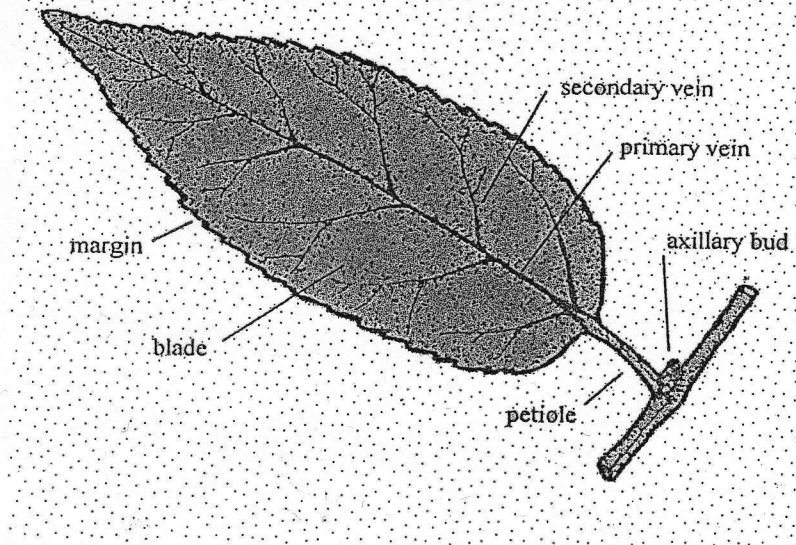


Parts of the leaf

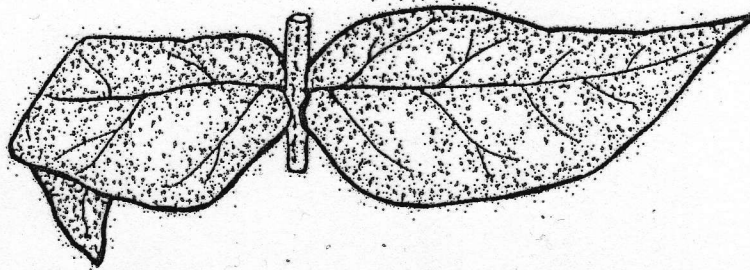
We will start with the parts of the leaf then focus on characteristics of the leaf such as shape, margin, leaf type and the arrangement of leaves on the stem.

One of the most obvious features of plants are their leaves. Leaves are particularly useful for identification because they are usually readily available, unlike flowers and fruit which are seasonal.



Axillary bud: *this is where the leaf starts!* It is a bud that is capable of growing into a new shoot, and it indicates where the leaf begins. This point on the stem is also called a node.

Petiole: the stalk that holds the leaf off the stem. If there is no petiole, the leaf is said to be "sessile" (see illustration below).



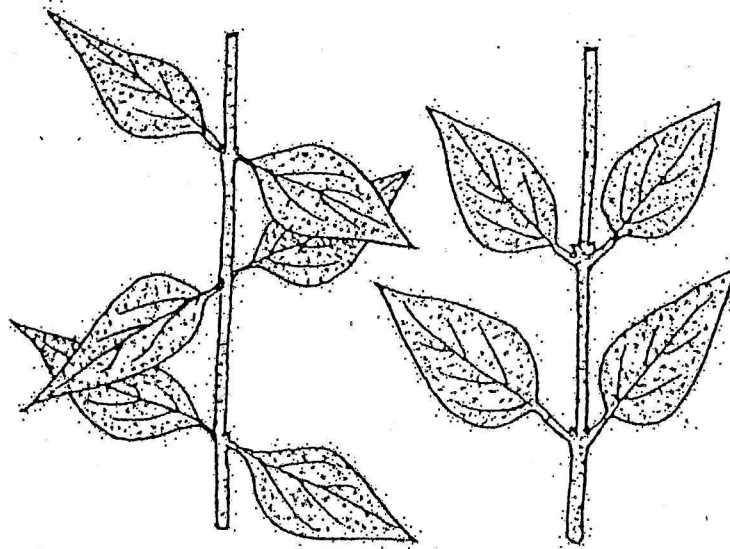
Two sessile leaves - notice that they lack a petiole and are attached directly to the stem.

