



# Flora of South Australia

5th Edition | Edited by Jürgen Kellermann

## ULMACEAE<sup>1</sup>

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Usually trees, deciduous or evergreen, rarely shrubs; stipules present, extra-petiolar, caducous; petiole present, short; leaves simple, alternate, 2-ranked (distichous), base often oblique, margin serrate, with pinnate veins running to the teeth (except in *Ampelocera* Klotzsch). **Flowers** small, wind pollinated, flowers perfect (bisexual) or unisexual, solitary and axillary or in cymes and panicles; perianth of (3–) 5 (–9) segments, in one whorl or spirally arranged, sometimes connate; stamens extrorse, anthers dorsifixed; ovary superior, of (2–) 3 united carpels, sterile and rudimentary in staminate flowers; styles 3. **Fruit** a samara, seeds with embryo in little or no endosperm.

Seven genera and about 50–65 species found in the temperate northern hemisphere from North America to Europe and northern Asia into subtropical Asia, tropical America and tropical Africa. Only one genus *Ulmus*, has naturalised in Australia.

The family Ulmaceae has been re-circumscribed by APGIII (2009). The previously used Cronquist classification recognised two subfamilies, Ulmoideae and Celtidoideae. Ulmoideae, containing 7 genera, remains in Ulmaceae *s.str.*, but Celtidoideae, containing 10 genera, has been placed in Cannabaceae. Apart from *Ulmus*, the only other commonly cultivated genus in Ulmaceae *s.str.* (Ulmoideae), in South Australia, is *Zelkova* Spach. As a result of the APGIII reclassification, Australia has no native representatives in Ulmaceae, as the genera *Aphananthe* Planch. and *Trema* Lour. have now been transferred to Cannabaceae, along with *Celtis* L., which is questionably naturalised in S.A.

Ornamental and timber trees.

Reference: APGIII (2009), Hewson (1989), Stevens (2001).

### 1. ULMUS L.

*Sp. Pl.* 1: 225 (1753).

(Latin name for the elm tree.)

Trees, rarely shrubs, to c. 30 m tall, deciduous or evergreen; crown conic, fan-topped or domed; branches hairy or glabrous; tree developing suckers or not; leaves of young growth (suckers, epicormic growth and elongate shoots) highly variable and different from adult leaves on mature short shoots from the crown; stipules present, sometimes caducous; petiole present, mostly short; leaves simple, rounded to elliptic, alternate, 2-ranked, base mostly oblique, margins serrate or crenate, apex acute to obtuse, normally long acuminate to long cuspidate, midrib present, obvious lateral pinnate veins extending to margins and ending in a tooth, glabrous to hispid above, glabrous to pubescent below. **Inflorescences** bisexual in inconspicuous clusters, appearing before leaves; perianth segments 4–9, base attenuate, petals absent; stamens 5–6; ovary superior, 1-locular with 1 ovule. **Fruit** a samara, ovoid to oblong, to c. 20 mm diam., with papery wings, green at first, drying brown, glabrous; seed in the middle, compressed, ovoid, wind-dispersed. **Elms.**

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*Ulmus* comprises c. 25–40 species. It is native in the temperate northern hemisphere from North Mexico throughout Europe to central Asia and known to be weedy or establishing in other temperate parts of the world. In Australia the genus is naturalised in all eastern states, Tas. and S.A.

In Europe, Dutch Elm Disease has greatly affected elm populations. This disease, caused by several fungal species of the genus *Ophiostoma* Syd. & P.Syd., triggers widespread wilting of trees leading to their ultimate demise. In the 1970s a particularly virulent strain decimated British elm populations to such an extent that they have never recovered. The disease is transmitted by elm bark beetles, which emerge from the bark of diseased elms and carry spores to healthy trees. Bean (1980) provides a historical synopsis and Grimshaw & Bayton (2009) summarize recent research into the disease. Dutch Elm Disease is not known in Australia and some of the finest examples of mature elm trees are now to be found here (Spencer 1991).

