

KEYS TO THE IDENTITY OF CACTI OF THE ALBUQUERQUE & SANTA FE AREA
(Bernalillo, Sandoval, Santa Fe, Socorro, Torrance, and Valencia Counties)

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This is a dichotomous key, in which each number indicates a "couplet," requiring a choice between "a" and "b." Each choice leads to a name or another couplet.

Key to Subfamilies, Tribes, and Genera

- 1a** Stems segmented. With "glochids" (tiny barbed spines) in addition to normal spines. Seeds with a hard pale bony covering ("aril")..... **subfamily Opuntioideae 2**
- 1b** Stems not segmented (sometimes branching). Without glochids. Seeds dark brown or black..... **subfamily Cactoideae 4**
- 2a** Stems made of mostly flattened segments (at least somewhat flattened) without tubercles. Spines with no sheath..... **tribe Opuntiae genus Opuntia**
- 2b** Stems made up of cylindrical or club-shaped joints, often with strong tubercles. Spines with papery sheath at least at tip **tribe Cyliandropuntiae 3**
- 3a** Plants low and spreading, forming mats of stems on the ground. Joints club-shaped. Spine sheaths only at tip of spines, usually deciduous in less than a year. Flowers yellow; fruit soon drying to papery. **genus Corynophuntia C. clavata**
- 3b** Plant shrubby, with continuous upright main stems. Spine sheaths covering entire spine, and usually persistent for several years. Fruit fleshy, falling or drying slowly and becoming hard..... **genus Cyliandropuntia**
- 4a** Stems ribbed. Areoles not elongate above the spines. Spines never hooked. Flowers from the sides of the stem. Ovary and fruit with spines (scars and spines from flowers and fruit can usually be found, even when not flowering or fruiting)..... **tribe Pachycereae genus Echinocereus**
- 4b** Stems tubercled or, if ribbed, flowers from tip of stem. Often with hooked spines, and/or areoles elongate above the spines. With no spines on fruit. **tribe Cacteeae 5**
- 5a** Stems tubercled, with areole at base of tubercle (with wool and sometimes bristles), and at tip (with spines). Flowers in a ring away from tip of plant. Fruit a juicy berry, with small pitted seeds. **genus Mammillaria**
- 5b** With only one areole, not two separate areoles per tubercle. **6**
- 6a** Stems tubercled. Areoles elongated above spines (on top side of tubercle) into a long narrow groove that reaches toward base of tubercle. Fruit a juicy berry, with small pitted seeds. **genus Escobaria**
- 6b** Stems ribbed or tubercled. Areoles usually rounded or oval, not elongated into a thin groove above spines; part above spines usually no longer than part with spines. Ripe fruit dry inside, with large non-pitted seeds **7**
- 7a** Stems of mature plants bluish with broad rounded ribs. Spines stout (often over 2 mm thick), curved, and annulate (with cross lines). Flowers pink to magenta. Ovary and fruit with pungent scales and covered in wool. Ripe fruit a brittle papery bag. **Echinocactus horzonthalonius**
- 7b** Not as above. Fruit not covered in wool, still fleshy when mature but drying soon after. **8**
- 8a** Stems flattened, hemispheric or globose, tubercled. Spines not papery or hooked. With flowers in a ring around top. Fruit top-shaped, splitting by slits along side and top when ripe. Found in Montane Zone of mountains. **Pediocactus simpsonii variety minor**
- 8b** Stems mostly columnar, often ribbed (at least in age). With flowers from the center of the stem. Fruit more barrel-shaped, not splitting (but may easily tear); seeds usually falling out bottom. From lower elevations **genus Sclerocactus**

Key to the Species of *Cylindropuntia*

Note: Hybrids sometimes occur between species and are intermediate in character to their parents.

