

## ASCLEPIADACEAE MILKWEED FAMILY

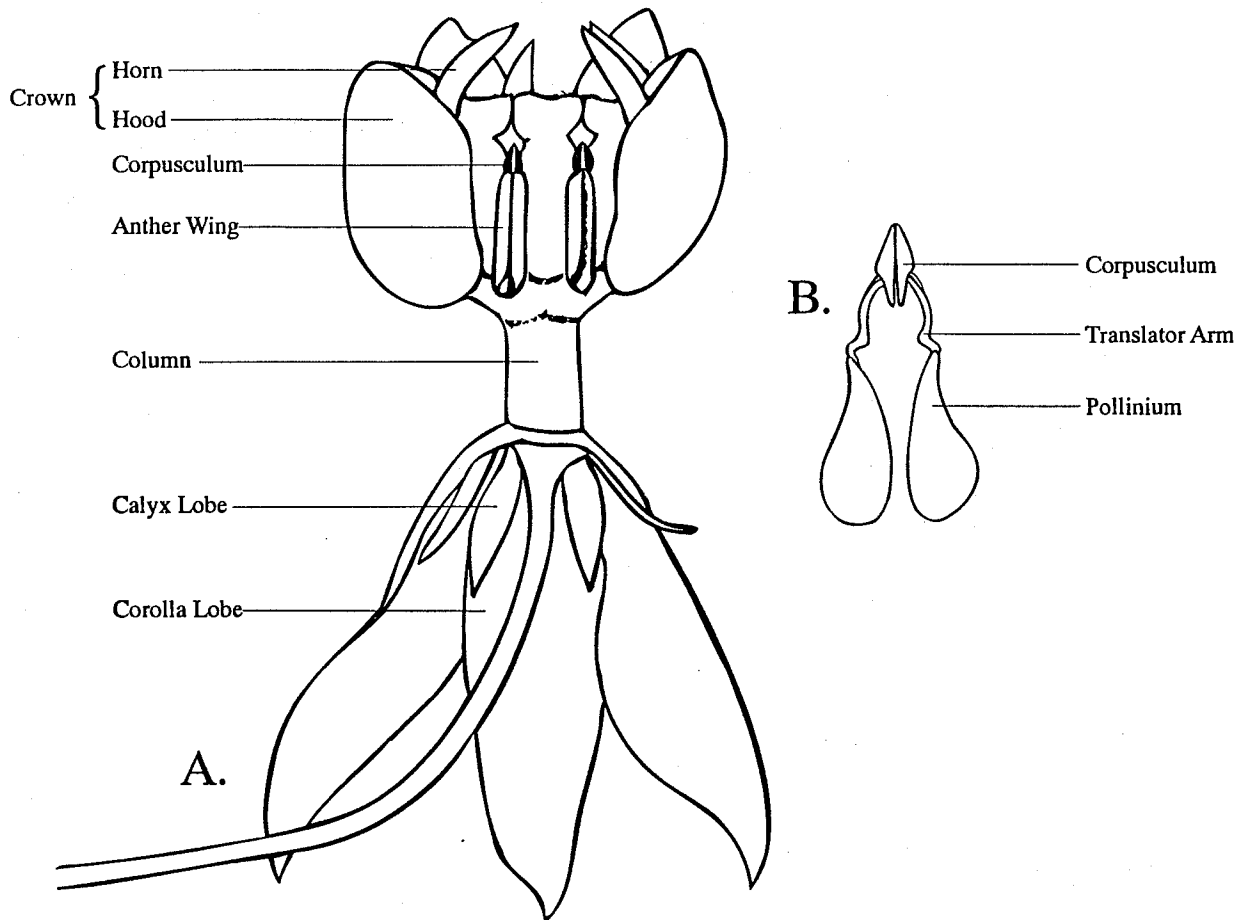
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Perennial herbs, vines, or shrubs, mostly with milky sap. LEAVES opposite, less commonly whorled or alternate, simple, entire; stipules absent or vestigial. INFLORESCENCES interpetiolar or rarely terminal cymes, in ours, mostly racemose to umbelliform. FLOWERS perfect, actinomorphic, 5-merous except for the gynoecium; calyx lobes basally connate; corolla sympetalous; stamens epipetalous, arising from the corolla tube, the filaments fused into a ring or tube (column) which surrounds the ovaries and styles, the anthers coherent or connate into a ring (anther head) and adherent to the thickened stigma head forming the central gynostegium, each anther with a terminal hyaline appendage and lateral, typically corneous margins (anther wings), the margins of each pair of adjacent anthers forming a slit leading to the stigmatic surface; pollen grains of each anther sac firmly coherent in a yellow, waxy mass (pollinium), the adjacent pollinia from each pair of anthers attached to a yoke-like, solidified secretion of the stigma head (translator), the translator consisting of 2 translator arms linked to a corpusculum, the entire apparatus of corpusculum, translator arms and paired pollinia (pollinarium) constituting the unit of pollen dispersal; gynoecium of 2 distinct, 1-carpellate, superior ovaries united only at the apex by the enlarged, peltate stigma head, this with 5 lateral stigmatic surfaces opposite the anther wing slits; flowers typically with an elaborate, often showy corona (crown) arising from the column or from the region of union of the column and corolla, in ours consisting of a single cycle of 5 flat to infolded, hood-like or nearly spherical segments, distinct or united into a ring or tube, frequently each bearing a horn-like appendage within, or the crown in 2 separate cycles or rarely entirely absent. FRUIT a many-seeded, ovoid to lanceolate follicle, the seeds typically flat, pear-shaped, with an apical tuft of silky hairs. --250 genera, 2000 spp.; chiefly of tropical and subtropical regions of both hemispheres, and including many stem succulents of the Old World deserts, the ecological counterparts of the unrelated New World cacti. The Milkweed Family is elaborately adapted to entomophily: nectar-seeking insects engage the corpuscula with their legs or proboscises, thereby removing pollinia and transferring them to other flowers, where they are inadvertently inserted between the anther wings, making contact with the stigmatic surfaces. In North America, milkweeds constitute the principal food of the monarch butterfly larva; cardenolides, poisonous compounds related to digitalis, are absorbed by the larvae from the plants and render both larva and adult butterfly unpalatable to avian predators; the striking color patterns of both larva and adult monarch serve to warn birds of this unpalatability. Woodson, R. E., Jr. 1941. *Ann. Missouri Bot. Gard.* 28:193-244; Bookman, S. S. 1981. *Amer. J. Bot.* 68:675-679.

1. Stems erect to decumbent, never twining.
  2. Stems and leaves non-glandular; corolla lobes glabrous or minutely pustular hairy inside; crown of 5 distinct segments folded inward forming hoods, each with an inner crest or horn-like appendage, or rarely the horn absent; follicles erect, rarely pendulous ..... *Asclepias*
  - 2' Stems and leaves glandular; corolla lobes densely matted-hirsute inside; crown of 5 distinct obovate-elliptic, apically retuse segments, scarcely infolded at the base but never hood-like, the horns absent; follicles pendulous ..... *Matelea*
- 1' Stems twining, at least at the tips.
  3. Plants in flower.
    4. Crown double, consisting of a low ring inserted on the corolla tube and 5 distinct, turgid segments or vesicles arising from the column below each anther ..... *Sarcostemma*
    - 4' Crown absent or single and various, but never of both a ring and vesicles.
      5. Stems densely pilose, hirsute, or pubescent throughout, frequently also conspicuously

- glandular; leaves ovate to lanceolate with cordate to hastate or rounded bases ..... *Matelea*
- 5' Stems glabrate at least above or finely pubescent in lines above the petioles, non-glandular; leaves oblong to linear or narrowly lanceolate with obtuse to attenuate bases, rarely ovate-cordate ..... *Cynanchum*
- 3' Plants in fruit.
6. Stems glandular or if non-glandular then the follicles warty or 5-winged ..... *Matelea*
- 6' Stems non-glandular; follicles smooth, neither warty nor winged.
7. Inflorescences umbelliform with peduncles 1-6 cm long; mature seeds 5-7 mm long ..... *Sarcostemma*
- 7' Inflorescences umbelliform and subsessile or racemose and pedunculate, or if both umbelliform and pedunculate (in *C. utahense*) then the peduncles 1-2 cm long and the mature seeds 10-12 mm long ..... *Cynanchum*



Asclepias Figure 1. A, Typical *Asclepias* flower (one hood and horn, two corolla lobes, and one calyx lobe removed) with exerted horns arching over stigma head. B, Pollinarium.

**Asclepias L. Milkweed**

Perennial herbs, rarely shrubs or subshrubs. STEMS pubescent to glabrous, non-glandular. LEAVES opposite, whorled or irregularly alternate. INFLORESCENCES umbelliform cymes, the flowers opening synchronously. FLOWERS showy; calyx divided nearly to the base; corolla deeply divided, the lobes mostly reflexed, displaying the prominent crown and anther head, in ours glabrous to sparsely hairy outside, mostly minutely pustular-hairy inside; crown extremely variable in form, arising from the column below each anther, of 5 distinct, infolded to subglobular segments (hoods), each with an inner crest or appendage (horn), rarely the horn entirely absent; anther head elevated on a more or less conspicuous column, the anther wings mostly flaring outward toward the base giving the anther head a truncate-conic form; pollinia pendulous from the translator arms, flat, asymmetrically obovate to oblanceolate; stigma head truncate with a central depression. FOLLICLES mostly erect on deflexed pedicels, the surface smooth, rarely tuberculate. --Ca. 150 spp.; in the Americas, particularly Mex. and the U.S., also Afr. (For Aesculapius, legendary Greek physician and god of medicine.) A genus of many documented uses among American Indians; also stem fibers have been used for cordage and textiles, the silky seed hairs as a kapok substitute, and the latex for rubber; the latex has most recently been investigated as a petroleum substitute. Milkweed cardenolides, physiologically active compounds related to digitalis, are of interest for their powerful emetic and cardiotoxic properties. A number of species are toxic to livestock but are distasteful and are seldom eaten. Woodson, R. E., Jr. 1954. Ann. Missouri Bot. Gard. 41:1-211.

