Studies of the distribution and taxonomy of *Xanthorrhoea glauca* subsp. *angustifolia* (Xanthorrhoeaceae) in Victoria

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Abstract

The Victorian distribution and taxonomy of *Xanthorrhoea glauca* subsp. *angustifolia* D.J.Bedford is confirmed and described. Current morphological ranges for taxonomic characters do not provide adequately for Victorian populations. A revised key for *Xanthorrhoea* in Victoria is provided to resolve this matter. In Victoria the taxon occurs in woodland and forest on impoverished, often auriferous, soils on inland hills and foothills of the Great Dividing Range. The morphologically similar *X. australis* R.Br. has a non-overlapping distribution mainly in current and former coastal landscapes. The importance of marine transgression of western Victoria in contributing to speciation in *Xanthorrhoea* is discussed.

***Key words**:* Box-Ironbark, Grey Grass-tree, Rushworth

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Introduction

Xanthorrhoea Sm. is an iconic monocotyledonous genus containing 29 taxa (Bedford 1988). *Xanthorrhoea* is endemic to continental Australia and associated offshore islands. There are six taxa currently recorded for Victoria. Four taxa were accepted as occurring in Victoria by Conn (1994) (*Xanthorrhoea australis* R.Br., *X. minor* subsp. *lutea* D.J.Bedford, *X. resinosa* Pers. (as *X. resinifera* (Sol. ex C.Kite) E.C.Nelson & D.J.Bedford), and *X. semiplana* F.Muell. subsp. *semiplana*). *Xanthorrhoea caespitosa* D.J.Bedford has since been recorded for western Victoria although confirmation is still required. The recognition and distribution of the sixth taxon, *X. glauca* subsp. *angustifolia* D.J.Bedford, Grey Grass-tree, is discussed here.

The concepts of *X. glauca* and of *X. australis* have varied since their first discovery. Robert Brown described *X. australis* based on a specimen collected in 1804 from Grass Tree Hill, near Risdon Cove north of Hobart, Tasmania. This name has subsequently been widely used for populations throughout eastern Australia. Prior to publication of the *Flora of Australia* volume 46 in 1986 there was a very broad concept of *X. australis,* including now discrete taxa in Queensland, New South Wales, Victoria, South Australia and Tasmania. The inadequacy of a broadly circumscribed *X. australis* had been recognised for decades. Alma Lee (1966a, 1966b), formerly of the New South Wales Herbarium, proposed a new subspecies of *X. australis.* Jacobs and Pickard (1981) described western and eastern forms of *X. australis* subsp. *australis* separated by the spine of the Great Dividing Range.

Xanthorrhoea glauca was described in the *Flora of Australia* by David Bedford (1986) as part of the first systematic review of the genus (and in his doctoral thesis (Bedford 1988)). In that treatment he recognised two subspecies. *Xanthorrhoea glauca* subsp. *glauca* is a taxon of the northern coastal hinterland of New South Wales. *Xanthorrhoea australis* subsp.

australis (western form) was circumscribed by Bedford (1986) as *X. glauca* subsp. *angustifolia*. Taxonomic features that separate the two subspecies of *X. glauca* are leaf shape, leaf width and leaf colour. As only *X. glauca* subsp. *angustifolia* occurs in Victoria, further references to *X. glauca* herein relate only to this subspecies. In Victoria, the character states that distinguish *X. australis* and *X. glauca* are of importance (Table 1). It is difficult to determine *Xanthorrhoea* species on single characters (Bedford 1988) and there can be wide variation in the dimensions of many taxonomic characters within a single individual and considerable variation within populations. The acute shape of at least some (the most mature) *X. glauca* packing bracts of the inflorescence is the most useful taxonomic character in contrast with *X. australis*. In addition, the inflorescence scape length, and the lower ratio of the inflorescence scape to spike length for *X. glauca* are usually sufficient for identification, provided measurements of several inflorescences can be taken.

