

UTAH'S OPUNTIAS

by Tony Frates, Dorde W. Woodruff, and Ty Harrison+
 (+1942-2017; this document is dedicated to his memory)

Note: this is an ongoing work-in-process and subject to future changes.

Plants of the genus *Opuntia* are characterized by flat stems (or subcylindric to spheric in the case of *O. fragilis*), called pads, joints, or nopales. Similar to *Cylindropuntia* and *Grusonia* (previously included within *Opuntia*, and all part of subfamily Opuntioideae), they are unique in having areoles bearing glochids (short, barbed spines) and early deciduous ephemeral leaves. Unlike *Cylindropuntia* and *Grusonia*, *Opuntia* spines do not separate into a deciduous sheath.

Dry Fruits

Tan at maturity – note: dry fruits that have been parasitized will appear fleshy

Basilaris complex – pink-red filaments, white stigmas, subspheric seeds with smaller raphe, pink inner perianth parts

Current name, with author last names and as commonly abbreviated — see end notes)	Distribution and rank (NS=NatureServe) where appropriate	2n=**	Synonyms/variants/misapplied names/comments
<i>O. basilaris</i> Engelm. & Bigelow var. <i>basilaris</i>	In Utah found only in the southwestern portion of state, principally at low elevations in Wash Co. and disjunct in southeastern Kane Co.; also in AZ, NV, CA and northern Mexico. Var. <i>basilaris</i> is primarily a Mojave desert species.	22 (2x)	Taxonomic treatment has remained fairly constant, but has been generally confused with <i>O. aurea</i> . May form hybrids with <i>O. erinacea</i> . Pads bluish-gray, flattened to somewhat curved or wavy, heart-shaped, clavate-suborbicular to broadly obovate, numerous closely-spaced glochids (10-16 most often diagonally at mid-stem) Taxa in the <i>O. basilaris</i> complex appear to survive over a wide range as a hardy diploid; plants in this complex are typically surrounded by polyploids with which they only occasionally hybridize.
<i>O. basilaris</i> Engelm. & Bigelow var. <i>heilii</i> Welsh & Neese	Utah endemic restricted to a small area of Emery and Wayne Cos.	22 (2x)	None. Counts thus far confirmed as 22 by Dean Stock (2013). Included as a synonym in FNA Vol. 4:145.

	<p>NS rank: G5T2T3; of conservation concern.</p>	<p>2003, and Pinkava (2003) under <i>O. basilaris</i> var. <i>longiareolata</i> but referred to incorrectly as <i>O. heilii</i> Welsh & Neese (it was in fact published as a variety of <i>basilaris</i> in GBN, 43(4):700. 1983).</p> <p>Occurs near the Dirty Devil/Fremont/Muddy river system, Factory Butte, Hanksville, and Blue Benches. Replaced by <i>O. nicholii</i> at higher elevations. Similar distribution to <i>Sclerocactus wrightiae</i> in <i>wrightiae</i>'s SE range.</p> <p>Light green/green pads lack or mostly lack trichomes. Pads mostly obovate, occasionally spatulate or sub-cordate, yellow glochids, usually 5-6 diagonally at mid-stem (less closely spaced than other varieties).</p> <p>Flowers in hues of pale pink, off-white/pale chartreuse to pink filaments and style; stigma pale cream; pale yellow anthers This entity is very distinct from the one below and should not have been lumped into it; the most aberrant of the basillares.</p>
<p><i>O. basilaris</i> Engelm. & Bigelow var. <i>longiareolata</i> (Clover & Jotter) Benson</p>	<p>Primarily occurs in Coconino Co. AZ (e.g. Lee's Ferry) and downstream in the Grand Canyon; in Utah relict in along the Colorado River drainage in extreme northeastern Garfield and northwestern San Juan Cos. (Cataract Canyon and just above, on the Colorado)</p> <p>NS rank: G5T2Q</p> <p>Of conservation concern particularly in Utah</p>	<p>22 (2x)</p> <p>See above. We disagree with FNA and any other treatment that includes var. <i>heilii</i> within this entity.</p> <p>Sometimes misspelled as “longiaureolata.”</p> <p>Specific epithet is not a diagnostic character; some areoles are elongated but not all.</p> <p>Occurs along the Colorado river system. Possibility of extremely relict, sparse occurrence in Glen Canyon before the dam.</p> <p>Darker green pads contain significantly fewer trichomes than var. <i>basilaris</i>. Spatulate pads, yellow-brown glochids, typically 8-9 diagonally at mid-stem. Pink/red-pink flowers. Midway in features between var. <i>basilaris</i> and var. <i>heilii</i>.</p>