1. Stems leafless at maturity, the leaves narrowly linear, deciduous at or before time of flowering; desert shrubs.
  2. Crown hoods oblong, dilated above, 5-9 mm long, 2-5 mm longer than the gynostegium ..... *A. subulata*
  - 2' Crown hoods oblong-quadrate, 2-3 mm long, ca. 1 mm shorter than the gynostegium ..... *A. albicans*
- 1' Stems persistently leafy, the leaves linear to ovate or circular; shrubs or mostly perennial herbs of various habitats.
  3. Plants shrubby to suffrutescent; leaves narrowly linear, to 1-2 mm broad; hoods longer than the gynostegium; at least the young stems finely pubescent.
    4. Stems bearing numerous, raised leaf scars below; leaves alternate to spirally approximate; hoods mostly 3-3.6 mm long, erect or ascending ..... *A. linaria*
    - 4' Stems without conspicuous leaf scars; leaves opposite; hoods 4-5 mm long, more or less recurved- spreading in the middle ..... *A. macrotis*
  - 3' Plants herbaceous above the rootstock; leaves linear to ovate or circular, mostly broader than 2 mm; hoods shorter to longer than the gynostegium; stems glabrous to pubescent.
    5. Hoods 6-14 mm long, 4-10 mm longer than the gynostegium; leaves opposite, broadly elliptic to broadly lanceolate or ovate, 2 cm or more broad.
      6. Stems shaggy pilose; leaf blades to 16 cm broad, rounded to truncate or retuse at the apex ..... *A. lemmonii*
      - 6' Stems woolly to pubescent or glabrate; leaf blades to 10 cm broad, acute to obtuse or rounded at the apex.
        7. Stems pubescent more or less in lines above the petioles; hoods oblong, dilated above ..... *A. nyctaginifolia*
        - 7' Stems woolly or short woolly, particularly above, more or less glabrate below; hoods ovoid-attenuate to oblong-attenuate, narrowed above.
          8. Leaves persistently short woolly beneath, the surface conspicuously whitened from the dense mat of curly hairs; corolla greenish purple, the crown dark purple; follicle surface smooth ..... *A. hypoleuca*
          - 8' Leaves more or less woolly beneath but the surface green, scarcely whitened; corolla bright purple, the crown yellowish; follicle surface typically with soft, elongate tubercles ..... *A. speciosa*

- 5' Hoods 1-8 mm long, shorter than to 3 mm longer than the gynostegium; leaves opposite or alternate, linear to ovate or circular, variously broad.
9. Inflorescence solitary and terminal.
10. Umbels 4-7 cm broad, pedunculate; corolla lobes curved-ascending, 9-12 mm long ..... *A. asperula*
- 10' Umbels 2-5 cm broad, sessile and subtended by 1-4 bracteal leaves; corolla lobes reflexed, 4-6 mm long ..... *A. involucreta*
- 9' Inflorescences several to many, lateral at the upper nodes or rarely (in *A. uncialis*) crowded at the upper nodes and appearing terminal.
11. Hoods 1.5-3 mm longer than the gynostegium; leaves alternate to irregularly approximate.
12. Plants pilose; principal leaves narrowly lanceolate, 3-15 mm broad; hoods 4-5.5 mm long ..... *A. tuberosa*
- 12' Plants finely pubescent; principal leaves broadly lanceolate, 20-45 mm broad; hoods 5.5-6.5 mm long ..... *A. hallii*
- 11' Hoods shorter than to about equalling the gynostegium (to somewhat longer in some *A. angustifolia*); leaves alternate, opposite or whorled.
13. Horns exerted mostly 1 mm or more, pointing or arching inward, toward or above the stigma head.
14. Leaves linear to narrowly lanceolate or elliptic, to 1(1.5) cm broad.
15. Leaves whorled, the blades 1-4 mm broad ..... *A. subverticillata*
- 15' Leaves opposite, the blades 2-11(-15) mm broad.
16. Corollas white or flushed with pale purple; umbels solitary at the upper nodes; stems to 70 cm tall ..... *A. angustifolia*
- 16' Corollas bright purple-pink; umbels paired at the upper nodes, solitary below; stems to 150 cm tall ..... *A. incarnata*
- 14' Leaves broadly elliptic to broadly lanceolate, ovate or circular, 1-12 cm broad.
17. Plants diminutive, to about 10 cm tall; leaves to 5 cm long ..... *A. nummularia*
- 17' Plants 20-180 cm tall; leaves 5-23 cm long.
18. Leaf blades broadly rounded to truncate or retuse at the apex, the margins entire.
19. Umbels mostly 5-8 cm broad, subsessile or the peduncles to ca. 2 cm long; calyx lobes ca. 4 mm long, shorter than the corolla lobes; anther wings 2.7-3.2 mm long, broadest at the base; follicles erect on deflexed pedicels, the surface smooth ..... *A. latifolia*
- 19' Umbels ca. 3-4 cm broad, the peduncles 2-4 cm long; calyx lobes 6-8 mm long, about equalling the corolla lobes; anther wings ca. 1.4 mm long, broadest near the middle; follicles spreading to pendulous on spreading pedicels, the surface with soft, subulate tubercles ..... *A. welshii*
- 18' Leaf blades attenuate to an acute apex, the margins erose ..... *A. erosa*
- 13' Horns otherwise: absent, rudimentary, wholly included within the hoods, or, if exerted, then erect and surpassing the hood margins by no more than 1 mm.
20. Crown rims conspicuously 5-toothed ..... *A. quinquedentata*
- 20' Crown rims truncate, rounded, or the margins developed into a more or less prominent pair of acute or attenuate teeth.
21. Stems and leaves entirely glabrous.
22. Leaves linear, to 1 cm broad, scattered to irregularly approximate ..... *A. engelmanniana*
- 22' Leaves broadly oblong or elliptic to circular, mostly 2-9 cm broad, opposite below the inflorescences.
23. Crown hoods 4-5 mm long, truncate; stems erect; umbels subterminal, all pedunculate, the peduncles 3-15 cm long ..... *A. elata*

- 23' Crown hoods 7-8 mm long, attenuate above the middle and abruptly contracted at the tip to a pair of tooth-like lobes; stems decumbent; umbels terminal and frequently also lateral, the terminal with peduncles 1-8 cm long, the lateral sessile ..... *A. cryptoceras*
- 21' Stems and leaves variously pubescent.
24. Horns absent; hoods appressed to the anthers, the hood rims rounded ..... *A. viridiflora*
- 24' Horns erect, included to scarcely exerted; hoods erect-ascending, their rims with more or less well developed marginal tooth-like lobes.
25. Umbels pedunculate, the peduncles 5-15 mm long ..... *A. brachystephana*
- 25' Umbels sessile or subsessile, the peduncles to 2 mm long.
26. Leaves all narrowly linear, 1-3 mm broad ..... *A. cutleri*
- 26' Leaves ovate to lanceolate or linear-lanceolate, becoming progressively narrower upwards, 1-25 mm broad ..... *A. uncialis*

***Asclepias albicans*** S. Watson (whitish). Wax Milkweed. --Shrubs 100-300(-400) cm tall. STEMS erect or ascending, wandlike, branching above, glabrous except on very young growth, conspicuously white-glaucous, in age leafless. LEAVES opposite or in whorls of 3, narrowly linear, 1-3 cm long, early-deciduous. UMBELS lateral at the upper nodes, 3-5 cm broad, the peduncles 1-3 cm long, sparsely hairy to glabrate, the pedicels more or less woolly. FLOWERS with the calyx lobes 3-4 mm long; corolla drying greenish white or flushed with pale purple, the lobes 6-9 mm long; hoods drying yellow brown, ascending, oblong-quadrate, 2-3 mm long, 1.6-2.4 mm broad, ca. 1 mm shorter than the gynostegium, the horns attached the full length of the hoods and free apically for ca. 2 mm, the free portion digitate, mostly straight, appressed to the hood apices, scarcely exerted toward the stigma head; anther wings 2 mm long; corpusculum 0.3 mm long, the pollinia 1.3-1.5 mm long. FOLLICLES pendulous on spreading to drooping peduncles and pedicels, 8-15 cm long. --Rocky desert flats and slopes of sw AZ: La Paz, Maricopa, Pinal, Yuma cos.; 150-750 m (500-2500 ft); Sep-Jun; s CA; Baja C., Mex.

***Asclepias angustifolia*** Schweigger (narrow-leaved). --Slender herbs. STEMS erect, unbranched or with a few lateral shoots from the middle and upper nodes, 20-70 cm tall, finely pubescent in lines above the petioles or becoming glabrous. LEAVES opposite, subsessile, the petioles 1-6 mm long, the blades linear to narrowly lanceolate or elliptic, 4-12 cm long, 2-11(-15) mm broad, attenuate at apex and base, glabrous on both surfaces, or with a few hairs on the margins and midvein below. UMBELS lateral in the upper portion of the stem, one per node, or infrequently single and appearing terminal, 2-3 cm broad, the peduncles 1-6 cm long. FLOWERS small; calyx lobes ca. 2.5 mm long; corolla white or flushed with pale purple, the lobes 5-6 mm long; hoods white, erect-ascending, obovoid-oblong, 2.5-3.4 mm long, 1.6-2.2 mm broad along the sloping apex, about as long as to slightly longer than the gynostegium, obtuse-rounded above, the horns digitate, attached near the base of the hoods, exerted ca. 2 mm and arching over the stigma head; anther wings 1.6-2 mm long; corpusculum ca. 0.2 mm long, the pollinia 1.1-1.2 mm long. FOLLICLES erect on erect pedicels, 5-9 cm long. [*A. texana* Heller of s TX and n Mex. is an eastern form with broader and shorter, elliptic leaves.] --Riparian woodlands and canyons, mts. of se AZ: Cochise, Pima, Santa Cruz, cos.; 1050-1750 m (3500-5700 ft); May-Aug; s TX; Son. to Tamps., s to Chis., Mex.

***Asclepias asperula*** (Decaisne) Woodson (a little rough, referring to surface texture). Antelope Horns, Green Milkweed. --Rather low herbs, the vegetative parts typically roughened with a fine pubescence. STEMS ascending to rather decumbent, unbranched, 10-80 cm tall, infrequently somewhat glabrate below. LEAVES irregularly alternate, the petioles 2-11 mm long, the blades lanceolate to less often linear-lanceolate, 5-19 cm long, 6-27 mm broad, acute or infrequently obtuse at the base, long attenuate to an acute apex. UMBELS solitary and terminal, 4-7 cm broad, sessile or more often long-pedunculate with the peduncles to 20(-30) cm long. FLOWERS large; calyx lobes 3-6 mm long; corolla greenish, uncommonly

purple-tipped, bowl-shaped, the lobes curved-ascending, 9-12 mm long; hoods sessile and attached along the entire height of the column, oblong-tubular, "J"- to "C"-shaped, spreading-descending at the base and gradually curving upward near the middle, the upper portion erect to incurved, ca. 5-8 mm long, 2-2.6 mm broad at the median bulge, about as high as the gynostegium, the horns radially flat, attached in the top of the hoods, triangular, entirely included within the hood margins; anther wings 1.8-2 mm long; corpusculum 0.3-0.4 mm long, the pollinia 1.2-1.4 mm long. FOLLICLES erect on deflexed pedicels, 5-10 cm long. --2 subsp.; KS, OK and TX, w to s ID, UT, e NV and se CA; s to Dgo. and Hgo., Mex.

Subsp. *asperula*. --Umbels characteristically pedunculate, crown hoods dark purple. --Open woodlands, chaparral, grasslands, spreading to roadsides: all counties except Yuma; 750-2500 m (2500-8200 ft); Apr-Sep; CO and w TX, w to s ID, e NV and se CA; s to Dgo. and Hgo., Mex. Subsp. *asperula* is replaced in the eastern portion of its range by subsp. *capricornu* (Woodson) Woodson [*A. capricornu* Woodson], with umbels sessile or subsessile and hoods greenish cream. The latter in turn is weakly separable from *A. viridis* Walter of the Midwest and Southeast.

