

# Eyre Peninsula Landscape Board

## PEST SPECIES REGIONAL MANAGEMENT PLAN

### *Lycium ferocissimum*

### *African Boxthorn*

This plan has a five year life period and will be reviewed in 2027.



# INTRODUCTION

## Synonym(s)

*Lycium macrocalyx* Domin., *Lycium europaeum* L. (misapplied by Bailey, F.M. 1901, The Queensland Flora. 4: 1094.), *Lycium chinense* auct. non Mill.:Benth., partly.

Boksdorn, boxthorn.

## Biology

African boxthorn *Lycium ferocissimum* Miers (Family Solanaceae) is an erect, intricately branched, semi-deciduous, perennial shrub up to five metres high, with rigid branches [1, 2]. Spines up to 15 cm long occur on the main stems, with smaller spines on the branchlets, which terminate in a spine [2]. African boxthorn has an extensive, deep, root system [2]. Established plants produce suckers or shoots from roots, including root fragments. African boxthorn reproduces from seed. One or two flowers grow from leaf axils [2]. Flowering and fruiting occur mainly in spring and summer (Table 1) [2], but are sporadic throughout the year [1]. Birds or foxes readily eat the orange-red globular fruit and excrete viable seeds [2]. Seeds can germinate at any time of the year, with a flush in autumn and spring when temperatures are above 15 °C. Seedlings develop an extensive root system in the first few months [2], ensuring young plants can compete for water and tolerate dry periods. Plants do not flower until at least two years of age [2].

**Table 1: Summary of African boxthorn seasonal growth patterns in temperate southern Australia.**

	J	F	M	A	M	J	J	A	S	O	N	D
Dormant	Y	Y				V	V	V				
Active Growth	Y	Y	Y	Y	Y				Y	Y	Y	Y
New Growth									Y	Y	Y	
Flowering	Y	Y	Y							Y	Y	Y
Seeding			Y	Y	Y							
Germination	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Conventional Treatment					Y	Y	Y	Y	Y	Y	Y	
Graslin Treatment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

**Legend:** Y = Yes, regularly, V = Varies with season

The plants may be deciduous under extreme condition such as dry or cold, with new leaves

produced in spring. In the Eyre Peninsula region plants are not always dormant in winter under milder conditions, but are regularly dormant over summer due to lack of moisture, with some plants defoliating (P. Elson. *Pers. Comm.* 19/04/2012).

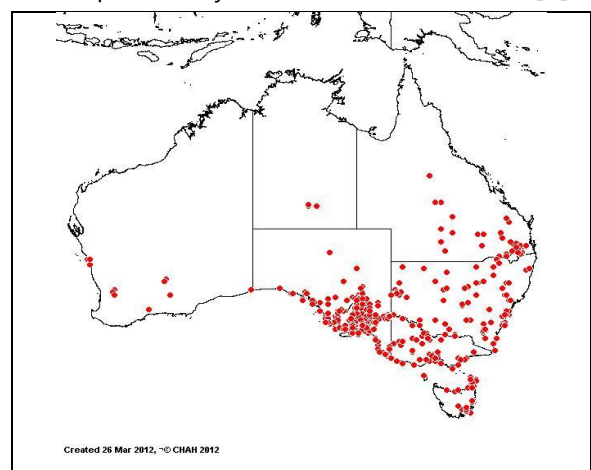
African boxthorn prefers dry, light soils but it will grow on all soil types. It invades coastal areas, pastures, neglected areas, roadsides, railway lines and waterways.

## Origin

*Lycium ferocissimum* is native to the western and eastern Cape Provinces of South Africa and the adjoining country of Lesotho [3]. Worldwide, the introduced range includes Morocco and Tunisia, south west Spain and Cyprus, Massachusetts, North Carolina and Florida in the USA, and New Zealand [4]. In 1858 African boxthorn was established at the Adelaide Botanic Gardens, and was planted extensively as a windbreak [5].