Bedford (1986) described the distribution of *X. glauca* as 'mainly along the ranges from the slopes of the Snowy Mountains to Inverell' and 'growing on rocky and gravely slopes'. He did not consider *X. glauca* present in Victoria, but described *X. australis* as growing inland 'south of Wangaratta', and in the Grampian Ranges and Little Desert. The close proximity of Wangaratta (putative *X. australis*) to the inland slopes of the Snowy Mountains (*X. glauca*) presented a distributional anomaly that was not addressed by Bedford or in the later published *Flora of Victoria* (Conn 1994). At the time of Bedford's thesis completion in 1988, the southernmost herbarium specimen for *X. glauca* was Mount McDonald in the Australian Capital Territory (*Burbidge 6713* (CANB, NSW)). A lack of herbarium specimens south of Canberra gave the false impression that there was a distributional disjunction to inland Victorian *Xanthorrhoea* localities. As was the case in southern New South Wales, Victoria's recorded localities were at that time very few and specimens largely absent from herbaria.

New South Wales agencies have since contributed data entries for *X. glauca* that currently include locations west of the Snowy Mountains such as The Rock (30 km south-west of Wagga Wagga) and an isolated occurrence in the Big Bush (13 km north-west of Temora in central New South Wales). A distributional extension of *X. glauca* into Victoria seemed likely, with one *X. glauca* locality near Walwa in New South Wales only 13 km from the nearest Victorian record of *X. australis*. In 2002, material, including slices of flowering inflorescences, were sent from Chiltern National Park (north-east Victoria) (MEL 2154357, MEL 2154356) to the National Herbarium of Victoria. This material was then sent to Karen Wilson of the Royal Botanic Gardens, Sydney, and confirmed as *X. glauca*. The taxon was added to the census of the Victorian vascular flora (Walsh & Stajsic 2007).

Victoria's eastern populations are contiguous with the New South Wales distribution along the southern slopes of the Great Dividing Range. Chiltern is in the north-east of Victoria near the New South Wales border, and populations of *Xanthorrhoea* occur further into Victoria as close as the Warby Ranges and Killawarra State Forest (~45 km south-west of Chiltern), at Glenrowan (~51 km south-west of Chiltern), and at Upotipotpon (west of Benalla). The low lying, wide and north-trending Goulburn River valley separates the Warby Ranges and Chiltern from populations to the west in north-central Victoria. *Xanthorrhoea glauca* occurs in the hills surrounding Seymour, Nagambie, Rushworth, Redesdale and Heathcote in central Victoria (~100 km

Table 1. Summary of the main differences between *Xanthorrhoea glauca* subsp. *angustifolia* and *X. australis* (Bedford 1986)

Character	***X. glauca* subsp. *angustifolia***	***X. australis***
Leaf width mm	1.3–2.8	1.2–3
Leaf thickness mm	0.9–1.6	1–2.2
Scape diameter mm	18–40	18–40
Scape length cm	50–100	30–50
Spike diameter mm	40–50	50–80
Spike length cm	100–160 (<250)	110–180 (<250)
Scape/spike ratio	1 to 1.5–4 (rarely equal)	1 to 2–6
Packing bracts	Acute	Elongated, subulate, glabrous
Leaf colour	Greyish	Blue-grey, glaucous

to the south-west of the Warby Ranges). The Goulburn Valley separates many closely related taxa in the Box-Ironbark ecosystem, most notably the dominant tree species Mugga Ironbark (*Eucalyptus sideroxylon* A.Cunn. ex Woolls) and its disjunct relative Red Ironbark (*Eucalyptus tricarpa* (L.A.S.Johnson) L.A.S.Johnson & K.D.Hill). There are also subtle floristic community differences (Muir et al. 1995). In 2003, specimens were collected in the Rushworth–Heathcote forest for both the National Herbarium of Victoria (MEL 2212500, MEL 2212501) and the National Herbarium of New South Wales (NSW 591768). These specimens were confirmed as *X. glauca* subsp. *angustifolia*.

The current paper aims to provide some clarity regarding taxonomic identification and distribution of *X. glauca* across Victoria. Herbarium specimen localities and locality records held by the Victorian, New South Wales and South Australian governments are analysed and mapped. In addition, an extensive field survey for new populations is reported for Central Victoria. Measurements are made of inflorescences and leaves, offering a revised taxonomic key for Victoria. The paper also discusses biogeographical interpretation of distribution and the taxon's conservation status.

Methods

Site visits and taxonomic data collection and analysis: During 2003 and 2004 many *Xanthorrhoea* populations across central Victoria and southern New South Wales were located on field trips (Table 2). In central Victoria, data were collected for a numerical taxonomic study at five sites. The width (*n*=499) and thickness (*n*=499) of leaves were recorded. The diameter of the scape (*n*=30) and spike (*n*=27), the length of scape (*n*=48), and the overall length of the inflorescence (spike plus scape) and scape to spike ratio (*n*=47) were also recorded. Descriptive statistics were calculated and the range reported in text as two standard deviations from the mean.