Primary vein: is the main vein starting at the base of the leaf. It is noticeably wide than the other veins.

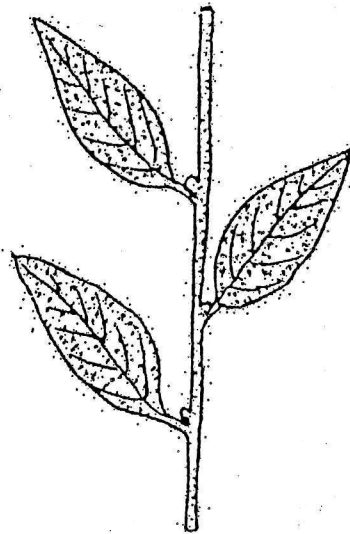
Secondary veins: veins usually branching off the primary vein, are noticeably narrower than the primary vein.

Leaf arrangements on the stem

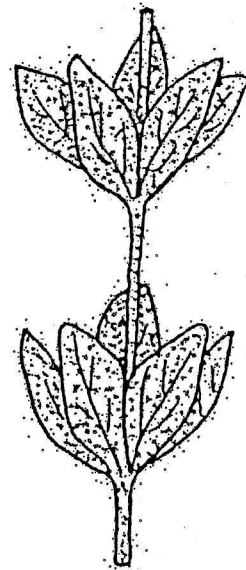
Leaves can be attached to the stem in one of three ways: alternating, opposite or whorled. The leaf arrangement is fairly consistent, but you may find a few plants that exhibit more than one type of leaf arrangement. When determining how the leaves are attached to the stem, don't look at leaves near the tip of the stem since those leaves may be crowded together and confuse you. Rather, look farther down the stem



Leaves opposite on the stem. Two at a node.



Leaves alternating on the stem. One at a node.

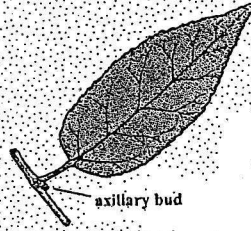


Leaves whorled on the stem. Three or more at a node.

LEAF TYPES

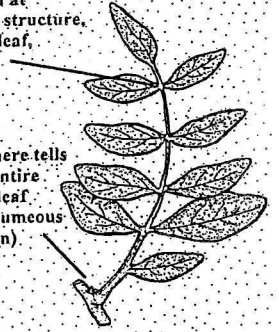
There are several different types of leaves. When deciding the type of leaf you are looking at, remember that the axillary bud defines the leaf.

No axillary bud at the base of this structure, so this is not a leaf, it is a leaflet.

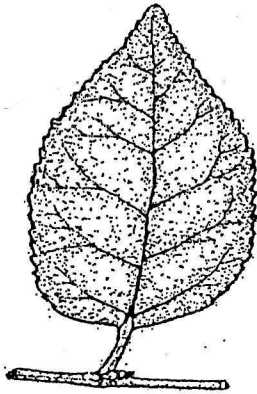


A simple leaf is composed of one leaf blade where the blade is not subdivided into smaller leaflets.

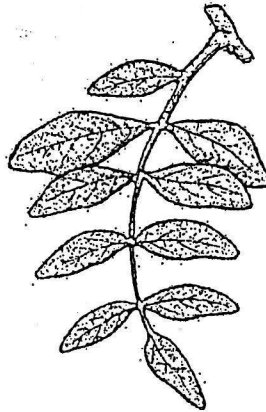
Axillary bud here tells you that this entire structure is a leaf, composed of numerous (in this case ten) leaflets.