- 1a** Stems mostly over 1.5 cm thick. Spines numerous. Fruit strongly tubercled, falling or ripening yellow, not reddish. **2**
- 1b** Stems mostly less than 1.5 cm thick. Spines four or fewer per areole. Fruit usually not strongly tubercled when mature. Often reddish or red when ripe. Occasional at low elevation south from Albuquerque. **4**
- 2a** Plants usually over 1 meter tall. Flowers pink to magenta (rarely white). Common below about 7,000 feet..... ***C. imbricata* variety *arborescens***
- 2b** Plants usually under one meter tall. Flowers not as above. **3**
- 3a** Roots tuberous. Joints loosely attached. Spine sheaths loose and baggy, yellow (becoming gold-brown in age), dominating color of plant from a distance. Flowers coppery green. Fruit sterile, green, never ripening. Occasional in grasslands east of Rio Grande..... ***C. davisii***
- 3b** Roots not tuberous. Joints firmly attached. Spine sheaths loose and baggy, of varied color, usually white, dominating color of plant. Flowers greenish-yellow. Fruit fertile, ripening yellow. Mostly northwest Sandoval County; occasionally to Albuquerque. ***C. whipplei***
- 3c** Roots not tuberous. Joints loosely attached. Spine sheaths not as baggy, mostly pinkish, not dominating appearance of plant. Flowers usually light orange, often with green highlights, sometimes varying to red. Santa Fe to Pojoaque (rare). ***C. viridiflora***
- 4a** Stems mostly over 1 cm thick. Spines 2-4 per areole. Flowers variable in color, usually pink. Fruit mostly over 1.5 cm long, usually greenish, orange, or pink when mature. ***C. kleiniae***
- 4b** Stems mostly less than 1 cm thick. Spines 0-1 per areole. Flowers chartreuse. Fruit mostly under 1.5 cm long, bright red at maturity. ***C. leptocaulis***

Key to the Species of *Opuntia*

Even though our local species are relatively easily recognized once one is familiar with them, it is very difficult to make a workable identification key. It helps to look at plants several times during the year to get a reliable identification. Some of the traits given below are subjective, but should nonetheless prove helpful. Always remember that no single trait is written in stone for any species; rely on the combination of traits, not just one. Measurements may vary individually, and may vary from the “norm” considerably depending on growing conditions, and are just given as a rough guide, not as absolutes.

When looking at areole and glochid traits, it is best to look at joints about a year of age (the upper-most mature joints on the plant), unless otherwise stated. Joints too young or old will not show the characteristics outlined as well, or often not at all.

Twenty two or three native species are found in our area, which can be divided into seven groups or “Series”; these Series are usually rather easily distinguished from one another, but the species within each may be very similar, probably are very closely related to one another, and can be easily confused. These series are not formally recognized groupings, but rather used for convenience.

Our species all belong to **subgenus *Opuntia***.

- 1a** Low plants with creases on older joints; wrinkled and often becoming prostrate in winter. Fruit dry and usually with numerous spines at maturity. **series *Polyacanthae*.....2**
- 1b** Plants of various habits. Fruit juicy berries at maturity, with at most few inconspicuous spines. **7**
- 2a** Plants very small. Joints small (mostly under 3 cm) and proportionately thick, often nearly globose. Joints easily detached from plant. Not common, mostly in sandy soils, north of Santa Fe and near Cuba. ***O. fragilis***
- 2b** Plants with joints mostly at least 3 cm long and wide, not thickened as above; not easily detached. **3**

