

RUBIACEAE MADDER FAMILY

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Annual or perennial herbs, shrubs, vines or trees. LEAVES entire, generally opposite; sometimes appearing whorled because the stipules are leaf-like. INFLORESCENCE cymose, or paniculate, flowers in heads, clusters, or solitary. FLOWERS actinomorphic, perfect, sometimes functionally imperfect; sepals 4-5(-6), united, the lobes sometimes reduced or obsolete; petals (3-)4-5, united; stamens epipetalous, alternate with corolla lobes; ovary inferior, 2-4-loculed, the style 1, sometimes bifid. FRUIT of 2-4 nutlets, or berries, drupes, or capsules. --Ca. 500 genera, ca. 6000 spp.; world-wide, especially tropical. Many cultivated, including *Coffea*, (coffee), *Cinchona*, (quinine), and many ornamentals.

1. Shrubs to 10 m high.
 2. Flowers sessile, congested in spherical heads *Cephalanthus*
 - 2' Flowers pedicellate, not in heads.
 3. Corolla rotate, whitish, 2 mm across *Galium stellatum*
 - 3' Corolla tubular or salverform, red, 17-35 mm long *Bouvardia*
- 1' Herbs (or suffrutescent), to 60 cm high.
 4. Ovule 1 in each carpel; fruit indehiscent nutlet or circumscissile capsule.
 5. Leaves opposite.
 6. Flowers long-pedicelled in lax few-flowered cymes; stipules small, mostly entire, separate from leaf bases *Kelloggia*
 - 6' Flowers sessile, clustered at nodes; stipules fimbriate, forming a sheath with leaf bases.
 7. Fruit a circumscissile capsule *Mitracarpus*
 - 7' Fruit not circumscissile, the carpels separating by longitudinal cleavage.
 8. Sepals not united, usually persistent on mature fruit *Diodia*
 - 8' Sepals united at base, deciduous before or at maturity of fruit *Crusea*
 - 5' Leaves in apparent whorls.
 9. Calyx of 6 teeth; flowers sessile in few-flowered heads, subtended by deeply divided involucre *Sherardia*
 - 9' Calyx absent; flowers solitary or in cymules, or panicles of cymules; involucre none *Galium*
 - 4' Ovules and seeds several in each carpel or locule; fruit capsular, 2-loculed.
 10. Small annuals; corollas 1-3 mm long, white or only the lobes purplish; seeds either obtusely 3-angled or with a hilar ridge in an oblong concavity *Hedyotis*
 - 10' Small annuals or perennials; corollas 3.5-41 mm long, purple, pink, reddish, rose, or white; seeds either subglobose with an interior hilar cavity or with a hilar ridge in a saucer- or cup-shaped concavity *Houstonia*

Bouvardia Salisb.

Small shrubs (rarely perennial herbs). LEAVES simple, sometimes whorled, the stipules subulate. FLOWERS in terminal cymes, perfect; calyx 4-lobed, the lobes persistent; corolla long-tubular or salverform, with 4 spreading lobes; stamens 4, attached in tube or throat; styles included or exerted; stigmas 2. FRUIT a 2-loculed loculicidal capsule. --ca. 50 spp. From AZ, NM, and TX through Mex. and C. Amer. to n S. Amer. (for Charles Bouvard).

Bouvardia ternifolia (Cav.) Schldl. (three-leaved). Scarlet Bouvardia, Trompetilla, Clavillo. --Shrubs or suffrutescent herbs to 1.5 m high. LEAVES 3-4 per node, glabrous or velvety, 2-9 cm long, short-

petiolate; blades ovate to lanceolate, the apices acuminate to long-attenuate, the margins scabrous; stipular sheath long cuspidate to multi-aristate. FLOWERS few to many in cymes, villous outside with short coarse hairs; calyx lobes lanceolate to filiform, erect; corolla tube slender, widening toward throat, red, 15-32 mm long, the lobes ovate, 2-3 mm long; stamens mostly included, the anthers subsessile, 2.5-3 mm long; styles filiform, more or less exerted at maturity. FRUIT a didymous-globose capsule, 5-7 mm broad, the calyx lobes persistent. SEEDS numerous, compressed-winged, brown. [*B. glaberrima* Engelm.]. --Rocky slopes and canyon bottoms; pine-oak and juniper-oak woodlands; oak chaparral; granite sand: Cochise, Graham, Greenlee, Pima, Pinal, Santa Cruz cos.; 750-2450 m (2500-8000 ft); May-Oct; NM, TX; Mex. A garden ornamental.

Cephalanthus L. Button Bush

Shrubs or small trees. LEAVES opposite or ternate. FLOWERS densely aggregated into spherical pedunculate heads; calyx 4-toothed; corolla narrowly funnelform, slender, the limb 4-cleft; style filiform, much exerted, the stigma capitate; ovary and fruit obpyramidal. FRUIT dry and hard, splitting from the base at maturity into 2-4 1-seeded achene-like portions. --Ca. 17 spp. warm and temperate portions of Asia, Amer., and s Afr. (Greek: *kephale* = head + *anthos* = flower).

