

# KEY TO FAMILIES OF VASCULAR PLANTS IN ARIZONA

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## Key to Groups

1. Plants never bearing seeds, but reproducing by freely dispersed spores .....  
[FERNS AND FERN ALLIES] ..... KEY 1
- 1' Plants reproducing by seeds; spores produced but retained in ovules or developing into pollen grains.
  2. Ovules exposed to the external environment at the time of pollination; ovules directly pollinated; seeds produced in dry or fleshy cones or cone-like structures; plants never producing ovaries, stigmas, or fruits [GYMNOSPERMS] ..... KEY 2
  - 2' Ovules enclosed in an ovary at the time of pollination; the pollen-receptive structure a stigma; seeds borne in fleshy or dry fruits derived from ripened carpel tissue [ANGIOSPERMS].
    3. Gynoecium composed of 2 or more pistils (each of which is an individual carpel) ...  
..... KEY 3
    - 3' Gynoecium composed of 1 pistil, this either simple (composed of 1 carpel) or compound (composed of 2 or more connate carpels).
      4. Perianth absent or represented by a single whorl or spiral.
        5. Plants definitely woody ..... KEY 4
        - 5' Plants herbaceous or only slightly woody at the base.
          6. Ovary inferior. .... KEY 5
          - 6' Ovary superior.
            7. Leaves alternate. .... KEY 6
            - 7' Leaves opposite ..... KEY 7
        - 4' Perianth represented by 2 or more whorls or complete spirals, the outer usually treated as sepals and the inner as petals.
          8. Perianth parts usually in whorls of 3 [MOSTLY MONOCOTS] ..... KEY 8
          - 8' Perianth parts usually in whorls (or spirals) of 4 or 5, or indefinite in number [MOSTLY DICOTS].
            9. Petals connate into a ring or tube, sometimes only at the base, the entire corolla falling as a single unit.
              10. Ovary or ovaries superior ..... KEY 9
              - 10' Ovary partially or wholly inferior ..... KEY 10
            - 9' Petals distinct, at least at the base, falling individually or in pairs, never connate into a ring or a tube.
              11. Ovary inferior or half-inferior; flowers epigynous ..... KEY 11
              - 11' Ovary superior; flowers hypogynous or perigynous.
                12. Number of stamens more than twice the number of petals, often numerous ..... KEY 12
                - 12' Number of stamens twice the number of petals or fewer.
                  13. Leaves compound or very deeply divided ..... KEY 13
                  - 13' Leaves simple.
                    14. Plants woody ..... KEY 14
                    - 14' Plants herbaceous ..... KEY 15

**Key 1: Plants Reproducing by Spores – Ferns and Fern Allies**

1. Leaves linear to oblong or scale-like, 1-veined or apparently so, or plants leafless.
  2. Plants free-floating or stranded on mud, very small; leaves 2-lobed. . . . . **AZOLLACEAE**
  - 2' Plants not floating, epiphytic or anchored in wet to dry soil.
    3. Leaves linear, entire, all basal; stem corm-like; sporangia concealed in axils of leaves . . . . . **ISOETACEAE**
    - 3' Leaves or leaflike structures scale-like, entire or minutely toothed, all cauline; stem elongated; sporangia axillary or in terminal cone-like aggregations.
      4. Stems concealed by numerous overlapping scale-like leaves, the internodes very short; sporangia borne in axils of fertile leaves (sporophylls), that are aggregated into cone-like groups; sporangia of 2 kinds, some producing 4 megaspores, others producing numerous microspores; spores yellow or orange . **SELAGINELLACEAE**
      - 4' Stems evident, not concealed, the internodes elongated, green; sporangia borne singly along the stems or aggregated in a terminal conelike structure; all spores similar in size and color, either yellow or green.
        5. Stems hollow, jointed, either unbranched or with a central axis and whorled branches; leaves connate, whorled, 1-veined; sporangia borne on the undersurfaces of peltate sporangiophores that are aggregated into terminal cones; sporangia all similar; spores green . . . . . **EQUISETACEAE**
        - 5' Stems solid, dichotomously forked; true leaves absent but veinless scales scattered on stems; sporangia scattered along stems; spores yellow . . . . . **PSILOTACEAE**
  - 1' Leaves well-developed with numerous veins.
    6. Leaves palmate with 4 leaflets; plants aquatic, at least early in growing season; rooting on bottom of shallow pools or streams; leaf-blades free-floating or raised above water surface . . . . . **MARSILEACEAE**
    - 6' Leaves simple or 1- to several-times pinnate, but never palmate with 4 leaflets; plants terrestrial or sometimes growing in wet soil; leaf-blades never free-floating.
      7. Sporangia 0.5-1.0 mm diameter, spherical, without an annulus, sessile in spike-like or panicle-like clusters on specialized stalks arising from the petiole; young leaves never coiled. . . . . **OPHIOGLOSSACEAE**
      - 7' Sporangia with an annulus, much smaller, microscopically slender stalked, usually aggregated in groups (sori) on the margins or undersurfaces of leaves; young leaves coiled, uncoiling as they develop.
        8. Sori borne along margin of leaf; indusia absent or sori covered by reflexed leaf-margin.
          9. Leaflets all entire . . . . . **PTERIDACEAE**
          - 9' Some or all of the leaflets toothed or lobed.
            10. Rhizome and base of petiole covered with felt-like hairs; rhizome long-creeping; petiole often much more than 3 mm diameter, strongly grooved; greenish or straw-colored above the base; leaves (including petiole) often more than 80 cm long, sometimes more than 2 m long . . . . . **DENNSTAEDTIACEAE**
            - 10' Rhizome and base of petiole bearing linear to ovate scales; rhizome short and compact to long-creeping; petiole generally 2.5 mm diameter or less, round or nearly so, light brown to black throughout except when very young; leaves generally much shorter than 80 cm . . . . . **PTERIDACEAE**
    - 8' Sori borne away from margin on underside of leaves or leaflets, or sporangia scattered over undersurface and not organized into well-defined sori; indusia present or absent.
      11. Indusia absent.
        12. Sporangia scattered along veins or over undersurface of leaves, not organized into well-defined sori . . . . . **PTERIDACEAE**

- 12' Sporangia aggregated into well-defined sori, these variously arranged on undersurface of leaves.
  - 13. Leaf-blades oblong to ovate in outline, once pinnately lobed. .... **POLYPODIACEAE**
  - 13' Leaf-blades broadly triangular, 2-3 times pinnately compound. .... **DRYOPTERIDACEAE (*Gymnocarpium*)**
- 11' Indusia present.
  - 14. Veinlets of leaflet-blades forming a network.
    - 15. Leaves generally more than 1 m long; sori elongated, borne end to end in rows ..... **BLECHNACEAE**
    - 15' Leaves generally shorter than 1 m; sori round, scattered in several series ..... **DRYOPTERIDACEAE (*Phanerophlebia*)**
  - 14' Veinlets of leaf-blades or leaflet-blades not forming a network, extending free to margins of leaf.
    - 16. Blade with 1-celled needle-like hairs; petiole with 2 vascular strands. .... **THELYPTERIDACEAE**
    - 16' Blade without needle-like hairs; petiole with 3 or more vascular strands (except in *Athyrium* and *Asplenium*).
      - 17. Sori round or nearly so, scarcely longer than wide ..... **DRYOPTERIDACEAE**
      - 17' Sori elongated, oblong to linear, sometimes curved.
        - 18. Leaves simple or once pinnate ..... **ASPLENIACEAE**
        - 18' Leaves 2 or more times pinnate.
          - 19. Leaves generally 30-100 cm long; petiole and rachis generally pale green or straw-colored; pinnae decreasing in size toward base of blade **DRYOPTERIDACEAE (*Athyrium*)**
          - 19' Leaves 10-30 cm long; petiole and rachis usually dark green to black or dark brown; pinnae increasing in size toward base of blade. .... **ASPLENIACEAE (*Asplenium adiantum-nigrum*)**

## Key 2: Gymnosperms – Seed Plants Without Carpels

- 1. Leaves needle-like, elongated, thick, and green.
  - 2. Leaves alternate or in fascicles of 2-5; cones woody; cone-scales more or less free from subtending bracts (this sometimes difficult to observe); trees ..... **PINACEAE**
  - 2' Leaves opposite or whorled; cones fleshy and berrylike; cone-scales wholly adnate to subtending bracts; shrubs, mostly 1 m tall or less **CUPRESSACEAE (*Juniperus communis*)**
- 1' Leaves all scale-like, if elongated, thin and dry.
  - 3. Leaves many, green, closely overlapping, concealing the branchlets or nearly so; branchlets more or less flexible; internodes very short; ovules 1-many, enclosed in spherical or ovoid cones, these fleshy and berrylike or dry and woody; pollen sacs sessile on undersurfaces of scales of pollen cones; shrubs and trees ..... **CUPRESSACEAE**
  - 3. Leaves comparatively few, dry, often early-deciduous, not overlapping, not concealing the stem; branchlets stiff, jointed, green; internodes much elongated; ovules 1-3, surrounded by a cluster of perianth-like, dry, membranous scales; pollen sacs anther-like, borne on stalks arising from pollen cone; shrubs ..... **EPHEDRACEAE**

**Key 3: Plants with Two or More Simple Pistils per Flower**

1. Stems jointed, green; leaves opposite or whorled, dry and scale-like, and generally early deciduous; the apparent perianth composed of dry, membranous scales; plant actually a gymnosperm, the apparent pistils actually ovules closely enveloped by tubular pairs of fused cone scales ..... **EPHEDRACEAE**
- 1' Stems not jointed, green or brown to black; leaves variously arranged, but if opposite or whorled, not dry and scale-like; perianth parts, if present, not dry, membranous scales; angiosperms with true pistils.
  2. Perianth absent or represented by only 1 whorl of parts, generally treated as sepals even when petal-like in color and texture.
    3. Hypanthium present, well-developed ..... **ROSACEAE**
    - 3' Hypanthium absent.
      4. Flowers clustered in dense spherical heads, all imperfect, the staminate and pistillate flowers in different heads.
        5. Herb, aquatic or semiaquatic; leaves linear strap-shaped, unlobed, parallel-veined; gynoecium not truly apocarpous, each pistil with its own perianth, but this often difficult to observe ..... **SPARGANIACEAE**
        - 5' Tree, terrestrial or along streams; leaves alternate, palmately veined and lobed; gynoecium truly apocarpous, pistils in groups, each group with a perianth, this evident on close examination of flowering specimens ..... **PLATANACEAE**
      - 4' Flowers solitary or variously clustered but never in dense spherical heads, perfect or imperfect.
        6. Leaves toothed, lobed, or compound; perianth parts often very showy and petal-like ..... **RANUNCULACEAE**
        - 6' Leaves simple, entire; perianth parts generally small and inconspicuous, not petal-like.
          7. Leaves all basal; flowers scapose; receptacle elongated, cylindrical, bearing numerous spirally attached pistils **RANUNCULACEAE** (*Myosurus*)
          - 7' Leaves all cauline; flowers axillary or borne in a terminal spike or raceme.
            8. Plants terrestrial; flowers borne in an elongated raceme; ovaries coalescing at maturity, forming a flattened berry ..... **PHYTOLACCACEAE** (*Phytolacca*)
            - 8' Plants aquatic; stems and leaves submersed or floating; flowers axillary or in spikes, submersed or raised a short distance above water surface.
              9. Perianth parts 4; flowers several to many in spikes; leaves submersed, floating, or both ..... **POTAMOGETONACEAE**
              - 9' Perianth absent; flowers solitary, axillary, or borne on 2-flowered peduncles.
                10. Flowers sessile in leaf-axils; leaves mostly opposite; fruits sessile or short-stalked, more or less roughened ..... **ZANNICHELLIACEAE**
                - 10' Flowers borne in 2-flowered spikes on slender peduncles; leaves mostly alternate; fruits stalked in umbel-like clusters, smooth; peduncle often coiled ..... **RUPPIACEAE**
      - 2' Perianth parts in 2 or more whorls or complete spirals, the outer series usually treated as sepals and the inner as petals.
        11. Petals 3; sepals 3.
          12. Sepals green or brown; petals white or tinged with pink; leaves sometimes broad and clearly differentiated into blade and petiole; ovaries 1-ovuled, generally wholly distinct ..... **ALISMACEAE**

- 12' Sepals and petals all similar, all petal-like, white or cream-colored, each with a greenish or yellowish basal gland; leaves both basal and cauline, all linear and parallel veined; ovaries many-ovuled, connate at least at the base ..... **LILIACEAE (*Zigadenus*)**
- 11. Petals 4 or more; sepals 4 or more (except in Papaveraceae: *Platystemon*).
- 13. Stamens twice as many as the petals or fewer.
- 14. Petals connate, at least at the base.
- 15. Carpels 4 or more; sap clear.
- 16. Leaves simple, succulent; ovules many per carpel; fruit a cluster of follicles ..... **CRASSULACEAE**
- 16' Leaves pinnately compound, not succulent; ovule 1 per carpel; fruit a cluster of achenes ..... **ROSACEAE**
- 15' Carpels 2; sap milky.
- 17. Styles distinct but stigmas connate and adnate to anthers forming a drum-shaped gynostegium ..... **ASCLEPIADACEAE**
- 17' Styles distinct or connate; stigmas connate but free from stamens; anthers sometimes connivent around the styles ..... **APOCYNACEAE**
- 14' Petals distinct.
- 18. Leaves and often stems thick and fleshy. .... **CRASSULACEAE**
- 18' Leaves and stems not very thick and fleshy.
- 19. Hypanthium present.
- 20. Ovules several to many in each ovary; leaves simple, usually not stipulate, usually palmately veined ..... **SAXIFRAGACEAE**
- 20' Ovules mostly 1-4 per ovary; leaves simple or compound, usually stipulate, usually pinnately veined or venation obscure.
- 21. Leaves alternate; seeds without arils ..... **ROSACEAE**
- 21' Leaves opposite; seeds with arils ..... **CROSSOSOMATAACEAE (*Apacheria*)**
- 19' Hypanthium absent or very poorly developed.
- 22. Leaves compound ..... **SIMAROUBACEAE (*Ailanthus*)**
- 22' Leaves simple.
- 23. Leaves mostly or all basal; erect or spreading herbs ..... **SAXIFRAGACEAE**
- 23' Leaves all cauline, sometimes scale-like and early-deciduous; shrubs, trees, or more or less woody vines.
- 24. Branches essentially leafless, forming rigid green thorns; erect shrub or small tree ..... **SIMAROUBACEAE (*Castela*)**
- 24' Branches leafy, not at all thorny; trailing or twining vines.
- 25. Leaves opposite ..... **MALPIGHIACEAE**
- 25' Leaves alternate ..... **MENISPERMACEAE**
- 13' Stamens more than twice as many as petals or petaloid perianth elements.
- 26. Plants definitely woody, shrubs or trees.
- 27. Stipules usually present; leaves mostly toothed, lobed or compound; seeds without arils ..... **ROSACEAE**
- 27' Stipules absent; leaves entire or tridentate at apex; seeds with arils ..... **CROSSOSOMATAACEAE**
- 26' Plants herbaceous or only slightly woody at base.
- 28. Hypanthium present ..... **ROSACEAE**
- 28' Hypanthium absent.
- 29. Sepals 4-many, present at anthesis, often petaloid . **RANUNCULACEAE**
- 29' Sepals 2-3, falling as the flower opens, not petaloid ..... **PAPAVERACEAE (*Platystemon*)**

**Key 4: Woody Plants, Mostly Dicots; Perianth Parts Absent or in  
One Whorl or Spiral; Pistil One per Flower**

1. Plants parasitic on the branches of trees and shrubs and not connected to the ground ..... **VISCACEAE**
- 1' Plants not parasitic on branches of trees or shrubs (but sometimes root-parasitic), normally rooted in the ground.
  2. Arrangement of flowers, either the staminate or pistillate, or both, in catkins (spikes or spike-like inflorescences of apetalous imperfect flowers); flowers all imperfect.
    3. Plant a fleshy subshrub of saline areas; leaves succulent, linear to oblanceolate or scale-like leaves; catkins erect ..... **CHENOPODIACEAE**
    - 3' Plant not fleshy, not of saline areas; leaves linear to ovate, sometimes compound.
      4. Plant a low shrub with narrowly linear leaves; catkins erect ..... **EUPHORBIACEAE (*Stillingia linearifolia*)**
      - 4' Plant a broadleaved vine, shrub, or tree; catkins erect or drooping.
        5. Pistillate flowers solitary or in small clusters, not borne in catkins.
          6. Leaves once pinnate ..... **JUGLANDACEAE**
          - 6' Leaves simple.
            7. Pistillate flowers individually surrounded by involucre of scaly bractlets; fruit a nut (acorn) enclosed at base in a cup-like involucre (acorn cup) of numerous scaly bractlets; staminate catkins very slender, drooping, with 1 flower at each node; pubescence, when present, of stellate hairs ..... **FAGACEAE**
            - 7' Pistillate flowers without an involucre; fruit a capsule; locules and seeds 2-3; staminate catkins stiff, erect, with several flowers at each node; pubescence not stellate ..... **EUPHORBIACEAE (*Sapium*)**
- 5' Pistillate flowers borne in catkins.
  8. Leaves mostly or all opposite; shrubs and woody vines.
    9. Vine with twining stems, deciduous; leaves lobed, thin; staminate flowers in an open panicle; pistillate flowers in head-like catkins ..... **CANNABACEAE (*Humulus*)**
    - 9' Erect evergreen shrub; leaves entire, leathery; stems not twining; staminate flowers in catkins; pistillate flowers in catkins ..... **GARRYACEAE**
  - 8' Leaves alternate; trees and shrubs.
    10. Catkins without bractlets; fruit an achene closely surrounded by 4 tightly appressed fleshy sepals, the combination resembling a small berry; pistillate catkin ripening as a spherical to ellipsoid multiple fruit; sap milky ..... **MORACEAE**
    - 10' Catkins with flowers subtended by bractlets (these sometimes early-deciduous); fruit a samara, a nut, or a capsule; sepals, if present, not fleshy; pistillate catkin not fleshy; sap clear.
      11. Bractlets of pistillate catkins tightly appressed at anthesis, only the stigmas protruding; fruits 1-seeded, either small nuts individually surrounded by thin inflated involucre derived from enlarged catkin scales or many small samaras in a conelike fruiting catkin ..... **BETULACEAE**
      - 11' Bractlets of pistillate catkins often spreading or loosely appressed at anthesis, or sometimes early deciduous; fruit capsular; seeds 2 to many.
        12. Stigmas green to black, capitate or variously lobed but not dissected into threadlike segments; plants dioecious; capsule 1-loculed; seeds several to many, each with a tuft of hairs ..... **SALICACEAE**