Polyacantha complex — white to yellow to pink-red filaments, green stigmas, seeds flat with larger

raphe, inner perianth yellow to pink (listed alphabetically)

Current name	Distribution	2n=	Synonyms/variants/misapplied names/ comments
<i>O. aurea</i> Baxter	<p>Restricted endemic in western Kane Co, mainly north of Kanab; adjoining AZ); <i>O. aurea</i> x <i>O. polyacantha</i> hybrids with variable morphology occur in Zion area and northwest to Iron Co./possibly west to Bull Valley Mtns and north end of Beaver Dam Mtns. Also hybrids up Long Valley to Panguitch.</p> <p>NS rank: G3 (S1 in Utah but appears secure)</p>	66 (6x)	<p><i>O. basilaris</i> var. <i>aurea</i>, <i>O. erinacea</i> var. <i>aurea</i></p> <p>Historically confused with spineless morphotypes of <i>O. polyacantha</i> as well as with <i>O. basilaris</i> generally</p> <p>Pads have scattered trichomes. Hybrid forms widespread throughout southern Utah in Washington, Iron and Kane Counties and north into Garfield Co. Has yellow flowers but pink when introgressed with <i>O. polyacantha</i> or <i>O. pinkavae</i>. East of Kanab (Johnson Canyon) and south of Colorado City, AZ. Hybridizes with <i>O. pinkavae</i>. Forms large hybrid swarms in both areas.</p>
<i>Opuntia fragilis</i> (Nutt.) Haw.	<p>A higher elevation species scattered mainly in the central-eastern half of the state in mountain brush communities as well as sandy foothill habitats, known in Utah from Box Elder, Carbon, Davis, Duchesne, Emery, Garfield, Juab, Kane, Morgan, Piute, Salt Lake, San Juan, Sevier, Uintah, Utah, Weber and Wayne Cos. Also in AZ, CA, CO, ID, IL, IA, KS, MI, MN, MT, NV (Ribbens 2007), NM, ND, OK, OR, SD, TX, WA, WI, WY and Canada</p>	66 (6x)	<p><i>O. brachyarthra</i></p> <p>Rounded but often at least somewhat flattened when introgressed. Highly variable but normally distinct. Hybridizes with <i>O. polyacantha</i> and <i>O. aurea</i> where ranges overlap (may have evolved from the same group of diploid ancestors as <i>O. polyacantha</i>). In the general vicinity of Hatch, Utah it hybridizes with <i>O. aurea</i> hybrids (i.e., with <i>O. aurea</i> x <i>O. polyacantha</i>) producing some plants with pink flowers.</p> <p>Distribution in Morgan Co. has been confirmed. Small and inconspicuous, it may occur in other counties though not reported.</p>
<i>O. pinkavae</i> Parfitt	<p>Restricted Arizona Strip endemic in southwestern Kane Co. (not in Wash Co.); and northern Mohave and Coconino Cos., AZ</p> <p>NS rank: G3; likely of</p>	88 (8x)	<p><i>O. rubrifolia</i> may be a synonym</p> <p>Hybridizes with <i>O. aurea</i>. Somewhat resembles in aspect the fleshy fruited <i>O. macrorhiza</i>. Distal spines slender, to stout; often white but can be dark red brown when new; to 6cm in length.</p>