Cephalanthus occidentalis L. (of the west). Button-willow. --Shrubs or trees 2-7(-10) m high, the trunks to 50 cm in diameter. LEAVES 2-3 per node, 7-12 cm long, glabrous or the dorsal veins and margins minutely scabrous; blades narrowly to broadly elliptic or ovate, narrowed to short petioles, more or less attenuate at apices; stipules very small, scarious, triangular or lunate, entire or fimbriate. INFLORESCENCES heads 3-3.5 cm in diameter, solitary or cymosely clustered at ends and upper nodes of branches; peduncles 2.5-9 cm long. FLOWER: calyx densely pubescent within, shallowly and somewhat irregularly lobed; corolla 8 mm long, white or yellowish, more or less pubescent within, the tube slender, longer than throat and ovate obtuse lobes; anthers included; styles much exerted (to 4 mm). FRUIT turbinate, irregularly compressed, falling when ripe, the heads 2 cm in diameter. 2 vars.; throughout U.S.; Can.

Var. **californicus Benth.** (of California). --Differs chiefly in the narrower, generally smaller, and less abruptly petiolate leaves, and in the shorter petioles. --Near streams, washes, and desert lakes; rocky creek beds; swampy land: Apache, Cochise, Gila, Maricopa, Pima, Pinal, Yavapai cos.; 400-1400 m (1300-4600 ft) Jun-Sep; CA, NM, OK, TX; s through Mex.

Crusea Cham.

Plants small, annual. STEMS slender, erect or ascending, simple or sparingly branched, more or less angular when young. LEAVES opposite, oblong-lanceolate to subulate, united at base by a fimbriate stipular sheath. FLOWERS small, in terminal or axillary glomerules; calyx lobes 2-4, unequal, often conspicuously united at base, deciduous at maturity; corolla 4-lobed, salverform or nearly so. FRUIT didymous, nutlets obovoid, separating at maturity. --15 spp.; sw U.S.; Mex., C. Amer. (for W. Cruse).

1. Leaves linear-lanceolate or subulate, not more than 3 mm wide, only the midvein apparent; herbage glabrous or sparsely hispidulous; corolla whitish, the tube enlarged toward lobes *C. subulata*
- 1' Leaves lanceolate, up to 10 mm wide, conspicuously several-veined; herbage, especially leaf bases, hirsute with long straight hairs; corolla pink or purple, the tube very slender *C. wrightii*

Crusea subulata (Pav.) A. Gray (awl-shaped). --STEMS 3-22 cm tall, sparingly branched. LEAVES glabrous or sparsely hispidulous, to 3 cm long, not more than 3 mm wide, linear-lanceolate or subulate, with only the midveins apparent. FLOWERS: calyx lobes very unequal, some lanceolate-foliaceous, others reduced to setaceous, scarious teeth; corolla whitish, 7 mm long, the tube enlarged toward lobes. NUTLETS glabrous or pubescent. --In woods or in the open: Cochise, Pima, Santa Cruz cos.; 1500-2300 m (5000-7500 ft); Aug-Sep; s NM; Mex.

Crusea wrightii A. Gray (for Charles Wright). --STEMS 8-35 cm tall, slender scarcely angled, sparingly branched, hirsute with long straight hairs. LEAVES 2.5-4.5 cm long, lanceolate, conspicuously several-veined, the bases expanded and somewhat sheathing the floescence; stipular sheath short, few-toothed, together with the expanded leaf bases, set with long bristly hairs. FLOWERS: calyx lobes acicular, bristly at base; corolla 7-8 mm long, pink or purple, the tube very slender, the lobes spreading; ovary didymous, nearly glabrous. NUTLETS glabrous. --Moist soil in canyon bottoms and hillsides: Cochise, Santa Cruz cos.; 1050-1300 m (3500-4300 ft); Aug-Sep; n Mex.

Diodia L. Buttonweed

Annuals or perennial herbs, rarely low shrubs. STEMS terete or 4-angled. LEAVES opposite with connecting fimbriate stipules. INFLORESCENCE: 1-several flowers in axillary glomerules. FLOWERS small; calyx 2-4 dentate; corolla funnelform, 4-lobed; stamens 4. FRUIT 2 nutlets, the calyx teeth persistent. Ca. 50 spp. mostly of warmer parts of Amer., a few in Afr. (Greek: *diodos* = a thoroughfare, because often found growing by the wayside).

Diodia teres Walter (terete, referring to the stem). Rough Buttonweed. Poor Joe. --Erect annuals, 7-25 cm tall, simple or divaricately branched. STEMS 4-angled, at least above, glabrous or with short scattered hairs. LEAVES 1.5-3.5 cm long, linear to narrowly lanceolate-oblancoate, the apices subulate bearing a sharp terminal hair, the margins scabrous, the bases somewhat hyaline, forming with the connecting fimbriate stipules a cup containing the sessile flowers. FLOWERS 1-several in leaf axils; calyx lobes unequal, ovate or lanceolate, the smallest adaxial, the other 3 large and adhering to the abaxial nutlet; corolla white or pink, glabrous or hispid externally, 3 mm long, the lobes small; stamens and style included or scarcely exerted. FRUIT: nutlets 3 mm long, obovoid-turbinate, flattened at the plane of separation, covered with stiff straight, apically directed hairs, topped with persistent calyx. --Sandy, gravelly slopes and washes; grasslands; moist soil with oaks, pines, junipers: Cochise, Gila, Graham, Greenlee, Pima, Santa Cruz cos.; 1100-2450 m (3600-8000 ft). Aug-Oct; e, c, sw U.S.; Mex. s to S. Amer.

