Tree Keys

Nº. 56

INTERMEDIATE

Science

LESSON SUMMARY

Students will develop the observation and classification skills necessary to identify trees by developing tree identification keys.

FORESTS ONTARIO

Focus on Forests

Activity Information

Grade Level: Intermediate

Estimated Duration: 1 to 1 ½ hours

Materials: At least five different leaves (coniferous and deciduous) per student, two or three tree identification guides per class, notebooks and pencils, at least two sheets of laminating plastic per student (optional), one sheet of drawing paper or newsprint and charcoal crayon per student (optional), six to eight conifer branches per pair of students, masking tape and markers, copies of Tree Wheels (one per group)

Setting: Indoors and outdoors

Key Vocabulary: Hardwood, softwood, coniferous, deciduous, evergreen, leaf margin, classification keys, broadleaf

Background

Most people can tell the difference between a maple tree and a pine tree: they know one is a deciduous tree (a tree that produces and sheds its leaves in the same year) and the other an evergreen tree (a tree on which leaves are not shed in the same year they appear). They may be unaware, however, that in order to make this distinction, they have used one of the many ways of classifying or organizing information about trees.

Trees can be identified by the features of their parts (e.g., leaves, bark, twigs, buds, flowers, and fruits) and by their shape or silhouette. For some species, a particular feature stands out (e.g., white birch has a distinctive bark, weeping willow has an easily recognizable shape). However, leaves are the most common feature considered when identifying a tree.

The shape of a leaf, the kind of leaf margin, the leaf type, and the arrangement of leaves on the twig are all important factors in tree identification.

a) Shape. Leaf blades can be long and narrow, oval, heart-shaped, spear-shaped or circular. Poplar leaves, for example, are generally oval in shape. Birch leaves are more triangular, whereas basswood trees have heart-shaped leaves. Willow leaves are long and slender.

b) Leaf margin. Leaf edges, or margins, also differ. They can be smooth, finely notched, coarsely notched, or wavy. Maple and oak leaves are lobed. Ash, beech and elm have leaves with a toothed edge.

c) Leaf type. Leaves can be simple (all one piece) or compound (divided into many separate leaflets). Beech maple, oak, and poplar have simple one-piece leaves. Hickory and ash have compound leaves made of several leaflets.

d) Arrangement. On some trees, the leaves are attached alternately on the twig. Oak, poplar, and cherry are three examples. On others, for example the maple, the leaves are attached opposite each other. Still other trees have leaves arranged in a whorl.

Evergreen leaves can also be differentiated by shape. For example, the leaves of the white pine are long and needle-like, while cedar leaves are flat and scale-like.

Some needle-like leaves occur singly on the twig: others occur in bunches. Spruce, hemlock, and fir needles occur singly. White pines have needles in clusters of five. Jack pine, red pine, and Scots pine have two needles per cluster.

Classification keys are used to correctly identify tree species. A key is a series of comparative questions that lead to the species name. Each question or choice has a yes or no answer that directs the user to the next appropriate question. Another way to think of a key is as a series of forks in the road that move from clue to clue until accurate identification is established. The following is an example of a classification key used to identify several species of pine.

Advance Preparation

Make copies of the information sheet on Regeneration, the Regeneration Process Activity Sheet, and Site Class chart (one per student or team).

ACTIVITY #1

Before going outdoors, ask your students: How many different kinds of trees are there on the school grounds? Have each student write down a rough estimate of the total number of trees on the school property and the numbers of different kinds of trees. They do not need to know the tree names. Encourage them to use their own systems for sorting or classifying the differences between trees (e.g. flowering trees/non-flowering trees: deciduous/evergreen trees). Assist your students in sorting their answers into categories.

Move outdoors and have your students compare their estimates with the actual number of trees on the grounds. Do they come close to their rough estimates? Have them observe the trees and devise new categories for their sorting system (e.g. divide trees into categories based on leaf shape).

While outdoors, students may collect the leaves (from both evergreen and deciduous trees) in preparation for Activity #2 (encourage them to collect fallen leaves if possible).

Back in the classroom: analyze the students' sorting systems. Do some trees fall into more than one category? Are the categories exclusive or overlapping?

ACTIVITY #2

Discuss how botanists, foresters, environmental scientists, gardeners, or anyone who wants to know the name of a tree can use certain characteristics of the tree to lead them to correctly identify the tree. Introduce students to the characteristics of leaves that are used to determine a correct identification of a tree species (see Background Information).

