

# Lesson Five:

## PLANT/ANIMAL INTERACTIONS

*This lesson will provide students with an opportunity to examine ways in which plants and animals depend on one another by examining mutualistic symbiosis.*

### Part I. LESSON OVERVIEW

#### A. Learning Objectives

Upon completion of this lesson students will be able to:

- Identify organisms involved in symbiotic relationships by matching cards in the ecosystem partner activity.
- Create a fictitious mutualistic relationship between two organisms by drawing a picture of the partnership.
- Explain the benefits of the fictitious mutualistic relationship by presenting their drawing to the rest of the class.

#### B. Correlation to State and National Standards and Guidelines

[See chart](#)

#### C. Textbook Compatibility

[See chart](#)

#### D. Materials

- Ecosystem partner cards (laminated) – 1 set per group
- Video: *Microcosmos*

#### E. Advance Preparation

To initiate this lesson, facilitators must assemble the EcoTeam Partner Cards ([text](#)) ([images](#)).

Place the text and the corresponding image back to back, cut the page in half and then laminate.

If necessary, communicate with the classroom teacher prior to the lesson about audiovisual equipment to make sure that a TV and VCR will be available.

#### F. Key Vocabulary

**INTERACTION**

A joint activity involving two or more living things

## MUTUALISM

A type of interaction between two living things in which both benefit

## G. References

Alaska Department of Fish and Game. *Alaska's Ecology*, 1995, 1999. Ecosystem Partners, 67-74.

American Forest Foundation. *Project Learning Tree: Environmental Education Activity Guide (Pre K-8)* 5 ed., 1997. Dynamic Duos, 79-82.

## PHASE II: LEARNING CYCLE APPLICATION

### Phase One: Exploration (E)

1. Introduce the lesson and explain the exploration activity.

*The class will be divided into groups of two or three. Each group will receive a set of cards. Your task is to read the back of each card. After you have read all of the cards you must determine a partner, or match for each card. Once you have matched all of the pairs, each one of you will choose one pair that you find most interesting and answer the questions in your journal.*

2. Divide the students into groups of two or three, depending on the class size.
3. Hand out a set of cards to each group.
4. Allow students to explore.
5. Circulate through the class as the students explore. Make sure that students are reading the descriptions that correspond to each card.
6. Remind students that once they have matched all the cards they are to choose one pair of cards and answer the questions in their journals.
7. Collect the sets of cards and ask students to return to their seats.

### Phase Two: Concept Introduction (CI)

1. Discuss the exploration activity with the class. Begin by asking students to explain if they can describe different ways that plants and animals depend on one another.
2. Introduce key vocabulary
3. Define INTERCATION. A joint activity involving two or more living things

4. Define MUTUALISM. A type of interaction between two living things in which both benefit
5. Explain the Dynamic Duo activity to the class.

*In your groups, you are going to create two make-believe species that interact so as to benefit each other. Be creative and have fun. Your species can live anywhere. They might live in water, in the sky, or on the land. Draw a picture of your species and their relationship. Use your imagination and be ready to explain your creation.*

- *What are the names of your two species?*
  - *How do they help each other?*
  - *What might happen to them if they did not have help from each other?*
6. It may help to draw an example of your own creation on the board.
  7. Circulate through the classroom and ask the children to articulate their partnership in order to prepare students for their presentations.
  8. Allow adequate time for the students to develop their Dynamic Duos, then begin presentations. Encourage the children to present their drawings and descriptions to the class by telling each child how great their design is. It is important to remember that some children might be anxious about speaking in front of their peers. It is fine to let these children not present. However, remember to positively reinforce the good work they did and to remind them that if they change their mind and want to share their work with the class, to let you know (Often children gain confidence after they see some of their classmates do a presentation).

### Phase Three: Concept Application (CA)

*EcoTeam Application Lesson and Roots & Shoots Service-Learning Project*, please see corresponding sections of website.

## PART III. BACKGROUND INFORMATION FOR FACILITATOR

### A. General

All organisms are part of a community of other living things. This biological community consists of all species from microbes to large multicellular animals in a given ecosystem. The interactions within and between species play a fascinating and important role in ecology. In this learning cycle, we will take a look at some types of INTERSPECIFIC INTERACTIONS, or those interactions that occur between different species living together within a community. SYMBIOSIS is the term used to describe an exclusive and intimate relationship between two species.

Sometimes people use the word symbiosis to mean a mutually beneficial relationship between species. The more accurate definition of symbiosis is any close relationship between two species. Symbiosis can be divided into three different types of interactions depending on whether or not the relationships have negative, neutral or positive effects on the species involved. The following chart defines the three types of symbiosis: COMMENSALISM, PARASITISM, and MUTUALISM.