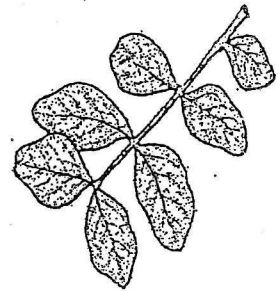
A compound leaf is a leaf that is divided into smaller units called leaflets. Notice that there is no axillary bud at the base of a leaflet.



Simple - leaf blade not subdivided.

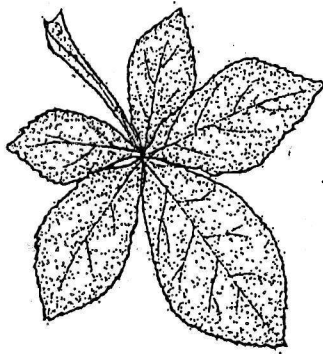


Compound pinnate. Also called compound odd-pinnate when a terminal leaflet is present.

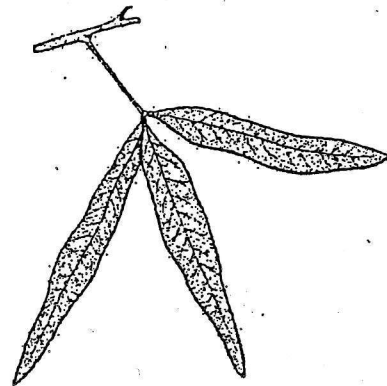


Compound pinnate. Also called compound even-pinnate when a terminal leaflet is not present.

Compound bi-pinnate. The leaflet is sub-divided again into smaller units called secondary leaflets.



Compound palmate - shaped like the palm of your hand. In this example, the leaf blade is subdivided into five distinct leaflets.

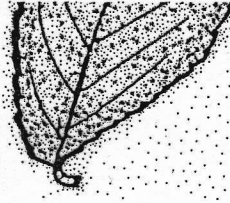


Compound palmate - shaped like the palm of your hand. In this example, the leaf blade is subdivided into three distinct leaflets.

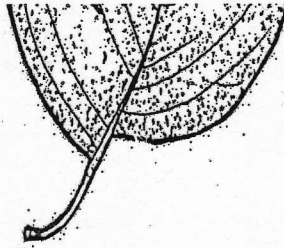
LEAF BASE AND APEX

The shape of the leaf base and apex (tip) of the leaf can be useful for identifying plants. Below are some basic shapes associated with those areas.

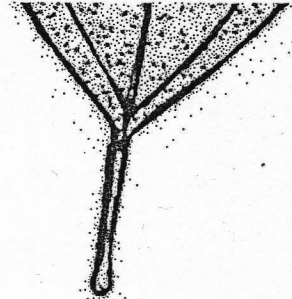
LEAF BASE



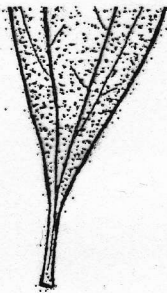
Oblique - unequal sided



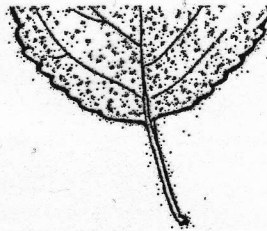
Very oblique



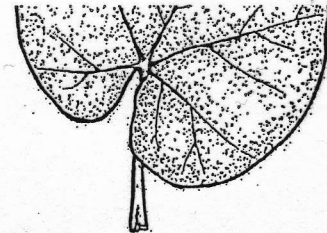
Not oblique - left and right side of blade equal