- 3a** Plants tend to form compact upright clumps, usually not creeping in chains of joints. Joints with areoles small and very closely spaced. Spines (especially on older joints) always very numerous, slender, flexible, and elongating with age. Spines on fruit numerous and similarly flexible. Flowers always yellow (they may fade to orange before closing). Mostly on hot steep rocky slopes. (chromosomes ? always 22) ***O. trichophora***
- 3b** Plants tend to form spreading mats of chains of joints. Joints with areoles variable, but mostly larger and fewer in number. Spines highly variable in number, length, and thickness; normally stiff, sometimes slender and flexible along lower portion of older joints. Flowers yellow, yellow with orange or red centers, pink, or magenta. Very common, mostly not on hot steep slopes. (chromosomes ? always 44) ***O. polyacantha***..... **4**
- 4** Varieties of *O. polyacantha* intergrade where they meet, and many plants are not typical of any one variety.
- 4a** Plants dwarf, joints usually fewer than 5 cm long, spines variable, but mostly short. Plants mostly of Montane woodlands and big sagebrush scrub over 7,000 feet, in northwest part of area, rare in Sandia and Manzano Mountains. **variety *schweriniana***
- 4b** Plants larger. **5**
- 5a** Spines few, mostly short and limited to upper part of joints. Plants mostly of Piñon-juniper woodlands (sometimes into higher elevations). **variety *juniperiana***
- 5b** Plants mostly with numerous spines on entire joint. **6**
- 6a** Areoles typically under 1 cm apart. Central spine typically one per areole and under 3 cm long. Fruit typically nearly globose, usually not reddish. Plants of the Great Plains east of the mountains..... **variety *polyacantha***
- 6b** Areoles typically over 1 cm apart. Central spines often two or more and over 3 cm long. Fruit typically elongate, and turning reddish before drying. Common in most desert and grassland areas west of Plains. **variety *hystricina***
- 7a** Low (usually under 30 cm tall), often spreading plants (or sometimes forming clumps of joints); often with permanent creases across older joints; becoming prostrate and mostly strongly wrinkled in winter. **8**
- 7b** Plants low to upright, rarely with creases across joints, mostly not becoming prostrate, and most not strongly wrinkled in winter. In extreme weather, most low species will wrinkle some, but the wrinkles do not form sharp creases in the joints. **15**
- 8a** Mostly with only one to three spines only in upper areoles, spines usually quite slender (under 1 mm thick). Flowers mostly with pale stigmata (often near white). **series *Opuntiae***..... **9**
- 8b** Mostly with more than three spines in over one half of the areoles. Flowers with rich green stigmata. **series *Tortispinae*** **12**
- 9a** Plants form spreading mats of chains of joints, rooting where they touch soil. Without tuberous central taproot. Joints with mostly six or fewer areoles per diagonal row across joint. Leaves usually bluish-green and over 7 mm long. Spines mostly three or fewer per areole, mostly only in upper areoles. Flowers usually pale yellow, often red in center, petals usually spreading widely. Found in local colonies in sandy soil. Belen, Alameda, Pojoaque to Española, Moriarty, etc. ***O. macrorhiza***
- 9b** Plants with clumps of joints usually not rooting when touching soil. With thick tuberous central taproot. Joints often narrowed near base (stipitate). Leaves usually green or reddish and roughly 5 mm long. Flowers mostly small (under 5 cm across) with petals curving upward and rolled back at sides. Varieties intergrade where they meet. ***O. pottsii***..... **10**
- 10a** Joints usually light bluish or grayish green, longer than wide, and distinctly stipitate. Rhizomes commonly present. Root tuber usually long and roughly cylindrical. Flowers (in ours) usually orange or pink. Fruit mostly narrow with slender base, and mostly greenish to pinkish when ripe. Uncommon south from Albuquerque at low elevation..... **variety *pottsii***
- 10b** Joints usually dark to somewhat bluish green, weakly or not stipitate. Rhizomes uncommon. Root tuber globose. Flowers (in ours) usually pale yellow (often red in center). **11**
- 11a** Joints mostly wider than long. Spines usually white. Fruit mostly chunky and short, usually pinkish. Mostly in areas of conifer or oak woodland above 6,000 feet, occasional in grasslands at lower elevations. **variety *montana***