Have students sketch each of the five different leaves collected. Make sure each sketch is at least half an 8 -1/2 x 11 inch page in size and that all distinguishing characteristics are shown. Alternatively, have students laminate leaves between sheets of adhesive plastic or do a leaf rubbing by placing the leaf under a sheet of paper and rubbing the surface of the paper with a charcoal crayon or the edge of a pencil lead. Label the distinguishing leaf characteristics on the sketches.

ACTIVITY #3

Divide your class into groups of five and play a few rounds of the Leaf I.D. Game. Call out one of the following features (or create your own categories according to the leaves found in your area). See which group can most quickly create a pile of leaves from their leaf sketches to match the characteristics:

- all needles
- all broadleaves
- all oval shaped
- all heart shaped
- all lobed
- all not lobed
- all toothed
- all simple leaves
- all compound leaves

As students become more familiar with leaf characteristics, increase the complexity:

- all double compound
- all double-toothed
- all single lobed leaves
- all double lobed margins

Try:

- all the pine
- all the maple

ACTIVITY #4

A dichotomous key is an identification tool that presents a series of two (hence dichotomous) questions or choices that are opposite traits. Among other things, dichotomous keys are often used to identify tree species.

Have students construct their own keying systems that are easy for someone else to follow. To give students some practice in designing keys, have them create a key for simple objects found around the classroom. Choose objects that haw several features in common (e.g., notebooks —rectangular and made of paper; pens, pencils, and chalk — all roughly cylindrical and used for writing; paper clips and staples — made of metal and used to fasten paper) and then make a list of opposite characteristics that could be used to identify them. Use the example attached as a guide.

Test the key by choosing books at random and keying them out. Do all students' books fit into one of the categories? If not, there may be a problem with the key. Make sure that only opposite traits are listed. Once the students have completed this exercise, they can then go on and create keys for trees.

ACTIVITY #5

Construct a key for selected conifers. Divide students into pairs or small groups.
Give each pair six to eight conifer branches.

Have each pair follow these instructions:

1. Put masking tape around the base of each branch to form a label. Label each branch with a symbol (e.g., v x o A #). (You don't need to know the name of the tree.)
2. Choose one distinguishing characteristic that will divide the branches into two exclusive groups (e.g.. needles in bunches/not in bunches). Separate the branches into two groups according to this characteristic.
3. Now pick two more opposite characteristics (one pair for each group of branches) and separate the branches into four sub-groups based on these characteristics. Continue to do this until you have only one branch in each group.
4. Draw a diagram of the whole key, right down to the individual branches. Use the symbols throughout the key.
5. Trade keys and branches with another group (remove masking tape labels first). If others are unable to correctly identify the branches, track down and correct the errors in the key.

Extensions

1. Have students plan out an area on the school-yard or in the community where trees could be planted.
2. The students will take pride in their stand and can certainly use it for other studies. The stand could become part of a local campaign to improve the school and community or the inspiration for holding an annual "plant a tree" program in your community during National Forest Week in the spring of each year.
3. Visit a nearby forest that has been artificially regenerated within the last 20 to 40 years. Note all the indicators of reforestation. If possible, visit a forest that was artificially regenerated 50 years ago (or more) and make comparisons between the two.
4. Visit a tree nursery or research station to learn more about regeneration methods. Research and describe "prescribed burning" as an important forest management tool. How does this technique facilitate regeneration?

Summary of Leaf Characteristics

Broadleaf
Leaf shape
Leaf margin
Leaf type
Arrangement on twig
Attachment to twig

Conifer
Needle shape
Number of needles in a bundle
Needle length
Leaf type (scales or needle-like)
Attachment to twig

