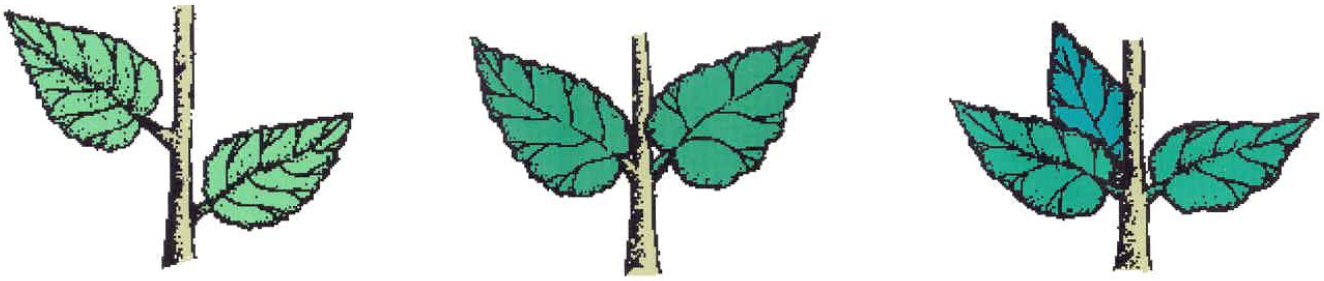
MASTER GARDENER
COLORADO STATE UNIVERSITY
EXTENSION

Identifying Trees and Shrubs

References and Review Questions



References / Supplemental Reading

- **Print References:**
  - ***Flora of Colorado*** Jennifer Ackerfield. Brit Press. 2015
  - ***Plant Identification Terminology: An Illustrated Glossary*** James and Melina Harris. Spring Lake Publishing. Second Edition, 2001.
  - ***Identification Key for Woody Plants of the Pikes Peak Region.*** Colorado State University Extension, El Paso County
  - ***Manual of Woody Landscape Plants, Sixth Edition.*** Michael A. Dirr. Stipes. 1998
  - ***Trees and Shrubs of Colorado.*** Jack L. Carter. Second edition, 2006
  - ***Winter Guide to Central Rocky Mountain Shrubs.*** Colorado Department of Natural Resources, Division of Wildlife. 1976

- **Web**
  - *USDA Plant Data Base* at https://plants.usda.gov/java/
  - Colorado State University Online Herbarium at https://herbarium.biology.colostate.edu/collection/specimens/
  - International Plant Name Index at http://www.ipni.org/ipni/plantnamesearchpage.do
  - Royal Botanic Gardens, Kew Resource Page at https://www.kew.org/science/data-and-resources/names

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Identifying Trees and Shrubs curriculum developed by Alison O'Connor, David Whiting, Linda McMulkin, and Christine Prins, CSU Extension. Line drawings by Scott Johnson and David Whiting.

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COLORADO STATE UNIVERSITY
EXTENSION

CMG GardenNotes #171

Identifying Trees and Shrubs

Outline:

I. Introduction

Plant identification is a skill that takes time and patience to develop. There are a myriad of rewards for developing this skill including:

- Serving your community as an informed plant expert
- Confidently communicating with clients about plant ID-related questions
- Enhanced ability to utilize plant diagnostics materials (most are based on plant identification)
- Obtaining the personal satisfaction of knowing the names of plants in gardens, landscaping, and in natural areas

The steps to plant identification involve observation, questioning, and research, similar to the process learned in diagnosing tree disorders (*CMG GardenNotes* #112).

Colorado Master Gardeners are often asked to identify plants either over the phone, with photos, or with a single leaf or plant part. Asking informed questions about the plant may provide the details needed for successful identification, but more than likely you will need to see a sample. Good samples include the stem with leaves attached, and flowers or fruit whenever possible.

For details on the taxonomic system, including use of scientific names, refer to *CMG GardenNotes* #122, **Taxonomic Classification**.

II. Plant Identification Tools

The most important skill used in successful plant identification is the ability to observe and define the characteristics of an individual plant. Examine the plant and note the overall appearance, and the structure, shape, and texture of stems, leaves, flowers and fruit, as well as any available roots. Use visual clues as well as the texture and scent of the plant. However, use caution, as some plants or plant parts are known to be irritating or toxic. One thing to keep in mind when observing plant characteristics is that even on the same plant, there is variation in

each of the leaves, stems, flowers, etc. Your chances of a correct identification increase when you look at the characters as an average from the whole plant, not just from one or two leaves.

Simple tools such as a hand lens, ruler, and a sharp blade (knife, scalpel or pruning shears) are helpful for examining plant parts. For more detailed work, a dissecting microscope is useful, especially for observing the details of small hairs or floral parts.

If you aren't able to identify a plant on the spot, you can collect samples (with permission only) for future identification or simply maintaining a visual collection of your own! Samples can be stored short-term in resealable plastic bags in the refrigerator for 1-2 weeks. Long-term storage involves pressing the sample between layers of newspaper in a plant press or between flat, heavy objects (stacks of books work well). When the specimen is completely dried, it can be mounted on special herbarium paper.

