]](http://www.mitchamcouncil.sa.gov.au/webdata/resources/files/khaki_weed_control1.pdf).
8. Parsons, W.T. and E.G. Cuthbertson, *Noxious Weeds of Australia*. Second Edition ed. 2001, Collingwood, Victoria: CSIRO Publishing. 705.
9. Simmonds, H., P. Holst, and C. Bourke, *The Palatability, and Potential Toxicity of Australian Weeds to Goats*. 2000, Canberra: Rural Industries Research and Development Corporation. 156.