Galium L. Bedstraw, Cleavers

Annual or perennial herbs or shrubs. STEMS 4-angled, the angles sometimes expanded to obscure the sides. LEAVES opposite, but appearing whorled, the stipules leaf-like. FLOWERS perfect or imperfect in panicles or axillary cymes, the basic unit usually a cymule of 3 flowers; calyx absent; corolla usually rotate, sometimes campanulate, the lobes usually 4; styles 2 usually fused at base. FRUIT of 2 nutlets (in ours), or sometimes berry-like. --Ca. 400 spp. worldwide, especially temperate regions. (Greek: *gala* = milk, from use of some species for curdling).

1. Fruits of 2 spherical, hard, smooth mericarps, generally black when mature, lightly joined together; leaf apices generally rounded, not tipped with a hair *G. trifidum* var. *pusillum*
- 1' Fruits various, but not as above; leaves usually not round at apex.
 2. Leaves more than 4 per node.
 3. Fruits with long uncinat hairs; plants climbing or more or less prostrate, the flowers solitary or few on short lateral branchlets; corollas rotate.
 4. Annual, generally climbing; leaves lanceolate *G. aparine*
 - 4' Perennial, generally prostrate; leaves narrowly to broadly ovoid *G. triflorum*
 - 3' Fruit with very short uncinat hairs or these reduced to tubercles; plants more or less erect, the flowers many in diffuse inflorescence; corollas more or or less cupped at base
..... *G. mexicanum*
 - 2' Leaves 4 or fewer per node.
 5. Annual.
 6. Flowers solitary in axils, long-pedicellate; corolla 3-parted *G. bifolium*
 - 6' Flowers nearly sessile on several-flowered branchlets; corolla 4-parted ... *G. proliferum*
 - 5' Perennial.

7. Flowers sessile in 4-leaved involucre; fruits granulate or tuberculate, without specialized hairs *G. microphyllum*
- 7' Flowers pedicellate, not involucre; fruits with specialized hairs not found elsewhere on plant.
 8. Fruits with uncinata hairs *G. uncinulatum*
 - 8' Fruits hairs straight not uncinata.
 9. All flowers perfect *G. boreale*
 - 9' All or some flowers imperfect.
 10. Plants dioecious.
 11. Plants true shrubs *G. stellatum*
 - 11' Plants merely suffrutescent at base.
 12. Leaves mostly linear; fruiting pedicels elongated, noticeably downturned; ne corner Apache Co. *G. coloradoense*
 - 12' Leaves lanceolate to ovate; pedicels usually straight *G. munzii*
 - 10' Plants polygamous.
 13. Inflorescence glomerulate; leaves narrowly to broadly elliptic *G. collomae*
 - 13' Inflorescence expanded, not glomerulate; leaves generally narrower, rarely elliptic.
 14. Leaves and stems with microscopic velvety pubescence; inflorescence generally somewhat narrow, the branchlets and peduncles short *G. fendleri*
 - 14' Leaves and stems variously clothed, usually not velvety; inflorescence generally much expanded with long spreading branchlets and peduncles *G. wrightii*

Galium aparine L. (old generic name). Goose-grass, Cleavers --Clambering or prostrate annuals, very scabrous with retrorse prickly hairs. STEMS 10-90 cm or more long. LEAVES 6-8 at each node, the earliest often spatulate and petiolate, the later ones linear-oblongate to oblongate, 13-31 mm long, tapering to narrow bases and to mucronate apices. FLOWERS perfect, few on well exerted leafy indeterminate lateral branchlets, 1-2 in a cymule or often 1 in an axil; corolla rotate, the lobes obtuse or acute, white or yellowish. FRUIT with uncinata, upturned hairs usually shorter than the fruit body. $2n = 20, 22, 42, 44, 63, 64, 66, \text{ca. } 86, 88$. --Moist places; north slopes; in shade of chaparral or forest edges; locally common: Coconino, Gila, Graham, La Paz, Maricopa, Mohave, Pima, Pinal, Yavapai, Yuma cos.; 600-2200 m (2000-7300 ft); Apr-Sep; whether native or introduced is uncertain. All continents except Antarctic.

Galium bifolium S. Watson (2-leaved). --Erect, open, slender annuals, 5-20 cm high, glabrous. LEAVES lanceolate or narrowly elliptic, obtuse or acute, not apiculate, mostly 4 per node, in 2 unequal pairs, the larger pair 10-21 mm long, the upper nodes often 2-leaved. FLOWERS perfect, solitary in axils, the long pedicels bent away from the leaves, sharply reflexed below fruit; corolla generally 3-lobed, glabrous, cleft about 2/3 of their length, white, the lobes ascending, ovate, obtuse, shorter than ovaries. FRUITS with short uncinata hairs; mericarps joined 2/3 of their length, nearly separated at maturity. Open meadows or shady slopes: Apache, Mohave cos.; 1700-2600 m (5500-8600 ft). May-Jun; w N. Amer. from s B.C., Can. and MT to s CA and c CO.