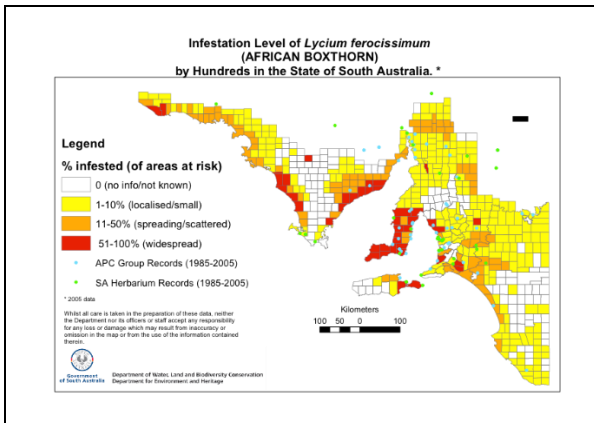
## Distribution

In Australia, *Lycium ferocissimum* is a widespread introduced weed in all but the driest and tropical regions, being found in all states and mainland territories [6] (Figure 1). It can occur where the average annual rainfall is greater than 200 mm and can be particularly abundant in wetter areas [7].

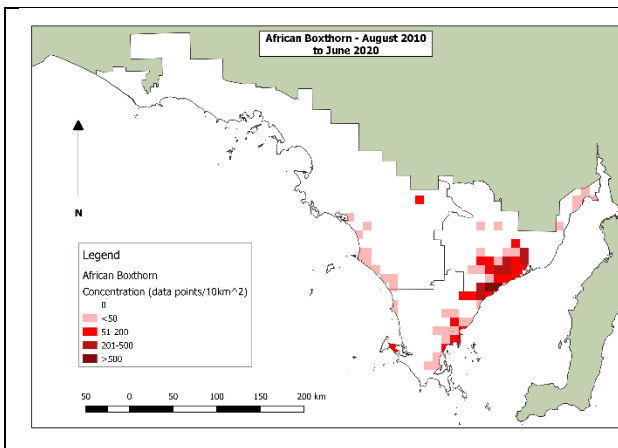


**Figure 1: Distribution of *Lycium ferocissimum* in Australia** Source: Australia's Virtual Herbarium (2012) [www.chah.gov.au/avh](http://www.chah.gov.au/avh)

Where its distribution enters drier regions, plants are generally found close to permanent or seasonal water supplies [1]. Boxthorn is mainly a weed of open areas such as woodlands, rangelands, coastal areas including offshore islands, watercourses, roadsides, rail reserves and pastures that are not cultivated [7]. It is tolerant of most soil types and also of some salinity [1], occurring across extensive area of South Australia (Figure 2), being particularly widespread and common near the sea. The current distribution of African boxthorn on the Eyre Peninsula is extensive, but particularly concentrated on the east coast (Figure 3).



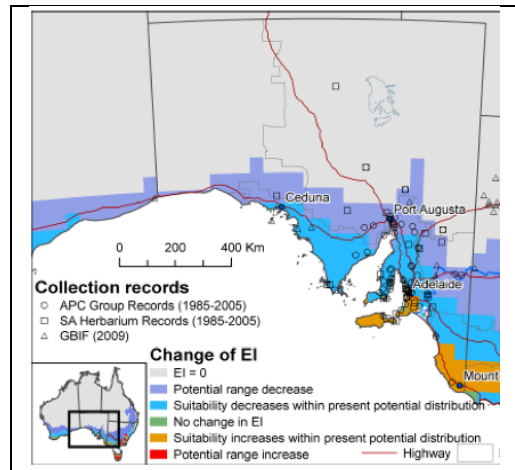
**Figure 2: Distribution by hundreds and percentage infestation of area at risk in South Australia, 2005 data. Source: PIRSA**



**Figure 3: Distribution of *Lycium ferocissimum* on Eyre Peninsula using BDBSA data and EPLB control data. Note there are certainly other areas that have large infestations of African Boxthorn that are not captured on this map.**

