Colorado State University Extension

Colorado Master Gardener℠ Program

CMG GardenNotes #173

Identifying Broadleaf Flowering Trees and Shrubs

Outline:

Identification of broadleaf trees and shrubs is a skill mastered with practice and knowledge of the plant families. Most trees and shrubs can be readily identified to family and genus with a basic knowledge of the plant's characteristics and the use of a key. There are always a few exceptions with plants that do not look like their relatives. Identification to a specific epithet requires more skill and a closer look at plant characteristics. Identification to variety and cultivar is difficult to impossible, as the defining characteristics may not be clearly observable from plant samples. Most keys start with leaf arrangement and shape.

Leaf Characteristics

Arrangement on Stem [Figure 1]

- **Alternate** – Arranged in staggered fashion along stem (willow)
- **Opposite** – Pair of leaves arranged across from each other on stem (maple)
- **Whorled** – Arranged in a ring (catalpa)

Figure 1. Leaf arrangement on stem

Leaflet Arrangement on Petiole [Figure 2]

- **Simple –** Leaf blade is one continuous unit (cherry, maple, and elm)
- **Compound** – Several ***leaflets*** arise from the same petiole
    - **Pinnately compound** – Leaflets arranged on both sides of a common rachis (leaf stalk), like a feather (mountain ash)
    - **Palmately compound** – Leaflets radiate from one central point (Ohio buckeye and horse chestnut)
    - **Double pinnately compound** – Double set of compound leaflets

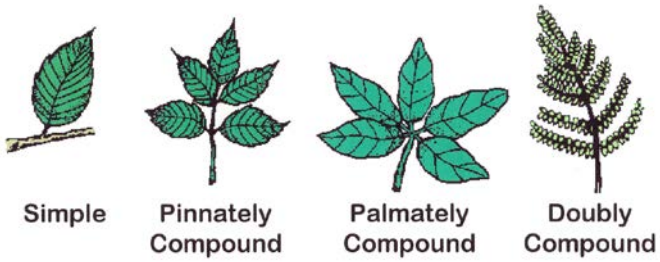


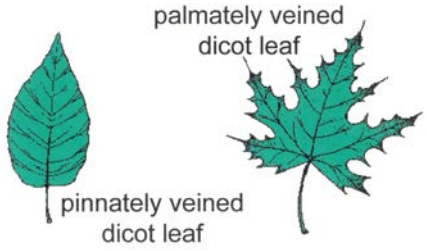
Figure 2. Leaflet arrangement on petiole

Note: Sometimes identifying a "leaf" or "leaflet" can be confusing. Look at the petiole attachment. A leaf petiole attaches to the stem at a bud node. There is no bud node where leaflets attach to the petiole.

Venation [Figure 3]

- **Pinnately** veined leaves have a central vein down the center with veinlets branching off and extending to the edge. [elm, peach, and linden]
- **Palmately** veined leaves radiate veinlets out in a fan-shaped pattern from a central point at the petiole (leaf stem). [maple, mulberry, and poplar)]

Figure 3. Leaf venation



Leaf Shape

Leaf shape is a primary tool in plant identification. Descriptions often go into minute detail about general leaf shape, and the shape of the leaf apex and base. There is no magic line where one type suddenly becomes another type; rather it is a judgment call. When using keys, look at several leaves and be flexible in your description. The following are common shapes as used in the *Manual of Woody Landscape Plants* by Michael Dirr. [Figures 4-7]