*Asclepias brachystephana* Engelman ex Torrey (short-crowned). --Low herbs to 20-50 cm tall. STEMS ascending, much branched below, finely short woolly, especially on younger growth. LEAVES opposite, the petioles 2-8 mm long, the blades narrowly lanceolate to linear-lanceolate, 3-13 cm long, 5-20 mm broad, long attenuate to an acute apex, obtuse to acute at the base, rather persistently white woolly above, glabrate below. UMBELS lateral from many of the upper nodes, 2-4 cm broad, the peduncles 0.5-1.5 cm long, woolly, the pedicels white woolly. FLOWERS small; calyx lobes 2-3 mm long; corolla purple, the lobes 5-6 mm long; hoods drying yellow brown, erect-ascending, hemispheric, widening upward to a truncate to 3-lobed rim, the triangular marginal lobes slightly higher than the rounded median lobe, 1.5-2.6 mm long, 1.4-2 mm broad, ca. 1-2 mm shorter than the gynostegium, the horns attached near the middle of the hoods, tangentially flat, tongue-shaped, erect, short-exserted to about the height of the marginal lobes; anther wings 1.6-1.8 mm long; corpusculum 0.2-0.3 mm long, the pollinia 1-1.1 mm long. FOLLICLES erect on deflexed pedicels, 4-7 cm long, more or less conspicuously purple-striped. --Desert mts. and plains, grasslands, roadsides: Cochise, Graham, Pima, Santa Cruz cos.; 1300-2000 m (4200-6500 ft); May-Sep; s NM, w TX; s to Gto., Mex.

*Asclepias cryptoceras* S. Watson (with hidden horns). --Glabrous herbs. STEMS decumbent to prostrate, sparingly branched below, 10-30 cm long. LEAVES opposite, subsessile, the petioles 1-6 mm long, the blades circular to broadly elliptic, 2.5-9.5 cm long, 2-7.5 cm broad, rounded to shallowly cordate at the base, obtuse to rounded-apiculate at the apex. UMBELS terminal, pedunculate, frequently also lateral and sessile at the uppermost nodes, 6-7 cm broad, the peduncles 1-8 cm long. FLOWERS large; calyx lobes 6-9 mm long; corolla yellowish, the lobes 11-13 mm long; hoods purple, attached along the full height of the column, erect, ovoid, truncate to attenuate, in ours 7-7.5 mm long, 3-4 mm broad, about as long as the gynostegium, the horns attached near the middle of the hoods, sickle-shaped and abruptly bent inward or variously reduced to a minute tooth, entirely concealed within the hoods; anther wings 1.9-2.2 mm long; corpusculum 0.3-0.4 mm long, the pollinia 1.2-1.4 mm long. FOLLICLES erect on spreading pedicels, 5.5-7 cm long. --2 subsp.; se WA s and e to e CA, WY, n AZ, w CO.

Subsp. *cryptoceras*. --Crown hoods broadly rounded dorsally from base to apex, attenuate above the middle and abruptly contracted at the tip to a pair of erect or recurved tooth-like lobes. --High desert and chaparral of n AZ: Coconino, Mohave cos.; 1450-1600 m (4800-5300 ft); May-Jun; e CA, NV, UT, s WY, s to n AZ, w CO.

*Asclepias cutleri* Woodson (for H. C. Cutler). --Low, slender herbs to 10-20 cm high. STEMS ascending, sparingly branched below, strigose-pubescent with appressed-ascending to loosely spreading hairs. LEAVES irregularly alternate to approximate, sessile, the blades narrowly linear, 1-8 cm long, 1-3 mm broad, acute at the apex, attenuate at the base, pubescent to rather strigose, or more or less glabrate below. UMBELS terminal and lateral at the upper nodes, 1-3 cm broad, sessile or the peduncles to 0.2 cm long. FLOWERS small; calyx lobes 2-3 mm long; corolla purple to pinkish, the lobes 4-5 mm long; hoods off-

white, erect-ascending, hemispheric, widening upward to a more or less truncate, marginally-lobed rim, 2-2.8 mm long, 1.6-2.2 mm broad, ca. 1 mm shorter than the gynostegium or the triangular marginal lobes about equalling it, the horns attached below to near the middle of the hoods, tangentially flat, ovate-attenuate, erect, short-exserted to about the height of the marginal lobes; anther wings 1.1-1.2 mm long; corpusculum ca. 0.25 mm long, the pollinia 0.4-0.5 mm long. FOLLICLES more or less pendulous on spreading or drooping pedicels, ca. 5 cm long. --Sandy and gravelly substrates, ne AZ: Apache, Coconino, Navajo cos.; 1300-1600 m (4300-5200 ft); Apr-Jun; se UT. A narrow endemic of the Colorado Plateau.

*Asclepias elata* Benth (tall). --Herbs. STEMS erect, unbranched, 40-80 cm tall, glabrous to rather glaucous. LEAVES opposite or the bracteal leaves subtending the peduncles alternate, sessile, or the petioles to 2 mm long, the blades broadly oblong to ovate-elliptic, 3-16 cm long, (1-)2-7 cm broad, shallowly cordate and more or less clasping at the base, obtuse to rounded at the apex, apiculate, glabrous on both surfaces, glaucous beneath. UMBELS 1 to several, subterminal at the uppermost nodes, finely pubescent, 5-7 cm broad, the peduncles 3-15 cm long. FLOWERS large; calyx lobes 5-8 mm long; corolla green or with a touch of purple on the tips outside, tardily reflexed-spreading, the lobes 9-12 mm long; hoods yellowish with white margins, sessile and attached along almost the entire height of the column, ovoid-oblong and more or less "J"-shaped, horizontally spreading-saccate from the base, curved upward near the middle to an erect, truncate apex, ca. 4-5 mm long, 2-4 mm broad at the top, slightly shorter than the gynostegium, the horns radially flat, attached the full length of the hoods, triangular to sickle-shaped, mostly concealed within the hoods; anther wings 2.4-2.8 mm long; corpusculum 0.8-1 mm long, the pollinia 1.1-1.3 mm long. FOLLICLES erect on deflexed pedicels, 11-15 cm long. --Canyons, rocky stream beds, open woodlands, mts. of se AZ: Cochise, Gila, Graham, Pima, Santa Cruz, cos.; 1200-2150 m (3900-7100 ft); Jul-Sep; s NM, sw TX; Mex. to Guatemala.

*Asclepias engelmanniana* Woodson (for G. Engelmann). --Herbs. STEMS erect, typically unbranched, 60-120(-150) cm tall, glabrous to rather glaucous. LEAVES irregularly alternate to approximate, sessile, the blades linear, 5-25 cm long, 1-8 mm broad, attenuate at apex and base, glabrous on both surfaces, or with a few hairs on the margins and midvein below. UMBELS lateral in the upper portion of the stem, spreading-pubescent, 2-4 cm broad, sessile or the peduncles to 3.5 cm long. FLOWERS small; calyx lobes 3.5-5 mm long; corolla greenish or flushed with pale purple, the lobes 5-7 mm long; hoods sessile, curved-ascending, ovoid-oblong, 2.2-3 mm long, 0.9-1.5 mm broad in the middle, half to two-thirds as long as the gynostegium, truncate to retuse at the top, rounded-saccate at the base and with a pair of wing-like, rounded lobes spreading at right angles from the margins, the horns digitate, erect, attached near the middle of the hoods, ca. 1 mm long and scarcely exerted, or concealed within the hoods and variously reduced in length, or entirely absent and represented by a more or less distinct vertical ridge at the base of the back wall of the hoods; anther wings 2-2.4 mm long; corpusculum 0.6 mm long, the pollinia 1.2-1.3 mm long. FOLLICLES erect on deflexed pedicels, 7-12 cm long. --Creeks, canyons, open woodlands: Apache, Cochise, Coconino, Gila, Graham, Mohave, Navajo, Pima, Yavapai cos.; 1050-2200 m (3500-7200 ft); Jun-Aug; common on the high plains: NE, w to se UT and s to TX, AZ and n Mex. Plants with more or less well developed crown horns are the more common in the western portion of the range and have been recognized as var. *rusbyi* (Vail) Kearney (for H. H. Rusby, collector of type specimen along Oak Creek, Yavapai Co., in 1883) [*A. rusbyi* (Vail) Woodson]. Most Arizona plants possess at least a minute nub and belong here. However, even within the same collection (Lehto L23157 from Gila Co.), the horn can vary from well developed, ca. 1 mm long, and scarcely exerted (ARIZ) to entirely suppressed and represented by an indistinct ridge at the base of the back wall of the hood (ASU). Typical *A. engelmanniana* of the great plains lacks both horn and ridge.

*Asclepias erosa* Torrey (erose, referring to leaf margins). Desert Milkweed. --Stout herbs. STEMS erect, unbranched, 50-180 cm tall, densely short wooly when young, soon glabrate. LEAVES opposite, sessile or the petioles to 2 mm, the blades broadly lanceolate to mostly ovate, 4-25 cm long, 3-11 cm broad, rounded to shallowly cordate and more or less clasping at the base, attenuate to an acute apex, densely short

woolly when young, in age more or less glabrate on both surfaces, the margins erose. UMBELS lateral to subterminal at the upper nodes, 5-8 cm broad, the peduncles 2-13 cm long, the pedicels woolly. FLOWERS large; calyx lobes ca. 3-4 mm long; corolla greenish, the lobes 6-9 mm long; hoods greenish white to yellow-brown, erect-ascending, obovoid-triangular, widening upward to a truncate apex, 3.5-5 mm long along the dorsal surface, 2.5-5 mm broad at the top, about as long as the gynostegium, the horns radially flat, attached to about the middle of the hoods, sickle-shaped, exerted ca. 2 mm to the center of the stigma head; anther wings 2-2.8 mm long; corpusculum ca. 0.4 mm long, the pollinia 1.4-1.5 mm long. FOLLICLES erect on deflexed pedicels, 7-9 cm long.  $2n = 22$ . --Washes and roadsides in desert scrub communities: Coconino, La Paz, Mohave, Yuma cos.; 50-1500 m (200-5000 ft); Apr-Oct; sw UT, s NV, s CA; n Son. and Baja C., Mex. One of the largest American milkweeds.

*Asclepias hallii* A. Gray (for Elihu Hall). --Finely pubescent herbs. STEMS erect or ascending, typically unbranched, 30-50 cm tall. LEAVES irregularly alternate to approximate, the petioles 5-11 mm long, the blades lanceolate to narrowly ovate, 6-13 cm long, 2-4.5 cm broad, attenuate to a broadly acute to rounded-apiculate apex, rounded or obtuse at the base, pubescent to glabrate on both surfaces. UMBELS lateral and terminal, typically clustered at the uppermost nodes, sometimes compound, 4-6 cm broad, the peduncles 1-6 cm long. FLOWERS rather large; calyx lobes 3-4 mm long; corolla purple to pink, the lobes ca. 6-7 mm long; hoods yellowish white, ascending, obovoid-ellipsoid, more or less abruptly narrowed above the middle, obtuse-rounded at the top, 5.5-6.5 mm long, 1.6-2.1 mm broad, ca. 3 mm longer than the gynostegium, the horns attached near the base of the hoods, radially flat, sickle-shaped, exerted 1-2 mm and arching over the stigma head; anther wings 1.5-1.8 mm long; corpusculum 0.3-0.4 mm long, the pollinia 1.3-1.4 mm long. FOLLICLES erect on deflexed pedicels, 8-12 cm long. --Reported in AZ apparently from a single collection from the San Francisco Peaks, Coconino Co.; 1850-2450 m (6000-8000 ft); Jun-Aug; CO, NM, NV, UT, s WY.

