

---

# Taxonomy & Field Guide Warm-Up

---

## Activity Overview

Students learn about plant parts and begin learning how to use a wildflower field guide.

**Objectives:** Students will

- Develop a botanical vocabulary for describing plant, leaf and flower types
- Distinguish differences between plants by their morphology or appearance
- Identify wildflowers using a dichotomous key

**Subjects Covered:** Science

## Grades

Part 1: 2 through 12.

Part 2: 6 through 12

**Activity Time:** 50 minutes per Part

## Season

Any (plants collected during growing season)

## Materials

Wildflower Field Guide Warm Up worksheet, Taxonomy Treasure Hunt worksheet, plant specimens, pencils, clipboards, and hand lens

## State Standards

### Science:

Decide which questions to ask (A.4.1)

Decide which collected data is pertinent to new problems (A.4.2)

Identify questions using available resources (C.8.1)

Identify data and sources to answer questions (C.8.2)

Use inferences and observations (C.8.4),

State learning from investigations (C.8.6)

Use explanations & models to describe results (C.12.5)

Present results (C.12.6)

## Background

Learning to identify plants using a field guide is fun and can become an enriching life-long learning experience. At first, learning how to identify plant species may be frustrating. Keying out plants is a skill that with practice becomes easier and very satisfying. For developing and maintaining a school-yard planting, learning how to key plants is essential to understanding cultural needs of plants and to identifying desired and undesired plants on the school grounds or natural area. Botanists have developed a special vocabulary and set of criteria to identify plants based on morphology or the appearance of plant parts. In order to determine a particular plant species, they also developed a tool called a dichotomous key specific to plants. A dichotomous key is a series of paired plant descriptions. You choose the best description for each set of choices as you move down sets of options. Each choice becomes increasingly more specific until you arrive at an identity. Depending on the kind of field guide used these criteria can be difficult or relatively simple to understand. However, hands-on practice will facilitate the effective use of criteria to identify plants. The following will give students the opportunity to learn and identify plant parts and demonstrate how they are integrated into a field guide to identify unknown plants. The guide used in this activity is Newcomb's Wildflower Guide by Lawrence Newcomb. Many other guides are available. The benefits of this guide include fairly simple botanical terms and key, clear, detailed illustrations and the identification of the family and the plant's origin.

## Pre-Activity Description

### *Part 1: Learning about plant parts.*

Collect specimens that represent each type of plant characteristic. Include plants with opposite, alternate, basal and whorled leaf arrangements, leaves that are entire, toothed, lobed or divided, and examples of regular and irregular flowers. See illustrations and definitions in the activity.

### *Part 2: Using a field guide.*

Collect four or five specimens of a flowering plant species for classroom practice. Try keying out the plant to locate any potential "wrong turns" ahead of time.

## Activity Description

### *Part 1: Learning about plant parts*

1. Display and describe plant part samples using an overhead project. Give students the activity worksheets for reference.
2. Next it is time to venture outside for hands-on experience. Students should take a clipboard, pencil and the "Taxonomy Treasure Hunt" worksheet. Have students search their restoration site or nearby natural area to find examples of different kinds of leaves and flowers. Have students draw the examples of what they find. This exercise demonstrates

---

## Taxonomy & Field Guide Warm-Up (cont.)

---

### Science Standards continued

Illustrate organisms' life stages (F.4.3)

Investigate structure & function of organisms (F8.1)

Show organism's adaptations (F.8.2)

Investigate and explain heredity (F.8.4)

Explain reproduction (F.8.5)

Understand an organism's behavioral adaptations (F.8.7)

Evaluate structures and functions of a cell (F.12.1)

Find connections between functions of cells and organisms (F.12.4)

Understand evolution theory, natural selection, biological classification (F.12.5)

Understand species changes & diversity (F.12.6)

Investigate cooperation & competition (F.12.7)

how to identify specific plant characteristics in the field and provides good preparation for using a field guide.

