

CACTACEAE CACTUS FAMILY
Part Six.
Opuntia P. Miller Prickly-pears

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Trees or shrubs, erect, decumbent to trailing, much branched, the branches segmented. STEM SEGMENTS (pads), of varied lengths and widths, strongly flattened or, in a few species, subcylindric to subspheric, bearing small, ephemeral, fleshy, conic, leaves. AREOLES bearing glochids and a dense wool. SPINES with epidermis intact, not sheathing; major spines flattened to cylindric. FLOWERS borne singly in areole; inner tepals pale yellow to orange, pink to red or magenta, rarely white, or with bases of a different color, oblong to spatulate, emarginate-apiculate; outer tepals green to yellow with margins tinged color of inner tepals; stamens thigmotropic. POLLEN GRAINS with reticulate ornamentation. FRUITS fleshy to juicy (bleeding) and green, yellow or red to purple or dry and tan to gray, clavate to cylindric to subspheric, spineless or spiny, bearing on top an umbilicus (a large, usually depressed scar left from abscised flower parts). SEEDS glabrous, pale yellow to tan to gray, 3-10 mm long, generally circular to reniform, flattened (discoïd) to subspheric, angular to squarish, sometimes warped, commonly bearing 1-4 large, shallow depressions due to pressures from adjacent developing seeds, the girdle (midvein of funiculus which envelopes seed) smooth to protruding, ridged to strongly winged.

About 180 species (14 in the flora); Canada to southern Argentina, West Indies, Galápagos Islands. Many introduced to the Old World; many cultivated. (Origin of "opuntia" uncertain; presumably based on name of Greek town, Opus, perhaps, where a cactus-like plant grew). Parfitt, B. D. 1980. Origin of *Opuntia curvospina* (Cactaceae). *Systematic Botany* 5:408-418. Parfitt, B. D. 1998. New nomenclatural combinations in the *Opuntia polyacantha* complex. *Cact. & Succ. J. (Los Angeles)* 70:188.

1. Fruits when ripe fleshy or juicy ("bleeding"), green, yellow, orange, pink, red, or purple, rarely spiny.
2. Plants with at least some pads bearing spines.
 3. Trees massive, 3-6 m tall, with well-developed trunks; pads 25-60+ cm long, obovate, elliptic to oblong; spines, when present, subulate, white, sometimes basally yellow to brown, erect to spreading; glochids apical in areole, inconspicuous, less than 2 mm long; known only from cultivation and escapes therefrom. *O. ficus-indica*
 - 3' Trees small or shrubs erect to prostrate, to 2.5 m tall, usually much shorter; pads rarely to 25 cm long; variable in shape; spines, when present, subulate or acicular; glochids conspicuous, more than 2 mm long.
 4. Shrubs prostrate, trailing or forming clumps, sometimes with enlarged rootstocks; pads 5-11(-17) cm long, fleshy to flabby; major spines (0-)1-3(-6) in distal areoles, terete or one central flattened; fruits elongate, subterete; inner perianth yellow with red bases to clear red; stigmas white to yellow-cream (rarely tinted pale green).
 5. Inner tepals red; spines acicular very slender, ca. 0.25 mm in diameter, white to reddish brown; pads commonly rhombic *O. pottsii*
 - 5' Inner tepals yellow with red basal portions, occasionally only a blush, spines rather stout, ca. 0.5 mm in diameter; pads obovate to subcircular.
. *O. macrorhiza*
- 4' Shrubs or small trees, erect to sprawling, 0.5-2.5 m tall, not prostrate, trailing or clump-forming; pads 10+ cm long, firm; spines, flowers and fruits various.

6. Major spines all yellow (blackish in age), acicular, flexible, (0-)1-8+ per areole, all strongly deflexed (sometimes some spines divergent along edges of the pad); mid-pad areoles bearing densely packed marginal glochids that increase in length toward base of areole *O. chlorotica*
- 6' Major spines acicular to subulate, of other colors, or if yellow, then also subulate, 1-15+ per areole, not all deflexed; mid-pad areoles bearing densely packed to widely spaced marginal glochids that are subequal or decreasing in length toward base of areole.
7. Glochids widely spaced (not dense), at least in most areoles, usually irregular in length in an apical crescent partially encircling the areole's margin and usually also in a subapical cluster above the (0-)1-6(-12) subulate major spines, these yellow (darkening with age), in one variety with chalky white coating (yellow spine shows through when wetted), and sometimes red-brown at commonly flattened or angular bases; inner tepals of uniform color, clear yellow (sometimes pink, red or rarely white); shrubs (occasionally with a short trunk) erect to sprawling, to 2.5 m tall; fruits juicy, purple throughout, often with long tapering bases. *O. engelmannii*
- 7' Glochids in an apical crescent partially encircling the areoles, of equal length or decreasing in length from the apex, sometimes with a subapical cluster above the 0-15+ spines; inner tepals of uniform color or with bases of a different color; fruits fleshy (rarely slightly juicy), red to purplish, often with greenish pulp, without tapering bases.
8. Inner tepals clear yellow or yellow with a faint reddish blush at bases; small trees with short trunks.
9. Spines, if present, usually 1-2 in a few distal or marginal areoles per pad, the longest ones to 4 cm long, pale yellow-grey, aging red-brown; pads thin, often purplish (particularly with stress), at least around the areoles. *O. santa-rita*
- 9' Spines in most areoles, 4-8+ per areole, reddish yellow to red-brown, spreading to deflexed, subterete to flattened or channelled adaxially, sometimes twisted and curved, the longest ones 4-6 cm long; pads thick, gray-green to yellow-green; juncture of AZ, CA, NV *O. ×curvispina*
- 8' Inner tepals yellow with red centers or all reddish; erect to sprawling shrubs.
10. Spines 0-15+ per areole (few and distal on a pad to many and well distributed on pad), major ones usually reddish brown to blackish, or rarely yellow (w. TX) often partly to wholly chalky white, mostly terete except at base, usually 5-17+ cm long, erect to upward-spreading (appears to need a "haircut"), rarely also a small deflexed spine; pads often purplish (particularly with stress), at least around the areoles *O. macrocentra*
- 10' Spines 0-4(-6) per areole (in upper 1/3 to 2/3 areoles of pad), major ones gray to tan with red-brown bases or mostly red-brown, sometimes blackish, mostly flattened, 3-8 cm long, divergent or reflexed, also 1-3+ small deflexed gray to tan spines; pads sometimes reddish under stress *O. phaeacantha*
- 2' Plants with pads spineless or bearing only vestigial spines (sometimes taxa have spineless individuals that cannot be safely identified without flowers and/or fruits (avoid sterile specimens or those from unhealthy or infested plants; [see also spineless plants of dry-fruited taxa below in key].

