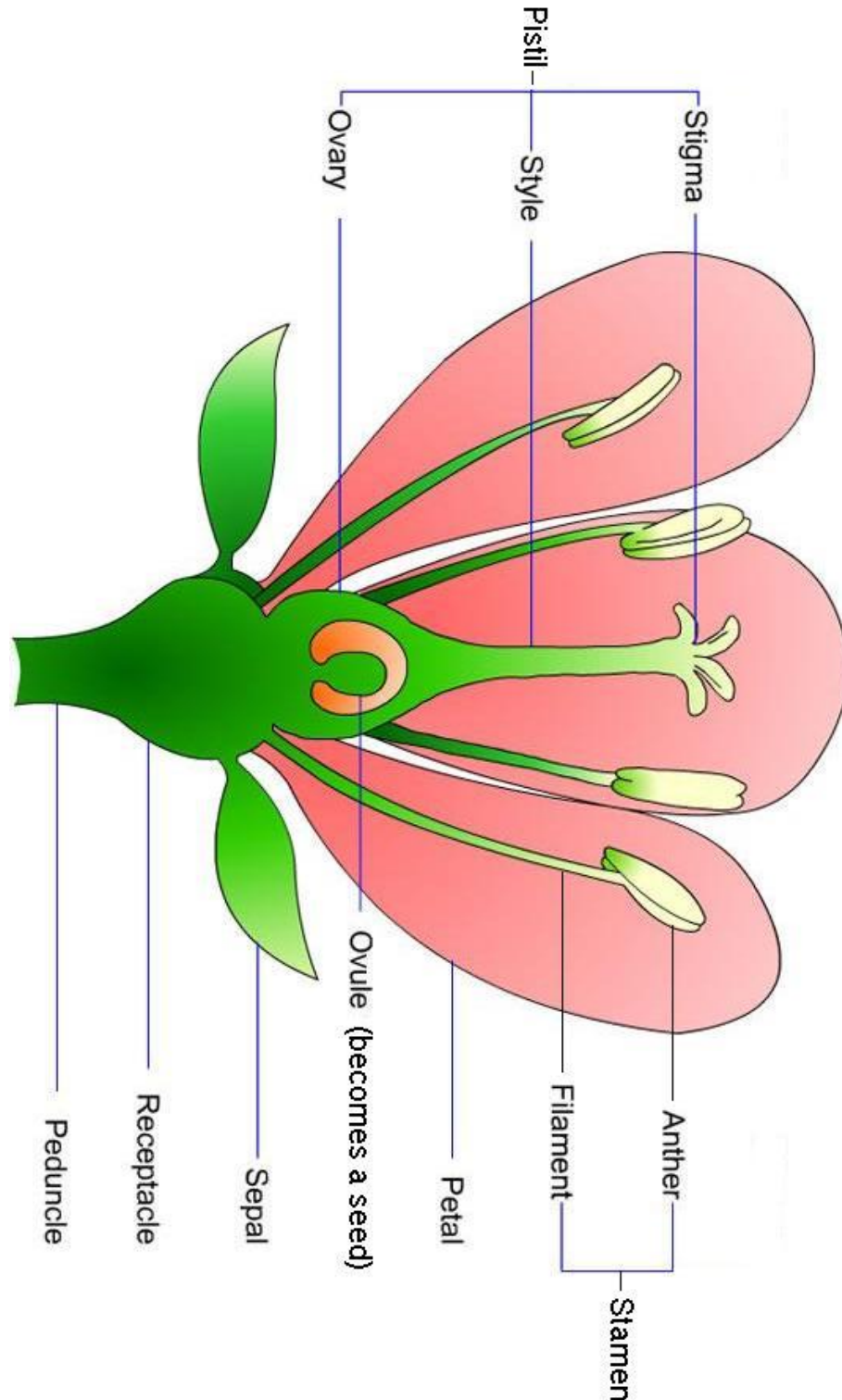
