PLANT MORPHOLOGICAL TERMS

PLANT PARTS

bud - an immature shoot, vegetative or reproductive or both, the outer leaves of which may be modified as protective scales; may be gametophytic or sporophytic.

capsule - the spore-producing components of the sporophytes of liverworts, hornworts, and mosses. [Note: the term "capsule" is also used for a specific fruit type of angiosperms; see below.]

cone / strobilus - a modified, determinate, reproductive shoot system of many non-flowering vascular plants, consisting of a stem axis bearing either sporophylls (in "simple" cones) or modified shoot systems (in "compound" cones).

flower - the reproductive organ of flowering plants; a modified, determinate shoot bearing sporophylls (stamens and/or carpels), with or without outer modified leaves (the perianth).

fruit - the mature ovary of flowering plants, consisting of the pericarp (mature ovary wall), seeds, and (if present) accessory parts.

inflorescence - an aggregate of one or more flowers, the boundaries of which generally occur with the presence of vegetative leaves; may be composed of two or more unit inflorescences.

leaf - a generally dorsi-ventrally flattened organ, usually functioning in photosynthesis and transpiration; derived from a leaf primordium in the shoot apex; in vascular plants containing one to many vascular bundles (veins); often variously modified.

ovule - a megasporganium enveloped by one or more protective integuments; the immature seed.

rhizoids - uniseriate chains of cells arising typically from the base of the gametophytes of liverworts, hornworts, and mosses that function in water and mineral absorption.

root - a cylindrical organ of virtually all vascular plants, consisting of an apical meristem that gives rise to a protective root cap, a central endodermis-bounded vascular system, absorptive epidermal root hairs, and endogenously developed lateral roots; usually functioning in anchorage and absorption of water and minerals; initially derived from the radicle of the embryo and typically growing downward.

shoot - a stem plus associated, derivative leaves; initially formed by an apical meristem that gives rise to the stem and external (exogenous) leaf primordia; may be gametophytic or sporophytic.

sporangium - the spore-producing part of a plant; sporangia are of two types - male (microsporangium) or female (megasporangium) - in all heterosporous plants, including all of the seed plants.

stem - a generally cylindrical organ that bears leaves, typically functioning in support and elevation of the leaves and reproductive structures and in conduction of water, minerals, and sugars; in vascular plants initially derived from the epicotyl of the embryo and generally growing upward.

thallus - the flattened (dorsi-ventral) gametophyte of some liverworts and all hornworts.

vein - the discrete vascular bundles of the leaves of vascular plants.

PLANT HABIT (= general form of plant, including stem duration, branching pattern, development, and texture)

herb - a plant with annual aboveground shoots (including a flower or inflorescence); the plant itself may be annual, biennial, or perennial

- **geophyte** - a perennial herb, typically with a bulb, corm, rhizome, or tuber at the underground stem