11. Fruits and pads puberulent (use lens); flowers yellow (fading apricot to reddish); pads bright green; areoles close-set, usually low shrubs to 1 m tall with many small pads; escapes from cultivation *O. microdasys*
- 11' Fruits and pads glabrous or glaucous; habit, pads, and flowers various.
12. Plants massive trees, 3-6 m tall; trunks well developed, to 30-45 cm in diameter; pads 2-3+ cm thick, broadly oblong to ovate to narrowly elliptic; usually (20-)40-60+ cm long; inner tepals all yellow or orange; plants known only from cultivation or rarely as escapes *O. ficus-indica*
- 12' Shrubs or small trees to 2 m tall; pads 1-2 cm thick, yellow-green to blue-green to purple, pads of various shapes and sizes, generally not cuneate; inner tepals variously colored and patterned.
13. Midpad areoles bearing marginal glochids that increase in length toward base of areole; fresh stigmas white. *O. chlorotica*
- 13' Midpad areoles bearing marginal glochids subequal or decreasing in length toward base of areole; fresh stigmas yellow green to green.
14. Glochids in mid-pad areoles widely spaced, irregular in length, encircling (or nearly so) the areole margin, also in subapical region, these often embedded in wool; large shrubs (sometimes with short trunks); fruit purple, juicy; [spines absent only in vars. *engelmannii* and *lindheimeri*] ...
..... *O. engelmannii*
- 14' Glochids in mid-pad areoles dense, subequal or increasing in length toward apex of marginal apical crescent, also dense in subapical tuft, small trees or shrubs; fruits fleshy or juicy, reddish to purple.
15. Inner tepals clear yellow; small trees or erect shrubs; pads lavender to red-purple when under stress, at least around areoles ... *O. santa-rita*
- 15' Inner tepals yellow with red bases; shrubs erect to trailing; pads usually green, sometimes reddish or purplish particularly when under stress.
16. Shrubs low, with trailing branches; lowermost spine in areole deflexed, short, whitish, often the only spine in basal areoles of pads; pads green, sometimes reddish when under stress
..... *O. phaeacantha*
- 16' Shrubs erect, not trailing; lowermost deflexed whitish spine in areole absent, sometimes in one to few areoles per pad; pads purplish when under stress *O. macrocentra*
- 1' Fruits dry at maturity, sometimes tardily so, usually bearing spines and an apical flange.
17. Seeds subspheric, 4-4.5 mm thick, the girdle projecting 0.5-1 mm from body; inner perianth pink, pink-magenta or rarely white; filaments red-magenta (rarely pale); fresh stigmas white; pads and fruits minutely puberulent, spineless (in our vars.) . *O. basilaris*
- 17' Seeds flattened, 1.5-3.5 mm thick, the girdle projecting 1-3.5 mm from body of seed; inner tepals yellow to red-magenta; filaments white, yellow or red-magenta; fresh stigmas green; pads and fruits glabrous or minutely puberulent, usually spiny.
18. Areoles in apical third of pads bearing 0-4 spines (absent from basal 50-100% of pad); fruits spineless or nearly so; fruits and pads glabrous or minutely puberulent.
19. Plants mostly spineless (absent from the basal 95-100% of pad); areoles in apical third of pad bearing 0(-1) spines; pads sometimes puberulent; fruits spineless. ...
..... *O. aurea*
- 19' Plants spiny (absent from basal 50-80% of pad, rarely spineless); areoles in apical third of pad bearing (0-)1-4 spines; fruits spiny.
20. Number of areoles in a row diagonally across midpad 7-8, rarely fewer; pads sometimes papillate; glochids conspicuous; longest spines per areole 5-7 cm long; areoles (8-)12-17 per fruit *O. pinkavae*

- 20' Number of areoles in a row diagonally across midpad 3-5; pads glabrous; glochids of pads areoles inconspicuous; longest spine per areole 0.8-2.4 cm long; areoles 12-22 per fruit *O. fragilis*
- 18' Areoles in apical third of pad bearing 6-20 spines (absent from 0-40% of pad); fruits very spiny to nearly spineless; fruits and pads glabrous.
- 21. Depressed spines 0-3, at lower edge of areole, 1-3 mm long; largest spine per areole 0.8-2.4 cm long; pads readily detached, (1.5-)2-5.5 cm long, (1-) 1.5-3 cm broad, subspheric to cylindrical to flattened and elliptic obovate *O. fragilis*
- 21' Depressed spines 5-7 at lower edge of areole, 4-20 mm long; largest spine per areole 2-6 cm long; pads firmly attached, (4-)6-27 cm long, 5-18 cm broad, flattened, obovate to circular (or, if elliptic, then pads longer than 9 cm) *O. polyacantha*

Opuntia aurea McCabe ex E. Baxter (golden, for flowers). –Shrubs low, clump-forming or with trailing branches, 10-30 cm tall. PADS green to blue-green, usually papillate, elliptic to obovate, 6-15 cm long, 5-12 cm broad. AREOLES 7-11 in a diagonal row across midpad, subcircular to elliptic, 3-5 mm long, 2-4 cm wide; wool tan. SPINES absent or only 1 spine in 1 to few distal areoles per pad, yellow to gray, deflexed, to 6 mm long. GLOCHIDS yellow, in a dense apical crescent and a dense subapical tuft, to 3 mm long. FLOWERS: inner tepals yellow (sometimes magenta), 2.5-3 cm long; filaments white to yellow; style white; fresh stigmas green. FRUITS tan to gray, dry at maturity, spineless, 2.5-3 cm long, 1.5-2 mm in diameter; areoles 18-26. SEEDS tan, very large, subcircular, 9-12 mm in diameter; girdle broad, protruding 2.5-3.5 mm. $2n = 66$. [*Opuntia basilaris* Engelm. & J. M. Bigelow var. *aurea* (McCabe ex E. Baxter) W. T. Marshall; *O. erinacea* Engelm. var. *aurea* (McCabe ex E. Baxter) Welsh]. –Red sand of pinyon-juniper woodlands, Mohave Co.; 1500-1800 m (4900-5900 ft); May-Jun; AZ-UT borderlands.

Hybridizes with *O. polyacantha* var. *erinacea*, *O. phaeacantha* and *O. pinkavae*.

Opuntia basilaris Engelm. & J. M. Bigelow (arising from base). –Shrubs, clump-forming, 1-2(-3) pads and 7-40 cm tall. PADS blue- to yellow-green, sometimes tinged maroon-purple, papillose to puberulent, rarely glabrous, spatulate to broadly obovate or subcircular, thick, 5-22(-35) cm long, 2-13.5(-16) cm broad. AREOLES 4-16(-19) in a row diagonally across midpad, circular to elliptic, 3-5 mm long, 3 mm wide; wool white to tan, aging gray. SPINES, when present, mostly in distal areoles, yellow, straight, spreading, 0(-8) per areole, 5-25 mm. GLOCHIDS numerous, nearly filling the areoles, yellow to red- or dark brown, to 3 mm long. FLOWERS: inner tepals pink to magenta, rarely white; filaments deep pink to magenta; style white to pink; fresh stigmas white to cream. FRUITS maturing dry and tan, puberulent, spineless except in var. *treleasei*, 2-4 cm long, 1.5- 2.3 cm in diameter, the umbilicus 5-12 mm deep; areoles 24-76. SEEDS yellowish to tan, subcircular but angular, thick, 6.5-9 mm long, 6.5-7 mm wide, the sides smooth or bearing 1-3 depressions; girdle protruding to 1 mm.

Varieties 4 (2 in the flora): sw United States, adjacent Mexico.

- 1. Pads broadly obovoid to subcircular, erect; (8-)10-16(-19) areoles in a row diagonal across midpad. var. *basilaris*
- 1' Pads spatulate to elongate, oblong, usually decumbent; 4-8(-9) areoles in a row diagonal across midpad var. *longiareolata*

Var. basilaris. Beavertail Prickly-pear. –PADS erect, obovate, flattened throughout, 7-22(-35) cm long, 6.5-13.5(-16) cm broad. AREOLES (8-)10-16(-19) in a diagonal row across midpad, circular. SPINES absent (or very rarely 1–few very short spines per pad). FRUITS spineless. $2n = 22$. [*Opuntia basilaris* var. *ramosa* Parish; *O. whitneyana* E. Baxter]. –Sandy to rocky desert flats and hills to chaparral and woodlands, La Paz, Maricopa, Mohave, Yavapai, Yuma cos.; 350-1700 m (1200-5600 ft); Feb-Jun; AZ, se CA, UT; adjacent Mex.

Var. *longiareolata* (Clover & Jotter) L. D. Benson (elongate areoles). Grand Canyon Beavertail Prickly-pear. –PADS often decumbent, spatulate, flattened apically, (5-)9-18 cm long, 4-11 cm broad. AREOLES 6-8(-9) in a diagonal row across midpad, elongate to mostly circular. SPINES absent. FRUITS spineless. $2n = 22$. [*Opuntia longiareolata* Clover & Jotter, *Opuntia heilii* Welsh & Neese]. –Mojave and Great Basin deserts, along canyon bottoms to bluffs; Coconino, Mohave cos.; 600-1600 m (1900-5200 ft); Mar-Apr; UT.

The elongate areoles that the varietal epithet implies are not at all characteristic for the variety.