Galium boreale L. (northern) Northern Bedstraw. --Erect perennials, 3-6 dm high, nearly glabrous. LEAVES 4 per node, 13-31 mm long, linear to broadly lanceolate, 3-veined, minutely scaberulous, the apices mostly obtuse. FLOWERS perfect, numerous in a more or less condensed terminal, nearly leafless panicle of cymules; corollas rotate or a little cupped at base, the 4 lobes ovate, the apices blunt; ovaries generally densely hairy with short upwardly-curved hairs. FRUITS dry, with short bristles, the mericarps becoming reniform. $2n = 66$. North America, Asia, Europe.

Subsp. *septentrionale* (Roem. & Schult.) Iltis (northern). --North American and east Asian plants differ from European and west Asian material in being hexaploid ($2n = 44$). Minor morphological differences include larger corollas, fruits and anthers, hairier nodes, whiter corollas, narrower bracts, and more divaricate inflorescence. --Meadows, streamsides, moist shady places: Apache, Greenlee cos.; 2150-2900 m (7000-9500 ft); Jun-Aug; montane areas n to AK and Can. e to NJ; e Asia.

Galium collomae J. T. Howell (for Rose E. Collom). --Polygamous perennials, hispid with long spreading hairs. STEMS 20-35 cm long from woody bases. LEAVES 4 per node, 7-15 mm long, narrowly to broadly elliptical, narrowed to a petiolar base; stipule leaves a little smaller than true leaves. FLOWERS small in congested, bracteate panicles; corollas more or less hispid externally, the apices short to moderately long, sordid yellow. FRUITS ca. 1 mm wide, the hairs short, straight. $2n = 22$. --At base of steep cliffs, and in rock crevices; Gila, Yavapai cos.; 1150-1900 m (3800-6200 ft); Jul-Nov; AZ endemic.

Galium coloradoense W. F. Wight (of Colorado). --Dioecious perennials, glabrous. STEMS 15-40 cm long from woody bases. LEAVES 4 per node, 9-24 mm long, mostly linear, occasionally lanceolate; apices usually pungent and often reflexed. FLOWERS few, the branchlets and pedicels long and divaricate; corolla rotate, glabrous, whitish. FRUITS 5-7 mm wide, on pedicels curved sharply downward, the long straight hairs yellowish or brown, not thickly set. $2n = 22$. --Shaded areas among rocks; crevices of sandstone ledges and cliffs; with juniper and pinyon pine: Apache Co.; 1450-2550 m (4800-8400 ft); Jun-Aug; w CO, NM, e UT.

Galium fendleri A. Gray (for August Fendler). --Polygamous perennials, very finely puberulent. STEMS 15-45 cm long from woody bases, little branched, the branches short. LEAVES 4 per node, 10-23 mm long, linear to narrowly lanceolate-oblongate, each narrowed to a broad insertion and narrowed abruptly to a non-pungent apex. FLOWERS on narrow inflorescence, the branchlets short, ascending, little exserted; corollas glabrous, greenish or yellow, the apices usually short and blunt. FRUITS a little nodding, densely covered with long straight hairs. $2n = 22$. --Moist shady places, talus slopes, rock crevices, hillsides: Apache, Cochise, Gila, Graham, Pima, Pinal, Santa Cruz cos.; 2050-3150 m (6800-10400 ft); Jul-Oct; NM; Chih., Mex.

Galium mexicanum Kunth (of Mexico). --Perennial creeping or climbing herb, the stems to 90 cm long. STEMS and leaf margins with few to many aculeate hairs. LEAVES 5-12 (commonly 6) at each node. FLOWERS perfect, with generally (not always) campanulate corollas. FRUITS with well developed or obscure uncinuate hairs. 4 subsp. Western U.S.; Central America.

subsp. *asperrimum* (A. Gray) Dempster (rough). --LEAVES linear to broadly oblanceolate, usually broadest above the middle, commonly 1-2 cm long, narrowed gradually at base and abruptly at apex, sharp with terminal hair. FLOWERS in diffuse, lax, many-flowered inflorescence, on terminal and lateral branches with reduced leaves. COROLLAS white, not pilose, cleft usually more than halfway, the lobes spreading, not sharply reflexed, the throat flaring to nearly rotate. FRUIT hairs arising from tubercles, sometimes much reduced. $2n = 22, 66$. [*G. asperrimum* A. Gray]. --Along streams and in moist places in mixed forests; Apache, Cochise, Coconino, Gila, Graham, Greenlee, Navajo, Pima, Pinal, Santa Cruz cos.; 1200-2900 m (4000-9500 ft); Jun-Oct; CO, NM; Chih., Dgo., Son., Mex. Although easily distinguished in CO and NM, subsp. *asperrimum* in s AZ intergrades with subsp. *mexicanum* of Mex. and C. Amer. (Dempster, Madroño 23:378-386. 1976).