*Asclepias hypoleuca* (Gray) Woodson (white beneath). --Herbs. STEMS erect, unbranched, 30-100 cm tall, short woolly, especially above. LEAVES opposite, the petioles 3-15 mm long, the blades elliptic-oblong to mostly broadly elliptic or ovate, 4-15 cm long, 2-10 cm broad, obtuse to rounded, truncate or shallowly cordate at the base, broadly acute to rounded at the apex, apiculate, green and glabrous to sparsely hairy above, persistently short woolly beneath, the surface conspicuously whitened from the dense mat of curly hairs. UMBELS terminal to subterminal or lateral at the uppermost nodes, 5-8 cm broad, the peduncles 2-15 cm long. FLOWERS large; calyx lobes 3.5-5 mm long; corolla greenish outside, purplish inside, the lobes 8-11 mm long; hoods purple, erect-ascending, oblong-attenuate, obtuse-rounded at the apex, 6-10 mm long, 4-8 mm longer than the gynostegium, the margins with a pair of sharp teeth ca. 2 mm long arching over the stigma head, the horns absent; anther wings 2-2.4 mm long; corpusculum ca. 0.5 mm long, the pollinia 0.9-1.1 mm long. FOLLICLES erect on deflexed pedicels, 8-12 cm long. --Oak and pine woodlands to the ponderosa zone, mts. of se AZ: Apache, Cochise, Pima, Santa Cruz cos.; 1850-2550 m (6000-8300 ft); Jun-Sep; NM; n Mex.

*Asclepias incarnata* L. (flesh-colored). Swamp Milkweed. --Tall, rather stout herbs. STEMS erect, branching from the upper nodes, to 150 cm tall, finely pubescent in lines above the petioles. LEAVES opposite, the petioles 3-8 mm long, the blades linear-lanceolate to narrowly elliptic- or oblong-lanceolate, 7-15 cm long, 5-10 mm broad, attenuate at apex, attenuate to abruptly acute at base, sparsely pubescent above and on the veins below. UMBELS lateral in the upper portion of the stem, typically paired at the upper nodes, finely pubescent, ca. 3 cm broad, the peduncles ca. 4 cm long. FLOWERS small; calyx lobes ca. 2 mm long; corolla bright purple-pink, the lobes ca. 5 mm long; hoods drying white, erect-ascending, ovoid-oblong, 2.5-3 mm long, 1.3-1.6 mm broad along the sloping apex, about as long as the gynostegium, obtuse-rounded above, the horns digitate, attached near the base of the hoods, exerted ca. 1.5 mm and arching over the stigma head; anther wings 1.6-1.7 mm long; corpusculum ca. 0.3 mm long, the pollinia ca. 1 mm long. FOLLICLES erect on erect pedicels, 6-7 cm long. --Recorded in AZ from a single population on Turkey Creek near Canelo, Santa Cruz Co.; 1500 m (5000 ft); Aug; common in the ne and c U.S.,



becoming uncommon in the se and sw; ME to FL, w to SD, CO and AZ; s Can. The Turkey Creek plants bear unusually narrow leaves, more typical of the closely related, sympatric *A. angustifolia*. The two species are best distinguished by stature, flower color, and habitat: *A. incarnata* are marsh plants, the AZ population growing in a wet, flat, grassy meadow adjacent to the creek; *A. angustifolia* in AZ are plants of canyon bottoms and steep, rocky slopes. Arizona plants represent subsp. *incarnata*.

***Asclepias involucrata*** Engelm ex Torrey (surrounded with bracts). --Low herbs, the vegetative parts sparsely to densely covered with short curly hairs. STEMS several to many from the root crown, loosely ascending to horizontally spreading, sparingly branched below, 10-20 cm long. LEAVES mostly erect, subopposite to irregularly alternate, subsessile, the petioles 1-3 mm long, the blades ovate to mostly lanceolate or oblong-linear, becoming more or less narrower upwards, 1-6 cm long, 5-25 mm broad, long attenuate, acute to obtuse apically, acute to obtuse or rounded at the base, the margins short woolly, the upper surface glabrous or nearly so, the lower surface glabrate, pubescent or sparsely short woolly. UMBELS solitary and terminal on the longer branches, sessile, more or less closely subtended by 1-4 leaflike bracts, 2-5 cm broad. FLOWERS small; calyx lobes ca. 3 mm long; corolla greenish to purplish, the lobes 4-6 mm long; hoods mostly white to yellow, quite variable in form, erect-ascending to divergent, narrowly to very broadly obovoid to rarely somewhat oblong, widening upward to a truncate or oblique rim, mostly broader than long, 2.2-4.2 mm long along the dorsal surface, 1.2-3.8 mm broad across the top, as long as to ca. 1 mm longer than the gynostegium, the horns attached near the middle of the hoods, radially flat, incurved, exerted 0.5-2 mm; anther wings 1.2-1.6 mm long; corpusculum 0.3-0.4 mm long, the pollinia 0.8-1 mm long. FOLLICLES erect on deflexed to spreading pedicels, 3.5-6 cm long. --Sandy desert scrub, grassland, oak and pine woodland: Apache, Cochise, Coconino, Graham, Navajo, Pima, Santa Cruz, Yavapai cos.; 1150-2200 m (3700-7300 ft); Apr-Jul; sw KS to e UT, s to AZ to w TX; s to Dgo., Mex. This species is so variable in pubescence, leaf outline, and crown form, that its distinctiveness has been insufficiently appreciated. In AZ, the dwarfed, spreading habit, more or less erect leaves with short woolly margins, and terminal, bracteate umbels clearly mark it as a cohesive genetic and taxonomic entity. In northern AZ, plants in some populations exhibit one or more of the following character extremes: woolly pubescence, ovate leaves, oblong and upright crown hoods, and larger seeds. Although these have been recognized as *A. involucrata* var. *tomentosa* Eastwood (woolly) [*A. macrosperma* Eastwood], these character states do not consistently correlate, nor are there clear, morphological discontinuities discernable between contrasting conditions. Fruits are reported to be used as chewing gum by the Hopi.

***Asclepias latifolia*** (Torrey) Rafinesque (broad-leaved). Broad-leaved Milkweed. --Stout herbs. STEMS erect or ascending, unbranched, 20-80 cm tall, short woolly to more or less glabrate. LEAVES opposite, subsessile or the petioles to 10 mm long, the blades nearly circular to mostly broadly elliptic, 5-14 cm long, 4-12 cm broad, broadly rounded to subcordate at the base, broadly rounded to truncate or retuse at the apex, apiculate, short woolly when young, in age more or less glabrate on both surfaces. UMBELS lateral at most of the upper nodes, persistently short woolly, (4-)5-8 cm broad, subsessile or the peduncles to 2(-3) cm long. FLOWERS large; calyx lobes ca. 4 mm long; corolla greenish, the lobes 7-10 mm long; hoods whitish to yellow-brown, erect or uncommonly ascending, mostly oblong-quadrate, truncate at the apex, 3-4 mm high, 2-3 mm broad, about as long as the gynostegium, the horns radially flat, fused nearly the full length of the hoods, triangular to sickle-shaped, abruptly incurved and short-exserted; anther wings 2.7-3.2 mm long; corpusculum 0.4-0.5 mm long, the pollinia 1.7-1.9 mm long. FOLLICLES erect on deflexed pedicels, 7-9 cm long.  $2n = 22$ . --Canyons and rocky slopes, desert grasslands, spreading to roadsides: Apache, Cochise, Coconino, Greenlee, Mohave, Navajo, Yavapai cos.; 750-2150 m (2500-7000 ft); Jun-Sep; common on the high plains, less frequent to the w and s; NE to e CA, s to AZ to TX.

***Asclepias lemmonii*** A. Gray (for J. G. Lemmon, collector of type specimen in s AZ in 1881) --Stout herbs. STEMS erect, unbranched, 40-150 cm tall, shaggy pilose. LEAVES opposite, subsessile, the petioles 2-5 mm long, the blades ovate-elliptic, 6-25 cm long, 3-16 cm broad, rounded to shallowly cordate and more or less clasping at the base, rounded to truncate or retuse at the apex, apiculate, pilose to pubescent beneath,

sparsely so above, the margins ciliate. UMBELS subterminal at the uppermost nodes, 5-8 cm broad, the peduncles 3-12 cm long. FLOWERS large; calyx lobes 4-5 mm long; corolla green to purplish outside, greenish inside, the lobes 9-11 mm long; hoods pale pink, erect-spreading, oblong-quadrate in the lower portion, more or less recurved-divergent at the middle, attenuate to the apex, 7-8 mm long along the dorsal surface, 5-8 mm broad at the top, 4-6 mm longer than the gynostegium, the horns radially flat, attached at the base of the hoods, oblong, erect, exerted ca. 1 mm; anther wings 2.5-2.6 mm long; corpusculum 0.4-0.5 mm long, the pollinia 1.6 mm long. FOLLICLES erect on deflexed pedicels, 9-12 cm long. --Canyons and roadsides, open woodlands, mts. of se AZ: Cochise, Pima cos.; 1600-2150 m (5300-7000 ft); Jul-Aug; s to Jal., Mex.

*Asclepias linaria* Cavanilles (flax-like). --Shrubs or suffrutescent perennials, 30-150 cm tall. STEMS erect or ascending, branching, bearing numerous raised leaf scars below, pubescent at least on leafy, younger growth. LEAVES spirally approximate, crowded, sessile, narrowly linear, resembling pine needles, the margins revolute, 1-6 cm long, ca. 1 mm broad, mostly with a few scattered hairs. UMBELS subterminal or lateral at several of the upper nodes, 2-4 cm broad, the peduncles 0.5-2 cm long. FLOWERS small; calyx lobes 2-3 mm long; corolla white and typically pink- or purple-tipped outside, the lobes ca. 4-5 mm long; hoods drying yellow brown, erect or ascending, ovoid, oblong-quadrate in the lower half, narrowed in the middle on the inner face to an attenuate, rounded tip, (2.6-)3-3.6(-4) mm long, 1-1.4 mm broad in the middle, ca. 1-2 mm longer than the gynostegium, the horns attached to about the middle of the hoods, the free portion 0.5-1 mm long, radially flat or subdigitate, erect, scarcely exerted to about the same height as the gynostegium; anther wings 1-1.2 mm long; corpusculum ca. 0.25 mm long, the pollinia ca. 0.8 mm long. FOLLICLES erect or ascending on deflexed pedicels, 3-6 cm long.  $n = 11$ . --Rocky slopes and canyons, mts. of se AZ: Cochise, Gila, Graham, Greenlee, Maricopa, Pima, Pinal, Santa Cruz, Yavapai cos.; 800-1750 m (2600-5800 ft); Feb-Dec; throughout Mex. except Baja C.

*Asclepias macrotis* Torrey (long-eared, referring to the attenuate crown hoods). --Low, suffrutescent perennials, 15-35 cm tall. STEMS numerous, ascending, slender, copiously branched, finely short pubescent in lines above the leaves. LEAVES opposite, sessile, the blades narrowly linear, 2-9 cm long, 0.5-1.5 mm broad, glabrous, the margins revolute. UMBELS lateral at 1 to few of the upper nodes, ca. 2 cm broad, the peduncles 0.1-0.7 cm long. FLOWERS small; calyx lobes ca. 2 mm long; corolla green to purple-tipped outside, greenish inside, the lobes 4-5 mm long; hoods purple below, yellowish white on the sides, undulate and ciliate along the upper margin, broadly rounded at the base, erect-ascending and oblong in the lower portion, recurved-spreading near the middle to an attenuate apex, 4-5 mm long along the dorsal surface, the margins ca. 2 mm high and about as long as the gynostegium, the horns radially flat, attached near the base of the hoods, erect, exerted ca. 1 mm; anther wings 1-1.1 mm long; corpusculum 0.3 mm long, the pollinia 0.6-0.7 mm long. FOLLICLES erect on deflexed pedicels, 4-8 cm long. --Grasslands and open woodlands, mts. of se AZ, often on limestone: Cochise, Pima cos.; 1400-2050 m (4600-6800 ft); Jun-Aug; s CO, NM, w OK, w TX; n Mex.