Figure 4. Leaf shapes

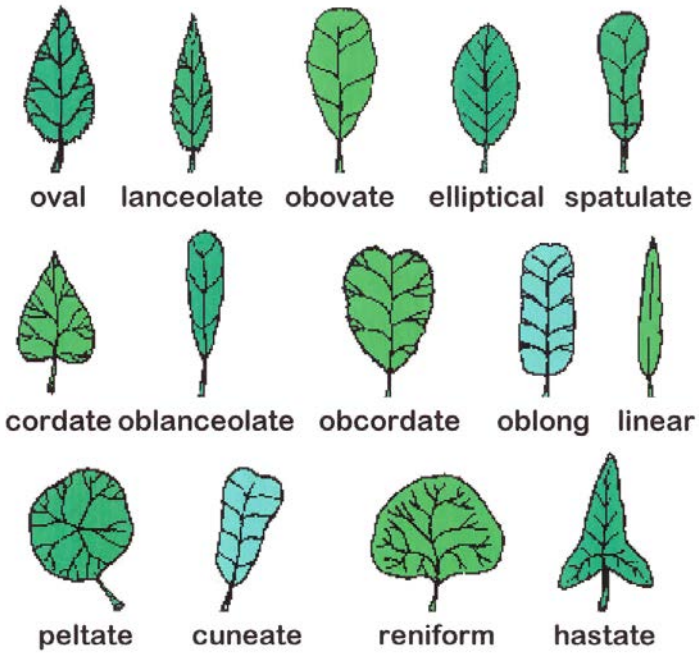


Figure 5. Tip shape

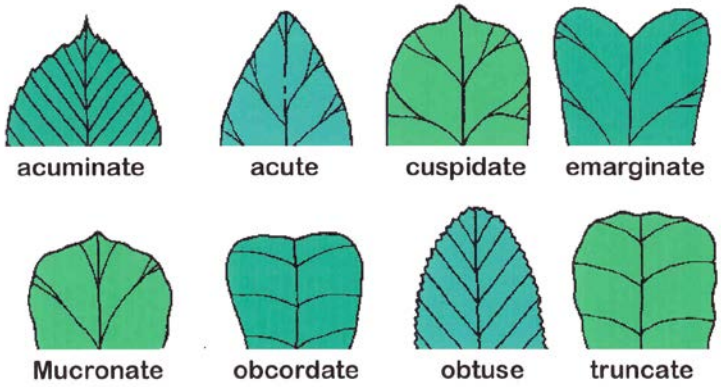


Figure 6. Base shapes

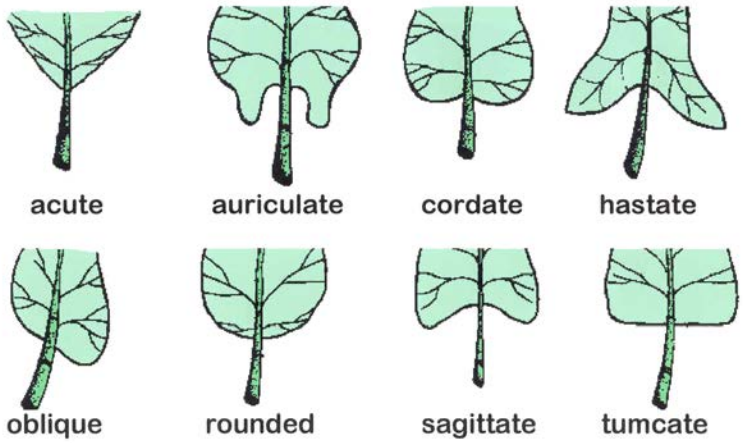
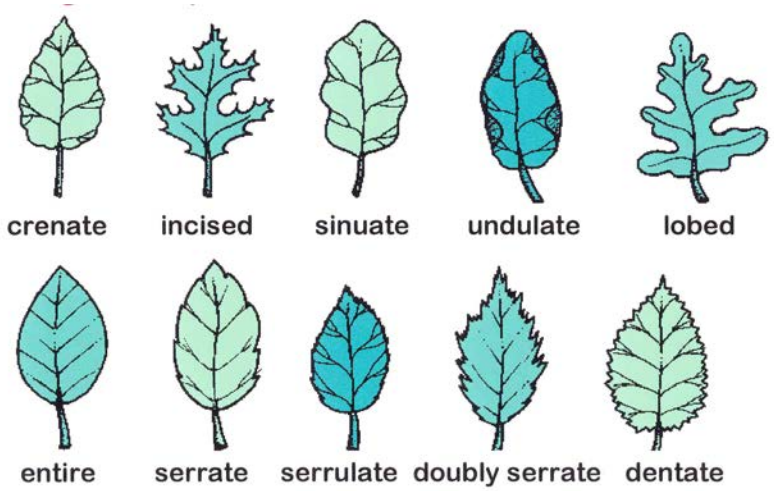


Figure 7. Leaf margin



Leaf Surface Texture

Look at all the surfaces, noting location, color, density and length of scales and hairs. In addition to terms previously discussed, these terms are commonly encountered when describing leaves.