The following definitions are helpful for talking about plant parts and for using field guides:

### LEAVES

#### *Leaf Parts*

- Petiole – The stalk of a leaf that attaches the leaf to the stem.
- Blade – The broad part of the leaf.
- Apex – The tip of the leaf; it may be narrow or broad.
- Base – The part of the leaf that connects to the petiole.
- Margin – The edge of the leaf; it may be smooth (entire), (toothed) serrated, or lobed.
- Leaflet – One of the blades of a compound leaf.
- Stipule – An appendage at the base of a leaf.

#### *Leaf Arrangement*

Leaves and buds are attached to the stem at a node. How the leaves are grouped at a node determines leaf arrangement. Leaves are arranged the following ways:

- Alternate - Leaves are spaced singly along the length of a stem like steps. Only one leaf is attached to each node.
- Opposite - Two leaves are attached to a node directly across from each other like arms on a body.
- Whorled - Three or more leaves are attached to each node.
- Basal – Leaves located at the base of the stem.

#### *Leaf Type*

- Simple – A simple leaf has only one part and is not divided.
- Compound or Divided – A leaf is divided into smaller leaflets.
- Pinnately Compound - Leaflets are arranged along the length of a central stalk.
- Palmately Compound - Leaflets radiate from a single point like fingers radiating from the palm of a hand.
- Bipinnately Compound - Leaflets are arranged along a branched stalk.

#### *Leaf Margins*

- Entire (smooth) - A smooth leaf margin.
- Toothed (serrated) - A margin with teeth.
- Lobed - Rounded divisions along the margin.

---

## Taxonomy & Field Guide Warm-Up (cont.)

---

### FLOWERS

#### *Flower Parts*

- Sepals – A leaf-like structure that surrounds and protects the flower bud, collectively called the calyx.
- Petals – Leaf-like, often colorful structures that surround the reproductive parts of the flower and serve to attract pollinators.
- Stamens – The male or pollen-producing organ of the flower composed of the anther and filament.
- Anther – Produces pollen.
- Filament – Supports the anther.
- Pistil – The female part of the flower composed of an ovary, style and stigma.
- Ovary – The lower, usually enlarged part of the pistil, which contains the egg cells and where the seeds are produced. The ovary becomes the fruit.
- Style – The stalk-like portion of a pistil connecting the stigma and ovary. Pollen travels through the style to get to the ovary.
- Stigma- The terminal part of the pistil that traps pollen.
- Pedicel – The stalk of a single flower.

#### *Flower Types (as described by Lawrence Newcomb in Newcomb's Wildflower Guide)*

- Regular – Flowers are radially symmetrical. All petals or petal-like parts are a similar size, shape and color. Petals may be fused or united into a bell-shape and will all still be similar. Daisy-like flowers will have petals, rays arranged like spokes on a wheel. Sometimes a hand lens is needed to see small flowers grouped together on a spike. Typical examples include sunflower, rose, harebell, and lily.
- Irregular – The flower is not radially symmetrical nor are the petals the same size, shape or color. Some flowers may have a distinct upper and lower part called lips. Typical examples include beans, peas, violets, and irises.
- Indistinguishable – Flowers with no visible flower parts or that are too small to count and determine petal arrangement. Examples include plantains, thistles, and Joe-pye-weeds.

#### *Part 2: Using a Field Guide*

1. Pass out four to five specimens of a flowering plant to teams of students. Each student should have access to a plant specimen to be able to observe it closely. During this part of the activity students will use the Newcomb technique for identifying plants and flowers.
2. Identify the unknown plant together as a class to become familiar with the wildflower guide. Newcomb asks a total of three classification questions concerning flower type, plant type, and leaf type. Fill out the “Wildflower Field Guide Warm-Up” worksheet to answer each classification question. After answering the three questions, the class will have a three-digit group number. Use the dichotomous “Locator Key” (pages 1 – 14) in the wildflower guide to begin identifying the plant. The key will eventually take the class to the pages where the plant will be identified. The class may need to retrace their steps if the description and illustration don't

---

## Taxonomy & Field Guide Warm-Up (cont.)

---

match your plant specimen. Expect this will happen!

