



**Duke Farms**  
Living Habitats

**Lesson Plan: Plant and Animal Relationships**

An Instructor-Guided Lesson for Students Grades 6-8

**NJCCS Addressed:**

6	Various human activities have changed the capacity of the environment to support some life forms.	5.3.6.C.1	Explain the impact of meeting human needs and wants on local and global environments.
6	The number of organisms and populations an ecosystem can support depends on the biotic resources available and on abiotic factors, such as quantities of light and water, range of temperatures, and soil composition.	5.3.6.C.2	Predict the impact that altering biotic and abiotic factors has on an ecosystem.
6	All organisms cause changes in the ecosystem in which they live. If this change reduces another organism's access to resources, that organism may move to another location or die.	5.3.6.C.3	Describe how one population of organisms may affect other plants and/or animals in an ecosystem.
8	Symbiotic interactions among organisms of different species can be classified as: <ul style="list-style-type: none"> <li>• Producer/consumer</li> <li>• Predator/prey</li> <li>• Parasite/host</li> <li>• Scavenger/prey</li> <li>• Decomposer/prey</li> </ul>	5.3.8.C.1	Model the effect of positive and negative changes in population size on a symbiotic pairing.

**Common Core Standards: English Language Arts:** SL.6.1 – 6.6; SL7.1-7.6, SL8.1-8.6

**Goal:** Students will be able to describe 4 different relationships that occur between plants and animals and generate hypotheses about plant and animal relationships.

**Objective:** Students will be able to define the following plant and plant/animal relationships: mutualism, commensalism, predation and parasitism and find examples in the field.

**Objective:** Students will be able to identify the impact of humans on these relationships.

**Objective:** Students will be able to identify the importance of habitats to ensure these plant/animal relationships.

**Objective:** Students will be able to look at environments around them and explain examples of plant relationships they see.

**Materials Needed:**

- Clipboards with pencil/pen attached
- Duke farms Eco-Kit (requires a \$250 refundable deposit) 1 per instructor, more if desired
- Plant Relationships Lesson Plan and Activity Sheets – 1 per student
- Duke Farms Map – Available at Front Desk in Orientation Center

**Duration:** 2.5 hours

**Distance traveled by foot:** Approximately 2.25 miles

**Vocabulary:**

Habitat, predation, mutualism, commensalism, pollination, parasitism, lichen, carnivorous, symbiotic, ecosystem, environment, acorn, squirrel

**Procedure:**

***Introduction:*** (5 minutes)

Assemble all students in the Farm Barn Orientation center. Here you can obtain an Eco-Kit and a Duke Farms Map. Please use this time to have the students use the restroom as facilities are limited once you head out into the field. Explain to the students that they are at Duke Farms, a property dedicated to protecting and creating habitats for native plants and animals. Review what a habitat is with your students. (A habitat is a home for animals.) Explain to the students that they will be going outside on a hike to view plant relationships. Ask them if they can guess what type of plant relationships they might see outside. If they are having trouble, ask them how plants function in the natural world. Why are they there? What do they do? Explain to them that plants are parts of the habitat. The health of a habitat determines the success of all species in that habitat. It is important that all parts of the habitat are there in order for the ecosystem and the environment to remain healthy and productive. We are going to go out and look for partnerships so we have a better understanding of the important role plants play in the environment and to consider what would happen if one of the partners is removed from the environment.

**Introduction Activity:** (15 minutes)

Have the students gather in front of the Ecosystems Services wall in the Education Area (What's the name of this?) Review the parts and importance of an ecosystem with the students by using the information contained on the rotating interpretative panels. Ask them if they can summarize how each part of an ecosystem is connected to the other.

Have the students move over to the Regenerating Habitats and Protecting Wildlife interpretative panels. Here you will find 3-sided panels that explain the relationship of animals and plants to their habitats. Have each student choose a panel and read each side. On one side of the panel the student will be asked to connect the plant or animal they are learning about with another plant or animal that can be found somewhere in the rest of the panels. After 5 minutes, have the students move to a panel that connects with what they were just reading about. In some cases more than one student will be at a panel. Have them repeat the process one more time. Ask the students to share with the group what their two related species were. Ask them to analyze what this activity exhibits in the way of interconnectedness of one species. Ask them to predict what would happen if one of their species was removed from the habitat.

