

# Seedlings for Schools

## Teacher Resource Guide



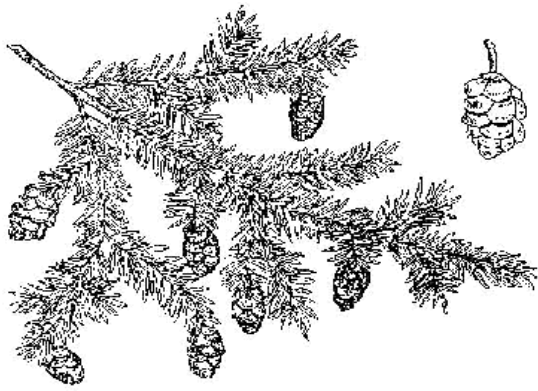
Pennsylvania Game Commission  
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[www.pgc.state.pa.us](http://www.pgc.state.pa.us)





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# Eastern Hemlock

## *Tsuga canadensis* (L.) Carr.

Pennsylvania State Tree

*Grows in sun and partial shade. Prefers moist, well drained soils. Will grow to 100 ft. tall. This tree can be planted close together and trimmed for use as a hedge. Eastern hemlock is native to Pennsylvania.*

**Leaves:** Evergreen needles occur singly, appearing 2-ranked on twigs, flattened, about 1/2" long, dark green and glossy, light green with 2 white lines below.

**Twigs:** Slender, tough, yellowish brown to grayish brown. Buds are egg-shaped, 1/16" long, reddish brown.

**Bark:** Flaky on young trees, gray brown to red brown, thick and roughly grooved when older.

**Fruit:** Cones are 3/4" long, egg-shaped, hanging singly from the tips of twigs. Under each scale are 2 small, winged seeds.

**General:** A large, long-lived tree, important for construction timber and as a source of tannic acid for tanning leather. Found in cool, moist woods throughout the Commonwealth, Eastern hemlock is the official state tree of Pennsylvania. Ruffed grouse, wild turkey and songbirds find food (seeds) and shelter in this tree. Deer browse it heavily when deep snow makes other food scarce.

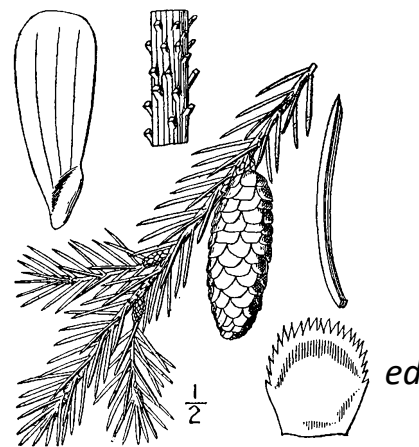
Hemlock is used for timbers and general construction, boxes and crates, railway ties and pulp. Historically it was used as a source of tannin for tanning leather. Native Americans used the moist inner bark to make a poultice for wounds and sores. Today hemlock oil, distilled from the needles and twigs, continues to be used in liniments.

The hemlock woolly adelgid, *Adelges tsugae*, was introduced from Asia into the Pacific Northwest of the United States around 1924. Since then, it has spread across the country. It was first discovered in Pennsylvania in 1967. This insect feeds on hemlock trees, sucking fluids from the needles. Some trees will die within 4 years of being infested while others will continue to live, but in a much weakened state. The stationary larvae cover themselves with a cotton swab-like covering that clings to the undersides of branches.

# Featured Tree - Seedlings for Your Class

## White Spruce *Picea glauca*

*The white spruce is an attractive conifer tree which grows to 60-70 feet in height. This tree has been and continues to be a valuable tool in reforestation projects in Pennsylvania because deer tend to shy away from eating it. This tree can be planted in a stand of other white spruce, mixed with other trees or by itself. When planted in the open the white spruce will develop a conical shape from crown to the ground.*



**Leaves:** Blue-green needles, 4-sided and approximately 1/3 - 3/4 inches long

**Twigs:** Orange-brown to gray

**Bark:** Thin, flaky, grayish-brown .

**Fruit:** Cones are 1-1/2" to 2-1/2" long, narrow and oblong; light brown; scales on cones are thin and flexible.

**General:** The white spruce is often found in the wild in pure stands or in a mixture with quaking aspen, paper birch, balsam fir and black and red spruces. It is one of the most important and widely distributed conifers in Canada and the northern United States. White spruce prefers moist loam soils. While it can be found in many different types of sites, white spruce is often found on stream banks, along lakes and adjacent slopes.

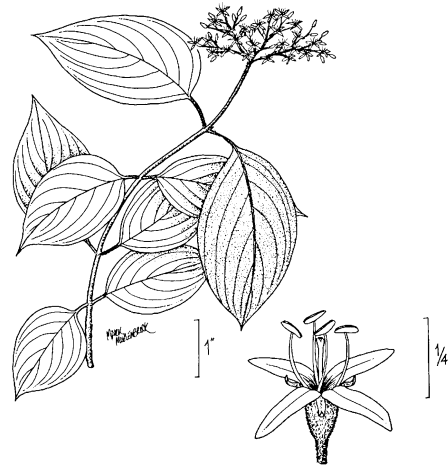
**Uses:** White spruce provides seeds and valuable cover for wildlife. Deer do not like to eat white spruce which makes it very useful to plant in areas where forests need to regenerate. It is used extensively in regeneration projects throughout the state. In the past the flexible roots of white spruce were used by Native Americans to lace birch bark canoes and to make woven baskets.

Tree summaries taken from *Common Trees of Pennsylvania*: Bureau of Forestry, DCNR [www.dcnr.state.pa.us](http://www.dcnr.state.pa.us)  
Illustration from USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. 3 vols. Charles Scribner's Sons, New York. Vol. 1: 61.

# Featured Shrub - Seedlings for Your Class

## Silky Dogwood *Cornus amomum*

*Grows in sun and partial shade. Prefers moist soils. Will grow 6-10 ft. tall. Silky dogwood has many stems and grows like a shrub. It can be planted to form a “wild” border or hedge. Attracts birds and other wildlife. Silky dogwood is native to Pennsylvania.*



**Leaves:** Opposite, simple. Green, oval shaped.

**Twigs:** Young trees have bright red stems in fall, winter and early spring; will turn purple to reddish brown in the Fall. As plant matures, the stems become reddish-brown year round and then will turn gray.

**Fruit:** Bright blue berries often with white highlights that ripen in early fall

**Flowers:** Yellow-white flowers bloom in Spring

**General:** Silky dogwood is considered a large shrub, often 6-10 feet in height. Multiple stems grow from the ground instead of a single trunk. In the fall, silky dogwood will have blue berries that attract birds and other wildlife. Where stems come in contact with the ground, roots will develop, making this ideal for hedges.

Silky dogwood is used for field and farm windbreaks and wildlife borders. It is also being used with willows for stream bank protection. Other beneficial uses are for fish and wildlife habitat improvement, slope stabilization, borders, and as an ornamental.

Tree summary reproduced from U.S. Dept. Agriculture, Natural Resources Conservation Service, <https://plants.usda.gov/core/profile?symbol=COAM2>; Illustration from USDA NRCS. Wetland flora: Field office illustrated guide to plant species. USDA Natural Resources Conservation Service. Provided by NRCS National Wetland Team.

# Featured Tree - Seedlings for Your Class



## **Northern Red Oak** *Quercus rubra*

*A fast-growing native oak. Does well in a variety of moist soils and prefers full sun or openings in forest canopy. Large acorns are a valuable food source for a variety of wildlife species.*

**Leaves:** Leaves are 4"-9" long, 3"-6" wide; moderately lobed, thin and dull above, hairless beneath, with short bristle tips. Leaves turn red in the fall.

**Twigs:** Greenish to reddish brown in color, short, stout and rigid. Clusters of reddish-brown buds on tips, ¼" long, with slightly hairy scales.

**Fruit:** Acorns, alone or in pairs, 5/8" to 1 1/8" long. Cups are flat with tight scales, resembles a beret hat. Good seed crops come in 2-5-year intervals.

**General:** Deciduous, medium to large tree. Grows up to 90' tall in closed forest stands. Red oaks grown in open fields have wide-spread branches and do not get as tall when there is no competition for light as seen in the photo above.



## Greystem Dogwood

*Cornus racemosa*



*Grows in sun and partial shade, prefers moist soils. Will grow 6 to 10 feet tall. Greystem dogwood has many stems and grows like a shrub. It can be planted to form a “wild” border or hedge. Attracts birds and other wildlife. Greystem dogwood is native to Pennsylvania.*

**Leaves:** Opposite, simple. Green, oval shaped. Elliptic to egg shaped, 3 to 5 pairs of veins somewhat whitened. Hairless or slightly hairy beneath.

**Twigs:** shrubs have brownish twigs, pith white, brown.

**Fruit:** clusters of white berries that ripen in early fall June to July

**Flowers:** Yellow-white flowers bloom in spring

**General:** greystem dogwood is a small to medium sized shrub. Multiple stems grow from the ground instead of a single trunk. In the fall, greystem dogwood will have white berries that are eaten by grouse and pheasants.

## Norway Spruce

*Picea abies*



*Fast growing spruce with pyramidal shape and pendulous persistent branches, 60 to 90 feet tall at maturity. Good conifer for shelters, windbreaks and wildlife cover. Prefers full sun but tolerates partial shade. Grows best in moist, sandy, acidic, well-drained soils.*

**Leaves:** are stiff, short (½” to 1” long), sharp needles. Dark green color, needles surround the twig.

**Twigs:** when needles are removed, the twigs are rough because the base of the needle remains. Branches arc down from tree trunk and twigs hang downward.

**Fruit:** 4” to 6” cones start green, turn brown and woody while still hanging on tree. Light, thin scales. Seeds eaten by squirrels

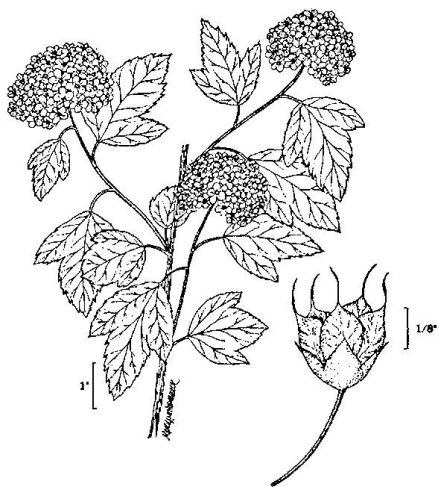
**General:** A non-native spruce that was naturalized by extensive planting for soil conservation in the 1930’s. Main source of pulp for paper making.



# Featured Shrub - Seedlings for Your Class

## Ninebark

### *Physocarpus opulifolius*



Ninebark gets its name from its bark which peels in thin strips exposing a new layer of bark below. Its flowers are an excellent nectar source, and the fruits are eaten by many species of birds. Ninebark grows on a spectrum of sites, found on moist soils in thickets, along streams in sand or gravel bars, and on rocky slopes and bluffs. It produces attractive clusters of fluffy white flowers in early summer.

**Leaves:** Deciduous, alternate, simple, ovate to obovate or nearly round, 1" - 5" long, with 3 or sometimes 5 shallow, palmate-veined lobes. Glabrous above and mostly so beneath but sometimes with a sparse covering of hairs. Crenate or dentate margins.

**Twigs:** Brown to yellow, glabrous dark brown to orange

**Bark:** Peeling into thin strips or broader sheets on larger trunks

**Fruit:** A compressed but inflated, ovoid papery bladder, shiny red at maturity, 1/4" - 1/2" in size.

**Flowers:** Mid-May to July with an inflorescence of numerous flowers found in rounded clusters 1" - 3" wide; individual flowers 1/4" across, with 5 petals, white or pinkish in color.

**Pollinator Use:** An excellent nectar source for bees.

Tree summary reproduced from U.S. Dept. Agriculture, Natural Resources Conservation Service, <https://plants.usda.gov/core/profile?symbol=PHOP>; illustration from USDA NRCS. Wetland flora: Field office illustrated guide to plant species. USDA Natural Resources Conservation Service. Provided by NRCS National Wetland Team.