3. Practice with more specimens as a class, if needed. Once everyone is fairly comfortable with using the wildflower field guide in group practice, either go outside to identify plants in the field or use additional specimens in the classroom.

### Extensions

- Students can create their own field guide for the plants that exist in their restoration site. Each student creates a field sheet for the species in the guide. Students can include the common and scientific names, an accurate colored drawing, physical observations (i.e., size, shape, texture, etc.), additional field guide information (i.e. bloom time, height, etc.), habitat (i.e. prairie, wetland, woodland, etc.), unique facts (i.e. medicinal uses, Native American uses, etc.), and the date of their personal encounter with the plant in its natural habitat. Students should remember to cite all sources. Students can then gather all their field sheets into one field guide binder and create an index and key for a formal field guide look. (Source: Mark Lee) See The Earth Partnership for Schools activities, “Up Close and Personal” and “Construct a Key” for useful materials and information.
- Learn how to use different field guides. Compare the guides for usability, accuracy of illustrations, etc.
- Dissect flowers to learn about the flower parts and their function.
- Students can research how the parts of the plant function for the plant’s survival, such as how the parts of the flower promote pollination and fertilization.

### Additional Resources

- Cohen, J. Pranis, E. (1990). *GrowLab: Activities for growing minds*. Burlington, VT: National Gardening Association.
- Hunken, J. (1989). *Botany for all ages: Discovering nature through activities using plants*. Chester, CT: The Globe Pequot Press.
- Lawrence, G. (1955). *An introduction to plant taxonomy*. New York, NY: The Macmillan Company.
- Newcomb, L. (1977). *Newcomb’s wildflower guide*. Boston, MA: Little, Brown and Company

### Assessments

- Without looking at a picture of the plant, use the field guide going backwards and construct a drawing of what the plant looks like. Then compare your drawing to the illustration for accuracy.
- Describe a plant using botanical terms.
- Identify three specimens using a field guide.

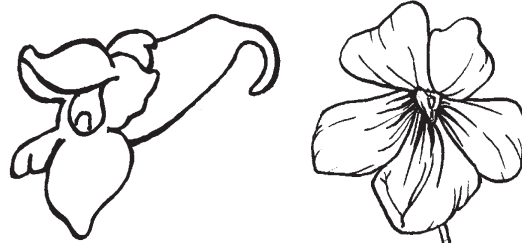
## Taxonomy & Field Guide Warm-Up (cont.)