	conservation concern in Utah (conservation status largely unknown, may be secure in Arizona)		<p>Included by Benson in the various morphotypes of <i>O. erinacea</i> var. <i>utahensis</i> (which is not however a synonym of this taxon).</p> <p>Parfitt indicates that <i>O. basilaris</i> var. <i>woodburyi</i> (invalidly published) belongs here but it does not.</p>
<i>Opuntia</i> sp. nov. Stock or hybrid form	<p>Under study. Restricted endemic occurring solely in extreme southwestern Utah (Wash. Co.)</p> <p>Of conservation concern; threats include off-road vehicles, overgrazing, habitat loss</p>	88 (8x)	<p><i>O. basilaris</i> var. <i>woodburyi</i> (invalidly published), <i>O. erinacea</i> var. <i>woodburyi</i></p> <p>A seemingly stable entity of possible hybrid origin between <i>O. pinkavae</i> and <i>O. aurea</i> and now isolated from its parent species. Distinguished by relative lack of spines, Spines often yellow, especially when new; larger size; and a distinct green color of pads. Glochids often conspicuous.</p>
<p><i>Opuntia polyacantha</i> complex:</p> <p><i>Opuntia polyacantha</i> Haw. var. <i>polyacantha</i></p>	<p>While plants in northern and northeastern UT were previously placed here, it appears that this var. in fact mostly does not occur in Utah except at distant edges in Rich and Box Elder Cos.</p> <p>Reported from AZ, CO, ID, KS, MT, NE, NV, NM, ND, OK, SD, TX, WY and Canada</p>	44 (4x)	<p>Derived in part from <i>O. trichophora</i></p> <p>Hybrid entries have been assigned names within the polyacantha complex used to reference plants not referred to elsewhere below include:</p> <p><i>O. barbata</i> <i>O. heacockiae</i> <i>O. juniperina</i>, <i>O. polyacantha</i> var. <i>juniperina</i>, <i>O. erinacea</i> var. <i>juniperina</i>, <i>O. media</i></p> <p><i>O. missouriensis</i> (and in combination with numerous varietal names in addition to those mentioned here – said to occur as low as 4,200 ft in the SL Valley by Watson)</p> <p><i>O. polyacantha</i> var. <i>salmonia</i> <i>O. polyacantha</i> var. <i>spirocentra</i> <i>O. polyacantha</i> var. <i>watsonii</i> <i>O. rufispina</i> , <i>O. polyacantha</i> var. <i>rufispina</i></p> <p><i>O. rutila</i> (said to have occurred from Fillmore)</p>

			<p>to St. George by Watson)</p> <p><i>O. schweriniana</i>, <i>O. polyacantha</i> var. <i>schweriniana</i> <i>O. splendens</i></p> <p><i>O. rhodantha</i>, <i>O. erinacea</i> var. <i>rhodantha</i>, <i>O. xanthostemma</i>, <i>O. erinacea</i> var. <i>xanthostemma</i>.</p> <p>Per Parfitt (1997), the type of <i>O. erinacea</i> var. <i>utahensis</i> is a few-spined individual within the range of this taxon. Northern Utah plants in the past referred to as <i>O. rhodantha</i> and <i>O. erinacea</i> var. <i>utahensis</i> probably belong here.</p> <p>Garrett and others misapplied morphotypes of this var. to: <i>O. utahensis</i> Purpus (a form with unknown relationships), <i>O. hystricina</i>, and <i>O. angustata</i>. The names <i>O. rhodantha</i>, <i>O. erinacea</i> var. <i>utahensis</i> (and <i>O. erinacea</i> without a varietal name) have been misapplied and often misdescribed when referencing this taxon in northern UT.</p> <p>An earlier name <i>Opuntia sphaerocarpa</i> var. <i>utahensis</i> corresponds to the valid but no longer recognized name of <i>O. erinacea</i> var. <i>utahensis</i> (Engelm) Benson (these are not the same as <i>O. utahensis</i> Purpus, but all are moot)</p>
<p><i>O. polyacantha</i>* x <i>O. macrorhiza</i> x <i>O. fragilis</i></p> <p>*and potentially others</p>	<p>Plants in northern Utah, particularly in the Wasatch are introgressed and may be partially or completely spineless.</p>	<p>44 (4x)</p>	<p>See some of the names listed in var. <i>polyacantha</i>.</p> <p>Reduced spine to spineless plants of hybrid origin have frequently been described as new entities and/or misidentified.</p>
<p><i>O. erinacea</i> Engelm. & Bigelow syn. <i>O. polyacantha</i> Haw. var. <i>erinacea</i> (Engelm. &</p>	<p>Southwestern Utah (e.g., Virgin Mtns) to Zion in Virgin River Valley, becoming part of the hybrid mix in the western half of the state; also in AZ, CA and NV</p>	<p>44 (4x)</p>	<p><i>O. ursina</i>, <i>O. erinacea</i> var. <i>ursina</i>,, <i>O. hystricina</i> var. <i>ursina</i></p> <p>See also some of the names listed in var. <i>polyacantha</i>.</p> <p>Contributes to the hybrid mix in the Great</p>