Explain that they are now going to head outside for a hike (long walk through nature) to examine other plant relationships. Explain that they will be looking for animals and insects and in order to see them they must be quiet in the habitats.

Eco-Kit Review and Distribution (5 minutes)

1. Explain to the students that they will be looking for habitats around Duke Farms. They will be using some of the same tools that scientists use to look for habitats. Go through the Eco-Kit, telling the students the names of the tools and how they will be used out in the field. When the time comes in the field you may have to explain this again and guide the students in their use.
2. Explain to the Students that we are borrowing these kits, they do not belong to us and we must be very careful to make sure we bring them back exactly as we borrowed them.
3. Distribute the Eco-Kits. Ask the students to refrain from opening them until they get to their first stop on the hike.

**Activity:** (1.5 hours)

1. Depart the Farm Barn Orientation Center via the front doors and follow the gravel path to the right. You will pass a pavilion with a Green Roof on it on your left. Keep following the gravel walk to Habitat Lane. Bear right to follow Habitat Lane across Duke Parkway West. There is a button to press to indicate to cars that you will be crossing the road. Wait for the cars to stop before crossing. When you cross into the core of Duke Farms you will be on a paved road. Very close to the gate you just passed through there will be a set of boulder Stairs on your left. Have the group descend the stairs and gather in the wood-chipped area next to Duke's Brook. If the students are quiet they should be able to see turtles and hear frogs and birds. Here is a great place to talk about animal relationships. Ask them what a predator is. (A living organism that consumes another living organism) Ask who would be the predator in this brook. (turtle would eat insects, heron will eat fish, frogs eat insects) Ask them if they can think of any other animal relationships that happen in this habitat? What happens to the dead or dying animals? Who eats the turtle? Who eats the heron? Ask them to take a look at the plants around the pond. What

relationships do plants have to the animals they just named? What role do plants play in the lives of the animals?

2. Now that the students are thinking about the role plants play in an ecosystem, have them go back up the boulder steps and turn left to continue along Central Way and then bear left onto Habitat Lane, this is a gravel roadway. On the left will be Duke Brook and on the right is Hay Barn Meadow.
  - a. Walk a short ways along Habitat Lane and then stop to look at the meadow. Ask the students to describe what they see. They will see flowers and grasses and insects and birds flying around. Ask the students if they see any insects on the plants. Are the insects on the flowers or the stems? Ask the students why they think those insects are there? What are they doing? In the meadow you will find two types of plant relationships. The first students will probably notice is ***mutualism***. Mutualism is the relationship between two organisms in which each species receives a benefit from the relationship. ***Pollination*** is an example of mutualism. Ask the students why the insect is on the flower? What is the insect getting from the flower? (Nectar – food) What is the flower getting from the insect? (The insect is moving pollen from flower to flower that eventually fertilizes the ovary creating a seed, the insect is helping the plant to reproduce). When both species benefit – flower gets to reproduce and insect gets to eat – this is called mutualism. Can they find a couple more examples of mutualism in the meadow? Have them explain it to you. Ask them what would happen if one of the partners in this relationship disappeared (because the meadow was mowed into a lawn or the insect was killed by pesticides). Have them defend their answer.
  - b. Have the students walk a couple hundred yards further up Habitat Lane and then spread out along the meadow in the grass. Have them examine the leaves, stems and flowers of the plants. They must do this gently! They do not want to break the stems or leaves of the plants or disturb any animals they may find. Ask if they see any insects on the plants? Have them describe what they see. What is that insect doing there? What is the insect getting out of the plant? What is the plant getting out of the insect? Chances are the students will find aphids on the plants (if they are having trouble – have them be sure to check the bottoms of the leaves, that’s where insects pests like to hang out!). Aphids are piercing-sucking plant pests, sometimes called plant-lice. This is an example of ***parasitism***. Parasitism occurs when one species gains its nutrition at the expense of another species. In this case the aphid is a parasite on the milkweed. The aphid may eventually kill the milkweed. The milkweed receives no benefit at all from the aphid but the aphid gets nutrition from the milkweed. Ask the students to defend the importance of the aphid. What role does it play in the ecosystem? (food for other animals, milkweed population control) Have the students examine the meadow for other examples of parasitism and show them to you and justify their reasoning for believing it is parasitism. What would happen if one of the partners disappeared?
3. Once you are finished examining the meadow, continue along Habitat Lane to Woods Lane. Here you will make a right onto Wood Lane. Woods lane takes you through a forested area. This is a woodland habitat (this is the 3<sup>rd</sup> type of habitat you have visited – brook, meadow, and woodland). As you enter the woodland, ask the students to compare this habitat with the other two habitats. What is different (shade, large trees, shrubs)? What is the same? (plants, insects, birds) Now that the students have witnessed and examined 2 different types of plant