Reference locations from authoritative sources: Site locality records were obtained from the Victorian *Flora Information System* (Viridans Pty Ltd), records held by New South Wales Parks and Wildlife Queanbeyan, and the South Australian Department of Environment and Heritage. These data were carefully checked for misidentifications and erroneous entry of geographical coordinates. Locality data were also available for herbarium specimens. Victorian material of *Xanthorrhoea australis* collected by Bedford (1986) was included in the assessment (NSW 382659).

Finally, a literature review was undertaken and a few key references used as reliable sources of information. A chemical analysis of *Xanthorrhoea* resin from Mangalore, Victoria, was undertaken by Duewell (1997) in an attempt to understand taxonomic differences in resin composition. Duewell concluded that Mangalore shared an identical chemistry with populations from the Cotter Dam–Uriarra Crossing in the ACT and

Table 2. Victorian *Xanthorrhoea glauca* localities visited

Site name	Locality	UTM (84)
Carapooee	Forest, 8.8 km (17°) from Stuart Mill	54 H 706228 5931645
St Arnaud	Forest, 1.5 km (247°) from St Arnaud	54 H 700374 5944835
Whroo	Forest, 43 km (237°) from Shepparton	55 H 321172 5948177
Beehive	Forest, 3.5 km (103°) from Chiltern	55 H 467684 5998037
Coyles	Forest, 6.2 km (111°) from Chiltern	55 H 470069 5996614
Glenrowan	Roadside reserve, 3 km (28°) from Glenrowan	55 H 431234 5966959
Mount Pilot	Forest, Mount Pilot, 12.6 km (158°) from Chiltern	55 H 469210 5987159
Mangalore	Private Land, 7.8 km (42°) from Seymour	55 H 340000 5906000
Crosbie	Forest, 12 km (91°) from Axedale	55 H 288934 5926200
Fontainbleu	Forest, 12.5 km (200°) from Rushworth	55 H 318300 5937200
Melville's Lookout	Forest, 28.8 km (57°) from Heathcote	55 H 319200 5926900
Beechworth	Rail reserve, 11.5 km (242°) from Beechworth	55 H 461421 5969746
Ararat	Forest, 5 km (300°) from Ararat	54 H 666881 5874306
Lurg	4.3 km south-east of Lurg Fire Tower	55 H 428542 5952715[1]
Mia Mia	Private Property, south of Heathcote	55 H 229578 6011888

1 Locality is approximate

from Goulburn, New SouthWales. Although Duewell recognised the chemical identity, he acknowledged the help of David Bedford in assigning the name used in his paper (Duewell 1997) *X. glauca* subsp. *angustifolia*. This is considered reliable evidence to extend the known distribution of *X. glauca* far south-west to Mangalore near Seymour in Victoria.

Construction of a distribution map: Point locations of all samples are layered over a base map of Australia and a distributional grid is constructed for each 10-minute grid cell for both *X. australis* and *X. glauca* in Victoria and adjoining regions using the software ArcGIS. The line of the Great Dividing Range and major cities is included in this map.

Results

Distribution

The distribution of *Xanthorrhoea glauca* in New South Wales is contiguous with that of north-eastern and central Victoria (Fig. 1). The distribution follows the inland slopes of the Great Dividing Range (and isolated occurrences further inland) both in New South Wales