Opuntia chlorotica Engelmann & J. M. Bigelow (lacking chlorophyll). Pancake Prickly-pear. –Trees or erect shrubs, 2-2.5 m tall, with spiny trunks to 30 cm long. PADS blue-green, obovate to circular, glabrous, 13-21 cm long, 11.5-19 cm broad. AREOLES 7-10 in a row diagonal across midpad, subcircular to elliptic with a basal ridge, 3-6 mm long, 2.5-4 mm wide; wool tan, aging grayish white. SPINES absent or mostly in distal areoles to well distributed over entire pad, yellow, aging red-brown to blackish, straight or weakly curved, acicular, deflexed except some erect in pads' marginal areoles; larger spines (0-)1-8+ per areole, terete or basally flattened, 2.5-4.5 cm long, usually accompanied by few straight to wavy bristle-spines. GLOCHIDS crowded in narrow marginal apical crescent, increasing in length toward base of areole, the subapical tuft absent or poorly developed, yellow, aging reddish brown, to 14 mm long. FLOWERS: inner tepals yellow (sometimes with reddish blush at base), broadly spatulate-apiculate, 1.8-3 cm; filaments white to yellow; style and fresh stigmas white to yellowish or very pale green. FRUITS red, barrel-shaped, fleshy (often mummifying), glabrous, spineless, 3-5 cm long, 2-4 cm in diameter, the umbilicus 6-9 mm deep; areoles 40-68. SEEDS yellowish, reniform to subcircular, flattened but often warped, 3.5-4 mm long, 3-3.5 mm wide, 1.5-1.8 mm thick; girdle protruding 0.1-0.5 mm. $2n = 22$. –Rocky ledges, hills, canyons, or uncommonly desert flats, desert grasslands, woodlands and chaparral, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai cos.; 600-2400 m (1900-7900 ft); Apr-Jul; CA, NV, NM; Mex: Baja Calif., Son.

Hybridizes with diploid *O. santa-rita* in se AZ and hexaploid *O. phaeacantha* where AZ, CA and NV all meet, forming tetraploid *O. ×curvispina*.

Opuntia ×curvispina Griffiths, pro sp. [*O. chlorotica* × *O. phaeacantha*]. (with curved spines). –Trees, shrubby, 0.5-1.5 m tall, with trunks to 20 cm long. PADS gray-green to yellow-green, glabrous, circular to broadly obovate, sometimes wider than long, 12-22 cm long, 12.5-20 cm broad. AREOLES 6-9 in a row diagonal across midpad, circular to elliptic, 4-7 mm long, 3-7 mm wide; wool tan to brown, aging gray. SPINES in most areoles, reddish yellow to red-brown, the distal ones often yellow, the basal ones sometimes whitish; major spines stiff, (0-)4-8(-9), mostly deflexed but sometimes spreading, particularly on pad margins, subterete to flattened, even channelled adaxially, sometimes twisted and curved, the largest 4-6 cm long. GLOCHIDS 1-6(-12) mm long, yellow to yellow-brown, crowded in an extended marginal apical crescent nearly encircling the areole plus a less dense subapical tuft obscured by the long dense wool. FLOWERS: inner tepals yellow sometimes with a faint basal reddish blush, broadly obovate, apiculate, 2.2-3.5 cm long; filaments yellow; style white; fresh stigmas greenish white. FRUITS dull red with green flesh, ovate to obovate, spineless, 3.2-5.0 cm long, 1.5-3 cm in diameter, the umbilicus 4-6 mm deep; areoles 28-46. SEEDS yellowish, reniform to subcircular, the flat sides smooth; girdle protruding 0.5-0.8 mm. $2n = 44$. –Sandy to gravelly flats or slopes, desert grassland to oak and/or juniper woodlands, Mohave Co.; 1000-1500 m (3200-5000 ft); Apr-Jul; CA, NV.

Parfitt (1980) separated *Opuntia martiniana* (L. D. Benson) Parfitt [*O. littoralis* Engelm. var. *martiniana* (L. D. Benson) L. D. Benson; (for William P. Martin)] from this taxon by the former having styles widest at the middle (vs near the base) and minor often overlapping differences such as more yellow spines, fewer areoles per pad and size differences of fruits. Since both are tetraploid putative hybrids, ranging in close proximity, and share very many

character states, I am reluctant to separate them until more evidence is obtained. Perhaps *O. engelmannii* is a parent, rather than *O. phaeacantha*.

Opuntia engelmannii Salm-Dyck ex Engelm. (for George Engelmann). –Shrubs or trees with short trunk, spreading to sometimes decumbent, 1-3 m tall. PADS yellow-green to blue-green, glabrous, often glaucous, circular to obovate to rhombic, or (in var. *linguiformis*, the apex tapering, elongate), 15-40(-120) cm long, 10-40 cm broad. AREOLES 5-8 in a row diagonal across midpads, subcircular to obovate, 4-7 mm long, 4-6 mm wide; wool tawny, aging blackish. SPINES evenly distributed on pad to absent, white to yellow, usually red to dark brown at extreme bases, aging gray to ± black), subulate, straight to curved, flattened to angular at least at base, (0-)1-6(-12) per areole, the largest spreading to strongly reflexed, 1-3(-5) cm long. GLOCHIDS yellow to red-brown, aging gray or blackish, widely spaced, of irregular lengths to 12 mm long, in apical crescent and encircling the areole or nearly so, and scattered in subapical tuft. FLOWER: inner tepals of uniform color, yellow to buff, sometimes orange to pink to red, rarely whitish, 3-4 cm long; filaments and style whitish to cream-colored; fresh stigmas yellow-green to green. FRUIT deep red to purple throughout, elongate-ovate to barrel-shaped, sometimes stipitate, spineless, juicy (bleeding and staining), 3.5-9 cm long, 2-4 cm in diameter; areoles 20-32, mostly toward apex. SEEDS tan to grayish, subcircular to deltoid, flat, 2.5-6 mm long, 2-5 mm wide; girdle protruding 0.3-0.5 mm. JUVENILES with pad bases bearing long hair-like spines.

Varieties 5+ (4 in the flora): sc and sw United States, n Mexico.

1. Pad becoming very elongate, at least 2 times as long as wide, lanceolate to linear-lanceolate, often falcate (only as escapes) var. *linguiformis*
- 1' Pad up to 1.5 times longer than wide, commonly circular, rhombic to obovate.
 2. Spines chalky-white, yellow when wetted, with dark red-brown extreme bases var. *engelmannii*
 - 2' Spines pale to dark yellow, not chalky-white, at times with darkened extreme bases.
 3. Pads with spines straight or slightly curving, spreading (only as escapes) var. *lindheimeri*
 - 3' Pads with spines arching downward near bases; sc AZ var. *flavispina*

Var. **engelmannii**. Engelmann Prickly-pear. –PADS circular, rhombic to obovate, 20-40 cm long, 17-30 cm broad. SPINES absent or at most areoles, chalky-white, yellow when wetted, aging gray to black, usually with ± red-dark brown extreme bases, (0-)1-5(-12) per areole, the largest 2-5(-7.5) cm long. Fruit usually edible. $2n = 66$ (only once reported as 44 in TX).

[*Opuntia discata* Griffiths; *O. phaeacantha* Engelm. var. *discata* (Griffiths) L. D. Benson & Walkington; *O. superbispina* sensu L. D. Benson, not as to type]. –Sandy soils to rocky hillsides, deserts, grasslands, woodlands, on plains and lower to mid-slopes of mountains; Cochise, Coconino, Gila, Graham, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai cos.; 300-2650 m (1000-8700 ft); Apr-Jul; CA, NV, NM, TX, UT; adjacent Mexico.

Var. *engelmannii* hybridizes with *O. phaeacantha* yielding numerous named and unnamed forms in AZ, CA and NM; the various intermediates counted are $2n = 66$.

