

ONION WEED

Asphodelus fistulosus

Environmental Impact Assessment

Prepared by Jennifer Jackson
For the GNRBA, January 2023



INTRODUCTION

The Goldfields Nullarbor Rangelands Biosecurity Association (GNRBA) has recently started investigating biological control options for the weed *Asphodelus fistulosus*, commonly known as Onion Weed. A desktop review produced for the GNRBA (Owen, 2021) outlined the difficulties with controlling onion weed across the rangelands, and suggested that a time and cost-effective alternative, eg. Biological control be considered for its control.

This document considers the environmental impacts of *Asphodelus fistulosus* in Western Australia (WA) and more specifically the Goldfields and Nullarbor regions of WA. The establishment and spread potential, the impact potential and the geographic potential is considered.

WEEDS

A weed is a plant that is growing in an area where it naturally would not occur or is not wanted; it can be an introduced plant from another country or even just another region within Australia. Weeds are a potential threat to biodiversity and cultural values. Weeds can impact biodiversity through the exclusion of native flora species, modification of the structure and composition of native vegetation communities, loss of native fauna habitat and by contributing to changes in fire regime (frequency and intensity) and hydrology (DEC, 2013).

In Western Australia weed control is a shared responsibility between landholders, grower groups, biosecurity groups and the Department of Primary Industries and Regional Development (DPIRD). DPIRD regulates weeds under the *Biosecurity and Agriculture Management Act 2007 (BAM Act 2007)*. Plants that have control/management or keeping requirements or that are prevented entry into the State are known as declared pests. The [Western Australian Organism List \(WAOL\)](#) contains information on the area(s) in which a plant is declared and the control and keeping categories to which it has been assigned in WA.

Weeds can also be listed as a Weed of National Significance. The Weeds of National Significance (WoNS) program coordinates the national effort against Australia's worst invasive plants. WoNS species are those that have degraded large portions of Australia's natural and productive landscape and require action at a national level to reduce their impact (Australian Government, 2008). For each WoNS species, there is a national management strategy, management committee and program coordinator. Classification as a WoNS does not carry with it any legislative requirements, but it does mean that species is more likely to be included under state weed legislation.

ONION WEED

Onion Weed (*Asphodelus fistulosus*) is an upright herb with a flowering stem growing to 80 cm high. It has hollow leaves and 6-petalled white or pink flowers with a brown or reddish stripe along the centre of each petal. It occurs on roadsides, railway lines, neglected areas and poorer pastures, in semi-arid areas and sandy coastal environments across most of Australia. Onion Weed invades pastures, is unpalatable to livestock, competes successfully with cereal crops and invades relatively undisturbed woodland. The seedbank can persist for several years (Western Australian Herbarium, 1998-).

Onion weed is native to Europe and Africa, predominately the Mediterranean region (Western Australian Herbarium, 1998-). Cullen et al. (2012) states that it was first introduced to Australia in the 19th century. Florabase records show the earliest collections of Onion Weed in WA are from 1897 and 1900, and these are from Fremantle (Western Australian Herbarium, 1998-). There is a collection from 1930 from "Forrest, near station", assuming this is the train station at Forrest. Forrest is a former small railway settlement on the Nullarbor Plain, 88 kilometres west of the WA/ South Australia state border. Another record from Florabase confirms Onion weed was collected 80 km north of Rawlinna in 1970 (Western Australian Herbarium, 1998-). Collections from Florabase show that Onion Weed now occurs in 13 Interim Biogeographic Regionalisation of Australia

(IBRA) regions and 40 Local Government Areas in WA (Figure 1). It is also widespread in Australia, and present across all states and territories (ALA, 2023).



Figure 1: Distribution of Onion Weed (*Asphodelus fistulosus*) in Western Australia, January 2023 (Western Australian Herbarium, 1998-).

Onion Weed was first noticed at Fraser Range and Southern Hills Stations in the late 1980s and 1990s (Figure 2). Now Pastoral stations east of Kalgoorlie and Norseman have large stands of Onion Weed which are effectively outcompeting native grasses, herbs and small shrubs (Amanda Day, pers comm).