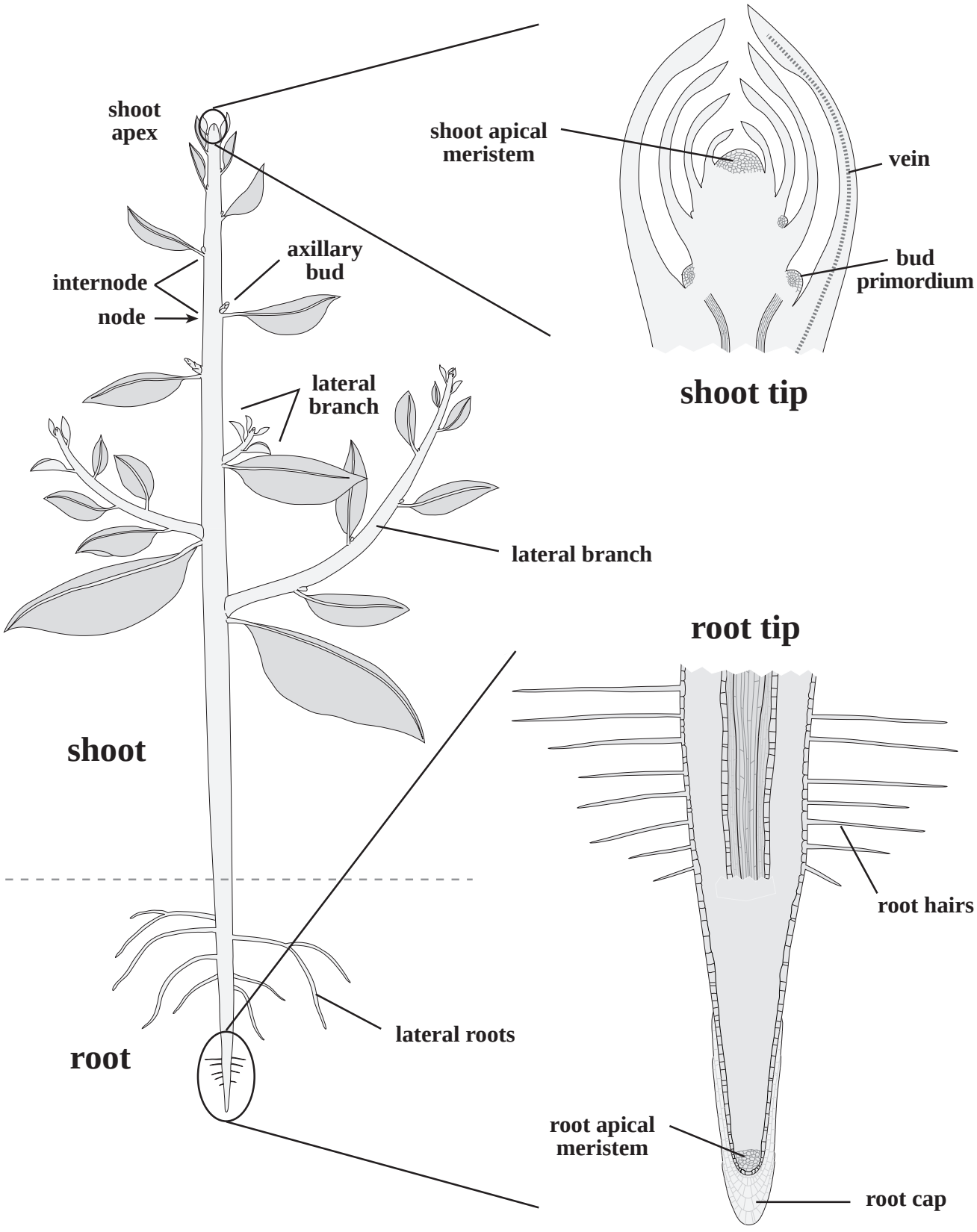
shrub - a perennial, woody plant having several main stems arising at ground level

- **subshrub -** a short shrub that is woody only at the base and that seasonally bears new, non-woody, annual shoots above

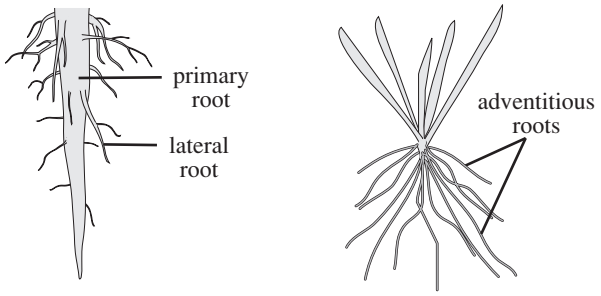
tree - a generally tall, perennial, woody plant having one main stem (the trunk) arising at ground level

vine - a plant with elongate, weak stems, supported by means of scrambling, twining, tendrils, or roots; may be annual or perennial, herbaceous or woody

- **liana -** a woody, perennial vine, in tropical forests often a component of the tree canopy layer


shoot apex
shoot apical meristem
vein
bud primordium
shoot tip
axillary bud
internode
node
lateral branch
lateral branch
shoot
root tip
root hairs
lateral roots
root
root apical meristem
root cap

ROOTS



tap root **fibrous roots**

ROOT TYPE

adventitious roots - a root arising from an organ other than a root, usually from a stem
- **aerial roots -** adventitious roots that absorb moisture and minerals from the air or runoff; common in some epiphytic plants, e. g., of Araceae and Orchidaceae
- **fibrous roots -** lacking a taproot, having adventitious roots that are typically fine and numerous
- **prop root -** above-ground, adventitious roots that function in supporting the stem

buttress roots - enlarged, horizontally spreading and often vertically thickened roots at the base of trees that aid in mechanical support

lateral [secondary] root - roots that are derived endogenously from the pericycle of an existing root

primary root - the root derived from the original radicle of the embryo

radicle - the first root of the embryo

storage root [root tuber] - a swollen taproot containing concentrations of high energy compounds such as starch

taproot - a persistent, well-developed primary root

STEM / SHOOT PARTS

leaf primordium - an immature leaf of the shoot

epicotyl - the first shoot of a seed plant, derived from the embryo of the seed

node - the point of attachment of a leaf to a stem

internode - the region between two adjacent nodes

bud primordium - an immature bud of the shoot, typically located in the axil, the upper (adaxial) junction of leaf and stem

vascular strands - vascular tissue, composed of xylem and phloem, functioning in fluid transport

bud - an immature shoot system, often surrounded by protective scale leaves, developing into a lateral branch, a flower, or an inflorescence

bark - tissues external to vascular cambium in stem (and roots) of woody plants, consisting of secondary phloem (inner bark) and derivatives of cork cambium (outer bark or periderm)