Var. **flavispina** (L. D. Benson) Parfitt & Pinkava. (yellow-spined). –PADS obovate, 15-23 cm long, 14-18 cm broad. SPINES evenly distributed on pads, yellow with reddish brown extreme bases, aging deep red to black, arching downward, often twisted, (0-)1-7 per areole, the major ones 6.5-7.5 cm long, a smaller one depressed, whitish. $2n = 66$. [*Opuntia phaeacantha* Engelm. var. *flavispina* L. D. Benson]. –Sandy bajadas, Sonoran Desert; Maricopa, Pima, Yavapai cos.; 500-800 m (1700-2700 ft); Apr-May; adjacent Mex.

Var. **lindheimeri** (Engelm.) Parfitt & Pinkava (for F. Lindheimer). Texas Prickly-pear. –PADS broadly obovate to subcircular, sometimes broader than wide, 15-30 cm long, 12.5-25 cm wide. SPINES evenly distributed on pad to absent, clear yellow sometimes with red extreme bases, aging blackish, (0-)1-6 per areole, the largest 1.2-7.5 cm long. $2n = 66$; several counts of $2n = 22, 44, ca. 44$ require taxon verification. [*Opuntia lindheimeri* Engelm. & A. Gray; *O.*

lindheimeri var. *lehmannii* L. D. Benson, *O. lindheimeri* var. *tricolor* (Griffiths) L. D. Benson, *O. subarmata* Griffiths (a spineless morphotype)]. –Sandy to gravelly or rocky soils, Chihuahuan Desert, plains to woodlands and chaparral; escaped in Cochise Co.; 1000-1300 m (3300-4500 ft); Mar-Jun; LA, NM, ?OK, TX; adjacent Mex.; escaped in S. Afr.

Var. *linguiformis* (Griffiths) Parfitt & Pinkava (tongue-shaped). Cow's Tongue Prickly-pear. –PADS lanceolate to linear-lanceolate, becoming very elongate, often falcate, 35-120+ cm long, 8-17.5 cm broad. SPINES absent or irregularly to regularly arranged at most distal areoles, yellow, aging blackish, 0-3 per areole, the largest 1.2-3 cm long. $2n = 66$. [*Opuntia linguiformis* Griffiths; *Opuntia lindheimeri* Engelm. var. *linguiformis* (Griffiths) L. D. Benson]. –Widely cultivated, at times escaping; disturbed habitats, Sonoran and Chihuahuan deserts, escaped in Maricopa, Pima cos.; 100-600 m (400-2000 ft); Apr-May; TX (presumed native); Mex.: Coah.

This taxon is hardly more than a mutant form of var. *lindheimeri*.

Opuntia ficus-indica (L.) Miller (Indian-fig). Indian-fig Prickly-pear. –Trees to 6 m tall, with trunk to 30 cm in diameter. PADS green, glabrous, elliptic, oblong to obovate to lanceolate, 25-60+ cm long, 15-40 cm broad. AREOLES 6-9 in a diagonal row across mid-pad, rhombic to subcircular, 2-4(-5) mm in diameter; wool brown. SPINES absent or very highly reduced, or in marginal to nearly all areoles, whitish to tan to \pm brown, bristle-like only or bristle-like and subulate, these straight to slightly curved, spreading basally angular-flattened, 1-6 per areole, 0.1-4 cm; 0-2 small, basal bristle-like deflexed spines to 0.5 cm long. GLOCHIDS yellowish, aging brown, on distal margin of areole, in an inconspicuous tuft, less than 1.5 mm long. FLOWERS: inner tepals yellow to orange, 2.5-5 cm long; filaments yellow; style bright red; fresh stigmas yellow. FRUITS: yellow to orange to \pm purple, usually spineless, fleshy to \pm juicy, edible, 5-10 cm long, 4-9 cm in diameter; areoles 36-58, well distributed on fruit. SEEDS pale tan, subcircular, 4-5 mm in diameter, warped; girdle only slightly protruding. $2n = 88$. [*Cactus ficus-indica* L.; *Opuntia compressa* MacBride; *O. vulgaris* Miller, not sensu L. D. Benson]. –Sandy to gravelly desert soils, associated with human activity, Maricopa, Pima cos.; 250-750 m (900-2500 ft); Apr; cultivated (with escapes) semi-tropical and tropical regions worldwide.

Presumed native of Mexico, but definitely known only from cultivation (or persisting as escapes from cultivation); now introduced for its large delicious fruits (tunas) to tropical and warm temperate regions world-wide. Of its many morphotypes are spineless or near-spineless to very spiny types, with either narrow or broad pads. Numerous cultivar names have been proposed. Origin is probably from selection over time by natives of Mexico for spineless forms of *Opuntia streptacantha* Lemaire (also $2n = 88$) to ease the culturing and collection of cochineal scale insects for their red dye.

Opuntia fragilis (Nutt.) Haw. (fragile, disarticulating). Brittle Prickly-pear, Little Prickly-pear. –Shrubs low, mat-forming, 2-10 cm tall. PADS dark green, glabrous, the terminal ones easily detached, subspheric to cylindrical, to flattened and elliptic obovate, low-tuberculate (becoming pronounced when dried), (1.5-)2-5.5 cm long, (1-)1.5-3 cm broad. AREOLES 3-5 in a row diagonal across midpad, oval, 3 mm long, 2.5 mm wide; wool white. SPINES in most areoles, gray with brown tips, terete, straight, spreading, 3-8 per areole, the largest to 3.5 cm long. GLOCHIDS inconspicuous, tan to brown, in apical crescent in areole. FLOWERS: inner tepals yellow, sometimes basally red, 2-2.6 cm long; filaments white or red; style white; fresh stigmas green. FRUITS tan, dry, 1-3 cm long, 0.8-1.5 cm in diameter; areoles 19-21, the uppermost ones bearing 1-6 short spines. SEEDS 5-6 mm in diameter; girdle protruding 1-1.5 mm. $2n = 66$. [*Cactus fragilis* Nuttall; *Opuntia brachyarthra* Engelm. & J. M. Bigelow, *O. fragilis* var. *brachyarthra* (Engelm. & J. M. Bigelow) J. M. Coult.]. –Sandy or gravelly soils or on outcrops of granite or quartzite, barren areas in grasslands, woodlands, forests, Apache, Coconino, Navajo cos.; 1500-2400 m (4900-7900 ft); May-Jul; from B.C. to Ont. south to AZ and NM.

Opuntia macrocentra Engelm. (large central spines). Black-spined Prickly-pear, Purple Prickly-pear. –Shrubs, erect to decumbent, to 1 m tall. PADS all purple to green with purple near

areoles and pad margins, glabrous, broadly obovate to subcircular, thickish, 7-20 cm long, 6-18 cm broad. AREOLES 6-8(-18) in a row diagonal across midpad, elliptic to circular, 3-7 mm long, 2.5-5 mm wide; wool tan to whitish, aging black. SPINES absent or along distal pad margin to at most areoles, usually erect to spreading, sometimes deflexed, straight or curving, acicular and often flexible, subterete to flattened basally, 0-15+ per areole, the larger ones 5-12(-17) cm long, red-brown to black (rarely yellow to red), partly to wholly chalky white.

GLOCHIDS reddish yellow, aging brown, dense in an apical crescent and a well developed subapical tuft, reddish yellow aging brown, 2-3(-6) mm long. FLOWERS: inner tepals yellow with red bases, obovate-apiculate, 2.5-4 cm long; filaments yellowish; style cream; fresh stigmas green. FRUITS purplish, obovoid to barrel-shaped, spineless, fleshy, sometimes slightly juicy, 2.5-4 cm long, 2-2.3 cm in diameter; umbilicus 8-10 mm deep; areoles 22-44. SEEDS yellowish, suborbicular to reniform, angled, the sides flattened, 5-7 mm long, 3.5-5 mm wide; girdle protruding 0.8-1.2 mm. $2n = 22, 44$ (in AZ, only 44). [*Opuntia violacea* Engelm. ex B. D. Jacks. var. *violacea*, var. *castetteri* L. D. Benson and var. *macrocentra* (Engelm.) L. D. Benson.].