- 12' Stigmas red, dissected into numerous elongated, thread-like segments; plants monoecious; capsule 2-3-loculed; seeds 2-3, smooth ..... **EUPHORBIACEAE (*Acalypha*)**
- 2' Arrangement of flowers various, but not in catkins; flowers perfect or imperfect.
13. Inflorescence [at least of the pistillate flowers] a dense spherical to ellipsoid head or a dense spike.
14. Leaves bipinnately compound; flowers usually perfect; both sepal and petals actually present, but very small and often concealed by stamens .... **FABACEAE**
- 14' Leaves simple; flowers imperfect, the staminate and pistillate flowers in different heads; petals truly absent.
15. Pistillate heads armed with straight or hooked spines, maturing as burs; pistillate flowers 1-3 ..... **ASTERACEAE (*Ambrosia*)**
- 15' Pistillate heads unarmed, not maturing as burs; pistillate flowers many.
16. Stems armed with thorns; leaves entire; fruit clusters fleshy; fruits coalescent into a multiple fruit with fleshy tissue derived from sepals or receptacle; tree or shrub; bark not flaking away in large plates ..... **MORACEAE (*Maclura*)**
- 16' Stems unarmed; leaves palmately lobed; fruits or fruit-clusters dry, maturing as a dense spherical cluster of hairy achenes; tree with bark flaking away in large flat plates ..... **PLATANACEAE**
- 13' Inflorescence not a spherical to ellipsoid head or a dense spike.
17. Foliage and young branches bearing peltate scales or forked, dendritic, or stellate hairs.
18. Flowers perfect.
19. Flowers very showy; calyx generally more than 3 cm diameter, bowl-shaped, yellow-orange; sepals connate at base; stamens strongly connate around style; hairs stellate. .... **STERCULIACEAE (*Fremontodendron*)**
- 19' Flowers inconspicuous; calyx less than 1 cm diameter, straw-colored; sepals distinct; stamens distinct; hairs dendritic ..... **AMARANTHACEAE (*Tidestromia oblongifolia*)**
- 18' Flowers imperfect; plants monoecious or dioecious.
20. Pistillate flowers without sepals but enclosed by a pair of appressed bractlets; fruit an indehiscent utricle ..... **CHENOPODIACEAE**
- 20' Pistillate flowers with a calyx, not enclosed by a pair of bractlets; fruit a capsule or berrylike.
21. Stigmas, styles, and locules of ovary 2 or more, most commonly 3; calyx not tubular; ovary obviously superior; fruit a capsule ..... **EUPHORBIACEAE**
- 21' Stigma, style, and locule of ovary 1; calyx tubular; ovary appearing inferior, tightly enclosed by base of calyx; fruit an achene enclosed by a fleshy calyx-base, thus appearing berry-like ..... **ELAEAGNACEAE**
- 17' Foliage and branches glabrous or with unbranched hairs.
22. Ovary wholly or partly inferior (or appearing so).
23. Leaves whorled ..... **RUBIACEAE (*Galium*)**
- 23' Leaves opposite or alternate.
24. Inflorescence unit an involucrate head (sometimes superficially resembling a single flower).
25. Style 2-branched near apex; anthers (or less commonly filaments) usually connate; anthers generally with a sterile terminal appendage; ray flowers sometimes present; ovary truly inferior ... **ASTERACEAE**

- 25' Style unbranched; anthers and filaments always distinct; anthers without a sterile terminal appendage; ray flowers never present; ovary actually superior but tightly enwrapped by base of perianth .  
 ..... NYCTAGINACEAE (*Mirabilis*)
- 24' Inflorescence unit a 2-flowered cluster, an umbel, or a cyme.  
 26. Leaves alternate ..... SANTALACEAE  
 26' Leaves opposite.  
 27. Inflorescence a 2-flowered cluster subtended by a pair of conspicuous, reddish, distinct bracts; perianth yellow or orange; carpels 2-3; ovules 2-8 per locule; ovary truly inferior; fruit a black berry . CAPRIFOLIACEAE (*Lonicera involucrata*)  
 27' Inflorescence a several-flowered umbel subtended by an involucre of several connate bracts; perianth white or yellow; carpel and ovule 1; ovary actually superior but tightly enwrapped by base of perianth; fruit an achene .....  
 ..... NYCTAGINACEAE (*Commicarpus*)
- 22' Ovary superior.  
 28. Leaves opposite or whorled.  
 29. Stems green, jointed, nearly leafless, the leaves dry, scale-like, often early deciduous; apparent pistils actually ovules tightly enclosed by flask-like cone-scales that are prolonged into style-like tips, surrounded by dry, perianth-like cone scales; stamens with 2-8 anther sacs ..... EPHEDRACEAE  
 29' Stems green to brown or gray, not jointed, leafy (though leaves sometimes absent at time of flowering); true pistils present; stamens with 1-2 anther sacs.  
 30. Fruit a samara; leaves usually lobed or compound.  
 31. Samara 1-loculed; wing single; leaves pinnately compound or rarely simple ..... OLEACEAE (*Fraxinus*)  
 31' Samara 2-loculed; wing double; leaves pinnately compound or simple and palmately lobed ..... ACERACEAE  
 30' Fruit not winged; leaves simple and entire.  
 32. Flowers perfect, with a conspicuous 4-lobed yellow hypanthium; leaves narrow, stiff, fascicled .....  
 ..... ROSACEAE (*Coleogyne*)  
 32' Flowers imperfect (rarely perfect), without a hypanthium; perianth greenish or minute, sepals 4-5, distinct or nearly so.  
 33. Leaves thick and leathery, 10-25 mm wide; calyx conspicuous; styles 3; locules of ovary 3 .....  
 ..... SIMMONDSIACEAE  
 33' Leaves thin, 5-13 mm wide; calyx very small; style 1; locules of ovary 2 ..... OLEACEAE (*Forestiera*)
- 28' Leaves alternate.  
 34. Leaves pinnately compound; flowers in elongated racemes .....  
 ..... FABACEAE (*Errazurizia*)  
 34' Leaves simple; flowers solitary or variously clustered.  
 35. Flowers strongly zygomorphic; calyx purple; fruit an indehiscent pod armed with barbed spines ..... KRAMERIACEAE  
 35' Flowers actinomorphic, or if zygomorphic, not purple; fruit not spiny.  
 36. Stamens as many as and alternate with the sepals .....  
 ..... RHAMNACEAE  
 36' Stamens opposite the sepals or of a different number.  
 37. Leaves glutinous; fruit winged SAPINDACEAE (*Dodonaea*)

- 37' Leaves not glutinous; fruit not winged.
- 38. Flowers perfect.
  - 39. Stamens numerous; style in fruit plumose; ovary surrounded by a tubular hypanthium ..... **ROSACEAE (*Cercocarpus*)**
  - 39' Stamens 9 or fewer.
  - 40. Fruit an orbicular to ovate disclike samara; trees ..... **ULMACEAE (*Ulmus*)**
  - 40' Fruit an achene or a utricle; low shrubs or woody vines.
  - 41. Flowers several to many in a calyx-like involucre . . **POLYGONACEAE (*Eriogonum*)**
  - 41' Flowers bractless or subtended by solitary bracts ..... **CHENOPODIACEAE**
- 38' Flowers imperfect.
  - 42. Ovary more or less 2- to 4-lobed; locules 2-4; ovules 2-8; sap often milky; fruit a capsule ..... **EUPHORBIACEAE**
  - 42' Ovary unlobed; locule 1; ovules 1-2; sap clear; fruit a drupe, samara, achene, or utricle.
  - 43. Fruit a drupe or samara, not enclosed by bracts. .... **ULMACEAE**
  - 43' Fruit an achene or utricle, enclosed by 2 persistent bracts ..... **CHENOPODIACEAE**

**Key 5: Herbaceous Dicots with Perianth Absent or Represented by a Single Whorl or Spiral; Ovary Inferior [Or Appearing So]**

- 1. Plants parasitic on the stems of woody host plants.
- 2. Flowers and fruits emerging directly from stem of host, the remainder of parasite internal; parasitic on *Psoralea* spp. .... **RAFFLESACEAE**
- 2' Flowers and fruits borne on leafy stems of parasite (leaves often much-reduced); parasitic on various hosts, but not on *Psoralea*. .... **VISCACEAE**
- 1' Plants free-living or parasitic on roots of host plants.
- 3. Inflorescence with a well-developed involucre.
  - 4. Bracts of involucre petal-like, widely spreading, white to rose-pink or purple; inflorescence a short, dense spike ..... **SAURURACEAE**
  - 4' Bracts of involucre not or scarcely petal-like, green or variously tinged; inflorescence an umbel or a head.
  - 5. Perianth parts distinct; inflorescence a simple or compound umbel ... **APIACEAE**
  - 5' Perianth parts connate into a tube; inflorescence a head
  - 6. Anthers distinct; style unbranched; ovary actually superior but tightly enveloped by base of perianth; ray flowers never present . . **NYCTAGINACEAE**
  - 6' Anthers connate (or in a few genera distinct), forming a tube around the style; style branches 2; ovary truly inferior; ray flowers often present **ASTERACEAE**
- 3' Inflorescence without an involucre.
  - 7. Tendrils present; flowers imperfect; anthers connate ..... **CUCURBITACEAE**
  - 7' Tendrils absent; flowers mostly perfect; anthers distinct.
  - 8. Plants aquatic, wholly or in large part submersed or sometimes stranded.
  - 9. Flowers in simple or compound umbels ..... **APIACEAE**
  - 9' Flowers axillary or in spikes.
  - 10. Leaves whorled, pinnately dissected ..... **HALORAGACEAE**
  - 10' Leaves opposite, entire ..... **ONAGRACEAE (*Ludwigia*)**

- 8' Plants terrestrial, if growing in wet places stems and leaves generally extending well out of water.
  - 11. Leaves opposite or whorled.
    - 12. Leaves opposite; perianth tube well-developed (at least in pistillate flowers; ovary actually superior but tightly enveloped by base of perianth, 1-seeded, unlobed though base of perianth sometimes ridged or winged.
      - 13. Perianth not at all petaloid; flowers minute, imperfect, clustered in dense axillary spikes; leaves serrate . . . . . URTICACEAE (*Boehmeria*)
      - 13' Perianth generally more or less showy, petaloid; flowers larger, perfect, borne in umbels, heads, cymes, terminal spikes, racemes, or panicles; leaves entire or wavy-margined. . . . . NYCTAGINACEAE
    - 12' Leaves whorled; perianth tube very short; ovary truly inferior, 2-lobed, 2-seeded . . . . . RUBIACEAE
  - 11' Leaves all alternate or some alternate and some basal.
    - 14. Perianth parts obviously connate, forming a short to elongate tube; flowers solitary or in cymes.
      - 15. Perianth strongly zygomorphic; flowers solitary, axillary; leaves hastate; fruit a capsule with many seeds . . . . . ARISTOLOCHACEAE
      - 15' Perianth actinomorphic; flowers in terminal cymes; leaves entire; fruit indehiscent, nutlike, 1-seeded . . . . . SANTALACEAE
    - 14' Perianth parts distinct or nearly so.
      - 16. Flowers axillary or in leafy-bracted spikes; fruit a many-seeded capsule, dehiscent on the sides by pores . . . CAMPANULACEAE (*Triodanis*)
      - 16. Flowers in umbels or tight, headlike cymes; fruit indehiscent, 1- to 2-seeded.
        - 17. Flowers in simple or compound umbels; perianth parts 5, short, not at all featherlike; herbage unarmed; fruit a 2-seeded, splitting into two, 1-seeded segments . . . . . APIACEAE
        - 17' Flowers in tight headlike cymes; perianth parts 10, elongate, plumose with spreading bristles; herbage armed with barbed and stinging hairs; fruit 1-seeded, not splitting apart . . . . . LOASACEAE (*Cevallia*)

**Key 6: Herbaceous Monocots and Dicots with Perianth Absent Or Represented by a Single Whorl or Spiral; Ovary Superior; Leaves Alternate or Some Alternate and Some Basal, Or Leaves and Stems Not Differentiated**

- 1. Herbage sparsely to densely covered with scales or pubescent with branched hairs.
  - 2. Leaf-surfaces bearing powdery sessile scales . . . . . CHENOPODIACEAE
  - 2' Leaf-surfaces bearing peltate scales or stellate hairs.
    - 3. Ovary strongly flattened, more or less wing-margined in fruit; flowers perfect, borne in terminal spikes; perianth of 1 early deciduous sepal . . . . . CHENOPODIACEAE (*Corispermum*)
    - 3' Ovary not flattened, not wing-margined; flowers imperfect, solitary or in small clusters; perianth, at least in staminate flowers, of 5 or more sepals . . . . . EUPHORBIACEAE (*Croton*, *Eremocarpus*)
- 1' Herbage glabrous or variously hairy, but without scales or branched hairs.
  - 4. Plants aquatic, the plant body either submersed or floating, or barely raised above the water surface; stems, if present, lax and unable to support the plant out of water.
    - 5. Plant body free-floating, raftlike, or stranded on mud.

- 6. Plants minute, less than 1 cm long, not differentiated into stem and leaves; roots, if present, unbranched; flowers produced from beneath a tiny marginal flap of tissue ..... **LEMNACEAE**
- 6' Plants larger, with a rosette of palmately veined velvety leaves; flowers enclosed or subtended by one or more small sheathing bractlets ..... **ARACEAE**
- 5' Plant body differentiated into stems and leaves, usually rooted.
  - 7. Flowers imperfect, clustered in heads, the staminate and pistillate flowers in different heads ..... **SPARGANIACEAE**
  - 7' Flowers all perfect.
    - 8. Leaves pinnately veined, the lateral veins numerous, extending toward margins; perianth parts red to rose-purple .... **POLYGONACEAE** (*Polygonum*)
    - 8' Leaves parallel-veined, or if pinnately veined, the lateral veins extending the length of the leaf;
      - 9. Fruits sessile on axis of spike; peduncles straight; inflorescence several- to many-flowered; perianth parts 4; stamens 4 .... **POTAMOGETONACEAE**
      - 9' Fruits stalked in umbelliform clusters; peduncles usually becoming spirally coiled in age; inflorescence 2-flowered; perianth absent; stamens 2 ..... **RUPPIACEAE**
- 4' Plants terrestrial or rooted in shallow water; leaves various; if plants growing in wet places the stems extending well above water surface.
  - 10. Leaves compound or deeply divided.
    - 11. Leaves 2-several times compound or divided
      - 12. Perianth parts yellow or orange ..... **PAPAVERACEAE** (*Eschscholzia*)
      - 12' Perianth parts white ..... **RANUNCULACEAE** (*Actaea*, *Cimicifuga*)
    - 11' Leaves deeply divided or once compound.
      - 13. Leaves pinnate ..... **ROSACEAE** (*Sanguisorba*)
      - 13' Leaves palmately lobed or divided.
        - 14. Leaves palmately 1-2 times divided, all basal; lobes entire; flowers perfect ..... **VIOLACEAE** (*Viola pedatifida*)
        - 14' Leaves once palmately divided or compound, all cauline; leaflets or principal lobes usually serrate or pinnately lobed; flowers imperfect.
          - 15. Leaflets 3; herbage armed with stinging hairs ..... **EUPHORBIACEAE** (*Tragia laciniata*)
          - 15' Leaflets or principal lobes generally 5-11 or more; herbage without stinging hairs.
            - 16. Leaves palmately compound; leaflets serrate; plants dioecious .... **CANNABACEAE** (*Cannabis*)
            - 16' Leaves palmately divided; principal lobes coarsely toothed or lobed; plants monoecious ..... **EUPHORBIACEAE** (*Manihot*)
  - 10' Leaves simple, entire, toothed, or shallowly lobed.
    - 17. Leaves linear, sheathing, parallel-veined, or leaves all reduced to bladeless basal sheaths.
      - 18. Flowers all imperfect in dense spikes or spherical heads 1-4 cm in diameter.
        - 19. Flowers individually subtended or enclosed by bractlets.
          - 20. Pistillate flowers individually enclosed in hollow, flask-like bractlets that are in turn subtended by flattened, scale-like bractlets, the rachis not thick or hardened; each staminate flower subtended by a single, scale-like bractlet ..... **CYPERACEAE** (*Carex*)
          - 20' Pistillate flowers subtended by 4 bractlets in two pairs, alternately sunken into hollows in a thick, hardened rachis; each staminate flower subtended by two pairs of scale-like bractlets . **POACEAE** (*Tripsacum*)
        - 19. Flowers not subtended or enclosed by bractlets.
          - 21. Flowers in terminal spikes 10-30 cm long; pistillate flowers subtended by fine bristles ..... **TYPHACEAE**

- 21' Flowers in spherical heads; pistillate flowers subtended by tiny chaffy scales ..... **SPARGANIACEAE**
- 18' Flowers perfect, or if imperfect, inflorescence less than 1 cm in diameter.
  - 22. Inflorescence a slender, bractless raceme; carpels 3-6, weakly united, separating at maturity ..... **JUNCAGINACEAE**
  - 22' Inflorescence of solitary flowers, panicles, spikes or spikelets; flowers subtended by 1 or more bractlets; carpels 2-3, strongly connate, not separating.
    - 23. Fruit a capsule with 3 or more seeds; perianth parts 6 (rarely 4), all well-developed and sepaloid; inflorescence of heads or panicles ..... **JUNCACEAE**
    - 23' Fruit one-seeded, an achene or a caryopsis; perianth segments absent or reduced to bristles or minute scales; inflorescence of spikelets or spikes, these solitary or variously clustered.
      - 24. Stem 3-angled or terete, solid; nodes not swollen; inflorescence of spikes or spikelets without specialized sterile basal bractlets; each flower subtended by a solitary bractlet or (in pistillate flowers of *Carex*) enclosed by a hollow saclike bract (perigynium); perianth (if present) of very short to elongated bristles; fruit a biconvex or triangular achene ..... **CYPERACEAE**
      - 24' Stem terete (rarely flattened), often hollow; nodes swollen, knotlike; inflorescence of spikelets, each subtended by a pair of basal bracts (glumes) that do not directly subtend flowers; each flower generally enclosed by a pair of bractlets (lemma and palea); perianth reduced to an inconspicuous pair of scales (lodicules) or sometimes absent; fruit a caryopsis ..... **POACEAE**
- 17' Leaves linear to ovate, not sheathing; blades mostly pinnately or palmately veined or leaves more or less fleshy and venation obscure.
  - 25. Leaves stipulate, the stipules sometimes reduced to glands.
    - 26. Style 1, unbranched, or stigma 1, sessile; ovules many; fruit a capsule ... **VIOLACEAE**
    - 26' Styles, style branches, or sessile stigmas 2 or more; ovules 1-6; fruit an achene or a capsule.
      - 27. Stipules united into a sheath (ocrea) around stem, sometimes shredded as branches develop ..... **POLYGONACEAE**
      - 27' Stipules distinct, not united around stem; not shredded as branches develop.
        - 28. Flowers perfect; ca. 1 mm diameter; style branches 2; sap never milky ..... **CARYOPHYLLACEAE (*Herniaria*)**
        - 28' Flowers imperfect, larger or reduced to individual stamens and pistils and clustered within more or less flower-like cup-shaped involucre with marginal nectar-glands (cyathia); styles, style branches, or sessile stigmas usually 3, sometimes forked or repeatedly divided; sap often milky ..... **EUPHORBIACEAE**
  - 25' Leaves exstipulate.
    - 29. Perianth parts 6, all more or less petal-like.
      - 30. Stamens many; flowers never borne within an involucre ..... **PAPAVERACEAE**
      - 30' Stamens 9 or fewer; flowers often borne within a cuplike or tubular involucre ..... **POLYGONACEAE**
    - 29' Perianth parts 5 or fewer, sometimes 0, usually not petal-like.
      - 31. Inflorescence a raceme.
        - 32. Flowers of raceme not subtended by bracts ..... **BRASSICACEAE**
        - 32' Flowers of raceme individually subtended by bracts.