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Teaching Note

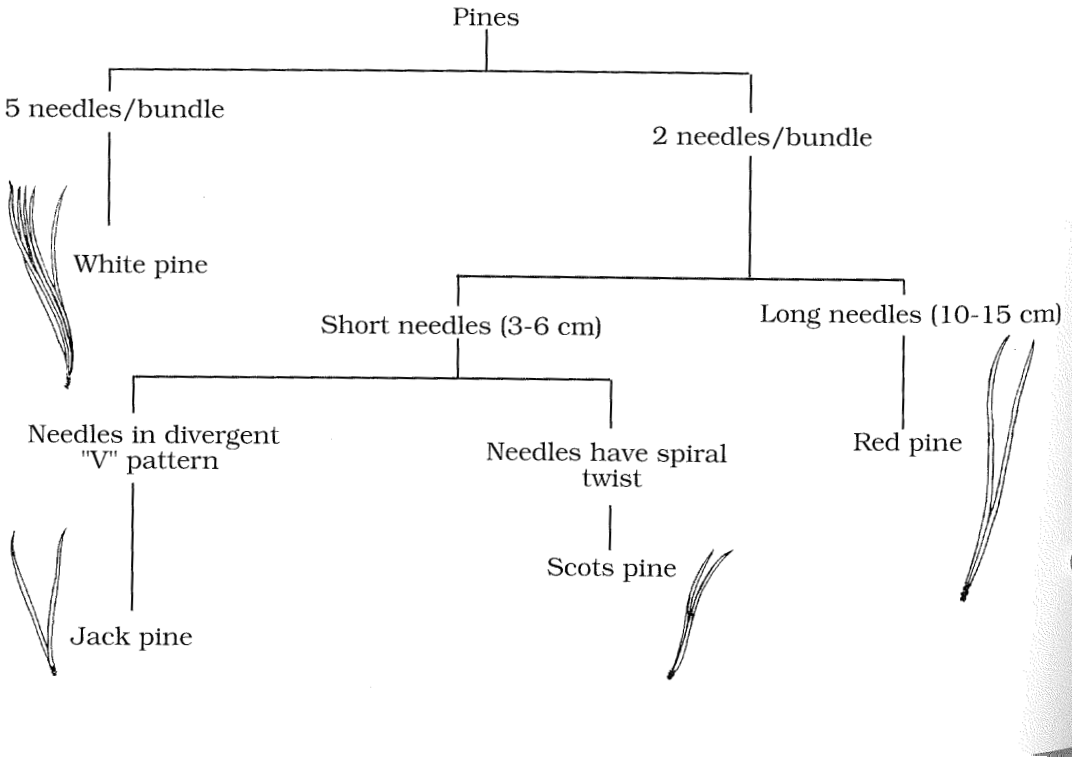
Trees planted in schoolyards and on lawns may be "exotic" (i.e., non-native). Such species are not included in a native tree key.

Advance Preparation

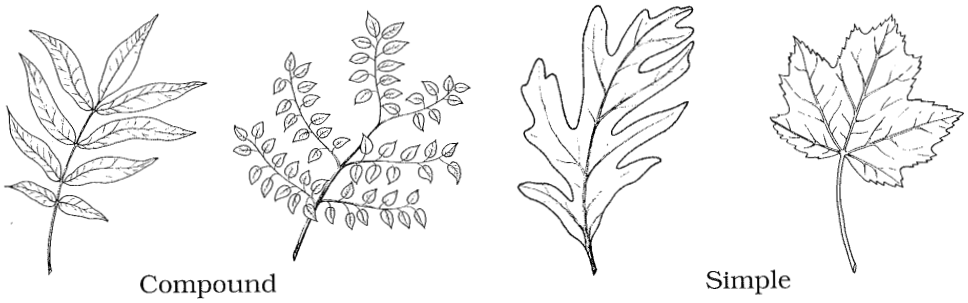
1. Review the activities and, depending on which you choose and the availability of the leaves, collect the appropriate number of deciduous leaves or conifer branches.

2. For Activity #5, copy and make Tree Wheels for each group of students (see attached black line master).

Key to Selected Pines



Leaf Types



Compound

Simple

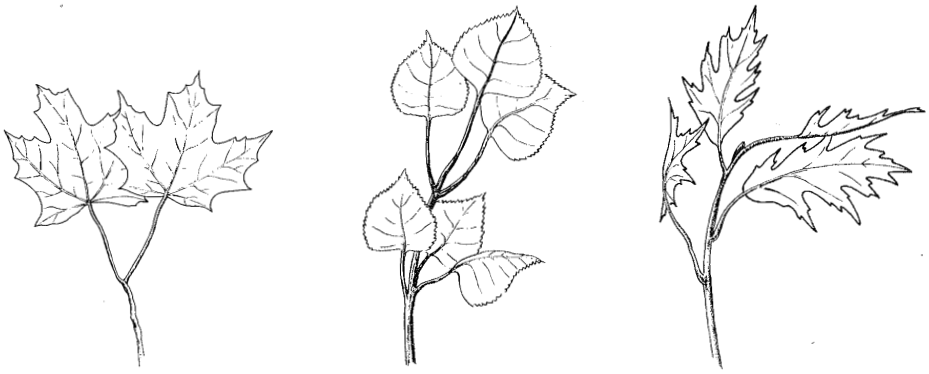
Scale-like

Needle-like (in bundles of five)

Needle-like (in bundles of two)

Needle-like (singly on twig)