—Sandy desert flats to rocky hills and valleys, desertic uplands, grasslands or oak woodlands, Cochise, Gila, Graham, Pima, Pinal cos.; 900-1600 m (2900-5300 ft); Mar-Jun; NM, TX; Mex: Chih., Coah., Son.

Opuntia macrorhiza Engelm. (large rootstock). Western Prickly-pear, Plains Prickly-pear —Clump-formers, to 35 cm tall, sometimes from tuber-like rootstocks. PADS dark green, glabrous, usually glaucous, fleshy to flabby, often cross-wrinkled with stress, obovate to subcircular, 5-11 cm long, 3.5-7.5 cm broad. AREOLES 5-7(-8) in diagonal row across mid-pad, oval to subcircular, 2-4 mm in diameter; wool tan. SPINES mostly in pads' upper areoles, white to red-brown, the major ones straight, rather stout (ca. 0.5 mm in diameter near base), erect and/or deflexed, (0-)1-4 per areole, the largest 2-6 cm long. GLOCHIDS pale yellow, tan to red-brown, aging brown, forming a well-developed, dense apical tuft, to 6 mm long. FLOWERS: inner tepals yellow with red or reddish bases, 2.5-4 cm long; filaments pale yellow; style white; fresh stigmas yellow. FRUITS green, yellowish, to dull red, elongate-obovoid, long-stipitate, spineless, fleshy, 2.5-4 long, 1.5-2.8 cm in diameter; areoles 12-26. SEEDS tan, subcircular, 4-5 mm in diameter, thickish, warped; girdle broad, protruding to 0.5 mm. $2n = 44$. [*Opuntia mesacantha* Raf. var. *macrorhiza* (Engelm.) J. M. Coult.; *O. compressa* (Salisb.) Macbride var. *macrorhiza* L. D. Benson]. —Sandy to rocky soils, plains, chaparral, grassy woodlands and coniferous forests; all cos. except La Paz and Yuma; 900-1850 m (2900-6100 ft.); May-Jul; ID to ND s to Son, and Chih.

Hybridizes with *Opuntia pottsii* in se AZ.

Opuntia microdasys (Lehm.) Lehm. ex Pfeiffer (small, close-set bristles). Bunny-ears Prickly-pear. —Shrubs, erect to sprawling, 40-80 cm tall. PADS bright green, pubescent, circular to elliptic-obovate, (5-)7-10(-15) cm long, (3-)4-8(-10) cm broad. AREOLES (9-)11-16 in a row diagonal across midpad, subcircular, 2-5 mm in diameter; wool white to tan, aging gray. SPINES absent. GLOCHIDS numerous, reddish brown or usually yellow or whitish, 1-2 mm long. FLOWERS: inner tepals bright yellow, aging peach, 2.5-3 cm long; filaments and style white; fresh stigmas dark green. FRUITS red, fleshy, pubescent, globose to ovoid, 2-2.5 cm long. SEEDS tan, nearly spheric (very slightly flattened), 1-1.2 mm in diameter (perhaps immature); girdle protruding to 1.5 mm. $2n = 22$. [*Cactus microdasys* Lehmann]. —Sandy to loamy calcareous soils of desert hills, uplands, escaped in Pima, Pinal cos.; 1700-2100 m (5500-6900 ft) in Mex.; Apr-May; widely cult., Mex: Coah., Zac., Hgo., N.L., S.L.P., Tam., Zac.

Opuntia phaeacantha Engelm. (dark-colored). Brown-spined Prickly-pear. —Shrubs decumbent to commonly trailing, 0.3-1 m tall. PADS green to dark-green, glabrous, obovate to circular, 10-25 cm long, 7-20 cm broad. AREOLES 5-7 in a row diagonal across midpad, obovate to elliptic to circular, 10-25 mm long, 7-20 mm wide; wool tan to brown, aging grayish. SPINES at most areoles to only distal fourth of pad surface, or essentially absent, brown to white, (0-)2-8 per areole; central spines straight or curved, brown to red-brown (to blackish),

partly to wholly chalky-white, subulate, usually flattened at base, 3.5-7 cm long; lowermost basal spines usually 1(-3), deflexed, shorter to 2 cm long, whitish, often the only spines in pad's basal areoles, flattened. GLOCHIDS tan to red-brown, dense in an apical crescent and a subapical tuft, to 8 mm long. FLOWERS: inner tepals yellow with red basal portions, rarely entirely pink to red, 3-4 cm long; filaments greenish below, pale yellow to white above; style white; fresh stigmas green to yellow-green. FRUITS wine-red to purple, with greenish flesh (sometimes juicy in age), obovate to barrel-shaped, not long-stipitate, spineless, 3-5 cm long, 2-3 cm in diameter; areoles 15-40. SEEDS tan, subcircular, 4-5 mm in diameter, notched, warped; girdle protruding ca. 1 mm. $2n = 66$. [*Opuntia angustata* Engelm. & J. M. Bigelow; *O. phaeacantha* var. *brunnea* Engelm., var. *camanchica* (Engelm. & J. M. Bigelow) L. D. Benson, var. *laevis* (J. M. Coult.) L. D. Benson [a spineless or nearly spineless morphotype], and var. *major* Engelm.; *O. superbispina* Griffiths (as to type), not sensu L. D. Benson.]. -Sandy to rocky soils, deserts, surrounding mountains, plains; all cos. except Greenlee, La Paz, Yuma cos.; 600-2100 m (2000-6900 ft); Apr-Jun; CA, CO, KS, NM, ?OK, TX, UT; n Mex.

Overlapping character states in different combinations make separation of var. *major* Engelm. from var. *phaeacantha* impractical. Presumably var. *major* comprises sprawling to erect shrubs with obovate pads bearing a few brown to blackish spines (usually 1-3) per areole, in distal half of the pad or less; var. *phaeacantha* as trailing shrubs with narrowly obovate pads bearing more whitish spines (usually 3-10) per areole, throughout most to all of the pad. Distinctions among taxa is further blurred by hybridization of *O. phaeacantha* with *O. engelmannii*, yielding several named and unnamed hybrids. Population by population analyses (morphological and genetic) are needed before names can be assigned to many of these plants with confidence. Also hybridizes with: *O. chlorotica* (as *O. ×curvispina*), members of the *O. polyacantha* complex in Four Corners region, and with *O. ficus-indica* in CA. *Opuntia phaeacantha* may represent more than one species.

Opuntia pinkavae Parfitt (for D. J. Pinkava). -Shrubs low; branches ascending to prostrate, 10-25 cm tall. PADS green, glabrous to papillate, narrowly to broadly obovate, 6.5-15 cm long, 3-11 cm wide. AREOLES (4-)7-8 in a row diagonal across midpad, subcircular, 3-3.5 mm in diameter; wool white. SPINES in distal 20-50(-70)% of areoles, yellow-gray to whitish gray, sometimes brown in basal half, porrect to reflexed, slender, 1-3(-4) per areole, the largest (3.5-)5-7 cm long. GLOCHIDS red-brown, in a broad, dense apical crescent, the sides sometimes converging into a central column, conspicuous, to 6(-10) mm long. FLOWERS: inner tepals magenta, 2.5-3.5 cm long; filaments yellow to red-orange to magenta; style white; fresh stigmas green. FRUITS tan, maturing dry, 2-3 cm long, 1.8-2 cm in diameter; areoles (8-)12-17, uppermost bearing 1-4 short spines. SEEDS tan, oval to subcircular, 6.5-8 mm in diameter, warped; girdle protruding 1.5-2 mm. $2n = 88$. [*Opuntia basilaris* Engelm. & J. M. Bigelow var. *woodburyi* W. Earle, nom. inval.]. -Red, sandy or limestone loam soils, grasslands and margins of pinyon-juniper woodlands, Mohave Co.; 1370-1560 m (4500-5200 ft); May-Jun; sw UT. Hybridizes with *O. aurea*.