relationships, can they find any examples of those relationships in this habitat? (Parasitism – caterpillars on tree leaves, mutualism – squirrel and acorns). Another type of plant relationship is evident if you look at the trees in the forest. Look closely at the bark of the trees as you follow Woods Lane. Do you notice anything growing on the bark? (You should find blue-green splotches on the bark. This is lichen. Lichen is a symbiotic relationship between an algae and a fungus. The algae photosynthesize making food for the algae and the fungus while the fungus gathers moisture and offers protection for the algae. This relationship is mutualism. The tree provides support to the lichen, but the tree is neither helped nor harmed in this relationship, commensalism.) Ask the students what they think these splotches are. Ask what they think the tree gets from this relationship? What does the lichen get? Explain that there are some relationships in an ecosystem in which one partner benefits and the other partner does not benefit and is not harmed from the relationship. This type of relationship is called **commensalism**. Do they think there is anything that would eat the lichen? What type of relationship would that be? Do they think the lichen might provide shelter for another organism? What type of relationship would that be?

4. Once you have taken a close look at the woods, continue along Woods Lane to the wood chipped pathway on the right. (you should be able to see concrete steps in grass as you look up the path) Follow this pathway, which will take you in front of the Old Foundation and through the Great Meadow. Remind the students to keep an eye out for plant relationships as you walk along. Continue along this wood-chipped path making a right onto the Great Meadow Path. Very quickly you will come to a 'Y' in the path. Follow the trail to the left of the 'Y' which will take you to the Orchid Range. You will go through a small section of meadow, cross over a paved roadway (Central Way) and follow another gravel path to the Orchid Range which is a glass Conservatory. Before going in, explain to the students that they are entering a Conservatory. Ask them if this is a man-made or a natural habitat. (Man-Made) They will be visiting a replica of a South Eastern Coastal Plain Habitat. Be sure they now where the south east is (Florida, Louisiana, and that they know what a coastal plain is – along the Gulf of Mexico or Atlantic Ocean) Take them inside the Conservatory. You will find a garden area when you walk inside. This is the replica Southeast Coastal Plain. You will also find laminated cards that tell you what each of the plants is. Locate one of those and bring it with you as you walk around the display garden. Locate the carnivorous plant collection. Here you will find pitcher plants, sundews and Venus fly traps. These plants have evolved to eat insects because they live in nutrient poor soils. The soils do not provide the nutrient the plant needs to grow so they get these nutrients from insects they capture and digest. There are a few ways these plants capture their prey. They all attract their prey with sweet nectar the insect would like to eat. A pitcher plant lures the insects into the pitcher and downward pointing hairs keep the insect from being able to exit, enzymes digest the insect. Sundews trap the insect on sticky hairs and then the leaf folds over the insects and doesn't open up again until it is digested. A Venus flytrap traps the insect inside its leaves after the insect trips a couple of trigger hairs located inside the trap. Pitcher Plants and Sundews can be found in bogs throughout New Jersey. This type of plant relationship is called **predation**. This is when one species consumes another species. Can the students think of other Predation examples in nature? What is the benefit to the ecosystem of this type of Plant Relationship? What will happen to ecosystem if one of these partners is removed? These are all flowering plants. How does the plant get pollinated if the plant is eating all of the insects that come near it? The flowers of these plants are formed very high above the leaves so that insects are able to pollinate the plant without the potential for being digested! Once you have examined the carnivorous plants, take a walk into the tropical orchid display.