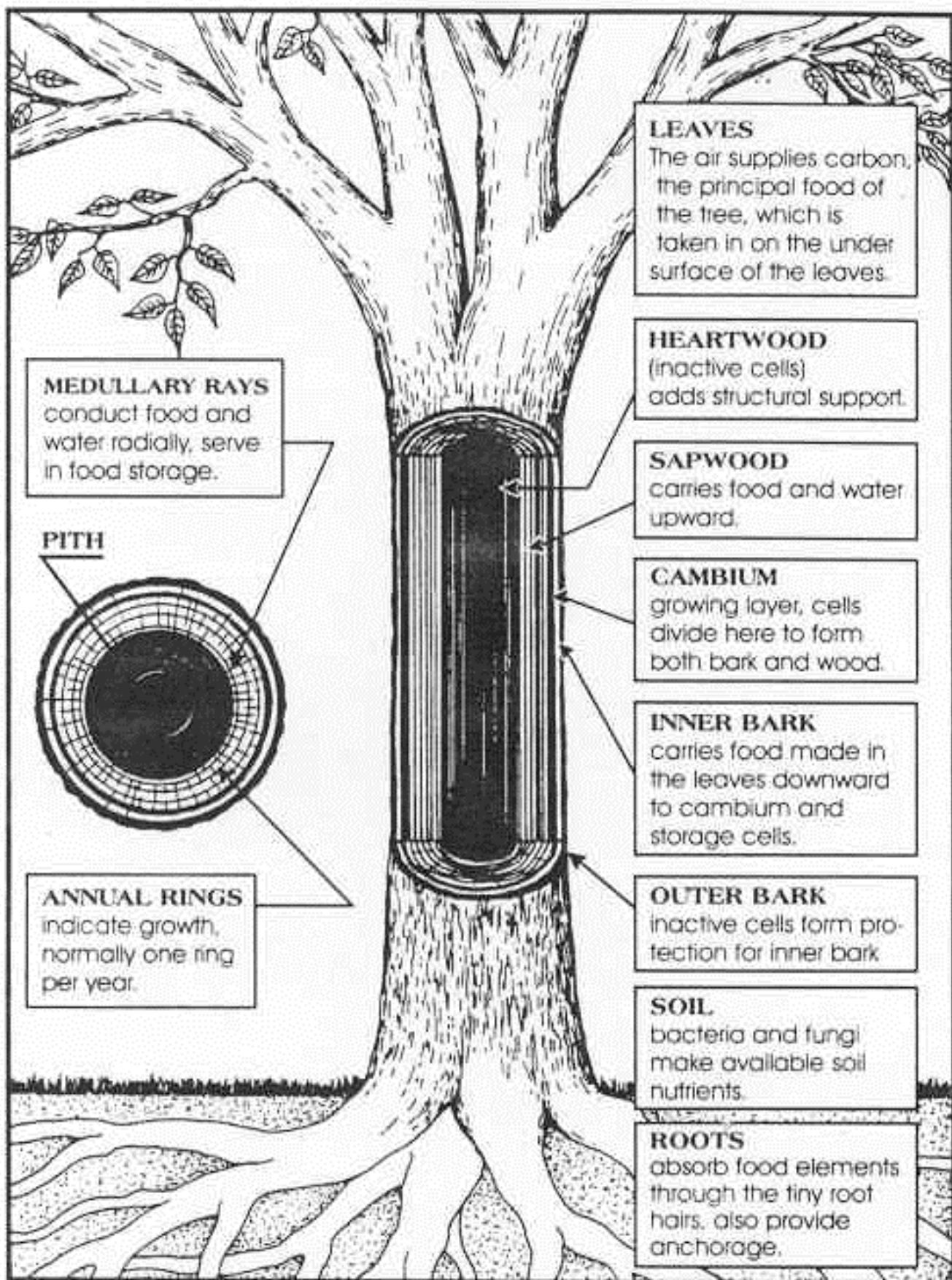