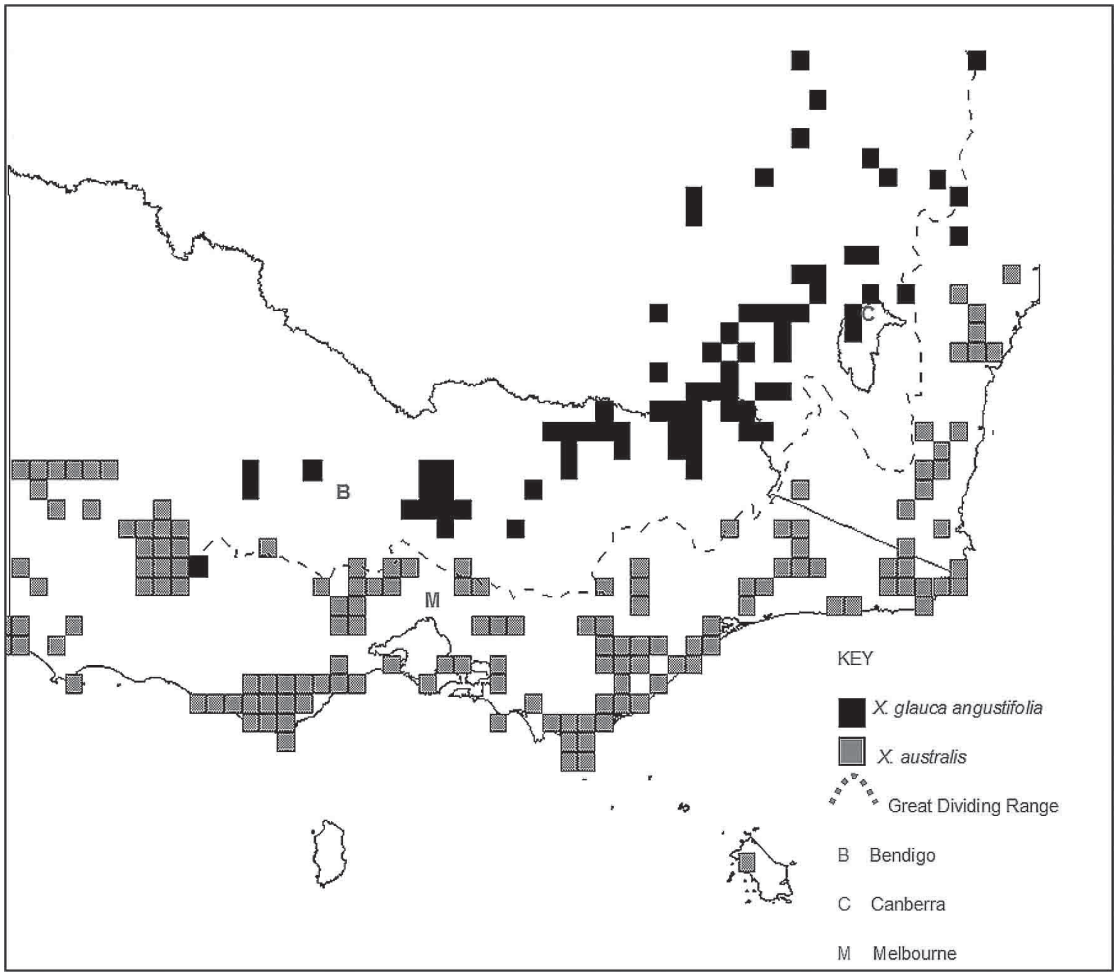

Figure 1. Distributional map of *Xanthorrhoea glauca* subsp. *angustifolia* and *X. australis* in Victoria and adjoining regions. The proposed distribution of both species is shown for Victoria and adjoining regions (South Australian border region, Bass Strait Islands, New South Wales and the Australian Capital Territory). Black represents known locality records for *X. glauca* subsp. *angustifolia*, and the grey shading, *X. australis*. Each rectangle represents at least one site locality recorded within 10 minutes of latitude and longitude (~19 km × 15 km). The position of the Great Dividing Range and three cities is shown (M = Melbourne, B = Bendigo, C = Canberra). Localities of discussion are the Grampians (1), the Otway Ranges (2), St Arnaud (3), RHFB (4) and Chiltern (5).

and Victoria. By comparison, *X. australis* is predominantly a species of coastal plains and hinterlands, except in far western Victoria where the species extends as far inland as the Little Desert. The Great Dividing Range (Fig. 1, dashed line) is an effective demarcation between the two species in most of Victoria and New South Wales. *Xanthorrhoea glauca* has been reliably identified as far north as Glenbar Ridge, a sandplain 69 km from Charleville, Queensland (BRI AQ0331097), although the distributional knowledge is not as reliable as in Victoria, especially north of Canberra. In Victoria, many of the *X. glauca* 10-minute grid squares are represented by small populations and in some cases just a few individuals remain. Larger populations in the Rushworth–Heathcote area and east of Wangaratta represent core populations in public forests, but the apparent connectivity of the grid squares (Fig. 1) consists of small isolated populations on private land. A few individuals were found south-west of St Arnaud, near Arnold/Kingower (and possibly at Ararat) in Box-Ironbark vegetation.

Taxonomy of Central Victorian populations

The Rushworth–Heathcote population is morphologically close to, but not entirely consistent with, Bedford's (1986, 1988) concept of *X. glauca*. Comparisons between field measurements and Bedford's ranges are given in Table 3.