# Educational Standard Correlations for Activities

Activity	Grades	Subject	Standard Description
Planting and Caring for the Tree Seedlings	preK-8	Environment & Ecology	<ul style="list-style-type: none"> <li>-Describe the basic needs of an organism</li> <li>-Investigate what animals/plants need to grow</li> <li>-Understand limiting factors and predict their effects on an organism</li> <li>-Describe how the availability of resources affects organism in an ecosystem</li> </ul>
Can this Animal Live Here?	2-5	Environment & Ecology	<ul style="list-style-type: none"> <li>-Describe the basic needs of an organism</li> <li>-Investigate what animals/plants need to grow</li> <li>-Explain how adaptations help an animal survive in its habitat.</li> <li>-Understand limiting factors and predict their effect on an organism.</li> <li>-Identify local animals and their habitats.</li> </ul>
Habitat Evaluation	6-10	Environment & Ecology	<ul style="list-style-type: none"> <li>-Describe and explain adaptations of plants and animals to their habitats</li> <li>-Understand limiting factors and predict their effects on an organism</li> <li>-Describe how the availability of resources affects organism in an ecosystem</li> </ul>
Identify Trees through a Dichotomous Key	3-8	Science, Technology & Engineering	<ul style="list-style-type: none"> <li>-Classify plants and animals based on characteristics</li> <li>-Compare and contrast major characteristics.</li> </ul>
My Munching Mouthparts	1-2 3-5	Science	<ul style="list-style-type: none"> <li>-Understand that insects can be categorized by the different type of mouthparts that they have</li> <li>-Mouthparts give us clues to what and how the insect eats</li> </ul>
Pretend Pollinators	1-2 3-5 & higher	Language Arts	<ul style="list-style-type: none"> <li>-Use knowledge of local pollinators including their role in the garden, habitat and eating habits to create an imaginary pollinator</li> <li>-Write a story about the creature</li> </ul>
Pollinator Needs: Who Needs Pollinators?	3-5 6-8	Science	<ul style="list-style-type: none"> <li>-Understand that habitats satisfy animal needs</li> <li>-People and animals (specifically pollinators) have similar basic needs including: shelter, food, water and warmth</li> <li>-Explore the garden and see how it meets the habitat needs of pollinators</li> </ul>

# Safety Note: Please Read

This information is generally given to those who work in nurseries or are avid gardeners and horticulturalists. This is being distributed as a courtesy so that caution is used to prevent an uncommon infection. Plants, seedlings, sphagnum moss, hay, soil, along with most organic matter, may carry a fungus known as “Sporotrix Shenkii” which could cause an infection called “Sporotrichosis.”

Sporotrichosis is a fungus borne infection that is **relatively easy to prevent** and **easy to treat if caught in the early stage of development**. It may be found in sphagnum moss, soil, humus, organic fertilizer, mushrooms, hay, bark, wood, flowers, leaf litter, pine needles, sawdust, seedlings, and even cacti.

The fungus, or its spores, invades the skin through puncture wounds or small cuts, cracks or nicks in the skin. It is also believed that the spores can become airborne, creating a risk of infection by inhaling the spores (this is even rarer). When infected with the fungus it causes small lesions on the skin that may resemble a pimple in the early stage. However, the lesions do not respond to normal treatment and are often misdiagnosed as other infections such as staph. If you have a minor infection that is not responding to treatment, you should see a doctor and inform him/her that you have been handling seedlings and may have come in contact with a fungus which can cause the disease known as Sporotrichosis.

## PREVENTION

- Everyone working with seedlings should protect their hands and arms by wearing protective gloves and long sleeves.
- Use an antibacterial soap to wash hands and other exposed areas of the body often (Be sure to wash at each break and definitely when finished working with the seedlings for the day.)
- All scrapes, cuts or puncture wounds should be thoroughly cleaned and treated with a disinfectant such as Tincture of Iodine, then bandaged and kept clean.
- If working in a small or enclosed area with many seedlings and particulate organic matter, it is recommended that a dust mask be worn.

**If you do develop any infections that do not respond to normal treatment, be sure to see a doctor and insist on being tested for fungus infections which may be associated with the handling of seedlings or other nursery products.**

# Seedling Care and Planting Directions

## Transporting Your Seedlings

- Protect your seedlings from the drying effects of the wind by transporting them in a covered vehicle or by covering them with light-colored tarp.
- Park in the shade to avoid excessive heat and drying.
- Unload your seedlings and move to a cool area as soon as possible.

## Storing Your Seedlings

Seedlings should be planted immediately after receiving, however should storage be necessary

- Open bundle and insure roots are moist (not soaking wet). If dry, add water to the roots only.
- Store at 35 - 40° F for up to two weeks.
- Store in a basement or other cool enclosed area at no more than 50° F for up to one week.

## Site Preparation

Reducing competition from existing vegetation for 1 - 2 years after planting is essential to your seedling growth and

- Heavy Sod or dense weed growth** ⇒ Plow down sod, scalp sod with a mattock or spade, and/or apply herbicides according to label instructions.
- Crowding or overtopping vegetation** ⇒ Mechanical removal such as hand- or chain-saws and/or apply herbicides according to label instructions.

## Planting Method

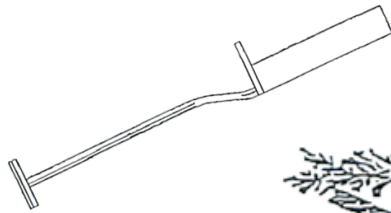
- Planting bar** ⇒ Preferred by experienced planters because of its speed and efficiency. Harder to assure a proper planting depth. Must be especially careful not to leave air pockets around the roots. Works in any soil type.
- Posthole digger or auger** ⇒ Works in sandy or loose soils. Can prevent crowded roots. Easier to plant large-rooted hardwood seedlings. Should not be used in heavy or clay soils because of the tendency to get a “pot-bound” effect.
- Shovel or spade** ⇒ Slower, but easier to assure proper planting depth

## Most Importantly...

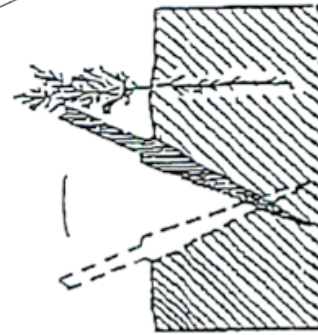
- ◆ Do not expose the roots of the seedlings to the sun, wind or air...Dry roots can be fatal!
- ◆ While planting, keep the roots moist in a bucket or bag with a wetted medium such as sphagnum moss, planting gels/crystals or even shredded paper.
- ◆ Do not completely cover your seedlings in water

**See illustrations on the next page for helpful planting tips.**

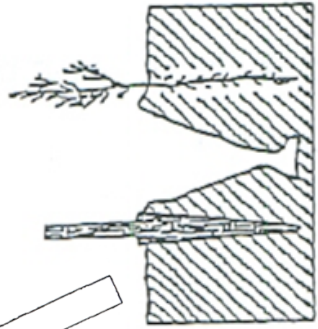
## USING A PLANTING (DIBBLE) BAR



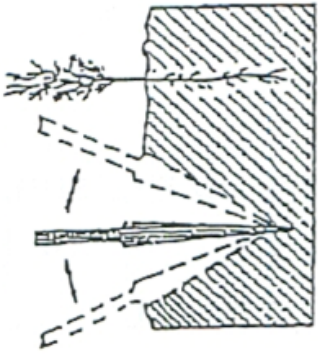
Insert bar at shallow angle and push forward to upright position.



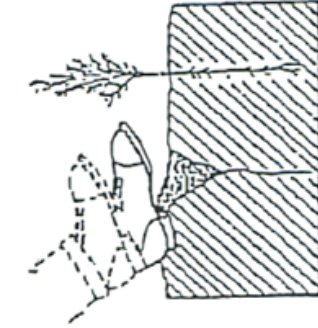
Remove bar and place seedling at correct depth.



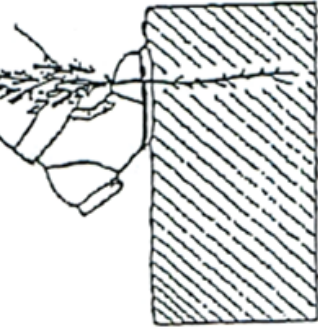
Insert bar between yourself and seedling (about 2 inches from initial hole).



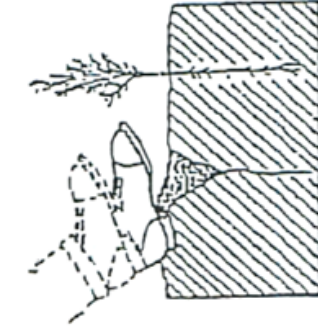
Pull handle toward yourself to push soil against the roots of the seedling.



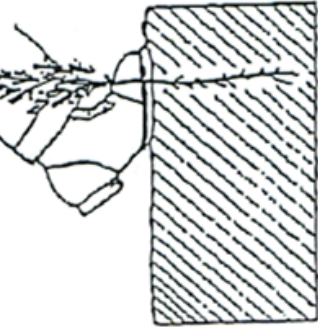
Push handle toward seedling to firm the soil at the top of roots.



Use your heel to push soil into the last hole.

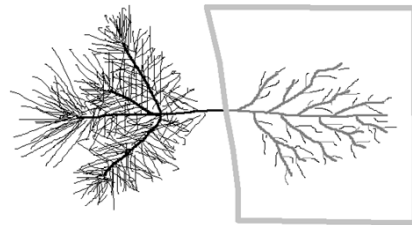


Firm soil around seedling with your foot.

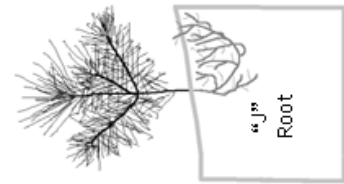


## HOW TO CORRECTLY PLACE YOUR SEEDLINGS

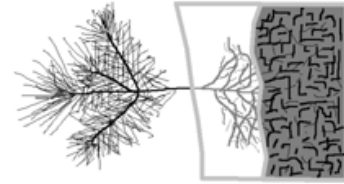
Seedlings should be placed in the ground at the same depth at which it grew in the nursery.



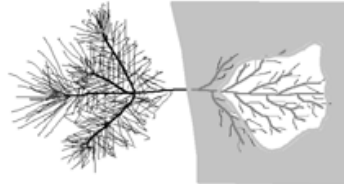
This depth can be determined by the change to a lighter colored bark where the stem was below ground or by a swelling or "root collar".



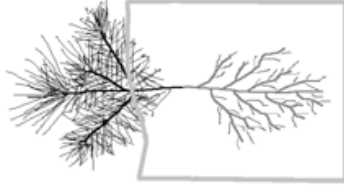
Upturned Roots!



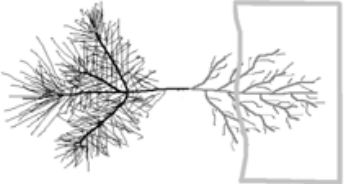
Shallow Bedrock!



Air Pocket!



Too Deep!



Too Shallow!