# 2018 Envirothon

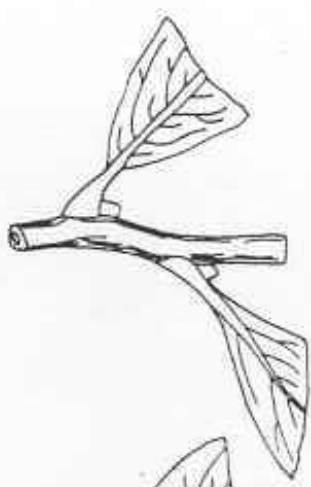
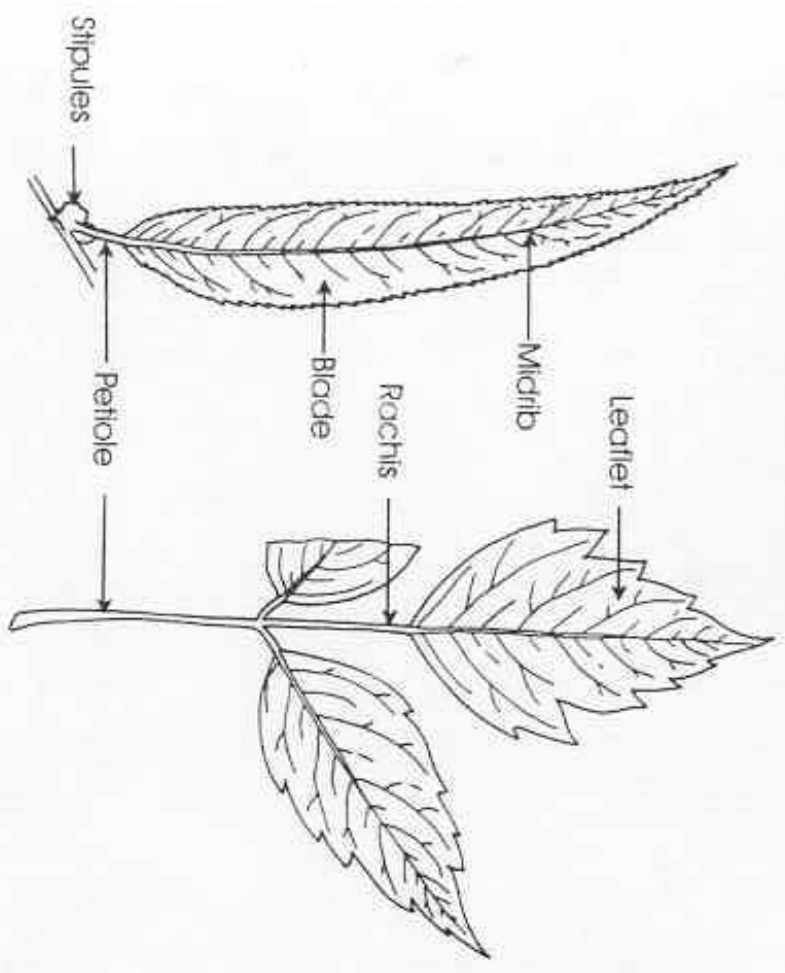
## Wetland Plants Study Materials: diagrams and glossary





**DIAGRAM SHOWING FUNCTIONS OF DIFFERENT PARTS OF A TREE**

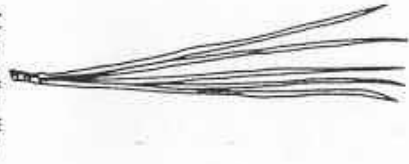
*Courtesy of the New Tree Experts Manual by Richard R. Fenska*



Alternate



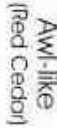
Opposite



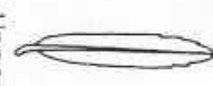
Needle-like  
(White Pine)



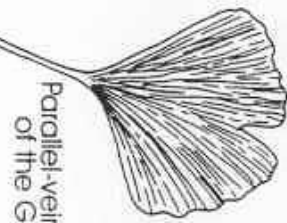
Scale-like  
(Red Cedar)



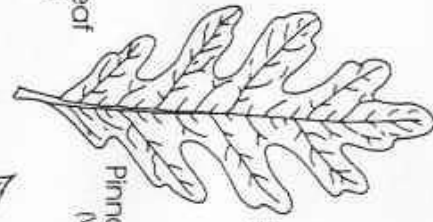
Awl-like  
(Red Cedar)



Linear  
(Hemlock)



Parallel-veined leaf  
of the Ginkgo



Pinnately Lobed  
(White Oak)



Pinnately Compound  
(White Ash)