*Asclepias nummularia* Torrey (money-like, referring to the circular leaves). --Diminutive, densely to sparingly woolly herbs, the plant above ground level 3-12 cm tall. STEMS one to several from the base, erect or ascending. LEAVES opposite, the petioles 1-7 mm long, the blades circular to broadly elliptic, 1.5-5 cm long, 1-5.5 cm broad, obtuse, rounded or subcordate at the base, obtuse to rounded or truncate at the apex, apiculate. UMBELS lateral but overtopping the leaves and appearing terminal, 3-5 cm broad, the peduncles 2-8 cm long. FLOWERS small; calyx lobes 2-3 mm long; corolla purple-pink, the lobes 4-6 mm long; hoods pinkish to yellowish, erect-ascending, obovoid-triangular, widening upward to a truncate apex, 2.2-3 mm long along the dorsal surface, 1.6-2.2 mm broad at the top, about as long as the gynostegium, the horns radially flat, variably attached from the lower to the upper portion of the hoods, triangular to sickle-shaped, abruptly incurved and exerted ca. 1 mm; anther wings 1-1.2 mm long; corpusculum 0.2-0.3 mm long, the pollinia 0.5-0.6 mm long. FOLLICLES erect on deflexed pedicels, 4-6 cm long. --Oak and conifer woodlands, grasslands of se AZ: Cochise, Pima, Santa Cruz cos.; 1200-1600 m (4000-5200 ft); Mar-May;

s NM, w TX; s to S.L.P., Mex.

***Asclepias nyctaginifolia*** A. Gray (leaves resembling those of *Nyctaginia*). --Herbs. STEMS erect to spreading, sparingly branched from near the base, 10-40(-60) cm tall, pubescent more or less in lines above the petioles. LEAVES opposite, the petioles 1-3 cm long, the blades ovate to broadly lanceolate, 3-14 cm long, 2-7 cm broad, the bases broadly obtuse to rounded or truncate, more or less abruptly narrowed to the petiole, obtuse to acute at the apex, pubescent with more or less spreading hairs on both surfaces or infrequently glabrate. UMBELS 1 to many, lateral, 5-8 cm broad, sessile or the peduncles to 2 cm long. FLOWERS large; calyx lobes 3.5-6 mm long; corolla purplish-green, the lobes 12-16 mm long; hoods yellowish to orangish, erect, oblong from a rounded base, more or less dilated above to an oblique or truncate apex, 8-11 mm long, 2-3 mm broad at the top, 4-7 mm longer than the gynostegium, the horns radially flat, attached in the upper half of the hoods, triangular, with a sharp, tooth-like projection exerted ca. 1 mm; anther wings 1.2-1.6 mm long; corpusculum 0.3 mm long, the pollinia 1.2-1.5 mm long. FOLLICLES erect on deflexed pedicels, 5-9 cm long. --Washes, slopes, roadsides of deserts, grasslands, and open woodlands, nw to s AZ: Cochise, Gila, Graham, La Paz, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai, Yuma cos.; 500-2000 m (1600-6500 ft); Apr-Oct; s CA, NM; n Son., Mex.

***Asclepias quinquentata*** A. Gray (five-toothed, referring to the apex of the crown hoods). --Glabrous to sparsely and finely pubescent, erect or bushy herbs. STEMS slender, more or less erect, with secondary shoots ascending and spreading from the lower nodes, 20-60 cm tall. LEAVES opposite, sessile or the petioles 1-2 mm long, the blades linear, 2-14 cm long, 1-5 mm broad, attenuate at apex and base. UMBELS 1 to several from the upper nodes, 2-5 cm broad, the peduncles 1-8 cm long. FLOWERS small; calyx lobes ca. 3 mm long; corolla purplish, the lobes 5-7 mm long; hoods erect-ascending, ovoid, 2.4-3.6 mm long along the dorsal surface, 1.2-2 mm broad at the base, about as long as the gynostegium, the rim conspicuously 5-toothed, the horns radially flat, erect, attached nearly to the top of the hoods, exerted and appearing as a sixth tooth; anther wings 1.5-1.7 mm long; corpusculum 0.5 mm long, the pollinia 0.8-1 mm long. FOLLICLES erect on deflexed pedicels, 11-15 cm long. --Open mt. woodlands with oak, ponderosa pine, and Douglas-fir, mts. of c and se AZ: Cochise, Coconino, Graham, Pima, Santa Cruz, cos.; 1300-2550 m (4300-8300 ft); Jul-Aug; NM; s to S.L.P., Mex.

***Asclepias speciosa*** Torrey (showy). Showy Milkweed. --Stout, pubescent herbs. STEMS erect, unbranched, 40-100 cm tall, densely white woolly to pubescent when young, more or less glabrate below. LEAVES opposite, the petioles 4-10 mm long, the blades ovate to broadly lanceolate, 7-20 cm long, 2-9 cm broad, obtuse to broadly rounded or rarely subcordate at the base, attenuate to an obtuse or acute apex, pubescent above, rather woolly beneath. UMBELS lateral at the upper nodes, 4-9 cm broad, the peduncles 2-11 cm long. FLOWERS large; calyx lobes 4-6 mm long; corolla purplish, the lobes 9-11 mm long; hoods drying yellow-brown, ascending, ovoid-attenuate, more or less abruptly narrowed near the middle, 10-14 mm long, 5-10 mm longer than the gynostegium, the horns attached near the base of the hoods, radially flat, exerted 1-2 mm and incurved over the stigma head; anther wings 2.4-3 mm long; corpusculum 0.7-0.8 mm long, the pollinia 1.3-1.6 mm long. FOLLICLES erect on deflexed pedicels, 11-13 cm long, the surface typically with soft, elongate tubercles.  $2n = 22$ . --Mountain meadows and open woodlands, streamsides, spreading to roadsides and other disturbed sites: Apache, Coconino, Greenlee, Navajo cos.; 1500-2600 m (5000-8500 ft); Jun-Aug; sw Canada, MN to nw TX and w to the Pacific coast. This species bears the largest flowers of the North American milkweeds.

***Asclepias subulata*** Decaisne (awl-shaped, referring to the crown hoods). Rush Milkweed. --Shrubs 80-300 cm tall. STEMS erect or ascending, wand-like, branching above, glabrous, more or less glaucous and grayish green, in age leafless. LEAVES opposite, narrowly linear, 1-5 cm long, deciduous at about the time of early flowering. UMBELS lateral and sometimes approximate at the upper nodes, 3-6 cm broad, the peduncles mostly 0.5-3 cm long, glabrate, the pedicels more or less pubescent. FLOWERS rather large; calyx lobes 2-4 mm long; corolla mostly greenish, the lobes 7-11 mm long; hoods yellowish, erect, oblong,

dilated in the upper portion to a truncate or oblique apex, 5-9 mm long, 2-4 mm broad at the top, 2-5 mm longer than the gynostegium, the horns attached in the upper half of the hoods, radially flat, more or less triangular, with an inwardly pointed, beaklike tip, concealed within the hoods or scarcely exerted; anther wings 2.2-2.8 mm long; corpusculum 0.4-0.5 mm long, the pollinia 1.3-1.6 mm long. FOLLICLES more or less pendulous on spreading to drooping peduncles and pedicels, 8-13 cm long.  $2n = 22$ . --Desert washes and scrub communities: La Paz, Maricopa, Mohave, Pinal, Yuma cos.; 50-850 m (200-2800 ft); all year; s CA, s NV; Baja C., Sin., Son., Mex.

***Asclepias subverticillata*** (A. Gray) Vail (somewhat whorled). Horsetail Milkweed, Poison Milkweed, Whorled Milkweed. --Slender, rather leafy herbs. STEMS erect or ascending, unbranched or branching, frequently also with dwarf, lateral shoots in at least some of the leaf axils, 20-100 cm tall, glabrous or finely pubescent above. LEAVES whorled, mostly 3 or 4 per node, subsessile, the petioles 1-4 mm long, the blades linear, 2-12 cm long, ca. 1-4 mm broad, attenuate and acute at apex and base, essentially glabrous on both surfaces, the margins more or less revolute. UMBELS lateral to subterminally crowded, single or paired at the upper nodes, 2-4 cm broad, the peduncles mostly 1-5 cm long. FLOWERS small; calyx lobes ca. 2 mm long; corolla white, greenish, or grayish purple, the lobes 4-5 mm long; hoods white or yellowish, erect-ascending, quadrate to oblong-obovoid, 1.4-2.4 mm long, 0.8-1.6 mm broad at the truncate to oblique rim, about as long as to 1 mm shorter than the gynostegium, the horns radially flat, attached near the base of the hoods, exerted 1-2 mm and arching over the stigma head; anther wings 1.4-1.6 mm long; corpusculum ca. 0.25 mm long, the pollinia 0.8-1.2 mm long. FOLLICLES erect on erect pedicels, 6-12 cm long. [*A. verticillata* L. var. *subverticillata* A. Gray]. --Open woodlands, grasslands, stream terraces, invading roadsides, pastures, yards and gardens: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Mohave, Navajo, Pima, Santa Cruz, Yavapai cos.; 950-2400 m (3100-7800 ft); Jun-Sep; CO, s ID, NM, w TX, UT; Son. to N.L., s to Dgo., Mex. *Asclepias subverticillata* forms a morphological continuum with *A. fascicularis* Decaisne of the Pacific states and *A. verticillata* of the c and e U.S. and could justifiably be treated as a variety of the latter species.

***Asclepias tuberosa*** L. (bearing tubers). Butterfly-weed, Pleurisy Root. --Pilose herbs. STEMS erect or ascending, branching only in the inflorescence, 20-80 cm tall. LEAVES irregularly alternate, usually crowded, distinctly short-petiolate, the petioles 1-2 mm long, the blades lanceolate, linear-lanceolate or narrowly oblong, 2-10 cm long, 3-15(-22) mm broad, acute apically, acute to mostly obtuse, rounded, truncate, or subhastate at the base, pilose beneath particularly on the veins, pilose to somewhat hirsute above. UMBELS lateral and subterminal, simple to irregularly compound, 3-5 cm broad, typically clustered at the uppermost nodes forming a more or less flat-topped to rounded secondary inflorescence, the peduncles indistinct to mostly 1-6 cm long. FLOWERS of medium size; calyx lobes 2-3 mm long; corolla bright orange or less commonly yellow, the lobes 6-8 mm long; hoods orange to yellow, erect or ascending, lanceolate to oblong, attenuate above the middle to a rounded apex, 4-5.5 mm long, 1-2 mm broad, ca. 1.5-3 mm longer than the gynostegium, the horns attached below the middle of the hoods, digitate, exerted 1-2 mm and more or less arching over the stigma head; anther wings 1.8-2 mm long; corpusculum 0.2-0.3 mm long, the pollinia 1.2-1.4 mm long. FOLLICLES erect on deflexed pedicels, 7-13 cm long.  $2n = 22$ . --3 subsp.; s Ontario; NY to MS, w to MN, SD, UT, AZ; n Mex. One of few North American milkweeds lacking milky sap.