The naturalised taxa of *Ulmus* found in Australia are mainly from Europe and most likely introduced from England, with the exception of the distinctive Chinese species *Ulmus parvifolia*. Elm taxonomy in Europe and the United Kingdom is not fully resolved and there have been differing views on how many species, subspecies, varieties and hybrids exist (Armstrong & Sell 1996). Significant accounts were published by Melville (1974), Richens (1983) and Clapham *et al.* (1952, 1962, 1987), with each author recognising different numbers of taxa and hybrids. Ambiguity in delimiting taxa arises from their ease of hybridization and the fact that they have been in cultivation for thousands of years, with artificial selection of hybrids and desirable clones. Spencer (1991) comments that the introduction of selected clones into Australia from England combined with further hybridization has led to a mix of elms somewhat different from that in England. Further morphological and molecular work is required to determine the history of elms in the U.K. and Europe, and this would also help resolve *Ulmus* taxonomy in Australia.

This account deviates from the Australian treatments of Spencer *et al.* (1991) and Spencer (1997) and follows Richens (1983) in accepting only two wild species in the U.K., *U. minor* (establishing in S.A.) and *U. glabra* (cultivated in S.A.). Richens' concepts are now supported by molecular studies (Gil *et al.* 2004).

Identification of elms primarily uses leaf characters, including size, shape, hairiness, vein number, lobing at the base of the leaf, and petiole length. Typical adult leaves from the canopy should be selected for reliable identification. Juvenile or intermediate phase leaves on young growth of suckers, epicormic growth and elongate shoots are highly variable and can be misleading. **Petiole length** is measured on the longer side of the petiole, where the leaf lamina is shortest. **Vein number** refers to strong veins on the longer side of the lamina (extending furthest down the petiole), with minor veins in the long acuminate to long cuspidate apex excluded.

Bark and canopy (crown shape) are also useful characters in the field. Bean (1980) bases identification on tree shape, focussing on the crown habit. However, this is not used here as it only applies to mature trees and the information is lacking for most herbarium specimens.

The timber can be used in carpentry. Elms are frequently cultivated in major cities and regional towns along streets and in parks. They are widely grown around Adelaide and in the higher rainfall areas of the south-east of S.A.; also in Qld, N.S.W., Tas., and Vic., especially around Melbourne. Several of the European taxa sucker, forming weedy thickets in unmanaged areas. *Ulmus parvifolia* produces an abundance of seed and germinates readily in the right conditions.

In addition to the species treated here, *Ulmus glabra* Huds. (Scotch elm, Wych elm) is often grown in S.A., particularly the cultivar 'Lutescens' (Golden elm). This species does not sucker unless the roots are disturbed, but suckers may be present when it is grafted on rootstock of other species.

Reference: Richens (1983), Spencer *et al.* (1991), Tutin (1964), Clapham *et al.* (1962).

- 1. Adult leaves mostly < 4 cm long, uniserrate ..... 3. **Ulmus parvifolia**
- 1: Adult leaves mostly > 4 cm long, mostly biserrate
  - 2. Adult leaves elliptic to orbicular, longer side with base approaching petiole at right angles or slightly rounded but not overlapping petiole; shorter side usually almost straight in lower half..... 2. **Ulmus minor**
  - 2: Adult leaves broadly ovate to obovate to elliptic, longer side with base strongly lobed, often overlapping petiole ± adjacent stem; shorter side rounded in lower half ... 1. **Ulmus ×hollandica**

1. \***Ulmus ×hollandica** Mill., *Gard. Dict.* ed. 8: 5 (1768). — *Ulmus procera* auct. non Salisb.: W.R.Barker, *J. Adelaide Bot. Gard.* 12: 7 (1989). — **Illustr.:** R.D.Spencer, *Hort. Fl. S.E. Austral.* 2: 110–113 (1997); A.F.Mitch., *Field Guide Trees Brit. & N. Europe.* 252 (1974).