- 11b** Joints usually longer than wide. Spines usually partly blackish. Fruit mostly elongate and reddish-purple. Favors low areas in stream and river bottoms in Rio Grande drainage below 7,000 feet, often growing with *Sporobolus* species. Can be very similar to *O. macrorhiza* in general appearance. **variety *riograndensis* var. unpub.**
- 12a** Joints usually rhombic, with six or fewer areoles per diagonal row across joint; typically somewhat grayish glaucous in color; usually not creased, and wrinkle less noticeably in winter than relatives. With mostly two or three similar main spines, stout, and angular in cross-section, pale, slightly yellowish. Lower bristle-like spines usually none or one, white. Flowers yellow (rarely to orange) without red center, petals curved upward and rolled under at margins. Fruit mostly orange to red. Scattered in colonies on sandy soil ***O. zuniensis***
- 12b** Joints mostly rounded or obovate, with mostly six or more areoles per diagonal row across joint. Spines often more than five per areole in most areoles. Usually with one to four main upper spines and three or more smaller lower spines. Fruit usually purplish or brownish. **13**
- 13b** Plants from thickened taproot, though this is rather small and slender (usually under 4 cm thick). Usually not rooting along lower sides of stems. Joints typically broad, not stipitate at base, often "wavy". Flowers showy, usually well over 5 cm across, yellow with red center, pistils rich green, petals usually spreading and not noticeably rolled under at margins. Known so far only from the Santa Fe area and on Great Plains northeast from our area. Very similar vegetatively to *O. cymochila*, perhaps a variety of it. Some traits are like *O. pottsii*. ***Opuntia "curvoclada" sp. unpub.***
- 13a** Plants without thick taproot (young plants may have a slender taproot), with joints tending to root along lower edge. Locally common throughout area. **14**
- 14a** Older joints typically with creases showing, even when plump in summer. Flowers yellow, rarely orange or red in center (occasional plants with pink or magenta flowers). Petals usually curved upward (flower rather open tulip-shaped) and rolled under along margins. Fruit typically narrowed abruptly at top to an acute rim, sometimes slightly tubercled, brownish, and quite sweet. Seeds usually over 6 mm across with wide margins and irregular in shape. Common in grassland areas. ***O. cymochila***
- 14b** Older joints typically with creases not visible in growing season. Main spines typically over 1 mm thick and some very angular in cross-section (flat on top). Flowers yellow (rarely orange or magenta), commonly orange or red in center. Petals usually widely spreading and not noticeably rolled under at margins. Fruit usually smooth and round at top end, mostly dark purplish (sometimes orange or pink) when ripe. Seeds usually smaller with narrow rims and more regular in shape. Common in grassland and desert areas, sometimes in woodland on level areas and gentle slopes. ***O. tortispina***
- 15a** Plants tree-like in habit, typically about 4 to 6 ft tall at maturity (occasionally to 10 or 12 ft), developing one or more erect trunks, joints usually yellow-green with no purplish coloring, with many areoles, each bearing yellow glochids and usually several yellow spines. Spines (if present) and glochids increasing in number and length on trunks. Flowers yellow with stigmata usually pale. Fruit roughly globose with many areoles and usually bright red when ripe; typically nearly flavorless. Found usually on steep rocky slopes and outcrops; within our area occurs in western Socorro County. Seedlings not hairy. **series *Tomentosae*..... *O. chlorotica* var. *chlorotica***
- 15b** Plants not tree-like in habit, either low and spreading or bushy. Rarely developing vertical trunks, and then usually only as part of a larger multi-stemmed bush. Otherwise not with above combination of characters. **16**
- 16a** Joints and fruits mostly with numerous areoles, usually with seven or more per diagonal row across joint. Areoles mostly rather small (mostly under 3mm long), with glochids arranged in two distinct series (these often of different lengths), an inner clump and outer ring. Spines mostly few and relatively slender. **series *Gilvescentes*.... 17**
- 16b** Joints and fruits with fewer areoles, usually with seven or fewer per diagonal row across joint. Areoles and spines varied. **19**
- 17a** Relatively compact small plants (mostly under 60 cm wide and tall), with branches usually not lying on ground. Joints mostly well under 17 cm long and wide, mostly narrowed toward base, most often obdeltoid, or broadly obovate but varied in shape; individual cristate pads are often present; dull somewhat grayish or bluish, turning purple under stress. Spines few, mostly in upper areoles, with main spines usually slender, often over 8 cm long, mostly blackish and nearly white at tip (aging to dark red-brown). Flower rich yellow with deep red center. Stigmata pale, often white. Fruit commonly of a dull brownish hue, narrowed at the top with acute rim. Seedlings not hairy. Common in Socorro County, becoming rare north of about Belen. ***O. macrocentra***