Bigelow) Parfitt			Basin continuing well to the north but mostly south of the Great Salt Lake and Utah Lake but absent from eastern Utah.
Misapplied in Utah: <i>O. polyacantha</i> Haw. var. <i>hystricina</i> (Engelm. & Bigelow) Parfitt	Absent from Utah contrary to what was previously thought. Also in: AZ, CA, CO, NV and NM	44 (4x)	The 66 chromosome plants which occupy a large habitat along the Colorado Plateau with likely incursions into the Uinta Basin is <i>O. nicholii</i> . <i>O. hystricina</i> , <i>O. erinacea</i> var. <i>hystricina</i>
<i>O. nicholii</i> Benson syn. <i>O. polyacantha</i> Haw. var. <i>nicholii</i> (Benson) Parfitt	Formerly thought to be restricted to Glen Canyon drainage in Garfield (?), Kane, San Juan Cos., but now known to occupy a larger area in southeastern Utah's canyon country; barely in northern Coconino Co., AZ NS Utah rank: S1S2 But not now likely to be of conservation concern	66 (6x)	Most of what was thought to be <i>O. hystricina</i> in southeastern Utah is this entity. This form should be recognized at the species level. It is a distinct form derived from ancient ancestors in common with <i>O. polyacantha</i> . It has no relationship to <i>O. phaeacantha</i> as often described in the literature. It does hybridize however with <i>O. phaeacantha</i> particularly in southeastern Utah forming reduced spine hybrids. <i>O. nicholii</i> , <i>O. hystricina</i> var. <i>nicholii</i> Occurs east of <i>O. aurea</i> and <i>O. pinkavae</i> but hybridizes with <i>O. pinkavae</i> <u>in House Rock Valley, AZ.</u>
<i>O. trichophora</i> (Engelm. & J.M. Bigelow) Britton & Rose syn: <i>O. polyacantha</i> Haw. var.	In Utah, occurs only in Grand and San Juan Cos. Curving/curly/flexible hair-like appressed spines and small stem segments Reported also from AZ, CO, NM and TX.	22 (2x)	Treated by Parfitt (1991, see p. 87) and previously by us as a morphotype within the <i>O. polyacantha</i> complex but which has been found to be diploid, and appears to in fact be an ancestral plant whose genes have been passed along in tetraploid plants and hence the reason for Parfitt's observation that it is found in the range of the species.

<i>trichophora</i> (Engelm. & Bigelow) Coulter		More properly recognized at the species level. <i>O. trichophora</i> , <i>O. polyacantha</i> var. <i>trichophora</i> , <i>Opuntia missouriensis</i> var. <i>trichophora</i>
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Fleshy fruits

At maturity orange to red or very dark red throughout. Listed alphabetically.