Galium microphyllum A. Gray (small-leaved). --Tufted perennials, woody at base, mostly glabrous. STEM clumps to 40 cm high, the angles thick. LEAVES 4 per node, mostly less than 1 cm long, usually linear, sometimes ovate, apices sharp, the margins thick and pale. FLOWERS perfect, solitary at nodes or on several-flowered branchlets, each sessile in a 4-leaved involucre; corollas rotate, the lobes ovate, spreading, greenish or white. FRUITS granulate or tuberculate, not hairy. $2n = 22$. [*G. nitens* Jones, *Relbunium microphyllum* Hemsl.]. --Along streams; moist places in pine-oak forests, chaparral, grasslands:

Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pima, Pinal, Santa Cruz, Yavapai, Yuma cos.; 750-2300 m (2400-7500 ft); Mar-Dec; NM, TX; Mex.

Galium munzii Hilend & J. T. Howell (for Philip Munz). --Wiry dioecious plants, glabrous to hispid. STEMS 10-30 cm long above woody bases. LEAVES 4 per node, 7-19 mm long, lanceolate or ovate, tapering to acute apex. FLOWERS in narrow inflorescences, the branches short; corollas strictly rotate, externally hispid with usually long hairs. FRUIT with long straight hairs. --2 subsp.; n AZ, se CA, se NV, sw UT.

1. Leaves hispid, narrowly to broadly ovate, rarely lanceolate; nw Mohave Co. subsp. *munzii*
 1' Leaves glabrous or nearly so, lanceolate to narrowly ovate; Coconino and Mohave cos.
 subsp. *ambivalens*

Subsp. *ambivalens* Dempster & Ehrend. (intermediate, referring to subsp. *munzii* and *G. magnifolium*). --Plants 15-30 cm tall, glabrous or nearly so (rarely hairy). LEAVES lanceolate to narrowly ovate, 8-23 mm long, tapering to gradual, acute, but not usually pungent apices. $2n = 42, 44$. [*G. watsonii* of Kearney & Peebles]. --Rock crevices and rocky slopes: Coconino, Mohave cos.; 1000-2300 m (3300-7500 ft); May-Aug; endemic to AZ.

Subsp. *munzii*. Plants 10-30 cm tall, coarsely hispid. LEAVES generally ovate, rarely lanceolate, 7-19 mm long, tapered or a little abrupt toward the often pungent apex. $2n = 44, 45$. --Crevices of rocks and cliffs; rocky n- or e-facing slopes; shady canyon bottoms. with juniper, pinyon pine, sometimes oaks: nw Mohave Co.; 1050-2300 m (3500-7600 ft); May-Aug; CA, NV, UT.

Galium proliferum A. Gray (bearing offspring). --Annuals to 30 cm high, erect or ascending, simple or branching at base, glabrous to hairy. LEAVES 4 per node, 3-9 mm long, the lower petiolate and spatulate, the upper linear to ovate-obovate and more or less sessile, remote on stem. FLOWERS perfect, minute, 1-several on short branches from most nodes, usually hidden, the pedicels very short; corolla smaller than ovary, the lobes erect, rounded at apices, white. FRUIT strongly downturned from a pair of erect leaves; mericarps kidney-shaped with many long uncinat hairs. --Moist places along streambeds and edge of washes; rocky n-facing slopes; grassy areas; in open or under shrubs or trees: Cochise, Coconino, Gila, Greenlee, La Paz, Maricopa, Mohave, Pima, Pinal, Yavapai, Yuma cos.; 450-1600 m (1500-5300 ft); Dec-Jun; s CA, NM, NV, w TX, UT; Mex.

Galium stellatum Kellogg (in error, for stellate hairs). --Dioecious shrub, the herbage more or less densely hairy. LEAVES 4 at nodes, sharp. FLOWERS in diffuse leafy panicles; corollas rotate. FLOWERS in diffuse leafy panicles; corollas rotate. FRUIT densely covered with white silky straight hairs. $2n = 22, 44, 88$.

Var. *eremicum* Hilend & J. T. Howell (of the desert). --Spreading shrub to 90 cm high, the old stems brittle (to 2 cm in diameter), with whitish peeling bark; flower-bearing stems slender, not usually persistent. LEAVES 4-17 mm long, lanceolate to needle-shaped, light green, rigid, narrowed gradually to sharp apex. COROLLAS white, yellowish or greenish, the apices blunt or a little elongated. $2n = 22, 44$. --Rocky desert slopes; rock crevices in canyons; sandy washes and talus slopes; Sonoran desert scrub; pinyon-juniper: Coconino, Gila, Graham, La Paz, Maricopa, Mohave, Pima, Pinal, Yavapai, Yuma cos.; 300-1200 m (1000-4000 ft); Feb-Jun; CA, NM, NV; Baja C., Son., Mex. Var. *eremicum* differs from var. *stellatum* of Cedros Island in habit and in chromosome number. The Cedros Island plant is octoploid ($2n = 88$), and is a low, densely-growing, semiprostrate suffrutescent.

Galium trifidum L. (three-parted). --Variable perennial (rarely annual). LEAVES 4-6 at nodes, rounded at apices, not bristle-tipped. FLOWERS perfect; corolla rotate, 3-4-lobed. FRUITS of 2 hard, spherical, smooth, brown or black mericarps. $2n = 24$. More or less circumpolar, extending southward in North America to Temperate Zone. Subspecies or varieties 4.