Inflorescence dimensions: Typical ratios (0.82–)1–*1.7*–2.58(–3.1) (*n*=47) are below the absolute range 1.5–4 for *X. glauca* given by Bedford (1988). Scape length is (63–)65.6–*103*–140.4(–146) cm (*n*=48) and exceeds the upper absolute limit of 100 cm for *X. glauca* but is further in excess of *X. australis* (–50 cm). Scape diameter (mm) is a reliable and consistent measure, with dimensions (19.8–)24.1–*34.9*–45.7(–49.6) mm (*n*=30) better aligned to the upper limit of the range of *X. glauca* (46 mm) compared with the smaller *X. australis* (40 mm).

Packing bracts: All mature packing bracts are distinctly acute to triangular although many non-mature linear bracts are also usually present. Frequently bracts are abruptly tapered above the base of the bract and increase in width towards the apex so that they are spathulate. These shapes are not evident in *X. australis* and are the most reliable character for recognition of *X. glauca*.

Leaves: Fresh leaves are usually transverse-rhombic, quadrate-rhombic or broadly transverse-rhombic when mature. They are glaucous to grey although they may occasionally be green. There is a tendency for *X. glauca* to have greyer leaves than *X. australis* but this is not a reliable character on its own. Leaf dimensions of the Rushworth–Heathcote population for thickness are (0.85–)0.95–*1.47*–1.99(–2.40) mm (*n*=499). These measurements encompass the *X. australis* concept but the lower dimensions are more consistent with the thinner-leaved *X. glauca* (hence, the Latin epithet *angustifolia*). Leaf width (mm) (1.50–)1.71–*2.37*–3.03(–3.40) is not a reliable diagnostic in distinguishing either taxon.

Flowering phenology: *Xanthorrhoea glauca* flowers gregariously in mast events either triggered by fire or other environmental factors. Typically, under non-fire-stimulated flowering, apical crowns of many (but not a majority of) plants produce a single inflorescence. Following fire, multiple inflorescences can be initiated per crown. Most populations of *X. australis* notably do not flower unless exposed to fire when they flower *en masse* (Gill 1993). In the drought conditions of (roughly) 2000–2011 limited flowering of *X. australis* occurred near Mt Zero in the drier northern area of the Grampians (Gariwerd) National Park. Over the same period populations of *X. glauca* flowered in mast events every two to three years.

Table 3. Comparison of morphological characters of Central Victorian populations of *Xanthorrhoea glauca* from this study compared to Bedford's (1986) measurements

Character	Min.	Max.	Av.	S.D.	Bedford (1986)
Leaf thickness mm	0.85	2.4	1.47	0.26	0.9–1.6
Leaf width mm	1.5	3.4	2.37	0.33	1.3–2.8
Scape length cm	63	146	103	18.7	50–100
Scape diameter mm	19.8	49.6	34.9	5.4	18–46
Spike width mm	33.3	79.4	60	9.5	35–77
Inflorescence length cm	65	242	170	36.4	150–250
Scape/spike ratio	0.82	3.1	1.7	0.44	1.5–4

Discussion

Taxonomy of Victorian Populations

The differences in scape length and scape:spike ratio would be consistent with a third subspecies given the very minor morphological differences between the two subspecies currently recognised within the *Xanthorrhoea glauca* concept (Bedford 1988). However, the published morphological ranges are based on small sample sizes and it is believed preferable to extend the currently recognised morphological dimensions of *X. glauca* to accommodate Victorian populations within subsp. *angustifolia* in that species. An alternative to the current taxonomic key for Victoria (Conn 1994) is provided for this purpose. Adapted from Conn (1994), it includes *X. caespitosa* and permits a wider morphometric range of character states for *X. glauca*. In the key, secondary consideration is given in to inclusion of light brown packing bracts, the more acutely shaped packing bracts and strong glaucous coloration of the leaves. Likewise, morphometric ranges are extended for *X. australis* (data in Bellette 2009).

Records of *X. australis* from far east Gippsland in coastal sand plains correlate well with the environmental conditions and newer locality records of *X. resinosa*. It is possible that records of *X. australis* in the mountainous terrain of east Gippsland and in the upper Snowy River valley in particular may be referable to *X. glauca*. This author concurs with Walsh and Entwisle (1994) that some records of *X. australis* in the far west of the state are likely to be referable to *X. caespitosa* or *X. semiplana* subsp. *semiplana*. Further research is required.