Though you may not see any of the plant relationships going on here, it is important to remember that plants like these grow in the wild somewhere in the world and are part of an ecosystem.

5. Once you have finished in the Orchid Range, go out the front door, bear left and follow the path to the paved road, Central Way. Make a left on Central Way. Follow Central Way to Railroad Way. Make a left on Railroad Way and then a Right on Research Path. Research Path will take you through a small amount of woods and a meadow. Have the students continue to look for examples of the 4 types of Plant relationships they have learned about so far. Also ask them what type of habitat they are in as they move through various types. At the statue of the Bull you will continue right and go past the Hay Barn which contains statues. Make a right on the path that goes through the Hay Barn, and then a left on Central Way. You will walk under an allee of trees (a row of trees on both sides) and will eventually end up back at the gate. The crossing guard will assist you in crossing Duke Parkway West. Return to the Farm Barn Orientation Center. As you walk back ask the students to look for more examples of each of these types of plant relationships. There is space on their activity sheet to write it down. (animals living in holes in trees, nests in trees, mammals with seeds, birds eating seeds of plants, vines growing on trees, caterpillars on leaves)

**Conclusion:**

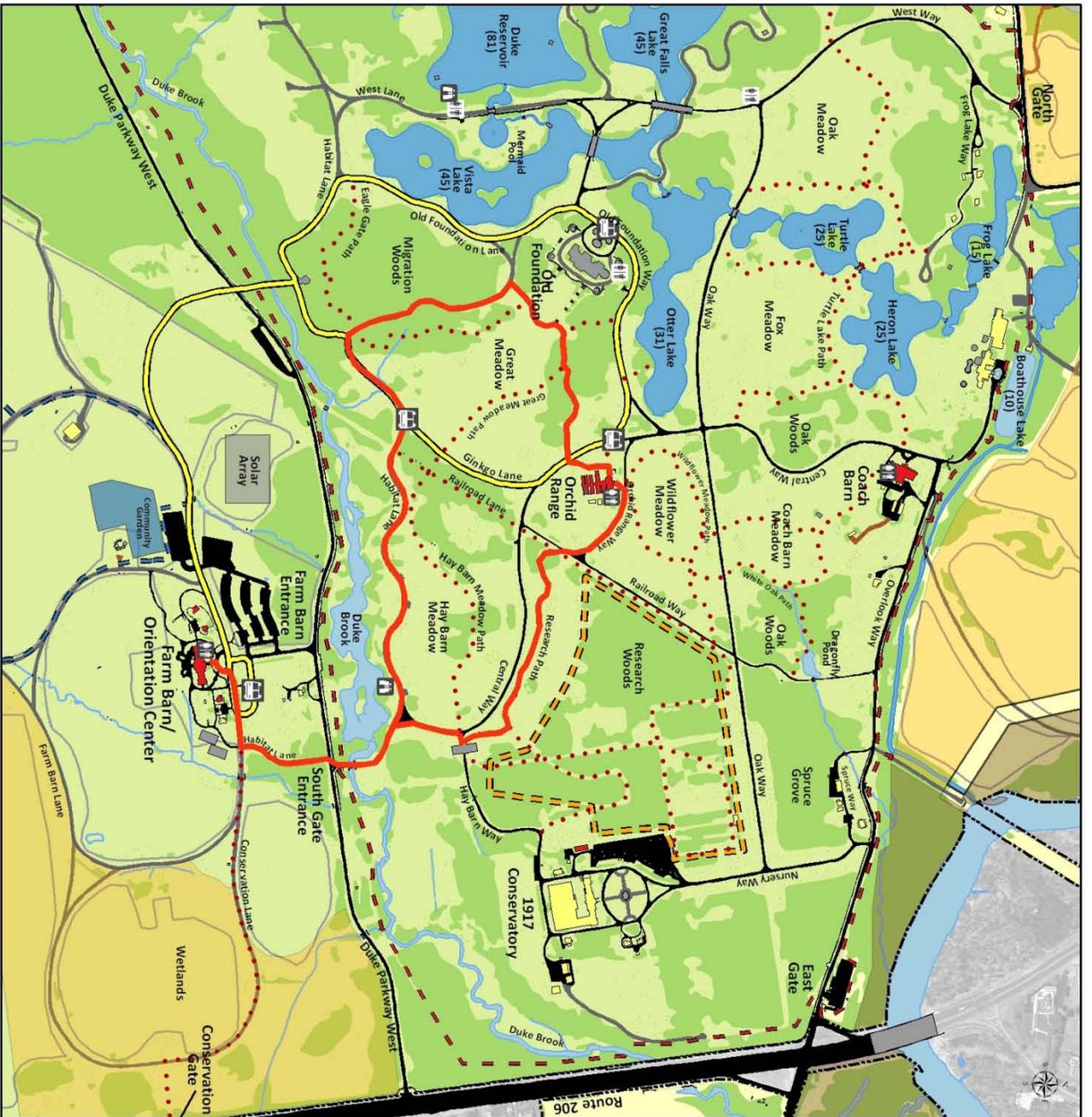
Review with the students what the various types of plant relationships are. Ask them if they found any other examples along the way that they would like to share with the class. Ask the class for a volunteer to summarize the inter-connectedness of plants and animals in the environment. Ask a student to explain what would happen if just one of the pieces of the relationship were missing. Ask the students what they are going to go home and tell their family about what they learned today.