Subsp. *interior* Woodson (of the interior, referring to geographic locality). --Leaf blades lanceolate, linear-lanceolate or narrowly oblong, apically acute. --Chaparral, ponderosa pine, and riparian woodlands, meadows, roadsides; n & e AZ: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Mohave, Navajo, Pima, Santa Cruz, Yavapai cos; 900-2450 m (3000-8000 ft); May-Sep; s Ontario; NH s to FL, w to MN, SD, UT, AZ; n Mex. Subsp. *interior* of c and sw N. Amer. is distinguished by its narrow leaves with obtuse to truncate bases.

***Asclepias uncialis*** Greene (one inch in length). --Dwarf to rather low herbs. STEMS few to several

from the root crown, loosely ascending to decumbent, mostly unbranched, 5-20 cm long, sparsely to densely covered with short curly hairs. LEAVES erect or spreading, opposite to irregularly alternate, the petioles 1-5 mm long, the blades broadly ovate to lanceolate or linear-lanceolate, becoming progressively narrower upwards, 1-5 cm long, 1-25 mm broad, apically rounded or obtuse to mostly attenuate-acute, rounded to obtuse or acute at the base, the margins short woolly, the upper and lower surfaces short woolly to glabrous, the veins typically persistently pubescent. UMBELS 1 to several, sessile to infrequently short-pedunculate, lateral at the upper nodes, more or less crowded, but (at least on older plants) not simulating a solitary, terminal inflorescence, 1-4 cm broad. FLOWERS small; calyx lobes 2-4 mm long; corolla purple, the lobes 3-6 mm long; hoods yellowish to pinkish, mostly erect, hemispheric to somewhat oblong, 1.2-2.1 mm long, 1-2.1 mm broad, the rim truncate with a more or less well developed pair of triangular marginal lobes, about as long as to 1 mm shorter than the gynostegium, the horns attached mostly near the middle of the hoods, tangentially flat to subdigitate, 0.5-1.5 mm long, included to scarcely exerted; anther wings 1.1-1.7 mm long; corpusculum ca. 0.2-0.3 mm long, the pollinia 0.5-0.7 mm long. FOLLICLES erect on deflexed to spreading pedicels, 4-6 cm long. --A poorly understood, variable complex of intergrading morphological phases, known from rather widely scattered localities on the high deserts and dry plains of AZ, CO, NM, NV, w OK and UT.

Var. *uncialis* --STEMS to 5-10 cm long; leaf blades lanceolate, grading to linear above, pubescent only on the margins and veins. FLOWERS relatively small, the corolla lobes 3-4 mm long, the column 0.4-0.6 mm high, the anther wings 1.1-1.4 mm long; hoods with the marginal lobes well developed, the horns tangentially flat, ovate. --Known in AZ from two collections: White Mts. near Springerville, Apache Co. and foothills of Patagonia Mts. near Sonoita, Santa Cruz Co.; open woodlands, high desert scrub; 1500-2150 m (5000-7000 ft); Mar-May; CO, w NM, w OK.

Var. *ruthiae* (Maguire) Sundell (for Ruth Maguire). --STEMS mostly to 10-20 cm long; leaf blades mostly ovate, broadly elliptic or circular, grading to narrowly ovate or broadly lanceolate above, the margins short woolly, the upper and lower surfaces short woolly to glabrous. FLOWERS relatively large, the corolla lobes 4-6 mm long, the column 0.6-0.8 mm high, the anther wings 1.3-1.7 mm long; hoods with the marginal lobes indistinct to moderately developed, the horns subdigitate. [*A. ruthiae* Maguire, *A. sanjuanensis* Heil, Porter & Welsh]. --Known in AZ from two collections: Red Mesa, Apache Co. and s of Navajo Bridge, Coconino Co.; desert scrub and pinyon-juniper communities; 1100-1900 m (3600-6300 ft); Apr-Jun; nw NM, se UT.

*Asclepias viridiflora* Rafinesque (green-flowered). --Pubescent herbs. STEMS erect or ascending, typically unbranched, 10-50 cm tall. LEAVES opposite to irregularly alternate, the petioles 2-7 mm long, the blades narrowly lanceolate to linear, 5-14 cm long, 2-17 mm broad, attenuate to an acute apex, acute to obtuse at the base. UMBELS lateral at 1 to few of the upper nodes, 3-4 cm broad, the peduncles 0.4-1.5 cm long. FLOWERS small; calyx lobes 3-4 mm long; corolla greenish, the lobes 5-7 mm long; hoods greenish yellow, erect and appressed to the anthers, ellipsoid-oblong, obtuse-rounded at the top, 2.8-3.8 mm long, 1-1.3 mm broad in the middle, ca. 1 mm shorter than the gynostegium, the horns absent; anther wings 2-2.6 mm along their entire length, the upper portion 1.4-1.7 mm long; corpusculum 0.3-0.4 mm long, the pollinia conspicuously long attenuate above, 1.6-2 mm long. FOLLICLES erect on deflexed pedicels, 7-15 cm long.  $2n = 22$ . --Open pine forests; apparently rare: Coconino, Yavapai cos.; 1600-2150 m (5300-7000 ft); May-Aug; more common in the e and c U.S.; CT to GA, w to MT, WY, CO and AZ; s Can. Leaf position and outline are tremendously variable in this species.

*Asclepias welshii* N. Holmgren & P. Holmgren (for Stanley Welsh). --Stout herbs. STEMS erect or ascending, unbranched, 20-100 cm tall, densely woolly above, glabrate below. LEAVES opposite, the principal ones with petioles to 7 mm long, the blades (ob)ovate to mostly broadly oblong-elliptic, 6-11 cm long, 4-8 cm broad, rounded at the base, obtuse to mostly rounded-truncate at the apex, apiculate, densely woolly when young, becoming glabrous especially beneath. UMBELS lateral at the upper nodes, compactly-flowered, ca. 3-4 cm broad, the peduncles 2-4 cm long. FLOWERS large; calyx lobes 6-8 mm long; corolla cream with a rose tinge, the lobes 6-7 mm long; hoods cream, ascending, widening upward to a truncate

apex, 3-4 mm long, ca. 2 mm broad at the top, ca. 1 mm longer than the gynostegium, the horns radially flat, attached to about the middle of the hoods, sickle-shaped, abruptly incurved and more or less horizontally exerted 1-1.5 mm over the stigma head; anther wings prominently projected outward near the middle, the upper portion 1.4 mm long, the lower portion slightly shorter; corpusculum 0.4 mm long, the pollinia ca. 1.1 mm long. FOLLICLES spreading to pendulous on spreading pedicels, 4-7 cm long, bearing soft, subulate tubercles. --Known in AZ from a single collection from the Arizona/Utah state line, Coconino/Kane cos. Endemic to Kane Co., UT, and adjacent AZ, where it is locally common on sand dunes in sagebrush, juniper, pine, and oak communities; 1700-1900 m (5600-6200 ft); Jun-Jul.

### *Cynanchum* L. Milkweed Vine, Climbing Milkweed

Herbaceous to suffrutescent, twining vines. STEMS sparsely pubescent to glabrous, nonglandular. LEAVES opposite. INFLORESCENCES few-flowered, racemose or umbelliform cymes. FLOWERS showy to very small; corolla rotate to campanulate, in ours concealing the gynostegium and much of the crown; crown absent or well developed and arising from the region of union of the corolla and filaments, cup-shaped to tubular and variously lobed or of 5 united or distinct, dorsiventrally flat, petaloid segments, typically opposite the anthers; anther head sessile, the column short and thick, the anther wings flaring outward at the base giving the anther head a truncate-conic form; pollinia pendulous from the translator arms; stigma head apically flat to rounded or beaked. FOLLICLES smooth or striate.  $2n = 22, 24, 44$ . --Ca. 150 spp.; mostly in the warmer regions of both hemispheres (Greek: *kyon* = dog + *anchein* = to strangle, the name of some ancient plant supposed to poison dogs). Sundell, E. 1981. *Evol. Monographs* 5:1-63.

1. Leaves cordate, to 13 cm long; flowers 9-11 mm long, the crown segments united into a ring 1-2 mm high ..... *C. ligulatum*
- 1' Leaves oblong to linear, to 5 cm long; flowers 3-4 mm long, the crown absent or the crown segments distinct.
  2. Peduncles ca. 1 mm or less long; corolla lobes longer than the tube, reflexed; crown of 5 distinct segments; seeds ca. 5-7 mm long, brown.
  3. Leaves oblong (or the margins revolute and the leaves appearing linear), to 3 cm long; corolla lobes densely pilose within; crown segments linear-lanceolate; anther membranes ca. 0.5 mm long, shorter than the erect portion of the corolla lobes; apex of the stigma head rounded, about equaling the crown segments ..... *C. arizonicum*
  - 3' Leaves linear, to 5 cm long; corolla lobes very short hairy near the tips within, becoming pilose only toward the base; crown segments elliptic; anther membranes ca. 1 mm long, about equalling the erect portion of the corolla lobes; apex of the stigma head prolonged into a cylindrical beak longer than the crown segments ..... *C. wigginsii*
- 2' Peduncles 10-20 mm long; corolla lobes shorter than the tube, inflexed; crown absent; seeds 10-12 mm long, olive green ..... *C. utahense*

*Cynanchum arizonicum* (A. Gray) Shinnars (of Arizona). --STEMS pubescent in lines above the petioles. LEAVES oblong (the revolute margins often giving a linear appearance, especially in dried material), 0.6-3 cm long, 0.3-0.5 cm broad, glabrous, sparsely pubescent to glabrate on the midvein above and beneath, the margins sparsely ciliate; petioles pubescent above, 2-3 mm long. INFLORESCENCES subsessile, umbelliform, ca. 1 cm across. FLOWERS 3-4 mm long; calyx lobes ca. 2 mm long; corolla whitish to yellowish, campanulate, the tube ca. 1 mm long, the lobes narrowly ovate, 2-4 mm long, densely pilose inside, the tips recurved; crown segments distinct, 1-2 mm long, erect, linear-lanceolate, slightly surpassing the stigma-head; anther wings ca. 0.4 mm long; corpusculum 0.2 mm long, the pollinia oblanceolate, ca. 0.25 mm long; stigma head apically rounded. FOLLICLES 3-6(-7) cm long. [*Metastelma arizonicum* A. Gray; *M. watsonianum* Standley]. --Rocky slopes and canyons of desert mt. ranges: Maricopa, Pima, Pinal cos.; 450-1350 m (1500-4500 ft); all year (mostly May-Oct); Son., Mex.

*Cynanchum ligulatum* (Bentham) Woodson (strap-shaped, referring to the tips of the crown segments).