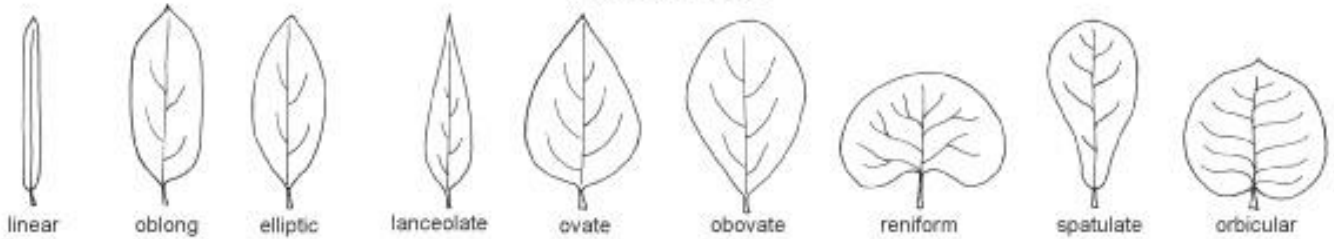
Palmately Lobed  
(Red Maple)



Palmately Compound  
(Ohio Buckeye)

# ILLUSTRATED GLOSSARY OF LEAF SHAPES

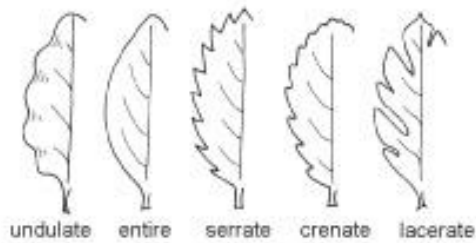
## LEAF SHAPES



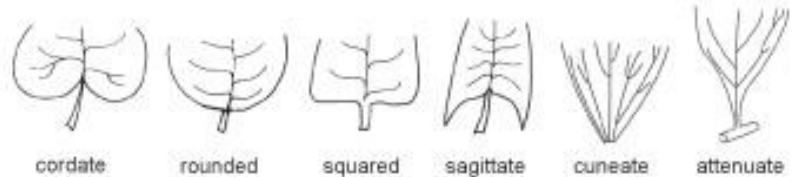
## LEAF TIPS



## LEAF MARGINS



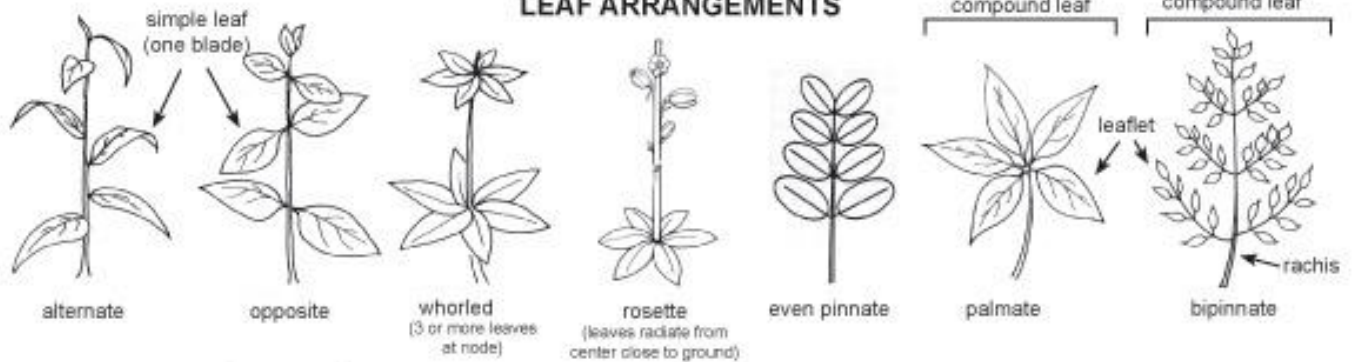
## LEAF BASES



## LEAF ATTACHMENTS

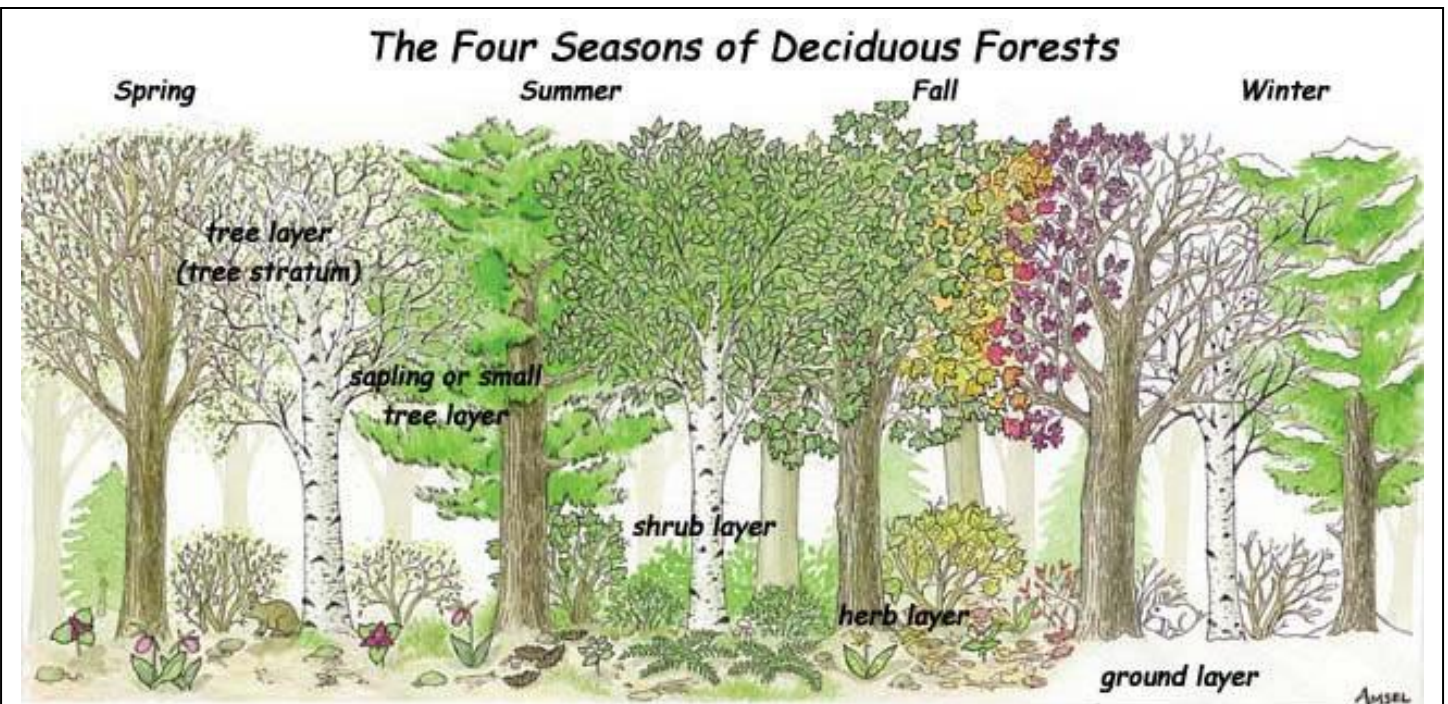


## LEAF ARRANGEMENTS



## HABIT





## Layers in a Deciduous Forest

**Ground Layer** – leaf litter, fallen branches, lichens, clubmosses, and true mosses

**Herb Layer** – short plants like ferns and trillium

**Shrub Layer** – shrubs like rhododendrons, azaleas, mountain laurels, and huckleberries

**Understory** (sapling or small tree layer) – short tree species (dogwood, sassafras) and young trees

**Canopy** (tree layer) – the tallest layer, 60 -100 feet high, with large oak, maple, beech, hickory, elm, basswood, linden, walnut, white pine, hemlock, cedar