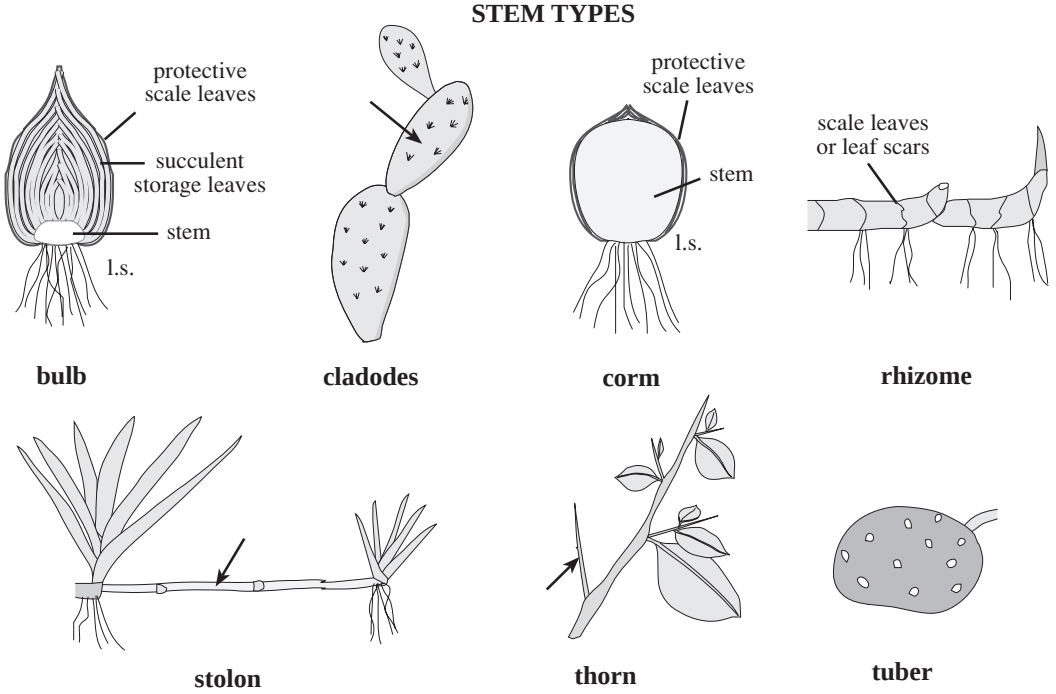
cortex - outer, mostly parenchymatous tissue, external to vasculature

ground meristem - mostly parenchymatous tissue surrounding vascular bundles in atactostele

pith - central, mostly parenchymatous tissue, internal to vasculature of siphonosteles and eusteles

wood - secondary xylem tissue, derived from vascular cambium of woody vascular plants

STEM TYPES



bulb **cladodes** **corm** **rhizome**

stolon **thorn** **tuber**

STEM / SHOOT TYPES

cladode - a flattened photosynthetic stem, functioning as and resembling a leaf [cladophyll, phylloclad]

rootstock - a general term for an underground stem or shoot; these generally give rise to aerial shoots either by direct conversion of the terminal apical meristem or via lateral buds

bulb - a short, erect, underground stem surrounded by fleshy leaves

corm - an enlarged, solid underground storage stem or stem base, with outer, protective scales

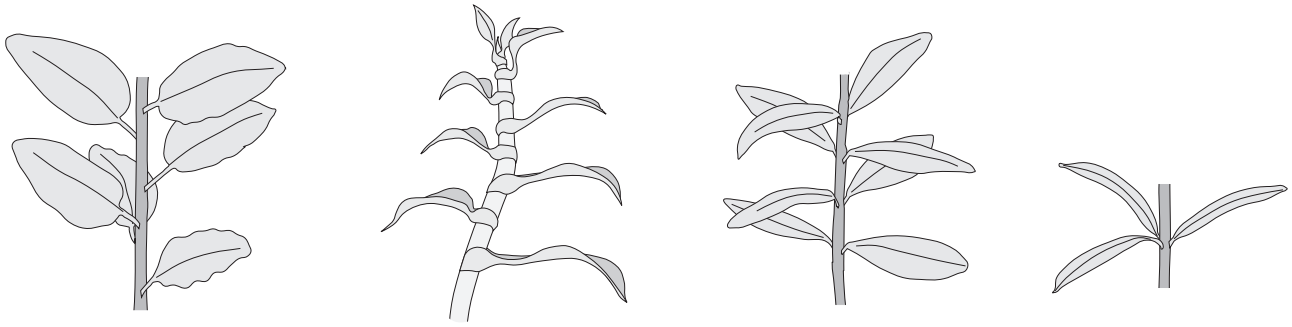
rhizome - a horizontal, underground stem, generally with short internodes and scale-like leaves; term also used for horizontal stems of ferns that are at ground level

tuber - a thick, underground storage stem, usually not upright, typically bearing outer buds and lacking surrounding storage leaves or protective scales

stolon / runner - an indeterminate, elongate, slightly underground or aboveground propagative stem, with long internodes, rooting at the tip forming new plants

thorn - a sharp-pointed stem or shoot (cf. prickle, spine)