There are many references available for plant identification, both print and electronic. While photo books are easy to use, they often only contain the most common of species (otherwise photo books would large, heavy, and very expensive). Website search features often require that the user already know something about the family or the name of the plant, but they are very useful in confirming identification or to obtain additional information regarding characteristics.

a. Plant Identification Keys

Plant Identification keys are designed to systematically compare plant structures until the identification of a plant species is reached. Authors of plant keys use the most up-to-date and scientific references to design a series of choices based on differing plant characteristics. In most cases, keys attempt to use easily distinguishable characteristics. However, when groups are more similar (i.e. determining between species or subspecies), the characters used in sorting out groups will require closer inspection and greater attention to detail.

i. Dichotomous Keys

The term "dichotomous" comes from the Greek word *dikhotomos*, which means "to cut in two". The premise of a dichotomous key is to give two choices, and only two choices, at each step. The step is called a couplet and will compare variations in similar plant characteristics, such as

1a. Leaves narrow, less than ½ inch……..….go to 2
1b. Leaves wider than ½ inch…….go to 7

Read both statements in the couplet and choose the statement that best describes the plant being examined. Each statement is followed by a number, which indicates the next couplet you will read. If the leaf width is less than ½ inch, move down to the couplet labeled 2a and 2b. If the leaf width is more than ½ inch, skip couplets 2 through 6 and resume the process at 7a and 7b. Remember: try to look at the average appearance of the plant as a whole to answer questions about individual characteristics.

When you reach a couplet that gives you a plant name instead of a number, you have reached your identification. Check with your online and print resources to check that your identification is correct!

ii. Outline Keys

In outline keys, the options you compare are at each indentation level. More often these options not be adjacent in line order. For example, from the key below the first choice would be either I (needles single) or II (needles in clusters). If the needles were single, the next choice would be a (needles flat) or b (needles square).

I. Needles single
  a. Needles flat in cross-section and flexible
    i. Leaf scar oval, bud tips pointed – ***Pseudotsuga* (Douglas fir)**
    ii. Leaf scar round, bud tips roundish – ***Abies* (fir)**
  b. Needles square in cross-section and stiff – ***Picea* (spruce)**
II. Needles in clusters of 2 or more – ***Pinus* (pine)**

There are many key formats that give you more than just two options to evaluate each subsequent level. Select the characteristics that best describe the plant as a whole.

III. Terminology

The terminology of plant identification can be intimidating to a beginner, as well as the experienced plant taxonomist. There are specific terms for the tiniest of traits. For example, in ***Plant Identification Terminology: An Illustrated Glossary***, James Harris lists 35 terms that describe the hairs on the surfaces of stems and leaves. Because there are so many specific terms, most plant taxonomists have specific glossaries with drawings (such as the one listed above).

Most keys and photo references also often contain a glossary with definitions of the botanical terms used in that publication. With practice, commonly used words become familiar; however, there are some terms that are used infrequently. There is no need to memorize all botanical terms! Use your resources and look them up as needed. When you are first learning to use botanical terms, it is often helpful to draw a picture of the structures or paraphrase the definitions in your own words.

IV. The Plant Identification Process

Plant identification is a process that begins with observing the plant as a whole, followed by systematically evaluating the details of the plant parts. When observing the whole plant, take some notes and draw some pictures of the larger features. Attention to detail is important in plant identification, but at the beginning of the process, try not to get overwhelmed with those details. There are an unlimited numbers of features on each plant, but you will only require some of them to identify the plant. The necessary details can be determined as you work through the key. Follow these first steps to get you started in your plant identification process—these will provide you with the larger features that will narrow down your possibilities before diving into more detailed observations.

a. Step 1: Collect Basic Information Regarding the Plant

i. Determine if the Tree/Shrub is a Conifer or a Broadleaf Flowering Plant

- **Conifers** are woody trees and shrubs generally with <u>needle-like or scale-like foliage</u>, and usually evergreen. Seeds are produced in cones, which are generally woody, (like a pine cone) but sometime fleshy and berry-like (juniper fruit) (see **Figure 1**). Examples include arborvitae, Douglas fir, fir, junipers, larch, pine, spruce, and yews.

  Conifers are *Gymnosperms* (along with *Ginkgo biloba* and cycads), which are a group of plants that do not flower, but instead produce seed in a 'cone' structure made of modified leaves called scales. The term 'Gymnosperm' literally means "naked seed" and refers to the exposure of the female reproductive structure during pollination (instead of wrapped in an ovary as in flowering plants) rather than the actual seed being uncovered.