Var. *pusillum* A. Gray (very small). --STEMS slender, weak, many, 5-10 cm high, glabrous. LEAVES 4-10 mm long, linear-oblongate to obovate, glabrous. FLOWERS solitary or 1-4 on slender axillary peduncles; corolla 3-parted, the broadly ovate lobes ascending, much longer than ovaries, white or pinkish. [*G. tinctorium* of Kearney & Peebles]. --Along streams and lake margins; wet meadows, mixed forests: Apache, Coconino, Navajo cos.; 2300-2900 m (7500-9500 ft); Jul-Sep; mountainous areas of w N. Amer. to AK.

Galium triflorum Michx. (three-flowered). Sweet-scented Bed-straw. --Perennial herbs, glabrous or minutely scabrous on veins and margins. STEMS 20-45 cm long, commonly decumbent and radiating from a center, or sometimes supported by other plants. LEAVES 6 per node, 6-38 mm long, usually in horizontal plane regardless of stem position, elliptic to ovate-obovate, narrowed gradually at base, abruptly toward apiculate or mucronate apices. FLOWERS perfect, (1)-2-3(-5) in pedicellate cymes, on axillary peduncles 2.5-4 cm long; corollas rotate, about as long as ovaries, cream-colored. FRUITS densely covered with soft white or brownish uncinata hairs as long as fruit body; mericarps brain-shaped. $2n = 22, 44, 66$. --Creeping on damp or shaded forest floors, or semi-erect near streams: Apache, Coconino, Graham, Pima, Yavapai cos.; 1400-3050 m (4600-10000 ft); May-Sep; N. Amer.; Mex., Eur., Asia.

Galium uncinatum DC. (with small uncinata hairs). --Prostrate or sprawling perennials, not woody above ground, sparsely and softly hairy. STEMS to 60 cm long, slender, with long internodes. LEAVES 4 per node, 6-30 mm long, elliptic to ovate, 3-veined, narrowed to a short petiole, apiculate. FLOWERS perfect, in axillary and terminal, few-flowered, very open cymes, the pedicles and peduncles slender; corolla campanulate to rotate, glabrous, the lobes acute, yellowish or greenish. FRUIT with uncinata hairs; pedicels elongating to 12 mm, straight but sharply downturned just below fruit. [*G. pilosum* of Kearney and Peebles, not Ait.]. --Wet canyons, woodlands: Pinaleno Mts. Graham Co.; 1850-2150 m (6000-7000 ft); Jun-Aug; s TX; Mex. s to Panama

Galium wrightii A. Gray (for Charles Wright). --Polygamous perennials, variously glabrate, velvety, scabrous or hispid, but hairs not hooked. STEMS several to many, 15-50 cm high from suffrutescent bases. LEAVES 4 per node, 7-20 mm long, linear, oblanceolate, rarely elliptic, narrowed gradually to broad insertions, narrowed abruptly to acute, often pungent, apices. FLOWERS in diffuse inflorescences, the branchlets divaricate and much exserted; corollas red, pink, or rarely yellow, rotate, mostly glabrous, the tips usually long and slender. FRUITS with long straight hairs. $2n = 22$. [*G. rothrockii* A. Gray]. --Moist banks and sheltered slopes, in partial shade: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai cos.; 1000-2650 m (3500-8700 ft); May-Nov; CA, NM, NV, w TX, UT; Baja C., Coah., Son., Mex.

Hedyotis L.

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In AZ, annual herbs. LEAVES opposite with interpetiolar stipules. INFLORESCENCE cymose or solitary. FLOWERS heterostylous (distylous) or homostylous; calyces 4-lobed; corollas 4-lobed, funnelform or tubular; stamens 4; stigmas bifid. FRUITS biloculate capsules, 3/4-9/10 inferior. SEEDS few-many per capsule, non-crateriform (lacking ventral cavity or depression), the hilum punctiform, or in *H. vegrandis* crateriform with hilar ridge (latter species atypical for (*Hedyotis*)). --Ca. 150 spp.; Asia, Australia, Americas. Extremely variable genus with uncertain circumscription. (Greek: *hedys* = sweet + *otos* = ear, significance unknown).

1. Stems 3-16 cm tall; flowers and capsules sessile or on erect pedicels to ca. 16 mm long; corollas 2-3

- mm long; seeds 0.5-0.8 mm long, obtusely 3 angled *H. greenei*
 1' Stems 1-3(-9) cm tall; flowers and capsules subsessile or on recurved pedicels to 1 mm long;
 corollas 1-2 mm long; seeds 0.8-1.2 mm long, flattened, with hilar ridge in a concavity
 *H. vegrandis*

Hedyotis greenei (A. Gray) W. H. Lewis (for E. L. Greene). --Small annuals. STEMS 3-16 cm tall, slender. LEAVES narrowly oblanceolate, narrowly elliptic, or linear, 5-32 mm long, 0.5-5.0 mm wide. Flowers heterostylous, earliest ones sessile, later ones on erect pedicels to ca. 16 mm long; corollas 2-3 mm long, funnellform or subsalverform, white. FRUITS 2-4 mm long and wide, 3/4-9/10 inferior, thin-walled, sessile or on erect pedicels ca. 16 mm long. SEEDS 0.5-0.8 mm long, obtusely 3-angled. [*Oldenlandia greenei* A. Gray; *Houstonia greenei* (A. Gray) Terrell]. --Outcrops, rocky slopes, in pine-oak, oak-juniper; Cochise, Graham, Greenlee, Pima, Santa Cruz, Yavapai cos.; 1500-2450 m (5000-8000 ft); Aug-Sep; w NM.