Arrangement



alternate-spiral **distichous** **opposite** **whorled**

LEAF ARRANGEMENT (= placement with respect to similar parts)

alternate - one leaf or other structure per node

distichous - alternate leaves or other structures two-ranked, in one plane

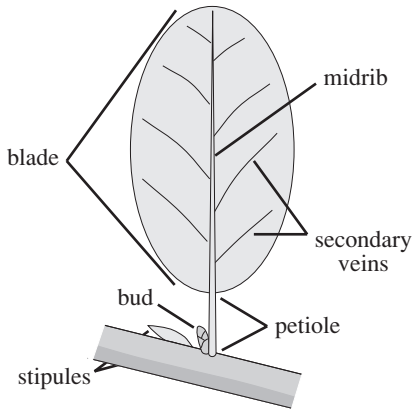
spiral - alternate leaves or other structures in more than two rows [polystichous]

opposite - two leaves or other structures per node, on opposite sides of stem or central axis

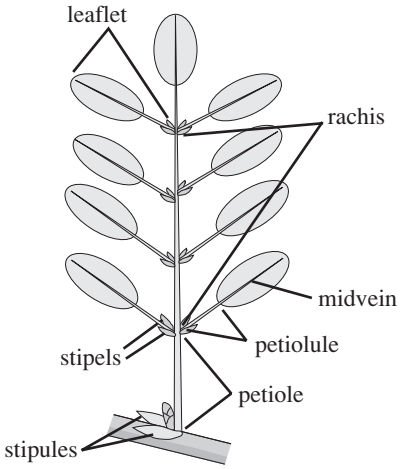
decussate - opposite leaves or other structures at right angles to preceding pair

whorled - three or more leaves or other structures per node [verticillate]