### 1. Flower Type



**Regular Flowers**

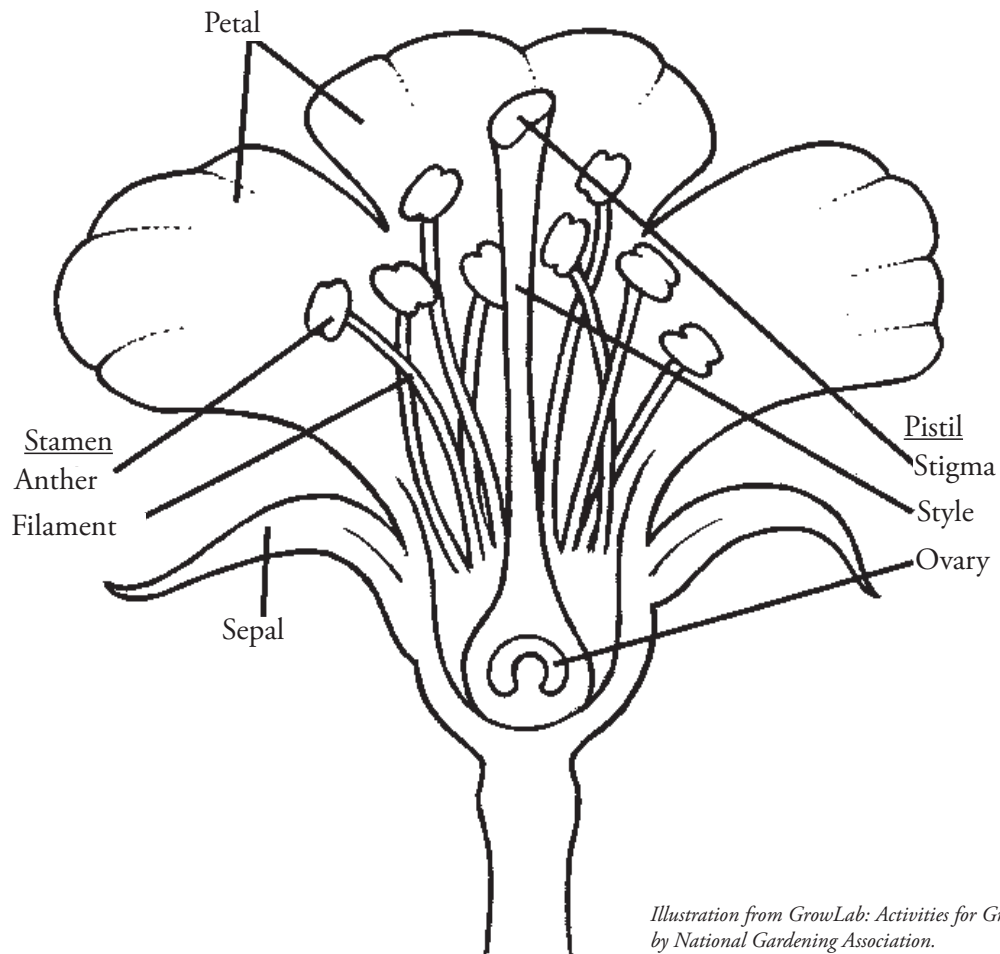
Petals arranged around the center and are similar in size.



**Irregular Flowers**

Petals are not arranged around the center and are not similar in size.

### Flower Structure



*Illustration from GrowLab: Activities for Growing Minds by National Gardening Association.*

---

## Taxonomy & Field Guide Warm-Up (cont.)

---

### 2. Plant Type

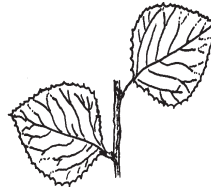
(Leaf Arrangement)



**Basal**



**Opposite**

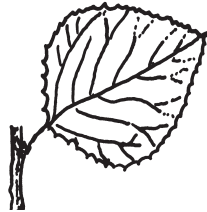


**Alternate**



**Whorled**

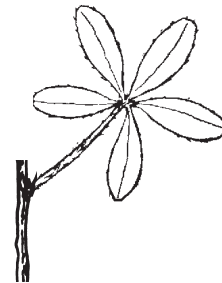
### 3. Leaf Type



**Simple**



**Divided**



**Entire (smooth)**



**Toothed**



**Lobed**

# Wildflower Field Guide Warm-up

Directions: First, circle the flower, plant and leaf types that match your plant. Then write the “Classification Type Number” from the “The Three Classifications” chart in *Newcomb’s Wildflower Guide*. Next, using the three numbers, locate and identify your plant beginning with the “Locator Key” in the field guide.

## 1) Identify Flower Type:



### Irregular Flowers

Petals are not arranged around the center and are not similar in size.

### Regular Flowers

Petals arranged around the center and are similar in size.