- 33. Flowers actinomorphic; stamens distinct; fruit a berry ..... **PHYTOLACCACEAE**
- 33' Flowers zygomorphic; stamens connate, forming a U-shaped tube around ovary; fruit a capsule ..... **POLYGALACEAE**
- 31' Inflorescences various or flowers solitary.
- 34. Perianth parts petaloid ..... **PAPAVERACEAE**
- 34' Perianth parts sepeloid.
- 35. Stigma 1, composed of a minute sessile tuft of straight hairs, often early deciduous from ovary; leaves very thin, entire .... **URTICACEAE (*Parietaria*)**
- 35' Stigmas 2-6, linear or borne on separate styles, persistent or deciduous; leaves thin to thick and fleshy, entire to toothed or shallowly lobed.
- 36. Ovary 3-lobed, 3-seeded, maturing as a capsule; sap often milky ..... **EUPHORBIACEAE**
- 36' Ovary unlobed, 1-seeded, maturing as a utricle; sap clear.
- 37. Utricle circumscissile ..... **AMARANTHACEAE**
- 37' Utricle indehiscent.
- 38. Flowers bractless or bracts not scarious-margined; leaves sometimes covered with powdery or bead-like hairs ..... **CHENOPODIACEAE**
- 38' Flowers closely subtended by scarious-margined bracts; leaves without powdery or beadlike hairs.
- 39. Leaves petioled, the blades flat; habitats mostly not saline .. **AMARANTHACEAE (*Amaranthus*)**
- 39' Leaves sessile, linear, often terete or subterete, the blades not or scarcely differentiated; habitats often saline ..... **CHENOPODIACEAE**

**Key 7: Herbaceous Monocots and Dicots with Perianth Absent or Represented by a Single Whorl or Spiral; Ovary Superior; Leaves Opposite or Whorled**

- 1. Herbage sparsely to densely covered with scales or pubescent with branched hairs.
- 2. Leaf-surfaces bearing powdery sessile scales; leaves of a pair generally equal ..... **CHENOPODIACEAE**
- 2' Leaf-surfaces bearing stellate or dendritic hairs; leaves of a pair or whorl often very unequal.
- 3. Fruit 1-seeded, indehiscent ..... **AMARANTHACEAE (*Tidestromia*)**
- 3' Fruit several- to many-seeded, dehiscent ..... **MOLLUGINACEAE (*Glinus*)**
- 1' Herbage glabrous or variously hairy, but without scales or branched hairs.
- 4. Plants aquatic, weak-stemmed, submersed, floating, or stranded on mud.
- 5. Leaves opposite.
- 6. Ovary 2- or 4-lobed, 4-seeded ..... **CALLITRICHACEAE**
- 6' Ovary not lobed, 1-seeded.
- 7. Leaves with free membranous stipules, entire; pistils several per leaf axil, each with a single stigma; fruits beaked ..... **ZANNICHELLIACEAE**
- 7' Leaves estipulate (although base somewhat auriculate); pistil 1 per leaf axil, bearing 3-4 stigmas; fruit beakless ..... **NAJADACEAE**
- 5' Leaves whorled; ovary unlobed; seed 1.
- 8. Leaves dissected into narrow lobes ..... **CERATOPHYLLACEAE**
- 8' Leaves entire ..... **HIPPURIDACEAE**
- 4' Plants terrestrial, sometimes growing in damp soil.
- 9. Locules of ovary 2 or more (if in doubt, try both ways)
- 10. Flowers imperfect; sap often milky ..... **EUPHORBIACEAE**

- 10' Flowers perfect; sap clear.
  - 11. Leaves appearing whorled ..... **MOLLUGINACEAE (*Mollugo*)**
  - 11' Leaves opposite.
    - 12. Perianth parts without petaloid margin; capsule splitting lengthwise ..... **LYTHRACEAE (*Rotala*)**
    - 12' Perianth parts with thin petaloid margin; capsule circumscissile ..... **AIZOACEAE**
- 9' Locule of ovary 1.
  - 13. Ovules 3-many; fruit a capsule.
    - 14. Capsule circumscissile; plants more or less succulent ..... **AIZOACEAE**
    - 14' Capsule splitting by apical teeth; plants mostly not succulent ..... **CARYOPHYLLACEAE**
  - 13' Ovule 1; fruit an achene or a utricle.
    - 15. Style 1, undivided, or stigma 1, sessile.
      - 16. Perianth parts small, green, inconspicuous or apparently absent; leaves toothed and often armed with stinging hairs ..... **URTICACEAE**
      - 16' Perianth parts petal-like, united into a tube; leaves entire or shallowly lobed, never bearing stinging hairs ..... **NYCTAGINACEAE**
    - 15' Styles, style-branches, or sessile stigmas 2 or more.
      - 17. Leaves palmately compound or deeply lobed ..... **CANNABACEAE**
      - 17' Leaves simple, entire or toothed, or apically notched.
        - 18. Fruit a triangular achene; perianth parts 6, in 2 similar to very dissimilar whorls ..... **POLYGONACEAE**
        - 18' Fruit not triangular; perianth parts 5 or fewer.
          - 19. Leaves stipulate ..... **CARYOPHYLLACEAE**
          - 19' Leaves exstipulate.
            - 20. Leaves reduced to fleshy scales; inflorescence a fleshy spike ..... **CHENOPODIACEAE (*Salicornia*)**
            - 20' Leaves linear to ovate; inflorescences various.
              - 21. Bracts subtending flowers leaflike or fleshy; flowers loosely to densely aggregated; plants often succulent or herbage covered with bead-like or powdery hairs; habitat often saline; utricle indehiscent ..... **CHENOPODIACEAE**
              - 21' Bracts subtending flowers generally dry and hyaline or scarious; flowers generally very densely aggregated; plants not succulent; herbage glabrous or variously pubescent, but without bead-like or powdery hairs; habitat usually not saline; utricle sometimes circumscissile ..... **AMARANTHACEAE**

#### Key 8: Monocots and Dicots; Perianth Parts in Whorls of Three

- 1. Carpels separate to the base or nearly so, each forming a separate simple pistil with its own stigma and ovary.
  - 2. Sepals green; petals white to pink; carpels many; leaves often with expanded, palmately veined blade ..... **ALISMATACEAE**
  - 2' Sepals and petals all similar, all petaloid; carpels 3-6; leaves all strap-shaped, parallel veined ..... **LILIACEAE (*Zigadenus*)**
- 1' Carpel 1 or carpels 2 or more, strongly connate, forming a single pistil with a compound ovary.
  - 3. Ovary superior.
    - 4. Trees or shrubs with 1 or more well-developed trunks.
      - 5. Leaves compound; leaflets with spiny margins ..... **BERBERIDACEAE**
      - 5' Leaves simple; leaves with entire or spiny margins.

- 6. Leaves very large, long-petioled, blade pleated, palmately lobed ..... ARECACEAE (*Washingtonia*)
- 6' Leaves linear, not differentiated into petiole and blade ..... AGAVACEAE
- 4' Herbs or coarse rosette-forming perennials with stiff, fibrous leaves.
- 7. All 6 perianth parts sepaloid, brown or green.
- 8. Leaves with expanded blades ..... POLYGONACEAE (*Rumex*)
- 8' Leaves narrowly linear, flat to terete.
- 9. Flowers in an erect, unbranched spike; anthers sessile; carpels 6, separating at maturity ..... JUNCAGINACEAE
- 9' Flowers in panicles, heads, or rarely solitary; anthers borne on filaments; carpels 3 (rarely 2), maturing as a capsule ..... JUNCACEAE
- 7' All 6 perianth parts petaloid, or the outer 3 sepaloid and the inner 3 petaloid.
- 10. Plants aquatic or subaquatic, floating or rooted in shallow water ..... PONTEDERIACEAE
- 10' Plants terrestrial or epiphytic, or if growing in wet soil, extending well above the water surface.
- 11. Leaves coarse, leathery, fibrous, perennial; plants strongly xerophytic.
- 12. Plants terrestrial ..... AGAVACEAE
- 12' Plants epiphytic ..... BROMELIACEAE
- 11' Leaves thin, not strongly fibrous, replaced annually; plants moderately or not at all xerophytic.
- 13. Leaves, at least the basal ones, pinnately veined .... POLYGONACEAE
- 13' Leaves all parallel veined.
- 14. Leaves all basal; flower or inflorescence borne on a leafless scape ..... LILIACEAE
- 14' Some or all the leaves cauline; flower or inflorescence borne on a leafy stem.
- 15. Sepals and petals all similar in color, all petaloid . LILIACEAE
- 15' Sepals green, petals white or variously pigmented.
- 16. Flowers borne in umbels subtended by one or more or less spathe-like bracts ..... COMMELINACEAE
- 16' Flowers solitary, or in an open, leafy-bracted raceme or panicle ..... LILIACEAE (*Calochortus*)
- 3' Ovary inferior.
- 17. Plants aquatic; flowers imperfect; staminate flowers breaking free from parent plant and drifting on water surface; pistillate flower with an elongated submersed hypanthium ..... HYDROCHARITACEAE
- 17' Plants terrestrial; flowers perfect, all remaining attached to plant.
- 18. Plants strongly xerophytic; leaves coarse, leathery, fibrous, perennial, often coarsely toothed, spine-tipped ..... AGAVACEAE (*Agave*)
- 18' Plants not or only slightly xerophytic; leaves not strongly fibrous, entire, not spine-tipped.
- 19. Stamens 6, free from stigma and style ..... LILIACEAE
- 19' Stamens 3 or fewer, sometimes adnate to stigma and style.
- 20. Flowers strongly zygomorphic; functional stamens 1 or 2, wholly adnate to style and stigmas forming a gynandrium or column; ovary usually with a half twist; leaves, when present, not folded, clearly bifacial; plants sometimes without green pigmentation ..... ORCHIDACEAE
- 20' Flowers (in ours) actinomorphic; stamens 3, all functional, free from the style and stigmas; ovary not twisted; leaves vertically folded with only the undersurface exposed, appearing as if attached "edge-on" to the stem; plants always with green pigmentation ..... IRIDACEAE

### Key 9: Dicots with Petals United into a Ring or Tube And a Superior Ovary

1. Plants lacking green pigmentation, parasites or mycotrophic symbionts.
  2. Slender twining leafless vines ..... **CUSCUTACEAE**
  - 2' Upright fleshy herbs with scale-like leaves, sometimes the inflorescence extending only a few cm above the soil surface.
  3. Filaments free from corolla or nearly so; flowers pendent ..... **MONOTROPACEAE (*Pterospora*)**
  - 3' Filaments adnate to corolla tube; flowers not pendent.
    4. Flowers actinomorphic or nearly so; stamens equal in number to the corolla lobes ..... **LENNOACEAE**
    - 4' Flowers strongly zygomorphic; stamens fewer than corolla lobes ..... **OROBANCHACEAE**
- 1' Plants green and photosynthetic.
  5. Anther-bearing stamens more numerous than corolla lobes.
    6. Leaves compound.
      7. Leaves bipinnate; placentation marginal; fruit a legume ..... **FABACEAE**
      - 7' Leaves palmate with 3 or more leaflets; placentation axile; fruit a capsule ..... **OXALIDACEAE**
    - 6' Leaves simple.
      8. Flowers zygomorphic ..... **POLYGALACEAE**
      - 8' Flowers actinomorphic.
        9. Corolla lobes 3 or 6; ovule 1, placentation basal; fruit an achene ..... **POLYGONACEAE**
        - 9' Corolla lobes 5.
          10. Filaments connate, forming a long tube around the style; leaves usually palmately veined ..... **MALVACEAE**
          - 10' Filaments distinct; leaves pinnately veined or veins obscure.
            11. Stems covered with large stiff petiolar spines; anthers dehiscing by longitudinal slits; corolla tubular, bright red; drought-deciduous shrubs of hot desert and arid grassland habitats ..... **FOQUIERIACEAE**
            - 11' Stems unarmed; anther dehiscing by terminal pores; corolla urceolate or campanulate, white or pink; evergreen shrubs or trees of chaparral or more mesic habitats ..... **ERICACEAE**
    - 5' Anther-bearing stamens as many as corolla lobes or fewer.
      12. Functional stamens fewer than corolla lobes; staminodes sometimes present.
        13. Submersed aquatics with only the flowering stems raised above water surface; underwater parts finely divided, bearing minute hollow traps that ingest aquatic invertebrates; roots absent; placentation free-central ..... **LENTIBULARIACEAE**
        - 13' Terrestrial plants, or if growing in water, leafy stems as well as flowers above water surface; underwater parts, if any, not finely dissected and trap-bearing; roots present; placentation axile, parietal, or basal.
          14. Flowers actinomorphic or nearly so.
            15. Corolla lobes 4. .... **SCROPHULARIACEAE (*Veronica*)**
            - 15' Corolla lobes 5 or 6.
              16. Plants annual; leaves mostly basal, those of the stem all very reduced; stamens 3; fruit a very small, more or less 3-angled achene ..... **POLYGONACEAE (*Chorizanthe brevicornu, Nemacaulis*)**
              - 16' Plants perennial, suffrutescent or decidedly woody; leaves all cauline, sometimes much reduced; stamens 2; fruit a conspicuously inflated, bilobed capsule ..... **OLEACEAE (*Menodora*)**
          - 14' Flowers strongly zygomorphic.
            17. Fruit of 2-4 nutlets or drupelets, or a drupe with a bony, more-or-less lobed endocarp; ovary often deeply 4-lobed; leaves opposite.

- 18. Ovary deeply 4-lobed; style arising from near base of ovary between the lobes, or less commonly subapically . . . **LAMIACEAE (LABIATAE)**
- 18' Ovary entire or shallowly lobed; style terminal . . . . . **VERBENACEAE**
- 17' Fruit a capsule or a berry; ovary not deeply 4-lobed; leaves opposite or alternate.
- 19. Plants woody.
  - 20. Leaves generally more than 10 cm long, simple or pinnately compound; trees or large shrubs; capsules linear, 10 cm or more long; seeds winged or fringed with hairs . . . . . **BIGNONIACEAE**
  - 20' Leaves generally 6 cm long or less, simple; shrub or subshrub; capsules less than 2 cm long; seeds not winged.
  - 21. Staminate absent, anther-bearing stamens 2; capsules elastically dehiscent into 2 valves; seeds few . . **ACANTHACEAE**
  - 21' Staminate present, bearded with long hairs, anther-bearing stamens 4; capsules not elastically dehiscent, valves 4; seeds many . . . . . **SCROPHULARIACEAE (*Keckiella*)**
- 19' Plants herbaceous, sometimes slightly woody at base.
  - 22. Leaves long-petioled, palmately veined; herbage covered with sticky glands; fruit 8 cm long or more, green and fleshy when young, the apical portion forming a hooked beak several cm long; at maturity the outer layer of pericarp sloughing off and the woody endocarp dehiscent, the beak splitting into 2 sharp claw-like structures; flowers large, showy . . . . . **MARTYNIACEAE**
  - 22' Leaves sessile or short-petioled, palmately or pinnately veined; herbage glabrous or variously pubescent, sometimes glandular; fruit much shorter than 8 cm, beakless or beak much shorter and straight; outer portions of pericarp not sloughing off; claw-like structures never produced; flowers small to large, inconspicuous to very showy.
  - 23. Leaves alternate or all basal.
    - 24. Stamens 2 or 4; anthers of all the stamens with 2 fertile anther sacs, the filaments not flattened and expanded, not densely ciliate with long, woolly hairs, the tips of the filaments not curved downward and closing the mouth of the corolla . . . . . **SCROPHULARIACEAE**
    - 24' Stamens 4; anthers of the upper stamen pair each with 1 fertile and 1 abortive anther sac, their filaments flattened and expanded, densely ciliate with long, woolly hairs, the tips of their filaments curved downward and closing the mouth of the corolla . . . . . **SOLANACEAE (*Browallia*)**
  - 23' Leaves opposite.
    - 25. Ovules generally 2 (-8) per locule; corolla lobes more or less twisted together in bud; capsule elastically dehiscent into 2 valves, ejecting the seeds; seeds flattened, disc-shaped, seed stalks persistent on the placenta (except in *Elytraria*) as hardened, hook-like projections . . . . . **ACANTHACEAE**
    - 25' Ovules generally many per locule; corolla lobes generally overlapping or edge to edge in bud; capsule not elastically dehiscent, valves 2-4; seeds variously shaped, seed stalks not persistent on the placentas as hardened, hook-like appendages . . . . . **SCROPHULARIACEAE**
- 12' Functional stamens as many as corolla lobes.
- 26. Leaves opposite, whorled, or all basal.

- 27. Sepals 2, distinct; cauline leaves one pair, sometimes connate; leaves somewhat fleshy . . . . . **PORTULACACEAE (*Claytonia*)**
- 27' Sepals 4 or more, distinct or connate.
  - 28. Lobes of corolla 4.
    - 29. Leaves all basal; inflorescence a spike or umbel.
      - 30. Corolla dry, scarious; inflorescence a spike . . . **PLANTAGINACEAE**
      - 30' Corolla of normal petaloid texture; inflorescence an umbel . . . . . **PRIMULACEAE (*Dodecatheon*)**
    - 29' Leaves all or mostly cauline; inflorescences various.
      - 31. Ovary deeply 4-lobed; herbage sometimes with strong minty aroma . . . . . **LAMIACEAE**
      - 31' Ovary unlobed; herbage not scented.
        - 32. Herbs; inflorescence open, few- to many-flowered . . . . . **GENTIANACEAE**
        - 32' Shrubs; inflorescences condensed, headlike . **BUDDLEJACEAE**
  - 28' Lobes of corolla 5.
    - 33. Ovaries 2, distinct, united only by connate style apices and stigmas; sap usually milky.
      - 34. Stamens and stigma adnate, forming a cylindrical gynostegium . . . . . **ASCLEPIADACEAE**
      - 34' Stamens free from stigma or merely adherent . . . . **APOCYNACEAE**
    - 33' Ovary 1; sap clear.
      - 35. Stigmas or style-branches 3; calyx lobes united by a scarious or hyaline membrane . . . . . **POLEMONIACEAE**
      - 35' Stigma 1-2, or style entire or 2-branched; calyx lobes not united by a scarious or hyaline membrane.
        - 36. The apparent corolla actually a petaloid calyx, constricted near the base; style passing through the constriction and joining the top of the ovary; ovule 1, basal; leaves of a pair often markedly unequal; plants often sticky-glandular . . . . . **NYCTAGINACEAE**
        - 36' A true corolla present, without a basal constriction; ovules 2-many, axile, parietal, or free-central; leaves of a pair generally equal; plants mostly not sticky-glandular.
          - 37. Leaves toothed, lobed, or compound **HYDROPHYLLACEAE**
          - 37' Leaves entire.
            - 38. Leaves all basal.
              - 39. Stamens opposite the corolla lobes; placentation free-central. . . . . **PRIMULACEAE**
              - 39' Stamens alternate with corolla lobes; placentation parietal . . . . . **HYDROPHYLLACEAE**
            - 38' Some or all of the leaves cauline.
              - 40. Inflorescence a scorpioid cyme; ovary deeply 4-lobed . . . . . **BORAGINACEAE (*Plagiobothrys*)**
              - 40' Inflorescence not scorpioid; ovary not lobed.
                - 41. Stamens opposite the corolla lobes, this readily apparent; corolla rotate, the tube very short; placentation free-central . . . . . **PRIMULACEAE**
                - 41' Stamens alternate with corolla lobes, this sometimes difficult to observe; corolla rotate to tubular or campanulate, the tube short to elongated; placentation parietal or axile.