## COMMON PLANTING MISTAKES

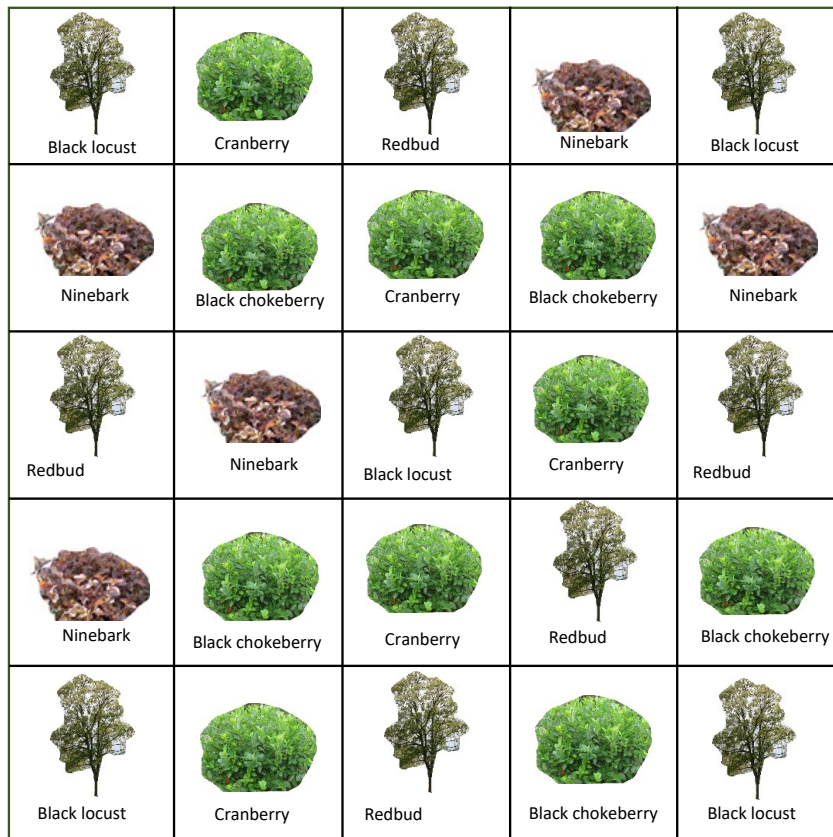
# Pollinator Garden Design Example

First, use the chart below to learn the site preferences of your seedlings before planting:

Species	Site Preferences		Mature Height (feet)	Description
	Shade Tolerance	Soil Moisture		
<b>SHRUBS</b>				
Black Chokeberry ( <i>Aronia melocarpa</i> )			3 - 6	Best growth and fruit production is on low, moist, well-drained sites. Not drought tolerant. Single white flowers in May become purple-black berries relished by birds in the fall.
Ninebark ( <i>Physocarpus opulifolius</i> )			10	Named for its bark which peels in thin strips. Flowers excellent nectar source, fruits eaten by many species of birds. Found on moist soils in thickets, along streams in sand or gravel bars, and on rocky slopes and bluffs. Attractive clusters of fluffy white flowers in early summer.
Am Highbush Cranberry ( <i>Viburnum trilobum</i> )			6 - 12	Medium to large, multi-stemmed shrub with oblong red berry-like drupes which persist through late winter and serve as winter survival food for many birds. Considered rare in Pennsylvania. Excellent for riparian plantings.
<b>TREES</b>				
Redbud ( <i>Cercis canadensis</i> )			15 - 25	A small tree blooming in early spring. Pink to reddish purple flowers. Moist, rich, sandy, well-drained & clay soils. Northern bobwhite quail eat the seeds and use the tree for shelter and nesting.
Black Locust ( <i>Robinia pseudacacia</i> )			60 - 75	Native hardwood with thorns and white fragrant flowers in June that attract bees. Tolerates and improves poor, sterile and dry soils by root nodules with nitrogen fixing bacteria.

## Pollinator Garden Design

Minimally we suggest 5 foot spacing between each of your seedlings to give them enough space to grow and be observed. Planting your seedlings with 5 feet between them will require a 25 foot by 25 foot area. The design below is one suggestion. Black locust trees are in the corners and middle because they will grow tallest and need the most room.





# Activity: Can This Animal Live Here?

Grades: 2-5

Subjects: Science, language arts

Skills: evaluation, recording

Vocabulary: habitat, evaluation

**Objectives:** Students will 1) evaluate a habitat 2) determine if a specific species can live in that habitat 3) make recommendations to improve the habitat

**Method:** Students will become biologists and evaluate a habitat to determine the suitability of the habitat for a specific species.

**Materials:** Habitat Evaluation Sheets, pencils, and clipboard

**Background:** All animals need food, water, shelter, and space to survive. Animals meet these needs in their habitat. Each animal species has its own specific requirements for food, water, shelter and space. A squirrel eats nuts and lives in and around trees, robins also need trees, but prefer earthworms for food. The food, water, shelter and space requirements must all be found in an arrangement that is suited to the species. For example, an eagle may fly many miles to find food, but a rabbit must find food in a relatively small area.

## Procedure:

1. Go over the basic needs of animals. Explain that the class will now be teams of wildlife biologists who must determine if a specific species could live in their schoolyard.
2. Divide students into teams of 2-4 then give each team a Habitat Evaluation Sheet.
3. Take students outside and have them evaluate the schoolyard for their assigned animals. Ask them to answer the questions on the sheet.
4. Make a large chart to summarize the findings of the students. Which animals can live in the schoolyard, which cannot. Which animals actually live in their schoolyard? Are there any animals that could live there with some habitat improvements?
5. Discuss what students could do to help the wildlife that does live in the schoolyard and what they could do to attract other wildlife to the schoolyard.

## Evaluation:

\*Students explain why or why not the schoolyard is a good habitat for specific wildlife species.

\*Students make a display of wildlife species that lives in their schoolyard and how they meet their needs.

## Extension:

- Students conduct a habitat inventory of their schoolyard.
- Students conduct a wildfire inventory of their schoolyard.
- Students research other wildlife that might live in their schoolyard.
- Students develop and implement a plan to improve their schoolyard for wildlife.

# Habitat Evaluation Worksheet for Can This Animal Live Here?

Name (s) \_\_\_\_\_ Date \_\_\_\_\_

---

Today's Weather \_\_\_\_\_ Temperature \_\_\_\_\_

**Directions:** You are a team of biologists. You have been assigned an animal. Your task is to determine if this habitat is suitable for your animal.

**Instructions:**

1. **Read** about your animal.
2. **Complete** PART 1
3. **Examine** the habitat in your area and complete PART 2.

***PART 1: Animal Information***

Animal species name: \_\_\_\_\_

Describe your animal:

What is your animal's habitat? *(what type of habitat does it live in?)*

\_\_\_\_\_

**Basic needs of your animal:** complete the following

**A. Water:** Where do you think your animal gets water to drink?

\_\_\_\_\_

**B. Food:** What does your animal eat? \_\_\_\_\_

\_\_\_\_\_

**C. Shelter:** Where does your animal take shelter?

\_\_\_\_\_

**D. Space:** How much space does your animal need to survive? A lot of space to find all of its needs or just a small amount of space?

\_\_\_\_\_

**PART 2: Habitat Information.**

**Describe the habitat of your site (what does your site look like):**

**1. Is there food for your animal on this site? \_\_\_\_\_**

a. If yes, list some examples:

b. Where would be the best places for your animal to find this food?

**2. Are there places for your animal to take shelter? \_\_\_\_\_**

If yes, list some examples:

**3. Are there places for your animal to make a nest or raise their young? \_\_\_\_\_**

If yes, list an example:

**4. Can your animal find water on or near your site? \_\_\_\_\_**

If yes, where?

**5. Is there enough space for your animal on this site? \_\_\_\_\_ Please explain.**

**PART 3: Evaluate the Habitat.**

**6. Could your animal live in this site? \_\_\_\_\_**

Why or why not?

**7. Do you think your animal lives on this site? \_\_\_\_\_**

a. Why or why not?

b. If you do not know, how could you find out?

**8. Are there ways to improve this site for your animal?**

a. If yes, give some examples.

# Activity: Habitat Evaluation For Wildlife

**Grades:** 5-9

**Subjects:** Biology, Environmental Science, English

**Vocabulary:** habitat, evaluation

**Skills:** observation, evaluation, recording, conclusions

**Environment and Ecology Standards:** 4.6.7A, C Demonstrate the dependency of organisms on the non-living environment; Explain how a change in an ecosystem that relates to humans.

**Objectives:** Students will 1) evaluate a habitat 2) determine if a specific species can live in that habitat 3) make recommendations to improve the habitat

**Method:** Students will *become* biologists and evaluate a habitat to determine the suitability of the habitat for a specific wildlife species.

**Materials:** Habitat Evaluation Sheets, pencils, Pennsylvania Game Commission Wildlife Notes., plant and animal ID materials, clipboard

**Background:** All animals need food, water, shelter, and space to survive. Animals meet these needs in their habitat. Each animal species has its own specific requirements for food, water, shelter and space. A squirrel eats nuts and lives in and around trees, robins also need trees, but prefer earthworms for food. The food, water, shelter and space requirements must all be found in an arrangement that is suited to the species. For example, an eagle may fly many miles to find food, but a rabbit must find food in a relatively small area.

## Procedure:

1. Go over the basic needs of animals. Explain that the class will now be teams of wildlife biologists who must determine if a specific species could live in their schoolyard or assigned area.
2. Divide students into teams of 2-4. Assign each team a specific wildlife species to research. Students should obtain basic information about the animal- natural history, food, shelter, space and water requirements and other information pertinent to the species. Species can found at the Pennsylvania Game Commission website [www.pgc.state.pa.us](http://www.pgc.state.pa.us) click on wildlife then wildlife notes.
3. Take students outside and assign them an area to evaluate. Student should then complete the first section of the Habitat Evaluation Form, recording their names, the location, date and type of habitat. Give students time to look for wildlife in the area and identify plants found in the area.
4. Next, have each team complete the sections regarding their assigned wildlife species based on the information they compiled in their research.
5. Then, have each team evaluate the area as wildlife habitat based on the needs of their assigned animals. Does the area provide the needed habitat for their wildlife species?

6. Have students complete the Human Interactions and Management sections of the Habitat Evaluation Form.

7. Make a large chart to summarize the findings of the students. Which animals can live in the area , which cannot. Which animals actually live in their area. Are there any animals that could live there with some habitat improvements?

8. Discuss what students could do to help the wildlife that does live in the area and what they could do to attract other species wildlife to the area.

**Evaluation:**

\*Students complete worksheet and explain why or why not the schoolyard or other assigned area is a good habitat for specific wildlife species.

**Extension:**

- Students conduct a land-use inventory of their schoolyard and explain how this affects wildlife on their site.
- Students conduct a habitat inventory of their schoolyard explain how this affects wildlife on their site.
- Students conduct a wildlife inventory of their schoolyard.
- Students research other wildlife that might live in their schoolyard.
- Students develop and implement a plan to improve their schoolyard for wildlife.
- Students make a video or slide show about the wildlife species that lives in their schoolyard. How species meet their needs should be included.

*Developed by T. Alberici, Information and Education, Pennsylvania Game Commission*

# Habitat Evaluation Worksheet for Habitat Evaluation for Wildlife

Name(s) \_\_\_\_\_ Date \_\_\_\_\_

Location: \_\_\_\_\_

*You will be assigned a species of wildlife. Once you are assigned an animal, please read about your species and complete the Habitat Evaluation for your species as directed by your teacher.*

## **Part 1: Natural History**– Record the information about your species in the space provided.

**Wildlife Species:** \_\_\_\_\_

**Description of animal:**

**Specific needs of animal:**

Food:

Water:

Space:

Shelter (all types-nesting, wintering, storage, resting, protection)

Other:

## **Part 2: Habitat Description**– Briefly describe your assigned habitat area.

**Habitat type:** (circle all applicable)

Mixed Forest

Lake

Urban

Deciduous Forest

River

Suburban

Agricultural field

Pond

Rural

Mixed field/shrub

Stream

Mixed field/shrub/some trees

Wetland

Shrub

Park

Shrub with some trees

Houses, many trees, mowed lawn

Schoolyard

Houses, few trees and little lawn

Neighborhood

Buildings, scattering of trees, little or no lawn

Business Area

Buildings, lots of mowed lawn, some trees

**Briefly describe habitat:**

**Major vegetation:**

**Wildlife known to be on site:**

**Food:** Does this site provide food for this animal? \_\_\_\_\_

If yes, list foods found on site:

Are foods limited to one or more seasons? \_\_\_\_\_ Which seasons? \_\_\_\_\_



**Part 3: Evaluate the suitability of this habitat for your species.**

**Food:** Does this site provide food for this animal? \_\_\_\_\_

If yes, list foods found on site:

Are foods limited to one or more seasons? \_\_\_\_\_ Which seasons? \_\_\_\_\_

**Shelter:** Animals require different types of shelter. Place an "x" next to those shelter types your animal requires, then decide if this site meets the needs for the animal. If yes, list possible places where the animal may find this shelter on your site.