**Do this at Home or at School:**

Students can take their family and friends on a hike and look for examples of each of these types of relationships in their backyard, schoolyard or local park. Students should explain each type to their family and friends.

**\*\*DISCLAIMER\*\***

Duke Farms serves as a habitat for native plants and animals. Care should be taken when exploring the grounds. Hazards such as open waterways, roadways with bicycles, poison ivy and stinging and biting insects are present on the property. Adults are responsible for the minors in their care. Precaution should be taken to avoid prolonged exposure to the sun as well as to biting and stinging insects. Participants should bring water with them. Participants should familiarize themselves with potential hazards and act accordingly. This is a carry-in, carry-out facility so all garbage created during your program should be taken back with you to your school.



# Plant & Animal Relationships

Grades: 6 - 8

-  Walk Route
-  Tram Loop
-  Tram Stops
-  Habitat Hides
-  Composting Toilets
-  Indoor Toilets

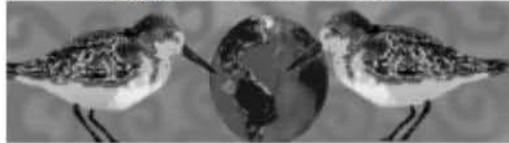
**Distance:**

2.25 Miles Roundtrip

**Route:**

- Front of Farm Barn to Pedestrian Entrance
- Continue on Habitat Lane along Duke Brook
- Right onto Woods Lane
- Right onto Great Meadow Path
- Left onto Orchard Range Path
- Right out of Orchard Range
- Right onto Railroad Way
- Left onto Research Path
- Right onto Hay Barn Way
- Left onto Central Way
- Left onto Habitat Lane to Return to the Farm Barn





# How to Use Binoculars

## Teacher

*This information is adapted from the Sister Shorebird Schools Arctic Nesting Curriculum.*

Usually, we must account for a difference in eye strength when using binoculars. Center-focusing binoculars have an adjustment to compensate for eyes of unequal strength or vision. You will notice that only one eyepiece is independently adjustable, and it has a scale marked off in diopters, the optical measuring unit for spherical power. Note that the individual eyepiece setting, once adjusted, can be considered permanent. The scale reading should be noted and checked occasionally as it may be accidentally moved by handling or in moments of excitement.