Arrangement on Twig

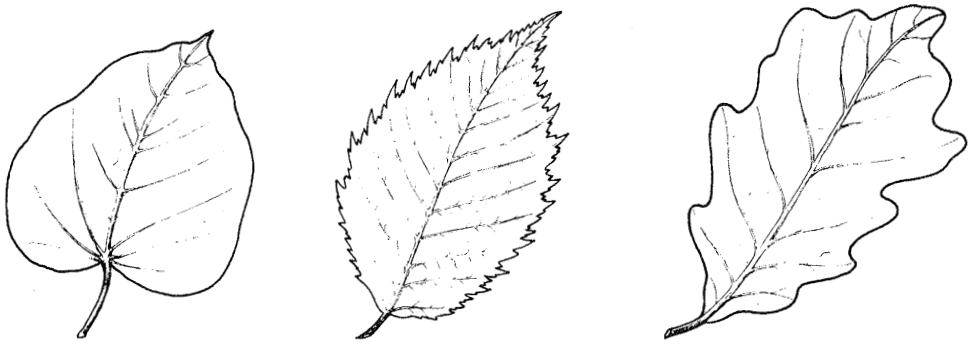


Opposite

Whorled

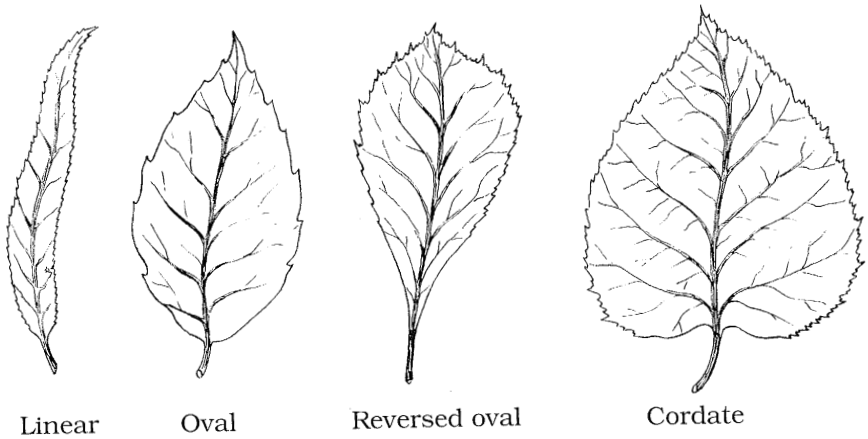
Alternate

Leaf Margins

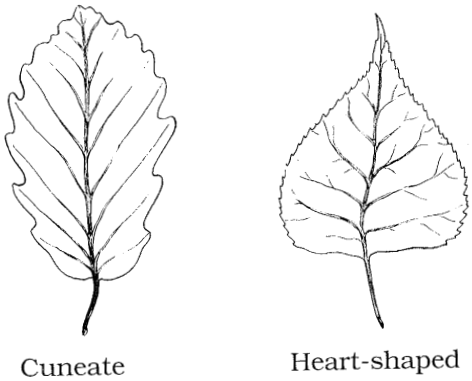


Smooth Toothed Wavy

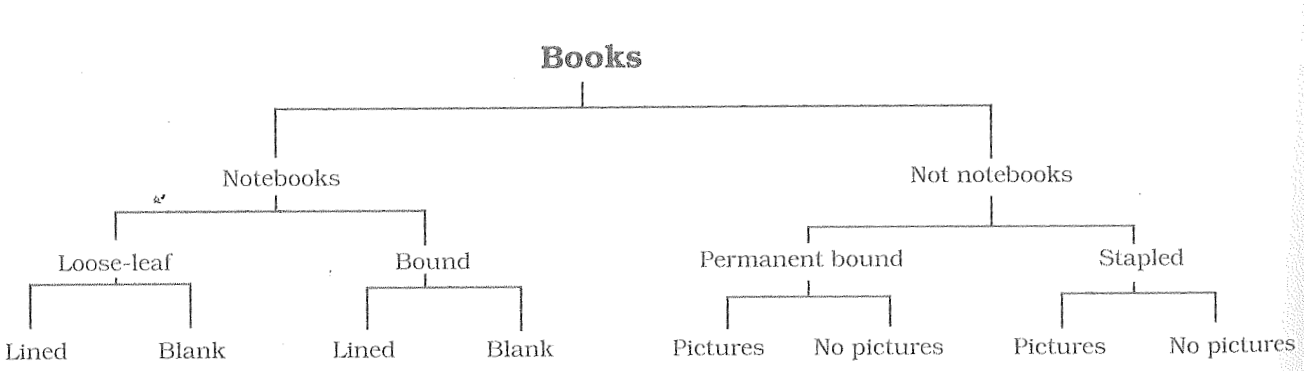
Leaf Shapes



Linear Oval Reversed oval Cordate



Cuneate Heart-shaped


Books
Notebooks
Not notebooks
Loose-leaf
Bound
Permanent bound
Stapled
Lined
Blank
Lined
Blank
Pictures
No pictures
Pictures
No pictures