

ULMACEAE ELM FAMILY

Jeffrey W. Brasher
Department of Plant Biology
Arizona State University
Box 871601
Tempe, AZ 85287-1601

Trees or shrubs, often monoecious. LEAVES deciduous (except *Celtis pallida*), alternate, simple, often asymmetrical at the base, often 2-ranked; stipules deciduous. INFLORESCENCES axillary, uniflorous or few-flowered cymes, racemes, or fascicles. FLOWERS actinomorphic, usually imperfect; sepals (1-)5(-9), persistent, usually connate; petals absent; stamens (1-)5(-9), opposite the sepals; pistil 1, the carpels 1-2(-3), the ovary superior, the locules 1(-2), the ovules 1 per locule, the style branches (1-)2. FRUITS drupes, samaras, or nut-like. $x = 10, 11, 14$.—Ca. 18 genera, 150 sp., tropical and n temperate zones. Sherman-Broyles, S. L., W. T. Barker, and L. M. Schulz. 1997. Ulmaceae. In: *Flora of North America*. Vol. 3. Many species cultivated. Some spp. (especially of *Ulmus*) used for wood, fiber, and landscaping.

1. Leaf venation palmate at the base and pinnate toward the apex; fruits drupes; flowers appearing with the new leaves *Celtis*
- 1' Leaf venation pinnate throughout; fruits samaras; flowers appearing prior to or much later than the leaves *Ulmus*

Celtis L. Hackberry, Sugarberry

Trees or shrubs; branches without or with thorns. LEAVES: margins serrate, crenate, or entire; venation palmate at the base, pinnate at the apex. INFLORESCENCES uniflorous or small cymes or fascicles, appearing with new leaves. FLOWERS with pedicels, staminate near the base of the new spring growth, distally pistillate, the intermediate flowers sometimes perfect; calyx lobes usually 5-6, distinct nearly to the base; stamens 4-5, exserted, non-functional and usually shorter in pistillate flowers; pistil reduced in staminate flowers; styles 2, plumose. DRUPES fleshy, ovoid or spherical, the stones thick-walled. $x = 0$.—60 spp., 2 in AZ; tropical and n temperate zones. (Classical Latin, Pliny's name for *Celtis australis* L.). Drupes harvested by the Tohono O'odham, birds, and mammals. Wood used for fenceposts. *Celtis occidentalis* L., with leaves over 5 cm long and coarsely serrate at least apically, is cultivated in AZ.

1. Shrubs or trees to ca. 15 m tall, unarmed; bases of leaf blades often conspicuously asymmetrical; leaves usually much more than 2 cm wide *C. reticulata*
- 1' Shrubs to 3 m tall, armed with thorns to 2.5 cm long; bases of leaf blades symmetrical or nearly so; leaves usually less than 2 cm wide *C. pallida*

Celtis pallida Torr. (pale). Desert Hackberry, Granjeno. —Large shrubs, in ours to 3 m tall, with thorns to 2.5 cm long; branches zigzag; bark gray, smooth. LEAVES evergreen; blades ovate to elliptic, symmetrical or nearly so, to 3(-4) cm long and 2(-2.3) cm wide, green above and below, thickish, without insect galls, the base rounded but sometimes slightly notched, the apex rounded to acute, mucronate or sometimes with a tiny apical notch; margin entire basally, then often crenate to serrate apically, a tooth often mucronate; veins not reticulate, the basal set of axils bearing domatia (small pits in which insects and arachnids often live); surfaces scabrous, the abaxial hairs many both on and in between veins with those between veins erect to appressed, antrorse, and weakly pustular. DRUPES spherical to ovoid, orange, yellow, or red, 3-5 mm in diameter, on pedicels 1-5 mm long. [*C. tala* Gillies var. *pallida* (Torr.) Planch.]. —Usually in desert washes and riparian floodplains, often forming thickets: Cochise, Gila, Graham, Greenlee, Maricopa, Pima, Pinal, Yavapai cos.; 400-1200(-1700) m [1300-4000(-5600) ft.]; fl. buds year-round, fl. Mar-Nov (especially Mar-Jun), fr. year-round, especially Apr-Jul and

Nov-Jan; FL, NM, and TX, southward into s Mex. Provides important food and cover for wildlife, and is reportedly of value as a honey plant.