- **Ciliate –** Orderly, widely spaces hairs along the edge (margin), also called fringed
- **Glandular –** Hairs bearing glands
- **Glutinous –** Sticky to the touch
- **Scabrous –** Hairs very short
- **Stellate –** Star shaped hair (needs magnification)
- **Velutinous –** Dense hairs of equal height, like velvet

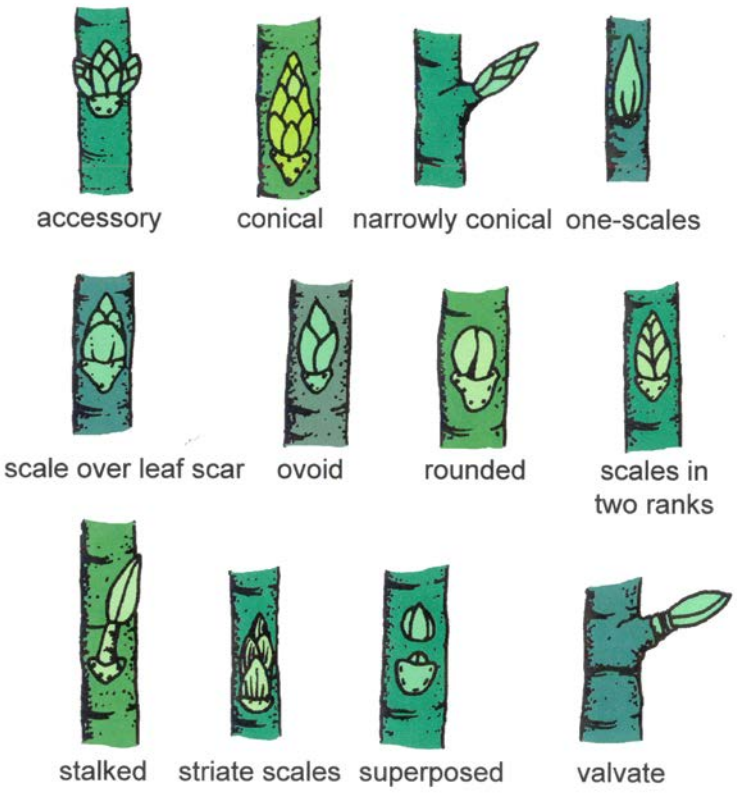
Stem Characteristics

Stems contain several features important to identifying plants. Cut into the stem to see the pith. Look at the epidermis, buds, arrangement of the nodes and any surface coating or texture. For winter identification of woody plants, look at the pattern of the scales on the terminal and lateral buds and the shape of the leaf scars.

Bud Type

The type of bud is also used in plant identification. Figure 8 illustrates bud types used in the *Manual of Woody Landscape Plants*. [Figure 8]

Figure 8.
Bud types



Leaf Scar and Bundle Scar Shape

Leaf scar – Mark left on stem where leaf was attached. The shape of the leaf scar is often used in woody plant identification. [Figure 9]

Bundle scar – Marks left in the leaf scar from the vascular tissue attachment. The shape of the bundle scare is often used in woody plant identification. [Figure 9]

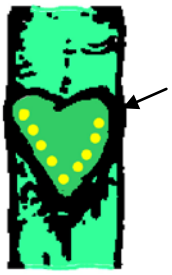


Figure 9

Heart-shaped leaf scar with v-shaped bundle scar inside.

Stem Surface Texture

The surface of woody twigs may have a texture that can be used to distinguish one plant from another. Terms used to describe the surfaces of stems can also apply to leaves.

- **Farinose** – Covered with a mealy , powdery substance
- **Glabrous** – Smooth
- **Glaucous** – Having a bloom or whitish covering, often waxy
- **Hirsute** – Covered with coarse, stiff hairs, rough enough to break the skin
- **Pubescent** – Covered with hairs
- **Scurfy** – Covered with small scales
- **Tomentose** – Covered with short, matted or tangled, soft, wooly hairs

Internal Stem Features

Pith is the tissue found at the center of stems and roots. Pith characteristics may provide identification clues. A diagonal cut across the stem reveals if the center of the stem is hollow or if the pith is solid or chambered. A straight cut across the stem reveals the shape of the pith (rounded, star or triangle). [Figure 10]

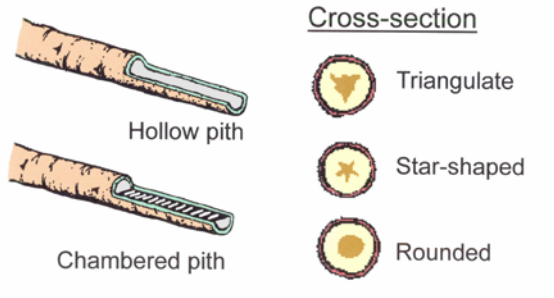


Figure 10.
Internal stem features used in plant identification

Fruit Characteristics

Generally, the identification of trees and shrubs is done without fruit, as the fruit is only around for a short season. However, when fruit is present, it can be a tool in plant identification. For example, double samaras indicates maples. [Table 1]

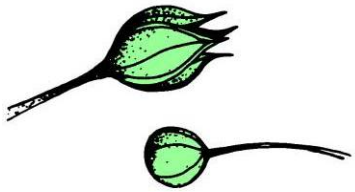
Table 1. Examples of Fruit Found on Trees and Shrubs