Distributional patterns of Grass Trees in Victoria

Biogeography: *Xanthorrhoea glauca* occurs on a wide range of geologies across its southern range. At Bungonia Gorge near Goulburn, *X. glauca* grows on limestone cliffs, whereas near Yass, Tumut, Tumblong, Coolac and Gundagai it grows on slates and sandstones as well as serpentine geologies (Lyons et al. 1974). In the Australian Capital Territory, at Birragai Rock Shelter and Tidbinbilla it is found in association with granite outcrops. *Xanthorrhoea glauca* occurs in the Eastern and Western Uplands of Victoria (Department of Primary Industries 2013), and is highly correlated with auriferous country, often in association with granite batholiths and associated contact and regional metamorphism,

Key to *Xanthorrhoea* in Victoria[1]

1 Flower-bearing axis (spike) of the inflorescence shorter than or equal to the non-flowering axis (scape); sepals and bracts between flowers usually hairy; stem subterranean or up to 0.6 m high **2**

1: Flower-bearing axis (spike) of the inflorescence longer than the non-flowering axis (scape); sepals and bracts between flowers subglabrous to glabrous; trunk usually well-developed, up to 5 m high, or sometimes absent **4**

2 Cluster bracts not prominent except at the base of the spike ..... ***X. resinosa***

2: Cluster bracts prominent for at least part of the inflorescence **3**

3 Leaves usually about 3.2–7 mm wide, grey, glaucous; scape 90–120 cm long. Packing-bracts fringed with hairs to moderately hirsute ..... ***X. caespitosa***

3: Leaves 1.9-3.5 mm wide, green, not glaucous; scape 30–60 cm long ..... ***X. minor* subsp. *lutea***

4 Packing bracts subulate **5**

4: Packing bracts tending narrowly triangular to triangular, acute, usually subglabrous, dark or light brown in colour; leaves blue-green to greyish, often glaucous ***7***

5 Leaves 5–12 mm wide, bluish, very glaucous; scape 80–120 cm long ..... ***X. glauca* subsp. *angustifolia***

5: Leaves 1.2–3.1 mm wide, often green, or occasionally bluish or glaucous; scape usually less than 60 cm long ..... **X. australis**

1. At the time of publication there exists uncertainty as to the taxonomic and distributional status of both *X. caespitosa* and *X. semiplana* subsp. *semiplana* in western Victoria and the population would benefit from molecular taxonomic study. In the absence of this information both species are identified here using Bedford's original diagnostic characters.

and on limited Tertiary alluvial deposits. The majority of locality records occur on Palaeozoic sandstones and in some instances on granites. *Xanthorrhoea glauca* is well represented on Silurian sandstones east of the Mt William Fault (running roughly north-south between Melbourne and Echuca) but is sparse on Ordovician sandstone west of the Mt William Fault (in the area known as the Bendigo Structural Zone) (Edwards et al. 1998). The high quartz composition and infertile soils derived from granites and Silurian sandstone is a likely explanation for this distribution. *Xanthorrhoea glauca* does not extend west of the Moyston Fault, an important geological feature in Australia forming the terrane boundary between the Delamerian and Lachlan fold belts (Birch 2003).

Bellette (2009) has shown that the distribution of *X. glauca* inland is limited to areas with annual rainfall in excess of 450–500 mm. Locality records west of Bendigo are few and many appear to be associated with Tertiary alluvial (non-marine) deposits. Since the Oligocene, the sea has at times encroached into the Murray Basin causing possible disjunctions in plant populations and subsequent speciation. In Victoria, the maximum extent of inundation brought the coastline into what is Central Victoria today, most of the Otway Basin and coastal areas of the Gippsland Basin (Cochrane et al. 1995). The distribution of *X. australis* is associated with areas either inundated by sea or fringing its perimeter (including Tasmania), including the Otway Ranges, the Grampians, the Brisbane Ranges, and parts of Gippsland (Wallace et al. 2005). West of the eastern fringe of the Murray Basin, *Xanthorrhoea semiplana* grows on the relict sandplain of this shallow sea bed in South Australia and probably Victoria.