Celtis reticulata Torr. (net-like). Net-leaf Hackberry, Palo-blanco, Sugarberry. —Unarmed large shrubs or small trees to ca. 15 m tall in AZ; trunks to 5 dm in diameter; bark gray, smooth, but in age with corky vertical ridges and/or ring-shaped bumps. LEAVES deciduous, highly variable; blades ovate to lanceolate, asymmetrical, (1-)2-9.5 cm long, (0.6-)2-5 cm wide, gray-green above, yellow-green below, often leathery, consistently bearing insect galls, the base asymmetrical and rounded to cordate, the apex usually acuminate to acute; margins entire or serrate on the distal $\frac{3}{4}$, the base nearly always entire; veins reticulate, the basal set of axils with dense tufts of hair; surfaces harshly scabrous to almost smooth, the abaxial hairs mostly on veins with those between veins very few, mostly erect, weakly pustular. DRUPES spherical, orange to red, 6-8 mm in diameter, on pedicels (3-)7-20 mm long. [*C. laevigata* Willd. var. *reticulata* (Torr.) L. D. Benson] —Usually in riparian and other wet areas: All AZ cos. except Navajo and Yuma; 600-1700(-2050) m [2000-5500(-6700) ft]; Mar-Apr (fr. Aug-Oct and persisting after leaves); WA and KS s to n Mex. The Navajo-Kayenta used *C. reticulata* to treat indigestion. Vegetative specimens of *Morus microphylla* (Moraceae) are commonly misidentified as *C. reticulata*. The former can be distinguished by its having leaves without galls; hairs of the lower surfaces between the veins very numerous, strongly pustular, antrorse; and basal leaf margins serrate.

Ulmus L. Elm

Trees and shrubs; mature trunk bark in ours gray to brown, furrowed. LEAVES once or twice serrate; venation pinnate. INFLORESCENCES fascicles or cymes, appearing prior to the leaves or much later. FLOWERS pedicellate or sessile, perfect; calyx bell-shaped, 3-9-lobed; stamens 3-9, exserted; styles persistent, deeply 2-lobed. SAMARAS membranously winged, dispersed upon maturity. SEEDS (in ours) thickened, not inflated. $x=14$. —20-40 spp., 2 naturalized in AZ; n. temperate zones. (Latin *ulmus*, elm). Several species are grown as shade trees in AZ. *Ulmus procera* Salisb., English elm, according to Sherman-Broyles et al. in *Flora of North America* (1997) is locally established in AZ, but apparently no specimens document this. It is recognized as follows: old growth branchlets with corky wings; leaf blade over 7 cm long, strongly asymmetrical basally; densely pubescent below, scabrous above; samaras ciliate only at apex. Collectors should document any naturalized occurrence of *Ulmus*.

1. Leaf blade over 7 cm long, the margins twice serrate; flowers on pendulous pedicels 1-2 cm long; samaras ciliate; calyx lobes 7-9 *U. americana*
- 1' Leaf blade less than 7 cm long, the margins once or twice serrate; flowers sessile or subsessile; samaras without marginal hairs; calyx lobes 4-5 *U. pumila*

Ulmus americana L. (American). American Elm. —Naturalized trees to 35 m tall; buds lance-ovoid; bark of mature trunk gray, furrowed. LEAVES: blade ovate-oblong to obovate, 7-15 cm long, 3-7.5 cm wide, the base asymmetrical, the apex acuminate, glabrous to scabrous above, pubescent to sub-glabrous below, with tufts of hairs and/or domatia in vein axils; margins twice serrate; 1-12 of the lateral veins forking per side in ours. INFLORESCENCES pendulous fascicles, appearing before the leaves, the pedicels 1-2 cm long. FLOWERS: calyx 7-9 lobed; stamens 7-9. SAMARAS ovate to elliptic, flat, ca. 1 cm long, deeply notched apically, ciliate. $2n=56$. —Widely cultivated, apparently naturalized at only 2 AZ localities: Canyon de Chelly, Apache Co., 1747 m (5730 ft), and Tempe, Maricopa Co., ca. 350 m (1100 ft); winter to early spring; native to e U.S. and se Can., e of the Rocky Mts., cultivated there and elsewhere, reportedly escaped in other places such as ID. Valued shade tree. Susceptible to Dutch elm disease.