A suckering variable tree to 25–30 m tall, deciduous; suckering and epicormic young growth with corky flanges; young branchlets normally hairless, rarely with scattered hairs; winter buds small, elongate-orbicular, to c. 2.5–4 × 2–3 mm, glabrous, with long ciliate margins, cilia c. 0.5 mm; stipules linear, 0.5–1.5 mm long; petiole 0.5–1.9 mm long, glabrous to sparsely hairy on one side; adult leaves varying in size on same branchlet (largest leaf up to 2.4 times longer than smallest), broadly ovate to obovate to elliptic, (35–) 60–120 (–150) × (20–) 35–55 (–100) mm, base oblique, left and right margins joining petiole with a 1–3 (–4) mm displacement, base of shorter side rounded or weakly to moderately lobed, base of longer side strongly lobed, often overlapping the petiole and sometimes the adjacent stem, margin biserrate or multiserrate, teeth 2–3 (–4) mm long, apex long cuspidate to long acuminate to acuminate, midrib prominent below, pinnate veins 13–16, upper surface slightly rough to touch with sparse minute, antrorse, strigose hairs, lower surface glabrous or occasionally with a few scattered hairs, apart from prominent hairy tufts in the vein axils and some hairs along lateral veins; suckering leaves hispidulous, rough to touch. **Inflorescence** a cyme crowded on short stalks emerging before leaves; flowers inconspicuous, small, bisexual. **Fruit** a samara, ovoid flat and papery, 10–21 × 7–19 mm, calyx persistent, dark brown, base round, apex notched, glabrous, dehiscent; seed 5–7 × 3–5 mm, ≤ 1 mm thick. **Dutch Elm. Pl. 1A–B.**

S.A.: \*NL, \*SL, <sup>2</sup>cKI, \*SE; \*Qld; \*N.S.W.; \*Vic.; \*Tas. Natural hybrids occur in Europe through to Turkey and Iran. Naturalised in Australia and New Zealand. Flowers: spring, before the leaves appear, Aug.–Sep.; fruits develop Nov.–Dec., often retained until the following flowering season, but inconsistently produced in S.A.

*Ulmus ×hollandica* is a hybrid and, although there is some uncertainty, most authors accept the parentage as *U. glabra* × *U. minor*. There is much variation in leaf shape and size, as noted by Spencer *et al.* (1991) who state that specimens can show differing proportions of character expression from each putative parent. It is highly likely that the ‘Dutch elm group’, known here by the name *U. ×hollandica*, is a historical hybrid swarm with a number of taxa contributing to the variation seen today around the world and in Australia. Most of the S.A. collections appear closest to cv. ‘Hollandica’; others may involve hybridization with English Elm (*U. minor* cv. ‘Atinia’) as suggested by Spencer *et al.* (1991). Many trees that were traditionally known as *U. procera* are now recognised as *U. ×hollandica*.

Used as street trees and specimen plantings; will readily sucker if not managed properly.

2. \***Ulmus minor** Mill., *Gard. Dict.* ed. 8: 6 (1768). — *Ulmus procera* Salisb., *Prodr. Stirp. Chap. Allerton* 391 (1796). *U. minor* Mill. cv. ‘Atinia’. — **Illustr.:** A.F.Mitch., *Field Guide Trees Britain & N. Europe* pl. 22: 3a (as *U. procera*), 3b & 4a–d (as *U. carpinifolia*) (1974); R.Phillips, *Trees Britain, Europe, N. Amer.* 213 (1978) (as *U. minor* & *U. procera*); R.D.Spencer, *Hort. Fl. S.E. Austral.* 2: 113 & 115 (1997) (as *U. procera*).