Cuneate - wedge-shaped

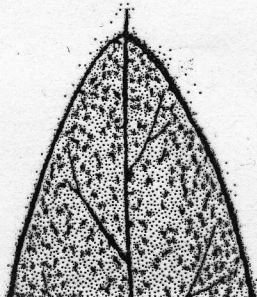


Rounded

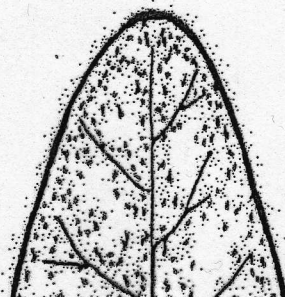


Cordate - heart-shaped

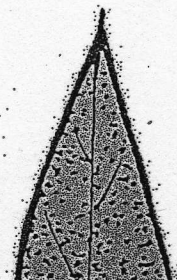
LEAF APEX



Mucronate - leaf apex with short spiney tip.



Obtuse - rounded



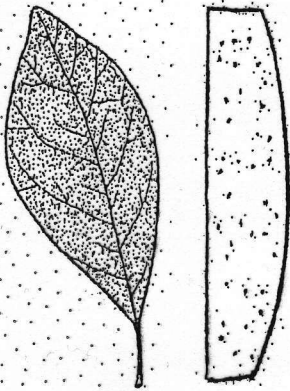
Acute - apex ending in a sharp point.

Leaf margins

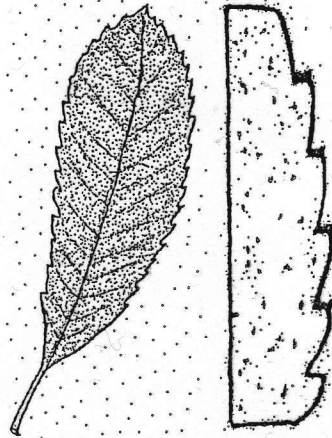
The leaf margin (edge of the leaf blade) can be very useful when identifying plants. Like leaf shapes, you want to look at more than just one leaf to determine its margin type.

BASIC LEAF or LEAFLET MARGINS

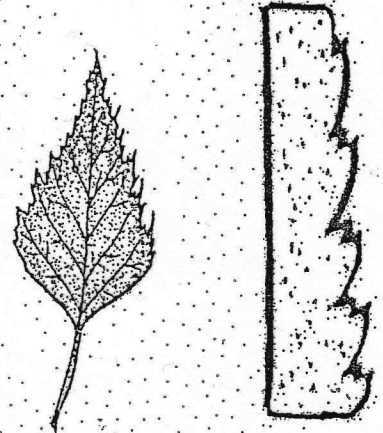
Note: some leaves are divided into smaller units called leaflets. Margin terms apply whether you are looking at a leaf or leaflet.



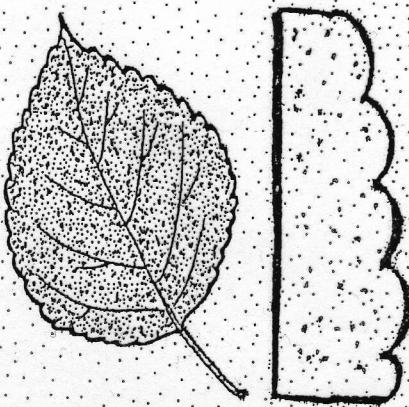
Entire (smooth - no teeth or lobes)



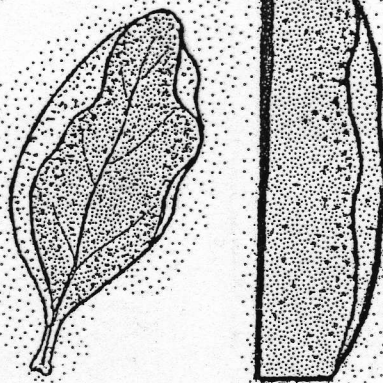
Serrate (teeth pointing forward)