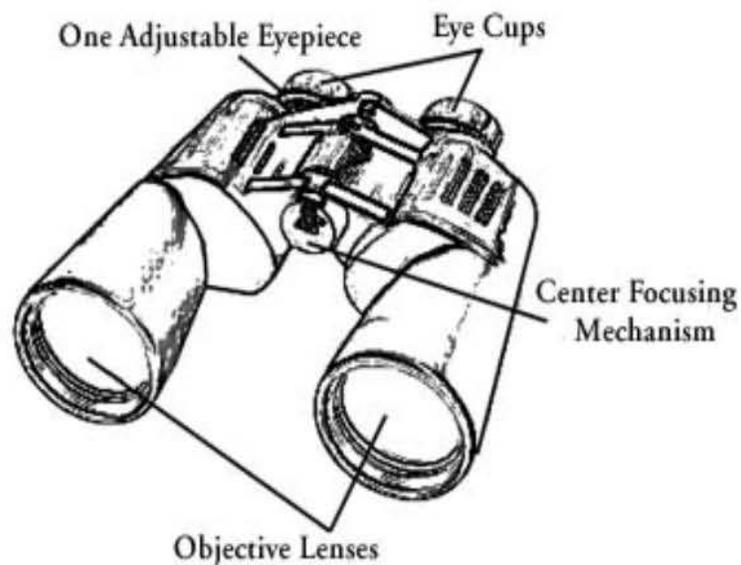
To adjust binoculars for any difference in the strength of your eyes, first, using the lens cover or your hand, cover the objective lens (the outer, big lens) which is on the same side as the adjustable eyepiece. With both eyes open to avoid distortion by squinting, look through the binoculars and, using the central focusing mechanism, focus on a distant object until it is sharp and clear. Now transfer the cover to the other objective lens. Again with both eyes open, but this time using the adjustable eyepiece, focus on the same object until it is clear.

Your binoculars are now properly focused for your use. Now, all you have to do is use the central focusing mechanism to focus for objects at various distances from you.

Focusing on moving objects and focusing quickly on something that is about to fly or move out of view are real challenges. If you practice, over time you will be surprised to find how your coordinated use of eyes and binoculars improves. Be patient and practice, practice, practice.

Another challenge is finding and focusing on objects in the sky. This is because the sky has depth, and there is not a background of objects (trees or horizon line) to use as reference points which both find your object and figure out what distance it is at.

Note that many binoculars have rubber eye cups which can fold down for use with glasses or sunglasses.



# Teaching a Student to Use a Compass

Begin by teaching children the four basic directions: north, east, south and west. An easy way to help children remember these is to use mnemonic device, such as "Never Eat Shredded Wheat" or "Never Eat Soggy Waffles." Show children how each letter in the phrase stands for a direction (the "n" in "never" represents "north"), and teach them that the order of the directions in the mnemonic device is the same as the rotation of a clock's hands.

Show children a basic map, and introduce the compass rose (a one-dimensional representation of a compass typically featured in the corner of a map). The compass rose marks both the four directions and the four intermediary directions (northeast, southeast, southwest and northwest). Provide opportunities to practice reading intermediary directions on the map.

Show children a compass and explain that it will always point to the north. Allow children to practice turning their bodies in different directions and moving the compass to various locations, noting which direction the compass points each time.

Practice finding directions other than north. South is the easiest to find, since it's simply the opposite of north. If you want to go south, you just go the opposite of the way the compass is pointing. To find east, go to the right of the direction the compass points. To find west, go to the left of the compass arrow. You can play a "Which Way?" game in which you have children take three steps in one particular direction, then three steps in another direction, and so on, ending in a special predetermined location.