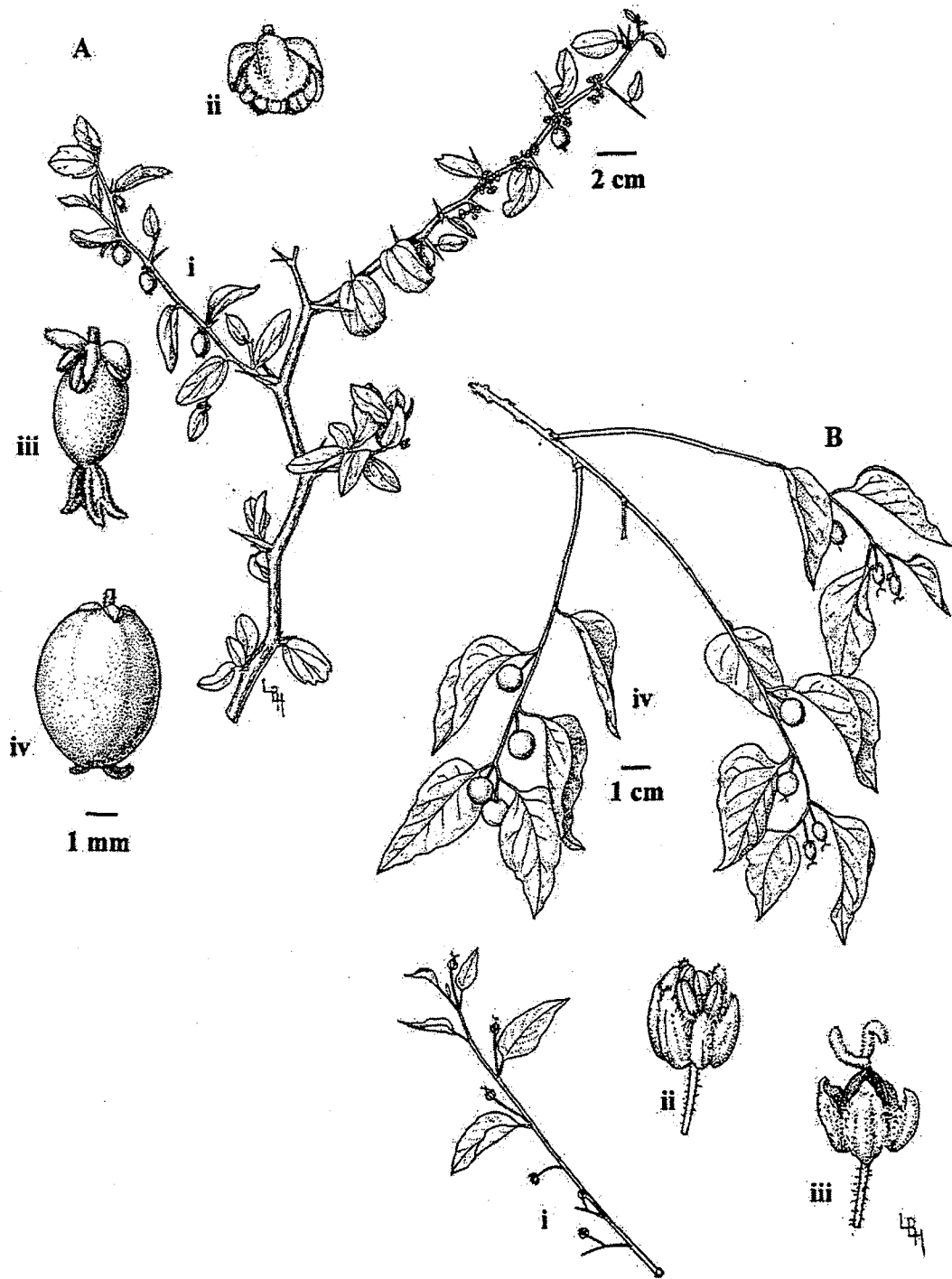
Ulmus pumila L. (dwarf). Siberian Elm. —Naturalized trees to 8 m tall in AZ, frequently root-sprouting; buds spherical to subspherical; bark of mature trunk gray to brown, rough.