- 17b** Large shrubby or spreading plants (mostly well over 60 cm wide and often taller). Joints mostly rather large (many will be 20 cm long or more), mostly broadly obovate to round, typically dark to rich green, somewhat yellowish in color. Spines usually one to three (occasionally more, or none) per areole, and usually under 3 cm in length. Flowers large, yellow, may fade to orange, but rarely with distinct orange or red centers. Fruit usually broadly egg-shaped to barrel-shaped or round, not much tubercled, usually deep purplish in color when ripe..... **18**
- 18a** Plants usually under 1 m tall, low spreading bushes mostly up to about 60 cm tall and much wider. Joints typically longer than wide, obovate or somewhat spatulate; usually becoming purplish in winter. Spines rather slender (not much over 1 mm thick); varied in color, but most often somewhat reddish or brownish at least at base; the stoutest usually rounded in cross-section; varied but mostly of an orange-brown to gold-brown color. Flower typically pale yellow with pale stigmata. Seeds mostly well over 3 mm in diameter. Seedlings not hairy. Common on bajadas and lower slopes of Sandia, Manzano, & Los Piños Mountains, less common elsewhere in our area..... **O. gilvescens**
- 18b** Usually large robust shrubs mostly over 1 m tall and somewhat wider than tall. Joints usually broad, round or sometimes oval, usually not narrower in basal half than apical half; usually not becoming purplish in winter. Spines from none to three or four per areole (mostly one or two); varied in color, but most often pale brownish, yellowish or whitish; one usually stouter, often subulate (somewhat flattened in cross section), and often curving down. Flower typically rich yellow with large green stigmata, often fading to orange or red before closing. Seeds mostly small, less than 3 mm, but often with some larger seeds mixed in. Seedlings hairy. Rare north from Valencia County, becoming more common southward, mostly at lower elevations in hilly terrain..... **O. orbiculata**
- 19a** Areoles mostly rather small (mostly under 3mm long), with glochids arranged in two distinct series (these often of different lengths), an inner clump and outer ring. Flowers varied in color, but usually yellow, often with red centers, often with pale stigmata, veins of petals usually not darker than surrounding color. Fruit not tubercled, often light-colored, often of sour flavor. **series Phaeacanthae**..... **20**
- 19b** Areoles often larger, often slightly raised. Glochids of mixed sizes scattered through areole. Seedlings often hairy. Flowers yellow (often fading orange), usually with at least faintly orange veins, but rarely with distinct red centers. Stigmata rich green. Fruit large, slightly tubercled, juicy, sweet in most, deep purple when ripe. **series Dillenii** .. **23**
- 20** The species this choice leads to are often all lumped under one catch-all name - *O. phaeacantha*. The fact that they may grow together and do not intergrade shows their distinctness from one another, but they are similar to one another, and a reliable key is difficult to construct. Therefore, the key must be used with some allowance for overlap of traits of all the taxa, and every trait should be used in combination with others.
- 20a** Rather large bushy plants, often several joints high. Joints usually over 15 cm long, typically broadly obovate to round. Main spines typically pale orange-brown and whitish in color (but may be other colors). Flowers usually rather large (over 7 cm across), light rich yellow, often orange or red in the center, with green stigmata. Rocky slopes and canyons, west base of Sandia, Manzano & Los Piños Mountains, lime outcrops west of Belen. Less common in remainder of our area north to Santa Fe..... **O. dulcis**
- 20b** Smaller plants, usually not over two joints high. Joints usually fewer than 15 cm long..... **21**
- 21a** Plants not woody, joints mostly obovate, usually distinctly longer than wide; sometimes wrinkle somewhat and flop over in winter, commonly turning purplish when dormant. Usually one or two (or more) main central spines point up and/or outward, some usually over 3 cm long, of varied colors, but usually brownish with lighter tips; the primary one or two usually terete, but others may be flattened or angular in cross section. Usually with two or three lower small white spines. Flowers yellow (rarely orange, red, or magenta), mostly with orange or red center and (in our area) mostly with green stigmata; usually opening widely. Fruit usually smooth, barrel-shaped rounded toward top, sometimes narrowed into a brief "neck" toward base, and varied in color (most often red to dark red). Very common below 7,500 feet, mostly on gentle slopes in grassland and woodland. **O. phaeacantha**
- 21b** Plants with stems becoming woody. Joints mostly nearly round, and when mature thick, normally remaining vertical and entirely or mostly green through most **22**
- 22a** May turn reddish around areoles when stressed. Areoles mostly about 5 in a diagonal row across joint. Main spines varied in color, but usually dark brown, often nearly black, and pale toward tip; commonly turning reddish in age; most main spines distinctly angular in cross-section, with some usually over 3 cm long. One or two lower small spines white to dark. Flowers typically (in our area) light yellow, occasionally red in center, stigmata usually pale whitish, usually not opening widely (somewhat tulip-shaped). Fruit as in *O. phaeacantha*, but usually darker in color. Mostly hot slopes at lower elevations southward from Santa Fe. **O. camanchica**