Once children are proficient at reading basic maps and using a simple compass, they can combine the two skills and begin using the compass to get from one location to another. This can be done by creating imaginary treasure hunts or embarking on trips to "mystery destinations" in the car, or through other fun practice games.

One authentic way to practice compass-reading skills is in the car. Have children determine the direction the vehicle is heading at each turn, and also in the context of the trip as a whole. For example, you might ask, "If we have to drive east to get to the school, which way will we drive to get home?" With large groups of children, you may put students in pairs or triads and have them share a compass, completing activities together while you facilitate discussion

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Read more: [How to Teach Children How to Use a Compass | eHow.com](http://www.ehow.com/how_4841689_teach-children-how-use-compass.html#ixzz1xg2eYsFm)  
[http://www.ehow.com/how\\_4841689\\_teach-children-how-use-compass.html#ixzz1xg2eYsFm](http://www.ehow.com/how_4841689_teach-children-how-use-compass.html#ixzz1xg2eYsFm)



**Duke Farms**  
Living Habitats

# Plant Relationships

## Activity Sheet

(Adapted from *Plants and Partners* by the Missouri Botanical Garden)

### Plant and Animal Relationship:

*An interaction between individuals of two different species in which:*

One living organism consumes another = Predation

One individual gains its nutrition at the expense of the other = Parasitism

One individual benefits and the other organism is neither helped nor harmed = Commensalism

Both species receive a benefit = Mutualism

**Complete the Chart using the definitions above:**

Location	Plant/Partner	Effect on Plant	Effect on Partner	Type of Relationship	Effect if one partner disappears
Hay Barn Meadow	Aster/bees				
Hay Barn Meadow	Milkweed/Aphids				
Migration Woods	Acorn/Squirrel				
Migration Woods	Lichen/Tree				
Orchid Range	Pitcher Plant/Insect				

## Plant Relationships Activity Sheet

**Match the definition to the vocabulary word and the vocabulary word to the proper example by drawing a line to each.**

Definition	Vocabulary Term	Example
One individual gains its nutrition at the expense of the other	<b>Mutualism</b>	Lichen growing on the bark of a tree
Both species receive a benefit	<b>Predation</b>	Bee pollinating a flower
One living organism consumes another	<b>Commensalism</b>	Aphid eating the fluids of a milkweed plant
One individual benefits and the other organism is neither helped nor harmed	<b>Parasitism</b>	Pitcher plant consuming insects

**Label the picture with the type of Plant Relationship shown:**




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**Describe any additional examples of Plant Relationships you see while hiking:**

Predation: \_\_\_\_\_

Mutualism: \_\_\_\_\_

Commensalism: \_\_\_\_\_

Parasitism: \_\_\_\_\_

## **Glossary:**

**Acorn** – The hard, dry fruit of oak trees.

**Carnivorous** – Preying on animals

**Commensalism** - An interaction between individuals of two different species in which one individual benefits and the other is neither helped nor harmed

**Ecosystem** – The interacting system of a community of organisms and their non-living environment

**Environment** – The external factors that affect the success of an organism.

**Habitat** – The place where an organism lives

**Lichen** – A symbiotic relationship between an algae and a fungus in which the algae provides food to the fungus through photosynthesis and the fungus protects the algae from the weather.

**Mutualism** – An interaction between individuals of different species which is mutually beneficial to each species.

**Parasitism** – An interaction between individuals of two different species in which one individual gains its nutrition at the expense of the other. Differs from predation in that the parasite is usually smaller than and generally does not kill the host on which it continues to feed.

**Pitcher Plant** - A plant with a deep pitcher-shaped pouch that contains fluid into which insects are attracted and trapped. The plant then absorbs nutrients from their bodies

**Pollination** - The process by which pollen is transferred in the reproduction of plants, thereby enabling fertilization and sexual reproduction

**Predation** – The consumption of one living organism by another

**Squirrel** - An agile tree-dwelling rodent with a bushy tail, typically feeding on nuts and seeds

**Symbiosis** – Occurs when two organisms benefit by living together.