Shelter Type	Needed by Animal?	Found on Site?	Locations (be specific)
Breeding/nesting/ Nursery			
Roosting/Resting			
Hibernating			
Protection			
Other:			

**Water:** Does this site provide adequate water? \_\_\_\_\_

If yes, list sources:

**Space:** Does this site provide adequate space? \_\_\_\_\_ Explain

**Part 4 People and the Environment**– Answer the following questions.

1. Are there many activities by people on this site:

If yes, list

2. Are these activities compatible with this animal inhabiting this site? \_\_\_\_\_

Explain:

3. Could this habitat be easily managed to attract your species or to encourage your species to inhabit the area? If no, explain why not. If yes, explain why and give examples of what can be done. Use additional paper to explain your answer.

# Pennsylvania Game Commission Wildlife Notes

## NORTHERN LEOPARD FROG

**HABITAT:** The Northern leopard frog lives in small ponds, damp fields and wetlands.

**FOOD:** frog eats insects, spider, worms, grasshopper and snails.



**HABITAT:** The Eastern Bluebird lives in grassy fields, farms, parks, schoolyards & neighborhoods. They need large grassy areas to hunt for food. They nest in holes in trees, fence posts and nest boxes.

**FOOD:** Bluebirds eat insects such as ants, caterpillars and grasshoppers. Sometimes they eat holly berries, dogwood berries and other berries.

## EASTERN BLUEBIRD



## RACCOON



**HABITAT:** Raccoons live by lakes, streams, ponds and wetlands as well as towns, cities, parks and neighborhoods. Most raccoons have a home den site in a hollow of a large tree or in an old groundhog hole. They travel a mile or more to search for food.

**FOOD:** Raccoons eat many different kinds of food including grapes, raspberries, corn, grasshoppers, beetles, frogs and eggs. They also get into trash cans searching for scraps like apple cores and chicken.

## GREY SQUIRREL



**HABITAT:** Gray squirrels live in towns, parks, forests and neighborhoods; any place where there are large trees that produce nuts. Gray squirrels den in holes in trees. They also will make large nests of leaves high in trees for shelter. They prefer deciduous trees (trees that lose their leaves in the winter)

**FOOD:** Gray squirrels eat many different foods but especially nuts. Acorns, walnuts, hickory nuts and pine seeds are their favorites.

**HABITAT:** Minks live around streams, wetlands, ponds, lakes, rivers and near forests. Minks take cover in hollow logs, muskrat lodges and in rock piles.

**FOOD:** Minks are predators, they hunt and eat other animals. One of their favorites animals to eat is the muskrat. They also eat rabbits, mice, fish, frogs, crayfish and snakes.

## MINK





## BLACK SWALLOWTAIL BUTTERFLY

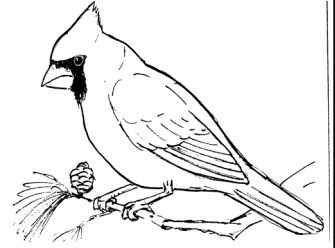
**HABITAT:** Black swallowtail butterflies live in fields, backyards and gardens. They live in sunny places with low wind where there are flowers for nectar and plants for their caterpillars.

**FOOD:** Black swallowtail butterflies eat the nectar from flowers such as butterfly weed, butterfly bush, coneflowers, black-eyed Susan, Joe-Pye weed, and zinnias. The caterpillar feeds on parsley.

**HABITAT:** Cardinals live in open woods, brush areas, parks, school-yards and backyards. They build their nests in shrubs and trees. The nest is usually located less than 10 feet from the ground.

**FOOD:** The main foods of cardinals are seeds, fruits and berries. They eat the seeds from many different flowers as well as the berries from dogwood and other trees and bushes. At bird feeders, cardinals eat many different seeds, especially sunflower seeds.

## CARDINAL



## AMERICAN ROBIN



**HABITAT:** The American Robin lives in many different habitats including towns, farms, backyards, parks and the edges of forests. The robin builds a nest in a tree or shrub usually where two strong branches come together. The nest can be 3 feet to 40 feet from the ground.

**FOOD:** Robins eat earthworms, grasshoppers, caterpillars and other insects. Robins eat some fruits: grapes, poison ivy & dogwood berries and mulberry.

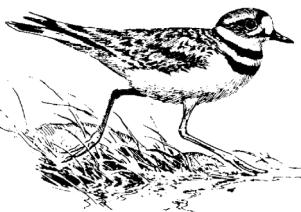


## LITTLE BROWN BAT

**HABITAT:** In the winter, little brown bats hibernate in tunnels, mine shafts, caves and houses. From spring to fall, female bats form nursery colonies in attics, barns, bat boxes and other dark, warm places. Nurseries are where the females raise their young. The nurseries can be small, with just several bats or large with over 1000 bats living together. When the females are in the nursery the adult males remain alone, roosting in hollow trees, under loose boards or shingles and in rock crevices.

**FOOD:** Little brown bats eat many different kinds of flying insects such as, moths, beetles, flies and mosquitoes. A little brown bat can eat around 1000 mosquitoes in one night.

## KILLDEER



**HABITAT:** Killdeer live in grassy fields, wet meadows, along lake shores and often live in schoolyards or in business areas where there are lots of grassy areas. They do not really build a nest, instead they scratch the ground a bit and lay their spotted eggs. They will even lay eggs among pebble borders or in the gravel often found on the roofs of school and business buildings.

**FOOD:** Killdeer will search the ground for food. Most of their diet is made up of insects, but they will eat spiders, snails and earthworms.



# Activity: Tree Identification Using Leaves and a Dichotomous Key

## Introduction:



Trees are important for wildlife, people and the environment. Trees provide food and shelter for wildlife and a multitude of resources and benefits for people. Trees are a renewable source of lumber, paper, nuts and chemicals and provide shade, oxygen, protection from winter winds and filtering of pollution. In short, trees are pretty terrific.

Pennsylvania is considered a tree state with 108 native tree species and many others from Europe and Asia. Identifying the different tree species can seem a daunting task but with a bit of practice, repetition and use of tree guides and dichotomous keys, tree identification can be within anyone's reach.

Trees can be identified in many different ways. Bark, shape of tree, twig arrangement, fruits, leaves and even smell all provide clues to the species of tree. One of the simplest methods to identify trees is by using the leaves. Of course, since we have deciduous and evergreen trees, leaf identification is only good in the seasons that all trees have their leaves. In addition, the arrangement of leaves on the tree is important, so it is helpful to have more than 1 leaf for use in the identification.

In this activity students will be introduced to tree identification using a dichotomous key. Cards are supplied with drawings of leaves and sketches indicating the arrangement of leaves on a branch. All cards have trees found in this key.



**Using a dichotomous key:** A dichotomous key is often used by biologists to identify various species. There are dichotomous keys for bats, mammals, insects, etc. **A dichotomous key contains a series of steps where the biologists** or any interested person **must make choices that guide them to a decision.** Since "dichotomous" means divide into 2 parts, the biologist is given 2 choices for each step. The choice leads to additional steps and so on until a final answer is achieved. An incorrect choice in the beginning of the key can lead to an incorrect answer or no answer at all.

Keep in mind that a dichotomous key is limited to those species for which the key is designed. If the key is for trees of Asia or trees of Michigan, chances are they will not work for the species in our state. Keys are typically not all inclusive, therefore it is possible that you may have a tree species not covered by the key— even if the key is for trees of PA.



# A Dichotomous Key for Tree ID



## Leaves

*Leaf placement on branch is needed to ID some species*

	If the tree has	Go to
<b>1a.</b>	Leaves needle or scale-like	2
<b>1b.</b>	Leaves broad and flat	12
<b>2a.</b>	Leaves scale-like	3
<b>2b.</b>	Leaves needles	4
<b>3a.</b>	Scales pointed, twigs not flat	red cedar
<b>3b.</b>	Scales blunt, twigs flat	white cedar
<b>4a.</b>	Needles (leaves) single on twigs	5
<b>4b.</b>	Needles (leaves) in bundles, tufts or rosettes	7
<b>5a.</b>	Needles flat, blunt	6
<b>5b.</b>	Needles four-side and sharp-pointed	spruce
<b>6a.</b>	Needles with small stalks (attaches needle to twig)	hemlock
<b>6b.</b>	Needles without stalks	fir
<b>7a.</b>	Needles in bundles with sheaths at base	8
<b>7b.</b>	Needles in tufts or rosettes	larch
<b>8a.</b>	Needles in bundles of 5	white pine
<b>8b.</b>	Needles not in bundles of 5	9
<b>9a.</b>	Needles in bundles of 3	pitch pine
<b>9b.</b>	Needles in bundles of 2	10
<b>10a.</b>	Needles about 4 inches long	11
<b>10b.</b>	Needles 1.5– 3 inches long	Virginia Pine
<b>11a.</b>	Needles sharp-pointed and flexible	Austrian pine
<b>11b.</b>	Needles stiff, snap apart when bent	red pine
<b>12a.</b>	Leaves opposite or whorled on stem	13
<b>12b.</b>	Leaves alternate on stem	18
<b>13a.</b>	Leaves opposite on stem	14
<b>13b.</b>	Leaves whorled on stem	catalpa
<b>14a.</b>	Leaves simple	15
<b>14b.</b>	Leaves compound (leaf made up of leaflets)	16