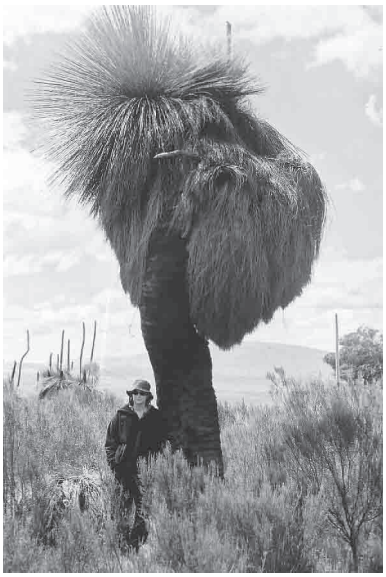

Figure 2. *Xanthorrhoea glauca* subsp. *angustifolia* on private land adjoining the Heathcote–Greytown National Park

Flora: Allied *Eucalyptus* species are always present with *X. glauca* although the trees can show severe drought stress and poor health as a result of the impoverished soils. There is a strong association with *E. macrorhyncha* F.Muell. ex Benth., and in the mountainous inland slopes with *E. dives* Schauer. Throughout the entire distribution in Victoria and New South Wales *Gonocarpus tetragynus* Labill., *Brachyloma daphnoides* (Sm.) Benth. and *Lomandra filiformis* (Thunb.) Britten are typical species of the lower strata (Bellette 2009). By comparison, *X. australis* associates with a wide range of lowland eucalypts (e.g. *E. baxteri* (Benth.) Maiden & Blakely ex J.M.Black, *E. radiata* Sieber ex DC., *E. sieberi* L.A.S.Johnson and *E. viminalis* subsp. *pryoriana* (L.A.S.Johnson) Brooker & Slee, whereas the association of *X. semiplana* and/or *X. caespitosa* is primarily with *Eucalyptus arenacea* J.C.Marginson & Ladiges and a few mallee species. Marine transgression has been proposed to account for the speciation and current distribution of *E. baxteri* and *E. arenacea* (Marginson & Ladiges1988). There is at least one exception adding complexity to a consistent pattern of *Xanthorrhoea/Eucalyptus* species association as *E. macrorhyncha* and *X. australis* co-occur in areas surrounding Melbourne. Despite this anomaly, the relevant *Xanthorrhoea* of the Melbourne region and the Otways is *X. australis*. Ian Staff (1976) provided photographic evidence of a flowering *Xanthorrhoea* suggesting that populations in the Kinglake area are *X. australis*. Likewise, the scape:spike ratio of inflorescences in a photo taken at Anglesea after the 1983 bushfire (Gill 1993) are consistent with the that of *X. australis*. *Xanthorrhoea australis* often grows in heathland lacking a consistent *Eucalyptus* canopy.

Conservation

Although *X. glauca* has a wide distribution across northern and north-eastern Victoria, many isolated populations are very small and have shown inadequate recruitment for long-term persistence. Isolated populations on private farmland suggest that the

species was once more common and widely distributed. Land clearing and forest disturbance have considerably reduced the extent of *X. glauca* in Victoria. Vast areas of native forest have been cleared and would likely have supported *Eucalyptus macrorhyncha* and possibly *X. glauca* in many districts including suitable geologies around Chiltern, Lurg, Rushworth, Seymour, Redesdale, St Arnaud and Ararat. Lawrence and Bellette (2009) detailed historical practices of forest management, including gold mining and gravel extraction in the Box-Ironbark Forest. These practices would have directly reduced Grass-tree populations within the forest estate. *Xanthorrhoea* species are very susceptible to the introduced soil pathogen *Phytophthora cinnamomi* Rands and adults are prone to high mortality rates following burning (Curtis 2003). There is also an undocumented extent of illegal harvesting for nursery sale, and leaf harvesting for floristry. The species has recently been listed as Threatened under the Victorian *Flora and Fauna Guarantee Act 1988*. The species confidently qualifies as critically endangered in Victoria within the IUCN Red List categories (IUCN 2001) as it satisfies the following criteria: CR A4abcde.

Summary

Xanthorrhoea glauca subsp. *angustifolia*, Grey Grass-tree, occurs across northern Victoria from the north-east border with New South Wales as far south-west as Ararat. The taxon occupies a unique biophysical environment compared with the morphologically similar *X. australis*. The taxonomic key provided accommodates the distinctive morphology of Victorian populations, namely the larger inflorescences compared with published data for this taxon and for *X. australis*. Physical protection, particularly from fire, and applied research are required to protect this highly threatened taxon from ongoing threats and facilitate recovery.

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