White to yellow filaments, yellow to green stigmas, seeds flat with larger raphe, inner perianth yellow (sometimes with red base) to orange-red

Current name	Distribution and rank	2n=	Older names/comments
<i>O. chlorotica</i> Engelm. & Bigelow	Limited distribution in Utah in Wash. Co. (a state rare species); also in AZ, CA, NV, NM and Mexico NS Utah rank: S1; of conservation concern in Utah	22 (2x)	<i>O. palmeri</i> may be a synonym Known to hybridize with <i>O. phaeacantha</i> elsewhere Typically in south/southwestern facing sandstone rock crevices To be sought in southwestern Kane Co. (plants occur within two miles of the Utah border southwest of the Coral Pink Sand Dunes, in Mohave Co., AZ
<i>O. macrorhiza</i> Engelm. var. <i>nov.</i> Frates, Woodruff & Harrison	Primarily in Salt Lake and Davis Cos. but also in Weber and the eastern edge of Box Elder, and to be expected in Cache Co. Distant and ongoing hybridization is evident with <i>O. polyacantha</i> var. <i>hystricina</i> with more significant ongoing contact in northern Davis County, and with intermittent zones of ongoing contact northward. So far only known from along the western flank (i.e. the Wasatch Front) of the	44 (4x)	At species level, some prior references used in Utah have included: <i>O. compressa</i> var. <i>macrorhiza</i> ; <i>O. mesacantha</i> var. <i>macrorhiza</i> . <i>O. compressa</i> without the inclusion of a varietal name was formerly used to refer to this entity in Utah Not synonymous with <i>O. utahensis</i> Purpus (the type of which is uncertain and the specimen is not a match) A canyon rims/higher elevation species. Poorly understood, greatly confused with <i>O. phaeacantha</i> , <i>O. aurea</i> and varieties of <i>O. polyacantha</i> with which it also hybridizes.

	<p>Wasatch Mtns. Occurs slightly to the interior of the central to northern Wasatch range where where Lake Bonneville was able to penetrate.</p> <p>Very limited occurrences of the species occur in Garfield, Kane and San Juan Cos. (although in San Juan Co. plants are hybrids with <i>O. trichophora</i>) are likely best classified as <i>O. macrorhiza</i> var. <i>macrorhiza</i>.</p> <p>Increasingly rare, of conservation concern.</p> <p>U.S. distribution of <i>Opuntia macrorhiza</i> as a whole is somewhat uncertain due to many misidentifications, FNA reports as : AZ, AK, CO, KS, MO, NM, OK, TX and Mexico as reported by FNA, however, this misses reports in IL, LA, OH, NE, SD, and WI (some of which may be confused with other species/morphotypes)</p> <p>USDA indicates also ID and MT however we have reviewed the lone ID specimen and consider it at best a hybrid; MT is unconfirmed</p>		<p>Diploid counts $2n=22$ first reported by Majure (2012) from Texas.</p> <p>Baker (2009) reports $2n=55$ for a, <i>O. macrorhiza</i> x <i>O. phaeacantha</i> from Arizona Hybridizes with <i>O. polyacantha</i> and others. See also Lucas (2012) where diploids in eastern Texas and southeastern New Mexico are discussed.</p> <p>Suspected to hybridize with <i>O. pinkavae</i> or involved in its lineage or both.</p> <p>Plants in Weber Co. and Box Elder are somewhat more introgressed.</p> <p>Reports of the species from southwestern Utah including Zion National park largely in error, or involve possible hybrid plants including small pockets in eastern Washington and southwestern Kane) Cos., frequently misidentified, and has been misreported as being abundant; overall status uncertain with hybrid forms; not in La Sals and not verified elsewhere except for the Glendale Bench in Kane Co. area and near the eastern border of Zion National Park plus one small unusual occurrence under investigation in the Natural Bridges Monument area where there is introgression with <i>O. trichophora</i>. East/West Kaibab Plateau plants in adjoining AZ below 7000' are somewhat <i>O. phaeacantha</i> influenced but appear to be strongly related.</p>
<i>O. engelmannii</i> Salm-Dyck ex Engelm. var.	Mainly Wash Co., also San Juan.	66 (6x)	Large upright plants with concolor yellow flowers, white spines. This form is widely