--Stems pubescent in lines above the petioles. LEAVES ovate-cordate, 2-13 cm long, less than 2 times longer than broad, glabrate above, sparsely pubescent on the veins beneath; petioles pubescent above, shorter than to about as long as the blades. INFLORESCENCES racemose, tardily elongating to ca. 6 cm, the peduncles mostly 1-3 cm long. FLOWERS 9-11 mm long; calyx lobes 3-5 mm long; corolla white (in ours), broadly open-campanulate, the tube 2-3 mm long, the lobes oblong, spreading-recurved, 6-9 mm long, sparsely pubescent inside; crown whitish, 8-9 mm long, the segments 6-8 mm long, erect and conspicuous, ovate with attenuate-ligulate tips exerted ca. 4-5 mm beyond the stigma-head, united at their base into a ring 1-2 mm high; anther wings ca. 1 mm long; corpusculum ca. 0.3 mm long, the pollinia ovoid-ellipsoid, ca. 0.4 mm long; stigma head apically rounded. FOLLICLES 8-9 cm long. [*Mellichampia sinaloensis* (T.S. Brandege) Kearney & Peebles]. --Known only from the Baboquivari Mts., Pima Co., and between Nogales and Patagonia, Santa Cruz Co.; Aug; w Mex. s to Mich., Mor., Oax. Flowers in the southern part of the range are generally larger, with striking maroon corollas.

***Cynanchum utahense*** (Engelmann) Woodson (of Utah). --Stems pilose at base, glabrous upwards or sparsely pubescent at the nodes. LEAVES linear, 1-6 cm long, ca. 0.2 cm broad, more or less revolute, glabrous above, sparsely pubescent to glabrate below, the margins sparsely ciliate; petioles absent or indistinct. INFLORESCENCES umbelliform, ca. 1 cm across, the peduncles mostly 1-2 cm long. FLOWERS ca. 3-4 mm long; calyx lobes 1-2 mm long; corolla yellowish, cylindric-campanulate, the tube 2-3 mm long, pubescent inside, the lobes incurved and hooded, their tips more or less closing the corolla tube; crown absent; anther wings 0.5-0.6 mm long; corpusculum 0.3-0.4 mm long, the pollinia oblong-obovate, ca. 0.4 mm long; stigma head apically rounded. FOLLICLES ca. 6-7 cm long. [*Astephanus utahensis* Engelmann]. --Deserts of w AZ, sand dunes: La Paz, Mohave cos.; 150-900 m (500-3000 ft); Apr-Jun; se CA, s NV, sw UT.

***Cynanchum wigginsii*** Shinnery (for Ira Wiggins). --Stems pubescent in lines above the petioles. LEAVES linear, the margins more or less revolute, 1.5-5 cm long, mostly 0.2-0.3 cm broad, sparsely pubescent to glabrate on the midvein above, glabrous beneath, the margins sparsely ciliate; petioles pubescent above, mostly 3-5 mm long. INFLORESCENCES subsessile, umbelliform, ca. 1 cm across. FLOWERS ca. 3 mm long; calyx lobes ca. 3 mm long; corolla whitish to yellowish, broadly campanulate, the tube ca. 1 mm long, the lobes ovate, ca. 3 mm long, short pilose inside toward the tips, the hairs becoming longer and bristle-like below opposite the anther wings, the tips recurved; crown segments distinct, 1.5 mm long, erect, elliptic, shorter than the stigma-head; anther wings ca. 0.4 mm long; corpusculum 0.25 mm long, the pollinia oblong, 0.3 mm long; stigma head apically projected into a cylindrical beak. FOLLICLES 4-7 cm long. [*Basistelma angustifolium* (Torrey) Bartlett]. --Rocky slopes and canyons, oak woodlands: desert mt. ranges of Cochise and Santa Cruz cos.; 1050-1700 m (3500-5500 ft); Aug-Oct; sw NM; Son., Mex.

#### Matelea Aublet Milkweed Vine, Angle-pod

Perennial herbs or subshrubs, with vegetative parts more or less conspicuously hairy and frequently glandular. STEMS twining or prostrate to strictly erect. LEAVES opposite, in ours petiolate, ovate to lanceolate and mostly cordate at the base. INFLORESCENCES 1- to several-flowered racemose, umbelliform, or irregular cymes, mostly sequentially blooming. FLOWERS showy to rather small; corolla rotate to campanulate, mostly dull colored in shades of white, green, yellow or purple; crown extremely variable, in ours arising near the region of union of the corolla and filaments and more or less concealed by the corolla, ring- or cup-shaped and variously undulate to lobed or of 5 distinct, dorsiventrally flat to somewhat infolded segments opposite the anthers; anther head in ours subsessile or the column to 2 mm high, mostly disk- to funnel-shaped, the anther wings more or less curving down beneath the anther head; pollinia horizontal or less typically pendulous from the translator arms, with a sterile, hyaline area at the junction with the arm; stigma head flat to variously beaked. FOLLICLES smooth, winged, or warty. --Ca 250 spp.; in warm temperate and tropical regions of N. and S. Amer. A taxonomically little-studied group exhibiting varied and perplexing elaborations of the crown, corolla, and stigma head, and often divided into several dozen segregate genera.

1. Stems erect, not twining; corolla lobes densely and prominently matted-hirsute inside; mature follicles with a dense covering of long straight hairs and shorter glandular trichomes ..... *M. balbisii*
- 1' Stems twining, at least toward the tips; corolla lobes glabrous inside or merely pilose toward the base; mature follicles glabrous to glabrate.
  2. Leaves small, to 2 cm long; peduncles 1-2 mm long; flowers ca. 5 mm long ..... *M. parvifolia*
  - 2' Leaves relatively large, mostly 2-9 cm long; peduncles mostly 10-50 mm long; flowers 8-20 mm long.
  3. Stems glandular; follicles unwinged.
    4. Corolla lobes about as long as the tube; stigma head apically flat, depressed in the center; stems glandular with mostly yellow- to brown-tipped trichomes ..... *M. producta*
    - 4' Corolla lobes about twice as long as the tube; stigma head projected apically 1-2 mm into a fluted column capped by an irregularly crested knob; stems glandular with mostly white-tipped trichomes ..... *M. cordifolia*
    - 3' Stems non-glandular; follicles 5-winged ..... *M. arizonica*

**Matelea arizonica** (A. Gray) Shinnars (of Arizona). --Densely pilose, non-glandular, twining vines. LEAVES lanceolate to ovate, the bases deeply to shallowly cordate to subsagittate, 2-9 cm long; petioles 1-5 cm long, shorter than the blades. INFLORESCENCES irregularly umbelliform to racemose, the peduncle tardily elongating to 3-4 cm. FLOWERS 8-10 mm long; calyx lobes 4-6 mm long, somewhat longer than the corolla tube; corolla yellowish to white, green-veined on the lobes within, campanulate, the tube ca. 4-5 mm long, the lobes oblong, spreading-erect, about as long as the tube, hirsute to pilose outside and pilose toward the base inside; crown included within the corolla tube from which it arises and to which it is fused for ca. 1 mm, fleshy and cup-shaped, ca. 1.5 mm long on the inner surface and about equalling the base of the anther head, the rim free of the corolla for ca. 0.5 mm, undulate, the inner surface with 5 vertical ridges terminating at the rim in 5 pairs of knoblike lobes opposite the anthers; gynostegium elevated, the column ca. 2 mm high, the anther head funnel-shaped, slightly exserted from the corolla tube, the anther wings ca. 1 mm long; corpusculum 0.25 mm long, the pollinia pendulous from the translator arms, obovate, ca. 0.8 mm long with the upper 0.3 mm sterile and transparent; stigma head apically flat, depressed in the center. FOLLICLES 8-11 cm long, glabrous, prominently 5-winged. [*Lachnostoma arizonicum* A. Gray]. --Canyons and stream beds, desert mt. ranges of se AZ: Graham, Pima, Santa Cruz cos.; 900-1350 m (3000-4500 ft); Jul-Nov; Son., Mex.

**Matelea balbisii** (Decaisne) Woodson (for G. B. Balbis). --Densely hirsute, erect herbs to 50 cm tall, the long straight hairs mixed with shorter, glandular, typically dark-tipped trichomes. LEAVES ovate to orbicular below, more or less grading to lanceolate or elliptic above, the bases subcordate to rounded, 2-10 cm long; petioles 0.8-2(-4) cm long, less than one-third as long as the blades. INFLORESCENCES umbelliform, the peduncles 2-5 mm long. FLOWERS ca. 6 mm long; calyx lobes 3-4 mm long, 1-2 mm longer than the corolla tube; corolla whitish to yellowish-green, hirsute outside, densely matted-hirsute inside, campanulate, the tube 2-3 mm long, the lobes ovate-triangular, spreading-erect, ca. 4 mm long; crown arising from the region of union of the corolla tube and filaments, of 5 distinct, obovate-elliptic segments opposite the anthers, 1.2-2 mm long, 1-1.5 mm broad, about as long as the stigma head, broadly retuse at the apex with rounded lateral lobes, the margins more or less folded inward at the base; gynostegium subsessile, the anther head disk-shaped, the anther wings ca. 0.2 mm long; corpusculum ca. 0.25 mm long, the pollinia horizontal from the translator arms, asymmetrically obovate, 0.3-0.4 mm long; stigma head apically projected into a cylindrical protuberance ca. 1 mm long and broad. FOLLICLES pendulous on deflexed pedicels, 6-10 cm long, hirsute and glandular. [*Pherotrichis balbisii* (Decaisne) A. Gray]. --Known in AZ only from the Huachuca Mountains: Cochise Co.; open woodlands, chaparral; 1050-2300 m (3500-7500 ft); Jun-Oct; Mex. s to Guatemala.



**Matelea cordifolia** (A. Gray) Woodson (heart-leaved). --Densely hirsute to pilose, twining vines, the long straight hairs mixed with shorter, glandular, typically white-tipped trichomes. LEAVES cordate, the apex attenuate to abruptly apiculate, 3-9 cm long; petioles 2-7 cm long, mostly somewhat shorter than the blades. INFLORESCENCES irregularly cymose, from umbelliform to racemose-paniculate, the peduncles tardily elongating to 2-5 cm. FLOWERS ca. 1-2 cm long; calyx lobes 4-6 mm long, about equal to the corolla tube or slightly shorter; corolla white or tinged with green or light rose, sparsely short-hairy on the tube outside, glabrous inside, rotate-ascending, the tube ca. 3-5 mm long, the lobes oblong, spreading-erect, 7-13 mm long, mostly about twice as long as the tube; crown included within the corolla tube, arising from the column, of 5 distinct, fleshy, rectangular-saccate segments opposite and appressed to the anthers, ca. 0.5-1 mm high, 1-2 mm broad, about as long as the anther head, apically truncate and bidentate to erose toward the middle, the margins more or less folded inward; gynostegium scarcely elevated, the column 0.5-1 mm high, the anther head disk-shaped, the anther wings indistinct; corpusculum 0.1-0.2 mm long, the pollinia pendulous from the sharply bent translator arms, obovate, 0.4-0.5 mm long; stigma head apically projected 1-2 mm into a fluted column capped by an irregularly crested knob. FOLLICLES 10-13 cm long, glabrous. [*Rothrockia cordifolia* A. Gray]. --Ajo Mts., Pima Co.; 1500 m (5000 ft); Aug-Nov; Son., Baja C., Mex.