Opuntia polyacantha Haw. (many-spined). -Shrubs low, with ± prostrate branches, 5-50 cm tall. PADS green, glabrous, the terminal ones not easily detached, elliptic, narrowly to broadly obovate to circular, (4-)6-27 cm long, 2-18 cm broad. AREOLES 4-14 in a row diagonal across midpad, subcircular, 3-6 mm in diameter; wool tan to brown. SPINES at all to only distal areoles of pad, either of one kind: 1) not separable into major and minor spines, yellow to dark-brown to black turning gray, pink-gray to gray-brown, (0-)1-18 per areole, the largest (3.5-)4-9(-18.5) cm long and spreading and curling in all directions to ± straight, erect, ascending to deflexed or 2) of ± two kinds: major spines yellow-brown to brown to gray, reflexed to porrect, 1-5, the largest 2-15 cm long; minor spines white to white-gray, deflexed, 5-11, the largest 0.4-1.6 cm long. GLOCHIDS yellow, aging brown, in crescent at areole apex, 1-5 mm long. FLOWERS: inner tepals yellow to magenta, 2.5-4 cm long; filaments white, yellow to magenta; style white to pale pink; fresh stigmas green. FRUITS tan to brown, dry at maturity, 1.5-4.5 cm long, 1.2-2.5 cm in diameter; areoles 10-33, each or only the uppermost bearing 3-16 spines, 4-20 mm long,

sometimes bur-like. SEEDS tan to gray, oblong to subcircular, 3-7 mm long, 2-4 mm wide; girdle protruding 1-2 mm.

Varieties 5 (4 in the flora); sw Canada, w United States, nc Mexico.

1. Spines of two kinds: major spines 1-3 per areole, mostly deflexed on terminal pad, but sometimes ascending at pad apex; minor spines 1-3 per areole, deflexed, white, subtending major spines.
 2. Longest spine 2-4 cm long; distance between areoles 6-13 mm; pads (4-)6-15 cm long (Great Plains, northern and eastern Great Basin) var. *polyacantha*
 - 2' Longest spine 4.5-12 cm long; distance between areoles 12-30 mm; pads 10-27 cm long (Colorado River near AZ-UT border) var. *nicholii*
- 1' Spines not of two kinds, grading in length, from ascending to deflexed, 7-18 per areole, the longest spines of terminal pad porrect to ascending, shorter ones deflexed to porrect.
 3. Spines commonly dark brown, those of lower pads like those of the terminal pads, porrect to ascending, straight and stiff; fruit areoles 11-21, its spines not bur-like var. *hystricina*
 - 3' Spines commonly pale, those of lower pads not like those of terminal pads, more numerous, longer and more reflexed, flexuous and hair-like or thread-like; fruit areoles 20-33, its spines forming a densely spiny bur var. *erinacea*

Var. *erinacea* (Engelm. & J. M. Bigelow) Parfitt (hedgehog-like). Mojave Prickly-pear. -PADS elliptic to obovate, (7-)10-20 cm long, 5-10 cm broad. AREOLES ca. 12-17 mm apart, 8-14 in a row diagonal across midpad. SPINES in essentially all areoles, of one kind, grading in size and orientation, yellow to dark brown turning gray, pink-gray, or gray-brown, 1-18, the longest spreading and curling in all directions, usually ascending and \pm straight near pad apex, deflexed to reflexed near base, (3.5-)4-9(-18.5) cm long; spines of older pads more numerous, less straight, and more deflexed. FRUITS stout; areoles 20-33, each bearing 7-13 spines, 8-20 mm long. $2n = 44$. [*Opuntia erinacea* Engelm. & J. M. Bigelow; *O. erinacea* var. *ursina* (F. A. C. Weber) Parish]. -Alluvial, sandy or gravelly soils, desert to desert grasslands and juniper woodlands, Mohave Co.; 1050-1350 m (3500-4500 ft); late spring; CA, NV, UT.

Var. *hystricina* (Engelm. & J. M. Bigelow) Parfitt (porcupine-like). Porcupine Prickly-pear. -PADS obovate, 8-10 cm long, 5-8 cm broad. AREOLES ca. 10-17 mm apart, (6-)8-10 in a row diagonal across midpad. SPINES in most areoles, the major ones grading in size and orientation, the longest (yellow-gray to) brown to black, slightly descending porrect, ascending near apex, (4-)5-8 cm long, (1-)2-6 per areole, the minor ones shorter, gray-white, reflexed, 4-6 per areole. FRUITS stout; areoles 11-21, most bearing 4-8 spines 4-18 mm long. $2n = 44, 66$. [*Opuntia hystricina* Engelm. & J. M. Bigelow; *O. erinacea* (Engelm. & J. M. Bigelow) var. *hystricina* (Engelm. & J. M. Bigelow) L. D. Benson; *O. erinacea* var. *rhodantha* (K. Schumann) L. D. Benson; *O. erinacea* var. *xanthostemma* (K. Schumann) Rehder; *O. rhodantha* K. Schumann; *O. xanthostemma* K. Schumann]. -Clay or limestone soils, grasslands to pinyon-juniper woodlands, Apache, Coconino, Navajo cos.; 1350-1850(-2400) m (4400-6000[-7900] ft); late spring; CA, CO, NV, NM, UT.

Var. *nicholii* (L. D. Benson) Parfitt (for A. A. Nichol). Navajo Bridge Prickly-pear. -PADS narrowly to broadly obovate, 10-27 cm long, 7-18 cm broad. AREOLES ca. 12-30 mm apart, 8-11 in a row diagonal across midpad. SPINES in most areoles, of two kinds: major spines pink-gray or basal two-thirds brown to black, down-curved, ascending near pad apex, 1-5 per areole, the largest 4.5-15 cm long; minor spines 3-8 per areole, white to gray, deflexed, 6-22 cm long; spine cluster easily detached in preparing specimens. FRUITS stout; areoles 18-24, most bearing 3-12 spines, 8-17 mm long. $2n = 66$. [*Opuntia nicholii* L. D. Benson; *O. hystricina* Engelm. & J. M. Bigelow var. *nicholii* (L. D. Benson) Backeberg]. -Red sandy soil or on limestone chips, barren areas with saltbush and ephedra, Coconino Co.; 1190-1300 m (3900-4300 ft); spring; above Colorado River at AZ-UT border.

Var. *polyacantha*. Starvation Prickly-pear. -PADS broadly obovate to circular, (4-)8.5-12 cm long, (4-)5.5-11 cm broad. AREOLES 6-13 mm apart, 6-11 in a row diagonal across midpad. SPINES in most areoles, of two kinds: major spines yellow-brown to gray, deflexed to reflexed

or porrect at pad apex, 1-3(-5) per areole, 2-3.5(-4) cm long; minor spines white, deflexed, 0-5, per areole, 5-10(-16) mm long. FRUITS stout; areoles 12-28 most bearing (4-)6-15 spines, 5-10 mm long. $2n = 22, 44$. [*Opuntia heacockae* Arp; *O. juniperina* Britt. & Rose; *O. missouriensis* var. *microsperma* Engelm.; *O. polyacantha* var. *rufispina* (Engelm. & J. M. Bigelow) L. D. Benson; *O. polyacantha* var. *trichophora* (Engelm.) J. M. Coult.]. —Clay, sandy or gravelly soils, grasslands to pinyon-juniper woodlands, Apache, Navajo Cos.; 500-2000(-2750) m (1600-6500 [-9100] ft); late spring; Alta., Sask. to ND s to AZ, Chih. and TX.