## GLOSSARY

<b>alternate</b>	The arrangement of leaves along a stem where consecutive leaves alternate along different sides of the stem. Taken together, all of the leaves plus the stem lie in roughly the same geometric plane. In winter (after leaf drop for deciduous plants), the arrangement can be determined by looking at the leaf scars or buds on the dormant twigs.
<b>axil</b>	The area between a leaf and stem, where an axillary bud forms. The axillary bud can be a floral bud that becomes a flower, or a vegetative bud that may produce a lateral stem (or remain dormant).
<b>basal</b>	Located at or near the base of a plant stem, or at the base of any other plant part:
<b>bole</b>	Another term for the trunk of a tree
<b>bud</b>	The tightly wrapped structure that contains miniaturized forms of leaves and stems (vegetative bud) which may open at a later date or remain dormant forever, or flowers (floral bud) which open the following spring.
<b>bundle</b>	The grouping together of needles on a pine tree into a unified cluster, bound by a sheath (or fascicle) at the base, and attached at a single point to the twig. Individual species of pine trees are known by the number of needles in a bundle; for example, White Pine has five, Loblolly Pine has three, and Scotch Pine has two.
<b>bundle scar</b>	Any small mark left on the leaf scar from the vascular tissue, where the leaf was once attached to the stem
<b>cambium</b>	The growth layer of a woody plant. A meristem that gives rise to radial rows of cells in stem and root, increasing them in girth; commonly applied to the vascular cambium which produces wood and phloem and cork cambium, which produces bark
<b>catkin</b>	Elongated cluster of single-sex flowers bearing scaly bracts and usually lacking petals
<b>conifer</b>	A plant that has cones, rather than fruits, as its method of dispersing seeds. Most conifers are needle-foliaged (evergreens such as the Spruces and Pines, or deciduous versions such as Larch) that have relatively large cones that spread open at maturity. However, others have a miniature berry-like cone (such as the Junipers) or a ball-like cone (such as Bald Cypress, a deciduous conifer) instead.
<b>cultivar</b>	Literally meaning a "cultivated variety", a cultivar is a form of a species that is propagated in mass production at nurseries, for sale as a landscape plant. Since most cultivars are clones, they are genetically identical to one another and display uniformity in all features, such as fall foliage color.
<b>deciduous</b>	A woody plant that drops its leaves in autumn. Most deciduous trees are broad-leaved, but several are "deciduous conifers" that have needles that drop in autumn. These include Eastern Larch and Bald Cypress.
<b>defoliate</b>	To strip (a tree, bush, etc.) of leaves.

## GLOSSARY

<b>dioecious</b>	Plants that have male flowers (or staminate flowers) on one plant, and female flowers (or pistillate flowers) on another plant. Therefore, a pollinating male plant bears no fruits or seeds, whereas a female plant may have fruits, if pollination and favorable environmental conditions occur. Examples of dioecious trees include Green Ash and Osage Orange. An advantage of dioecious trees is that seedless males can be selected and propagated.
<b>drupe</b>	A type of fruit having a single seed enclosed in a hard layer and covered with soft, often juicy flesh, as in cherries and peaches
<b>evergreen</b>	A woody plant that retains its leaves throughout the winter. These include broad-leaved evergreens (such as most rhododendrons and bayberries) and the more common needle evergreens (the pines, spruces, firs, and hemlocks).
<b>floral bud</b>	A bud that develops into a flower the following year. Although often occurring as a lateral bud, it can also be a terminal bud (as in European Horsechestnut) or even on the bark of trunks (as in Redbud).
<b>fruit</b>	The reproductive structure that includes the inner seeds. Mature fruits can be moist (such as the fleshy fruit of Pawpaw), mealy (such as the nuts of the Hickories), or dry (such as the wafers of the Elms).
<b>glaucous</b>	Covered with a grayish, bluish, or whitish waxy coating or bloom that is easily rubbed off
<b>hardwood</b>	A term used in reference to the relative hardness of wood in a tree. Examples of hardwoods include the oaks, hickories, and ashes.
<b>inflorescence</b>	A flower cluster.
<b>lateral bud</b>	A bud that originates just above the point of leaf attachment to the stem. A lateral bud may be a floral bud that flowers the following year, or a vegetative bud that can potentially become a lateral stem.
<b>leaf scar</b>	The scarred portion of a twig where a leaf once attached. After several years, the enlarging twig becomes a branch, and the bark of the branch overwhelms the leaf scars, rendering them non-existent.
<b>leaflet</b>	In compound leaves such as the ashes, the green blades that attach to the central rachis are termed leaflets (a simple leaf like Redbud, on the other hand, does not have leaflets, but instead has only a single leaf blade attached to a petiole).
<b>legume</b>	A pod, such as that of a pea or bean, that splits into two valves with the seeds attached to one edge of the valves.
<b>lenticel</b>	A small opening (either a pore or a slit) in the bark of the tree, through which the tree "breathes" air into the cambium and other living tissues of the outer trunk. While all trees have lenticels, some are more easily observed on twigs and young branches (such as those of Black Cherry and River Birch) than others.