Large suckering tree to 30 m tall, mature trees with rounded to conical crown, ascending when young, deciduous; rough bark on older trunk and limbs, branches with smooth grey-brown bark, suckering growth without corky wings (at least in S.A.), young shoots glabrous, or rarely sparsely hairy, suckering growth usually hairy; buds small to c. 3–4 (–5) mm long, conical, apex pointed, dark; stipules thin, caducous, lanceolate, to c. 8 × 2 mm, tapering from base to an acuminate apex, orange-brown glands on margins and adaxial surface, interspersed with white pilose hairs, abaxial surface ± glabrous with occasional hairs; petiole (5–) 10–18 mm long, sparsely pilose to finely pubescent; adult leaves varying in size on same branchlet (largest leaf up to 4 times longer than smallest), ± elliptic (to orbicular in cv. ‘Atinia’ and related forms), (15–) 40–90 × (10–) 25–55 mm, base oblique, left and right margins joining petiole with a 1–5 mm displacement, shorter side almost straight in lower half (to rounded in cv. ‘Atinia’ and related forms), longer side rounded and joining petiole at c. 90°; or sometimes turned slightly toward apex and weakly lobed, margins usually biserrate or multiserrate, rarely uniserrate, sometimes teeth pronounced, to 4 (–5) mm long, apex shortly acute to acuminate, midrib obvious, lateral veins 10–12 (–14), upper surface usually smooth and glabrous with waxy feel (but rough to touch with short hispid hairs in cv. ‘Atinia’ and related forms), lower surface glabrous apart from dense pubescent tufts in lateral vein axils; suckering leaves hispidulous, rough to touch. **Inflorescence** cymose, clustered on short stalks, emerging before leaves; flowers small, inconspicuous, bisexual, stamens dark red. **Fruit** a samara, ovoid flat and papery, 10–17 mm long, dark brown, with persistent calyx; base round, apex with apical notch, glabrous; seed ≤ 1mm thick. **Field elm**, now includes what was once known in the UK and Australia as the **English elm. Fig. 1C–D, Pl. 1F–I.**

S.A.: \*NL, \*SL, <sup>2</sup>cSE; \*N.S.W., \*Vic. A species that is known from all corners of Europe, to eastern Russia,



Fig. 1. A–B, *Ulmus ×hollandica*: A, stem of sucker showing corky flanges; B, cross section through stem. C–D, *U. minor*, leaves. E, *U. parvifolia*, young twig with leaves. Line drawing by G.R.M. Dashorst.

temperate western Asia and Northern Africa. Since it has been transported and planted across these areas the precise extent of its original native distribution is unclear. Naturalised in South Africa and the U.S.A. Flowers: Sep. & Oct., before leaves emerge; fruit inconsistently produced in S.A.

*U. minor* is a widespread and geographically variable species rendered more complex by hybridization and cultivation. Recent DNA studies (Gil *et al.* 2004) have shown that the English elm, known previously as *U. procera*, is actually a single female-sterile clone of *U. minor*. This clone is thought to have originated as a cultivar in Italy as suggested by Richens (1983) and has been referred to as *U. minor* cv. ‘Atinia’. Some of the plants in S.A. previously known as English elm were misidentified and are now determined as *U. ×hollandica* (q.v.). To date there are no collections of typical English Elm (*U. minor* cv. ‘Atinia’) recorded as naturalising in S.A., and most of the wild collections of *U. minor* in S.A. come from suckering plants associated with parent trees that have smooth ± elliptic leaves. However, a few collections have adult leaves with slightly rough upper surfaces and/or a more rounded shape and these may be hybrids involving cv. ‘Atinia’. One specimen also shows possible influence of *U. pumila* L. (Siberian elm).

Used as a street tree and within parks and gardens.

3. \**Ulmus parvifolia* Jacq., *Pl. Rar. Hort. Schoenbr.* 3: 6, t. 262 (1798). — **Illustr.:** *Fl. China Illustr.* 5: 4, fig. 4.9–11 (2004).