- 22b** Usually remaining green through stress. Areoles mostly about 6 or 7 in a diagonal row across joint. Two or three main spines, most often terete, under 3 cm long, translucent gold-colored. white toward tip. Also one or two small white lower spines. Flowers rich yellow with deep red centers. Stigmata pale green to nearly white. Fruit wide, rounded, often nearly globose; usually very dark in color when ripe. Found only in central New Mexico, mostly at lowest elevations on gravelly slopes south of Santa Fe, and west from Sandia, Manzano & Los Piños Mountains. **O. "sandiana" sp. unpub.**
- There is** a blackish-spined form of **O. "sandiana"** that occurs in the Belen area (and apparently nowhere else), which could key out to *O. camanchica* above. It can have purplish coloring on the stems also. Except for coloring, it is the same as normal yellowish-spined *O. sandiana*.
- 23** The species this choice leads to are often all lumped under one catch-all name - *O. engelmannii*. The fact that they may grow together and do not intergrade, shows their distinctness from one another, but they are similar to one another, and a reliable key is difficult to construct. Therefore, the key must be used with some allowance for overlap of traits of all the taxa, and every trait should be used in combination with others.
- 23a** Plants mostly under 60 cm tall. Joints rounded, averaging less than 18 cm long. Seedlings not hairy. Fruit not much longer than wide, mostly less than 5 cm long. **24**
- 23b** Plants mostly over 60 cm tall. Joints averaging over 17 cm long. Seedlings usually hairy. Fruit mostly 5 cm or longer. **25**
- 24a** Spines yellowish, often without dark bases. Plants occurring east of our area in Pecos and Canadian River drainages, perhaps in Torrance County. **O. cyclodes**
- 24b** Spines cream to white, with brown base. Plant of lower slopes of Mountains, very similar to *O. engelmannii* but smaller, lower, more spreading, and averaging spinier..... **O. "valencia" sp. unpub.**
- 25a** Joints rounded to broadly obovate. Areoles usually light in color. Spines usually yellowish to white with or without dark bases; not increasing in number with age; oldest stems often bare of spines. Flowers usually light but brilliant yellow, commonly fading to orange. Fruit rounded, not much longer than wide, sweet. Seedlings hairy. **26**
- 25b** Joints mostly more elongate, tending toward rhombic. Areoles usually dark blackish-brown. Spines tending to increase in number on older stems. Fruit elongate, usually about twice as long as wide..... **27**
- 26a** Joints broad, usually round, sometimes a produced into an obtuse angle apically; often wavy or curved (potato chip-like); usually somewhat bluish or grayish (especially younger joints). Spines stout, angular in cross section, usually under 3 cm long, with usually 3 to 5 arranged in a bird's-foot pattern; white (rarely yellowish), with base, if dark, usually a "chocolate" brown (not reddish or yellowish). Often with one or two much smaller spines randomly placed, and one of those often darker in color. Rare in our area, mostly south from Belen and west of the Rio Grande on rocky hot slopes..... **O. discata**
- 26b** Joints usually longer than wide, obovate, and broadly rounded apically, usually flat; usually less bluish or grayish green. Spines usually longer, varying in number, but one or two usually terete and pointing outward, with surrounding spines flattened or angular. Spine color varies, usually pale with darker bases, often somewhat yellowish, sometimes dark red-brown., Often with one to three smaller white lower spines. Scattered in warmer parts of area from west slope of Sandia, Manzano, and Los Piños Mountains westward. **O. engelmannii**
- 27a** Joints mostly dark yellowish green, with new growth often distinctly dark and often brownish. Spines relatively slender, few to several per areole, greatly varied in length from plant to plant, usually pale yellowish apically, grading into a darker base. Flowers usually rich deep yellow, tinged orange, and often fading to orange before closing. Fruit sour in flavor. Seedlings apparently may be hairy or not. Rare in our area, but locally common in lower levels of west side of Sandia, Manzano, and Los Piños Mountains..... **O. wootonii**
- 27b** Joints usually distinctly bluish or grayish green (especially younger ones), new growth usually green to blue-green. Spines several per areole and stout, mostly distinctly angular in cross section; often annular patterned; white to cream-colored with deep brown bases. Flowers usually light yellow, often not fading to orange. Fruit sweet. Seedlings hairy. Rare or absent from most of our area, but found commonly along west base of Sandia Mountains, Four Hills, and in San Ysidro area. Species distribution is from Sandia Mountains and San Ysidro south into Trans-Pecos, TX..... **O. valida**

Key to the Species of *Echinocereus*

- 1a** Stems usually with 12 or more ribs. With usually 12 or more thin pectinate radial spines (usually too short to reach adjacent ribs). With few (usually 0-3) slender central spines under 2 cm long. Fruit drying quickly and always splitting by one to three slits. **2**
- 1b** Stems usually with fewer than 12 ribs. With fewer than 12 radials, not pectinate, usually long enough to reach adjacent ribs. Central spines 0-4 (sometimes to 6), stout and often over 2 cm long. Fruit very juicy, not drying quickly, often not splitting. **3**
- 2a** Rarely with central spines. Flowers large (over 3 cm across), pink to magenta. Perhaps in eastern Torrance County..... ***E. reichenbachii* var. *perbellus***
- 2b** Often with central spines. Flowers small (under 3 cm across), green, yellow, or brownish. Mostly above 6,500 feet and on Plains. ***E. viridiflorus* var. *viridiflorus***
- 3a** Flowers mostly over 5 cm across, pink to magenta, closing at night. Central spine 0-1, tending to point upward. Typically at least some spines with a dark lengthwise stripe. ***E. fendleri* var. *fendleri***
- 3b** Flowers mostly under 5 cm across, orange to red, not closing at night. Central spines varied (0-6), usually none pointing noticeably upward. Spines with no dark lengthwise stripe. **4**
- 4a** Ribs typically 5-7. Spines usually 8 or fewer, thick and angular in cross-section. Mostly only 0-1 central spine. Mostly in woodland areas. ***E. triglochidiatus* var. *triglochidiatus***
- 4b** Ribs typically more than 7. Spines usually more than 8, slender and rounded in cross-section. Mostly 4 (1-6) central spines. Usually on sunny rocky slopes. ***E. coccineus* var. *coccineus***