Irregular flower = 1

Regular flower parts with = 2, 3, 4, 5, 6, 7 parts or 8 (indistinguishable parts)

Flower Type Number: \_\_\_\_\_

## 2) Identify Plant Type:



Basal = 2



Alternate = 3



Opposite and



Whorled = 4

Shrub = 5

Vine = 6

No Apparent Leaves = 1

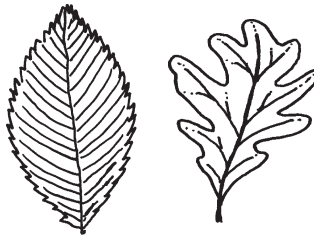
Plant Type Number: \_\_\_\_\_

### 3) Identify Leaf Type:

No apparent leaves = 1



Leaves Entire  
(smooth) = 2



Leaves Toothed  
or Lobed = 3



Leaves Divided = 4

Leaf Type Number: \_\_\_\_\_

### 4) Identify Your Plant:

Write the "Classification Type Numbers" on the lines below. Use the "Locator Key" in Newcomb's Wildflower Guide and follow the key to the appropriate page number. Continue keying out your plant. Use the drawings to confirm the identify of your plant. Once identified, write the name of your plant below.

\_\_\_\_\_   
Flower Type Number

\_\_\_\_\_   
Plant Type Number

\_\_\_\_\_   
Leaf Type Number

Plant Name: \_\_\_\_\_

Scientific Name: \_\_\_\_\_

Genus

Species



---

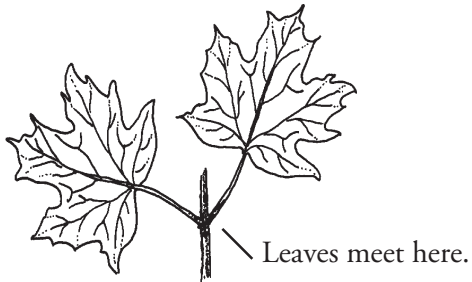
## Taxonomy Treasure Hunt

---

<p>Find a plant in bloom. Draw the flower. Is the flower regular or irregular?</p>     <p>Common Name: _____</p> <p>Scientific Name: _____</p>	<p>Find a divided leaf. Draw the leaf.</p>     <p>Common Name: _____</p> <p>Scientific Name: _____</p>
<p>Find a plant with alternate leaves. Draw a leaf.</p>     <p>Common Name: _____</p> <p>Scientific Name: _____</p>	<p>Find a sedge or grass with flowers or seeds. Draw the inflorescence (the entire flower cluster).</p>     <p>Common Name: _____</p> <p>Scientific Name: _____</p>
<p>Find a member of the composite family.</p> <p>What color is the flower?</p> <p>_____</p> <p>What is the leaf arrangement?</p> <p>_____</p> <p>How tall is the plant? (estimate)</p> <p>_____</p> <p>Common Name: _____</p> <p>Scientific Name: _____</p>	<p>Wild Card! Draw a plant of your choice. Label its parts using taxonomic names.</p>     <p>Common Name: _____</p> <p>Scientific Name: _____</p>

# Taxonomy Treasure Hunt

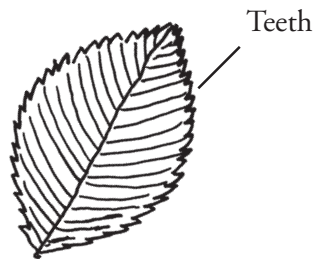
Find a plant with two leaves that meet at the stem.



These are opposite leaves.

Draw a plant with opposite leaves here.

Find a plant that has leaves with teeth along the edge.

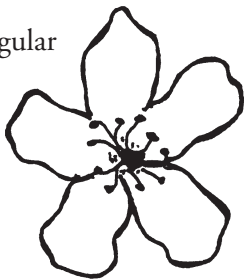


These leaves are toothed or serrated.

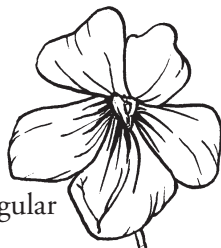
Draw a plant with toothed leaves here.

Find a plant with flowers.

Regular



Irregular



Draw and describe a flower.