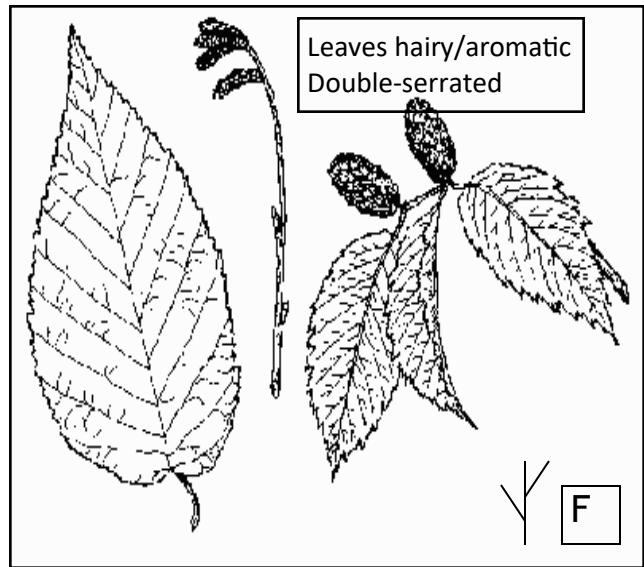
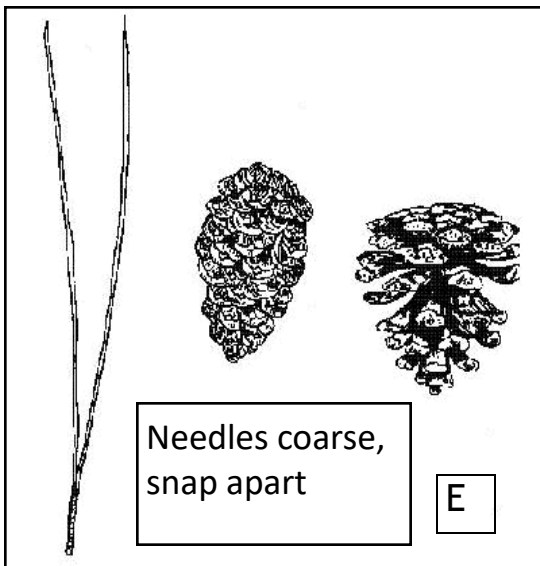
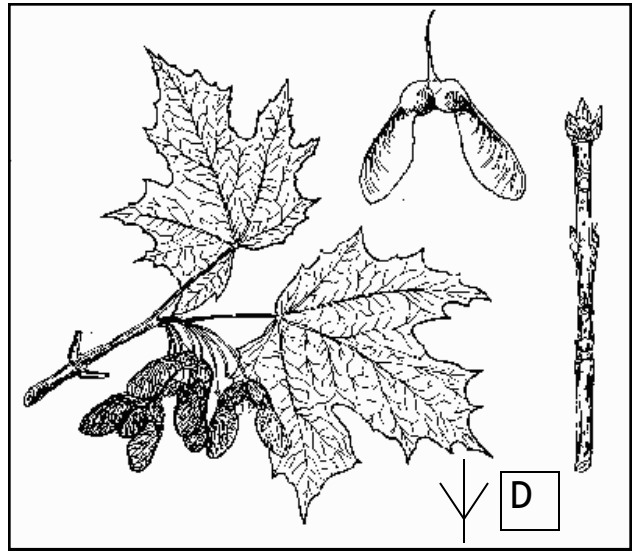
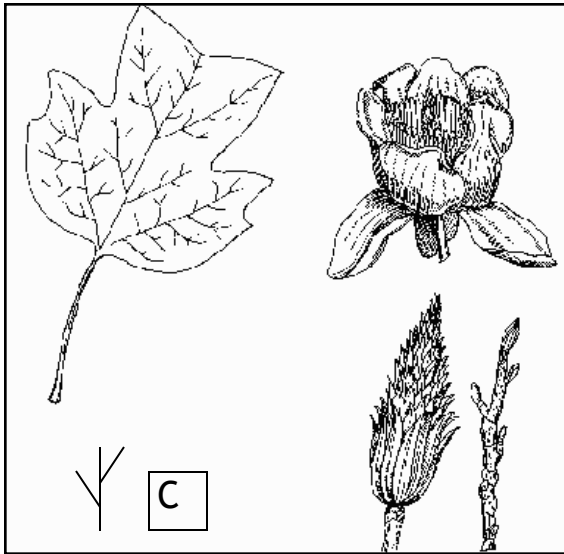
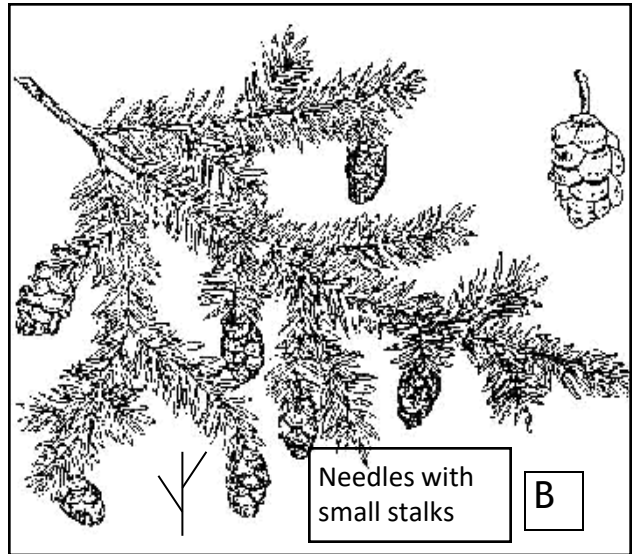
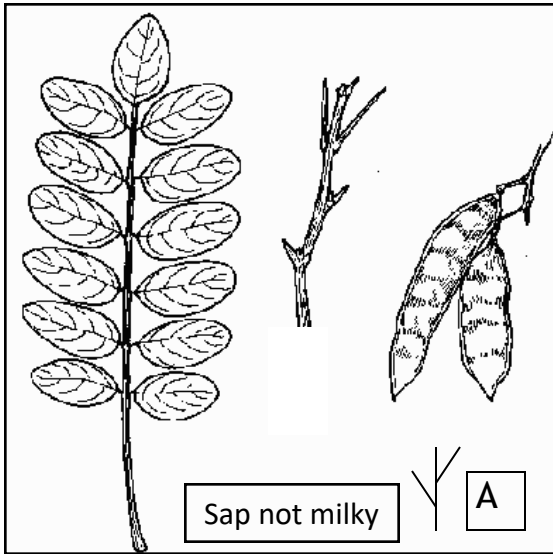
If the tree has		Go to
<b>15a.</b>	Margins entire	dogwood
<b>15b.</b>	Margins lobed	maples
<b>16a.</b>	Pinnately-compound	17
<b>16b.</b>	Palmately-compound	horse chestnut
<b>17a</b>	Leaf divided into 3 to 5 leaflets	box-elder
<b>17b.</b>	Leaf divided into 7 leaflets	ash
<b>18a</b>	Leaves simple	19
<b>18b.</b>	Leaves compound (leaf-made up of leaflets)	40
<b>19a.</b>	Margins entire	20
<b>19b.</b>	Margins deeply cut, lobed, or toothed	22
<b>20a.</b>	Leaf base heart-shaped	redbud
<b>20b.</b>	Leaf base tapering	21
<b>21a.</b>	Leaves 2 to 5 inches long, leathery	black gum
<b>21b.</b>	Leaves 5 to 10 inches long, thin	cucumber
<b>22a.</b>	Margins deeply cut or lobed	23
<b>22b.</b>	Margins coarsely or finely toothed	29
<b>23a.</b>	Leaves with five deeply cut lobes, star-shaped leaf	sweet gum
<b>23b.</b>	Leaves not star-shaped	24
<b>24a.</b>	Leaves fairly square or notched at top	tulip poplar
<b>24b.</b>	Leaves not square or notched	25
<b>25a.</b>	Leaves from the <u>same tree</u> may be entire, or have 1 or 2 lobes, aromatic, smooth edges	sassafras
<b>25b.</b>	Leaves can be entire or lobed ; edges may be smooth or serrated	26
<b>26a.</b>	Leaf veins pinnate or palmate, leaf can be entire or have irregular lobes	27
<b>26b.</b>	Leaf veins pinnate, leaf has regular, deeply cut lobes, more than 2 lobes.	28
<b>27a.</b>	Leaf veins pinnate or palmate, leaf can be entire or possible to have 1, 3, or 5 irregular lobes with serrated edges; leaves are bluish green	mulberry spp.
<b>27b.</b>	Leaf veins palmate, leaf has 3-5 major lobes, lobes are irregular; coarsely toothed; leaves are yellowish-green	sycamore
<b>28a.</b>	Lobes rounded	white oak group
<b>28b.</b>	Lobes sharp-pointed with hair-like bristles on end of each lobe	red oak group

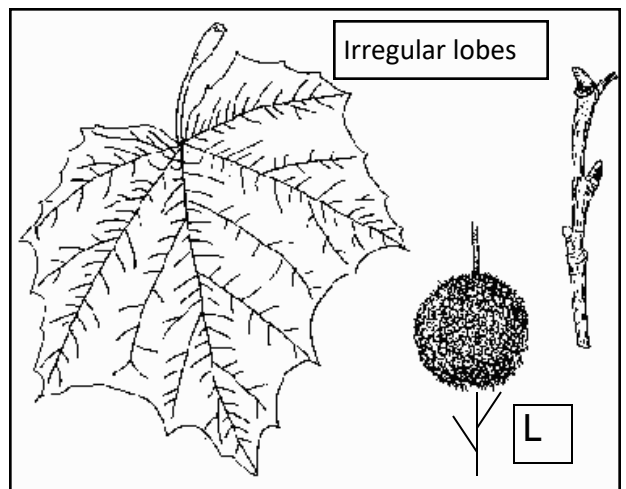
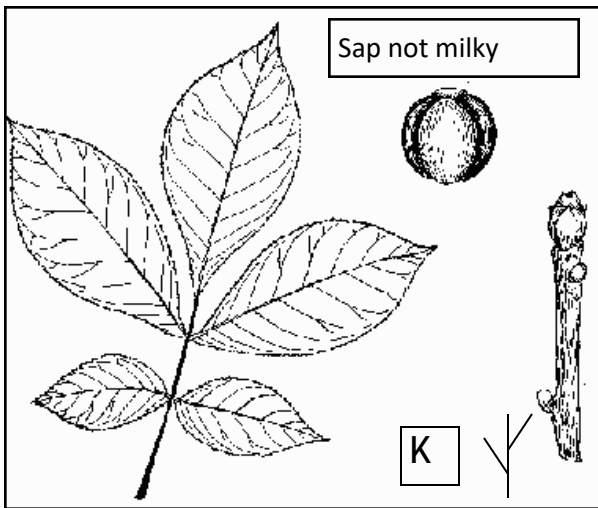
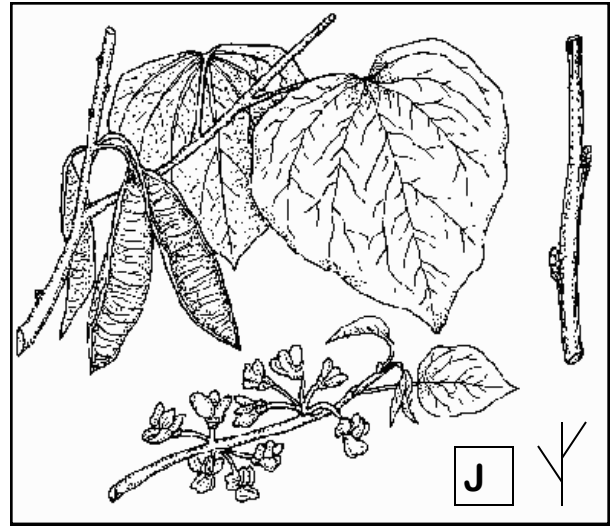
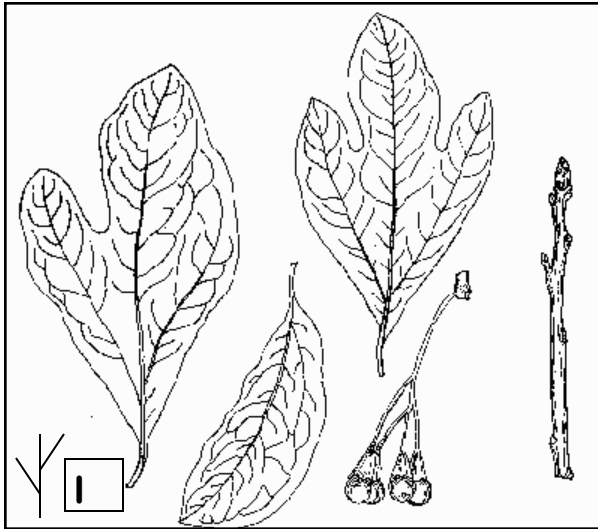
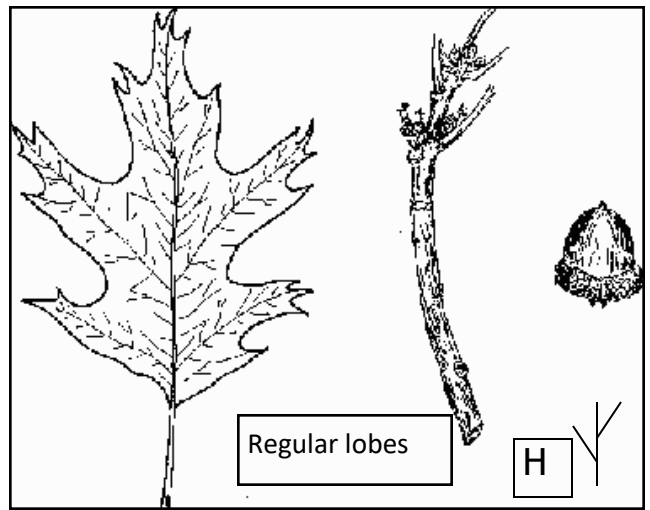
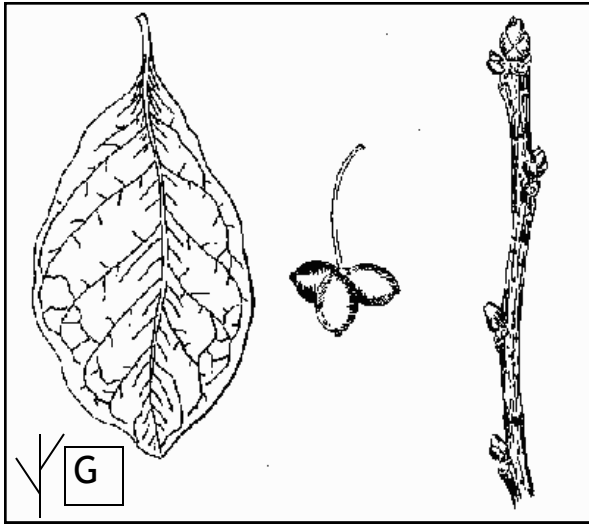