Key to the Species of *Escobaria*

- 1a** Flowers pale greenish, yellowish, or brownish (rarely pinkish), with green stigmata. Fruit bright red with dried flower deciduous. Seeds black with white basal hilum. Uncommon, usually at Montane elevations in mountains; occasionally lower..... **subgenus *Neobesseya*.....*E. missouriensis* var. *missouriensis***
- 1b** Flowers pink to magenta (rarely white), with white to magenta stigmata. Ripe fruit green to reddish or purplish brown, with dried flower persistent. Seeds brown with lateral hilum. Very common below sub-alpine elevations **subgenus *Escobaria*.....*E. vivipara*..... **2****
- 2** Varieties of *E. vivipara* tend to intergrade in our area, and some plants may not be clearly assignable to a variety.
- 2a** Juveniles with central spines similar to those of the adult. With +/- 4 distinct central spines pointing in several directions, variable in color (typically brown to yellowish). Plants including spines tend to appear flat on top. Flowers with stigmata usually pink to magenta. Found east of the mountains. **variety *vivipara***
- 2b** Juveniles with central spines missing, radial spines pectinate. Adults with most of central spines not distinct from radial spines and tending to point toward top of plant, making top of (mature) plant typically appear pointed. Flowers with stigmata usually white (sometimes pale pink). **3**
- 3a** Spines tending toward brown. Usually with fewer than 30 radial spines. Common west of Great Plains. **variety *arizonica***
- 3b** Spines typically white with little brown. Often with more than 30 radial spines. Usually in rocky calcareous habitats, mostly south of Santa Fe. **variety *neomexicana***

Key to the Species of *Mammillaria*

- 1a** Plant bodies soft, with clear sap. Tubercles rounded in cross section. Central spines hooked. Flowers pink to magenta. Fruit very soft and watery. Seeds black. **subgenus *Dolicothele*.....*M. wrightii***
- 1b** Plant bodies hard, with milky sap. Tubercles angular in cross section. Central spines not hooked. Fruit firm and fleshy. Seeds brown. **subgenus *Mammillaria*.....*M. meiacantha***

Key to the Species of *Sclerocactus*

- 1** *Echinomastus* may be treated as a distinct genus if preferred. Here it is combined under *Sclerocactus* to be more consistent with other generic treatments (i.e., *Mammillaria* or *Escobaria*). *Sclerocactus*, *Echinomastus*, and *Ancistrocactus* (not *Glandulicactus*) are **very** closely related.
- 1a** Spines not flat/papery or hooked. Mostly south of I-40.**Subgenus *Echinomastus*.....*S. intertextus* var. *dasyacanthus***
- 1b** At least some spines flat and often papery, central spines often hooked.**subgenus *Sclerocactus*2**
- 2a** Central spines papery, if hooked not stiff. Flower small (under 2.4 cm across), white or pale yellowish to pinkish. Seeds flattened. ***S. (Toumeyia) papyracanthus***
- 2b** At least one central spine stiff and hooked. Flowers lavender to magenta (in our plants).**3**
- 3a** Mature plants commonly over 12 cm in diameter, over 12 cm tall, and with more than one hooked central (but not always). Flowers mostly over 2.5 cm across and mostly lavender to light magenta. In our area south of Cuba, Los Alamos, and Santa Fe, west of mountains.***S. parviflorus***
- 3b** Mature plants mostly under 12 cm in diameter, under 12 cm tall, and rarely with more than one hooked central. Radial spines fewer (but the number varies with age in both species). Flowers mostly under 2.5 cm across and mostly fairly dark magenta (flowers two weeks earlier than *S. parviflorus* if growing under like conditions). Enters northwest Sandoval County in our area. ***S. cloveriae***

CONVERSIONS

(approximate)

Measurements are given in metric measures, except for elevations above sea level, which are given in feet.