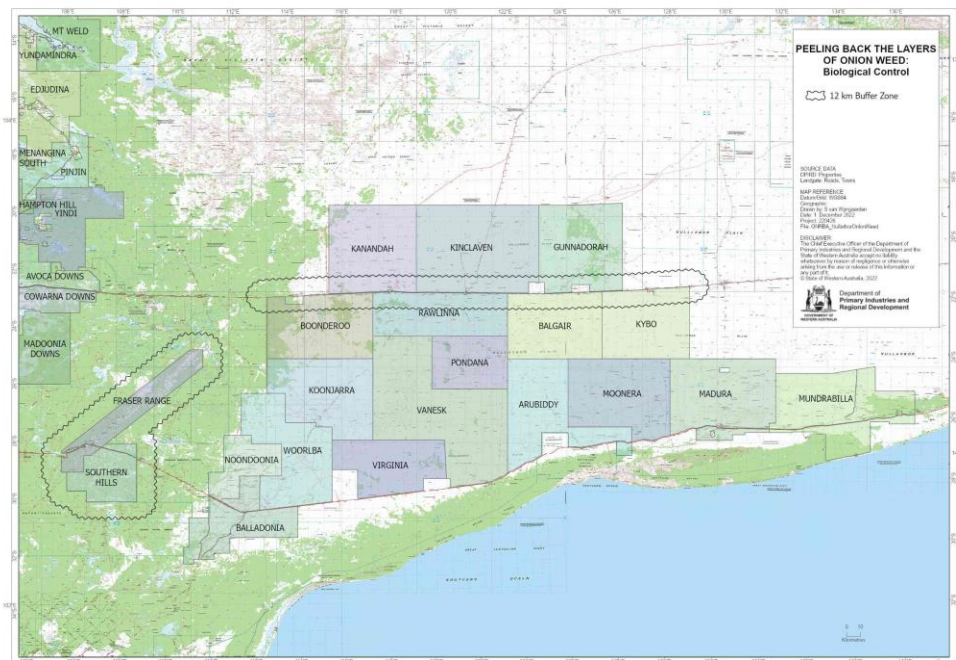


Figure 2: Onion Weed (*Asphodelus fistulosus*) was noticed at Fraser Range and Southern Hills Stations in the 1980 and 1990s, and now is common along the 'Transline' east of Kalgoorlie.

Onion weed is not a declared plant in Western Australia, or a Weed of National Significance.

It is not toxic, but is unpalatable to stock, and it thrives in overgrazed areas where it can form dense infestations and therefore reduces the availability of productive pasture to stock (Cullen *et al.* 2012). On the Nullarbor it also grows well and outcompetes native flora in areas that are not overgrazed (Amanda Day, pers comm).

A. fistulosus thrives in warm temperate, semi-arid to subhumid regions with annual rainfall of 250-500mm (Agriculture Victoria 2020, and Queensland Government, 2020). Alkaline sandy or gravelly well drained soils are preferred (Cullen *et al.* 2012). The plant is frost and drought hardy once established (Western Australian Herbarium, 1998-).

A. fistulosus is a prolific seed-producer with seeds that can remain viable in the seed bank for several years and are easily transported in trade, on vehicles, and by animals (USDA, 2019) up to 13,200 seeds per plant, (Parsons and Cuthbertson, 2001; Roark, 1955 in Cullen *et al.* 2012).

IMPACT ASSESSMENT

ESTABLISHMENT AND SPREAD POTENTIAL

The establishment and spread potential of *Asphodelus fistulosus* is considered high. The factors supporting this rating are discussed in Table 1.

Table 1: Factors supporting the rating of High for Onion Weed (*Asphodelus fistulosus*) establishment /spread potential.

Factor	Comments	Reference
Invasive elsewhere	Widespread in Australia, and present across all states and territories.	ALA, 2023.
	It is considered invasive in Australia and is naturalized in the United States, New Zealand, South Africa, Argentina, Bolivia, Chile, and Mexico.	USDA, 2019.
Ability to form dense populations	Although reproduction is mostly by seed, plants can also branch at the base, building larger and therefore denser clumps.	Cullen <i>et al.</i> , 2012.
Potential to reproduce within the first year of growth	Plants usually reproduce after 18 months, but if conditions are favourable plants can germinate in the first year.	USDA, 2019.
Prolific seed producer with a high germination rate	Prolific seed-producer, up to 13,200 seeds produced per plant.	Cullen <i>et al.</i> , 2012. Parsons and Cuthbertson, 2001.
Seeds can remain viable in the ground for several years and seeds have many forms of dispersal	Most seed dispersal is by wind, however can also be dispersed by vehicles, machinery, animals and water.	Parsons and Cuthbertson, 2001.