<p><i>engelmannii</i></p>	<p>Also in: AZ, CA, NV, NM, TX and Mexico</p>		<p>introgressed with <i>O. phaeacantha</i> in southern Utah's Virgin River valley and may only be in relatively pure form within Zion Canyon. Appears to be maintaining its form within large population of <i>O. phaeacantha</i> by apomictic reproduction.</p> <p><i>O. discata</i>, <i>O. phaeacantha</i> var. <i>discata</i>, <i>O. megacarpa</i>, <i>O. procumbens</i>, <i>O. angustata</i></p> <p>A lower elevation species. Hybridizes with <i>O. phaeacantha</i>; often confused with that taxon. See discussion elsewhere re: <i>O. woodsii</i></p> <p>The name <i>O. tenuispina</i> was used by Angus Woodbury in 1933 to refer to Zion NP occurrences of <i>O. engelmannii</i>. <i>O. tenuispina</i> is a synonym of <i>O. pottsii</i> (<i>O. macrorhiza</i> var. <i>pottsii</i>) which does not occur in Utah.</p>
<p><i>O. phaeacantha</i> Engelm. var. <i>phaeacantha</i></p>	<p>Beaver, Millard (Wah Wah Mtns), eastern/northeastern Sevier (Upper Ivie Creek; Link Canyon), Garfield, Grand, Iron, Kane, San Juan, Washington, and (eastern to central-western) Wayne Cos. Also in: AZ, CA, CO, KS, NV, NM, OK, SD (?), TX and Mexico</p> <p>Primarily found in Utah in Washington, Kane, San Juan and Grand Cos. with scattered occurrences in other counties in the southern half of the state.</p>	<p>66 (6x)</p>	<p><i>O. phaeacantha</i> var. <i>major</i>, <i>O. gilvescens</i>, <i>O. phaeacantha</i> var. <i>laevis</i>, <i>O. laevis</i> (the spineless "laveis" form is known from the Beaver Dam wash area in Wash. Co.)</p> <p><i>O. woodsii</i> Backeb. (or <i>O. x woodsii</i>) is also a name synonymized by some sources to this taxon but more properly refers to hybrids with <i>O. engelmannii</i> from Zion Park and into the Virgin River Valley.</p> <p><i>O. phaeacantha</i> has a more northerly distribution in Utah that has been previously documented and may be a Holocene relict, and more responsible for creating reduced spine hybrids that has previously been realized. Welsh 23187A places it in northeastern Sevier near its border with Emery and Sanpete Cos line, and it is known from the Fremont Junction area where various hybrids are also found (with both <i>O. fragilis</i> and <i>O. cf. nicholii</i>).</p> <p>In Colorado, its most northerly known distribution is about seven miles north of Boulder in Boulder County, Colorado</p>

			(roughly the same latitude as northern Utah Co./Tooele Co. in Utah).
<i>O. phaeacantha</i> Engelm. var. <i>castorea</i> Welsh & Atwood	Utah endemic in the Beaver Dam Wash/ Mtns, Wash Co. Extent of rarity unknown; included in UNPS 2009 watch list; conservation concern unknown	66? (6x)	Named in 2003. Not accepted as a valid segregate by some authorities. These large flowered/fruited forms are largely restricted to the wash area where non-native <i>O. santa-rita</i> were planted by local ranchers. It is not known if hybridization has occurred. This form deserves further study.

Introduced and possibly escaped: cacti are commonly used in horticulture throughout the state. These are usually confined to private or public gardens. Washington Co.'s favorable climate allows for the possibility of some imported plants persisting and creating biologic confusion.