Opuntia pottsii Salm-Dyck (for John Potts, collector of type). Potts Prickly-pear. —Clump-formers, to 35 cm tall, often from tuber-like rootstocks. PADS green, glabrous, usually glaucous, fleshy, not disarticulating, cuneate-obovate to commonly rhombic, 5-20 cm long, 4-8 cm broad. AREOLES 5-7(-8) in diagonal row across mid-pad, oval to subcircular, 2-4 mm in diameter; wool tan. SPINES mostly in distal 40% of pad, gray-white to red-brown, erect or reflexed, (0-)1-6 per areole, straight, slender (0.25 mm diam. near base), flexible, terete or lower ones flattened, the largest 2-6 cm long. GLOCHIDS yellowish, tan to red-brown, aging brown, in dense apical tuft, to 6 mm long. FLOWERS: inner tepals \pm red to rose; filaments pale yellow, style white; fresh stigmas yellow. FRUITS green to yellowish, fleshy, elongate-obovoid, long-stipitate, spineless, 2.5-4 cm long, 1.5-2.8 cm in diameter; areoles 12-26. SEEDS tan, subcircular, 4-5 mm in diameter, thickish, warped; girdle broad, protruding to 0.5 mm. $2n = 44$. [*O. macrorhiza* Engelm. var. *pottsii* (Salm-Dyck) L. D. Benson; *O. ballii* Rose; *O. delicata* Rose]. —Sandy to loamy soils of grassy plains and hills; Cochise, Pinal cos.; 900-1850 m (2900-6000 ft.); May-Jul; NM, TX; Mex.: Chih.

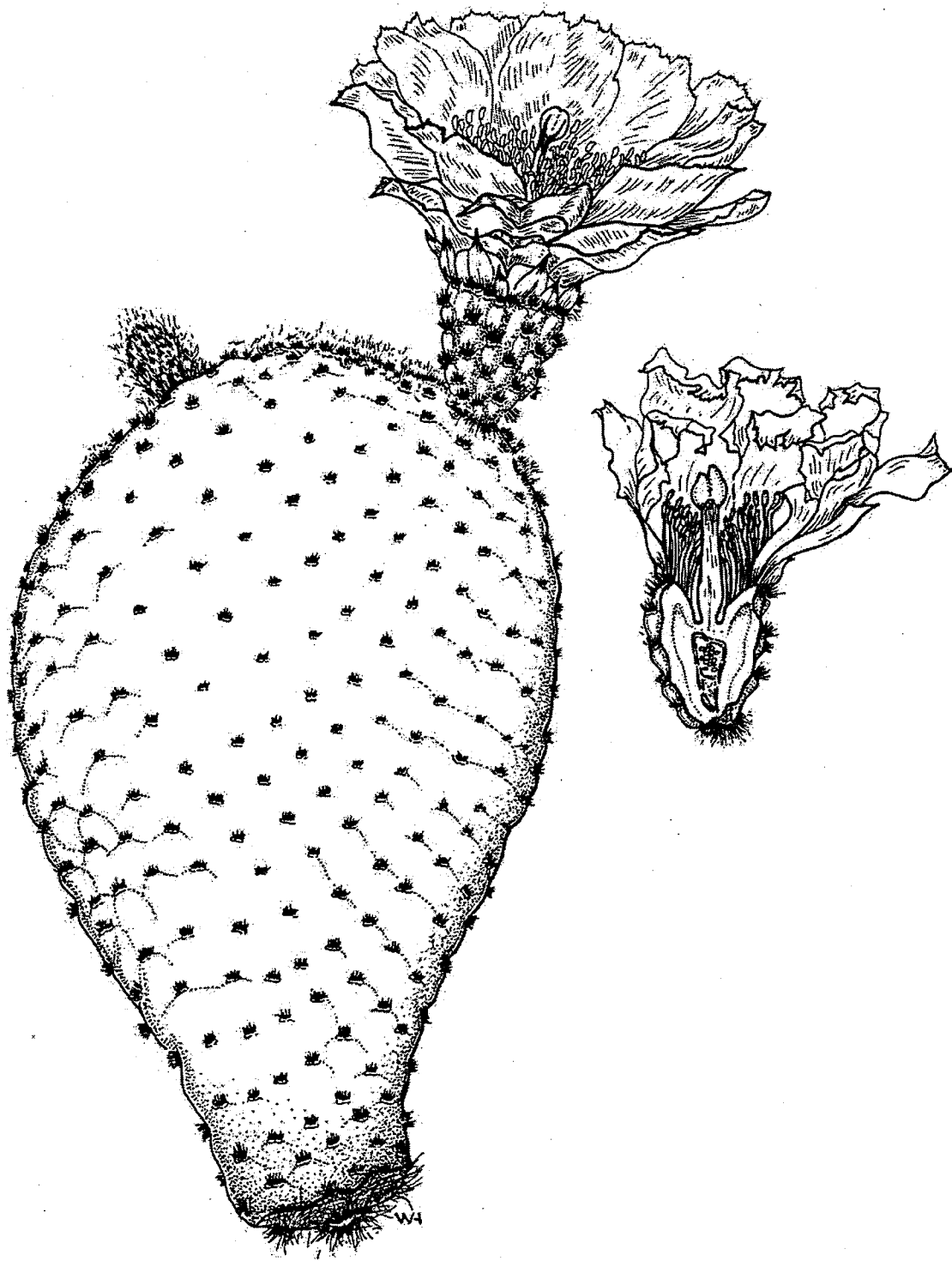
Hybridizes with *Opuntia macrorhiza* in se AZ.

Opuntia santa-rita (Griffiths & Hare) Rose (from Santa Rita Mountains, AZ). Purple prickly-pear. —Trees, shrubby with short trunks, to 2 m tall. PADS all purple to green with purple areas around areoles and pad margins, glabrous, subcircular, sometimes ovate or obovate, sometimes wider than long, thin, 10-20 cm long, 9.5-20 cm broad. AREOLES 6-8(-9) in diagonal row across mid-pad, obovate or elliptic to subcircular, sometimes reniform, 3-3.5 mm long, 2-2.5 mm wide; wool tan to brown. SPINES, if present, mostly in distal areoles and commonly marginal in pad, pale yellow to pale yellow-grey, aging red-brown, straight to slightly curved, acicular, deflexed to erect, 0-1(-2) per areole and usually few per pad, the largest ones to 4 cm long, usually shorter. GLOCHIDS yellow to tan, aging brown, dense, of even height, 3(-6) mm long, in an elongated apical crescent that nearly encircles areole plus a subapical tuft. FLOWERS: inner tepals yellow throughout, fading orangish, 2.5-4.5 cm long; filaments cream-colored or pale yellow below, white above; style white; fresh stigmas light green. FRUITS purplish, green inside, fleshy, obovate to barrel-shaped, spineless, 2.5-4.5 cm long, 2-3 cm in diameter; areoles 34-44(-54). SEEDS tan, flattened sides convex, often bearing bumps, 3.5-5 mm long, 3-4 mm wide; girdle protruding to 0.5 mm. $2n = 22$. [*Opuntia chlorotica* Engelm. & J. M. Bigelow var. *santa-rita* Griffiths & Hare; *Opuntia violacea* Engelm. ex B. D. Jacks. var. *santa-rita* L. D. Benson]. —Sandy to rocky soils on flats and slopes; deserts, grasslands to oak woodlands; Pima, Santa Cruz cos.; 750-1600 m (2400-5300 ft.); Apr-early Jun; reportedly sw NM, but no specimens seen; Mex.: Son.