The distribution, habitat requirements and climatic needs of *Lycium ferocissimum* in its native range in

South Africa and its range in New Zealand have been used to determine CLIMEX parameter values to model the potential impacts of climate change on distribution in Australia [4]. Modelling for South Australia of the CLIMEX Ecoclimatic Index (EI) using CSIRO Mk3 projections for 2080 based on the A1B SRES emissions scenario [4] predicts a marked range decrease across the northern half of its existing distribution, and a decline in habitat suitability within a large portion of the southern half of the distribution (Figure 4).



**Figure 4: Predicted change in climate suitability for *Lycium ferocissimum* in South Australia as indicated by the CLIMEX Ecoclimatic Index (EI) using CSIRO Mk3 projections for 2080 based on the A1B SRES emissions scenario [4].**

Importantly, as temperatures warm, the suitability of climate improves in the coastal areas of EP. Thus, the threats posed by African boxthorn will increase through more vigorous growth and higher fecundity in these areas. Combined with decreasing herbicide efficacy, the weed threats in coastal areas could increase considerably in the future [4].

## RISK ASSESSMENT

### Pest risk

African boxthorn is considered a significant woody weed in Australia, meriting 24<sup>th</sup> ranking from 71 weeds nominated for the Weeds of National Significance (WoNS) assessment [8]. On 20 April 2012, African boxthorn was endorsed by the Australian Weeds Committee as one of 12 additional species listed as WoNS in Australia. These additional weeds were selected based on



their economic, environmental and social impacts and their potential to spread. A national strategy for WoNS has been developed and can be found at:

<https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/pests-diseases-weeds/consultation/aws-final.pdf>

Fruit production per plant appears to vary with environmental conditions. Erkelenz [9] recorded an average of 223 fruit / plant at Streaky Bay in SA, but in Victoria between 730 and 4219 were recorded on ten plants. An average of 21 seeds / fruit were recorded at Streaky Bay, but in Victoria between 35 and 70 were recorded [9].

African boxthorn regenerates rapidly after fire or when aboveground growth is cut. The taproot can resprout if physically damaged, making it difficult to kill by pulling [10]. If new growth is pruned, shrubs can produce flowers and fruit on old growth [2].

Foxes, birds and skinks (reptiles) commonly eat fruit and viable seeds are excreted. Starlings, silver and Pacific gulls, rock doves and silvereyes eat the fruit, spreading seeds widely from initial plantings [5]. Blackbird habitat preferences and behaviour result in germinable seeds being deposited in a range of sites, particularly in shrubby habitats [11]. Blackbirds mostly deposit seeds within 50 m of the source plant, but some may be carried a kilometre or more to develop new invasive loci [11]. Dense infestations of African boxthorn are common under trees, shrubs, posts, fences or power lines where birds perch. Spread can also occur if seeds contaminate agricultural produce, gravel or mud, but these are of minor importance [2]. Based on these data an effective seed dispersal distance of up to 500 m from an infestation can be anticipated, but where blackbirds, starlings and foxes are important vectors this distance should be extended to two kilometres.

If untreated, African boxthorn grows to a great size and dense infestations out-compete native plants. It invades watercourses denying animals' access to water. Livestock avoids it. It reduces the value of pastoral land and native vegetation areas, and provides harbour for pest animals such as rabbits, foxes, starlings and sparrows. It interferes with seal breeding on Recherche Archipelago and with sea lion breeding.

African boxthorn is a common weed of agricultural and semi-arid pastoral areas [5] and waste places around towns and cities [1]. It is a weed of offshore islands, where it forms impenetrable thickets [5]. By invading pasture and watercourses it reduces carrying capacity, impedes stock movement and prevents stock access to water. Once established, it is difficult to eradicate, requiring sustained effort and removal of the taproot. Such control efforts can be expensive, often requiring heavy machinery to complete physical removal.