Current name	Distribution	2n=	Synonyms/variants/misapplied names/ comments
<i>O. engelmannii</i> Salm-Dyck ex Engelmann var. <i>linguiformis</i> (Griffiths) B. D. Parfitt & Pinkava	Introduced in Utah in the Beaver Dam Wash, Wash. Co. Considered as an escapee even in Arizona (Breslin et al. 2015). Native to Texas and Coahuila Mexico (Pinkava 2003)	66 (6x)	<i>Opuntia linguiformis</i> <i>Opuntia lindheimeri</i> var. <i>linguiformis</i> Introduced in the vicinity of Lytle Ranch (see for example Harper 2001-143 at UVSC). Apparently cold hardy (has survived cold winters in Salt Lake County in a commercial/restaurant planting.)
<i>O. santa-rita</i> (Griffiths & Hare) Rose	Introduced in Utah in the Beaver Dam Wash, Wash. Co. Native to southern Arizona where it hybridizes with <i>O.</i> <i>chlorotica</i> ; popular in cultivation in central and southern Arizona (Breslin et al. 2015), and Sonora Mexico	22 (2x)	<i>Opuntia chlorotica</i> var. <i>santa-rita</i> <i>Opuntia violacea</i> var. <i>santa-rita</i> * (*Harper 2001-14 at UVSC initially identified as <i>Opuntia violacea</i> likely should be here) Established plants were observed on the Terry's Ranch in the late 1940's to early 50s by A. Dean Stock (pers. comm.). A gas station at Beaver Dam, Arizona had a cactus collection; local ranchers acquired plants from the station and planted them in the Beaver Dam Wash. A large plant still exists in front of the main building at BYU's Lytle Ranch Preserve. Not determined if plants have become naturalized in area.

END NOTES:

*As a result of other changes in more modern treatments of the Cactaceae, all species in Utah that fall into the genus *Opuntia* are plants with flat pads since the chollas previously called *Opuntia acanthocarpa*, *O. echinocarpa* and *O. whipplei* now fall under the genus *Cylindropuntia*, and *O. pulchella* is now placed under *Grusonia*.

**Cacti generally: x=11

Author abbreviations of Utah native species:

Baxter Edgar M. Baxter (1903-1967)

Benson Lyman D. Benson 1909-1993 (often abbreviated as L. Benson or L.D. Benson)

Backeb. Curt Backeberg (1894-1966)

Clover & Jotter Elzada U. Clover (1897-1980), Mary Lois Jotter (Lois Jotter Cutter) (b. 1914)+

Engelm. & Bigelow George Engelmann (see below) and John M. Bigelow (1804-1878)

Engelm. George Engelmann (1809–1884)

Haw. Adrian H. Haworth (1768–1833)

Neese Elizabeth J. Neese (1934-2008)

Nutt. Thomas Nuttall (1786–1859)

Parfitt Bruce D. Parfitt (1953-2009)

Welsh & Atwood Stanley L. Welsh (b. 1928) and N. Duane Atwood (b. 1938)

+Clover and Jotter were the first women to float completely through the Colorado system (1938)

Taxa either indicated elsewhere as occurring in Utah but which do not actually occur here, or which no longer have any direct conceptual relationships with our plants:

O. martiniana (syn. *O. littoralis* var. *martiniana*) — not a distinguishable taxon

O. covillei was also used to distinguish certain plants from *O. phaeacantha* (mainly to distinguish Benson's *O. littoralis* var. *martiniana* so in that sense the two are synonymous, but, these names now do not apply to *Opuntias* in Utah and have no direct connection to any of our plants as currently understood; these names have been since synonymized with taxa that occur elsewhere.

O. humifusa, an eastern U.S. species which does not occur in Utah

O. debreczyi, described in 2005 by an overseas author based on a plant in horticulture since 1973 and purported by some to extend into Utah appears to be an *Opuntia fragilis* hybrid and relates to morphotypes that may not comprise a taxon and cannot in any event be considered as appropriate for use for any *Opuntia* species in Utah and probably also not elsewhere.

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Coloradans Scott Smith and the late Dale Denham provided valuable insight and materials with respect to the distribution of certain pricklypear taxa in their state for comparison with Utah materials, particularly with respect to *Opuntia macrorhiza*.

References:

[To be added: all of the early Utah floras and additional publications we have reviewed]
[To be added: Watson reference and then coordinate reference with text above re: 4200 ft valley location]

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