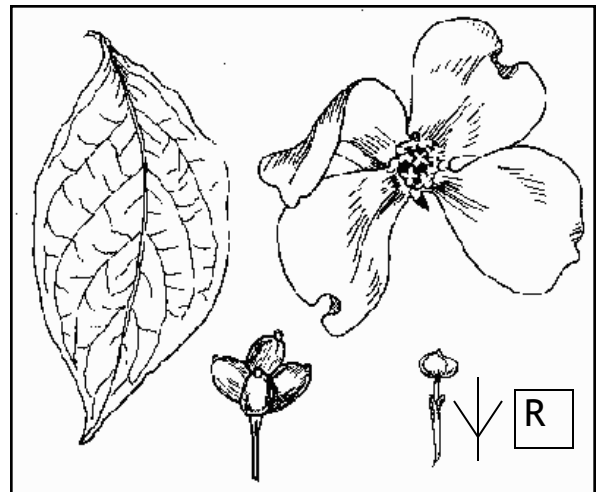
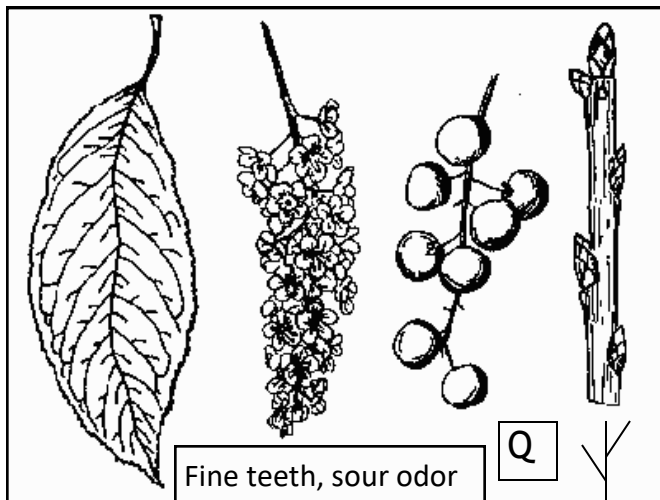
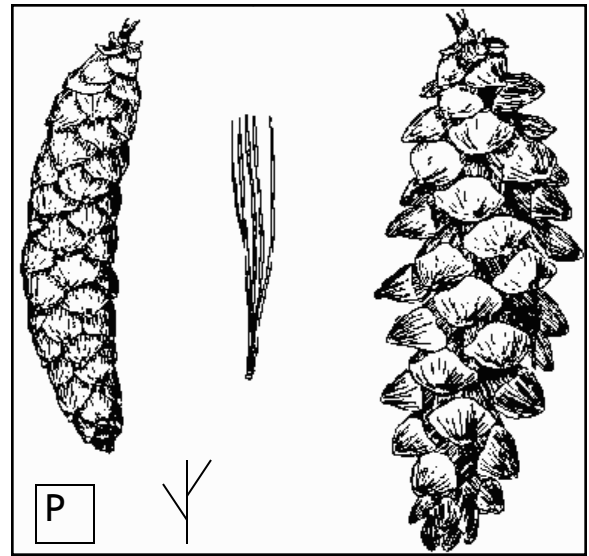
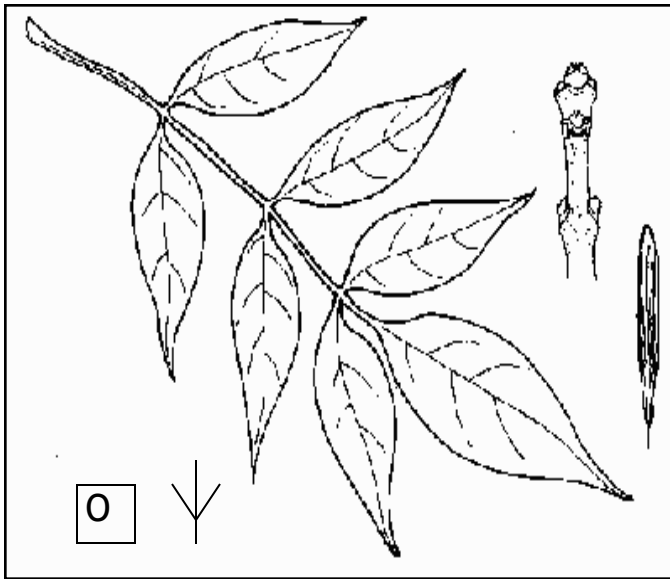
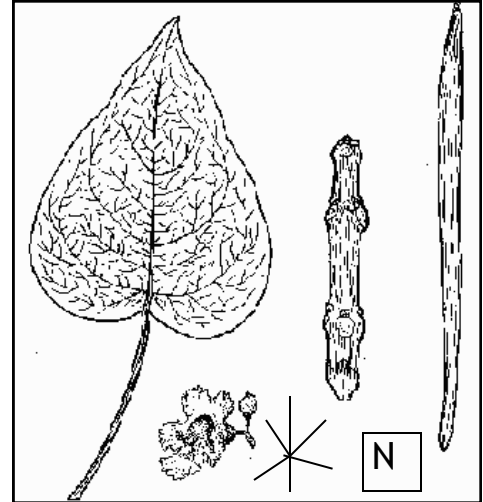
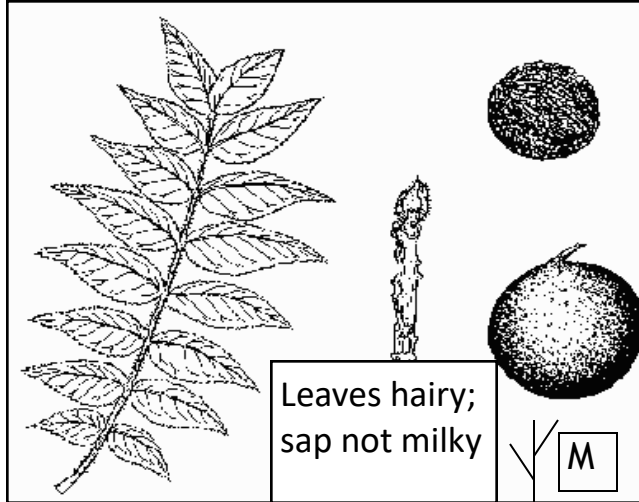
	If the tree has	Go to
<b>29a.</b>	Teeth coarse, one at end of each lateral vein	30
<b>29b.</b>	Teeth fine, several for each main lateral vein	31
<b>30a.</b>	Leaves slender, 3 times as long as broad (wide)	chestnut
<b>30b.</b>	Leave not more than 2 times as long as broad (wide)	beech
<b>31a.</b>	Leaves very narrow, 4 or 5 times as long as broad (wide)	willow
<b>31b.</b>	Leaves broad	32
<b>32a.</b>	Leaves not over 1.5 times as long as broad	34
<b>32b.</b>	Leaves about twice as long as broad	33
<b>33a.</b>	Unequal heart-shaped leaf base, round stem	basswood
<b>33b.</b>	Leaf base not heart-shaped, sides equal at base, stem tends to be flattened	aspen
<b>34a.</b>	Leaves smooth, single serrate, fine teeth	35
<b>34b.</b>	Leaves rough or hairy	36
<b>35a.</b>	Leaf stalk with one or two glands (small bumps on stem); has a sour odor when twig is broken	cherry
<b>35b.</b>	Leaf stalk without glands	Juneberry (serviceberry)
<b>36a.</b>	Rough leaves	37
<b>36b.</b>	Soft, hairy leaves	38
<b>37a.</b>	Leaf margins double-serrate from base, pinnately veined	elm
<b>37b.</b>	Leaf margins single serrate from above base, tips long-pointed, pinnately-veined	hackberry
<b>38a.</b>	Leaf margins double-serrate, base blunt to slightly heart-shaped, some aromatic	birch
<b>38b.</b>	Leaf margins double-serrate, base tapered or rounded	39
<b>39a.</b>	Leaves nearly as broad as long	alder
<b>39b.</b>	Leaves narrow and pointed	hops hornbeam (ironwood)
<b>40a.</b>	Sap milky (in stems)	sumac
<b>40b.</b>	Sap not milky	41
<b>41a.</b>	Terminal leaflet usually larger than other leaflets	hickories
<b>41b.</b>	Terminal leaflet as larger or smaller than other-leaflets or it may be lacking	42

If the tree has		Go to
<b>42a.</b>	Leaflet rounded at tips	black locust
<b>42B.</b>	Leaflets pointed	43
<b>43a</b>	Leaves smooth	44
<b>43b.</b>	Leaves hairy	45
<b>44a.</b>	Leaves not over 7 inches long	mountain ash
<b>45a</b>	Terminal leaflet as large as other leaflets	butternut
<b>45b.</b>	Terminal leaflet small or lacking	black walnut

**End of this key**



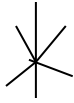






# Key to Names

<b>A</b>	Black Locust	<b>J</b>	Redbud
<b>B</b>	Eastern Hemlock	<b>K</b>	Shagbark Hickory
<b>C</b>	Tulip Tree	<b>L</b>	Sycamore
<b>D</b>	Sugar Maple	<b>M</b>	Black Walnut
<b>E</b>	Red Pine	<b>N</b>	Catalpa
<b>F</b>	Yellow Birch	<b>O</b>	Ash
<b>G</b>	Black Gum	<b>P</b>	Eastern White Pine
<b>H</b>	Red Oak	<b>Q</b>	Black Cherry
<b>I</b>	Common Sassafras	<b>R</b>	Flowering Dogwood

# Key to Symbols

	Leaves whorled around stem		Leaves alternate on stem
	Leaves opposite on stem		

## Glossary

### Leaves:

*Simple*— each leaf made up of a single leaf

*Compound*— leaf made up of several leaflets

*Pinnately compound*— leaflets arranged opposite one another

*Palmately compound*— leaflets come from 1 point and fan out

### Leaf Arrangement

*Alternate leaves*— arranges at intervals along twigs, not opposite

*Opposite leaves*— arranged opposite each other along a twig

*Whorled leaves*— arranged in circles around the twig.

### Veins

*Pinnately veined*— one major vein with smaller veins coming off a central vein

*Palmately veined*— several main veins coming from 1 location with smaller veins coming off each main vein

*Leaf entire*— no lobes or cuts in leaf; edge of leaf is smooth

*Lobed leaf*— leaf has deep indentations or cuts; can be rounded or sharp

*Serrations/toothed*— leaves has small indentations/jagged edges

*Sheath*— needles have a small, papery covering at the bottom

*Terminal Leaf*— leaflet on the end of a compound leaf

Simple leaf



Pinnately compound



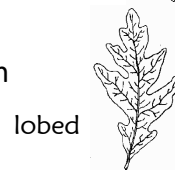
Palmately compound



Pinnately veined



Palmately veined



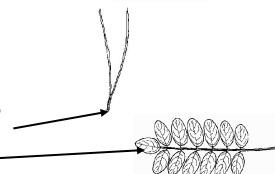
lobed



entire



serrated





## Pollinator Gardens Supplemental Curriculum: ESSENTIAL INFORMATION FOR TEACHERS

### Insect and Pollinator Information

ANATOMY *Insects* (including butterflies, flies, beetles, bees, dragonflies, ants, and many others) are characterized by six (6) **legs**, three (3) body parts [**HEAD, THORAX, and ABDOMEN**], a hard **EXOSKELETON** and **COMPOUND EYES**. Most insects have a pair of **ANTENNAE** and two (2) pairs of wings.

*Spiders* are NOT insects, but like insects and are **ARTHROPODS** (jointed legs, hard outer layer). They have eight (8) legs, compound eyes, an exoskeleton and two (2) body parts [**HEAD and CEPHALOTHORAX**]. Some spiders have **URTICATING HAIRS** which they will throw at a predator when attacked. This defense stings the predator's eyes and temporarily blinds it.