IMPACT POTENTIAL

Impact potential is considered to be high, based on it being able to establish then out compete native plants without any grazing impacts.

There is little documented evidence about the ecological impacts of *Asphodelus fistulosus*. Given that it is unpalatable to livestock and macropods (Greg Keighery, pers comm), and therefore has no method of being eliminated from the environment, it will evidently compete against native plants for resources. Dense infestations of this species will grow so thickly that the cover of other vegetation, particularly grasses, is reduced. These infestations eventually lower soil nitrogen levels, preventing other plants establishing and competing with this species (Lucid, 2016).

GEOGRAPHIC POTENTIAL

Based on climate and soil types, it is estimated that 15 IBRA regions of Western Australia are suitable for the establishment of *Asphodelus fistulosus* (Figure 3). Collections from Florabase show that Onion Weed currently is known from 13 IBRA regions in WA (Western Australian Herbarium, 1998-).

Several IBRA regions were considered not to be suitable for the establishment due to their high rainfall, remoteness and in areas of the southwest, no known populations are currently recorded (Western Australian Herbarium, 1998-).

The Nullarbor IBRA region is possibly at a greater risk due to being dominated by limestone plains, with calcareous shallow loams and calcareous loamy earths (Barton, Cowan and Tiedemann, 2002). Given that Alkaline sandy or gravelly well drained soils are preferred by *Asphodelus fistulosus*, the soils of the Nullarbor are well suited to supporting its growth.