1 inch	=	2.5 centimeters
4 inches	=	10 centimeters
1 foot	=	30 centimeters
1 yard	=	91.4 centimeters
39.4 inches	=	1 meter
1000 feet	=	305 meters
3281 feet	=	1000 meters

GLOSSARY

- apical** – The end away from the base; the apex, top, or tip.
- areole** – The cushion-like or follicle-like structure on the stem from which spines grow, and at which flowers and branches are produced; a condensed “short shoot”; unique to cacti and a few related families of plants.
- aril** – A protective layer that grows not from the seed, but from the funiculus, but which covers the seed.
- basal** – Appearing as if at the base or bottom.
- central spines** – The spines located centrally within an areole, which are usually larger, and often of different structure than the radial spines.
(or **centrals**)
- dehisce** – To split open.
- dioecious** – With pistillate (female) and staminate (male) flowers on different plants.
- glaucous** – Appearing grayish or bluish due to wax coating.
- globose** – Spherical; ball-shaped.
- glochid** – A very small, barbed, easily detached spine.
- funiculus** – Equivalent to the umbilical cord of a developing seed within a fruit.
- hilum** – A pit-like mark on the seed where the funiculus originally attached.
- joint** – Technically a “cladode”; often called a “joint”, a “pad”, or incorrectly a “leaf”; a thickened, flattened, leaf-like section of jointed stem.
- lateral** – On the side of.
- monoecious** – With pistillate (female) and staminate (male) flowers on the same plant.
- obovate** – Oval but widest at top; upside-down egg-shaped.
- ovary** – The structure located below and which supports the flower, and which will later develop into a fruit.
- pectinate** – Comb-like in arrangement.
- perfect** – With functional female and male parts in the same flower.
- perianth** – The portion of the flower including the tube or hypanthium, sepals, and petals.
- radial spines** – The spines located peripherally within an areole, which are usually smaller, and often of different structure than the central spines.
(or **radials**)
- reniform** – Bean-shaped.
- rhombic** – Elongate and roughly four-sided.
- sp. unpub.** – A not yet published /described species. The names used are not yet “legal”, yet these have appeared in seed and plant listings.
- stigmata** – The structures which receive pollen, located at the end of the “style” in the center of a flower together with the style, making up the “pistil”.
- stipitate** – With a narrowed base, almost stalk-like.
- strophiole** – Like an aril, but only surrounding the hilum, and not covering the seed.
- tubercle** – A rounded or conical swelling on a surface.
- turgid** – Swollen to capacity; full of moisture.
- umbilicus** – Flower scar at top of fruit.
- var. unpub.** – A not yet published /described variety.

Species Most Likely to Be Confused With One Another

Some species are rather similar in appearance, and more likely to be confused with one another than most. These do not always group together in the keys above.

Echinocereus reichenbachii and *Echinocereus viridiflorus*
Echinocereus fendleri and *Echinocereus triglochidiatus*
Echinomastus intertextus and *Escobaria vivipara*
Opuntia camanchica and *Opuntia dulcis*
Opuntia camanchica and *Opuntia sandiana*
Opuntia curvoclada and *Opuntia cymochila*
Opuntia curvoclada and *Opuntia pottsii* var. *montana*
Opuntia cymochila and *Opuntia tortispina*
Opuntia discata and *Opuntia valencia*
Opuntia discata and *Opuntia valida*
Opuntia engelmannii and *Opuntia valida*
Opuntia gilvescens and *Opuntia dulcis*
Opuntia macrorhiza and *Opuntia phaeacantha*
Opuntia macrorhiza and *Opuntia zuniensis*
Opuntia orbiculata and *Opuntia discata*
Opuntia phaeacantha and *Opuntia camanchica*
Opuntia phaeacantha and *Opuntia tortispina*
Opuntia phaeacantha and *Opuntia zuniensis*
Opuntia polyacantha and *Opuntia cymochila*
Opuntia wootonii and *Opuntia dulcis*

Opuntia polyacantha and *O. pottsii* are the only New Mexico Cactus species so far known to sometimes produce underground rhizomes. This is most often seen in sand soils and shallow soils overlying rock.

Many species can produce variously shaped (usually fusiform) tuberous swellings on the lateral roots, which are used for nutrient and water storage, and apparently are also sites where nitrogen-fixing bacteria reside. These "nodules" or "root tubers" are most often developed in sandy nutrient poor soils, and may be variously absent or present in the same species. Root tubers are often cited as a characteristic for species identification, but are unreliable for this purpose. Some species do more consistently produce them than others, and some of the larger woody species may not produce them at all (but this is uncertain).