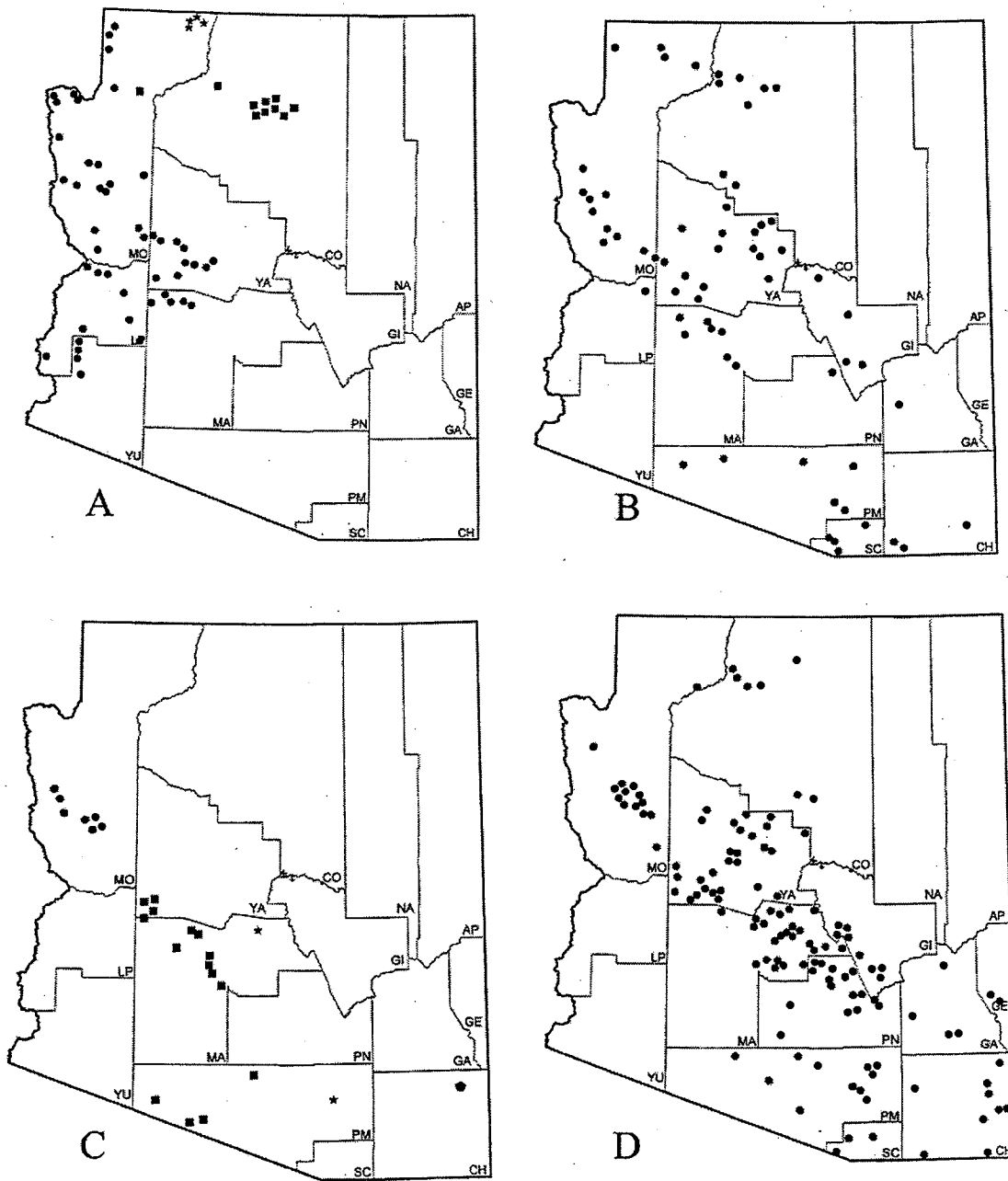
Hybridizes with *O. chlorotica* in s. Ariz. This hybrid ($2n = 22$) apparently accounts for Benson's (1982) inclusion of Mexico's *O. gosseliniana* F. A. C. Weber in the U.S.

ACKNOWLEDGMENTS

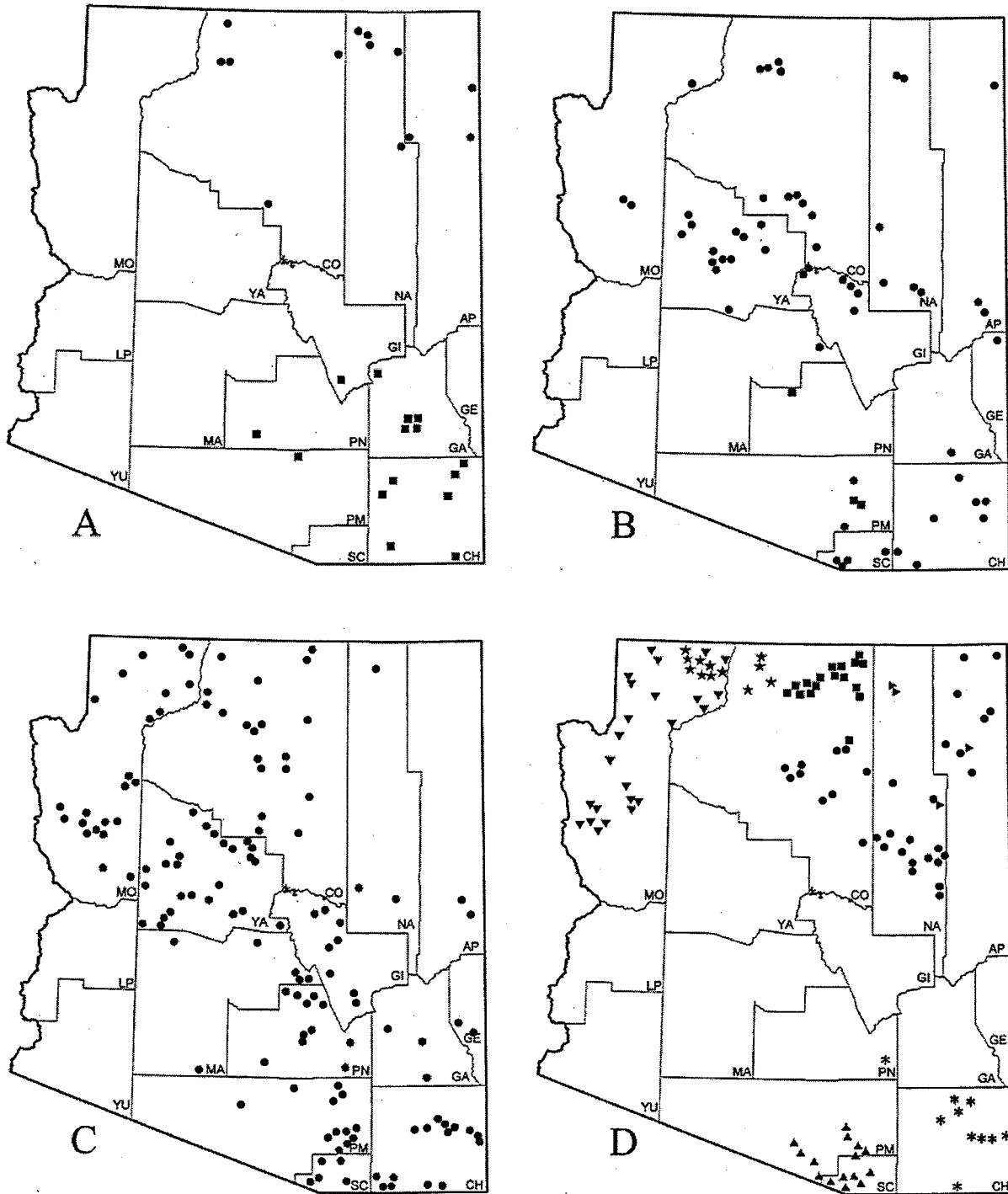
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Cactaceae. Fig. 1. *Opuntia basilaris* var. *basilaris*. Pad with two flowers, one in longitudinal section. Scale about natural size. Drawn by Wendy Hodgson.



Cactaceae. Fig. 2. Distribution of: A. *Opuntia aurea* (stars), *O. basilaris* var. *basilaris* (circles), and *O. basilaris* var. *longiareolata* (squares); B. *Opuntia chlorotica* (circles); C. *Opuntia* \times *curvispina* (circles), *O. engelmannii* var. *flavispina* (squares), *O. engelmannii* var. *lindheimeri* (pentagon), and *O. engelmannii* var. *linguiformis* (stars); D. *Opuntia engelmannii* var. *engelmannii* (circles).



Cactaceae. Fig. 3. Distribution of: A. *Opuntia fragilis* (circles) and *O. macrocentra* (squares); B. *Opuntia macrorhiza* (circles) and *O. microdasys* (squares); C. *Opuntia phaeacantha* (circles). D. *Opuntia pinkavae* (stars); *O. polyacantha* var. *erinacea* (inverted triangles), *O. polyacantha* var. *hystricina* (circles), *O. polyacantha* var. *nicholii* (squares), *O. polyacantha* var. *polyacantha* (tilted triangles), *O. pottsii* (asterisks) and *O. santa-rita* (upright triangles).