In NSW, African boxthorn has been found to provide a breeding place for pest insects such as fruit fly, dried fruit beetle, tomato fly and the house fly [2].

Fruit of African boxthorn may be toxic to humans as berries contain toxic alkaloids, and its spines can inflict painful injuries. It is suspected of being slightly toxic to stock although seldom grazed due to long spines [2]. If left untreated, large plants and dense infestations can impede access by people and vehicles [2]. Dead plants can still be a problem to stock and tyres, as they remain spiky for up to 20 years if not burnt [10].

African boxthorn can easily be confused with the widespread native species *Lycium australe*. Care must be taken when controlling for African boxthorn. Native Australian boxthorn *Lycium australe* grows in subsaline soil at the edge of salt lakes and claypans in arid areas of Australia. This species has narrow leaves usually less than 5 mm long. In contrast African boxthorn leaves are fleshy and elliptic to 4 cm long.

## Feasibility of control

A planned strategic approach using an integrated control strategy consisting of six methods of control is recommended [7]. Prior to starting, development of a long-term weed management plan should be undertaken. This consists of site investigation, development and implementation of an action plan and ongoing monitoring and evaluation. This is essential to ensure that after treatment, desirable plant cover rather than new boxthorn seedlings, regrowth or other weeds replace boxthorn. Like most weeds, African boxthorn seedlings are susceptible to competition from other plants. For the long-term control of this weed, once removed, it is important that it is

replaced with other suitable vegetation. The vegetation used will depend on the site. It can include the establishment of native vegetation or perennial pastures.

Mature boxthorn is difficult to destroy because of its large size, thorns and capacity to regrow vigorously from roots or stumps [7]. All but the smallest plants are difficult to pull out completely without breaking off at the root or disturbing surrounding vegetation. Cut stems can also take root if left in contact with the soil.

No biological control agents have been identified [7]. African boxthorn is moderately palatable to goats with no known risks of toxicity [12] and they will graze dense thickets.

Seedlings can be hand pulled if the ground is not too hard. For extensive infestations in pastures, mechanical equipment such as a 'Boxthorn Plucker' may be used on individual plants. Plants should be pulled when not in fruit to avoid dispersing seed. After physical removal of the mature plants, suitable sites can be deep ripped, bringing most remaining root fragments to the surface to be raked and burned. In some instances, cultivation may result in the deeper root fragments shooting. In this case, follow-up treatment will need to be directed at the regrowth over several years. Regrowth should not be treated with a foliar herbicide until the plants are at least 50 cm high (approximately 18 months old). Strategic weeding is required in native vegetation; for example it is best to weed from the least weed-infested bush areas towards weed-dominated areas.

As heavy machinery is involved, the plucker method is unsuitable in native vegetation due to off-target damage.

Chemical control using herbicide can be highly effective, providing it is carefully chosen and selectively applied to minimise regrowth, off-target damage and disturbance. The main herbicide treatments for boxthorn are foliage spray, cut-stump, stem injection, and basal bark application or root applied herbicide in the form of pellets. All of these methods are only effective if the plants are actively growing at the time of application. Spray when bushes are actively growing, prior to, or at flowering. Adequate soil moisture should be available to ensure herbicide is taken up. In the Adelaide region, chemical control is best carried

out from May to November, as plants are usually moisture stressed over summer (P. Elson. *Pers. Comm.* 19/04/2012).

Chemical control using tebuthiuron (200 g / kg) (e.g. Graslan®), a residual for root application, at 2 g / m<sup>2</sup>, has been effective on Eyre Peninsula. Note that tebuthiuron should not be used within a distance of twice the height of desirable trees or near flow paths / streams or water bodies. Low level aerial control with direct application from hovering helicopters has been cost effective and highly accurate in controlling boxthorn across extensive areas of difficult to access terrain in bushland and on farms across Eyre Peninsula (A. Freeman, *Pers. Comm.* 10/02/2015).