LEAVES: blade ovate to lanceolate (occasionally obovate), 2-6.5(7.5) cm long, (1.5)2-3.5 cm wide, nearly symmetrical, the apex acute to acuminate, glabrous to scabrous above, glabrous below with tufts of hair and/or domatia in vein axils; margins once or twice serrate; 0-3(4) of the lateral veins forking per side. INFLORESCENCES sessile fascicles appearing before the leaves. FLOWERS: calyx 4-5-lobed; stamens 4-8. SAMARAS nearly circular, flat, 1-1.4 cm long, notched apically, without marginal hairs. $2n=28$. -Widely cultivated, naturalized or weedy in riparian areas and developed land (including roadsides): documented as naturalized in Apache, Coconino, Gila, Maricopa, Navajo, Mohave, Pima, Santa Cruz, Yavapai cos., to be expected in others; 350-2450 m (1100-8000 ft); Feb-Mar (fr. at least Mar-Apr); introduced from c Asia, widely cultivated and naturalized in U.S., more sporadically in Mex. Fast-growing, but the branches break easily; infections produce a slime flux on the trunks.

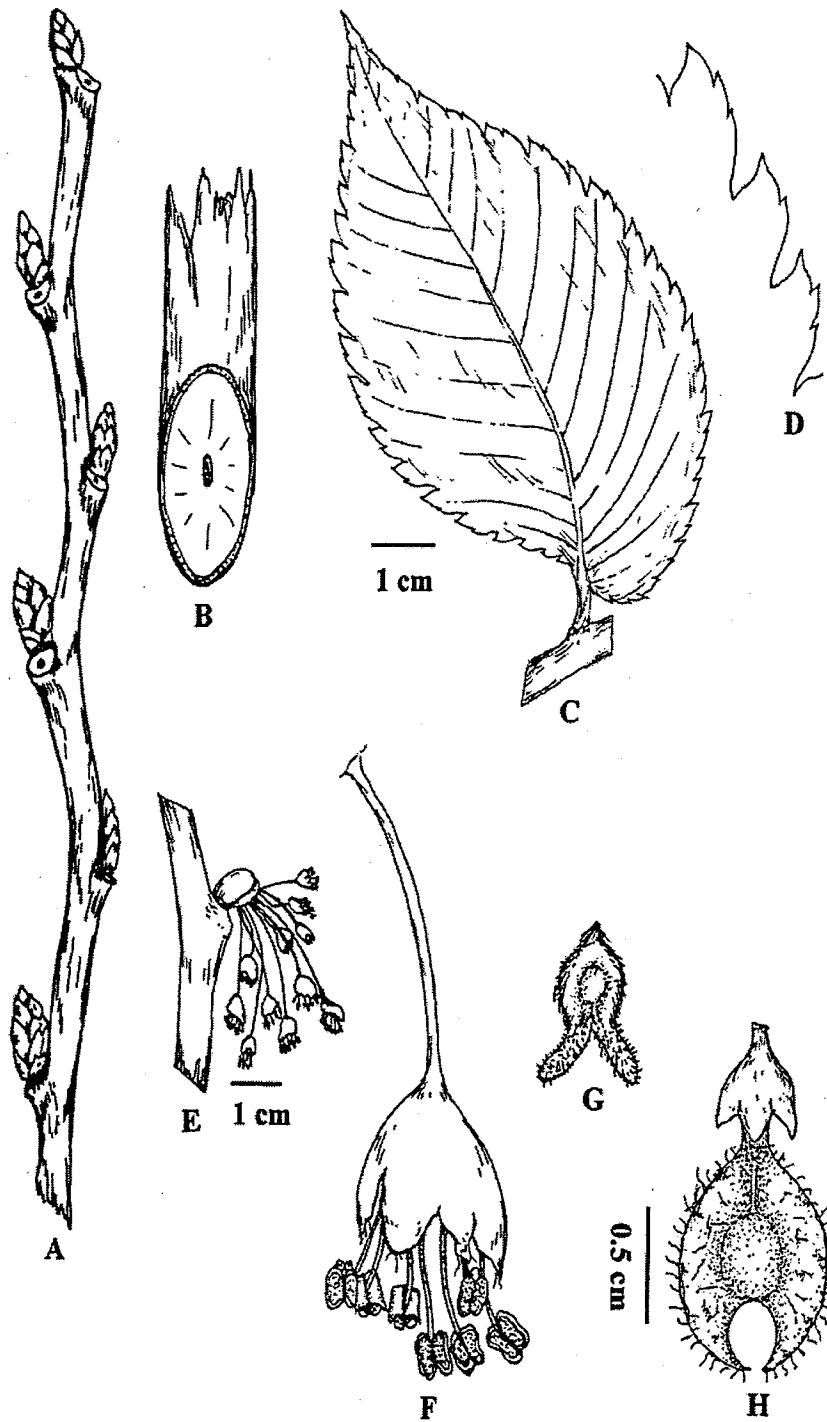
Ulmus parvifolia L., Chinese elm, is commonly cultivated in AZ, but apparently not naturalized. Herbarium specimens of *U. pumila* are often misidentified as *U. parvifolia*, which is distinguished as follows: bark of mature trunk exfoliating in plates leaving patches of gray and orange; buds lanceolate to ovoid; leaves tardily deciduous; mature leaf blades usually less than 2 cm wide, 5 or more of the lateral veins forking per side, the upper leaf surface glossy, often cracked on herbarium specimens; flowering and fruiting late summer through autumn.