- 42. Herbage glandular-puberulent; stems prostrate, mat-forming; corolla slightly zygomorphic; placentation axile ..... **SOLANACEAE (*Calibrachoa*)**
- 42' Herbage glabrous; stems generally not prostrate, often erect; corolla actinomorphic; placentation parietal ..... **GENTIANACEAE**
- 26' Leaves alternate or of unusual arrangement.
- 43. Plants decidedly woody; shrubs, trees, or woody vines.
  - 44. Tendrils present; leaves palmately lobed or compound ..... **VITACEAE**
  - 44' Tendrils absent; leaves pinnately veined, simple.
  - 45. Inflorescence of several elongated scorpioid cymes ..... **HYDROPHYLLACEAE (*Eriodictyon*)**
  - 45' Inflorescence not scorpioid, or if so, the cymes very short.
  - 46. Flowers yellow-orange, 2-3 cm diameter or more; herbage covered with branched hairs ..... **STERCULIACEAE (*Fremontodendron*)**
  - 46' Flowers white or cream-colored to pink or purple; herbage glabrous or with unbranched hairs.
  - 47. Anther-bearing stamens opposite the corolla lobes; staminodes 5; tree or large shrub ..... **SAPOTACEAE**
  - 47' Anther-bearing stamens alternate with corolla lobes; staminodes 0; small or large shrubs.
  - 48. Calyx lobes and bracts awn-tipped; stigmas or style-branches 3; calyx lobes united by a scarious or hyaline membrane; fruit a slender capsule ..... **POLEMONIACEAE (*Leptodactylon, Loeselia*)**
  - 48' Calyx lobes and bracts (if any) not awn-tipped; stigma and style entire or stigmas and style branches 2-4; fruit a berry, drupe, or schizocarp.
  - 49. Style unbranched; stems thorny; ovules generally many ..... **SOLANACEAE (*Lycium*)**
  - 49' Style 2- or 4-branched; stems not thorny; ovules 4 ..... **BORAGINACEAE (*Cordia, Tiquilia*)**
- 43' Plants herbaceous or sometimes suffrutescent.
- 50. Ovary deeply 2- or 4-lobed or ovaries 2.
  - 51. Ovaries 2, distinct, each containing numerous ovules; stigmas connate and adnate to anthers; sap milky ..... **ASCLEPIADACEAE**
  - 51' Ovary 1, deeply 2- or 4-lobed, each lobe containing a single ovule; fruit of 2-4 nutlets, in some species 1 or more of the nutlets aborting; sap generally clear.
  - 52. Flowers in scorpioid cymes or head-like clusters; ovary 4-lobed; leaves never reniform; plants usually erect or ascending, seldom rooting at nodes ..... **BORAGINACEAE**
  - 52' Flowers solitary; leaves reniform; ovary 2-lobed; plants prostrate, creeping, rooting at the nodes .. **CONVOLVULACEAE (*Dichondra*)**
- 50' Ovary 1, unlobed or very shallowly lobed.
  - 53. Styles 5 or style 1 and 5 lobed ..... **PLUMBAGINACEAE**
  - 53' Styles (0)1 or 2, each entire or 2- to 3-lobed (or stigma sessile).
  - 54. Stems twining; sap often milky ..... **CONVOLVULACEAE**
  - 54' Stems not twining; sap mostly clear.
  - 55. Styles, style-branches, or stigmas more than 1.
  - 56. Style-branches or stigmas 3; calyx lobes united by a scarious or hyaline membrane (except in *Polemonium*) ... **POLEMONIACEAE**

- 56' Style 1, 2-branched or styles 2, each entire or 2-branched.
- 57. Leaves toothed, lobed, or compound. .... **HYDROPHYLLACEAE**
- 57' Leaves entire.
- 58. Inflorescence of scorpioid cymes ..... **HYDROPHYLLACEAE**
- 58' Inflorescence of non-scorpioid cymes or flowers solitary.
- 59. Plants perennial ..... **CONVOLVULACEAE**
- 59' Plants annual .. **HYDROPHYLLACEAE** (*Nama*)
- 55' Style 0 or 1, entire; stigma 1, entire or nearly so.
- 60. Inflorescence of 1 or more scorpioid cymes ..... **BORAGINACEAE** (*Heliotropium*)
- 60' Inflorescence not scorpioid.
- 61. Ovules 4; sap often milky ..... **CONVOLVULACEAE**
- 61' Ovules generally numerous.
- 62. Stamens opposite the petals; placentation free-central ... **PRIMULACEAE** (*Centunculus*, *Samolus*)
- 62' Stamens alternate with petals; placentation axile or parietal.
- 63. Flowers strongly zygomorphic. .... **SCROPHULARIACEAE**
- 63' Flowers actinomorphic or nearly so.
- 64. Some or all the stamens bearing dense tufts of hair; flowers yellow; corolla lobes imbricate in bud; flowers in spikes or racemes **SCROPHULARIACEAE** (*Verbascum*)
- 64' Stamens glabrous or hairy only at base; flower color various; corolla plicate or valvate in bud; flowers solitary or variously cymose ..... **SOLANACEAE**

#### Key 10: Dicots with Petals United into a Ring or Tube And an Inferior Ovary

- 1. Stamens many.
- 2. Spiny perennial succulent; petals overlapping in several series ..... **CACTACEAE**
- 2' Unarmed annual; petals 5 in 1 series ..... **LOASACEAE** (*Eucnide*)
- 1' Stamens 10 or fewer.
- 3. Tendrils usually present; flowers imperfect; plants monoecious ..... **CUCURBITACEAE**
- 3' Tendrils absent; flowers perfect or imperfect.
- 4. The apparent corolla tube actually a petaloid hypanthium bearing both petals and sepals.
- 5. Perianth parts in 4's; placentation axile; leaf-venation pinnate; fruit a capsule or an indehiscent, nutlike structure ..... **ONAGRACEAE**
- 5' Perianth parts in 5's; placentation parietal; leaf-venation palmate; fruit a berry ... **GROSSULARIACEAE**
- 4' The apparent corolla tube composed of only one perianth whorl.
- 6. Leaves alternate or all basal (or both alternate and opposite).
- 7. Flowers grouped in involucre heads that often bear a superficial resemblance to an individual flower; calyx represented by a dry pappus of bristles, awns, or scales, often greatly reduced; ray flowers often present .... **ASTERACEAE**

- 7' Flowers solitary or variously clustered, but not grouped in involucrate heads; calyx of a normal herbaceous texture; ray flowers never present.
- 8. Low shrub; stamens 10, all anther-bearing, distinct; anthers with bristle-like lateral appendages and releasing pollen through tubular appendages; corolla urceolate, actinomorphic; fruit a berry. .... **ERICACEAE (*Vaccinium*)**
- 8' Annual or perennial herbs; anther-bearing stamens 5, distinct or anthers connate into a tube around the style; anthers unappendaged; corolla shapes various, but not urceolate, actinomorphic or zygomorphic; fruit a capsule.
- 9. Herbage coarsely hirsute **HYDROPHYLLACEAE (*Nama stenocarpum*)**
- 9' Herbage glabrous or finely pubescent.
- 10. Anther-bearing stamens opposite the corolla lobes; staminodes 5, alternate with the corolla lobes; stamens always distinct; flowers always actinomorphic; placentation free-central ..... **PRIMULACEAE (*Samolus*)**
- 10' Anther-bearing stamens alternate with corolla lobes; staminodes 0; stamens distinct or connate; flowers actinomorphic or zygomorphic; placentation axile ..... **CAMPANULACEAE**
- 6' Leaves opposite or whorled throughout.
- 11. Ovary actually superior, surrounded by but not fused to the hardened or winged base of the corolla-like calyx; style passing through constriction separating calyx base from petaloid portion and joining to top of ovary; style unbranched; stigma 1 ..... **NYCTAGINACEAE**
- 11' Ovary truly inferior; flowers with a true corolla and often a well-developed calyx as well, this sometimes modified as a pappus of bristles, scales, or awns; style branches or stigmas generally 2 or more.
- 12. Inflorescence of heads or dense spikes, these often secondarily clustered.
- 13. Inflorescence with a well-developed involucre.
- 14. Stems, peduncles, leaves and involucral bracts bearing coarse prickles; calyx represented by a lobed cup ..... **DIPSACACEAE**
- 14' Plants not prickly; calyces various.
- 15. Oldest flowers in the center of head; flowers usually 4-merous; stamens distinct; ovary 2- to 4-locular; fruit a schizocarp or a capsule; stipules present; calyx of 4 sepals, at least 2 of them generally of a normal foliaceous texture; ray flowers never present ..... **RUBIACEAE**
- 15' Oldest flowers around periphery of head; flowers usually 5-merous; anthers connate (except in some monoecious species), forming a tube around the style; ovary 1-locular; fruit an achene; stipules absent; calyx, if present, represented by a dry pappus of bristles, awns, or scales, often greatly reduced; ray flowers often present. .... **ASTERACEAE**
- 13' Inflorescence without a well-developed involucre.
- 16. Corolla lobes 4; flowers actinomorphic; inflorescence a dense, spherical head; fruits dry ..... **RUBIACEAE (*Cephalanthus*)**
- 16' Corolla lobes 5; flowers more or less zygomorphic; inflorescence not spherical; fruits fleshy ..... **CAPRIFOLIACEAE (*Lonicera*)**
- 12' Inflorescences various but not of heads or dense spikes.
- 17. Leaves compound, or simple and some or all of them lobed.
- 18. Shrubs or trees; stamens 5; fruit a berry; sepals 5, small but of ordinary herbaceous texture ..... **CAPRIFOLIACEAE (*Sambucus, Symphoricarpos*)**

- 18' Herbs; stamens 3; fruit an achene; sepals at anthesis unformed, in fruit developing as a pappus of several to many plumose bristles . . . VALERIANACEAE (*Valeriana*)
- 17' Leaves simple, entire.
  - 19. Leaves whorled or appearing so. . . . . RUBIACEAE
  - 19' Leaves opposite.
    - 20. Leaves stipulate, linear to narrowly elliptic; corolla lobes usually 4 . . . . . RUBIACEAE
    - 20' Leaves usually exstipulate, generally broader; corolla lobes usually 5.
      - 21. Erect herbs; inflorescence several- to many-flowered; calyx lobes undeveloped at anthesis, sometimes wholly abortive . . . . . VALERIANACEAE
      - 21' Shrubs, or if apparently herbaceous, the inflorescence 2-flowered; calyx lobes present at anthesis though sometimes small . . . . . CAPRIFOLIACEAE

### Key 11: Dicots with Distinct Petals and an Inferior Ovary

- 1. Stamens numerous, more than twice as many as the petals or more than 15.
- 2. Petals indefinite in number, generally numerous.
  - 3. Plants aquatic with floating or emergent leaves and flowers . . . . . NYMPHAEACEAE (*Nymphaea*)
  - 3' Plants terrestrial.
    - 4. Plants not succulent; herbage, flowers, and fruits generally bearing harsh, often barbed or stinging hairs . . . . . LOASACEAE
    - 4' Plants succulent; herbage not bearing harsh, often barbed or stinging hairs, though sometimes armed with spines.
      - 5. Leaves well-developed, covered with bead-like water-filled vesicles; stems spineless; ovary 5-loculed; annuals . . . . AIZOACEAE (*Mesembryanthemum*)
      - 5' Leaves much-reduced or absent, never bearing bead-like water-filled vesicles; stems generally bearing clusters of spines; ovary 1-loculed; perennials, often shrubby or of tree-like proportions . . . . . CACTACEAE
- 2' Petals 4 or 5 (or exact multiple thereof).
  - 6. Herbs or brittle-stemmed subshrubs.
    - 7. Herbage, flowers, and fruits generally bearing harsh, often barbed or stinging hairs; leaves not succulent . . . . . LOASACEAE (*Eucnide*, *Mentzelia*)
    - 7' Herbage glabrous or hairs simple, never stinging; leaves more or less succulent . . . . . PORTULACACEAE (*Portulaca*)
  - 6' Shrubs or trees; stems decidedly woody.
    - 8. Leaves alternate; petals 5; fruit a pome . . . . . ROSACEAE
    - 8' Leaves opposite; petals usually 4; fruit a capsule . . . . . HYDRANGEACEAE (*Philadelphus*)
- 1' Stamens not more than twice as many as petals, not more than 15.
  - 9. Styles (or style-like ovary beaks) more than 1, separate to base or nearly so.
    - 10. Plant a submersed aquatic with dimorphic leaves . . . . . HALORAGACEAE
    - 10' Plant terrestrial, or if aquatic, the leaves all similar.
      - 11. Sepals 2; plants succulent; seeds numerous . . . . . PORTULACACEAE (*Portulaca*)
      - 11' Sepals more than 2 or obscure.
        - 12. Stamens as many as petals.
          - 13. Hairs of leaves very rough to the touch; stinging hairs sometimes present . . . . . LOASACEAE (*Cevallia*, *Petalonyx*)
          - 13' Hairs of leaves (if any) fine and soft; stinging hairs never present.
            - 14. Stamens opposite the petals . . . . . RHAMNACEAE

- 14' Stamens alternate with the petals.
  - 15. Ovary 1-loculed; seeds several to many; hypanthium present, well-developed, extending well beyond ovary; leaves simple.
    - 16. Perennial herbs; leaves mostly or all basal; plants never prickly or spiny; fruit a capsule ..... **SAXIFRAGACEAE (*Heuchera*)**
    - 16' Shrubs; leaves all cauline; plants sometimes prickly or spiny; fruit a berry ..... **GROSSULARIACEAE**
  - 15' Ovary 2- to 6-loculed; seeds 1 per locule; hypanthium absent; leaves simple or variously compound.
    - 17. Styles 2; fruit splitting into 2 indehiscent mericarps; herbage usually aromatic; inflorescence a compound (rarely simple) umbel or a cluster of heads .... **APIACEAE (UMBELLIFERAE)**
    - 17' Styles 4-6; fruit a berry, not splitting into mericarps; herbage not aromatic; inflorescence a panicle of umbels. .... **ARALIACEAE (*Aralia*)**
- 12' Stamens more numerous, generally twice as many as petals.
  - 18. Plants herbaceous; leaves mostly basal ... **SAXIFRAGACEAE (*Saxifraga*)**
  - 18' Plants woody; leaves all cauline.
    - 19. Leaves opposite; fruit a capsule. .... **HYDRANGEACEAE**
    - 19' Leaves alternate; fruit fleshy ..... **ROSACEAE**
- 9' Style 1, sometimes branched above the middle, or stigma(s) sessile.
  - 20. Plant a tendril-bearing vine, monoecious ..... **CUCURBITACEAE**
  - 20' Plants never tendril-bearing; flowers usually perfect.
    - 21. Herbs, rarely suffrutescent; petals in most genera 4; less commonly 2 or 5 ..... **ONAGRACEAE**
    - 21' Shrubs; stems decidedly woody.
      - 22. Stamens equal in number to petals and opposite them ..... **RHAMNACEAE**
      - 22' Stamens alternate with the petals or sometimes of a different number.
        - 23. Leaves alternate; blades palmately veined and often lobed; petals 5.
          - 24. Woody vines; flowers in umbels; hypanthium absent; locules of ovary 3-5; ovules 1 per locule ..... **ARALIACEAE (*Hedera*)**
          - 24' Erect or spreading shrub; flowers solitary or in axillary clusters or racemes; hypanthium present, generally well-developed, petaloid; locule of ovary 1; ovules several to many ..... **GROSSULARIACEAE**
        - 23' Leaves opposite; blades pinnately veined, unlobed; petals 4 (-5).
          - 25. Stamens as many as petals ..... **CORNACEAE**
          - 25' Stamens twice as many as petals ..... **HYDRANGEACEAE (*Fendlera*)**

### Key 12: Dicots with Distinct Petals, Numerous Stamens, and a Superior Ovary

- 1. Leaves compound or so deeply divided as to appear compound.
  - 2. Leaves once compound or divided.
    - 3. Petals 4; herbage densely glandular; leaves compound, leaflets 3, entire; capsule linear-oblong ..... **CAPPARACEAE (*Polanisia*)**
    - 3' Petals 5; herbage not glandular; leaves deeply divided, lobes 3 or more, serrate; capsule ovoid ..... **BIXACEAE**
  - 2' Leaves 2 or more times compound or divided.
    - 4. Petals 4, yellow or orange, more conspicuous than the stamens; ovary compound ... **PAPAVERACEAE (*Eschscholzia*)**
    - 4' Petals 4-10, inconspicuous in comparison to the much longer stamens; ovary simple.
      - 5. Leaves 2 times pinnate; leaflets entire; fruit a legume; plants mostly woody ..... **FABACEAE subf. MIMOSOIDEAE**
      - 5' Leaves 2 or more times ternate; leaflets serrate; fruit a berry; plants herbaceous ... **RANUNCULACEAE (*Actaea*)**

- 1' Leaves simple, entire, toothed, or lobed.
  - 6. Flowers 3-merous; fruit a triangular achene ..... **POLYGONACEAE**
  - 6' Flowers 4- to 6-merous or petals numerous.
    - 7. Sepals falling as flowers open; petals 4 or 6; sap often milky or colored, especially in roots ..... **PAPAVERACEAE**
    - 7' Sepals present in open flowers; petals 4-many; sap clear.
      - 8. Plants aquatic; leaves large, ovate, deeply cordate, long-petioled; blades floating or raised above water surface ..... **NYMPHAEACEAE** (*Nuphar*)
      - 8' Plants terrestrial; leaves smaller.
        - 9. Leaves opposite.
          - 10. Plants herbaceous; stamens connate by their filaments in 5 bundles. .... **CLUSIACEAE**
          - 10' Plants woody; stamens distinct.
            - 11. Flowers white or pink; ovary compound; fruit a capsule ..... **HYDRANGEACEAE** (*Philadelphus*)
            - 11' Flowers yellow; ovary simple; fruit indehiscent ..... **ROSACEAE** (*Coleogyne*)
    - 9' Leaves alternate or all basal.
      - 12. Leaves more or less succulent, entire; placentation free-central. .... **PORTULACACEAE**
      - 12' Leaves not succulent, mostly toothed or lobed; placentation marginal, axile, or parietal.
        - 13. Hypanthium present ..... **ROSACEAE**
        - 13' Hypanthium absent.
          - 14. Flowers actinomorphic; filaments connate, forming a tube around the style; sepals connate; style branches and stigmas 3-many ..... **MALVACEAE**
          - 14' Flowers zygomorphic; filaments distinct; sepals distinct; style 1, unbranched; stigma 1 ..... **BIXACEAE**

**Key 13: Dicots with Distinct Petals, Few Stamens, a Superior Ovary,  
and Compound or Deeply Dissected Leaves**

- 1. Leaves 2 or more times compound or divided.
  - 2. Shrubs, trees, or woody vines.
    - 3. Leaflets entire ..... **FABACEAE**
    - 3' Leaflets toothed or lobed.
      - 4. Plant a tree ..... **MELIACEAE**
      - 4' Plant a woody vine ..... **SAPINDACEAE** (*Cardiospermum*)
  - 2' Herbs.
    - 5. Petals 4.
      - 6. Petals all equal or nearly so; flowers actinomorphic; inflorescence a bractless raceme ..... **BRASSICACEAE**
      - 6' Petals very unequal; flowers zygomorphic; inflorescence a raceme or a cymose panicle with bracts ..... **FUMARIACEAE**
    - 5' Petals 5.
      - 7. Leaves palmately divided ..... **VIOLACEAE** (*Viola pedatifida*)
      - 7' Leaves pinnately or ternately divided or compound.
        - 8. Sepals deeply divided ..... **ZYGOPHYLLACEAE** (*Peganum*)
        - 8' Sepals entire.
          - 9. Leaflets toothed; ovary 5-carpellate ..... **GERANIACEAE**
          - 9' Leaflets entire; ovary 1-carpellate ..... **FABACEAE**
  - 1' Leaves once compound or divided.
    - 10. Leaflets or lobes 3 or fewer.