## GLOSSARY

<b>lobe</b>	A division or projecting part of the blade of a leaf
<b>monoecious</b>	Plants that have male flowers (or staminate flowers) and female flowers (or pistillate flowers) on the same plant. Therefore, a monoecious plant will bear fruit from some of the female flowers scattered throughout its growth, if favorable environmental conditions occur. Examples of monoecious trees include American Beech and Black Walnut.
<b>node</b>	The place along a stem or twig where a structure (such as a leaf, leaf scar, or lateral bud) is attached. Nodes may have single structures (alternate arrangement), dual structures (opposite arrangement), or multiple structures (whorled arrangement). Usually, the apex of a twig is considered the terminal node. The areas of a twig between the nodes are called the internodes, and constitute the overwhelming majority of the twig.
<b>opposite</b>	The arrangement of leaves along a stem where a pair of leaves are opposite one another, with the stem in-between. Taken together, all of the leaves plus the stem lie in roughly the same geometric plane. In winter (after leaf drop for deciduous plants), the arrangement can be determined by looking at the leaf scars or buds on the dormant twigs.
<b>palmately compound</b>	The arrangement of leaflets in whorled fashion around the top of the petiole, which then attaches to the stem of the plant. This resembles the arrangement of fingers attached to the palm of a hand, which itself attaches to the arm (at the wrist). Ohio Buckeye and European Horsechestnut are good examples of palmately compound leaves.
<b>pedicel</b>	The stem-like structure that attaches a developing flower (or fruit) to the twig (or peduncle, which then attaches to the twig).
<b>petiole</b>	In a simple leaf, the petiole is the structure that attaches the leaf blade to the stem. In a palmately compound leaf, the petiole attaches the leaflets to the stem. In a pinnately compound leaf, the petiole attaches the leaflets to the rachis, which attaches to the stem.
<b>phloem</b>	In vascular plants, the downward flowing food conducting tissue
<b>pinnately compound leaf</b>	The situation where a leaf is not simple, but rather composed of leaflets attached to a central rachis, which then attaches to the true twig of the plant. In autumn for woody plants, the leaflets detach from the rachis, and the rachis falls off from the twig, completing leaf drop. Black Locust and White Ash are good examples of pinnately compound leaves.
<b>pistillate</b>	Having female flower parts (pistil) but no male flower parts (stamens)
<b>pith</b>	The spongy material in the center of twigs and young trunks (may be solid, diaphragmed, chambered, star-shaped, etc.)
<b>pubescence</b>	The fuzziness found on some leaves, stems, buds, floral structures, and fruits, especially when they are immature.
<b>raceme</b>	An unbranched flower cluster, consisting of a single central stem or rachis, along which individual flowers grow on small stalks at intervals, blooming from the base toward the apex, as in the lily of the valley

## GLOSSARY

<b>rachis</b>	In a pinnately compound leaf, the elongated structure that attaches to both the leaflets and the petiole, which then attaches to the stem. A rachis is sometimes referred to as the axis of the pinnately compound leaf.
<b>samara</b>	A type of dried fruit that has a seed attached to a wing, which often causes the fruit to spin downward when it falls from a tree. Most Maples have paired samaras in clusters, while most Ashes and Tree-of-Heaven have single samaras in large clusters.
<b>simple leaf</b>	The most common type of leaf, where a single leaf blade attaches to a petiole, which then attaches to a twig of the plant. In autumn, both the leaf blade and the petiole detach from the twig as a single unit, completing leaf abscission.
<b>sinus</b>	A recess or indentation between lobes of a leaf
<b>softwood</b>	A term used in reference to the relative softness of the wood in a tree. Examples of softwoods include Colorado Spruce, and White Pine.
<b>staminate</b>	Having male flower parts (stamens) but no female flower part (pistil)
<b>stipule</b>	Very small, leaf like structures that occur at the base of the petiole on the leaves of a very few trees, usually appearing briefly in early spring with leaf emergence, and soon falling away. Examples include the large stipules of Tulip tree and the very small ones of some American Chestnuts.
<b>terminal bud</b>	A bud that occurs at the end of a stem. Although it is usually a vegetative bud that will continue the growth of the stem the following year, it can also be a floral bud that will flower the following year. Some trees do not have a true terminal bud (Tree of Heaven is a good example), in which case the uppermost lateral bud serves its purpose.
<b>vegetative bud</b>	A bud that develops into a stem with leaves, either originating as a terminal bud or as a lateral bud.
<b>whorled</b>	The arrangement of leaves along a stem where a cluster of three or more leaves occurs at the same juncture on the stem. In winter (after leaf drop for deciduous plants), the arrangement can be determined by looking at the leaf scars on the dormant twigs, such as in Catalpa.
<b>xylem</b>	In vascular plants, the wood tissue that conducts water and minerals up through the plant