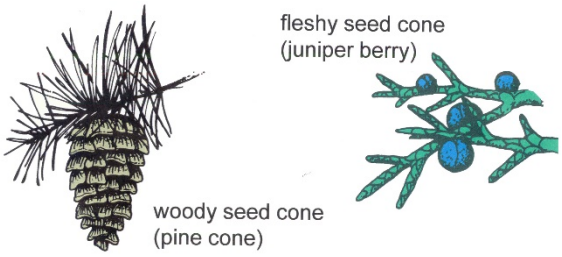

Figure 1: Woody and fleshy cones of conifers

- **Broadleaf flowering plants** are *Angiosperms*, which is a highly diverse group of plants that produce flowers and seeds enclosed in fruits. Flowers range from tiny and inconspicuous to large and showy.. This group includes woody trees, shrubs, and vines and is often referred to as broadleaf plants due to the <u>large, flattened leaf blade</u> (see **Figure 2**).

Figure 2: Large, flattened leaf blade common of Angiosperms

ii. Determine if the Plant is Deciduous or Evergreen

- **Deciduous** plants shed leaves in the fall. Most broadleaf flowering plants in Colorado are deciduous, along with a few conifers such as some *Larix* (Larch).
- **Semi-evergreen** plants may retain some leaves, depending on winter temperatures and moisture.
- **Evergreen** plants retain leaves for multiple seasons. Leaves (needles) will be present throughout the year. Most conifers are evergreen, along with some broadleaf plants such as *Mahonia* (Oregon grape).

iii. Determine the Growth Habit of the Plant.

Growth habit refers to the genetic tendency of a plant to grow in a certain shape and to attain a certain mature height and spread.

- **Trees** typically have a single trunk and mature height over 12 feet.
- **Shrubs** typically have multiple-branches from the ground and a mature height less than 12 feet.
- **Vines** have a climbing, clasping, or self-clinging growth habit.

Note: Many landscape plants could be considered small trees or large shrubs. The term "tree" or "shrub" would be applied based on the general appearance of the plant. The species, cultivar, or variety name sometimes indicates plant characteristic, including form.

b. Step 2 – Consult a Key to Lead You Through the Identification Process.

Each region of the county has a variety of keys written for trees in that region. Examples of keys for the Colorado region include the following:

- ***Key to Common Landscape Trees and Shrubs of Colorado***, CMG GardenNotes #177 at http://www.cmg.colostate.edu/TreeID/177.html
- ***Identifying Conifers***, CMG GardenNotes #172 at http://www.ext.colostate.edu/mg/Gardennotes/172.pdf
- ***Flora of Colorado*** Jennifer Ackerfield. Brit Press. 2015
- ***Trees and Shrubs of Colorado.*** Jack L. Carter. Second edition, 2006

CMG GardenNotes #172, **Identifying Conifers**, gives more details on

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Authors: Linda McMulkin, David Whiting, Alison O'Connor, and Christine Prins, Colorado State University Extension. Line drawings by Scott Johnson and David Whiting; used by permission.

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CMG GardenNotes #172

Identifying Conifers

(Arborvitae, Douglas Fir, Fir, Juniper, Pine, Spruce, and Yew)

Outline:

I. Characteristics of Conifers

a. Leaves

Most conifers (cone bearing plants) have characteristic leaf shape and arrangement that allow them to be quickly identified to the genus level.

- The *Pinaceae* family contains members such as pine, spruce, fir and Douglas fir. This family has the classic needle-shaped leaves you think of when you think of Conifers (i.e. pine needles). The genera of the *Pinaceae* family are further sorted by how the needles are clustered on the stem (see **Figure 1**).

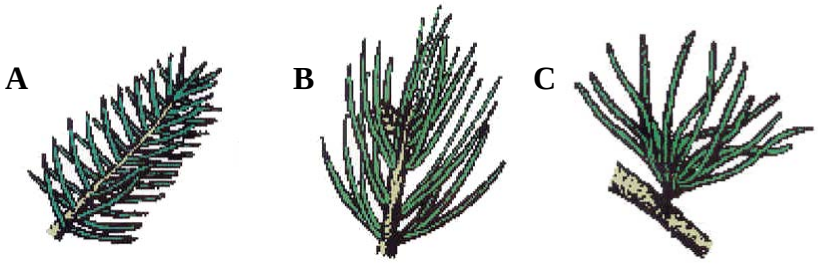

Figure 1: A) Single needles characteristic of the genera *Picea* and *Pseudotsuga*. B) Bundled needles characteristic of the genus *Pinus*. C) Clustered needles characteristic of the genus *Larix*.

- The *Cupressaceae* family includes members such as juniper and arborvitae. This family has leaves that are more scale-like or awl-like (see **Figure 2A –B**)
- The *Taxaceae* family is the Yew family. The leaves of these Conifers are flat and arranged along the stem in a manner that resembling a feather (see **Figure 2C**)