- 11. Herbs, subshrubs, or vines.
  - 12. Flowers strongly zygomorphic.
    - 13. Odd petal uppermost in flower; stamens 10, all filaments or 9 of them connate (rarely all distinct), forming a tube around ovary; carpel 1; fruit a legume, loment, or indehiscent pod . . . . . **FABACEAE subf. PAPILIONOIDEAE**
    - 13' Odd petal lowermost in flower; stamens 5, distinct, but tightly appressed against ovary; carpels 3; fruit a capsule . . . . . **VIOLACEAE**
  - 12' Flowers actinomorphic or weakly zygomorphic.
    - 14. Tendrils present; plant a vine.
      - 15. Flower with a conspicuous fringed corona; ovary raised above the receptacle on a stipe; style conspicuously 3-branched, stigmas capitate; flowers solitary, axillary . . . . . **PASSIFLORACEAE**
      - 15' Flower without a corona; ovary sessile on the receptacle; style very short, 2-branched, stigmas punctiform; inflorescence an umbel-like cyme . . . . . **VITACEAE**
    - 14' Tendrils absent; plant an erect to prostrate herb or subshrub.
      - 16. Petals 4; stamens 6.
        - 17. Pedicels of raceme not subtended by bracts; ovary usually not borne above receptacle on a stipe; fruit generally with a membranous septum . . . . . **BRASSICACEAE**
        - 17' Pedicels of raceme individually subtended by bracts; ovary borne above receptacle on a stipe; fruit without a septum. . . **CAPPARACEAE**
      - 16' Petals 5; stamens 10.
        - 18. Leaflets toothed or lobed; style-base thickened and elongated, stiff, especially in fruit, persistent as coiled beaks on segments of fruit; fruit a schizocarp . . . . . **GERANIACEAE (*Geranium*)**
        - 18' Leaflets entire; styles slender, generally not elongated, never forming coiled beaks on segments of fruit; fruit a capsule or a legume.
          - 19. Leaves opposite; seeds 1 per locule . . . . . **ZYGOPHYLLACEAE**
          - 19' Leaves alternate or all basal; seeds several to many per locule.
            - 20. Ovary compound; fruit a capsule; leaflets notched at apex; stamens more or less connate, at least at base . . **OXALIDACEAE**
            - 20' Ovary simple; fruit a legume; leaflets not notched; stamens distinct . . . . . **FABACEAE (*Senna bauhinoides*)**
  - 11' Trees or well-developed shrubs.
    - 21. Leaves opposite.
      - 22. Petals 2 . . . . . **OLEACEAE (*Fraxinus dipetala*)**
      - 22' Petals 4-6.
        - 23. Leaves deeply 2-lobed, resinous, sticky; petals bright yellow; fruit covered with long white hairs . . . . . **ZYGOPHYLLACEAE (*Larrea*)**
        - 23' Leaves compound, not resinous, not sticky; petals white to pale yellow; fruit not long-hairy.
          - 24. Leaflets linear or oblong, obtuse, densely gland-dotted; ovary 5-lobed, unwinged . . . . . **RUTACEAE (*Choisya*)**
          - 24' Leaflets lanceolate or ovate, acute, not gland-dotted; ovary 2-lobed, 2-winged . . . . . **ACERACEAE (*Acer glabrum*)**
    - 21' Leaves alternate.
      - 25. Flowers strongly zygomorphic; stamens 10, all filaments or 9 of them connate, forming a tube around ovary . . . **FABACEAE subf. PAPILIONOIDEAE**
      - 25' Flowers actinomorphic or weakly zygomorphic.
        - 26. Flowers bright yellow.
          - 27. Leaflets spiny-toothed; petals 6 . . . . . **BERBERIDACEAE**
          - 27' Leaflets entire; petals 5. . . . . **FABACEAE (*Senna armata*)**
        - 26' Flowers greenish white to pale yellow.

- 28. Leaflets entire, dotted with translucent oil glands; ovary 2-locular;  
fruit flattened, winged ..... **RUTACEAE (*Ptelea*)**
- 28' Leaflets toothed or shallowly lobed, not gland-dotted; ovary 1-locular;  
fruit a drupe, not flattened or winged ..... **ANACARDIACEAE**
- 10' Leaflets or lobes 4 or more.
- 29. Leaves palmately compound.
- 30. Leaves opposite ..... **RUTACEAE (*Choisya*)**
- 30' Leaves alternate.
- 31. Petals 4; ovary borne above receptacle on a stipe ..... **CAPPARACEAE**
- 31' Petals 5; ovary sessile on receptacle.
- 32. Woody vine with tendrils; flowers actinomorphic; stamens 5, distinct,  
opposite the petals; fruit a berry ..... **VITACEAE (*Parthenocissus*)**
- 32' Shrub or herb without tendrils; flowers zygomorphic; stamens 10, all  
filaments or 9 of them connate, forming a tube around ovary; fruit a  
legume or an indehiscent pod ..... **FABACEAE subf. PAPILIONOIDEAE**
- 29' Leaves pinnately compound or dissected.
- 33. Petals 2-4.
- 34. Plant a large shrub or small tree; leaves opposite; stamens 2 .....  
..... **OLEACEAE (*Fraxinus*)**
- 34' Plant an herb or small shrub; stamens 4-6.
- 35. Sepals 2; flowers strongly zygomorphic; 1 petal prolonged, forming a spur  
..... **PAPAVERACEAE subf. FUMARIOIDEAE**
- 35' Sepals 4; flowers actinomorphic or nearly so; spur never present .....  
..... **BRASSICACEAE**
- 33' Petals 5-6.
- 36. Flowers strongly zygomorphic; stamens usually 10, all filaments or 9 of them  
connate (rarely all distinct), forming a tube around ovary .....  
..... **FABACEAE subf. PAPILIONOIDEAE**
- 36' Flowers actinomorphic or weakly zygomorphic; stamens 5-10, generally  
distinct.
- 37. Shrubs or trees.
- 38. Petals 6; leaflets spiny-toothed; stems and leaves non-scented .....  
..... **BERBERIDACEAE**
- 38' Petals 5 or rarely 6; leaflets entire or toothed but not spiny; stems and  
leaves often strongly scented.
- 39. Ovary divided into 2-5 flattened lobes; fruit a cluster of elongated  
samaras; leaflets with gland-tipped teeth near base .....  
..... **SIMAROUBACEAE (*Ailanthus*)**
- 39' Ovary entire; fruit a legume or a drupe; leaflets without  
gland-tipped teeth.
- 40. Ovary elongated; fruit a legume; sepals very unequal .....  
..... **FABACEAE subf. CAESALPINIOIDEAE**
- 40' Ovary not elongated; fruit a drupe; sepals equal or nearly so.
- 41. Stamens as many as petals ..... **ANACARDIACEAE (*Rhus*)**
- 41' Stamens twice as many as petals.
- 42. Flowers solitary or in few-flowered axillary clusters;  
fruit a more or less dry, blackish purple, triangular  
drupe ..... **BURSERACEAE**
- 42' Flowers in many-flowered panicles; fruit a fleshy,  
yellow, spherical drupe. ... **SAPINDACEAE (*Sapindus*)**
- 37. Herbs or subshrubs.
- 43. Stamens as many as petals.
- 44. Petals 6; leaflets spiny-toothed ..... **BERBERIDACEAE**
- 44' Petals 5, stalked; leaflets entire ..... **FABACEAE (*Dalea*)**

- 43' Stamens (including staminodes) twice as many as petals.
- 45. Placentation marginal; fruit a legume ..... **FABACEAE subf. CAESALPINIOIDEAE**
- 45' Placentation axile; fruit a schizocarp or capsule.
- 46. Styles elongated, especially in fruit, generally 2 cm or more long, persistent as coiled beaks on segments of fruit; inflorescence usually an umbel; leaflets toothed ..... **GERANIACEAE (*Erodium*)**
- 46' Styles usually short; beak short to rarely 1 cm, never coiling; flowers solitary or in pairs; leaflets entire or dissected into narrow lobes. .... **ZYGOPHYLLACEAE**

**Key 14: Shrubs and Trees with Distinct Petals, Few Stamens,  
A Superior Ovary, and Simple Leaves**

- 1. Leaves opposite or whorled.
  - 2. Style 1, unbranched; stigma 1, entire or nearly so.
    - 3. Petals greenish to purplish brown ..... **CELASTRACEAE**
    - 3' Petals yellow or orange.
      - 4. Leaves deeply 2-lobed, resin-coated; erect shrubs; carpels 4-6; fruit 4-6-lobed, densely long-pilose with white hairs ..... **ZYGOPHYLLACEAE (*Larrea*)**
      - 4' Leaves not lobed or resin coated; small shrubs or twining vines; carpels 1-3; fruit not long-pilose.
        - 5. Petals long-clawed; fruit 2- to 3-lobed and tuberculate or 2- to 3-winged; vines ..... **MALPIGHIACEAE**
        - 5' Petals sessile; carpel 1; fruit not lobed, smooth ..... **CROSSOSOMATAACEAE (*Apacheria*)**
  - 2' Styles or style-branches 2-5, each terminated by a stigma.
    - 6. Stamens equal in number to and opposite the petals; petals generally more or less cupped ..... **RHAMNACEAE**
    - 6' Stamens more numerous than petals; petals flat.
      - 7. Ovary 2-winged, maturing as a 2-winged samara; leaves palmately veined and lobed ..... **ACERACEAE**
      - 7' Ovary not winged, maturing as a capsule; leaves pinnately veined, unlobed ..... **HYDRANGEACEAE**
- 1' Leaves alternate, sometimes reduced to minute scales or so quickly deciduous that the plants are usually leafless.
  - 8. Leaves palmately veined; blades well-developed.
    - 9. Tendrils absent; erect shrub or small tree; flowers strongly zygomorphic ..... **FABACEAE (*Cercis*)**
    - 9' Tendrils present; woody vines; flowers actinomorphic.
      - 10. Flowers solitary, axillary, with a conspicuous fringed corona; sepals and petals both petal-like; ovary raised above the receptacle on a stipe; style conspicuously 3-branched, stigmas capitate ..... **PASSIFLORACEAE**
      - 10' Flowers many in panicles, without a corona; sepals and petals both sepal-like, petals deciduous as flower opens; ovary sessile on the receptacle; style very short, 2-branched, stigmas punctiform ..... **VITACEAE**
  - 8. Leaves pinnately veined, 1-veined, or reduced to bladeless scales.
    - 11. Flowers strongly zygomorphic.
      - 12. Stamens 4, all inserted on 1 side of ovary, distinct or nearly so; sepals rose-purple, petal-like, widely spreading; petals 5, the upper 3 stalked, distinct or more or less connate, the lower 2 reduced to fleshy scales; fruit an indehiscent pod bearing barb-tipped prickles ..... **KRAMERIACEAE**

- 12' Stamens 8 or 10, all filaments, or all but 1 connate into a tube around the ovary; sepals variously colored, sometimes petal-like; petals 3 or 5, not reduced to fleshy scales; fruit a capsule, legume, or unarmed indehiscent pod.
13. Sepals all fused, at least at base, forming a cup-shaped to cylindrical calyx tube, usually not petal-like; petals 5, the odd petal (banner) uppermost, overlapping the margins of the 2 upper lateral petals; lower 2 lateral petals usually free at base but fused toward tip, forming a keel that encloses stamens and ovary; fruit a legume, loment, or indehiscent pod ..... **FABACEAE subf. PAPILIONOIDEAE**
- 13' Sepals distinct, petal-like, 2 of them spreading and very different from the other 3; petals 3, the odd petal lowermost, often appendaged, folded and forming a keel enclosing stamens and ovary; banner petal never present; fruit a flattened capsule ..... **POLYGALACEAE**
- 11' Flowers actinomorphic or nearly so.
14. Fertile stamens more numerous than petals.
15. Stems and leaves densely gland-dotted; herbage very strongly scented ..... **RUTACEAE (*Thamnosma*)**
- 15' Stems and leaves not gland-dotted; herbage not strongly scented.
16. Flowers imperfect.
17. Locules of ovary 1-3, each 1-seeded; filaments connate toward the base; sap milky or herbage bearing 2-branched hairs attached in the middle ..... **EUPHORBACEAE (*Ditaxis*)**
- 17' Locule of ovary 1, 1- to 2-seeded; filaments distinct; sap clear; herbage bearing hairs attached at 1 end ..... **CROSSOSOMATAACEAE (*Glossopetalon*)**
- 16' Flowers perfect.
18. Flowers in elongated, terminal, usually bractless racemes; sepals and petals 4; stamens 6; stems not ending in thorn ..... **BRASSICACEAE**
- 18' Flowers solitary or in small axillary clusters, if in racemes, flowers individually subtended by bracts; sepals and petals 4-6; stamens 8-12; stems often terminating in stout thorns.
19. Leaves linear or narrowly elliptic, more or less persistent; stem gray or brown; locule of ovary 1.
20. Undersurface of leaves covered with peltate scales; ovary raised above receptacle on a short stipe; fruit a berry ..... **CAPPARACEAE (*Atamisquea*)**
- 20' Undersurface of leaves without peltate scales; ovary sessile on receptacle; fruit a follicle ..... **CROSSOSOMATAACEAE (*Glossopetalon*)**
- 19' Leaves scale-like, soon deciduous; stem smooth, green, leafless through most of year; locules of ovary 2-5.
21. Ovary raised above receptacle on a short stipe; locules 2; fruit a spherical drupe ..... **CAPPARACEAE (*Koeberlinia*)**
- 21' Ovary sessile on receptacle; locules 5; fruit an ellipsoid woody capsule tapering to a stiff beak .... **CELASTRACEAE (*Canotia*)**
14. Fertile stamens equal in number to petals.
22. Leaves all reduced to bladeless scales; twigs very slender, jointed, green .... **TAMARICACEAE**
- 22' Leaves with expanded blades, sometimes early-deciduous; twigs not jointed, green or brown.
23. Stamens opposite the petals; petals usually with cupped blades. .... **RHAMNACEAE**

- 23' Stamens alternate with petals; petals usually flat.
- 24. Stigmas 3-5; style 1, unbranched or style branches 3-5.
- 25. Leaves less than 15 mm long, sessile or subsessile, the margin thickened; style 1, stigmas 4-5; fruit a 1-seeded capsule ..... **CELASTRACEAE (*Mortonia*)**
- 25' Leaves usually more than 25 mm long, petioled, the margin not thickened; style branches or styles 3-5
- 26. Leaves thick and leathery, entire or nearly so; styles or style-branches 3; ovary 1-loculed; fruit a drupe ..... **ANACARDIACEAE (*Rhus ovata*)**
- 26' Leaves thin, crenate-serrate; styles or style-branches 5; ovary 5-loculed; fruit a capsule ..... **STERCULIACEAE (*Waltheria*)**
- 24' Stigma 1, sessile or borne on an unbranched style.
- 27. Leaves toothed; filaments connate ..... **STERCULIACEAE**
- 27' Leaves entire; filaments distinct. .... **CROSSOSOMATAACEAE (*Glossopetalon*)**

### Key 15: Herbs with Distinct Petals, Few Stamens, a Superior Ovary, and Simple Leaves

- 1. Flowers zygomorphic.
  - 2. Leaves stipulate.
    - 3. Odd petal uppermost in flower; stamens 10, 9 of them connate forming a U-shaped tube around the ovary; carpel 1; fruit a legume, loment, or indehiscent pod ..... **FABACEAE subf. PAPILIONOIDEAE**
    - 3' Odd petal lowermost in flower; stamens 5, distinct, but tightly appressed against ovary; carpels 3; fruit a capsule ..... **VIOLACEAE**
  - 2' Leaves exstipulate.
    - 4. Petals 2; stamens 3 ..... **RESEDACEAE**
    - 4' Petals 3-6; stamens usually 6 or more.
      - 5. Filaments distinct; petals not or scarcely overlapping ..... **BRASSICACEAE**
      - 5' Filaments connate, forming a U-shaped tube around ovary; petals strongly overlapping.
        - 6. Sepals all fused, at least at base, forming a cup-shaped to cylindrical calyx tube, usually not petal-like; petals 5, the odd petal (banner) uppermost, overlapping the margins of the 2 upper lateral petals; lower 2 lateral petals usually free at base but fused toward tip, forming a keel that encloses stamens and ovary; fruit a legume, loment, or indehiscent pod ..... **FABACEAE subf. PAPILIONOIDEAE**
        - 6' Sepals distinct, petal-like, 2 of them spreading and very different from the other 3; petals 3, the odd petal lowermost, often appendaged, folded and forming a keel enclosing stamens and ovary; banner petal never present; fruit a flattened capsule ..... **POLYGALACEAE**
- 1' Flowers actinomorphic.
  - 7. Plants without green pigmentation ..... **MONOTROPACEAE**
  - 7' Plants green and photosynthetic.
    - 8. Petals 4 or fewer.
      - 9. Leaves alternate.
        - 10. Petals 2-3 ..... **POLYGONACEAE**
        - 10' Petals 4.
          - 11. Flowers of raceme subtended by bractlets; ovary raised above receptacle on a stipe; fruit without a septum ..... **CAPPARACEAE**
          - 11' Flowers of raceme generally not subtended by bractlets; ovary usually not raised above receptacle on a stipe; fruit generally with a membranous septum ..... **BRASSICACEAE**

- 9' Leaves opposite or whorled.
  - 12. Petals borne on inside of a tubular hypanthium ..... LYTHRACEAE
  - 12' Petals attached directly to receptacle.
    - 13. Petals 6-20 mm long, each bearing a prominent basal gland ..... GENTIANACEAE (*Fraseria*)
    - 13' Petals less than 3 mm long, without basal glands.
      - 14. Flowers sessile in leaf axils; leaves stipulate; petals 2-4; stamens 2-4 ..... ELATINACEAE
      - 14' Flowers pedicelled, terminal or from upper axils, sometimes cymose; leaves exstipulate; petals 4; stamens 4 . CARYOPHYLLACEAE (*Sagina*)
- 8' Petals 5 or more.
  - 15. Flowers imperfect ..... EUPHORBIACEAE
  - 15' Flowers perfect.
    - 16. Sepals 2; plants often more or less succulent ..... PORTULACACEAE
    - 16' Sepals 5 or more; plants mostly not succulent.
      - 17. Stamens more numerous than petals.
        - 18. Leaves alternate, or some leaves alternate and some basal, or all basal.
          - 19. Ovary 5-lobed, tipped by an elongated style-base; ovules 1 per locule; fruit a schizocarp, breaking apart into 5 one-seeded segments, each tipped by a coiled beak ..... GERANIACEAE
          - 19' Ovary not or scarcely lobed, not tipped by an elongated style-base; ovules several to many per locule; fruit a capsule.
            - 20. Capsule 2-5 cm long ..... TILIACEAE
            - 20' Capsule 1 cm long or shorter.
              - 21. Stigmas 2-3, sessile, or each borne on its own style ..... SAXIFRAGACEAE
              - 21' Stigma 1, sessile or borne on an unbranched style.
                - 22. Ovary deeply bilobed; stem and leaves gland-dotted throughout; herbage strongly scented ..... RUTACEAE (*Thamnosma*)
                - 22' Ovary unlobed or with several shallow lobes; stem and leaves not gland-dotted; herbage not strongly scented.
                  - 23. Flowers with a tubular hypanthium; anthers dehiscent along sides by slits ..... LYTHRACEAE
                  - 23' Flowers disk-shaped, without a hypanthium; anthers dehiscent by pores ..... PYROLACEAE
      - 18' Leaves opposite, or some leaves opposite and some basal.
        - 24. Leaves shallowly palmately lobed ..... SAXIFRAGACEAE (*Lithophragma*)
        - 24' Leaves linear to oblong, entire.
          - 25. Style 1, unbranched; petals attached to a cylindrical hypanthium; placentation axile ..... LYTHRACEAE
          - 25' Styles or style-branches 2-5; petals attached to receptacle; placentation generally free-central (rarely axile). ..... CARYOPHYLLACEAE
    - 17' Stamens as many as or fewer than petals.
      - 26. Style 1, unbranched.
        - 27. Stamens opposite petals ..... PRIMULACEAE
        - 27' Stamens alternate with petals.
          - 28. Stems twining; petals clawed ..... MALPIGHIACEAE
          - 28' Stems not twining; petals sessile.
            - 29. Leaves entire ..... GENTIANACEAE (*Swertia*)
            - 29' Leaves toothed ..... STERCULIACEAE
      - 26' Style or style-branches 2 or more.