1. **Simple fruit** – fruit formed from one ovary

   A. Dry fruit

      1) Dehiscent fruits (splitting open when mature)

         a) **Capsule** – Many seeded fruits formed from more than one united carpels. Examples: *Deutzia* (Deutzia), *Forsythia* (Forsythia), *Philadelphus* (Mockoranage), *Rhododendron (Rhododendron)*, and *Syringa* (Lilac)



         b) **Follicle** – Composed of one carpel but splits open at maturity along one suture exposing seeds. Examples: *Spiraea* (Spiraea), individual fruit of Magnolia

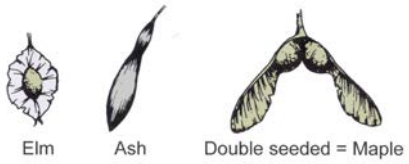
         c) **Legume** (Pod) – Composed of one carpel that splits open along two sutures (like a pea pod). Characteristics of most members of the *Fabaceae* (*Leguminosae*) family. Examples: *Albizia* (Silk-tree, Mimosa), *Cercis* (Redbud), *Gleditsia* (Honeylocust), *Gymnocladus*

(Kentucky Coffeetree), Laburnum (Goldenchain tree), and Robina (Locust)

2) Indehiscent fruits (not splitting open at maturity)

a) **Achene** – One seeded fruit with seed attached at only one place to the pericarp. Pericarp is very close-fitted and does not split open, at least along regular established lines. Examples: *Calycanthus* (Sweetshrub), *Chimonanthus* (Wintersweet), and *Rosa* (Rose) & Sunflower

b) **Samara** – One or two seeded with a membranous wing. Examples: *Acer* (Maples) – double winged, *Fraxinus* (Ash) – singled-winged, and *Ulmus* (Elm) – small, single-winged fruit



c) **Nut** – A bony, hard, one-seeded fruit. Examples *Castanea* (Chestnut), *Corylus* (Filbert), *Juglans* (Walnut) and *Quercus* (Oak)

d) **Nutlet** – A tiny nut. Example: *Betula* (Birch), *Carpinus* (Hornbean), and *Ostrya* (Hophornbean)

B. Fleshy fruits

1. **Berry** – The entire pericarp is fleshy. Examples: Tomato, *Lonicera* (Honeysuckle), and *Vaccinium* (Blueberry and Cranberry)

2. **Drupe** – the pericarp is clearly differentiated into three layers; the exocarp is the epidermis; mesocarp (middle layer) is fleshy; and the endocarp (inner layer) is stony. Examples: Ilex, *Prunus* (Cherry, Peach, Plum), *Sassafras* (Sassafras), *Viburnum* (Viburnum), and numerous other woody plants.

3) **Pome** – The pericarp is surrounded by the floral tube which become the fleshy edible fruit. Examples *Malus* (Apples), *Pyrus* (Pear), and *Chaenomeles* (Quince)

2. **Aggregate fruits** – Develop from a single flower that contains many pistils. Several of the fruits are massed on one receptacle. Examples:

   - *Fragaria* (strawberry) – aggregate of achenes
   - *Liriodendron* (Tuliptree) – aggregate of samaras
   - *Maclura* (Osage-orange) – aggregate of drupes
   - *Magnolia* (Magnolia) – aggregate of follicles
   - *Rubus* (Raspberry) – aggregate of drupes

3. **Multiple fruits** – Consists of several flowers which are more or less united into one mass. Example: *Morus* (Mulberry), Pineapples

Identification Keys to Landscape Trees

- ***Key to Common Landscape Trees and Shrubs of Colorado***, CMG GardenNotes #156 at www.cmg.colostate.edu/TreeID/156.html
- ***What Tree Is This?*** National Arbor Day Foundation, at www.arborday.org/trees/index-identification.cfm
- ***Colorado Flora, Eastern Slope*** by William Weber and Ronald Wittman
- ***Colorado Flora, Western Slope*** by William Weber and Ronald Wittman
- ***Identification Key for Woody Plants of the Pikes Peak Region*** by Colorado State University Extension, El Paso County
- ***Trees and Shrubs of Colorado*** by Jack L. Carter

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- Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu.
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Table 2. Characteristics of Common Woody Plant Families with
Alternate Leaf Arrangement on Stem