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 African boxthorn 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 EP Landscape region a risk management assessment [13] (Table 2) shows African boxthorn merits manage weed in all alnduses apart from southern perennial pasture which is manage sites.

Table 2: Regional Assessment Table

Land Use	Pest Risk	Feasibility of Containment	Management Action
Native vegetation	very high	negligible	Manage weed
Coastal	very high	negligible	Manage weed
Southern Perennial Pasture	medium	medium	Manage sites
Urban	high	low	Manage weed

## REGIONAL RESPONSE

### Special considerations / Board position

Where African boxthorn provides critical habitat for native fauna, a staged conversion / transition from boxthorn habitat to habitat consisting of native flora, able to provide equivalent habitat value for the fauna species, needs to be implemented.

### Outcomes

To reduce the impact of African boxthorn on key environmental, social and productive sites/assets and prevent spread into unaffected areas.

### Objectives

To:

1. Control African boxthorn in key sites/assets and control sources of reinfestation within 500m of key sites/assets.
2. Raise community awareness to promote control across the region.

### Area/s to be protected

Key sites/assets to be protected are:

- EPBC listed vegetation communities.
- Areas containing EPBC listed plant and animal species.
- Coastal areas identified in the EP Coastal Action Plan (CAP) with the highest priority conservation values (areas visually displayed in Figure 5.1 of CAP)
- Islands.
- Other areas where African boxthorn control has already occurred and needs further follow-up control (ie coastal areas in the WildEyre area).
- Agricultural areas where community interest is large enough to warrant a coordinated approach.

### Actions

**Land managers to:**

1. survey and control infestations near key sites/assets annually and supply survey and control information on request to Landscape Board staff;

2. prevent the spread of African boxthorn by searching annually for outlier infestations near known infestations;
3. monitor areas of previous control works and undertake follow-up control works as required

**Landscape Board staff to:**

4. facilitate, encourage, compel (develop action plans) control on private land to protect key sites/assets;
5. facilitate, encourage, compel or undertake control on public land, including roadsides, to protect key sites/assets (costs may be recovered from landmanagers);
6. carry out opportunistic monitoring for sale of African boxthorn plants at markets and community events;
7. coordinate district control actions across the region to assist community led broadscale control;
8. Develop localised annual action plans to achieve the objectives and actions of this management plan;
9. undertake systematic data collection (control and survey numbers, location and date information) and storage in a central spatial database; and
10. provide education on control methods and encourage wider control.

### Evaluation

Evaluation of success will be based on:

- annual analysis in November of monitoring and control data to evaluate the success of pest plan actions (including the update of spatial layers);
- identify any gaps in delivery and action as soon as possible; and
- review of this pest management plan every five years.

### Declarations

In South Australia African boxthorn *Lycium ferocissimum* is a declared weed under Schedule 2 (CLASS 19 – Provisions: 186 (2), 188 (1) (2), 192 (2), and 194 for the whole state) of the *Landscape South Australia Act 2019* (Table 3). This means the movement or transport of the plant on a public road, by itself or as a contaminant, or the sale by itself or as a contaminant is prohibited. Landscape

authorities may require land owners to control African boxthorn plants growing on their land. Landscape authorities are required to control plants on road reserves, and may recover costs from the adjoining land owners.

**Table 3: Relevant sections of the *Landscape South Australia Act 2019*. Provisions for the whole of state for African boxthorn *Lycium ferocissimum*.**

Section	How the section applies
<b>Provision for whole of State</b>	
186 (2)	Cannot transport the plant or anything with the plant in it in the state
188 (1) (2)	Cannot sell the plant Cannot sell any produce/goods carrying the plant
192 (2)	Land owner must take action to control and keep controlled all plants on their property
194	Landscape board may recover costs for control of weeds on road reserves from adjoining land owners

## More information

Contact your local Eyre Peninsula Landscape Board office

[www.landscape.gov.au/ep/contact-us](http://www.landscape.gov.au/ep/contact-us)

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