Insects grow by **MOLTING**, shedding their old exoskeleton and growing a new, larger one. When they have just molted, and before the new exoskeleton hardens, insect bodies are soft and vulnerable.

Insects also go through **COMPLETE METAMORPHOSIS**. Life cycle stages are **EGG, LARVA, PUPA** and **ADULT**. Butterflies, bees and beetles are insects whose larval forms are distinctly different from the adult form. Insects whose larval form resembles the adult go through **INCOMPLETE METAMORPHOSIS**. Crickets and cockroaches go through incomplete metamorphosis.

**BEHAVIOR** Insects can be herbivorous or carnivorous. Some insects are pests to humans: mosquitoes feed on mammalian blood, aphids and scale insects infest our gardens and wasps produce a nasty sting.

But many more insects are incredibly beneficial to humans: bees, beetles and butterflies pollinate our gardens and crops, making possible such foods as chocolate, honey, nuts and most fruits; some insects are decomposers, helping to breakdown dead material; and other insects, like ladybugs and praying mantis, feed on pest insects. Even mosquitoes and many other insects are food for other animals.

Flowers have adapted various attributes (**color, scent, shape, size**) to attract certain pollinators such as bees, butterflies and hummingbirds. These pollinators sip sweet **nectar** from the flower, collect **pollen** and carry this pollen to the next flower of the same species (or in some cases, the pollinator moves the pollen within the same flower), thus fertilizing the flower.

### Vocabulary

- **Adapt** – To grow and change in response to environmental conditions.
- **Adaptation** – Special body features or behaviors that help a creature survive in its environment.
- **Biodiversity** – The diverse variety of life forms: the different plants, animals and micro-organisms; and the Eco-systems they form. Usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.
- **Carnivores or Secondary Consumers** – These animals don't eat plants, but feed on animals that do eat plants.

- **Decomposer** – An animal that breaks down dead or decomposing plant materials, thus recycling important nutrients and returning them to the environment.
- **Ecosystem** – A dynamic system of plant, animal and micro-organism communities and non-living components interacting as an ecological unit.
- **Endangered** – Animal or plant species in danger of extinction throughout all or a significant portion of their range due to one or more causes, including loss of habitat, over-exploitation, competition or disease.
- **Environment** – The complex web of inter-relationships between living organisms and non-living components, which sustain all life on earth.
- **Fauna** – All of the animals found in a given area.
- **Flora** – All of the plants found in a given area.
- **Food Web** – A group of interlinked food chains. In addition to herbivores, omnivores and carnivores, the food web also contains scavengers and decomposers, so that no available source of energy is ever allowed to go to waste.
- **Habitat** – A place where an animal or plant lives which provides food, water, shelter and space for survival.
- **Herbivores or Primary Consumers** – Animals that eat primarily plants.
- **Metamorphosis** – The process of change from young to adult in which the young is very different from the adult.
- **Migration** – The seasonal, usually two-way and goal-oriented movement from one place or habitat to another to avoid unfavorable climatic conditions and/or to seek more favorable energetic conditions.
- **Native** – Indigenous to and dwelling within a specific area for an entire lifespan.
- **Nectar** – A sugary fluid produced by flowers to attract animal pollinators.
- **Petals** – Colorful flower parts that surround the floral reproductive structures.
- **Pistil** – The name for the collective female floral reproductive parts including the stigma, style and ovary.
- **Pollen** – A collective name for pollen grains. Pollen bears sperm for plant reproduction.
- **Pollen Tube** – Tube formed after germination of the pollen grain. It carries the male reproductive information to the ovule.
- **Pollinated** – The condition of the flower in which the female parts of a flower have received pollen transferred from the male parts of the same flower, or another flower of the same species, resulting in the production of seeds and fruits.
- **Pollination** – The spreading of pollen from the male parts to the female parts of a flower of the same species, resulting in the production of seeds and fruits.
- **Pollinator** – An animal that carries pollen from the male parts of flowers to the female parts, fertilizing plant “eggs” with plant “sperm.”
- **Primary Producers** – All food chains begin in green plants (“primary producers”) with a process called photosynthesis. Energy from the sun lands on plants and is collected by chlorophyll. With this energy plants can then make sugar and oxygen, food for other animals.
- **Seed** – The part of the fruit of a plant which is capable of growing (germinating) and producing a new plant.
- **Stamen** – The name for the collective male floral reproductive parts, including the anthers and filaments.
- **Threatened** – Species, subspecies or varieties likely to become endangered within the foreseeable future throughout all or a significant portion of their range, without special protection and management efforts.

## Pollinator Gardening Supplemental Curriculum: Science

Level: 3rd-5th and higher grades

### MY MUNCHING MOUTHPART



**Objective:** *Students will understand that insects can be categorized by the different type of mouthparts that they have. The mouthpart gives us clues to what and how the insect eats.*

**Materials:** Photo of an ice cream cone, 5-6 paper plates, 5-6 straws (some of these should be cut in half so that they are ½ length, the others should be long enough to reach the bottom of the bottles), 3-4 small drink cups with lids (with slits for straws), 3- 4 long neck plastic bottles (a soda bottle will work), foods for the activity: peanut butter, crackers, honey or jelly, juice or water.

**Vocabulary to review:** Habitat, prey, predator, Mouthparts: chewing, sucking/piercing, lapping/ sponging.

**Procedure:**

1. Introduce the idea of **mouthparts** and how they help us eat.

-- What mouthparts do **people** have? Teeth and tongue.  
Hold up (a picture of) an ice cream cone. How would a person eat this? Lick the ice cream with your tongue. Bite and chew the ice cream and cone. Suck the melted ice cream from the bottom of the cone. Are there other ways you could eat ice cream? Suck it up through a straw (milk shake).

**Question:** What mouthparts do **insects** have?

**CA Science Content Standards: (1st, 2nd)** Life Sciences 2a-d [plants and animals meet their needs in different ways, inhabit different environments and have different physical features to help them thrive],

**(3rd, 4th)** Life Sciences a,c,d (3rd) and 2a-c & 3a-d (4th) [adaptations in structure improve chance for survival, plants are an important part of most food chains, plants and animals have different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other, there are many beneficial microorganisms].

**Answer:** It depends on the insect. The type of mouthpart an insect has helps determine what the insect eats. Insects specialize on certain types of food. There are 3 major categories of insect mouthparts: **chewing, sucking/piercing** and **lapping**.

2. Activity: Practice and explore with insect mouthparts.

Set out a table with “insect foods.”

**Food A:** Juice in small cups with lids.

**Food B:** A small amount of juice in the soda bottles.

**Food C:** Paper plate with a little bit of honey or jelly on it.

**Food D:** Paper plate with a little peanut butter holding a couple of crackers up on edge.

Assign students to one of 4 groups of insects. Each insect group will get one “insect mouthpart” to try to eat their food. They will have to determine which of the foods they will be capable of eating, and eat only that food. Insects and “Mouthparts” are:

Group A: **Bee** (sucking/piercing): Allowed only to use **straws (1/2 length)**

Group B: **Butterfly** (sucking): Allowed only to use **straws (long)**

Group C: **Fly** (lapping): Allowed only to use **tongue**

Group D: **Caterpillar** (Chewing): Allowed only to use **teeth**.

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## Pollinator Gardening Supplemental Curriculum: Science

Level: 3rd-5th and higher grades

### MY MUNCHING MOUTHPART (continued)

Once the group has its mouthparts, they should put their hands/arms behind their backs and go for the food!

Ask the groups questions to promote concepts:

*Fly, can you chew leaves? Butterfly, can you lick flowers? Caterpillar, can you drink juice from the cup? Bee, can you chew?*

#### 3. Discuss.

-- What other insects can you think of with each type of mouthpart? [Students may mention mosquito, spider (piercing); ant, grasshopper, cockroach (chewing).]

-- Talk about why it is important to have different mouthparts:  
Insects eat different things.

Different mouthparts allow different insects to *specialize* on different parts of plants, or different parts of the same plant. (ie. One flowering bush may have butterflies sucking nectar from the flowers, bees sucking nectar and collecting pollen, aphids piercing the leaves to get the sweet juice inside, and a caterpillar or beetle chewing on the leaves)

Some insects are good for the garden, while others are bad and cause damage to the plants. These are called *pests*. We need to be sure to have plants in the garden that provide food for insects that are good.

Some of these “beneficial” insects eat pest insects. Ladybugs, spiders, praying mantis and lacewing are all good for the garden because they eat pests.

**CA Science Content Standards: (1st, 2nd)** Life Sciences 2a-d [plants and animals meet their needs in different ways, inhabit different environments and have different physical features to help them thrive],

**(3rd, 4th)** Life Sciences a,c,d (3rd) and 2a-c & 3a-d (4th) [adaptations in structure improve chance for survival, plants are an important part of most food chains, plants and animals have different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other, there are many beneficial microorganisms].

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## Pollinator Gardening Supplemental Curriculum: Language Arts

Level: 1st/2nd , 3rd-5th and higher



### Pretend Pollinators

**Objective:** *Students will use knowledge of local pollinators including: their role in the garden, habitat and eating habits, to create an imaginary pollinator. Students will write a story about the*

**Materials:** A copy of activity sheet “my Pollinator.”  
Optional: images of various pollinators and pollinated plants.

**Vocabulary to review:** pollinator vocabulary: insect, flower, pollen, nectar, fertilize, mouthpart, seed, petal.

#### **Procedure:**

Review what students have learned about pollinators and their role in a healthy garden. Review what students know about physical attributes of actual pollinators. You may want to look at images of pollinators, paying attention to: shape of body, wings, legs, mouthparts; size; and color. Also review what students know about pollinated plants, where their pollen and nectar are found, and their shape and color.

Students should then design their own pretend pollinator. The teacher should give students criteria by which to design. Students should write answers to the following questions:

- What does your pollinator eat?
- How does it eat?
- What colors is it attracted to?
- How big is it?
- What special body features does it have?
- Where does it live?
- What are its predators?

Students should draw and color their pollinator. **Younger students** may answer these questions on the “My Pollinator” page. **Older students** can use these questions as a base for a short essay about their pretend pollinator.

**CA Language Arts Content Standards 1st/2nd :** Reading 1.0 (sight words, fluency); Writing 1.0 (focused writing, group ideas, use descriptive words); Language Conventions 1.0 (use complete sentences).

**CA Language Arts Content Standards 3rd-5th :** Writing 1.0-1.1 (write clearly and coherently to develop a central idea, using supporting details); [4th] 1.7 (use reference materials); 2.0-2.2 (Write descriptive narratives)

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

### My Pollinator

I am \_\_\_\_\_'s pollinator.

My name is \_\_\_\_\_.

I am a \_\_\_\_\_.

I eat \_\_\_\_\_ and \_\_\_\_\_.

I live in \_\_\_\_\_.

I can \_\_\_\_\_ and \_\_\_\_\_.

I help the garden because \_\_\_\_\_

\_\_\_\_\_.

I like to \_\_\_\_\_

\_\_\_\_\_.

## Pollinator Gardening Supplemental Curriculum: Science

Level: 3rd-5th , 6th-8th and higher



### POLLINATOR NEEDS: WHO NEEDS POLLINATORS?

**Objective:** *Students will understand that habitats satisfy plant and animal needs. People and animals (specifically pollinators) have similar basic needs, including: shelter, food, water and warmth. Students will explore the garden to see how it is meeting the habitat needs of pollinators.*

**Location:** Start inside, move into the garden

**Materials:** large dry erase board/ poster paper with markers, access to a building with roof, door, windows, water, kitchen, (optional: snacks)

**Vocabulary and ideas to review:** Habitat, Needs v. Wants (how are these similar? different?), pollinator, flower, nectar, pollen, fertilization, flower parts (petal, stamen, pistil), ecosystem

#### **Procedure:**

1. *Discuss Needs.*

-- Ask: What are things that people NEED to survive?

[hint: Direct students to go beyond "I want a video game."]. Start a list on the board.