Small tree to 10–12 m tall, crown rounded to orbicular, deciduous (not in S.A.) or semi-evergreen to evergreen; trunk mottled orange-brown, bark peeling in places, branching at c. 1–1.5 m; smaller branches brown to brownish orange, occasionally tinged purplish red; young growth soft-hairy; young twigs zig-zag from node to node, densely pubescent; winter buds brown-orange, ovoid-orbicular, glabrous; stipules pubescent, similar in length to petiole, linear, caducous; petiole 3–6 mm long hairy; leaves glabrous, elliptic, sometimes ovate-elliptic to obovate-elliptic, (15–) 20–50 (–55) × 8–20 mm, base cuneate, oblique, margin mostly obtusely uniserrate, apex acuminate, midrib a dark line above, prominent below, main lateral veins 10–12, upper surface bright glossy green, lower surface paler. **Inflorescence** a cyme, flowers 2–6 in leaf axils, pedicels c. 0.1–0.15 mm long; flowers bisexual, inconspicuous, c. 1 × 2 mm long. **Fruit** a samara, ovoid, flat, 8–15 × 6–9 mm, calyx persistent, dark brown, fruit green at first, ripening papery brown, base rounded with thin stalk, tip with apical notch, glabrous, eventually dehiscent; seed c. 6–10 × 7–8 mm, and ≤ 1mm thick. **Chinese elm, lace-bark elm.** Fig. 1E, Pl. 2.



S.A.: <sup>2</sup>cSL, <sup>2</sup>cSE; \*W.A.; \*Qld; \*N.S.W.; \*Vic. Native to China, Japan, North Korea, Taiwan and Vietnam. Naturalised in India and North America. Flowers: in late summer, Feb.–Mar.

Widely cultivated in temperate areas of S.A. (especially Adelaide Plains and SE) as an ornamental street tree and within parks and gardens. Its dense canopy provides heavy shade. A single tree produces an abundance of wind-dispersed fruit from which natural regeneration sometimes occurs.

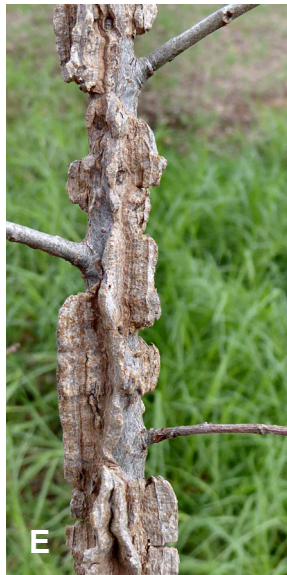
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*Ulmus x hollandica* (A, B, C, D & E)

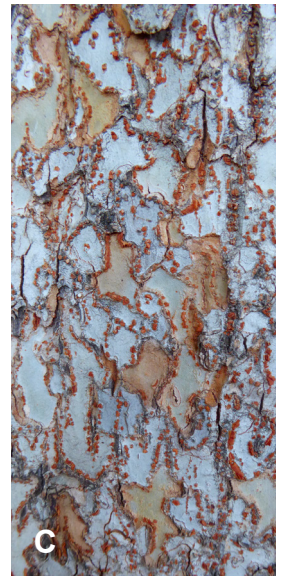


*U. minor* (F, G, H & I)



**Pl. 1.** **A.** C.J. Brodie 6028, Stirling, Adelaide Hills, SL. **B.** CJB 6825, Brownhill Creek R.P., Adelaide, SL. **C.** cult., Waite Arboretum, Urrbrae, SL. **D.** young suckers, CJB 6825, Brownhill Creek R.P., Adelaide, SL. **E.** cork flanges on suckering stems, Waite Arboretum, Urrbrae, SL. **F–I.** CJB 6836, Mt George C.P., Adelaide Hills, SL. Photos: A, B, D & F–I, C.J. Brodie, DEWNR; C & E, P.J. Lang, DEWNR.





*Ulmus parvifolia* (A, B, & C)

Pl. 2. A–C, cult., Adelaide, SL. Photos: A–C, P.J. Lang, DEWNR.