Family	Genera	Typical Leaf Shape	Noteworthy Flowers and Fruit
Betulaceae Birch family	o *Alnus* – Alder o *Betula* – Birch	o Simple, pinnately veined	o Flowers: male and female catkins o Fruit: nutlet
Fabaceae Pea family	o *Cercis* – Redbud o *Caragana* – Peashrub o *Gleditsia* – Honeylocust o *Gymnocladus* – Kentucky Coffee o *Sophora* – Pagodatree	o Simple, palmately veined o Pinnately compound o Bipinnately compound	o Fruit: Pea-like pod
Fagaceae Oak and Beech family	o *Castanea* – Chestnut o *Fagus* – Beech o *Quercus* – Oak	o Simple, pinnately veined o Simple, pinnately veined and pinnately lobed	o Flowers: catkin o Fruit: Nut (acorn) 
Juglandaceae Walnut family	o *Juglans* – Walnut	o Pinnately compound	o Fruit: nut
Moraceae Mulberry family	o *Morus – Mulberry*	o Simple and polymorphic (lobed and unlobed)	o Fruit: Multiple drupe
Platanaceae Sycamore family	o *Platanus* – Planetree and Sycamore	o Simple, palmately veined and lobed	
Rosaceae Rose family	o *Amelancheir* – Serviceberry o *Aronia* – Chokecherry o *Cercocarpus* – Mountain Mahogany o *Chaenomeles* - Quince o *Cotoneaster* – Cotoneaster o *Crataegus* - Hawthorne o *Fallugia* – Apache Plume o *Fragaria* – Strawberry o *Kerria* – Kerria o *Malus* – Crabapple o *Physocarpus* – Ninebark o *Potentilla* – Potentilla o *Prunus* – Almond, Apricot, Cherry, Peach and Plum o *Pyrus* – Pear o *Ribes* – Alpine currant o *Rosa* – Rose o *Rubus* – Blackberry and Raspberry o *Sorbus* – Mountain Ash o *Spiraea* – Spiraea	o Simple, pinnately veined o Simple, lobed o Pinnately compound o Palmately compound o Pair of stipules (leaf-like appendage) common where leaf stalk joins stem. Stem often have thorns or spines.	
Salicaceae Willow family	o *Populus* – Aspen, Poplar and Cottonwood o *Salix* – Willow	o Simple o Simple and palmately lobed o Stipules at leaf base	o Fruit: tiny, often catkin o Seeds wind dispersed with the aid of long hairs
Sapidaceae Soapberry family	o *Koelreuteria* – Raintree	o Pinnately or bipinnately compound	o Flowers: Large panicles of yellow flowers
Tiliaceae Linden family	o *Tilia* – Linden	o Simple	

Family	Genera	Typical Leaf Shape	Noteworthy Flowers and Fruit
Ulmaceae Elm Family	o *Celtis* – Hackberry o *Ulmus* – Elm	o Simple, pinnately veined	Elm fruit small samara with disc shaped wing 

Table 3. Characteristics of Common Woody Plant Families with <u>Opposite Leaf Arrangement on Stem</u>

Family	Genera	Typical Leaf Shape	Noteworthy Flowers and Fruit
Aceraceae Maples family	o Acer -- Maple and Box Elder	o Simple and palmately veined and lobed o Pinnately compound and pinnately veined o Simple and pinnately veined.	o Fruit: two-winged samaras 
Caprifoliaceae Honeysuckle family	o Lonicera – Honeysuckle o Sambucus – Elders o Symphoricarpos – Snowberry, Coralberry and Buckbrush o Viburnum -Viburnum	o Simple, pinnately veined o Simple and palmately veined and lobed o Pinnately compound o Leaves lacking stipules	o Fruit: usually fleshy and berry-like
Oleaceae Olive family	o *Forsythia* – Forsythia o *Fraxinum* – Ash o *Ligustrum* – Privet o *Syringa* - Lilac	o Simple, pinnately veined o Pinnately compound (ash) o Without stipules	o Flowers: Often fused petals form a corolla tube o Fruit: berry, drupe or capsule. o Ash has single-winged samara. 
Cornaceae Dogwood family	o *Cornus* – Dogwood	Simple, pinnately veined	o Fruit: drupe
Hippocastanaceae Horsechestnut family	o *Aesulus* – Horsechestnut and Buckeye	Palmately compound	o Flower: Often a showy cone of flowers o Fruit: nut-like capsule

Characteristics of Common Woody Plant Families with <u>Whorled or Opposite Leaf Arrangement on Stem</u>

Family	Genera	Typical Leaf Shape	Noteworthy Flowers and Fruit
Bignoniaceae Trumpet-Creeper family	o *Catalpa* – Catalpa	o Simple	o Fruit: long pod capsule