ACKNOWLEDGMENTS

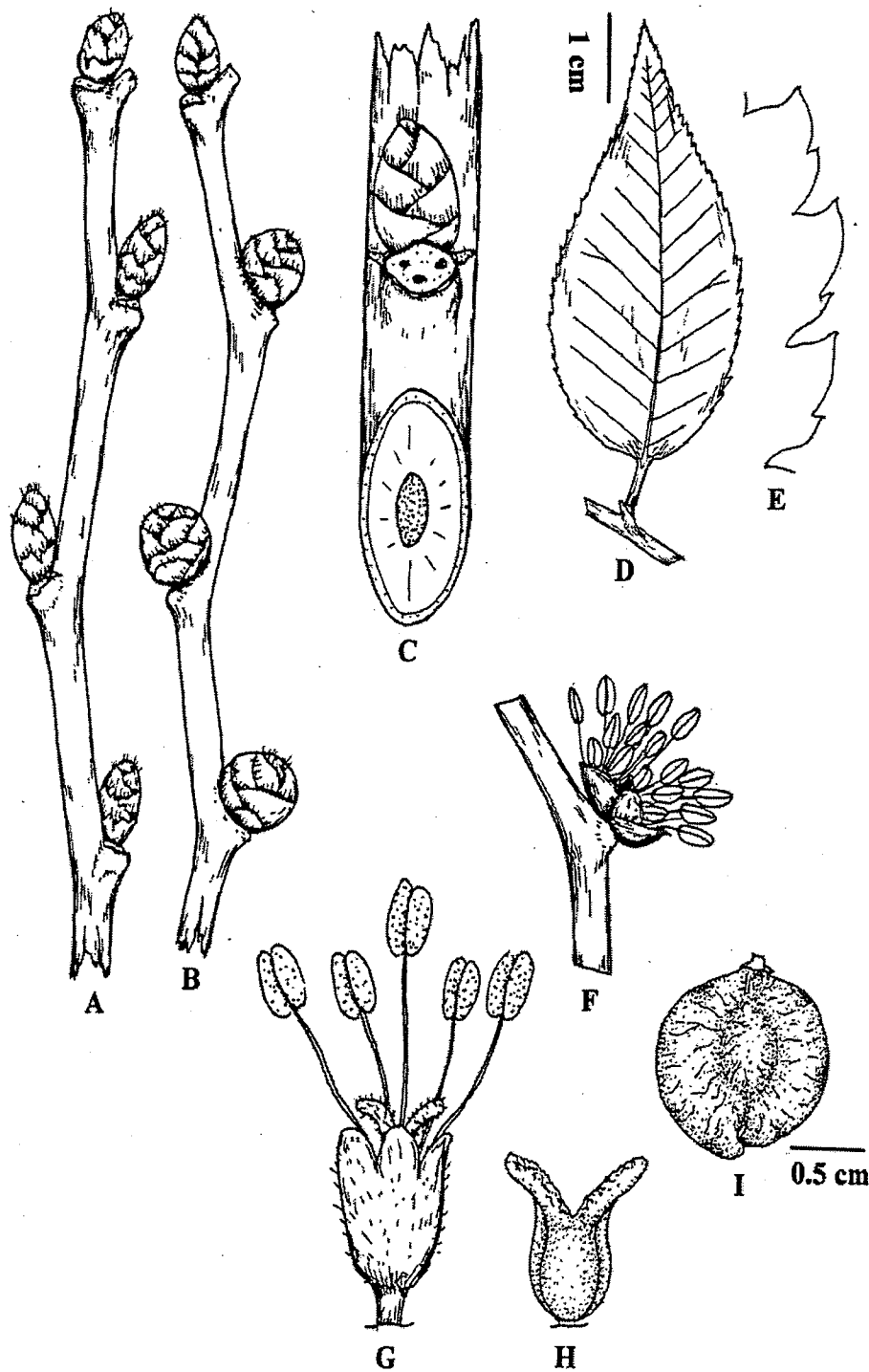
I thank the following herbaria for use of their specimens: ASC, ARIZ, ASU, BRY, DES, MNA, UT, and UTC. Sue Sherman-Broyles kindly reviewed the manuscript and with Leila Schulz provided information on *Ulmus* distributions. Wayne and David Brasher assisted with map preparation. Funding for this study was provided in part by a grant from the Arizona State University College of Liberal Arts and Sciences.