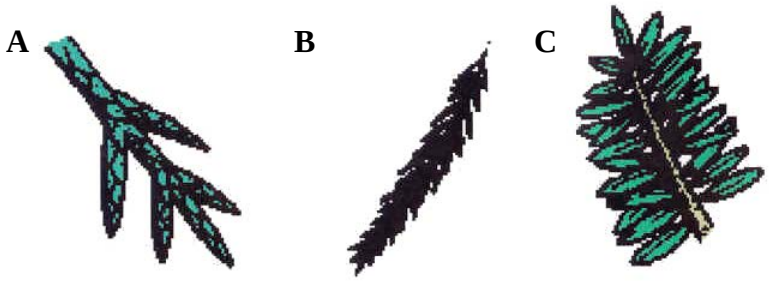

Figure 2: A) S**cale**-like leaves characteristic of *Juniperus* and *Thuja*. B) Awl-shaped leaves characteristic of *Juniperus*. C) Linear, feather-like leaves characteristic of *Taxus*.

b. Seed Production

Conifers are **Gymnosperms** (along with *Ginkgo biloba* and cycads), which are a group of plants that do not flower, but instead produce seed in a 'cone' structure made of modified leaves called scales. The term 'Gymnosperm' literally means "naked seed" and refers to the exposure of the female reproductive structure during pollination (instead of wrapped in an ovary as in flowering plants) rather than the actual seed being uncovered.

Members of the *Pinaceae* family and arborvitae are **monoecious** plants. These plants have separate male and female cones on the same plant (the term "monoecious" is Greek for 'one house'). Male cones produce pollen and are normally short lived. Female cones are generally larger and longer-lived, remaining on the tree until the seeds are mature and distributed. Junipers and Yews are **dioecious** plants, which have separate male and female plants ("dioecious" is Greek for 'two houses').

Cones of pines, spruce, and fir are made up of leathery or woody scales, which open to distribute the seed when the see is mature. The cones of junipers have fused scales around the see, resulting in a more berry-like appearance (see **Figure 3**).

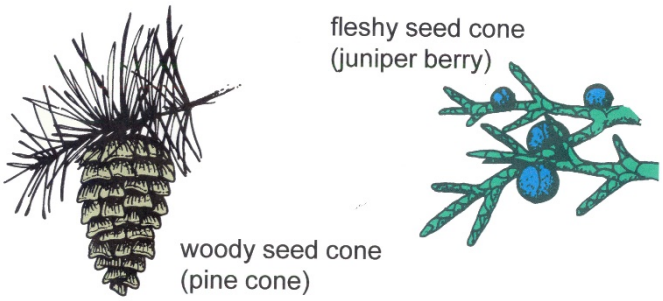

Figure 3: Woody cones of the *Pinaceae* family and fleshy cones of the *Juniperus* genus.

II. Key to Conifers

a. Leaves scale-like or awl-like. Fruit is a berry-like cone with scales fused together – *Cupressaceae* family (Junipers and Arborvitae)

- **i.** Leaves scale-like or awl-like, often closely pressed to the branches. Foliage arranged around the branch, rather than flattened. Cones are berry-like with scales pressed close together – ***Juniperus* (Junipers)**
- **ii.** Leaves small, scale-like, hugging the stem. Foliage in flattened plate-like display. Cones are berry-like with thick scales – ***Thuja* (Arborvitae) – visit the Key to *Thuja*** on page 5

b. Leaves needle-like. *Pinaceae* family (pine, spruce, fir, and Douglas fir)

- **i.** Needles single
  - **1.** Needles flat in cross-section and flexible
    - **a.** Leaf scar oval, bud tips pointed. Cones have three-prong lobed tongue-like "bract" that extend out beyond the scales – ***Pseudotsuga menziesii* (Douglas Fir)**
    - **b.** Leaf scar round, bud tips roundish. Cones grow upright on the branch, usually disintegrating before falling to the ground – ***Abies* (Fir) – visit the Key to *Abies*** on page 3
  - **2.** Needles square in cross-section and stiff. Older twigs studded with the persistent stumps of fallen needles – ***Picea* (Spruce) – visit the Key to *Picea*** on page 3
- **ii.** Needles sheathed at the base in bundles of two to five. Cone scales thick and woody with swollen tips – ***Pinus* (Pine) – visit the Key to *Pinus*** on page 4
- **iii.** Short needles in tufts of ten or more. May be deciduous – ***Larix* (Larch)**

c. Leaves flat, linear-shaped in a feather-like arrangement. Shrubs with dark green leathery leaves. Red, berry-like fruit – ***Taxus* (Yew)**

III. Key to *Abies* (Fir)

a. Young stems not hairy. Needles usually longer than 1 inch (but can be misleading). Cones grayish green, 2 ½ to 5 inches long. Bracts of the cone scales with a short, triangular tip – ***Abies concolor* (White Fir)**

b. Young stems hairy. Needles usually shorter than 1 inch. Cones dark brown/purple, 2 to 4 inches long. Bracts of the cones scale are long with sublated tip. Native to higher elevations – ***Abies lasiocarpa* or *Abies bifolia* (Subalpine Fir)**