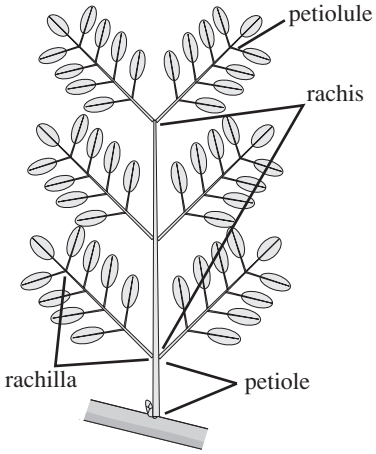
LEAF TYPES



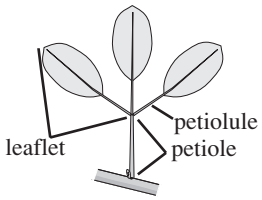
simple



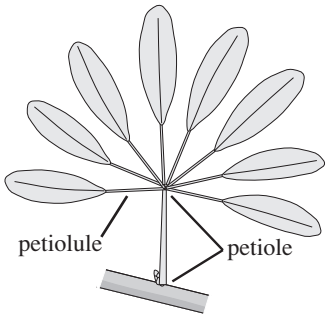
pinnately compound



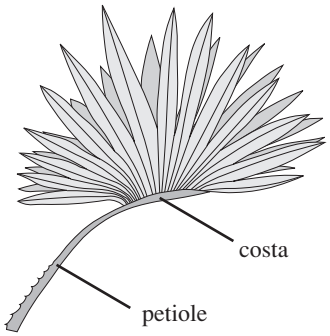
bipinnately compound



ternate



palmately compound



costa-palmate

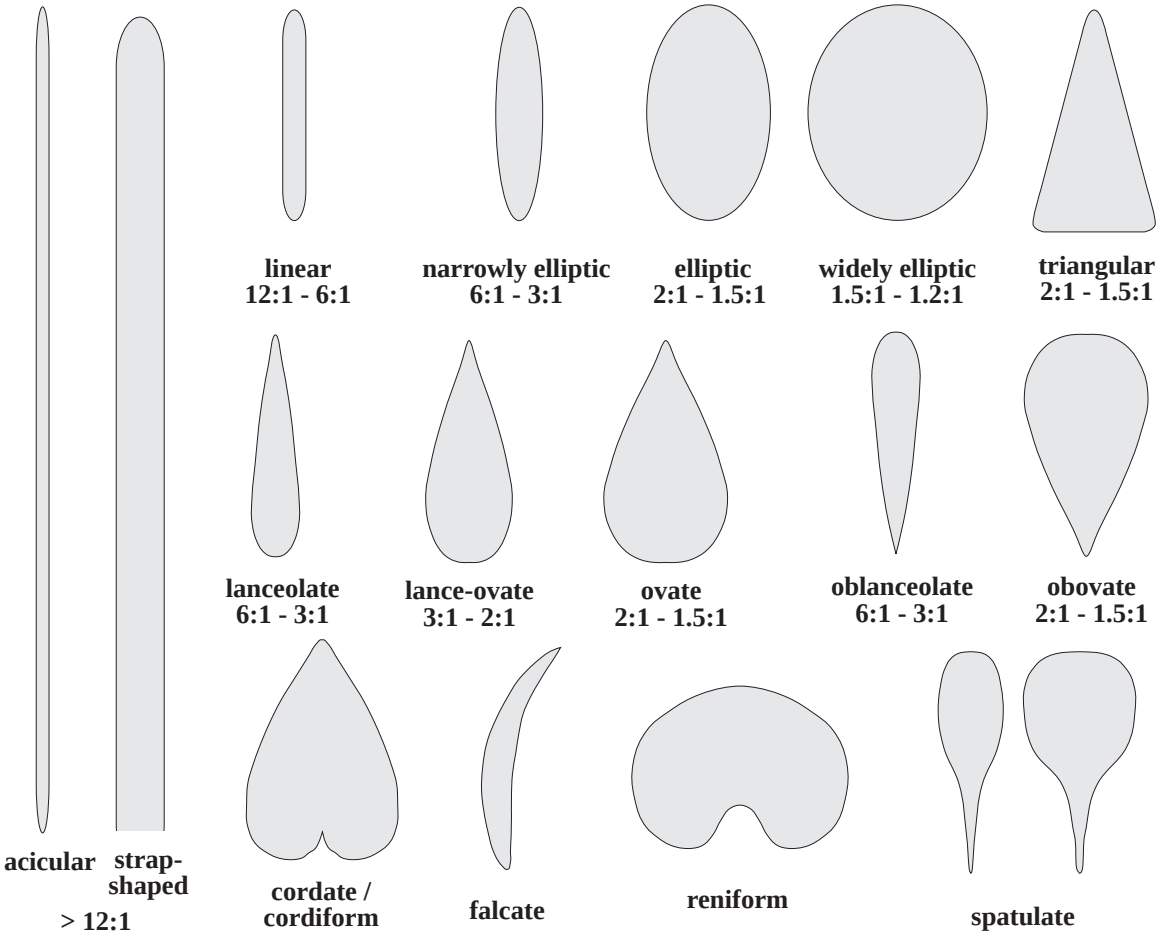
LEAF PARTS

blade / lamina - the flat, expanded portion of leaf
leaflet - a distinct and separate segment of a leaf
petiole / stipe - a leaf stalk; the term "stipe" used for ferns
petiolule - a leaflet stalk
pinna - the first divisions of a leaf, usually applied to ferns
pinnule - the ultimate divisions or leaflets of a leaf, usually applied to ferns
rachilla - a lateral or secondary axis of a bipinnate leaf (plural, "rachillae")
rachis - the main axis of a pinnately compound leaf
sheath - a flattened leaf base or petiole that partially or wholly clasps the stem; e. g., Poaceae and many Apiaceae
stipules - paired leaf-like structures, which may be modified as spines or glands, at either side of the base of a petiole
    stipulate - with stipules
    exstipulate - without stipules
vein / nerve - the vascular bundle of a leaf, containing the conductive tissues