Hedyotis vegrandis W.H. Lewis (diminutive). --Diminutive annuals. STEMS 1-3(-9) cm tall, slender. LEAVES narrowly oblanceolate, linear, or narrowly elliptic, 5-14 mm long, 0.5-2.5 mm wide. FLOWERS apparently homostylous, solitary, subsessile or on pedicels to 1 mm long; corollas 1-2 mm long, funnellform or tubular, white or lobes purplish. FRUITS 2-3 mm long, 3-4 mm wide, 3/4 inferior, thin-walled, subsessile or on recurved pedicels ca. 1 mm long. SEEDS 0.8-1.2 mm long, boat-shaped, bent longitudinally, with linear hilar ridge in an oblong concavity. [*H. sinaloae* W. H. Lewis; *Houstonia prostrata* Brandege]. --An anomalous species atypical of *Hedyotis*. Known from one collection, gravel deposits on rock outcrop, Guadalupe Canyon, se Cochise Co.; Aug-Sep; Baja C., Sin., Son., Mex.

NOTE

Hedyotis nigricans (Lamarck) Fosberg has been reported from Arizona, but the specimens seen that were so named were *Houstonia wrightii*. *Hedyotis nigricans* can be distinguished by having very thick woody taproots and stem bases, densely pubescent corollas, mature capsules longer than wide, and ellipsoid non-crateriform seeds with a punctiform hilum.

Houstonia L. Houstonia, Bluets

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Annual or perennial herbs. LEAVES opposite (in AZ), with inter-petiolar stipules. INFLORESCENCE cymose or solitary. FLOWERS heterostylous (distylous) or homostylous; calyces 4-lobed; corollas 4-lobed, salverform, funnellform, or tubular; stamens 4; stigmas bifid. FRUITS biloculate capsules, 1/4-3/4 inferior. SEEDS 2-45 per capsule, crateriform, i.e., subglobose with interior hilar cavity lacking hilar ridge, or slightly to somewhat compressed, with linear or oblong hilar ridge in a saucer- or cup-shaped concavity. --20 spp.; U.S., Can., Mex. (for William Houstoun, British physician).

1. Plants small annuals; leaves usually elliptic, ovate, or spatulate; flowers solitary on pedicels to ca. 4 cm long; seeds subglobose with rounded interior cavity *H. pusilla*
- 1' Plants small perennials with woody taproots; leaves linear, oblanceolate, or elliptic; flowers in cymes or solitary on pedicels to 6 mm long; seeds slightly to somewhat compressed, with hilar ridge in a saucer- or cup-shaped concavity.
2. Leaves 0.5-1.0(-3) mm wide, usually erect or strongly ascending; flowers usually 1 per node; corollas 8-41 mm long *H. rubra*
- 2' Leaves 0.5-4.0 mm wide, usually spreading; flowers in small cymes; corollas 3.5-9.5 mm long
 *H. wrightii*

Houstonia pusilla Schoepf (very small). Small Bluets. --Small annuals. STEMS 1.5-15(-25) cm tall, slender. LEAVES usually elliptic, ovate, or spatulate, to 25 mm long, 0.5-5(-9) mm wide. FLOWERS homostylous, solitary on long erect or nodding pedicels to ca. 4 cm long; corollas 3.5-10(-12.5) mm long, salverform, usually purple or violet with reddish or brownish center. FRUITS 1.5-4 mm long, 2.5-6 mm wide, thin walled, 1/2 inferior. SEEDS 0.5-1 mm in diameter, subglobose, with a small orifice opening into a subglobose hilar cavity without a hilar ridge. $2n = 16$. [*Hedyotis crassifolia* Rafinesque; *Houstonia patens* Elliott]. --Grassy places, fields, in open or forested areas: 2 collections in Rincon Mts., Pima Co.; 1000-1350 m (3300-4400 ft); Apr-May; se U.S. to n MD and nw FL, w to IL, KS, OK, c TX, disjunct to AZ.

Houstonia rubra Cav. (red). --Small caespitose perennials with woody taproots. STEMS 1-5(-10) cm tall, slender. LEAVES linear or the lower ones oblanceolate or elliptic, 5-28 mm long, 0.5-1(-3) mm wide, erect or strongly ascending. FLOWERS heterostylous, usually one per node, subsessile or on pedicels to 4 mm long; corollas 8-41 mm long, salverform, pink, purplish, reddish, rose or white. FRUITS 2-3.5 mm long, 2-5 mm wide, thick-walled, 1.8-1.3 inferior, on recurved pedicels. SEEDS 0.8-2.1 mm in diameter, with hilar ridge in a saucer-shaped concavity. $2n = 22$. --Desert plains, washes, sometimes with pinyon-juniper or oak-pine: Apache, Cochise, Coconino, Navajo, Pima, Santa Cruz, Yavapai cos.; 1300-2500 m (4200-8200 ft); Feb-Nov; NM, se UT, w TX; to s Mex.