Types of Symbiosis

Commensalism (+, 0)	One species benefits, the other is unaffected.
Parasitism (+, --)	One species benefits, the other is harmed
Mutualism (+, +)	Both species benefit

In a commensalistic relationship, one partner benefits without significant effects, either negative or positive, for the other species in the partnership. Both partners benefit from a mutualistic relationship. In a parasitic relationship, one partner, the PARASITE, benefits by harming the HOST species. Again, the focus of this learning cycle is Mutualism.

### **Commensalism**

Commensalism is a type of relationship in which one species benefits from the association and the other is unaffected. An example of such a relationship exists between humans and microscopic mites. Many humans have microscopic mites living in their hair follicles, such as eyebrows. These mites scavenge on oils and other secretions. They do not harm or hurt us in any way. In fact, most humans aren't even aware of them. The mites on the other hand, benefit from the association as humans provide a place for the mites to live and feed.

### **Parasitism**

Parasitism is the type of symbiosis in which one species causes harm by living in or on another species. Many examples of parasitism involve microscopic organisms or invertebrates. Many organisms are parasitic for only a part of their life cycle. The following are some dramatic examples of parasitic relationships:

- Historically, human beings have carried parasites such as fleas, lice, intestinal worms, and ticks. Modern preventative medicine and improved health practices have limited the presence of such parasites in most developed countries.
- Brown-headed cowbirds lay their eggs in the nests of other small birds. Other birds will mistake these eggs for their own and take care of them. They will continue to do so even after the eggs hatch. Eventually cowbird chicks will kill other chicks in the nest so they do not have to compete for food. As forests become increasingly fragmented, cowbird parasitism contributes to the decline of many songbirds due to the “edge-effect.” The brown-headed cowbird is a species that thrives in broken, fragmented forest. In the past, cowbirds were relatively scarce birds in eastern forests. With increased deforestation, these SOCIAL PARASITES continue to spread and multiply.
- Some stream mussels in the Southern Appalachian region spew their eggs into fish gills. Sometimes they attract the fish with false lures. The larvae attach themselves to the gills of the fish and suck their blood.

### **Mutualism**

Mutualism is a relationship in which two species benefit from one another. In contrast to commensal association, mutualistic relationships often lead to CO-ADAPTATIONS. The following are examples of co-evolved mutualistic relationships:

- Nitrogen fixation by bacteria in the root nodules of legumes
- The digesting bacteria of *ruminant* mammals
- Interactions between unicellular algae in the tissues of coral
- The relationship between bull horn acacia and the ants that protect these trees from herbivorous insects
- Ruby-throated hummingbirds pollinate many species of flowers in North America. In fact, many of these flowers appear to be primarily adapted to pollination by this species. Ruby-throated hummingbirds are most attracted to red blooms. The cardinal flower is a

species that is strongly influenced by the foraging patterns of ruby-throated hummingbirds. The bird relies on the cardinal flower for nectar. During nectar foraging pollen from the cardinal flower is deposited on the head of the hummingbird and transferred to other plants.

The most specialized forms of Mutualism are those in which two species absolutely depend on the other partner. These are called OBLIGATE MUTUALISM. Lichens are an excellent example of obligate Mutualism. Lichens are fungus and algae that cannot live independently. In lichen symbiosis, cyanobacteria (“blue-green algae”) photosynthesize and provide nutrients to the partnership. In turn, the fungus provides the algae with an appropriate physical environment for growth.

## **B. Humans and Symbiosis**

Symbiosis relationships between animals and plants are often crucial to their survivorship. In many cases partnerships between the two provide resources or services not otherwise available to solitary species. For humans, too, our close relationships with other species are essential. Certainly the most pervasive and important relationship exists between us and the animals and plants that we have domesticated.

Honeybees not only provide honey, but also essential pollination serves for most of our food crops. Modern crop production would be unrecognizable without honeybees. The total economic gain annually in the US from honeybees in agricultural production exceeds the total cost of all crop damages from other insect pests. Humans need only provide housing and wax to “pay” for the bees’ services.

## **C. Environmental Citizenship**

Given our dependence on our agricultural symbionts, it’s not surprising that many debates now occur on ethical issues concerning our relationship to these species. The debates range from the humane treatment of animals to genetic alteration of food plants. One broad concern with modern agriculture is our dependence on a very small variety of plants, which themselves lack genetic variability. A recent development to fight this trend is SEED BANKS that are created to preserve the natural variability of “heirloom” varieties.