LEAF TYPE

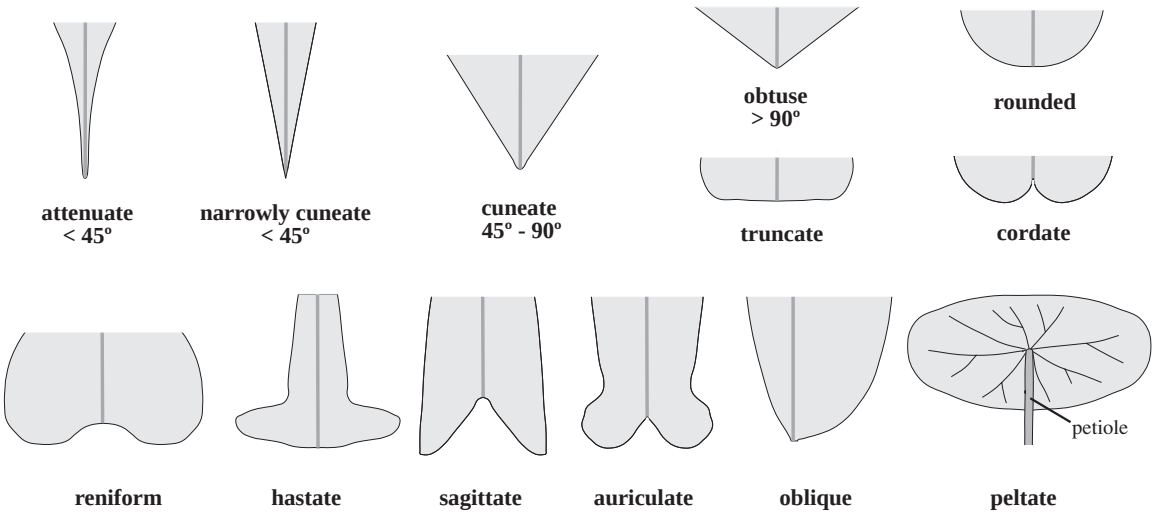
compound - with leaf divided into two or more discrete leaflets
    bipinnately comp. - with two orders of leaflets, each pinnately compound (bipinnate)
    costapalmate - essentially palmately lobed to compound but with an elongate, rachis-like extension of the petiole, as in some palms
    palmately compound - with 4 or more leaflets arising from a common point, usually at the end of the petiole (palmate)
    pinnately compound - with leaflets arranged oppositely or alternately along a central axis, the rachis (pinnate)
    trifoliolate / ternate - with three leaflets (ternately compound) [trifoliate]
simple - with leaf not divided into leaflets, bearing a single blade

Shape: Plane



SHAPE: PLANE [Note: generally after Taxon 11(5): 145-156 (1962)]
acicular - needlelike, often round in cross-section; margins straight, parallel, length:width ratio > 12:1
cordate - heart-shaped; approximately ovate with a cordate base (see "**Base**") [cordiform]
elliptic - margins curved, widest at midpoint, length:width ratio between 2:1 and 3:2
falcate - lanceolate to linear and curved to one side; scimitar-shaped [falciform]
lanceolate - margins curved, widest near base, length:width ratio between 6:1 and 3:1
lance-ovate - margins curved, widest near base, length:width ratio between 3:1 and 2:1
linear - margins straight, parallel, length:width ratio between 12:1 and 6:1
narrowly elliptic - margins curved, widest near midpoint, length:width ratio between 6:1 and 3:1
oblanceolate - margins curved, widest near apex, length:width ratio between 6:1 and 3:1
oblance-ovate - margins curved, widest near apex, length:width ratio between 3:1 and 2:1
oblong - margins straight, parallel, length:width ratio 2:1 and 3:2
obovate - margins curved, widest near apex, length:width ratio between 2:1 and 3:2
ovate - margins curved, widest near base, length:width ratio between 2:1 and 3:2
reniform - kidney-shaped; wider than long with a rounded apex and reniform base (see "**Base**")
spatulate - oblong, obovate, or oblanceolate with a long attenuate base
subulate - awl-shaped; approximately narrowly oblong to narrowly triangular
triangular - three-sided, length:width ratio between 2:1 and 3:2

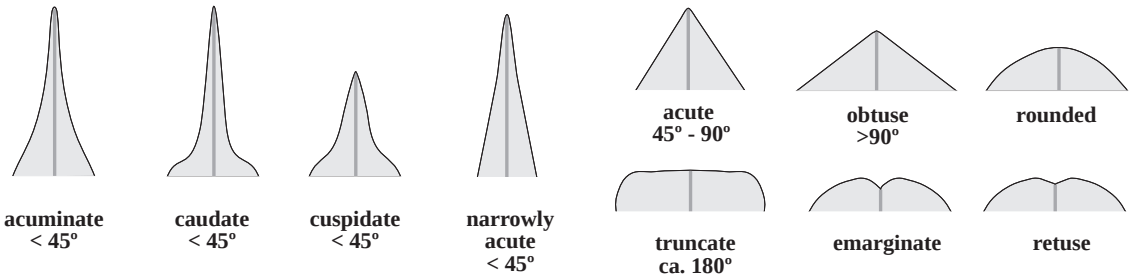
Base



BASE

attenuate - basal margins abrubtly incurved (concave), basal intersection angle < 45º
auriculate - with two rounded, basal lobes, margins above lobes concave
cordate - with two rounded, basal lobes intersecting at sharp angle, margins above lobes rounded
cuneate - basal margins approximately straight, intersection angle 45º - 90º
hastate - with two basal lobes, more or less pointed and oriented outwardly, approximately 90º relative to central axis
narrowly cuneate - basal margins approximately straight, intersection angle < 45º
oblique - with an asymmetrical base
obtuse - basal margins approximately straight, intersection angle > 90º
peltate - having petiole attached away from the margin, on the underside of blade
reniform - with two rounded, basal lobes, smoothly concave at intersection of lobes
rounded - basal margins convex, forming a single, smooth arc
sagittate - with two basal lobes, more or less pointed and oriented downward, away from apex
sheathing - having a basal, clasping leaf sheath
truncate - basal margin cut straight across, angle approximately 180º