- 30. Leaves opposite; placentation free-central . **CARYOPHYLLACEAE**
- 30' Leaves alternate or all basal.
  - 31. Leaves linear, entire ..... **LINACEAE**
  - 31' Leaves broader, often toothed or lobed.
    - 32. Flowers with a fringed corona.
      - 33. Plant a tendril-bearing vine; ovary raised above  
receptacle on a stipe ..... **PASSIFLORACEAE**
      - 33' Plant a scapose herb; ovary sessile on receptacle .....  
..... **SAXIFRAGACEAE** (*Parnassia*)
    - 32' Flowers without a fringed corona.
      - 34. Styles elongated, forming a beak; fruit breaking into 5  
one-seeded segments, each tipped by a coiled beak  
segment; flowers in umbels ..... **GERANIACEAE**
      - 34' Styles not elongating and forming a beak; fruit  
1-seeded, not breaking apart; flowers in cymose  
panicles ..... **PLUMBAGINACEAE**

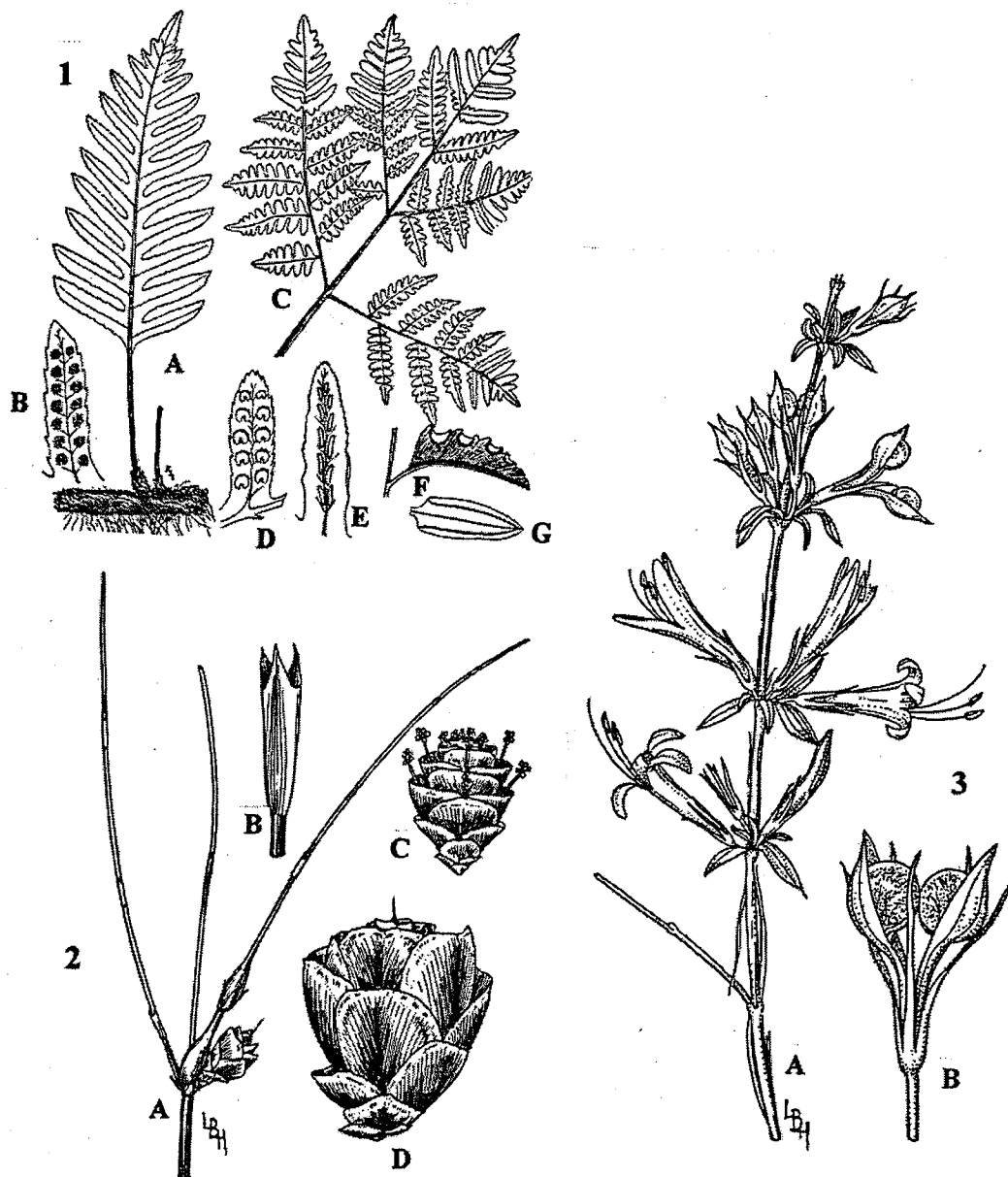


Fig. 1. *Polypodium* (Polypodiaceae): A, pinnatifid leaf and creeping rhizome; B, leaf segment from beneath with naked sori of sporangia. *Pteridium* (Dennstaedtiaceae): C, small leaf, twice-pinnate, then pinnatifid. *Dryopteris* (Dryopteridaceae): D, pinnule with each sorus covered with true indusium (reniform). *Woodwardia* (Blechnaceae): E, pinnule with elongate indusium. *Adiantum* (Adiantaceae): F, pinnule with false indusium (portion of leaf margin folded over). *Pellaea* (Adiantaceae): G, pinnule with false indusium formed by whole leaf margin. Reproduced with permission from *A California Flora* by P. A. Munz and D. D. Keck (1968). Drawn by R. J. Shaw.

Fig. 2. *Ephedra trifurca* (Ephedraceae): A, branch with scale leaves in 3's at the nodes, with irregular swellings (galls) caused by insects, and with a seed-bearing strobilus; B, a whorl of 3 coalescent leaves; C, pollen-bearing strobilus with whorls of bracts and of microsporophylls bearing pollen sacs; D, seed-bearing strobilus with whorls of bracts and a single ovule, with an elongate micropylar tube around the micropyle. Figure by Lucretia Hamilton from *Trees and Shrubs of the Southwestern Deserts*, by Lyman Benson and Robert Darrow. ©1981 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

Fig. 3. *Anisacanthus thurberi* (Acanthaceae). A, branchlet with bracts and flowers; B, fruit opening, exposing the 2 seeds. Figure by Lucretia Hamilton from *Trees and Shrubs of the Southwestern Deserts*, by Lyman Benson and Robert Darrow. ©1981 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

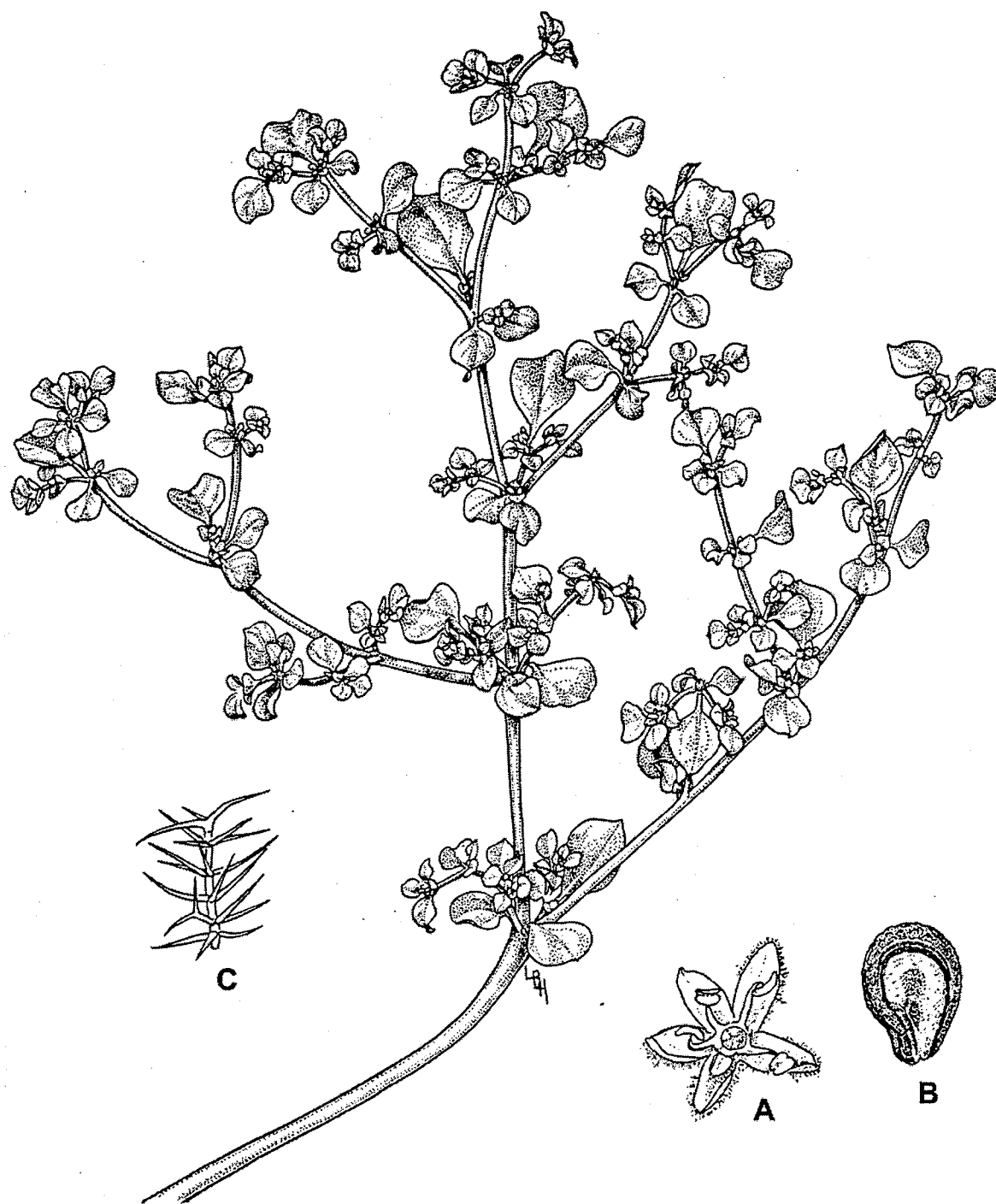


Fig. 4. *Tidestromia lanuginosa* (Amaranthaceae) flowering branch. A, flower; B, seed; C, branched hair. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

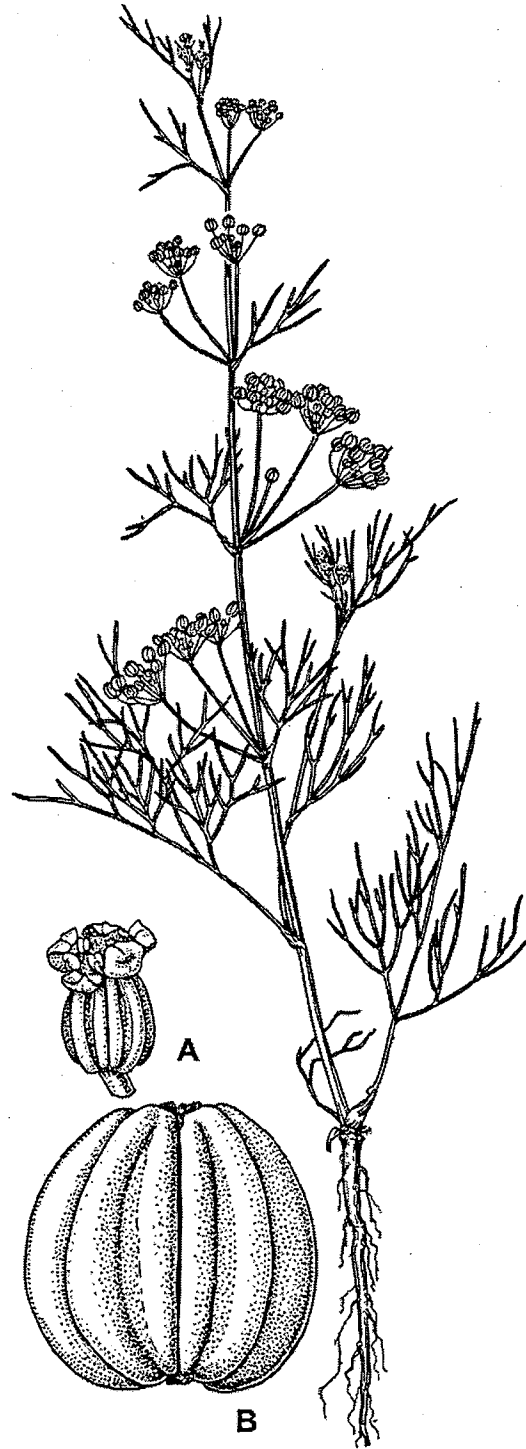
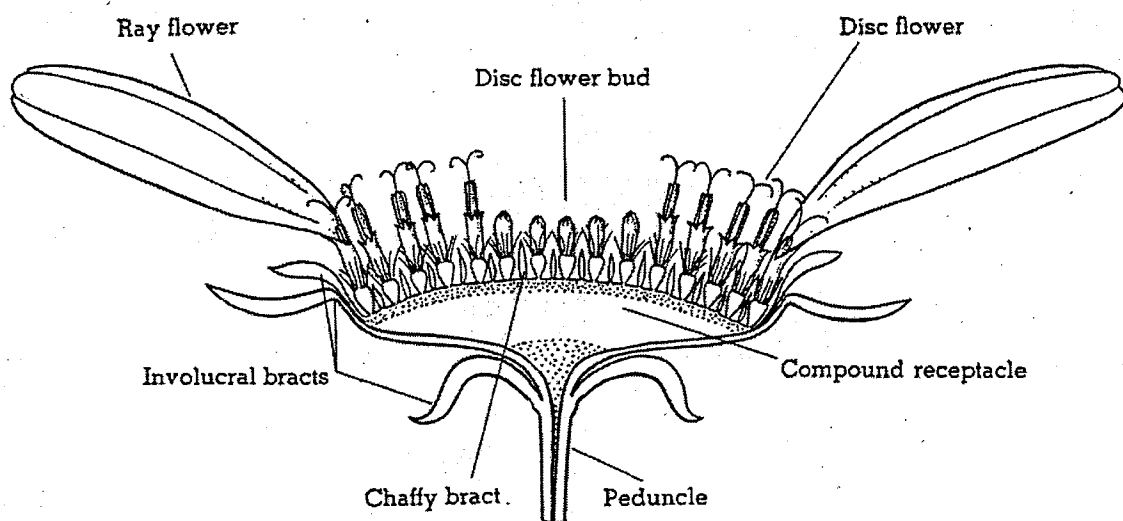


Fig. 5. *Cyclospermum leptophyllum* (Apiaceae). Leafy plant with flowers and fruits. A, flower; B, fruit. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

## THE SUNFLOWER FAMILY



## FLOWER HEAD

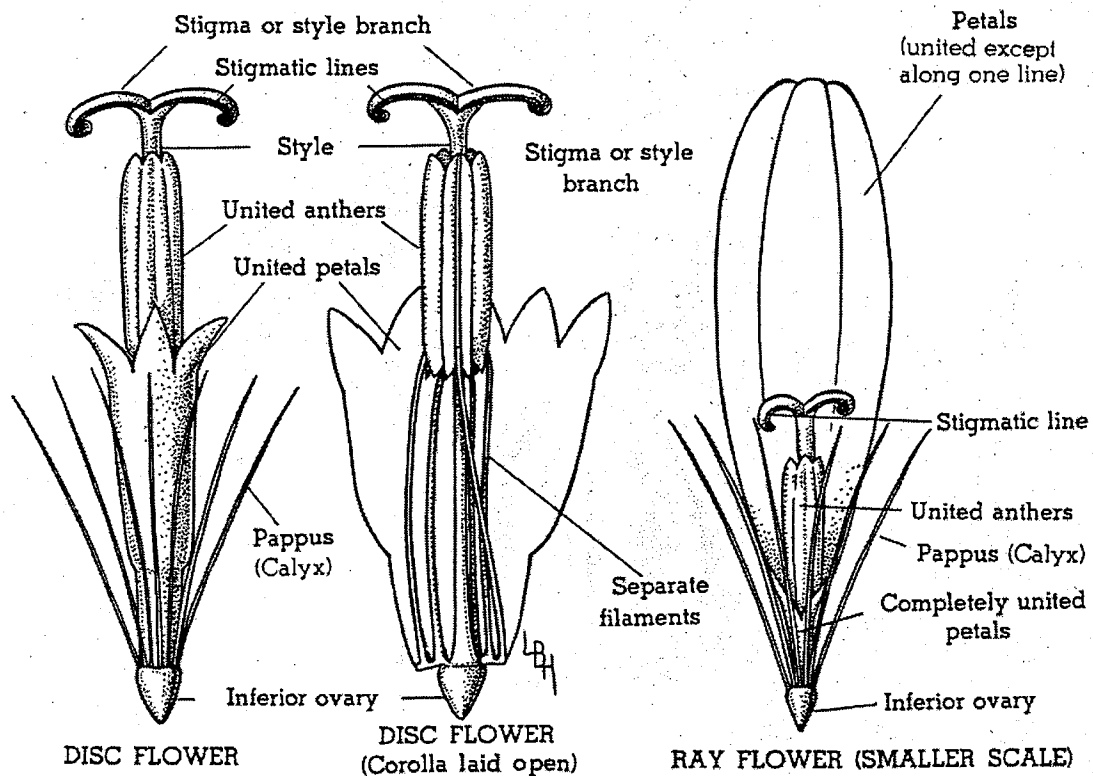


Fig. 6. Asteraceae family characters. Structure of the flower head and of ray and disk flowers. From *Vascular Plant Taxonomy*, 4th ed. by D. R. Walters and D. J. Keil. ©1996 by Kendall/Hunt Publishing Company. Used with permission. Drawn by B. K. Walters.