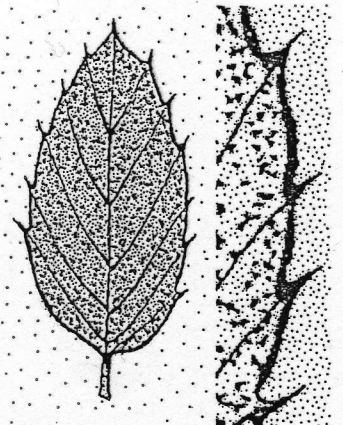
Double serrate



Crenate (teeth rounded)

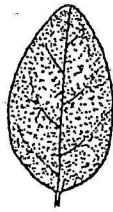


Undulate (wavy)



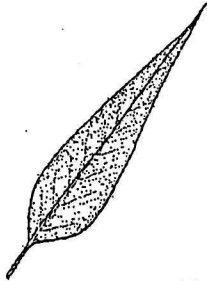
Spinose - main vein of tooth extends beyond leaf margin.

Leaf shapes



Ovate. Egg-shaped, widest near leaf base.

Leaf shapes can be very useful for identifying plants. It is important to remember though that shape can be somewhat variable even on a single plant. When determining leaf shape, look at many leaves to get a feel for the overall leaf shape represented.



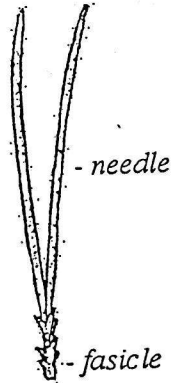
Lanceolate. Shaped like a lance, leaf blade widest near leaf base.



Scale - like. Illustrated is a branchlet with scale-like leaves. Each leaf is about 1/16" (1.5 mm) long.



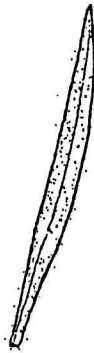
Awl-like. Illustrated is a branchlet with awl-like leaves, each leaf is typically 1/3 to 1/2" (8 to 13 mm) long.



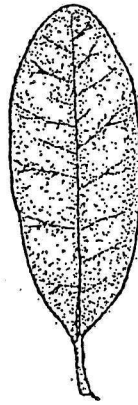
Needle-like leaves (pine trees). In this illustration, two leaves are present. They are bound at the base by a fascicle.



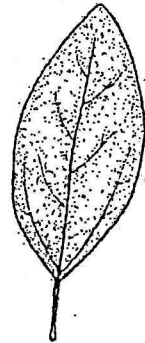
Oblanceolate. Shape opposite from lanceolate.



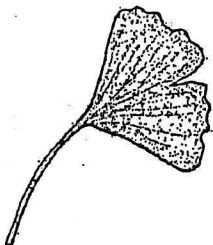
Linear. Narrow, long with parallel sides.



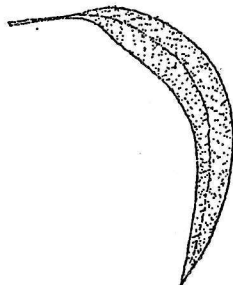
Oblong. Sides nearly parallel.



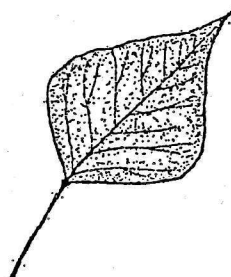
Elliptic. Margins curve, leaf widest near middle.



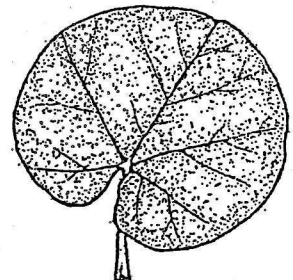
Fan-shaped (Ginkgo biloba)



Falcate (sickle-shaped)



Rhombic-ovate



Cordate (heart-shaped)