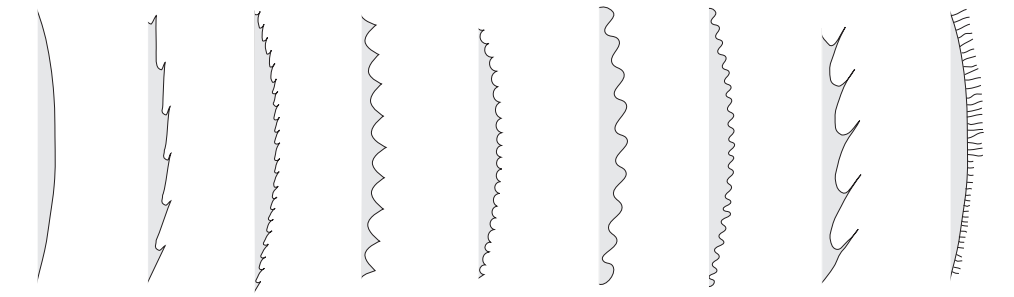
Apex: Shape



APEX (plural, "Apices")

acuminate - apical margins abruptly incurved (concave), apical intersection angle < 45º
acute - apical margins approximately straight, intersection angle 45º - 90º
caudate - abruptly acuminate into a long, narrowly triangular (tail-like) apical region
cuspidate - abruptly acuminate into a triangular, stiff or sharp apex
emarginate - having an apical incision, cut $^{1}/_{16}$ - $^{1}/_{8}$ distance to midrib, midvein, or junction of primary veins
narrowly acute - apical margins approximately straight, intersection angle < 45º
oblique - with an asymmetrical apex (see **Base**)
obtuse - apical margins approximately straight, intersection angle > 90º
retuse - having an apical incision, cut up to $^{1}/_{16}$ distance to midrib, midvein, or junction of main veins
rounded - apical margins convex, forming a single, smooth arc
truncate - apical margin cut straight across, angle approximately 180º

Margin

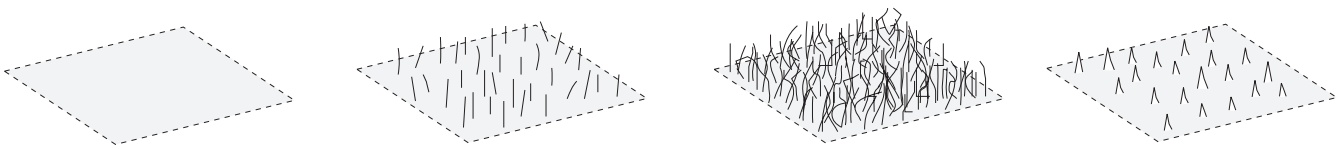


entire **serrate** **serrulate** **dentate** **denticulate** **crenate** **crenulate** **spinose** **ciliate / ciliolate**

MARGIN
ciliate - with trichomes protruding from margins
ciliolate - with minute trichomes protruding from margins; minutely ciliate
crenate - with rounded to obtuse, shallowly ascending teeth, cut $^1/_{16}$ - $^1/_8$ distance to midrib, midvein, or junction of primary veins
crenulate - diminutive of crenate, teeth cut to 1/16 distance to midrib, midvein, or junction of primary veins
dentate - with sharp, coarse teeth that point outward at right angles to margin outline, cut $^1/_{16}$ - $^1/_8$ distance to midrib, midvein, or junction of primary veins
denticulate - diminutive of dentate, cut to $^1/_{16}$ distance to midrib, midvein, or junction of primary veins
doubly serrate - with large, serrate teeth having along the margin smaller, serrate teeth
eciliate - without trichomes protruding from margins, regardless of presence or absence of teeth
entire - without teeth on margins; locally smooth (Note, however, that surface may be divided.)
serrate - saw-toothed; teeth sharp and ascending, lower side longer, cut $^1/_{16}$ - $^1/_8$ distance to midrib, midvein, or junction of primary veins
serrulate - diminutive of serrate, teeth cut to $^1/_{16}$ distance to midrib, midvein, or junction of primary veins
spinose - margins with teeth bearing sharp, stiff, spine-like processes

EPIDERMAL EXCRESCENCE (from structural outgrowths or secretions of epidermis)
farinaceous - finely mealy, covered with small granules [granular, scurfy]
glaucous - covered with a smooth, usually whitish, waxy coating (that can be rubbed off with touch)
prickly - with prickles = sharp non-spine, non-thorn appendages
scabrous - having a rough surface, like that of sandpaper (also treated under "**Vestiture**")