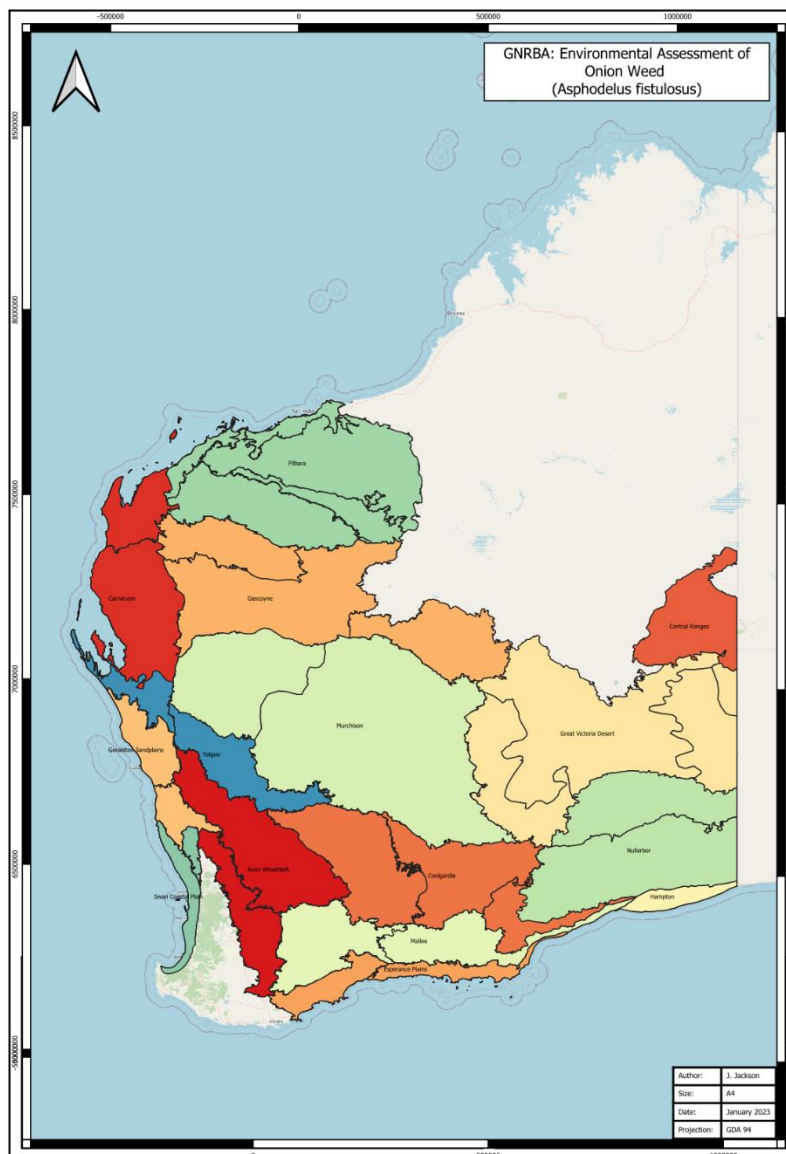


Figure 3: IBRA regions of WA where Onion Weed (*Asphodelus fistulosus*) has already established or has the potential to establish.

DISCUSSION

The result of the weed risk assessment for *Asphodelus fistulosus* is High Risk of becoming weedy or invasive in many areas of Western Australia, including the Goldfields and particularly the Nullarbor. *A. fistulosus* is known to form dense populations and is mostly unpalatable, given its high seed load per plant and that seeds can survive for several years after dispersal from the plant, it has a high potential to impact the environment of WA and the Goldfields and Nullarbor by reducing the ability of native plants to grow. The profitability of pastureland will ultimately be reduced when Onion Weed outcompetes pasture grasses. Not only this, but it will also eventually lead to a reduction of habitat and resources for small native fauna.

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PERSONAL COMMENTS

- Amanda Day, Chief Executive officer, GNRBA
- Greg Keighery, Former Senior Research Scientist, Department of Biodiversity, Conservation and Attractions.

APPENDIX 1 TRIP REPORT

Trip report, Onion weed site visit for GNRBA, December 2022

7th December 2022 to 8th December 2022

As part of this work with GNRBA, I visited an area east of Kalgoorlie, on the Nullarbor with GNRBA CEO Amanda Day. The purpose of this trip was to get an overview of where Onion weed (*Asphodelus fistulosus*) is growing, and how it is impacting the environment in these areas.

Amanda was also collecting seed and plants from several populations of Onion weed as part of a study being done by CSIRO to consider biological control options for the species in Western Australia. Populations visited and collected from is shown in Figure 1.