Fig. 7. *Dugaldia hoopesii* (Asteraceae). A, basal portion of plant; B, basal leaf; C, upper part of plant, showing 3 flower heads with large marginal (ray) flowers and small central flowers; D, central (disk) flower showing ribbed achene with crown of scales. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

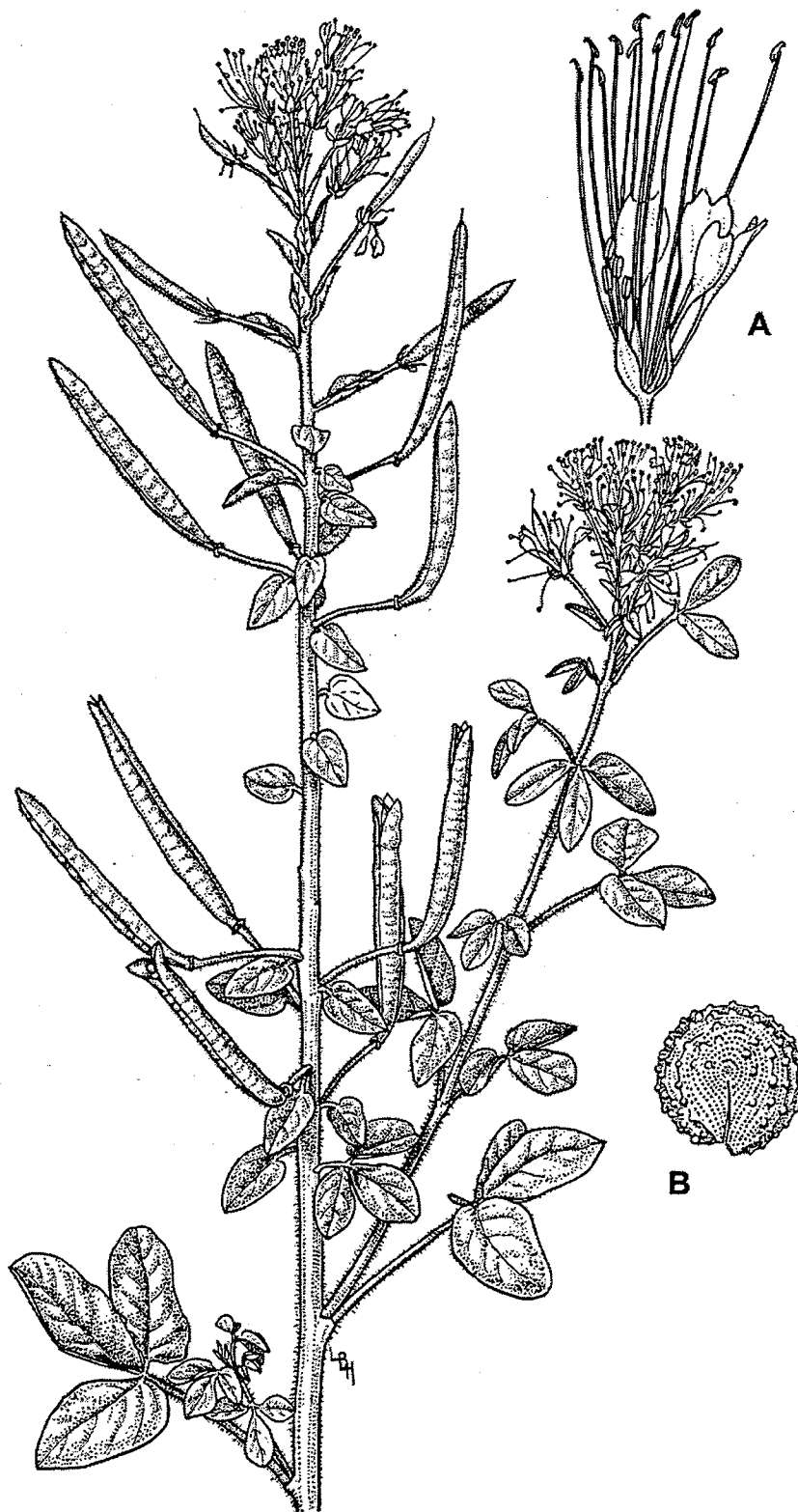


Fig. 8. *Polanisia trachysperma* (Capparaceae) branch with flowers and fruit. A, flower; B, seed. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

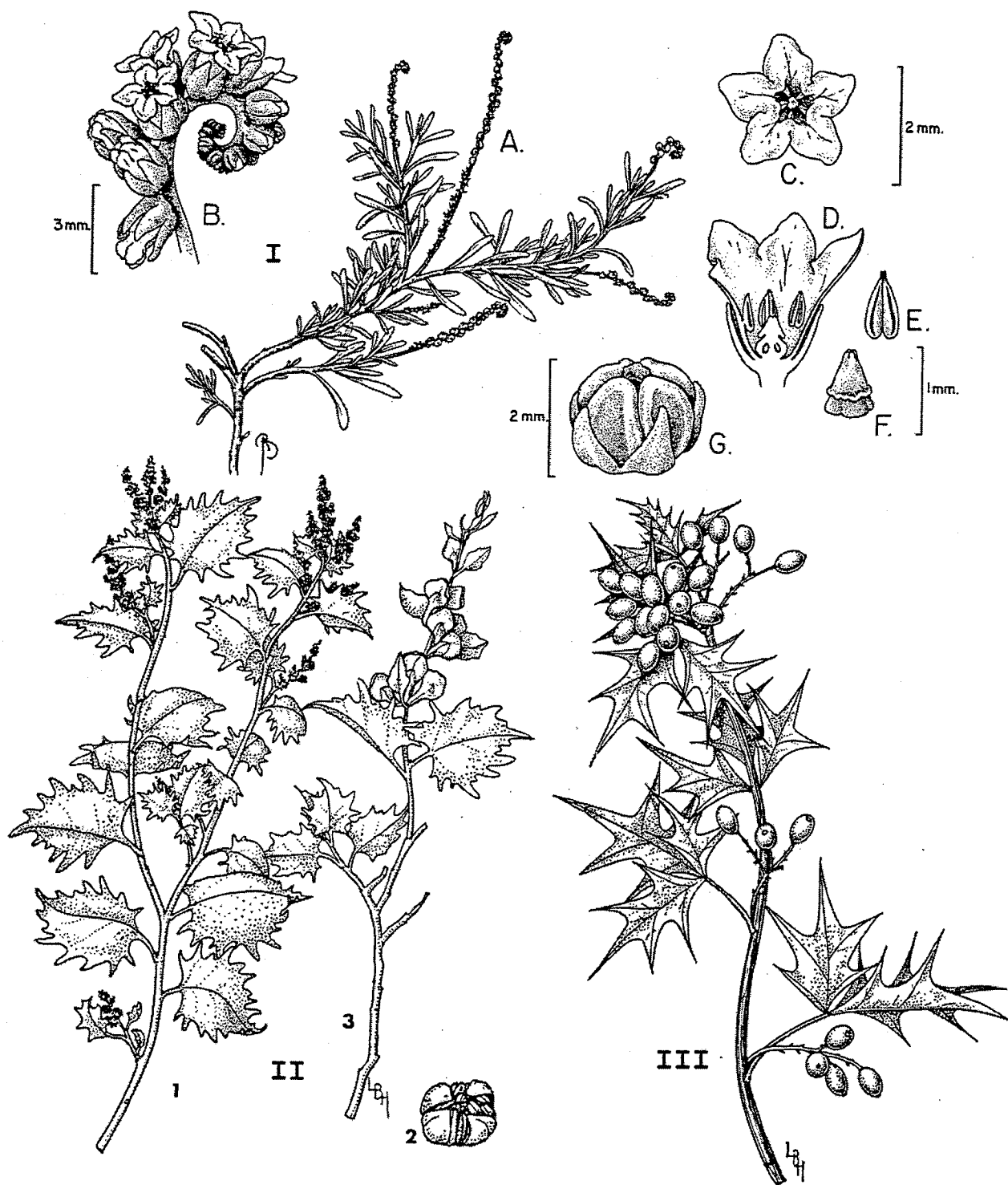


Fig. 9. I, *Heliotropium curassavicum* (Boraginaceae): A, flowering branch; B, detail of scorpioid cyme; C, flower; D, flower l.s.; E, anther; F, pistil; G, fruit of 4 nutlets. II, *Atriplex hymenelytra* (Chenopodiaceae): 1, flowering branch of staminate plant; 2, staminate flower consisting of sepals and stamens; 3, fruiting branch of pistillate plant. III, *Berberis harrisoniana* (Berberidaceae), branch with (blue-black) fruits. I reproduced with permission from *Flora of St. John, U.S. Virgin Islands* by P. Acevedo-Rodríguez and collaborators (1996), drawn by B. Angell. II and III by Lucretia Hamilton from *Trees and Shrubs of the Southwestern Deserts*, by Lyman Benson and Robert Darrow. ©1981 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

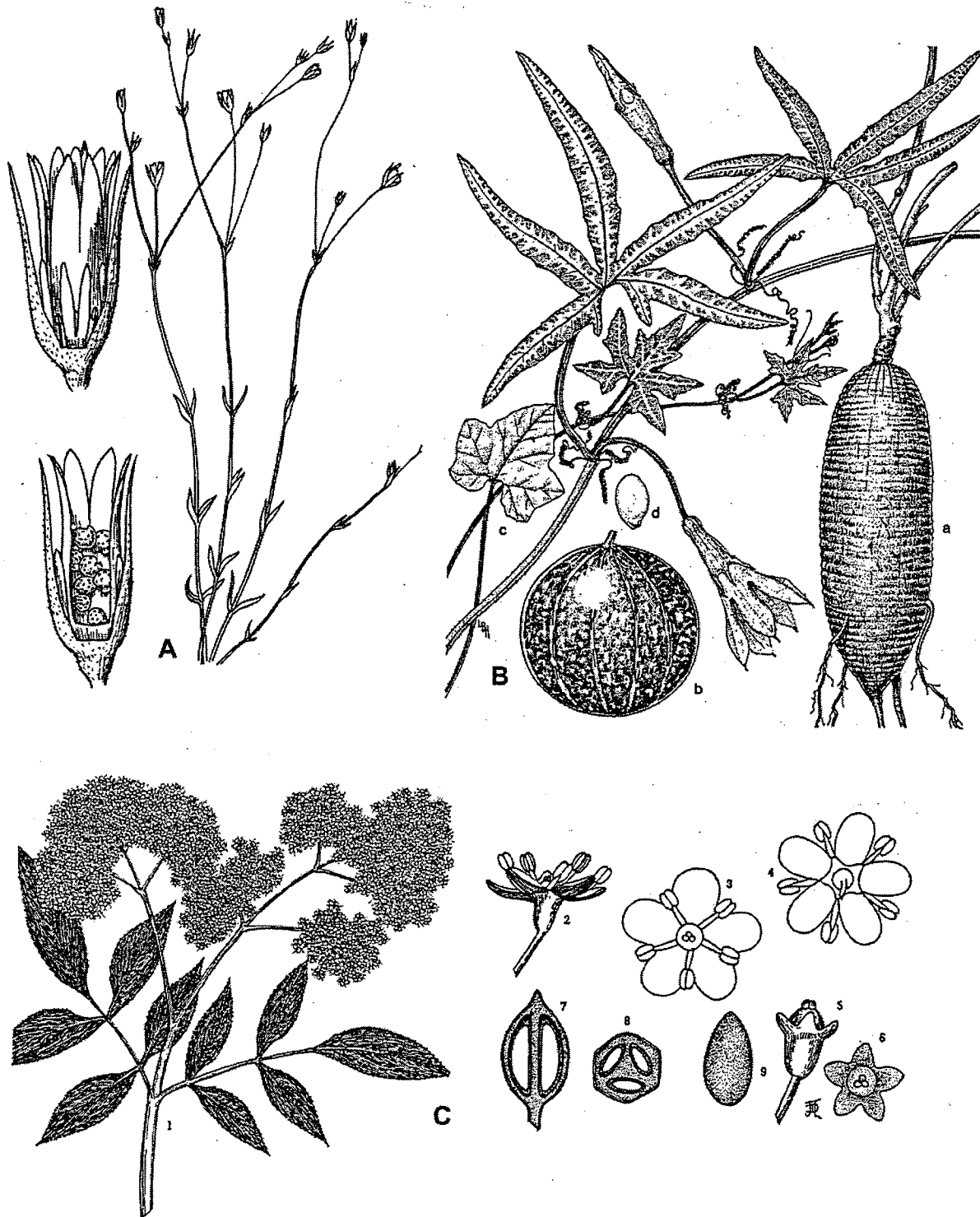


Fig. 10. A, *Stellaria nitens* (Caryophyllaceae). B, *Cucurbita digitata* (Cucurbitaceae): portion of vine showing leaves, tendrils and flowers; a, fleshy, tuberlike taproot; b, fruit; c, seedling leaf; d, enlarged seed. C, *Sambucus nigra* (Caprifoliaceae): 1, branch with inflorescence and leaves; 2-6, flower before and after petals fall; 7, diagrammatic l.s. of fruit; 8, diagrammatic x.s.; 9, young seed. A and B by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press. C reproduced with permission from *Plant Classification* by L. Benson (1957), drawn by J. D. Laudermilk.



Fig. 11. *Arbutus arizonica* (Ericaceae). A, flowering branch; B, flower l.s.; C, fruiting branch. Reproduced from *Silva of North America* by C. S. Sargent (1890-1902). Drawn by C. E. Faxon.

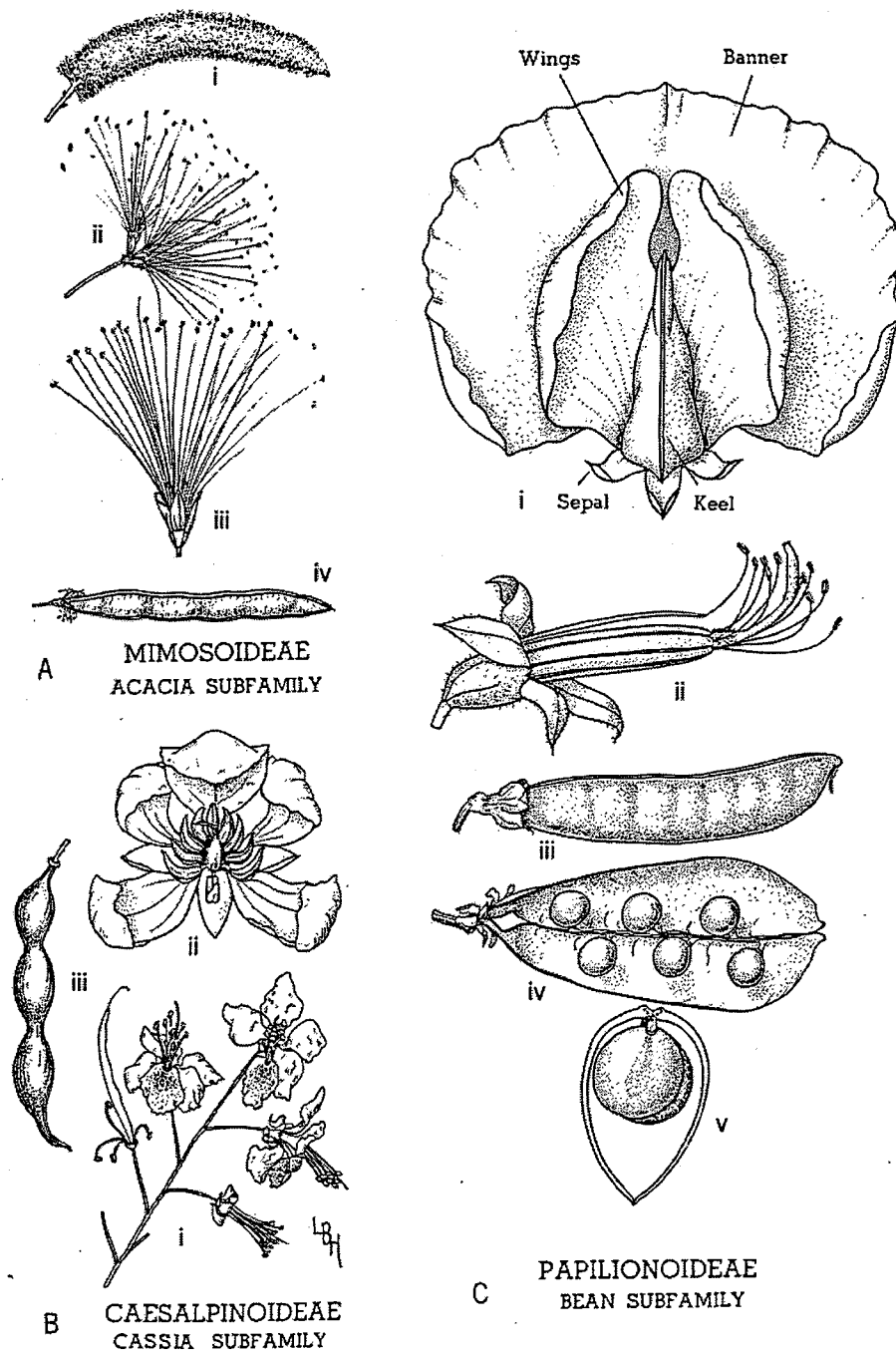


Fig. 12. The 3 subfamilies of Fabaceae. A, *Mimosoideae*, the *Acacia* subfamily: I, a dense spike (alternately a dense head) of small flowers; ii, flowers at the end of a spike; iii, flower showing the small sepals, equal petals, and numerous stamens common in the subfamily; iv, fruit a legume. B, *Caesalpinoideae*, the *Cassia* subfamily: I, inflorescence with flowers and a young fruit; ii, flower, showing the nearly equal petals, the upper one a banner and somewhat differentiated, the others about equal and separate, the flower large; iii, fruit a legume. C, *Papilionoideae*, the bean subfamily: I, typical pea flower with 5 petals, a banner, 2 wings, and a keel composed of 2 fused petals; ii, side view of a flower with petals removed; iii, fruit a legume, formed from a single carpel and ultimately splitting along both margins; iv, fruit opened from the under (midrib) side; v, fruit x.s. Figures by Lucretia Hamilton from *Trees and Shrubs of the Southwestern Deserts* by L. Benson and R. A. Darrow ©1981 Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.