--Things people NEED to live should fit into these categories:

**1. Shelter/protection-** a place to live, doors, clothes-to protect us from weather;

**2. Food;**

**3. Water;**

**4. Warmth-**sunshine and light.

Write these and students' ideas on the board.

-- How about animals? What do they NEED to survive? Probably some of the same things that people need!

Create a third list on a separate sheet of paper. Be sure to emphasize **Shelter, Food, Water** and **Warmth**.

*A good habitat provides for all of these NEEDS for its inhabitants.*

-- What animals live in the garden?

Introduce/review the idea that many animals here are pollinators.

2. *Explore the garden.* Students should search for specific ways in which the garden satisfies the NEEDS of pollinators.

-- Students should be given a list of questions to explore/answer in the garden. Think about the NEEDS of pollinators. How does this garden meet those needs:

-Do you see any pollinators? If not, where do you think they are?

-Is there water nearby?

-Where could pollinators hide? Is it safe here? What would make it safer for pollinators?

-What can they eat here?

-How does the garden provide for warmth?

-Is there sun?

- Students may sketch what they find, or take notes.

**CA Science Content Standards: (3rd, 4th)** Life Sciences a,c,d (3rd) and 2a-c & 3a-c (4th)

[adaptations in structure improve chance for survival: different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other], Earth Sciences 4 [the sun changes position throughout the day]

**(6th-8th)** Life Sciences and Ecology [organisms exchange nutrients within ecosystems, evolution, structure of plants and animals are complementary]

*Pollinator Gardening is a program of the non-profit Pollinator Partnership, a catalyst for biodiversity stewardship.*

## **Pollinator Gardening Supplemental Curriculum: Science**

**Level:** 3rd-5th , 6th-8th and higher

### **POLLINATOR NEEDS: WHO NEEDS POLLINATORS? (continued)**

3. *Bring ideas back to the group.* Discuss.  
Compare findings and ideas.

*Emphasize that pollinators are important to the garden so we must be sure to create a habitat that serves the needs of these creatures, so that they will continue to help the garden to flourish.*

4. *Tie pollinators into people's needs.*

-- Pollinators are important to people because they help us meet our need of food.

-- We need pollinators in order to pollinate flowers and grow foods like chocolate, oranges, bananas, apples and nuts.

-- Have a pollinator-inspired snack (fruit, peanut butter, nuts, juice, etc). The garden provides not only the pollinators with a good habitat, but helps people as well!

**Extension 1:** [Language Arts] Have students come up with ideas of how to better serve the needs of pollinators. How could they attract more pollinators to the garden? What could they provide? Change? Draw or write about their ideas.

**Extension 2:** [Science] Students visit another habitat and explore to find out how IT satisfies the needs of its inhabitants. How is this different from the school garden? What different inhabitants does it attract? Different pollinators?

**CA Science Content Standards: (3rd, 4th)** Life Sciences a,c,d (3rd) and 2a-c & 3a-c (4th)

[adaptations in structure improve chance for survival: different structures, organisms can change their environment which has effects on other organisms, ecosystems have living and non-living parts, animals and plants are dependent upon each other], Earth Sciences 4 [the sun changes position throughout the day]

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# Pennsylvania Game Commission Offices

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P.O. BOX 31, FRANKLIN, PA 16323  
PHONE: 814-432-3187

## SOUTHWEST REGION

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## SOUTHCENTRAL REGION

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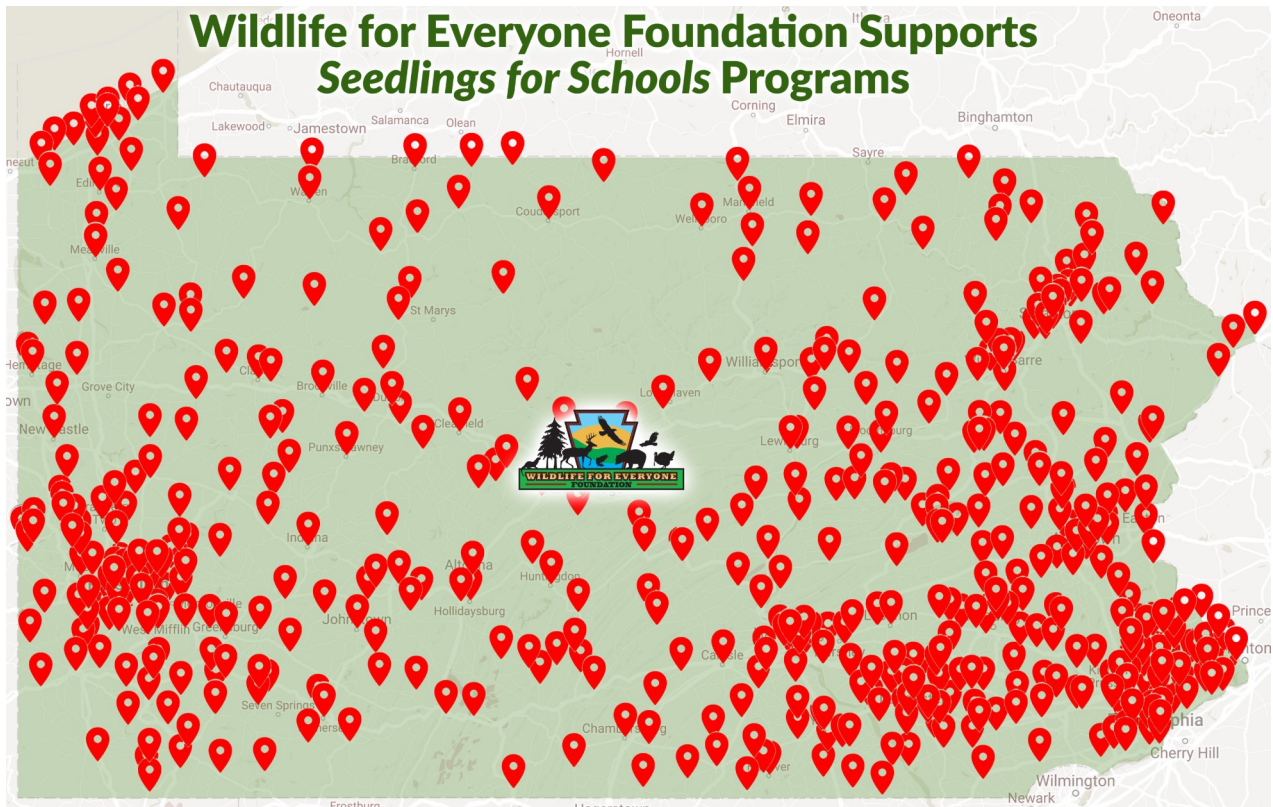
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Your State Wildlife Agency

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## Pennsylvania Game Commission

### Programs, Resources and Workshops for Teachers and Students

WWW.PGC.STATE.PA.US

The Pennsylvania Game Commission is the state agency responsible for conserving and managing the wild birds and mammals of our state. In carrying out this mission, the Game Commission provides a variety of services such as, enforcing wildlife laws; managing lands for wildlife; providing wildlife education programs for educators, youth and adults; conducting hunter education classes; conducting wildlife research; working with farmers and other land owners to benefit wildlife and cooperating with other agencies and wildlife organizations. Education is a key component of conserving and managing wildlife. Through a variety of programs, workshops and materials, the Commission is committed to providing educational opportunities to all Pennsylvanians.

**CLASSROOM PROGRAMS** - Wildlife Education Supervisors/Specialists and Wildlife Conservation Officers conduct classroom and club programs for youth of all ages. Programs cover a wide range of wildlife topics and are developed to directly correlate to classroom curriculum or club programming. Examples of programs include: adaptation, wildlife and their habitats, predator/prey relationships, ecosystems, endangered species, bluebirds, songbirds, white-tailed deer, habitat improvements, and wildlife management.

**EDUCATOR WORKSHOPS**- The Commission sponsors *Project WILD* and *Pennsylvania Songbirds*. Project WILD is a national hands-on interdisciplinary curriculum supplement about wildlife and habitat. Pennsylvania Songbirds is a Pennsylvania-based curriculum supplement about songbirds and their environment. Topic and species oriented workshops are also offered. These vary by region and by year. Examples of workshops include: Endangered Species, Neotropical Migratory Birds, Peregrine Falcon, WILD about ELK, Black Bears Habitat Improvement on School Grounds, Biodiversity, WILD about Bats, and WILD about Deer.

**WILD ACTION GRANTS**: Each year mini-grants are awarded to schools and youth organizations for habitat improvement projects on school and community grounds.

**AUDIO-VISUAL RESOURCES**: Each region has a selection of videos, films and slide programs for loan to schools, organizations and groups. These resources vary and cover a wide variety of topics .

**RESOURCES**- There are many free and "cost" publications available. Publications include:

\**Pennsylvania Game News* is a monthly magazine providing current information about wildlife, conservation and management. A free subscription is provided to all school libraries on request.

\* *Wildlife Notes* is a series of pamphlets providing in-depth natural history of Pennsylvania mammals and birds. These are available free of charge and can be obtained in quantity. A shipping fee may be required for large quantities.

\**Pamphlets* on a wide variety of topics are available free of charge. There may be a shipping fee for large quantities. Examples include, but are not limited to, 50 Birds and Mammals, Nesting Boxes, Bird Houses, What do Deer Eat?, Wings Out Your Window, Pheasant Recovery Project, The Hunter, Deer Diseases and Parasites and Some Plants are Poison.

\**Charts* depicting birds and mammals grouped by habitat are available in two sizes for a small charge.

\*Books for sale about Pennsylvania's wild birds and mammals.

\*Woodworking for Wildlife nesting box plans are available at [www.pgc.state.pa.us](http://www.pgc.state.pa.us). Nesting boxes are available for sale.

To view all items for sale, please visit the General Store on our web page

# POLLINATOR PARTNERSHIP

Here are some other ways to support pollinators!



## PLANT

Join the Million Pollinator Garden Challenge! Every human interface with a landscape can simply have areas reserved for the environment. When you plant for plants, pollinators, people, and the environment all benefit. Get involved and register your landscape by visiting [http://www.pollinator.org/mpgcmmap!](http://www.pollinator.org/mpgcmmap)



## JOIN

Join the Pollinator Action Team (P.A.T.), by giving us your email address you can learn about volunteer opportunities in your area, recent events, news and much more by visiting <http://www.pollinator.org/takeaction>.



## DOWNLOAD

BeeSmart™ Pollinator Gardener App- Plant a garden that butterflies, hummingbirds, and bees will love as much as you! Get your comprehensive guide to selecting plants for pollinators specific to your area. <http://pollinator.org/beesmartapp.htm>.



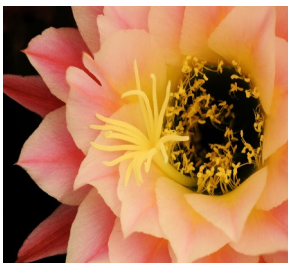
## PLAN

Pollinator Week is a week to get the importance of pollinators' message out to as many people as possible. It's not too early to start thinking about an event at your school, garden, church, etc. Visit <http://pollinator.org/pollinatorweek> for more information.



## DONATE

Bees and other pollinators are threatened, but with your support the Pollinator Partnership is finding ways to help them. Your support is what makes our work for pollinators possible (<http://pollinator.org/donate.htm>).



## LIKE

“Like” us on Facebook! Follow our tweets on Twitter! Subscribe to our videos on YouTube! Follow us on Instagram! Find all these links at the top of our homepage, [www.pollinator.org](http://www.pollinator.org).

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Educational materials are developed by the **Pennsylvania Game Commission's Wildlife Education Section** and **The Pollinator Partnership**, 423 Washington St., 5th Fl., San Francisco, CA, 94111; (415)377-9245 [info@pollinator.org](mailto:info@pollinator.org)

The **Seedlings for Schools** program is generously supported by:

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If you would also like to help support this program, please call or email the Wildlife for Everyone Foundation (814)238-8138 [info@wildlifeforeveryone.org](mailto:info@wildlifeforeveryone.org)