**Matelea parvifolia** (Torrey) Woodson (small-leaved). --Pubescent, non-glandular twining vines from a woody base, the hairs of the stems curving downward. LEAVES ovate- to lanceolate-triangular, subcordate to hastate-sagittate at the base, 0.5-2 cm long, pubescent on both surfaces or the hairs restricted to the veins below; petioles to 1 cm long, shorter than the blades. INFLORESCENCES umbelliform or the flowers appearing solitary, the peduncles indistinct to 1-2 mm long. FLOWERS ca. 4-5 mm long; calyx lobes 2-3 mm long, equalling or a bit longer than the corolla tube; corolla greenish to purple, sparsely pubescent to glabrate outside, pilose toward the base of the lobes inside, hemispherical, the tube 1-2 mm long, the lobes triangular-ovate, erect, ca. 3 mm long; crown arising from the corolla tube, cup-shaped, undulate-spreading, ca. 0.5 mm long, highest opposite the anthers where it about equals the column, the inner surface with 5 spoke-like ridges united to the column and dividing the cup into 5 pouches opposite the corpuscula; gynostegium elevated, the column ca. 1 mm high, the anther head disk-shaped, the anther wings ca. 0.2 mm long; corpusculum 0.2 mm long, the pollinia horizontal from the translator arms, oblong-quadrate, 0.3-0.4 mm long; stigma head apically flat. FOLLICLES 6-9 cm long, glabrate, sparsely warty. [*Gonolobus parvifolius* Torrey, *G. californicus* Jepson]. --Desert scrub, mts. and canyons: Gila, Maricopa, Mohave, Pima, Pinal, Yavapai, Yuma cos.; 450-1350 m (1500-4500 ft); Oct-Jun; s CA to w TX; n Mex.

**Matelea producta** (Torrey) Woodson (extended or elongated). --Hirsute to pubescent, twining vines from a woody base, the hairs mixed with shorter, glandular, mostly yellow- to brown-tipped trichomes. LEAVES cordate to subhastate, more or less abruptly narrowed to an attenuate tip, 1-9 cm long; petioles 1-3 cm long, shorter than the blades. INFLORESCENCES umbelliform, the peduncles tardily elongating to 3 cm. FLOWERS ca. 1 cm long; calyx lobes ca. 3 mm long, half as long as the corolla tube; corolla greenish yellow, pubescent outside, glabrous inside, cylindric-campanulate, the tube 4-7 mm long, the lobes oblong, erect, about as long as the tube, the tips spreading; crown included deep within the corolla tube and arising from it, cup-shaped, 1-2 mm long, about as long as the stigma head, the rim entire and undulate to mostly notched opposite the corpuscula, the inner surface with 5 fleshy protuberances opposite the anthers; gynostegium subsessile, the anther head disk-shaped, the anther wings ca. 0.25 mm long; corpusculum 0.2-0.3 mm long, the pollinia horizontal from the translator arms, deltoid to oblong-quadrate, ca. 0.4 mm across; stigma head apically flat, depressed in the center. FOLLICLES 9-12 cm long, glabrous. [*Gonolobus productus* Torrey]. --Desert grasslands, chaparral, alluvial thickets, mts. of w, c, and s AZ: Cochise, Gila, Graham, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai cos.; 900-1700 m (3000-5500 ft); May-Aug; s NM, w TX; w Mex. s to Zac.

**Sarcostemma** R. Brown Milkweed Vine, Climbing Milkweed

Suffrutescent, twining vines. STEMS pubescent to glabrous, non-glandular. LEAVES opposite.

INFLORESCENCES in ours umbelliform on well developed peduncles, with 5-30 flowers opening synchronously. FLOWERS rather showy; corolla broadly cup-shaped to rotate; crown double, of a low ring arising from the corolla tube and 5 distinct, turgid segments (vesicles) arising from the column below each anther, in ours about as long as the gynostegium; anther head more or less elevated on a distinct column, the anther wings flaring outward at the base giving the anther head a truncate-conic form; pollinia pendulous (to slightly divergent) from the translator arms, oblong to oblong-elliptic; stigma head apically rounded and indistinctly 2-lobed. FOLLICLES striate, the seeds in ours papillate at least on the placental surface.  $2n = 22$ . --Ca. 35 spp.; in the warmer regions of both hemispheres, preferring more or less arid habitats, and including several leafless succulents of the Old World deserts (Greek: *sarx* = flesh + *stemma* = wreath or garland, referring to the fleshy inner crown segments). Holm, R. 1950. Ann. Missouri Bot. Gard. 37: 477-560.

1. Stems and leaves densely short pilose; leaf blades obtuse to attenuate at the base; crown ring adnate to the base of the vesicles ..... *S. hirtellum*
- 1' Stems and leaves appressed pubescent to glabrate; leaf blades cordate, sagittate, hastate or truncate (rarely obtuse) at the base; crown ring free from the vesicles.
  2. Column ca. 2 mm high, elevating the crown vesicles and anther head ca. 1 mm above the crown ring; calyx lobes lanceolate, more than 3 times longer than wide; leaf blades pubescent, the midvein more or less whitened with a mat of hairs above, the margins more or less undulate; stems persistently pubescent, rarely glabrate ..... *S. crispum*
  - 2' Column ca. 0.5-1 mm high, elevating the crown vesicles and anther head to about the level of the crown ring; calyx lobes ovate, less than 3 times longer than wide; leaf blades sparsely pubescent to glabrate, the midvein at most pubescent above, the margins flat; stems soon glabrate ..... *S. cynanchoides*

*Sarcostemma crispum* Benth (curled, referring to the undulate leaf margins). --STEMS with downward curving hairs. LEAVES lanceolate to mostly narrowly lanceolate to linear, hastate or sagittate to truncate at the base, attenuate to the apex, the margins (especially of younger leaves) more or less conspicuously undulate, 3-10 cm long, pubescent above, the midvein often whitened by a mat of hairs, the lower surface somewhat more sparsely hairy, the petioles 2-15 mm long. UMBELS 4-10 flowered, the peduncles mostly 1-5 cm long, the pedicels with mostly curved or appressed hairs. FLOWERS 6-10 mm long; calyx lobes lanceolate-attenuate, 2.5-5 mm long, more than 3 times longer than wide, pubescent both outside and toward the tips inside; corolla broadly cup-shaped, green to purplish and pubescent outside, dark purple (rarely green), smooth and glabrous inside, or minutely hairy at the base of the crown ring, the tube ca. 2-3 mm long, the lobes oblong to ovate-elliptic, 5-9 mm long; crown ring free from the base of the vesicles, 0.6-1.1 mm high, the vesicles arising from the column ca. 1 mm above its union with the corolla tube, ca. 1.5 mm long in the upper portion, mostly as broad as or broader than long, flattened at the top and saccate below on the tangential surface, the lower portion constricted to a stalk-like base; column well developed, ca. 2 mm high beneath the anther wings, these 0.8-1 mm long; corpusculum ca. 0.25 mm long, the pollinia 0.7-0.9 mm long. FOLLICLES single, lanceolate-fusiform, long attenuate, 9-16 cm long. [*Funastrum crispum* (Benth) Schlechter]. --Mt. ranges, nw to se AZ: Cochise, Gila, Graham, Mohave, Pima, Pinal, Santa Cruz, Yavapai cos.; 900-1600 m (2900-5200 ft); Apr-Aug; s CO to w OK, s to S.L.P., Mex.

*Sarcostemma cynanchoides* Decaisne (*Cynanchum*-like). --STEMS glabrate or sparsely pubescent at the nodes. LEAVES ovate to mostly lanceolate or linear, cordate to hastate, sagittate or truncate at the base, rarely obtuse, the margins flat, 1-8(-10) cm long, sparsely pubescent to glabrate on both surfaces, the petioles 0.2-4 cm long. UMBELS 5-30 flowered, the peduncles mostly 1-6 cm long, the pedicels with spreading or curved hairs. FLOWERS 5-7 mm long; calyx pubescent to subpilose, the lobes ovate to ovate-elliptic, mostly 2-3 mm long, less than 3 times longer than broad; corolla rotate to broadly cup-shaped, bright purplish to white, pubescent outside, minutely so inside, the tube 1.5-2.5 mm long, the lobes ovate to ovate-

triangular, 4-6 mm long; crown ring free from the base of the vesicles, 0.2-0.5 mm high, the vesicles arising from a short column less than 1 mm above its union with the corolla tube, ca. 1.5-2.5 mm long in the upper portion, longer than broad, rounded at the top and smoothly contoured on the tangential surface, indistinctly constricted at the base; column 0.5-1 mm high beneath the anther wings, these 1-1.2 mm long; corpusculum ca. 0.2 mm long, the pollinia 0.7-0.8 mm long. FOLLICLES single, lanceolate-attenuate, 6-12 cm long. -Our most common and variable desert milkweed. 2 subspp., whose ranges meet in c and se AZ.

Subsp. *cynanchoides* --Leaves ovate to broadly lanceolate, to 3-4 times as long as broad, the bases cordate, the petioles mostly 1-4 cm long; flowers predominantly white; follicles mostly 6-8 cm long. [*Funastrum cynanchoides* (Decaisne) Schlechter]. --Flood plains, canyons, disturbed sites, nc to se AZ: Cochise, Coconino, Graham, Pima, Pinal, Santa Cruz, Yavapai cos.; 750-1200 m (2400-4000 ft); Jul-Nov; NM, OK, TX; n Mex.

Subsp. *hartwegii* (Vail) R. Holm (for T. Hartweg). --Leaves lanceolate to mostly narrowly lanceolate or linear, more than 3-4 times as long as broad, sagittate to hastate, truncate or rarely obtuse at the base, the petioles mostly to 1 cm long; flowers purplish; follicles 7-10(-12) cm long. [*Funastrum heterophyllum* (Engelmann) Standley]. --Desert washes and slopes, canyons, floodplains, disturbed sites: nearly throughout the state, unrecorded only from Apache and Greenlee cos.; 150-1700(-2050) m (500-5500(-6800) ft); Mar-Dec; s CA and s UT to s NM, sw TX; s in Mex. to Baja C. Sur, Jal. and Qro.

*Sarcostemma hirtellum* (A. Gray) R. Holm (short-hirsute). --STEMS canescent, densely short-pilose. LEAVES linear to narrowly lanceolate, obtuse to attenuate at the base, 0.8-4.5 cm long, the petioles indistinct to 5(-7) mm long. UMBELS 6-18 flowered, the peduncles ca. 1-6 cm long. FLOWERS ca. 4 mm long; calyx lobes ca. 3 mm long; corolla broadly cup-shaped to rotate, cream colored to pink or purplish, short pilose outside, glabrous to minutely pubescent inside, the tube ca. 2 mm long, the lobes triangular-ovate, ca. 4 mm long; crown ring adnate to the base of the vesicles, these ca. 1.5 mm long; column ca. 0.5 mm high beneath the anther wings, these 0.8-1 mm long; corpusculum ca. 0.25 mm long, the pollinia 0.4-0.5 mm long. FOLLICLES single or paired, narrowly lanceolate, attenuate, 3-6 cm long, canescent and short pilose. [*Funastrum hirtellum* (A. Gray) Schlechter]. --Desert washes, lake shores, roadsides: Coconino, La Paz, Mohave cos.; 150-900 m (500-3000 ft); Feb-May; se CA, s NV. Endemic to the Mohave and Colorado Deserts.

#### ACKNOWLEDGMENTS

Appreciation is expressed to Page Castile and Dennis Scogin for their help with the illustration and to the administrators of the following herbaria who made their collections of Asclepiadaceae available for study: A, ARIZ, ASC, ASU, CAS, CM, COLO, CS, DES, DS, F, G, GH, ISC, K, MNA, MO, NMC, RSA, NY, UC, UNM, and US. Research on this project was facilitated by a Faculty Research Grant from the University of Arkansas at Monticello.