Fig. 13. A, *Astragalus allochrous* var. *playanus* (Fabaceae: Papilionoideae). B, *Senna hirsuta* (Fabaceae: Caesalpinioideae). C, *Prosopis juliflora* (Fabaceae: Mimosoideae). Figures by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

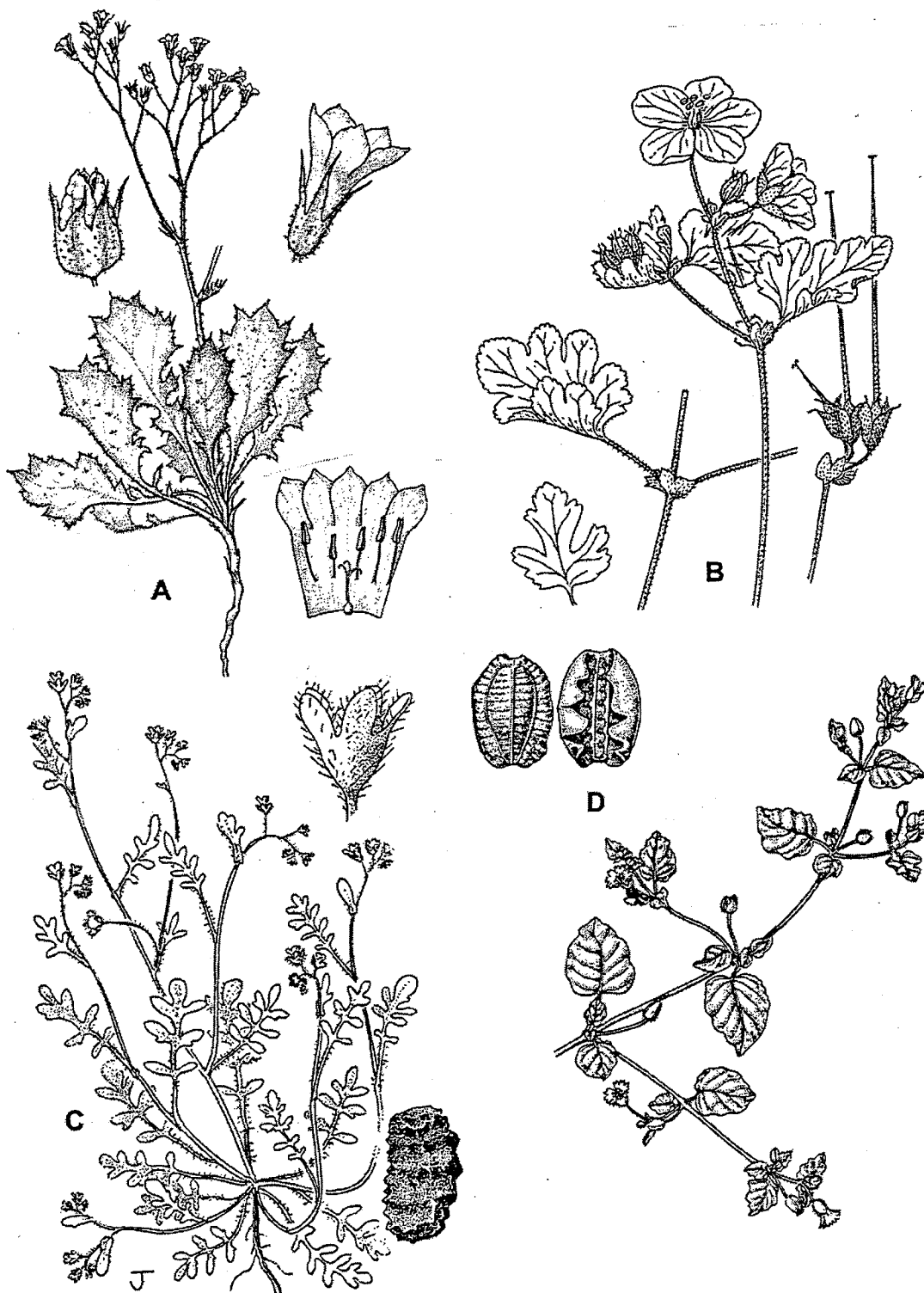


Fig. 14. A, *Gilia latifolia* (Polemoniaceae). B, *Erodium texanum* (Geraniaceae). C, *Eucrypta micrantha* (Hydrophyllaceae). A-C. Reproduced with permission from *Flora of Baja California* by I. L. Wiggins (1980). D, *Allionia incarnata* (Nyctaginaceae). Flowering branch and upper and lower sides of fruit. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

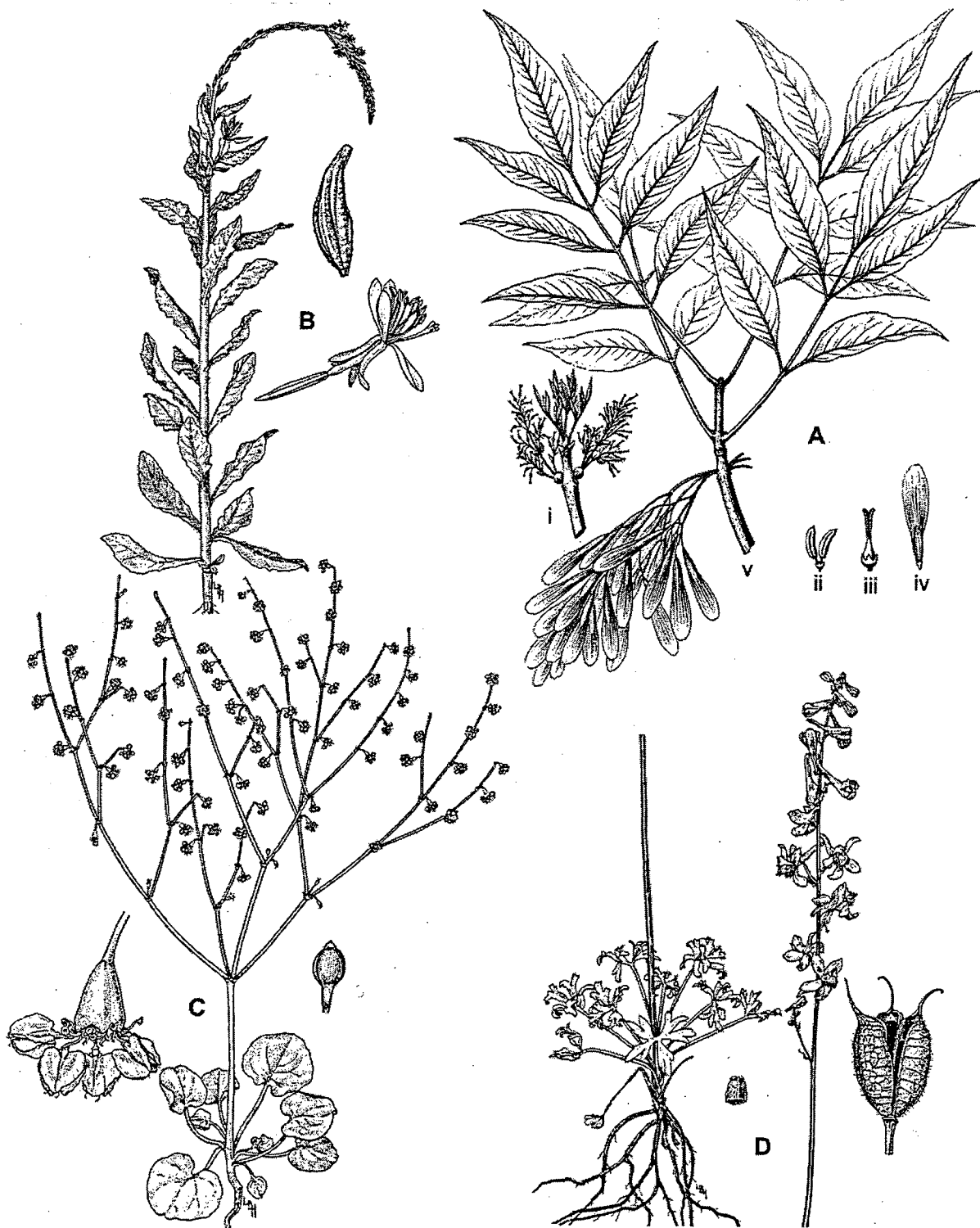


Fig. 15. A, *Fraxinus velutina* (Oleaceae). I, flowering branch of pistillate tree; ii, enlarged staminate flower; iii, enlarged pistillate flower; iv, enlarged fruit; v, fruiting branch. Reproduced from *Silva of North America* by C. S. Sargent (1890-1902). Drawn by C. E. Faxon. B, *Gaura mollis* (Onagraceae) with enlarged flower and fruit. C, *Eriogonum deflexum* (Polygonaceae) with enlarged flower and fruit. D, *Delphinium scaposum* (Ranunculaceae) with enlarged fruit and seed. B-D by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.



Fig. 16. A, *Anagallis arvensis* (**Primulaceae**) reproduced from *An Illustrated Flora of the Northern United States and Canada* by N. L. Britton and A. Brown (1913). B, *Ziziphus obtusifolia* (**Rhamnaceae**), thorny flowering branch, flower, and fruit; by Lucretia Hamilton from *Trees and Shrubs of the Southwestern Deserts*, by Lyman Benson and Robert Darrow. ©1981 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press. C, *Diodia teres* (**Rubiaceae**). D, *Saxifraga odontoloma* (**Saxifragaceae**). C and D reproduced with permission from *Flora of Baja California* by I. L. Wiggins (1980) where illustration of *S. odontoloma* appeared as "*S. arguta*." Drawn by J. R. Janish.



Fig. 17. A, *Keckiella antirrhinoides* (Scrophulariaceae); B, *Aloysia wrightii* (Verbenaceae); C, *Larrea tridentata* (Zygophyllaceae), branch, flower, and fruit. Figure by Lucretia Hamilton from *Trees and Shrubs of the Southwestern Deserts*, by Lyman Benson and Robert Darrow. ©1981 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

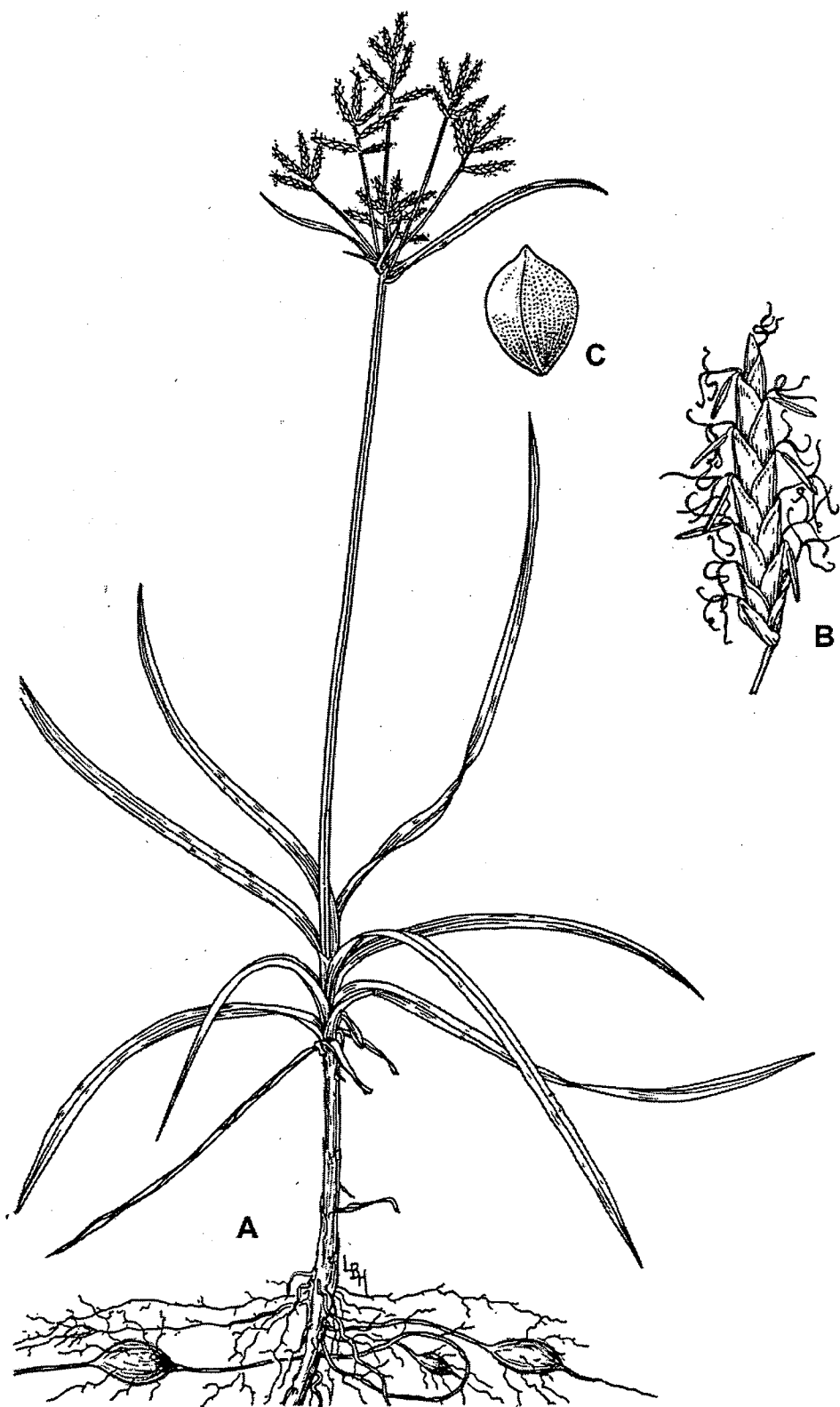


Fig. 18. Cyperaceae. *Cyperus rotundus*; A, flowering plant showing underground stems with nutlets or tubers at the tips; B, spikelet in flower; C, fruit. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.

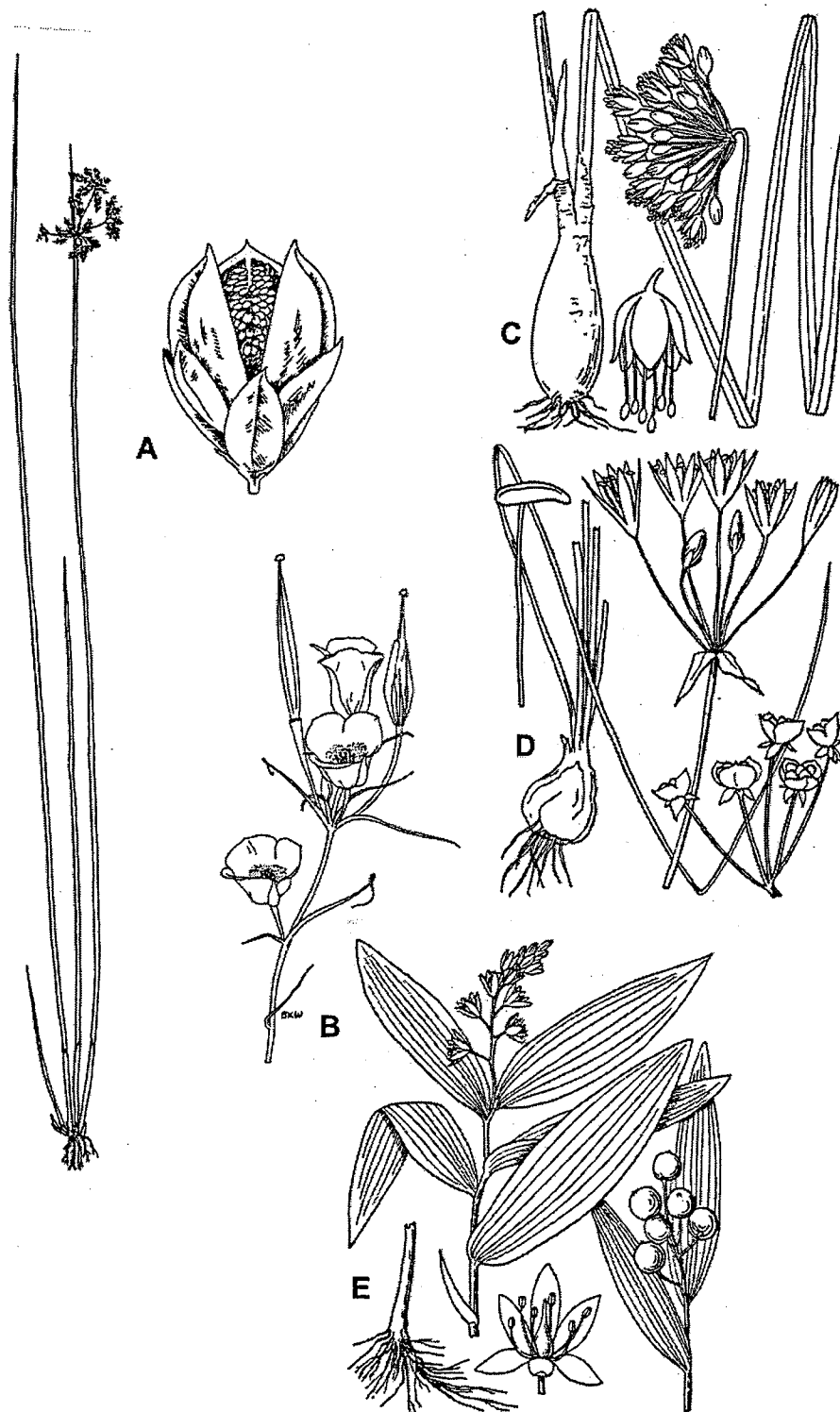


Fig. 19. **Juncaceae**. A, *Juncus*; A, plant with slender, cylindrical, leafless stems, the leaves reduced to bladeless basal sheaths and an enlarged loculicidal capsule. **Liliaceae**. B, inflorescence of *Calochortus* with flowers and immature capsules; C, *Allium cernuum*; D, *Nothoscordum bivale*; E, *Maianthemum stellatum*. A-B, from *Vascular Plant Taxonomy*, 4th ed. by D. R. Walters and D. J. Keil. 1996 by Kendall/Hunt Publishing Company. Used with permission. Drawn by B. K. Walters. C-E reproduced from *An Illustrated Flora of the Northern United States and Canada* by N. L. Britton and A. Brown (1913).



Fig. 20. Poaceae. *Urochloa fasciculata*; A, habit; B, lower and upper views of spikelet; C, two views of grain. Figure by Lucretia Hamilton from *An Illustrated Guide to Arizona Weeds*, by Kittie Parker. ©1972 The Arizona Board of Regents. Reprinted by permission of the University of Arizona Press.