IV. Key to *Picea* (Spruce)

a. Needles very stiff, sharp, ¾ to 1½ inch long, often bluish, pointing outwards from stem. Stems not hairy. Cones 2½ to 4 inches long. Cone scales papery, furrowed, pointed/ragged. Bark black to dark grey furrowed. Native, generally below 9000 feet elevation – ***Picea pungens* (Colorado Spruce)**

b. Needles somewhat blunt, not as stiff or sharp, pointed toward end of twig. Young stems somewhat hairy. Cones less than 2½ inches long. Cone scales rounded. Bark smooth, with purplish-brown to russet red scales on mature trees. Native. – ***Picea englemannii*** **(Englemann Spruce)**

c. Needles ¼ to ½ inches long. Each branch very short (2-4 inches long). Landscape shrub. – ***Picea glauca*** **'Conica' (Dwarf Alberta Spruce)**

V. Key to *Pinus* (Pine)

a. Two needles per bundle

i. Needles ½-1 ½ inches long, curved, medium green with white lines, some resin droplets. Cones small, rough, without prickles on scale. Seeds large (pine nuts). Shrubby tree. Native to the plateaus and mesas – ***Pinus edulis*** **(Pinon Pine)**

ii. Needles 1-2 inches long, finely toothed, slightly twisted, curved, dark green, persisting 5 plus years. Branches out abruptly from trunk base, central leader not obvious, more shrub-like – ***Pinus mugo*** **(Mugo Pine)**

iii. Needles 1-3 inches long, yellowish-green, slightly twisted. Cones small, less than 2 inches long, hard, one-sided with prickled tips on scales. Branches slender, slightly flexible. Bark scaly, not becoming platy. Native in dense forest stands in higher elevations – ***Pinus contorta*** **(Lodgepole Pine)**

iv. Needles 1½ -3 inches long, twisted, persistent 2-4 years. Cones 1½inches long, scatter throughout the tree, without prickles on the scales. Older bark orange – ***Pinus sylvestris*** **(Scotch Pine, Scots Pine)**

v. Needles 3-6 inches long, stiff, dark green, dense on the branch, persisting 4 plus years. Cones 2-3 inches long with small prickles on scales. Buds whitish. Older bark dark gray, furrowed – ***Pinus nigra*** **(Austrian Pine)**

b. Two and three needles per bundle, 3-10 inches long, medium green, crowded at end of branches on older trees, persisting 3 years. Cones 3-5 inches long, armed with sharp prickles on scales. Bark furrowed, eventually breaking into reddish plates. Native from outer foothills to subalpine regions – ***Pinus ponderosa*** **(Ponderosa Pine)**

c. Five needles per bundle – **White Pines** group

i. White resin dots scattered on dark green needles, 1-1½ inches (25-38 mm) long. Cone scales long, sharp prickles. Native to higher elevations – ***Pinus aristata*** **(Bristlecone Pine)**

ii. Needles 1-3 inches long, rigid, dark green, often clustered near branch ends, margins smooth, pointing forward, persist for 5-6 years. Cones 4-8 inches long on short stalk, with no prickles on scales. Branches very flexible. Bark silvery white to light gray. Small tree with irregular trunk and branching pattern Native to higher elevation and high plains, often on open sites – ***Pinus flexilis*** **(Limber Pine)**

iii. Needles 2-5 inches long, blue-green, very soft, thin, margin toothed, persistent 2 years. Branches green-brown. Cones 3-8 inches long with 1 inch long stalk. Cone scales thin, don't bend back – ***Pinus strobus*** **(Eastern White Pine)**

iv. Needles with a few small teeth near tip, not as soft as Eastern White Pine. Branchlets yellow-brown or red-brown. Cones are short-stalked. Cone scales bend back. Tall tree with straight, unbranched trunks. Native to San Juan Mountains. Sangre de Cristo and Rampart ranges – ***Pinus strobiformis*** **(Southwestern White Pine)**

VI. **Key to *Thuja* (Arborvitae)**

a. Foliage in vertical plate-like displays – ***Thuja orientalis* (Oriental Arborvitae)**
b. Foliage in horizontal plate-like displays – ***Thuja occidentalis* (American or Eastern Arborvitae)**

Authors: David Whiting, Linda McMulkin, Joanne Jones, Alison O'Connor, Laurel Potts, and Christine Prins, CSU Extension.
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- Colorado Master Gardener *GardenNotes* are available online at http://www.cmg.colostate.edu/GardenNotesUpdate.shtml#WoodyID
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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 specific epithet requires more skill and a closer look at plant characteristics. Identification to variety and cultivar can be very difficult, as the defining characteristics may not be clearly observable from plant samples. Identify the plant to the level you are comfortable and to what the task requires!

Keys can be arranged in a variety of ways, but most start by separating Gymnosperms from Angiosperms (the key to the common Conifers was covered in GardenNotes #172), then start with broad, easily identifiable characteristics to narrow the plant to family level. Usually, the more specific and smaller plant characteristics will be used to narrow the plant down to genus and specific epithet. The following sections will cover the most common characteristics you will encounter in a plant key. Some of these characteristics you will come across with every plant you key, and you should be comfortable using these terms.

Note: This should be a general review from the ***Botany*** trek, but the information is vital to the plant ID process.