Houstonia wrightii A. Gray (for Charles Wright). --Small caespitose perennials with woody taproots. STEMS 2-18(-32) cm tall, slender. LEAVES linear, elliptic, or oblanceolate, 5-15(-30) mm long, 0.5-4 mm wide, spreading. FLOWERS heterostylous, cymose, subsessile or on pedicels to ca. 6 mm long; corollas 3.5-9.5 mm long, funnelform or salverform, purple, pink, or white. FRUITS 1-3 mm long, 2-4 mm wide, thick-walled, 1/8-1/2 inferior, on recurved pedicels. SEEDS 0.7-1.7 mm long with hilar ridge in a cup-shaped concavity. $2n = 22$. [*Hedyotis pygmaea* Roemer & Schultes]. --Rocky slopes, grassland, oak-juniper or ponderosa pine forests: Apache, Cochise, Coconino, Gila, Graham, Greenlee, Navajo, Pima, Santa Cruz, Yavapai cos.; 1200-4000m (4000-13000 ft); May-Oct; NM, TX; to s Mex.

Kelloggia Torrey

Slender perennial herbs. LEAVES opposite with interposed stipules. FLOWERS 4-5-merous, in loose forking terminal cymes; corolla funnelform; ovary 2-loculed, each locule with 1 ovule. FRUIT splitting at maturity into 2 closed mericarps. 2 spp. w N. Amer. and China. (for Albert Kellogg).

Kelloggia galioides Torrey (resembling *Galium*). --STEMS erect, several to many, 15-40 cm high. LEAVES glabrous or puberulent, opposite, but often somewhat fascicled, 19-38 mm long, lanceolate, narrowly ovate, with acute or obtuse at apices; stipules pale or hyaline, 0.5-2 mm long, lanceolate, bifid or erose. INFLORESCENCE few-flowered, becoming widely divaricate; pedicels filiform, 6-25 mm long, forming a bulbous swelling below the flowers. FLOWERS: calyx lobes inconspicuous, claw-shaped, curved inward toward the corolla, generally shorter than ovary hairs; corolla 4-8 mm long, pink or white, pubescent outside, dotted with tack-shaped hairs inside, the tube slender, the lobes lanceolate, spreading; stamens, style and bifid stigma included within corolla lobes. FRUIT obovoid, 3 mm long, densely covered with uncinat hairs, bifid when mature. --Moist shaded places in coniferous forests and adjacent meadows: Apache, Coconino, Navajo cos.; 1400-8000 m (4600-8600 ft); Jun-Sep; Rocky Mts. n to WY, Pacific coasts of CA, OR, WA.

Mitracarpus Zuccarini

Annuals. STEMS erect, simple or sparingly branched. LEAVES opposite, connected at base by a hyaline stipular shield. FLOWERS small in very dense, terminal and axillary clusters; calyx with 2 pairs of lobes very unlike in size and texture; corolla salverform or funnelform, with 4 spreading lobes; stamens 4, oblong or linear. FRUIT a 2-loculed, thin-walled, circumscissile capsule. --Spp. 40; tropical S.Amer., W. Ind., Afr. (Greek: *mitr* = turban + *carp* = fruit).

Mitracarpus breviflorus A. Gray (short-flowered). White Girdle-pod. --Herbs 5-40 cm high, simple or branched from base. LEAVES 2.5 cm long, lanceolate to oblanceolate, glabrous or margins and veins slightly scabrous; apices obtuse to acute; petiolar base often pubescent on lower surface, each stipular connection with about 5-7 prominent and many hair-like setae. FLOWERS: 2 large calyx lobes lanceolate-subulate, equaling or surpassing corolla; 2 small calyx lobes dentiform and hyaline; corolla 1.5-2 mm long, white glabrous. FRUIT ca. 1.5 mm in diameter, circumscissile about the middle. --Rocky slopes and washes; grasslands with oaks, pines or junipers: Cochise, Pima, Santa Cruz cos.; 1200-2300 m (3900-7600 ft); Aug-Oct; TX; Baja C., Chih., Mor., Sin., Son., Mex.

Sherardia L.

Annual plants with straight often stout hairs. STEMS 4-angled, decumbent, often much branched from the base, frequently rooting at nodes, 7-36 cm long. LEAVES including leaf-like stipules appear whorled, 5-6 per node, 4-13 mm long, lanceolate-oblanceolate; apices acute or pungent; margins with white callous, with apically directed short stoutish hairs. INFLORESCENCES heads, solitary in upper axils on slender 3-25 mm long peduncles, the involucre commonly of 8 leaf-like lobes united 1/8-1/4 their length. FLOWERS 2-3 per head, sub-sessile, ca. 4 mm long, scarcely exerted from deeply divided involucre; calyx of 6 persistent teeth which crown the fruit; corolla pink or lavender, salverform, the tube slender, the limb usually 4-lobed, the lobes ovate, spreading; stamens included; pistil slightly exerted; mature carpels softly pubescent with appressed hairs; style filiform, 2-cleft. FRUIT dry, didymous, separating into 2 indehiscent 1-seeded carpels. $2n = 22$. --1 sp.; Mediterranean. (For William Sherard).

Sherardia arvensis L. (of the field). Field Madder. --Naturalized in lawns: Maricopa, Pima cos.; 300-750 m (1000-2500 ft); Apr-May; introduced.