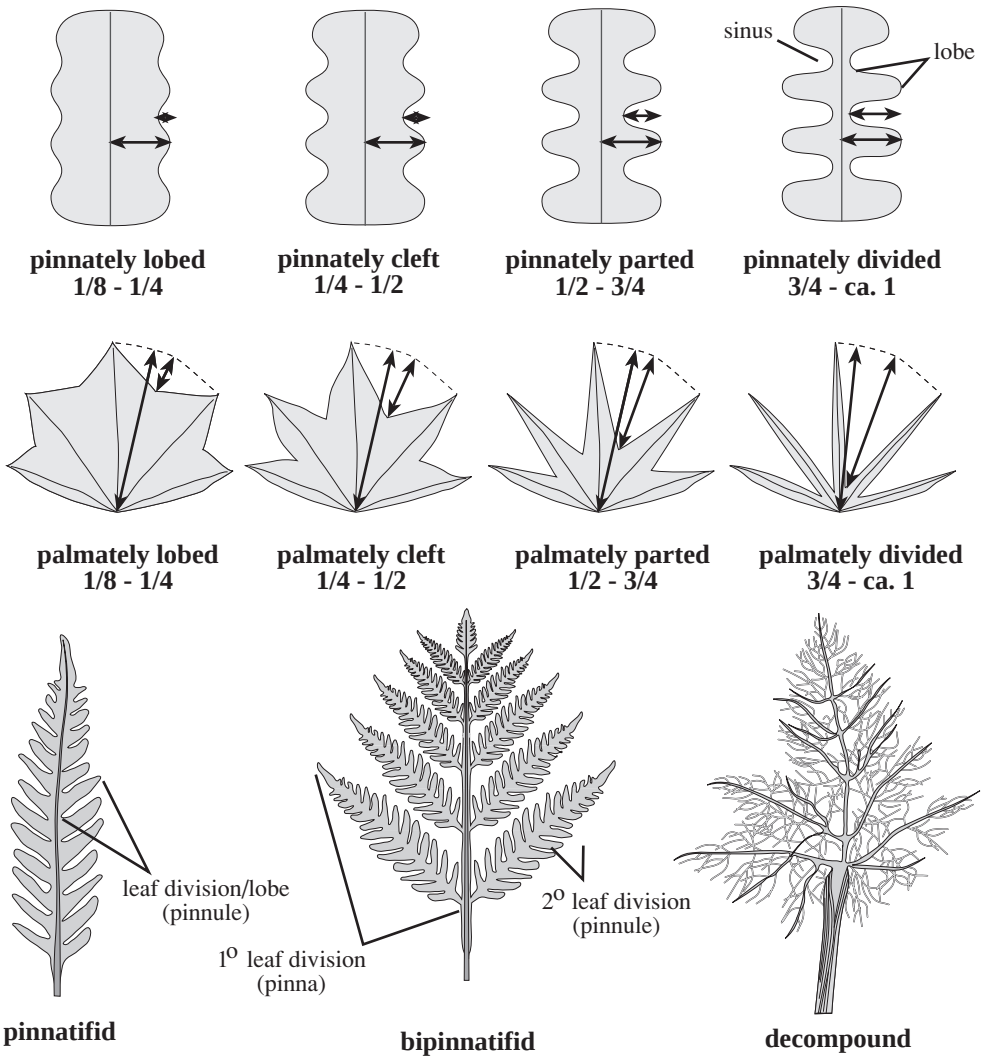
Vestiture



glabrous **pubescent** **tomentose** **scabrous**

VESTITURE (=trichome cover, a combination of type, length, strength, shape, density, and color)
glabrous - without trichomes
pubescent - with straight, short, soft, somewhat scattered, slender trichomes (Note: This can be a general term = "having trichomes.")
tomentose - covered with dense, interwoven trichomes

DIVISION



DIVISION (=nature of sinuses (incisions), these defining lobes or segments; often treated as "**Margin**")
lobed - sinuses extending (pinnately or palmately) $^{1}/_{8}$ - $^{1}/_{4}$ distance to midrib, midvein, or vein junction
cleft - sinuses extending (pinnately or palmately) $^{1}/_{4}$ - $^{1}/_{2}$ distance to midrib, midvein, or vein junction
parted - sinuses extending (pinnately or palmately) $^{1}/_{2}$ - $^{3}/_{4}$ distance to midrib, midvein, or vein junction
divided - sinuses extending (pinnately or palmately) $^{3}/_{4}$ - almost to midrib, midvein, or vein junction
bipinnatifid - bipinnately lobed to divided
decompound - deeply divided into numerous segments such that leaflets not clearly defined
pinnatifid - pinnately lobed to divided