I. Leaf Characteristics

a. Leaf Arrangement (see **Figure 1)**

- **Alternate** – Arranged in staggered fashion along stem (i.e. Willow)
- **Opposite** – Pair of leaves arranged across from each other on stem (i.e. Maple)
- **Whorled** – Arranged in a ring around the stem (i.e. Catalpa)

Figure 1: Leaf arrangement on the stem

b. Leaf Form (see **Figure 2**)

- **Simple –** Leaf blade is one continuous unit (i.e. Cherry, Maple, and Elm)
- **Compound** – Several ***leaflets*** arranged on one petiole
  - **Pinnately compound** – Leaflets arranged on both sides of a rachis an extension of the petiole, like a feather (i.e. Honeylocust).
  - **Palmately compound** – Leaflets radiate from one central point at the tip of the petiole (i.e. Ohio Buckeye and Horse Chestnut).
  - **Doubly pinnately (or bipinnately) compound** – leaflets are arranged on a branches off of the rachis (i.e. Kentucky Coffee Tree).

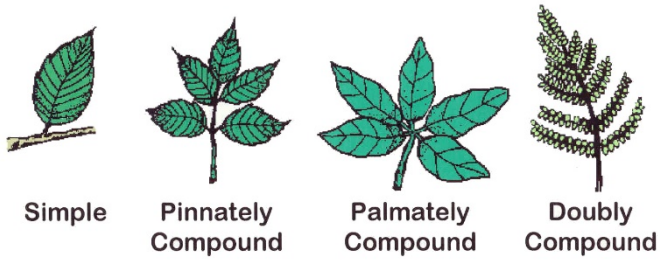


Figure 2: Variety of leaf forms

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.

c. Leaf Venation (see **Figure 3**)

- **Pinnately** veined leaves have a central vein down the center with smaller veins branching off and extending to the leaf margin (i.e. Elm, Peach, and Linden).
- **Palmately** veined leaves radiate smaller veins out in a fan-shaped pattern from a central point at the petiole leaf stem (i.e. Maple, Mulberry, and Poplar).

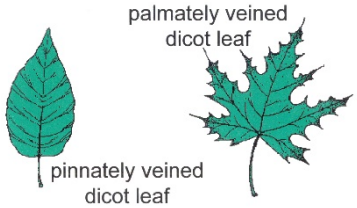


Figure 3: Variety of leaf venation

d. Leaf Shape (see **Figures 4-7**)

Leaf shape is a primary tool in plant identification. Descriptions often go into fine detail about general leaf shape, and the shape of the leaf apex and base. There is no hard and fast dividing line where one type suddenly becomes another type; rather it is a judgment call. When using keys, look at several leaves from the plant, select the average shape, and be flexible in your description. The authors of thes plant identification keys are aware of the variation within plants, and will often write several options into the key. The following figures show the common overall shapes, leaf apexes and bases, and leaf margins:

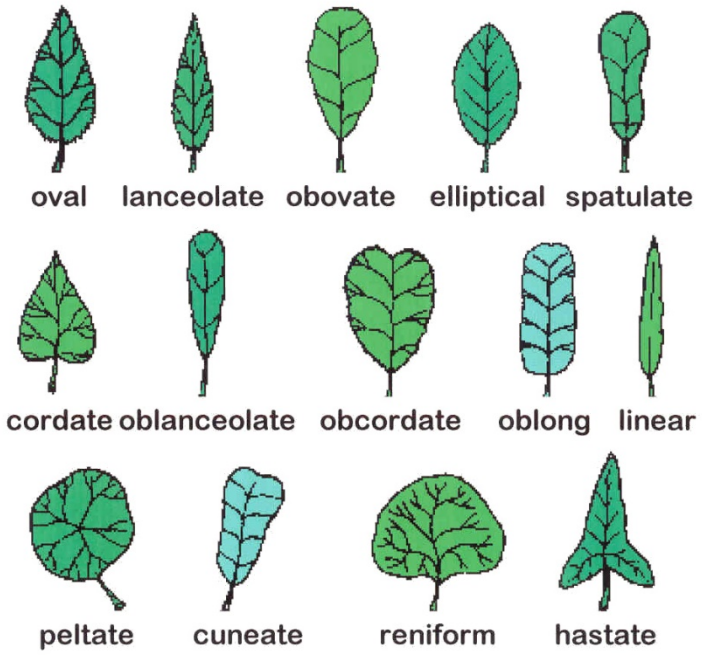


Figure 4: Variety of overall leaf shapes

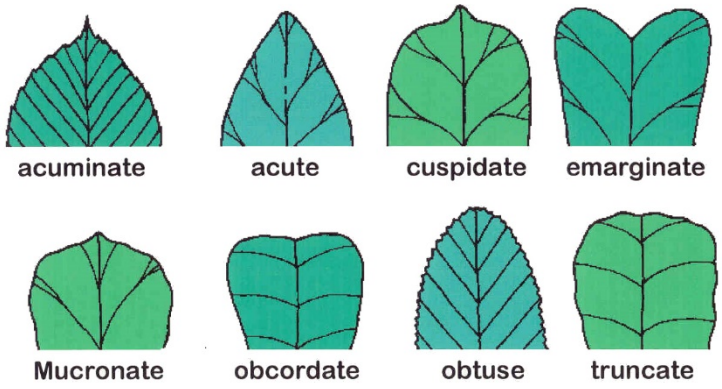


Figure 5: Variety of Leaf Apex shapes

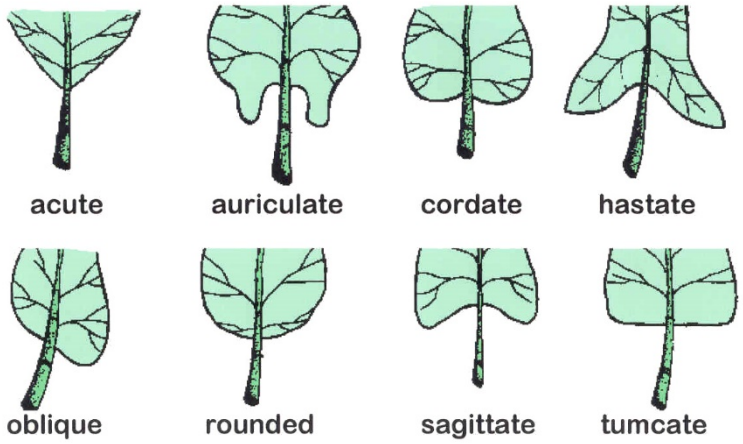


Figure 6: Variety of leaf base shapes

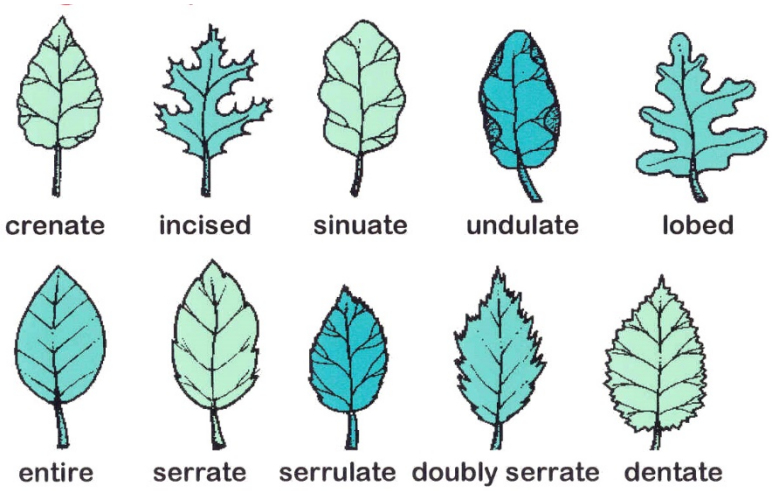


Figure 7: Variety of leaf margins

e. Leaf Surface Texture

Look at all the leaf surfaces, above and below. Note the location, color, density and length of scales and hairs. These terms are commonly encountered when describing leaf surface texture

- **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

II. 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.

a. External Stem Features (see **Figure 8)**

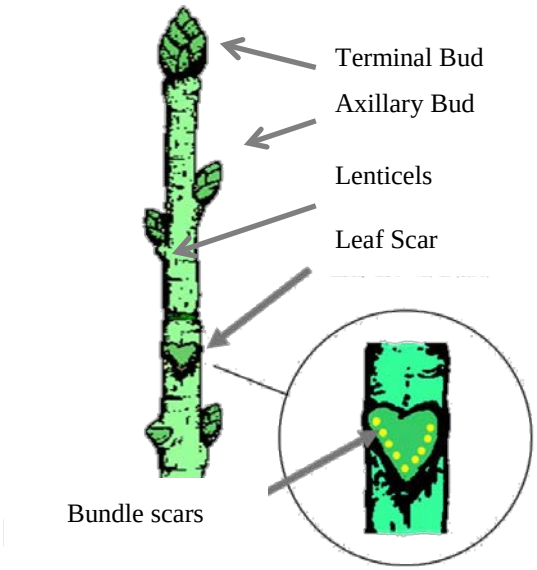


Figure 8: External Stem Features

- **Terminal bud** – This bud is where growth that lengthens the stem happens. The young, dividing cells are protected by **Terminal bud scales**
- **Axillary bud** – These buds, when actively dividing, will become a new branch. They are smaller versions of the terminal bud and can also be protected by scales
- **Leaf scar** – The mark left on stem where leaf was attached. The shape of the leaf scar is often used in woody plant identification.
- **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.
- **Lenticels** – Woody twigs have these pores in the bark to allow for gas exchange. These look like little dots along the stem.

b. Axillary Bud Type

The type of axillary bud (the way the scales are arranged over the bud) is another feature used in plant identification. Figure 9 illustrates bud types used in the *Manual of Woody Landscape Plants*. (See **Figure 9**)