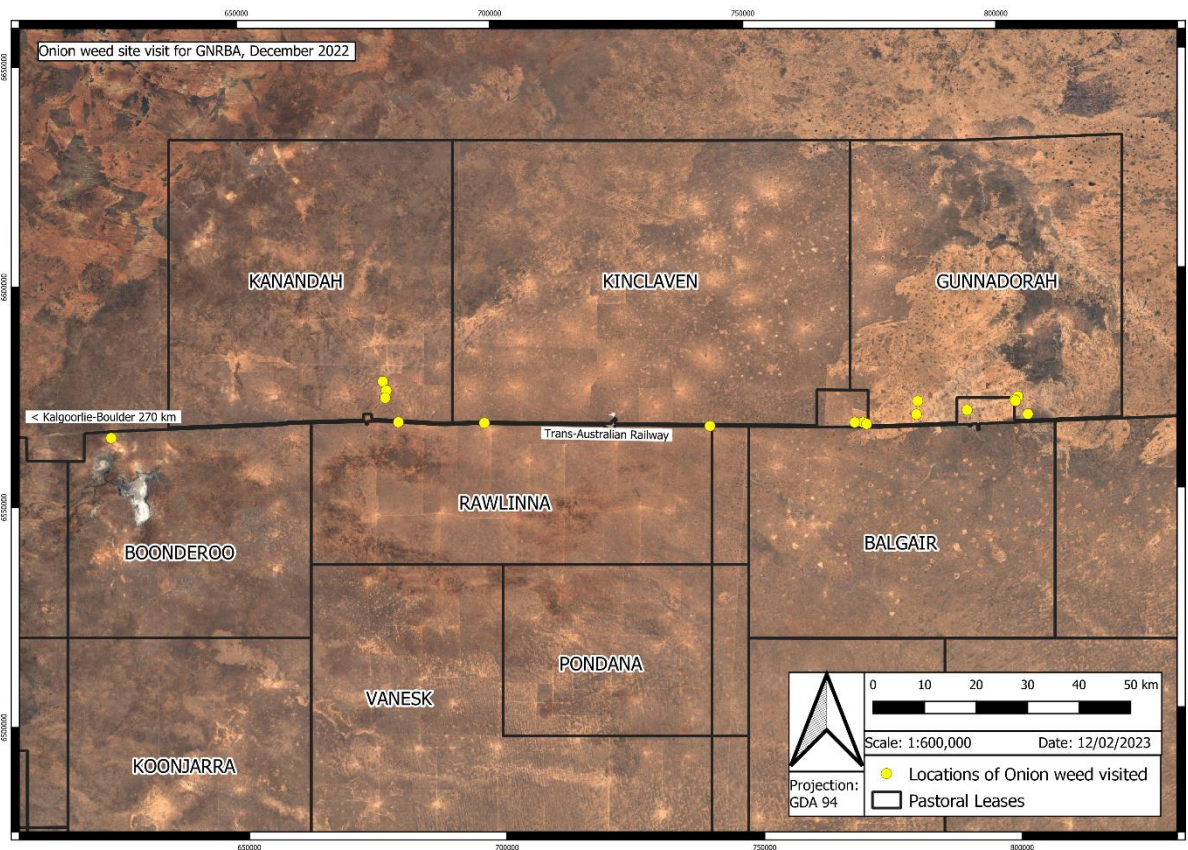


Figure 1. Map showing stations and populations of Onion weed (*Asphodelus fistulosus*) visited during December 2022

7th December 2022

We visited pastoral station Gunnadorah and spent the afternoon with Pastoralist Brett Day. Brett showed us numerous large stands of Onion Weed on the station and showed how it was spreading out north from the Trans-Australian Railway (the transline), more than 6 km in some areas. Brett has been trialling several different herbicides and methods (eg. dose rates) on the Onion weed and is still finding it difficult to control. The areas where onion weed is growing, it appears it is claiming all or most of any available resources eg. water and is very effective at outcompeting any native grasses or small herbs or shrubs. Overall the plants appear very healthy, and in some cases, herbicide is not having any impact on the plants. At some populations plants are spreading and cover several hectares.



Figure 2. Dense population of Onion weed at Gunnadorah Station.

8th December 2022

We visited Kanandah where we met with Pastoralists Karen and Mark Forrester. The Forresters have the leases for Kanandah and Balgair stations and both are certified organic beef producing stations. Therefore, this means that the Forresters are not able to use herbicides to control Onion weed. Mark showed us several populations of Onion weed on Kanandah, they were growing very well and plants appeared healthy. These populations were more than 9 km from the transline. Again, and with no control being done here, plants were spreading and starting to cover several hectares at each population. Karen and Mark are very keen to see a biological control for Onion weed introduced, as they are concerned about the spread of the weed, and it outcompeting native plants.



Figure 3. A dense and healthy population of Onion weed at Kanandah Station.

Plant and Seed Collection

Amanda was collecting plants and seeds for CSIRO, this is part of a study to determine if a biological control can be effective at controlling the Onion weed, and as part of this study plants and seeds from various populations needed to be collected.

The plants were being collected for DNA analysis to determine the lineage of these Australian plants and populations, and how they compare to native populations in Europe.

The seeds were being sent to France to be grown into plants to be used in a study to determine if the biological control agents that CSIRO propose to use will be effective at controlling these Australian plants.

Summary

Onion weed is thriving in areas of the Nullarbor, an area that is well known for having poor calcareous soils and low annual rainfall. It is proving difficult to control with herbicide, and populations appear healthy and are spreading even with low recent rainfall. If Onion weed can't be controlled with already available herbicides, it will only spread further from the locations where it is currently growing. It is effectively outcompeting native plants, this will eventually lead to a reduction of feed for stock, and a reduction of habitat and resources for small native fauna. I would suggest that a biological control would be a very worthwhile initiative to investigate.

J. Jackson

Jennifer Jackson

Environmental Consultant

BSc (Honours) Environmental Management

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