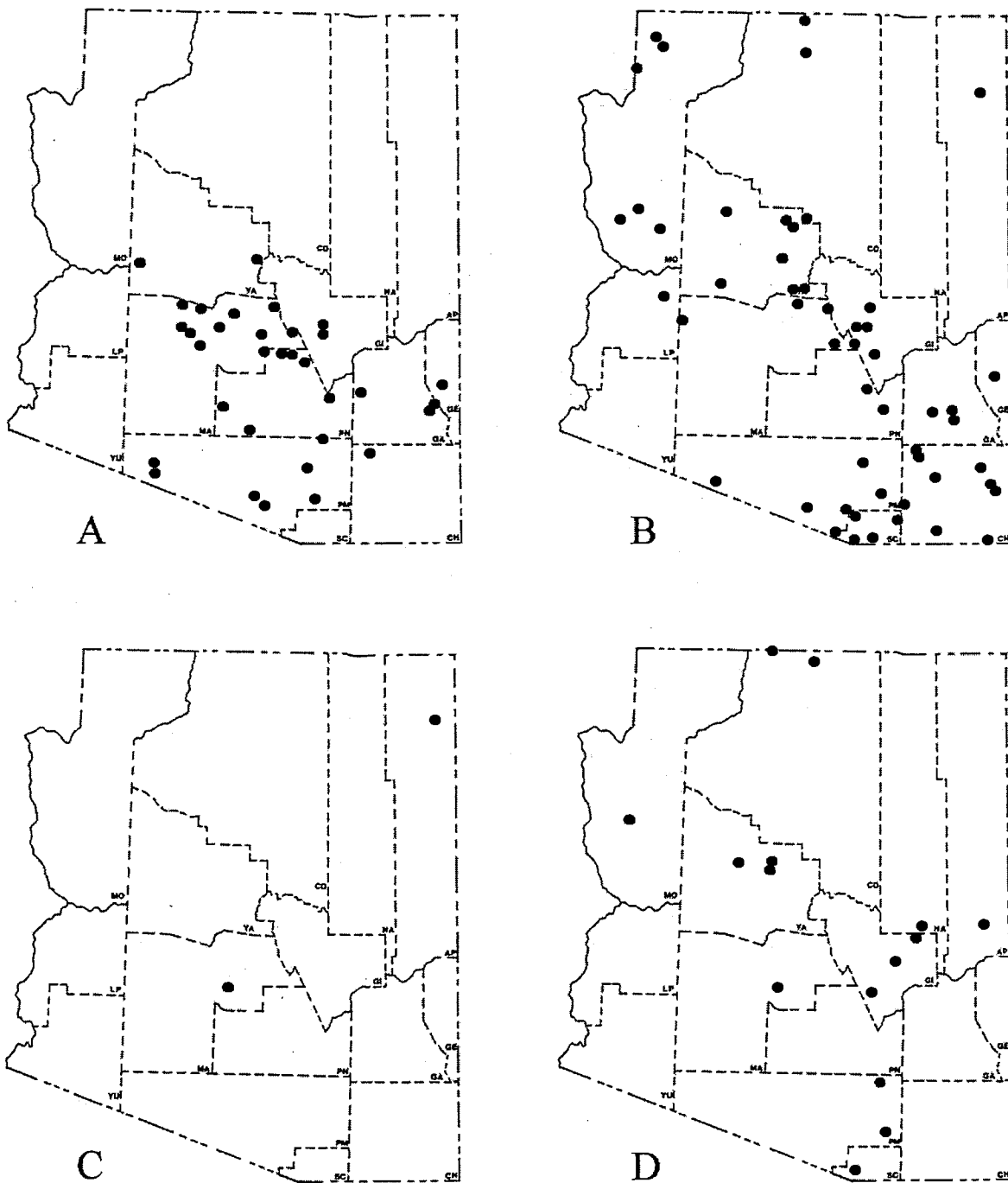
Ulmaceae Fig. 1. A: *Celtis pallida*; I, branch with flowers and fruits; ii, staminate flower; iii, perfect (transitional) flower composed of calyx, stamens, and pistil; iv, pistillate flower composed of calyx and pistil (now developed into a fruit). B: *C. reticulata*; I, young branch with immature leaves and with pistillate flowers above and staminate below; ii, staminate flower with sepals and stamens; iii, pistillate flower with sepals and a pistil; iv, branch with fruits. Reproduced by permission of the University of Arizona Press from *Trees and Shrubs of the Southwestern Deserts*, by L. Benson and R. Darrow, ©1981 The Arizona Board of Regents. Drawn by L. B. Hamilton.



Ulmaceae Fig. 2. *Ulmus americana*. A, winter twig; B, section of twig; C, leaf; D, leaf margin; E, inflorescence; F, flower; G, pistil; H, fruit. Reproduced with publisher's permission from *Woody Plants of the North Central Plains*, by H.A. Stephens, author and illustrator, ©1979, University Press of Kansas, Lawrence.



Ulmaceae Fig. 3. *Ulmus pumila*. A, winter twig, leaf buds; B, twig, flower buds; C, detail of twig; D, leaf; E, leaf margin; F, inflorescence; G, flower; H, pistil; I, fruit. Reproduced with publisher's permission from *Woody Plants of the North Central Plains*, by H.A. Stephens, author and illustrator, ©1979, University Press of Kansas, Lawrence.



Ulmaceae Fig. 4. Distributions of: A, *Celtis pallida*; B, *C. reticulata*; C, *Ulmus americana*; and D, *U. pumila*.