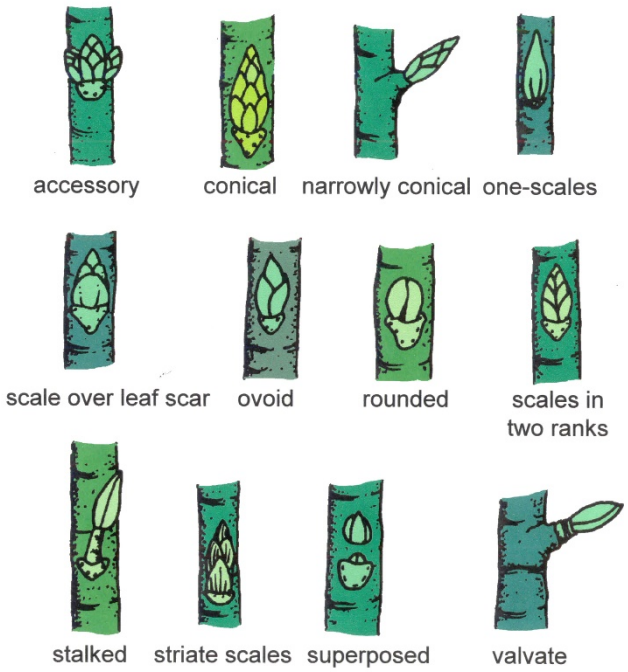


Figure 9: Axillary Bud types

c. Stem Surface Texture

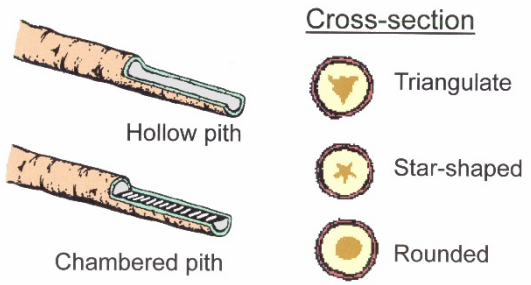
The surface of woody twigs may have a texture that can be used to distinguish one plant from another. Terms used to describe the surfaces of stems can also apply to leaves.

- **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

d. 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). (See **Figure 10**).

Figure 10:
Internal stem features used in plant identification



III. 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, legumes are characteristic of the Pea family (*Fabaceae)*. The following is an outline key defining the different fruit types you may see on trees and shrubs.

A note on floral terms here: the pistil refers to the female part of a flower. A pistil can have one ovary (chamber) or several ovaries fused together. Single flowers can also have multiple pistils. The pistil is the part of the flower that the fruit is derived from, so these differences in fruit types come from differences in the arrangement of the pistil. A good place to practice your fruit identification is at the grocery store!

a. Key of Fruit Types

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

   A. Dry fruit

      1) *Dehiscent* fruits—these fruits split open when mature to release seeds

         a) **Capsule** – Many seeded fruits formed from more than one united carpels.

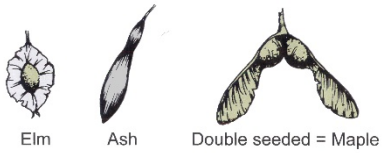
         b) **Follicle** – Composed of one carpel but splits open at maturity along one suture exposing seeds.

         c) **Legume** (Pod) – Composed of one carpel that splits open along two sutures (like a pea pod). Characteristics of most members of the *Fabaceae* family.

      2) *Indehiscent* fruits – these fruits do not split open when mature; the seed stays intact inside

         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.

         b) **Samara** – One or two seeded with a membranous wing.



         c) **Nut** – A bony, hard, one-seeded fruit.

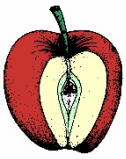
         d) **Nutlet** – A tiny nut.

   B. Fleshy fruits

      1. **Berry** – The entire fruit is fleshy.

      2. **Drupe** – the fruit is clearly differentiated into three layers; the outside layer is the epidermis, the middle layer is fleshy, and the inside layer forms a stony "pit" around the seed.

      3) **Pome** – The pericarp is surrounded by the floral cup (*hypanthium*),which becomes the fleshy edible part of the fruit.



2. **Aggregate fruits** – Develop from a single flower that contains many separate pistils. The fruits from the individual pistils are arranged 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

IV. Identification Keys to Landscape Trees

The following is a helpful list of plant identification keys you can use in your broadleaf shrubs and trees identification:

- ***Key to Common Landscape Trees and Shrubs of Colorado***, CMG GardenNotes #177 at http://www.cmg.colostate.edu/TreeID/177.html
- ***Flora of Colorado*** Jennifer Ackerfield. Brit Press. 2015
- ***Trees and Shrubs of Colorado.*** Jack L. Carter. Second edition, 2006

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- Colorado Master Gardener *GardenNotes* are available online at www.cmg.colostate.edu.
- Colorado Master Gardener training is made possible, in part, by a grant from the *Colorado Garden Show, Inc.*
- Colorado State University, U.S. Department of Agriculture and Colorado counties cooperating.
- Extension programs are available to all without discrimination.
- No endorsement of products mentioned is intended nor is criticism implied of products not mentioned.

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