Leaf venation

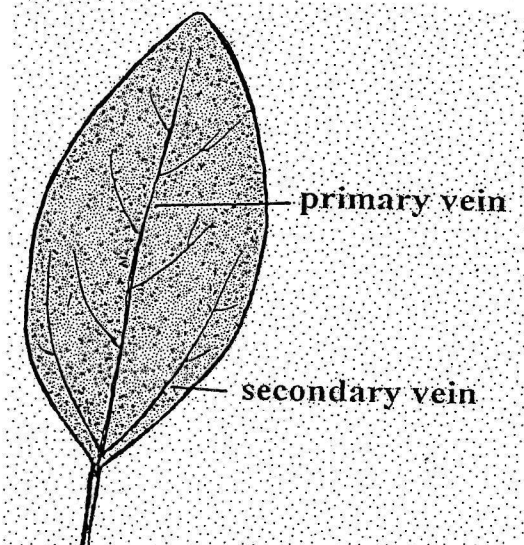
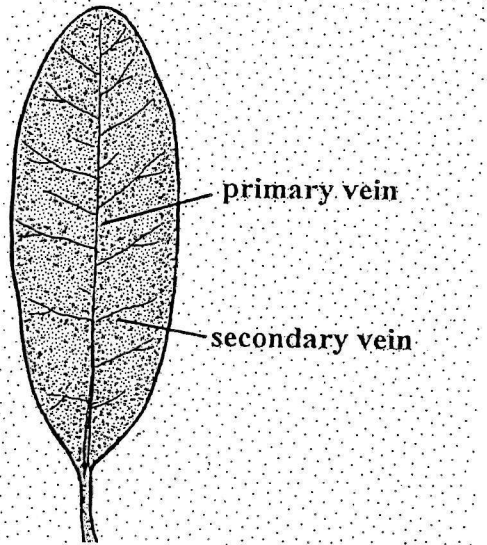
Leaf venation refers to the pattern of veins on the leaf. The veins supply the leaf with water and minerals from the roots and transport materials from the leaf to the rest of the plant. The vein pattern can be useful for plant identification

LEAF VENATION PATTERNS

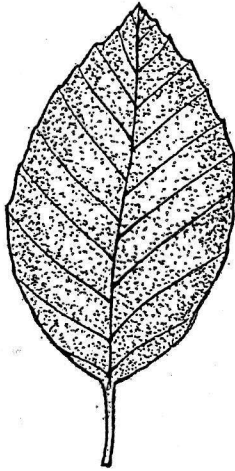
The primary vein is like the trunk on a tree. It is the widest vein on the leaf and starts at the base of the leaf.

Secondary veins are like the main branches on a tree, they are smaller than the primary vein.

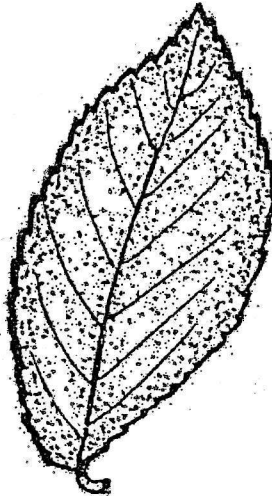
There are two ways the secondaries may come off the primary. In one pattern, illustrated on the left below, the secondaries come off of the primary vein all along the length of the primary. In the second pattern, illustrated on the right below, secondaries originate from at or near the base of the primary.



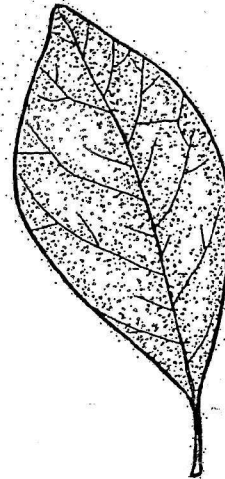
The secondary veins can also create a pattern that can be helpful for identifying certain plants. Again, the pattern must be distinctive and obvious to be of use. Here are three patterns:



Secondary veins parallel to each other for their entire length, stay straight all the way to the leaf margin.



Secondary veins parallel to each other for their entire length, curve upward as they approach the leaf margin.



Leaf secondary veins not parallel to each other for their entire length, secondary veins much-branched.